

Dual P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
- 20	0.756 at V _{GS} = - 4.5 V	- 0.35	1 nC
	1.038 at V _{GS} = - 2.5 V	- 0.35	
	1.44 at V _{GS} = - 1.8 V	- 0.1	
	2.4 at V _{GS} = - 1.5 V	- 0.05	

FEATURES

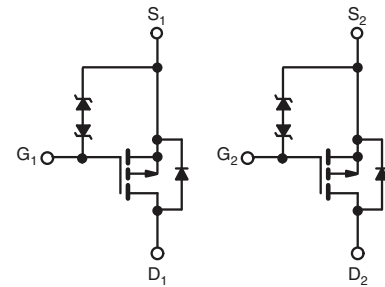
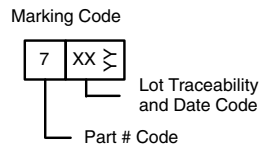
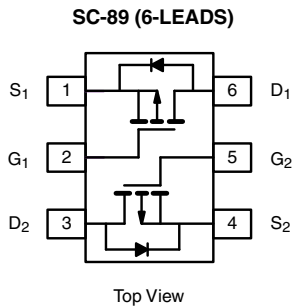
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- Typical ESD protection: 1000 V (HBM)
- Fast Switching Speed
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load and Small Signal Switch for Portable Devices
- Drivers: Relays, Solenoids, Displays, Lamps
- Battery Operated Systems
- Smart Phones, Tablet PCs



Dual P-Channel MOSFET

Ordering Information: Si1023CX-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)	I _D	T _A = 25 °C	- 0.45 ^{b, c}
		T _A = 70 °C	- 0.36 ^{b, c}
Pulsed Drain Current (t = 300 μs)	I _{DM}	- 1.5	A
Continuous Source-Drain Diode Current	I _S	- 0.18 ^{b, c}	W
Maximum Power Dissipation	P _D	T _A = 25 °C	
		T _A = 70 °C	0.14 ^{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 ^{a, b}	R _{thJA}	t ≤ 5 s	470	°C/W
		Steady State State	560	

Notes:

- Maximum under steady state conditions is 675 °C/W.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.

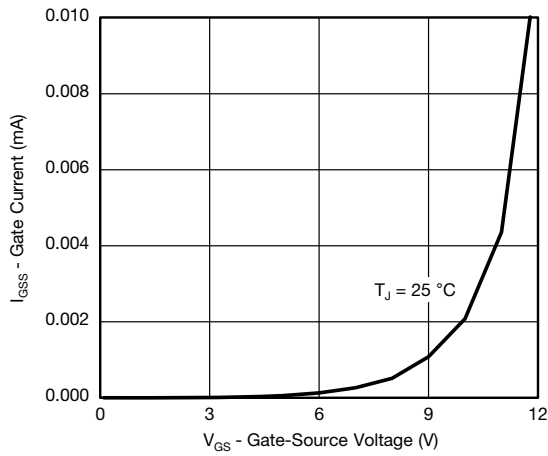
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 12		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			1.8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	- 0.4		- 1	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 8\text{ V}$			± 30	μA
		$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 4.5\text{ V}$			± 1	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$			- 1	
		$V_{DS} = -20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 85\text{ }^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = -4.5\text{ V}$	- 1.5			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}$, $I_D = -0.35\text{ A}$		0.630	0.756	Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -0.35\text{ A}$		0.865	1.038	
		$V_{GS} = -1.8\text{ V}$, $I_D = -0.1\text{ A}$		1.20	1.44	
		$V_{GS} = -1.5\text{ V}$, $I_D = -0.05\text{ A}$		1.6	2.4	
Forward Transconductance	g_{fs}	$V_{DS} = -10\text{ V}$, $I_D = -0.4\text{ A}$		1		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		45		pF
Output Capacitance	C_{oss}			15		
Reverse Transfer Capacitance	C_{rss}			10		
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}$, $V_{GS} = -4.5\text{ V}$, $I_D = -0.4\text{ A}$		1.65	2.50	nC
				1	2	
Gate-Source Charge	Q_{gs}	$V_{DS} = -10\text{ V}$, $V_{GS} = -2.5\text{ V}$, $I_D = -0.4\text{ A}$		0.2		
Gate-Drain Charge	Q_{gd}			0.26		
Gate Resistance	R_g	$f = 1\text{ MHz}$	2.4	12	24	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}$, $R_L = 33.3\text{ }\Omega$ $I_D \cong -0.3\text{ A}$, $V_{GEN} = -4.5\text{ V}$, $R_g = 1\text{ }\Omega$		9	18	ns
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(off)}$			10	20	
Fall Time	t_f			8	16	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}$, $R_L = 33.3\text{ }\Omega$ $I_D \cong -0.3\text{ A}$, $V_{GEN} = -8\text{ V}$, $R_g = 1\text{ }\Omega$		1	2	
Rise Time	t_r			8	16	
Turn-Off Delay Time	$t_{d(off)}$			9	18	
Fall Time	t_f			5	10	
Drain-Source Body Diode Characteristics						
Pulse Diode Forward Current ^a	I_{SM}				- 1.5	A
Body Diode Voltage	V_{SD}	$I_S = -0.3\text{ A}$		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -0.3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		16	24	ns
Body Diode Reverse Recovery Charge	Q_{rr}			8	16	nC
Reverse Recovery Fall Time	t_a			11		ns
Reverse Recovery Rise Time	t_b			5		

Notes:

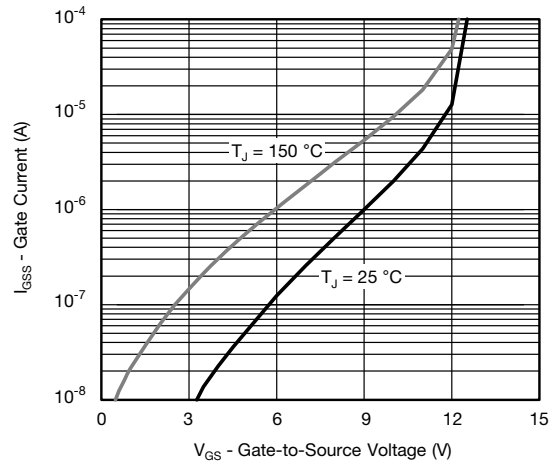
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

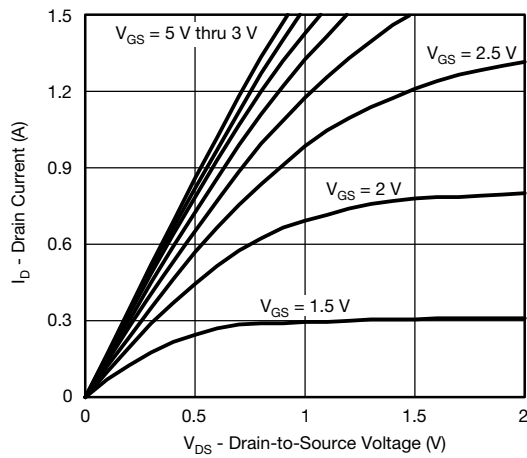
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



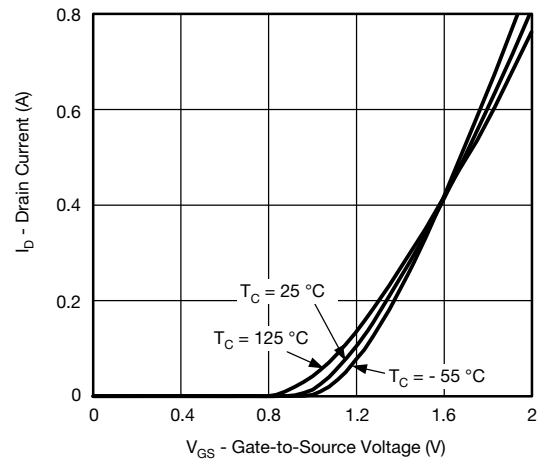
Gate Current vs. Gate-Source Voltage



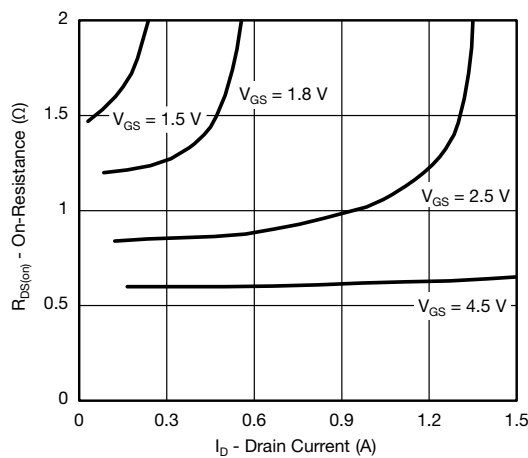
Gate Current vs. Gate-Source Voltage



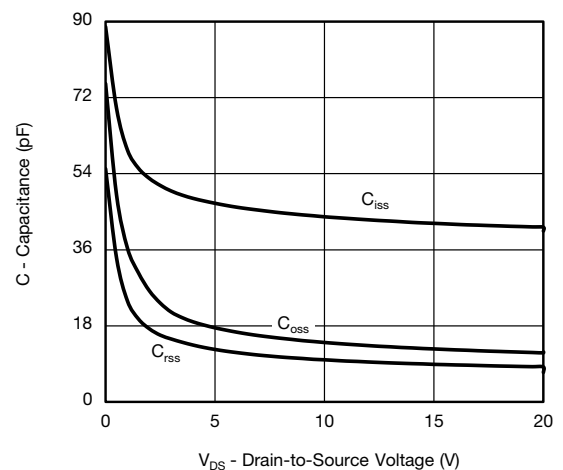
Output Characteristics



Transfer Characteristics

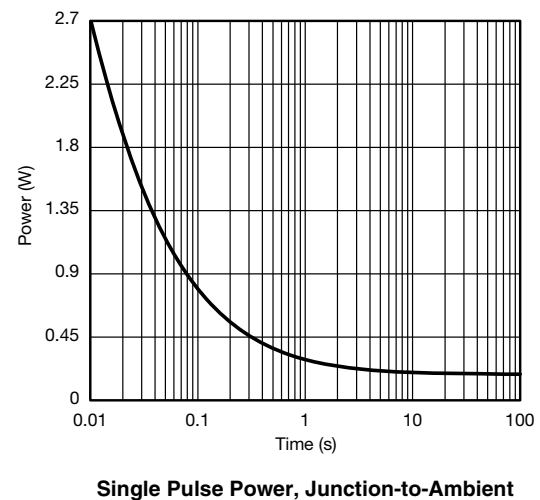
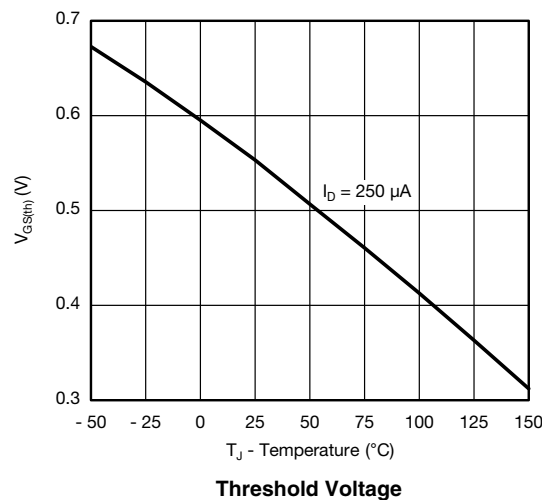
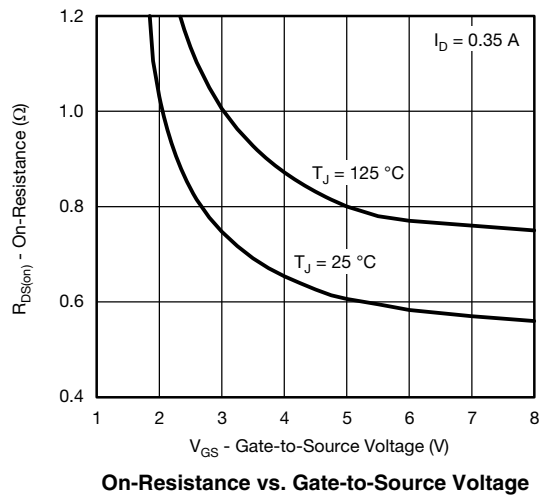
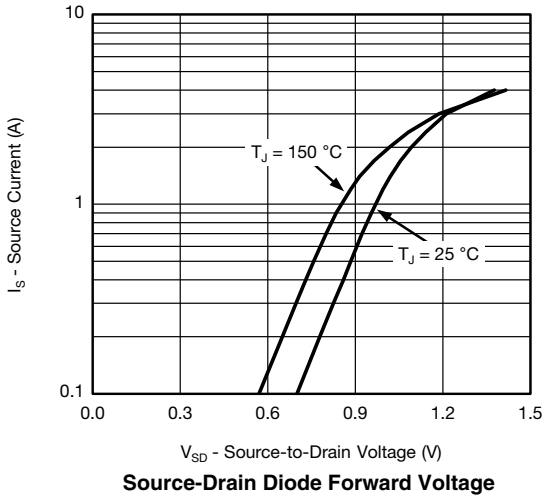
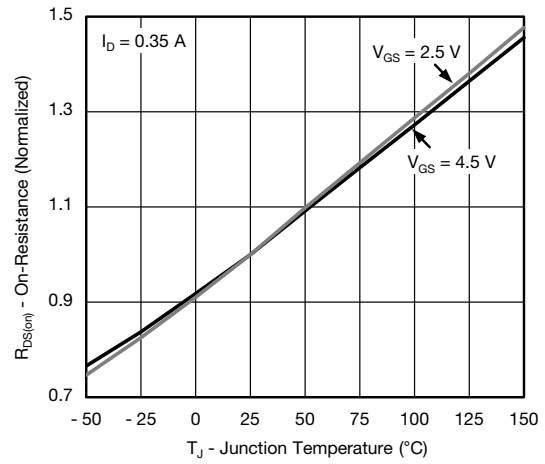
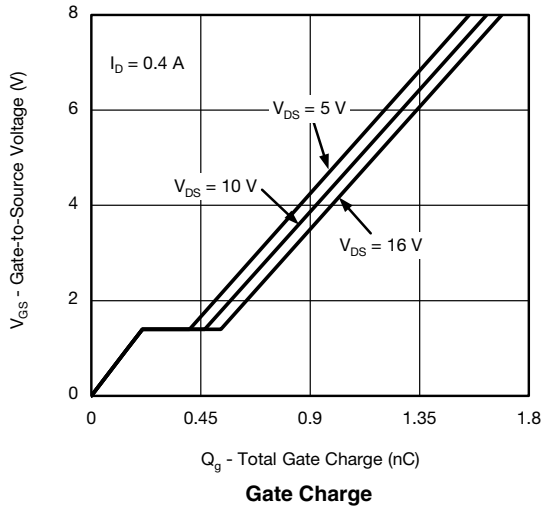


On-Resistance vs. Drain Current

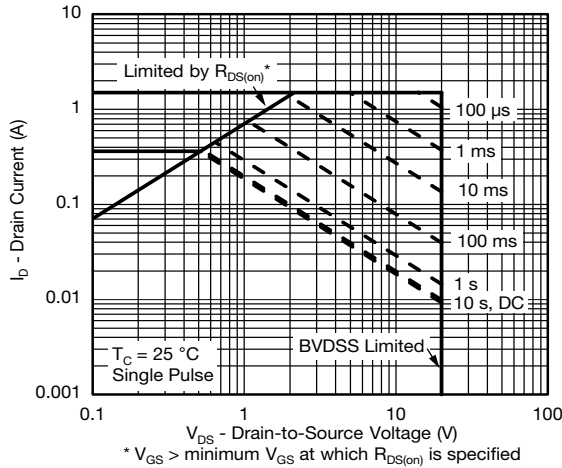


Capacitance

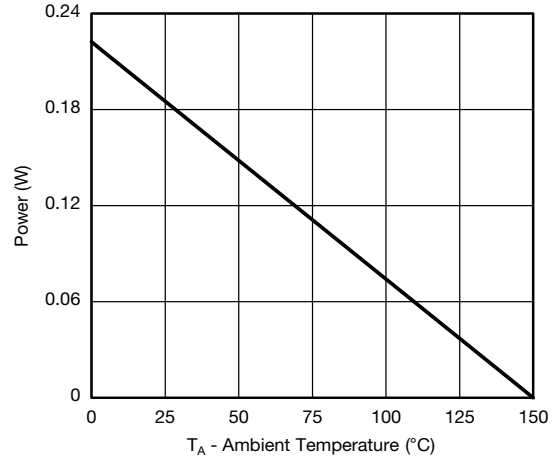
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



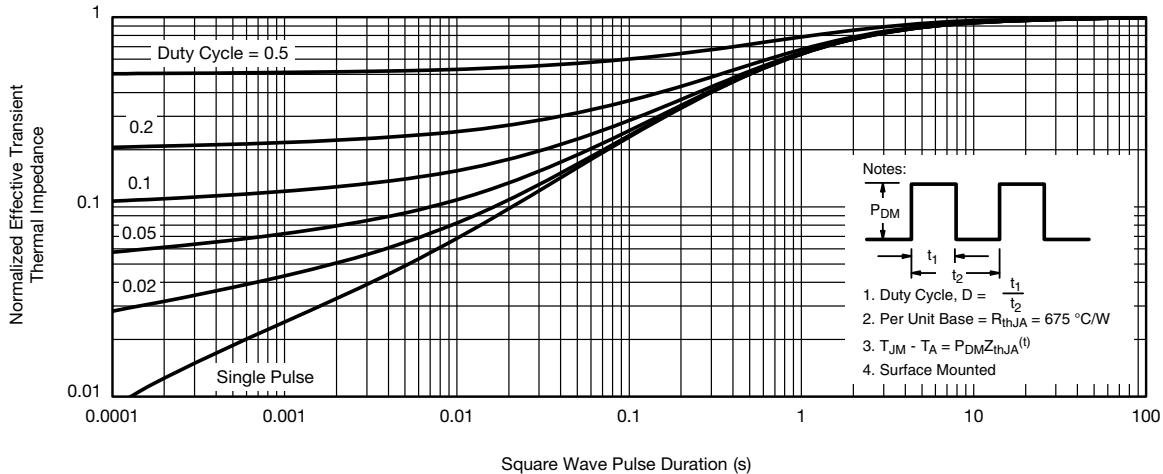
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



Power Derating, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient

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SC-89 6-Leads (SOT-563F)



Notes

1. Dimensions in millimeters.
- ⚠ Dimension D does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15 mm per dimension E1 does not include interlead flash or protrusion, interlead flash or protrusion shall not exceed 0.15 mm per side.
- ⚠ Dimensions D and E1 are determined at the outmost extremes of the plastic body exclusive of mold flash, the bar burrs, gate burrs and interlead flash, but including any mismatch between the top and the bottom of the plastic body.
- ⚠ Datums A, B and D to be determined 0.10 mm from the lead tip.
- ⚠ Terminal numbers are shown for reference only.
- ⚠ These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.56	0.58	0.60
A1	0	0.02	0.10
b	0.15	0.22	0.30
c	0.10	0.14	0.18
D	1.50	1.60	1.70
E	1.50	1.60	1.70
E1	1.15	1.20	1.25
e	0.45	0.50	0.55
e1	0.95	1.00	1.05
L	0.25	0.35	0.50
L1	0.10	0.20	0.30

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DWG: 5880

RECOMMENDED MINIMUM PADS FOR SC-89: 6-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

[Return to Index](#)



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