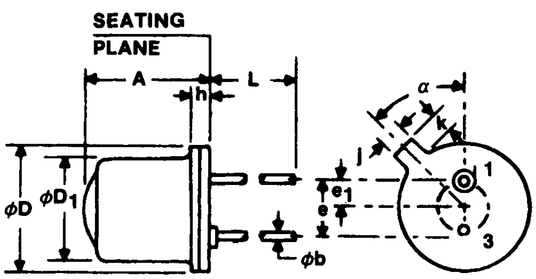
GaAs INFRARED EMITTING DIODE

1N6266

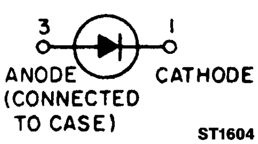
PACKAGE DIMENSIONS



ST1332

SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN.	MAX.	MIN.	MAX.	
A		.255		6.47	
φb	.016	.021	.407	.533	
φD	.209	.230	5.31	5.84	
$φD_1$	.180	.188	4.57	4.77	
e	.100 NOM.		2.54 NOM.		2
e_1	.050 NOM.		1.27 NOM.		2
h		.030		.76	
j	.031	.044	.79	1.11	
k	.036	.046	.92	1.16	1
L	1.00		25.4		
α	45°	45°	45°	45°	3

PACKAGE OUTLINE



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NOTES:
1. MEASURED FROM MAXIMUM DIAMETER OF DEVICE.
2. LEADS HAVING MAX. DIAMETER .021″ (.533mm) MEASURED IN GAUGING PLANE .054″ + .001″ − .000 (137 + 025 − 000mm) BELOW THE REFERENCE PLANE OF THE DEVICE SHALL BE WITHIN .007″ (.778mm) THEIR TRUE POSITION RELATIVE TO A MAXIMUM WIDTH TAB.
3. FROM CENTERLINE TAB.

DESCRIPTION

The 1N6266 is a 940nm LED in a narrow angle, T0-46 package.

FEATURES

- Good optical to mechanical alignment
- Mechanically and wavelength matched to TO-18 series phototransistor
- Hermetically sealed package
- High irradiance level
- (*) indicates JEDEC registered values

QT OPTOELECTRONICS

GaAs INFRARED EMITTING DIODE

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C Unless Otherwise Specified)

*Storage Temperature .... −65°C to +150°C
Operating Temperature .... −65°C to +125°C
*Soldering:
*Lead Temperature (Iron) .... 240°C for 5 sec.[3,4,5,6]
*Lead Temperature (Flow) .... 260°C for 10 sec.[3,4,6]
*Continuous Forward Current .... 100 mA
*Forward Current (pw, 1μS; 200 Hz) .... 10 A
*Reverse Voltage .... 3 Volts
*Power Dissipation (T_A = 25°C) .... 170 mW[1]
Power Dissipation (T_C = 25°C) .... 1.3 W[2]

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless Otherwise Specified)
(All measurements made under pulse conditions.)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Forward Voltage	V_F	—		1.7	V	I_F = 100 mA
*Reverse Leakage Current	I_R	—		10	μA	V_R = 3 V
*Peak Emission Wavelength	λ_p	935		955	nm	I_F = 100 mA
Emission Angle at ½ Power	θ	—	±10	—	Degrees	
*Radiant Intensity	Ie	25		—	mW/sr	I_F = 100 mA
Rise Time 0-90% of output	t_r	—	1.0	—	μS	
Fall Time 100-10% of output	t_f	—	1.0	—	μS	

NOTES

1. *Derate power dissipation linearly 1.70 mW/°C above 25°C ambient.*
2. *Derate power dissipation linearly 13.0 mW/°C above 25°C case.*
3. *RMA flux is recommended.*
4. *Methanol or Isopranol alcohols are recommended as cleaning agents.*
5. *Soldering iron tip 1/16″ (1.6 mm) minimum from housing.*
6. *As long as leads are not under any stress or spring tension.*

MAXIMUM RATING CURVES

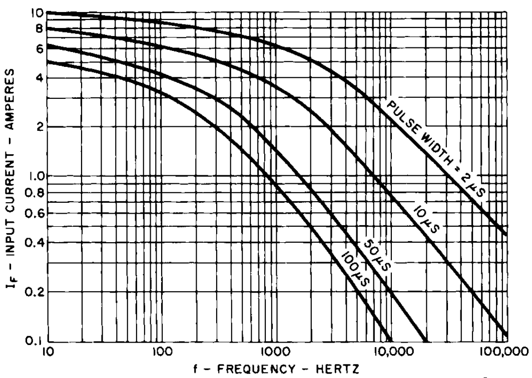

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Fig. 1. Maximum Pulse Capability

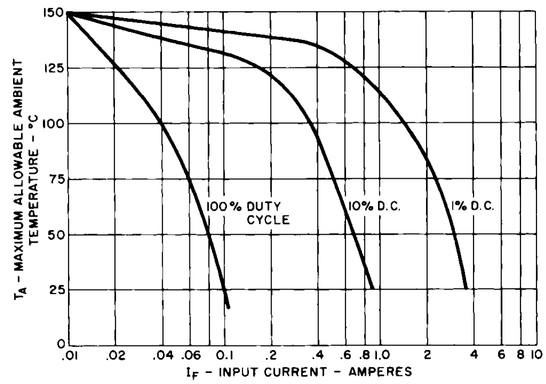

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Fig. 2. Maximum Temperature vs. Input Current

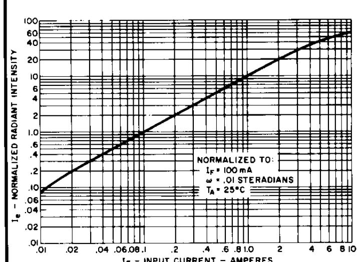

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Fig. 3. Radiant Intensity vs. Input Current ΔIe/ΔI

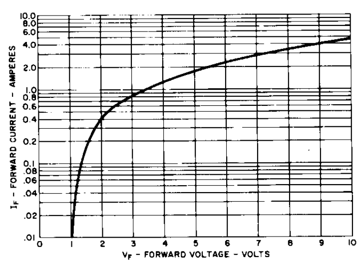

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Fig. 4. Forward Voltage vs. Forward Current

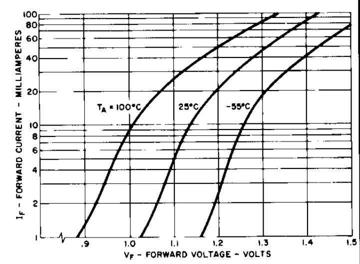

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Fig. 5. Forward Voltage vs. Forward Current

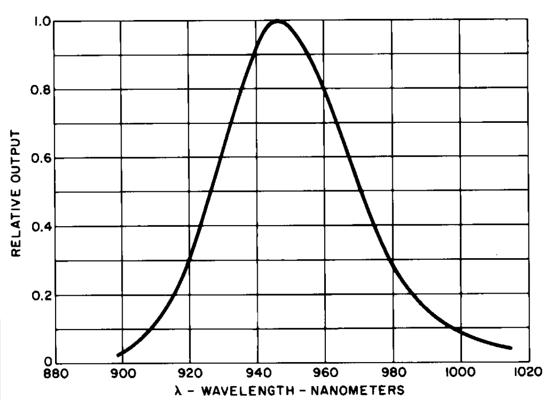

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Fig. 6. Spectral Output

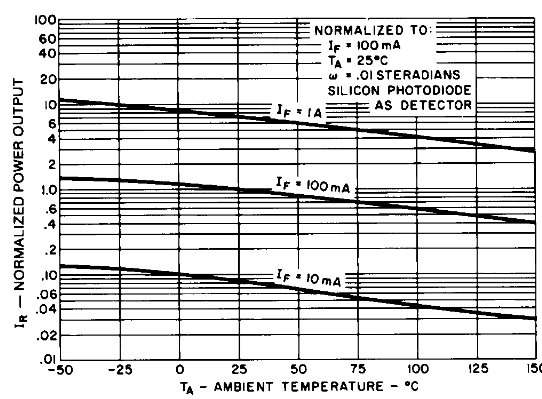

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Fig. 7. Output vs. Temperature

INFRARED EMITTING DIODE RADIANT INTENSITY

The design of an Infrared Emitting Diode (IRED)-photodetector system normally requires the designer to determine the minimum amount of infrared irradiance received by the photodetector, which then allows definition of the photodetector current. Prior to the introduction of the 1N6266, the best method of estimating the photodetector received infrared was to geometrically proportion the piecewise integration of the typical beam pattern with the specified minimum total power output of the IRED. However, due to the inconsistencies of the IRED integral lenses and the beam lobes, this procedure will not provide a valid estimation.

The 1N6266 now provides the designer specifications which precisely define the infrared beam along the device's mechanical axis. The 1N6266 is a premium device selected to give a minimum radiant intensity of 25 mW/steradian into the 0.01 steradians referenced by the device's mechanical axis and seating plane. Radiant intensity is the IRED beam power output, within a specified solid angle, per unit solid angle.

A quick review of geometry indicates that a steradian is a unit of solid angle, referenced to the center of a sphere, defined by 4π times the ratio of the area projected by the solid angle to the area of the sphere. The solid angle is equal to the projected area divided by the squared radius.

$$\text{Steradians} = 4\pi\, A/4\pi R^2 = A/R^2 = \omega.$$

As the projected area has a circular periphery, a geometric integration will solve to show the relationship of the Cartesian angle (α) of the cone, (from the center of the sphere) to the projected area.

$$\omega = 2\pi\,(1 - \cos\tfrac{\alpha}{2}).$$

Radiant intensity provides an easy, accurate tool to calculate the infrared power received by a photodetector located on the IRED axis. As the devices are selected for beam characteristics, the calculated results are valid for worst case analysis. For many applications a simple approximation for photodetector irradiance is:

$$H \cong I_e/d^2, \text{ in mw/cm}^2$$

where d is the distance from the IRED to the detector in cm.

IRED power output, and therefore I_e, depends on IRED current. This variation ($\Delta I_e/\Delta I$) is documented in Figure 1, and completes the approximation: $H = I_e/d^2\,(\Delta I_e/\Delta I)$. This normally gives a conservative value of irradiance. For more accurate results, the effect of precise angle viewed by the detector must be considered. This is documented in Figure 2 ($\Delta I_e/\Delta\omega$) giving:

$$H = I_e/d^2\,(\Delta I_e/\Delta I) \text{ in mw/cm}^2.$$

For worst case designs, temperature coefficients and tolerances must also be considered.

The minimum output current of the detector (I_L) can be determined for a given distance (d) of the detector from the IRED.

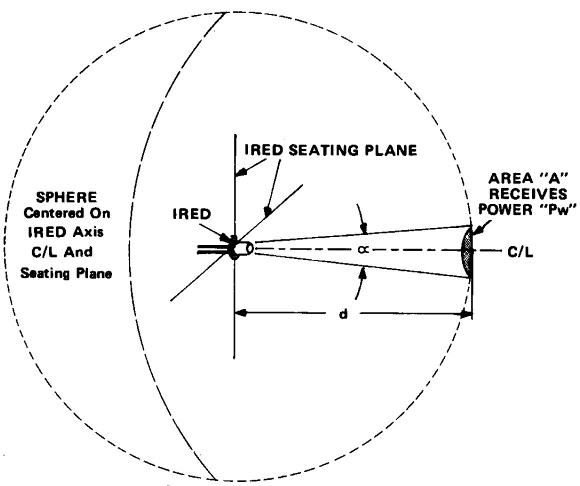
$$I_L = (S)H \cong (S)I_e/d^2$$

or

$$I_L = (S)H = (S)\,(I_e/d^2)\,(\Delta I_e/\Delta\omega)\,(\Delta I_e/\Delta I)$$

where S is the sensitivity of the detector in terms of output current per unit irradiance from a GaAs source.

IRED RADIANT INTENSITY SPECIFICATION CONCEPT



$\omega = A/d^2 = 2\pi\ (1 - \cos\frac{\alpha}{2})$ Steradians

$I_e = Pw/\omega$ mW/Steradian

$H = Pw/A = I_e/d^2$ mW/cm²

MATCHING A PHOTOTRANSISTOR WITH 1N6266

Assume a system requiring a 10mA I_L at an IRED to detector spacing of 2cm (seating plane to seating plane), with bias conditions at specification points.

Given: $d_1 = 2$ cm; $I_{L_1} = 10$ mA min.; Ie = 25 mW/Steradian

Then: $H_1 \cong Ie/D_1{}^2 = 25/(2)^2 = 6.25$ mW/cm².

Detector Evaluation:

TYPE	I_L MIN. @ mA	H (Tungsten) mw/cm²	≅	H(GaAs) mw/cm²	S(GaAs) mA/mw/cm²
L14G1	6	10		3	2
L14G2	3	10		3	1

Calculated $I_L = d_1$ is:

L14G1 (S) H_1 = (2) 6.25 = 12.5 mA

L14G2 (S) H_1 = (1) 6.25 = 6.25 mA

Since the system requires an I_L of 10 mA minimum the correct device to use is the L14G1.

TYPICAL CHARACTERISTICS

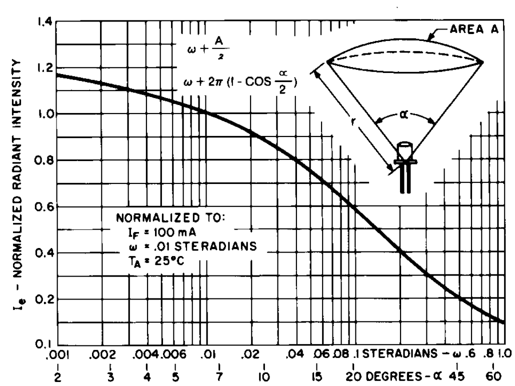


Fig. 1 Intensity and Power vs. Angle
Δ Ie/Δω

TYPICAL CHARACTERISTICS

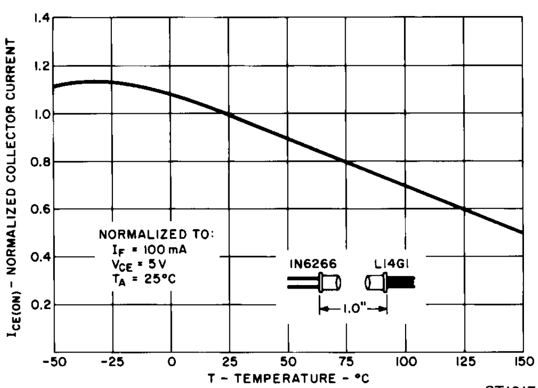


Fig. 2. Output vs. Temperature IRED/Phototransistor Pair

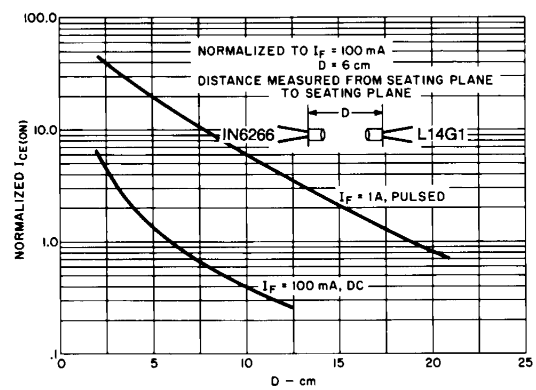


Fig. 3. I_L vs. Distance IRED/Phototransistor Pair