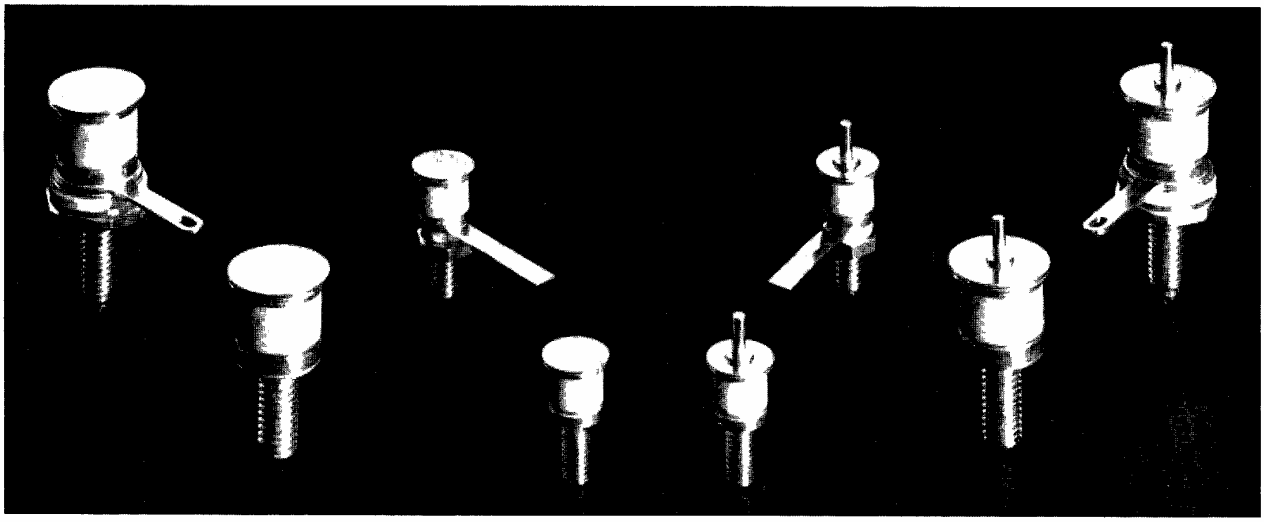
KILOVOLT™ PIN Diodes

2000 Volt and 3000 Volt PIN Diodes

MA4PK2000 and MA4PK3000 Series



Features

- Voltage Ratings to 3000 Volts
- 25 Ampere Current Rating
- Designed for HF, Multi-Kilowatt Switches
- Low Loss, Low Distortion Design
- Rugged, Hermetically Sealed Packaging
- Convenient Solder Lug Attachment

Description

M/A-COM's KILOVOLT™PIN diodes utilize modern semiconductor and packaging technology that assures low loss, low distortion, and reliable performance in multi-kilowatt switch applications at frequencies as low as 1 MHz. The semiconductor chips employed have low resistance, high power dissipation and very high stand-off voltage capability.

KILOVOLT™PIN diodes employ ultra high resistivity, long carrier lifetime, float zone silicon intrinsic material onto which P+ and N+ regions are deposited using an epitaxial process specifically designed at M/A-COM for high voltage PIN diodes. This process results in better preservation of the intrinsic carrier lifetime and superior junctions in comparison to the conventional double diffused process. The processing of the I-region width is tightly controlled using modern lapping techniques.

KILOVOLT™PIN diode chips utilize M/A-COM's proprietary cermachip™ glass passivation. The hard glass covers all exposed junction and intrinsic region surfaces. This results in a hermetically sealed, passivated chip that has been accepted in many hi-rel military programs.

Packaging

New metal-ceramic packages were developed for the KILOVOLT™PIN diode series. They were designed to withstand extremely high voltages and currents and to be compatible with the semiconductor chip and RF circuitry. These packages meet the environmental requirements of MIL-STD-202 and MIL-STD-750.

The PIN diode chip is bonded to the package and the anode strap is bonded to the chip at temperatures exceeding 300°C. The anode strap is a unique, large cross-section area design allowing for high current capability. The packages are sealed using a projection welding technique in an inert environment.

KILOVOLT™PIN diodes are available with a solder lug on the anode electrode to allow a convenient and reliable wrap-around wire connection. ALL 2000 VOLT DIODES ARE IN NON-MAGNETIC PACKAGES.

Applications

M/A-COM's KILOVOLT™PIN diodes are designed for use as high power switching elements in multi-kilowatt HF and VHF applications. These PIN diodes have been extensively characterized for their electrical and thermal properties to assure predictable low loss, high power handling, and low distortion performance. Some typical applications are as follows:

1. Filter Switches
2. Antenna Couplers
3. Power Amplifier By-pass Switches
4. MRI Switches

Bulletin No. 4335

M/A-COM SEMICONDUCTOR DIVISION • Burlington, MA 01803 • (617) 272-3000 • FAX (617) 272-8861

M/A-COM KILOVOLT PIN Diodes

Part Numbers

2000 Volt Rating	3000 Volt Rating	Package Type
MA4PK2000	MA4PK3000	Pill
MA4PK2001	MA4PK3001	Stud – Solder Lug
MA4PK2002	MA4PK3002	Stud – No Solder Lug
MA4PK2003	MA4PK3003	Insulated Stud – Solder Lug
MA4PK2004	MA4PK3004	Insulated Stud – No Solder Lug

Maximum Ratings

Operating and Storage Temperature	–65°C to +175°C
Installation Temperature	250°C, 30 Seconds
Instantaneous Reverse Voltage	Voltage Rating
Forward Current (RF and DC)	25 Amperes
Power Dissipation at 25°C Case Temperature	
MA4PK2001, MA4PK2002	50 Watts
MA4PK2003, MA4PK2004	37.5 Watts
MA4PK3001, MA4PK3002	75 Watts
MA4PK3003, MA4PK3004	50 Watts

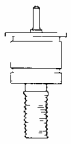
Note: Cathode heat sink is standard on all parts. Reverse polarity, NIP diodes are available on request.

Electrical Specifications @ 25°C

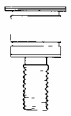
Parameter	Condition	MA4PK2000 Series	MA4PK3000 Series
Reverse Voltage Rating	10 μA	2000 Volts	3000 Volts
Series Resistance (Max)	F = 4 MHz, I = 0.5 A	0.20 Ω	0.25 Ω
Series Resistance (Typ)	F = 1.0 - 100 MHz, I = 0.5 A	0.10 Ω	0.15 Ω
Total Capacitance (Max)	F = 1 MHz, V = 100 V	3.2 pF	4.0 pF
Reverse Bias Conductance (Max)	F = 10 MHz, V = 100 V	1 μS	1 μS
Carrier Lifetime (Min)	I_F = 10 mA	10 μs	20 μs
Forward Voltage (Max)	I_F = 1 A	1.2 V	1.2 V
Thermal Resistance (Max)		3°C/W (Stud) 4°C/W (Ins. Stud)	2°C/W (Stud) 3°C/W (Ins. Stud)
I-Region Width (Nom)		200 μm	325 μm

MA4PK2000 MA4PK3000

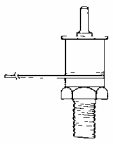
MA4PK2001 MA4PK3001



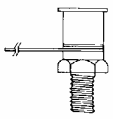
MA4PK2002 MA4PK3002



MA4PK2003 MA4PK3003



MA4PK2004 MA4PK3004



Typical Characteristics

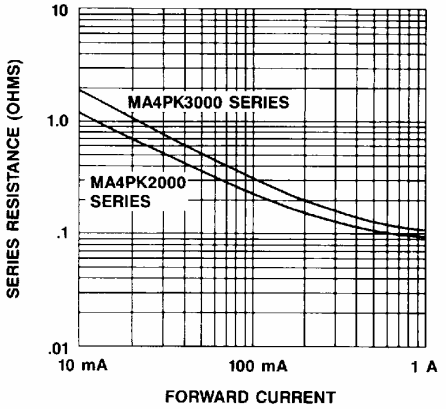


FIGURE 1. SERIES RESISTANCE VS. CURRENT FREQUENCY 1 – 100 MHz

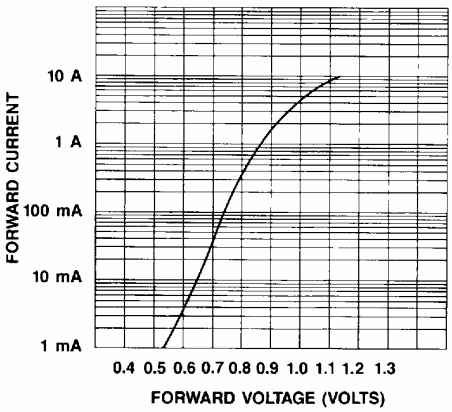


FIGURE 2. DC FORWARD VOLTAGE VS. FORWARD CURRENT MA4PK2000 SERIES AND MA4PK3000 SERIES

Typical Characteristics (Cont'd)

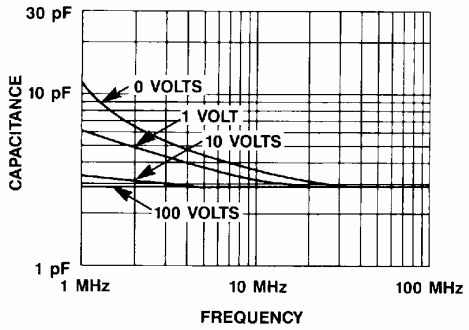


FIGURE 3. REVERSE BIAS CAPACITANCE VS. FREQUENCY AND REVERSE VOLTAGE – MA4PK2000 SERIES

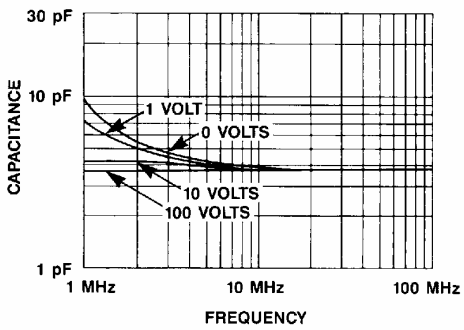


FIGURE 4. REVERSE BIAS CAPACITANCE VS. FREQUENCY AND REVERSE VOLTAGE – MA4PK3000 SERIES

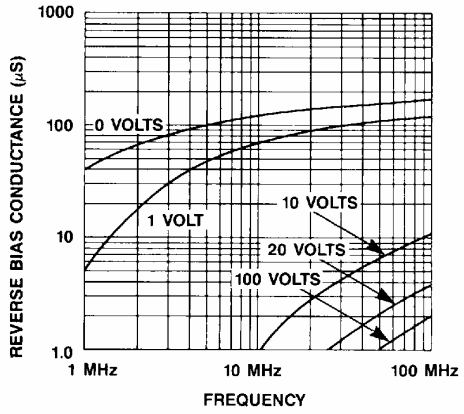


FIGURE 5. REVERSE BIAS CONDUCTANCE VS. FREQUENCY AND REVERSE VOLTAGE – MA4PK2000 SERIES

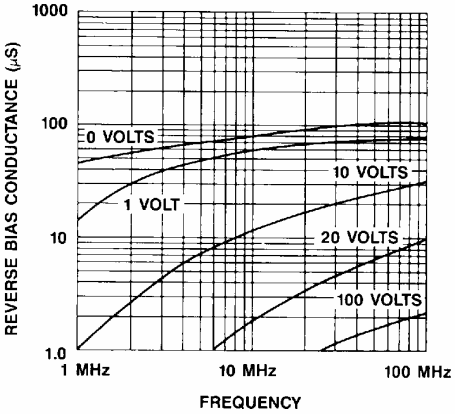


FIGURE 6. REVERSE BIAS CONDUCTANCE VS. FREQUENCY AND REVERSE VOLTAGE – MA4PK3000 SERIES

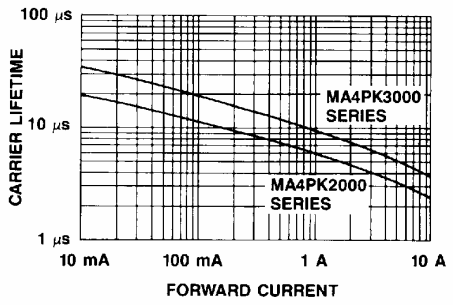


FIGURE 7. CARRIER LIFETIME VS. FORWARD CURRENT

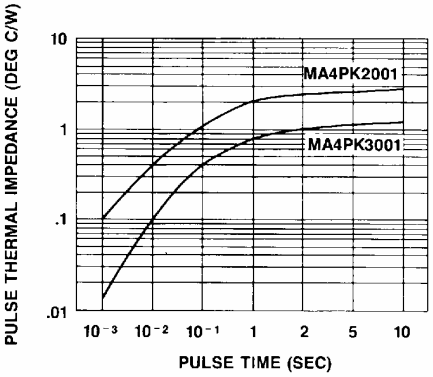
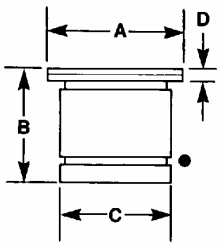


FIGURE 8. PULSED THERMAL RESISTANCE

Case Styles*

● DENOTES CATHODE

Pill



MA4PK2000
ODS-1027

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	304	316	7.72	8.02
B	254	270	6.45	6.86
C	245	255	6.22	6.48
D	023	031	0.58	0.79

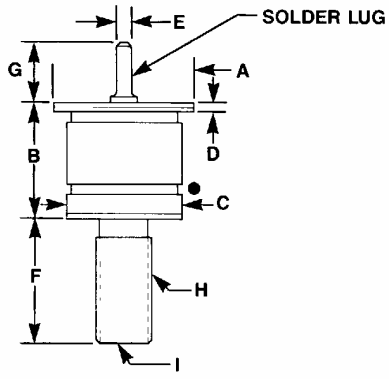
C_P = .45 pF
L_S = 2 nH

MAPK3000
ODS-1073

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	468	485	11.9	12.3
B	373	395	9.45	10.0
C	390	400	9.91	10.2
D	028	042	0.71	1.06

C_P = .75 pF
L_S = 3 nH

Stud



MA4PK2001 **MA4PK2002**
ODS-1082 **ODS-1048**
(Solder Lug) **(No Solder Lug)**

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN	MAX
A	304	316	7.72	8.02
B	266	292	6.45	6.86
C	245	255	6.22	6.48
D	023	031	0.58	0.79
E	060	065	1.52	1.65
F	281	305	7.14	7.75
G	190	205	4.83	5.21
H	6-40 UNF 3A			
I	072 SPLINE x .07 DP			

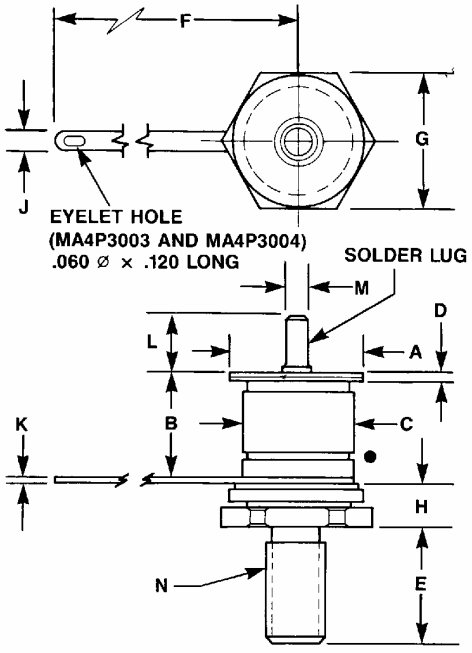
C_P = .45 pF
L_S = 2 nH

MA4PK3001 **MA4PK3002**
ODS-1084 **ODS-1074**
(Solder Lug) **(No Solder Lug)**

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX.
A	468	485	11.9	12.3
B	387	411	9.83	10.4
C	390	400	9.90	10.1
D	028	042	0.71	1.06
E	060	065	1.52	1.65
F	425	445	10.8	11.3
G	190	205	4.83	5.21
H	10-32 UNF-2A			
I	.050 SLOT x .06 DP			

C_P = .75 pF
L_S = 3 nH

Insulated Stud



MA4PK2003 **MA4PK2004**
ODS-1080 **ODS-1038**
(Solder Lug) **(No Solder Lug)**

DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN	MAX.
A	304	316	7.72	8.02
B	254	270	6.45	6.86
C	245	255	6.22	6.48
D	023	031	0.58	0.79
E	221	252	5.61	6.40
F	780	790	19.8	20.1
G	245	255	6.22	6.48
H	128	137	3.25	3.48
J	120	130	3.05	3.30
K	007	009	0.18	0.23
L	190	205	4.83	5.21
M	060	065	1.52	1.65
N	6-32 UNC-3A			

C_P = .45 pF
L_S = 2 nH
C_{GRD} = 1.1 pF

MA4PK3003 **MA4PK3004**
ODS-1085 **ODS-1075**
(Solder Lug) **(No Solder Lug)**

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	468	485	11.9	12.3
B	373	395	9.47	10.0
C	390	400	9.91	10.2
D	028	042	0.71	1.07
E	422	452	10.7	11.5
F	805	820	20.4	20.8
G	490	500	12.4	12.7
H	148	170	3.76	4.32
J	120	130	3.05	3.30
K	022	026	0.559	0.660
L	190	205	4.83	5.21
M	060	065	1.52	1.65
N	10-32 UNF-2A			

C_P = .75 pF
L_S = 3 nH
C_{GRD} = 4.2 pF

***For drop-in replacements of select competitor packages, please consult the factory.**