

N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
20	0.091 at V _{GS} = 4.5 V	1.3 ^a	3.5
	0.124 at V _{GS} = 2.5 V	1.1	

FEATURES

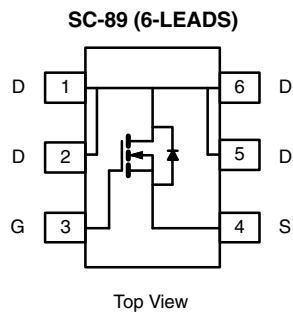
- TrenchFET[®] Power MOSFET
- 100 % R_g and UIS Tested
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912



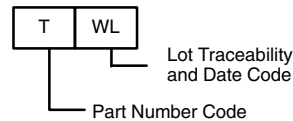
RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load Switch for Portable Devices



Marking Code



Ordering Information: Si1058X-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}	± 12		
Continuous Drain Current (T _J = 150 °C) ^a	T _A = 25 °C	1.3 ^{b, c}	A	
	T _A = 70 °C	1.03 ^{b, c}		
Pulsed Drain Current	I _{DM}	6		
Avalanche Current	L = 0.1 mH	I _{AS}	7	
Repetitive Avalanche Energy		E _{AS}	2.45	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}	R _{thJA}	t ≤ 5 s	440	530	°C/W
		Steady State	540	650	

Notes:

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under steady state conditions is 650 °C/W.

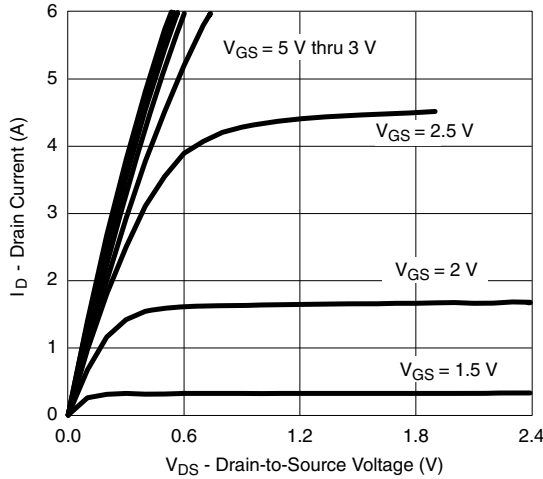
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		18.9		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-3.6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.7		1.55	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 4.5\text{ V}$	6			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 1.3\text{ A}$		0.076	0.091	Ω
		$V_{GS} = 2.5\text{ V}, I_D = 1.1\text{ A}$		0.103	0.124	
Forward Transconductance	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 1.3\text{ A}$		5.5		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		380		pF
Output Capacitance	C_{oss}			75		
Reverse Transfer Capacitance	C_{rss}			45		
Total Gate Charge	Q_g	$V_{DS} = 10\text{ V}, V_{GS} = 5\text{ V}, I_D = 1.3\text{ A}$		3.9	5.9	nC
		$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 1.3\text{ A}$		3.51	5.3	
Gate-Source Charge	Q_{gs}			0.82		
Gate-Drain Charge	Q_{gd}		0.61			
Gate Resistance	R_g	$f = 1\text{ MHz}$		4.3	5.6	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 15\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		8	12	ns
Rise Time	t_r			20	30	
Turn-Off Delay Time	$t_{d(off)}$			13	18	
Fall Time	t_f			6	9	
Drain-Source Body Diode Characteristics						
Pulse Diode Forward Current ^a	I_{SM}				6	
Body Diode Voltage	V_{SD}	$I_S = 1\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 1\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		10.4	16	nC
Body Diode Reverse Recovery Charge	Q_{rr}			3.7	5.7	ns
Reverse Recovery Fall Time	t_a			6.5		
Reverse Recovery Rise Time	t_b			3.9		

Notes:

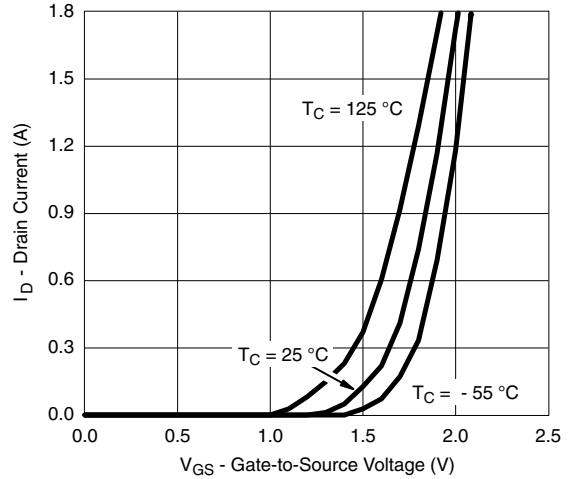
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

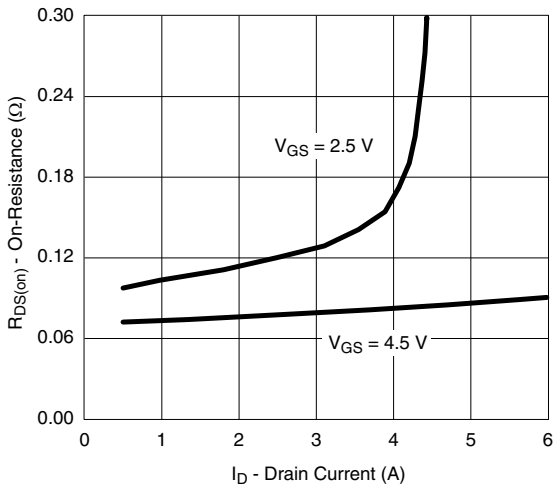
TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted)



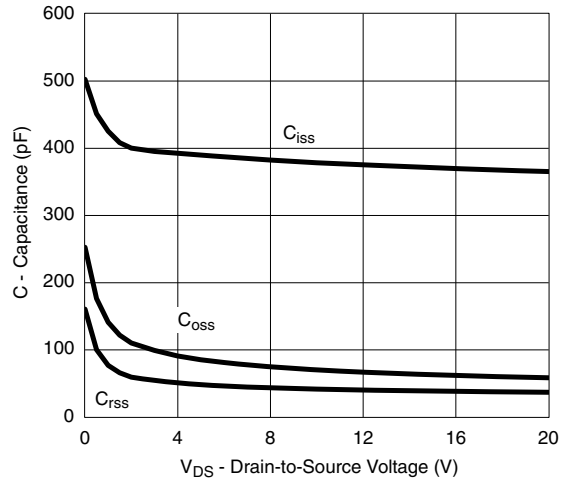
Output Characteristics



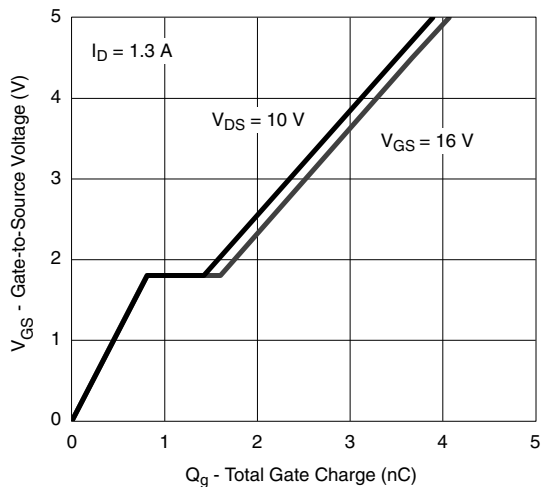
Transfer Characteristics Curves vs. Temp.



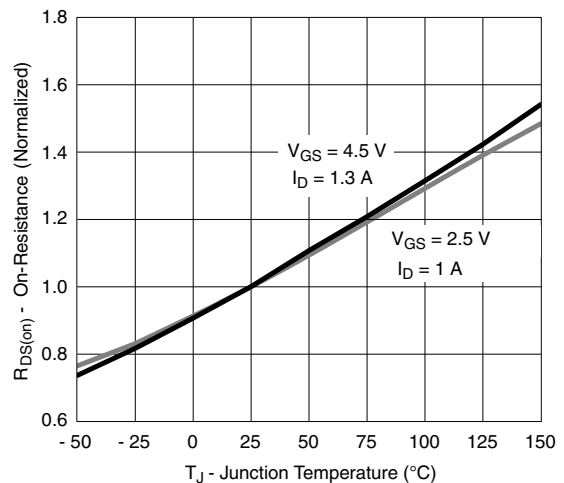
On-Resistance vs. Drain Current



Capacitance

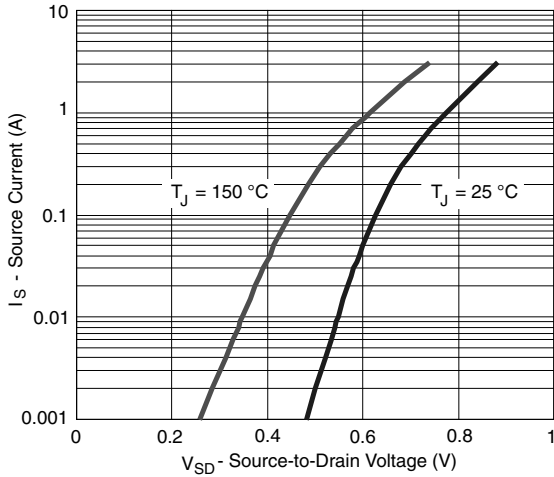


Gate Charge

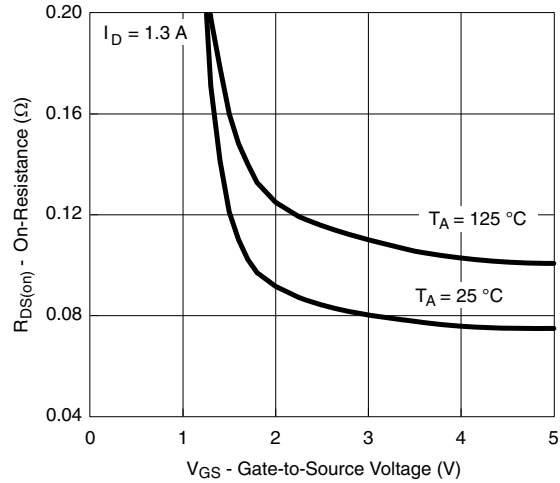


On-Resistance vs. Junction Temperature

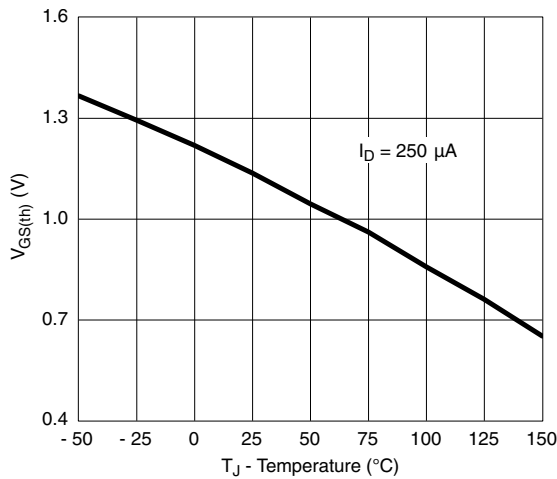
TYPICAL CHARACTERISTICS (T_A = 25 °C, unless otherwise noted)



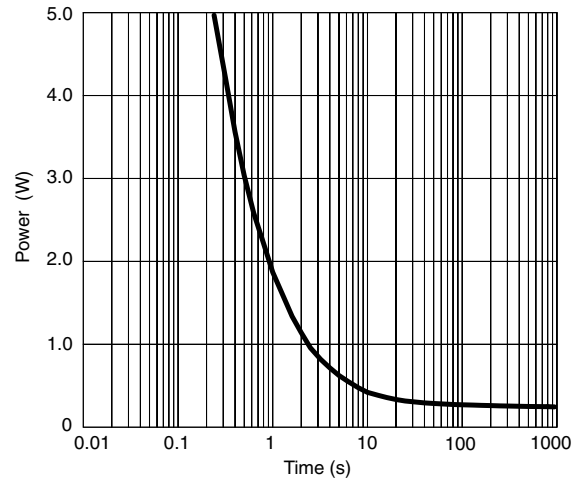
Source-Drain Diode Forward Voltage



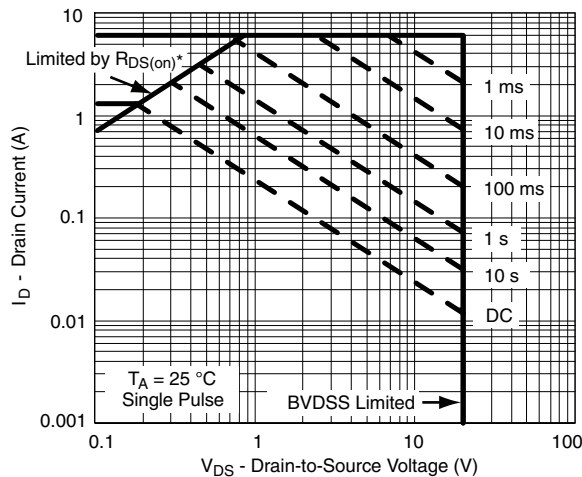
R_{DS(on)} vs. V_{GS} vs. Temperature



Threshold Voltage

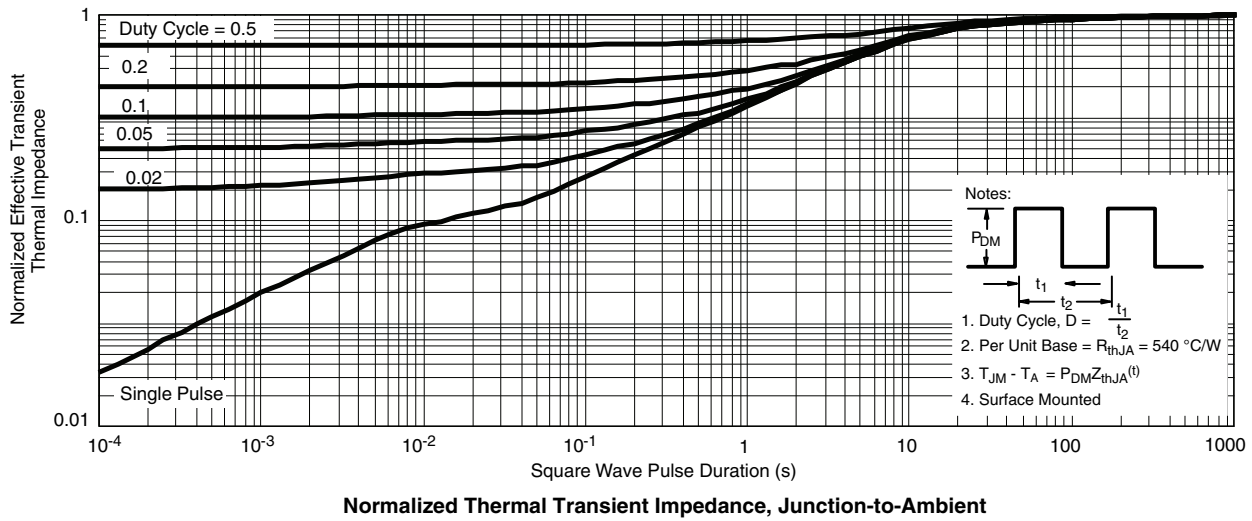


Single Pulse Power



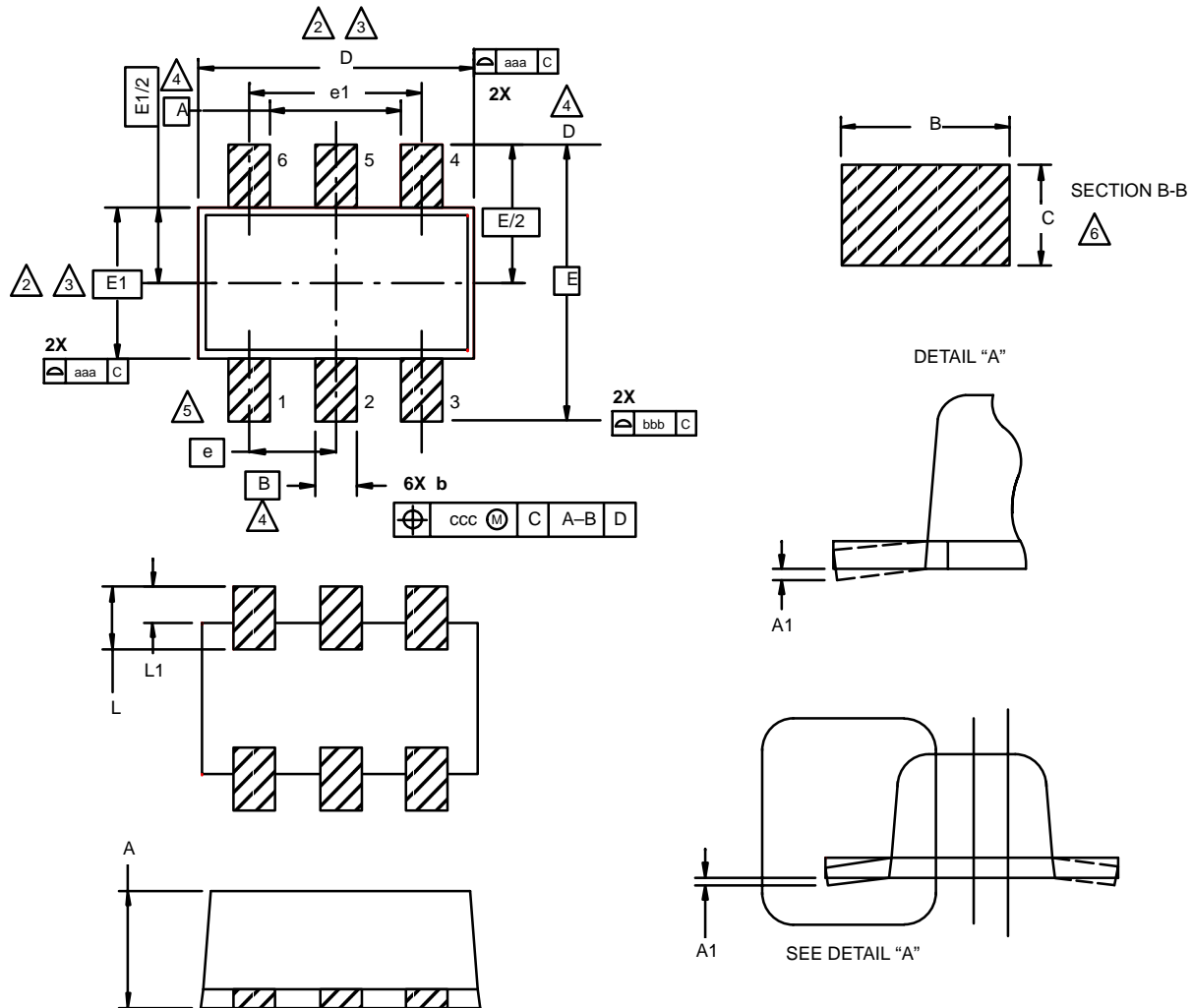
* V_{GS} > minimum V_{GS} at which R_{DS(on)} is specified
Safe Operating Area, Junction-to-Ambient

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



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?73894.

SC89: 6- LEADS (SOT-563F)



NOTES:

1. Dimensions in millimeters.

2 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.

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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