

## 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

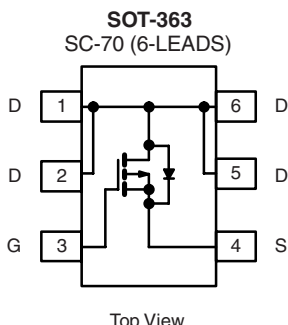
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFETs: 1.8 V Rated
- Thermally Enhanced SC-70 Package
- Compliant to RoHS Directive 2002/95/EC



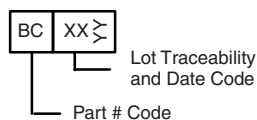
**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

- Load Switching
- PA Switch
- Level Switch



### Marking Code



Ordering Information: Si1413DH-T1-E3 (Lead (Pb)-free)  
Si1413DH-T1-GE3 (Lead (Pb)-free and Halogen-free)

### ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted

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

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	$R_{thJA}$	60	80	$^\circ\text{C/W}$
		100	125	
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	34	45	

Note:

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

**SPECIFICATIONS**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

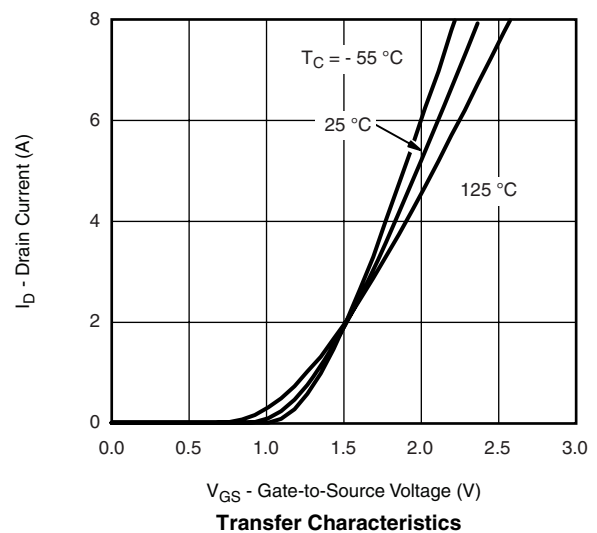
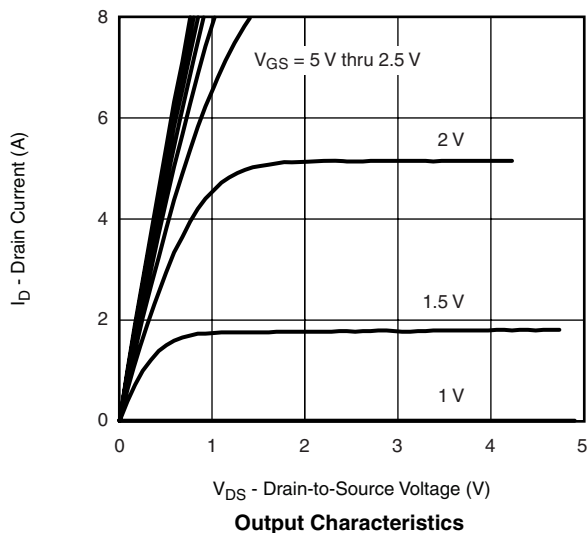
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -100\ \mu\text{A}$	-0.45		-0.8	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\ \text{V}, V_{GS} = \pm 8\ \text{V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -16\ \text{V}, V_{GS} = 0\ \text{V}$			-1	$\mu\text{A}$
		$V_{DS} = -16\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85^\circ\text{C}$			-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	$Q_g$	$V_{DS} = -10\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -2.9\ \text{A}$		6	8.5	nC
Gate-Source Charge	$Q_{gs}$			1.2		
Gate-Drain Charge	$Q_{gd}$			1.2		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\ \text{V}, R_L = 10\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -4.5\ \text{V}, R_g = 6\ \Omega$		13	20	ns
Rise Time	$t_r$			32	50	
Turn-Off Delay Time	$t_{d(off)}$			34	50	
Fall Time	$t_f$			42	65	

Notes:

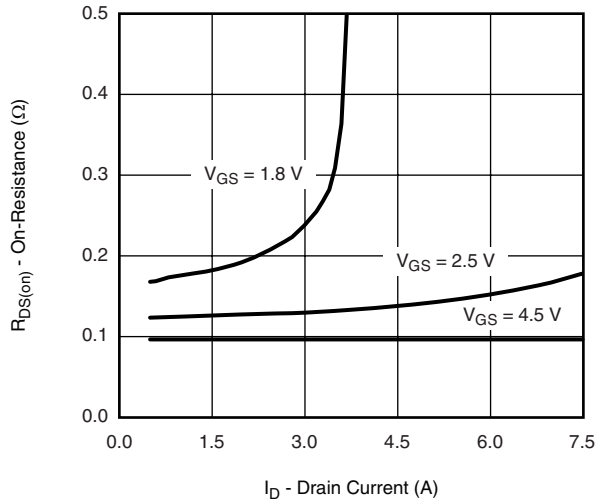
a. Pulse test; pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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

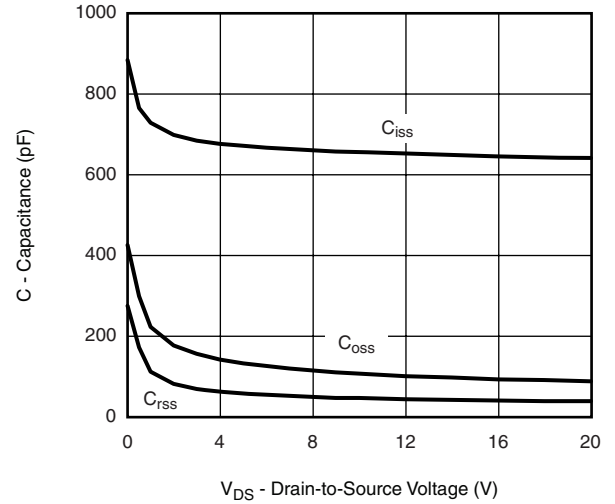
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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

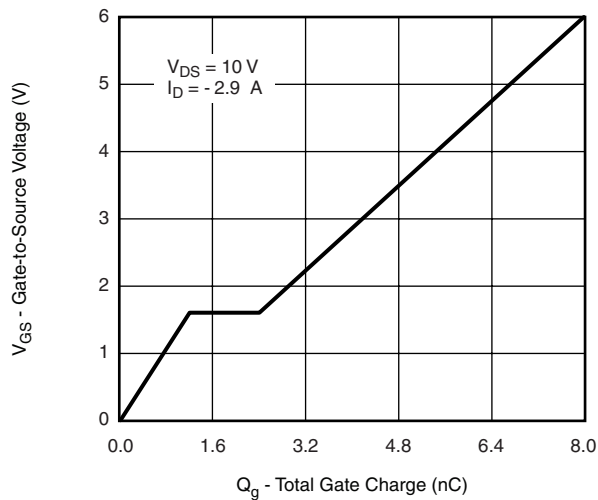
## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



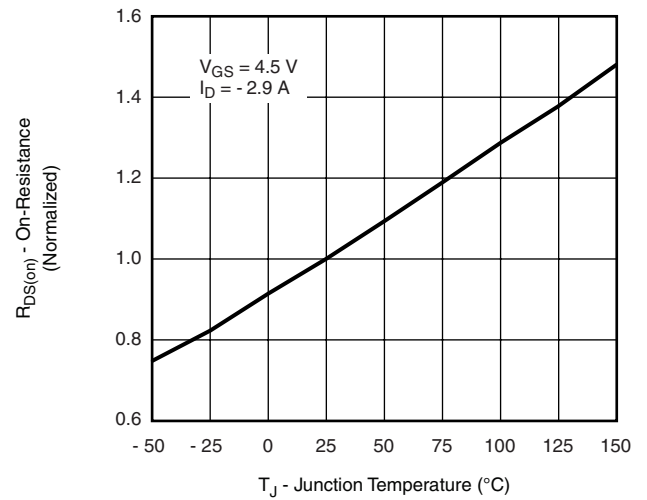
On-Resistance vs. Drain Current



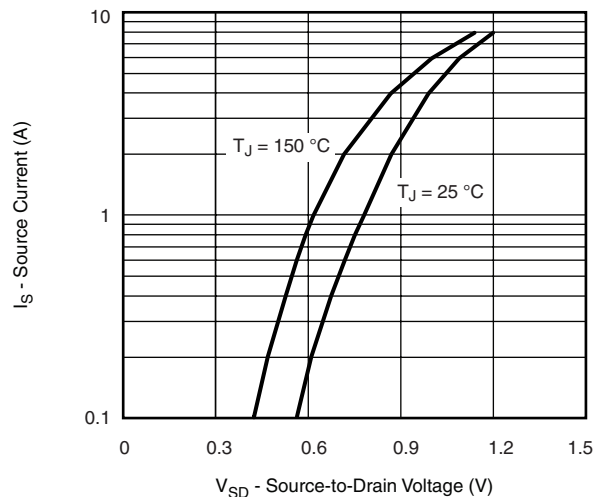
Capacitance



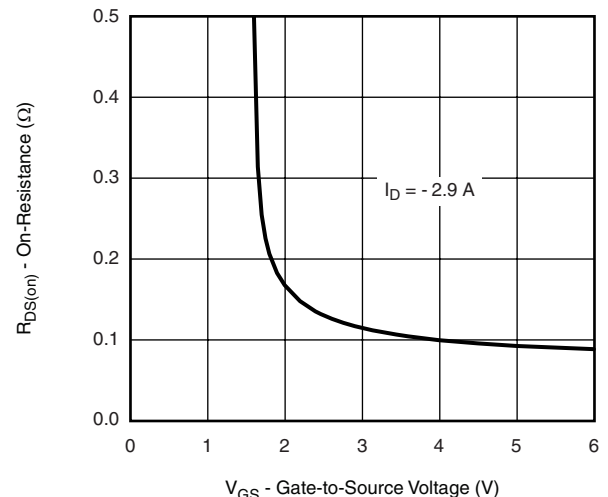
Gate Charge



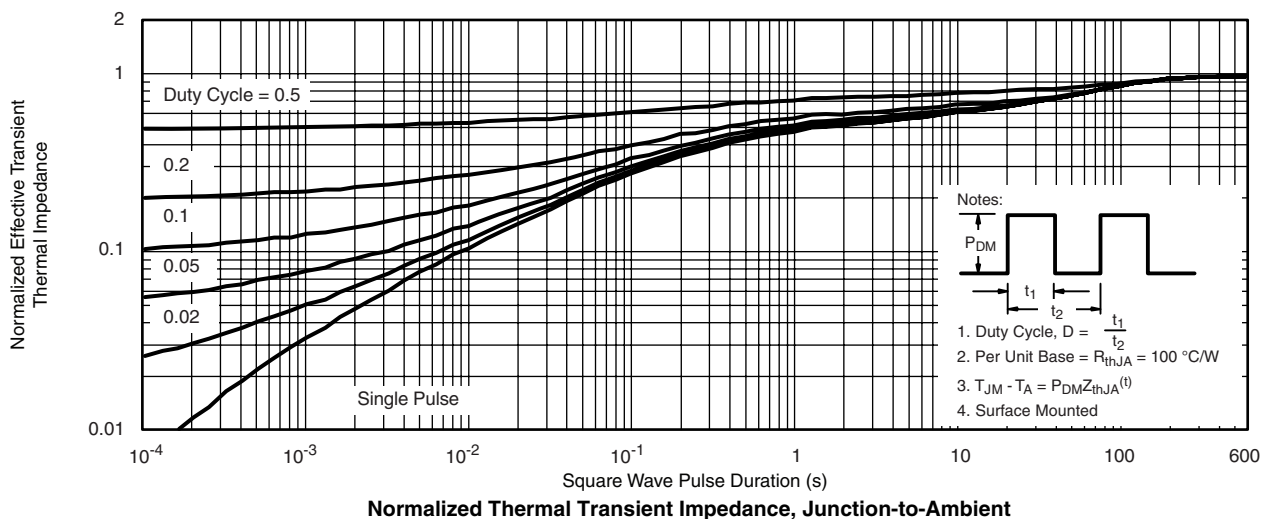
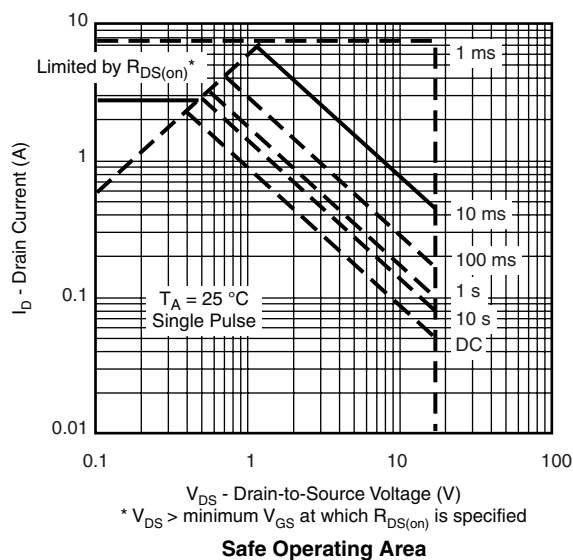
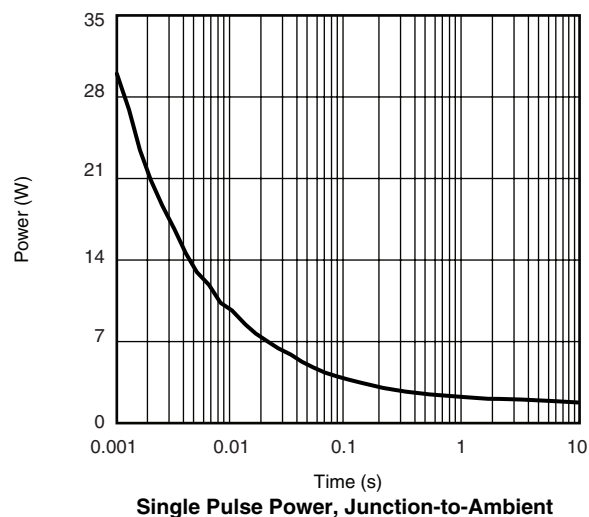
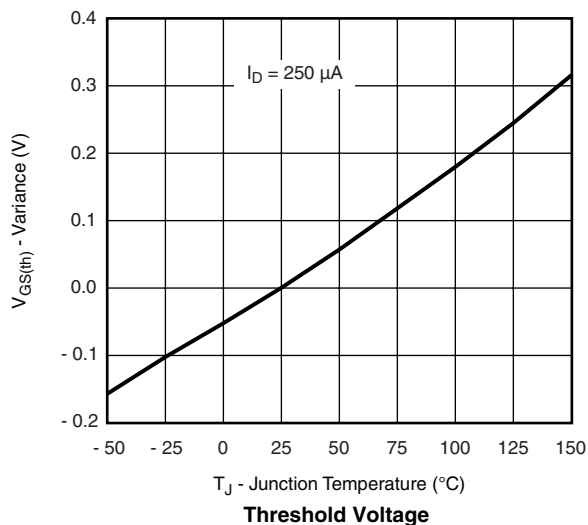
On-Resistance vs. Junction Temperature



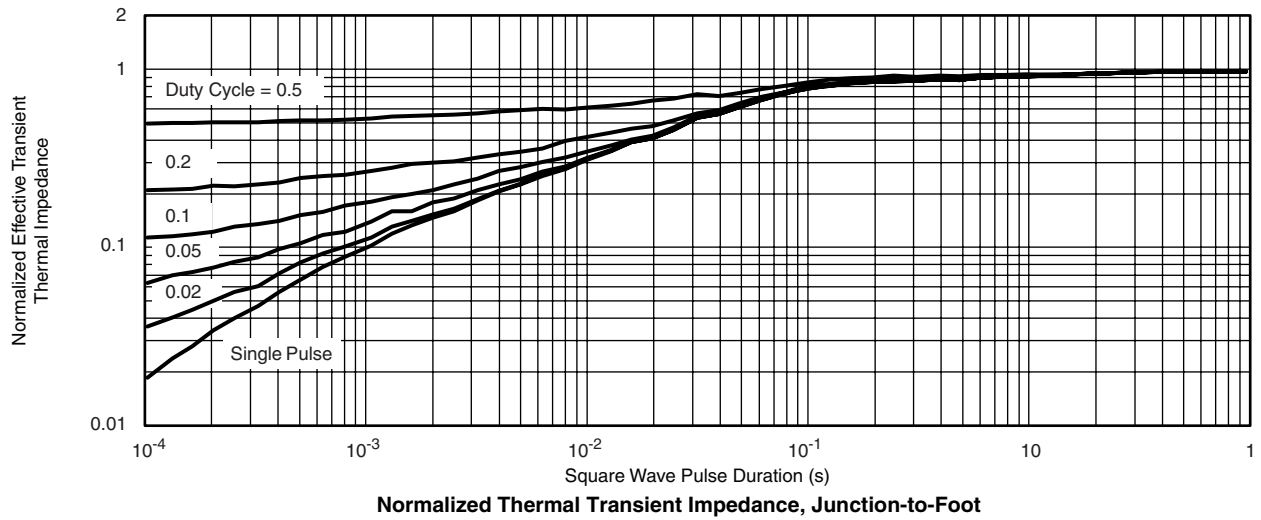
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

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