Coaxial

Low Noise Amplifier

ZKL-33ULN-S+

50Ω 0.4 to 3.0 GHz

CASE STYLE: BY493

The Big Deal

- Ultra Low Noise Figure, 0.36 dB typ. at 0.9 GHz
- High Dynamic Range
- Small connectorized package

Product Overview

The ZKL-33ULN-S+ (RoHS compliant) uses Mini-Circuits' E-PHEMT technology to offer very high gain with a combination of ultra low noise figure over a broad frequency range and high OIP3. Housed in a rugged shielded package with class 3A ESD rating and internal voltage regulator, this amplifier supports a wide variety of applications requiring moderate power output, low distortion and 50 ohm matched input/output ports.

Key Features

Feature	Advantages
Ultra Low Noise Figure, 0.36 dB at 0.9 GHz	Outstanding world class noise figure performance.
High OIP3 vs. DC power consumption +36 dBm typical at 0.9 GHz	Combination of Low Noise and High OIP3 make this model ideal for use in a Low Noise Receiver Front End (RFE)
Small Size, 1.38" x 1.5"	The small size and construction enable the ZKL-33ULN-S+ to be used in extremely compact connectorized applications.

Coaxial

Low Noise Amplifier

ZKL-33ULN-S+

50Ω 0.4 to 3.0 GHz

Generic photo used for illustration purposes only

CASE STYLE: BY493

Connectors	Model
SMA	ZKL-33ULN-S+

+RoHS Compliant

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

Features

- Low Noise Figure, 0.36 dB typ. at 0.9 GHz
- High OIP3, +36 dBm at 0.9 GHz typ.
- High Pout, P1dB, +18 dBm typ. at 0.9 GHz typ.
- High Gain, 35.0 dB at 0.9 GHz typ.

Applications

- Base station infrastructure
- Portable Wireless
- LTE
- GPS
- GSM
- Airborne radar

Electrical Specifications at 25°C and 5.0 V unless noted

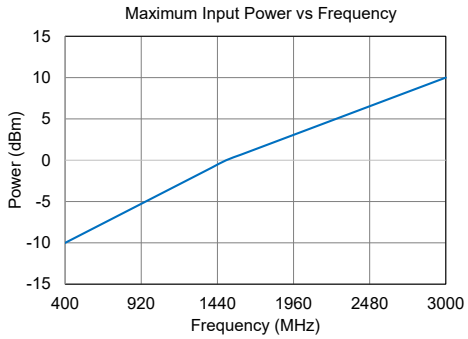
Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		0.4		3.0	GHz
Noise Figure	0.4 0.9 1.5 2.0 3.0		0.29 0.36 0.50 0.68 1.44	0.70	dB
Gain	0.4 0.9 1.5 2.0 3.0	33	47 35 27 22 15	37	dB
Output Power @ 1 dB compression	0.4 0.9 1.5 2.0 3.0	17	18.0 18.0 18.0 18.0 13.5		dBm
Output IP3	0.4 0.9 1.5 2.0 3.0	34	34 36 37 38 36		dBm
Input VSWR	0.4 0.9 1.5 2.0 3.0		1.28 1.25 1.41 1.33 1.34		:1
Output VSWR	0.4 0.9 1.5 2.0 3.0		1.65 1.29 1.12 1.05 1.25		:1
Active Directivity (Isolation-Gain)	0.4-3.0		8		dB
DC Supply Voltage		—	5.0	—	V
Supply Current		—	100	150	mA

50Ω 0.4 to 3.0 GHz

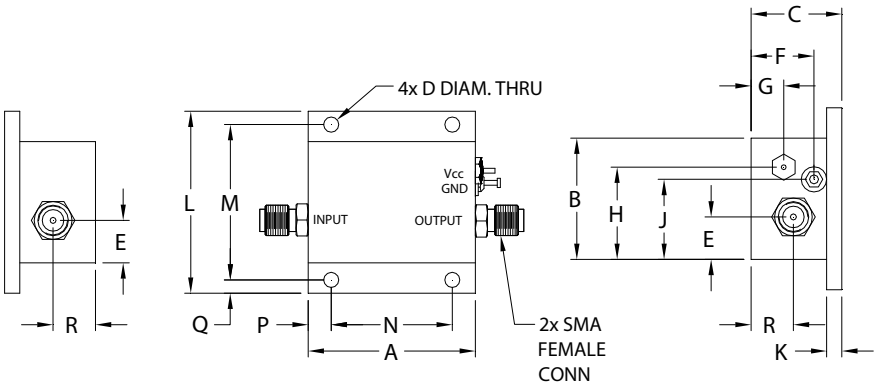
Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C Case
Storage Temperature	-55°C to 100°C
DC Voltage	5.5 V
Input RF Power (no damage)	From 400 MHz to 1500 MHz: -10 dBm to 0 dBm From 1500 MHz to 3000 MHz: 0 dBm to +10 dBm
Power Consumption	0.75 W

Permanent damage may occur if any of these limits are exceeded.



Outline Drawing



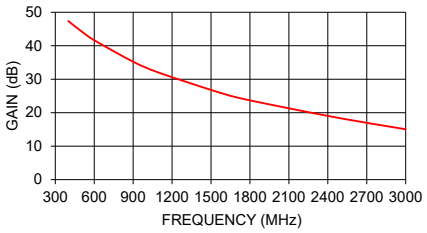
NOTE: When soldering the DC connections, caution must be used to avoid overheating the DC terminal. See Application Note. AN-40-010.

Outline Dimensions (inch / mm)

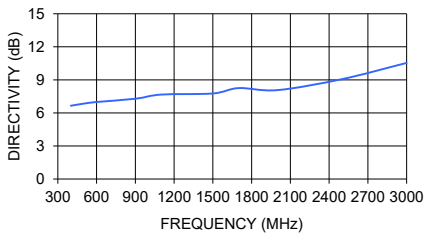
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	wt
1.38	1.00	.75	.125	.35	.52	.27	.76	.66	.125	1.50	1.281	1.000	.19	.11	.35	grams
35.05	25.40	19.05	3.18	8.89	13.21	6.86	19.30	16.76	3.18	38.10	32.54	25.40	4.83	2.79	8.89	40

FREQUENCY (MHz)	GAIN (dB)	DIRECTIVITY (dB)	VSWR (:1)		POUT at 1dB COMPR. (dBm)	NOISE FIGURE (dB)	OUTPUT IP3 (dBm)
			IN	OUT			
400	47.4	6.7	1.28	1.65	18.5	0.3	33.9
500	44.4	6.8	1.19	1.54	18.6	0.3	34.1
600	41.6	7.0	1.17	1.46	18.7	0.3	34.7
900	35.2	7.3	1.25	1.29	18.3	0.4	36.0
1100	31.9	7.7	1.33	1.23	17.9	0.5	36.2
1500	26.8	7.8	1.41	1.12	17.9	0.5	36.8
1700	24.6	8.3	1.38	1.08	17.6	0.6	38.5
2000	22.1	8.1	1.35	1.05	18.0	0.7	37.6
2500	18.3	9.1	1.29	1.17	16.2	0.9	38.4
3000	15.0	10.5	1.34	1.25	13.4	1.4	36.1

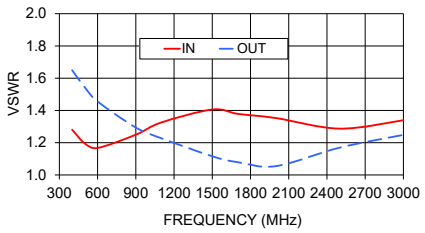
ZKL-33ULN-S+
GAIN



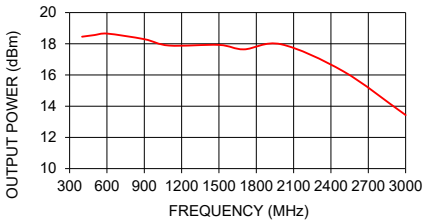
ZKL-33ULN-S+
DIRECTIVITY



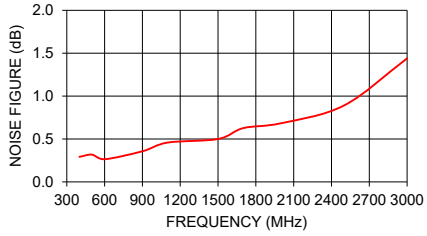
ZKL-33ULN-S+
VSWR



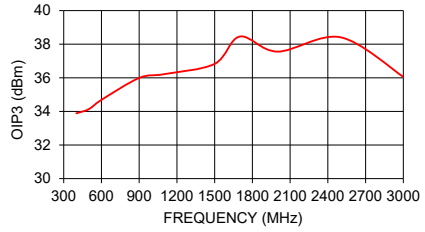
ZKL-33ULN-S+
OUTPUT POWER AT 1dB COMPRESSION



ZKL-33ULN-S+
NOISE FIGURE



ZKL-33ULN-S+
OIP3



Additional 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.

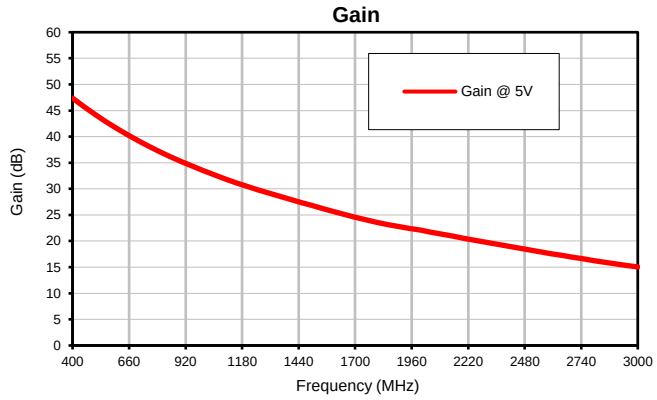
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

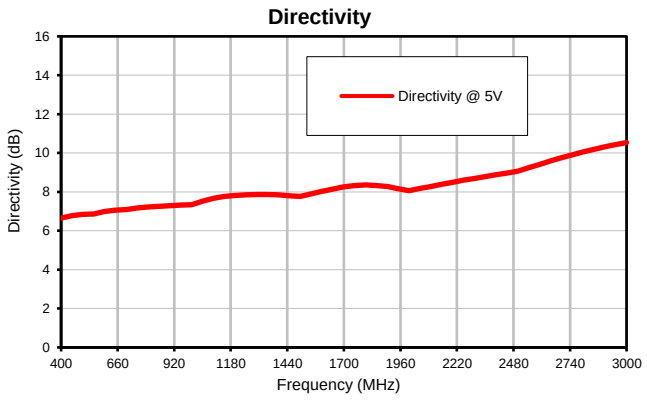
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive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

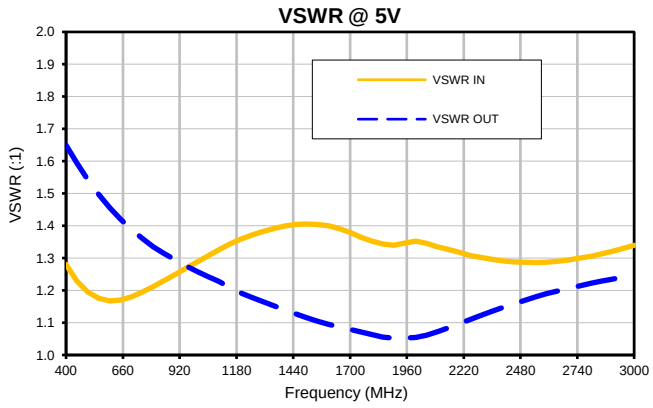
Typical Performance Data

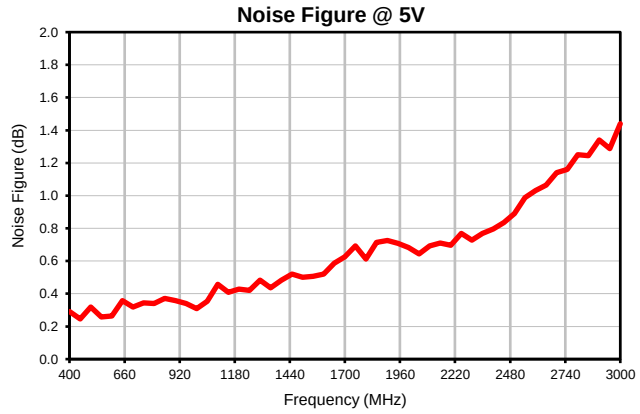
FREQUENCY (MHz)	GAIN (dB) 5V	DIRECTIVITY (dB) 5V	VSWR (:1) IN 5V	VSWR (:1) OUT 5V	NOISE FIGURE (dB) 5V	Pout @ 1 dB COMPRESSION (dBm) 5V	OUTPUT IP3 (dBm) 5V
400	47.38	6.65	1.28	1.65	0.29	18.45	33.88
450	45.82	6.77	1.23	1.59	0.25	18.61	33.85
500	44.35	6.84	1.19	1.54	0.32	18.56	34.14
550	42.96	6.86	1.18	1.50	0.26	18.54	34.77
600	41.65	6.99	1.17	1.46	0.26	18.65	34.69
650	40.42	7.06	1.17	1.42	0.36	18.46	34.89
700	39.26	7.10	1.18	1.39	0.32	18.42	35.03
750	38.17	7.18	1.20	1.36	0.34	18.66	35.61
800	37.13	7.22	1.21	1.34	0.34	18.42	35.65
850	36.16	7.25	1.23	1.31	0.37	18.28	35.65
900	35.24	7.29	1.25	1.29	0.36	18.30	35.99
950	34.36	7.32	1.27	1.28	0.34	18.48	36.04
1000	33.51	7.35	1.29	1.26	0.31	18.32	36.11
1050	32.71	7.52	1.31	1.24	0.35	17.91	36.08
1100	31.94	7.66	1.33	1.23	0.46	17.89	36.22
1150	31.21	7.77	1.34	1.21	0.41	18.14	36.35
1200	30.52	7.82	1.36	1.19	0.43	17.84	36.36
1250	29.86	7.85	1.37	1.18	0.42	17.72	36.63
1300	29.21	7.87	1.38	1.17	0.48	18.10	36.98
1350	28.59	7.86	1.39	1.15	0.44	17.75	36.48
1400	27.98	7.84	1.40	1.14	0.48	17.88	36.98
1450	27.39	7.81	1.40	1.13	0.52	17.94	37.18
1500	26.81	7.77	1.41	1.12	0.50	17.93	36.83
1550	26.23	7.90	1.40	1.11	0.51	17.33	36.52
1600	25.67	8.02	1.40	1.10	0.52	18.40	38.38
1650	25.10	8.15	1.39	1.09	0.59	17.84	38.11
1700	24.56	8.25	1.38	1.08	0.63	17.64	38.46
1750	24.05	8.33	1.36	1.07	0.69	17.81	39.01
1800	23.58	8.35	1.35	1.06	0.61	18.17	38.94
1850	23.16	8.33	1.34	1.06	0.71	18.02	38.08
1900	22.78	8.27	1.34	1.05	0.72	17.91	38.10
1950	22.44	8.17	1.35	1.05	0.71	18.09	38.24
2000	22.09	8.07	1.35	1.05	0.68	17.97	37.56
2050	21.71	8.17	1.35	1.06	0.64	18.28	38.74
2100	21.32	8.29	1.33	1.07	0.69	18.18	38.70
2150	20.93	8.39	1.33	1.08	0.71	17.96	38.34
2200	20.54	8.50	1.32	1.10	0.70	17.80	38.19
2250	20.16	8.60	1.31	1.11	0.77	17.94	39.08
2300	19.79	8.69	1.30	1.12	0.73	17.60	38.60
2350	19.41	8.79	1.30	1.14	0.77	17.25	38.87
2400	19.04	8.88	1.29	1.15	0.80	16.97	37.94
2450	18.67	8.97	1.29	1.16	0.83	16.92	38.78
2500	18.31	9.07	1.29	1.17	0.89	16.23	38.41
2550	17.95	9.25	1.29	1.18	0.99	15.79	38.34
2600	17.60	9.42	1.29	1.19	1.03	15.49	38.26
2650	17.24	9.59	1.29	1.20	1.07	15.20	37.91
2700	16.90	9.75	1.29	1.21	1.14	14.72	37.23
2750	16.57	9.91	1.30	1.21	1.16	14.23	36.72
2800	16.24	10.05	1.31	1.22	1.25	14.13	36.43
2850	15.93	10.19	1.31	1.23	1.25	13.94	36.19
2900	15.62	10.32	1.32	1.23	1.34	13.60	36.10
2950	15.32	10.43	1.33	1.24	1.29	13.44	36.08
3000	15.05	10.54	1.34	1.25	1.44	13.43	36.06

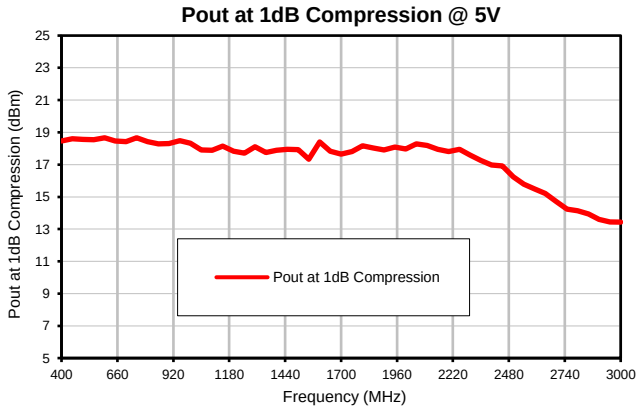
Typical Performance Curves

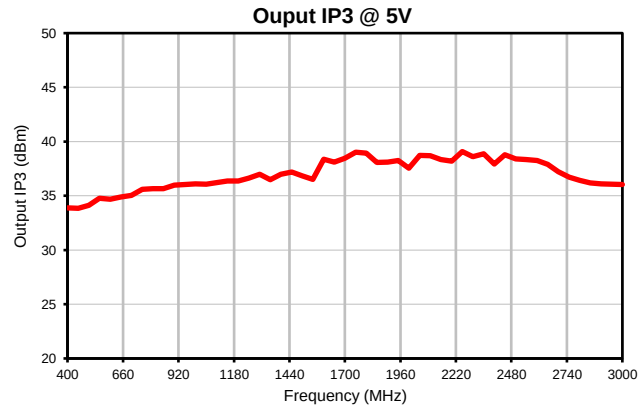








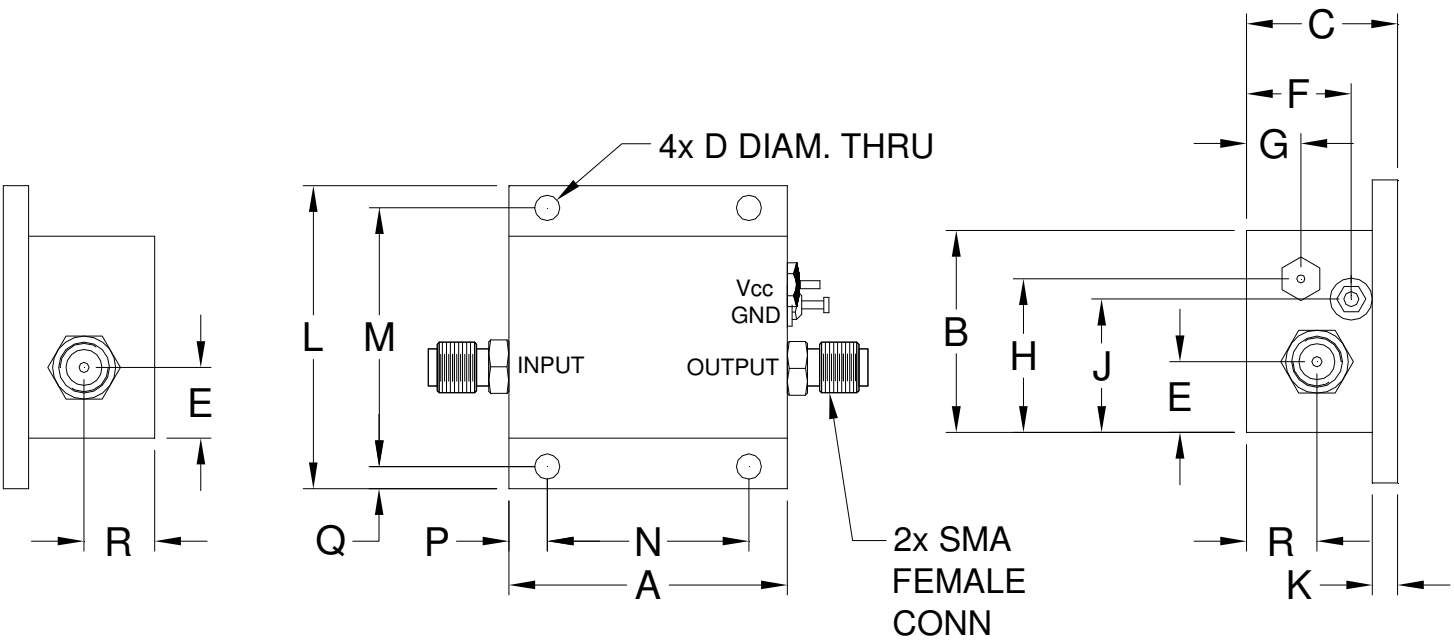




Case Style BY

Outline Dimensions

BY493



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
BY493	1.38 (35.05)	1.00 (25.40)	.75 (19.05)	.125 (3.18)	.35 (8.89)	.52 (13.21)	.27 (6.86)	.76 (19.30)	.66 (16.76)	.125 (3.18)	1.50 (38.10)	1.281 (32.54)	1.000 (25.40)

CASE#	P	Q	R	WT. GRAMS
BY493	.19 (4.83)	.11 (2.79)	.35 (8.89)	40

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .03; 3 Pl. ± .015

Notes:

1. Case material: Aluminum alloy.
2. Case finish: Clear chemical conversion coating, non-chrome or trivalent chrome based.

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

Mini-Circuits

Environmental Specifications ENV23T6

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 75°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Stabilization Bake	(non-operating) 125°C, 24 hours	- - -
Burn-in at Elevated Temp.	(DC on) 160 hours at 85° C	MIL-STD-202, Method 108
Thermal Shock	-55° to 100°C, 5 cycles	MIL-STD-202, Method 107, Condition A, except 100°C