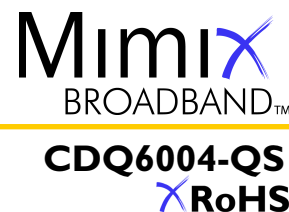


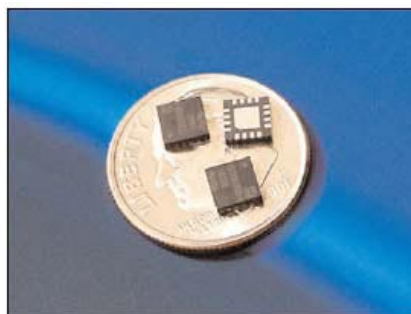
# 0.05-4.0 GHz Dual High Dynamic Range Amplifier



May 2008 - Rev 01-May-08

## Features

- ✓ Matched Pair of Amplifiers for Optimum Balanced Design
- ✓ 0.05 to 4.0 GHz Frequency Range
- ✓ 44 dBm Output IP3 (Balanced configuration)
- ✓ 41 dBm Output IP3 (Single-ended configuration)
- ✓ 15 dB Gain @ 2 GHz
- ✓ 23 dBm P1dBm
- ✓ 2.1 dB Noise Figure
- ✓ RoHS Compliant 4X4 QFN Package
- ✓ Single Positive Supply
- ✓ +3V to +5V Voltage Rail



## General Description

The CDQ6004-QS is a dual high dynamic range amplifier designed for applications operation within the 0.05 to 4.0 GHz frequency range. Co-located matched amplifiers are assembled in the 4mm X 4mm QFN package. The low-cost, surface-mount, 16 terminal, plastic package is RoHS compliant. The CDQ6004-QS is an ideal solution for implementing balanced or push-pull designs. The amplifier can also be used for dual-band operation where single-ended design is used for each band. The amplifier has the flexibility of being optimized for a number of wireless applications. The combination of low noise figure and high IP3 at the same bias point make it an ideal transmit or receive solution when used in applications including CATV operating from 50 to 850 MHz, cellular and PCS (personal communications service) operating from 0.8 to 2.2 GHz; MMDS (multichannel multipoint distribution systems) operating from 2.2 to 2.7 GHz; and WLAN (wireless LAN) operation at 2.4 GHz. All devices are 100% RF and DC tested.

## Absolute Maximum Ratings

|                            |                   |
|----------------------------|-------------------|
| Supply Voltage             | +6.0 V            |
| RF Input Power*            | +20 dBm           |
| Storage Temperature (Tstg) | -55 °C to +125 °C |
| Junction Temperature       | 150 °C            |
| Operating Temperature      | -40 °C to +85°C   |
| Thermal Resistance         | 52 °C/W           |

Operation of this device above any of these parameters may cause damage.  
\*Operation with more than 10 dBm of input power may cause 2 dB degradation in OIP3 performance.

## Typical Parameters

| Parameter          | Typical |     |      | Units |
|--------------------|---------|-----|------|-------|
| Frequency Range    | 0.9     | 2   | 2.4  | GHz   |
| Gain               | 16.5    | 15  | 14.9 | dB    |
| Input Return Loss  | -13     | -11 | -20  | dB    |
| Output Return Loss | -16     | -12 | -11  | dB    |
| Output IP3         | 42      | 41  | 40.5 | dBm   |
| Noise Figure       | 2.1     | 2.1 | 2.6  | dB    |
| Output P1dB        | +23     | +23 | +24  | dBm   |

Typical values reflect performance in recommended application circuit @ +5V.

## Electrical Characteristics (T = 25°C)

Unless otherwise specified, the following specifications are guaranteed at room temperature in a Mimix fixture.

| Parameter               | Condition          | Units | Min. | Typ. | Max. |
|-------------------------|--------------------|-------|------|------|------|
| Frequency Range         |                    | GHz   | 0.25 |      | 3.0  |
| Gain                    | Externally Matched | dB    | 13.5 | 15   |      |
| Input Return Loss       | Externally Matched | dB    |      | -10  |      |
| Output Return Loss      | Externally Matched | dB    |      | -10  |      |
| Output IP3              |                    | dBm   | 38   | 41   |      |
| Noise Figure            |                    | dB    |      | 2.1  |      |
| Output P1dB             |                    | dBm   |      | 23   |      |
| Operating Current Range |                    | mA    | 130  | 160  | 200  |
| Supply Voltage          |                    | V     |      | 5.0  |      |

Notes:

1. T = 25°C, Frequency = 2 GHz, 50 Ohm system.
2. Each single ended amplifier is tested separately.
3. OIP3 is measured with two tones at output power of 5 dBm/tone separated by 10 MHz.
4. Slight performance degradation is expected over temperature.

Mimix Broadband, Inc., 10795 Rockley Rd., Houston, Texas 77099  
Tel: 281.988.4600 Fax: 281.988.4615 mimixbroadband.com

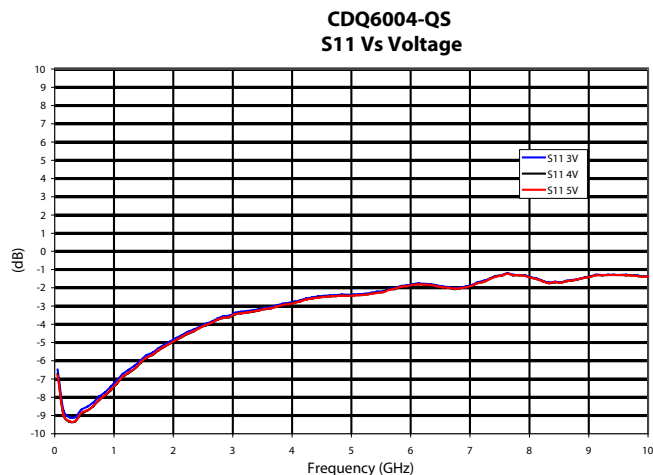
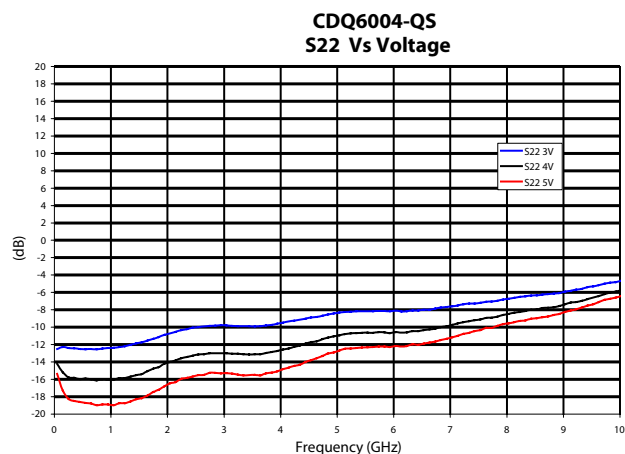
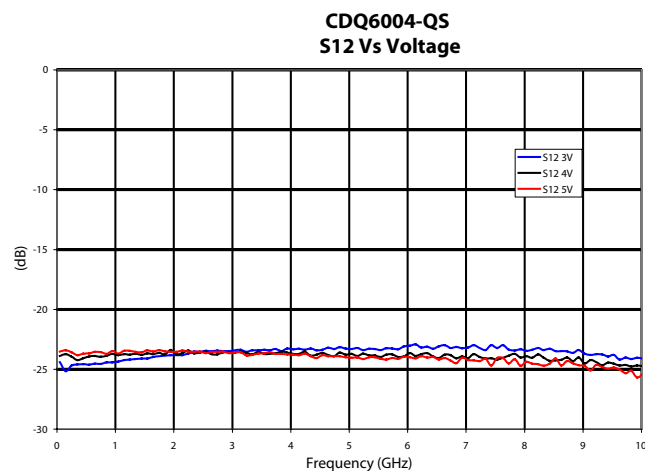
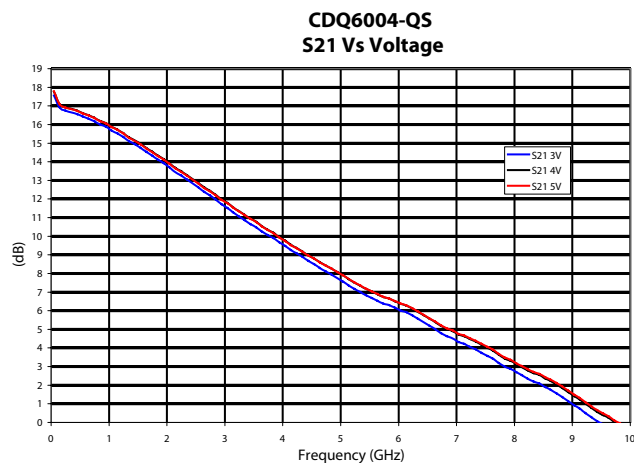
Page 1 of 11

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# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

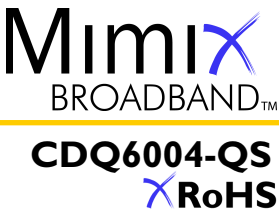
May 2008 - Rev 01-May-08

## Typical Device S-Parameters



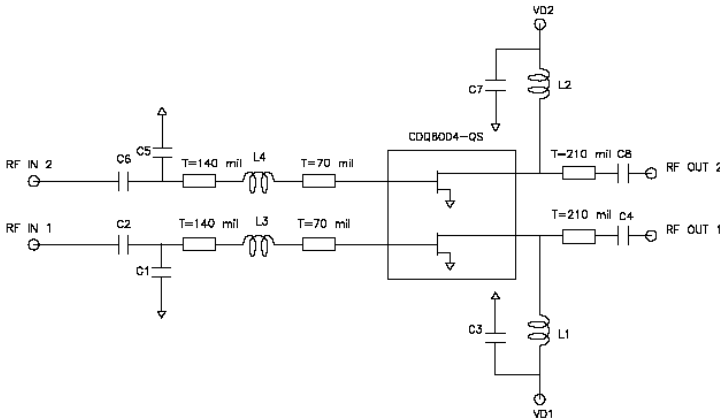
# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

May 2008 - Rev 01-May-08

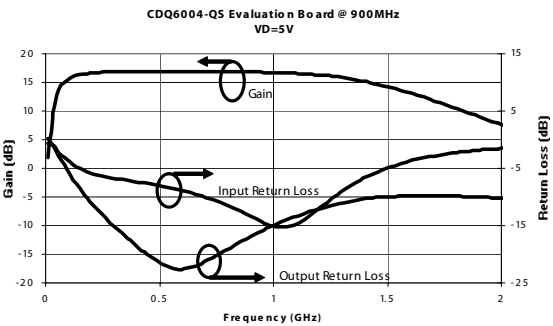


## Application Circuit @ 900 MHz

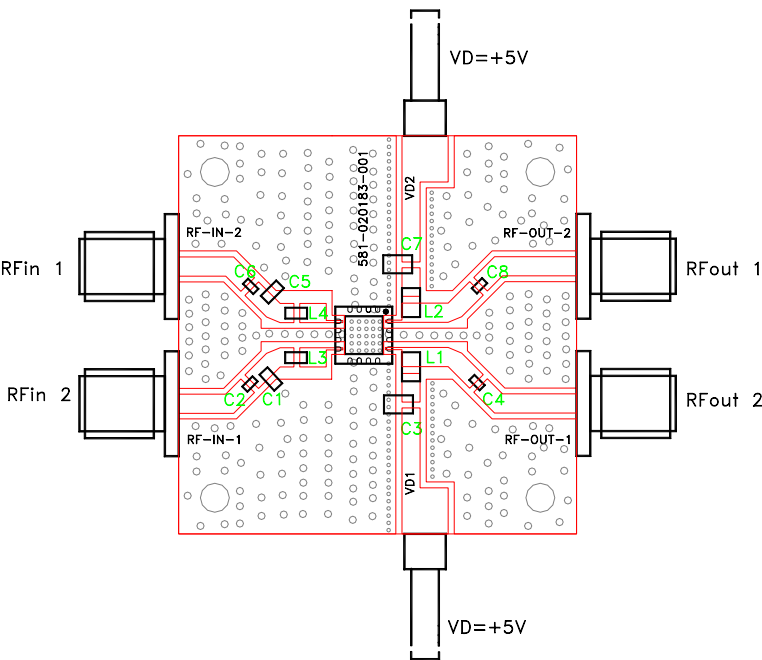
### Schematic:



### Typical Performance:



### Board Layout:



- \* Material: FR4, 28 mil
- \* Plating: 1.5 oz. Copper both sides

| Parameter          | Typical | Units |
|--------------------|---------|-------|
| Frequency Range    | 0.9     | GHz   |
| Gain               | 16.5    | dB    |
| Input Return Loss  | -13     | dB    |
| Output Return Loss | -16     | dB    |
| Output IP3         | 42      | dBm   |
| Noise Figure       | 2.1     | dB    |
| Output P1dB        | 23      | dBm   |

### Components

| Ref Designator | Value   | Size |
|----------------|---------|------|
| C2, C4, C6, C8 | 2.7 pf  | 0402 |
| C1, C5         | 1.5 pf  | 0603 |
| C3, C7         | 1000 pf | 0805 |
| L1, L2         | 47 nH   | 0805 |
| L3, L4         | 6.8 nH  | 0603 |

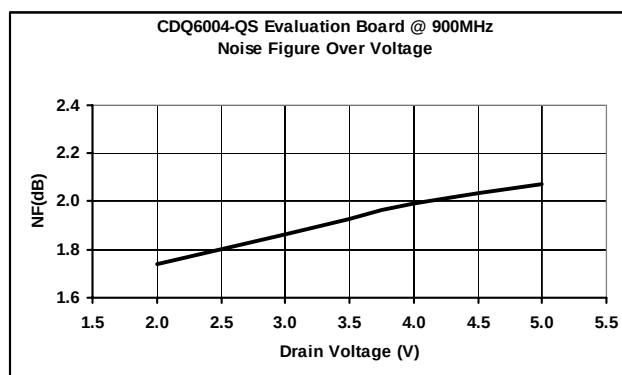
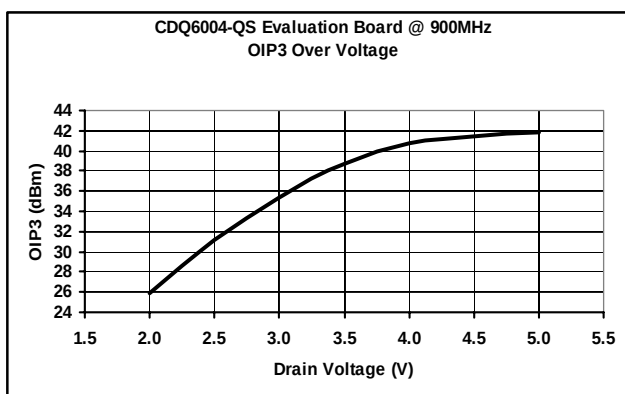
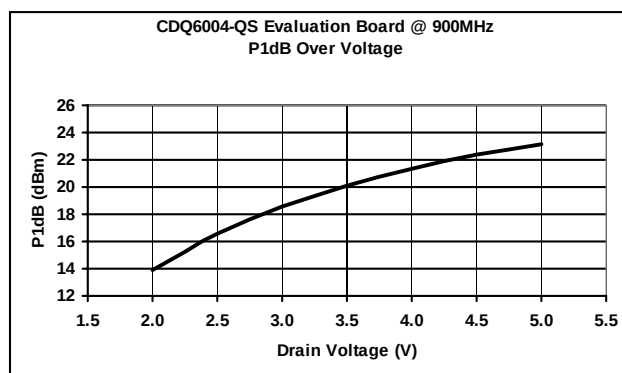
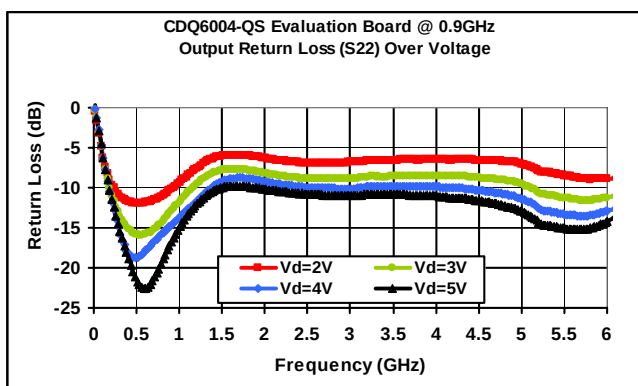
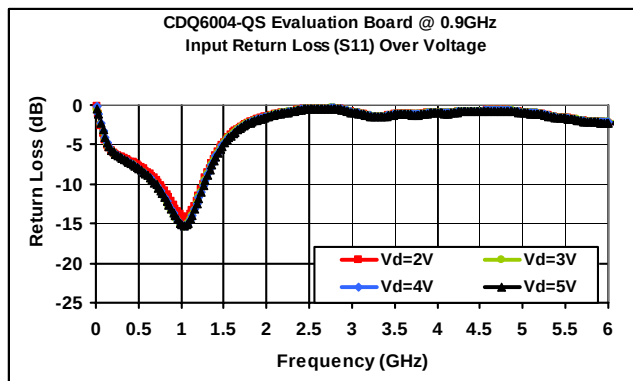
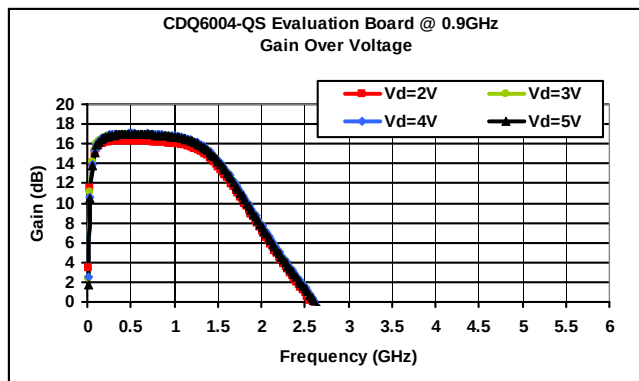
# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

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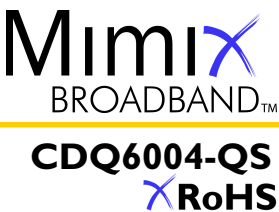
CDQ6004-QS  
RoHS

## Typical Performance @ 900 MHz (50 Ohm system over voltage)



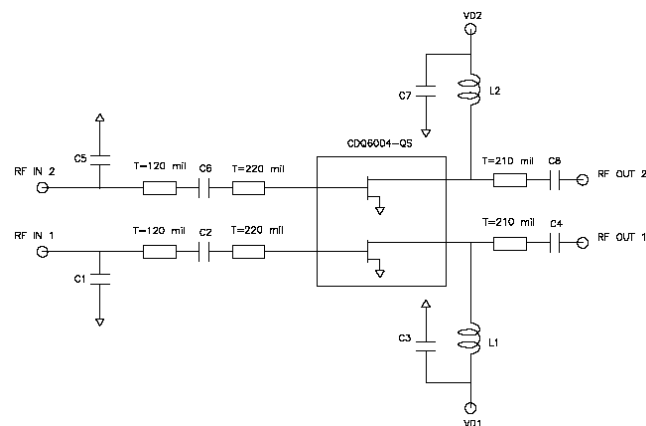
# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

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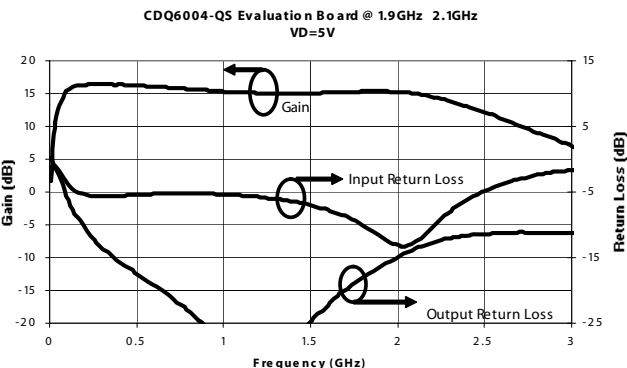


## Application Circuit @ 1.9 GHz ~ 2.1 GHz:

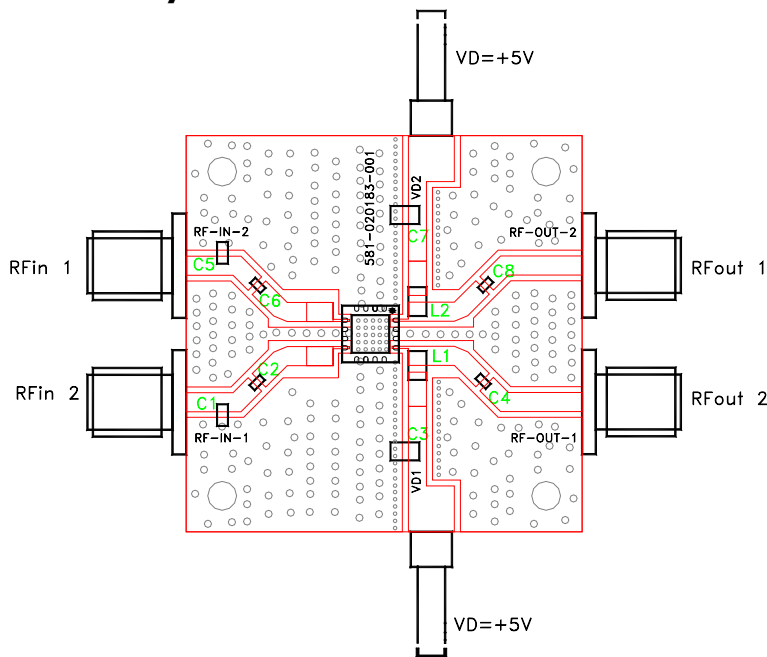
### Schematic:



### Typical Performance:



### Board Layout:



- \* Material: FR4, 28 mil
- \* Plating: 1.5 oz. Copper both sides

| Parameter          | Typical |       | Units |
|--------------------|---------|-------|-------|
| Frequency Range    | 1.9     | 2.1   | GHz   |
| Gain               | 15.3    | 15.0  | dB    |
| Input Return Loss  | -11.9   | -12.5 | dB    |
| Output Return Loss | -16.3   | -13.6 | dB    |
| Output IP3         | 41      | 41.3  | dBm   |
| Noise Figure       | 2.1     | 2.1   | dB    |
| Output P1dB        | 23      | 23    | dBm   |

### Components

| Ref Designator | Value   | Size |
|----------------|---------|------|
| C2, C4, C6, C8 | 100 pf  | 0402 |
| C1, C5         | 1.5 pf  | 0603 |
| C3, C7         | 1000 pf | 0805 |
| L1, L2         | 47 nH   | 0805 |

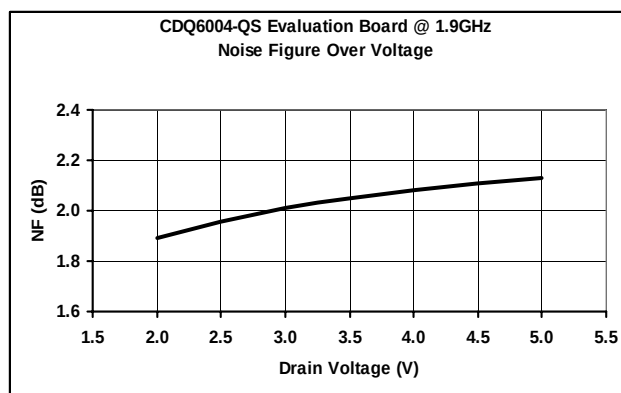
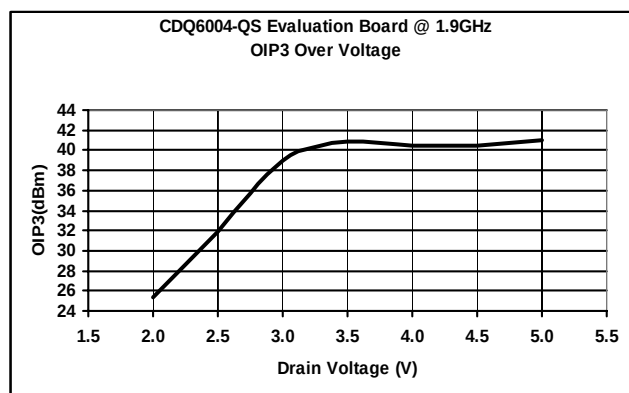
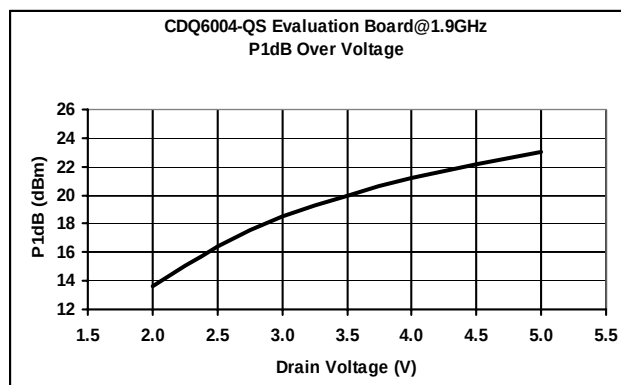
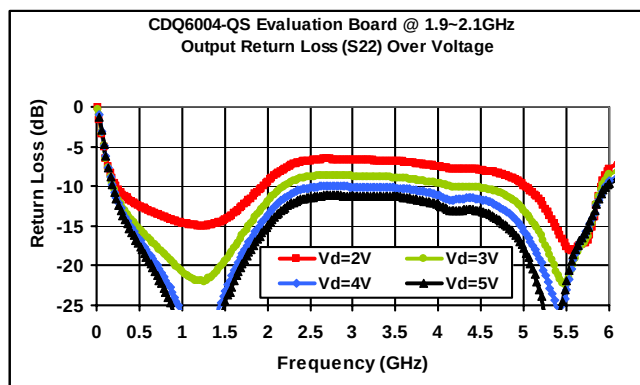
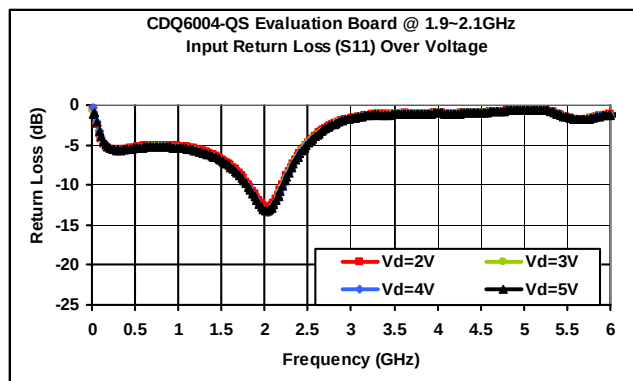
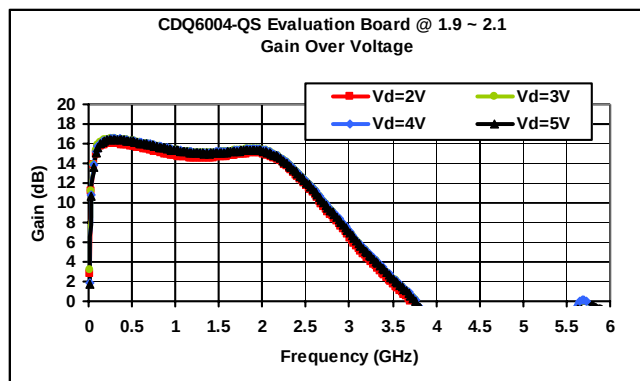
# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

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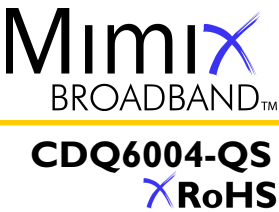
CDQ6004-QS  
RoHS

## Typical Performance @ 1.9 GHz (50 Ohm system over voltage)



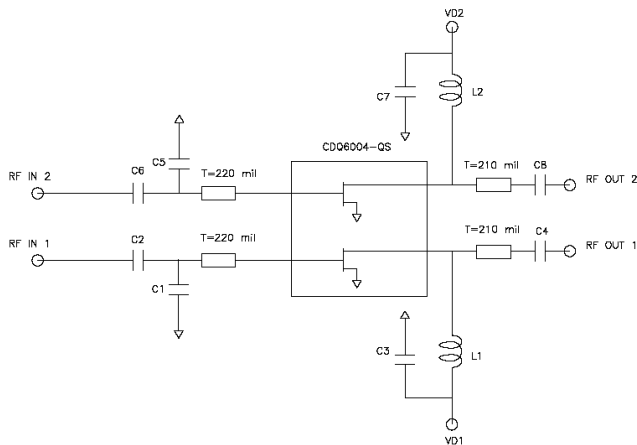
# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

May 2008 - Rev 01-May-08

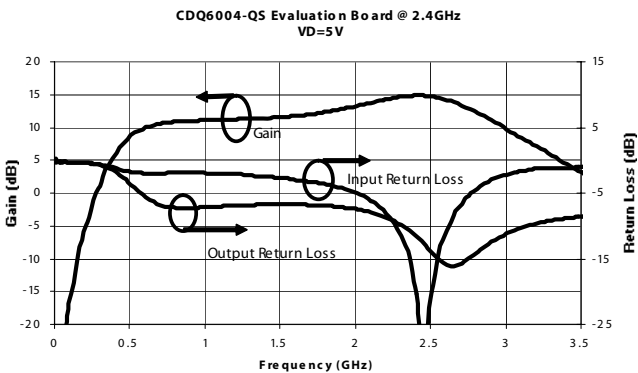


## Application Circuit @ 2.4 GHz:

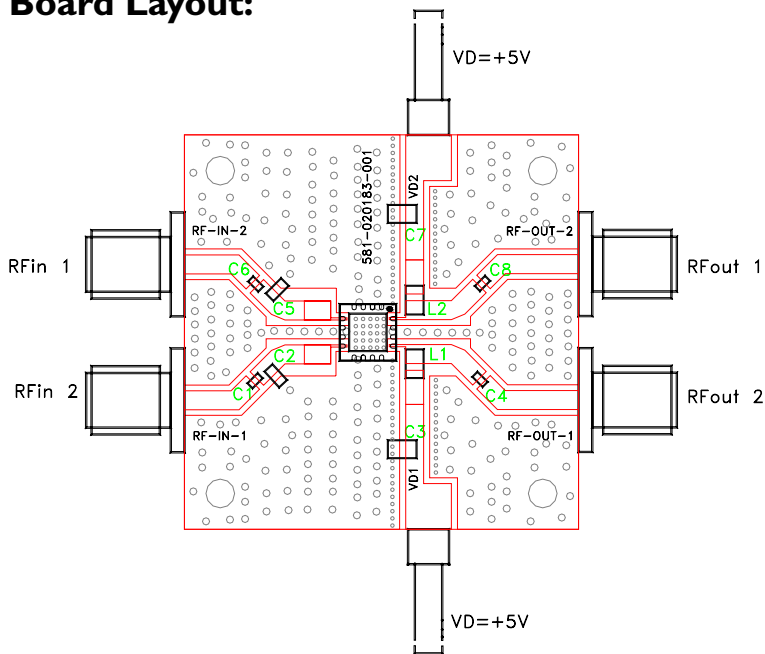
### Schematic:



### Typical Performance:



### Board Layout:



- \* Material: FR4, 28 mil
- \* Plating: 1.5 oz. Copper both sides

### Components

| Ref Designator | Value   | Size |
|----------------|---------|------|
| C2, C4, C6, C8 | 2.7 pf  | 0402 |
| C1, C5         | 1.2 pf  | 0603 |
| C3, C7         | 1000 pf | 0805 |
| L1, L2         | 47 nH   | 0805 |

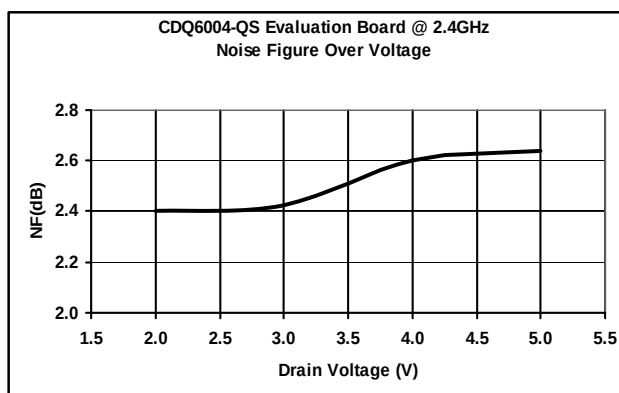
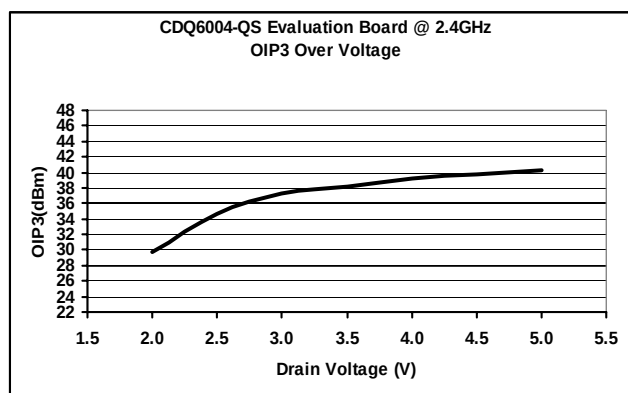
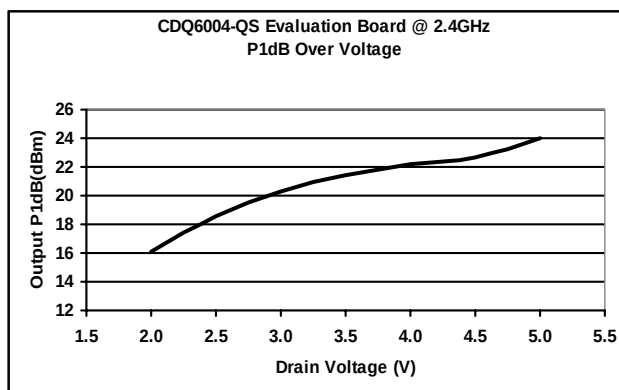
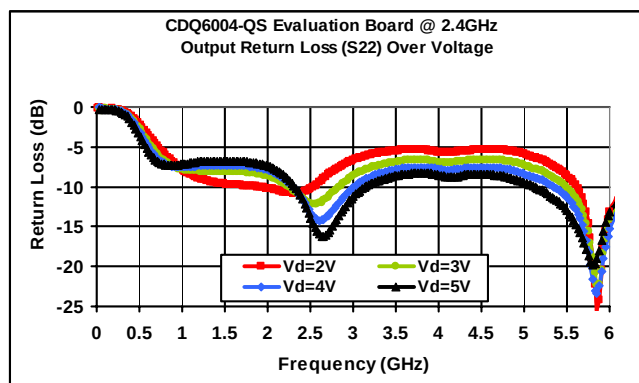
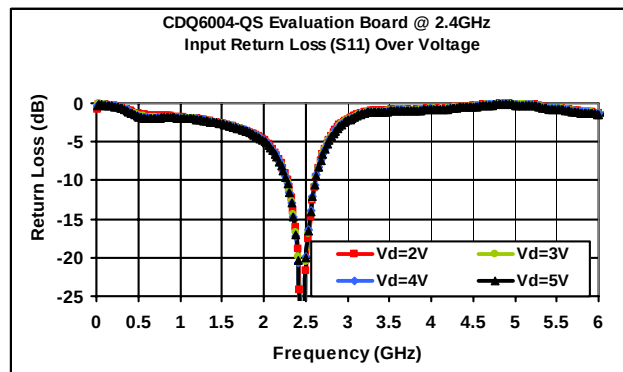
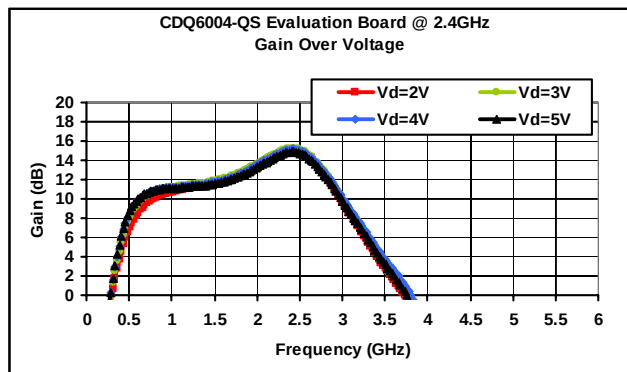
# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

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CDQ6004-QS  
RoHS

## Typical Performance @ 2.4 GHz (50 Ohm system over voltage)

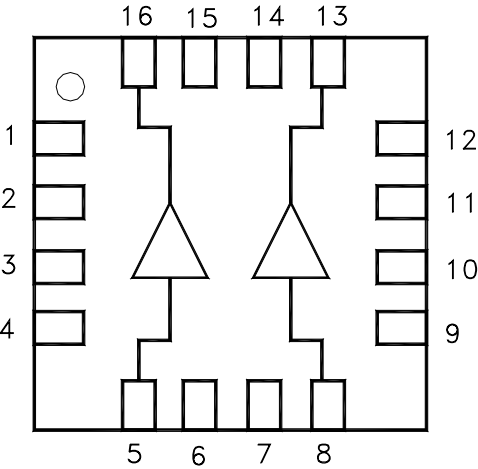




# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

May 2008 - Rev 01-May-08

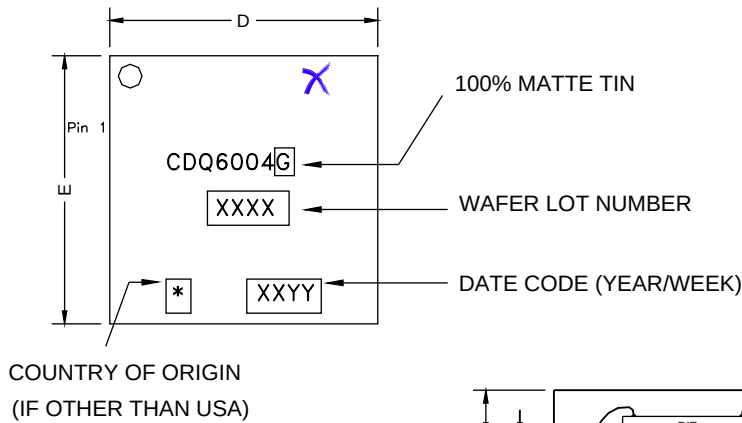
## Functional Block Diagram



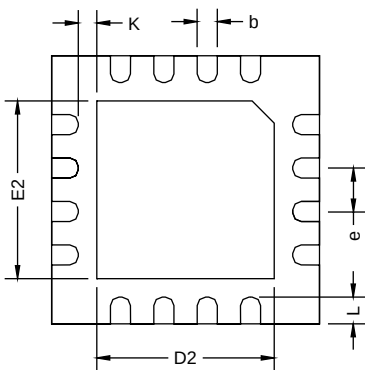
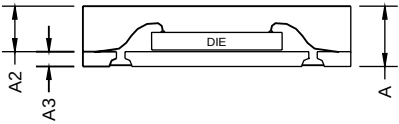
## Pin Out Detail

| Pin        | Function | Description                   |
|------------|----------|-------------------------------|
| 5          | IN 1     | Amplifier 1 RF Input          |
| 8          | IN 2     | Amplifier 2 RF Input          |
| 16         | OUT 1    | Amplifier 1 RF Output         |
| 13         | OUT 2    | Amplifier 2 RF Output         |
| 1,2,3,4    | VS 1     | Amplifier 1 Source Connection |
| 9,10,11,12 | VS 2     | Amplifier 2 Source Connection |
| 6,7,14,15  | GND      | Main Heat-Sinking Connection  |

## Physical Dimensions



NOTES:  
1. ALL DIMENSIONS ARE IN mm



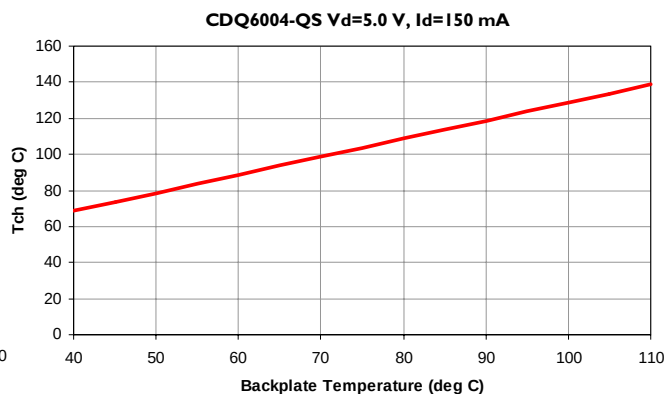
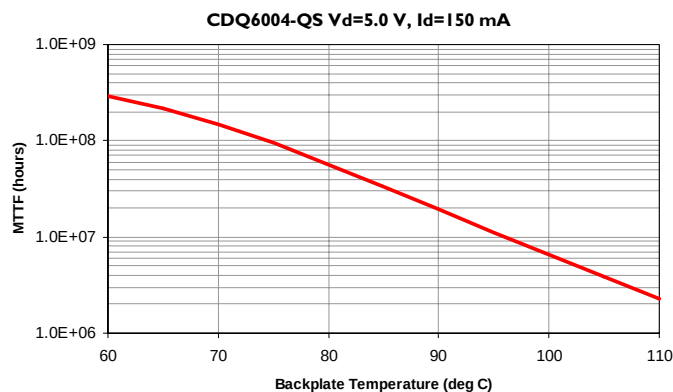
|    | MIN      | NOM  | MAX  |
|----|----------|------|------|
| A  | 0.80     | 0.90 | 1.00 |
| A3 | 0.20 REF |      |      |
| A2 | 0        | 0.65 | 1.00 |
| b  | 0.25     | 0.30 | 0.35 |
| K  | 0.20     | -    | -    |
| D  | 4.00 BSC |      |      |
| E  | 4.00 BSC |      |      |
| e  | 0.65     |      |      |
| D2 | 2.50     | 2.65 | 2.80 |
| E2 | 2.50     | 2.65 | 2.80 |
| L  | 0.35     | 0.40 | 0.45 |

# 0.05-4.0 GHz Dual High Dynamic Range Amplifier

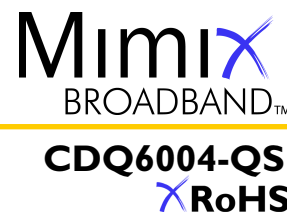
May 2008 - Rev 01-May-08

## MTTF

These numbers were calculated based on accelerated life test information received from the fabrication foundry and measured thermal resistance.



# 0.05-4.0 GHz Dual High Dynamic Range Amplifier



May 2008 - Rev 01-May-08

## 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. Care should be taken not to apply heavy pressure to the top or base material to avoid package damage. 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.

**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

CDQ6004-QS-0G00  
CDQ6004-QS-0G0T

### Description

Matte Tin plated RoHS compliant QFN4x4 16L surface mount package in bulk quantity  
Matte Tin plated RoHS compliant QFN4x4 16L surface mount package in tape and reel

PB-CDQ6004-QS-00A0  
PB-CDQ6004-QS-00B0  
PB-CDQ6004-QS-00C0

CDQ6004-QS Evaluation Board @ 900 MHz  
CDQ6004-QS Evaluation Board @ 1.9 GHz~2.1 GHz  
CDQ6004-QS Evaluation Board @ 2.4 GHz

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