

N-Channel 20-V (D-S) MOSFET



RoHS
COMPLIANT

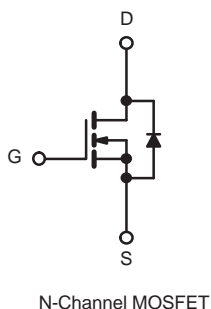
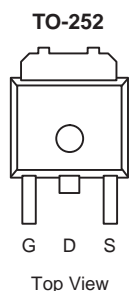
PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^{a, e}	Q _g (Typ)
20	0.0027 at V _{GS} = 4.5 V	90	90 nC
	0.0038 at V _{GS} = 2.5 V	70	

FEATURES

- DT-Trench Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2011/65/EU

APPLICATIONS

- OR-ing
- Server
- DC/DC



ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	20	V	
Gate-Source Voltage	V _{GS}	± 12		
Continuous Drain Current (T _J = 175 °C)	I _D	T _C = 25 °C	90 ^{a, e}	A
		T _C = 70 °C	76 ^e	
		T _A = 25 °C	26.5 ^{b, c}	
		T _A = 70 °C	15 ^{b, c}	
Pulsed Drain Current	I _{DM}	270		
Avalanche Current Pulse	I _{AS}	35	mJ	
Single Pulse Avalanche Energy				
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	90 ^{a, e}	A
		T _A = 25 °C	2.9 ^{b, c}	
Maximum Power Dissipation	P _D	T _C = 25 °C	225 ^a	W
		T _C = 70 °C	151	
		T _A = 25 °C	3.25 ^{b, c}	
		T _A = 70 °C	2.21 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 175	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typ.	Max.	Unit	
Maximum Junction-to-Ambient ^{b, d}	R _{thJA}	35	45	°C/W	
Maximum Junction-to-Case	R _{thJC}	0.6	0.8		

Notes:

a. Based on T_C = 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 90 A.

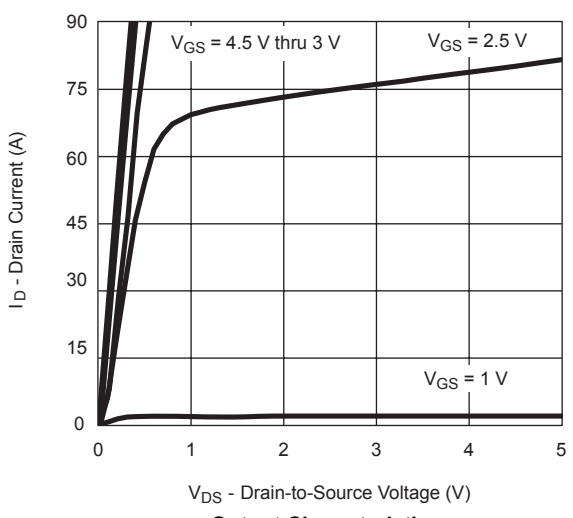
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		35		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-7.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.5		1.0	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	90			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		0.0027	0.0035	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 20\text{ A}$		0.0038	0.0048	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		135		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		8850		pF
Output Capacitance	C_{oss}			2780		
Reverse Transfer Capacitance	C_{rss}			830		
Total Gate Charge	Q_g	$V_{DS} = 16\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$		105		nC
		$V_{DS} = 16\text{ V}, V_{GS} = 2.5\text{ V}, I_D = 20\text{ A}$		65		
Gate-Source Charge	Q_{gs}			32		
Gate-Drain Charge	Q_{gd}			21		
Gate Resistance	R_g	$f = 1\text{ MHz}$		1.5		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 16\text{ V}, R_L = 0.625\text{ }\Omega$ $I_D \cong 30\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		21		ns
Rise Time	t_r			15		
Turn-Off Delay Time	$t_{d(off)}$			77		
Fall Time	t_f			13		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 0.67\text{ }\Omega$ $I_D \cong 20\text{ A}, V_{GEN} = 2.5\text{ V}, R_g = 1\text{ }\Omega$		56		
Rise Time	t_r			173		
Turn-Off Delay Time	$t_{d(off)}$			58		
Fall Time	t_f			15		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			90	A
Pulse Diode Forward Current ^a	I_{SM}				270	
Body Diode Voltage	V_{SD}	$I_S = 22\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		55	80	ns
Body Diode Reverse Recovery Charge	Q_{rr}			73	115	nC
Reverse Recovery Fall Time	t_a			27		ns
Reverse Recovery Rise Time	t_b			29		

Notes:

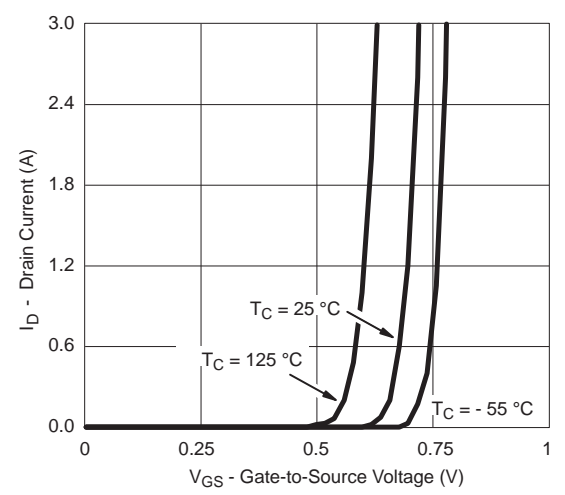
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

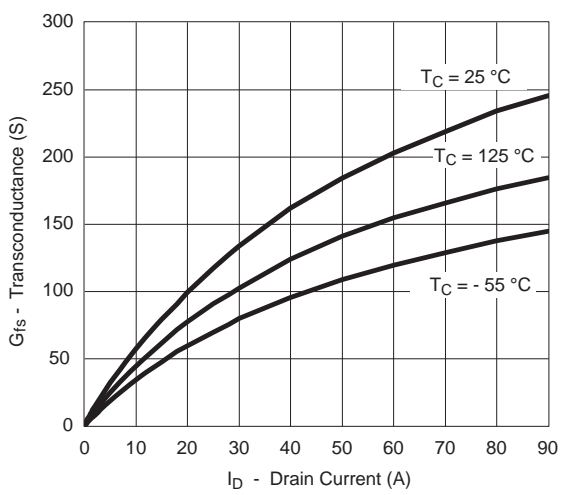
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



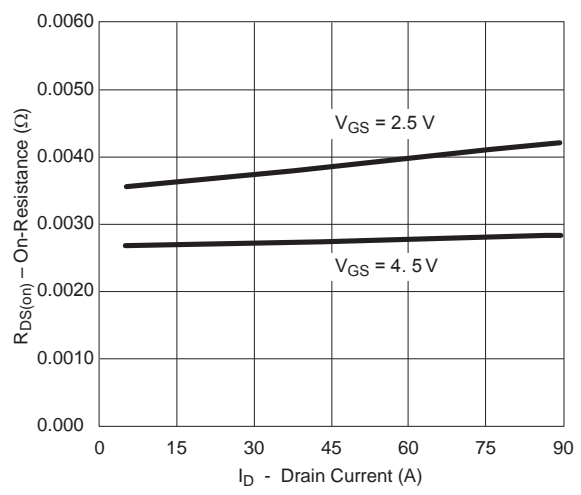
Output Characteristics



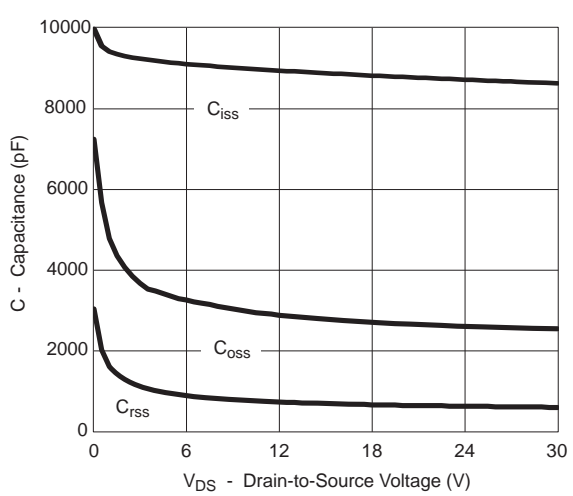
Transfer Characteristics



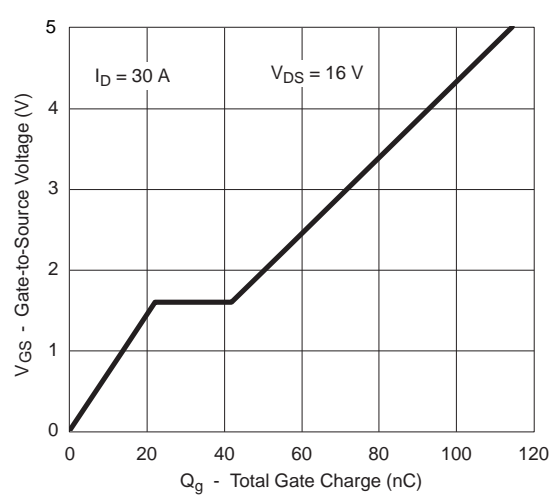
Transconductance



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

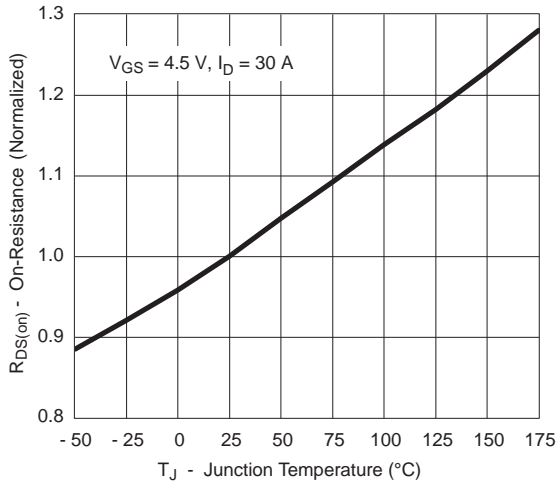


Capacitance

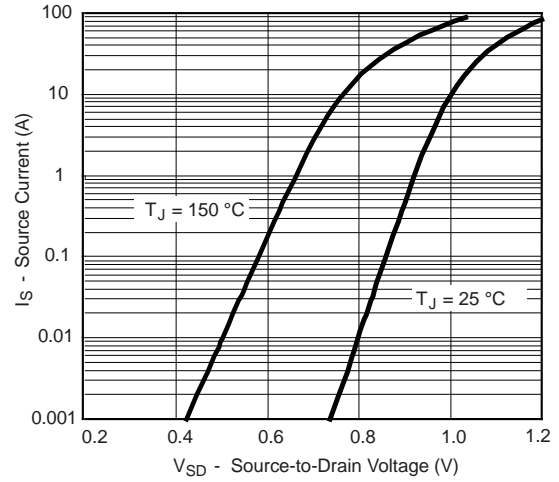


Gate Charge

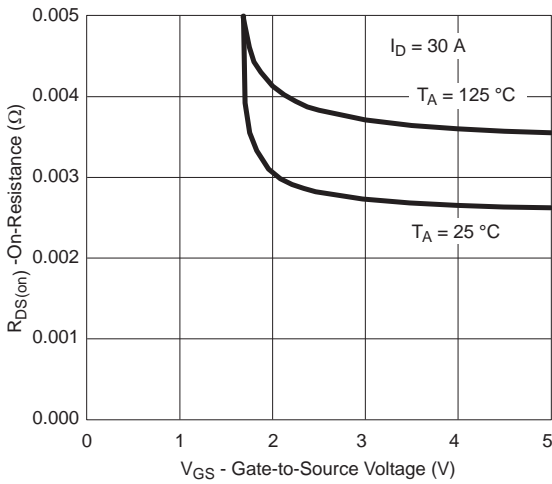
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



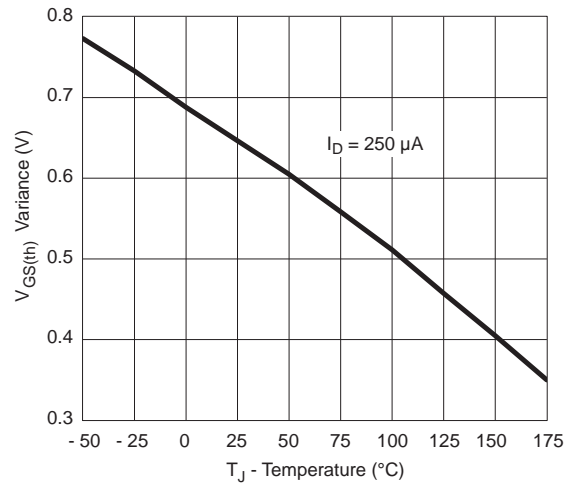
On-Resistance vs. Junction Temperature



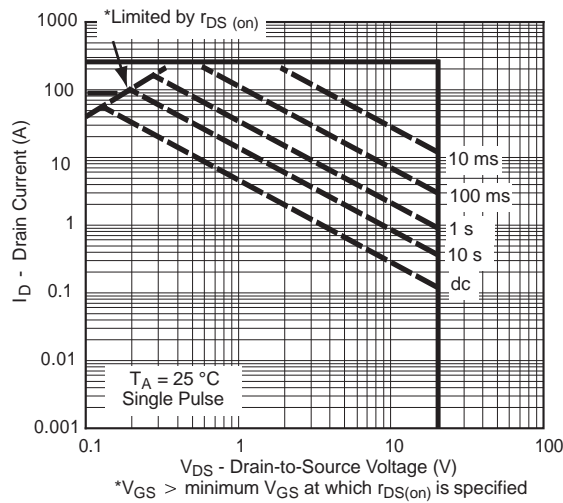
Forward Diode Voltage vs. Temperature



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

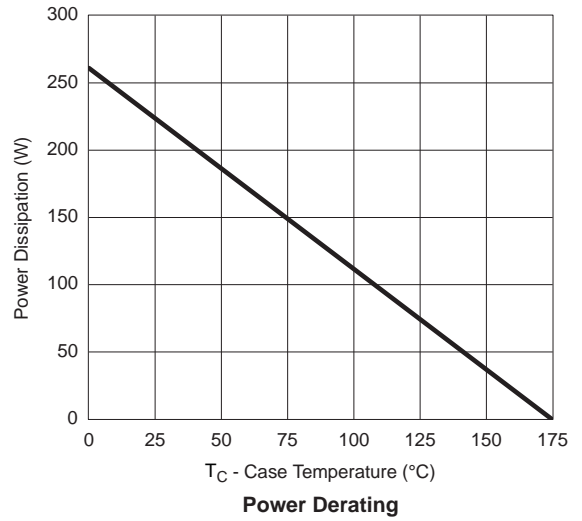
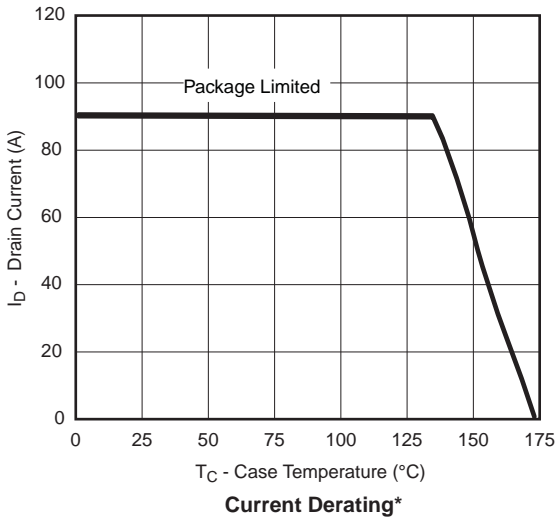


Threshold Voltage

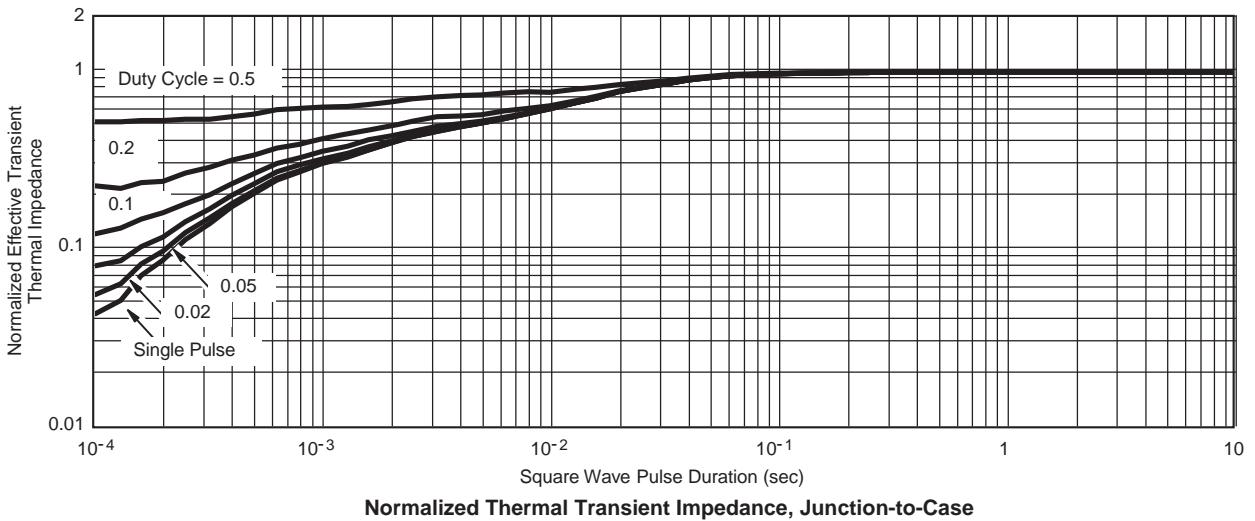


Safe Operating Area, Junction-to-Ambient
*V_{GS} > minimum V_{GS} at which r_{DS(on)} is specified

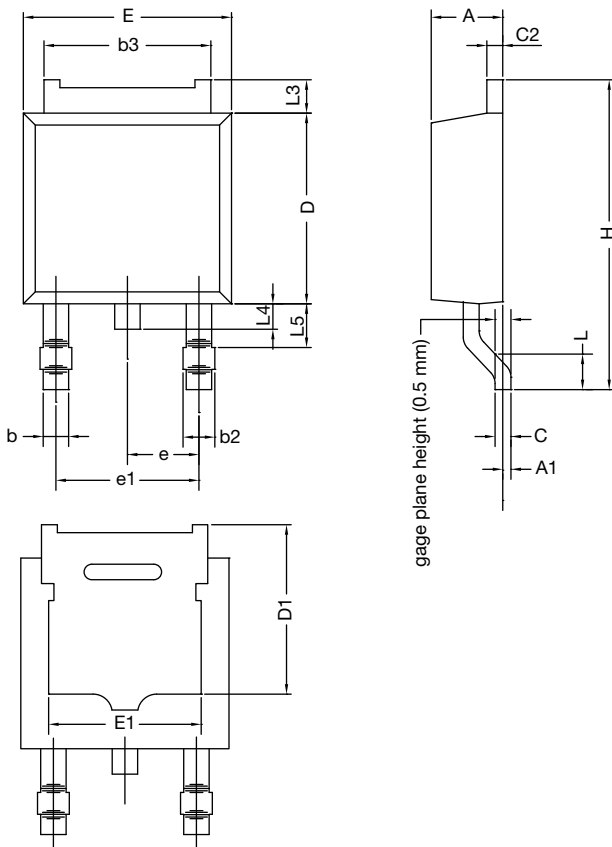
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



*The power dissipation P_D is based on $T_{J(max)} = 175\text{ °C}$, 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

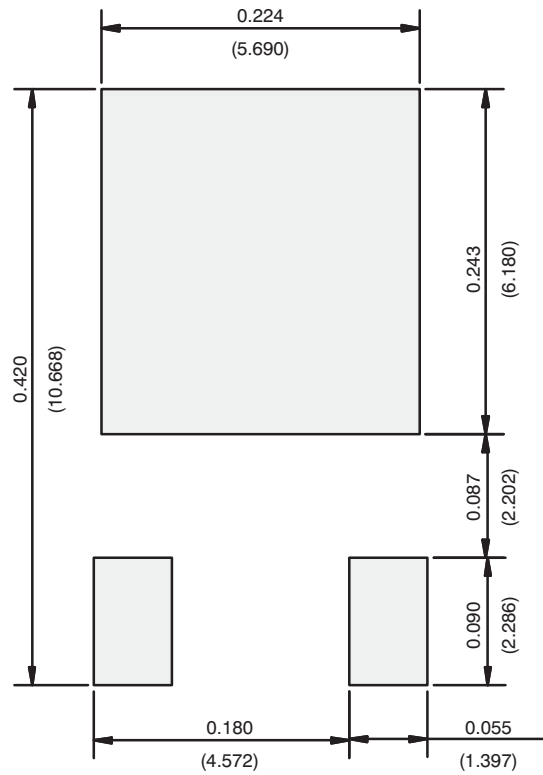


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.21	-	0.205	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40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