Preliminary

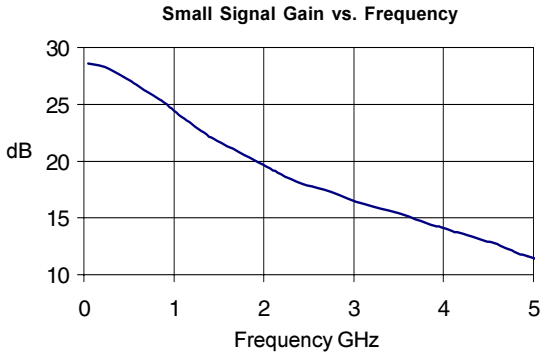
SGA-6589

DC-4000 MHz Silicon Germanium HBT Cascadeable Gain Block

Product Description

Stanford Microdevices' SGA-6589 is a high performance cascadeable 50-ohm amplifier. 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-6589 requires only DC blocking and bypass capacitors for external components.



Product Features

- DC-4000 MHz Operation
- Single Voltage Supply
- High Output Intercept: +32.5dBm typ. at 850 MHz
- High Output Power : 21.5 dBm typ. at 850 MHz
- High Gain : 25.6 dB typ. at 850 MHz

Applications

- Oscillator Amplifiers
- Final PA for Low Power Applications
- IF/ RF Buffer Amplifier
- Drivers for CATV Amplifiers

Symbol	Parameters: Test Conditions: Z_0 = 50 Ohms, I_D = 80 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		21.5 19.0 17.8	
IP_3	Third Order Intercept Point Power out per tone = 0 dBm	f = 850 MHz f = 1950 MHz f = 2400 MHz	dBm dBm dBm		32.5 31.6 30.3	
S_{21}	Small Signal Gain	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		25.6 20.5 18.8	
Bandwidth	(Determined by S_{11}, S_{22} Values)		MHz		4000	
S_{11}	Input VSWR	f = DC-4000 MHz	-		1.60:1	
S_{22}	Output VSWR	f = DC-4000 MHz	-		1.80:1	
S_{12}	Reverse Isolation	f = 850 MHz f = 1950 MHz f = 2400 MHz	dB dB dB		28.7 24.3 22.9	
NF	Noise Figure, Z_S = 50 Ohms	f = 1950 MHz	dB		2.9	
V_D	Device Voltage		V		4.8	
Rth,j-l	Thermal Resistance (junction - lead)		° C/W		97	

Absolute Maximum Ratings

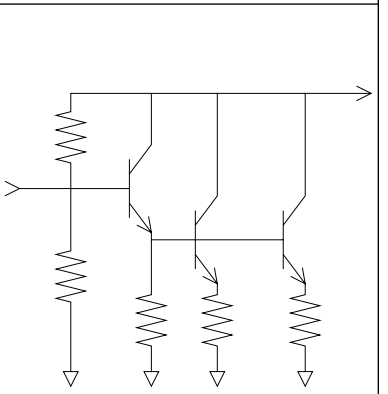
Operation of this device above any one of these parameters may cause permanent damage.

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	160	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:

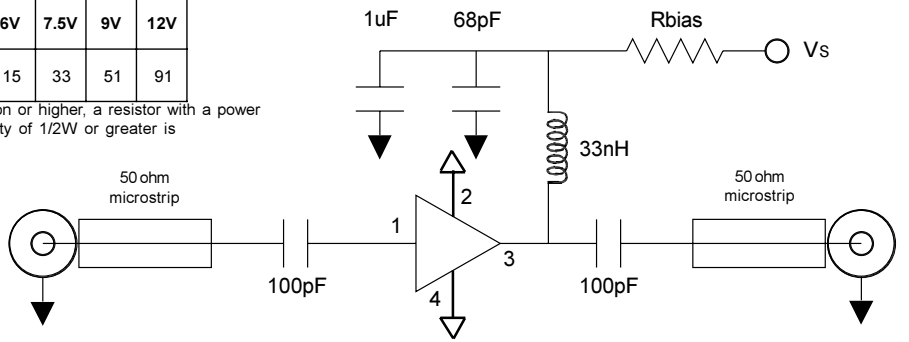
Parameter	Typical 25°C	Unit	Test Condition (I_D = 80 mA, unless otherwise noted)
500 MHz			
Gain	27.4	dB	
Noise Figure	2.5	dB	Z_S = 50 Ohms
Output IP3	32.1	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	21.6	dBm	
Input Return Loss	13.8	dB	
Isolation	29.9	dB	
850 MHz			
Gain	25.6	dB	
Noise Figure	2.5	dB	Z_S = 50 Ohms
Output IP3	32.5	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	21.5	dBm	
Input Return Loss	15.7	dB	
Isolation	28.7	dB	
1950 MHz			
Gain	20.5	dB	
Noise Figure	2.9	dB	Z_S = 50 Ohms
Output IP3	31.6	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	19.0	dBm	
Input Return Loss	14.0	dB	
Isolation	24.3	dB	
2400 MHz			
Gain	18.8	dB	
Noise Figure	3.3	dB	Z_S = 50 Ohms
Output IP3	30.3	dBm	Tone spacing = 1 MHz, Pout per tone = 0 dBm
Output P1dB	17.8	dBm	
Input Return Loss	12.5	dB	
Isolation	22.9	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.	

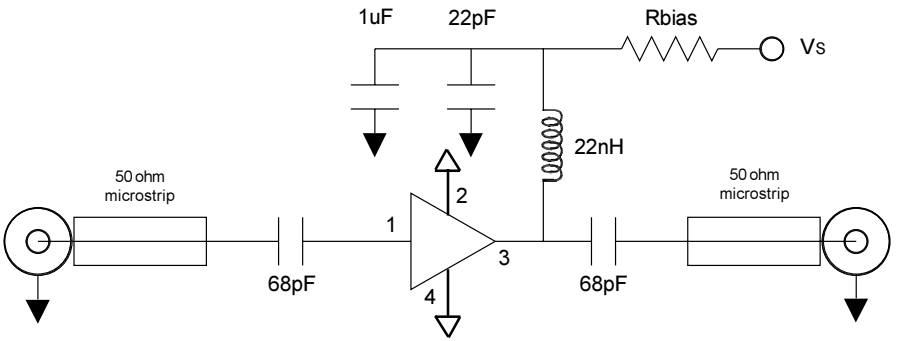
Application Schematic for Operation at 850 MHz

Recommended Bias Resistor Values				
Supply Voltage(Vs)	6V	7.5V	9V	12V
Rbias (Ohms)	15	33	51	91

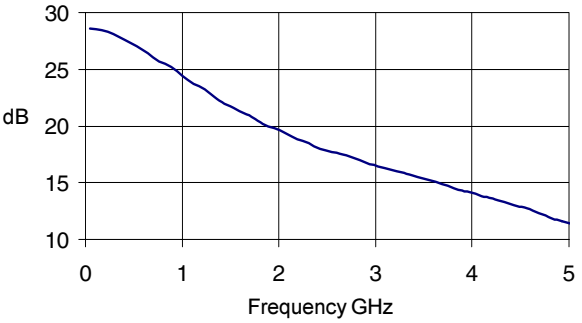
For 7.5V operation or higher, a resistor with a power handling capability of 1/2W or greater is recommended.



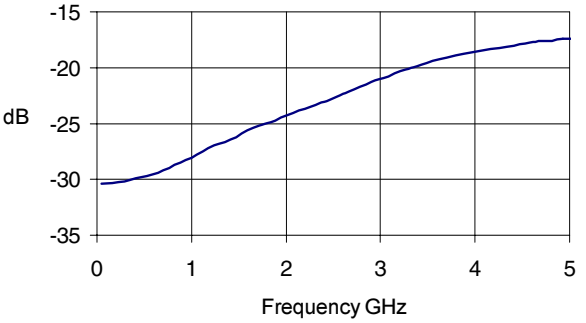
Application Schematic for Operation at 1950 MHz



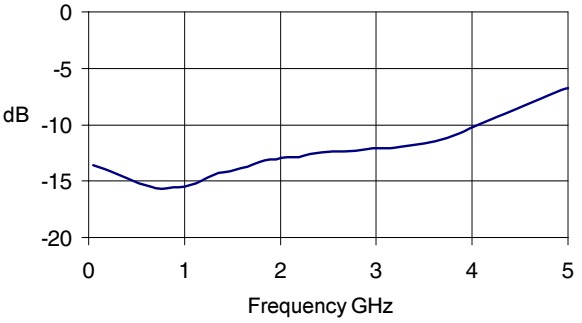
S21, I_D =80mA, T=25C



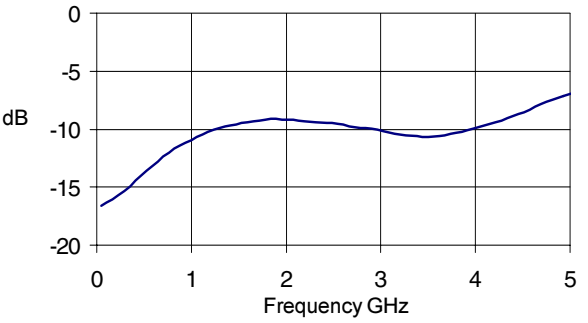
S12, I_D =80mA, T=25C



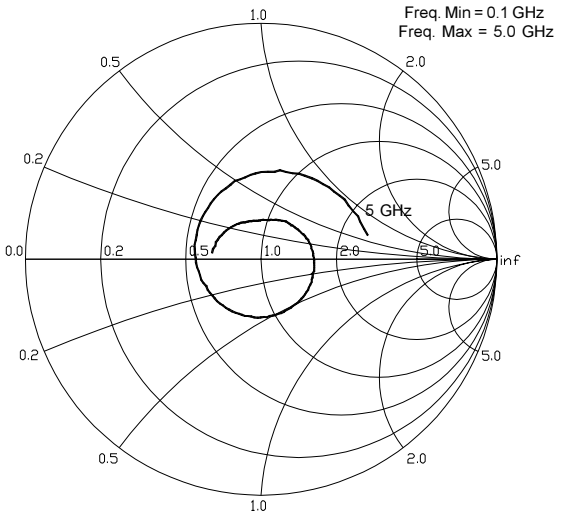
S11, I_D =80mA, T=25C



S22, I_D =80mA, T=25C



S11, I_D=80mA, Ta=25C



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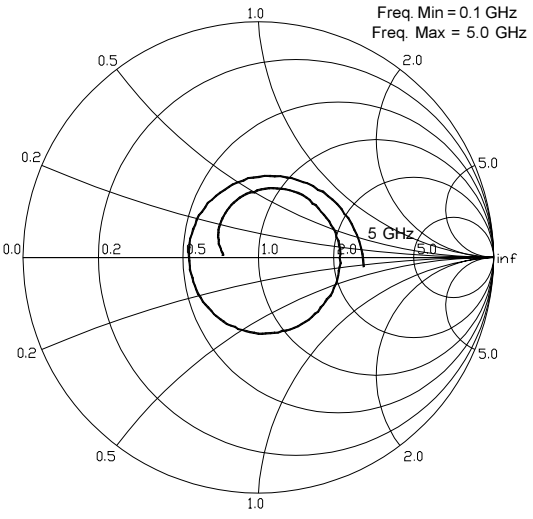
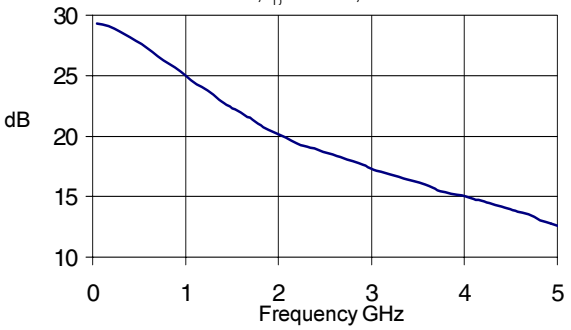


S21, I_D =80mA, T=-40C



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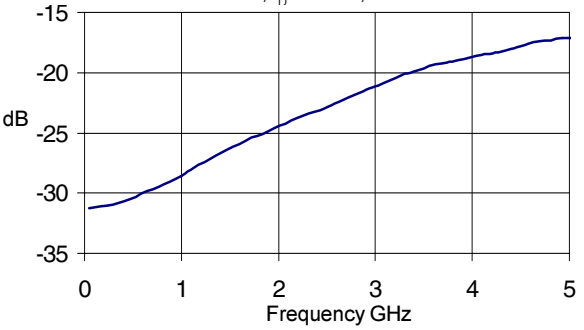

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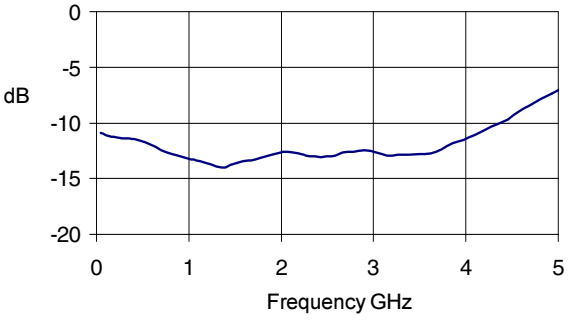

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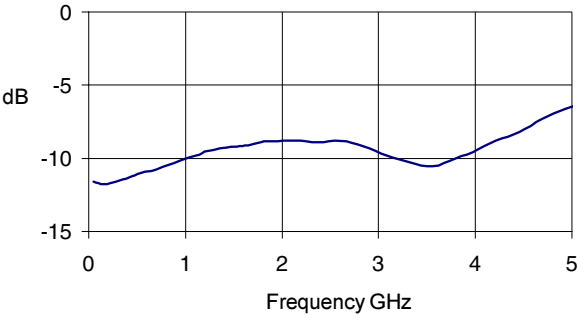

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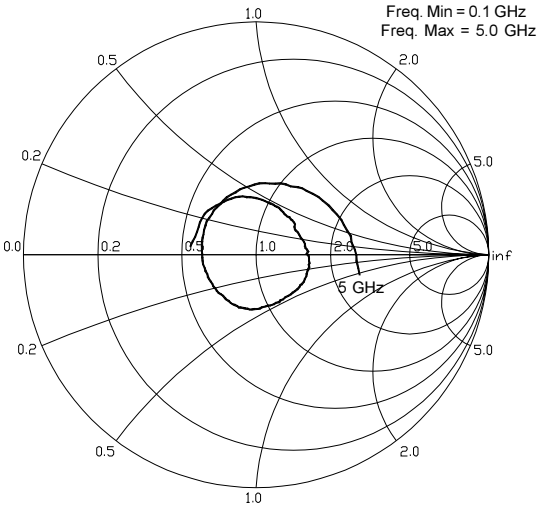
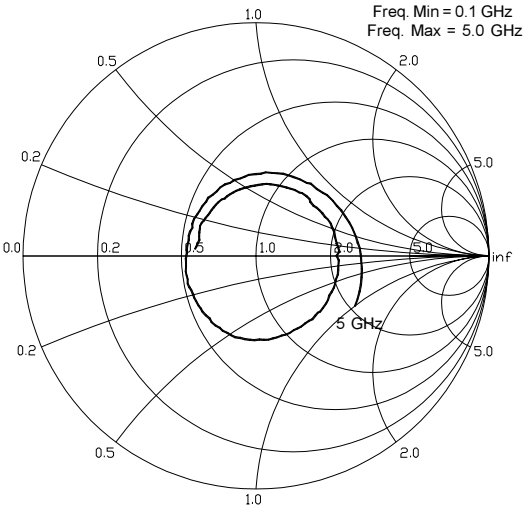
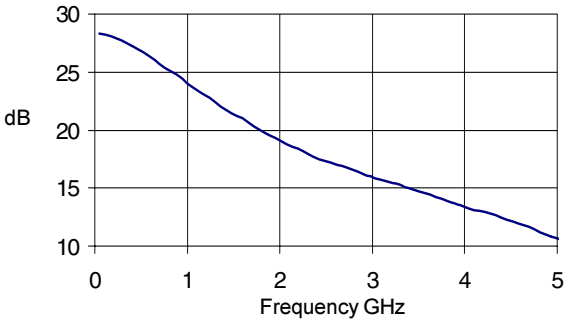


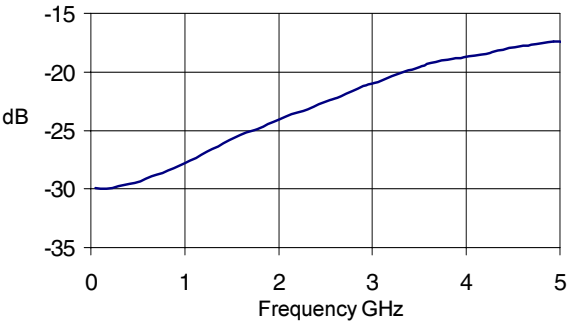
S22, I_D=80mA, Ta=-40C



S21, I_D =80mA, T=85C



S12, I_D =80mA, T=85C



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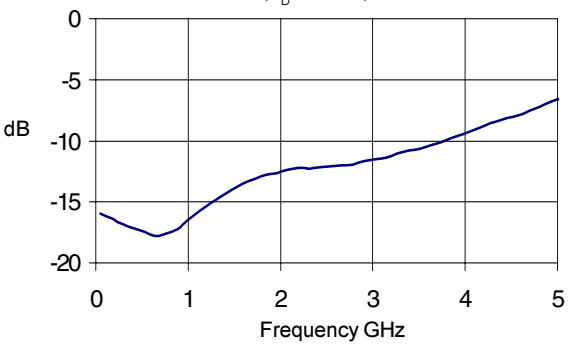

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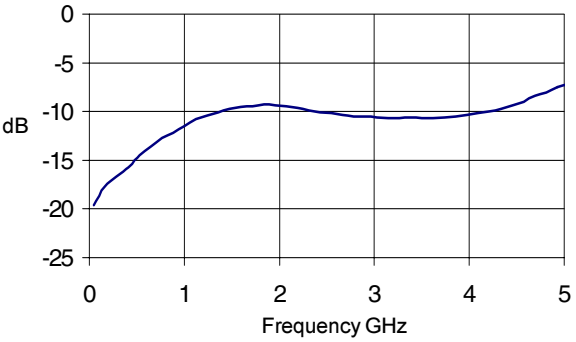

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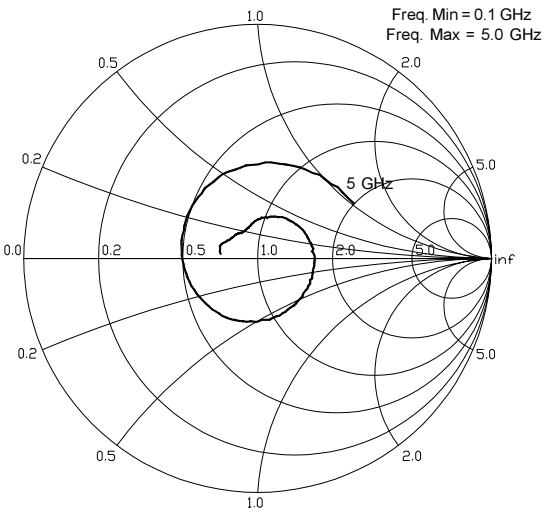

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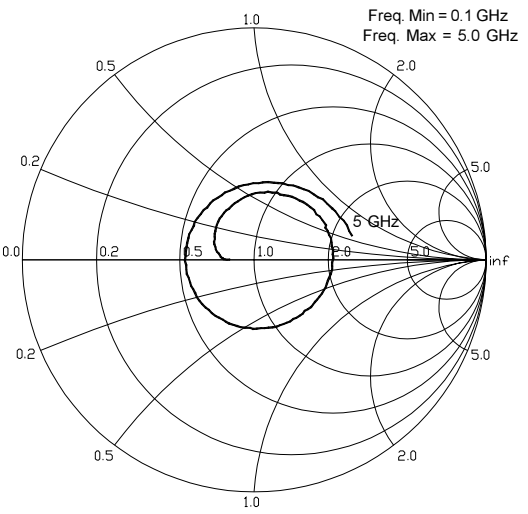


SGA-6589 DC-4000 MHz 4.8V SiGe Amplifier

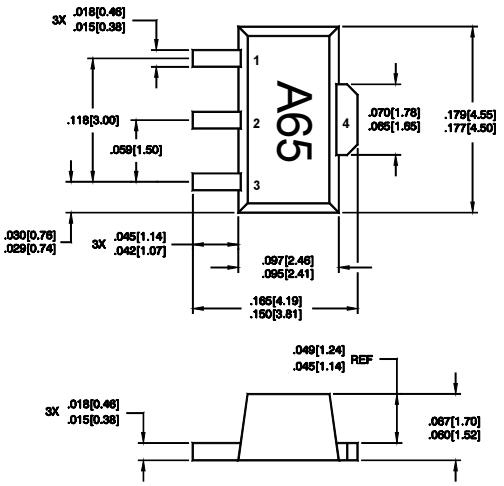
Caution: ESD Sensitive
Appropriate precautions in handling, packaging and testing devices must be observed.

Part Number Ordering Information

Part Number	Reel Size	Devices/Reel
SGA-6589	13"	3000

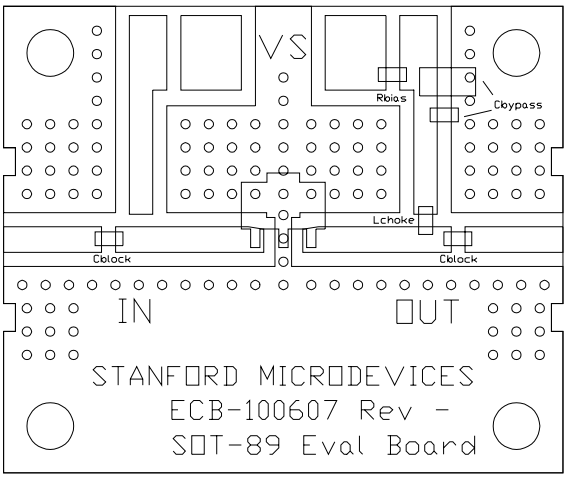
Package Dimensions

Outline Drawing



DIMENSIONS ARE IN INCHES [MM]

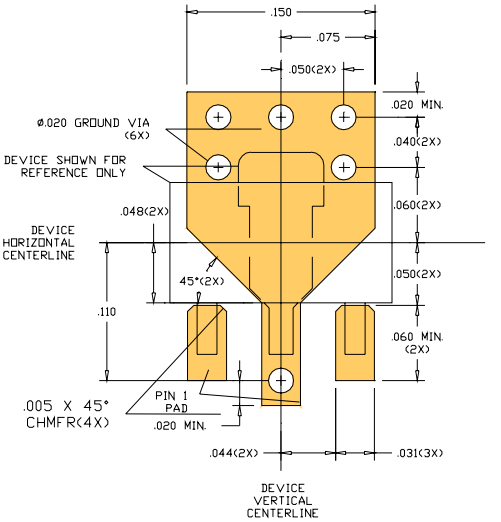
Pin assignments shown for reference only, not marked on part



Part Symbolization

The part will be symbolized with an "A65" designator on the top surface of the package.

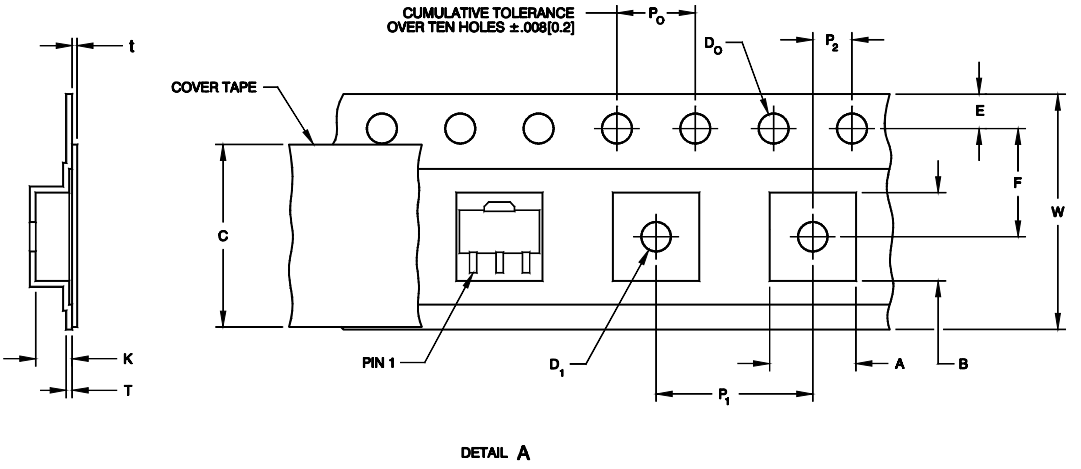
PCB Pad Layout



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