BCP020T

HIGH EFFICIENCY HETEROJUNCTION POWER FET CHIP (.25µm x 200µm)

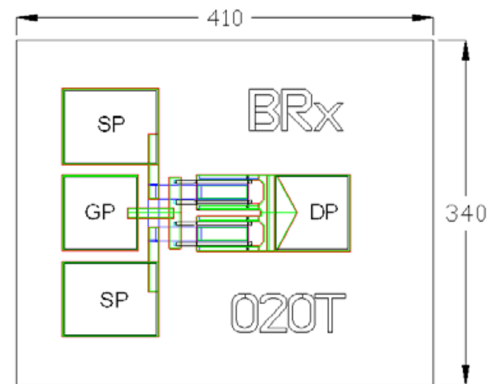
The BeRex BCP020T is a GaAs Power pHEMT with a nominal 0.25 micron gate length and 200 micron gate width making the product ideally suited for amplifier applications where high-gain and medium power from DC to 26 GHz. The product may be used in either wideband or narrow-band applications. The BCP020T is produced using state of the art metallization with SI_3N_4 passivation and is screened to assure reliability.

PRODUCT FEATURES

- 24 dBm Typical Output Power @12 GHz
- 14 dB Typical Gain @12 GHz
- 60% PAE Typical @12 GHz
- 0.25 X 200 µm Recessed Gate
- Also available in 70 mil. ceramic package (BCP020T-70)

APPLICATIONS

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



Chip dimensions : 410 X 340 microns
Gate pad(GP) : 75 X 75 microns
Drain pad(DP) : 75 X 75 microns
Source pad(SP) : 95 X 75 microns
Chip thickness : 100 microns

DC CHARACTERISTICS T_a = 25° C

SYMBOL	PARAMETER/TEST CONDITIONS	MIN.	TYPICAL	MAX.	UNIT
I_{dss}	Saturated Drain Current (V_{gs} = 0V, V_{ds} = 1.0V)	40	60	80	mA
G_m	Transconductance (V_{ds} = 3V, V_{gs} = 50% I_{dss})		80		mS
V_p	Pinch-off Voltage (I_{ds} = 0.3 mA, V_{ds} = 3V)	-2.5	-1.1	-0.5	V
BV_{gd}	Drain Breakdown Voltage (I_g = 0.6 mA, source open)		-15	-12	V
BV_{gs}	Source Breakdown Voltage (I_g = 0.6 mA, drain open)		-13		V
R_{th}	Thermal Resistance (Au-Sn Eutectic Attach)		160		°C/W

ELECTRICAL CHARACTERISTICS (TUNED FOR POWER) T_a = 25° C

SYMBOL	PARAMETER/TEST CONDITIONS	TEST FREQ.	MIN.	TYPICAL	MAX.	UNIT
P_{1dB}	Output Power @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	22.5	24.0 24.0		dBm
G_{1dB}	Gain @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	12.0	14.0 12.0		dB
PAE	PAE @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz		60 55		%
NF	50 Ohm Noise Figure (V_{ds}=2V, I_{ds}=10 mA)	12 GHz		1.09		dB

Specifications are subject to change without notice. ©BeRex 2015 Rev. 1.7

ELECTRICAL CHARACTERISTICS (TUNED FOR GAIN) T_a = 25° C

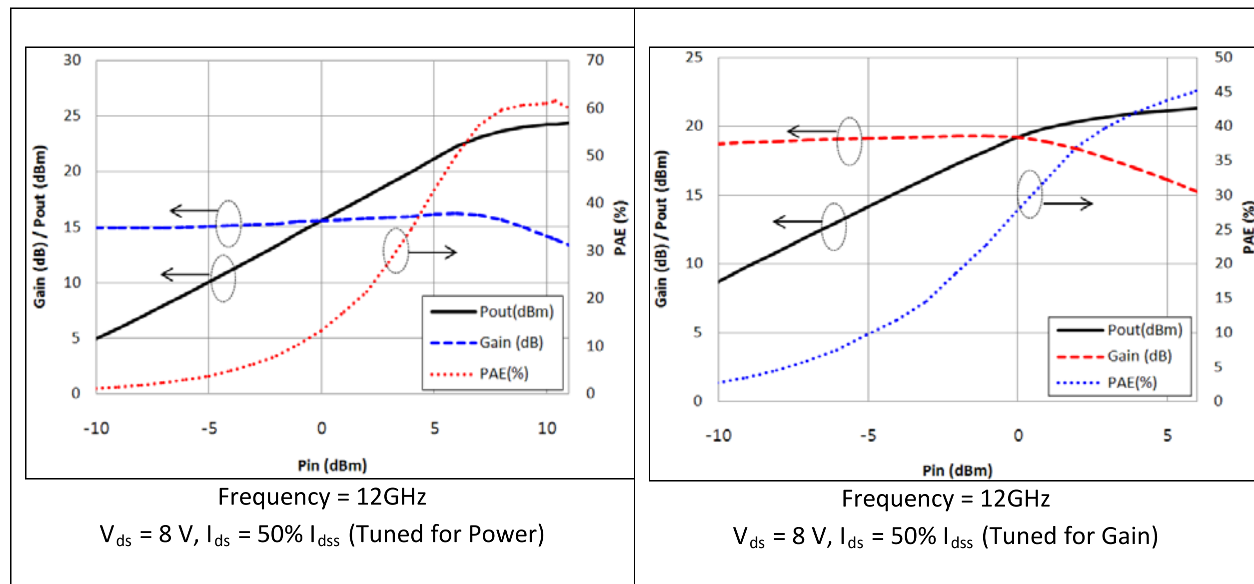
SYMBOL	PARAMETER/TEST CONDITIONS	TEST FREQ.	MIN.	TYPICAL	MAX.	UNIT
P_{1dB}	Output Power @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	20.0	21.0 21.0		dBm
G_{1dB}	Gain @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	15.5	17.0 13.0		dB
PAE	PAE @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz		45 45		%
NF	50 Ohm Noise Figure (V_{ds}=2V, I_{ds}=10 mA)	12 GHz		1.09		dB

MAXIMUM RATINGS (T_a = 25° C)

SYMBOLS	PARAMETERS	ABSOLUTE	CONTINUOUS
V_{ds}	Drain-Source Voltage	12 V	8 V
V_{gs}	Gate-Source Voltage	-6 V	-3 V
I_{ds}	Drain Current	I_{dss}	I_{dss}
I_{gsf}	Forward Gate Current	11 mA	2 mA
P_{in}	Input Power	17 dBm	@ 3dB compression
T_{ch}	Channel Temperature	175° C	150° C
T_{stg}	Storage Temperature	-60° C - 150° C	-60° C - 150° C
P_t	Total Power Dissipation	1.0 W	0.8 W

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

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

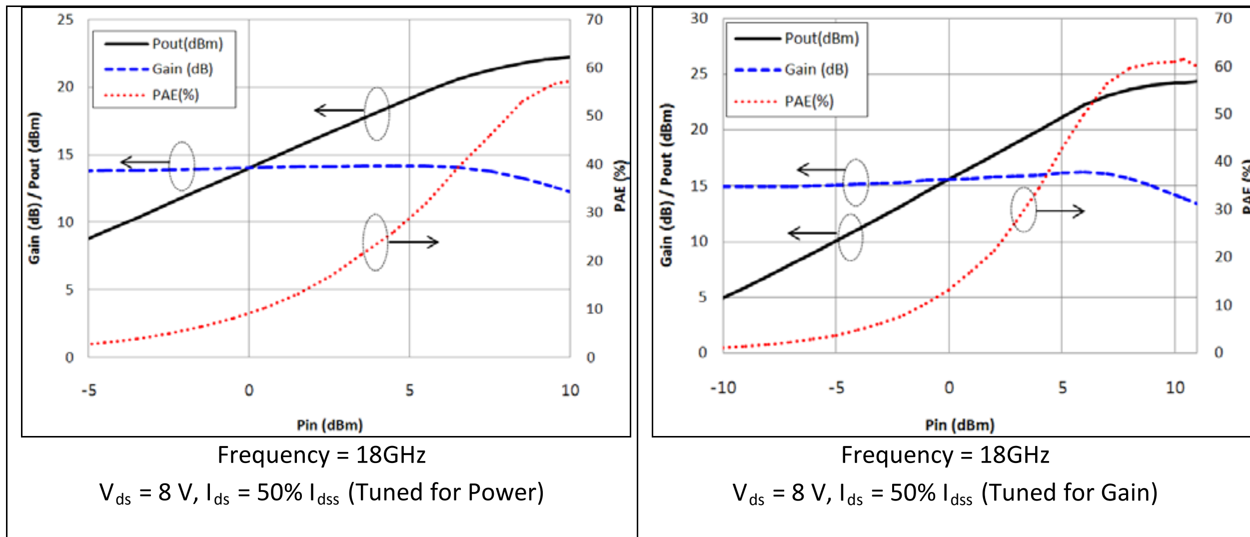


Frequency = 12GHz
V_{ds} = 8 V, I_{ds} = 50% I_{dss} (Tuned for Power)

Frequency = 12GHz
V_{ds} = 8 V, I_{ds} = 50% I_{dss} (Tuned for Gain)

Specifications are subject to change without notice. ©BeRex 2015 Rev. 1.7

P_{IN}_P_{OUT}/Gain, PAE (18 GHz)



Frequency = 18GHz
V_{ds} = 8 V, I_{ds} = 50% I_{dss} (Tuned for Power)

Frequency = 18GHz
V_{ds} = 8 V, I_{ds} = 50% I_{dss} (Tuned for Gain)

S-PARAMETERS (V_{ds} = 8V, I_{ds} = 50% I_{dss})

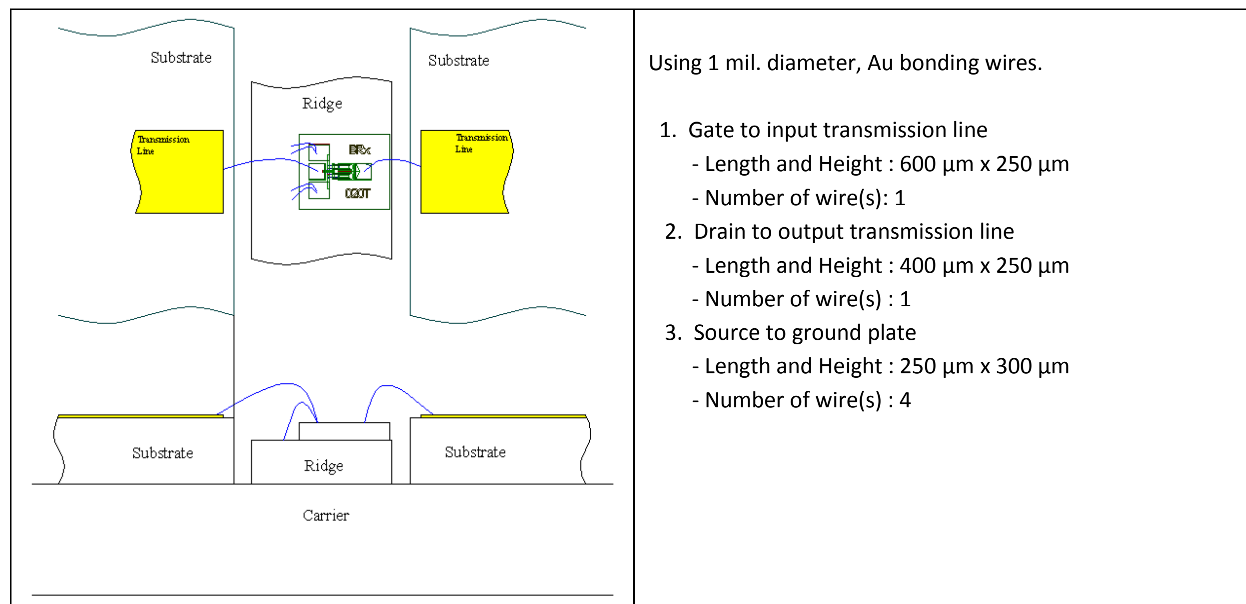
FREQ. [GHZ]	S11 [MAG]	S11 [ANG.]	S21 [MAG]	S21 [ANG.]	S12 [MAG]	S12 [ANG.]	S22 [MAG]	S22 [ANG.]
1	0.98	-17.63	6.54	165.56	0.014	81.13	0.80	-5.99
2	0.95	-35.11	6.35	152.34	0.027	70.37	0.78	-11.31
3	0.90	-52.87	6.08	140.12	0.039	64.06	0.75	-15.78
4	0.85	-69.99	5.77	127.94	0.048	53.79	0.71	-20.09
5	0.80	-88.24	5.43	116.00	0.054	47.49	0.67	-24.42
6	0.76	-105.52	5.04	104.87	0.058	40.26	0.63	-27.88
7	0.72	-122.72	4.68	93.83	0.063	33.49	0.59	-32.54
8	0.71	-138.65	4.33	84.53	0.064	29.01	0.56	-34.82
9	0.69	-152.44	3.97	75.99	0.063	25.78	0.53	-36.61
10	0.68	-166.12	3.69	67.53	0.064	22.40	0.51	-38.64
11	0.69	-178.47	3.38	59.72	0.064	18.97	0.47	-39.57
12	0.70	170.61	3.17	51.75	0.067	17.78	0.46	-42.35
13	0.71	158.55	2.94	44.52	0.061	12.25	0.43	-43.48
14	0.73	149.14	2.73	37.18	0.062	12.90	0.40	-45.06
15	0.74	140.53	2.57	30.17	0.063	10.83	0.37	-47.57
16	0.78	131.12	2.40	22.71	0.064	8.80	0.33	-49.99
17	0.81	125.12	2.23	15.52	0.062	6.82	0.29	-55.76
18	0.82	117.90	2.06	8.53	0.066	2.23	0.24	-62.01
19	0.84	111.86	1.89	0.82	0.065	0.95	0.19	-72.70
20	0.86	109.58	1.74	-5.04	0.066	-1.33	0.14	-89.32
21	0.87	105.71	1.60	-11.40	0.068	-0.98	0.11	-123.58
22	0.88	103.28	1.45	-17.65	0.068	-3.31	0.13	-160.51
23	0.88	103.13	1.32	-22.86	0.070	-5.10	0.18	174.94
24	0.88	101.01	1.20	-28.51	0.070	-5.63	0.25	162.82
25	0.90	100.91	1.08	-33.17	0.066	-6.26	0.32	154.30
26	0.90	102.38	1.00	-36.21	0.070	-2.08	0.38	150.28

Note: S-parameters include bond wires. Reference planes are at edge of substrates shown on "Wire Bonding Information" figure below.

Specifications are subject to change without notice. ©BeRex 2015 Rev. 1.7

WIRE BONDING INFORMATION

Follow the wire bonding diagrams recommended by BeRex below to achieve optimum device performance. BeRex recommends thermo-compression wedge bonding. 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. Ultrasonic bonding is not recommended.



Using 1 mil. diameter, Au bonding wires.

1. Gate to input transmission line
   - Length and Height : 600 µm x 250 µm
   - Number of wire(s): 1
2. Drain to output transmission line
   - Length and Height : 400 µm x 250 µm
   - Number of wire(s) : 1
3. Source to ground plate
   - Length and Height : 250 µm x 300 µm
   - Number of wire(s) : 4

Proper ESD procedures should be followed when handling this device.

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.

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.

STORAGE & SHIPPING:

BeRex’s standard chip device shipping package consists of an antistatic “Gel-Pak”, holding the chips, placed inside a sealed antistatic and moisture barrier 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.

Specifications are subject to change without notice. ©BeRex 2015 Rev. 1.7

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.

LIFE SUPPORT POLICY

BEREX PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES WITHOUT THE EXPRESS WRITTEN APPROVAL OF BEREX.

1. Life support devices or systems are devices or systems which (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labeling, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

DISCLAIMER

BEREX RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. BEREX DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN.

RoHS COMPLIANT

For complete specifications, S-parameters and information on bonding and handling, visited our website; *www.berex.com*

Specifications are subject to change without notice. ©BeRex 2015 Rev. 1.7