

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

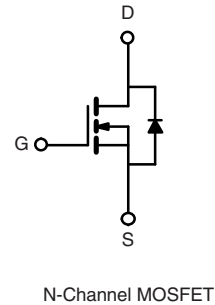
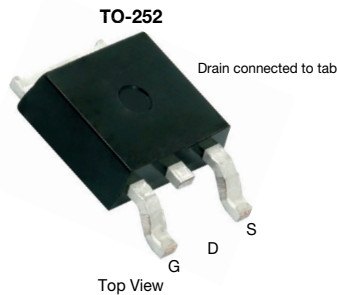
 AUTOMOTIVE  
GRADE

**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

### 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)



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	$I_D$	$T_C = 25$ °C <sup>a</sup>	40
		$T_C = 125$ °C	26
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	40	A
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	160	
Single Pulse Avalanche Current	$I_{AS}$	40	
Single Pulse Avalanche Energy	$E_{AS}$	80	mJ
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	136
		$T_C = 125$ °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	$R_{thJA}$	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 ( $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$		100	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$		1.5	-	2.5	
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$		-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 100\text{ V}$	-	-	1.0	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = 100\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 100\text{ V}$ , $T_J = 175\text{ }^\circ\text{C}$	-	-	250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	50	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 40\text{ A}$	-	0.019	0.025	$\Omega$
		$V_{GS} = 10\text{ V}$	$I_D = 40\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	0.050	
		$V_{GS} = 10\text{ V}$	$I_D = 40\text{ A}$ , $T_J = 175\text{ }^\circ\text{C}$	-	-	0.063	
		$V_{GS} = 4.5\text{ V}$	$I_D = 20\text{ A}$	-	0.021	0.029	
Forward Transconductance <sup>b</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 40\text{ A}$		-	73	-	S
<b>Dynamic <sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	-	2703	3380	$\text{pF}$
Output Capacitance	$C_{oss}$			-	312	390	
Reverse Transfer Capacitance	$C_{rss}$			-	127	160	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = 10\text{ V}$	$V_{DS} = 50\text{ V}$ , $I_D = 40\text{ A}$	-	46	70	$\text{nC}$
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	8.2	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	13	-	
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		0.9	1.8	3.1	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 50\text{ V}$ , $R_L = 1.25\text{ }\Omega$ $I_D \cong 40\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 1\text{ }\Omega$		-	11	17	$\text{ns}$
Rise Time <sup>c</sup>	$t_r$			-	11	17	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			-	27	41	
Fall Time <sup>c</sup>	$t_f$			-	6	9	
<b>Source-Drain Diode Ratings and Characteristics <sup>b</sup></b>							
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	160	A
Forward Voltage	$V_{SD}$	$I_F = 40\text{ A}$ , $V_{GS} = 0\text{ V}$		-	0.9	1.5	V

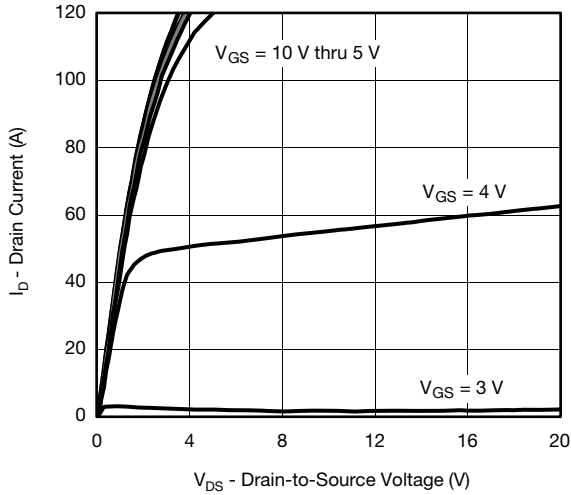
**Notes**

- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

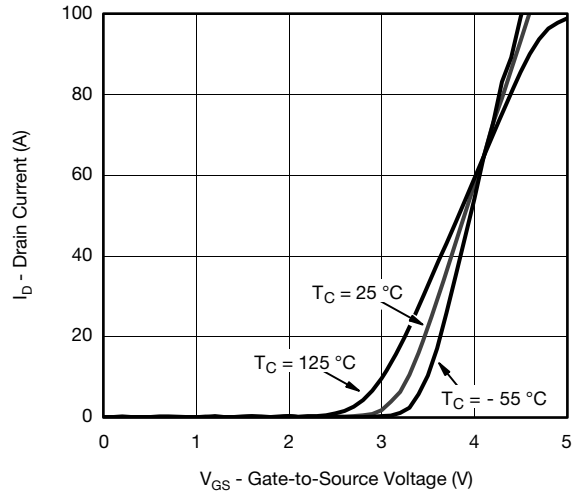
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



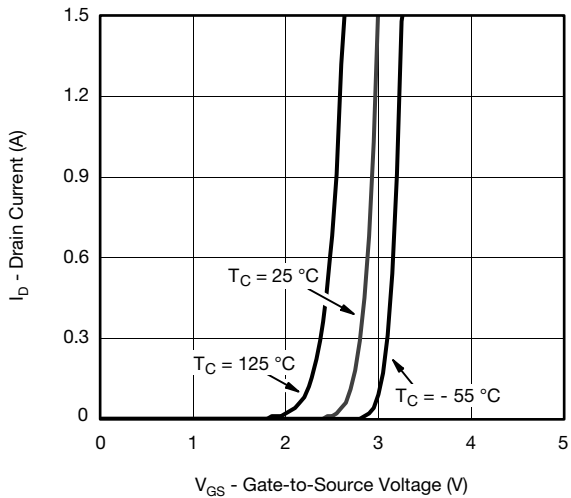
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



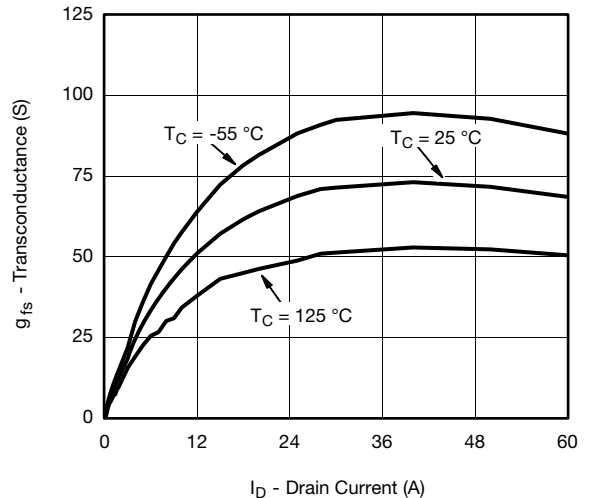
**Output Characteristics**



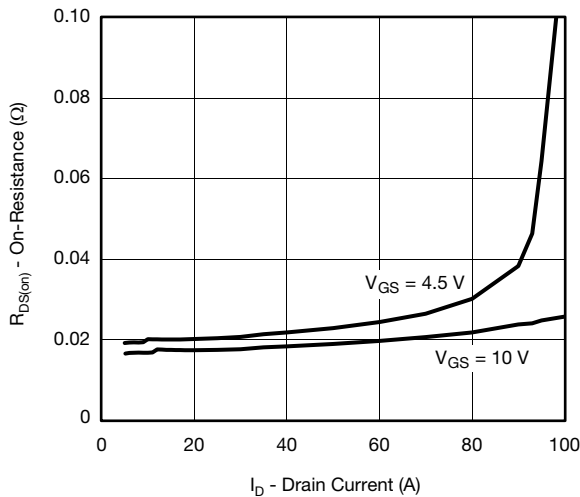
**Transfer Characteristics**



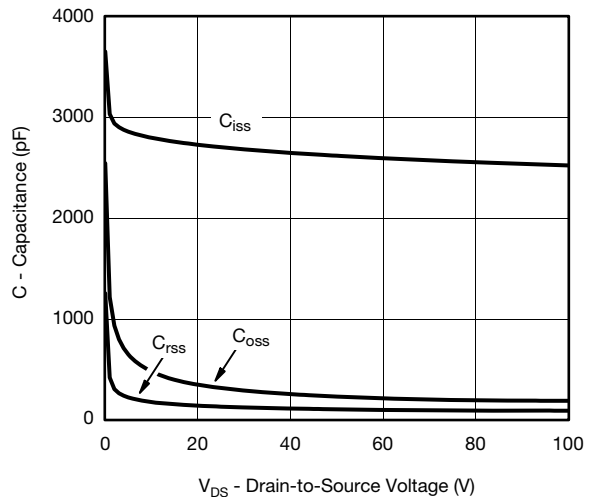
**Transfer Characteristics**



**Transconductance**



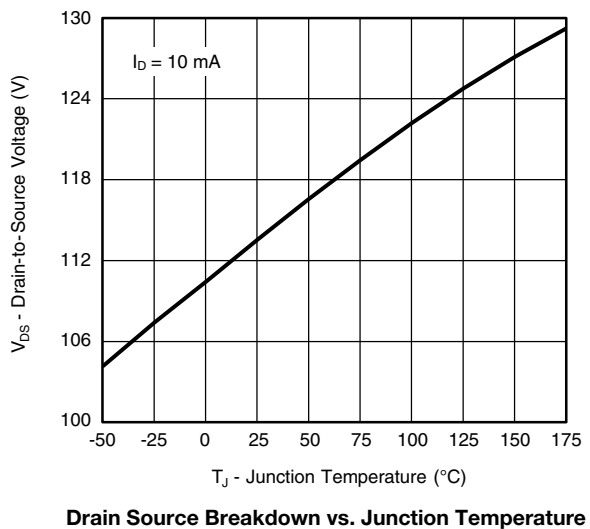
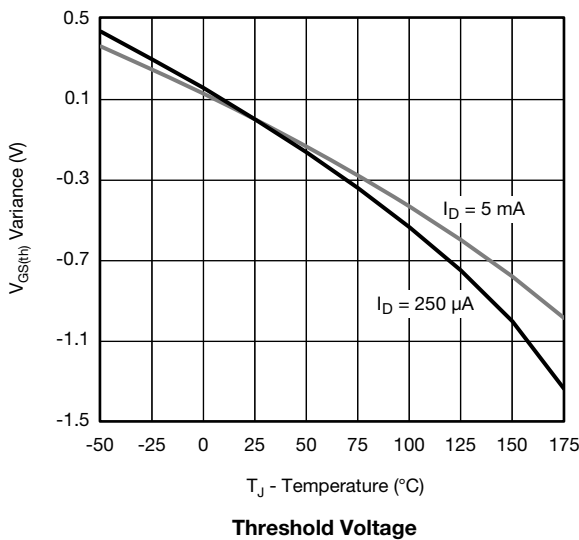
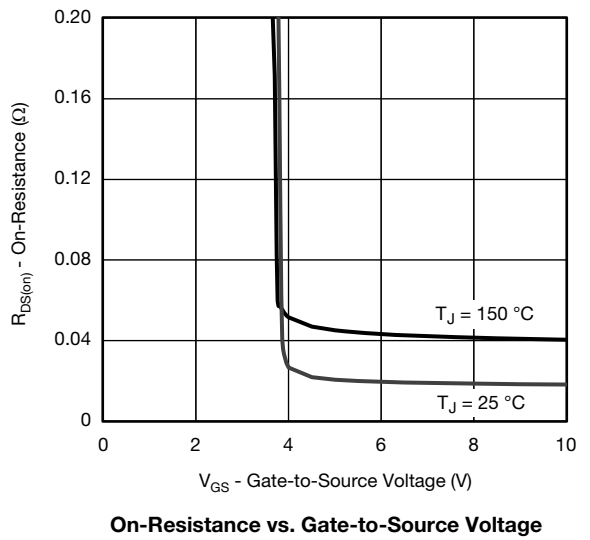
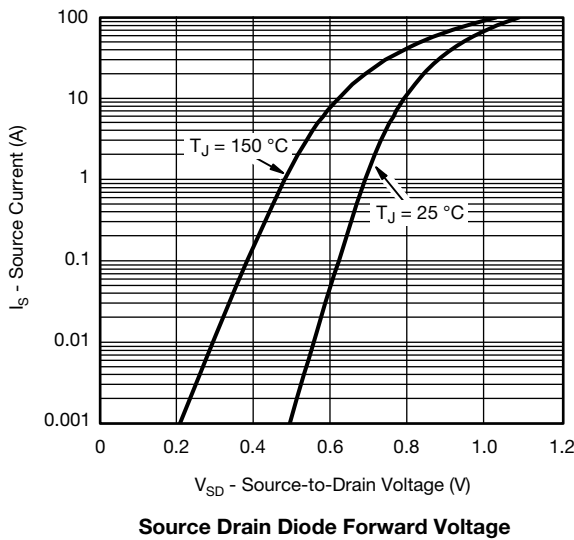
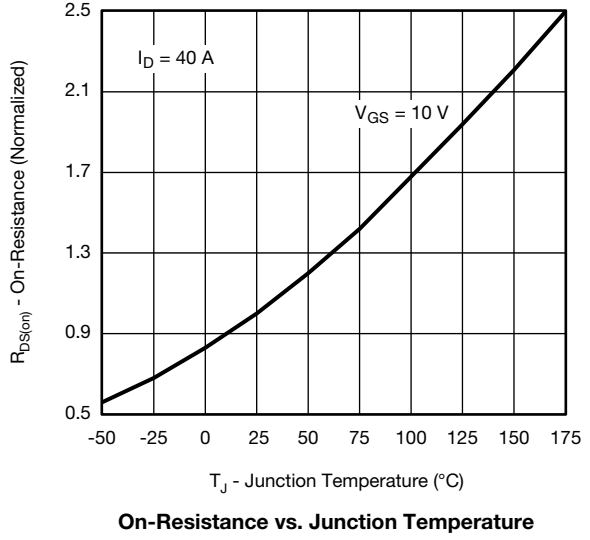
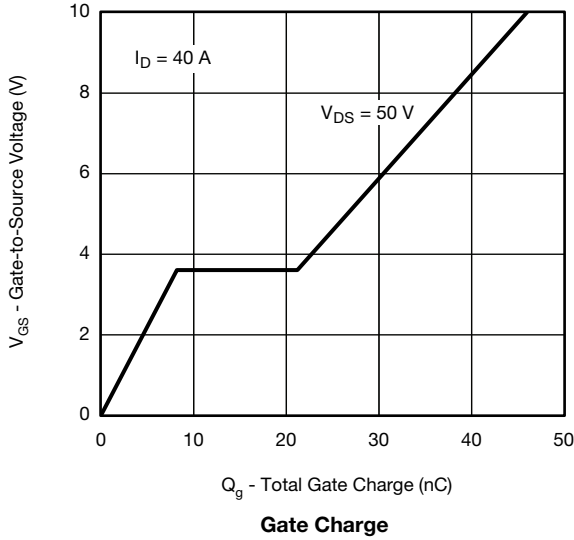
**On-Resistance vs. Drain Current**



**Capacitance**

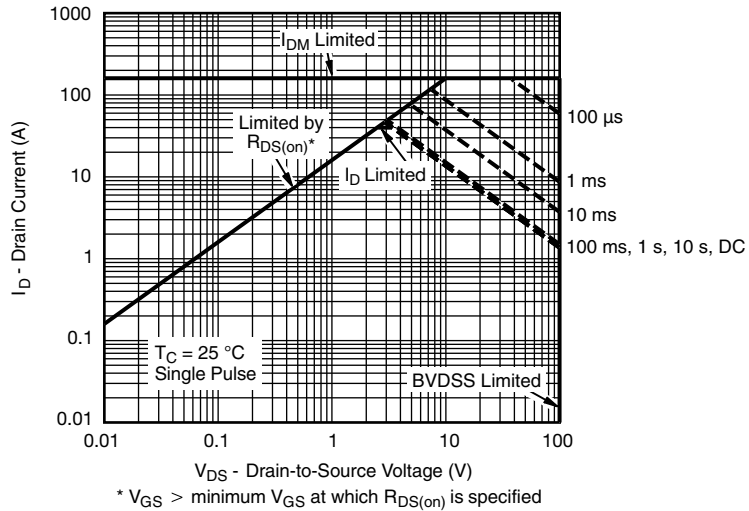


**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)

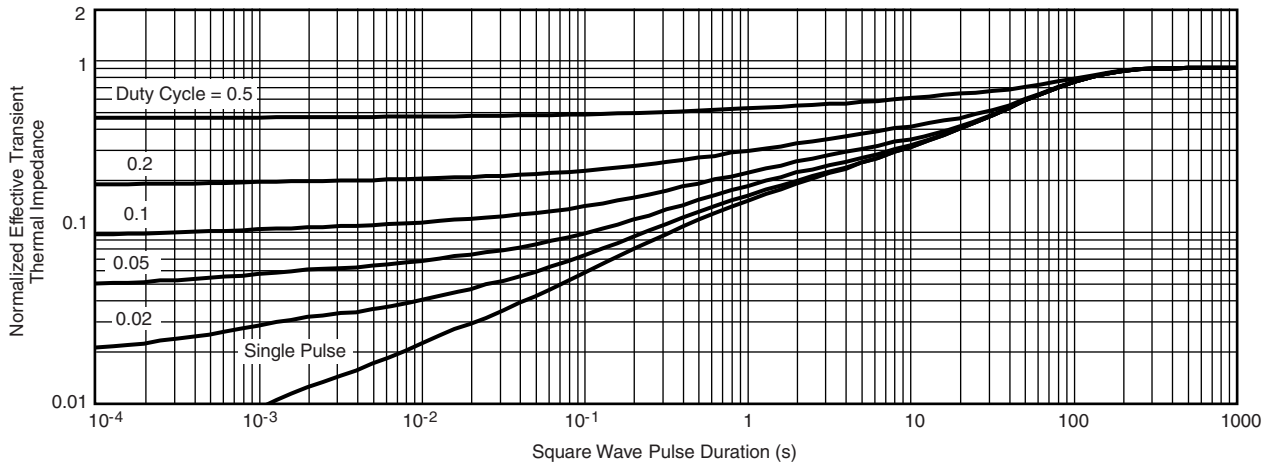




**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



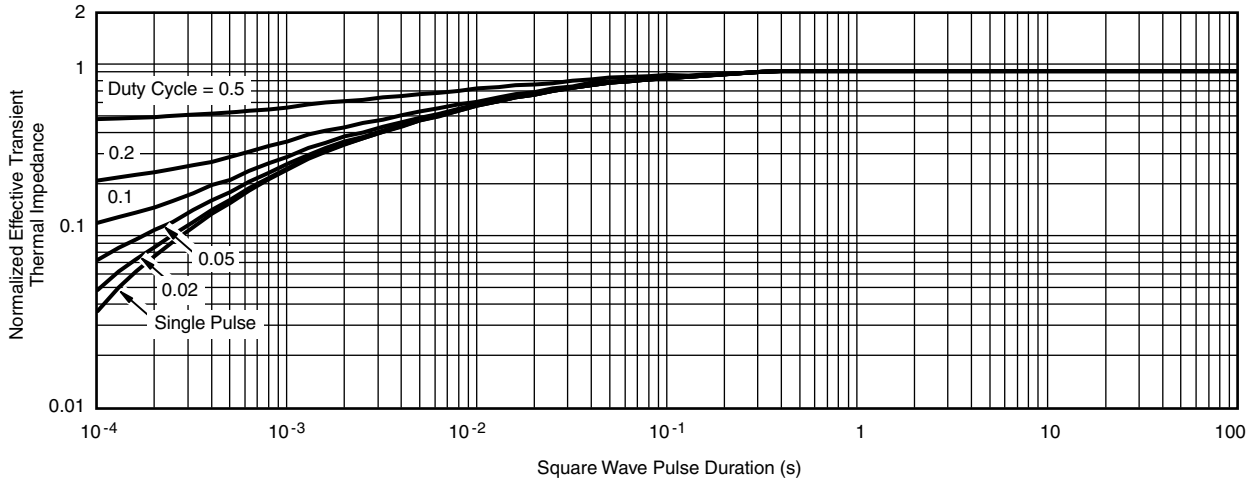
**Safe Operating Area**



**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
E	04-Aug-15	• Revised R <sub>g</sub> minimum limit

**Note**

a. As of April 2014



### 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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