

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

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
- 20	0.115 at $V_{GS} = - 4.5$ V	- 2.9
	0.155 at $V_{GS} = - 2.5$ V	- 2.4
	0.220 at $V_{GS} = - 1.8$ V	- 2.0

### FEATURES

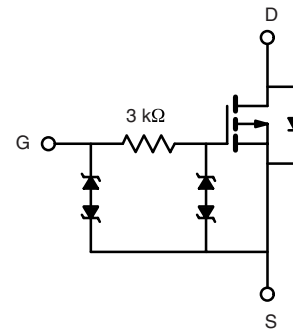
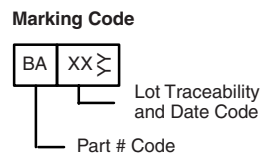
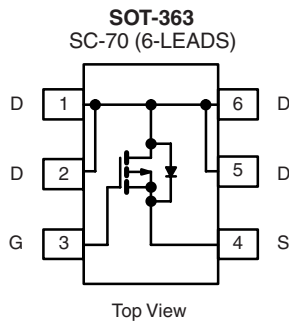
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET: 1.8 V Rated
- ESD Protected: 3000 V
- Thermally Enhanced SC-70 Package
- Compliant to RoHS Directive 2002/95/EC



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

### APPLICATIONS

- Load Switching
- PA Switch
- Level Switch



**Ordering Information:** Si1413EDH-T1-E3 (Lead (Pb)-free)  
Si1413EDH-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter	Symbol	5 s	Steady State	Unit
Drain-Source Voltage	$V_{DS}$	- 20		V
Gate-Source Voltage	$V_{GS}$	$\pm 12$		
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	- 2.9	- 2.3
		$T_A = 85$ °C	- 2.0	- 1.6
Pulsed Drain Current	$I_{DM}$	- 8		A
Continuous Diode Current (Diode Conduction) <sup>a</sup>	$I_S$	- 1.4	- 0.9	
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °C	1.56	1.0
		$T_A = 85$ °C	0.81	0.52
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150		°C

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	$t \leq 5$ s	60	80
		Steady State	100	125
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	34	45	°C/W

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	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -100\text{ }\mu\text{A}$	-0.45			V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			$\pm 1.5$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			$\pm 10$	$\text{mA}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			-5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -4.5\text{ V}$	-4			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -2.9\text{ A}$		0.095	0.115	$\Omega$
		$V_{GS} = -2.5\text{ V}, I_D = -2.4\text{ A}$		0.125	0.155	
		$V_{GS} = -1.8\text{ V}, I_D = -1.0\text{ A}$		0.180	0.220	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}, I_D = -2.9\text{ A}$		6		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -1.4\text{ A}, V_{GS} = 0\text{ V}$		-0.8	-1.1	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -2.9\text{ A}$		5.6	8	nC
Gate-Source Charge	$Q_{gs}$		1.2			
Gate-Drain Charge	$Q_{gd}$		1.2			
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$		0.75	1.1	$\mu\text{s}$
Rise Time	$t_r$		1.6	2.3		
Turn-Off Delay Time	$t_{d(off)}$		3.9	5.5		
Fall Time	$t_f$		3.9	5.5		

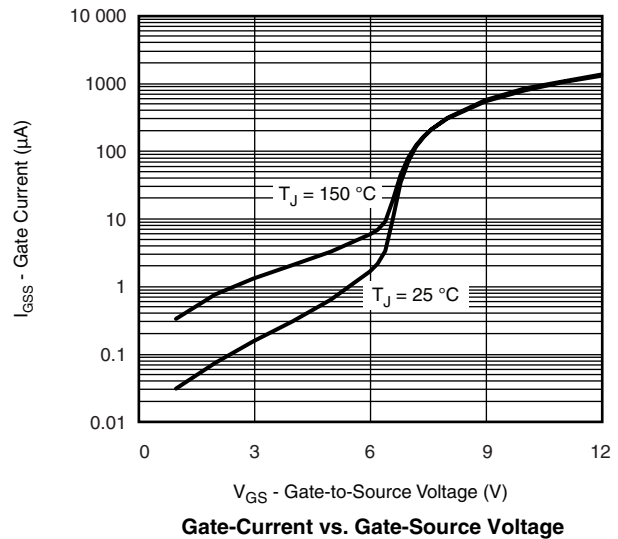
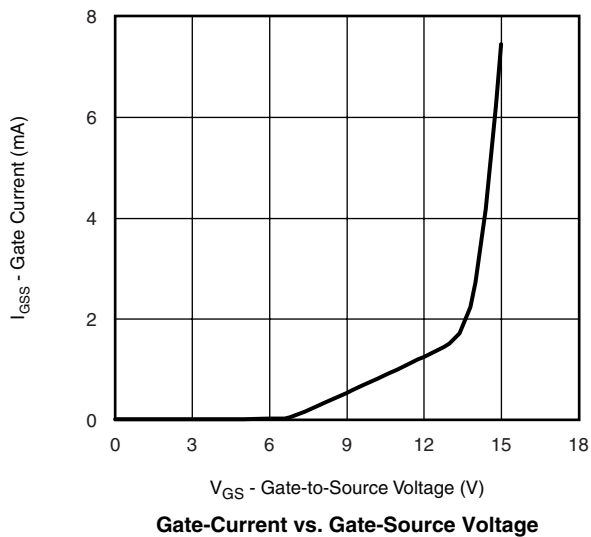
Notes:

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

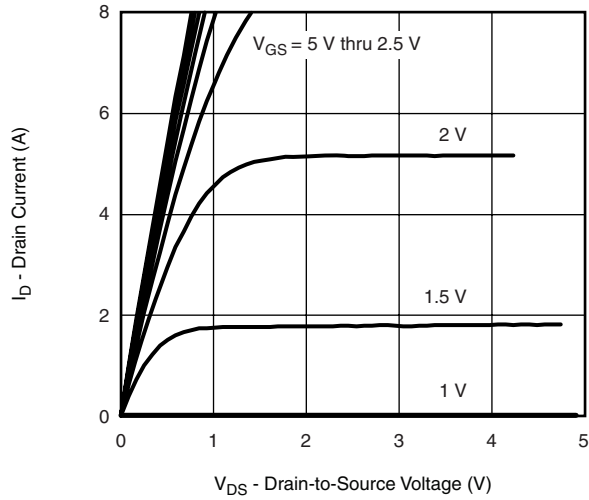
b. Guaranteed by design, not subject to production testing.

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.

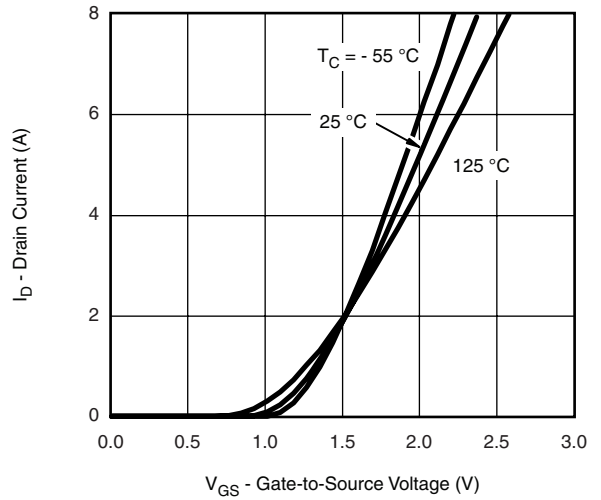
### TYPICAL CHARACTERISTICS $25\text{ }^\circ\text{C}$ , unless otherwise noted



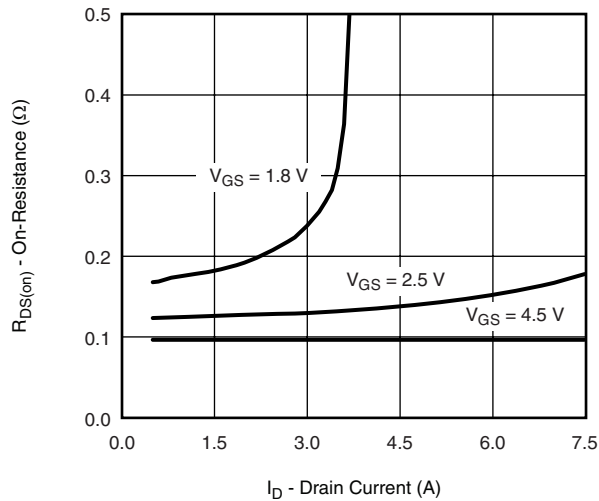
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



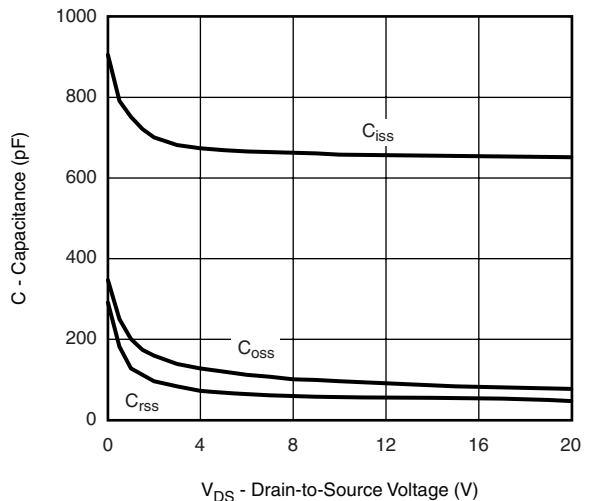
**Output Characteristics**



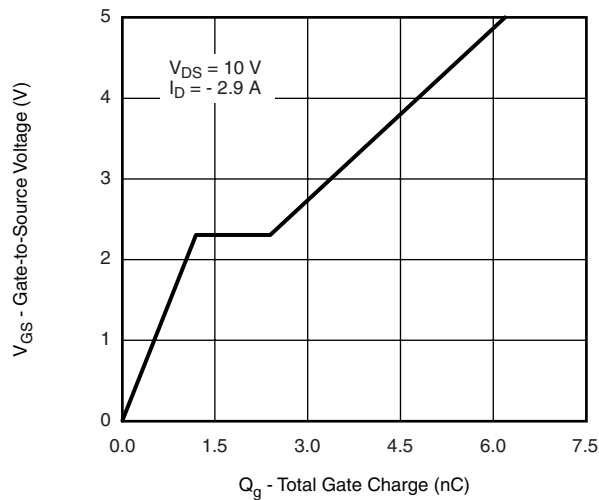
**Transfer Characteristics**



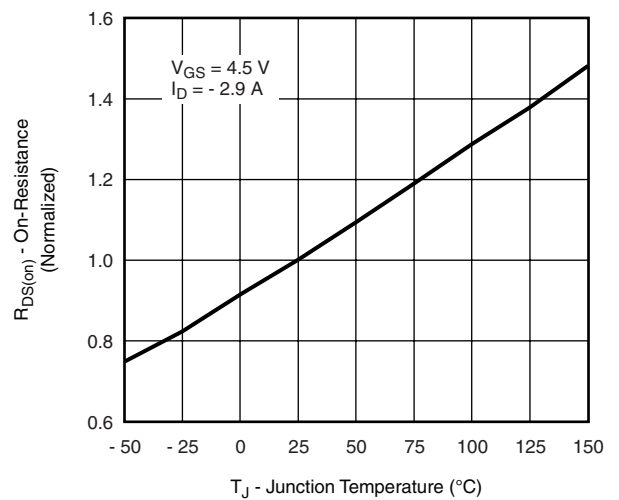
**On-Resistance vs. Drain Current**



**Capacitance**

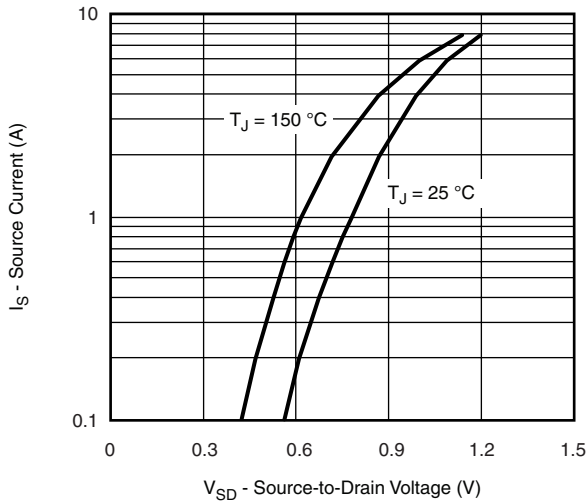


**Gate Charge**

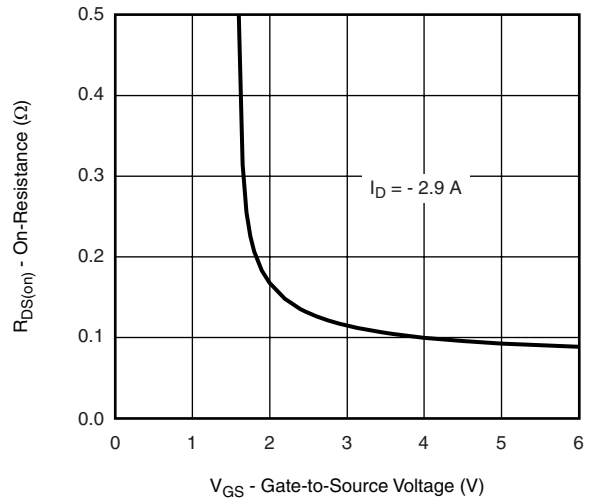


**On-Resistance vs. Junction Temperature**

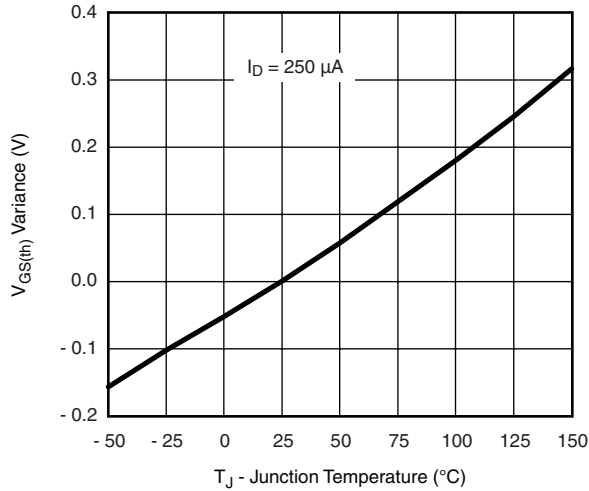
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



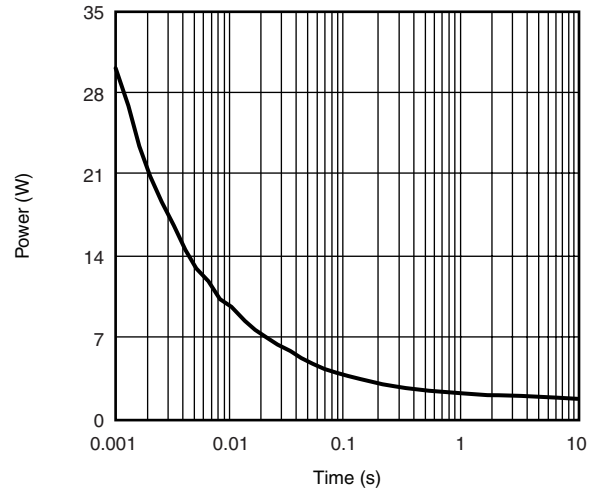
**Source-Drain Diode Forward Voltage**



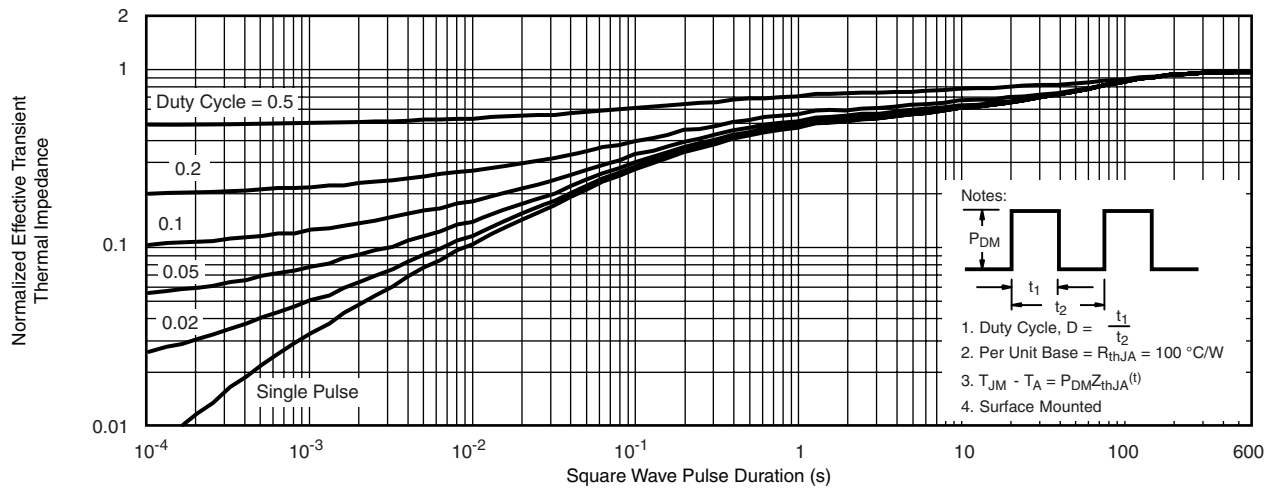
**On-Resistance vs. Gate-to-Source Voltage**



**Threshold Voltage**

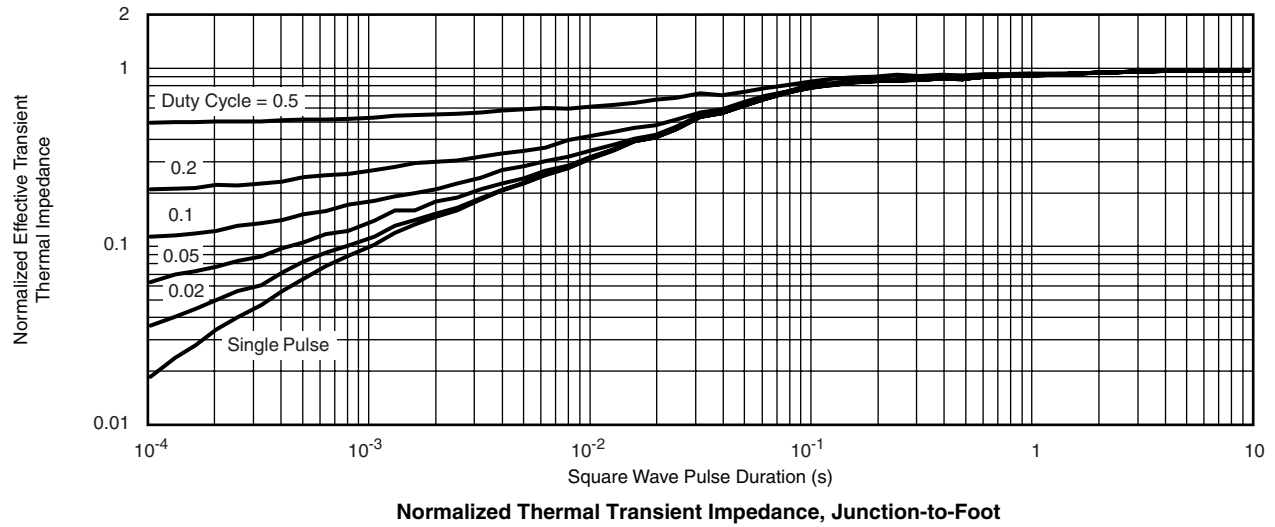


**Single Pulse Power, Junction-to-Ambient**



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

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



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