346C Series Multi-Octave 10 Bit Digital PIN Diode Attenuators

Contact us

Application Notes for Microwave Attenuators

- **Frequency range: 0.5 GHz-18GHz in four overlapping ranges**
- **Attenuation range: 60 dB**
- **Programming: 10-Bit binary**
- **LSB: 0.06 dB**
- **Monotonicity: guaranteed**

3460C

The 346C Series is a family of Non-reflective PIN diode attenuators, each programmable to 60 dB in attenuation steps as low as 0.06 dB, and covering the frequency range from 0.5 GHz to 18 GHz in four overlapping multi-octave bands.

Each model in the Series comprises an integrated assembly of a dual (current-controlled) PIN diode attenuator, and a driver circuit consisting of a D/A converter and a voltage-to-current converter. (See Figure 1 below)

The RF circuit consists of two wide-band, T-pad attenuator sections in tandem. The levels of series and shunt currents required to maintain a bilateral match at all attenuation levels are provided by the driver.

This arrangement assures monotonicity over the operating band at all levels of attenuation and for any programmed attenuation step.

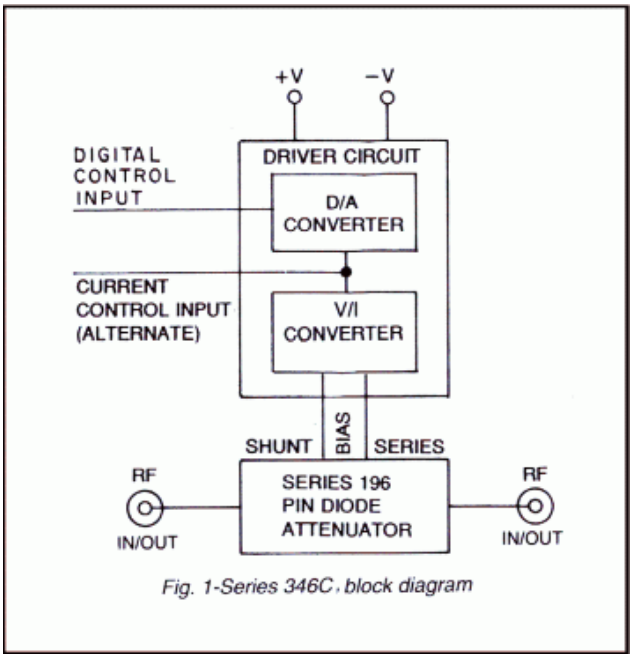


Fig. 1-Series 346C, block diagram

PERFORMANCE CHARACTERISTICS

CHARACTERISTIC		MODEL 3460C*	MODEL 3461C	MODEL 3462C*	MODEL 3468C
Frequency Range (GHz)		0.5-4	0.5-8	2-8	2-18
Mean Attenuation Range (dB)		60	60	60	60
Insertion Loss (dB) (max)		2.5	2.5 (0.5-4 GHz) 3.2 (4-8 GHz)	3.2	4.5
VSWR (max)		1.8	1.8	1.8	2.0
Flatness up to	**20 dB**	± 0.5 dB	± 0.75 dB	± 0.75 dB	± 1.0 dB
	40 dB	± 0.75 dB	± 1.0 dB	± 1.0 dB	± 1.25 dB
	60 dB	± 1.0 dB	± 1.5 dB	± 1.5 dB	± 3.0 dB

*Special-order product. Consult factory before ordering.

Accuracy of Attenuation

0 to 20 dB.....	± 1.0 dB
20 to 40 dB.....	± 1.5 dB
40 to 60 dB.....	± 2.0 dB
Monotonicity.....	Guaranteed

Minimum Attenuation Step 0.06 dB(1)

Logic Input

Logic "0" (Bit OFF)	-0.3 to +0.8V
Logic"1" (Bit ON)	+2.0 to +5.0V
Input Current	10 µA max.

Phase Shift..... See figure 2

Temperature Coefficient..... ± 0.02 dB/ °C

Power Handling Capability

Without Performance Degradation

All Units..... Up to 50 mW cw or peak (see figure 3)

Survival Power

All units..... 2 W average or peak, from -65(°)C to +25(°)C (see figure 4 for higher temperatures).

Switching Time

ON Time..... 1.0 µsec. max.

OFF Time..... 0.5 µsec. max.

Programming..... Positive true binary. For complementary code, specify Option 2. To interface with other logic families, please contact factory.

Nominal Control Voltage Characteristics

Range..... 0 to 3 mA

Transfer Function..... 20 dB / mA

Input Impedance.....3 kohm

Power Supply

Requirements..... +12V to +15V, 90 mA
-12V to -15V, 60 mA

Power Supply

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

1. The Series 346C attenuators are 10-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 346C unit operated as an 8-bit unit would have Pin 15 and Pin 3 connected to ground. All other parameters remain unchanged.

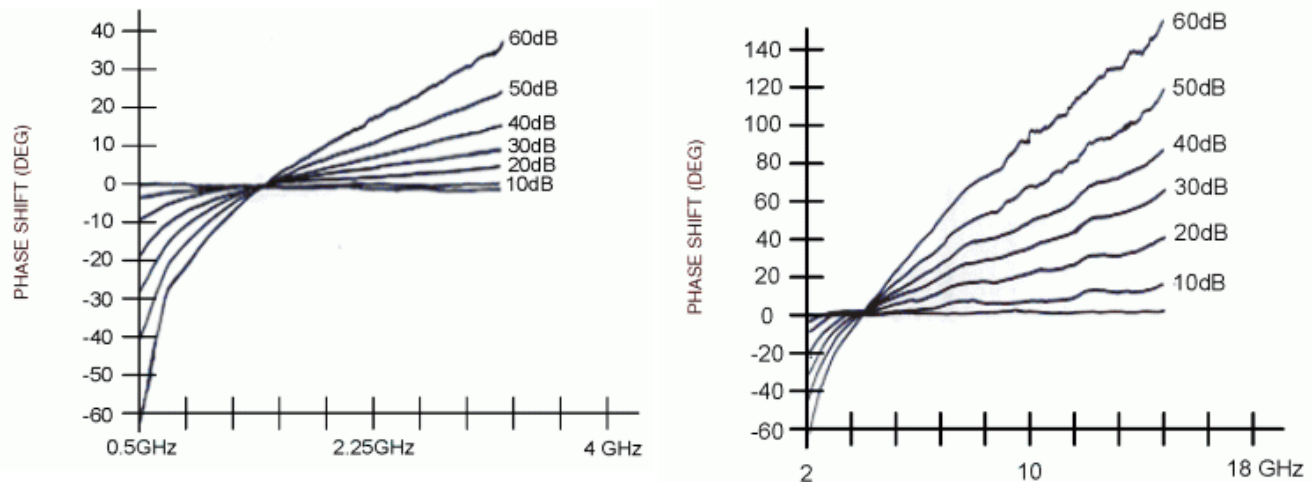
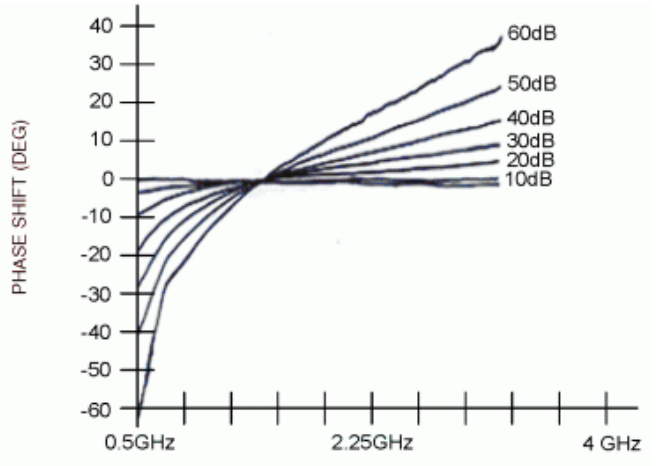
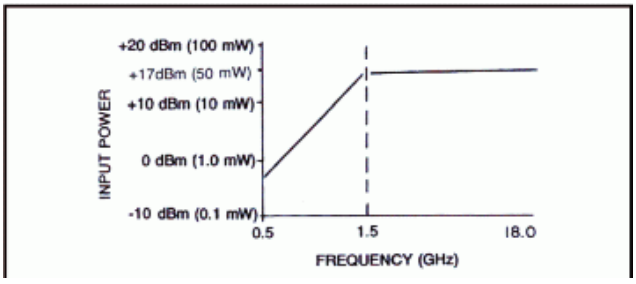


Fig. 2 - Series 346C, typical phase shift as a function of attenuation & frequency





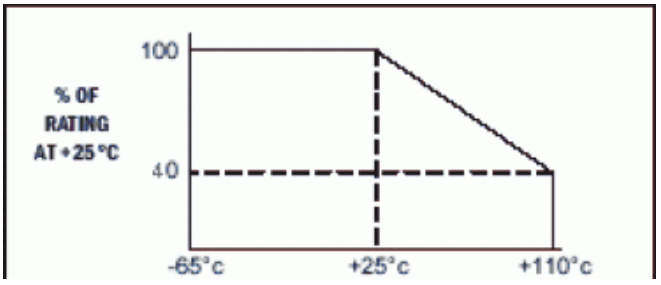


Fig. 3-Series 346C, maximum peak and average operating power without performance degradation

TEMPERTURE

Fig. 4-Model 346C, survival power derating factor

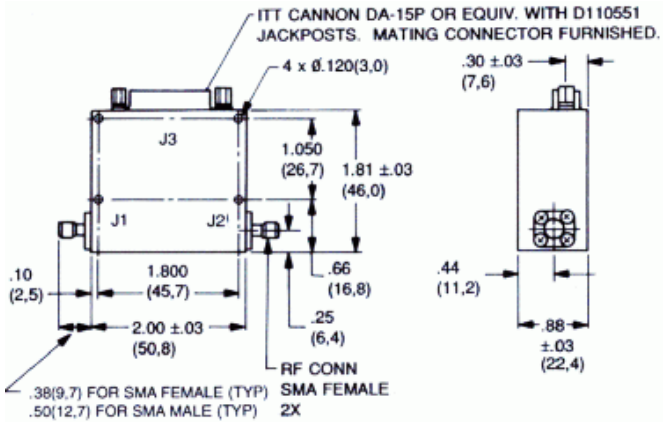
ENVIRONMENTAL RATINGS

Operating Temperature Range	-54°C to +110°C
Non-Operating Temperature Range	-65°C 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
2	Complementary programming (logic "0" is bit on)
7	Two SMA male RF connectors
10	One SMA male (J1) and one SMA female (J2) RF connector
C38	30 dB attenuation range. Consult factory for impact on specifications.
Z06	1 to 18 GHz operation. I.L 4.8dB max.

DIMENSIONS AND WEIGHT



SERIES 346C
Wt: 3 0z. (85 gm) approx.

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

ACCESSORY FURNISHED

Mating power/logic connector

PIN NO.	J3 PIN FUNCTIONS(1)(4)
1	GND (Note 2)
2	ANALOG INPUT(Note 3)
3	0.13 dB
4	GND
5	0.25 dB
6	0.5 dB
7	1dB
8	2dB
9	4dB
10	8dB
11	16dB
12	32 dB(MSB)
13	+V
14	-V
15	0.06 dB(LSB)

(1) All unused logic inputs must be grounded.

(2) For normal programming control Pin 1 must be grounded or at logic "0" . Application of logic "1" to Pin 1 overrides the digital input and sets the unit to insertion loss. For units with complementary programming (Option 2), the application of a logic "1" to Pin 1 sets the unit to high isolation (60 dB or greater).

(3) Pin 2 is available to (a) monitor the D/A converter output, (b) apply a modulation signal from a current source, or (c) apply an independent analog signal for turn-on, turn-off or vernier attenuation levels. If not used as described in (a), (b) or (c). Pin 2 must be open.

(4) The Series 346C attenuators are 10-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 346C unit oper - ated as an 8-bit unit would have Pin 15 and Pin 3 connected to ground. All other parameters remain unchanged.

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