CGB8001-SC

High Dynamic Range Amplifier, InGaP HBT
DC - 2.8 GHz, 0.5 W, Medium Power

Rev. V2

Features

- 18 dBm Linear Power @ 2140 MHz
- 15.5 dB Gain @ 2140 MHz
- 12 dB Gain @ 2700 MHz
- 27 dBm P1dB @ 2140 MHz
- Low Performance Variation Over Temperature
- 100% DC On-Wafer Testing
- ESD Protection on All Die: >4000V HBM
- Low Thermal Resistance: <35ºC/Watt
- Low Voltage Supply: 5 V, Active Bias
- RoHS* Compliant SOT-89 SMT Package

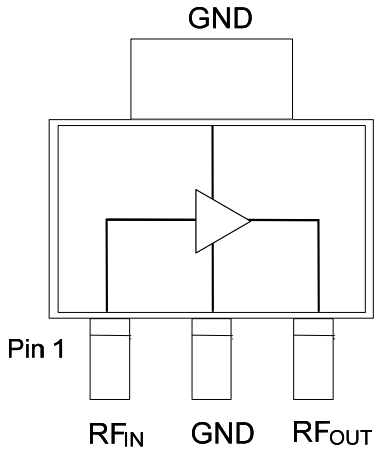
Description

The CGB8001-SC is a single stage, medium power, high dynamic range amplifier. This device has a an on-chip integrated active bias circuit providing stable current over temperature variations. The device is biased with a single +5V supply in a class AB mode making it efficient at back-off input power levels. This MMIC amplifier is available in an industry standard, RoHS compliant, SOT-89 package.

The CGB8001-SC is designed for applications operating within the DC to 2.8 GHz frequency range. It is an ideal solution for transmit, receive and IF applications. This medium power amplifier offers significant ease of use in a broad range of applications with minimum external matching elements. The combination of high gain, P1dB and high linear power at low current makes this device an ideal transmit solution as a driver or output stage when used in applications including 3G, fixed wireless broadband, WLAN and WiMAX.

The CGB8001-SC is manufactured using InGaP HBT technology and an industry low thermal resistance offers a thermally robust and reliable gain block solution. The InGaP HBT die have extra pads to enable thorough DC testing. This unique test capability and the inclusion of ESD protection on all die, significantly enhances the quality, reliability and ruggedness of this product.

Functional Block Diagram



Pin Configuration[1]

Pin No.	Function
1	RF Input
2	Ground
3	RF Output/Bias
4	Ground

1. The exposed pad centered on the package bottom must be connected to RF and DC ground.

Ordering Information [2,3]

Part Number	Package
CGB8001-SC-0G00	Bulk
CGB8001-SC-0G0T	3000 piece reel
PB-CGB8001-SC-00A0	850-950 MHz Evaluation Board
PB-CGB8001-SC-00B0	1800-2200 MHz Evaluation Board
PB-CGB8001-SC-00C0	2400-2800 MHz Evaluation Board

2. Reference Application Note M513 for reel size information.
3. All sample boards include 5 loose parts.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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• **India** Tel: +91.80.43537383 • **China** Tel: +86.21.2407.1588
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High Dynamic Range Amplifier, InGaP HBT
DC - 2.8 GHz, 0.5 W, Medium Power

Electrical Specifications: T_A = 25°C, V_{DD} = 5 V, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Small Signal Gain	0.90 GHz 1.95 GHz 2.14 GHz 2.50 GHz 2.70 GHz	dB	— 14.5 — — —	20.5 16.2 15.5 13.5 12.0	—
Noise Figure	0.90 GHz 1.95 GHz 2.14 GHz 2.50 GHz 2.70 GHz	dB	—	3.6 3.7 3.9 4.3 5.5	—
Output P1dB	0.90 GHz 1.95 GHz 2.14 GHz 2.50 GHz 2.70 GHz	dBm	— 26.5 — — —	27.6 27.0 27.0 26.5 25.2	—
Pout @ ACPR = -45 dBc, IS-95, 9 Forward Channels	0.90 GHz 1.95 GHz 2.14 GHz 2.50 GHz 2.70 GHz	dBm	—	21 21 18 16 16	—
Current	—	mA	—	100	130

Absolute Maximum Ratings [4,5]

Parameter	Absolute Maximum
Supply Voltage	+6 Volts
Current	400 mA
Dissipated Power	1.2 W
Input Power	+17 dBm
Junction Temperature	170°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-55°C to +150°C
Thermal Resistance	35°C/W

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 3B (HBM), Class C (MM) devices.

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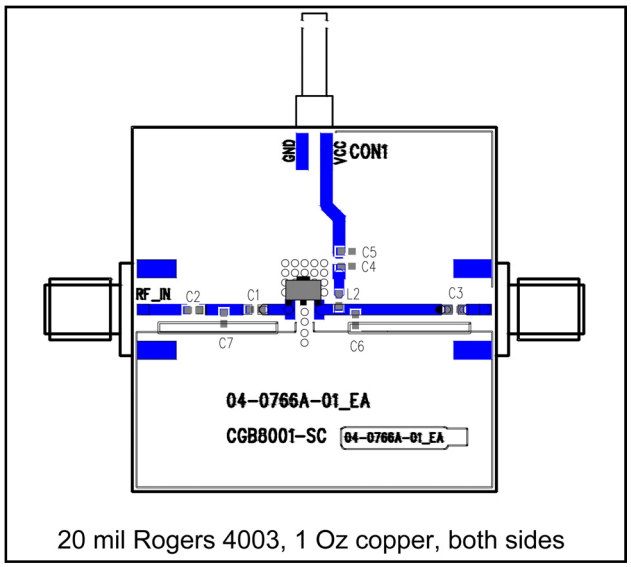
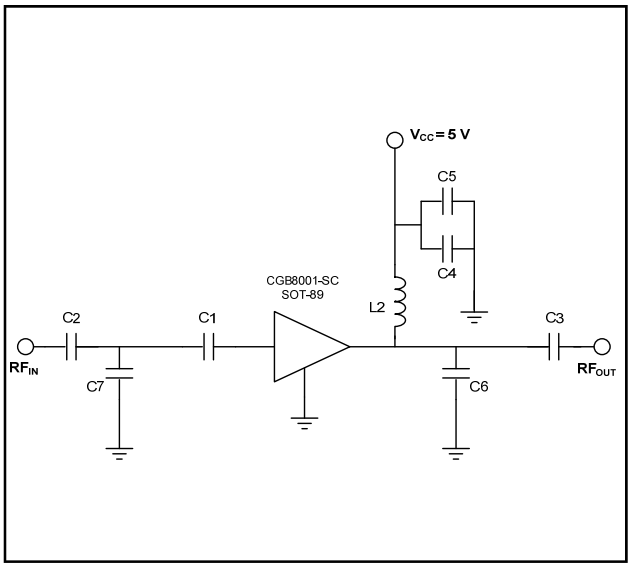
Evaluation Board Layout



20 mil Rogers 4003, 1 Oz copper, both sides

Recommended Schematic



Component List

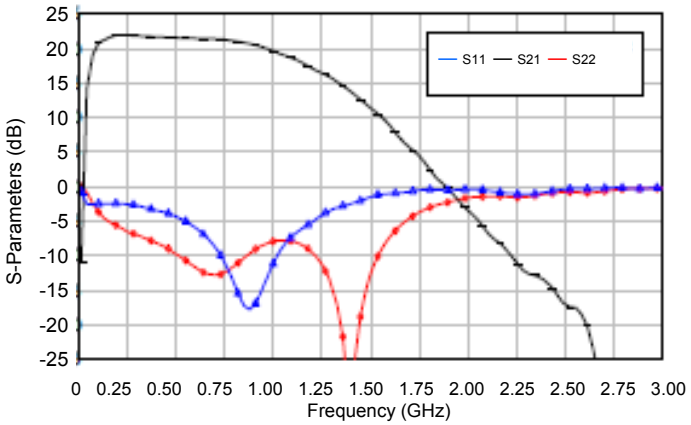
Part	.85 - .95 GHz	1.8 - 2.2 GHz	2.4 - 2.8 GHz	Case Style
C1	short	2.2 pF	27 pF	0603
C2	100 pF	short	short	0603
C3	100 pF	100 pF	100 pF	0603
C4	1000 pF	1000 pF	1000 pF	0603
C5	1 µF	1 µF	1 µF	0805
C6	3.9 pF	1 pF	1 pF	0603
C7	5.5 pF	DNP	DNP	0603
L2	39 nH	27 nH	22 nH	0603
TL1	6 mm, 50 Ω	N/A	N/A	N/A
TL2	3 mm, 50 Ω	3 mm, 50 Ω	3 mm, 50 Ω	N/A
TL3	1.5 mm, 50 Ω	1.5 mm, 50 Ω	1.5 mm, 50 Ω	N/A
TL4	3.5 mm, 50 Ω	3.5 mm, 50 Ω	3.5 mm, 50 Ω	N/A

6. 1.8 - 2.2 GHz linearity can be improved by moving C13 mm away from the CGB8001-SC.

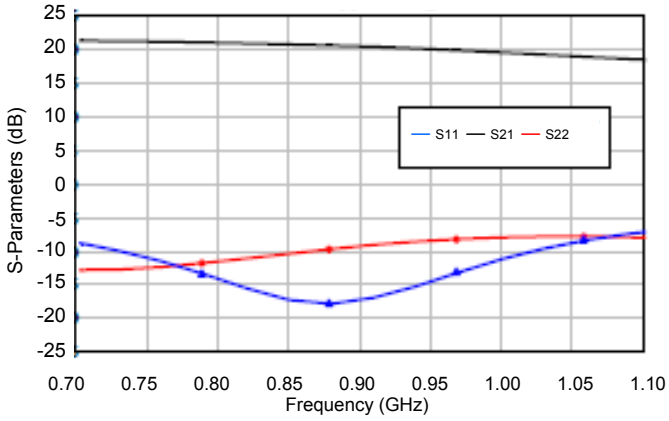
Typical Performance @ 0.9 GHz

Parameter	Units	-40°C	+25°C	+85°C
Gain	dB	20.3	20.5	20.1
Noise Figure	dB	3.1	3.7	4.4
Output P1dB	dBm	28.0	27.6	26.1

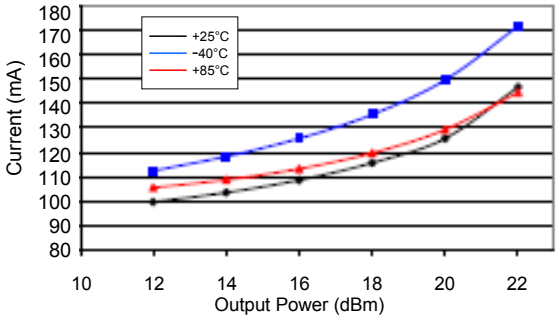
5V, 100 mA, App CKT



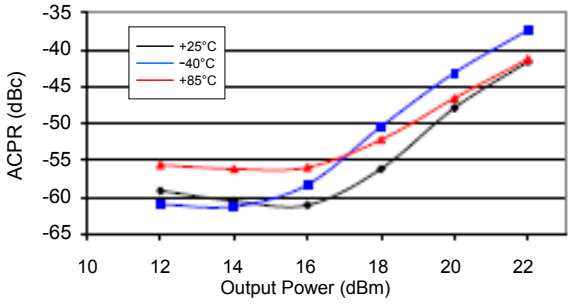
5V, 100 mA, App CKT



Current
Vd = 5V, Iq = 100 mA,
Is-95A Downlink, 9 Channels Forward



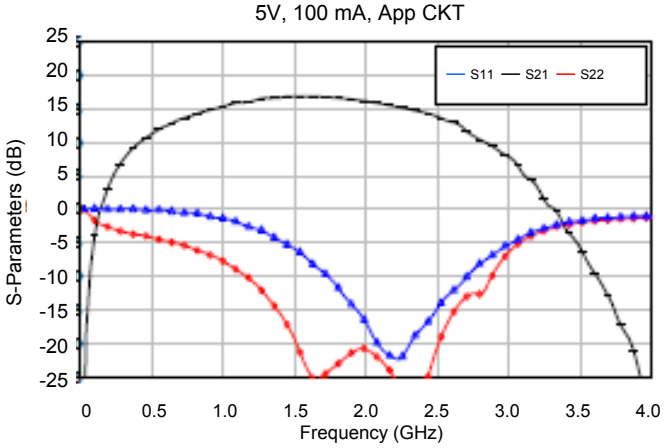
ACPR
Vd = 5V, Iq = 100 mA,
Is-95A Downlink, 9 Channels Forward



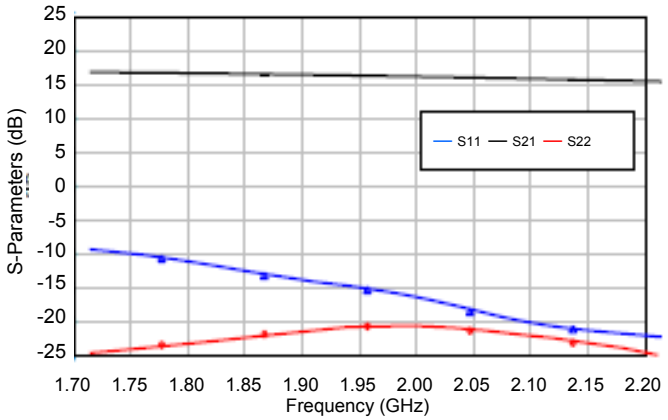
Typical Performance @ 1.96 GHz

Parameter	Units	-40°C	+25°C	+85°C
Gain	dB	16.4	16.2	15.9
Noise Figure	dB	3.1	3.7	4.3
Output P1dB	dBm	27.8	27.2	26.8

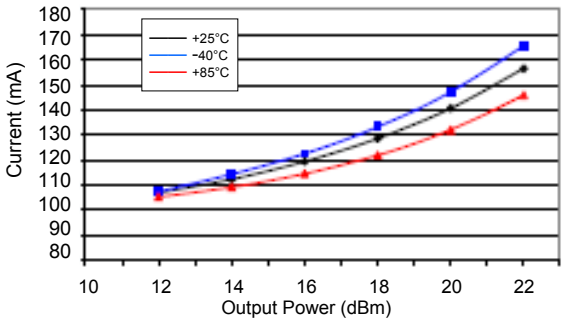
5V, 100 mA, App CKT



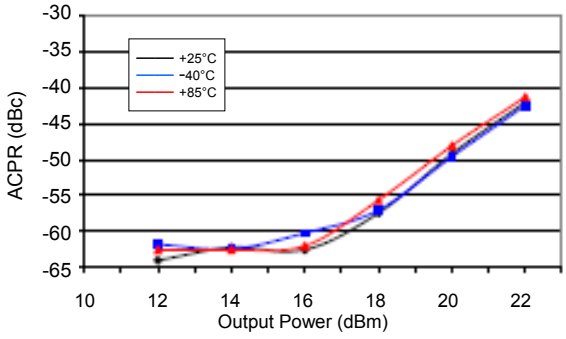
5V, 100 mA, App CKT



Current
Vd = 5V, Iq = 100 mA,
Is-95A Downlink, 9 Channels Forward



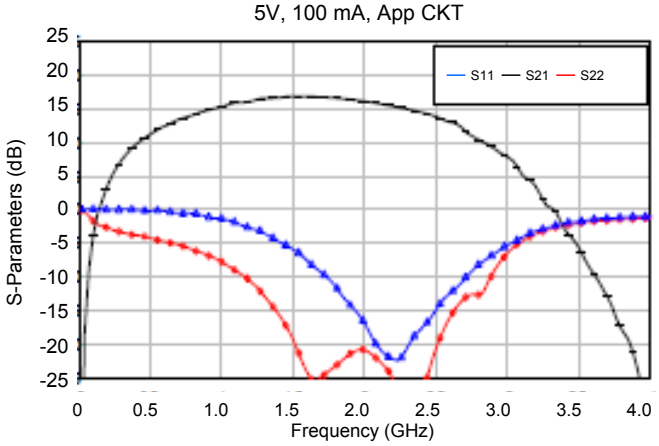
ACPR
Vd = 5V, Iq = 100 mA,
Is-95A Downlink, 9 Channels Forward



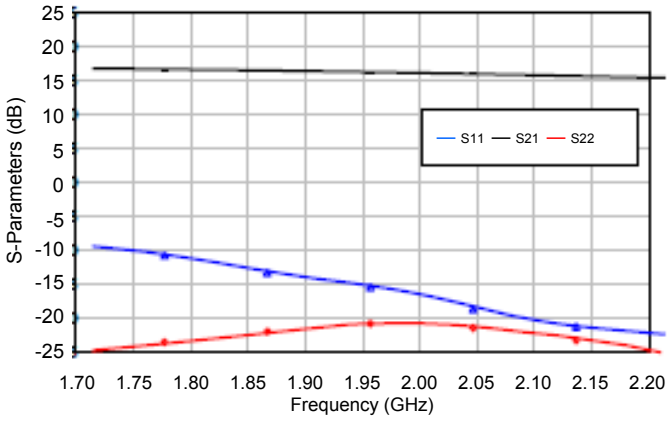
Typical Performance @ 2.14 GHz

Parameter	Units	-40°C	+25°C	+85°C
Gain	dB	15.8	15.5	14.9
Noise Figure	dB	3.3	3.9	4.7
Output P1dB	dBm	28.2	27.0	26.7

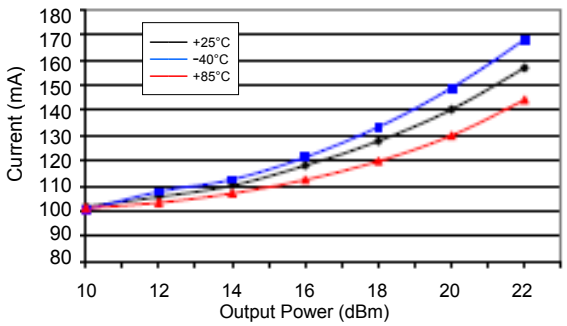
5V, 100 mA, App CKT



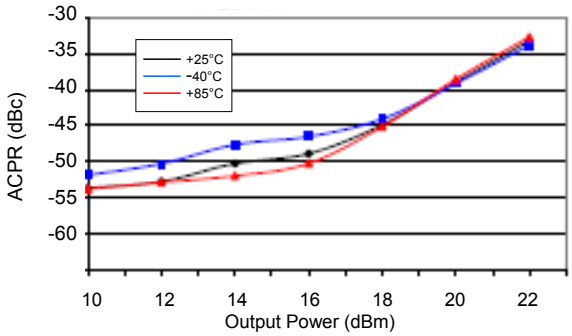
5V, 100 mA, App CKT



Current
Vd = 5V, Iq = 100 mA,
WCDMA TM-1 64 DPCH



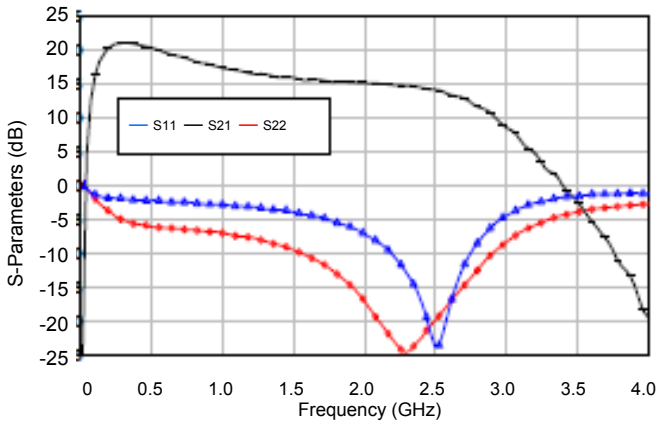
ACPR
Vd = 5V, Iq = 100 mA,
WCDMA TM-1 64 DPCH



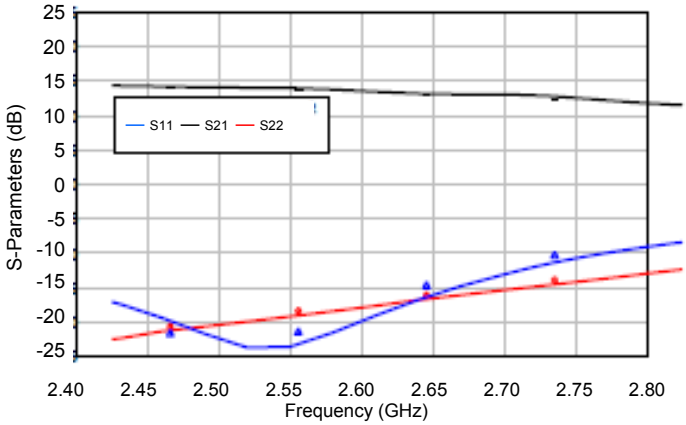
Typical Performance @ 2.45 GHz

Parameter	Units	-40°C	+25°C	+85°C
Gain	dB	14.0	13.7	12.8
Noise Figure	dB	3.8	4.1	4.9
Output P1dB	dBm	26.8	26.6	26.2

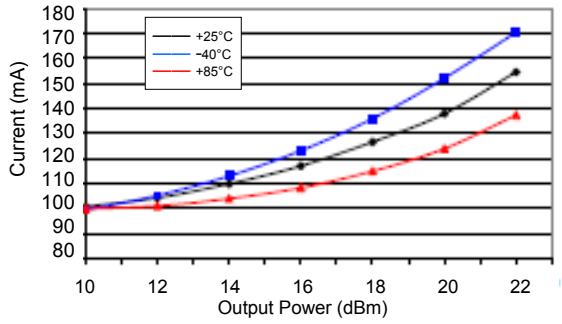
5V, 100 mA, App CKT



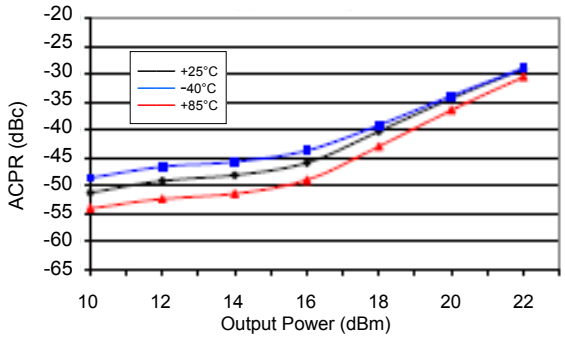
5V, 100 mA, App CKT



Current
Vd = 5V, Iq = 100 mA,
WCDMA TM-1 64 DPCH



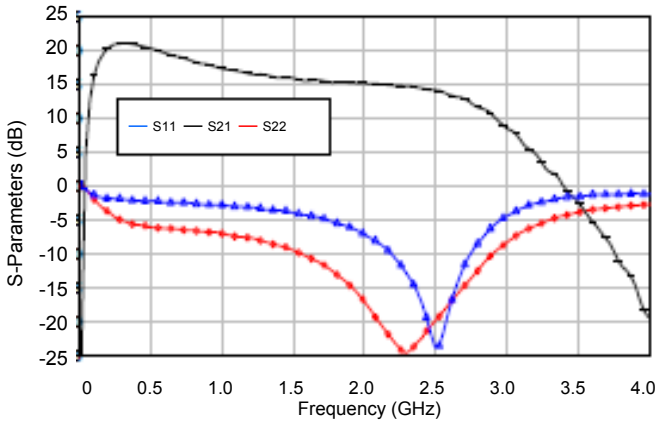
ACPR
Vd = 5V, Iq = 100 mA,
WCDMA TM-1 64 DPCH



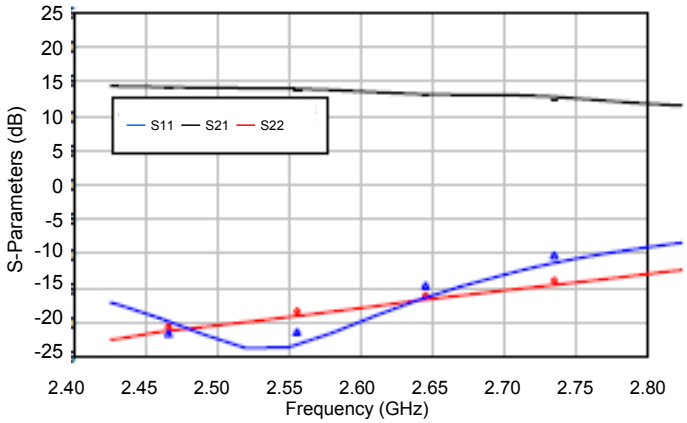
Typical Performance @ 2.75 GHz

Parameter	Units	-40°C	+25°C	+85°C
Gain	dB	12.3	11.9	11.0
Noise Figure	dB	4.7	5.5	7.5
Output P1dB	dBm	25.4	25.2	24.8

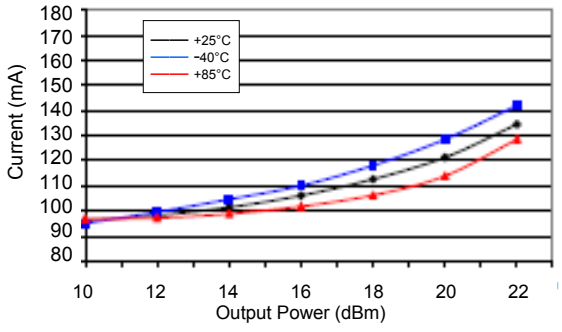
5V, 100 mA, App CKT



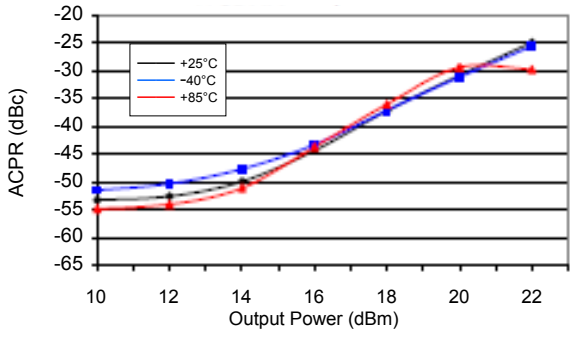
5V, 100 mA, App CKT



Current
Vd = 5V, Iq = 100 mA,
WCDMA TM-1 64 DPCH



ACPR
Vd = 5V, Iq = 100 mA,
WCDMA TM-1 64 DPCH



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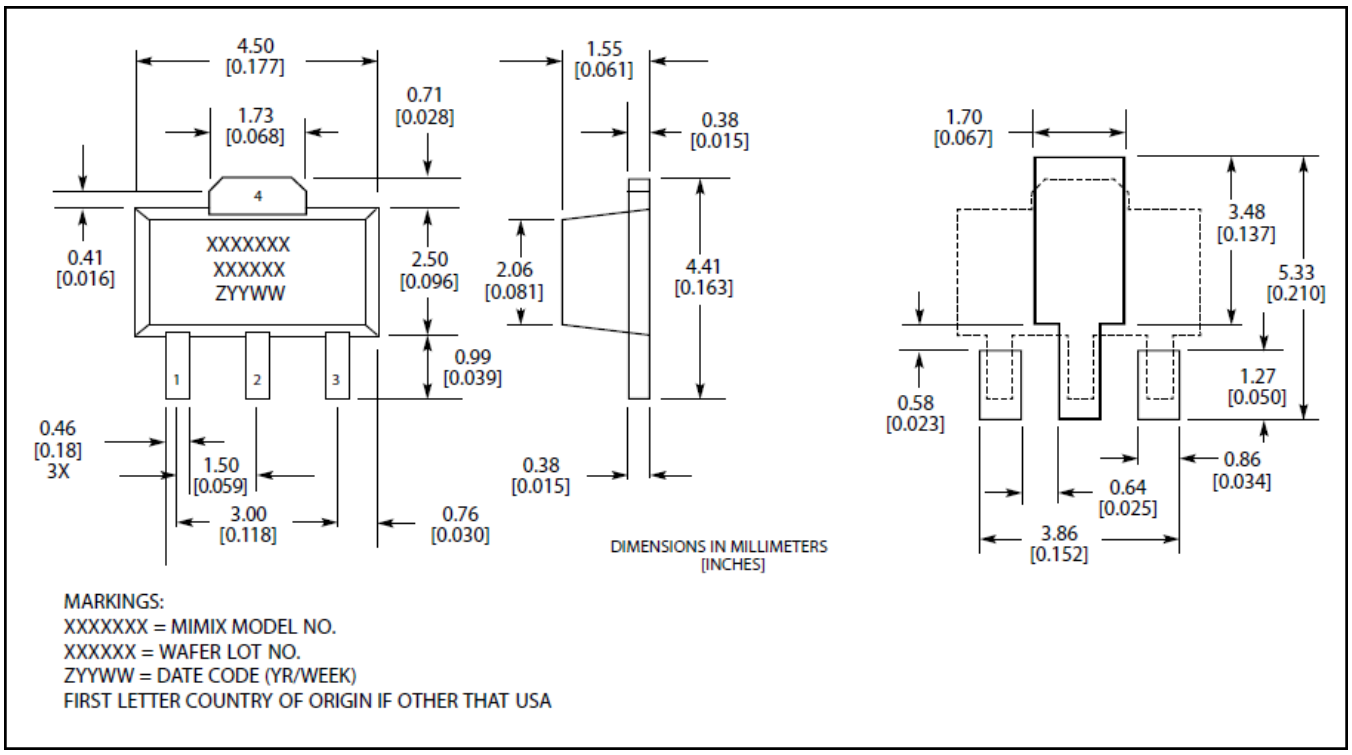
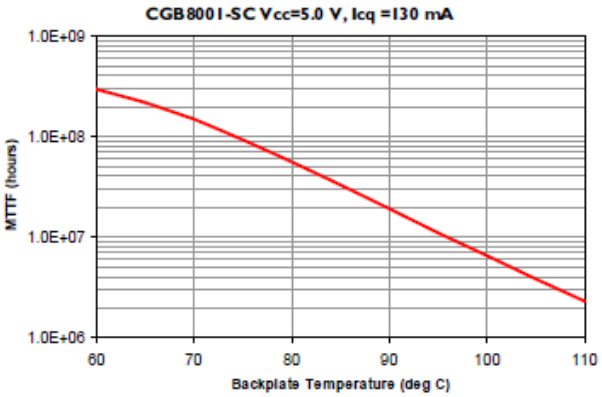
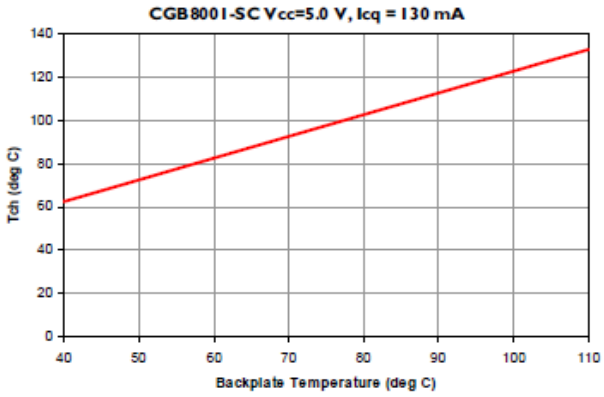
Lead-Free SOT-89†



† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin plating over copper

MTTF[7]





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