



Mini-Circuits

LTCC SURFACE MOUNT

90° Hybrid

HPCJ-03-422+

50Ω 3.2 to 4.2 GHz 3 dB

THE BIG DEAL

- High Input Power Handling, Max, 50W
- Low Insertion Loss, 0.14 dB typ.
- High Isolation, 26 dB typ.
- Miniature Size, 2012 package
- LTCC Construction

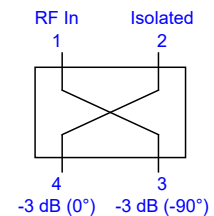


Generic photo used for illustration purposes only

APPLICATIONS

- Wireless Infrastructure
- 5G Base Stations in NR mid-band
- Satellite Communications for C-band uplink/downlink
- Test and Measurement
- Radar Systems

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' Model HPCJ-03-422+ is an LTCC 3 dB, 90° hybrid splitter/combiner operating from 3200 to 4200 MHz and supporting a variety of applications. This model provides 0.14 dB typical average insertion loss above 3 dB, 26 dB typical isolation and handles up to 50W RF input power when used as a splitter. Featuring optimized phase and amplitude unbalance, this quadrature hybrid enables operation over a wide temperature range of -55 to +125 °C. Housed in a small 0.2" x 0.125" x 0.079" form factor, the unit is ideal for dense PCB layouts and exhibits minimal performance variation due to parasitics.

KEY FEATURES

Features	Advantages
High Power Handling, 50 W Maximum	Capable of operating with up to 50 W RF input power as a splitter, the construction of the HPCJ-03-422+ makes this quadrature hybrid robust and rugged enough to be used effectively in medium power amplifier architectures with multiple devices per stage.
Low Phase Unbalance, $\pm 2^\circ$ from 90°	Improved combining efficiency and higher cancellation of odd-order harmonic distortion products.
Low Amplitude Unbalance, ± 0.8 dB	Ensures consistent signal integrity, superior power distribution and optimized efficiency for next-generation networks.
High Operating Temperature Range, -55 to +125 °C	Operation up to +125 °C allows the quadrature hybrid to be used in power amplifiers with minimal change in performance with temperature.

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ELECTRICAL SPECIFICATIONS^{1,2} AT +25°C, $Z_0 = 50\Omega$

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Units
Frequency Range		3200	-	4200	MHz
Average Insertion Loss (above 3 dB) ³	3300 - 3800	-	0.14	0.20	dB
	3200 - 4200	-	0.16	0.25	
Isolation	3300 - 3800	23	26	-	dB
	3200 - 4200	20	26	-	
Phase Unbalance (±) (Relative to 90°)	3300 - 3800	-	2	4	Degree
	3200 - 4200	-	2	5	
Amplitude Unbalance (±)	3300 - 3800	-	0.65	1	dB
	3200 - 4200	-	0.8	1.2	
Return Loss (Input, , -3 dB/_0, -3 dB/_-90, Isolated)	3300 - 3800	23	24.5	-	dB
	3200 - 4200	18	24.5	-	

1. Tested on Evaluation Board TB-HPCJ-03422C+. De-embedded to the device reference plane using TRL.

2. Symmetrical, all ports are interchangeable. See Pad Configuration Table and S-Parameters for actual performance.

3. See Page 3 for insertion loss data vs. frequency

ABSOLUTE MAXIMUM RATINGS⁴

Parameter	Ratings
Operating Temperature	-55 °C to +125 °C
Storage Temperature	-55 °C to +125 °C
Input Power ⁵	50 W at +25 °C

4. Permanent damage may occur if any of these limits are exceeded.

5. At +25°C derate linearly to 13 W at +125 °C.





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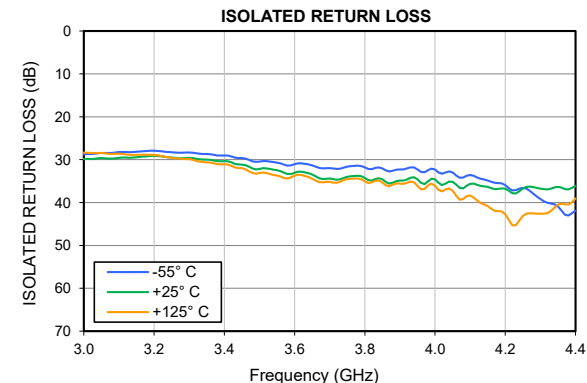
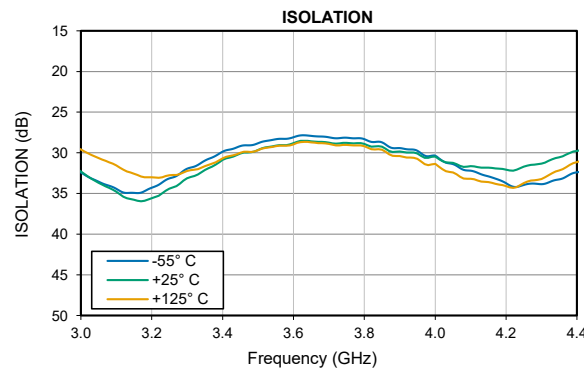
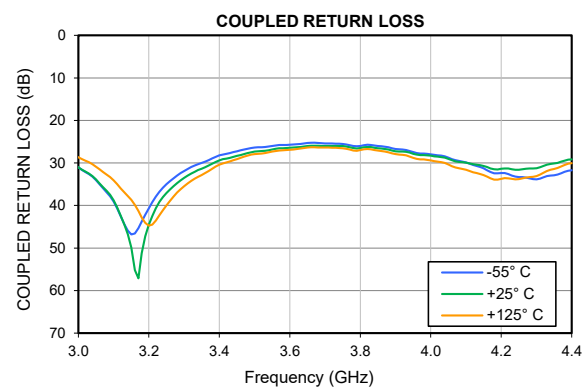
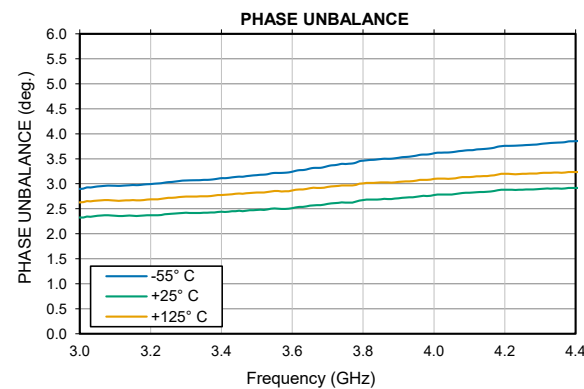
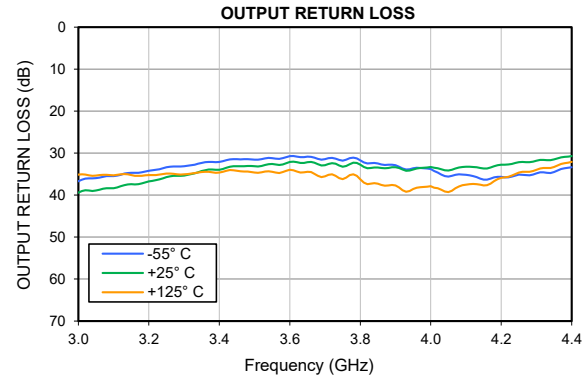
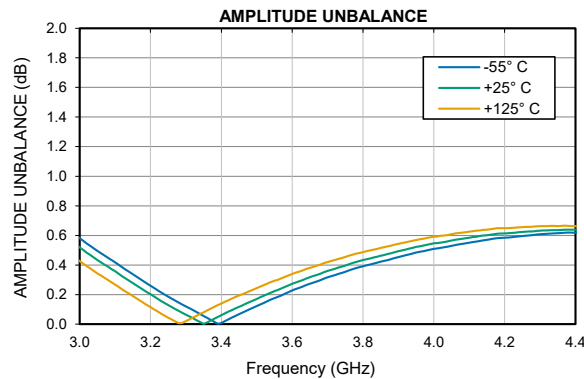
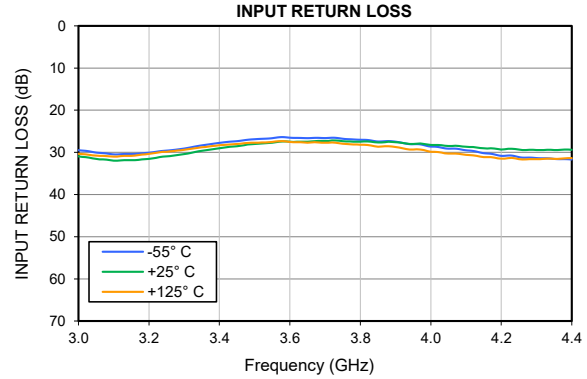
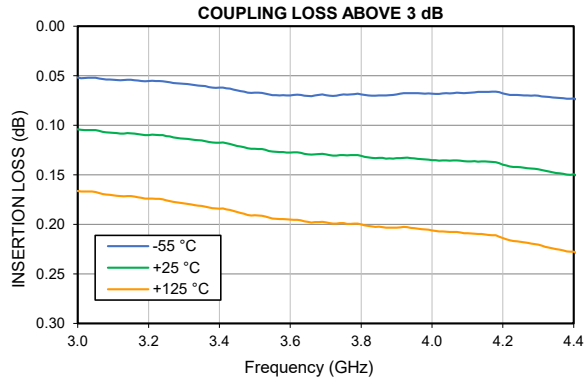
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TYPICAL PERFORMANCE GRAPHS





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FUNCTIONAL DIAGRAM

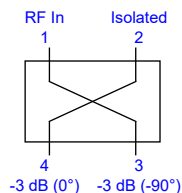
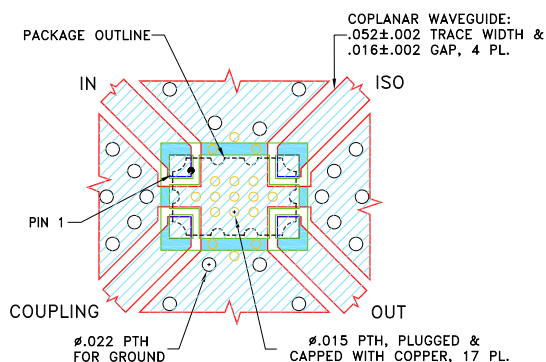


Figure 1. HPCJ-03-422+ Functional Diagram

PAD DESCRIPTION

Function	Pad Number	Description
Input	1	Connects to RF Input Port
Isolated	2	Connects to Isolated Port
-3 dB /_90	3	Connects to Quadrature Port
-3 dB/_0	4	Connects to In-Phase Port

SUGGESTED PCB LAYOUT (PL-846)



NOTES:

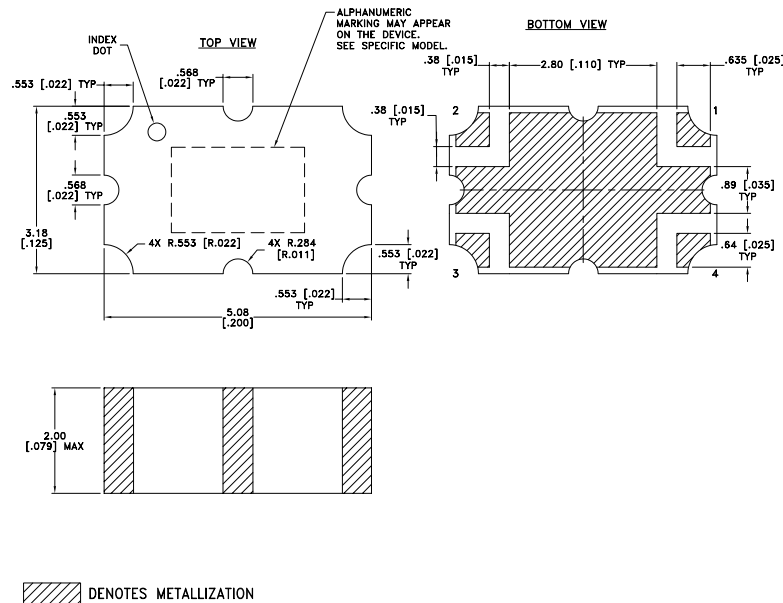
1. TRACE WIDTH & GAP ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS: .030±.002; COPPER: 1/2 OZ. ON EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

Figure 2. Suggested PCB Layout PL-846

CASE STYLE DRAWING



Weight: 0.124 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.025; 3 Pl. ±.0.127 mm

PRODUCT MARKING*: Z1

*Marking may contain other features or characters for internal lot control.



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ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD.

[CLICK HERE](#)

Performance Data & Graphs	Data Graphs S-Parameter (S4P Files) Data Set (.zip file) De-embedded to device pads
Case Style	AAE3610 Lead Finish: Tin over Nickel Plating
RoHS Status	Compliant
Tape and Reel	F110
Suggested Layout for PCB Design	PL-846
Evaluation Board	TB-HPCJ-03422C+ Gerber File
Environmental Rating	ENV06T10

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-Circuits' applicable established test performance criteria and measurement instructions.
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