Series D195 Octave-Band PIN Diode Attenuator/Modulators

SERIES D195

The Series D195 voltage-controlled linearized attenuator/modulators are integrated assemblies consisting of a Series 195 unit and a hybridized driver circuit which provides a nominal transfer function of 10 dB per volt. (See figure 1 below.)

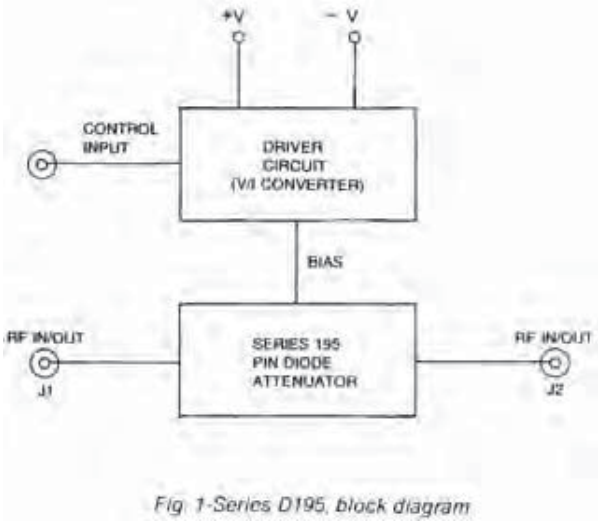


Fig. 1-Series D195, block diagram

All of the Series D195 units except the D1950A* exhibit fall times of 20 nsec max and rise times of 1.5 µsec max for attenuation steps of 10 dB or more. For smaller excursions, the fall times can increase to several hundred nsec, while the rise times remain essentially unchanged. In applications where a rapid return to insertion loss from any level of attenuation is required, Option 59 is available. With this option, an external pulse is applied to trigger a high-speed reset circuit, and recovery times of 200 nsec max are obtained. Where use of an external reset pulse as described above is not feasible, an internal reset option (Option 58) is available which will automatically reset the unit to insertion loss within 200 nsec for a step of 50 dB or more.

The fall and rise time specifications for the D1950A* are 500 nsec max and 10 µsec max, respectively. Options 58 and 59 are not available for this model.

*Model D1950A is a special-order product. Consult factory before ordering.

- **Absorptive**
- **Linearized**
- **Frequency range: 0.5 to 18 GHz**
- **High performance MIC quadrature hybrid design**
- **High speed**

Attenuator Model D1952

Attenuator Model D1952

Attenuator Model D1958

ALL UNITS IN THIS SERIES ARE EQUIPPED WITH INTEGRATED DRIVERS

Series D195 Specifications

MODEL	FREQUENCY RANGE (GHz)	MAX. INSERTION LOSS (dB)	MAX. VSWR	FLATNESS (±dB) AT MEAN ATTENUATION LEVELS UP TO				
				10 dB	20 dB	40 dB	60 dB	80 dB
D1950A*	0.5 – 1.0	1.5	2.0	0.3	0.8	1.7	3.0	3.6
D1951	1.0 – 2.0	1.7	1.5	0.3	0.8	1.5	1.6	
	0.75 – 2.25 (1)	1.8	2.0	0.5	1.4	3.0	3.5	
D1952	2.0 – 4.0	2.0	1.5	0.3	0.8	1.5	1.6	
	1.5 – 4.5 (1)	2.1	2.0	0.5	1.4	3.0	3.5	
D1953	2.6 – 5.2	2.2	1.6	0.3	0.8	1.5	1.8	
	1.95 – 5.85 (1)	2.3	2.1	0.5	1.4	3.0	3.5	
D1954	4.0 – 8.0	2.6	1.7	0.3	0.8	1.5	1.6	
	3.0 – 9.0 (1)	2.7	2.2	0.5	1.4	3.0	3.5	
D1955	5.0 – 10.0	2.8	1.7	0.5	0.9	1.5	1.6	
	3.75 – 11.25 (1)	2.9	2.2	0.7	1.4	3.0	3.5	
D1956	6.0 – 12.0	2.9	1.8	0.7	1.0	1.5	1.6	
	4.5 – 13.5 (1)	3.0	2.2	0.9	1.5	3.0	3.5	
D1958	8.0 – 18.0	3.0 (2)	1.8 (2)	0.7	1.0	1.5	1.6	
	6.0 – 18.0 (1)	3.0 (2)	1.8 (2)	0.9	1.5	3.0	3.5	

(1) Specifications for the extended frequency ranges are typical.
(2) *Except from 16-18 Ghz where insertion loss is 4.0 dB max and VSWR is 2.0 max.*

PERFORMANCE CHARACTERISTICS

Mean Attenuation Range
D1950A* ..... 80 dB
All other units ..... 60 dB

Accuracy of Attenuation
0-30 dB ..... ±0.5 dB
>30 to 50 dB ..... ±1.0 dB
>50 to 60 dB ..... ±1.5 dB
>60 to 80 dB ..... ±2.0 dB (D1950A* only)

Monotonicity ..... Guaranteed

Phase Shift ..... See page 44

Temperature Coefficient ..... ±0.035 dB/°C

Power Handling Capability
Without Performance Degradation
D1950A*, D1951 ..... 10 mW cw or peak
All other units ..... 100 mW cw or peak

Survival Power (from –65°C to +25°C; see figure 2 for higher temperatures)
All Units ..... 1W average
25W peak (1 µsec max pulse width)

Switching Characteristics
OFF Time
D1950A* ..... 600 nsec max
All other units ..... 100 nsec max

ON Time
D1950A* ..... 10 µsec max
All other units ..... 1.6 µsec max

Fall Time
D1950A* ..... 500 nsec max
All other units ..... 30 nsec max

Rise Time
D1950A* ..... 10 µsec max
All other units ..... 1.5 µsec max

Nominal Control Voltage Characteristics

Range	Operating	Maximum
D1950A*	0 to +8V	±15V
All other units	0 to +6V	±15V

Transfer Function ..... 10 dB/volt

Input Impedance ..... 10 kΩ

Modulation Bandwidth
Small Signal
D1950A* ..... 25 kHz
All other units ..... 500 kHz
Large Signal
D1950A* ..... 5 kHz
All other units ..... 50 kHz

Power Supply Requirements ..... +12V ±5%, 100 mA
–12V ±5%, 50 mA

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

*Model 1950A is a special-order product. Consult factory before ordering.

Series D195 Specifications

ENVIRONMENTAL RATINGS

Operating Temperature Range .....–54° to +110°C

Non-Operating Temperature Range .....–65° to +125°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

AVAILABLE OPTIONS

Option No.	Description
3	SMA female control connector
7	Two SMA male RF connectors
10	One SMA male (J1) and one SMA female (J2) RF connector
58	Internally-generated reset to insertion loss (not available on D1950A)(1)
59	Externally-triggered reset to insertion loss (not available on D1950A)(2) (3)
61	20 dB/volt transfer function with 0 to +3V control signal input (+4V for the D1950A*)
62	±15 volt operation
64	SMC male control connector
64A	SMB male control connector

(1) *Where use of an Option 59 external reset pulse (see note 2 below) is not feasible, this option is available which will automatically sense the slope and magnitude of the control signal and reset the unit to the insertion loss state within 200 nsec for a step of 50 dB or more.*

(2) *An external terminal is provided for the user to apply a fast (10 nsec max rise time) positive-going 3-volt pulse at least 0.5 μsec wide to accelerate the return of the attenuator to the insertion loss state with the simultaneous lowering of the control signal to the zero voltage level. This reset can be accomplished within 200 nsec.*

(3) *The input impedance of units equipped with Option 59 is a circuit equivalent to approximately 50 pF in series with a parallel combination of 100 pF and 1000 ohms.*

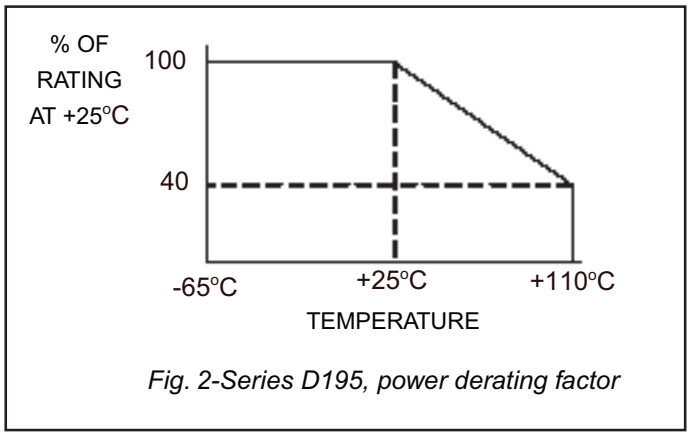


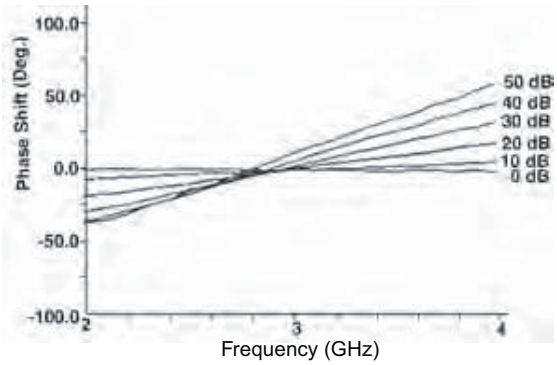
Fig. 2-Series D195, power derating factor

*Model D1950A is a special-order product. Consult factory before ordering.

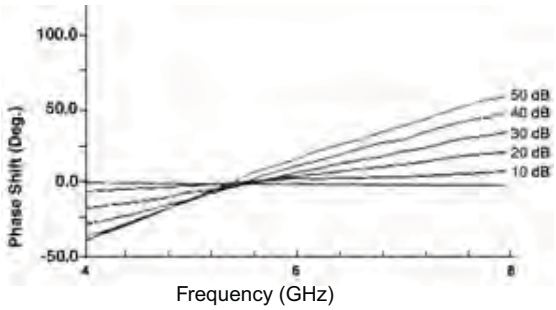
Attenuators

PHASE SHIFT vs. ATTENUATION

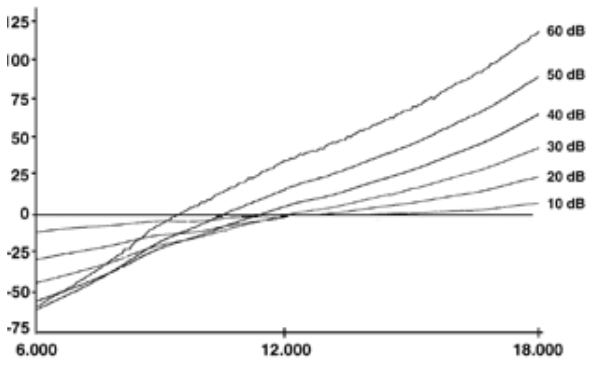
All attenuators exhibit a variation in phase shift with attenuation level (AM/PM modulation). Fig. 6 shows typical phase shift variation as a function of attenuation for a number of GMC attenuator models. The phase shift is attributable to both the stray reactance of the PIN diodes as well as the lengths of transmission line interconnecting the diodes. While it is possible to minimize the AM/PM by careful design, it is not possible to eliminate it entirely. Where minimum change of phase with attenuation is a critical parameter, the use of GMC's line of Phase Invariant Attenuators described above should be considered.



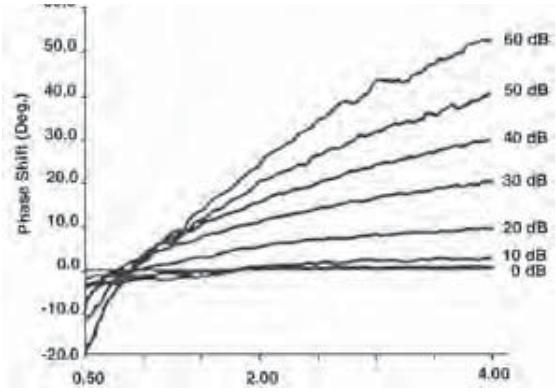
MODELS 1952, D1952 & 3492-64



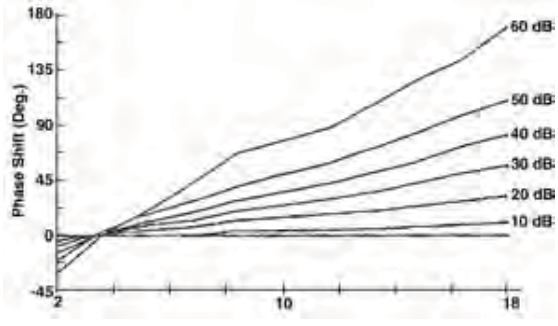
MODELS 1954, D1954 & 3494-64



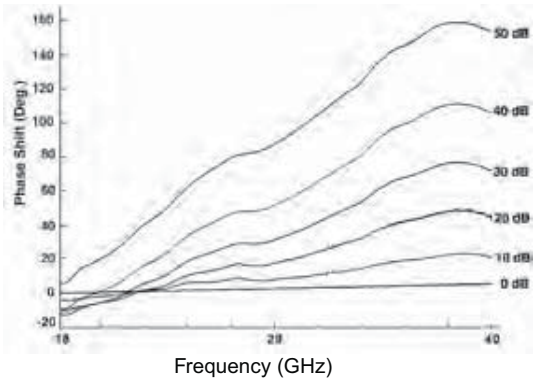
MODELS 1958, D1958 & 3498-64



MODELS D1960 & 3460C



MODELS D1968B, 1761 & 3468C

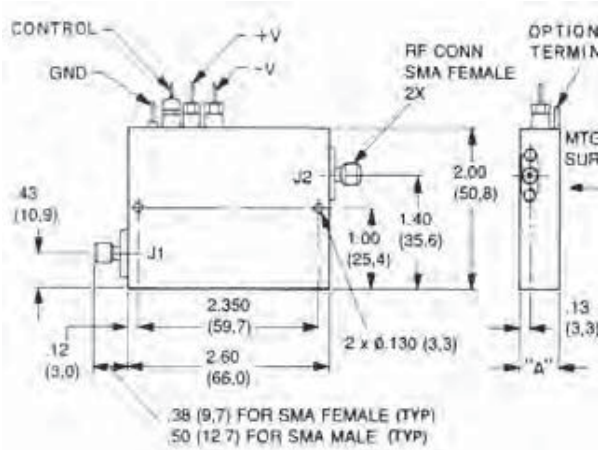


MODELS 1959, D1959 & 3499

Fig. 6–Typical Phase vs. Attenuation & Frequency

Series D195 Specifications

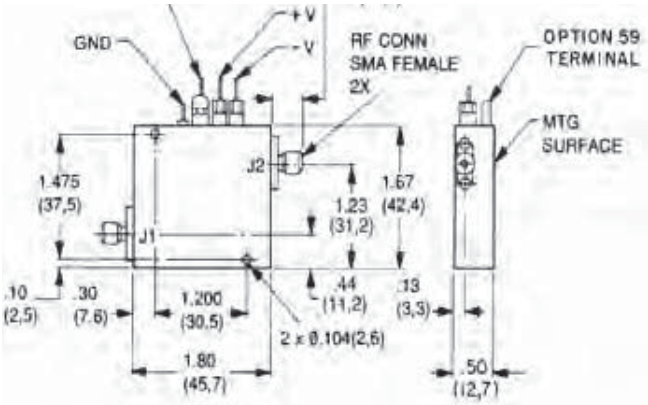
DIMENSIONS AND WEIGHTS



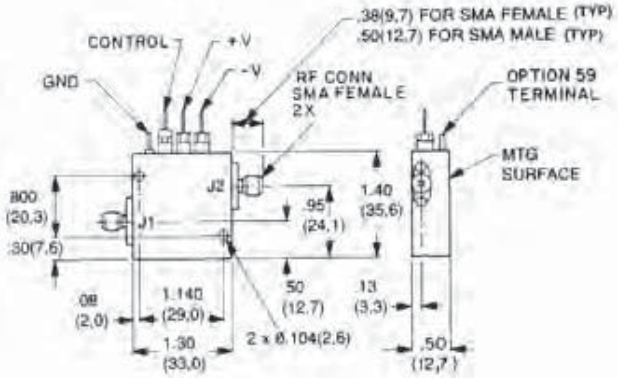
MODEL	DIM "A"
D1950A	.70 (17,8)
D1951	.50 (12,7)

MODELS D1950A* AND D1951
Wt: 3 oz. (85 gr.) approx.

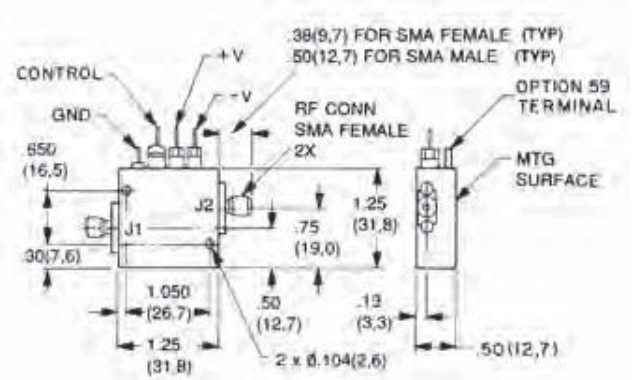
*Model 1950A is a special-order product. Consult factory before ordering.



MODELS D1952 AND D1953
Wt: 2 oz. (57 gr.) approx.



MODELS D1954, D1955 AND D1956
Wt: 1 oz. (28 gr.) approx.



MODEL D1958
Wt: 1 oz. (28 gr.) approx.

Dimensional Tolerances, unless otherwise indicated: .XX ±.02; .XXX ±.005