

2 Way-0° 50Ω 1150 to 1950 MHz

## The Big Deal

- Exceptional amplitude unbalance, 0.05 dB typ. at 1550 MHz
- Good phase unbalance, 0.8 deg. typ.
- Tiny Size, 1.4 mm x 2.0 mm
- Excellent power handling, 1.5W



CASE STYLE: MC2601

## Product Overview

Mini-Circuits' NP2G+ is a MMIC 2-way 0° splitter/combiner designed for narrowband operation from 1150 to 1950 MHz supporting many applications requiring high performance across a narrowband frequency range including the GPS, Radar, mobile and radio navigation. This model provides excellent power handling up to 1.5W (as a splitter) with low insertion loss, good isolation, and low phase and amplitude unbalance in a tiny 1.4 x 2.0 mm, 6-Lead MCLP package. Manufactured using Silicon IPD\* process technology.

## Key Features

Feature	Advantages
Wide range of applications	One power splitter can be used in the GPS, Radar, mobile and radio navigation.
Tiny size, 1.4 x 2.0 mm, 6-Lead MCLP package	Tiny foot print saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.
Good Isolation, 19 dB typ. 1400 to 1650 MHz	Minimizes interference between input ports.

\*IPD (Integrated passive device)

# Power Splitter/Combiner

2 Way-0° 50Ω 1150 to 1950 MHz

### Features

- Excellent amplitude unbalance, 0.05 dB typ. at 1550 MHz
- Good phase unbalance, 0.8 deg. typ.
- Small size, 1.4mm x 2.0mm
- Aqueous washable

### Applications

- GPS
- Radar
- Mobile
- Radio navigation



CASE STYLE: MC2601

### +RoHS Compliant

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

### Electrical Specifications<sup>1</sup> at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		1150		1950	MHz
Insertion Loss above 3.0 dB	1150 - 1950	—	0.4	1.1	dB
	1400 - 1650	—	0.3	0.9	
Isolation	1150 - 1950	9	20	—	dB
	1400 - 1650	18	29	—	
Phase Unbalance	1150 - 1950	—	0.8	4	Degree
	1400 - 1650	—	0.6	4	
Amplitude Unbalance	1150 - 1950	—	0.1	0.4	dB
	1400 - 1650	—	0.1	0.4	
VSWR (Input)	1150 - 1950	—	1.3	—	dB
	1400 - 1650	—	1.2	—	
VSWR (Output)	1150 - 1950	—	1.3	—	dB
	1400 - 1650	—	1.2	—	

1. Tested on Mini-Circuits Test Board TB-1059+

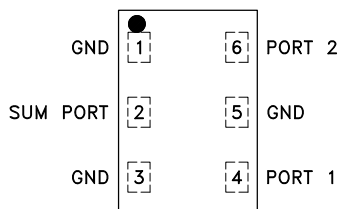
### Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-65°C to 150°C
Power Input (as a splitter)	1.5W at 25°C
Internal Dissipation (as a combiner)	0.75W at 25°C

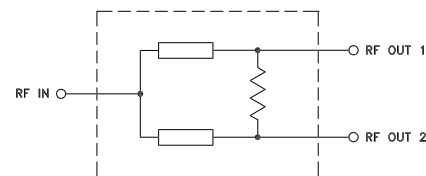
Permanent damage may occur if any of these limits are exceeded

### Pad Connections

Function	Pad Number
SUM PORT	2
PORT 1	4
PORT 2	6
GND	1,3,5



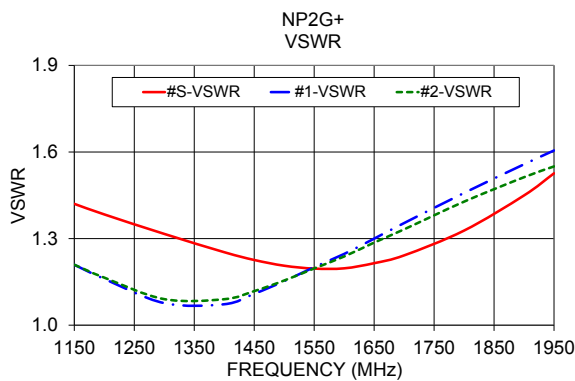
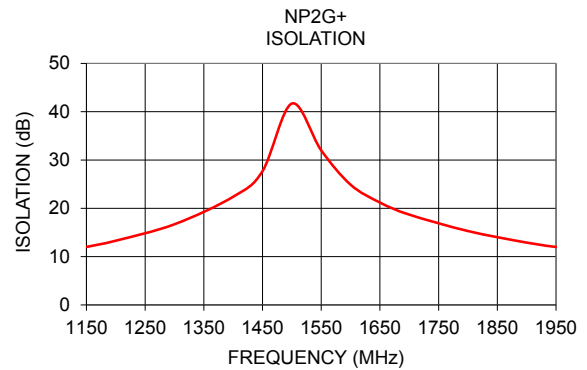
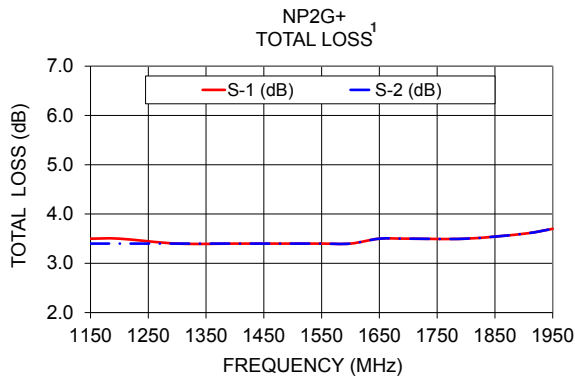
### Simplified Electrical Schematic



Typical Performance Data

Frequency (MHz)	Total Loss <sup>1</sup> (dB)		Amplitude Unbalance (dB)	Isolation (dB)	Phase Unbalance (deg.)	VSWR S	VSWR 1	VSWR 2
	S-1	S-2						
1150	3.50	3.40	0.03	12.00	0.20	1.42	1.21	1.21
1200	3.50	3.40	0.02	13.30	0.20	1.38	1.16	1.16
1300	3.40	3.40	0.02	16.70	0.20	1.32	1.08	1.09
1400	3.40	3.40	0.01	22.40	0.30	1.25	1.07	1.09
1450	3.40	3.40	0.01	27.70	0.40	1.23	1.11	1.12
1500	3.40	3.40	0.01	41.70	0.40	1.21	1.15	1.15
1550	3.40	3.40	0.01	32.00	0.50	1.20	1.20	1.20
1600	3.40	3.40	0.01	24.90	0.50	1.20	1.25	1.24
1650	3.50	3.50	0.01	21.20	0.60	1.21	1.30	1.29
1700	3.50	3.50	0.01	18.70	0.60	1.24	1.35	1.33
1800	3.50	3.50	0.02	15.30	0.70	1.33	1.46	1.43
1900	3.60	3.60	0.05	12.90	0.80	1.45	1.56	1.51
1950	3.70	3.70	0.07	12.00	0.80	1.53	1.61	1.55

1. Total Loss = Insertion Loss + 3dB splitter loss.



<b>Additional Detailed Technical Information</b>	
<i>additional information is available on our dash board. To access this information <a href="#">click here</a></i>	
<b>Performance Data</b>	Data Table
	Swept Graphs
	S-Parameter (S3P Files) Data Set (.zip file)
<b>Case Style</b>	MC2601 <i>Plastic package, exposed paddle</i> <i>lead finish: Matte Tin</i>
<b>Tape &amp; Reel</b> Standard quantities available on reel	F104 <i>7" reels with 20, 50, 100, 200, 500, 1000 and 2000 devices</i>
<b>Suggested Layout for PCB Design</b>	PL-609
<b>Evaluation Board</b>	TB-1059+
<b>Environmental Ratings</b>	ENV12

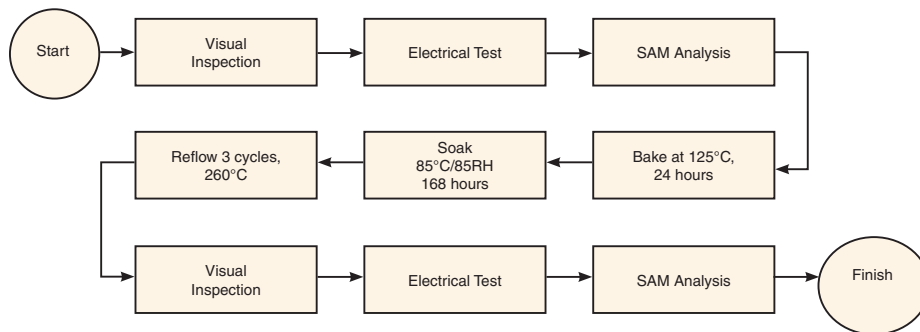
**ESD Rating**

Human Body Model (HBM): Class 1 (250 to <500V) in accordance with ANSI/ESD STM 5.1 - 2001

**MCL Rating**

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

**MSL Test Flow Chart**



**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/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



# 2 Way-0° Power Splitter/Combiner

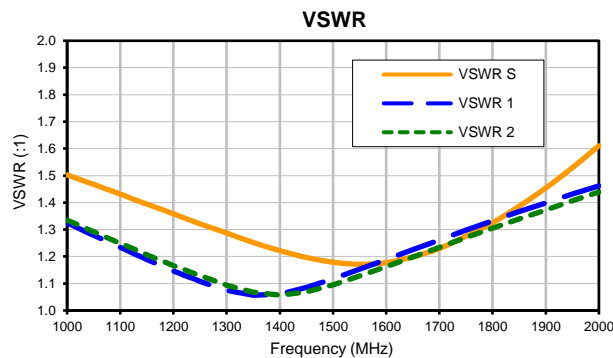
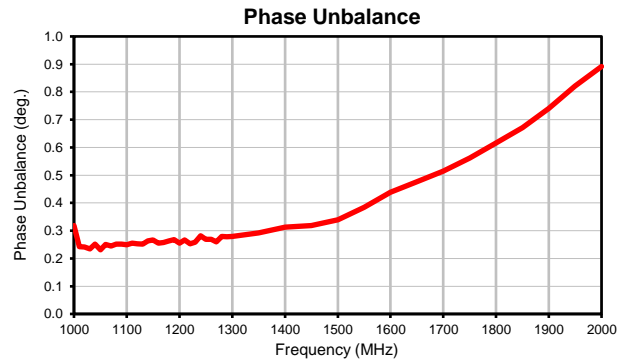
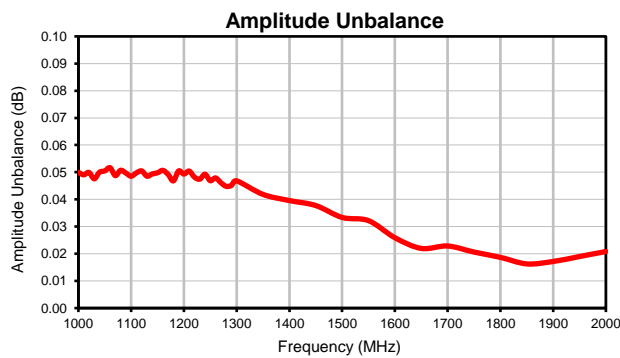
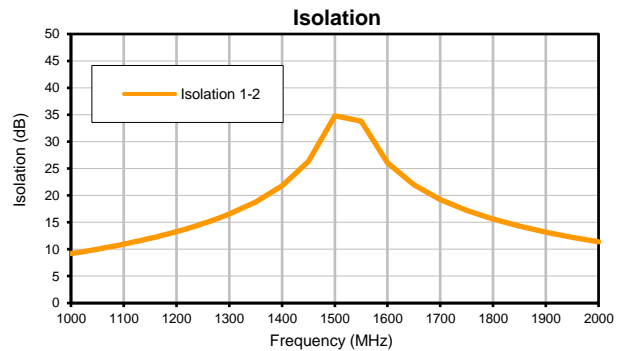
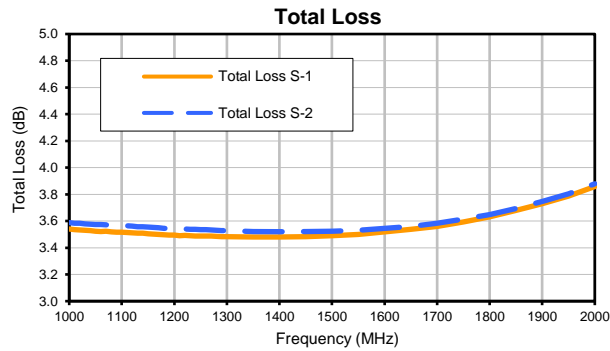
# NP2G+

## Typical Performance Data

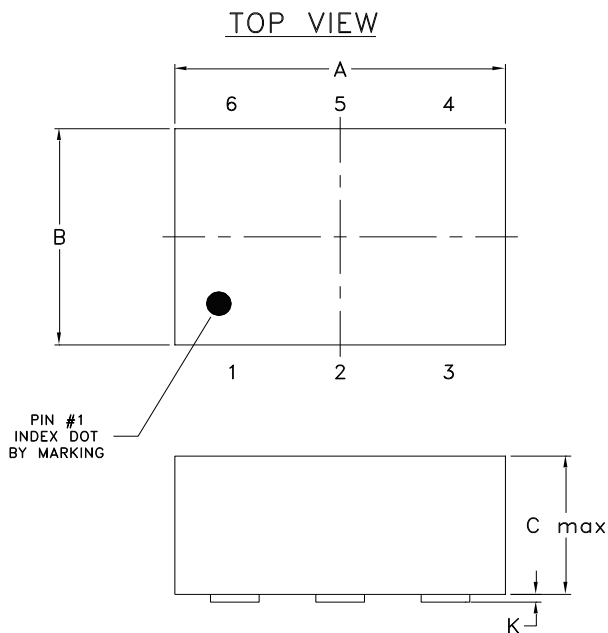
FREQUENCY (MHz)	TOTAL LOSS <sup>1</sup> (dB)		AMPLITUDE UNBALANCE (dB)	ISOLATION (dB) 1-2	PHASE UNBALANCE (deg.)	FREQUENCY (MHz)	VSWR (:1)		
	S-1	S-2					S	1	2
1000	3.54	3.59	0.05	9.19	0.32	1000	1.50	1.32	1.34
1010	3.53	3.58	0.05	9.35	0.24	1010	1.50	1.32	1.33
1020	3.53	3.58	0.05	9.51	0.24	1020	1.49	1.31	1.32
1030	3.53	3.58	0.05	9.67	0.23	1030	1.48	1.30	1.31
1040	3.53	3.58	0.05	9.84	0.25	1040	1.47	1.29	1.30
1050	3.52	3.57	0.05	10.01	0.23	1050	1.47	1.28	1.29
1060	3.52	3.57	0.05	10.19	0.25	1060	1.46	1.27	1.28
1070	3.52	3.57	0.05	10.37	0.24	1070	1.45	1.26	1.27
1080	3.52	3.57	0.05	10.56	0.25	1080	1.45	1.25	1.27
1090	3.52	3.57	0.05	10.75	0.25	1090	1.44	1.24	1.26
1100	3.52	3.56	0.05	10.95	0.25	1100	1.43	1.23	1.25
1110	3.51	3.56	0.05	11.16	0.26	1110	1.42	1.23	1.24
1120	3.51	3.56	0.05	11.36	0.25	1120	1.42	1.22	1.23
1130	3.51	3.56	0.05	11.57	0.25	1130	1.41	1.21	1.22
1140	3.51	3.56	0.05	11.79	0.26	1140	1.40	1.20	1.22
1150	3.51	3.55	0.05	12.02	0.27	1150	1.39	1.19	1.21
1160	3.50	3.55	0.05	12.25	0.25	1160	1.39	1.18	1.20
1170	3.50	3.55	0.05	12.49	0.26	1170	1.38	1.17	1.19
1180	3.50	3.55	0.05	12.74	0.26	1180	1.37	1.16	1.18
1190	3.49	3.54	0.05	13.00	0.27	1190	1.37	1.15	1.17
1200	3.49	3.54	0.05	13.27	0.25	1200	1.36	1.15	1.17
1210	3.49	3.54	0.05	13.55	0.27	1210	1.35	1.14	1.16
1220	3.49	3.54	0.05	13.83	0.25	1220	1.34	1.13	1.15
1230	3.49	3.54	0.05	14.12	0.26	1230	1.34	1.12	1.14
1240	3.49	3.54	0.05	14.44	0.28	1240	1.33	1.12	1.14
1250	3.49	3.53	0.05	14.75	0.27	1250	1.32	1.11	1.13
1260	3.49	3.54	0.05	15.08	0.27	1260	1.31	1.10	1.12
1270	3.49	3.53	0.05	15.42	0.26	1270	1.31	1.09	1.11
1280	3.49	3.53	0.04	15.78	0.28	1280	1.30	1.09	1.11
1290	3.48	3.53	0.05	16.15	0.28	1290	1.29	1.08	1.10
1300	3.48	3.53	0.05	16.54	0.28	1300	1.29	1.08	1.09
1350	3.48	3.52	0.04	18.78	0.29	1350	1.25	1.06	1.07
1400	3.48	3.52	0.04	21.78	0.31	1400	1.22	1.06	1.06
1450	3.48	3.52	0.04	26.29	0.32	1450	1.20	1.09	1.07
1500	3.49	3.52	0.03	34.80	0.34	1500	1.18	1.12	1.10
1550	3.50	3.53	0.03	33.83	0.38	1550	1.17	1.15	1.13
1600	3.52	3.54	0.03	26.08	0.44	1600	1.18	1.19	1.16
1650	3.54	3.56	0.02	21.94	0.48	1650	1.20	1.23	1.20
1700	3.56	3.58	0.02	19.24	0.51	1700	1.23	1.26	1.23
1750	3.59	3.61	0.02	17.21	0.56	1750	1.28	1.30	1.27
1800	3.63	3.65	0.02	15.61	0.62	1800	1.33	1.33	1.30
1850	3.68	3.69	0.02	14.28	0.67	1850	1.39	1.37	1.34
1900	3.73	3.75	0.02	13.17	0.74	1900	1.45	1.40	1.37
1950	3.79	3.80	0.02	12.21	0.82	1950	1.53	1.43	1.41
2000	3.86	3.88	0.02	11.37	0.89	2000	1.61	1.46	1.44

<sup>1</sup>Total Loss = Insertion Loss + 3dB Splitter Loss

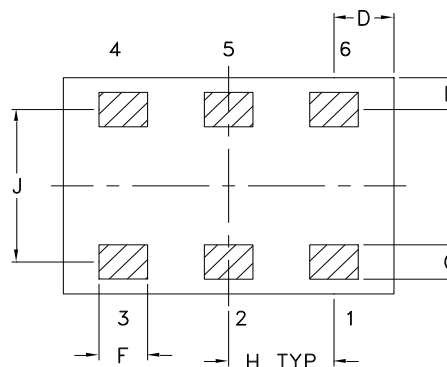
## Typical Performance Curves



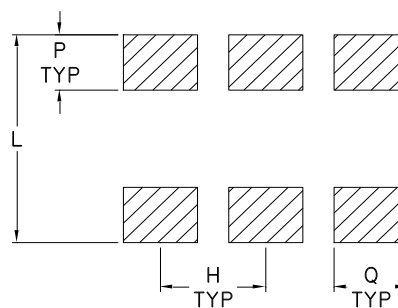
### Outline Dimensions



### BOTTOM VIEW



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.02$

CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
MC2601	.080 (2.040)	.055 (1.390)	.035 (0.90)	.015 (0.370)	.008 (0.205)	.012 (0.300)	.009 (0.220)	.026 (0.650)	.039 (0.980)	.002 (0.050)	.053 (1.336)	-	-	.014 (0.356)

CASE #.	Q	R	WT, GRAM
MC2601	.018 (0.457)	-	.006

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

### Notes:

1. Case material: Plastic.
2. Termination finish:  
For RoHS Case Styles: Matte Tin plate. All models, (+) suffix.
3. The terminal #1 identifier may be either a molded or marked feature.  
The terminal #1 identifier must be located in the zone indicated.



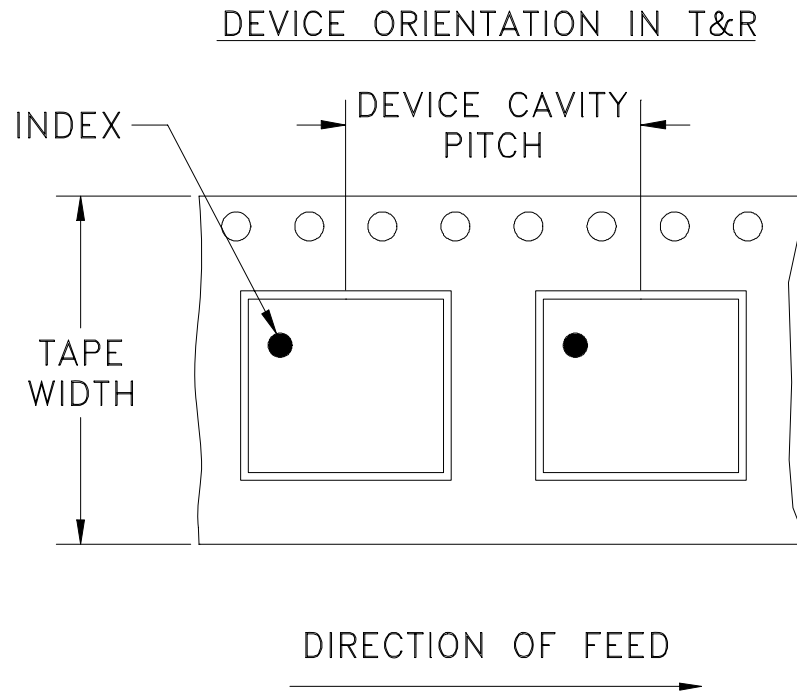
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F104



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

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](http://www.minicircuits.com/pages/pdfs/tape.pdf)



INTERNET <http://www.minicircuits.com>

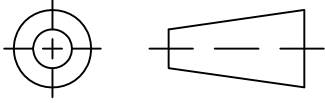
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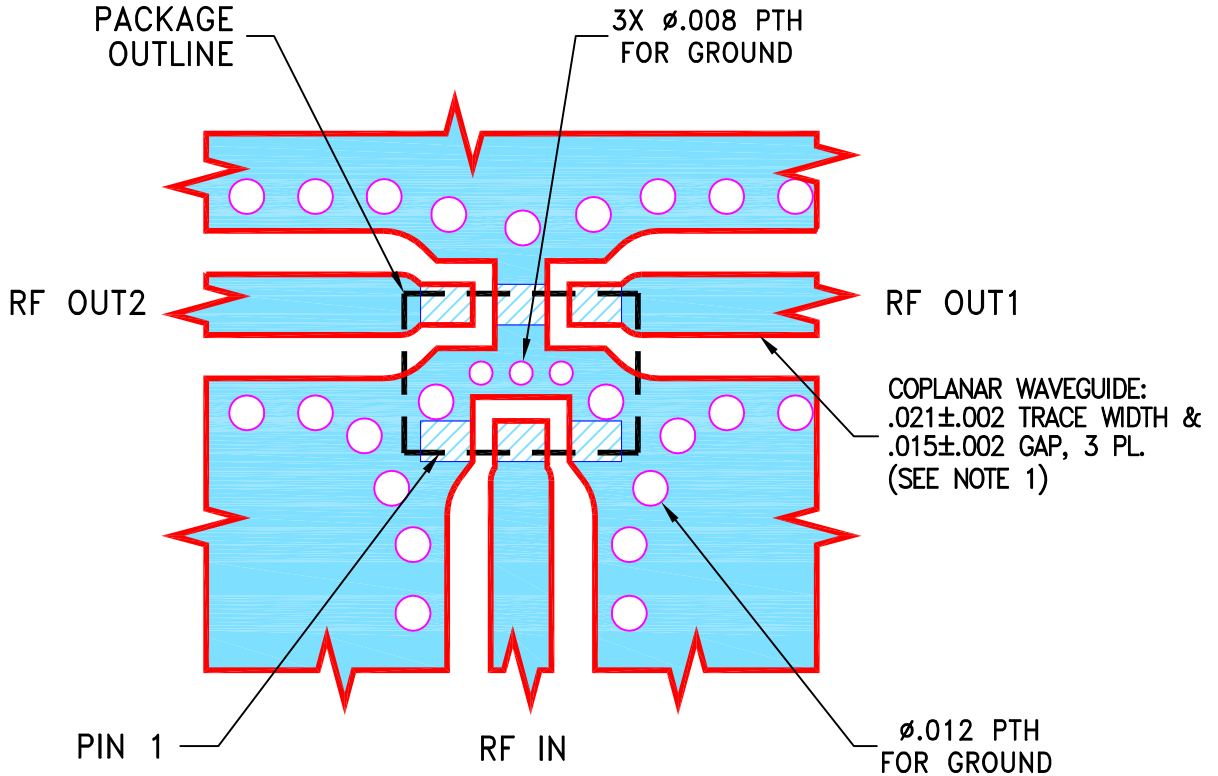
THIRD ANGLE PROJECTION



REVISIONS

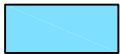
REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M169871	NEW RELEASE	09/06/18	ITG	RS

SUGGESTED MOUNTING CONFIGURATION  
FOR MC2601 CASE STYLE, "06SP14" PIN CODE

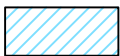


NOTES:

1. TRACE WIDTH AND GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010 $\pm$ .001. COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND 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 TOLERANCES ON: 2 PL DECIMALS $\pm$ 3 PL DECIMALS $\pm$ .005 ANGLES $\pm$ FRACTIONS $\pm$	DRAWN	ITG 09/06/18
	CHECKED	GF 09/06/18
	APPROVED	RS 09/06/18



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Brooklyn NY 11235

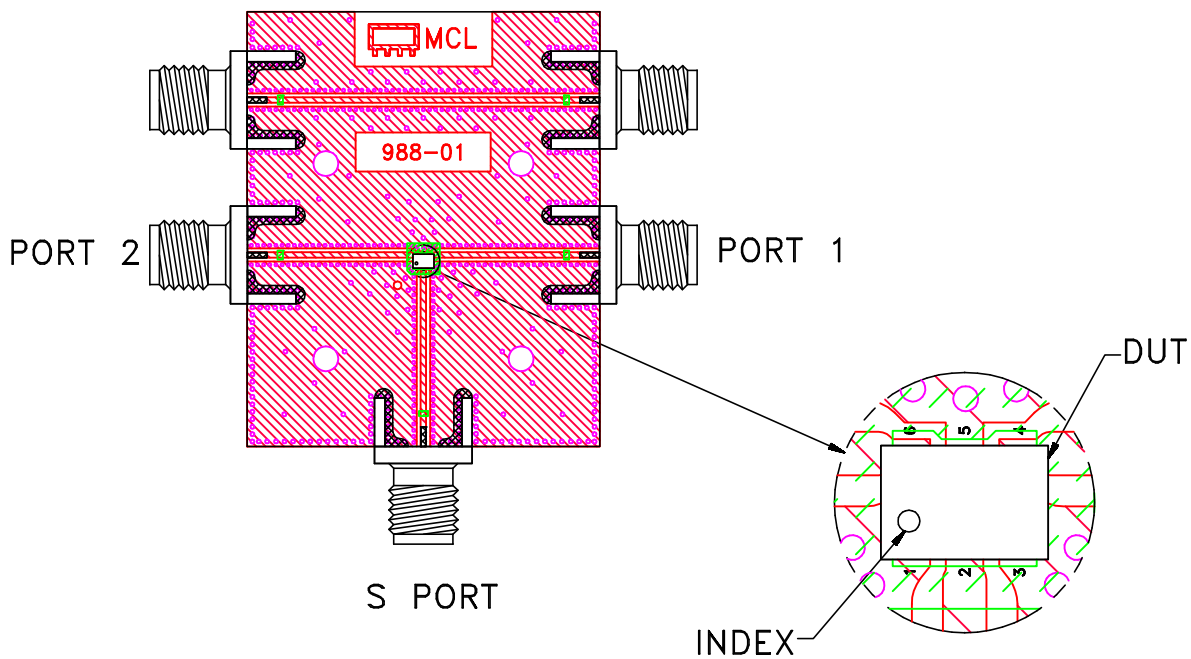
PL, 06SP14, MC2601, TB-1059+

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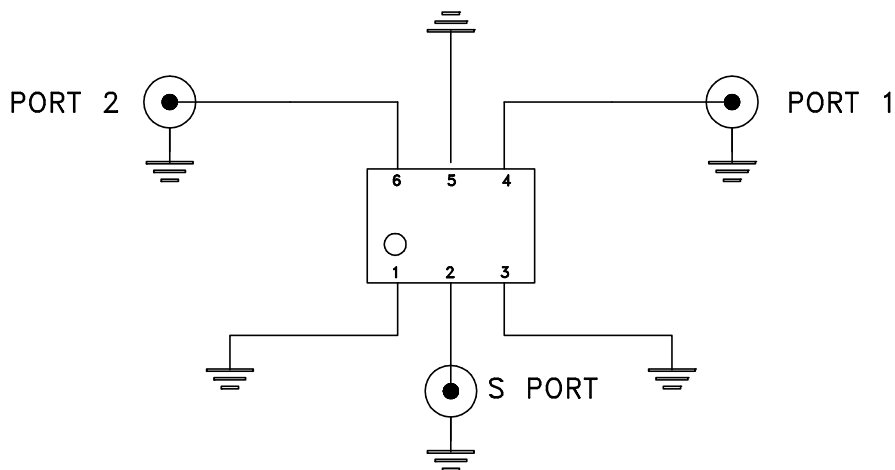
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SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-609	OR
FILE:	98PL609	SCALE: 15:1	SHEET: 1 OF 1

# Evaluation Board and Circuit




TB-1059+



Schematic Diagram

## Notes:

1. 50 Ohm 2.40mm Female end launch connectors.
2. PCB Material: R04350 or equivalent,  
Dielectric Constant=3.5, Thickness=.010 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	-65° to 150° C Ambient Environment	Individual Model Data Sheet
Autoclave	15 psig, 100% RH, 121°C, 96 hours	JESD22-A102-C, Condition C
Temperature Cycling	-65° to 150°C, 100 cycles	JESD22-A104
Temperature Humidity	85°C/ 85% RH, 168 hours	JESD22-113
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 240°C peak (Non-RoHS) or 260°C (RoHS)	J-STD-020
Solderability	10X magnification, 95% coverage	JESD22-B102, Method 1: Dip and Look Test
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D