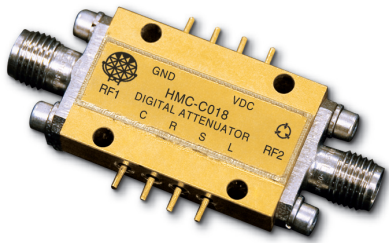


## 0.5dB LSB GaAs MMIC 6-BIT DIGITAL SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz



### Features

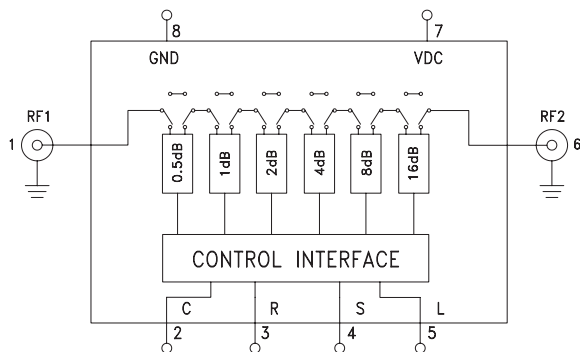
- 0.5 dB LSB Steps to 31.5 dB
- CMOS Compatible Serial Data Interface
- ± 0.3 dB Typical Bit Error
- Hermetically Sealed Module
- Field Replaceable SMA Connectors
- 55 to +85 C Operating Temperature

### Typical Applications

The HMC-C018 is ideal for:

- Telecom Infrastructure
- Military Radio, Radar & ECM
- Space Systems
- Test Instrumentation

### Functional Diagram



### General Description

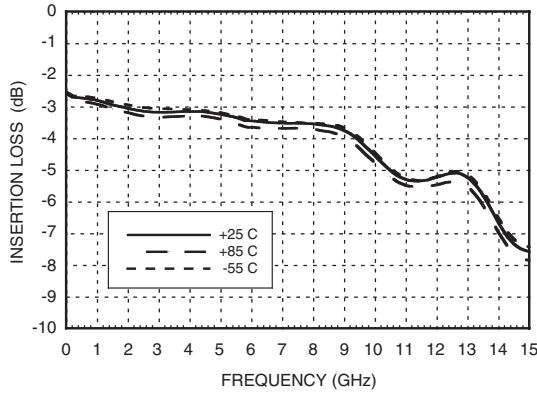
The HMC-C018 is a DC to 13 GHz 6-bit GaAs IC Digital Serial Control Attenuator housed in a miniature hermetic module. This wideband attenuator features 3.6 dB typical insertion loss, +38 dBm input IP3, and bit values of 0.5 (LSB), 1, 2, 4, 8, and 16 dB for a total attenuation of 31.5 dB. Attenuation accuracy is excellent with ±0.3 dB typical step error. A six bit CMOS compatible serial control word is used to select each attenuation state and a single VDC bias of -5V allows operation at frequencies down to DC. Removable SMA connectors can be detached to allow direct connection of the module's I/O pins to a microstrip or coplanar circuit.

### Electrical Specifications, $T_A = +25^\circ \text{C}$ , With VDC = -5V and 0/+5V CMOS Control

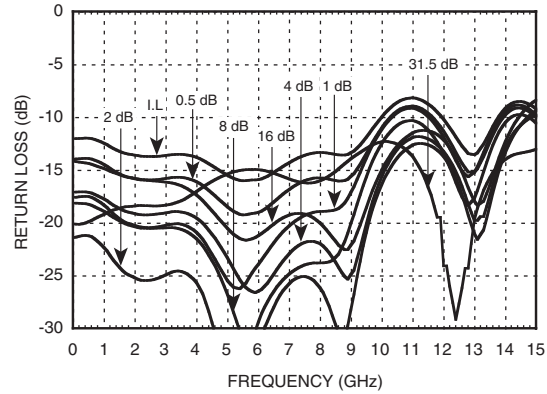
Parameter	Frequency (GHz)	Min.	Typ.	Max.	Units
Insertion Loss	DC - 4.0 GHz		3.2	3.7	dB
	4.0 - 8.0 GHz		3.6	4.1	dB
	8.0 - 13.0 GHz		5.0	6.0	dB
Attenuation Range	DC - 13.0 GHz		31.5		dB
Return Loss (RF1 & RF2, All Atten. States)	DC - 8.0 GHz		15		dB
	8.0 - 13.0 GHz		10		dB
Attenuation Accuracy: (Referenced to Insertion Loss) All States	DC - 3.0 GHz	± (0.2 + 3% of Atten. Setting) Max			dB
	3.0 - 10.0 GHz	± (0.4 + 3% of Atten. Setting) Max			dB
	3.0 - 10.0 GHz	± (0.5 + 6% of Atten. Setting) Max			dB
	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 (Two-Tone Input Power= 0 dBm Each Tone)	1.0 - 13.0 GHz	REF State	46		dBm
		All Other States	32		dBm
Switching Characteristics	DC - 13.0 GHz				
tRISE, tFALL (10/90% RF)			600		ns
tON/tOFF (50% CTL to 10/90% RF)			700		ns

**0.5dB LSB GaAs MMIC 6-BIT DIGITAL SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz**

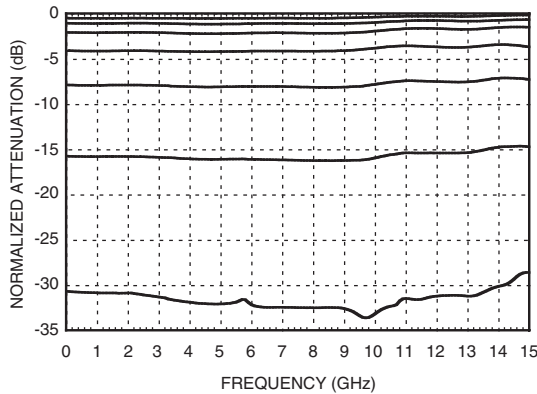
**Insertion Loss**



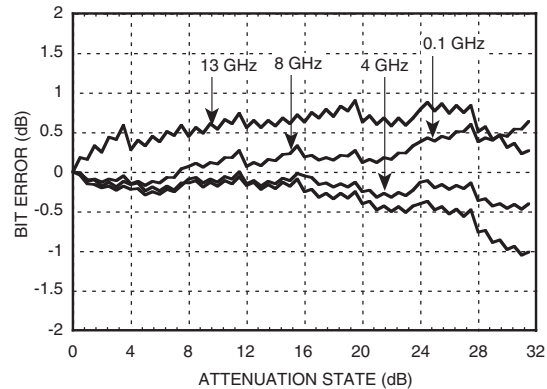
**Return Loss RF1, RF2**  
(Only Major States are Shown)



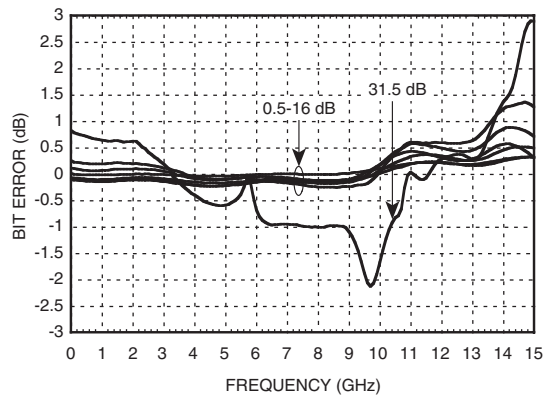
**Normalized Attenuation**  
(Only Major States are Shown)



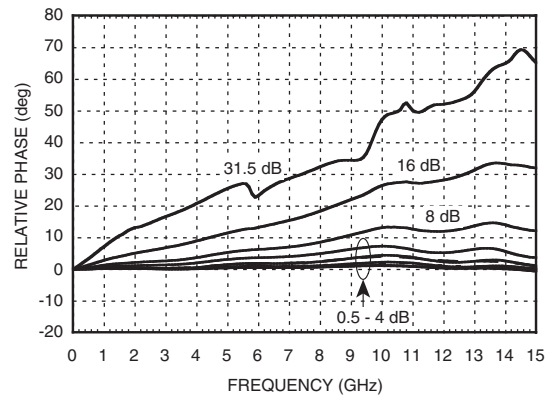
**Bit Error vs. Attenuation State**



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

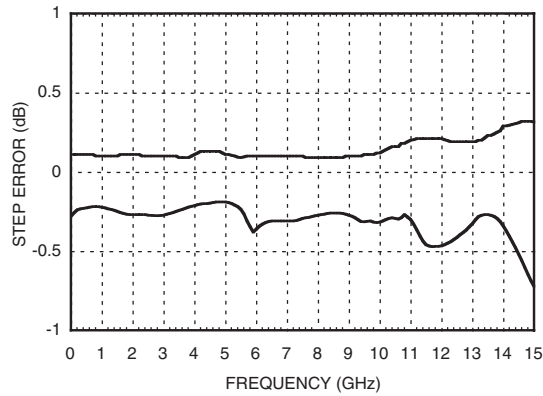


**Relative Phase vs. Frequency**  
(Only Major States are Shown)



**0.5dB LSB GaAs MMIC 6-BIT DIGITAL  
SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz**

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



**Absolute Maximum Ratings**

Digital Inputs (Reset, Shift Clock, Latch Enable & Serial Input)	-0.5V to +5.5V
Bias Voltage (VDC)	-7.0 Vdc
Storage Temperature	-65 to + 150 °C
Operating Temperature	-55 to +85 °C
RF Input Power (0.5 - 13.0 GHz)	+25 dBm



**ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS**

**Bias Voltage & Current**

VDC Range= -5.0 Vdc ± 10%		
VDC	Idc (Typ.) (mA)	Idc (Max.) (mA)
-5.0	5	9

**CMOS Control Voltages**

State	Bias Condition
Low	0 to +1.3V
High	+3.5 to +5.0V

**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**

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

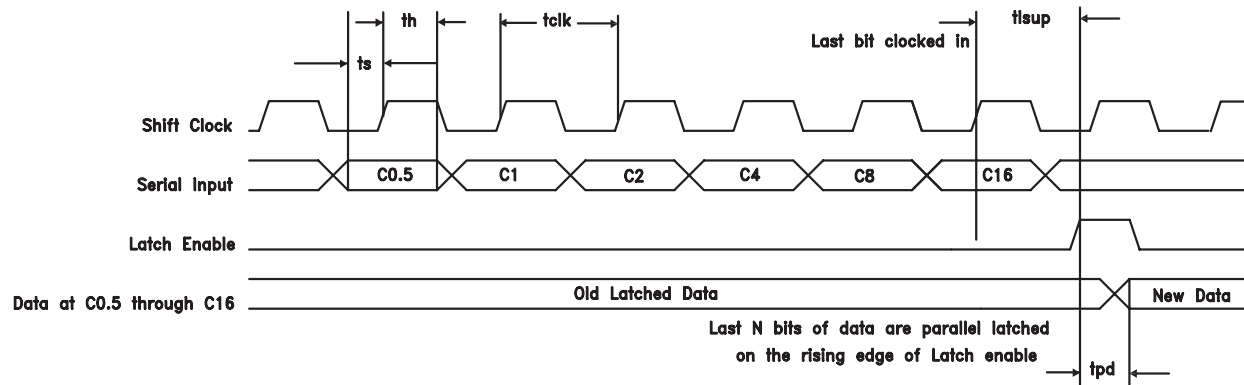
**0.5dB LSB GaAs MMIC 6-BIT DIGITAL SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz**

**Timing**

Parameter	Symbol	Min.	Max.	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	tisup	40	-	ns
Propagation delay, Latch Enable to C0.5 through C8	tpd	-	30	ns
Setup time from Reset to Shift Clock	-	20	-	ns
Clock Frequency (1/tclk)	fclk	-	30	MHz

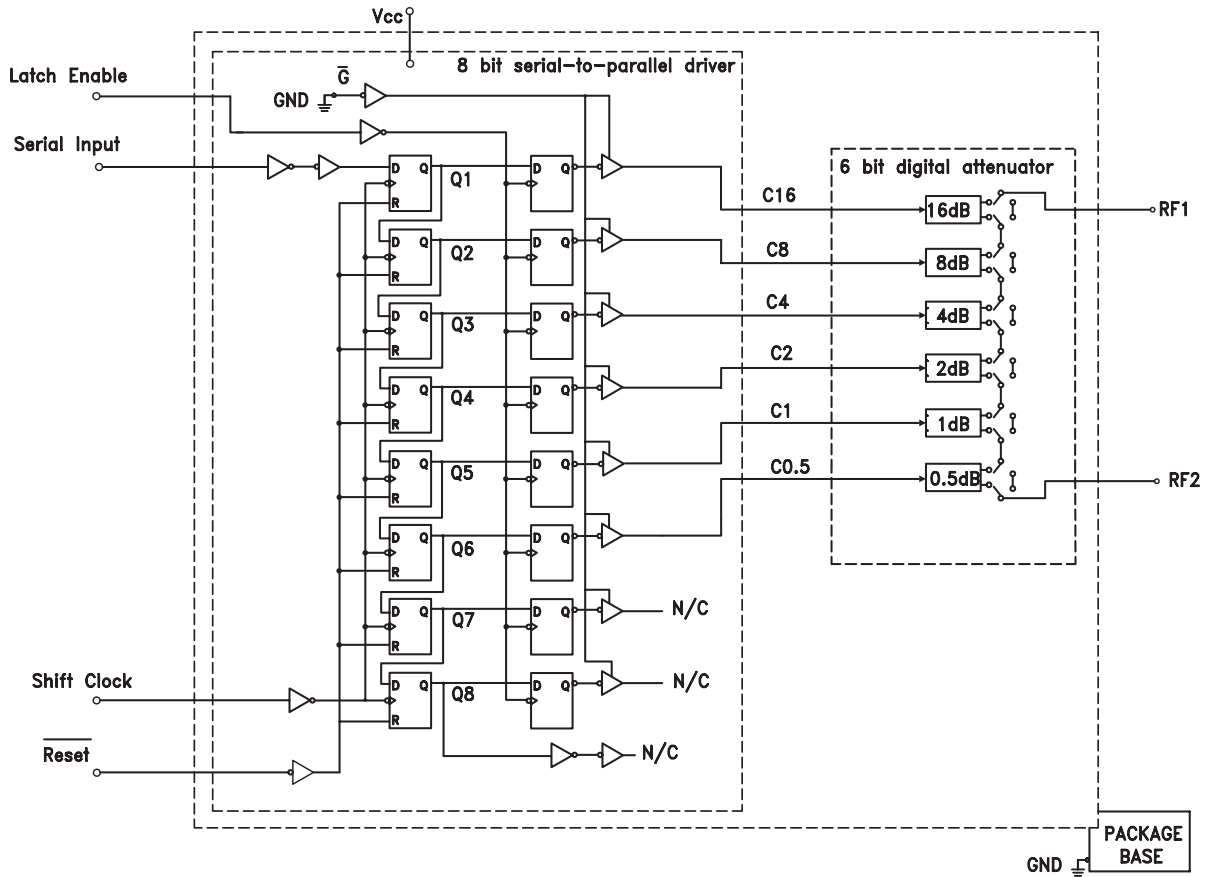
**Timing Diagram**

Serial data is shifted in on the rising edge of the Shift Clock, LSB first, and is latched on the rising edge of Latch Enable.



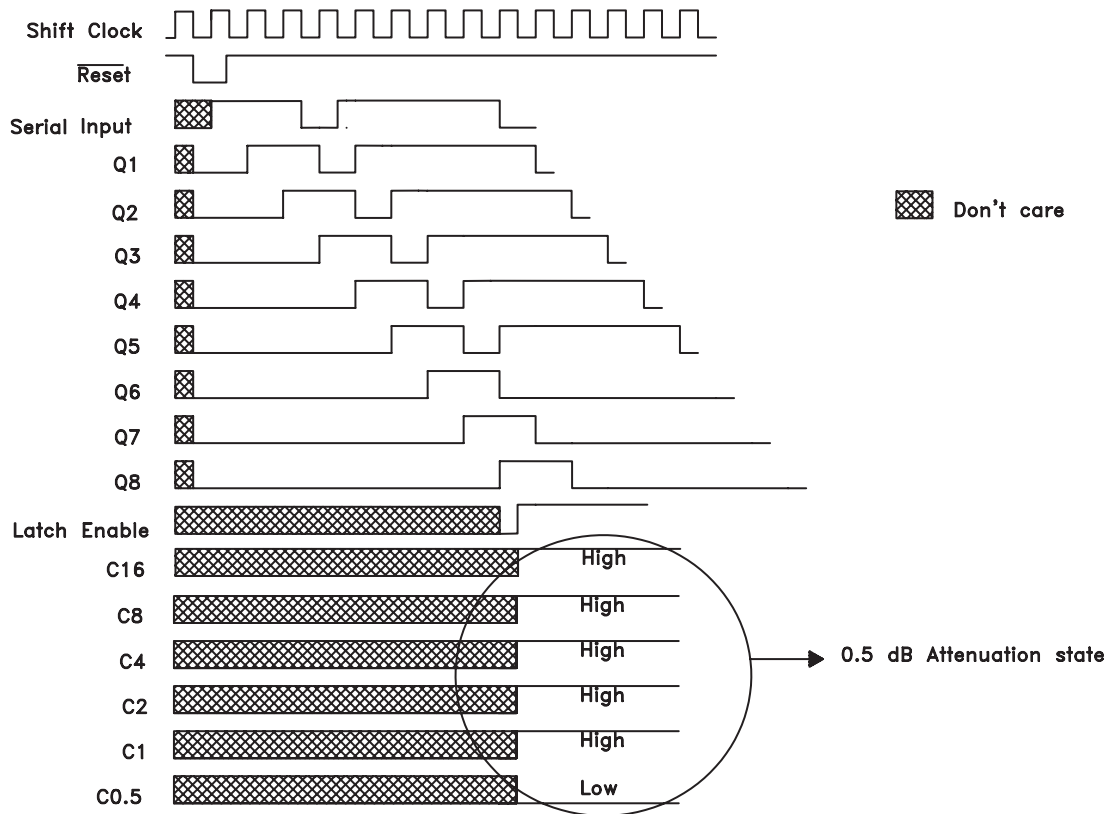
**0.5dB LSB GaAs MMIC 6-BIT DIGITAL SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz**

**Logic / Functional Diagram**



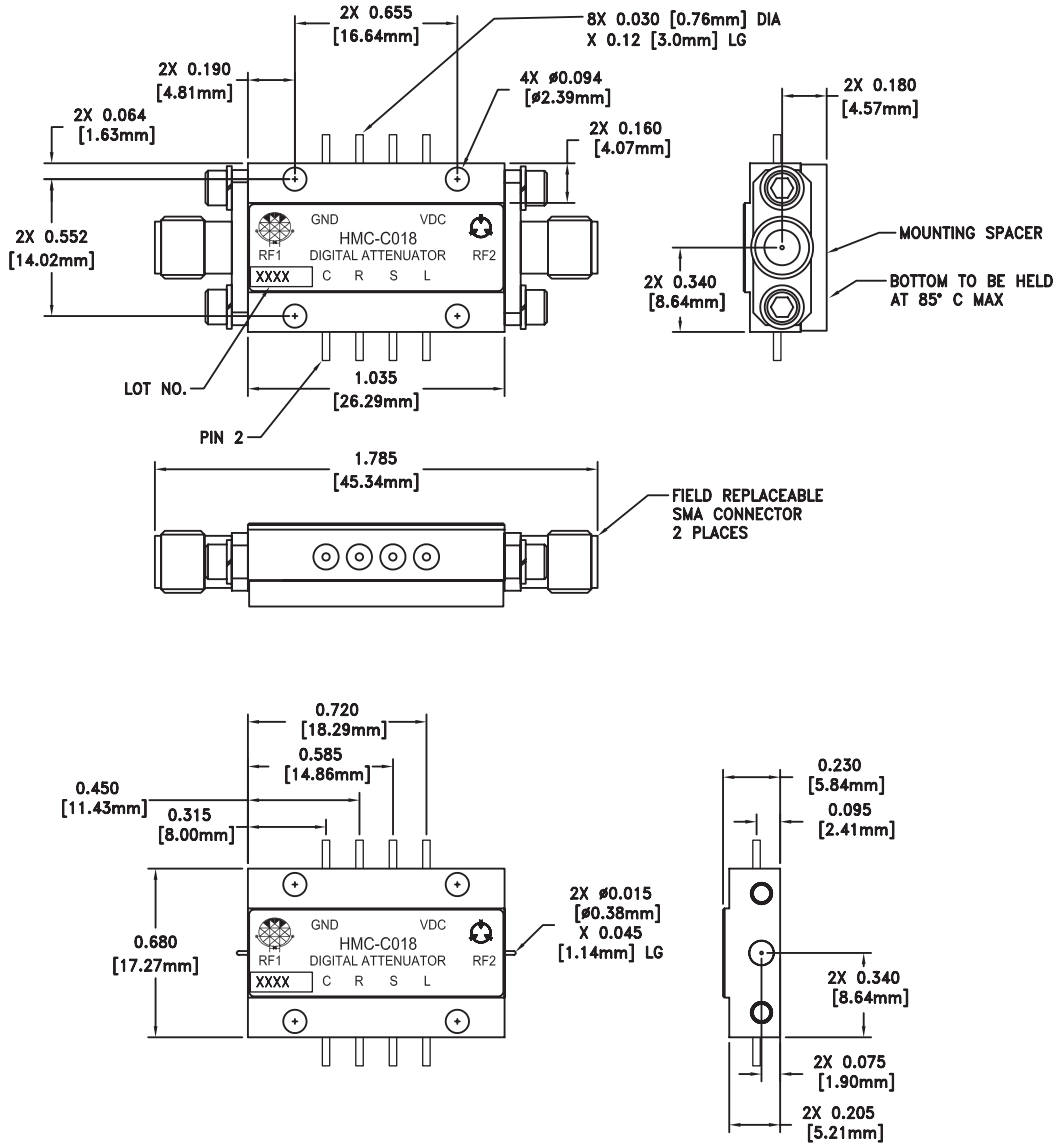
**0.5dB LSB GaAs MMIC 6-BIT DIGITAL SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz**

**Programming Example to Select 0.5 dB Attenuation State**



## 0.5dB LSB GaAs MMIC 6-BIT DIGITAL SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz

### Outline Drawing

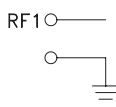
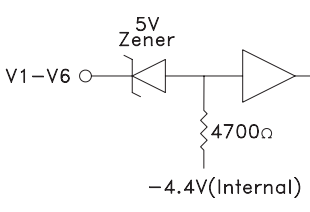
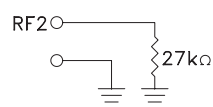
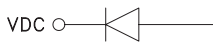



**NOTES:**

1. PACKAGE, LEADS, COVER MATERIAL: KOVAR™
  2. BRACKET MATERIAL: ALUMINUM
  3. PLATING: ELECTROLYTIC GOLD 50 MICROINCHES MIN., OVER ELECTROLYTIC NICKEL 75 MICROINCHES MIN.
  4. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].
  5. TOLERANCES ±.005 [0.13] UNLESS OTHERWISE SPECIFIED.
  6. FIELD REPLACEABLE SMA CONNECTORS.
- TENSOLITE 5602 - 5CCSF OR EQUIVALENT.
- MOUNT MODULE TO SYSTEM PLATFORM WITH #2-56 HARDWARE

**0.5dB LSB GaAs MMIC 6-BIT DIGITAL SERIAL CONTROL ATTENUATOR MODULE, DC - 13 GHz**

**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	





Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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