MAAP-010169

10 W Power Amplifier
2 - 6 GHz

V1

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.

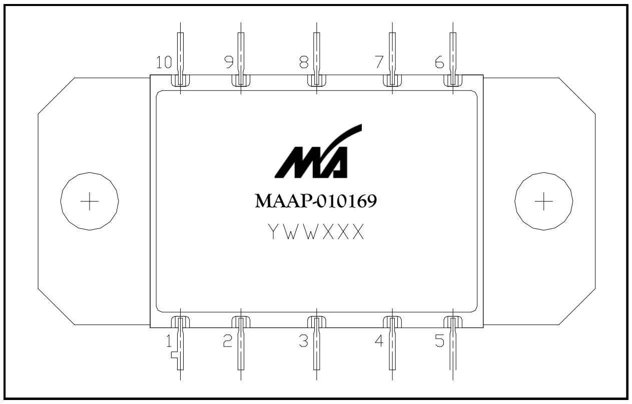
Ordering Information[1]

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[2]

Pin No.	Function
1	$V_{GG}2$
2	$V_{GG}1$
3	RF Input
4	$V_{GG}1$
5	$V_{GG}2$
6	$V_{DD}1$
7	$V_{DD}2$
8	RF Output
9	$V_{DD}2$
10	$V_{DD}1$

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.

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

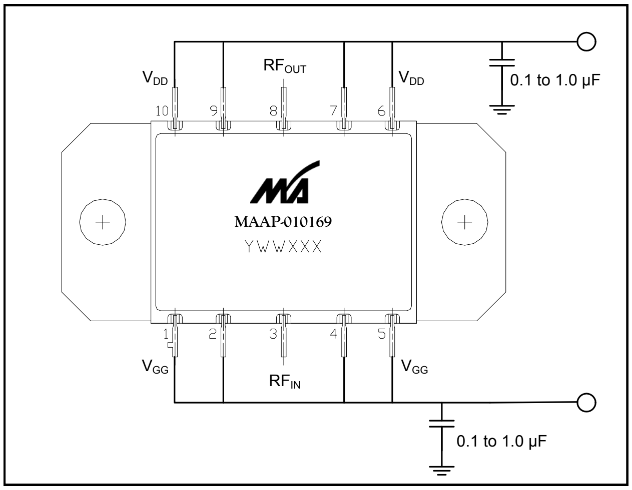
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	—	dB	14	18	—
Input Return Loss	—	dB	—	8	—
Output Return Loss	—	dB	—	10	—
P1dB	—	dBm	—	38	—
P_{SAT}	—	dBm	—	40	—
PAE	P_{SAT}	%	—	30	—
Duty Cycle	—	%	—	—	100
Gate Bias	Voltage	V	—	-0.56	—
Current	I_{DQ} P_{SAT}	A	—	3.5 5.5	—

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 V
Operating Temperature[6]	-40°C to +25°C
Channel Temperature[7]	+150 °C
Storage Temperature	-65°C to +150°C

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



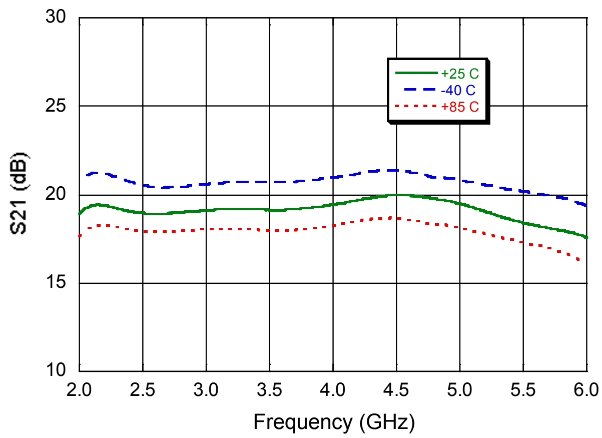
Operating the MAAP-010169

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.

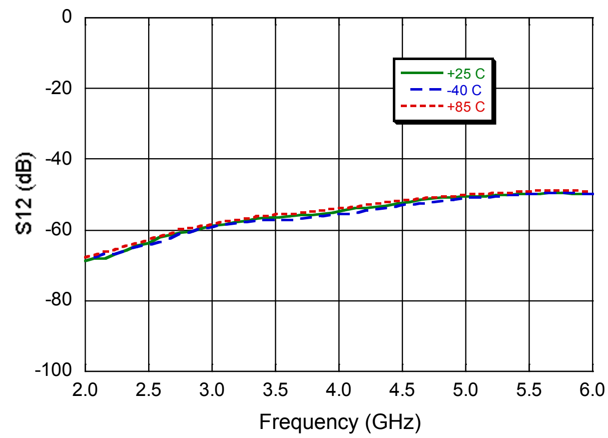
1. Apply V_{GG} (-1.5 V).
2. Apply V_{DD} (10 V Typical).
3. Set I_{DQ} by adjusting V_{GG}.
4. Apply RF_{IN}.

Typical Performance Curves

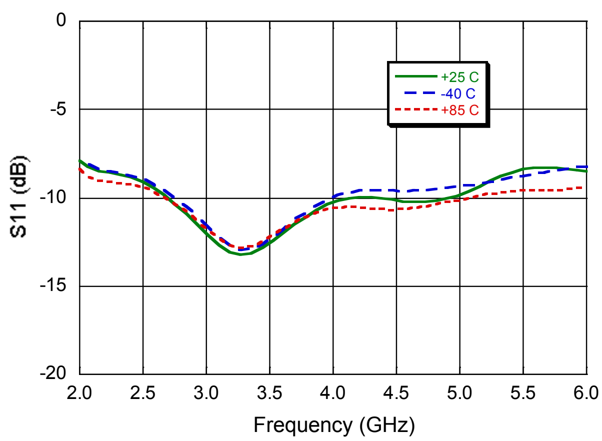
Gain



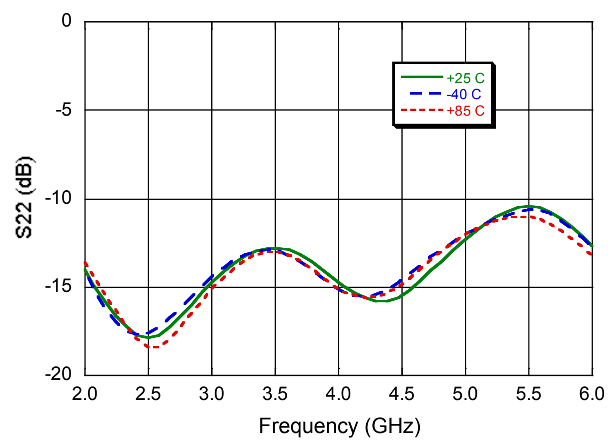
Reverse Isolation



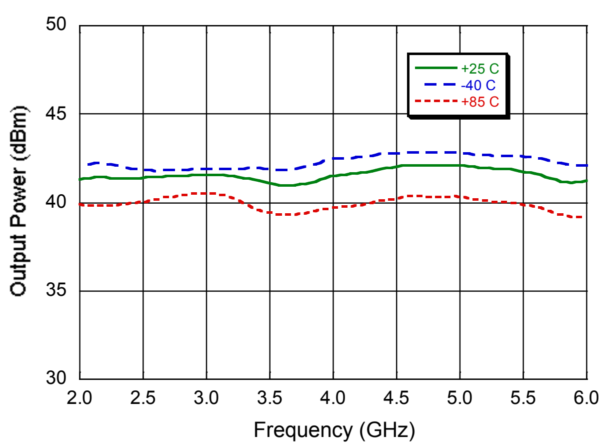
Input Return Loss



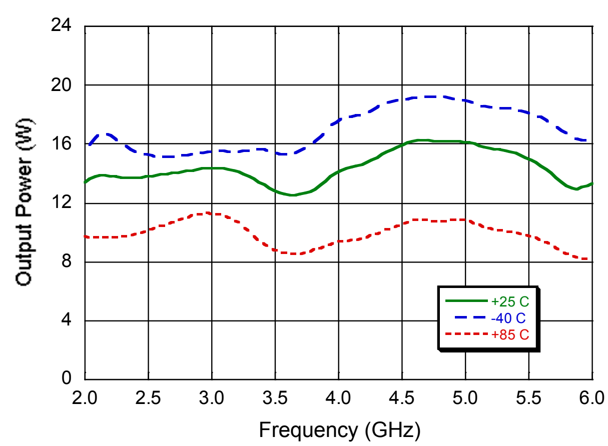
Output Return Loss



Output Power (dBm)

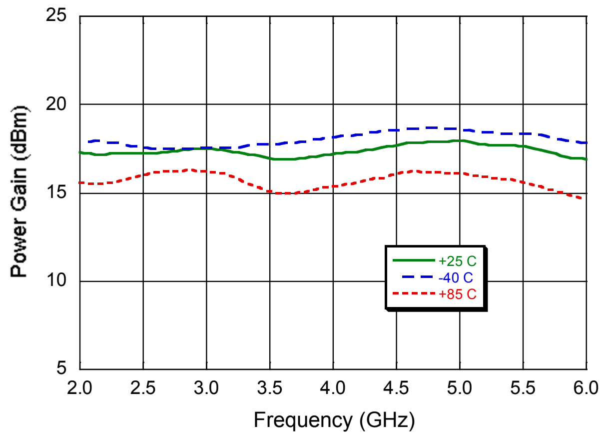


Output Power (W)

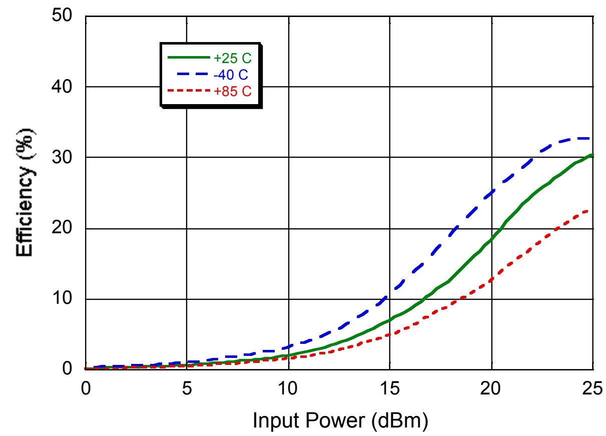


Typical Performance Curves

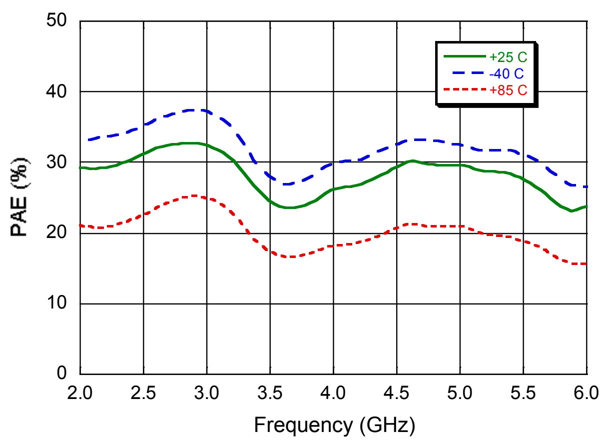
Power Gain



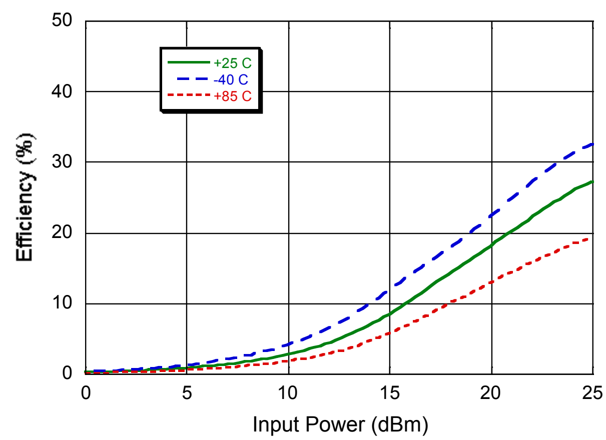
Efficiency @ 2 GHz



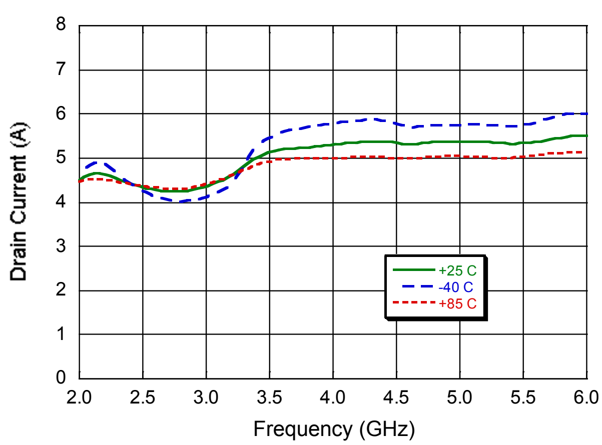
Power Added Efficiency



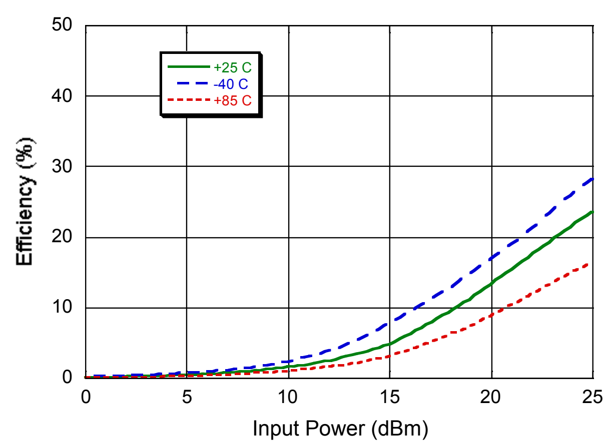
Efficiency @ 4 GHz



Drain Current



Efficiency @ 6 GHz



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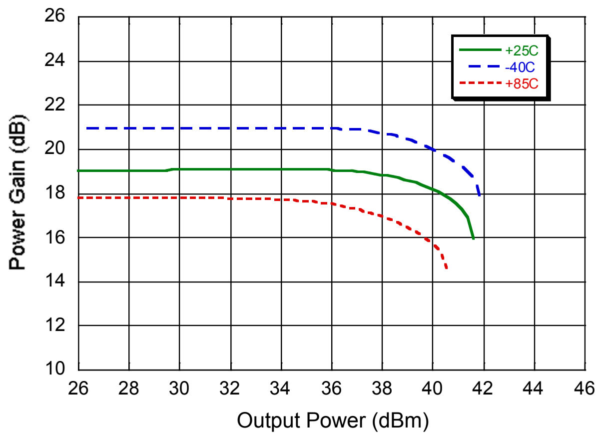
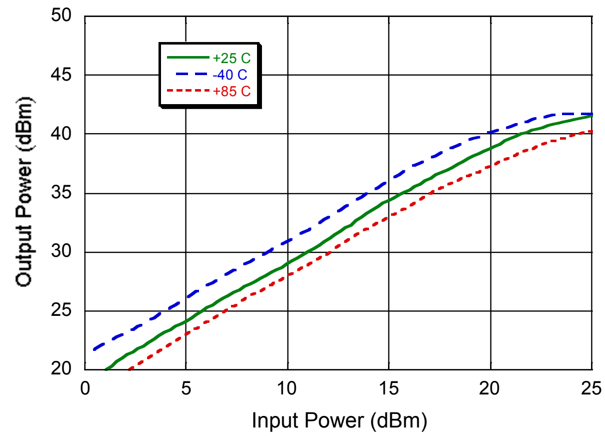
Typical Performance Curves

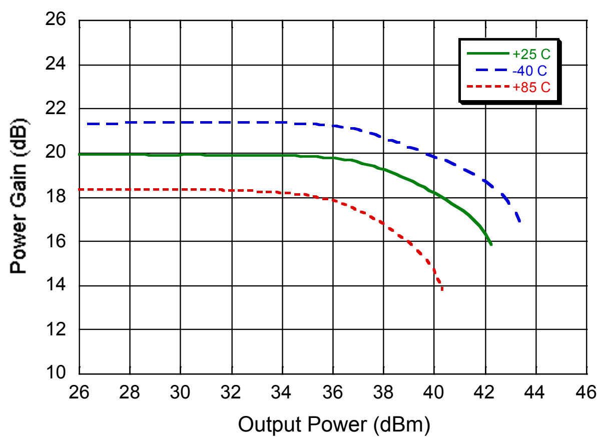
Power Gain @ 2 GHz



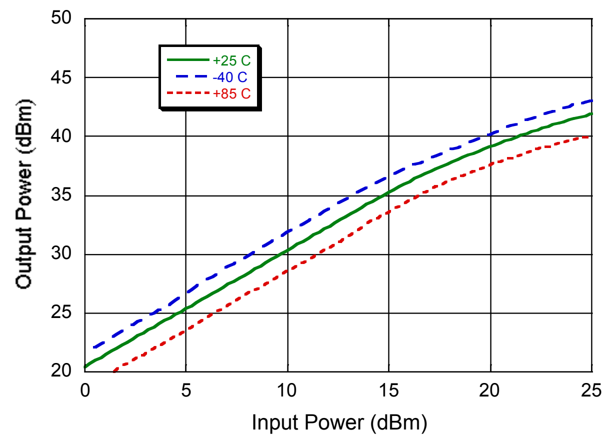
Output Power Sweep @ 2 GHz



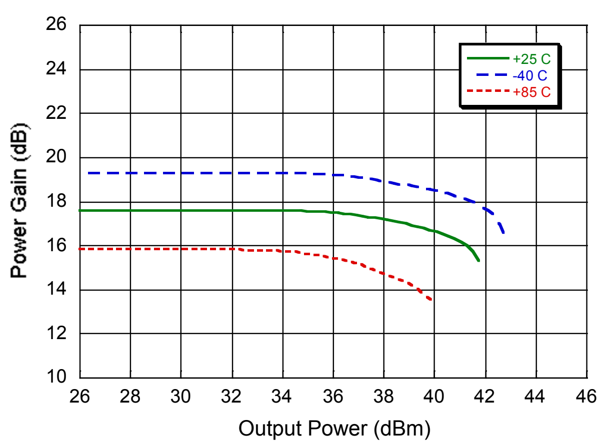
Power Gain @ 4 GHz



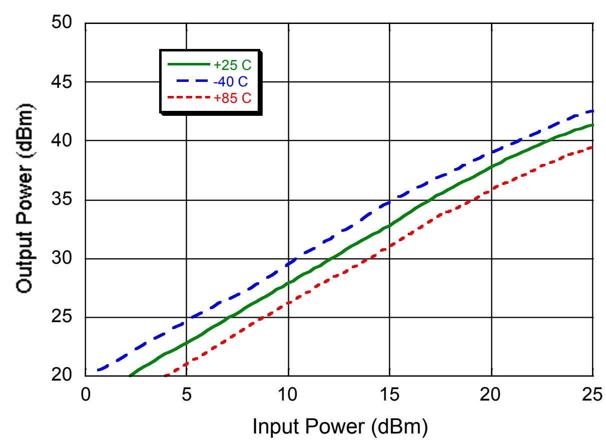
Output Power Sweep @ 4 GHz



Power Gain @ 6 GHz



Output Power Sweep @ 6 GHz



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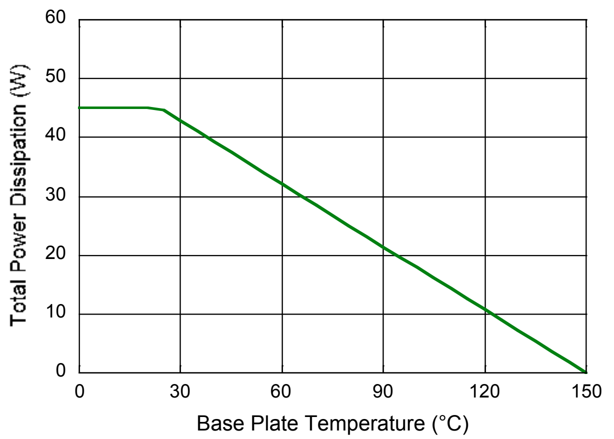
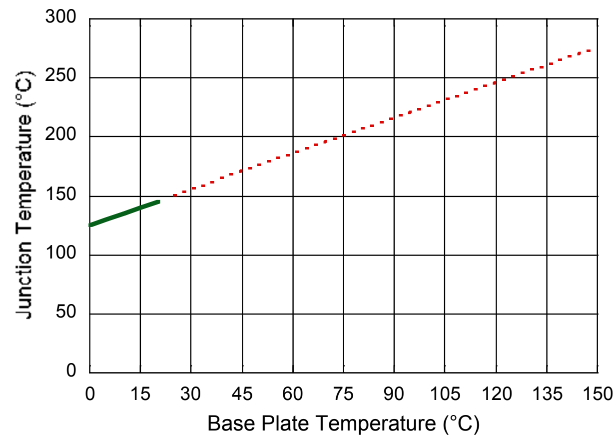
Typical Performance Curves

Max. Power Dissipation vs. Base Plate Temperature[8]

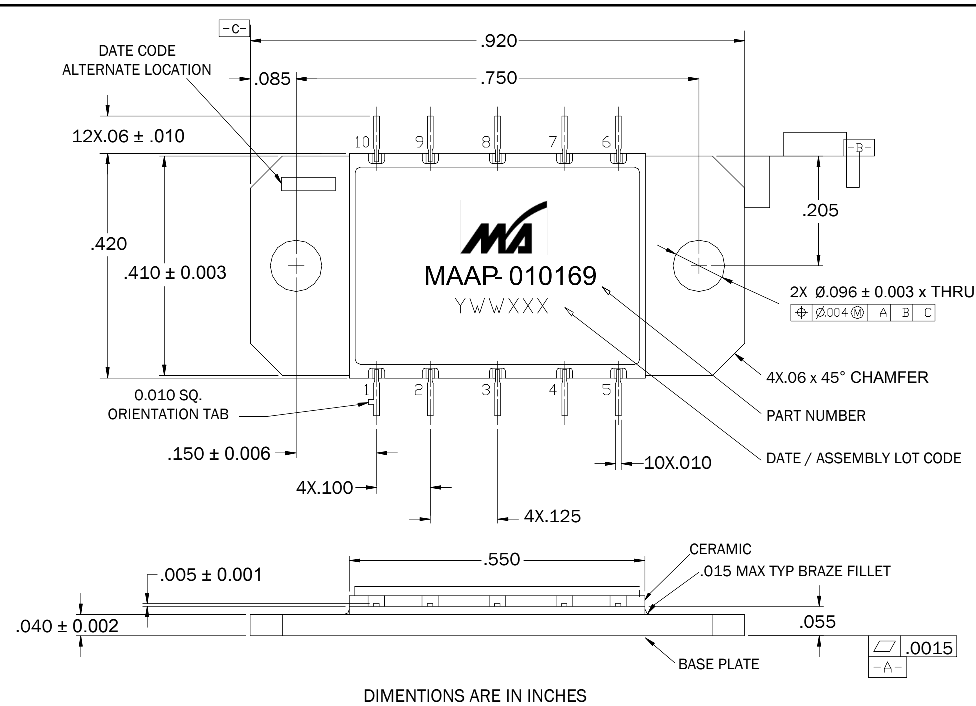


8. Power dissipation should not exceed the maximum plot shown above to maintain T_J <150°C. It is recommended to monitor power dissipation and decrease power dissipation in the device as required.

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



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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