



# Automotive power selection guide 2019

Ultimate power – perfect control



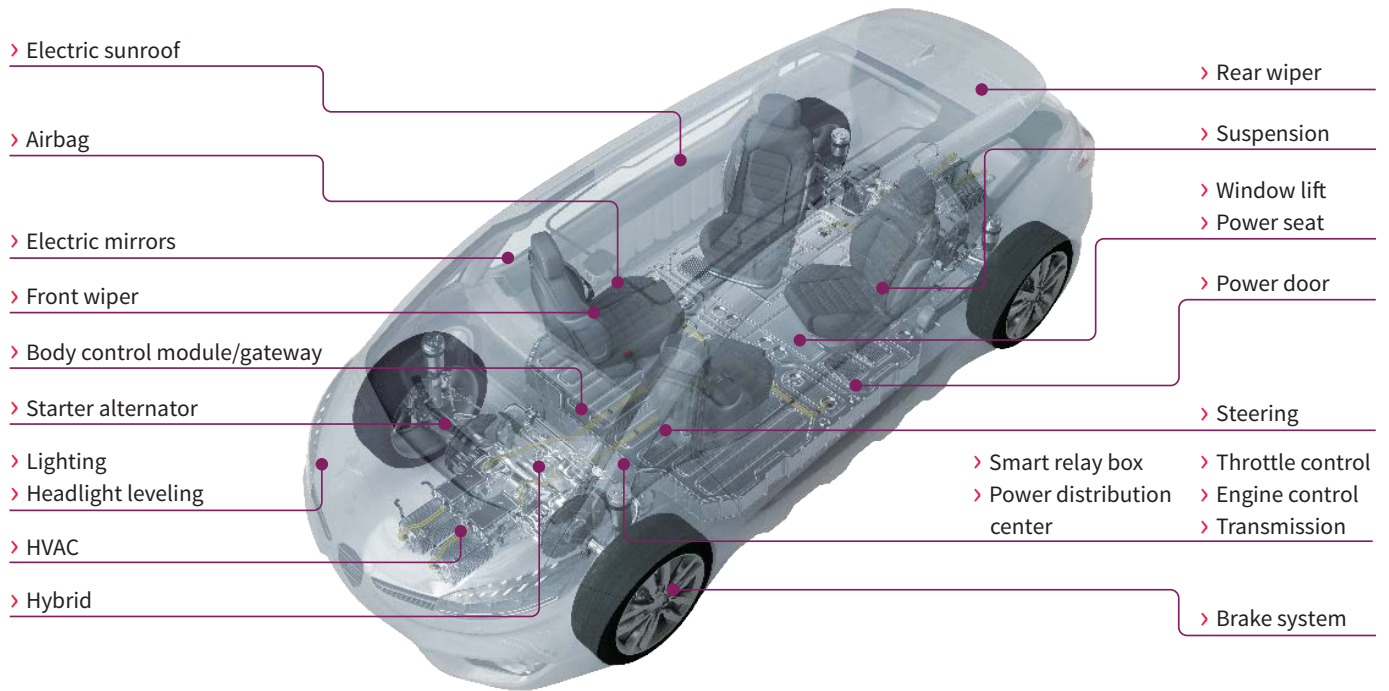
## The ultimate power to control your applications – including automotive, transportation, industrial, lighting or motor drive.

For a comprehensive and reliable portfolio of products for automotive and other applications, look no further than the product range from Infineon. We have used our 40 years of experience in developing and producing products to meet the demands of the automotive market. With our innovative technologies we have designed and produced a large number of power products that meet the requirements of the automotive industry as well as the transportation, lighting and motor drive industries.

Our commitment to quality is demonstrated through our focus on automotive excellence with the most rigorous zero-defect program in the industry.

This selection guide provides an overview of our ICs and their packages, which are automotive-qualified (AEC-Q100 or AEC-Q101) and available for your current and future electronic system designs.

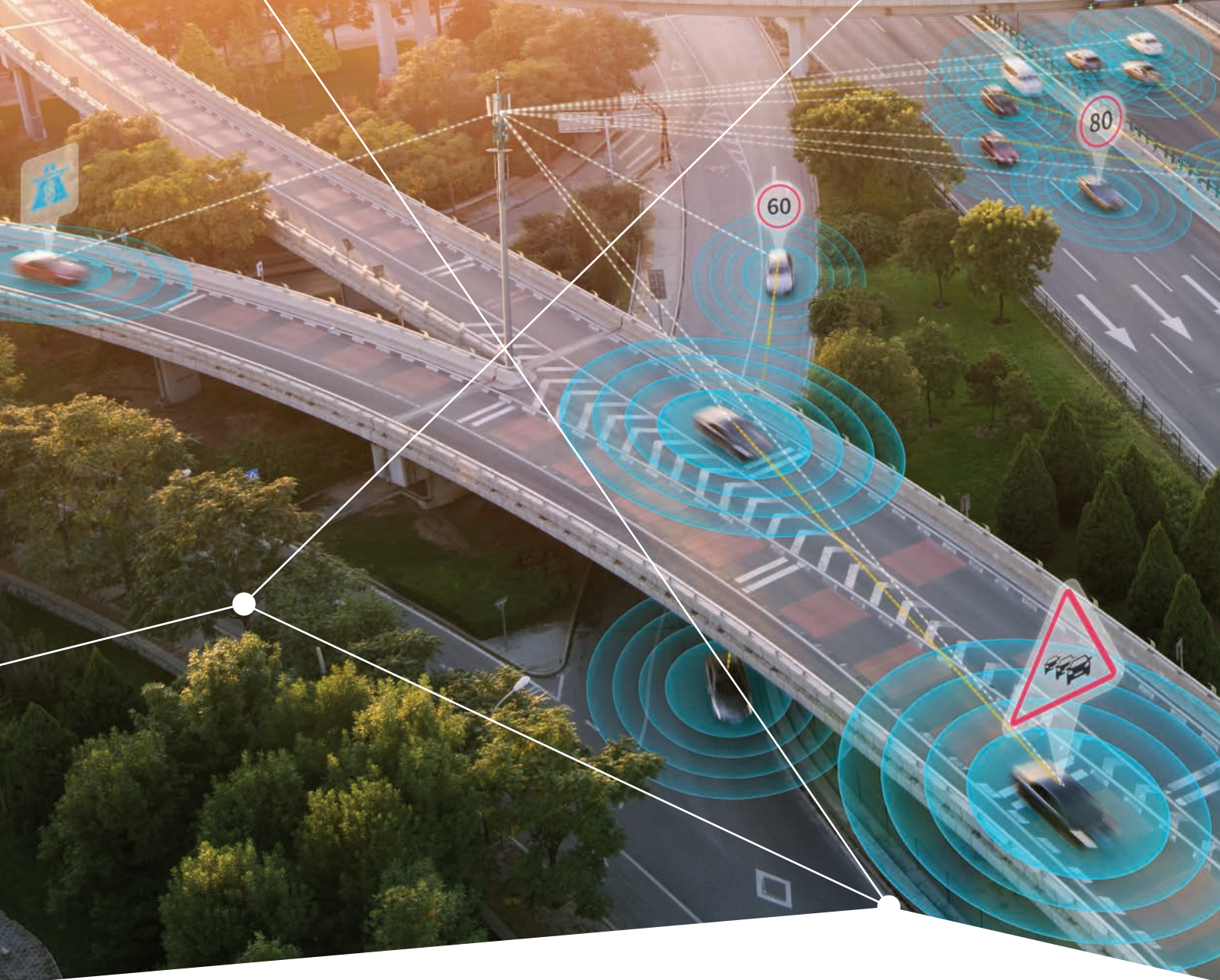
# Automotive applications



## Automotive power components used in other applications







# We shape the future of mobility

With microelectronics enabling clean, safe, smart cars

For leading solutions in automotive electronics from the pioneer in the industry, turn to Infineon Technologies. Choose our semiconductors for your body, powertrain, safety, and hybrid and electric vehicle applications and profit from products resulting from nearly 40 years of experience in automotive applications and standards. Our commitment to innovation and high quality means that you can count on us to successfully drive your applications into the tomorrow and beyond.

- › Car IT security and connectivity
- › Hybrid and electric powertrain
- › Safety and ADAS
- › Body and convenience
- › Powertrain

[www.infineon.com/automotive](http://www.infineon.com/automotive)





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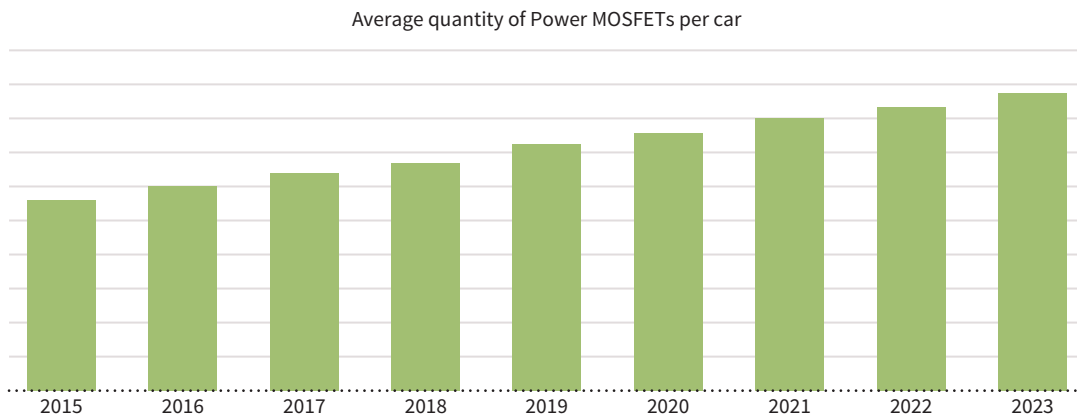
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\*<sup>1</sup>) ARM and Cortex are trademarks of ARM Limited, UK

# Automotive MOSFETs contribute to your success

We offer high quality beyond AEC-Q101

The number of power MOSFETs per car increases continuously as more features are embedded in every new car sold worldwide. The amount of MOSFETs becomes even higher in electric high-end cars where up to 400 MOSFETs can be found in a single car. For this reason it is becoming more and more important to use high quality Automotive MOSFETs.



All automotive-qualified MOSFETs from Infineon meet and even exceed the AEC-Q101 standard that in order to achieve more robust products and a very low dpm rate.

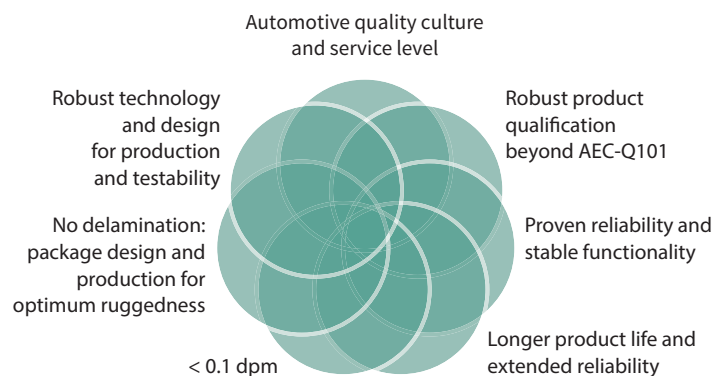
Why is AEC-Q101 not enough for us?

- › It may not cover “untypical or stringent” mission profiles
- › It does not provide any indication of the stability of the manufacturing process over the years
- › It doesn’t prove any dpm below 10.000

How do we achieve the best quality you can get on the market?

- › Robustness
  - Strong application know-how, good requirement-capturing for product, technology and process roadmaps
  - Dedicated automotive design goals based on 40 years of experience in automotive applications
  - Stringent product monitoring/process controls
  - Enhanced test coverage
- › Enhanced testing and qualification
  - More than just the datasheet parameters
  - Qualification beyond AEC-Q101
  - Usage of PAT (Part Average Testing) in front-end and back-end for power MOSFET

What have we achieved so far?

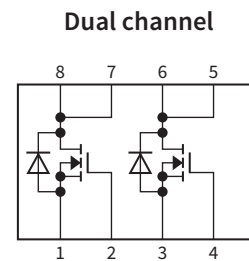
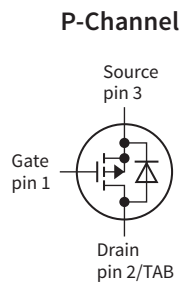
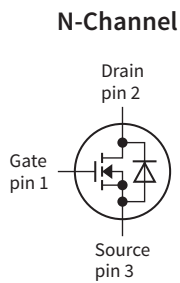




# OptiMOS™ Automotive MOSFETs

Infineon's automotive MOSFET portfolio offers benchmark quality, wide voltage range and diversified package

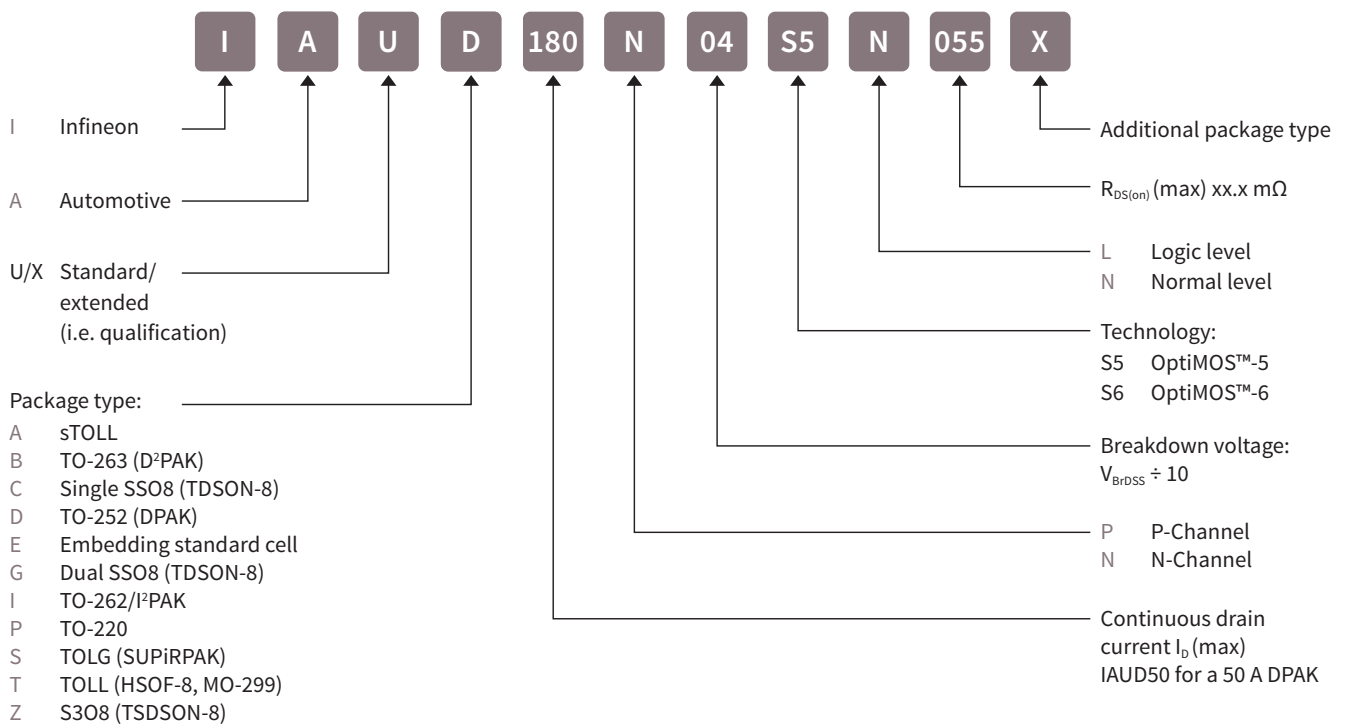
- › Best-in-class  $R_{DS(on)}$  performance for increased system efficiency
- › Lowest switching and conduction power losses for increased thermal system reliability
- › Benchmark for quality and reliability
- › Wide voltage range from 24 to 300 V for N-Channel FET, and from 20 to 150 V for P-Channel FET
- › Robust green package for easy process handling
- › Diversified package portfolio caters to customers' needs for:
  - Package size minimization (down to 11 mm<sup>2</sup> in S308)
  - High current capability (up to 300 A in TOLL)



Polarity	Voltage class [V]	Trench MOSFET						Planar MOSFET		
		OptiMOS™-5	OptiMOS™-T2	OptiMOS™-T	Gen12.7 ex-IR MOSFETs	Gen10.7 ex-IR MOSFETs	Gen10.2 ex-IR MOSFETs	OptiMOS™	Gen7 ex-IR MOSFETs	Gen5 ex-IR MOSFETs
N-Channel	24						•			
N-Channel	30		•				•	•	•	•
N-Channel	40	•	•	•	•	•	•	•	•	
N-Channel	55						•	•	•	•
N-Channel	60		•			•	•	•	•	
N-Channel	75	•	•			•	•	•	•	
N-Channel	80	•	•			•	•			
N-Channel	100	•	•	•		•	•			•
N-Channel	120		•							
N-Channel	150					•				•
N-Channel	200					•				
N-Channel	250			•		•				
N-Channel	300					•				
P-Channel	20									•
P-Channel	30		•							•
P-Channel	40		•							
P-Channel	55									•
P-Channel	100									•
P-Channel	150									•
Dual N-Channel	2 x 30									•
Dual N-Channel	2 x 40		•		•					
Dual N-Channel	2 x 50									•
Dual N-Channel	2 x 55						•			•
Dual N-Channel	2 x 60		•							
Dual N-Channel	2 x 100		•							
Dual P-Channel	2 x 20									•
Dual P-Channel	2 x 30									•
Dual P-Channel	2 x 55									•
Dual N+P Channel	2 x 30									•
Dual N+P Channel	2 x 55									•

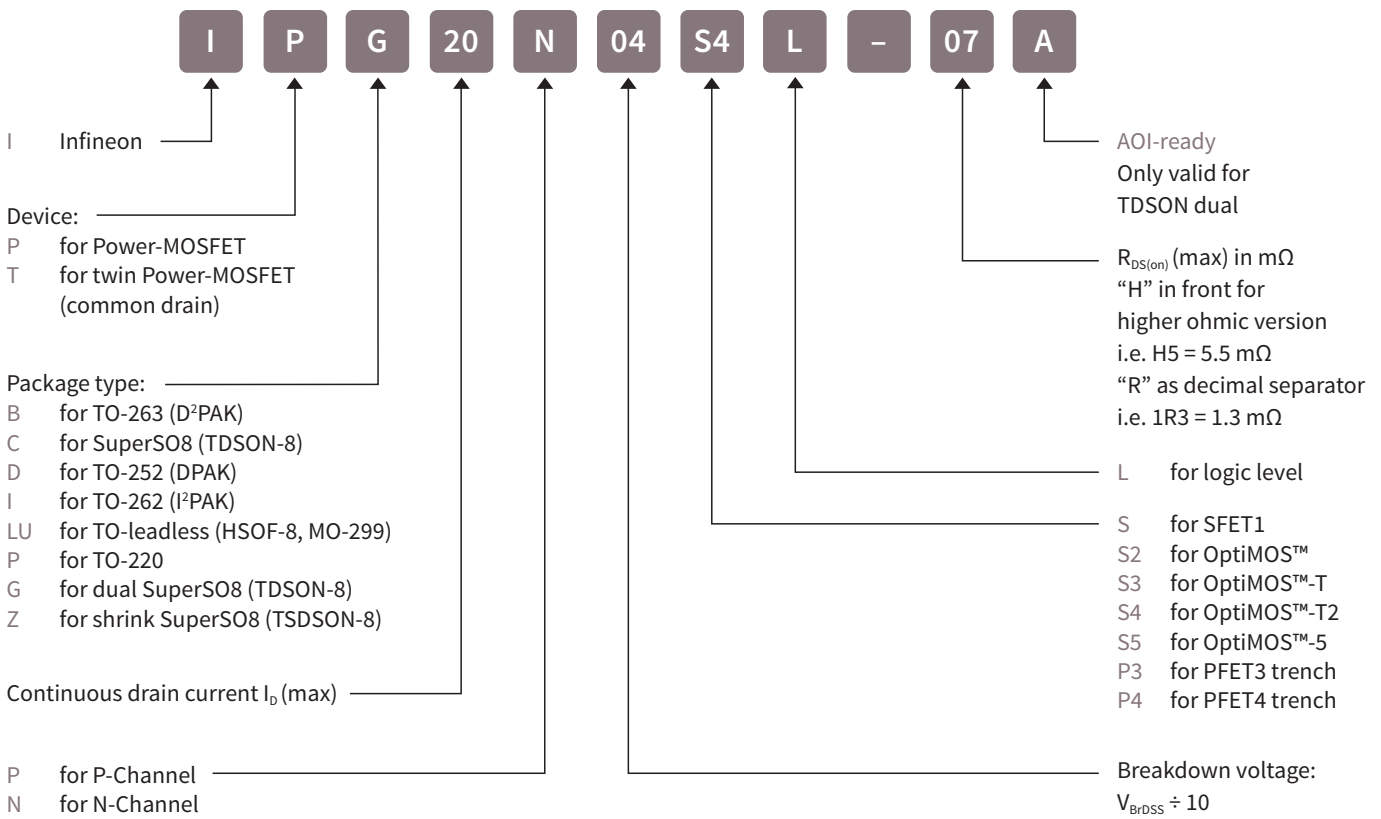


## Automotive MOSFET naming system for new products

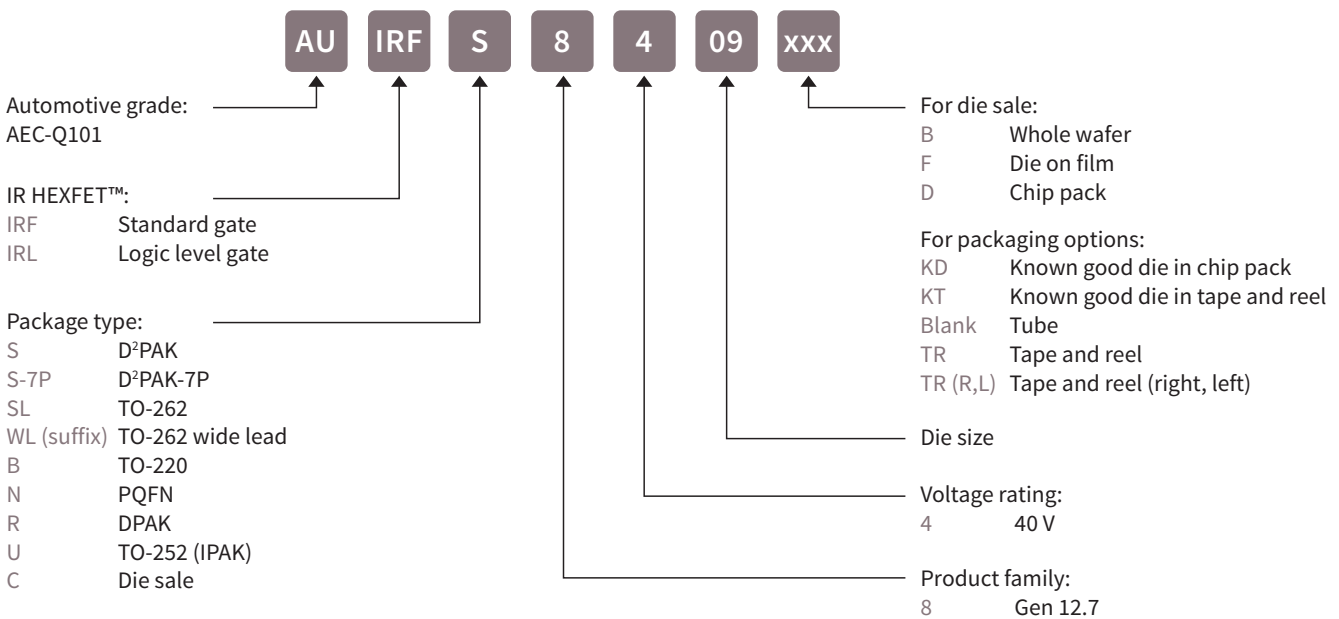




## Infineon automotive MOSFET naming system



## Former IRF COOLiRFET™ naming system



# Automotive N-Channel MOSFETs

## 24 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF1324S-7P	Gen 10.2	1.00	240	0.50	2.00 ... 4.00	180	Normal	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRF1324WL	Gen 10.2	1.30	240	0.50	2.00 ... 4.00	120	Normal	TO-262-3 WideLead
AUIRF1324	Gen 10.2	1.50	195	0.50	2.00 ... 4.00	160	Normal	TO-220-3
AUIRFP2602	Gen 10.2	1.60	180	0.40	2.00 ... 4.00	260	Normal	TO-247-3
AUIRF1324S	Gen 10.2	1.65	195	0.50	2.00 ... 4.00	160	Normal	TO-263-3 (D <sup>2</sup> PAK)

## 30 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB240N03S4L-R8	OptiMOS™-T2	0.76	240	0.50	1.00 ... 2.20	290	Logic	TO-263-7-3
IPB240N03S4L-R9	OptiMOS™-T2	0.92	240	0.70	1.00 ... 2.20	230	Logic	TO-263-7-3
IPB180N03S4L-H0	OptiMOS™-T2	0.95	180	0.60	1.00 ... 2.20	230	Logic	TO-263-7-3
IPB180N03S4L-01	OptiMOS™-T2	1.05	180	0.80	1.00 ... 2.20	187	Logic	TO-263-7-3
IPD90N03S4L-02	OptiMOS™-T2	2.20	90	1.10	1.00 ... 2.20	110	Logic	TO-252-3 (DPAK)
IPB80N03S4L-02	OptiMOS™-T2	2.40	80	1.10	1.00 ... 2.20	110	Logic	TO-263-3-2
AUIRF2903ZL	Gen 10.2	2.40	160	0.65	2.00 ... 4.00	160	Normal	TO-262-3
AUIRF2903ZS	Gen 10.2	2.40	160	0.65	2.00 ... 4.00	160	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPI80N03S4L-03	OptiMOS™-T2	2.70	80	1.10	1.00 ... 2.20	110	Logic	TO-262-3
IPP80N03S4L-03	OptiMOS™-T2	2.70	80	1.10	1.00 ... 2.20	110	Logic	TO-220-3
IPB120N03S4L-03	OptiMOS™-T2	3.00	120	1.90	1.00 ... 2.20	55	Logic	TO-263-3-2
IPD90N03S4L-03	OptiMOS™-T2	3.30	90	1.60	1.00 ... 2.20	60	Logic	TO-252-3 (DPAK)
IPB80N03S4L-03	OptiMOS™-T2	3.40	80	1.60	1.00 ... 2.20	60	Logic	TO-263-3-2
IPD70N03S4L-04	OptiMOS™-T2	4.30	70	2.20	1.00 ... 2.20	37	Logic	TO-252-3 (DPAK)
IPD50N03S4L-06	OptiMOS™-T2	5.50	50	2.70	1.00 ... 2.20	24	Logic	TO-252-3 (DPAK)
IPD40N03S4L-08	OptiMOS™-T2	8.00	40	3.60	1.00 ... 2.20	15	Logic	TO-252-3 (DPAK)
IPD30N03S4L-09	OptiMOS™-T2	9.00	30	3.60	1.00 ... 2.20	15	Logic	TO-252-3 (DPAK)
IPD30N03S4L-14	OptiMOS™-T2	13.60	30	4.90	1.00 ... 2.20	11	Logic	TO-252-3 (DPAK)
IPB22N03S4L-15	OptiMOS™-T2	14.60	22	4.90	1.00 ... 2.20	11	Logic	TO-263-3-2

## 40 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF8739L2	Gen 12.7	0.60	375	0.44	2.20 ... 3.90	375.00	Normal	DirectFET™2 L8
AUIRFS8409-7P	Gen 12.7	0.69	360	0.40	2.20 ... 3.90	305.00	Normal	TO-263-7 (D <sup>2</sup> PAK 7-leg)
NEW IAUS300N04S4N007	OptiMOS™-T2	0.74	300	0.40	2.00 ... 4.00	263.00	Normal	HSOG-8
AUIRSL8409-7P	Gen 12.7	0.75	240	0.40	1.00 ... 2.40	177.00	Logic	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRFS8409-7P	Gen 12.7	0.75	240	0.40	2.20 ... 3.90	305.00	Normal	TO-263-7 (D <sup>2</sup> PAK 7-leg)
IPLU300N04S4-R8	OptiMOS™-T2	0.77	300	0.35	2.00 ... 4.00	221.00	Normal	HSOF-8
IPB240N04S4-R9	OptiMOS™-T2	0.87	240	0.50	2.00 ... 4.00	220.00	Normal	TO-263-7-3
IPB180N04S4-00	OptiMOS™-T2	0.98	180	0.50	2.00 ... 4.00	220.00	Normal	TO-263-7-3
AUIRF7739L2	Gen 10.7	1.00	270	1.20	2.00 ... 4.00	220.00	Normal	DirectFET™2 L8
AUIRFS8408-7P	Gen 12.7	1.00	240	0.51	2.20 ... 3.90	210.00	Normal	TO-263-7-3
NEW IAUA200N04S5N010	OptiMOS™-5	1.00	200	0.90	2.20 ... 3.40	99.00	Normal	HSOF-5
IPB240N04S4-1R0	OptiMOS™-T2	1.00	240	0.65	2.00 ... 4.00	170.00	Normal	TO-263-7-3

1) See packages on page 142 to 144



## 40 V (Trench) (cont'd)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB180N04S4L-H0	OptiMOS™-T2	1.00	180	0.60	1.20 ... 2.20	239.00	Logic	TO-263-7-3
IPB180N04S4-H0	OptiMOS™-T2	1.10	180	0.60	2.00 ... 4.00	173.00	Normal	TO-263-7-3
IPC100N04S5L-1R1	OptiMOS™-5	1.10	100	1.00	1.20 ... 2.00	105.00	Logic	TDSON-8-34 SuperSO8 single
IPLU300N04S4-1R1	OptiMOS™-T2	1.15	300	0.50	2.00 ... 4.00	116.00	Normal	HSOF-8
IPB180N04S4L-01	OptiMOS™-T2	1.20	180	0.80	1.20 ... 2.20	188.00	Logic	TO-263-7-3
AUIRFS8409	Gen 12.7	1.20	195	0.40	2.20 ... 3.90	300.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFSL8409	Gen 12.7	1.20	195	0.40	2.20 ... 3.90	300.00	Normal	TO-262-3
IPC100N04S5-1R2	OptiMOS™-5	1.20	100	1.00	2.20 ... 3.40	99.00	Normal	TDSON-8-34 SuperSO8 single
IPB180N04S4-01	OptiMOS™-T2	1.30	180	0.80	2.00 ... 4.00	135.00	Normal	TO-263-7-3
AUIRFB8409	Gen 12.7	1.30	195	0.40	2.20 ... 3.90	300.00	Normal	TO-220-3
AUIRFS8407-7P	Gen 12.7	1.30	240	0.65	2.20 ... 3.90	150.00	Normal	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRF3004WL	Gen 10.7	1.40	240	0.40	2.00 ... 4.00	140.00	Normal	TO-262-3 WideLead
AUIRLS3034-7P	Gen 10.7	1.40	240	0.40	1.00 ... 2.50	120.00	Logic	TO-263-7 (D <sup>2</sup> PAK 7-leg)
IPB160N04S4L-H1	OptiMOS™-T2	1.50	160	0.90	1.20 ... 2.20	146.00	Logic	TO-263-7-3
IPI120N04S4-01	OptiMOS™-T2	1.50	120	0.80	2.00 ... 4.00	135.00	Normal	TO-262-3
IPB120N04S4-01	OptiMOS™-T2	1.50	120	0.80	2.00 ... 4.00	135.00	Normal	TO-263-3-2
IPC100N04S5L-1R5	OptiMOS™-5	1.50	100	1.30	1.20 ... 2.00	70.00	Logic	TDSON-8-34 SuperSO8 single
IAUS180N04S4N015	OptiMOS™-T2	1.50	180	0.90	2.00 ... 4.00	103.00	Normal	HSOG-8
IPB160N04S4-H1	OptiMOS™-T2	1.60	160	0.90	2.00 ... 4.00	105.00	Normal	TO-263-7-3
AUIRF7738L2	Gen 10.7	1.60	184	1.60	2.00 ... 4.00	129.00	Normal	DirectFET™2 L6
IPLU250N04S4-1R7	OptiMOS™-T2	1.70	250	0.80	2.00 ... 4.00	76.00	Normal	HSOF-8
IPB120N04S4L-02	OptiMOS™-T2	1.70	120	0.95	1.20 ... 2.20	143.00	Logic	TO-263-3-2
AUIRFP4004	Gen 10.2	1.70	195	0.40	2.00 ... 4.00	220.00	Normal	TO-247-3
IPC100N04S5-1R7	OptiMOS™-5	1.70	100	1.30	2.20 ... 3.40	62.00	Normal	TDSON-8-34 SuperSO8 single
IPB120N04S4-02	OptiMOS™-T2	1.80	120	0.95	2.00 ... 4.00	103.00	Normal	TO-263-3-2
AUIRFS8407	Gen 12.7	1.80	195	0.65	2.20 ... 3.90	150.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFSL8407	Gen 12.7	1.80	195	0.65	2.20 ... 3.90	150.00	Normal	TO-262-3
IPP120N04S4-02	OptiMOS™-T2	1.80	120	0.95	2.00 ... 4.00	103.00	Normal	TO-220-3
AUIRF7737L2	Gen 10.7	1.90	156	1.80	2.00 ... 4.00	89.00	Normal	DirectFET™2 L6
AUIRF8736M2	Gen 12.7	1.90	137	2.40	2.20 ... 3.90	136.00	Normal	DirectFET™2 M4
IPD100N04S4L-02	OptiMOS™-T2	1.90	100	1.00	1.20 ... 2.20	126.00	Logic	TO-252-3 (DPAK)
IPC100N04S5L-1R9	OptiMOS™-5	1.90	100	1.50	1.20 ... 2.00	61.00	Logic	TDSON-8-34 SuperSO8 single
IPC100N04S5-1R9	OptiMOS™-5	1.90	100	1.50	2.20 ... 3.40	50.00	Normal	TDSON-8-34 SuperSO8 single
AUIRFR8405	Gen 12.7	1.98	100	0.92	2.20 ... 3.90	103.00	Normal	TO-252-3 (DPAK)
AUIRFU8405	Gen 12.7	1.98	100	0.92	2.20 ... 3.90	103.00	Normal	TO-251-3 (IPAK)
IPD100N04S4-02	OptiMOS™-T2	2.00	100	1.00	2.00 ... 4.00	91.00	Normal	TO-252-3 (DPAK)
AUIRFB8407	Gen 12.7	2.00	195	0.65	2.20 ... 3.90	150.00	Normal	TO-220-3
IPB90N04S4-02	OptiMOS™-T2	2.10	90	1.00	2.00 ... 4.00	91.00	Normal	TO-263-3-2
IPI120N04S4-02	OptiMOS™-T2	2.10	120	0.95	2.00 ... 4.00	103.00	Normal	TO-262-3
AUIRFSL8405	Gen 12.7	2.30	120	0.92	2.20 ... 3.90	107.00	Normal	TO-262-3
IPD90N04S4-02	OptiMOS™-T2	2.40	90	1.00	2.00 ... 4.00	91.00	Normal	TO-252-3 (DPAK)
IPB100N04S4-H2	OptiMOS™-T2	2.40	100	1.30	2.00 ... 4.00	70.00	Normal	TO-263-3-2
IPI90N04S4-02	OptiMOS™-T2	2.50	90	1.00	2.00 ... 4.00	91.00	Normal	TO-262-3
AUIRFB8405	Gen 12.7	2.50	120	0.92	2.20 ... 3.90	107.00	Normal	TO-220-3
IPC100N04S5L-2R6	OptiMOS™-5	2.60	100	2.00	1.20 ... 2.00	41.00	Logic	TDSON-8-33 SuperSO8 single
IPI100N04S4-H2	OptiMOS™-T2	2.70	100	1.30	2.00 ... 4.00	70.00	Normal	TO-262-3
IPP100N04S4-H2	OptiMOS™-T2	2.70	100	1.30	2.00 ... 4.00	70.00	Normal	TO-220-3
IPC100N04S5-2R8	OptiMOS™-5	2.80	100	2.00	2.20 ... 3.40	34.00	Normal	TDSON-8-33 SuperSO8 single
IPZ40N04S5L-2R8	OptiMOS™-5	2.80	40	2.10	1.20 ... 2.00	39.00	Logic	TSDSO8-8
AUIRF7736M2	Gen 10.7	3.00	108	2.40	2.00 ... 4.00	72.00	Normal	DirectFET™2 M4
AUIRL7736M2	Gen 10.7	3.00	112	2.40	1.00 ... 2.50	52.00	Logic	DirectFET™2 M4

1) See packages on page 142 to 144

# Automotive N-Channel MOSFETs

40 V (Trench) (cont'd)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_g$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPZ40N04S5-3R1	OptiMOS™-5	3.10	40	2.10	2.20 ... 3.40	31.00	Normal	TSDSON-8
AUIRFR8403	Gen 12.7	3.10	100	1.52	2.20 ... 3.90	66.00	Normal	TO-252-3 (DPAK)
AUIRFU8403	Gen 12.7	3.10	100	1.52	2.20 ... 3.90	66.00	Normal	TO-251-3 (IPAK)
AUIRL1404Z	Gen 10.2	3.10	160	0.75	1.40 ... 2.70	75.00	Logic	TO-220-3
AUIRL1404ZL	Gen 10.2	3.10	160	0.75	1.40 ... 2.70	75.00	Logic	TO-262-3
AUIRL1404ZS	Gen 10.2	3.10	160	0.75	1.40 ... 2.70	75.00	Logic	TO-263-3 (D <sup>2</sup> PAK)
IPD90N04S4-03	OptiMOS™-T2	3.20	90	1.60	2.00 ... 4.00	51.00	Normal	TO-252-3 (DPAK)
IPC90N04S5L-3R3	OptiMOS™-5	3.30	90	2.40	1.20 ... 2.00	30.00	Logic	TDSON-8-33 SuperSO8 single
IPB80N04S4-03	OptiMOS™-T2	3.30	80	1.60	2.00 ... 4.00	51.00	Normal	TO-263-3-2
AUIRFS8403	Gen 12.7	3.30	100	1.52	2.20 ... 3.90	62.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFSL8403	Gen 12.7	3.30	100	1.52	2.20 ... 3.90	62.00	Normal	TO-262-3
IPC90N04S5-3R6	OptiMOS™-5	3.60	90	2.40	2.20 ... 3.40	24.50	Normal	TDSON-8-33 SuperSO8 single
IPB120N04S4-04	OptiMOS™-T2	3.60	120	1.90	2.00 ... 4.00	42.00	Normal	TO-263-3-2
IPI80N04S4-03	OptiMOS™-T2	3.70	80	1.60	2.00 ... 4.00	51.00	Normal	TO-262-3
IPP80N04S4-03	OptiMOS™-T2	3.70	80	1.60	2.00 ... 4.00	51.00	Normal	TO-220-3
AUIRF1404Z	Gen 10.2	3.70	160	0.75	2.00 ... 4.00	100.00	Normal	TO-220-3
AUIRF1404ZL	Gen 10.2	3.70	160	0.75	2.00 ... 4.00	100.00	Normal	TO-262-3
AUIRF1404ZS	Gen 10.2	3.70	160	0.75	2.00 ... 4.00	100.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPD90N04S4L-04	OptiMOS™-T2	3.80	90	2.10	1.20 ... 2.00	46.00	Logic	TO-252-3 (DPAK)
IPB80N04S4L-04	OptiMOS™-T2	4.00	80	2.10	1.20 ... 2.00	46.00	Logic	TO-263-3-2
IPD90N04S4-04	OptiMOS™-T2	4.10	90	2.10	2.00 ... 4.00	33.00	Normal	TO-252-3 (DPAK)
IPC70N04S5L-4R2	OptiMOS™-5	4.20	70	3.00	1.20 ... 2.00	22.00	Logic	TDSON-8-33 SuperSO8 single
IPB80N04S4-04	OptiMOS™-T2	4.20	80	2.10	2.00 ... 4.00	33.00	Normal	TO-263-3-2
AUIRFR8401	Gen 12.7	4.25	100	1.90	2.20 ... 3.90	42.00	Normal	TO-252-3 (DPAK)
AUIRFU8401	Gen 12.7	4.25	100	1.90	2.20 ... 3.90	42.00	Normal	TO-251-3 (IPAK)
IPI80N04S4L-04	OptiMOS™-T2	4.30	80	2.10	1.20 ... 2.00	46.00	Logic	TO-262-3
IPP80N04S4L-04	OptiMOS™-T2	4.30	80	2.10	1.20 ... 2.00	46.00	Logic	TO-220-3
IPC70N04S5-4R6	OptiMOS™-5	4.60	70	3.00	2.20 ... 3.40	18.20	Normal	TDSON-8-33 SuperSO8 single
IPI80N04S4-04	OptiMOS™-T2	4.60	80	2.10	2.00 ... 4.00	33.00	Normal	TO-262-3
IPP80N04S4-04	OptiMOS™-T2	4.60	80	2.10	2.00 ... 4.00	33.00	Normal	TO-220-3
IPZ40N04S5L-4R8	OptiMOS™-5	4.80	40	3.50	1.20 ... 2.00	22.00	Logic	TSDSON-8
AUIRF7734M2	Gen 10.7	4.90	72	3.30	2.00 ... 4.00	48.00	Normal	DirectFET™2 M2
IPD90N04S4-05	OptiMOS™-T2	5.20	90	2.30	2.00 ... 4.00	33.00	Normal	TO-252-3 (DPAK)
IPZ40N04S5-5R4	OptiMOS™-5	5.40	40	3.50	2.00 ... 3.40	17.00	Normal	TSDSON-8
IPC50N04S5L-5R5	OptiMOS™-5	5.50	50	3.60	1.20 ... 2.00	17.00	Logic	TDSON-8-33 SuperSO8 single
IPC50N04S5-5R8	OptiMOS™-5	5.80	50	3.60	2.20 ... 3.40	13.00	Normal	TDSON-8-33 SuperSO8 single
AUIRFN8459	Gen 12.7	2 x 5.9	50	3.00	2.20 ... 3.90	40.00	Normal	PQFN 5x6 dual
IPD75N04S4-06	OptiMOS™-T2	5.90	75	2.60	2.00 ... 4.00	24.50	Normal	TO-252-3 (DPAK)
IPB70N04S4-06	OptiMOS™-T2	6.20	70	2.60	2.00 ... 4.00	24.50	Normal	TO-263-3-2
IPI70N04S4-06	OptiMOS™-T2	6.50	70	2.60	2.00 ... 4.00	24.50	Normal	TO-262-3
IPP70N04S4-06	OptiMOS™-T2	6.50	70	2.60	2.00 ... 4.00	24.50	Normal	TO-220-3
AUIRL7732S2	Gen 10.7	6.60	58	3.50	1.00 ... 2.50	24.00	Logic	DirectFET™2 SC
AUIRF7732S2	Gen 10.7	6.95	55	3.70	2.00 ... 4.00	30.00	Normal	DirectFET™2 SC
IPP80N06S4-07	OptiMOS™-T2	7.10	80	1.90	2.00 ... 4.00	43.00	Normal	TO-220-3
IPG20N04S4L-07	OptiMOS™-T2	2 x 7.2	20	2.30	1.20 ... 2.20	39.00	Logic	TDSON-8-10 SuperSO8 dual
IPG20N04S4L-07A	OptiMOS™-T2	2 x 7.2	20	2.30	1.20 ... 2.20	39.00	Logic	TDSON-8-10 SuperSO8 dual
ITD50N04S4L-07	OptiMOS™-T2	7.20	50	3.20	1.20 ... 2.20	25.00	Logic	TO-252-5 (DPAK 5-leg)
IPD50N04S4L-08	OptiMOS™-T2	7.30	50	3.30	1.20 ... 2.00	23.00	Logic	TO-252-3 (DPAK)
IPZ40N04S5L-7R4	OptiMOS™-5	7.40	40	4.40	1.20 ... 2.00	13.00	Logic	TSDSON-8
IPG20N04S4-08A	OptiMOS™-T2	2 x 7.5	20	2.30	2.00 ... 4.00	28.00	Normal	TDSON-8-10 SuperSO8 dual
IPI45N04S4L-08	OptiMOS™-T2	7.60	45	3.30	1.20 ... 2.00	23.00	Logic	TO-262-3
IPP45N04S4L-08	OptiMOS™-T2	7.60	45	3.30	1.20 ... 2.00	23.00	Logic	TO-220-3
IPG20N04S4-08	OptiMOS™-T2	2 x 7.6	20	2.30	2.00 ... 4.00	28.00	Normal	TDSON-8-10 SuperSO8 dual
IPD50N04S4-08	OptiMOS™-T2	7.90	50	3.30	2.00 ... 4.00	17.20	Normal	TO-252-3 (DPAK)
IPP45N06S4L-08	OptiMOS™-T2	7.90	45	2.10	1.20 ... 2.20	49.00	Logic	TO-220-3
IPG20N04S4L-08A	OptiMOS™-T2	2 x 8.1	20	2.80	1.20 ... 2.20	30.00	Logic	TDSON-8-10 SuperSO8 dual
IPG20N04S4L-08	OptiMOS™-T2	2 x 8.2	20	2.80	1.20 ... 2.20	30.00	Logic	TDSON-8-10 SuperSO8 dual

1) See packages on page 142 to 144



## 40 V (Trench) (cont'd)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPZ40N04S5-8R4	OptiMOS™-5	8.40	40	4.40	2.20 ... 3.40	10.30	Normal	TSDSON-8
IPG20N04S4-09	OptiMOS™-T2	2 x 8.6	20	2.80	2.00 ... 4.00	21.70	Normal	TDSO8-8-10 SuperSO8 dual
IPD50N04S4-10	OptiMOS™-T2	9.30	50	3.70	2.00 ... 4.00	14.00	Normal	TO-252-3 (DPAK)
AUIRFN8458	Gen 12.7	2 x 10.0	43	4.40	2.20 ... 3.90	22.00	Normal	PQFN 5x6 dual
IPG20N04S4L-11	OptiMOS™-T2	2 x 11.6	20	3.70	1.20 ... 2.20	20.00	Logic	TDSO8-8-10 SuperSO8 dual
IPG20N04S4L-11A	OptiMOS™-T2	2 x 11.6	20	3.70	1.20 ... 2.20	20.00	Logic	TDSO8-8-10 SuperSO8 dual
IPG20N04S4-12	OptiMOS™-T2	12.20	20	3.70	2.00 ... 4.00	14.00	Normal	TDSO8-8-10 SuperSO8 dual
IPG20N04S4-12A	OptiMOS™-T2	2 x 12.2	20	3.70	2.00 ... 4.00	14.00	Normal	TDSO8-8-10 SuperSO8 dual
IPG20N10S4L-22	OptiMOS™-T2	22.00	20	2.50	1.10 ... 2.10	21.00	Logic	TDSO8-8-10 SuperSO8 dual
IPG20N10S4L-35	OptiMOS™-T2	35.00	20	3.50	1.10 ... 2.10	13.40	Logic	TDSO8-8-10 SuperSO8 dual

## 55 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF3805L-7P	Gen 10.2	2.60	160	0.50	2.00 ... 4.00	130	Normal	TO-263CA 7 pin
AUIRF3805S-7P	Gen 10.2	2.60	160	0.50	2.00 ... 4.00	130	Normal	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRF3805	Gen 10.2	3.30	160	0.50	2.00 ... 4.00	190	Normal	TO-220-3
AUIRF3805L	Gen 10.2	3.30	160	0.50	2.00 ... 4.00	190	Normal	TO-262-3
AUIRF1405ZL	Gen 10.2	4.90	150	0.65	2.00 ... 4.00	120	Normal	TO-262-3
AUIRF1405ZS	Gen 10.2	4.90	150	0.65	2.00 ... 4.00	120	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRF1405ZS-7P	Gen 10.2	4.90	120	0.65	2.00 ... 4.00	150	Normal	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRF3205Z	Gen 10.2	6.50	75	0.90	2.00 ... 4.00	76	Normal	TO-220-3
AUIRF48Z	Gen 10.2	11.00	42	1.64	2.00 ... 4.00	40	Normal	TO-252-3 (DPAK)
AUIRF2905Z	Gen 10.2	14.50	42	1.38	2.00 ... 4.00	29	Normal	TO-252-3 (DPAK)
AUIRF4105Z	Gen 10.2	24.50	30	3.12	2.00 ... 4.00	18	Normal	TO-252-3 (DPAK)
AUIRLL024Z	Gen 10.2	60.00	5	n/a	2.00 ... 4.00	7	Normal	SOT-223-3
AUIRF2905Z	Gen 10.2	14.50	42	1.38	2.00 ... 4.00	29	Normal	TO-252-3 (DPAK)
AUIRF4105Z	Gen 10.2	24.50	30	3.12	2.00 ... 4.00	18	Normal	TO-252-3 (DPAK)

## 60 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF7749L2	Gen 10.7	1.50	345	0.50	2.00 ... 4.00	183.00	Normal	DirectFET™2 L8
IPB180N06S4-H1	OptiMOS™-T2	1.70	180	0.60	2.00 ... 4.00	208.00	Normal	TO-263-7-3
AUIRLS3036-7P	Gen 10.7	1.90	240	0.40	1.00 ... 2.50	110.00	Logic	TO-263-7 (D <sup>2</sup> PAK 7-leg)
IPB120N06S4-H1	OptiMOS™-T2	2.00	120	0.60	2.00 ... 4.00	208.00	Normal	TO-263-3-2
AUIRLS3036	Gen 10.7	2.40	195	0.40	1.00 ... 2.50	91.00	Logic	TO-263-3 (D <sup>2</sup> PAK)
IPB120N06S4-02	OptiMOS™-T2	2.40	120	0.80	2.00 ... 4.00	150.00	Normal	TO-263-3-2
IPP120N06S4-H1	OptiMOS™-T2	2.40	120	0.60	2.00 ... 4.00	208.00	Normal	TO-220-3
IPB120N06S4-03	OptiMOS™-T2	2.80	120	0.90	2.00 ... 4.00	125.00	Normal	TO-263-3-2
IP1120N06S4-02	OptiMOS™-T2	2.80	120	0.80	2.00 ... 4.00	150.00	Normal	TO-262-3
IPB90N06S4L-04	OptiMOS™-T2	3.40	90	1.00	1.20 ... 2.20	133.00	Logic	TO-263-3-2
IP190N06S4L-04	OptiMOS™-T2	3.40	90	1.00	1.20 ... 2.20	133.00	Logic	TO-262-3
IPD100N06S4-03	OptiMOS™-T2	3.50	100	1.00	2.00 ... 4.00	99.00	Normal	TO-252-3 (DPAK)
IPD90N06S4L-03	OptiMOS™-T2	3.50	90	1.00	1.20 ... 2.20	133.00	Logic	TO-252-3 (DPAK)

1) See packages on page 142 to 144

# Automotive N-Channel MOSFETs

## 60 V (Trench) (cont'd)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/logic level	Package <sup>1)</sup>
IPB90N06S4-04	OptiMOS™-T2	3.70	90	1.00	2.00 ... 4.00	99.00	Normal	TO-263-3-2
IPD90N06S4-04	OptiMOS™-T2	3.80	90	1.00	2.00 ... 4.00	99.00	Normal	TO-252-3 (DPAK)
IPI90N06S4-04	OptiMOS™-T2	4.00	90	1.00	2.00 ... 4.00	99.00	Normal	TO-262-3
AUIRFS3306	Gen 10.7	4.20	120	0.65	2.00 ... 4.00	85.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPD90N06S4L-05	OptiMOS™-T2	4.60	90	1.40	1.20 ... 2.20	83.00	Logic	TO-252-3 (DPAK)
IPB80N06S4L-05	OptiMOS™-T2	4.80	80	1.40	1.20 ... 2.20	83.00	Logic	TO-263-3-2
IPD90N06S4-05	OptiMOS™-T2	5.10	90	1.40	2.00 ... 4.00	62.00	Normal	TO-252-3 (DPAK)
IPB80N06S4-05	OptiMOS™-T2	5.40	80	1.40	2.00 ... 4.00	62.00	Normal	TO-263-3-2
IPI80N06S4-05	OptiMOS™-T2	5.40	80	1.40	2.00 ... 4.00	62.00	Normal	TO-262-3
IPD90N06S4L-06	OptiMOS™-T2	6.30	90	1.90	1.20 ... 2.20	58.00	Logic	TO-252-3 (DPAK)
IPB80N06S4L-07	OptiMOS™-T2	6.40	80	1.90	1.20 ... 2.20	58.00	Logic	TO-263-3-2
IPI80N06S4L-07	OptiMOS™-T2	6.40	80	1.90	1.20 ... 2.20	58.00	Logic	TO-262-3
IPD90N06S4-07	OptiMOS™-T2	6.90	90	1.90	2.00 ... 4.00	43.00	Normal	TO-252-3 (DPAK)
AUIRF7648M2	Gen 10.7	7.00	68	2.40	3.00 ... 4.90	35.00	Normal	DirectFET™2 M4
IPB80N06S4-07	OptiMOS™-T2	7.10	80	1.90	2.00 ... 4.00	43.00	Normal	TO-263-3-2
IPI80N06S4-07	OptiMOS™-T2	7.40	80	1.90	2.00 ... 4.00	43.00	Normal	TO-262-3
IPD50N06S4L-08	OptiMOS™-T2	7.80	50	2.10	1.20 ... 2.20	49.00	Logic	TO-252-3 (DPAK)
IPB45N06S4L-08	OptiMOS™-T2	7.90	45	2.10	1.20 ... 2.20	49.00	Logic	TO-263-3-2
IPI45N06S4L-08	OptiMOS™-T2	8.20	45	2.10	1.20 ... 2.20	49.00	Logic	TO-262-3
AUIRF1010EZS	Gen 10.2	8.50	75	1.11	2.00 ... 4.00	58.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPD50N06S4-09	OptiMOS™-T2	9.00	50	2.10	2.00 ... 4.00	36.00	Normal	TO-252-3 (DPAK)
IPI45N06S4-09	OptiMOS™-T2	9.40	45	2.10	2.00 ... 4.00	36.00	Normal	TO-262-3
IPP45N06S4-09	OptiMOS™-T2	9.40	45	2.10	2.00 ... 4.00	36.00	Normal	TO-220-3
IPD50N06S4L-12	OptiMOS™-T2	12.00	50	3.00	1.20 ... 2.20	30.00	Logic	TO-252-3 (DPAK)
AUIRFR3806	Gen 10.7	15.80	43	2.12	2.00 ... 4.00	22.00	Normal	TO-252-3 (DPAK)
IPD30N06S4L-23	OptiMOS™-T2	23.00	30	4.20	1.20 ... 2.20	16.10	Logic	TO-252-3 (DPAK)
IPD25N06S4L-30	OptiMOS™-T2	30.00	25	5.10	1.20 ... 2.20	12.50	Logic	TO-252-3 (DPAK)
AUIRF7640S2	Gen 10.7	36.00	21	5.00	3.00 ... 5.00	7.30	Normal	DirectFET™2 SB
IPG20N06S4L-11	OptiMOS™-T2	2 x 11.2	20	2.30	1.20 ... 2.20	41.00	Logic	TDSO8-8-4 SuperSO8 dual
IPG20N06S4L-11A	OptiMOS™-T2	2 x 11.2	20	2.30	1.20 ... 2.20	41.00	Logic	TDSO8-8-10 SuperSO8 dual
IPG20N06S4L-14	OptiMOS™-T2	2 x 13.7	20	3.00	1.20 ... 2.20	30.00	Logic	TDSO8-8-4 SuperSO8 dual
IPG20N06S4L-14A	OptiMOS™-T2	2 x 13.7	20	3.00	1.20 ... 2.20	30.00	Logic	TDSO8-8-10 SuperSO8 dual
IPG20N06S4-15	OptiMOS™-T2	2 x 15.5	20	3.00	2.00 ... 4.00	22.00	Normal	TDSO8-8-4 SuperSO8 dual
IPG20N06S4-15A	OptiMOS™-T2	2 x 15.5	20	3.00	2.00 ... 4.00	22.00	Normal	TDSO8-8-10 SuperSO8 dual
IPG20N06S4L-26	OptiMOS™-T2	2 x 26.0	20	4.50	1.20 ... 2.20	15.00	Logic	TDSO8-8-4 SuperSO8 dual
IPG20N06S4L-26A	OptiMOS™-T2	2 x 26.0	20	4.50	1.20 ... 2.20	15.00	Logic	TDSO8-8-10 SuperSO8 dual

## 75 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/logic level	Package <sup>1)</sup>
AUIRF7759L2	Gen 10.7	2.30	160	1.20	2.00 ... 4.00	200	Normal	DirectFET™2 L8
AUIRFS3107	Gen 10.7	3.00	195	0.40	2.00 ... 4.00	160	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPP80N08S4-06	OptiMOS™-T2	5.50	80	1.00	2.00 ... 4.00	70	Normal	TO-220-3

1) See packages on page 142 to 144

## 80 V (Trench)



	Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
NEW	IAUT300N08S5N012	OptiMOS™-5	1.20	300	0.40	2.20 ... 3.80	178	Normal	HSOF-8
NEW	IAUS300N08S5N012	OptiMOS™-5	1.20	300	0.40	2.20 ... 3.80	178	Normal	HSOG-8
NEW	IAUT300N08S5N014	OptiMOS™-5	1.40	300	0.50	2.20 ... 3.80	144	Normal	HSOF-8
NEW	IAUS300N08S5N014	OptiMOS™-5	1.40	300	0.50	2.20 ... 3.80	144	Normal	HSOG-8
NEW	IAUT240N08S5N019	OptiMOS™-5	1.90	240	0.65	2.20 ... 3.80	100	Normal	HSOF-8
NEW	IAUS240N08S5N019	OptiMOS™-5	1.90	240	0.65	2.20 ... 3.00	100	Normal	HSOG-8
NEW	IPB180N08S4-02	OptiMOS™-T2	2.20	180	0.54	2.00 ... 4.00	167	Normal	TO-263-7-3
NEW	IAUT200N08S5N023	OptiMOS™-5	2.30	200	0.70	2.20 ... 3.80	85	Normal	HSOF-8
NEW	IAUS200N08S5N023	OptiMOS™-5	2.30	200	0.70	2.20 ... 3.80	85	Normal	HSOG-8
	IPB120N08S4-03	OptiMOS™-T2	2.50	120	0.54	2.00 ... 4.00	167	Normal	TO-263-3-2
	IPI120N08S4-03	OptiMOS™-T2	2.50	120	0.54	2.00 ... 4.00	167	Normal	TO-262-3
	IPP120N08S4-03	OptiMOS™-T2	2.50	120	0.54	2.00 ... 4.00	167	Normal	TO-220-3
NEW	IAUT165N08S5N029	OptiMOS™-5	2.90	165	0.90	2.20 ... 3.80	70	Normal	HSOF-8
NEW	IAUS165N08S5N029	OptiMOS™-5	2.90	165	0.90	2.20 ... 3.80	70	Normal	HSOG-8
NEW	IAUC100N08S5N031	OptiMOS™5	3.10	100	0.90	2.20 ... 3.80	59	Normal	TDSO8-8-34 SuperSO8 single
	IPB160N08S4-03	OptiMOS™-T2	3.20	160	0.72	2.00 ... 4.00	112	Normal	TO-263-7-3
	IPB120N08S4-04	OptiMOS™-T2	4.10	120	0.84	2.00 ... 4.00	95	Normal	TO-263-3-2
	IPI120N08S4-04	OptiMOS™-T2	4.10	120	0.84	2.00 ... 4.00	95	Normal	TO-262-3
	IPP120N08S4-04	OptiMOS™-T2	4.10	120	0.84	2.00 ... 4.00	95	Normal	TO-220-3
NEW	IPB140N08S4-04	OptiMOS™-T2	4.20	140	0.90	2.00 ... 4.00	80	Normal	TO-263-7-3
NEW	IAUC100N08S5N043	OptiMOS™5	4.30	100	1.20	2.20 ... 3.80	43	Normal	TDSO8-8-34 SuperSO8 single
	IPP80N07S4-05	OptiMOS™-T2	5.20	80	1.00	2.00 ... 4.00	69	Normal	TO-220-3
	IPD90N08S4-05	OptiMOS™-T2	5.30	90	1.00	2.00 ... 4.00	68	Normal	TO-252-3 (DPAK)
	IPB80N08S4-06	OptiMOS™-T2	5.50	80	1.00	2.00 ... 4.00	70	Normal	TO-263-3-2
	IPI80N08S4-06	OptiMOS™-T2	5.50	80	1.00	2.00 ... 4.00	70	Normal	TO-262-3
NEW	IAUC70N08S5N074	OptiMOS™5	7.40	70	1.80	2.20 ... 3.80	23	Normal	TDSO8-8-33 SuperSO8 single
	IPD50N08S4-13	OptiMOS™-T2	13.20	50	2.10	2.00 ... 4.00	30	Normal	TO-252-3 (DPAK)

## 100 V (Trench)



	Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
NEW	IAUT300N10S5N015	OptiMOS™-5	1.50	300	0.40	2.20 ... 3.80	166.00	Normal	HSOF-8
NEW	IAUT260N10S5N019	OptiMOS™-5	1.90	260	0.50	2.20 ... 3.80	128.00	Normal	HSOF-8
	IPB180N10S4-02	OptiMOS™-T2	2.50	180	0.50	2.00 ... 3.50	156.00	Normal	TO-263-7-3
	IPB180N10S4-03	OptiMOS™-T2	3.30	180	0.60	2.00 ... 3.50	108.00	Normal	TO-263-7-3
	IAUT150N10S5N035	OptiMOS™-5	3.50	150	0.90	2.20 ... 3.80	67.00	Normal	HSOF-8
	IPB120N10S4-03	OptiMOS™-T2	3.50	120	0.60	2.00 ... 3.50	108.00	Normal	TO-263-3-2
	IPI120N10S4-03	OptiMOS™-T2	3.50	120	0.60	2.00 ... 3.50	108.00	Normal	TO-262-3
	IPP120N10S4-03	OptiMOS™-T2	3.50	120	0.60	2.00 ... 3.50	108.00	Normal	TO-220-3
	AUIRF7769L2	Gen 10.7	3.50	124	1.20	2.00 ... 4.00	200.00	Normal	DirectFET™2 L8
	AUIRLS4030-7P	Gen 10.7	3.90	190	0.40	1.00 ... 2.50	93.00	Logic	TO-263-7 (D <sup>2</sup> PAK 7-leg)
NEW	IAUC100N10S5L040	OptiMOS™-5	4.00	100	0.90	1.20 ... 2.00	60.00	Logic	TDSO8-8-34 SuperSO8 single
NEW	IAUC100N10S5N040	OptiMOS™-5	4.00	100	0.90	2.20 ... 3.80	60.00	Normal	TDSO8-8-34 SuperSO8 single
	AUIRLS4030	Gen 10.7	4.30	180	0.40	1.00 ... 2.50	87.00	Logic	TO-263-3 (D <sup>2</sup> PAK)
	AUIRF7669L2	Gen 10.7	4.40	114	1.20	3.00 ... 5.00	81.00	Normal	DirectFET™2 L8
	AUIRFP4110	Gen 10.7	4.50	120	0.40	2.00 ... 4.00	150.00	Normal	TO-247-3
	IPB120N10S4-05	OptiMOS™-T2	5.00	120	0.80	2.00 ... 3.50	70.00	Normal	TO-263-3-2

1) See packages on page 142 to 144



# Automotive N-Channel MOSFETs

100 V (Trench) (cont'd)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{th,jc}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPI120N10S4-05	OptiMOS™-T2	5.00	120	0.80	2.00 ... 3.50	70.00	Normal	TO-262-3
IPP120N10S4-05	OptiMOS™-T2	5.00	120	0.80	2.00 ... 3.50	70.00	Normal	TO-220-3
AUIRFS4310Z	Gen 10.7	6.00	120	0.60	2.00 ... 4.00	120.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPD90N10S4L-06	OptiMOS™-T2	6.60	90	1.10	1.10 ... 2.10	75.00	Logic	TO-252-3 (DPAK)
IPD90N10S4-06	OptiMOS™-T2	6.70	90	1.10	2.00 ... 3.50	52.00	Normal	TO-252-3 (DPAK)
AUIRFS4310	Gen 10.2	7.00	75	0.50	2.00 ... 4.00	170.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFB4410	Gen 10.2	10.00	75	0.61	2.00 ... 4.00	120.00	Normal	TO-220-3
AUIRL7766M2	Gen 10.7	10.00	51	2.40	1.00 ... 2.50	44.00	Logic	DirectFET™2 M4
IPD70N10S3-12	OptiMOS™-T	11.10	70	1.20	2.00 ... 4.00	51.00	Normal	TO-252-3 (DPAK)
IPB70N10S3-12	OptiMOS™-T	11.30	70	1.20	2.00 ... 4.00	51.00	Normal	TO-263-3-2
IPD70N10S3L-12	OptiMOS™-T	11.50	70	1.20	1.10 ... 2.10	60.00	Logic	TO-252-3 (DPAK)
IPI70N10S3-12	OptiMOS™-T	11.60	70	1.20	2.00 ... 4.00	51.00	Normal	TO-262-3
IPB70N10S3L-12	OptiMOS™-T	11.80	70	1.20	1.20 ... 2.40	60.00	Logic	TO-263-3 (D <sup>2</sup> PAK)
IPD60N10S4L-12	OptiMOS™-T2	12.00	60	1.60	1.10 ... 2.10	38.00	Logic	TO-252-3 (DPAK)
IPP70N10S3L-12	OptiMOS™-T	12.10	70	1.20	1.20 ... 2.40	60.00	Logic	TO-220-3
IPD60N10S4-12	OptiMOS™-T2	12.20	60	1.60	2.00 ... 3.50	26.00	Normal	TO-252-3 (DPAK)
AUIRFB4610	Gen 10.2	14.00	73	0.77	2.00 ... 4.00	90.00	Normal	TO-220-3
IPD50N10S3L-16	OptiMOS™-T	15.00	50	1.50	1.20 ... 2.40	49.00	Logic	TO-252-3 (DPAK)
IPB50N10S3L-16	OptiMOS™-T	15.40	70	1.50	1.20 ... 2.40	49.00	Logic	TO-263-3-2
IPI50N10S3L-16	OptiMOS™-T	15.70	50	1.50	1.20 ... 2.40	49.00	Logic	TO-262-3
IPP50N10S3L-16	OptiMOS™-T	15.70	50	1.50	1.20 ... 2.40	49.00	Logic	TO-220-3
AUIRF3710ZS	Gen 10.2	18.00	59	0.92	2.00 ... 4.00	82.00	Normal	TO-263-3 (D2PAK)
IPG20N10S4L-22A	OptiMOS™-T2	2 x 22.0	20	2.50	1.10 ... 2.10	21.00	Logic	TDSO8-8-10 SuperSO8 dual
IPD35N10S3L-26	OptiMOS™-T	24.00	35	2.10	1.20 ... 2.40	39.00	Logic	TO-252-3 (DPAK)
IPB35N10S3L-26	OptiMOS™-T	26.30	35	2.10	1.20 ... 2.40	30.00	Logic	TO-263-3 (D <sup>2</sup> PAK)
AUIRF540ZS	Gen 10.2	26.50	36	1.64	2.00 ... 4.00	42.00	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFR540Z	Gen 10.2	26.50	36	1.64	2.00 ... 4.00	42.00	Normal	TO-252-3 (DPAK)
AUIRF540Z	Gen 10.2	26.50	36	1.64	2.00 ... 4.00	43.00	Normal	TO-220-3
IPD30N10S3L-34	OptiMOS™-T	31.00	30	2.60	1.20 ... 2.40	24.00	Logic	TO-252-3 (DPAK)
AUIRF7647S2	Gen 10.7	31.00	24	3.70	3.00 ... 5.00	14.00	Normal	DirectFET™2 SC
IPG20N10S4L-35A	OptiMOS™-T2	2 x 35.0	20	3.50	1.10 ... 2.10	13.40	Logic	TDSO8-8-10 SuperSO8 dual
IPG20N10S4-36A	OptiMOS™-T2	2 x 36.0	20	3.50	2.00 ... 3.50	9.40	Normal	TDSO8-8-10 SuperSO8 dual
IPG16N10S4-61	OptiMOS™-T2	2 x 61.0	16	5.20	2.00 ... 3.50	5.40	Normal	TDSO8-8-4 SuperSO8 dual
IPG16N10S4-61A	OptiMOS™-T2	2 x 61.0	16	5.20	2.00 ... 3.50	5.40	Normal	TDSO8-8-10 SuperSO8 dual
IPG16N10S4L-61A	OptiMOS™-T2	2 x 61.0	16	5.20	1.10 ... 2.10	8.50	Logic	TDSO8-8-10 SuperSO8 dual
AUIRF7665S2	Gen 10.7	62.00	14	5.00	3.00 ... 5.00	8.30	Normal	DirectFET™2 SB
AUIRFU120Z	Gen 10.2	190.00	9	4.28	2.00 ... 4.00	7.00	Normal	TO-251-3 (IPAK)

120 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{th,jc}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB100N12S3-05	OptiMOS™-T	4.80	100	0.50	2.00 ... 4.00	139	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPI100N12S3-05	OptiMOS™-T	5.10	100	0.50	2.00 ... 4.00	139	Normal	TO-262-3
IPP100N12S3-05	OptiMOS™-T	5.10	100	0.50	2.00 ... 4.00	139	Normal	TO-220-3
IPD70N12S3-11	OptiMOS™-T	11.10	70	1.20	2.00 ... 4.00	51	Normal	TO-252-3 (DPAK)
IPI70N12S3-11	OptiMOS™-T	11.30	70	1.20	2.00 ... 4.00	51	Normal	TO-262-3
IPP70N12S3-11	OptiMOS™-T	11.30	70	1.20	2.00 ... 4.00	51	Normal	TO-220-3
IPB70N12S3-11	OptiMOS™-T	11.30	70	1.20	2.00 ... 4.00	51	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPD70N12S3L-12	OptiMOS™-T	11.50	70	1.20	1.20 ... 2.40	59	Logic	TO-252-3 (DPAK)
IPI70N12S3L-12	OptiMOS™-T	11.80	70	1.20	1.20 ... 2.40	59	Logic	TO-262-3
IPP70N12S3L-12	OptiMOS™-T	11.80	70	1.20	1.20 ... 2.40	59	Logic	TO-220-3

1) See packages on page 142 to 144

## 120 V (Trench) (cont'd)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB70N12S3L-12	OptiMOS™-T	11.80	70	1.20	1.20 ... 2.40	59	Logic	TO-263-3 (D <sup>2</sup> PAK)
IPD50N12S3L-15	OptiMOS™-T	15.00	50	1.50	1.20 ... 2.40	44	Logic	TO-252-3 (DPAK)
IPI50N12S3L-15	OptiMOS™-T	15.40	50	1.50	1.20 ... 2.40	44	Logic	TO-262-3
IPP50N12S3L-15	OptiMOS™-T	15.40	50	1.50	1.20 ... 2.40	44	Logic	TO-220-3
IPB50N12S3L-15	OptiMOS™-T	15.40	50	1.50	1.20 ... 2.40	44	Logic	TO-263-3 (D <sup>2</sup> PAK)
IPD35N12S3L-24	OptiMOS™-T	24.00	35	2.10	1.20 ... 2.40	30	Logic	TO-252-3 (DPAK)
IPB35N12S3L-26	OptiMOS™-T	26.30	35	2.10	1.20 ... 2.40	30	Logic	TO-263-3 (D <sup>2</sup> PAK)
IPD30N12S3L-31	OptiMOS™-T	31.00	30	2.60	1.20 ... 2.40	24	Logic	TO-252-3 (DPAK)

## 150 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRFP4568	Gen 10.7	5.90	171	0.29	3.00 ... 5.00	151	Normal	TO-247-3
AUIRFS4115-7P	Gen 10.7	11.80	105	0.40	3.00 ... 5.00	73	Normal	TO-263-7 (D <sup>2</sup> PAK 7-leg)
AUIRFS4115	Gen 10.7	12.10	99	0.40	3.00 ... 5.00	77	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFR4615	Gen 10.7	42.00	33	1.05	3.00 ... 5.00	26	Normal	TO-252-3 (DPAK)
AUIRF7675M2	Gen 10.7	56.00	18	3.30	3.00 ... 5.00	21	Normal	DirectFET™2 M2

## 200 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRFR4620	Gen 10.7	78	24	1.05	3.00 ... 5.00	25	Normal	TO-252-3 (DPAK)

## 250 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB64N25S3-20	OptiMOS™-T	20	64.00	0.50	2.00 ... 4.00	67	Normal	TO-263-3-2
AUIRF7799L2	Gen 10.7	32	35.00	1.20	3.00 ... 5.00	110	Normal	DirectFET™2 L8
IPB17N25S3-100	OptiMOS™-T	100	17.00	1.40	2.00 ... 4.00	14	Normal	TO-263-3-2
IPP17N25S3-100	OptiMOS™-T	100	17.00	1.40	2.00 ... 4.00	14	Normal	TO-220-3
AUIRFR4292	Gen 10.7	345	9.30	1.50	3.00 ... 5.00	13	Normal	TO-252-3 (DPAK)
IPD5N25S3-430	OptiMOS™-T	430	5.00	3.70	2.00 ... 4.00	5	Normal	TO-252-3 (DPAK)

1) See packages on page 142 to 144

# Automotive N-Channel MOSFETs

## 300 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRFP4409	Gen 10.7	69	38	0.44	3.00 ... 5.00	83	Normal	TO-247-3
AUIRFS6535	Gen 10.7	185	19	0.71	3.00 ... 5.00	38	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFL6535	Gen 10.7	185	19	0.71	3.00 ... 5.00	38	Normal	TO-262-3

## 30 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPD50N03S2L-06	OptiMOS™	6.40	50.00	1.10	1.20 ... 2.00	50	Logic	TO-252-3 (DPAK)
AUIRL2203N	Gen 7	7.00	75.00	0.85	1.00 ... 3.00	60	Logic	TO-220-3
IPD50N03S2-07	OptiMOS™	7.30	50.00	1.10	2.10 ... 4.00	52	Normal	TO-252-3 (DPAK)
IPD30N03S2L-10	OptiMOS™	10.00	30.00	1.50	1.20 ... 2.00	31	Logic	TO-252-3 (DPAK)
IPD30N03S2L-20	OptiMOS™	20.00	30.00	2.50	1.20 ... 2.00	14	Logic	TO-252-3 (DPAK)
AUIRF7313Q	Gen 5	2 x 29.00	7.00	20.00	1.00 ... 3.00	22	Logic	SO-8 (DSO-8)
AUIRF7303Q	Gen 5	2 x 50.00	4.90	20.00	1.00 ... 3.00	14	Logic	SO-8 (DSO-8)

## 40 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB160N04S2L-03	OptiMOS™	2.70	160	0.50	1.20 ... 2.00	230	Logic	TO-263-7-3
IPB160N04S2-03	OptiMOS™	2.90	160	0.50	2.10 ... 4.00	123	Normal	TO-263-7-3
IPB100N04S2-04	OptiMOS™	3.30	100	0.50	2.10 ... 4.00	172	Normal	TO-263-3-2
IPB80N04S2-04	OptiMOS™	3.40	80	0.50	2.10 ... 4.00	127	Normal	TO-263-3-2
IPB80N04S2-H4	OptiMOS™	3.70	80	0.50	1.20 ... 2.00	103	Normal	TO-263-3-2
IPI80N04S2-04	OptiMOS™	3.70	80	0.50	2.10 ... 4.00	170	Normal	TO-262-3
AUIRF1404	Gen 7	4.00	75	0.75	2.00 ... 4.00	131	Normal	TO-220-3
AUIRF1404S	Gen 7	4.00	75	0.75	2.00 ... 4.00	131	Normal	TO-263-3 (D <sup>2</sup> PAK)
IPI80N04S2-H4	OptiMOS™	4.00	80	0.50	2.10 ... 4.00	148	Normal	TO-262-3
AUIRF7484Q	Gen 7	10.00	14	20.00	1.00 ... 2.00	69	Logic	SO-8 (DSO-8)

## 50 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF7103Q	Gen 5	2 x 130	3	20.00	1.00 ... 3.00	10	Logic	SO-8 (DSO-8)

1) See packages on page 142 to 144



## 55 V (Planar) (cont'd)



Product name	Technology	R <sub>DS(on)</sub> @ 10 V [mΩ]	I <sub>D</sub> [A]	R <sub>thJC</sub> (max) [K/W]	V <sub>GS(th)</sub> (min-max) [V]	Q <sub>G</sub> (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB100N06S2L-05	OptiMOS™	4.40	100	0.50	1.20 ... 2.00	170.00	Logic	TO-263-3-2
IPB100N06S2-05	OptiMOS™	4.70	100	0.50	2.10 ... 4.00	130.00	Normal	TO-263-3-2
IPB80N06S2L-H5	OptiMOS™	4.70	80	0.50	1.20 ... 2.00	145.00	Logic	TO-263-3-2
IPP100N06S2L-05	OptiMOS™	4.70	100	0.50	1.20 ... 2.00	170.00	Logic	TO-220-3
IPB80N06S2-05	OptiMOS™	4.80	80	0.50	2.10 ... 4.00	130.00	Normal	TO-263-3-2
IPI80N06S2L-05	OptiMOS™	4.80	80	0.50	1.20 ... 2.00	170.00	Logic	TO-262-3
IPP80N06S2L-H5	OptiMOS™	5.00	80	0.50	1.20 ... 2.00	145.00	Logic	TO-220-3
IPB80N06S2-H5	OptiMOS™	5.20	80	0.50	2.10 ... 4.00	116.00	Normal	TO-263-3-2
AUIRFP1405	Gen 7	5.30	95	0.49	2.00 ... 4.00	120.00	Normal	TO-247-3
IPP80N06S2-H5	OptiMOS™	5.50	80	0.50	2.10 ... 4.00	116.00	Normal	TO-220-3
IPB80N06S2L-06	OptiMOS™	6.00	80	0.60	1.20 ... 2.00	114.00	Logic	TO-263-3-2
IPB80N06S2-07	OptiMOS™	6.30	80	0.60	2.10 ... 4.00	86.00	Normal	TO-263-3-2
IPI80N06S2-07	OptiMOS™	6.60	80	0.60	2.10 ... 4.00	86.00	Normal	TO-262-3
IPP80N06S2-07	OptiMOS™	6.60	80	0.60	2.10 ... 4.00	86.00	Normal	TO-220-3
IPB80N06S2L-07	OptiMOS™	6.70	80	0.70	1.20 ... 2.00	95.00	Logic	TO-263-3-2
IPP80N06S2L-07	OptiMOS™	7.00	80	0.70	1.20 ... 2.00	95.00	Logic	TO-220-3
IPB80N06S2-08	OptiMOS™	7.70	80	0.70	2.10 ... 4.00	72.00	Normal	TO-263-3-2
IPI80N06S2-08	OptiMOS™	8.00	80	0.70	2.10 ... 4.00	72.00	Normal	TO-262-3
AUIRF3205	Gen 5	8.00	75	0.75	2.00 ... 4.00	97.30	Normal	TO-220-3
AUIRF3305	Gen 5	8.00	140	0.45	2.00 ... 4.00	100.00	Normal	TO-220-3
IPB80N06S2L-09	OptiMOS™	8.20	80	0.80	1.20 ... 2.00	82.00	Logic	TO-263-3-2
IPP80N06S2L-09	OptiMOS™	8.50	80	0.80	1.20 ... 2.00	82.00	Logic	TO-220-3
IPB80N06S2-09	OptiMOS™	8.80	80	0.80	2.10 ... 4.00	60.00	Normal	TO-263-3-2
IPP80N06S2-09	OptiMOS™	9.10	80	0.80	2.10 ... 4.00	60.00	Normal	TO-220-3
IPB80N06S2L-11	OptiMOS™	10.70	80	0.95	1.20 ... 2.00	62.00	Logic	TO-263-3-2
IPI80N06S2L-11	OptiMOS™	11.00	80	0.95	1.20 ... 2.00	62.00	Logic	TO-262-3
IPP80N06S2L-11	OptiMOS™	11.00	80	0.95	1.20 ... 2.00	62.00	Logic	TO-220-3
IPB77N06S2-12	OptiMOS™	11.70	77	0.95	2.10 ... 4.00	45.00	Normal	TO-263-3-2
IPP77N06S2-12	OptiMOS™	12.00	77	0.95	2.10 ... 4.00	45.00	Normal	TO-220-3
IPD50N06S2L-13	OptiMOS™	12.70	50	1.10	1.20 ... 2.00	52.00	Logic	TO-252-3 (DPAK)
IPD30N06S2L-13	OptiMOS™	13.00	30	1.10	1.20 ... 2.00	52.00	Logic	TO-252-3 (DPAK)
AUIRFZ48N	Gen 7	14.00	64	0.95	2.00 ... 4.00	54.00	Normal	TO-220-3
IPD50N06S2-14	OptiMOS™	14.40	50	1.10	2.10 ... 4.00	39.00	Normal	TO-252-3 (DPAK)
IPD30N06S2-15	OptiMOS™	14.70	30	1.10	1.20 ... 2.00	39.00	Normal	TO-252-3 (DPAK)
IPD30N06S2L-23	OptiMOS™	23.00	30	1.50	1.20 ... 2.00	33.00	Logic	TO-252-3 (DPAK)
IPD30N06S2-23	OptiMOS™	23.00	30	1.50	2.10 ... 4.00	25.00	Normal	TO-252-3 (DPAK)
BSP603S2L	OptiMOS™	33.00	5.2	20.00	1.20 ... 2.00	31.00	Logic	SOT-223
IPD26N06S2L-35	OptiMOS™	35.00	30	2.20	1.20 ... 2.00	10.00	Logic	TO-252-3 (DPAK)
IPG20N06S2L-35	OptiMOS™	2 x 35.0	20	2.30	1.20 ... 2.20	18.00	Logic	TDSON-8-4 SuperSO8 dual
IPG20N06S2L-35A	OptiMOS™	2 x 35.0	20	2.30	1.20 ... 2.20	18.00	Logic	TDSON-8-10 SuperSO8 dual
IPD25N06S2-40	OptiMOS™	40.00	29	2.20	2.10 ... 4.00	14.00	Normal	TO-252-3 (DPAK)
AUIRF7341Q	Gen 5	2 x 50.0	5.1	20.00	1.00 ... 3.00	29.00	Logic	SO-8 (DSO-8)
IPG20N06S2L-50	OptiMOS™	2 x 50.0	20	2.90	1.20 ... 2.20	12.40	Logic	TDSON-8-4 SuperSO8 dual
IPG20N06S2L-50A	OptiMOS™	2 x 50.0	20	2.90	1.20 ... 2.20	12.40	Logic	TDSON-8-10 SuperSO8 dual
IPD15N06S2L-64	OptiMOS™	64.00	19	3.20	1.20 ... 2.00	11.00	Logic	TO-252-3 (DPAK)
IPG20N06S2L-65	OptiMOS™	2 x 65.0	20	3.50	1.20 ... 2.20	10.00	Logic	TDSON-8-4 SuperSO8 dual
IPG20N06S2L-65A	OptiMOS™	2 x 65.0	20	3.50	1.20 ... 2.20	10.00	Logic	TDSON-8-10 SuperSO8 dual
AUIRF224NS	Gen 5	70.00	17	3.30	2.00 ... 4.00	13.30	Normal	TO-263-3 (D2PAK)
IPD14N06S2-80	OptiMOS™	80.00	17	3.20	2.10 ... 4.00	8.00	Normal	TO-252-3 (DPAK)

1) See packages on page 142 to 144

# Automotive N-Channel MOSFETs

## 75 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/logic level	Package <sup>1)</sup>
IPB100N08S2L-07	OptiMOS™	6.50	100	0.50	1.20 ... 2.00	185	Logic	TO-263-3-2
IPB100N08S2-07	OptiMOS™	6.80	100	0.50	2.10 ... 4.00	153	Normal	TO-263-3-2
IPB80N08S2L-07	OptiMOS™	6.80	80	0.50	1.20 ... 2.00	186	Logic	TO-263-3-2
IPP100N08S2L-07	OptiMOS™	6.80	100	0.50	1.20 ... 2.00	182	Logic	TO-220-3
IPB80N08S2-07	OptiMOS™	7.10	80	0.50	2.10 ... 4.00	182	Normal	TO-263-3-2
IPP100N08S2-07	OptiMOS™	7.10	100	0.50	2.10 ... 4.00	144	Normal	TO-220-3
IPI100N08S2-07	OptiMOS™	7.10	100	0.50	2.10 ... 4.00	144	Normal	TO-262-3
IPP80N08S2L-07	OptiMOS™	7.10	80	0.50	1.20 ... 2.00	183	Logic	TO-220-3
IPI80N08S2-07	OptiMOS™	7.40	80	0.50	2.10 ... 4.00	144	Normal	TO-262-3
IPD30N08S2L-21	OptiMOS™	20.50	30	1.10	1.20 ... 2.00	43	Logic	TO-252-3 (DPAK)
IPD30N08S2-22	OptiMOS™	21.50	30	1.10	2.10 ... 4.00	44	Normal	TO-252-3 (DPAK)
IPD22N08S2L-50	OptiMOS™	50.00	22	2.00	1.20 ... 2.00	21	Logic	TO-252-3 (DPAK)

## 100 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/logic level	Package <sup>1)</sup>
AUIRLR3410	Gen 5	105	15	1.90	1.00 ... 2.00	23	Logic	TO-252-3 (DPAK)

1) See packages on page 142 to 144

# Automotive P-Channel MOSFETs

## 30 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB80P03P4L-04	OptiMOS™-P2	4.10	-80	1.10	-2.00 ... -1.00	125	Logic	TO-263-3-2
IPP80P03P4L-04	OptiMOS™-P2	4.40	-80	1.10	-2.00 ... -1.00	125	Logic	TO-220-3
IPD90P03P4L-04	OptiMOS™-P2	4.50	-90	1.10	-2.00 ... -1.00	100	Logic	TO-252-3 (DPAK)
IPD90P03P4-04	OptiMOS™-P2	4.50	-90	1.10	-4.00 ... -2.00	100	Normal	TO-252-3 (DPAK)
IPB80P03P4-05	OptiMOS™-P2	4.70	-80	1.10	-4.00 ... -2.00	100	Normal	TO-263-3-2
IPD80P03P4L-07	OptiMOS™-P2	6.80	-80	1.70	-2.00 ... -1.00	80	Logic	TO-252-3 (DPAK)
IPB80P03P4L-07	OptiMOS™-P2	6.90	-80	1.70	-2.00 ... -1.00	63	Logic	TO-263-3-2
IPI80P03P4L-07	OptiMOS™-P2	7.20	-80	1.70	-2.00 ... -1.00	63	Logic	TO-262-3
IPD50P03P4L-11	OptiMOS™-P2	10.50	-50	2.60	-2.00 ... -1.00	42	Logic	TO-252-3 (DPAK)
IPB45P03P4L-11	OptiMOS™-P2	10.80	-45	2.60	-2.00 ... -1.00	42	Logic	TO-263-3-2

## 40 V (Trench)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
IPB180P04P4L-02	OptiMOS™-P2	2.40	-100	1.00	-2.20 ... -1.70	220	Logic	TO-263-7-3
IPB180P04P4-03	OptiMOS™-P2	2.80	-100	1.00	-4.00 ... -2.00	190	Normal	TO-263-7-3
IPB120P04P4L-03	OptiMOS™-P2	3.00	-120	1.10	-2.20 ... -1.70	180	Logic	TO-263-3-2
IPP120P04P4L-03	OptiMOS™-P2	3.40	-120	1.10	-2.20 ... -1.70	180	Logic	TO-220-3
IPB120P04P4-04	OptiMOS™-P2	3.60	-120	1.10	-4.00 ... -2.00	158	Normal	TO-263-3-2
IPB80P04P4L-04	OptiMOS™-P2	4.20	-90	1.20	-2.20 ... -1.70	135	Logic	TO-263-3-2
IPD90P04P4L-04	OptiMOS™-P2	4.30	-90	1.20	-2.20 ... -1.70	135	Logic	TO-252-3 (DPAK)
IPD90P04P4-05	OptiMOS™-P2	4.70	-90	1.20	-4.00 ... -2.00	118	Normal	TO-252-3 (DPAK)
IPB80P04P4-05	OptiMOS™-P2	4.90	-80	1.20	-4.00 ... -2.00	118	Normal	TO-263-3-2
IPB80P04P4L-06	OptiMOS™-P2	6.40	-80	1.70	-2.20 ... -1.70	71	Logic	TO-263-3-2
IPD85P04P4L-06	OptiMOS™-P2	6.40	-85	1.70	-2.20 ... -1.70	80	Logic	TO-252-3 (DPAK)
IPI80P04P4L-06	OptiMOS™-P2	6.70	-80	1.70	-2.20 ... -1.70	71	Logic	TO-262-3
IPB80P04P4-07	OptiMOS™-P2	7.30	-80	1.70	-4.00 ... -2.00	71	Normal	TO-263-3-2
IPD85P04P4-07	OptiMOS™-P2	7.30	-85	1.70	-4.00 ... -2.00	69	Normal	TO-252-3 (DPAK)
IPD70P04P4L-08	OptiMOS™-P2	7.80	-70	2.00	-2.20 ... -1.70	63	Logic	TO-252-3 (DPAK)
IPB80P04P4L-08	OptiMOS™-P2	7.90	-80	2.00	-2.20 ... -1.20	71	Logic	TO-263-3-2
IPD70P04P4-09	OptiMOS™-P2	8.90	-70	2.00	-4.00 ... -2.00	54	Normal	TO-252-3 (DPAK)
IPB70P04P4-09	OptiMOS™-P2	9.30	-70	2.00	-4.00 ... -2.00	54	Normal	TO-263-3-2
IPD50P04P4L-11	OptiMOS™-P2	10.60	-50	2.60	-2.20 ... -1.70	45	Logic	TO-252-3 (DPAK)
IPD50P04P4-13	OptiMOS™-P2	12.60	-50	2.60	-4.00 ... -2.00	39	Normal	TO-252-3 (DPAK)

1) See packages on page 142 to 144

# Automotive P-Channel MOSFETs

## 30 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF7316Q	Gen 5	2 x 58	-4.90	n/a	-3.00 ... -1.00	23	Logic	SO-8 (DSO-8)

## 55 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF4905	Gen 5	20	-74.00	0.75	-4.00 ... -2.00	120	Normal	TO-220-3
AUIRF4905L	Gen 5	20	-74.00	0.75	-4.00 ... -2.00	120	Normal	TO-262-3
AUIRF4905S	Gen 5	20	-74.00	0.75	-4.00 ... -2.00	120	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRFR5305	Gen 5	65	-28.00	1.40	-4.00 ... -2.00	42	Normal	TO-252-3 (DPAK)
AUIRF7342Q	Gen 5	2 x 105	-3.40	n/a	-3.00 ... -1.00	26	Logic	SO-8 (DSO-8)

## 150 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$R_{thJC}$ (max) [K/W]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF6215S	Gen 5	290	-13	1.40	-4.00 ... -2.00	44	Normal	TO-263-3 (D <sup>2</sup> PAK)
AUIRF6215	Gen 5	290	-13	1.40	-4.00 ... -2.00	44	Normal	TO-220-3
AUIRFR6215	Gen 5	295	-13	1.40	-4.00 ... -2.00	44	Normal	TO-252-3 (DPAK)

# Automotive N+P-Channel MOSFETs

## 30 V (Planar)



Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF7379Q	Gen 5	45/90	5.80/-4.30	1.00 ... 3.00	25.00/25.00	Logic	SO-8 (DSO-8)
AUIRF7309Q	Gen 5	50/100	4.70/-3.50	1.00 ... 3.00	25.00/25.00	Logic	SO-8 (DSO-8)

## 55 V (Planar)

Product name	Technology	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Normal/ logic level	Package <sup>1)</sup>
AUIRF7343Q	Gen 5	50/105	4.70/-3.40	1.00 ... 3.00	24/26	Logic	SO-8 (DSO-8)

1) See packages on page 142 to 144





Glossary  
Symbols

Support

System ICs

Network ICs

OPTIREG™  
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Power Supply ICs

Motor drivers

LED drivers

High-side  
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multichannel  
switches

Low-side  
switches

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discretes and  
modules

MOSFETs



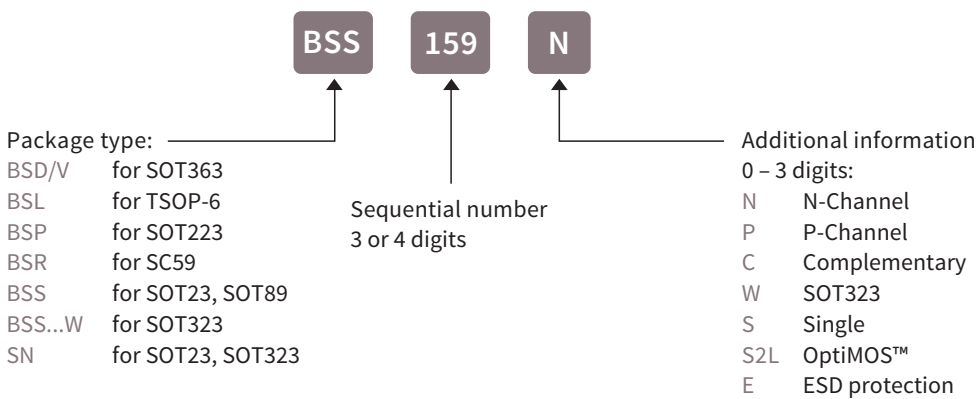
# Small Signal MOSFETs

Infiniteon offers a full range of Small Signal MOSFETs qualified according AEC-Q101.

**The portfolio includes:**

- > Polarity: N-Channel enhancement, N-Channel depletion and P-Channel MOSFETs
- > Voltage classes: -250 ... 800 V
- > V<sub>GS</sub> rating: 10 V (normal level), 4.5 V (logic level), 2.5 V (super logic level), 1.8 V (ultra logic level)
- > Packages: SOT223, SOT89, TSOP-6 (single and dual), SC59, SOT23, SOT323, SOT363 (single and dual)
- > SC59 is an enhanced version of the SOT23: Its footprint is compatible with the SOT23, but it allows a larger chip inside and therefore a lower R<sub>DS(on)</sub>.
- > Configuration: single, dual, complementary (n+p pairs)
- > Additional features: Products with names ending with "E" have an Integrated ESD protection

## Naming system



[www.infineon.com/smallsignalmosfets](http://www.infineon.com/smallsignalmosfets)  
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## N-Channel MOSFETs

Voltage	Product name	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
20 V	BSR202N	21 <sup>2)</sup>	3.80	0.70 ... 1.20	5.80	OptiMOS™2	SC59
	BSL202SN	22 <sup>2)</sup>	7.50	0.70 ... 1.20	5.80	OptiMOS™2	TSOP-6/6
	BSR802N	23 <sup>3)</sup>	3.70	0.30 ... 0.75	4.70	OptiMOS™2	SC59
	BSS205N	50 <sup>2)</sup>	2.50	0.70 ... 1.20	2.10	OptiMOS™2	SOT23
	BSL806N	57 <sup>3)</sup>	2.30	0.30 ... 0.75	1.70	OptiMOS™2	TSOP-6/6 dual
	BSS806N	57 <sup>3)</sup>	2.30	0.30 ... 0.75	1.70	OptiMOS™2	SOT23
	BSS214N	140 <sup>2)</sup>	1.50	0.70 ... 1.20	0.80	OptiMOS™2	SOT23
	BSS214NW	140 <sup>2)</sup>	1.50	0.70 ... 1.20	0.80	OptiMOS™2	SOT323
	BSD214SN	140 <sup>2)</sup>	1.50	0.70 ... 1.20	0.80	OptiMOS™2	SOT363
	BSS816NW	160 <sup>3)</sup>	1.40	0.30 ... 0.75	0.60	OptiMOS™2	SOT323
	BSD816SN	160 <sup>3)</sup>	1.40	0.30 ... 0.95	0.60	OptiMOS™2	SOT363
30 V	BSD235N	350 <sup>2)</sup>	0.95	0.70 ... 1.20	0.32	OptiMOS™2	SOT363 dual
	BSD840N	400 <sup>3)</sup>	0.88	0.30 ... 0.75	0.26	OptiMOS™2	SOT363 dual
	BSS306N	57	2.30	1.20 ... 2.00	1.50	OptiMOS™2	SOT23
	BSS316N	160	1.40	1.20 ... 2.00	0.60	OptiMOS™2	SOT23
55 V	BSD316SN	160	1.40	1.20 ... 2.00	0.60	OptiMOS™2	SOT363
	BSS670S2L	650	0.54	1.20 ... 2.00	1.70	OptiMOS™	SOT23
60 V	BSS606N	60	3.20	1.30 ... 2.30	3.70	OptiMOS™3	SOT89
	BSL606SN	60	4.50	1.30 ... 2.30	3.70	OptiMOS™3	TSOP-6/6
	BSP318S	90	2.60	1.20 ... 2.00	14.00	SIPMOS™	SOT223
	BSP320S	120	2.90	2.10 ... 4.00	9.70	SIPMOS™	SOT223
	BSP295	300	1.80	0.80 ... 1.80	14.00	SIPMOS™	SOT223
	2N7002DW	3000	0.30	1.50 ... 2.50	0.40	OptiMOS™	SOT363 dual
	BSS138N	3500	0.23	0.60 ... 1.40	1.00	SIPMOS™	SOT23
	BSS138W	3500	0.28	0.60 ... 1.40	1.00	SIPMOS™	SOT223
	SN7002N	5000	0.20	0.80 ... 1.80	1.00	SIPMOS™	SOT23
	BSS7728N	5000	0.20	1.30 ... 2.30	1.00	SIPMOS™	SOT23
	SN7002W	5000	0.23	0.80 ... 1.80	1.00	SIPMOS™	SOT323
100 V	BSP372N	230	1.80	0.80 ... 1.80	9.50	OptiMOS™	SOT223
	BSP373N	240	1.80	2.10 ... 4.00	6.20	OptiMOS™	SOT223
	BSP296N	600	1.20	0.80 ... 1.80	4.50	OptiMOS™	SOT223
	BSS123N	6000	0.19	0.80 ... 1.80	0.60	OptiMOS™	SOT23
	BSS119N	6000	0.19	1.30 ... 2.30	0.60	OptiMOS™	SOT23
200 V	BSP297	1800	0.66	0.80 ... 1.80	12.90	SIPMOS™	SOT223
240 V	BSP89	6000	0.35	0.80 ... 1.80	4.30	SIPMOS™	SOT223
	BSP88	6000	0.35	0.60 ... 1.40	4.50	SIPMOS™	SOT223
	BSS87	6000	0.26	0.80 ... 1.80	3.70	SIPMOS™	SOT89
	BSS131	14,000	0.11	0.80 ... 1.80	2.10	SIPMOS™	SOT23
400 V	BSP298	3000	0.50	2.10 ... 4.00	-	SIPMOS™	SOT223
	BSP324	25,000	0.17	1.30 ... 2.30	4.50	SIPMOS™	SOT223
500 V	BSP299	4000	0.40	2.10 ... 4.00	-	SIPMOS™	SOT223
600 V	BSP125	45,000	0.120	1.30 ... 2.30	4.40	SIPMOS™	SOT223
	BSS225	45,000	0.090	1.30 ... 2.30	3.90	SIPMOS™	SOT89
800 V	BSS127	500,000	0.021	1.40 ... 2.60	1.40	SIPMOS™	SOT23
	BSP300	20,000	0.190	2.00 ... 4.00	-	SIPMOS™	SOT223

1) See packages on page 142 to 144

2)  $R_{DS(on)}$  at 4.5 V3)  $R_{DS(on)}$  at 2.5 V

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# Small Signal MOSFETs

P-Channel MOSFETs							
Voltage	Product name	$R_{DS(on)}$ @ 10 V [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
-20 V	BSL207SP	41 <sup>2)</sup>	-6.00	-1.20 ... -0.60	-13.30	OptiMOS™ P	TSOP-6/6
	BSL211SP	67 <sup>2)</sup>	-4.70	-1.20 ... -0.60	-8.30	OptiMOS™ P	TSOP-6/6
	BSL215P	150 <sup>2)</sup>	-1.50	-1.20 ... -0.60	-3.55	OptiMOS™ P2	TSOP-6/6 dual
	BSS215P	150 <sup>2)</sup>	-1.50	-1.20 ... -0.50	-3.60	OptiMOS™ P2	SOT23
	BSV236SP	175 <sup>2)</sup>	-1.50	-1.20 ... -0.60	-3.80	OptiMOS™ P	SOT363
	BSS209PW	550 <sup>2)</sup>	-0.63	-1.20 ... -0.60	-1.00	OptiMOS™ P	SOT323
	BSS223PW	1,200 <sup>2)</sup>	-0.39	-1.20 ... -0.60	-0.50	OptiMOS™ P	SOT323
	BSD223P	1,200 <sup>2)</sup>	-0.39	-1.20 ... -0.60	-0.50	OptiMOS™ P	SOT363
-30 V	BSL307SP	43	-5.50	-2.00 ... -1.00	-23.40	OptiMOS™ P	TSOP-6/6 dual
	BSL308PE	80	-2.00	-2.00 ... -1.00	-5.00	OptiMOS™ P3 + integrated ESD diode	TSOP-6/6 dual
	BSS308PE	80	-2.00	-2.00 ... -1.00	-5.00	OptiMOS™ P3 + integrated ESD diode	SOT23
	BSS314PE	140	-1.50	-2.00 ... -1.00	-2.90	OptiMOS™ P3 + integrated ESD diode	SOT23
	BSD314SPE	140	-1.50	-2.00 ... -1.00	-2.90	OptiMOS™ P3 + integrated ESD diode	SOT363
	BSS315P	150	-1.50	-2.00 ... -1.00	-2.30	OptiMOS™ P2	SOT23
-60 V	BSP613P	130	-2.90	-4.00 ... -2.10	-22.00	SIPMOS™	SOT223
	BSP170P	300	-1.90	-4.00 ... -2.10	-10.00	SIPMOS™	SOT223
	BSP171P	300	-1.90	-2.00 ... -1.00	-13.00	SIPMOS™	SOT223
	BSP315P	800	-1.17	-2.00 ... -1.00	-5.20	SIPMOS™	SOT223
	BSR315P	800	-0.62	-2.00 ... -1.00	-4.00	SIPMOS™	SC59
	BSS83P	2000	-0.33	-2.00 ... -1.00	-2.38	SIPMOS™	SOT23
	BSS84P	8000	-0.17	-2.00 ... -1.00	-1.00	SIPMOS™	SOT23
	BSS84PW	8000	-0.15	-2.00 ... -1.00	-1.00	SIPMOS™	SOT323
-100 V	BSP322P	800	-1.00	-2.00 ... -1.00	-12.40	SIPMOS™	SOT223
	BSP321P	900	-0.98	-4.00 ... -2.10	-9.00	SIPMOS™	SOT223
	BSP316P	1800	-0.68	-2.00 ... -1.00	-5.10	SIPMOS™	SOT223
	BSR316P	1800	-0.36	-2.00 ... -1.00	-3.00	SIPMOS™	SC59
-250 V	BSR92P	11	-0.14	-2.00 ... -1.00	-3.60	SIPMOS™	SC59
	BSP92P	12	-0.26	-2.00 ... -1.00	-4.30	SIPMOS™	SOT223
	BSS192P	12	-0.19	-2.00 ... -1.00	-4.90	SIPMOS™	SOT89
	BSP317P	4000	-0.43	-2.00 ... -1.00	-11.60	SIPMOS™	SOT223

1) See packages on page 142 to 144

2)  $R_{DS(on)}$  at 4.5 V

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 www.infineon.com/complementary  
 www.infineon.com/pchannel  
 www.infineon.com/depletion



## Complementary MOSFETs

Voltage	Product name	$R_{DS(on)}$ (max) @ $V_{GS} = 10\text{ V}$ [m $\Omega$ ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
20 V	BSL215C/n-ch	140 <sup>2)</sup>	1.50	0.70 ... 1.20	0.73	OptiMOS™2	TSOP-6/6
-20 V	BSL215C/p-ch	150 <sup>2)</sup>	-1.50	-1.20 ... -0.60	-3.00	OptiMOS™ P2	TSOP-6/6
20 V	BSD235C/n-ch	350 <sup>2)</sup>	0.95	-1.20 ... -0.60	0.34	OptiMOS™2	SOT363
-20 V	BSD235C/p-ch	1200 <sup>2)</sup>	-0.53	0.70 ... 1.20	-0.40	OptiMOS™ P2	SOT363
20 V	BSZ15DC02KD/n-ch	55 <sup>2)</sup>	5.10	0.80 ... 1.40	2.10	OptiMOS™2	TSOSON-8
-20 V	BSZ15DC02KD/p-ch	150 <sup>2)</sup>	-3.20	-1.40 ... -0.70	-3.00	OptiMOS™ P2	TSOSON-8
30 V	BSL316C/n-ch	160	1.40	1.20 ... 2.00	0.60	OptiMOS™2	TSOP-6/6
-30 V	BSL316C/p-ch	150	-1.50	-2.00 ... -1.00	-2.40	OptiMOS™ P2	TSOP-6/6
30 V	BSL308C/n-ch	57	2.30	1.20 ... 2.00	1.50	OptiMOS™2	TSOP-6/6
-30 V	BSL308C/p-ch	80	-2.00	-2.00 ... -1.00	-5.00	OptiMOS™ P3	TSOP-6/6

## Depletion MOSFETs

Voltage	Product name	$R_{DS(on)}$ (max) @ $V_{GS} = 10\text{ V}$ [m $\Omega$ ]	$I_D$ [A]	$Q_G$ (typ) [nC]	Technology	Package <sup>1)</sup>
60 V	BSS159N	8,000	0.230	2.20	SIPMOST™	SOT23
100 V	BSS169	12,000	0.170	2.10	SIPMOST™	SOT23
200 V	BSP149	3,500	0.660	11.00	SIPMOST™	SOT223
240 V	BSP129	6,000	0.350	3.80	SIPMOST™	SOT223
250 V	BSS139	30,000	0.100	2.30	SIPMOST™	SOT23
400 V	BSP179	24,000	0.210	4.50	SIPMOST™	SOT223
600 V	BSP135	60,000	0.120	3.70	SIPMOST™	SOT223
	BSS126	700,000	0.021	1.40	SIPMOST™	SOT23

1) See packages on page 142 to 144

2)  $R_{DS(on)}$  at 4.5 V

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[www.infineon.com/complementary](http://www.infineon.com/complementary)

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# 600/650 V CoolMOS™ Power MOSFETs

## 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA

Following the release of the first series of high-voltage automotive MOSFETs – the 600 V CoolMOS™ CPA series – Infineon has launched its second generation of market-leading, automotive-qualified, high-voltage MOSFETs, the 650 V CoolMOS™ CFDA series. Whereas the first generation of 600 V CoolMOS™ CPA series addresses the well-known attributes of high quality and reliability required by the automotive industry, the newer 650 V CoolMOS™ CFDA series also caters to special application needs with its integrated fast body diode. This fast body diode is the key for addressing resonant switching topologies, resulting in lower switching losses. The softer commutation behavior and consequent reduced EMI appearance gives the 650 V CoolMOS™ CFDA series a clear advantage over competitor parts. Furthermore, limited voltage overshoot during

hard commutation of the body diode enables easier implementation of layout and design.

The basic 600 V CoolMOS™ CPA portfolio is complemented by the broad 650 V CoolMOS™ CFDA portfolio, which provides all the benefits of a fast-switching Super-Junction MOSFET fulfilling the enhanced reliability requirements for automotive applications realized with special screening measures in front-end and back-end as well as compliance with AEC-Q100.

Therefore, the combination of both technologies – the 600 V CoolMOS™ CPA and the new 650 V CoolMOS™ CFDA – is the best choice for switching topologies in automotive applications.

### Common key features CoolMOS™ “A”

- > First 600 V/650 V automotive-qualified high-voltage technologies for the automotive market
- > Compliant to AEC-Q101 standard

### Key features 600 V CoolMOS™ CPA

- > Lowest  $R_{DS(on)}$  per package
- > Lowest gate charge value  $Q_G$

### Key feature 650 V CoolMOS™ CFDA

- > Limited voltage overshoot during hard commutation – self-limiting  $di/dt$  and  $dv/dt$
- > Low  $Q_{rr}$  at repetitive commutation on body diode and low  $C_{oss}$

### Applications for 600 V CoolMOS™ CPA

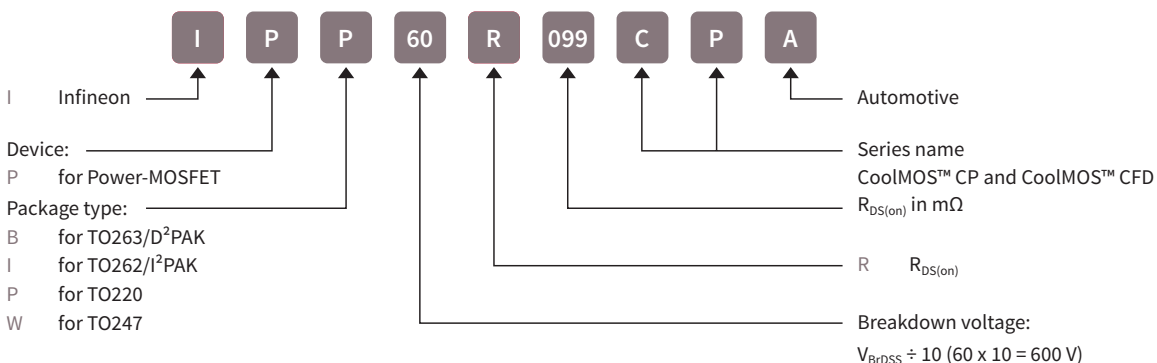
- > Hard switching topologies
- > PFC boost stages in on-board charger
- > Active clamp or 2-transistor forward in DC-DC converter

### Applications for 650 V CoolMOS™ CFDA

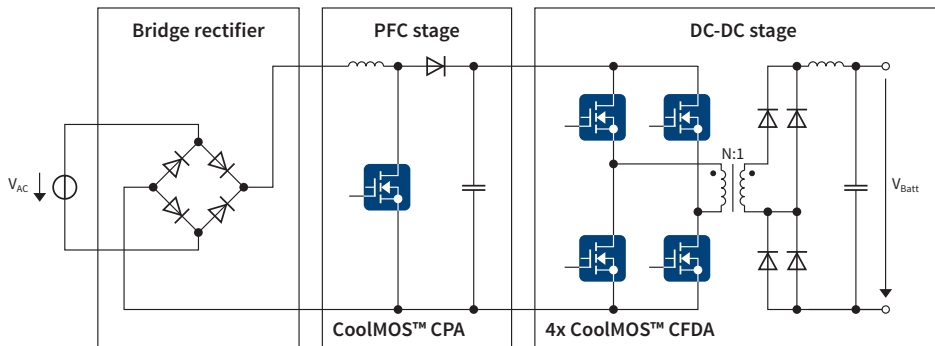
- > Resonant switching topologies
- > LLC or full-bridge ZVS in DC-DC converter
- > HID lamp



## Naming system



## Example for automotive topology using CoolMOS™ CFDA



### On-board battery charger with ZVS phase shifted topology

#### 600 V CoolMOS™ CPA product portfolio

Product name	$R_{DS(on)}$ @ $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	$I_D$ (max) @ $T_J = 25^\circ\text{C}$ [A]	$I_{Dpuls}$ (max) [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	$R_{thJC}$ (max) [K/W]	Package <sup>1)</sup>
IPB60R099CPA	105	31	93	-20 ... 20	60	0.50	TO263-3-2
IPB60R199CPA	199	16	51	-20 ... 20	32	0.90	TO263-3-2
IPB60R299CPA	299	11	34	-20 ... 20	22	1.30	TO263-3-2
IPP60R099CPA	105	31	93	-20 ... 20	60	0.50	TO220-3
IPW60R045CPA	45	60	230	-20 ... 10	150	0.29	TO247-3
IPW60R075CPA	75	39	130	-20 ... 20	87	0.40	TO247-3
IPW60R099CPA	105	31	93	-20 ... 20	60	0.50	TO247-3
IPI60R099CPA	105	31	93	-20 ... 20	60	0.50	TO262-3

#### 650 V CoolMOS™ CFDA product portfolio

Product name	$R_{DS(on)}$ @ $T_J = 25^\circ\text{C}$ $V_{GS} = 10\text{ V}$ [mΩ]	$I_D$ (max) @ $T_J = 25^\circ\text{C}$ [A]	$I_{Dpuls}$ (max) [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	$R_{thJC}$ (max) [K/W]	Package <sup>1)</sup>
IPD65R420CFDA	420	8.70	27.00	3.50 ... 4.50	32	1.50	TO252-3 (DPAK)
IPD65R660CFDA	660	6.00	17.00	3.50 ... 4.50	20	2.00	TO252-3 (DPAK)
IPB65R110CFDA	110	31.20	99.60	3.50 ... 4.50	118	0.45	TO263-3-2
IPB65R150CFDA	150	22.40	72.00	3.50 ... 4.50	86	0.64	TO263-3-2
IPB65R190CFDA	190	17.50	57.20	3.50 ... 4.50	68	0.83	TO263-3-2
IPB65R310CFDA	310	11.40	34.40	3.50 ... 4.50	41	1.20	TO263-3-2
IPB65R660CFDA	660	6.00	17.00	3.50 ... 4.50	20	2.00	TO263-3-2
IPP65R110CFDA	110	31.20	99.60	3.50 ... 4.50	118	0.45	TO220-3
IPP65R150CFDA	150	22.40	72.00	3.50 ... 4.50	86	0.64	TO220-3
IPP65R190CFDA	190	17.50	57.20	3.50 ... 4.50	68	0.83	TO220-3
IPP65R310CFDA	310	11.40	34.40	3.50 ... 4.50	41	1.20	TO220-3
IPP65R660CFDA	660	6.00	17.00	3.50 ... 4.50	20	2.00	TO220-3
IPW65R048CFDA	48	63.30	228.00	3.50 ... 4.50	270	0.25	TO247-3
IPW65R080CFDA	80	43.30	127.00	3.50 ... 4.50	161	0.32	TO247-3
IPW65R110CFDA	110	31.20	99.60	3.50 ... 4.50	118	0.45	TO247-3
IPW65R150CFDA	150	22.40	72.00	3.50 ... 4.50	86	0.64	TO247-3
IPW65R190CFDA	190	17.50	57.20	3.50 ... 4.50	68	0.83	TO247-3

1) See packages on page 142 to 144

# IGBTs: discretes and modules

## IGBT discretes

Infinite offers an extensive and dedicated range of automotive AEC-Q101-qualified IGBTs from 600 to 1200 V and up to 160 A. Specially designed for hybrid and electric vehicles, both the IGBT and diode are optimized to provide the best performance for applications ranging from low to ultra-high switching frequencies. Available in a wide variety of packages from D<sup>2</sup>PAK and TO-247 to high-performance packages such as Super-TO-220 and Super-TO-247, the portfolio has suitable packaging solutions to enable higher current handling or the realization of creepage requirements, as well as benchmark-level performance.

### Key applications

- > Main and auxiliary inverters
- > PFC
- > OBC and DC-DC
- > PTC heater

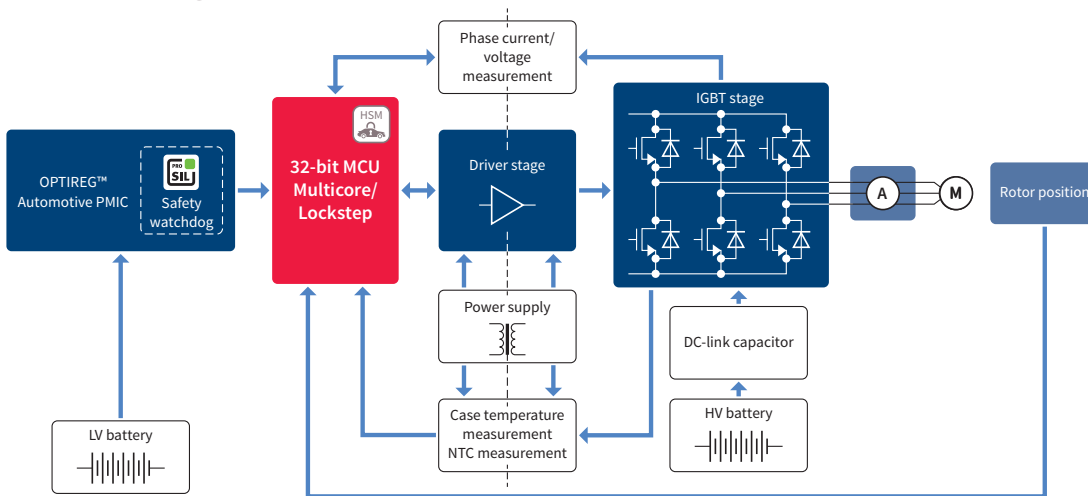
### Key features

- > 600 to 1200 V up to 160 A
- > SMD and through-hole packages
- > AEC-Q101 qualified
- > Thorough and dynamic final test routine implemented

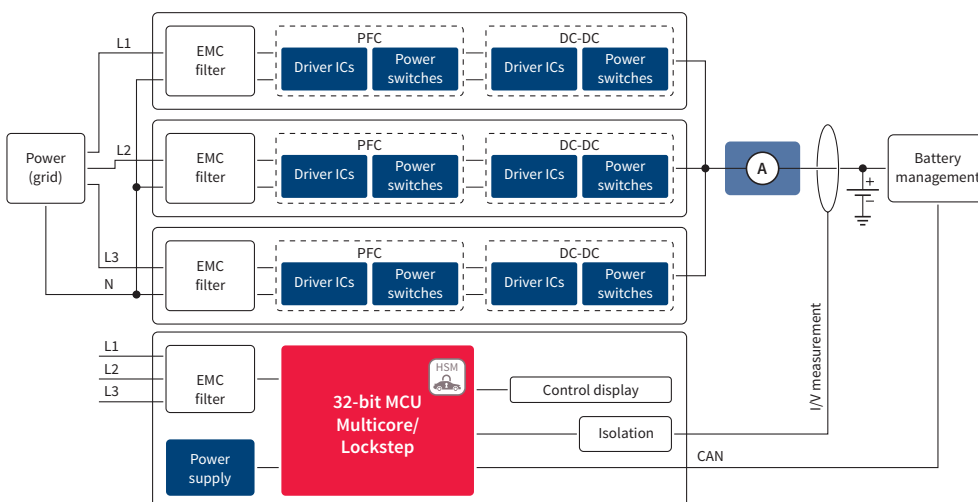
### Key benefits

- > Application-based performance optimization
- > Benchmark performance delivers high system-level efficiency
- > Robust and reliable design

## Inverter diagram



## On-board charger





## IGBT discretes

IGBT								
Product name	V <sub>ces</sub> [V]	I <sub>c</sub> @ 100°C [A]	V <sub>ce(on)</sub> [V]	T <sub>sc</sub> @ 150°C [μs]	E <sub>on</sub> @ 25°C [μJ]	E <sub>off</sub> @ 25°C [μJ]	V <sub>f</sub> (typ) @ 25°C [V]	Package <sup>1)</sup>
AIKD03N60RF	600	2.50	2.20	5	50	40	2.10	TO-252-3 (DPAK 3-leg)
AIKD04N60R	600	4.00	1.65	5	90	150	1.70	TO-252-3 (DPAK 3-leg)
AIKD04N60RF	600	4.00	2.20	5	60	50	2.10	TO-252-3 (DPAK 3-leg)
AIKD06N60R	600	6.00	1.65	5	110	220	1.70	TO-252-3 (DPAK 3-leg)
AIKD06N60RF	600	6.00	2.20	5	90	90	2.10	TO-252-3 (DPAK 3-leg)
AIKD10N60R	600	10.00	1.65	5	210	380	1.70	TO-252-3 (DPAK 3-leg)
AIKD10N60RF	600	10.00	2.20	5	190	160	2.10	TO-252-3 (DPAK 3-leg)
AUIRG4BC30U-S	600	12.00	1.95	-	160	200	-	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AIKD15N60R	600	15.00	1.65	5	370	530	1.70	TO-252-3 (DPAK 3-leg)
AIKD15N60RF	600	15.00	2.20	5	270	250	2.10	TO-252-3 (DPAK 3-leg)
AUIRG4BC30S-S	600	18.00	1.40	-	260	3450	-	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AIKB20N60CT	600	20.00	1.50	5	310	460	1.65	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AIKP20N60CT	600	20.00	1.50	5	310	460	1.65	TO-220
AIKW20N60CT	600	20.00	1.50	5	310	460	1.65	TO-247
AUIRGP4062D-E	600	24.00	1.60	5 <sup>2)</sup>	115	600	1.80	TO-247
AUIRG4PC40S-E	600	31.00	1.32	-	450	6500	-	TO-247
AIKW30N60CT	600	32.50	1.50	5	690	770	1.65	TO-247
AUIRGP35B60PD-E	600	34.00	1.85	-	220	215	1.30	TO-247
AUIRGS4062D1	600	39.00	1.57	5 <sup>2)</sup>	532	311	1.57	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRGS4062D1	600	39.00	1.57	5 <sup>2)</sup>	532	311	1.57	TO-262
AUIRGF65G40D0	600	41.00	1.80	5	298	147	1.70	TO-247
AUIRGP50B60PD1E	600	45.00	2.00	-	255	375	1.30	TO-247
AUIRGS30B60K	600	50.00	1.95	10	350	825	-	TO-263-3 (D <sup>2</sup> PAK 3-leg)
AUIRGS30B60K	600	50.00	1.95	10	350	825	-	TO-262
AIKW50N60CT	600	57.50	1.50	5	1200	1400	1.65	TO-247
AUIRGP4063D-E	600	60.00	1.60	5 <sup>2)</sup>	625	1275	1.95	TO-247
AIKW75N60CT	600	80.00	1.50	5	2000	2500	1.65	TO-247
AIKQ100N60CT	600	145.00	1.50	5	3100	2500	1.65	Super-TO-247
AIKQ120N60CT	600	155.00	1.50	5	4100	2800	1.65	Super-TO-247
AUIRGPS4070D0	600	160.00	1.70	6 <sup>2)</sup>	8200	2900	1.90	Super-TO-247
AIGW40N65F5	650	46.00	1.60	-	350	100	-	TO-247
AIGW40N65H5	650	46.00	1.66	-	360	110	-	TO-247
AIKW40N65DF5	650	46.00	1.60	-	350	100	1.55	TO-247
AIKW40N65DH5	650	46.00	1.66	-	380	120	1.55	TO-247
AIGW50N65F5	650	53.50	1.66	-	490	140	-	TO-247
AIGW50N65H5	650	53.50	1.66	-	450	160	-	TO-247
AIKW50N65DF5	650	53.50	1.66	-	490	140	1.54	TO-247
AIKW50N65DH5	650	53.50	1.66	-	450	160	1.54	TO-247
AUIRGDC0250	1200	81.00	1.37	-	-	29000	-	Super-TO-220 Reflow
AUIRG4PH50S	1200	81.00	1.47	-	-	29000	-	TO-247

1) See packages on page 142 to 144

2) T<sub>sc</sub> at 25°C

# IGBTs: discretes and modules

## IGBT modules

Infineon's HybridPACK™ family extends across the full power spectrum required by IGBT modules for the main inverter in hybrid and electric vehicles. Various product versions in five different packages enable maximum scalability across voltage and power classes ranging from 200 A to 900 A and 400 V to 1200 V (nominal chip values). The HybridPACK™ modules feature half-bridge and six-pack IGBTs and are specially designed and qualified for automotive applications.

HybridPACK™ DSC is a family of molded modules that offer increased power density due to double-sided cooling and integrated die temperature and current sensors. HybridPACK™ DSC modules can be stacked to offer a scalable solution in accordance with the customer's approach to inverter design.

The automotive Easy1B and Easy2B packages are easy-to-assemble modules for high voltage auxiliaries and DC-DC converters in hybrid and electric vehicles.

## Automotive power modules

### HybridPACK™ 1, HybridPACK™ Light, HybridPACK™ DC6 – power module for hybrid and full electric vehicle applications for a power range up to 100 kW

Sales name	$I_c$ [A]	$V_{CES}$ [V]	Application	Product status	Packages <sup>1)</sup>
FS400R07A1E3_S7	400	705	Inverter	Released	HybridPACK™ 1
FS215R04A1E3D	215	400	Inverter	Released	HybridPACK™ 1
FS200R07A5E3_S6	200	705	Inverter	Released	HybridPACK™ Light
FS400R07A3E3	400	705	Inverter	Released	HybridPACK™ 1 DC6
NEW FS400R07A3E3_H6	400	705	Inverter	Released	HybridPACK™ 1 DC6 Wave

### HybridPACK™ 2 – power module for hybrid and full electric vehicle applications for a power range up to 180 kW

Sales name	$I_c$ [A]	$V_{CES}$ [V]	Application	Product status	Packages <sup>1)</sup>
FS400R12A2T4	400	1200	Inverter	Not for new design	HybridPACK™ 2
FS600R07A2E3_B31	600	680	Inverter	Not for new design	HybridPACK™ 2 Enhanced
FS600R07A2E3_B32	600	680	Inverter	Not for new design	HybridPACK™ 2 Enhanced
FS800R07A2E3_B31	800	680	Inverter	Not for new design	HybridPACK™ 2 Enhanced
FS800R07A2E3_B32	800	680	Inverter	Not for new design	HybridPACK™ 2 Enhanced
FS900R08A2P2_B31	900	750	Inverter	Released	HybridPACK™ 2 Enhanced
FS900R08A2P2_B32	900	750	Inverter	Released	HybridPACK™ 2 Enhanced

### HybridPACK™ Drive – power module for hybrid and full electric vehicle applications for a power range up to 160 kW

Sales name	$I_c$ [A]	$V_{CES}$ [V]	Application	Product status	Packages <sup>1)</sup>
FS820R08A6P2	820	750	Inverter	Released	HybridPACK™ Drive
FS820R08A6P2B	820	750	Inverter	Released	HybridPACK™ Drive
FS820R08A6P2LB	820	750	Inverter	Released	HybridPACK™ Drive
NEW FS660R08A6P2FB	660	750	Inverter	Coming Q4/2018	HybridPACK™ Drive Flat
NEW FS660R08A6P2FLB	660	750	Inverter	Coming Q4/2018	HybridPACK™ Drive Flat
NEW FS770R08A6P2B	770	750	Inverter	Coming Q4/2018	HybridPACK™ Drive Wave

1) See power modules on page 145

## HybridPACK™ DSC – molded power module for hybrid and full electric vehicle applications for a power range up to 100 kW

Sales name	$I_c$ [A]	$V_{CES}$ [V]	Application	Product status	Packages <sup>1)</sup>
FS200R07A02E3_S6	200	700	Inverter	Released	HybridPACK™ DSC L
FF400R07A01E3_S6	400	700	Inverter	Released	HybridPACK™ DSC S

## Automotive Easy modules - power modules for high voltage auxiliary applications up to 10 kW

Sales name	$I_c$ [A]	$V_{CES}$ [V]	Application	Product status	Packages <sup>1)</sup>
FS75R07W2E3_B11A	75	650	Inverter	Released	Automotive Easy 2B
FS50R07W1E3_B11A	50	650	Inverter	Released	Automotive Easy 1B
F4-50R07W1H3_B11A	50	650	DC-DC converter	Released	Automotive Easy 1B
F4-75R07W1H3_B11A	75	650	DC-DC converter	Released	Automotive Easy 1B

## Evaluation kits

Board name	SP number	Description
Hybrid kit 1+	SP000806996	Evaluation kit for applications with HybridPACK™ 1 FS400R07A1E3
Easy kit aux drives	SP001020068	Evaluation kit for applications with Easy 1B FS50R07W1E3_B11A
Easy kit DC-DC	SP001007734	Evaluation kit for applications with Easy 1B F4-50R07W1H3_B11A
Hybrid KIT Drive	SP001464622	Inverter evaluation kit with HybridPACK™ Drive FS820R08A6P2B
Hybrid KIT Drive Sense	SP001464626	Inverter evaluation kit with HybridPACK™ Drive FS820R08A6P2LB (long AC tabs) and LEM current sensor
Hybrid KIT DSC	SP001683524	Inverter evaluation kit with HybridPACK™ DSC S FF400R07A01E3_S6

1) See power modules on page 145

# Temperature-protected switches TEMPFET™

TEMPFET™ provides the first level of temperature and current protection via its temperature sensor.

The temperature sensor is available on external pins and enables direct gate access and flexible temperature response control.

## Features

- > Logic level input
- > Analog driving capability
- > Potential-free temperature sensor
- > High-speed switching (100 kHz)
- > Overload protection and thermal shutdown with external circuit
- > Avalanche rated

## Product overview TEMPFET™: temperature protected switches

Product name	$V_{DS}$ [V]	$R_{DS(on)}$ [mΩ]	$I_D$ [A]	$V_{GS(th)}$ (min-max) [V]	$Q_G$ (typ) [nC]	Package <sup>1)</sup>
BTS282Z	49	6.50	80	1.20 ... 2.00	155	TO263-7 (D <sup>2</sup> PAK 7-leg), TO220-7-12
BTS244Z	55	12.00	35	1.20 ... 2.00	85	TO263-5-2 (D <sup>2</sup> PAK 5-leg), TO220-5-12
BTS247Z	55	18.00	33	1.20 ... 2.00	60	TO263-5-2 (D <sup>2</sup> PAK 5-leg)

1) See packages on page 142 to 144



# Protected low-side switches HITFET™

The HITFET™+ family enables a significant shrink compared to the existing HITFET™ portfolio (up to 50 percent shrink). To meet all application requirements, Infineon offers a highly scalable portfolio based on two different packages

(TO252-3 DPAK 3-leg/TO-252-5 DPAK 5-leg and TDOS-8 EP) and two types of feature sets: the standard HITFET™+ family (BTS3xxx) and the full-featured HITFET™+ family (BTF3xxx).

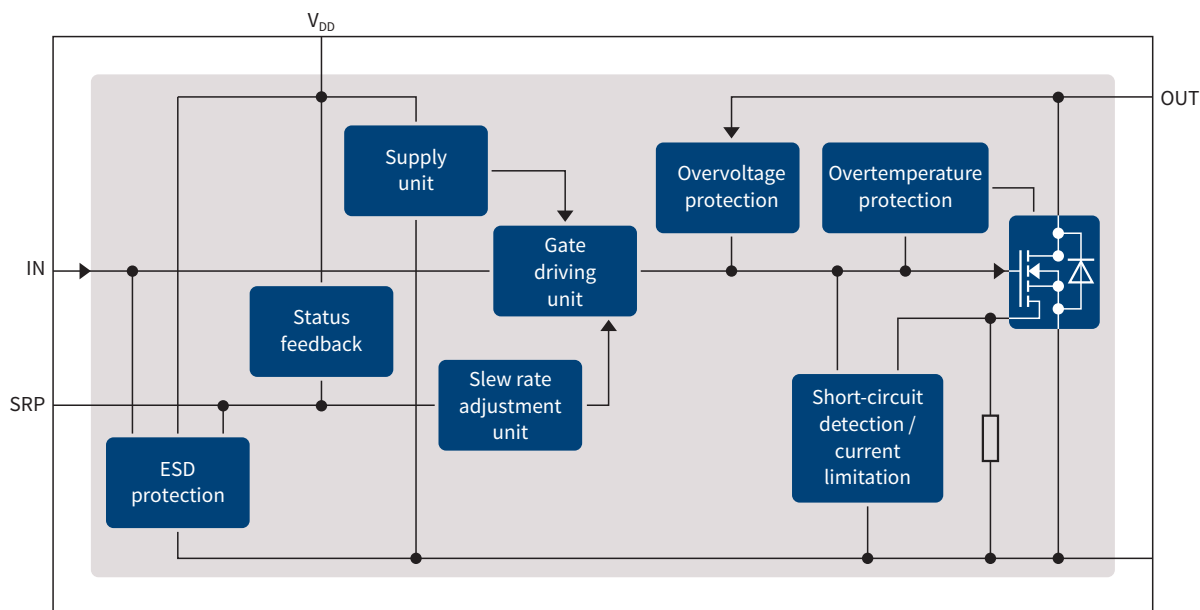
## Features

- › Overtemperature protection
- › Overload protection
- › Current limitation
- › Short-circuit protection
- › Open-load detection (only on BTS3408G)
- › Thermal shutdown with auto-restart or latch behavior
- › Overvoltage protection
- › Logic-level input
- › Electrostatic Discharge (ESD) protection
- › Linear drive capability
- › Status feedback
  - Digital flag or with external resistor
  - Analogous with external resistor at input
- › Adjustable slew rate (only on BTF3050TE)

## Automotive and industrial applications

- › Relays
- › Fans and pumps
- › Solenoids
- › Valves
- › Heating elements
- › Bulbs and LEDs
- › Fuses
- › Line drivers and supply switches

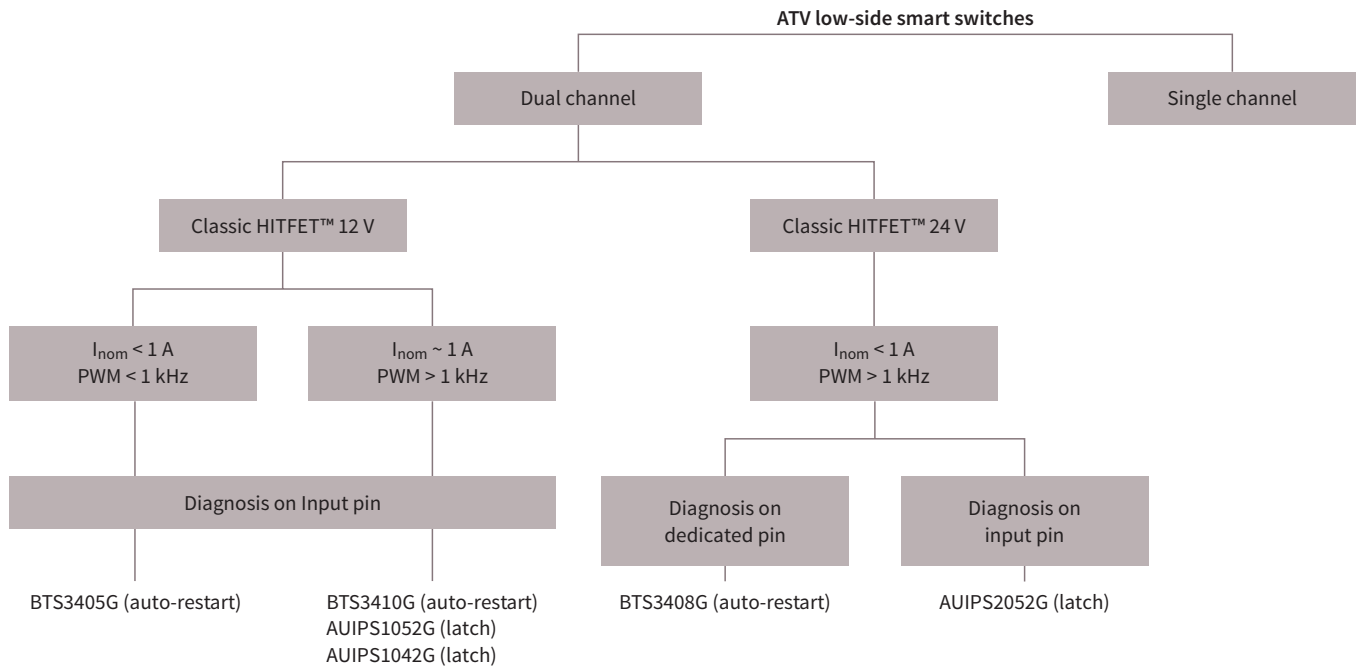
## Block diagram HITFET™+ BTF3050TE



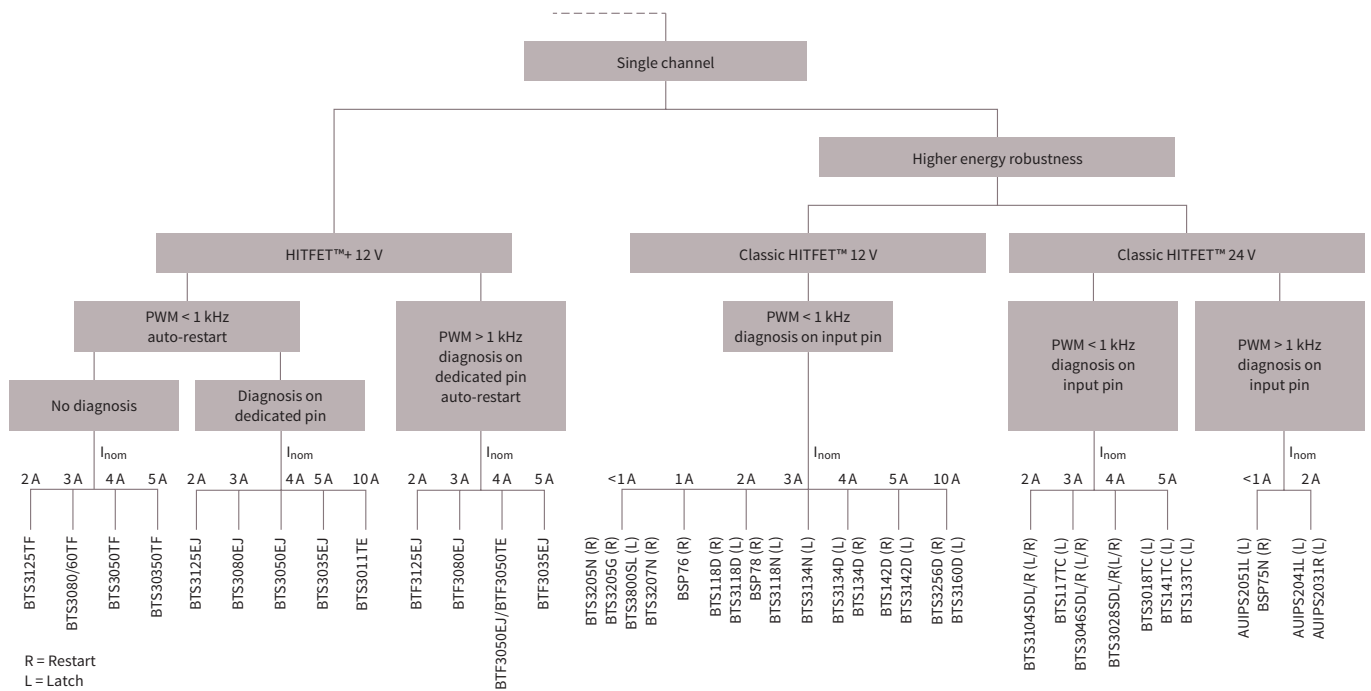


# Protected low-side switches HITFET™

Selection tree – protected low side switches (dual channel)



Selection tree – protected low side switches (single channel)



## Product overview Classic HITFET™/HITFET™+: protected low-side switches

Product name	R <sub>DS(on)</sub> [mΩ]	R <sub>DS(on)</sub> (typ) @ 25°C [mΩ]	R <sub>DS(on)</sub> (max) @ 150°C [mΩ]	Channels	V <sub>DS(AZ)</sub> [V]	I <sub>L(NOM)</sub> [A]	I <sub>L(lim)</sub> [A]	I <sub>L(LM)-Trigger</sub> [A]	PWM [kHz]	Diagnostic	Package <sup>1)</sup>
<b>HITFET™+ product portfolio</b>											
NEW BTS3011TE	11	10.7	22	1	40	10.00	35.00	70.00	1.0	STATUS pin	TO252-5 (DPAK 5-leg)
BTS3035EJ	35	28	70	1	40	5.00	20.00	-	1.0	STATUS pin	TDSO-8 EP
BTS3035TF	35	30	70	1	40	5.00	20.00	-	1.0	-	TO252-3 (DPAK)
BTF3035EJ	35	28	70	1	40	5.00	14.00	41.00	20.0	STATUS pin	TDSO-8 EP
BTF3050TE	50	40	100	1	40	3.00	8.00	30.00	10.0	through SRP pin	TO252-5 (DPAK 5-leg)
BTS3050EJ	50	40	100	1	40	4.00	15.00	-	1.0	STATUS pin	TDSO-8 EP
BTS3050TF	50	44	100	1	40	4.00	15.00	-	1.0	-	TO252-3 (DPAK)
BTF3050EJ	50	40	100	1	40	4.00	10.00	29.00	20.0	STATUS pin	TDSO-8 EP
BTS3060TF	60	50	135	1	40	3.00	10.50	-	1.0	-	TO252-3 (DPAK)
BTS3080EJ	80	64	160	1	40	3.00	10.00	-	1.0	STATUS pin	TDSO-8 EP
BTS3080TF	80	69	160	1	40	3.00	10.00	-	1.0	-	TO252-3 (DPAK)
BTF3080EJ	80	64	160	1	40	3.00	7.00	18.00	20.0	STATUS pin	TDSO-8 EP
BTS3125EJ	125	100	250	1	40	2.00	7.00	-	1.0	STATUS pin	TDSO-8 EP
BTS3125TF	125	108	250	1	40	2.00	7.00	-	1.0	-	TO252-3 (DPAK)
BTF3125EJ	125	100	250	1	40	2.00	5.00	12.00	20.0	STATUS pin	TDSO-8 EP
<b>Classic HITFET™ product portfolio</b>											
BTS3160D	10	8	18	1	40	7.80	-	70.00	1.0	digital	TO252-5 (DPAK 5-leg)
BTS3256D	10	10	20	1	40	7.50	42.00	-	10.0	digital	TO252-5 (DPAK 5-leg)
AUIPS1025R	28	28	55	1	36	4.90	-	15.00	50.0	-	TO-252 (DPAK 3-leg)
AUIPS1041R	100	80	175	1	39	2.20 (@ 50 K/W Rth)	-	4.50	1.0	-	TO-252 (DPAK 3-leg)
AUIPS1042G	100	80	175	2	39	0.70 (@ 130 K/W Rth)	-	4.50	1.0	-	SO-8 (DSO-8)
BTS3410G	200	150	480	2	42	1.30	5.00	-	1.0	through input pin	DSO-8
AUIPS1051L	250	160	450	1	39	1.40 (@ 60 K/W Rth)	-	2.80	10.0	-	SOT-223
AUIPS1052G	250	160	450	2	39	0.50 (@ 130 K/W Rth)	-	2.80	10.0	-	SO-8 (DSO-8)
BTS3207N	500	500	1200	1	42	0.70	5.00	-	1.0	through input pin	SOT223
BTS3205G	700	700	2400	1	42	0.35	0.60	-	1.0	through input pin	DSO-8
BTS3405G	700	700	2400	2	42	0.35	0.60	-	1.0	through input pin	DSO-8
BTS3205N	700	700	2400	1	42	0.35	0.60	-	1.0	through input pin	SOT223
BTS3800SL	800	800	1600	1	42	0.35	0.60	-	10.0	-	SCT595-5
BTS3018TC	18	14	44	1	60	6.00	30.00	-	1.0	through input pin	TO263-3-2
BTS141TC	30	25	68	1	60	5.10	25.00	-	1.0	through input pin	TO263-3-2
BTS3028SDL	30	28	91	1	60	5.00	18.00	-	1.0	through input pin	TO252-3 (DPAK)
BTS3028SDR	30	28	91	1	60	5.00	18.00	-	1.0	through input pin	TO252-3 (DPAK)
BTS133TC	50	40	120	1	60	3.80	21.00	-	1.0	through input pin	TO263-3-2
BTS3046SDL	50	46	134	1	60	3.60	10.00	-	1.0	through input pin	TO252-3 (DPAK)
BTS3046SDR	50	46	134	1	60	3.60	10.00	-	1.0	through input pin	TO252-3 (DPAK)
AUIPS2031R	60	45	110	1	68	2.30 (@ 70 K/W Rth)	-	10.00	20.0	-	TO-252 (DPAK 3-leg)
BTS117TC	100	80	240	1	60	3.50	7.00	-	1.0	through input pin	TO263-3-2
BTS3104SDL	104	104	323	1	60	2.00	6.00	-	1.0	through input pin	TO252-3 (DPAK)
BTS3104SDR	104	104	323	1	60	2.00	6.00	-	1.0	through input pin	TO252-3 (DPAK)
AUIPS2041L	130	100	240	1	68	1.40 (@ 100 K/W Rth)	-	5.00	25.0	-	SOT-223
AUIPS2051L	300	250	520	1	70	0.90 (@ 100 K/W Rth)	-	1.80	35.0	-	SOT-223
AUIPS2052G	300	250	520	2	70	0.90 (@ 100 K/W Rth)	-	1.80	35.0	-	SO-8 (DSO-8)
BTS3408G	550	480	1000	2	60	0.55	1.00	-	1.0	through input pin	DSO-8
BSP75N	550	490	1350	1	60	0.70	1.00	-	5.0	through input pin	SOT223

1) See packages on page 142 to 144

# Smart multichannel switches for body (SPIDER+)

Infiniteon's integrated SPIDER+ family comprises nine value-scalable products. The simplified portfolio includes two LS (8 + 4-channel), two HS (8-channel) and five flexible devices (8-channel) with up to six configurable channels. Hence, a broad range of applications is addressable. Above all, the new 8-channel HS device offers a very cost-efficient solution to drive small HS loads, including open load at ON detection.

SPIDER+ devices are equipped with limp home and cranking, very low current consumption and enhanced diagnostics

## Applications

- › Automotive/industrial relays and solenoids
- › Single LEDs and small bulbs
- › Unipolar stepper motors

## Key features of SPIDER+

- › Limp home and cranking functionality implemented for all products (down to 3 V battery power)
- › Short circuit, overload and overtemperature protection
- › Open load at ON diagnosis
- › Paralleling of outputs possible
- › Very low current consumption in sleep mode
- › 16-bit SPI communication (5 MHz)
- › Enhanced diagnosis capability
- › 2 PWM inputs with mapping function
- › 4-channel devices: TSDSO-14 EP package
- › 8-channel devices: TSDSO-24 package

features, excellent thermal performance (exposed pad packages) and an input mapping function for the two direct inputs.

The family approach with consistent SPI registers, identical output stages for all channels and a comprehensive pin-to-pin compatibility reduce the design effort and therefore keeps system costs down with the ability to adjust without the need for a PCB re-design. Small TSDSO-14 EP and 24-pin packages realize PCB space savings.

## Benefits

- › Highest operational safety
- › Only one-time design effort required (family concept)
- › High design flexibility
- › Up to six configurable channels
- › Reduce costs without re-design
- › Entire path from microcontroller to loads trackable (supports ISO 26262)
- › Cost-efficient HS driver available
- › PCB space savings (small packages)
- › Value-scalable product portfolio
- › Excellent performance vs. price ratio

## SPIDER+ LED

The SPIDER+ LED devices combine the feature set of the SPIDER+ family with additional features to drive small bulbs or LEDs.

## Applications

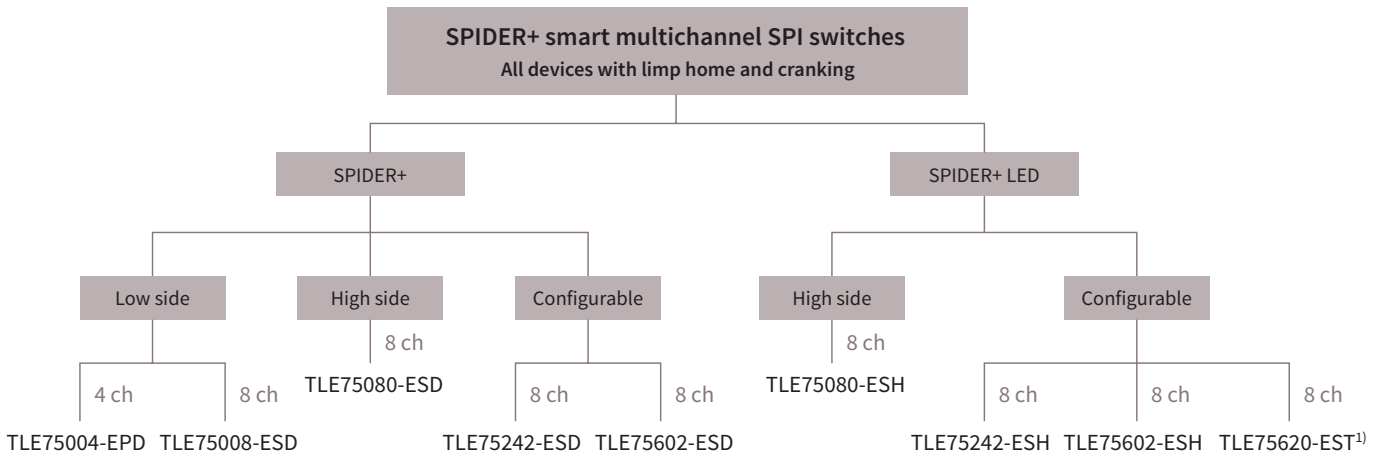
- › Single LEDs and small bulbs
- › Resistor-based LED lighting designs

Besides one high-side channel device, three configurable devices support LED designs in the most cost-effective way with diagnostic and protective features.

## Key features

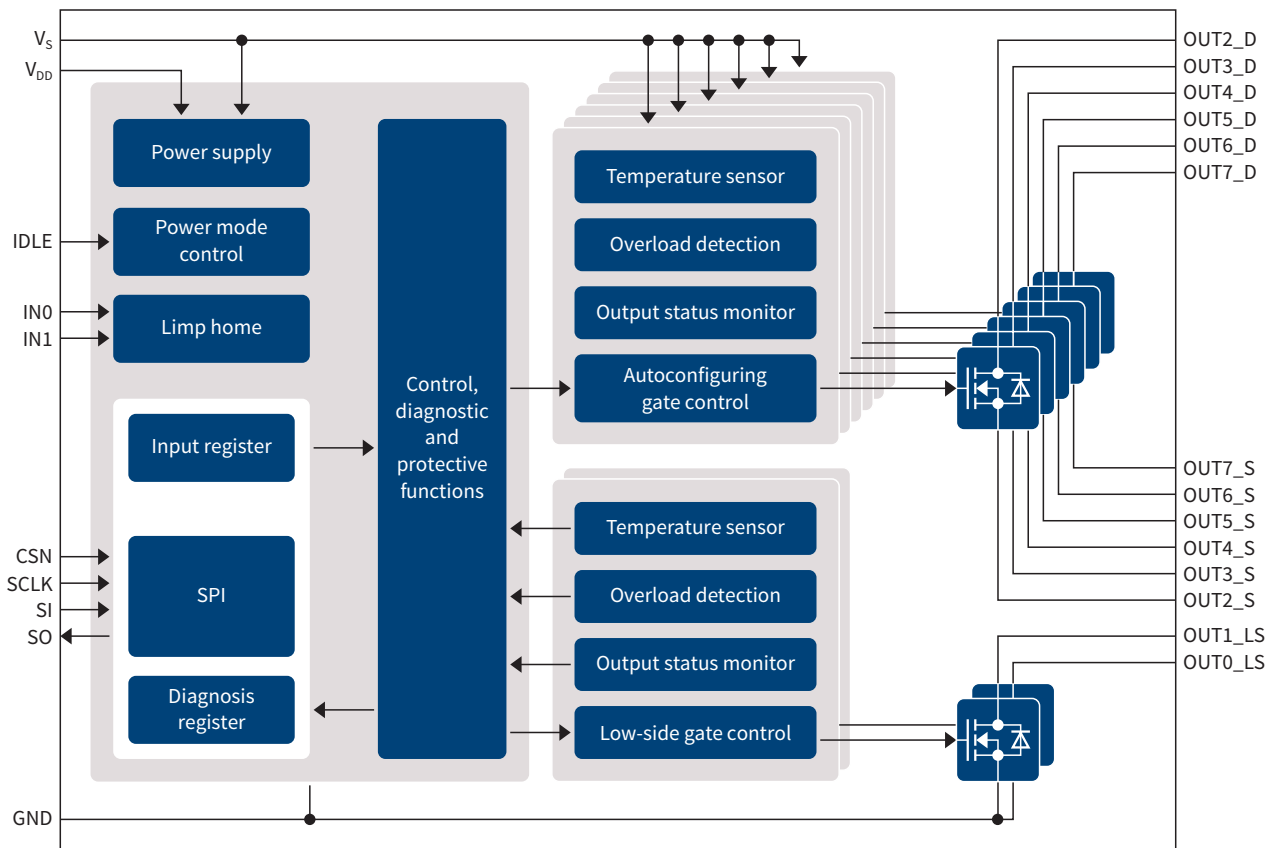
- › SPIDER+ feature set
- › Open load at ON diagnosis with tight threshold of 6 mA for TLE75620-EST to avoid LED glimmering
- › 2 additional PWM generators
- › Bulb inrush mode to drive small bulbs

## SPIDER+ whole family overview/selection tree



1) With open load at ON threshold of 6 mA

## Block diagram TLE75602-ESD







# Smart multichannel switches for body (SPIDER+)

## SPIDER/SPIDER+ product overview

	Product name	Configurable	High side	Low side	Cranking mode [V]	Limp home	LED driver OL @ ON, +2 add. PWM, bulb inrush	R <sub>DS(on)</sub> (typ) @ 25°C [Ω]	V <sub>DS(AZ)</sub> (min) [V]	I <sub>L(NOM)</sub> [mA]	Energy capability (repetitive 1 × 10 <sup>5</sup> cycles) [mJ]	Number of direct inputs	Package <sup>1)</sup>
SPIDER+	TLE75004-EPD			4	3	●		1.0	42	470	10	2	TSDSO-14 EP
	TLE75008-ESD			8	3	●		1.0	42	330	10	2	TSDSO-24 EP
	TLE75602-ESD	6		2	3	●		1.0	42	330	10	2	TSDSO-24 EP
	TLE75080-ESD		8		3	●		1.0	42	330	10	2	TSDSO-24 EP
	TLE75242-ESD	2	4	2	3	●		1.0	42	330	10	2	TSDSO-24 EP
SPIDER+ LED	TLE75080-ESH		8		3	●	●	1.0	42	330	10	2	TSDSO-24 EP
	TLE75242-ESH	2	4	2	3	●	●	1.0	42	330	10	2	TSDSO-24 EP
	TLE75602-ESH	6		2	3	●	●	1.0	42	330	10	2	TSDSO-24 EP
	TLE75620-EST	6	2		3	●	●	1.0	42	330	10	2	TSDSO-24 EP
SPIDER	TLE7233EM			4		●		1.1	41	470	13	4	SSOP-24-EP
	TLE7244SL			8		●		0.8	41	290	24	4	SSOP-24
	TLE7230R			8				0.8	48	500	15	4	DSO-36

1) See packages on page 142 to 144

# Smart multichannel switches for powertrain and safety

The multichannel low-side switch family for powertrain, safety and industrial applications is specially designed to drive a diverse range of loads from relays, injector valves, oxygen-probe heaters and general-purpose solenoids to unipolar stepper motors and more.

## Applications

- › Engine management systems
- › Diesel direct injection
- › Gasoline direct injection
- › Multi-port injection
- › Industrial applications

## Features

- › Overvoltage protection
  - Active clamping for inductive loads
- › Undervoltage protection
  - Power-on reset
  - Undervoltage shutdown
- › Overcurrent protection
  - Current limitation
  - Overcurrent switch-off
- › Overtemperature protection
  - Thermal shutdown
- › Electrostatic Discharge (ESD) protection
- › Direct input control (for PWM)
- › Communication interface (control/diagnosis)
  - Serial Peripheral Interface (SPI)
  - Micro Second Channel (MSC)
- › 5 V and 3.3 V  $\mu$ C compatibility
- › Status flag
- › 2-bit diagnosis feedback for:
  - Short-to-GND
  - Open-load
  - Short-to-battery
  - Normal operation

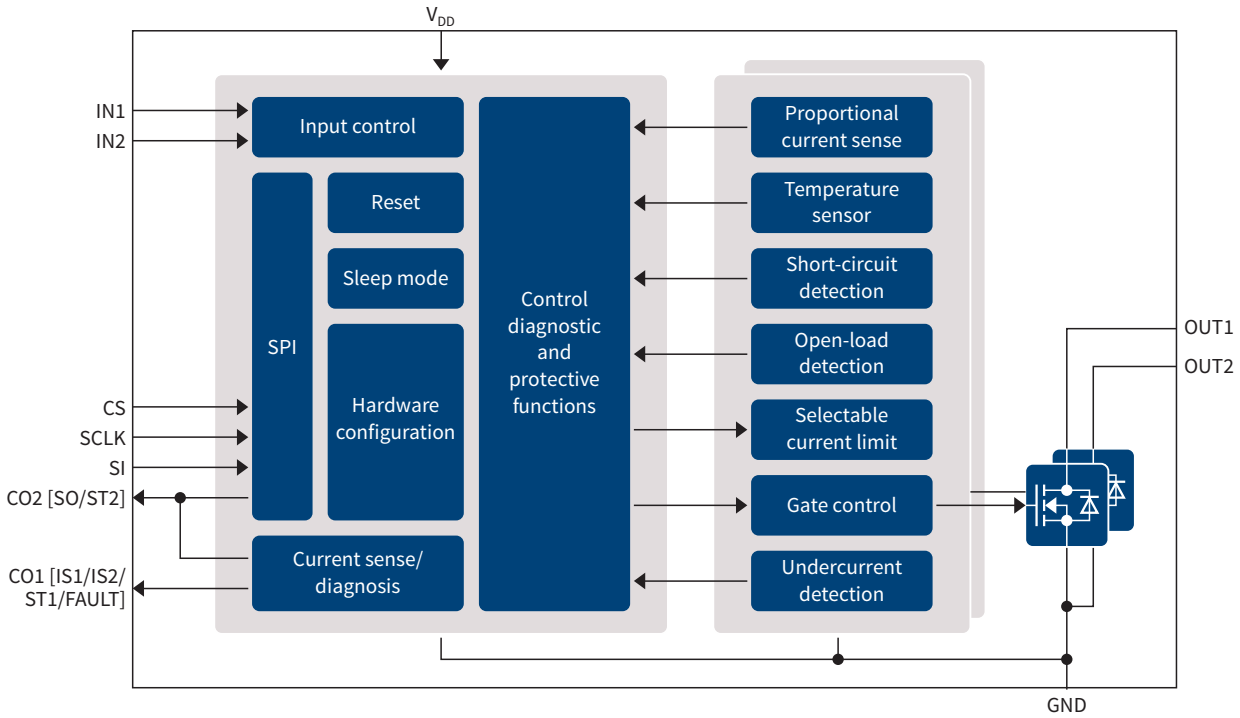
We offer a complete family concept with full scalability from 2 to 18-channels and leading-edge technology. All multichannel switches have full certification and are equipped with the embedded protection functions and enhanced diagnostics that are used in numerous industry platforms.

## Benefits

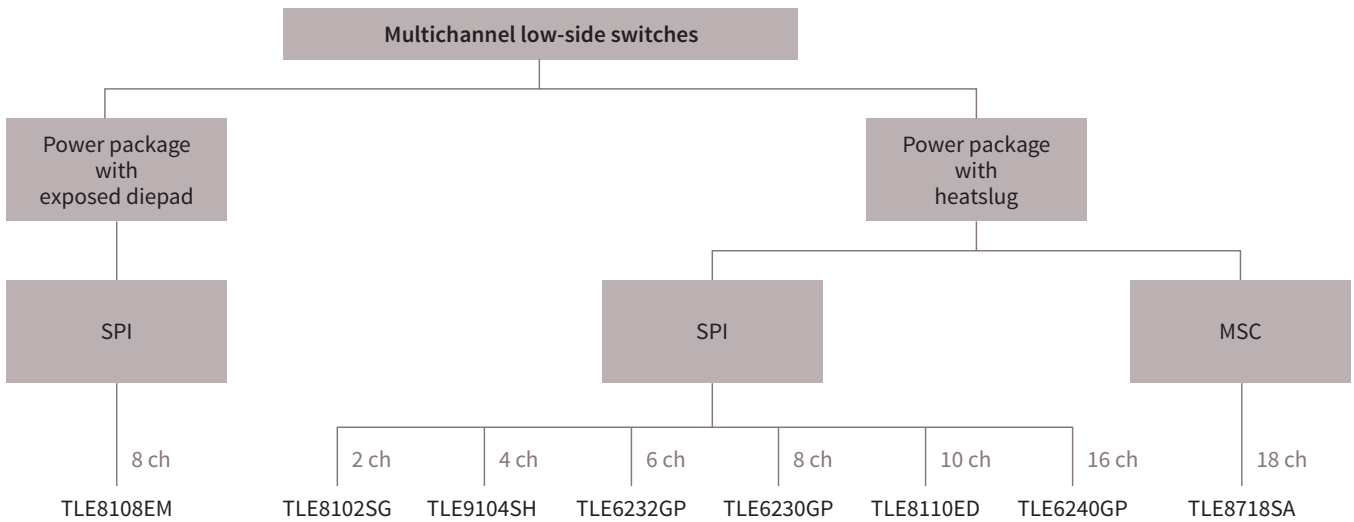
- › Single-family concept
- › Designed for dedicated applications, but also available for off-the-shelf use as standard products
- › Integrated self-protection and diagnostics
- › Enhanced error detection for improved system reliability
- › Control via standard SPI Bus or MicroSecond channel (TLE8718SA) or direct inputs
- › Suitable for daisy-chain configuration to save I/O ports
- › Support of safety-critical applications by overvoltage protection on all pins (TLE8718SA)
- › High quality ensured with automotive excellence program and Zero-Defect strategy



### Block diagram TLE8102SG



### Selection tree – multichannel low-side switches



# Smart multichannel switches for powertrain and safety

## Product overview

	Target loads <sup>2)</sup>	Channels	Electrical specification				Interface				Overcurrent protection		Status flag	Package <sup>1)</sup>
			#	R <sub>DS(on)</sub> (max) @ 25°C [mΩ]	I <sub>L(lim)</sub> (max) [A]	V <sub>CL</sub> (typ) [V]	Direct input pins	SPI	MSC	Daisy-chain	I-limit	Switch-Off		
TLE8102SG	High-current solenoids, O2-heater	2	2x	0.18	5.00 (9.00)	54	2	8-bit		•	•	•	•	DSO-12
TLE9104SH	Injectors, high-current solenoids, high-current relays	4	4x	0.15	5.00	60	4	16-bit		•		•		DSO-20 (Heatslug)
TLE6232GP	High-current relays, injectors, high-current solenoids	6	4x 2x	0.25 0.45	3.00 1.50	53	6	16-bit				•	•	DSO-36 (Power-SO)
TLE6230GP	Relays, high-current relays	8	8x	0.80	1.00	43	4	16-bit				•	•	DSO-36 (Power-SO)
TLE8108EM	LEDs, relays	8	8x	0.80	0.50	45	4	16-bit		•		•		SSOP-24 EP
TLE8110ED	LED, relays, injectors, high-current solenoids	10	4x 4x 2x	0.60 0.30 0.25	1.70 2.60 3.70	55 55 55	10	16-bit		•		•		DSO-36 (Dual gauge)
TLE6240GP	High-current relays, injectors, high-current solenoids	16	8x 4x 4x	1.00 0.35 0.30	1.00 3.00 3.00	50 53 53	8	16-bit		•	•		•	DSO-36 (Power-SO)
TLE8718SA	LEDs, relays, injectors, high-current solenoids, O2-heater	18	2x 2x 8x 2x 2x	0.15 0.26 0.53 0.35 1.78 0.96	8.00 3.00 2.20 2.20 0.60 0.60	55			LVDS + LVTTTL			•	•	DSO-36 (Power-SO)

1) See packages on page 142 to 144

2) Indication only. Devices can drive any kind of inductive/resistive load according to spec





Glossary  
Symbols

Support

System ICs

Network ICs

OPTIREG™  
Automotive  
Power Supply ICs

Motor drivers

LED drivers

High-side  
switches

Smart  
multichannel  
switches

Low-side  
switches

IGBTs  
discretes and  
modules

MOSFETs





## Protected high-side switches PROFET™

The highly integrated PROFET™ family (PROTECTED FET) incorporates a broad range of smart features, such as diagnostics and protection. PROFET™ intelligent power switches consist of a DMOS power transistor and CMOS logic circuitry for complete built-in protection.

The PROFET™ family offers protection against overload, overvoltage, short-circuit, excessive temperature, loss of ground, loss of power, and Electrostatic Discharge (ESD). The PROFET™ family products are also capable of protecting against dynamic overvoltage such as load dump and inductive load turn-off.

The PROFET™ diagnostics offer the choice of either status or current sense features, or a combination of both. In the event of a malfunction, the status feature is able to diagnose overtemperature or open-load. The PROFET™ diagnostic features also provide the user with precise information about switch and load. Diagnostic feedback and load current sensing minimize risks by eliminating the need for additional discrete circuitry and assembly.

This vast range of smart features makes the PROFET™ ideal for a variety of automotive (12 V), truck and agricultural (24 V), and industrial applications.

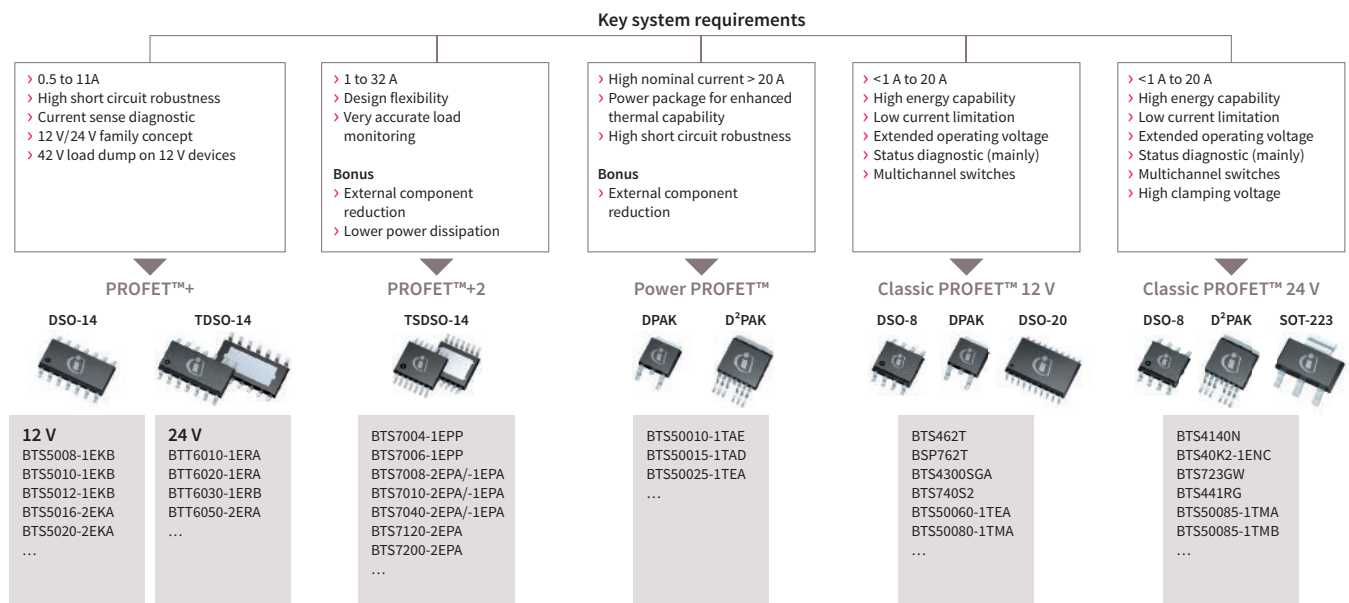
### PROFET™+2

PROFET™+2 is Infineon's latest protected high-side power switch in a TSDSO-14 exposed pad package with state-of-the-art diagnostic and protection features. The family offers a benchmark form factor, the lowest  $R_{\text{DS(ON)}}$  ( $1 \times 2 \text{ m}\Omega$ ), and the smallest package (TSDSO-14 EP) with a pin pitch of 0.65 mm.

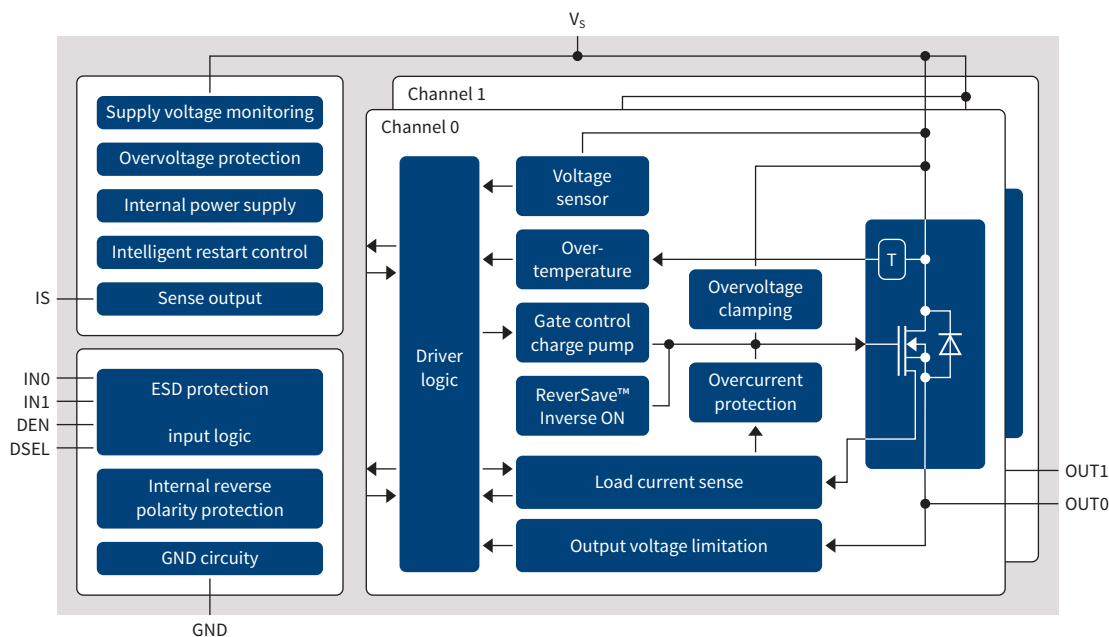
The whole family is compatible with the hardest reverse battery requirements, with ReverSave™ available for the first time on the market on a single chip product. The family offers outstanding energy efficiency with reduced current consumption, state-of-the-art current sense accuracy ( $K_{\text{ILIS}}$ ), benchmark low cranking voltage capability and faster switching/slew rate with no impact on EMC.



# Automotive smart high-side switches



## Block diagram BTS7xxx-2EPy



### Application examples

- > Lighting
  - Exterior and interior lighting (bulb/LED)
- > Power distribution
  - Relay and fuse replacement, solid state, relay, Smart Power Distribution Center (PDC)
- > Heating
  - Seat, PTC, auxiliary, glow plug

- > Motor control
  - DC brush motor, pumps, fans
- > Infotainment

### Load

- > Capacitive, such as LED modules
- > Resistive, such as seat heating
- > Inductive, such as solenoids
- > Electronic, such as ECU

# Protected high-side switches PROFET™

## PROFET™ families overview

Family name	Basic features	Benefits
PROFET™+2	<ul style="list-style-type: none"> <li>› High-side switches for nominal load currents between 0.5 and 10 A</li> <li>› Especially suitable for capacitive loads e.g., halogen bulbs and LED modules</li> <li>› Capable of driving resistive loads e.g., small seat heating applications requiring nominal currents below 8 A</li> <li>› Operating voltage range: 3.1 – 28 V</li> <li>› 3.3 and 5 V compatible logic input</li> <li>› PWM capability up to 1 kHz</li> <li>› Protection: current tripping, overtemperature, over-voltage, load dump, reverse polarity, short-circuit</li> <li>› Diagnostics: load current sense output</li> </ul>	<ul style="list-style-type: none"> <li>› 50% reduced current consumption</li> <li>› Simplified and cost-effective ground network that requires only a small resistor while offering functional system safety</li> <li>› Outstanding current sense accuracy (<math>K_{ILIS} \leq 5\%</math> at nominal current)</li> <li>› Benchmark cranking voltage capability able to work down to 3.1 V</li> <li>› 40% smaller package than previous generation offering PCB area savings</li> <li>› Optimized for design flexibility across the family due to pin-to-pin compatibility</li> <li>› Very low output leakage current “quiescent current” (<math>\leq 0.5 \mu\text{A}</math> up to 85°C)</li> </ul>
Power PROFET™	<ul style="list-style-type: none"> <li>› High-side switches for load currents up to 45 A</li> <li>› Suitable for resistive, capacitive and inductive loads</li> <li>› Optimized for 12 V supply voltage</li> <li>› Voltage-driven input logic (3.3 and 5 V)</li> <li>› Stable behavior during cranking down to 3.2 V supply voltage</li> <li>› Lowest on-state resistance down to 1.0 mΩ</li> <li>› Protection: overtemperature, overvoltage, load dump, reverse polarity, short-circuit</li> <li>› Diagnostics: load current sense output</li> </ul>	<ul style="list-style-type: none"> <li>› Efficient and robust drivers for high-current loads</li> <li>› Monitoring of load current</li> <li>› Protection of device, wiring harness and load</li> <li>› High short-circuit robustness</li> <li>› Available in standard power package (D<sup>2</sup>PAK, DPAK)</li> </ul>
PROFET™+ 12V and 24V	<ul style="list-style-type: none"> <li>› High-side switches for load currents between 0.5 and 10 A</li> <li>› Especially suitable for capacitive loads</li> <li>› Operating voltage range:                             <ul style="list-style-type: none"> <li>› PROFET™+ 12V: 5 – 28 V</li> <li>› PROFET™+ 24V: 5 – 36 V</li> </ul> </li> <li>› 3.3 and 5 V compatible logic input</li> <li>› PWM capability up to 200 Hz (PROFET™+ 12V) or 400 Hz (PROFET™+ 24V)</li> <li>› Protection: overtemperature, overvoltage, load dump, reverse polarity, short-circuit</li> <li>› Diagnostics: load current sense output</li> </ul>	<ul style="list-style-type: none"> <li>› Maximum design flexibility thanks to identical footprint</li> <li>› Pin-compatibility between 12 and 24 V and within each of the individual family members</li> <li>› Very low stand-by current (&lt; 0.5 μA max.)</li> <li>› High short-circuit robustness</li> <li>› Outstanding current sense accuracy</li> <li>› Improved heat dissipation of DSO package</li> </ul>
Classic PROFET™	<ul style="list-style-type: none"> <li>› High-side switches for load currents between 0.25 and 23 A</li> <li>› Suitable for resistive, capacitive and inductive loads</li> <li>› Optimized for 12 V and 24 V supply voltages</li> <li>› Extended operating voltage range, up to 60 V</li> <li>› Protection: overtemperature, overvoltage, load dump, short-circuit, reverse polarity, ESD</li> <li>› Diagnostics: open load at OFF detection, open load at ON detection (partly), load current sense output</li> <li>› Open drain diagnosis output (status feedback)</li> </ul>	<ul style="list-style-type: none"> <li>› Established and proven technology/products for more than 10 years</li> <li>› Benchmark in energy robustness</li> <li>› High-voltage capability</li> <li>› Fast switching capability</li> <li>› Fast demagnetization of inductive loads</li> <li>› Efficient and robust drivers for high-current loads</li> <li>› Low current consumption</li> <li>› Broad application range</li> </ul>

## No diagnosis

Product name	Product family	$R_{DS(on)}$ (typ) [mΩ]	$R_{DS(on)}$ (max) @ $T_j = 150^\circ\text{C}$ [mΩ]	Nominal load current [A]	$E_{AS}$ [mJ]	Operating voltage range [V]	$I_{L(SC)}$ (typ) [A]	24 V capable	Package <sup>1)</sup>
BTS4140N <sup>2)</sup>	Classic PROFET™ 24 V	1000	3000	< 3	1000 @ 0.15 A	4.90 ... 60.00	0.70	●	SOT223
BTS41KOS-ME-N	Classic PROFET™ 24 V	800	3000	< 3	1001 @ 0.15 A	4.90 ... 45.00	0.70	●	SOT223
BSP742T	Classic PROFET™ 12 V	260	700	< 3	100 @ 0.50 A	5.00 ... 34.00	3.00		DSO-8
BSP452	Classic PROFET™ 12 V	160	400	< 3	500 @ 0.50 A	5.00 ... 34.00	1.50		SOT223
BTS452T	Classic PROFET™ 24 V	150	380	< 3	150 @ 1.00 A	6.00 ... 52.00	6.00	●	TO252-5 (DPAK 5-leg)
BSP752T	Classic PROFET™ 24 V	150	380	< 3	125 @ 1.00 A	6.00 ... 52.00	6.00	●	DSO-8
BTS4141N	Classic PROFET™ 24 V	150	320	< 3	700 @ 0.70 A	12.00 ... 45.00	1.10	●	SOT223
BTS4142N	Classic PROFET™ 24 V	150	320	< 3	160 @ 1.00 A	12.00 ... 45.00	2.20	●	SOT223
BSP762T	Classic PROFET™ 12 V	70	200	< 3	870 @ 1.00 A	5.00 ... 34.00	7.00		DSO-8
BTS462T	Classic PROFET™ 12 V	70	200	3–5	4400 @ 1.00 A	5.00 ... 34.00	10.00		TO252-5 (DPAK 5-leg)
BTS730	Classic PROFET™ 12 V	70	140	3–5	n/a	5.90 ... 16.90	20.00		DSO-20
BSP772T	Classic PROFET™ 12 V	50	120	3–5	900 @ 1.50 A	5.00 ... 34.00	12.00		DSO-8
BTS441TG	Classic PROFET™ 24 V	15	37	> 15	700 @ 21.00 A	4.75 ... 41.00	65.00	●	TO263-5-2

1) See packages on page 142 to 144

2) Current controlled input at  $T_j = 125^\circ\text{C}$ 

## Digital diagnosis

Product name	Product family	$R_{DS(on)}$ (typ) [mΩ]	$R_{DS(on)}$ (max) @ $T_j = 150^\circ\text{C}$ [mΩ]	Nominal load current [A]	$E_{AS}$ [mJ]	Operating voltage range [V]	$I_{L(SC)}$ (typ) [A]	Number of channels	24 V capable	High current limit	Low current limit	Short-circuit diagnosis			Package <sup>1)</sup>
												Overvoltage shutdown	to GND	to battery	
BTS4300SGA	Classic PROFET™ 12 V	300	600	< 3	800 @ 0.300 A	5.00 ... 34.00	1.00	1			●	●	●		DSO-8
BSP742R	Classic PROFET™ 12 V	250	700	< 3	800 @ 0.300 A	5.00 ... 34.00	1.00	1			●	●	●		DSO-8
BSP742RI <sup>2)</sup>	Classic PROFET™ 12 V	250	700	< 3	800 @ 0.300 A	5.00 ... 34.00	1.00	1			●	●	●		DSO-8
BTS307	Classic PROFET™ 24 V	220	500	< 3	-	5.80 ... 58.00	10.00	1	●	●		●	●		TO263-5-2
BTS410-F2	Classic PROFET™ 24 V	190	440	< 3	-	4.70 ... 42.00	5.50	1	●	●		●	●		TO263-5-2
BTS410-E2	Classic PROFET™ 24V	190	440	< 3	-	4.70 ... 42.00	12.00	1	●	●		●	●		TO263-5-2
BTS4175SSGA	Classic PROFET™ 24 V	175	350	< 3	125 @ 1.000 A	6.00 ... 52.00	6.50	1	●	●		●	●		DSO-8
BTS712N1	Classic PROFET™ 12 V	165	400	< 3	150 @ 1.900 A	5.00 ... 34.00	4.00	4		●		●	●		DSO-20
BTS711L1	Classic PROFET™ 12 V	165	400	< 3	150 @ 1.900 A	5.00 ... 35.00	4.00	4		●		●	●	●	DSO-20
BTS409L1	Classic PROFET™ 12 V	160	400	< 3	335 @ 2.300 A	5.00 ... 34.00	7.50	1		●		●	●		TO263-5-2
BTS4160DGA	Classic PROFET™ 12 V	160	320	< 3	65 @ 2.900 A	5.50 ... 20.00	6.50	2		●			●		DSO-14
BTS611L1	Classic PROFET™ 12 V	160	400	< 3	290 @ 2.300 A	5.00 ... 34.00	7.50	2		●		●	●	●	TO263-5
BTS612N1	Classic PROFET™ 12 V	160	400	< 3	290 @ 2.300 A	5.00 ... 34.00	7.50	2		●		●	●		TO220
BSP752R	Classic PROFET™ 24 V	150	380	< 3	125 @ 1.000 A	6.00 ... 52.00	6.00	1	●	●		●	●		DSO-8
BTS452R	Classic PROFET™ 24 V	150	380	< 3	150 @ 1.000 A	6.00 ... 52.00	6.00	1	●		●	●			TO252-5 (DPAK 5-leg)
BTS4880R	Classic PROFET™ 24 V	150	320	< 3	10,000 @ 0.625 A	11.00 ... 45.00	1.10	8	●			●			DSO-36 (Power-SO)

1) See packages on page 142 to 144

2) Inversed logic for diagnosis

# Protected high-side switches PROFET™

## Digital diagnosis (cont'd)

Product name	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150°C [mΩ]	Nominal load current [A]	E <sub>AS</sub> [mJ]	Operating voltage range [V]	I <sub>L(SC)</sub> (typ) [A]	Number of channels	24 V capable	High current limit	Low current limit	Overvoltage shutdown	Short-circuit diagnosis			Package <sup>1)</sup>
													to GND	to battery	Open-load in ON-state	
BTS716GB	Classic PROFET™ 24V	140	280	< 3	76 @ 2.300 A	5.50 ... 40.00	6.50	4	●	●			●		DSO-20	
BTS4130QGA	Classic PROFET™ 12V	130	260	< 3	76 @ 2.300 A	5.50 ... 20.00	6.50	4		●			●		DSO-20	
BTS5210G	Classic PROFET™ 24V	110	280	< 3	65 @ 2.900 A	5.50 ... 40.00	6.50	2	●	●			●		DSO-14	
BTS5210L	Classic PROFET™ 24V	110	280	< 3	84 @ 2.900 A	5.50 ... 40.00	6.50	2	●	●			●		DSO-12	
BTS716G	Classic PROFET™ 24V	110	280	< 3	76 @ 2.300 A	5.50 ... 40.00	6.50	4	●	●			●		DSO-20	
BTS723GW	Classic PROFET™ 24V	95	210	< 3	110 @ 2.500 A	7.00 ... 58.00	8.00	2	●		●		●	●	DSO-14	
BTS721L1	Classic PROFET™ 12V	85	200	< 3	300 @ 2.900 A	5.00 ... 34.00	8.00	4		●		●	●		DSO-20	
AUIPS7091G	Classic PROFET™ 24V	80	230	< 3	–	6.00 ... 35.00	5.00	1			●		●		SO-8 (DSO-8)	
BTS621L1	Classic PROFET™ 12V	80	200	3–5	395 @ 4.400 A	5.00 ... 34.00	14.00	2		●		●	●	●	TO263-7	
BTS5215L	Classic PROFET™ 24V	70	180	3–5	178 @ 3.500 A	5.50 ... 40.00	12.00	2	●	●			●		DSO-12	
BTS724G	Classic PROFET™ 24V	70	180	< 3	120 @ 3.300 A	5.50 ... 40.00	12.00	4	●	●			●		DSO-20	
BTS426L1	Classic PROFET™ 12V	50	120	5–10	740 @ 7.000 A	5.00 ... 34.00	25.00	1		●		●	●	●	TO263-5-2	
BTS428L2	Classic PROFET™ 24V	50	120	5–10	190 @ 7.000 A	4.75 ... 41.00	17.00	1	●	●			●	●	TO252-5 (DPAK 5-leg)	
BTS436L2	Classic PROFET™ 24V	35	72	5–10	–	4.75 ... 43.00	51.00	1	●	●			●	●	TO263-5-2	
AUIPS7221R	Classic PROFET™ 24V	30	70	5–10	–	6.00 ... 60.00	30.00	1	●	●			●		TO-252 (DPAK 5-leg)	
AUIPS72211R	Classic PROFET™ 24V	30	70	5–10	–	6.00 ... 60.00	30.00	1	●	●			●		TO-252 (DPAK 5-leg)	
BTS441RG	Classic PROFET™ 24V	15	37	> 15	700 @ 21.000 A	4.75 ... 41.00	55.00	1	●	●			●		TO263-5-2	

1) See packages on page 142 to 144

## Current sense, current input

Product name	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150°C [mΩ]	Nominal load current [A]	E <sub>AS</sub> @ 20 A [mJ]	Operating voltage range [V]	I <sub>L(SC)</sub> (typ) [A]	24 V capable	Short-circuit to GND protection		Over-temperature protection		Inverse current operation capability	Open-load in ON detection	Package <sup>1)</sup>
									Latch	Restart	Latch	Restart			
BTS6163D	Classic PROFET™ 24V	20.0	40.0	5–10	250	62.0	80	●	●			●		●	TO252-5 (DPAK 5-leg)
BTS443P	Classic PROFET™ 24V	16.0	32.0	5–10	150	5.0 ... 36.0	65			●		●		●	TO252-5 (DPAK 5-leg)
BTS5016SDA	Classic PROFET™ 12V	16.0	32.0	5–10	120	20.0	75		●			●		●	TO252-5 (DPAK 5-leg)
BTS5014SDA	Classic PROFET™ 12V	14.0	28.0	5–10	150	5.5 ... 20.0	80		●			●		●	TO252-5 (DPAK 5-leg)
BTS5012SDA	Classic PROFET™ 12V	12.0	24.0	5–10	200	20.0	105		●			●		●	TO252-5 (DPAK 5-leg)
BTS6142D	Classic PROFET™ 12V	12.0	22.0	5–10	250	24.0	100		●			●		●	TO252-5 (DPAK 5-leg)
BTS6143D	Classic PROFET™ 12V	10.0	18.0	5–10	300	38.0	105		●			●		●	TO252-5 (DPAK 5-leg)
BTS6133D	Classic PROFET™ 12V	10.0	18.0	5–10	300	38.0	105		●			●	●	●	TO252-5 (DPAK 5-leg)
BTS50085-1TMA	Classic PROFET™ 24V	9.0	17.0	10–15	1200	58.0	90	●	●			●	●		TO263-7 (D <sup>2</sup> PAK 7-leg)
BTS50085-1TMB	Classic PROFET™ 24V	9.0	17.0	10–15	1200	58.0	90	●	●			●	●		TO220-7-11
BTS50080-1TMA	Classic PROFET™ 12V	8.0	16.0	10–15	400	38.0	130		●			●		●	TO263-7 (D <sup>2</sup> PAK 7-leg)
BTS50080-1TMB	Classic PROFET™ 12V	8.0	16.0	10–15	400	38.0	130		●			●		●	TO220-7-12
BTS50080-1TMC	Classic PROFET™ 12V	8.0	16.0	10–15	400	38.0	130		●			●		●	TO263-7 (D <sup>2</sup> PAK 7-leg)

1) See packages on page 142 to 144



## Current sense, current input (cont'd)

Product name	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150°C [mΩ]	Nominal load current [A]	E <sub>AS</sub> @ 20 A [mJ]	Operating voltage range [V]	I <sub>L(SC)</sub> (typ) [A]	24 V capable	Short-circuit to GND protection		Over- temperature protection		Inverse current operation capability	Open-load in ON detection	Package <sup>1)</sup>
									Latch	Restart	Latch	Restart			
BTS50080-1TEA	Classic PROFET™ 12V	8.0	16.0	5–10	300	30.0	125		●			●		●	TO252-5 (DPAK 5-leg)
BTS50080-1TEB	Classic PROFET™ 12V	8.0	16.0	5–10	300	30.0	125		●			●	●	●	TO252-5 (DPAK 5-leg)
AUIPS7111S	Classic PROFET™ 24V	6.0	15.0	10–15	-	8.0 ... 50.0	45	●	●		●		●		TO-263-5 (D <sup>2</sup> PAK 5-leg)
BTS50055-1TMA	Classic PROFET™ 12V	6.0	11.0	> 15	1500	34.0	130		●			●	●		TO263-7 (D <sup>2</sup> PAK 7-leg)
BTS50055-1TMB	Classic PROFET™ 12V	6.0	11.0	10–15	1500	34.0	130		●			●	●		TO220-7-11
BTS50055-1TMC	Classic PROFET™ 12V	6.0	11.0	10–15	1500	34.0	130			●		●	●		TO263-7 (D <sup>2</sup> PAK 7-leg)
AUIR3316S	Classic PROFET™ 12V	5.5	13.5	10–15	-	6.0 ... 26.0	120		●		●		●		TO-263-5 (D <sup>2</sup> PAK 5-leg)
AUIR3320S	Classic PROFET™ 12V	3.3	6.5	10–15	-	6.0 ... 26.0	75		●		●		●		TO-263-5 (D <sup>2</sup> PAK 5-leg)

1) See packages on page 142 to 144

## Current sense, voltage input

Product name	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150°C [mΩ]	Nominal load current [A]	E <sub>AS</sub> [mJ]	Operating voltage range [V]	I <sub>L(SC)</sub> (typ) [A]	Number of channels	Load current		Overvoltage shutdown	Sense enable	Open-load in OFF	Latch	24 V	ReverSave™	Package <sup>1)</sup>
									Limit	Trip							
<b>Automotive grade</b>																	
BTS40k2-1ENC	Classic PROFET™ 24V	200	400	< 3	20 @ 1 A	5.0 ... 48.0	5	1	●			●	●		●		TDSO-8 EP
BTS740S2	Classic PROFET™ 12V	27	60	3–5	370 @ 5.5 A	5.0 ... 34.0	50	2	●		●						DSO-20
BTS640S2G	Classic PROFET™ 12V	27	60	3–5	410 @ 12.6 A	5.0 ... 34.0	50	1	●		●						TO-263-7-1
BTS50060-1TEA	Classic PROFET™ 12V	6	12	> 15	280 @ 20 A	4.7 ... 28.0	75	1		●			●	●			TO-252-5 (DPAK 5-leg)
BTf50060-1TEA <sup>2)</sup>	Classic PROFET™ 12V	6	12	> 15	280 @ 20 A	4.7 ... 28.0	75	1		●			●	●			TO-252-5 (DPAK 5-leg)
AUIR3330S	Classic PROFET™ 12V	3	6.2	> 15	N/A	5.0 ... 48.0	70	1		●				●			TO263-7 (D <sup>2</sup> PAK 7-leg)
AUIR33402S	Classic PROFET™ 12V	3	6.2	> 15	N/A	5.0 ... 48.0	70	1		●				●			TO263-7 (D <sup>2</sup> PAK 7-leg)
<b>NEW</b>	BTS7200-2EPA	PROFET™+2 12V	66.5	120	< 3	13.5 @ 2.4 A	3.1 ... 28.0	10	2		●		●	●			TSDSO-14 EP
<b>NEW</b>	BTS7200-2EPC	PROFET™+2 12V	66.5	120	< 3	13.5 @ 2.4 A	2.7 ... 28.0	10	2		●		●	●			TSDSO-14 EP
<b>NEW</b>	BTS7120-2EPA	PROFET™+2 12V	61	110	< 3	13.5 @ 4.0 A	3.1 ... 28.0	18.2	2		●		●	●			TSDSO-14 EP
<b>NEW</b>	BTS7080-2EPA	PROFET™+2 12V	20.9	39.6	3–5	36 @ 6 A	3.1 ... 28.0	36	2		●		●	●		●	TSDSO-14 EP
<b>NEW</b>	BTS7040-2EPA	PROFET™+2 12V	19	36	3–5	36 @ 7 A	3.1 ... 28.0	46	2		●		●	●		●	TSDSO-14 EP
<b>NEW</b>	BTS7040-1EPA	PROFET™+2 12V	19	36	3–5	30 @ 9 A	3.1 ... 28.0	46	1		●		●	●		●	TSDSO-14 EP
	BTS7030-2EPA	PROFET™+2 12V	13.5	25	3–5	38 @ 9 A	3.1 ... 28.0	60	2		●		●	●		●	TSDSO-14 EP
	BTS7020-2EPA	PROFET™+2 12V	12.7	23.7	5–10	42 @ 10 A	3.1 ... 28.0	71	2		●		●	●		●	TSDSO-14 EP
	BTS7012-2EPA	PROFET™+2 12V	11.5	21.5	5–10	42 @ 12 A	3.1 ... 28.0	73	2		●		●	●		●	TSDSO-14 EP
<b>NEW</b>	BTS7012-1EPA	PROFET™+2 12V	11.5	21.5	5–10	50 @ 17 A	3.1 ... 28.0	73	1		●		●	●		●	TSDSO-14 EP
	BTS7010-2EPA	PROFET™+2 12V	9.5	19.5	5–10	55 @ 13 A	3.1 ... 28.0	77	2		●		●	●		●	TSDSO-14 EP
<b>NEW</b>	BTS7010-1EPA	PROFET™+2 12V	9.5	19.5	5–10	55 @ 18 A	3.1 ... 28.0	77	1		●		●	●		●	TSDSO-14 EP
	BTS7008-2EPA	PROFET™+2 12V	9	16	5–10	75 @ 15 A	3.1 ... 28.0	82	2		●		●	●		●	TSDSO-14 EP
<b>NEW</b>	BTS7008-1EPA	PROFET™+2 12V	9	16.4	10–15	65 @ 20 A	3.1 ... 28.0	88	1		●		●	●		●	TSDSO-14 EP
<b>NEW</b>	BTS7008-1EPP	PROFET™+2 12V	8.8	16	10–15	70 @ 22 A	3.1 ... 28.0	77.5	1		●		●	●	●	●	TSDSO-14 EP

1) See packages on page 142 to 144

# Protected high-side switches PROFET™

## Current sense, voltage input (cont'd)

Product name	Product family	R <sub>DS(on)</sub> (typ) [mΩ]	R <sub>DS(on)</sub> (max) @ T <sub>J</sub> = 150°C [mΩ]	Nominal load current [A]	E <sub>AS</sub> [mJ]	Operating voltage range [V]	I <sub>L(ISC)</sub> (typ) [A]	Number of channels	Load current		Overvoltage shutdown	Sense enable	Open-load in OFF	Latch	24 V	ReverSave™	Package <sup>1)</sup>	
									Limit	Trip								
<b>Automotive grade</b>																		
NEW	BTS7006-1EPP	PROFET™+2 12V	6.6	12	10–15	95 @ 25 A	3.1 ... 28.0	89.5	1		●		●	●	●		●	TSDSO-14 EP
	BTS7004-1EPP	PROFET™+2 12V	4.4	8	10–15	150 @ 30 A	3.1 ... 28.0	113	1		●		●	●	●		●	TSDSO-14 EP
NEW	BTS7002-1EPP	PROFET™+2 12V	2.6	4.8	> 15	315 @ 42 A	3.1 ... 28.0	133	1		●		●	●	●		●	TSDSO-14 EP
	BTS5200-4EKA	PROFET™+ 12V	200	400	< 3	50 @ 0.5 A	5.0 ... 28.0	7.3	4	●			●	●				DSO-14 EP
	BTT6200-4EMA	PROFET™+ 24V	200	400	< 3	20 @ 1 A	5.0 ... 48.0	11	4	●			●	●	●	●		SSOP-24
	BTT6200-1ENA	PROFET™+ 24V	200	400	< 3	20 @ 1 A	5.0 ... 48.0	11	1	●			●	●	●	●		TDSO-8 EP
NEW	BTS5200-1ENA	PROFET™+ 12V	200	400	< 3	40 @ 1 A	4.1 ... 28.0	11	1	●			●	●				TDSO-8-31
	BTS5180-2EKA	PROFET™+ 12V	180	360	< 3	30 @ 1 A	5.0 ... 48.0	12	2	●			●	●				DSO-14 EP
	BTS5120-2EKA	PROFET™+ 12V	120	240	< 3	15 @ 2 A	5.0 ... 48.0	12	2	●			●	●				DSO-14 EP
	BTT6100-2EKA	PROFET™+ 24V	100	200	< 3	36 @ 1.5 A	5.0 ... 48.0	25	2	●			●	●	●	●		DSO-14 EP
	BTS5090-2EKA	PROFET™+ 12V	90	180	< 3	42 @ 3 A	5.0 ... 28.0	32	2	●			●	●				DSO-14 EP
	BTS5090-1EJA	PROFET™+ 12V	90	180	< 3	42 @ 3 A	5.0 ... 28.0	32	1	●			●	●				DSO-8 EP
	BTS6110-1SJA	PROFET™+ 12V	80	200	< 3	N/A	8.0 ... 24.0	27	1	●					●			DSO-8
	BTF6070-2EKV	PROFET™+ 24V	60	135	< 3	40 @ 2 A	5.0 ... 48.0	11	2	●			●	●	●	●		DSO-14 EP
	BTT6050-2EKA	PROFET™+ 24V	50	100	< 3	55 @ 4 A	5.0 ... 48.0	47	2	●			●	●	●	●		DSO-14 EP
	BTT6050-1EKA	PROFET™+ 24V	50	100	3–5	55 @ 4 A	5.0 ... 48.0	47	1	●			●	●	●	●		DSO-14 EP
	BTS5045-2EKA	PROFET™+ 12V	45	90	< 3	35 @ 4 A	5.0 ... 28.0	32	2	●			●	●				DSO-14 EP
	BTS5045-1EJA	PROFET™+ 12V	45	90	3–5	35 @ 4 A	5.0 ... 28.0	32	1	●			●	●				DSO-8 EP
	BTT6030-2EKA	PROFET™+ 24V	30	64	3–5	50 @ 4 A	5.0 ... 48.0	70	2	●			●	●	●	●		DSO-14 EP
	BTT6030-1EKA	PROFET™+ 24V	30	64	5–10	50 @ 6 A	5.0 ... 48.0	70	1	●			●	●	●	●		DSO-14 EP
	BTT6030-2EKB	PROFET™+ 24V	30	62	3–5	85 @ 4 A	5.0 ... 48.0	50	2	●			●	●	●	●		DSO-14 EP
	BTS5030-2EKA	PROFET™+ 12V	30	60	3–5	50 @ 6 A	5.0 ... 28.0	47	2	●			●	●				DSO-14 EP
	BTS5030-1EJA	PROFET™+ 12V	30	60	3–5	50 @ 6 A	5.0 ... 28.0	47	1	●			●	●				DSO-8 EP
	BTT6020-1EKA	PROFET™+ 24V	20	42	5–10	100 @ 7 A	5.0 ... 48.0	74	1	●			●	●	●	●		DSO-14 EP
	BTS5020-2EKA	PROFET™+ 12V	20	40	3–5	75 @ 6 A	5.0 ... 28.0	65	2	●			●	●				DSO-14 EP
	BTS5020-1EKA	PROFET™+ 12V	20	40	3–5	74 @ 6 A	5.0 ... 28.0	65	1	●			●	●				DSO-14 EP
	BTS5016-2EKA	PROFET™+ 12V	16	32	5–10	95 @ 7 A	5.0 ... 28.0	65	2	●			●	●				DSO-14 EP
	BTS5016-1EKB	PROFET™+ 12V	16	32	5–10	95 @ 7 A	5.0 ... 28.0	65	1	●			●	●				DSO-14 EP
	BTS5012-1EKB	PROFET™+ 12V	12	24	5–10	110 @ 10 A	5.0 ... 28.0	65	1	●			●	●				DSO-14 EP
	BTS5010-1EKB	PROFET™+ 12V	10	20	5–10	155 @ 10 A	5.0 ... 28.0	65	1	●			●	●				DSO-14 EP
	BTT6010-1EKA	PROFET™+ 24V	10	22	5–10	100 @ 8 A	5.0 ... 48.0	115	1	●			●	●	●	●		DSO-14 EP
	BTT6010-1EKB	PROFET™+ 24V	10	22	5–10	100 @ 8 A	5.0 ... 48.0	86	1	●			●	●	●	●		DSO-14 EP
	BTS5008-1EKB	PROFET™+ 12V	8	16	10–15	160 @ 11 A	5.0 ... 48.0	65	1	●			●	●				DSO-14 EP
NEW	BTS50025-1TEA <sup>3)</sup>	Power PROFET™ 12 V	2.5	5	> 15	400 @ 19 A	3.1 ... 27.0	80	1		●				●		●	TO252-5 (DPAK 5-leg)
	BTS50025-1TAD	Power PROFET™ 12V	2.5	5	> 15	1050 @ 25 A	5.5 ... 28.0	100	1		●				●		●	T0263-7-10
	BTS50020-1TAD	Power PROFET™ 12V	2	4	> 15	1700 @ 29 A	5.5 ... 28.0	140	1		●				●		●	T0263-7-10
	BTS50015-1TAD	Power PROFET™ 12V	1.5	3	> 15	3000 @ 33 A	5.5 ... 28.0	185	1		●				●		●	T0263-7-10
	BTS50010-1TAD	Power PROFET™ 12V	1	2	> 15	3000 @ 40 A	5.5 ... 28.0	200	1		●				●		●	T0263-7-10
NEW	BTS50010-1TAE <sup>4)</sup>	Power PROFET™ 12V	1	2.1	> 15	450 @ 250 A	5.5 ... 28.0	250	1		●				●		●	T0263-7-10

1) See packages on page 142 to 144

2) Speed PROFET™, capable for PWM up to 25 kHz

3) Coming Q4/2018

4) Coming Q3/2018



## SPI power controller SPOC™+2

SPOC™+2 devices are high-side smart power multichannel switches providing embedded protection diagnostics and intelligence. They are specially designed for standard exterior lighting in automotive applications, but can also be used for other automotive and industrial applications such as heating, motor driving or power distribution.

### Features

- › **Protection features:** absolute and dynamic temperature limitation with controlled restart, overcurrent protection (tripping) with programmable restart control and current threshold, undervoltage shutdown, overvoltage protection with external components
- › **Diagnostic features:** proportional load current sensing, open load in ON and OFF state, short circuit to ground and battery, diagnosis feedback via SPI
- › **Functional safety features:** limp home mode, monitoring of input pin status (IN and LHI), checksum verification of control registers, current sense verification mode

### System benefit vs. discrete solution

- › **PCB area savings:** 4–6 channel device with smallest package size and highest integrated feature set
- › **Scalable solution:** same pin-out as previous generation SPOC™+, family pin-out and footprint concept to support population variants
- › **Load driving capability:** Up to 14 A nominal load current with parallel channel configuration. Best-in-class power dissipation to support most severe usage conditions, ReverSave™, -50 percent compared to PROFET™+ and -12 percent vs. PROFET™+2.

Integration helps to reduce the complexity of electronics, allowing board space reduction and decreasing the need of external components. Control, configuration and diagnostics are carried out via a Serial Peripheral Interface (SPI), which saves I/Os on the microcontroller and provides solution flexibility.

### Application focus

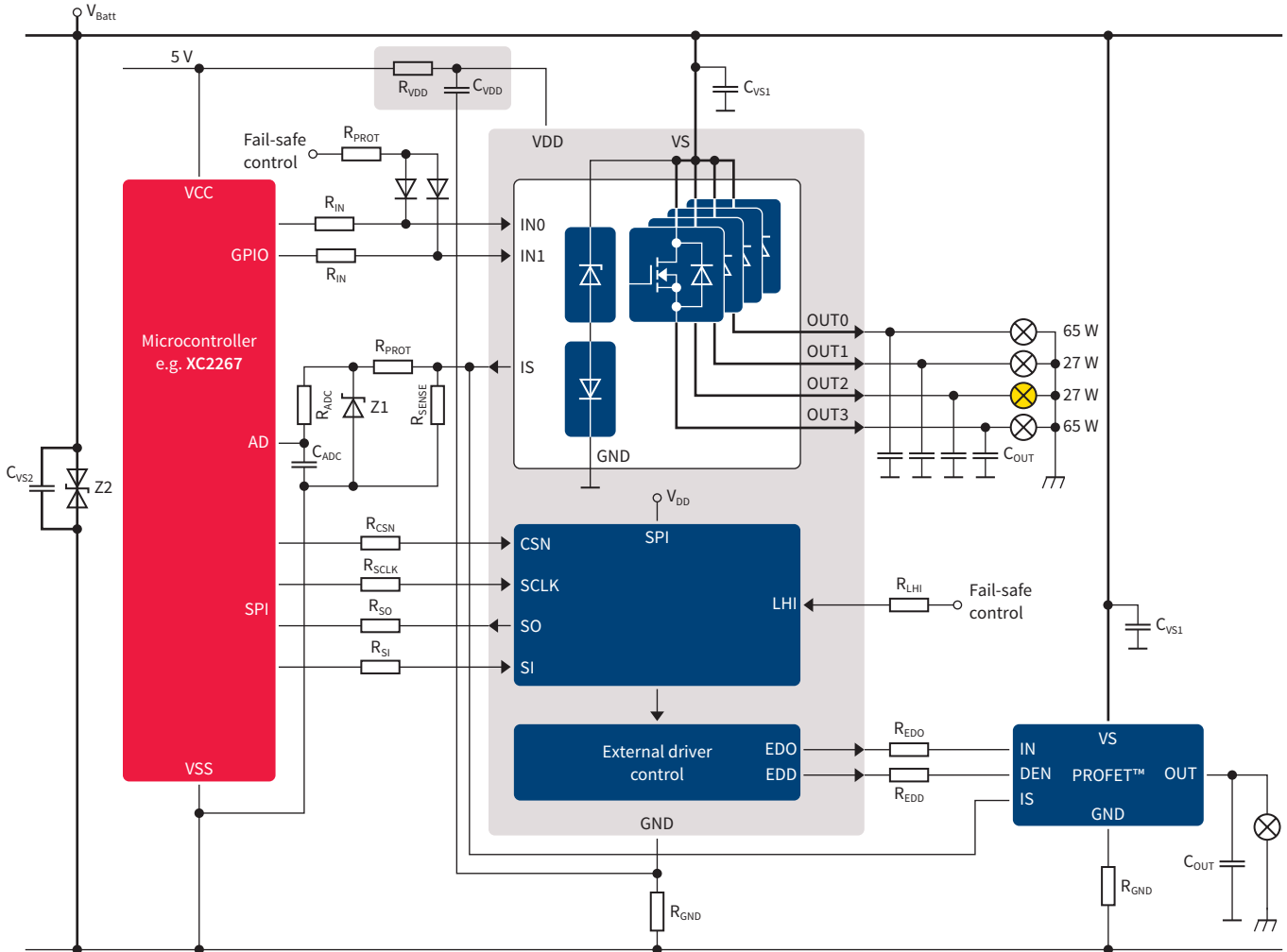
High-side switch with diagnostic and embedded protection functions for automotive applications. Suitable for:

- › Resistive, inductive and capacitive loads to replace electromechanical relays, fuses and discrete circuits
- › Capable of driving high inrush current loads such as lamps, HIDs or LED modules

- › **Feature to cost:** I/O savings due to SPI, optimized feature set for PWMoverSPI, best in class  $K_{ILIS}$ , fewer external components required due to integrated  $K_{ILIS}$  range switch and simple GND network, functional safety features, cranking, external drive, channel parallelization, configurable slew rate, configurable overload threshold and programmable restart control, logic supply is 3.3 V compatible

# SPI power controller SPOC™+2

## Application diagram BTS72220-4ESE

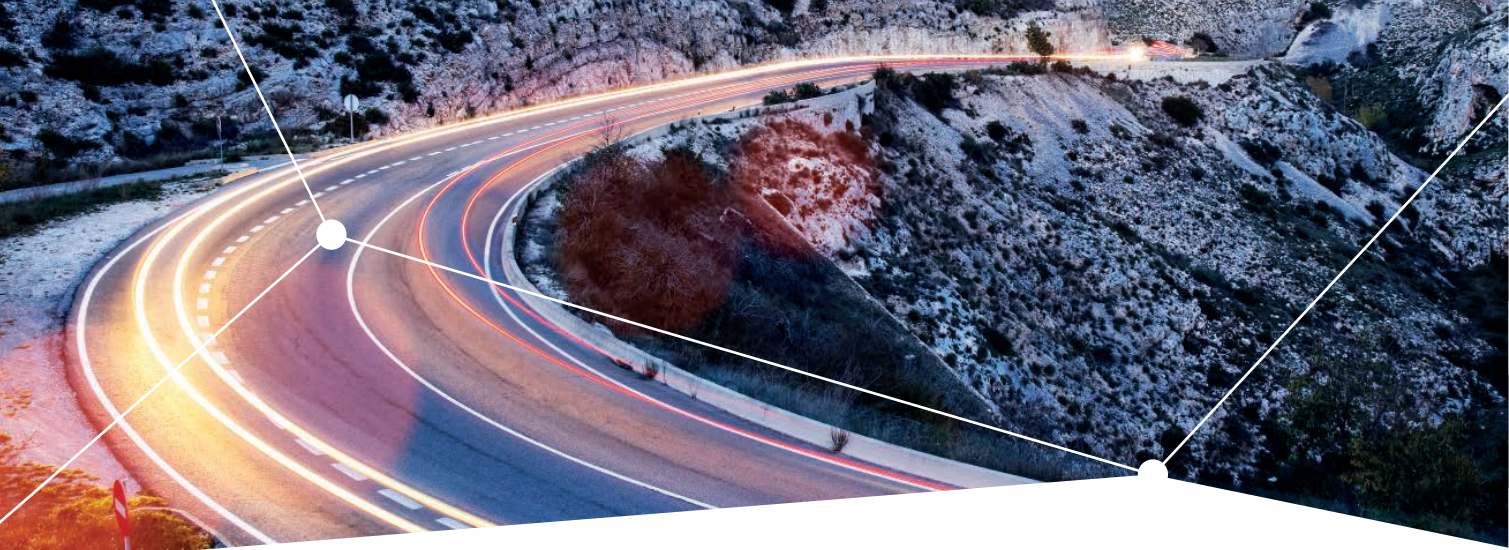


### Portfolio

Product name	No of channels	Channel mix [mΩ]					Nominal load current <sup>2)</sup> [A]	I <sub>L(SC)</sub> (typ) [A]	Ext. driver [V]	V <sub>DD</sub> [V]	V <sub>S</sub> [V]	ReverSave™	Limp home	Package <sup>1)</sup>
		HID H9 65 W	55 W	H8 42 W	27 W	10 W								
BTS72220-4ESA	4	2 x 5.5	0	2 x 13.5	0	0	2 x 7 and 2 x 4	116/62		3.3 ... 5	6 ... 18	●	●	TSDSO-24
BTS72220-4ESE	4	2 x 5.5	0	2 x 13.5	0	0	2 x 7 and 2 x 4	116/62	●	3.3 ... 5	6 ... 18	●	●	TSDSO-24
BTS71220-4ESA	4	0	2 x 9.5	0	2 x 22.5	0	2 x 5 and 2 x 3	89/48		3.3 ... 5	6 ... 18	●	●	TSDSO-24
BTS71220-4ESE	4	0	2 x 9.5	0	2 x 22.5	0	2 x 5 and 2 x 3	89/48	●	3.3 ... 5	6 ... 18	●	●	TSDSO-24
BTS71040-4ESA	4	0	0	0	4 x 22.5	0	4 x 3	48		3.3 ... 5	6 ... 18	●	●	TSDSO-24
BTS71040-4ESE	4	0	0	0	4 x 22.5	0	4 x 3	48	●	3.3 ... 5	6 ... 18	●	●	TSDSO-24
BTS71033-6ESA <sup>3)</sup>	6	0	0	0	3 x 22.5	3 x 70	3 x 3 and 3 x 1.5	48/22		3.3 ... 5	6 ... 18	for 27 W chl	●	TSDSO-24

1) See packages on page 142 to 144  
 2) Chl. parallelization will double I<sub>Nom</sub>  
 3) Coming Q1/2020





# LITIX™ Automotive LED driver from Infineon

The LITIX™ Automotive LED driver from Infineon is an enabler of protected and high-performing lighting applications in the automotive industry. In particular, the constant current regulation secures the stable brightness of the LED over the whole automotive temperature and voltage range. Both

the driver and LED are protected against overstress caused, for example, voltage spikes or overtemperature. All kinds of load conditions are detected by its diagnostic features, such as open-load or shorted LED. All features are required to drive LEDs in harsh automotive environment conditions.

## Features

- > Constant output current for constant brightness and extended LED lifetime
- > Wide input voltage range
- > Low drop voltage
- > Open-load detection
- > Overtemperature protection
- > Short-circuit proof
- > Reverse-polarity proof
- > Wide temperature range
- > Very small SMD packages
- > Automotive-qualified

## Applications

Infineon automotive-optimized LED drivers address interior and exterior, low-power to high-power automotive LED applications such as: high and low beam, fog, DRL, position, tail, stop, CHMSL, RCL, reverse, turn indicator, dome, ambient lighting, status lamps etc.

## LITIX™ Automotive LED driver from Infineon consists of five sub-families

### LITIX™ Basic

- > Flexible linear current source family with scalable feature set
- > Most flexible single LED short in the market

drive low-power LEDs

- > Linear current sources for low, medium and low-cost high-power applications

### LITIX™ Basic+

- > Extension of existing LITIX™ Basic with additional features, e.g. the most flexible Single LED Short in the market

### LITIX™ Power

- > DC-DC converter and controller for medium to high-power applications

### LITIX™ Linear

- > BCR400 series is the most cost-effective solution to

### LITIX™ Power Flex

- > Multitopology DC-DC controller for highest flexibility/power applications

## SPIDER+ LED – smart multichannel switches

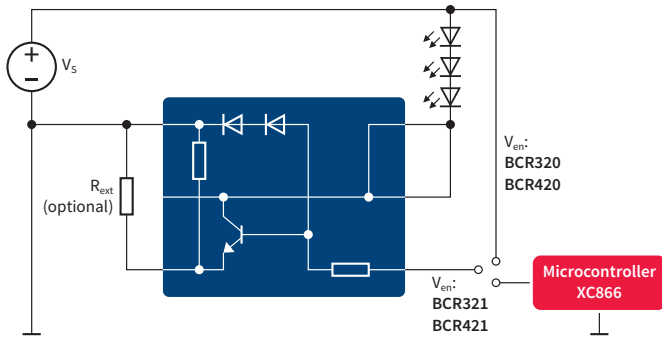
For resistor-based LED taillight designs the SPIDER+ LED family offers cost-optimized LED control either on a central BCM or on decentralized electronics. The included diagnostic and protection functions enable the use of the smallest possible wire diameter.



# LITIX™ Linear

BCR400 series is the most cost-effective solution for driving power LEDs

Block diagram BCR42x-U



## Product overview

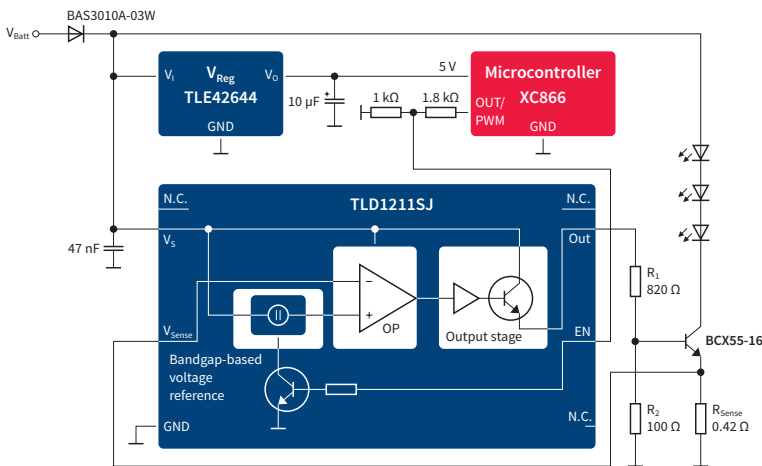
Product name	Output current (max) [mA]	Adjustable output current	Supply voltage (max) [V]	Inhibit	PWM enable	P <sub>tot</sub> [mW]	Package <sup>1)</sup>
BCR401U	65	●	40			750	SC74
BCR401W	65	●	18			500	SOT343
BCR402U	65	●	40			750	SC74
BCR402W	65	●	18			500	SOT343
BCR405U	65	●	40			750	SC74
BCR320U	250	●	27			1000	SC74
BCR321U	250	●	27	●	●	1000	SC74
BCR420U	150	●	40			1000	SC74
BCR421U	150	●	40	●	●	1000	SC74

1) See packages on page 142 to 144

Linear current sources for low to medium power applications

LED drivers designed to supply constant current up to 500 mA and with an external transistor of up to 2.5 A. This enables constant LED brightness and ensures extended LED lifetime, regardless of the supply voltage or LED forward voltage class.

Application diagram TLD1211SJ



## Product overview

Product name	Output current (max) [mA]	Adjustable	Driver for external transistor	Open-load detection	PWM/enable input	Adjustable high/low current switch	Package <sup>1)</sup>
TLD1211SJ	85, 2,500 (ext. transistor)	●	●		●		DSO-8
TLE4241GM	60	●		●	●	●	DSO-8
TLE4242EJ	250	●		●	●		DSO-8 EP
TLE4242G	450	●		●	●		TO263-7 (D <sup>2</sup> PAK 7-leg)

1) See packages on page 142 to 144

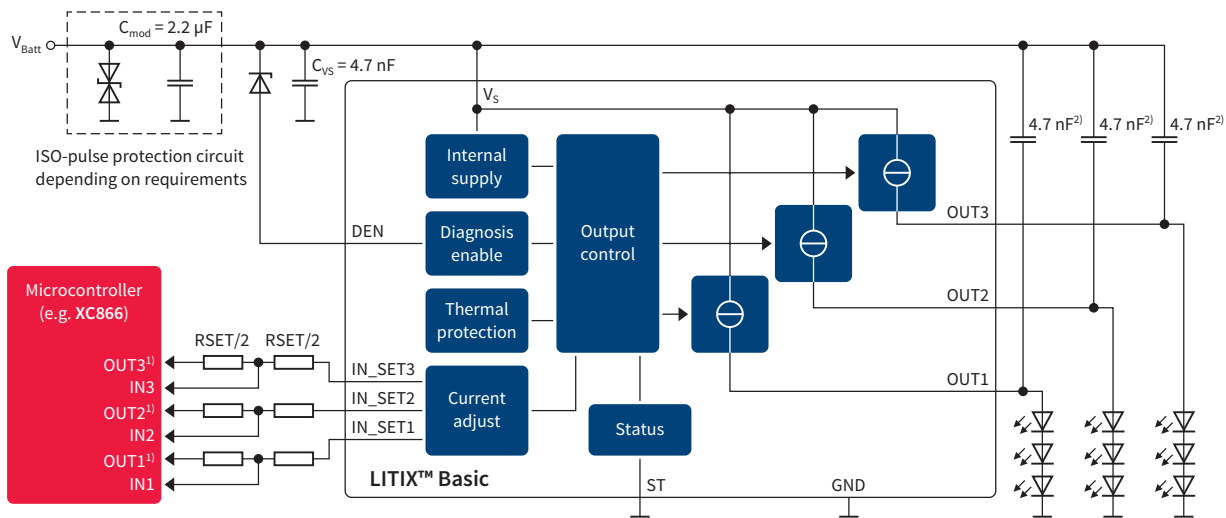
# LITIX™ Basic

Flexible linear current source family with scalable feature set

Infinion LITIX™ Basic LED drivers are optimized for the control of low- to medium-power LEDs in automotive applications. The whole family of linear constant current sources offers footprint compatibility ranging from one to three output channels and 60–180 mA and enables stable and reliable LED brightness through precise current control.

Its diagnostics and logic feature set enables improved system reliability through significant component reduction on the board level, improved system protection (e.g., against ISO pulses), as well as an energy optimized system solution (DC-DC control).

## Application diagram TLD2314EL



- 1) Open drain
- 2) For EMI improvement, if required

Product overview											
Product name	1 IN 1 OUT	1 IN 3 OUT	3 IN 3 OUT	Output current range (typ.) per channel [mA]	PWMI	N - 1	OL and SC detection	OL and SC with dou- ble fault detection	DEN	Matrix	Package <sup>1)</sup>
TLD1120EL	•			180							SSOP-14 EP
TLD1310EL		•		60							SSOP-14 EP
TLD2310EL			•	60							SSOP-14 EP
TLD1312EL		•		60	•						SSOP-14 EP
TLD1311EL		•		60		•					SSOP-14 EP
TLD1121EL	•			180			•				SSOP-14 EP
TLD2311EL			•	60			•				SSOP-14 EP
TLD1313EL		•		60				•			SSOP-14 EP
TLD1124EL	•			180			•		•		SSOP-14 EP
TLD1314EL		•		60			•		•		SSOP-14 EP
TLD2314EL			•	60			•		•		SSOP-14 EP
TLD1125EL	•			180	•		•				SSOP-14 EP
TLD1315EL		•		60	•	•	•				SSOP-14 EP
TLD1326EL		•		60	•	•				•	SSOP-14 EP
TLD2326EL			•	60			•			•	SSOP-14 EP

1) See packages on page 142 to 144

PWMI = Internal PWM dimming engine  
 N - 1 = Complete device deactivation during open-load  
 OL = Open-load diagnosis  
 SC = Short-circuit diagnosis

DEN = Diagnosis Enable input  
 Matrix = Feedback to DC-DC to optimize efficiency  
 ERRN = Error Network for fault communication

# LITIX™ Basic+

A complementary family of six linear current sources as extension of LITIX™ Basic

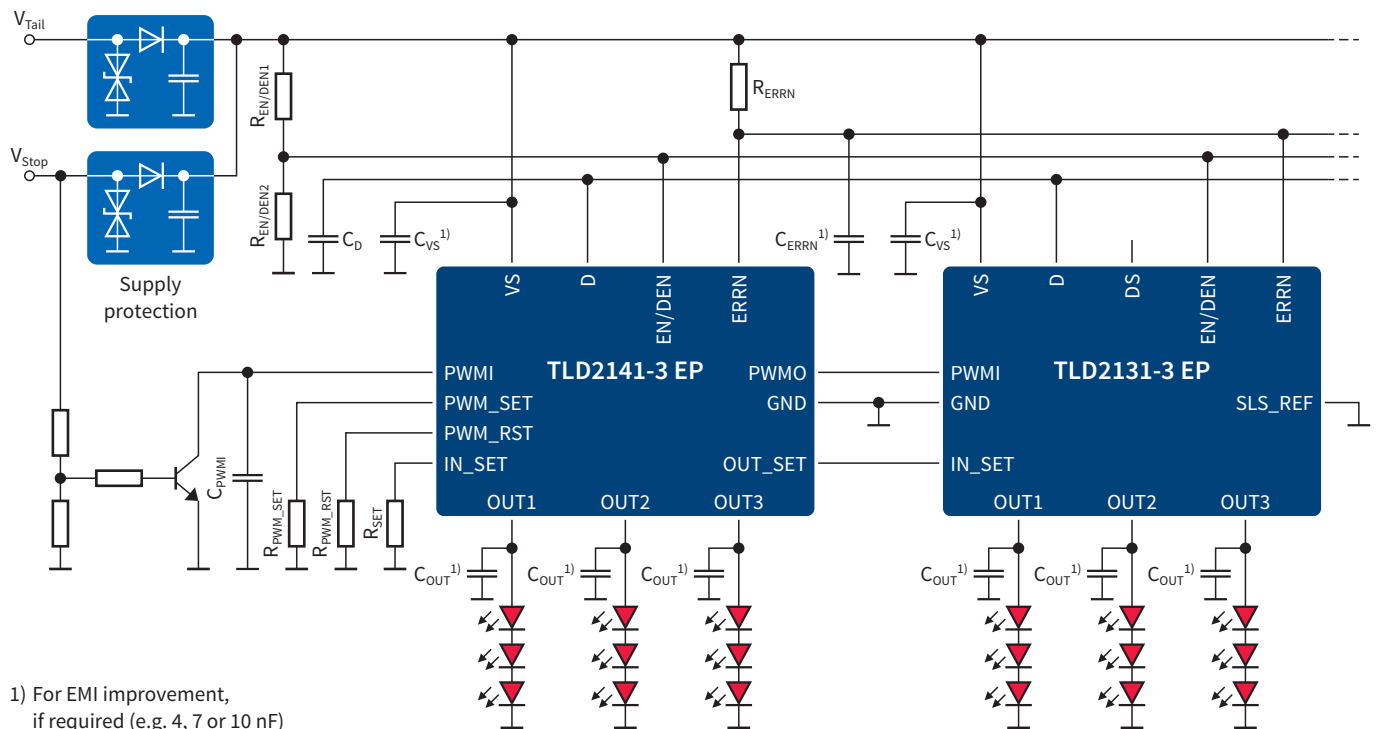
Infineon LITIX™ Basic+ LED drivers serve as perfect extension to the existing LITIX™ Basic family. LITIX™ Basic+ linear constant current sources with their one to three inputs/outputs build a scalable family to reduce system costs (e.g., less external components needed, introduction of power shift feature).

current accuracy. Several selectable fault management modes offer high design flexibility. LITIX™ Basic+ offers the most flexible Single LED Short (SLS) feature on the market: the device can either go to a latched off-state, active retry or simply diagnosis without channel deactivation.

Output currents from 5 mA up to 360 mA (with power shift) can be served with LITIX™ Basic+. The family also has optimized diagnostic features as well as improved output

Last but not least, LITIX™ Basic+ supports design flexibility through footprint compatibility – if you know one device, you know the whole family.

## Application diagram TLD2131-3EP and TLD2141-3EP



### Product overview

Product name	1 IN 1 OUT	1 IN 3 OUT	3 IN 3 OUT	Output current range per channel [mA]	OL, SC, EN/DEN PWMI, ERRN	Power shift EN, PWMI, ERRN	Single LED short SLS	PWM engine	Package <sup>2)</sup>
TLD1114-1EP	•			14–360		•			TSDSO-14 EP
TLD2132-1EP	•			14–240	•		•		TSDSO-14 EP
TLD2131-3EP		•		14–240	•		•		TSDSO-14 EP
TLD2331-3EP			•	5–80	•		•		TSDSO-14 EP
TLD2142-1EP	•			14–240	•			•	TSDSO-14 EP
TLD2141-3EP		•		5–80	•			•	TSDSO-14 EP

2) See packages on page 142 to 144

OL = Open-Load diagnosis  
 SC = Short-Circuit to GND diagnosis  
 EN/DEN = Combined enable/diagnosis enable input

PWMI = PWM input pin  
 ERRN = Error Network for fault communication



# LITIX™ Power Flex

Synchronous DC-DC controller for high-current, high-power and cost-optimized applications

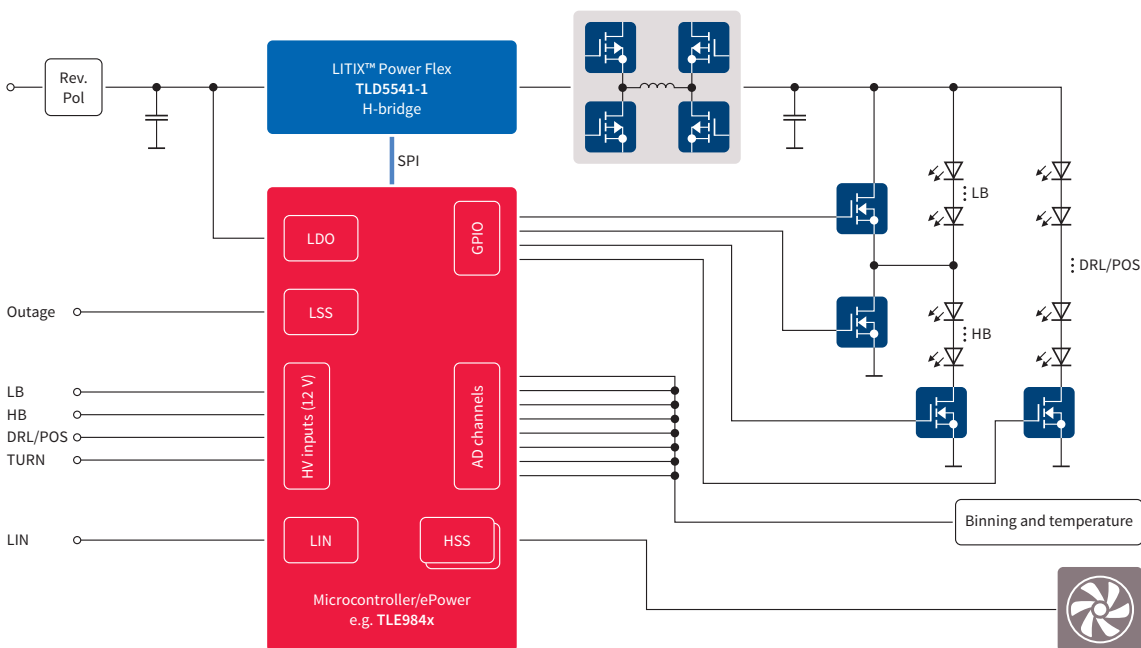
LEDs are the big enabler in automotive front lighting, supporting new design possibilities, energy savings and new applications like matrix or laser high beam. These trends come with the demand for flexible DC-DC driver solutions for LED systems of even more than 50 W – or LEDs in configurations with currents of even more than 3 A – with high efficiency.

The new LITIX™ Power Flex devices are the perfect answer to these new trends, as their synchronous topologies are beneficial for driving high-power LEDs with maximum system efficiency (well above 90 percent).

With its seamless buck-boost regulation and fast dynamic load jump behavior, the TLD5541-1QV is an innovative solution for realizing cost optimized LED headlamps with complete protection and diagnosis features – e.g., by driving two, three or more separately switched LED loads in one up to 55 V voltage string with just one DC-DC controller.

The two dual-channel devices TLD5541-2QV and TLD5501-2QV perfectly complement the H-bridge device to form a powerful family. They offer additional flexibilities to realize high power applications or cost-optimized LED headlamps as they come with two individually controllable synchronous DC-DC channels and a broad variety of DC-DC topologies to choose from.

Application diagram TLD5541-1: Example of cost-optimized LED headlamp electronics



## Product overview

Product name	Topology	Power stage	Current (max) [A]	V <sub>IN</sub> range [V]	V <sub>OUT</sub> (max) [V]	Package <sup>1)</sup>
TLD5541-1QV	Synchronous H-bridge w / SPI	External	Depending on external MOSFET	4.50 ... 40.00	55	VQFN-48
TLD5541-1QU	Synchronous H-bridge w / SPI	External	Depending on external MOSFET	4.50 ... 40.00	55	TQFP-48 EP
TLD5541-2QV	Synchronous dual channel multitopology w / SPI	External	Depending on external MOSFET	4.50 ... 40.00	55	VQFN-48
TLD5501-2QV	Synchronous dual channel buck w / SPI	External	Depending on external MOSFET	4.50 ... 40.00	50	VQFN-48

1) See packages on page 142 to 144



# SPIDER+ LED

## Smart multichannel switches

The SPIDER+ LED devices combine the feature set of the SPIDER+ family with additional features to drive small bulbs or LEDs. Beside one high-side channel device, three configurable devices support LED designs in the most cost-efficient way with diagnostic and protection features.

### Applications

- > Single LEDs and small bulbs
- > Resistor-based LED light designs

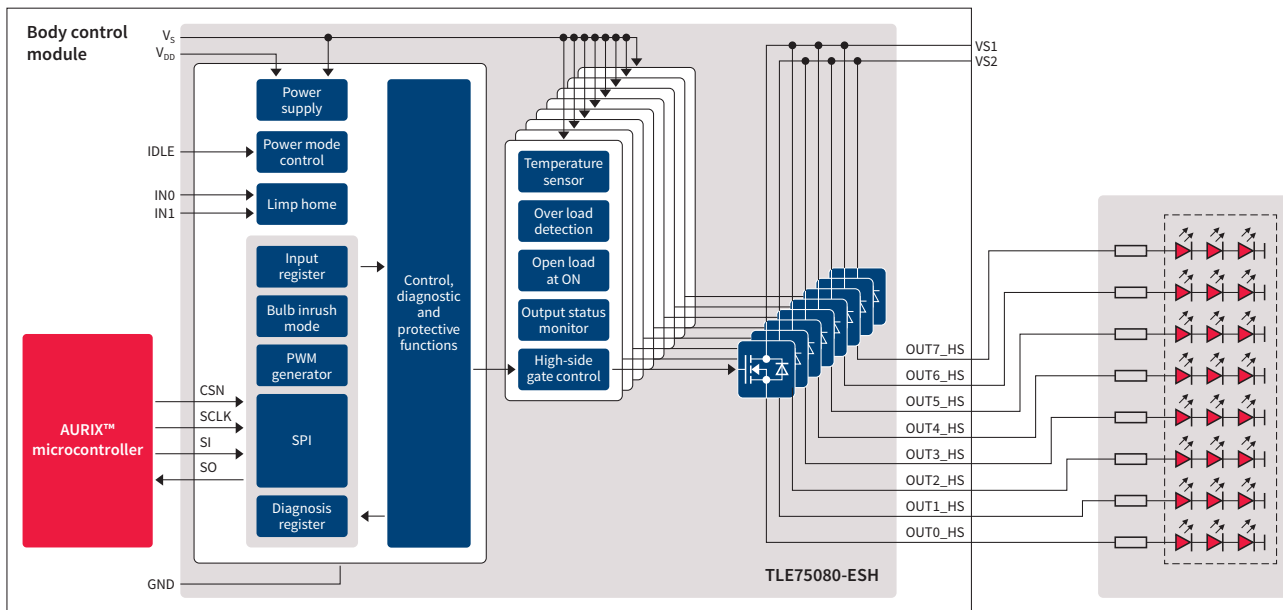
### Benefits

- > Small wire diameter can be used due to 500 mA latched protection
- > Two battery feeds for left/right supply
- > Cost-efficient LED diagnostics and protection
- > Fail-safe operation mode

### Key features

- > SPIDER+ feature set
- > Open load at ON diagnostics with tight threshold of 6 mA for TLE75620-EST to avoid LED glowing
- > Two additional PWM generators
- > Bulb inrush mode to drive small bulbs

## Application diagram TLE75080-ESH: resistor based rear light solutions with SPIDER+ LED



Product overview												
	Product name	Configurable	High side	Low side	Cranking mode [V]	Limp home	LED driver OL @ ON, +2 add. PWM, bulb inrush	$R_{DS(on)}$ (typ) @ 25°C [mΩ]	$V_{DS(AZ)}$ (min) [V]	$I_{L(NOM)}$ [mA]	Number of direct inputs	Package <sup>1)</sup>
SPIDER+ LED	TLE75080-ESH		8		3	●	●	1.0	42	330	2	TSDSO-24 EP
	TLE75242-ESH	2	4	2	3	●	●	1.0	42	330	2	TSDSO-24 EP
	TLE75602-ESH	6		2	3	●	●	1.0	42	330	2	TSDSO-24 EP
	TLE75620-EST	6	2		3	●	●	1.0	42	330	2	TSDSO-24 EP

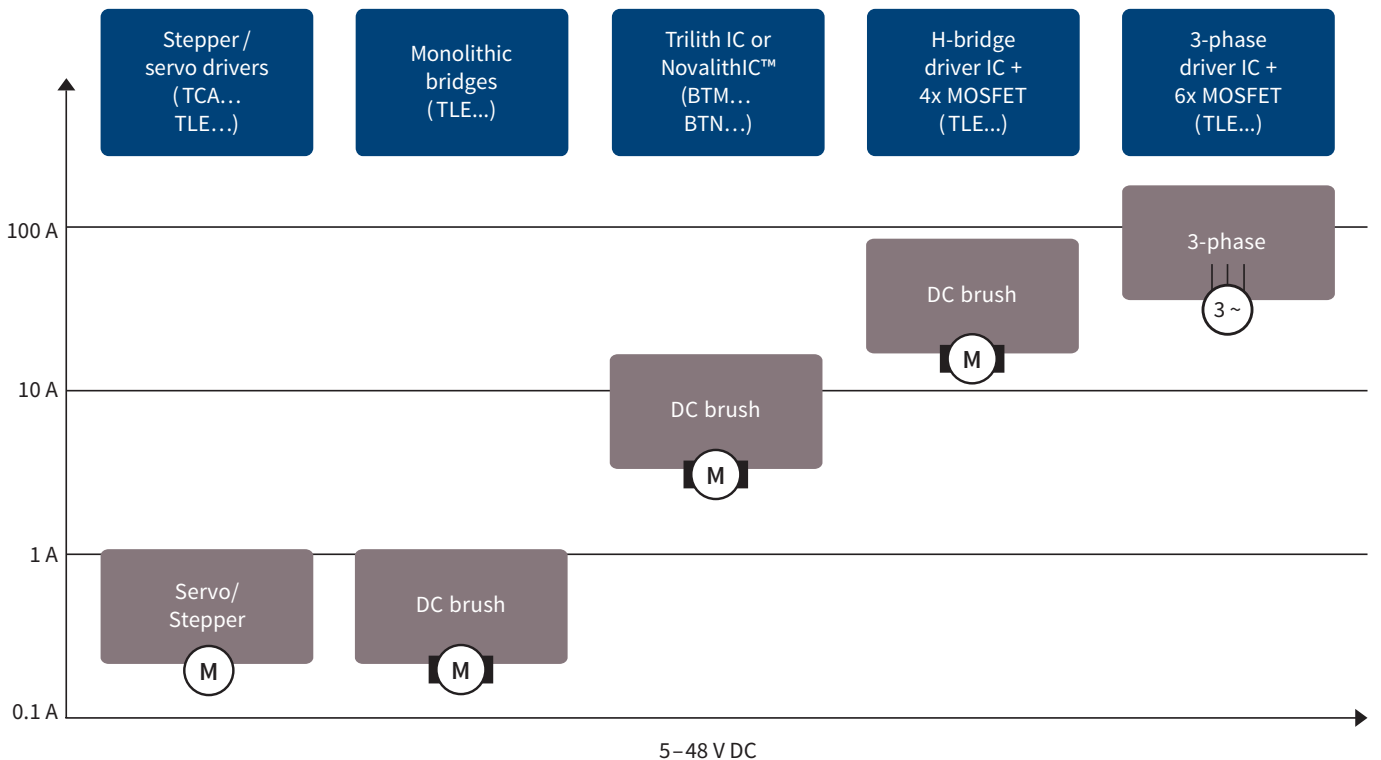
1) See packages on page 142 to 144



# Motor drivers: The right driver for every motor

The search for a solution to drive applications powered by low-voltage motors ends with Infineon. From 0.1 to 100 A,

and from steppers to 3-phase drivers, we offer the right solution for every current range and application requirement.



# Integrated low-current motor drivers

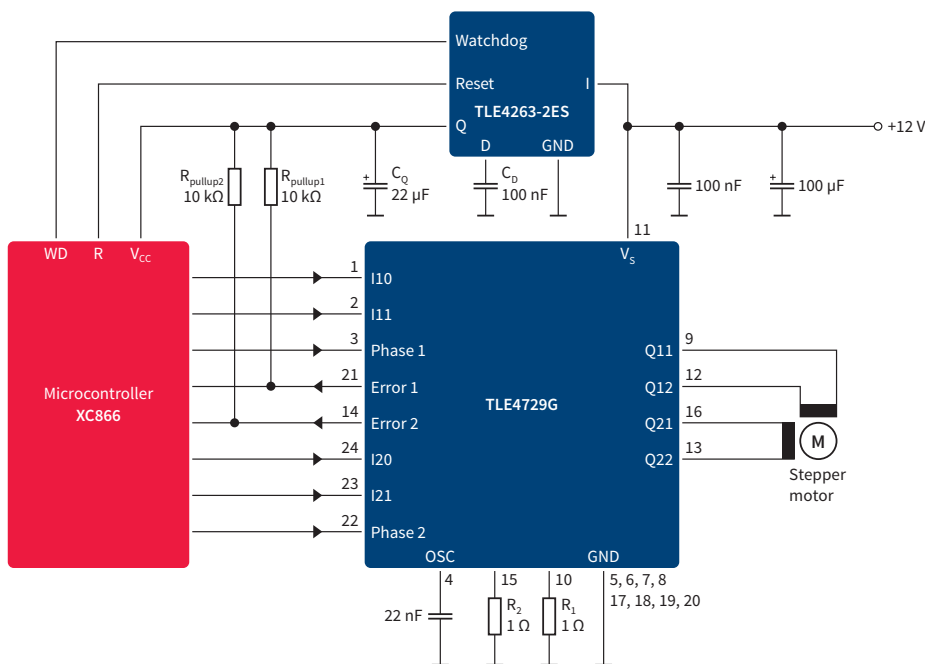
The Infineon low-current motor bridge family consists of a broad variety of bridges for stepper and DC brush motors, including servo motors. They are designed for use in automotive and industrial applications. Typical applications are light leveling, HVAC flap control, and mirror adjustment.

The products are offered with protection features as well as diagnostics. Depending on the product type, the protection ranges from basic protection against overtemperature to a full set of protection against open-load, overvoltage, undervoltage, overtemperature and short-circuit. The diagnostic capabilities range from a simple status flag to communication via a 16-bit SPI.

## Stepper motor drivers

The TCA3727 and TLE4726 cover a broad range of applications from automotive to industrial. The TLE4726 can be used in 24 V applications. TLE4729G is dedicated to automotive applications and offers additional protection compared to TLE4726G.

TLE94004EP and TLE8444SL offer a low-cost solution for simple stepper motor applications. Only full-step and half-step modes are possible.



## Product overview

Product name	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	$I_q$ [ $\mu$ A]	$V_{S(OP)}$ [V]	Step operations	Protection	Diagnostic interface	Highlights	Package <sup>1)</sup>
<b>Current controlled</b>									
TCA3727G	2 x 0.75	2 x 1.50	200	5–50	Full to mini step	OT	–	High operating voltage, low quiescent current with inhibit	DSO-24
TLE4726G	2 x 0.75	2 x 1.50	200	5–50	Full to mini step	OT	–		DSO-24
TLE4729G	2 x 0.70	2 x 1.50	50	6–16	Full to mini step	OL, OT, SC	Status flag	Very low quiescent current with inhibit	DSO-24
<b>Voltage controlled</b>									
TLE94004EP	4 x 0.30	4 x 0.90	0.2	5.5–20	Full to half-step	OC, OT, VS UV/OV	Direct interface	TLE94xyz family concept + small package	TSDSO-14
TLE8444SL	4 x 0.50	4 x 0.90	1	8–18	Full to half-step	SC, OT, OV, UV, OL	Status flag	Open-load detection in ON-state	SSOP-24

1) See packages on page 142 to 144

LO = Lockout  
OL = Open-Load

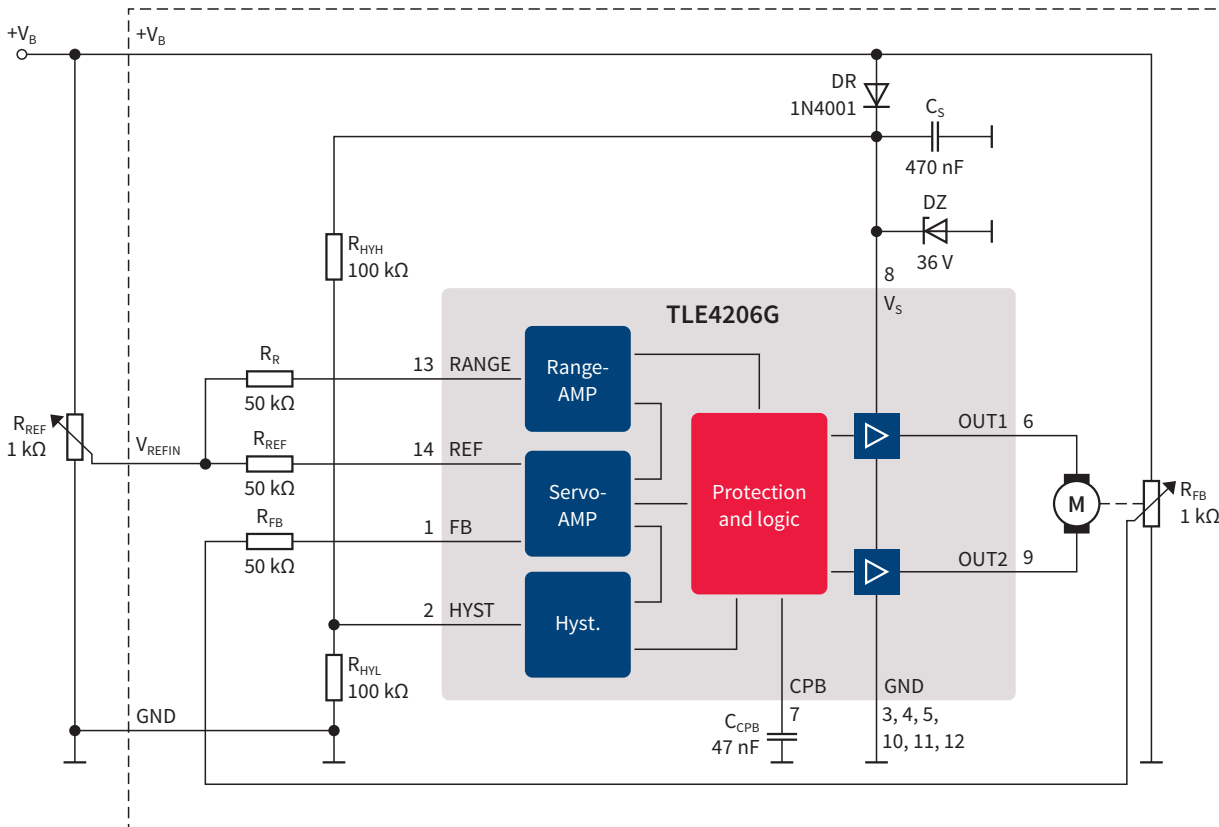
OV = Overvoltage  
UV = Undervoltage

OT = Overtemperature  
SC = Short-Circuit

# Integrated low-current motor drivers

## Servo drivers

The TLE4205, TLE4206 and TLE4209 are protected H-bridge drivers for automotive applications like headlight beam control and industrial servo control applications.



Product name	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	$I_q$ [ $\mu$ A]	$V_{S(OP)}$ [V]	Protection	Inhibit	Highlights	$V_{sat path}$	Package <sup>1)</sup>
TLE4205G	0.60	1.00	0.10	6 ... 32	SC	•	Dual power comparator for higher voltage	2.1 V at 0.6 A <sup>2)</sup> supply voltage	DSO-20
TLE4206-2G	0.80	1.50	12.00	8 ... 18	OT, OV, UV, LO, SC		Switching hysteresis on range input	1.2 V at 0.4 A <sup>2)</sup>	DSO-14
TLE4209G	0.80	1.50	12.00	8 ... 18			Servo driver	1.2 V at 0.3 A <sup>2)</sup>	DSO-14

1) See packages on page 142 to 144

2) Total drop saturation voltage typ. value at 25°C and 0.4 A

LO = Lockout

OL = Open-Load

OV = Overvoltage

UV = Undervoltage

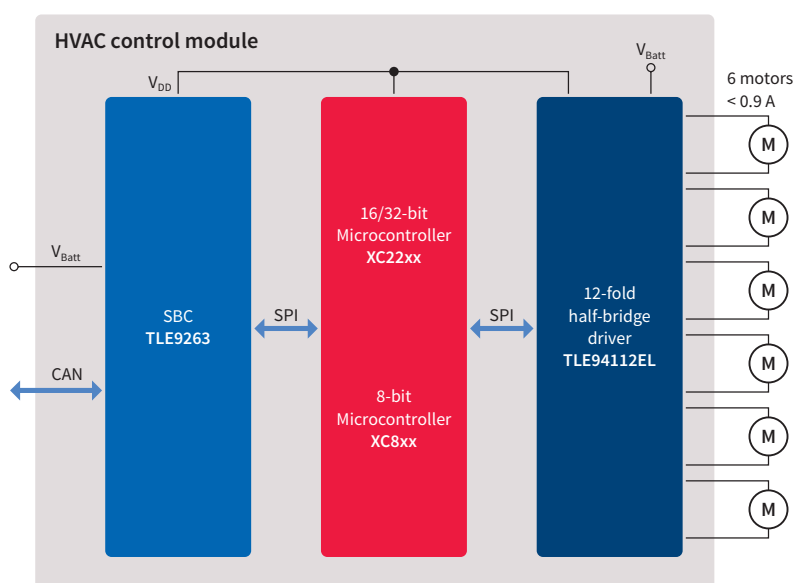
OT = Overtemperature

SC = Short-Circuit

## Multi half-bridge driver ICs

The TLE94xyz as well as TLE4207G and TLE6208/-6G are multipurpose bridges designed to drive DC brush motors with nominal load currents < 1 A for automotive and industrial applications.

The TLE94xyz design is based on a family specification which supports platform designs where the number of motors may range from two to six or more.



### Basic features

- > OV = Overvoltage
- > UV = Undervoltage
- > OT = Overtemperature
- > SC = Short-Circuit

Product name	Config.	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ (min) [A]	$I_q$ [μA]	$V_{S(OP)}$ [V]	Protection	Diagnostic interface	Highlights	$R_{DS(on)}$ (typ) @ 25°C	Package <sup>1)</sup>
TLE4207G	2x H-bridge	2 x 0.80	2 x 1.50	20	8 ... 18	OC, OT, VS UV/OV	Status flag	Error det.	1.2 V <sup>2)</sup>	DSO-14
TLE8444SL	4x H-bridge	4 x 0.50	4 x 0.90	1	8 ... 18	OC, OT, OL, VS UV/OV	Status flag	Open-load detection in ON-state	600 mΩ <sup>3)</sup> /switch	SSOP-24
TLE6208-6G	6x H-bridge	6 x 0.80	6 x 1.00	12	8 ... 40	OC, OT, OL, VS UV/OV	16-bit SPI	Single switch usage possible	800 mΩ <sup>3)</sup> /switch	DSO-28
TLE94003EP	3x H-bridge	3 x 0.30	3 x 0.90	0.2	5.5 ... 20	OC, OT, VS UV/OV	Direct interface	TLE94xyz family concept + small package	850 mΩ <sup>3)</sup> /switch	TSDSO-14
TLE94103EP	3x H-bridge	3 x 0.30	3 x 0.90	0.2	5.5 ... 20	OC, OT, OL, VS UV/OV	16-bit SPI	TLE94xyz family concept + small package	850 mΩ <sup>3)</sup> /switch	TSDSO-14
TLE94004EP	4x H-bridge	4 x 0.30	4 x 0.90	0.2	5.5 ... 20	OC, OT, VS UV/OV	Direct interface	TLE94xyz family concept + small package	850 mΩ <sup>3)</sup> /switch	TSDSO-14
TLE94104EP	4x H-bridge	4 x 0.30	4 x 0.90	0.6	5.5 ... 20	OC, OT, OL, VS UV/OV	16-bit SPI	TLE94xyz family concept + small package	850 mΩ <sup>3)</sup> /switch	TSDSO-14
TLE94106ES	6x H-bridge	6 x 0.30	6 x 0.90	0.2	5.5 ... 20	OC, OT, OL, VS UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84106EL	850 mΩ <sup>3)</sup> /switch	TSDSO-24
TLE94108EL	8x H-bridge	8 x 0.30	8 x 0.90	0.6	5.5 ... 20	OC, OT, OL, VS UV/OV	16-bit SPI	TLE94xyz family concept	850 mΩ <sup>3)</sup> /switch	SSOP-24
TLE94110EL	10x H-bridge	10 x 0.30	10 x 0.90	0.6	5.5 ... 20	OC, OT, OL, VS UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84110EL	850 mΩ <sup>3)</sup> /switch	SSOP-24
TLE94112EL	12x H-bridge	12 x 0.30	12 x 0.90	0.6	5.5 ... 20	OC, OT, OL, VS UV/OV	16-bit SPI	TLE94xyz family concept + 12 outputs in one package	850 mΩ <sup>3)</sup> /switch	SSOP-24

1) See packages on page 142 to 144

2) Total drop saturation voltage typ. value at 25°C and 0.4 A

3)  $R_{DS(on)}$  is typical and specified at  $T_j = 25^\circ\text{C}$

LO = Lockout

OC = Overcurrent

OL = Open-Load

OV = Overvoltage

UV = Undervoltage

OT = Overtemperature

VS = Voltage supply



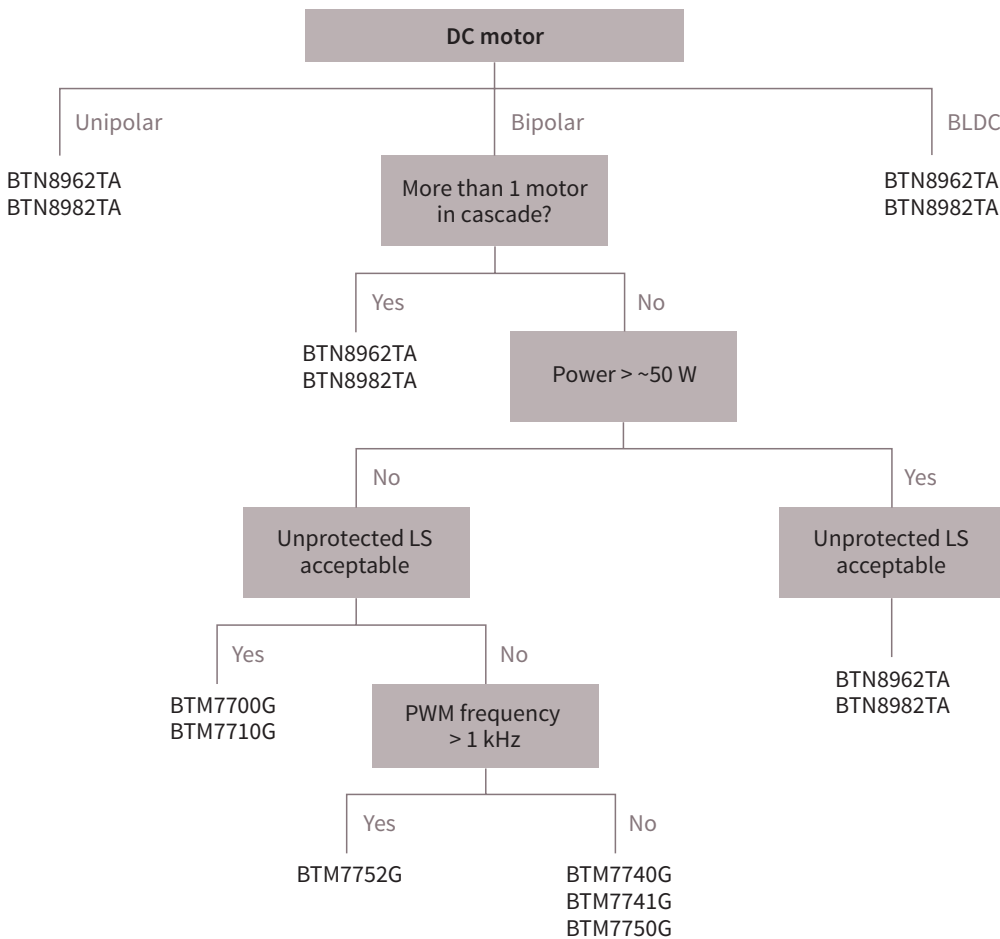
# Integrated high-current motor drivers

## NovalithIC™/Trilith IC

The NovalithIC™ provides a complete low-ohmic-protected half-bridge in a single package. It can be combined with an additional NovalithIC™ to create an H-bridge or 3-phase bridge. The NovalithIC™ family has the capability to switch fast PWM signals while providing overcurrent, undervoltage and overtemperature protection. Current sensing is available to monitor load current. The NovalithIC™ family offers cost-optimized solutions for protected high-current PWM motor drives with very low board-space consumption—scaled to your needs.

The Trilith IC family members combine two high-side and two low-side switches in one package. They are geared to drive high-current DC motors in an H-bridge configuration, but can also be used as single independent switches. All Trilith ICs include overcurrent and overtemperature protection for the high-side switches. For the low-side switches, the user can choose between unprotected switches as well as protected switches.

## Selection tree – NovalithIC™ (BTNxxxx)/Trilith IC (BTMxxxx)



# Trilith IC – integrated H-bridge

## Basic features

- > Low quiescent current
- > Capable of high PWM frequency

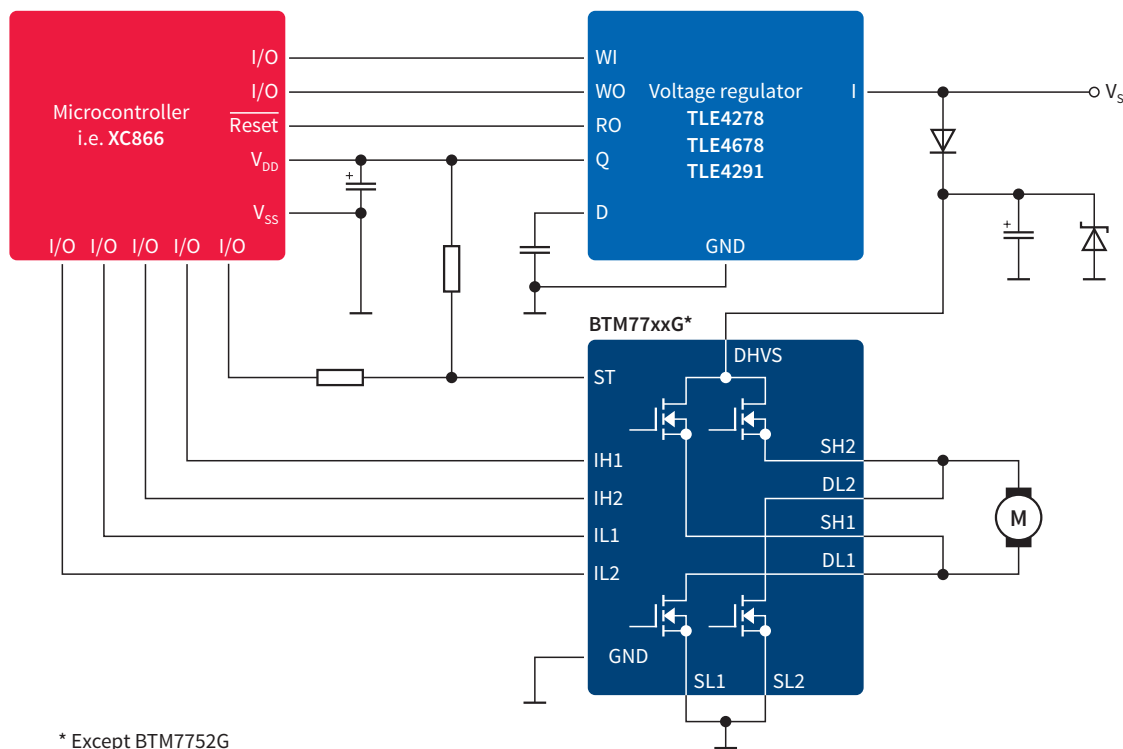
## Diagnostic features

- > Overvoltage
- > Overtemperature
- > Short-circuit/overcurrent
- > Current sense/status
- > Open-load

## Protection features

- > Overvoltage
- > Undervoltage
- > Overtemperature
- > Short-circuit/overcurrent

## Application diagram Trilith IC



## Trilith IC product overview

Product name	Operating range [V]	R <sub>DS(on)</sub> path (typ) @ 25°C [mΩ]	I <sub>D(lim)</sub> (typ) [A]	I <sub>q</sub> (typ) [μA]	Switch freq. (typ) [kHz]	Diagnosis	Protect	Package <sup>1)</sup>
BTM7740G	4.80 ... 42.00	210	8.00	5	1	OT	OT, SC	DSO-28
BTM7741G	4.80 ... 42.00	210	10.00	5	1	OT, OL	OT, SC	DSO-28
BTM7700G	4.80 ... 42.00	190	9.50	5	1	OT	OT, SC	DSO-28
BTM7750G	4.80 ... 42.00	115	12.00	5	1	OT	OT, SC	DSO-28
BTM7710G	4.80 ... 42.00	110	15.00	5	1	OT	OT, SC	DSO-28
BTM7752G	5.50 ... 28.00	150	12.00	5	25	OV, OT, SC/OC, CS	OV, UV, OT, SC/OC	DSO-36

1) See packages on page 142 to 144

CS = Current Sense  
OL = Open-Load  
OV = Overvoltage

UV = Undervoltage  
OT = Overtemperature  
SC = Short-Circuit  
OC = Overcurrent

# Half-bridge with integrated driver IC

## NovalithIC™ – integrated half-bridge

### Basic features

- > Low quiescent current
- > Capable of high PWM frequency
- > Logic level input
- > Adjustable slew rate
- > Cross-current protection

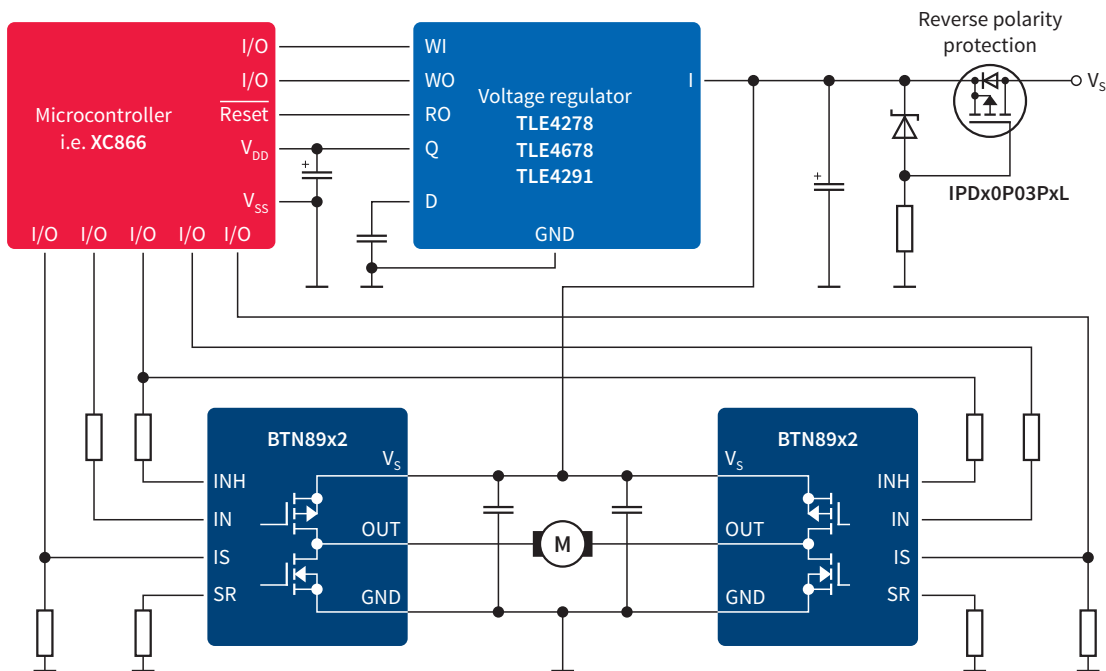
### Diagnostic features

- > Overtemperature
- > Overcurrent
- > Current sense and status

### Protection features

- > Overtemperature shutdown
- > Undervoltage
- > Overcurrent
- > Cross-current

## Application diagram NovalithIC™



## NovalithIC™ product overview

Product name	Operating range [V]	$R_{DS(on)}$ path (typ) [mΩ]	$I_{D(lim)}$ (typ) [A]	$I_o$ (typ) [μA]	Switch time (typ) [μs]	Diagnosis	Protect	Package <sup>1)</sup>
BTN8962TA	5.50 ... 40.00	14.20	42	7	0.25	OT, OC, CS	UV, OT, OC	T0263-7 (D <sup>2</sup> PAK 7-leg)
BTN8982TA	5.50 ... 40.00	10.00	77	7	0.25	OT, OC, CS	UV, OT, OC	T0263-7 (D <sup>2</sup> PAK 7-leg)

1) See packages on page 142 to 144

OC = Overcurrent  
CS = Current Sense

UV = Undervoltage  
OT = Overtemperature

# Powertrain system ICs

## H-bridges for powertrain applications

The Infineon H-bridge portfolio addresses a broad range of DC brush motor applications. Originally designed and optimized for Electronic Throttle Control (ETC), the H-bridges can also be used for applications like Exhaust

Gas Recirculation (EGR) valve control, idle control, swirl and tumble flaps, variable intake manifold, turbo charger waste gate, variable turbo geometry or industrial DC brush motor applications.

Product name	$R_{DS(on) HS}$ [mΩ]	$R_{DS(on) LS}$ [mΩ]	$I_{LIM}$ min. [A]	$I_Q$ max. [mA]	$V_{S(OP)}$ [V]	Diagnostic IF	$V_{DD}$ mon.	Package <sup>1)</sup>
TLE5205-2G	220	220	6.00	10.00	6.00 ... 40.00	Status flag		TO263-7 (D <sup>2</sup> PAK 7-leg)
TLE5206-2S	220	220	6.00	10.00	6.00 ... 40.00	Status flag		TO220-7-12
TLE6209R	140	130	3.40 ... 5.95	0.05	5.20 ... 40.00	SPI		DSO-20 (Power-SO)
TLE7209-3R	150	150	5.50	20.00	5.00 ... 28.00	SPI and status flag		DSO-20 (Power-SO)
TLE8209-2SA	115	125	1.00 ... 7.70	0.02	4.50 ... 28.00	SPI and status flag	●	DSO-20 (Power-SO)
TLE9201SG	100	100	6.00	0.03	5.00 ... 28.00	SPI and status flag		DSO-12
TLE9202ED <sup>2)</sup>	100	100	6.00	0.03	5.00 ... 28.00	SPI and status flag		DSO-36 (Dual gauge)

1) See packages on page 142 to 144

2) Coming Q4/2017

## Flex multichannel low-side switches (powertrain and safety)

Multichannel low-side switches are designed for multipurpose loads (solenoids, relays and resistive loads). The so-called Flex products are a flexible way to serve the engine requirements with a different number of low-side drivers.

Please refer to page 44 for the product overview.

# Motor driver ICs

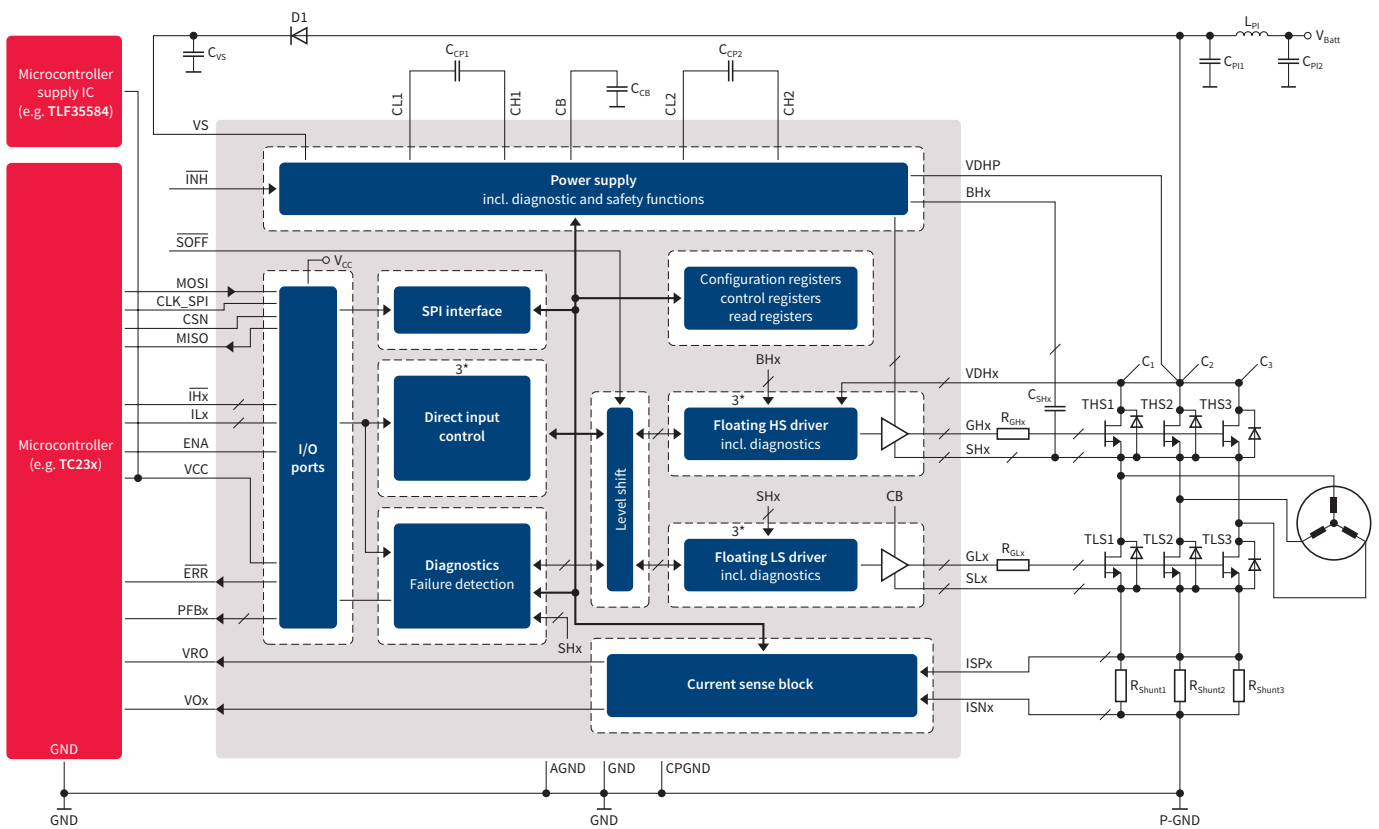
Our line-up of gate driver ICs for external MOSFETs covers everything you need for brushless DC and brush DC motors in 12 V, 24 V and 48 V automotive applications, including protection and diagnostic features to meet ISO 26262.

The trend to advanced driver assistance systems, autonomous driving, challenging regulatory emission targets and the increasing electrification of the drivetrain spur the need for sophisticated electric motor drives in vehicles.

Applications such as HVAC compressors or engine cooling fans will be controlled by variable speed drives in the future.

Electric power steering and brake booster systems will transition from fail-safe to fail-operational systems with the need for the highest ASIL D level. The introduction of 48 V MHEV will be a game changer for traditional alternators to become integrated starter generators.

At Infineon, we have a full range of motor driver ICs to provide the required performance and functional safety for the versatility that these systems demand. Leveraging more than 15 years' experience and our strong technical resources, we have leading-edge products in place to master the automotive revolution.

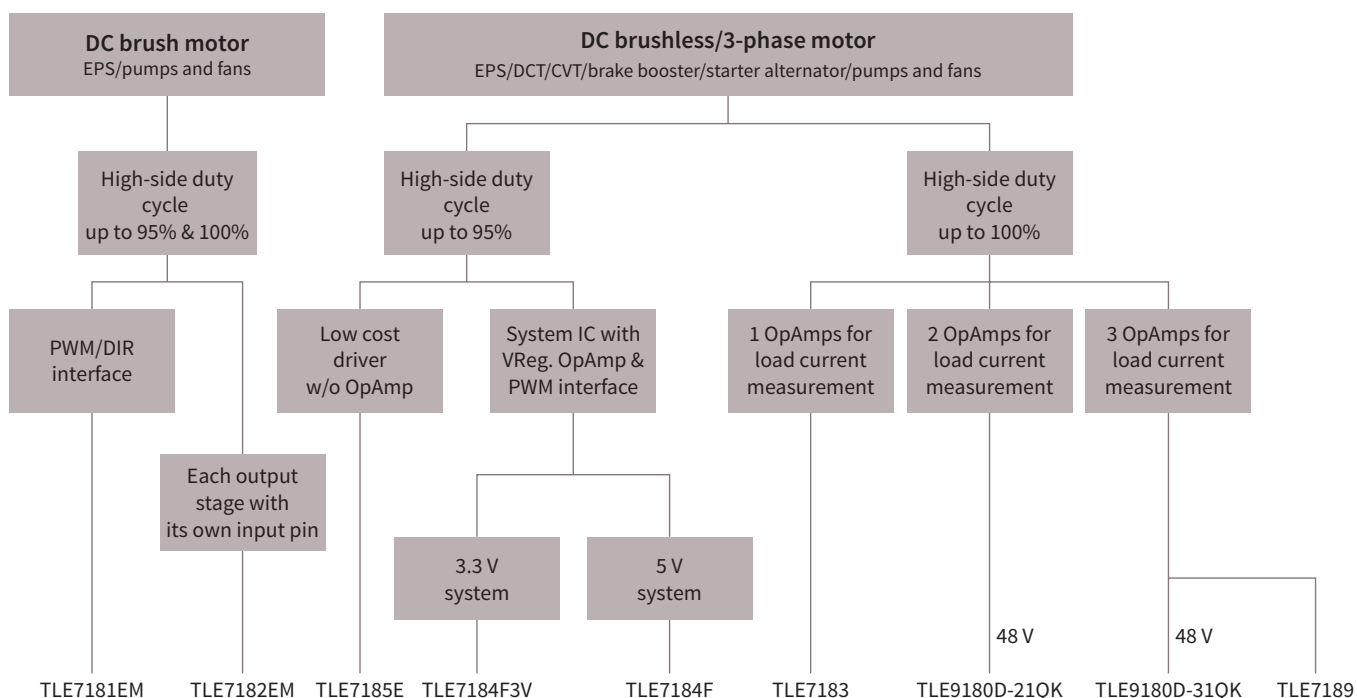


## Applications

- > Power steering
- > Fan and pump control
- > Starter alternator
- > Seat belt pretensioner
- > VVT
- > Electric park brake
- > ECMT
- > E-turbo



## Selection tree – motor drivers



### H-bridge/dual half-bridge drivers family

Product name	Operating range [V]	OpAmp	PWM/DIR input	Reverse polarity protection	Diagnosis	Package <sup>1)</sup>
TLE7181EM	7 ... 34	1		●	UV, OV, OC, SCD, OT	SSOP-24
TLE7182EM	7 ... 34	1		●	UV, OV, OC, SCD, OT	SSOP-24

### 3-phase bridge driver IC

Product name	Operating range [V]	Drives stage	D.C.-range @ 20 kHz [%]	Numbers of integrated OpAmps for load current measurement	Adjustable dead time	ISO 26262 ready	Diagnosis	Package <sup>1)</sup>
TLE7183F	5.50 ... 28.00	1.50/1.50 A	0 ... 100	1	●		OT, UV, OV, OC, OCD	VQFN-48
TLE7183QU	5.50 ... 28.00	1.50/1.50 A	0 ... 100	1	●		OT, UV, OV, OC, SCD	TQFP-48 EP
TLE7184F TLE7184F-3V <sup>2)</sup>	7.00 ... 32.00	12.50/9.00 Ω 12.50 Ω	0 ... 95	1	●		UV, OV, OC, SCD, OT, VDD supervision	VQFN-48
TLE7185E	5.50 ... 32.00	12.50/9.00 Ω	0 ... 95	0	●		UV, OV, SCD, OT	DSO-36 EP
TLE7189F	5.50 ... 28.00	1.50/1.50 A	0 ... 100	3		●	UV, OV, SCD, OT, VDD supervision	VQFN-48
TLE7189QK	5.50 ... 28.00	1.50/1.50 A	0 ... 100	3		●	UV, OV, SCD, OT, VDD supervision	LQFP-64
AUIRS20302	8.00 ... 17.00 Output offset 200 V	0.20/0.35 A	0 ... 95	1 (SC protection)			One error flag for OTW, UV, SC	DSO-28 (28 lead SOIC)
TLE9180D-21QK	5.50 ... 60.00	2.00/2.20 A	0 ... 100	2	●	●	UV, OV, SCD, OT, diagnostic, limp mode	LQFP-64
TLE9180D-31QK	5.50 ... 60.00	2.00/2.20 A	0 ... 100	3	●	●	UV, OV, SCD, OT, diagnostic, limp mode	LQFP-64

1) See packages on page 142 to 144

2) System IC for fans and pumps with integrated LDO and PWM interface

LO = Lockout  
OL = Open-Load  
OV = Overvoltage  
OC = Overcurrent

UV = Undervoltage  
OT = Overtemperature  
SCD = Short-Circuit Detection

# Gate drivers for automotive high-voltage applications (hybrid and electric vehicles)

## Isolated gate driver ICs

The Infineon EiceDRIVER™ family includes single- and dual-channel automotive IGBT driver ICs providing galvanic isolation and bidirectional signal transmission. The products are ideal for main inverter systems in automotive applications where efficiency, space savings and monitoring functions are priorities.

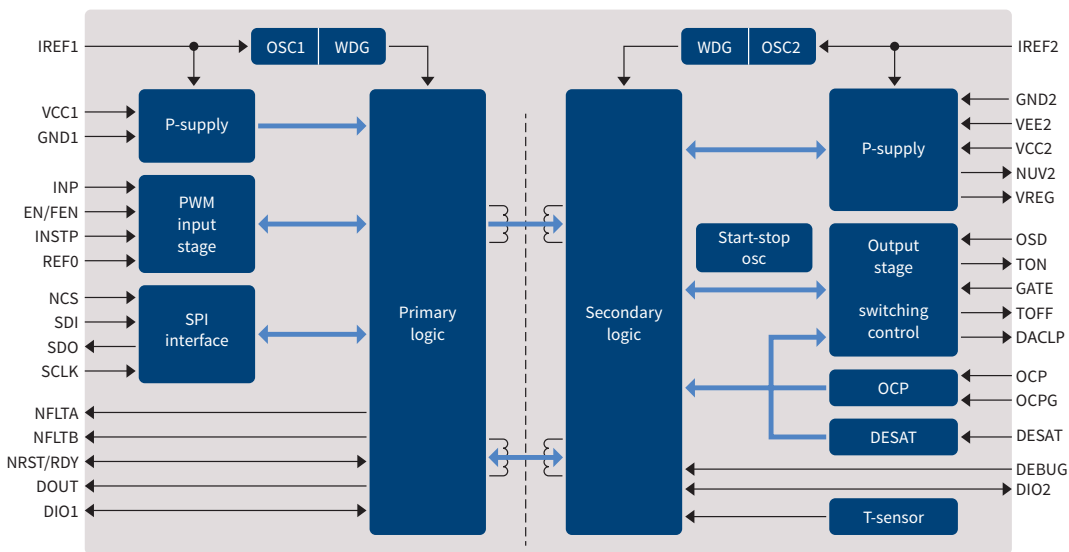
### Key features

- > On-chip galvanic isolation
- > Advanced safety functions
- > Standard SPI interface
- > Gate signal shaping
- > Overcurrent monitoring
- > 8-bit ADC with programmable offset and gain
- > AEC-Q100 qualified

### Applications

- > (H)EV main inverter
- > AC-DC charger
- > DC-DC converter

## Block diagram 1EDI2002AS



Product name	Voltage class [V]	Source current [A]	Sink current [A]	Channels	Topology	Package <sup>1)</sup>
1ED020I12FA2	1200	2	2	1	Single	DSO-20
1ED020I12FTA	1200	2	2	1	Single	DSO-20
2ED020I12FA	1200	2	2	2	Half-bridge	DSO-36
1EDI2001AS	1200	1	1	1	Single	DSO-36
1EDI2002AS	1200	1	1	1	Single	DSO-36
1EDI2004AS <sup>2)</sup>	1200	1	1	1	Single	DSO-36
1EDI2010AS	1200	1	1	1	Single	DSO-36
1EDI2015AS	1200	1	1	1	Single	DSO-36
1EBN1001AE	40	15	15	1	Buffer	DSO-14 EP
AUIR08152S	40	10	10	1	Buffer	SO-8 (DSO-8)

1) See packages on page 142 to 144

2) Coming Q1/2019

## General-purpose gate driver ICs (HVIC)

Our comprehensive portfolio of automotive-qualified gate driver ICs helps to simplify the design and optimize the performance of all FETs and IGBTs driving stages.

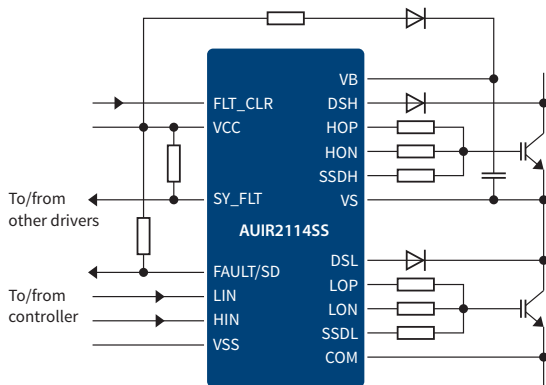
### Key features

- › Off-set voltage 600 V
- › Multiple driving topologies
- › Short propagation delay
- › High tolerance to negative  $V_s$  spikes
- › AEC-Q100 qualified

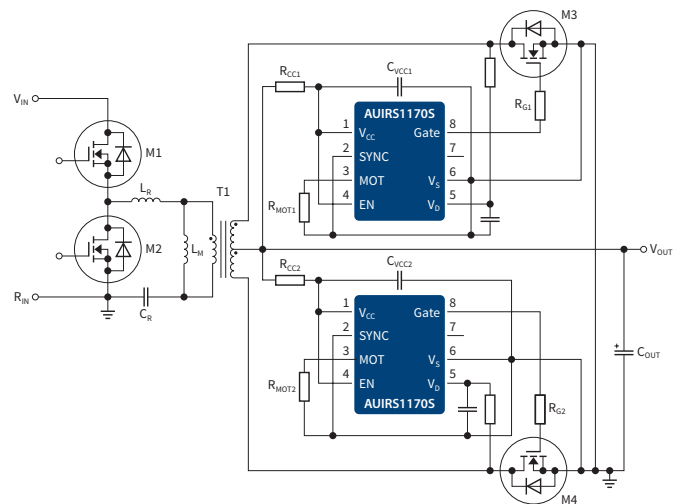
### Applications

- › Wireless in-cabin charging of phones
- › AC-DC charger
- › DC-DC converter
- › HVAC compressor
- › HV fans and pumps
- › PTC heater

### Application diagram AUIR2214SS



### Application diagram AUIRIS1170S



Product name	Voltage class [V]	Source current [A]	Sink current [A]	Channels	Topology	Package <sup>1)</sup>
AUIRS1170S	200	3.00	6.00	1	Synchronous rectification IC	SO-8 (DSO-8)
AUIRS2117S	600	0.29	0.60	1	Single high-side driver	SO-8 (DSO-8)
AUIRS2118S	600	0.29	0.60	1	Single high-side driver	SO-8 (DSO-8)
AUIRS2123S	600	0.50	0.50	1	Single high-side driver	SO-8 (DSO-8)
AUIRS2124S	600	0.50	0.50	1	Single high-side driver	SO-8 (DSO-8)
AUIRS2127S	600	0.29	0.60	1	Single high-side driver	SO-8 (DSO-8)
AUIRS21271S	600	0.29	0.60	1	Single high-side driver	SO-8 (DSO-8)
AUIRS2113S	600	2.50	2.50	2	Half-bridge	SO-16 WB (16 lead SOIC)
AUIRS2181S	600	1.90	2.30	2	Half-bridge	SO-8 (DSO-8)
AUIRS21811S	600	1.90	2.30	2	Half-bridge	SO-8 (DSO-8)
AUIRS21814S	600	1.90	2.30	2	Half-bridge	SO-14 NB (14 lead SOIC)
AUIRS2191S	600	3.50	3.50	2	Half-bridge	SO-16 NB (16 lead SOIC)
AUIRS2301S	600	0.20	0.35	2	Half-bridge	SO-8 (DSO-8)
AUIRS2336S	600	0.20	0.35	6	Half-bridge	DSO-28 (28 lead SOIC)
AUIR2114SS <sup>2)</sup>	700	2.00	3.00	2	Half-bridge	SSOP-24
AUIR2214SS <sup>2)</sup>	1200	2.00	3.00	2	Half-bridge	SSOP-24

1) See packages on page 142 to 144

2) Coming Q3/2018

# Gate drivers for power distribution

The Infineon AUIR32xx family offers the capability of addressing high-current applications where a power switch of less than 1 mΩ is required. The AUIR3200S is a general-purpose driver for use in various applications where a high-

current (< 10 A) protected switch is required. The AUIR3240S, AUIR3241S and AUIR3242S can be used in any application to achieve a low quiescent current when on, such as the battery switch in a stop-and-start system.

## AUIR3200S: MOSFET gate driver with protection and diagnostic features

### Applications

- > Battery switch
- > Relay replacement
- > Motor control

### Key features

- > Operating range: 6–36 V
- > Programmable overcurrent protection
- > Programmable overtemperature shutdown

- > Latched protection
- > Diagnostics
- > Reverse battery protection (turn on the MOSFET)
- > Smart undervoltage protection
- > Loss of ground protection
- > PWM capability
- > Very low stand-by current

## AUIR3240S/AUIR3241S/AUIR3242S: MOSFET gate drivers with very low current consumption

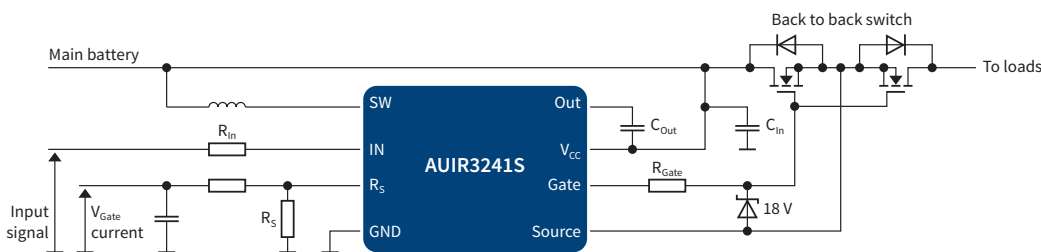
### Applications

- > Power switch for stop-and-start board net stabilizer
- > Battery switch (AUIR3241/AUIR3242S)
- > Q-diode switch (AUIR3240)

### Key features

- > Very low quiescent current in on and off state
- > Back-to-back configuration (AUIR3241/AUIR3242S)

- > Temperature monitoring with NTC interface (AUIR3240)
- > Boost converter with integrated diode
- > Standard level gate voltage
- > Input active high
- > Undervoltage lockout with diagnostic
- > Wide operating voltage 3–36 V
- > Ground loss protection



Product name	Topology	Min supply voltage [V]	Max supply voltage [V]	Output gate voltage [V]	Special features	Package <sup>1)</sup>
AUIR3200S	Single high-side driver	6	36	6	Overcurrent and overtemperature protection, diagnostics	SO-8 (DSO-8)
AUIR3240S	Single high-side driver	4	36	13	Very low operating current	SO-8 (DSO-8)
AUIR3241S	Single high side back-to-back driver	3	36	13	Very low operating current, active high input	SO-8 (DSO-8)
AUIR3242S	Single high side back-to-back driver	3	36	13	Very low operating current, active low input	SO-8 (DSO-8)

1) See packages on page 142 to 144



# 32-bit Embedded Power ICs based on ARM Cortex<sup>\*)</sup>-M

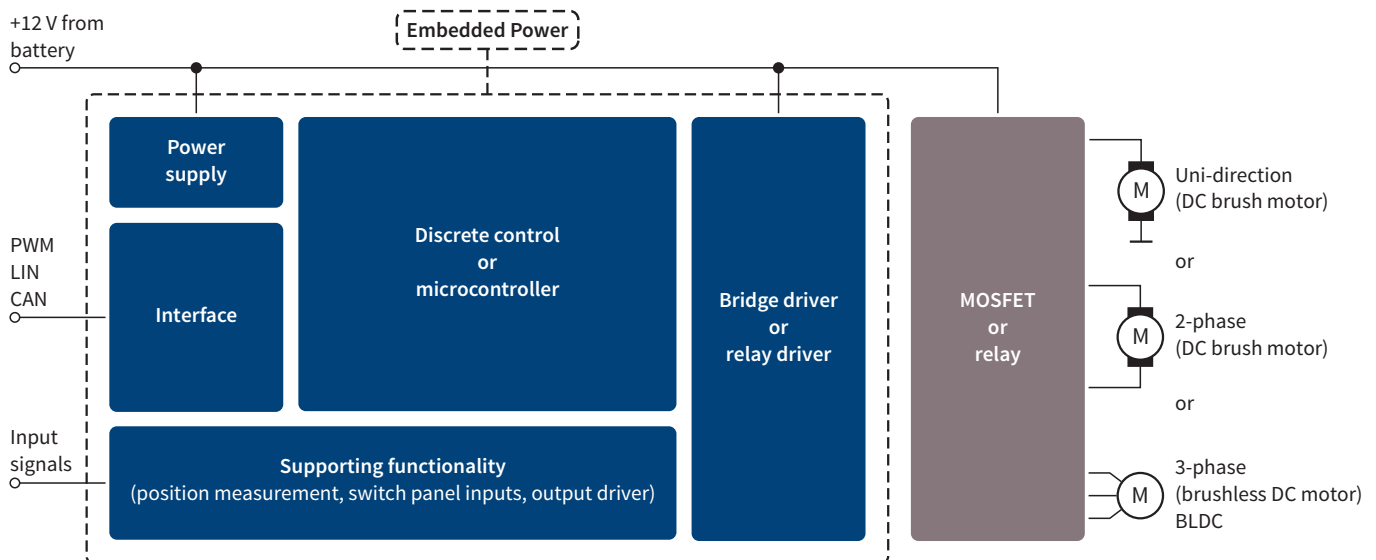
## System-on-chip motor control

Infineon Embedded Power ICs are specifically designed to enable mechatronic motor control solutions for a range of motor control applications where a small package form factor and a minimum number of external components are essential. Such applications include window lift, sunroof, wiper, fuel pump, HVAC fans, engine cooling fan and water pumps, to name but a few.

Produced on the basis of Infineon's first-in-industry automotive-qualified Smart Power technologies, Embedded Power System-on-Chip (SoC) solutions offer an unmatched level of integration of all functions required to sense, control and actuate a motor.

The Infineon Embedded Power ICs integrate on a single die the microcontroller, the non-volatile flash memory, the analog and mixed signal peripherals, the communication interfaces along with the driving stages needed for either relay, half-bridge or full-bridge DC and BLDC motor applications.

All Infineon Embedded Power ICs are offered in a space-saving VQFN-48 package.





# 32-bit Embedded Power ICs based on ARM Cortex<sup>\*)</sup>-M

## Key benefits

**Enable cost and board space improvements** – our system-on-chip solution integrates data processing, actuation and sensing. The chip comes in a leadless VQFN package with 7 x 7 mm footprint and enables PCB space saving. The Embedded Power IC families allow driving of relays and MOSFETs at  $V_{Batt} \geq 6\text{ V}$  without external components, providing a very cost effective solution on a system level.

**Enabling high levels of system reliability** – extensive diagnostics and protections are embedded within the system-on-chip, more than a discrete approach can offer. In addition both the Embedded Power IC and the external MOFESTs can be protected.

**Support multiple and flexible designs with minimal effort** – all Embedded Power ICs are software compatible, maximizing a single design through scalability.

Selection table – Embedded Power ICs for motor control

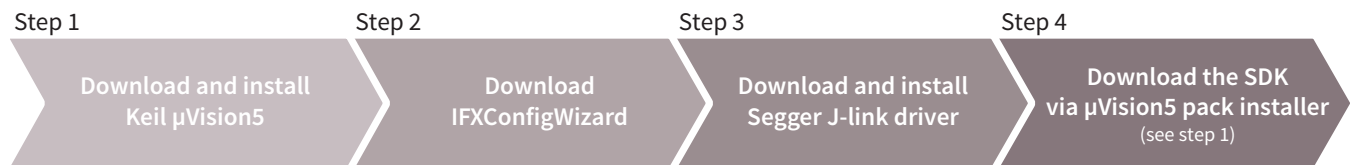
Criteria	TLE984x	TLE9845QX	TLE9851QXW	TLE985x	TLE986x	TLE987x
Controller	ARM Cortex <sup>*)</sup> -M0				ARM Cortex <sup>*)</sup> -M3	
Core frequency	25/40 MHz	40 MHz			24/40 MHz	
Flash size	36–64 KB	48 KB	64 KB	48–96 KB	36–128 KB	
Driver stage	Relay	Half-bridge		H-bridge		B6-bridge
		PN FET	NN FET	N FET		N FET
High-voltage monitor inputs	4 – 5	5	4		1	
Junction temperature levels	150°C	150°C	175°C	150°C/175°C	150°C/175°C	
Package <sup>1)</sup>	VQFN-48-31		VQFN-48-29	VQFN-48-29 VQFN-48-31	VQFN-48-29 VQFN-48-31	
Applications	Window lift Sunroof	Engine cooling fan Auxiliary water pump HVAC blower Fuel pump		Window lift Sunroof Wiper Power lift gate	Engine cooling fan Oil/water/fuel pump HVAC blower Power tools	

1) See packages on page 142 to 144

## Tools and software for Embedded Power ICs

Infineon Embedded Power ICs are supported by a complete development tool chain provided by Infineon and third-party vendors. The tool chain includes compilers,

debuggers, several evaluation boards, LIN low level drivers and configuration tools as well as various software code examples.



For each Embedded Power IC family we offer evaluation boards to evaluate all functions and peripherals providing access to all device I/Os. In addition, evaluation

and applications kits are available which are space- and cost-optimized to demonstrate near-application solutions.

\*) ARM and Cortex are trademarks of ARM Limited, UK

## Relay driver ICs with integrated ARM Cortex<sup>®</sup>-M0

The TLE984x product family integrates an ARM Cortex<sup>®</sup>-M0 microcontroller core along with relay drivers, high-side switches, LIN transceiver, and a power supply system that enables the device to operate at the vehicle battery level.

Its peripheral set includes a 10-bit ADC with 13 multiplexed analog inputs to process up to 5 high-voltage monitoring inputs, 6 low-voltage inputs and 2 high-voltage inputs for sensing the battery voltage and the supply of the device. It further includes an 8-bit ADC with 7 multiplexed inputs for voltage and temperature supervision. Its digital peripherals include a PWM signal generator unit and 16-bit timer along

with a number of general-purpose I/Os (serial interfaces and UARTs). It also includes an on-chip linear voltage regulator to supply external loads.

The TLE984x family concept offers scalability in terms of flash memory sizes ranging from 36 kB to 64 kB with pin-compatible devices. It is specifically designed to fit to a wide range of LIN-slave motor control applications such as window lifts, wipers, sun roofs, fans and blowers.

The chip comes in a leadless VQFN package with a 7 x 7 mm footprint that saves space on the PCB.

### Applications

- › Window lift
- › Sunroof
- › Wiper

### TLE984x family features

- › Two protected low-side switches (min. 270 mA)
- › Up to two protected high-side switches
- › Up to five high-voltage inputs with wake-up functionality
- › Integrated LIN transceiver compatible with LIN 2.2 and compliant to SAE J2602
- › Two full-duplex serial interfaces (UART) with LIN support
- › Two Synchronous Serial Channel (SSC), compatible with SPI
- › On-chip oscillator and PLL for clock generation with loss-of-lock detection
- › Measurement unit:
  - 8-bit ADC module with 7 multiplexed inputs for system supervision
  - 10-bit ADC module with 13 multiplexed inputs
  - Two on-chip temperature and battery voltage measurement units
- › Independent programmable window watchdog
- › 5 V/1.5 V internal power supplies
- › External supply ( $V_{DDEXT}$ ): 5 V  $\pm$ 2% at 20 mA
- › Power-saving modes: MCU slow-down mode, sleep mode, stop mode, cyclic wake-up from sleep mode or stop mode
- › Overtemperature protection

### System benefits

- › System-on-chip solution with integrated ARM Cortex<sup>®</sup> for DC motor control
- › Platform solution for a size- and weight-optimized, relay-based motor control
- › Integrated voltage regulator, LIN transceiver, switch inputs and relay driver
- › Cyclic sense and cyclic wake-up capability saves average current consumption
- › Minimum number of external components reduces BOM cost
- › VQFN package with 7 x 7 mm footprint enables PCB space-saving
- › Single-chip solution improves module reliability

### Features of the microcontroller and its peripherals

- › 32-bit ARM Cortex<sup>®</sup>-M0 core, up to 25/40 MHz clock frequency
- › 36 KB to 64 KB flash memory, up to 4 kByte RAM
- › Boot ROM for startup firmware, bootstrap loader and flash routines
- › Seven 16-bit timers
- › Capture/compare unit for PWM signal generation (CCU6) with 2 x 16-bit timers

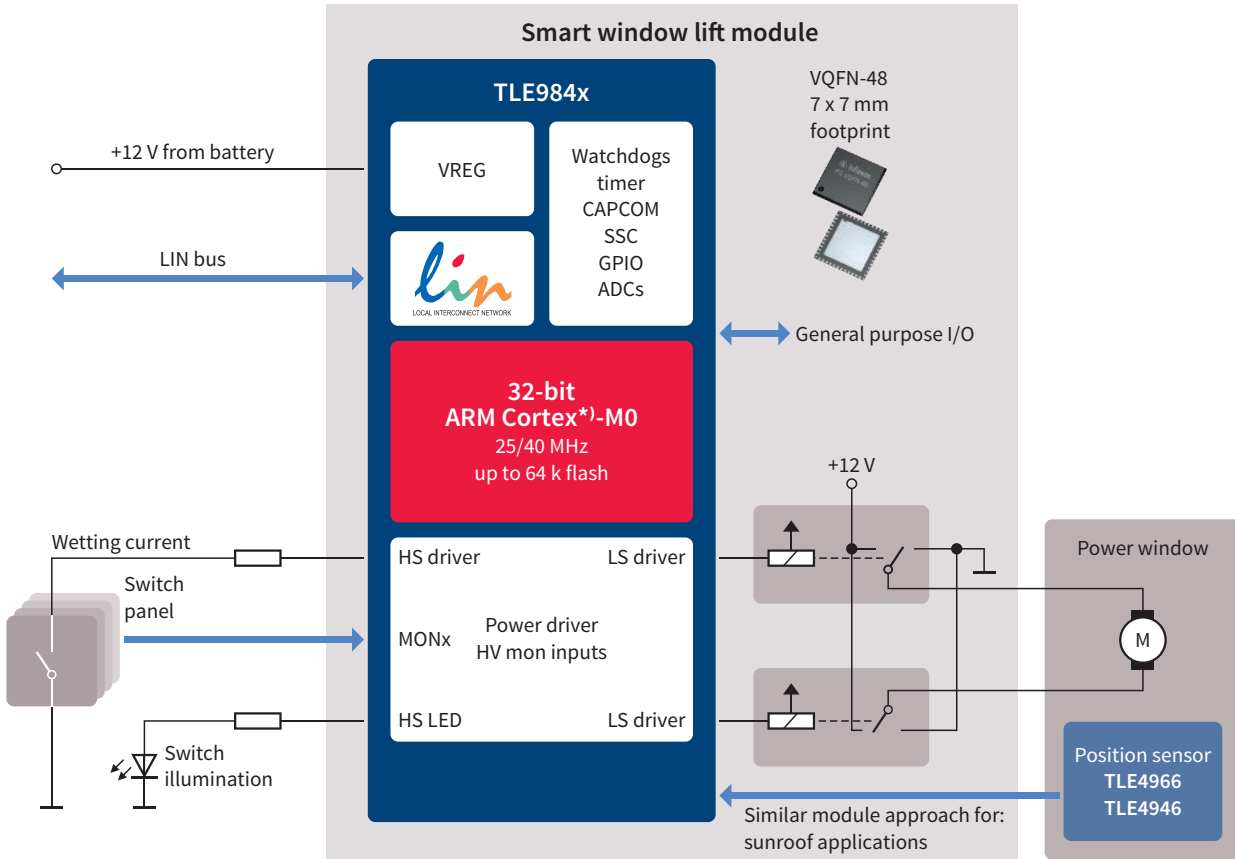
### General characteristics

- › Operating supply voltage  $V_S = 5.5$  to 28 V, maximum rating 40 V
- › Extended operating range  $V_S = 3.0$  to 28 V, MCU/flash fully functional
- › Wide operating temperature range:  $T_j$ : up to 150°

\*) ARM and Cortex are trademarks of ARM Limited, UK

# 32-bit Embedded Power ICs based on ARM Cortex<sup>\*)</sup>-M

Application diagram: TLE984xQX: smart window lift



Space is of the essence for smart window lift applications. The ideal: a system-on-chip solution at a low price point – with a small form factor to save valuable PCB board space. A single-chip solution for improved module reliability is also in high demand. In line with your smart window lift

needs, Infineon offers high-quality semiconductors and a chip with a small form factor and small housing. What's more, our solutions use fewer external devices than any other on the market.

## TLE984x product overview

Product name	ARM Cortex <sup>*)</sup>	Flash [KB]	RAM [KB]	EEPROM in flash included [KB]	Freq [MHz]	High-side switch	High-voltage monitor input	GPIO	Analog inputs	Interface	Package <sup>1)</sup>
TLE9842QX	M0	36	2	4	25	1	4	10	6	PWM + LIN	VQFN-48
TLE9842-2QX	M0	40	2	4	40	2	5	10	6	PWM + LIN	VQFN-48
TLE9843QX	M0	48	4	4	25	1	4	10	6	PWM + LIN	VQFN-48
TLE9843-2QX	M0	52	4	4	40	2	5	10	6	PWM + LIN	VQFN-48
TLE9844QX	M0	64	4	4	25	1	4	10	6	PWM + LIN	VQFN-48
TLE9844-2QX	M0	64	4	4	40	2	5	10	6	PWM + LIN	VQFN-48

1) See packages on page 142 to 144

\*) ARM and Cortex are trademarks of ARM Limited, UK

## Half-bridge driver IC with integrated ARM Cortex<sup>®</sup>-M0 core

Supporting the trend away from relay-based to MOSFET-driven solutions to enable e.g., silent switching, Infineon offers integrated solutions such as half-bridge driver ICs and H-bridge driver ICs to address DC brushed motor control applications.

Our Embedded Power ICs family also includes a solution for half-bridge based solutions. Based on an ARM Cortex<sup>®</sup>-M0 cores, unidirectional brushed DC motor applications can be addressed either with a PN or NN MOSFET.

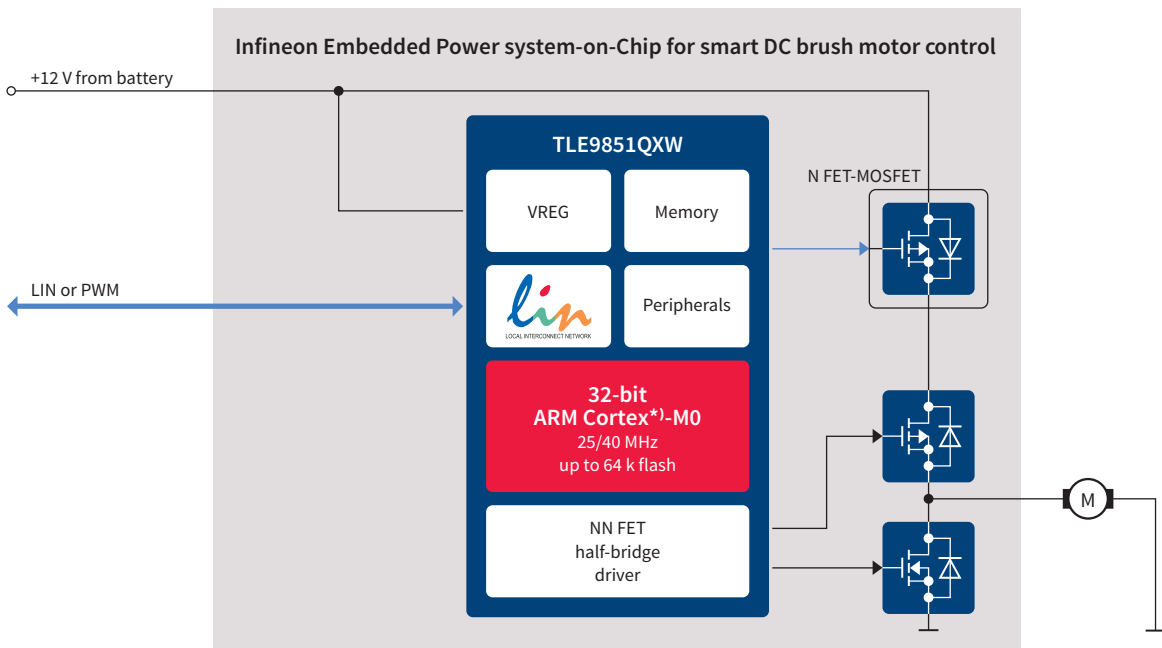
### Applications

- > HAVC blower
- > Single-phase auxiliary pumps and fans, e.g. fuel pump and electric fan

These system-on-chip solutions enable a system solution that increases efficiency using smart power-on-demand control. The TLE9845QX and TLE9851QXW enable a true mechatronic solution that places the electronics adjacent to the motor. As a result, the external control signal (LIN or simple PWM) to the motor controller does not produce any unacceptable emissions that can disturb other electronic components in the car.

Both the TLE9845QX and the TLE9851QXW are software-compatible with all other Embedded Power ICs.

## Application diagram TLE9851QXW: single phase auxiliary pump



Product overview													
Product name	ARM Cortex <sup>®</sup>	Flash [kB]	RAM [kB]	EEPROM in flash included [kB]	Freq [MHz]	High-side switch	High-voltage monitor input	GPIO	Analog inputs	MOS driver	Operation temperature [°C]	Interface	Package <sup>1)</sup>
TLE9845QX	M0	48	4	4	40	2	5	10	6	PN	150	PWM + LIN	VQFN-48
TLE9851QXW	M0	64	4	4	40	1	4	10	5	NN	175	PWM + LIN	VQFN-48

1) See packages on page 142 to 144

<sup>\*)</sup> ARM and Cortex are trademarks of ARM Limited, UK

# 32-bit Embedded Power ICs based on ARM Cortex<sup>\*)</sup>-M

## H-bridge driver IC with integrated ARM Cortex<sup>\*)</sup>-M0/M3 core

Infineon has combined its wealth of experience in motor control drivers for automotive applications with an industry-standard core. The unique result, our Embedded Power IC based on ARM Cortex<sup>\*)</sup>-M cores, addresses a wide range of smart 2-phase DC motor control applications like sunroof, power window lift, electrical pumps and fans. The TLE985x

(ARM Cortex<sup>\*)</sup>-M0) and TLE986x (ARM Cortex<sup>\*)</sup>-M3) families offer scalability in terms of flash memory sizes and MCU system clock frequency supporting a wide range of motor control algorithms. Both the TLE985x and TLE986x are based on the same platform as the TLE984x and TLE987x, enabling design synergies between DC and BLDC motor control applications.

### Applications

- › Sunroof
- › Window lift
- › Wiper
- › Electrical pumps
- › Electrical fans

### Benefits

- › Complete system-on-chip for DC motor control
- › Minimum number of external components reduces BOM cost
- › Platform solution for a wide range of motor control algorithms
- › Simplifies EMC design based on slope-programmable MOSFET driver
- › Intelligent power saving modes including stop and sleep modes support energy management (on demand)
- › VQFN package with 7 x 7mm footprint enable PCB space-saving
- › Reduced motor size and weight
- › Single-die solution improves module reliability

### TLE985x family features

- › MOSFET driver including charge pump for H-bridge motor applications with programmable current settings
- › One protected high-side switch
- › Integrated LIN transceiver compatible with LIN 2.2 and compliant to SAE J2602
- › Two full duplex serial interface (UART) with LIN support
- › Two Synchronous Serial Channel (SSC)
- › On-chip OSC and PLL for clock generation with loss-of-lock detection
- › Four high-voltage monitoring input with wake-up functionality
- › High-speed operational amplifier for motor current sensing via shunt (CSA)

### › Measurement unit

- 8-bit ADC module with 9 multiplexed inputs
- 10-bit ADC module with 7 multiplexed inputs, 5 external analog inputs
- Two on-chip temperature and battery voltage measurement units
- › Independent programmable window watchdog
- › 5 V/1.5 V internal supplies
- › External supply ( $V_{DDEXT}$ ): 5 V  $\pm$ 2% at 40 mA
- › Power-saving modes: MCU slow-down mode, sleep mode, stop mode, cyclic wake-up sleep mode
- › Overtemperature protection
- › Math co-processor unit with divider unit for signed and unsigned 32-bit division operations

### TLE986x family features

- › Ones current programmable drivers with charge pump for N-Channel MOSFET
- › Integrated LIN transceiver compatible with LIN 2.2 and compliant to SAE J2602
- › Two full-duplex serial interfaces (UART) with LIN support
- › Two Synchronous Serial Channel (SSC) interfaces
- › On-chip OSC and PLL for clock generation with loss-of-lock detection
- › One high-voltage monitoring input with wake-up functionality
- › High-speed operational amplifier for motor current sensing via shunt
- › Measurement unit
  - 8-bit ADC module with 10 multiplexed inputs
  - 10-bit ADC module with 8 multiplexed inputs, 5 external analog inputs
  - On chip temperature and battery voltage measurement unit
- › Independent programmable window watchdog
- › 5 V/1.5 V internal supplies

\*) ARM and Cortex are trademarks of ARM Limited, UK

- > External supply ( $V_{DDEXT}$ ): 5 V  $\pm$ 2% at 20 mA
- > Power-saving modes: MCU slow-down mode, sleep mode, stop mode, cyclic wake-up sleep mode
- > Overtemperature protection

### Features of the microcontroller

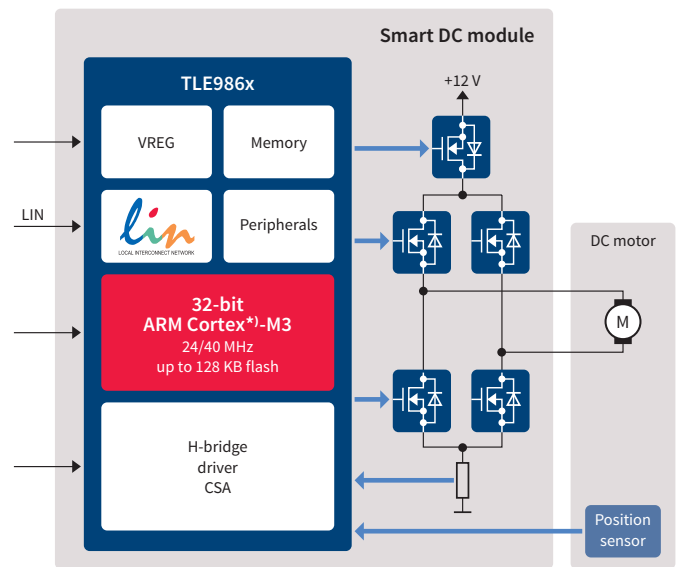
- > 32-bit ARM Cortex<sup>®</sup>-M0/M3 core with 24/40 MHz clock frequency
- > 36 KB to 128 KB flash memory, up to 6 KB RAM
- > Seven/eight 16-bit timers
- > Capture/compare unit for PWM signal generation (CCU6) with 2x 16-bits timers

### General characteristics

- > Operating supply voltage  $V_S$  = 5.5 to 28 V, maximum rating 40 V
- > Extended operating range  $V_S$  = 3.0 to 28 V, MCU/flash fully functional
- > ESD performance
  - up to 2 kV / handling on all pins
  - 4 kV at HV inputs
  - 6 kV at LIN pin
- > Overvoltage device clamp (load dump ruggedness) up to 40 V
- > Wide operating temperature range:  $T_j$ : -40°C up to 150°C/175°C

An Embedded Power IC based on ARM Cortex<sup>®</sup>-M core is Infineon's solution for addressing a wide-range of smart 2-phase DC motor control applications like sunroof, front/rear wiper, sliding door or trunk/tail gate. It integrates on a single die all the necessary functions to sense, actuate and control a motor for improved module reliability while being space-saving and energy-efficient.

Block diagram TLE986x



## Product overview

Product name	ARM Cortex <sup>®</sup>	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM emulation [KB]	OP-AMP	Low-side MOSFET drivers	High-side MOSFET drivers	Package <sup>1)</sup>
32-bit $\mu$ C with H-bridge MOSFET gate driver for DC motors										
TLE9853QX	M0	40	PWM + LIN	4	48	4	Yes	2	2	VQFN-48
TLE9854QX	M0	40	PWM + LIN	4	64	4	Yes	2	2	VQFN-48
TLE9855QX	M0	40	PWM + LIN	4	96	4	Yes	2	2	VQFN-48
TLE9861QXA20	M3	24	PWM	3	36	4	Yes	2	2	VQFN-48
TLE9867QXA20	M3	24	PWM + LIN	6	64	4	Yes	2	2	VQFN-48
TLE9867QXA40	M3	40	PWM + LIN	6	64	4	Yes	2	2	VQFN-48
TLE9869QXA20	M3	24	PWM + LIN	6	128	4	Yes	2	2	VQFN-48
32-bit $\mu$ C with H-bridge MOSFET gate driver for DC motors (grade-0, $T_j$ = 175°C)										
TLE9854QXW	M0	40	PWM + LIN	4	64	4	Yes	2	2	VQFN-48
TLE9867QXW20	M3	24	PWM + LIN	6	64	4	Yes	2	2	VQFN-48

1) See packages on page 142 to 144

<sup>\*</sup>) ARM and Cortex are trademarks of ARM Limited, UK



# 32-bit Embedded Power ICs based on ARM Cortex<sup>\*)</sup>-M

## 3-phase bridge driver IC with integrated ARM Cortex<sup>\*)</sup>-M3 core

BLDC motors are most suitable for continuous-mission applications requiring steady operation and variable speeds. Consequently, reliability, durability and accurate motion control have become critical for the functioning of body applications. As reliability and durability increase, the need for maintenance is reduced for BLDC motors. BLDC motor control applications enable high RPM with high dynamic and agility.

### Applications

- › HVAC blower
- › Engine cooling fan
- › Auxiliary pumps (e.g., water, oil and fuel pumps)

### TLE987x family features

- › Six current programmable drivers with charge pump for N-Channel MOSFET
- › Integrated LIN transceiver compatible with LIN 2.2 and compliant with SAE J2602
- › Two full duplex serial interfaces (UART) with LIN support
- › Two Synchronous Serial Channel (SSC) interfaces
- › On-chip OSC and PLL for clock generation
- › One high-voltage monitoring input with wake-up functionality
- › High-speed operational amplifier for motor current sensing via shunt
- › Measurement unit
  - 8-bit ADC module with 10 multiplexed inputs
  - 10-bit ADC module with 8 multiplexed inputs, 5 external analog inputs
  - On chip temperature and battery voltage measurement unit
- › Independent programmable window watchdog
- › 5 V/1.5 V internal supplies
- › External supply ( $V_{DDEXT}$ ): 5 V  $\pm$ 2% at 20 mA
- › Power-saving modes
  - MCU slow-down mode
  - Sleep mode
  - Stop mode
  - Cyclic wake-up sleep mode
- › Overtemperature protection
- › Loss of lock detection with fail-safe mode for power switches

Our 3-phase bridge driver with Integrated ARM Cortex<sup>\*)</sup>-M3 product family is perfectly in line with these requirements. We offer single-chip system ICs that improve module reliability, and platform solutions for a variety of applications with optimized size and weight. Additionally, our solutions provide high reliability and increased lifetime. With their simplified EMC design and a standard microcontroller core, the ARM Cortex<sup>\*)</sup>-M3, you will easily find the best fit.

### Benefits

- › Complete system-on-chip for BLDC motor control
- › Minimum number of external components reduces BOM cost
- › Platform solution for a wide range of motor control algorithms
- › Supports sensor-less, field-oriented control motor control algorithm
- › Simplifies EMC design based on slope-programmable MOSFET driver
- › Intelligent power saving modes, including stop-and-sleep mode, supports energy management (on demand)
- › VQFN package with 7 x 7 mm footprint enables PCB space-saving
- › Reduced motor size and weight
- › Single-die solution improves module reliability

### Features of the microcontroller

- › 32-bit ARM Cortex<sup>\*)</sup>-M3 Core, up to 40 MHz clock frequency
- › 36 KB to 128 KB flash memory, up to 6 KB RAM
- › Harvard architecture
- › Eight 16-bit timers
- › Capture/compare unit for PWM signal generation (CCU6) with 2x 16-bits timers

### General characteristics

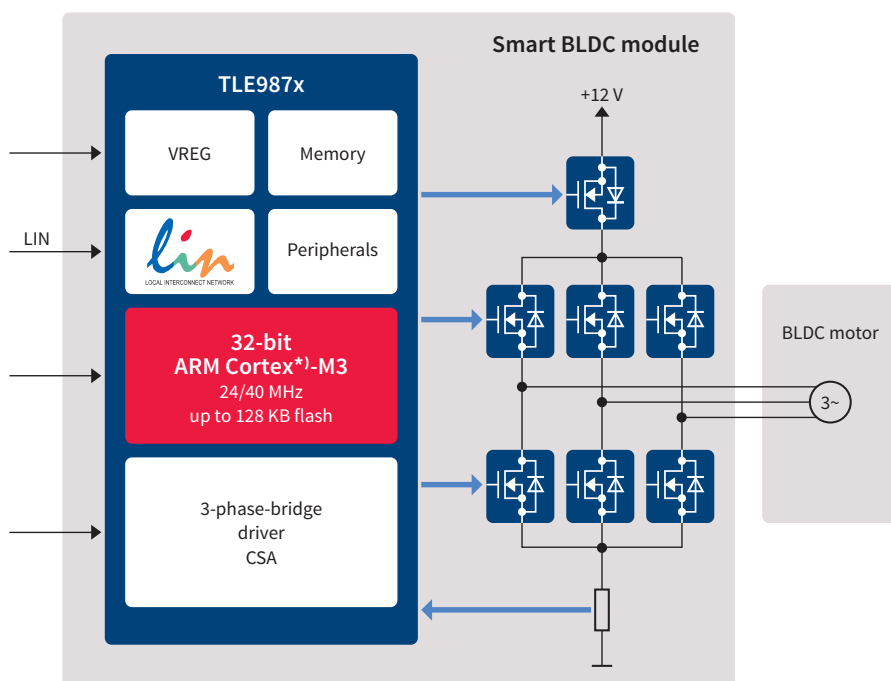
- › Operating supply voltage  $V_S = 5.5$  to 28 V, max. rating 40 V
- › Extended operating range  $V_S = 3.0$  to 28 V, MCU/flash fully functional
- › ESD performance
  - up to 2 kV / handling on all pins
  - 4 kV at HV inputs
  - 6 kV at LIN pin
- › Overvoltage device clamp (load dump ruggedness) up to 40 V
- › Wide operating temperature range:  
 $T_j$ : -40°C up to 150°C/175°C

\*) ARM and Cortex are trademarks of ARM Limited, UK

Thanks to its experience in motor control drivers for automotive applications, Infineon has developed an Embedded Power IC with an integrated ARM Cortex<sup>®</sup>-M3 microcontroller core. As a complete system-on-chip for BLDC motors, this solution addresses a wide range of smart 3-phase brushless

DC motor control applications, such as engine cooling fans, fuel pumps, HVAC blowers, and auxiliary pumps for things like water, fuel and oil. Space saving, energy-efficient and scalable – these are the essential features of Embedded Power ICs.

### Block diagram TLE987x



Product overview										
Product name	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM emulation [KB]	OP-AMP	Low-side MOSFET drivers	High-side MOSFET drivers	Sigma-delta ADC	Package <sup>1)</sup>
TLE987x 32-bit $\mu$ C with 3-phase MOSFET gate driver for BLDC motors										
TLE9871QXA20	24	PWM	3	36	4	Yes	3	3	No	VQFN-48
TLE9877QXA20	24	PWM + LIN	6	64	4	Yes	3	3	No	VQFN-48
TLE9877QXA40	40	PWM + LIN	6	64	4	Yes	3	3	No	VQFN-48
TLE9879QXA20	24	PWM + LIN	6	128	4	Yes	3	3	No	VQFN-48
TLE9879QXA40	40	PWM + LIN	6	128	4	Yes	3	3	No	VQFN-48
TLE9879-2QXA40	40	PWM + LIN	6	128	4	Yes	3	3	Yes	VQFN-48
TLE987x 32-bit $\mu$ C with 3-phase N FET gate driver for DC motors, (grade-0, $T_j = 175^\circ\text{C}$ )										
TLE9873QXW40	40	PWM + LIN	3	48	4	Yes	3	3	No	VQFN-48
TLE9877QXW40	40	PWM + LIN	6	64	4	Yes	3	3	No	VQFN-48
TLE9879QXW40	40	PWM + LIN	6	128	4	Yes	3	3	No	VQFN-48

1) See packages on page 142 to 144

<sup>\*</sup>) ARM and Cortex are trademarks of ARM Limited, UK  
[www.infineon.com/embeddedpower](http://www.infineon.com/embeddedpower)

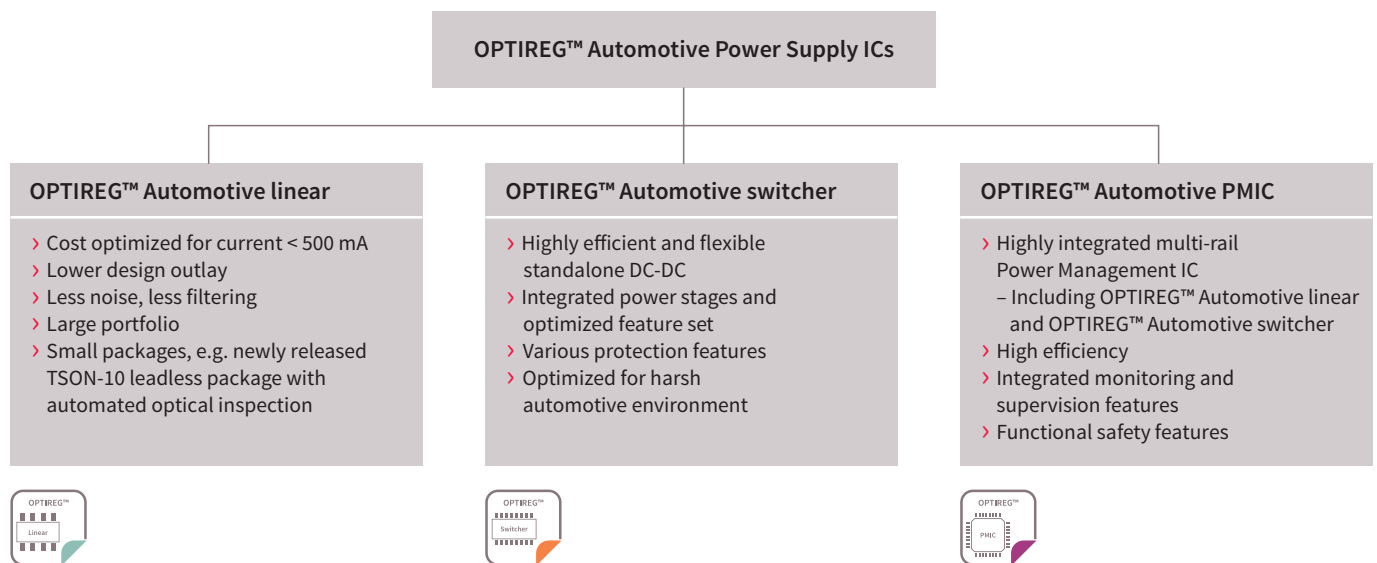


# OPTIREG™ Automotive Power Supply ICs

OPTIREG™ Automotive linear, OPTIREG™ Automotive switcher, OPTIREG™ Automotive PMIC

In automotive ECUs, microcontrollers and other electronic system components have to be supplied by a stable and reliable voltage that is lower than the battery voltage (e.g. 3.3 V or 5 V) and works over the entire temperature range (from -40°C to 150°C).


Depending on the application – i.e. the output current and the requested system efficiency – linear voltage regulators or DC-DC converters are ideal for use in the automotive world.








# OPTIREG™ Automotive linear


## Linear voltage regulator families


- 

Standard solution of linear voltage regulators, suitable for almost all automotive applications due to a wide-range legacy portfolio
- 

Best-in-class linear voltage regulators with regards to energy savings and stop-and-start systems (e.g., for cold cranking conditions)
- 


Supply ICs for sensor applications; robust and accurate voltage distribution with integrated protection features
- 


Linear voltage regulators not directly connected to the battery line (e.g., used after a pre. DC-DC converter)
- 


Linear voltage regulators for application-specific solutions (e.g., active antenna)
- 


Linear voltage regulators for 24 V battery applications


## Main features

- 

Enable function for main output. Low current consumption in stand-by.
- 

Power-on reset sensing output voltage
- 

Standard and window watchdog
- 

Early warning comparator for sensing input undervoltage
- 

“Power Good” indicates the undervoltage and/or overvoltage error condition at the output

# OPTIREG™ Automotive linear general purpose



Selection table for 12 V battery applications

Output current	15 mA	30 mA	100 mA	150 mA	180/200 mA	300 mA ultra low power	400/450 mA	> 500 mA
No feature	TLE4285 (5 V)	TLE4294 (5 V)	TLE42644 (5 V) TLE42344 (5 V)			TLE7274-2 (5 V)	TLE42744 (5 V, 3.3 V)	TLE4284 (adj., 1.5 V, 1.8 V, 2.6 V, 3.3 V, 5 V)
EN		TLE4296-2 (5 V, 3.3 V)	TLS710B TLE42364 TLE42664 (5 V)	TLS715B (5 V)		TLE7276-2 (5 V)	TLE42764 (adj., 5 V)	
RES	TLE4286 (5 V)	TLE4295 (5 V, 3.3 V)	TLF4949 (5 V)	TLE42694 (5 V)		TLE7270-2 (5 V)	TLE42754 (5 V, 3.3 V) TLE4675 (5 V)	
EN, RES				TLE42994E (5 V, 3.3 V)	TLE4699 (5 V)	TLE7272-2 (5 V)		
RES, WD					TLE4678(-2) (5 V)			
EN, RES, WD					TLE4263-2 (5 V) TLE7278-2 (5 V) TLE7273-2 (window WD) (2.6 V, 3.3 V, 5 V)		TLE4291 (5 V)	

Selection table for 24 V battery applications

Output current	70 mA	400/450 mA	> 500 mA
EN	TLT807B0 (adj.)		
EN, RES		TLE4267-2 (5 V)	
EN, RES, WD			TLE4271-2 (5 V)

## Key features

- > Standard features
  - Wide operation range up to 45 V
  - Low dropout voltage
  - Wide temperature range: -40°C ... +150°C
- > Standard protection
  - Short-circuit protection
  - Reverse polarity protection as option
  - Overload protection
  - Overtemperature protection

## Key benefits

- > Broad portfolio: devices available for all types of applications
- > Best-in-class quality
- > Full 150°C automotive qualification
- > Long-term availability

Selection table for 12 V battery applications

Product name	I <sub>Q</sub> [mA]	I <sub>q</sub> [μA]	V <sub>S</sub> range [V]	V <sub>Q</sub> [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [μF]	Reset	Adjustable reset threshold	Enable	Watchdog	Early warning	Package <sup>1)</sup>
TLE4285	15	100	6.00–45.00	5.00	0.80	4	1.00	● <sup>2)3)</sup>					SCT595-5
TLE4286	15	60	6.00–45.00	5.00	0.80	4	1.00			●			SCT595-5
TLE4294	30	120	5.50–45.00	5.00	0.25	4	2.20						SCT595-5
TLE4295	30	120	3.50–45.00	3.30; 5.00	0.25	4	2.20	● <sup>2)3)</sup>					SCT595-5
TLE4296-2	30	130	4.00–45.00	3.30; 5.00	0.25	4	3.30			●			SCT595-5
TLS710	100	36	4.00–45.00	5.00	0.20	2	1.00			●			DSO-8 EP
TLF4949	100	180	3.50–45.00	5.00	0.30	2	4.70	● <sup>3)</sup>				●	DSO-8, DSO-8 EP
TLE42344	120	300	5.50–45.00	5.00	0.25	2	10.00						SOT223
TLE42364	120	300	5.50–45.00	5.00	0.25	2	10.00			●			SOT223
TLS715	150	36	4.00–45.00	5.00	0.20	2	1.00			●			DSO-8 EP
TLE42644	150	40	5.50–45.00	5.00	0.22	2	10.00						SOT223
TLE42664	150	40	5.50–45.00	5.00	0.25	2	10.00			●			SOT223
TLE42694	150	210	5.50–45.00	5.00	0.25	2	10.00	●	●			●	DSO-8, DSO-14, SSOP-14 EP
TLE42694-2	150	210	5.50–45.00	5.00	0.25	2	4.70	●	●				SSOP-14 EP
TLE42794	150	150	5.50–45.00	5.00	0.25	2	10.00	●	●			●	DSO-8, DSO-14, SSOP-14 EP
TLE42994	150	65	4.40–45.00	3.30; 5.00	0.25	2	22.00	●	●	●		●	DSO-8, DSO-14, SSOP-14 EP
TLE4268	180	300	5.50–45.00	5.00	0.25	2	22.00	●	●		●		DSO-8, DSO-20
TLE7273-2	180	28	4.20–45.00	2.60; 3.30; 5.00	0.25	2	0.50	●		●	● <sup>4)</sup>		DSO-14, SSOP-14 EP
TLE7278-2	180	28	4.20–45.00	5.00	0.25	2	0.50	●		●	●		DSO-14, SSOP-14 EP
TLE7279-2	180	28	4.20–45.00	2.60; 3.30; 5.00	0.25	2	0.50	●		●		●	DSO-14, SSOP-14 EP
TLE4263/-2	200	900	5.50–45.00	5.00	0.35	2	22.00	●	●	●	●		DSO-8 EP, DSO-20
TLE4278	200	180	5.50–45.00	5.00	0.25	2	10.00	●	●		●		DSO-14
TLE4678/-2	200	60	3.30–45.00	5.00	0.25	2	10.00	●	●		●		DSO-14, SSOP-14
TLE4699	200	70	3.30–45.00	5.00	0.16	2	10.00	●	●	●		●	DSO-14, SSOP-14
TLE7270-2	300	20	5.50–45.00	5.00	0.20	2	0.50	●					SSOP-14 EP, TO252-5 (DPAK 5-leg), TO263-5 (D <sup>2</sup> PAK 5-leg)
TLE7272-2	300	20	5.50–45.00	5.00	0.25	2	0.50	●		●			SSOP-14 EP, TO252-5 (DPAK 5-leg)
TLE7274-2	300	20	5.50–45.00	5.00	0.25	2	0.50						SSOP-14 EP, TO252-3 (DPAK), TO263-3 (D <sup>2</sup> PAK)
TLE7276-2	300	20	5.50–45.00	5.00	0.25	2	0.50			●			SSOP-14 EP, TO252-5 (DPAK 5-leg)
TLE4267-2	400	1300	5.50–40.00 (60.00)	5.00	0.30	2	22.00	●		●			TO263-7 (D <sup>2</sup> PAK 7-leg)
TLE42744	400	100	3.30–45.00	3.30; 5.00	0.25	2	22.00						SOT223, SSOP-14 EP, TO252-3 (DPAK), TO263-3 (D <sup>2</sup> PAK)
TLE42754	400	150	5.50–45.00	3.30; 5.00	0.25	2	22.00	●					SSOP-14 EP, TO252-5 (DPAK 5-leg), TO263-5 (D <sup>2</sup> PAK 5-leg)
TLE42764	400	100	4.50–45.00	Adj.; 5.00	0.25	2	22.00			●			SSOP-14 EP, TO252-5 (DPAK 5-leg), TO263-5 (D <sup>2</sup> PAK 5-leg)
TLE4675	400	65	3.30–45.00	5.00	0.25	2	22.00	●					TO252-5 (DPAK 5-leg), TO263-5 (D <sup>2</sup> PAK 5-leg)
TLE4291	450	220	3.30–45.00	5.00	0.25	2	22.00	●	●	●	●		SSOP-14 EP
TLE4284	1000	1000	2.90–40.00	Adj.; 1.50; 1.80; 2.60; 3.30; 5.00	1.00	3	10.00						TO252-3 (DPAK)

1) See packages on page 142 to 144

2) Power good

3) Power fail

4) Window watchdog



# OPTIREG™ Automotive linear general purpose



Selection table for 24 V battery applications

Product name	I <sub>Q1</sub> [mA]	I <sub>Q2/3</sub> [mA]	I <sub>q</sub> [μA]	V <sub>S</sub> range [V]	V <sub>Q</sub> [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [μF]	Overvoltage protection	Reset	Adjustable reset threshold	Enable	Watchdog	Early warning	Package <sup>1)</sup>
TLT807B0	70		36	4.70–42.00 (58.00)	Adj.	0.25	2	1	•			•			TSDSO-14 EP
TLE4267-2	400		1300	5.50–40.00 (60.00)	5.00	0.30	2	22	•	•		•			TO263-7 (D <sup>2</sup> PAK 7-leg)
TLE4476	430	350	300 mA	5.70–42.00 (60.00)	5.00 & 3.30	0.30	4	10/10	•						TO252-5 (DPAK 5-leg)
TLE4471	450	50 100	1100 mA	5.50–40.00 (60.00)	3x 5.00	0.25	2	22/10/10	•	•	•		•		DSO-20 (Power-SO)
TLE4271-2	550		800	6.00–42.00 (60.00)	5.00	0.35	2	22	•	•		•	•		TO263-7 (D <sup>2</sup> PAK 7-leg) TO220-7
TLE4470	350	180	180	5.60–45.00 (60.00)	5.00 & Adj.	0.30	2	6/10	•	•	•			•	DSO-20 (Power-SO)

Power supply multiple output regulators

Product name	I <sub>Q1</sub> [mA]	I <sub>Q2/3</sub> [mA]	I <sub>q</sub> [mA]	V <sub>S</sub> range [V]	V <sub>Q1</sub> [V]	V <sub>Q2/3</sub> [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [μF]	Overvoltage protection	Reset	Adjustable reset threshold	Watchdog	Early warning	Package <sup>1)</sup>
TLE7469G	215	200	55	4.20–45.00	5.00	2.60 or 3.30	0.30	3	1/1	•	•		•	•	DSO-12
TLE4473/-2	300	180	200	5.60–45.00	5.00	3.30 or 5.00	0.30	2	10/22		•		•		DSO-12
TLE4470	350	180	180	5.60–45.00 (60.00)	5.00	Adj.	0.30	2	6/10		•	•		•	DSO-14, DSO-20
TLE4476	350	430	300	5.70–42.00 (60.00)	5.00	3.30	0.30	4	10/10	•					TO252-5 (DPAK 5-leg)
TLE4471	450	50 100	1100	5.50–40.00 (60.00)	5.00	2x 5.00	0.25	2	22/10/10	•	•		•		DSO-20 (Power-SO)

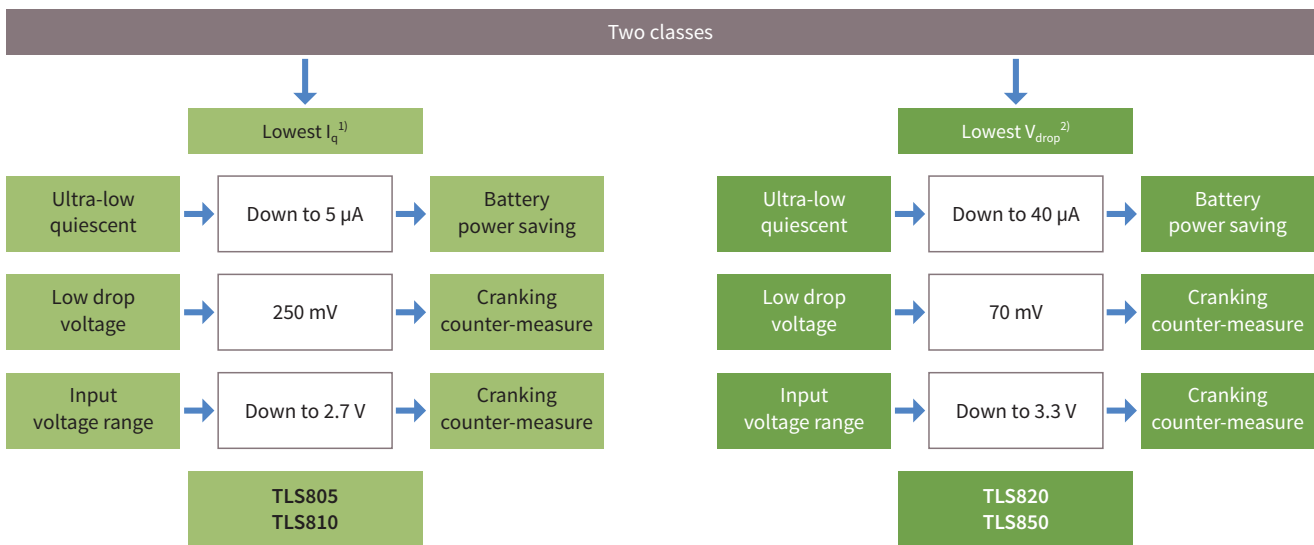
1) See packages on page 142 to 144

# OPTIREG™ Automotive linear high-performance



Selection table

Output current	50 mA	100 mA	200 mA	350 mA	400 mA	500 mA
No feature		TLS810A1 (5 V, 3.3 V)			TLF80511 (5 V, 3.3 V)	
EN	TLS805B1 (5 V, 3.3 V, adj.)	TLS810B1 (5 V, 3.3 V)	TLS820B2 (5 V, 3.3 V)	TLS835B2 (5 V, 3.3 V, adj.)		TLS850B0 (5 V, 3.3 V)
RES		TLS810C1 (3.3 V)				
EN, RES	TLS805D1 (5 V)	TLS810D1 (5 V, 3.3 V)	TLS820D0 (5 V, 3.3 V)	TLS835D2 (5 V, 3.3 V)		TLS850D0 (5 V, 3.3 V)
EN, RES, WD			TLS820F0 (5 V, 3.3 V) TLS820F1 (5 V)			TLS850F0 (5 V, 3.3 V) TLD850F1 (5 V)
Lowest $I_q$ <sup>1)</sup>	Lowest $V_{drop}$ <sup>2)</sup>					

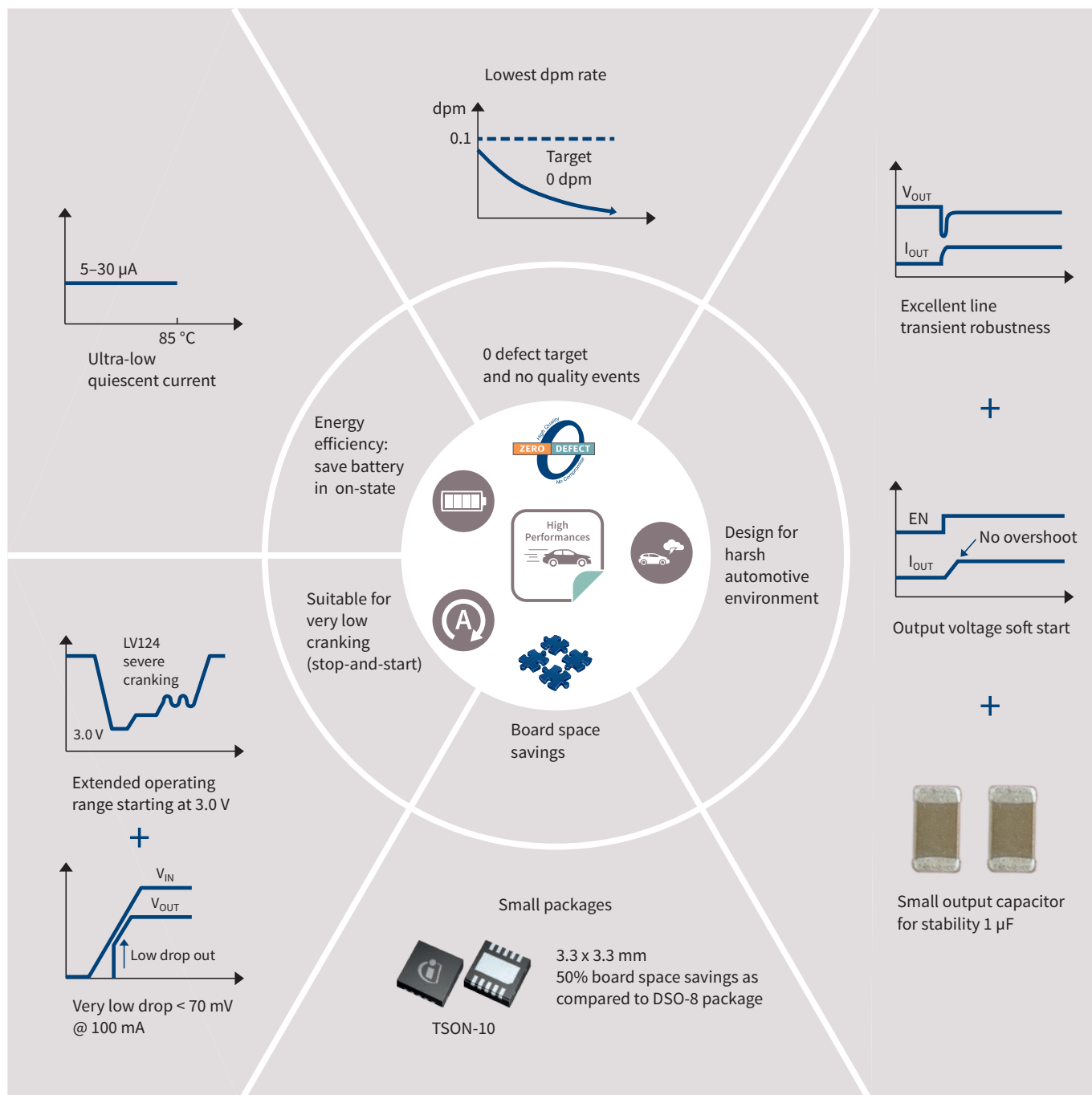


1)  $I_q$  describes the current consumption of the device  
 2)  $V_{drop}$  describes the dropout voltage across the power stage in the device

# OPTIREG™ Automotive linear high-performance

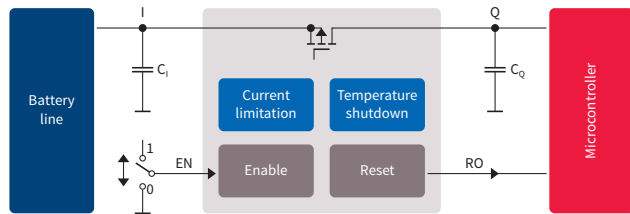


## Key features and benefits



## Application diagrams

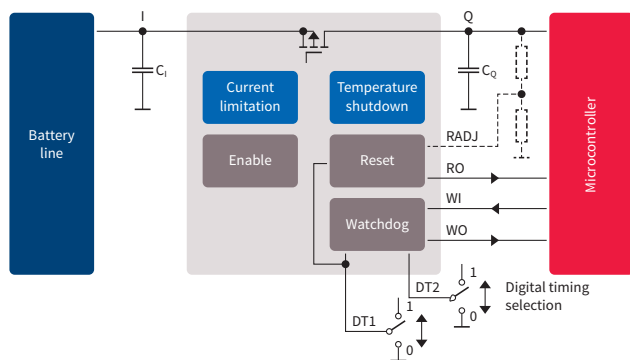
### Energy efficient family



### Applications

- > Applications with direct battery connection
  - RKE, immobilizer, gateway
  - Infotainment, alarm, dashboard
- > General automotive ECUs

### Robust family



### Applications

- > BCM, RKE, trunk, dashboard, HVAC
- > Brake, EPS, TPMS, BMS
- > Transmission
- > General automotive ECUs

## The OPTIREG™ Automotive linear high-performance by output current

Product name	$I_Q$ [mA]	$I_q$ [μA]	$V_S$ range [V]	$V_Q$ [V]	Drop voltage [mV]	Accuracy [%]	$C_Q$ [μF]	Reset	Enable (= Inhibit)	Watchdog	Package <sup>1)</sup>
TLS805B1	50	5.00	2.75–42.00	Adj., 3.3, 5.0	100	2.00	1		•		TSOP-10 DSO-8
TLS805D1	50	9.50	2.75–42.00	5.0	100	2.00	1	•	•		TSOP-10
TLS810A1	100	5.00	2.75–42.00	3.3, 5.0	250	2.00	1				TSOP-10
TLS810B1	100	5.50	2.75–42.00	3.3, 5.0	250	2.00	1		•		TSOP-10 DSO-8 EP
TLS810C1	100	9.00	2.75–42.00	3.3	250	2.00	1	•			DSO-8 EP
TLS810D1	100	9.50	2.75–42.00	3.3, 5.0	250	2.00	1	•	•		TSOP-10 DSO-8 EP
TLS820D0	200	40.00	3.00–40.00	3.3, 5.0	70	2.00	1	•	•		SSOP-14
TLS820F0	200	40.00	3.00–40.00	3.3, 5.0	70	2.00	1	•	•	•	SSOP-14
TLS820F1	200	40.00	3.00–40.00	5.0	70	2.00	1	•	•	•	SSOP-14
NEW TLS820B2	200	17.00	3.00–40.00	3.3, 5.0	100	2.00	1		•		SSOP-14
NEW TLS835B2	350	17.00	3.00–40.00	Adj., 3.3, 5.0	120	2.00	1		•		SSOP-14
NEW TLS835D2	350	20.00	3.00–40.00	3.3, 5.0	120	2.00	1	•	•		SSOP-14
TLS730	400	5.50	2.50–40.00	Adj.	200	2.00	1		•		TSDSO-14
TLF80511	400	38.00	3.30–40.00	3.3, 5.0	100	2.00	1				DSO-8 EP TO263-3 (D <sup>2</sup> PAK)
NEW TLS850B0	500	23.00	3.00–40.00	3.3, 5.0	100	2.00	1		•		TO263-5 (D <sup>2</sup> PAK 5-leg) TO252-5 (DPAK 5-leg)
TLS850D0	500	40.00	3.00–40.00	3.3, 5.0	70	2.00	1	•	•		TO263-7 (D <sup>2</sup> PAK 7-leg) TO252-5 (DPAK 5-leg)
TLS850F0	500	40.00	3.00–40.00	3.3, 5.0	70	2.00	1	•	•	•	TO263-7 (D <sup>2</sup> PAK 7-leg)
TLS850F1	500	40.00	3.00–40.00	5.0	70	2.00	1	•	•	•	TO263-7-1 (D <sup>2</sup> PAK 7-leg)

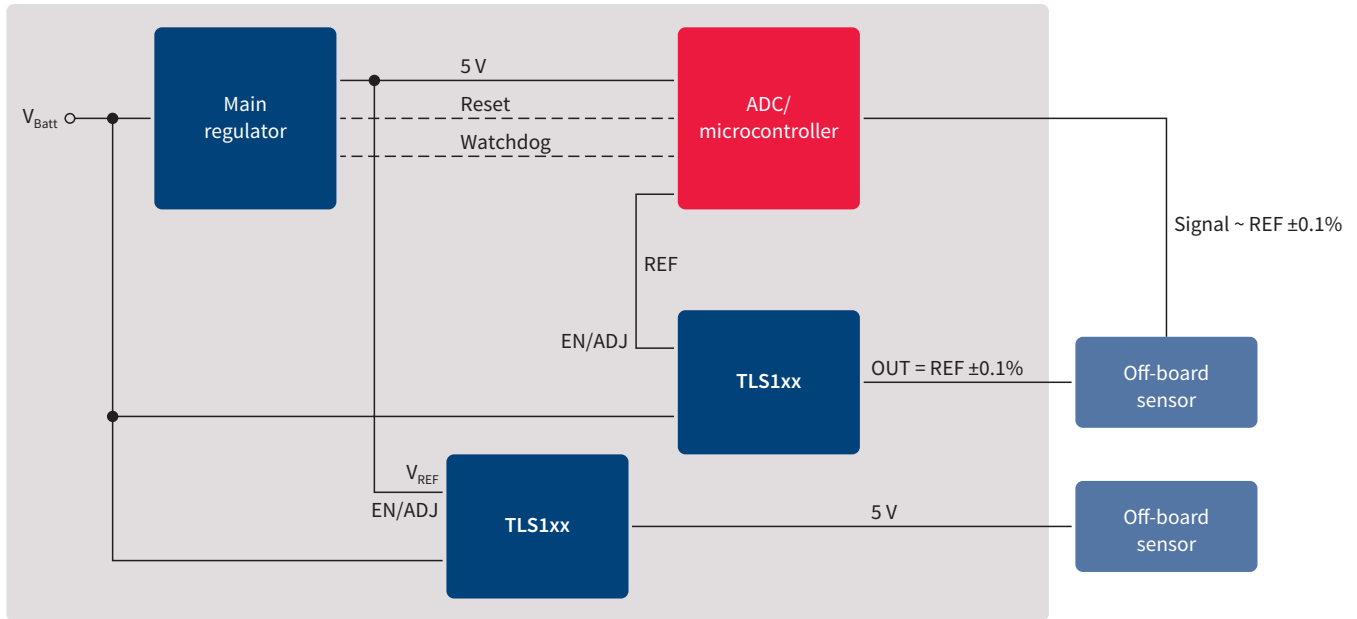
1) See packages on page 142 to 144

# OPTIREG™ Automotive linear trackers



Voltage trackers are specially designed to supply off-board sensors. They provide harsh-environment protection for the ECU and the sensor incorporating overvoltage, overtemperature, reverse polarity and reverse current protection. Additional output voltage monitoring diagnostics have been implemented in selected devices.

## Application diagram



### System benefits using voltage tracker ICs

- > Reliable protection for ECU/sensor
  - Cable short to GND and BAT protected
  - Accurate current limitation
  - Battery reverse polarity
- > High tracking accuracy
- > Ease of use
- > High flexibility/scalability

### Key features

- >  $V_{IN}$ : -16–45 V at 50 mA max current
- > Adjustable output voltage down to 2 V
- > High tracking accuracy: 0.1 percent
- > Small ceramic output capacitor ( $\geq 1 \mu F$ )
- > Reverse voltage and overcurrent protection
- > Soft start
- > Temp. range:  $-40^{\circ}C \leq T_j \leq 150^{\circ}C$

### Key benefits

- > Improved system robustness
  - Various protection means
  - Overvoltage/undervoltage monitor
- > Reduced system cost
  - Low implementation effort
  - Supports low-cost external components

## OPTIREG™ Automotive linear trackers by output current

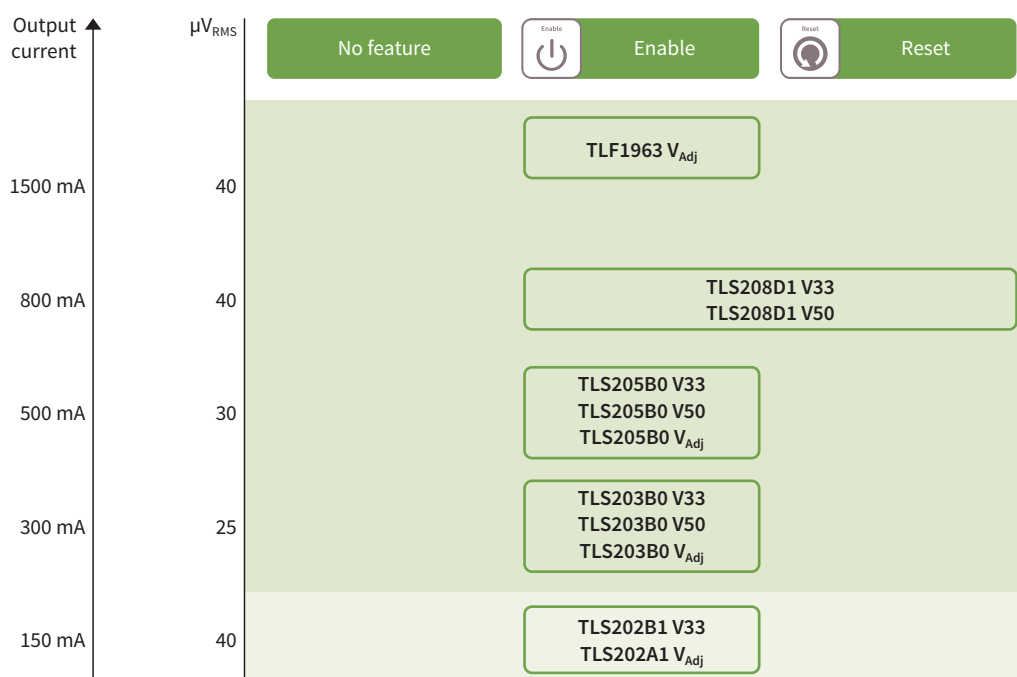
NEW  
NEW

Product name	$I_Q$ [mA]	Adjust voltage (min) [V]	Accuracy [%]	Independent EN pin	Power good	Package <sup>1)</sup>
TLS102B0	20	2.0	±0.1			SCT595-5
TLS105B0	50	2.0	±0.1			SCT595-5
TLE4250-2	50	2.5	±0.5			SCT595-5
TLE4254	70	2.0	±0.1		•	DSO-8 DSO-8-EP
TLS115B0	150	2.0	±0.1	•		DSO-8 EP TSON-10
TLS115D0	150	2.0	±0.1	•	•	DSO-8 EP TSON-10
TLE4252	250	1.5	±0.2	•		TO252
TLE4253	250	2.0	±0.2			DSO-8 DSO-8-EP
TLE4251	400	2.5	±0.2	•		TO252-5 (DPAK 5-leg) TO263-5 (D <sup>2</sup> PAK 5-leg)

1) See packages on page 142 to 144

OPTIREG™ Automotive linear  
post regulators

## Selection table





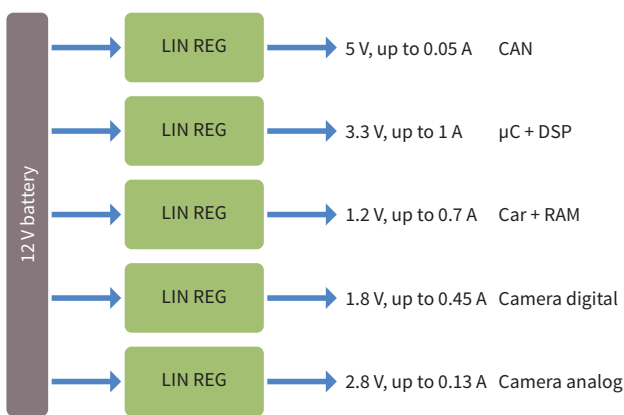
# OPTIREG™ Automotive linear post regulators



## Applications

- > ADAS: radars and cameras
- > ADAS: MMIC (low noise)
- > Infotainment, displays, cluster
- > CPU supplies (FPGA, DSP), memory
- > Post regulation after DC-DC converter
- > EMS

## Linear solution



Low system efficiency  
High power losses

## Post regulation DC-DC and linear



High efficiency-to-cost ratio

## Maximum efficiency and optimal flexibility

System benefits	TLF51801 controller	Linear post regulator
<ul style="list-style-type: none"> <li>&gt; Higher efficiency</li> <li>&gt; Higher flexibility</li> <li>&gt; Lower system cost</li> <li>&gt; Higher reliability</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Adjustable voltage</li> <li>&gt; Max. current up to 10 A</li> <li>&gt; Current limitation</li> <li>&gt; Advanced feature set</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Higher <math>V_{IN}</math> range than CMOS (<math>V_{IN} = 20\text{ V max}</math>)</li> <li>&gt; Adjustable voltage</li> <li>&gt; Max. current up to 1.5 A</li> <li>&gt; Low noise</li> </ul>
Automotive-qualified $T_j$ up to 150°C		

## OPTIREG™ Automotive linear post regulators by output current

Product name	$I_Q$ [mA]	$I_q$ [μA]	$V_S$ range [V]	$V_Q$ [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [μF]	Reset	Adjustable reset threshold	Enable	Package <sup>1)</sup>
NEW TLS202B1	150	50	2.70–20.00	3.3, 5.0	0.50	3	1.00			•	SCT595-5
TLS202A1	150	50	2.70–20.00	Adj.	0.50	3	1.00				SCT595-5
TLS203B0	300	30	2.30–20.00	Adj., 3.3, 5.0	0.30	3	3.30			•	DSO-8 EP, TSON-10
TLS205B0	500	30	2.30–20.00	Adj. 3.3, 5.0	0.30	3	3.30			•	DSO-8 EP, TSON-10
TLS208D1	800	90	–	Adj., 3.3	–	2	–	•	•		DSO-8 EP, TSON-10
TLF1963	1500	1100	2.50–20.00	Adj.	0.34	3	10.00			•	TO263-5 (D <sup>2</sup> PAK 5-leg) TO252-5 (DPAK 5-leg)

1) See packages on page 142 to 144



# OPTIREG™ Automotive linear application specifics

## TLF4277

### Key applications

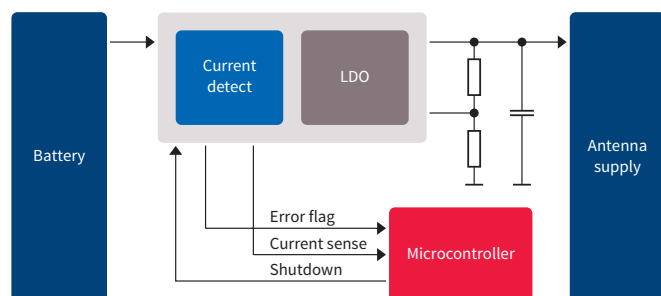
- > Active antennas
- > Battery chargers
- > Microphones

### Key features

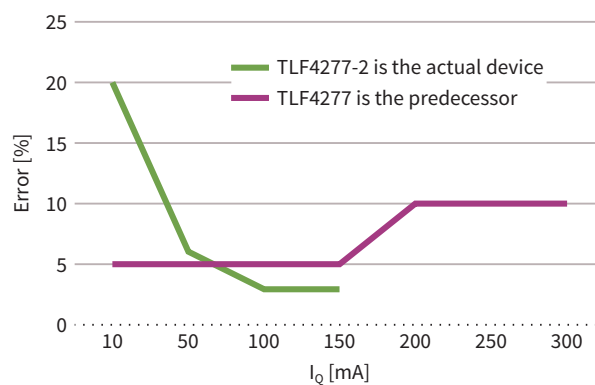
- > Current monitor functionality
- > Adjustable current limitation
- > Adjustable output voltage
- > Short-circuit detection to GND and battery voltage level
- > SSOP-14 EP package
- > TSON-10 package, leadless and capable of automatic optical inspection
- > Overtemperature detection/protection

### Key benefits

- > Diagnosis of antenna system status (linear current detection)
- > Flexible protection of sensitive components
- > Easy adjustment to application requirements
- > Fast identification of short-circuit failures
- > Enhances thermal characteristics



### Current sensing performance



## OPTIREG™ Automotive linear application specifics family

Product name	I <sub>q</sub> [mA]	I <sub>q</sub> [μA]	V <sub>s</sub> range [V]	V <sub>o</sub> [V]	Drop voltage [V]	Accuracy [%]	Output capacitance (min) [μF]	Enable	Package <sup>1)</sup>
TLF4277 <sup>2)</sup>	200	140	5.00–45.00	Adj.	0.25	2	10	●	SSOP-14 EP
TLF4277-2 <sup>2)</sup>	300	150	5.00–45.00	Adj.	0.20	2	1	●	SSOP-14 EP TSON-10

1) See packages on page 142 to 144  
2) LDO with current monitor and status output

# OPTIREG™ Automotive switcher



Infiniteon Technologies offers optimized DC-DC converters that are designed specifically for harsh automotive environments. Wide input voltage range, optimized feature set and extended qualification make our DC-DC converters perfectly suitable for automotive applications.

Our DC-DC portfolio contains various products that operate in step-down (buck), step-up (boost) or combination of those (buck-boost/sepic). High integration, efficiency and flexibility are main focus for our new products intended to help to use them in the harsh automotive environment.

## Key features

- › Wide input voltage range
- › Very low current consumption
- › High efficiency
- › Short-circuit protection
- › Overtemperature protection
- › Automotive-specific features
- › Small and robust packages
- › Long availability and high robustness
- › Wide temperature range
- › Automotive-qualified

## OPTIREG™ Automotive switcher

Product name	Input voltage $V_{S(OP)}$ [V]	Output current [mA]	Quiescent current (EN = ON) [mA]	Output voltage $V_O$ [V]	Synchronous topology	Accuracy [%]	Switching frequency PWM $f_{sw}$ [kHz]	Enable	PFM operation	Reset	Watchdog	Early warning	Package <sup>1)</sup>
<b>Buck converter (integrated MOSFET)</b>													
TLE6365	8.00 ... 40.00	400	1500	5.00		2	100			•			DSO-8
TLE8366	4.75 ... 45.00	1800	7000	Adj., 3.30, 5.00		2(4)	200 ... 530	•					DSO-8 EP
NEW TLE4120D0	3.70 ... 36.00	2000	0.032	Adj., 3.30, 5.00	•	2	380 ... 2800	•	•	•			TSDSO-14 EP
NEW TLE4125D0	3.70 ... 36.00	2500	0.032	Adj., 3.30, 5.00	•	2	380 ... 2800	•	•	•			TSDSO-14 EP
TLF50281	4.75 ... 45.00	500	0.045	5.00		2	800 ... 2200	•	•	•	•		SSOP-14 EP
TLF50251	4.75 ... 45.00	500	0.045	5.00		2	800 ... 2200	•	•	•			SSOP-14 EP
TLF50241	4.75 ... 45.00	500	0.045	5.00		2	800 ... 2200		•	•			SSOP-14 EP
TLF50211	4.75 ... 45.00	500	0.045	5.00		2	800 ... 2200	•	•				SSOP-14 EP
TLF50201	4.75 ... 45.00	500	0.045	5.00		2	800 ... 2200		•				SSOP-14 EP
<b>Buck controller (external MOSFET)</b>													
TLE6389-2GV	5.00 ... 60.00	2300	0.120	Adj.		3	250 ... 530	•	•	•		•	DSO-14
TLE6389-2GV50	5.00 ... 60.00	2300	0.120	5.00		3	250 ... 530	•	•	•		•	DSO-14
TLE6389-3GV50	5.00 ... 60.00	2300	0.120	5.00		3	250 ... 530	•	•	• <sup>2)</sup>		•	DSO-14
TLF51801	4.75 ... 45.00	Adj. max 10,000	< 2.000 $\mu$ A	1.20–Dmax* $V_S$	•	2	100 ... 700	•					SSOP-14 EP
<b>Boost controller</b>													
TLE8386-2 <sup>3)</sup>	4.75 ... 45.00	dep.on $V_O$	7000	Adj. (max 9-times of $V_S$ )		4	100 ... 500	•					SSOP-14 EP

1) See packages on page 142 to 144

2) Different voltage reset hysteresis

3) LS-sense-boost

## Featured product: An integrated TLS4120D0 2 A, synchronous step-down regulator

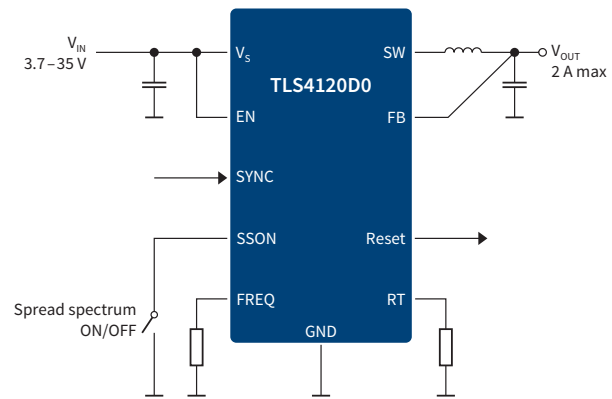
### Key features

- › Wide input voltage:  $V_{IN} = 3.7 - 35 \text{ V}$
- › Synchronous rectification for high efficiency
- › Integrated high- and low-side power MOSFETs
- › Wide switching frequency: 320 kHz ... 2.8 MHz
- › 100% duty cycle suitable for cranking
- › Current mode control with PWM and PFM
- › Internal compensation
- › Spread spectrum and frequency synchronization
- › Overvoltage/undervoltage monitoring
- › Low current consumption in ON mode: 31  $\mu\text{A}$  (EN = ON)
- › High efficiency
- › Ultra-low current consumption in shutdown: 1  $\mu\text{A}$  (EN = OFF)
- › Wide temperature range:  $T_j = -40 \dots +150 \text{ }^\circ\text{C}$
- › Robust automotive package: TSDSO-14

### Key benefits

- › High integration and efficiency
- › Easy to design and small solution size
- › Suitable for cranking applications
- › Over- and undervoltage monitoring

### Application diagram



### Key applications

- › ADAS, camera, dashboard
- › Cluster, display
- › Infotainment and telematics
- › USB supply

## Featured product: TLF51801 synchronous 10 A flexible pre-regulator

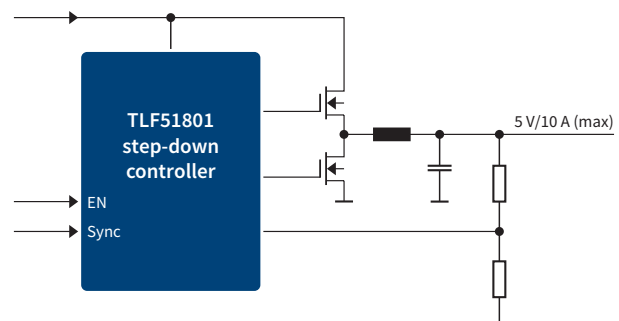
### Key features

- › Driving FETs for loads up to 10 A
- › Adjustable switching frequency can be synchronized to an external clock
- › Very low shut-down current
- › Internal soft-start
- › Protection functions
- › SSOP-14 EP small thermally enhanced package

### Key benefits

- › Flexibility in current limitation to reduce external components
- › Integrated soft-start limits the current peak as well as voltage overshoot at startup

### Application diagram



### Key applications

- › ADAS, camera, radar ECUs
- › Wireless charger, USB port for mobile phone charger
- › Telematic and eCall applications

# OPTIREG™ Automotive PMIC

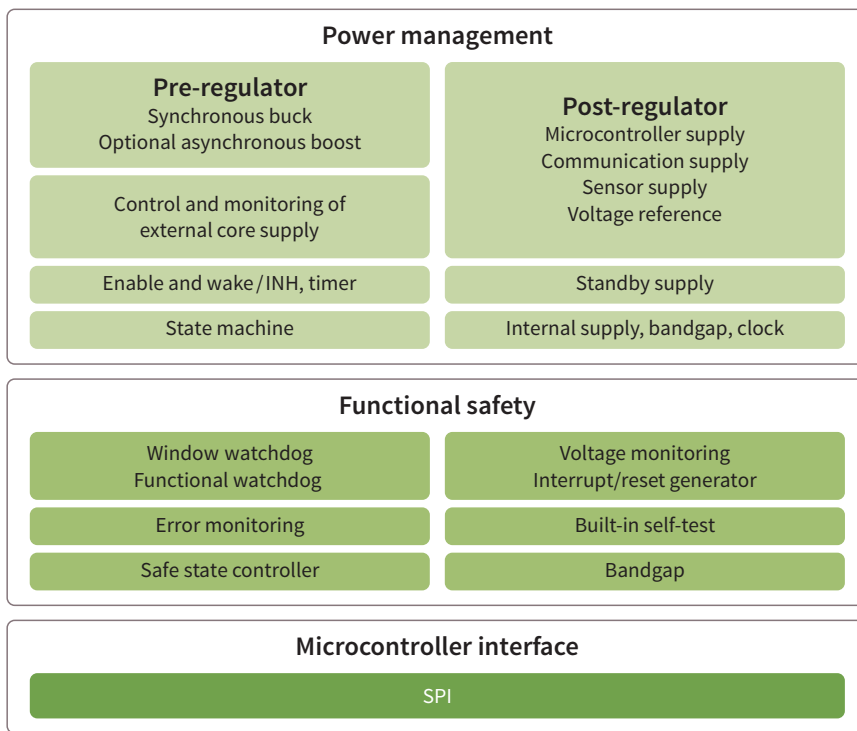


## TLF35584 – PMIC for safety-relevant applications

Infiniteon Technologies offers integrated switching converters with a pre-/post-regulator architecture

(PMIC: Power Management IC) for safety relevant applications in safety, chassis, powertrain and electrical drive train.

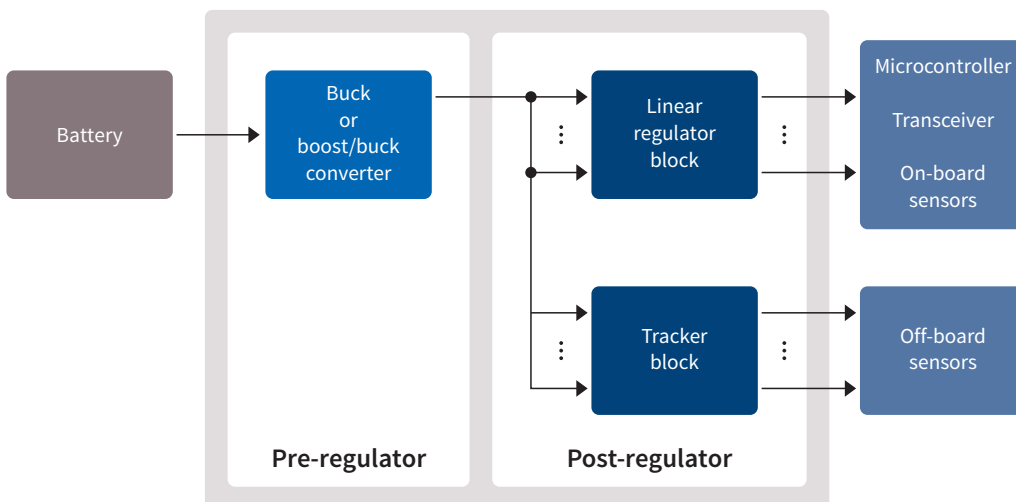
### Functional block diagram



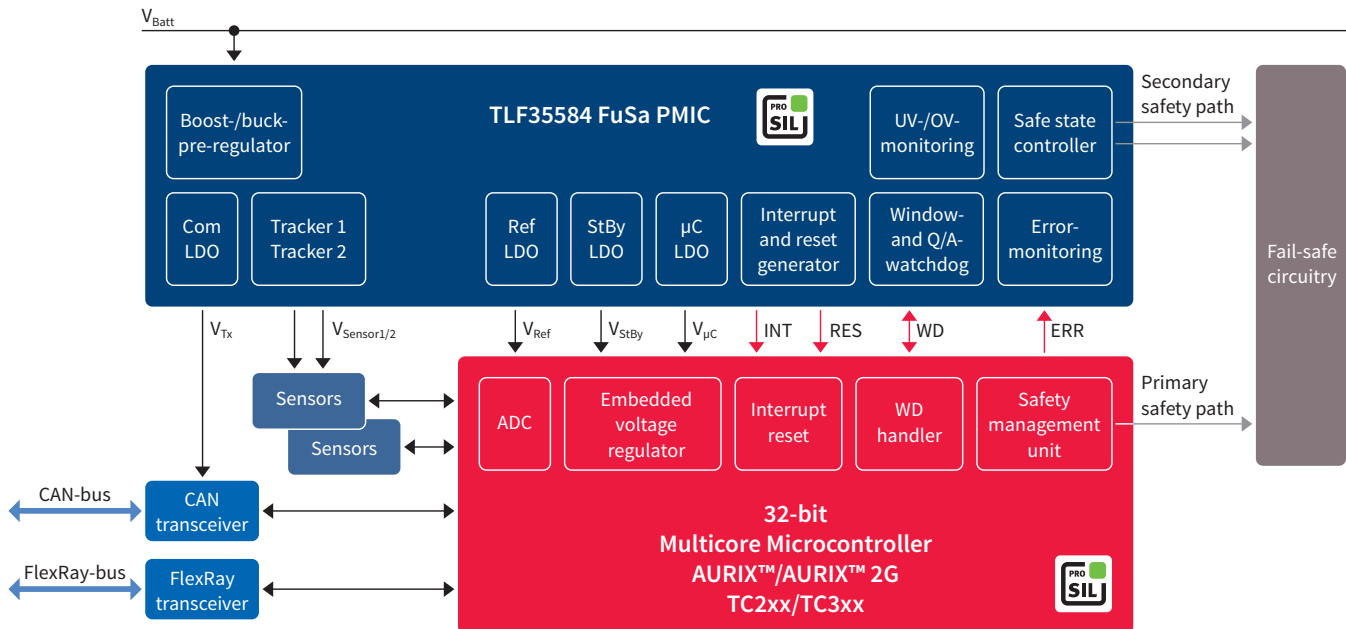
### Applications

- > Safety/chassis: EPS, braking, suspension, domain control, ADAS fusion box
- > Powertrain: Engine management, transmission, transfer case and starter generator
- > Electrical drive train: Battery management, inverter, DC-DC, charger

### Pre-/post-regulator architecture for high efficiency



## Application diagram



### Key features

- >  $V_{IN}$ : 3–40 V
- > Buck/boost-pre-regulator
  - $I_Q = 1.3$  A;  $f$ : 300 kHz – 2.5 MHz
- > Post-regulators
  - Microcontroller supply: 3.3 V/5 V at 600 mA
  - Reference LDO: 5 V at 150 mA ( $\pm 1$  percent)
  - 2x tracker: 5 V at 150 mA
  - Communication supply: 5 V at 200 mA
- > Standby LDO: 3.3 V/5 V at 10 mA
- > EN/wake (T15 and CAN/FlexRay)
- > Extended state machine
- > SPI
- > Safety features
  - Development acc. to ISO 26262
  - Multiple bandgap (supply versus V-monitoring)
  - UV/OV monitoring of all rails
  - ERR monitoring of microcontroller's safety management unit
  - Functional WD and window WD with dedicated error counters
  - Safe state control/secondary safety paths
  - Built-in self-test
- > VQFN-48 EP and LQFP-64 EP (both thermally enhanced)

### Key benefits

- > Ensures operation during cold cranking
- > High efficiency
- > ADC supply regardless of microcontroller load
- > Precise sensor supply
- > Flexible wake-up management
- > Usage in applications with ASIL requirements (up to ASIL-D)
- > Avoids common cause failures thanks to independence and protection
- > Application adaptable
  - Flexible monitoring concept
  - Flexible watchdog concept
  - Flexible safe-state control and safety paths
- > All safety features testable on demand
- > Small footprint package (VQFN-48)
- > Good thermal behavior

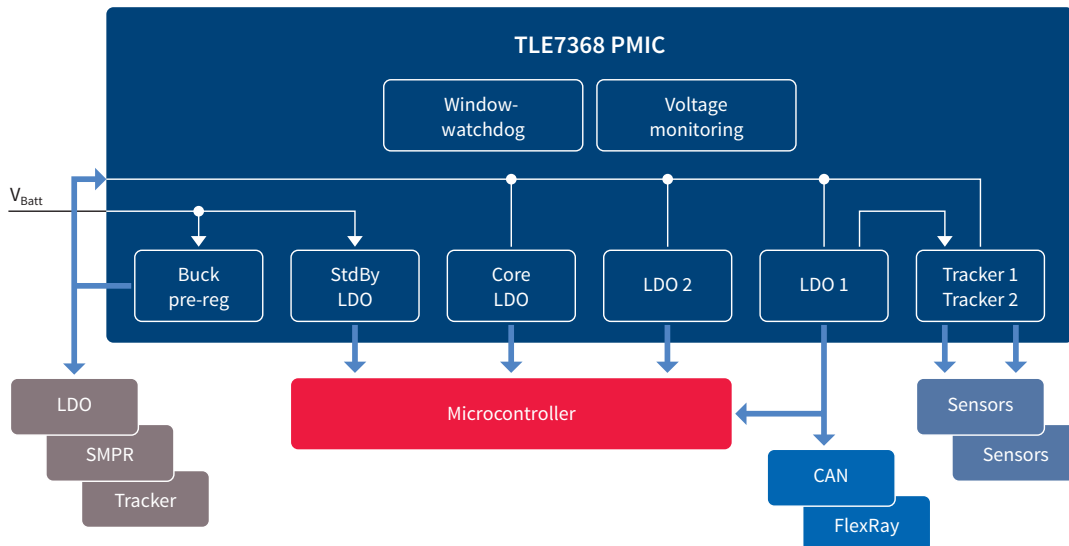


# OPTIREG™ Automotive PMIC



TLE7368/-2/-3 – optimized PMIC for 32-bit  $\mu\text{C}$

Application diagram



## Key features

- › Input voltage range: 4.5–45 V
- › DC-DC buck pre-regulator to 5.5 V/2.5 A
  - Integrated slew rate control
- › Post-regulators for  $\mu\text{C}$  and on-board
  - LDO1: 5 V ( $\pm 2$  percent), 700 mA
  - LDO2: 3.3 V or 2.6 V ( $\pm 2$  percent), 500 mA
  - LDO3: control for ext. NPN
  - LDO3: 1.5 V, 1.2 V and 1.3 V ( $\pm 2$  percent)
  - 2 trackers for off-board supply: 5 V, 105 mA/50 mA
- › Stand-by regulator for lowest current consumption
- › 2 enable inputs
- › Reset for all LDOs with adj. reset delay time
- › Window watchdog with adj. timing
- › Monitoring circuit for stand-by supply
- › Power sequencing on contributing supplies
- › Overcurrent protection for all regulators
- › Overtemperature shutdown
- › DSO-36 EP (thermally enhanced)

## Key benefits

- › Maintains operation under sensor short-circuit condition
- › EME reduction (high frequency content)
- › Power sequencing for proper start-up/ramp-down

## Applications

- › Powertrain: transmission, engine management
- › Safety: EPS

## OPTIREG™ Automotive PMIC

Product name	$V_{S(EP)}$ [V]	$V_O$ [V]	$V_{O2}$ [V]	$V_{O3}$ [V]	$V_{O4}$ [V]	$V_O$ additional [V]	Accuracy 1 [%]	Accuracy 2 [%]	Accuracy 3 [%]	Accuracy 4 [%]	Additional output accuracy	$I_Q$ [mA]	$I_Q 2$ [mA]	$I_Q 3$ [mA]	$I_Q 4$ [mA]	$I_Q$ additional [mA]	$I_Q$ [mA]	$f_{sw}$ [kHz]	Stand-by regulator [V-mA]	PFM operation	Reset	Watchdog	SPI and add. logic	Enable/disable possibility	Early warning	Package <sup>1)</sup>	
<b>Buck plus linear</b>																											
TLE7368	4.50 ... 45.00	5.50	5.00	2.60 or 3.30	1.50	2 x 5	-2.00 ... +9.00	2	2	2	1.50	2500	800	700	Adj.	105 and 50	120	280 ... 425	1.00/2.60-30.00		•	WWD		•		DSO-36 EP, DSO-36 (Power-SO)	
TLE7368-2	4.50 ... 45.00	5.50	5.00	2.60 or 3.30	1.20	2 x 5	-2.00 ... +9.00	2	2	2	1.50	2500	800	700	Adj.	105 and 50	120	280 ... 425	1.00/2.60-30.00		•	WWD		•		DSO-36 EP	
TLE7368-3	4.50 ... 45.00	5.50	5.00	2.60 or 3.30	1.30	2 x 5	-2.00 ... +9.00	2	2	2	1.50	2500	800	700	Adj.	105 and 50	120	280 ... 425	1.00/2.60-30.00		•	WWD		•		DSO-36 EP	
TLE6368	5.50 ... 60.00	5.50	5.00	2.60 or 3.30	2.60 or 3.30	6 x 5	10.00	5	5	5	1.00	1500	800	500	350	6 x 17	30	280 ... 425	2.40-1.00		•	WWD	•	•		DSO-36 (Power-SO)	
<b>Boost plus buck</b>																											
TLE6711	4.50 ... 45.00	27.50	5.00	-	-	-	12.00	2	-	-	-	1000	700	-	-	-	4	95			•	WWD				DSO-14, DSO-20	
TLF35584	3.00 ... 40.00	5.80	5.00 or 3.30	5.00	5.00	2 x 5	2.50	2	2	1	-	1300	600	200	150	2 x 150	50	400 ... 2500	5.00 or 3.30/10.00		•	•	WWD/FWD	•	•		LQFP-64, VQFN-48

1) See packages on page 142 to 144

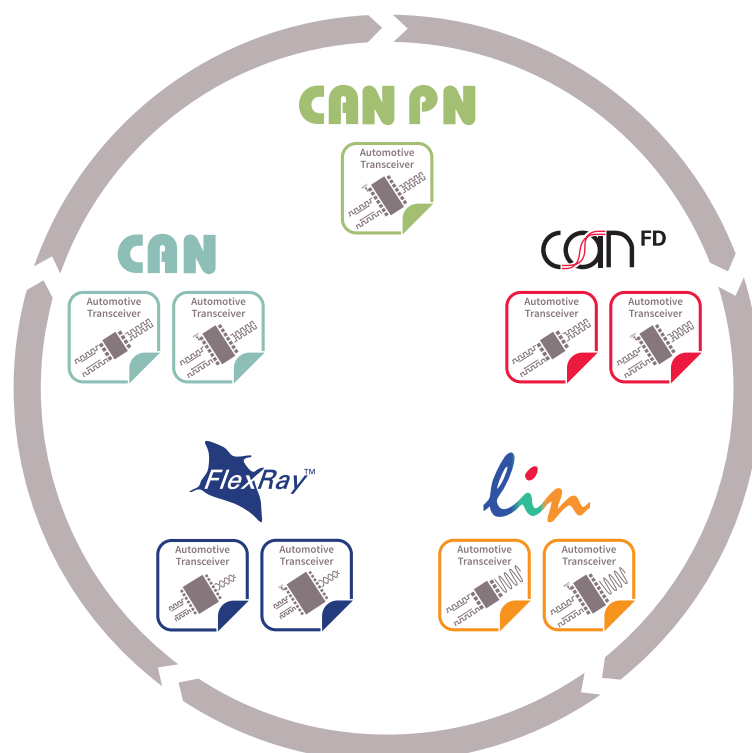


## Network ICs

Due to the ever-increasing demand for data exchange in modern vehicles, the automotive industry has implemented networks such as CAN (Controller Area Network), LIN (Local Interconnect Network) and FlexRay protocol-based bus systems.

Infineon offers a broad product portfolio of automotive transceivers – all of which are perfectly suited and designed to withstand the harsh automotive environment – for the various automotive bus segments.

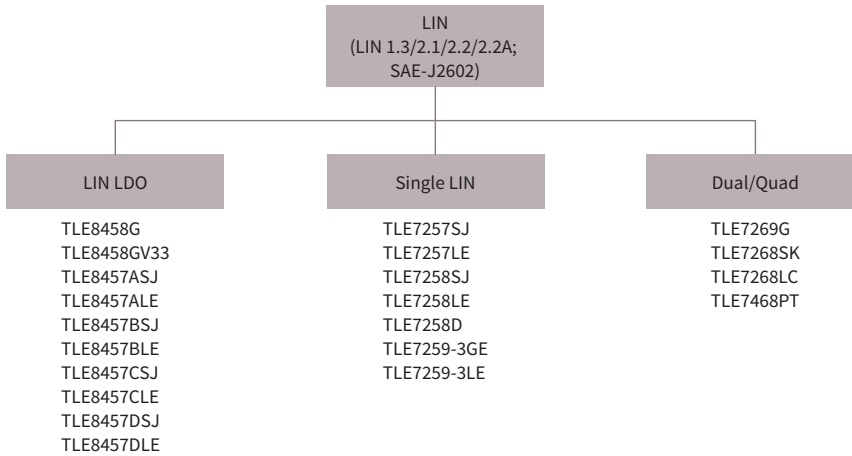
Different transceiver types are used in accordance with the respective vehicle network architecture and the related ECU supply path. Infineon transceivers ensure reliable communication and help minimize the current consumption and associated CO<sub>2</sub> emissions at the vehicle level. Thanks to their high-performance, ruggedness and reliable communication, Infineon's transceiver products offer the ultimate in value.





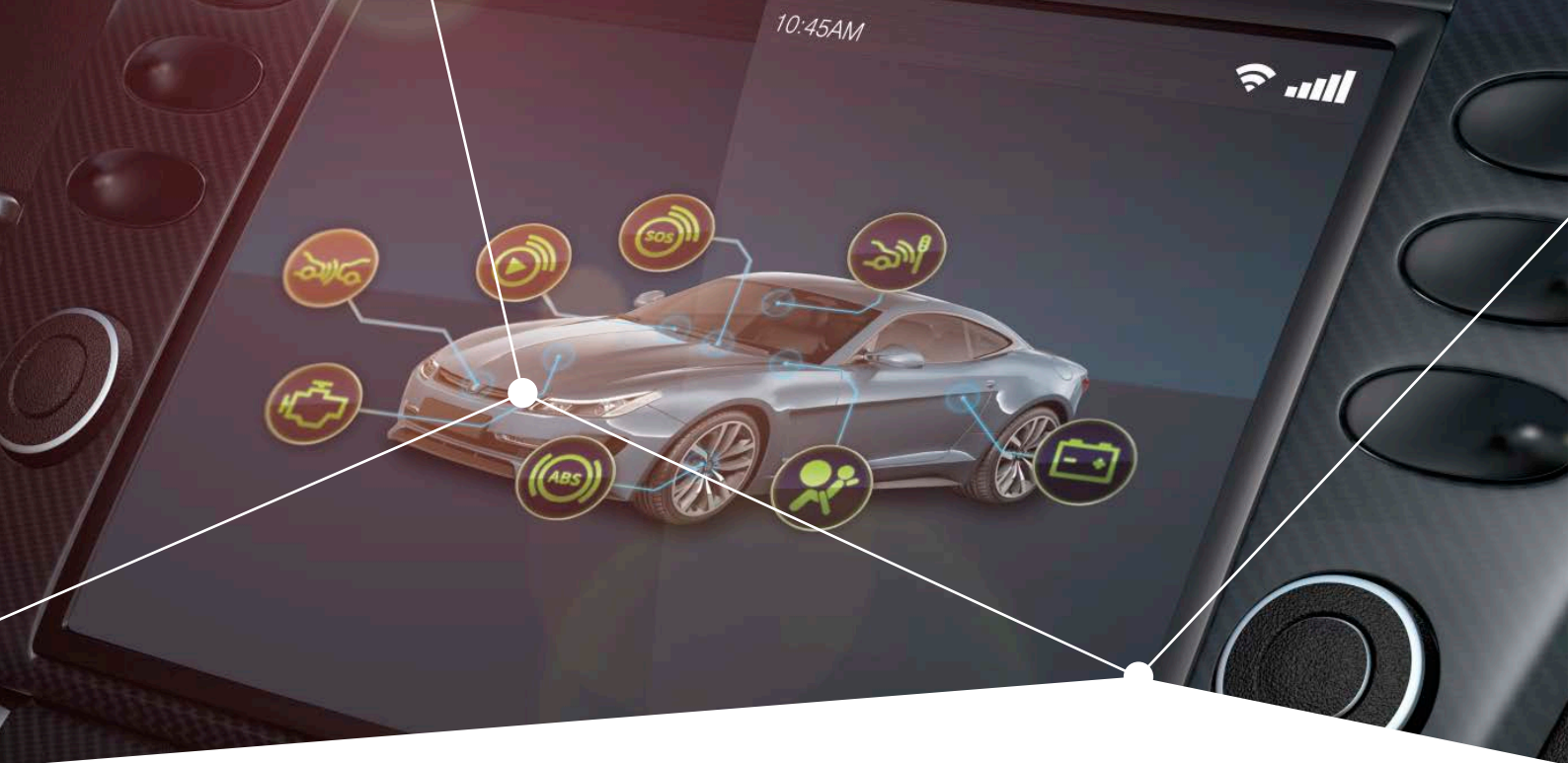
Infineon offers a complete LIN portfolio including single and dual LIN transceivers as well as LIN-LDOs.

## Selection tree – Automotive LIN transceivers



Product overview								
Product name	Transmission rate (max)	Low-power mode I <sub>q</sub> [μA] (max)	Bus wake-up capability	Wake-up inputs	Number of channels	Bus failure management	Fast programming	Package <sup>1)</sup>
<b>LIN LDO</b>								
TLE8458G	20 kbit/s	< 12 sleep mode	•	•	1	•	•	DSO-8
TLE8458GV33	20 kbit/s	< 12 sleep mode	•	•	1	•	•	DSO-8
TLE8457ASJ	20 kbit/s	< 16 sleep mode	•		1	•		DSO-8
TLE8457ALE	20 kbit/s	< 16 sleep mode	•		1	•		TSON-8
TLE8457BSJ	20 kbit/s	< 16 sleep mode	•		1	•		DSO-8
TLE8457BLE	20 kbit/s	< 16 sleep mode	•		1	•		TSON-8
<b>Single LIN</b>								
TLE6258-2G	20 kbit/s	< 40 sleep mode	•		1			DSO-8
TLE7257SJ	20 kbit/s	< 15 sleep mode	•		1	•		DSO-8
TLE7257LE	20 kbit/s	< 15 sleep mode	•		1	•		TSON-8
TLE7258SJ	20 kbit/s	< 15 sleep mode	•		1	•		DSO-8
TLE7258LE	20 kbit/s	< 15 sleep mode	•		1	•		TSON-8
TLE7258D	20 kbit/s	< 15 sleep mode	•		1	•		TSON-8
TLE7259-3GE	20 kbit/s	< 10 sleep mode	•	•	1	•	•	DSO-8
TLE7259-3LE	20 kbit/s	< 10 sleep mode	•	•	1	•	•	TSON-8
<b>Dual LIN</b>								
TLE7269G	20 kbit/s	< 10 sleep mode	•	•	2	•	•	DSO-14
TLE7268LC	20 kbit/s	< 20 sleep mode	•		2	•		TSON-14
TLE7268SK	20 kbit/s	< 20 sleep mode	•		2	•		DSO-14
<b>Quad LIN</b>								
TLE7468PT	20 kbit/s	< 18 sleep mode	•		4			TSSOP-16

1) See packages on page 142 to 144



## Network ICs

**CAN**



Classical CAN transceivers are available in standard DSO-8 and DSO-14 packages along with tiny leadless TSON-8 packages.

**CAN<sup>FD</sup>**



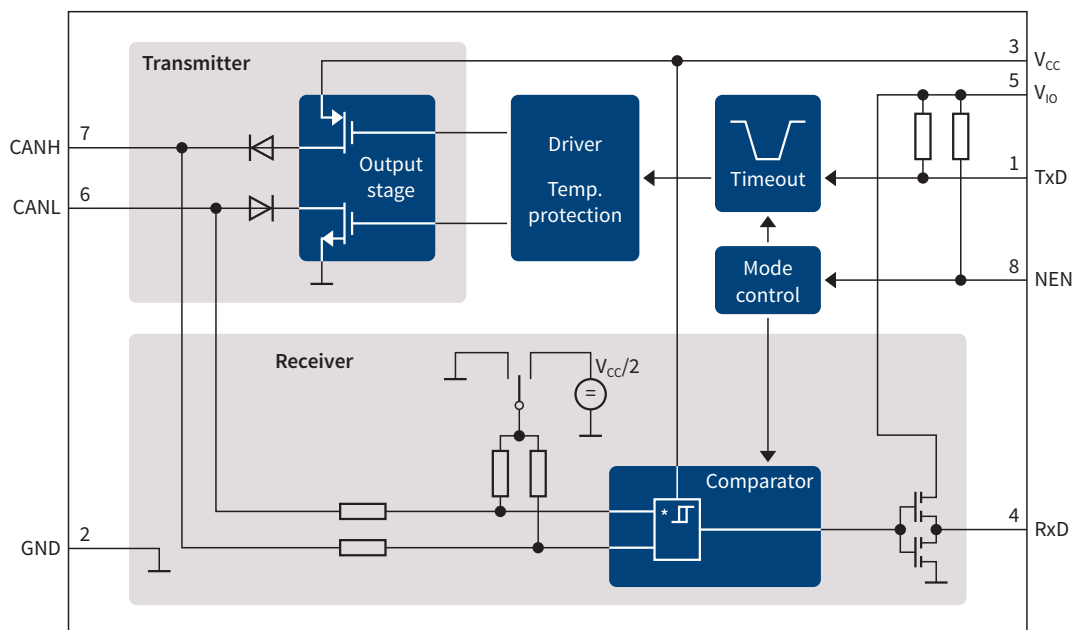
CAN transceivers for Flexible Data-Rate speed up the CAN traffic with data rates of up to 5 Mbit/s.

**CAN PN**

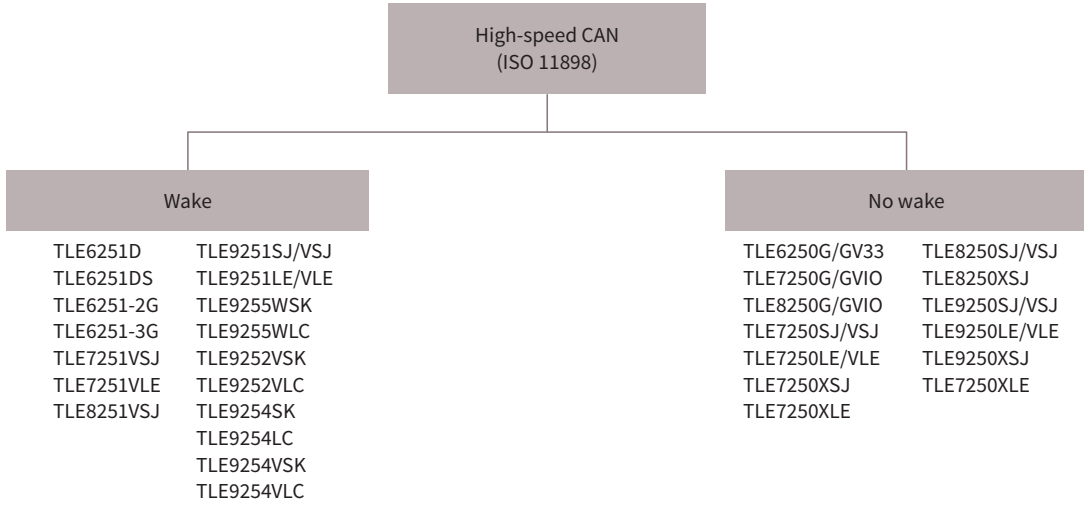


CAN transceivers for partial networking improve energy efficiency and make cars greener.

### Block diagram example of high-speed CAN: TLE9250V



## Selection tree – Automotive CAN and CAN FD transceivers















Product overview								
Product name	Transmission rate (max)	Low-power mode $I_q$ [μA] (max)	Bus wake-up capability	Wake-up inputs	Number of channels	Bus failure management	CAN FD	Package <sup>1)</sup>
High-speed CAN ISO 11898-2								
TLE6250G	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
TLE6250GV33	1 Mbit/s	< 10 @ 5 V stand-by			1			DSO-8
TLE7250G	1 Mbit/s	< 15 @ 5 V stand-by			1			DSO-8
TLE7250GVIO	1 Mbit/s	< 15 @ 5 V stand-by			1			DSO-8
TLE8250G	1 Mbit/s	< 15 @ 5 V stand-by			1			DSO-8
TLE8250GVIO	1 Mbit/s	< 15 @ 5 V stand-by			1			DSO-8
TLE7250SJ TLE8250SJ	CON <sup>FD</sup> 2 Mbit/s	< 12 @ 5 V power save mode			1		●	DSO-8
TLE7250LE	CON <sup>FD</sup> 2 Mbit/s	< 12 @ 5 V power save mode			1		●	TSON-8
TLE7250VSJ TLE8250VSJ	CON <sup>FD</sup> 2 Mbit/s	< 8 @ 5 V power save mode			1		●	DSO-8
TLE7250VLE	CON <sup>FD</sup> 2 Mbit/s	< 8 @ 5 V power save mode			1		●	TSON-8
TLE7250XSJ TLE8250XSJ	CON <sup>FD</sup> 2 Mbit/s	n/a			1		●	DSO-8
TLE7250XLE	CON <sup>FD</sup> 2 Mbit/s	n/a			1		●	TSON-8
TLE9250SJ	CON <sup>FD</sup> 5 Mbit/s	< 20 @ 5 V power save mode			1		●	DSO-8
TLE9250LE	CON <sup>FD</sup> 5 Mbit/s	< 20 @ 5 V power save mode			1		●	TSON-8
TLE9250VSJ	CON <sup>FD</sup> 5 Mbit/s	< 15 @ 5 V power save mode			1		●	DSO-8
TLE9250VLE	CON <sup>FD</sup> 5 Mbit/s	< 15 @ 5 V power save mode			1		●	TSON-8
TLE9250XSJ	CON <sup>FD</sup> 5 Mbit/s	n/a			1		●	DSO-8
TLE9250XLE	CON <sup>FD</sup> 5 Mbit/s	n/a			1		●	TSON-8

1) See packages on page 142 to 144



# Network ICs

Product overview								
Product name	Transmission rate (max)	Low-power mode $I_q$ [ $\mu$ A] (max)	Bus wake-up capability	Wake-up inputs	Number of channels	Bus failure management	CAN FD	Package <sup>1)</sup>
<b>High-speed CAN ISO 11898-5</b>								
TLE6251D	1 Mbit/s	< 25 @ 5 V stand-by	•		1			DSO-8
TLE6251DS	1 Mbit/s	< 30 @ 5 V stand-by	•		1			DSO-8
TLE6251-2G	1 Mbit/s	< 30 sleep mode	•	•	1	•		DSO-14
TLE6251-3G	1 Mbit/s	< 30 sleep mode	•	•	1	•		DSO-14
TLE7251VSJ TLE8251VSJ 	2 Mbit/s	< 14 $\mu$ A @ 5 V stand-by	•		1		•	DSO-8
TLE7251VLE 	2 Mbit/s	< 14 $\mu$ A @ 5 V stand-by	•		1		•	TSON-8
TLE9251VSJ 	5 Mbit/s	< 15 $\mu$ A @ 5 V stand-by	•		1		•	DSO-8
TLE9251VLE 	5 Mbit/s	< 15 $\mu$ A @ 5 V stand-by	•		1		•	TSON-8
TLE9251SJ 	5 Mbit/s	< 15 $\mu$ A @ 5 V stand-by	•		1		•	DSO-8
TLE9251LE 	5 Mbit/s	< 15 $\mu$ A @ 5 V stand-by	•		1		•	TSON-8
TLE9255WSK  	5 Mbit/s	< 26 sleep mode	•	•	1		•	DSO-14
TLE9255WLC  	5 Mbit/s	< 26 sleep mode	•	•	1		•	TSON-14
TLE9252VSK 	5 Mbit/s	< 26 sleep mode	•	•	1		•	DSO-14
TLE9252VLC 	5 Mbit/s	< 26 sleep mode	•	•	1		•	TSON-14
TLE9254VSK	5 Mbit/s	< 24 sleep mode	•		2		•	DSO-14
TLE9254VLC	5 Mbit/s	< 24 sleep mode	•		2		•	TSON-14
TLE9254SK	5 Mbit/s	< 32 sleep mode	•		2		•	DSO-14
TLE9254LC	5 Mbit/s	< 32 sleep mode	•		2		•	TSON-14
<b>Fault-tolerant CAN ISO 11898-3</b>								
TLE6254-3G	125 kbit/s	< 65 sleep mode	•	•	1	•		DSO-14

1) See packages on page 142 to 144



Infiniteon provides FlexRay transceivers in SSOP-16, TSSOP-14 and the world's smallest FlexRay in TSON-14 package for reliable communication in safety-related applications.

Product overview							
Product name	Transmission rate (max)	$I_q$ [ $\mu$ A]	Bus wake-up capability	Wake-up inputs	Number of channels	Bus failure management	Package <sup>1)</sup>
<b>FLexRay</b>							
TLE9221SX	10 Mbit/s	< 65 sleep mode	•	•	1	•	SSOP-16
TLE9222PX	10 Mbit/s	< 50 stand-by mode	•		1	•	TSSOP-14
TLE9222LC	10 Mbit/s	< 50 stand-by mode	•		1	•	TSON-14

1) See packages on page 142 to 144



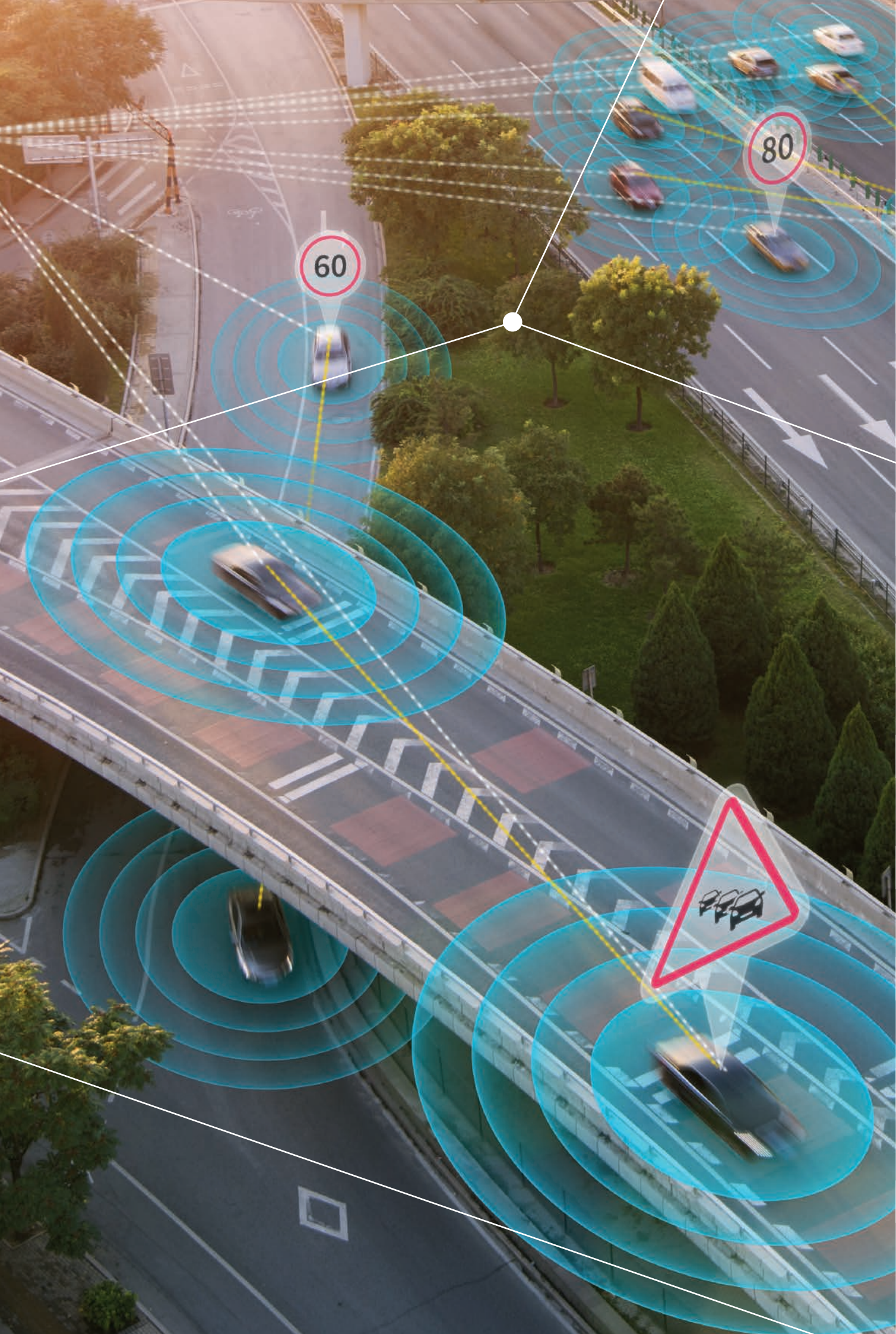
OEM



RoHS

[www.infineon.com/automotive-transceivers](http://www.infineon.com/automotive-transceivers)





Glossary Symbols

Support

System ICs

Network ICs

OPTIREG™  
Automotive  
Power Supply ICs

Motor drivers

LED drivers

High-side switches

Smart multichannel switches

Low-side switches

IGBTs  
discretes and  
modules

MOSFETs



# System Basis Chips (SBCs)

## Lite System Basis Chip family supporting CAN Flexible Data-Rate (FD) and Partial Networking (PN)

Infineon's Lite System Basis Chip (SBC) family offers high integration and high-performance at optimized system cost for various automotive applications.

The Lite SBC family offers two variants: Lite LDO SBC with a low-drop voltage regulator with 150 mA and the Lite DC-DC SBC with a DC-DC buck converter up to 500 mA. Both variants are available with a 5 V or 3.3 V output voltage option for microcontrollers, network transceivers, sensors and other peripherals' power supply. They feature an auxiliary 5 V integrated low-drop voltage regulator with up to 100 mA. The communication interface incorporates one CAN transceiver with flexible data-rate performance up to 5 Mbit/s according to ISO 11898-2:2016 (including partial networking option), complying with the latest automotive standards and OEM requirements. The devices include

### Key features

LDO variant (TLE9461): 5 V/3.3 V linear voltage regulator up to 150 mA (VCC1)

DC-DC variant (TLE9471): 5 V/3.3 V buck converter up to 500 mA

- > 5 V linear voltage regulator up to 100 mA (VCC2)
- > CAN FD up to 5 Mbit/s (acc. to ISO 11898-2:2016), CAN PN and FD tolerant ("-3" variants)
- > 1x HV wake input, watchdog, reset, interrupt, fail output
- > Charge pump output for reverse polarity control
- > Alternative functions to fail output: wake, low-side or high-side switch (up to 45 mA)
- > Low-power modes with full wake capability

### Key benefits

- > Reduced system cost through low component count and small PCB footprint
- > Cost-effective reverse battery protection through its integrated charge pump that drives an external N-FET
- > Extended battery life with very low quiescent current modes
- > Enables design flexibility and reduces software design effort through shared state machine and SPI access with the entire Lite SBC family

diagnostic and supervision features for support of ECU functional safety concepts like under-voltage monitoring, window watchdog with reset, fail-safe operating mode and fail-safe outputs. The Lite SBC family also features a charge pump to drive high-side n-channel power MOSFETs to disconnect high power loads during sleep mode to reduce quiescent current, and can also be used for cost-effective reverse battery protection. The Lite SBC family extends the system battery life with its very low quiescent current consumption in low power mode. All devices feature a TSDSO-24 high-performance package with exposed pad in an 8.65 x 6 mm footprint. The entire Lite SBC family is hardware compatible, and is also software compatible with the Mid-Range+, DC-DC and MultiCAN Power+ SBC families (TLE926x and TLE927x). All Infineon SBCs are qualified according to AEC-Q100 and are designed to withstand the severe conditions of automotive applications.

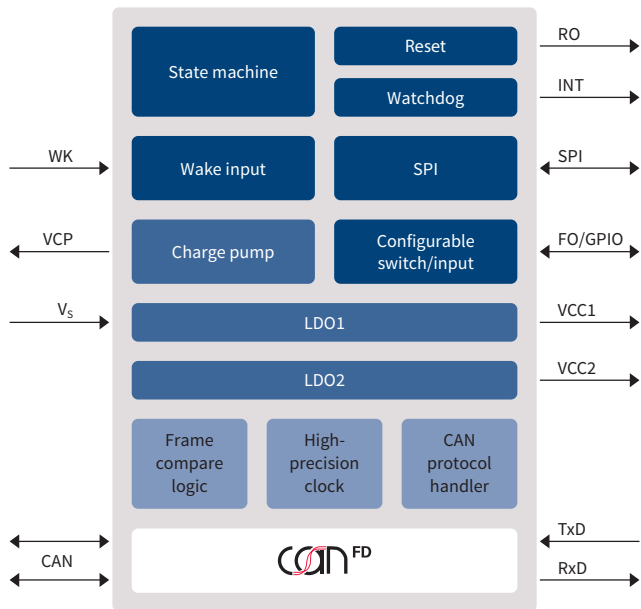
- > Meet major car OEM requirements with excellent EMC and ESD performance
- > Safely supply off-board loads (e.g., sensors) with short circuit protected low-drop voltage regulators

### Applications

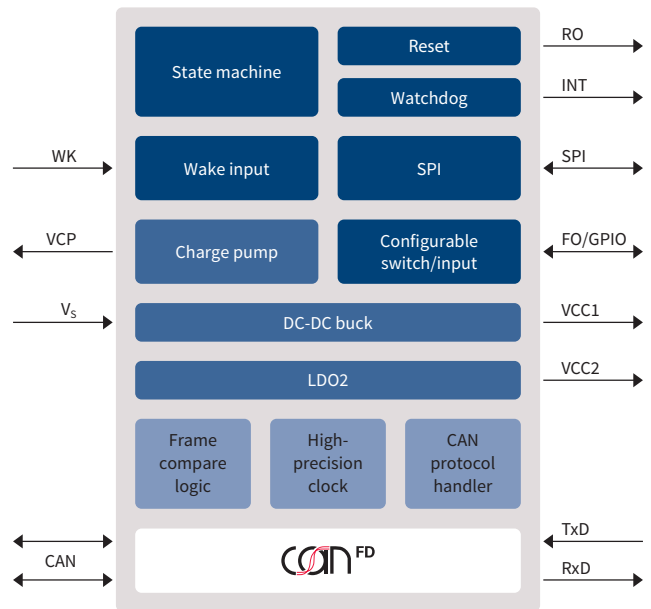
- > In-cabin wireless charger
- > Auto transmission
- > Transfer case
- > Exhaust module and NOx sensor
- > Steering column and steering lock
- > Seat control module
- > Seat belt pretensioner
- > Closure (power lift gate, sliding door, etc.)
- > Heating, Ventilation and Air Conditioning (HVAC)
- > Gear shifter and selectors
- > Light Control Unit (LCU) for front and rear
- > Smart power distribution modules
- > Fuel and water pump



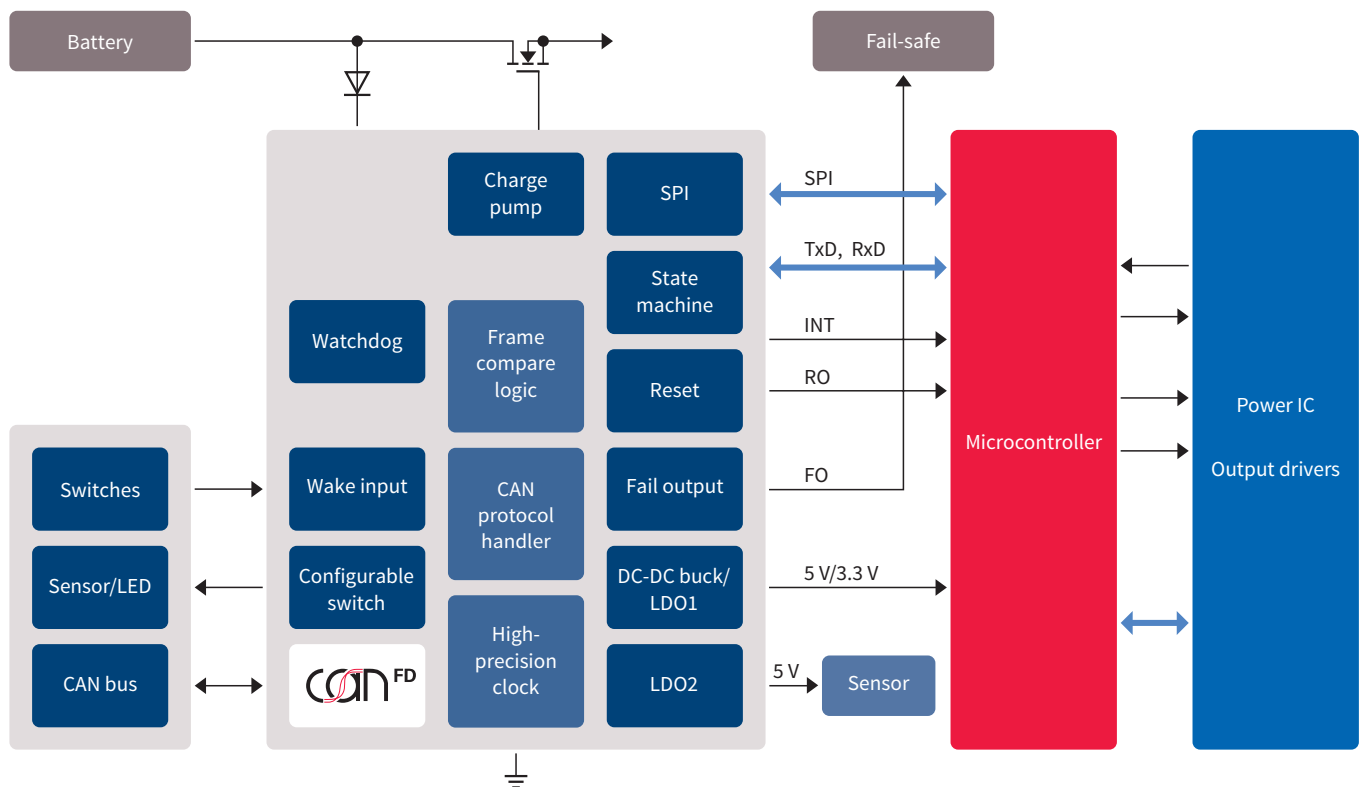
Block diagram TLE9461



Block diagram TLE9471



Application diagram TLE9461/71



# System Basis Chips (SBCs)

## Mid-Range+ System Basis Chip family supporting CAN Flexible Data-rate (FD) and Partial Networking (PN)

Infineon's highly integrated Mid-Range+ System Basis Chip (SBC) family TLE926xB offers best performance and scalability for various automotive applications. The Mid-Range+ SBCs feature three low-drop voltage regulators with 5 V or 3.3 V output voltage options for microcontrollers, network transceivers, sensors and other peripherals' power supply. As communication interfaces they incorporate one CAN transceiver (including Partial Networking option) with Flexible Data-Rate performance up to 5 Mbit/s and up to two LIN transceivers, complying with the latest automotive standards and OEM requirements. The devices include diagnostic and supervision features for support of ECU functional safety concepts like undervoltage monitoring, window watchdog with reset,

fail-safe operating mode, and fail-safe outputs. Four high-side switches are available in order to drive external loads, three wake-inputs and two General Purpose Input-Outputs (GPIOs) allow monitoring of inputs or activation of loads. The Mid-Range+ SBCs can be put into low-power modes with full wake capability for very low quiescent current consumption in order to support applications that are connected permanently to the battery. All devices feature an exposed pad VQFN-48 (7 mm x 7 mm) power package supporting Automatic Optical Inspection (AOI). The entire family is pin-to-pin and software compatible, also with other Infineon SBC families, and is designed to withstand the severe conditions of automotive applications.

### Key features

- › Integrated low-drop voltage regulator (5 V or 3.3 V up to 250 mA)
- › Integrated low-drop voltage regulator (5 V up to 100 mA), protected for off-board usage
- › Voltage regulator (5 V, 3.3 V or 1.8 V) with external PNP transistor, protected for off-board usage or for load-sharing
- › 1 CAN transceiver supporting FD communication up to 5 Mbit/s according ISO 11898-2:2016
- › CAN Partial Networking FD tolerant mode
- › 2 LIN transceivers LIN2.2/J2602
- › 4 high-side outputs 7 Ω typ.
- › 2 HV GPIOs, 3 HV wake inputs
- › Interrupt, reset output
- › Integrated fail-safe functions: 3 fail-safe outputs, watchdog, fail-safe operating modes
- › 16-bit SPI for configuration and diagnostics
- › Voltage, current and temperature protection and monitoring

### Key benefits

- › Reduced system cost through low component count and small PCB footprint
- › Low-drop voltage regulators for on- and off-board supply
- › Wide supply input voltage and temperature range
- › High-performance network transceivers
- › Flexible number of integrated LIN transceivers
- › Very low quiescent current modes
- › Very small package supporting AOI
- › Pin and software compatibility amongst all family members
- › Excellent EMC and ESD performance meeting major car OEM requirements

### Applications

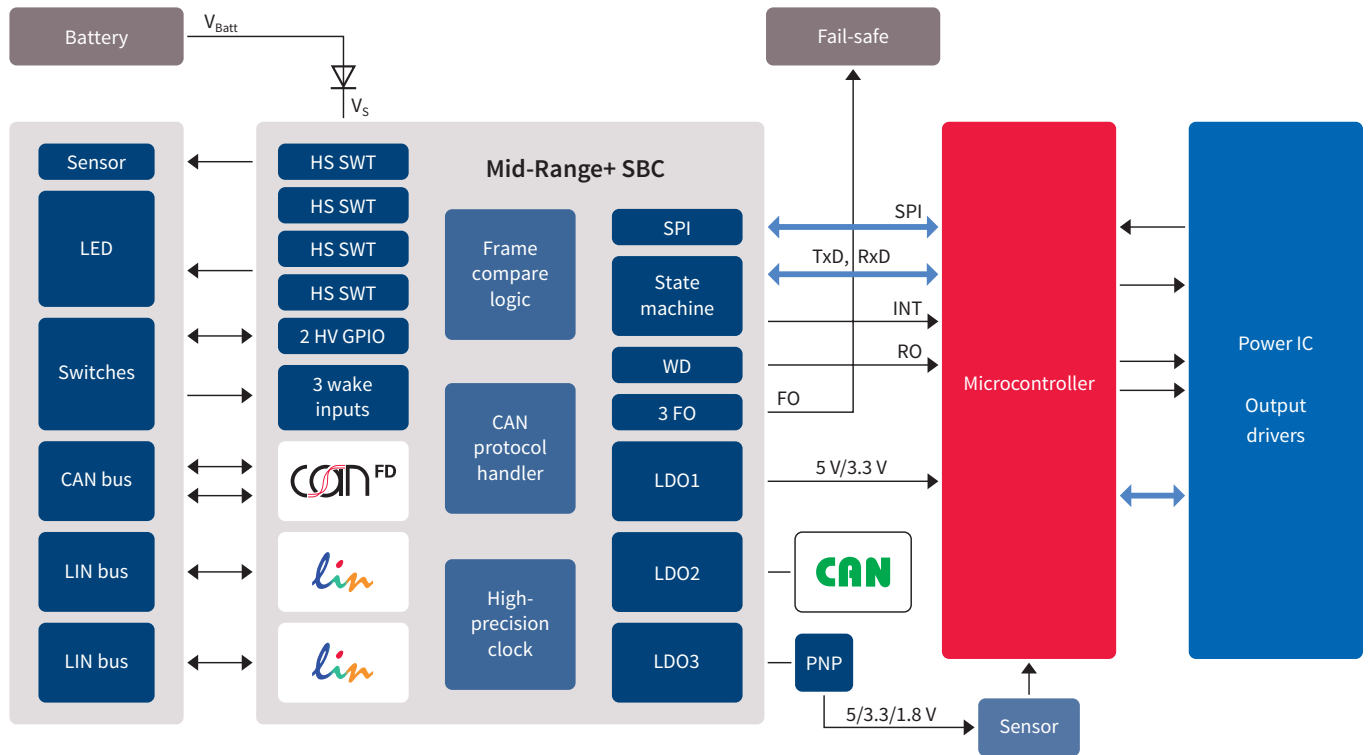
- › Body Control Modules (BCM) and gateways
- › Heating, Ventilation and Air Conditioning (HVAC)
- › Door, roof, tailgate, trailer and closure modules
- › Passive keyless entry, passive start modules
- › Seat control modules
- › Light control modules
- › Gear shifters and selectors



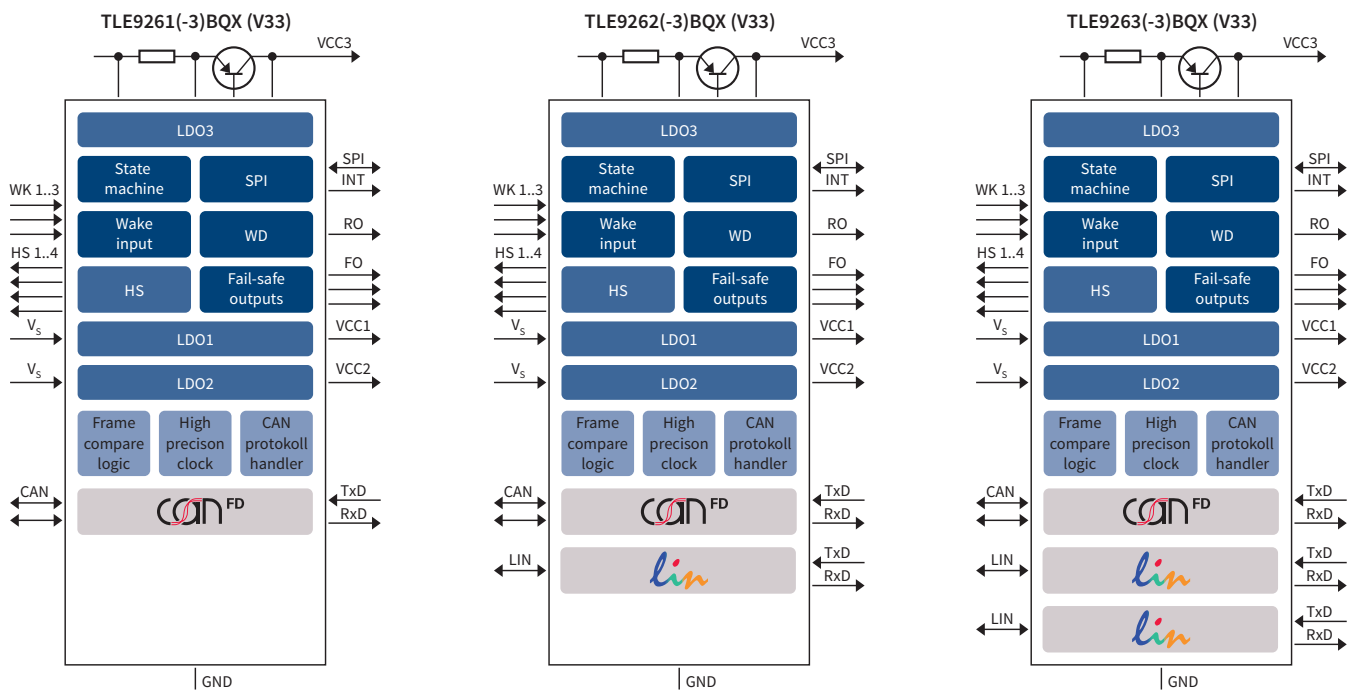
RoHS

[www.infineon.com/sbc](http://www.infineon.com/sbc)

## Application diagram



## Family overview





# System Basis Chips (SBCs)

## DC-DC System Basis Chip family supporting CAN Flexible Data-Rate (FD)

Infineon's highly integrated DC-DC System Basis Chip (SBC) family TLE927xQX offers optimal performance and scalability for various automotive applications. DC-DC SBC features a switch-mode power supply voltage regulator (SMPS) with 5 V or 3.3 V output voltage, one 5 V low-drop voltage regulator, one CAN FD and up to four LIN transceivers that comply with the latest automotive standards and OEM requirements. The devices include fail-safe features for supporting

ECU functional safety concepts, high-voltage wake-input for monitoring inputs, along with a very low quiescent current in low-power modes with full wake-up capability. All devices feature an exposed pad VQFN-48 (7 x 7 mm) power package (supporting AOI). The entire family is not only pin-to-pin and software compatible, but also compatible with other Infineon SBC families, and is designed to withstand the severe conditions of automotive applications.

### Key features

- › Integrated high-efficiency SMPS buck converter with edge shaping for an optimized EMC performance (5 V or 3.3 V up to 750 mA)
- › The SMPS boost controller with edge shaping for an optimized EMC performance enables functionality at a low supply voltage ( $V_s > 3$  V) with external power switching
- › Integrated low-drop voltage regulator (5 V up to 100 mA) protected for off-board usage
- › 1 CAN transceiver supporting ISO 11898-2 CAN Flexible Data-Rate (CAN FD) up to 5 Mbit/s
- › Up to 4 LIN transceivers LIN2.2/J2602
- › Fully compliant with "Hardware Requirements for LIN, CAN and FlexRay Interfaces in Automotive Applications" Revision 1.3, 2012-05-04
- › 1 HV wake input for switch status monitoring
- › Interrupt, reset output
- › Integrated fail-safe functions:  
3 fail-safe outputs, 1 fail-safe input, watchdog, fail-safe operating modes
- › 16-bit SPI for configuration and diagnostics (compatible with all new-generation SBC TLE926x and TLE927x)
- › Voltage, current and temperature protection and monitoring

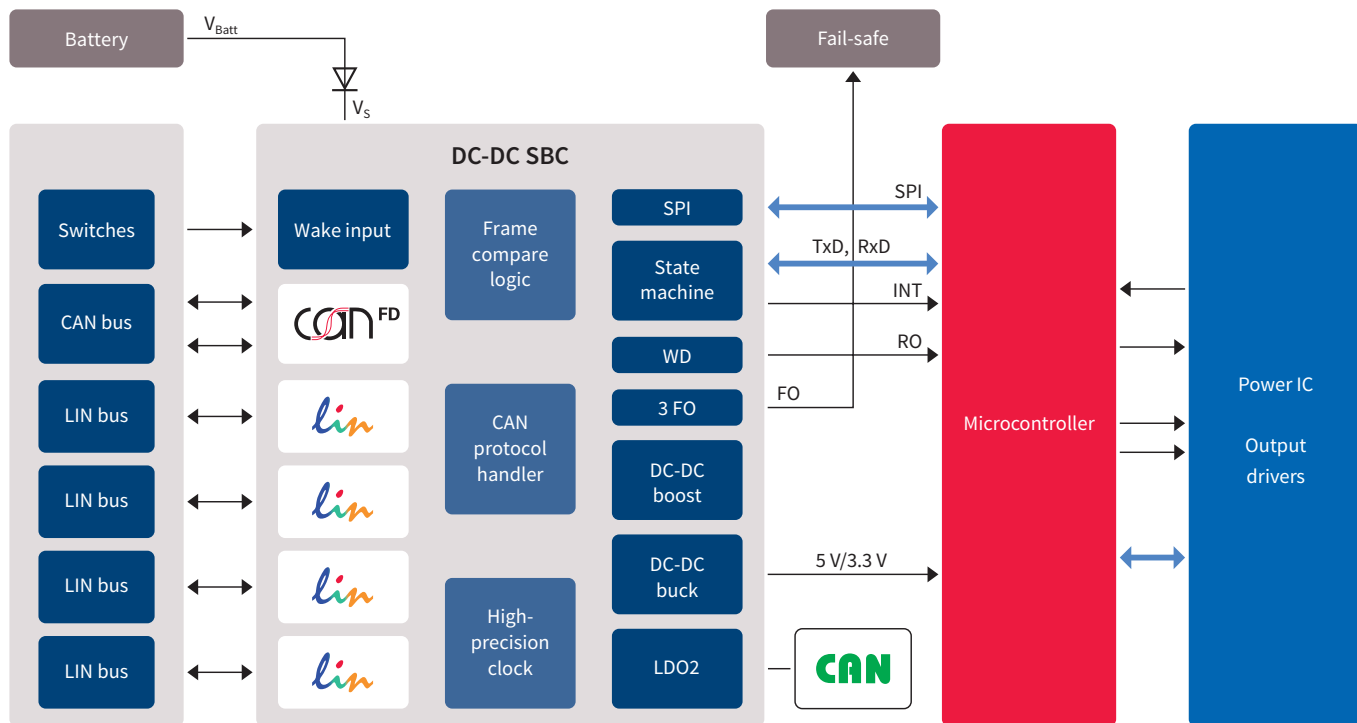
### Key benefits

- › High-efficiency SMPS buck and boost for supplying high current even at low battery voltage
- › Low-drop voltage regulator for on- and off-board supply
- › Flexible number of integrated LIN transceivers
- › Very low quiescent current
- › Very small leadless package supporting AOI
- › Pin compatibility among all family members
- › Wide supply input voltage and temperature range
- › Reduced system cost thanks to a low component count and less PCB space
- › Excellent EMC and ESD performance meeting major automotive OEM requirements

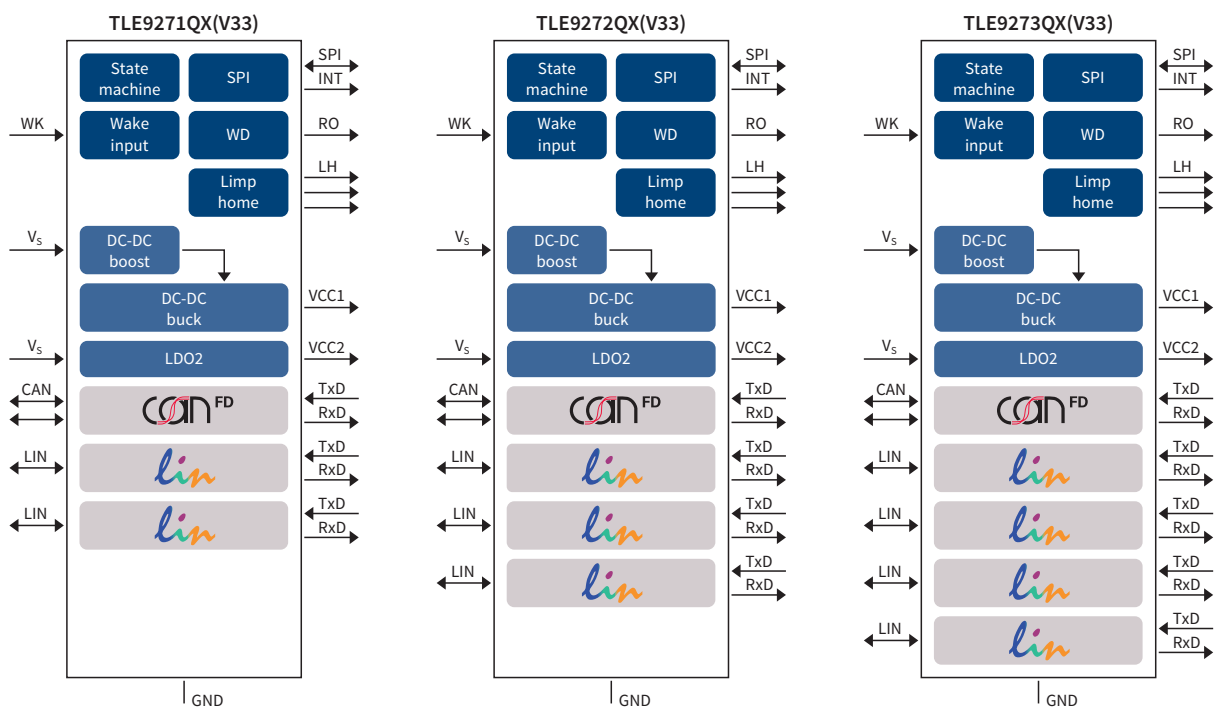
### Applications

- › Body control modules
- › Gateway
- › Climate control

## Application diagram TLE9273



## DC-DC System Basis Chip family overview



# System Basis Chips (SBCs)

## MultiCAN Power+ System Basis Chip family supporting CAN Flexible Data-Rate (FD) and Partial Networking (PN)

Infinion's MultiCAN Power+ System Basis Chip (SBC) TLE9278B family offers the highest level of integration at the smallest footprint for automotive applications requiring multiple channels of CAN transceivers like gateways and high-end Body Control Modules (BCM).

### Key features

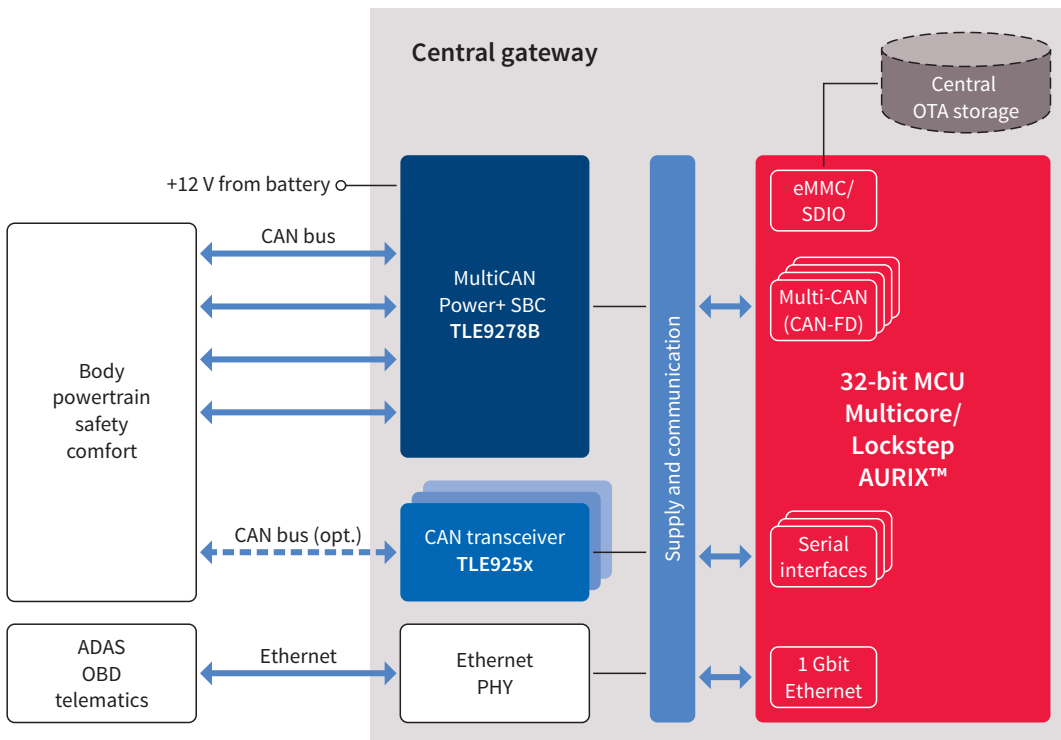
- > 4x CAN Flexible Data-Rate transceivers up to 5 Mbit/s
- > Partial Networking w/ "-3" variants
- > Buck regulator up to 750 mA
- > Boost controller at 6.5/8/10/12 V
- > 16-bit serial peripheral interface
- > Time-out/window watchdog
- > Fail-safe output
- > Low-power modes
- > 7 x 7 mm VQFN package

A high-efficiency Switch Mode Power Supply (SMPS) buck regulator provides an external 5 V or 3.3 V output voltage at up to 750 mA, while an additional DC-DC boost converter supports applications or conditions at low supply input voltages.

### Key benefits

- > Highly integrated solution for multichannel CAN applications
- > Highly efficient power supply
- > High power for strong processors
- > Tolerates low voltage line drops
- > Easy configuration and control
- > Advanced diagnostics functions
- > Fail-safe functions for safety
- > Power-saving modes
- > Minimal PCB footprint

## Application diagram TLE9278B



## Body System ICs – System Basis Chips product overview

Product name	Family name	Transmission rate	$I_{q, stop}$ (typ) [μA]	$I_{q, sleep}$ (typ) [μA]	$V_{reg, 1}$ [V]	$V_{reg, 2}$ [V]	$V_{reg, 3}$ [V]	CAN	LIN	Partial networking support	Wake-up inputs	Watchdog	Output drivers	Package <sup>1)</sup>
CAN ISO 11898-2 / LIN 2.2A														
NEW	TLE9461ES(V33)	Lite SBC	5 Mbit/s (CAN)	44	15	150 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	-	1x CAN FD	-	No	1 high-voltage (cyclic sense) time-out/window	fail-safe outputs/GPIO/charge pump	TSDSO-24
NEW	TLE9461-3ES(V33)	Lite SBC	5 Mbit/s (CAN)	44	15	150 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	-	1x CAN FD	-	Yes	1 high-voltage (cyclic sense) time-out/window	fail-safe outputs/GPIO/charge pump	TSDSO-24
NEW	TLE9471ES(V33)	Lite SBC	5 Mbit/s (CAN)	44	15	500 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	-	1x CAN FD	-	No	1 high-voltage (cyclic sense) time-out/window	fail-safe outputs/GPIO/charge pump	TSDSO-24
NEW	TLE9471-3ES(V33)	Lite SBC	5 Mbit/s (CAN)	44	15	500 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	-	1x CAN FD	-	Yes	1 high-voltage (cyclic sense) time-out/window	fail-safe outputs/GPIO/charge pump	TSDSO-24
	TLE9261BQX(V33)	Mid-Range+ SBC	5 Mbit/s (CAN)	30	50	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x CAN FD	-	No	3 high-voltage (cyclic sense) time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
	TLE9261-3BQX(V33)	Mid-Range+ SBC	5 Mbit/s (CAN)	30	50	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x CAN FD	-	Yes	3 high-voltage (cyclic sense) time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
	TLE9262BQX(V33)	Mid-Range+ SBC	5 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	50	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x CAN FD	1x LIN 2.x and SAE J2602	No	3 high-voltage (cyclic sense) time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
	TLE9262-3BQX(V33)	Mid-Range+ SBC	5 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	50	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x CAN FD	1x LIN 2.x and SAE J2602	Yes	3 high-voltage (cyclic sense) time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
	TLE9263BQX(V33)	Mid-Range+ SBC	5 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	50	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x CAN FD	2x LIN 2.x and SAE J2602	No	3 high-voltage (cyclic sense) time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
	TLE9263-3BQX(V33)	Mid-Range+ SBC	5 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	50	250 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	400 mA @ 5 V/3.3 V (3.3 V/1.8 V avail. on V33 variant)	1x CAN FD	2x LIN 2.x and SAE J2602	Yes	3 high-voltage (cyclic sense) time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
	TLE9260QX	Mid-Range SBC	1 Mbit/s (CAN)	30	50	250 mA @ 5 V	100 mA @ 5 V	-	1x High-speed CAN	-	No	3 high-voltage (cyclic sense) time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48

1) See packages on page 142 to 144

# System Basis Chips (SBCs)

## Body System ICs – System Basis Chips product overview (cont'd)

Product name	Family name	Transmission rate	$I_{q, stop}$ (typ) [ $\mu$ A]	$I_{q, sleep}$ (typ) [ $\mu$ A]	$V_{reg, 1}$ [V]	$V_{reg, 2}$ [V]	$V_{reg, 3}$ [V]	CAN	LIN	Partial networking support	Wake-up inputs	Watchdog	Output drivers	Package <sup>1)</sup>
TLE9261QX	Mid-Range SBC	1 Mbit/s (CAN)	30	50	250 mA @ 5 V	100 mA @ 5 V	400 mA @ 5 V/3.3 V	1x High-speed CAN	-	No	3 high-voltage (cyclic sense)	time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
TLE9262QX	Mid-Range SBC	1 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	50	250 mA @ 5 V	100 mA @ 5 V	400 mA @ 5 V/3.3 V	1x High-speed CAN	1x LIN 2.x and SAE J2602	No	3 high-voltage (cyclic sense)	time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
TLE9263QX	Mid-Range SBC	1 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	50	250 mA @ 5 V	100 mA @ 5 V	400 mA @ 5 V/3.3 V	1x High-speed CAN	2x LIN 2.x and SAE J2602	No	3 high-voltage (cyclic sense)	time-out/window	4x high-side switch 150 mA, 3 fail-safe outputs	VQFN-48
<b>NEW</b> TLE9271QX(V33)	DC-DC SBC	5 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	55	750 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	-	1x CAN FD	2x LIN 2.x and SAE J2602	No	1 high-voltage	time-out/window	3 fail-safe outputs	VQFN-48
<b>NEW</b> TLE9272QX(V33)	DC-DC SBC	5 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	55	750 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	-	1x CAN FD	3x LIN 2.x and SAE J2602	No	1 high-voltage	time-out/window	3 fail-safe outputs	VQFN-48
<b>NEW</b> TLE9273QX(V33)	DC-DC SBC	5 Mbit/s (CAN) 20 kbit/s 10.4 kbit/s (LIN)	30	55	750 mA @ 5 V (3.3 V on V33 variant)	100 mA @ 5 V	-	1x CAN FD	4x LIN 2.x and SAE J2602	No	1 high-voltage	time-out/window	3 fail-safe outputs	VQFN-48
TLE9278BQX(V33) <sup>2)</sup>	MultiCAN Power+ SBC	5 Mbit/s	30	55	750 mA @ 5 V (3.3 V on V33 variant)		400 mA @ 5 V/3.3 V/1.8 V/1.2 V	4x CAN FD		No	1 high-voltage	time-out/window	1 fail-safe output	VQFN-48
TLE9278-3BQX(V33) <sup>2)</sup>	MultiCAN Power+ SBC	5 Mbit/s	30	55	750 mA @ 5 V (3.3 V on V33 variant)		400 mA @ 5 V/3.3 V/1.8 V/1.2 V	4x CAN FD		Yes	1 high-voltage	time-out/window	1 fail-safe output	VQFN-48

1) See packages on page 142 to 144

2) Coming Q4/2018

# Powertrain system ICs

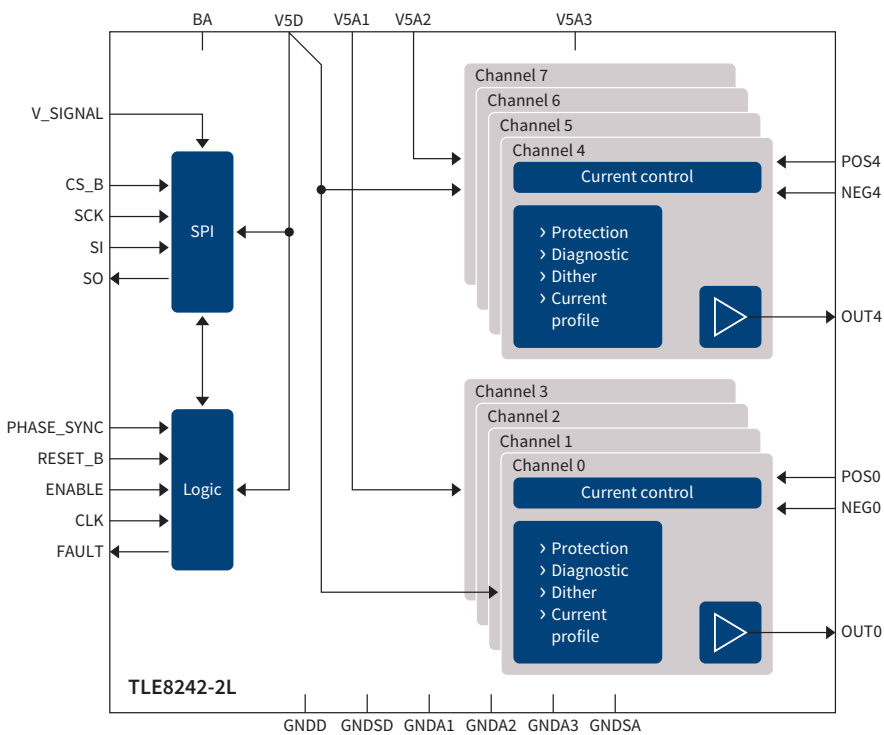
## Constant current control ICs

Infinion's solution for variable force or constant current controlled solenoids typically used in automatic transmissions, idle speed/valve/suspension control or Exhaust Gas Recirculation (EGR) applications

### Features

- > Four integrated low-side switches, control logic and outputs for external high-side switches
- > Shorted-load detection
- > Open-load detection in ON/OFF state
- > Short-to-ground detection
- > Max. output average current approx. 1.2 A

## Block diagram TLE8242-2L



Product name	Number of channels	Output current [A]	$R_{DS(on)}$ [mΩ]	Quiescent current [mA]	Operational range $V_s$ [V]	SPI	Comment	Package <sup>1)</sup>
TLE6288R	6	2.00	150	0.050	6.00 ... 16.00	16-bit	Smart 6 channel peak and hold switch	DSO-36 (Power-SO)
TLE7242-2G	4	n/a	n/a	0.005	5.50 ... 42.00	32-bit	4-Channel fixed frequency constant current control IC	DSO-28
TLE8242-2L	8	n/a	n/a	0.005	5.50 ... 42.00	32-bit	8-Channel fixed frequency constant current control IC	LQFP-64
TLE82543-3SA	3	1.60	250 (max)	0.010	5.50 ... 17.00	32-bit	3-Channel high/low-side configurable constant	DSO-36 (Power-SO)
TLE82452-3SA	2	1.60	250 (max)	0.010	5.50 ... 17.00	32-bit	2-Channel high/low-side configurable constant	DSO-36 (Power-SO)
TLE82463-3SA	3	1.60	250 (max)	0.010	5.50 ... 17.00	32-bit	3-Channel low-side constant	DSO-36 (Power-SO)
TLE82462-3SA	2	1.60	250 (max)	0.010	5.50 ... 17.00	32-bit	2-Channel low-side constant	DSO-36 (Power-SO)

1) See packages on page 142 to 144

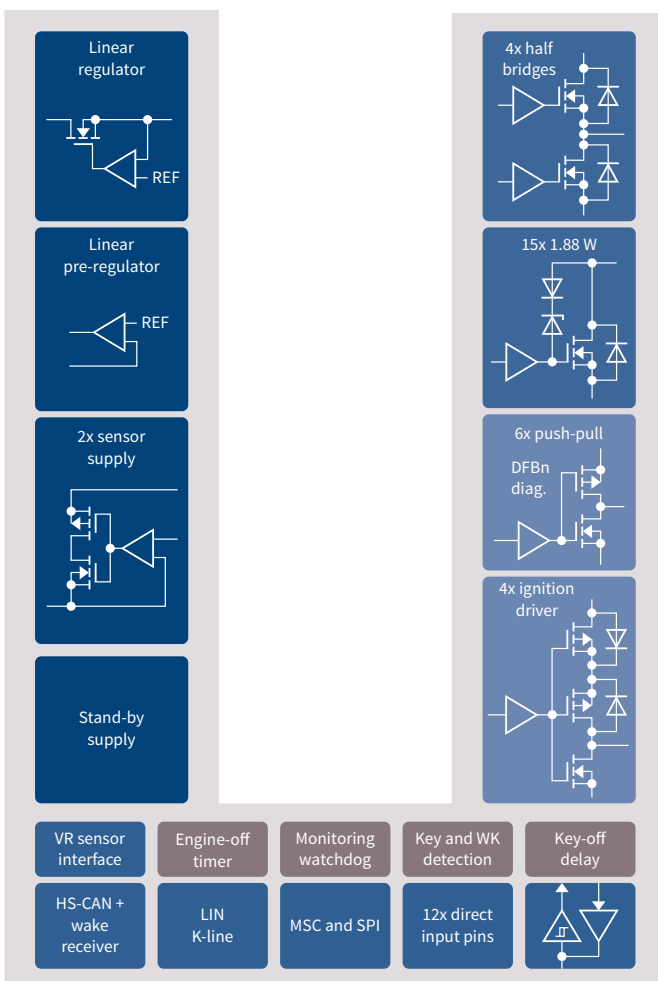


# Engine management system ICs

The TLE8888QK is the optimal ‘all-in-one-device’ solution in the field of automotive engine management systems. It contains the necessary output stages to drive the actuators attached to the electronic control unit of 4-cylinder automotive engine management systems, such as solenoids, injectors, relays, and stepper motors. A special edge-shaping slew-rate control is implemented in the output stages to ensure electromagnetic conformance optimization. The TLE8888 also includes state-of-the-art communication interfaces, as well as ECU and sensor supply functions.

The protection and safety features of the TLE8888 include diagnosis detection (SCG, OL, SCB), overtemperature and current protection, active clamping, under- and overvoltage monitoring, internal and ECU power-on reset, bidirectional disable pin, safety watchdog, enable inputs for injectors, ignition and key-off delay output.

The TLE8888 also includes a variable reluctance sensor interface, a key input detection and delayed key-out, wake-up input detection, engine-off timer, after-run mode and a delay timer, as well as two delayed outputs.



## Features

- > Supply system with microcontroller, sensor supplies and stand-by regulator
- > 29 power outputs for inductive loads, half-bridges and ignition
- > Communication I/F: Direct Inputs, microsecond bus, CAN H, and LIN I/F
- > Protection and safety features: diagnostics, active clamping, UV/OV detection, safety watchdog
- > Advanced features: VRS I/F, key input detection, engine-off timer, after-run mode and delay timer
- > Package: LQFP-100

## Applications

- > 4-cylinder automotive engine management systems
- > MPI and GDI systems
- > All-in-one chip solution for small engine applications

Product name	Description	Ordering code	Package <sup>1)</sup>
TLE8888QK	Fixed parameter setting for the watchdog	SP000921534	LQFP-100
TLE8888-1QK	Configurable parameter setting for the watchdog	SP001279928	LQFP-100
TLE8888-2QK	Watchdog function is disabled	SP001279926	LQFP-100

1) See packages on page 142 to 144

# Small engine management ICs

The TLE8080EM and TLE8088EM are engine management system ICs for small engines. They include basic functionality for supporting 1-cylinder combustion engines with a focus on the state-of-the-art Electronic Fuel Injection (EFI) technology, but can also be easily deployed in electronic e-carburetor or enhanced Capacitor Discharge Ignition (CDI) systems.

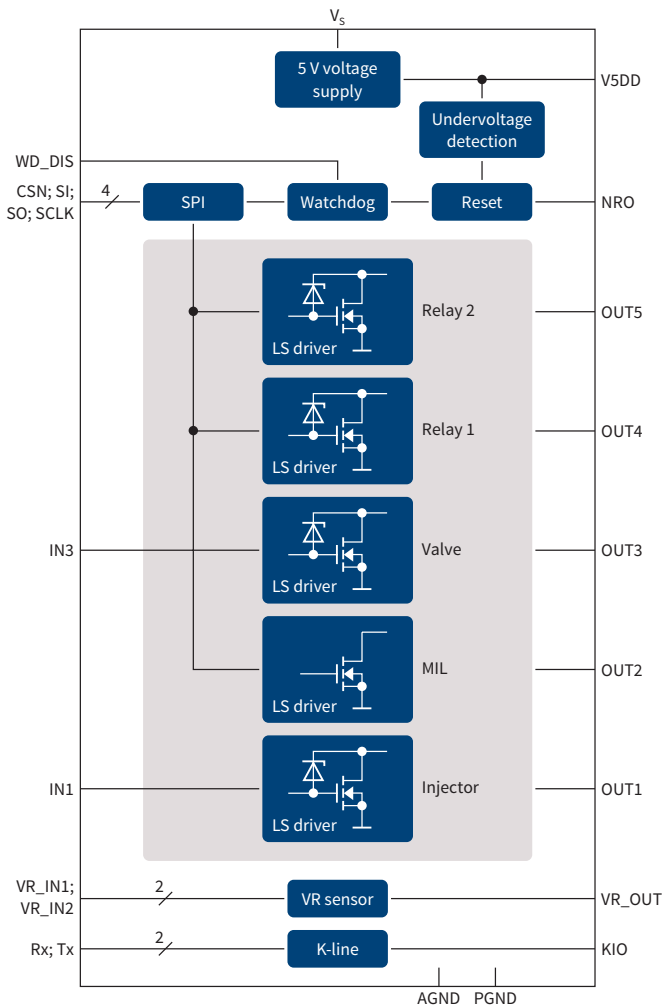
The TLE8080EM contains a 5 V power supply with current of up to 250 mA, a K-line transceiver (ISO 9141) and 5 power

stages, a Variable Reluctance Sensor (VRS) interface, and features an SPI for control and diagnostics.

The TLE8088EM contains a 5 V power supply, a K-line transceiver, and 2 power stages.

Basic protection and diagnostic features are included in both devices: overtemperature, overcurrent protection, undervoltage reset and open-load in Off.

## Block diagram TLE8080EM

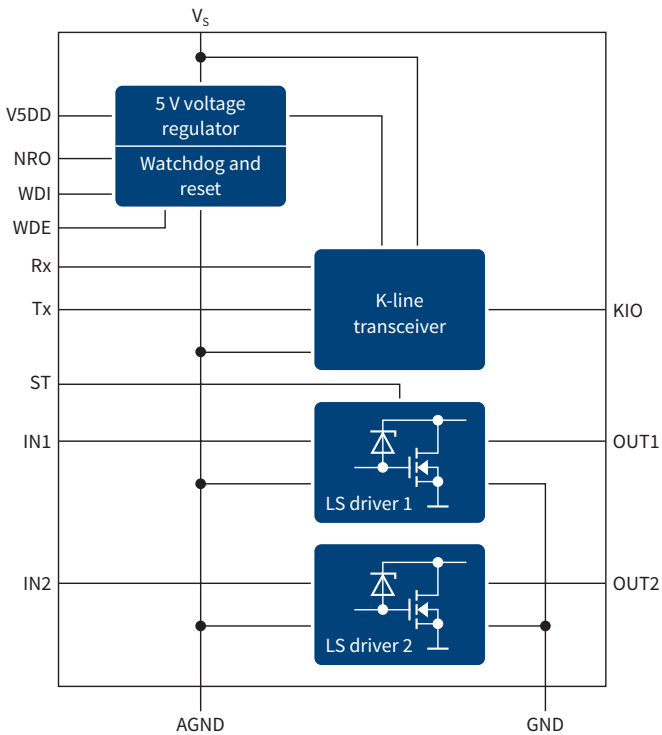


### Features of the TLE8080EM

- > 5 V supply including watchdog and reset
- > 2 low-side drivers for fuel injector and valves
- > 1 low-side driver for malfunction indicator lamp
- > 2 relay drivers
- > K-line transceiver (ISO 9141)
- > Variable reluctance sensor interface
- > SPI control
- > Package: SSOP-24 (150 mil)

# Small engine management ICs

## Block diagram TLE8088EM



### Features of the TLE8088EM

- > 5 V supply including watchdog and reset
- > 1 low-side driver for fuel injector
- > 1 low-side driver for malfunction indicator lamp
- > K-line transceiver (ISO 9141)
- > Package: SSOP-24 (150 mil)

### Applications

4-stroke small combustion engines for:

- > Motorcycles, 2- and 3-wheelers and scooters
- > Motorized watercrafts, e.g. motor boats or jet-skis
- > Snow mobiles, lawn-tractors or -mowers
- > Small gasoline-powered generators

Product name	Supply voltage funct. range [V]	5 V supply $I_{V5DD}$ (max) [mA]	$V_{5DD}$ reset threshold (typ) [V]	Power-on reset delay time (typ) [ms]	Injector $I_{OUT}$ max < 2.6 A (nom = 1.3 A)	Valve $I_{OUT}$ max < 2.6 A (nom = 1.3 A)	MIL <sup>2)</sup> $I_{OUT}$ max < 3 A (nom = 300 mA)	Relay driver max < 350 mA (nom = 300 mA)	VRS I/F variable reluctance interface	K-Line acc. ISO 9141	SPI I/F diagnosis/control I/F	Package <sup>1)</sup>
TLE8080EM	6-18	250	4.25	15	•	•	•	2x •	•	•	•	SSOP-24 EP
TLE8080-2EM	6-18	250	3.65	40	•	•	•	2x •	•	•	•	SSOP-24 EP
TLE8080-3EM	6-18	250	3.65	15	•	•	•	2x •	•	•	•	SSOP-24 EP
TLE8088EM	6-18	250	4.25	15	•	•	•			•		SSOP-24 EP

1) See packages on page 142 to 144

2) Malfunction Indicator Lamp (MIL)

# Restraint system ICs

Infiniteon, a world leading supplier of airbag ICs with more than 15 years of experience, offers several complete solutions for cost efficiency across the entire range from basic to high-end airbag systems. With a product portfolio rang-

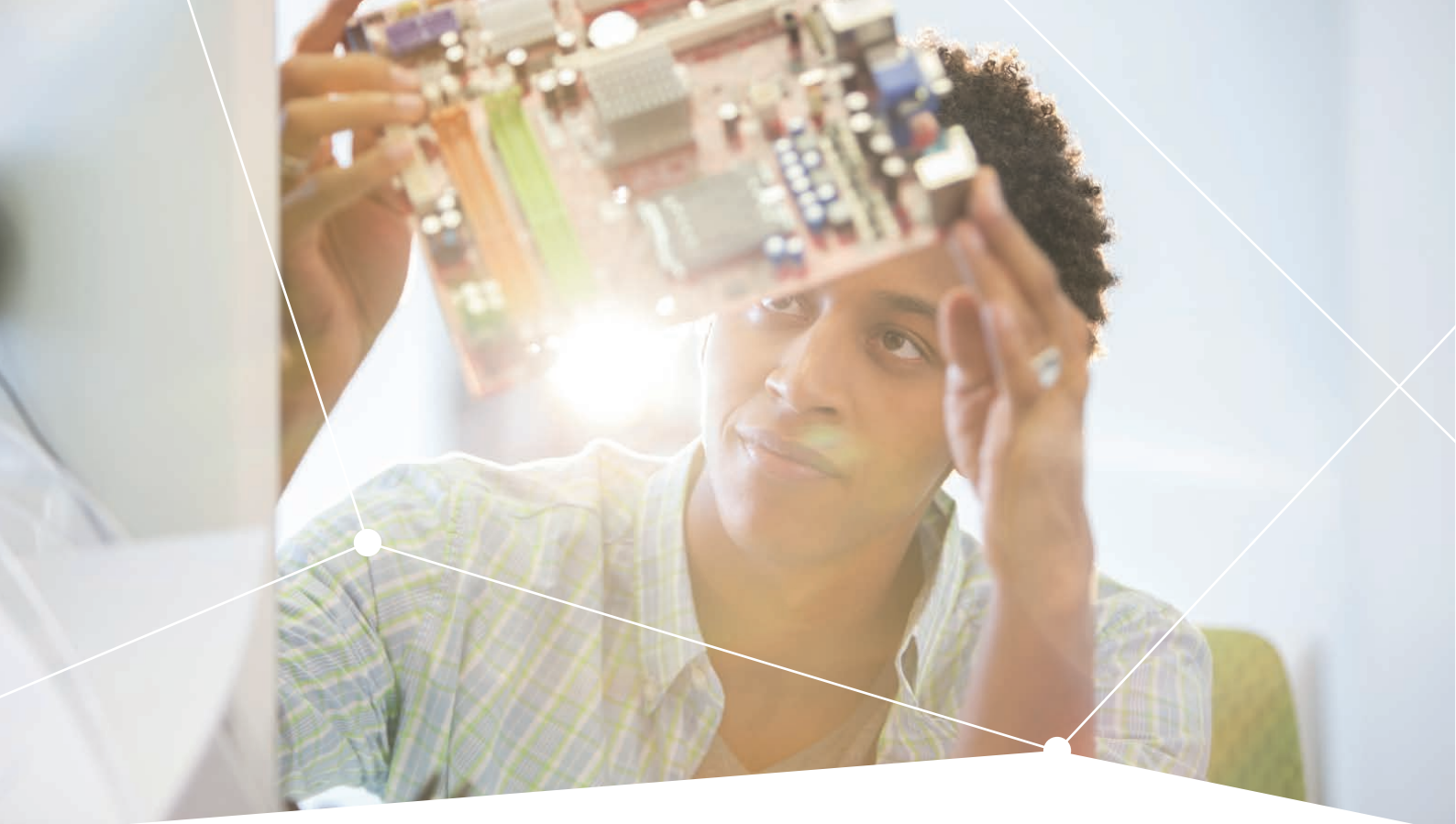
ing from high-content integrated system ICs to smart-firing ICs to power supplies, Infineon is well positioned to meet the market's requirements for cost efficiency, high quality and flexibility.

## Features

- > 16-bit Serial Peripheral Interface (SPI)
- > Squib diagnostics via resistance measurement

Airbag firing ICs										
Product name	Channels	Warning lamp output driver	Digital output for firing current detection	3.3 V compatible I/O	Buckle switch detection	Number of analog output for signal monitoring	Firing loop enable inputs	Firing current (max) [A]	Programmable deployment firing timer	Package <sup>1)</sup>
TLE7714	4	0				1	4 + SPI	1.75	4	DSO-52
TLE7718	8	0		•		1	4 + SPI	1.75	8	DSO-52
TLE8754	4	0	•	•		SPI	4 + SPI	1.20/1.75	4	VQFN-48
TLE8758	8	0	•	•		SPI	4 + SPI	1.20/1.75	8	VQFN-48

1) See packages on page 142 to 144




# Infiniteon support for engineers

At Infineon, our mission is to help you transition your idea to a fully functional solution as quickly and effortlessly as possible. This is why we place all the support, tools and information resources you need at your fingertips.

You will find production documentation like data sheets and application notes as well as design files and simulation models or evaluation boards on the **product's webpage**.

With Infineon's **Design Tool & Product Finder**, you can search Infineon's website for specific products and support materials such as evaluation boards.

## BTT6010-1EKA

<ul style="list-style-type: none"> <li>Overview</li> <li>Parameters</li> <li>Diagrams</li> <li>Documents</li> <li>Order</li> <li>Boards</li> <li>Simulation</li> <li>Videos</li> <li>Packaging</li> <li>Support</li> </ul>	<p><b>Description:</b> The BTT6010-1EKA is a 10 mΩ single channel Smart High-Side Power Switch, embedded in a PG-DSO-14-47 EP, Exposed Pad package, providing protective functions and diagnosis. The power transistor is built by an N-channel vertical power MOSFET with charge pump. The device is integrated in Smart6 technology. It is specially designed to drive lamps up to 7 x P21W 24V or 2 x 75W 24V, as well as LEDs in the harsh automotive environment.</p> <p><b>Summary of Features:</b></p> <ul style="list-style-type: none"> <li>• One channel device</li> <li>• Very low stand-by current</li> <li>• 3.3 V and 5 V compatible logic inputs</li> <li>• Electrostatic discharge protection (ESD)</li> <li>• Optimized electromagnetic compatibility</li> <li>• Logic ground independent from load ground</li> <li>• Very low power DMOS leakage current in OFF state</li> <li>• Green product (RoHS compliant)</li> <li>• AEC qualified</li> </ul> <p><b>Target Applications:</b></p> <ul style="list-style-type: none"> <li>• Suitable for resistive, inductive and capacitive loads</li> <li>• Replaces electromechanical relays, fuses and discrete circuits</li> <li>• Most suitable for loads with high inrush current, such as lamps</li> <li>• Suitable for 24V truck and transportation system</li> </ul>	<p><a href="#">Add To Cart</a></p> <p><a href="#">BTT6010-1EKA Data Sheet (2 MB, EN)</a></p> 
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Design Tools			
Thermal Simulation	Electrical Simulation	Sensor Simulation	
<ul style="list-style-type: none"> <li> IPDSIM (High Power Modules &amp; Disk Devices)</li> <li> IPM Motor Drive Simulator</li> </ul>	<ul style="list-style-type: none"> <li> Discrete IGBT Motor Drive Simulator</li> <li> Discrete IGBT Simulator</li> </ul>	<ul style="list-style-type: none"> <li> Infineon Designer Digital Prototyping</li> <li> Power Desk Sup/Buck-DC-DC POL</li> <li> Power Supply Simulation Tool</li> </ul>	<ul style="list-style-type: none"> <li> Magnetic Sensor Simulation Tool</li> </ul>
Evaluation Boards & Designs			
Simulation Models (SPICE, S-parameters, SABER)			
Software Development Kit for XMC™ (DAVE™)		Software Development Kit for TriCore™	

Parametric Product Finders			
Power Discretes & Modules	Mixed Signal & MCU	Security & Smart Card	RF & Sensor
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# Infineon support for engineers

Questions? Please contact us!

Support from our talented team of experts is available in German, English, and Mandarin.

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## Infineon for makers

Explore our portfolio for makers including shields for Arduino and tiny applications kits 2Go plus software examples and development tools.

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## Upcoming events in 2019

To get in touch with Infineon Technologies AG face-to-face and experience our company and products, you can meet us at several events throughout the year. The following link will redirect you to our event calendar.

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discretes and  
modulesLow-side  
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switchesHigh-side  
switches

LED drivers

Motor drivers

OPTIREG™  
Automotive  
Power Supply ICs

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# Symbols

Symbol	Description
$C_D$	Delay capacitor
$C_I$	Input capacitor
$C_{mod}$	Module input capacitance
$C_{oss}$	Output capacitance
$C_Q$	Output capacitor
$C_{VS}$	Supply voltage capacitance
$E_{AS}$	Maximum energy dissipation single pulse
$E_{off}$	Turn-off energy
$E_{on}$	Turn-on energy
$f_{sw}$	Switching frequency
$I_C$	Collector current
$I_D$	DC drain current
$I_{D(lim)}$	Limitation current
$I_{Dpuls}$	Pulsed-drain current
$I_{L(LIM)-Trigger}$	Load-current limitation trigger
$I_{L(SC)}$	Short circuit current
$I_{L(lim)}$	Load current limit
$I_{L(NOM)}$	Load current (TA = 85°C, specified PCB)
$I_{LIM}$	Limitation current
$I_{Nom}$	Nominal current
Inverse	Normal VS polarity and Inverse Load current
$I_{OUT}$	Output current
$I_q$	Quiescent current
$I_Q$	Output current
$P_{tot}$	Total power dissipation
PWM	Pulse Width Modulation
$Q_G$	Total gate charge
$Q_{rr}$	Reverse recovery charge
$R_{DS(on)}$	Typical drain source resistance in ON-state @ 25°C (multiply by 2 for max @ 150°C)
$R_{DS(on) path}$	Typical drain source resistance in ON-state @ 25°C of both high-side and low-side
Reverse	Reverse VS polarity and reverse load current
$R_{ext}$	External resistor
$R_{pullup1}$	Pull-up resistor
$R_{pullup2}$	Pull-up resistor
$R_{Sense}$	Sense resistance
$R_{thJC}$	Thermal resistance junction to case
$T_j$	Junction temperature
$T_{SC}$	Short circuit temperature

Symbol	Description
$V_{5DD}$	5 V supply output
$V_{AC}$	Alternate-current voltage
$V_{Adj}$	Adjustment voltage
$V_{Batt}$	Battery voltage
$V_{CC}$	Supply voltage
$V_{ce(on)}$	Collector-emitter on voltage
$V_{ces}$	Collector-emitter saturation voltage
$V_{CL}$	Clamp voltage
$V_{DD}$	Supply voltage
$V_{DDEXT}$	External supply
$V_{DS}$	Drain source voltage
$V_{DS(AZ)}$	Drain source voltage (active Zener)
$V_{en}$	Enable voltage
$V_f$	Forward voltage
$V_{GS}$	Gate source voltage
$V_{GS(th)}$	Gate threshold voltage
$V_{IN}$	Input voltage
$V_{IO}$	Input/output voltage
$V_{OUT}$	Output voltage
$V_Q$	Output voltage
$V_{REF}$	Reference voltage
$V_{reg}$	Voltage regulator
$V_S$	Supply voltage
$V_{S(OP)}$	Operation supply voltage
$V_{sat path}$	Path saturation voltage
$V_{Sense}$	Sense voltage

# Infineon's next level of zero defect program

## On the way to zero-defect products and services

The most valuable aspect of cars is the people they carry. Therefore, safety should never be compromised. This is the most important consideration for everybody involved in making automobiles – from the smallest suppliers to the manufacturers themselves. As car components become more and more complex, and as the number of control units in vehicles increases, the likelihood of a product failure becomes greater. Quality performance is a key differentiator for automotive market success. Our target of Zero-Defect means:

- › No quality events
- › Defect-free product launches
- › Automotive product quality of zero failed parts per million
- › Low non-conformance costs
- › Highest quality image in the market
- › More business due to satisfied customers

### No compromise when it comes to quality

Infineon established the most comprehensive quality program called "AUTOMOTIVE EXCELLENCE" in the semiconductor industry in 2003. The continuation of the successful "Automotive Excellence" program is "NEXT LEVEL of ZERO DEFECT". The Program is founded on four pillars: people, products, processes and production. Due to our "no compromise" policy in all four pillars our program really works. Our employees truly live the credos of Zero Defect, considering the highest quality requirements and understanding the importance of prevention. They are trained to deeply understand the tools and methods used to avoid deviations and to solve problems by addressing both technical and systemic root causes.

### On the way to zero-defect products

On the way to zero-defect products, some examples:

- › BEAR (Back End Automation Roadmap) project reduces manual handling“
- › Top5 Defects Reduction in Backend” deeply addresses technical and systemic root causes
- › Quality Firewall: Subproject “Highest outgoing product quality by intelligent outlier screening”
- › Extend “Next Level of Zero Defect” into supplier base

### “Next Level of Zero Defect” is your competitive advantage

Many of our partners have expressed their satisfaction with the quality of our products and the way we execute “Next Level of Zero Defect”.

- › „Honor Quality Award Toyota Hirose“ received in 2010 for zero defect quality for last four years. Infineon is the First non- Japanese company that received this honour in this highest level category.
- › 7 quality awards in 2004, 2006, 2007, 2008, 2009, 2010 and 2011 from Toyota's Hirose plant.
- › “Supplier Performance Award” for the year 2008 and “Automotive Supplier of the Year 2009, 2010 and 2011” from Continental
- › “Excellent Supplier Award 2008” from Hitachi Cable Japan

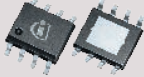
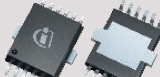






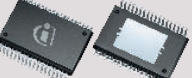








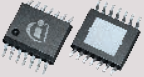



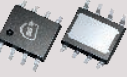

Our quality is clearly seen as the industry benchmark by almost all of our automotive customers.



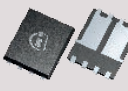































# Infineon packages<sup>1)</sup>

DSO-8 	DSO-8 EP 	DSO-12 	DSO-14 	DSO-14 EP 	DSO-20 
DSO-20 EP 	DSO-20 (Heatslug) 	DSO-20 (Power-SO) 	DSO-24 	DSO-28 	DSO-36 
DSO-36 (Dual gauge) 	DSO-36 EP 	DSO-36 (Power-SO) 	DSO-52 	HSOF-8 TOLL (TO-Leadless) 	HSOG-8 
LQFP-64 	LQFP-100 	MQFP-64 (Power) 	SC59 	SC74 TSOP-6/6 dual 	SCT595-5 
SOT23 	SOT89 	SOT223 	SOT323 	SOT343 	SOT363/dual 
SSOP-14 EP 	SSOP-16 	SSOP-24 	SSOP-24 EP 	TDSO-8 EP 	TDSON-8-4 SuperSO8 dual 

1) For further information on Infineon packages, please visit our internet site at [www.infineon.com/packages](http://www.infineon.com/packages)

<p>TDSON-8-10 SuperSO8 dual</p> 	<p>TDSON-8-33/34 SuperSO8 single</p> 	<p>TO252-3 (DPAK)</p> 	<p>TO252-5 (DPAK 5-leg)</p> 	<p>TO263-3 (D<sup>2</sup>PAK)</p> 	<p>TO263-3-2</p> 
<p>TO263-5 (D<sup>2</sup>PAK 5-leg)</p> 	<p>TO263-5-2</p> 	<p>TO263-7 (D<sup>2</sup>PAK 7-leg)</p> 	<p>TO263-7-3/10</p> 	<p>TQFP-48 EP</p> 	<p>TSDSO-14</p> 
<p>TSDSO-14 EP</p> 	<p>TSDSO-24</p> 	<p>TSDSO-24 EP</p> 	<p>TSDSON-8</p> 	<p>TSOP-8</p> 	<p>TSOP-10</p> 
<p>TSOP-14</p> 	<p>TSSOP-14</p> 	<p>TSSOP-16</p> 	<p>VQFN-48</p> 	<p>TO220-3</p> 	<p>TO220-5-11</p> 
<p>TO220-5-12</p> 	<p>TO220-7-11</p> 	<p>TO220-7-12</p> 	<p>TO247-3</p> 	<p>TO262-3</p> 	

# Former IR packages<sup>1)</sup>

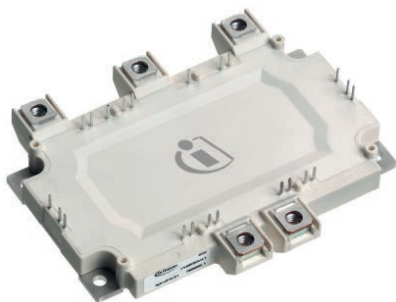
Valid for former IR products and product types starting with AU... or Al...

DirectFET™2 L6	DirectFET™2 L8	DirectFET™2 M2	DirectFET™2 M4	DirectFET™2 SB	DirectFET™2 SC
DSO-28 (28 lead SOIC)	PQFN 5x6 mm	PQFN 5x6 dual	SO-8 (DSO-8)	SO-14 NB (14 lead SOIC)	SO-16 NB (16 lead SOIC)
SO-16 WB (16 lead SOIC)	SOT-223	TO-252 (DPAK 3-leg)	TO-252 (DPAK 5-leg)	TO-263-3 (D <sup>2</sup> PAK 3-leg)	TO-263-5 (D <sup>2</sup> PAK 5-leg)
TO-263-7 (D <sup>2</sup> PAK 7-leg)	IPAK (TO-262)	Super TO-220	Super TO-247	TO-220	TO-220 FullPak
TO-247	TO-247AC	TO-262	TO-262 WideLead	TO-263CA 7 pin	

1) For further information, please visit our internet site at [www.infineon.com/packages](http://www.infineon.com/packages)

# Infineon Power Modules

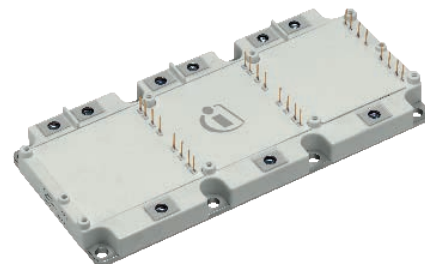
HybridPACK™ 1



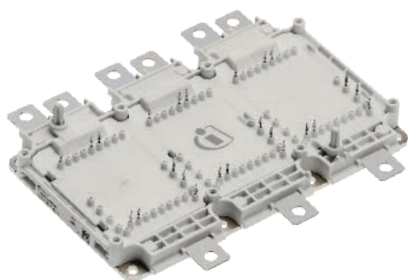
HybridPACK™ Light



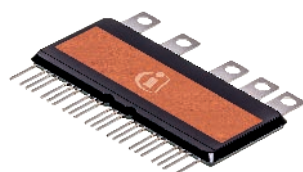
HybridPACK™ 2 Enhanced



HybridPACK™ Drive



HybridPACK™ DSC L



HybridPACK™ DSC S



Automotive Easy 1B



Automotive Easy 2B



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- > Direct access ..... +49 89 234-0 (interconnection fee, German/English)

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