



# HMC-C053

## VOLTAGE VARIABLE ATTENUATOR MODULE, DC - 20 GHz



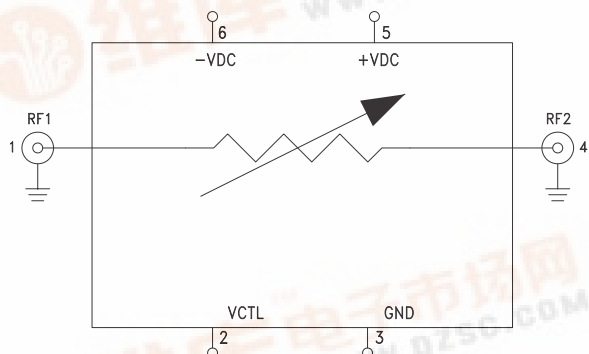
### Features

- Wide Bandwidth: DC - 20 GHz
- Low Phase Shift vs. Attenuation
- 30 dB Attenuation Range Up to 12 GHz
- Hermetically Sealed Module
- Field Replaceable SMA Connectors
- 55 to +85 C Operating Temperature

### Typical Applications

- The HMC-C053 is ideal for:
- Telecom Infrastructure
  - Military Radio, Radar & ECM
  - Space Systems
  - Test Instrumentation

### Functional Diagram



### General Description

The HMC-C053 is an absorptive Voltage Variable Attenuator (VVA) operating from DC - 20 GHz. The HMC-C053 features a simple single voltage attenuation control, 0 to -3V. The device is ideal in designs where an analog DC control signal must control RF signal levels over a 30 dB amplitude range. Its broad frequency range makes it an attractive choice for many applications particularly those involved with AGC or temperature compensation of multiple gain stages, typically found in microwave radio or test instrumentation architecture. 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, $T_A = +25^\circ C$ , with +Vdc = +5V, Vdc = -5V & VCTL = 0 to -3V

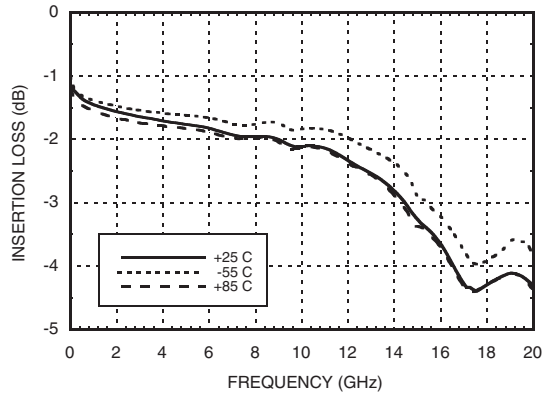
| Parameter  | Frequency (GHz) | Min.                            | Typ. | Max. | Units |
|--|-----------------|---------------------------------|------|------|-------|
| Insertion Loss (VCTL = 0V)   | DC - 5          |                                 | 1.5  |      | dB    |
|  | 5 - 10          |                                 | 1.9  |      | dB    |
|  | 10 - 14         |                                 | 2.4  |      | dB    |
|  | 14 - 20         |                                 | 4.0  |      | dB    |
| Attenuation Range (VCTL = -2.9V)   | DC - 5          | 30                              | 32   |      | dB    |
|  | 5 - 10          | 31                              | 33   |      | dB    |
|  | 10 - 14         | 27                              | 30   |      | dB    |
|  | 14 - 20         | 23                              | 26   |      | dB    |
| Return Loss at RF1   | DC - 14         |                                 | 15   |      | dB    |
|  | DC - 20         |                                 | 8    |      | dB    |
| Input Power for 0.25 dB Compression  | 0.5 - 8.0       | Min Attenuation                 | 7    |      | dBm   |
| Attenuation > 5 dB   |                 | -4                              |      | dBm  |       |
| Input Third Order Intercept Point (Two-Tone Input Power= 10 dBm Each Tone) | 0.5 - 16        | Min Attenuation                 | 22   |      | dBm   |
| Attenuation > 10 dB  |                 | 25                              |      | dBm  |       |
| Switching Characteristics  |                 | tRISE, tFALL (10/90% RF)        | 3    |      | ns    |
|  |                 | tON/tOFF (50% CTL to 10/90% RF) | 9    |      | ns    |
|  |                 |                                 |      |      |       |



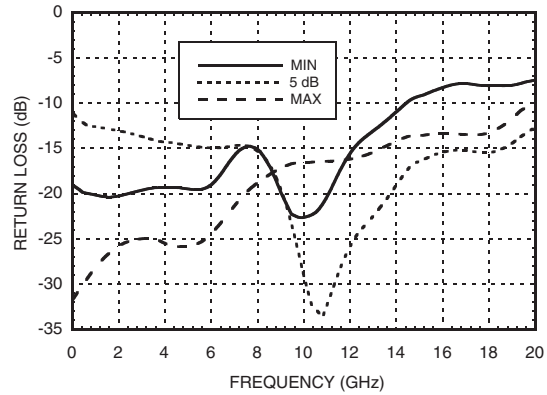


**VOLTAGE VARIABLE ATTENUATOR  
MODULE, DC - 20 GHz**

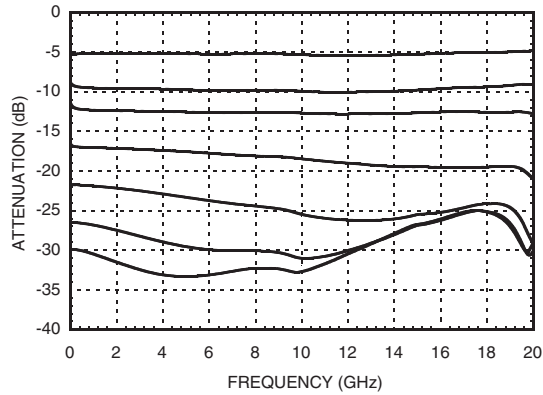
**Insertion Loss vs.  
Frequency Over Temperature**



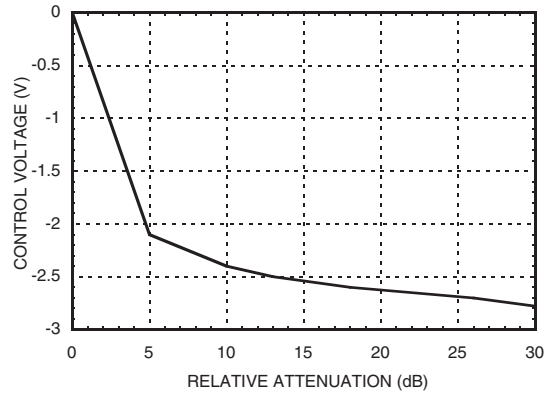
**Return Loss RF1 vs.  
Frequency Over Attenuation**



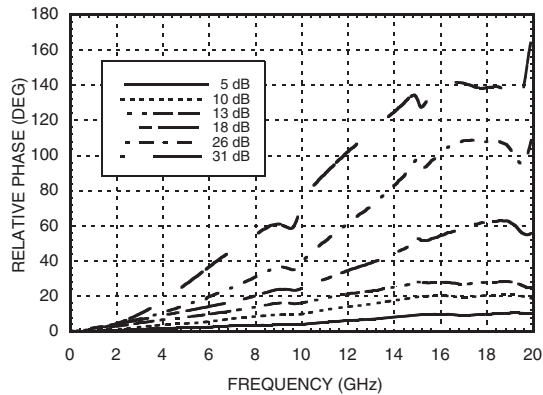
**Relative Attenuation vs. Frequency**



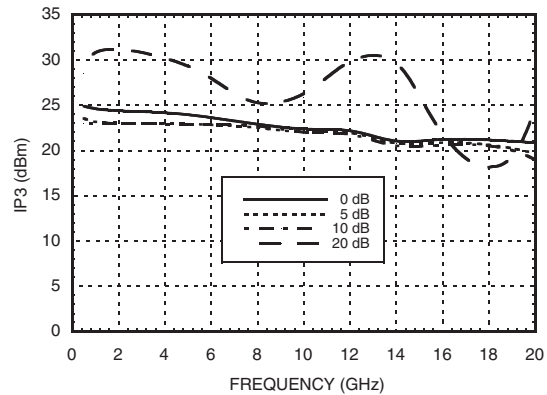
**Relative Attenuation vs.  
Control Voltage @ 10 GHz**



**Relative Phase vs. Frequency**

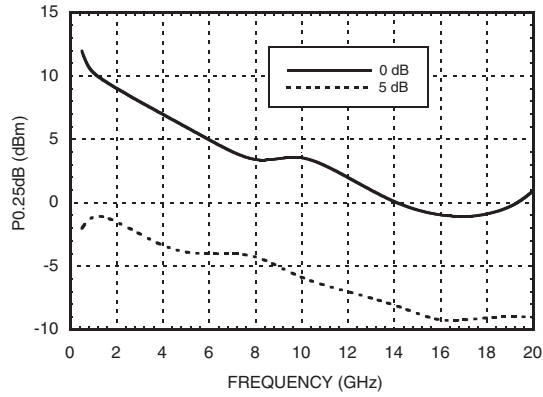


**Input IP3 vs.  
Frequency Over Attenuation**

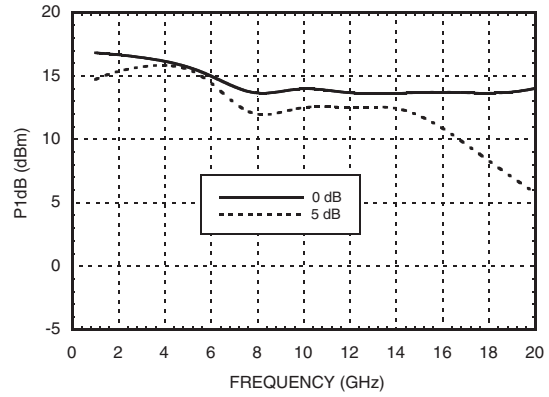




**0.25 dB Compression vs.  
Frequency Over Attenuation**



**1 dB Compression vs.  
Frequency Over Attenuation**





MICROWAVE CORPORATION v01.0608



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### Absolute Maximum Ratings

|                               |                 |
|-------------------------------|-----------------|
| Control Voltage (Vctl)        | +1 to -5 Vdc    |
| Bias Voltage (Vdc / -Vdc)     | +16V / -16V Vdc |
| RF Input Power (0.5 - 20 GHz) | +18 dBm         |
| Storage Temperature           | -65 to + 150 °C |
| Operating Temperature         | -55 to +85 °C   |

### Bias Voltage & Current

| Vdc Range= ± 10% |                    |                    |
|------------------|--------------------|--------------------|
| +Vdc / -Vdc      | Idc (Typ.)<br>(mA) | Idc (Max.)<br>(mA) |
| 5.0              | 3.3                | 3.7                |
| -5.0             | -6.9               | -8.8               |



ELECTROSTATIC SENSITIVE DEVICE  
OBSERVE HANDLING PRECAUTIONS

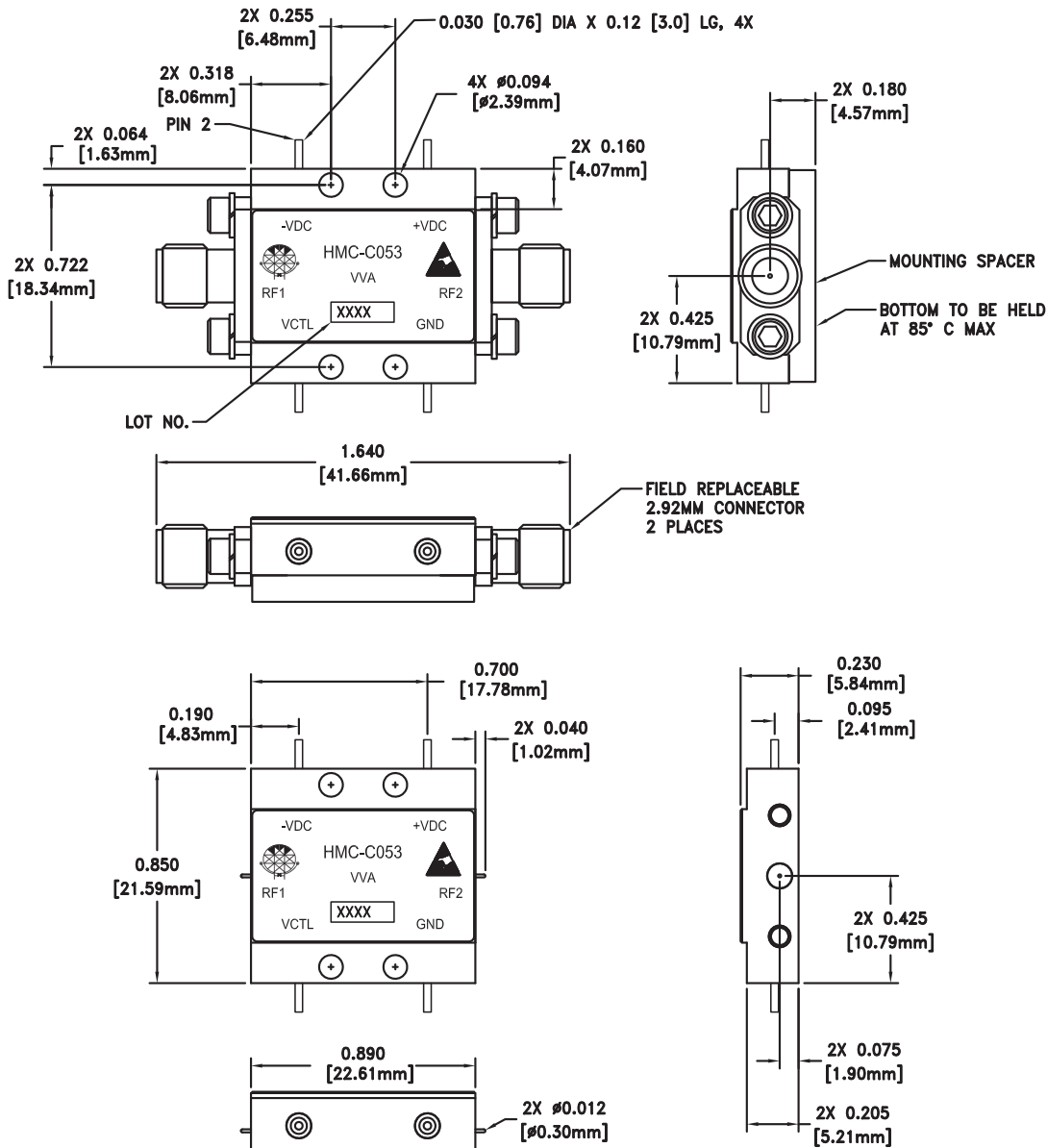
### Control Voltage

| State     | Bias Condition (Vctl) |
|-----------|-----------------------|
| Min Atten | 0V                    |
| Max Atten | -2.9V                 |



## VOLTAGE VARIABLE ATTENUATOR MODULE, DC - 20 GHz

### Outline Drawing



### Package Information

|                               |                         |
|-------------------------------|-------------------------|
| Package Type                  | C-10                    |
| Package Weight <sup>[1]</sup> | 18.7 gms <sup>[2]</sup> |
| Spacer Weight                 | 3.3 gms <sup>[2]</sup>  |

[1] Includes the connectors

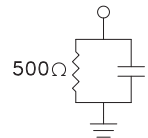

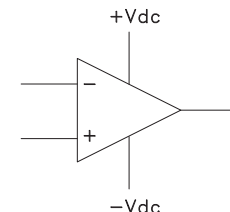
[2]  $\pm$ 1 gms Tolerance

### NOTES:

1. PACKAGE, LEADS, COVER MATERIAL: KOVART™
2. SPACER MATERIAL: ALUMINUM
3. PLATING: ELECTROLYTIC GOLD 50 MICROINCHES MIN., OVER ELECTROLYTIC NICKEL 75 MICROINCHES MIN.
4. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. TOLERANCES  $\pm$ .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



### Pin Description

| Pin Number | Function   | Description   | Interface Schematic  |
|------------|------------|---|--|
| 1, 4       | RF1, RF2   | This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required if the RF line potential is not equal to 0V. |  |
| 2          | Vctl       | Control Input (Master).   |   |
| 3          | GND        | Package bottom has exposed metal paddle that must also be connected to PCB RF ground.                                       |   |
| 5, 6       | -Vdc, +Vdc | Supply Voltages   |  |