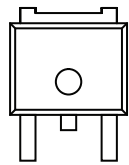


## Automotive P-Channel 40 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V)	- 40
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -10$ V	0.013
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = -4.5$ V	0.040
$I_D$ (A)	- 50
Configuration	Single

**FEATURES**

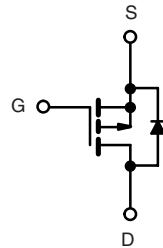
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Package with Low Thermal Resistance
- Compliant to RoHS Directive 2002/95/EC
- AEC-Q101 Qualified<sup>d</sup>
- Find out more about Vishay's Automotive Grade Product Requirements at: [www.vishay.com/applications](http://www.vishay.com/applications)


**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	SQD50P04-13L-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		$V_{GS}$	$\pm 20$	
Continuous Drain Current <sup>a</sup>	$T_C = 25$ °C	$I_D$	- 50	A
	$T_C = 125$ °C		- 39	
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	- 50	
Pulsed Drain Current <sup>b</sup>		$I_{DM}$	- 100	
Single Pulse Avalanche Current	L = 0.1 mH	$I_{AS}$	40	
Single Pulse Avalanche Energy		$E_{AS}$	80	mJ
Maximum Power Dissipation <sup>b</sup>	$T_C = 25$ °C	$P_D$	136	W
	$T_A = 25$ °C		3	
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 <sup>c</sup>	$R_{thJA}$	55	°C/W
Junction-to-Case (Drain)		$R_{thJC}$	1.4	

**Notes**

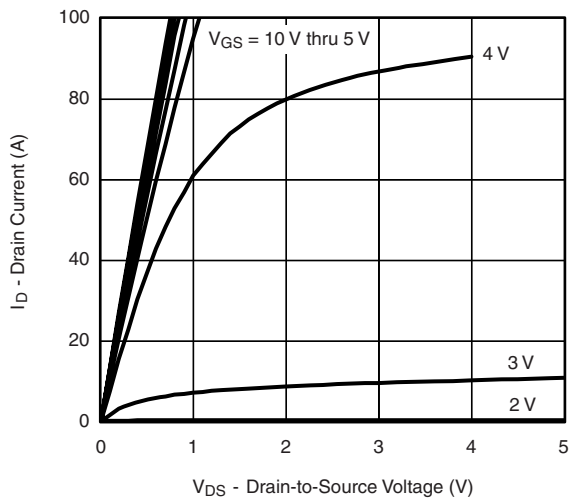
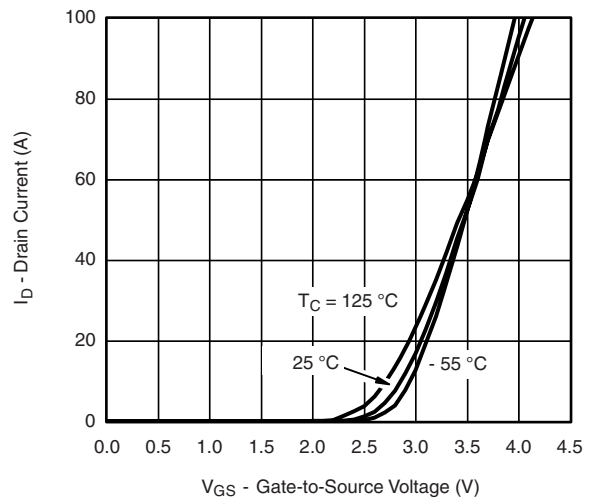
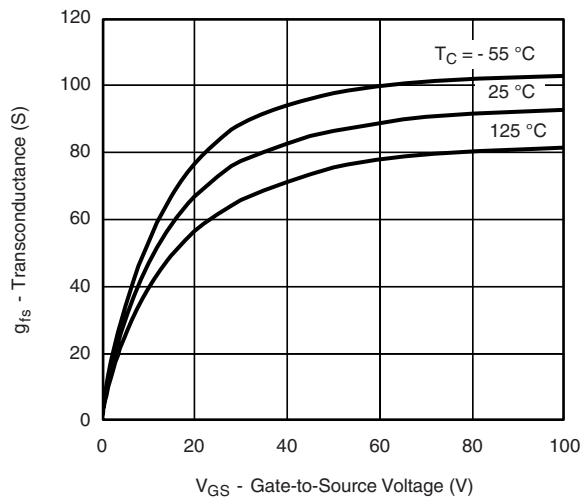
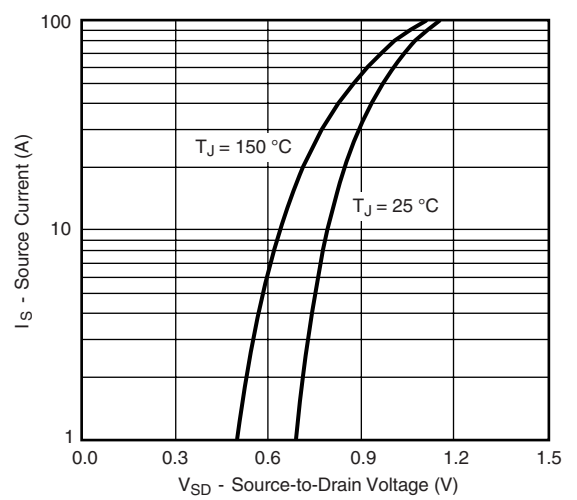
- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.

<b>SPECIFICATIONS</b> $T_C = 25\text{ }^\circ\text{C}$ , unless otherwise noted							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = -250\text{ }\mu\text{A}$		-40	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{A}$		-1.5	-	-2.5	
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$		-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = -48\text{ V}$	-	-	-1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = -48\text{ V}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	-50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = -48\text{ V}$ , $T_J = 175\text{ }^\circ\text{C}$	-	-	-150	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{GS} = -10\text{ V}$	$V_{DS} \geq -5\text{ V}$	-50	-	-	A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$	$I_D = -17\text{ A}$	-	0.010	0.013	$\Omega$
		$V_{GS} = -10\text{ V}$	$I_D = -50\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	-	0.017	
		$V_{GS} = -10\text{ V}$	$I_D = -50\text{ A}$ , $T_J = 175\text{ }^\circ\text{C}$	-	-	0.020	
		$V_{GS} = -4.5\text{ V}$	$I_D = -14\text{ A}$	-	0.020	0.040	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\text{ V}$ , $I_D = -17\text{ A}$		-	61	-	S
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	-	3350	-	$\mu\text{F}$
Output Capacitance	$C_{oss}$			-	500	-	
Reverse Transfer Capacitance	$C_{rss}$			-	385	-	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = -10\text{ V}$	$V_{DS} = -30\text{ V}$ , $I_D = -50\text{ A}$	-	80	-	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	14	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	22	-	
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = -30\text{ V}$ , $R_L = 0.6\text{ }\Omega$ $I_D \cong -50\text{ A}$ , $V_{GEN} = -10\text{ V}$ , $R_g = 6.0\text{ }\Omega$		-	8	-	ns
Rise Time <sup>c</sup>	$t_r$			-	50	-	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			-	105	-	
Fall Time <sup>c</sup>	$t_f$			-	100	-	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>							
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	-50	A
Forward Voltage	$V_{SD}$	$I_F = -50\text{ A}$ , $V_{GS} = 0\text{ V}$		-	-1.0	-1.5	V

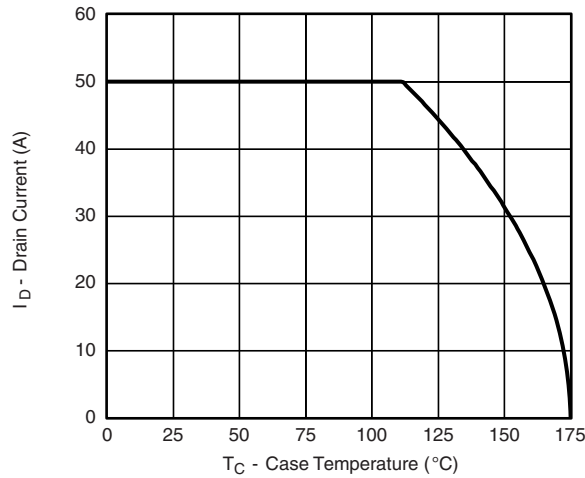
### Notes

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

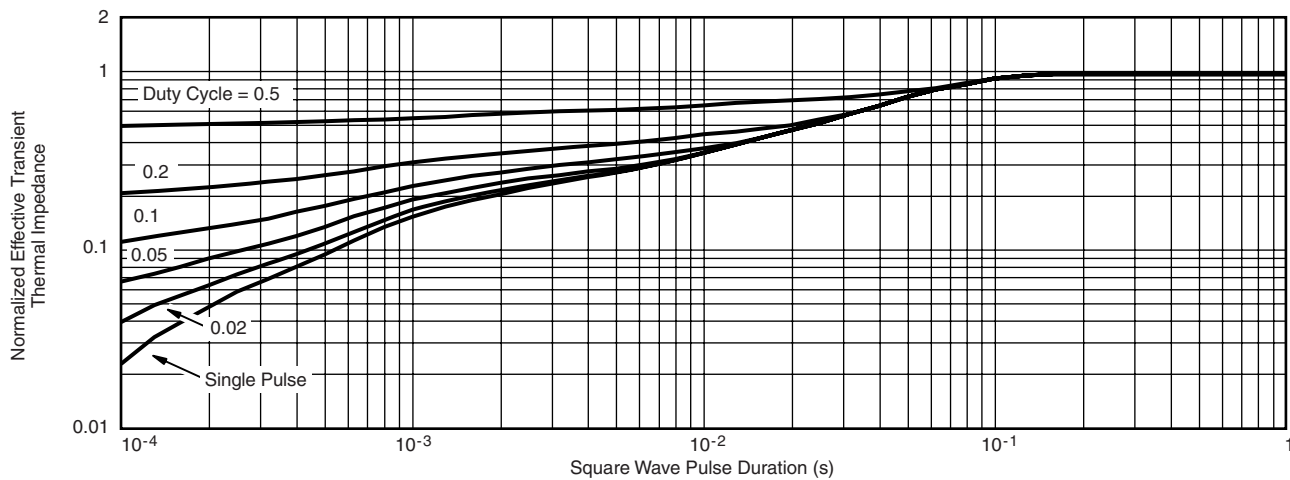
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**Source Drain Diode Forward Voltage**

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



**Maximum Drain Current vs. Ambient Temperature**



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

**Note**

The characteristics shown in the graph.

Normalized Transient Thermal Impedance Junction to Ambient ( $25\text{ }^\circ\text{C}$ ) is 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.

*Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see [www.vishay.com/ppq?65157](http://www.vishay.com/ppq?65157).*



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