

Packaged PIN Diodes

RoHS Compliant

Rev V.9

Features

- ◆ High Power
- ◆ Fast Speed
- ◆ Voltage Ratings to 1500 Volts
- ◆ Wide Selection of Carrier Lifetimes
- ◆ Wide Selection of Capacitances
- ◆ Assortment of Packages Styles
- ◆ Available Screened for Military Applications

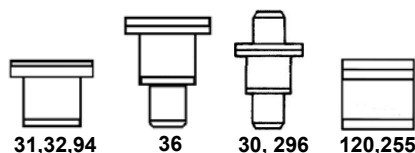
Description and Applications

M/A-COM's broad line of packaged PIN diodes encompasses a comprehensive range of electrical characteristics and package outlines. This diverse union of semiconductor technology and chip packaging gives considerable flexibility to the circuit designer. The fast switching series of packaged PIN diodes utilize a thin I-region and silicon oxide or glass passivated chips which provide for low leakage currents and low insertion loss. Using in process control monitors to regulate wafer fabrication parameters these devices achieve consistent performance in control circuit applications. The high voltage product line of packaged PIN diodes employs M/A-COM's unique CERMACHIP[®] passivation process which provides for a hard glass encapsulation that hermetically seals the active area of the chip. These packaged CERMACHIP[®] PIN diodes are ideally suited for use in high power applications where high RF voltages are present. The diode chips are bonded into sealed ceramic packages that are designed for the most stringent electrical and environmental conditions. A wide choice of packages are available which can be mounted into a variety of microwave and RF circuit media. The Packaged PIN Diodes series are designed to have a high inherent reliability and may be ordered screened to meet many MIL-STD reliability levels.

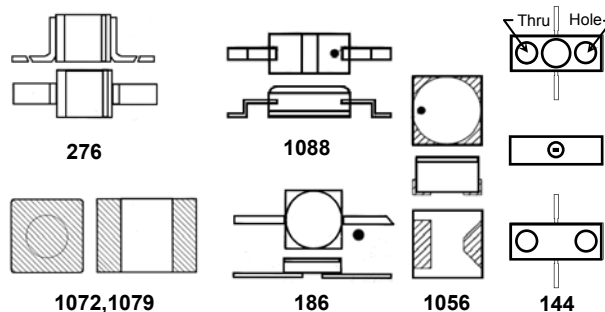
Maximum Power Dissipation

| | |
|---|---|
| <u>Cathode Heatsink Packages</u> 30,31,32,36,43,94,111,120, 150,255 258,296,1072,1079 | $P_{diss} = \frac{T(\text{max Operating}) - 25^{\circ}\text{C}}{\text{Thermal Resistance}}$ |
| <u>Leaded Packages @+25°C</u> 144, 186, 276,1088 | $P_{diss} = 250\text{mW}$ |
| <u>Surface Mount Package +25°C</u> 1056 | $P_{diss} = 300\text{mW}$ |

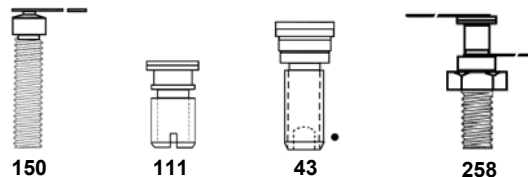
Co-Axial Packages



Leaded/Surface Mount Packages



Threaded Packages



Unpackaged Die



131,132,134 , 212

Absolute Maximum Ratings¹

| Parameter | Absolution Max. |
|---|-----------------------|
| Voltage | As Specified in Table |
| Operating Temperature | - 65°C to +175°C |
| Storage Temperature | - 65°C to +200°C |
| Operating and Storage (Case Style 1088) | - 65°C to +125°C |

1. Operation beyond any one of the above conditions may cause permanent damage to the device.

Specifications subject to change without prior notification.

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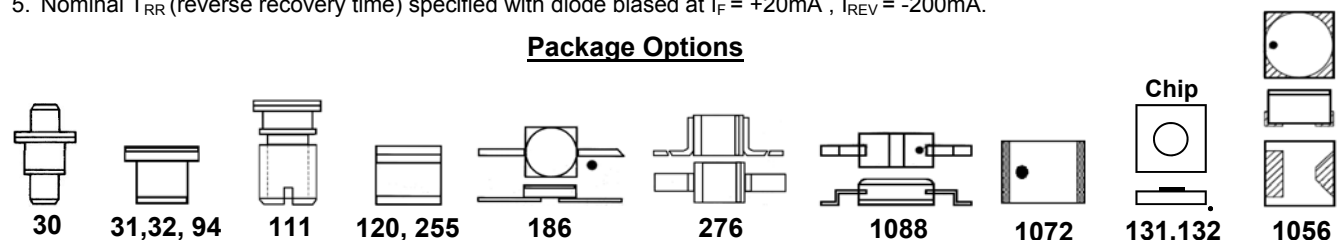
35V to 250V Fast Switching PIN Diodes Specifications ($T_{AMB} = +25^{\circ}C$)

| Part Number | Minimum Reverse Voltage ¹ | (Unless otherwise specified) Maximum Capacitance | (Unless otherwise specified) Maximum Series Res. | Maximum Thermal Resistance | Nominal Characteristics | | |
|-------------|--------------------------------------|--|--|----------------------------|-------------------------------|-----------------------|------------------------|
| | @ $I_R < 10\mu A$ | $C_T @ -10V$ $f = 1MHz$ pF | $R_S @ 10mA$ $f = 500MHz$ Ω | $^{\circ}C/W$ | Carrier Lifetime ⁴ | T_{RR} ⁵ | I-Region Width Microns |
| | Volts | | | | nS | nS | μM |
| MA4P202-120 | 100 | 0.25 | 2.50 | 60 | 60 | 5 | 12 |
| MA4P203-30 | 100 | 0.35 | 1.50 | 30 | 100 | 20 | 12 |
| MA4P303-32 | 200 | 0.35 | 1.50 | 30 | 200 | 60 | 20 |
| MA4P404-30 | 250 | 0.40 ² | 0.60 ³ | 20 | 1000 | 100 | 30 |

Notes:

- The minimum specified V_R (Reverse Voltage) is sourced and the resultant reverse leakage current, I_R , is measured to be $<10\mu A$
- At $V_R = -50V$
- R_S measured at $I_F = +50mA$, $f = 100MHz$.
- Nominal carrier life time specified with diode biased at $I_F = +10mA$, $I_{REV} = -6mA$
- Nominal T_{RR} (reverse recovery time) specified with diode biased at $I_F = +20mA$, $I_{REV} = -200mA$.

Package Options



Package dimensions can be found on the M/A-COM website at <http://www.macom.com/TechApps/OutlineDrawings.asp>

35V to 500V MELF General Purpose Switching Diodes Specifications ($T_{AMB} = +25^{\circ}C$)

| Part Number ¹ | Minimum Reverse Voltage ² | Maximum Capacitance | (Unless otherwise specified) Maximum Series Res. | CW Power Dissipation Rating | Nominal Characteristics | | |
|--------------------------|--------------------------------------|---------------------------------|--|-----------------------------|--|-------------------------------|----------------|
| | $I_R < 10\mu A$ | $C_T @ 10V$ $f = 1MHz$ pF | $R_S @ 10mA$ $f = 100MHz$ Ω | Watts | Typical I_F When $R_S = 75\Omega$ mA | Carrier Lifetime ³ | I-Region Width |
| | Volts | | | | | μS | mils |
| MA4PH235-1072T | 35 | 1.2 | 0.5 | 1.0 | — | 0.3 | 0.4 |
| MA4PH236-1072T | 200 | 0.5 | 3.0 | 1.0 | — | 1.5 | 2.0 |
| MA4PH237-1079T | 200 | 1.5 | 0.6@50mA | 2.0 | — | 3.0 | 3.0 |
| MA4PH238-1072T | 200 | 0.5 | 6.0 | 1.0 | 0.30-0.60 | 2.0 | 4.0 |
| MA4PH239-1079T | 200 | 0.8 | 25.0 | 2.0 | 1.20-2.40 | 6.0 | 14.0 |
| MADP-000234-10720T | 500 | 1.5 ⁴ | 0.25@100mA | 5.0 | — | 3.0 | 2.0 |

Notes:

- Only available in case styles indicated.
- The minimum specified V_R (Reverse Voltage) is sourced and the resultant reverse leakage current, I_R , is measured to be $<10\mu A$.
- Nominal carrier life time specified with diode biased at $I_F = +10mA$, $I_{REV} = -6mA$
- Ct tested at 100V



Case Styles 1072, 1079

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500V PIN Diodes Specifications ($T_{AMB} = +25^{\circ}\text{C}$)

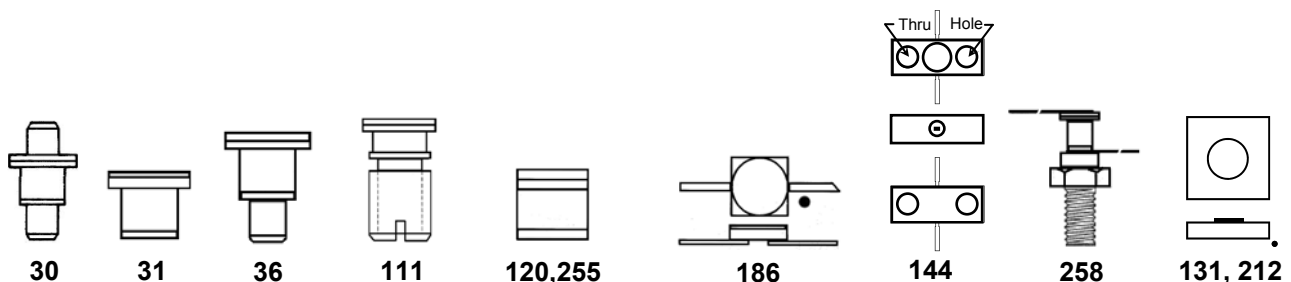
| Part Number | Minimum Reverse Voltage ¹ | Maximum Capacitance | Maximum Series Resistance | CW Power Dissipation Rating | Nominal Characteristics | |
|--------------------------------|--------------------------------------|---|--|-----------------------------|--|------------------------|
| | $I_R < 10\mu\text{A}$ Volts | $C_T @ 100\text{V}$ $f = 1\text{ MHz}$ pF | $R_S @ 100\text{mA}$ $f = 100\text{ MHz}$ Ω | Watts | Carrier Lifetime ² μS | I-Region Width mils |
| MA4P504-30 | 500 | 0.40 | 0.60 | 10 | 1.0 | 2 |
| MADP000015-000030 ³ | 500 | 0.55 | 0.45 | 15 | 2.0 | 2 |
| MA4P506-30 | 500 | 0.90 | 0.30 | 15 | 3.0 | 2 |

Notes:

1. The minimum specified V_R (Reverse Voltage) is sourced and the resultant reverse leakage current, I_R , is measured to be $<10\mu\text{A}$.
2. Nominal carrier life time specified with diode biased at $I_F = +10\text{mA}$, $I_{REV} = -6\text{mA}$
3. To order this part in a package other than 30, use the prefix MA4P505 followed by a dash and the desired package style.

Package Options

Consult the Package Availability Table in the "Ordering Information" section (pg. 7) for part number choices.



Package dimensions can be found on the M/A-COM website at <http://www.macomtech.com/TechApps/OutlineDrawings.asp>

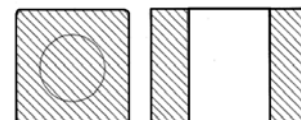
500V MELF PIN Diode Specifications ($T_{AMB} = +25^{\circ}\text{C}$)

| Part Number | Minimum Reverse Voltage ¹ | Maximum Capacitance | Maximum Series Resistance | CW Power Dissipation Rating | Nominal Characteristics | |
|---------------|--------------------------------------|---|--|-----------------------------|--|------------------------|
| | $I_R < 10\mu\text{A}$ Volts | $C_T @ 100\text{V}$ $f = 1\text{ MHz}$ pF | $R_S @ 100\text{mA}$ $f = 100\text{ MHz}$ Ω | Watts | Carrier Lifetime ² μS | I-Region Width mils |
| MA4P504-1072T | 500 | 0.5 | 0.60 | 10 | 1.0 | 2 |
| MA4P505-1072T | 500 | 0.65 | 0.45 | 15 | 2.0 | 2 |
| MA4P506-1072T | 500 | 1.0 | 0.30 | 15 | 3.0 | 2 |

Notes:

1. The minimum specified V_R (Reverse Voltage) is sourced and the resultant reverse leakage current, I_R , is measured to be $<10\mu\text{A}$.
2. Nominal carrier life time specified with diode biased at $I_F = +10\text{mA}$, $I_{REV} = -6\text{mA}$

1072 Package



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1000V CERMACHIP PIN Diodes Specification ($T_{AMB} = +25^{\circ}\text{C}$)

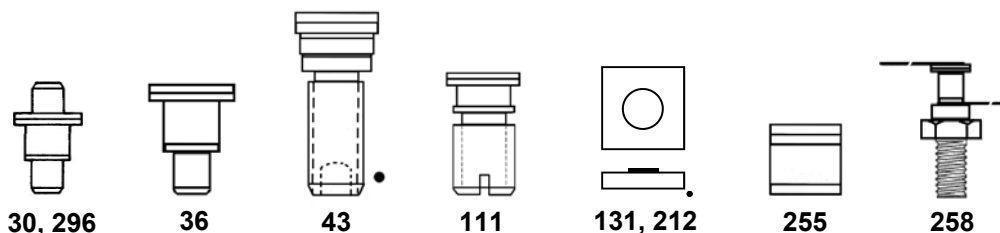
| Part Number | Minimum Reverse Voltage ¹ | Maximum Capacitance | Maximum Series Resistance | CW Power Dissipation Rating | Nominal Characteristics | |
|-------------|--------------------------------------|--|---|-----------------------------|--|------------------------|
| | $I_R < 10\mu\text{A}$ Volts | $C_T @ 100\text{V}$ $f = 1\text{MHz}$ pF | $R_s @ 100\text{mA}$ $f = 100\text{MHz}$ Ω | Watts | Carrier Lifetime ² μS | I-Region Width Mils |
| MA4P604-30 | 1000 | 0.50 | 1.00 | 15 | 3.0 | 4 |
| MA4P606-30 | 1000 | 0.80 | 0.70 | 20 | 4.0 | 4 |
| MA4P607-43 | 1000 | 2.00 | 0.40 | 25 | 5.0 | 4 |

Notes:

- The maximum specified V_R (reverse voltage) is sourced and the resultant reverse leakage current, I_r , is measured to be $< 10\mu\text{A}$
- Nominal carrier life time specified with diode biased at $I_F = +10\text{mA}$, $I_{REV} = -6\text{mA}$

Package Options

Consult table in "Ordering Information" section (pg. 7) for availability



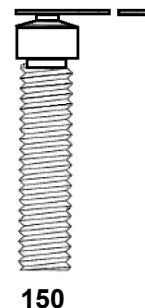
Package dimensions can be found on the M/A-COM website at <http://www.macomtech.com/TechApps/OutlineDrawings.asp>

1500V CERMACHIP PIN Diode Specifications ($T_{AMB} = +25^{\circ}\text{C}$)

| Part Number | Minimum Reverse Voltage ¹ | Maximum Capacitance | Maximum Series Resistance | Maximum Thermal Resistance | Nominal Characteristics | |
|-------------|--------------------------------------|--|---|----------------------------|--|------------------------|
| | $I_R < 10\mu\text{A}$ Volts | $C_t @ 100\text{V}$ $f = 1\text{MHz}$ pF | $R_s @ 200\text{mA}$ $f = 100\text{MHz}$ Ω | $^{\circ}\text{C/W}$ | Carrier Lifetime ² μS | I-Region Width mils |
| MA4P709-150 | 1500 | 3.30 | 0.25 | 2 | 10.0 | 7 |

Notes:

- The minimum specified V_R (reverse voltage) is sourced and the resultant reverse leakage current, I_r , is measured to be $< 10\mu\text{A}$
- Nominal carrier life time specified with diode biased at $I_F = +10\text{mA}$, $I_{REV} = -6\text{mA}$



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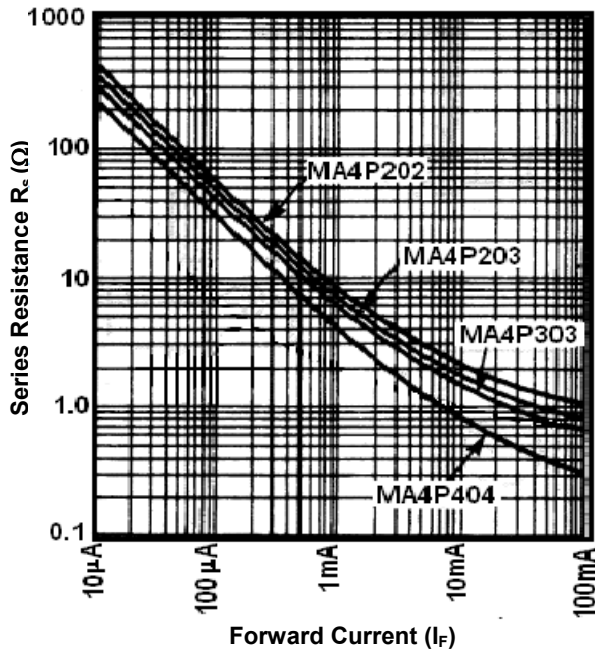
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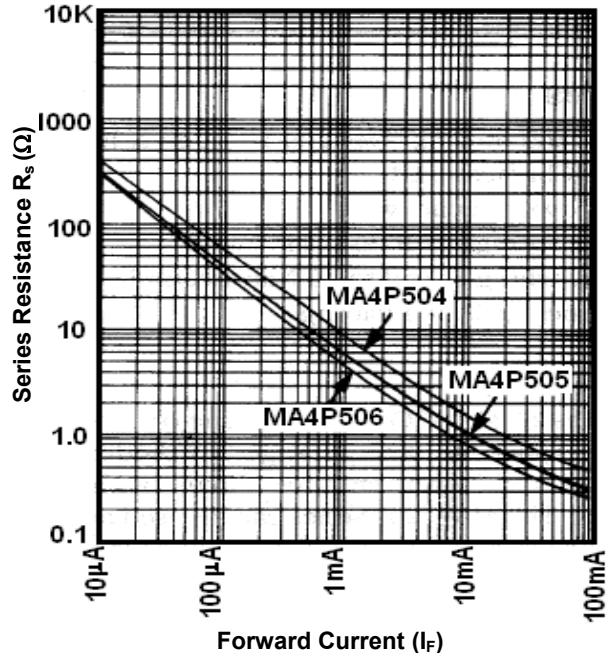
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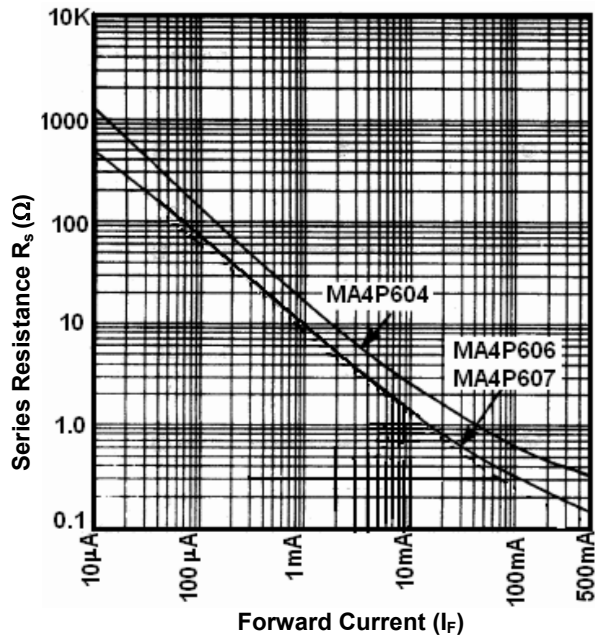
Forward Current vs. Series Resistance
MA4P202, MA4P203, MA4P303 and MA4P404
 100MHz



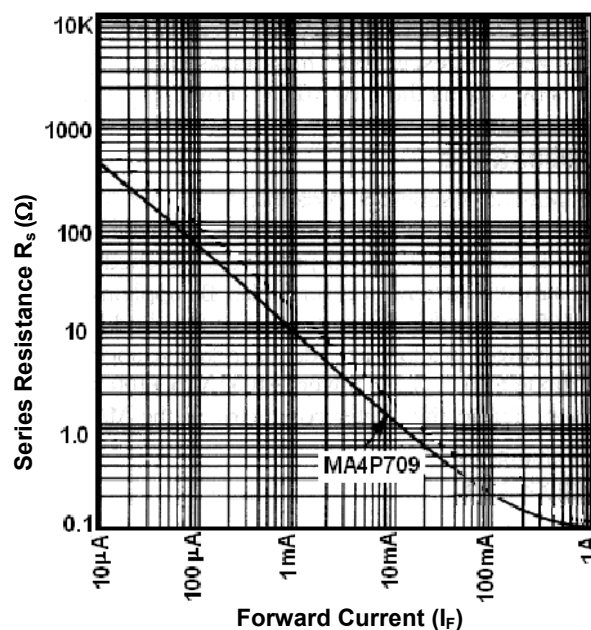
Forward Current vs. Series Resistance
MA4P504, MA4P505 and MA4P506
 100MHz



Forward Current vs. Series Resistance
MA4P604, MA4P606 and MA4P607
 100MHz



Forward Current vs. Series Resistance
MA4P709
 100MHz



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Recommended Groups B&C Testing Per MIL-STD 750

Recommended methods and conditions for Groups B and C, TX and TXV level screening.

| Inspection | Method | Condition |
|-----------------------|--------|------------------------------|
| Storage Temperature | 1031 | See Maximum Ratings |
| Operating Temperature | — | See Maximum Ratings |
| Temperature Cycling | 1051 | 5 cycles - 65°C to +150°C |
| Shock | 2016 | 500g's |
| Vibration | 2056 | 15g's |
| Constant Acceleration | 2006 | 20,000g's |
| Humidity | 1021 | 10 Days |

Recommended Screening Per MIL-STD 750

Recommended methods and conditions for TX and TXV level screening.

| Inspection | Method | Condition |
|--------------------------------|------------|------------------------------------|
| Internal Visual and / or X-Ray | 2072, 2076 | See Note |
| High Temp. Storage | 1032 | 48 hours min. @ max. storage temp. |
| Thermal Shock | 1051 | 10 Cycles |
| Constant Acceleration | 2006 | 20,000 g's, Y1 |
| Fine Leak | 1071 | H |
| Gross Leak | 1071 | C or E |
| Electrical | — | See Note |
| Burn-In | 1038 | See Note |

Notes:

1. Conditions and details of test depend on specific model number. Information available upon request.
2. Case styles 1056 and 1088 are not military, MIL-STD-750, rated packages.

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Maximum Soldering Temperature

For hand soldering operation:

Case Style: 144, 150*, 186, 258*, 1088, 1072, 1079 ♦ 265°C maximum for 5 seconds

Case Style: 120, 255, 276 ♦ 265°C maximum for 5 seconds.

Case Style: 30*, 31, 32, 36*, 43*, 94, 111*, 296* ♦ 225°C maximum for 5 seconds.

***Note:**

Package styles that are threaded or have pronged ends rely on a pressure connection and do not require solder attachment but can be soldered if desired.

For solder reflow profiles:

Refer to application note M-538 on the M/A-COM website using the following link:

<http://www.macomtech.com/Application%20Notes/pdf/M538.pdf>

Ordering Information

The Packaged PIN Diode specifications shown in the tables on pages 2, 3, & 4 are for the standard style package. The standard package style is indicated by the number following the dash after the base part number. Note that the specification tables lists the total diode capacitance for the standard case style. The total capacitance for the base part in an alternative package will differ and is computed by adding the junction capacitance of the chip and the parasitic capacitance of the alternative package as defined in the **Package Parasitic Capacitance** table below. To compute the chip junction capacitance, subtract the total capacitance shown in the specifications tables on pages 2, 3, & 4 from the appropriate standard style package capacitance below. The various base part numbers are only available in the case styles shown in the **Package Availability Table** below. To order, indicate the base part number followed by a dash and the desired package style.

For example: The MA4P506-258 is the MA4P506 chip in the 258 style package.

Package Availability Table

| Base Part Number | Available ODS Package Styles |
|-------------------|-------------------------------------|
| MA4P202 | 120, 134, 276, 1056 |
| MA4P203 | 30, 32, 94, 111, 134, 1056 |
| MA4P303 | 32, 36, 94, 120, 186, 255, 1088 |
| MA4P404 | 30, 31, 36, 111, 132, 258, 1072T* |
| MA4P504 | 30, 120, 132, 144, 186, 255, 1072T* |
| MA4P505 | 36, 131, 255, 1072T* |
| MA4P506 | 30, 31, 36, 131, 255, 258, 1072T* |
| MA4P604 | 30, 43, 131, 255, 258 |
| MA4P606 | 30, 36, 131, 258 |
| MA4P607 | 43, 212, 296 |
| MA4P709 | 150 |
| MADP000015-000030 | 30 |
| MA4PH235 | 1072T* |
| MA4PH236 | 1072T* |
| MA4PH237 | 1079T* |
| MA4PH238 | 1072T* |
| MA4PH239 | 1079T* |
| MADP-000234 | 10720T* (1072 package style) |

***Note:** "T" after the package style number indicates tape and reel.

Package Parasitic Capacitance

| Package Style | Cap. (pF) |
|---------------|------------|
| 30 | 0.18 |
| 31 | 0.18 |
| 32 | 0.30 |
| 36 | 0.18 |
| 43 | 0.75 |
| 94 | 0.15 |
| 111 | 0.27 |
| 120 | 0.13 |
| 131 | N/A (chip) |
| 132 | N/A (chip) |
| 134 | N/A (chip) |
| 144 | 0.42 |
| 186 | 0.15 |
| 212 | N/A (chip) |
| 255 | 0.30 |
| 258 | 0.18 |
| 276 | 0.13 |
| 296 | 0.35 |
| 1056 | 0.20 |
| 1072 | 0.16 |
| 1079 | 0.13 |
| 1088 | 0.12 |

Tape and reel information can be found on the M/A-COM website at <http://www.macomtech.com/Application%20Notes/pdf/M513.pdf>

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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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