

## Automotive N-Channel 20 V (D-S) 175 °C MOSFET

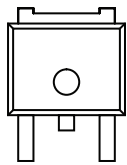
PRODUCT SUMMARY	
$V_{DS}$ (V)	20
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.0043
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.006
$I_D$ (A)	50
Configuration	Single

**FEATURES**

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



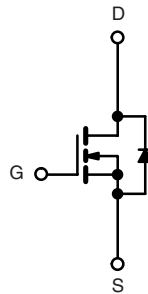
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**


**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	SQD50N02-04-GE3

**ABSOLUTE MAXIMUM RATINGS**  $T_C = 25$  °C, unless otherwise noted

PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	$V_{DS}$	20	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current <sup>a</sup>	$I_D$	$T_C = 25$ °C	34	A
		$T_C = 100$ °C	50	
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	8.3		
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	100		
Single Pulse Avalanche Energy	$E_{AS}$	65	mJ	
Single Pulse Avalanche Current				$I_{AS}$
Maximum Power Dissipation <sup>b</sup>	$P_D$	$T_C = 25$ °C	8.3	W
		$T_A = 25$ °C	136	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 175	°C	

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	$R_{thJA}$	50	°C/W
Junction-to-Case (Drain)			

**Notes**

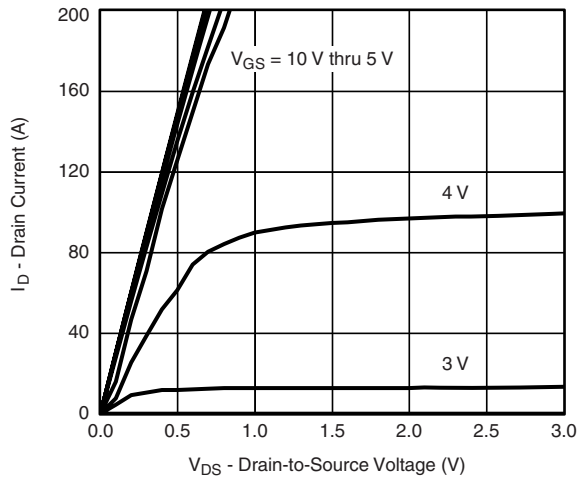
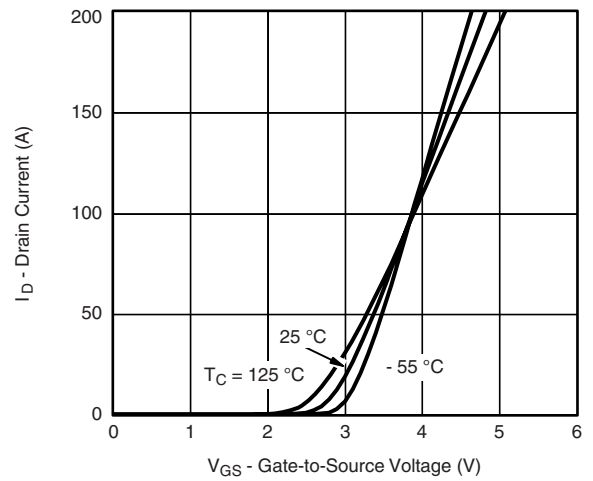
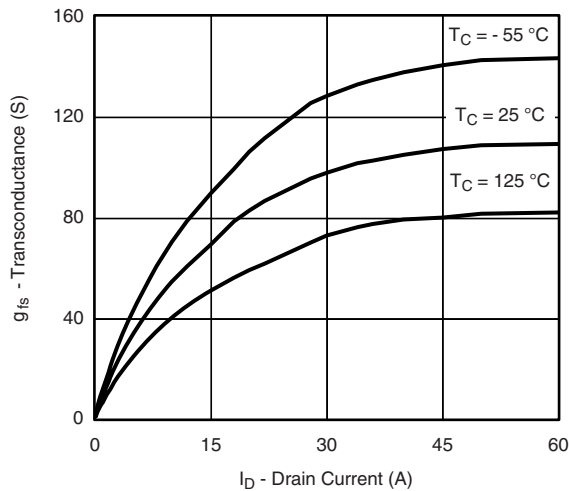
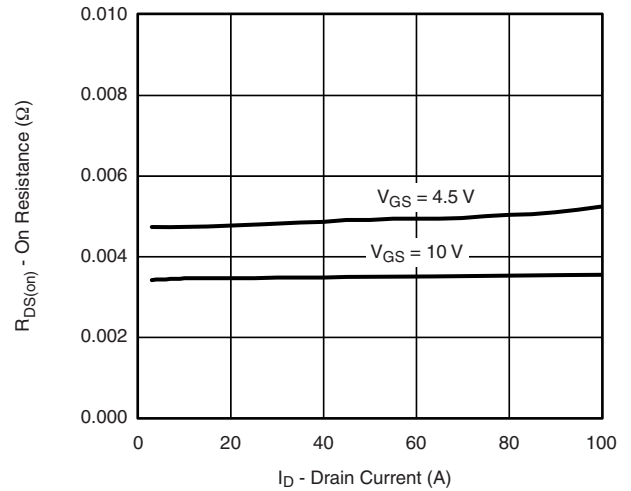
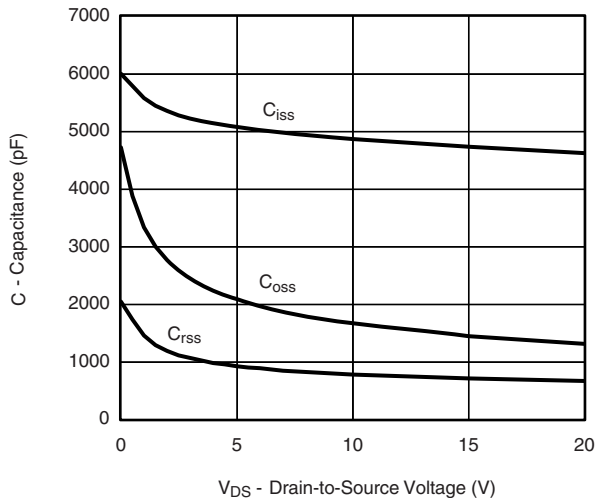
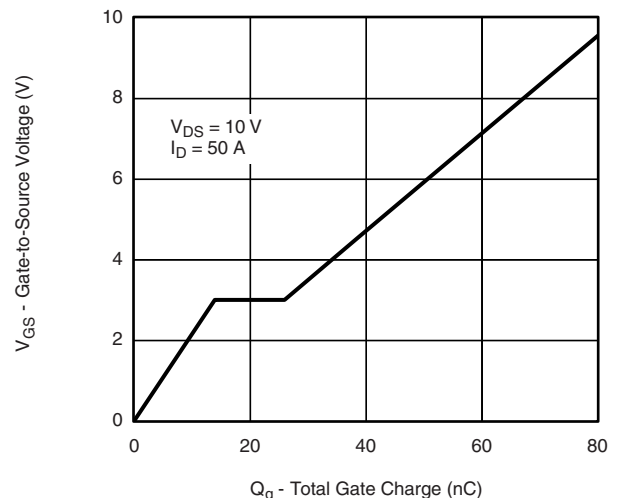
- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.

<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	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		20	-	-	V
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		0.8	-	3.0	
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$		-	-	$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 20\text{ V}$	-	-	1.0	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$	$V_{DS} = 20\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	-	50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 20\text{ V}, T_J = 175\text{ }^\circ\text{C}$	-	-	-	
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>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}$	-	0.0035	0.0043	$\Omega$
		$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	0.0061	
		$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	-	-	
		$V_{GS} = 4.5\text{ V}$	$I_D = 20\text{ A}$	-	0.0048	0.006	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}, I_D = 20\text{ A}$		15	-	-	S
<b>Dynamic<sup>b</sup></b>							
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$	$V_{DS} = 10\text{ V}, f = 1\text{ MHz}$	-	5000	-	$\mu\text{F}$
Output Capacitance	$C_{oss}$			-	1650	-	
Reverse Transfer Capacitance	$C_{rss}$			-	770	-	
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = 4.5\text{ V}$	$V_{DS} = 10\text{ V}, I_D = 50\text{ A}$	-	40	-	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			-	14	-	
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			-	13	-	
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 0.2\text{ }\Omega$ $I_D \cong 50\text{ A}, V_{GEN} = 10\text{ V}, R_g = 2.5\text{ }\Omega$		-	20	-	ns
Rise Time <sup>c</sup>	$t_r$			-	20	-	
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$			-	50	-	
Fall Time <sup>c</sup>	$t_f$			-	15	-	
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}$ <sup>b</sup>							
Pulsed Current <sup>a</sup>	$I_{SM}$			-	-	100	A
Forward Voltage	$V_{SD}$	$I_F = 50\text{ A}, V_{GS} = 0\text{ V}$		-	0.9	1.5	V

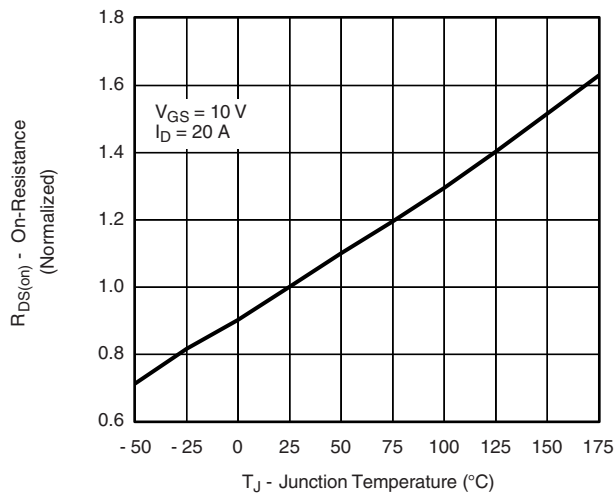
**Notes**

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

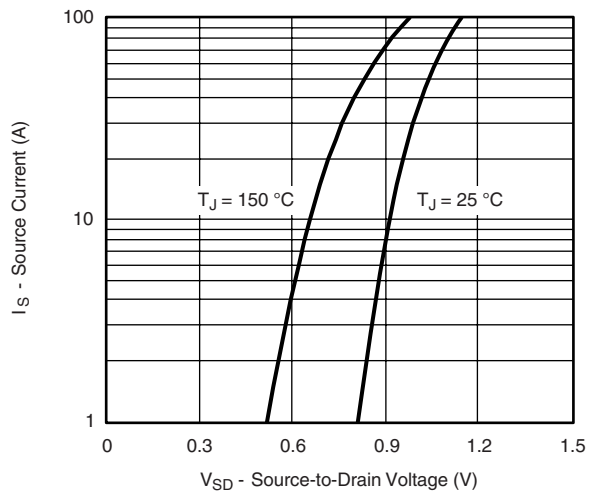
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

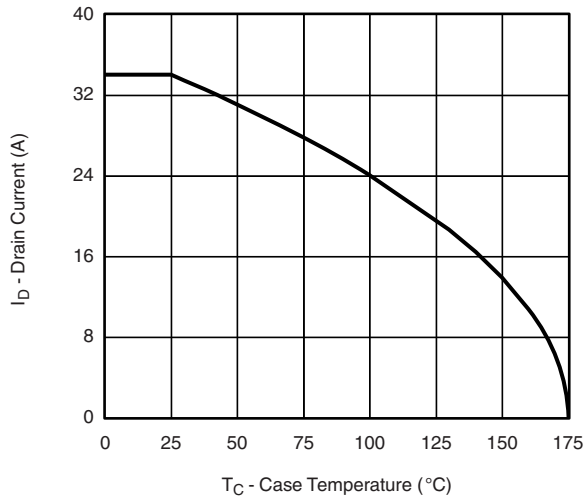
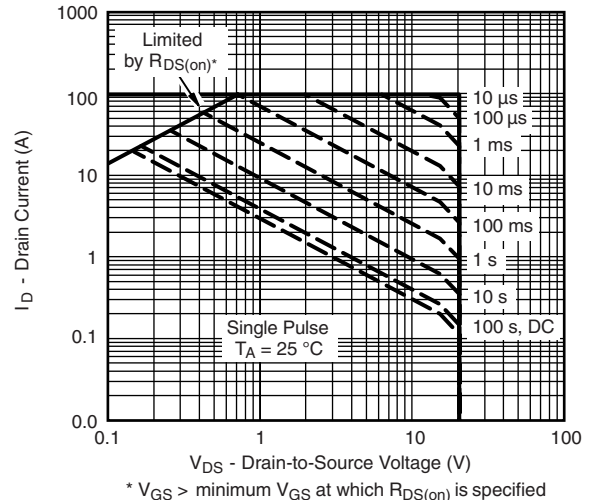
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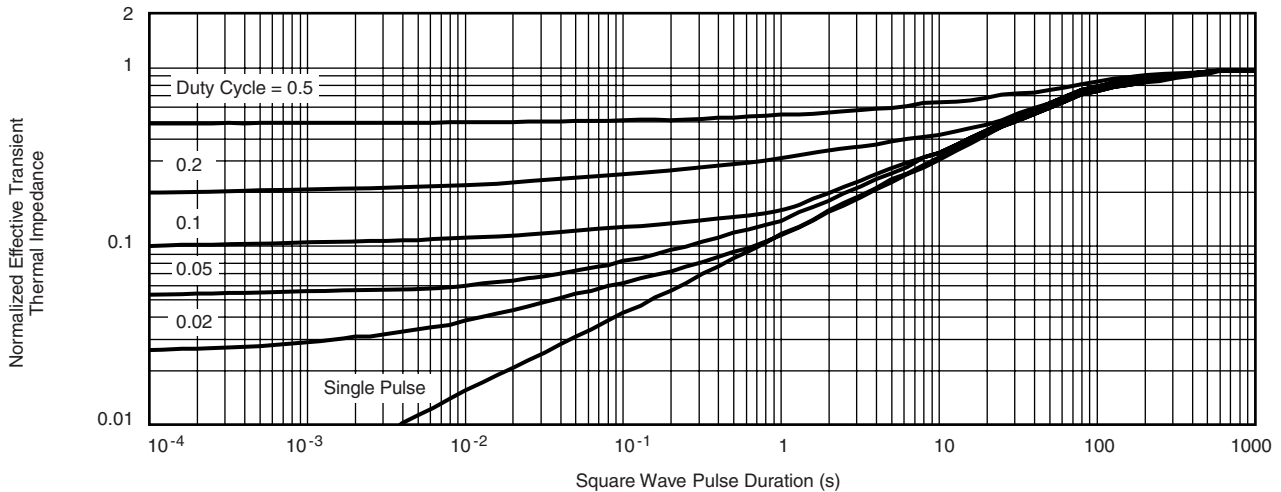


**On-Resistance vs. Junction Temperature**



**Source Drain Diode Forward Voltage**

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

**Maximum Drain Current vs. Ambient Temperature**

 \*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**Safe Operating Area**

**Normalized Thermal Transient Impedance, Junction-to-Ambient**
**Note**

The characteristics shown in the graph. Normalized Transient Thermal Impedance Junction to Ambient ( $25\text{ }^\circ\text{C}$ ) 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  $1\text{''} \times 1\text{''} \times 0.062\text{''}$ , 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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