Preliminary

SGA-5289

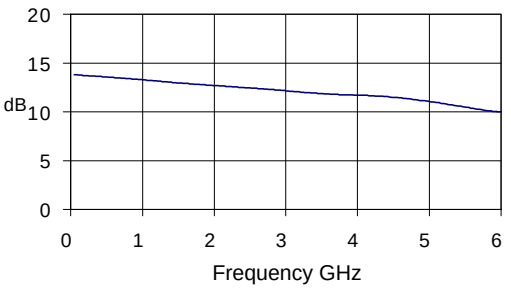
DC-5000 MHz Silicon Germanium HBT Cascadeable Gain Block

Product Description

Stanford Microdevices' SGA-5289 is a high performance cascadeable 50-ohm amplifier designed for operation at voltages as low as 3.4V. This RFIC uses the latest Silicon Germanium Heterostructure Bipolar Transistor (SiGe HBT) process featuring 1 micron emitters with F_T up to 50 GHz.

This circuit uses a darlington pair topology with resistive feedback for broadband performance as well as stability over its entire temperature range. Internally matched to 50 ohm impedance, the SGA-5289 requires only DC blocking and bypass capacitors for external components.

Small Signal Gain vs. Frequency



Product Features

- **DC-5000 MHz Operation**
- **Single Voltage Supply**
- **High Output Intercept: +32 dBm typ. at 850 MHz**
- **Low Current Draw: 60mA typ. at 3.4V**
- **Low Input/Output VSWR**

Applications

- **Oscillator Amplifiers**
- **Broadband Gain Blocks**
- **IF/ RF Buffer Amplifier**
- **Drivers for CATV Amplifiers**

Symbol	Parameters: Test Conditions: Z_0 = 50 Ohms, I_D = 60 mA, T = 25°C		Units	Min.	Typ.	Max.
P_{1dB}	Output Power at 1dB Compression	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		15.8 14.4 13.6	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		31.8 28.1 26.3	
S_{21}	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		13.2 12.6 12.4	
Bandwidth	3dB Bandwidth		MHz		5000	
S_{11}	Input VSWR	f = DC-5000 MHz	-		1.25:1	
S_{22}	Output VSWR	f = DC-5000 MHz	-		1.40:1	
S_{12}	Reverse Isolation	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		18.4 19.2 19.5	
NF	Noise Figure, Z_S = 50 Ohms	f = 1950 MHz	dB		3.8	
V_D	Device Voltage		V	3.1	3.4	3.9
Rth,j-l	Thermal Resistance (junction - lead)		° C/W		97	

Absolute Maximum Ratings

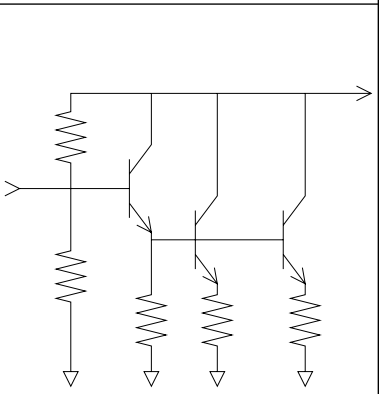
Operation of this device above any one of these parameters may cause permanent damage.

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

Parameter	Value	Unit
Supply Current	120	mA
Operating Temperature	-40 to +85	C
Maximum Input Power	+10	dBm
Storage Temperature Range	-40 to +150	C
Operating Junction Temperature	+150	C

Key parameters, at typical operating frequencies:

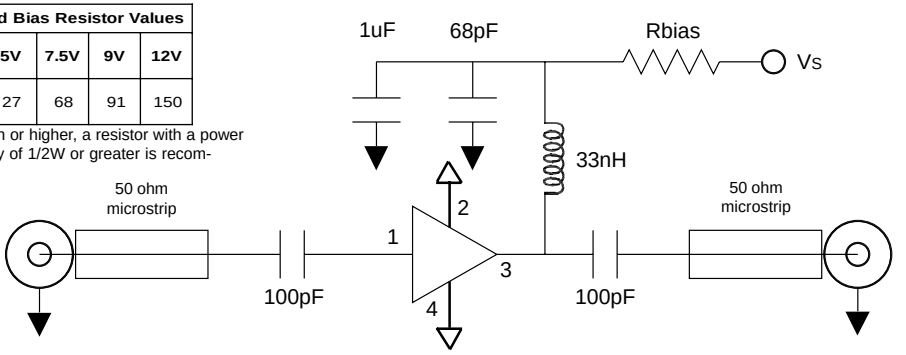
Parameter	Typical 25°C	Unit	Test Condition (I_D = 60 mA, unless otherwise noted)
500 MHz			
Gain	13.4	dB	
Noise Figure	4.3	dB	Z_S = 50 Ohms
Output IP3	32.1	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	16.0	dBm	
Input Return Loss	23.6	dB	
Isolation	18.2	dB	
850 MHz			
Gain	13.2	dB	
Noise Figure	4.2	dB	Z_S = 50 Ohms
Output IP3	31.8	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	15.8	dBm	
Input Return Loss	23.0	dB	
Isolation	18.4	dB	
1950 MHz			
Gain	12.6	dB	
Noise Figure	3.8	dB	Z_S = 50 Ohms
Output IP3	28.1	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	14.4	dBm	
Input Return Loss	23.1	dB	
Isolation	19.2	dB	
2400 MHz			
Gain	12.4	dB	
Noise Figure	5.0	dB	Z_S = 50 Ohms
Output IP3	26.3	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	13.6	dBm	
Input Return Loss	25.6	dB	
Isolation	19.5	dB	

Pin #	Function	Description	Device Schematic
1	RF IN	RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.	
2	GND	Connection to ground. Use via holes for best performance to reduce lead inductance. Place vias as close to ground leads as possible.	
3	RF OUT/Vcc	RF output and bias pin. Bias should be supplied to this pin through an external series resistor and RF choke inductor. Because DC biasing is present on this pin, a DC blocking capacitor should be used in most applications (see application schematic). The supply side of the bias network should be well bypassed.	
4	GND	Same as Pin 2.	

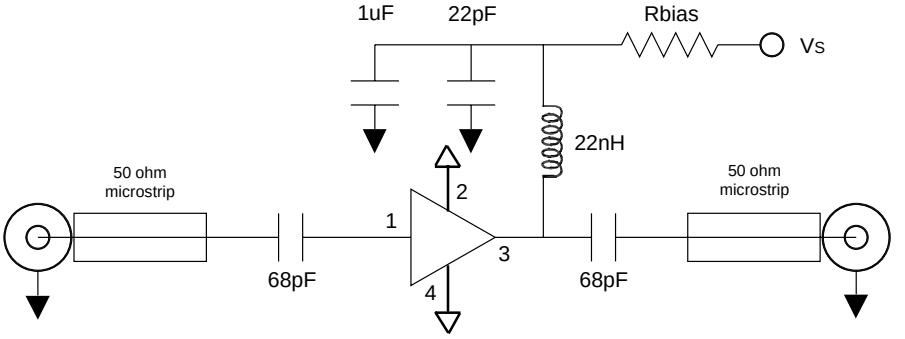
Application Schematic for Operation at 850 MHz

Recommended Bias Resistor Values				
Supply Voltage(Vs)	5V	7.5V	9V	12V
Rbias (Ohms)	27	68	91	150

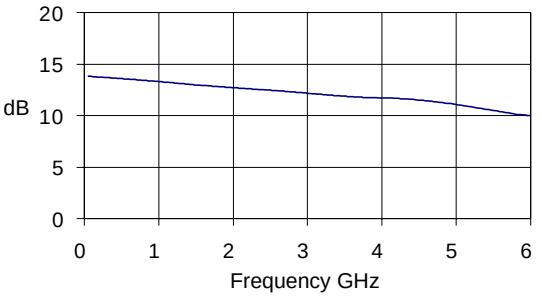
For 7.5V operation or higher, a resistor with a power handling capability of 1/2W or greater is recommended.



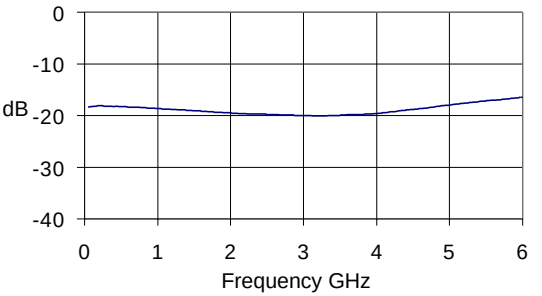
Application Schematic for Operation at 1950 MHz



S21, I_D =60mA, T=+25C



S12, I_D =60mA, T=+25C



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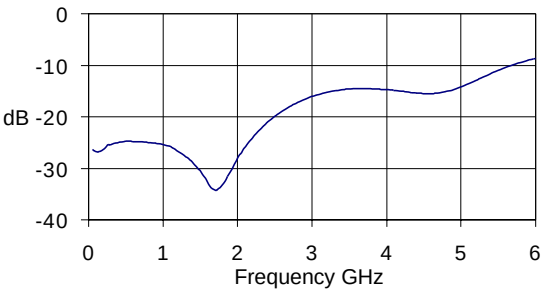
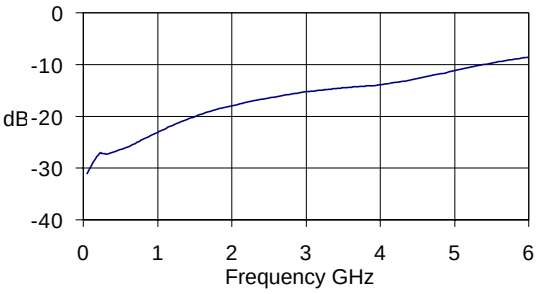
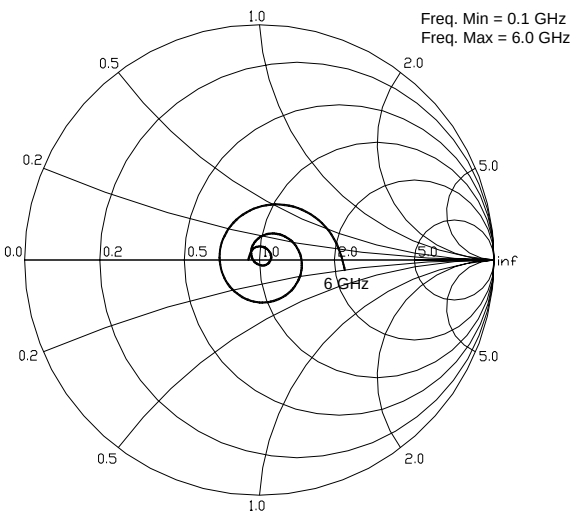


S22, I_D =60mA, T=+25C



S11, I_D=60mA, Ta= +25C



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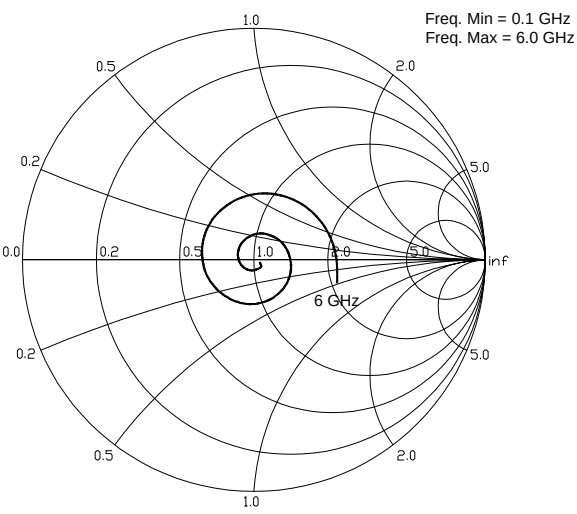
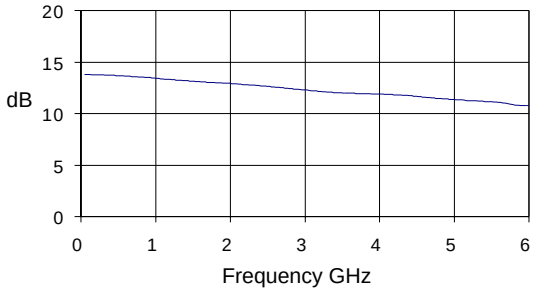


S21, I_D =60mA, T=-40C



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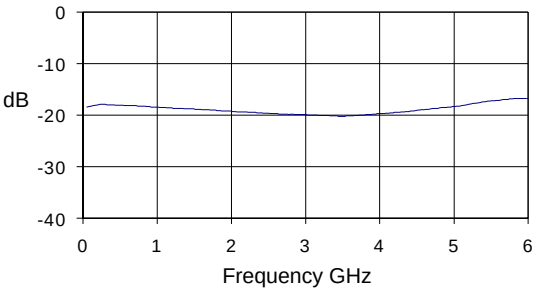

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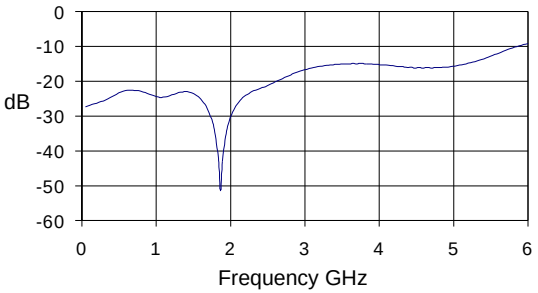
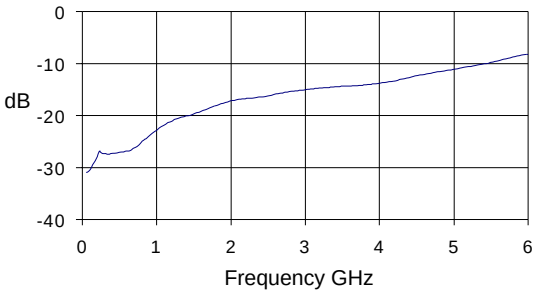


S22, I_D =60mA, T=-40C



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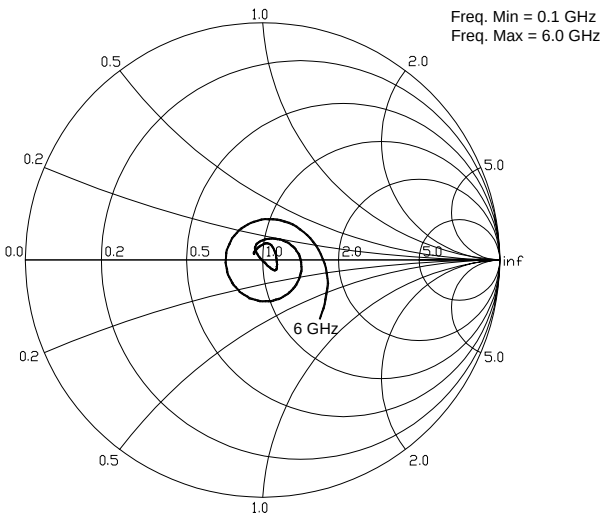

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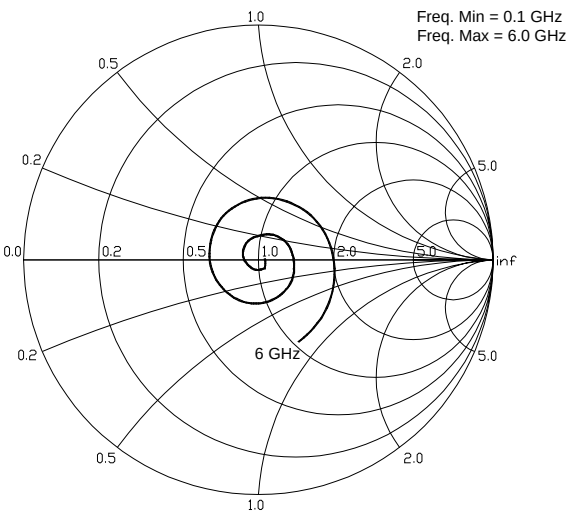
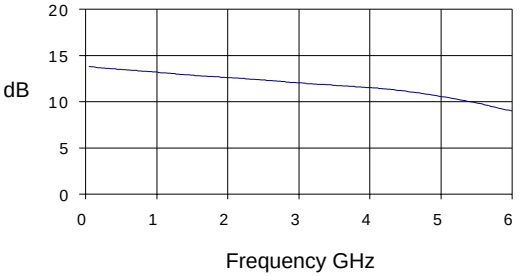
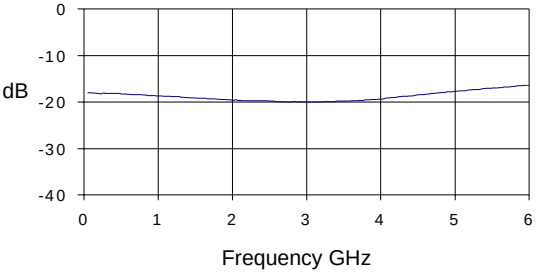


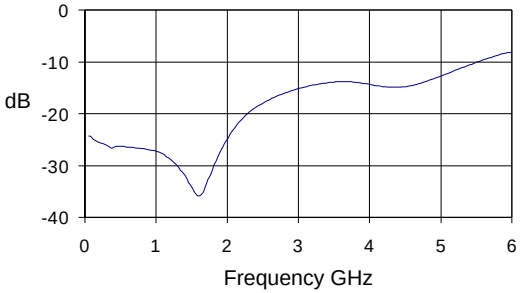
S21, I_D =60mA, T=85C



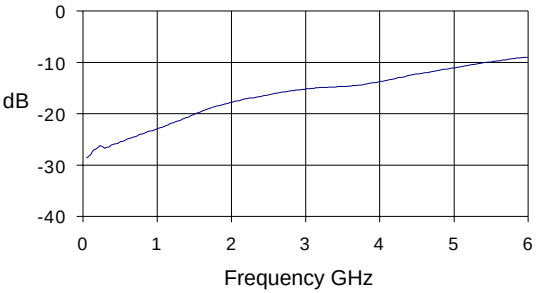
S12, I_D =60mA, T=85C



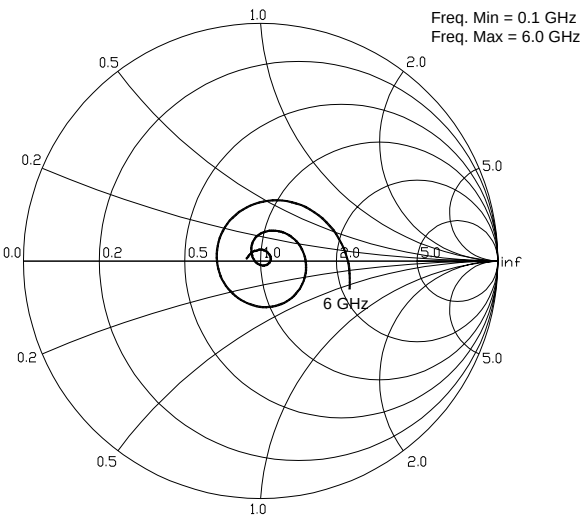
S11, I_D =60mA, T=85C



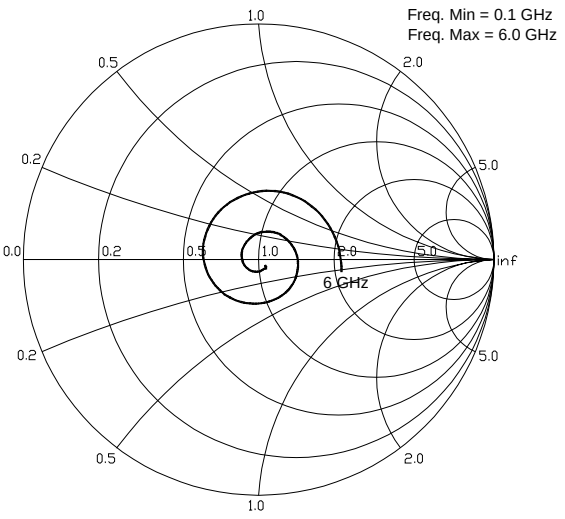
S22, I_D =60mA, T=85C



S11, I_D=60mA, Ta= 85C



S22, I_D=60mA, Ta= 85C



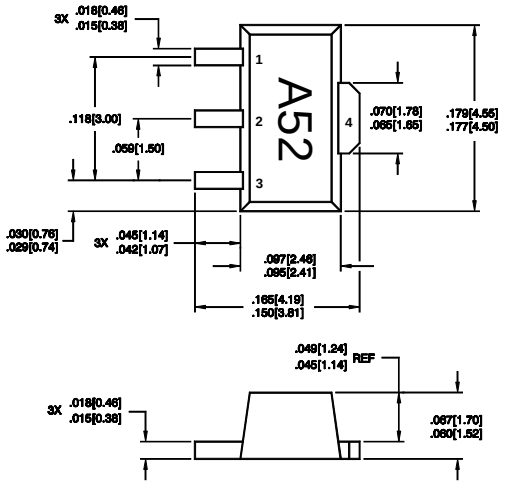
Caution: ESD sensitive
Appropriate precautions in handling, packaging and testing devices must be observed.

Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SGA-5289	13"	3000

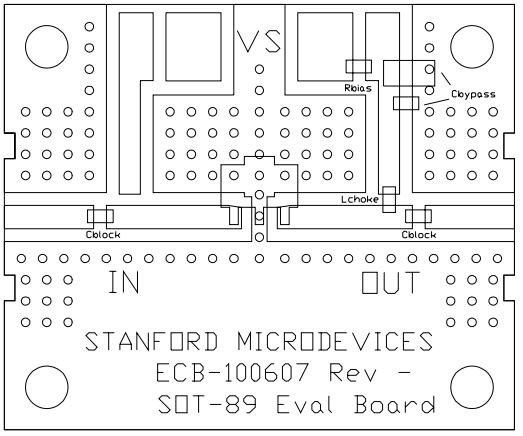
Package Dimensions

Outline Drawing



DIMENSIONS ARE IN INCHES [MM]

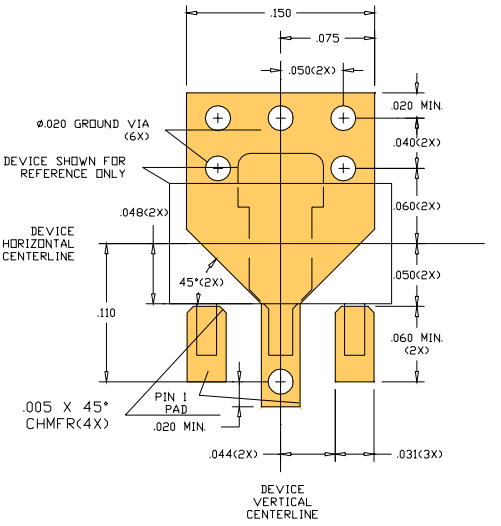
Pin assignments shown for reference only, not marked on part



Part Symbolization

The part will be symbolized with a “A52” designator on the top surface of the package.

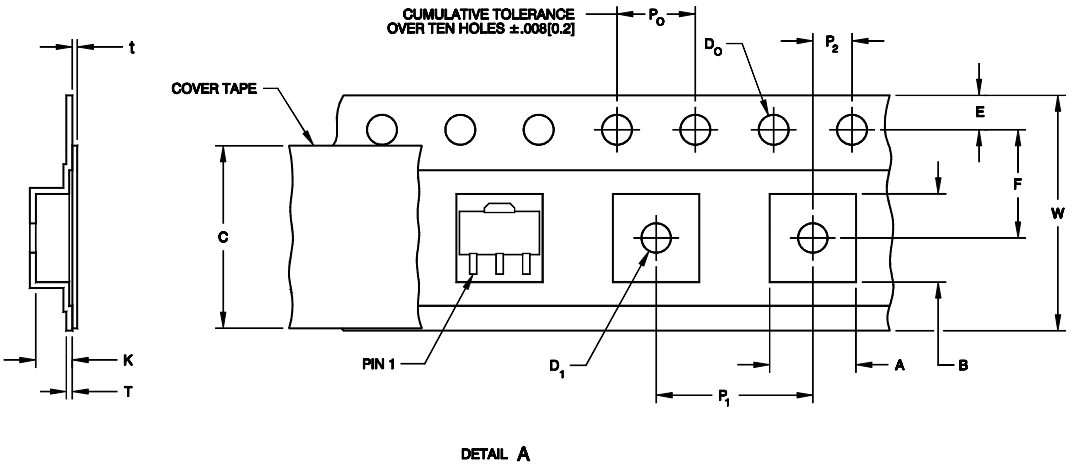
PCB Pad Layout



Component Tape and Reel Packaging

Tape Dimensions

For 89 Outline



Description		Symbol	Size (mm)
Cavity	Length	A	4.91 +/- 0.01
	Width	B	4.52 +/- 0.01
	Depth	K	1.90 +/- 0.01
	Pitch	P_1	8.00 +/- 0.01
	Bottom Hole Diameter	D_1	1.60 +/- 0.10
Perforation	Diameter	D_0	1.55 +/- 0.05
	Pitch	P_0	4.00 +/- 0.01
	Position	E	1.75 +/- 0.01
Cover Tape	Width	C	9.10 +/- 0.25
	Tape Thickness	t	0.05 +/- 0.01
Carrier Tape	Width	W	12.0 +/- 0.03
	Thickness	T	0.30 +/- 0.05
Distance	Cavity to Perforation (Width Direction)	F	5.50 +/- 0.10
	Cavity to Perforation (Length Direction)	P_2	2.00 +/- 0.10