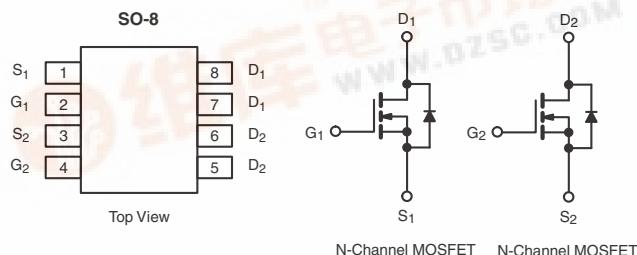


# Automotive Dual N-Channel 60 V (D-S) 175 °C MOSFET

PRODUCT SUMMARY	
$V_{DS}$ (V)	60
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 10$ V	0.064
$R_{DS(on)}$ ( $\Omega$ ) at $V_{GS} = 4.5$ V	0.082
$I_D$ (A) per leg	6
Configuration	Dual

**FEATURES**

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 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)

**ORDERING INFORMATION**

Package	SO-8
Lead (Pb)-free and Halogen-free	SQ9945BEY-T1-GE3

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current	$I_D$	5.4	A
		3.1	
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	3.6	
Pulsed Drain Current <sup>b</sup>	$I_{DM}$	21.5	
Single Pulse Avalanche Current	$I_{AS}$	8.5	mJ
Single Pulse Avalanche Energy		3.6	
Maximum Power Dissipation <sup>b</sup>	$P_D$	4.0	W
		1.3	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	°C

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	$R_{thJA}$	112	°C/W
Junction-to-Foot (Drain)	$R_{thJF}$	38	

**Notes**

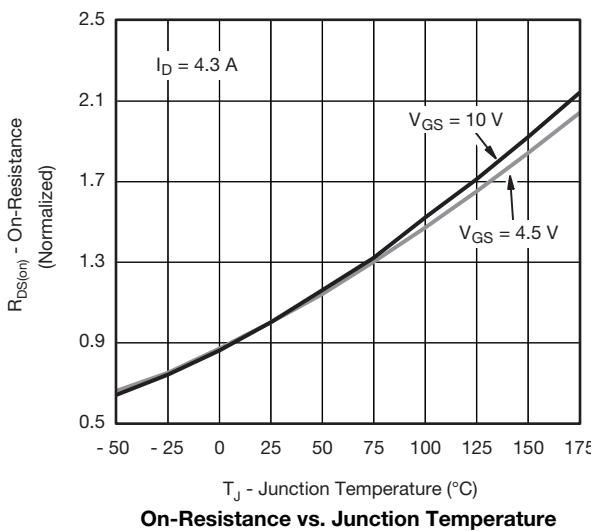
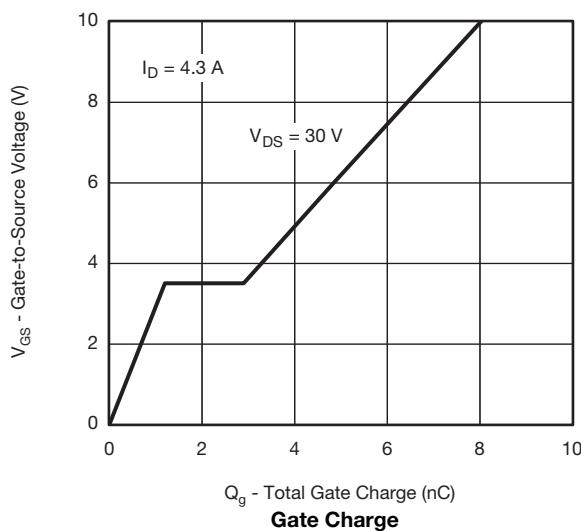
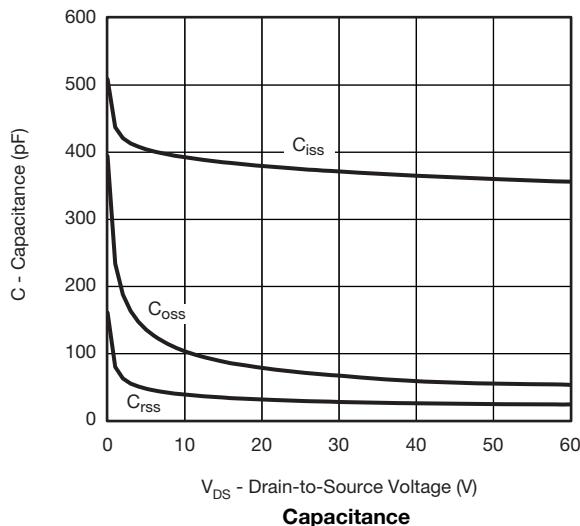
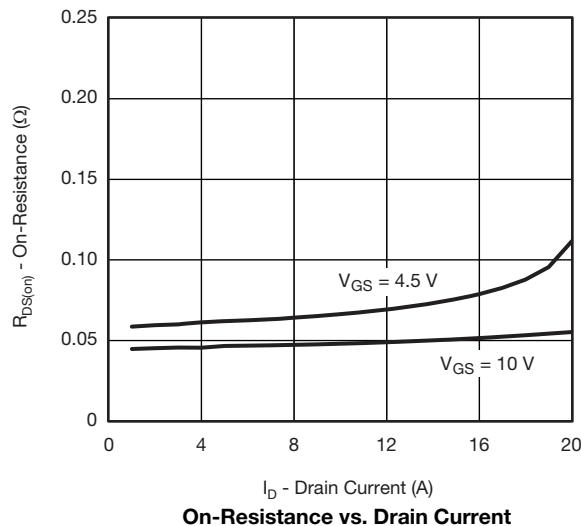
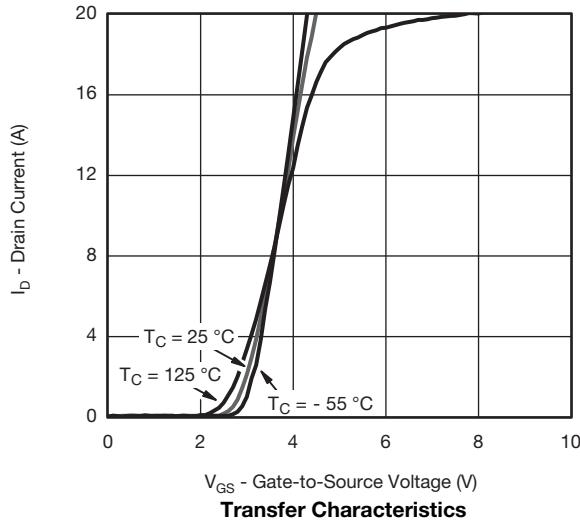
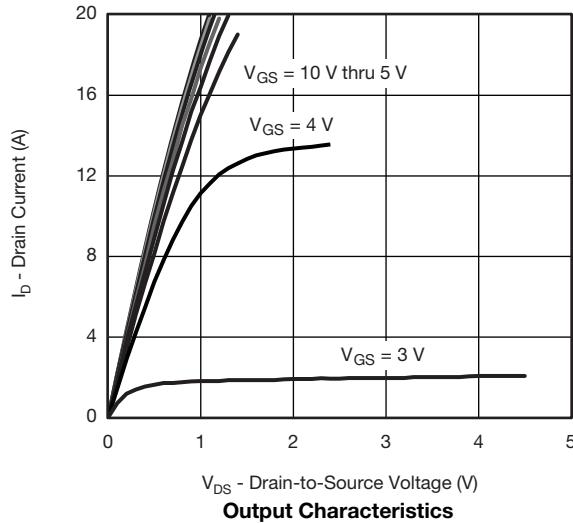
- Package limited.
- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.

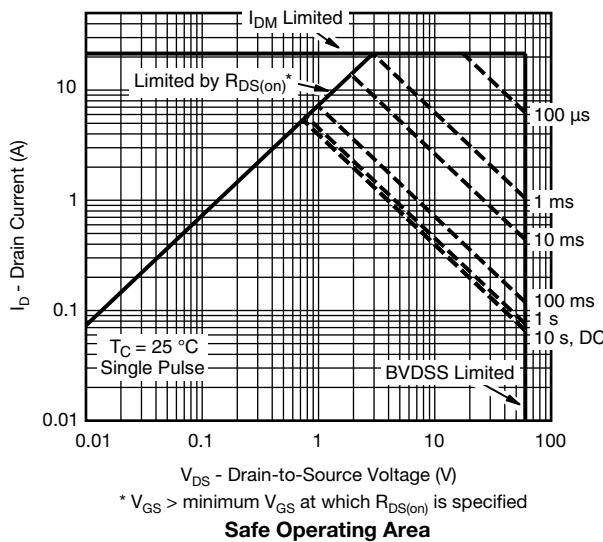
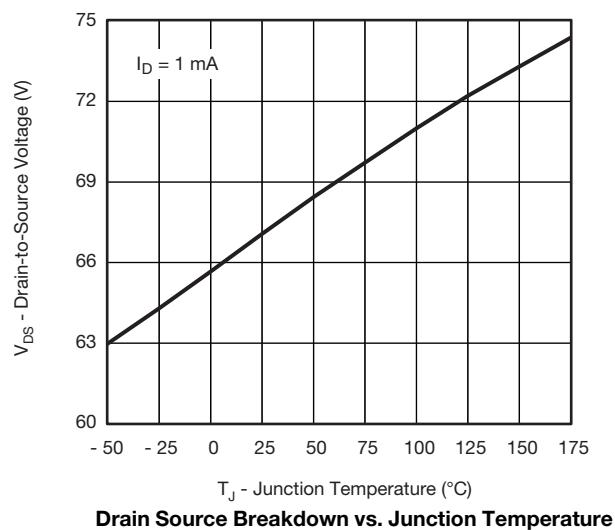
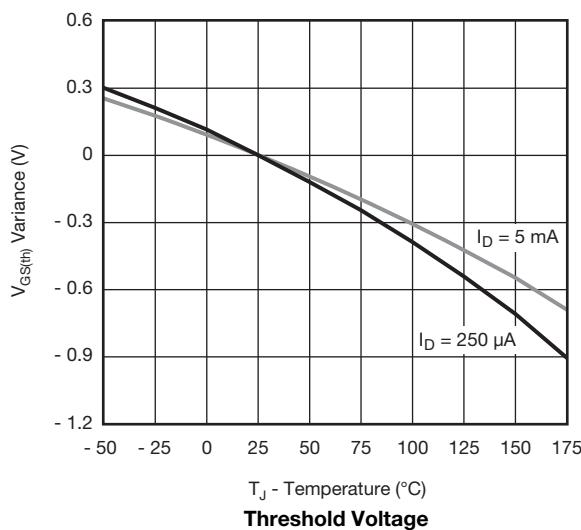
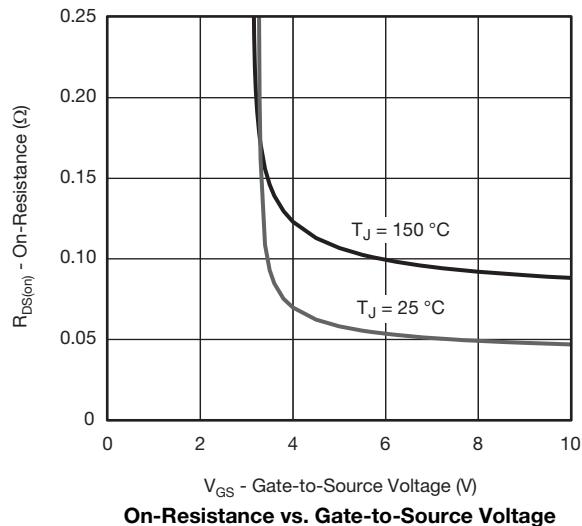
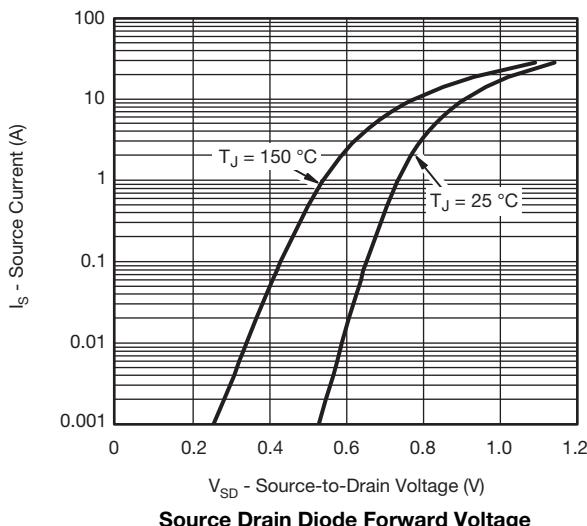
<b>SPECIFICATIONS</b> ( $T_C = 25^\circ\text{C}$ , unless otherwise noted)									
PARAMETER	SYMBOL	TEST CONDITIONS			MIN.	TYP.	MAX.	UNIT	
<b>Static</b>									
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$			60	-	-	V	
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$			1.5	2.0	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	$I_{DSS}$	$V_{GS} = 0 \text{ V}$	$V_{DS} = 60 \text{ V}$		-	-	1.0	$\mu\text{A}$	
		$V_{GS} = 0 \text{ V}$	$V_{DS} = 60 \text{ V}$ , $T_J = 125^\circ\text{C}$		-	-	50		
		$V_{GS} = 0 \text{ V}$	$V_{DS} = 60 \text{ V}$ , $T_J = 175^\circ\text{C}$		-	-	150		
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{GS} = 10 \text{ V}$	$V_{DS} \geq 5 \text{ V}$		20	-	-	A	
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}$	$I_D = 3.4 \text{ A}$		-	0.045	0.064	$\Omega$	
		$V_{GS} = 10 \text{ V}$	$I_D = 3.4 \text{ A}$ , $T_J = 125^\circ\text{C}$		-	-	0.110		
		$V_{GS} = 10 \text{ V}$	$I_D = 3.4 \text{ A}$ , $T_J = 175^\circ\text{C}$		-	-	0.137		
		$V_{GS} = 4.5 \text{ V}$	$I_D = 3.7 \text{ A}$		-	0.060	0.082		
Forward Transconductance <sup>f</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}$ , $I_D = 3.7 \text{ A}$			-	12	-	S	
<b>Dynamic<sup>b</sup></b>									
Input Capacitance	$C_{iss}$	$V_{GS} = 0 \text{ V}$	$V_{DS} = 25 \text{ V}$ , $f = 1 \text{ MHz}$		-	375	470	pF	
Output Capacitance	$C_{oss}$				-	70	88		
Reverse Transfer Capacitance	$C_{rss}$				-	30	36		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{GS} = 10 \text{ V}$	$V_{DS} = 30 \text{ V}$ , $I_D = 4.3 \text{ A}$		-	8	12	nC	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$				-	1.2	1.5		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$				-	1.7	2.6		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 30 \text{ V}$ , $R_L = 8.8 \Omega$ $I_D \approx 3.4 \text{ A}$ , $V_{GEN} = 10 \text{ V}$ , $R_g = 1 \Omega$			-	6	9	ns	
Rise Time <sup>c</sup>	$t_r$				-	2.8	4.2		
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$				-	17	26		
Fall Time <sup>c</sup>	$t_f$				-	1.7	3		
<b>Source-Drain Diode Ratings and Characteristics<sup>b</sup></b>									
Pulsed Current <sup>a</sup>	$I_{SM}$				-	-	21.5	A	
Forward Voltage	$V_{SD}$	$I_F = 2.0 \text{ A}$ , $V_{GS} = 0 \text{ V}$			-	0.75	1.1	V	

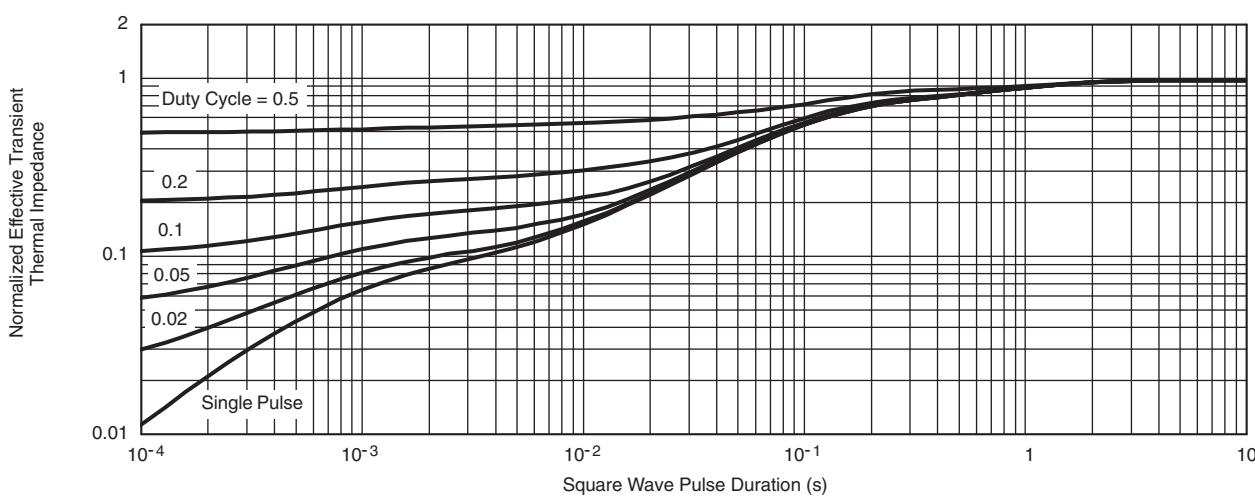
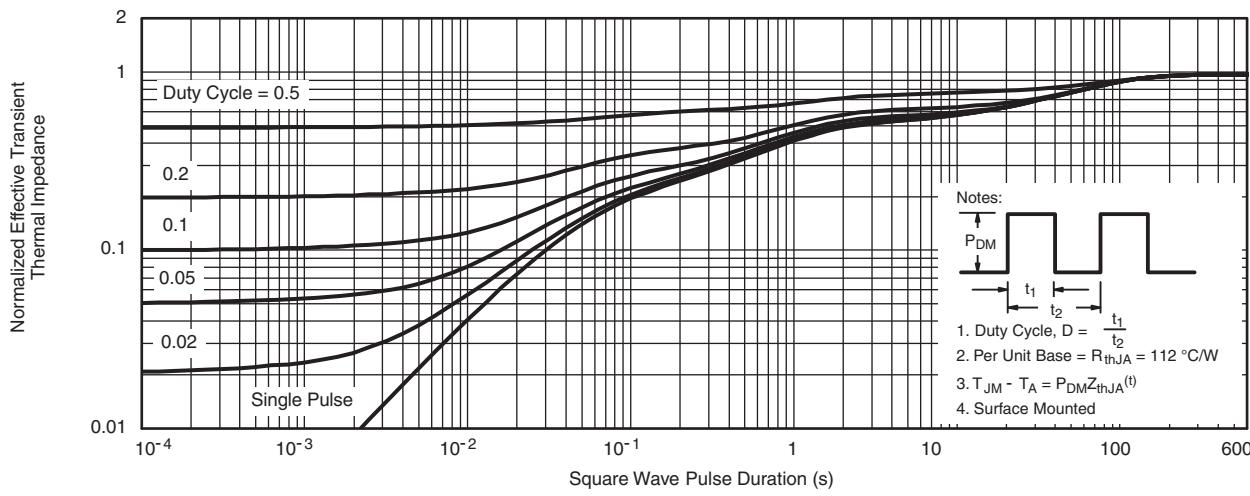
**Notes**

- e. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .  
f. Guaranteed by design, not subject to production testing.  
g. 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** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)


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

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

**Note**

- The characteristics shown in the two graphs
    - Normalized Transient Thermal Impedance Junction-to-Ambient ( $25^\circ\text{C}$ )
    - Normalized Transient Thermal Impedance Junction-to-Foot ( $25^\circ\text{C}$ )
- 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.

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/ppg?71504](http://www.vishay.com/ppg?71504).

## **Disclaimer**

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.