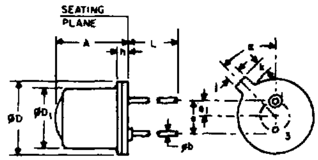
1N6266

Infrared Emitter
Gallium Arsenide Infrared Emitting Diode

The 1N6266 is a gallium-arsenide, infrared emitting diode which emits non-coherent, infrared energy with a peak wavelength of 940 nanometers. This device is characterized to precisely define the infrared beam along the mechanical axis of the device.



SYMBOL	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX.	NOTES
A		255		6.47	
øb	016	021	.407	533	
øD	209	230	5.31	584	
øD1	.180	.188	4.57	4.77	
e	100NOM		2 54NOM		2
e1	.050NOM.		1 27NOM		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°		3

absolute maximum ratings: (T_A = 25°C unless otherwise specified)

Voltages

*Reverse Voltage	V_R	3	Volts

Currents

*Forward Current (Continuous)	I_F	100	mA
*Forward Current (pw 1 μsec 200Hz)	I_F	10	A

Dissipation

*Power Dissipation (T_A = 25°C) †	P_T	170	mWatts
Power Dissipation (T_C = 25°C) ††	P_T	1.3	Watts

Temperatures

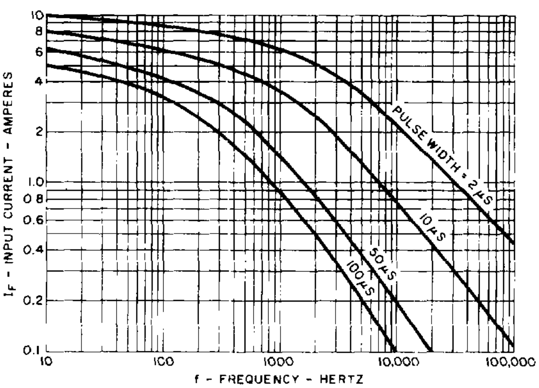
*Junction Temperature	T_J	-65 to +150	°C
*Storage Temperature	T_{STG}	-65 to +150	°C
*Lead Soldering Time (1/16", 1.6mm, from case for 10 sec.)	T_L	+260	°C

†Derate 1.36mW/°C above 25°C ambient.
††Derate 10.4mW/°C above 25°C case.

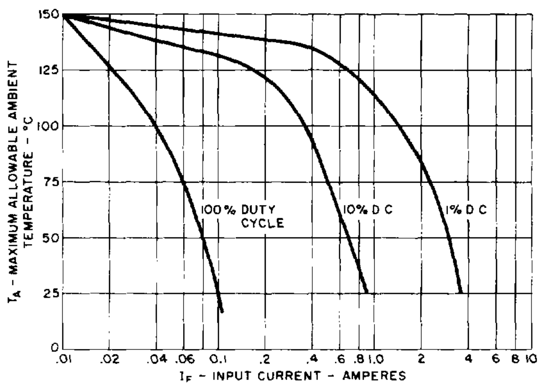
*Indicates JEDEC registered values.

1. Measured from maximum diameter of device.
2. Leads having max. diameter .021" (.533mm) measured in gaging 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.

MAXIMUM RATING CURVES



MAXIMUM PULSE CAPABILITY



MAXIMUM TEMPERATURE VS. INPUT CURRENT

electrical characteristics: (T_A = 25°C unless otherwise specified)

Static Characteristics	SYMBOL	MIN.	TYP.	MAX.	UNITS
*Reverse Leakage Current (V_R = 3V)	I_R	–	–	10	μA
*Forward Voltage (I_F = 100 mA)	V_F	0.9	–	1.7	Volts
*Radiant Intensity (I_F = 100 mA, ω = 0.01 Sr)	I_e	25	–	–	mW/sr
*Peak Emission Wavelength (I_F = 100 mA)	λ_p	935	–	955	nm
Spectral Shift with Temperature		–	.28	–	nm/°C
*Spectral Bandwidth – 50%	$\Delta\lambda$	–	–	60	nm
*Half Intensity Beam Angle	θ_{HI}	–	–	20	deg.
Rise Time	t_r	–	1.0	–	μs
Fall Time	t_f	–	1.0	–	μs

*Indicates JEDEC registered values.

I_e
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.

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

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.

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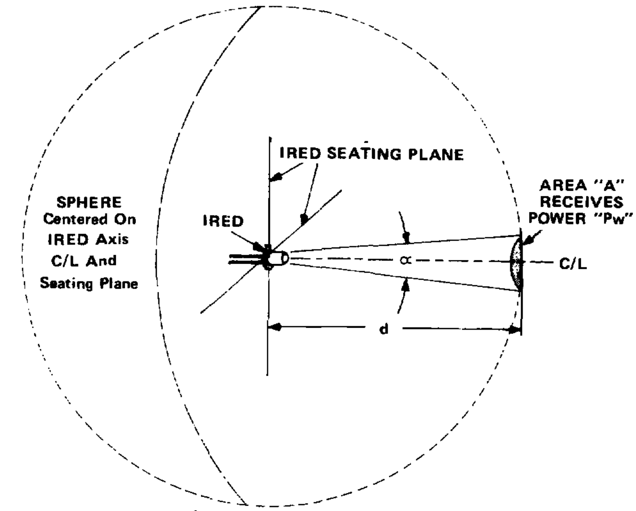
IRED RADIANT INTENSITY SPECIFICATION CONCEPT



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

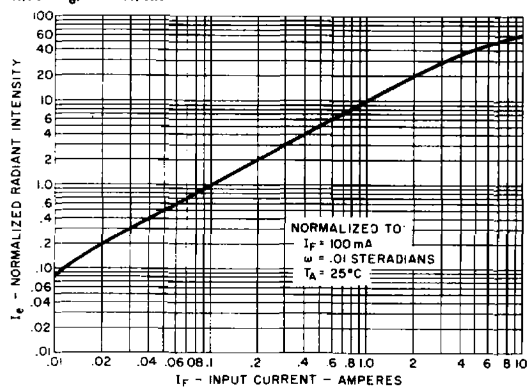
Calculated $I_L = d_1$ is:

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

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

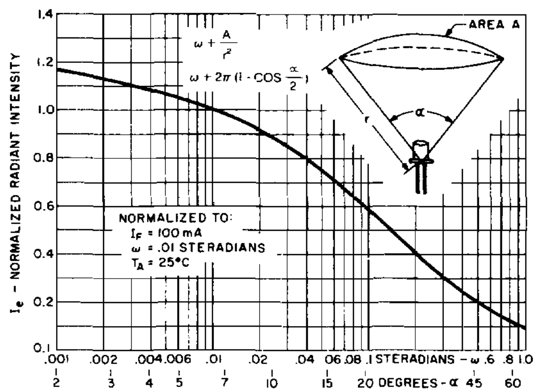
Since the system requires an I_L of 10 mA minimum the correct device to use is the L14G1.

TYPICAL CHARACTERISTICS



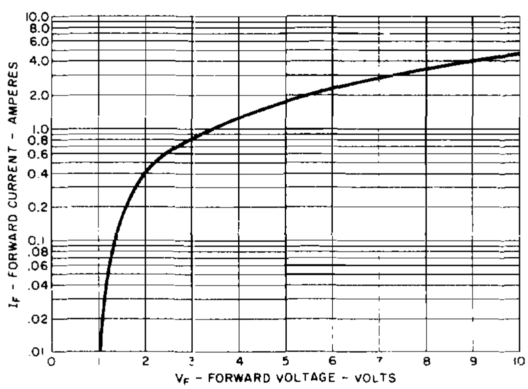
1. RADIANT INTENSITY VS. INPUT CURRENT

Δ Ie/ΔI

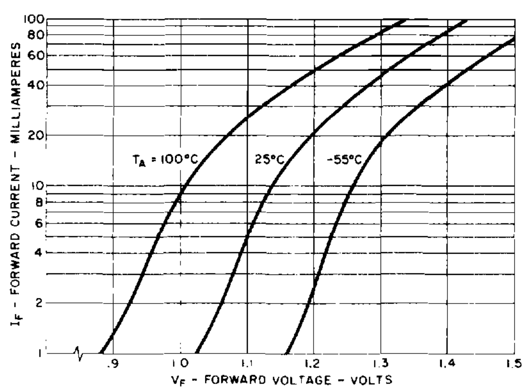


2. INTENSITY AND POWER VS. ANGLE

Δ Ie/Δω



3. FORWARD VOLTAGE VS. FORWARD CURRENT



4. FORWARD VOLTAGE VS. FORWARD CURRENT

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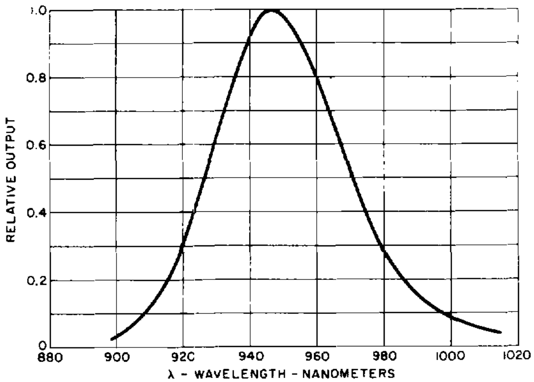
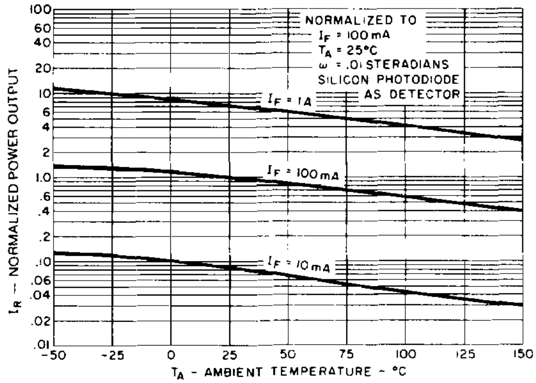
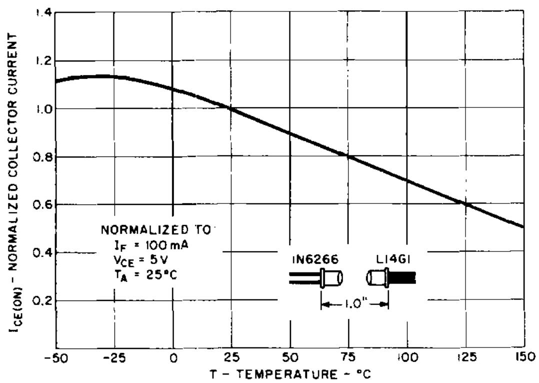
TYPICAL CHARACTERISTICS



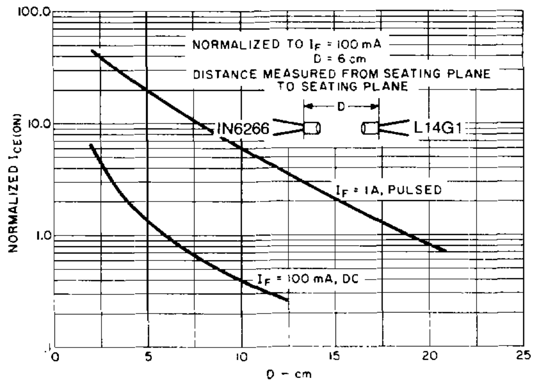
5. SPECTRAL OUTPUT



6. OUTPUT VS. TEMPERATURE

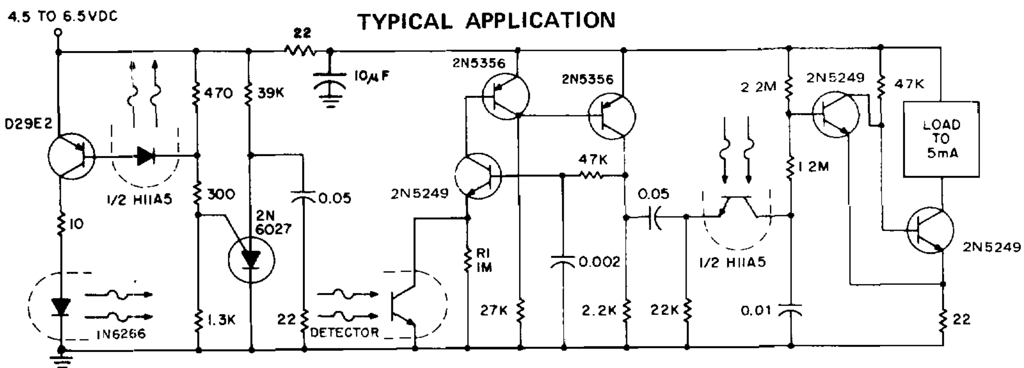


7. OUTPUT VS. TEMPERATURE IRED/PHOTOTRANSISTOR PAIR



8. IL VS. DISTANCE IRED/PHOTOTRANSISTOR PAIR

TYPICAL APPLICATION



DETECTOR SELECTION	TRANSMISSION RANGE	REFLECTIVE RANGE
L14Q1	12"	3"
L14G3	48"	12"

OBJECT DETECTOR FEATURING LOW POWER CONSUMPTION AND LONG-RANGE CAPABILITY.

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