

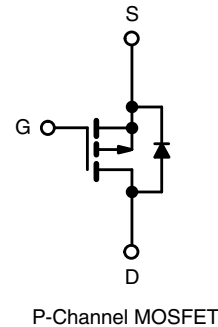
Automotive P-Channel 40 V (D-S) 175 °C MOSFET



FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- 100 % R_{θ} and UIS tested
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

 AUTOMOTIVE
GRADE

RoHS
COMPLIANT
HALOGEN
FREE


PRODUCT SUMMARY	
V_{DS} (V)	-40
$R_{DS(on)}$ (Ω) at $V_{GS} = -10$ V	0.0115
$R_{DS(on)}$ (Ω) at $V_{GS} = -4.5$ V	0.0150
I_D (A)	-50
Configuration	Single
Package	TO-252

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	-40	V
Gate-source voltage		V_{GS}	± 20	
Continuous drain current	$T_C = 25$ °C ^a	I_D	-50	A
	$T_C = 125$ °C		-31	
Continuous source current (diode conduction) ^a		I_S	-50	
Pulsed drain current ^b		I_{DM}	-180	
Single pulse avalanche current	L = 0.1 mH	I_{AS}	-27	
Single pulse avalanche energy		E_{AS}	36.4	
Maximum power dissipation ^b	$T_C = 25$ °C	P_D	62	W
	$T_C = 125$ °C		20	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +175	°C

THERMAL RESISTANCE RATINGS				
PARAMETER		SYMBOL	LIMIT	UNIT
Junction-to-ambient	PCB mount ^c	R_{thJA}	50	°C/W
Junction-to-case (drain)		R_{thJC}	2.4	

Notes

- Package limited
- Pulse test; pulse width ≤ 300 μ s, duty cycle ≤ 2 %
- When mounted on 1" square PCB (FR4 material)

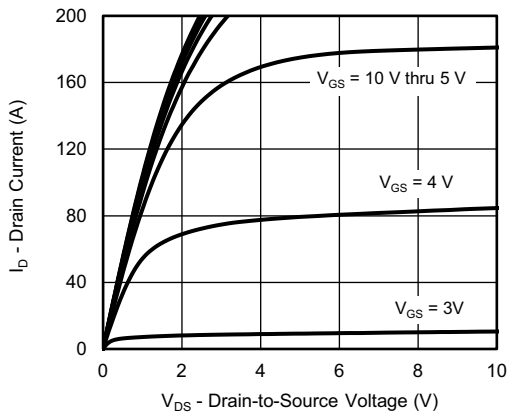
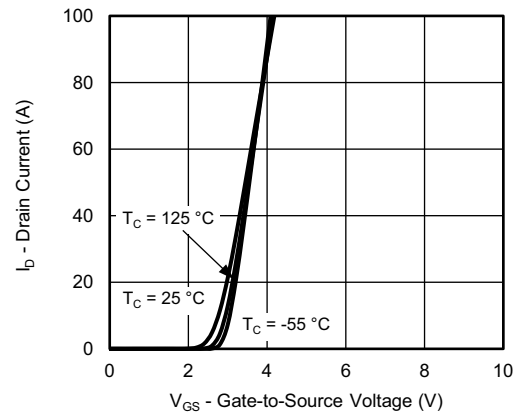
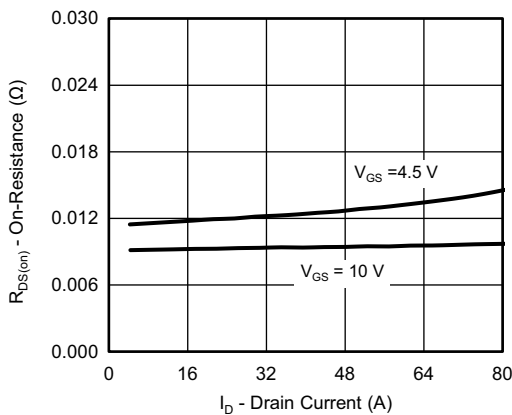
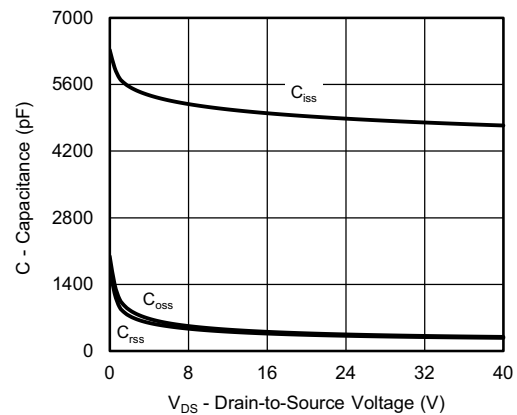
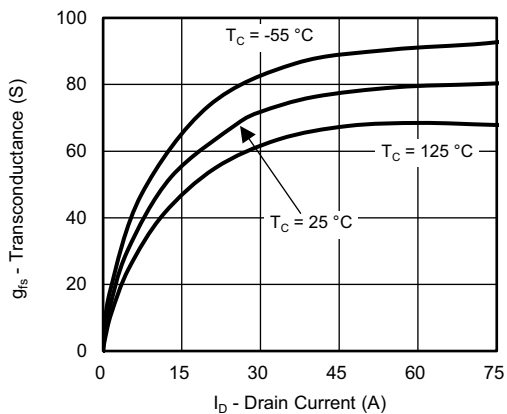
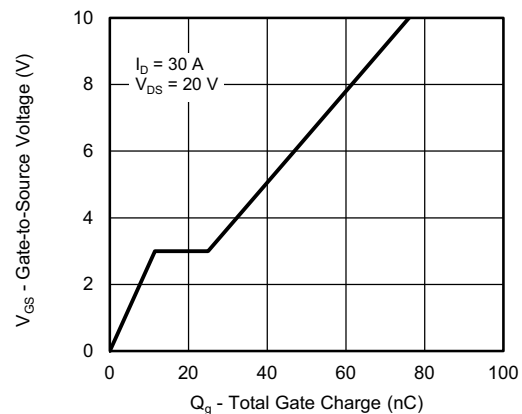


SPECIFICATIONS (T _C = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V _{DS}	V _{GS} = 0 V, I _D = -250 μA		-40	-	-	V
Gate-source threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA		-1.5	-2	-2.5	
Gate-source leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V		-	-	± 100	nA
Zero gate voltage drain current	I _{DSS}	V _{GS} = 0 V	V _{DS} = -40 V	-	-	-1	μA
		V _{GS} = 0 V	V _{DS} = -40 V, T _J = 125 °C	-	-	-50	
		V _{GS} = 0 V	V _{DS} = -40 V, T _J = 175 °C	-	-	-250	
On-state drain current ^a	I _{D(on)}	V _{GS} = -10 V	V _{DS} ≥ 5 V	-30	-	-	A
Drain-source on-state resistance ^a	R _{DS(on)}	V _{GS} = -10 V	I _D = -30 A	-	0.0095	0.0115	Ω
		V _{GS} = -10 V	I _D = -30 A, T _J = 125 °C	-	-	0.0171	
		V _{GS} = -10 V	I _D = -30 A, T _J = 175 °C	-	-	0.0203	
		V _{GS} = -4.5 V	I _D = -25 A	-	0.0121	0.0150	
Forward transconductance ^b	g _{fs}	V _{DS} = -15 V, I _D = -30 A		-	71	-	S
Dynamic ^b							
Input capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = -25 V, f = 1 MHz	-	4872	6600	pF
Output capacitance	C _{oss}			-	344	500	
Reverse transfer capacitance	C _{rss}			-	316	450	
Total gate charge ^c	Q _g	V _{GS} = -10 V	V _{DS} = -20 V, I _D = -30 A	-	76	115	nC
Gate-source charge ^c	Q _{gs}			-	11.5	-	
Gate-drain charge ^c	Q _{gd}			-	13.5	-	
Gate resistance	R _g	f = 1 MHz		2	4	6	Ω
Turn-on delay time ^c	t _{d(on)}	V _{DD} = -20 V, R _L = 0.7 Ω I _D ≡ -30 A, V _{GEN} = -10 V, R _g = 1 Ω		-	13	20	ns
Rise time ^c	t _r			-	7	15	
Turn-off delay time ^c	t _{d(off)}			-	66	100	
Fall time ^c	t _f			-	28	45	
Source-Drain Diode Ratings and Characteristics ^b							
Pulsed current ^a	I _{SM}			-	-	-180	A
Forward voltage	V _{SD}	I _F = -30 A, V _{GS} = 0 V		-	-0.9	-1.5	V
Body diode reverse recovery time	t _{rr}	I _F = -30 A, di/dt = 100 A/μs		-	43	90	ns
Body diode reverse recovery charge	Q _{rr}			-	45	100	nC
Reverse recovery fall time	t _a			-	26	-	ns
Reverse recovery rise time	t _b			-	17	-	
Body diode peak reverse recovery current	I _{RM(REC)}					-	-2.8

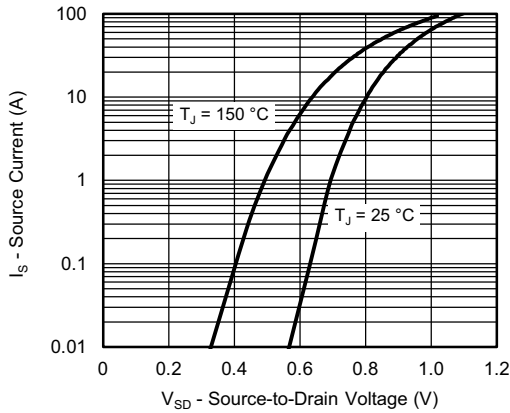
Notes

- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %
- b. Guaranteed by design, not subject to production testing
- c. Independent of operating temperature

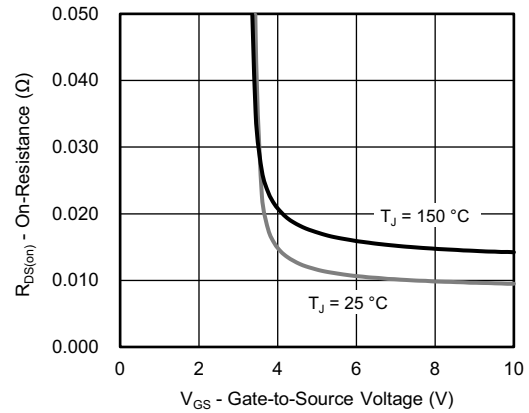
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Transconductance

Gate Charge

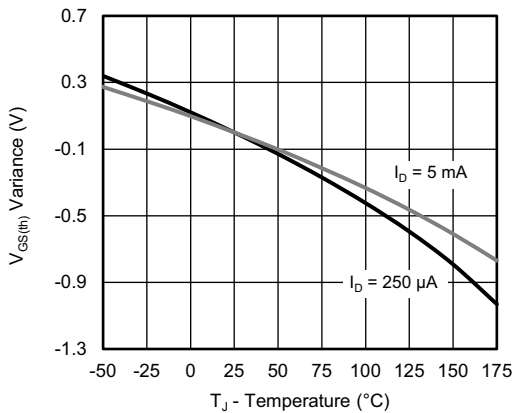
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



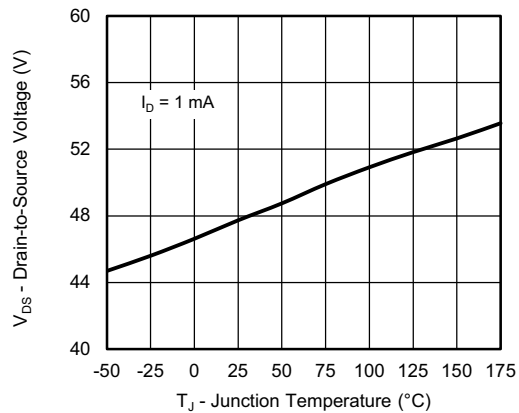
Source Drain Diode Forward Voltage



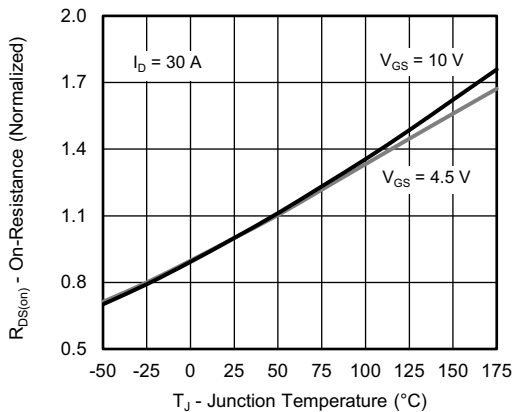
On-Resistance vs. Gate-to-Source Voltage



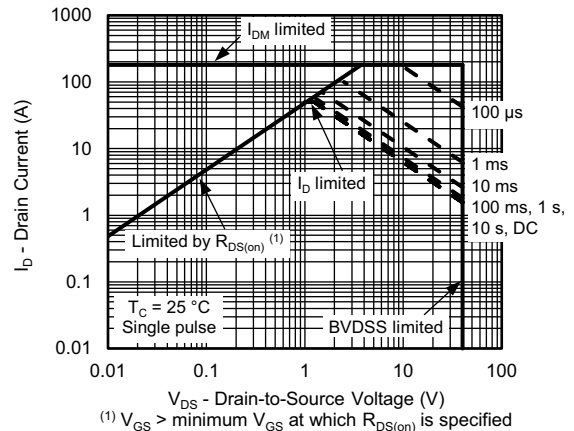
Threshold Voltage



Drain Source Breakdown vs. Junction Temperature



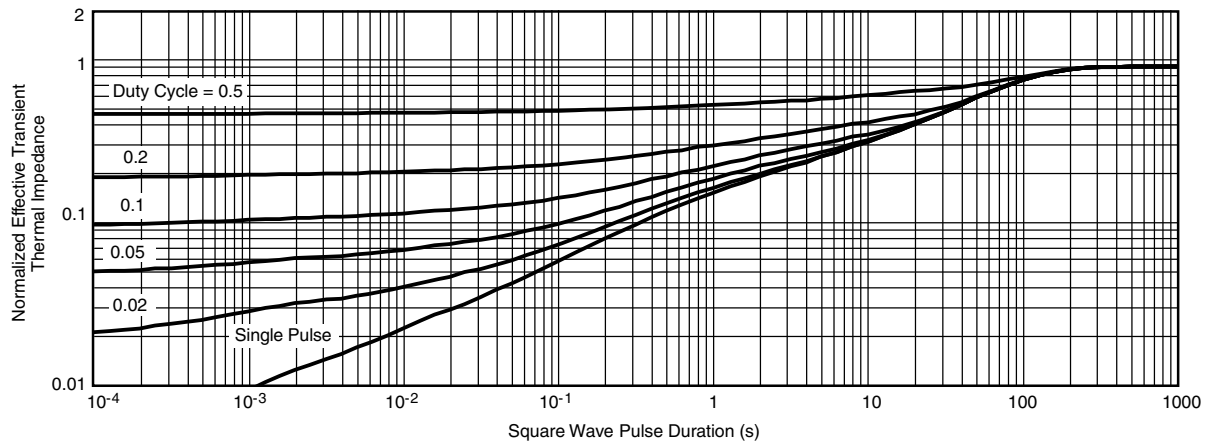
On-Resistance vs. Junction Temperature



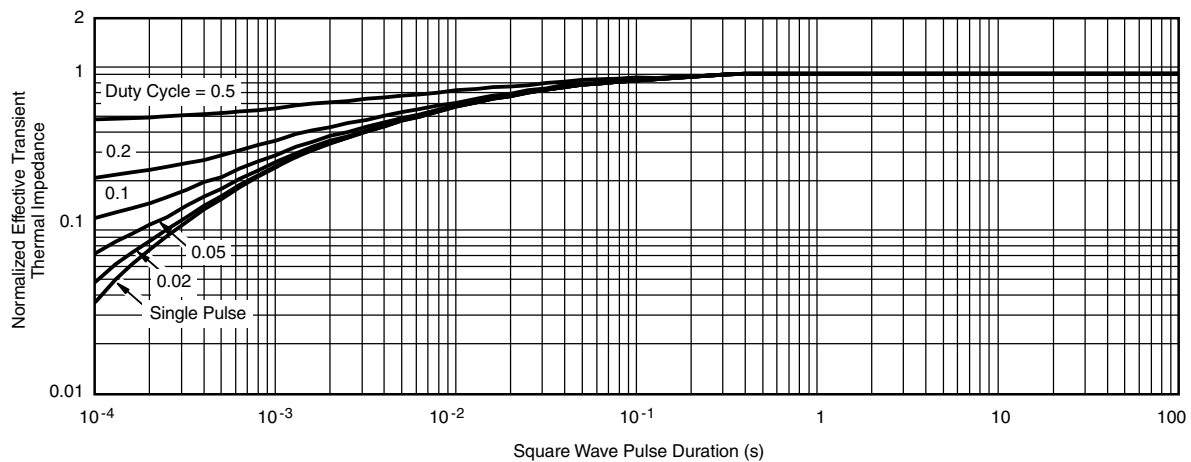
Safe Operating Area



THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

Note

- The characteristics shown in the two graphs
 - Normalized Transient Thermal Impedance Junction to Ambient ($25\text{ }^\circ\text{C}$)
 - Normalized Transient Thermal Impedance Junction to Case ($25\text{ }^\circ\text{C}$)
 are given for general guidelines only to enable the user to get a “ball park” indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size 1" x 1" x 0.062", double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions

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TO-252AA Case Outline

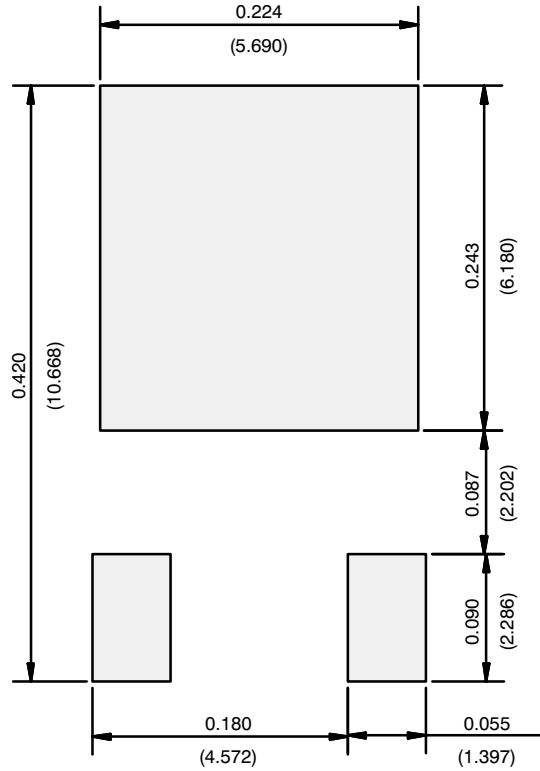


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	4.10	-	0.161	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	10.41	0.370	0.410
e	2.28 BSC		0.090 BSC	
e1	4.56 BSC		0.180 BSC	
L	1.40	1.78	0.055	0.070
L3	0.89	1.27	0.035	0.050
L4	-	1.02	-	0.040
L5	1.01	1.52	0.040	0.060
ECN: T13-0592-Rev. A, 02-Sep-13				
DWG: 6019				

Note

- Dimension L3 is for reference only.

RECOMMENDED MINIMUM PADS FOR DPAK (TO-252)



Recommended Minimum Pads
Dimensions in Inches/(mm)

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