

Precision

# Digital Step Attenuator

50Ω TTL Control, Pin Diode 10 to 1000 MHz

## ZSAT-31R5+



Generic photo used for illustration purposes only

CASE STYLE: AR214  
Connectors    Model  
SMA            ZSAT-31R5

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

### Maximum Ratings

Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 125°C
Input Power	15 dBm
DC Voltage	5.5 V
TTL	5.5V

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

### Features

- precision 6 bit attenuator
- wideband, 10 to 1000 MHz
- excellent step accuracy, 0.2 dB typ.

### Applications

- test sets
- cellular
- gain control transmitters/receivers

### Digital Step Attenuator Electrical Specifications

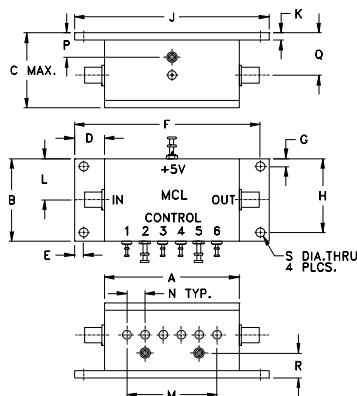
MODEL NO.	FREQUENCY (MHz)		PRIMARY ATTENUATION STEPS (dB)						ATTENUATION (dB) LOGIC STATE		VSWR (:1)		
	f <sub>L</sub>	f <sub>U</sub>	@ CONTROL PORT						(1,1,1,1,1,1)** Nom.	(0,0,0,0,0,0) Max.	L	M	U
			#1	#2	#3	#4	#5	#6					
ZSAT-31R5	10	1000	0.5±0.18	1±0.25	2±0.25	4±0.3	8±0.4	16±0.5	31.5	7.0	2.0	1.5	1.6

L=10 to 100 MHz      M=100 to 500 MHz      U=500 to 1000 MHz

\*\* Total attenuation above thru-loss.

1. Step accuracy is specified for basic steps. For combination of steps accuracy is additive.
2. Thru-loss is minimum insertion loss with all attenuation elements bypassed (All TTL controls state are Low)

### Outline Drawing



### Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J
2.25	1.38	1.25	.50	.150	3.100	.138	1.238	3.25
57.15	35.05	31.75	12.70	3.81	78.74	3.51	31.45	82.55
K	L	M	N	P	Q	R	S	wt
.12	.69	1.50	.30	.41	.71	.41	.150	grams
3.05	17.53	38.10	7.62	10.41	18.03	10.41	3.81	112

### Additional Specifications

DC Voltage	+5V
DC Current	12mA max.
Switching Time (50% TTL to within specified accuracy of the next-selected attenuation step, and to within 0.1 dB of steady-state Thru-Loss)	10µs typ., 15µs max.,
TTL Input High Threshold	2V min
TTL Input Low Threshold	0.8V max.
TTL Toggle Rate	50 kHz typ.
1dB Compression	10 dBm (10-100 MHz) +15 dBm (100-1000MHz)

### Notes

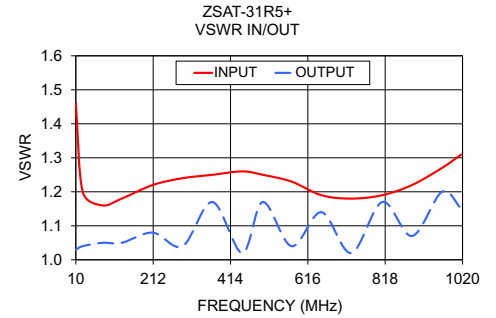
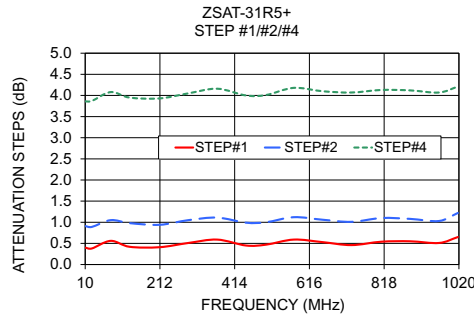
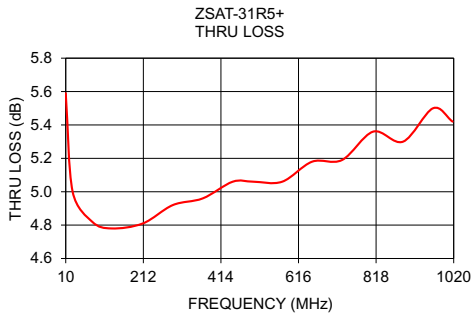
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ZSAT-31R5+  
DJ/VV/CP/AM  
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# ZSAT-31R5+



## Step Attenuation\* at TTL Control State

FREQ.	000000	000001	000010	000100	001000	010000	100000	111111
(MHz)	THRU LOSS (dB)	THRU LOSS (dB)	THRU LOSS (dB)	THRU LOSS (dB)	THRU LOSS (dB)	THRU LOSS (dB)	THRU LOSS (dB)	THRU LOSS (dB)
9.99	5.59	0.40	0.91	1.89	3.86	7.84	15.88	31.28
27.97	5.00	0.38	0.89	1.88	3.87	7.83	15.90	31.42
78.93	4.82	0.56	1.05	2.08	4.08	8.06	16.09	31.59
129.89	4.78	0.42	0.98	1.98	3.95	7.95	16.00	31.50
210.82	4.81	0.41	0.94	1.93	3.93	7.89	15.93	31.31
288.76	4.92	0.51	1.05	2.04	4.05	8.04	16.07	31.68
366.69	4.96	0.59	1.11	2.11	4.16	8.12	16.14	31.82
444.63	5.06	0.45	0.99	1.98	4.00	7.94	16.00	31.59
498.58	5.06	0.47	1.00	1.99	4.01	7.95	15.99	31.52
573.52	5.06	0.59	1.12	2.14	4.18	8.09	16.18	31.86
651.45	5.18	0.53	1.06	2.03	4.10	8.01	16.05	31.88
729.39	5.19	0.46	1.01	2.01	4.07	7.99	16.03	31.74
810.32	5.36	0.54	1.10	2.06	4.13	8.02	16.10	31.98
888.26	5.30	0.55	1.08	2.03	4.12	7.99	16.09	31.78
966.19	5.50	0.51	1.03	1.98	4.07	7.88	15.97	31.85
1017.15	5.42	0.65	1.22	2.12	4.21	8.03	16.17	31.82

## INPUT VSWR

FREQ.	000001	000010	000100	001000	010000	100000	111111
(MHz)							
9.99	1.46	1.44	1.42	1.43	1.46	1.50	1.29
27.97	1.20	1.20	1.19	1.19	1.20	1.21	1.13
78.93	1.16	1.15	1.14	1.15	1.15	1.16	1.11
129.89	1.18	1.18	1.16	1.16	1.17	1.18	1.13
210.82	1.22	1.23	1.19	1.19	1.19	1.21	1.16
288.76	1.24	1.21	1.21	1.22	1.21	1.23	1.20
366.69	1.25	1.23	1.23	1.24	1.24	1.25	1.24
444.63	1.26	1.28	1.24	1.26	1.26	1.27	1.27
498.58	1.25	1.27	1.24	1.27	1.27	1.27	1.30
573.52	1.23	1.22	1.23	1.27	1.27	1.26	1.32
651.45	1.19	1.22	1.21	1.25	1.26	1.24	1.34
729.39	1.18	1.20	1.21	1.23	1.25	1.20	1.34
810.32	1.19	1.21	1.21	1.21	1.23	1.18	1.35
888.26	1.22	1.28	1.24	1.21	1.22	1.16	1.35
966.19	1.27	1.29	1.26	1.20	1.20	1.16	1.36
1017.15	1.31	1.34	1.27	1.20	1.20	1.17	1.36

## OUTPUT VSWR

FREQ.	000001	000010	000100	001000	010000	100000	111111
(MHz)							
9.99	1.03	1.66	1.47	1.42	1.23	1.10	1.09
27.97	1.04	1.59	1.22	1.32	1.11	1.05	1.04
78.93	1.05	1.50	1.14	1.21	1.06	1.03	1.02
129.89	1.05	1.20	1.13	1.02	1.06	1.02	1.02
210.82	1.08	1.61	1.18	1.22	1.07	1.05	1.04
288.76	1.04	1.12	1.18	1.08	1.08	1.04	1.05
366.69	1.17	1.57	1.22	1.25	1.10	1.07	1.07
444.63	1.02	1.07	1.20	1.12	1.10	1.07	1.07
498.58	1.17	1.41	1.21	1.23	1.12	1.09	1.09
573.52	1.04	1.28	1.19	1.18	1.11	1.09	1.09
651.45	1.14	1.29	1.17	1.23	1.13	1.12	1.11
729.39	1.02	1.16	1.13	1.19	1.14	1.11	1.12
810.32	1.17	1.25	1.11	1.25	1.17	1.14	1.14
888.26	1.07	1.06	1.10	1.22	1.18	1.14	1.15
966.19	1.20	1.32	1.12	1.28	1.21	1.17	1.17
1017.15	1.15	1.16	1.15	1.31	1.24	1.17	1.17

\* Step attenuation above thru-loss (TTL logic 000)

### Notes

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# ZSAT-31R5+

## Typical Performance Data

FREQUENCY (MHz)	STEP ATTENUATION* AT TTL CONTROL STATE (dB)							
	000000	000001	000010	000100	001000	010000	100000	111111
	THRU LOSS	0.5 dB	1.0 dB	2.0 dB	4.0 dB	8.0 dB	16.0 dB	31.5 dB
9.99	5.59	0.40	0.91	1.89	3.86	7.84	15.88	31.28
27.97	5.00	0.38	0.89	1.88	3.87	7.83	15.90	31.42
78.93	4.82	0.56	1.05	2.08	4.08	8.06	16.09	31.59
129.89	4.78	0.42	0.98	1.98	3.95	7.95	16.00	31.50
210.82	4.81	0.41	0.94	1.93	3.93	7.89	15.93	31.31
288.76	4.92	0.51	1.05	2.04	4.05	8.04	16.07	31.68
366.69	4.96	0.59	1.11	2.11	4.16	8.12	16.14	31.82
444.63	5.06	0.45	0.99	1.98	4.00	7.94	16.00	31.59
498.58	5.06	0.47	1.00	1.99	4.01	7.95	15.99	31.52
573.52	5.06	0.59	1.12	2.14	4.18	8.09	16.18	31.86
651.45	5.18	0.53	1.06	2.03	4.10	8.01	16.05	31.88
729.39	5.19	0.46	1.01	2.01	4.07	7.99	16.03	31.74
810.32	5.36	0.54	1.10	2.06	4.13	8.02	16.10	31.98
888.26	5.30	0.55	1.08	2.03	4.12	7.99	16.09	31.78
966.19	5.50	0.51	1.03	1.98	4.07	7.88	15.97	31.85
1017.15	5.42	0.65	1.22	2.12	4.21	8.03	16.17	31.82

\* Step Attenuation above Thru Loss (TTL Logic 000000).

FREQUENCY (MHz)	INPUT VSWR AT TTL CONTROL STATE (:1)						
	000001	000010	000100	001000	010000	100000	111111
	0.5 dB	1.0 dB	2.0 dB	4.0 dB	8.0 dB	16.0 dB	31.5 dB
9.99	1.46	1.44	1.42	1.43	1.46	1.50	1.29
27.97	1.20	1.20	1.19	1.19	1.20	1.21	1.13
78.93	1.16	1.15	1.14	1.15	1.15	1.16	1.11
129.89	1.18	1.18	1.16	1.16	1.17	1.18	1.13
210.82	1.22	1.23	1.19	1.19	1.19	1.21	1.16
288.76	1.24	1.21	1.21	1.22	1.21	1.23	1.20
366.69	1.25	1.23	1.23	1.24	1.24	1.25	1.24
444.63	1.26	1.28	1.24	1.26	1.26	1.27	1.27
498.58	1.25	1.27	1.24	1.27	1.27	1.27	1.30
573.52	1.23	1.22	1.23	1.27	1.27	1.26	1.32
651.45	1.19	1.22	1.21	1.25	1.26	1.24	1.34
729.39	1.18	1.20	1.21	1.23	1.25	1.20	1.34
810.32	1.19	1.21	1.21	1.21	1.23	1.18	1.35
888.26	1.22	1.28	1.24	1.21	1.22	1.16	1.35
966.19	1.27	1.29	1.26	1.20	1.20	1.16	1.36
1017.15	1.31	1.34	1.27	1.20	1.20	1.17	1.36

FREQUENCY (MHz)	OUTPUT VSWR AT TTL CONTROL STATE (:1)						
	000001	000010	000100	001000	010000	100000	111111
	0.5 dB	1.0 dB	2.0 dB	4.0 dB	8.0 dB	16.0 dB	31.5 dB
9.99	1.03	1.66	1.47	1.42	1.23	1.10	1.09
27.97	1.04	1.59	1.22	1.32	1.11	1.05	1.04
78.93	1.05	1.50	1.14	1.21	1.06	1.03	1.02
129.89	1.05	1.20	1.13	1.02	1.06	1.02	1.02
210.82	1.08	1.61	1.18	1.22	1.07	1.05	1.04
288.76	1.04	1.12	1.18	1.08	1.08	1.04	1.05
366.69	1.17	1.57	1.22	1.25	1.10	1.07	1.07
444.63	1.02	1.07	1.20	1.12	1.10	1.07	1.07
498.58	1.17	1.41	1.21	1.23	1.12	1.09	1.09
573.52	1.04	1.28	1.19	1.18	1.11	1.09	1.09
651.45	1.14	1.29	1.17	1.23	1.13	1.12	1.11
729.39	1.02	1.16	1.13	1.19	1.14	1.11	1.12
810.32	1.17	1.25	1.11	1.25	1.17	1.14	1.14
888.26	1.07	1.06	1.10	1.22	1.18	1.14	1.15
966.19	1.20	1.32	1.12	1.28	1.21	1.17	1.17
1017.15	1.15	1.16	1.15	1.31	1.24	1.17	1.17



For detailed performance specs & shopping online see web site

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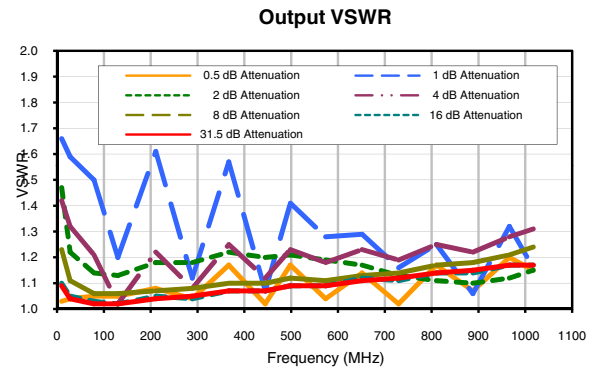
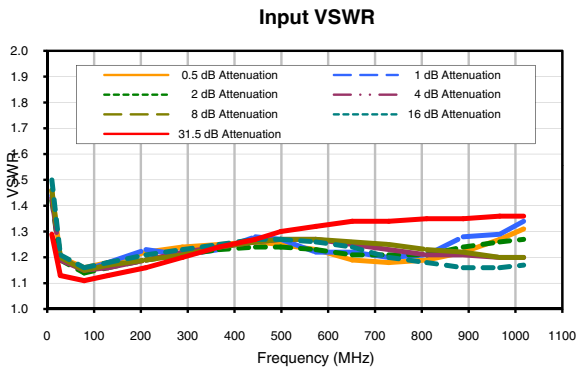
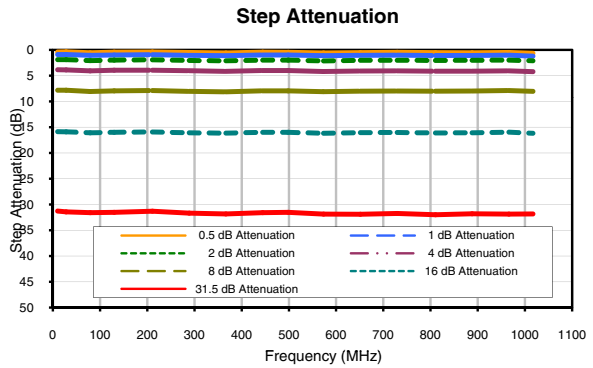
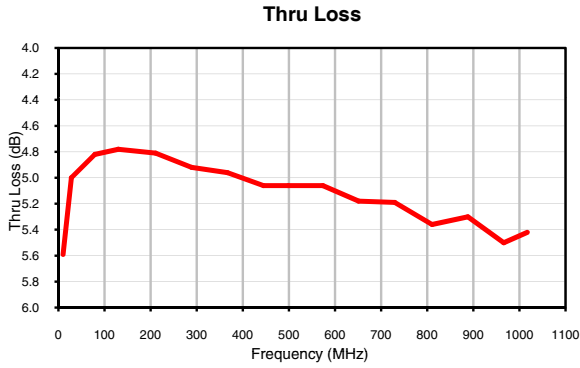
IF/RF MICROWAVE COMPONENTS

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## Typical Performance Curves



For detailed performance specs & shopping online see web site

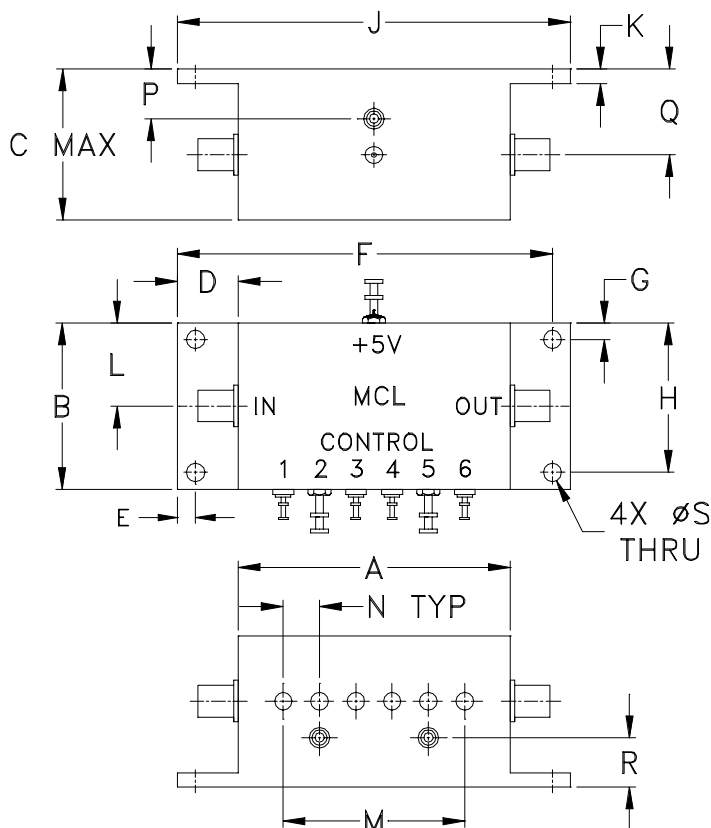
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REV. OR  
 ZSAT-31R5+  
 131110  
 Page 1 of 1

### Outline Dimensions



CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N	P
AR214	2.25 (57.15)	1.38 (35.05)	1.25 (31.75)	.50 (12.70)	.150 (3.81)	3.100 (78.74)	.138 (3.51)	1.238 (31.45)	3.25 (82.55)	.12 (3.05)	.69 (17.53)	1.50 (38.10)	.30 (7.62)	.41 (10.41)

CASE #.	Q	R	S	WT, GRAM
AR214	.71 (18.03)	.41 (10.41)	.150 (3.81)	112

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

#### Notes:

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



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 125° 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