

## N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω) Max.	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ.)
20	0.420 at V <sub>GS</sub> = 4.5 V	0.5	1 nC
	0.492 at V <sub>GS</sub> = 2.5 V	0.2	
	0.597 at V <sub>GS</sub> = 1.8 V	0.2	
	0.762 at V <sub>GS</sub> = 1.5 V	0.05	

### FEATURES

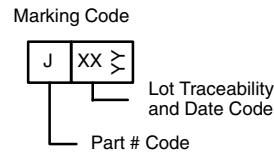
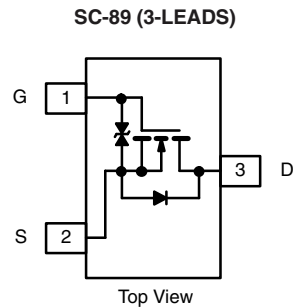
- TrenchFET® Power MOSFET
- Gate-Source ESD Protected: 1000 V
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Load/Power Switching for Portable Devices
- Drivers: Relays, Solenoids, Lamps, Hammers, Displays, Memories
- Battery Operated Systems
- Power Supply Converter Circuits



Ordering Information: Si1062X-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS (T <sub>A</sub> = 25 °C, unless otherwise noted)				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V <sub>DS</sub>	20	V	
Gate-Source Voltage	V <sub>GS</sub>	± 8		
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	T <sub>A</sub> = 25 °C	0.53 <sup>a, b</sup>	A	
	T <sub>A</sub> = 70 °C	0.43 <sup>a, b</sup>		
Pulsed Drain Current (t = 300 μs)	I <sub>DM</sub>	2		
Continuous Source-Drain Diode Current	T <sub>A</sub> = 25 °C	I <sub>S</sub>	0.18 <sup>a, b</sup>	A
Maximum Power Dissipation <sup>a</sup>	T <sub>A</sub> = 25 °C	P <sub>D</sub>	0.22 <sup>a, b</sup>	W
	T <sub>A</sub> = 70 °C		0.14 <sup>a, b</sup>	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typ.	Max.	Unit	
Maximum Junction-to-Ambient <sup>b</sup>	R <sub>thJA</sub>	t ≤ 5 s	440	530	°C/W
		Steady State	540	650	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. t = 5 s.

SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	20			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		11		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	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 8\text{ V}$			$\pm 30$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 4.5\text{ V}$			$\pm 1$	
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 <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$ , $V_{GS} = 4.5\text{ V}$	2			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}$ , $I_D = 0.5\text{ A}$		0.350	0.420	$\Omega$
		$V_{GS} = 2.5\text{ V}$ , $I_D = 0.2\text{ A}$		0.410	0.492	
		$V_{GS} = 1.8\text{ V}$ , $I_D = 0.2\text{ A}$		0.459	0.597	
		$V_{GS} = 1.5\text{ V}$ , $I_D = 0.05\text{ A}$		0.510	0.762	
Forward Transconductance	$g_{fs}$	$V_{DS} = 10\text{ V}$ , $I_D = 0.5\text{ A}$		7.5		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		43		pF
Output Capacitance	$C_{oss}$			14		
Reverse Transfer Capacitance	$C_{rss}$			8		
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 8\text{ V}$ , $I_D = 0.5\text{ A}$		1.8	2.7	nC
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 0.5\text{ A}$		1	2	
Gate-Drain Charge	$Q_{gd}$			0.16		
Gate Resistance	$R_g$		$f = 1\text{ MHz}$		0.13	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}$ , $R_L = 20\text{ }\Omega$ $I_D \cong 0.4\text{ A}$ , $V_{GEN} = 4.5\text{ V}$ , $R_g = 1\text{ }\Omega$		2	4	ns
Rise Time	$t_r$			14	24	
Turn-Off Delay Time	$t_{d(off)}$			16	30	
Fall Time	$t_f$			11	20	
<b>Drain-Source Body Diode Characteristics</b>						
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				2	A
Body Diode Voltage	$V_{SD}$	$I_S = 0.4\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 0.4\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		10	15	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			2	4	nC
Reverse Recovery Fall Time	$t_a$			5		ns
Reverse Recovery Rise Time	$t_b$			5		

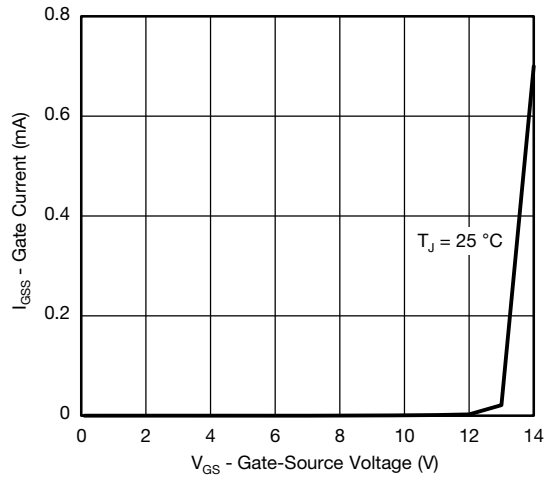
## Notes:

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

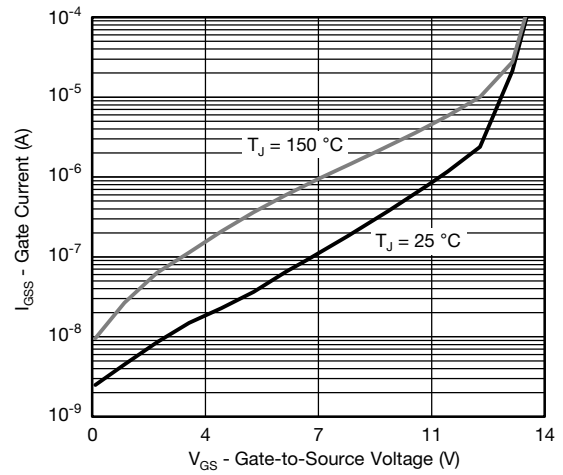
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



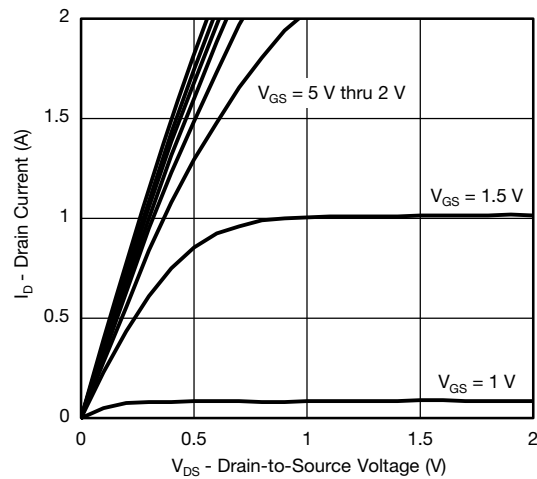
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



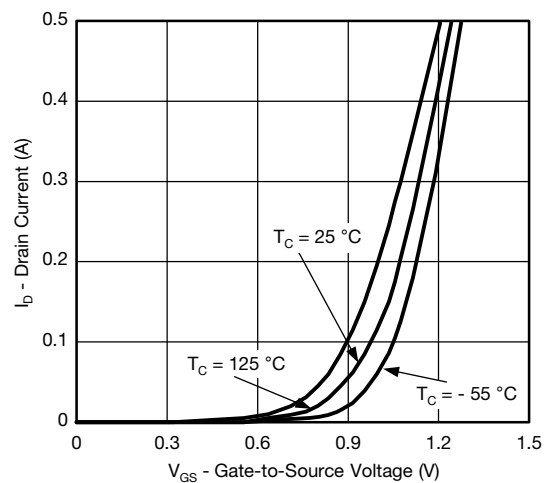
Gate Current vs. Gate-Source Voltage



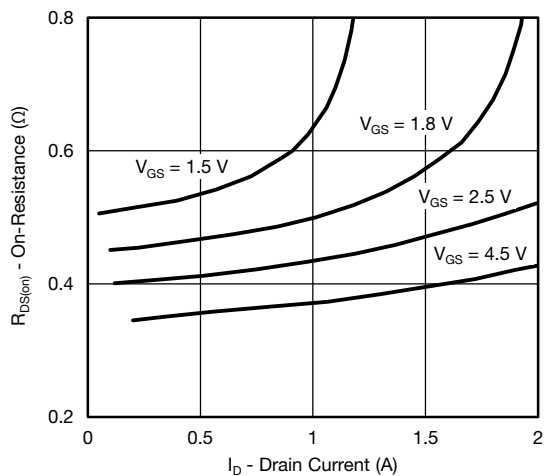
Gate Current vs. Gate-Source Voltage



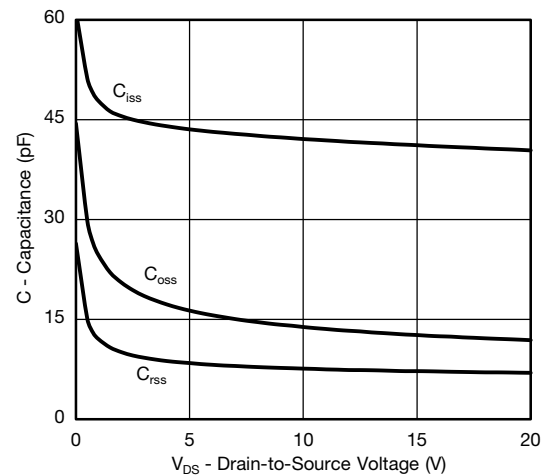
Output Characteristics



Transfer Characteristics



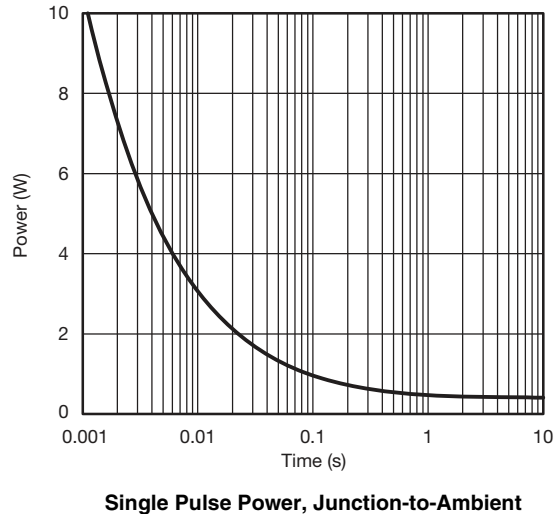
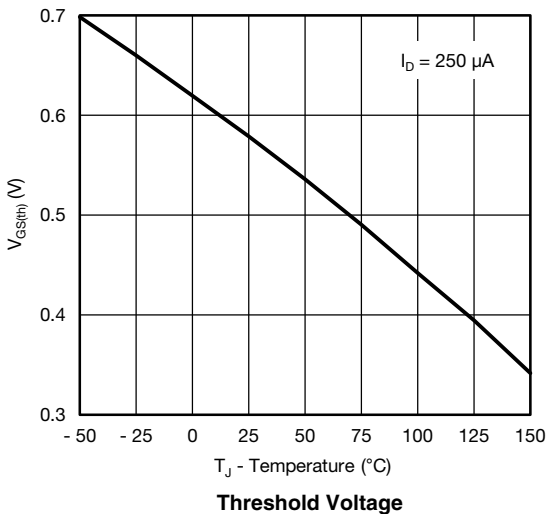
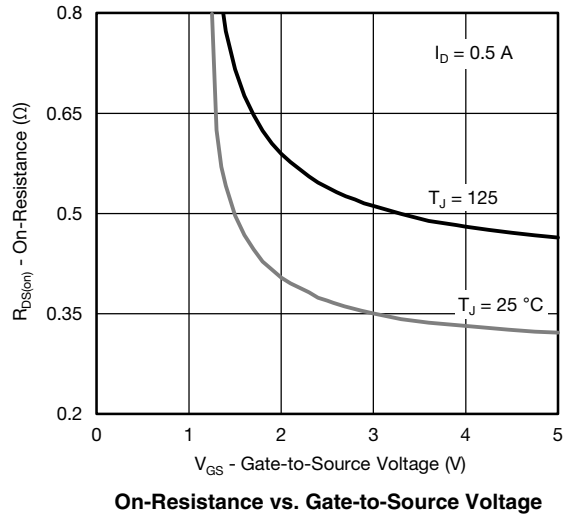
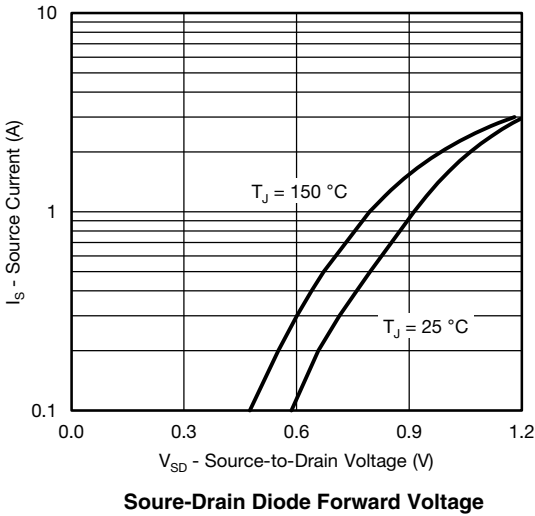
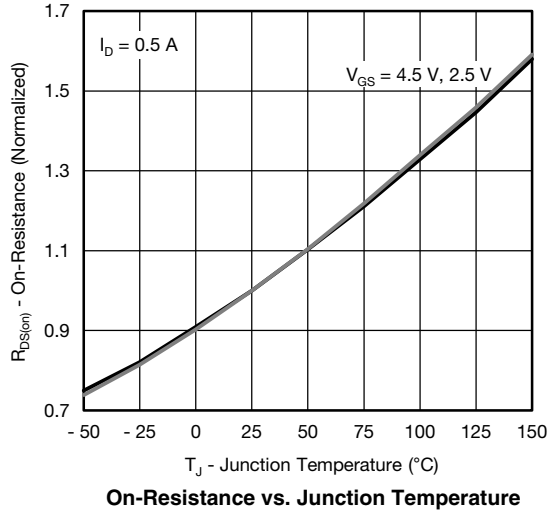
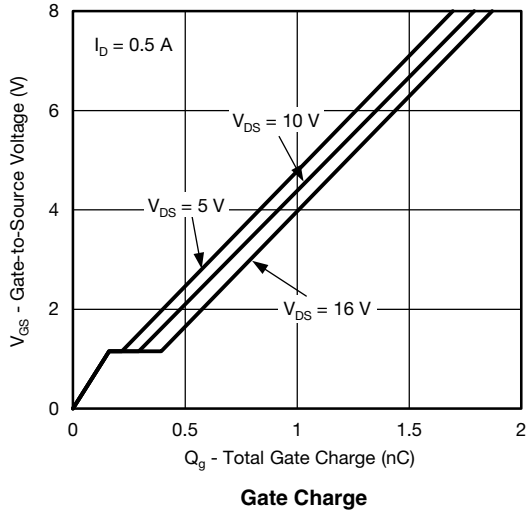
On-Resistance vs. Drain Current



Capacitance

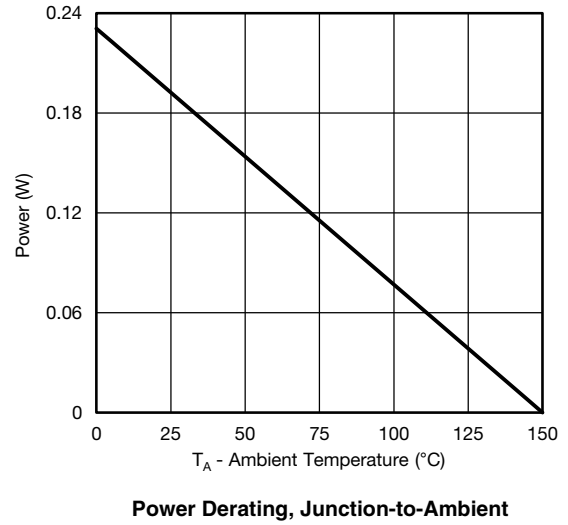
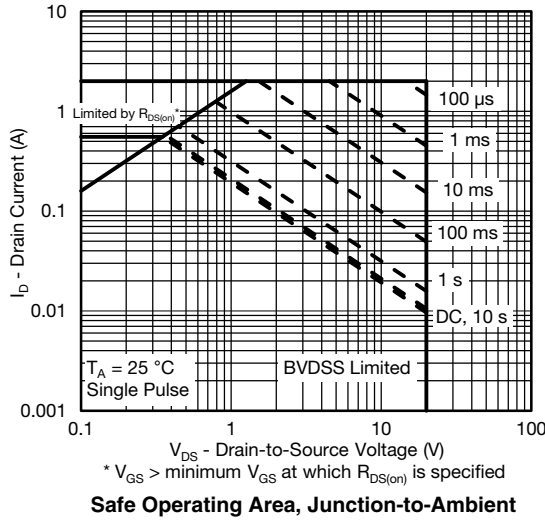


**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

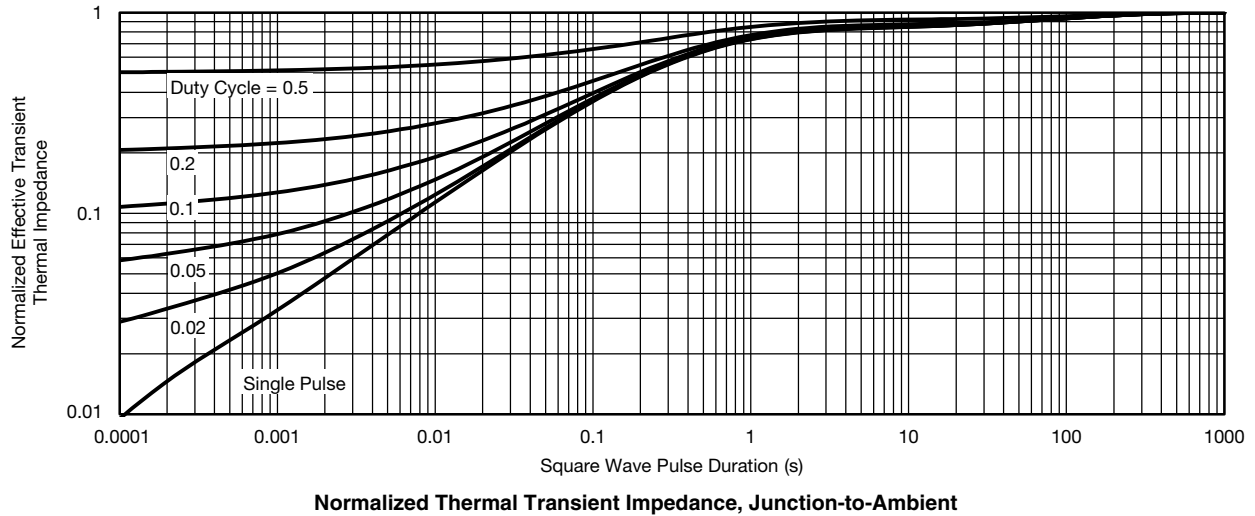




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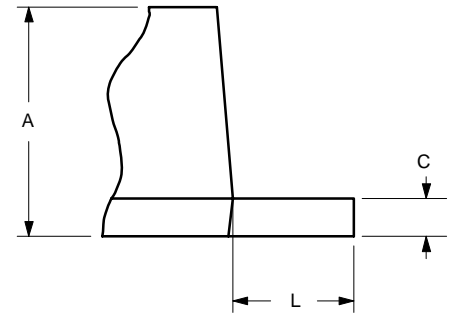
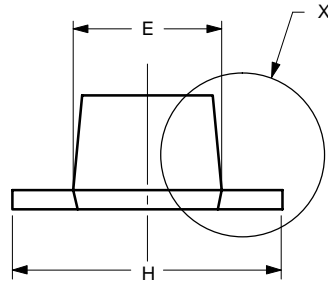
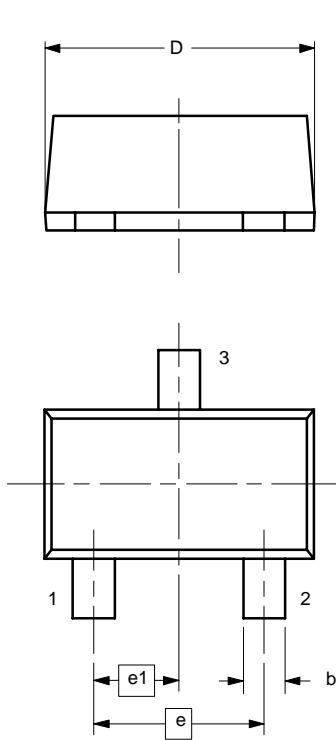
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150\text{ }^\circ\text{C}$ , using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



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SC89-3

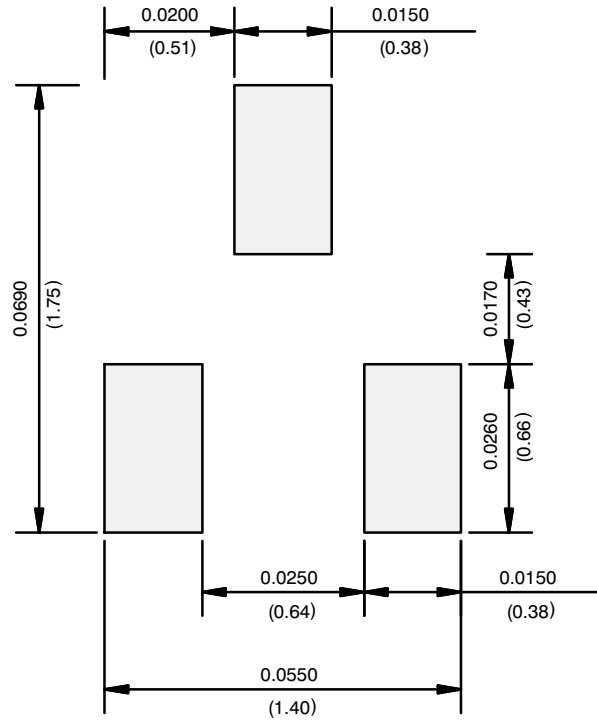


DETAIL X

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
<b>A</b>	0.60	0.80	0.024	0.031
<b>b</b>	0.23	0.33	0.009	0.013
<b>C</b>	0.10	0.20	0.004	0.008
<b>D</b>	1.50	1.70	0.059	0.067
<b>E</b>	0.75	0.95	0.030	0.037
<b>e</b>	1.00 BSC		0.040 BSC	
<b>e<sub>1</sub></b>	0.50 BSC		0.020 BSC	
<b>H</b>	1.50	1.70	0.059	0.067
<b>L</b>	0.30	0.50	0.012	0.020

ECN: S-03946—Rev. B, 09-Jul-01  
DWG: 5869

## RECOMMENDED MINIMUM PADS FOR SC-89: 3-Lead



Recommended Minimum Pads  
Dimensions in Inches/(mm)

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