BCL016B

SUPER LOW NOISE PHEMT CHIP (.15µm x 160µm)

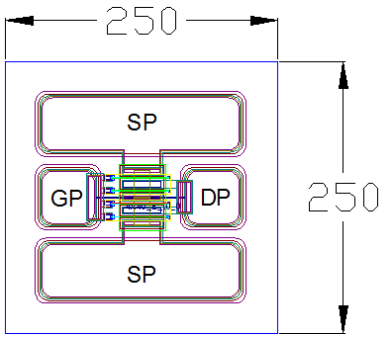
The BeRex BCL016B is a GaAs super low noise pHEMT with a nominal 0.15 micron gate length and 160 micron gate width making the product ideally suited for applications requiring very low noise and high associated gain, in frequencies of up to 40 GHz. The BCL016B offers high insertion gain and a low noise figure for broadband applications. The BCL016B is produced using state of the art metallization with SI_3N_4 passivation and is screened to assure reliability

PRODUCT FEATURES

- Low 0.4dB typical noise figure @12 GHz
- High 13.5dB Typical associated Gain @12 GHz
- High P_{in} of up to 20dBm
- 0.15 X 160 Micron Recessed Gate

APPLICATIONS

- Commercial
- Military / Hi-Rel.
- Test & Measurement



Chip dimensions : 250 X 250 microns
Gate pad(GP) : 48 X 48 microns
Drain pad(DP) : 48 X 48 microns
Source pad(SP) : 180 X 48 microns
Chip thickness : 100 microns

ELECTRICAL CHARACTERISTICS (T_a = 25° C)

SYMBOL	PARAMETER/TEST CONDITIONS	TEST FREQ.	MIN.	TYPICAL	Max.	UNIT
NF	Noise Figure (Vds = 2V, Id = 10mA)	12 GHz 18 GHz		0.4 0.6		dB
G_A	Associated Gain (Vds = 2V, Id = 10mA)	12 GHz 18 GHz	12.5 10.5	13.5 11.5		dB
P1dB	Output Power @ p1dB (Vds = 2V, Id = 10mA)	12 GHz	13	14.5		dBm
I_{DSS}	Saturated Drain Current (Vgs = 0V, Vds = 2V)			50		mA
G_M	Transconductance (Vds = 2V, Vgs = -0.3V)			120		mS
V_P	Pinch-off Voltage (Vds = 2V, Id = 200µA)			-0.7		V
BV_{GD}	Gate-Drain Breakdown Voltage, (Ig = -200 µA, source open)			9		V
BV_{GS}	Gate-Source Breakdown Voltage, (Ig = -200 µA, drain open)			6		V
R_{TH}	Thermal Resistance, junction to back side (Au-Sn Eutectic Attach)			270		° C/W

MAXIMUM RATING (T_a = 25° C)

SYMBOLS	PARAMETERS	ABSOLUTE
V_{DS}	Drain-Source Voltage	5 V
V_{GS}	Gate-Source Voltage	-3 V
I_{DS}	Drain Current	50 mA
I_{GSF}	Forward Gate Current	30 mA
P_{IN}	Input Power	20 dBm
T_{CH}	Channel Temperature	150° C
T_{STG}	Storage Temperature	-60° C - 150° C
P_T	Total Power Dissipation	200 mW

Exceeding any of the above Maximum Ratings will result in reduced MTTF and may cause permanent damage to the device.

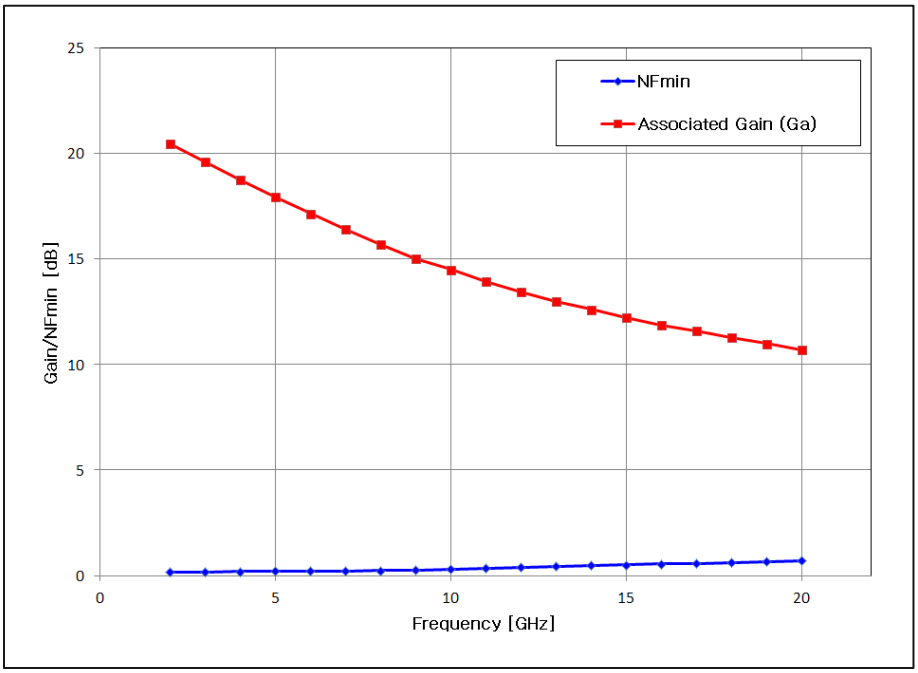
S-PARAMETERS (V_{ds} = 2 V, I_{ds} = 10 mA)

Freq [GHz]	S11 [MAG]	S11 [Ang]	S21 [MAG]	S21 [Ang]	S12 [MAG]	S12 [Ang]	S22 [MAG]	S22 [Ang]
1	0.99	-11.25	5.95	169.63	0.017	83.73	0.54	-5.90
2	0.98	-22.22	5.93	160.06	0.033	76.58	0.53	-11.65
3	0.97	-32.54	5.68	151.26	0.048	70.53	0.51	-17.14
4	0.95	-44.55	5.73	142.08	0.062	64.57	0.48	-21.53
5	0.93	-54.26	5.52	133.35	0.076	58.37	0.44	-27.50
6	0.91	-65.76	5.59	124.70	0.089	53.16	0.40	-32.21
7	0.88	-79.02	5.45	114.83	0.101	45.48	0.33	-42.00
8	0.85	-90.99	5.42	106.08	0.113	40.18	0.28	-45.56
9	0.82	-101.41	5.31	97.75	0.125	33.41	0.23	-58.00
10	0.78	-116.54	5.22	87.78	0.133	26.50	0.15	-73.89
11	0.74	-131.03	5.13	78.33	0.143	19.24	0.11	-103.09
12	0.68	-150.07	5.00	66.81	0.151	10.38	0.13	-157.16
13	0.66	-169.47	4.69	56.28	0.153	2.15	0.18	164.27
14	0.63	168.75	4.46	45.46	0.157	-6.54	0.26	148.69
15	0.64	145.31	4.10	33.81	0.154	-16.06	0.36	135.43
16	0.66	124.37	3.70	23.23	0.148	-24.06	0.44	126.12
17	0.69	102.63	3.30	11.86	0.141	-32.66	0.51	119.95
18	0.73	88.34	2.85	3.09	0.130	-38.61	0.57	111.43
19	0.76	75.06	2.48	-5.82	0.120	-43.78	0.62	106.03
20	0.80	59.85	2.12	-15.00	0.109	-48.60	0.65	101.91
21	0.82	52.72	1.80	-21.27	0.100	-50.84	0.67	98.55
22	0.84	42.62	1.52	-28.44	0.093	-53.53	0.69	96.42
23	0.86	35.06	1.23	-34.89	0.084	-57.23	0.71	92.69
24	0.89	32.73	1.04	-38.66	0.076	-60.50	0.73	90.55
25	0.91	24.09	0.86	-43.76	0.062	-61.13	0.76	89.32
26	0.93	19.10	0.69	-48.13	0.054	-60.20	0.77	88.42

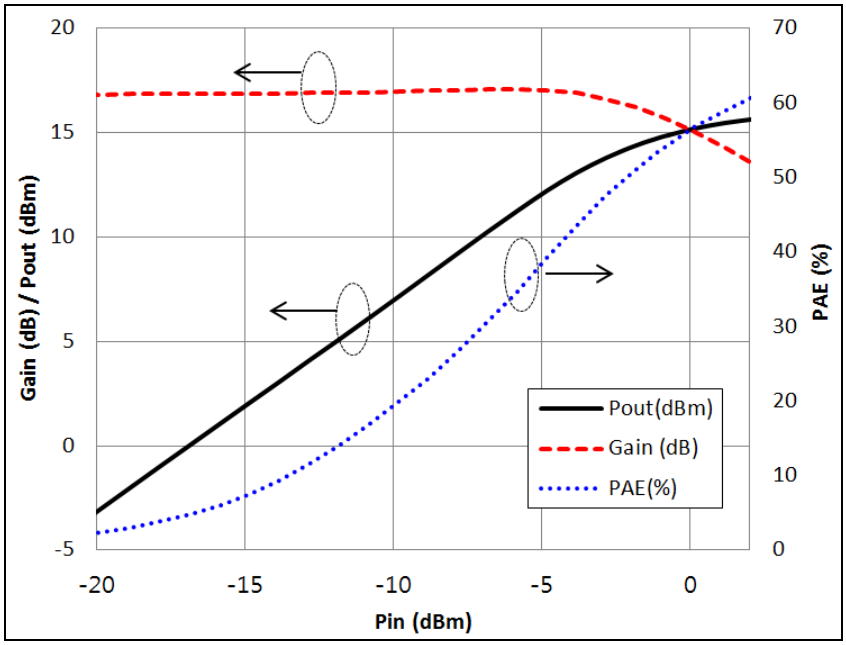
NOTE: S-parameters include 12 mil gold bond wires: 1 gate wire, 1 drain wire, 4 source wires. Reference planes are at the edge of substrates shown in the "Wire Bonding Information" figure below.

NOISE PARAMETERS (V_{ds} = 2 V, I_{ds} = 10 mA)

FREQUENCY (GHz)	NF MIN. (dB)	GAMMA OPT. (Mag.)	GAMMA OPT. (Ang.)	Associated Gain (dB)	Normalized Rn
2	0.16	0.827	3.649	20.460	0.188
3	0.18	0.810	15.551	19.580	0.181
4	0.19	0.783	27.376	18.740	0.171
5	0.20	0.752	30.667	17.920	0.164
6	0.21	0.712	34.528	17.140	0.156
7	0.23	0.668	36.600	16.390	0.149
8	0.24	0.623	37.402	15.670	0.143
9	0.26	0.582	33.305	14.990	0.143
10	0.30	0.519	37.280	14.490	0.128
11	0.35	0.449	37.264	13.920	0.124
12	0.39	0.395	39.953	13.430	0.111
13	0.43	0.318	44.861	12.970	0.103
14	0.47	0.228	55.706	12.600	0.087
15	0.51	0.105	88.026	12.210	0.073
16	0.55	0.113	-164.031	11.860	0.061
17	0.59	0.287	-126.824	11.580	0.062
18	0.61	0.461	-106.229	11.290	0.098
19	0.67	0.606	-89.016	10.980	0.201
20	0.71	0.703	-73.513	10.700	0.304



P_{IN}_P_{OUT}/Gain, PAE (12 GHz)

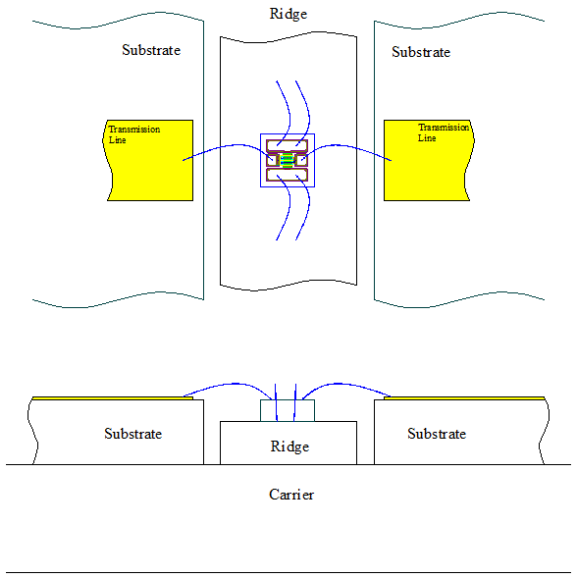


Frequency = 12GHz

V_{DS} = 2 V, I_{DS} = 10 mA (Tuned for Power)

WIRE BONDING INFORMATION

Always follow wire bonding diagrams recommended by BeRex for each device to achieve optimum device performance and reliability. As a general rule, bonding temperature should be kept to a maximum of 280°C for no longer than 2 minutes for all bonding wires.



Using 1 mil. Diameter, Au bonding wires.

1. Gate to input transmission line
- Length and Height : 500 µm x 250 µm
- Number of wire(s): 1
2. Drain to output transmission line
- Length and Height : 500 µm x 250 µm
- Number of wire(s) : 1
3. Source to ground plate
- Length and Height : 350 µm x 200 µm
- Number of wire(s) : 4

Proper ESD procedures should be followed when handling this device.

HANDLING PRECAUTIONS:

GaAs FETs are very sensitive to and may be damaged by Electrostatic Discharge (ESD). Therefore, proper ESD precautions must be taken whenever you are handling these devices. It is critically important that all work surfaces, and assembly equipment, as well as the operator be properly grounded when handling these devices to prevent ESD damage.

DIE ATTACH RECOMMENDATIONS:

BeRex recommends the "Eutectic" die attach using Au/Sn (80/20) pre-forms. The die attach station must have accurate temperature control, and the operation should be performed with parts no hotter than 300°C for less than 10 seconds. An inert forming gas (90% N_2/10% H_2) or clean, dry N_2 should be used.

Use of conductive epoxy (gold or silver filled) may also be acceptable for die-attaching low power devices.

SHIPPING & STORAGE:

BeRex's standard chip device shipping package consists of an antistatic "Gel-Pak", holding the chips, placed inside a sealed metallized bag. This packaging is designed to provide a reasonable measure of protection from both mechanical and ESD damage.

Chip devices should be stored in a clean, dry Nitrogen gas environment at room temperature until they are required for assembly. Only open the shipping package or perform die assembly in a work area with a class 10,000 or better clean room environment to prevent contamination of the exposed devices.

CAUTION:

THIS PRODUCT CONTAINS GALLIUM ARSENIDE (GaAs) WHICH CAN BE HAZARDOUS TO THE HUMAN BODY AND THE ENVIRONMENT. THEREFORE, IT MUST BE HANDLED WITH CARE AND IN ACCORDANCE WITH ALL GOVERNMENTAL AND COMPANY REGULATIONS FOR THE SAFE HANDLING AND DISPOSAL OF HAZARDOUS WASTE. DO NOT DO NOT BURN, DESTROY, CUT, CRUSH OR CHEMICALLY DISSOLVE THE PRODUCT. DO NOT LICK THE PRODUCT OR IN ANY WAY ALLOW IT TO ENTER THE MOUTH. EXCLUDE THE PRODUCT FROM GENERAL INDUSTRIAL WASTE OR GARBAGE AND DISPOSE OF ONLY IN ACCORDANCE TO APPLICABLE LAWS AND/OR ORDINANCES.

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