

- Spectral response range - 1100 to 1700 nm
- High responsivity
- Low capacitance
- Fast response time
- Low dark current and noise
- Available in a variety of convenient packages

RCA's new low capacitance, high speed InGaAs photodetectors offer improved passivation and contact technologies to provide lower dark current and noise with negligible series resistance. 200°C purging, extended lifetest and periodic qualification programs assure high quality, reliable devices ideally suited for today's demanding electro-optics and communications industries.

Absolute Maximum Ratings¹

| | | C30616 | | | C30637 | | | C30617 | | | UNITS | |
|-----------------------------|-----------|------------------------|------|------|--------|------|------|--------|------|------|-------|----|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | | |
| Forward Current | I_F | | | 5 | | | 5 | | | 5 | mA | |
| Total Power Dissipation | P_T | | | 25 | | | 50 | | | 100 | mW | |
| Ambient Temper.: Storage | T_{STG} | CER E EQC EFC | -60 | | +125 | -60 | | +125 | -60 | | +125 | °C |
| | | | | | | | | | -60 | | +125 | °C |
| | | | | | | | | | -40 | | +80 | °C |
| Operating | T_A | CER E EQC EFC | -40 | | +80 | -40 | | +80 | -40 | | +80 | °C |
| | | | | | | | | | -40 | | +80 | °C |
| | | | | | | | | | -40 | | +70 | °C |
| Soldering (10s) | T_{sd} | (All) | | 250 | | 250 | | 250 | | 250 | °C | |

¹ These are limiting values of operating and environmental conditions. Exceeding these values can cause damage to the device.

Electrical Characteristics
 ($T_A = 25^\circ\text{C}$, $V_r = -5\text{V}$)

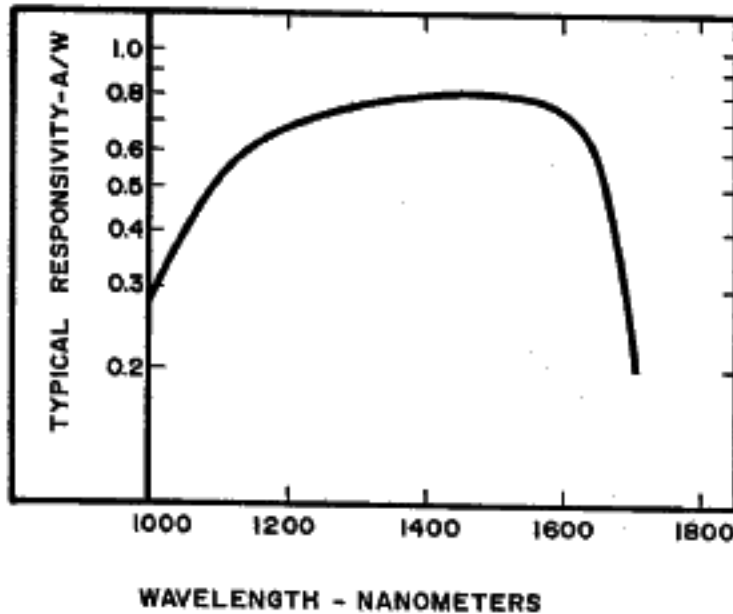
| | Sym. Pkg. | C30616 | | | C30637 | | | C30617 | | | UNITS |
|--|--------------------------|--------|----------|------|--------|----------|------|--------|----------|------|----------------------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| Operating Voltage | V_r (all) | 1 | 5 | 10 | 1 | 5 | 10 | 1 | 5 | 10 | V |
| Breakdown Voltage | V_b (all) | 20 | 50 | | 20 | 50 | | 20 | 50 | | V |
| Responsivity at 1300 nm | $R_{1.3}$ CER | .80 | .86 | | .80 | .86 | | .80 | .86 | | A/W |
| | E | | | | | | | .78 | .84 | | A/W |
| | EQC | | | | | | | .73 | .79 | | A/W |
| | EFC (mono mode fiber) | | | | | | | .73 | .79 | | A/W |
| Responsivity at 1550 nm | $R_{1.55}$ CER | .85 | .90 | | .85 | .90 | | .85 | .90 | | A/W |
| | E | | | | | | | .83 | .88 | | A/W |
| | EQC | | | | | | | .80 | .85 | | A/W |
| | EFC (mono mode fiber) | | | | | | | .80 | .85 | | A/W |
| Reverse Dark Current | I_d (all) | | <1 | 2 | | <1 | 3 | | 1 | 4 | nA |
| | | | | | | | | | | | |
| Noise Current ($f = 10$ kHz, $\Delta f = 1.0$ Hz) | I_n (all) | | <.05 | .15 | | <.05 | .15 | | <.05 | .15 | pA/Hz ^{1/2} |
| Capacitance | C CER | | .35 | .55 | | .4 | .6 | | .5 | .7 | pF |
| | E | | | | | | | | .8 | 1.0 | pF |
| | EQC | | | | | | | | .8 | 1.0 | pF |
| | EFC | | | | | | | | .8 | 1.0 | pF |
| Rise Time (10%-90%) | t_r (all) | | .1 | .5 | | .1 | .5 | | .1 | .5 | ns |
| Fall Time (90%-10%) | t_f (all) | | .1 | .5 | | .1 | .5 | | .1 | .5 | ns |
| Chip Photosensitive Surface Shape | (all) | | Circular | | | Circular | | | Circular | | mm ² |
| Useful Area | (all) | | .002 | | | .004 | | | .008 | | mm ² |
| Useful Diameter | (all) | | 50 | | | 75 | | | 100 | | μm |

Reliability and Quality Assurance:

RCA has implemented several programs to assure the highest quality and reliability.

These include:

- 200°C Burn-In:** All RCA InGaAs PIN photodiodes are subjected to 200°C at -10V bias for 16 hours to eliminate any weak units.
- Lifetest:** Before a wafer is sourced for production, a sample lot is first tested at 200°C for 500 hours, ensuring a MTTF of at least 10^7 hours at 50°C ($E_a = .7\text{eV}$). Extended lifetesting of random samples show that the typical MTTF at 50°C is greater than 10^9 hours.
- Periodic Qualification:** Process control is maintained by annual requalification testing of production samples. These tests include extensive electrical, thermal and mechanical stress as well as extended lifetest.



VC-100 RI

Figure 1 - Typical Spectral Responsivity

The useful spectral range of the InGaAs photodiode is determined by the bandgaps of the semiconductors used in the heterostructure. This InP / InGaAs structure provides a high quantum efficiency of near 80% in the wavelength range of 1150 nm to 1650 nm.

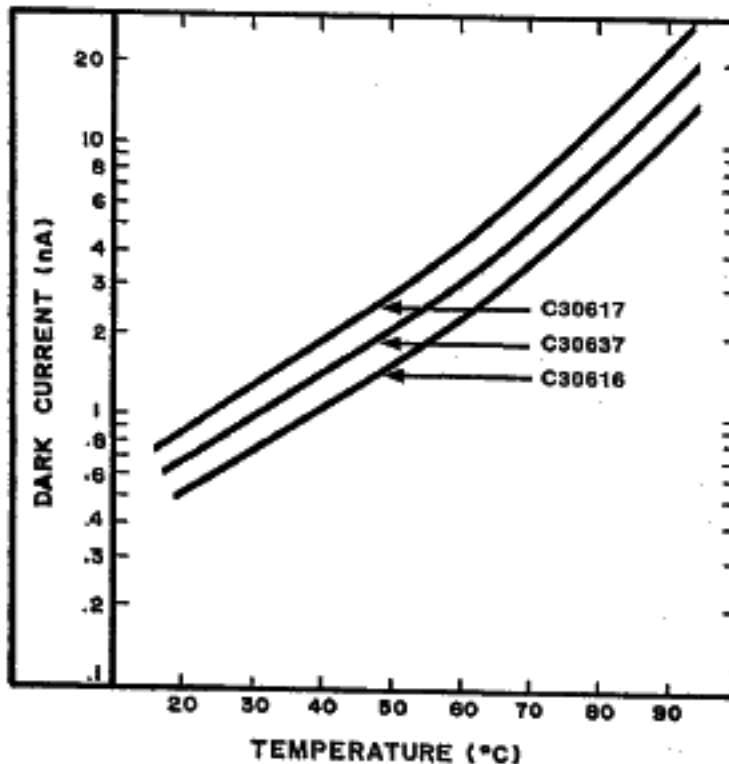
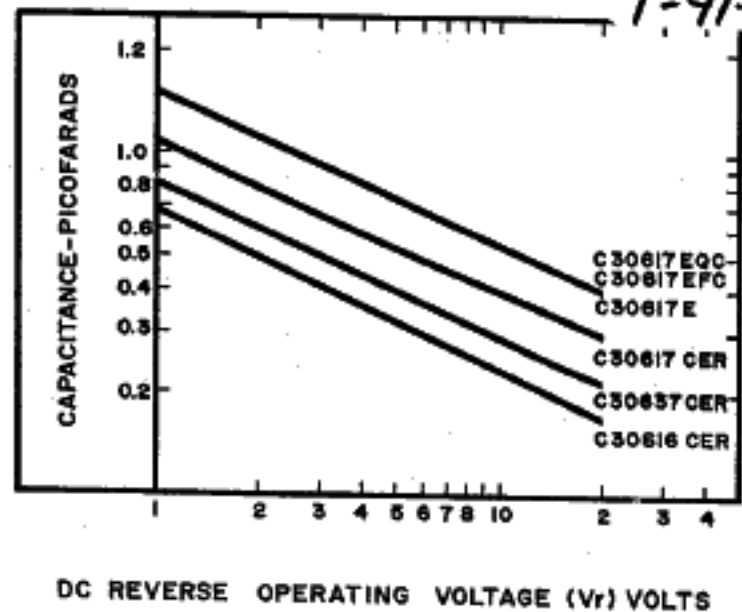


Figure 3 - Typical Photodiode Dark Current

In the temperature range of interest, the reverse bias dark current has two contributions. The surface current, dominant at low temperature, is kept to a minimum by RCA's advanced passivation process. The bulk current, dominant at higher temperatures, is also exceptionally low due to the high quality of RCA's VPE grown heterostructure.



VC-130

Figure 2 - Typical Photodetector Capacitance

The total device capacitance is a sum of the diode capacitance and that of the package. RCA's high purity semiconductor material produces diodes with a capacitance of about $5 \text{ nF} / \text{cm}^2$ at -5 volts. The CER package adds .07 pF, while the E package adds about .3 pF.

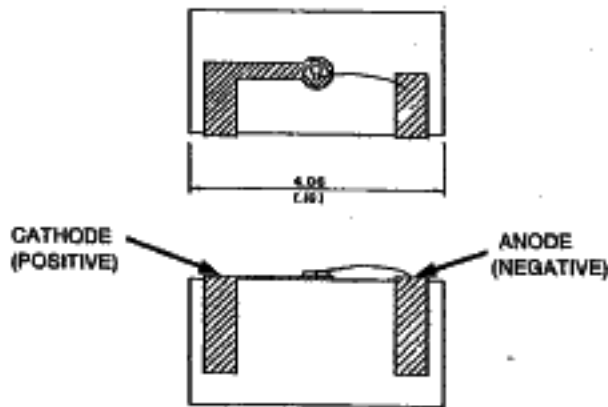


Figure 4 - CER PACKAGE

A low capacitance ceramic block for hybrid assemblies.

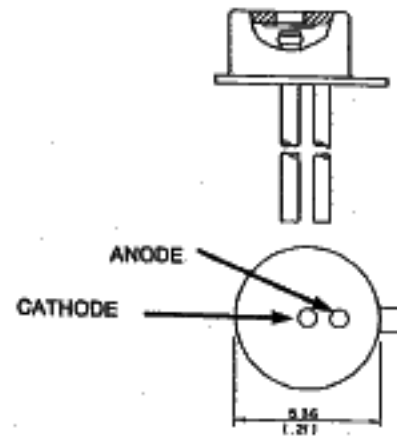


Figure 5 - E PACKAGE

TO-18 package, with a low profile silicon window to reduce the optical distance from the window surface to the chip.

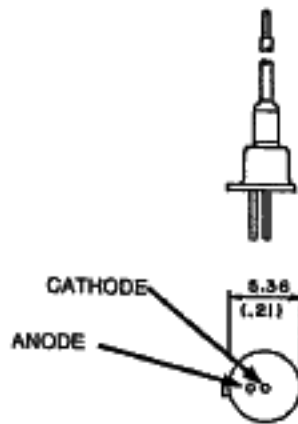


Figure 6 - EQC PACKAGE

E package with an integral fiber optic pigtail (available with C30617 only).

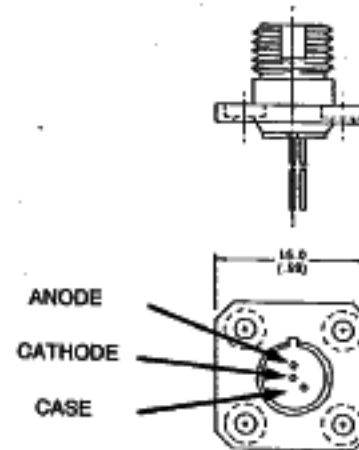


Figure 7 - EFC PACKAGE

E package aligned and epoxied in an "FC" compatible receptacle (available with C30617 only).

PART NUMBER: C30617EQC

Chip Type | Package

Dimensions in millimeters. Dimensions in parentheses are in inches.

For further information, please contact your local RCA Electro Optics representative or RCA Inc., Electro Optics, P.O. Box 900, Vaudreuil, Canada J7V 7X3
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