P-Channel 8 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 8	0.122 at V_{GS} = - 4.5 V	1.2	5.91
	0.141 at V_{GS} = - 2.5 V	1.1	
	0.168 at V_{GS} = - 1.8 V	0.60	
	0.198 at V_{GS} = - 1.5 V	0.50	

FEATURES
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET[®] Power MOSFET
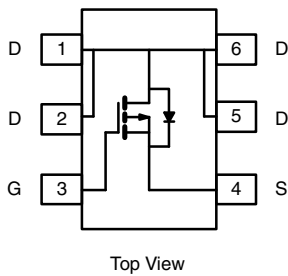- 100 % R_g Tested
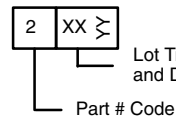- Compliant to RoHS Directive 2002/95/EC
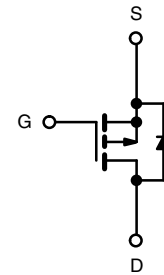
APPLICATIONS
- Load Switch for Portable Applications

SC-89 (6-LEADS)

Top View

Marking Code

Lot Traceability and Date Code

Part # Code

P-Channel MOSFET

Ordering Information: Si1051X-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}	- 8	V
Gate-Source Voltage		V_{GS}	± 5	
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	1.2[b, c]	A
	T_A = 70 °C		0.97[b, c]	
Pulsed Drain Current		I_{DM}	- 8	
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]	$t \leq 5$ s	R_{thJA}	440	530	°C/W
	Steady State		540	650	

Notes:
a. Based on T_A = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
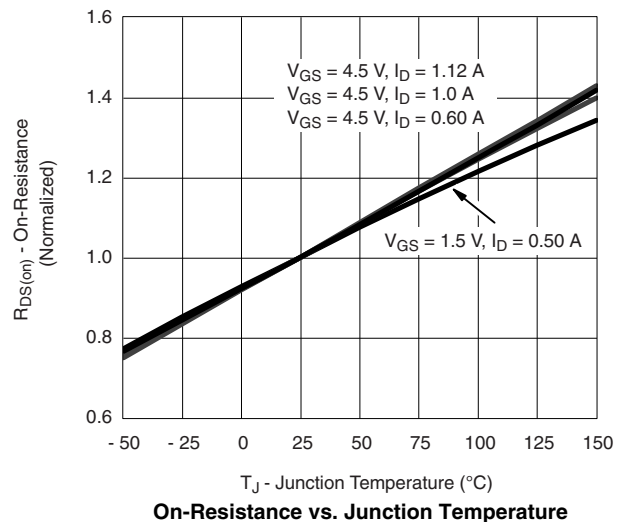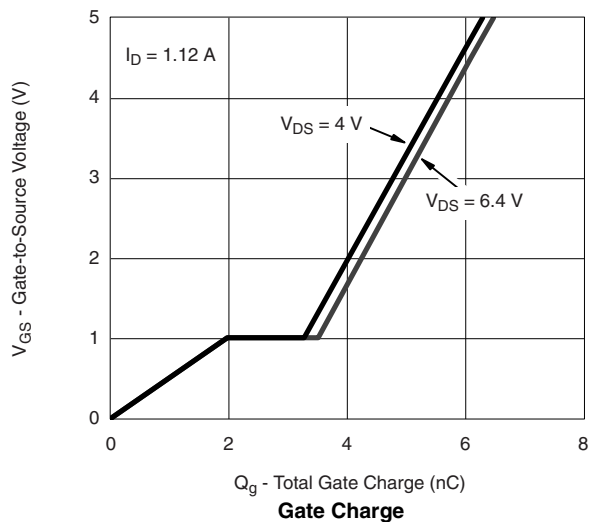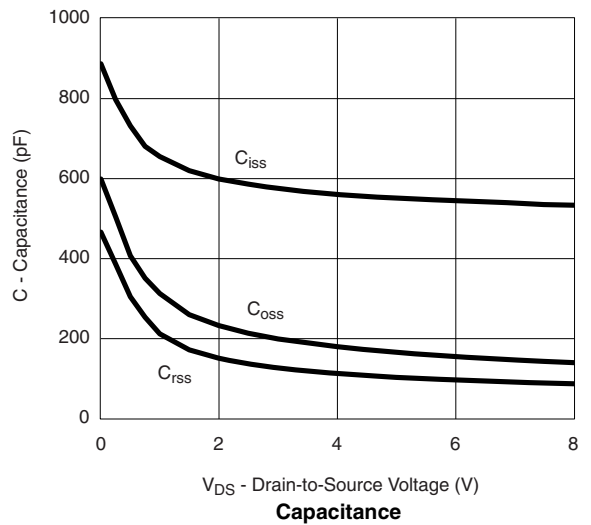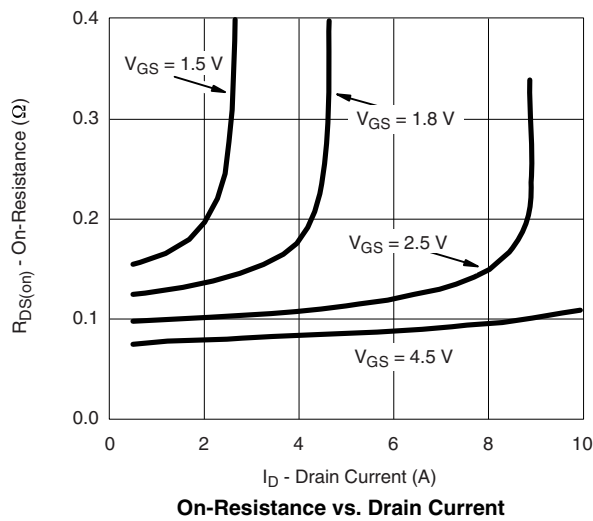d. Maximum under steady state conditions is 650 °C/W.

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

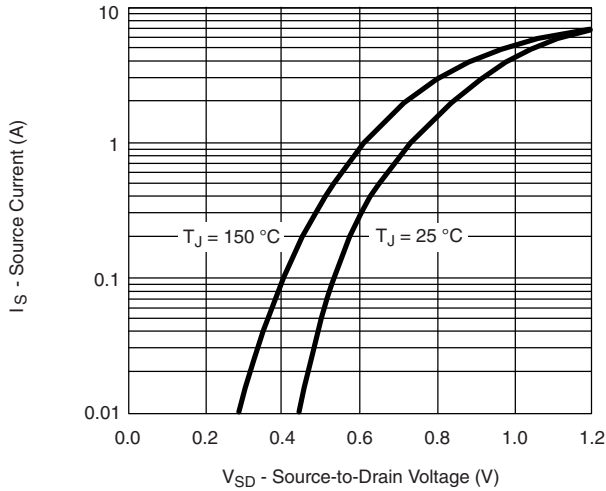| Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 8			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 6.19		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.13		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 0.3		- 1	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 5 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 8 V, V_{GS} = 0 V			- 1	nA
		V_{DS} = - 8 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	- 8			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 1.2 A		0.091	0.122	Ω
		V_{GS} = - 2.5 V, I_D = - 1.1A		0.106	0.141	
		V_{GS} = - 1.8 V, I_D = - 0.60 A		0.117	0.168	
		V_{GS} = - 1.5 V, I_D = - 0.50 A		0.129	0.198	
Forward Transconductance	g_{fs}	V_{DS} = - 4 V, I_D = - 1.2 A		4.93		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 4 V, V_{GS} = 0 V, f = 1 MHz		560		pF
Output Capacitance	C_{oss}			180		
Reverse Transfer Capacitance	C_{rss}			112		
Total Gate Charge	Q_g	V_{DS} = - 4 V, V_{GS} = - 5 V, I_D = - 1.2 A		6.3	9.45	nC
				5.91	8.87	
Gate-Source Charge	Q_{gs}	V_{DS} = - 4 V, V_{GS} = - 4.5 V, I_D = - 1.2 A		1.98		
Gate-Drain Charge	Q_{gd}			1.25		
Gate Resistance	R_g	f = 1 MHz		9.8	14.7	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 4 V, R_L = 4.16 Ω $I_D \cong$ - 0.96 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		7.2	10.8	ns
Rise Time	t_r			36	54	
Turn-Off DelayTime	$t_{d(off)}$			52	78	
Fall Time	t_f			16	24	
Drain-Source Body Diode Characteristics						
Pulse Diode Forward Current[a]	I_{SM}				- 8	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		18.8	28.2	nC
Body Diode Reverse Recovery Charge	Q_{rr}			4.7	7.05	ns
Reverse Recovery Fall Time	t_a			15		
Reverse Recovery Rise Time	t_b			3.8		

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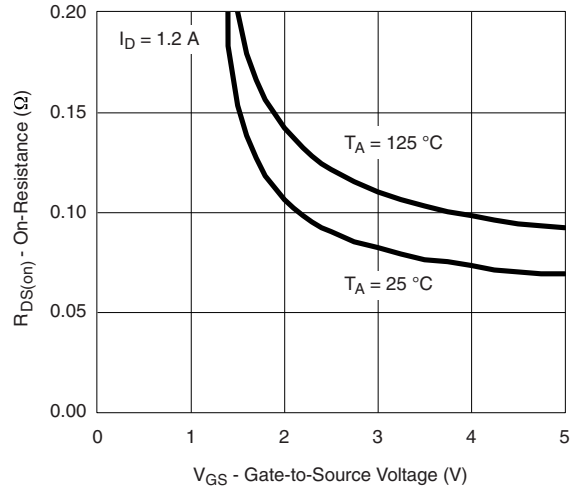
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)

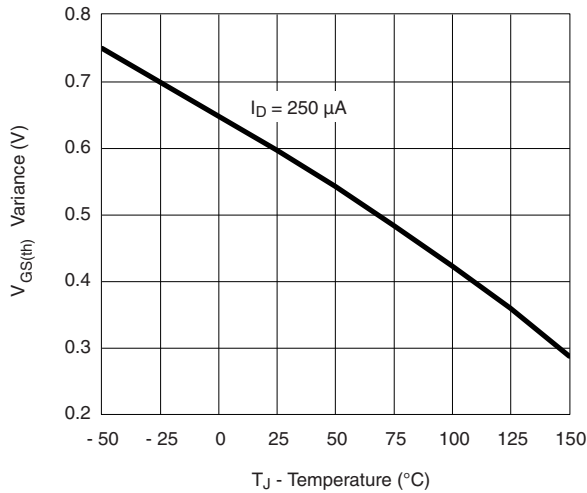**Output Characteristics**

V_{GS} = 5 V thru 2.5 V
V_{GS} = 2 V
V_{GS} = 1.5 V
V_{GS} = 1 V

I_D - Drain Current (A)
V_{DS} - Drain-to-Source Voltage (V)

Transfer Characteristics Curves vs. Temp.

T_C = 25 °C
T_C = 125 °C
T_C = - 55 °C

I_D - Drain Current (A)
V_{GS} - Gate-to-Source Voltage (V)

On-Resistance vs. Drain Current

V_{GS} = 1.5 V
V_{GS} = 1.8 V
V_{GS} = 2.5 V
V_{GS} = 4.5 V

$R_{DS(on)}$ - On-Resistance (Ω)
I_D - Drain Current (A)

Capacitance

C_{iss}
C_{oss}
C_{rss}

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

Gate Charge

I_D = 1.12 A
V_{DS} = 4 V
V_{DS} = 6.4 V

V_{GS} - Gate-to-Source Voltage (V)
Q_g - Total Gate Charge (nC)

On-Resistance vs. Junction Temperature

V_{GS} = 4.5 V, I_D = 1.12 A
V_{GS} = 4.5 V, I_D = 1.0 A
V_{GS} = 4.5 V, I_D = 0.60 A
V_{GS} = 1.5 V, I_D = 0.50 A

$R_{DS(on)}$ - On-Resistance (Normalized)
T_J - Junction Temperature (°C)

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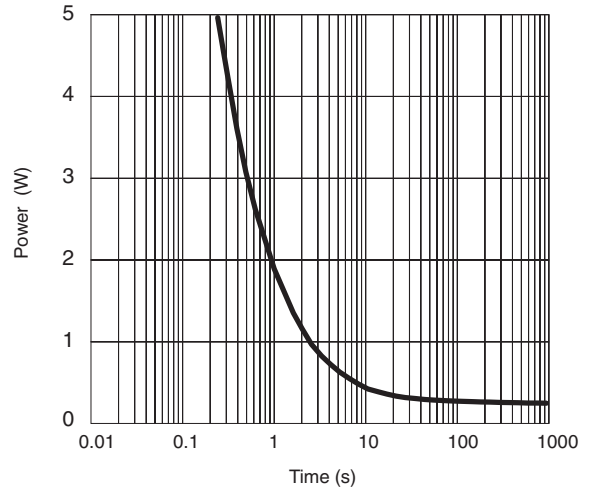

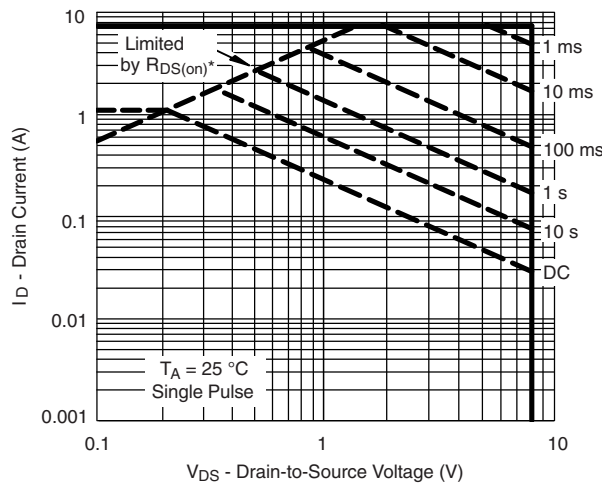**Source-Drain Diode Forward Voltage**

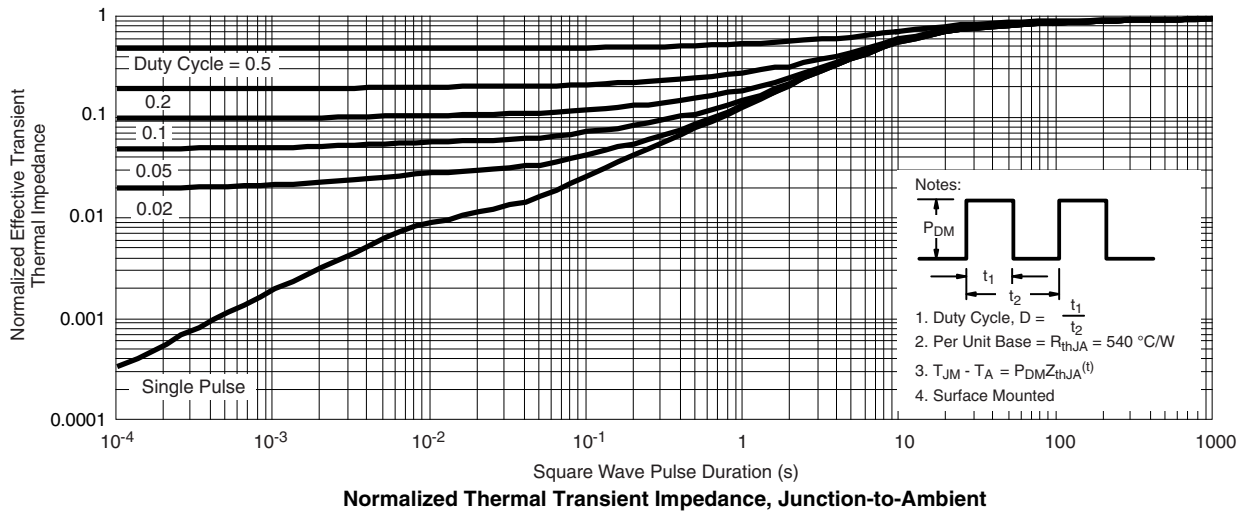**On-Resistance vs. Gate-to-Source Voltage**

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)

Normalized Effective Transient Thermal Impedance vs. Square Wave Pulse Duration (s)

Duty Cycle = 0.5
0.2
0.1
0.05
0.02
Single Pulse

Notes:

1. Duty Cycle, D = $\dfrac{t_1}{t_2}$
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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