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

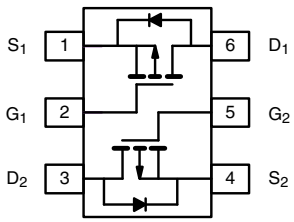
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Typical ESD protection: 1000 V (HBM)
- Fast Switching Speed
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

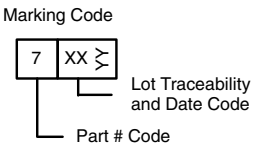
APPLICATIONS

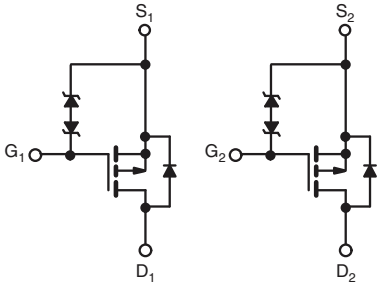
- Load and Small Signal Switch for Portable Devices
- Drivers: Relays, Solenoids, Displays, Lamps
- Battery Operated Systems
- Smart Phones, Tablet PCs

SC-89 (6-LEADS)



Top View





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)	T_A = 25 °C	I_D	- 0.45[b, c]	A
	T_A = 70 °C		- 0.36[b, c]	
Pulsed Drain Current (t = 300 µs)		I_{DM}	- 1.5	
Continuous Source-Drain Diode Current	T_A = 25 °C	I_S	- 0.18[b, c]	
Maximum Power Dissipation	T_A = 25 °C	P_D	0.22[b, c]	W
	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]	t ≤ 5 s	R_{thJA}	470	565	°C/W
	Steady State State		560	675	

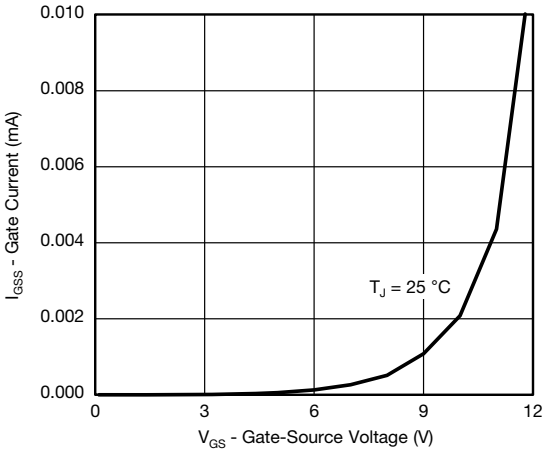
Notes:
a. Maximum under steady state conditions is 675 °C/W.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.

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		- 12		mV/°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 µA	- 0.4		- 1	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 30	µA
		V_{DS} = 0 V, V_{GS} = ± 4.5 V			± 1	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 20 V, V_{GS} = 0 V			- 1	
		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	- 1.5			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 0.35 A		0.630	0.756	Ω
		V_{GS} = - 2.5 V, I_D = - 0.35 A		0.865	1.038	
		V_{GS} = - 1.8 V, I_D = - 0.1 A		1.20	1.44	
		V_{GS} = - 1.5 V, I_D = - 0.05 A		1.6	2.4	
Forward Transconductance	g_{fs}	V_{DS} = - 10 V, I_D = - 0.4 A		1		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 10 V, V_{GS} = 0 V, f = 1 MHz		45		pF
Output Capacitance	C_{oss}			15		
Reverse Transfer Capacitance	C_{rss}			10		
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 0.4 A		1.65	2.50	nC
		V_{DS} = - 10 V, V_{GS} = - 2.5 V, I_D = - 0.4 A		1	2	
Gate-Source Charge	Q_{gs}			0.2		
Gate-Drain Charge	Q_{gd}			0.26		
Gate Resistance	R_g	f = 1 MHz	2.4	12	24	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 33.3 Ω I_D ≅ - 0.3 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		9	18	ns
Rise Time	t_r			10	20	
Turn-Off DelayTime	$t_{d(off)}$			10	20	
Fall Time	t_f			8	16	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 33.3 Ω I_D ≅ - 0.3 A, V_{GEN} = - 8 V, R_g = 1 Ω		1	2	
Rise Time	t_r			8	16	
Turn-Off DelayTime	$t_{d(off)}$			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 A		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 0.3 A, dI/dt = 100 A/µs		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		

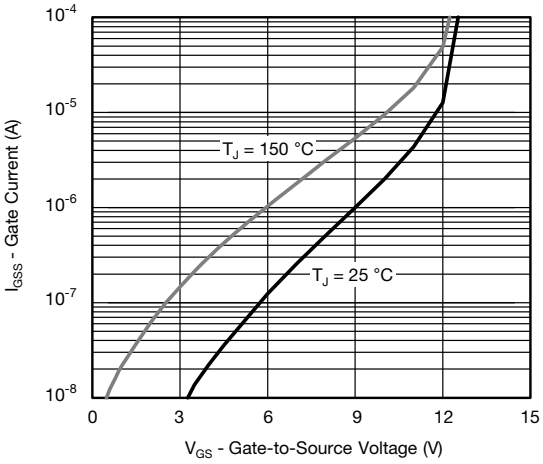
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

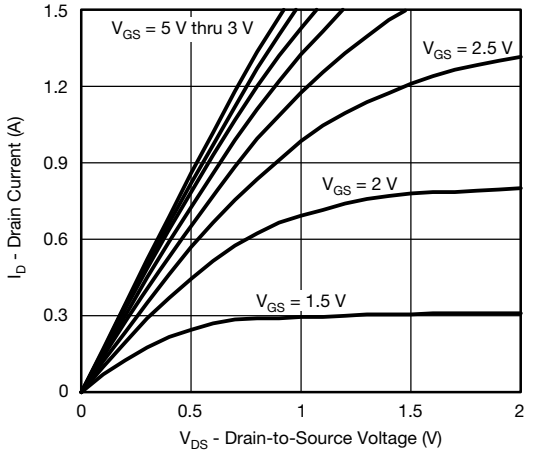
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



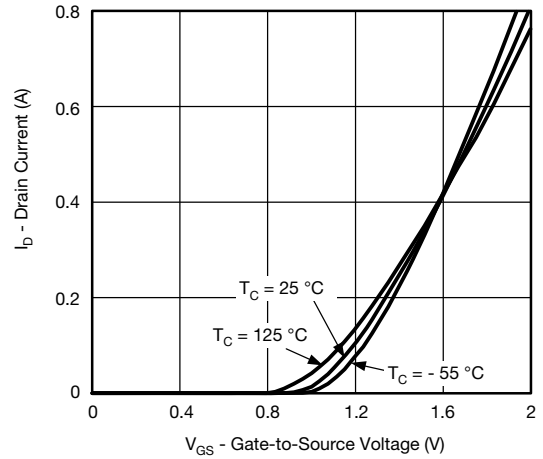
Gate Current vs. Gate-Source Voltage



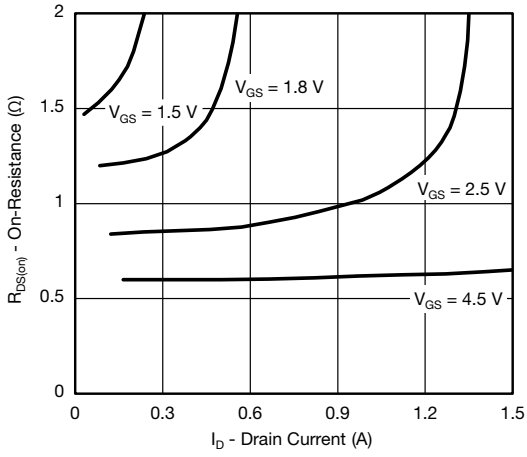
Gate Current vs. Gate-Source Voltage



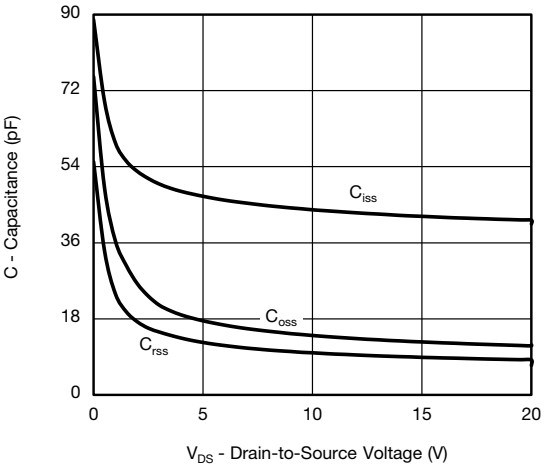
Output Characteristics



Transfer Characteristics

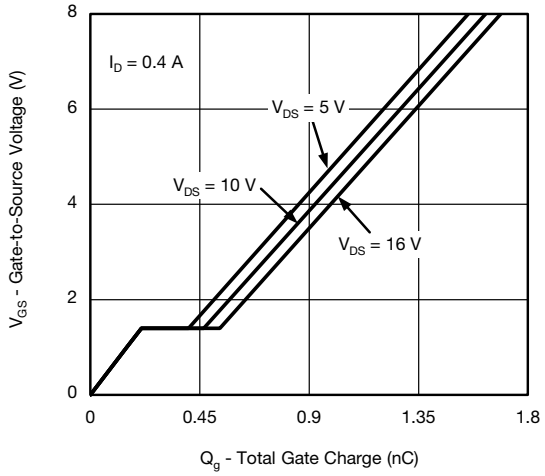


On-Resistance vs. Drain Current

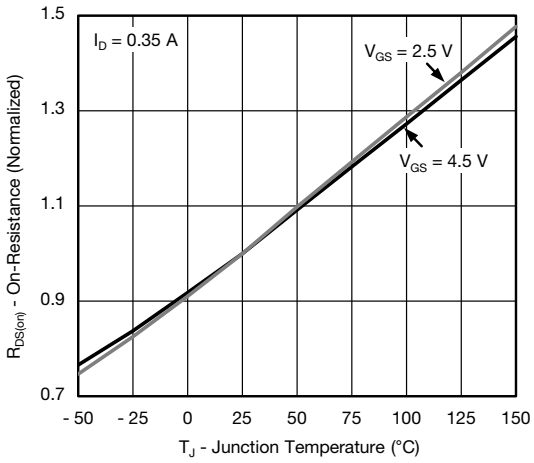


Capacitance

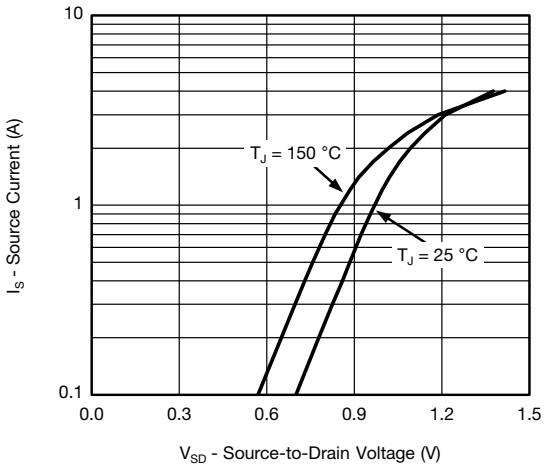
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



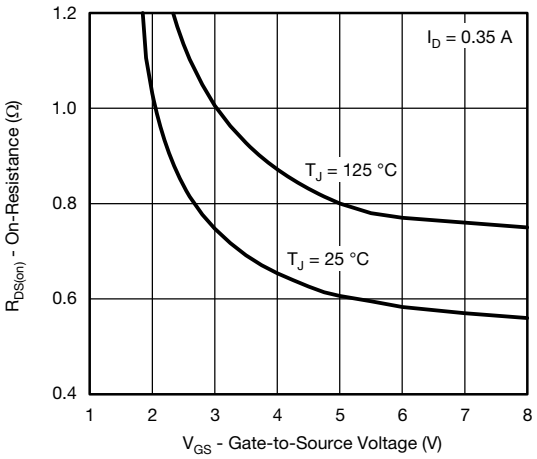
Gate Charge



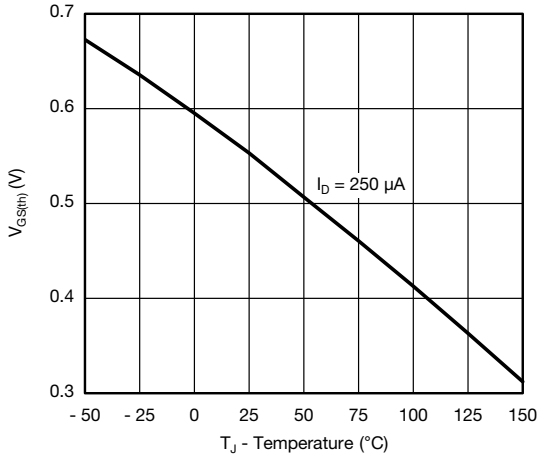
On-Resistance vs. Junction Temperature



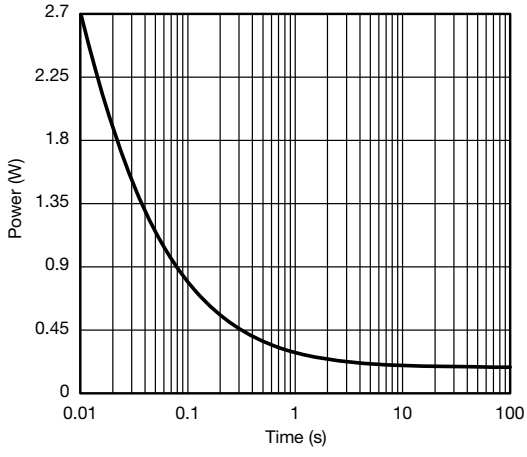
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

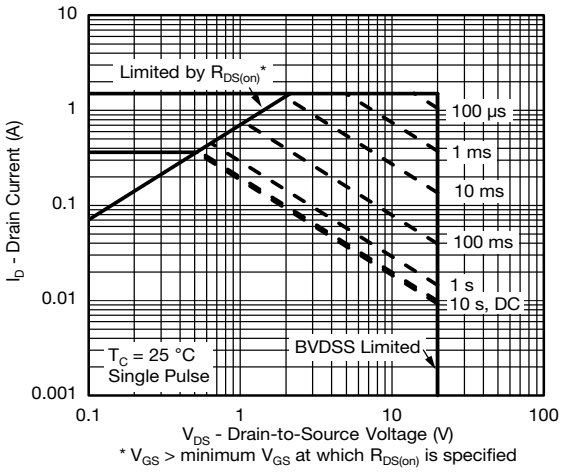


Threshold Voltage

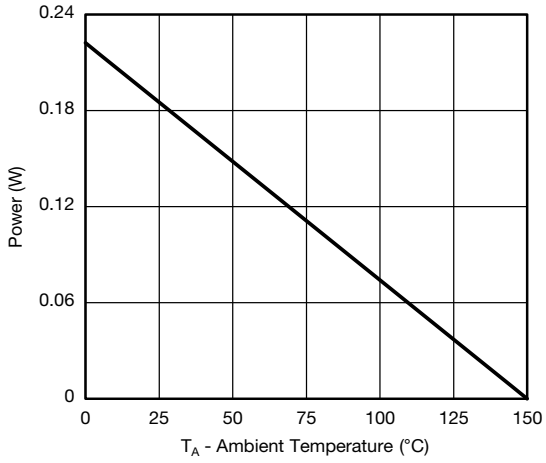


Single Pulse Power, Junction-to-Ambient

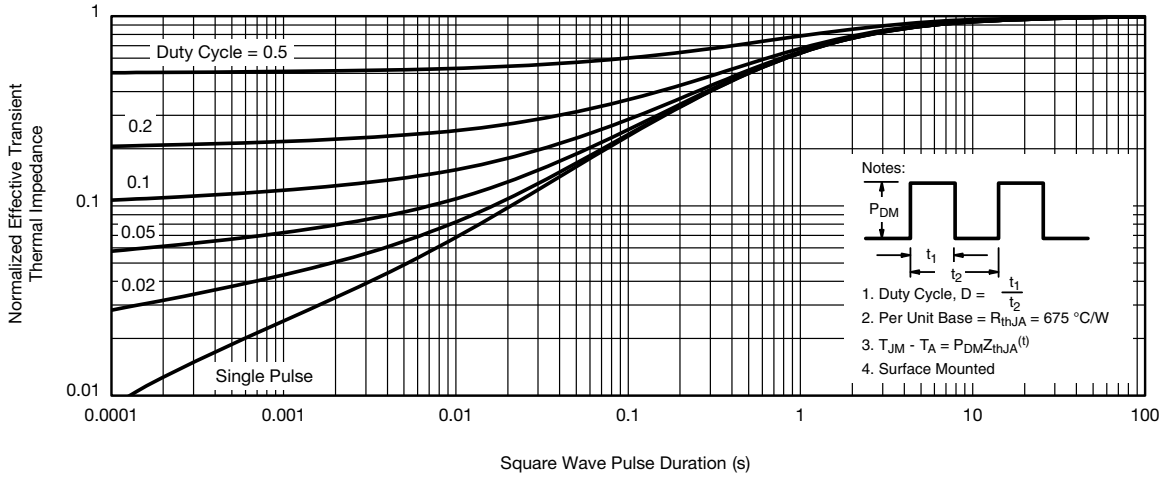
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



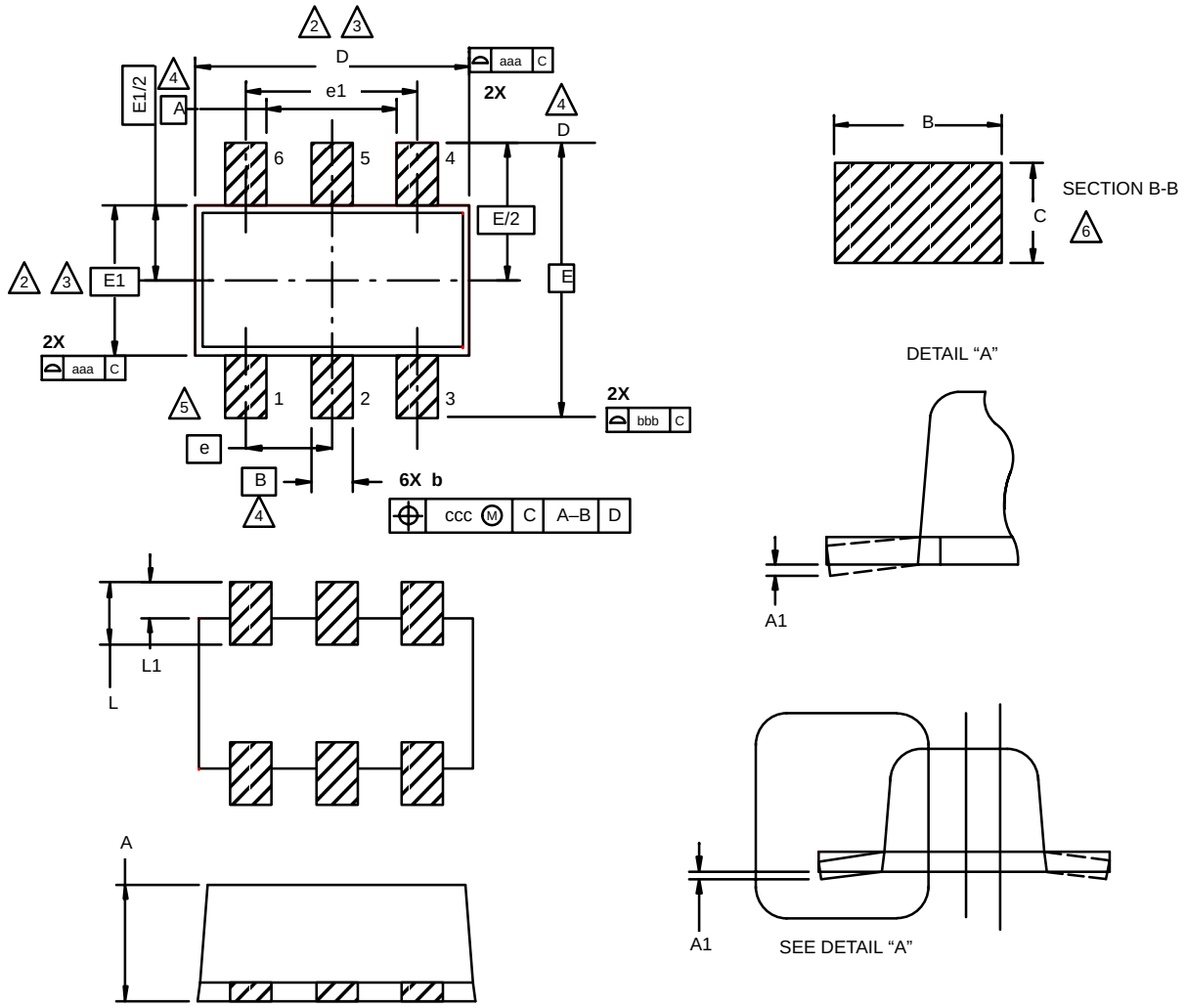
Power Derating, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?63303.

SC89: 6- LEADS (SOT-563F)



NOTES:

1. Dimensions in millimeters.

2. Dimension D does not include mold flash, protrusions or gate burrs. Mold flush, 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.

3. 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.

4. Datums A, B and D to be determined 0.10 mm from the lead tip.

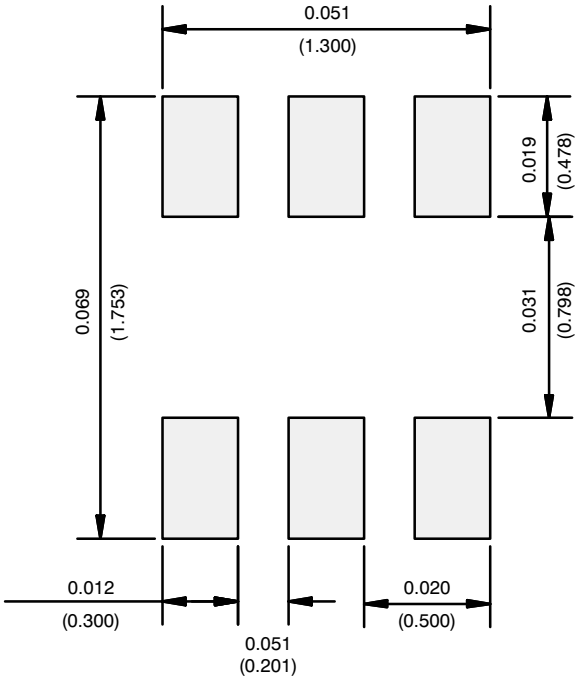
5. Terminal numbers are shown for reference only.

6. These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

Dim	MILLIMETERS		Note	Symbol	Tolerances Of Form And Position
	Min	Max			
A	0.56	0.60		aaa	0.10
A1	0.00	0.10		bbb	0.10
b	0.15	0.30		ccc	0.10
c	0.10	0.18			
D	1.50	1.70	2, 3		
E	1.55	1.70			
E1	1.20 BSC		2, 3		
e	0.50 BSC				
e1	1.00 BSC				
L	0.35 BSC				
L1	0.20 BSC				

ECN: E-00499—Rev. B, 02-Jul-01
DWG: 5880

RECOMMENDED MINIMUM PADS FOR SC-89: 6-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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