

## Features

- Attenuation: 1.0 dB Steps to 31 dB
- Low DC Power Consumption
- Plastic SOW, Wide Body, SMT Package
- Integral TTL Driver
- 50  $\Omega$  Impedance
- Test Boards are Available
- Tape and Reel Packaging Available
- Lead-Free SOW-16 Package
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT65-0263

## Description

The MAATCC0007 is a GaAs FET 5-bit digital attenuator with integral TTL driver. Step size is 1.0 dB providing 31 dB total attenuation range. This device is in a SOW-16 plastic surface mount package.

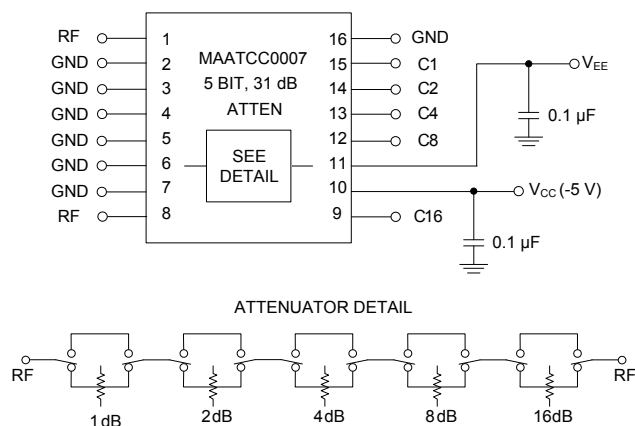
The MAATCC0007 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required.

## Ordering Information<sup>1</sup>

| Part Number   | Package           |
|---------------|-------------------|
| MAATCC0007    | Bulk Packaging    |
| MAATCC0007TR  | 1000 piece reel   |
| MAATCC0007-TB | Sample Test Board |

1. Reference Application Note M513 for reel size information.

## Schematic with Off-Chip Components



## Pin Configuration

| Pin No. | Function | Pin No. | Function |
|---------|----------|---------|----------|
| 1       | RF       | 9       | C16      |
| 2       | GND      | 10      | Vcc      |
| 3       | GND      | 11      | Vee      |
| 4       | GND      | 12      | C8       |
| 5       | GND      | 13      | C4       |
| 6       | GND      | 14      | C2       |
| 7       | GND      | 15      | C1       |
| 8       | RF       | 16      | GND      |

\* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

**Electrical Specifications: Freq. = DC - 2 GHz, T<sub>A</sub> = 25°C**

| Parameter                                                             | Test Conditions                                                                                           | Units | Min.                                                                                      | Typ.        | Max.          |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------|-------------|---------------|
| Insertion Loss                                                        | —                                                                                                         | dB    | —                                                                                         | 2.8         | 3.2           |
| Attenuation Accuracy                                                  | Individual Bits 1, 2, 4, 8, 16<br>Any Combination of bits 3 - 29 dB<br>Any Combination of bits 30 - 31 dB | dB    | ±(0.5 +5% of atten setting)<br>±(0.5 +5% of atten setting)<br>±(0.7 +7% of atten setting) |             |               |
| VSWR                                                                  | Full Range                                                                                                | Ratio | —                                                                                         | 1.5:1       | 1.8:1         |
| Switching Speed                                                       | 50% Control to 90%/10% RF<br>10% to 90% or 90% to 10%                                                     | ns    | —                                                                                         | 75<br>20    | 150<br>50     |
| 1 dB Compression                                                      | 50 MHz<br>0.5-2.0 GHz                                                                                     | dBm   | —                                                                                         | +21<br>+24  | —             |
| Input IP3                                                             | Two-tone inputs up to +5 dBm<br>50 MHz<br>0.5-2.0 GHz                                                     | dB    | —                                                                                         | +35<br>+48  | —             |
| $V_{CC}^2$<br>$V_{EE}^2$                                              | —                                                                                                         | V     | 4.75<br>-8.0                                                                              | 5.0<br>-5.0 | 5.25<br>-4.75 |
| $V_{IL}$<br>$V_{IH}$                                                  | LOW-level input voltage<br>HIGH-level input voltage                                                       | V     | 0.0<br>2.0                                                                                | —           | 0.8<br>5.0    |
| Input Leakage Current                                                 | $V_{IN} = V_{CC}$ or GND                                                                                  | μA    | -1.0                                                                                      | —           | 1.0           |
| $I_{CC}$<br>(Quiescent Supply Current)                                | $V_{CTRL} = V_{CC}$ or GND                                                                                | μA    | —                                                                                         | 250         | 400           |
| $\Delta I_{CC}^3$<br>(Additional Supply Current<br>Per TTL Input Pin) | $V_{CC} = \text{max}$ , $V_{CTRL} = V_{CC} - 2.1$ 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 $\theta_{JA}$                                      | PCB mount on FR4 material,<br>copper trace, still air at +25°C                                            | °C/W  | —                                                                                         | 90 - 130    | —             |

- Decoupling capacitors (0.1 μF) are required on power supply lines.
- For calculating  $\Delta I_{CC}$ , the number of TTL input pins is 6.

## Absolute Maximum Ratings<sup>4,5</sup>

| Parameter                                | Absolute Maximum                                    |
|------------------------------------------|-----------------------------------------------------|
| Input Power<br>0.05 GHz<br>0.5 - 2.0 GHz | +27 dBm<br>+34 dBm                                  |
| V <sub>CC</sub>                          | -0.5 V ≤ V <sub>CC</sub> ≤ +7.0 V                   |
| V <sub>EE</sub>                          | -8.5 V ≤ V <sub>EE</sub> ≤ +0.5 V                   |
| V <sub>CC</sub> - V <sub>EE</sub>        | -0.5 V ≤ V <sub>CC</sub> - V <sub>EE</sub> ≤ 14.5 V |
| V <sub>IN</sub>                          | -0.5 V ≤ V <sub>IN</sub> ≤ V <sub>CC</sub> + 0.5 V  |
| Operating Temperature                    | -40°C to +85°C                                      |
| Storage Temperature                      | -65°C to +125°C                                     |

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.

## Truth Table (Digital Attenuator)

| C16 | C8 | C4 | C2 | C1 | Attenuation     |
|-----|----|----|----|----|-----------------|
| 0   | 0  | 0  | 0  | 0  | Loss, Reference |
| 0   | 0  | 0  | 0  | 1  | 1 dB            |
| 0   | 0  | 0  | 1  | 0  | 2 dB            |
| 0   | 0  | 1  | 0  | 0  | 4 dB            |
| 0   | 1  | 0  | 0  | 0  | 8 dB            |
| 1   | 0  | 0  | 0  | 0  | 16 dB           |
| 1   | 1  | 1  | 1  | 1  | 31 dB           |

0 = TTL Low; 1 = TTL High

## Handling Procedures

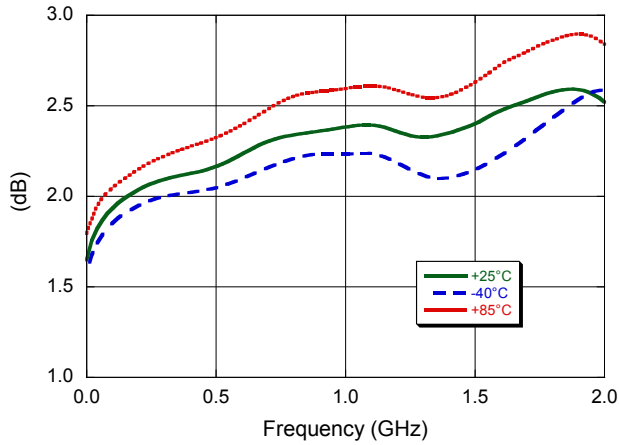
Please observe the following precautions to avoid damage:

## Static Sensitivity

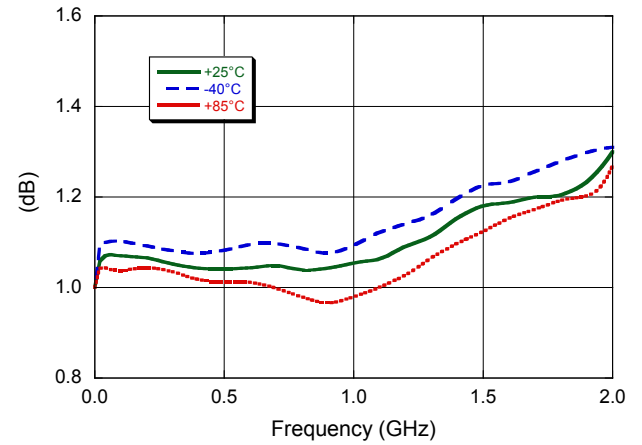
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## Typical Performance Curves

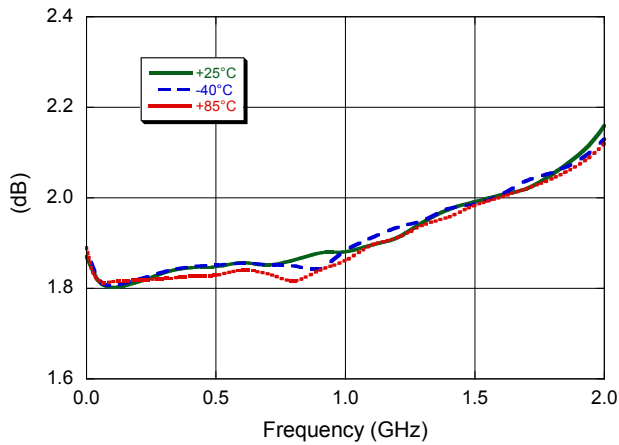
**Insertion Loss**



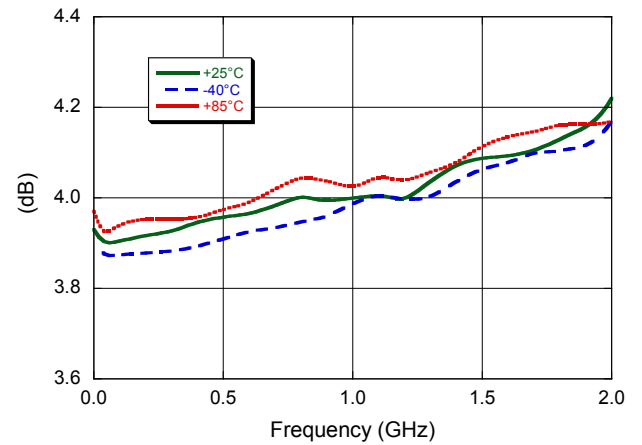
**Attenuation @ 1 dB**



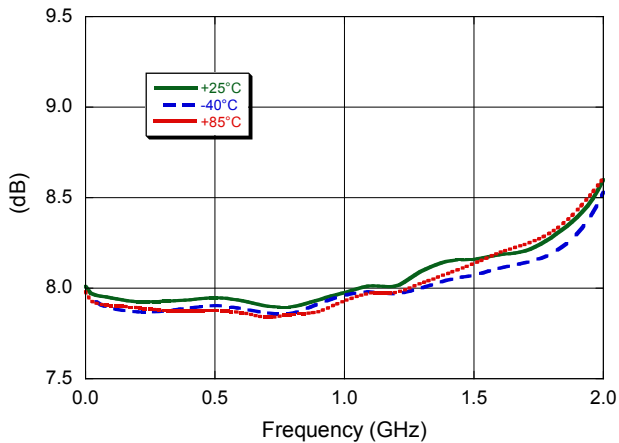
**Attenuation @ 2 dB**



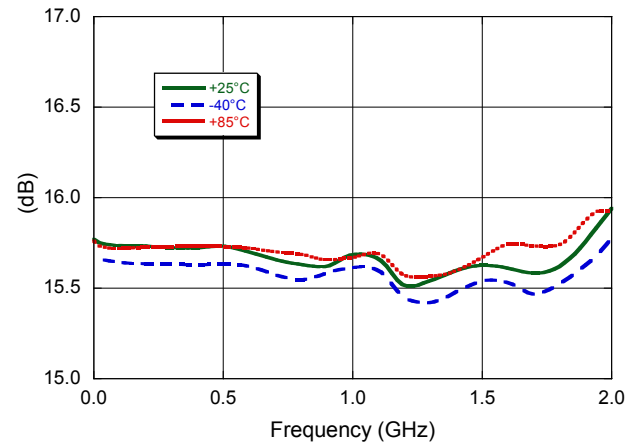
**Attenuation @ 4 dB**



**Attenuation @ 8 dB**

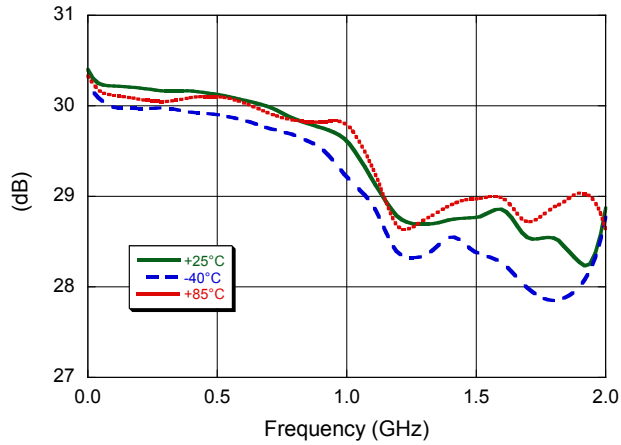


**Attenuation @ 16 dB**

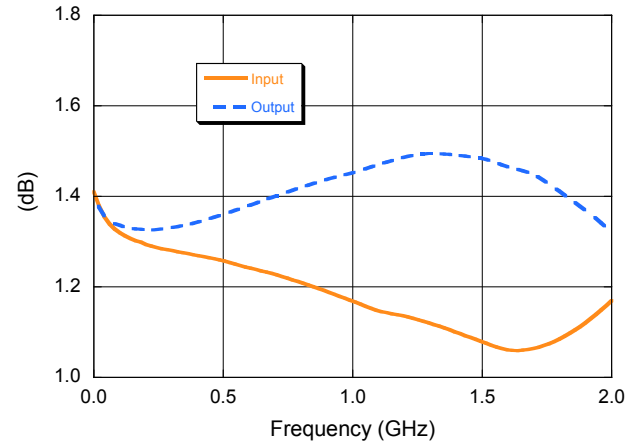


## Typical Performance Curves

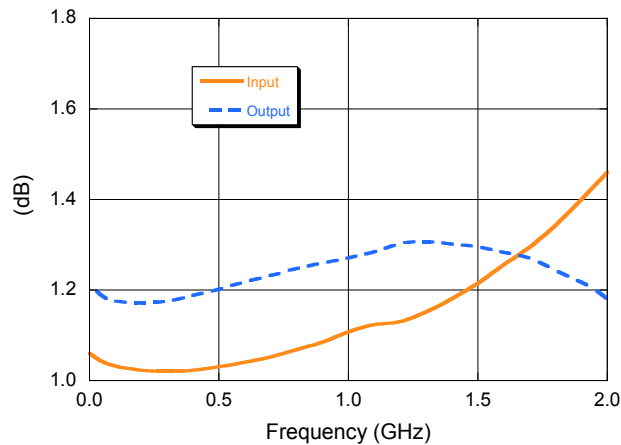
**Attenuation @ 31 dB**



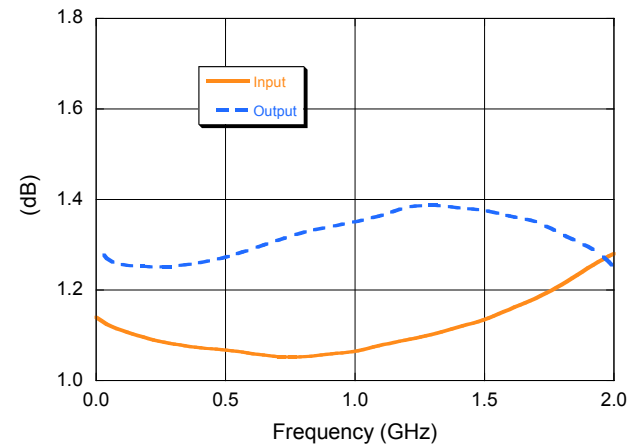
**Maximum VSWR, Loss**



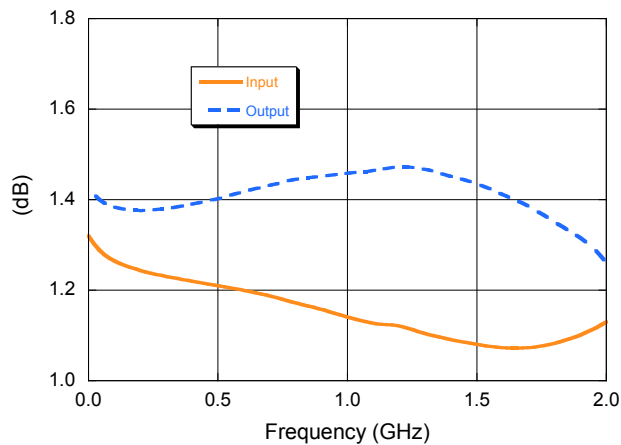
**Maximum VSWR, 1 dB Bit**



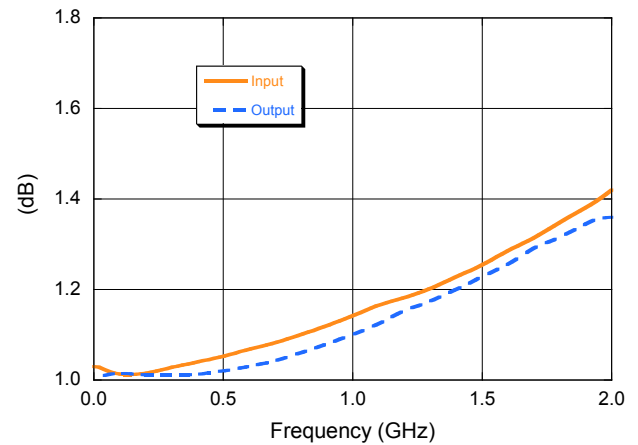
**Maximum VSWR, 2 dB Bit**



**Maximum VSWR, 4 dB Bit**

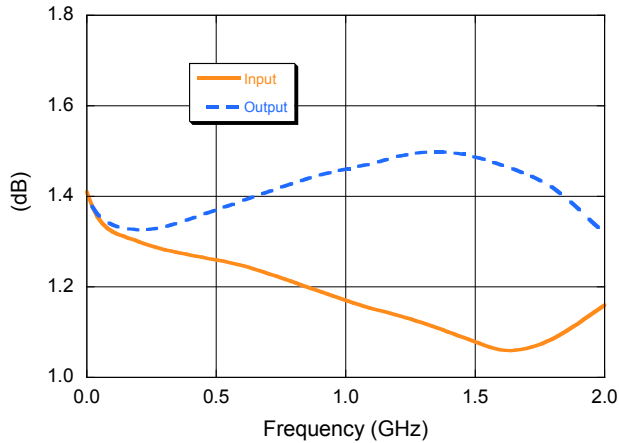


**Maximum VSWR, 8 dB Bit**

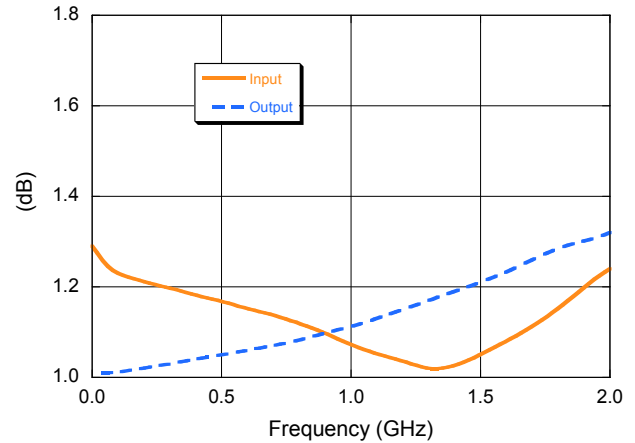


## Typical Performance Curves

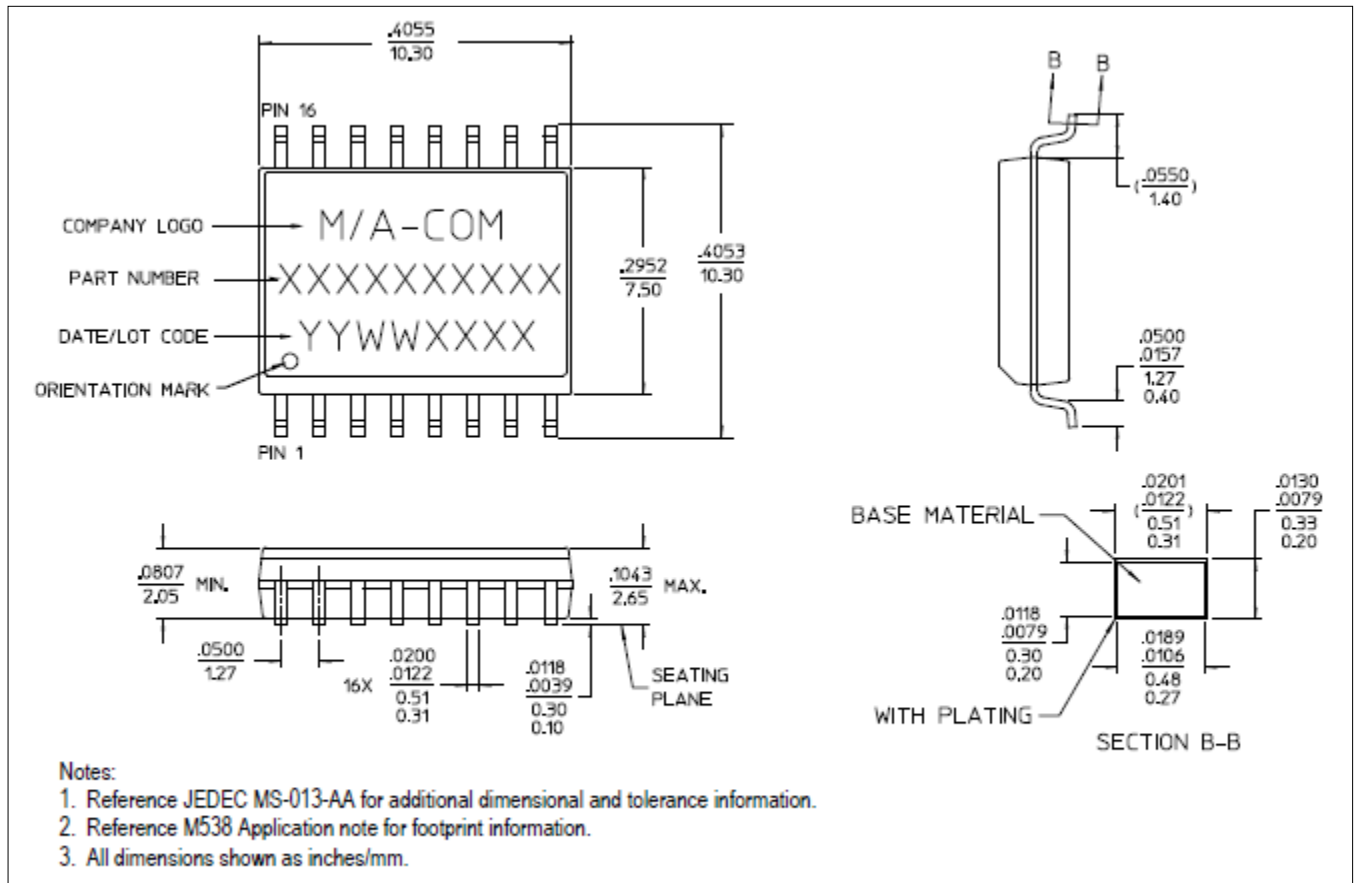
Maximum VSWR, 16 dB Bit



Maximum VSWR, 31 dB Bit



## Lead-Free, SOW-16<sup>†</sup>



6 <sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.

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