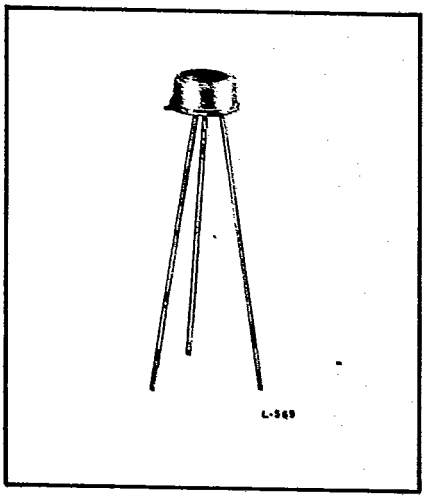
RCA Electro Optics and Devices

Photodiode

Developmental Type

C30900E

T-41-53



P-Type Silicon p-i-n Photodetector

- **Wide Range of Operating Voltage — 0 to 90 volts**
- **Anti-Reflection Coated to Enhance Responsivity at 900 nm**
- **Hermetically-Sealed Package**
- **Spectral Response Range — (10% points) 400 to 1100 nm**

RCA Developmental Type C30900E is a p-type silicon p-i-n photodiode designed for use in a variety of broadband low light level applications covering the spectral from about 400 to 1100 nanometers.

This device has a hermetically-sealed package and incorporates a guard ring in its structure to minimize surface leakage current.

The C30900E may be operated satisfactorily over a wide range of applied voltage with capacitance, speed of response, and dark current being functions of applied operating voltage.

The C30900E is anti-reflection coated to enhance its responsivity at 900 nm making the device highly useful for GaAs and HeNe laser detection as well as for optical communication and intrusion alarm systems.

Maximum Ratings, Absolute-Maximum Values

DC Reverse Operating Voltage, V_R	200 max.	V
Photocurrent Density, j_p, at 22° C:		
Average value, continuous operation	5	mA/mm²
Peak value	20	mA/mm²
Forward Current, I_F:		
Average value, continuous operation	10 max.	mA
Peak value	100 max.	mA
Maximum Total Power Dissipation at 22° C	0.5 max.	W
Ambient Temperature:		
Storage, T_{stg}	−60 to +100	°C
Operating, T_A	−40 to +80	°C
Soldering:		
For 5 seconds	200	°C

Mechanical Characteristics

Photosensitive Surface:

Shape	Circular	
Area	5	mm²
Diameter	2.52	mm

Optical Characteristics

Field of View:[a] (See Figure 5)

Full angle (α) for totally illuminated photosensitive surface	70	deg
Full angle (α') for partially illuminated photosensitive surface	120	deg

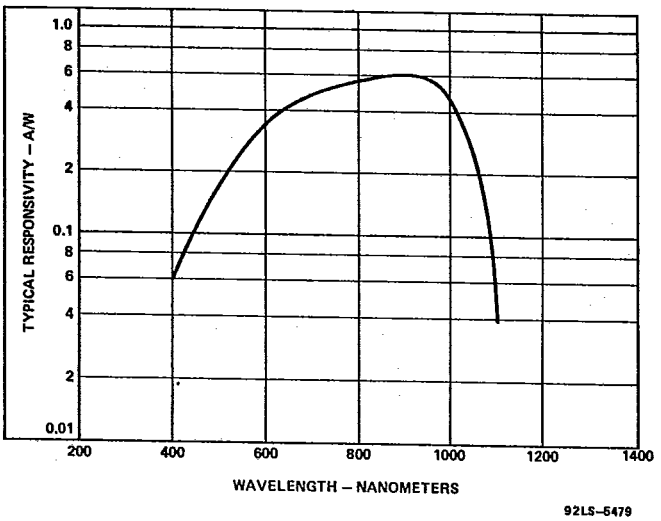


Figure 1 — Typical Spectral Responsivity Characteristic

For further information or application assistance on these devices, contact your RCA Sales Representative or Photodetector Marketing, RCA, Ste. Anne de Bellevue, Quebec, Canada H9X 3L3 (514) 457-9000.

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C30900E

Electrical Characteristics at T_A = 22° C	At V_R = 90 volts[b], unless otherwise specified.			Units
	Min.	Typ.	Max.	
Breakdown Voltage, V_{BR}	—	150	—	V
Responsivity:				
At 900 nm	0.5	0.6	—	A/W
Quantum Efficiency:				
At 900 nm	70	83	—	%
Dark Current, I_d:				
At V_R = 10 V	—	$1x10^{-8}$	$5x10^{-8}$	A
At V_R = 90 V	—	$1x10^{-7}$	$1.5x10^{-7}$	A
Noise Current, i_n:				
f = 1000 Hz, Δf = 1.0 Hz See Figure 3	—	$3x10^{-13}$	$7x10^{-13}$	$A/Hz^{1/2}$
Noise Equivalent Power (NEP):				
f = 1000 Hz, Δf = 1.0 Hz				
At 900 nm	—	$5x10^{-13}$	$1.4x10^{-12}$	$W/Hz^{1/2}$
Capacitance, C_d See Figure 4	—	5	7	pF
Channel Resistance	1	—	—	MΩ
Rise Time, t_r:				
R_L = 50 Ω, λ = 900 nm, 10% to 90% points	—	6	10	ns
Fall Time:				
R_L = 50 Ω, λ = 900 nm, 90% to 10% points	—	7	25	ns

a The values specified for field of view are approximate and are critically dependent on the dimensional tolerances of the package component parts.

b The recommended reverse operating voltage V_R at T_A = 22° C is 90 volts. However, when the devices are operated in the photovoltaic mode, i.e., at V_R = 0 volts, some of the electrical characteristics will differ from those shown.

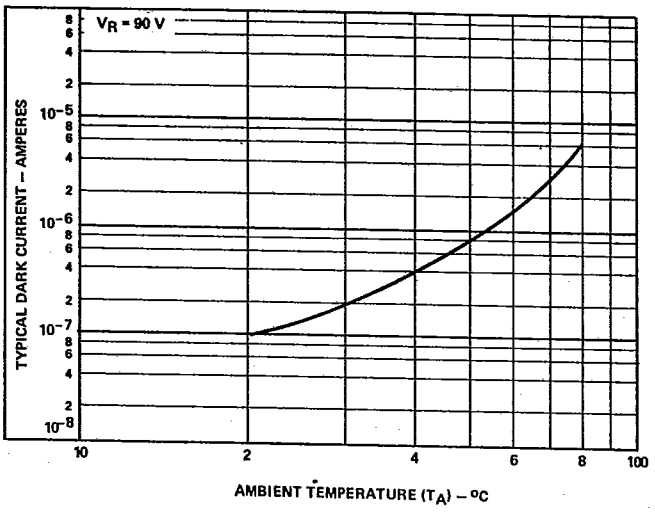


Figure 2 — Typical Dark Current vs Ambient Temperature

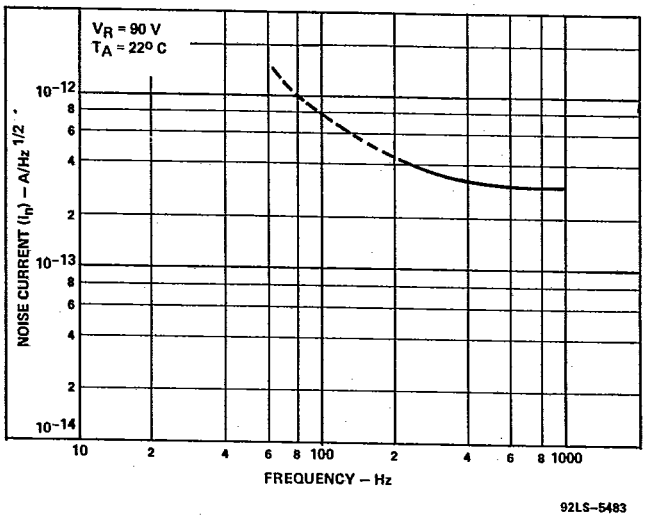


Figure 3 — Typical Noise Current vs Frequency

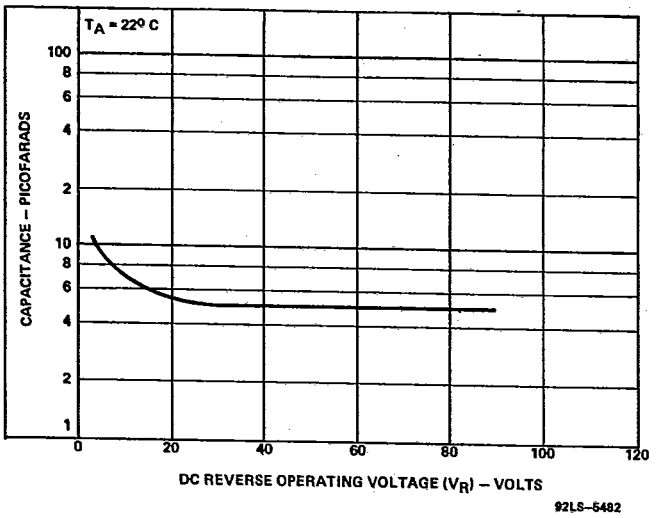
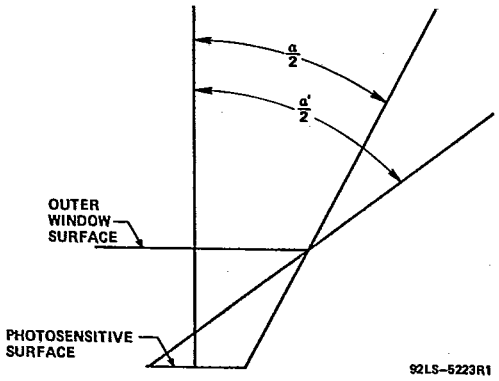


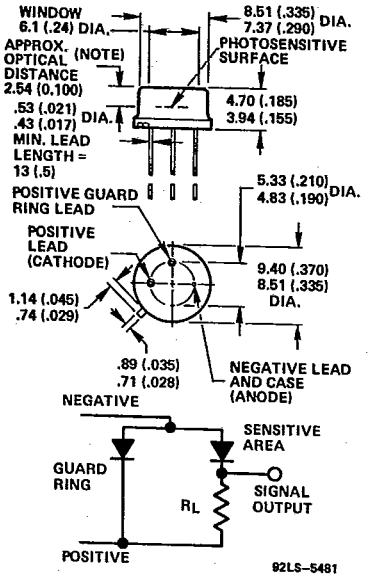
Figure 4 — Typical Photodetector Capacitance vs Operating Voltage



For incident radiation at angles $\leq \frac{a}{2}$, the photosensitive surface is totally illuminated.

For incident radiation at angles $> \frac{a}{2}$ but $\leq \frac{a'}{2}$, the photosensitive surface is partially illuminated.

Figure 5 — Definition of Half-Angle Approx. Field-of-View. (Scale is exaggerated for clarity)



Low-Profile TO-5 Package

Dimensions in millimeters. Dimensions in parentheses are in inches.

Note: Optical distance is defined as the distance from the surface of the silicon chip to the front surface of the window.

Figure 6 — Dimensional Outline