X2 Frequency Multiplier

50Ω Output 20 to 1000 MHz

ZX90-2-13-S+

Generic photo used for illustration purposes only

CASE STYLE: JA1242

Connectors	Model
SMA	ZX90-2-13-S+

+RoHS Compliant

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

Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Input Power, 25°C	23 dBm

Permanent damage may occur if any of these limits are exceeded.

Coaxial Connections

INPUT	1
OUTPUT	2

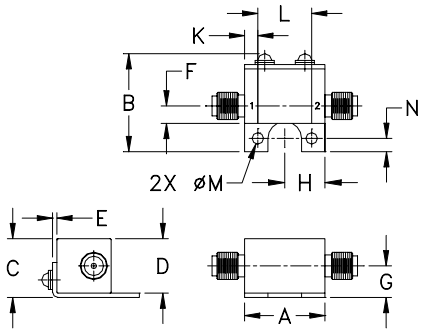
Features

- broadband
- low conversion loss, 11 dB typ.
- rugged construction
- protected by US Patent 6,790,049

Applications

- synthesizers
- local oscillators

Outline Drawing



Outline Dimensions (inch / mm)

A	B	C	D	E	F	G
.74	.90	.54	.50	.04	.16	.29
18.80	22.86	13.72	12.70	1.02	4.06	7.37

H	J	K	L	M	N	wt
.37	--	.122	.496	.106	.122	grams
9.40	--	3.10	12.60	2.69	3.10	19.0

Electrical Specifications

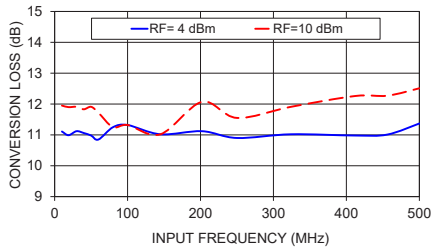
MULTIPLICATION FACTOR	FREQUENCY (MHz)		INPUT POWER (dBm)		CONVERSION LOSS (dB)		*HARMONIC OUTPUT (dBc)					
	F1	F2					F1		F3		F4	
	Input	Output	Min.	Max.	Typ.	Max.	Typ.	Min.	Typ.	Min.	Typ.	Min.
2	10-500	20-1000	4	10	11.0	14.5	45	21	45	25	21	12

* Harmonics of input frequency below the power level of F2

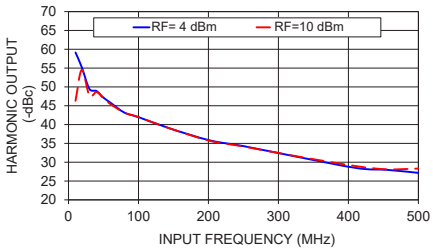
Typical Performance Data

Input Frequency (MHz)	INPUT RF=4dBm Conversion Loss (dB)	Harmonic Output Below F2 (-dBc) F1	F3	F4	INPUT RF=10 dBm Conversion Loss (dB)	Harmonic Output Below F2 (-dBc) F1	F3	F4
10.00	11.11	59.15	71.19	15.25	11.95	46.31	48.75	22.22
19.00	10.99	55.21	76.15	15.28	11.90	54.53	72.71	22.84
30.00	11.12	49.42	63.71	15.14	11.91	47.59	56.55	22.33
40.00	11.06	48.92	70.05	15.18	11.83	48.64	66.36	23.15
50.00	10.98	47.15	67.89	15.27	11.91	46.95	64.56	23.38
60.00	10.85	45.80	66.24	15.26	11.72	45.41	63.06	24.02
80.00	11.25	43.16	51.34	15.29	11.25	43.16	51.34	23.72
100.00	11.32	41.98	60.02	15.28	11.32	41.98	60.02	22.55
145.00	11.02	38.96	59.93	14.81	11.02	38.96	59.93	21.84
202.00	11.12	35.80	53.75	15.27	12.07	35.68	46.78	20.87
250.00	10.90	34.28	47.86	16.20	11.55	34.18	43.20	29.69
324.00	11.02	31.54	45.33	17.68	11.91	31.64	40.13	49.34
412.00	10.98	28.44	39.69	19.06	12.26	28.93	37.04	36.98
456.00	11.01	27.96	38.89	20.42	12.27	28.12	36.56	36.58
500.00	11.37	27.17	40.48	20.75	12.51	28.32	35.15	29.11

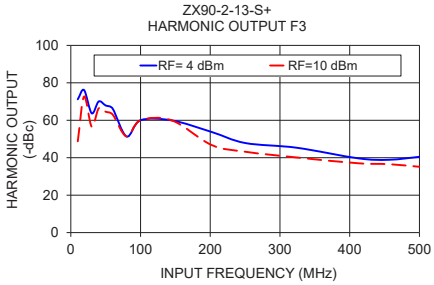
ZX90-2-13-S+
CONVERSION LOSS



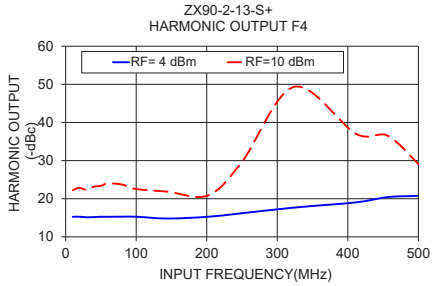
ZX90-2-13-S+
HARMONIC OUTPUT F1



ZX90-2-13-S+
HARMONIC OUTPUT F3



ZX90-2-13-S+
HARMONIC OUTPUT F4



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

Frequency Multiplier (Doubler) ZX90-2-13-S+

Typical Performance Data

Frequency (MHz)				RF IN = 4dBm			
				Conversion Loss (dB)	Harmonic Output* (-dBc)		
X1 Output	X2 Output	X3 Output	X4 Output	X2 Output	X1 Output	X3 Output	X4 Output
10	20	30	40	11.11	59.15	71.19	15.25
12	24	36	48	11.11	59.13	80.11	15.26
14	28	42	56	11.05	57.87	78.65	15.27
15	30	45	60	11.08	56.79	75.26	15.30
17	34	51	68	11.04	56.14	76.86	15.28
19	38	57	76	10.99	55.21	76.15	15.28
21	42	63	84	11.02	54.38	75.25	15.27
30	60	90	120	11.12	49.42	63.71	15.14
35	70	105	140	11.04	50.01	71.18	15.20
40	80	120	160	11.06	48.92	70.05	15.18
45	90	135	180	11.05	47.95	68.75	15.22
50	100	150	200	10.98	47.15	67.89	15.27
55	110	165	220	10.95	46.47	66.97	15.28
60	120	180	240	10.85	45.80	66.24	15.26
64	128	192	256	10.88	45.23	65.54	15.26
68	136	204	272	10.89	44.74	64.77	15.25
80	160	240	320	11.25	43.16	51.34	15.29
90	180	270	360	11.25	43.12	61.64	15.31
100	200	300	400	11.32	41.98	60.02	15.28
110	220	330	440	11.29	41.16	59.26	15.23
120	240	360	480	11.06	40.53	59.35	15.09
130	260	390	520	11.26	39.78	59.29	15.05
140	280	420	560	11.05	39.23	59.78	14.92
143	285	428	570	11.03	39.08	59.92	14.91
145	290	435	580	11.02	38.96	59.93	14.81
170	340	510	680	11.06	37.29	56.33	15.01
186	372	558	744	11.07	36.50	55.57	15.17
202	404	606	808	11.12	35.80	53.75	15.27
218	436	654	872	10.95	35.29	50.73	15.65
234	468	702	936	11.06	34.83	49.46	15.93
250	500	750	1000	10.90	34.28	47.86	16.20
260	520	780	1040	10.90	33.89	46.95	16.50
270	540	810	1080	10.90	33.53	46.33	16.52
280	560	840	1120	11.06	30.69	40.28	16.46
324	648	972	1296	11.02	31.54	45.33	17.68
368	736	1104	1472	10.99	29.85	41.65	18.38
412	824	1236	1648	10.98	28.44	39.69	19.06
456	912	1368	1824	11.01	27.96	38.89	20.42
500	1000	1500	2000	11.37	27.17	40.48	20.75

*Harmonic Output below power level of X2 Output .

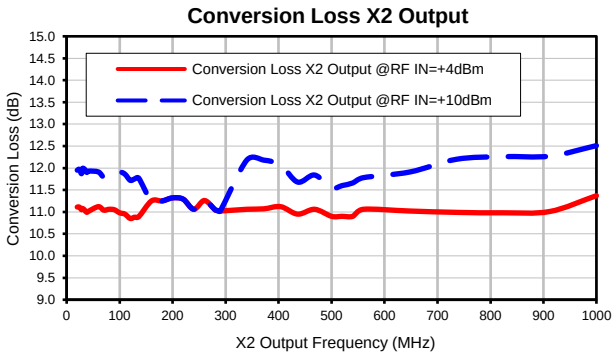
Frequency Multiplier (Doubler) ZX90-2-13-S+

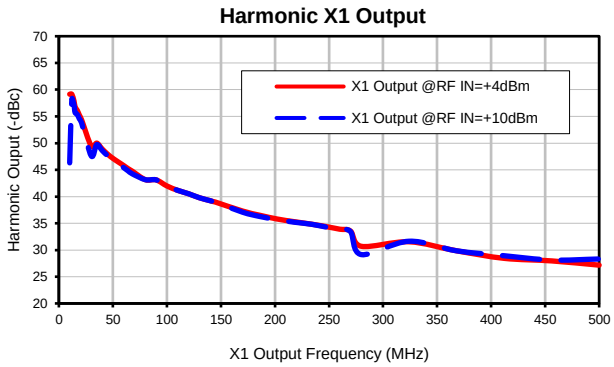
Typical Performance Data

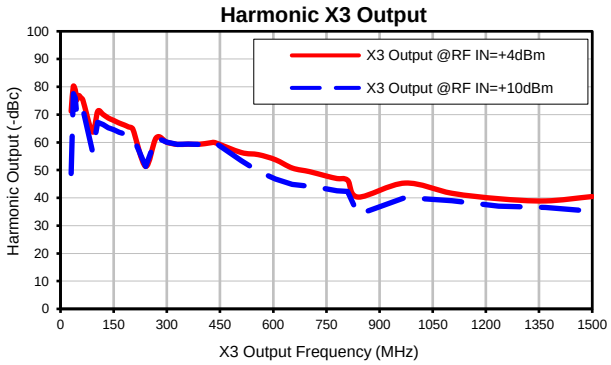
Frequency (MHz)				RF IN = 10dBm			
				Conversion Loss (dB)	Harmonic Output* (-dBc)		
X1 Output	X2 Output	X3 Output	X4 Output	X2 Output	X1 Output	X3 Output	X4 Output
10	20	30	40	11.95	46.31	48.75	22.22
12	24	36	48	11.97	58.24	77.56	22.07
14	28	42	56	11.87	57.08	76.03	22.67
15	30	45	60	11.99	55.73	70.81	22.00
17	34	51	68	11.97	55.37	73.44	22.41
19	38	57	76	11.90	54.53	72.71	22.84
21	42	63	84	11.93	53.82	71.85	22.76
30	60	90	120	11.91	47.59	56.55	22.33
35	70	105	140	11.79	49.72	67.27	22.85
40	80	120	160	11.83	48.64	66.36	23.15
45	90	135	180	11.84	47.67	65.30	23.40
50	100	150	200	11.91	46.95	64.56	23.38
55	110	165	220	11.86	46.13	63.68	23.67
60	120	180	240	11.72	45.41	63.06	24.02
64	128	192	256	11.75	44.81	62.56	24.06
68	136	204	272	11.77	44.24	62.01	24.07
80	160	240	320	11.25	43.16	51.34	15.29
90	180	270	360	11.25	43.12	61.64	15.31
100	200	300	400	11.32	41.98	60.02	15.28
110	220	330	440	11.29	41.16	59.26	15.23
120	240	360	480	11.06	40.53	59.35	15.09
130	260	390	520	11.26	39.78	59.29	15.05
140	280	420	560	11.05	39.23	59.78	14.92
143	285	428	570	11.03	39.08	59.92	14.91
145	290	435	580	11.02	38.96	59.93	14.81
170	340	510	680	12.18	37.07	53.41	19.35
186	372	558	744	12.18	36.27	49.55	19.34
202	404	606	808	12.07	35.68	46.78	20.87
218	436	654	872	11.68	35.20	44.84	23.42
234	468	702	936	11.84	34.81	44.13	25.71
250	500	750	1000	11.55	34.18	43.20	29.69
260	520	780	1040	11.60	33.80	42.59	32.25
270	540	810	1080	11.66	33.41	42.26	34.00
280	560	840	1120	11.78	29.14	33.99	31.13
324	648	972	1296	11.91	31.64	40.13	49.34
368	736	1104	1472	12.20	29.85	38.92	35.96
412	824	1236	1648	12.26	28.93	37.04	36.98
456	912	1368	1824	12.27	28.12	36.56	36.58
500	1000	1500	2000	12.51	28.32	35.15	29.11

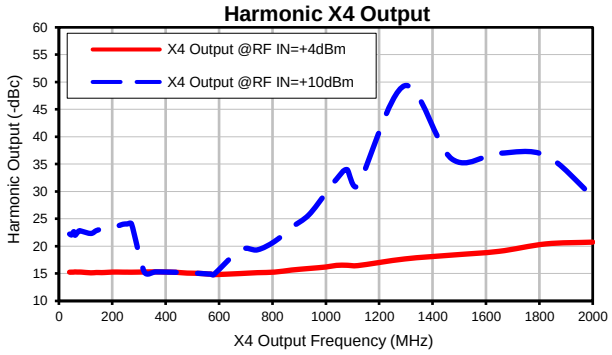
*Harmonic Output below power level of X2 Output .

Typical Performance Curves





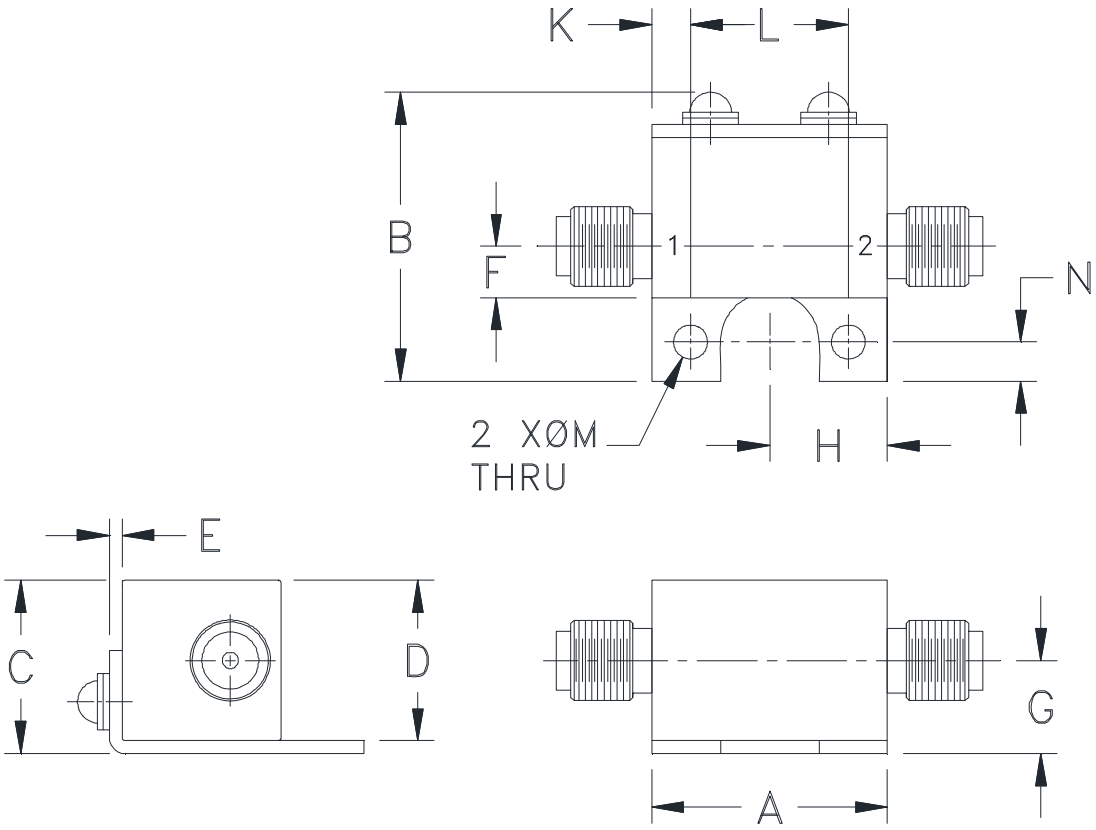




Case Style JA

JA1242

Outline Dimensions



CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	WT, GRAM
JA1242	.74 (18.80)	.90 (22.86)	.54 (13.72)	.50 (12.70)	.04 (1.02)	.16 (4.06)	.29 (7.37)	.37 (9.40)	- -	.122 (3.10)	.496 (12.60)	.106 (2.69)	.122 (3.10)	19.0

Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015.
Tolerance on hole size and interaxes dimensions to be ±.005.

Notes:

1. Case material: Brass.
2. Case finish: Nickel plate.

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Environmental Specifications **ENV28T5**

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	-40° to 85°C	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