

## Automotive N-Channel 100 V (D-S) 175 °C MOSFET

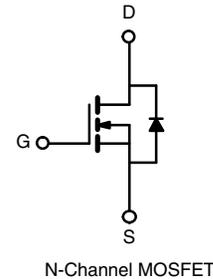
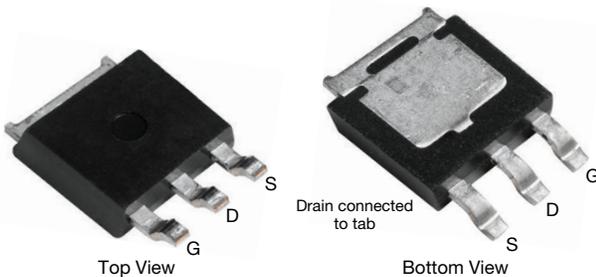
 AUTOMOTIVE  
GRADE

**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

PRODUCT SUMMARY	
$V_{DS}$ (V)	100
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.025
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.029
$I_D$ (A)	40
Configuration	Single
Package	TO-252 Reverse Lead DPAK

### FEATURES

- TrenchFET® power MOSFET
- Package with low thermal resistance
- 100 %  $R_g$  and UIS tested
- AEC-Q101 qualified
- Material categorization:  
for definitions of compliance please see  
[www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

**TO-252 Reverse Lead DPAK**


ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		$V_{DS}$	100	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current	$T_C = 25$ °C <sup>a</sup>	$I_D$	40	A
	$T_C = 125$ °C		26	
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	40	
Pulsed Drain Current <sup>b</sup>		$I_{DM}$	160	
Single Pulse Avalanche Current	L = 0.1 mH	$I_{AS}$	40	
Single Pulse Avalanche Energy		$E_{AS}$	80	mJ
Maximum Power Dissipation <sup>b</sup>	$T_C = 25$ °C	$P_D$	136	W
	$T_C = 125$ °C		45	
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 <sup>c</sup>	$R_{thJA}$	50	°C/W
Junction-to-Case (Drain)		$R_{thJC}$	1.1	

### Notes

- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR4 material).



SPECIFICATIONS (T <sub>C</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA		100	-	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA		1.5	-	2.5	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 100 V	-	-	1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 100 V, T <sub>J</sub> = 125 °C	-	-	50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 100 V, T <sub>J</sub> = 175 °C	-	-	250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> ≥ 5 V	50	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V	I <sub>D</sub> = 40 A	-	0.019	0.025	Ω
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 40 A, T <sub>J</sub> = 125 °C	-	-	0.050	
		V <sub>GS</sub> = 10 V	I <sub>D</sub> = 40 A, T <sub>J</sub> = 175 °C	-	-	0.063	
		V <sub>GS</sub> = 4.5 V	I <sub>D</sub> = 20 A	-	0.021	0.029	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 40 A		-	73	-	S
<b>Dynamic <sup>b</sup></b>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = 25 V, f = 1 MHz	-	2703	3380	pF
Output Capacitance	C <sub>oss</sub>			-	312	390	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	127	160	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = 10 V	V <sub>DS</sub> = 50 V, I <sub>D</sub> = 40 A	-	46	70	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	8.2	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	13	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		0.9	1.8	3.1	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = 50 V, R <sub>L</sub> = 1.25 Ω I <sub>D</sub> ≅ 40 A, V <sub>GEN</sub> = 10 V, R <sub>g</sub> = 1 Ω		-	11	17	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	11	17	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	27	41	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	6	9	
<b>Source-Drain Diode Ratings and Characteristics <sup>b</sup></b>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	160	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = 40 A, V <sub>GS</sub> = 0 V		-	0.9	1.5	V

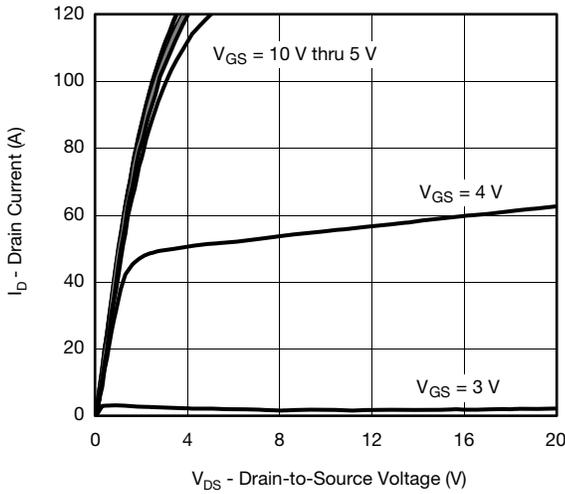
**Notes**

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

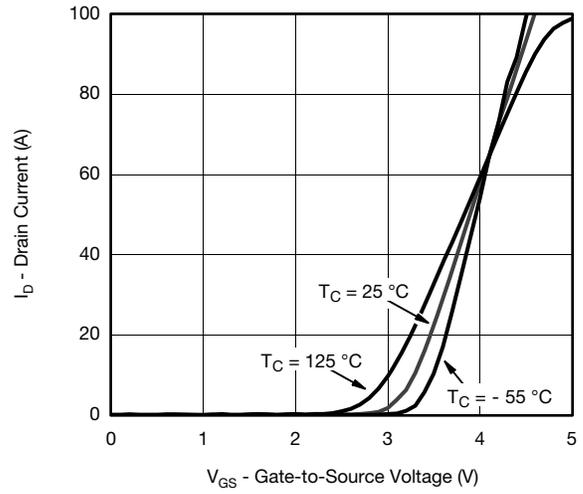
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



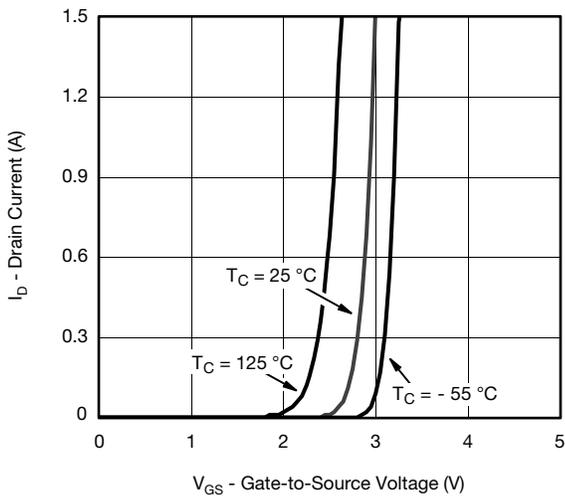
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



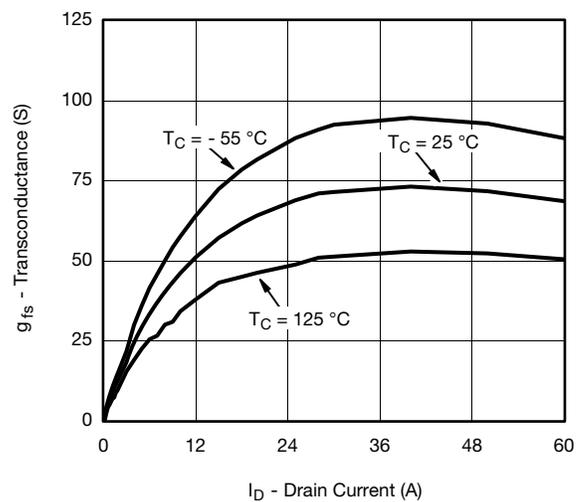
**Output Characteristics**



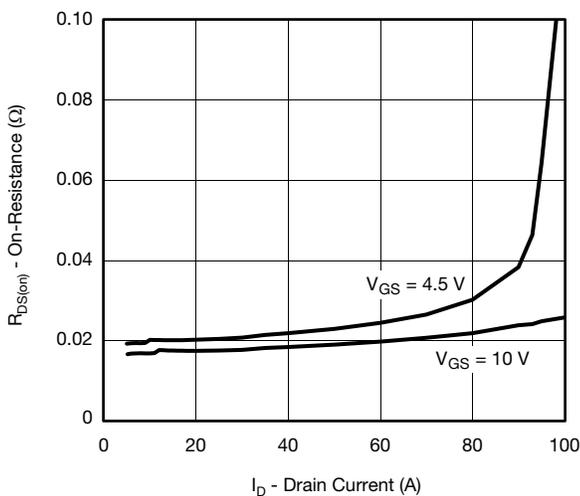
**Transfer Characteristics**



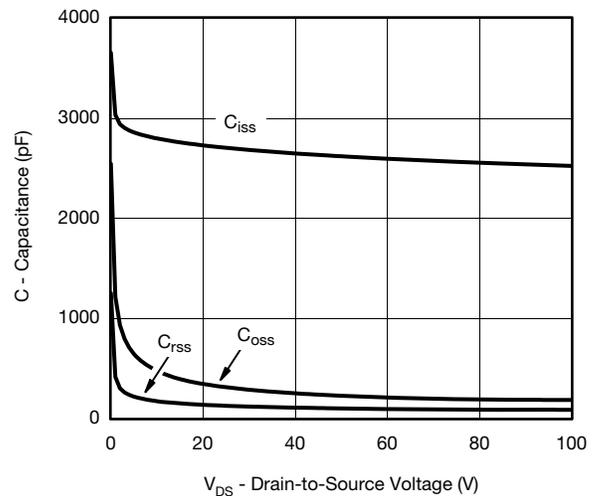
**Transfer Characteristics**



**Transconductance**



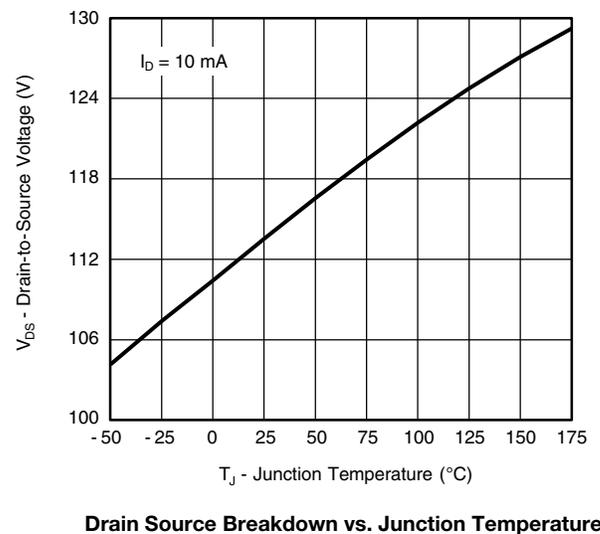
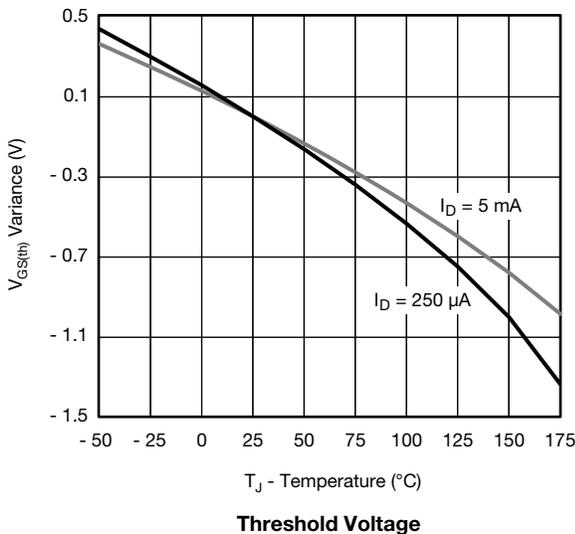
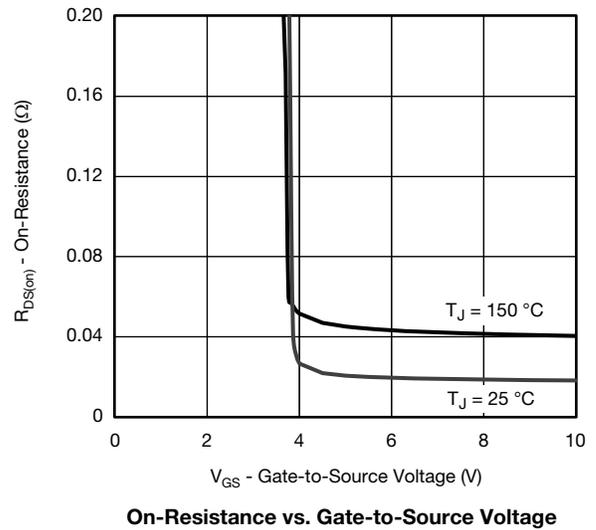
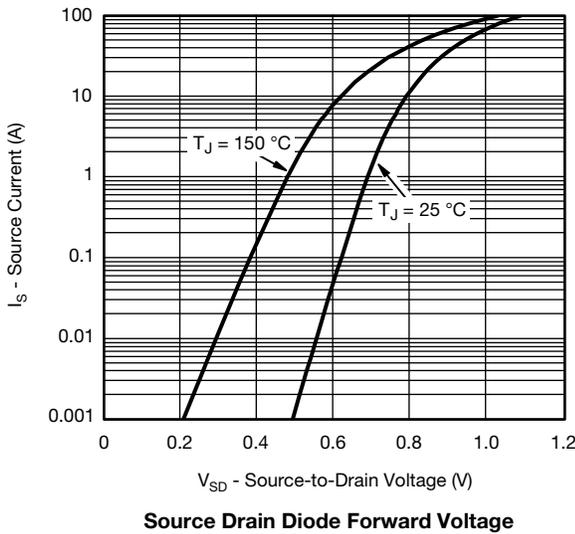
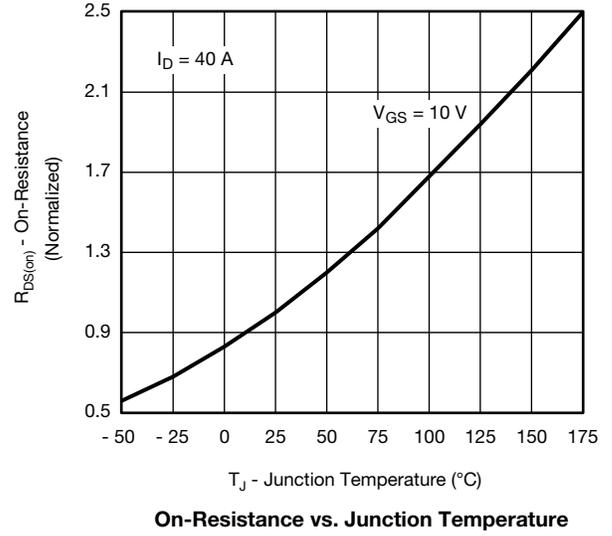
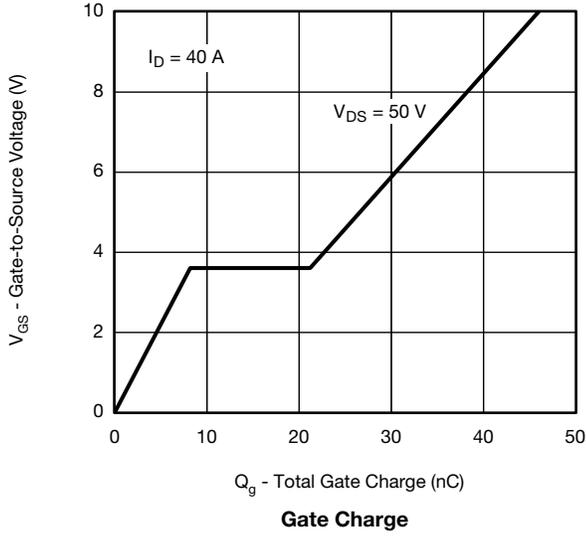
**On-Resistance vs. Drain Current**



**Capacitance**

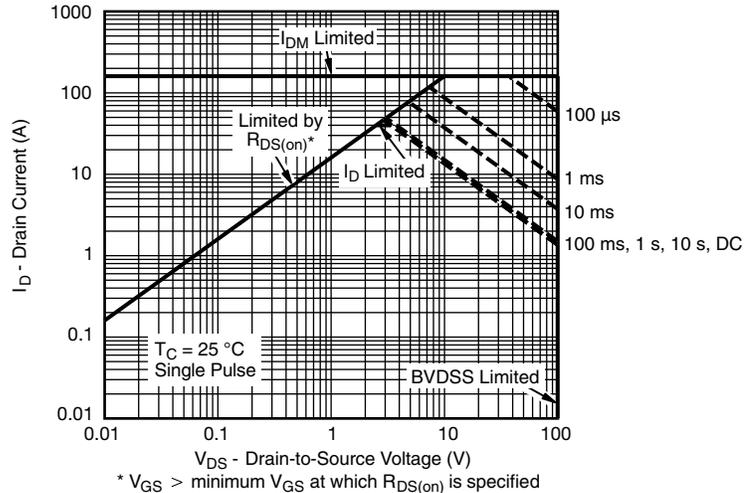


**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

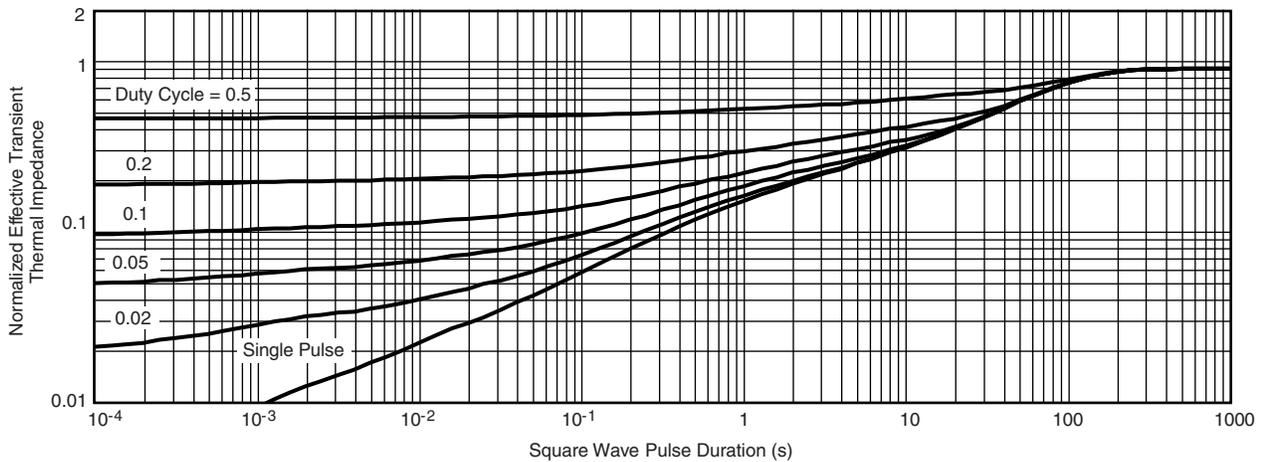




**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



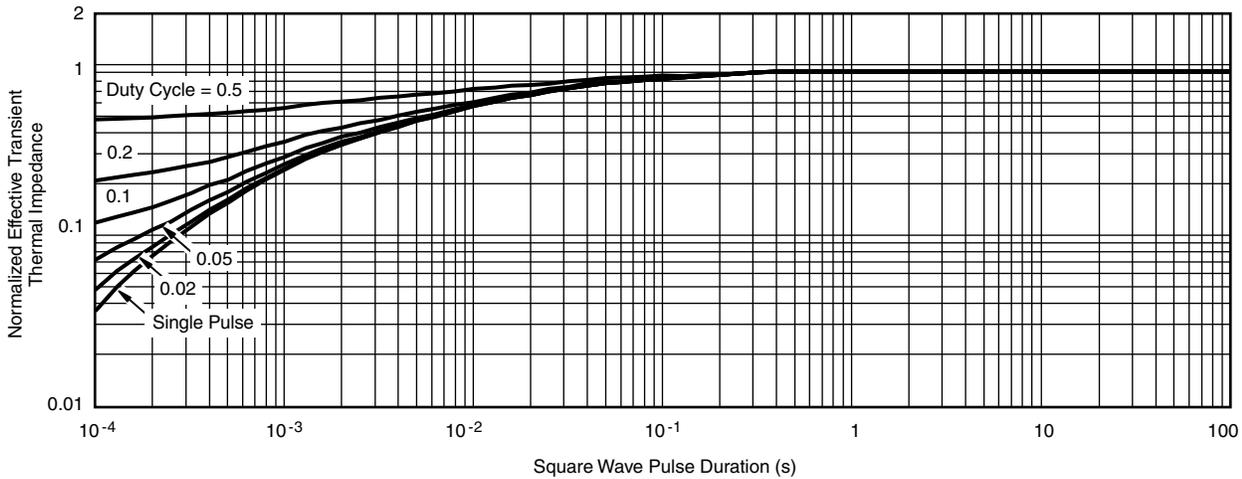
**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



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



**Normalized Thermal Transient Impedance, Junction-to-Case**

**Note**

- The characteristics shown in the two graphs
  - Normalized Transient Thermal Impedance Junction-to-Ambient (25 °C)
  - Normalized Transient Thermal Impedance Junction-to-Case (25 °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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REVISION HISTORY <sup>a</sup>		
REVISION	DATE	DESCRIPTION OF CHANGE
F	04-Aug-15	• Revised R <sub>g</sub> minimum limit

**Note**

a. As of April 2014



DPAK / TO-252 and Reverse DPAK

Ordering codes for the SQ rugged series power MOSFETs in the DPAK / TO-252 and Reverse DPAK packages:

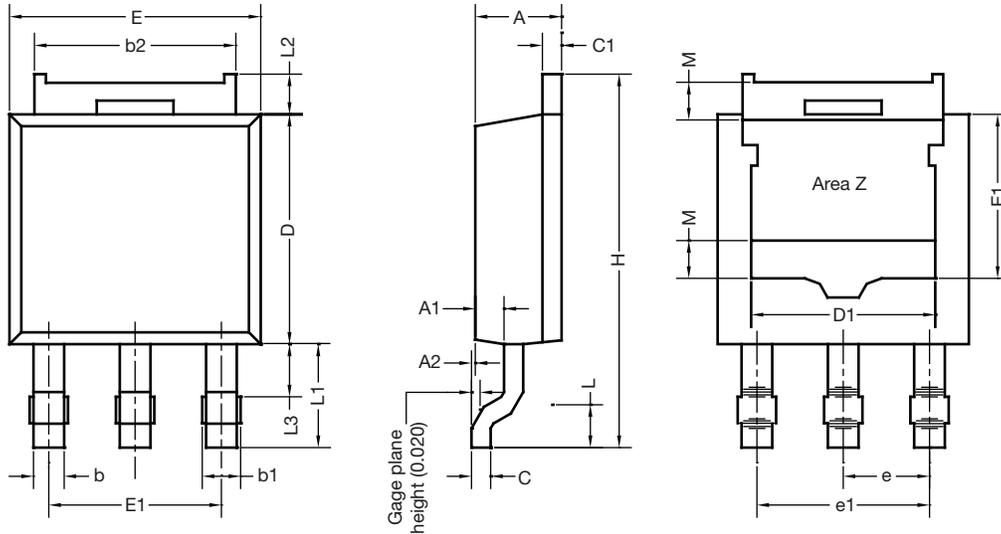
Table with 3 columns: DATASHEET PART NUMBER, OLD ORDERING CODE a, and NEW ORDERING CODE. It lists various MOSFET part numbers and their corresponding ordering codes.

Note

a. Old ordering code is obsolete and no longer valid for new orders



### TO-252 Reverse Lead Case Outline



**Notes**

- Dimension L3 for reference only
- Area Z: unplated area more than 80 % heatsink area and for partial plating part only

DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.23	2.33	0.088	0.092
A1	0.64	0.89	0.025	0.035
A2	0.03	0.18	0.001	0.007
b	0.71	0.88	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.44	0.206	0.214
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
D1	4.49	5.00	0.177	0.197
E	6.48	6.73	0.255	0.265
E1	4.32	-	0.170	-
e	2.28 BSC		0.090 BSC	
e1	4.57 BSC		0.180 BSC	
H	9.65	10.41	0.380	0.410
L	1.40	1.78	0.055	0.070
L1	2.74 BSC		0.108 BSC	
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.040	0.060
M	-	1.00 (reference only)	-	0.039 (reference only)

ECN: T16-0952-Rev. D, 16-Jan-17  
DWG: 5894



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