



EVERYTHING

IN A

NEW

LIGHT.

N-Type Silicon PIN Photodetectors

C30807, C30808, C30809, C30810, C30822, C30831



Description

This family of N-type silicon p-i-n photodiodes is designed for use in a wide variety of broad band low light level applications covering the spectral range from below 400 to over 1100 nm.

The different types making up this series provide a broad choice in photosensitive areas and in time response characteristics. Each of the types is antireflection coated to enhance responsivity at 900 nm.

These characteristics make the devices highly useful in HeNe and GaAs laser detection systems and in optical demodulation, data transmission, ranging, and high-speed switching applications.

Features

- Broad Range of Photosensitive Surface Areas
0.2 mm² to 100 mm²
- Low Operating Voltage $V_R = 45V$
- Anti-Reflection Coated to Enhance Responsivity at 900 nm
- Hermetically-Sealed Packages
- Spectral Response Range 400 to 1100 nm

Maximum Ratings, Absolute-Maximum Values (All Types)

DC Reverse Operating Voltage V_R 100 max. V

Photocurrent Density, j_p at 22°C:

Average value, continuous operation5 mA/mm²

Peak value20 mA/mm²

Forward Current, I_F :

Average value, continuous operation10 max. mA

Peak value20 max. mA

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 -

All typesCircular

Area -

Type C308310.2 mm ²
Type C308070.8 mm ²
Type C308085 mm ²
Type C3082220 mm ²
Type C3080950 mm ²
Type C30810100 mm ²

Optical Characteristics

Field of View: 1

See Figure 5

Approx. Full Angle For -	Complete Illumination Photosensitive Surface	Partial Illumination Photosensitive Surface
Type C30831	70	84 deg
Type C30807	62	90 deg
Type C30808	72	120 deg
Type C30822	104	144 deg
Type C30809	74	148 deg
Type C30810	74	140 deg

Note 1. The values specified for field of view are approximate and are critically dependent on the dimensional tolerances of the package components parts.

Electrical Characteristics at T_A = 22°C At a DC Reverse Operating Voltage (V_R) = 45 Volts², unless otherwise specified

	Type C30807			Type C30808			Type C30839			Units
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Breakdown Voltage, V_{BR}	100	-	-	100	-	-	100	-	-	V
Responsivity:										
At 900 nm	0.5	0.6	-	0.5	0.6	-	0.5	0.6	-	AW
At 1060 nm	0.1	0.15	-	0.1	0.15	-	0.1	0.15	-	AW
Quantum Efficiency:										
At 900 nm	70	85	-	70	83	-	70	83	-	%
At 1060 nm	12	15	-	12	17	-	12	17	-	%
Dark Current, i_d: See Figure 2										
At V _R = 10 V	-	2x10 ⁻⁹	1x10 ⁻⁸	-	5x10 ⁻⁹	2.5x10 ⁻⁸	-	2.5x10 ⁻⁸	1.3x10 ⁻⁷	A
At V _R = 45V	-	1x10 ⁻⁸	5x10 ⁻⁸	-	3x10 ⁻⁸	1.5x10 ⁻⁷	-	7x10 ⁻⁸	3.5x10 ⁻⁷	A
Noise Current, I_n: See Figure 3										
f = 1000 Hz, Δf = 1.0 Hz	-	6x10 ⁻¹⁴	4.2x10 ⁻¹³	-	1x10 ⁻¹³	7x10 ⁻¹³	-	1.5x10 ⁻¹³	1.1x10 ⁻¹²	A/Hz ^{1/2}
Noise Equivalent Power (NEP):										
f = 1000 Hz, Δf = 1.0 Hz										
At 900 nm	-	1x10 ⁻¹³	8x10 ⁻¹³	-	1.5x10 ⁻¹³	1.2x10 ⁻¹²	-	2x10 ⁻¹³	1.6x10 ⁻¹²	W/Hz ^{1/2}
At 1060 nm	-	4x10 ⁻¹³	3.2x10 ⁻¹²	-	6.5x10 ⁻¹³	5.2x10 ⁻¹²	-	1x10 ⁻¹²	8x10 ⁻¹²	W/Hz ^{1/2}
Capacitance, C_d: See Figure 4	-	2.5	3	-	6	10	-	35	45	pF
Rise Time, t_r:										
R _L = 50 Ω, λ = 900 nm, 10% to 90% points	-	3	5	-	5	8	-	10	15	ns
Fall Time:										
R _L = 50 Ω, λ = 900 nm, 10% to 90% points	-	6	10	-	8	13	-	15	20	ns

Note 2. The recommended range of reverse operating voltage V_R at T_A = 22°C is 0 to 50 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.

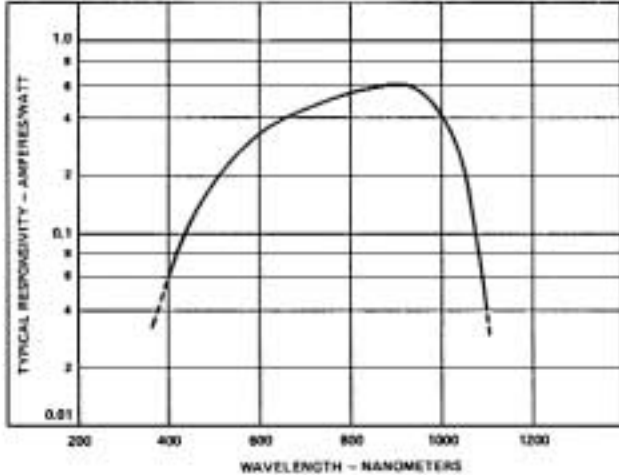


Figure 1. Typical Spectral Responsivity Characteristic

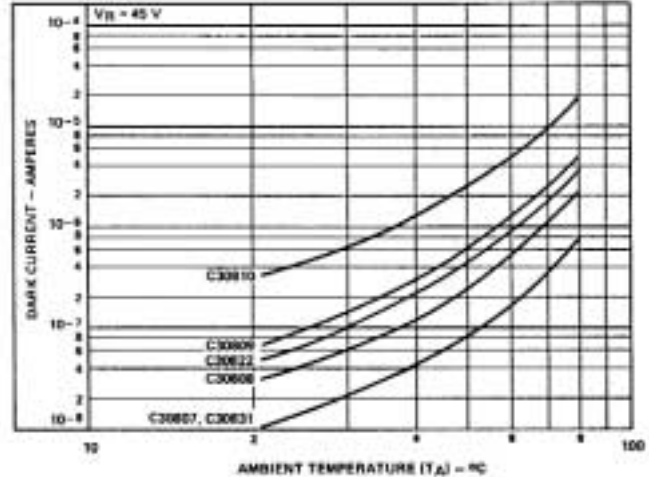


Figure 2. Typical Dark Current vs. Ambient Temperature

Electrical Characteristics at $T_A = 22^\circ\text{C}$ At a DC Reverse Operating Voltage (V_R) = 45 Volts², unless otherwise specified

	Type C30810			Type C30822			Type C30831			Units
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Breakdown Voltage, V_{BR}	100	-	-	100	-	-	100	-	-	V
Responsivity:										
At 900 nm	0.5	0.6	-	0.5	0.6	-	0.5	0.6	-	A/W
At 1060 nm	0.1	0.15	-	0.1	0.15	-	0.1	0.15	-	A/W
Quantum Efficiency:										
At 900 nm	70	83	-	-	83	-	-	83	-	%
At 1060 nm	12	17	-	-	17	-	-	17	-	%
Dark Current, i_d: See Figure 2										
At $V_R = 10\text{V}$	-	8×10^{-8}	4×10^{-7}	-	1×10^{-8}	5×10^{-8}	-	1×10^{-9}	5×10^{-9}	A
At $V_R = 45\text{V}$	-	3×10^{-7}	1.5×10^{-6}	-	5×10^{-8}	2.5×10^{-7}	-	1×10^{-8}	5×10^{-8}	A
Noise Current, I_n: See Figure 3										
$f = 1000\text{ Hz}, \Delta f = 1.0\text{ Hz}$	-	3×10^{-13}	2.1×10^{-12}	-	1.3×10^{-13}	9×10^{-13}	-	6×10^{-14}	4.2×10^{-13}	A/Hz ^{1/2}
Noise Equivalent Power (NEP):										
$f = 1000\text{ Hz}, \Delta f = 1.0\text{ Hz}$										
At 900 nm	-	4.5×10^{-13}	3.6×10^{-12}	-	2×10^{-13}	1.5×10^{-12}	-	1×10^{-13}	8×10^{-13}	W/Hz ^{1/2}
At 1060 nm	-	2×10^{-12}	1.6×10^{-11}	-	8×10^{-13}	7×10^{-12}	1	4×10^{-13}	3.2×10^{-12}	W/Hz ^{1/2}
Capacitance, C_d: See Figure 4	-	70	90	-	17	20	-	2	2.5	pF
Rise Time, t_r:										
$RL = 50\ \Omega, \lambda = 900\text{ nm},$ 10% to 90% points	-	12	17	-	7	12	-	3	5	ns
Fall Time:										
$RL = 50\ \Omega, \lambda = 900\text{ nm},$ 10% to 90% points	-	20	30	-	10	15	-	6	10	ns

Note 2. The recommended range of reverse operating voltage V_R at $T_A = 22^\circ\text{C}$ is 0 to 50 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.

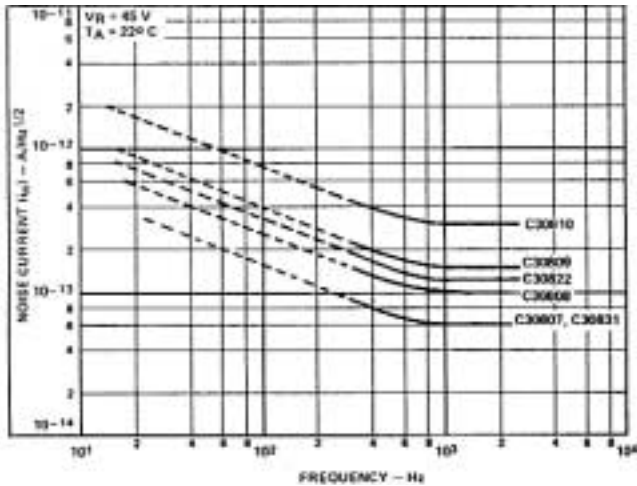


Figure 3. Typical Noise Current vs. Frequency

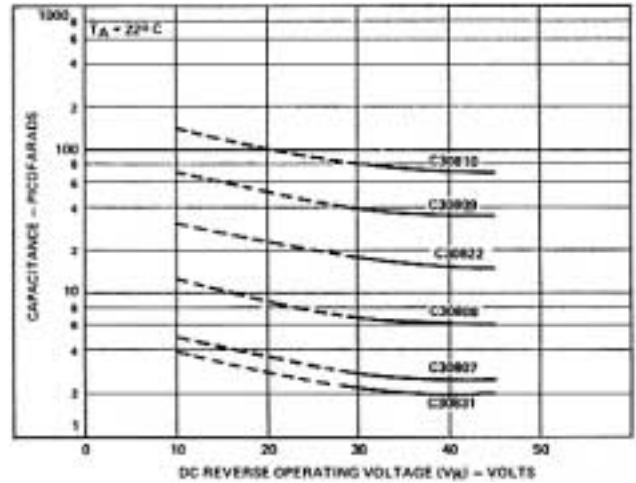


Figure 4. Typical Photodiode Capacitance vs. Operating Voltage

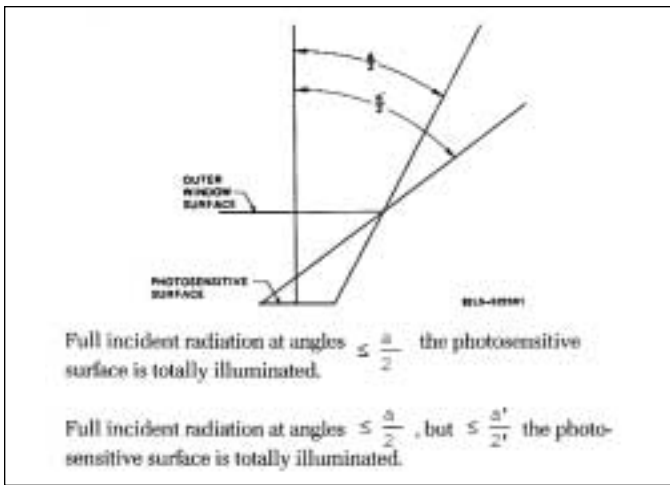


Figure 5. Definition of Half-Angle Approx. Field-of-View. (Scale is exaggerated for clarity)

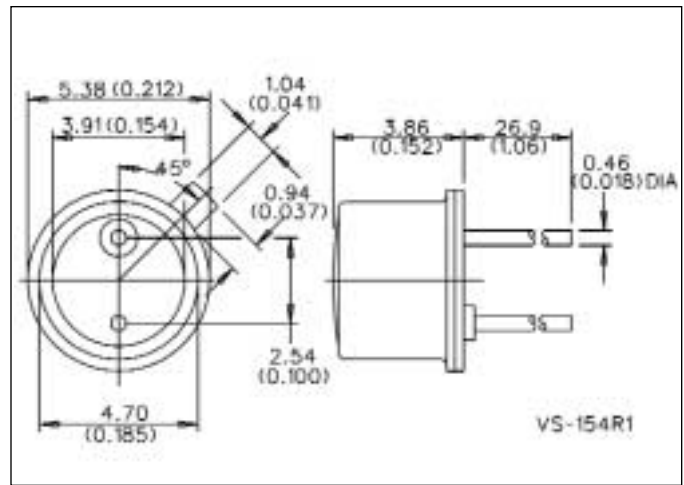


Figure 6. Dimensional Outline for C30807 and C30831

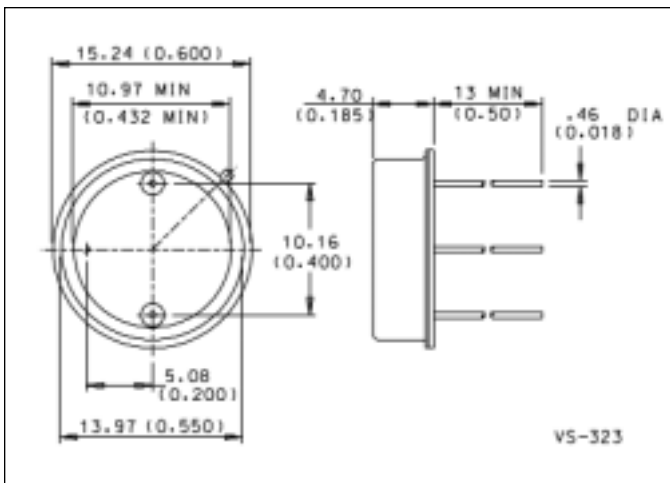


Figure 7. Dimensional Outline for C30809

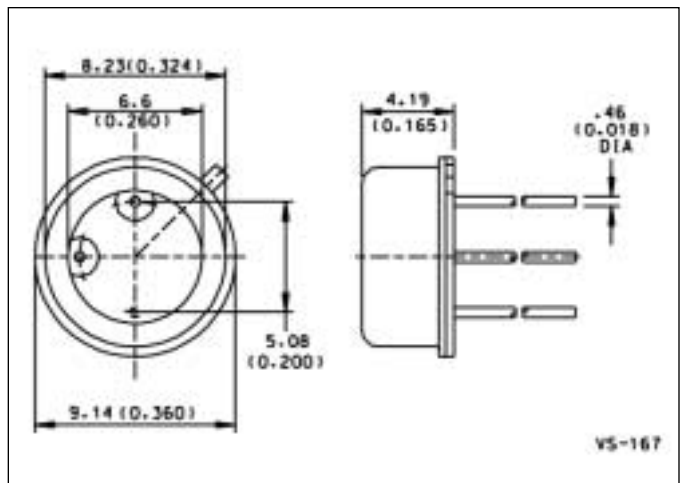


Figure 8. Dimensional Outline for C30808

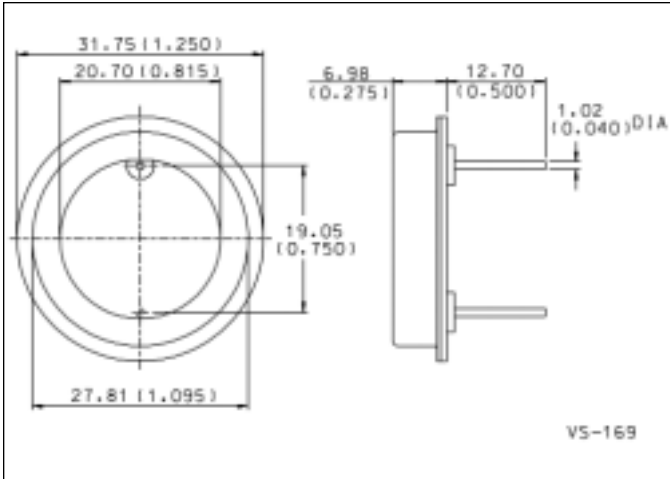


Figure 9. Dimensional Outline for C30810

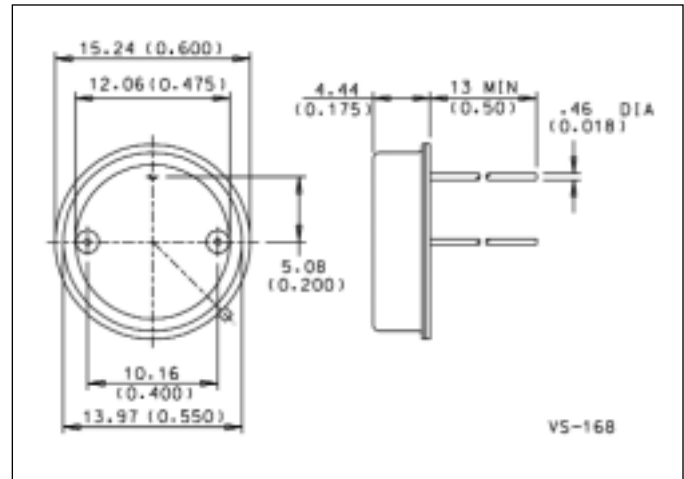


Figure 10. Dimensional Outline for C30822