

## N- and P-Channel 1.8 V (G-S) MOSFET

PRODUCT SUMMARY			
	V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)
N-Channel	12	0.235 at V <sub>GS</sub> = 4.5 V	1.3
		0.280 at V <sub>GS</sub> = 2.5 V	1.2
		0.340 at V <sub>GS</sub> = 1.8 V	1.0
P-Channel	- 12	0.535 at V <sub>GS</sub> = - 4.5 V	- 0.86
		0.880 at V <sub>GS</sub> = - 2.5 V	- 0.67
		1.26 at V <sub>GS</sub> = - 1.8 V	- 0.56

### FEATURES

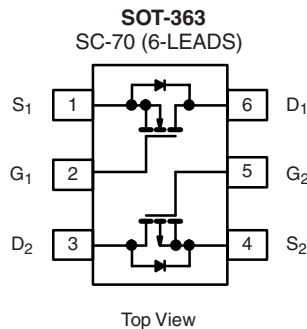
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFETs
- Thermally Enhanced SC-70 Package
- Fast Switching to Minimize Gate and Switching Losses
- Compliant to RoHS Directive 2002/95/EC



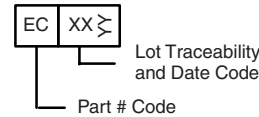
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

- Baseband dc-to-dc Converter Switch for Portable Electronics



#### Marking Code



**Ordering Information:** Si1557DH-T1-E3 (Lead (Pb)-free)  
Si1557DH-T1-GE3 (Lead (Pb)-free and Halogen-free)

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>	12		- 12		V	
Gate-Source Voltage	V <sub>GS</sub>	± 8					
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	1.3	1.2	- 0.86	- 0.77	A
		T <sub>A</sub> = 85 °C	0.9	0.8	- 0.62	- 0.55	
Pulsed Drain Current	I <sub>DM</sub>	3		- 2			
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	0.5	0.39	- 0.5	- 0.39		
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25 °C	0.6	0.47	0.6	0.47	W
		T <sub>A</sub> = 85 °C	0.3	0.25	0.3	0.25	
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>	170	210	°C/W
	Steady State		220	265	
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	105	125	

Notes:

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

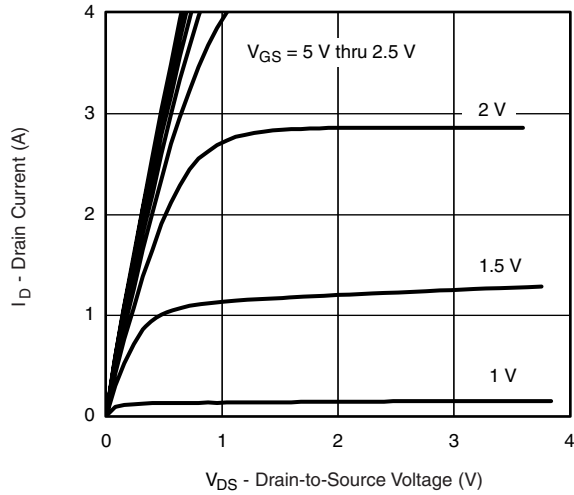
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
<b>Static</b>							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 100\ \mu\text{A}$	N-Ch	0.45		1	V
		$V_{DS} = V_{GS}, I_D = -100\ \mu\text{A}$	P-Ch	-0.45		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	$I_{DSS}$	$V_{DS} = 9.6\ \text{V}, V_{GS} = 0\ \text{V}$	N-Ch			1	$\mu\text{A}$
		$V_{DS} = -9.6\ \text{V}, V_{GS} = 0\ \text{V}$	P-Ch			-1	
		$V_{DS} = 9.6\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85\text{ }^\circ\text{C}$	N-Ch			5	
		$V_{DS} = -9.6\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85\text{ }^\circ\text{C}$	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	3			A
		$V_{DS} \leq -5\ \text{V}, V_{GS} = -4.5\ \text{V}$	P-Ch	-2			
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\ \text{V}, I_D = 1.2\ \text{A}$	N-Ch		0.195	0.235	$\Omega$
		$V_{GS} = -4.5\ \text{V}, I_D = -0.77\ \text{A}$	P-Ch		0.445	0.535	
		$V_{GS} = 2.5\ \text{V}, I_D = 1.0\ \text{A}$	N-Ch		0.230	0.280	
		$V_{GS} = -2.5\ \text{V}, I_D = -0.6\ \text{A}$	P-Ch		0.735	0.880	
		$V_{GS} = 1.8\ \text{V}, I_D = 0.2\ \text{A}$	N-Ch		0.284	0.340	
		$V_{GS} = -1.8\ \text{V}, I_D = -0.2\ \text{A}$	P-Ch		1.05	1.26	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 5\ \text{V}, I_D = 1.2\ \text{A}$	N-Ch		0.8		S
		$V_{DS} = -5\ \text{V}, I_D = -0.77\ \text{A}$	P-Ch		1.2		
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 0.39\ \text{A}, V_{GS} = 0\ \text{V}$	N-Ch		0.8	1.2	V
		$I_S = -0.39\ \text{A}, V_{GS} = 0\ \text{V}$	P-Ch		-0.8	-1.2	
<b>Dynamic<sup>b</sup></b>							
Total Gate Charge	$Q_g$	N-Channel $V_{DS} = 6\ \text{V}, V_{GS} = 4.5\ \text{V}, I_D = 1.2\ \text{A}$  P-Channel $V_{DS} = -6\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -0.1\ \text{A}$	N-Ch		0.8	1.2	nC
Gate-Source Charge	$Q_{gs}$		N-Ch		0.15		
Gate-Drain Charge	$Q_{gd}$		P-Ch		0.3		
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 6\ \text{V}, R_L = 12\ \Omega$ $I_D \cong 0.5\ \text{A}, V_{GEN} = 4.5\ \text{V}, R_g = 6\ \Omega$  P-Channel $V_{DD} = -6\ \text{V}, R_L = 12\ \Omega$ $I_D \cong -0.5\ \text{A}, V_{GEN} = -4.5\ \text{V}, R_g = 6\ \Omega$	N-Ch		15	25	ns
Rise Time	$t_r$		N-Ch		25	40	
			P-Ch		30	45	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		25	40	
			P-Ch		15	25	
Fall Time	$t_f$		N-Ch		10	15	
		P-Ch		10	15		
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 0.39\ \text{A}, dl/dt = 100\ \text{A}/\mu\text{s}$	N-Ch		20	40	
		$I_F = -0.39\ \text{A}, dl/dt = 100\ \text{A}/\mu\text{s}$	P-Ch		25	40	

Notes:

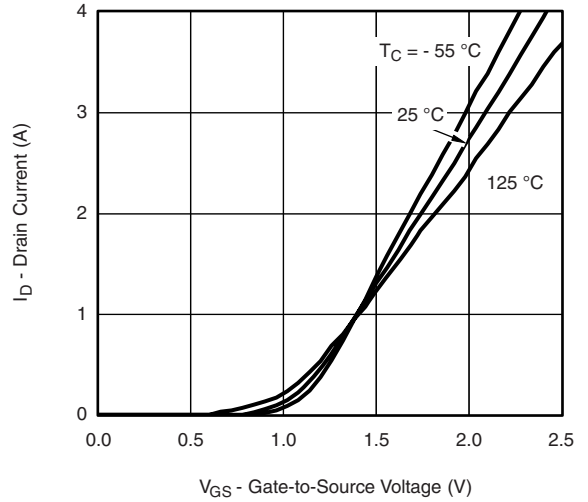
- a. Pulse test; pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.

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.

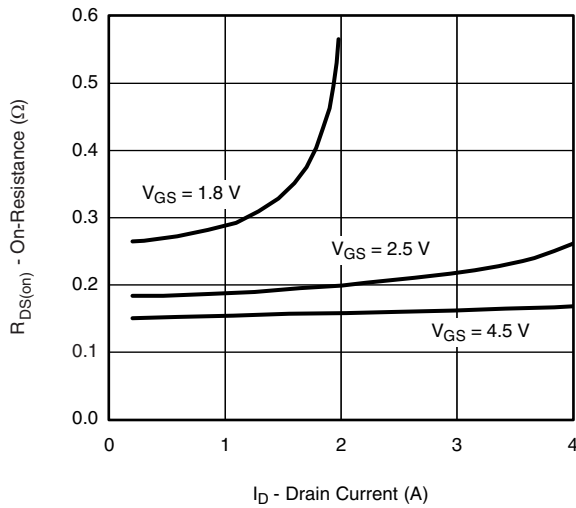
## N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



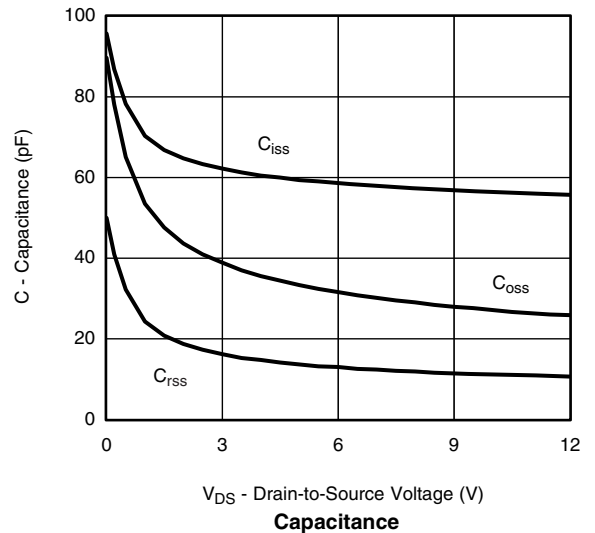
**Output Characteristics**



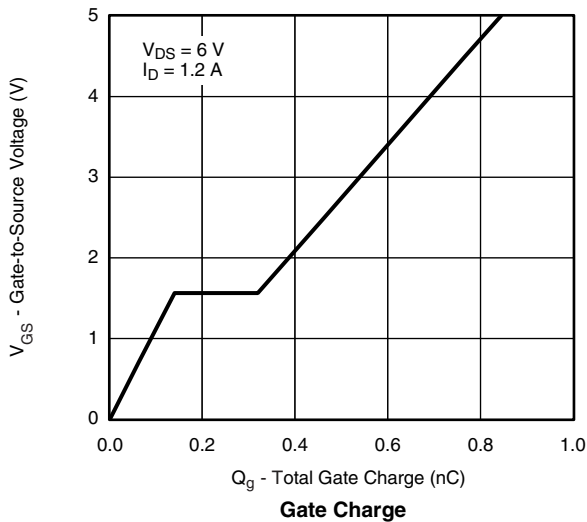
**Transfer Characteristics**



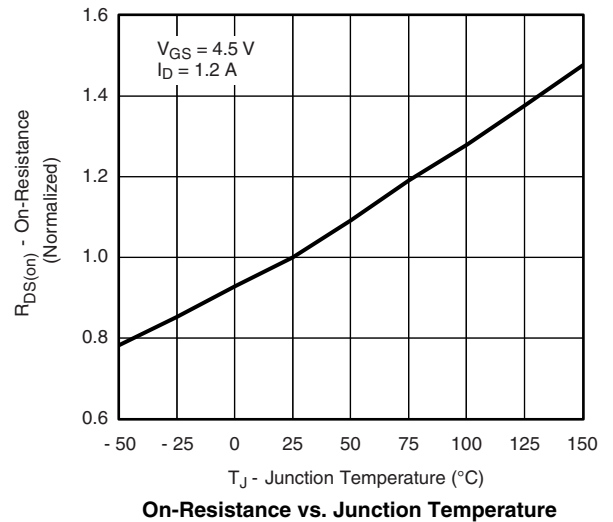
**On-Resistance vs. Drain Current**



**Capacitance**

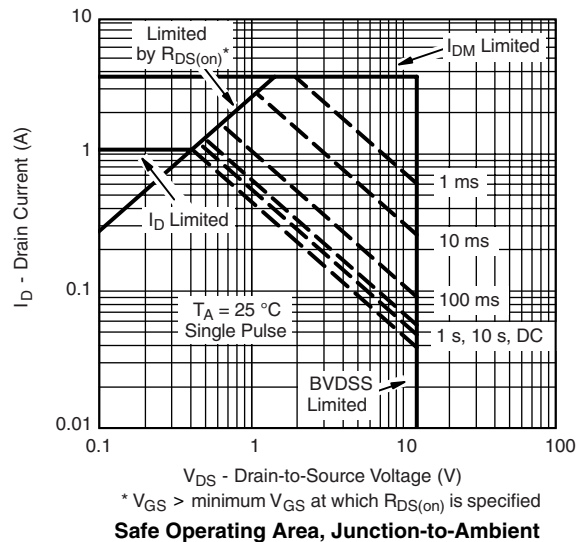
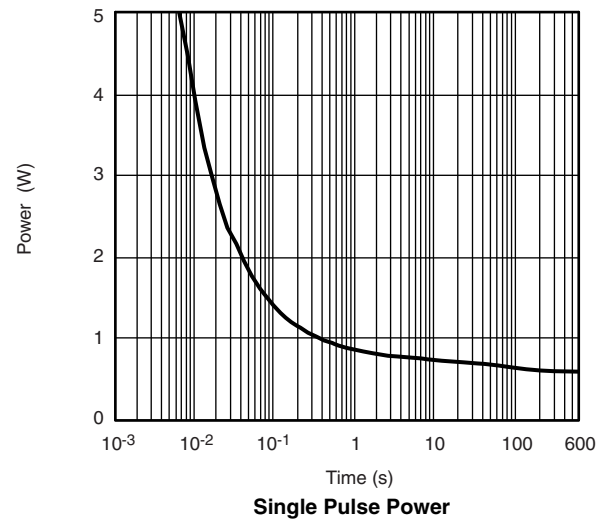
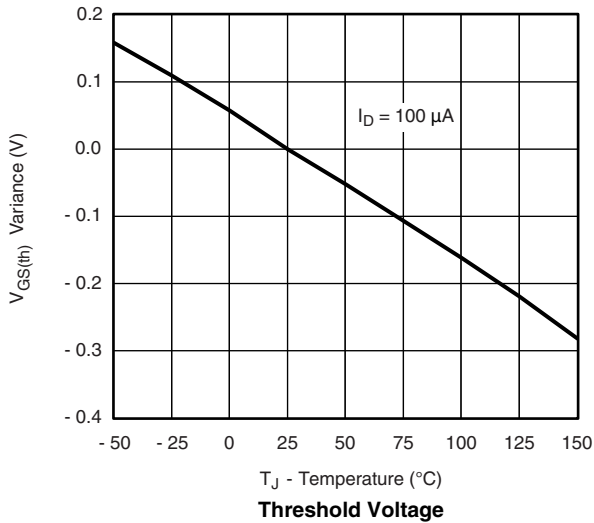
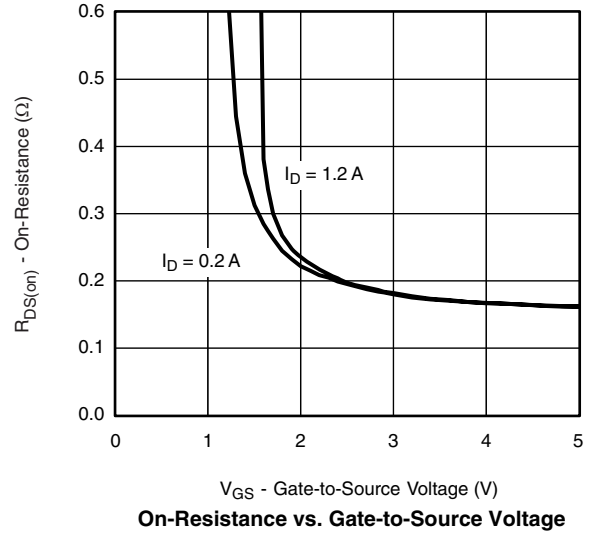
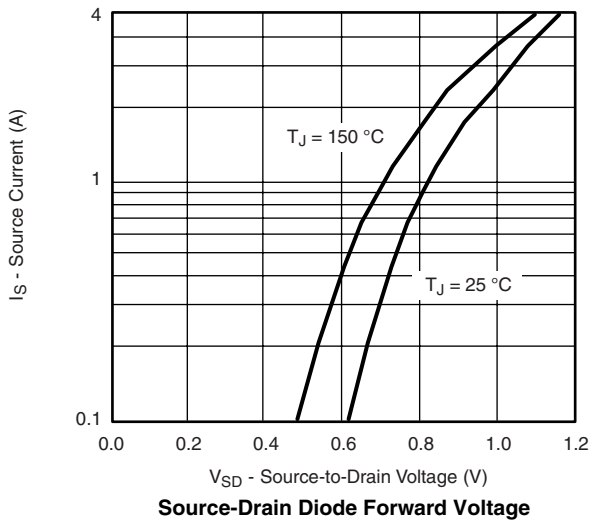


**Gate Charge**

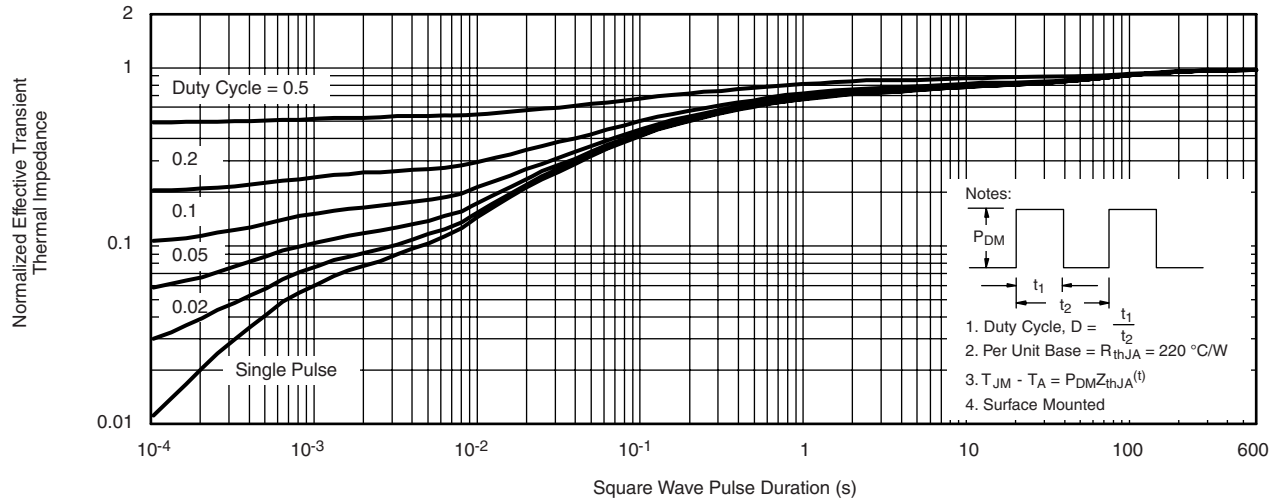


**On-Resistance vs. Junction Temperature**

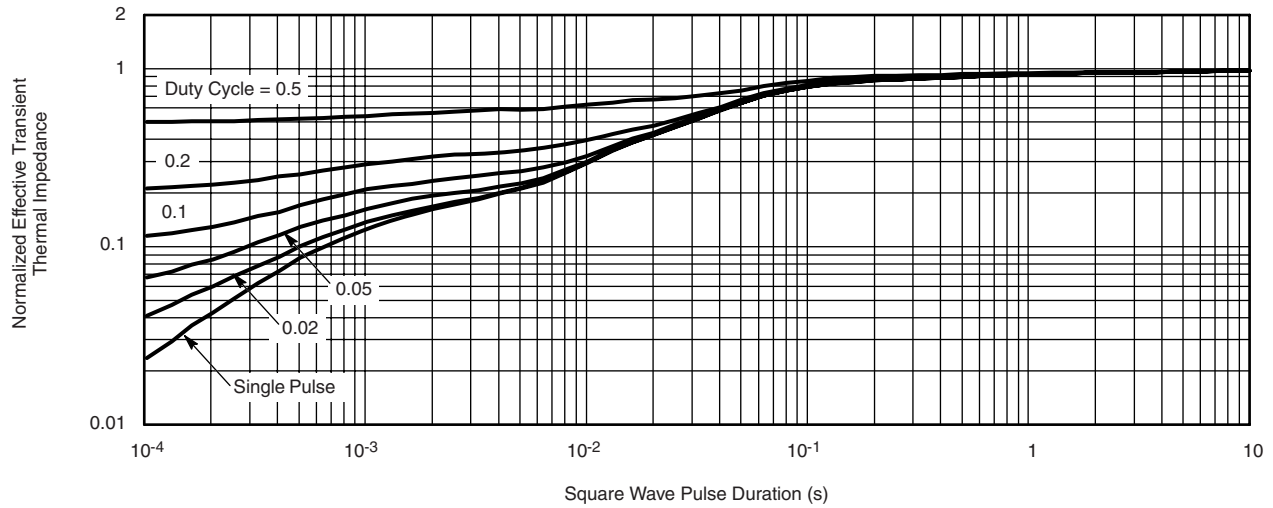
## N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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

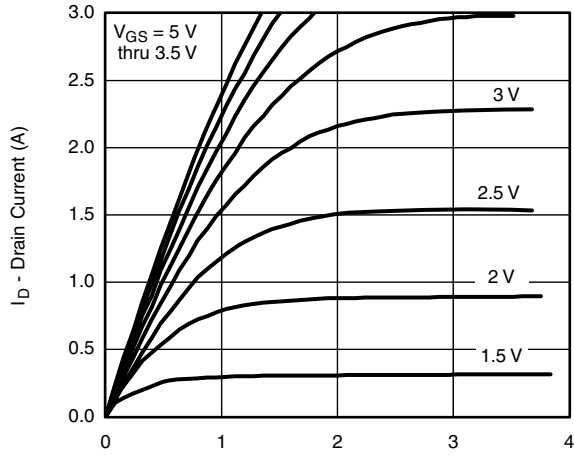


**Normalized Thermal Transient Impedance, Junction-to-Ambient**

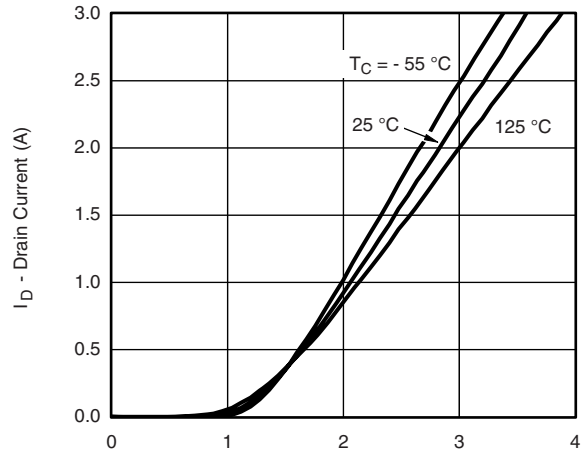


**Normalized Thermal Transient Impedance, Junction-to-Foot**

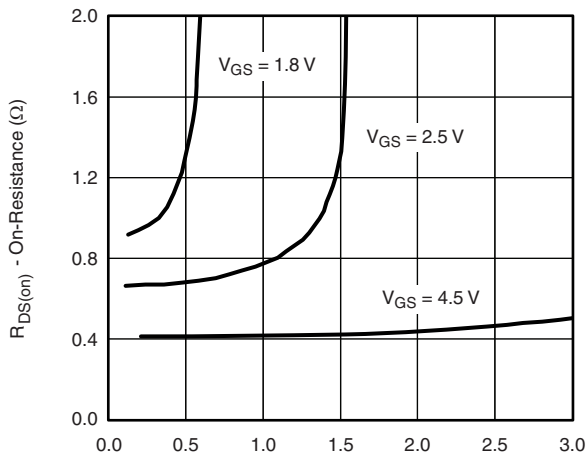
## P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



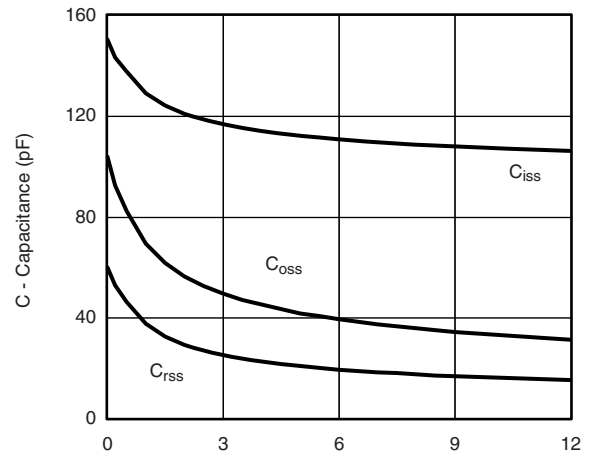
$V_{DS}$  - Drain-to-Source Voltage (V)  
**Output Characteristics**



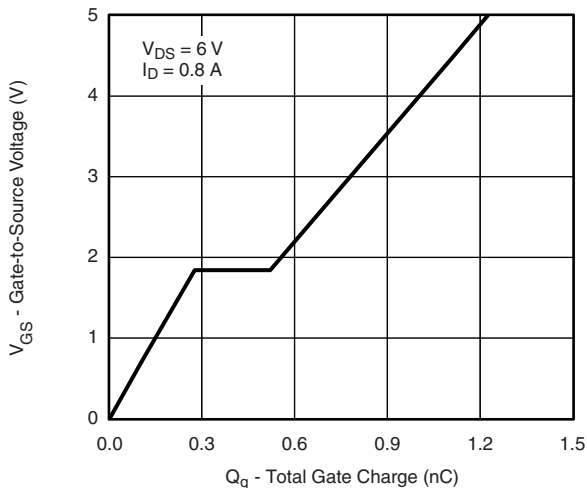
$V_{GS}$  - Gate-to-Source Voltage (V)  
**Transfer Characteristics**



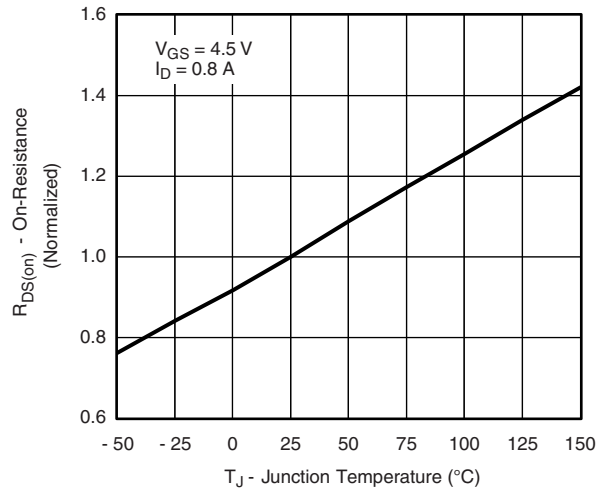
$I_D$  - Drain Current (A)  
**On-Resistance vs. Drain Current**



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

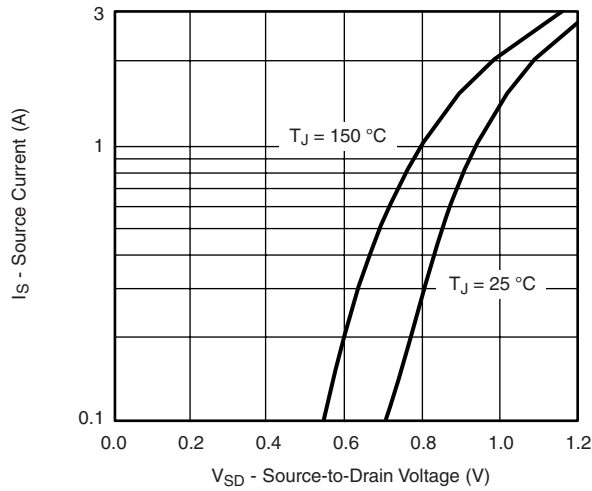


$Q_g$  - Total Gate Charge (nC)  
**Gate Charge**

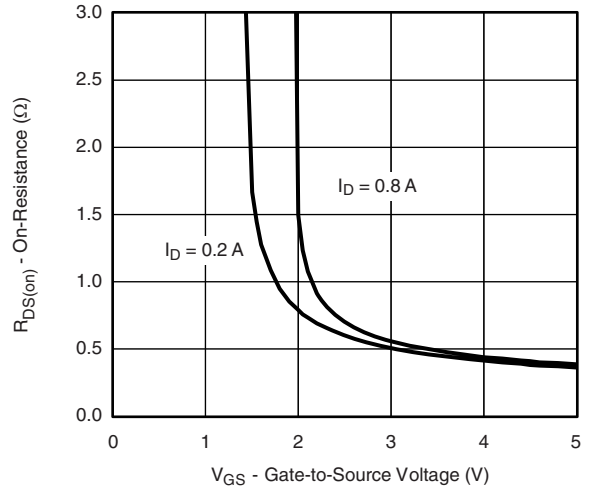


$T_J$  - Junction Temperature ( $^\circ\text{C}$ )  
**On-Resistance vs. Junction Temperature**

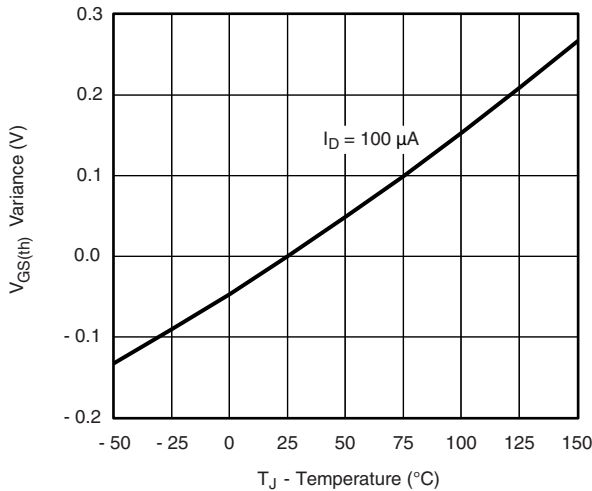
## P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



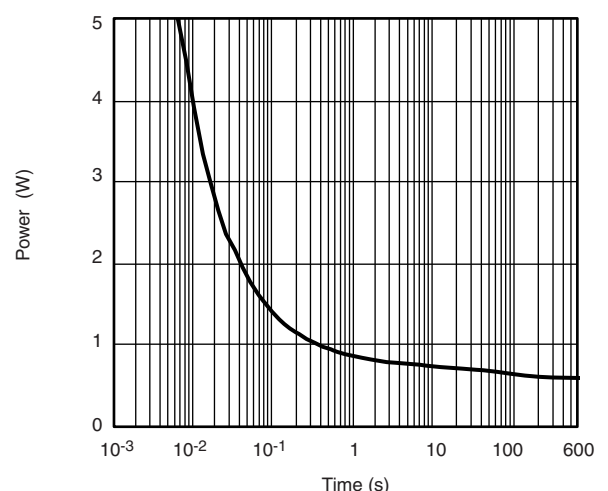
Source-Drain Diode Forward Voltage



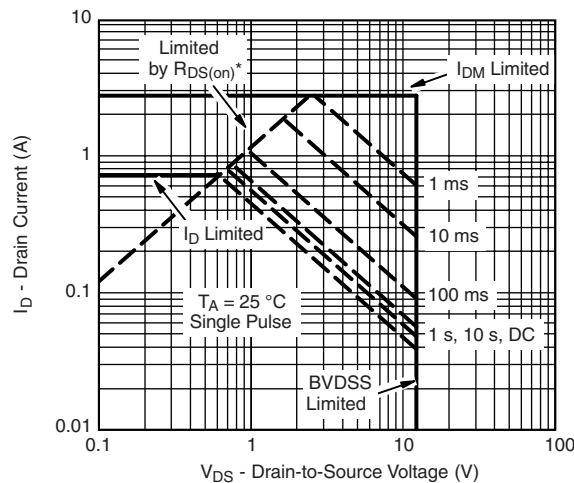
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



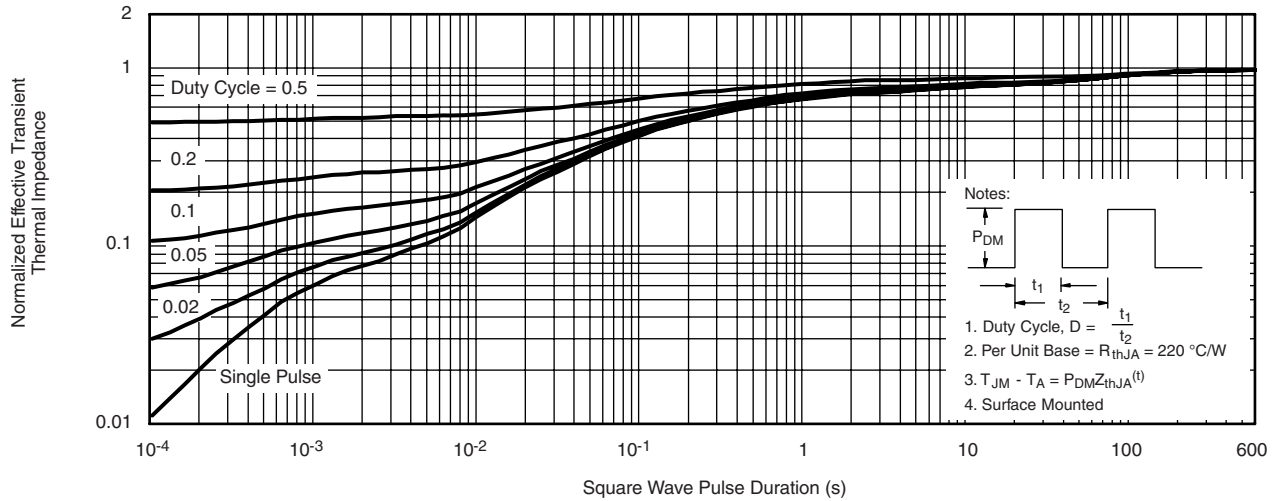
Single Pulse Power



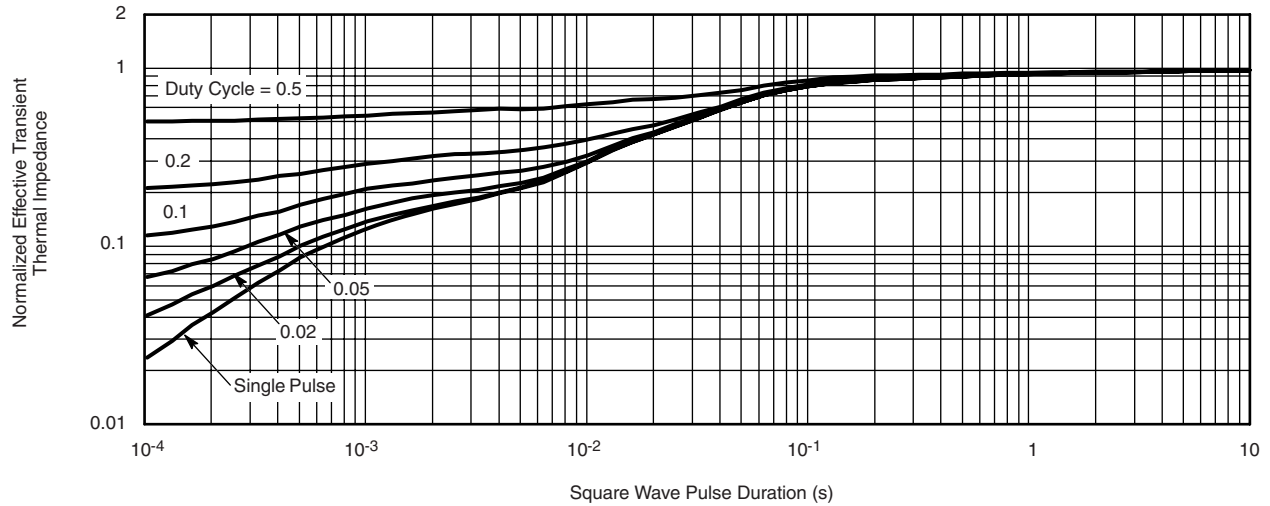
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area, Junction-to-Ambient

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



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



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

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