

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

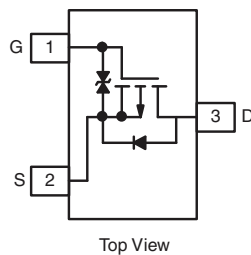


RoHS
COMPLIANT
HALOGEN
FREE

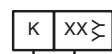
APPLICATIONS

- 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

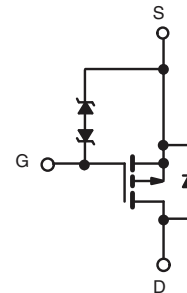
SC-89 (3-LEADS)



Marking Code



Lot Traceability
and Date Code
Part # Code



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	- 0.48 ^{b, c}	A
		- 0.38 ^{b, c}	
Pulsed Drain Current ($t = 300$ μ s)	I_{DM}	- 1.5	
Continuous Source-Drain Diode Current	I_S	- 0.16 ^{b, c}	W
Maximum Power Dissipation	P_D	0.19 ^{b, 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}	440	530	°C/W
		540	650	

Notes:

a. Maximum under steady state conditions is 650 °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, I _D = - 250 μA	- 12			V	
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = - 250 μA		- 7		mV/°C	
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J			1.7			
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = - 250 μA	- 0.35		- 0.8	V	
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 5 V			± 10	μA	
		V _{DS} = 0 V, V _{GS} = ± 4.5 V			± 1		
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = - 12 V, V _{GS} = 0 V			- 1		
		V _{DS} = - 12 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 = - 0.4 A		0.530	0.640	Ω	
		V _{GS} = - 2.5 V, I _D = - 0.2 A		0.730	0.880		
		V _{GS} = - 1.8 V, I _D = - 0.1 A		0.920	1.200		
		V _{GS} = - 1.5 V, I _D = - 0.05 A		1.100	1.443		
		V _{GS} = - 1.2 V, I _D = - 0.05 A		1.650	2.475		
Forward Transconductance	g _{fs}	V _{DS} = - 6 V, I _D = - 0.4 A		1		S	
Dynamic ^b							
Input Capacitance	C _{iss}	V _{DS} = - 6 V, V _{GS} = 0 V, f = 1 MHz		62		pF	
Output Capacitance	C _{oss}			26			
Reverse Transfer Capacitance	C _{rss}			20			
Total Gate Charge	Q _g	V _{DS} = - 6 V, V _{GS} = - 4.5 V, I _D = - 0.4 A		2	4	nC	
Gate-Source Charge	Q _{gs}	V _{DS} = - 6 V, V _{GS} = - 2.5 V, I _D = - 0.4 A		1.15	2		
Gate-Drain Charge	Q _{gd}			0.37			
				0.43			
Gate Resistance	R _g	f = 1 MHz		12		Ω	
Turn-On Delay Time	t _{d(on)}	V _{DD} = - 6 V, R _L = 20 Ω I _D ≅ - 0.3 A, V _{GEN} = - 5 V, R _g = 1 Ω		4	8	ns	
Rise Time	t _r			11	20		
Turn-Off DelayTime	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 A		- 0.8	- 1.2	V	
Body Diode Reverse Recovery Time	t _{rr}	I _F = - 0.3 A, dI/dt = 100 A/μs		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			

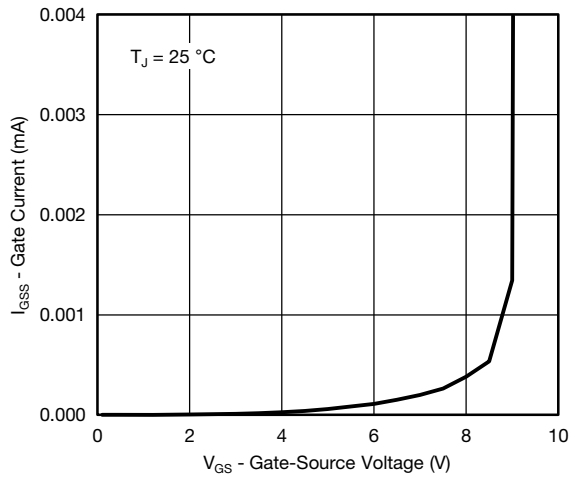
Notes:

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

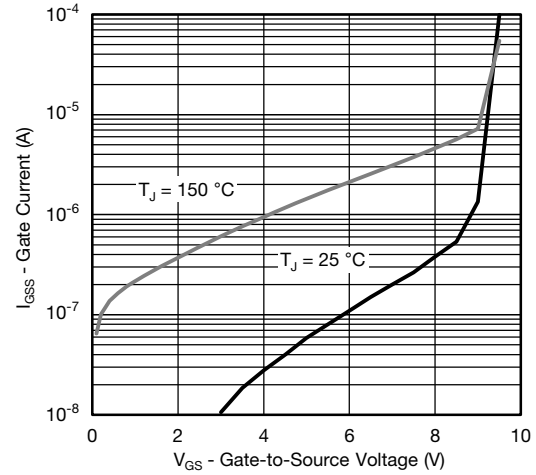
b. Guaranteed by design, not subject to production testing.

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.

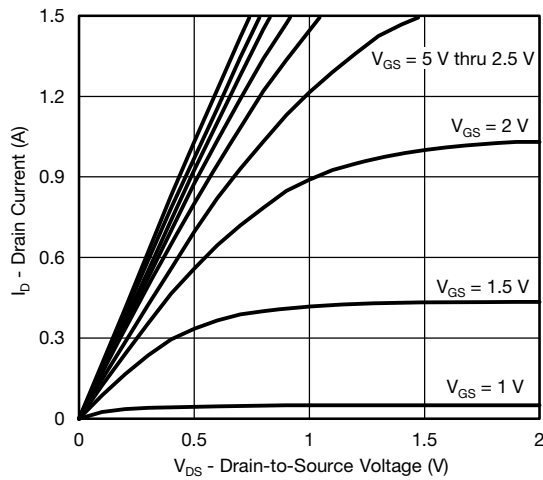
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



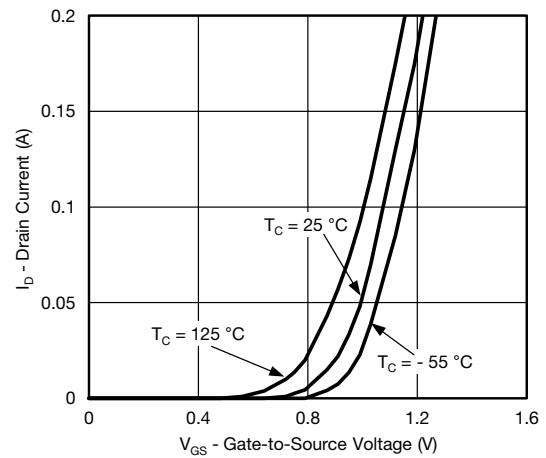
Gate Current vs. Gate-Source Voltage



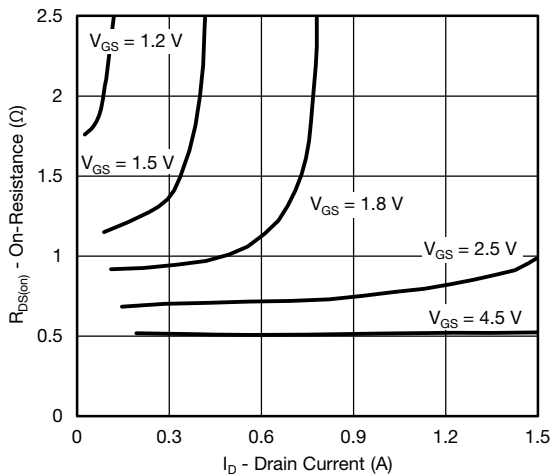
Gate Current vs. Gate-Source Voltage



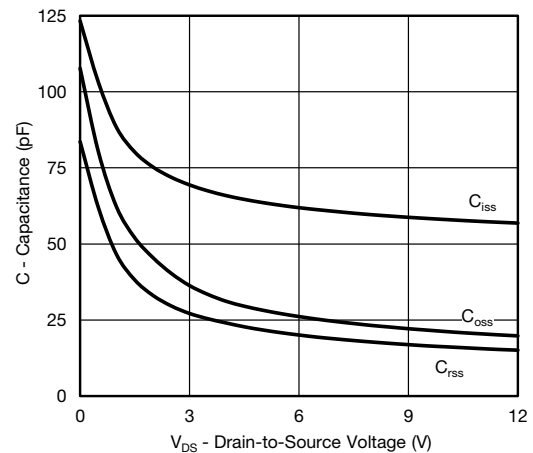
Output Characteristics



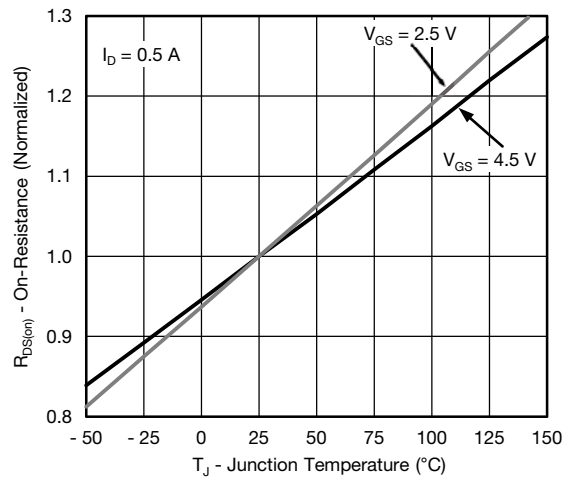
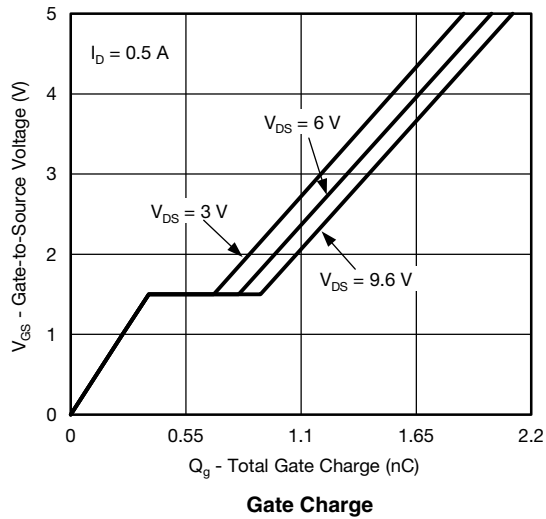
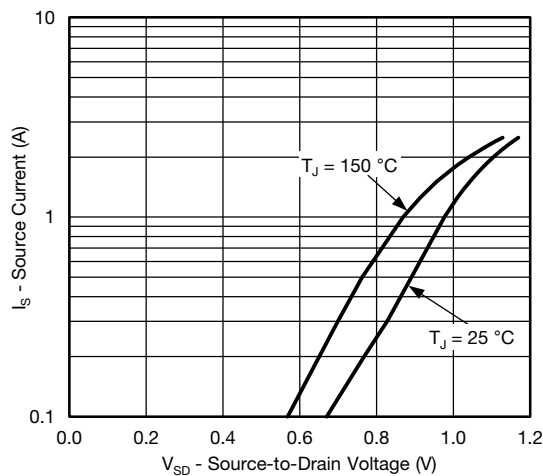
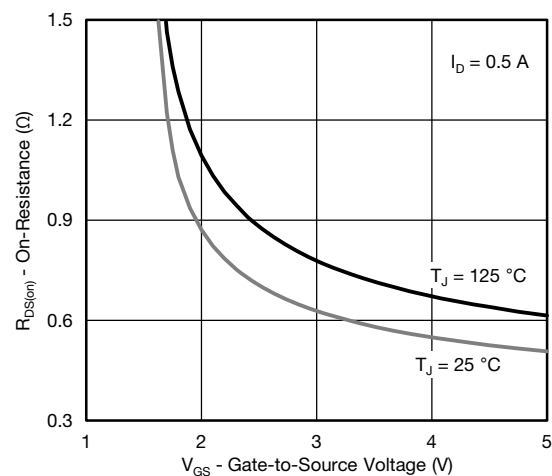
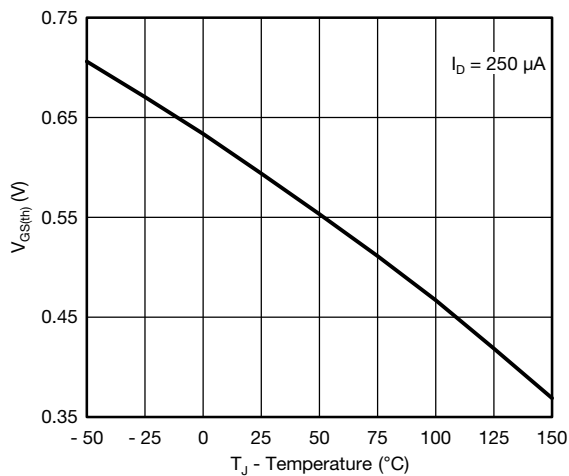
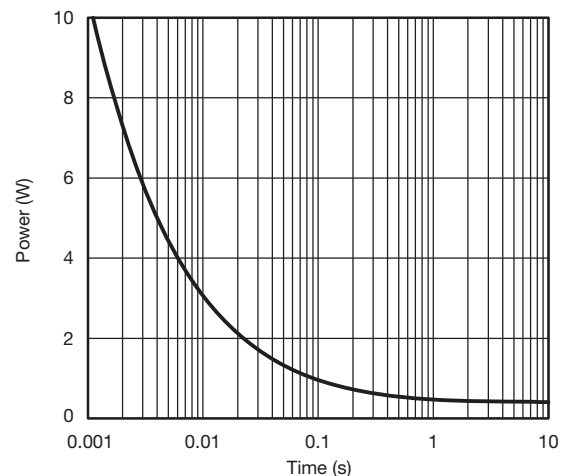
Transfer Characteristics



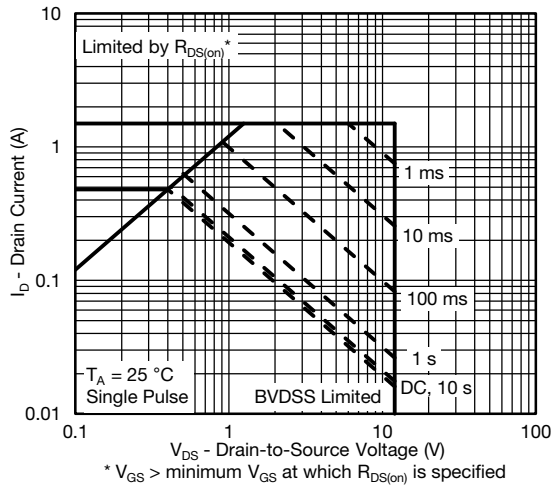
On-Resistance vs. Drain Current



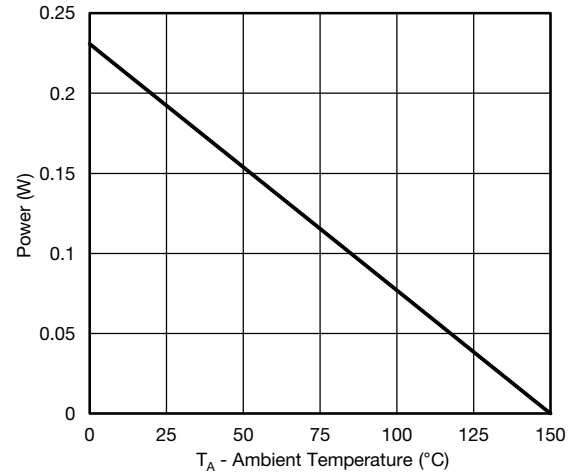
Capacitance

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

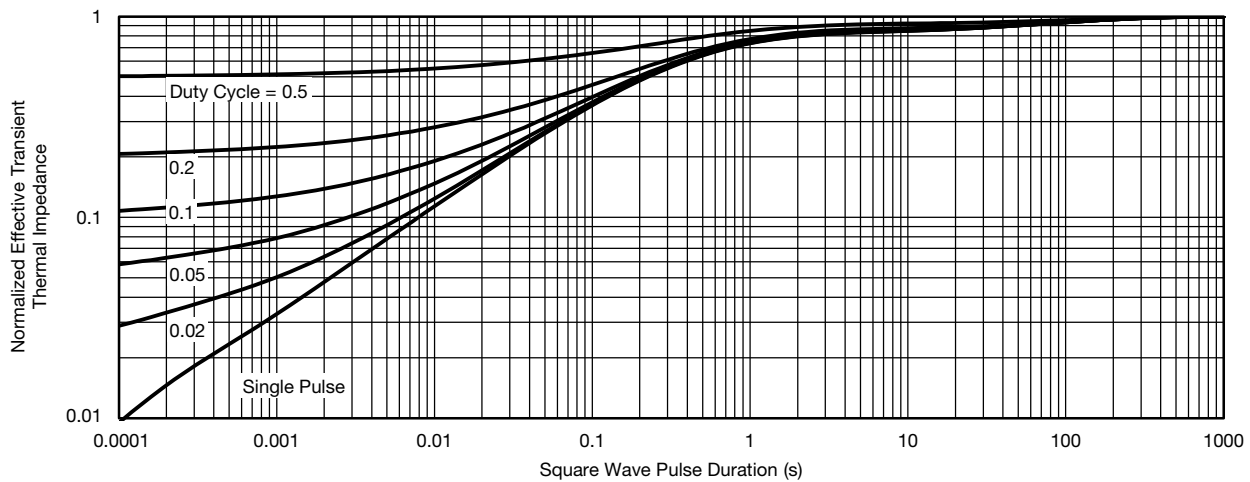
P-CHANNEL TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient



Power Derating, Junction-to-Ambient

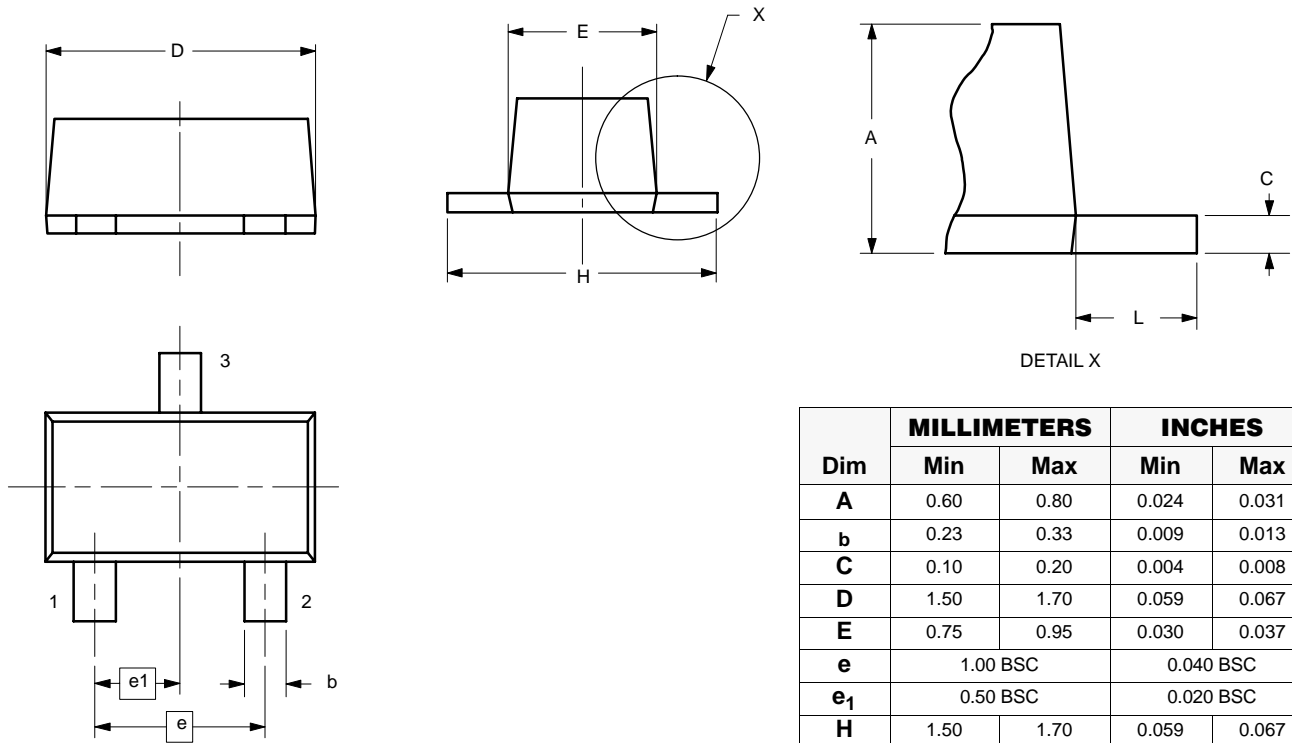


Normalized Thermal Transient Impedance, Junction-to-Ambient

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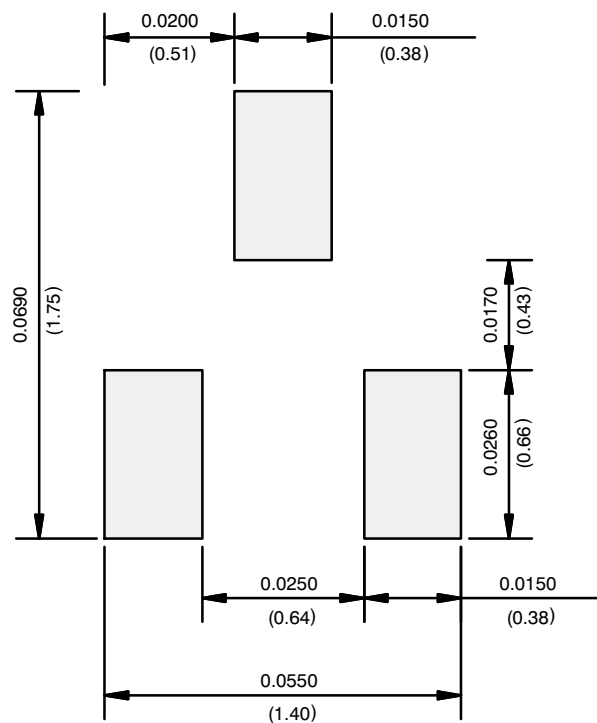
SC89-3



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	
e ₁	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)

[Return to Index](#)



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