



Mini-Circuits

LOW CURRENT, WIDEBAND, FLAT GAIN

Monolithic Amplifier

EHA-163L+

50Ω DC to 16 GHz

THE BIG DEAL

- Super Wideband, DC to 16 GHz
- Excellent Flat Gain, ± 0.75 dB Up to 12 GHz
- Low Current Consumption, 20 mA
- Good Input & Output Return Loss (>10 dB)
- Repeatable Performance (HBT Process)
- Small Package (2 x 2 mm 6L MCLP)



Generic photo used for illustration purposes only

CASE STYLE: MC1630-1

+RoHS Compliant

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

APPLICATIONS

- Instrumentation
- Cable Infrastructure
- 5G

PRODUCT OVERVIEW

The EHA-163L+ is a low current, wideband gain block that operates up to 16 GHz fabricated using highly reliable HBT process. This low current consumption Darlington pair amplifier delivers excellent gain flatness and good return loss across a wide bandwidth, without the need of an external matching network. It has highly repeatable performance from lot to lot and it is enclosed in a 2 x 2 mm 6-lead package.

KEY FEATURES

Feature	Advantages
Super Wideband, DC to 16 GHz	General purpose wideband amplifier is suitable for wideband and multi-band applications.
Low Current Consumption, 20 mA	Low current consumption is ideal for use in power sensitive applications such as portable test equipment and handheld radios.
Excellent Gain Flatness, ± 0.75 dB Up to 12 GHz	As a desirable characteristic of a wideband amplifier, excellent gain flatness allows amplification of a signal without changing the waveform in time domain.
No External Matching Component Required	EHA-163L+ provides input & output return loss of 10 dB up to 16 GHz without the need for any external matching components.

REV. B
ECO-025003
EHA-163L+
MCL NY
250326





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ELECTRICAL SPECIFICATIONS AT +25°C, $V_{CC} = +5\text{ V}$, $R = 50\Omega$ UNLESS NOTED OTHERWISE

Parameter	Condition (MHz)	$V_{CC} = +5\text{ V}^1$			$V_{CC} = +5\text{ V}^2$	Units
		Min.	Typ.	Max.	Typ.	
Frequency Range ³		10		16000	10-16000	MHz
Gain	10		15.7		15.3	dB
	5000		15.6		14.8	
	8000	13.1	15.3	16.0	14.2	
	10000		14.9		13.5	
	12000		14.2		13.1	
	16000		11.6		8.9	
Input Return Loss	10		18		17	dB
	5000		13		18	
	8000		12		15	
	10000		12		15	
	12000		11		15	
	16000		16		12	
Output Return Loss	10		14		14	dB
	5000		13		14	
	8000		13		16	
	10000		14		16	
	12000		13		11	
	16000		15		8	
Reverse Isolation	8000		19		20	dB
Output Power @ 1 dB Compression	10		+7.7		+6.2	dBm
	5000		+6.0		+5.2	
	8000		+6.5		+6.8	
	10000		+4.4		+3.9	
	12000		+2.7		+2.1	
	16000		+2.0		+0.3	
Output IP ₃ ⁴	10		+21.0		+19	dBm
	5000		+17.3		+17.8	
	8000		+15.6		+16.2	
	10000		+13.2		+13.3	
	12000		+12.0		+11.6	
	16000		+11.8		+10.7	
Noise Figure	10		5.2		5.2	dB
	5000		5.0		5.0	
	8000		5.2		5.2	
	10000		5.5		5.3	
	12000		5.4		5.3	
	16000		5.2		6.2	
DC Supply (V_{CC})		+4.75	+5	+5.25	+5	V
Device Operating Current			20.9	24	19.3	mA
Device Current Variation vs. Temperature ⁵			59		59	$\mu\text{A}/^\circ\text{C}$
Device Current Variation vs. Voltage ⁶			0.0178		0.0178	mA/mV
Thermal Resistance, Junction-to-Ground Lead at +85°C Stage Temp.			349		349	$^\circ\text{C}/\text{W}$

1. Measured on Mini-Circuits Characterization test circuit TB-883-163L+. See Characterization Test Circuit (Fig. 1).

2. Measured on Mini-Circuits Recommended Application Circuit TB-995+. See Application Test Circuit (Fig. 2).

3. Low frequency cut-off determined by external coupling capacitors & RF choke.

4. Tested at $P_{OUT} = -5\text{ dBm}/\text{tone}$.

5. (Current at +85°C - Current at -45°C)/130

6. (Current at +5.25 V - Current at +4.75 V)/1000





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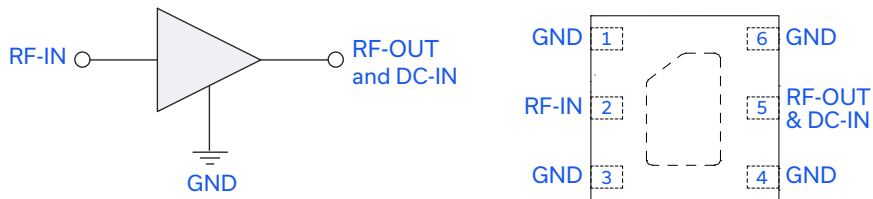
50Ω DC to 16 GHz

ABSOLUTE MAXIMUM RATINGS⁷

Parameter	Ratings
Operating Temperature (Ground Lead)	-40°C to +85°C
Storage Temperature	-65°C to +150°C
Junction Temperature	+150°C
Power Dissipation	0.2 W
Input Power (CW)	+22 dBm (5 minutes max.) +8 dBm (continuous)
V _{CC} (Supply Voltage)	+6 V

7. Permanent damage may occur if any of these limits are exceeded. Electrical maximum ratings are not intended for continuous normal operation.

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	2	RF input
RF-OUT and DC-IN	5	RF output and DC input
GND	Paddle	Ground
NC	1,3,4,6	No connections

CHARACTERIZATION TEST CIRCUIT

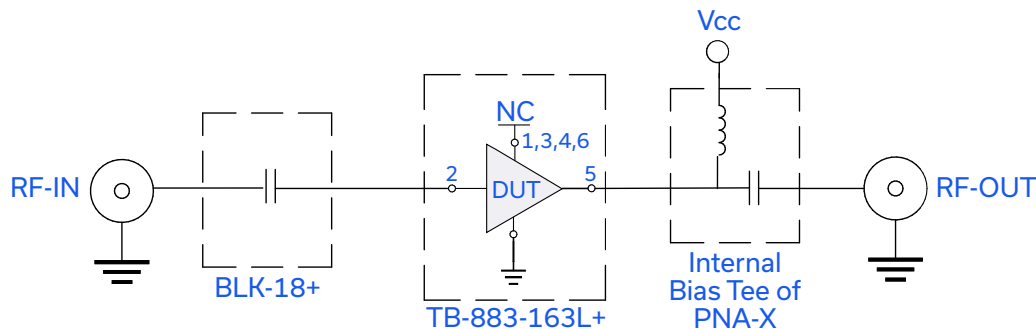


Fig 1. Characterization Circuit

Note: This block diagram is used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-883-163L+) Gain, Return Loss, Output Power at 1 dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain and Return Loss: P_{IN} = -25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at output.





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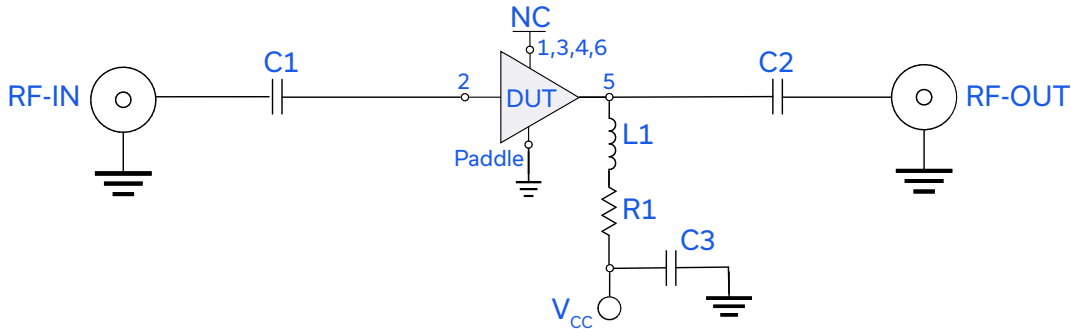
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APPLICATION TEST CIRCUIT



Component	P/N	Supplier	Value	Size
DUT	EHA-163L+	MCL	NA	2 mm x 2 mm
C1,C2	LBB0402X104MGT1C8	Presidio Components Inc	0.1 μ F	0402
C3	GRM155R71E103KA01D	Murata	0.01 μ F	0402
R1	RK73H1JTTD4R99F	KOA	49.9 ohms	0603
L1	BCR-652JLC	Coilcraft	6.5 μ H	4422

Fig 2. Application Test Circuit

Note: (DUT soldered on Mini-Circuits Application test board TB-995+) Gain, Return Loss, Output Power at 1 dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain and Return Loss: $P_{IN} = -25$ dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at output.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control.





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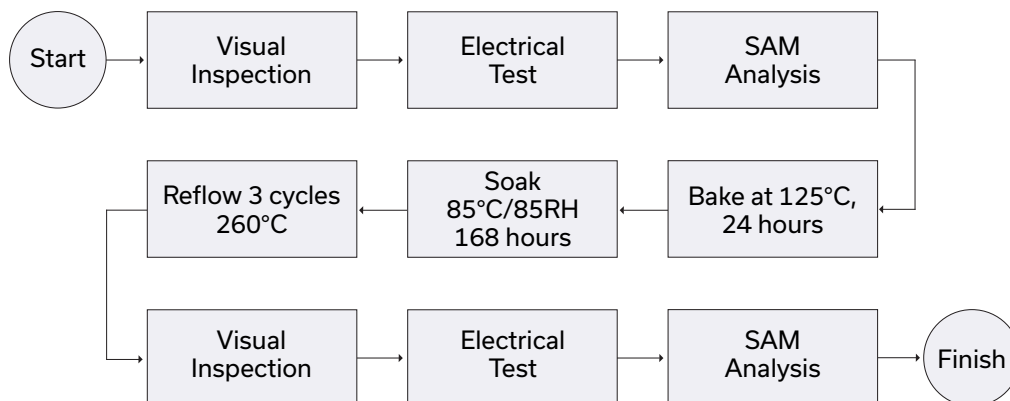
ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS [CLICK HERE](#)

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC1630-1 Plastic package, exposed paddle, lead finish: Matte-Tin
Tape & Reel Standard Quantities Available on Reel	F66 7" Reels with 20, 50, 100, 200, 500, 1000, 2000, or 3000 devices
Suggested Layout for PCB Design	PL-544
Evaluation Board	TB-995+
Environmental Ratings	ENV08T1

ESD RATING

Human Body Model (HBM): Class 1A (Pass 250 V) in accordance with ANSI/ESD STM 5.1 - 2001

MSL FLOW CHART



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/terms/viewterm.html

