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
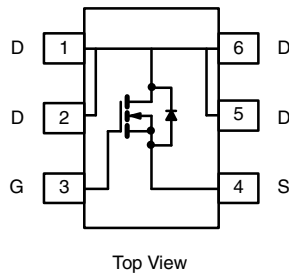- Compliant to RoHS Directive 2002/95/EC
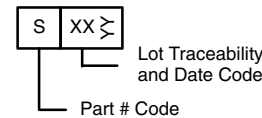
RoHS COMPLIANT

HALOGEN **FREE**

APPLICATIONS

- Load Switch for Portable Devices

SC-89 (6-LEADS)

Top View

Marking Code

Lot Traceability and Date Code

Part # 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]	T_A = 25 °C	I_D	1.32[b, c]	A
	T_A = 70 °C		1.05[b, c]	
Pulsed Drain Current		I_{DM}	6	
Avalanche Current	L = 0.1 mH	I_{AS}	8	
Repetitive Avalanche Energy		E_{AS}	3.2	mJ
Continuous Source-Drain Diode Current	T_A = 25 °C	I_S	0.2[b, c]	A
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	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 ≤ 5 s	R_{thJA}	440	530	°C/W
	Steady State		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	$\Delta V_{DS}/T_J$	I_D = 250 µA		18.2		mV/°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 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	µA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 85 °C			10	
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, dl/dt = 100 A/µs		10.0	15	nC
Body Diode Reverse Recovery Charge	Q_{rr}			3.5	5.3	
Reverse Recovery Fall Time	t_a			6.6		ns
Reverse Recovery Rise Time	t_b			3.4		

Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 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.
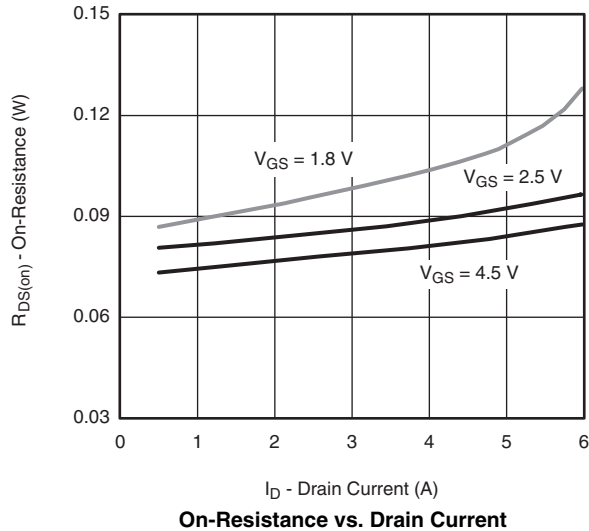
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)
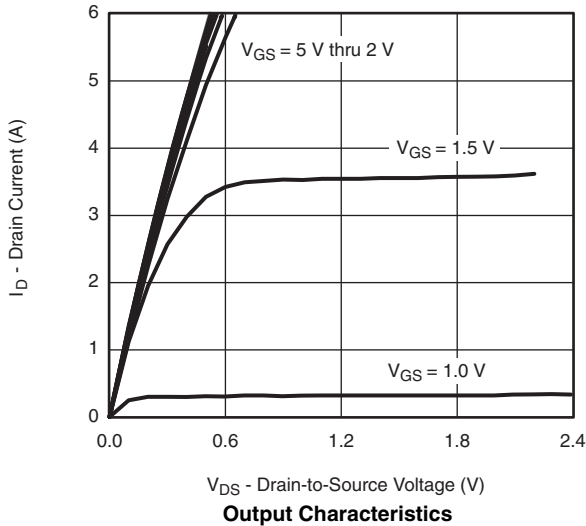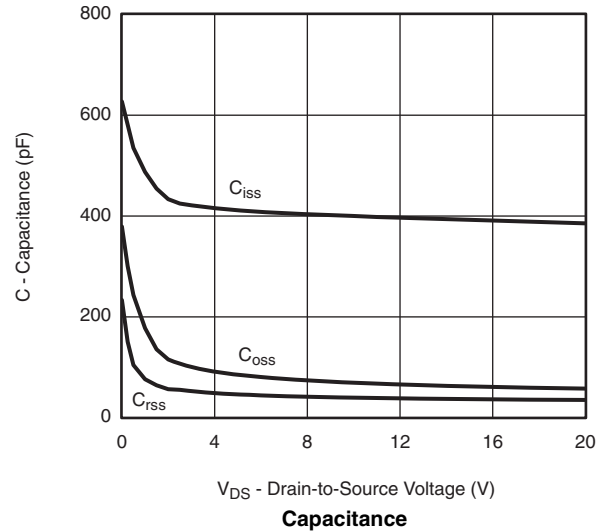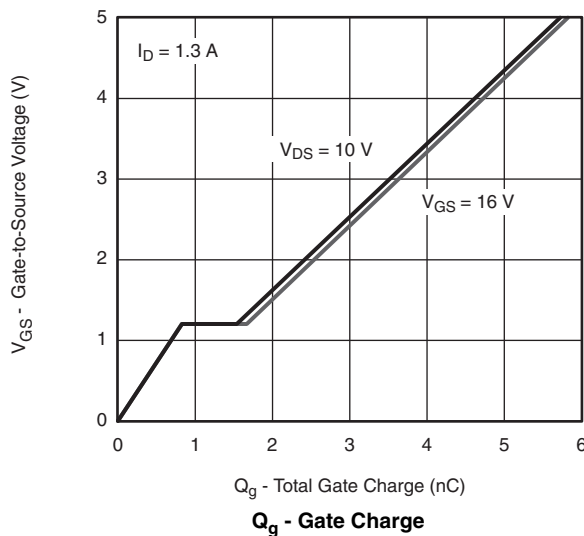
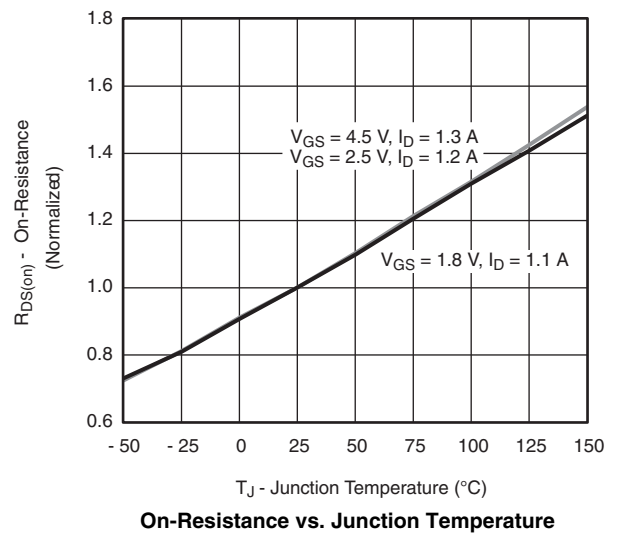**Output Characteristics**
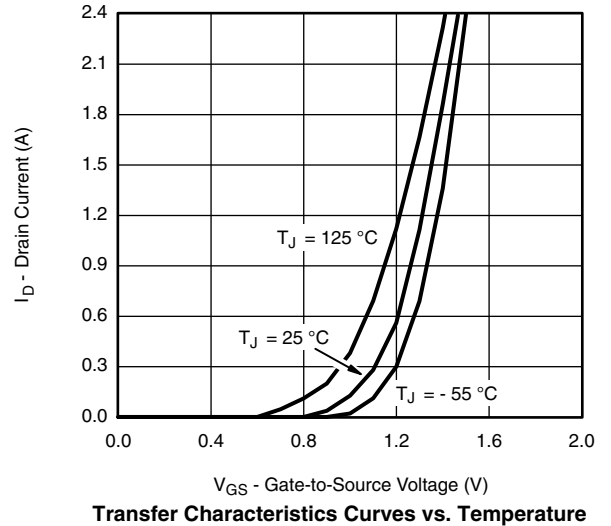
Transfer Characteristics Curves vs. Temperature
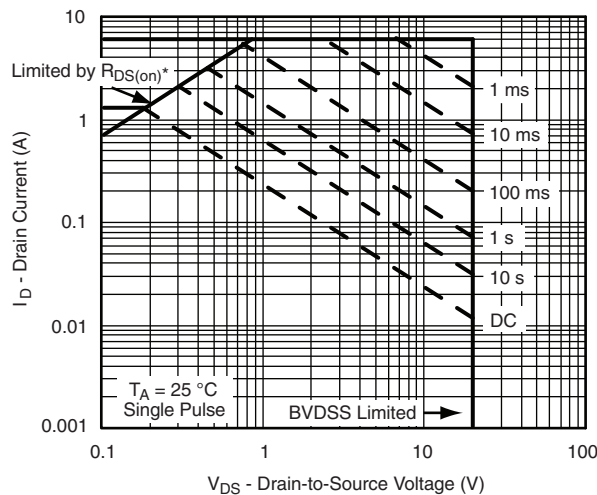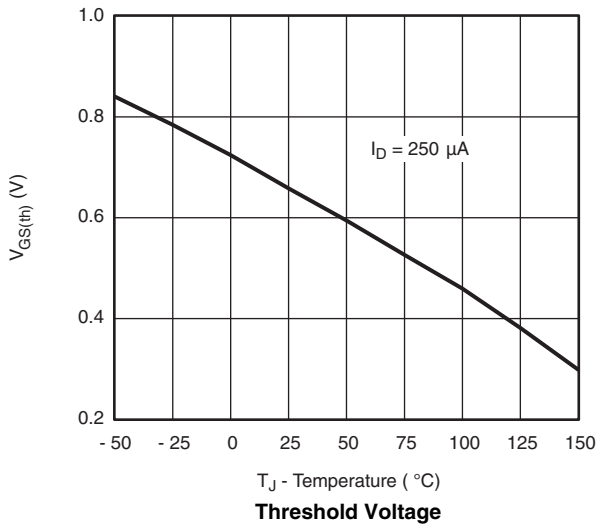
On-Resistance vs. Drain Current

Capacitance

Q_g - Gate Charge

On-Resistance vs. Junction Temperature

Si1056X

Vishay Siliconix

TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)

Source-Drain Diode Forward Voltage

$R_{DS(on)}$ vs. V_{GS} vs. Temperature

Threshold Voltage

Single Pulse Power
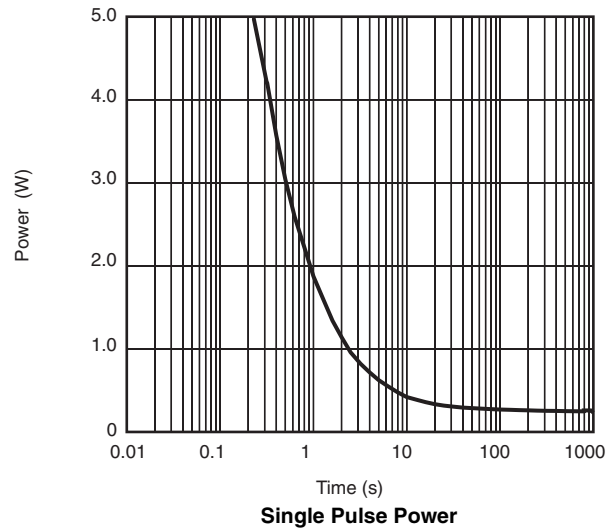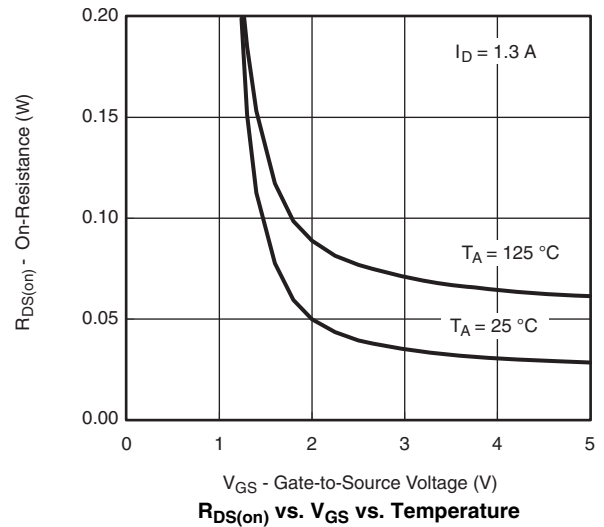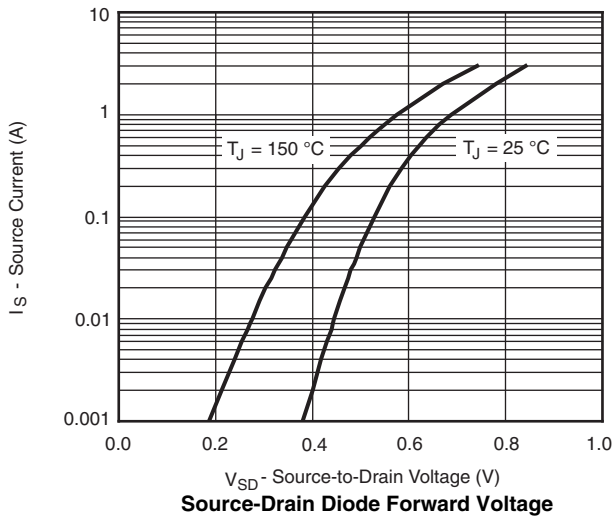
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified
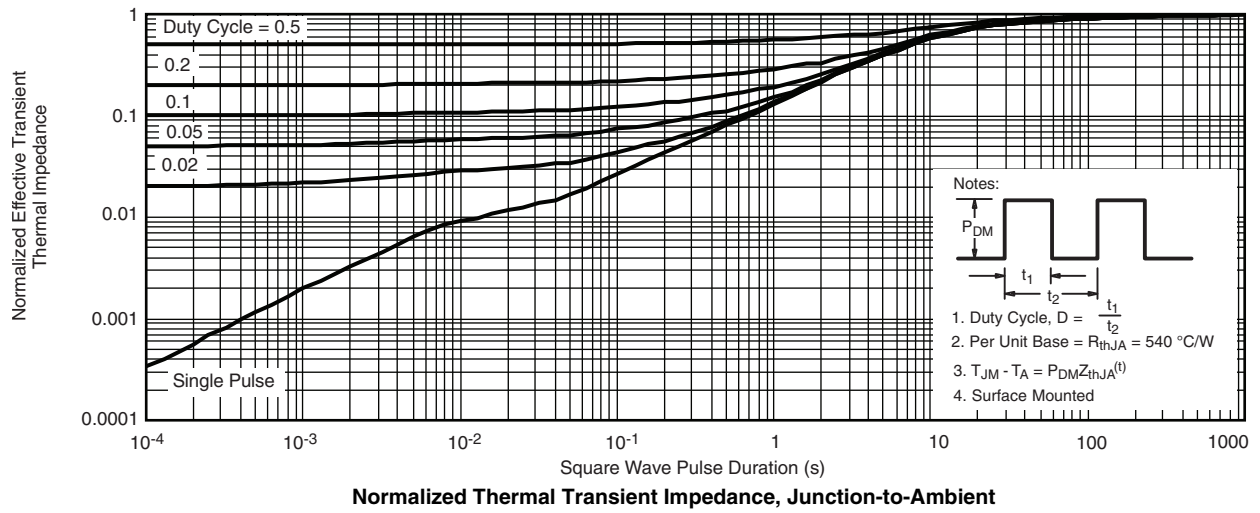
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)

Notes:

1. Duty Cycle, D = $\frac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 540 °C/W
3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

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