



Automotive N-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
V _{DS} (V)	60
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.031
R _{DS(on)} (Ω) at V _{GS} = 4.5 V	0.045
I _D (A)	23
Configuration	Single

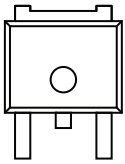
FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC
- AEC-Q101 Qualified^d



RoHS
COMPLIANT
HALOGEN
FREE

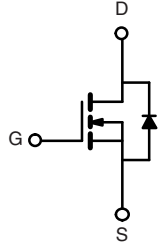
TO-252



G D S

Top View

Drain Connected to Tab



N-Channel MOSFET

ORDERING INFORMATION	
Package	TO-252
Lead (Pb)-free and Halogen-free	SQD23N06-31L-GE3

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)				
PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V _{DS}	60	V
Gate-Source Voltage		V _{GS}	± 20	
Continuous Drain Current	T _C = 25 °C	I _D	23	A
	T _C = 125 °C		13	
Continuous Source Current (Diode Conduction) ^a		I _S	30	
Pulsed Drain Current ^b		I _{DM}	90	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	20	
Single Pulse Avalanche Energy		E _{AS}	20	
Maximum Power Dissipation ^b	T _C = 25 °C	P _D	37	W
	T _C = 125 °C		12	
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}	4	

Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.



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		60	-	-	V
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		1.5	2.0	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} = 60 V	-	-	1.0	μA
		V _{GS} = 0 V	V _{DS} = 60 V, T _J = 125 °C	-	-	50	
		V _{GS} = 0 V	V _{DS} = 60 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 = 15 A	-	0.024	0.031	Ω
		V _{GS} = 10 V	I _D = 15 A, T _J = 125 °C	-	-	0.055	
		V _{GS} = 10 V	I _D = 15 A, T _J = 175 °C	-	-	0.070	
		V _{GS} = 4.5 V	I _D = 10 A	-	-	0.045	
Forward Transconductance ^b	g _{fs}	V _{DS} = 15 V, I _D = 15 A		-	25	-	S
Dynamic^b							
Input Capacitance	C _{iss}	V _{GS} = 0 V	V _{DS} = 25 V, f = 1 MHz	-	674	845	pF
Output Capacitance	C _{oss}			-	144	180	
Reverse Transfer Capacitance	C _{rss}			-	55	70	
Total Gate Charge ^c	Q _g	V _{GS} = 10 V	V _{DS} = 30 V, I _D = 23 A	-	16	24	nC
Gate-Source Charge ^c	Q _{gs}			-	4	-	
Gate-Drain Charge ^c	Q _{gd}			-	3	-	
Gate Resistance	R _g	f = 1 MHz		1.1	2.2	3.3	Ω
Turn-On Delay Time ^c	t _{d(on)}	V _{DD} = 30 V, R _L = 1.3 Ω I _D ≅ 23 A, V _{GEN} = 10 V, R _g = 1 Ω		-	6	9	ns
Rise Time ^c	t _r			-	8	12	
Turn-Off Delay Time ^c	t _{d(off)}			-	14	21	
Fall Time ^c	t _f			-	3	5	
Source-Drain Diode Ratings and Characteristics^b							
Pulsed Current ^a	I _{SM}			-	-	90	A
Forward Voltage	V _{SD}	I _F = 15 A, V _{GS} = 0 V		-	0.9	1.5	V

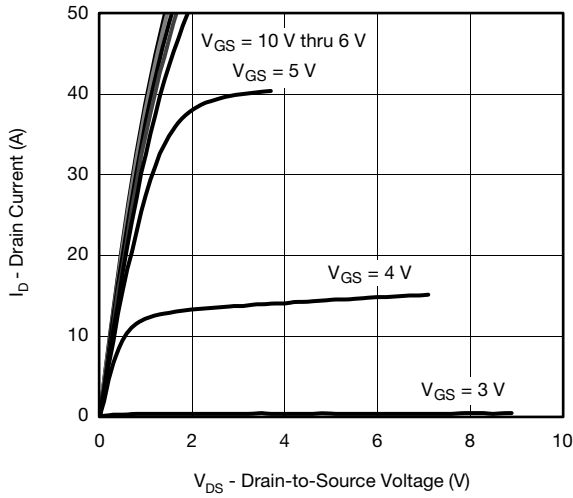
Notes

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

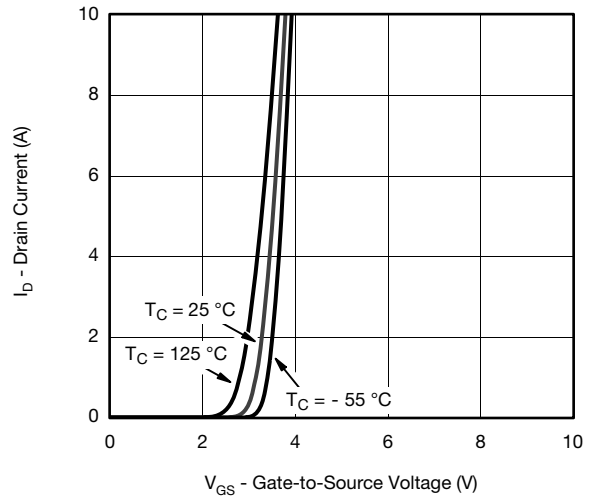
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



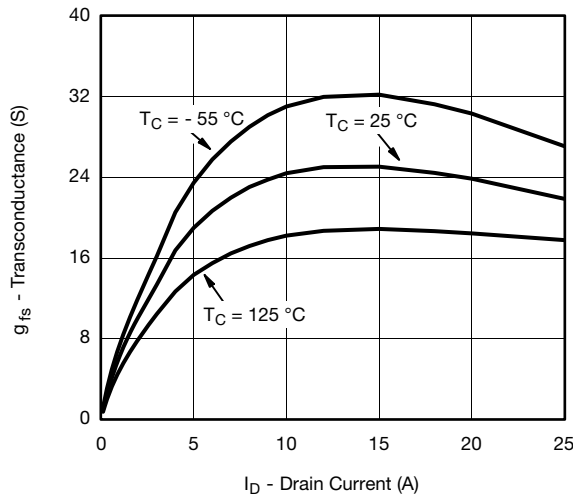
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



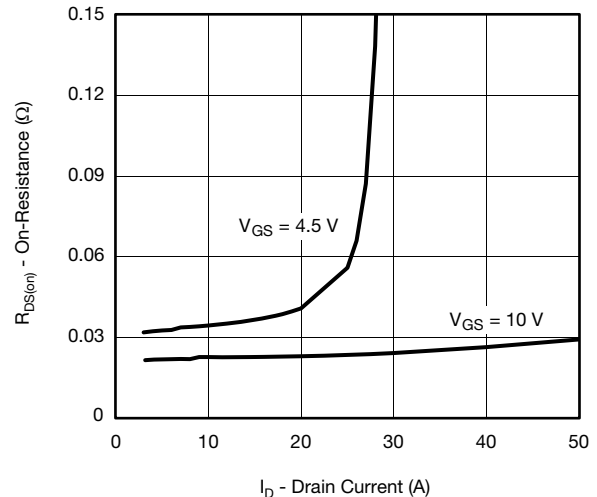
Output Characteristics



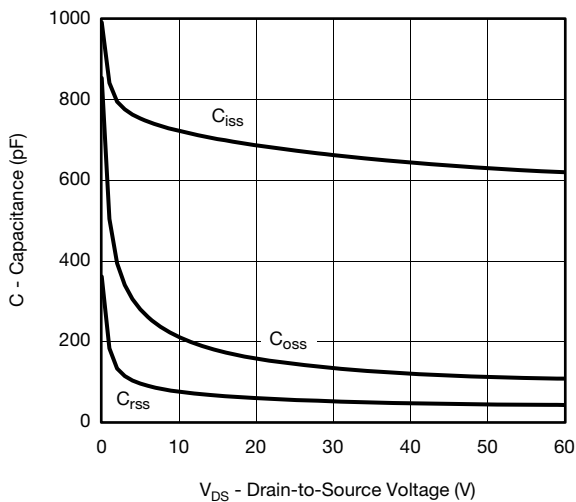
Transfer Characteristics



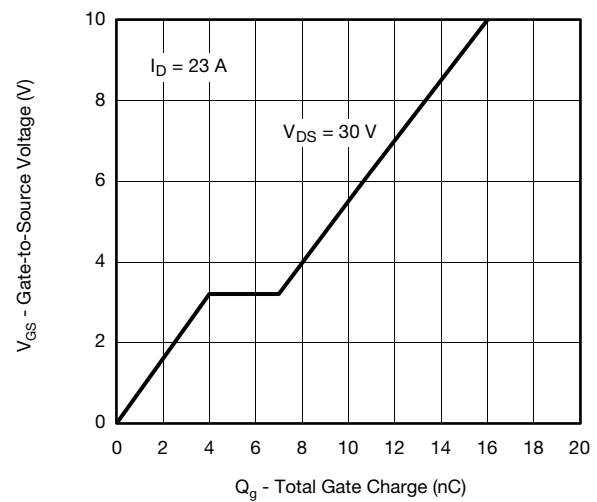
Transconductance



On-Resistance vs. Drain Current



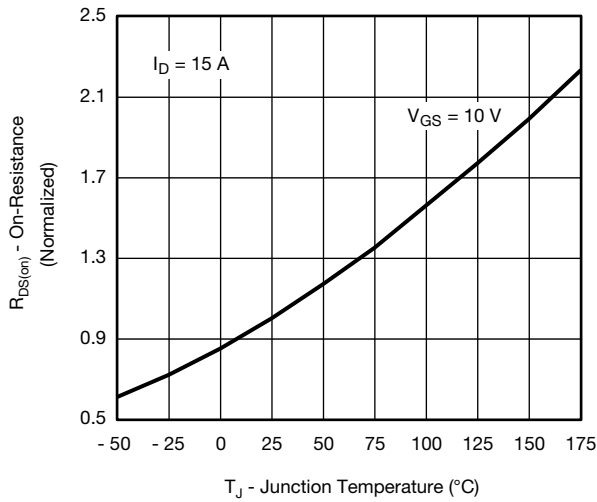
Capacitance



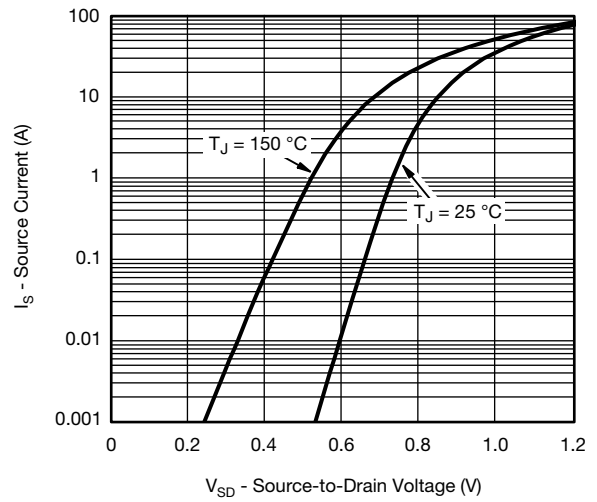
Gate Charge



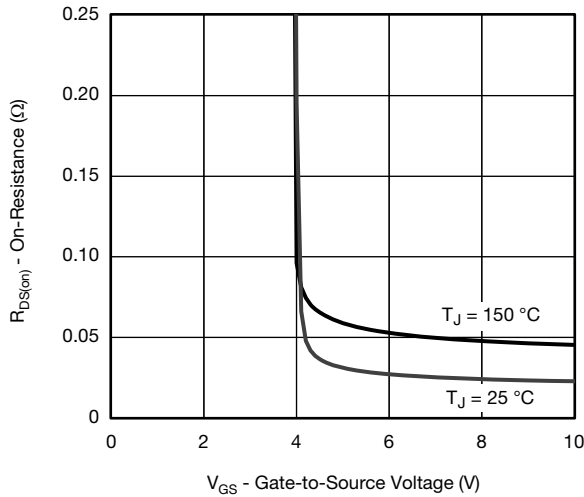
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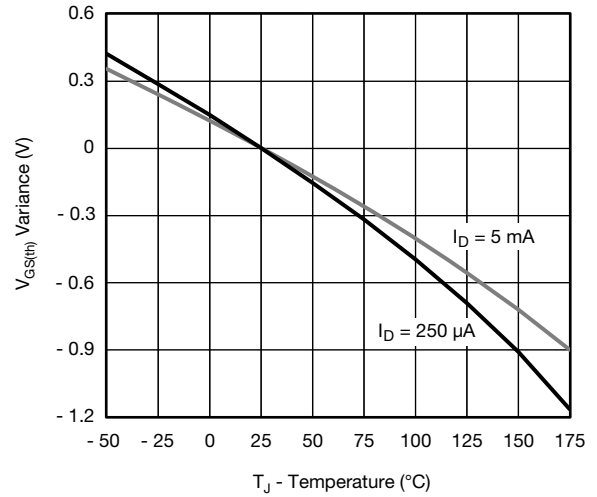
On-Resistance vs. Junction Temperature



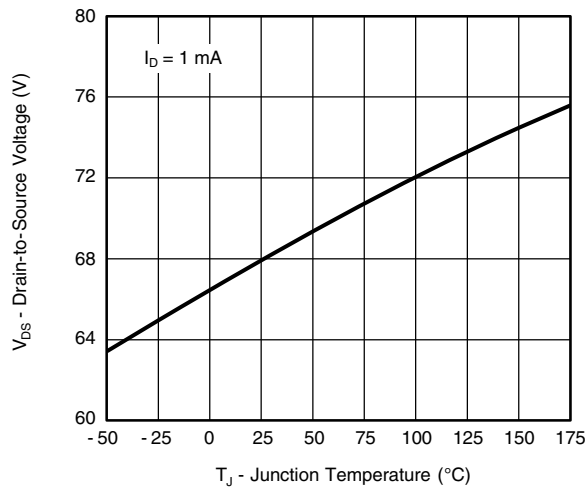
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage



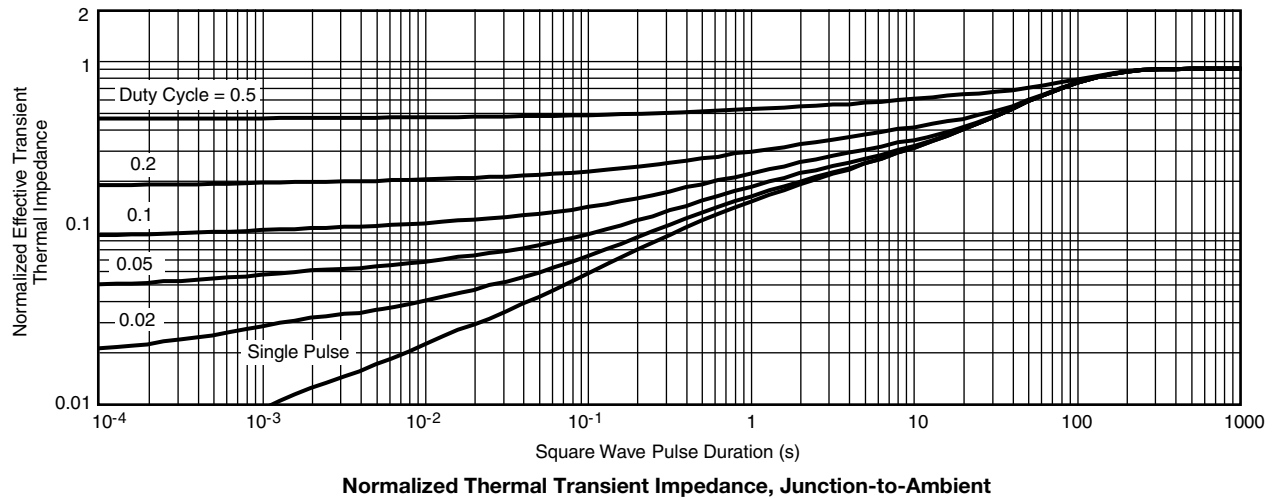
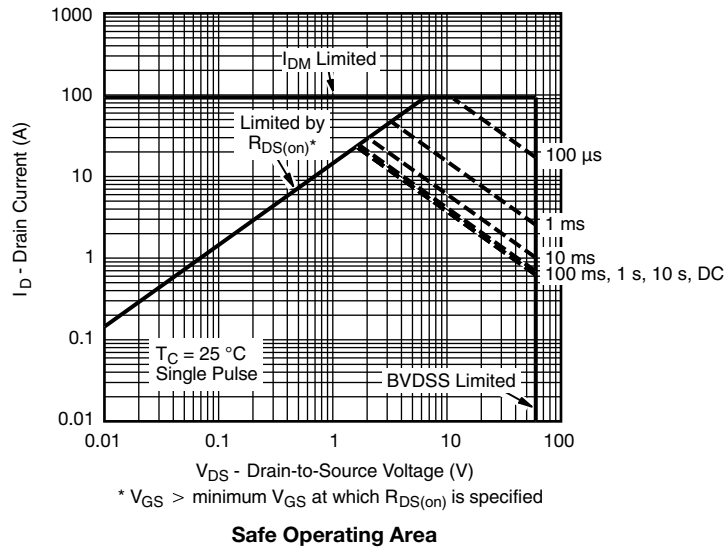
Threshold Voltage



On-Resistance vs. Junction Temperature

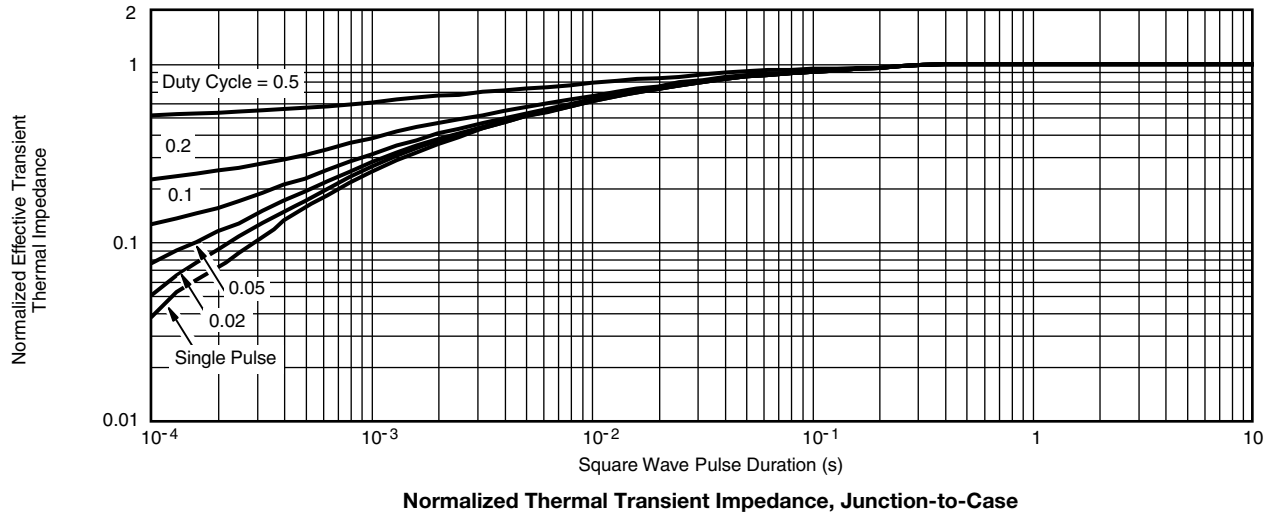


THERMAL RATINGS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)





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

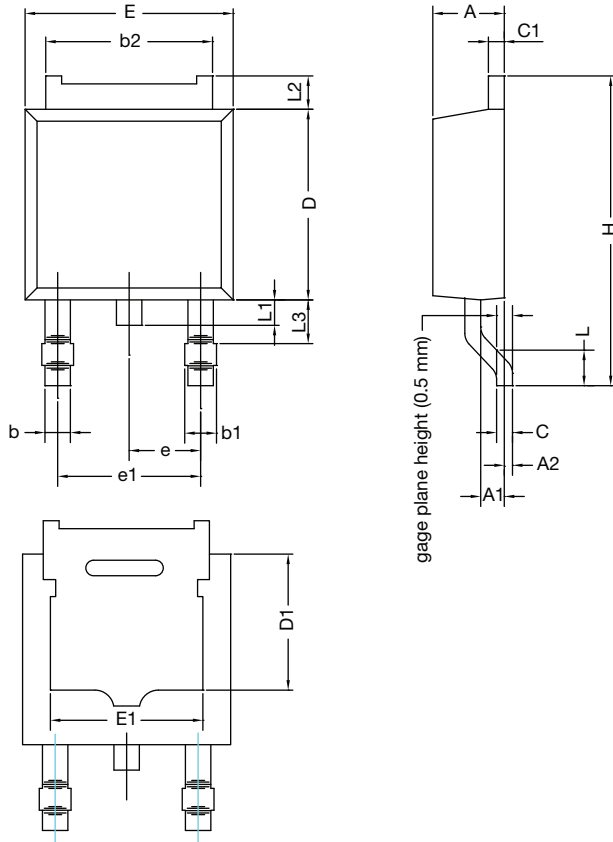


Note

- 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

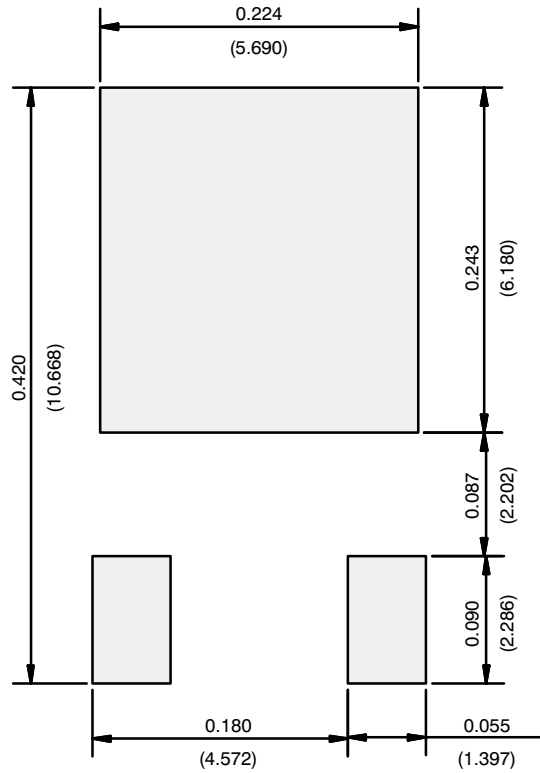


DIM.	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
A2	0.030	0.127	0.001	0.005
b	0.71	0.88	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.44	0.206	0.214
C	0.46	0.58	0.018	0.023
C1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
D1	4.10	4.45	0.161	0.175
E	6.48	6.73	0.255	0.265
E1	4.49	5.50	0.177	0.217
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	0.64	1.02	0.025	0.040
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.040	0.060
ECN: T11-0110-Rev. L, 18-Apr-11 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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