

Surface Mount

Monolithic Amplifier

DC-5 GHz

Product Features

- DC-5 GHz
- Output power, 17.3 dBm typ.
- Internally Matched to 50 Ohms
- Excellent package for heat dissipation, exposed metal bottom
- Flat output power to 10 GHz
- Aqueous washable
- Protected by US Patent 6,943,629
- Low additive phase noise, typically -171 dBc/Hz @ 10 KHz offset



Generic photo used for illustration purposes only

LEE-59+

CASE STYLE: FG873

+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

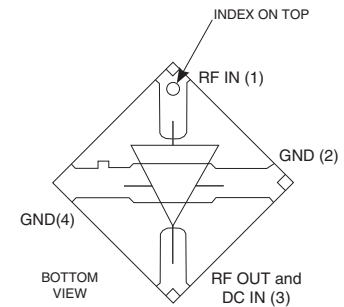
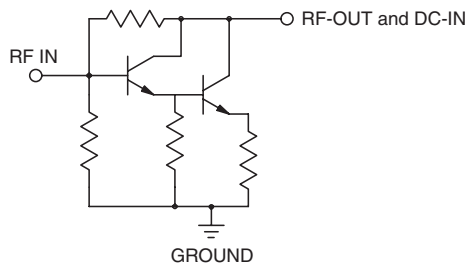
Typical Applications

- Cellular
- PCS
- Communication receivers & transmitters
- Satellite communication, military
- Suitable for low phase noise applications

General Description

LEE-59+ (RoHS compliant) is a wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in a 3X3mm MCLP molded plastic package.

simplified schematic and pin description



| Function | Pin Number | Description |
|------------------|------------|--|
| RF IN | 1 | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation. |
| RF-OUT and DC-IN | 3 | RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit". |
| GND | 2,4 | Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance. |

Notes

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- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp



Electrical Specifications at 25°C and 65mA, unless noted

| Parameter | | Min. | Typ. | Max. | Units |
|---|----------------------|------|------|------|--------|
| Frequency Range* | | DC | | 5 | GHz |
| Gain | f=0.1 GHz | — | 20.6 | — | dB |
| | f=1 GHz | — | 20.3 | — | |
| | f=2 GHz | 17.8 | 19.7 | — | |
| | f=4 GHz | — | 15.8 | — | |
| | f=5 GHz | — | 13.8 | — | |
| | f=8 GHz | — | 7.6 | — | |
| Input Return Loss | f= DC to 3 GHz | | 14 | | dB |
| | f= 3 to 5 GHz | | 14 | | |
| Output Return Loss | f= DC to 3 GHz | | 14 | | dB |
| | f= 3 to 5 GHz | | 12.5 | | |
| Output Power @ 1 dB compression | f= 2 GHz | 16.3 | 17.3 | — | dBm |
| | f= 5 GHz | 10.3 | 11.5 | — | |
| Output IP3 | | | 33 | | dBm |
| Noise Figure | | | 4.5 | | dB |
| Additive Phase Noise | 2 GHz, 10 KHz offset | | -171 | | dBc/Hz |
| Recommended Device Operating Current | | | 65 | | mA |
| Device Operating Voltage | | 4.3 | 4.8 | 5.2 | V |
| Device Voltage Variation vs. Temperature at 65 mA | | | -3.1 | | mV/°C |
| Device Voltage Variation vs. Current at 25°C | | | 6.2 | | mV/mA |
| Thermal Resistance, junction-to-case ¹ | | | 138 | | °C/W |

*Guaranteed specification DC-5 GHz. Low frequency cut off determined by external coupling capacitors.

Absolute Maximum Ratings

| Parameter | Ratings |
|------------------------|----------------|
| Operating Temperature* | -45°C to 85°C |
| Storage Temperature | -65°C to 150°C |
| Operating Current | 85mA |
| Input Power | 13dBm |

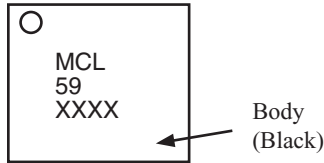
Note: Permanent damage may occur if any of these limits are exceeded. These ratings are not intended for continuous normal operation.
¹Case is defined as ground leads.
^{*}Based on typical case temperature rise 5°C above ambient.

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Product Marking



Markings in addition to model number designation may appear for internal quality control purposes.

Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

Case Style: FG873

Plastic package, exposed paddle, lead finish: matte-tin

Tape & Reel: F68

7" Reels with 20, 50, 100, 200, 500, 1K devices

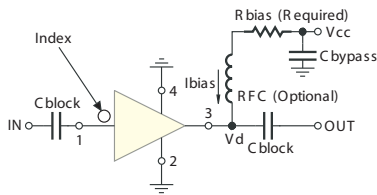
13" Reels with 2K, 3K, 4K devices

Suggested Layout for PCB Design: PL-252

Evaluation Board: TB-413-59+

Environmental Ratings: ENV08T2

Recommended Application Circuit



Test Board includes case, connectors, and components (in bold) soldered to PCB

| R BIAS | |
|--------|---|
| Vcc | "1%" Res. Values (ohms) for Optimum Biasing |
| 7 | 35.7 |
| 8 | 49.9 |
| 9 | 64.9 |
| 10 | 80.6 |
| 11 | 95.3 |
| 12 | 110 |
| 13 | 127 |
| 14 | 143 |
| 15 | 158 |
| 16 | 174 |
| 17 | 191 |
| 18 | 205 |
| 19 | 221 |
| 20 | 237 |

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ESD Rating

Human Body Model (HBM): Class 1B (500v to < 1000v) in accordance with ANSI/ESD STM 5.1 - 2001

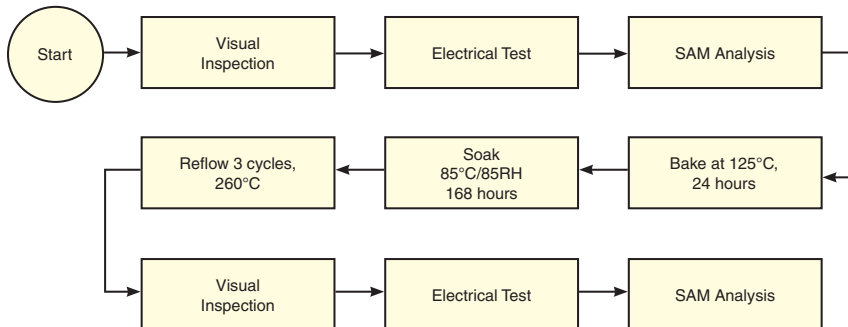
Machine Model (MM): Class M1 (< 100v) in accordance with ANSI/ESD STM 5.2 - 1999

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020C

| No. | Test Required | Condition | Standard | Quantity |
|-----|------------------------------|---|-----------------------------|----------|
| 1 | Visual Inspection | Low Power Microscope Magnification 40x | MIP-IN-0003 (MCT spec) | 45 units |
| 2 | Electrical Test | Room Temperature | SCD (MCL spec) | 45 units |
| 3 | SAM Analysis | Less than 10% growth in term of delamination | J-Std-020C (Jedec Standard) | 45 units |
| 4 | Moisture Sensitivity Level 1 | Bake at 125°C for 24 hours Soak at 85°C/85%RH for 168 hours Reflow 3 cycles at 260°C peak | J-Std-020C (Jedec Standard) | 45 units |

MSL Test Flow Chart



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