

## SQ1539EH-T1\_GE3-VB Datasheet

### N-and P- Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
	V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)
N-Channel	20	0.090 at V <sub>GS</sub> = 4.5 V	3.28
		0.110 at V <sub>GS</sub> = 2.5 V	2.13
		0.130 at V <sub>GS</sub> = 1.8 V	1.50
P-Channel	- 20	0.155 at V <sub>GS</sub> = - 4.5 V	- 2.80
		0.190 at V <sub>GS</sub> = - 2.5 V	- 1.81
		0.220 at V <sub>GS</sub> = - 1.8 V	- 1.15

#### FEATURES

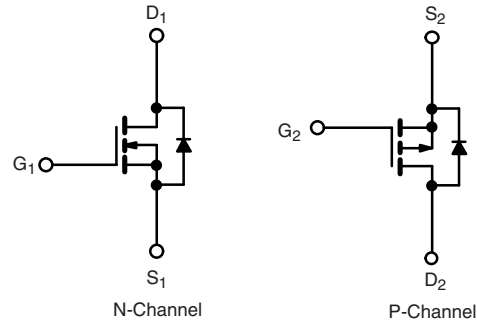
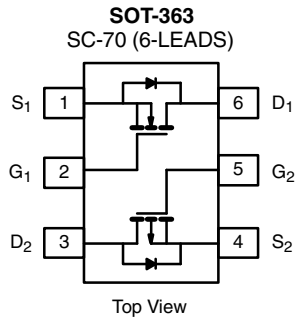
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFETs: 1.8 V Rated
- Thermally Enhanced SC-70 Package
- Fast Switching
- Compliant to RoHS Directive 2002/95/EC



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

#### APPLICATIONS

- Load Switch for Portable Devices



ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted							
Parameter	Symbol	N-Channel		P-Channel		Unit	
		5 s	Steady State	5 s	Steady State		
Drain-Source Voltage	V <sub>DS</sub>	20		- 20		V	
Gate-Source Voltage	V <sub>GS</sub>	± 20		± 20			
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	3.28	3.03	- 2.80	- 2.58	A
		T <sub>A</sub> = 85 °C	2.12	1.81	- 1.72	- 1.53	
Pulsed Drain Current	I <sub>DM</sub>	9.5		- 8.5			
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	2.61	2.48	- 1.61	-1.48		
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25 °C	1.24	1.17	1.10	0.97	W
		T <sub>A</sub> = 85 °C	0.88	0.75	0.66	0.5	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150				°C	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	t ≤ 5 s	R <sub>thJA</sub>	130	170	°C/W
	Steady State		170	220	
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	80	100	

Notes:

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

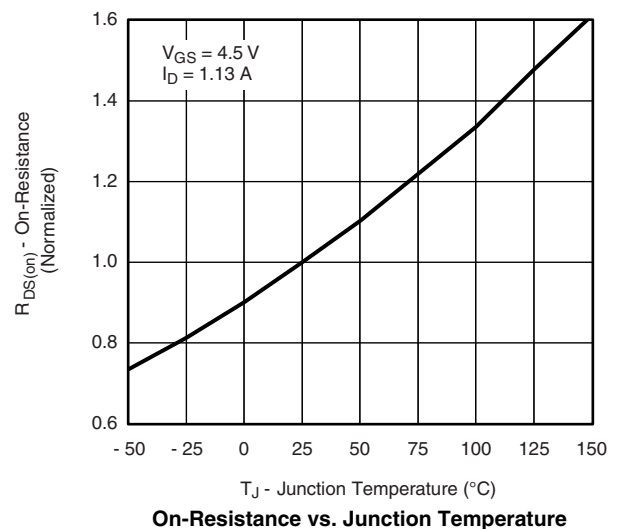
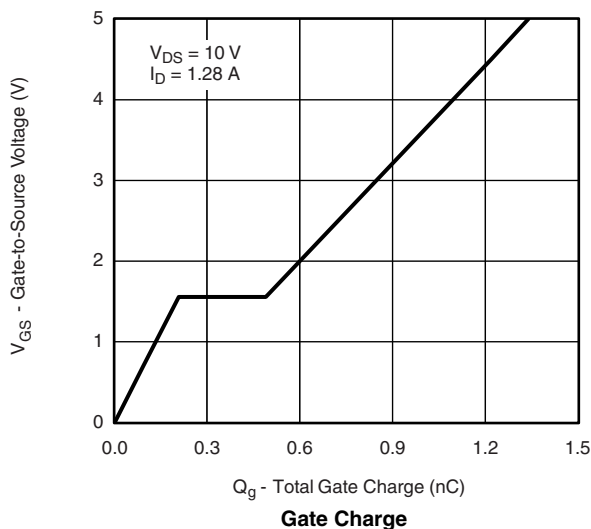
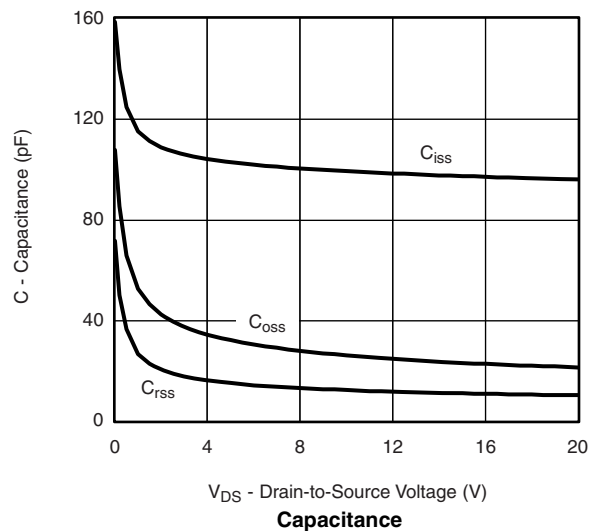
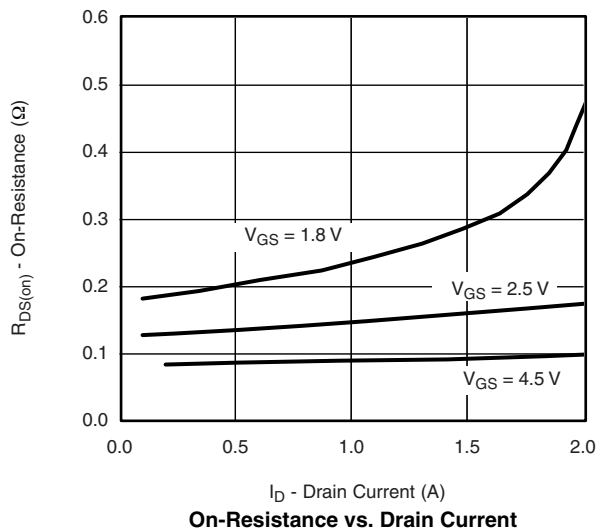
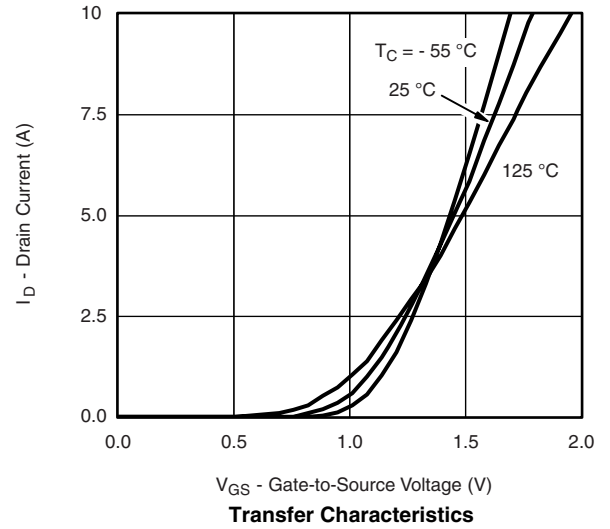
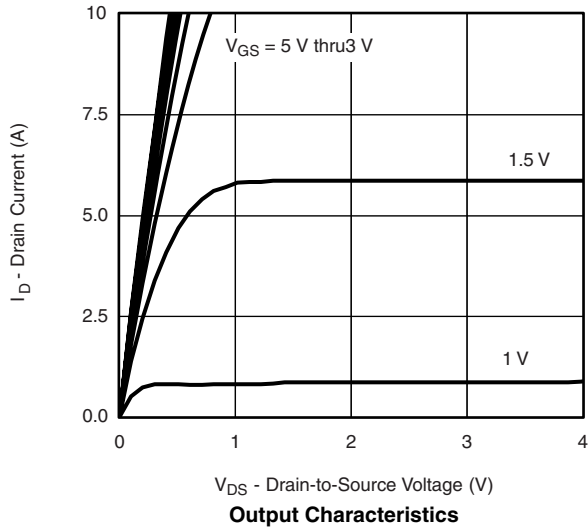
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted								
Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit	
<b>Static</b>								
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 100\text{ }\mu\text{A}$	N-Ch	0.45		1	V	
		$V_{DS} = V_{GS}, I_D = -100\text{ }\mu\text{A}$	P-Ch	-0.45		1		
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$	N-Ch P-Ch			$\pm 100$ $\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$	N-Ch			1	$\mu\text{A}$	
		$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$	P-Ch			-1		
		$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$	N-Ch			5		
		$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$	P-Ch			-5		
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	N-Ch	2			A	
		$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	P-Ch	-2				
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 2.55\text{ A}$	N-Ch		0.090		$\Omega$	
		$V_{GS} = -4.5\text{ V}, I_D = -1.85\text{ A}$	P-Ch		0.155			
		$V_{GS} = 2.5\text{ V}, I_D = 1.55\text{ A}$	N-Ch		0.110			
		$V_{GS} = -2.5\text{ V}, I_D = -1.35\text{ A}$	P-Ch		0.190			
		$V_{GS} = 1.8\text{ V}, I_D = 0.50\text{ A}$	N-Ch		0.130			
		$V_{GS} = -1.8\text{ V}, I_D = -0.50\text{ A}$	P-Ch		0.220			
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 1.13\text{ A}$	N-Ch		2.6		S	
		$V_{DS} = -10\text{ V}, I_D = -0.88\text{ A}$	P-Ch		1.5			
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 0.48\text{ A}, V_{GS} = 0\text{ V}$	N-Ch		0.8	1.2	V	
		$I_S = -0.48\text{ A}, V_{GS} = 0\text{ V}$	P-Ch		-0.8	-1.2		
<b>Dynamic<sup>b</sup></b>								
Total Gate Charge	$Q_g$	N-Channel $V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 2.55\text{ A}$  P-Channel $V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -0.88\text{ A}$	N-Ch		1.25	2	nC	
			P-Ch		1.2	1.8		
Gate-Source Charge	$Q_{gs}$		N-Ch		0.21			
			P-Ch		0.3			
Gate-Drain Charge	$Q_{gd}$		N-Ch		0.3			
			P-Ch		0.21			
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 10\text{ V}, R_L = 20\text{ }\Omega$ $I_D \cong 0.5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 6\text{ }\Omega$  P-Channel $V_{DD} = -10\text{ V}, R_L = 20\text{ }\Omega$ $I_D \cong -0.5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$	N-Ch		15	25	ns	
			P-Ch		18	30		
Rise Time	$t_r$		N-Ch		22	35		
			P-Ch		25	40		
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		25	40		
			P-Ch		15	25		
Fall Time	$t_f$		N-Ch		12	20		
			P-Ch		12	20		
Reverse Recovery Time	$t_{rr}$		$I_F = 0.48\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	N-Ch		30		60
				P-Ch		30		60

Notes:

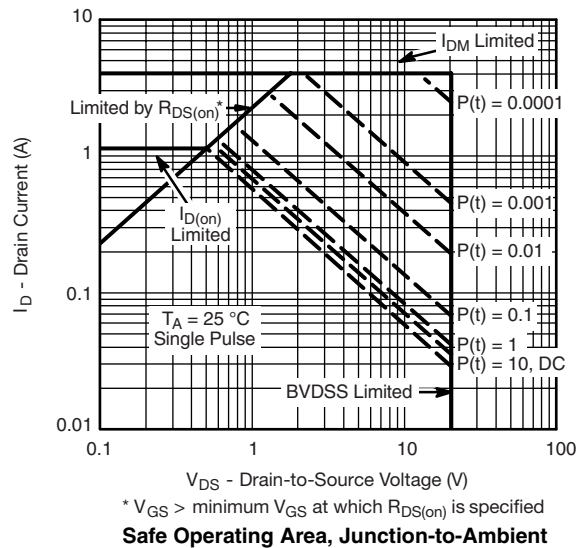
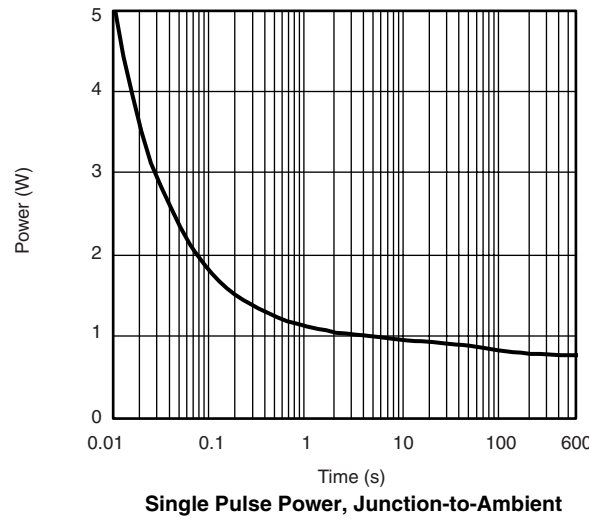
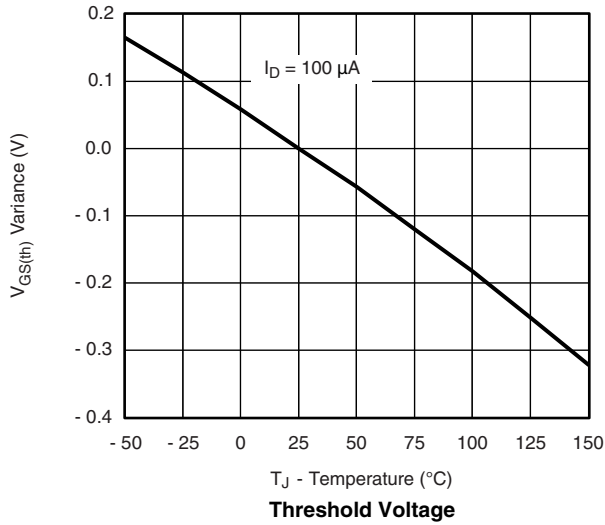
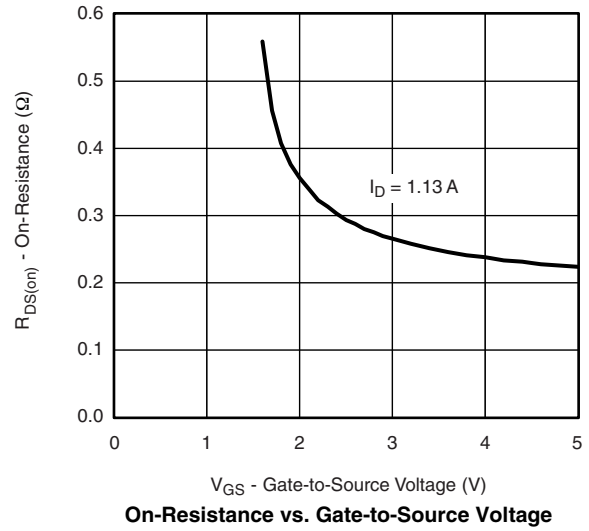
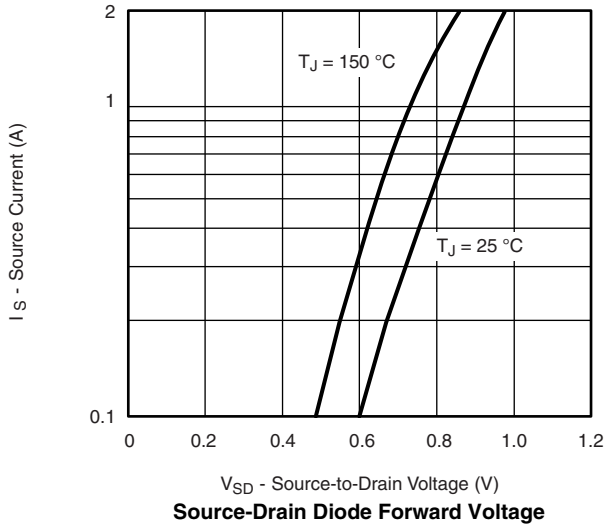
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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.

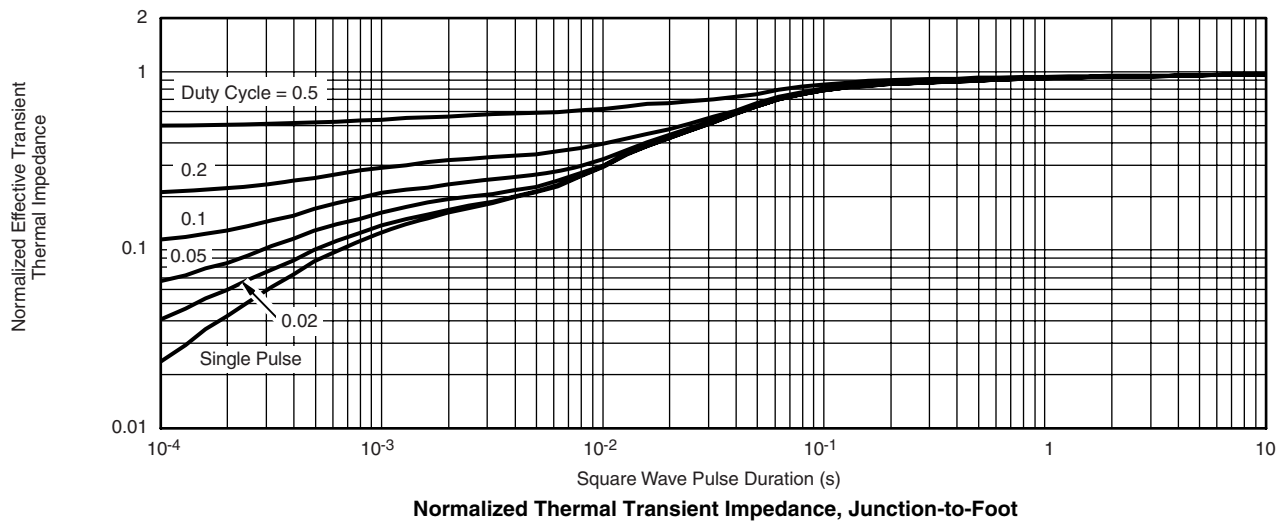
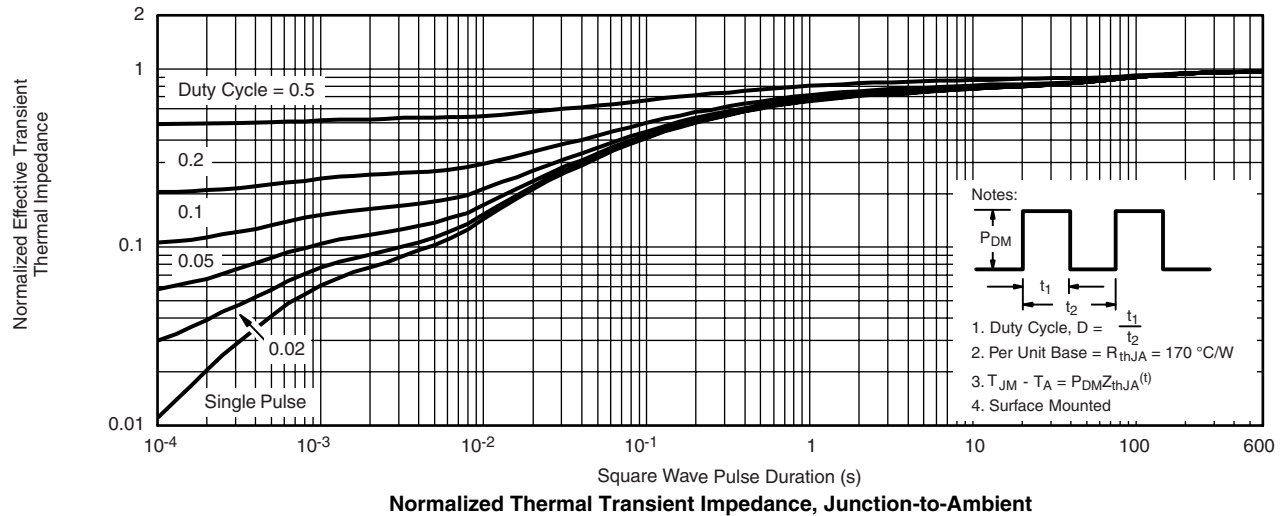
**N-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



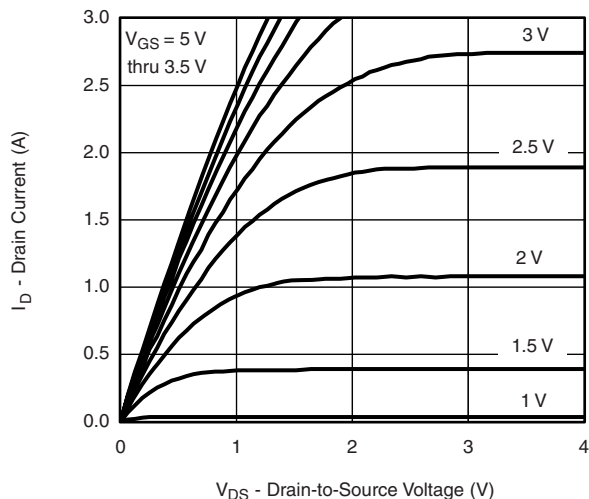
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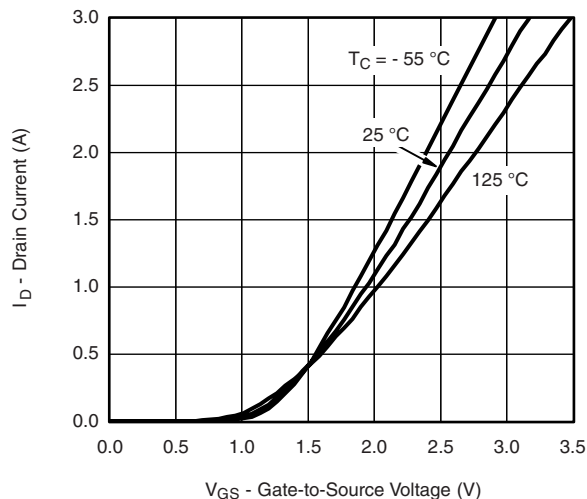
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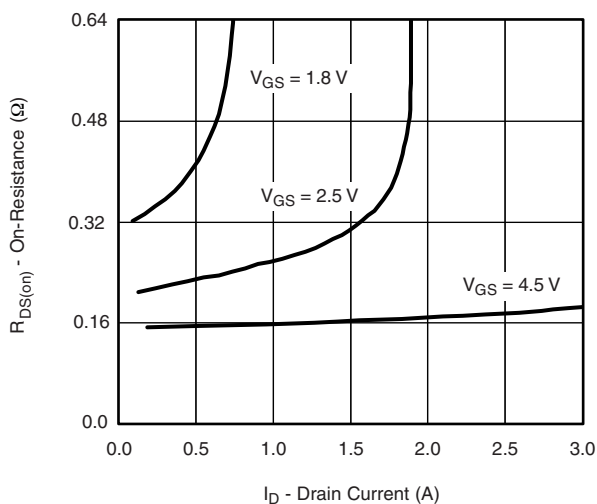
**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



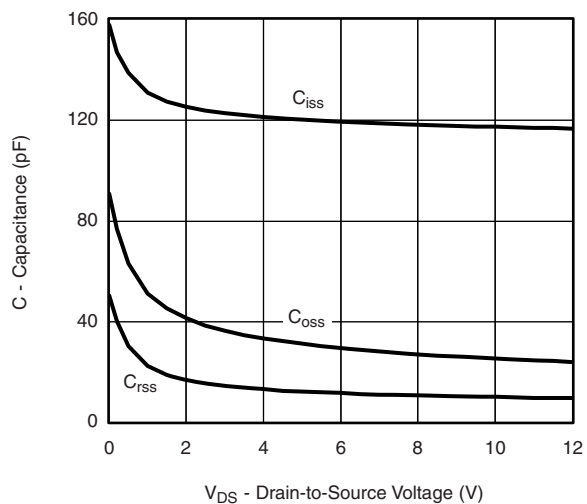
$V_{DS}$  - Drain-to-Source Voltage (V)  
**Output Characteristics**



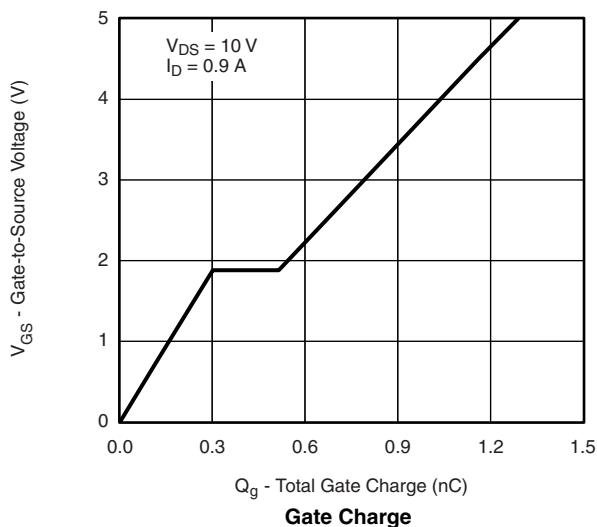
$V_{GS}$  - Gate-to-Source Voltage (V)  
**Transfer Characteristics**



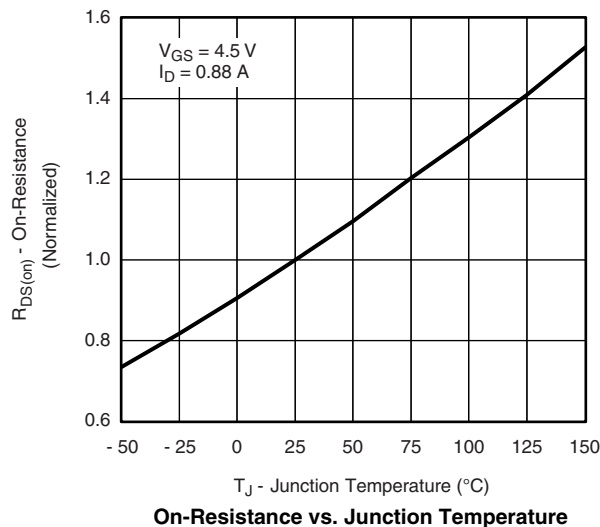
$I_D$  - Drain Current (A)  
**On-Resistance vs. Drain Current**



$V_{DS}$  - Drain-to-Source Voltage (V)  
**Capacitance**

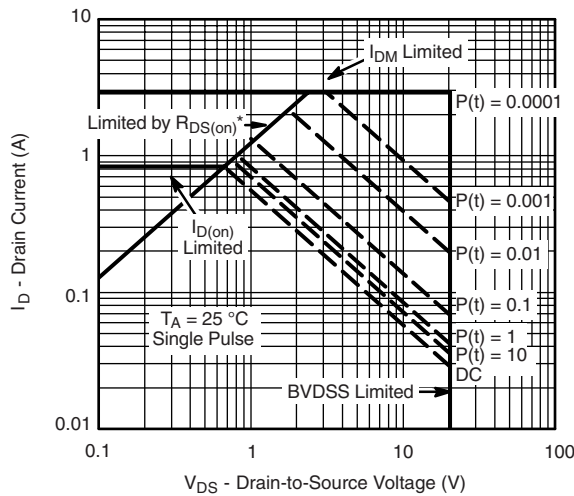
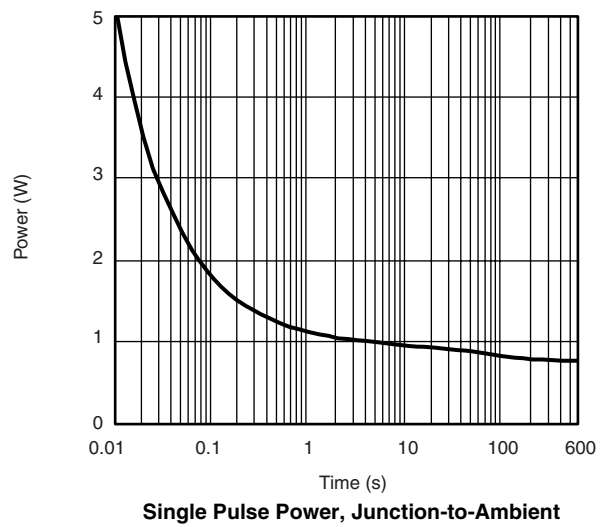
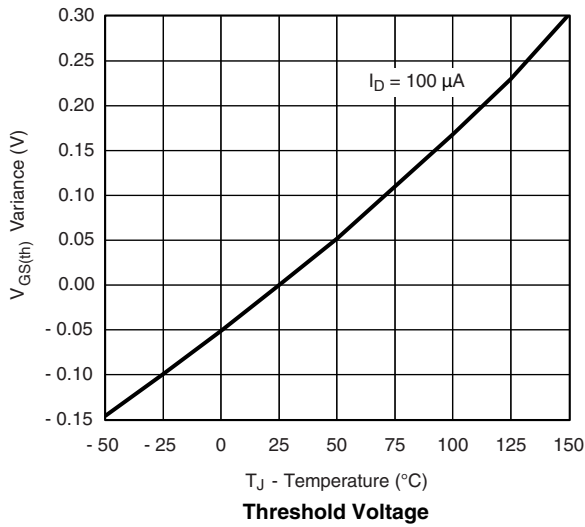
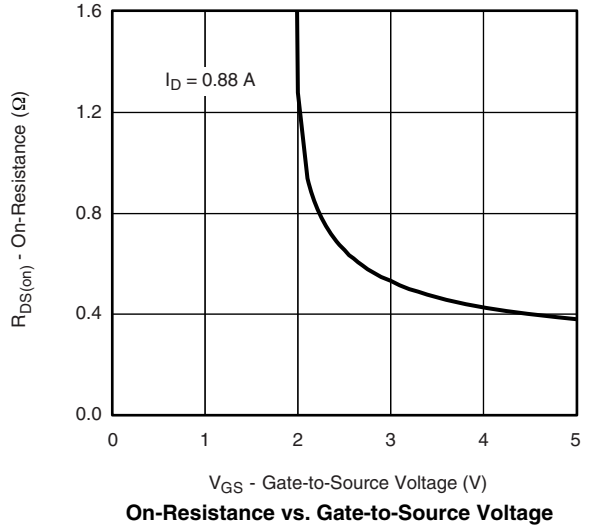
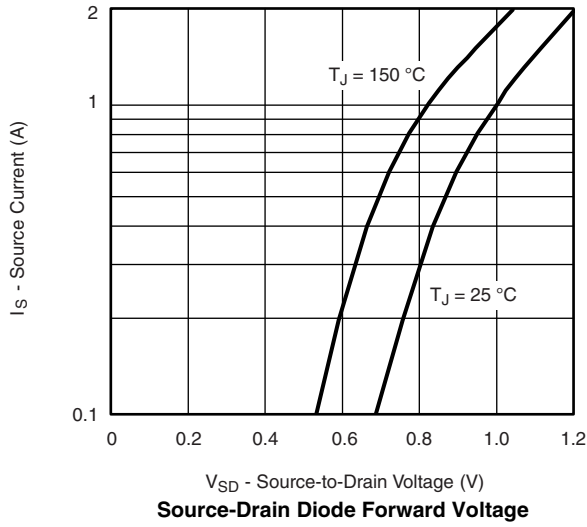


$Q_g$  - Total Gate Charge (nC)  
**Gate Charge**



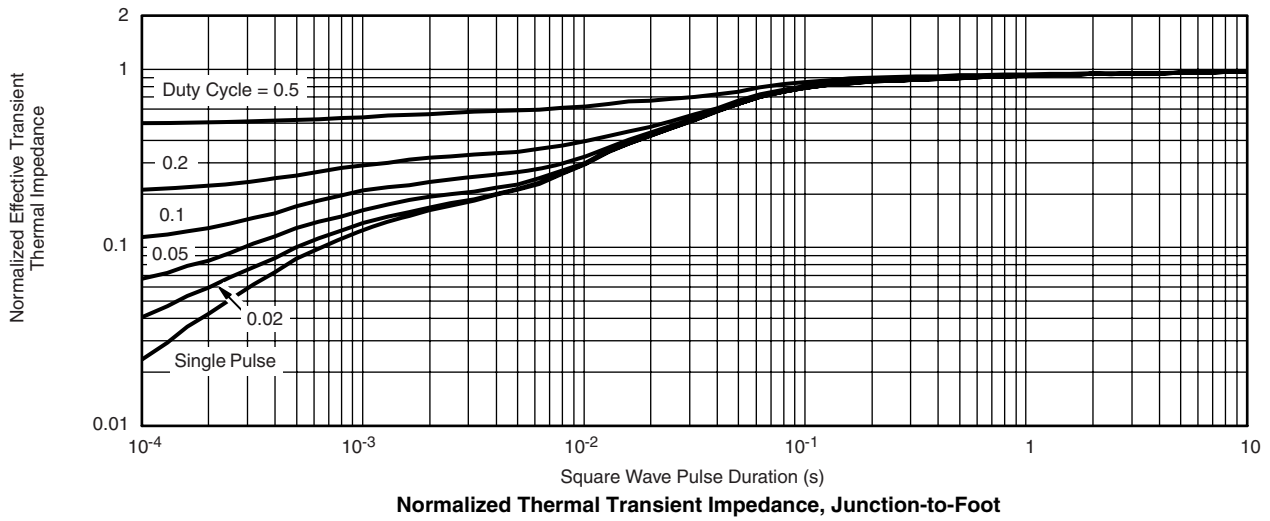
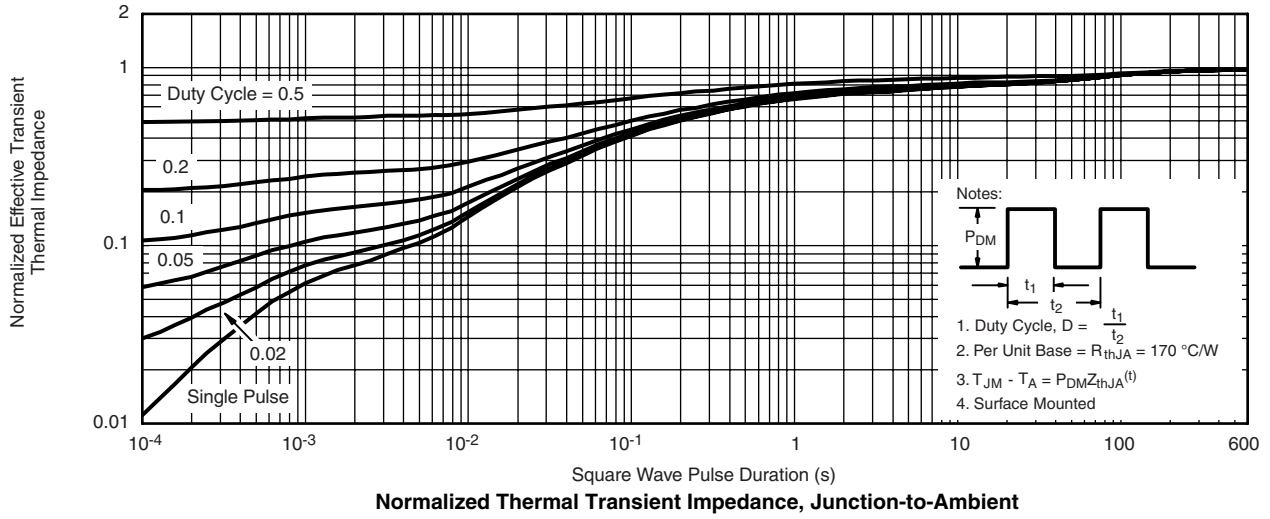
$T_J$  - Junction Temperature ( $^\circ C$ )  
**On-Resistance vs. Junction Temperature**

**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

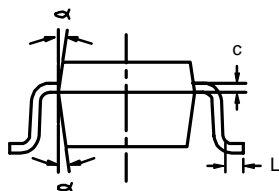
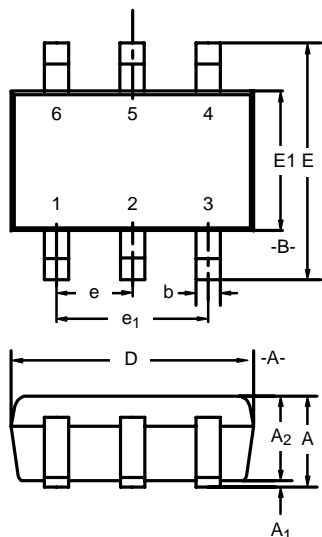


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**SC-70: 6-LEADS**



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.90	-	1.10	0.035	-	0.043
A <sub>1</sub>	-	-	0.10	-	-	0.004
A <sub>2</sub>	0.80	-	1.00	0.031	-	0.039
b	0.15	-	0.30	0.006	-	0.012
c	0.10	-	0.25	0.004	-	0.010
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.80	2.10	2.40	0.071	0.083	0.094
E <sub>1</sub>	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65BSC			0.026BSC		
e <sub>1</sub>	1.20	1.30	1.40	0.047	0.051	0.055
L	0.10	0.20	0.30	0.004	0.008	0.012
α	7°Nom			7°Nom		

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