

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	

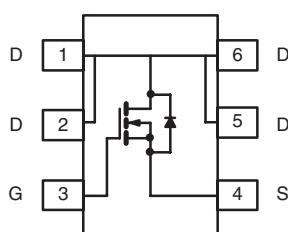
FEATURES

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

APPLICATIONS

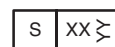
- Load Switch for Portable Devices


RoHS
COMPLIANT

SC-89 (6-LEADS)


Top View

Marking Code


Lot Traceability
and Date Code

Part # 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	1.32 ^{b, c}	A
		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	0.2 ^{b, c}	A
Maximum Power Dissipation ^a	P_D	0.236 ^{b, c}	W
		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}	440	530	°C/W
		540	650	

Notes:

a. Based on $T_C = 25$ °C.

b. Surface Mounted on 1" x 1" FR4 board.

c. $t = 5$ s.

d. Maximum under steady state conditions is 650 °C/W.

SPECIFICATIONS T _J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	20			V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA		18.2		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 2.71		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.35		0.95	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			1	nA
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 85 °C			10	μA
On-State Drain Current ^a	I _{D(on)}	V _{DS} = ≥ 5 V, V _{GS} = 4.5 V	6			A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 1.32 A		0.074	0.089	Ω
		V _{GS} = 2.5 V, I _D = 1.26 A		0.082	0.098	
		V _{GS} = 1.8 V, I _D = 1.13 A		0.093	0.121	
Forward Transconductance	g _{fs}	V _{DS} = 10 V, I _D = 1.32 A		7.5		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz		400		pF
Output Capacitance	C _{oss}			70		
Reverse Transfer Capacitance	C _{rss}			40		
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 5 V, I _D = 1.32 A		5.8	8.7	nC
		V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 1.32 A		5.2	7.8	
Gate-Source Charge	Q _{gs}			0.83		
Gate-Drain Charge	Q _{gd}			0.71		
Gate Resistance	R _g	f = 1 MHz		3.8	5.7	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 9.52 Ω I _D ≡ 1.05 A, V _{GEN} = 4.5 V, R _g = 1 Ω		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 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 1.0 A, di/dt = 100 A/μs		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		

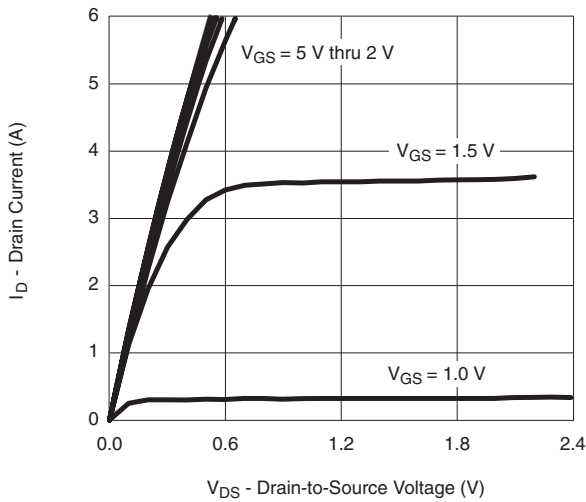
Notes:

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

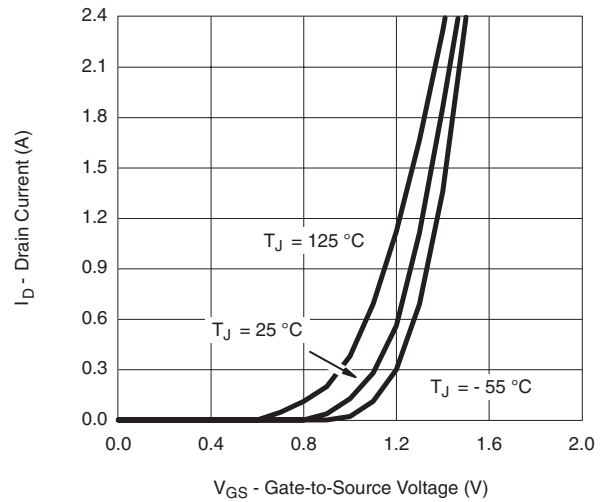
b. Guaranteed by design, not subject to production testing.

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.

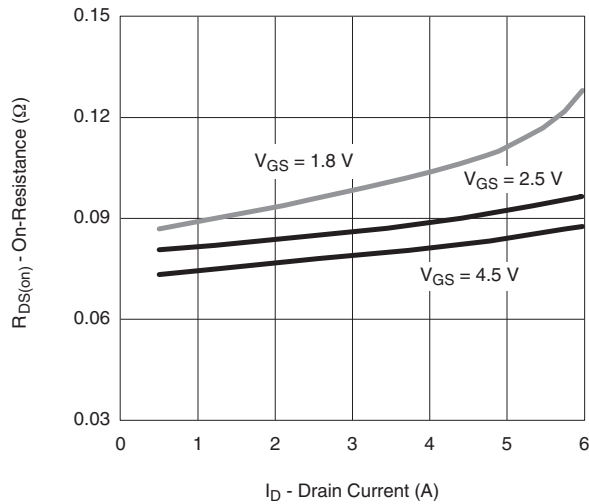
TYPICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, unless otherwise noted



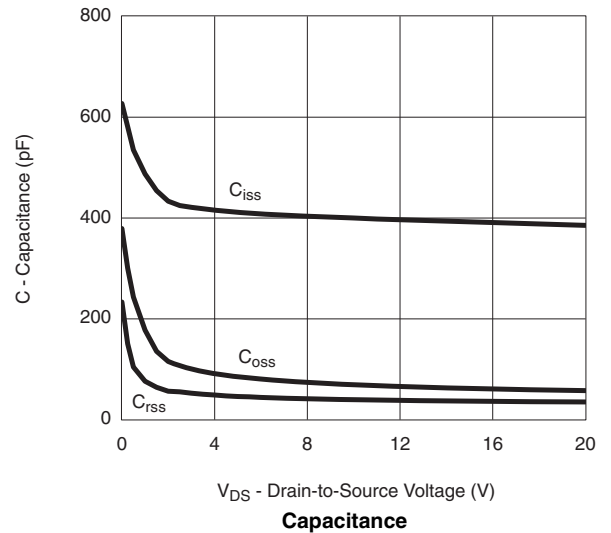
Output Characteristics



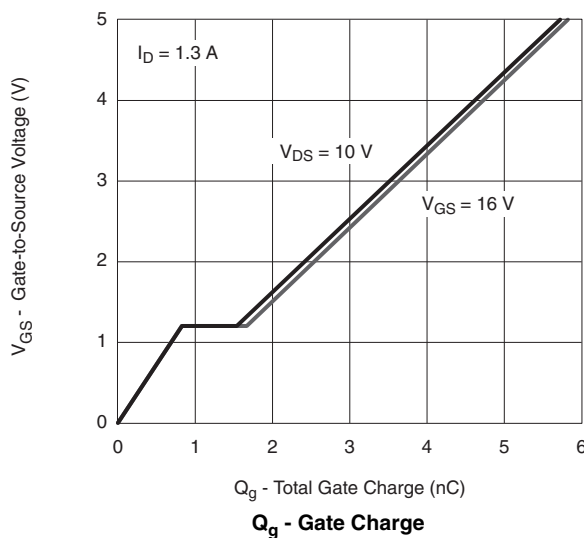
Transfer Characteristics Curves vs. Temp



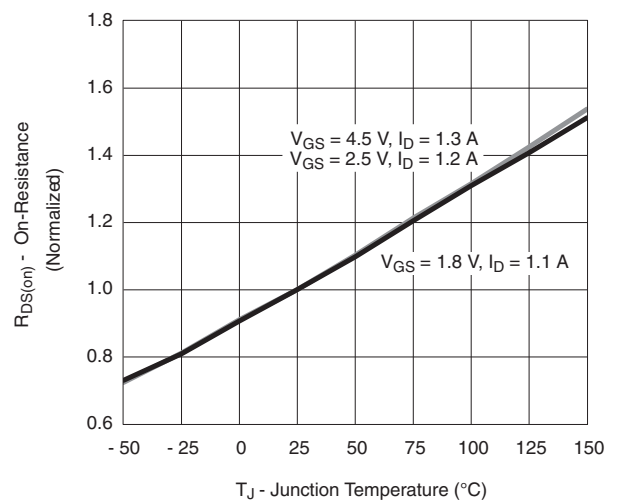
On-Resistance vs. Drain Current



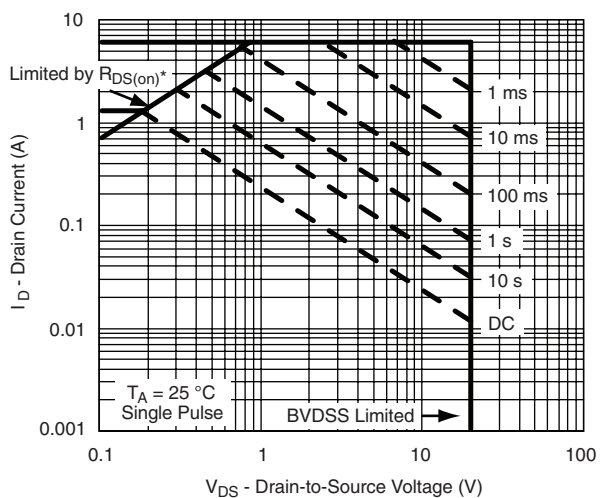
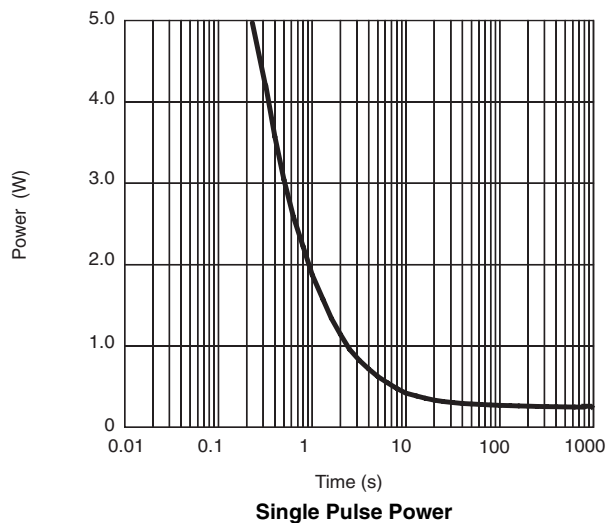
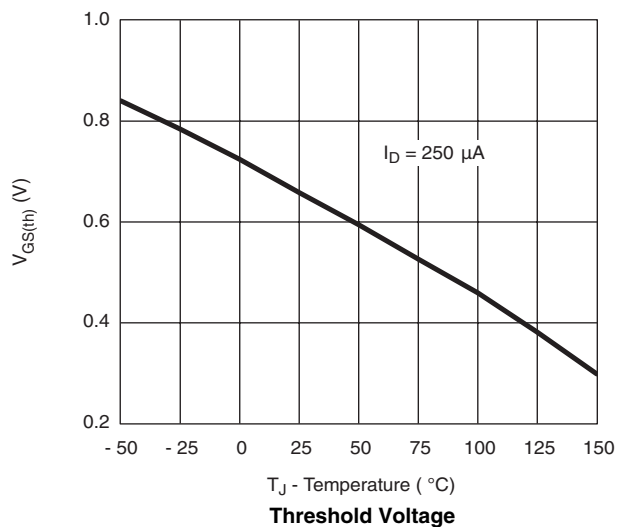
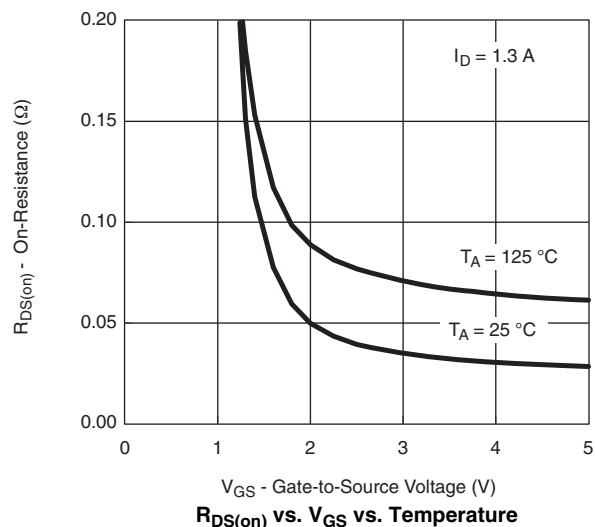
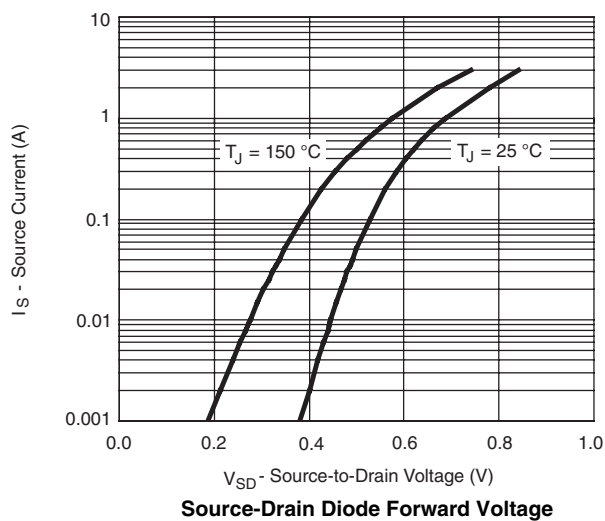
Capacitance



Q_g - Gate Charge



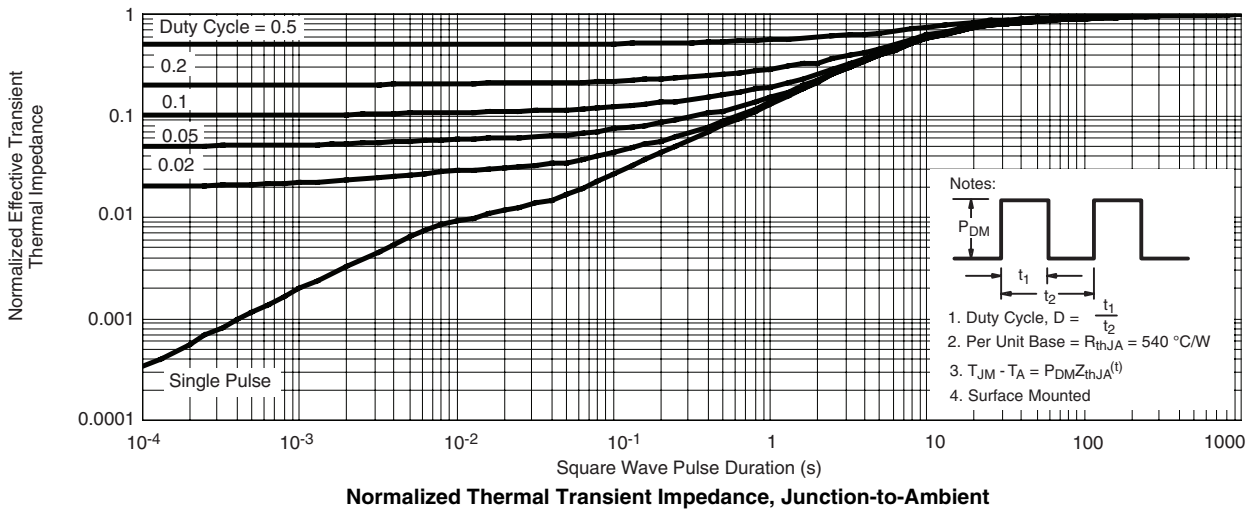
On-Resistance vs. Junction Temperature

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


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

Safe Operating Area, Junction-to-Ambient

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



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