

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

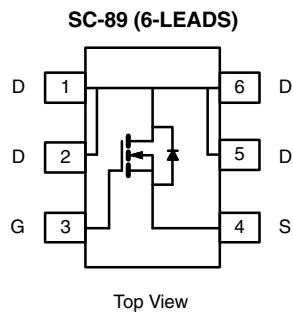
- TrenchFET® Power MOSFET
- 100 % R_g and UIS Tested
- Material categorization:
For definitions of compliance please see
www.vishay.com/doc?99912



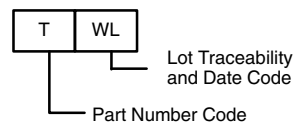
RoHS
COMPLIANT
HALOGEN
FREE

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	I_D	A
	$T_A = 70$ °C	1.3 ^{b, c}	
Pulsed Drain Current	I_{DM}	6	A
Avalanche Current	I_{AS}	7	
Repetitive Avalanche Energy	E_{AS}	2.45	mJ
Continuous Source-Drain Diode Current	I_S	0.2 ^{b, c}	A
Maximum Power Dissipation ^a	$T_A = 25$ °C	P_D	W
	$T_A = 70$ °C	0.236 ^{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	°C/W
	Steady State		530	
			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 °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	ΔV _{DS} /T _J	I _D = 250 μA		18.9		mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			- 3.6		
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.7		1.55	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 12 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 = 1.3 A		0.076	0.091	Ω
		V _{GS} = 2.5 V, I _D = 1.1 A		0.103	0.124	
Forward Transconductance	g _{fs}	V _{DS} = 10 V, I _D = 1.3 A		5.5		S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz		380		pF
Output Capacitance	C _{oss}			75		
Reverse Transfer Capacitance	C _{rss}			45		
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 5 V, I _D = 1.3 A		3.9	5.9	nC
		V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 1.3 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 MHz		4.3	5.6	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 15 Ω I _D ≡ 1 A, V _{GEN} = 4.5 V, R _g = 1 Ω		8	12	ns
Rise Time	t _r			20	30	
Turn-Off DelayTime	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 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 1 A, dI/dt = 100 A/μs		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		

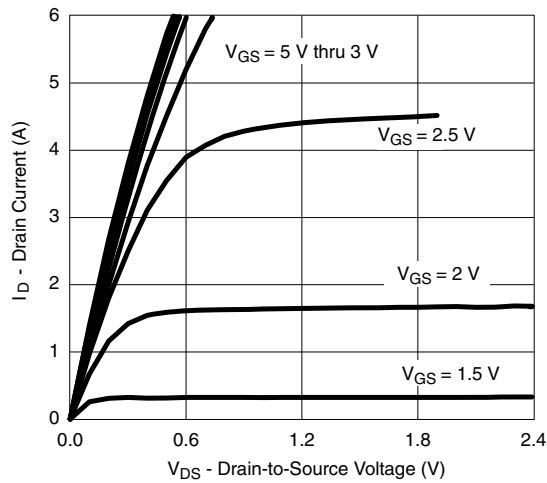
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

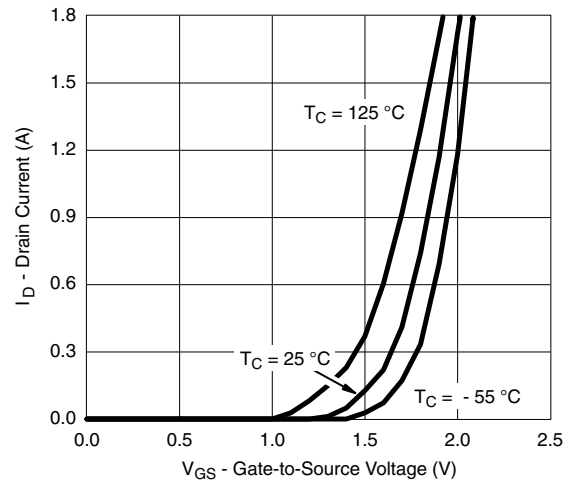
b. Guaranteed by design, not subject to production testing.

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.

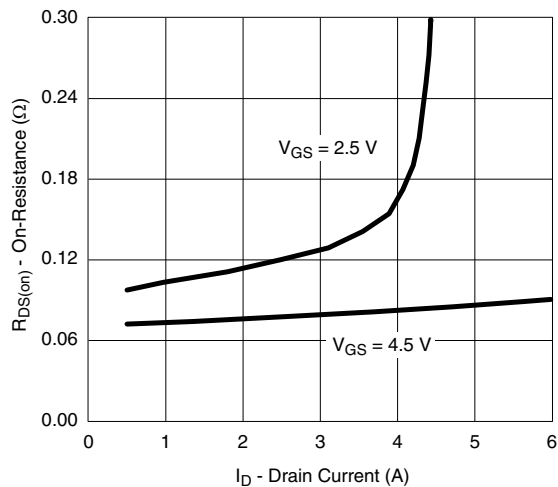
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, unless otherwise noted)



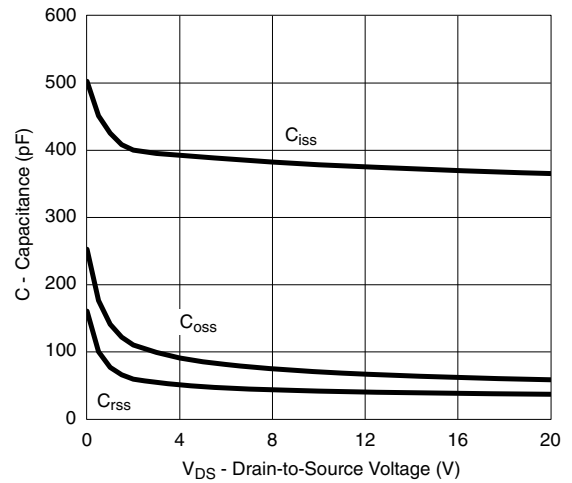
Output Characteristics



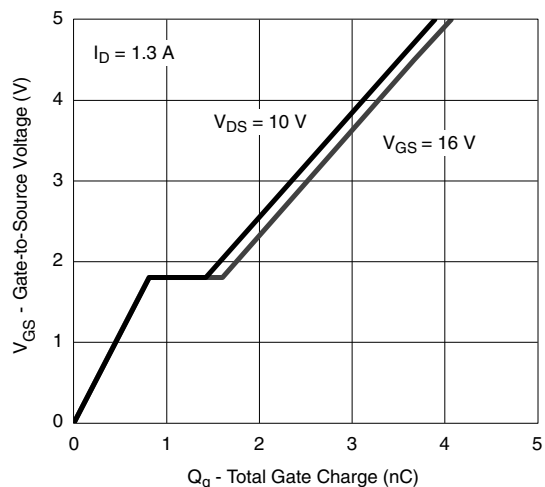
Transfer Characteristics Curves vs. Temp.



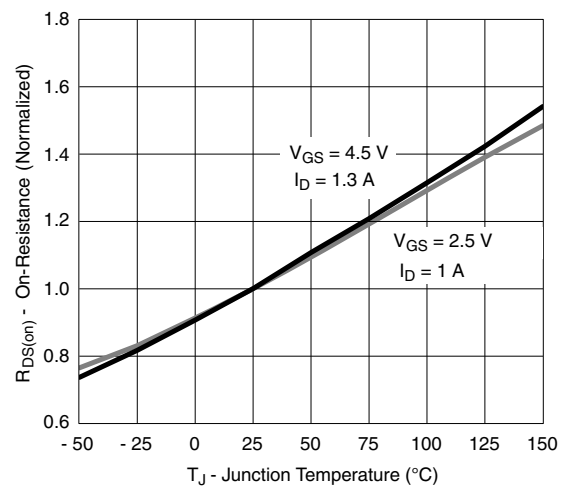
On-Resistance vs. Drain Current



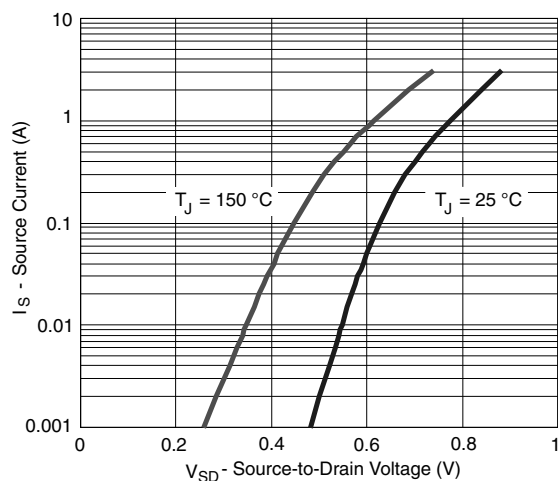
Capacitance



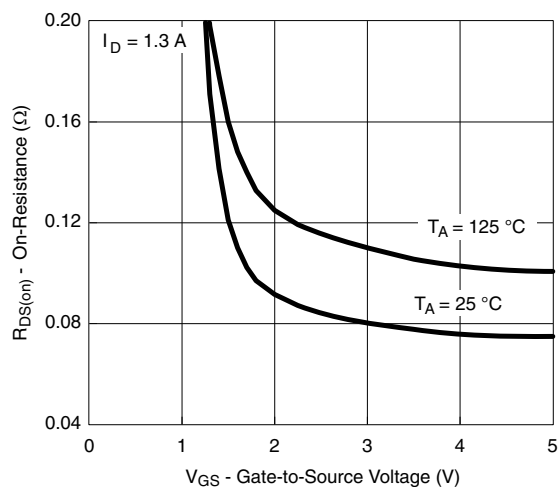
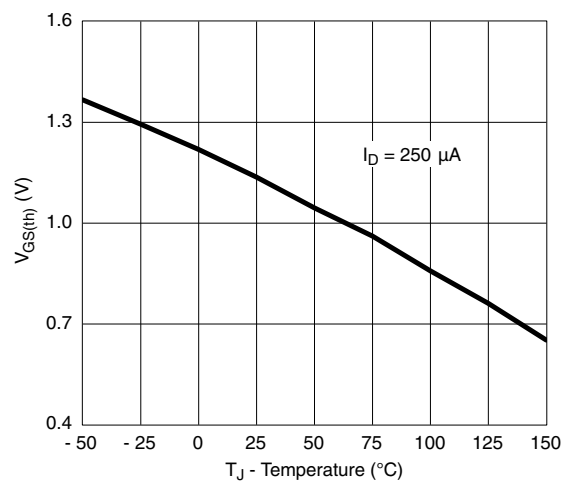
Gate Charge



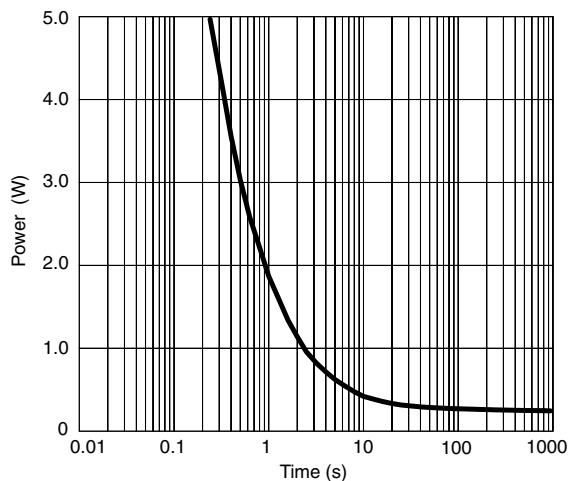
On-Resistance vs. Junction Temperature

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


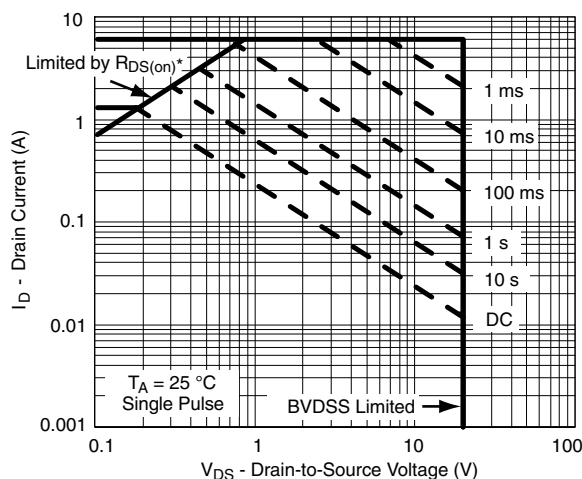
Source-Drain Diode Forward Voltage

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

Threshold Voltage

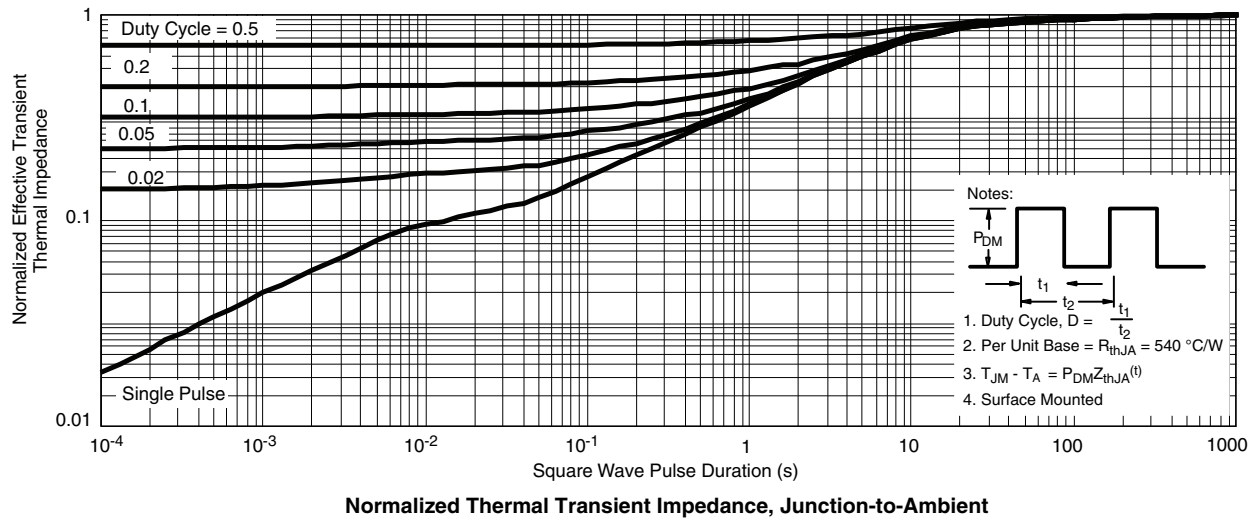


Single Pulse Power



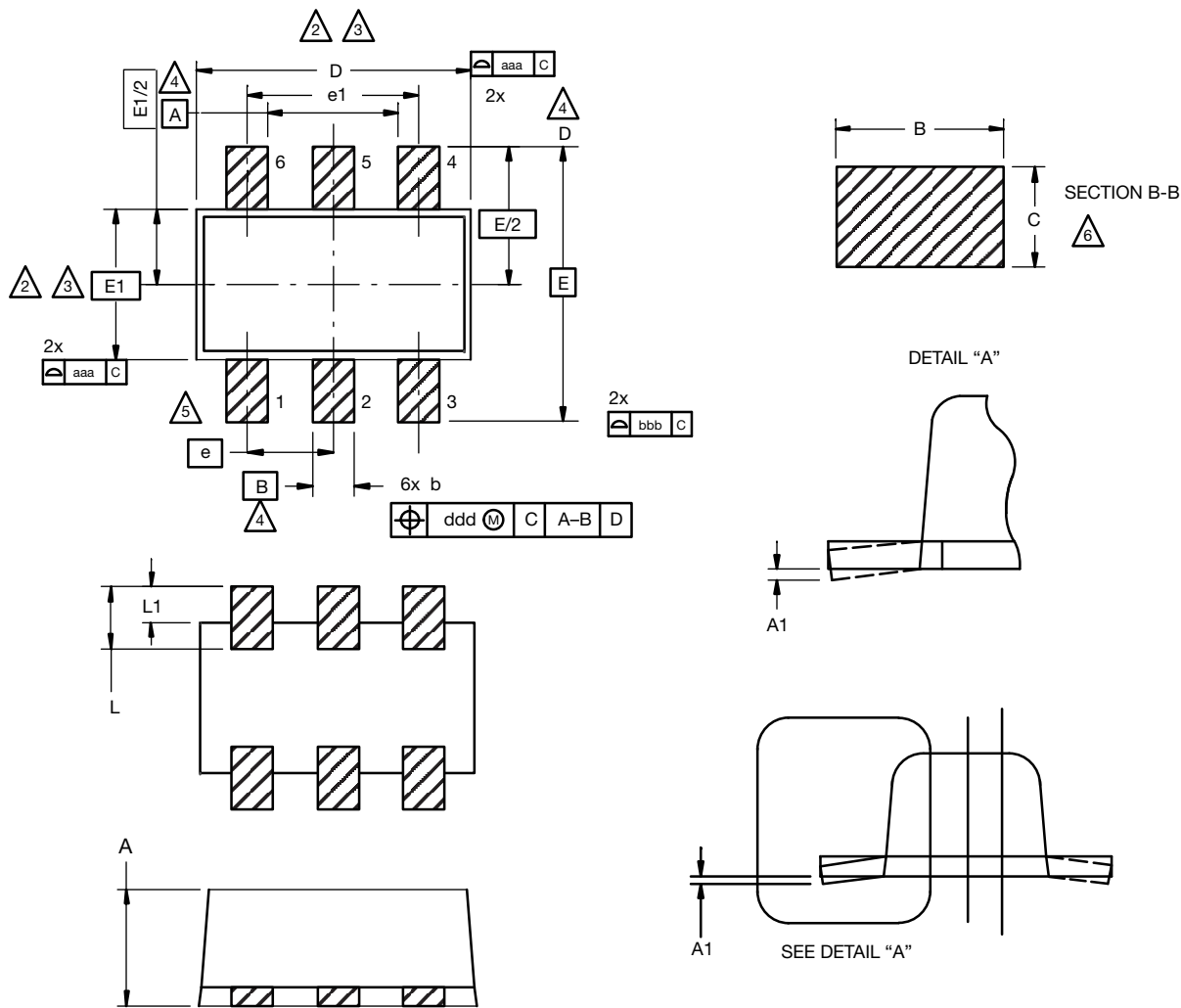
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

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



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



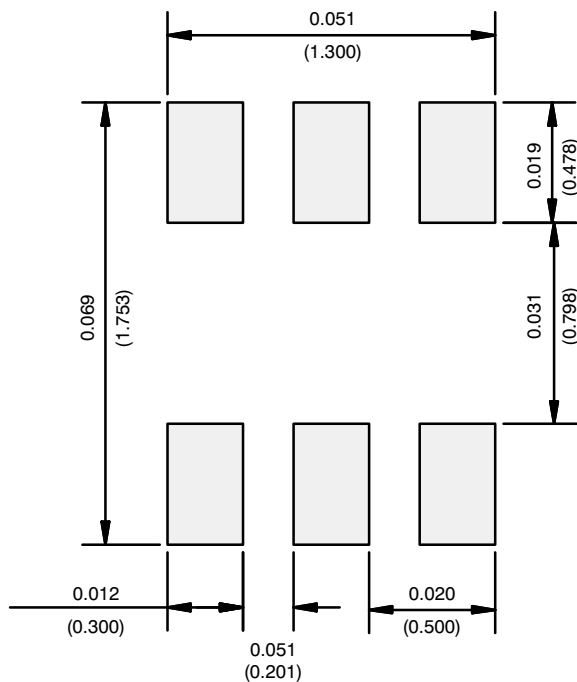
Notes

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		
	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)

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