

Low Noise Amplifier

RAMP-33LN+

50Ω 50 to 3000 MHz

The Big Deal

- Low Noise Figure, 1.1 dB typ.
- Wide bandwidth, 50 to 3000 MHz
- High IP3, 30 dBm typ.
- Integrated Bias Matching and Stability Circuits



CASE STYLE: CK605

Product Overview

The RAMP-33LN+ (RoHS compliant) utilizes advanced E-PHEMT technology in a single stage low noise amplifier design built into a shielded case (size: .500"x.500"x.180"). The drop-in module offers low noise figure and high output IP3 over the full bandwidth of 50 to 3000MHz, without the need for external matching components. 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
Wide band high dynamic range	The RAMP-33LN+ covers a wide spectrum of application frequencies from VHF through 'S' band. When combined with the output power and IP3, this amplifier supports a broad array of systems and test applications.
Low NF	With typical 1.1dB NF, the RAMP-33LN+ enables greater sensitivity for receiver applications. It includes all matching and stability circuits making this Drop-in LNA module a turn-key solution for ensuring system sensitivity in demanding applications.
High Output IP3	At +30 dBm IP3, in combination with its low noise performance, the RAMP-33LN+ can improve a systems' spur-free dynamic range which is often the critical driver in many receiver applications.
Power In at 1dB Comp.: +1dBm typ. Input no damage, +13dBm	Provides a good safety margin against damage or saturation from unwanted high power RF signals present at the input to a receiver.
Drop-in Module	Eliminates the need for designers to optimize low noise transistor bias and matching circuitry. The RAMP-33LN+ provides the outstanding combined performance and does not require any external elements. The case PCB area is smaller than most LNA transistor designs with external circuitry.
Metal Case	Provides a protective enclosure improving handling robustness in addition to shielding this sensitive high gain device from close by circuitry.
Unconditionally stable	No adverse effects due to loading of the input and output ports avoiding potential instability which can be a critical requirement when integrating high gain, high frequency devices on an open PCB assembly.



For detailed performance specs
& shopping online see web site

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IF/RF MICROWAVE COMPONENTS

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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.

Surface Mount

Low Noise Amplifier

RAMP-33LN+

50Ω

50 to 3000 MHz

Features

- Wide bandwidth, 50 to 3000MHz
- Low noise figure, 1.1 dB typ.
- Output power, up to +16.5 dBm typ.
- Good output IP3, 30 dBm typ.
- Unconditionally stable

Applications

- Front-end amplifier
- Cellular
- GPS
- Bluetooth



CASE STYLE: CK605
PRICE: \$19.95 ea. QTY (1-24)

+RoHS Compliant

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

Electrical Specifications at 25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Units
Frequency Range		50		3000	MHz
Noise Figure	50 - 3000		1.1	2.0	dB
Gain	100	13.0	22.0		dB
	1000		18.5		
	2000		14.5		
	3000		11.0		
Output Power at 1dB compression	50 - 3000	14.5	16.5		dBm
Output third order intercept point (OIP3)	50 - 3000		30		dBm
Input VSWR	50 - 3000		2.0		:1
Output VSWR	50 - 3000		1.4		:1
DC Supply Voltage			5.0		V
DC Supply Current			70	80	mA

Pin Connections

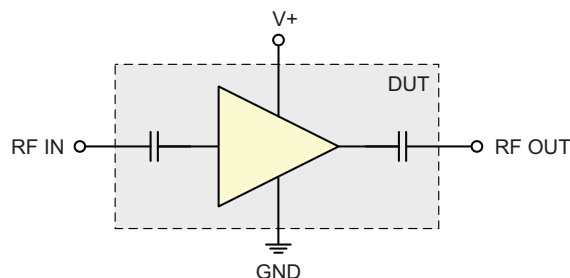
V+	10
RF OUT	14
RF IN	2
GROUND	1,3,4,5,6,7,8,9,11,12,13,15,16

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
Operating Voltage	5.5 V
Input RF Power (no damage)	+13 dBm
Power Consumption	440 mW

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

Simplified Schematic



ESD Rating

Human Body Model (HBM): Class 0 (< 250 V) in accordance with EIA/JESD22-A114-B

Machine Model (MM): Class A (< 200 V) in accordance with EIA/JESD22-A115-A



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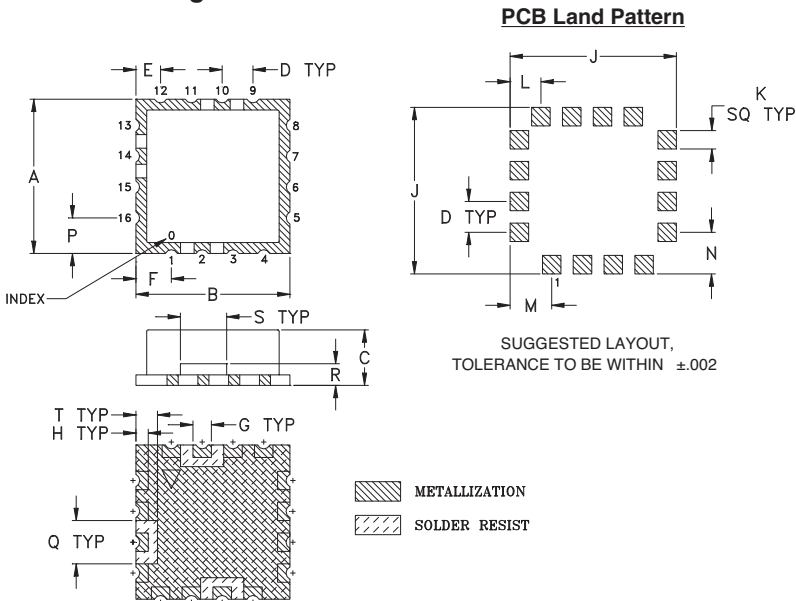
IF/RF MICROWAVE COMPONENTS

For detailed performance specs
& shopping online see web site

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RAMP-33LN+
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RAV
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Page 2 of 4

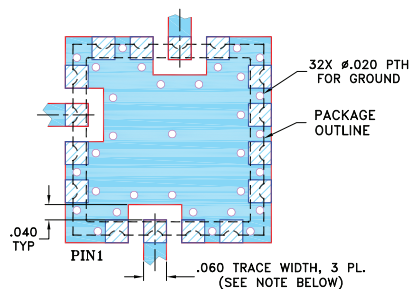
Outline Drawing



Outline Dimensions (inch)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	wt.
.500	.500	.180	.100	.080	.115	.060	.040	.540	.060	.100	.135	.135	.115	.140	.070	.150	.070	grams
12.70	12.70	4.57	2.54	2.03	2.92	1.52	1.02	13.72	1.52	2.54	3.43	3.43	2.92	3.56	1.78	3.81	1.78	1.0

Demo Board MCL P/N: TB-548+
Suggested PCB Layout (PL-012)

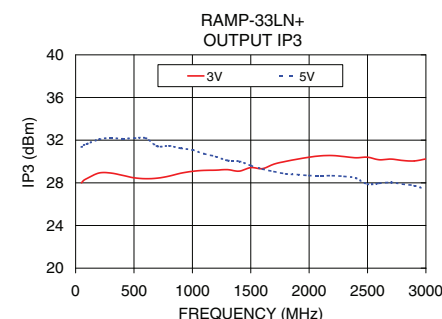
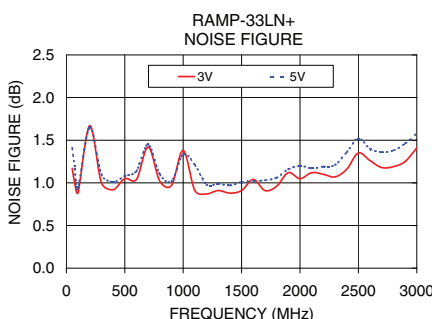
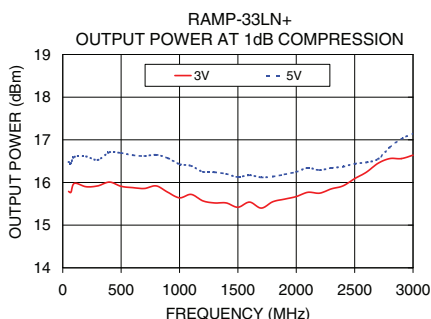
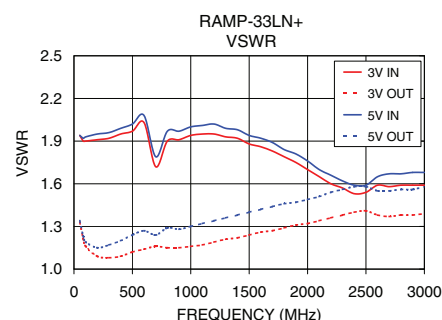
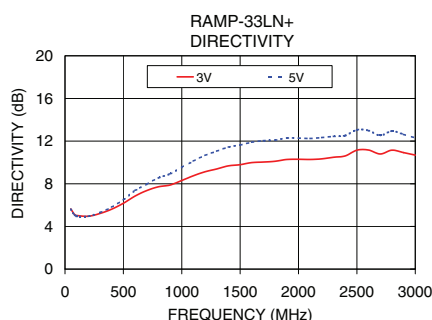
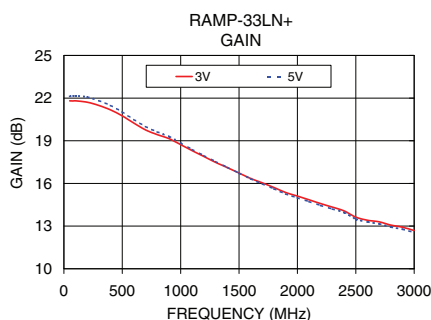


NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS $.030" \pm .002"$; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE BOTTOM IS CONTINUOUS GROUND PLANE.

-  DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
-  DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

FREQUENCY (MHz)	GAIN (dB)		DIRECTIVITY (dB)		VSWR IN (:1)		VSWR OUT (:1)		NOISE FIGURE (dB)		P. OUT at 1dB COMPR. (dBm)		IP3 (dBm)	
	3V	5V	3V	5V	3V	5V	3V	5V	3V	5V	3V	5V	3V	5V
50	21.81	22.12	5.64	5.60	1.94	1.94	1.33	1.34	1.17	1.41	15.79	16.48	28.00	31.36
100	21.81	22.16	5.03	4.95	1.90	1.93	1.16	1.19	0.89	0.95	15.98	16.60	28.42	31.66
200	21.71	22.07	4.96	4.95	1.91	1.95	1.09	1.15	1.67	1.65	15.90	16.61	28.92	32.07
300	21.48	21.82	5.22	5.30	1.92	1.96	1.08	1.17	1.00	1.10	15.92	16.53	28.92	32.20
400	21.17	21.48	5.62	5.81	1.95	1.99	1.09	1.20	0.92	1.01	16.01	16.71	28.71	32.13
500	20.75	21.03	6.17	6.50	1.97	2.02	1.12	1.24	1.05	1.08	15.91	16.69	28.47	32.19
600	20.24	20.49	6.85	7.37	2.03	2.08	1.14	1.27	1.04	1.14	15.88	16.64	28.39	32.19
700	19.76	20.00	7.36	7.96	1.72	1.79	1.16	1.24	1.42	1.45	15.86	16.62	28.44	31.43
800	19.43	19.62	7.72	8.55	1.90	1.97	1.15	1.29	1.02	1.10	15.92	16.65	28.63	31.47
900	19.15	19.30	7.88	8.93	1.91	1.97	1.15	1.28	0.97	1.02	15.77	16.57	28.90	31.24
1000	18.73	18.85	8.31	9.54	1.94	2.00	1.16	1.30	1.38	1.33	15.64	16.43	29.08	31.08
1500	16.73	16.73	9.79	11.63	1.88	1.94	1.24	1.40	0.91	1.01	15.42	16.13	29.43	29.63
2000	15.11	14.99	10.30	12.28	1.70	1.76	1.32	1.49	1.05	1.20	15.67	16.25	30.40	28.68
2500	13.63	13.50	11.15	13.06	1.54	1.59	1.41	1.58	1.35	1.52	16.09	16.44	30.40	27.87
3000	12.69	12.54	10.69	12.30	1.59	1.68	1.39	1.58	1.41	1.58	16.64	17.15	30.24	27.40



Amplifier

RAMP-33LN+

Typical Performance Data

FREQUENCY (MHz)	GAIN (dB)		DIRECTIVITY (dB)		VSWR IN (:1)		VSWR OUT (:1)		Output IP3 (dBm)		NOISE FIGURE (dB)		Pout at 1dB Comp. (dBm)	
	3V	5V	3V	5V	3V	5V	3V	5V	3V	5V	3V	5V	3V	5V
50.0	21.81	22.12	5.64	5.60	1.94	1.94	1.33	1.34	28.00	31.36	1.17	1.41	15.79	16.48
100.0	21.81	22.16	5.03	4.95	1.90	1.93	1.16	1.19	28.42	31.66	0.89	0.95	15.98	16.60
200.0	21.71	22.07	4.96	4.95	1.91	1.95	1.09	1.15	28.92	32.07	1.67	1.65	15.90	16.61
300.0	21.48	21.82	5.22	5.30	1.92	1.96	1.08	1.17	28.92	32.20	1.00	1.10	15.92	16.53
400.0	21.17	21.48	5.62	5.81	1.95	1.99	1.09	1.20	28.71	32.13	0.92	1.01	16.01	16.71
500.0	20.75	21.03	6.17	6.50	1.97	2.02	1.12	1.24	28.47	32.19	1.05	1.08	15.91	16.69
600.0	20.24	20.49	6.85	7.37	2.03	2.08	1.14	1.27	28.39	32.19	1.04	1.14	15.88	16.64
700.0	19.76	20.00	7.36	7.96	1.72	1.79	1.16	1.24	28.44	31.43	1.42	1.45	15.86	16.62
800.0	19.43	19.62	7.72	8.55	1.90	1.97	1.15	1.29	28.63	31.47	1.02	1.10	15.92	16.65
900.0	19.15	19.30	7.88	8.93	1.91	1.97	1.15	1.28	28.90	31.24	0.97	1.02	15.77	16.57
1000.0	18.73	18.85	8.31	9.54	1.94	2.00	1.16	1.30	29.08	31.08	1.38	1.33	15.64	16.43
1500.0	16.73	16.73	9.79	11.63	1.88	1.94	1.24	1.40	29.43	29.63	0.91	1.01	15.42	16.13
2000.0	15.11	14.99	10.30	12.28	1.70	1.76	1.32	1.49	30.40	28.68	1.05	1.20	15.67	16.25
2500.0	13.63	13.50	11.15	13.06	1.54	1.59	1.41	1.58	30.40	27.87	1.35	1.52	16.09	16.44
3000.0	12.69	12.54	10.69	12.30	1.59	1.68	1.39	1.58	30.24	27.40	1.41	1.58	16.64	17.15

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RAMP-33LN+
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Page 1 of 1



IF/RF MICROWAVE COMPONENTS • ISO 9001 ISO 14001 AS9100 CERTIFIED RoHS compliant

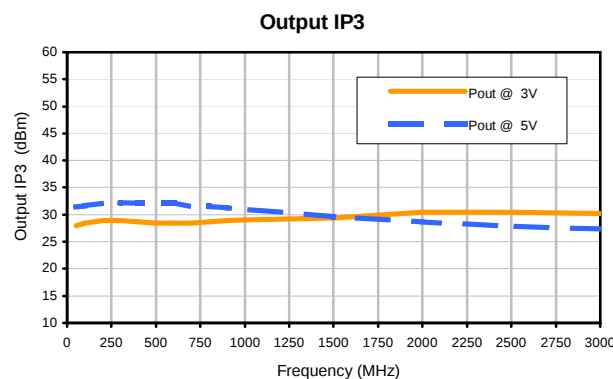
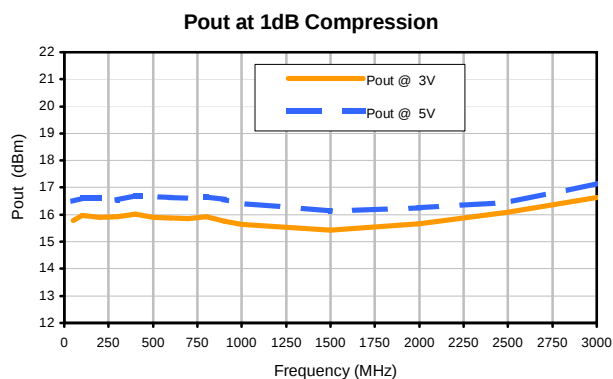
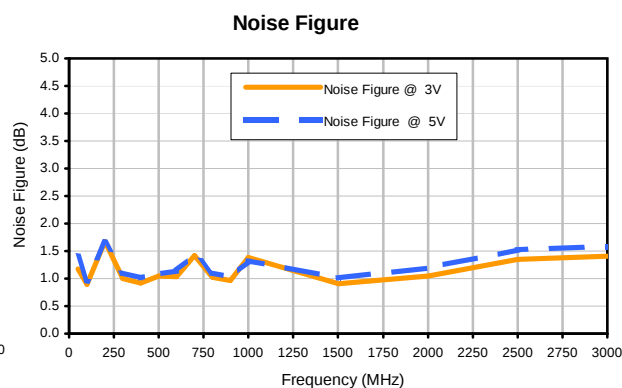
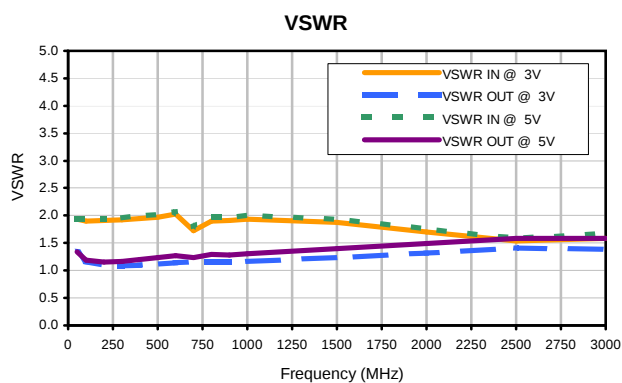
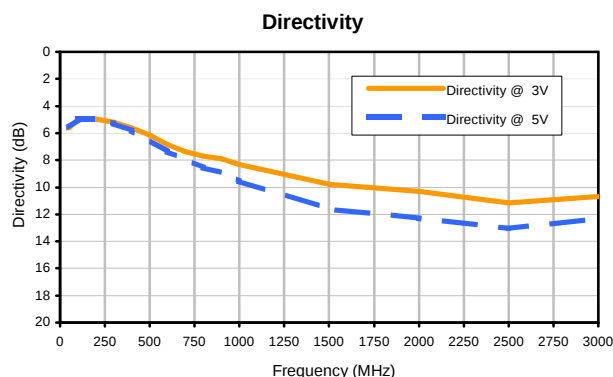
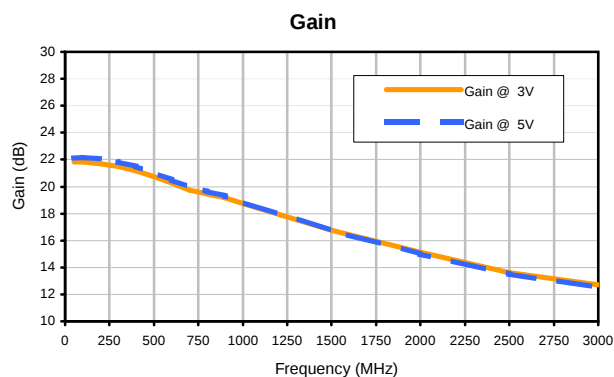
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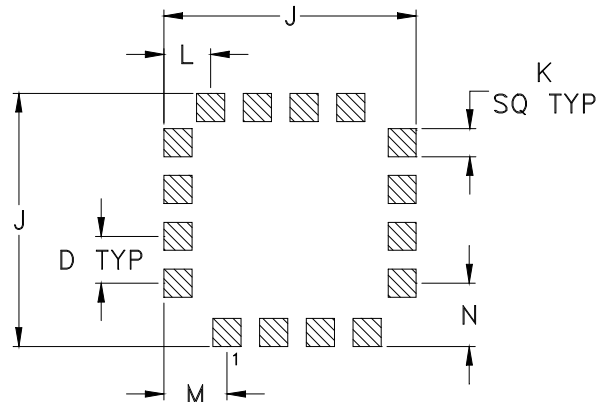
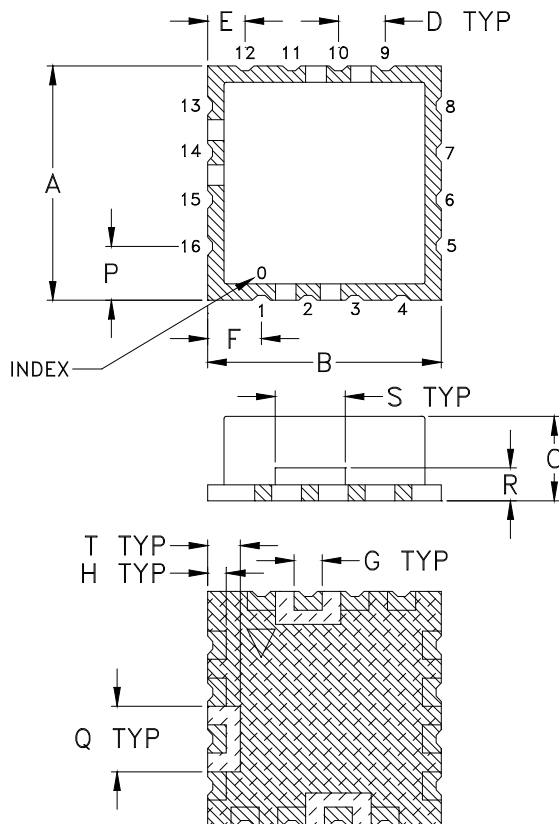
Typical Performance Curves



Outline Dimensions

CK605

PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

CASE #	A	B	C	D	E	F	G	H	J	K
CK605	.500 (12.70)	.500 (12.70)	.180 (4.57)	.100 (2.54)	.080 (2.03)	.115 (2.92)	.060 (1.52)	.040 (1.02)	.540 (13.72)	.060 (1.52)

CASE #	L	M	N	P	Q	R	S	T	WT. GRAM
CK605	.100 (2.54)	.135 (3.43)	.135 (3.43)	.115 (2.92)	.140 (3.56)	.070 (1.78)	.150 (3.81)	.070 (1.78)	1.2 +0.5 -0.0

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

Notes:

- Case material: Nickel-Silver alloy.
- Base: Printed wiring laminate.
- Termination finish:
For RoHS Case Styles: 3-5 μ inch (.08-.13 microns) Gold over 120-240 μ inch (3.05-6.10 microns) Nickel plate.
All models, (+) suffix.



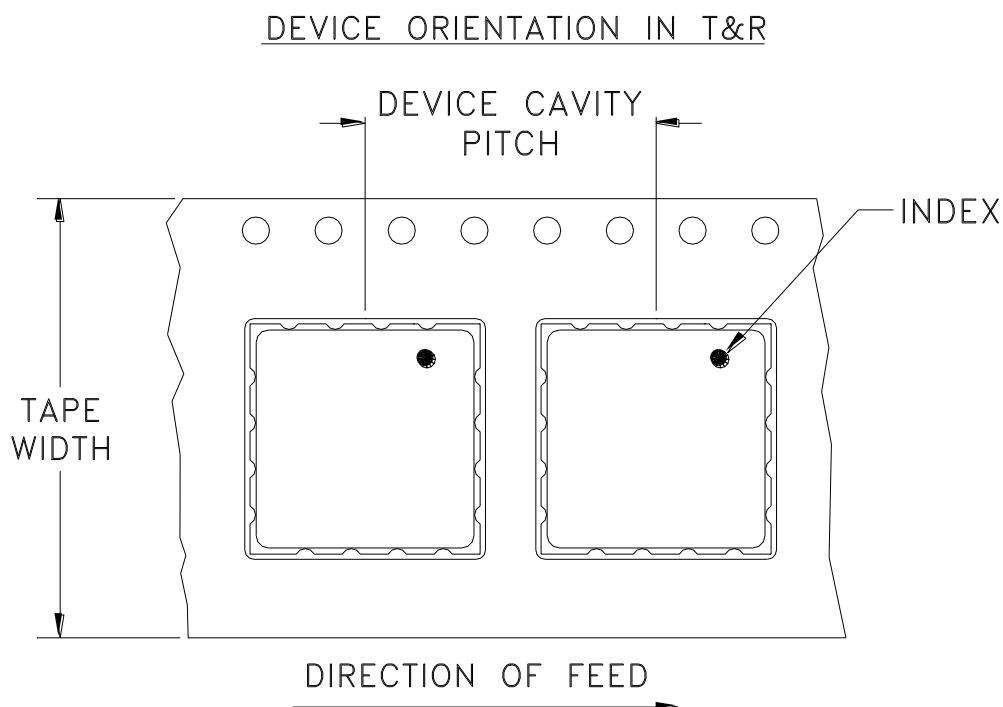
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RF/IF MICROWAVE COMPONENTS

Tape & Reel Packaging TR-F37



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel	
24	16	7	Small quantity standards (see note)	10
				20
				50
				100
		13	Standard	200
				500

Note: Please consult individual model data sheet to determine device per reel availability.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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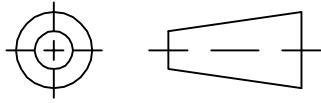
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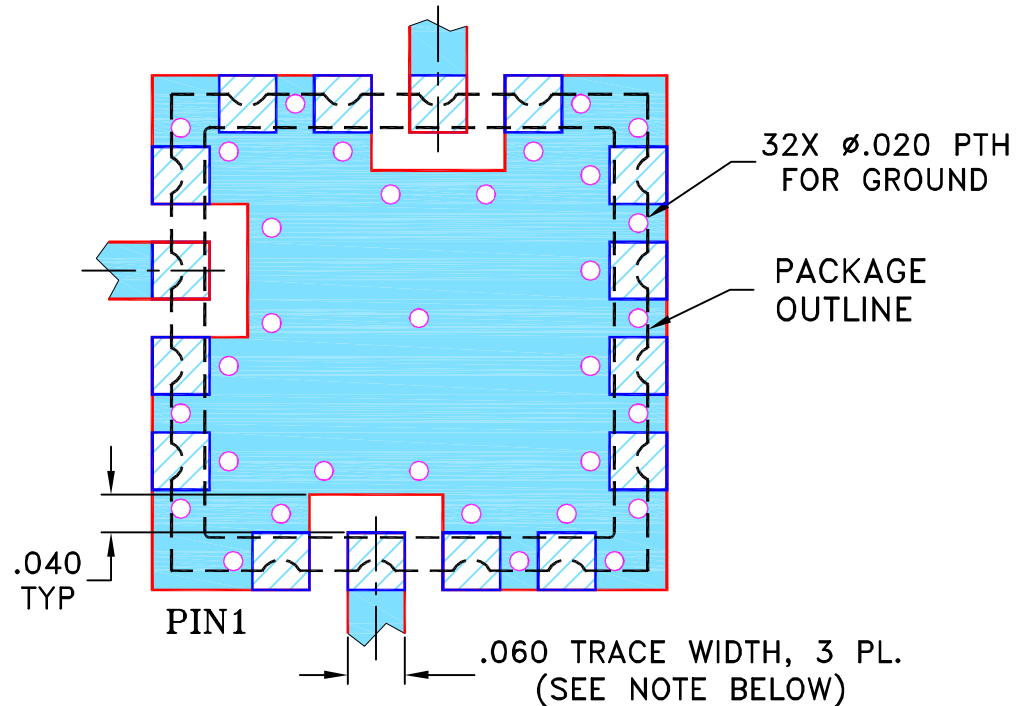
THIRD ANGLE PROJECTION



REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
E	M105563	ADDED "rl" PIN CONNECTION	06/02/06	MMG	DJ
F	M105640	CORRECTED NOTE 2	06/08/06	MMG	MM
G	M124395	ADDED "RAMP"	09/09	EM	HH
G	R77589	ADDED "RAMP"	09/09	EM	HH

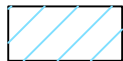
SUGGESTED MOUNTING CONFIGURATION FOR
CK605 CASE STYLE, "kg/rl/16AM01" PIN CONNECTION

NOTES:

- TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS .030" $\pm$.002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE BOTTOM IS CONTINUOUS GROUND PLANE.



DENOTES PCB COPPER LAYOUT WITH SMOBC
(SOLDER MASK OVER BARE COPPER)



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS $\pm$ 3 PL DECIMALS $\pm$.005ANGLES $\pm$ FRACTIONS $\pm$

DRAWN

AV

08/07/00

CHECKED

SK

08/08/00

APPROVED

DB

08/08/00

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ASHEETA1.DWG REV:A DATE:01/12/95



Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235

PL,kg/rl/16AM01,CK605,ROS/LAVI/RAMP

SIZE
A

CODE IDENT
15542

DRAWING NO:
98-PL-012

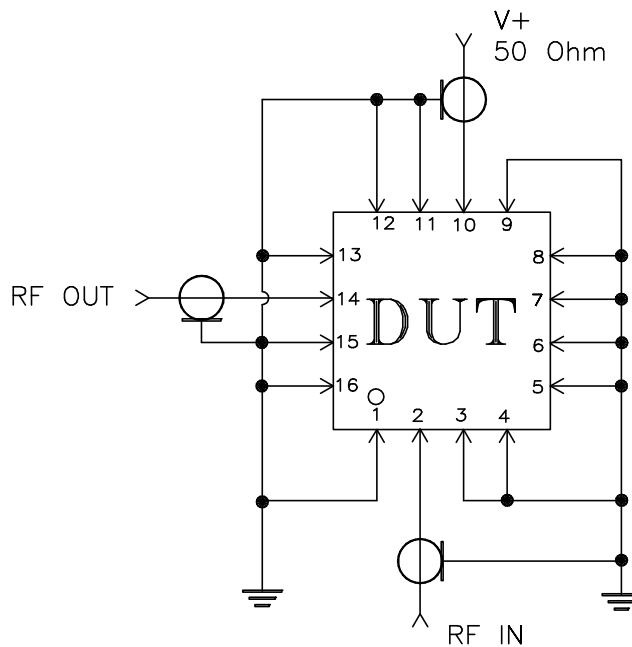
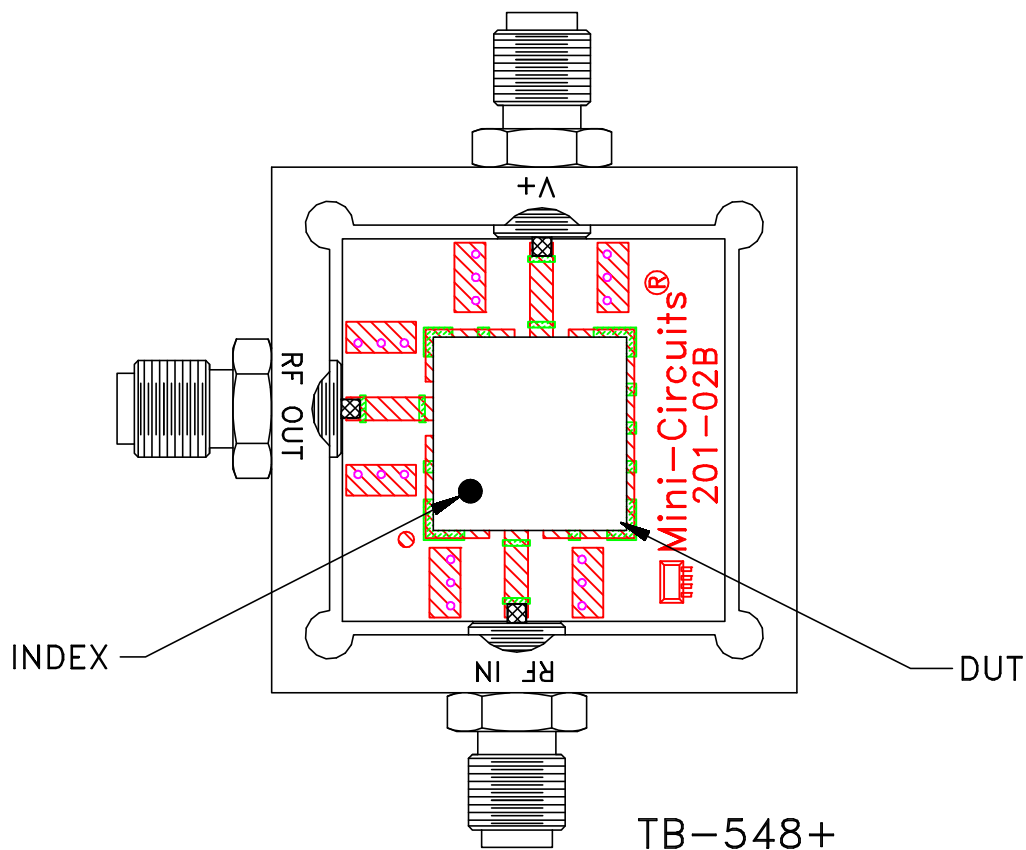
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FILE: 98PL012

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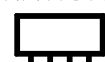
Evaluation Board and Circuit



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: FR4 GRADE IT-180TC (ITEQ CORPORATION) or equivalent, Dielectric Constant=4.7, Thickness=.028 inch.

 **Mini-Circuits®**



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 85° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Humidity	90 to 95% RH, 240 hours, 50°C	MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Solder Reflow Heat	Sn-Pb Eutectic Process: 225°C peak Pb-Free Process, 245°C peak	J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Vibration (High Frequency)	20g peak, 20-2000 Hz, 4 times in each of three axes (total 12)	MIL-STD-883, Method 2007.3, Condition A
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215