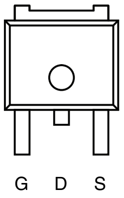
Automotive P-Channel 40 V (D-S) 175 °C MOSFET

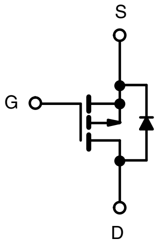
PRODUCT SUMMARY	
V_{DS} (V)	- 40
$R_{DS(on)}$ (Ω) at V_{GS} = - 10 V	0.0094
$R_{DS(on)}$ (Ω) at V_{GS} = - 4.5 V	0.0190
I_D (A)	- 50
Configuration	Single

TO-252



Drain Connected to Tab

Top View



P-Channel MOSFET

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC
- AEC-Q101 Qualified[d]

ORDERING INFORMATION	
Package	TO-252
Lead (Pb)-free and Halogen-free	SQD50P04-09L-GE3

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V_{DS}	- 40	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current[a]	T_C = 25 °C	I_D	- 50	A
	T_C = 125 °C		- 50	
Continuous Source Current (Diode Conduction)[a]		I_S	- 50	
Pulsed Drain Current[b]		I_{DM}	- 200	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	- 50	
Single Pulse Avalanche Energy		E_{AS}	125	mJ
Maximum Power Dissipation[b]	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[c]	R_{thJA}	50	°C/W
Junction-to-Case (Drain)		R_{thJC}	1.1	

Notes

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

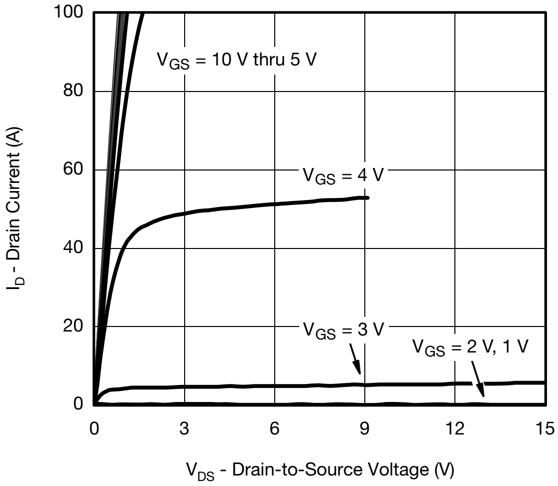
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 μA		- 40	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 μA		- 1.5	-	- 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} = - 40 V	-	-	- 1	μA
		V_{GS} = 0 V	V_{DS} = - 40 V, T_J = 125 °C	-	-	- 50	
		V_{GS} = 0 V	V_{DS} = - 40 V, T_J = 175 °C	-	-	- 150	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = - 10 V	$V_{DS} \leq$ - 5 V	- 50	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V	I_D = - 17 A	-	0.0076	0.0094	Ω
		V_{GS} = - 10 V	I_D = - 50 A, T_J = 125 °C	-	-	0.014	
		V_{GS} = - 10 V	I_D = - 50 A, T_J = 175 °C	-	-	0.017	
		V_{GS} = - 4.5 V	I_D = - 14 A	-	0.012	0.019	
Forward Transconductance[b]	g_{fs}	V_{DS} = - 15 V, I_D = - 17 A		-	46	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = - 20 V, f = 1 MHz	-	5339	6675	pF
Output Capacitance	C_{oss}			-	852	1065	
Reverse Transfer Capacitance	C_{rss}			-	681	855	
Total Gate Charge[c]	Q_g	V_{GS} = - 10 V	V_{DS} = - 20 V, I_D = - 50 A	-	103	155	nC
Gate-Source Charge[c]	Q_{gs}			-	24	-	
Gate-Drain Charge[c]	Q_{gd}			-	16	-	
Gate Resistance	R_g	f = 1 MHz		1.4	2.8	4.2	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = - 20 V, R_L = 0.4 Ω $I_D \cong$ - 50 A, V_{GEN} = - 10 V, R_g = 1 Ω		-	13	20	ns
Rise Time[c]	t_r			-	15	23	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	61	92	
Fall Time[c]	t_f			-	19	29	
Source-Drain Diode Ratings and Characteristics[b]							
Pulsed Current[a]	I_{SM}			-	-	- 200	A
Forward Voltage	V_{SD}	I_F = - 50 A, V_{GS} = 0 V		-	- 0.95	- 1.5	V

Notes

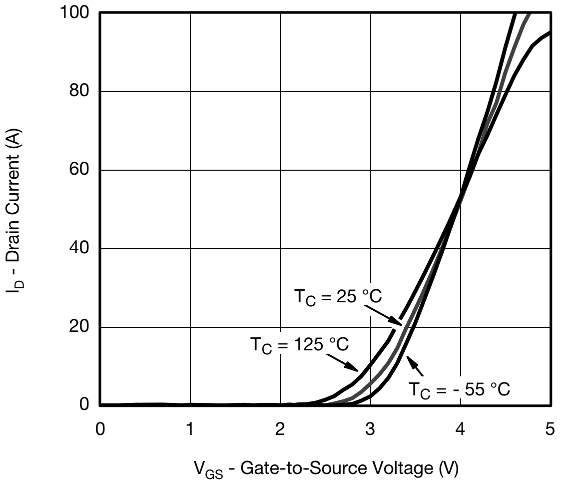
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

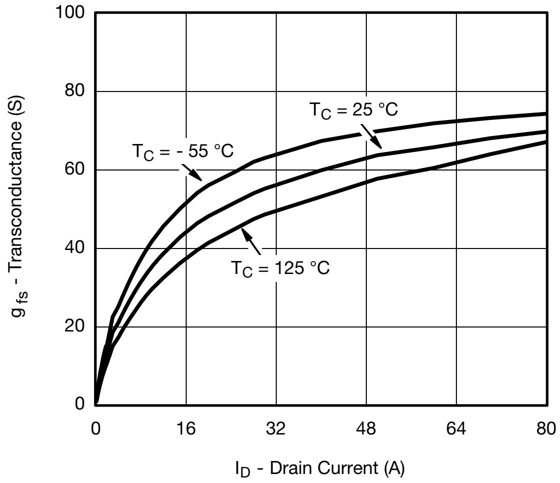
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



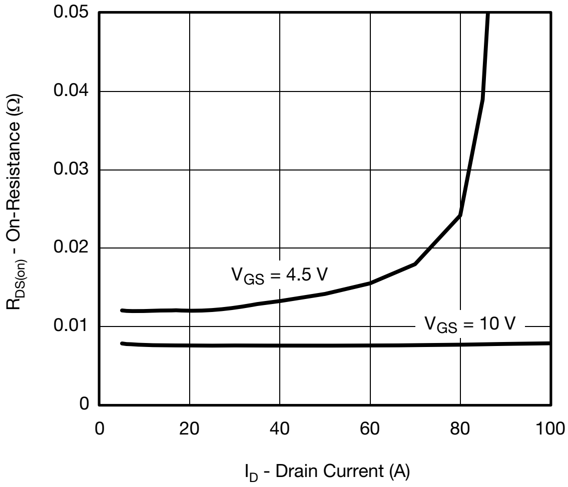
Output Characteristics



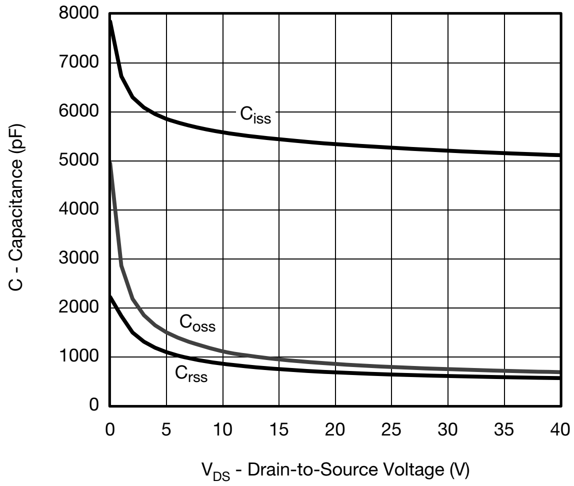
Transfer Characteristics



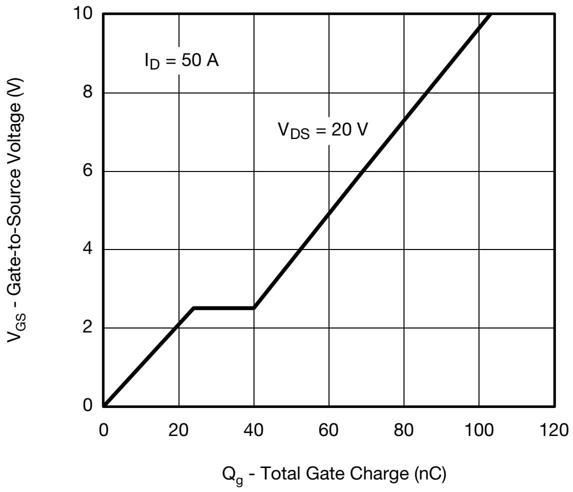
Transconductance



On-Resistance vs. Drain Current

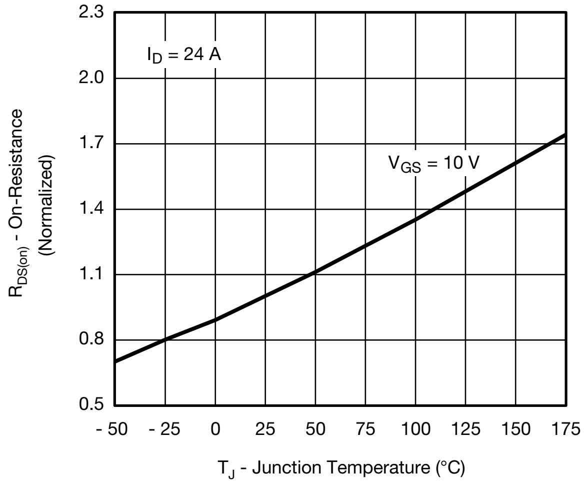


Capacitance

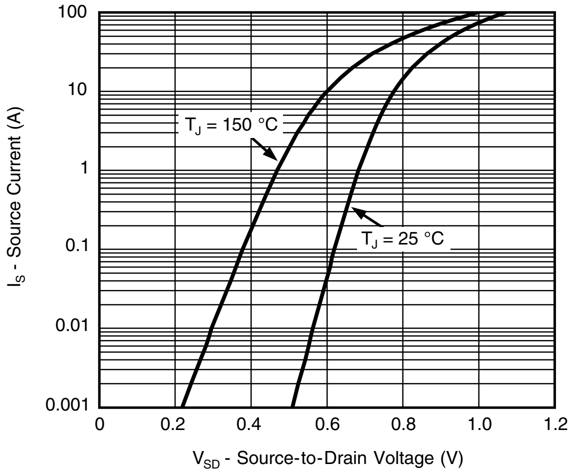


Gate Charge

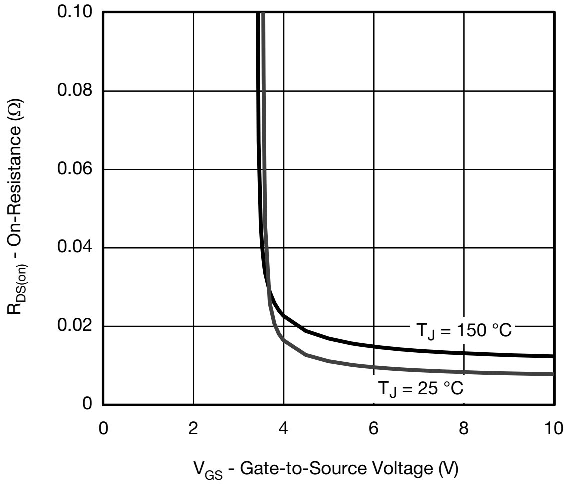
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



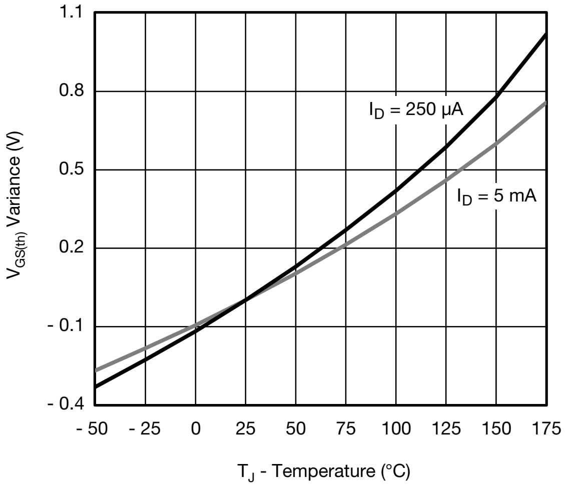
On-Resistance vs. Junction Temperature



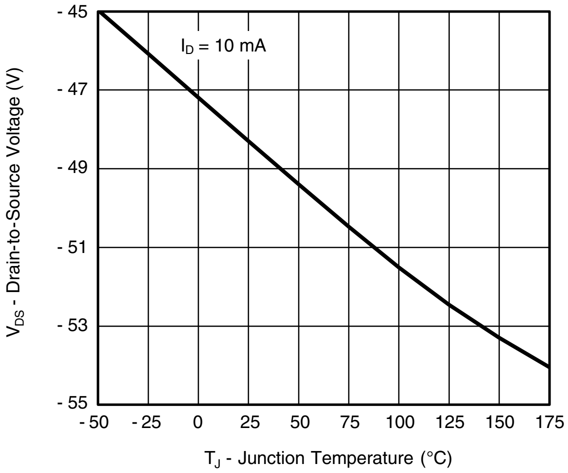
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

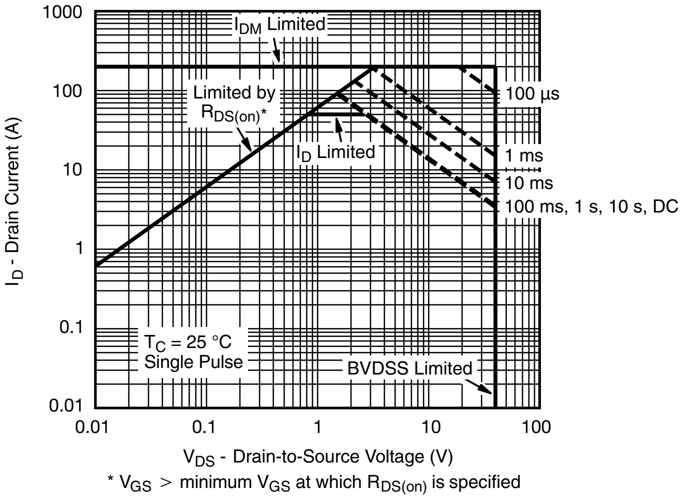


Threshold Voltage

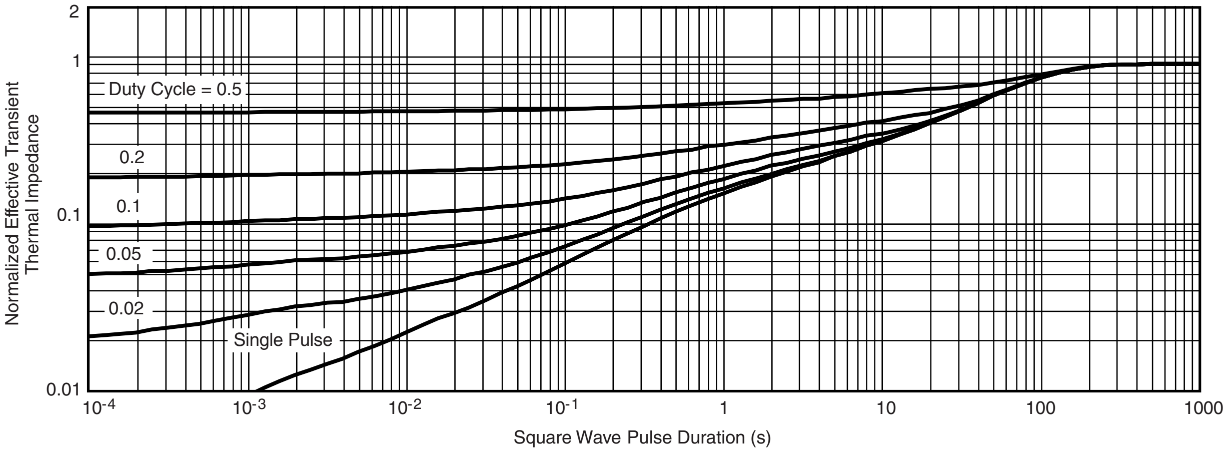


On-Resistance vs. Junction Temperature

THERMAL RATINGS (T_A = 25 °C, unless otherwise noted)

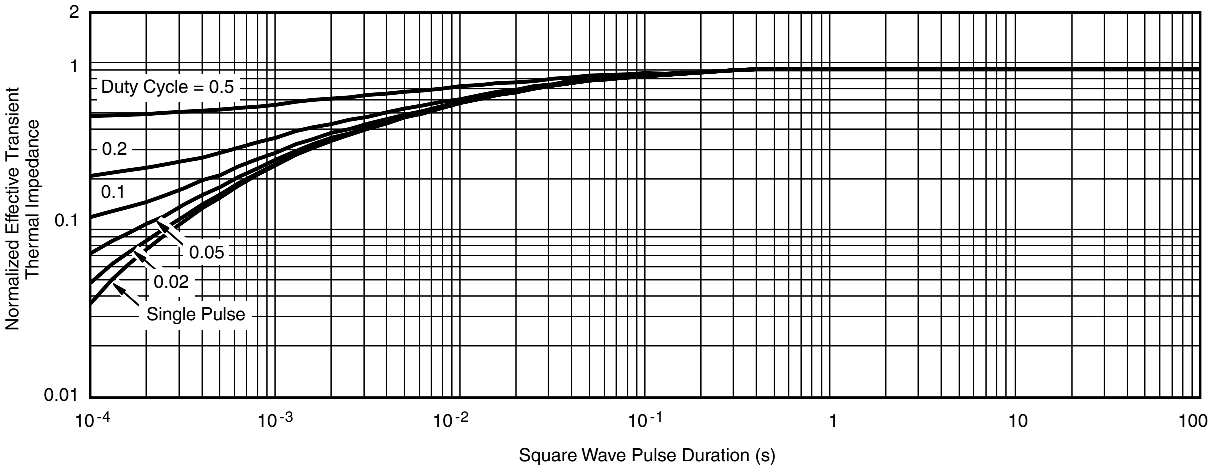


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Ambient

THERMAL RATINGS (T_A = 25 °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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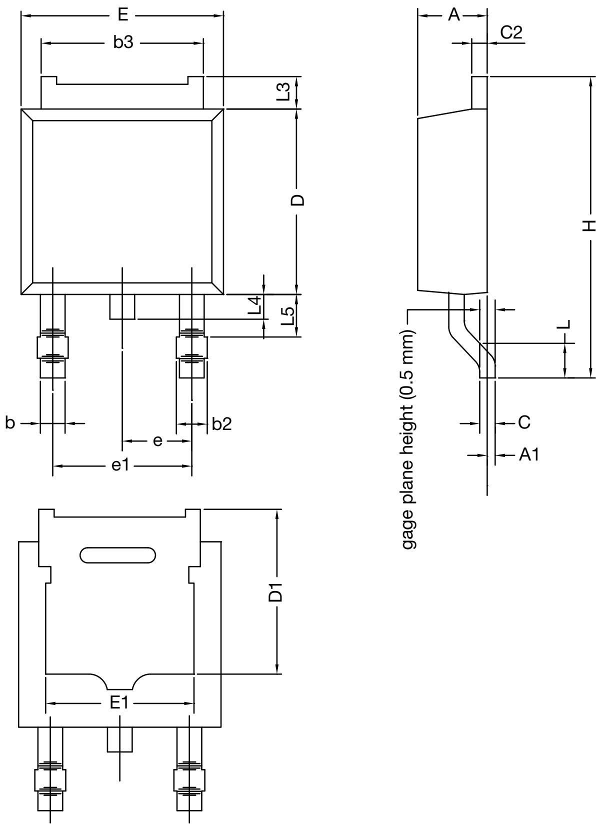
TO-252AA Case Outline

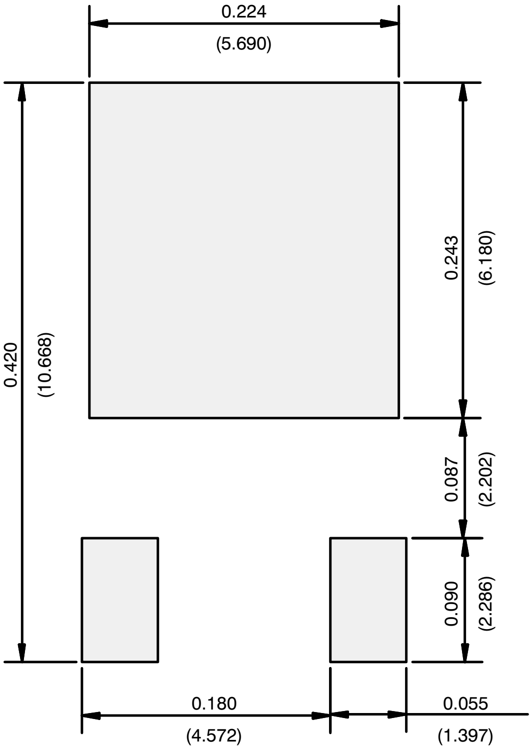


	MILLIMETERS		INCHES	
DIM.	**MIN.**	**MAX.**	**MIN.**	**MAX.**
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	4.10	-	0.161	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	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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