

Attenuator/Switch

50Ω Bi-Phase 5 to 450 MHz

ZAS-1

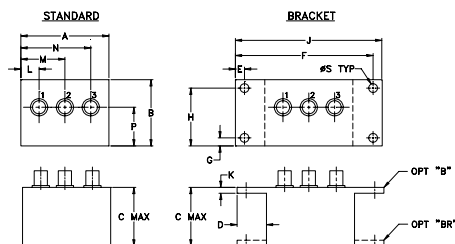
Maximum Ratings

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

Outline Drawing



Outline Dimensions (inch)

A	B	C	D	E	F	G	H	
2.25	1.38	1.24	.50	.150	3.100	.138	1.238	
57.15	35.05	31.50	12.70	3.81	78.74	3.51	31.45	
J	K	L	M	N	P	S	wt	
3.25	.10	.40	1.15	1.86	.64	.150	grams	
82.55	2.54	10.16	29.21	47.24	16.26	3.81	74.0	

Features

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

Applications

- bi-phase modulator
- electronic attenuator



CASE STYLE: M22

Connectors Model

BNC ZAS-1

BRACKET (OPTION "B")

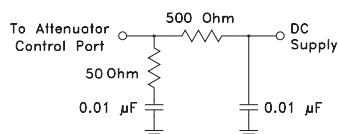
BRACKET (OPTION "BR")

Attenuator/Switch Electrical Specifications

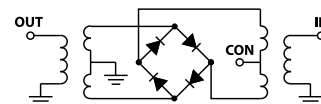
FREQUENCY (MHz)		INSERTION LOSS (dB) ±20 mA				MAX. INPUT PWR (dBm) ±20 mA		IN-OUT ISOLATION (dB) 0 mA						BI-PHASE X (±20 mA) Typ.			
IN	CON	Mid-Band m		Total Range		1 dB compr.	no damage	L	M	U				Δ AMP (dB)	Phase (deg.) deviation from 180°	Total Range	Total Range
f _L -f _U		Typ.	Max.	Typ.	Max.			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

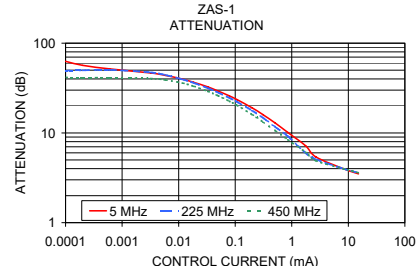
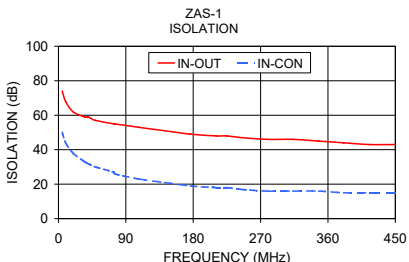
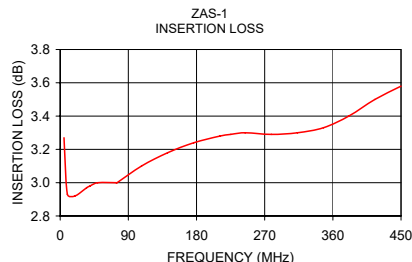


electrical schematic



Typical Performance Data

Freq. (MHz)	I. Loss (dB) at 20mA		±Control ΔAMP (dB)	20mA 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		
									5	225	450	5	225	450	5	225	450
	MHz	MHz	MHz	deg.	deg.	deg.	MHz	MHz	MHz								
$\bar{x}$	σ	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$											
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

- 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-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	
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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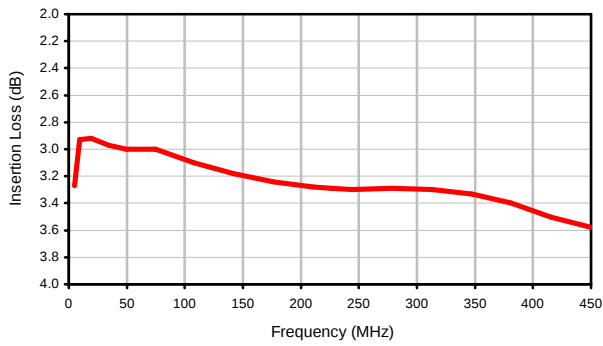


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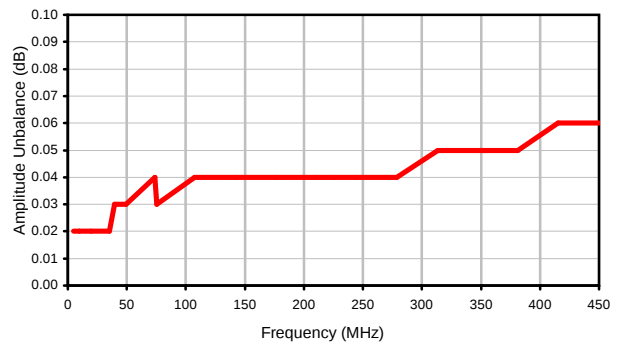


Typical Performance Curves

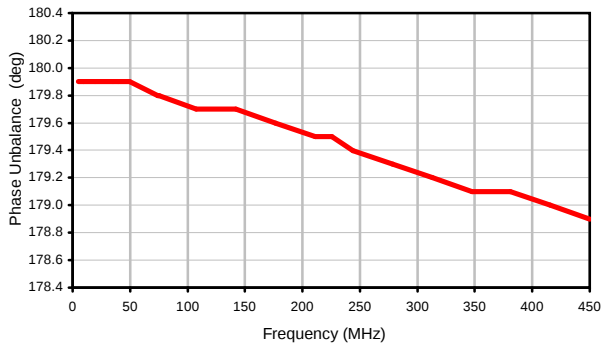
Insertion Loss @ 20 mA



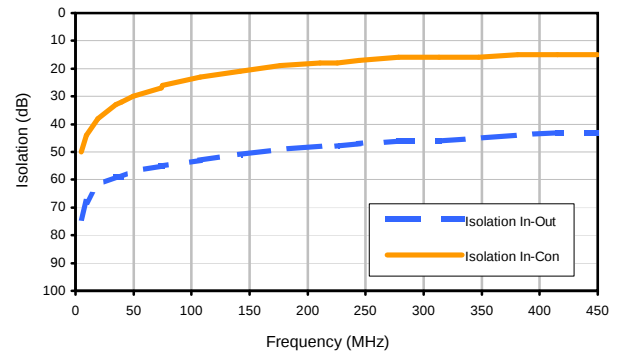
Amplitude Unbalance @ ± 20 mA



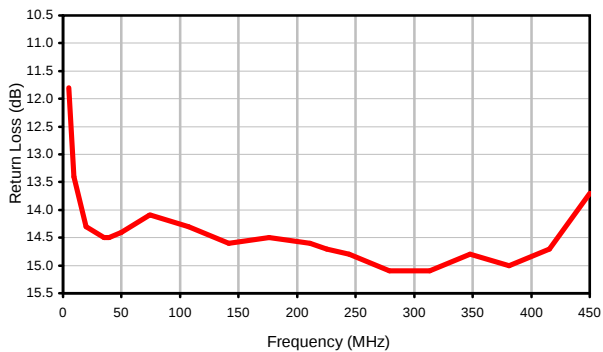
Phase Unbalance @ ± 20 mA



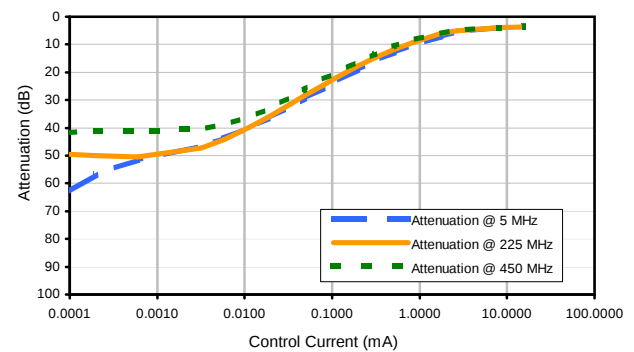
Isolation @ 0 mA



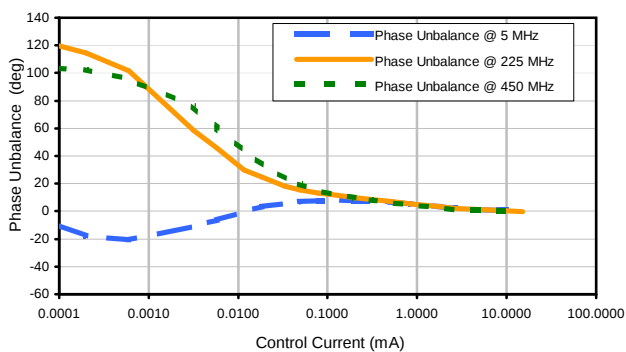
Return Loss Input



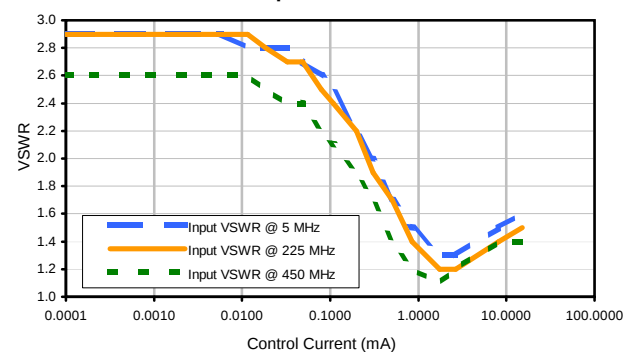
Attenuation



Phase Unbalance ref @ 15 mA



Input VSWR



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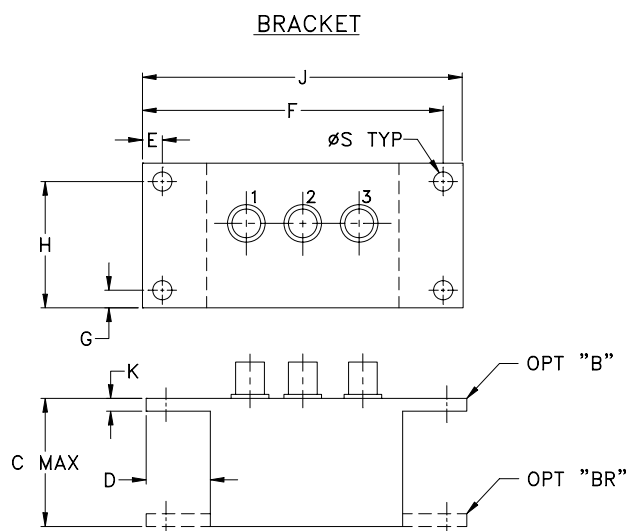
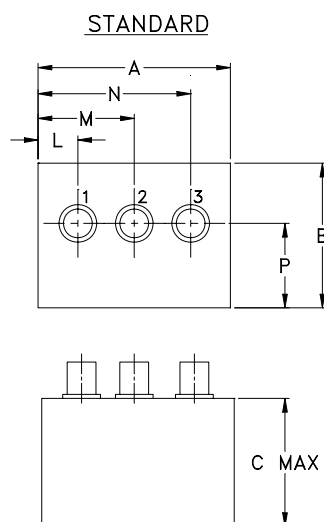


Outline Dimensions

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.



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 Mini-Circuits ISO 9001 & ISO 14001 Certified



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