



LTCC SURFACE MOUNT

90° Hybrid

HPCJ-03-222+

Mini-Circuits

50Ω 1.7 to 2.2 GHz 3 dB

THE BIG DEAL

- Robust 50 W continuous wave (CW) power handling
- 1.7 – 2.2 GHz coverage
- Low insertion loss and excellent port balance
- Compact, integration-ready footprint

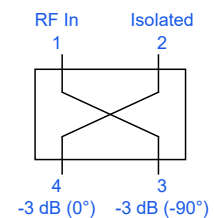


Generic photo used for illustration purposes only

APPLICATIONS

- Base stations and repeaters
- Power amplifier combining
- DAS and small cell deployments
- RF signal monitoring

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' Model HPCJ-03-222+ is a high-power, 3 dB, 90° hybrid splitter/combiner that delivers reliable performance across the 1.7 – 2.2 GHz band, making it ideal for cellular infrastructure, DAS, test environments, and communication platforms. With 50 W CW power handling capability and excellent signal balance, it provides robust and precise splitting and combining for demanding RF chains. Its compact footprint and stable performance make it a dependable choice for modern broadband designs.

KEY FEATURES

| Features | Advantages |
|---|---|
| High power handling, 50 W maximum | Supports robust operation in medium to high-power transmit chains and multi-carrier systems. |
| 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 isolation between output ports | Minimized signal leakage and enhanced performance in multi-path and multi-channel systems. |
| Splitter or combiner operation | Flexible use in power amplifier combining, antenna feed networks, and signal distribution stages. |

ELECTRICAL SPECIFICATIONS^{1,2} AT +25°C, Z₀ = 50Ω

| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Units |
|--|-----------------|------|------|------|--------|
| Frequency Range | | 1700 | - | 2200 | MHz |
| Average Insertion Loss (above 3 dB) ³ | 1700-2200 | - | 0.25 | 0.28 | dB |
| | 1805-1880 | - | 0.18 | - | |
| | 1930-1990 | - | 0.20 | - | |
| | 2110-2200 | - | 0.25 | - | |
| Isolation | 1700-2200 | 20 | 23 | - | dB |
| | 1805-1880 | - | 28 | - | |
| | 1930-1990 | - | 28 | - | |
| | 2110-2200 | - | 23 | - | |
| Phase Unbalance (±) (Relative to 90°) | 1700-2200 | - | 2 | 4 | Degree |
| | 1805-1880 | - | 2 | - | |
| | 1930-1990 | - | 2 | - | |
| | 2110-2200 | - | 2 | - | |
| Amplitude Unbalance (±) | 1700-2200 | - | 0.6 | 0.7 | dB |
| | 1805-1880 | - | 0.35 | - | |
| | 1930-1990 | - | 0.30 | - | |
| | 2110-2200 | - | 0.30 | - | |
| Return Loss (Input, -3 dB (0°), -3 dB (-90°), Isolated) | 1700-2200 | 20 | 21 | - | dB |
| | 1805-1880 | - | 26 | - | |
| | 1930-1990 | - | 25 | - | |
| | 2110-2200 | - | 20 | - | |

1. Tested on Evaluation Board TB-HPCJ-03222C+. De-embedded to the device reference plane using TRL.
2. Symmetrical, all ports are interchangeable. See Pad Description table and S-parameters for actual performance.
3. See Page 3 for insertion loss data vs. frequency

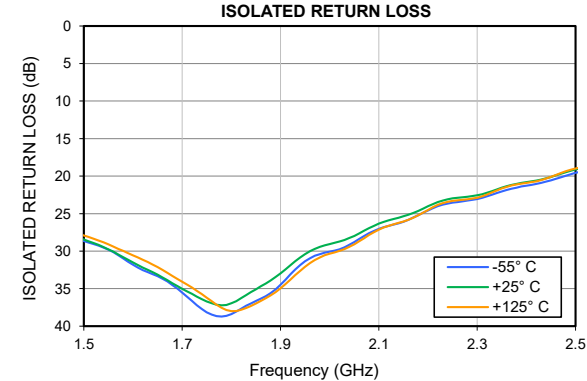
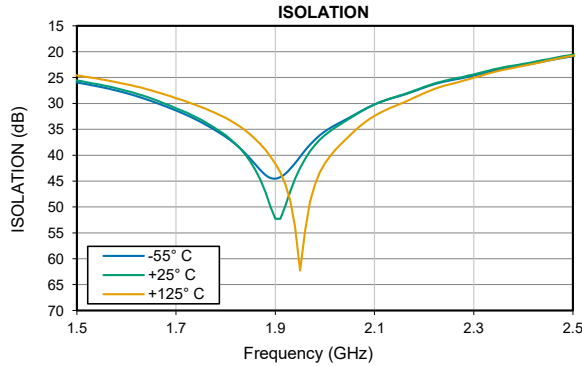
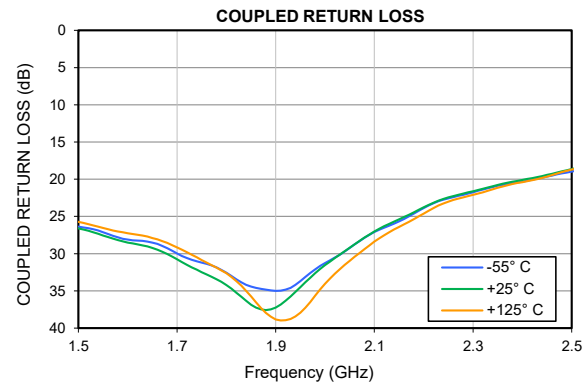
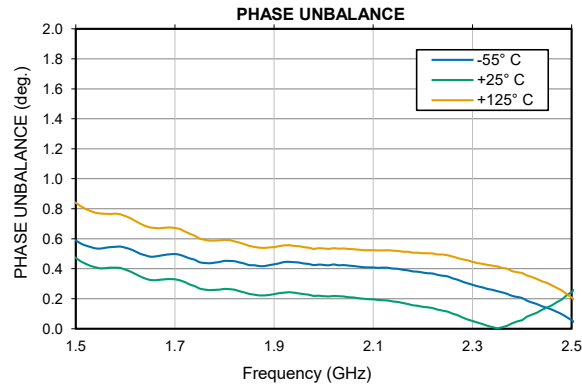
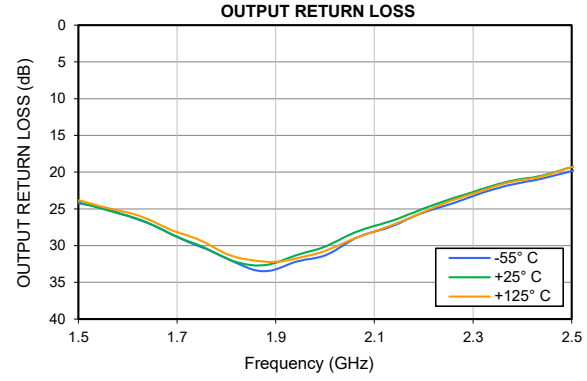
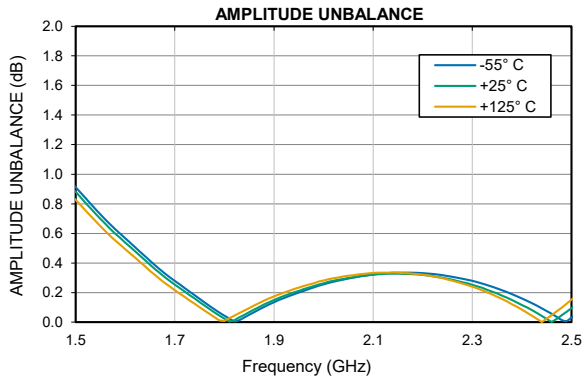
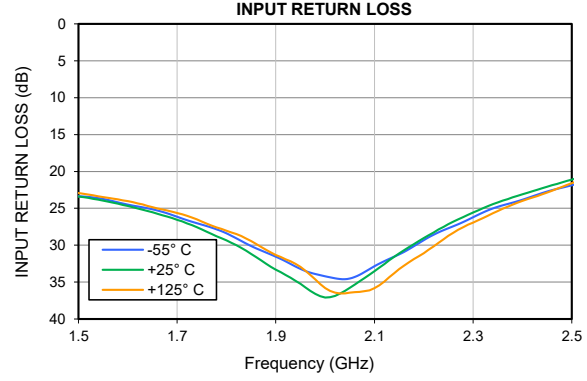
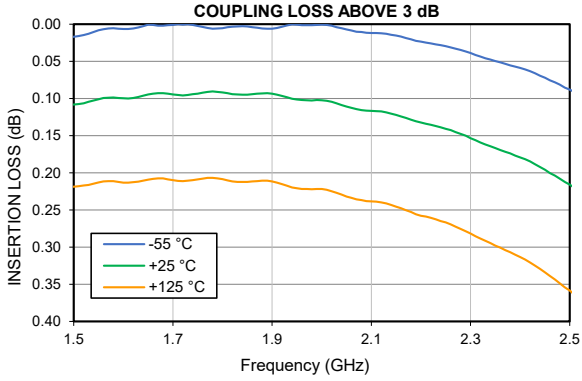
ABSOLUTE MAXIMUM RATINGS⁴

| Parameter | Ratings |
|--|-------------------|
| Operating Temperature | -55 °C to +125 °C |
| Storage Temperature | -55 °C to +125 °C |
| Input Power as a splitter 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 7.3 W at +125 °C.



TYPICAL PERFORMANCE GRAPHS





FUNCTIONAL DIAGRAM

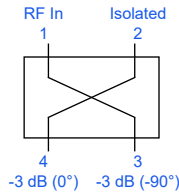
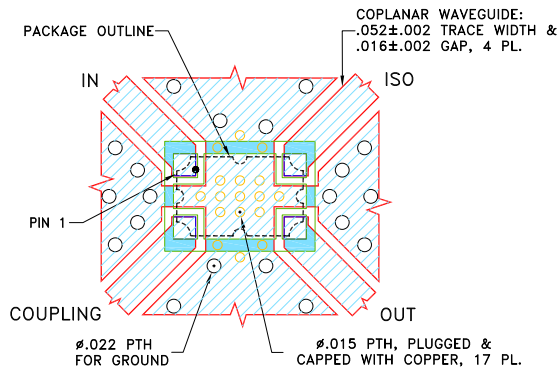


Figure 1. HPCJ-03-222+ Functional Diagram

PAD DESCRIPTION

| Function | Pad Number | Description |
|--------------|------------|-----------------------------|
| RF 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-856)

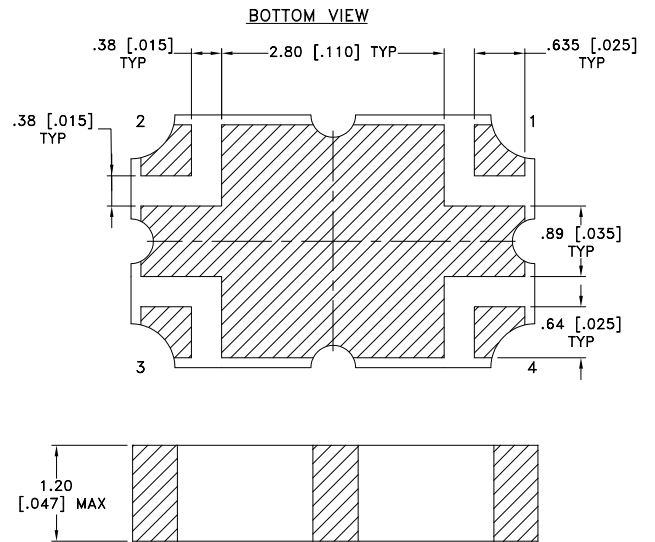
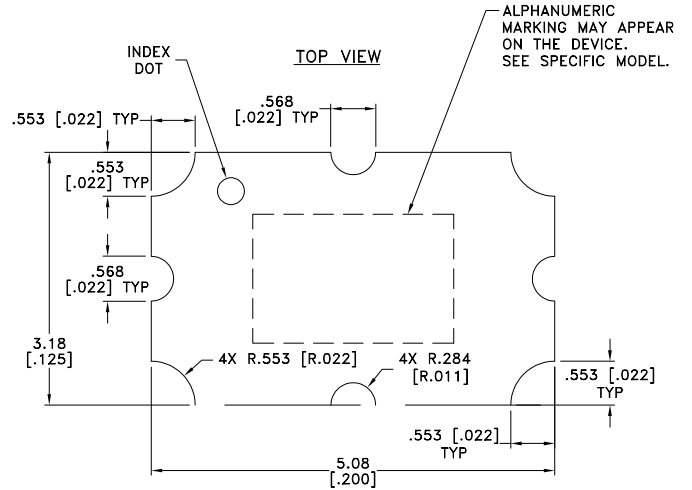


NOTES:
 1. TRACE WIDTH & GAP ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS: .030±.002; COPPER: 1/2 OZ. ON EACH SIDE.
 FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.

- 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-856

CASE STYLE DRAWING



DENOTES METALLIZATION

Weight: 0.049 grams

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

PRODUCT MARKING*: N/A

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



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 | AAE3610-2 Lead Finish: Tin over Nickel Plating |
| RoHS Status | Compliant |
| Tape and Reel | F110 |
| Suggested Layout for PCB Design | PL-856 |
| Evaluation Board | TB-HPCJ-03222C+ 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.
- 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/terms/viewterm.html