Preliminary

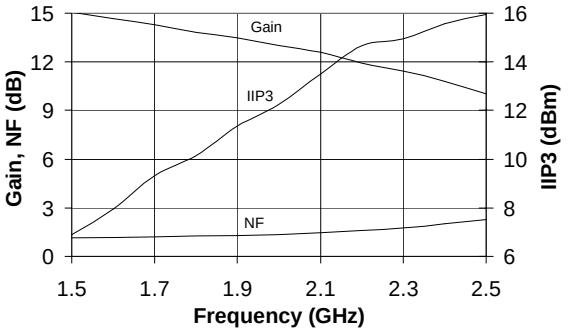
SGL-0263

1.5 - 2.4 GHz, Cascadable SiGe HBT MMIC Low Noise Amplifier

Product Description

Sirenza Microdevices' SGL-0263 is a high performance SiGe HBT MMIC low noise amplifier featuring 1 micron emitters with F_T up to 50 GHz. It is designed for operation at voltages as low as 2.5V. The SGL-0263 has been characterized at Vd = 3V for low power and 4V for medium power applications. This device has an internal temperature compensation circuit and can be operated directly from 3-4V supply. Only 2 DC-blocking capacitors, input matching components (depending upon frequency), a bias resistor, and an optional RF choke are required for operation.

Gain, Noise Figure, IIP3 vs. Frequency
I_B = 11 mA, T = +25C



Product Features

- Low Noise Figure
- High Input /Output Intercept
- Internal Temp. Compensation Circuit
- Internally Matched to 50 Ω
- Low Power Consumption
- Single Voltage Supply
- Small Package: SOT-363

Applications

- Receivers
- Cellular, Fixed Wireless, Land Mobile
- GPS

Symbol	Parameters: Test Conditions: Application Ckt Z_0 = 50 Ohms, T = 25°C		Units	Min. (I_D=11 mA)	Typ. (I_D=11 mA)	Max. (I_D =11 mA)	Typ. (I_D =23 mA)	Notes
P_{1dB}	Output Power at 1dB Compression	f = 1900 MHz f =2100 MHz f = 2400 MHz	dBm		5.6 6.8 7.9		11.4 12.3 12.8	App. Ckt See Sht. 2,3
IIP_3	Input Third Order Intercept Point Tone spacing = 1 MHz	f = 1900 MHz f =2100 MHz f = 2400 MHz	dBm		11.3 13.5 15.5		15.1 16.8 18.4	App. Ckt See Sht. 2,3
S_{21}	Small Signal Gain	f = 1900 MHz f =2100 MHz f = 2400 MHz	dB		13.4 12.5 10.8		13.8 12.9 11.3	App. Ckt See Sht. 2,3
NF	Noise Figure, Z_S = 50 Ohms	f = 1900 MHz f =2100 MHz f = 2400 MHz	dB		1.3 1.5 2.0		1.9 2.1 2.8	App. Ckt See Sht. 2,3
S_{11}	Input Return Loss	f = 1900 MHz f =2100 MHz f = 2400 MHz	dB		18.3 17.9 9.0		21.9 16.1 9.3	App. Ckt See Sht. 2,3
S_{22}	Output Return Loss	f = 1900 MHz f =2100 MHz f = 2400 MHz	dB		16.6 14.9 11.7		17.4 15.7 12.3	App. Ckt See Sht. 2,3
S_{12}	Reverse Isolation	f = 1900 MHz f =2100 MHz f = 2400 MHz	dB		21.6 20.7 20.1		21.8 21.0 20.3	App. Ckt See Sht. 2,3
V_D	Device Voltage		Volts		3.0		4.0	
$R_{th\ j-l}$	Thermal Resistance (junction - lead)		°C/W		255			

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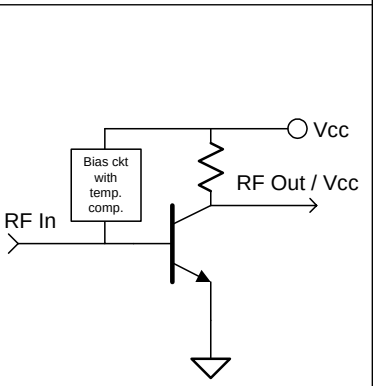
Absolute Maximum Ratings

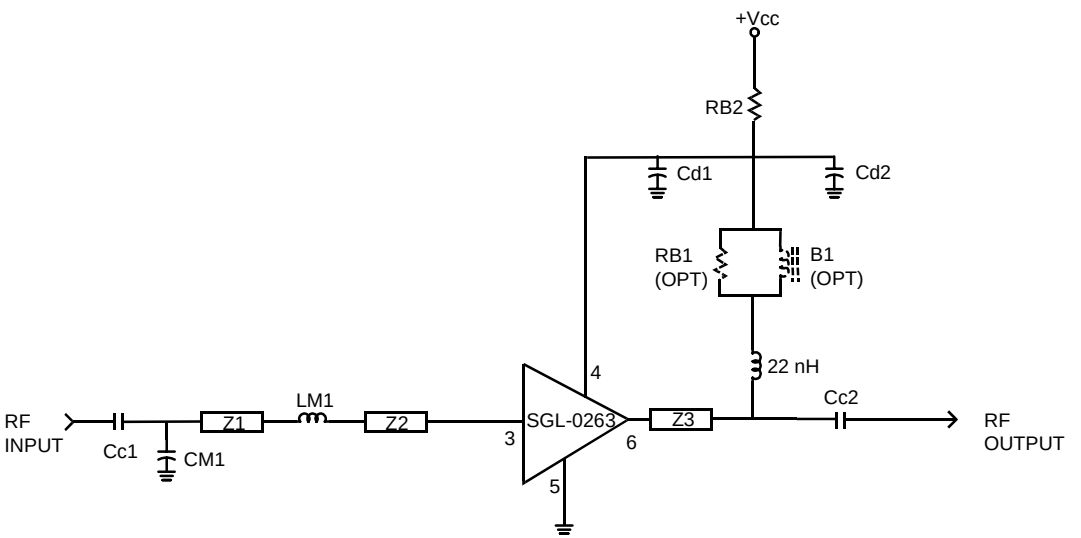
Operation of this device above any one of these parameters may cause permanent damage.

Bias Conditions should also satisfy the following expression: $I_D V_D$ (max) < (T_J - T_{OP})/R_{th},j-l

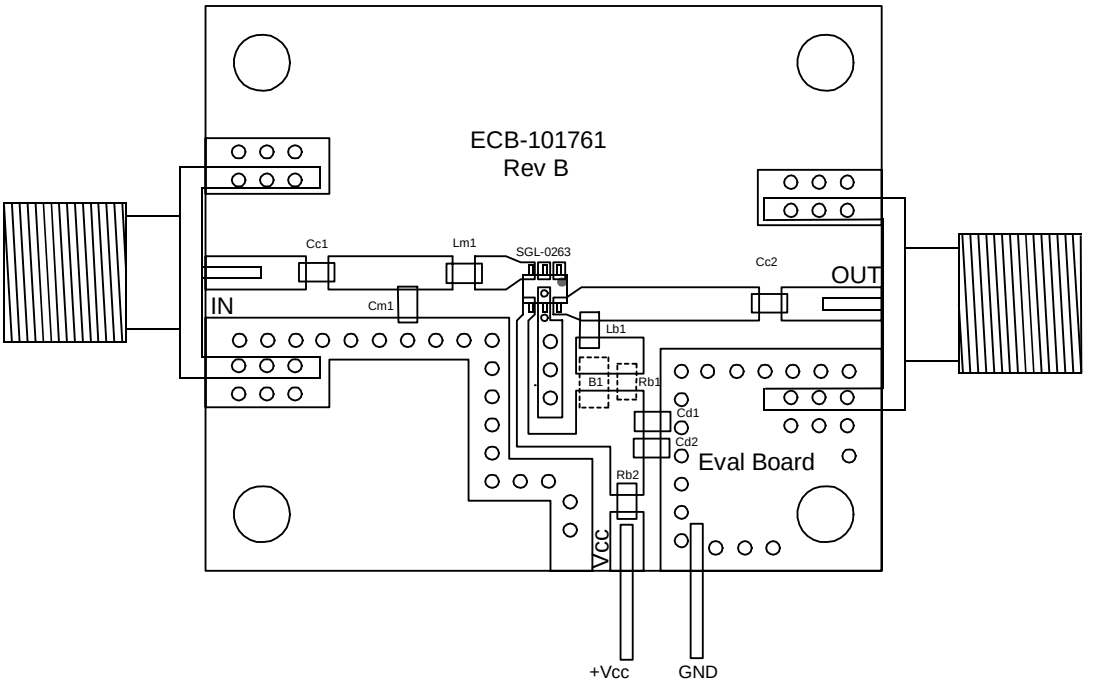
Parameter	Value	Unit
Supply Current	45	mA
Operating Temperature	-40 to +85	ºC
Maximum Input Power	10	dBm
Storage Temperature Range	-40 to +150	ºC
Operating Junction Temperature	+150	ºC
ESD voltage (Human Body Model)	400	V

Pin #	Function	Description	Device Schematic
1	N/C	No Connection.	
2	N/C	No Connection.	
3	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
4	Vcc	Supply connection. This pin should be bypassed with a suitable capacitor(s).	
5	GND	Connected to ground. For best performance use via holes as close to ground leads as possible.	
6	RF OUT VCC	RF output and DC supply. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	

Application Schematic (See Sheet 3 for layout)



SGL-0263 1.5-2.4 GHz Evaluation Board Layout (component side)



Refer to layout above and Schematic on Sheet 2 for Tables below

Application Circuit Parts List

Ref. Designator	Description	Value	Manufact. Part No.
Lb	Inductor	27 nH	TOKO LL1608-FS27NJ
LM1	Inductor	1.2 nH	TOKO LL1608-FS1R2NJ
B1 [2]	Ferrite Bead	1500 Ohms @100 MHz	FAIR-RITE 2508051527y0
Cc1,Cc2,Cd1	Capacitor,SM,0603	0.1 uF	SAMSUNG CL10B103KBNC T/R
CM1	Capacitor,SM,0603	1.0 pF	ROHM MCH185A1R0CK
Cd2	Capacitor,SM,0603	22 pF	ROHM MCH185AA220DJK
Rb1 [2]	Resistor,SM,0603	47 Ohms	PHILLIPS 9C06031A47R0 JL HFT
Rb2	Resistor,SM,0603	0 Ohms	PHILLIPS 9C06031A0R00 JL HFT
N/A [1]	Circuit Board	N/A	Stanford Microdevices ECB101761 Rev B

I/O Microstrip Parameters

I/O Microstrip Parameters	Value	Units
Width	.059	Inches
Dielectric Thickness	.029	Inches
Conductor Thickness	.001	Inches
Dielectric Constant	4.1	None

Table of Delay Elements

Ref. Des.	Zc (Ohms)	Phase shift @ 2GHz
Z1	50	11
Z2	50	13
Z3	50	6

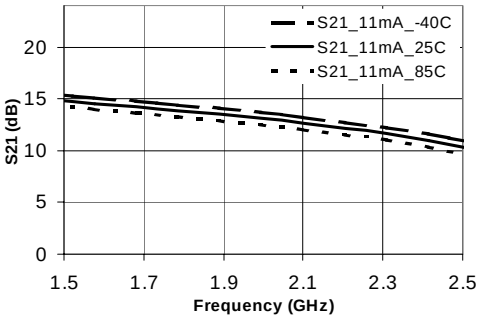
Notes:

(1) Circuit board dielectric material is GETEK,ML200C

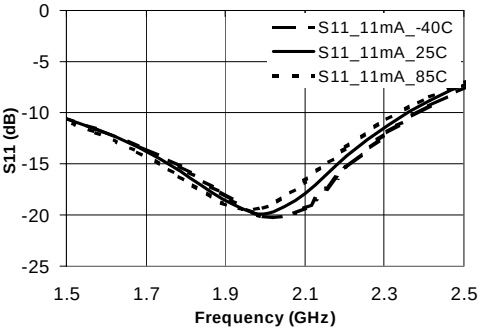
(2) B1 and Rb1 recommended for improved K-factor but are optional *

SGL-0263 1.5-2.4 GHz Evaluation Board
Scalar S-Parameters at Id=11mA

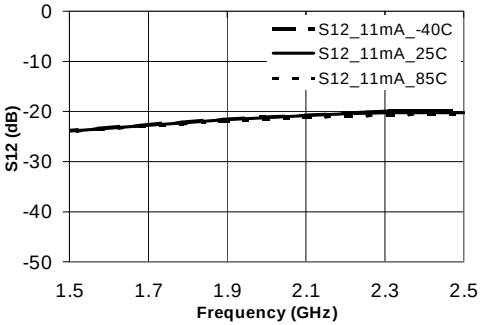
S21vs. Frequency,T=-40C,+25C,+85C
I_d = 11 mA



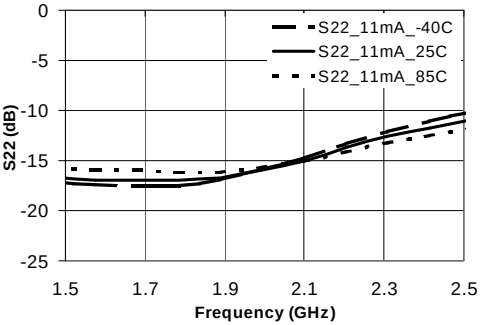
S11vs. Frequency,T=-40C,+25C,+85C
I_d = 11 mA



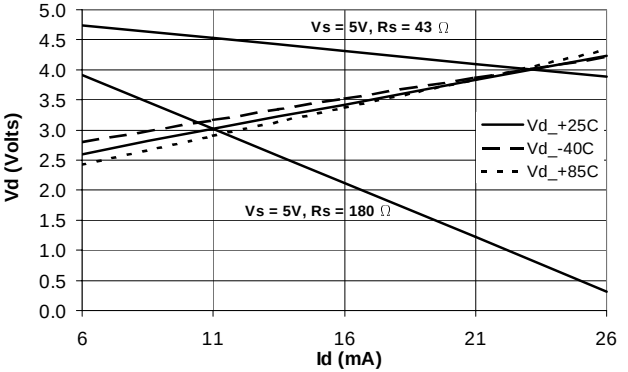
S12vs. Frequency,T=-40C,+25C,+85C
I_d = 11 mA



S22vs. Frequency,T=-40C,+25C,+85C
I_d = 11 mA

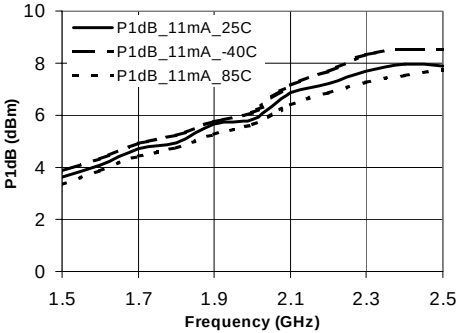


Device Voltage (Vd) vs. Device Current (Id)
for T = -40C, +25C, & +85C
Load lines for Vs =+5 Volts, Rs=43 Ω and 180 Ω

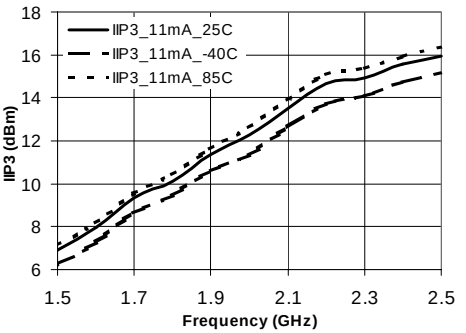


SGL-0263 1.5-2.4 GHz Evaluation Board
RF Performance at Id=11mA

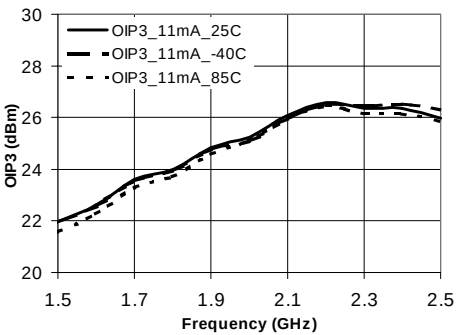
P1dB vs. Frequency, T = -40C,+25C,+85C
I_d =11 mA



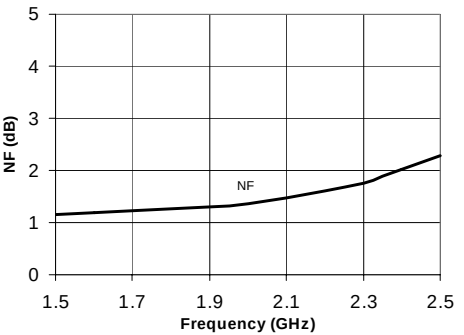
IIP3 vs. Frequency, T= -40C,+25C, +85C
I_d = 11 mA



OIP3 vs. Frequency, T = -40C,+25C,+85C
I_d = 11 mA

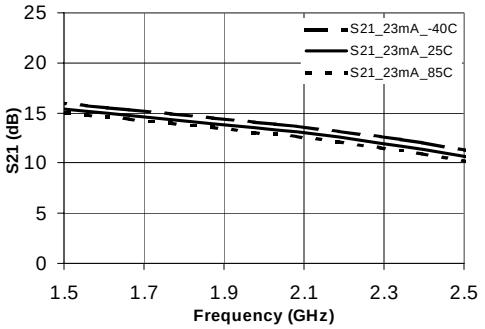


Noise Figure vs. Frequency
I_d = 11 mA, T = +25C

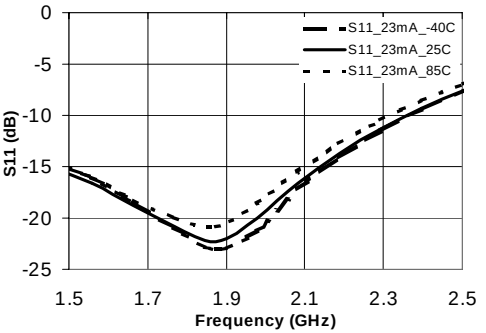


SGL-0263 1.5-2.4 GHz Evaluation Board
Scalar S-Parameters at Id=23mA

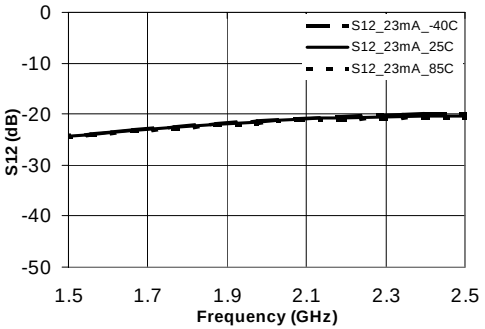
S21 vs. Frequency , T=-40C,+25C,+85C
I_d = 23 mA



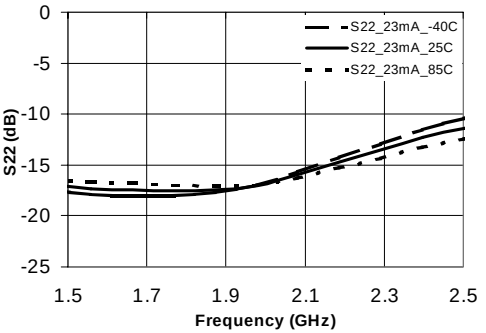
S11vs. Frequency , T=-40C,+25C,+85C
I_d = 23 mA



S12vs. Frequency , T=-40C,+25C,+85C
I_d = 23 mA

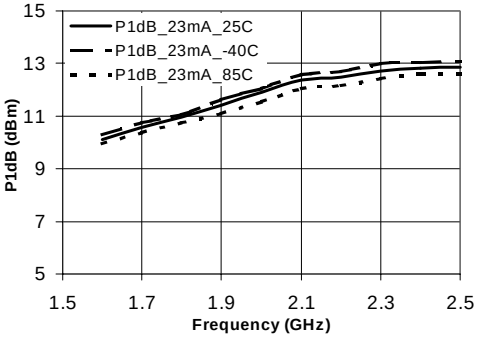


S22vs. Frequency , T=-40C,+25C,+85C
I_d = 23 mA

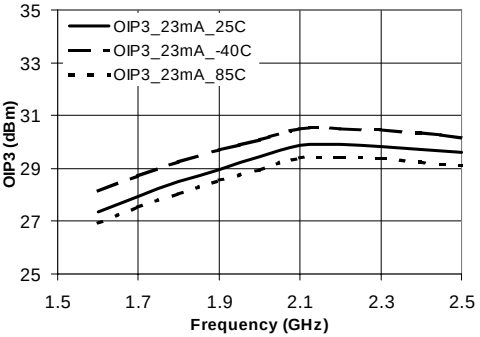


SGL-0263 1.5-2.4 GHz Evaluation Board
RF Performance at Id=23mA

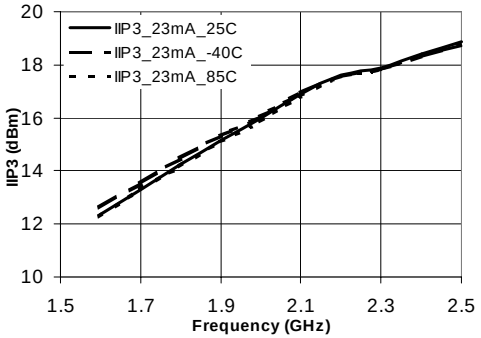
P1dB vs. Frequency, T = -40C,+25C,+85C
I_d = 23 mA



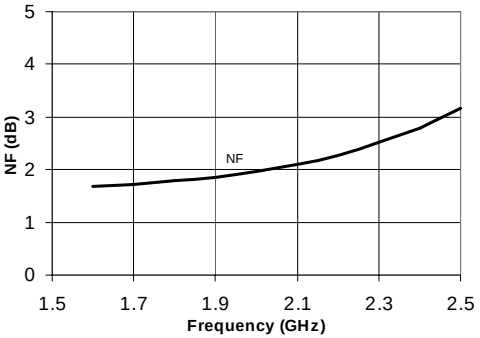
OIP3 vs. Frequency,T = -40C,+25C,+85C
I_d = 23 mA

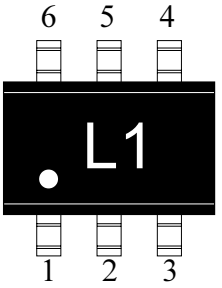


IIP3 vs. Frequency, T =-40C,+25C,+85C
I_d = 23 mA



Noise Figure vs. Frequency
T = +25C, I_d = 23 mA

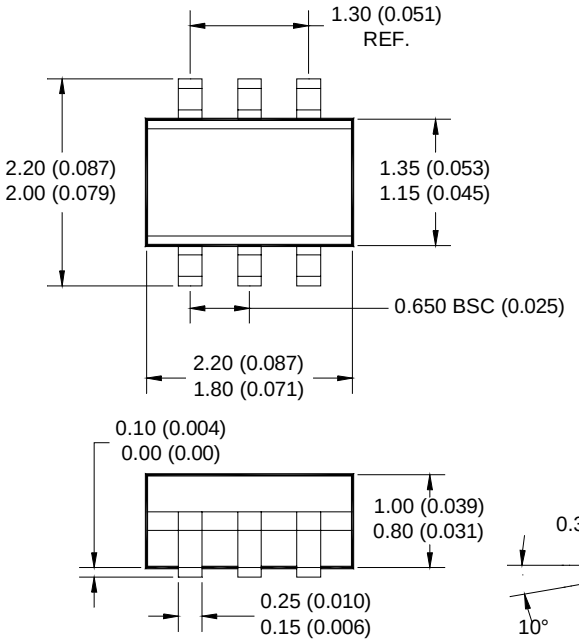




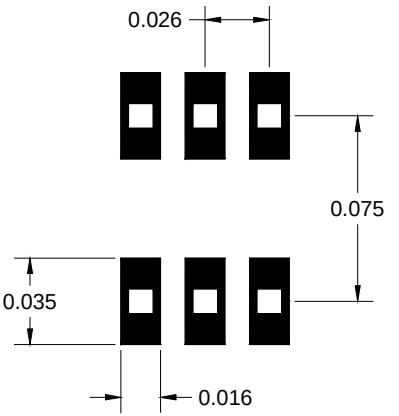
Pin Designation	
1	N/C
2	N/C
3	RF in
4	Vcc
5	GND
6	RF out / Vcc

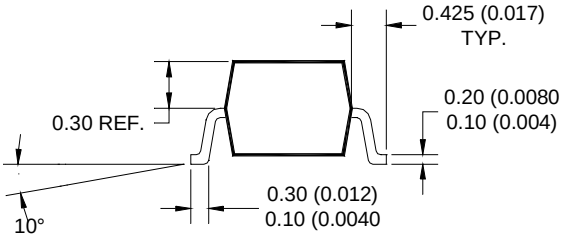
Note: Pin 1 is on lower left when you can read package marking

Package Dimensions



Pad Layout





DIMENSIONS ARE IN INCHES [MM]

Caution: ESD sensitive
Appropriate precautions in handling, packaging and testing devices must be observed.