ULTRA LOW NOISE, MEDIUM CURRENT

E-PHEMT Transistor

TAV2-14LN+

50Ω 0.05 to 10 GHz

THE BIG DEAL

- Low Noise Figure, 0.6 dB typ. at 6 GHz, +2V,
- Gain, 16.4 dB typ. at 6 GHz, +4V
- High Output IP3, +30.9 dBm at 6 GHz, +4V
- Output Power at 1dB comp., +18.8 dBm at 6 GHz, +4V
- External biasing and matching required
- Usable to 12 GHz

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

- 5G
- Cellular
- ISM
- GSM
- WCDMA
- WiMax
- WLAN
- UNII and HIPERLAN

PRODUCT OVERVIEW

Mini-Circuits' TAV2-14LN+ is a MMIC E-PHEMT* transistor with an operating frequency range from 0.05 to 10 GHz. This model combines high gain with extremely low noise figure, resulting in lower overall system noise. Low NF and IP3 performance make it an ideal choice for sensitive receivers in communications systems. Manufactured using highly repeatable E-PHEMT technology, the unit comes housed in a tiny 2x2mm MCLP package. This model requires external biasing and matching.

KEY FEATURES

Features	Advantages
Wideband, 0.05 to 10 GHz Usable to 12 GHz	A single device covers many wireless communications bands including cellular, ISM, GSM, WCDMA, WiMax, WLAN, 5G and more.
High IP3 vs. DC power consumption • +30.9 dBm at 6 GHz, +4V • +33.2 dBm at 12 GHz, +4V	The TAV2-14LN+ matches industry leading IP3 performance relative to device size and power consumption. Enhanced linearity over a broad frequency range makes the device ideal for use in: • Driver amplifiers for complex waveform up converter paths • Drivers in linearized transmit systems
Combines high gain (16.4 dB) with very low Noise Figure (0.7 dB)	The unique combination of high gain and low Noise Figure results in lower overall system noise.
2 x 2mm 6-lead MCLP package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

* Enhancement mode Pseudomorphic High Electron Mobility Transistor.

REV. A
ECO-014399
TAV2-14LN+
MCL NY
220809

E-PHEMT Transistor TAV2-14LN+

50Ω 0.05 to 10 GHz

ELECTRICAL SPECIFICATIONS AT T_{AMB}=25°C

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
DC SPECIFICATIONS						
V_{TH}	Threshold Voltage	V_{DS}=4V, I_{DS}=4 mA		0.37		V
I_{DSS}	Saturated Drain Current	V_{DS}=4V, V_{GS}=0 V	—	2.0	—	µA
G_M	Transconductance	V_{DS}=4V, Gm =$\Delta I_{DS}/\Delta V_{GS}$, $\Delta V_{GS} = V_{GS2}-V_{GS1}$, V_{GS2}=0.7V, V_{GS1}=0.6V ΔI_{DS} =(I_{DS} at V_{GS2})-(I_{DS} at V_{GS1})	—	192	—	mS
I_{GSS}	Gate leakage Current	V_{GD}=V_{GS}=-3V	—	1.0		µA

RF & DC SPECIFICATIONS, Zo=50 OHMS

Parameter	Condition (GHz)	V_{DS} = +4V[1], I_{DS} = 40mA			V_{DS} = +2V[1] I_{DS} = 20mA	VS = +5V[2]	VS = +3V[2]	Units
		Min.	Typ.	Max.	Typ.	Typ.	Typ.	
Gain	0.05	21	23.4	25.7	22	—	—	dB
	6	14.7	16.4	18	15.9	12.7	11.9	
	8	12.5	13.9	15.3	13.3	10.1	9.4	
	10	10.8	11.8	13.2	11.3	9.8	9.1	
	12	—	10.2	—	10	—	—	
Input Return Loss	0.05	—	—	—	—	—	—	dB
	6		7		6	11	10	
	8		7		6	15	12	
	10		7		7	8	7	
	12		8		7	—	—	
Output Return Loss	0.05		5		5	—	—	dB
	6		13		13	7	7	
	8		20		17	8	9	
	10		20		17	7	7	
	12		19		16	—	—	
P1dB[3]	0.05		17.7		13.3	—	—	dBm
	6		18.8		13.1	12.6	8.5	
	8		19.1		13.4	11.2	7.4	
	10		19.4		13.5	13.4	10.2	
	12		19.1		13	—	—	
OIP3 Pout=5dBm/Tone	0.05		27.1		22.8	—	—	dBm
	6		30.9		24.9	25.9	20.8	
	8		31.6		25.9	25.4	18.6	
	10		33.0		28.5	27.0	21.8	
	12		33.2		29.0	—	—	
Noise Figure	0.05		2.5		0.7	—	—	dB
	6		0.7		0.6	0.8	0.7	
	8		0.7		0.6	1.0	0.8	
	10		0.8		0.7	1.0	0.7	
	12		1.0		0.8	—	—	
I_{DS}	DC		40		20	54	23	mA
V_{GS}	DC	0.44	0.65	0.72	0.58	—	—	V

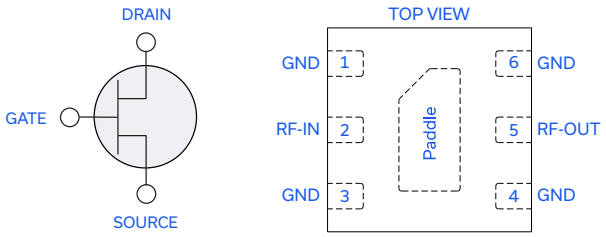
1. Measured in test board TB-TAV2-14LN+. See Fig 1.
2. Measured in eval board TB-TAV2-14LNE+ (designed for 6-10 GHz). See Fig. 2.
3. Drain current bias allowed to increase during compression measurement.

MAXIMUM RATINGS[4]

Symbol	Parameter	Max.
V_{DS}[5]	Drain-Source Voltage	+5V
V_{GS}[5]	Gate-Source Voltage at V_{DS}=4V	-5 &+1V
I_{DS}[5]	Drain Current at V_{DS}=4V	65mA
I_{GS}	Gate Current	15 µA
P_{DISS}	Total Dissipated Power	325mW
P_{IN}[6]	RF Input Power	+18 dBm (5 -minute max.) +15 dBm (continuous)
T_{CH}	Channel Temperature	150 °C
T_{OP}	Operating Temperature	-40 to 85 °C
T_{STD}	Storage Temperature	-65 to 150 °C
θjc	Thermal Resistance	170 °C/W

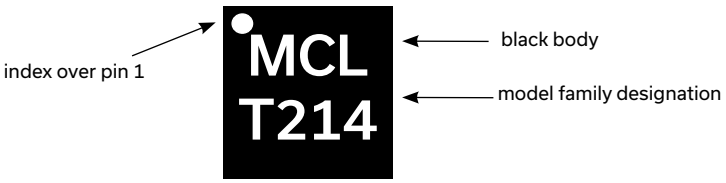
4. Operation of this device above any one of these parameters may cause permanent damage.
5. Assumes DC quiescent conditions.
6. I_{GS} is limited to 15µA during test.

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	2	Gate used for RF input
RF-OUT	5	Drain used for RF output
GND	1,3,4,6 & Paddle	Source terminal, normally connected to ground.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control

E-PHEMT Transistor TAV2-14LN+

50Ω 0.05 to 10 GHz

CHARACTERIZATION TEST CIRCUIT

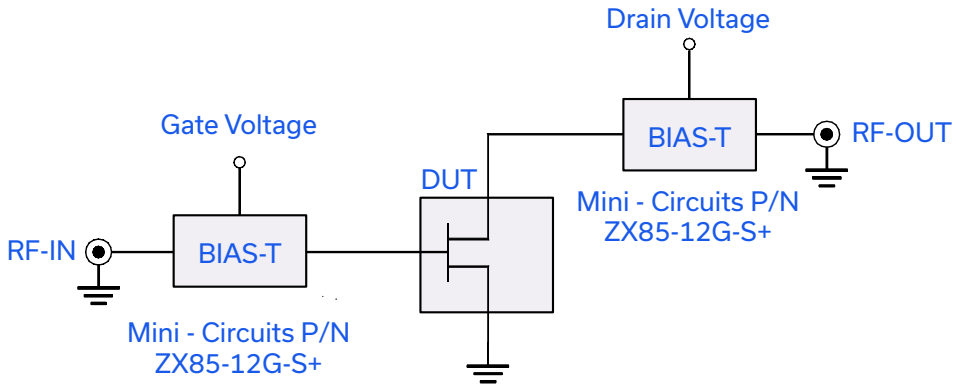
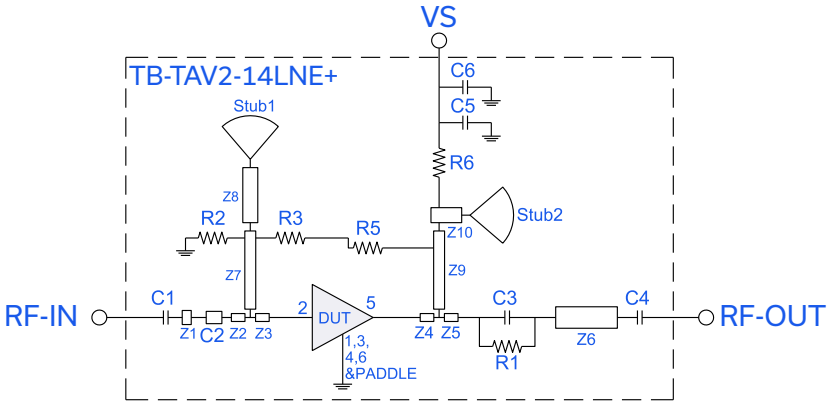


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT is soldered on Mini-Circuits Test Board TB-TAV2-14LN+)
Gain, Output power at 1dB compression (P1dB), Noise Figure and output IP3 (OIP3) are measured using Agilent's Microwave Network Analyzer N5242A PNA-X.

Conditions:
1. Drain voltage (with reference to source, VDS)= +2V & +4V as shown.
2. Gate Voltage (with reference to source, VGS) is set to obtain desired Drain-Source current (IDS) as shown in graphs or specification table.
3. Gain: Pin= -25 dBm
4. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +5 dBm/tone at output.
5. No external matching components used.

APPLICATION TEST CIRCUIT



Component	Size	Value	Part Number	Manufacturer
C1	0402	1pF	GRM1555C1H1R0CA01D	Murata
C2	Low-Zc microstrip as 0.15pF shunt capacitor to GND (refer to PCB layout for dimensions)			
C3	0402	0.3pF	GJM1555C1HR30BB01D	Murata
C4	0402	1pF	GRM1555C1H1R0CA01D	Murata
C5	0402	3.3pF	GRM1555C1H3R3CA01D	Murata
C6	0805	1uF	GRM21BR71C105KA01L	Murata
R1	0402	33Ohm	RK73H1ETTP33R0F	Koa
R2	0402	5.6KOhm	RK73H1ETTP5601F	Koa
R3	0402	8.2KOhm	RK73H1ETTP8201F	Koa
R5	0402	4.7KOhm	RK73H1ETTP4701F	Koa
R6	0402	43Ohm	RK73H1ETTP43R0F	Koa
Stub1, Stub2	Radial stubs of length = 1.75mm, angle = 70 deg, input line width = 0.54mm			
Z1-Z10	Transmission-line matching elements, refer to PCB layout for physical dimensions			

Fig 2. Block Diagram of Test Circuit used for characterization. (DUT is soldered on Mini-Circuits Application test board TB-TAV2-14LNE+)
Gain, Return loss, Output power at1dB compression (P1dB), output IP3 (OIP3) and noise figure measured using Agilent's microwave network analyzer N5242A PNA-X.

Conditions:
1. Supply voltage, VS=+3V & +5V
2. Gain and Return loss: Pin= -25 dBm
3. Output IP3 (OIP3): Two Tones spaced 1 MHz apart, +5dBm/ tone at output.

E-PHEMT Transistor TAV2-14LN+

50Ω 0.05 to 10 GHz

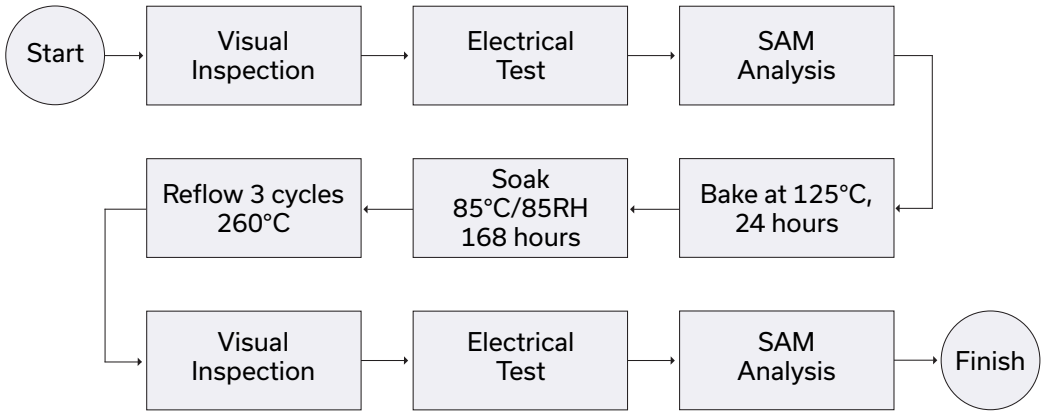
ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS CLICK HERE

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**	F55 7" reels with 20, 50, 100, 200, 500 or 2K devices
Suggested Layout for PCB Design	PL-659
Evaluation Board	TB-TAV2-14LN+ & TB-TAV2-14LNE+
Environmental Ratings	ENV08T1

ESD RATING

Human Body Model (HBM): Class 0 (50V to 250V) in accordance with ANSI/ESD STM 5.1 - 2001

MSL TEST FLOW CHART



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

MMIC Amplifier TAV2-14LN+

Typical Performance Data

Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 2.00V, Id = 20mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
100	22.12	51.36	0.00	4.38	0.01	1.27	24.22	13.03	0.65
200	22.10	45.16	0.02	4.41	0.03	1.27	24.10	12.96	0.58
300	22.06	41.41	0.04	4.44	0.06	1.27	24.38	13.24	0.64
400	22.01	39.22	0.07	4.47	0.06	1.27	24.50	12.81	0.69
500	21.95	37.29	0.11	4.52	0.09	1.26	24.04	12.88	0.68
1000	21.55	31.62	0.44	4.84	0.18	1.23	23.41	13.30	0.64
2000	20.28	26.75	1.44	5.77	0.34	1.14	23.19	12.84	0.67
3000	18.93	24.38	2.51	6.64	0.47	1.07	23.52	12.67	0.76
4000	17.82	22.73	3.60	7.68	0.57	1.01	23.67	12.76	0.72
5000	16.89	21.36	4.77	9.38	0.67	0.97	23.76	13.15	0.67
6000	15.88	20.35	5.89	12.39	0.78	0.95	25.45	13.20	0.75
7000	14.66	19.78	6.45	16.16	0.88	0.97	26.32	13.41	0.81
8000	13.39	19.40	6.55	17.80	0.97	1.00	26.56	13.41	0.83
9000	12.28	18.91	6.72	17.59	1.03	1.01	28.24	13.73	0.80
10000	11.37	18.29	7.12	17.44	1.07	1.00	28.98	13.52	0.78
11000	10.54	17.64	7.57	17.37	1.12	0.98	27.83	13.64	0.99
12000	9.70	17.04	7.48	16.35	1.15	0.97	29.89	13.33	1.01
13000	8.77	16.53	6.94	14.92	1.17	0.98	27.54	13.20	1.02
14000	7.89	15.98	6.59	14.26	1.19	0.99	30.01	13.42	1.13
15000	7.22	15.23	6.72	14.60	1.20	0.98	30.88	13.61	1.21
16000	6.66	14.35	7.07	15.31	1.19	0.96	30.61	13.91	1.37
17000	6.08	13.47	7.17	14.83	1.18	0.93	30.15	13.71	1.13
18000	5.36	12.71	6.87	12.99	1.17	0.90	32.36	13.46	1.27
19000	4.51	12.04	6.35	11.28	1.15	0.88	33.58	12.72	1.57
20000	3.65	11.35	5.98	10.19	1.14	0.86	34.36	12.55	2.00

Typical Performance Data

Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.00V, Id = 40mA @ Temperature = +25°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
100	23.49	51.66	0.05	5.77	0.13	1.46	27.30	17.57	1.76
200	23.46	45.86	0.06	5.80	0.08	1.46	27.55	17.67	1.26
300	23.42	42.17	0.09	5.82	0.09	1.45	28.09	17.75	1.18
400	23.36	39.63	0.13	5.85	0.11	1.45	28.38	17.71	1.09
500	23.30	37.76	0.18	5.90	0.12	1.44	28.17	17.77	0.99
1000	22.84	32.16	0.55	6.28	0.22	1.38	27.94	17.68	0.85
2000	21.44	27.33	1.70	7.34	0.39	1.23	28.44	17.76	0.83
3000	19.98	24.90	2.90	8.30	0.53	1.10	28.90	17.89	0.90
4000	18.75	23.13	4.12	9.46	0.64	1.00	29.48	18.10	0.88
5000	17.70	21.68	5.38	11.40	0.73	0.93	30.06	18.60	0.86
6000	16.57	20.64	6.53	14.82	0.83	0.89	31.04	18.90	0.88
7000	15.28	19.94	6.99	17.90	0.92	0.89	31.45	19.17	1.01
8000	13.97	19.40	7.00	17.42	0.99	0.91	31.89	19.13	0.95
9000	12.85	18.81	7.15	16.75	1.03	0.92	32.75	19.52	0.92
10000	11.92	18.07	7.57	16.77	1.06	0.91	33.27	19.39	0.96
11000	11.08	17.35	8.03	16.55	1.10	0.89	33.34	19.47	1.18
12000	10.21	16.69	7.89	15.19	1.12	0.88	33.45	19.19	1.25
13000	9.27	16.16	7.29	13.57	1.14	0.88	33.58	19.07	1.22
14000	8.37	15.57	6.91	12.90	1.15	0.89	34.26	19.27	1.20
15000	7.68	14.82	7.06	13.23	1.16	0.89	35.11	19.38	1.49
16000	7.10	13.95	7.45	13.89	1.16	0.87	34.37	19.68	1.58
17000	6.50	13.11	7.56	13.53	1.15	0.84	33.98	19.37	1.58
18000	5.75	12.39	7.24	11.99	1.14	0.81	35.90	18.07	1.61
19000	4.88	11.77	6.68	10.53	1.13	0.80	35.96	16.95	2.01
20000	4.00	11.12	6.28	9.61	1.13	0.79	36.53	13.85	2.33

Typical Performance Data

Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 2.00V, Id = 20mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
100	23.83	51.46	0.02	5.93	0.04	1.49	22.81	12.66	0.50
200	23.79	45.95	0.03	5.96	0.06	1.48	22.60	12.59	0.46
300	23.75	42.60	0.06	5.99	0.07	1.48	22.91	12.68	0.53
400	23.70	40.12	0.09	6.01	0.09	1.47	22.96	12.59	0.56
500	23.64	38.11	0.14	6.06	0.11	1.46	22.57	12.51	0.55
1000	23.20	32.46	0.51	6.44	0.21	1.40	21.71	12.52	0.50
2000	21.80	27.55	1.67	7.51	0.39	1.24	21.39	12.26	0.52
3000	20.32	25.09	2.88	8.43	0.53	1.10	21.74	11.93	0.59
4000	19.11	23.29	4.13	9.61	0.64	0.99	21.73	12.07	0.55
5000	18.05	21.86	5.43	11.54	0.73	0.91	21.67	12.66	0.44
6000	16.92	20.75	6.60	14.92	0.83	0.87	23.55	13.00	0.56
7000	15.64	20.02	7.10	18.01	0.91	0.87	24.57	13.28	0.61
8000	14.31	19.49	7.05	17.23	0.98	0.89	24.79	13.28	0.59
9000	13.19	18.85	7.22	16.98	1.02	0.90	26.44	13.63	0.55
10000	12.30	18.10	7.73	17.49	1.05	0.89	27.60	13.55	0.55
11000	11.46	17.33	8.21	17.06	1.08	0.86	26.29	13.67	0.72
12000	10.57	16.70	7.95	15.31	1.10	0.85	29.08	13.25	0.65
13000	9.62	16.15	7.34	13.40	1.12	0.85	27.20	13.25	0.71
14000	8.71	15.57	6.93	12.41	1.13	0.86	28.71	13.47	0.66
15000	8.01	14.84	7.03	12.69	1.13	0.86	30.14	13.69	0.71
16000	7.46	13.93	7.54	13.86	1.13	0.84	29.37	14.04	0.96
17000	6.88	13.06	7.76	13.72	1.12	0.81	28.92	13.88	0.78
18000	6.12	12.35	7.36	12.06	1.12	0.78	31.93	13.62	0.77
19000	5.26	11.73	6.74	10.80	1.11	0.78	32.53	12.85	1.17
20000	4.39	11.09	6.32	9.79	1.11	0.76	35.09	12.70	1.49

Typical Performance Data

Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.00V, Id = 40mA @ Temperature = -45°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
100	23.71	51.14	0.11	4.94	0.45	1.32	27.63	18.10	1.73
200	23.67	46.21	0.11	4.89	0.27	1.31	28.05	18.21	1.20
300	23.64	42.41	0.14	4.90	0.20	1.31	28.66	18.29	1.03
400	23.60	40.10	0.17	4.93	0.19	1.30	28.92	18.26	0.94
500	23.53	38.29	0.22	4.97	0.19	1.30	28.59	18.33	0.89
1000	23.09	32.59	0.59	5.36	0.24	1.26	28.76	18.24	0.67
2000	21.63	27.79	1.76	6.42	0.40	1.15	29.05	18.31	0.65
3000	20.12	25.44	2.97	7.31	0.54	1.05	29.56	18.40	0.69
4000	18.90	23.72	4.23	8.44	0.64	0.97	30.19	18.64	0.67
5000	17.80	22.34	5.53	10.20	0.74	0.93	30.71	19.00	0.58
6000	16.67	21.30	6.64	13.33	0.84	0.92	31.38	19.22	0.67
7000	15.42	20.54	7.02	17.92	0.93	0.93	31.70	19.48	0.65
8000	14.11	20.05	6.89	19.72	1.00	0.97	32.26	19.38	0.71
9000	13.02	19.42	7.08	19.70	1.05	0.98	33.33	19.88	0.66
10000	12.14	18.66	7.52	19.87	1.08	0.96	33.41	19.68	0.68
11000	11.30	17.88	7.95	19.57	1.11	0.94	33.66	19.78	0.76
12000	10.45	17.23	7.74	18.31	1.13	0.94	33.53	19.46	0.82
13000	9.52	16.64	7.04	15.87	1.14	0.94	32.97	19.30	0.83
14000	8.61	16.05	6.59	14.39	1.15	0.95	34.24	19.54	0.85
15000	7.93	15.27	6.78	14.85	1.15	0.95	35.22	19.71	1.01
16000	7.39	14.32	7.20	16.53	1.14	0.93	36.10	19.96	1.09
17000	6.84	13.40	7.34	15.66	1.13	0.89	34.32	19.69	1.08
18000	6.11	12.63	7.00	13.60	1.11	0.86	35.21	18.25	1.20
19000	5.33	11.89	6.52	12.43	1.10	0.85	34.37	17.07	1.49
20000	4.48	11.18	6.07	10.92	1.09	0.83	35.48	14.25	1.79

Typical Performance Data

Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 2.00V, Id = 20mA @ Temperature = +85°C

FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
100	23.82	51.77	0.01	5.16	0.03	1.39	24.36	13.03	0.81
200	23.77	45.94	0.02	5.19	0.03	1.39	24.26	12.95	0.72
300	23.74	42.49	0.04	5.23	0.04	1.39	24.55	13.26	0.82
400	23.69	39.92	0.08	5.27	0.08	1.38	24.73	12.82	0.81
500	23.63	38.14	0.13	5.32	0.10	1.37	24.30	12.89	0.81
1000	23.19	32.46	0.51	5.73	0.20	1.33	23.73	13.32	0.78
2000	21.74	27.63	1.70	6.81	0.39	1.19	23.65	12.88	0.88
3000	20.23	25.22	2.92	7.74	0.53	1.07	23.91	12.71	0.95
4000	19.01	23.48	4.18	8.92	0.64	0.98	24.09	12.81	0.87
5000	17.92	22.09	5.48	10.76	0.73	0.92	24.10	13.23	0.92
6000	16.78	21.03	6.60	14.05	0.83	0.90	25.62	13.27	0.95
7000	15.51	20.28	7.02	18.18	0.92	0.91	26.36	13.51	1.07
8000	14.18	19.77	6.91	18.62	0.99	0.93	26.73	13.33	1.05
9000	13.08	19.13	7.10	18.48	1.03	0.94	28.25	13.80	1.03
10000	12.20	18.36	7.56	18.84	1.06	0.93	29.11	13.57	0.99
11000	11.36	17.60	8.01	18.41	1.09	0.91	28.03	13.71	1.31
12000	10.49	16.94	7.80	16.87	1.11	0.90	29.99	13.43	1.41
13000	9.55	16.38	7.11	14.58	1.13	0.90	28.02	13.27	1.47
14000	8.63	15.81	6.67	13.28	1.14	0.91	30.10	13.49	1.35
15000	7.95	15.04	6.85	13.75	1.14	0.91	30.72	13.68	1.47
16000	7.41	14.11	7.29	15.21	1.13	0.89	30.74	13.89	1.64
17000	6.84	13.22	7.44	14.51	1.12	0.85	30.82	13.67	1.63
18000	6.10	12.47	7.09	12.75	1.11	0.83	32.03	13.47	1.68
19000	5.30	11.78	6.60	11.68	1.10	0.82	33.30	12.67	2.24
20000	4.44	11.11	6.15	10.35	1.10	0.80	33.92	12.59	2.38

Typical Performance Data

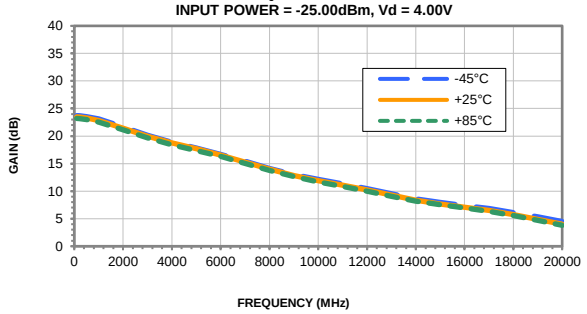
Definitions:
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.00V, Id = 40mA @ Temperature = +85°C

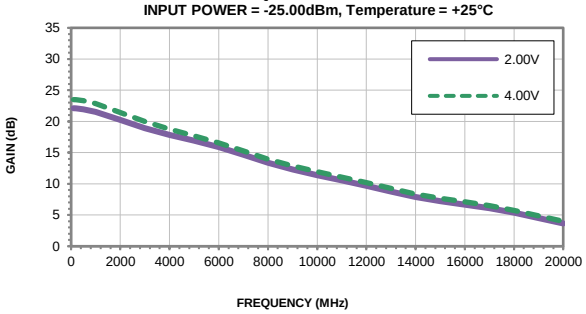
FREQ	Gain	Isolation	Input Return Loss	Output Return Loss	Stability		IP-3 Output	1dB Comp. Output	Noise Figure
(MHz)	(dB)	(dB)	(dB)	(dB)	K	Measure	(dBm)	(dBm)	(dB)
100	23.20	51.72	0.15	4.70	0.34	1.30	26.02	16.51	1.86
200	23.16	45.92	0.17	4.77	0.20	1.31	26.28	16.62	1.41
300	23.11	42.42	0.20	4.81	0.16	1.31	26.76	16.69	1.30
400	23.05	39.77	0.24	4.85	0.16	1.30	27.02	16.65	1.23
500	22.99	37.82	0.28	4.91	0.17	1.29	26.71	16.71	1.14
1000	22.52	32.23	0.66	5.29	0.23	1.26	26.39	16.62	0.97
2000	21.13	27.35	1.78	6.33	0.39	1.15	26.98	16.94	1.00
3000	19.67	24.99	2.98	7.33	0.53	1.06	27.41	17.25	1.06
4000	18.42	23.34	4.18	8.41	0.63	0.99	28.09	17.33	1.04
5000	17.38	21.98	5.41	10.15	0.73	0.94	28.57	17.69	0.95
6000	16.29	20.91	6.56	13.37	0.84	0.92	29.51	18.40	1.10
7000	15.02	20.26	7.02	17.30	0.93	0.94	30.14	18.85	1.11
8000	13.74	19.76	7.07	18.79	1.01	0.96	30.38	18.80	1.17
9000	12.63	19.18	7.19	18.41	1.06	0.97	31.49	19.22	1.14
10000	11.69	18.52	7.48	17.98	1.10	0.97	31.96	19.08	1.19
11000	10.83	17.78	7.92	17.67	1.13	0.95	31.69	19.14	1.43
12000	9.99	17.13	7.90	16.68	1.16	0.94	32.62	18.84	1.44
13000	9.07	16.56	7.32	15.20	1.18	0.95	32.47	18.81	1.45
14000	8.19	15.96	6.99	14.55	1.19	0.96	32.89	18.89	1.44
15000	7.53	15.14	7.28	15.25	1.19	0.95	33.95	19.13	1.65
16000	6.96	14.24	7.64	16.18	1.19	0.92	33.98	19.40	1.74
17000	6.34	13.41	7.55	15.17	1.18	0.90	32.88	19.09	1.65
18000	5.57	12.67	7.14	12.93	1.16	0.87	34.99	17.75	1.88
19000	4.69	12.02	6.59	11.27	1.15	0.86	35.73	16.63	2.32
20000	3.80	11.34	6.21	10.19	1.15	0.84	36.37	13.52	2.94

Typical Performance Curves

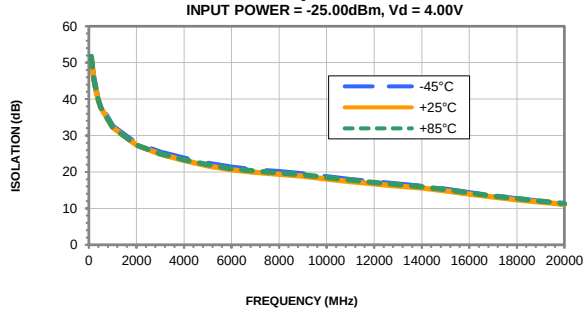
GAIN vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V



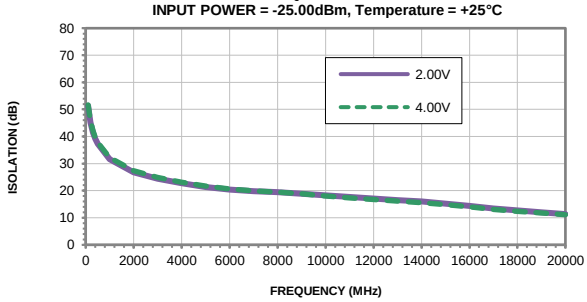
GAIN vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



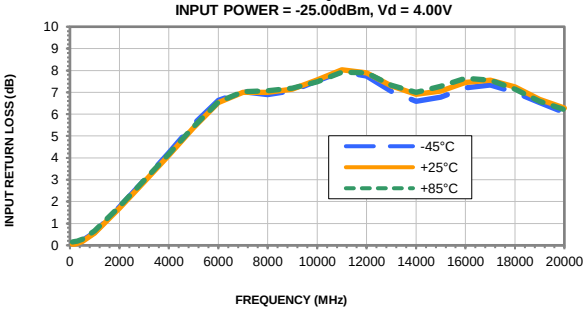
ISOLATION vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V



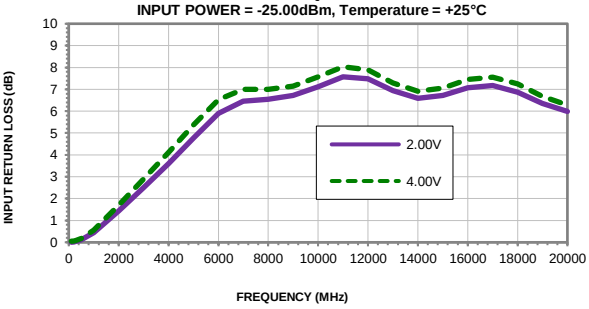
ISOLATION vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



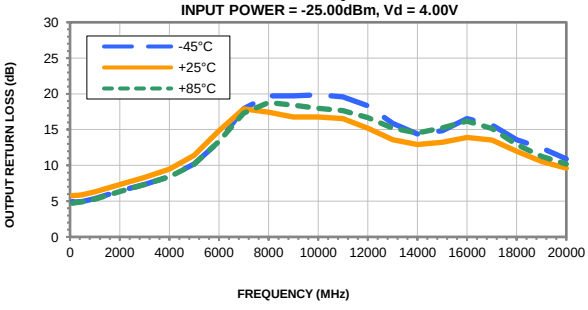
INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V



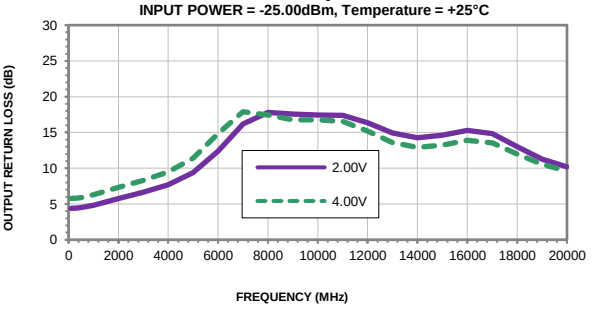
INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C



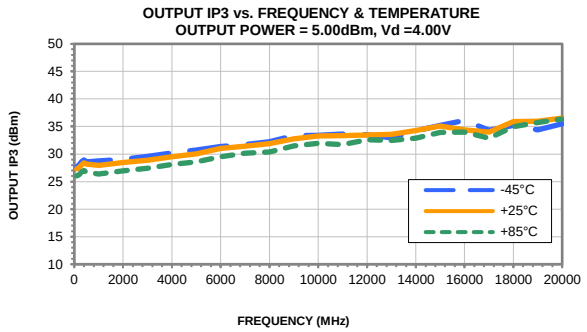
OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE
INPUT POWER = -25.00dBm, Vd = 4.00V

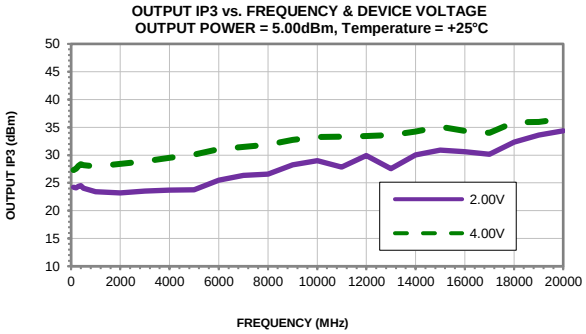


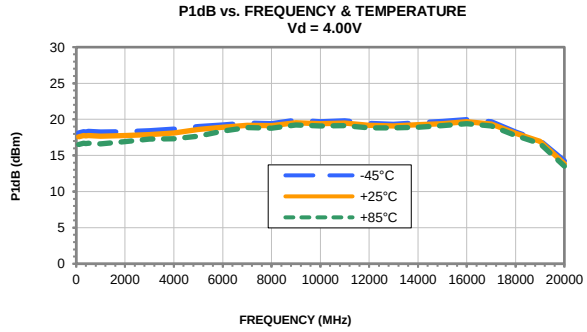
OUTPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE
INPUT POWER = -25.00dBm, Temperature = +25°C

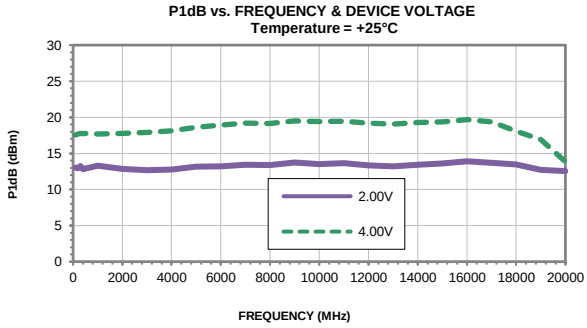


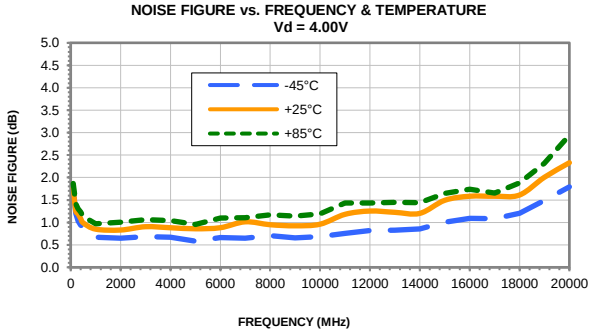
Typical Performance Curves

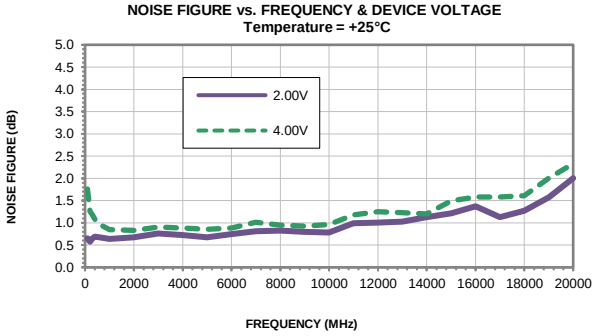


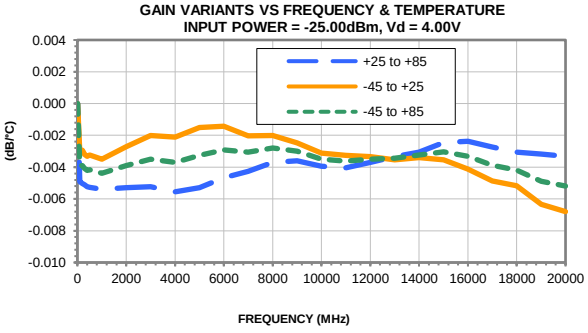










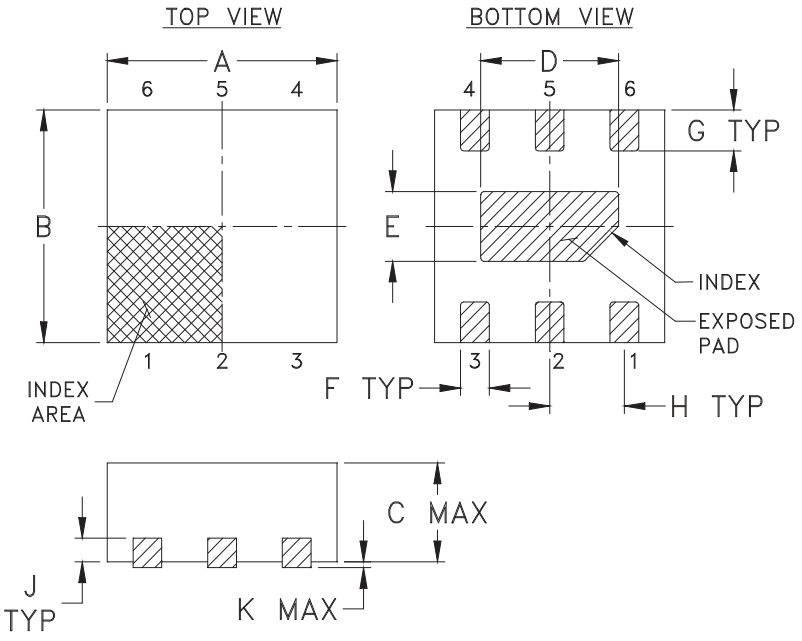


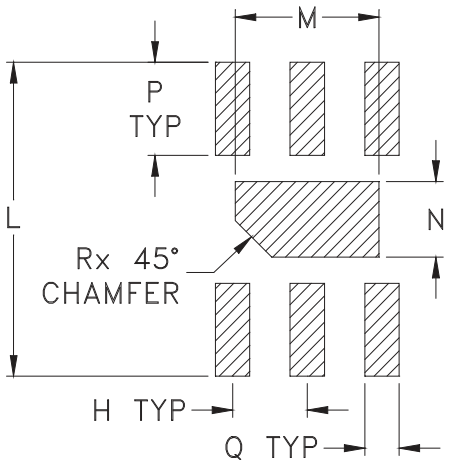
Case Style MC

MC1630-1

Outline Dimensions

PCB Land Pattern





Suggested Layout,
Tolerance to be within ±.002

CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
MC1630-1	.079 (2.00)	.079 (2.00)	.039 (1.00)	.047 (1.20)	.024 (.60)	.010 (.25)	.014 (.35)	.026 (.65)	.008 (.20)	.002 (.05)	.106 (2.70)	.049 (1.25)	.026 (.65)	.031 (.80)

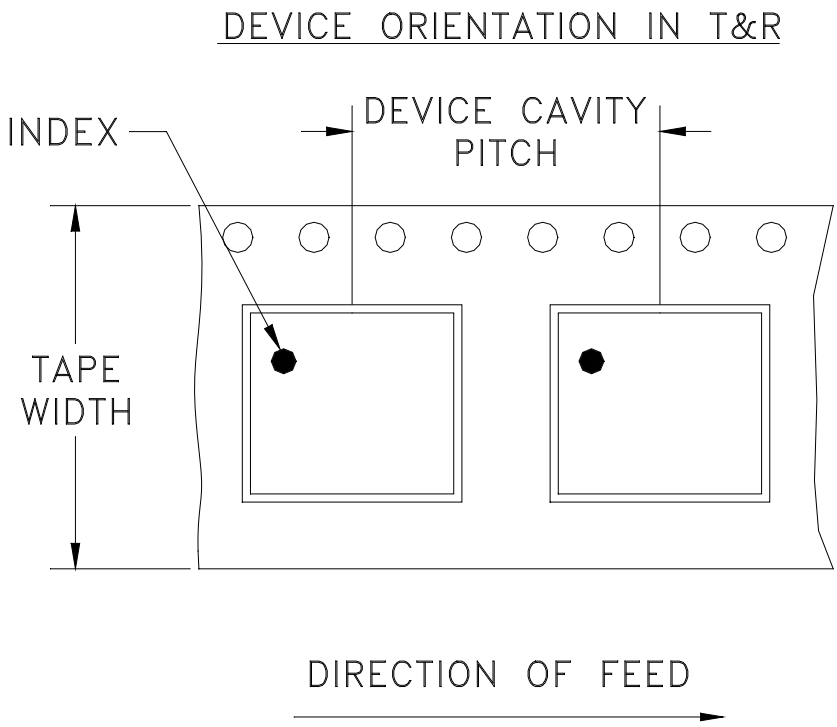
CASE #.	Q	R	WT, GRAM
MC1630-1	.012 (.30)	.012 (.30)	.006

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin-Silver over Nickel plated or Matte-Tin plated (See Data sheet).
   All models, (+) suffix.
3. Lead #1 identifier shall be located in the cross-hatched area shown.
   Identifier may be either a molded or marked feature.

Tape & Reel Packaging TR-F66



Tape Width, mm	Device Cavity Pitch, mm	Reel Size, inches	Devices per Reel see note	
8	4	7	Small quantity standard	20
				50
				100
				200
				500
		7	Standard	1000, 2000, 3000

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.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

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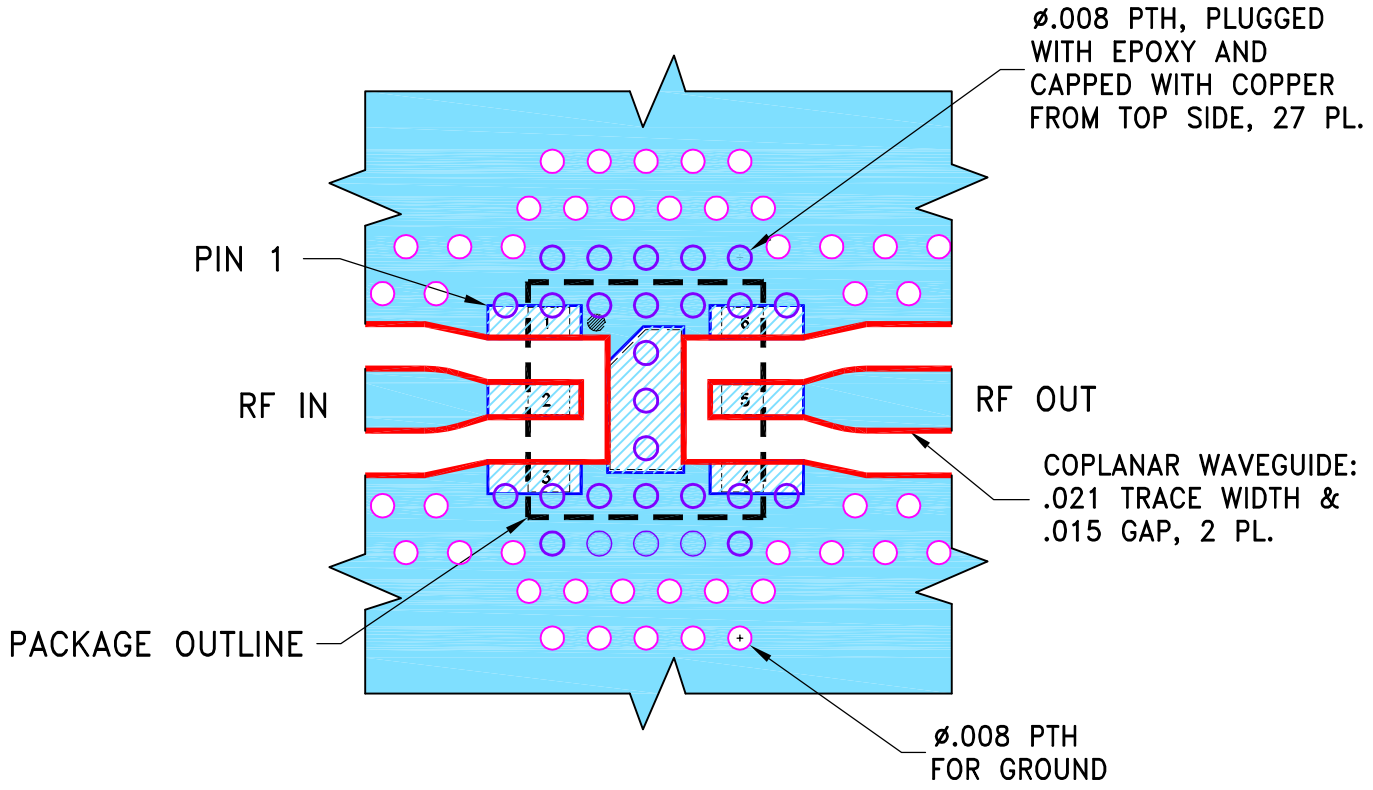
THIRD ANGLE PROJECTION

REVISIONS					
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
0R	ECO-000832	NEW RELEASE	11/27/19	GF	RS

SUGGESTED MOUNTING CONFIGURATION FOR MC1630-1 CASE STYLE,



NOTES:

1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010±.001. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB 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	DRAWN	GF	11/27/19
TOLERANCES ON:	CHECKED	IL	11/27/19
2 PL DECIMALS ±	APPROVED	RS	11/27/19
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

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

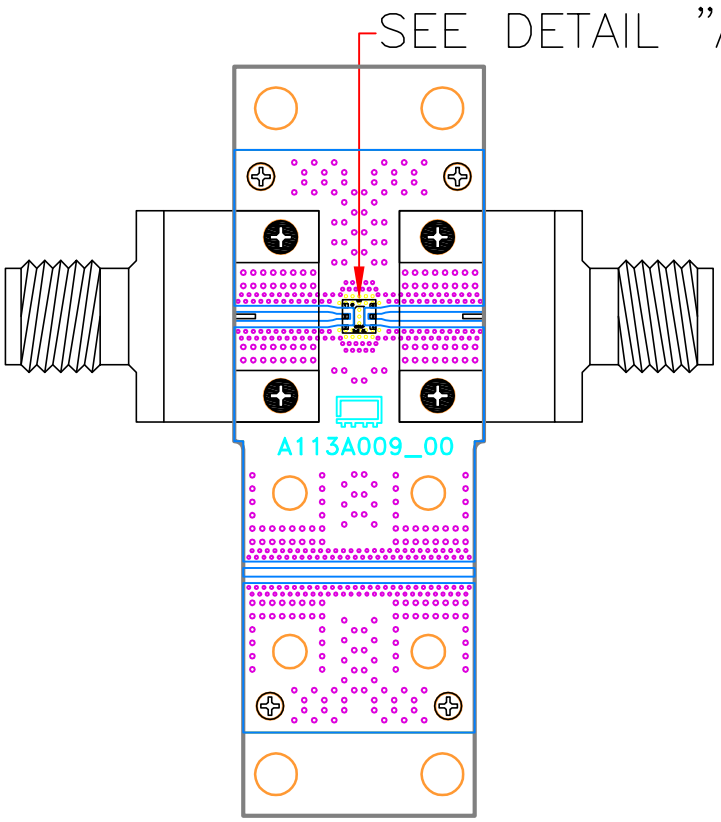
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

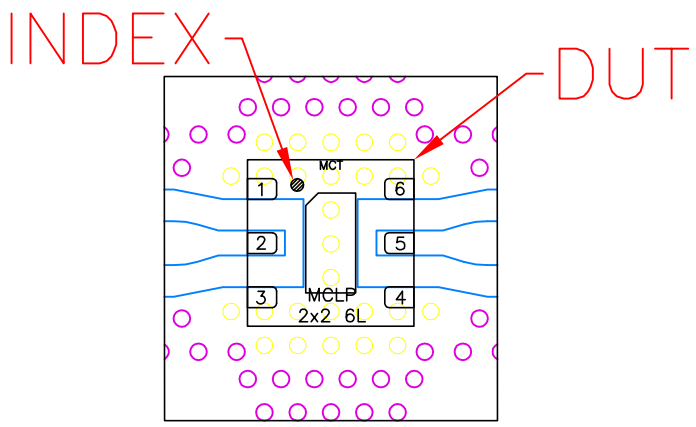
PL, MC1630-1, TB-TAV2-14LN+

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-659	0R

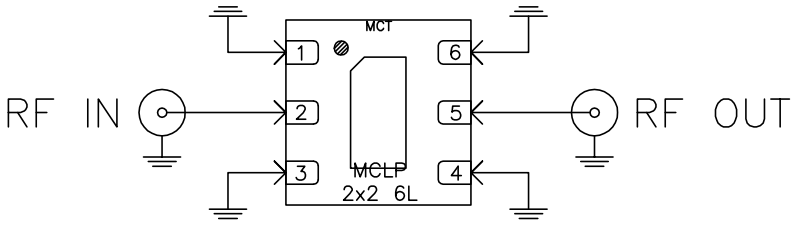
FILE:	SCALE:	SHEET:
98PL659	15:1	1 OF 1

Evaluation Board and Circuit

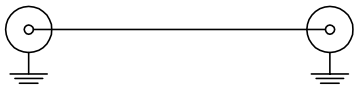




DETAIL "A"
(SCALE 5:1)



THRU LINE



SCHEMATIC DIAGRAM

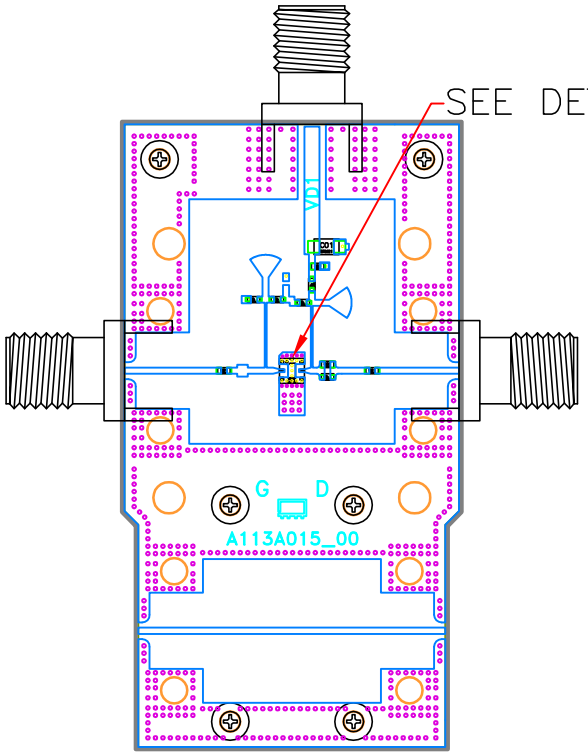
Function	Pad
RF IN	2
RF OUT	5
GND	1,3,4,6

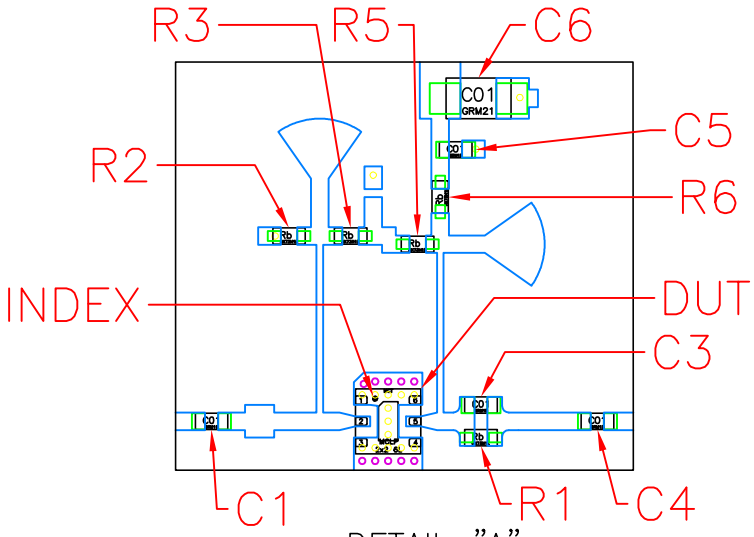
Notes:

1. 2.92mm Female Connectors.
2. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.010 inch

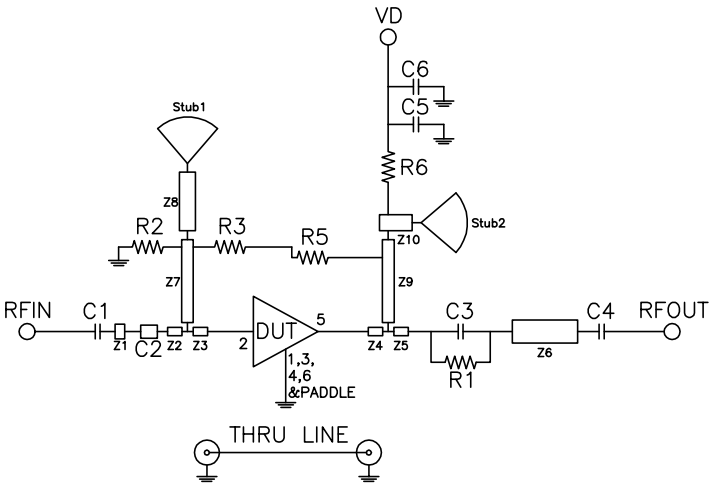
Mini-Circuits®

Evaluation Board and Circuit





DETAIL "A"
LOCATION OF INTERCONNECTOR
AND UNITS COMPONENTS
(SCALE 3:1)



SCHEMATIC DIAGRAM

Component	Size	Value	Part Number	Manufacturer
C1	0402	1pF	GRM1555C1H1R0CA01D	Murata
C2	Low-Zc microstrip as 0.15pF shunt capacitor to GND (refer to PCB layout for dimensions)			
C3	0402	0.3pF	GJM1555C1HR30BB01D	Murata
C4	0402	1pF	GRM1555C1H1R0CA01D	Murata
C5	0402	3.3pF	GRM1555C1H3R3CA01D	Murata
C6	0805	1uF	GRM21BR71C105KA01L	Murata
R1	0402	33Ohm	RK73H1ETTP33R0F	Koa
R2	0402	5.6KOhm	RK73H1ETTP5601F	Koa
R3	0402	8.2KOhm	RK73H1ETTP8201F	Koa
R5	0402	4.7KOhm	RK73H1ETTP4701F	Koa
R6	0402	43Ohm	RK73H1ETTP43R0F	Koa
Stub1, Stub2	Radial stubs of length = 1.75mm, angle = 70 deg, input line width = 0.54mm			
Z1-Z10	Transmission-line matching elements, refer to PCB layout for physical dimensions			

Notes:

1. SMA Female Connectors.
2. PCB Material: Roger RO4350B or equivalent, Dielectric constant=3.5, Thickness=0.010 inch

Mini-Circuits®

Mini-Circuits

Environmental Specifications **ENV08T1**

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 or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C or -65° to 150° Ambient Environment	Individual Model Data Sheet
HTOL	1000 hours at 125°C	MIL-STD-883, Method 1005, Condition B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Mechanical Shock	1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only	MIL-STD-883, Method 2002, Condition B, except Y1 direction only
Vibration (Variable Frequency)	50g peak	MIL-STD-883, Method 2007, Condition B
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102, Condition C
HAST	130°C, 85% RH, 96 hours	JESD22-A110
Solderability	10X Magnification	J-STD-002, Para 4.2.5, Test S, 95% Coverage
Solder Reflow Heat	Sn-Pb Eutetic Process: 240°C peak Pb-Free Process: 260°C peak	J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1
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-020

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Specification	Test/Inspection Condition	Reference/Spec
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