

Surface Mount Attenuator/Switch

50Ω Bi-Phase 10 to 1000 MHz

TFAS-2+
TFAS-2

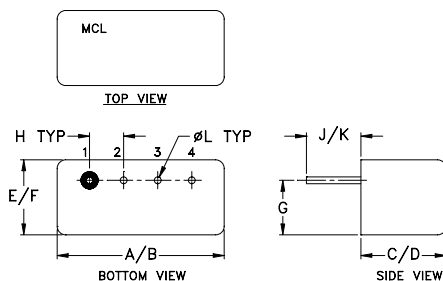
Maximum Ratings

Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
Control Current	30mA
Permanent damage may occur if any of these limits are exceeded.	

Pin Connections

INPUT	1
OUTPUT	4
CONTROL	2
GROUND	3
CASE GROUND	3

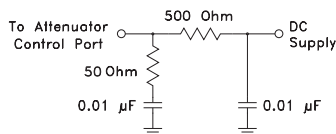
Outline Drawing



Outline Dimensions (inch mm)

A	B	C	D	E	F
.480	.500	.240	.255	.210	.230
12.19	12.70	6.10	6.48	5.33	5.84
G	H	J	K	L	wt
.16	.100	.14	.20	.020	grams
4.06	2.54	3.56	5.08	0.51	1.9

suggested control port biasing configuration



Features

- wideband, 10 to 1000 MHz
- high in-out isolation

Applications

- bi-phase modulator

Attenuator/Switch Electrical Specifications

FREQUENCY (MHz)		INSERTION LOSS (dB) ±20 mA				MAX. INPUT PWR (dBm) ±20 mA		IN-OUT ISOLATION (dB) 0 mA						BI-PHASE X (±20 mA) Typ.			
IN	CON	Mid-Band	Total			1 dB	no	L	M	U				Δ AMP	Phase		
f _L -f _U		Typ.	Max.	Typ.	Max.	compr.	damage	Typ.	Min.	Typ.	Min.	Typ.	Min.	m	Total	m	Total
10-1000	DC-0.5	3.7	4.5	5.0	8.0	17*	25	50	30	42	20	31	20	0.1	0.2	2.0	3.0

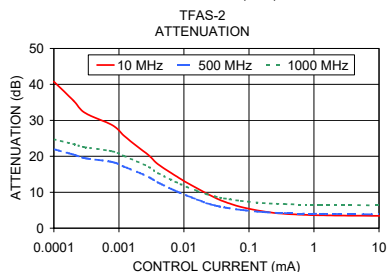
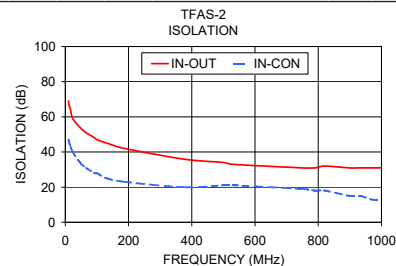
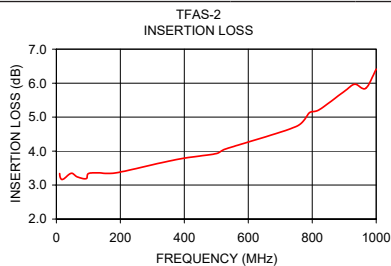
L = low range [f_L to 10 f_L] M = mid range [10 f_L to f_U/2] U = upper range [f_U/2 to f_U] m = [2 f_L to f_U/2]

* 13 dBm from 10-500 MHz.

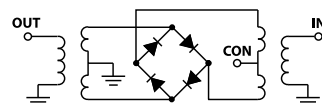
Performance specifications apply for input power up to 10 dB below stated 1 dB compression.

Typical Performance Data

Freq. (MHz)	I. Loss (dB) at 20mA		±Control ΔAMP (dB)		ΔPhase (deg.)		Isolation (dB) (in-out) (in-con)		Input R. Loss (dB)	Control Current (mA)	Attenuation (dB)			Phase Δ ref at 15mA Ctrl			Input VSWR		
											10 MHz	500 MHz	1000 MHz	10 MHz	500 MHz	1000 MHz	10 MHz	500 MHz	1000 MHz
10.0	3.34	0.009	0.00	180.0	69	47	11.4	0.0000	51.3	24.7	27.2	76.7	40.6	0.5	3.3	2.3	4.2		
11.4	3.24	0.006	0.01	180.0	67	46	11.6	0.0001	40.8	22.0	24.7	67.8	31.3	-6.7	3.2	2.2	4.0		
16.1	3.17	0.004	0.01	180.1	64	43	12.2	0.0002	35.5	20.5	23.4	61.3	25.4	-10.4	3.2	2.2	3.8		
23.2	3.18	0.003	0.00	180.1	59	40	12.5	0.0003	32.1	19.5	22.5	59.5	21.4	-12.8	3.1	2.1	3.7		
46.5	3.35	0.002	0.01	180.3	54	34	12.5	0.0008	28.6	18.4	21.4	55.8	17.3	-14.7	3.0	2.0	3.6		
65.8	3.24	0.002	0.01	180.5	51	31	12.4	0.0012	25.7	17.1	20.1	53.7	14.1	-15.8	2.9	1.9	3.4		
93.1	3.19	0.030	0.01	180.7	48	28	12.4	0.0019	22.8	15.7	18.6	51.0	10.9	-16.0	2.7	1.9	3.2		
100.2	3.34	0.003	0.01	180.7	47	28	12.4	0.0029	20.2	14.2	17.0	47.8	8.6	-15.1	2.6	1.7	3.1		
131.8	3.36	0.004	0.01	180.9	45	25	12.4	0.0040	17.8	12.7	15.3	45.1	6.8	-13.6	2.4	1.6	2.9		
186.6	3.36	0.005	0.02	181.3	42	23	12.3	0.0074	14.6	10.4	12.9	40.1	4.7	-10.7	2.1	1.5	2.7		
373.8	3.75	0.008	0.02	182.1	36	20	11.4	0.0110	12.7	9.1	11.5	36.8	3.7	-8.7	1.9	1.4	2.6		
500.8	3.93	0.015	0.03	182.5	34	21	11.3	0.0159	11.1	8.0	10.4	33.2	2.8	-7.2	1.7	1.4	2.6		
529.1	4.06	0.018	0.04	182.5	33	21	11.2	0.0221	9.7	7.0	9.5	29.5	2.2	-5.3	1.5	1.4	2.5		
748.8	4.72	0.055	0.10	182.6	31	19	10.7	0.0301	8.5	6.3	8.8	25.9	1.7	-4.3	1.3	1.4	2.6		
791.0	5.13	0.050	0.15	182.8	31	18	10.3	0.0416	7.4	5.8	8.3	22.4	1.0	-3.4	1.2	1.5	2.6		
820.5	5.21	0.052	0.15	182.4	32	18	10.1	0.0753	5.9	5.1	7.6	16.2	0.7	-2.1	1.2	1.6	2.6		
899.0	5.75	0.063	0.20	182.4	31	15	9.5	0.1640	4.7	4.5	7.0	9.2	0.2	-1.4	1.4	1.8	2.7		
932.5	5.97	0.089	0.27	182.0	31	15	9.3	0.3543	4.0	4.2	6.7	5.0	0.0	-0.8	1.6	1.9	2.7		
967.2	5.85	0.077	0.24	181.8	31	13	9.1	1.2309	3.6	4.0	6.5	1.7	-0.1	-0.5	1.8	2.0	2.7		
1000.0	6.41	0.111	0.38	181.4	31	13	8.8	15.1064	3.4	3.8	6.3	0.0	0.0	-0.1	1.9	2.0	2.7		



electrical schematic



Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
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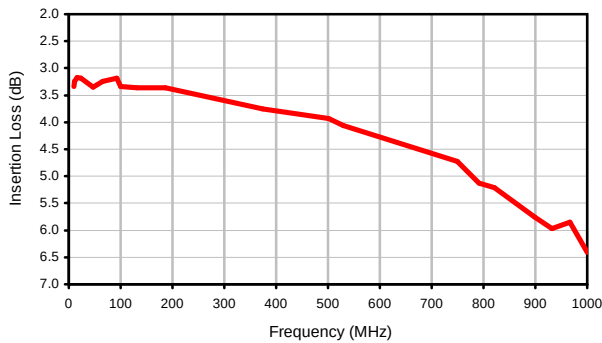
Typical Performance Data

FREQ. (MHz)	INSERTION LOSS (dB) at 20mA Control Current	AMP. UNBAL. (dB) at ± 20 mA Control Current	PHASE UNBAL. (deg.) at ± 20 mA Control Current	ISOLATION at 0 mA Control Current (dB)		RETURN LOSS (dB) Input
				In-Out	In-Con	
10.0	3.34	0.00	180.0	69	47	11.4
11.4	3.24	0.01	180.0	67	46	11.6
16.1	3.17	0.01	180.1	64	43	12.2
23.2	3.18	0.00	180.1	59	40	12.5
46.5	3.35	0.01	180.3	54	34	12.5
65.8	3.24	0.01	180.5	51	31	12.4
93.1	3.19	0.01	180.7	48	28	12.4
100.2	3.34	0.01	180.7	47	28	12.4
131.8	3.36	0.01	180.9	45	25	12.4
186.6	3.36	0.02	181.3	42	23	12.3
373.8	3.75	0.02	182.1	36	20	11.4
500.8	3.93	0.03	182.5	34	21	11.3
529.1	4.06	0.04	182.5	33	21	11.2
748.8	4.72	0.10	182.6	31	19	10.7
791.0	5.13	0.15	182.8	31	18	10.3
820.5	5.21	0.15	182.4	32	18	10.1
899.0	5.75	0.20	182.4	31	15	9.5
932.5	5.97	0.27	182.0	31	15	9.3
967.2	5.85	0.24	181.8	31	13	9.1
1000.0	6.41	0.38	181.4	31	13	8.8

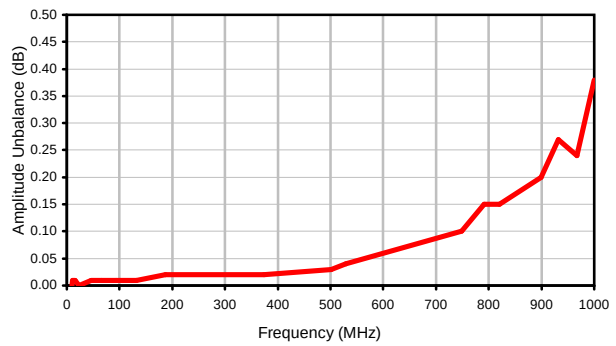
CONTROL CURRENT (mA)	ATTENUATION (dB)			PHASE UNBALANCE REF AT 15 mA CONTROL (deg.)			INPUT VSWR (:1)		
	10 MHz	500 MHz	1000 MHz	10 MHz	500 MHz	1000 MHz	10 MHz	500 MHz	1000 MHz
0.0000	51.3	24.7	27.2	76.7	40.6	0.5	3.3	2.3	4.2
0.0001	40.8	22.0	24.7	67.8	31.3	-6.7	3.2	2.2	4.0
0.0002	35.5	20.5	23.4	61.3	25.4	-10.4	3.2	2.2	3.8
0.0003	32.1	19.5	22.5	59.5	21.4	-12.8	3.1	2.1	3.7
0.0008	28.6	18.4	21.4	55.8	17.3	-14.7	3.0	2.0	3.6
0.0012	25.7	17.1	20.1	53.7	14.1	-15.8	2.9	1.9	3.4
0.0019	22.8	15.7	18.6	51.0	10.9	-16.0	2.7	1.9	3.2
0.0029	20.2	14.2	17.0	47.8	8.6	-15.1	2.6	1.7	3.1
0.0040	17.8	12.7	15.3	45.1	6.8	-13.6	2.4	1.6	2.9
0.0074	14.6	10.4	12.9	40.1	4.7	-10.7	2.1	1.5	2.7
0.0110	12.7	9.1	11.5	36.8	3.7	-8.7	1.9	1.4	2.6
0.0159	11.1	8.0	10.4	33.2	2.8	-7.2	1.7	1.4	2.6
0.0221	9.7	7.0	9.5	29.5	2.2	-5.3	1.5	1.4	2.5
0.0301	8.5	6.3	8.8	25.9	1.7	-4.3	1.3	1.4	2.6
0.0416	7.4	5.8	8.3	22.4	1.0	-3.4	1.2	1.5	2.6
0.0753	5.9	5.1	7.6	16.2	0.7	-2.1	1.2	1.6	2.6
0.1640	4.7	4.5	7.0	9.2	0.2	-1.4	1.4	1.8	2.7
0.3543	4.0	4.2	6.7	5.0	0.0	-0.8	1.6	1.9	2.7
1.2309	3.6	4.0	6.5	1.7	-0.1	-0.5	1.8	2.0	2.7
15.1064	3.4	3.8	6.3	0.0	0.0	-0.1	1.9	2.0	2.7

Typical Performance Curves

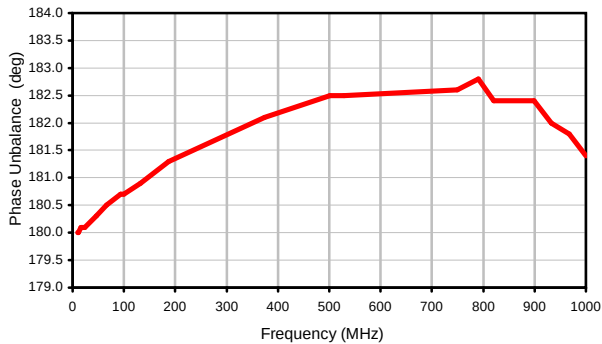
Insertion Loss @ 20 mA



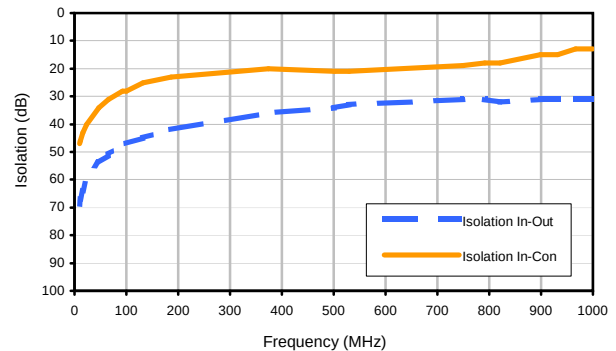
Amplitude Unbalance @ ± 20 mA



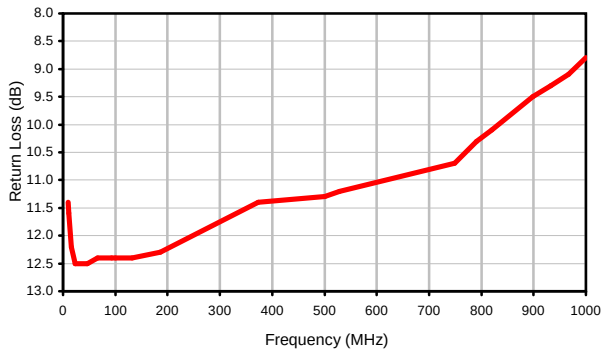
Phase Unbalance @ ± 20 mA



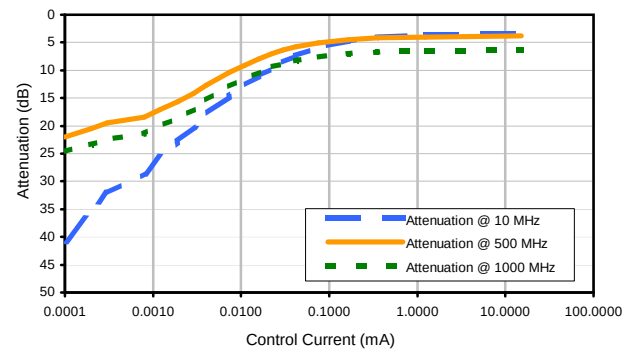
Isolation @ 0 mA



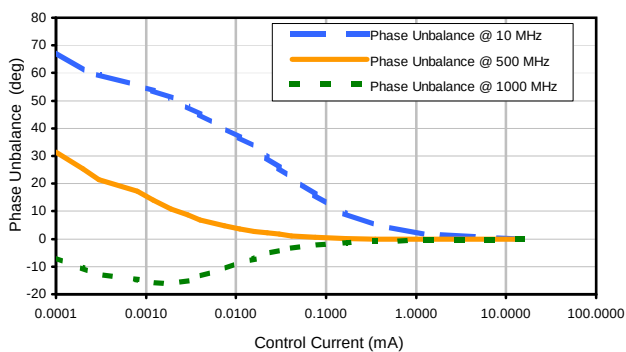
Return Loss Input



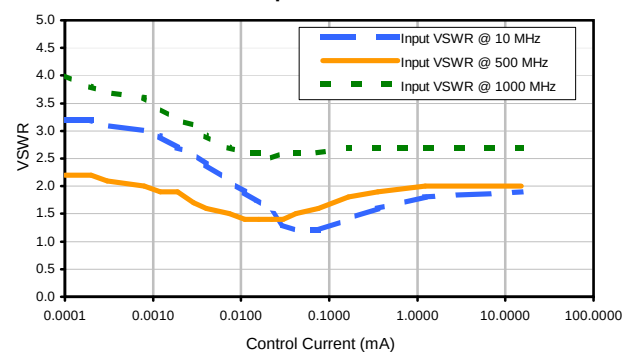
Attenuation



Phase Unbalance ref @ 15 mA



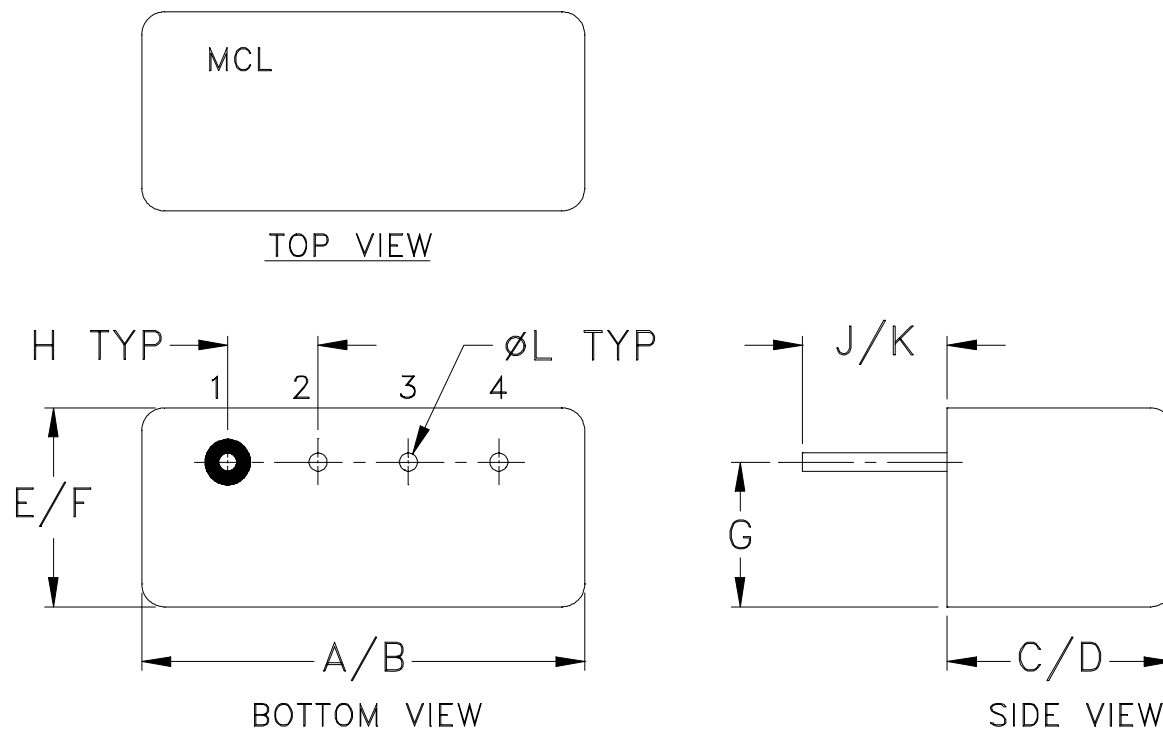
Input VSWR



B02

B13

Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	WT, GRAM
B02	.480 (12.19)	.500 (12.70)	.240 (6.10)	.255 (6.48)	.210 (5.33)	.230 (5.84)	.16 (4.06)	.100 (2.54)	.14 (3.56)	.20 (5.08)	.020 (.51)	1.9
B13			.390 (9.91)	.405 (10.29)								2.3

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .03$; 3 Pl. $\pm .015$

Notes:

- Header material: C.R.S.
Pin material: #52 alloy.
Cover material: Cupro-Nickel.
- Pin finish: Electro Tin-Silver.
- Tolerance on pin diameter $\pm .005$ inch.
- Glass meniscus 0.015 inch max.
- Blue bead indicates Pin 1. Pin numbers do not appear on unit, for reference only.



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All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-55° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes	MIL-STD-202, Method 213, Condition A
Moisture Resistance	10 cycles, 24 hours per cycle	MIL-STD-202, Method 106, Condition A, except 50°C and end point electrical test done within 12 hours
Solderability	10X Magnification	J-STD-002, 95% Coverage
Resistance to Solder Heat	260°C for 10 seconds	MIL-STD-202, Method 210, Condition B
Marking Resistance to Solvents	Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C	MIL-STD-202, Method 215
Terminal Strength	4 1/2 Pound Pull	MIL-STD-202, Method 211, Condition A



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D