BCL015

SUPER LOW NOISE PHEMT (0.15µm x 150µm gate)

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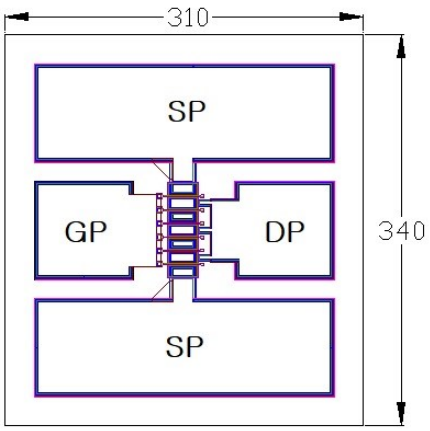
The BeRex BCL015 is a GaAs Super Low Noise Enhancement Mode pHEMT in an industry standard, bare die product. It's 0.15µm by 150µm recessed gate architecture provides low noise and high associated gain over a broad frequency range of 1000 MHz to 26 GHz.

Product Features

- 0.43 dB typical noise figure @12 GHz
- 12.0 dB typical associated gain @12 GHz
- 0.15 X 150 Micron Recessed Gate
- High Pin of up to 20dBm
- Single Positive Voltage Operation

Applications

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



Chip dimensions : 310 X 340 microns
Gate pad(GP) : 85 X 85 microns
Drain pad(DP) : 85 X 85 microns
Source pad(SP) : 260 X 85 microns
Chip thickness : 100 microns

Typical Performance

SYMBOLS	PARAMETER/TEST CONDITIONS	TEST FRE-QUENCY	MIN.	TYPICAL	Max	UNIT
NF	Noise Figure (Vds = 2V, Id = 10mA)	12 GHz		0.43	0.53	dB
G_A	Associated Gain (Vds = 2V, Id = 10mA)	12 GHz	10.0	12.0		dB
P1dB	Output Power @ p1dB (Vds = 2V, Id = 10mA)	12 GHz	12	15		dBm
I_{dss}	Saturated Drain Current (V_{gs} = 0.0 V, V_{ds} = 2.0 V)		0.15	0.25	40	uA
I_{dmax}	Maximum Drain Current (Vds = 2.0 V)			85		mA
G_m	Transconductance			130		mS
V_p	Pinch-off Voltage (I_{ds} = 0.015 mA, V_{ds} = 2V)		0.10	0.25	0.5	V
BV_{gd}	Drain Breakdown Voltage (I_g = 0.015 mA, source open)			10		V
BV_{gs}	Source Breakdown Voltage (I_g = 0.015 mA, drain open)			7		V
R_{th}	Thermal Resistance			280		° C/W

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MAXIMUM RATING (Ta = 25° C)

SYMBOLS	PARAMETERS	ABSOLUTE
V_{ds}	Drain-Source Voltage	5 V
V_{gs}	Gate-Source Voltage	3 V
I_{ds}	Drain Current	I_{max}
I_{gsf}	Forward Gate Current	20 mA
P_{in}	Input Power	20 dBm
T_{ch}	Channel Temperature	150° C
T_{stg}	Storage Temperature	-60° C to 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 (Vds = 2V, Ids = 10mA)

FREQ. [GHZ]	S11 [MAG]	S11 [ANG.]	S21 [MAG]	S21 [ANG.]	S12 [MAG]	S12 [ANG.]	S22 [MAG]	S22 [ANG.]
2	0.93	-36.30	7.61	149.80	0.042	69.84	0.72	-21.63
3	0.87	-50.81	6.93	137.83	0.057	62.87	0.68	-28.86
4	0.80	-62.89	6.27	127.74	0.069	57.83	0.64	-33.75
5	0.74	-73.02	5.71	119.30	0.077	54.48	0.61	-36.65
6	0.69	-82.46	5.26	111.56	0.084	51.81	0.58	-38.58
7	0.64	-91.41	4.89	104.52	0.090	49.83	0.56	-39.75
8	0.58	-100.29	4.59	97.86	0.096	48.12	0.53	-40.53
9	0.54	-109.43	4.35	91.51	0.100	46.61	0.51	-41.07
10	0.49	-119.24	4.15	85.16	0.105	44.97	0.48	-41.53
11	0.45	-130.12	3.99	78.75	0.109	43.26	0.46	-42.01
12	0.42	-141.92	3.86	72.24	0.112	41.68	0.44	-42.47
13	0.39	-155.67	3.75	65.44	0.115	39.65	0.41	-43.37
14	0.37	-172.03	3.66	58.34	0.119	36.67	0.38	-43.67
15	0.37	168.76	3.58	50.24	0.122	33.41	0.35	-45.17
16	0.39	147.78	3.49	41.38	0.125	29.15	0.29	-47.12
17	0.45	127.72	3.38	31.80	0.127	23.67	0.21	-48.95
18	0.54	110.43	3.23	21.67	0.126	16.95	0.12	-46.39
19	0.63	96.69	3.03	11.41	0.123	10.07	0.02	6.49
20	0.72	85.80	2.80	1.65	0.117	2.94	0.10	103.33
21	0.79	77.20	2.56	-7.42	0.109	-3.56	0.20	107.34
22	0.85	70.29	2.33	-15.98	0.102	-10.05	0.30	107.67
23	0.89	64.16	2.13	-24.23	0.095	-16.53	0.38	106.91
24	0.92	58.59	1.95	-32.44	0.088	-23.73	0.46	106.38
25	0.94	53.79	1.78	-40.02	0.081	-30.92	0.52	105.62
26	0.94	48.77	1.62	-47.92	0.075	-39.23	0.58	104.18

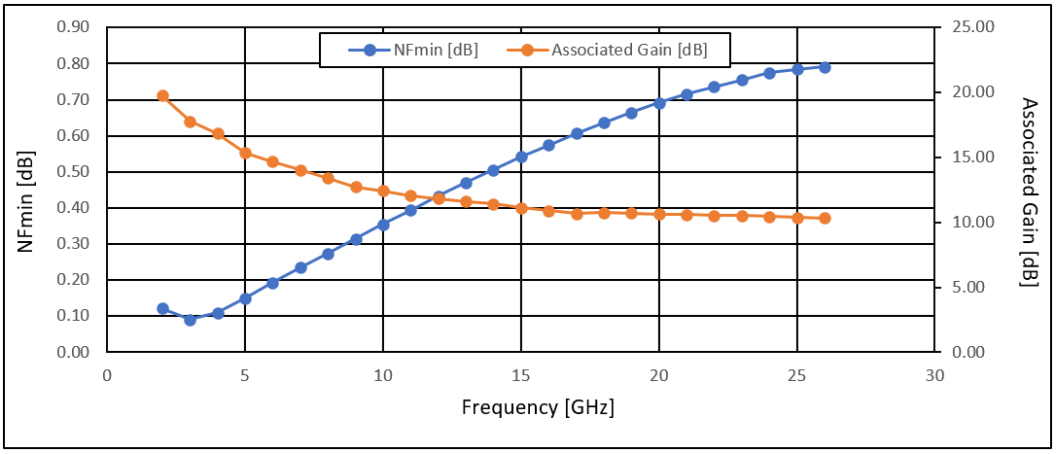
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NOISE PARAMETERS (Vds = 2 V, Ids = 10 mA)

FREQ. [GHZ]	NF MIN. [dB]	GAMMA OPT. [Mag.]	GAMMA OPT. [Ang.]	NORMALIZED Rn	ASSOCIATED GAIN [dB]
2	0.12	0.998	16.32	0.17	19.78
3	0.09	0.966	21.73	0.16	17.79
4	0.11	0.933	27.61	0.16	16.84
5	0.15	0.880	33.54	0.15	15.33
6	0.19	0.811	41.72	0.15	14.67
7	0.23	0.760	44.91	0.14	14.04
8	0.27	0.704	49.89	0.14	13.40
9	0.31	0.649	54.20	0.14	12.73
10	0.35	0.591	57.90	0.13	12.45
11	0.39	0.527	63.71	0.12	12.05
12	0.43	0.471	70.35	0.11	11.83
13	0.47	0.403	78.20	0.09	11.60
14	0.51	0.314	81.89	0.08	11.42
15	0.54	0.225	87.22	0.07	11.12
16	0.57	0.136	93.52	0.07	10.89
17	0.61	0.040	130.23	0.07	10.66
18	0.64	0.122	-95.94	0.09	10.74
19	0.66	0.255	-84.69	0.10	10.71
20	0.69	0.384	-80.70	0.11	10.65
21	0.72	0.517	-75.20	0.14	10.59
22	0.74	0.640	-72.62	0.18	10.54
23	0.75	0.763	-71.52	0.22	10.52
24	0.78	0.937	-68.60	0.30	10.44
25	0.78	0.970	-66.00	0.35	10.37
26	0.79	0.992	-63.87	0.40	10.34

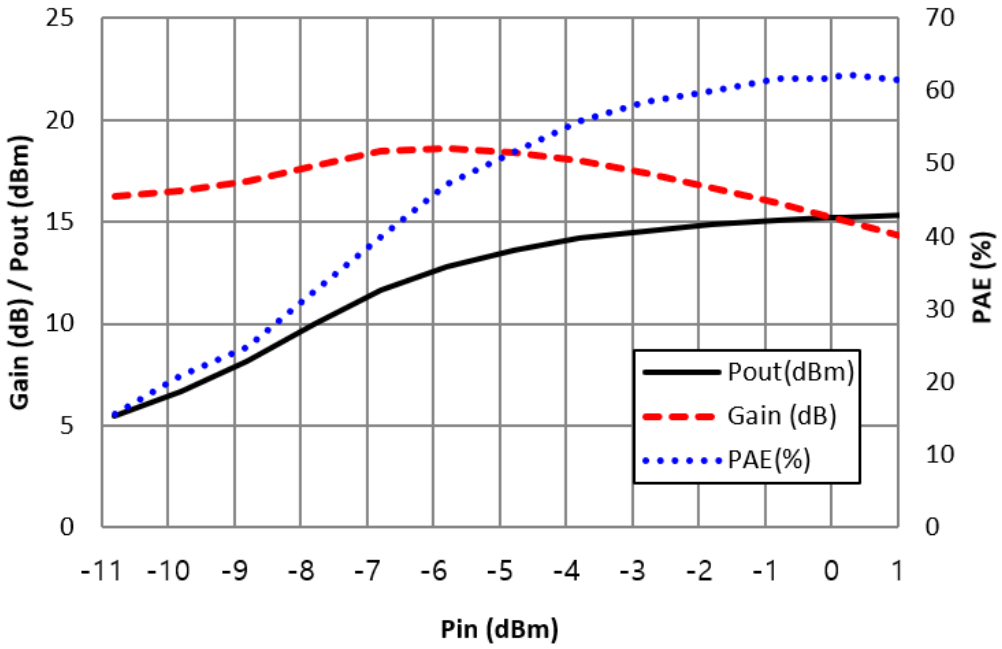
NOTE: NF data includes 20 mil gold bond wires: 1 gate wire, 1 drain wire, 4 source wires. Reference planes are at the edge of substrates shown in the “Wire Bonding Information”.

ASSOCIATED GAIN / NOISE FIGURE



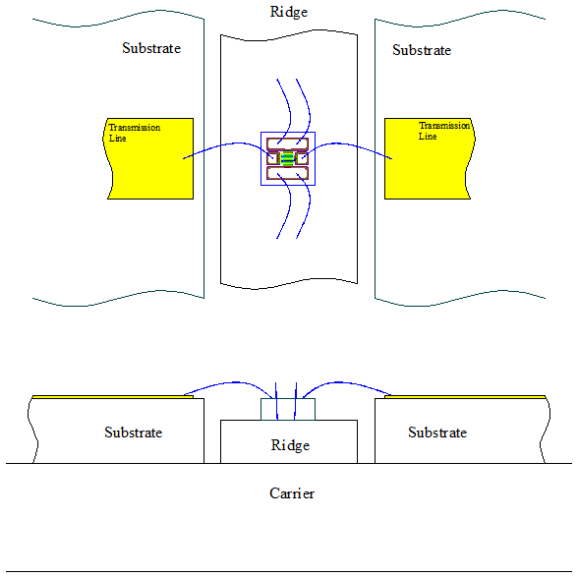
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PIN_POUT / Gain, PAE (@ 12 GHz)



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

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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 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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