ATTENUATORS, DIGITAL DIODE SERIES FG

0.1-16 GHz SWITCHED ATTENUATOR ELEMENTS

GENERAL INFORMATION: KDI/Triangle's digital attenuators are controlled by TTL binary logic. Each bit of an attenuator is actuated by a logic input. Therefore, an attenuator consisting of 4 bits is controlled by four logic lines, and has sixteen possible attenuation values. A four bit attenuator, with the smallest bit, 2 dB, is shown schematically. See Fig. 1.

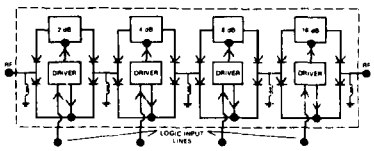


Figure 1

Digital attenuators in any of the frequency ranges listed below are available with one to seven bits. The customer can choose the value of the smallest bit to suit his particular need. For reasons of clarity of presentation, only those attenuators with four bits and 2 dB the smallest bit, are listed (0.2 dB available on special order for some models). If a six bit attenuator is desired, it can be provided. Also, the length and insertion loss is multiplied by 6/4. The value of the smallest bit desired should be noted when ordering a unit.

FREQUENCY RANGE: 0.10 to 16.0 GHz.

RF IMPEDANCE: 50 OHMS.

D.C. VOLTAGE: ±5 volts at ±70 mA per bit.

LOGIC: TTL compatible (Logic 0000 is reference)

ATTENUATION RANGE: available to 95 dB.

PHASE SHIFT VS. ATTENUATION: Not specified unless required as option. Typical phase shift of 10° max. can be provided under 'worst case' conditions.

AMPLITUDE/FREQUENCY FLATNESS: The flatness of attenuation with frequency and temperature is ±1.2 dB to 20 dB and ±2.0 dB to 30 dB for frequencies to 4 GHz and ±1.5 dB to 20 dB and ±2.65 dB to 30 dB for all others.

RF POWER: 0.5 watts CW 10 W peak. Standard. Specials to 4 kw peak, 30 watts avg. available.

TEMPERATURE INFORMATION: Operating temperature from −55°C to +85°C.

SWITCHING SPEED: The switching speed of all models is 500 nanoseconds (750 nanoseconds including storage and delay time). Any model can be switched in 15 nanoseconds (35 nanosec. including storage and delay time) if required. However, the insertion loss will increase by 15%. If 15 nanoseconds is required add -1 to the model no. (e.g., FG-25-1).

ENVIRONMENT: MIL-E-5400, MIL-STD-202, MIL-E-16400, MIL-STD-883 (Special request only).

CONNECTORS: SMA standard, others on request. A mating multipin connector is supplied for each unit with a multipin connector; ITT Cannon MDB1-9SSL or equiv.

NOTES:

1. Harmonic Distortion: Approximately −50 dBc for $P_{in} \leq 0$ dBm at a frequency of 1.0 GHz for most units. This value improves by approximately 10 dB per octave as the frequency increases; however, since this value is dependent on bandwidth of the unit, power input, and switching speed required, the factory should be consulted if harmonic content is an important system requirement.

2. Two Tone Intermodulation Products: Second and third order products approximately 50 dBC for $P_{in} \leq 0$ dBm (each signal) at all attenuation settings.

3. All performance characteristics can be held to tighter tolerances over narrower frequency ranges.

4. Units with small phase change vs. attenuation can be supplied on request.

5. If a narrow frequency bandwidth is required, KDI/Triangle can supply a unit that is electrically optimized for that bandwidth. Mechanical dimensions will remain the same as the standard unit, and the price will generally be lower. Specify the frequency range when ordering a narrow bandwidth model, and a special part number will be assigned.

ELECTRICAL PERFORMANCE

Model No.	Freq. Range GHz	No. of Bits See Notes	No. of Steps See Notes	Max. Atten. Value dB	VSWR Max.	Insertion Loss Max. dB	Out-line
FG-12	0.10-2.0	4	16	30	1.75	4.0	1
FG-18	0.25-0.5	4	16	30	1.5	1.25	1
FG-23	0.5-1.0	4	16	30	1.5	1.50	1
FG-25	1.0-4.0	4	16	30	1.75	2.50	1
FG-32	1.2-1.4	4	16	30	1.5	1.75	1
FG-41	1.7-2.4	4	16	30	1.6	2.50	1
FG-51	2.0-4.0	4	16	30	1.75	3.0	1
FG-53	3.3-3.6	4	16	30	1.6	2.50	1
FG-61	4.0-8.0 (1)	4	16	30	2.0	4.0	2
FG-72	5.4-5.9	4	16	30	1.6	3.5	2
FG-81	8.0-12.4 (1)	4	16	30	2.0	4.0	1
FG-88	9.0-9.5	4	16	30	1.6	3.50	1
FG-92	14.0-16.0 (1)	4	16	30	1.75	4.0	1

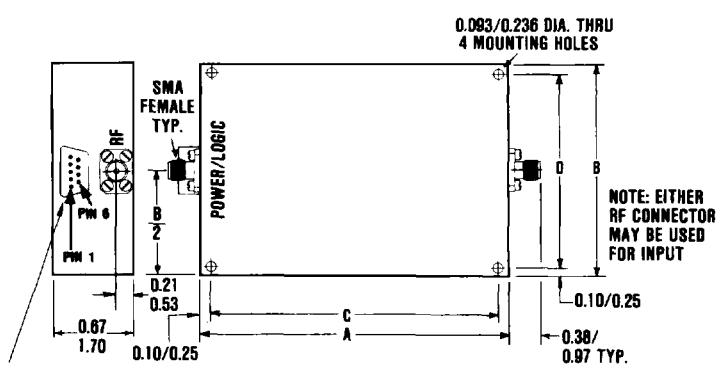
(1) 8% B.W. max., specify frequency.

• Least significant bit for all models is 2 dB.

MECHANICAL OUTLINES

KEY: Inches / centimeters XX ±.03 XXX ±.010 / XX ±.08 XXX ±.025

Out-line	A In./cm.	B In./cm.	C In./cm.	D In./cm.
1	4.50/11.40	1.20/3.05	4.300/10.920	1.000/2.540
2	4.50/11.40	1.50/3.80	4.300/10.920	1.300/3.300



POWER LOGIC PIN CONNECTIONS

PIN	FUNCTION
1-6	Logic Inputs
7	GND
8	+5 VDC
9	-5 VDC

Pin 1 is the least significant bit.

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