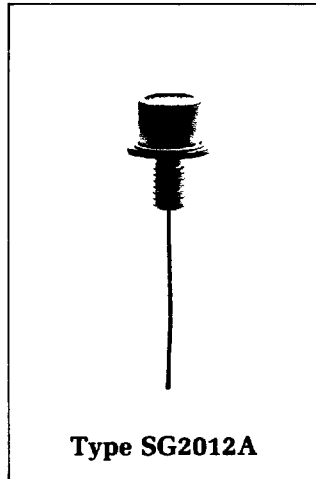
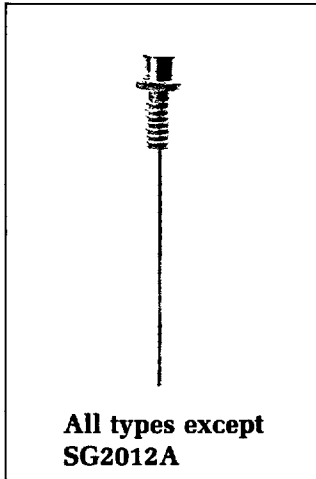


904 nm Gallium Arsenide Injection Lasers for Pulsed Operation



- Small Emitting Areas
- Variants With Reverse-Case Polarity are Available
- Coaxial Packages for Simple Mounting and Good Thermal Dissipation Capability
- Minimum Peak Power Outputs From 1 to 20 Watts:

Type	Watts	Amperes
SG2001A	1	10
SG2002A	2	10
SG2003A	3	25
SG2004A	5	25
SG2005A	5	20
SG2006A	7	40
SG2007A	10	40
SG2009A	12	75
SG2010A	15	75
SG2012A	20	100

The RCA SG2000A Series of single-diode gallium arsenide injection lasers emit radiant flux in the near-infrared region of the spectrum (904 nm) and will provide, at this wavelength, minimum peak power outputs of 1 to 20 watts at peak forward drive currents of 10 to 100 amperes. The construction of these devices is such that the emitted radiant flux is essentially confined to the junction region thus assuring both low threshold current and high efficiency.

These laser diodes are intended for a wide variety of applications including intrusion alarm systems and industrial control equipment.

Operating Considerations

The SG2000A Series lasers are operated by pulsing the devices in the forward-bias direction.

At temperatures of 27° C and higher, the forward current must be limited to the specified peak forward current rating; below 27° C, the peak forward current is derated.

The maximum rated pulse durations and duty factors must never be exceeded. If the specified pulse duration or duty cycle is exceeded, the lasing action may be quenched because of the heat generated in the junction and the diode may be eventually destroyed. However, the repetition rate may be increased if the pulse duration is reduced.

Maximum Ratings, Absolute-Maximum Values

Peak Forward Current, i_{FM}

At Case Temperature, $T_C \geq 27^\circ C$: See Above

At Case Temperatures, $T_C < 27^\circ C$: See Figure 2

Forward Current Pulse Conditions

For Case Temperature (T_C) Range of $-55^\circ C$ to $+70^\circ C$ (See Figure 2)

Pulse Duration, t_w (50% points) 200 ns

Duty Factor, du 0.1%

Peak Reverse Voltage, v_{RM} 2 V

Temperature

Storage, T_{stg} -55 to $+125^\circ C$

Operating, Case, T_C -55 to $+70^\circ C$

Soldering:

For 5 seconds (center lead only) $200^\circ C$

SG2000A SERIES

Typical Characteristics (Except as noted)	At $T_c = 27^\circ\text{C}$, prr = 3 kHz, $t_w = 200\text{ ns}$							At $T_c = 27^\circ\text{C}$, prr = 1 kHz, $t_w = 200\text{ ns}$			Units
	SG2001A	SG2002A	SG2003A	SG2004A	SG2005A	SG2006A	SG2007A	SG2009A	SG2010A	SG2012A	
Electrical											
Minimum Total Peak Radiant Flux, Φ_M (Power Output):											
At $i_F = i_{FM} = 10\text{ A}$	1	2	—	—	—	—	—	—	—	—	W
At $i_F = i_{FM} = 20\text{ A}$	—	—	—	—	5	—	—	—	—	—	W
At $i_F = i_{FM} = 25\text{ A}$	—	—	3	5	—	—	—	—	—	—	W
At $i_F = i_{FM} = 40\text{ A}$	—	—	—	—	—	7	10	—	—	—	W
At $i_F = i_{FM} = 75\text{ A}$	—	—	—	—	—	—	—	12	15	—	W
At $i_F = i_{FM} = 100\text{ A}$	—	—	—	—	—	—	—	—	—	20	W
Threshold Current, I_{th}	4	4	6	6	6	11	11	25	25	36	A
Peak Forward Voltage, v_F :											
At $i_F = i_{FM}$	4	4	6	6	5	7	7	10	10	15	V
Radiant Flux											
Wavelength of Peak Radiant Intensity, λ_M^*	904	904	904	904	904	904	904	904	904	904	nm
Spectral Bandwidth, $\Delta\lambda$, at 50% Intensity Points*	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	nm
Half-Angle Beam Spread at 50% Intensity Points:*											
In plane parallel to junction	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	deg
In plane normal to junction	9	9	9	9	9	9	9	9	9	9	deg
Optical Alignment Angle:*											
Peak radiant intensity from normal to seating plane of case	± 5	± 5	± 5	± 5	± 5	± 5	± 5	± 5	± 5	± 5	deg
Switching											
Rise Time of Emitted Pulse, t_r (10% to 90%)*	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	ns
Mechanical											
Emitting Region Dimensions	76.2×2 3×0.08	76.2×2 3×0.08	152.4×2 6×0.08	152.4×2 6×0.08	152.4×2 6×0.08	228.5×2 9×0.08	228.5×2 9×0.08	406.4×2 16×0.08	406.4×2 16×0.08	609.6×2 24×0.08	μm mils

*Measured at maximum rated peak forward current, i_{FM} .

Safety Considerations

Injection Laser Diodes emit electromagnetic radiation at wavelengths which may be invisible to the human eye. Suitable precautions must be taken to avoid possible damage to the eye from overexposure to this radiant energy. Precautionary measures include the following:

1. In systems with no external lens

Avoid viewing the laser source at close range. Since the emitted beam is not collimated, increasing the distance to the laser source greatly reduces the risk of over-exposure.

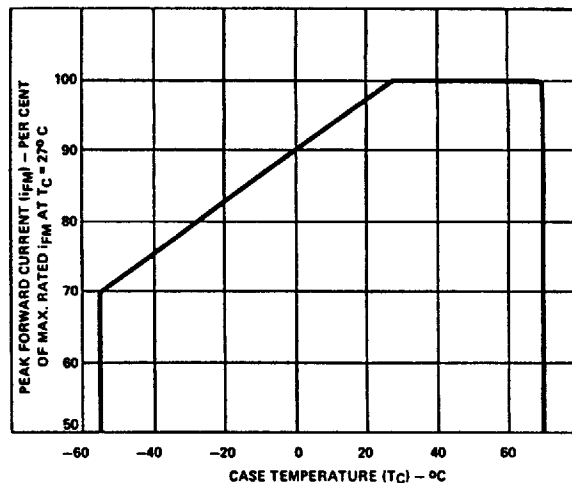
2. In systems utilizing external optics

Avoid viewing the emitter directly along the optical axis of the radiated beam.

3. Reflections from surfaces

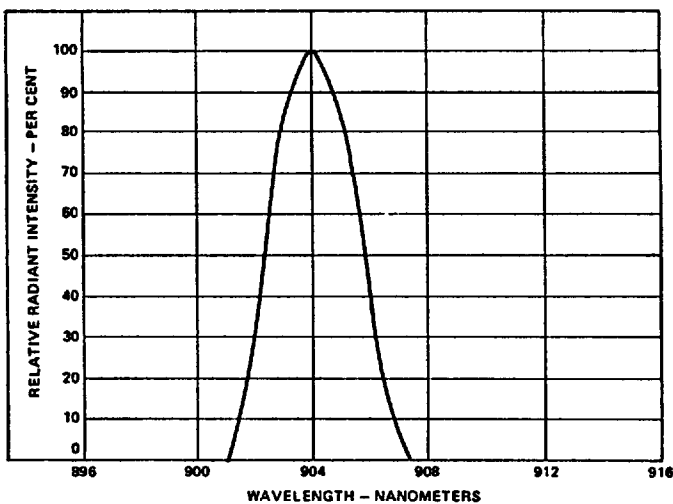
Minimize unwanted specular reflections in the system.

Warning - Personal Safety Hazards
Laser Radiation - These devices in operation produce invisible electromagnetic radiation which may be harmful to the human eye.



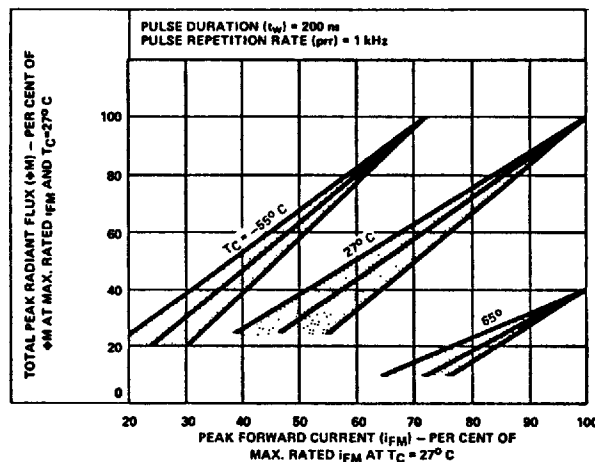
92LS-4350A

Figure 2 - Percent of Maximum Peak Forward Current vs Case Temperature For All Types



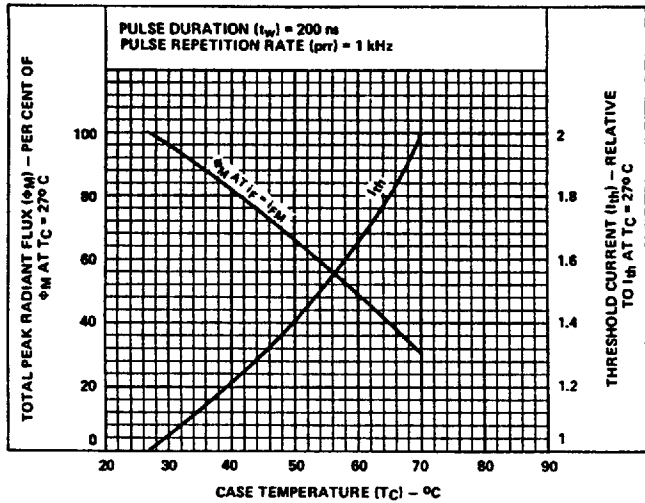
92LS-4845R3

Figure 1 - Relative Spectral Radiant Intensity vs Wavelength For All Types



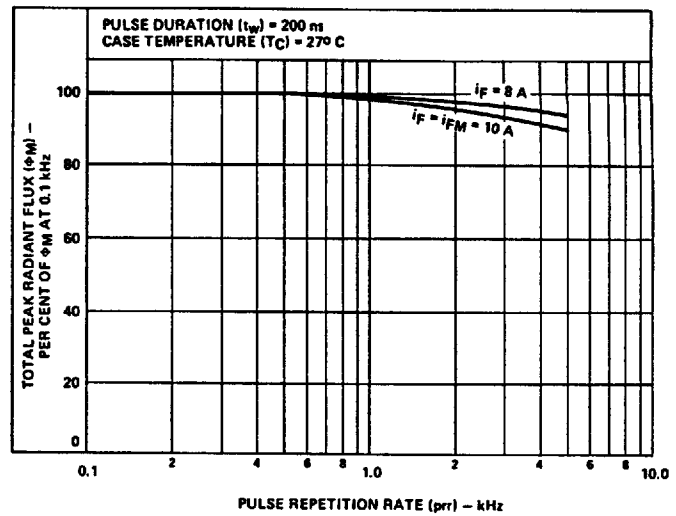
92LS-4352R3

Figure 3 - Typical Total Peak Radiant Flux vs Peak Forward Current For All Types



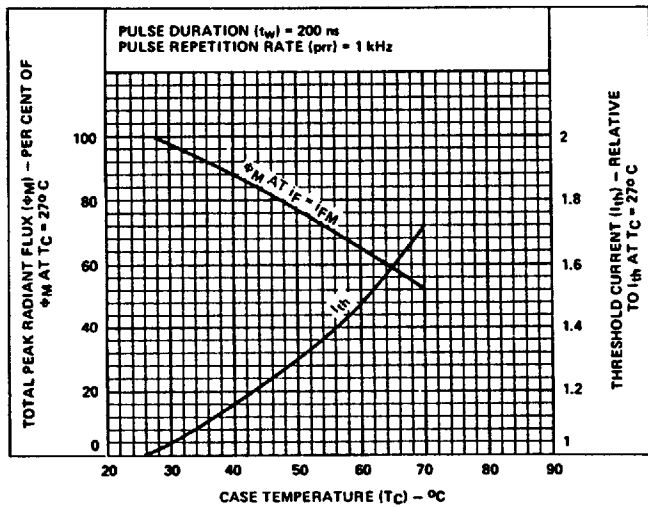
92LS-4351R2

Figure 4 - Typical Total Peak Radiant Flux And Threshold Current vs Case Temperature For Type SG2012A



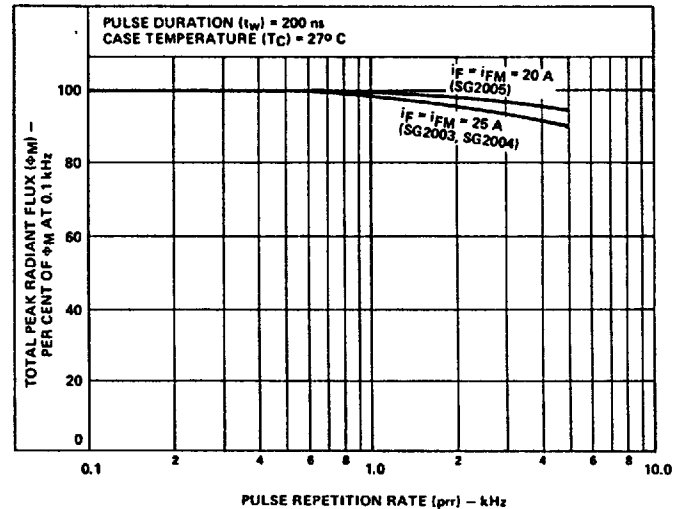
92LS-5514

Figure 6 - Typical Total Peak Radiant Flux vs Repetition Rate For Types SG2001A, and SG2002A



92LS-6513

Figure 5 - Typical Total Peak Radiant Flux And Threshold Current vs Case Temperature For All Types Except SG2012A



92LS-6515

Figure 7 - Typical Total Peak Radiant Flux vs Repetition Rate For Types SG2003A, SG2004A, and SG2005A

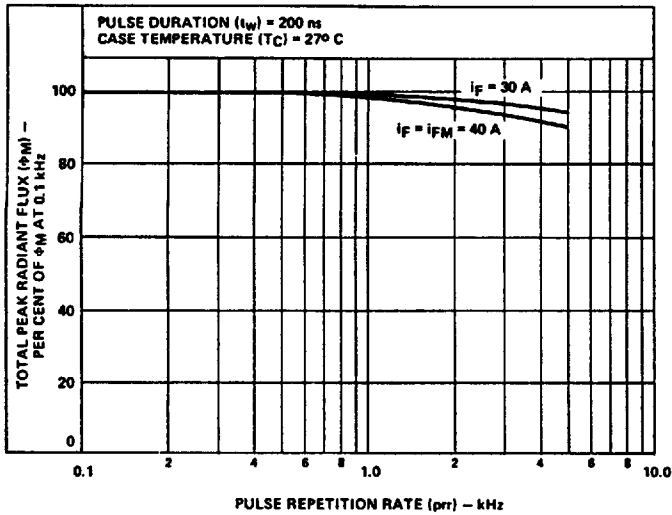


Figure 8 - Typical Total Peak Radiant Flux vs Repetition Rate For Types SG2006A, and SG2007A

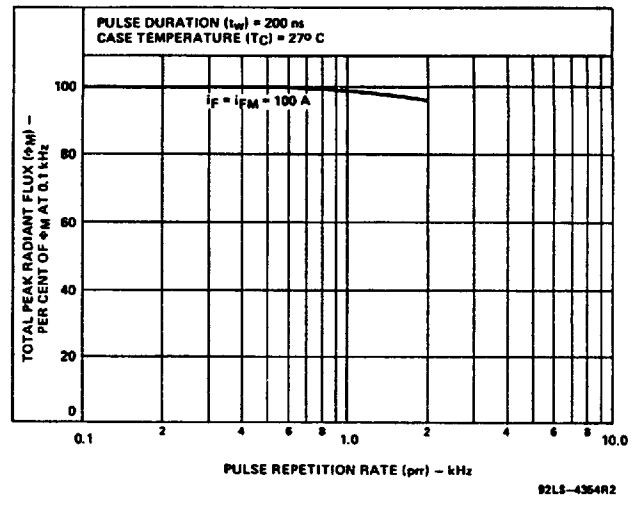


Figure 10 - Typical Total Peak Radiant Flux vs Repetition Rate For Type SG2012A

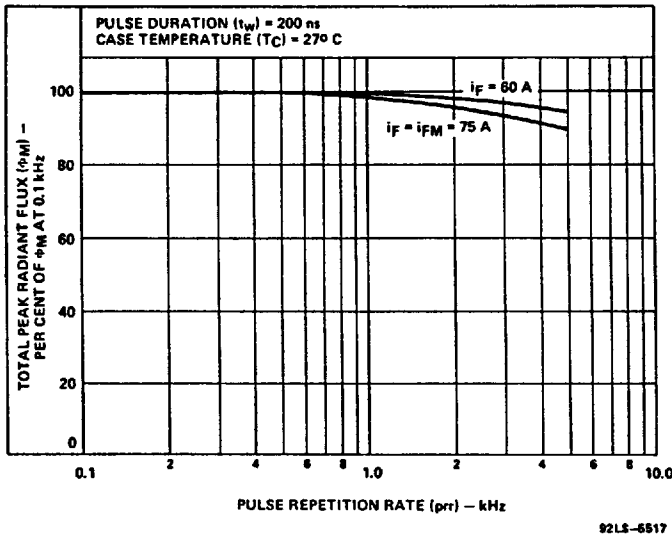


Figure 9 - Typical Total Peak Radiant Flux vs Repetition Rate For Types SG2009A, and SG2010A

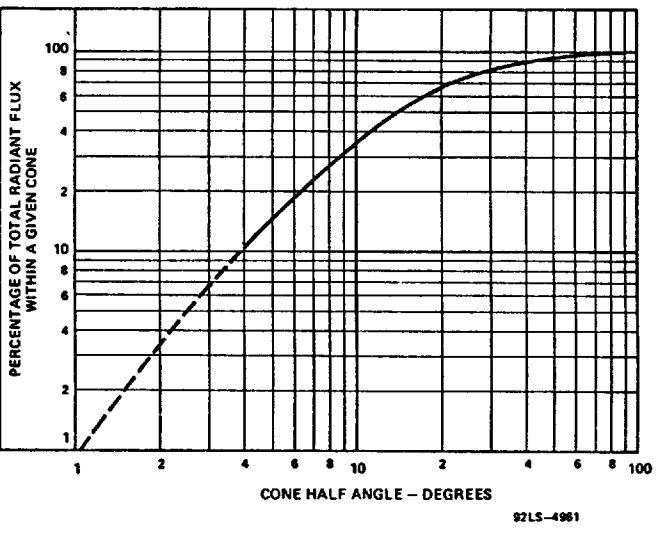


Figure 11 - Percentage of Total Radiant Flux Within A Given Cone Angle

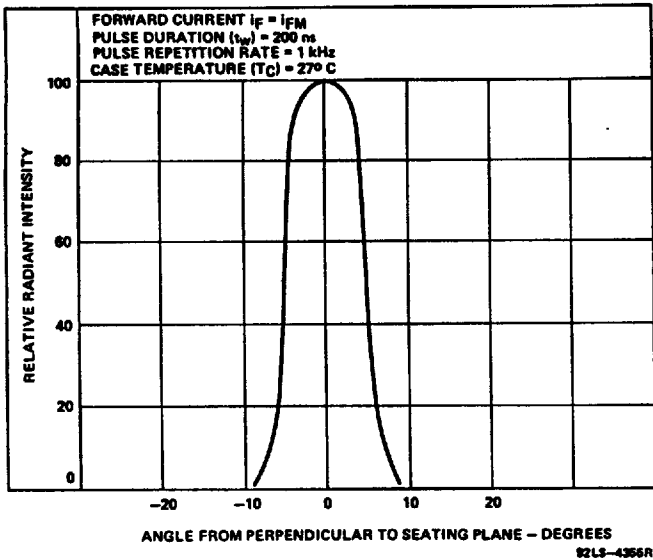


Figure 12 - Typical Radiation Pattern In The Plane Perpendicular To The Plane Of The Junction For All Types

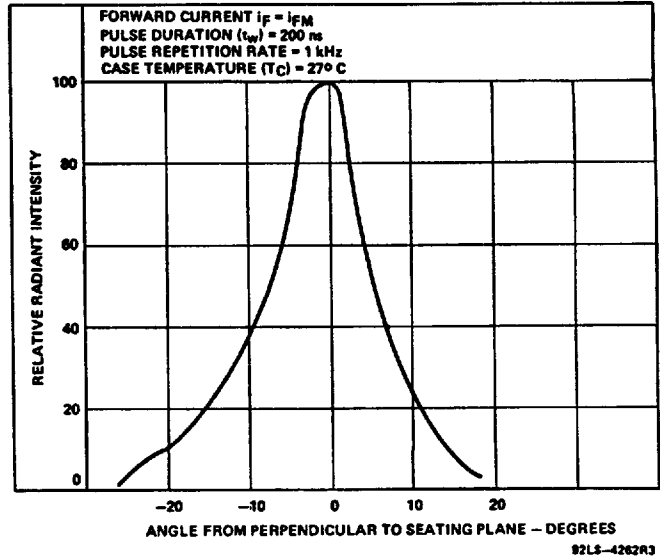


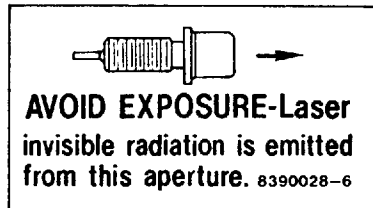
Figure 13 - Typical Radiation Pattern In The Plane Of The Junction For All Types

Because of the size of these devices, each of the labels shown below is attached to the individual laser-unit shipping container. They are illustrated here to comply with the requirements of DHHS standards under the Radiation Control for Health and Safety Act of 1968.

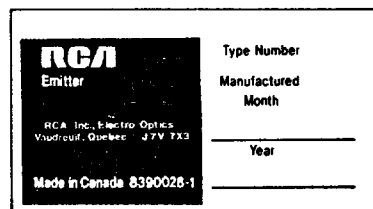


(**) The maximum accessible peak radiant flux output value, in watts, for each individual laser type, as specified in Table I, is entered in this position on the Warning and Certification Label.

Warning and Certification Label



Aperture Label



Identification Label

Table I

Maximum Peak Accessible Emission Levels (Power Output)

The maximum peak power output levels, to which human access is possible, are listed below for the specified laser devices. These values are the maximum **theoretical** levels of radiant flux output obtainable from the devices at 904 nanometers, the maximum permitted pulse duration of 200 nanoseconds, and the maximum permitted drive current. These radiant flux levels should not be considered as characteristic range limits; they are based on product design and include possible changes in device characteristics during life. Appropriate precautions should be taken to avoid harmful exposure.

Type No.	Maximum Peak Forward Current (Amperes)	Maximum Accessible Peak Radiant Flux Output (Watts)
SG2001A	10	9
SG2002A	10	9
SG2003A	25	18
SG2004A	25	18
SG2005A	20	18
SG2006A	40	27
SG2007A	40	27
SG2009A	75	48
SG2010A	75	48
SG2012A	100	72

In order to insure that this laser component meets the requirements of Class III b laser products, the device must not be operated outside of its maximum ratings. Power supplies (Laser energy sources) used with the component must be such that the maximum peak forward current can not be exceeded.

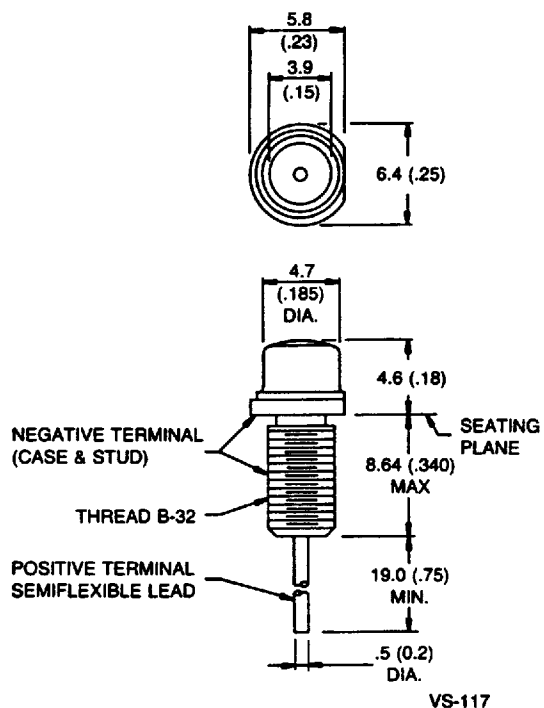


Figure 14 - Outline For All Types Except SG2012A

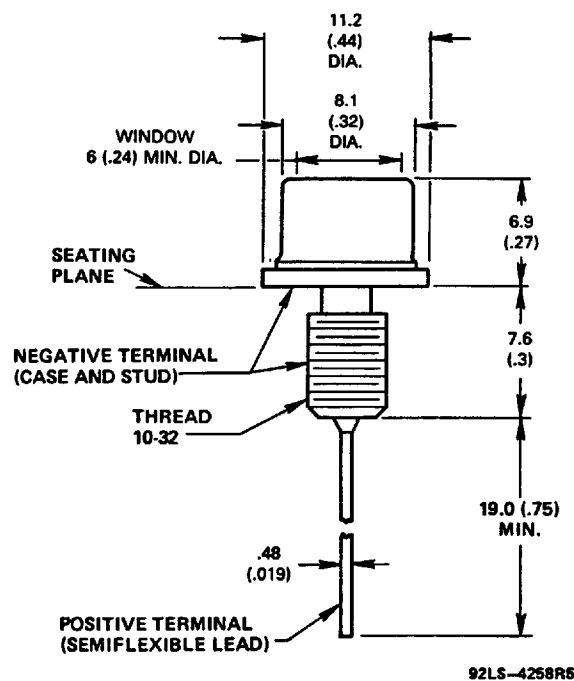


Figure 16 - Outline For Type SG2012A

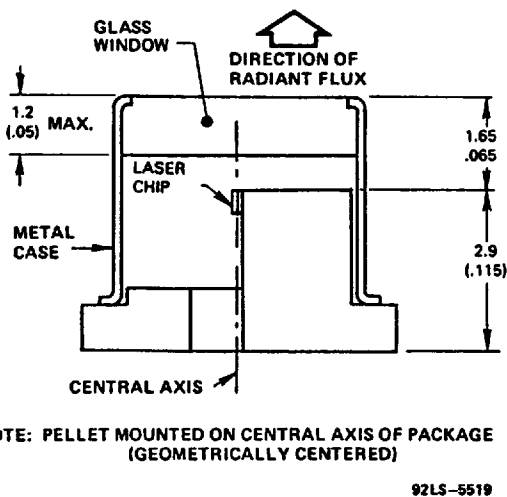


Figure 15 - Cross Section of RCA SG2000A Series (Except SG2012A) Showing Location Of Laser Chip

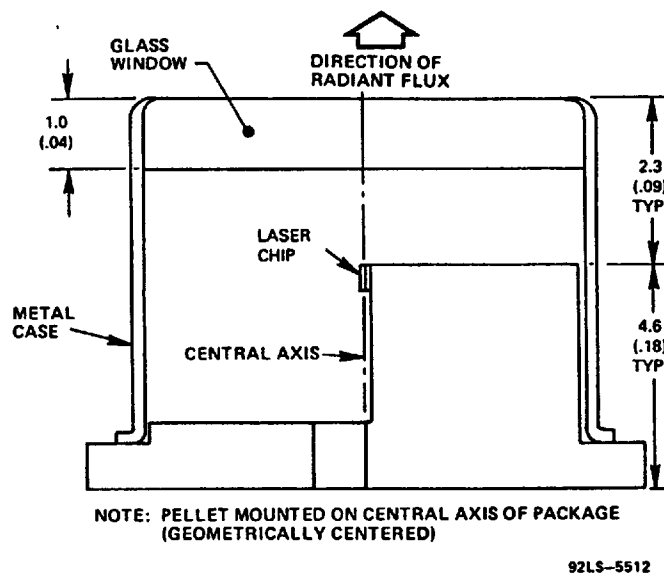


Figure 17 - Cross Section of RCA SG2012A Showing Location Of Laser Chip

Dimensions in millimeters. Dimensions in parentheses are in inches.