

# 2 Way-90° Power Splitter

QCS-592+

50Ω 3100 to 5900 MHz



CASE STYLE: GE0805C-1

## The Big Deal

- High Power handling (8W)
- Low Unbalance, 0.5 dB & 2 deg. typ.
- Industry leading combination of size/bandwidth

## Product Overview

Mini-Circuits new 90° Power Splitter, model: QCS-592+, 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-592+ 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 2 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-592+ makes this 90° hybrid a robust, rugged product that can be used effectively in either the transmit or receive paths.  |

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ISO 9001 ISO 14001 AS 9100 CERTIFIED

For detailed performance specs  
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IF/RF MICROWAVE COMPONENTS

**Notes:** 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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](http://www.minicircuits.com/MCLStore/terms.jsp).

# Power Splitter/Combiner

**QCS-592+**

2 Way-90° 50Ω 3100 to 5900 MHz



CASE STYLE: GE0805C-1  
PRICE: \$3.99 ea. QTY (10-49)

## Maximum Ratings

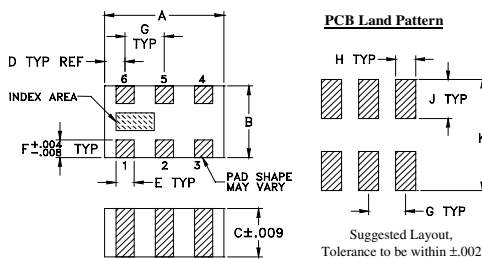
|                             |                |
|-----------------------------|----------------|
| Operating Temperature       | -55°C to 100°C |
| Storage Temperature         | -55°C to 100°C |
| Power Input (as a splitter) | 15W* max.      |

\*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  |

## Features

- Low insertion loss, 0.6 dB typ.
- High isolation, 23 dB typ.
- Miniature size, 0.079"x0.049"x0.033"
- LTCC construction
- High power

## Applications

- Balanced amplifiers
- Modulators
- WiMax
- WiFi
- ISM
- Phase Shifter
- Attenuator

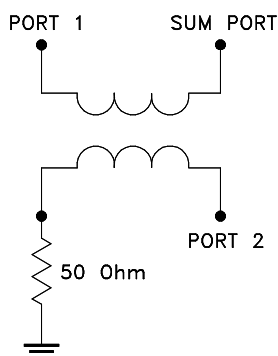
+ RoHS compliant in accordance with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

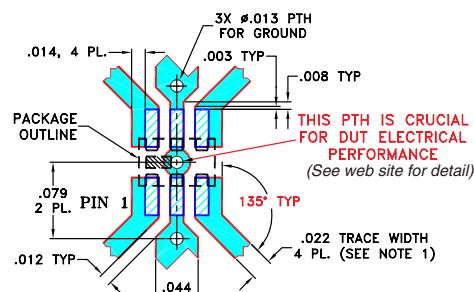
## Electrical Specifications at 25°C

| Parameter   | Frequency (MHz) | Min. | Typ. | Max. | Unit   |
|---|-----------------|------|------|------|--------|
| <b>Frequency</b>  |                 | 3100 |      | 5900 | MHz    |
| <b>Insertion Loss (Avg. Of Coupled Outputs) less 3 dB</b> | 3100-3300       |      | 0.5  | 0.7  | dB     |
|   | 3300-3600       |      | 0.5  | 0.7  |        |
|   | 3600-3900       |      | 0.5  | 0.7  |        |
|   | 3900-5100       |      | 0.5  | 0.7  |        |
|   | 5100-5700       |      | 0.5  | 0.8  |        |
| <b>Isolation</b>  | 5700-5900       |      | 0.7  | 1.0  | dB     |
|   | 3100-3300       | 19   | 25   |      |        |
|   | 3300-3600       | 20   | 28   |      |        |
|   | 3600-3900       | 18   | 27   |      |        |
|   | 3900-5100       | 17   | 24   |      |        |
| <b>Phase Unbalance</b>                                    | 5100-5700       | 16   | 24   |      | Degree |
|   | 5700-5900       | 16   | 23   |      |        |
|   | 3100-3300       |      | 2.0  | 5.0  |        |
|   | 3300-3600       |      | 2.0  | 5.0  |        |
|   | 3600-3900       |      | 2.0  | 5.0  |        |
| <b>Amplitude Unbalance</b>                                | 3900-5100       |      | 2.0  | 5.0  | dB     |
|   | 5100-5700       |      | 2.0  | 5.0  |        |
|   | 5700-5900       |      | 2.0  | 5.0  |        |
|   | 3100-3300       |      | 1.0  | 1.4  |        |
|   | 3300-3600       |      | 0.5  | 0.9  |        |
| <b>VSWR</b>   | 3600-3900       |      | 0.5  | 0.9  | dB     |
|   | 3900-5100       |      | 0.5  | 0.9  |        |
|   | 5100-5700       |      | 0.5  | 0.7  |        |
|   | 5700-5900       |      | 0.8  | 1.1  |        |
| <b>VSWR</b>   | 3100-5900       |      | 1.2  |      | :1     |

## Electrical Schematic



## Demo Board MCL P/N: TB-489-592+ Suggested PCB Layout (PL-304)



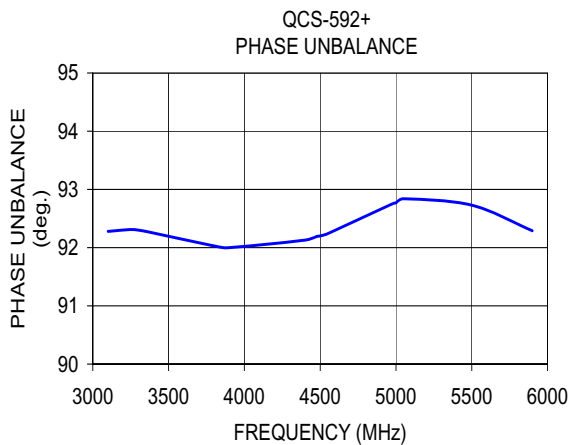
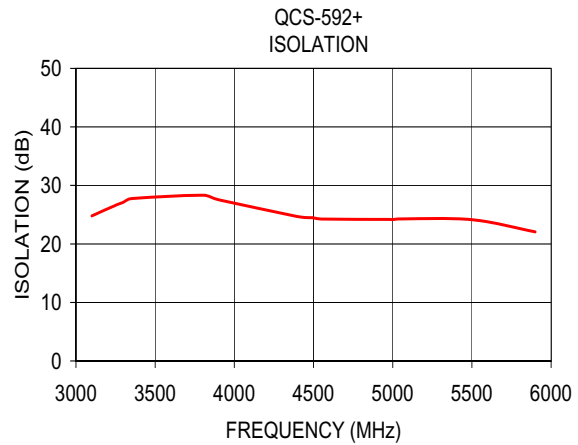
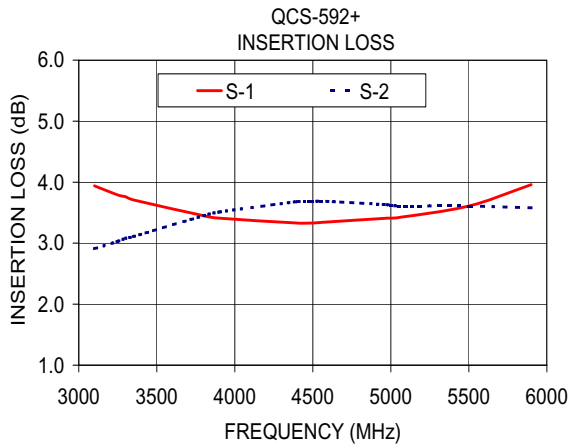
### NOTES:

1. 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.
2. 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) | Insertion Loss (dB) |      | Amplitude Unbalance (dB) | Isolation (dB) | Phase Unbalance (deg.) | VSWR S | VSWR 1 | VSWR 2 |
|-----------------|---------------------|------|--------------------------|----------------|------------------------|--------|--------|--------|
|                 | S-1                 | S-2  |                          |                |                        |        |        |        |
| 3100.00         | 3.94                | 2.91 | 1.03                     | 24.79          | 92.28                  | 1.11   | 1.36   | 1.12   |
| 3250.00         | 3.79                | 3.03 | 0.76                     | 26.60          | 92.31                  | 1.13   | 1.32   | 1.14   |
| 3300.00         | 3.76                | 3.08 | 0.68                     | 27.14          | 92.30                  | 1.14   | 1.31   | 1.14   |
| 3350.00         | 3.71                | 3.11 | 0.60                     | 27.75          | 92.28                  | 1.15   | 1.30   | 1.14   |
| 3800.00         | 3.45                | 3.45 | 0.00                     | 28.33          | 92.03                  | 1.18   | 1.24   | 1.16   |
| 3900.00         | 3.41                | 3.51 | 0.11                     | 27.56          | 92.00                  | 1.18   | 1.23   | 1.16   |
| 4400.00         | 3.33                | 3.68 | 0.35                     | 24.67          | 92.13                  | 1.14   | 1.22   | 1.12   |
| 4475.00         | 3.33                | 3.68 | 0.36                     | 24.49          | 92.19                  | 1.14   | 1.22   | 1.10   |
| 4500.00         | 3.33                | 3.68 | 0.35                     | 24.46          | 92.20                  | 1.14   | 1.22   | 1.10   |
| 4550.00         | 3.34                | 3.69 | 0.35                     | 24.26          | 92.24                  | 1.13   | 1.22   | 1.09   |
| 4975.00         | 3.41                | 3.63 | 0.22                     | 24.20          | 92.75                  | 1.13   | 1.15   | 1.12   |
| 5000.00         | 3.41                | 3.62 | 0.21                     | 24.16          | 92.77                  | 1.13   | 1.14   | 1.13   |
| 5050.00         | 3.42                | 3.61 | 0.19                     | 24.28          | 92.84                  | 1.14   | 1.13   | 1.14   |
| 5500.00         | 3.61                | 3.61 | 0.00                     | 24.15          | 92.73                  | 1.24   | 1.04   | 1.28   |
| 5900.00         | 3.96                | 3.58 | 0.37                     | 22.06          | 92.29                  | 1.38   | 1.25   | 1.42   |



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