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

PRODUCT SUMMARY

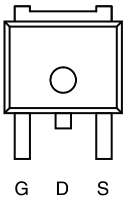
V_{DS} (V)	- 100
$R_{DS(on)}$ (Ω) at V_{GS} = - 10 V	0.040
$R_{DS(on)}$ (Ω) at V_{GS} = - 4.5 V	0.048
I_D (A)	- 38
Configuration	Single

FEATURES

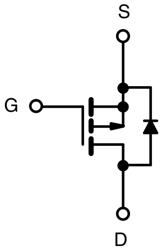
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- AEC-Q101 Qualified[d]
- 100 % R_g and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

AUTOMOTIVE GRADE
RoHS COMPLIANT
HALOGEN FREE

TO-252



Top View



P-Channel MOSFET

ORDERING INFORMATION

Package	TO-252
Lead (Pb)-free and Halogen-free	SQD40P10-40L-GE3

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}	± 20	
Continuous Drain Current	T_C = 25 °C	I_D	- 38	A
	T_C = 125 °C		- 22	
Continuous Source Current (Diode Conduction)[a]		I_S	- 50	
Pulsed Drain Current[b]		I_{DM}	- 150	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	- 44	
Single Pulse Avalanche Energy		E_{AS}	96	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.

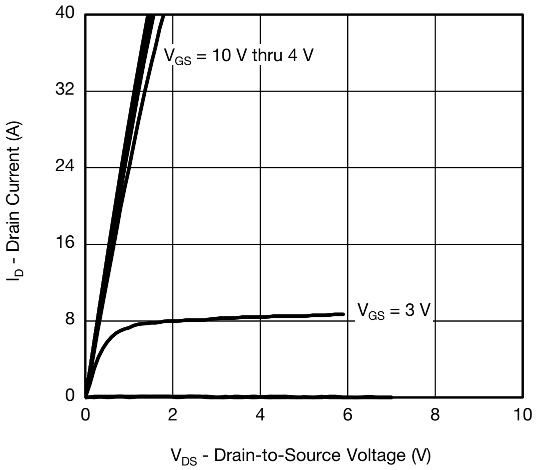
SPECIFICATIONS (T_C = 25 °C, unless otherwise noted)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 μA		- 100	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = - 250 μA		- 1.0	- 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} = - 100 V	-	-	- 1	μA
		V_{GS} = 0 V	V_{DS} = - 100 V, T_J = 125 °C	-	-	- 50	
		V_{GS} = 0 V	V_{DS} = - 100 V, T_J = 175 °C	-	-	- 250	
On-State Drain Current[a]	$I_{D(on)}$	V_{GS} = - 10 V	$V_{DS} \leq$ - 5 V	- 30	-	-	A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V	I_D = - 9.2 A	-	0.033	0.040	Ω
		V_{GS} = - 10 V	I_D = - 9.2 A, T_J = 125 °C	-	-	0.074	
		V_{GS} = - 10 V	I_D = - 9.2 A, T_J = 175 °C	-	-	0.093	
		V_{GS} = - 4.5 V	I_D = - 7.7 A	-	0.037	0.048	
Forward Transconductance[b]	g_{fs}	V_{DS} = - 15 V, I_D = - 9.2 A		-	35	-	S
Dynamic[b]							
Input Capacitance	C_{iss}	V_{GS} = 0 V	V_{DS} = - 25 V, f = 1 MHz	-	4433	5545	pF
Output Capacitance	C_{oss}			-	301	380	
Reverse Transfer Capacitance	C_{rss}			-	208	260	
Total Gate Charge[c]	Q_g	V_{GS} = - 10 V	V_{DS} = - 50V, I_D = - 9.2 A	-	96	144	nC
Gate-Source Charge[c]	Q_{gs}			-	8.4	-	
Gate-Drain Charge[c]	Q_{gd}			-	23.5	-	
Gate Resistance	R_g	f = 1 MHz		1.5	3.13	4.7	Ω
Turn-On Delay Time[c]	$t_{d(on)}$	V_{DD} = - 50 V, R_L = 6.49 Ω $I_D \cong$ - 7.7 A, V_{GEN} = - 10 V, R_g = 1.0 Ω		-	11	17	ns
Rise Time[c]	t_r			-	11	17	
Turn-Off Delay Time[c]	$t_{d(off)}$			-	78	117	
Fall Time[c]	t_f			-	15	23	
Source-Drain Diode Ratings and Characteristics[b]							
Pulsed Current[a]	I_{SM}			-	-	- 150	A
Forward Voltage	V_{SD}	I_F = - 7.7 A, V_{GS} = 0 V		-	- 0.8	- 1.5	V

Notes

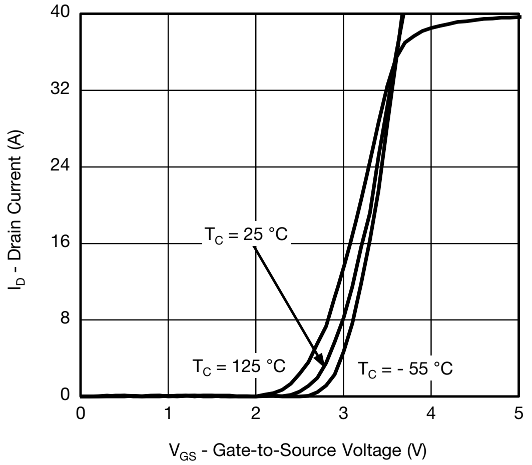
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.
c. Independent of operating temperature.

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.

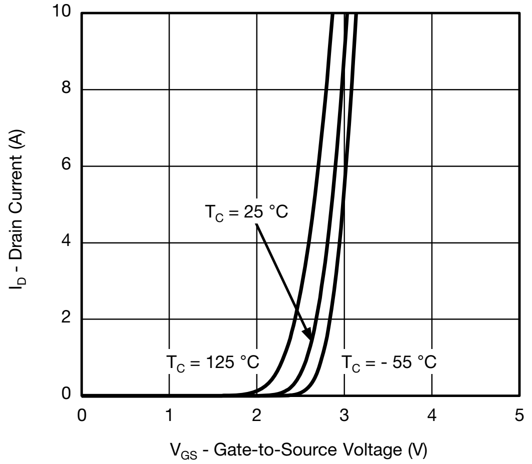
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



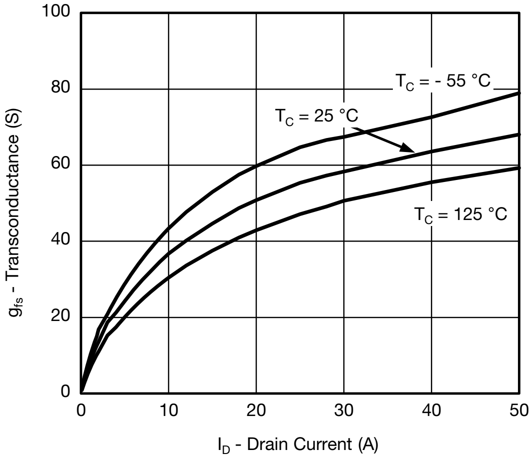
Output Characteristics



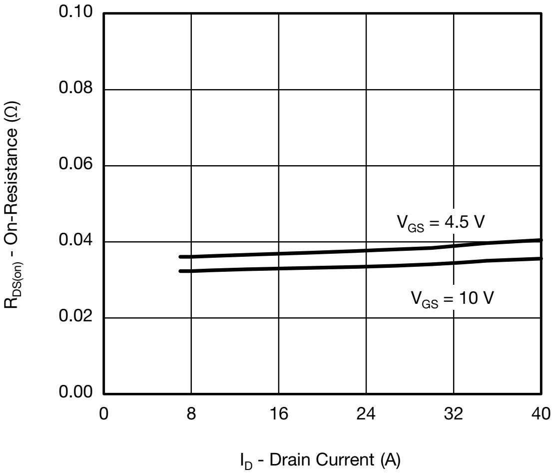
Transfer Characteristics



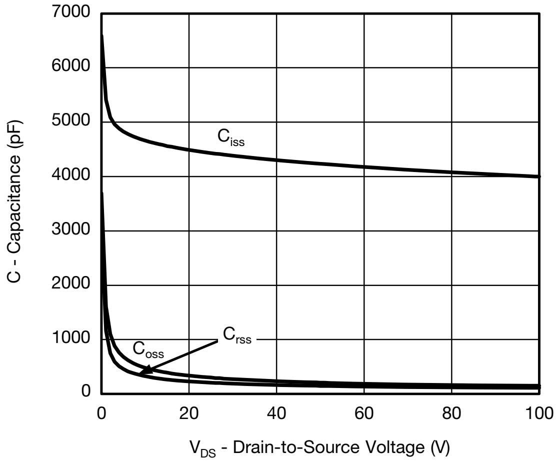
Transfer Characteristics



Transconductance

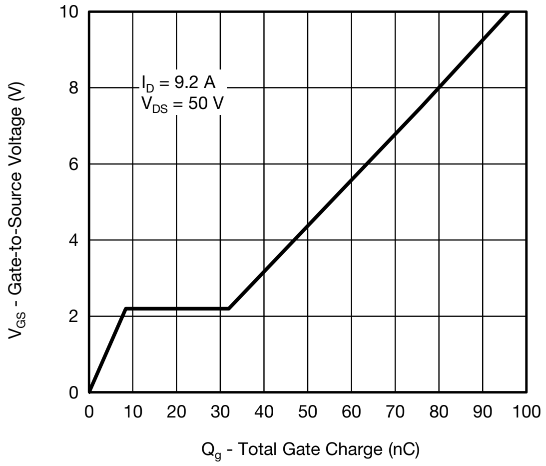


On-Resistance vs. Drain Current

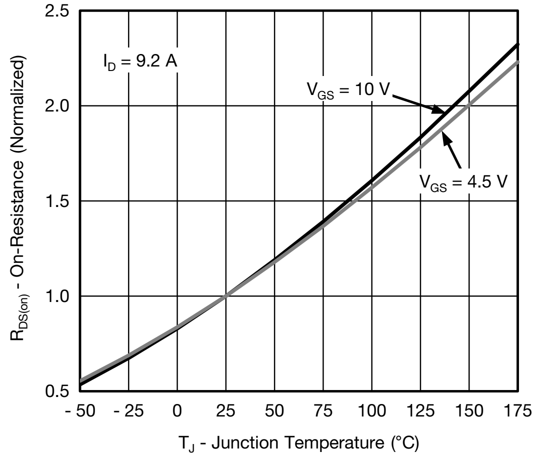


Capacitance

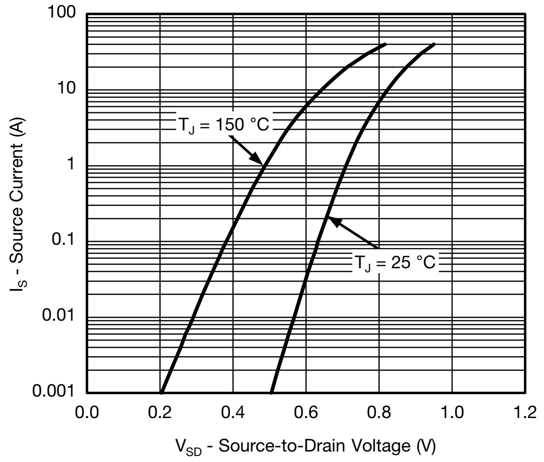
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



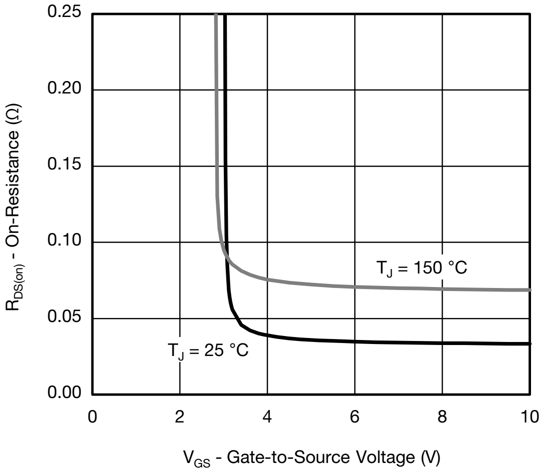
Gate Charge



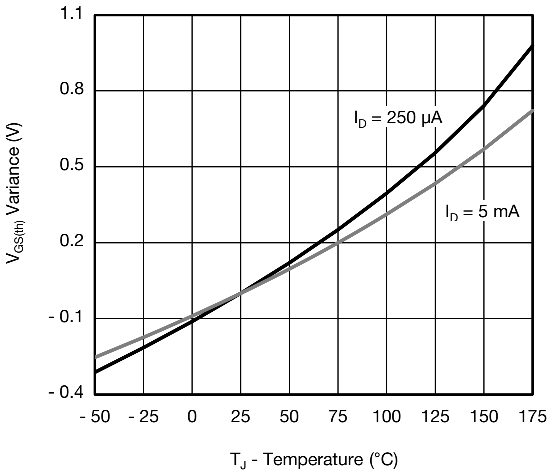
On-Resistance vs. Junction Temperature



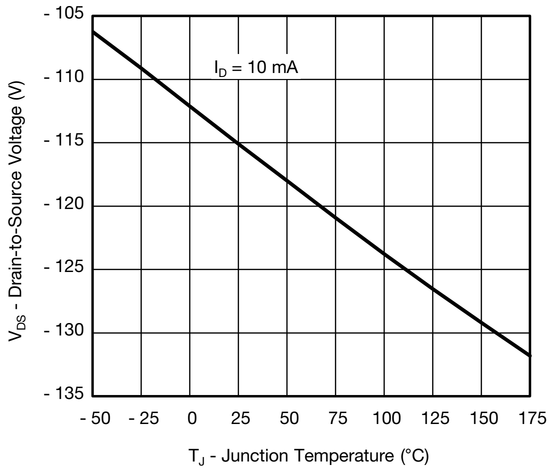
Source Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

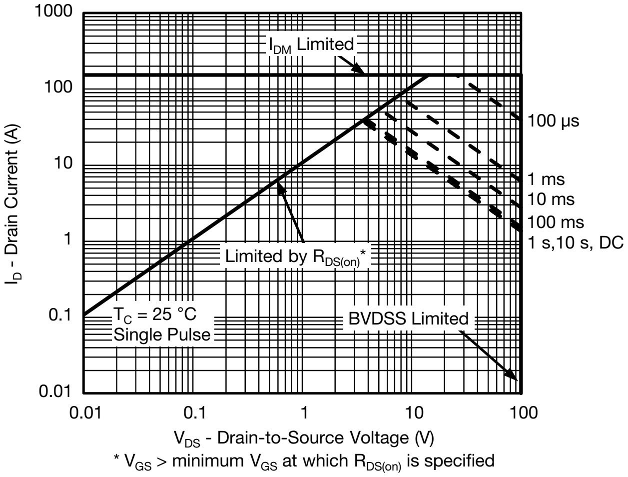


Threshold Voltage

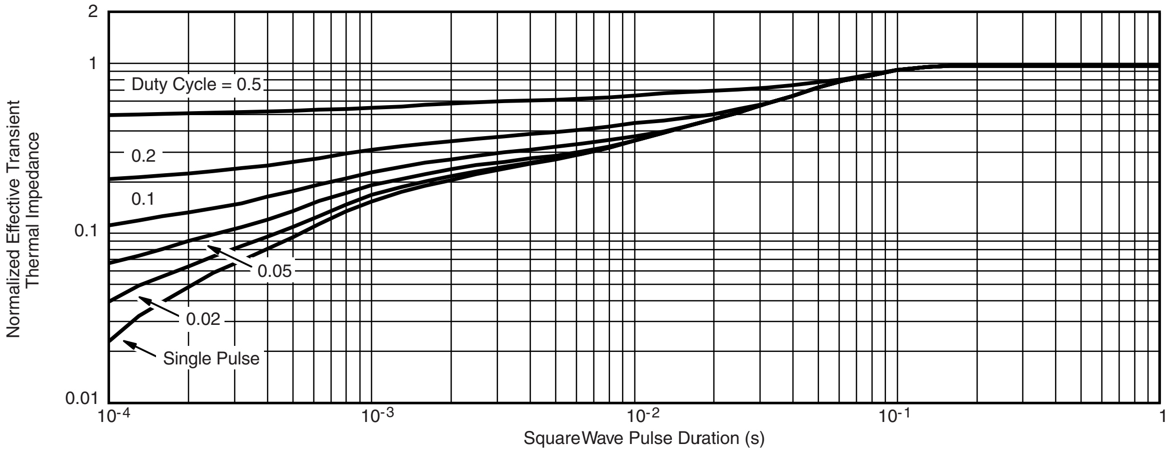


Drain Source Breakdown vs. Junction Temperature

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

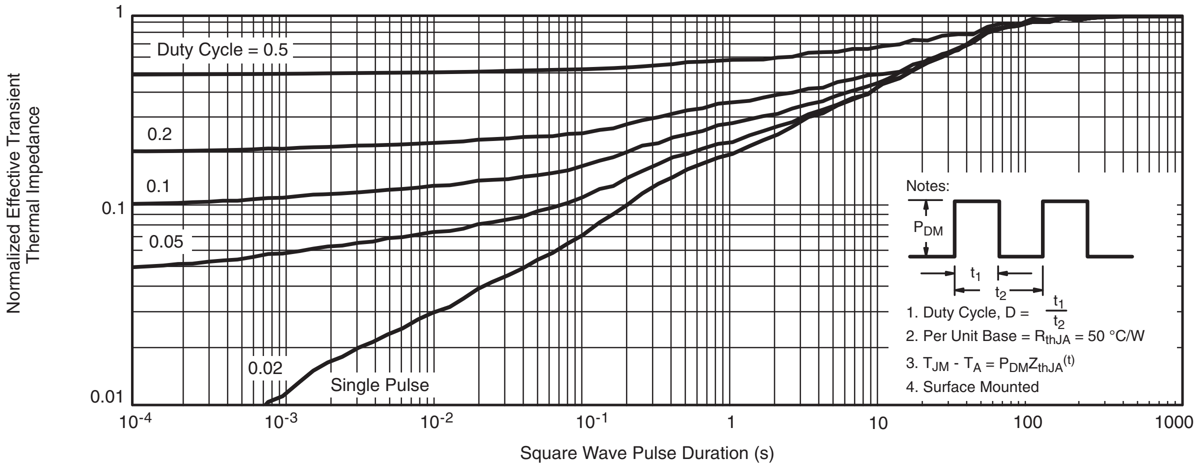


Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Case

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



Normalized Thermal Transient Impedance, Junction-to-Ambient

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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DPAK / TO-252 and Reverse DPAK

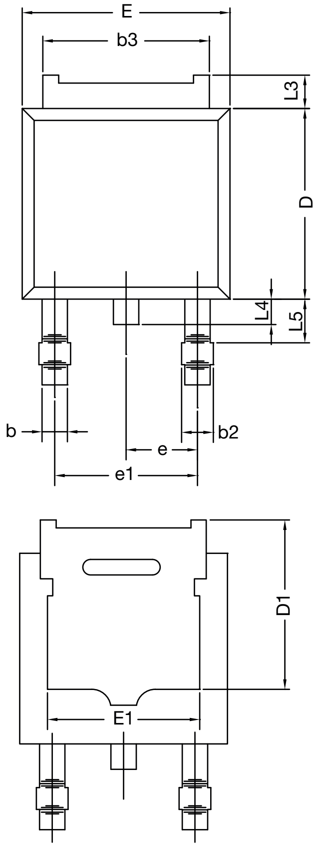
Ordering codes for the SQ rugged series power MOSFETs in the DPAK / TO-252 and Reverse DPAK packages:

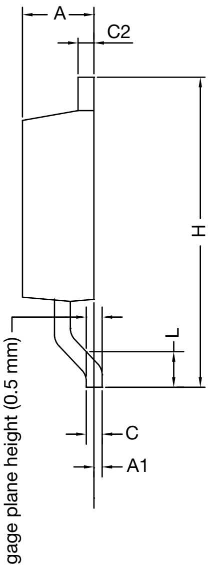
DATASHEET PART NUMBER	OLD ORDERING CODE [a]	NEW ORDERING CODE
SQD07N25-350H	SQD07N25-350H-GE3	**SQD07N25-350H_GE3**
SQD100N02-3m5L	-	**SQD100N02-3m5L_GE3**
SQD100N03-3m2L	SQD100N03-3M2L-GE3	**SQD100N03-3M2L_GE3**
SQD100N03-3m4	SQD100N03-3M4-GE3	**SQD100N03-3M4_GE3**
SQD100N04-3m6	SQD100N04-3M6-GE3	**SQD100N04-3M6_GE3**
SQD100N04-3m6L	SQD100N04-3M6L-GE3	**SQD100N04-3M6L_GE3**
SQD10N30-330H	SQD10N30-330H-GE3	**SQD10N30-330H_GE3**
SQD15N06-42L	SQD15N06-42L-GE3	**SQD15N06-42L_GE3**
SQD19P06-60L	SQD19P06-60L-GE3	**SQD19P06-60L_GE3**
SQD23N06-31L	SQD23N06-31L-GE3	**SQD23N06-31L_GE3**
SQD25N06-22L	SQD25N06-22L-GE3	**SQD25N06-22L_GE3**
SQD25N15-52	SQD25N15-52-GE3	**SQD25N15-52_GE3**
SQD30N05-20L	SQD30N05-20L-GE3	**SQD30N05-20L_GE3**
SQD40N06-14L	SQD40N06-14L-GE3	**SQD40N06-14L_GE3**
SQD40N10-25	SQD40N10-25-GE3	**SQD40N10-25_GE3**
SQD40P10-40L	SQD40P10-40L-GE3	**SQD40P10-40L_GE3**
SQD45P03-12	SQD45P03-12-GE3	**SQD45P03-12_GE3**
SQD50N04-5m6	SQD50N04-5M6-GE3	**SQD50N04-5M6_GE3**
SQD50N04-5m6L	-	**SQD50N04-5m6L_GE3**
SQD50N05-11L	SQD50N05-11L-GE3	**SQD50N05-11L_GE3**
SQD50N06-09L	SQD50N06-09L-GE3	**SQD50N06-09L_GE3**
SQD50N10-8m9L	SQD50N10-8M9L-GE3	**SQD50N10-8M9L_GE3**
SQD50P03-07	SQD50P03-07-GE3	**SQD50P03-07_GE3**
SQD50P04-13L	SQD50P04-13L-GE3	**SQD50P04-13L_GE3**
SQD50P04-09L	SQD50P04-09L-GE3	**SQD50P04-09L_GE3**
SQD50P06-15L	SQD50P06-15L-GE3	**SQD50P06-15L_GE3**
SQD50P08-25L	SQD50P08-25L-GE3	**SQD50P08-25L_GE3**
SQD50P08-28	SQD50P08-28-GE3	**SQD50P08-28_GE3**
SQD70140EL	-	**SQD70140EL_GE3**
SQD90P04-9m4L	SQD90P04-9M4L-GE3	**SQD90P04-9M4L_GE3**
SQD97N06-6m3L	SQD97N06-6M3L-GE3	**SQD97N06-6M3L_GE3**
SQR40N10-25	SQR40N10-25-GE3	**SQR40N10-25_GE3**
SQR50N04-3m8	SQR50N04-3M8-GE3	**SQR50N04-3M8_GE3**

Note

a. Old ordering code is obsolete and no longer valid for new orders

TO-252AA Case Outline



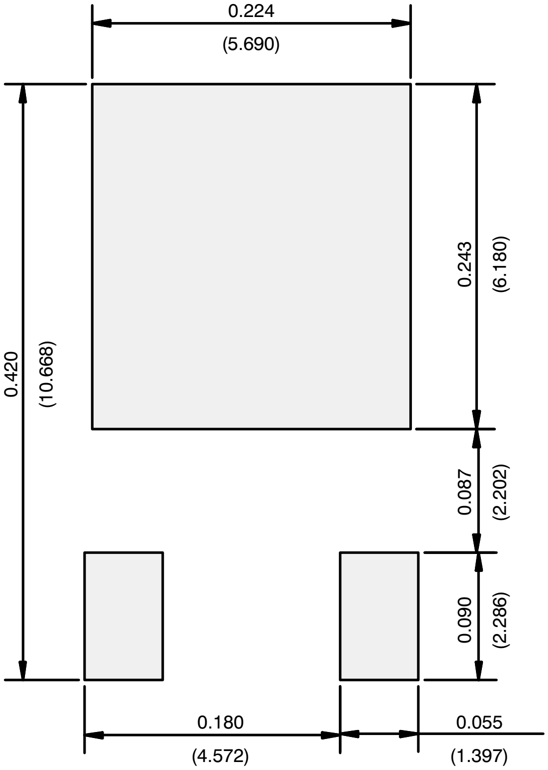


	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
A	2.18	2.38	0.086	0.094
A1	-	0.127	-	0.005
b	0.64	0.88	0.025	0.035
b2	0.76	1.14	0.030	0.045
b3	4.95	5.46	0.195	0.215
C	0.46	0.61	0.018	0.024
C2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	4.10	-	0.161	-
E	6.35	6.73	0.250	0.265
E1	4.32	-	0.170	-
H	9.40	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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