

N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
20	0.089 at V _{GS} = 4.5 V	1.32	5.2
	0.098 at V _{GS} = 2.5 V	1.26	
	0.121 at V _{GS} = 1.8 V	1.13	

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

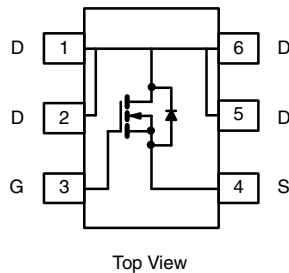


RoHS
COMPLIANT
HALOGEN
FREE

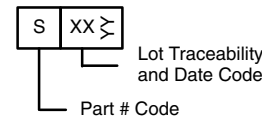
APPLICATIONS

- Load Switch for Portable Devices

SC-89 (6-LEADS)



Marking Code



Ordering Information: Si1056X-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	20	V
Gate-Source Voltage	V _{GS}	± 8	
Continuous Drain Current (T _J = 150 °C) ^a	I _D	T _A = 25 °C	1.32 ^{b, c}
		T _A = 70 °C	1.05 ^{b, c}
Pulsed Drain Current	I _{DM}	6	A
Avalanche Current	I _{AS}	8	
Repetitive Avalanche Energy	E _{AS}	3.2	
Continuous Source-Drain Diode Current	I _S	0.2 ^{b, c}	A
Maximum Power Dissipation ^a	P _D	T _A = 25 °C	0.236 ^{b, c}
		T _A = 70 °C	0.151 ^{b, c}
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 ^{b, d}	R _{thJA}	t ≤ 5 s	440	530	°C/W
		Steady State	540	650	

Notes:

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under steady state conditions is 650 °C/W.

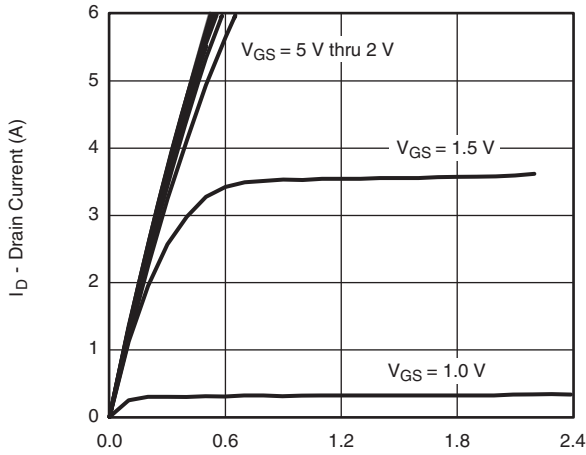
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		18.2		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-2.71		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.35		0.95	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	6			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 1.32\text{ A}$		0.074	0.089	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 1.26\text{ A}$		0.082	0.098	
		$V_{GS} = 1.8\text{ V}, I_D = 1.13\text{ A}$		0.093	0.121	
Forward Transconductance	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 1.32\text{ A}$		7.5		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		400		pF
Output Capacitance	C_{oss}			70		
Reverse Transfer Capacitance	C_{rss}			40		
Total Gate Charge	Q_g	$V_{DS} = 10\text{ V}, V_{GS} = 5\text{ V}, I_D = 1.32\text{ A}$		5.8	8.7	nC
				5.2	7.8	
Gate-Source Charge	Q_{gs}	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 1.32\text{ A}$		0.83		
Gate-Drain Charge	Q_{gd}			0.71		
Gate Resistance	R_g	$f = 1\text{ MHz}$		3.8	5.7	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 9.52\text{ }\Omega$ $I_D \cong 1.05\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		6.8	10.2	ns
Rise Time	t_r			19	28.5	
Turn-Off Delay Time	$t_{d(off)}$			18	27	
Fall Time	t_f			6	9	
Drain-Source Body Diode Characteristics						
Pulse Diode Forward Current ^a	I_{SM}				6	A
Body Diode Voltage	V_{SD}	$I_S = 1.0\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 1.0\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}$		10.0	15	nC
Body Diode Reverse Recovery Charge	Q_{rr}			3.5	5.3	ns
Reverse Recovery Fall Time	t_a			6.6		
Reverse Recovery Rise Time	t_b			3.4		

Notes:

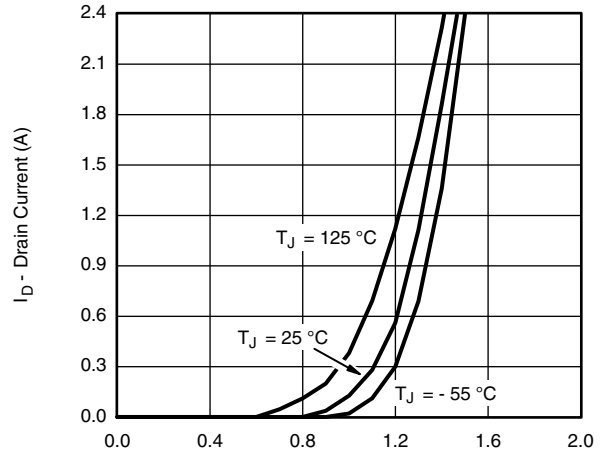
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

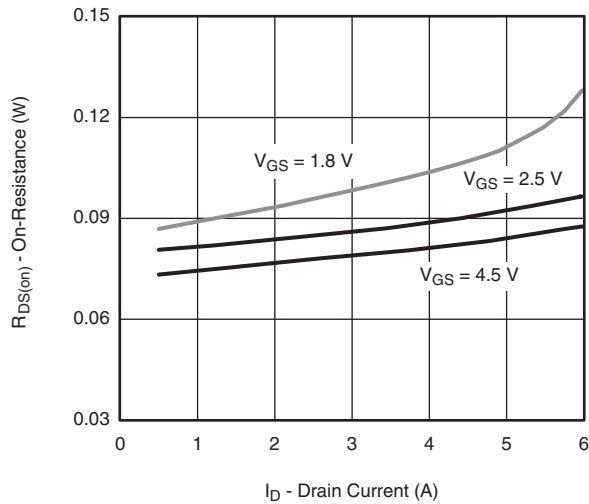
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



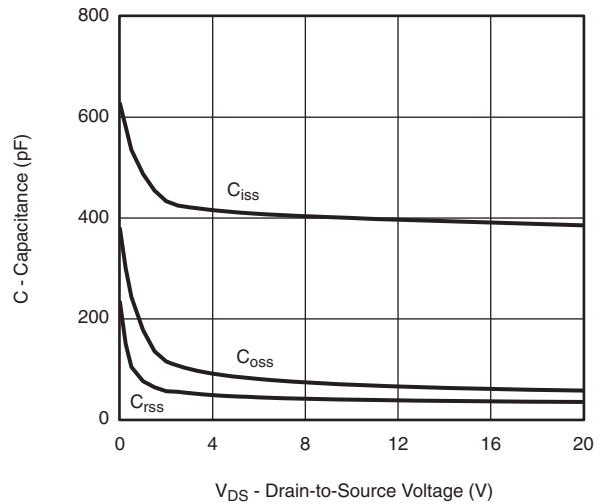
V_{DS} - Drain-to-Source Voltage (V)
Output Characteristics



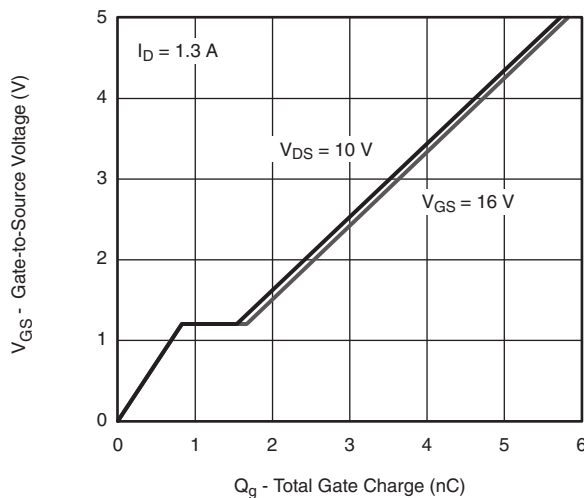
V_{GS} - Gate-to-Source Voltage (V)
Transfer Characteristics Curves vs. Temperature



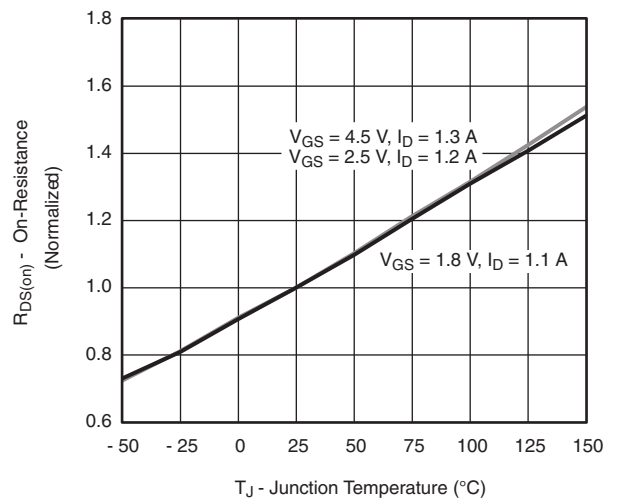
I_D - Drain Current (A)
On-Resistance vs. Drain Current



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

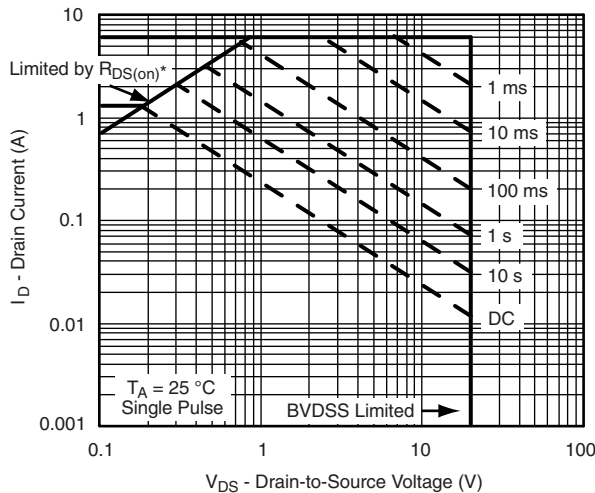
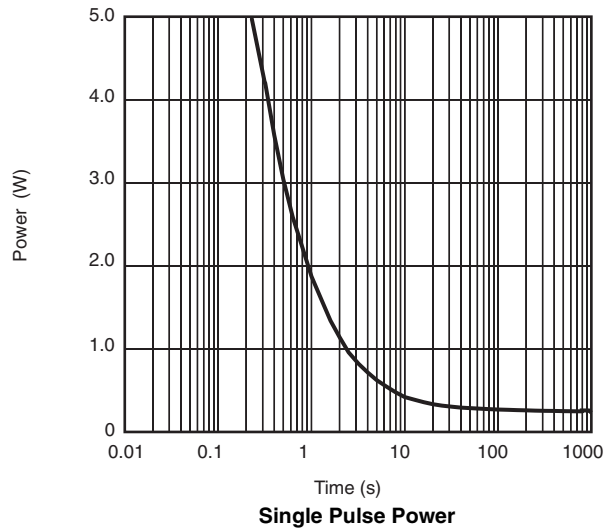
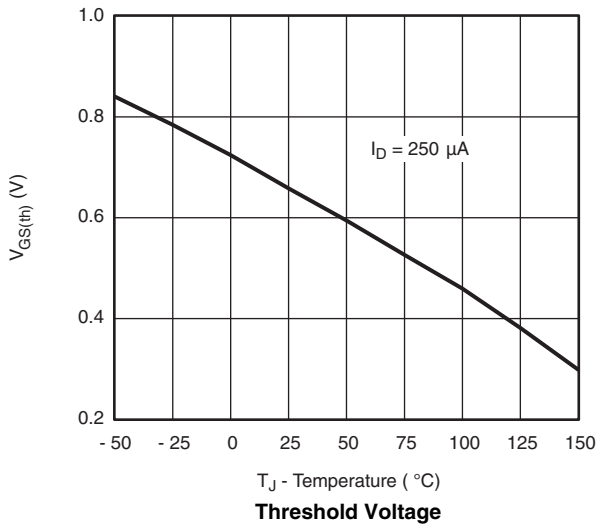
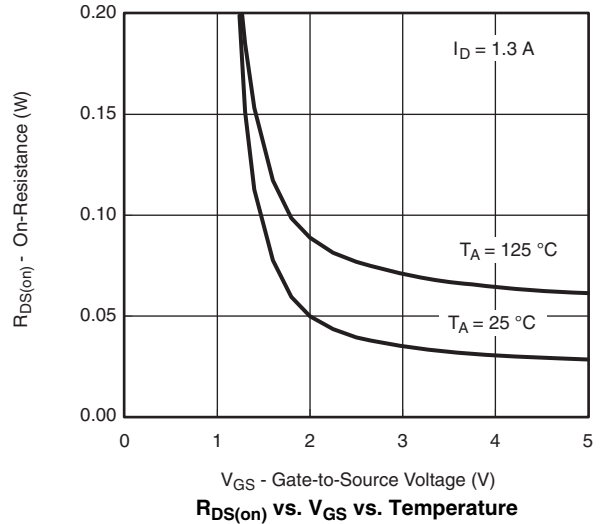
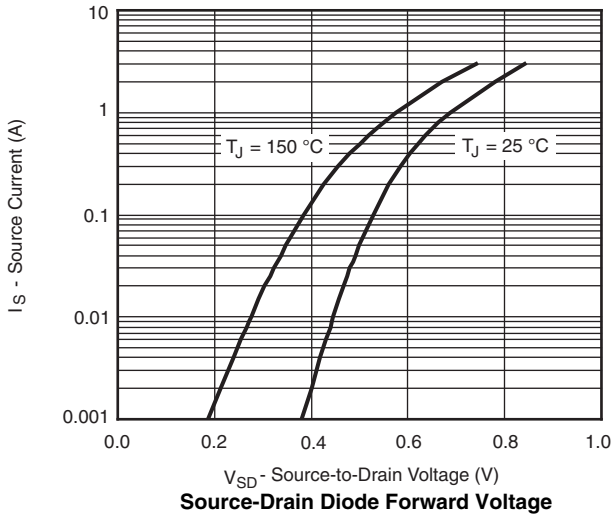


Q_g - Gate Charge



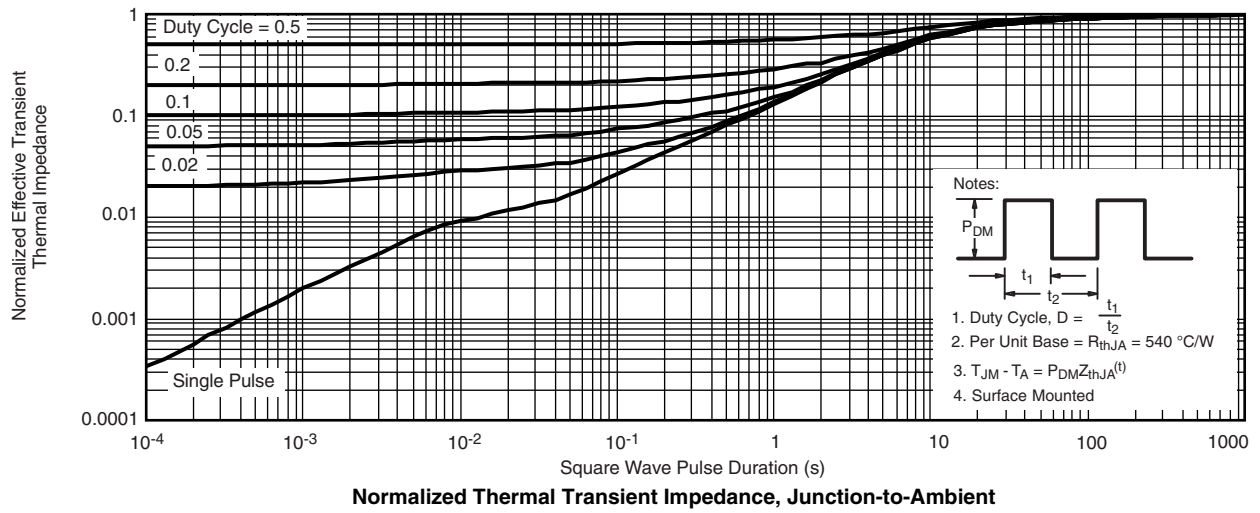
T_J - Junction Temperature ($^\circ\text{C}$)
On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



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

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



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