

## Complementary 20-V (D-S) MOSFET

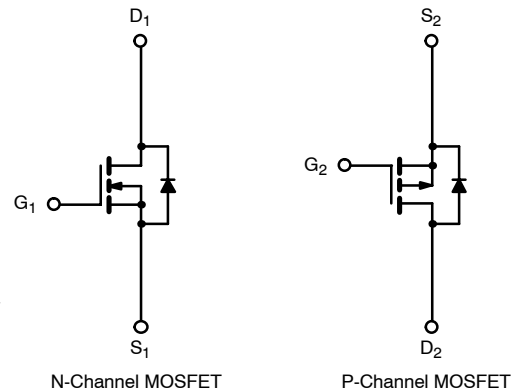
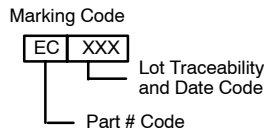
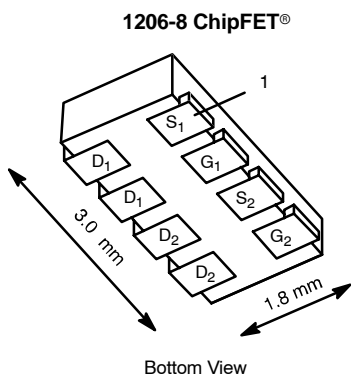
PRODUCT SUMMARY			
	$V_{DS}$ (V)	$r_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
N-Channel	20	0.040 @ $V_{GS} = 4.5$ V	5.9
		0.045 @ $V_{GS} = 2.5$ V	5.6
		0.052 @ $V_{GS} = 1.8$ V	5.2
P-Channel	-20	0.086 @ $V_{GS} = -4.5$ V	-4.1
		0.121 @ $V_{GS} = -2.5$ V	-3.4
		0.171 @ $V_{GS} = -1.8$ V	-2.9

### FEATURES

- TrenchFET® Power MOSFETS
- Ultra Low  $r_{DS(on)}$  and Excellent Power Handling In Compact Footprint

### APPLICATIONS

- Load Switching for Portable Devices



Ordering Information: Si5515DC-T1—E3

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)							
Parameter	Symbol	N-Channel		P-Channel		Unit	
		5 secs	Steady State	5 secs	Steady State		
Drain-Source Voltage	$V_{DS}$	20		-20		V	
Gate-Source Voltage	$V_{GS}$	±8					
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) <sup>a</sup>	$I_D$	$T_A = 25^\circ\text{C}$	5.9	4.4	-4.1	-3	A
		$T_A = 85^\circ\text{C}$	4.2	3.1	-2.9	-2.2	
Pulsed Drain Current	$I_{DM}$	20		-15			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	1.8	0.9	-1.8	-0.9		
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25^\circ\text{C}$	2.1	1.1	2.1	1.1	W
		$T_A = 85^\circ\text{C}$	1.1	0.6	1.1	0.6	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150					
Soldering Recommendations (Peak Temperature) <sup>b, c</sup>		260				$^\circ\text{C}$	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$t \leq 5$ sec	$R_{thJA}$	50	60	$^\circ\text{C/W}$
	Steady State		90	110	
Maximum Junction-to-Foot (Drain)	Steady State	$R_{thJF}$	30	40	

**Notes**

- Surface Mounted on 1" x 1" FR4 Board.
- See Reliability Manual for profile. The ChipFET is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

SPECIFICATIONS (T <sub>J</sub> = 25 °C UNLESS OTHERWISE NOTED)							
Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
<b>Static</b>							
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	N-Ch	0.4		1.0	V
		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	P-Ch	-0.4		-1.0	
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±8 V	N-Ch P-Ch			±100 ±100	nA
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V	N-Ch			1	μA
		V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V	P-Ch			-1	
		V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C	N-Ch			5	
		V <sub>DS</sub> = -20 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 85 °C	P-Ch			-5	
On-State Drain Current <sup>a</sup>	I <sub>D(on)</sub>	V <sub>DS</sub> ≥ 5 V, V <sub>GS</sub> = 4.5 V	N-Ch	20			A
		V <sub>DS</sub> ≤ -5 V, V <sub>GS</sub> = -4.5 V	P-Ch	-15			
Drain-Source On-State Resistance <sup>a</sup>	r <sub>DS(on)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 4.4 A	N-Ch		0.032	0.040	Ω
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -3.0 A	P-Ch		0.069	0.086	
		V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 4.1 A	N-Ch		0.036	0.045	
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -2.5 A	P-Ch		0.097	0.121	
		V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 1.9 A	N-Ch		0.042	0.052	
		V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -0.6 A	P-Ch		0.137	0.171	
Forward Transconductance <sup>a</sup>	g <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4.4 A	N-Ch		22		S
		V <sub>DS</sub> = -10 V, I <sub>D</sub> = -3 A	P-Ch		8		
Diode Forward Voltage <sup>a</sup>	V <sub>SD</sub>	I <sub>S</sub> = 0.9 A, V <sub>GS</sub> = 0 V	N-Ch		0.8	1.2	V
		I <sub>S</sub> = -0.9 A, V <sub>GS</sub> = 0 V	P-Ch		-0.8	-1.2	
<b>Dynamic<sup>b</sup></b>							
Total Gate Charge	Q <sub>g</sub>	N-Channel V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 4.4 A P-Channel V <sub>DS</sub> = -10 V, V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -3 A	N-Ch		5	7.5	nC
Gate-Source Charge	Q <sub>gs</sub>		N-Ch		0.85		
Gate-Drain Charge	Q <sub>gd</sub>		P-Ch		0.91		
Turn-On Delay Time	t <sub>d(on)</sub>	N-Channel V <sub>DD</sub> = 10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ 1 A, V <sub>GEN</sub> = 4.5 V, R <sub>G</sub> = 6 Ω P-Channel V <sub>DD</sub> = -10 V, R <sub>L</sub> = 10 Ω I <sub>D</sub> ≅ -1 A, V <sub>GEN</sub> = -4.5 V, R <sub>G</sub> = 6 Ω	N-Ch		20	30	ns
			P-Ch		18	30	
Rise Time	t <sub>r</sub>		N-Ch		36	55	
			P-Ch		32	50	
Turn-Off Delay Time	t <sub>d(off)</sub>		N-Ch		30	45	
			P-Ch		42	65	
Fall Time	t <sub>f</sub>	N-Ch		12	20		
		P-Ch		26	40		
Source-Drain Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 0.9 A, di/dt = 100 A/μs	N-Ch		45	90	
		I <sub>F</sub> = -0.9 A, di/dt = 100 A/μs	P-Ch		30	60	

## Notes

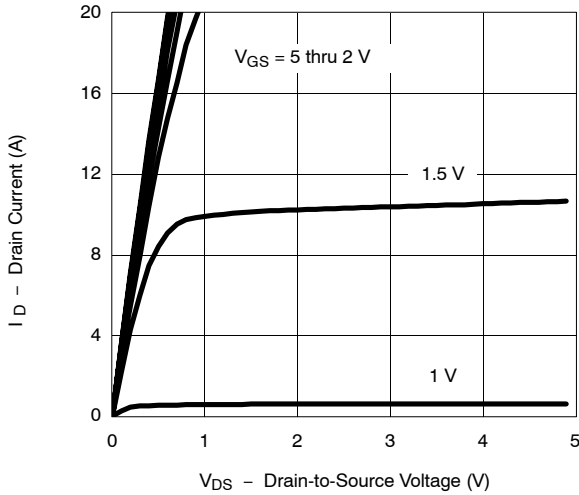
- a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%,  
b. Guaranteed by design, not subject to production testing.



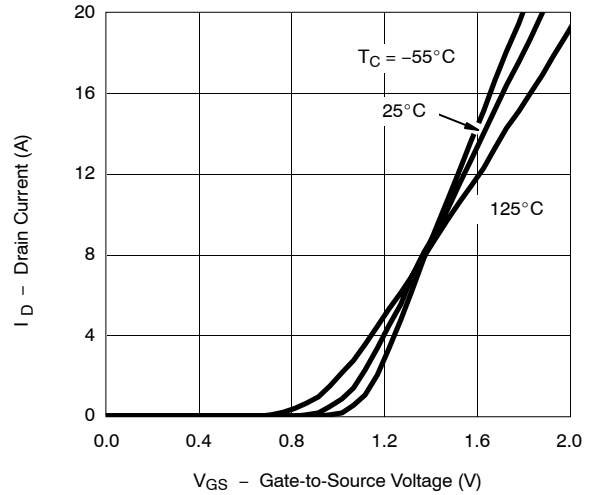
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

**N-CHANNEL**

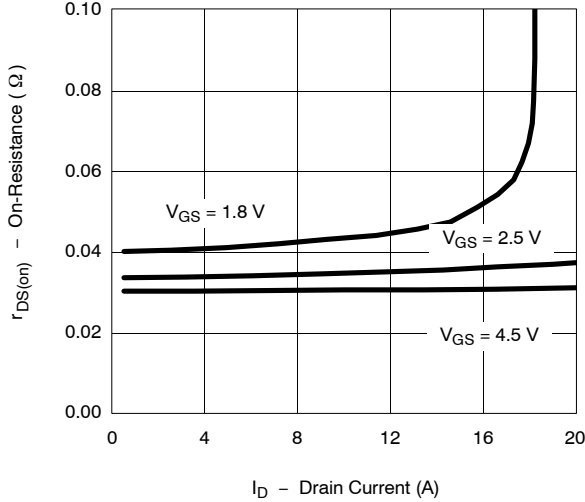
**Output Characteristics**



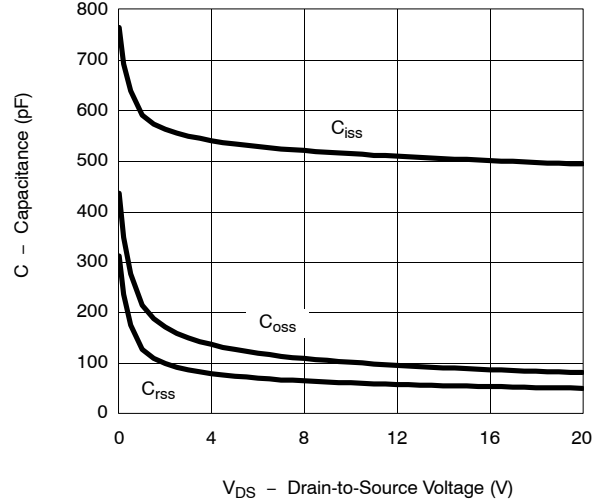
**Transfer Characteristics**



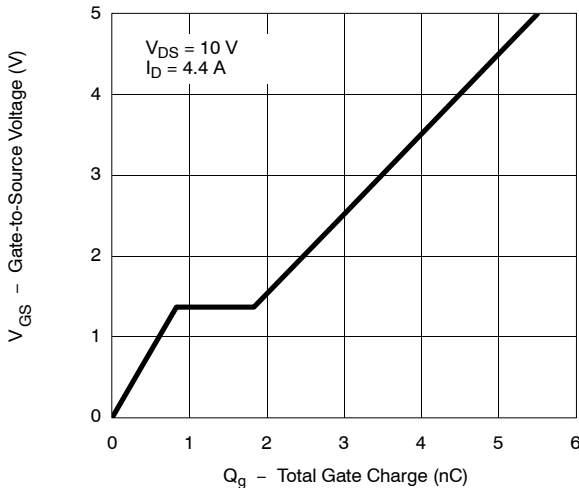
**On-Resistance vs. Drain Current**



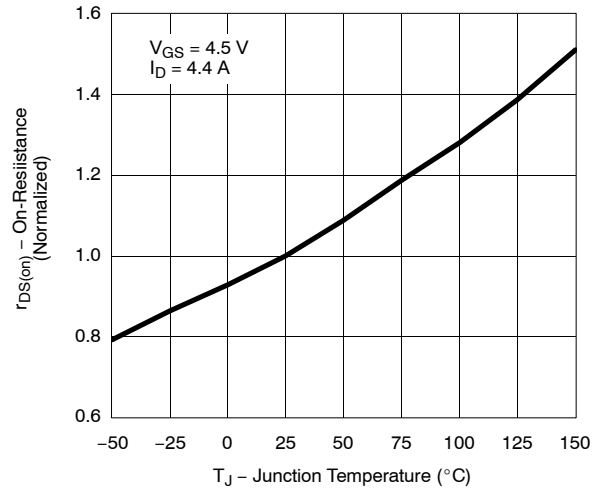
**Capacitance**



**Gate Charge**

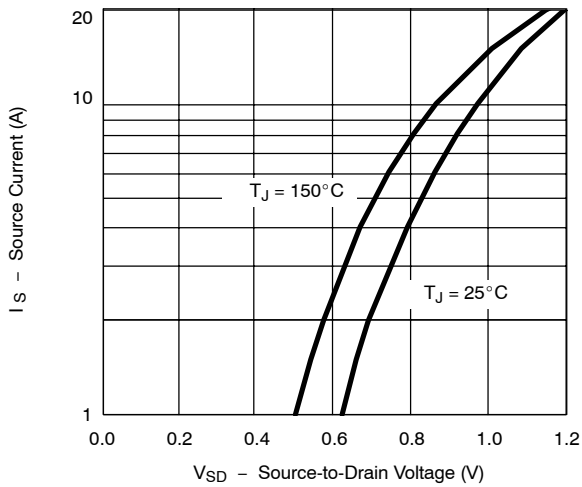


**On-Resistance vs. Junction Temperature**

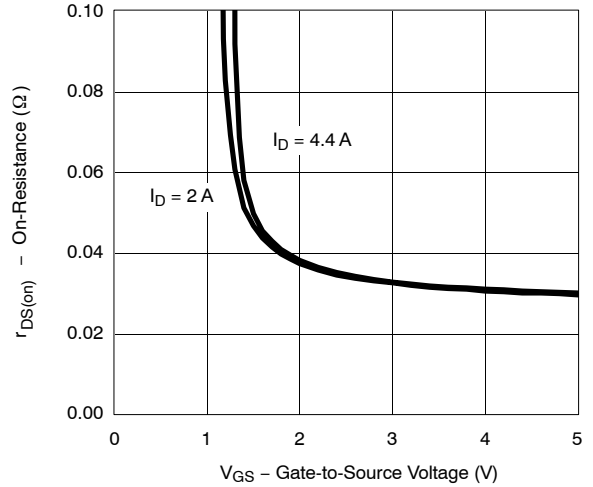


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED) N-CHANNEL**

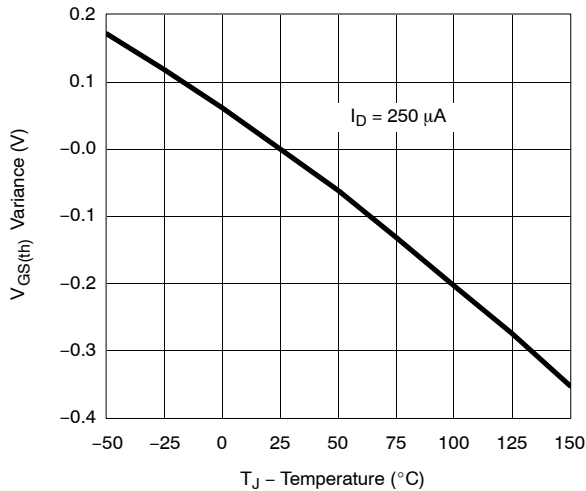
**Source-Drain Diode Forward Voltage**



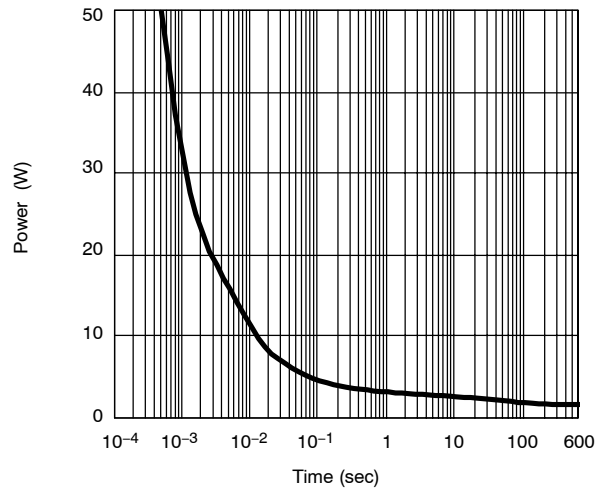
**On-Resistance vs. Gate-to-Source Voltage**



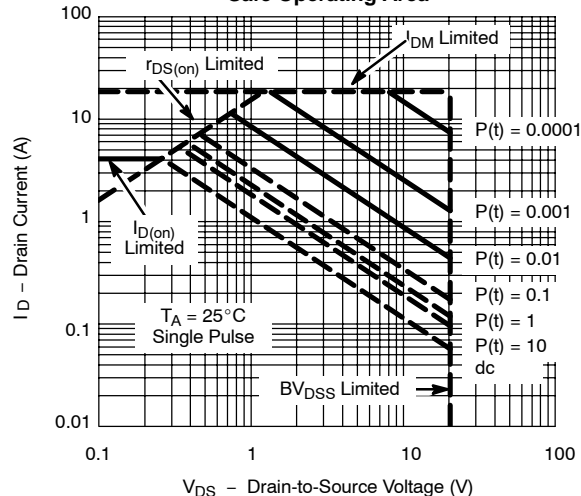
**Threshold Voltage**



**Single Pulse Power**



**Safe Operating Area**

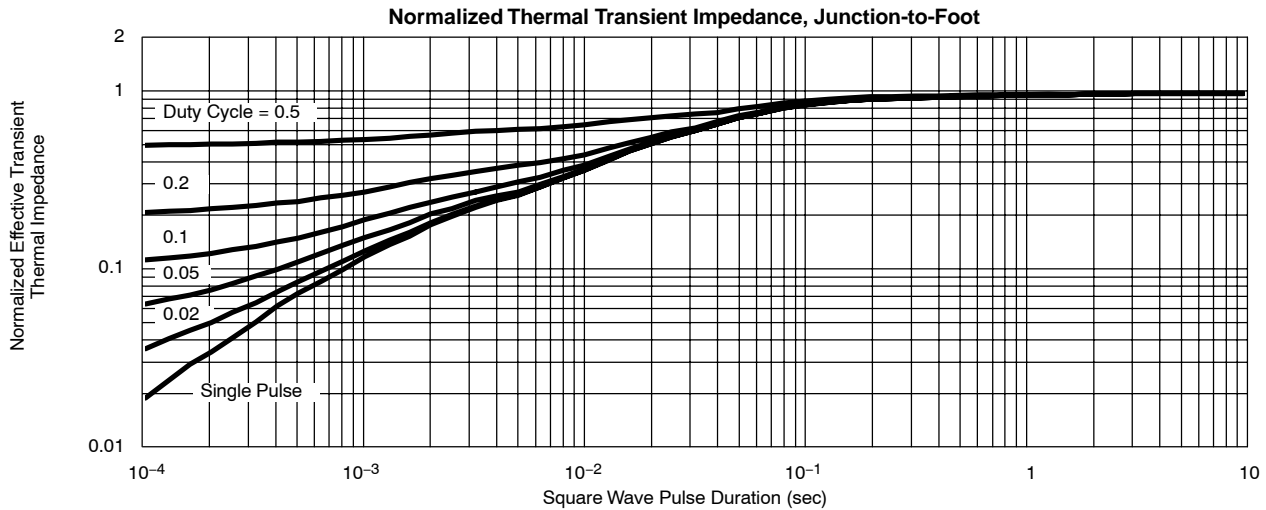
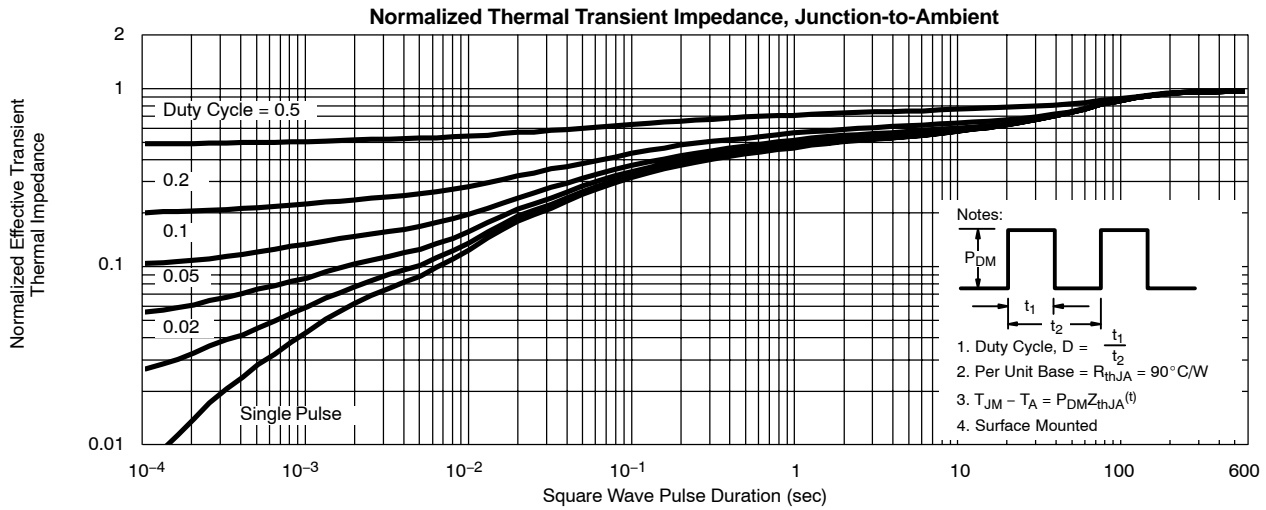


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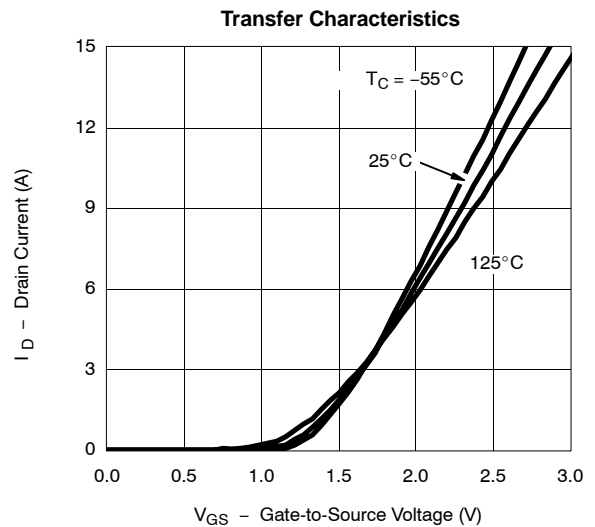
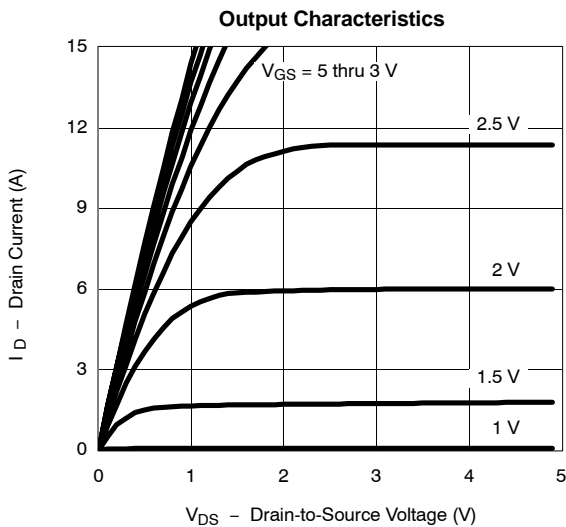
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

**N-CHANNEL**



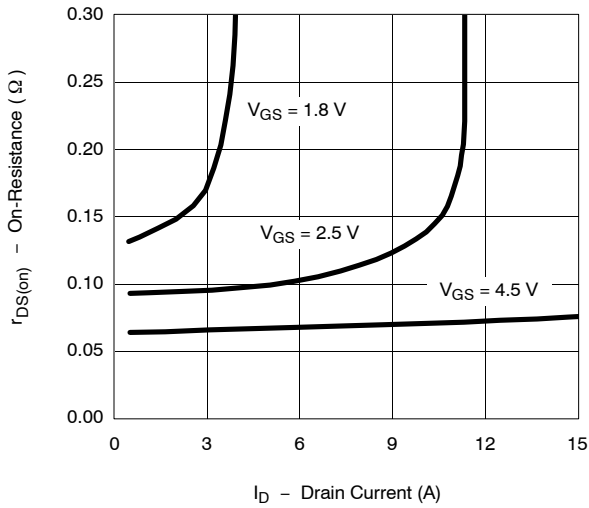
**TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)**

**P-CHANNEL**

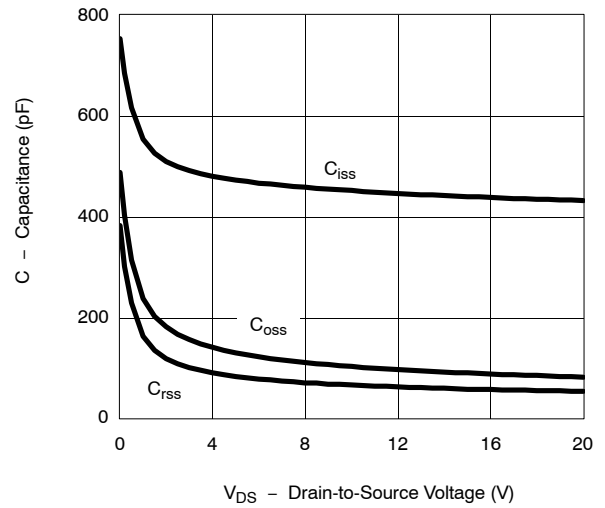


**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED) P-CHANNEL**

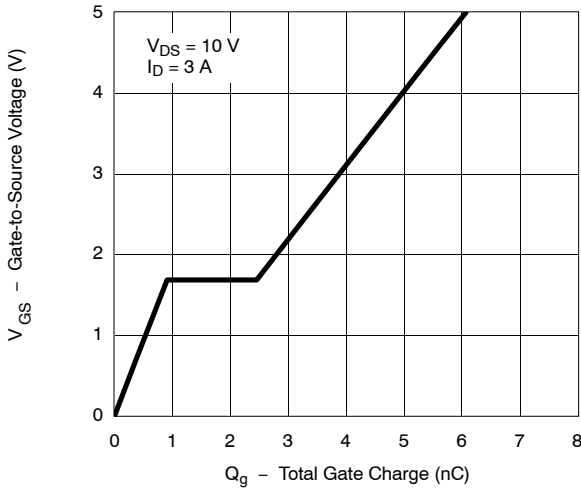
**On-Resistance vs. Drain Current**



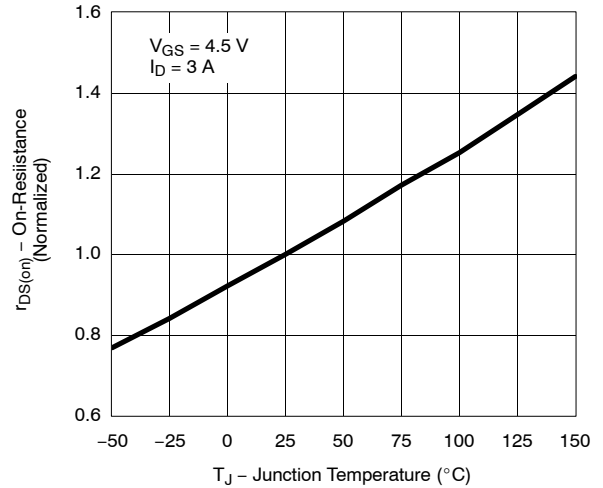
**Capacitance**



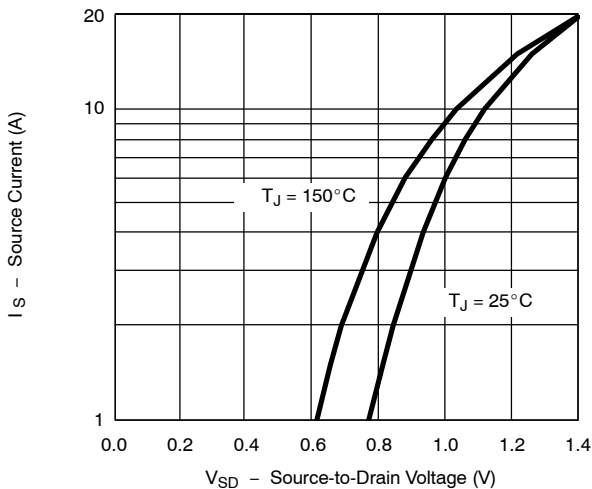
**Gate Charge**



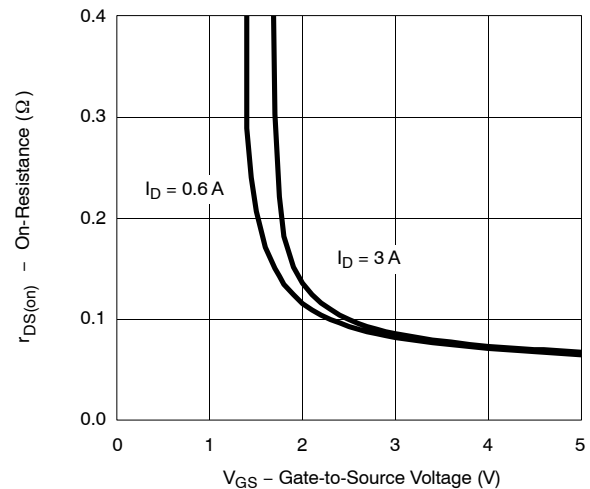
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**



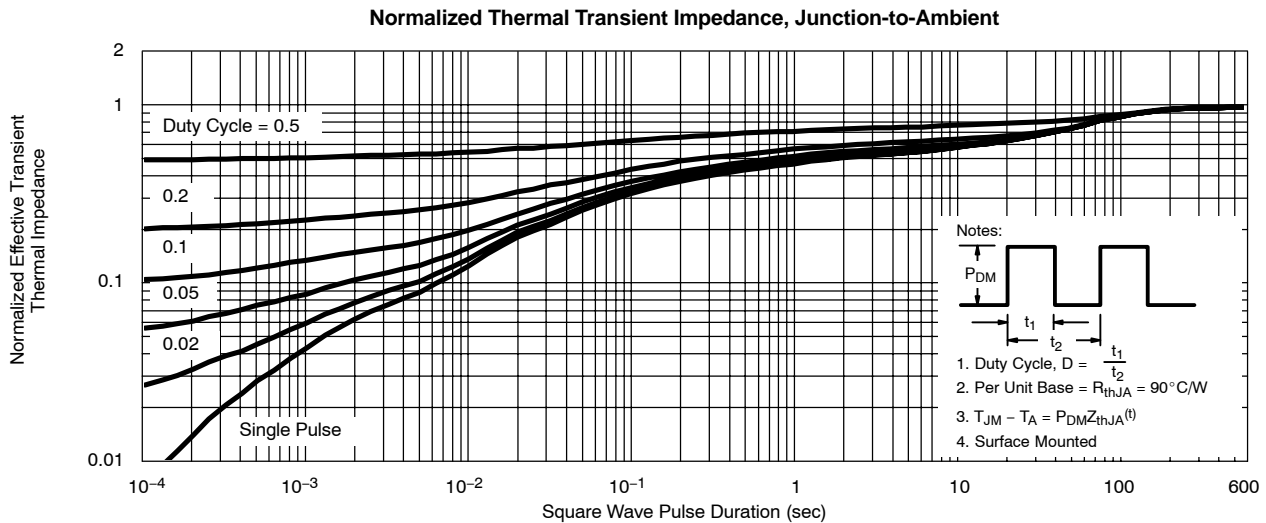
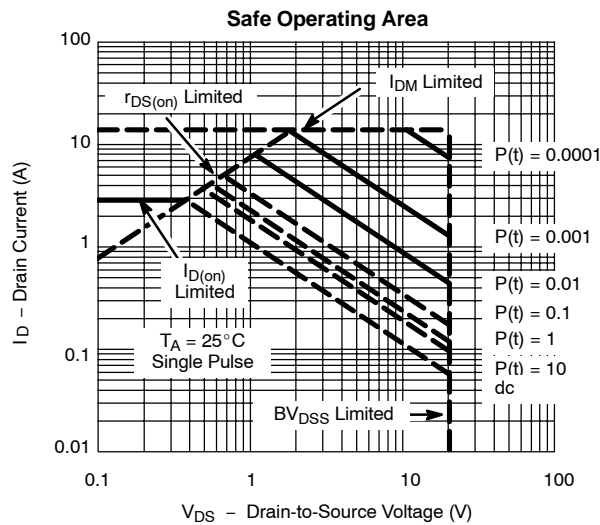
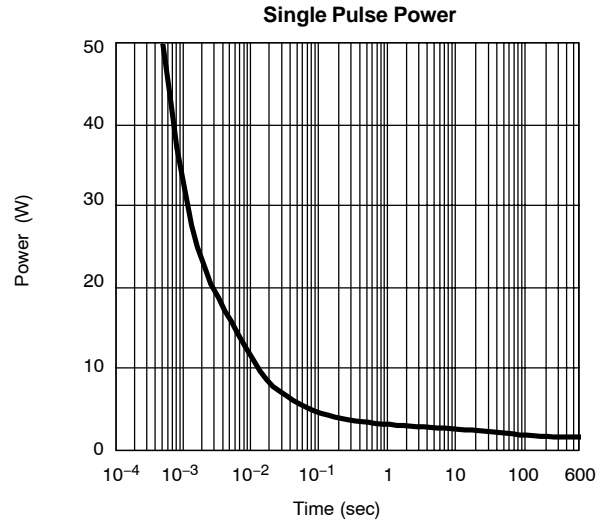
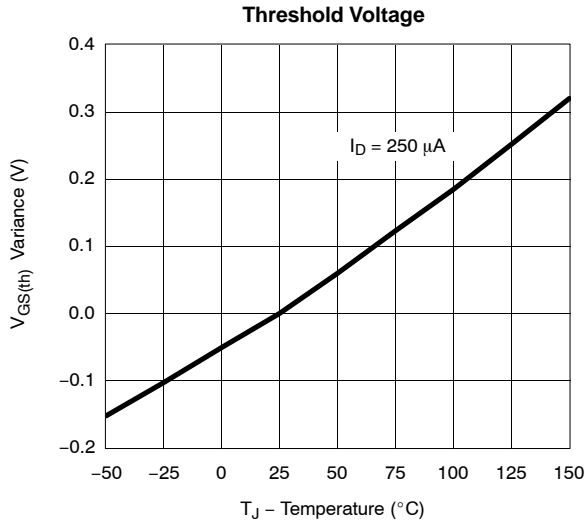
**On-Resistance vs. Gate-to-Source Voltage**





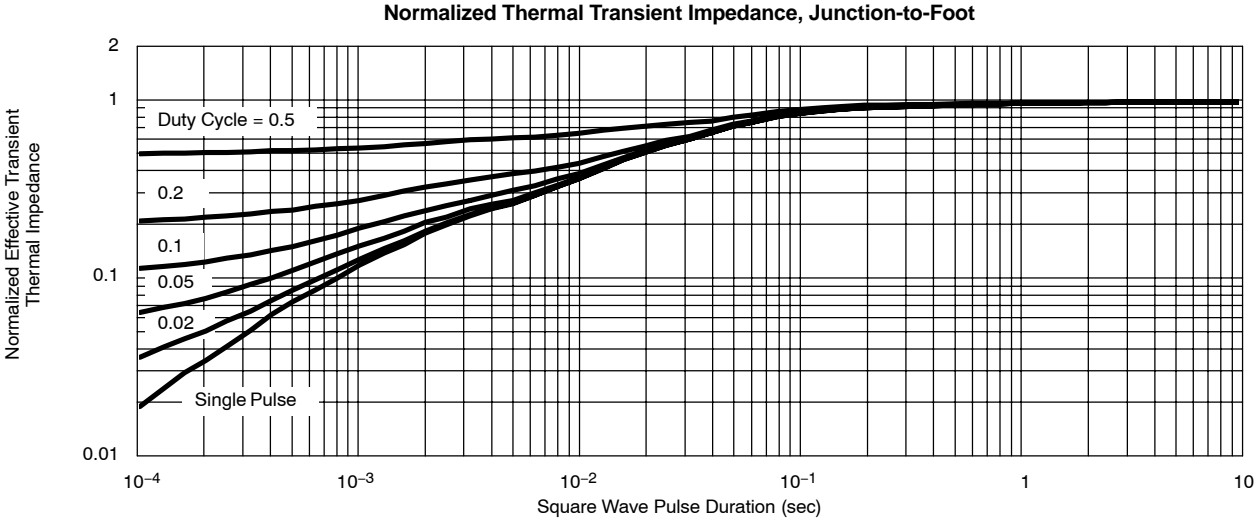
**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

**P-CHANNEL**





**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED) P-CHANNEL**







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