GaAs PIN Diodes

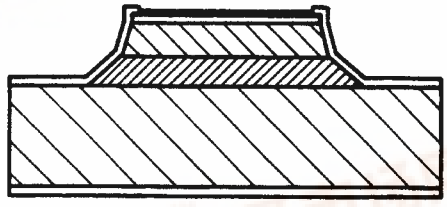
MA4GP Series

V 2.00

Features

- May be Driven Directly from TTL Signals
- Low Series Resistance
- Fast Switching Speed
- No Reverse Bias Required
- Available as Passivated Chips

Case Style 277



Description

Gallium Arsenide PIN diodes offer improved performance characteristics in many microwave semiconductor applications. These benefits result from the inherent semiconductor material properties of GaAs including high carrier mobility resulting in low resistance and fast switching speed. Low I-region carrier concentration results in near zero bias punch through. Gallium Arsenide's higher band gap also assures higher temperature capability.

Switching speeds in the low nanosecond range using inexpensive TTL buffer logic are achievable with GaAs PIN diodes. This performance is achieved because GaAs PIN diodes can exhibit high impedance at positive bias (up to 0.5 volts). Reverse bias is not required for many GaAs PIN diode applications. Low loss in switch and phase shifter circuits (up to 40 GHz) is achievable as a result of low parasitic series resistance in the conducting and non-conducting state.

Specifications T_A= +25°C Electrical Specifications

Model[1] Number	Maximum[2] Forward Rs @ 20 mA, 1 GHz (Ohms)	Capacitance 1 MHz @ - 10 volts Maximum (pF)	Minimum Reverse Voltage V_B @ 10 µA (Volts)	Nominal Switching[3] Speed (ns)	Nominal Carrier[4] Lifetime (ns)
MA4GP022	1.0	0.15	50	4.0	5.0
MA4GP025	0.85	0.35	75	4.0	10.0
MA4GP030	2.0	0.06	100	10.0	20.0
MA4GP032	1.5	0.12	100	10.0	25.0

Notes:

1. The passivated chip (case style 277) is the standard case style for the MA4GP series. Minimum bonding pad diameter is 2 mils. The other available case styles are 30, 31, 94 and 120. To specify the case style desired, add the case style number as a suffix to the model number when ordering. See Appendix for full dimensions.
2. Forward R_S is measured by terminating a transmission line with the diode in the case style 30 package.
3. Switching speed is measured between 1 dB and 20 dB loss in a shunt mounted 7.0 GHz switch.
4. Carrier lifetime is measured at 10 mA derived from stored charge measurements.

Maximum Ratings

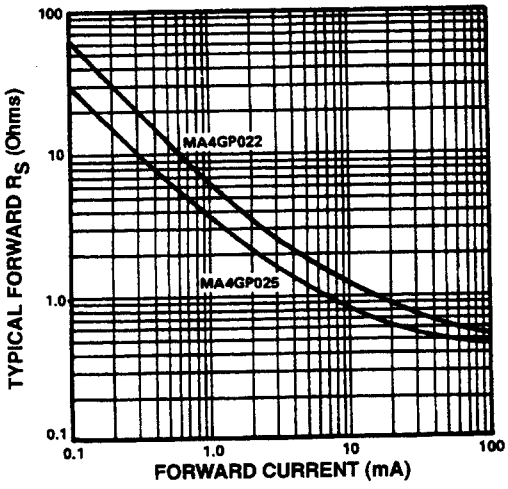
Parameter	Absolute Maximum
Temperature	
Operating	-65° C to +175°C
Storage	-65° C to +175°C
Voltage	Breakdown Voltage
Power Dissipation	250 mW @ +25°C

Environmental Rating PER MIL-STD-750

	Method	Level
Temperature, Cycling	1051	5 cycles, - 65° C to +150° C
Shock	2016	500 g's
Vibration	2056	15 g's
Constant Acceleration	2006	20,000 g's
Moisture Resistance (Packaged diodes)	1021	10 days

Typical Performance Curves

TYPICAL FORWARD RESISTANCE vs FORWARD CURRENT AT 1 GHz



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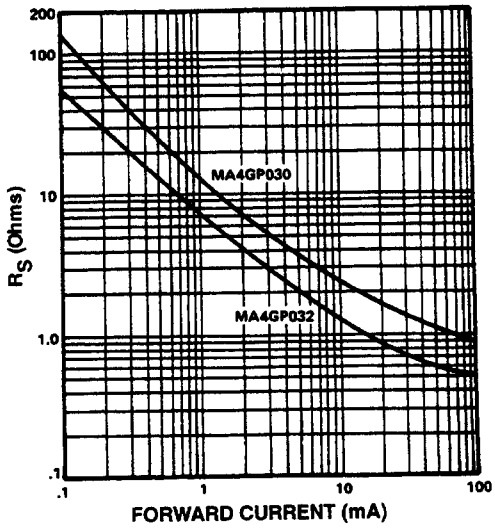
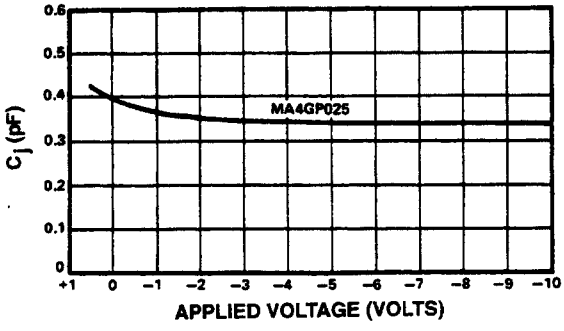


Typical Performance Curves

CAPACITANCE VOLTAGE CHARACTERISTICS AT 1 GHz



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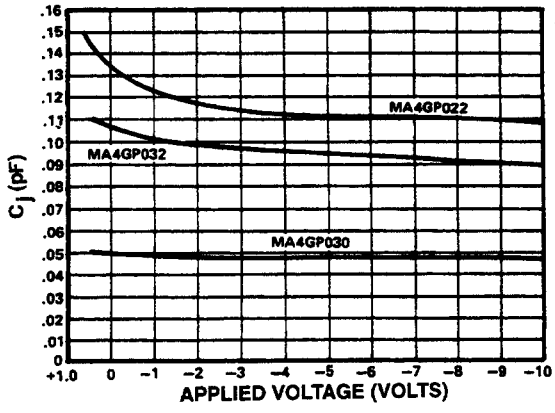
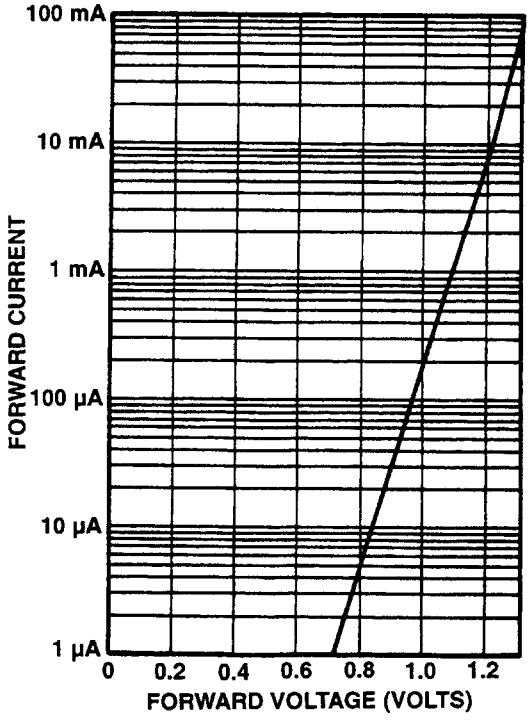
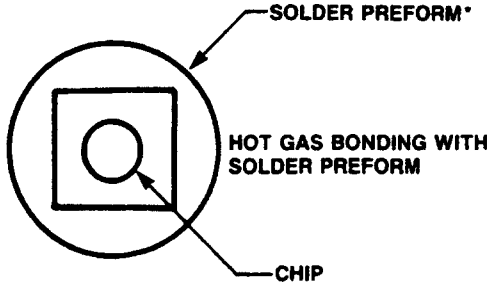


TYPICAL FORWARD CURRENT vs FORWARD VOLTAGE
@ +25°C (MA4GP SERIES)



Die Bonding

GaAs is softer and more brittle than Silicon. The use of gold tin solder preform (80% Au 20% Sn) with an eutectic melting point of 280° C is recommended. A clean gold plated surface is required to insure good wetting. The preform should be large enough to insure that the die fits within the areas as shown.



*Recommended thickness of preform is 1 mil (.025 mm)

The heating stage should be set at 240° C. An 80% N_2, 20% H_2 forming gas is effective as the hot gas jet. The temperature at the tip should be approximately 400° C.

Ribbon and Wire Attachment

It is recommended that thermo-compression bonding be used. The bonding tip should be smaller than the anode contact. The exact conditions will depend on the tool types used. It is recommended that a half hard gold wire or strap be used. The wire or strap diameter should be smaller than the diameter of the anode contact. Typical bonding force should be between 20 and 25 grams and should not exceed 30 grams. When wire bonding a thermal compression wedge bonding is recommended using a heated stage and heated tip. The stage temperature should be approximately 240° C and the recommended temperature for the tip is 120° C. Ultrasonic scrubbing is not recommended.