

Series 349 and 349H Octave-Band 11 Bit Digital PIN Diode Attenuators

The Series 349 and 349H programmable attenuators provide greater than octave-band performance and wide programming flexibility in compact rugged packages. Attenuation ranges up to 80 dB are available with attenuation increments as low as 0.03 dB.

Each Series 349 and 349H unit is an integrated assembly of a balanced PIN diode attenuator and a driver circuit consisting of a PROM, a D/A converter and a current-to-voltage converter. See Figure 1. This arrangement provides a high degree of accuracy and repeatability and preserves the inherent monotonicity of the attenuator.

SERIES 349

The maximum programmable attenuation range in every band except the 8.0 - 18.0 GHz frequency range is 80 dB. Attenuators limited in range to 64 dB exhibit switching times less than 500 nsec while the 80 dB units switch in less than 2 μ sec.

SERIES 349H

If even faster switching of 64 dB units is required, GMC offers its Series 349H attenuators. These units switch in less than 300 nsec with essentially the same performance specifications as the 64 dB Series 349 units.

All the attenuators are available with either a strobe/latch or a non-linear current or voltage controlled attenuation capability. Refer to the Available Options table and the Notes following the Pin Functions table.

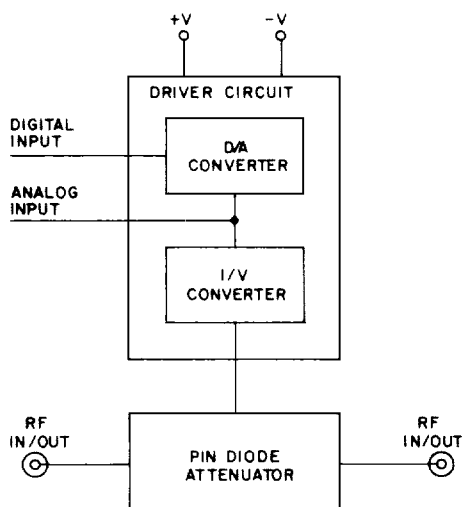
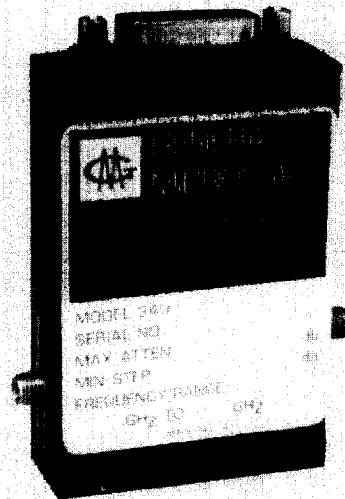


Fig. 1—Series 349 and 349H block diagram

- Absorptive
- 64 or 80 dB range
- .03 dB resolution
- Binary or BCD programming
- Guaranteed monotonicity
- Frequency range: 0.75 to 18 GHz



Series 349 and 349H Specifications

PERFORMANCE CHARACTERISTICS: SERIES 349

MODEL	FREQUENCY RANGE GHz	MAX. INSERTION LOSS (dB)	MAX. VSWR	FLATNESS (\pm dB) AT MEAN ATTENUATION LEVELS UP TO				
				10 dB	20 dB	40 dB	60 dB ⁽⁴⁾	80 dB ⁽¹⁾
3491-64 3491-80	1.0-2.0	1.6	1.5	0.3	0.8	1.5	1.6	1.9
	0.75-2.25 ⁽²⁾	1.7	2.0	0.5	1.4	3.0	3.5	3.8
3492-64 3492-80	2.0-4.0	1.8	1.5	0.3	0.8	1.5	1.6	1.9
	1.5-4.5 ⁽²⁾	1.9	2.0	0.5	1.4	3.0	3.5	3.8
3493-64 3493-80	2.6-5.2	2.0	1.6	0.3	0.8	1.5	1.6	1.9
	1.95-5.85 ⁽²⁾	2.1	2.1	0.5	1.4	3.0	3.5	3.8
3494-64 3494-80	4.0-8.0	2.4	1.7	0.3	0.8	1.5	1.6	1.9
	3.0-9.0 ⁽²⁾	2.5	2.2	0.5	1.4	3.0	3.5	3.8
3495-64 3495-80	5.0-10.0	2.6	1.7	0.5	0.9	1.5	1.6	1.9
	3.75-11.25 ⁽²⁾	2.7	2.2	0.7	1.4	3.0	3.5	3.8
3496-64 3496-80	6.0-12.0	2.7	1.8	0.7	1.0	1.5	1.6	1.9
	4.5-13.5 ⁽²⁾	2.8	2.2	0.9	1.5	3.0	3.5	3.8
3498-64	8.0-18.0	3.0 ⁽³⁾	1.8 ⁽³⁾	0.7	1.0	1.5	1.6	—
	6.0-18.0 ⁽²⁾	3.0 ⁽³⁾	1.8 ⁽³⁾	0.9	1.5	3.0	3.5	—

PERFORMANCE CHARACTERISTICS: SERIES 349H

MODEL	FREQUENCY RANGE GHz	MAX. INSERTION LOSS (dB)	MAX. VSWR	FLATNESS (\pm dB) AT MEAN ATTENUATION LEVELS UP TO			
				10 dB	20 dB	40 dB	60 dB ⁽⁴⁾
3491H-64	1.0-2.0	1.6	1.5	0.5	1.0	1.5	1.6
	0.75-2.25 ⁽²⁾	1.7	2.0	0.7	1.6	3.0	3.5
3492H-64	2.0-4.0	1.8	1.5	0.5	1.0	1.5	1.6
	1.5-4.5 ⁽²⁾	1.9	2.0	0.7	1.6	3.0	3.5
3493H-64	2.6-5.2	2.0	1.6	0.5	1.0	1.5	1.6
	1.95-5.85 ⁽²⁾	2.1	2.1	0.7	1.6	3.0	3.5
3494H-64	4.0-8.0	2.4	1.7	0.5	1.0	1.5	1.6
	3.0-9.0 ⁽²⁾	2.5	2.2	0.7	1.6	3.0	3.5
3495H-64	5.0-10.0	2.6	1.7	0.7	1.0	1.5	1.6
	3.75-11.25 ⁽²⁾	2.7	2.2	0.9	1.6	3.0	3.5
3496H-64	6.0-12.0	2.7	1.8	0.7	1.0	1.5	1.6
	4.5-13.5 ⁽²⁾	2.8	2.2	0.9	1.6	3.0	3.5
3498H-64	8.0-18.0	3.0 ⁽³⁾	1.8 ⁽³⁾	0.7	1.0	1.5	1.6
	6.0-18.0 ⁽²⁾	3.0 ⁽³⁾	1.8 ⁽³⁾	0.9	1.6	3.0	3.5

(1) Applicable only to 80 dB versions.

(2) Specifications for the extended frequency ranges are typical.

(3) Except from 16-18 GHz where insertion loss is 4.2 dB max. and VSWR is 2.2.

(4) Flatness specification at 64 dB level is ± 0.2 dB higher than at 60 dB level.



Series 349 and 349H Specifications

Mean Attenuation Range

349(x)-64, 349(x)H-64.....	64 dB
349(x)-80.....	80 dB

Accuracy of Attenuation

0-30 dB.....	± 0.5 dB
>30-50 dB.....	± 1.0 dB
>50-64 dB.....	± 1.5 dB
>64-80 dB.....	± 2.0 dB

Monotonicity Guaranteed

Temperature Coefficient ± 0.025 dB/°C

Power Handling Capability

Without Performance Degradation

3491, 3492H thru 3498H.....	10 mW cw or peak
3491H.....	1mW cw or peak
All other units.....	100 mW cw or peak

Survival Power (from -40°C to +25°C; see figure 2 for higher temperatures)

All units.....	1 W average 25 W peak (1 µsec max. pulse width)
----------------	--

Switching Time

349(x)H-64.....	300 nsec max.
349(x)-64.....	500 nsec max.
349(x)-80.....	2 µsec max.

ENVIRONMENTAL RATINGS

Operating Temperature

Range -40°C to +85°C

Non-Operating

Temperature Range .. -54°C to +100°C

Humidity MIL-STD-202F, Method 103B, Cond. B (96 hrs. at 95%)

Shock MIL-STD-202F, Method 213B, Cond. B (75G, 6 msec)

Vibration MIL-STD-202F, Method 204D, Cond. B (.06" double amplitude or 15G, whichever is less)

Altitude MIL-STD-202F, Method 105C, Cond. B (50,000 ft.)

Temp. Cycling MIL-STD-202F, Method 107D, Cond. A, 5 cycles.

Programming..... Positive true binary (standard) or BCD (Option 1). For complementary code, specify Option 2.

Minimum Attenuation Step

Binary Units	
349(x)-64, 349(x)H-64.....	0.03 dB
349(x)-80.....	0.04 dB
BCD Units.....	0.10 dB

Logic Input

Logic "0" (Bit Off).....	-0.3 to +0.8 V
Logic "1" (Bit On).....	+2.0 to +5.0 V
Logic Input Current.....	1 µA max.

Analog Input

349(x)-64, 349(x)H-64.....	0 to 6.4 V
349(x)-80.....	0 to 8 V
Input Resistance.....	10 K ohms

Power Supply

Requirements..... + 12 to +15V, 120 mA
- 12 to -15V, 50 mA

Power Supply

Rejection..... Less than 0.1 dB/volt change in either supply

AVAILABLE OPTIONS

Option No.	Description
1	BCD programming (Binary is standard)
2	Complementary programming (logic "0" is Bit On)
4	Strobe latch for data input. Attenuator responds to data input when logic "0" is applied. Attenuator latched to data input when logic "1" is applied.
7	Two SMA male rf connectors
10	One SMA male rf connector (J1) and one SMA female rf connector (J2).

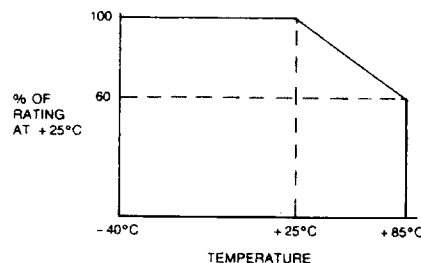


Fig. 2—Series 349 and 349H, power derating factor

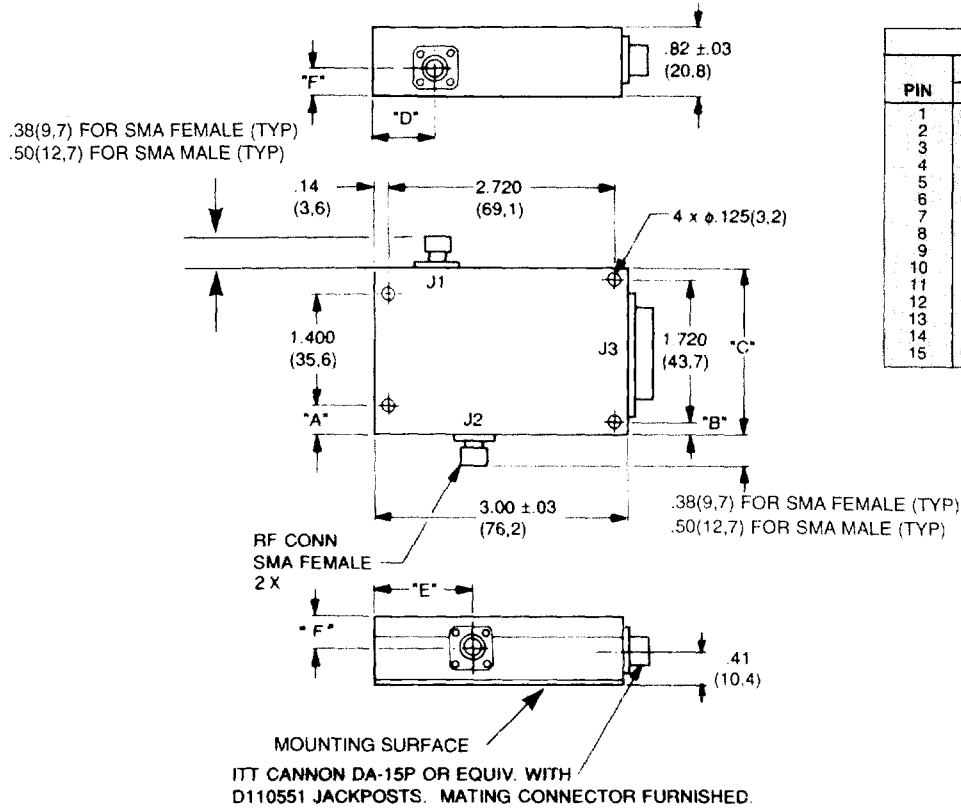
ACCESSORIES FURNISHED

Mating power/logic connector



Series 349 and 349H Specifications

DIMENSIONS AND WEIGHTS



PIN	BINARY		BCD
	64 dB	80 dB	
1	0.06 dB	0.08 dB	0.2 dB
2	0.13 dB	0.16 dB	0.4 dB
3	Analog Input / Strobe Latch ⁽¹⁾⁽²⁾		
4	GND		
5	0.25 dB	0.31 dB	0.8 dB
6	0.5 dB	0.63 dB	1 dB
7	1 dB	1.25 dB	2 dB
8	2 dB	2.5 dB	4 dB
9	4 dB	5 dB	8 dB
10	8 dB	10 dB	10 dB
11	16 dB	20 dB	20 dB
12	32 dB	40 dB	40 dB
13	+12 to +15 V		
14	-12 to -15 V		
15	0.03 dB	0.04 dB	0.1 dB

Series 349, 349H
Wt: 4 oz. (113 gm) approx.

MODEL	DIM "A"	DIM "B"	DIM "C"	DIM "D"	DIM "E"	DIM "E"
3491, 3491H	.58 (14.7)	.42 (10.7)	2.58 ± .03 (65.0)	.56 (14.2)	1.53 (38.9)	.34 (8.6)
3492,93, 3492H,93H	.30 (7.6)	.14 (3.6)	2.00 ± .03 (50.8)	.50 (12.7)	1.29 (32.8)	.34 (8.6)
3494,95,96, 3494H,95H,96H	.30 (7.6)	.14 (3.6)	2.00 ± .03 (50.8)	.75 (19.1)	1.19 (30.2)	.34 (8.6)
3498, 3498H	.30 (7.6)	.14 (3.6)	2.00 ± .03 (50.8)	.75 (19.1)	1.00 (25.4)	.34 (8.6)

NOTES

- Normally supplied as an Analog input. Optionally available as a strobe latch function for input data.
- Pin 3 is available to apply a current or voltage to control the attenuator in a non-linear fashion.
- The Series 349 attenuators are 11-bit digital attenuators. In order to use this device with a lesser number of bits (lower resolution), the user may simply ground the logic pins for the lowest order unused bits. For example, a Series 349 unit operated as an 8-bit unit would have Pin 15, Pin 1 and Pin 2 connected to ground. All other parameters remain unchanged.

