EG&G CANADA LTD.
Optoelectronics Division

Formerly RCA
Effective January 1, 1991

Photodiode C30919E DATA SHEET

Photodiode-Preamplifier Module

Completely Hybridized Temperature-Compensated Silicone Avalanche Photodiode-Preamplifier Module

- Responsivity Temperature Compensated to +10% for 1060 nm
- Modules Can be Supplied that are Responsivity Temperature Compensated for Other Wavelengths Upon Request
- Responsivity at $T_A = 25°C$ — 1×10^6 V/W at 900 nm — 2.5×10^5 V/W at 1060 nm
- System Noise Equivalent Power (NEP) at $T_A = 25°C$ — 2×10^{-14} W/Hz$^{1/2}$ at 900 nm — 8×10^{-14} W/Hz$^{1/2}$ at 1060 nm
- Wide Range of Amplifier Operating Voltages
- System Bandwidth (3 dB point) — DC to 40 MHz
- Fast Time Response — Rise and Fall Times, 10 ns Typical
- Hermetically-Sealed Modified 25 mm Package
- Low Power Consumption

RCA Type C30919E is a completely hybridized temperature compensated silicon avalanche photodiode-preamplifier module for the detection of radiation of wavelengths between 400 nm and 1100 nm. This device is especially useful in a wide variety of applications including laser detection, data transmission, optical communications, and spectrometry where ambient temperatures may vary.

The module consists of a silicon avalanche photodiode, a high frequency amplifier, a temperature sensing element, and associated circuitry for temperature compensation of the photodiode responsivity all of which are in hybrid form and have been packaged in a hermetically sealed 25 mm diameter package.

The avalanche photodiode used in the module is made using a "reach-through" structure which will provide high responsivity up to 1060 nanometers and beyond. The "reach-through" structure also allows fast rise and fall times to be achieved without "pulse-tailing" effects. Because the fall time has no "tail", the responsivity of the C30919E is constant and independent of modulation frequency over the full system bandwidth from DC to 40 MHz.

To obtain the wideband characteristics, the output of the module should be AC (capacitively) coupled to a 50-ohm termination. The module must not be DC coupled to loads of less than 500 ohms.

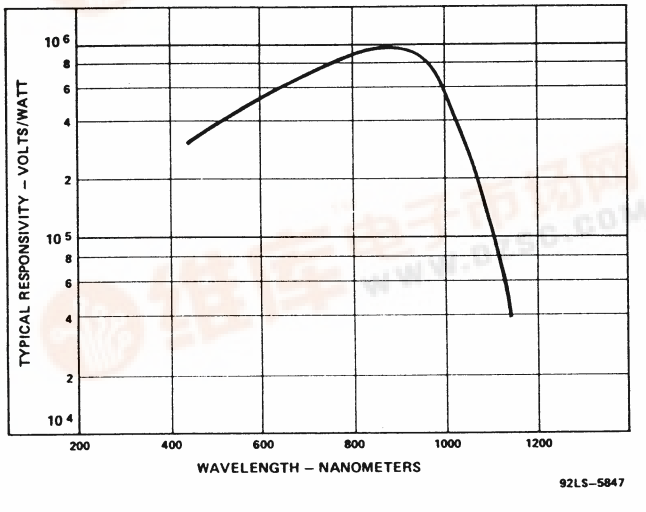

Figure 1 — Typical Spectral Responsivity Characteristic

Maximum and Minimum Ratings, Absolute Maximum Values

Photodiode Bias			
Voltage	600	max.	V
Current	100	max.	μA
Preamplifier Voltage	± 12.5	max.	V
	± 5.5	min.	V
Incident Radiant Flux, ΦM			
Average value	0.05	max.	mW
Peak value	0.5	max.	mW
Ambient Temperature			
Storage, T_{stg}	-50 to +100		°C
Operating, T_A	-40 to +70		°C

Mechanical Characteristics

Photosensitive Surface	
Shape	Circular
Useful area	0.5 mm^2
Useful diameter	0.8 mm
Approx. Field of View	150 deg

Electrical Characteristics at T_A=22°C

(unless otherwise noted[a])

At high voltage of 550 volts and preamplifier voltage of ± 6.0 V D.C.

	Min.	Typ.	Max.	Units
Responsivity:				
At 900 nm	0.8	1.0	—	MV/W
At 1060 nm	0.2	0.25	—	MV/W
Variation of responsivity over temperature range -40 to +70°C	—	± 10	± 25	%
Noise Equivalent Power (NEP): f = 100 kHz, Δf = 1 Hz				
At 900 mn	—	0.02	0.05	$pW/Hz^{1/2}$
At 1060 nm	—	0.08	0.2	$pW/Hz^{1/2}$
Output Spectral Noise Voltage Density: f = 100 kHz — 100 MHz Δf = 1 hZ	—	20	40	$nV/Hz^{1/2}$
Output Impedance	—	25	50	Ω
System Bandwidth, f_0 (3 dB point)	30	40	—	MHz
Rise time, t_r: λ = 900 & 1060 nm 10% to 90% pts	—	10	15	ns
Fall Time: λ = 900 & 1060 nm 90% to 10% pts	—	10	15	ns
Linear Output Voltage Swing	0.5	0.7	—	V
Voltage Swing	—	—	2	V
Output Offset Volt.	0	-1.5	-3	V
Supply Current	—	6	10	mA

[a] All measurements are made with the device AC (capacitively) coupled into a 50 Ω termination.

Warning — Personal Safety Hazards

Electrical Shock — Operating voltages applied to this device present a shock hazard.

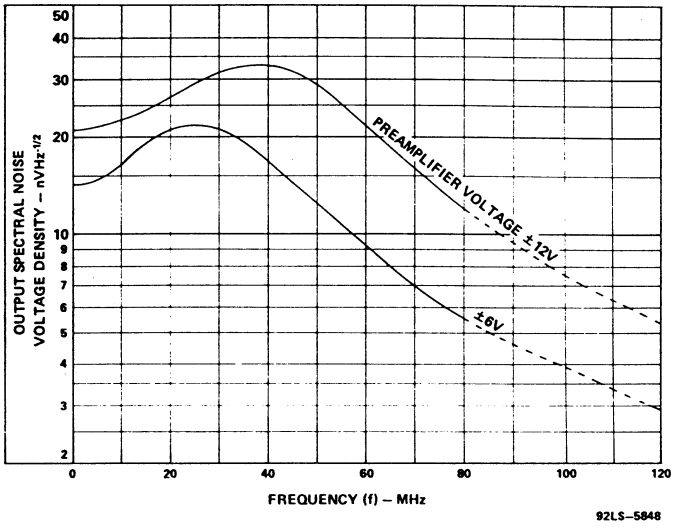

Figure 2 — Typical Output Spectral-Noise Voltage-Density As a Function of Frequency

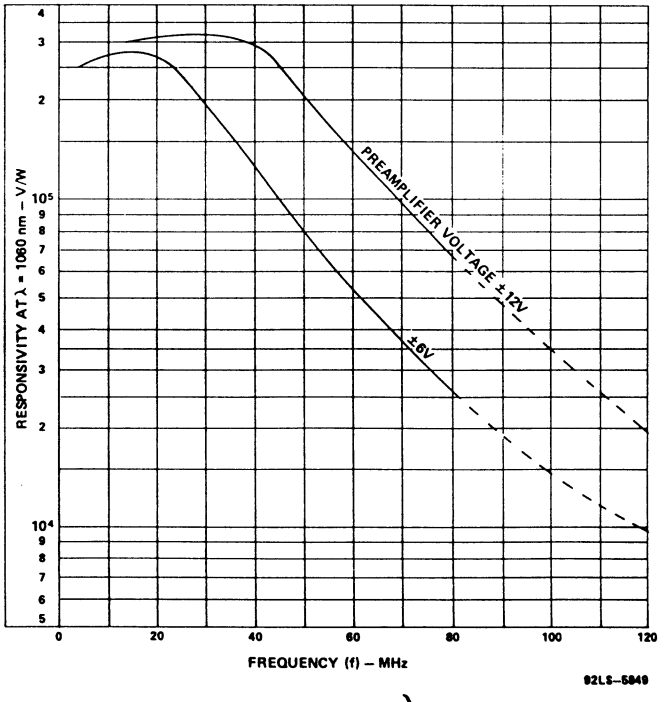

Figure 3 — Typical Responsivity at λ = 1060 nm As a Function of Frequency

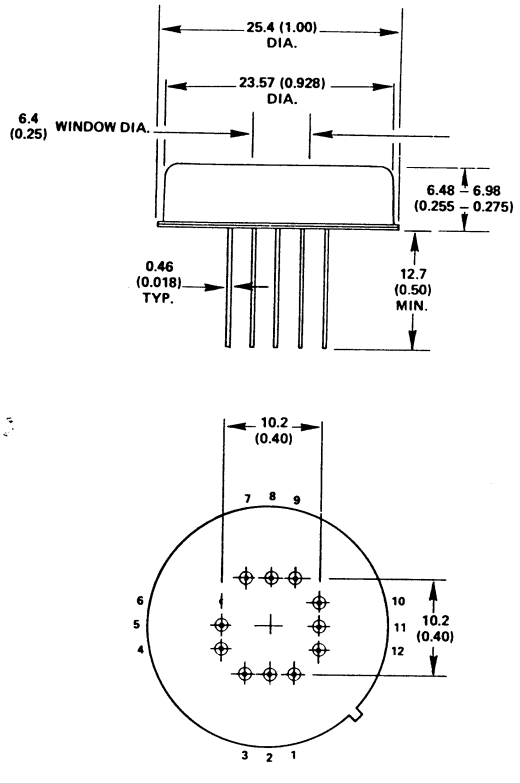

Figure 4 — Dimensional Outline

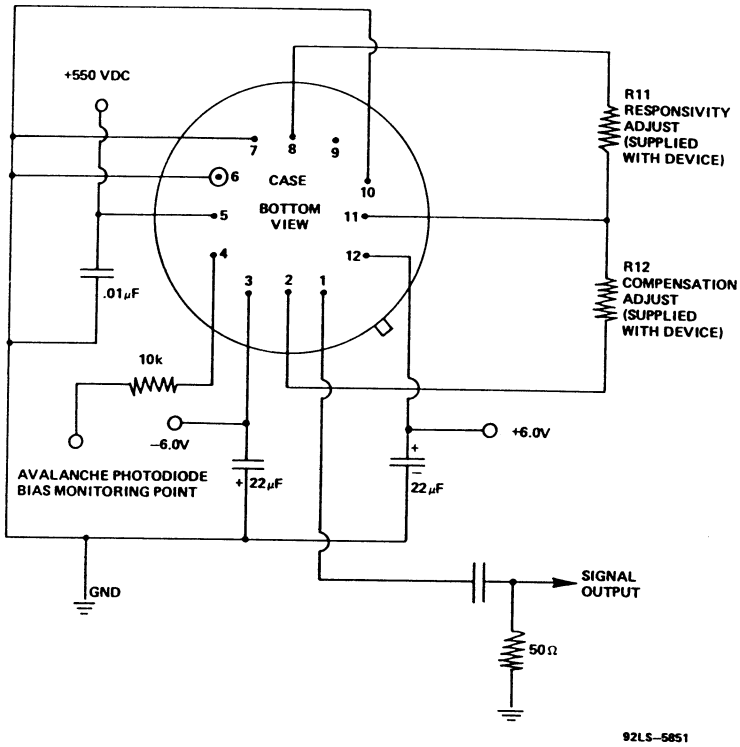

Figure 5 — Schematic of C30919E
(Bottom View of Device)