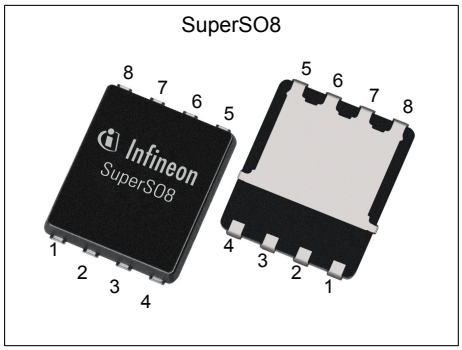
MOSFET

OptiMOS™3 M-Series Power-MOSFET, 30 V



Features

- Optimized for 5V driver application (Notebook, VGA, POL)
- Low FOM_{SW} for High Frequency SMPS
- 100% Avalanche tested
- N-channel
- Very low on-resistance $R_{DS(on)}$ @ V_{GS}=4.5 V
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Qualified according to JEDEC[1)] for target applications
- Superior thermal resistance
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

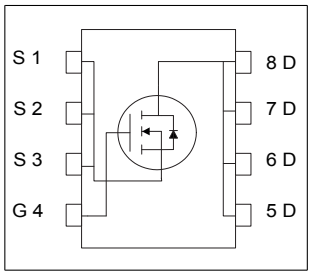


Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	30	V
$R_{DS(on),max}$, V_{GS}=10 V	2	mΩ
$R_{DS(on),max}$, V_{GS}=4.5 V	2.5	mΩ
I_D	176	A

Type / Ordering Code	Package	Marking	Related Links
BSC020N03MS G	PG-TDSON-8	020N03MS	-

[1)] J-STD20 and JESD22

Table of Contents

1 Maximum ratings

at T_A=25 °C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current[1]	I_D	- - - - -	- - - - -	176 111 158 100 25	A	V_{GS}=10 V, T_C=25 °C V_{GS}=10 V, T_C=100 °C V_{GS}=4.5 V, T_C=25 °C V_{GS}=4.5 V, T_C=100 °C V_{GS}=4.5 V, T_A=25 °C, R_{thJA}=50 K/W[2]
Pulsed drain current[3]	$I_{D,pulse}$	-	-	704	A	T_C=25 °C
Avalanche current, single pulse[4]	I_{AS}	-	-	50	A	T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	200	mJ	I_D=50 A, R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	- -	- -	96 2.5	W	T_C=25 °C T_A=25 °C, R_{thJA}=50 K/W[2]
Operating and storage temperature	T_j, T_{stg}	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	-	1.3	K/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	18	K/W	-
Device on PCB, 6 cm^2 cooling area[2]	R_{thJA}	-	-	50	K/W	-

[1] Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature at 25°C. For higher case temperature please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.
[2] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.
[3] See Diagram 3 for more detailed information
[4] See Diagram 13 for more detailed information

3 Electrical characteristics

at T_j=25 °C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	1	-	2	V	V_{DS}=V_{GS}, I_D=250 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	µA	V_{DS}=30 V, V_{GS}=0 V, T_j=25 °C V_{DS}=30 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=16 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	- -	2.0 1.7	2.5 2.0	mΩ	V_{GS}=4.5 V, I_D=30 A V_{GS}=10 V, I_D=30 A
Gate resistance	R_G	0.9	1.9	3.3	Ω	-
Transconductance	g_{fs}	60	120	-	S	|V_{DS}|>2|I_D|$R_{DS(on)max}$, I_D=30 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance[1)]	C_{iss}	-	7200	9600	pF	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz
Output capacitance[1)]	C_{oss}	-	1900	2500	pF	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz
Reverse transfer capacitance	C_{rss}	-	150	-	pF	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	27	-	ns	V_{DD}=15 V, V_{GS}=4.5 V, I_D=30 A, R_G=1.6 Ω
Rise time	t_r	-	14	-	ns	V_{DD}=15 V, V_{GS}=4.5 V, I_D=30 A, R_G=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	36	-	ns	V_{DD}=15 V, V_{GS}=4.5 V, I_D=30 A, R_G=1.6 Ω
Fall time	t_f	-	14	-	ns	V_{DD}=15 V, V_{GS}=4.5 V, I_D=30 A, R_G=1.6 Ω

Table 6 Gate charge characteristics[2)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge[1)]	Q_{gs}	-	19	25	nC	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V
Gate charge at threshold[1)]	$Q_{g(th)}$	-	11	15	nC	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V
Gate to drain charge[1)]	Q_{gd}	-	9.7	16	nC	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V
Switching charge[1)]	Q_{sw}	-	17	26	nC	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V
Gate charge total[1)]	Q_g	-	45	60	nC	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V
Gate plateau voltage	$V_{plateau}$	-	2.6	-	V	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V
Gate charge total[1)]	Q_g	-	93	124	-	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 10 V
Gate charge total, sync. FET[1)]	$Q_{g(sync)}$	-	39	52	nC	V_{DS}=0.1 V, V_{GS}=0 to 4.5 V
Output charge[1)]	Q_{oss}	-	51	68	-	V_{DD}=15 V, V_{GS}=0 V

[1)] Defined by design. Not subject to production test
[2)] See figure 16 for gate charge parameter definition.

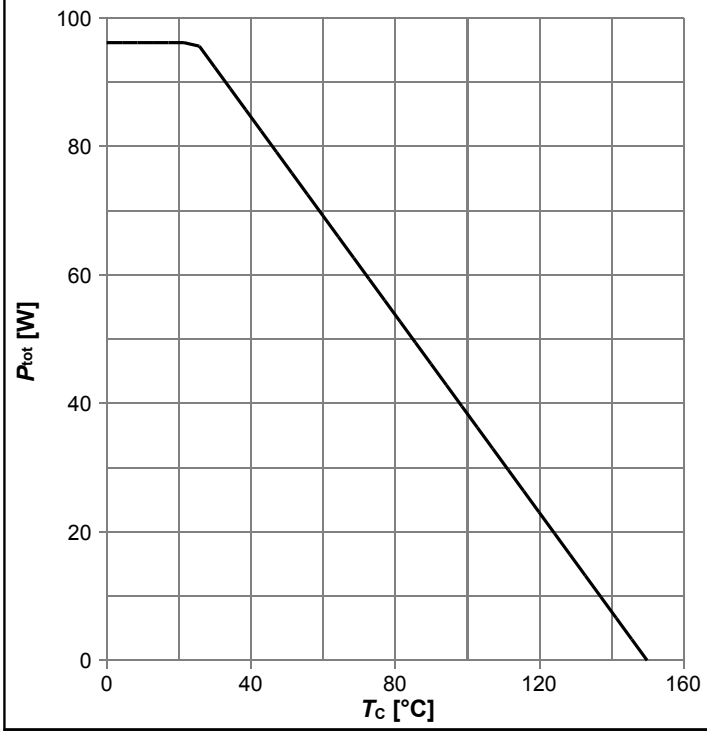
Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	87	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$	-	-	704	A	T_C=25 °C
Diode forward voltage	V_{SD}	-	0.81	1.1	V	V_{GS}=0 V, I_F=30 A, T_j=25 °C
Reverse recovery charge[1)]	Q_{rr}	-	-	20	nC	V_R=15 V, I_F=I_S, di_F/dt=400 A/µs

[1)] Defined by design. Not subject to production test

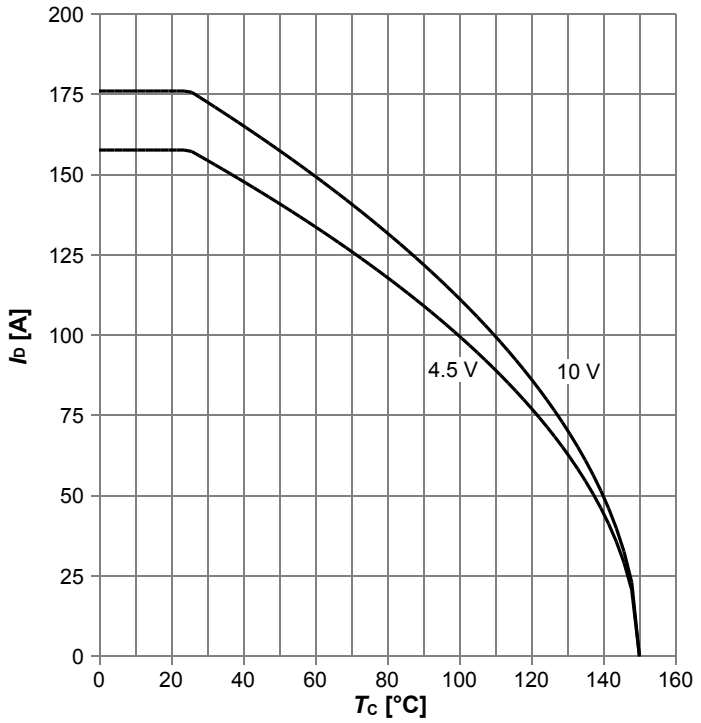
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



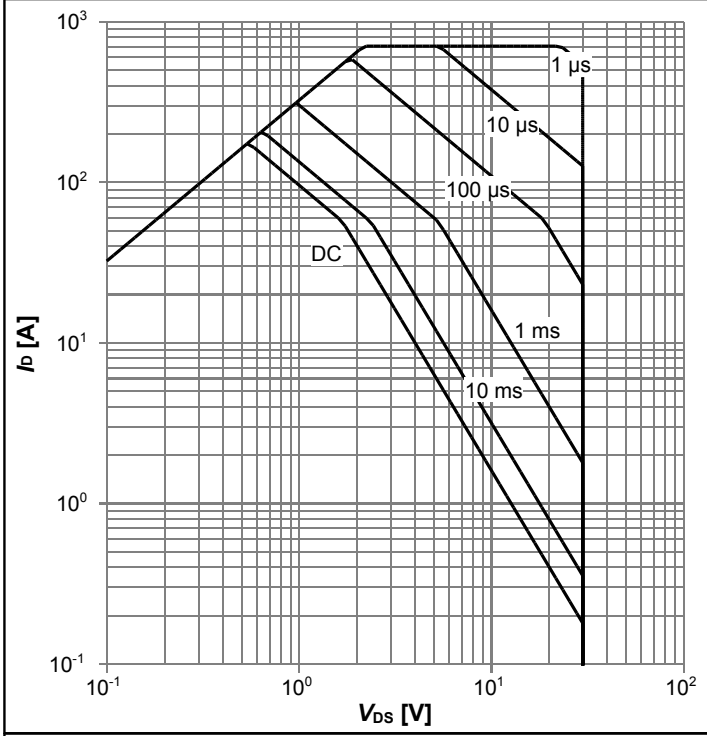
$P_{tot}=f(T_C)$

Diagram 2: Drain current



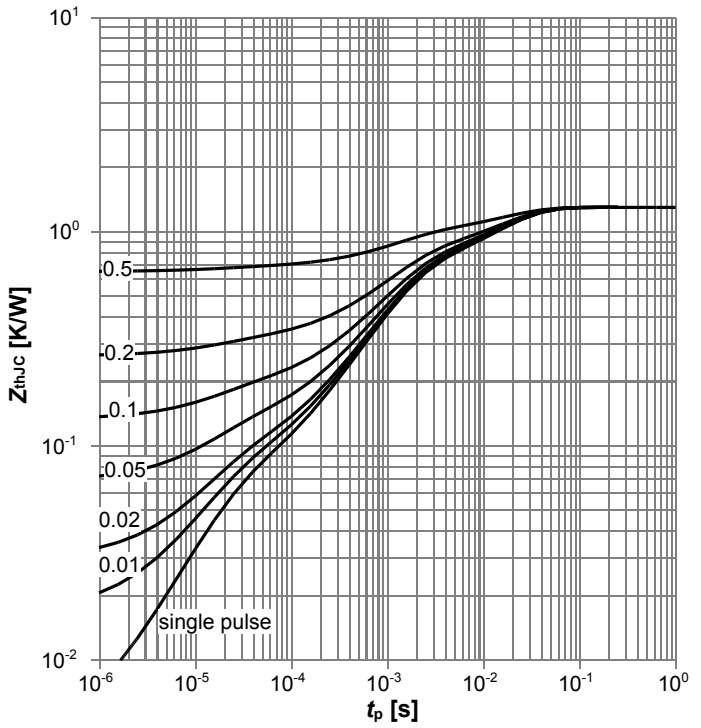
$I_D=f(T_C)$; parameter: V_{GS}

Diagram 3: Safe operating area



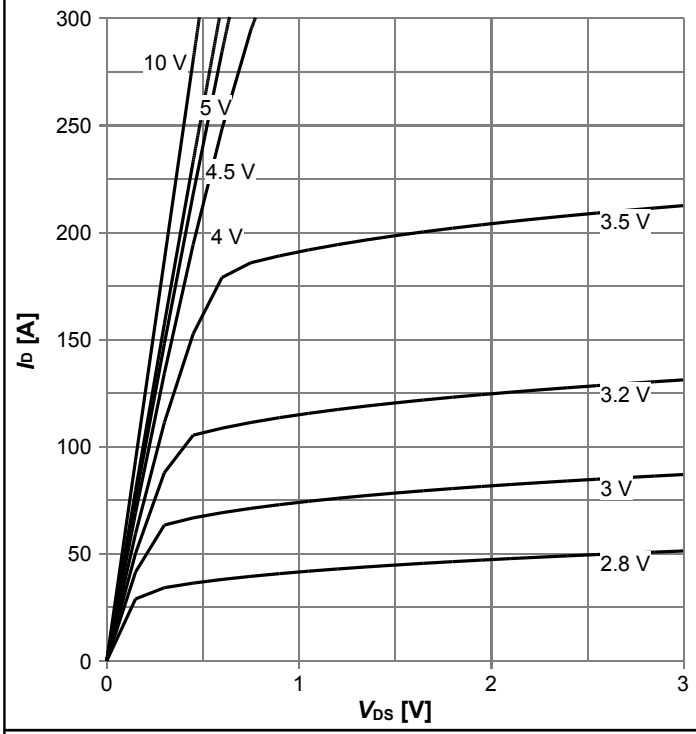
$I_D=f(V_{DS})$; T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



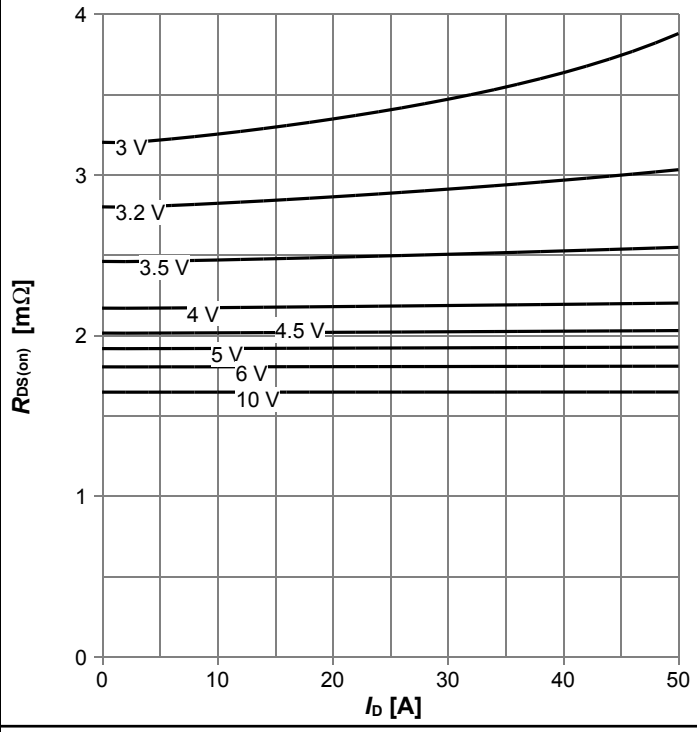
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



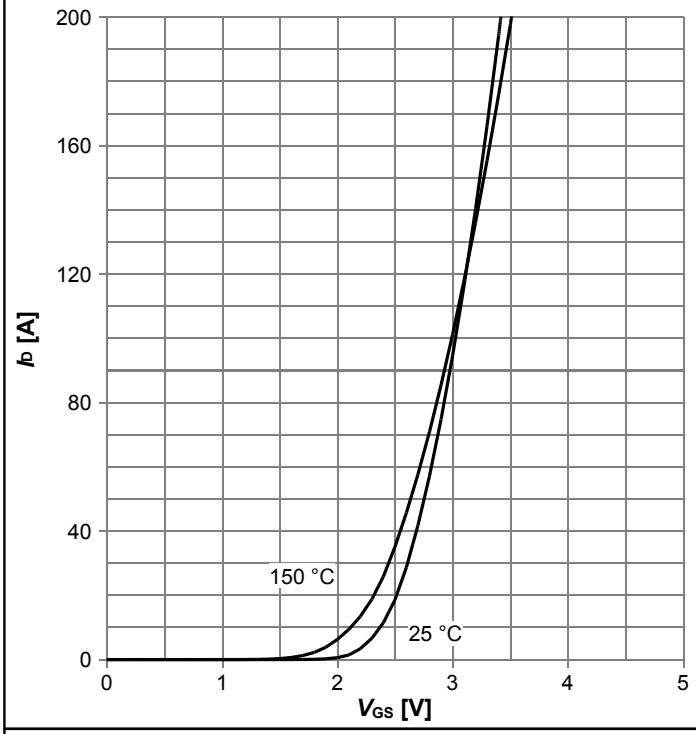
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



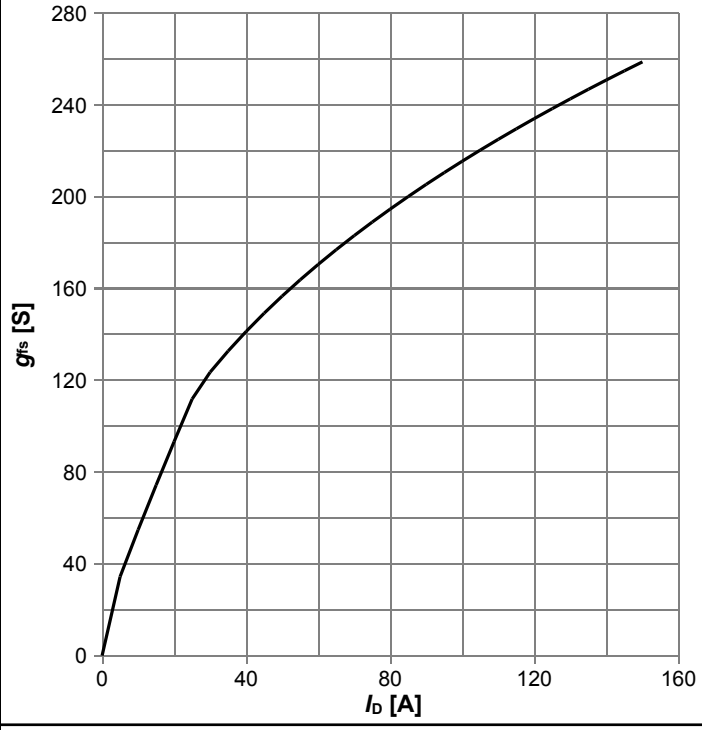
$R_{DS(on)}=f(I_D)$; $T_j=25$ °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



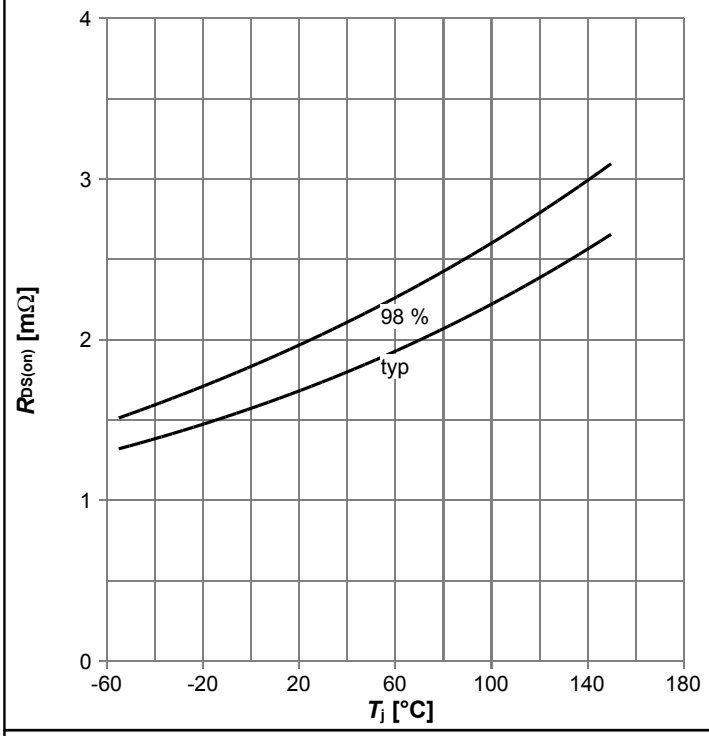
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



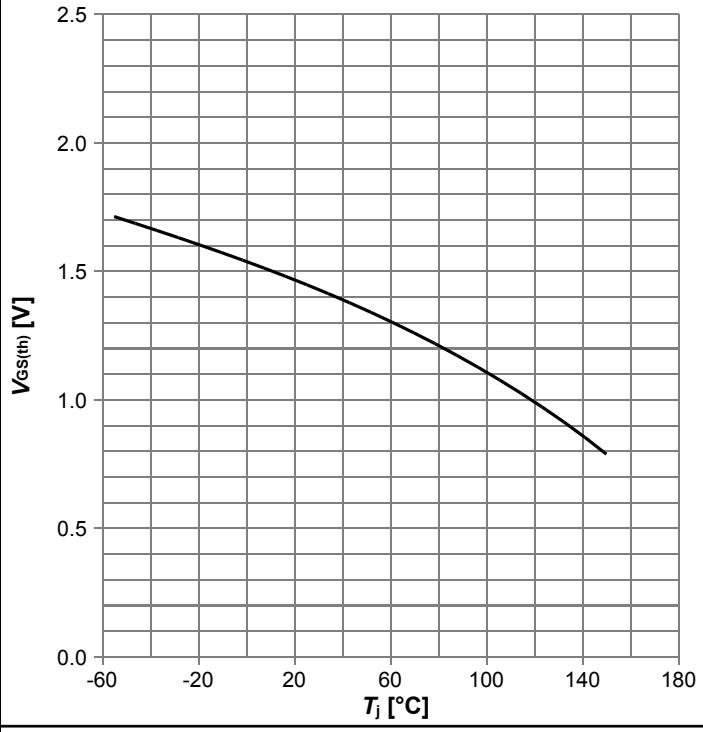
$g_{fs}=f(I_D)$; $T_j=25$ °C

Diagram 9: Drain-source on-state resistance



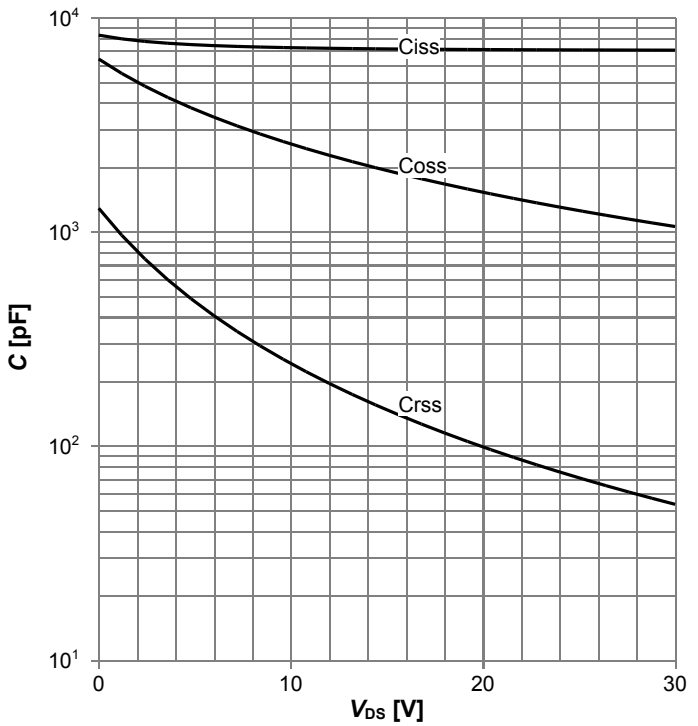
$R_{DS(on)}=f(T_j)$; I_D=30 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



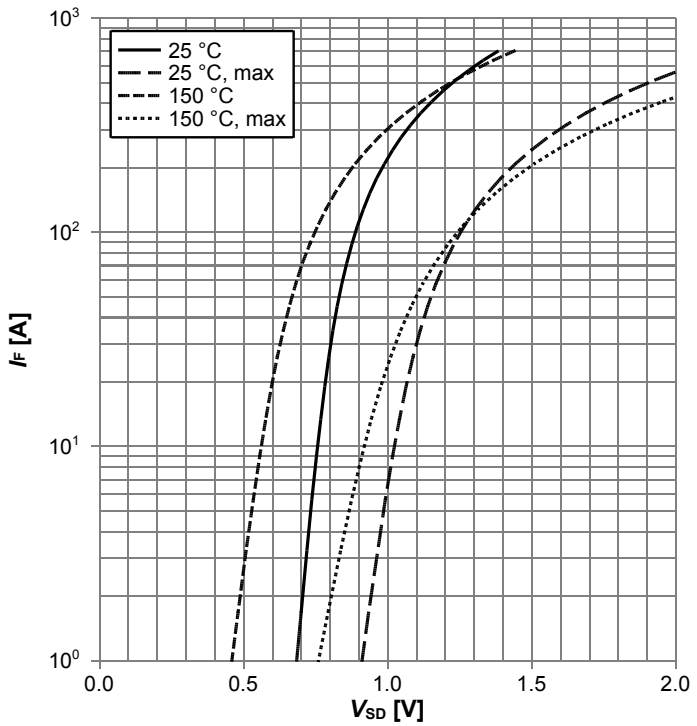
$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$; I_D=250 µA

Diagram 11: Typ. capacitances



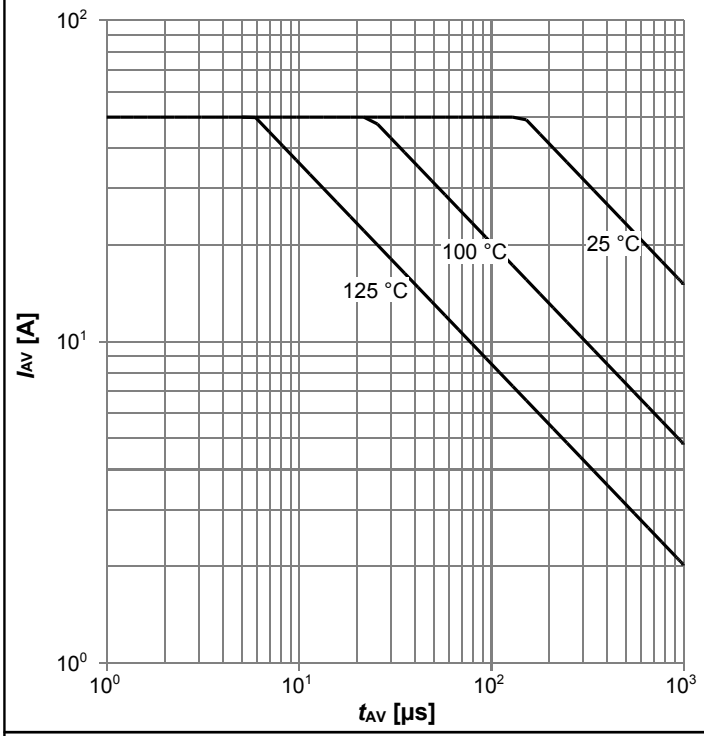
$C=f(V_{DS})$; V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



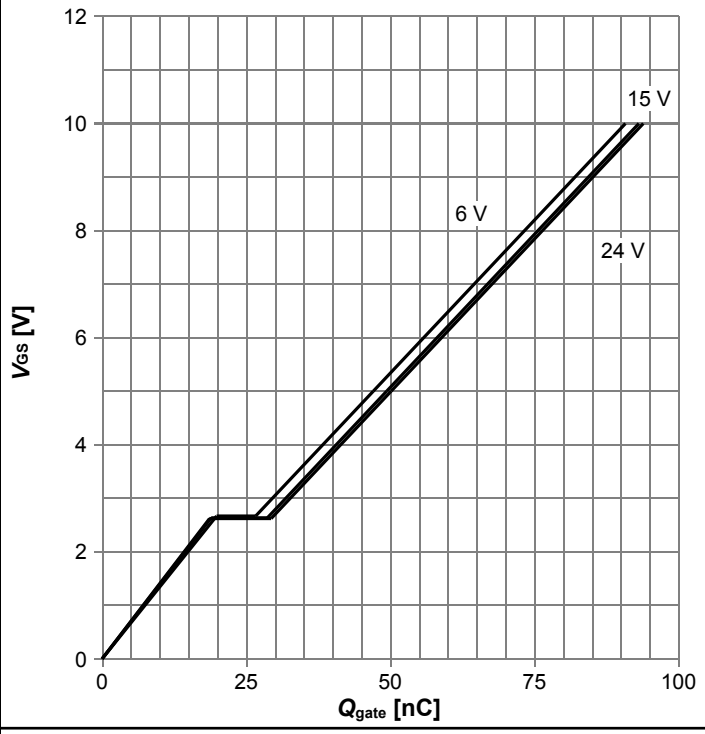
$I_F=f(V_{SD})$; parameter: T_j

Diagram 13: Avalanche characteristics



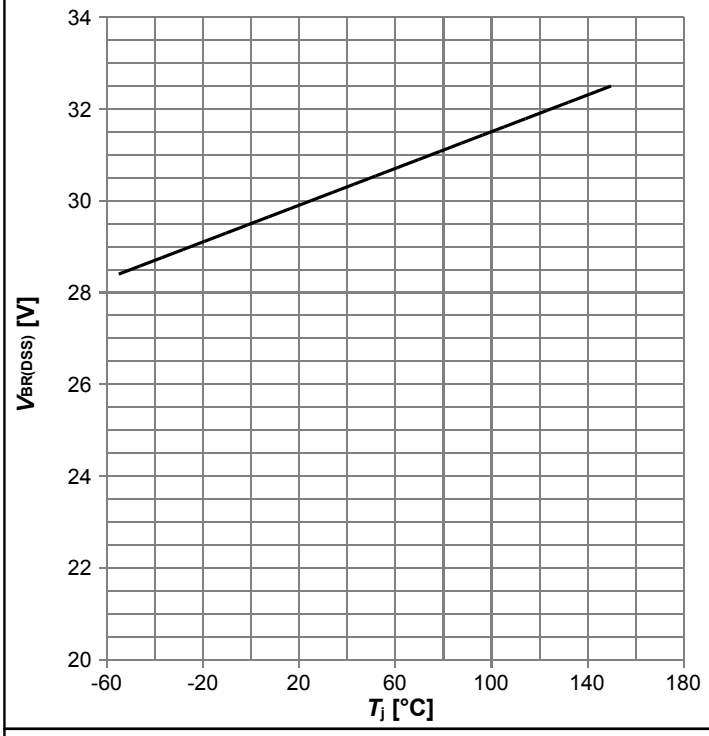
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



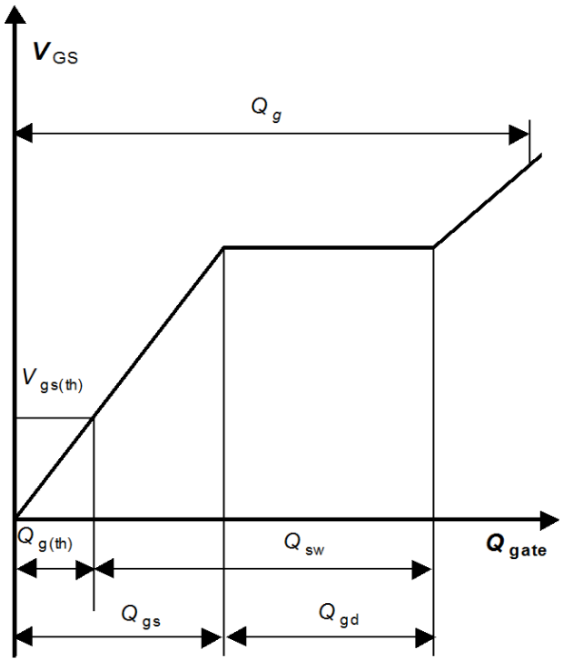
V_{GS}=f(Q_{gate}); I_D=30 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

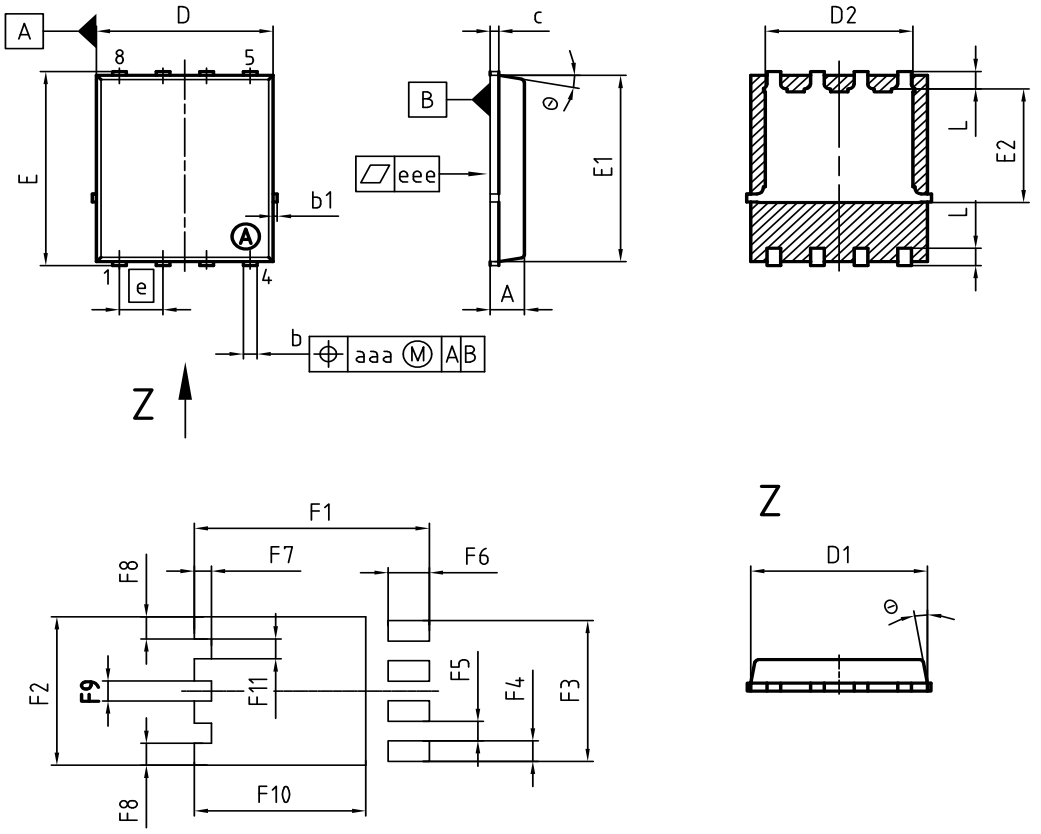


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram Gate charge waveforms



5 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.10	0.035	0.043
b	0.34	0.54	0.013	0.021
b1	0.02	0.22	0.001	0.008
c	0.15	0.35	0.006	0.014
D=D1	4.95	5.35	0.195	0.211
D2	4.20	4.40	0.165	0.173
E	5.95	6.35	0.234	0.250
E1	5.70	6.10	0.224	0.240
E2	3.40	3.80	0.134	0.150
e	1.27		0.050	
N	8		8	
L	0.45	0.65	0.018	0.026
Θ	8.5°	11.5°	8.5°	11.5°
aaa	0.25		0.010	
eee	0.05		0.002	
F1	6.75	6.95	0.266	0.274
F2	4.60	4.80	0.181	0.189
F3	4.36	4.56	0.172	0.180
F4	0.55	0.75	0.022	0.030
F5	0.52	0.72	0.020	0.028
F6	1.10	1.30	0.043	0.051
F7	0.40	0.60	0.016	0.024
F8	0.60	0.80	0.024	0.031
F9	0.53	0.73	0.021	0.029
F10	4.90	5.10	0.193	0.201
F11	0.53	0.73	0.021	0.029

DOCUMENT NO.
Z8B00003332

SCALE
0
2.5
0 2.5
5mm

EUROPEAN PROJECTION

ISSUE DATE
08-03-2007

REVISION
03

Figure 1 Outline PG-TDSON-8, dimensions in mm/inches

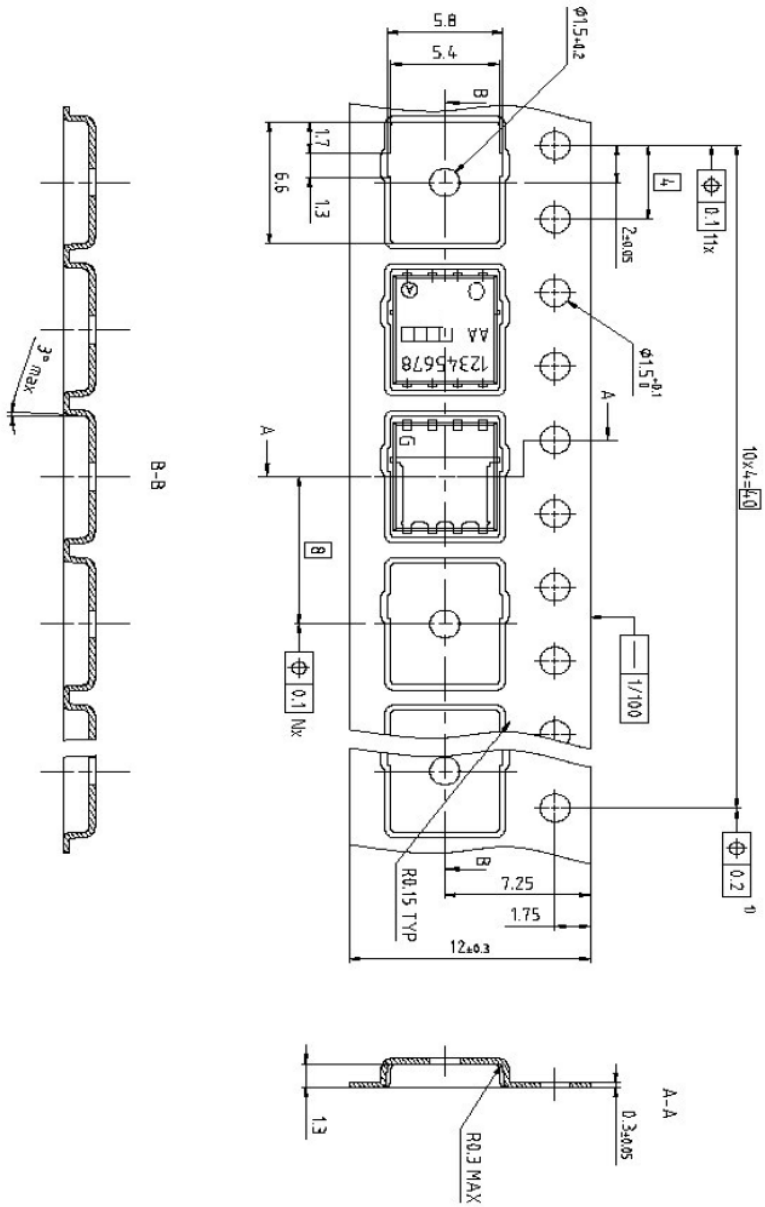


Figure 2 Outline Tape (PG-TDSON-8), dimensions in mm

Revision History

BSC020N03MS G

Revision: 2020-08-14, Rev. 2.1

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.1	2020-08-14	Update current and footnotes

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