

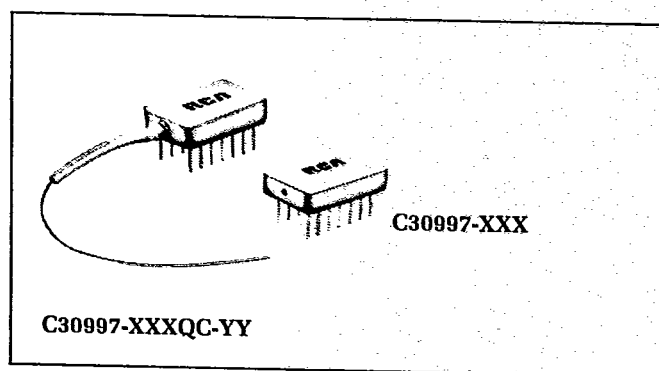
RCA Electro Optics

Silicon Photodiodes C30997 Series

DATA SHEET

T-41-67

Transimpedance Preamplifier Modules With or Without Integral Fiber Optic Pigtailed for Detection of 400 to 1000 nm Radiation



The RCA C30997 Series are Silicon (p-i-n) photodiodes with hybrid preamplifiers supplied in hermetically-sealed 14-pin dual in-line packages. They are available with glass windows which provide optical access to the photodiode or with integral fiber optic pigtailed.

The p-i-n photodiode (C30971) used in these devices is a high-speed silicon p-i-n photodiode made with a very thin depletion region. This structure provides a high responsivity between 400 and 1000 nanometers as well as extremely fast rise and fall times at all wavelengths. The preamplifier is a transimpedance type employing a low noise GaAs FET front-end and a cascode feedback circuit. An emitter follower-stage is added to the output to provide improved output coupling efficiency and isolation.

Modules are available having bandwidths ranging from 10 MHz to 250 MHz; they are designated C30997-XXX. The suffix -XXX denotes module bandwidth in MHz and the performance associated with this bandwidth can be derived from Figures 2 through 5. Modules with integral fiber optic pigtailed are designated C30997-XXXQC-YY. The suffix -YY denotes the fiber type (see Mechanical Characteristics). When ordering, the customer should specify the required bandwidth and preferred fiber. For example, C30997-090QC-01 is a device with a bandwidth of 90 MHz and a Corning 3008D 50 μ m graded index fiber.

To obtain wideband characteristics, the output of these devices should be AC (Capacitively) coupled to terminations equal to or greater than 500 ohms.

- System Bandwidth (3 dB Point)
10 MHz (C30997-010) to
250 MHz (C30997-250)
- Responsivity at $T_A = 22^\circ \text{C}$
150kV/W (C30997-010) to
6kV/W (C30997-250)
- Spectral Response Range
400 to 1000 nm
- Sensitivity at 10^{-9} B.E.R.
-49 dBm (C30997-010) to
-33 dBm (C30997-250)
- System Noise Equivalent Power (NEP) at $T_A = 22^\circ \text{C}$
 $7 \times 10^{-13} \text{ W/Hz}^{1/2}$ (C30997-010) to
 $5 \times 10^{-12} \text{ W/Hz}^{1/2}$ (C30997-250)
- Hermetically-Sealed 14-Pin Dual In-Line Packages

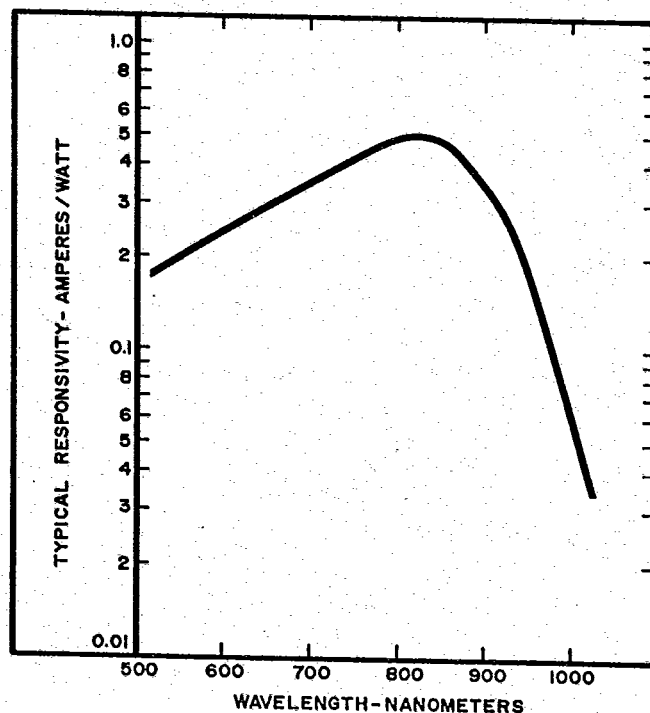


Fig. 1 Typical Spectral Responsivity

VC 123

T-41-67

Absolute-Maximum Ratings, Limiting Values¹

Photodiode Bias Voltage, V_R :		
At $T_A = 22^\circ\text{C}$	-200	V
Preamplifier Voltage:		
Positive, $+V_{CC}$	+6.3	V
Negative, $-V_{CC}$	-6.3	V
Incident Radiant Flux, Φ_M ($T_A = 22^\circ\text{C}$)		
Average value	1	mW
Peak value (1 sec. duration, non-repetitive)	4	mW
Ambient Temperature —		
Storage, T_{sig}	-50 to + 100	$^\circ\text{C}$
Operating, T_A	-40 to + 70	$^\circ\text{C}$

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

Mechanical Characteristics

Type (Series)	Diode Chip (Dia.)	Fiber Type	Fiber Optic Core Dia.
C30997-XXX	500 μm	—	—
C30997-XXXQC-01	—	Corning 3008D ²	50 μm
C30997-XXXQC-02 ⁴	—	Corning 0000105- 005004 ²	50 μm
C30997-XXXQC-04 ⁴	—	Spectran 300 ³	63 μm
C30997-XXXQC-00	—	Customer supplied	—

² A product of Corning Glass Works, Corning, NY 14831.

³ A product of Spectran Corp., Sturbridge, MA 01566.

⁴ QC-02 and QC-04 are "Hytrell" coated. QC-04 has oversize core to reduce connector losses.

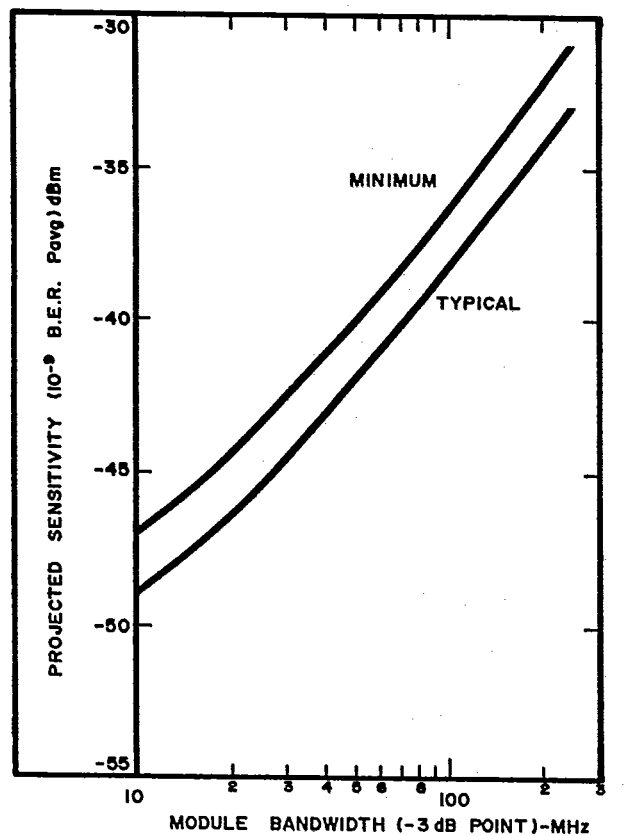
Electrical Characteristics

At an ambient temperature (T_A) of 22°C , negative photodiode bias of -100 VDC, preamplifier operating voltages of +5.2 VDC and -5.2 VDC, and the signal output AC (capacitively) coupled into a 500 ohm termination.

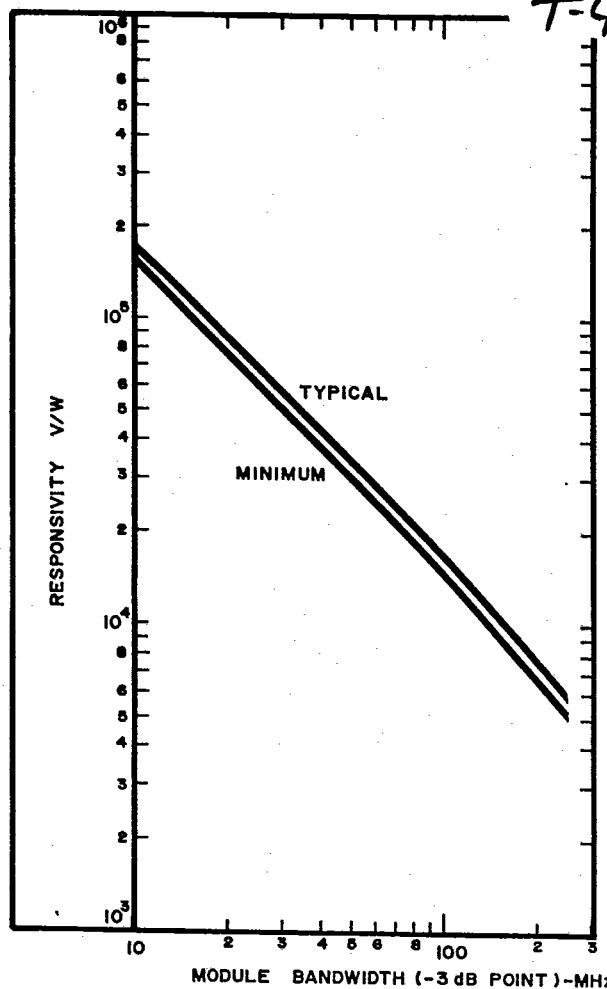
Performance of 10, 50, 90, and 250 MHz devices are tabulated. These devices are also available at other bandwidths on request; refer to Figure 2 through 5 for performance of specific types at 22°C , 820 nm and 500 ohm AC coupled load.

	C30997-010 C30997-010QC-YY			C30997-050 C30997-050QC-YY			C30997-090 C30997-090QC-YY			C30997-250 C30997-250QC-YY			Units
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Responsivity													
At 820 nm	1.2×10^5	1.5×10^5	—	3×10^4	3.4×10^4	—	1.5×10^4	1.8×10^4	—	5.4×10^3	5.9×10^3	—	V/W
At 900 nm	0.9×10^5	1.2×10^5	—	2.2×10^4	2.7×10^4	—	1.0×10^4	1.4×10^4	—	4.3×10^3	4.7×10^3	—	V/W
Noise Equivalent Power (NEP): 100 kHz $< f < f_0$													
At 820 nm	—	0.7	1.3	—	1.5	2.3	—	2.2	4.0	—	5.1	8.3	$\text{pW/Hz}^{1/2}$
At 900 nm	—	0.8	1.7	—	1.9	3.2	—	2.9	6.0	—	6.4	10.5	$\text{pW/Hz}^{1/2}$
Output Spectral Noise Voltage Density:													
100 kHz $< f < f_0$	—	100	150	—	50	70	—	40	60	—	30	45	$\text{nV/Hz}^{1/2}$
Output Impedance	—	20	40	—	20	40	—	20	40	—	20	40	
Bandwidth, f_0 (3 dB point)	7	10	—	40	50	—	70	90	—	200	250	—	MHz
Rise Time, t_r :													
$\lambda = 820 \text{ nm} \ \& \ 900 \text{ nm}$ 10% to 90% points	—	35	50	—	7	9	—	4	5	—	1.5	2	ns
Fall Time, t_f :													
$\lambda = 820 \text{ nm} \ \& \ 900 \text{ nm}$ 90% to 10% points	—	35	50	—	7	9	—	4	5	—	1.5	2	ns
Dynamic Range	21	24	—	21	24	—	21	24	—	21	24	—	dB
Output Offset Voltage	-0.7	-1.5	-3.0	-0.7	-1.5	-3.0	-0.7	-1.5	-3.0	-0.7	-1.5	-3.0	V
Supply Current:													
+5.2V	—	25	35	—	25	35	—	25	35	—	25	35	mA
-5.2V	—	8	15	—	8	15	—	8	15	—	8	15	mA
Projected Sensitivity @ 10^{-9} B.E.R. [NRZ, avg. power, Data Rate = 1.4x Bandwidth] at 820 nm	-47	-49	—	-40	-42	—	-37	-39	—	-31	-33	—	dBm

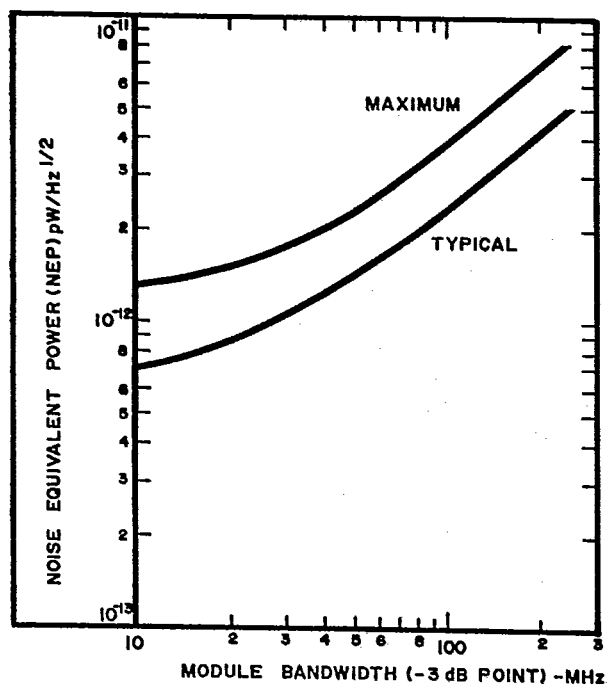
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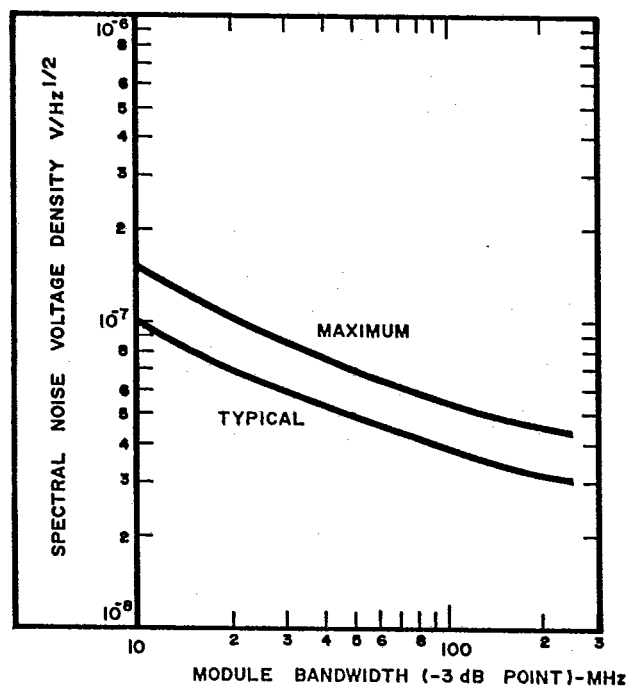
VC 110



VC 122



VC 120



VC 121

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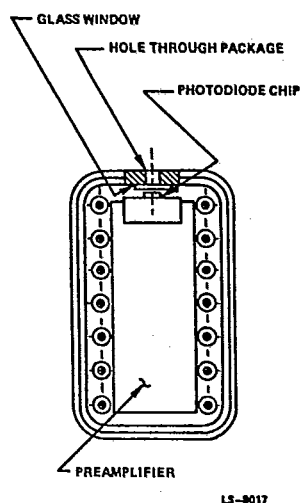


Fig. 6 Package With Cover Removed

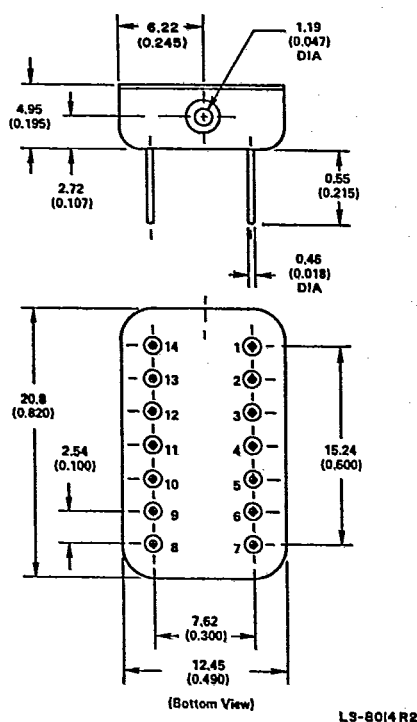


Fig. 7 Dimensional Outline - C30997-XXX

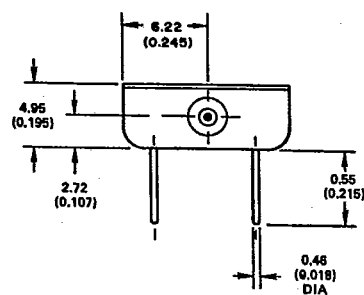


Fig. 8 Dimensional Outline - C30997-XXXQC-YY

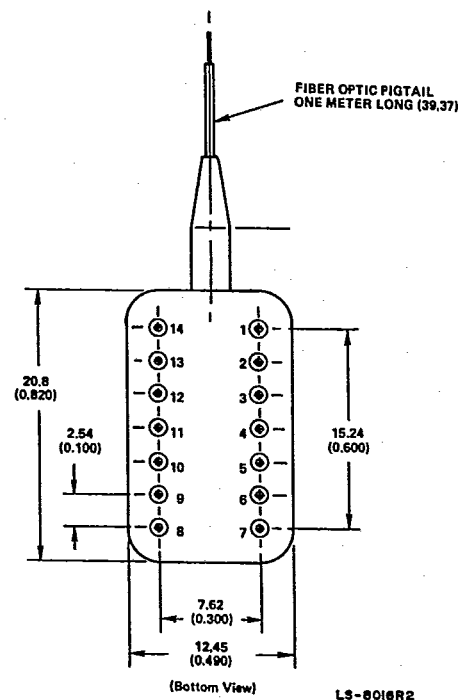


Fig. 9 Pin Connections - All Types

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
Tel.: (514) 455-6191

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