

## 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

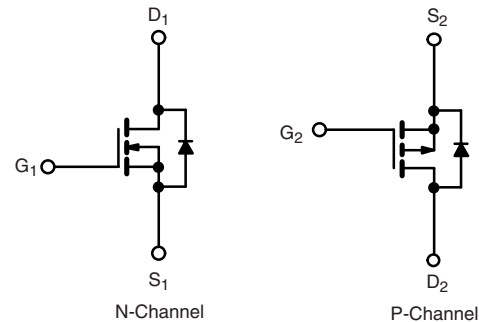
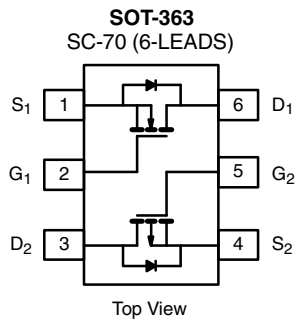
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFETs: 1.8 V Rated
- Thermally Enhanced SC-70 Package
- Fast Switching
- Compliant to RoHS Directive 2002/95/EC



**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.

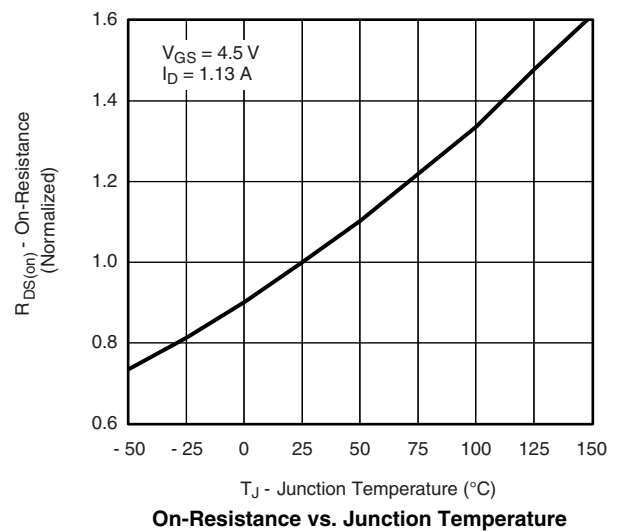
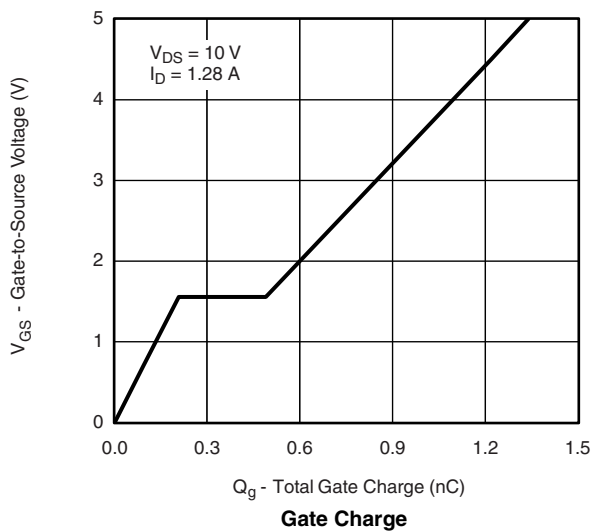
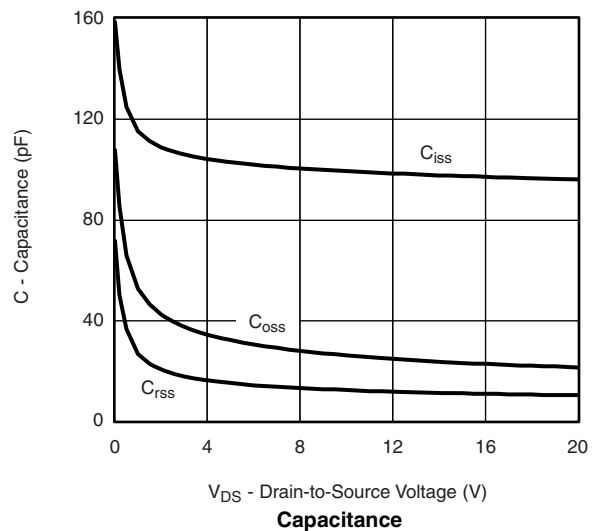
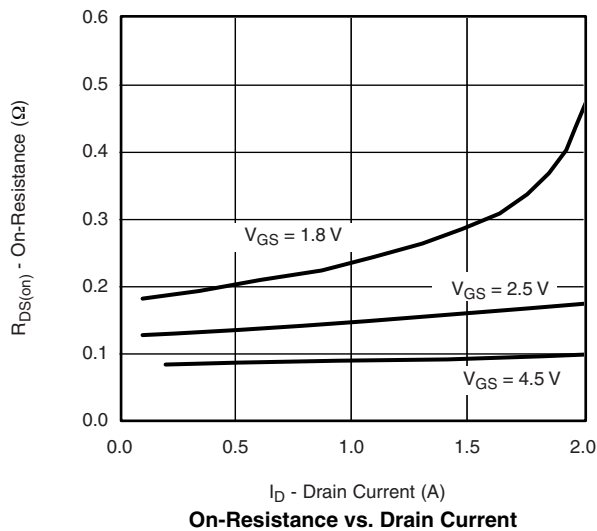
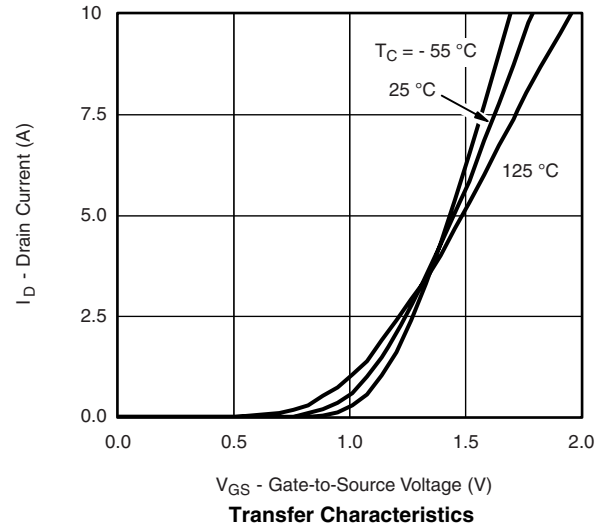
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
<b>Static</b>							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 100\text{ }\mu\text{A}$	N-Ch	0.45	1	V	
		$V_{DS} = V_{GS}, I_D = -100\text{ }\mu\text{A}$	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	V	
		$I_S = -0.48\text{ A}, V_{GS} = 0\text{ V}$	P-Ch		-0.8		
<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
Rise Time	$t_r$		P-Ch		18	30	
			N-Ch		22	35	
Turn-Off Delay Time	$t_{d(off)}$		P-Ch		25	40	
			N-Ch		15	25	
Fall Time	$t_f$		N-Ch		12	20	
			P-Ch		12	20	
Reverse Recovery Time	$t_{rr}$		N-Ch		30	60	
		P-Ch		30	60		

Notes:

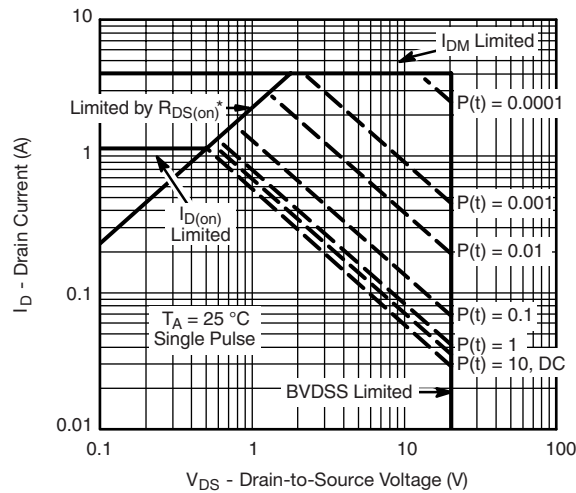
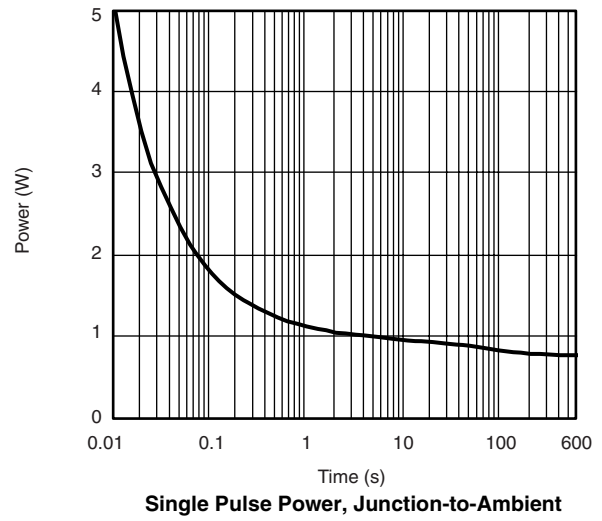
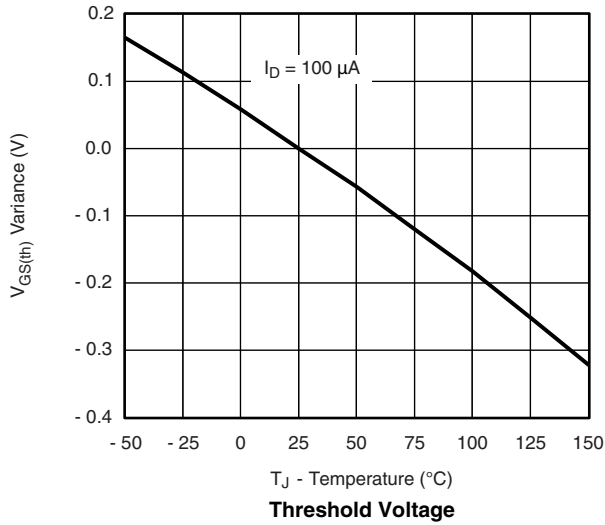
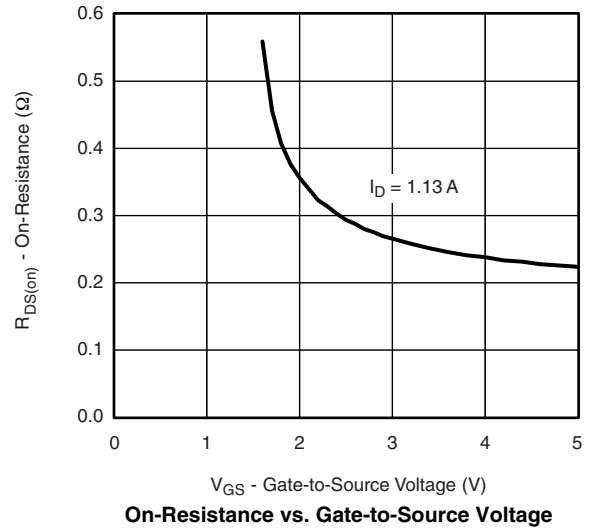
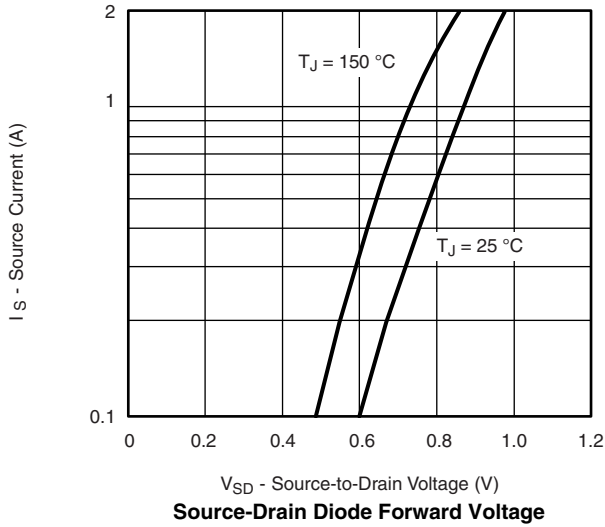
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

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

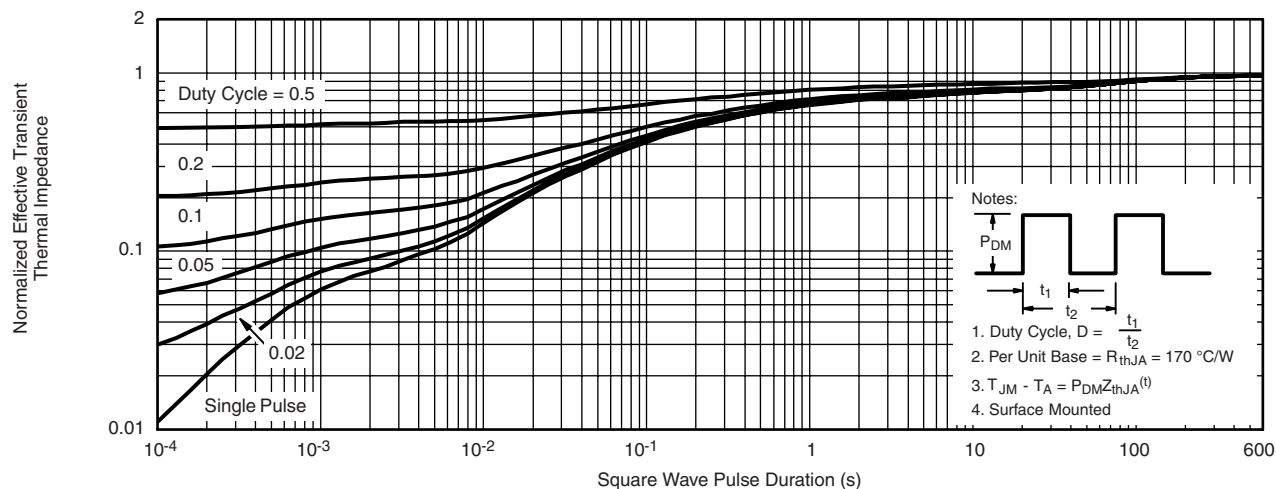


**N-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

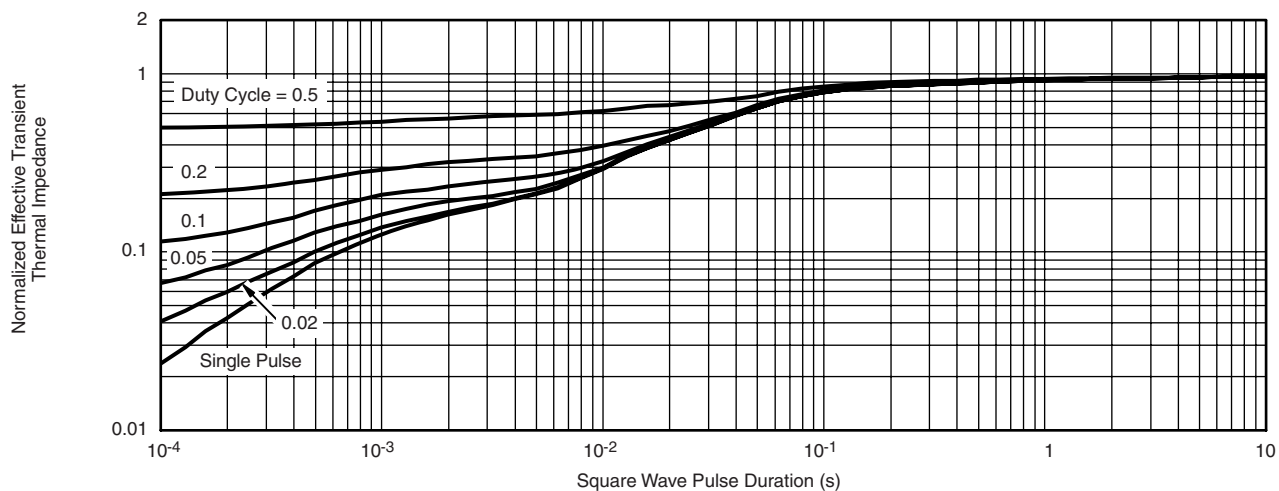


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified  
**Safe Operating Area, Junction-to-Ambient**

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

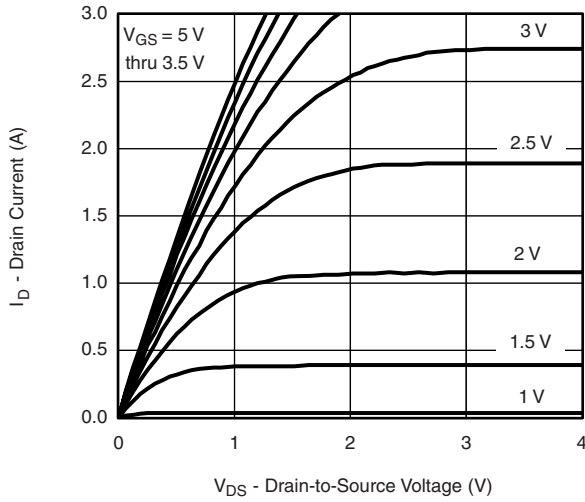


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

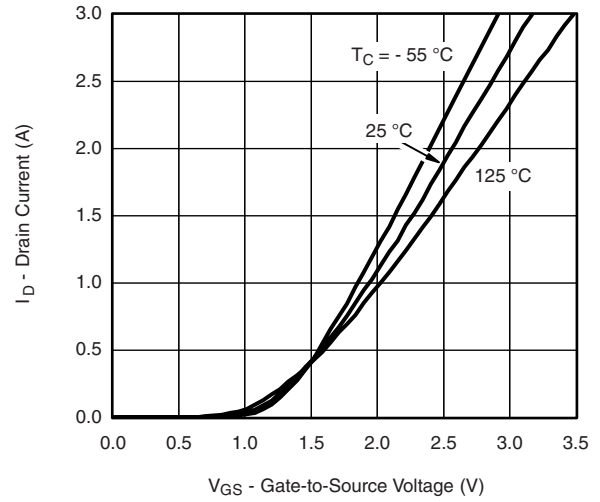


**Normalized Thermal Transient Impedance, Junction-to-Foot**

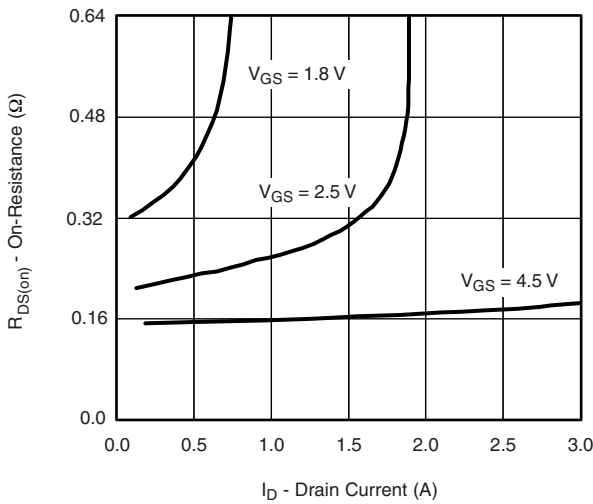
**P-CHANNEL TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



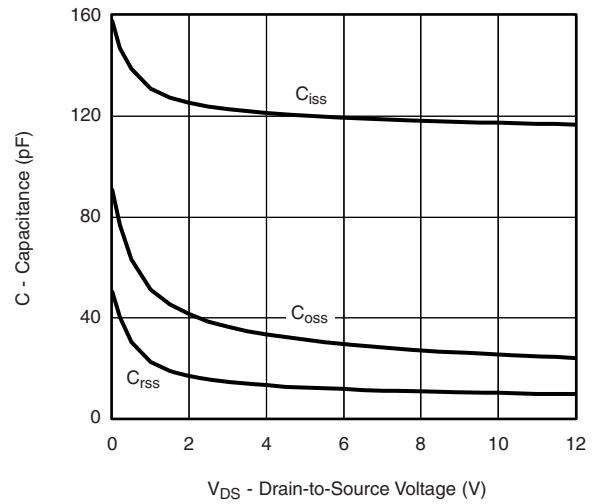
**Output Characteristics**



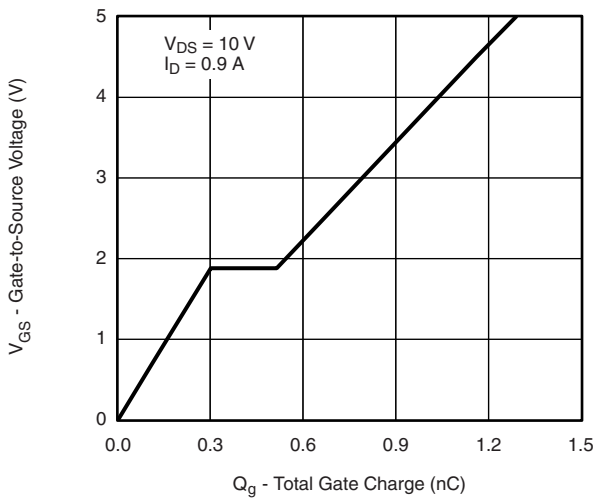
**Transfer Characteristics**



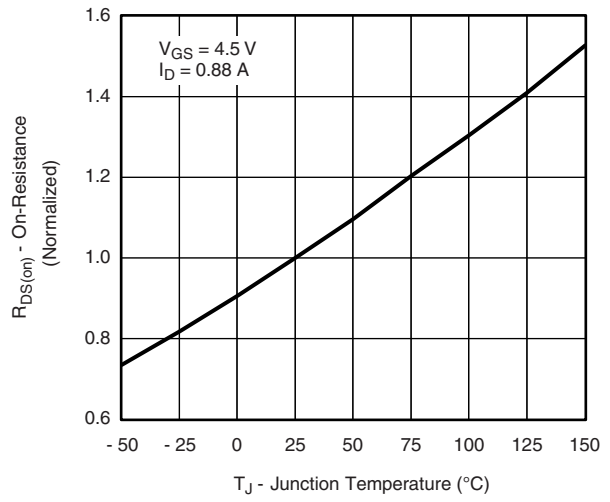
**On-Resistance vs. Drain Current**



**Capacitance**

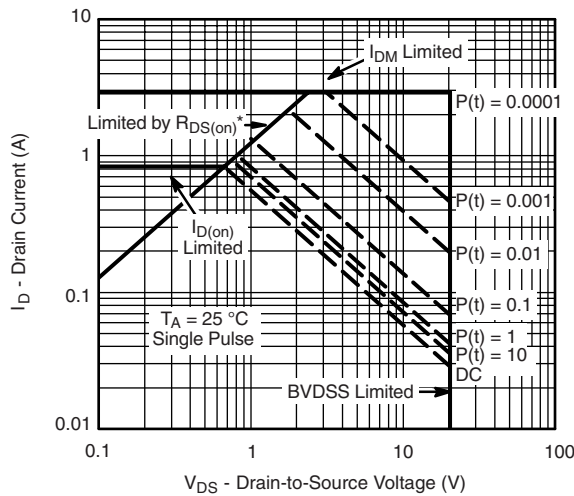
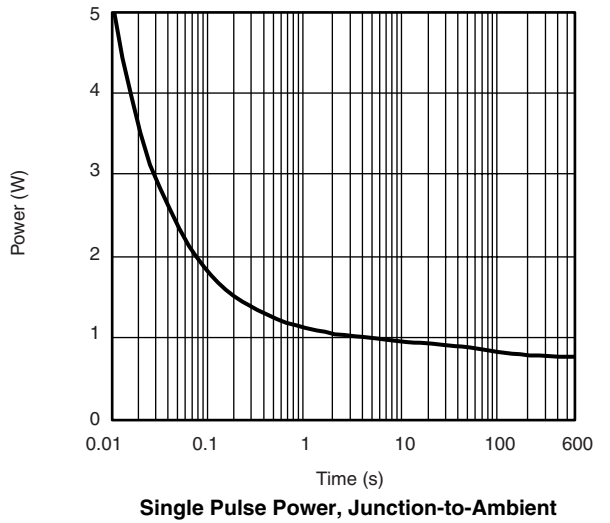
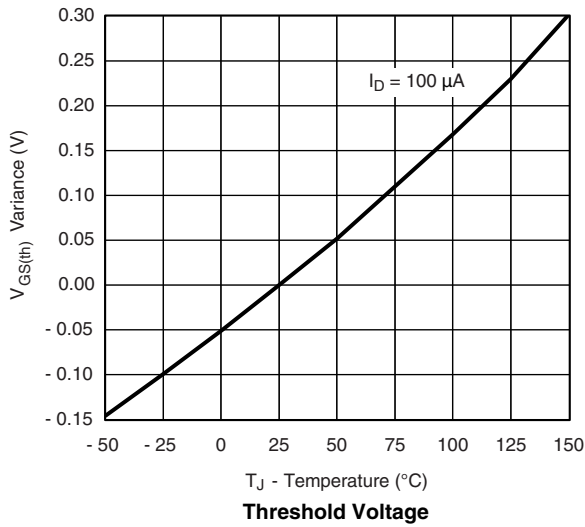
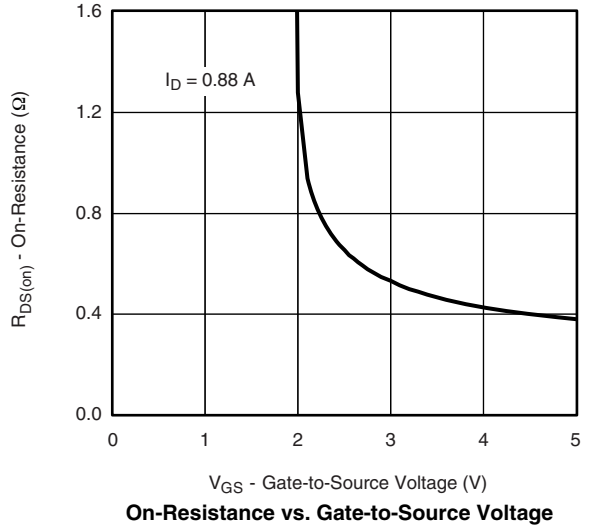
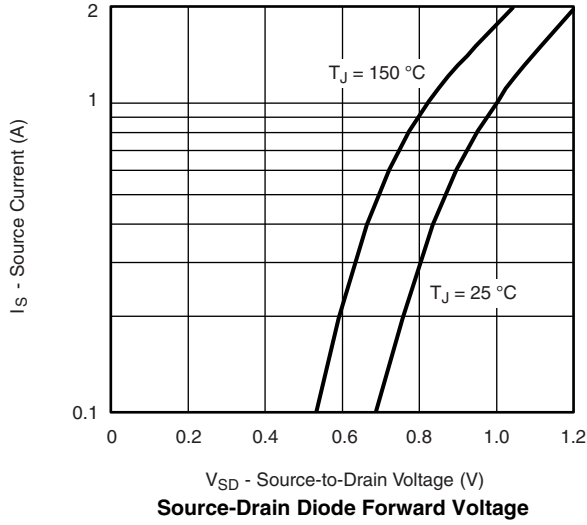


**Gate Charge**



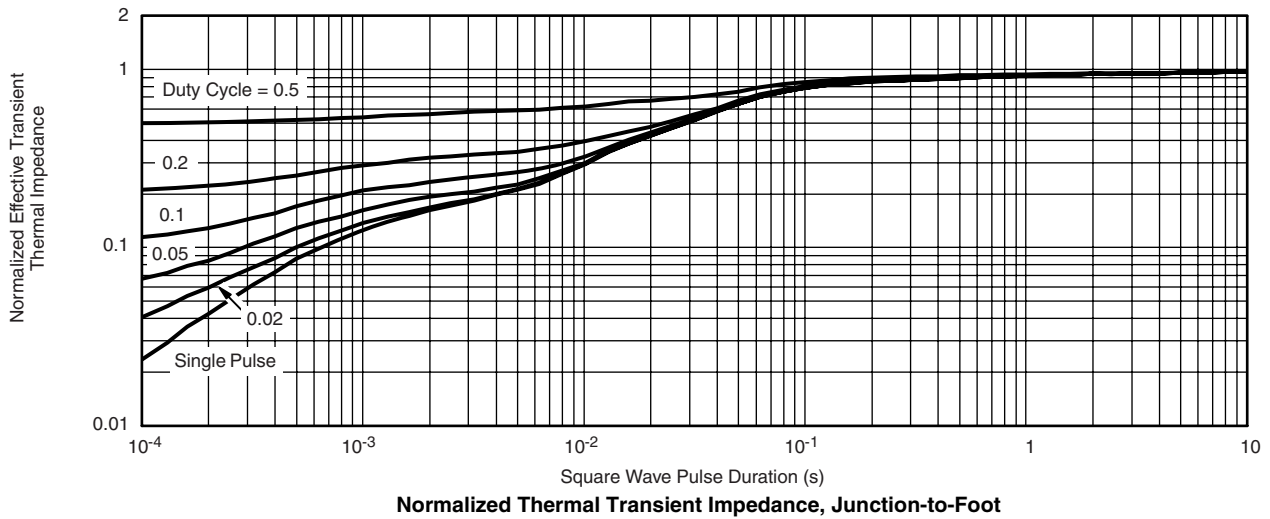
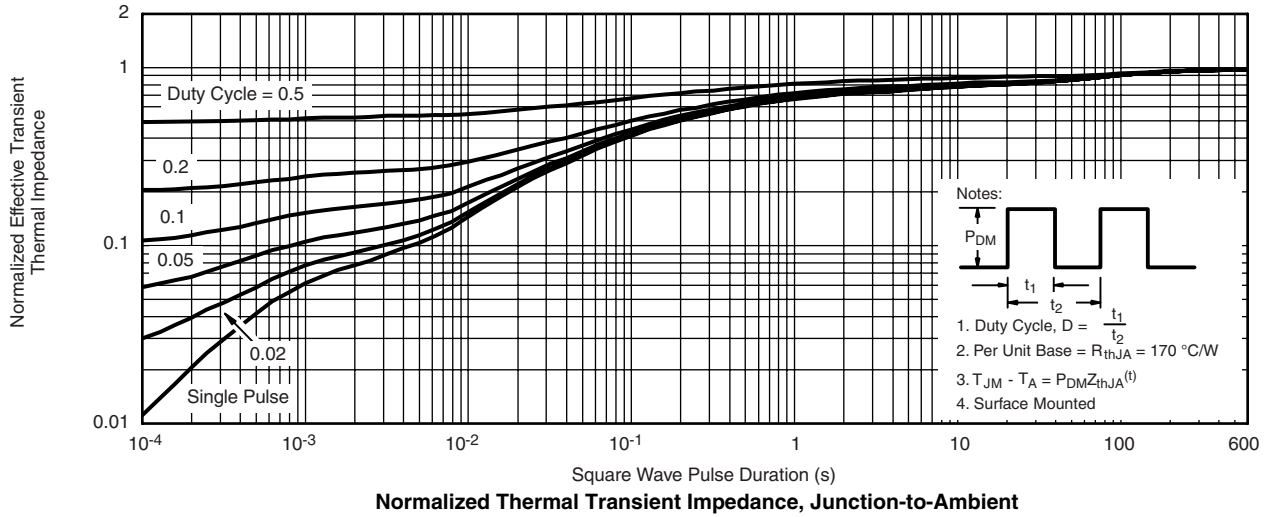
**On-Resistance vs. Junction Temperature**

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

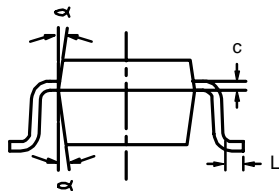
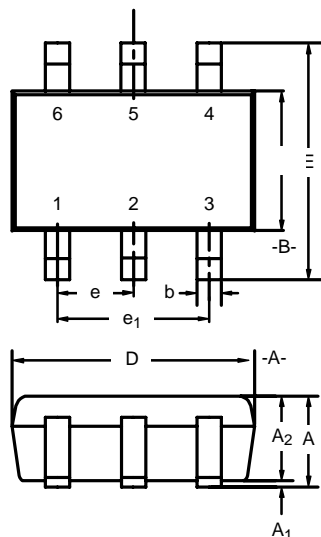


\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

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





**SC-70: 6-LEADS**

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

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