BCP040T

HIGH EFFICIENCY HETEROJUNCTION POWER FET CHIP (.25µm x 400µm)

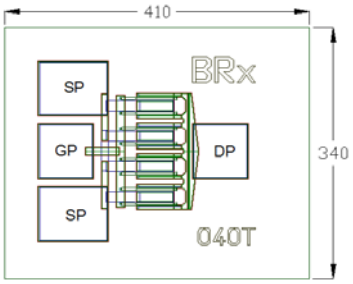
The BeRex BCP040T is a GaAs Power pHEMT with a nominal 0.25 micron gate length and 400 micron gate width making the product ideally suited for applications requiring high-gain and medium power from DC to 26 GHz. The product may be used in either wideband or narrow-band applications. The BCP040T is produced using state of the art metallization with SI_3N_4 passivation and is screened to assure reliability

PRODUCT FEATURES

- 26 dBm Typical Output Power
- 14 dB Typical Power Gain @ 12 GHz
- 0.25 X 400 Micron Recessed Gate

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)	80	120	160	mA
G_m	Transconductance (V_{ds} = 3V, V_{gs} = 50% I_{dss})		160		mS
V_p	Pinch-off Voltage (I_{ds} = 400 µA, V_{ds} = 2V)		-1.1		V
BV_{gd}	Drain Breakdown Voltage (I_{gd} = 0.4 mA, source open)		-16		V
BV_{gs}	Source Breakdown Voltage (I_g = 0.4 mA, drain open)		-14		V
R_{th}	Thermal Resistance (Au-Sn Eutectic Attach)		120		°C/W

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

SYMBOL	PARAMETER/TEST CONDITIONS	FREQ.	MIN.	TYPICAL	MAX.	UNIT
P_{1dB}	Output Power @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	24.5 23.5	26.0 25.0		dBm
G_{1dB}	Gain @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	13.0 9.0	14.0 10.0		dB
PAE	PAE @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz		65 65		%
NF	Noise Figure (V_{ds} = 2V, I_{ds} = 10mA)	12 GHz		1.0		dB

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

SYMBOL	PARAMETER/TEST CONDITIONS	FREQ.	MIN.	TYPICAL	MAX.	UNIT
P_{1dB}	Output Power @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	23.0 23.5	24.5 25.0		dBm
G_{1dB}	Gain @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz	13.5 9.5	14.5 10.5		dB
PAE	PAE @ P_{1dB} (V_{ds} = 8V, I_{ds} = 50% I_{dss})	12 GHz 18 GHz		55 50		%
NF	Noise Figure (V_{ds} = 2V, I_{ds} = 10mA)	12 GHz		1.0		dB

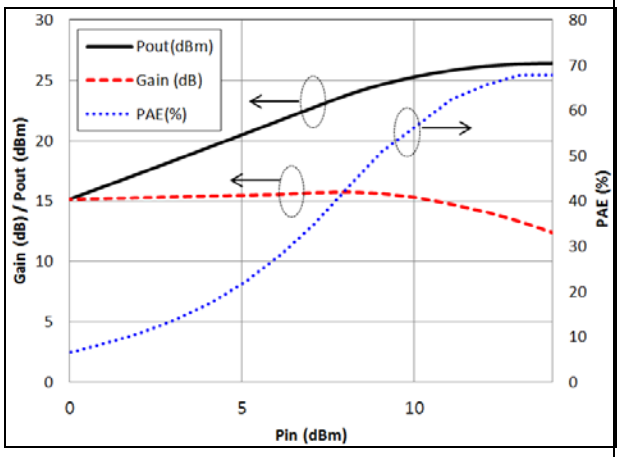
MAXIMUM RATING (T_a = 25° C)

SYMBOLS	PARAMETERS	ABSOLUTE	CONTINUOUS
V_{ds}	Drain-Source Voltage	12 V	8 V
V_{gs}	Gate-Source Voltage	-8 V	-3 V
I_{ds}	Drain Current	I_{dss}	I_{dss}
I_{gsf}	Forward Gate Current	20 mA	3 mA
P_{in}	Input Power	21 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	1.3 W	1.1 W

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

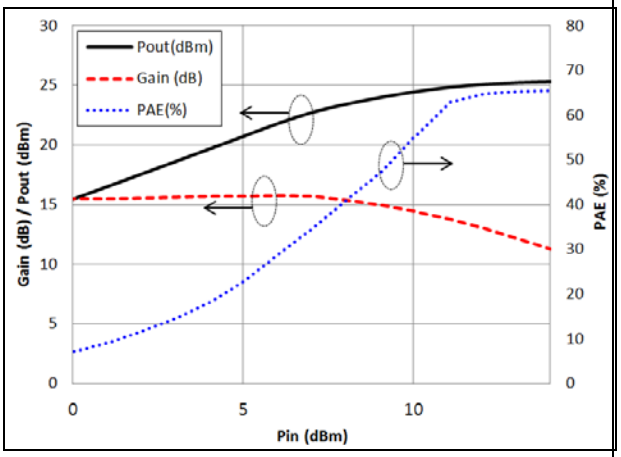
P_{IN}_P_{OUT}/Gain, PAE (12 GHz)

Frequency = 12GHz



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

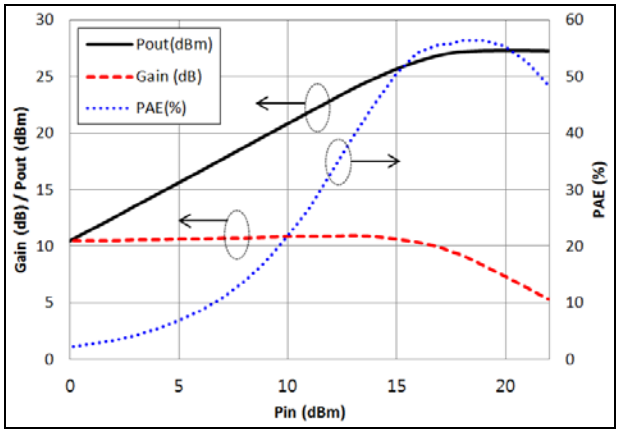
Frequency = 12GHz



V_{ds} = 8 V, I_{ds} = 50% Id_{ss} (Tuned for Gain)

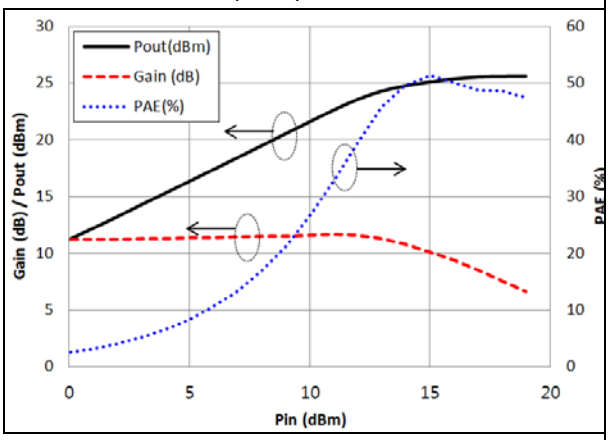
P_{IN}_P_{OUT}/Gain, PAE (18 GHz)

Frequency = 18GHz



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

Frequency = 18GHz



V_{ds} = 8 V, I_{ds} = 50% Id_{ss} (Tuned for Gain)

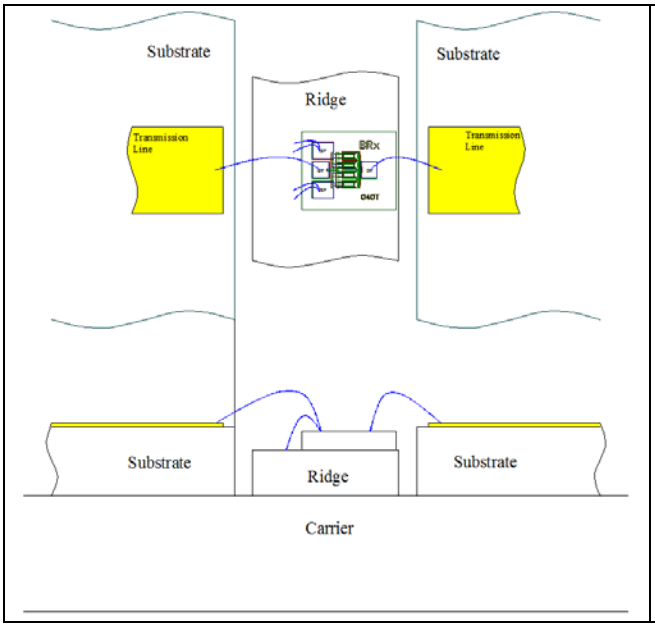
S-PARAMETER (V_{ds} = 8V, I_{ds} = 50% I_{dss})

FREQ. [GHZ]	S11 [MAG]	S11 [ANG.]	S21 [MAG]	S21 [ANG.]	S12 [MAG]	S12 [ANG.]	S22 [MAG]	S22 [ANG.]
1	0.96	-38.95	10.74	154.03	0.024	67.870	0.63	-16.38
2	0.90	-72.73	9.35	132.90	0.041	51.922	0.56	-28.82
3	0.84	-100.58	7.93	115.40	0.052	40.124	0.49	-38.66
4	0.80	-124.51	6.72	100.84	0.058	30.602	0.43	-45.59
5	0.79	-144.07	5.75	88.09	0.060	22.712	0.38	-51.83
6	0.77	-160.36	4.94	77.17	0.061	17.573	0.34	-56.32
7	0.77	-175.12	4.30	67.14	0.061	13.087	0.31	-60.95
8	0.78	172.50	3.77	57.90	0.060	8.273	0.29	-66.49
9	0.79	161.60	3.33	49.47	0.058	5.197	0.27	-71.96
10	0.80	151.54	2.95	41.38	0.056	2.259	0.25	-78.38
11	0.82	143.51	2.62	33.87	0.055	0.457	0.23	-86.25
12	0.84	137.56	2.35	27.30	0.054	-1.309	0.22	-93.90
13	0.85	131.64	2.11	20.76	0.052	-2.402	0.21	-103.35
14	0.87	126.69	1.91	14.58	0.052	-3.289	0.20	-116.08
15	0.88	122.78	1.76	9.18	0.052	-4.234	0.20	-125.70
16	0.89	118.31	1.61	3.27	0.052	-4.521	0.20	-137.48
17	0.90	114.15	1.50	-2.94	0.053	-6.342	0.21	-150.51
18	0.91	111.19	1.37	-8.97	0.054	-7.516	0.23	-162.04
19	0.92	106.48	1.25	-15.31	0.055	-8.383	0.24	-170.91
20	0.92	104.43	1.16	-21.21	0.057	-10.277	0.27	178.56
21	0.92	102.30	1.06	-26.28	0.057	-8.773	0.31	169.29
22	0.91	99.92	0.97	-31.27	0.059	-9.308	0.34	161.39
23	0.92	98.63	0.89	-35.98	0.060	-10.045	0.38	154.95
24	0.91	96.95	0.81	-40.77	0.059	-10.944	0.42	148.51
25	0.92	95.77	0.73	-45.07	0.058	-8.730	0.45	143.09
26	0.92	95.87	0.66	-48.56	0.058	-3.981	0.48	138.86

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

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.



Bonding Wire information

1. Gate to input transmission line
   - Length and Height : 400 um and 250 um
   - Number of wire : 1 wire
2. Drain to output transmission line
   - Length and Height : 350 um and 250 um
   - Number of wire : 1 wire
3. Source to ground plate
   - Length and Height : 200 um and 250 um
   - Number of wire : 4 wires

※ The diameter of bonding wires : 1 mil

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.

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.

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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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.

RoHS COMPLIANT

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