Advanced Product Information
July 2002

1.75 to 1.78 GHz 28.5 dBm, Korea PCS InGaP HBT Amplifier Module

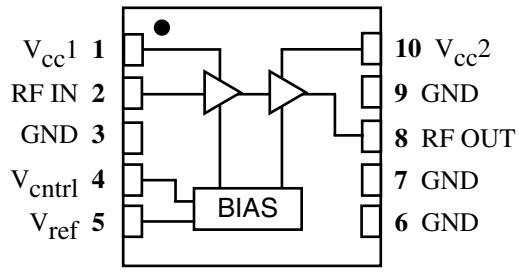
Features

- ❑ InGaP HBT Technology
- ❑ 4mm Square, 50 Ohm Power Module
- ❑ Single Positive Supply
- ❑ 35% Linear Power Added Efficiency
- ❑ +28.5 dBm Output Power (CDMA)
- ❑ +28.0 dBm Output Power (CDMA2K 1X)
- ❑ 27 dB Gain at Operating Output Power
- ❑ On-Board Power Down Mode

Applications

- ❑ Korea PCS Handsets
- ❑ CDMA Handsets
- ❑ CDMA2K 1X Handsets

Functional Block Diagram



Ground connection: pins 3, 6, 7, 9 and on backside

Description

The CHP1206-QM is a 50 ohm matched, single supply, linear power amplifier module intended for use in Korean handsets. The highly integrated amplifier meets the requirements of Korea PCS CDMA systems.It is a member of Celeritek's new ***QuadAmps***™ family of 3V power amplifier modules that are packaged in a low-cost, space efficient, 4mm square, matched module that provides excellent electrical stability and low thermal resistance. The module operates from a fixed positive voltage and requires no external matching which significantly reduces space, cost and enhances ease of use. A current adjustment pin (Vcntrl) is provided to improve efficiency for the low RF power range of operation.

The 4x4 mm package is self contained, incorporating 50 ohm input and output matching networks optimized for output power, linearity and efficiency.

Celeritek's InGaP HBT technology offers a thermally robust and reliable PAM (power amplifier module) solution.

Absolute Maximum Ratings

Parameter	Rating	Parameter	Rating	Parameter	Rating
Collector Voltage (+V_{cc})	+6.0 V*	Reference Voltage (V_{ref})	+3.1 V	Operating Temperature	-30°C to +95°C
Collector Current (I_{cc})	1.2 A	Power Dissipation	4 W	Storage Temperature	-55°C to +135°C
RF Input Power (High Mode)	7 dBm	Vcntrl	+3.1 V	Soldering Temperature	260°C for 5 Sec.
RF Input Power (Low Mode)	13 dBm				

* RF Off.

Recommended Operating Conditions

Parameter	Typ	Units	Parameter		Typ	Units
Collector Voltage (+V_{cc})	3.2 to 4.2	Volts	Operating Temperature (PC Board)		-20 to +70	°C
Reference Voltage (V_{ref}) (Fixed and regulated)	+3.0 (±0.1V)	Volts	Control Voltage (Vcntrl)	High Low	2.5-3.0 0-0.5	V V

Application Information

The CHP1206-QM is a two-stage amplifier that requires a single regulated positive supply along with the unregulated battery voltage for proper operation. Vref is a regulated 3.0 reference voltage for the bias control circuitry. It can also be used as a power down mode select. Vcc is an unregulated supply voltage directly from the battery. Vcc should be applied prior to Vref and before RF input power. Vcntrl is a control voltage selection between high and low power mode. The CHP1206-QM can be operated over a range of supply voltages and bias points by adjustment of Vref. It is important that the maximum power dissipation of the package be observed at all times and that the maximum voltage across the device is not exceeded.

Circuit Design Considerations

Biasing The positive Vcc supply voltages are applied to pins 1 and 10. Most bypass decoupling is provided on-board. Vref is applied to pin 5.

The recommended DC bypass capacitance is shown in the schematic diagram on Page 3.

Inadequate bypass capacitance and inductance around the DC supply lines can compromise the adjacent channel power ratio (ACPR), reduce power gain and/or create oscillations.

– Continued on Page 2 –

Electrical Characteristics

Unless otherwise specified, the following specifications are guaranteed at room temperature with collector voltage ($+V_{cc}$) = 3.4 V.

Parameter	Condition	Min	Typ	Max	Units
Frequency Range		1.75		1.78	GHz
Gain	Pout = +28.5 dBm	25	27	30	dB
Gain Ripple*	1750-1780 MHz		1.0	1.5	dB
Gain Variation	Over supply voltage		2		dB/V
	Over temperature		0.03		dB/°C
Power Output	CDMA mode (IS-95)		+28.5		dBm
Harmonics	2nd @ Po = +28.0 dBm CDMA mode, no additional output trapping		-30		dBc
	3rd @ Po = +28.0 dBm CDMA mode, no additional output trapping		-30		dBc
Noise Power in Receive Band			-91	-90	dBm
Linearity (ACPR)	CDMA mode @ +28.5 dBm Pout, 1.25 MHz offset		-50	-48	dBc/30KHz
	CDMA mode @ +28.5 dBm Pout, 1.98 MHz offset		-58	-56	dBc/30KHz
	CDMA2K 1X mode** @ +28.0 dBm Pout, 1.25 MHz offset		-48	-47	dBc/30KHz
	CDMA2K 1X mode** @ +28.0 dBm Pout, 1.98 MHz offset		-58	-56	dBc/30KHz
Noise Figure			6.0		dB
Input Return Loss			-10		dB
I_{cc}	Pout = +12.0 dBm - CDMA mode		100		mA
	Pout = +28.5 dBm - CDMA mode		590		mA
Quiescent Current (I_q)	No RF Vcntrl = Low		80		mA
	Vcntrl = High		55		mA
V_{ref} Supply Current (I_{ref})			3.0	5.0	mA
V_{ref} Supply Voltage (V_{ref})	Fixed and regulated (±0.1V tolerance)		3.0		V
Icntrl	Vcntrl = High		400	800	µA
Leakage Current	V_{ref} = 0 V, V_{cc} = 3.4 V			10	µA

* Specifications guaranteed over the temperature range of -20°C to +70°C. ** Modulation HPSK in 1.2288 MHz, RC3 PAR = 4.7 @ 1% CCDF.

RF Power Range Truth Table

Power State	Vref	Vcntrl	RF Power Renge
High Power	3.0 V	Low	16 – 28 dBm
Low Power	3.0 V	High	≤16 dBm
Shutdown	0 V	Low	—

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Modulation When biased as specified, the CHP1206-QM will achieve the required adjacent channel response for the digital system specified. Celeritek tests each product under digital modulation to ensure correlation to customer applications.

Thermal

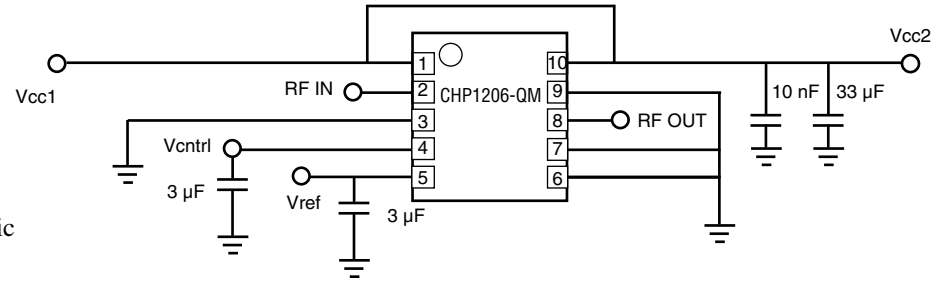
1. The ground pad on the backside of the CHP1206-QM must be soldered to the ground plane.
2. All leads of the package must be soldered to the appropriate electrical connection.

Physical Dimensions and PCB Footprint

Contact the factory for detailed information and dimensions of HBT power module package and recommended printed circuit board footprint.

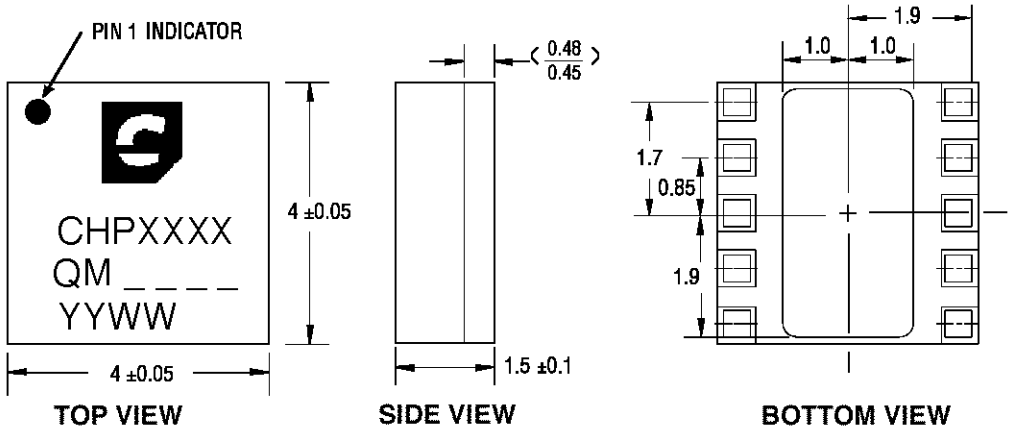
Recommended Application Circuit

Note: This schematic represents the topology of the application circuit recommended by Celeritek.



Evaluation Board Schematic
Board substrate:
ER = 4.60
Thickness = 0.031 in.

Physical Dimensions



Ordering Information

The CHP1206-QM is available in a surface mount 50 ohm matched module and devices are available in tube or tape and reel.

Part Number for Ordering	Package
CHP1206-QM-0000	**QM10 surface mount power package in tube**
CHP1206-QM-000T	**QM10 surface mount power package in tape and reel**
PB-CHP1206-QM	**Evaluation Board with SMA connectors for CHP1206-QM**

NOTES

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