



**THE DATASHEET OF
LEE-39+**



Surface Mount

Monolithic Amplifier

DC-8 GHz

Product Features

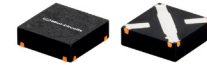
- DC-8 GHz
- Output power, 10.4 dBm typ.
- Internally Matched to 50 Ohms
- Excellent package for heat dissipation, exposed metal bottom
- Flat output power to 10 GHz
- Aqueous washable
- Protected by US Patent 6,943,629
- Low Additive Phase Noise

Typical Applications

- Cellular
- PCS
- Communication receivers & transmitters
- Satellite communication, military

General Description

LEE-39+ (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. Expected MTBF is 6,000 years at 85°C case temperature.



Generic photo used for illustration purposes only

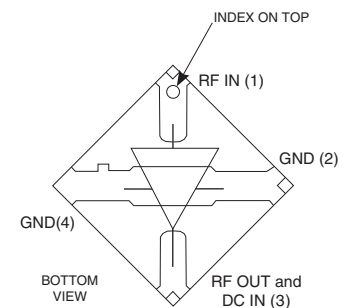
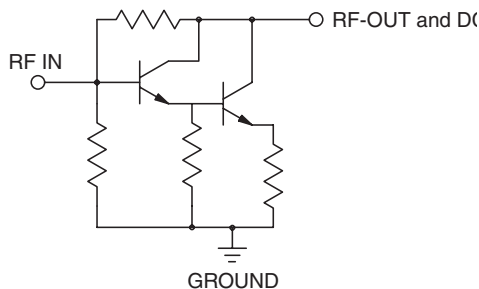
LEE-39+

CASE STYLE: FG873

+RoHS Compliant

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

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

- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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 35mA, unless noted

Parameter		Min.	Typ.	Max.	Units
Frequency Range*		DC		8	GHz
Gain	f=0.1 GHz	—	21.9	—	dB
	f=1 GHz	—	21.4	—	
	f=2 GHz	18.5	20.8	—	
	f=4 GHz	—	18.3	—	
	f=5 GHz	—	16.6	—	
	f=8 GHz	—	13.5	—	
Input Return Loss	f= DC to 3 GHz		17.5		dB
	f= 3 to 8 GHz		15.5		
Output Return Loss	f= DC to 3 GHz		17.5		dB
	f= 3 to 8 GHz		12.5		
Output Power @ 1 dB compression	f= 2 GHz	10.4	11.6	—	dBm
	f= 8 GHz		10.1		
Output IP3	f= 2 GHz		23.4		dBm
Noise Figure	f= 2 GHz		2.4		dB
Recommended Device Operating Current			35		mA
Device Operating Voltage		3.1	3.5	3.9	V
Device Voltage Variation vs. Temperature at 35 mA			-2.5		mV/°C
Device Voltage Variation vs. Current at 25°C			2.9		mV/mA
Thermal Resistance, junction-to-case ¹			127		°C/W

*Guaranteed specification DC-8 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	55mA
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: tin-silver over nickel

Tape & Reel: F68

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

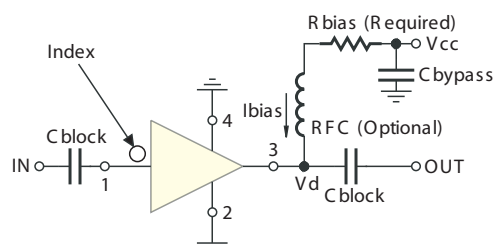
13" Reels with 2K, 3K, 4K devices

Suggested Layout for PCB Design: PL-252

Evaluation Board: TB-413-39+

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	107
8	133
9	162
10	191
11	221
12	249
13	280
14	309
15	340
16	365
17	392
18	422
19	453
20	475

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ESD Rating

Human Body Model (HBM): Class 1A (250v to < 500v) in accordance with ANSI/ESD STM 5.1 - 2001

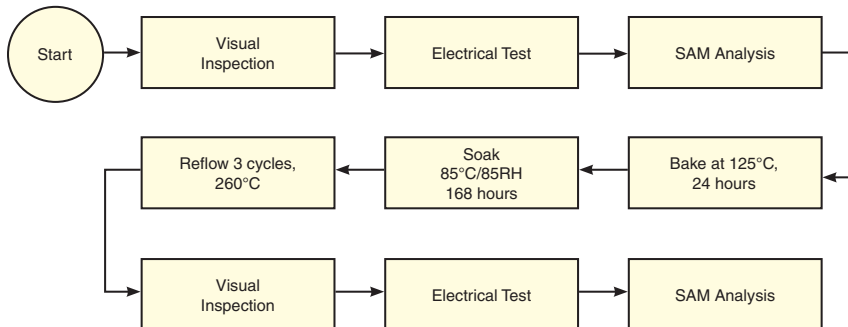
Machine Model (MM): Class M1 (< 100v) in accordance with ANSI/ESD STM 5.2 - 1999

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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