

High Power

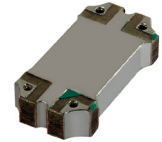
# 2 Way-90° Power Splitter

QCH-83

50Ω 2 Way-90° Up to 75W\* 4000 to 8000 MHz

## The Big Deal

- High power handling up to 75W
- Wide bandwidth
- Good Amplitude Unbalance,  $\pm 0.45$  dB
- Good Phase Unbalance,  $\pm 5$  deg



CASE STYLE: PQ2481

## Product Overview

Mini-Circuits new 2-way 90° power splitter, QCH-83 capable of handling up to 75W with amplitude unbalance of  $\pm 0.45$  dB typ and phase unbalance of  $\pm 5$  deg. typ. Operating over a frequency range of 4000 to 8000 MHz, the good phase and amplitude unbalance make this component a versatile building block for use in a variety of systems and sub-system designs from balanced amplifiers and antenna feeds to military applications and more. The splitter is fabricated using laminated PCB process (0.4 x 0.2 x 0.083") and includes wrap-around terminations for good solderability and easy visual inspection.

## Key Features

| Feature   | Advantages   |
|---|--|
| Wide bandwidth  | The QCH-83 wide band width (4000 - 8000 MHz) makes it suitable for a wide range of applications.   |
| High power handling:<br>75W @ +85°C<br>40W @ +105°C   | Usable in many systems with high-power requirements such as antenna feeds, power amplifiers, and others that require balanced high power outputs.                  |
| Good Phase and Amplitude Unbalance:<br>• $\pm 0.45$ dB Amplitude Unbalance<br>• $\pm 5^\circ$ Phase Unbalance | QCH-83 produces nearly equal signals with 90° phase shift - ideal for I/Q systems, balanced amplifiers, antenna feeds, phase shifters, and many more applications. |

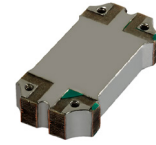
\*See power derating on page 2



# High Power Power Splitter/Combiner

## QCH-83

50Ω 2 Way-90° Up to 75W\* 4000 to 8000 MHz



CASE STYLE: PQ2481

### Maximum Ratings

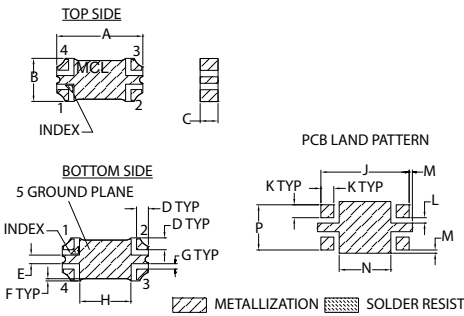
|                               |                   |
|-------------------------------|-------------------|
| Operating Temperature, case** | -55°C to 105°C    |
| Storage Temperature           | -55°C to 105°C    |
| Power Input*                  | 75W @ +85°C, case |

\*Derate to 55W at +95°C and 40W at +105°C case temperature  
 \*\*Case temperature is defined as temperature on base plate.  
 Permanent damage may occur if any of these limits are exceeded.

### Pad Connections\*\*\*

|               |   |
|---------------|---|
| SUM           | 1 |
| ISOLATION     | 2 |
| PORT 1 (0°)   | 3 |
| PORT 2 (+90°) | 4 |
| GROUND        | 5 |

\*\*\*Model is symmetrical and all ports are interchangeable, see port function table.

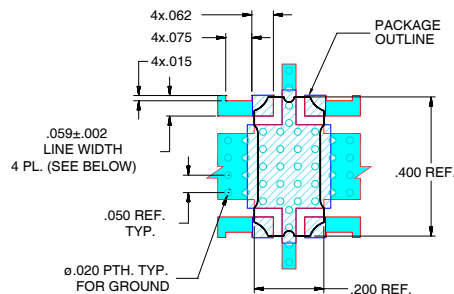


Base material: Printed wiring laminate.  
 Termination Finish: Tin-Lead plate.

### Outline Dimensions (inch/mm)

| A     | B     | C    | D    | E    | F    | G    |       |
|-------|-------|------|------|------|------|------|-------|
| .400  | .200  | .083 | .055 | .030 | .010 | .025 |       |
| 10.16 | 5.08  | 2.11 | 1.40 | 0.76 | 0.25 | 0.63 |       |
| H     | J     | K    | L    | M    | N    | P    | wt.   |
| .237  | .410  | .060 | .025 | .015 | .240 | .210 | grams |
| 6.02  | 10.41 | 1.52 | 0.63 | 0.38 | 6.10 | 5.33 | 1.0   |

### Demo Board MCL P/N: TB-964A Suggested PCB Layout (PL-525A)



NOTES:  
 1. TRACE WIDTH IS SHOWN FOR ROGERS RT/DUROID 5880 WITH DIELECTRIC THICKNESS: 0.020±.0015". COPPER: 1 OZ. EACH SIDE.  
 FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.  
 3. CUTOUTS IN RF LINES ARE REQUIRED TO ACHIEVE SPECIFIED ISOLATION.  
 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)  
 DENOTES COPPER LAND PATTERN FREE OF SOLDERMASK

### Features

- high power, up to 75W
- wide bandwidth
- good amplitude unbalance, ±0.45 dB Typ
- good phase unbalance, ±5 deg Typ

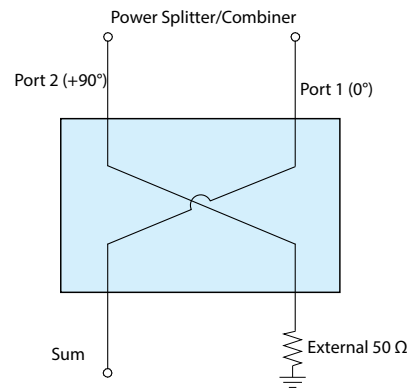
### Applications

- Balanced amplifiers
- I&Q Modulators
- Defense and military

### Electrical Specifications @ +25°C

| Parameter  | Condition (MHz) | Min.        | Typ.  | Max.  | Units |
|--|-----------------|-------------|-------|-------|-------|
| <b>Frequency Range</b>                                       |                 | 4000        |       | 8000  | MHz   |
| <b>Insertion Loss</b><br>(Avg. of Coupled outputs less 3 dB) | 4000 - 8000     | —           | 0.15  | 0.45  | dB    |
| <b>Isolation</b>   | 4000 - 8000     | 16.5        | 23    | —     | dB    |
| <b>Phase Unbalance</b>                                       | 4000 - 8000     | —           | ±5    | —     | deg   |
| <b>Amplitude Unbalance</b>                                   | 4000 - 8000     | —           | ±0.45 | ±0.65 | dB    |
| <b>VSWR</b>  | 4000 - 8000     | —           | 1.10  | 1.37  | :1    |
| <b>Input RF Power</b>  | @+85°C, case    | 4000 - 8000 | —     | 75    | W     |
|  | @+95°C, case    | 4000 - 8000 | —     | 55    |       |
|  | @+105°C, case   | 4000 - 8000 | —     | 40    |       |
| <b>Thermal Resistance</b>                                    | 4000 - 8000     | —           | 0.7   | —     | °C/W  |

### Electrical Schematic



### Port Function Configurations

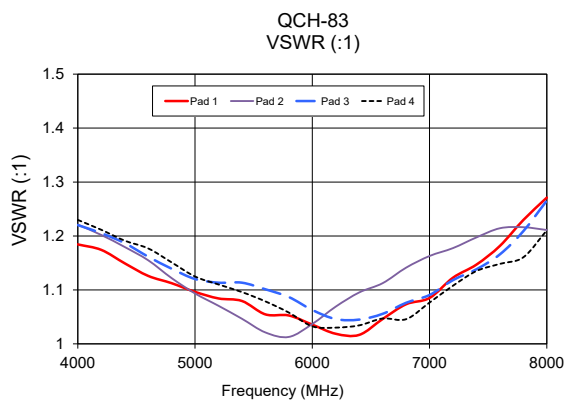
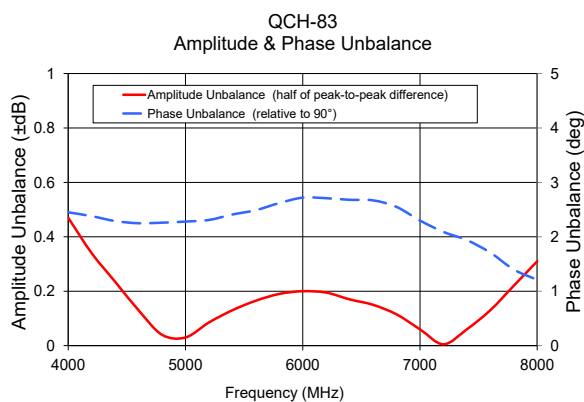
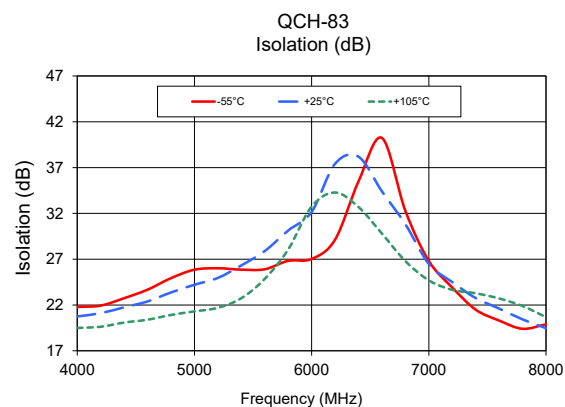
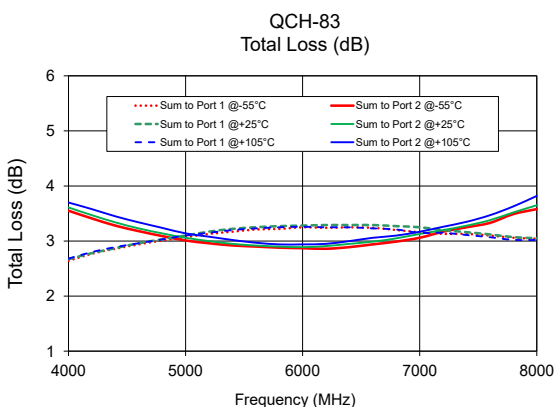
| Sum | Isolation | Port 1 (0°) | Port 2 (90°) |
|-----|-----------|-------------|--------------|
| 1   | 2         | 3           | 4            |
| 2   | 1         | 4           | 3            |
| 3   | 4         | 1           | 2            |
| 4   | 3         | 2           | 1            |

## Typical Performance Data <sup>1</sup>

| FREQUENCY<br>(MHz) | Total Loss <sup>2</sup><br>(dB) |       |        | Total Loss <sup>2</sup><br>(dB) |       |        | Amplitude<br>Unbalance<br>(±dB)<br>@ Sum=1 | Isolation<br>(dB)        |       |        | Phase<br>Unbalance<br>(deg)<br>Relative to 90°<br>@ Sum=1 | VSWR<br>(:1) |       |       |       |
|--------------------|---------------------------------|-------|--------|---------------------------------|-------|--------|--|--------------------------|-------|--------|---|--------------|-------|-------|-------|
|                    | Sum to Port 1 @ Sum=1           |       |        | Sum to Port 2 @ Sum=1           |       |        |  | Sum to Isolation @ Sum=1 |       |        |   | Pad 1        | Pad 2 | Pad 3 | Pad 4 |
|                    | -55°C                           | +25°C | +105°C | -55°C                           | +25°C | +105°C |  | -55°C                    | +25°C | +105°C |   |              |       |       |       |
| 4000.0             | 2.64                            | 2.67  | 2.68   | 3.55                            | 3.61  | 3.70   | 0.47                                       | 21.79                    | 20.75 | 19.49  | 2.45  | 1.18         | 1.22  | 1.22  | 1.23  |
| 4200.0             | 2.77                            | 2.78  | 2.80   | 3.41                            | 3.47  | 3.58   | 0.34                                       | 21.93                    | 21.11 | 19.62  | 2.38  | 1.17         | 1.20  | 1.21  | 1.21  |
| 4400.0             | 2.86                            | 2.87  | 2.89   | 3.28                            | 3.34  | 3.45   | 0.24                                       | 22.74                    | 21.75 | 20.08  | 2.29  | 1.15         | 1.18  | 1.19  | 1.19  |
| 4600.0             | 2.94                            | 2.96  | 2.96   | 3.18                            | 3.23  | 3.34   | 0.13                                       | 23.67                    | 22.39 | 20.39  | 2.25  | 1.13         | 1.16  | 1.16  | 1.18  |
| 4800.0             | 3.01                            | 3.03  | 3.03   | 3.09                            | 3.14  | 3.24   | 0.04                                       | 24.93                    | 23.37 | 20.91  | 2.26  | 1.11         | 1.12  | 1.14  | 1.15  |
| 5000.0             | 3.07                            | 3.10  | 3.10   | 3.01                            | 3.06  | 3.14   | 0.03                                       | 25.85                    | 24.21 | 21.30  | 2.28  | 1.10         | 1.09  | 1.12  | 1.12  |
| 5200.0             | 3.13                            | 3.17  | 3.15   | 2.96                            | 3.00  | 3.08   | 0.09                                       | 26.01                    | 24.96 | 21.69  | 2.31  | 1.08         | 1.07  | 1.11  | 1.11  |
| 5400.0             | 3.17                            | 3.22  | 3.20   | 2.92                            | 2.95  | 3.02   | 0.13                                       | 25.86                    | 26.32 | 22.74  | 2.41  | 1.08         | 1.05  | 1.11  | 1.10  |
| 5600.0             | 3.21                            | 3.25  | 3.23   | 2.90                            | 2.92  | 2.97   | 0.17                                       | 25.90                    | 27.89 | 24.85  | 2.49  | 1.05         | 1.02  | 1.10  | 1.08  |
| 5800.0             | 3.22                            | 3.27  | 3.25   | 2.88                            | 2.90  | 2.94   | 0.19                                       | 26.82                    | 30.13 | 28.06  | 2.62  | 1.05         | 1.01  | 1.09  | 1.06  |
| 6000.0             | 3.25                            | 3.28  | 3.26   | 2.87                            | 2.89  | 2.94   | 0.20                                       | 27.02                    | 32.16 | 32.75  | 2.72  | 1.04         | 1.04  | 1.06  | 1.03  |
| 6200.0             | 3.24                            | 3.29  | 3.25   | 2.86                            | 2.91  | 2.95   | 0.20                                       | 29.13                    | 37.42 | 34.28  | 2.71  | 1.02         | 1.07  | 1.05  | 1.03  |
| 6400.0             | 3.25                            | 3.29  | 3.25   | 2.89                            | 2.95  | 3.00   | 0.17                                       | 35.49                    | 38.19 | 32.70  | 2.68  | 1.02         | 1.10  | 1.05  | 1.03  |
| 6600.0             | 3.24                            | 3.29  | 3.23   | 2.94                            | 2.99  | 3.06   | 0.15                                       | 40.24                    | 34.41 | 29.80  | 2.67  | 1.05         | 1.11  | 1.06  | 1.05  |
| 6800.0             | 3.20                            | 3.27  | 3.21   | 2.99                            | 3.05  | 3.10   | 0.12                                       | 32.28                    | 30.82 | 26.79  | 2.55  | 1.07         | 1.14  | 1.08  | 1.05  |
| 7000.0             | 3.16                            | 3.25  | 3.15   | 3.06                            | 3.13  | 3.17   | 0.06                                       | 26.81                    | 26.48 | 24.69  | 2.30  | 1.09         | 1.16  | 1.09  | 1.08  |
| 7200.0             | 3.13                            | 3.20  | 3.15   | 3.17                            | 3.20  | 3.26   | 0.01                                       | 23.91                    | 24.50 | 23.65  | 2.09  | 1.12         | 1.18  | 1.12  | 1.11  |
| 7400.0             | 3.13                            | 3.16  | 3.11   | 3.25                            | 3.28  | 3.35   | 0.06                                       | 21.49                    | 22.76 | 23.28  | 1.94  | 1.15         | 1.20  | 1.14  | 1.14  |
| 7600.0             | 3.10                            | 3.12  | 3.07   | 3.33                            | 3.38  | 3.47   | 0.13                                       | 20.30                    | 21.61 | 22.71  | 1.71  | 1.18         | 1.21  | 1.17  | 1.15  |
| 7800.0             | 3.06                            | 3.07  | 3.02   | 3.49                            | 3.52  | 3.63   | 0.22                                       | 19.40                    | 20.43 | 21.89  | 1.40  | 1.23         | 1.22  | 1.21  | 1.16  |
| 8000.0             | 3.04                            | 3.05  | 3.02   | 3.58                            | 3.65  | 3.82   | 0.31                                       | 19.89                    | 19.47 | 20.67  | 1.21  | 1.27         | 1.21  | 1.27  | 1.21  |

1. Data at +25°C unless specified otherwise.

2. Total loss is the loss from Sum to each coupled port including the 3dB theoretical split.



### Additional 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.
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