



LTCC SMT

Thru-Line

TPCW-233+

Mini-Circuits

50Ω DC to 23 GHz

THE BIG DEAL

- Low Insertion Loss, 0.15dB Typ.
- Return Loss, 21dB Typ.
- 0603 Surface Mount Footprint
- Versatile "Place Holder" for Mini-Circuits LTCC Filters
- Power Handling: 7 Watts



Generic photo used for illustration purposes only

CASE STYLE: JC0603C

+RoHS Compliant

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

APPLICATIONS

- Test and Measurement Equipment
- Communication, EW, Radar and ECM Defense Systems
- 5G MIMO and Back Haul Radio Systems
- Satellite Communications

PRODUCT OVERVIEW

TPCW-233+ is a miniature low temperature co-fired ceramic (LTCC) 50 Ohm transmission line with low insertion loss through 23 GHz supporting a variety of applications. This model provides 0.15 dB typical insertion loss over a wide band due to its rugged monolithic construction. Housed in a tiny 0603 ceramic form factor with inspectable wrap-around terminations, the transmission line is ideal for dense signal chain PCB layouts where it complements MMIC size and performance. The LTCC fabrication process assures minimal RF performance variation while delivering a product that is well suited for environmental extremes of high humidity and temperature.

KEY FEATURES

Feature	Advantages
LTCC Construction	Provides repeatable performance in a rugged, ceramic package well suited for tough environments such as high humidity and temperature extremes.
Tiny size, 0603	Saves space in dense circuit board layouts and minimizes the effects of parasitics.
Wrap-around terminations	Provides excellent solderability and easy visual inspection.
Rugged Power handling	Handles up to 7 Watts in a small 0603 package.
Footprint Compatible "Place Holder"	Enables system designers the flexibility to plan to add LTCC filters to the PCB layout at a later stage in the design process, after system test results are available.

REV. C
 ECO-016258
 TPCW-233+
 EDU4334
 URJ
 221222





ELECTRICAL SPECIFICATIONS^{1,2} AT 25°C

Parameter		F#	Frequency (GHz)	Min.	Typ.	Max.	Units	
Passband	Insertion Loss	DC-F1	DC - 10	—	0.15	0.4	dB	
		F1-F2	10 - 16	—	0.5	1.0		
		F2-F3	16 - 23	—	0.9	—		
	Return Loss	DC-F1	DC - 10	—	21	—		dB
		F1-F2	10 - 16	—	14	—		
		F2-F3	16 - 23	—	10	—		
Group Delay	DC-F3	DC - 23	—	50	—	psec		

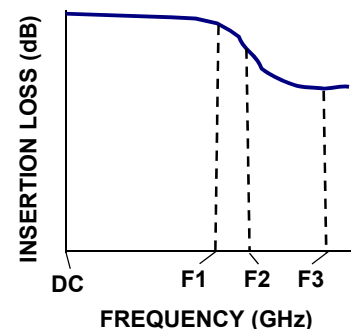
- DC blocking capacitors are required in applications where DC voltage and/or current is present at either input or output ports. Please contact Mini-Circuits for alternatives if DC pass from IN-OUT is required.
- Measured on Mini-Circuits Characterization Test Board TB-TPCW-233+

ABSOLUTE MAXIMUM RATINGS¹

Parameter	Ratings
Operating temperature	-55°C to 125°C
Storage temperature	-55°C to 125°C
RF Power Input ²	7W @25°C

- Permanent damage may occur if any of these limits are exceeded.
- Power rating applies only to signals within the passband. Power rating above +25°C should be derated linearly to 2.3W at +125°C.

TYPICAL FREQUENCY RESPONSE



FUNCTIONAL DIAGRAM



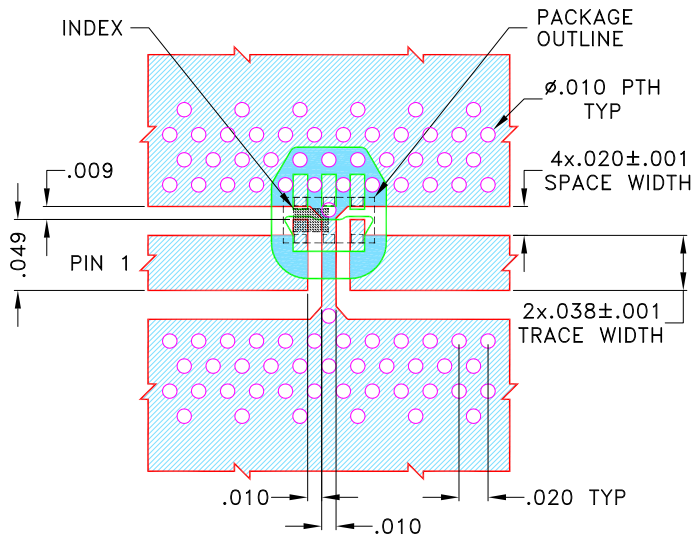


PAD CONNECTIONS

RF 1	1
RF 2	3
GROUND	2,4,5,6

PRODUCT MARKING: VP

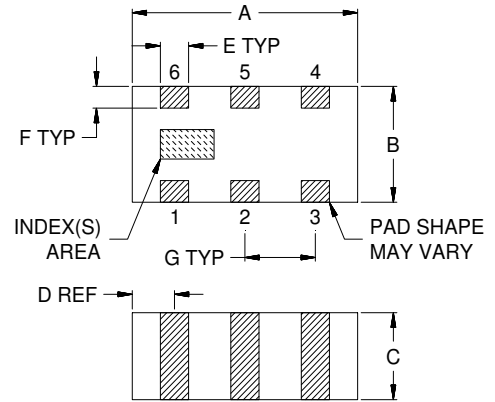
DEMO BOARD MCL P/N: TB-TPCW-233+ SUGGESTED PCB LAYOUT (PL-704)



NOTES:

1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS (R03003) WITH DIELECTRIC THICKNESS .020±.001 COPPER: 1/2 Oz. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
 2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.
- DENOTES PCB COPPER PATTERN WITH SMOBC (SOLDER MASK OVER BARE COPPER)
 DENOTES PCB COPPER PATTERN FREE OF SOLDERMASK

OUTLINE DRAWING



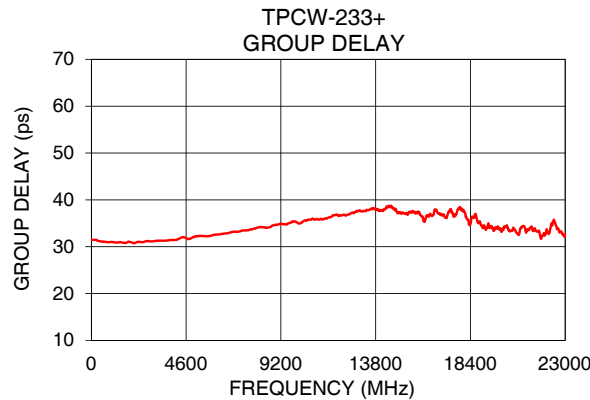
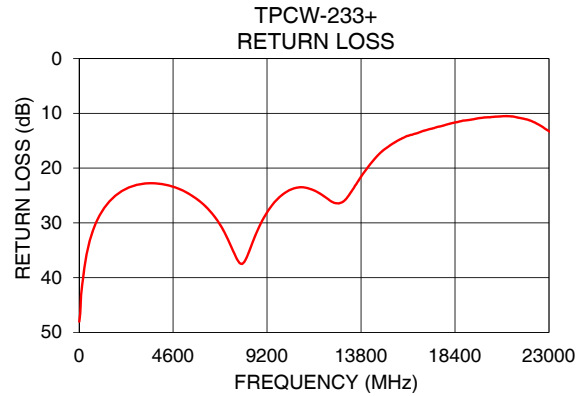
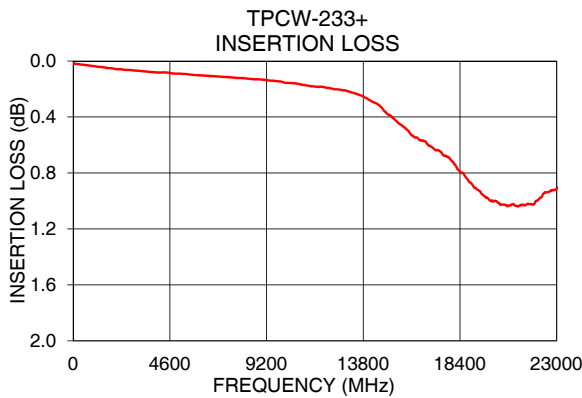
OUTLINE DIMENSIONS (Inches/mm)

A	B	C	D	E	F	G	Wt.
.063	.032	.024	.012	.008	.006	.020	grams
1.60	0.80	0.60	0.30	0.20	0.15	0.50	.005



TYPICAL PERFORMANCE DATA AT 25°C

Frequency (MHz)	Insertion Loss (dB)	Return Loss (dB)	Frequency (MHz)	Group Delay (pSec)
10	0.02	48.03	10	31.47
100	0.02	43.14	100	31.47
1000	0.04	28.68	1000	31.03
2000	0.06	24.41	2000	30.85
3000	0.07	22.93	3000	31.16
4000	0.08	22.88	4000	31.43
5000	0.09	23.97	5000	32.14
6000	0.10	26.34	6000	32.58
7000	0.11	30.94	7000	33.21
10000	0.15	24.72	10000	35.15
16000	0.51	14.21	16000	36.64
18000	0.71	12.04	18000	37.90
18500	0.80	11.61	18500	36.41
20000	1.00	10.72	20000	33.61
23000	0.91	13.27	23000	32.30



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

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