

# High Power 2 Way-90° Power Splitter

QCH-153+

50Ω 2 Way-90° 25W 3000 to 14500 MHz

## The Big Deal

- High power handling, up to 25W
- Ultra wide bandwidth
- Good Amplitude Unbalance,  $\pm 1.5$  dB
- Good Phase Unbalance,  $\pm 5$  deg



Generic photo used for illustration purposes only  
CASE STYLE: PQ2099-3

## Product Overview

Mini-Circuits' new 2-way 90° power splitter, QCH-153+ capable of handling up to 25W with amplitude unbalance of  $\pm 1.5$  dB typ and phase unbalance of  $\pm 5$  deg. typ. Operating over a frequency range of 3000 to 14500 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 (0.560 x 0.200 x 0.063") and includes wrap-around terminations for good solderability and easy visual inspection.

## Key Features

Feature	Advantages
Ultra wide bandwidth	The QCH-153+ ultra wide band width (3000 - 14500 MHz) makes it suitable for a wide range of applications.
High power handling: 25W @ +85°C 15W @ +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: • $\pm 1.5$ dB Amplitude Unbalance • $\pm 5^\circ$ Phase Unbalance	QCH-153+ produces nearly equal signals with 90° phase shift - ideal for I/Q systems, balanced amplifiers, antenna feeds, phase shifters, and many more applications.



# High Power Power Splitter/Combiner

## QCH-153+

50Ω 2 Way-90° 25W 3000 to 14500 MHz

### Maximum Ratings

Operating Temperature, case**	-55°C to 105°C
Storage Temperature	-55°C to 105°C
Power Input*	25W @ +85°C, case

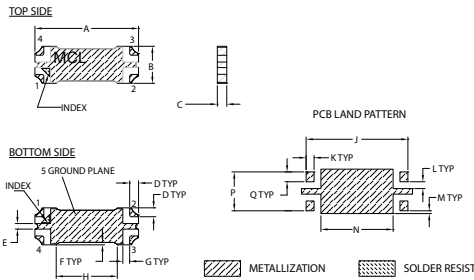
\*Derate to 20W at +95°C and 15W at +105°C case temperature  
 \*\*Case temperature is defined as temperature on base plate.  
 Permanent damage may occur if any of these limits are exceeded.

### 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 configuration table.

### Outline Drawing

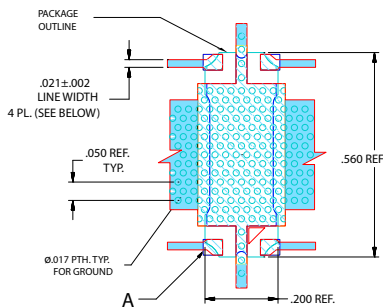


Base material: Printed wiring laminate.  
 Termination Finish: 2-5 µinch (0.05-0.13 microns) Immersion Gold.

### Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H
.560	.200	.063	.048	.030	.013	.037	.330
14.22	5.08	1.60	1.22	0.76	0.33	0.94	8.38
J	K	L	M	N	P	Q	wt.
.550	.043	.037	.015	.390	.210	.053	grams
13.97	1.09	0.94	0.38	9.91	5.33	1.35	1.2

### Demo Board MCL P/N: TB-990+ Suggested PCB Layout (PL-589)



#### NOTES:

- TRACE WIDTH IS SHOWN FOR TACONIC RF-35TC WITH DIELECTRIC THICKNESS. .010±.0015" COPPER; 1 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
- BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE, EXCEPT INDICATED AREAS "A" UNDER THE UNIT SIGNAL PINS WHERE A DISTANCE OF AT LEAST 0.10" (2.5 mm) TO THE GROUND PLANE SHOULD BE MAINTAINED FOR OPTIMAL RF PERFORMANCE, BY REDUCING THE PARASITIC CAPACITANCE BETWEEN PAD AND GROUND.

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

### Features

- High power, up to 25W
- Ultra wideband, 3000 - 14500 MHz
- Good amplitude unbalance, ±1.5 dB Typ
- Good phase unbalance, ±5 deg Typ

### Applications

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



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CASE STYLE: PQ2099-3

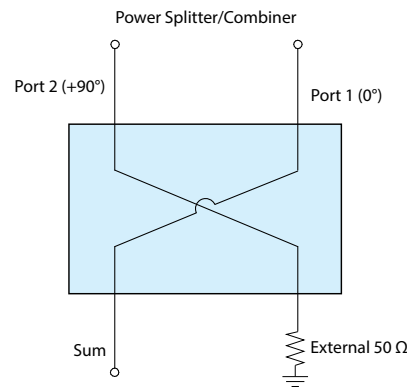
### +RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

### Electrical Specifications @ +25°C

Parameter	Condition (MHz)	Min.	Typ.	Max.	Unit
Frequency Range		3000		14500	MHz
Insertion Loss (Avg. of Coupled outputs less 3 dB)	3000 - 9000	—	0.4	0.8	dB
	9000 - 14500	—	1.0	2.0	
Isolation	3000 - 9000	15	20	—	dB
	9000 - 14500	8	13	—	
Phase Unbalance	3000 - 9000	—	±3	—	deg
	9000 - 14500	—	±5	—	
Amplitude Unbalance	3000 - 14500	—	±1.5	±1.8	dB
VSWR	3000 - 9000	—	1.2	1.7	:1
	9000 - 14500	—	1.5	2.4	
Input RF Power	@+85°C, case	3000 - 14500	—	25	W
	@+95°C, case	3000 - 14500	—	20	
	@+105°C, case	3000 - 14500	—	15	
Thermal Resistance	3000 - 14500	—	2	—	°C/W

### Electrical Schematic



### Port Function Configurations

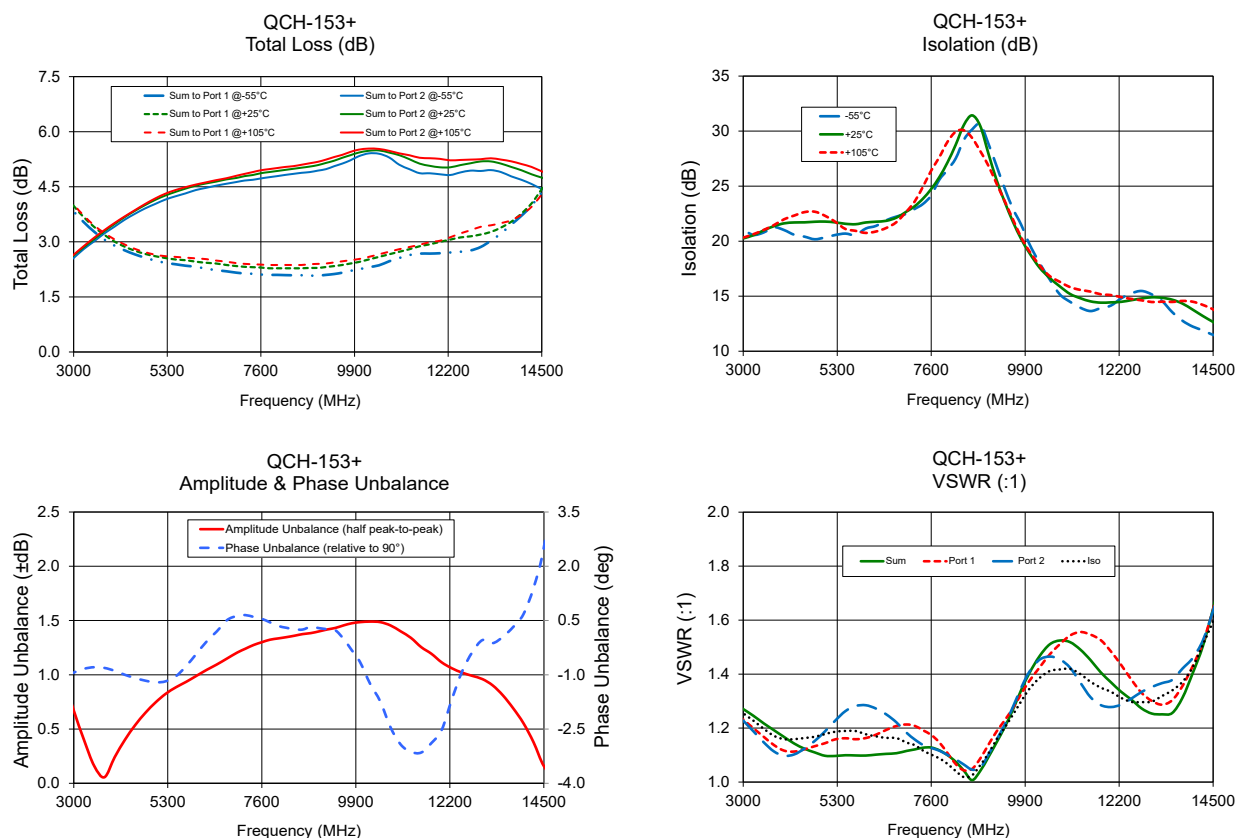
Config.	Sum	Isolation	Port 1 (0°)	Port 2 (90°)
A	1	2	3	4
B	2	1	4	3
C	3	4	1	2
D	4	3	2	1

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

Frequency (MHz)	Total Loss <sup>2</sup> (dB) Sum to Port 1			Total Loss <sup>2</sup> (dB) Sum to Port 2			Amplitude Unbalance (±dB)	Phase Unbalance (deg) Relative to 90°	Isolation (dB) Sum to Isolation			VSWR (:1) Sum Port 1 Port 2 Iso			
	-55°C	+25°C	+105°C	-55°C	+25°C	+105°C			-55°C	+25°C	+105°C	Sum	Port 1	Port 2	Iso
	3000	3.83	3.98	4.02	2.56	2.63			2.65	0.67	-0.94	20.96	20.25	20.32	1.27
3500	3.28	3.41	3.45	3.01	3.07	3.11	0.16	-0.79	20.79	20.98	21.02	1.22	1.17	1.15	1.20
4000	2.90	3.01	3.07	3.41	3.48	3.51	0.24	-0.89	21.01	21.62	21.99	1.17	1.12	1.10	1.16
4750	2.57	2.67	2.72	3.91	4.00	4.03	0.65	-1.16	20.17	21.77	22.68	1.11	1.13	1.15	1.17
5250	2.43	2.56	2.61	4.15	4.26	4.31	0.83	-1.18	20.56	21.71	21.77	1.10	1.16	1.23	1.19
6000	2.32	2.46	2.55	4.41	4.53	4.56	0.99	-0.42	21.15	21.70	20.75	1.10	1.16	1.28	1.18
6500	2.23	2.41	2.49	4.53	4.64	4.68	1.10	0.20	21.90	21.85	21.20	1.10	1.19	1.25	1.16
7200	2.14	2.32	2.40	4.67	4.79	4.85	1.24	0.65	22.94	23.19	23.63	1.12	1.21	1.16	1.14
7600	2.11	2.30	2.38	4.73	4.87	4.95	1.30	0.55	24.16	24.74	26.41	1.13	1.17	1.13	1.10
8200	2.09	2.28	2.37	4.82	4.96	5.04	1.35	0.30	27.52	28.76	29.94	1.08	1.07	1.08	1.04
8600	2.09	2.28	2.37	4.88	5.02	5.10	1.38	0.25	30.14	31.43	29.39	1.01	1.05	1.05	1.03
9200	2.10	2.32	2.41	4.98	5.15	5.24	1.42	0.26	26.84	25.56	25.23	1.15	1.19	1.16	1.16
9600	2.16	2.37	2.47	5.13	5.29	5.37	1.46	-0.01	22.95	21.77	21.99	1.27	1.27	1.28	1.25
10250	2.31	2.52	2.59	5.41	5.48	5.54	1.49	-1.25	18.03	17.61	17.82	1.47	1.42	1.45	1.39
10750	2.47	2.66	2.73	5.30	5.43	5.48	1.45	-2.45	15.16	15.89	16.30	1.52	1.51	1.45	1.42
11500	2.68	2.88	2.92	4.87	5.13	5.29	1.26	-3.15	13.65	14.53	15.42	1.45	1.55	1.31	1.37
12000	2.69	3.00	3.03	4.84	5.03	5.26	1.12	-2.53	14.15	14.44	15.10	1.37	1.48	1.28	1.33
12750	2.77	3.15	3.32	4.94	5.14	5.24	0.99	-0.38	15.48	14.80	14.63	1.27	1.33	1.33	1.30
13250	3.03	3.27	3.45	4.95	5.19	5.28	0.90	-0.13	14.56	14.86	14.50	1.25	1.29	1.37	1.32
14000	3.71	3.77	3.74	4.69	4.95	5.12	0.56	0.67	12.24	13.78	14.50	1.40	1.43	1.46	1.43
14500	4.35	4.44	4.30	4.44	4.75	4.92	0.16	2.51	11.49	12.66	13.80	1.64	1.64	1.64	1.60

<sup>1</sup> Data corresponds to Configuration A at +25°C unless specified otherwise.

<sup>2</sup> 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.
- 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](http://www.minicircuits.com/MCLStore/terms.jsp)