



THE DATASHEET OF
QCS-312+



2 Way-90° Power Splitter

QCS-312+

50Ω 1700 to 3100 MHz

The Big Deal

- High Power handling (8W)
- Low Unbalance, 0.5 dB & 4 deg. typ.
- Industry leading combination of size/bandwidth



CASE STYLE: GE0805C-1

Product Overview

Mini-Circuits new 90° Power Splitter, model: QCS-312+, offers an industry leading combination of operating bandwidth and size; supporting nearly an octave band in a miniature EIA-0805 form factor. The outstanding phase and amplitude unbalance make this component a versatile building block for use in a variety of systems and sub-system designs.

Key Features

| Feature | Advantages |
|-----------------------------------|--|
| Small Size | Offered in the EIA-0805 package size, the QCS-312+ offers an industry leading combination of size, bandwidth and frequency. The small footprint (2.0mm x 1.25mm) allows for reduced parasitics in systems with improved performance and simplified layout. |
| Low Phase and Amplitude Unbalance | Supporting 4 deg. and 0.5 dB unbalance make this 90° hybrid applicable for use in higher level integrated components such as image reject mixers, single sideband modulators, phase shifters, variable attenuators, and balance amplifiers. |
| High Power Handling | Capable of operating up to 8W, the LTCC construction of the QCS-312+ makes this 90° hybrid a robust, rugged product that can be used effectively in either the transmit or receive paths. |

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-Circuit's 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/MCLStore/terms.jsp



Power Splitter/Combiner

QCS-312+

2 Way-90° 50Ω 1700 to 3100 MHz



Generic photo used for illustration purposes only
CASE STYLE: GE0805C-1

Maximum Ratings

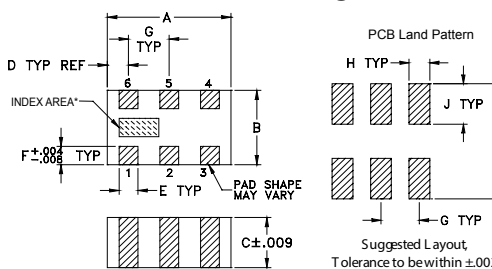
| | |
|-----------------------------|----------------|
| Operating Temperature | -55°C to 100°C |
| Storage Temperature | -55°C to 100°C |
| Power Input (as a splitter) | 15W* max. |

*Derate linearly to 7W at 100°C ambient.
Permanent damage may occur if any of these limits are exceeded.

Pin Connections

| | |
|----------------------|-----|
| SUM PORT | 1 |
| PORT 1 (0°) | 4 |
| PORT 2 (+90°) | 6 |
| GROUND | 2,5 |
| 50 OHM TERM EXTERNAL | 3 |

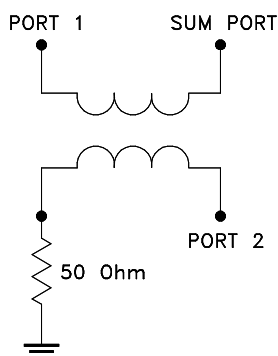
Outline Drawing



Outline Dimensions (inch/mm)

| | | | | | |
|------|------|------|------|------|-------|
| A | B | C | D | E | F |
| .079 | .049 | .033 | .014 | .012 | .012 |
| 2.01 | 1.24 | 0.84 | 0.36 | 0.30 | 0.30 |
| G | H | J | K | | wt |
| .026 | .014 | .039 | .110 | | grams |
| 0.66 | 0.36 | 1.00 | 2.80 | | .008 |

Electrical Schematic



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Features

- Low insertion loss, 0.5 dB typ.
- High isolation, 25 dB typ.
- Miniature size, 0.079"x0.049"x0.033"
- LTCC construction
- High power

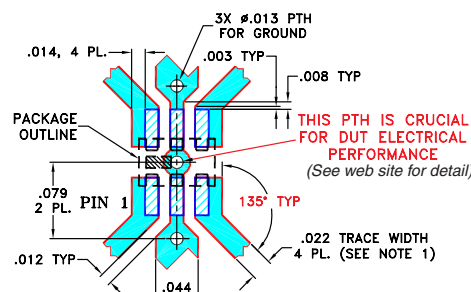
Applications

- Balanced amplifiers
- Modulators
- DCS, PCS, UMTS
- ISM
- WiMAX
- Phase Shifter
- Attenuator

Electrical Specifications at 25°C

| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Unit |
|--|-----------------|------|------|------|--------|
| Frequency | | 1700 | | 3100 | MHz |
| Insertion Loss (Avg. Of Coupled Outputs) above 3 dB | 1700-1850 | | 0.4 | 0.6 | dB |
| | 1850-1990 | | 0.4 | 0.6 | |
| | 1990-2170 | | 0.5 | 0.7 | |
| | 2170-2400 | | 0.5 | 0.7 | |
| | 2400-2700 | | 0.5 | 0.7 | |
| Isolation | 1700-1850 | 17 | 23 | | dB |
| | 1850-1990 | 18 | 24 | | |
| | 1990-2170 | 18 | 25 | | |
| | 2170-2400 | 18 | 25 | | |
| | 2400-2700 | 18 | 25 | | |
| Phase Unbalance | 1700-1850 | | 2.0 | 7.0 | Degree |
| | 1850-1990 | | 2.0 | 7.0 | |
| | 1990-2170 | | 2.0 | 7.0 | |
| | 2170-2400 | | 2.0 | 7.0 | |
| | 2400-2700 | | 2.0 | 7.0 | |
| Amplitude Unbalance | 1700-1850 | | 0.6 | 1.2 | dB |
| | 1850-1990 | | 0.2 | 0.7 | |
| | 1990-2170 | | 0.5 | 1.0 | |
| | 2170-2400 | | 0.5 | 1.0 | |
| | 2400-2700 | | 0.5 | 1.0 | |
| VSWR | 1700-3100 | | 1.2 | | :1 |

Demo Board MCL P/N: TB-489-312+ Suggested PCB Layout (PL-304)



NOTES:

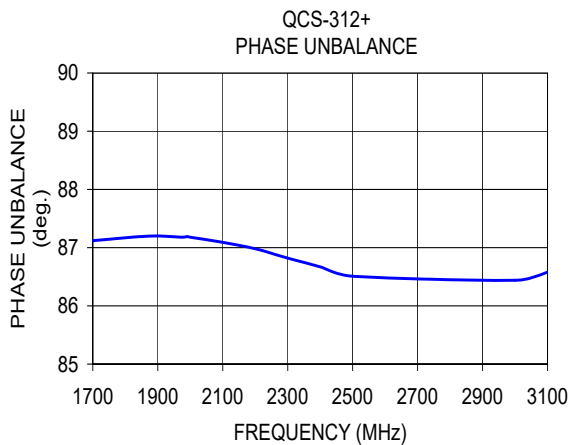
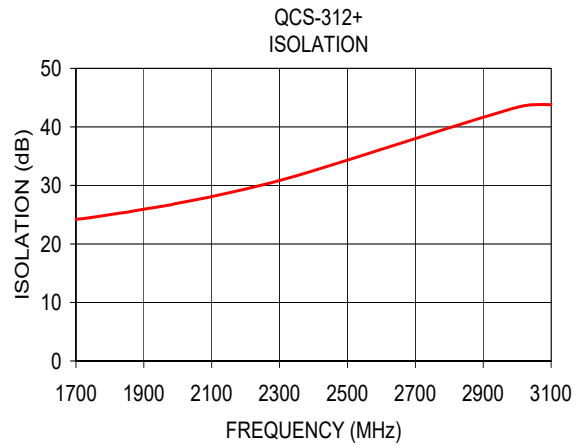
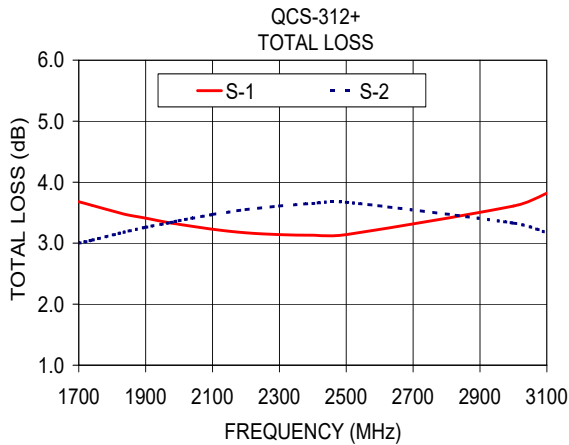
- TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

- DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)
- DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Typical Performance Data

| Frequency (MHz) | Total Loss ¹ (dB) | | Amplitude Unbalance (dB) | Isolation (dB) | Phase Unbalance (deg.) | VSWR S | VSWR 1 | VSWR 2 |
|-----------------|------------------------------|------|--------------------------|----------------|------------------------|--------|--------|--------|
| | S-1 | S-2 | | | | | | |
| 1700.00 | 3.68 | 3.00 | 0.69 | 24.22 | 87.12 | 1.01 | 1.30 | 1.02 |
| 1740.00 | 3.62 | 3.05 | 0.57 | 24.46 | 87.14 | 1.01 | 1.29 | 1.01 |
| 1820.00 | 3.50 | 3.16 | 0.34 | 25.20 | 87.18 | 1.02 | 1.28 | 1.02 |
| 1850.00 | 3.46 | 3.20 | 0.27 | 25.42 | 87.19 | 1.03 | 1.27 | 1.02 |
| 1900.00 | 3.41 | 3.26 | 0.14 | 25.94 | 87.20 | 1.03 | 1.26 | 1.03 |
| 1975.00 | 3.33 | 3.34 | 0.02 | 26.65 | 87.18 | 1.04 | 1.25 | 1.05 |
| 1990.00 | 3.32 | 3.36 | 0.05 | 26.85 | 87.19 | 1.04 | 1.24 | 1.05 |
| 2000.00 | 3.31 | 3.37 | 0.07 | 26.96 | 87.18 | 1.05 | 1.24 | 1.05 |
| 2100.00 | 3.23 | 3.47 | 0.24 | 28.10 | 87.09 | 1.06 | 1.22 | 1.07 |
| 2200.00 | 3.17 | 3.55 | 0.37 | 29.40 | 86.98 | 1.07 | 1.20 | 1.09 |
| 2300.00 | 3.14 | 3.61 | 0.47 | 30.83 | 86.82 | 1.08 | 1.17 | 1.11 |
| 2400.00 | 3.13 | 3.65 | 0.52 | 32.53 | 86.67 | 1.09 | 1.15 | 1.13 |
| 2500.00 | 3.14 | 3.67 | 0.52 | 34.34 | 86.51 | 1.10 | 1.13 | 1.14 |
| 3000.00 | 3.61 | 3.33 | 0.28 | 43.36 | 86.44 | 1.09 | 1.04 | 1.11 |
| 3100.00 | 3.82 | 3.17 | 0.65 | 43.80 | 86.58 | 1.07 | 1.04 | 1.08 |

1. Total Loss = Insertion Loss + 3dB splitter loss.



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