



## 6 Bit CMOS Controlled Programmable Attenuator, 31.5 dB Up to 13 GHz, 0.5 dB Steps, SMA Female

### TECHNICAL DATA SHEET

PE70A5003

The PE70A5003 is a 6 Bit Programmable 31.5 dB Pin Diode Attenuator with Step Resolution as Low as 0.5 dB over the Operating Frequency Range from 0 GHz to 13 GHz. The RF Input/Output Connectors are SMA Female. The control is thru a six bit CMOS compatible serial control word that is used to select attenuation state and a single -5 VDC bias that allows the operation at frequencies down to DC. The drop-in package is hermetically sealed with field replaceable SMA connectors and has an operating temperature range of -40°C to +85°C. And for added confidence, this rugged package assembly is designed to meet MIL-STD-883 test conditions for Hermeticity and Temperature Cycle.

#### Features

- 6 Bit Programmable 31.5 dB Attenuator
- 0 GHz to 6 GHz Frequency Range
- 31.5 dB Attenuation Range
- Step Resolution of 0.5 dB
- Insertion Loss 3.6 dB Typ
- SMA Female Field Replaceable Connectors
- 3 Pin Serial CMOS control

#### Applications

- Electronic Warfare
- Electronic Countermeasures
- Microwave Radio
- VSAT
- Radar
- Fiber Optic
- Space Systems
- Test Instrumentation
- Telecom Infrastructure

#### Electrical Specifications (Values at 25°C, sea level)

Description	Minimum	Typical	Maximum	Units
Frequency Range	DC		13	GHz
Mean Attenuation Range	0		31.5	dB
Insertion Loss		5		dB
Power Rating			+25.1	dBm
Step Size	0.5			dB
DC Power Supply			-5 ±10%	Volts

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#### Performance by Frequency

Description	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 4.0 GHz		3.2	3.7	dB
	4.0 - 8.0 GHz		3.6	4.1	dB
	8.0 - 13.0 GHz		5	6	dB
Attenuation Range	DC - 13.0 GHz		31.5		dB
Return Loss (RF1 & RF2, All Atten. States)	DC - 8.0 GHz		15		dB
	8.0 - 13.0 GHz		10		dB
Attenuation Accuracy: (Referenced to Insertion Loss)					
All States	DC - 3.0 GHz	± (0.2 + 3% of Atten. setting) Max			dB
0.5 - 27.5 dB	3.0 - 10.0 GHz	± (0.4 + 3% of Atten. setting) Max			dB
28.0 - 31.5 dB	3.0 - 10.0 GHz	± (0.5 + 6% of Atten. setting) Max			dB
All States	10.0 - 13.0 GHz	± (0.6 + 6% of Atten. setting) Max			dB
Input Power for 0.1 dB Compression	1.0 - 13.0 GHz		+22		dBm
Input Third Order Intercept Point	REF state		+46		dBm
(Two-Tone Input Power= 0 dBm Each Tone)	All Other States	1.0 - 13.0 GHz	+32		dBm
Switching Characteristics					
tRISE, tFALL (10/90% RF)			600		ns
tON/tOFF (50% CTL to 10/90% RF)	DC - 13.0 GHz		700		ns
Bias Voltage			-5 ± 10%		Vdc
Bias Current at -5 Vdc			5	9	mA

#### Absolute Maximum Ratings

Parameter	Rating	Units
Digital Inputs (Reset, Shift Clock, Latch Enable & Serial Input)	-0.5 to +5.5	V
Bias Voltage (VDC)	-7	Vdc
Storage Temperature	-65 to +150	°C
Operating Temperature	-55 to +85	°C
RF Input Power (0.5 - 13 GHz)	+25	dBm

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#### Mechanical Specifications

##### Size

Length	1.035 in [26.29 mm]
Width	0.68 in [17.27 mm]
Height	0.34 in [8.64 mm]
Weight	0.075 lbs [34.02 g]
Connector 1	SMA Female
Connector 2	SMA Female

#### Environmental Specifications

##### Temperature

Operating Range	-50 to +85 deg C
Storage Range	-65 to +150 deg C

Temperature Cycling  
Hermetic Seal

MIL-STD-883, Method 101C, Cond B  
Gross Leak MIL-STD-883 Method 1014C1/Fine Leak  
MIL-STD-883, Method 1014A2, 5 x 10-8 atm cc  
ESD Sensitive Material, Transport material in Approved  
ESD bags. Handle only in ESD Workstation.

ESD Sensitivity



**Compliance Certifications** (see [product page](#) for current document)

#### Plotted and Other Data

Notes:

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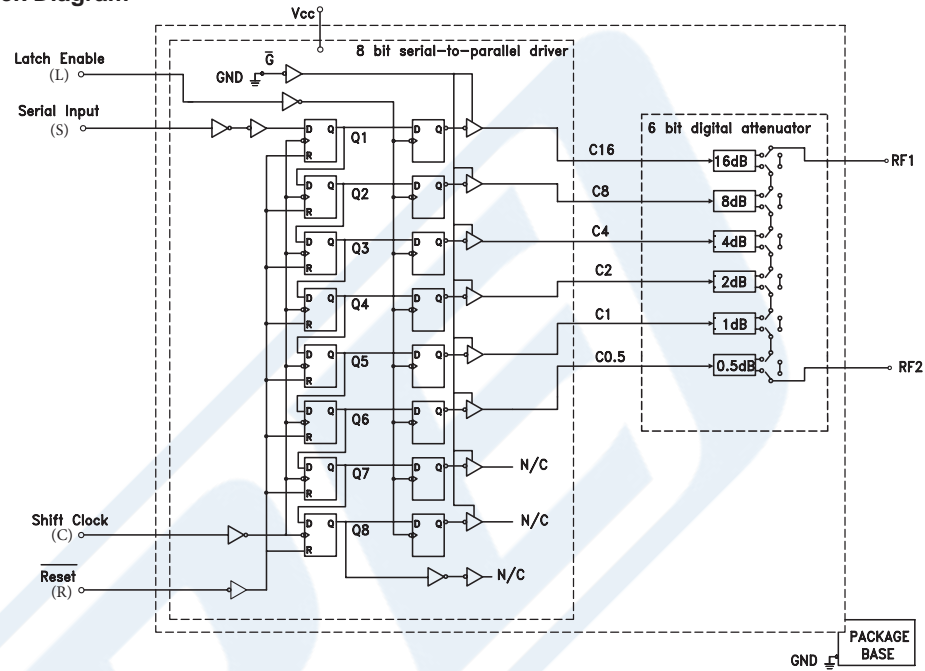


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Functional Block Diagram



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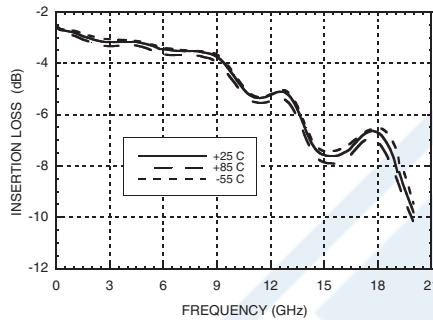


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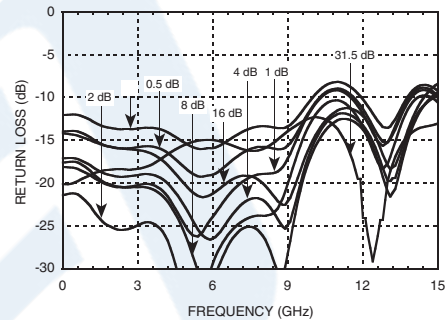
TECHNICAL DATA SHEET PE70A5003

Performance Data

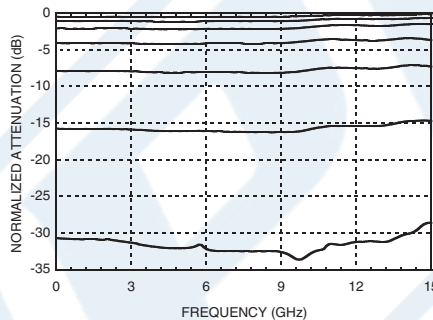
**Insertion Loss**



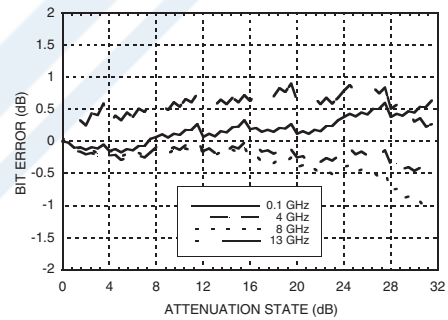
**Return Loss RF1, RF2**  
(Only Major States are Shown)



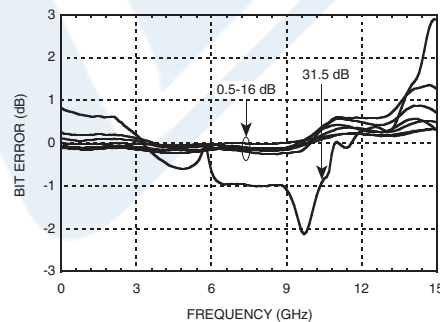
**Normalized Attenuation**  
(Only Major States are Shown)



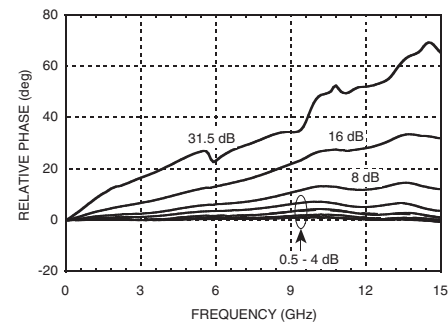
**Bit Error vs. Attenuation State**



**Bit Error vs. Frequency**  
(Only Major States are Shown)



**Relative Phase vs. Frequency**  
(Only Major States are Shown)



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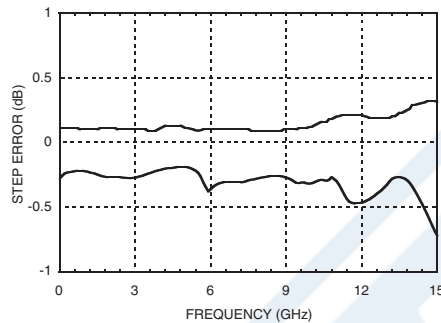


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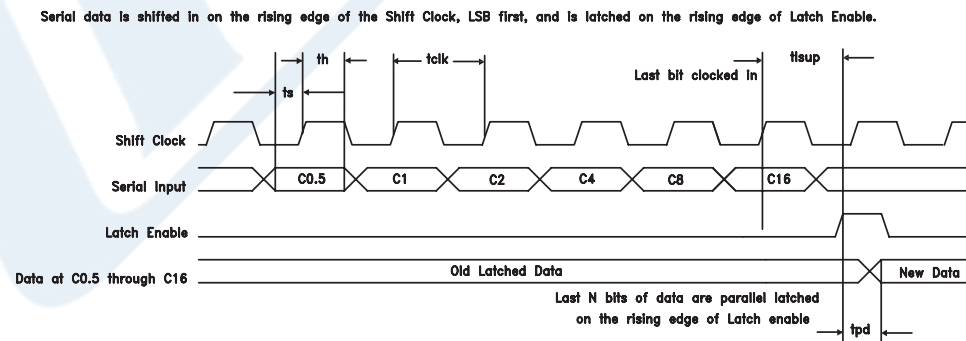
**Worst Case Step Error  
Between Successive Attenuation States**



**Timing**

Description	Symbol	Min.	Typ.	Units
Serial Input Setup Time	ts	20	-	ns
Hold Time from Serial Input to Shift Clock	th	0	-	ns
Setup Time from Shift Clock to Latch Enable	tlsup	40	-	ns
Propagation Delay, Latch Enable to C0.5 to C8	tpd	-	30	ns
Setup Time from Reset to Shift Clock	-	20	-	ns
Clock Frequency (1/tclk)	fclk	-	30	MHz

**Timing Diagram**



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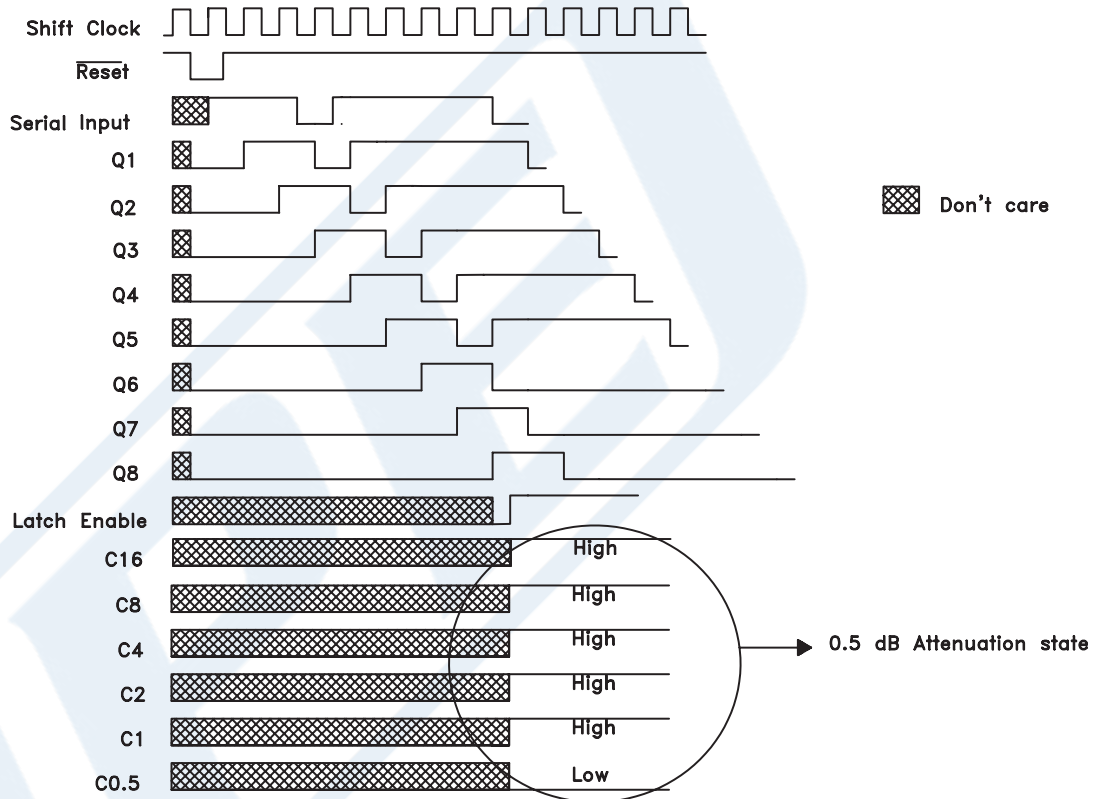


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Programming Example to Select 0.5 dB Attenuation State



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6 Bit CMOS Controlled Programmable Attenuator, 31.5 dB Up to 13 GHz, 0.5 dB Steps, SMA Female from Pasternack Enterprises has same day shipment for domestic and International orders. Our RF, microwave and millimeter wave products maintain a 99.4% availability and are part of the broadest selection in the industry.

Click the following link (or enter part number in "SEARCH" on website) to obtain additional part information including price, inventory and certifications: [6 Bit CMOS Controlled Programmable Attenuator, 31.5 dB Up to 13 GHz, 0.5 dB Steps, SMA Female PE70A5003](https://www.pasternack.com/31.5db-cmos-controlled-sma-female-sma-female-0.32-watts-attenuator-pe70a5003-p.aspx)

URL: <https://www.pasternack.com/31.5db-cmos-controlled-sma-female-sma-female-0.32-watts-attenuator-pe70a5003-p.aspx>

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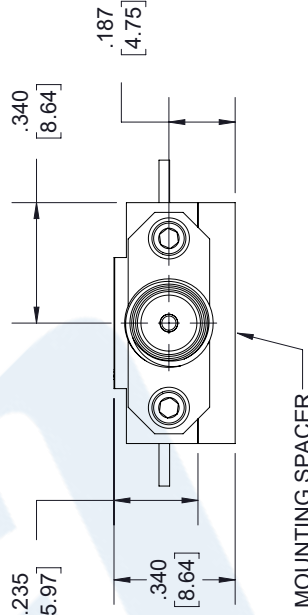
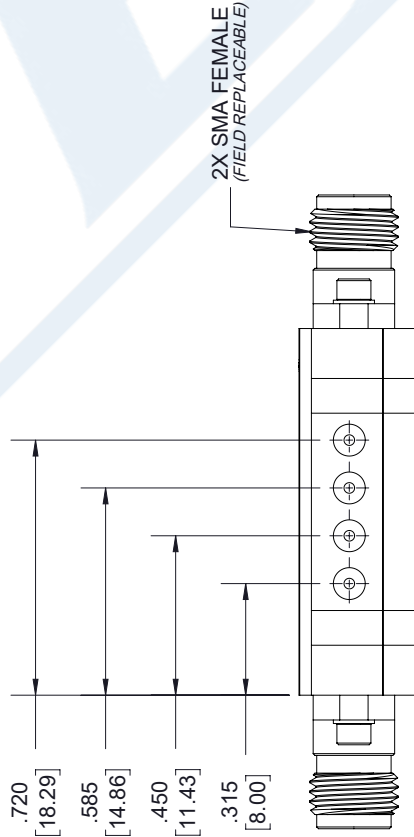
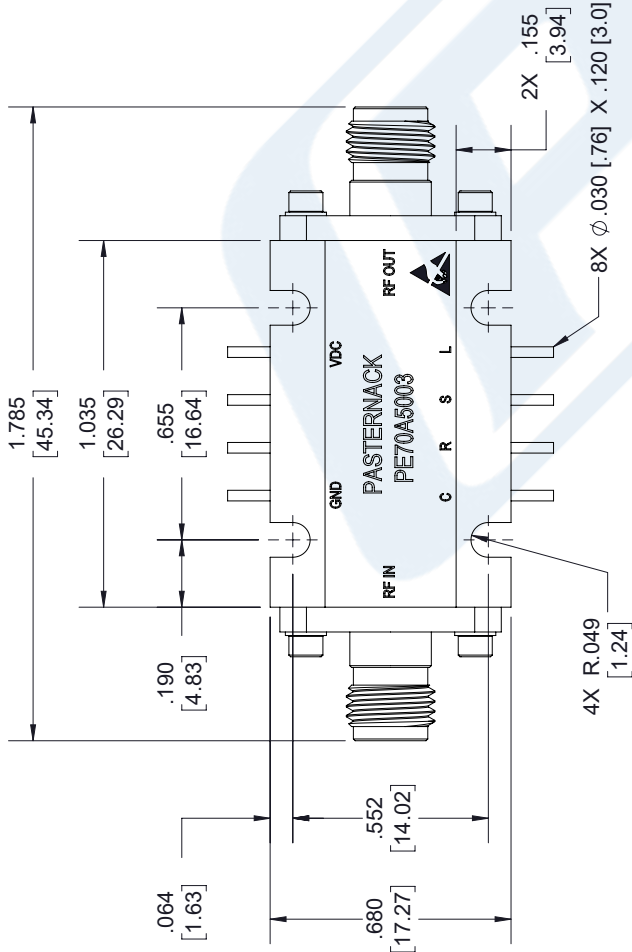
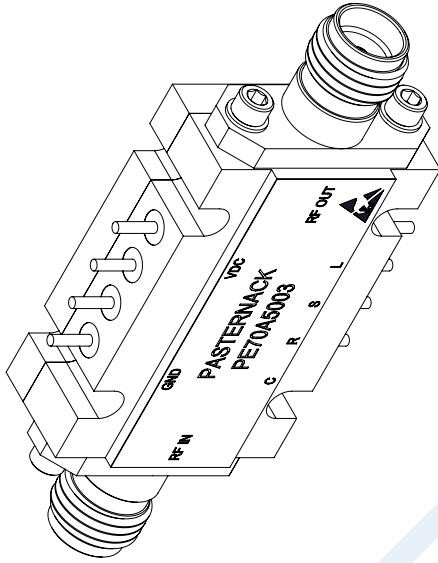


# PE70A5003 CAD Drawing

6 Bit CMOS Controlled Programmable Attenuator, 31.5 dB  
Up to 13 GHz, 0.5 dB Steps, SMA Female

REV.	DESCRIPTION	DATE	APPROVED
1.1	PCR PE70A5003 20190613	06/26/19	J.GARCIA

## REVISIONS



UNLESS OTHERWISE SPECIFIED LEADING DIMENSIONS ARE INCHES DIMENSIONS IN [ ] ARE MILLIMETERS	
TOLERANCES:	FRACTIONS
X±.2 [5.08]	±.132
.XX±.01 [25]	±.132
.XXX±.005 [13]	ANGLES ± 1°
ALL DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.	
THIRD-ANGLE PROJECTION	

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SIZE [CAGE] DRAWN BY PART NUMBER REV  
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SHEET 1	OF 2
SCALE	N/A

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## Pin Description

Pin Number	Function	Description	Interface Schematic
1	RF1	This pin is DC coupled and matched to 50 Ohms. Blocking capacitors are required if RF line potential is not equal to 0 Vdc.	
2	C	Shift Clock	
3	R	Reset	
4	S	Serial Input	
5	L	Latch Enable	
6	RF2	This pin is DC coupled and matched to 50 Ohms. Blocking capacitors are required if RF line potential is not equal to 0 Vdc.	
7	Vdc	Supply voltage: -5 Vdc ±10%. (Internal diode for reverse bias protection)	
8	GND	Power Supply Ground	

## Serial Input Truth Table

Latch Enable	Shift Clock	Reset	Function
X	X	L	Shift register cleared
X	↑	H	Shift register clocked
↑	X	H	Contents of shift register transferred to Digital Attenuator

## Truth Table

C0.5	Serial Control Input						Attenuation Settings	
	C1	C2	C4	C8	C16	C16	RF1 - RF2	Reference I.L.
H	H	H	H	H	H	H	H	Reference I.L.
L	H	H	H	H	H	H	H	0.5 dB
H	L	H	H	H	H	H	H	1 dB
H	H	L	H	H	H	H	H	2 dB
H	H	H	L	H	H	H	H	4 dB
H	H	H	H	L	H	H	H	8 dB
H	H	H	H	H	L	H	L	16 dB
L	L	L	L	L	L	L	L	31.5 dB

Any combination of the above states will provide an attenuation approximately equal to the sum of the bits selected.

UNLESS OTHERWISE SPECIFIED  
LEADING DIMENSIONS ARE INCHES  
DIMENSIONS IN [ ] ARE MILLIMETERS

TOLERANCES:  
X±.2 [5.08]  
XX±.01 [ .25]  
.XXX±.005 [ .13]

FRACTIONS  
±.132  
ANGLES ± 1°

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Phone: 1.949.261.1920 | 1.866.727.8376  
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