

## N-Channel 40-V (D-S) MOSFET



**RoHS**  
COMPLIANT

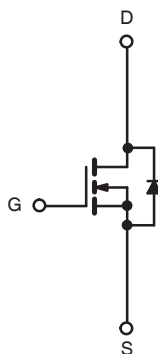
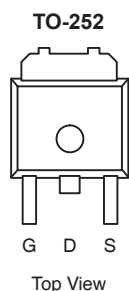
PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>a, e</sup>	Q <sub>g</sub> (Typ)
40	0.0028 at V <sub>GS</sub> = 10 V	95	80 nC
	0.0045 at V <sub>GS</sub> = 4.5 V	85	

### FEATURES

- DT-Trench Power MOSFET
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2011/65/EU

### APPLICATIONS

- OR-ing
- Server
- DC/DC



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V <sub>DS</sub>	40	V
Gate-Source Voltage		V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 175 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	95 <sup>a, e</sup>	A
	T <sub>C</sub> = 70 °C		80 <sup>e</sup>	
	T <sub>A</sub> = 25 °C		38 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		36 <sup>b, c</sup>	
Pulsed Drain Current		I <sub>DM</sub>	360	
Avalanche Current Pulse	L = 0.1 mH	I <sub>AS</sub>	40	
Single Pulse Avalanche Energy		E <sub>AS</sub>	75	mJ
Continuous Source-Drain Diode Current	T <sub>C</sub> = 25 °C	I <sub>S</sub>	90 <sup>a, e</sup>	A
	T <sub>A</sub> = 25 °C		3.5 <sup>b, c</sup>	
Maximum Power Dissipation	T <sub>C</sub> = 25 °C	P <sub>D</sub>	260 <sup>a</sup>	W
	T <sub>C</sub> = 70 °C		185	
	T <sub>A</sub> = 25 °C		3.9 <sup>b, c</sup>	
	T <sub>A</sub> = 70 °C		2.85 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient <sup>b, d</sup>	t ≤ 10 sec	R <sub>thJA</sub>	28	35	°C/W
Maximum Junction-to-Case	Steady State	R <sub>thJC</sub>	0.4	0.6	

Notes:

a. Based on T<sub>C</sub> = 25 °C.

b. Surface mounted on 1" x 1" FR4 board.

c. t = 10 sec.

d. Maximum under steady state conditions is 90 °C/W.

e. Calculated based on maximum junction temperature. Package limitation current is 80 A.

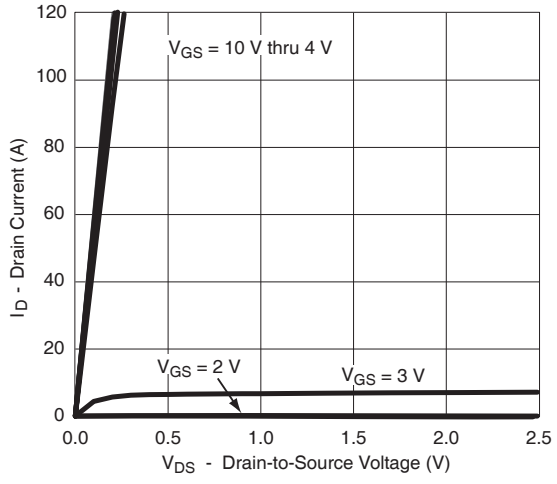
<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	40			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		35		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-7.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.5		2.5	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 32\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 32\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	95			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		0.0028	0.0045	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 27\text{ A}$		0.0045	0.0063	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 32\text{ V}, I_D = 30\text{ A}$		160		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		6100		pF
Output Capacitance	$C_{oss}$			1790		
Reverse Transfer Capacitance	$C_{rss}$			990		
Total Gate Charge	$Q_g$	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 30\text{ A}$		150		nC
		$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		80		
$Q_{gs}$			32			
$Q_{gd}$			25			
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		1.4		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 0.625\text{ }\Omega$ $I_D \cong 24\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		18		ns
Rise Time	$t_r$			11		
Turn-Off Delay Time	$t_{d(off)}$			70		
Fall Time	$t_f$			10		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 0.67\text{ }\Omega$ $I_D \cong 23\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		55		
Rise Time	$t_r$			180		
Turn-Off Delay Time	$t_{d(off)}$			55		
Fall Time	$t_f$			12		
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^\circ\text{C}$			95	A
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				360	
Body Diode Voltage	$V_{SD}$	$I_S = 22\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		52		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			71		nC
Reverse Recovery Fall Time	$t_a$			27		ns
Reverse Recovery Rise Time	$t_b$			25		

Notes:

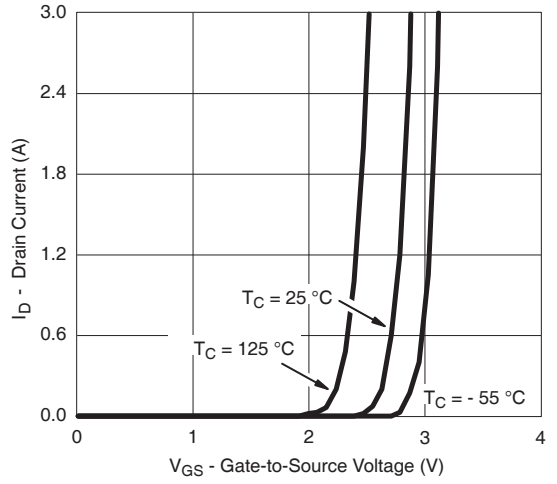
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

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.

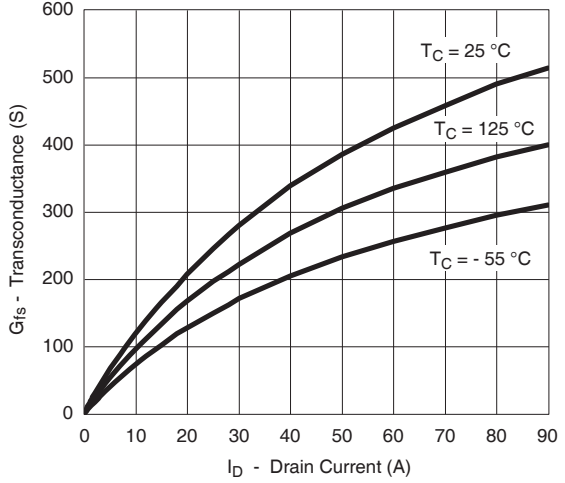
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



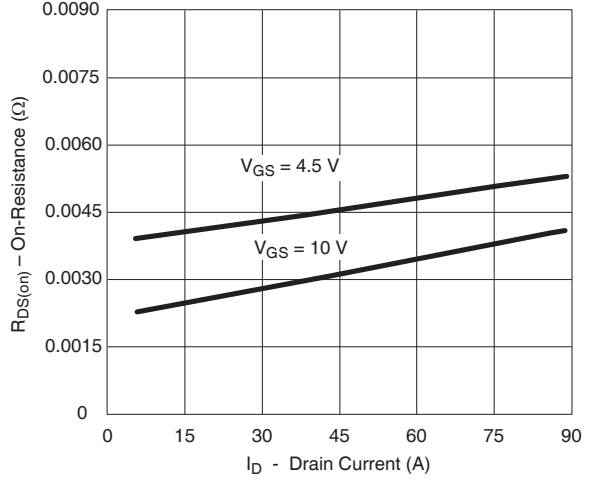
**Output Characteristics**



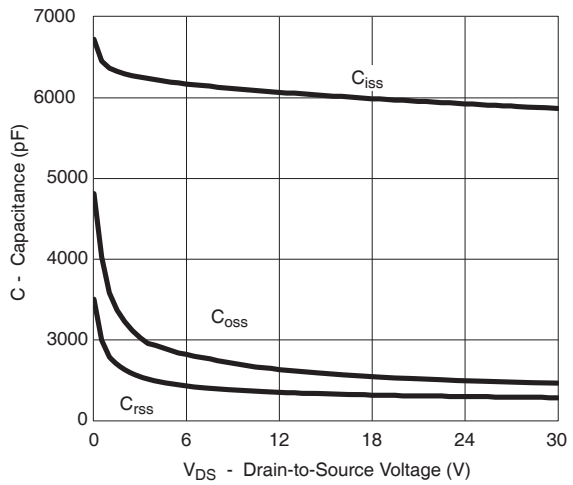
**Transfer Characteristics**



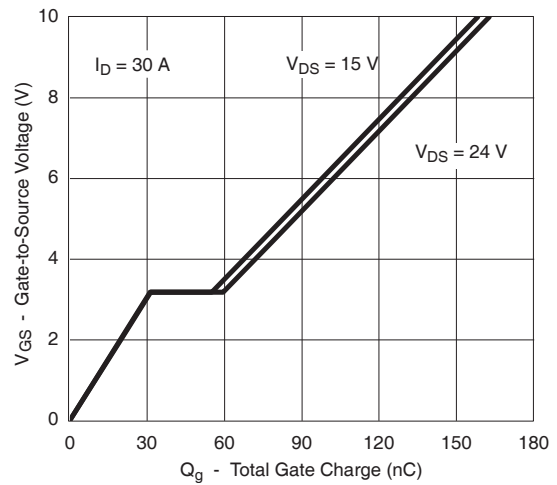
**Transconductance**



**$R_{DS(on)}$  vs. Drain Current**

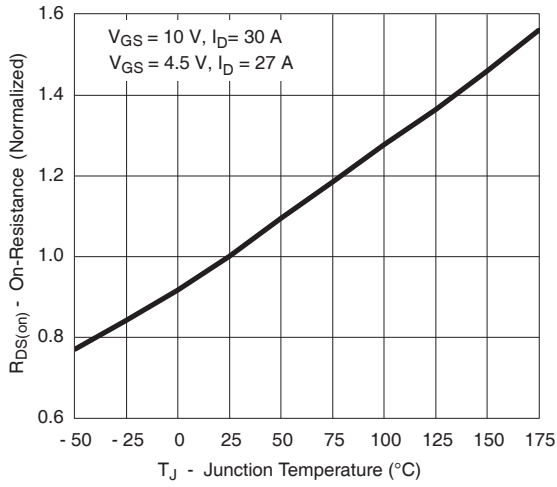


**Capacitance**

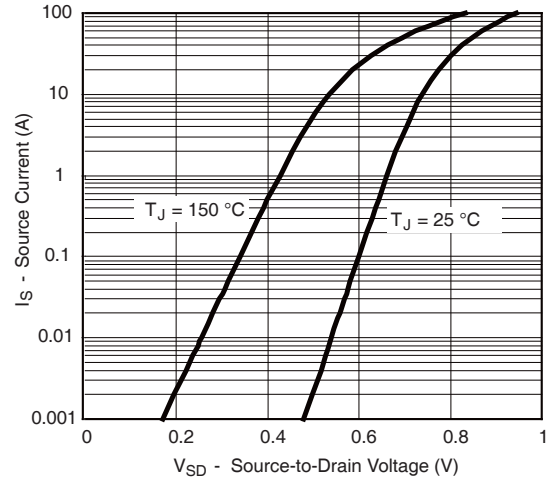


**Gate Charge**

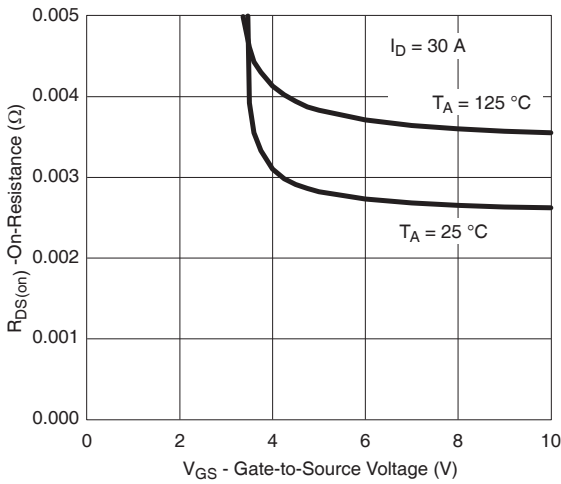
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



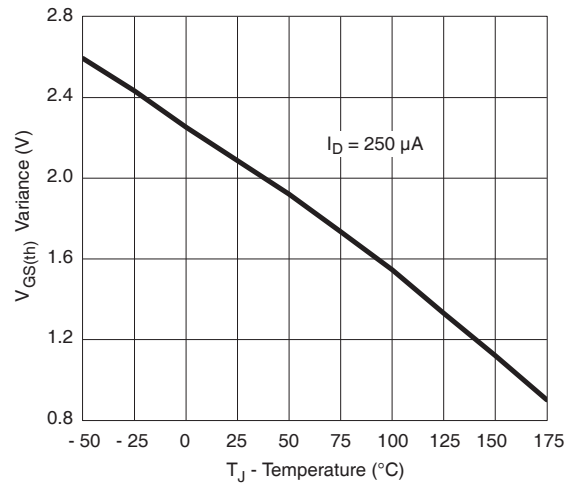
**On-Resistance vs. Junction Temperature**



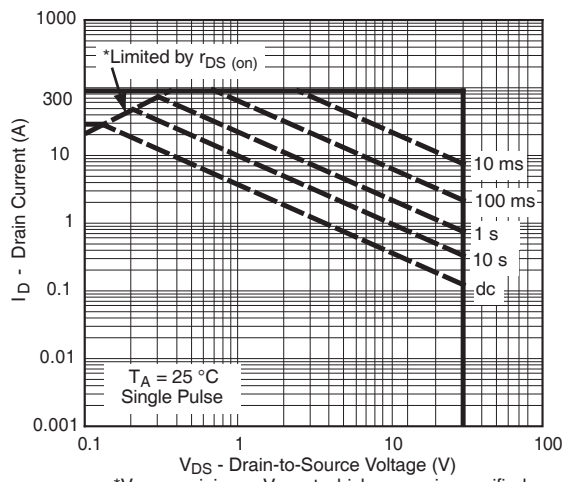
**Forward Diode Voltage vs. Temperature**



**$R_{DS(on)}$  vs.  $V_{GS}$  vs. Temperature**

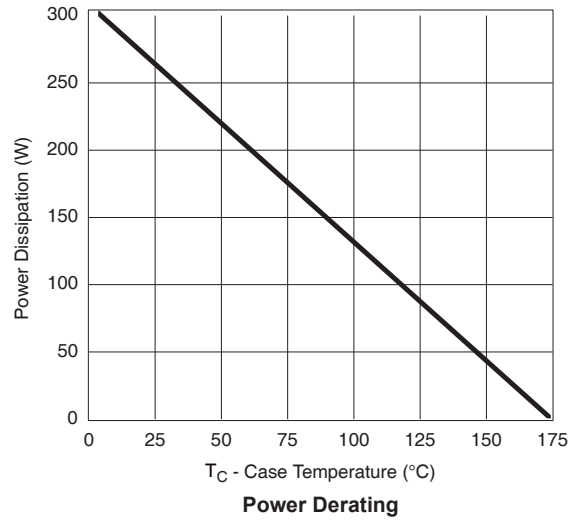
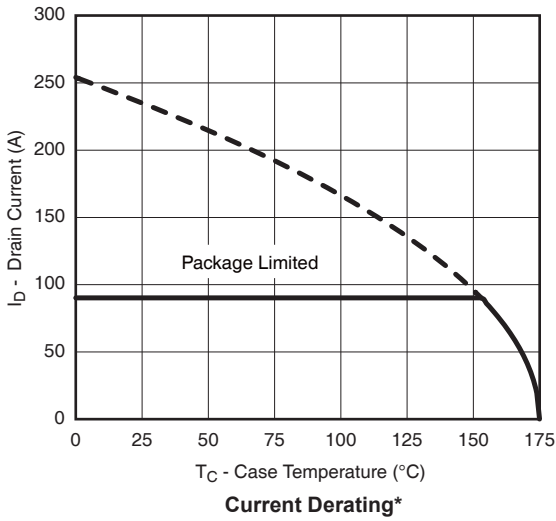


**Threshold Voltage**

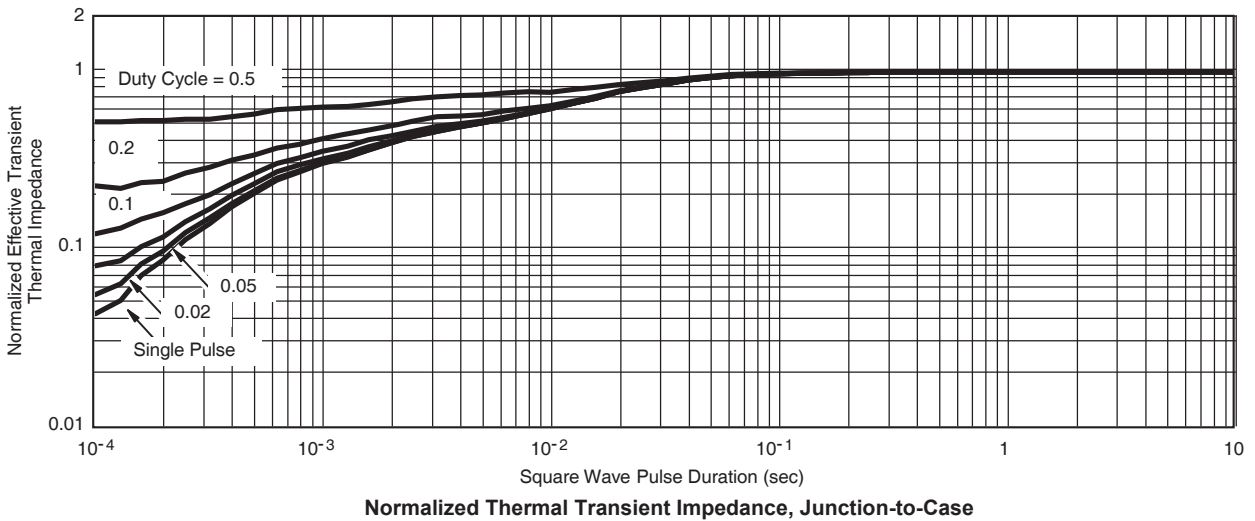


\* $V_{GS} >$  minimum  $V_{GS}$  at which  $r_{DS(on)}$  is specified  
**Safe Operating Area, Junction-to-Ambient**

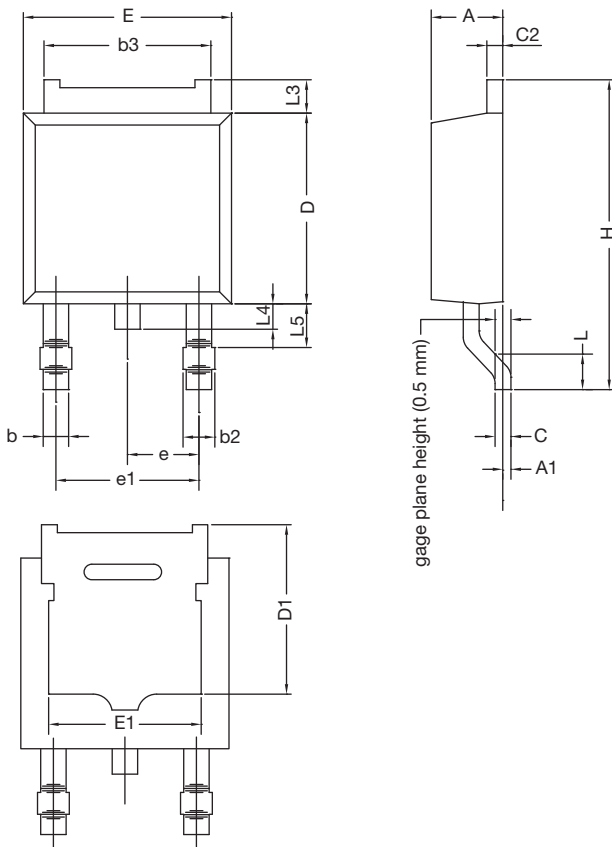
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



\*The power dissipation P<sub>D</sub> is based on T<sub>J(max)</sub> = 175 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



## TO-252AA CASE OUTLINE



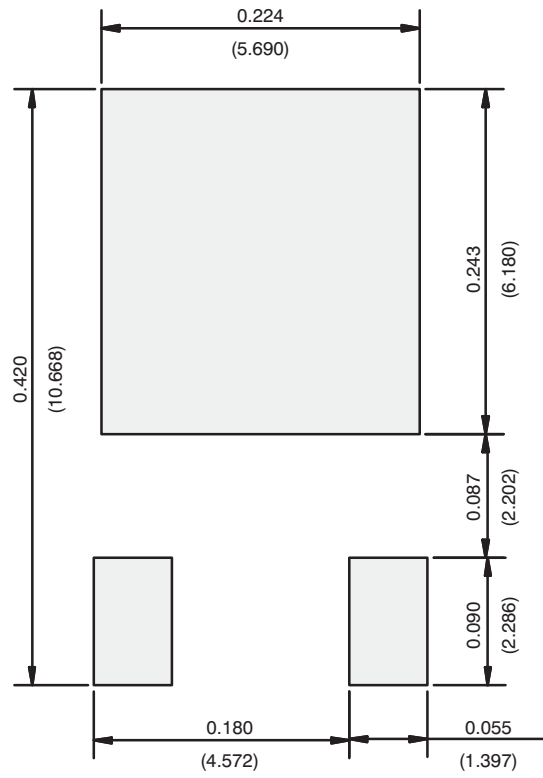
DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	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	1.14	1.52	0.045	0.060

ECN: X12-0247-Rev. M, 24-Dec-12  
DWG: 5347

**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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