

Mimix
BROADBAND™

CELERITEK

CMM3566-LC

3.45 to 3.5 GHz

7.0V, +24 dBm

W-CDMA Power Amplifier

**Preliminary Product Information**
November 2000

(1 of 4)

3.45 to 3.5 GHz
7.0V, +24 dBm
W-CDMA Power Amplifier**Features**

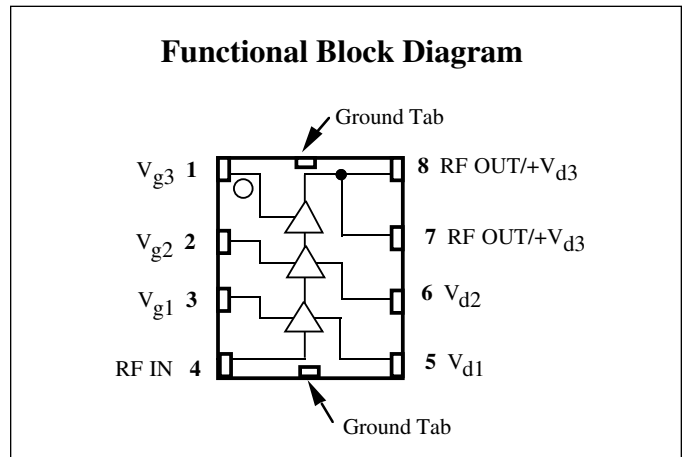
- ❑ 7.0V Bias Voltage
- ❑ +24 dBm Linear Output Power (W-CDMA)
- ❑ 30 dB Gain at Operating Output
- ❑ Tested Under Digital Modulation (W-CDMA)
- ❑ Leadless Chip Carrier (LCC) Package

Applications

- ❑ Wireless Local Loop Subscriber Units
- ❑ Wireless Local Loop Base Stations

Description

The CMM3566-LC is a 7.0 V, +24 dBm, linear power amplifier intended for use in PCS handsets and wireless local loop subscriber units and base stations. The amplifier is biased to meet the requirements of linear modulation systems of W-CDMA.



The CMM3566-LC is packaged in a low-cost, space efficient, power package that provides excellent electrical stability and low thermal resistance. The part requires minimal external circuitry for bias and matching to reduce space and cost.

Absolute Maximum Ratings

Parameter	Rating	Parameter	Rating	Parameter	Rating
Drain Voltage (+V _d)	+8 V*	Power Dissipation	5 W	Operating Temperature	-30°C to +90°C
Drain Current (I _d)	1.0 A	Thermal Resistance	20°C/W	Channel Temperature	150°C
RF Input Power	0 dBm*	Storage Temperature	-65°C to +150°C	Soldering Temperature	240°C for 5 Sec.
DC Gate Voltage (-V _g)	-4.0 V*	BV _{GD}	18 V		

* Max (+V_d) and (-V_g) under linear operation. Max potential difference across the device at 1dB gain compression point (2V_d + |-V_g|) not to exceed the minimum breakdown voltage (BV_{GD}) of +18V.

Recommended Operating Conditions

Parameter	Typ	Units	Parameter	Typ	Units
Drain Voltage (+V _d)	7.0	Volts	Operating Temperature (PC Board)	-40 to +70	°C

Application Information

The CMM3566-LC is a three stage amplifier that requires a positive and a negative supply voltages for proper operation. It is essential when turning on the device that the negative supply be applied before the positive supply. When turning the device off, the positive supply should be removed before the negative supply is removed.

The CMM3566-LC can be operated over a range of supply voltages and bias currents. It is important that the maximum power dissipation specification for the package be observed at all times and that the maximum voltage across the device not be exceeded.

Circuit Design Considerations

Biasing Three negative voltages are needed to set the bias current of the 3-stage GaAs FET power amplifier. The first stage bias is controlled via Vg1. The second stage bias is controlled via Vg2. The output stage is controlled via Vg3. The recommended divider networks for each gate bias shown in the schematic. The positive

supply voltage is applied to pins 5, 6, 7 and 8. The negative voltage supplies control the quiescent current of the device. The quiescent current needs to be set at the level specified in order to get the guaranteed RF performances.

Negative bias voltages can also be used to control the gain, the output power and the operating current during operation of the device.

Matching Circuits Output matching circuit is required to achieve the output power and gain guaranteed. Celeritek's recommendation for the topology of the matching circuit is shown in the schematic diagram of the test circuit in this data sheet.

In providing both the negative and positive bias voltages, it is important to provide adequate de-coupling between the RF signal and the DC voltages. Inadequate de-coupling could result in low output power, low gain or oscillation. Celeritek recommends the bias circuits shown in the evaluation circuit.

Electrical Characteristics

Unless otherwise specified, the following specifications are guaranteed at 3.45 GHz, room temperature with drain voltage (+V_d) = 7.0 V in Celeritek test fixture.

Parameter	Condition	Min	Typ	Max	Units
Frequency Range		3.45		3.5	GHz
Gain	@ Digital power output	26	28.5	31	dB
Gain Variation	Over supply voltage		2		dB/V
	Over temperature		0.03		dB/°C
Harmonics*	2nd (Pout = +22 to +26 dBm)		-35	-30	dBc
	3rd (Pout = +22 to +26 dBm) and above		-40	-35	dBc
Linear Output Power	±2.7 MHz from carrier (Pout = +22 dBm, Data Rate = 4.096Mc/Sec)		-43	-40	dBc/30 KHz
	±5.25 MHz from carrier (Pout = +22 dBm, Data Rate = 4.096Mc/Sec)		-50	-48	dBc/30 KHz
Linear Output Power	±2.7 MHz from carrier (Pout = +24 dBm, Data Rate = 4.096Mc/Sec)		-38	-35	dBc/30 KHz
	±5.25 MHz from carrier (Pout = +24 dBm, Data Rate = 4.096Mc/Sec)		-47	-45	dBc/30 KHz
Wideband Noise	10 MHz Bandwidth	-68			dBc
Noise Figure	Vdd = 7.0 V		5		dB
Return Loss Input		-10	-14		dB
Return Loss Output		-10	-14		dB
Positive Supply Current (I _d)	Pout = +24 dBm		540		mA
Quiescent Current (I _q)	No RF		520		mA
Negative Supply Current (-I _g)	Includes external resistor divider		2.0	4.0	mA
Negative Supply Voltage (-V _g)	Into external resistor divider	-0.3	-1.5	-3.0	V

* The integrity of the input signal at an offset of 5.25 MHz has an adjacent channel performance of not greater than -52 dBc.

– Continued from Page 1 –

Modulation When biased as specified, the CMM3566-LC will achieve the required adjacent channel response for the W-CDMA linearity. Celeritek tests each product under digital modulation to ensure compliance to system specifications.

Thermal

1. The copper pad on the backside of the CMM3566-LC must be soldered to the ground plane.

S-Parameters

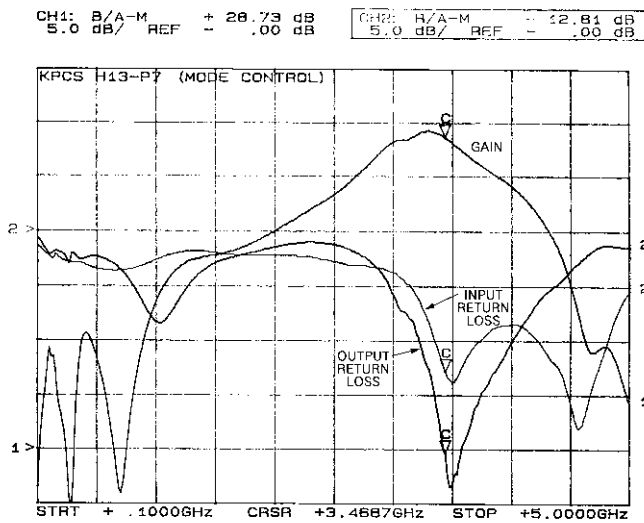
Vdd = 7V, ID 1 & 2 = 200, ID 3 = 300

Frequency (GHz)	S11		S21		S12		S22	
	Mag	ANG	Mag	ANG	Mag	ANG	Mag	ANG
0.6	0.646	136.623	2.393	20.992	0.002	-19.228	0.804	-23.817
0.8	0.659	54.979	1.283	17.015	0.003	-80.195	0.682	-89.402
1.0	0.732	-19.826	5.119	-67.405	0.004	-158.535	0.420	-138.407
1.2	0.778	-82.663	8.080	-171.314	0.005	132.866	0.382	-152.437
1.4	0.781	-140.684	10.458	93.318	0.005	67.738	0.533	150.599
1.6	0.751	155.653	12.110	-2.432	0.007	0.028	0.650	69.917
1.8	0.770	14.916	11.272	-176.757	0.006	-124.480	0.874	-61.986
2.0	0.770	11.996	11.158	-179.876	0.006	-126.766	0.880	-63.734
2.2	0.781	-40.876	11.715	106.441	0.007	173.071	0.911	-116.517
2.4	0.772	-81.765	15.438	32.091	0.008	128.121	0.877	-177.609
2.6	0.757	-121.242	21.302	-51.262	0.010	68.938	0.771	103.364
2.8	0.640	176.329	27.182	-150.627	0.011	-13.377	0.756	13.731
3.0	0.447	86.466	29.193	105.943	0.010	-79.627	0.690	-53.854
3.2	0.516	0.714	28.413	4.707	0.011	-137.593	0.471	-91.983
3.4	0.518	-69.213	25.542	-94.768	0.010	152.682	0.383	-99.415
3.6	0.131	-149.583	24.348	164.543	0.012	93.523	0.268	-121.022
3.8	0.423	-13.907	19.130	58.878	0.011	18.708	0.257	-98.953
4.0	0.578	-59.337	14.619	-37.638	0.008	-52.138	0.278	-134.978

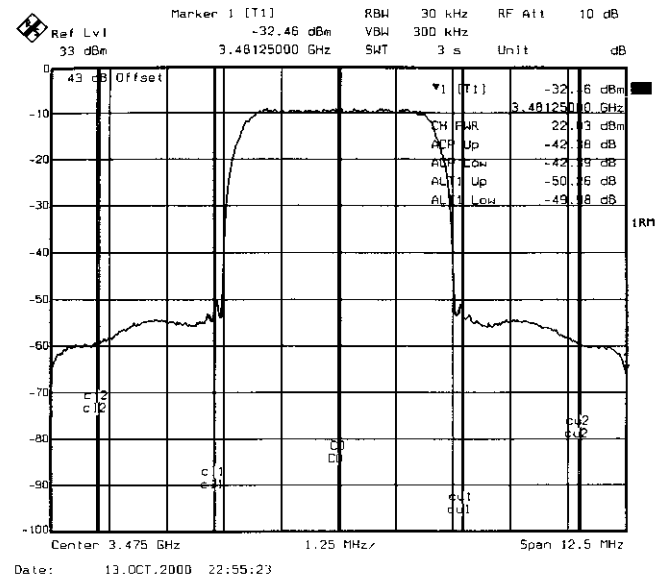


Typical Performance

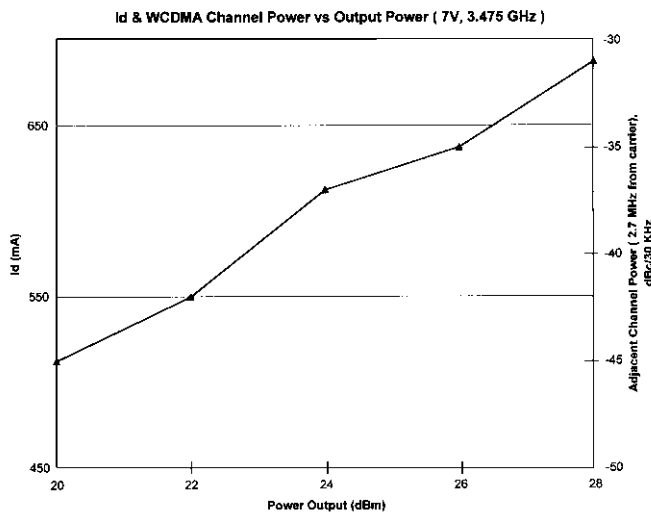
Gain and Return Loss vs Frequency



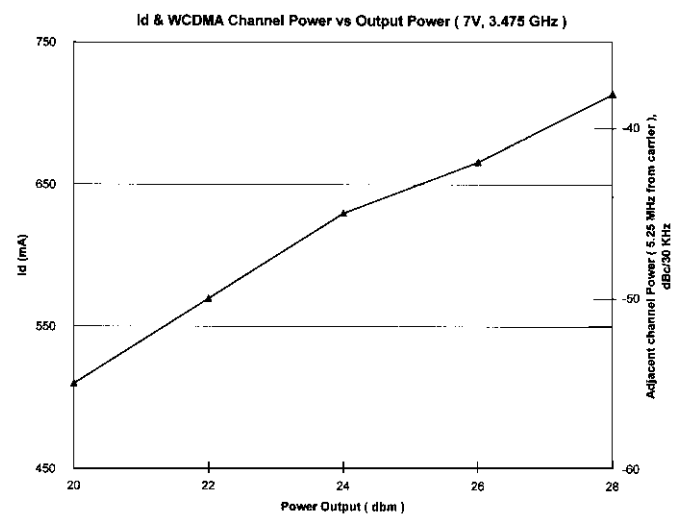
Linear Output Power vs Frequency



Id & Adjacent Channel Power vs Output Power (2.7 MHz from Carrier)



Id & Adjacent Channel Power vs Output Power (5.25 MHz from Carrier)



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Preliminary Product Information - November 2000
(4 of 4)

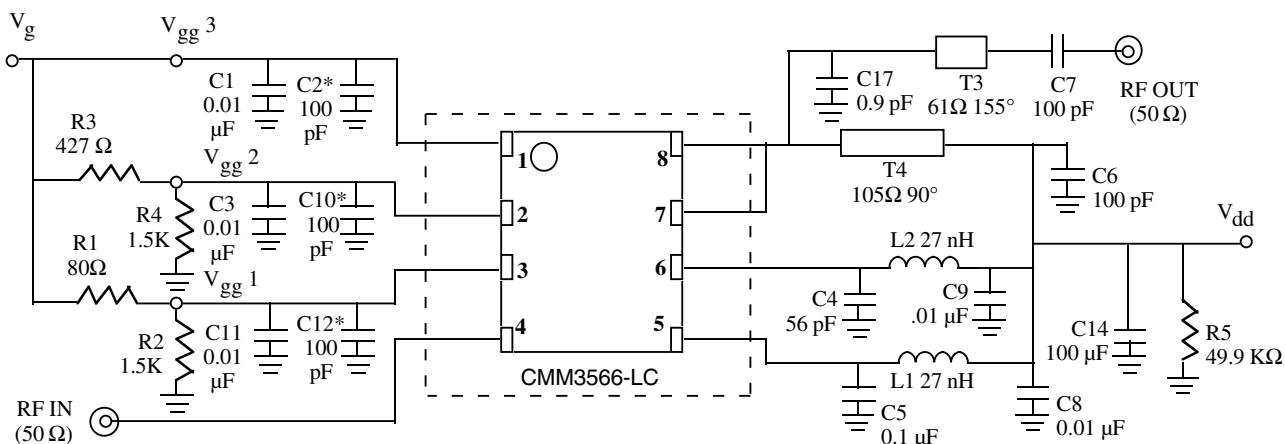
Recommended Matching Topology

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

Evaluation Board Schematic
Board substrate:

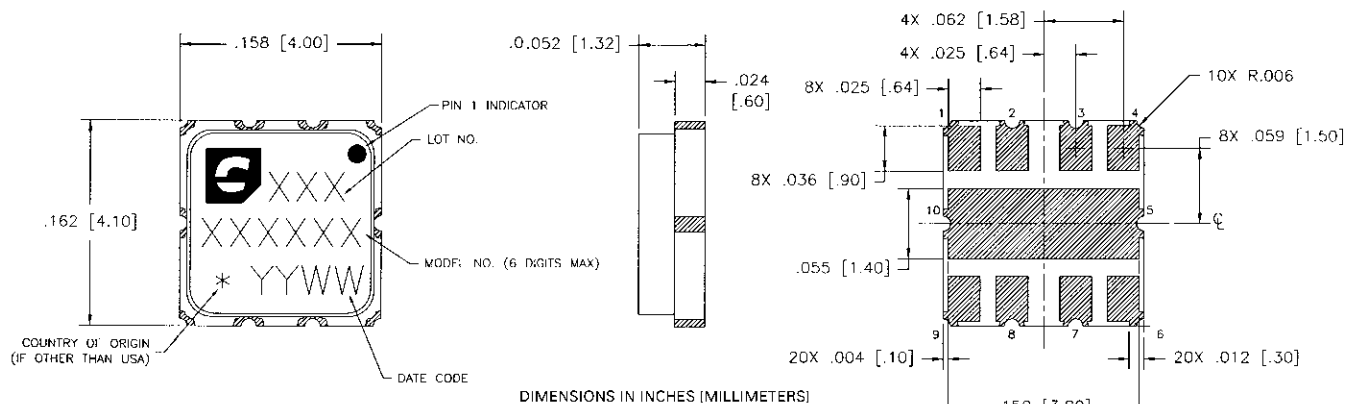
ER = 3.38

Thickness = 0.031 in.



* = Should be as close to leads as possible.

Physical Dimensions



Ordering Information

The CMM3566-LC is available in a surface mount plastic LCC-8 package and devices are available in tube or tape and reel.

Part Number for Ordering

CMM3566-LC

CMM3566-LC-000T

PB-CMM3566-LC

Package

LCC-8 surface mount power package

LCC-8 surface mount power package in tape and reel

Evaluation Board with SMA connectors for CMM3566-LC

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