

## P-Channel 60 V (D-S) MOSFET

### PRODUCT SUMMARY

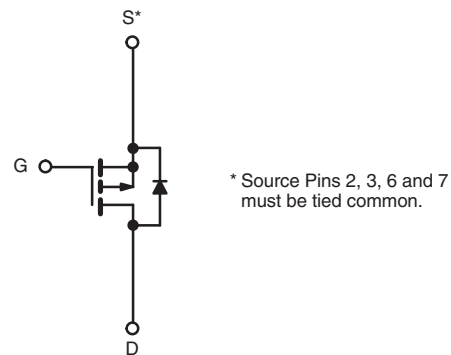
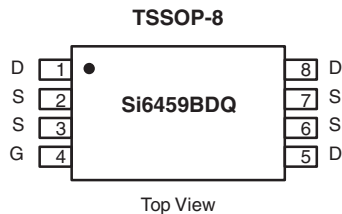
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
- 60	0.115 at $V_{GS} = -10$ V	- 2.7
	0.150 at $V_{GS} = -4.5$ V	- 2.4

### FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



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



Ordering Information: Si6459BDQ-T1-GE3 (Lead (Pb)-free and Halogen-free)

P-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

Parameter		Symbol	10 s	Steady State	Unit
Drain-Source Voltage		$V_{DS}$	- 60		V
Gate-Source Voltage		$V_{GS}$	$\pm$ 20		
Continuous Drain Current ( $T_J = 150\text{ }^{\circ}\text{C}$ ) <sup>a</sup>	$T_A = 25\text{ }^{\circ}\text{C}$	$I_D$	- 2.7	- 2.2	A
	$T_A = 70\text{ }^{\circ}\text{C}$		- 2.2	- 1.8	
Pulsed Drain Current (10 $\mu\text{s}$ Pulse Width)		$I_{DM}$	- 20		
Continuous Source Current (Diode Conduction) <sup>a</sup>		$I_S$	- 1.25	- 0.83	
Avalanche Current	L = 0.1 mH	$I_{AS}$	15		
Single Pulse Avalanche Energy		$E_{AS}$	11		
Maximum Power Dissipation <sup>a</sup>	$T_A = 25\text{ }^{\circ}\text{C}$	$P_D$	1.50	1.0	W
	$T_A = 70\text{ }^{\circ}\text{C}$		1.0	0.67	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to 150		$^{\circ}\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	66	83	$^\circ\text{C/W}$
		100	120	
Maximum Junction-to-Foot	$R_{thJF}$	50	60	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

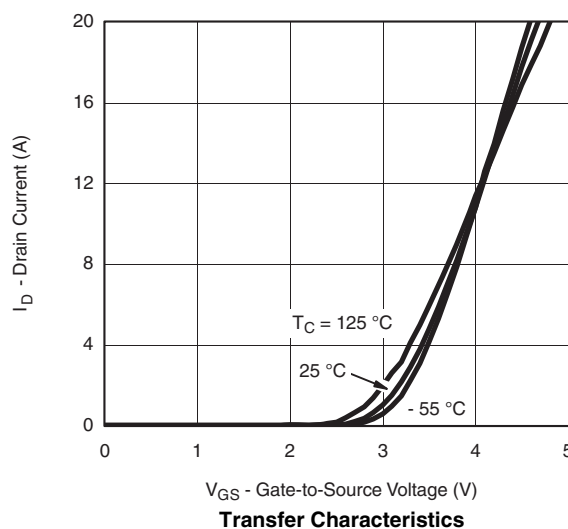
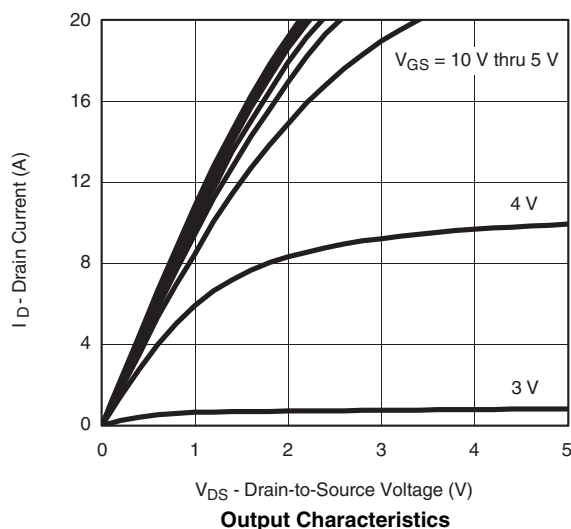
SPECIFICATIONS ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -250\text{ }\mu\text{A}$	-1		-3	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 70\text{ }^{\circ}\text{C}$			-10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = -5\text{ V}$ , $V_{GS} = -10\text{ V}$	-20			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}$ , $I_D = -2.7\text{ A}$		0.092	0.115	$\Omega$
		$V_{GS} = -4.5\text{ V}$ , $I_D = -2.4\text{ A}$		0.120	0.150	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\text{ V}$ , $I_D = -2.7\text{ A}$		8		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -1.25\text{ A}$ , $V_{GS} = 0\text{ V}$		-0.8	-1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -2.7\text{ A}$		14.5	22	nC
Gate-Source Charge	$Q_{gs}$			2.2		
Gate-Drain Charge	$Q_{gd}$			3.7		
Gate Resistance	$R_g$			14		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -30\text{ V}$ , $R_L = 30\text{ }\Omega$ $I_D \equiv -1\text{ A}$ , $V_{GEN} = -10\text{ V}$ , $R_g = 6\text{ }\Omega$		10	15	ns
Rise Time	$t_r$			15	22	
Turn-Off Delay Time	$t_{d(off)}$			50	75	
Fall Time	$t_f$			35	55	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = -1.25\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		30	50	

Notes:

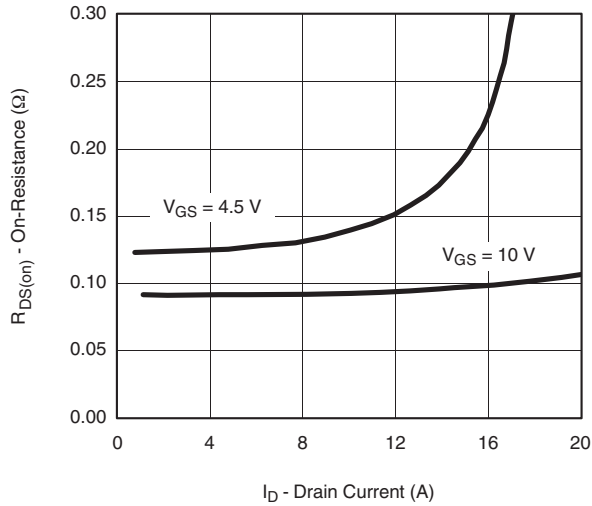
a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

b. Guaranteed by design, not subject to production testing.

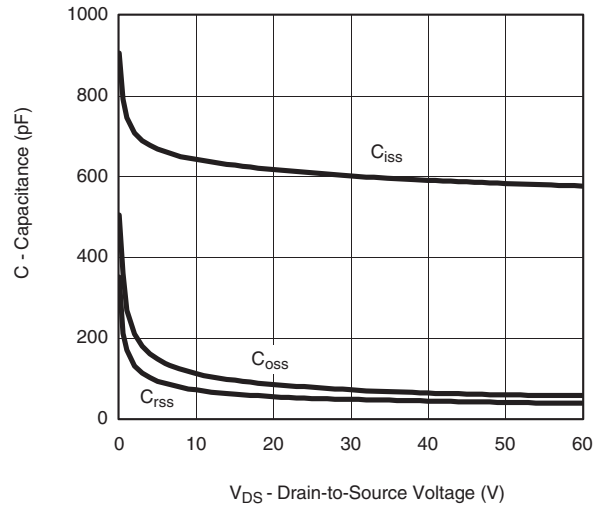
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

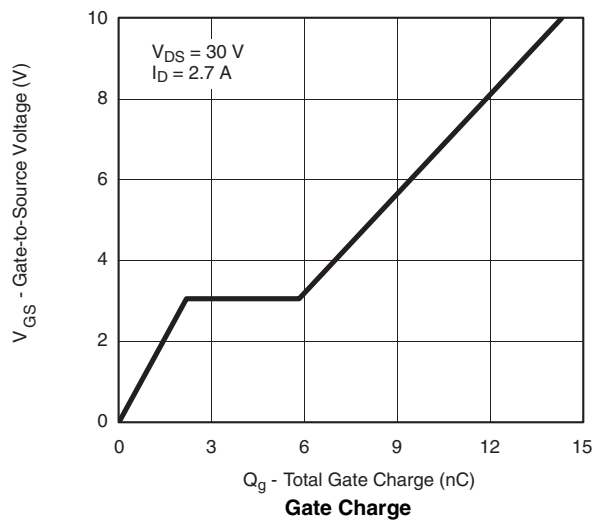
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



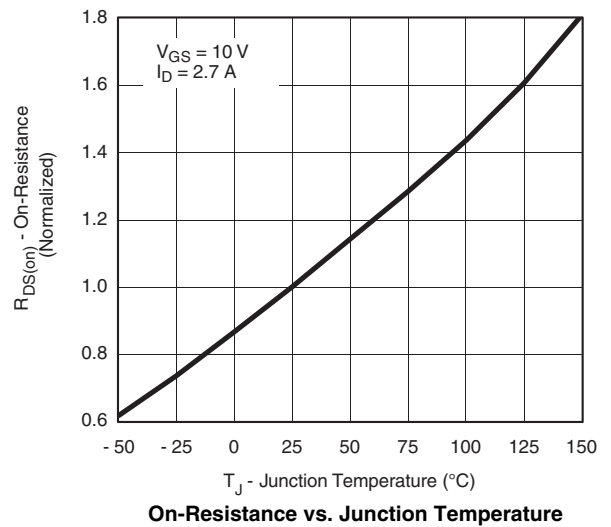
On-Resistance vs. Drain Current



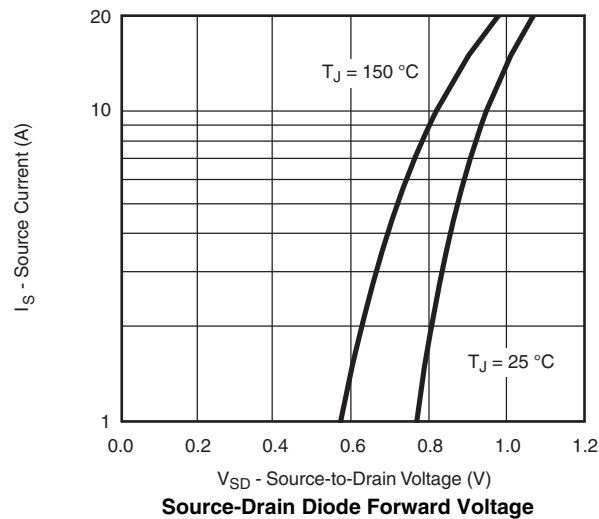
Capacitance



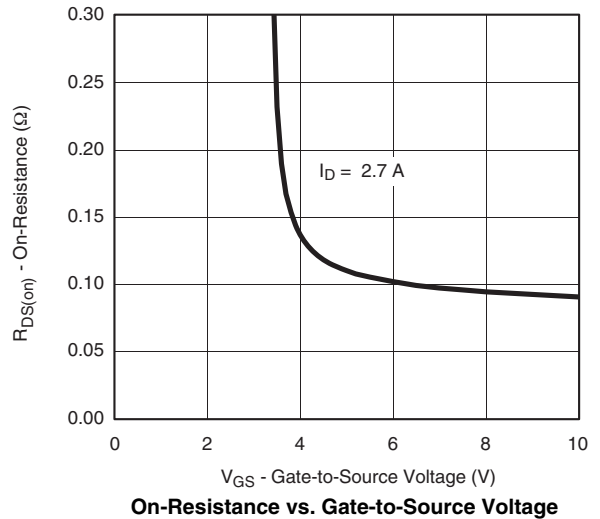
Gate Charge



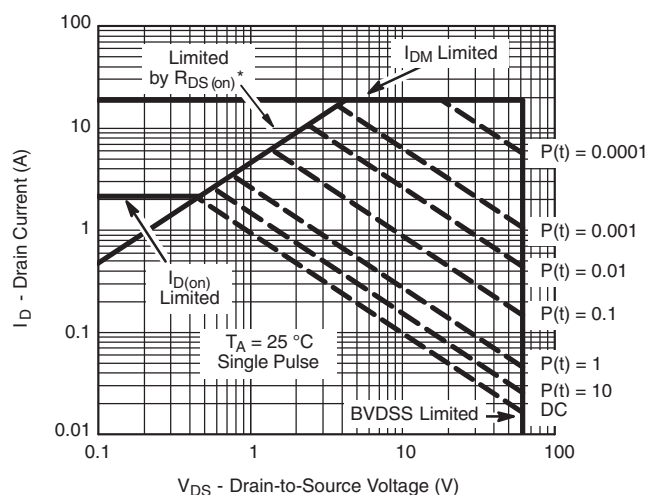
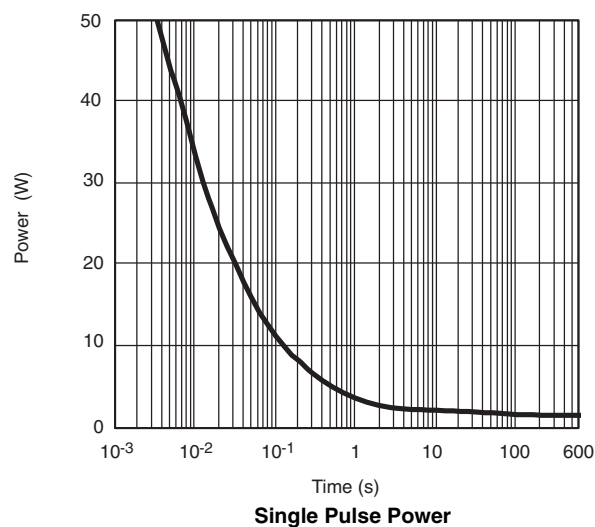
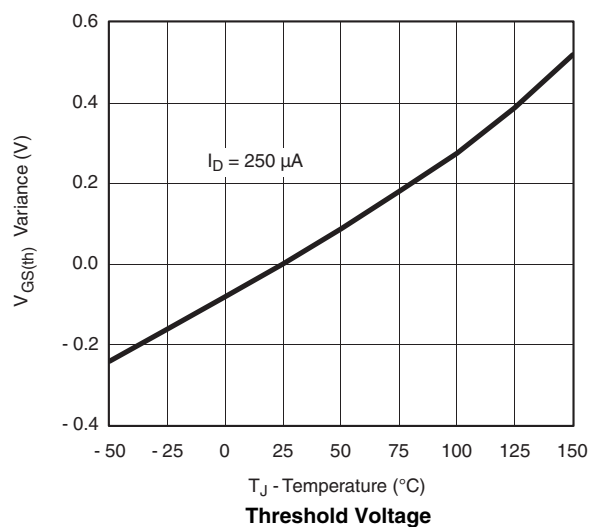
On-Resistance vs. Junction Temperature



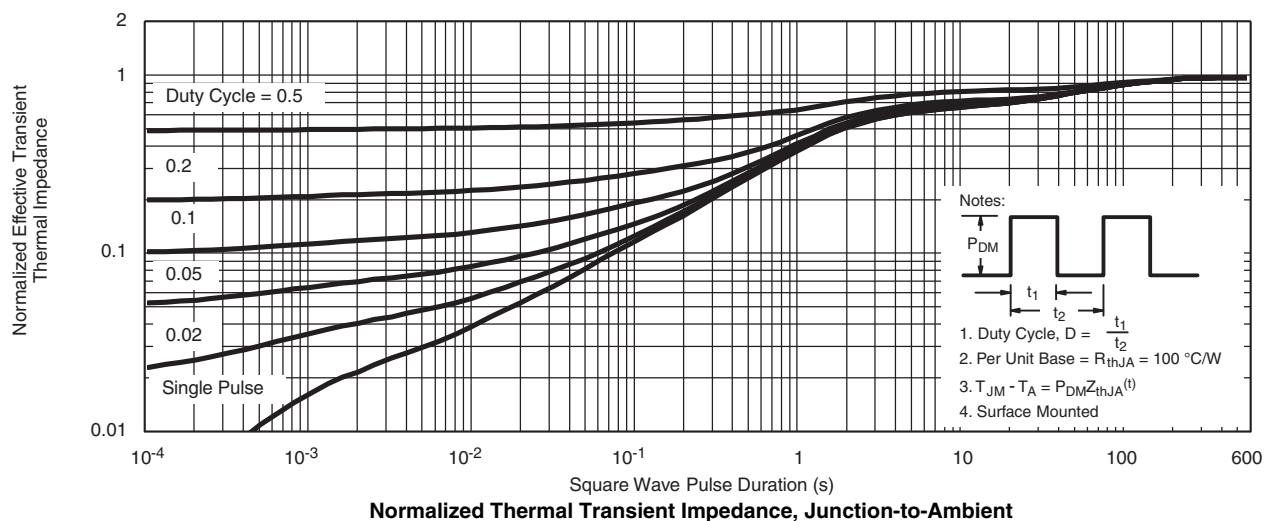
Source-Drain Diode Forward Voltage



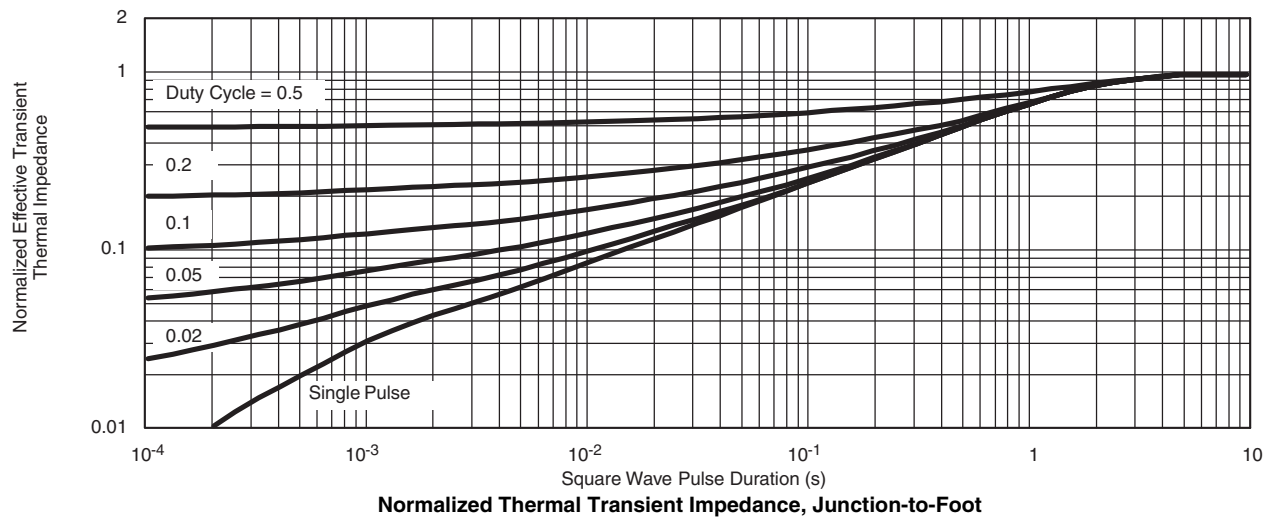
On-Resistance vs. Gate-to-Source Voltage

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

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

**Safe Operating Area, Junction-to-Case**

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



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