CMM6004-SC

0.25 to 3.0 GHz
High Dynamic Range Amplifier

January 2006 - Rev 06-Jan-06

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

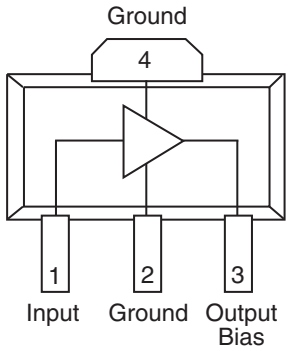
Advanced Product Information
January 2006 *(1 of 9)*

0.25 to 3.0 GHz High Dynamic Range Amplifier

Features

- ❑ 0.25 to 3.0 GHz Frequency Range
- ❑ 41 dBm Output IP3
- ❑ 2.1 dB Noise Figure
- ❑ 14.5 dB Gain
- ❑ 23.5 dBm P1dB
- ❑ SOT-89 SMT Package
- ❑ Single Power Supply
- ❑ +3V to +5V Voltage Rail

Functional Block Diagram



Description

The CMM6004-SC is a high dynamic range amplifier designed for applications operating within the 0.25 to 3.0 GHz frequency range. It is an ideal solution for transmit and receive functions where high linearity is required.

The amplifier has the flexibility of being optimized for a number of wireless applications. The combination of low NF and high IP3 at the same bias point make it an ideal transmit or receive solution when used in applications including 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) operating at 2.4 GHz.

The CMM6004-SC is packaged in a low-cost, space efficient, surface mount SOT-89 package which provides excellent electrical stability and low thermal resistance. All devices are 100% RF and DC tested.

Electrical Characteristics

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

Parameter	Condition	Min	Typ	Max	Units
Frequency Range		0.25		3.0	GHz
Gain	Externally matched	13.5	14.5		dB
Input Return Loss	Externally matched		-10		dB
Output IP3		+38	+41		dBm
Noise Figure		1.6	2.1		dB
Output P1dB			23		dBm
Operating Current Range		120	150	180	mA
Supply Voltage			5.0		V

Notes:
1. T = 25ºC, Vdd = 5.0, Frequency = 800 MHz, 50 Ohm system
2. OIP3 measured with two tones at output power of 5 dBm/tone separated by 10 MHz.

Typical Parameters

Parameter	Typical			Units
Frequency Range	900	1900	2400	MHz
Gain	16.5	14.5	13.6	dB
Input Return Loss	-18	-15	-15	dB
Output Return Loss	-14	-10	-12	dB
Output IP3	+41.5	+41.0	+41.0	dBm
Output P1dB	23.8	23.5	23.0	dBm
Noise Figure	1.8	2.2	2.3	dB

Notes:
1. Typical values reflect performance in recommended application circuit.

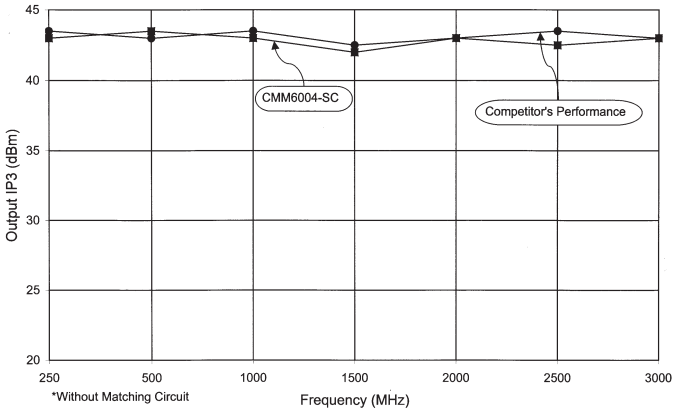
Absolute Maximum Ratings

Parameter	Rating	Parameter	Rating	Parameter	Rating
Supply Voltage	+6.0 V	Storage Temperature	-55ºC to +125ºC	Operating Temperature	-40ºC to +85ºC
RF Input Power	+20 dBm	Junction Temperature	150ºC	Thermal Resistance	52ºC/W

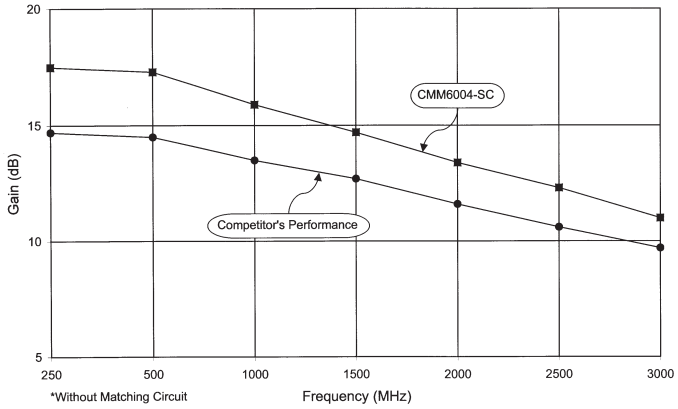
Operation of this device above any of these parameters may cause damage.

Typical Performance

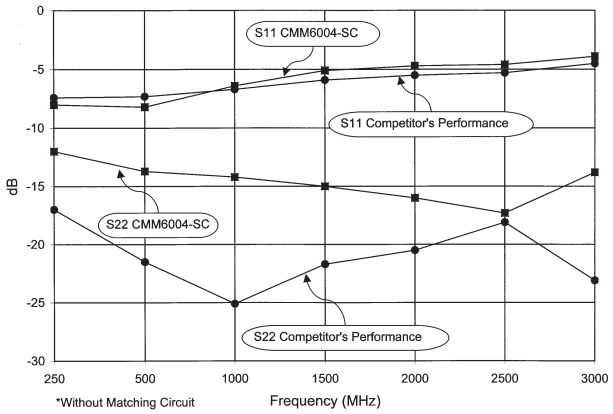
Output IP3 vs Frequency *



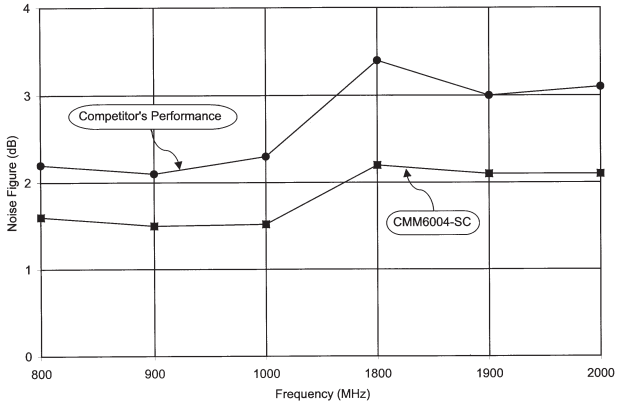
Gain vs Frequency *



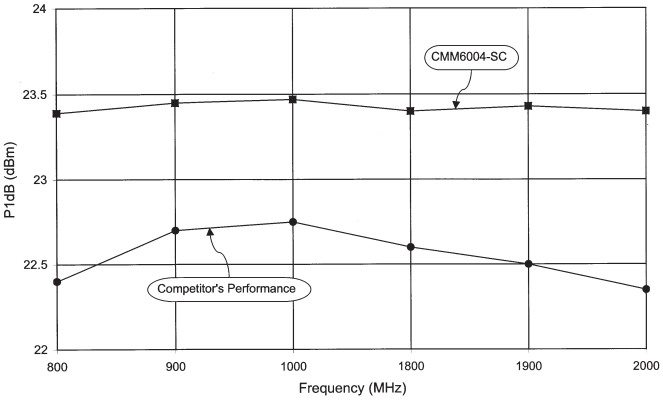
Input/Output Return Loss *



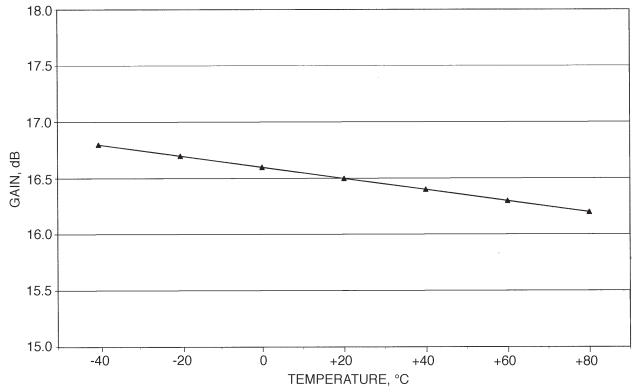
Noise Figure vs Frequency



P1dB vs Frequency



Gain vs Temperature at 900 MHz

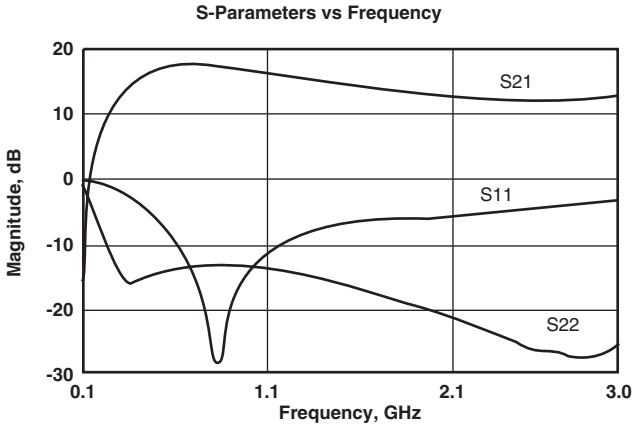


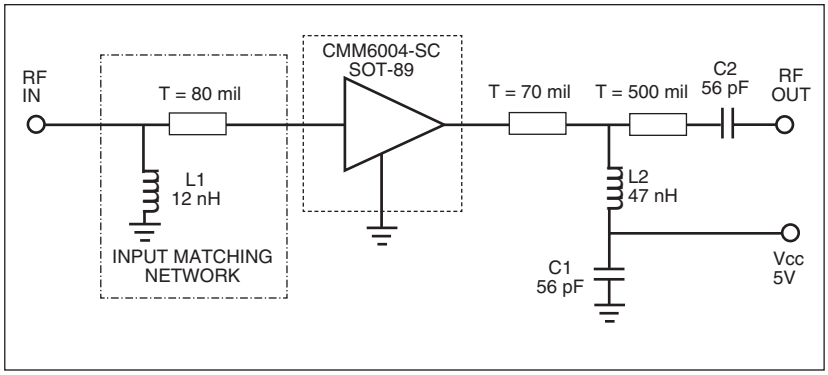
Application Circuit - 900 MHz

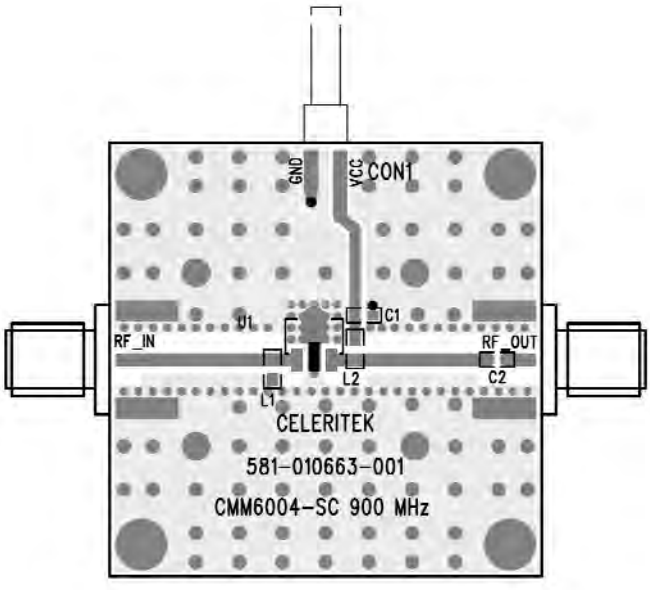
(CMM60004-SC-00A0)

Typical Performance (50 Ohm System)

	5V	3.3V
Frequency	900 MHz	900 MHz
Gain	16.5 dB	16.2 dB
Input Return Loss	-18.0 dB	-19.0 dB
Output Return Loss	-14.0 dB	-16.0 dB
OIP3	41.0 dBm	38.0 dBm
Noise Figure	1.8 dB	1.8 dB
Drain Current	Id = 173 mA	Id = 173 mA
P1dB	23.8 dBm	18.5 dBm



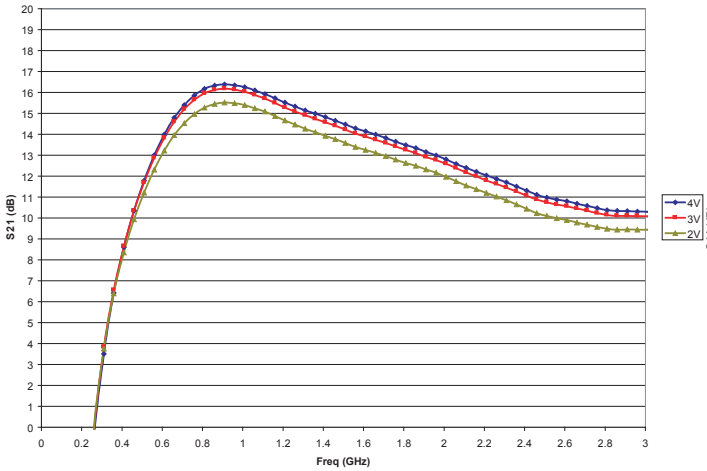




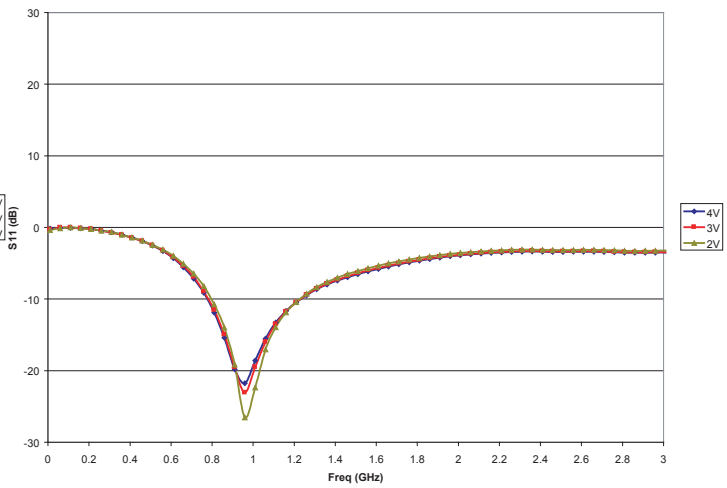
Ref Designator	Value	Description	Size
C1, C2	56 pF	MCH185A560JK	0603
L1	12 nH	TOKO LL1608-F12NK	0603
L2	47 nH	TOKO LL1608-F47NK	0603

Typical Performance Over Voltage:

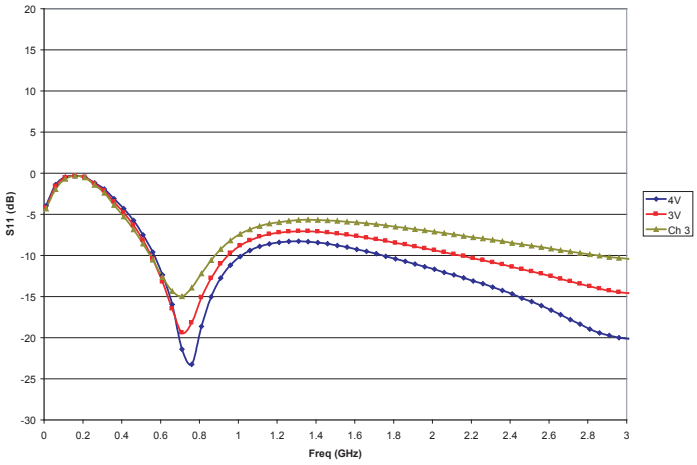
CMM6004-SC Evaluation board @ 900MHz
S21 Over Voltage



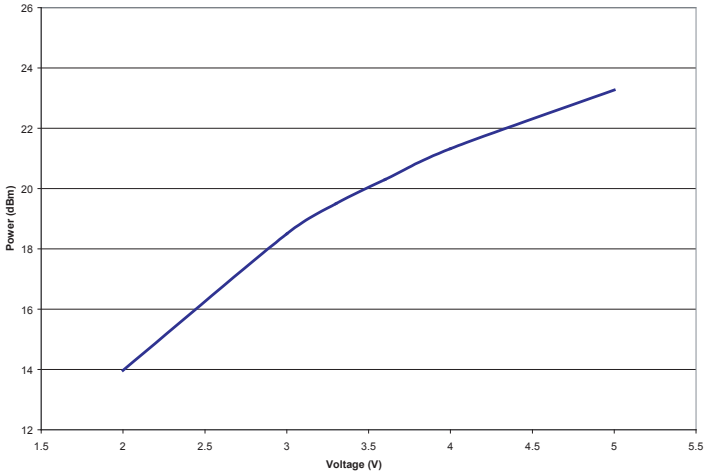
CMM6004-SC Evaluation board @ 900MHz
S11 Over Voltage



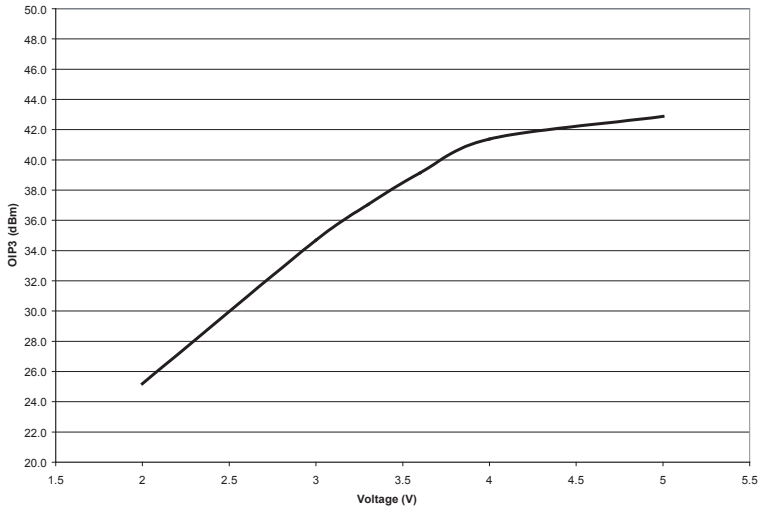
CMM6004-SC Evaluation board @ 900MHz
S22 Over Voltage



CCMM6004-SC Evaluation board @ 900MHz
P1dB Over Voltage



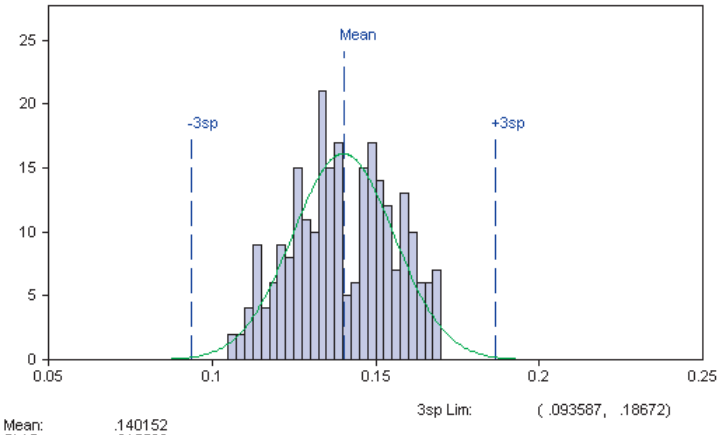
CCMM6004-SC Evaluation board @ 900MHz
OIP3 Over Voltage



3236 Scott Boulevard, Santa Clara, California 95054
Phone: (408) 986-5060 Fax: (408) 986-5095

Distribution Charts @ 3.3V

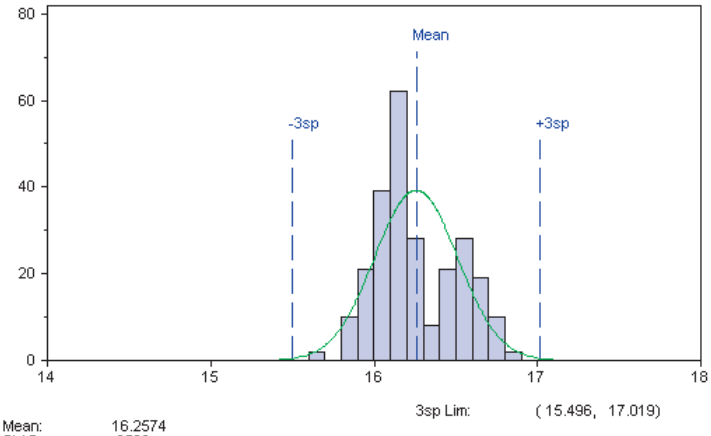
Idss @ 3.3V



3sp Lim: (.093587, .18672)

Mean: .140152
Std Dev: .015522
Skewness: -.068129

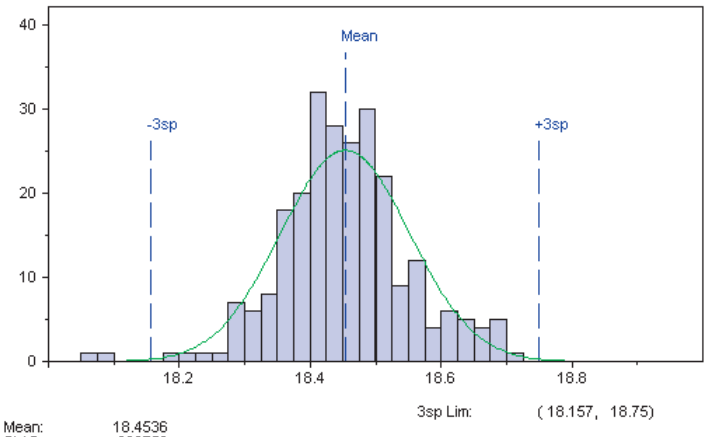
Gain @ 3.3V



3sp Lim: (15.496, 17.019)

Mean: 16.2574
Std Dev: .2538
Skewness: .41984

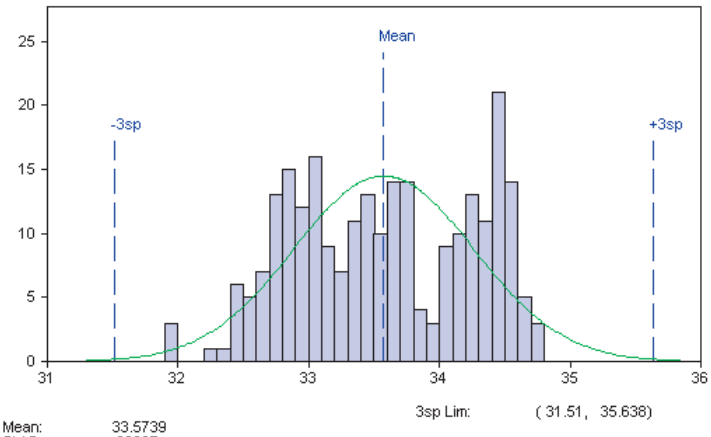
P1dB @ 3.3V



3sp Lim: (18.157, 18.75)

Mean: 18.4536
Std Dev: .098756
Skewness: -.090151

OIP3 @ 3.3V



3sp Lim: (31.51, 35.638)

Mean: 33.5739
Std Dev: .68807
Skewness: -.076963

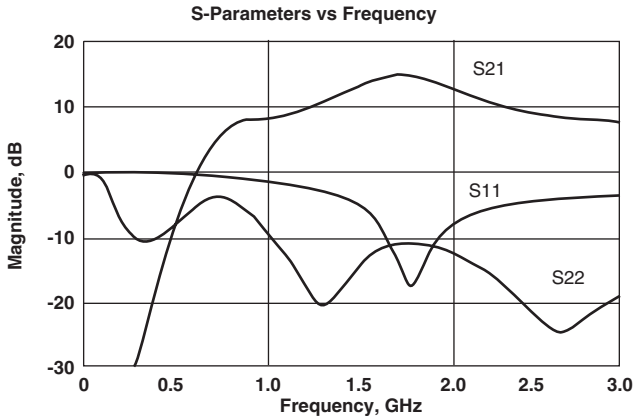
Note: Sample size is 250 samples taken from 3 different wafer lots.

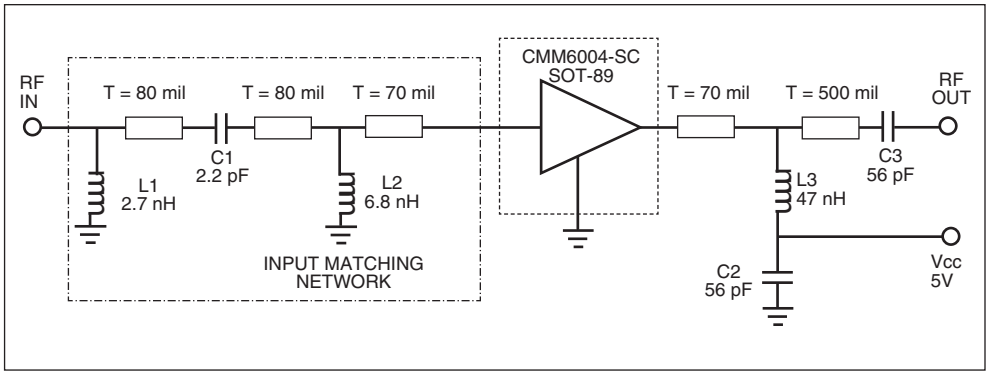
Application Circuit - 1900 MHz

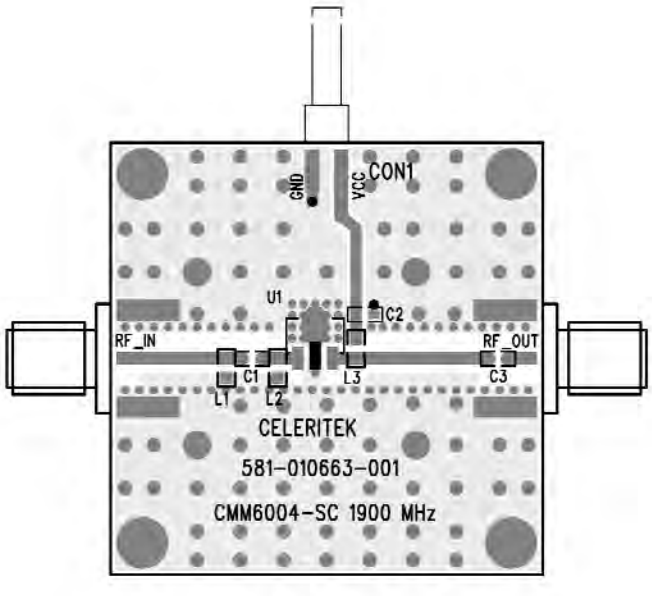
(CMM60004-SC-00B0)

Typical Performance (50 Ohm System)

Frequency	1900 MHz
Gain	14.5 dB
Input Return Loss	-15 dB
Output Return Loss	-10 dB
OIP3	41.0 dBm
Noise Figure	2.2 dB
Bias	Vds = 5V, Id = 174 mA
P1dB	23.5 dBm







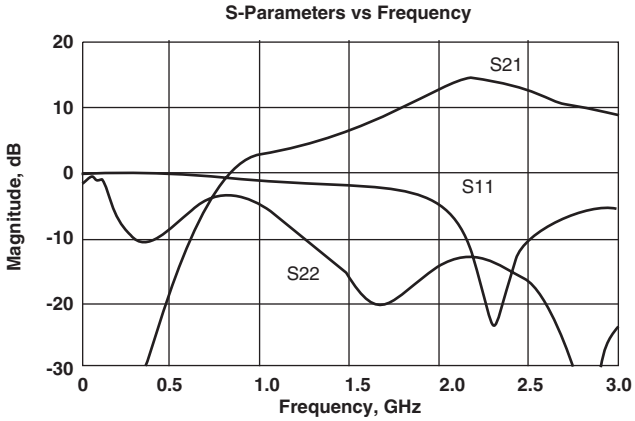
Ref Designator	Value	Description	Size
C1	2.2 pF	KOA 2.2pF 50V CER CAP 0603 NPO ±.25pF	0603
C2, C3	56 pF	MCH185A560JK	0603
L1	2.7 nH	TOKO LL1608-F2N7S	0603
L2	6.8 nH	TOKO LL1608-F6N8K	0603
L3	47 nH	TOKO LL1608-F47NK	0603

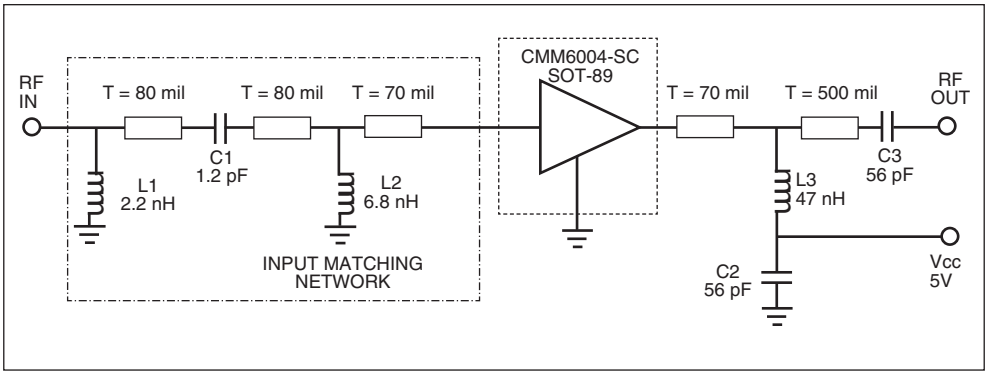
Application Circuit - 2400 MHz

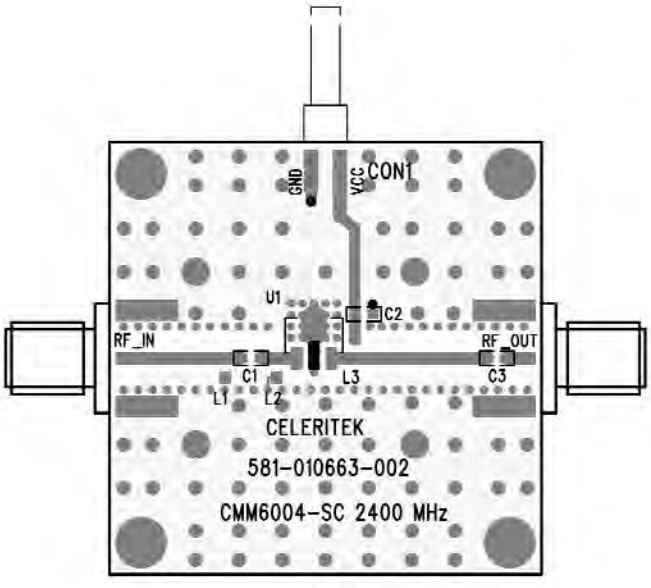
(CMM60004-SC-00C0)

Typical Performance (50 Ohm System)

Frequency	2400 MHz
Gain	13.6 dB
Input Return Loss	-15 dB
Output Return Loss	-12 dB
OIP3	41.0 dBm
Noise Figure	2.3 dB
Bias	Vds = 5V, Id = 175 mA
P1dB	23.0 dBm







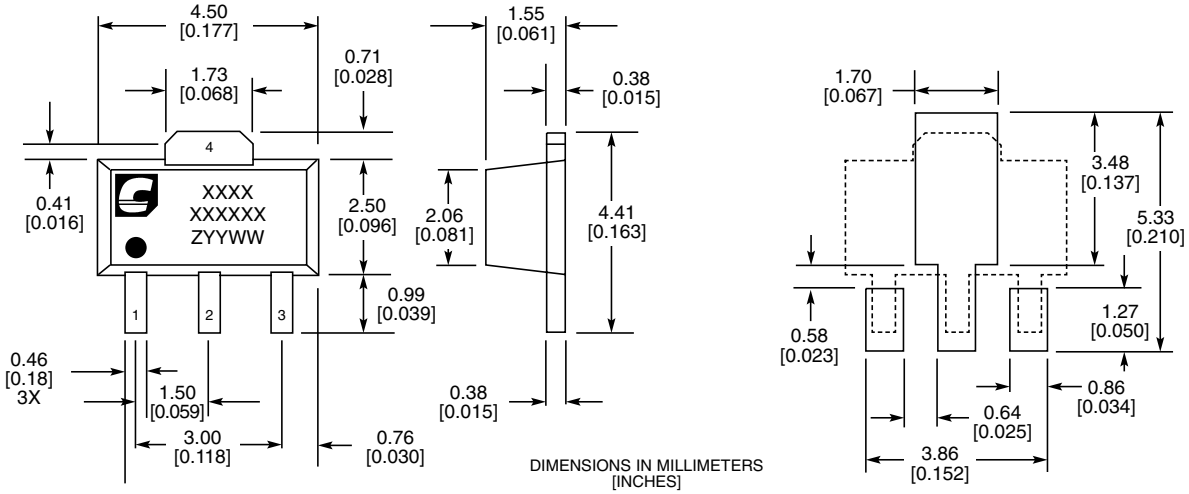
Ref Designator	Value	Description	Size
C1	1.2 pF	PHYC 1.2pF 50V CER CAP 0603 NPO ±.25pF	0603
C2, C3	56 pF	MCH185A560JK	0603
L1	2.2 nH	TOKO LL1608-F2N2S	0603
L2	6.8 nH	TOKO LL1608-F6N8K	0603
L3	47 nH	TOKO LL1608-F47NK	0603

Typical Scattering Parameters (Vds = +5V, Ids = 150 mA, T = 22ºC, unmatched device in a 50 ohm system)

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(MHz)	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)	(Mag)	(Ang)
300	0.337	-47.270	7.379	157.500	0.066	-3.397	0.067	-164.10
400	0.349	-58.240	7.259	151.400	0.066	-6.123	0.064	-173.50
500	0.363	-68.990	7.127	145.300	0.066	-8.429	0.062	-179.70
600	0.379	-79.290	6.986	139.300	0.066	-10.740	0.060	-173.90
700	0.396	-89.000	6.829	133.300	0.065	-12.900	0.059	-169.10
800	0.413	-98.120	6.666	127.400	0.065	-14.990	0.057	-165.00
900	0.430	-106.700	6.502	121.600	0.065	-16.990	0.055	-161.60
1000	0.447	-114.700	6.330	115.900	0.065	-18.970	0.053	-158.60
1100	0.467	-122.400	6.162	110.300	0.065	-20.840	0.052	-155.50
1200	0.475	-129.600	5.991	104.900	0.065	-22.900	0.049	-152.50
1300	0.490	-136.500	5.820	99.610	0.065	-24.660	0.047	-150.10
1400	0.502	-143.100	5.655	94.400	0.065	-26.510	0.046	-147.00
1500	0.513	-149.400	5.494	89.350	0.064	-28.490	0.044	-144.30
1600	0.524	-155.500	5.339	84.370	0.064	-30.130	0.042	-141.50
1700	0.534	-161.400	5.189	79.490	0.064	-32.120	0.041	-138.80
1800	0.543	-167.100	5.045	74.690	0.064	-34.010	0.040	-136.00
1900	0.551	-172.60	4.906	69.960	0.064	-35.800	0.039	-133.00
2000	0.559	-178.000	4.775	65.320	0.064	-37.620	0.038	-130.00
2100	0.565	176.800	4.647	60.730	0.064	-39.550	0.037	-127.20
2200	0.571	171.500	4.523	56.180	0.064	-41.370	0.037	-124.10
2300	0.577	166.400	4.402	51.720	0.064	-43.200	0.036	-119.80
2400	0.582	161.400	4.289	47.320	0.064	-45.090	0.035	-116.00
2500	0.588	156.500	4.183	42.960	0.064	-46.900	0.036	-111.50
2600	0.539	151.600	4.081	38.610	0.065	-48.790	0.035	-106.20
2700	0.597	146.800	3.983	34.330	0.065	-50.760	0.035	-101.30
2800	0.600	142.000	3.886	30.050	0.065	-52.670	0.036	-95.96
2900	0.605	137.200	3.795	25.810	0.065	-54.540	0.037	-90.92
3000	0.608	132.500	3.706	21.620	0.065	-56.660	0.038	-85.54

3236 Scott Boulevard, Santa Clara, California 95054
Phone: (408) 986-5060 Fax: (408) 986-5095

Physical Dimensions



MARKINGS:
XXXX = CELERITEK MODEL NO.
XXXXXX = WAFER LOT NO.
ZYYWW = DATE CODE (YR/WEEK)
FIRST LETTER COUNTRY OF ORIGIN IF OTHER THAT USA

Ordering Information

The CMM6004-SC is available in a surface-mount SOT-89 package and devices are available in tape and reel.

Part Number for Ordering	Package
CMM6004-SC	**SOT-89 surface-mount power package in tape and reel**
PB-CMM6004-SC-00A0	**Evaluation Board with SMA connectors for CMM6004-SC matched at 900 MHz**
PB-CMM6004-SC-00B0	**Evaluation Board with SMA connectors for CMM6004-SC matched at 1900 MHz**
PB-CMM6004-SC-00C0	**Evaluation Board with SMA connectors for CMM6004-SC matched at 2400 MHz**