

Features

- Attenuation: 0.5 dB Steps to 31.5 dB
- Low DC Power Consumption
- Small Footprint, JEDEC Package
- Integral TTL Driver
- 50 ohm Impedance
- Test Boards are Available
- Tape and Reel Packaging Available
- Lead-Free CSP-1 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of AT90-0107

Description

M/A-COM's MAATCC0009 is a GaAs FET 6-bit digital attenuator with integral TTL driver. Step size is 0.5 dB providing a 31.5 dB total attenuation range. This device is in an PQFN plastic surface mount package. The MAATCC0009 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required.

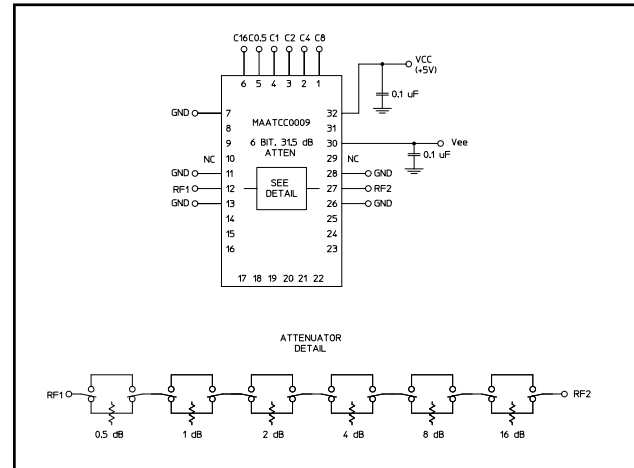
Ordering Information

| Part Number | Package |
|---------------|-------------------|
| MAATCC0009 | Bulk Packaging |
| MAATCC0009TR | 1000 piece reel |
| MAATCC0009-TB | Sample Test Board |

Note: Reference Application Note M513 for reel size information.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

Schematic with Off-Chip Components



Pin Configuration²

| Pin No. | Function | Pin No. | Function |
|---------|-----------------|---------|-----------------|
| 1 | C8 | 17 | NC |
| 2 | C4 | 18 | NC |
| 3 | C2 | 19 | NC |
| 4 | C1 | 20 | NC |
| 5 | C0.5 | 21 | NC |
| 6 | C16 | 22 | NC |
| 7 | GND | 23 | NC |
| 8 | NC | 24 | NC |
| 9 | NC | 25 | NC |
| 10 | NC ¹ | 26 | GND |
| 11 | GND | 27 | RF2 |
| 12 | RF1 | 28 | GND |
| 13 | GND | 29 | NC ¹ |
| 14 | NC | 30 | -Vee |
| 15 | NC | 31 | NC |
| 16 | NC | 32 | +Vcc |

1. Pins 10 & 29 must be isolated
2. The exposed pad centered on the package bottom must be connected to RF and DC ground. (For PQFN Packages)

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 • India Tel: +91.80.4155721 • China Tel: +86.21.2407.1588
 Visit www.macomtech.com for additional data sheets and product information.

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Digital Attenuator 31.5 dB, 6-Bit, TTL Driver, DC-4.0 GHz

Rev. V5

Electrical Specifications: $T_A = +25^\circ\text{C}$, $V_{ee} = -5\text{ V} \pm 0.25\text{ V}$, $V_{cc} = +5\text{ V} \pm 0.25\text{ V}$

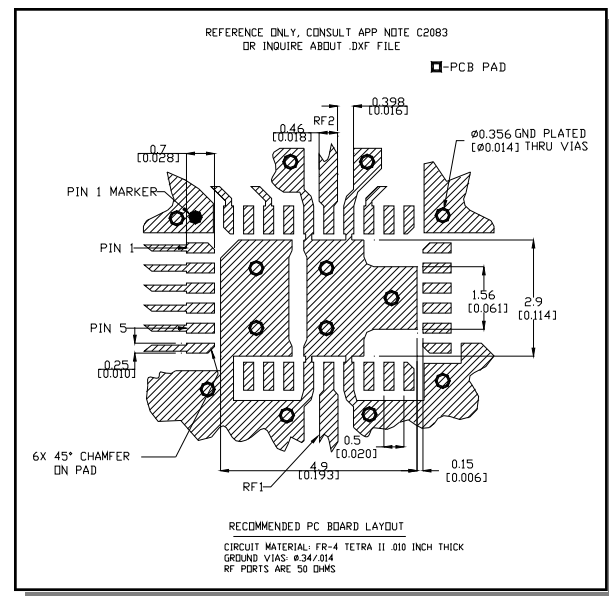
| Parameter | Test Conditions | Frequency | Units | Min | Typ | Max |
|--|--|------------------------------|--------------------|------------|------------|--|
| Insertion Loss | — | DC - 4.0 GHz | dB | — | 4.5 | 5.1 |
| Attenuation Accuracy | Individual Bits 0.5-1-2-4-8-16 dB Any Combination of Bits 1 to 31.5 dB | DC - 4.0 GHz DC - 4.0 GHz | dB dB | — — | — — | $\pm(.3 + 7\%$ of atten setting) $\pm(.5 + 8\%$ of atten setting) |
| VSWR | Full Range | DC - 4.0 GHz | Ratio | — | 2.0:1 | 2.2:1 |
| Switching Speed | 50% Cntl to 90%/10% RF 10% to 90% or 90% to 10% | — — | ns ns | — — | 75 20 | — — |
| 1 dB Compression | — — | 50 MHz 0.5 - 4.0 GHz | dBm dBm | — — | +21 +24 | — — |
| Input IP ₃ | Two-tone inputs up to +5 dBm | 50 MHz 0.5-4.0 GHz | dBm dBm | — — | +35 +48 | — — |
| V _{IL} V _{IH} | LOW-level input voltage HIGH-level input voltage | — — | V V | 0.0 2.0 | — — | 0.8 5.0 |
| I _{in} (Input Leakage Current) | V _{in} = V _{CC} or GND | — | uA | -1.0 | — | 1.0 |
| I _{cc} (Quiescent Supply Current) | V _{cntrl} = V _{CC} or GND | — | uA | — | 250 | 400 |
| Δ I _{cc} (Additional Supply Current Per TTL Input Pin) | V _{CC} = Max, V _{cntrl} = V _{CC} - 2.1 V | — | mA | — | — | 1.0 |
| I _{EE} | V _{EE} min to max, V _{in} = V _{IL} or V _{IH} | — | mA | -1.0 | -0.2 | — |
| Thermal Resistance θ_{jc} | — | — | $^\circ\text{C/W}$ | — | 15 | — |

Absolute Maximum Ratings^{3,4}

| Parameter | Absolute Maximum |
|---|---|
| Max. Input Power 0.05 GHz 0.5 - 4.0 GHz | +27 dBm +34 dBm |
| V _{CC} | -0.5V \leq V _{CC} \leq +7.0V |
| V _{EE} | -8.5V \leq V _{EE} \leq +0.5V |
| V _{CC} - V _{EE} | -0.5V \leq V _{CC} - V _{EE} \leq 14.5V |
| V _{in} ⁵ | -0.5V \leq V _{in} \leq V _{CC} + 0.5V |
| Operating Temperature | -40 $^\circ\text{C}$ to +85 $^\circ\text{C}$ |
| Storage Temperature | -65 $^\circ\text{C}$ to +125 $^\circ\text{C}$ |

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM does not recommend sustained operation near these survivability limits.
- Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

Recommended PCB Configuration⁶



6. Application Note S2083 is available on line at www.macom.com

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Moisture Sensitivity

The MSL rating for this part is defined as Level 2 per IPC/JEDEC J-STD-020. Parts shall be stored and/or baked as required for MSL Level 2 parts.

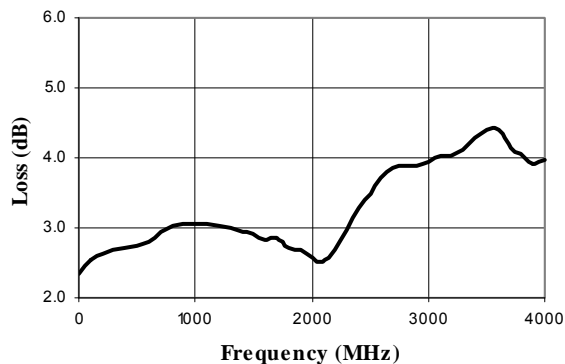
Truth Table (Digital Attenuator)

| C16 | C8 | C4 | C2 | C1 | C0.5 | Attenuation |
|-----|----|----|----|----|------|-----------------|
| 0 | 0 | 0 | 0 | 0 | 0 | Loss, Reference |
| 0 | 0 | 0 | 0 | 0 | 1 | 0.5 dB |
| 0 | 0 | 0 | 0 | 1 | 0 | 1.0 dB |
| 0 | 0 | 0 | 1 | 0 | 0 | 2.0 dB |
| 0 | 0 | 1 | 0 | 0 | 0 | 4.0 dB |
| 0 | 1 | 0 | 0 | 0 | 0 | 8.0 dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 16.0 dB |
| 1 | 1 | 1 | 1 | 1 | 1 | 31.5 dB |

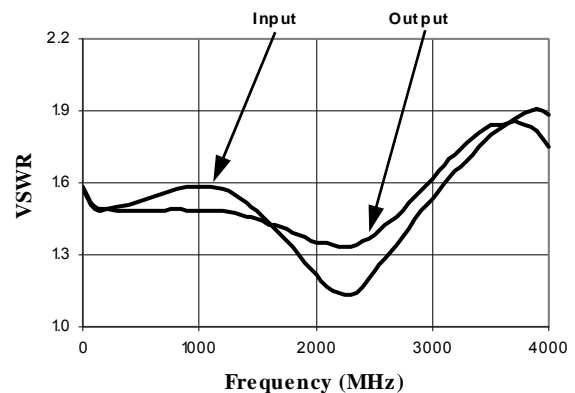
0 = TTL Low; 1 = TTL High

Typical Performance Curves

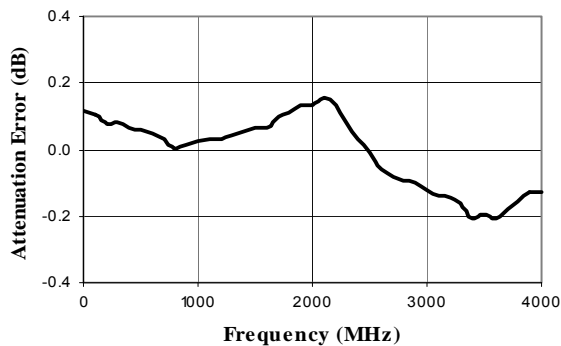
Insertion Loss



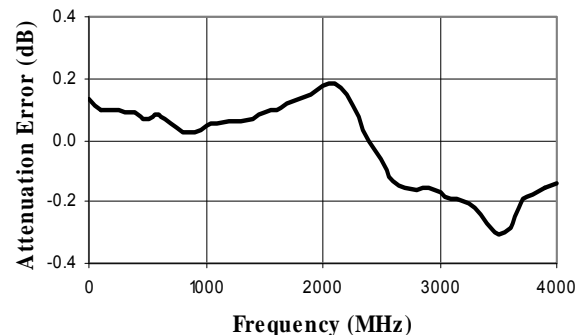
VSWR @ Insertion Loss



Attenuation Error, 0.5 dB Bit

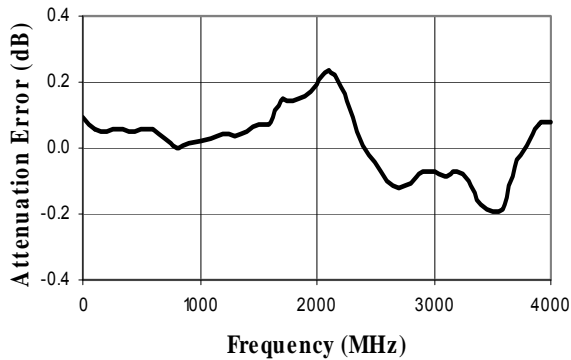


Attenuation Error, 1 dB Bit

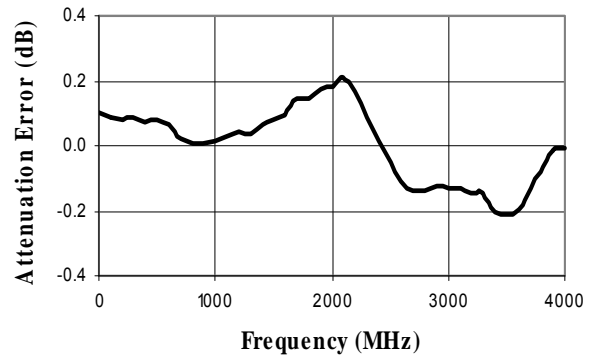


Typical Performance Curves

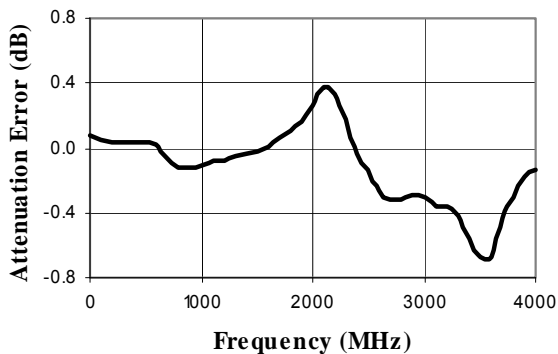
Attenuation Error, 2 dB Bit



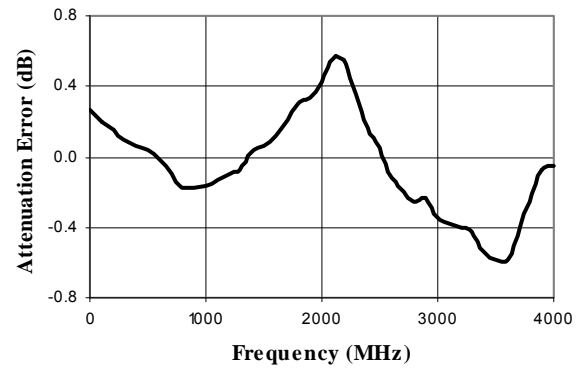
Attenuation Error, 4 dB Bit



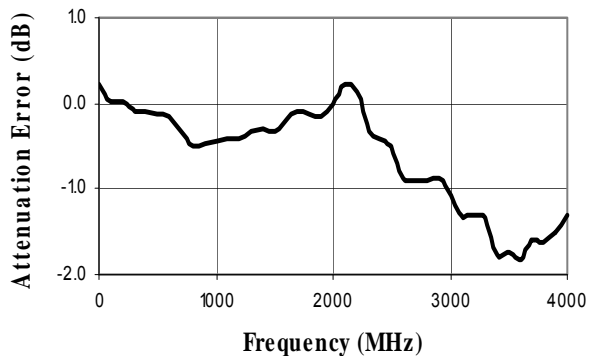
Attenuation Error, 8 dB Bit



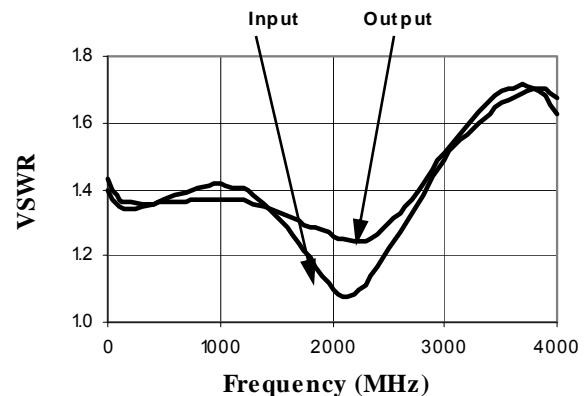
Attenuation Error, 16 dB Bit



Attenuation Error, Max. Attenuation

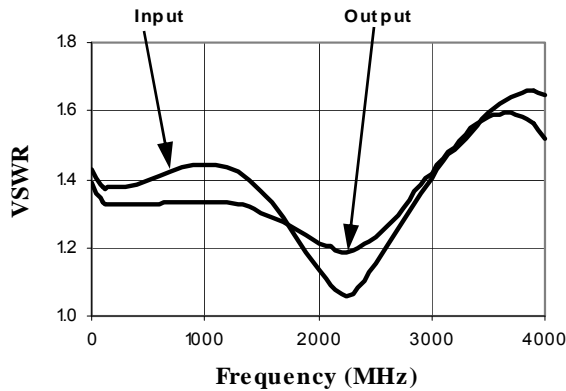


VSWR, 0.5 dB Bit

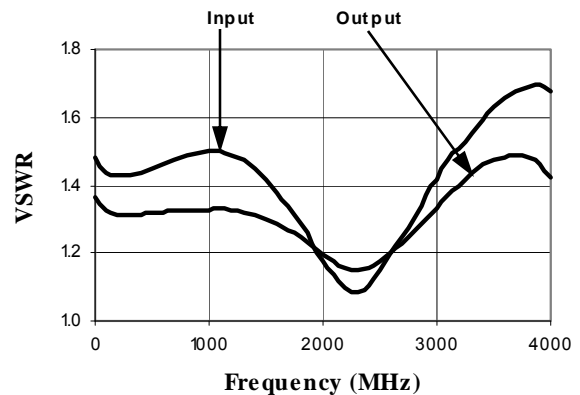


Typical Performance Curves

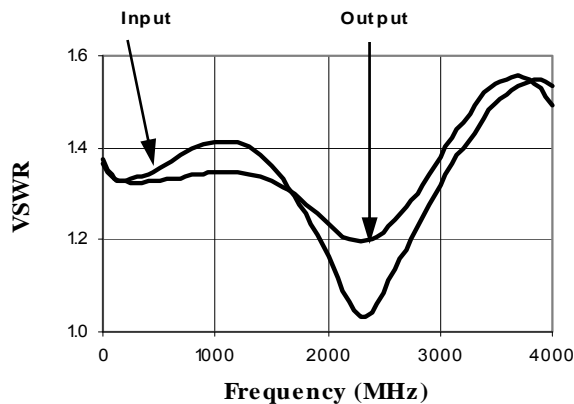
VSWR, 1 dB Bit



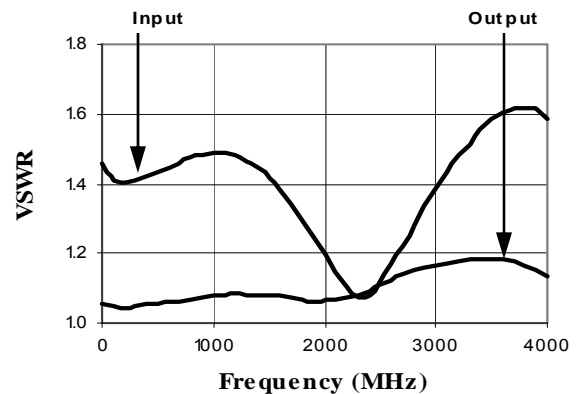
VSWR, 2 dB Bit



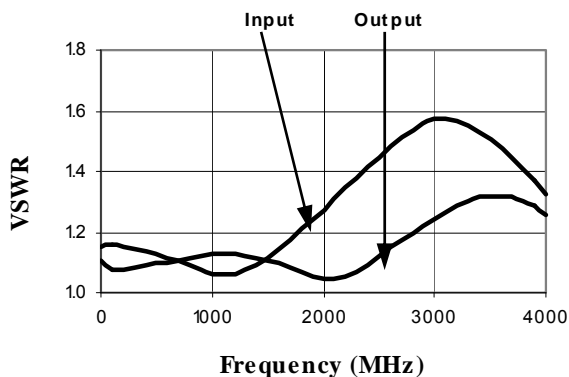
VSWR, 4 dB Bit



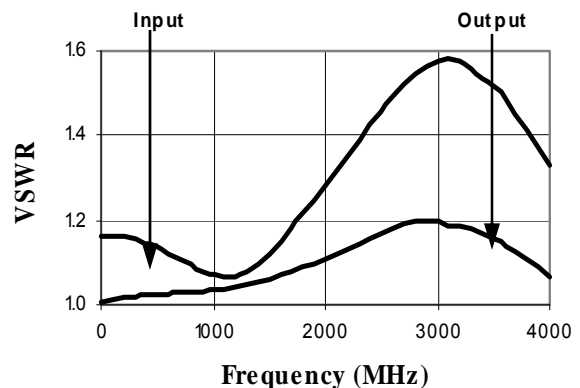
VSWR, 8 dB Bit



VSWR, 16 dB Bit

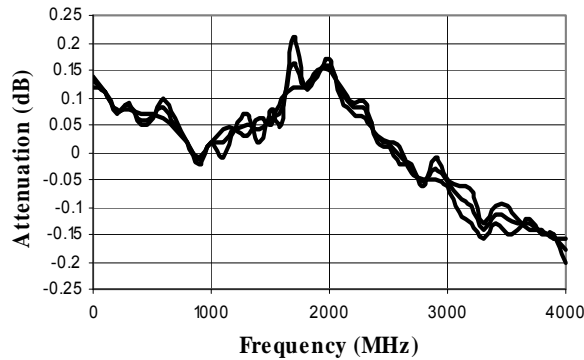


VSWR, Max. Attenuation

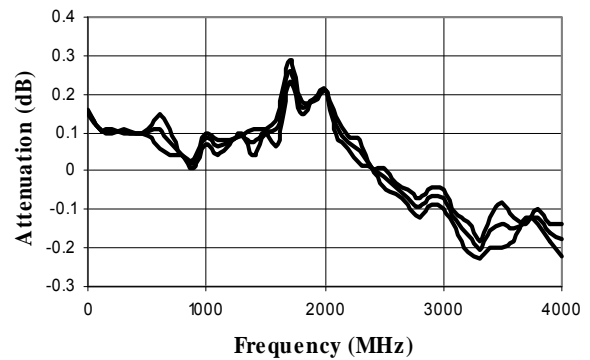


Typical Performance Curves

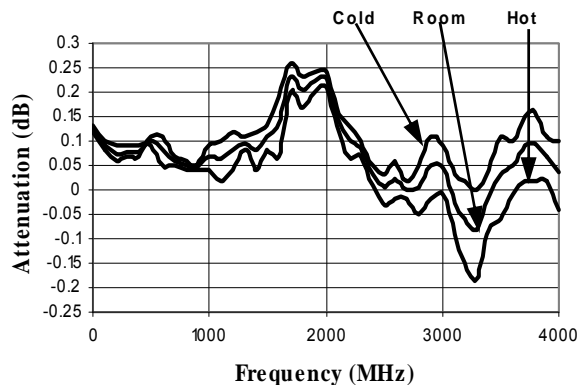
Typical Attenuation Deviation vs. Temperature for 0.5 dB Bit



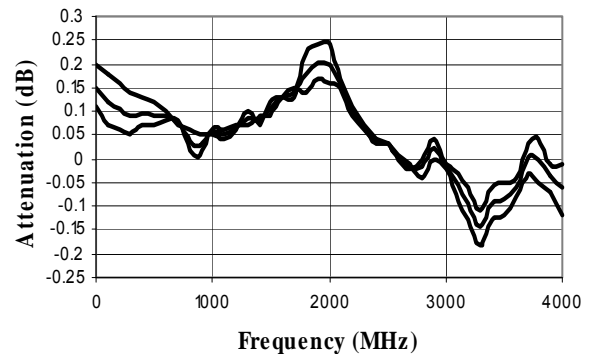
Typical Attenuation Deviation vs. Temperature for 1 dB Bit



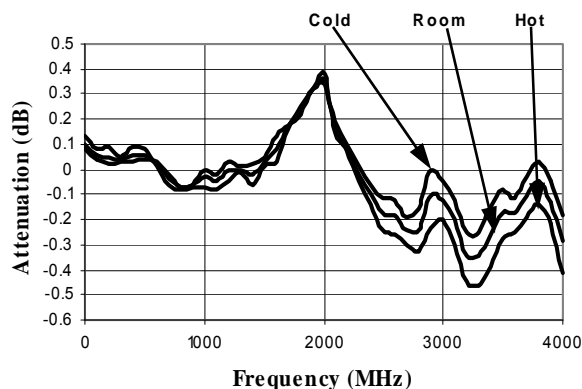
Typical Attenuation Deviation vs. Temperature for 2 dB Bit



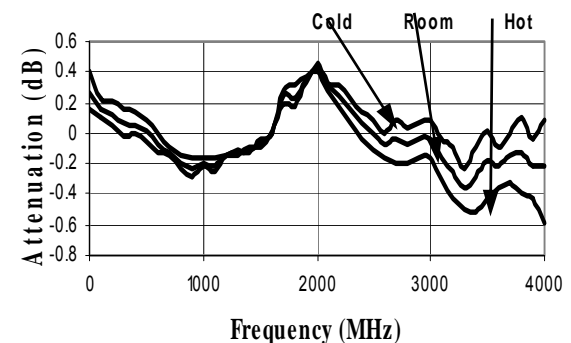
Typical Attenuation Deviation vs. Temperature for 4 dB Bit



Typical Attenuation Deviation vs. Temperature for 8 dB Bit

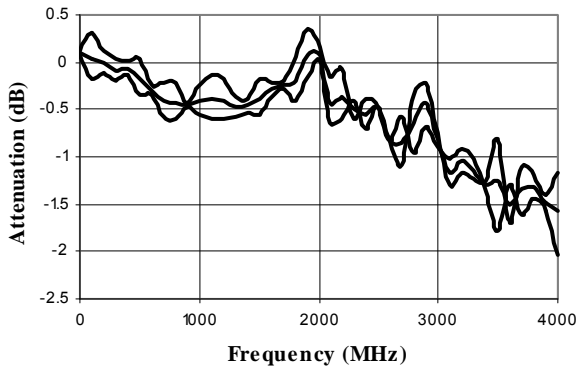


Typical Attenuation Deviation vs. Temperature for 16 dB Bit

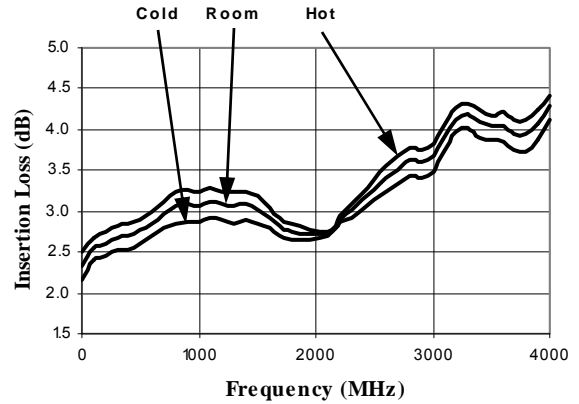


Typical Performance Curves

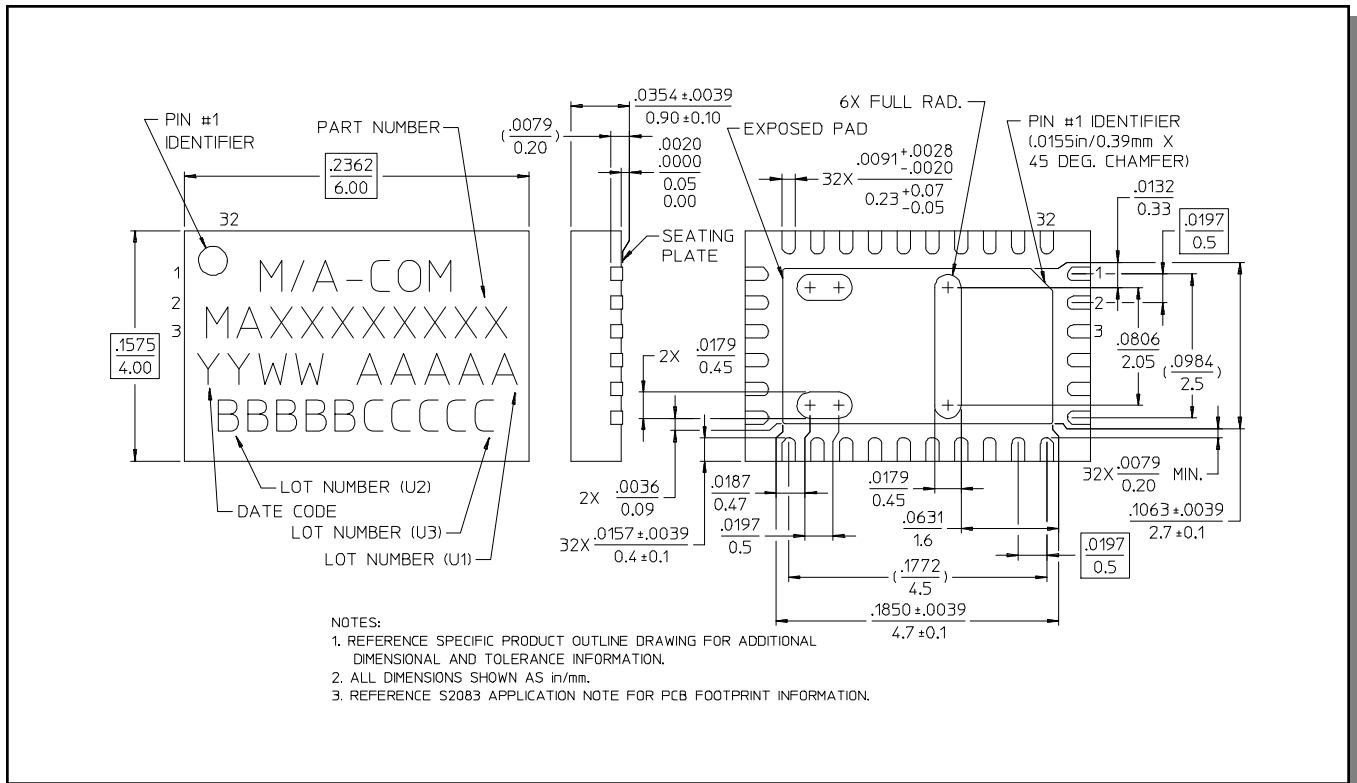
Typical Attenuation Deviation vs. Temperature at Maximum Atten.



Insertion Loss vs. Temperature



CSP-1, Lead-Free 4 x 6 mm, 32-lead PQFN†



† Reference Application Note M538 for lead-free solder reflow recommendations.



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- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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