

Bi-Directional Coupler

5 - 55 GHz



MACP-011096
Rev. V3

Features

- Broadband: 5 to 55 GHz
- Low Insertion Loss: 1 dB @ 50 GHz
- High Isolation: 40 dB @ 30 GHz
- Coupling Factor: 18 dB
- Miniature Lead-Free Surface Mount Package
- RoHS* Compliant

Applications

- Test and Measurement

Description

The MACP-011096 is a fully integrated 5 - 55 GHz bi-directional coupler, offering best in class RF performance in a miniature package.

MACOM's proprietary HMIC™ process enables market leading lightweight passive components. MACP-011096 weighs just 2 mg.

Ordering Information^{1,2}

Part Number	Package
MACP-011096	Gel Pack
MACP-011096-TR0100	100 Piece Reel
MACP-011096-TR0500	500 Piece Reel
MACP-011096-SB1	Sample Board

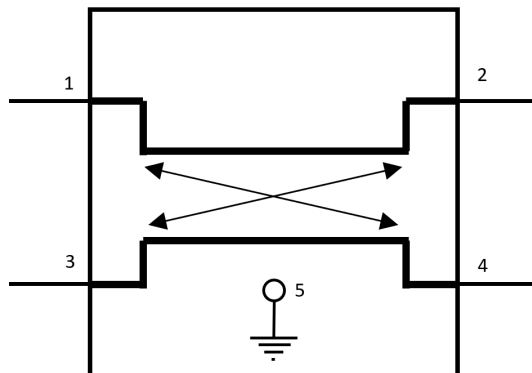
1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

Pin Description

Configuration	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
Configuration 1	Input	Output	Coupled	Isolated	Ground
Configuration 2	Output	Input	Isolated	Coupled	Ground
Configuration 3	Coupled	Isolated	Input	Output	Ground
Configuration 4	Isolated	Coupled	Output	Input	Ground

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Functional Schematic



Pin Names

Pin #	Function
1 - 4	R_{FIN} / R_{FOUT}
5	GND ³

3. The exposed die backside GND metal must be connected to RF, DC and thermal ground.

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AC Electrical Specifications: Freq. = 5 - 55 GHz, T_A = 25°C, Z₀ = 50 Ω, All Configurations

Parameter	Frequency Test Conditions (GHz)	Units	Min.	Typ.	Max.
Insertion Loss	5 - 15	dB	—	0.3	—
	15 - 45			0.6	
	45 - 55			1.0	
Coupling	5 - 15	dB	—	23	—
	15 - 45			18	
	45 - 55			25	
Return Loss, all ports	5 - 15	dB	—	30	—
	15 - 45			25	
	45 - 55			17	
Isolation	5 - 15	dB	—	50	—
	15 - 45			40	
	45 - 55			35	
Directivity	5 - 15	dB	—	27	—
	15 - 45			22	
	45 - 55			10	

Recommended Operating Conditions⁴

Parameter	Unit	Min.	Typ.	Max.
RF Input Power ⁵	dBm	—	—	33
DC Current ⁵	A	—	—	1.8
Operating Temperature	°C	-55	—	+105

4. All pins and frequencies.

5. See derating graph.

Absolute Maximum Ratings^{6,7}

Parameter	Unit	Min	Max
RF Input Power	dBm	—	41
DC Current	A	—	4
Storage Temperature	°C	-55	+105

6. Exceeding any one or combination of these limits may cause permanent damage to this device.

7. MACOM does not recommend sustained operation near these survivability limits.

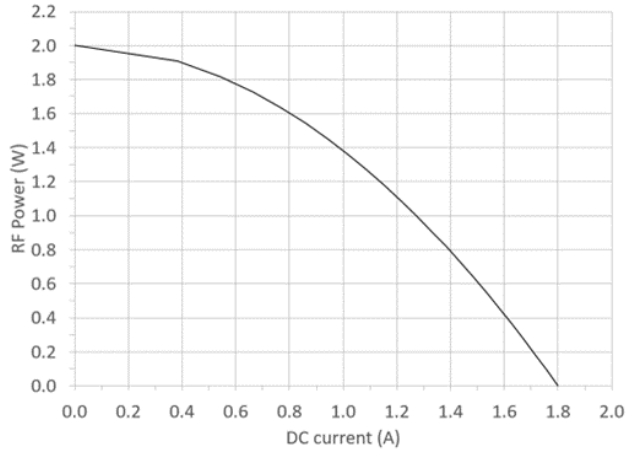
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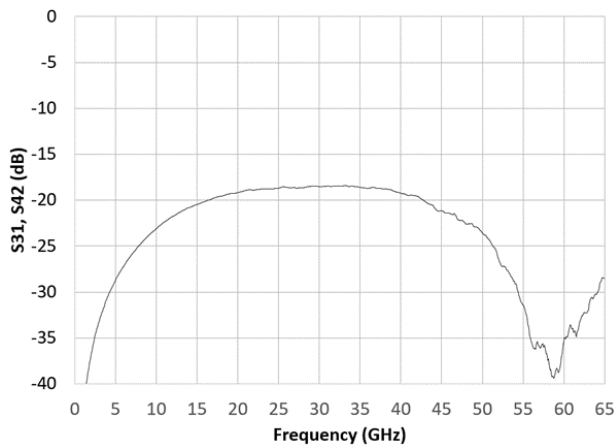
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De-Rating Curve @ $T_A = +105^\circ\text{C}$,
Maximum Operating RF Input Power vs. DC Input Current

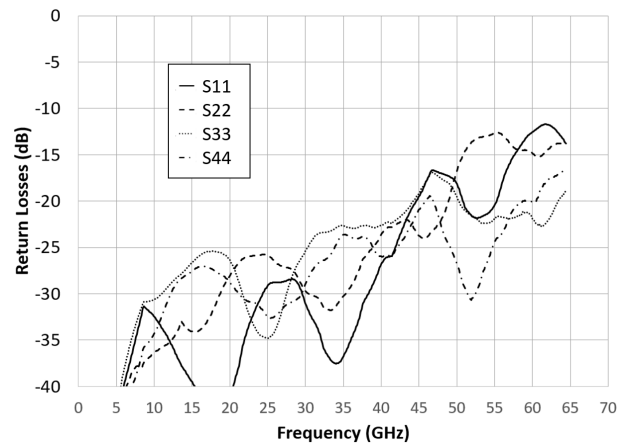


Typical Performance Curves: All Configurations

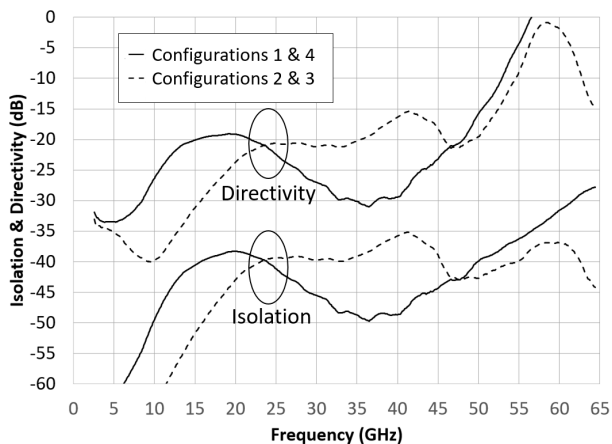
Coupling



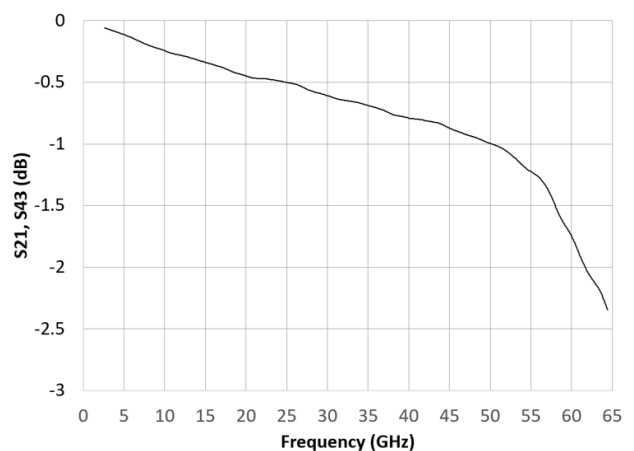
Return Loss



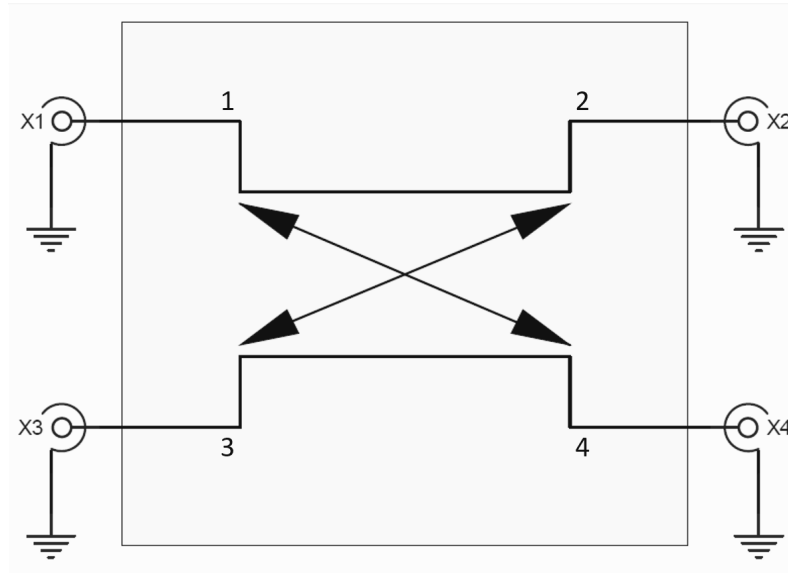
Isolation



Insertion Loss



Application Schematic



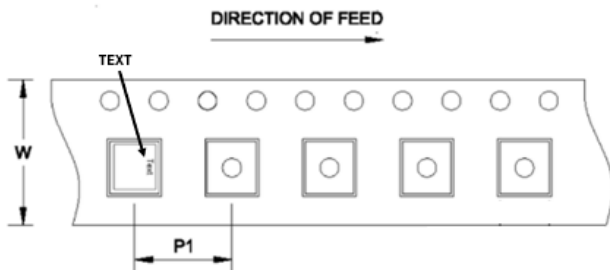
Mounting Techniques

Reference MACOM Application Note M538 for lead-free solder reflow recommendations. The gold plating on the back side of the die is 0.1 μm thick. For a suitable solder attach ensure the PCB is gold plated with a thickness of between 0.05 - 0.15 μm .

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Carrier Tape Orientation



Tape & Reel Information

Parameter	Units	Value
Qty per reel	—	100/500
Reel Size	mm	178
Tape Width	mm	12
P1	mm	8
Orientation	—	F3
Reference Application Note ANI-019 for orientation		

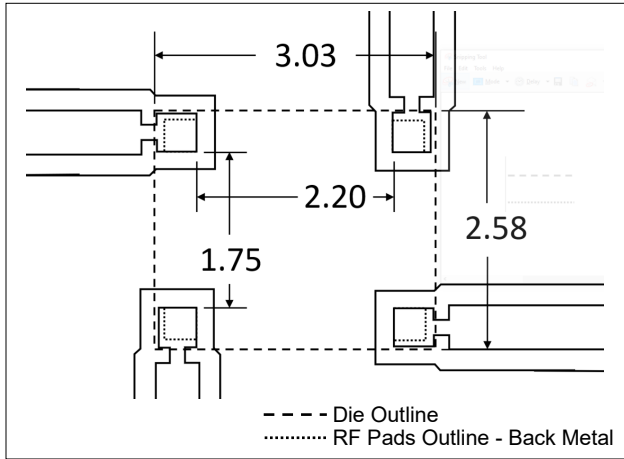
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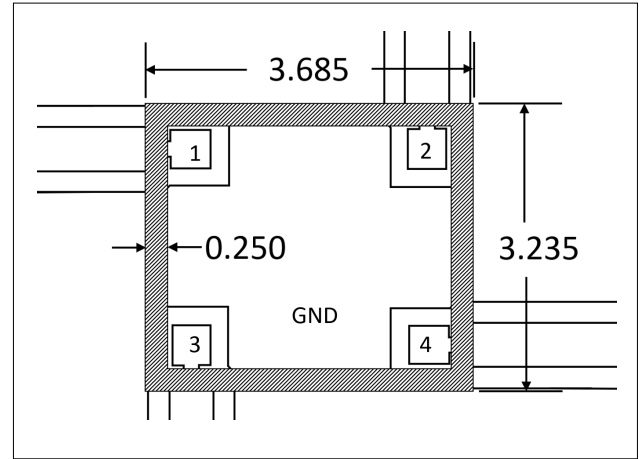


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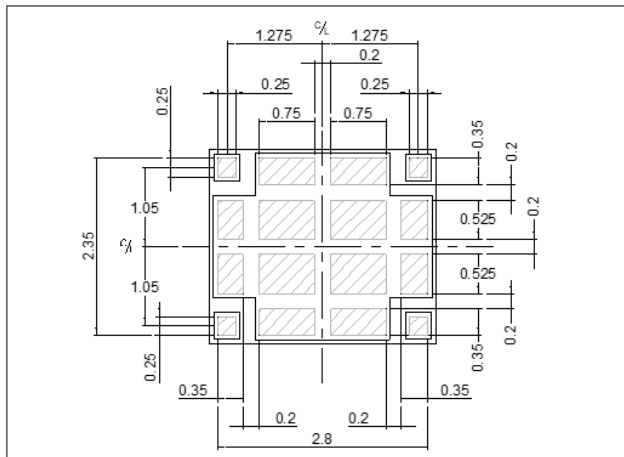
Recommended PCB footprint^{8,9}



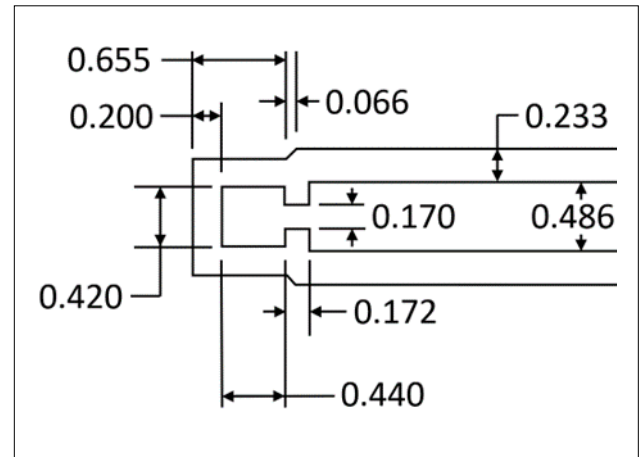
Solder Mask Coverage⁸



GND Metal Solder Paste Template^{8,9}



RF Line Dimensions^{8,10}



- 8. Dimensions in mm.
- 9. The exposed die backside GND metal must be connected to RF, DC and thermal ground.
- 10. Track dimensions apply to 44 μm thick copper on 0.254 mm Rogers 4350B.

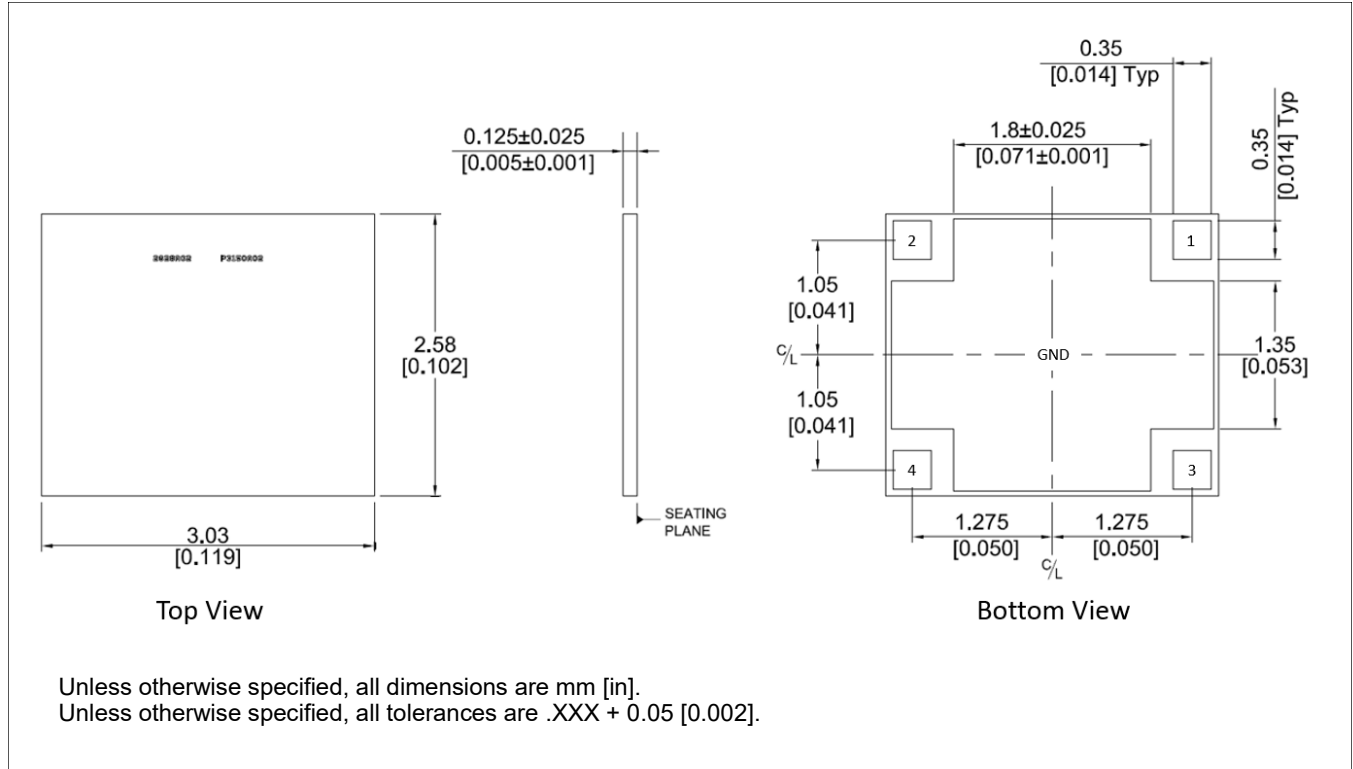
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Die Outline Drawing



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