MA46580 & MA46585

Beam Lead Constant Gamma GaAs Tuning Varactor

Rev. V4

Features

- Constant Gamma = 1.0 & 1.25 available
- High Q (3000 minimum at 4V 50MHz)
- Strong Beam Construction (Minimum 10 gram beam strength)
- Low Parasitic Capacitance
- Close Capacitance tracking
- Lead-Free (RoHs Compliant) equivalents available with 260°C reflow compatibility

Description

The MA46580 & MA46585 series beam lead constant gamma tuning varactors are hyper-abrupt junction gallium arsenide diodes with a constant gamma of 1.0 or 1.25. The high Q values and the elimination of package parasitics make these varactors very attractive for voltage controlled oscillators that require linear tuning. These tuning diodes are useful at frequencies as high as 40 Ghz.

The beam lead design eliminates almost all of the package parasitics resulting in improved linearity of the junction capacitance change with applied reverse bias voltage. This improves tracking between diodes and can improve VCO linearity.

Absolute Maximum Ratings @ T_A=+25 °C

(Unless Otherwise Noted) [1]

Parameter	Absolute Maximum
Reverse Voltage	18V
Operating Temperature	-65°C to +150°C
Storage Temperature	-65°C to +200°C
Power Dissipation	25mW at 25 °C
Beam Strength	10 grams minimum

1. Operation of this device above any one of these parameters may cause permanent damage.

Applications

These beam lead constant gamma tuning varactors are particularly useful in broadband VCO's, where linear frequency tuning is an important feature. They are also very useful for FM modulating a source for telecommunication transmitter and in many cases such circuits can be designed without a linearization circuit.

Electrical Specifications @ T_A = +25 °C

Gamma = 1.0[2]

Gamma4 = 0.9 - 1.1, VR = 2 - 12 Volts
Breakdown Voltage @ I_R = 10µA, V_b = 18 V Min
Reverse Leakage Current @ V_R =14V, I_R = 50 nA Max

Part Number	Case Style	Total Capacitance[1] +/-20%	Total Capacitance Ratio	Q Minimum
		Vr=4V	Vr=2V / Vr=12V	Vr=4V f=50MHz
		(pF)	-	-
MA46585-1209	1209	0.5	3.2-5.2	3000

Electrical Specifications @ T_A = +25 °C

Gamma = 1.25[2]

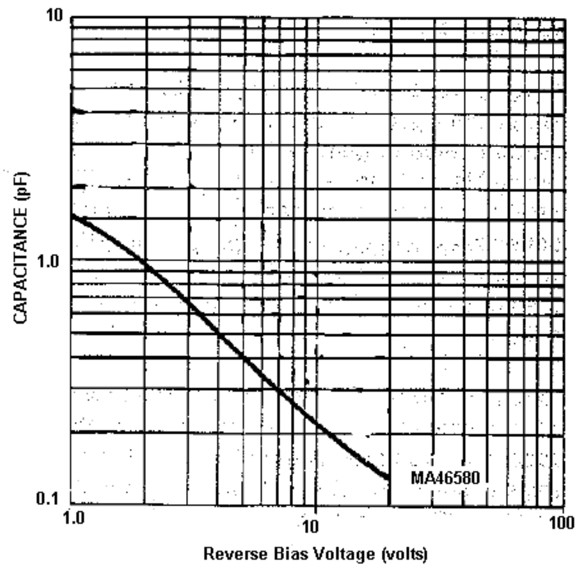
Gamma4 = 1.13-1.38, VR = 2 - 12 Volts
Breakdown Voltage @ I_R = 10µA, V_b = 18 V Min
Reverse Leakage Current @ V_R =14V, I_R = 50 nA Max

Part Number	Case Style	Total Capacitance[1] +/-20%	Total Capacitance Ratio	Q Minimum
		Vr=4V	Vr=2V / Vr=12V	Vr=4V f=50MHz
		(pF)	-	-
MA46580-1209	1209	0.5	4.5-6.5	3000

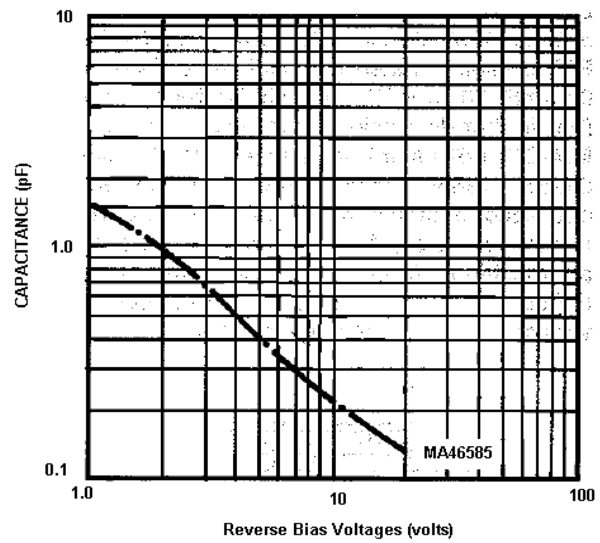
Notes:
1. Capacitance is measured at 1 MHz.
2. All junctions are hyperabrupt with nominal Γ= 1.0 or 1.25
3. Reverse voltage (VB) is measured at 10 microamps.

Typical Performance Curves @ 25°C

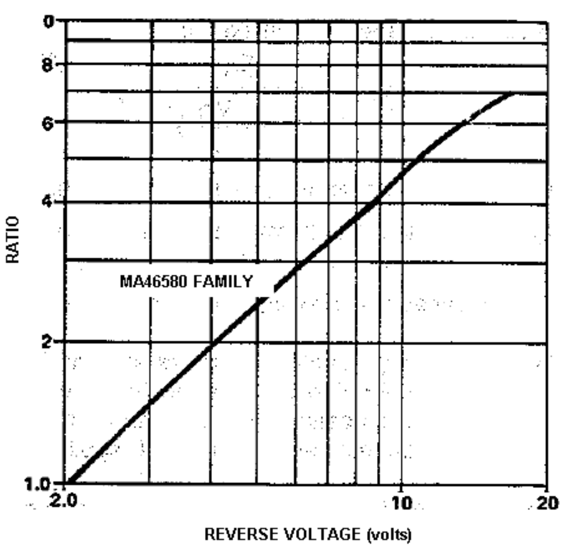
Capacitance vs. Voltage



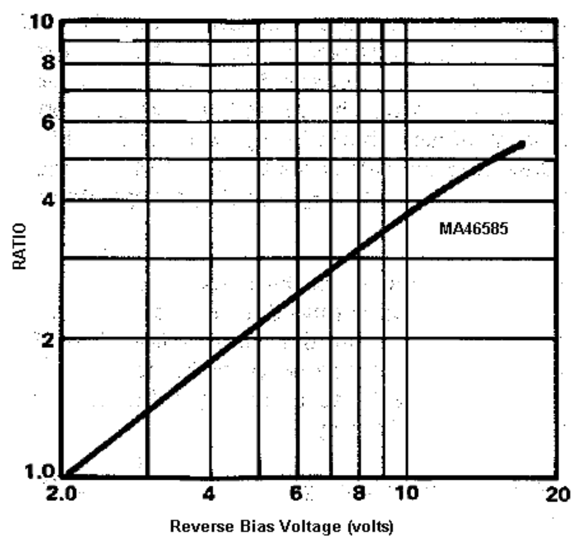
Capacitance vs. Voltage



Capacitance Ratio CT2V/CTV



Capacitance Ratio CT2V/CTV

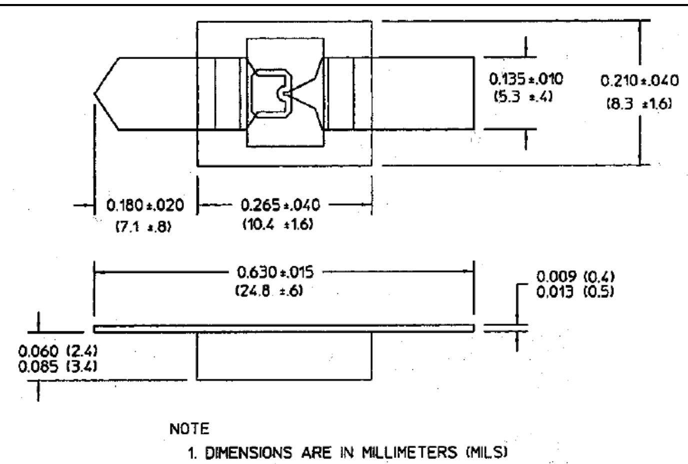


Environmental Ratings PER MIL-STD-750

	Method	Level
Storage Temperature	**1031**	**See maximum ratings**
Temperature Cycle	**1051**	**10 cycles, -65°C to +175°C**
Shock	**2016**	**500 g's**
Vibration	**2056**	**15 g's**
Constant Acceleration	**2006**	**20,000 g's**
Humidity	**1021**	**10 days**
Constant Acceleration	**2006**	**20,000 g's**
Humidity	**1021**	**10 days**

Case Styles

ODS-1209



BONDING BEAM LEAD DIODES

The preferred methods for bonding a beam lead diode are thermal compression bonding and parallel gap welding. For thermal compression bonding, the beam lead diode is placed down (gold beam to gold plated substrate) with the leads resting flat on the pad and the bond is made by using a heated wedge. Heat and pressure form a metallurgical bond. A minimum of 100 microinches of gold on the substrate is recommended for optimum bonding.

In the parallel gap technique, current is first passed through the substrate metallization, then through the device lead. Most of the heat is generated at the interface. Care must be taken to see that the step welder does not discharge through the diode junction or the diode will be destroyed. The bonding pressure should be approximately 900 gms/mm².

The major advantage of the parallel gap technique is that a cold ambient may be used. Heat is only generated in the vicinity of the bond itself. Caution must be taken when making the second bond because if the diode is placed in tension, the lead may break.

The following precautions will ensure better results when bonding beam leads:

To minimize the lead inductance, the wedge, or heated tips should be placed as close as possible to the edge of the chip without touching it. The chip is very easily damaged, and care must be taken that the bonding tip does not contact the chip at any time during the bonding process.

The bonding tip must be perpendicular to the beam during bonding, to prevent a torsional force which will pull the beams apart. This is particularly important when bonding the second lead.

BONDING TO SOFT CIRCUITS

Beam lead diode can be soft soldered, epoxied or parallel gap welded to Teflon fiberglass or soft circuit boards if low bond pressure is used. Bonding pressure must be reduced to a minimum to prevent diode breakage by forcing the beam into the board.

In general, soft soldering or reflow soldering is the preferable technique. The circuit board should be pretinned with solder or a solder plating to obtain the best wetting. Solder melting temperatures of 225-300°C are most satisfactory. Usually, the circuit board manufacturer's solder recommendations should be followed.

Conductive solder paste such as high conducting silver filled epoxy will also result in good low loss bonds. Care should be taken to ensure that the wet paste does not run up the beam lead and short it.