

Directional Coupler

5 - 55 GHz



MACP-011113
Rev. V3

Features

- Broadband: 5 to 55 GHz
- Low Insertion Loss: 1 dB @ 50 GHz
- High Isolation: 35 dB @ 30 GHz
- Coupling Factor: 18 dB
- On-Chip 50 Ω Termination
- Miniature Lead-Free Surface Mount Package
- RoHS* Compliant

Applications

- Test and Measurement

Description

The MACP-011113 is a fully integrated 5 - 55 GHz directional coupler with a 50 Ohm on-chip termination, offering best in class RF performance in a miniature package.

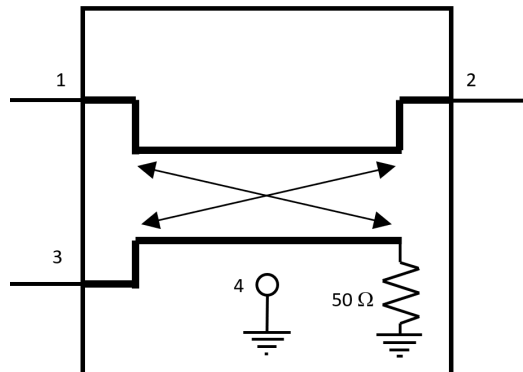
MACOM's proprietary HMIC™ process enables market leading lightweight passive components. MACP-011113 weighs just 2 mg.

Ordering Information^{1,2}

Part Number	Package
MACP-011113	Gel Pack
MACP-011113-TR0100	100 Piece Reel
MACP-011113-TR0500	500 Piece Reel
MACP-011113-SB1	Sample Board

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

Functional Schematic



Pin Names

Pin #	Function
1, 2	R_{FIN} / R_{FOUT}
3	Coupled Port
4	GND ³

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

Pin Description

Pin 1	Pin 2	Pin 3	Pin 4
Input	Output	Coupled	Ground

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

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AC Electrical Specifications: $T_A = 25^\circ\text{C}$, $Z_0 = 50 \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss	5 - 15 GHz	dB	—	0.3	—
	15 - 45 GHz			0.6	
	45 - 55 GHz			1.0	
Coupling	5 - 15 GHz	dB	—	23	—
	15 - 45 GHz			18	
	45 - 55 GHz			25	
Return Loss, S11 & S22	5 - 15 GHz	dB	—	35	—
	15 - 45 GHz			30	
	45 - 55 GHz			17	
Return Loss, S33	5 - 15 GHz	dB	—	22	—
	15 - 45 GHz			17	
	45 - 55 GHz			12	
Isolation	5 - 15 GHz	dB	—	45	—
	15 - 45 GHz			33	
	45 - 55 GHz			38	
Directivity	5 - 15 GHz	dB	—	22	—
	15 - 45 GHz			15	
	45 - 55 GHz			13	

Recommended Operating Conditions⁴

Parameter	Unit	Min.	Typ.	Max.
RF Input Power, port 3 (coupled port) ⁵	dBm	—	—	+12
RF Input Power, port 1 & 2 (through line) ⁵	dBm	—	—	+30
DC Current, port 3 (coupled port) ⁵	mA	—	—	16
DC Current, port 1 & 2 (through line) 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, port 3 (coupled port)	dBm	—	+23
RF Input Power, port 1 & 2 (through line)	dBm	—	+41
DC Current, port 3 (coupled port)	mA	—	50
DC Current, port 1 & 2 (through line)	A	—	4.0
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.

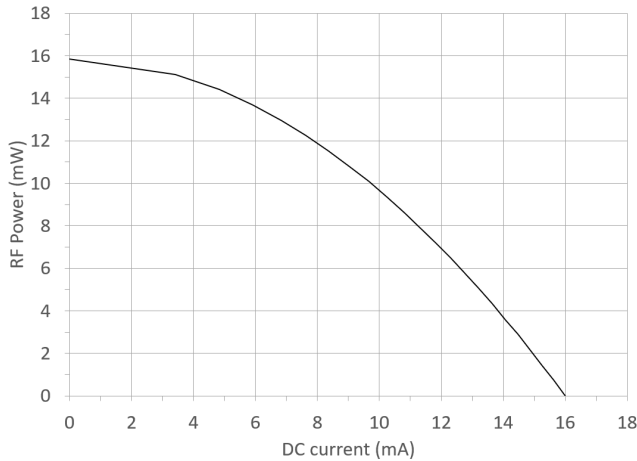
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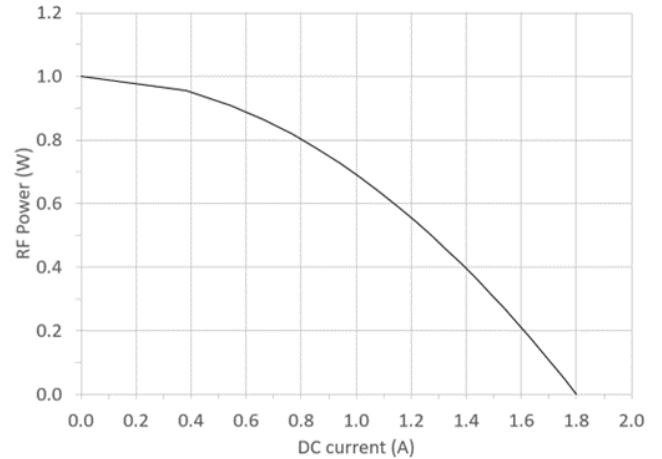


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**De-Rating Curve @ $T_A = +105^\circ\text{C}$,
Ports 3, Coupled Port:**
Maximum Operating RF Input Power vs. DC Input Current

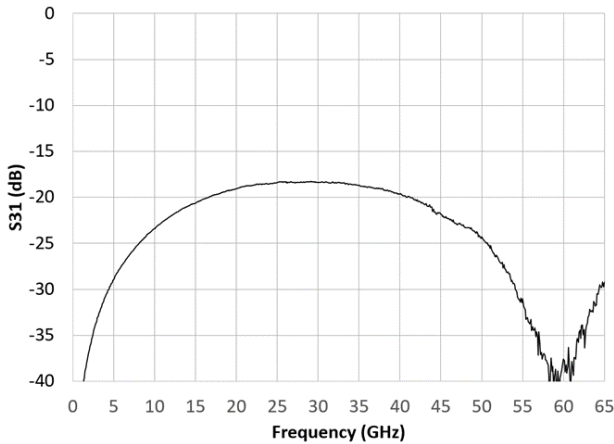


**De-Rating Curve @ $T_A = +105^\circ\text{C}$,
Ports 1 and 2, Through Line:**
Maximum Operating RF Input Power vs. DC Input Current

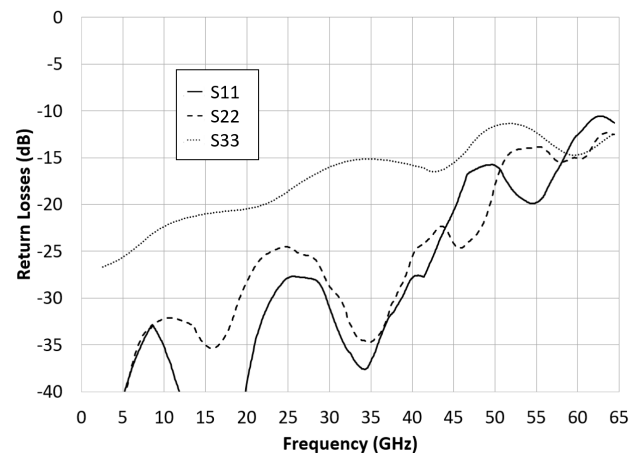


Typical Performance Curves: All Configurations

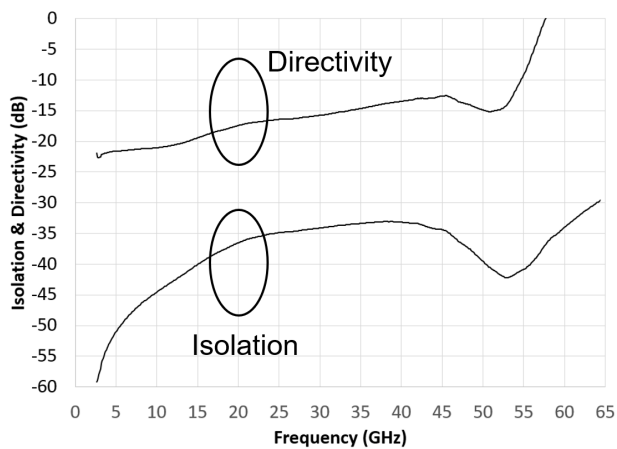
Coupling



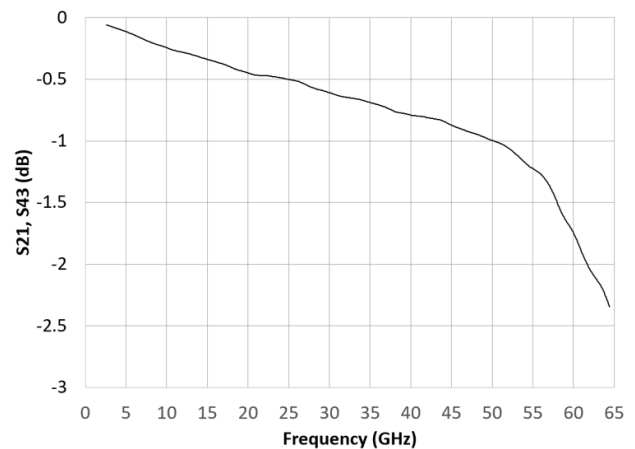
Return Loss



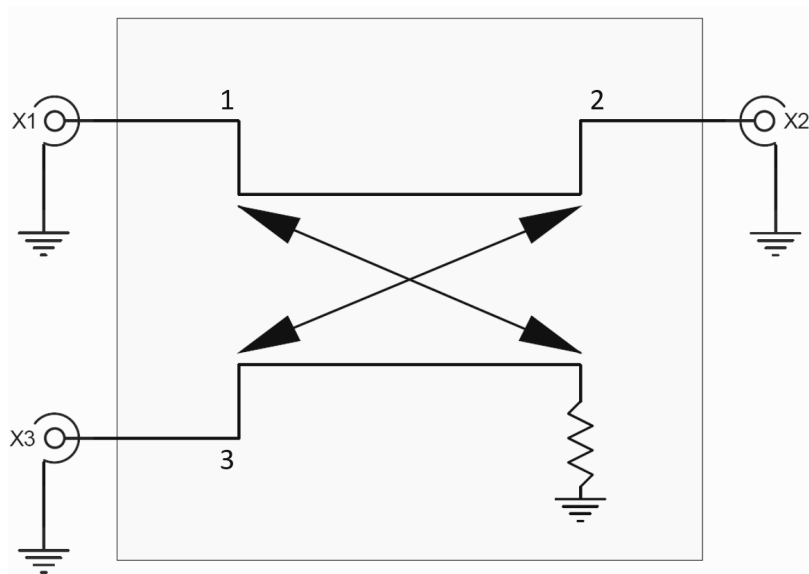
Isolation



Insertion Loss



Application Schematic



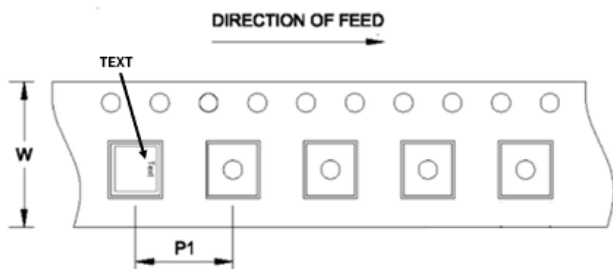
Mounting Techniques

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

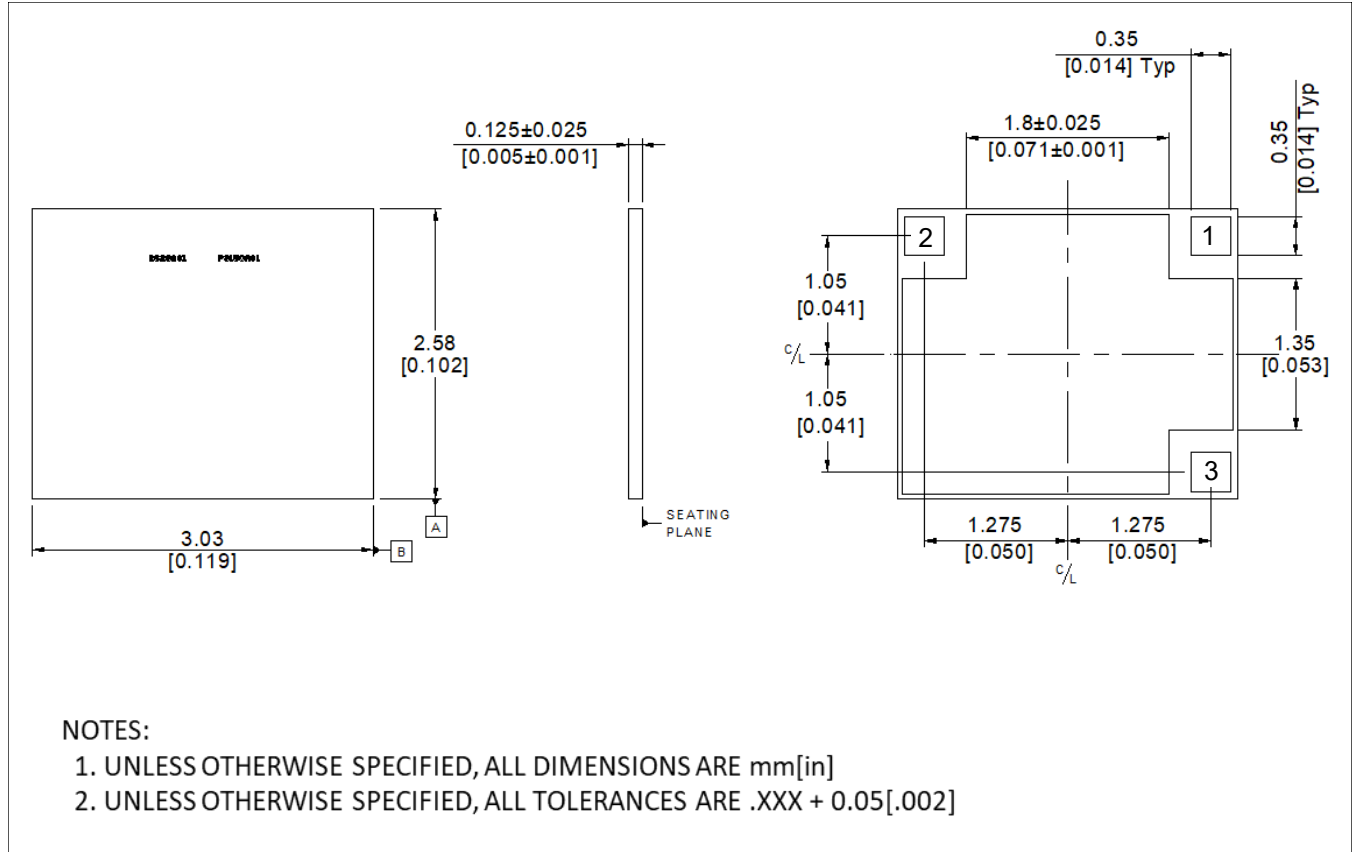
Parameter	Units	Value
Qty per reel	—	100/500
Reel Size	mm	178
Tape Width	mm	12
P1	mm	8
Orientation	—	F3
Reference Application Note ANI-019 for orientation		

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Die Outline Drawing



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