# MA4M Series

## MNS Microwave Chip Capacitors

M/A-COM Products
Rev. V4

### Features

- Excellent Repeatability
  ( Wafer-to-Wafer and Lot-to-Lot)
- Small Size
- Low Loss, High Q
- Available with Round or Square Bond Pads

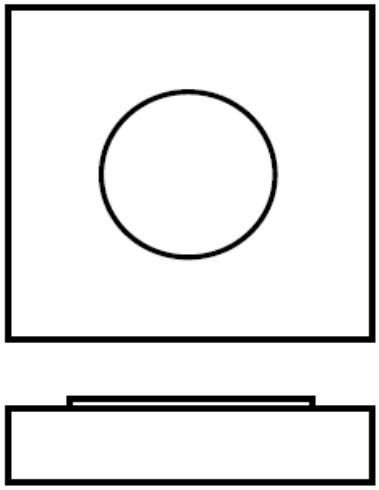
### Description and Applications

The 4M series of MNS (metal-nitride-silicon) chip capacitors is designed specifically for high reliability and repeatable performance in microwave circuit applications. These capacitors are made using a low pressure chemical vapor deposition (LPCVD) that results in dense, uniform nitride layers. These devices exhibit higher capacitance per unit area (resulting in smaller chip size) and improved ruggedness over similar MOS, MIS and ceramic capacitors. Evaporated gold contacts are used to provide an easily bondable metal pad on the capacitor chip. M/A-Com MNS capacitors have shown no measurable capacitance change when subjected to the rated standoff voltage at 150 Degrees C.

The MA4M series of chip capacitors is an excellent choice for use in hybrid microwave circuits up through Ku-band, where low loss, high reliability, small size and temperature stability are prime concerns.

These chip capacitors are suited for applications requiring DC blocks, coupling capacitors, bypass capacitors, capacitive loads and tuning elements in oscillators, multipliers and filters.

### Case Style



350

### Comparison of M/A-COM MNS Capacitors to Ceramic Chip Capacitors

| Characteristics Compared | MNS | Ceramic |
|---|---|---|
| Operating Temperature Range | -55 Deg C. to + 200 Deg. C. | -55 Deg C. to + 200 Deg. C. |
| Temperature Coefficient | 180 PPM | 1000 PPM |
| Insertion Loss of a 20 pf Capacitor in a 50 Ohm Line @ 15 GHz | .1 dB | .2 dB |
| Chip Size<br>200 pF, 100V<br>20 pF, 100V | <br>40 x 40 mils<br>22 x 22 mils | <br>70 x 70 mils<br>50 x 50 mils |





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Visit www.macomtech.com for additional data sheets and product information.

## .Specifications

### Chip Capacitors with Round Bonding Pads

| Model Number | Capacitance (pF) | Maximum Standoff Voltage Rating ( Volts ) | Chip Style | Nominal Top Contact Diameter ( mils ) |
|---|---|---|---|---|
| MA4M2020 | 20 | 200 | 132 | 13 |
| MA4M1050 | 50 | 100 | 132 | 11 |
| MA4M1100 | 100 | 100 | 199 | 20 |

### Chip Capacitors with Square Bonding Pads

| Model Number | Capacitance (pF) | Maximum Standoff Voltage Rating ( Volts ) | Chip Style |
|---|---|---|---|
| MA4M3010 | 10 | 200 | 350 |
| MA4M3030 | 30 | 200 | 352 |
| MA4M3050 | 50 | 200 | 354 |
| MA4M3100 | 100 | 50 | 358 |
| MA4M3150 | 150 | 50 | 359 |

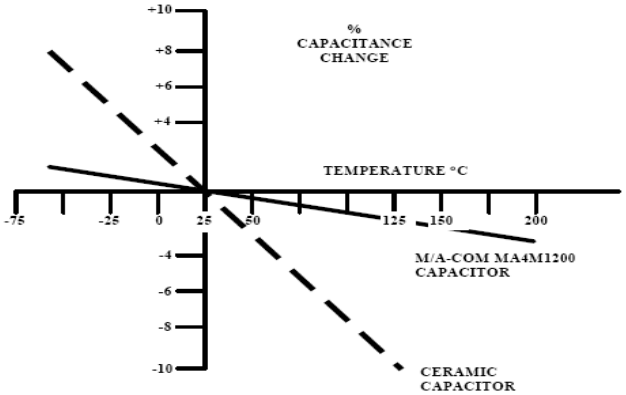
### Notes :

1. **Capacitance is measured @ 1 MHz.**
2. **Temperature coefficient of capacitance is nominally 180 PPM/Degrees C.**
4. **Device failure may occur is standoff voltage rating is exceeded.**
5. **Other capacitance and standoff voltage values are available on request.**

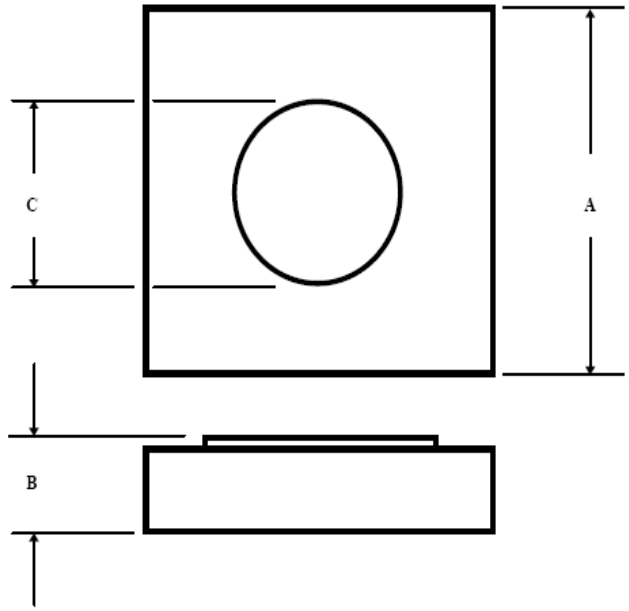
### Maximum Ratings

| | |
|---|---|
| Applied Voltage | Specified standoff voltage |
| Operating Temperature | -55 Deg.C to + 200 Deg. C |
| Storage Temperature | -55 Deg.C to + 200 Deg. C |

**TYPICAL CAPACITANCE CHANGE FOR MNS and CERAMIC CAPACITOR vs TEMPERATURE (200 pF CAPACITOR)**

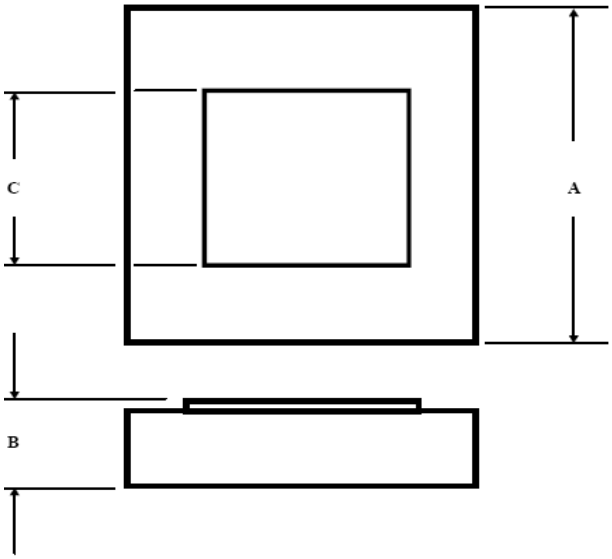


## Case Style




| Chip Style | DIM. | INCHES | | MILLIMETERS | |
|---|---|---|---|---|---|
| | | MIN. | MAX. | MIN. | MAX. |
| 132 | A | 0.020 | 0.024 | 0.51 | 0.61 |
| | B | 0.003 | 0.008 | 0.08 | 0.203 |
| 199 | A | 0.027 | 0.031 | 0.69 | 0.79 |
| | B | 0.004 | 0.008 | 0.10 | 0.203 |
| 200 | A | 0.037 | 0.041 | 0.94 | 1.04 |
| | B | 0.004 | 0.008 | 0.10 | 0.203 |
| 201 | A | 0.047 | 0.051 | 1.19 | 1.30 |
| | B | 0.004 | 0.008 | 0.10 | 0.203 |
| 263 | A | — | 0.060 | — | 1.52 |
| | B | 0.004 | 0.008 | 0.10 | 0.203 |

Note:
For "C" dimension on above case styles, see specifications.




| Chip Style | DIM. | INCHES | | MILLIMETERS | |
|---|---|---|---|---|---|
| | | MIN. | MAX. | MIN. | MAX. |
| 350 | A | 0.018 | 0.021 | 0.46 | 0.53 |
| | B | — | 0.008 | — | 0.203 |
| | C | — | 0.009 | — | 0.23 |
| 351 | A | 0.018 | 0.021 | 0.46 | 0.53 |
| | B | — | 0.008 | — | 0.203 |
| | C | — | 0.012 | — | 0.30 |
| 352 | A | 0.018 | 0.021 | 0.46 | 0.53 |
| | B | — | 0.008 | — | 0.203 |
| | C | — | 0.015 | — | 0.38 |
| 354 | A | 0.020 | 0.023 | 0.51 | 0.58 |
| | B | — | 0.008 | — | 0.203 |
| | C | — | 0.018 | — | 0.46 |
| 358 | A | 0.018 | 0.021 | 0.46 | 0.53 |
| | B | — | 0.008 | — | 0.203 |
| | C | — | 0.013 | — | 0.33 |
| 359 | A | 0.018 | 0.021 | 0.46 | 0.53 |
| | B | — | 0.008 | — | 0.203 |
| | C | — | 0.016 | — | 0.41 |

# Bonding and Handling Considerations for MNS Chip Capacitors

## Handling

Normal precautions that are common to the handling of hybrid semiconductors also apply to MNS chip capacitors. Removal of chips from waffle packs and subsequent handling should be done with a vacuum pencil. Pencils equipped with either metallic or nonmetallic tips are acceptable.

## Surface Preparation

Each MNS chip and substrate should be free of oils and other surface contamination. Such contaminants may result in poor solder wetting. Cleansing can be done with acetone, alcohol, freon, TMS or other common microelectronic solvents. Burnishing of MNS capacitor chips is not necessary or recommended.

## Solder

Soldering temperatures up to 300°C are acceptable for a duration not greater than 5 seconds for MNS chip capacitors. Any of the common tin-lead-silver, lead-indium, or higher temperature gold alloy solders are acceptable provided that the 300°C temperature is not exceeded. Pure tin or tin-antimony solders are not recommended. Cleaning of residual flux is required and can be accomplished with a fluorinated or chlorinated solvent.

## Conductive Epoxy

Any of the conductive epoxies that are available for semiconductor die attachment are acceptable for MNS chip capacitor attachment. Follow the manufacturer's recommendations for mixing and application carefully. Take care to seat the capacitor on the substrate using a soft implement.

## Lead Bonding

Ball, ultrasonic, TC or pulse bonding of the wire or ribbon leads are all acceptable methods. Temperature for the pulse bonder should not exceed 300°C. Maximum pressure applied to the MNS capacitor chips should not exceed 25 grams for any of the methods used. Proper procedure will result in bond strength that exceeds MIL-STD-883B Method 2011.2 for gold wire or gold ribbon.