

# 2.3-2.7 GHz InGaP HBT 8W Linear Power Amplifier

February 2008 - Rev 08-Feb-08

## Features

- ✕ P1dB, 8W
- ✕ Power Gain, 12 dB
- ✕ Efficiency, 25% @ 1W
- ✕ Positive Voltage Supply, +5V to +12V
- ✕ Integrated Active Bias Circuit
- ✕ Control Voltage Allows Different Current Settings
- ✕ Input Fully Matched Internally
- ✕ Output Pre-Matched Internally
- ✕ Thermally Efficient for Higher MTTF
- ✕ RoHS Compliant 6X6mm QFN
- ✕ Ideal for WiMAX and WiBro Applications (802.16)



## General Description

The CHV2720-QJ is a high linearity single stage class AB Heterojunction Bipolar Transistor (HBT) power amplifier capable of 12 dB of gain, 8 Watt of power at 1 dB compression and is housed in a 6X6mm QFN package. The CHV2720-QJ provides less than 2.5% EVM at 31dBm output power with 802.16 OFDM signal and peak to average power ratio of 9 dB. The input of the device is fully matched and the output is internally pre matched to 6 ohm facilitating a simplified output matching approach. This product operates off a single supply voltage between 5V and 12V and includes an internal bias circuitry to enable exact setting of quiescent current using an external control voltage. The device is ideal as a final or driver stage for WiMAX equipment in the 2.3 -2.7 GHz bands.

## Absolute Maximum Ratings

Voltage Supply (Vcc)	4.5 (min) / 12 V (max)
Current (Icc)	2000 mA
Dissipated Power (P <sub>diss</sub> )	18W
Input Power (P <sub>in</sub> )	22 dBm
Storage Temperature (T <sub>stg</sub> )	-60 to +150 °C
Channel Temperature (T <sub>ch</sub> )	175 °C
Thermal Resistance (R <sub>th</sub> )	5 °C/W
Operating Backside Temperature (T <sub>b</sub> )	-40 °C to (see note 1)

Operation outside any of these limits can cause permanent damage.  
(1) Calculate maximum operating temperature T<sub>max</sub> using the following formula: T<sub>max</sub>=175-(P<sub>diss</sub> [W] x 5) [C].

## Electrical Characteristics (Ambient Temperature T=25 °C, Vcc=12V)<sup>1</sup>

Description	Parameter	Units	Min.	Typ.	Max.
Operating Frequency	f	GHz	2.3	2.5	2.7
Quiescent Current <sup>(2)</sup>	I <sub>cc</sub>	mA	-	160	-
Power Gain @ P <sub>out</sub> = 31 dBm	G <sub>ps</sub>	dB	-	12	-
Efficiency @ 31 dBm	Eff	%	-	25	-
Output Power @ EVM = 2.5% <sup>(3)</sup>	P <sub>out</sub>	dBm	-	31.5	-
Adjacent Channel Power Ratio @ P <sub>out</sub> = 31 dBm <sup>(4)</sup>	ACPR	dBc	-	-40	-
Power @ 1dB Compression Point	P1dB	dBm	-	39	-
Output Third order intercept Point @ 31 dBm/tone <sup>(5)</sup>	OIP3	dBm	-	51	-
Input Reflection Coefficient	S11	dB	-	-12	-
Control Voltage	V <sub>ctrl</sub>	V	-	5	-
Noise Figure	NF	dB	-	9	-

(1) Data measured in a Mimix matched connectorized fixture.

(2) Quiescent current depends on Vcc

(3) Using an 802.16d OFDM signal format with PAR = 9dB

(4) Using 3 GPP WCDMA signal, PAR = 9.17dB

(5) 100KHz spacing

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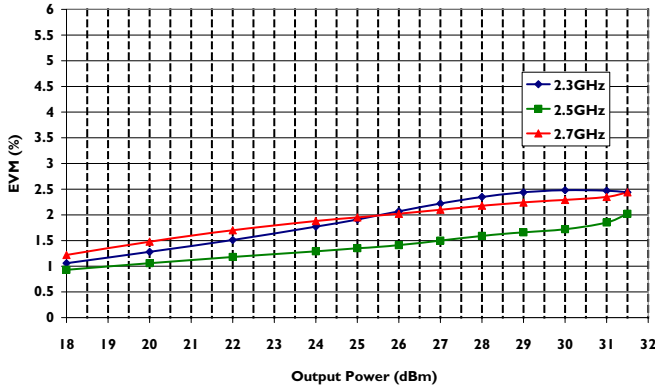


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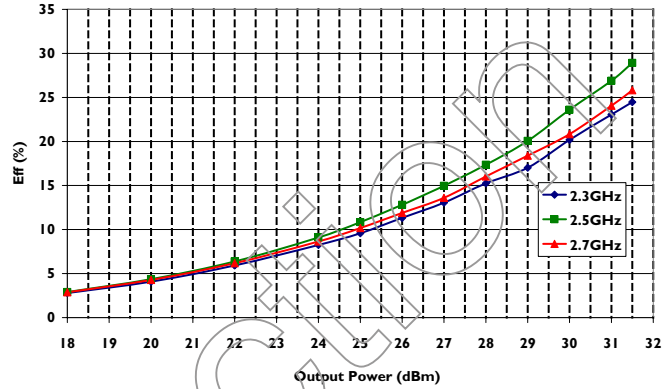
**CHV2720-QJ**  
RoHS

## Typical Performance

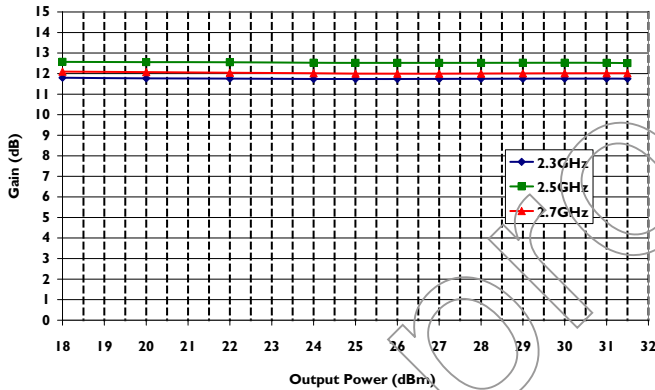
**EVM Vs Output Power Vs Frequency**  
OFDM 802.16d, 64QAM, PAR =9dB, +12V



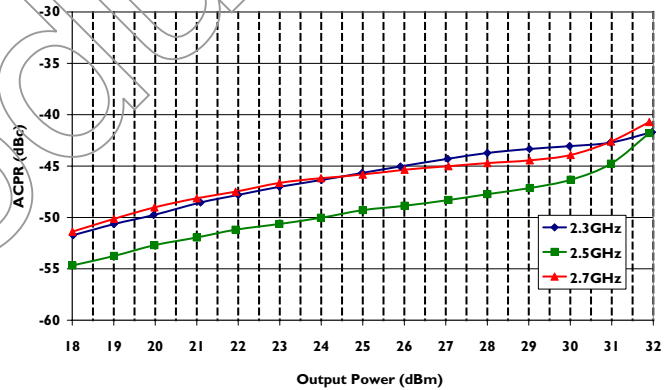
**Efficiency Vs Output power Vs Frequency**  
Vcc = +12V, Vcontrol = +5V, Icq = 160mA



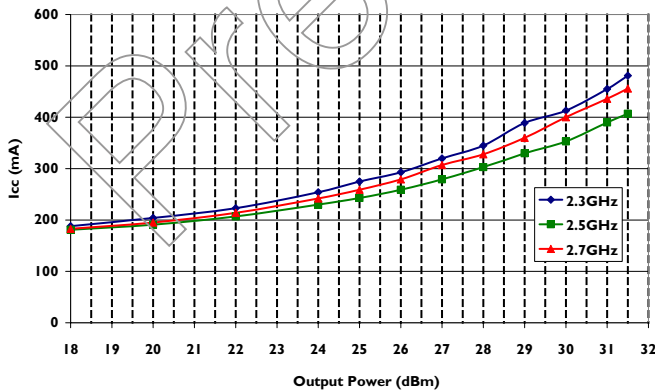
**Gain Vs Output power**  
Vcc = +12V, Vcontrol = +5V, Icq = 160mA



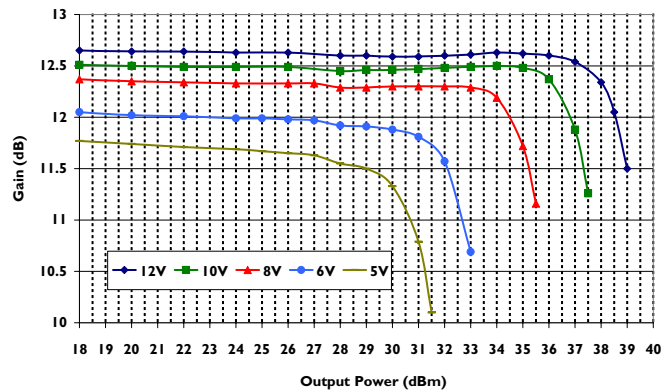
**ACPR Vs Output Power Vs Frequency**  
WCDMA, +12V



**Current Vs Output power Vs Frequency**  
Vcc = +12V, Vcontrol = +5V, Icq = 160mA



**Gain Vs Output Power Vs Voltage**  
2.5 GHz

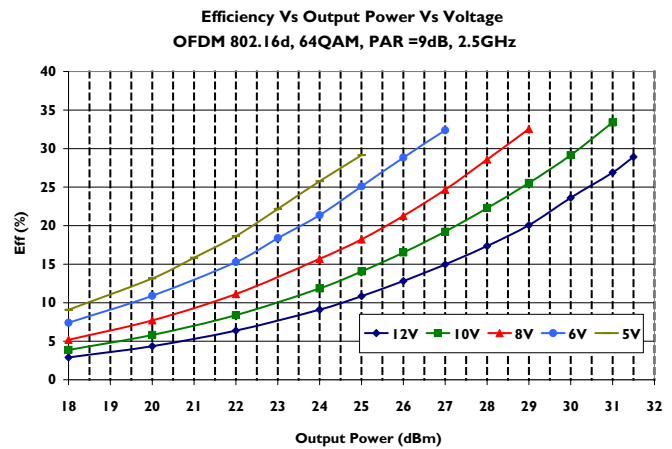
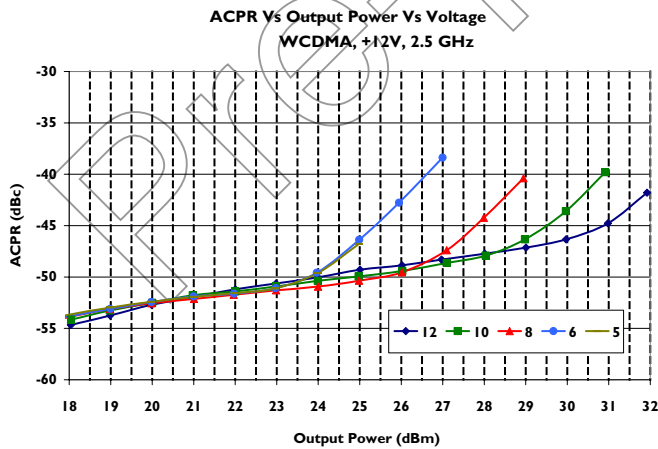
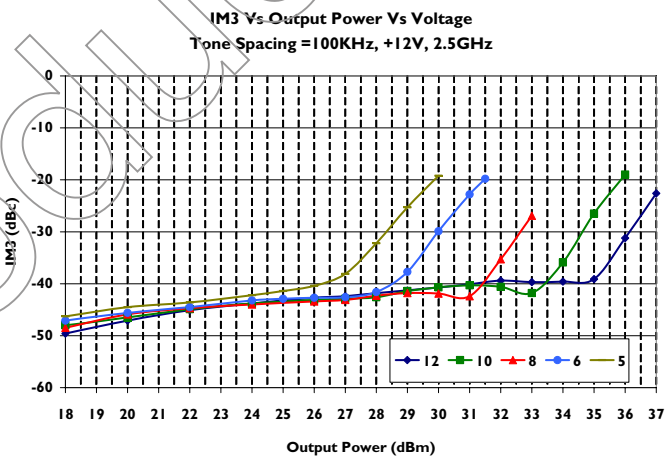
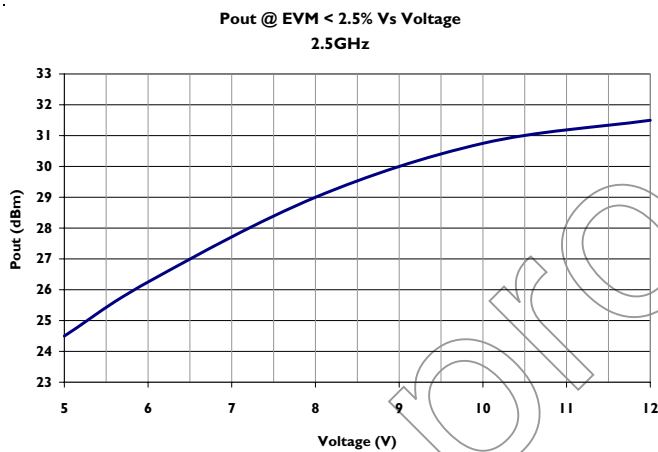
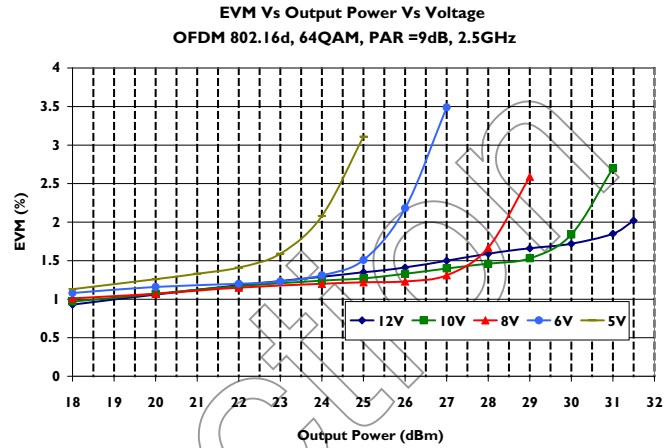
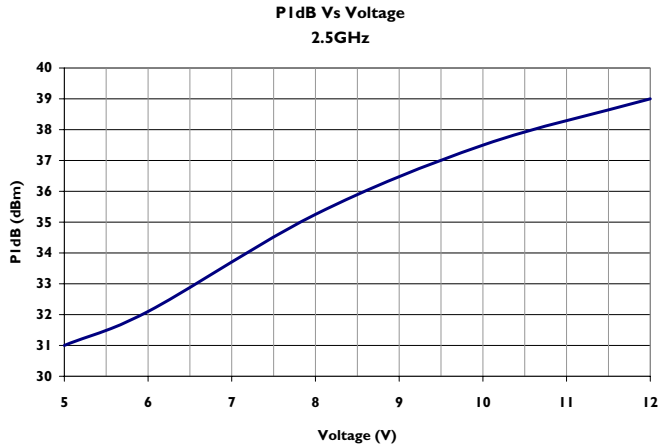


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## Typical Performance (cont.)



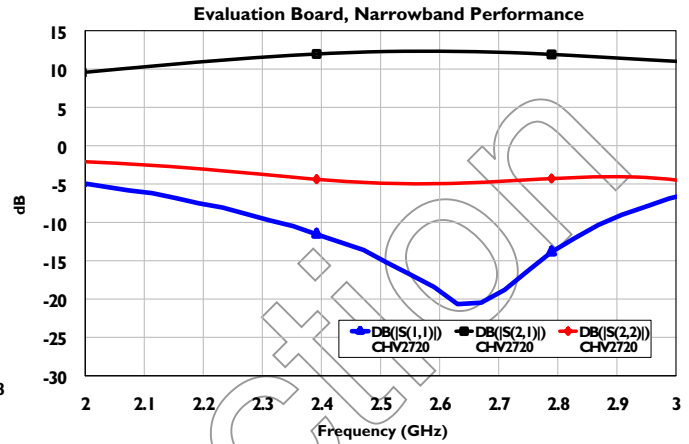
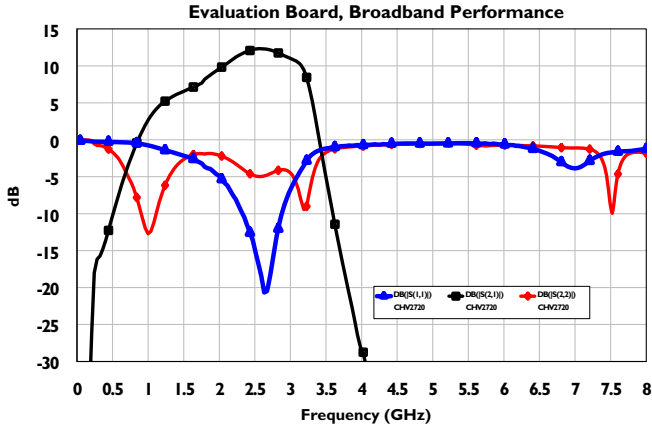
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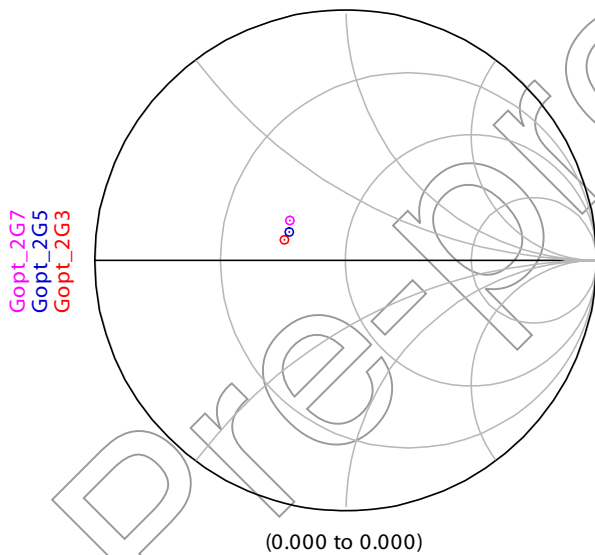
Mimix  
BROADBAND™

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RoHS

## Typical Performance (cont.)



## Zopt Package Reference Plane (Z0 = 10 ohms)



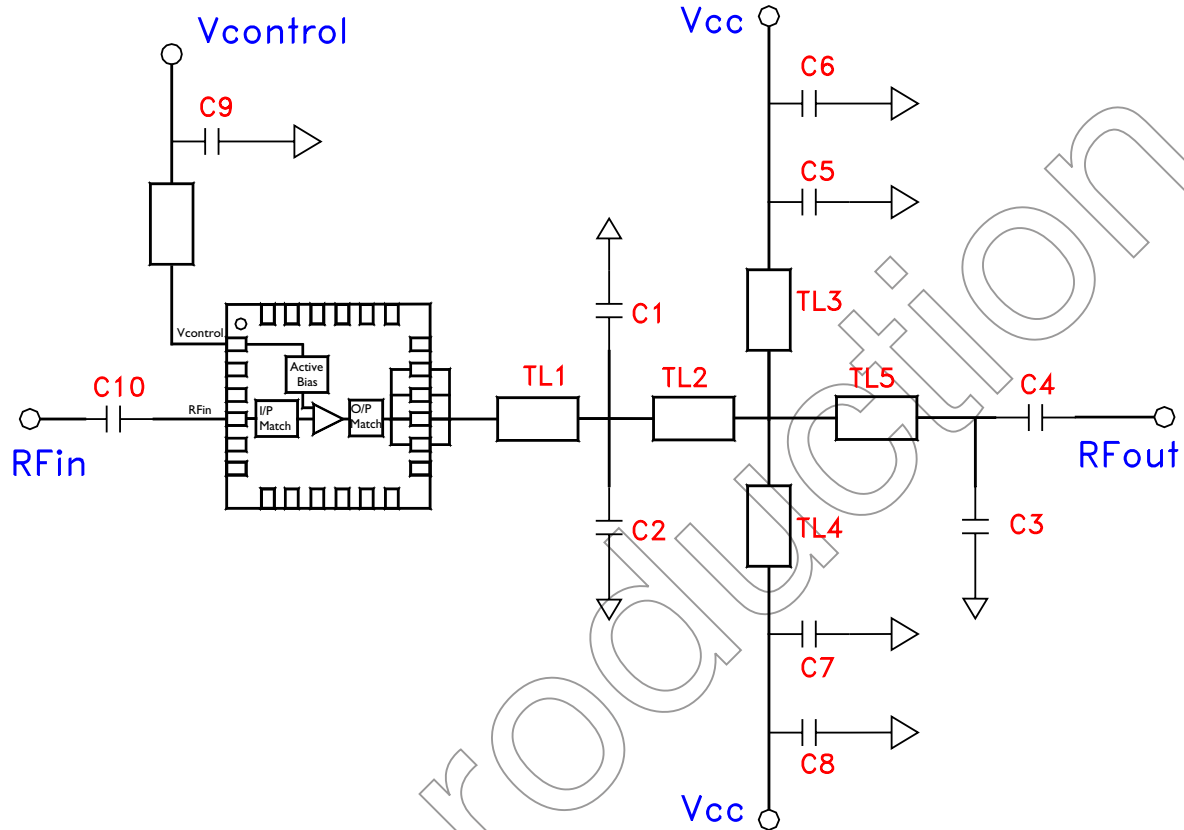
Zopt_2G3	Zopt_2G5	Zopt_2G7
6.00 + j1.05	6.20 + j1.50	6.10 + j2.10

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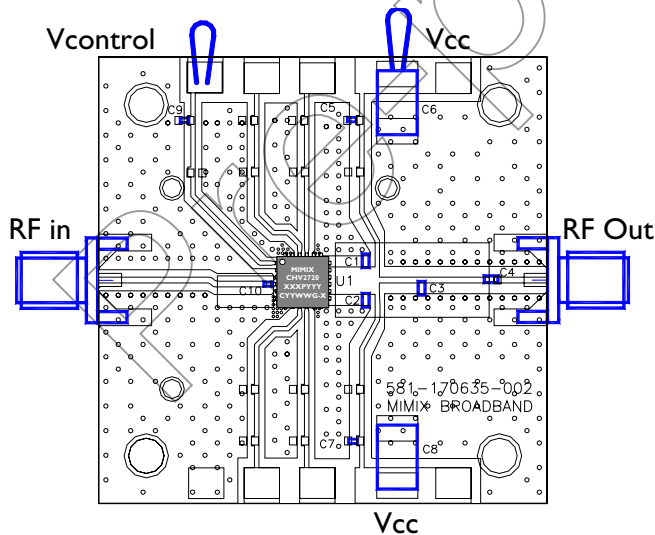
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## Recommended Schematic



## Evaluation Board Layout



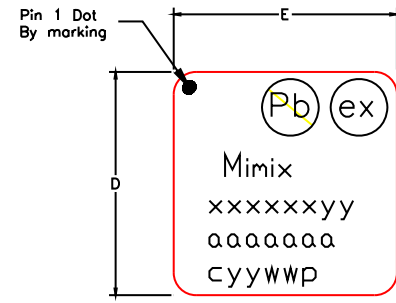
Part Identifier	Mfg	Mfg Part	QTY	Reference
1.6 pF 0603 Capacitor	Murata	ERB1885C2D1R6BDX1	2	C1,C2
1.5 pF 0603 Capacitor	Murata	ERB1885C2D1R5BDX1	1	C3
6.8 pF 0603 Capacitor	Murata	ERB1885C2D6R8BDX1	1	C4
10 nF 0603 Capacitor	Murata	GRM188R71E103KA01D	2	C5,C7, C9
100 uF Tantalum Capacitor	AVX	TAJD107K016R	3	C6,C8
100 pF 0603 Capacitor			1	C10

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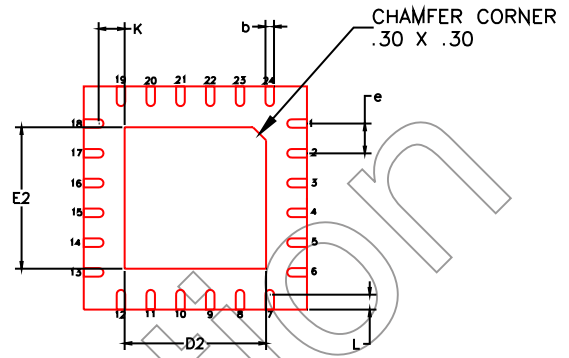
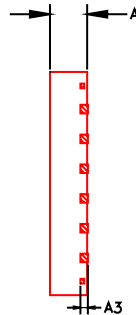
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## Physical Dimensions:



TOP VIEW

RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS

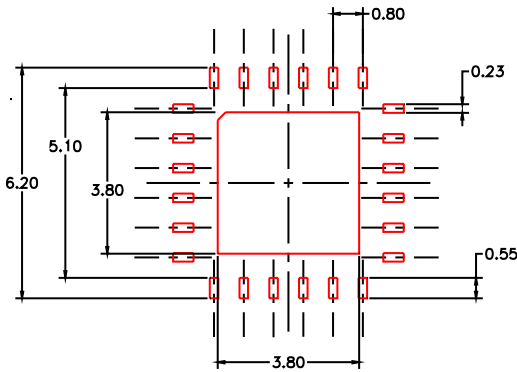


BOTTOM VIEW

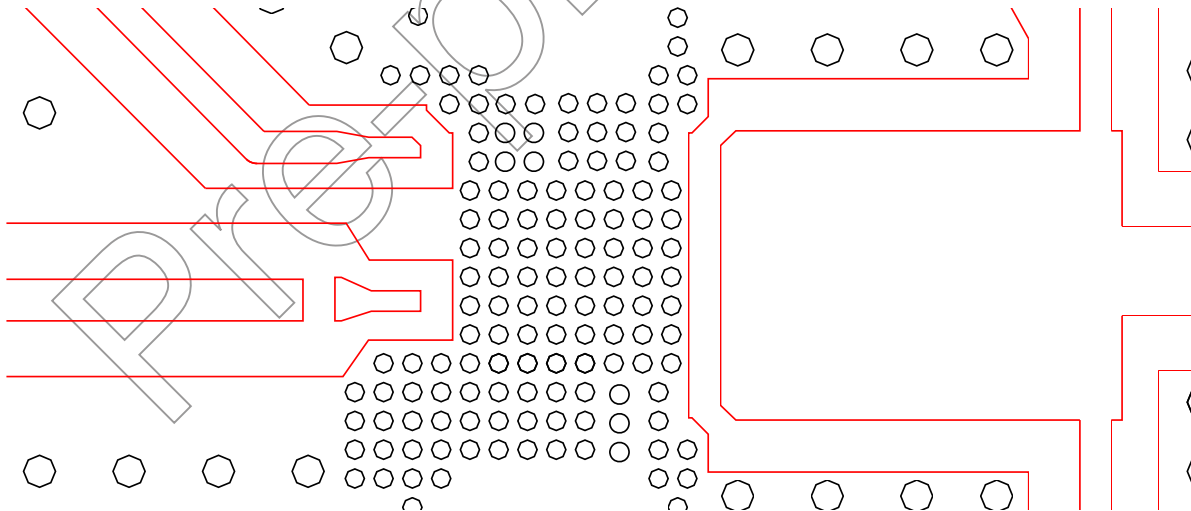
Note:

1. ALL DIMENSIONS ARE IN mm.

	MIN	TYP	MAX
A	.85	.90	.95
A3	0.203 REF		
b	0.18	0.23	0.28
K	0.50	-	-
D	6.00 BSC		
E	6.00 BSC		
e	0.80		
D2	3.70	3.80	3.90
E2	3.70	3.80	3.90
L	0.35	0.40	0.45



## Recommended Board Layout



It is recommended that all N/C pins be grounded and sufficient number of via holes to be present under the ground plane to insure good RF and thermal grounding.

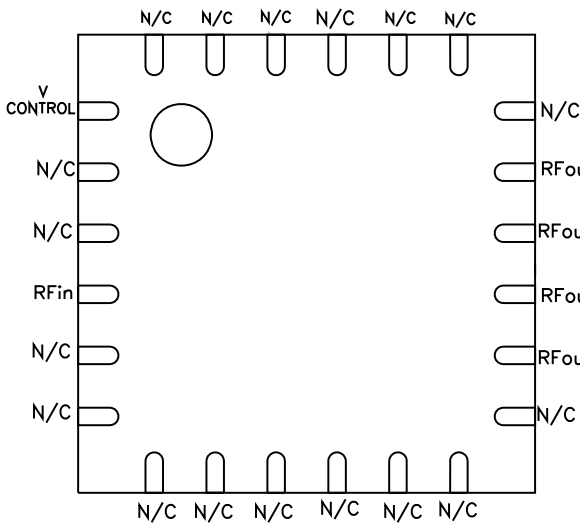
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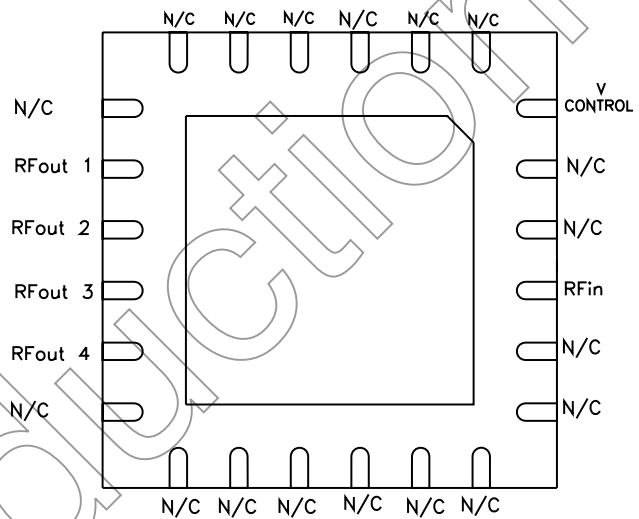
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**App Note [1] Biasing** - The CHV2720-QJ requires power supply sequencing. Vcc should be applied first and then Vcontrol. Quiescent current (Icq) can be varied by adjusting Vcontrol in order to obtain the optimum performance desired. RF power is applied after both Vcc and Vcontrol are present. When turning off the device Vcontrol is switched off first and then Vcc. Vcontrol can be used to turn off the current.

## Pin Assignment:

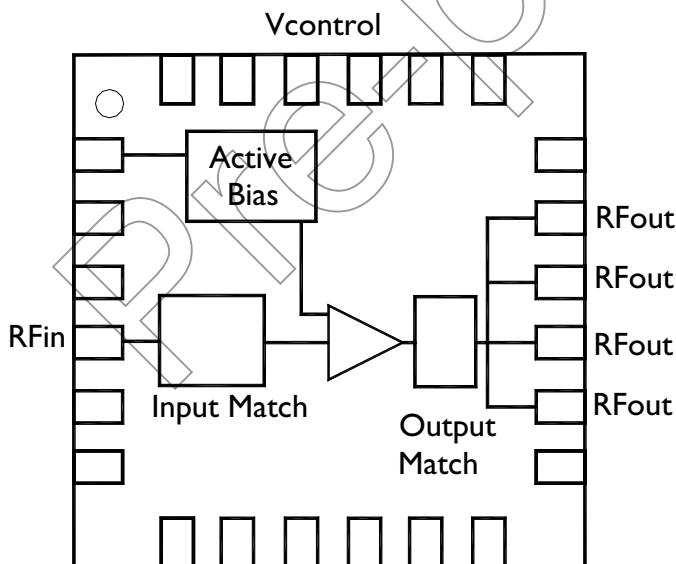


TOP VIEW



BOTTOM VIEW

## Functional Block Diagram:



Pin #	Description
1	Vcontrol
4	RF IN
14	RF OUT 4
15	RF OUT 3
16	RF OUT 2
17	RF OUT 1
2, 3, 5, 6, 7, 8, 9, 10, 11, 12 13, 18, 19, 20, 21, 22, 23, 24	N/C



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## Handling and Assembly Information

**CAUTION!** - Mimix Broadband MMIC Products contain gallium arsenide (GaAs) which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- Do not ingest.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.

**Life Support Policy** - Mimix Broadband's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President and General Counsel of Mimix Broadband. As used herein: (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, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a 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.

**Package Attachment** - This packaged product from Mimix Broadband is provided as a rugged surface mount package compatible with high volume solder installation. Vacuum tools or other suitable pick and place equipment may be used to pick and place this part. Care should be taken to ensure that there are no voids or gaps in the solder connection so that good RF, DC and ground connections are maintained. Voids or gaps can eventually lead not only to RF performance degradation, but reduced reliability and life of the product due to thermal stress.

### Typical Reflow Profiles

Reflow Profile	SnPb	Pb Free
Ramp Up Rate	3-4 °C/sec	3-4 °C/sec
Activation Time and Temperature	60-120 sec @ 140-160 °C	60-180 sec @ 170-200 °C
Time Above Melting Point	60-150 sec	60-150 sec
Max Peak Temperature	240 °C	265 °C
Time Within 5 °C of Peak	10-20 sec	10-20 sec
Ramp Down Rate	4-6 °C/sec	4-6 °C/sec

### Factory Automation and Identification

Mimix Designator	Package Type	Number of leads offered	W Tape Width	P <sub>1</sub> Component Pitch	P <sub>0</sub> Hole Pitch	Reel Diameter	Units per Reel
-QJ	QFN (6x6mm)	24	16mm	12mm	4mm	329mm (13in)	1000

Component Orientation: Parts are to be oriented with the PIN 1 closest to the tape's round sprocket holes on the tape's trailing edge.

Note: Tape and Reel packaging is ordered with a -000T suffix. Package is available in 500 unit reels through designated sales channels. Minimum order quantities should be discussed with your local sales representative.

**Mimix Lead-Free RoHS Compliant Program** - Mimix has an active program in place to meet customer and governmental requirements for eliminating lead (Pb) and other environmentally hazardous materials from our products. All Mimix RoHS compliant components are form, fit and functional replacements for their non-RoHS equivalents. Lead plating of our RoHS compliant parts is 100% matte tin (Sn) over copper alloy and is backwards compatible with current standard SnPb low-temperature reflow processes as well as higher temperature (260°C reflow) "Pb Free" processes.

## Ordering Information

Part Number for Ordering	Description
CHV2720-QJ-0G00	Matte Tin plated RoHS compliant 6X6 QFN surface mount package in bulk tested for WiMAX 2.5 GHz
CHV2720-QJ-0G0T	Matte Tin Plated RoHS compliant 6X6 QFN surface mount package in tape and reel tested for WiMAX 2.5 GHz
PB-CHV2720-QJ-00A0	Evaluation Board with SMA connectors for WiMAX 2.5 GHz

We also offer the plastic package with SnPb (Tin-Lead) or NiPdAu plating. Please contact your regional sales manager for more information regarding different plating types.



Proper ESD procedures should be followed when handling this device.