

## Features

- +41 dBm Saturated Output Power
- Linear Gain: 18 dB
- Power Added Efficiency: 30% at  $P_{SAT}$
- 50  $\Omega$  Input / Output Match
- Ceramic Flange Mount Package
- RoHS\* Compliant and 260°C Re-flow Compatible

## Description

The MAAP-010169 is a two stage MMIC power amplifier designed for broadband high power applications. It can be used as either a driver or an output stage amplifier. This device is fully matched input and output to 50  $\Omega$  which eliminates any sensitive external RF tuning components.

The device is packaged in a lead free 10-lead flanged package for high volume manufacturing.

The MAAP-010169 is fabricated using a high reliability pHEMT process, to realize good power added efficiency and gain. The pHEMT process features full passivation for high performance and reliability.

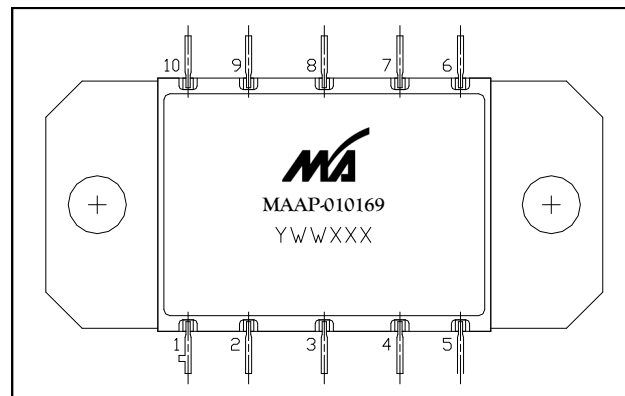
## Ordering Information<sup>1</sup>

Part Number	Package
MAAP-010169-000000	Bulk

1. Reference Application Note M567 for package handling and mounting procedure.

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

## Functional Schematic



## Pin Configuration<sup>2</sup>

Pin No.	Function
1	$V_{GG2}$
2	$V_{GG1}$
3	RF Input
4	$V_{GG1}$
5	$V_{GG2}$
6	$V_{DD1}$
7	$V_{DD2}$
8	RF Output
9	$V_{DD2}$
10	$V_{DD1}$

2. Flange is DC and RF ground.

## 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.

## 10 W Power Amplifier 2 - 6 GHz

V1

**Electrical Specifications: Freq. = 2 - 6 GHz,  $V_{DD} = 10$  V,  $I_{DQ} = 3.5$  A,  $T_A = +25$  °C,  $Z_0 = 50$   $\Omega$**

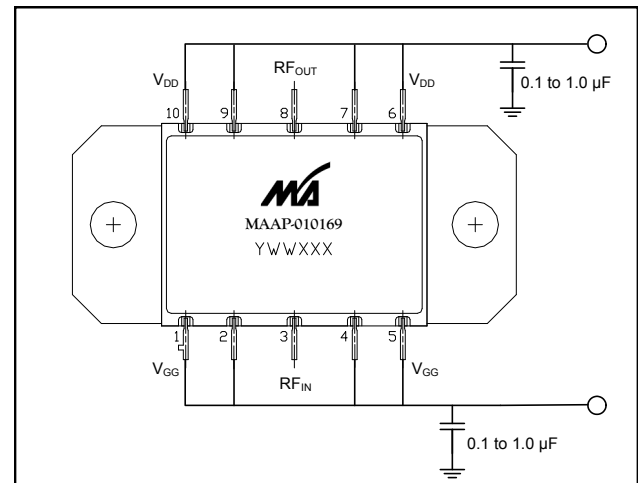
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	—	dB	14	18	—
Input Return Loss	—	dB	—	8	—
Output Return Loss	—	dB	—	10	—
P1dB	—	dBm	—	38	—
$P_{SAT}$	—	dBm	—	40	—
PAE	$P_{SAT}$	%	—	30	—
Duty Cycle	—	%	—	—	100
Gate Bias	Voltage	V	—	-0.56	—
Current	$I_{DQ}$ $P_{SAT}$	A	—	3.5 5.5	—

### Absolute Maximum Ratings <sup>3,4,5</sup>

Parameter	Absolute Maximum
Input Power	+26 dBm
Operating Supply Voltage	+11 Volts
Operating Gate Voltage	-2 V < $V_{GG} < 0$ V
Operating Temperature <sup>6</sup>	-40°C to +25°C
Channel Temperature <sup>7</sup>	+150 °C
Storage Temperature	-65°C to +150°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with  $T_J \leq +150$ °C will ensure MTTF >  $1 \times 10^6$  hours.
- Operating temperatures >25°C will require regulation of dissipated power to maintain  $T_J \leq 150$ °C. Refer to the Max. Power Dissipation vs. Base Plate Temperature curve on page 6.
- Junction Temperature ( $T_J$ ) =  $T_C + \Theta_{JC} * ((V * I) - (P_{OUT} - P_{IN}))$   
Typical thermal resistance ( $\Theta_{JC}$ ) = 2.8°C/W  
a) For  $T_C = 25$ °C, 4 GHz  
 $T_J = +130$ °C @ +10 V, 5.3 A,  $P_{OUT} = 42$  dBm,  $P_{IN} = 24$  dBm

### Recommended Bias Configuration



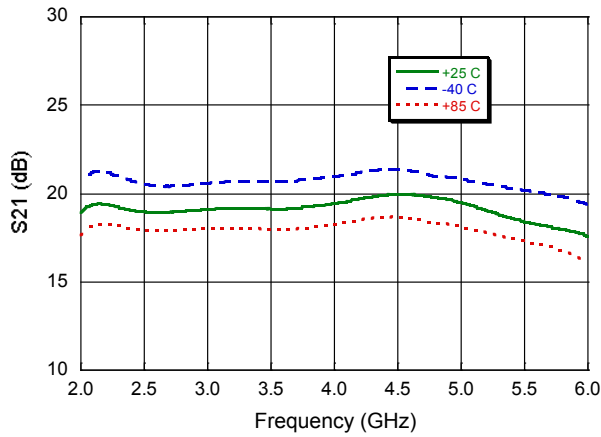
### Operating the MAAP-010169

The MAAP-010169 is static sensitive. Please handle with care. To operate the device, follow these steps. Ramp down or shutdown in reverse order (gate bias on first and off last). All  $V_{GG}$  pins should have the same voltage applied at all times.

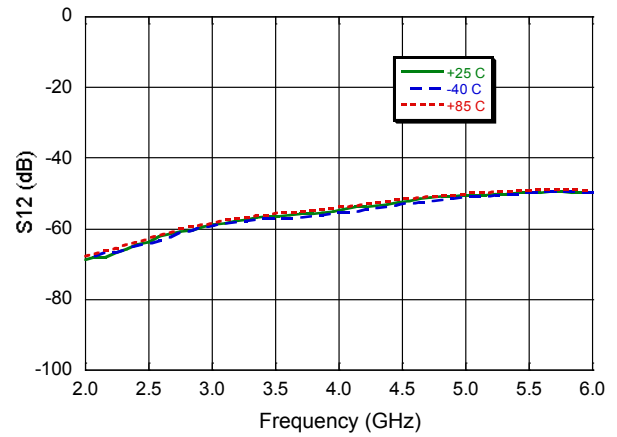
- Apply  $V_{GG}$  (-1.5 V).
- Apply  $V_{DD}$  (10 V Typical).
- Set  $I_{DQ}$  by adjusting  $V_{GG}$ .
- Apply  $RF_{IN}$ .

## Typical Performance Curves

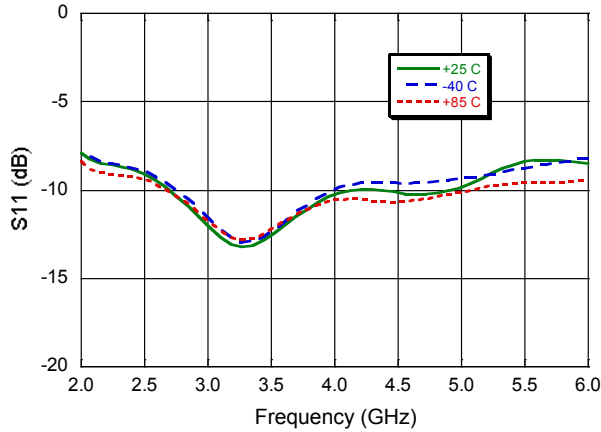
**Gain**



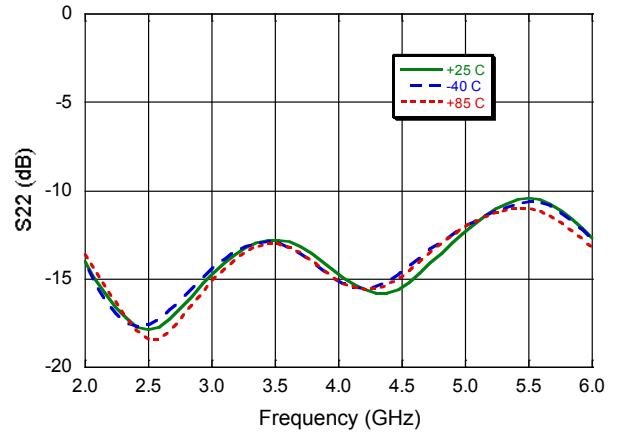
**Reverse Isolation**



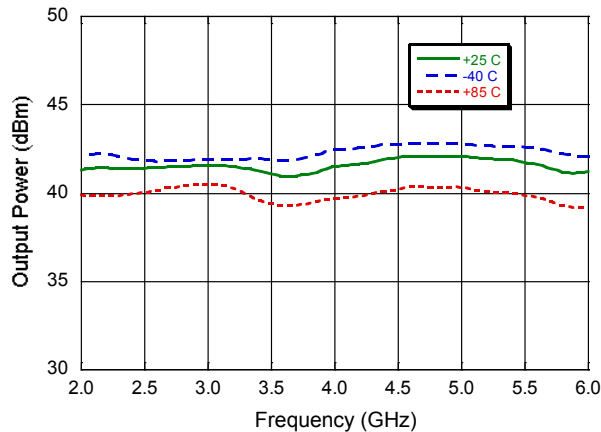
**Input Return Loss**



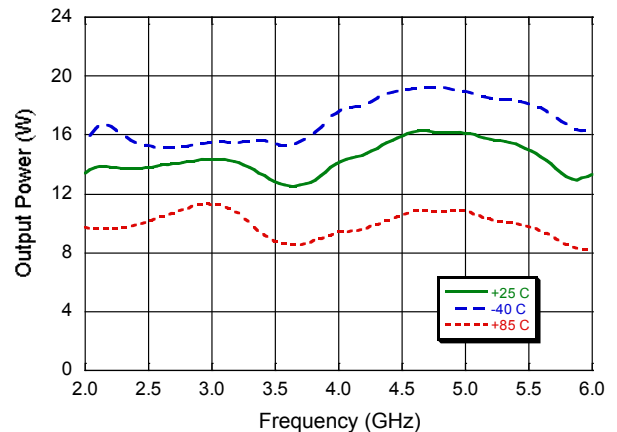
**Output Return Loss**



**Output Power (dBm)**

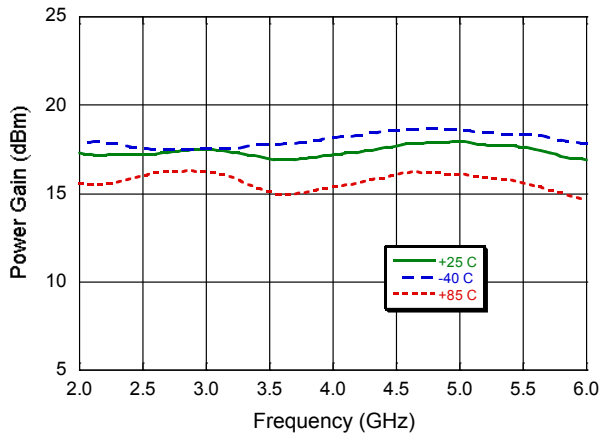


**Output Power (W)**

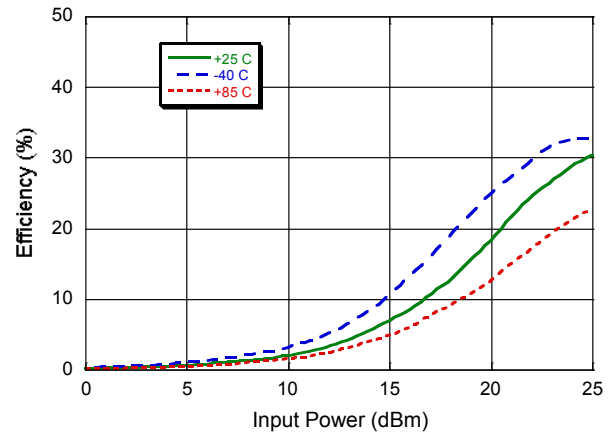


## Typical Performance Curves

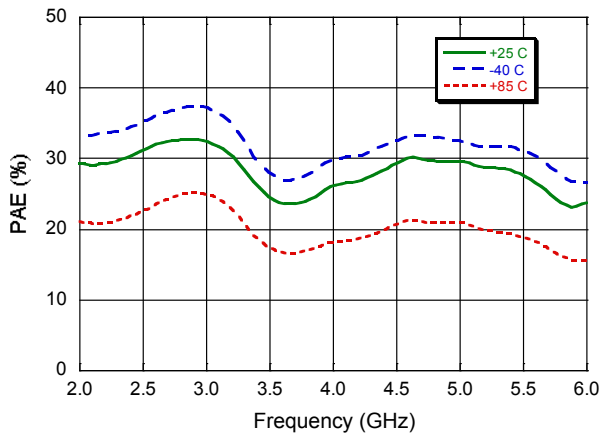
**Power Gain**



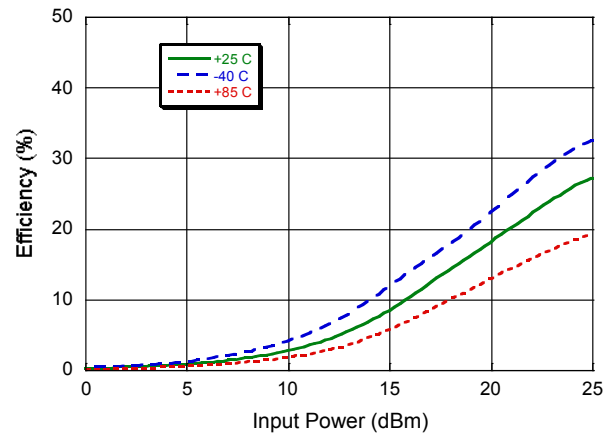
**Efficiency @ 2 GHz**



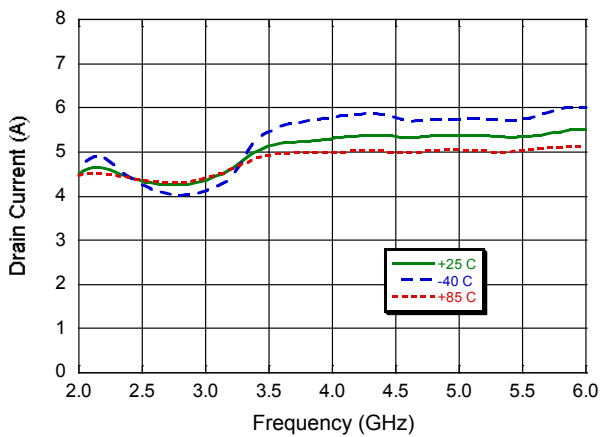
**Power Added Efficiency**



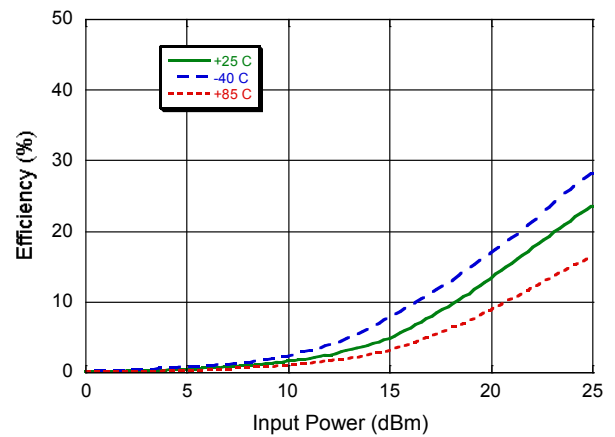
**Efficiency @ 4 GHz**



**Drain Current**

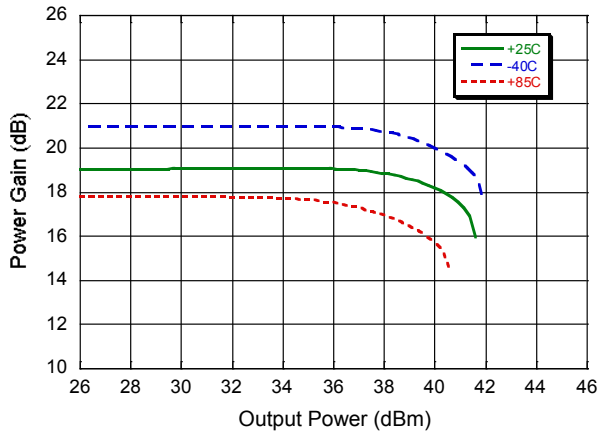


**Efficiency @ 6 GHz**

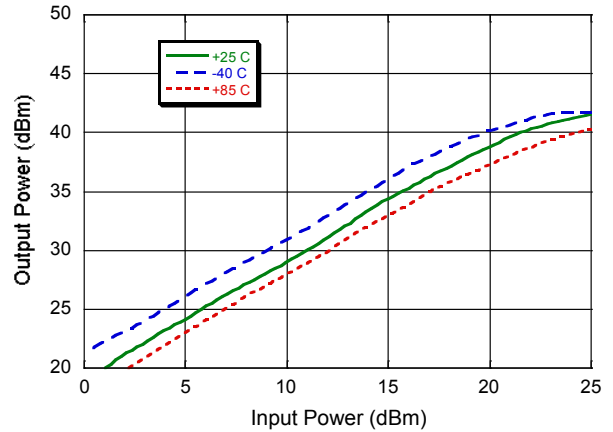


## Typical Performance Curves

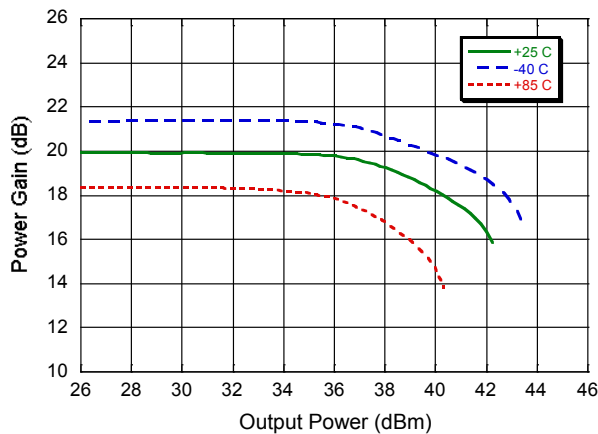
**Power Gain @ 2 GHz**



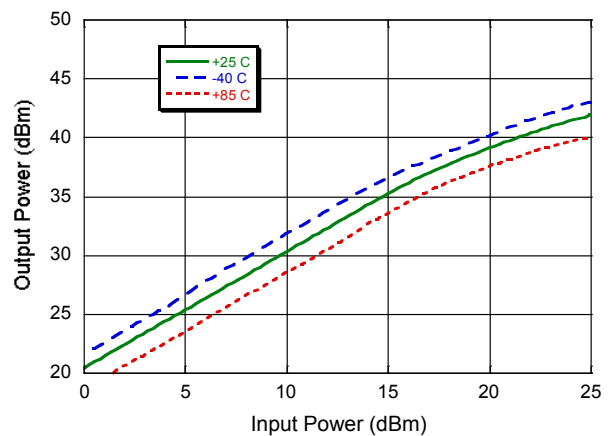
**Output Power Sweep @ 2 GHz**



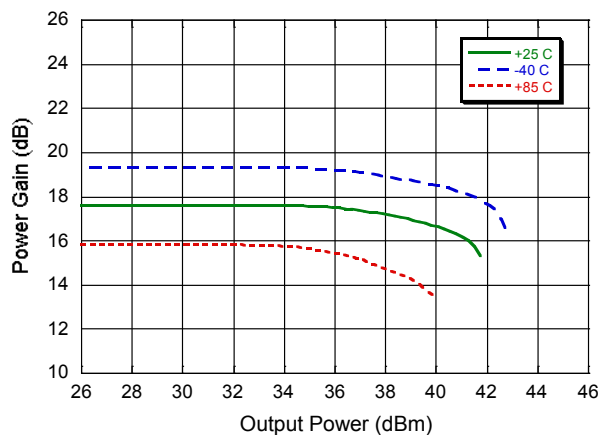
**Power Gain @ 4 GHz**



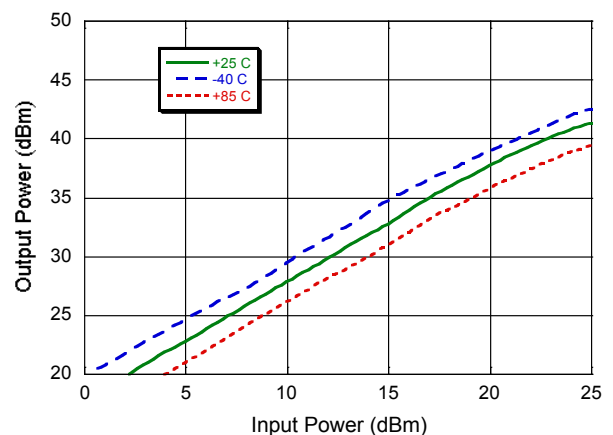
**Output Power Sweep @ 4 GHz**



**Power Gain @ 6 GHz**

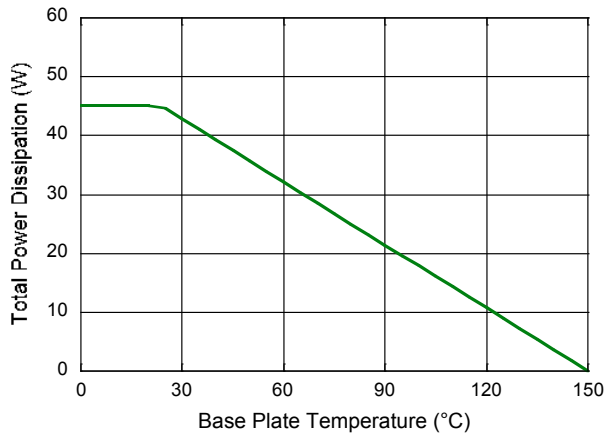


**Output Power Sweep @ 6 GHz**

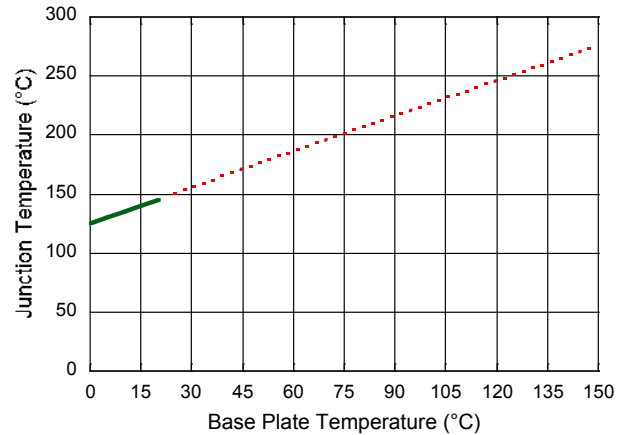


## Typical Performance Curves

**Max. Power Dissipation vs. Base Plate Temperature<sup>8</sup>**

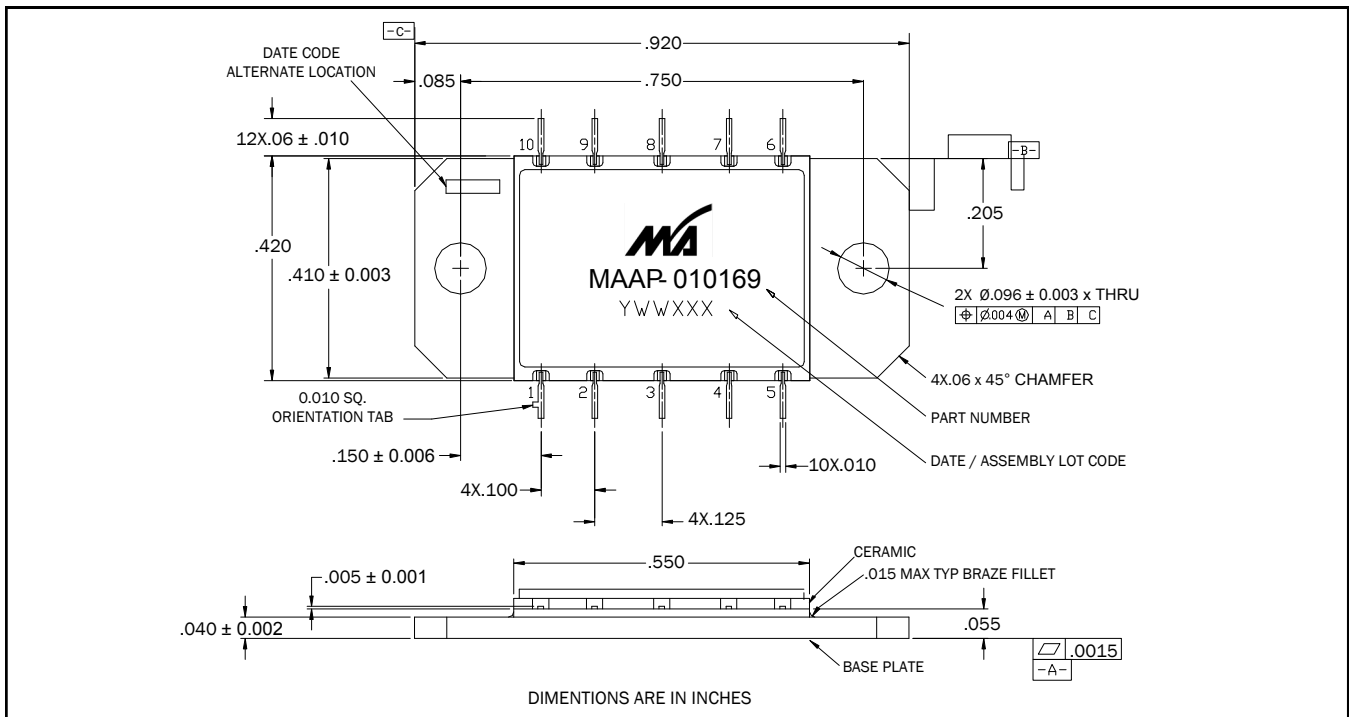


**Junction Temperature vs. Base Plate Temperature with 45 W Power Dissipation**



8. Power dissipation should not exceed the maximum plot shown above to maintain  $T_J < 150^\circ\text{C}$ . It is recommended to monitor power dissipation and decrease power dissipation in the device as required.

## Ceramic Flange Mount Package<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations. This is a high frequency, low thermal resistance package. The package consists of a cofired ceramic construction with a copper-tungsten base and iron-nickel-cobalt leads. The finish consists of electrolytic gold over nickel plate.

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