

Coaxial Attenuator/Switch

50Ω Bi-Phase 5 to 450 MHz

ZMAS-1



Generic photo used for illustration purposes only

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.	

Coaxial Connections

INPUT	3
OUTPUT	1
CONTROL	2

Features

- wideband, 5 to 450 MHz
- rugged shielded case
- excellent phase and amplitude unbalance

Applications

- bi-phase modulator
- electronic attenuator

CASE STYLE: M21

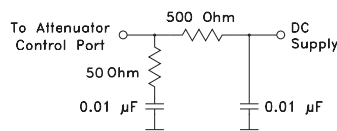
Connectors	Model
SMA	ZMAS-1
BRACKET (OPTION "B")	
BRACKET (OPTION "BR")	

Attenuator/Switch Electrical Specifications

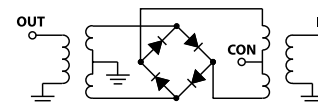
FREQUENCY (MHz)		INSERTION LOSS (dB) ±20 mA				MAX. INPUT PWR (dBm) ±20mA		IN-OUT ISOLATION (dB) 0 mA						BI-PHASE X (±20 mA) Typ.			
IN CON		Mid-Band m		Total Range		1 dB compr.		L		M		U		Δ AMP (dB)		Phase (deg.) deviation from 180°	
f _L -f _U		Typ.	Max.	Typ.	Max.	no damage		Typ.	Min.	Typ.	Min.	Typ.	Min.	m		m	
5-450	DC-0.05	3.5	4	3.5	4.7	20	30	65	50	55	37	35	25	0.10	0.1	0.5	1.2

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

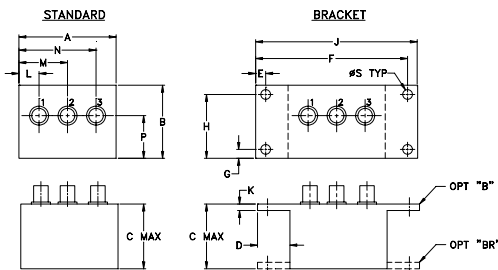
suggested control port biasing configuration



electrical schematic



Outline Drawing

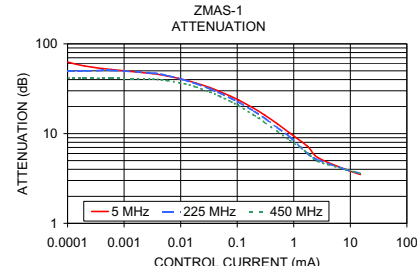
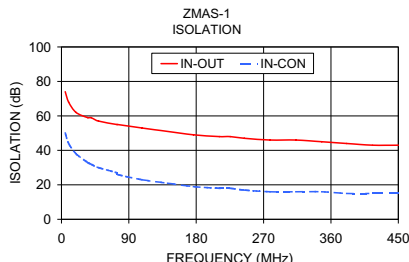
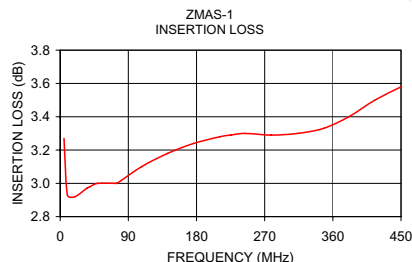


Outline Dimensions (inch mm)

A	B	C	D	E	F	G	H
1.50	1.13	1.00	.50	.155	2.345	.138	.987
38.10	28.70	25.40	12.70	3.94	59.56	3.51	25.07
J	K	L	M	N	P	S	wt
2.50	.10	.31	.75	1.19	.66	.150	grams
63.50	2.54	7.87	19.05	30.23	16.76	3.81	40.0

Typical Performance Data

Freq. (MHz)	I. Loss (dB) at 20mA		±Control ΔΔAMP (dB)	20mA ΔΔPhase (deg.)	Isolation (dB) (in-out) (in-con)		Input R. Loss (dB)	Control Current (mA)	Attenuation (dB)			Phase Δ ref at 15mA Ctrl			Input VSWR		
									5	225	450	5	225	450	5	225	450
	MHz	σ	σ	σ	σ	σ	σ	σ	MHz	MHz	MHz	deg.	deg.	deg.	MHz	MHz	MHz
5.0	3.27	0.025	0.02	179.9	74	50	11.8	0.0000	68.1	50.0	41.3	-52.4	124.7	108.2	2.9	2.9	2.6
9.5	2.93	0.019	0.02	179.9	68	44	13.4	0.0001	62.8	49.6	41.6	-9.9	119.7	103.2	2.9	2.9	2.6
19.5	2.92	0.017	0.02	179.9	62	38	14.3	0.0002	56.7	49.9	41.3	-18.0	114.6	102.4	2.9	2.9	2.6
35.0	2.97	0.017	0.02	179.9	59	33	14.5	0.0006	51.7	50.5	41.3	-20.7	101.4	95.5	2.9	2.9	2.6
39.5	2.98	0.017	0.03	179.9	59	32	14.5	0.0032	46.6	47.3	40.4	-10.7	58.4	76.3	2.9	2.9	2.6
49.5	3.00	0.017	0.03	179.9	57	30	14.4	0.0058	43.8	44.3	39.0	-6.4	45.6	60.3	2.9	2.9	2.6
74.0	3.00	0.019	0.04	179.8	55	27	14.1	0.0116	39.8	39.6	36.0	-0.4	29.9	43.3	2.8	2.9	2.6
75.1	3.00	0.018	0.03	179.8	55	26	14.1	0.0184	36.6	36.1	33.2	3.3	24.8	33.3	2.8	2.8	2.5
107.4	3.10	0.019	0.04	179.7	53	23	14.3	0.0327	32.6	31.6	29.1	5.9	18.3	23.7	2.8	2.7	2.4
141.8	3.18	0.019	0.04	179.7	51	21	14.6	0.0486	29.5	28.4	26.2	6.9	15.6	19.4	2.7	2.7	2.4
176.3	3.24	0.021	0.04	179.6	49	19	14.5	0.0787	25.9	24.6	22.6	7.6	13.3	14.8	2.6	2.5	2.2
210.8	3.28	0.021	0.04	179.5	48	18	14.6	0.1081	23.5	22.2	20.3	7.9	12.2	12.8	2.5	2.4	2.1
225.3	3.29	0.023	0.04	179.5	48	18	14.7	0.1975	19.1	17.8	16.1	7.8	10.0	9.7	2.2	2.2	1.9
244.2	3.30	0.024	0.04	179.4	47	17	14.8	0.3085	16.0	14.8	13.3	7.4	8.7	7.9	2.0	1.9	1.7
278.7	3.29	0.024	0.04	179.3	46	16	15.1	0.5100	12.9	11.7	10.6	6.5	7.3	6.0	1.7	1.7	1.4
313.2	3.30	0.026	0.05	179.2	46	16	15.1	0.8548	10.1	9.2	8.4	5.3	5.5	4.4	1.5	1.4	1.2
347.7	3.33	0.029	0.05	179.1	45	16	14.8	1.7555	7.2	6.0	6.1	3.3	3.4	2.5	1.3	1.2	1.1
381.0	3.40	0.034	0.05	179.1	44	15	15.0	2.6670	5.4	5.1	4.9	2.0	2.0	1.3	1.3	1.2	1.2
415.5	3.50	0.041	0.06	179.0	43	15	14.7	8.1232	4.0	4.0	4.0	0.5	0.5	0.4	1.5	1.4	1.4
450.0	3.58	0.044	0.06	178.9	43	15	13.7	15.1218	3.5	3.6	3.6	0.0	-0.1	0.0	1.6	1.5	1.4



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.
- 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



Attenuator/Switch

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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	
5.0	3.27	0.02	179.9	74	50	11.8
9.5	2.93	0.02	179.9	68	44	13.4
19.5	2.92	0.02	179.9	62	38	14.3
35.0	2.97	0.02	179.9	59	33	14.5
39.5	2.98	0.03	179.9	59	32	14.5
49.5	3.00	0.03	179.9	57	30	14.4
74.0	3.00	0.04	179.8	55	27	14.1
75.1	3.00	0.03	179.8	55	26	14.1
107.4	3.10	0.04	179.7	53	23	14.3
141.8	3.18	0.04	179.7	51	21	14.6
176.3	3.24	0.04	179.6	49	19	14.5
210.8	3.28	0.04	179.5	48	18	14.6
225.3	3.29	0.04	179.5	48	18	14.7
244.2	3.30	0.04	179.4	47	17	14.8
278.7	3.29	0.04	179.3	46	16	15.1
313.2	3.30	0.05	179.2	46	16	15.1
347.7	3.33	0.05	179.1	45	16	14.8
381.0	3.40	0.05	179.1	44	15	15.0
415.5	3.50	0.06	179.0	43	15	14.7
450.0	3.58	0.06	178.9	43	15	13.7

CONTROL CURRENT (mA)	ATTENUATION (dB)			PHASE UNBALANCE REF AT 15 mA CONTROL (deg.)			INPUT VSWR (:1)		
	5 MHz	225 MHz	450 MHz	5 MHz	225 MHz	450 MHz	5 MHz	225 MHz	450 MHz
0.0000	68.1	50.0	41.3	-52.4	124.7	108.2	2.9	2.9	2.6
0.0001	62.8	49.6	41.6	-9.9	119.7	103.2	2.9	2.9	2.6
0.0002	56.7	49.9	41.3	-18.0	114.6	102.4	2.9	2.9	2.6
0.0006	51.7	50.5	41.3	-20.7	101.4	95.5	2.9	2.9	2.6
0.0032	46.6	47.3	40.4	-10.7	58.4	76.3	2.9	2.9	2.6
0.0058	43.8	44.3	39.0	-6.4	45.6	60.3	2.9	2.9	2.6
0.0116	39.8	39.6	36.0	-0.4	29.9	43.3	2.8	2.9	2.6
0.0184	36.6	36.1	33.2	3.3	24.8	33.3	2.8	2.8	2.5
0.0327	32.6	31.6	29.1	5.9	18.3	23.7	2.8	2.7	2.4
0.0486	29.5	28.4	26.2	6.9	15.6	19.4	2.7	2.7	2.4
0.0787	25.9	24.6	22.6	7.6	13.3	14.8	2.6	2.5	2.2
0.1081	23.5	22.2	20.3	7.9	12.2	12.8	2.5	2.4	2.1
0.1975	19.1	17.8	16.1	7.8	10.0	9.7	2.2	2.2	1.9
0.3085	16.0	14.8	13.3	7.4	8.7	7.9	2.0	1.9	1.7
0.5100	12.9	11.7	10.6	6.5	7.3	6.0	1.7	1.7	1.4
0.8548	10.1	9.2	8.4	5.3	5.5	4.4	1.5	1.4	1.2
1.7555	7.2	6.0	6.1	3.3	3.4	2.5	1.3	1.2	1.1
2.6670	5.4	5.1	4.9	2.0	2.0	1.3	1.3	1.2	1.2
8.1232	4.0	4.0	4.0	0.5	0.5	0.4	1.5	1.4	1.4
15.1218	3.5	3.6	3.6	0.0	-0.1	0.0	1.6	1.5	1.4

REV. X1

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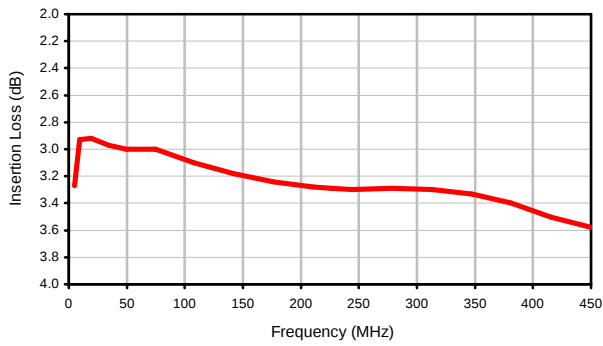


The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see

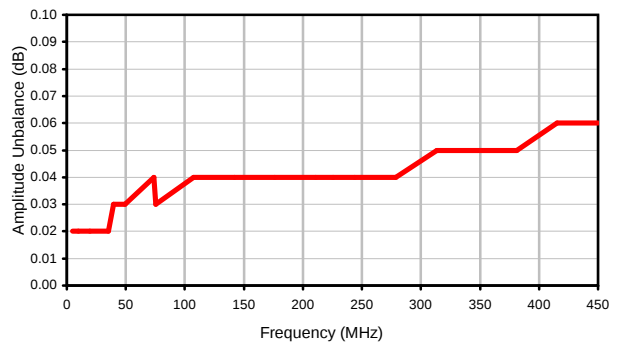


Typical Performance Curves

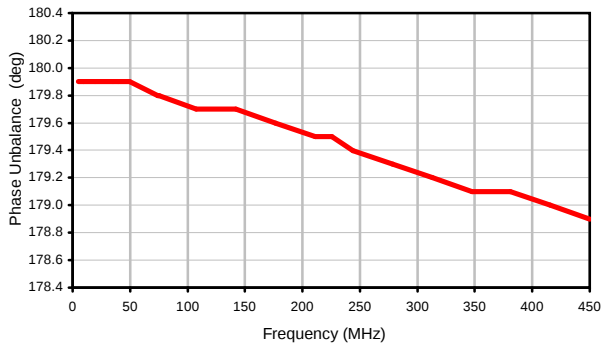
Insertion Loss @ 20 mA



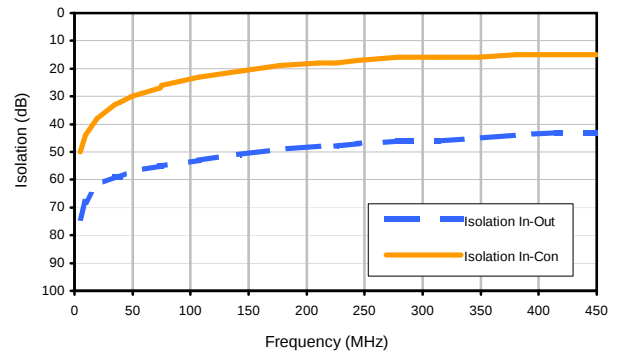
Amplitude Unbalance @ ± 20 mA



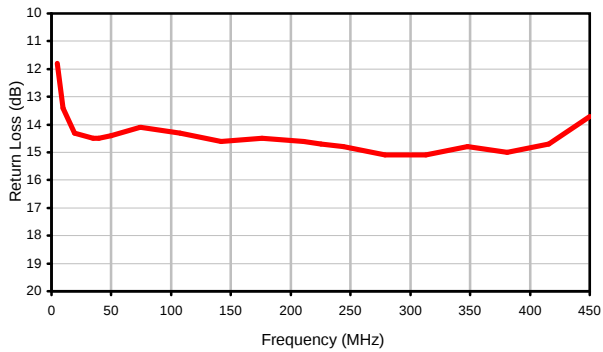
Phase Unbalance @ ± 20 mA



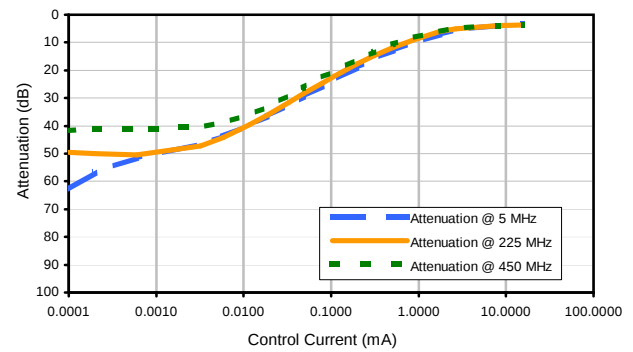
Isolation @ 0 mA



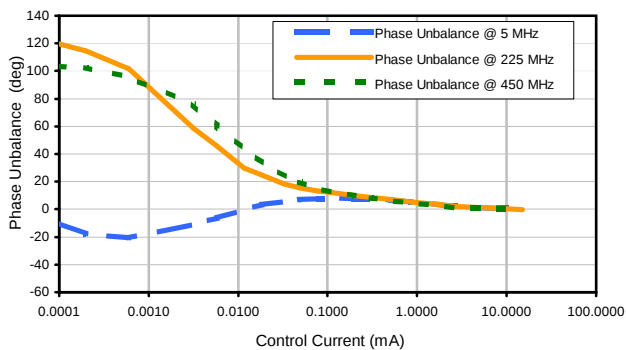
Return Loss Input



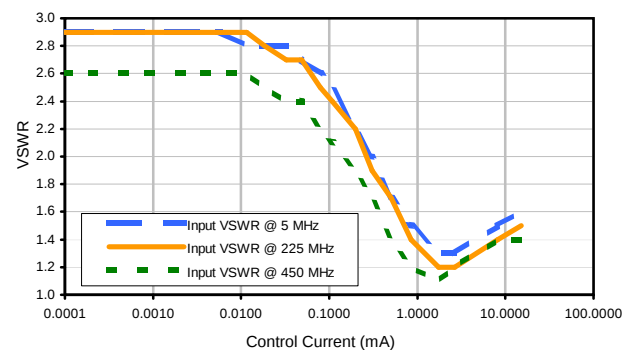
Attenuation



Phase Unbalance ref @ 15 mA



Input VSWR

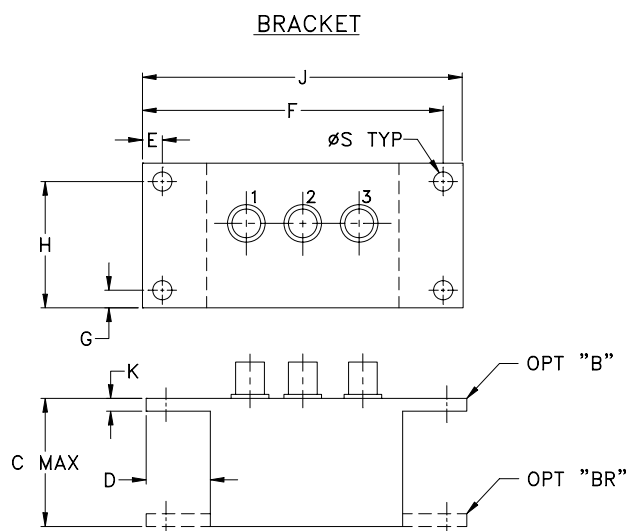
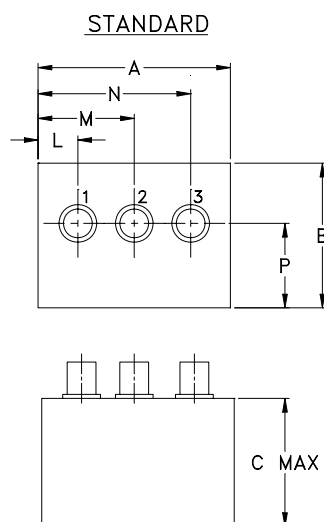


Outline Dimensions

M21

M22

M23



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
M21	1.50 (38.10)	1.13 (28.70)	1.00 (25.40)	.50 (12.70)	.155 (3.94)	2.345 (59.56)	.138 (3.51)	.987 (25.07)	2.50 (63.50)	.10 (2.54)	.31 (7.87)	.75 (19.05)	1.19 (30.23)
M22	2.25 (57.15)	1.38 (35.05)	1.24 (31.50)		.150 (3.81)	3.100 (78.74)		1.238 (31.45)	3.25 (82.55)		.40 (10.16)	1.15 (29.21)	1.86 (47.24)
M23	2.25 (57.15)	1.38 (35.05)	1.24 (31.50)		.150 (3.81)	3.100 (78.74)		1.238 (31.45)	3.25 (82.55)		.63 (16.00)	1.06 (26.92)	1.63 (41.40)

CASE#	P	Q	R	S	WT. GRAMS
M21	.66 (16.76)	--	--	.150 (3.81)	40.0
M22	.64 (16.26)	--	--		74.0
M23	.69 (17.53)	--	--		70.0

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

Notes:

- Case material: Aluminum alloy.
- Case finish:
 - For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
 - For Non-RoHS Case Styles: Yellow hexavalent chrome based conversion coating.

Due to transition from non-RoHS to RoHS, models will be supplied with either case style finish until the non-RoHS case inventory is depleted.
- Mounting bracket available on request. For bracket mounted on connector end add suffix B to part number and add \$5.00 to unit cost. For bracket mounted on the rear, add suffix BR to part number and add \$1.50 to unit cost.



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
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D
Humidity	90% RH, 65°C Units may require bake-out after humidity to restore full performance.	MIL-STD-202, Method 103
Thermal Shock	-65° to 125°C, 5 cycles	MIL-STD-202, Method 107, Condition B
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	100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)	MIL-STD-202, Method 213, Condition I