Mini-Circuits

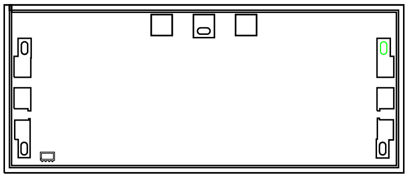
MMIC DIE

Wideband Amplifier AVA-26453LN-D+

50Ω 26 to 45 GHz

THE BIG DEAL

- Single Supply Voltage, +3V and 80 mA
- Wide Bandwidth, 26 to 45 GHz
- Low Noise Figure, Typ. 2.9 dB at 35 GHz
- Output IP3, Typ. +19.2 dBm at 35 GHz



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

SEE ORDERING INFORMATION ON THE LAST PAGE

APPLICATIONS

- 5G MIMO and Back Haul Radio Systems
- Satellite Ka-band Communications
- Test and Measurement Equipment
- Radar, EW, and ECM Defense Systems
- Excellent alternative to the Broadcom AMMC-6241[A,B]

PRODUCT OVERVIEW

The AVA-26453LN-D+ is a high gain low noise MMIC amplifier that operates from 26 to 45 GHz. The MMIC is fabricated on a high performance pHEMT process to enable high gain and low noise figure over a wide bandwidth in the millimeter wave region. This MMIC amplifier is impedance matched for a 50 ohm system, has unconditional stability, and operates from a single +3V supply voltage. The AVA-26453LN-D+ can be used as a first or second stage low noise amplifier for a wide variety of millimeter wave systems including 5G, Backhaul Radio, and Ka Band Satellite Systems.

KEY FEATURES

Features	Advantages
High Gain, Typ. 22.2 dB at 35 GHz.	Suitable for wide bandwidth applications.
P1dB and Output IP3, • P1dB Typ. +11.1 dBm at 35 GHz • OIP3 Typ. +19.2 dBm at 35 GHz	Suitable as a driver amplifier in receiver/transmitter chains.
Unpackaged Die	Suitable for chip and wire hybrid assemblies.

A. Suitability for model replacement within a particular system must be determined by and is solely the responsibility of the customer based on, among other things, electrical performance criteria, stimulus conditions, application, and compatibility with other components and environmental conditions and stresses.
B. The AMMC-6241 part number is used for identification and comparison purposes only.

ELECTRICAL SPECIFICATIONS[1] AT 25°C, Zo=50Ω AND, VDD=+3V, IDD=80mA, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		26		45	GHz
Gain	26		21.6		dB
	30		21.1		
	35		22.2		
	40		18.1		
	45		14.7		
Input Return Loss	26		8.9		dB
	30		9.3		
	35		11.9		
	40		8.1		
	45		5.3		
Output Return Loss	26		9.3		dB
	30		11.3		
	35		14.1		
	40		10.7		
	45		10.9		
Isolation	26-45		53.1		dB
Output Power at 1 dB Compression	26		+11		dBm
	30		+11.6		
	35		+11.1		
	40		+11.1		
	45		+10.2		
Output Third-Order Intercept Point (Pout = -5dBm/Tone)	26		+19.8		dBm
	30		+19.6		
	35		+19.2		
	40		+19.1		
	45		+18.9		
Noise Figure	26		2.6		dB
	30		2.7		
	35		2.9		
	40		3.4		
	45		3.7		
Device Operating Voltage (VDD)		+2.75	+3	+3.25	V
Device Operating Current (IDD)			80	108	mA
Device Current Variation Vs. Temperature[2]			-15.384		uA/°C
Device Current Variation Vs. Voltage[3]			0.0333		mA/mV
Thermal Resistance, Junction-to-Ground Lead (ΘJC)			42.5		°C/W

[1] Die is attached and measured on Mini-Circuits die characterization board. See Characterization & Application Circuits (Fig.1 and Fig.2)

[2] Device Current Variation vs. Temperature = (Current in mA at +85°C – Current in mA at -45°C)/+130°C

[3] Device Current Variation vs. Voltage = (Current in mA at +3.25V – Current in mA at +2.75V)/((+3.25V-+2.75V)*1000mA/mV)

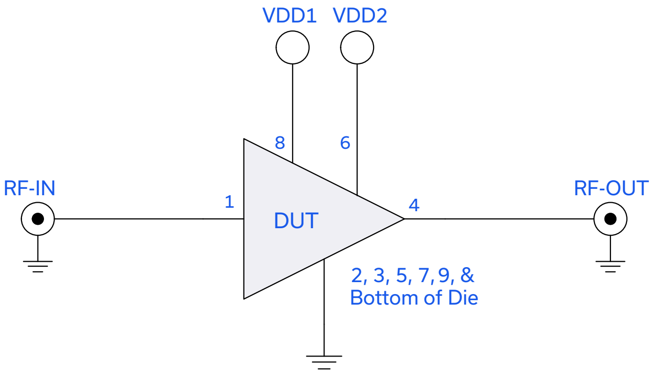
MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Case Temperature	-45°C to +85°C
Storage Temperature	+20°C to +35°C
Total Power Dissipation	1.2W
Junction Temperature[5]	+150°C
RF Input Power	+26 dBm (5 min max) +23 dBm (continuous)
DC Voltage at VDD	+4.5V
Current IDD	130 mA

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

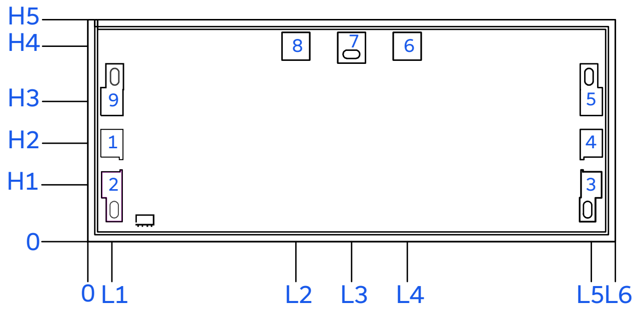
[5] Tj = +85°C + (VDD)*(IDD)*(ΘJC) = +95°C. Keeping Tj below +95°C will keep typical MTTF > 100 years.

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	1	RF-Input Pad
RF-OUT	4	RF-Output Pad
VDD1	8	DC Input Pad #1
VDD2	6	DC Input Pad #2
Ground	2, 3, 5, 7, 9, & Bottom of the Die	The bond pads are connected to backside through vias and do not require any wire-bond connections to ground.

BONDING PAD POSITION



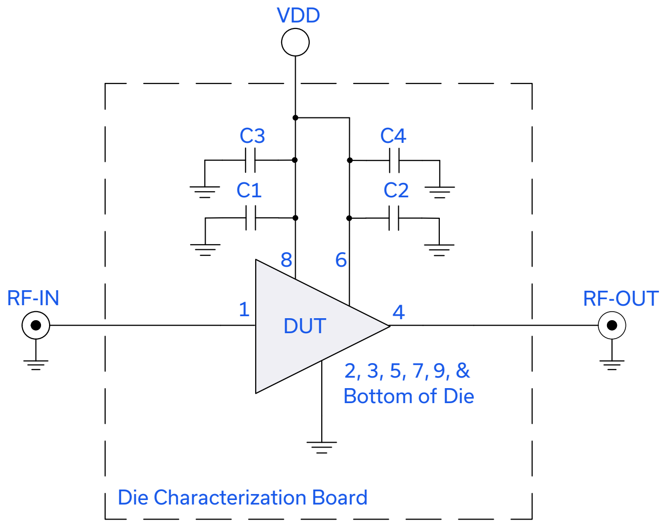
DIMENSIONS IN µM, TYP.

L1	L2	L3	L4	L5	L6
86.0	749.0	949.0	1150.0	1813.0	1900.0

H1	H2	H3	H4	H5
205.0	355.0	505.0	704.0	800.0

Thickness	Die Size	Pad Size 1,2,3,4, 5 & 9	Pad Size 6 & 8	Pad Size 7
100	1900 x 800	80 x 100	100 x 100	100 x 110

CHARACTERIZATION AND APPLICATION CIRCUIT



Component	Size	Value	Part Number	Manufacturer
C1, C2	0402	0.1 µF	GRM155R71C104KA88D	Murata
C3, C4	22x22mil	100pF	MA4M3100	Macom

Fig.1 Characterization & Application Circuit
Note: This block diagram is used for characterization (Die is attached and wire-bonded on a die characterization test board). Gain, Return Loss, and Noise Figure are measured using Agilent's N5245B PNA-X Microwave Network Analyzer.

Conditions:
1. VDD = +3V
2. Gain and Return Loss P_{IN} = -25 dBm

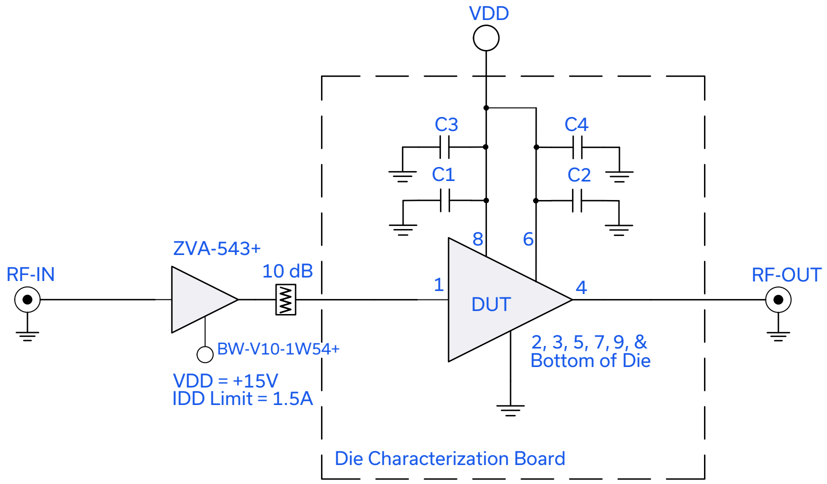
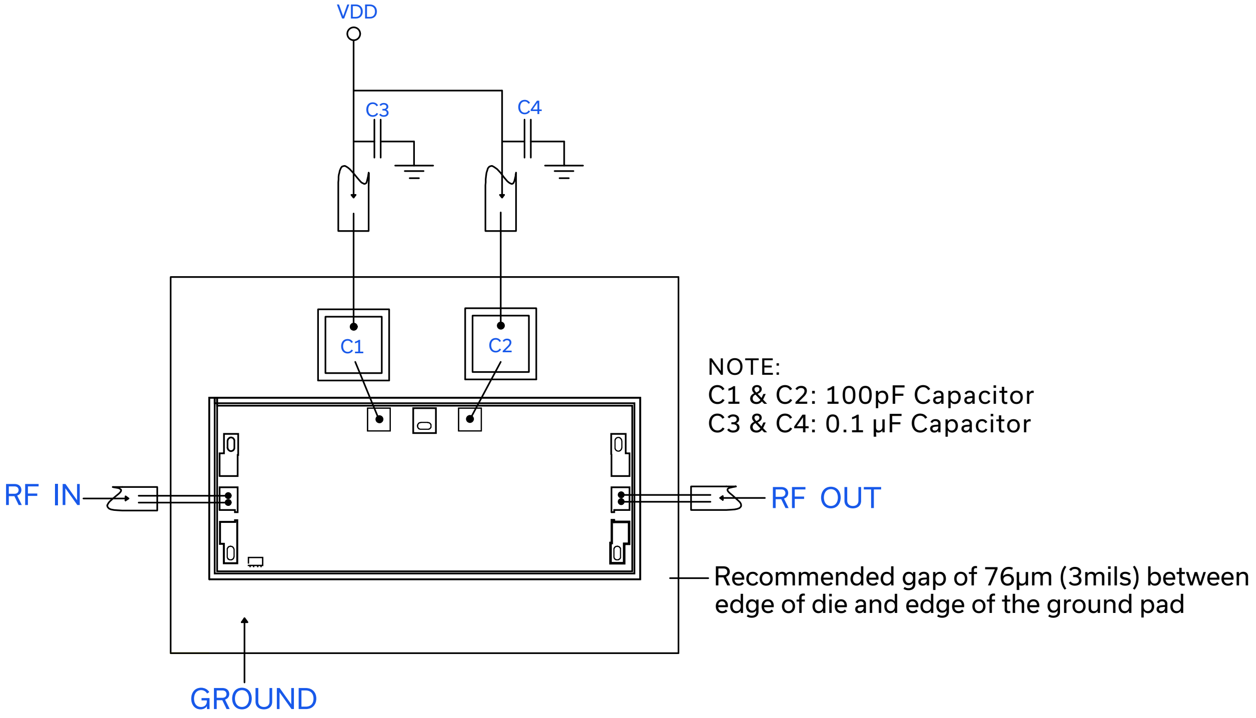


Fig.2 Characterization & Application Circuit with Pre-Amplifier
Note: This block diagram is used for characterization (Die is attached and wire-bonded on a die characterization test board). Gain, Output Power at 1 dB Compression (P1dB), and Output IP3 (OIP3) are measured using Agilent's N5245B PNA-X Microwave Network Analyzer.

Conditions:
1. VDD = +3V
2. Gain P_{IN} = -25 dBm
3. Output IP3 (OIP3): Two Tones, spaced 1 MHz apart, -5 dBm/Tone at Output.

ASSEMBLY DIAGRAM

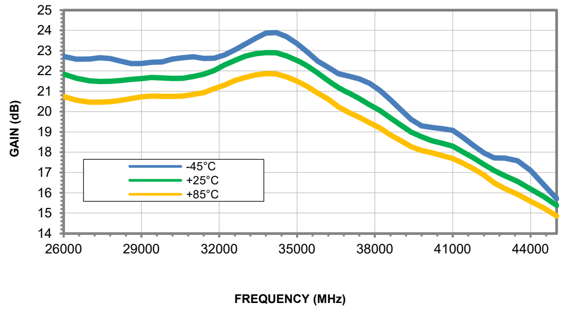


ASSEMBLY PROCEDURE

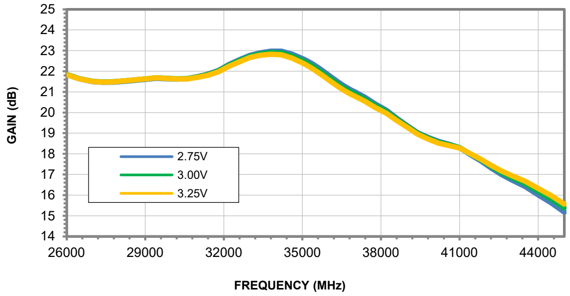
1. Storage
   Die should be stored in a dry nitrogen purged desiccators or equivalent.
2. ⚠ ESD
   MMIC pHEMT amplifier die are susceptible to electrostatic and mechanical damage. Die are supplied in anti-static protected material, which should be open in clean room conditions at an appropriately grounded anti-static workstation.
3. Die Handling and Attachment
   Devices need careful handling using correctly designed collets, it is recommended to handle the chip along the edges with a custom designed collet. The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are Ablestik 84-1 LMISR4 or equivalents. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. The surface of the chip has exposed air bridges and should not be touched with vacuum collet, tweezers or fingers.
4. Wire Bonding
   Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the Die gold bond pads. Thermo-sonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1mil diameter. Bonds must be made from the bond pads on the die to the packaged or substrate. All bond wire length and bond wire height should be kept as short as possible unless specified by the Assembly Drawing to minimize performance degradation due to undesirable series inductance.

TYPICAL PERFORMANCE CURVES

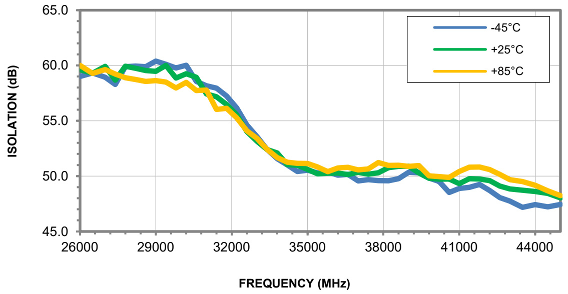
GAIN vs. FREQUENCY & TEMPERATURE
@ VDD = +3V



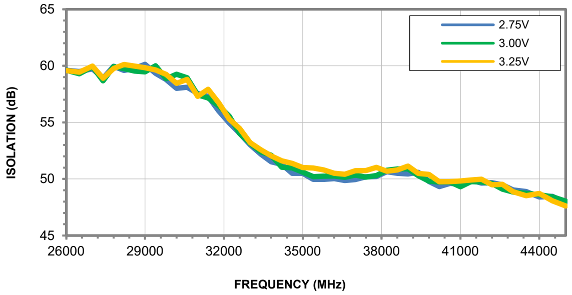
GAIN vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C



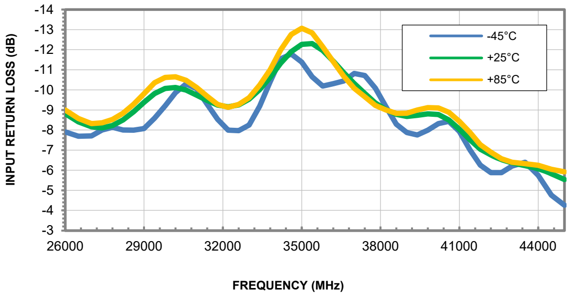
ISOLATION vs. FREQUENCY & TEMPERATURE
@ VDD = +3V



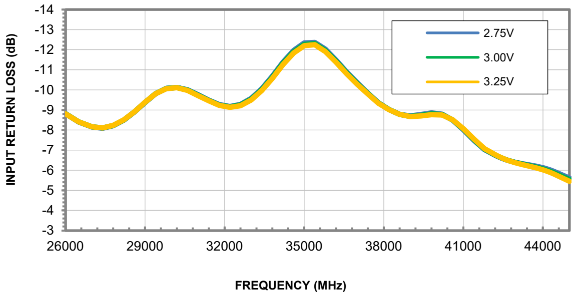
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C



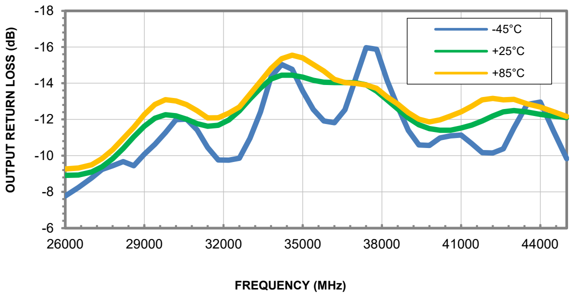
INPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +3V



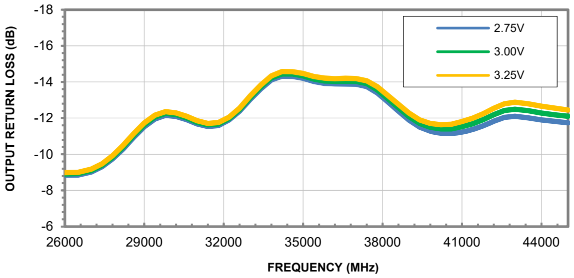
INPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C



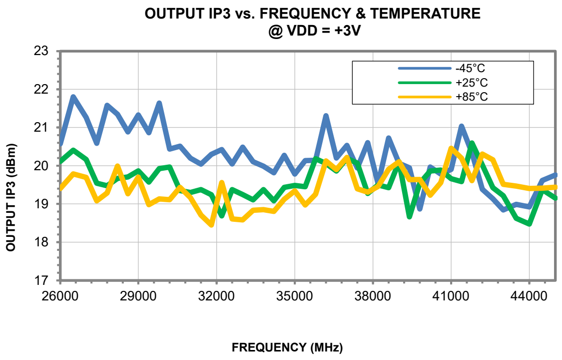
OUTPUT RETURN LOSS vs. FREQ. & TEMP.
@ VDD = +3V

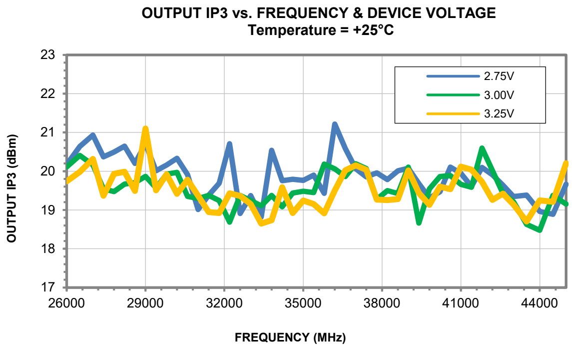


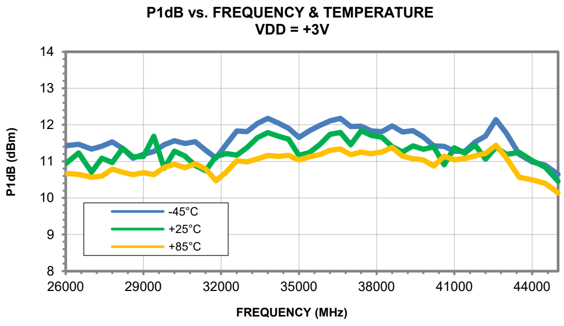
OUTPUT RETURN LOSS vs. FREQ. & DEVICE VOLTAGE
@ Temperature = +25°C

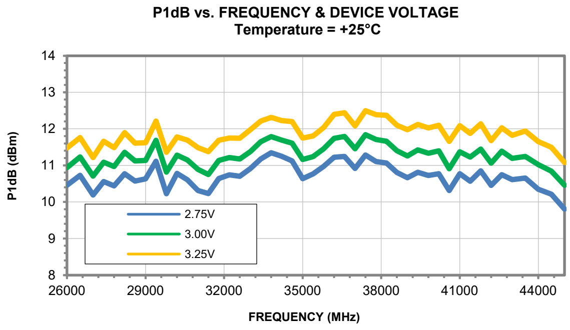


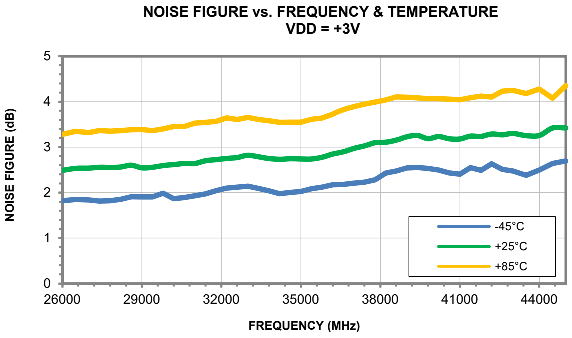
TYPICAL PERFORMANCE CURVES

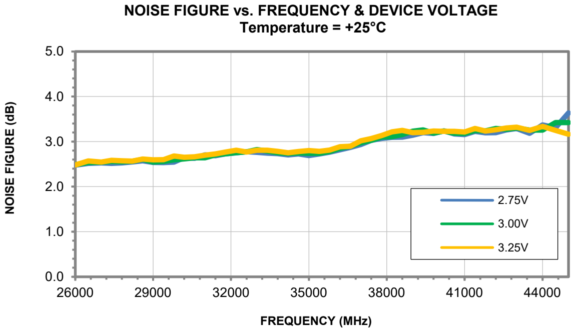

OUTPUT IP3 vs. FREQUENCY & TEMPERATURE
@ VDD = +3V


OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C


P1dB vs. FREQUENCY & TEMPERATURE
VDD = +3V


P1dB vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C


NOISE FIGURE vs. FREQUENCY & TEMPERATURE
VDD = +3V


NOISE FIGURE vs. FREQUENCY & DEVICE VOLTAGE
Temperature = +25°C

ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set with and without port extension (.zip file)	
Case Style	Die	
Die Ordering and packaging information	Quantity, Package	Model No.
	Gel – Pak: 5, 10, 50, 100	AVA-26453LN-DG+
	Medium†, Partial wafer: KGD*<1100	AVA-26453LN-DP+
	Full Wafer	AVA-26453LN-DF+
	†Available upon request contact sales representative Refer to AN-60-067	
Die Marking	EL-AMP-10-5	
Environmental Ratings	ENV80	

*Known Good Die ('KGD') means that the die in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such die fall within a predefined range. While DC testing is not definitive, it does provide a higher degree of confidence that die is capable of meeting typical RF electrical performance specified by Mini-Circuits.

NOTES

A. 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.

B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

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