BGS5

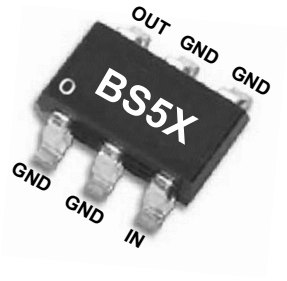
40-4000 MHz SILICON GERMANIUM Gain Block

Preliminary Datasheet

Device Features

- Single Fixed 3V supply
- No Dropping Resistor Required
- No matching circuit needed
- Lead-free/Green/RoHS compliant SOT-363 package
- Application: Driver Amplifier, Cellular, PCS, GSM, UMTS, WCDMA, Wireless Data

Part Marking (X: Wafer number)



Pin Description	
RF IN	3
RF OUT	6
GND	1,2,4,5

Product Description

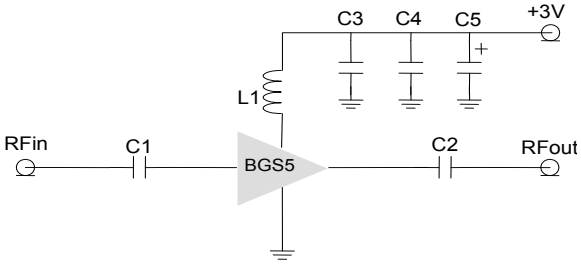
BeRex's BGS5 is a high SiGe HBT MMIC amplifier, internally matched to 50 Ohms without the need for external components. Designed to run directly from a 3V supply. The BGS5 is designed for high linearity 3V gain block applications . It is packaged in a RoHS-compliant with SOT-363 surface mount package.

Applications

- Driver Amplifier
- Cellular, PCS, GSM, UMTS, WCDMA

Applications Circuit

Application Circuit Values Example			
Freq.	70~900MHz	900MHz ~ 3GHz	3GHz ~ 4GHz
C1/C2	2nF	100pF	10pF
L1 (1608 Chip Ind.)	1uH	56nH	12nH



*C1, C2, C3 =100 pF ± 5%; C4 = 1000 pF ± 5%; C5 = 10uF; **L1 = 56nH

**less than 56nH improves RF performance at over 0.5GHz.

*820nH or higher value L1 improves RF performance at under 500MHz.

*Optimum value of L1 may vary with board design.

*C1,C2=2000pF, L1=820nH for 50MHz application.

*C1,C2=10pF, L1=12nH for 3.5GHz application.

Typical Performance[1]

Parameter	Frequency						Unit
	70	900	1900	2140	2650	3500	MHz
Gain	17.3	16.5	15	14.6	13.8	13.3	dB
S11	-16	-17	-17	-19	-40	-16.3	dB
S22	-14	-15	-13	-14	-17	-16.9	dB
OIP3[2]	32.5	31.5	28.5	28	27	24.6	dBm
P1dB	15.5	16.2	15.4	15	14.5	13.7	dBm
N.F	2.2	2.5	2.7	2.8	3	2.7	dB

[1] Device performance _ measured on a BeRex evaluation board at 25°C, 50 Ω system.

[2] OIP3 _ measured with two tones at an output of 0 dBm per tone separated by 1 MHz.

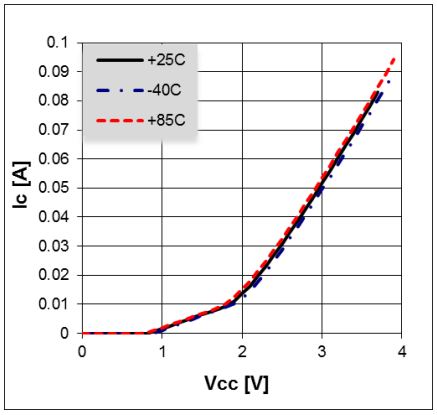
	Min.	Typical	Max.	Unit
Bandwidth	40		4000	MHz
I_C @ (Vc = 3V)	46	52	58	mA
V_C		3.0		V
dG/dT		-0.001		dB/°C
R_{TH}		130		°C/W

Absolute Maximum Ratings

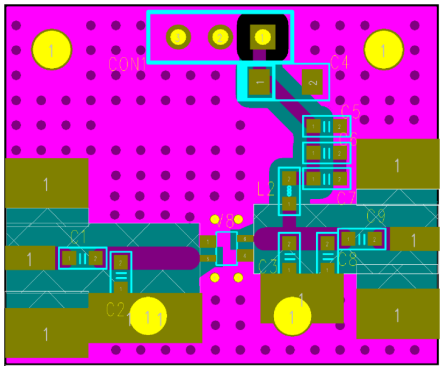
Parameter	Rating	Unit
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-55 to +155	°C
Junction Temperature	150	°C
Operating Voltage	+3.5	V
Supply Current	110	mA
Input RF Power	15	dBm

Operation of this device above any of these parameters may result in permanent damage.

V-I Characteristics



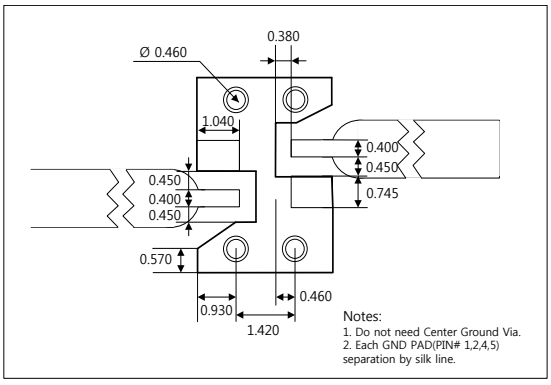
BeRex SOT-363 Evaluation



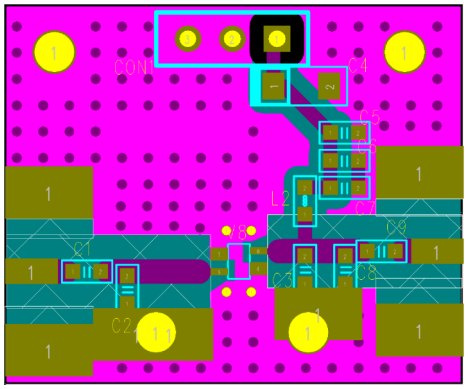
*Dielectric constant _ 4.2 *31mil thick FR4 PCB

Suggested PCB Land Pattern and PAD Layout

PCB Land Pattern



PCB Mounting



Note : All dimension _ millimeters

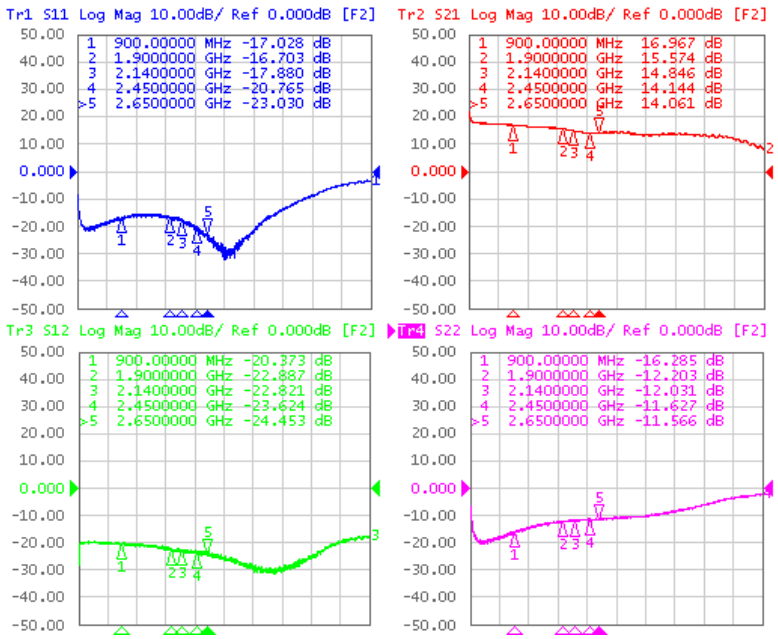
PCB lay out _ on BeRex website

BGS5

40-4000 MHz SILICON GERMANIUM Gain Block

Typical Device Data

S-parameters (Vc=3V, Ic=55mA, T=25°C, Bias Tee Data)



S-Parameter

(Vdevice = 3.0V, Icc = 55mA, T = 25 °C, calibrated to device leads, Bias Tee Data)

Freq [MHz]	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
70.00	0.121	-121.4	8.14	167.8	0.099	5.99	0.138	-118.5
900.00	0.141	102.7	7.0	145.4	0.094	-4.60	0.152	155.8
1000.00	0.147	94.1	6.99	143.2	0.093	-5.26	0.164	150.5
1500.00	0.159	68.6	6.38	129.0	0.087	-10.2	0.215	127.7
2000.00	0.141	48.2	5.82	112.2	0.074	-10.1	0.248	110.8
2500.00	0.085	31.7	4.97	104.8	0.063	-9.9	0.261	94.7
3500.00	0.066	130.0	4.7	80.8	0.037	3.36	0.296	63.3
4000.00	0.162	123.9	4.6	71.9	0.03	40.6	0.348	50.3

Typical Performance (Vd = 3.0V, Ic = 55mA, T = 25°C)

Freq	MHz	40	50	70	900	1900	2140	2450	2650	3500
S21	dB	19	18.6	17.3	16.5	15	14.6	14.1	13.8	13.3
S11	dB	-11	-13.5	-16	-17	-17	-19	-27	-40	-16.3
S22	dB	-16	-17.5	-14	-15	-13	-14	-15	-17	-16.9
P1	dBm	15	15	15.5	16.2	15.4	15	14.4	14.5	13.7
OIP3	dBm	32.5	32.5	32.5	31.5	28.5	28	27	27	24.6
NF	dB	2.2	2.2	2.2	2.5	2.7	2.8	2.9	3	2.7

Typical Performance (Vd = 2.7V, Ic = 39mA, T = 25°C)

Freq	MHz	40	50	70	900	1900	2140	2450	2650
S21	dB	18.7	18.4	18	16.7	14.9	14.6	14.1	13.7
S11	dB	10.9	12.8	15.7	21.9	20.3	23.4	28.2	23.7
S22	dB	19.8	20.8	21.8	17.8	14.9	15.2	15.8	16.1
P1	dBm	13.4	13.5	13.8	13.7	13.3	12.8	12.8	13.1
OIP3	dBm	29.5	29.8	29.4	27.7	26.1	25.4	24.8	25
NF	dB	2.08	2.04	2.2	2.38	2.6	2.68	2.75	2.83

Typical Performance (Vd = 2.8V, Ic = 43mA, T = 25°C)

Freq	MHz	40	50	70	900	1900	2140	2450	2650
S21	dB	18.8	18.5	18.1	16.8	15	14.7	14.2	13.8
S11	dB	11	12.8	15.7	21	19	22.8	29.3	24.9
S22	dB	20	20	21	17.5	15	15.4	16.1	16.4
P1	dBm	14.1	14.1	14.4	14.4	14	13.5	13.5	13.9
OIP3	dBm	30.7	31.2	30.8	29	27.3	26.6	26	26.1
NF	dB	2.1	2.07	2.2	2.39	2.62	2.69	2.76	2.84

Typical Performance (Vd = 2.9V, Ic = 48mA, T = 25°C)

Freq	MHz	40	50	70	900	1900	2140	2450	2650
S21	dB	18.9	18.6	18.1	16.8	15.1	14.7	14.2	13.9
S11	dB	11	12.8	15.6	20.4	19.5	22.5	30	26.2
S22	dB	20	20.6	21	17.2	15	15.5	16.3	16.6
P1	dBm	14.6	14.6	14.9	15.1	14.7	14.1	14.1	14.5
OIP3	dBm	32.2	32.3	32	30.3	28.3	27.6	27	27
NF	dB	2.13	2.08	2.22	2.41	2.64	2.71	2.78	2.85

Typical Performance (Vd = 3.1V, Ic = 57mA, T = 25°C)

Freq	MHz	40	50	70	900	1900	2140	2450	2650
S21	dB	19.1	18.7	18.3	16.9	15.2	14.8	14.3	14
S11	dB	11	12.8	15.5	19.6	19	21.8	30	28.8
S22	dB	20	20.4	20.5	16.8	15	15.6	16.6	17.2
P1	dBm	15.6	15.6	16	16.5	16	15.4	15.2	15.6
OIP3	dBm	33.6	33.8	33.6	32	29.8	29.1	28.3	28.2
NF	dB	2.15	2.12	2.26	2.47	2.7	2.76	2.82	2.93

Typical Performance (Vd = 3.2V, Ic = 61mA, T = 25°C)

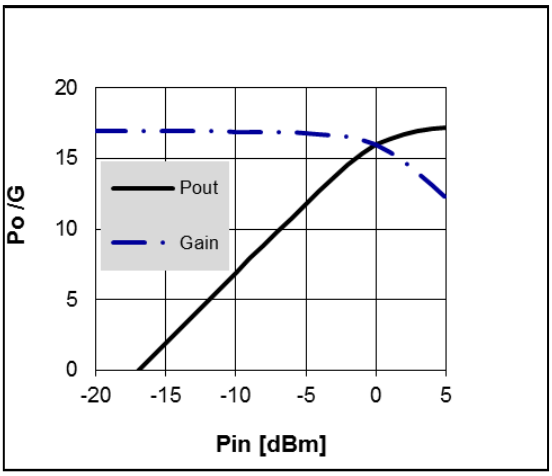
Freq	MHz	40	50	70	900	1900	2140	2450	2650
S21	dB	19.1	18.7	18.3	17	15.2	14.8	14.4	14
S11	dB	11	12.8	15.4	19.3	18.9	21.6	30.1	29.7
S22	dB	20.1	20.3	20.2	16.7	15.1	15.7	16.8	17.4
P1	dBm	16.1	16.1	16.5	17.1	16.6	15.9	15.7	16
OIP3	dBm	34.5	34.2	33.8	32.5	30.3	29.5	28.7	28.5
NF	dB	2.2	2.2	2.3	2.5	2.7	2.8	2.9	3.0

Typical Performance (Vd = 3.3V, Ic = 66mA, T = 25°C)

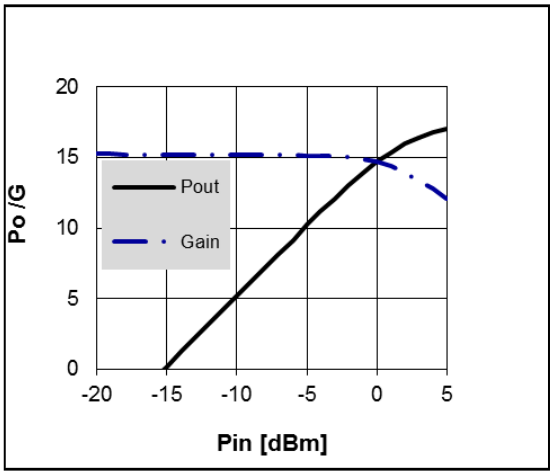
Freq	MHz	40	50	70	900	1900	2140	2450	2650
S21	dB	19.1	18.8	18.3	17	15.3	14.9	14.4	14
S11	dB	11	12.8	15.4	19.1	18.7	21.5	30	30.4
S22	dB	20	20	20	16.6	15.2	15.8	17	17.5
P1	dBm	16.5	16.5	17	17.7	17.1	16.3	16.1	16.4
OIP3	dBm	34.7	34.7	34.1	32.7	30.5	29.8	28.9	28.6
NF	dB	2.2	2.2	2.3	2.5	2.8	2.8	2.9	3

Device Performance

Pin-Pout-Gain

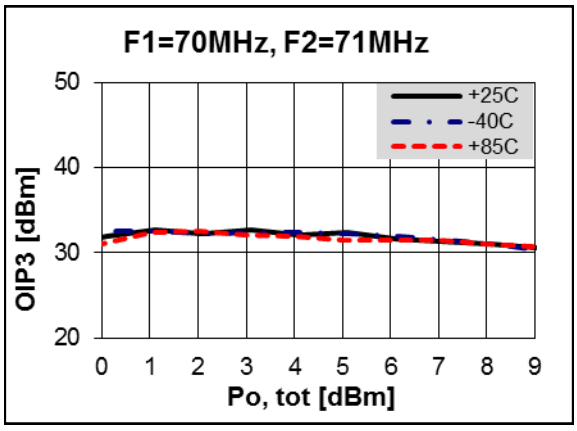


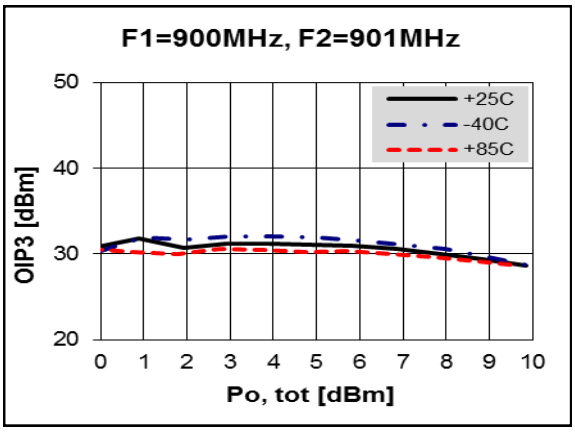
900MHz, 3V/52mA



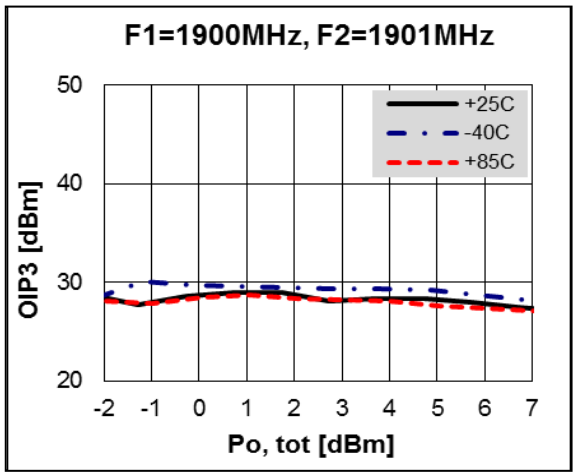
1900 MHz, 3V/52mA

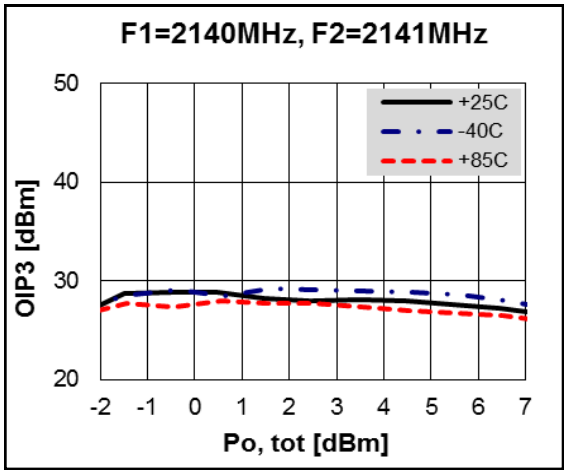
OIP3

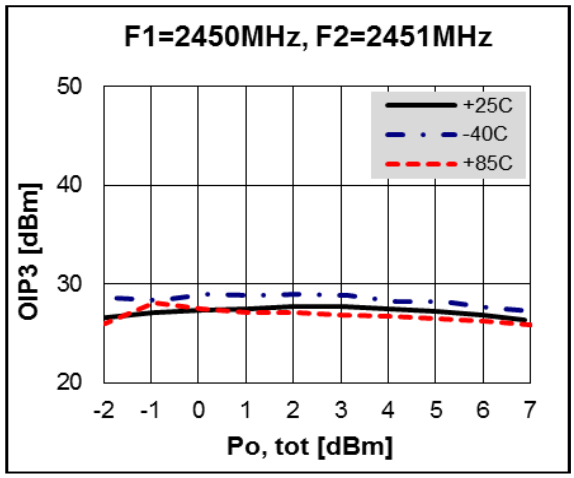


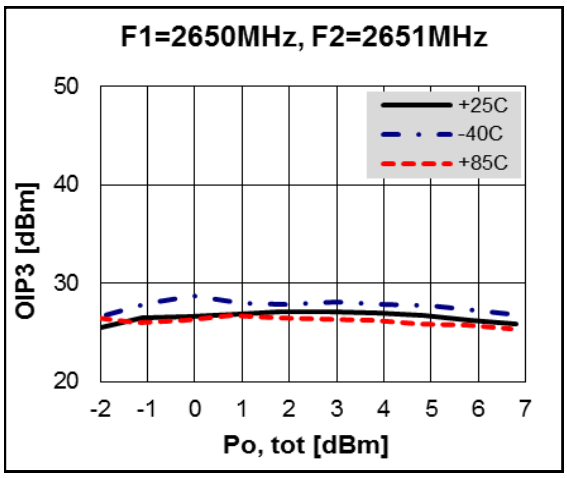


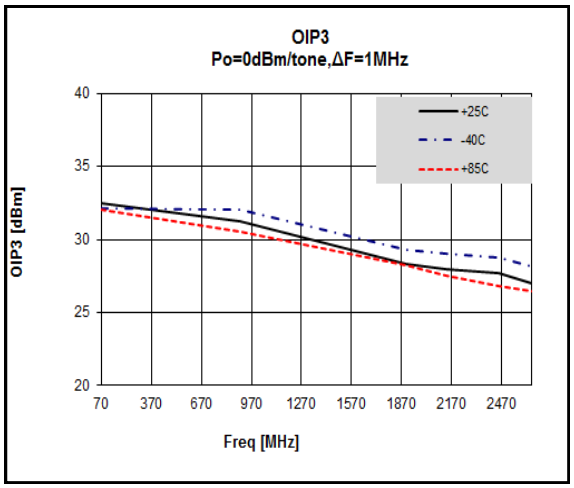
OIP3



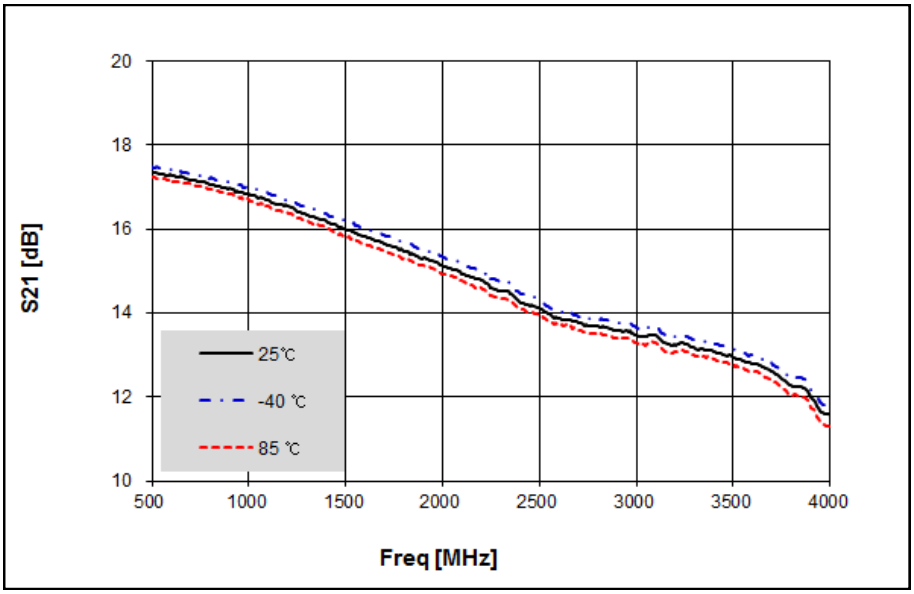




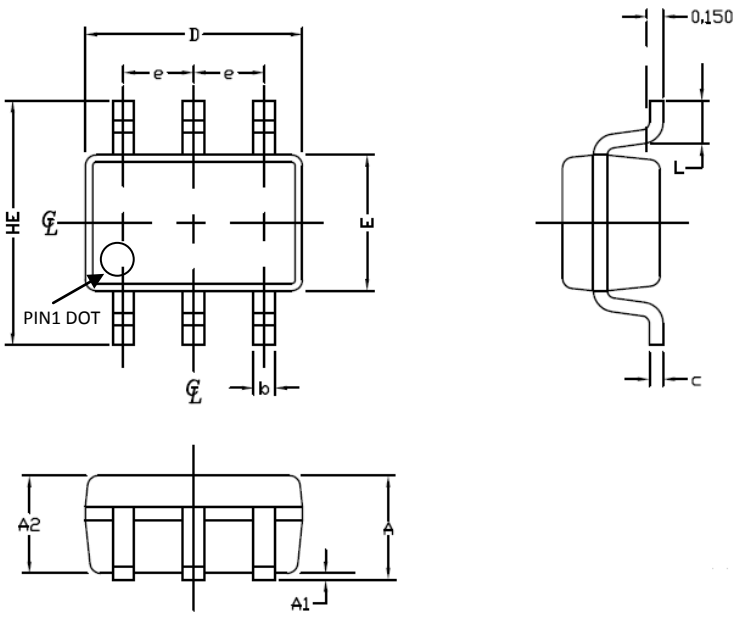




Gain Flatness

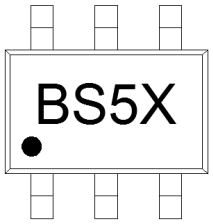


Package Outline Dimension (Unit. mm)



SYMBOL	MIN	MAX
E	1.15	1.35
D	1.85	2.25
HE	2.00	2.30
A	0.80	1.00
A2	0.80	0.91
A1	0.00	0.09
e	0.65 BSC	
b	0.15	0.30
c	0.08	0.25
L	0.21	0.41

Package Marking

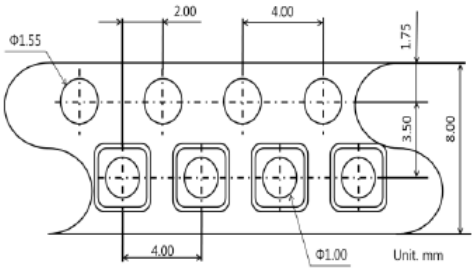


Pin 1

X = Wafer No.

Tape & Reel

SOT-363



Packaging information:

Tape Width (mm): 8

Reel Size (inches): 7

Device Cavity Pitch (mm): 4

Devices Per Reel: 3000

Lead plating finish

100% Tin Matte finish

(All BeRex products undergoes a 1 hour, 150 degree C, Anneal bake to eliminate thin whisker growth concerns.)

MSL / ESD Rating

ESD Rating:	Class 1C
Value:	**Passes <2000V**
Test:	Human Body Model (HBM)
Standard:	JEDEC Standard JESD22-A114B
MSL Rating:	**Level 1 at +265°C convection reflow**
Standard:	JEDEC Standard J-STD-020

NATO CAGE code:

2	**N**	**9**	**6**	**F**