

Features

- +41 dBm Saturated Output Power
- Linear Gain: 18 dB
- Power Added Efficiency: 30% at P_{SAT}
- 50 Ω 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 Ω 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.

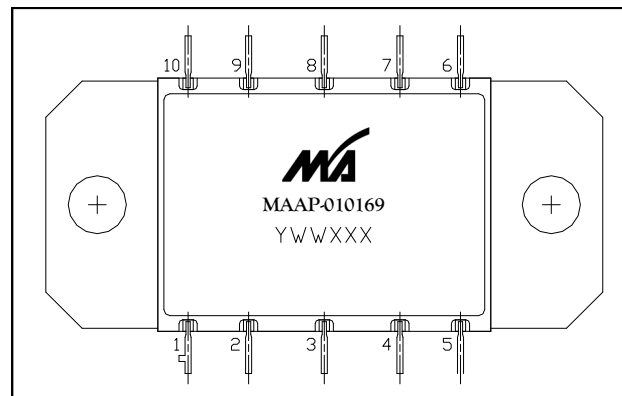
Ordering Information¹

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 Configuration²

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, $V_{DD} = 10\text{ V}$, $I_{DQ} = 3.5\text{ A}$, $T_A = +25\text{ }^{\circ}\text{C}$, $Z_0 = 50\text{ }\Omega$

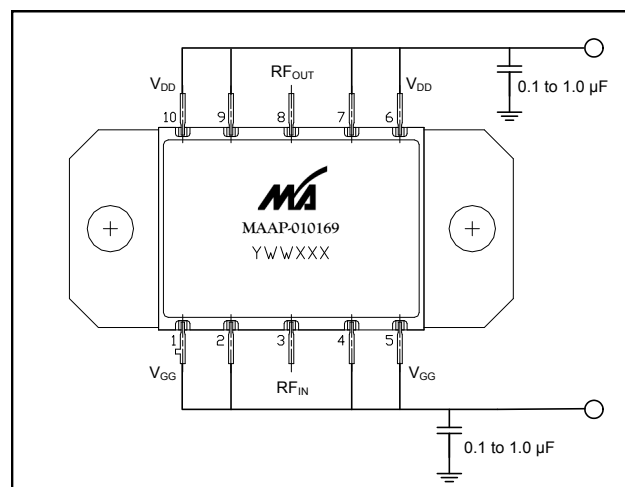
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	—	dB	14	18	—
Input Return Loss	—	dB	—	8	—
Output Return Loss	—	dB	—	10	—
P1dB	—	dBm	—	38	—
P_{SAT}	—	dBm	—	40	—
PAE	P_{SAT}	%	—	30	—
Duty Cycle	—	%	—	—	100
Gate Bias	Voltage	V	—	-0.56	—
Current	I_{DQ} P_{SAT}	A	—	3.5 5.5	—

Absolute Maximum Ratings^{3,4,5}

Parameter	Absolute Maximum
Input Power	+26 dBm
Operating Supply Voltage	+11 Volts
Operating Gate Voltage	-2 V < $V_{GG} < 0\text{ V}$
Operating Temperature ⁶	-40°C to +25°C
Channel Temperature ⁷	+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 $T_J \leq +150^{\circ}\text{C}$ will ensure $MTTF > 1 \times 10^6$ hours.
- Operating temperatures $>25^{\circ}\text{C}$ will require regulation of dissipated power to maintain $T_J \leq 150^{\circ}\text{C}$. 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 (Θ_{JC}) = 2.8°C/W
a) For $T_C = 25^{\circ}\text{C}$, 4 GHz
 $T_J = +130^{\circ}\text{C}$ @ +10 V, 5.3 A, $P_{OUT} = 42\text{ dBm}$, $P_{IN} = 24\text{ dBm}$

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.

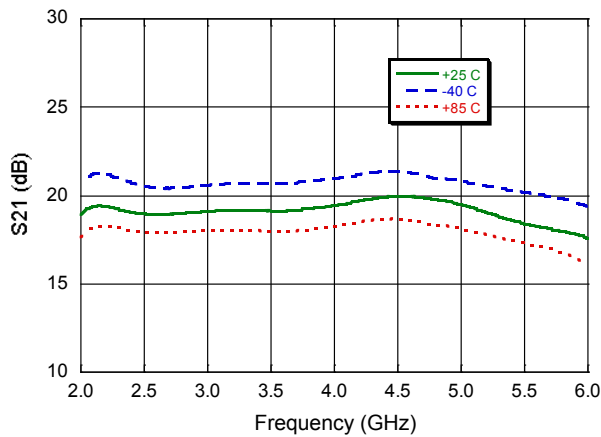
- Apply V_{GG} (-1.5 V).
- Apply V_{DD} (10 V Typical).
- Set I_{DQ} by adjusting V_{GG} .
- Apply RF_{IN} .

10 W Power Amplifier 2 - 6 GHz

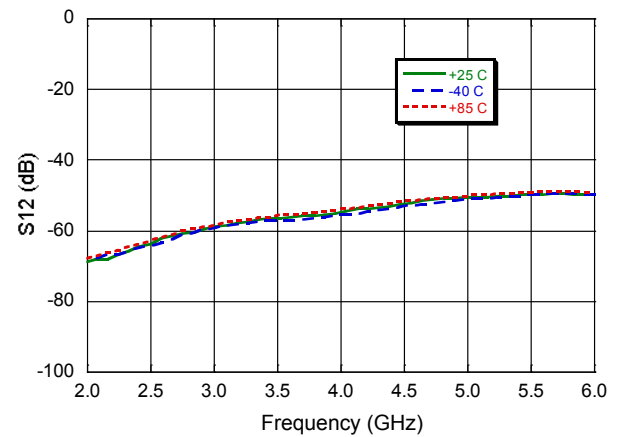
V1

Typical Performance Curves

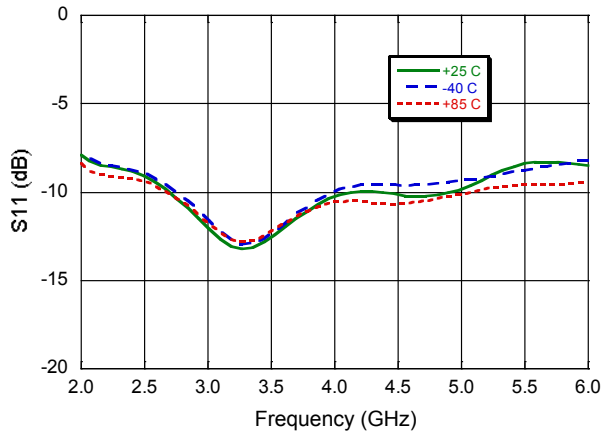
Gain



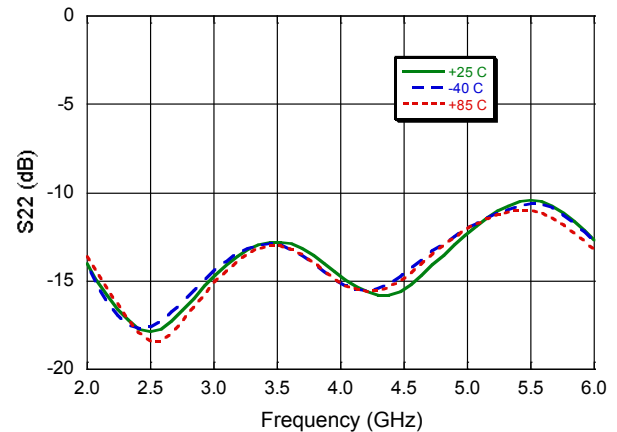
Reverse Isolation



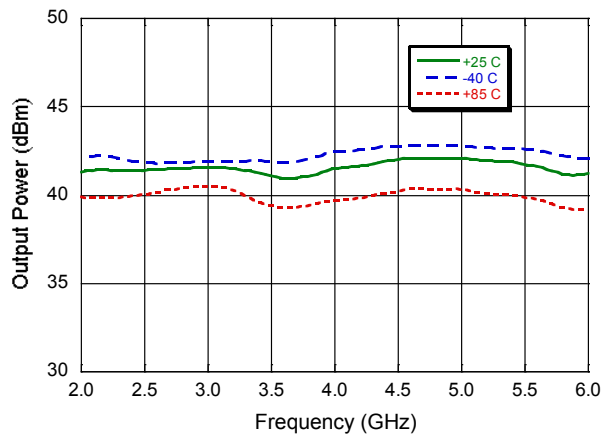
Input Return Loss



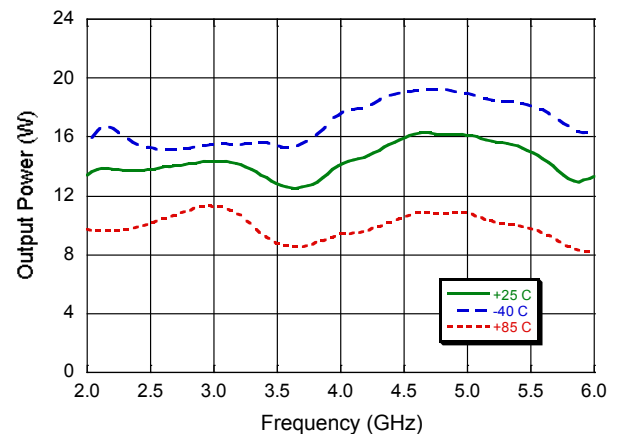
Output Return Loss



Output Power (dBm)



Output Power (W)

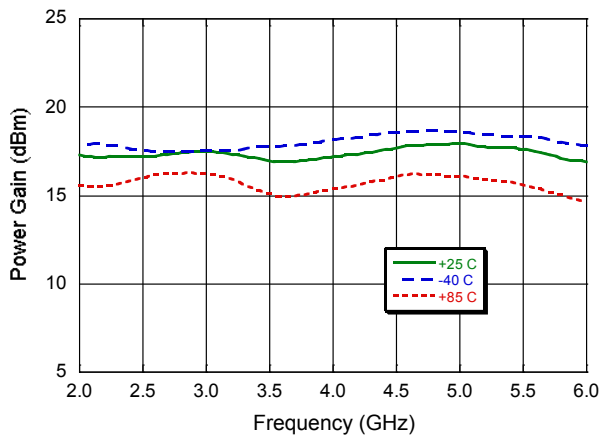


10 W Power Amplifier 2 - 6 GHz

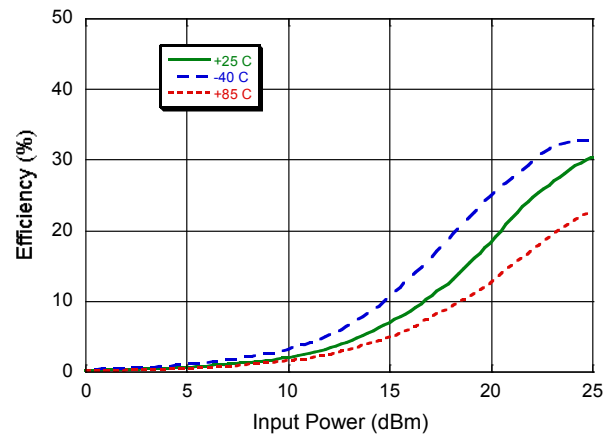
V1

Typical Performance Curves

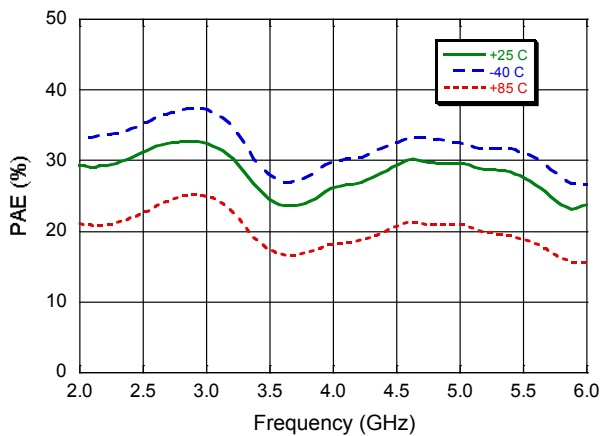
Power Gain



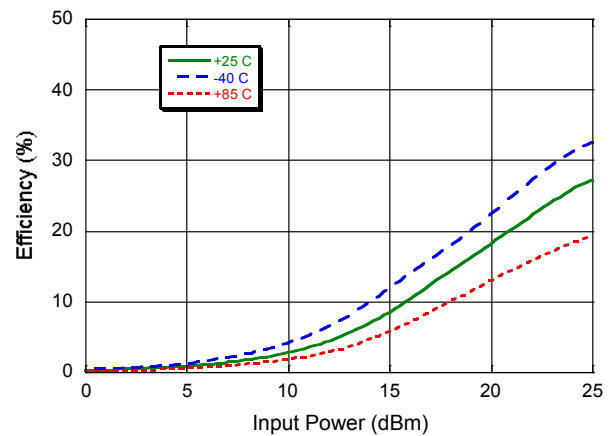
Efficiency @ 2 GHz



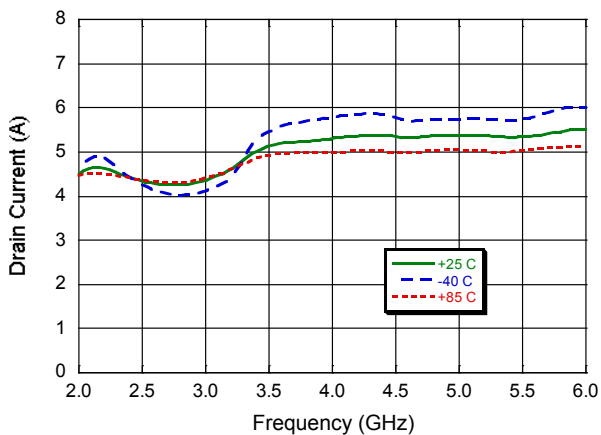
Power Added Efficiency



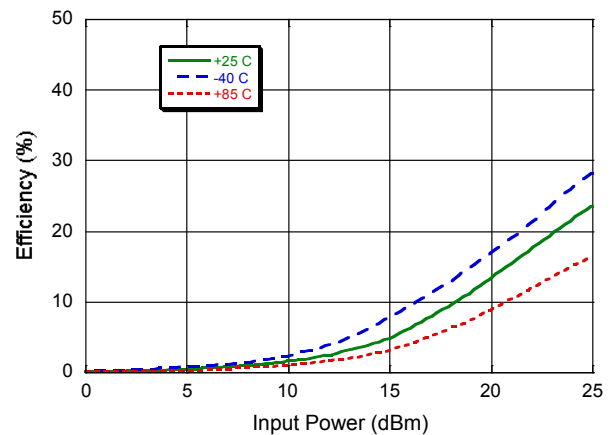
Efficiency @ 4 GHz



Drain Current



Efficiency @ 6 GHz

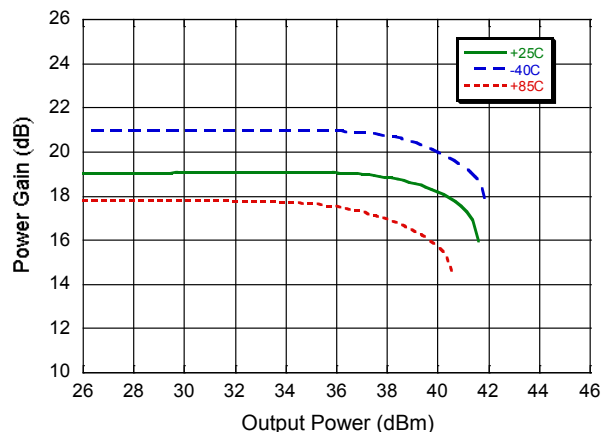


10 W Power Amplifier 2 - 6 GHz

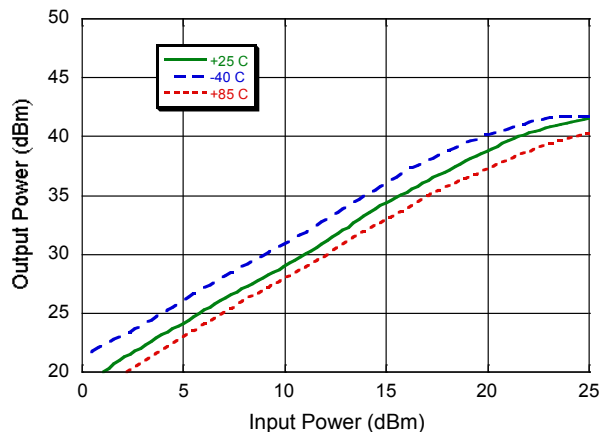
V1

Typical Performance Curves

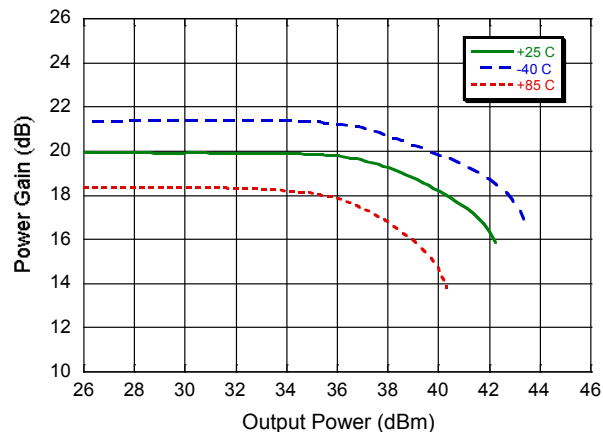
Power Gain @ 2 GHz



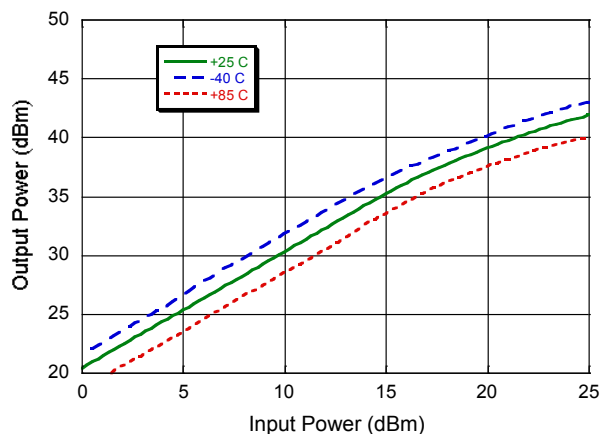
Output Power Sweep @ 2 GHz



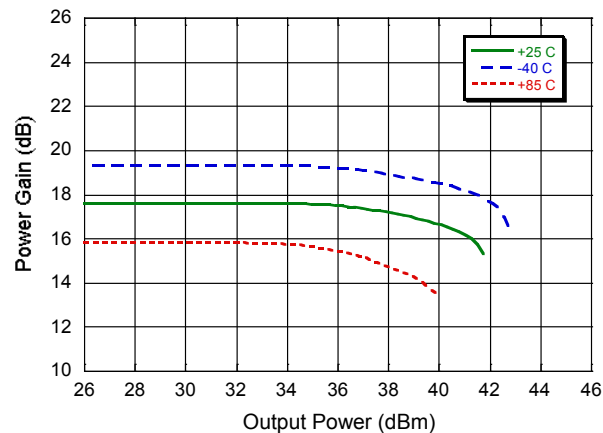
Power Gain @ 4 GHz



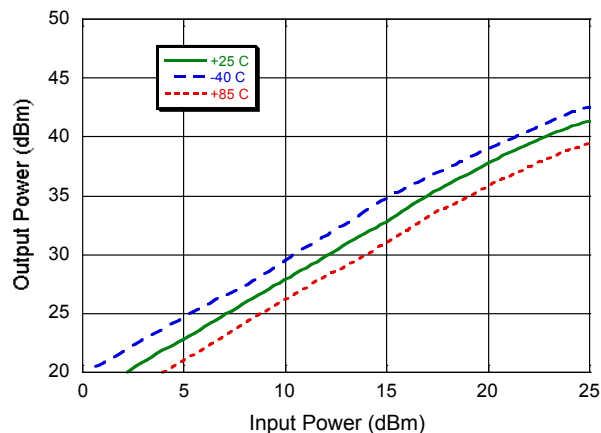
Output Power Sweep @ 4 GHz



Power Gain @ 6 GHz

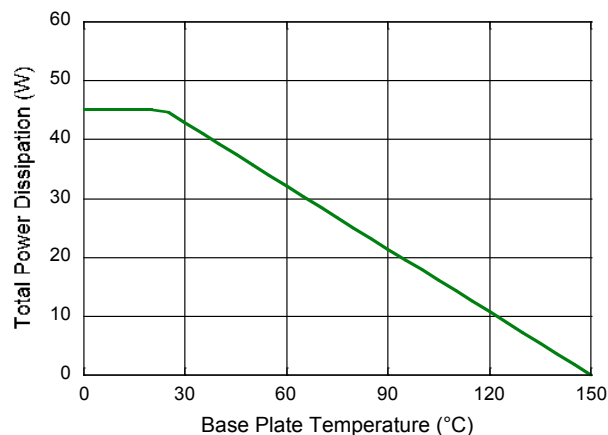


Output Power Sweep @ 6 GHz

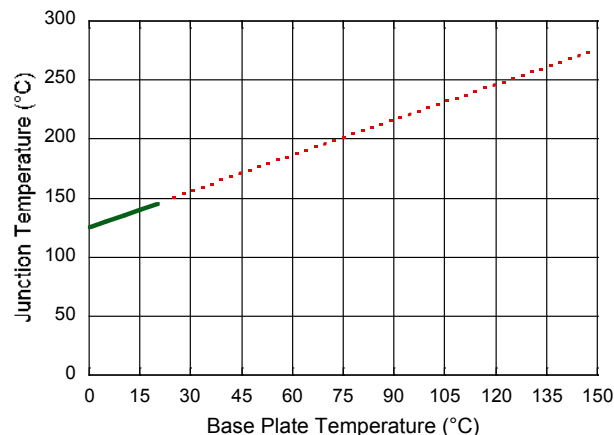


Typical Performance Curves

Max. Power Dissipation vs. Base Plate Temperature⁸

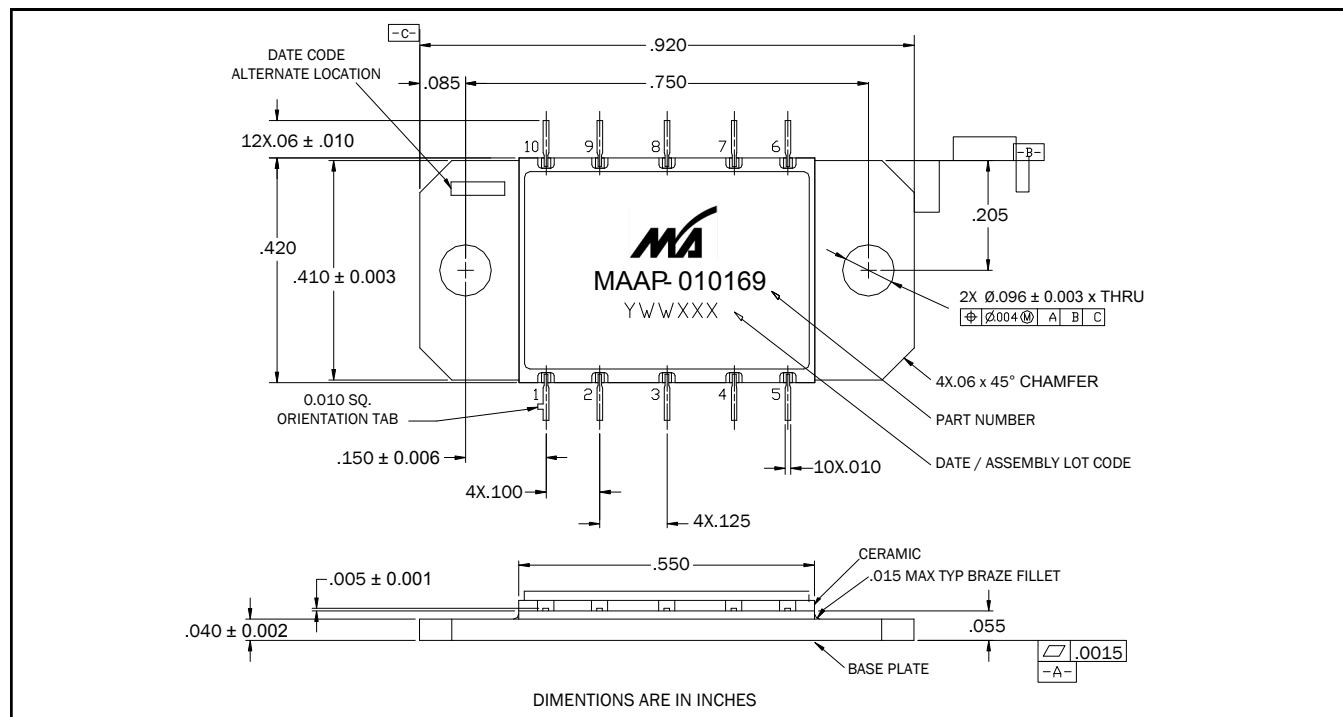


Junction Temperature vs. Base Plate Temperature with 45 W Power Dissipation



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[†]



[†] 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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