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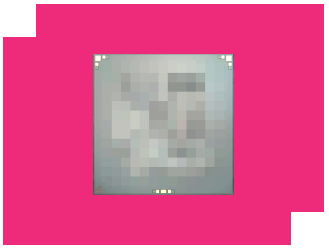
MPD-0R502CH

0.5 - 2 GHz MMIC 2-Way Wilkinson Power Divider/Power Splitter

DEVICE OVERVIEW

General Description

The MPD-0R502CH is a small footprint MMIC 2-Way Wilkinson power divider/power splitter featuring high isolation. The MPD-0R502CH uses a mix of lumped element and distributed circuits to significantly reduce the footprint while maintaining isolation at low frequencies. It is much smaller than a printed PCB Wilkinson Power Divider/Combiner. It can be used as an equal amplitude/phase power splitter or a power combiner with excellent isolation. Tight fabrication tolerances result in less unit-to-unit variation than traditional power divider technologies, allowing for accurate simulations using the provided S3P file taken from measured production units.



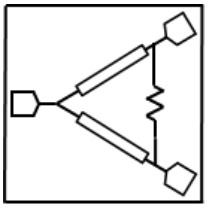
Features

- Can be used as a splitter or combiner
- Excellent equal amplitude and phase balance
- High isolation
- RoHS compliant

Applications

- Test Equipment
- Electronic Warfare
- Radar and satellite communications
- High Channel Count Systems

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Green Status	Product Lifecycle	Export Classification
MPD-0R502CH	0.5 - 2 GHz MMIC 2-Way Wilkinson Power Divider/Power Splitter	CH	REACH RoHS	Released	EAR99

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Table Of Contents

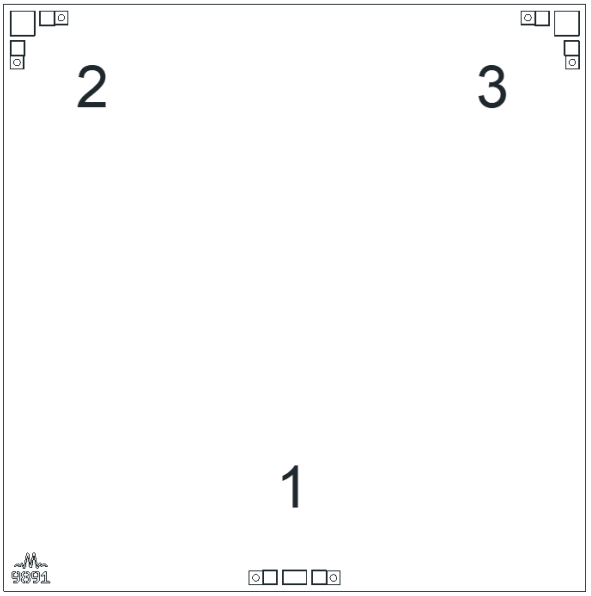
Revision History

Revision Code	Revision Date	Comment
-	2024-08-19	Initial Release

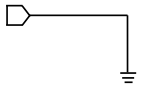
Port Configuration and Functions

Port Diagram

A top-down view of the MPD-0R502CH package outline drawing is shown below. The MMIC Power dividers are passive reciprocal devices allowing either power splitting or power combining.



Port Functions

Port	Function	Description	DC Equivalent Circuit
GND	Ground	CH package ground path is provided through the substrate and ground bond pads.	
Pad 1	Input/common	The common port is DC short to the other two ports and open to ground.	
Pad 2	Output 1	The output 1 port is DC short to the other two ports and open to ground.	
Pad 3	Output 2	The output 2 port is DC short to the other two ports and open to ground	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
DC Current	40	mA
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C

Package Information

Parameter	Details	Rating
ESD	< 250 Volts	HBM Class 0
Dimensions	-	3.55 x 3.55 mm

Electrical Specifications

The electrical specifications apply at TA=+25°C in a 50Ω system. Min and Max limits are guaranteed at TA=+25°C.

Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Amplitude Balance	-	0.5	2	-	0.02	-	dB
Common Port Return Loss	-	0.5	2	-	20	-	dB
Excess Insertion Loss [1]	-	0.5	2	-	1.1	-	dB
Impedance	-	0.5	2	-	50	-	Ω
Isolation	-	0.5	2	-	20	-	dB
Nominal Phase Shift	-	0.5	2	-	0	-	°
Nominal Power Splitting	-	0.5	2	-	3	-	dB
Output Return Loss	-	0.5	2	-	18	-	dB
Phase Balance	-	0.5	2	-	0.1	-	°

[1] Excess Insertion Loss = (Input Port to Common Port Insertion Loss) - 3dB

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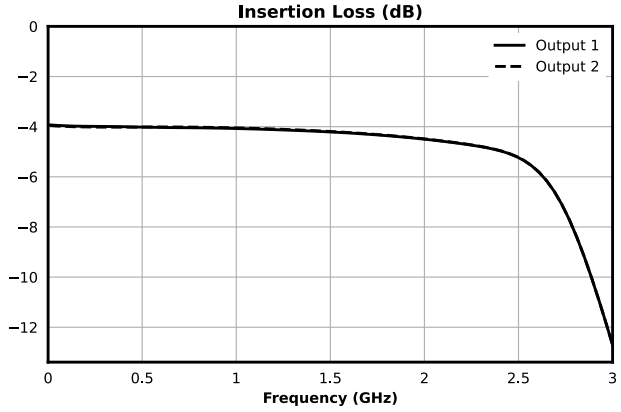
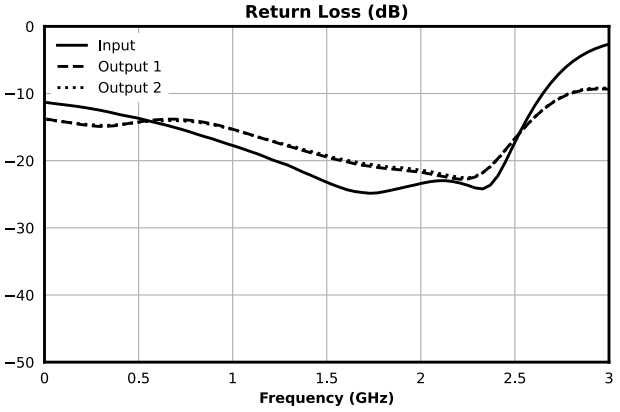
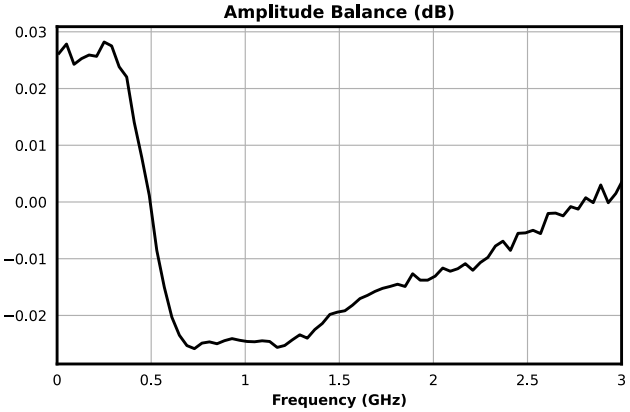
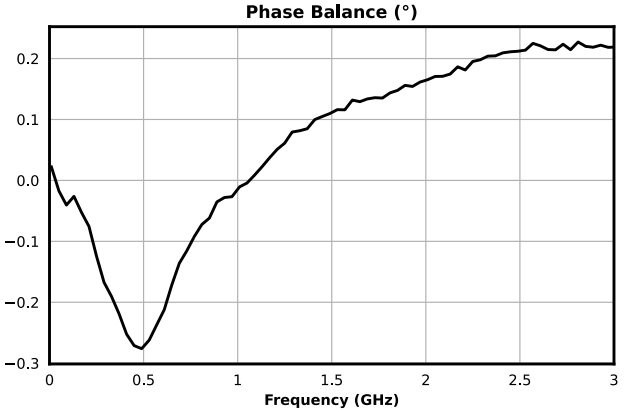
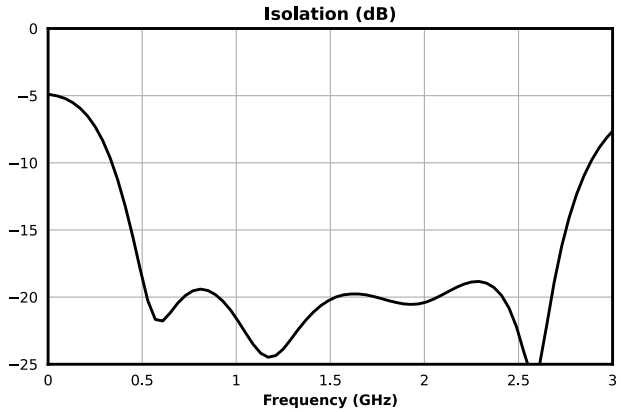
Typical Performance Plots











Die Mounting Recommendations

Mounting and Bonding Recommendations

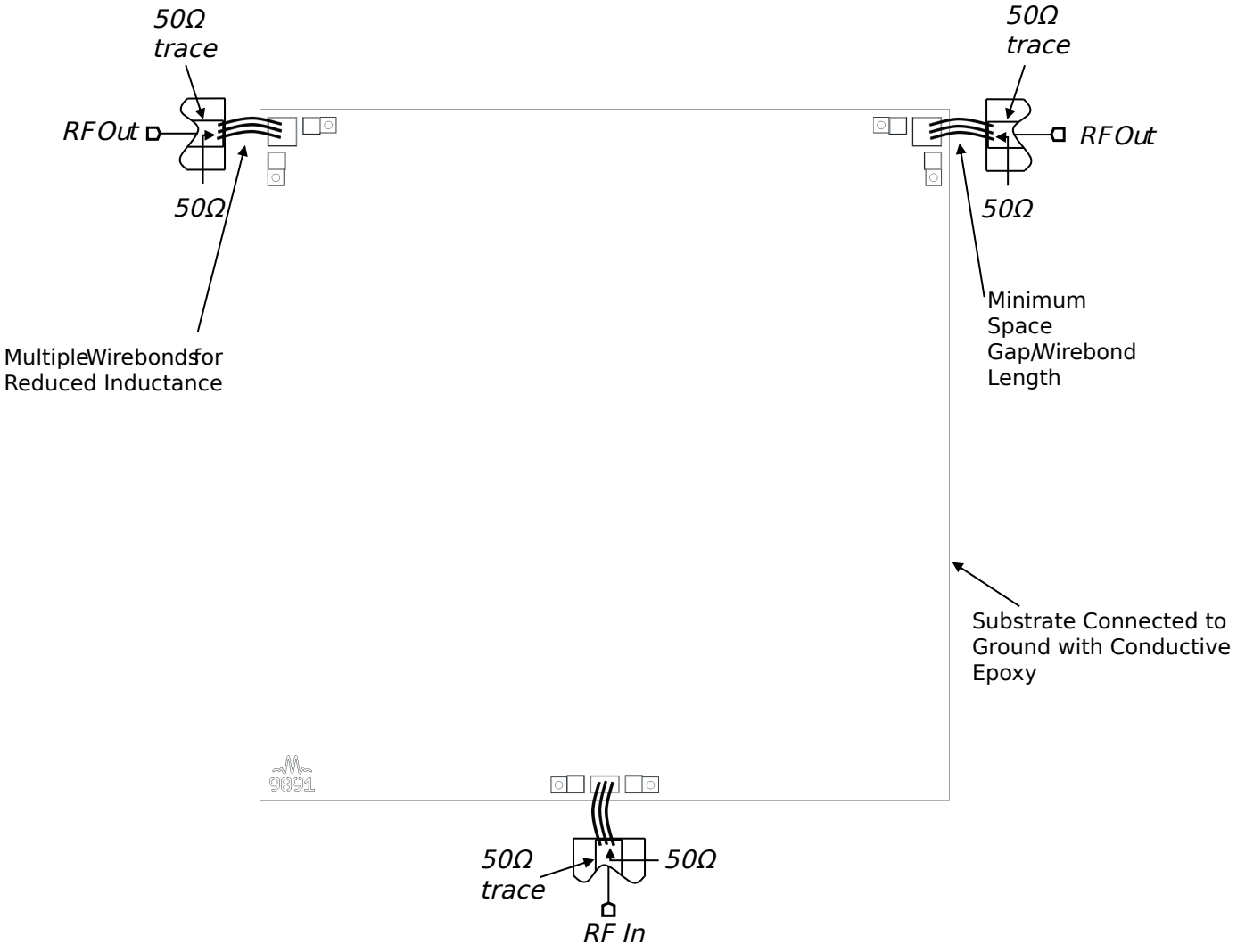
Marki MMICs should be attached directly to a ground plane with conductive epoxy. The ground plane electrical impedance should be as low as practically possible. This will prevent resonances and permit the best possible electrical performance. Datasheet performance is only guaranteed in an environment with a low electrical impedance ground.

Mounting - To epoxy the chip, apply a minimum amount of conductive epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip. Cure epoxy according to manufacturer instructions.

Wire Bonding - Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. Bond wire inductance will improve return loss. Bondwire inductance in the range of 30pH to 200pH will improve performance.

Circuit Considerations– 50 Ω transmission lines should be used for all high frequency connections in and out of the chip. Wirebonds should be kept as short as possible, with multiple wirebonds recommended for higher frequency connections to reduce parasitic inductance. Refer to table on page 11 for wirebond recommendation. In circumstances where the chip is more than .001” thinner than the substrate, a heat spreading spacer tab is optional to further reduce bondwire length and parasitic inductance.

Bonding Diagram



Handling Precautions

General Handling

Chips should be handled with care using tweezers or a vacuum collet. Users should take precautions to protect chips from direct human contact that can deposit contaminants, like perspiration and skin oils on any of the chip's surfaces.

Static Sensitivity

GaAs MMIC devices are sensitive to ESD and should be handled, assembled, tested, and transported only in static protected environments.

Cleaning and Storage

Do not attempt to clean the chip with a liquid cleaning system or expose the bare chips to liquid. Once the ESD sensitive bags the chips are stored in are opened, chips should be stored in a dry nitrogen atmosphere.

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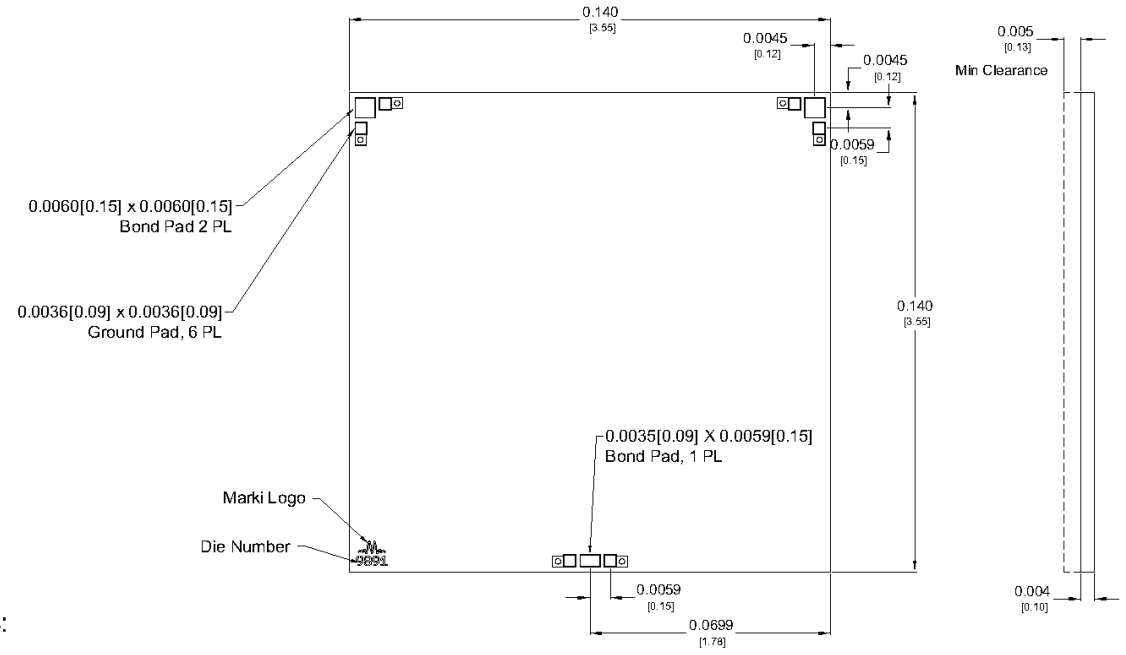
Mechanical Data

Outline Drawing

Download : Outline 2D Drawing

PROJECTION	REVISIONS			
INCH [MM]	REV.	DESCRIPTION	DATE	APPROVALS
	A	Release	6/5/24	WV



Notes:

1. CH substrate is .004 in Thick GaAs.
2. Traces are 5 microns Au.
3. Tolerance for X, Y dimensions is ± 0.002 in.
   Tolerance for Z dimension is ± 0.0005 in.
   Tolerance for pad location is ± 0.0001 in.

MATERIAL: 210-09881	NOTES:	Marki microwave www.markimicrowave.com	
FINISH:	DRAWN BY: AT	DATE: 6/5/24	Outline Chip Power Divider
DO NOT SCALE DRAWING		SIZE: A	CAGE CODE: 0UC32
		SCALE: None	DWG. NO.: MPD-0R502CH
			SHEET 1 OF 1

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