



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



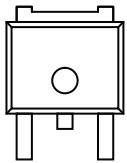
RoHS COMPLIANT HALOGEN FREE

PRODUCT SUMMARY	
V <sub>DS</sub> (V)	- 100
R <sub>DS(on)</sub> (Ω) at V <sub>GS</sub> = - 10 V	0.040
R <sub>DS(on)</sub> (Ω) at V <sub>GS</sub> = - 4.5 V	0.048
I <sub>D</sub> (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<sup>d</sup>
- 100 % R<sub>g</sub> and UIS Tested
- Compliant to RoHS Directive 2002/95/EC

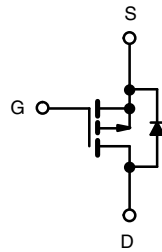
TO-252



G D S

Top View

Drain Connected to Tab



P-Channel MOSFET

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

ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted)			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V <sub>DS</sub>	- 100	V
Gate-Source Voltage	V <sub>GS</sub>	± 20	
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> = 25 °C	- 38
		T <sub>C</sub> = 125 °C	- 22
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	- 50	A
Pulsed Drain Current <sup>b</sup>	I <sub>DM</sub>	- 150	
Single Pulse Avalanche Current	I <sub>AS</sub>	- 44	
Single Pulse Avalanche Energy	E <sub>AS</sub>	96	mJ
Maximum Power Dissipation <sup>b</sup>	P <sub>D</sub>	T <sub>C</sub> = 25 °C	136
		T <sub>C</sub> = 125 °C	45
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to + 175	°C

THERMAL RESISTANCE RATINGS			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	R <sub>thJA</sub>	50	°C/W
Junction-to-Case (Drain)	R <sub>thJC</sub>	1.1	

### 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 <sub>C</sub> = 25 °C, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	V <sub>DS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA		- 100	-	-	V
Gate-Source Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = - 250 μA		- 1.0	- 2.0	- 2.5	
Gate-Source Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 100 V	-	-	- 1	μA
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 100 V, T <sub>J</sub> = 125 °C	-	-	- 50	
		V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 100 V, T <sub>J</sub> = 175 °C	-	-	- 250	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>GS</sub> = - 10 V	V <sub>DS</sub> ≤ - 5 V	- 30	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 9.2 A	-	0.033	0.040	Ω
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 9.2 A, T <sub>J</sub> = 125 °C	-	-	0.074	
		V <sub>GS</sub> = - 10 V	I <sub>D</sub> = - 9.2 A, T <sub>J</sub> = 175 °C	-	-	0.093	
		V <sub>GS</sub> = - 4.5 V	I <sub>D</sub> = - 7.7 A	-	0.037	0.048	
Forward Transconductance <sup>b</sup>	g <sub>fs</sub>	V <sub>DS</sub> = - 15 V, I <sub>D</sub> = - 9.2 A		-	35	-	S
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V	V <sub>DS</sub> = - 25 V, f = 1 MHz	-	4433	5545	pF
Output Capacitance	C <sub>oss</sub>			-	301	380	
Reverse Transfer Capacitance	C <sub>rss</sub>			-	208	260	
Total Gate Charge <sup>c</sup>	Q <sub>g</sub>	V <sub>GS</sub> = - 10 V	V <sub>DS</sub> = - 50V, I <sub>D</sub> = - 9.2 A	-	96	144	nC
Gate-Source Charge <sup>c</sup>	Q <sub>gs</sub>			-	8.4	-	
Gate-Drain Charge <sup>c</sup>	Q <sub>gd</sub>			-	23.5	-	
Gate Resistance	R <sub>g</sub>	f = 1 MHz		1.5	3.13	4.7	Ω
Turn-On Delay Time <sup>c</sup>	t <sub>d(on)</sub>	V <sub>DD</sub> = - 50 V, R <sub>L</sub> = 6.49 Ω I <sub>D</sub> ≅ - 7.7 A, V <sub>GEN</sub> = - 10 V, R <sub>g</sub> = 1.0 Ω		-	11	17	ns
Rise Time <sup>c</sup>	t <sub>r</sub>			-	11	17	
Turn-Off Delay Time <sup>c</sup>	t <sub>d(off)</sub>			-	78	117	
Fall Time <sup>c</sup>	t <sub>f</sub>			-	15	23	
<b>Source-Drain Diode Ratings and Characteristics<sup>b</sup></b>							
Pulsed Current <sup>a</sup>	I <sub>SM</sub>			-	-	- 150	A
Forward Voltage	V <sub>SD</sub>	I <sub>F</sub> = - 7.7 A, V <sub>GS</sub> = 0 V		-	- 0.8	- 1.5	V

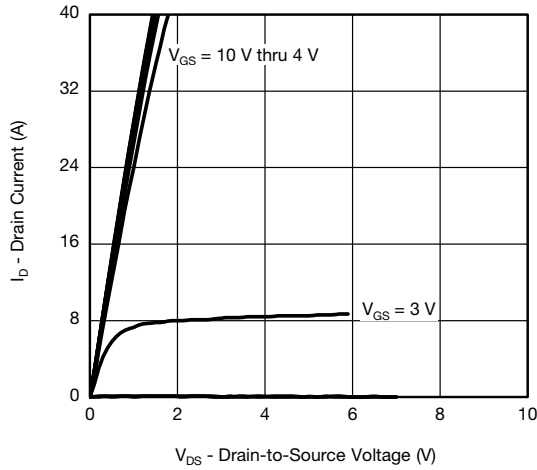
**Notes**

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

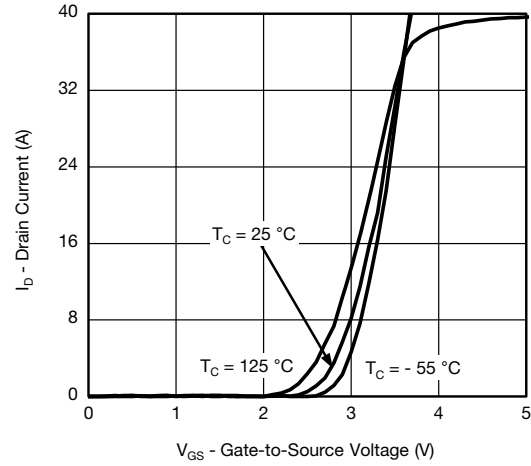
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



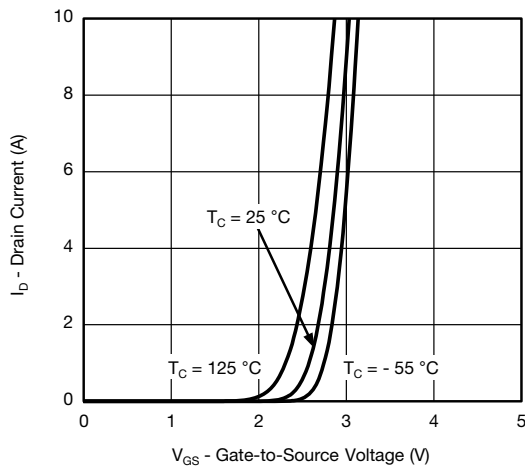
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



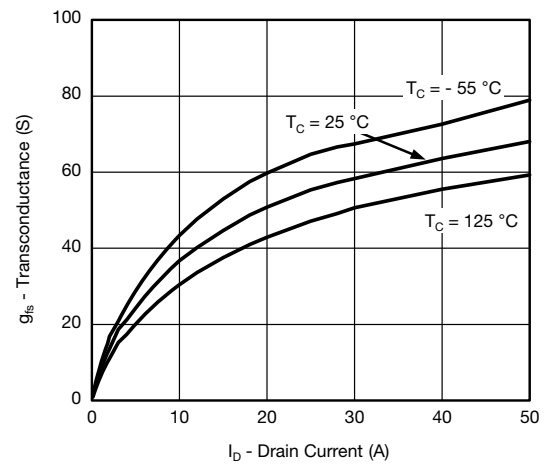
Output Characteristics



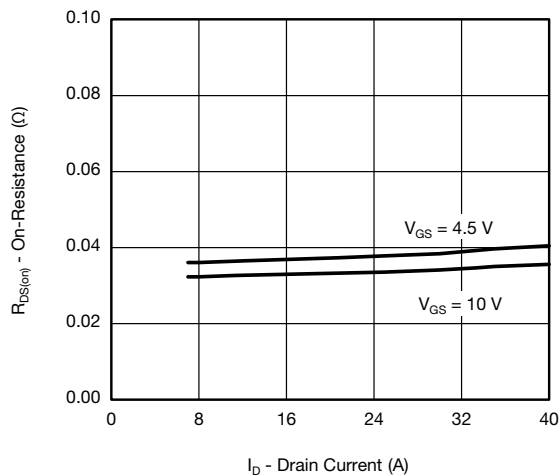
Transfer Characteristics



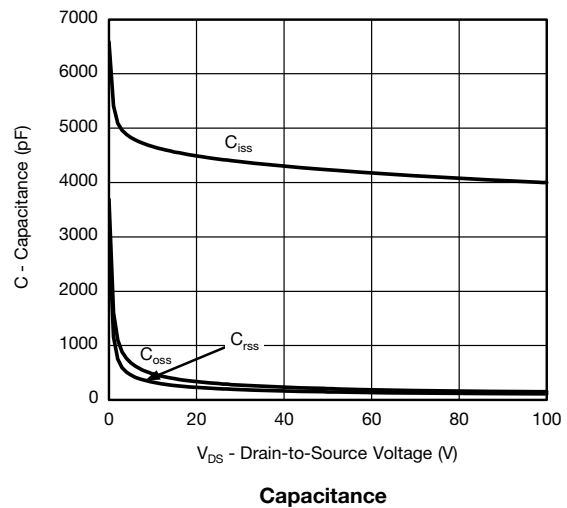
Transfer Characteristics



Transconductance

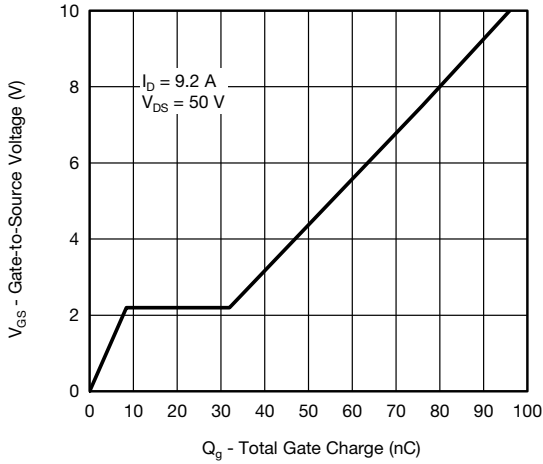


On-Resistance vs. Drain Current

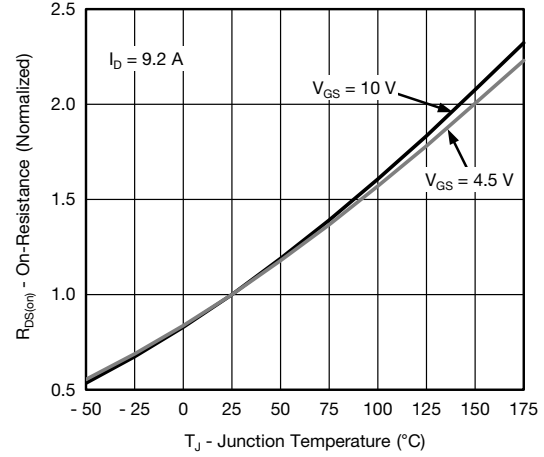


Capacitance

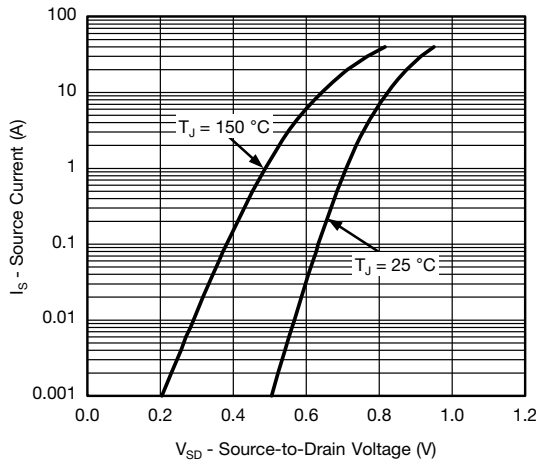
**TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



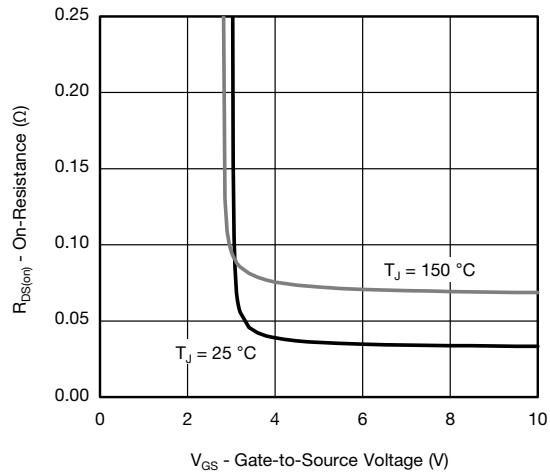
**Gate Charge**



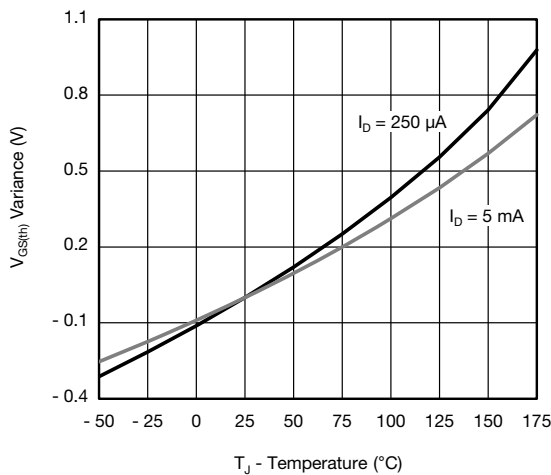
**On-Resistance vs. Junction Temperature**



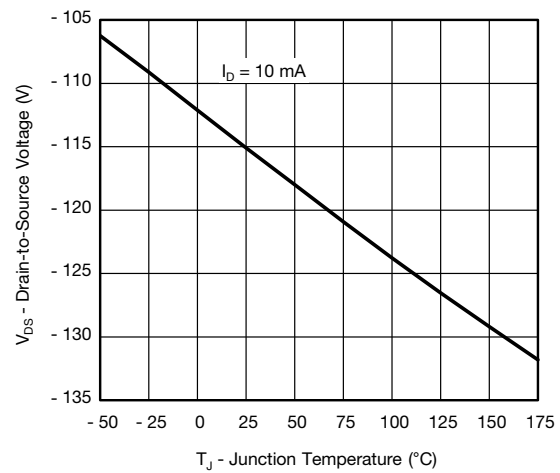
**Source Drain Diode Forward Voltage**



**On-Resistance vs. Gate-to-Source Voltage**



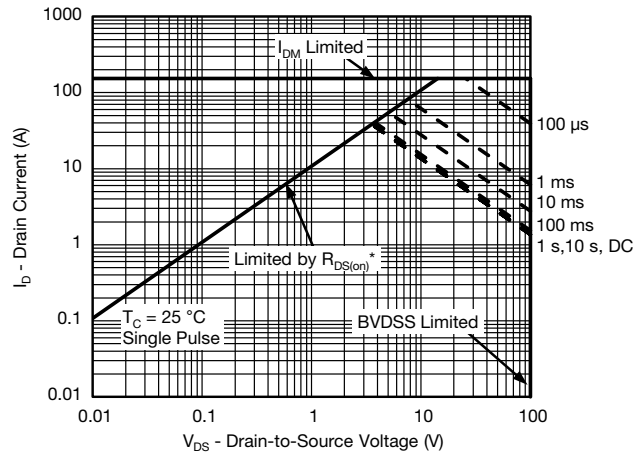
**Threshold Voltage**



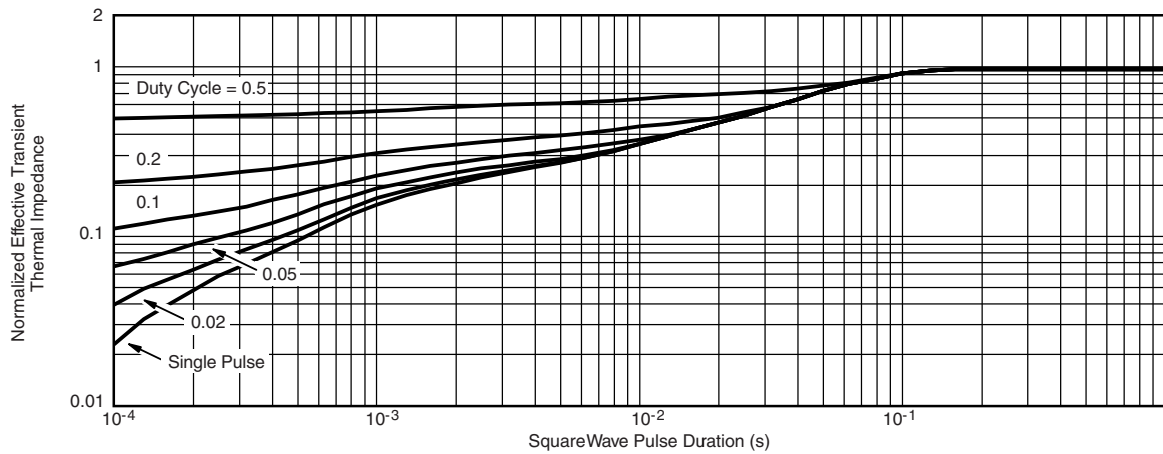
**Drain Source Breakdown vs. Junction Temperature**



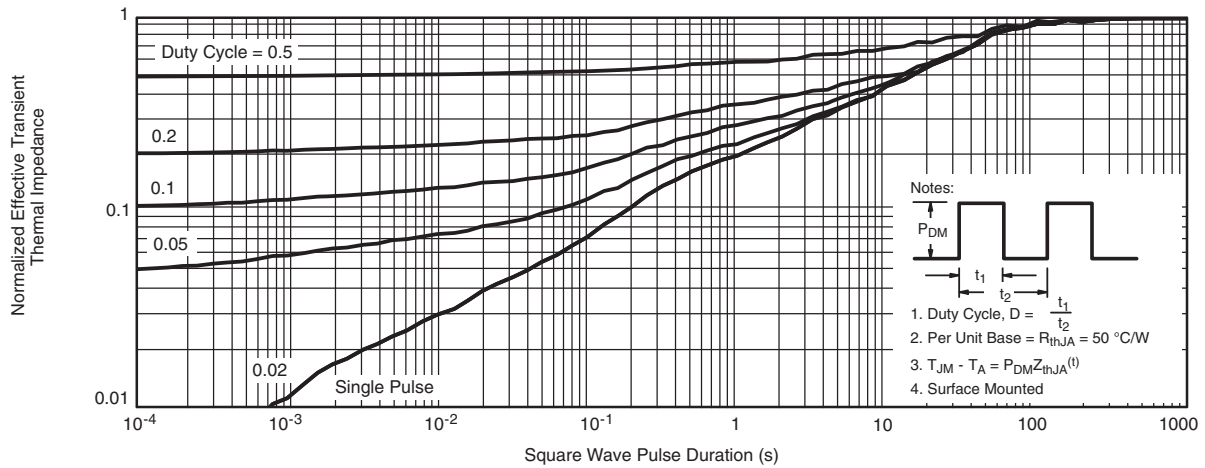
**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



**Safe Operating Area**



**Normalized Thermal Transient Impedance, Junction-to-Case**

**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , 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 ( $25\text{ }^\circ\text{C}$ )
  - 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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## 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 <sup>a</sup>	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
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



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	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)

[Return to Index](#)



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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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**Факс:** 8 (812) 320-02-42

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**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.