

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

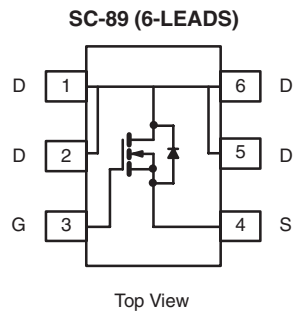
- Halogen-free Option Available
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested



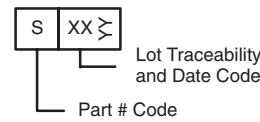
RoHS
COMPLIANT

APPLICATIONS

- Load Switch for Portable Devices



Marking Code



Ordering Information: Si1056X-T1-E3 (Lead (Pb)-free)
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}	A
		$T_A = 70$ °C	1.05 ^{b, c}	
Pulsed Drain Current	I_{DM}	6		
Avalanche Current	I_{AS}	8		
Repetitive Avalanche Energy	E_{AS}	3.2	mJ	
Continuous Source-Drain Diode Current				I_S
Maximum Power Dissipation ^a	P_D	$T_A = 25$ °C	0.236 ^{b, c}	W
		$T_A = 70$ °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}	$t \leq 5$ s	R_{thJA}	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.

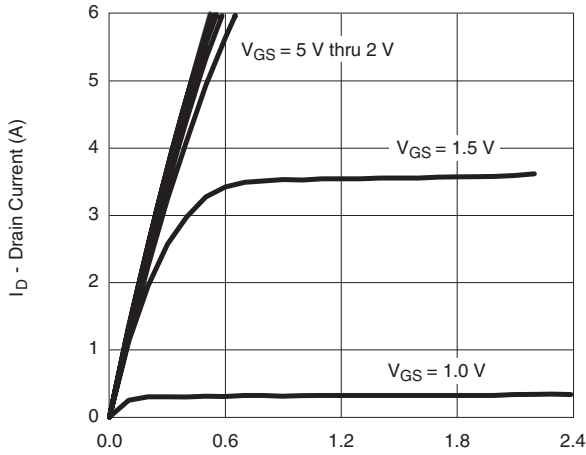
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		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	nA
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			10	μA
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:

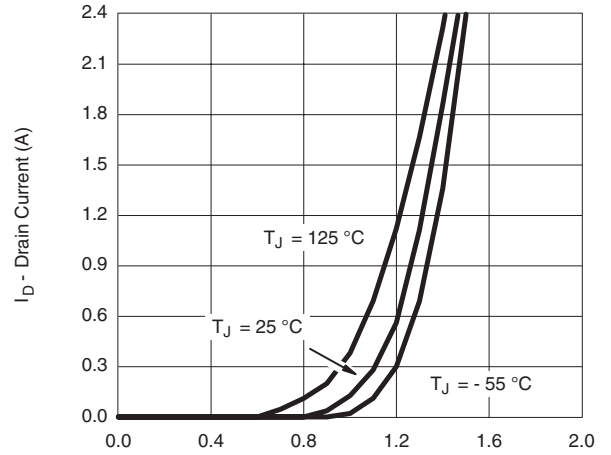
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

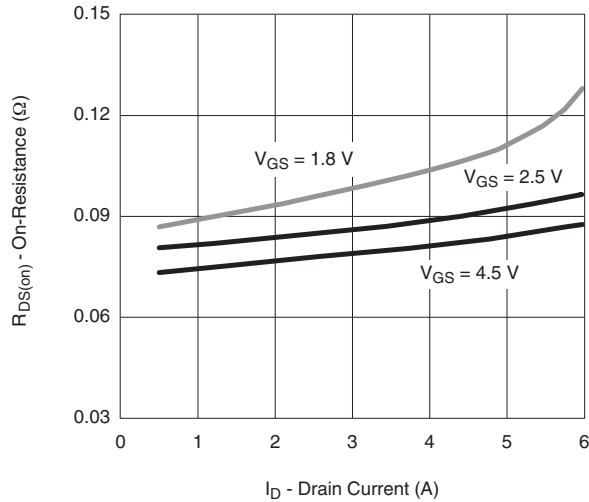
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



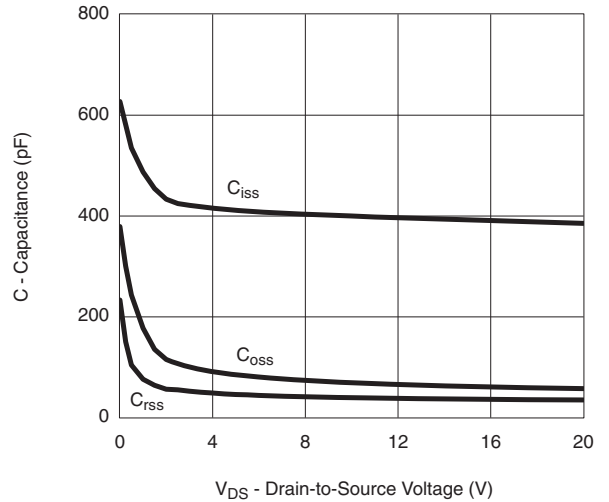
V_{DS} - Drain-to-Source Voltage (V)
Output Characteristics



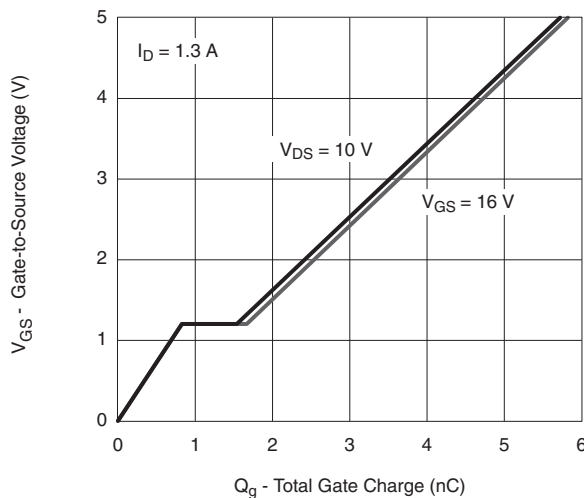
V_{GS} - Gate-to-Source Voltage (V)
Transfer Characteristics Curves vs. Temp



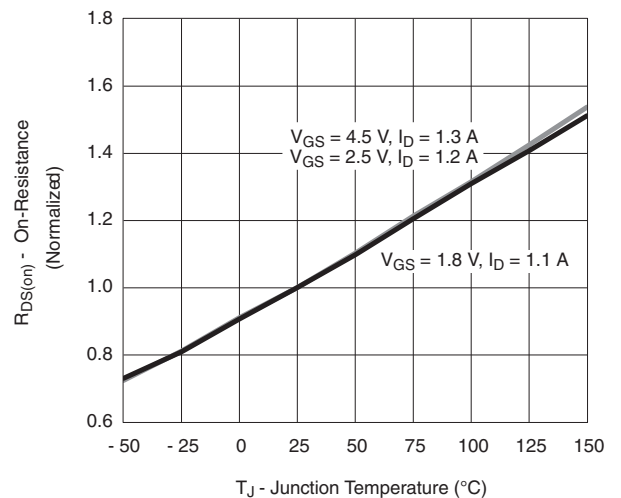
I_D - Drain Current (A)
On-Resistance vs. Drain Current



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

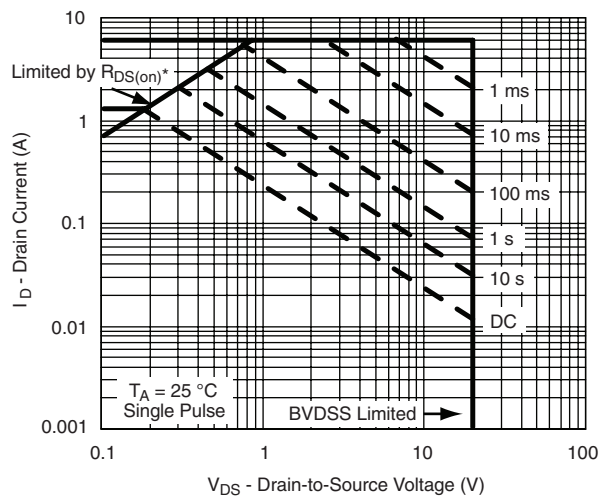
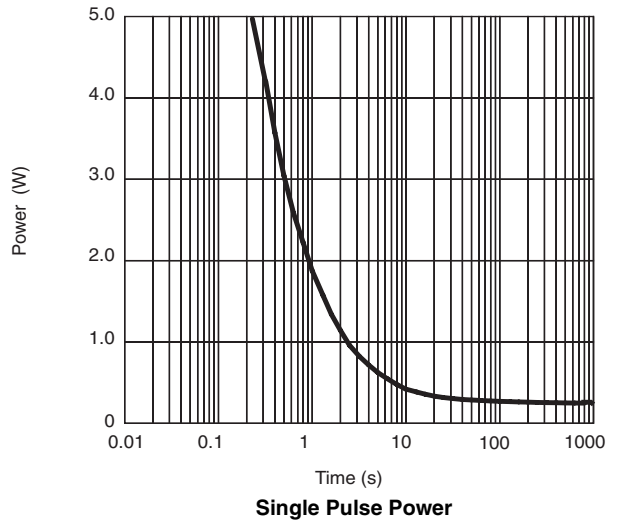
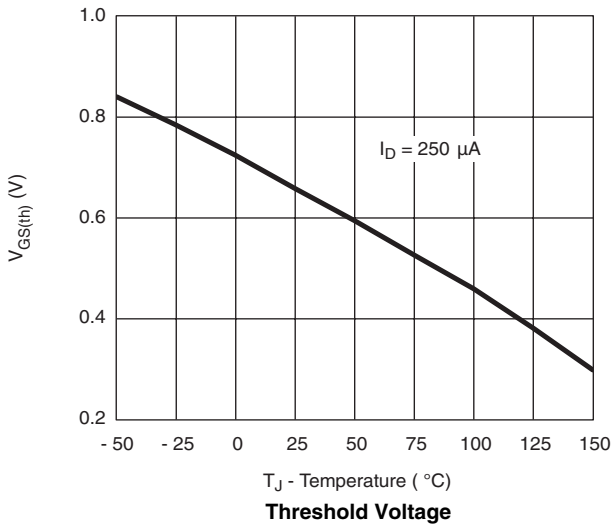
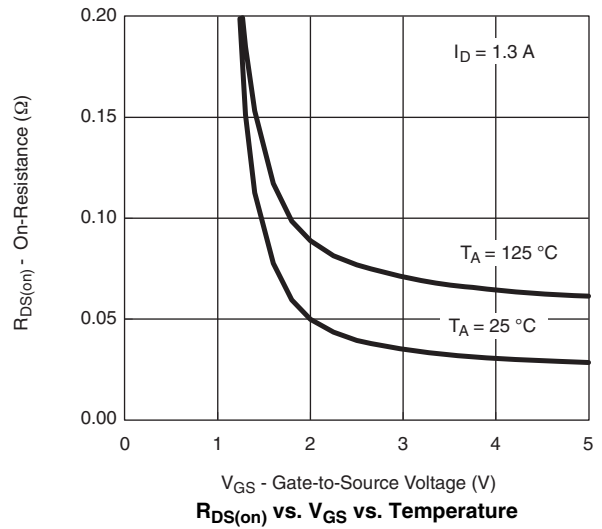
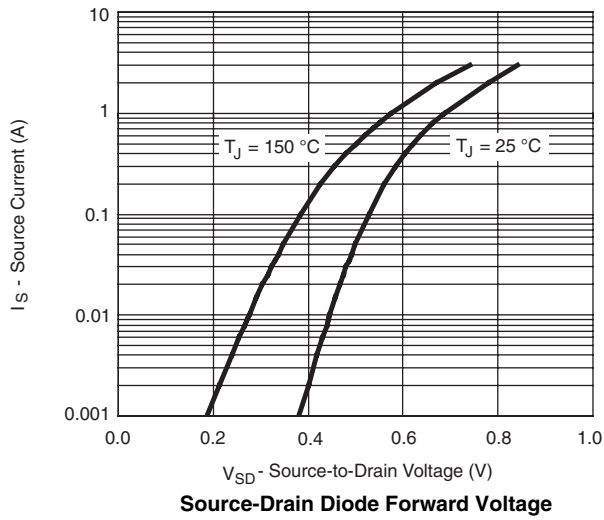


Q_g - Total Gate Charge (nC)
 Q_g - Gate Charge



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

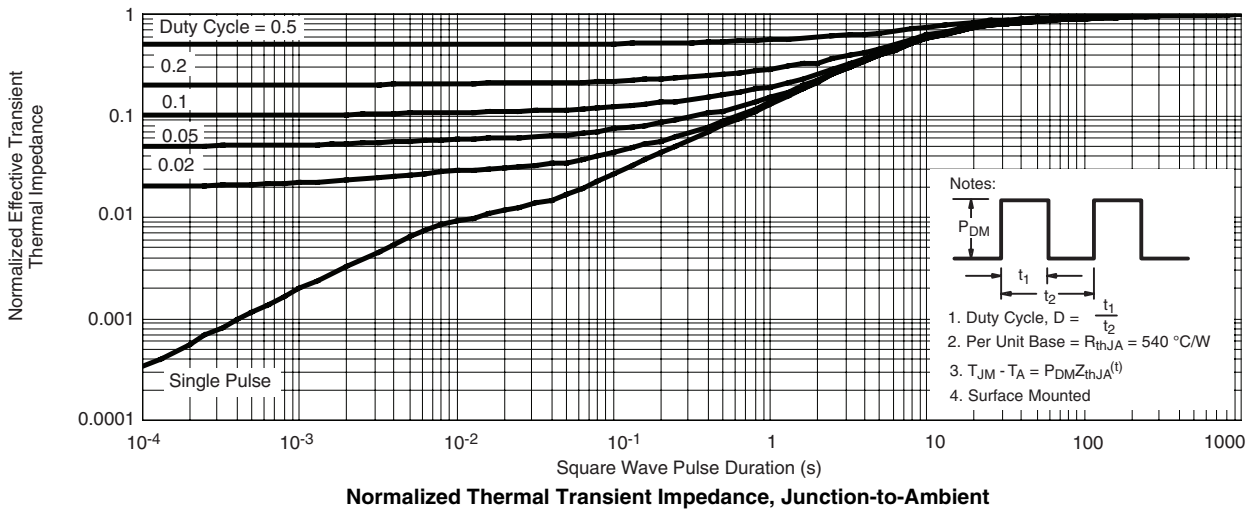
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* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

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



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