

P-Channel 12 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω) Max.	I _D (A)	Q _g (Typ.)
- 12	0.640 at V _{GS} = - 4.5 V	- 0.48	1.15 nC
	0.880 at V _{GS} = - 2.5 V	- 0.41	
	1.200 at V _{GS} = - 1.8 V	- 0.35	
	1.443 at V _{GS} = - 1.5 V	- 0.10	
	2.475 at V _{GS} = - 1.2 V	- 0.05	

FEATURES

- TrenchFET® Power MOSFET
- Typical ESD protection: 700 V (HBM)
- Fast Switching Speed
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912

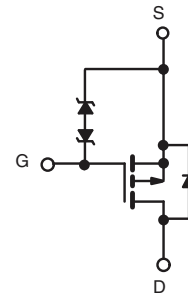
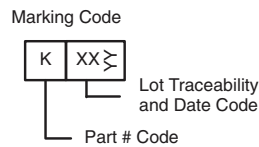
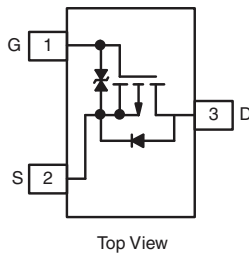


RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Portable Devices such as Smart Phones, Tablet PCs and Mobile Computing
 - Load Switch for Low Voltage Gate Drive
 - Load Switch for 1.2 V Power Line

SC-89 (3-LEADS)



Ordering Information: Si1011X-T1-GE3 (Lead (Pb)-free and Halogen-free)

P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	- 12	V	
Gate-Source Voltage	V _{GS}	± 5		
Continuous Drain Current (T _J = 150 °C)	I _D	T _A = 25 °C	- 0.48 ^{b, c}	A
		T _A = 70 °C	- 0.38 ^{b, c}	
Pulsed Drain Current (t = 300 μs)	I _{DM}	- 1.5		
Continuous Source-Drain Diode Current	I _S	- 0.16 ^{b, c}		
Maximum Power Dissipation	P _D	T _A = 25 °C	0.19 ^{b, c}	W
		T _A = 70 °C	0.12 ^{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	440	530	°C/W
		Steady State	540	650	

Notes:

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

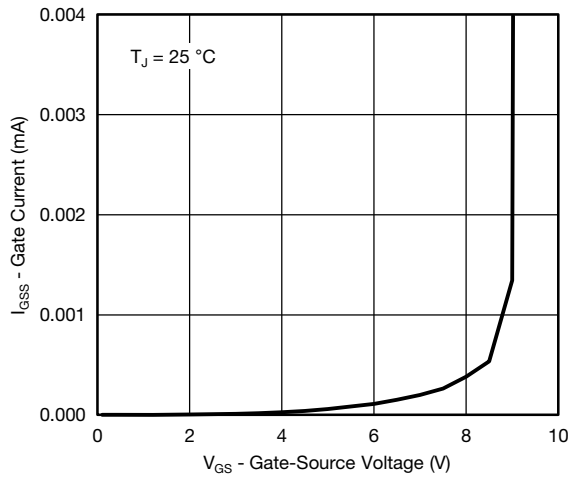
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0, I_D = -250\text{ }\mu\text{A}$	- 12			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 7		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			1.7		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	- 0.35		- 0.8	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 5\text{ V}$			± 10	μA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 1	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$			- 1	
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			- 10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	- 1.5			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -0.4\text{ A}$		0.530	0.640	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -0.2\text{ A}$		0.730	0.880	
		$V_{GS} = -1.8\text{ V}, I_D = -0.1\text{ A}$		0.920	1.200	
		$V_{GS} = -1.5\text{ V}, I_D = -0.05\text{ A}$		1.100	1.443	
		$V_{GS} = -1.2\text{ V}, I_D = -0.05\text{ A}$		1.650	2.475	
Forward Transconductance	g_{fs}	$V_{DS} = -6\text{ V}, I_D = -0.4\text{ A}$		1		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		62		μF
Output Capacitance	C_{oss}			26		
Reverse Transfer Capacitance	C_{rss}			20		
Total Gate Charge	Q_g	$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -0.4\text{ A}$		2	4	nC
				1.15	2	
Gate-Source Charge	Q_{gs}	$V_{DS} = -6\text{ V}, V_{GS} = -2.5\text{ V}, I_D = -0.4\text{ A}$		0.37		
Gate-Drain Charge	Q_{gd}			0.43		
Gate Resistance	R_g		$f = 1\text{ MHz}$		12	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 20\text{ }\Omega$ $I_D \cong -0.3\text{ A}, V_{GEN} = -5\text{ V}, R_g = 1\text{ }\Omega$		4	8	ns
Rise Time	t_r			11	20	
Turn-Off Delay Time	$t_{d(off)}$			9	18	
Fall Time	t_f			9	18	
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}	$I_F = -0.3\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		12	20	ns
Body Diode Reverse Recovery Charge	Q_{rr}			5	10	nC
Reverse Recovery Fall Time	t_a			7		ns
Reverse Recovery Rise Time	t_b			5		

Notes:

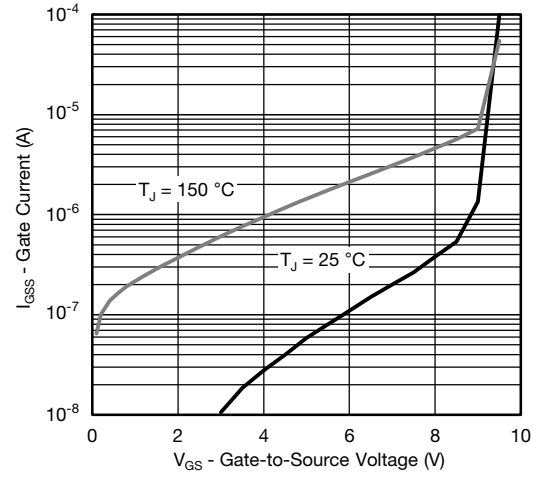
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

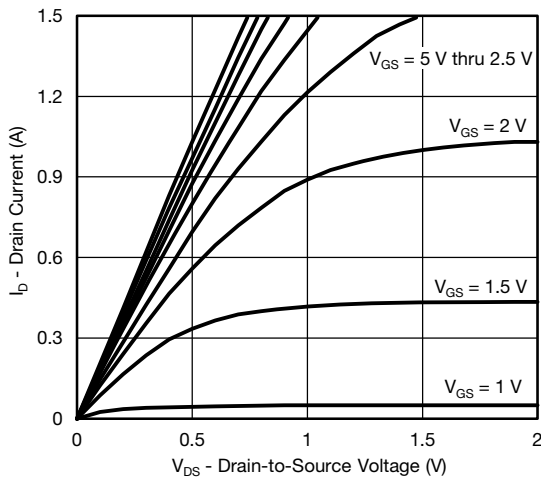
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



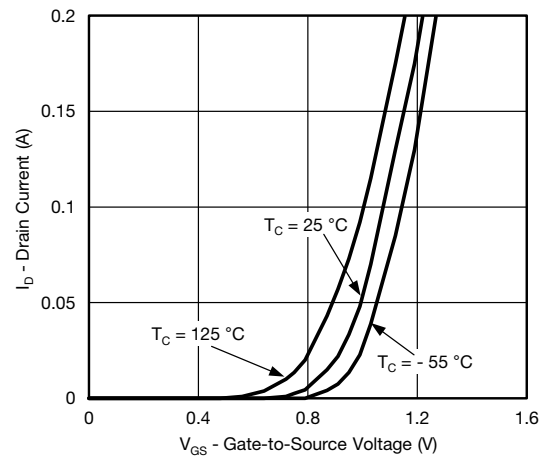
Gate Current vs. Gate-Source Voltage



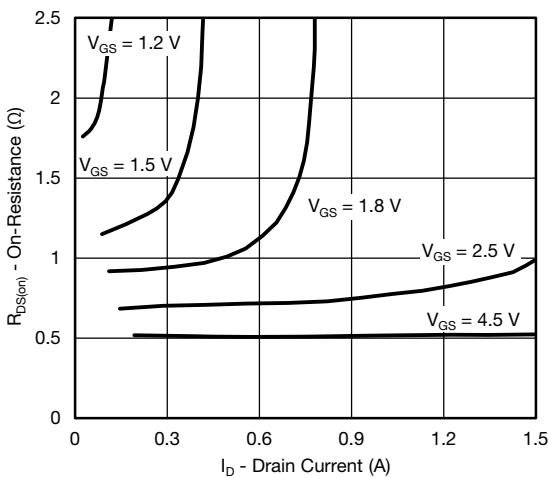
Gate Current vs. Gate-Source Voltage



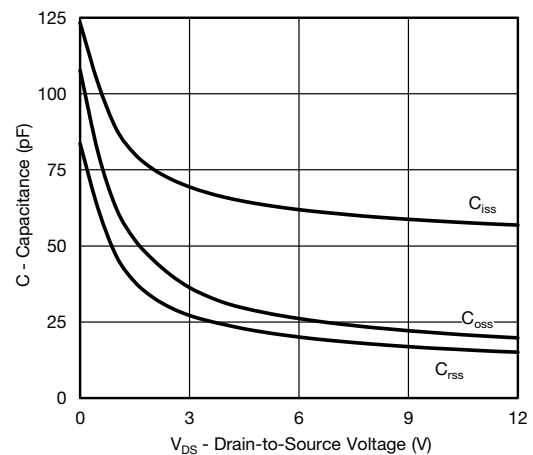
Output Characteristics



Transfer Characteristics

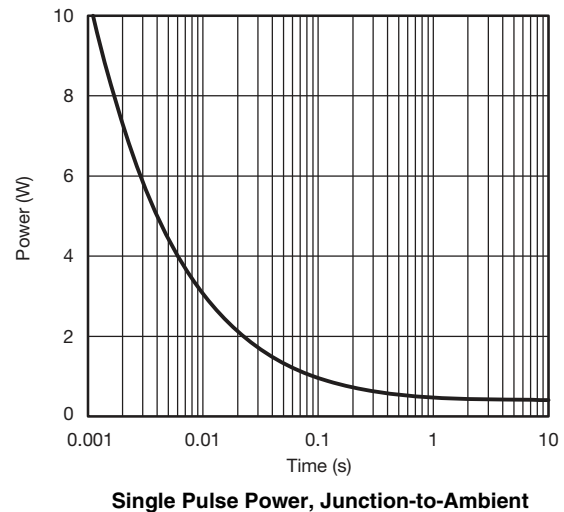
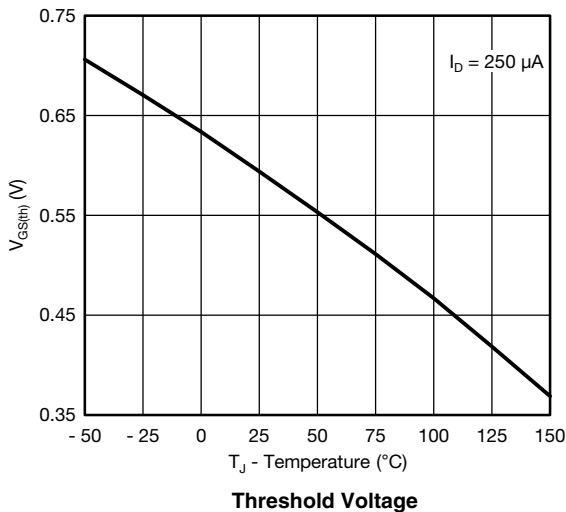
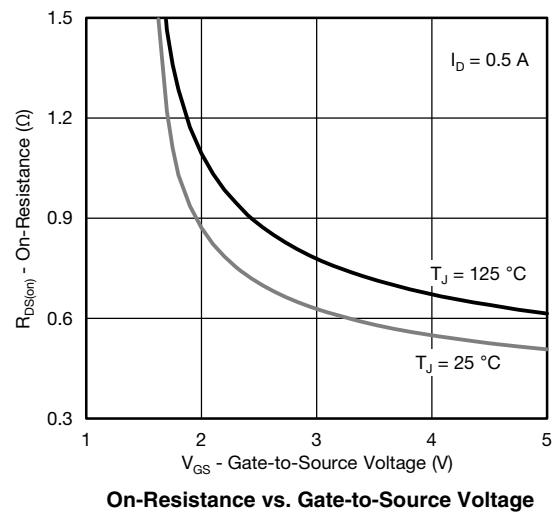
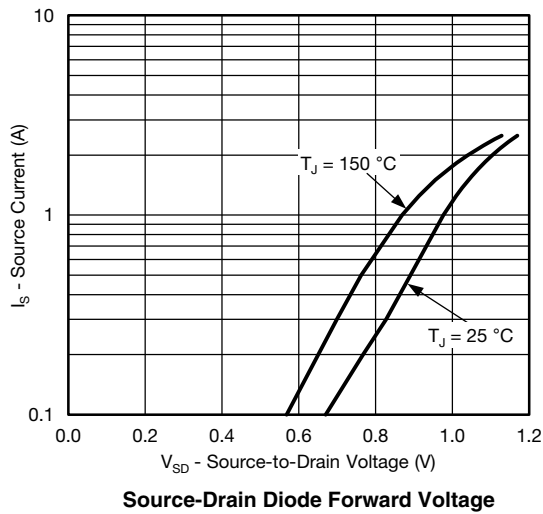
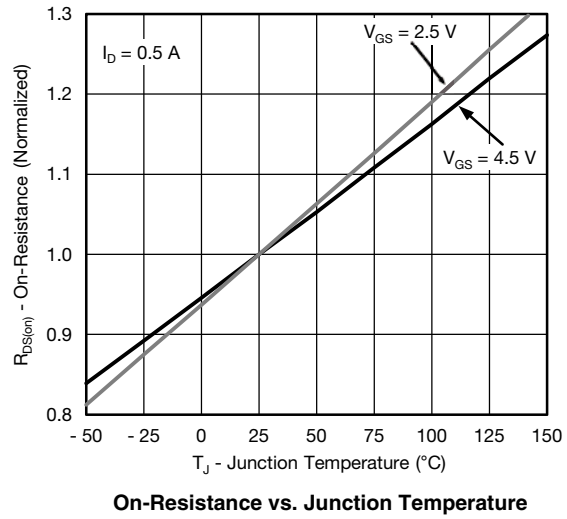
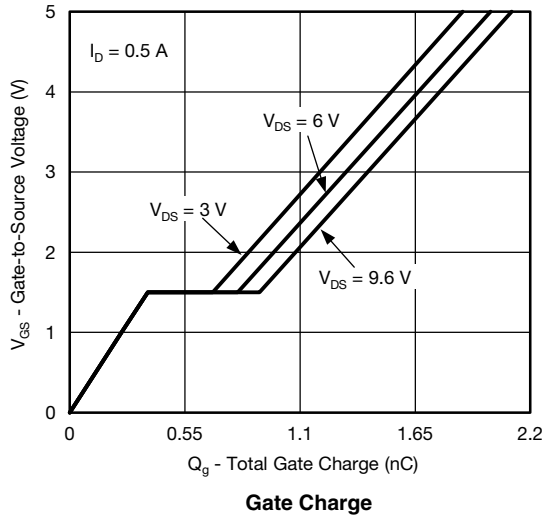


On-Resistance vs. Drain Current

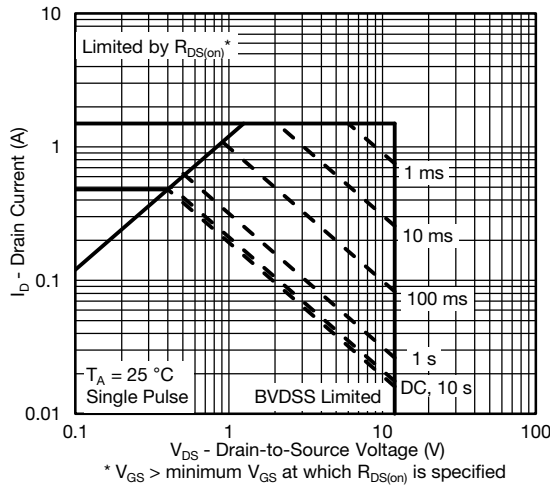


Capacitance

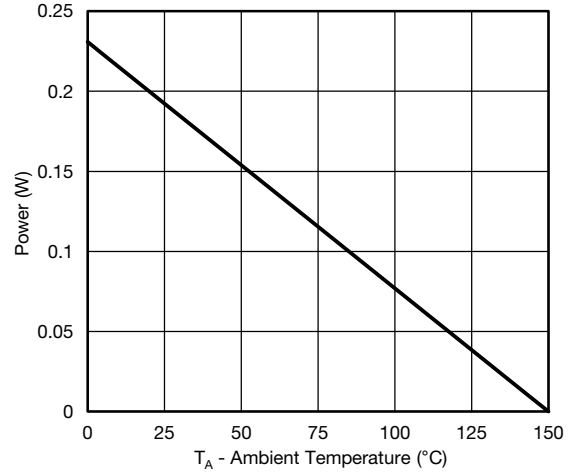
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



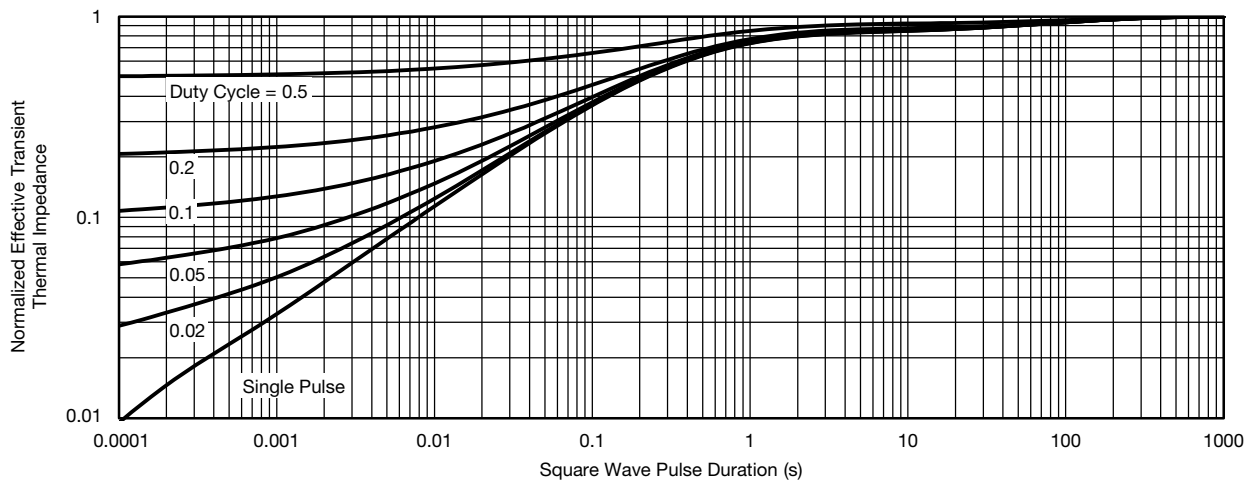
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



Power Derating, Junction-to-Ambient

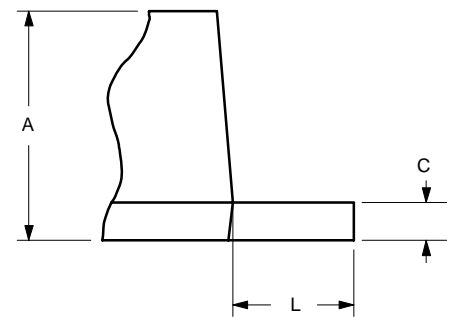
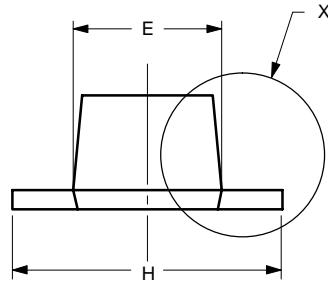
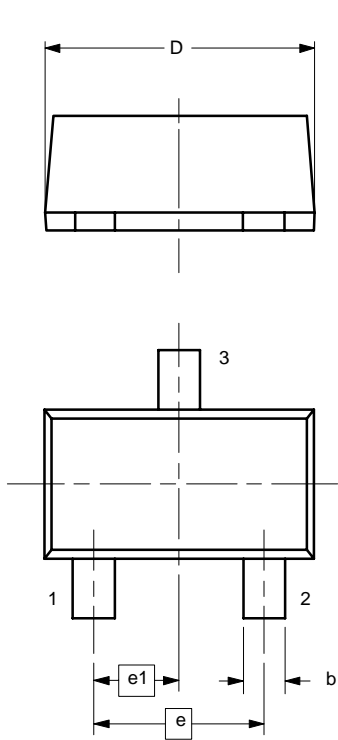


Normalized Thermal Transient Impedance, Junction-to-Ambient

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SC89-3

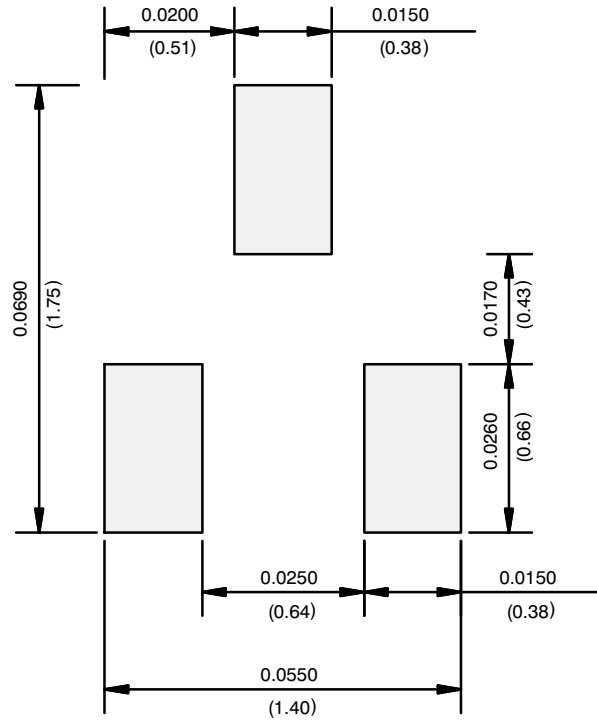


DETAIL X

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.60	0.80	0.024	0.031
b	0.23	0.33	0.009	0.013
C	0.10	0.20	0.004	0.008
D	1.50	1.70	0.059	0.067
E	0.75	0.95	0.030	0.037
e	1.00 BSC		0.040 BSC	
e₁	0.50 BSC		0.020 BSC	
H	1.50	1.70	0.059	0.067
L	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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