

# Blue-Enhanced Silicon Photodiodes

For Industrial & Commercial Applications

## SILICON PN PHOTODIODES ■

Silicon Photodiodes – VTB Series  
Ultra High Dark Resistance

## Silicon Photodiodes – VTB Series – Ultra High Dark Resistance



### Applications

- Ambient light sensing
- UV and blue light sensing
- Flame monitoring
- Light meters
- Photometry

### Features and Benefits

- UV to IR spectral range
- Integral IR rejection filters available
- Response @ 365 nm, 0.14A/W typical
- Response @ 220 nm, 0.06A/W typical with UV window
- 1 to 2 % linearity over 7 to 9 decades
- Very low dark current
- High shunt resistance
- RoHs compliant

### Product Description

This series of P on N silicon planar photodiodes have been designed for optimum response through the visible part of the spectrum. Units with UV transmitting windows also exhibit excellent response in the UV. "B" series units have a built-in infrared rejection filter for applications requiring a response approximating the human eye. Photodiodes made with the VTB process are primarily intended to be used in photovoltaic mode but may be used with a small reverse bias. All photodiodes in this series exhibit very high shunt resistance. This characteristic leads to very low offsets when used in high gain transimpedance op-amps circuits.

#### VTB1012



Small area planar silicon photodiode in flat window TO-46 package

#### VTB6061



Large area planar silicon photodiode in a flat window TO-8 package

#### VTB4051



Planar silicon photodiode mounted on a ceramic substrate and coated with a layer of clear epoxy

#### VTB8341



Planar silicon photodiode mounted on a ceramic substrate and coated with a layer of clear epoxy

Product Table

Silicon Photodiodes – VTB Series – Ultra High Dark Resistance

Symbol Unit	Package	Active Area (mm <sup>2</sup> )	Short Circuit Current @ 100 fc, 2850 K		Dark Current max I <sub>D</sub> VR = 2V (nA)	Typical Junction Capacitance @ VR = 0V (nF)	Typical Radiometric Sensitivity @ λ <sub>peak</sub> (A/W)	Spectral Range (nm)	Typical Peak Wavelength (nm)	Typical Noise
			min I <sub>SC</sub> μA							Equivalent Power W/√Hz
<b>VTB100AH</b>	Flat sidelooper	7.1	50		0.5 @VR = 10V	0.1	0.55	320-1100	925	9 X 10 <sup>-14</sup>
<b>VTB1012H</b>	TO-46	1.6	8		0.1	0.31	0.5	320-1100	920	3 X 10 <sup>-14</sup>
<b>VTB1012BH</b>	TO-46	1.6	0.8		0.1	0.31	0.29	330-720	580	5.3 X 10 <sup>-14</sup>
<b>VTB1013H</b>	TO-46	1.6	8		0.02	0.31	0.5	320-1100	920	5.9 X 10 <sup>-15</sup>
<b>VTB1013BH</b>	TO-46	1.6	0.8		0.02	0.31	0.29	330-720	580	1.1 X 10 <sup>-14</sup>
<b>VTB1112H</b>	TO-46 lensed	1.6	30		0.1	0.31	0.5	320-1100	920	3 X 10 <sup>-14</sup>
<b>VTB1112BH</b>	TO-46 lensed	1.6	3		0.1	0.31	0.29	330-720	580	5.3 X 10 <sup>-14</sup>
<b>VTB1113H</b>	TO-46 lensed	1.6	30		0.02	0.31	0.5	320-1100	920	5.9 X 10 <sup>-15</sup>
<b>VTB1113BH</b>	TO-46 lensed	1.6	3		0.02	0.31	0.29	330-720	580	1.1 X 10 <sup>-14</sup>
<b>VTB4051H</b>	Ceramic	14.8	100		0.25	3	0.5	320-1100	920	2.1 X 10 <sup>-14</sup>
<b>VTB5051H</b>	TO-5	14.8	85		0.25	3	0.5	320-1100	920	2.1 X 10 <sup>-14</sup>
<b>VTB5051BH</b>	TO-5	14.8	8		0.25	3	0.29	330-720	580	3.7 X 10 <sup>-14</sup>
<b>VTB5051JH</b>	TO-5 with 3 pins	14.8	85		0.25	3	0.5	320-1100	920	2.1 X 10 <sup>-14</sup>
<b>VTB5051UVH</b>	TO-5	14.8	85		0.25	3	0.1 @ 365 nm	200-1100	920	2.1 X 10 <sup>-14</sup>
<b>VTB5051UVJH</b>	TO-5 with 3 pins	14.8	85		0.25	3	0.1 @ 365 nm	200-1100	920	2.1 X 10 <sup>-14</sup>
<b>VTB6061H</b>	TO-8	37.7	260		2	8	0.5	320-1100	920	5.7 X 10 <sup>-14</sup>
<b>VTB6061BH</b>	TO-8	37.7	26		2	8	0.29	330-720	580	1 X 10 <sup>-13</sup>
<b>VTB6061CIEH</b>	TO-8	37.7			2	8		460-675	555	1.3 X 10 <sup>-13</sup>
<b>VTB6061JH</b>	TO-8 with 3 pins	37.7	260		2	8	0.5	320-1100	920	5.7 X 10 <sup>-14</sup>
<b>VTB6061UVH</b>	TO-8	37.7	260		2	8	0.1 @ 365 nm	200-1100	920	5.7 X 10 <sup>-14</sup>
<b>VTB6061UVJH</b>	TO-8 with 3 pins	37.7	260		2	8	0.1 @ 365 nm	200-1100	920	5.7 X 10 <sup>-14</sup>
<b>VTB8341H</b>	Ceramic	5.16	35		0.1	1	0.5	320-1100	920	2.4 X 10 <sup>-14</sup>
<b>VTB8440H</b>	8 mm Ceramic	5.16	35		2	1	0.5	320-1100	920	5.9 X 10 <sup>-14</sup>
<b>VTB8440BH</b>	8 mm Ceramic	5.16	4		2	1	0.29	330-720	580	1.1 X 10 <sup>-13</sup>
<b>VTB8441H</b>	8 mm Ceramic	5.16	35		0.1	1	0.5	320-1100	920	1.3 X 10 <sup>-14</sup>
<b>VTB8441BH</b>	8 mm Ceramic	5.16	4		0.1	1	0.29	330-720	580	2.4 X 10 <sup>-14</sup>

Figure 1

Package Drawing – VTB Series – Flat Sidelooper Package

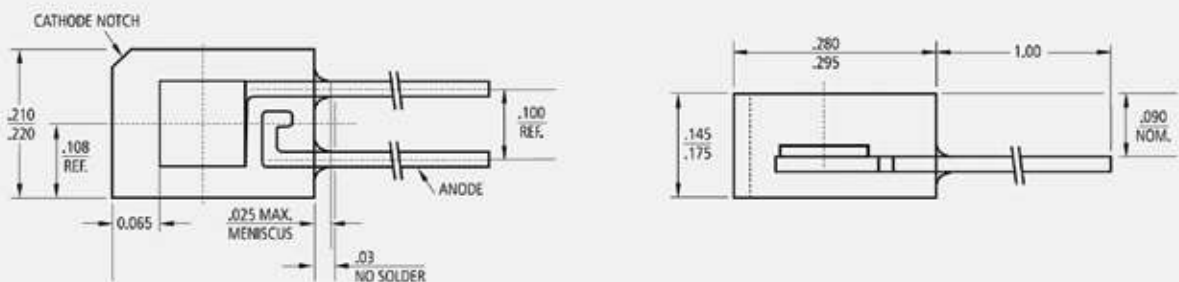


Figure 2

Package Drawing – VTB Series – TO-46 Package

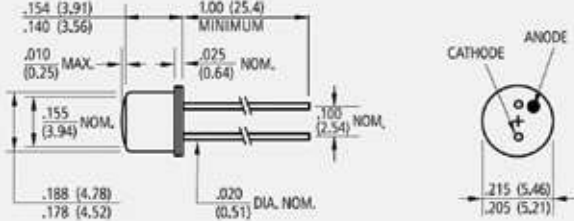


Figure 3

Package Drawing – VTB Series – TO-5 Package

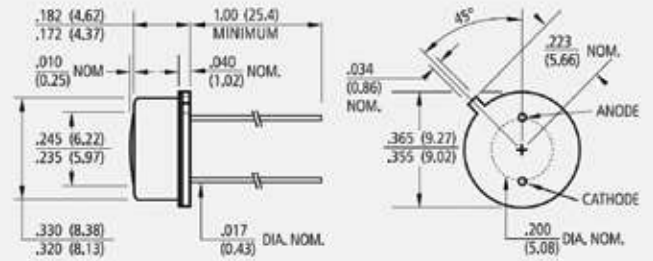


Figure 4

Package Drawing – VTB Series - TO-46 Lensed

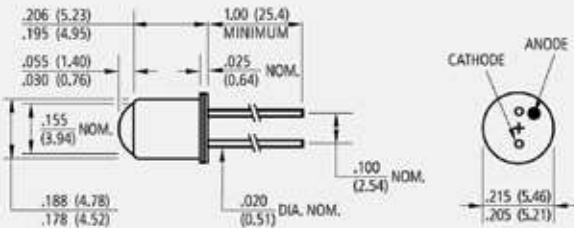


Figure 5

Package Drawing – VTB Series - Ceramic Package

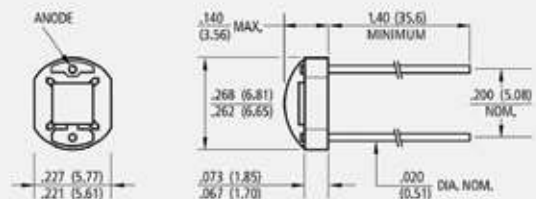


Figure 6

Package Drawing – VTB Series- 8mm Ceramic Package

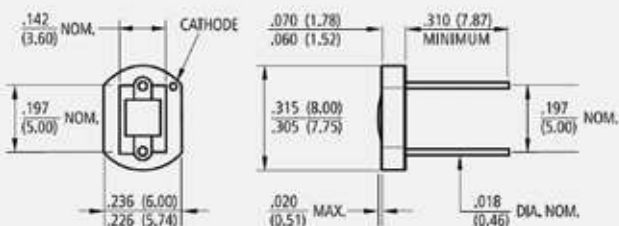
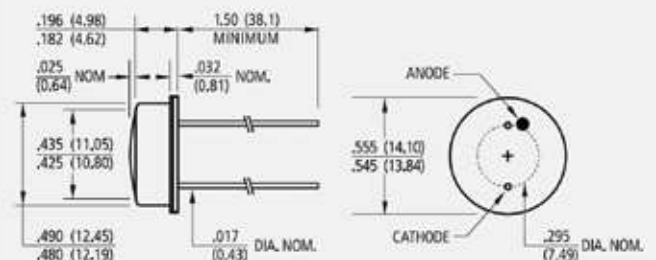


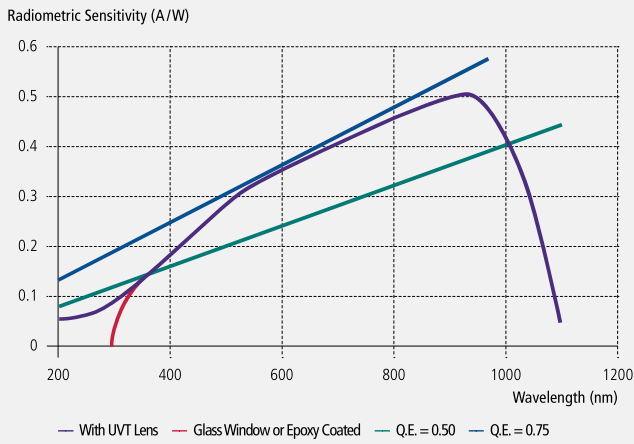
Figure 7

Package Drawing – VTB Series – TO-8 Package



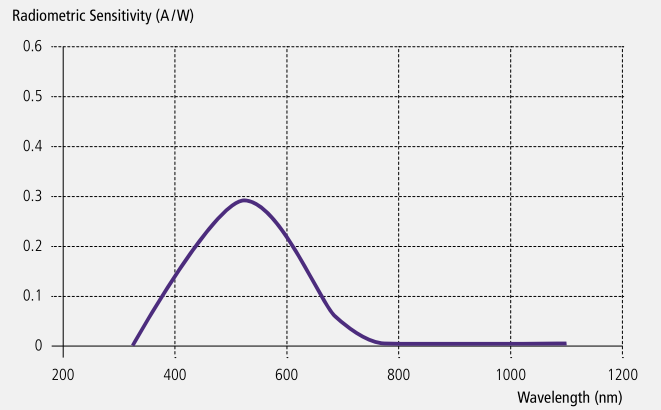
Graph 1

Absolute Spectral Response



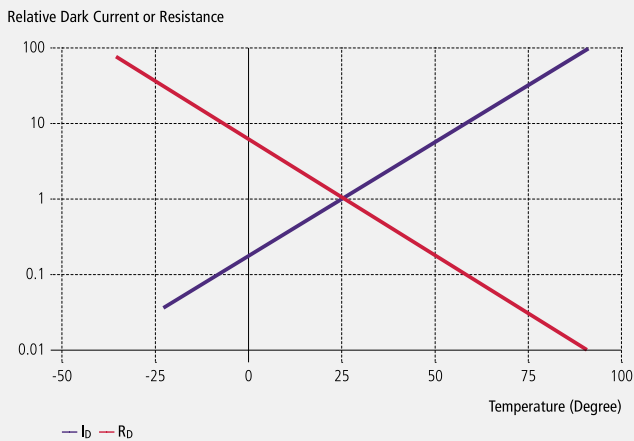
Graph 2

Absolute Spectral Response "B" Series (Filtered)



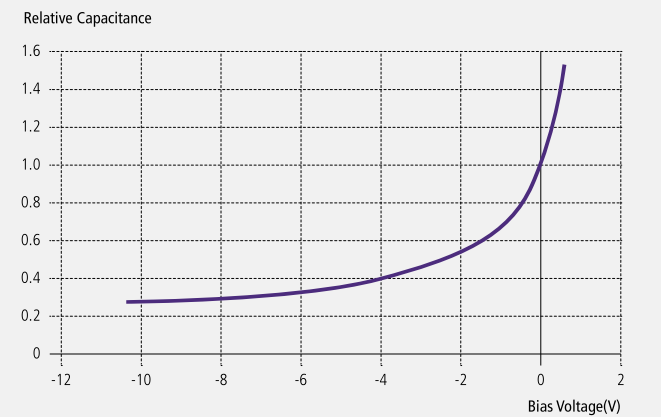
Graph 3

Rel. Current or Resistance vs. Temperature (Referred to 25°C)



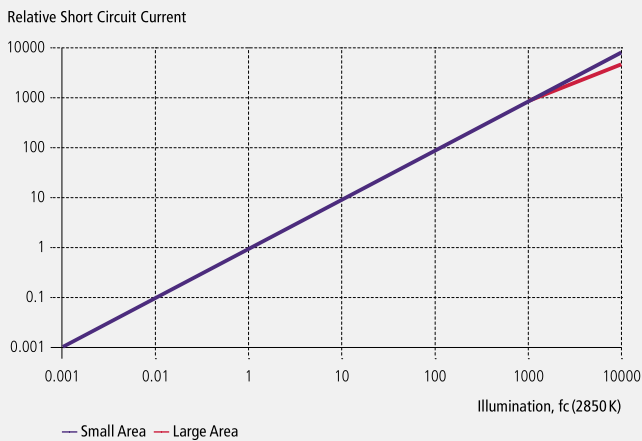
Graph 4

Relative Junction Capacitance vs. Voltage (Referred to Zero Bias)



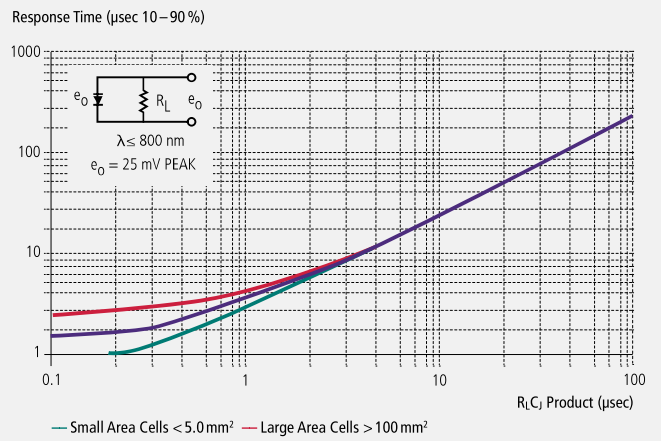
Graph 5

Relative Short Circuit Current vs. Illumination



Graph 6

Rise/Fall Times – Non Standard



# Fast Response Silicon Photodiodes

For Industrial & Commercial Applications

SILICON PN PHOTODIODES ■

Silicon Photodiodes – VTP Series



## Silicon Photodiodes – VTP Series

### Applications

- Smoke detection
- Barcode scanning
- Light meters
- Pulse oximeters

### Features and Benefits

- Visible to IR spectral range
- Integral visible rejection filters available
- 1 to 2 % linearity over 7 to 9 decades
- Low dark currents
- High shunt resistance
- Low capacitance

### Product Description

Photodiodes in this series have been designed for low junction capacitance. The lower the capacitance, the faster the response of the photodiode when the RC time constant is your limiting factor. Also, speed can be further increased by reverse biasing the photodiodes. These devices have excellent response in the IR region and are well matched to IR LEDs (VTE series). Some photodiodes are available in packages which incorporate a visible rejection filter, effectively blocking light below 700 nm. Photodiodes made with the VTP process are suitable for operation under reverse bias conditions but may be used in the photovoltaic mode. Typical reverse breakdown voltages are around 140V. Low dark currents under reverse bias are also a feature of this series.

### Product Table

## Silicon Photodiodes – VTP Series

Symbol	Package	Active Area mm <sup>2</sup>	Minimum Short Circuit	Maximum Dark	Junction Capacitance	Radiometric Sensitivity @ λ <sub>p</sub>	Spectral Range λ <sub>RANGE</sub> nm	Typical Peak Wavelength λ <sub>p</sub> nm	Typical Noise
			Current @ 100fc, 2850K	Current @ VR = 10V	max C <sub>j</sub>	typ S <sub>R</sub>			Equivalent Power
Unit			μA	(nA)	pF	A/W			W/√Hz
VTP100H	Flat Sidelooker IRT	7.45	35	30	50 @V <sub>R</sub> = 3V	0.5	725-1150	925	2.5 X 10 <sup>-14</sup>
VTP100CH	Flat Sidelooker	7.45	50	30	50 @V <sub>R</sub> = 3V	0.55	400-1150	925	9.0 X 10 <sup>-14</sup>
VTP1012H	TO-46	1.6	10	7 @V <sub>R</sub> = 50V	6 @V <sub>R</sub> = 15V	0.55	400-1150	925	8.7 X 10 <sup>-14</sup>
VTP1112H	TO-46 lensed	1.6	30	7 @V <sub>R</sub> = 50V	6 @V <sub>R</sub> = 15V	0.55	400-1150	925	8.7 X 10 <sup>-14</sup>
VTP1188SH	Lensed Ceramic	11	200 (Typical)	30 @V <sub>R</sub> = 10mV	300 @V <sub>R</sub> = 0V	0.55	400-1100	925	-
VTP1232H	T-1 3/4 lensed	2.326	100	25	100 @V <sub>R</sub> = 0V	0.6	400-1100	920	-
VTP1232FH	T-1 3/4 flat	2.326	21	25	100 @V <sub>R</sub> = 0V	0.6	400-1100	920	-
VTP1332H	T-1 3/4 lensed IRT	2.326	75	25	100 @V <sub>R</sub> = 0V	0.55	725-1100	920	-
VTP1332FH	T-1 3/4 flat IRT	2.326	17	25	100 @V <sub>R</sub> = 0V	0.55	725-1100	920	-
VTP3310LAH	T-1 Lensed	0.684	24	35 @V <sub>R</sub> = 50V	25 @V <sub>R</sub> = 3V	0.55	400-1150	925	1.9 X 10 <sup>-13</sup>
VTP3410LAH	T-1 lensed IRT	0.684	15	35 @V <sub>R</sub> = 50V	25 @V <sub>R</sub> = 3V	0.55	700-1150	925	1.9 X 10 <sup>-13</sup>
VTP3420LA	T-1 lensed IRT	1.64	34	35	150 @V <sub>R</sub> = 0V	0.55	700-1150	925	-

Electrical characteristics at T<sub>Ambient</sub> = 25 °C

Product Table

Silicon Photodiodes – VTP Series

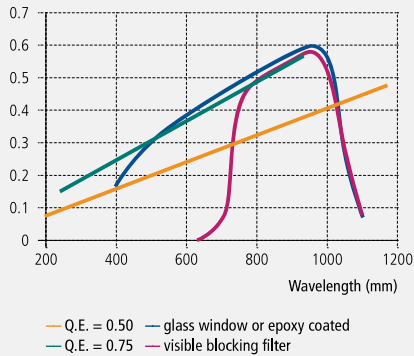
Symbol Unit	Package	Active Area mm <sup>2</sup>	Minimum Short Circuit	Maximum Dark	Junction Capacitance	Radiometric Sensitivity @ $\lambda_p$	Spectral Range $\lambda_{\text{RANGE}}$ nm	Typical Peak Wavelength $\lambda_p$ nm	Typical Noise Equivalent Power W/√Hz
			Current @ 100fc, 2850K $\mu\text{A}$	Current @ VR = 10V (nA)	max Cj pF	typ SR AW			
VTP413H	Lensed Sidelooker IRT	7.45	120 (Typical)	20	50 @VR = 3V	0.55	725-1150	925	2.3 X 10 <sup>-14</sup>
VTP4085H	Ceramic	21	200 (Typical)	100 @VR = 0.1V	Typical 350 @VR = 0V	0.55	400-1100	925	-
VTP4085SH	Ceramic	21	200 (Typical)	50 @VR = 0.1V	Typical 350 @VR = 0V	0.55	400-1100	925	-
VTP5050H	TO-5	7.45	40	18 @VR = 50	24 @VR = 15V	0.55	400-1150	925	1.4 X 10 <sup>-13</sup>
VTP6060H	TO-8	20.6	120	35 @VR = 50V	60 @VR = 15V	0.55	400-1150	925	1.9 X 10 <sup>-13</sup>
VTP7110H	Lensed Sidelooker	0.684	6	35	25 @VR = 3V	0.55	400-1150	925	1.9 X 10 <sup>-13</sup>
VTP7210H	Lensed Sidelooker IRT	0.684	5	35	25 @VR = 3	0.55	700-1150	925	1.9 X 10 <sup>-13</sup>
VTP7840H	Lensed Sidelooker IRT	5.27	50	20	40 @VR = 3V	0.55	725-1150	925	5.3 X 10 <sup>-14</sup>
VTP8350H	Ceramic	7.45	65	30	50 @VR = 3V	0.55	400-1150	925	1.8 X 10 <sup>-13</sup>
VTP8440H	8 mm ceramic	5.16	30	15 @VR = 50V	15 @VR = 15V	0.55	400-1150	925	1.3 X 10 <sup>-13</sup>
VTP8551H	Mini-Dip	7.45	50	30	50 @VR = 3V	0.55	400-1150	925	1.8 X 10 <sup>-13</sup>
VTP8651H	Mini-Dip IRT	7.45	35	30	50 @VR = 3V	0.5	725-1150	925	2.0 X 10 <sup>-13</sup>
VTP8740BTRH	SMT clear			20	50 @VR = 3V	0.6	400-1150	925	2.0 X 10 <sup>-13</sup>
VTP8740STRH	SMT clear	5.269	75	20	50 @VR = 3V	0.6	400-1150	925	2.0 X 10 <sup>-13</sup>
VTP8840BTRH	SMT IRT			20	50 @VR = 3V	0.6	750-1150	925	2.0 X 10 <sup>-13</sup>
VTP8840STRH	SMT IRT	5.269	50	20	50 @VR = 3V	0.6	750-1150	925	2.0 X 10 <sup>-13</sup>
VTP9412H	6 mm ceramic	1.6	10	7 @VR = 50V	6 @VR = 15V	0.55	400-1150	925	8.7 X 10 <sup>-14</sup>
VTP9812FH	T-1 3/4 flat	1.548	0.7	10	150 @VR = 10V	0.034	400-700	580	-

Electrical characteristics at T<sub>Ambient</sub> = 25 °C

Graph 1

Absolute Spectral Response\*

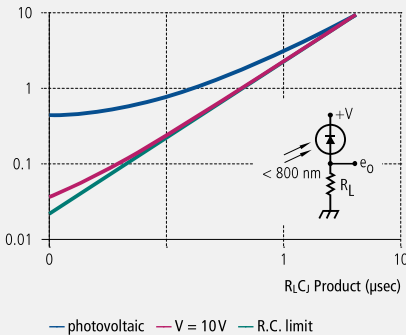
Radiometric Sensitivity, A/W



Graph 2

Rise/Fall Times – Non Saturated\*

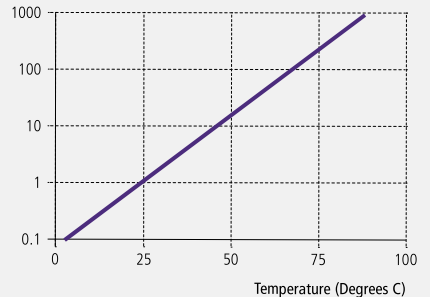
Response Time (µsec 10–90%)



Graph 3

Relative Dark Current vs. Temperature\*

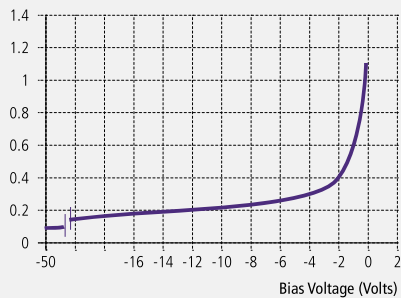
Relative Dark Current



Graph 4

Rel. Junction Capacitance vs. Voltage\*

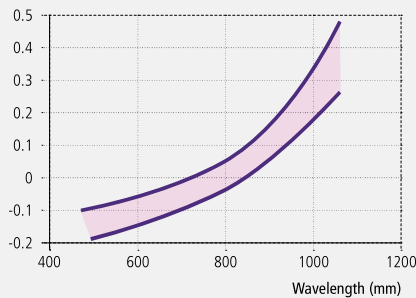
Relative Capacitance



Graph 5

Temp. Coefficient of Light Current vs. Wavelength\*

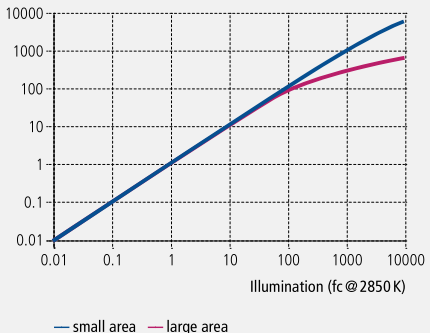
Temperature Coefficient (%) / Degree (C)



Graph 6

Rel. Short Circuit Current vs. Illumination\*

Relative Short Circuit Current



\* Typical characteristic curves @ 25 °C (unless otherwise noted)

# Industry Standard Silicon Photodiodes

## SILICON PN PHOTODIODES ■

Silicon Photodiodes – VTD Series



## Silicon Photodiodes – VTD Series

### Applications

- Pulse oximetry
- Automotive
- Surface mount assembly process

### Features and Benefits

- Alternate source for industry standard photodiodes
- Surface mount package available
- Available in package with integrated IR filtering
- Large area PN available on ceramic package
- RoHs compliant

### Product Description

The VTD series are photodiodes which have been used in many applications as replacement for competitive devices.

Product Table

### Silicon Photodiodes – VTD Series

Symbol Unit	Industry Equivalent	Package	Active Area mm <sup>2</sup>	Short Circuit Current		Maximum Dark	Junction Capacitance	Radiometric Sensitivity @ $\lambda_p$	Spectral Range $\lambda_{\text{RANGE}}$ nm	Typical Peak Wavelength $\lambda_p$ nm	Noise Equivalent Power
				min $I_{sc}$ $\mu\text{A}$	Current @ $V_R = 10\text{V}$ (nA)	typ $C_j$ pF	typ $S_R$ A/W	typ NEP W/√Hz			
VTD31AAH	CLD31AA	Ceramic	16.73	150 @ 5 mW/cm <sup>2</sup> , 2850K	50 @ $V_R = 15\text{V}$	Max 500 @ $V_R = 0\text{V}$	0.55	400-1150	860		
VTD34H	BPW34	Mini-Dip	7.45	50 @ 1000 Lux, 2850K	30	60 @ $V_R = 0\text{V}$	0.6	400-1100	900	4.8 X 10 <sup>-14</sup>	
VTD34FH	BPW34F	Mini-Dip	7.45	15 @ 0.5 mW/cm <sup>2</sup> , 940 nm	30	60 @ $V_R = 0\text{V}$	0.6	725-1150	940	4.8 X 10 <sup>-14</sup>	
VTD34SMH	BPW34	SMT	7.45	50 @ 1000 Lux, 2850K	30	Max 40 @ $V_R = 3\text{V}$	0.6	400-1100	900	4.8 X 10 <sup>-14</sup>	
VTD34FSMH	BPW34F	SMT	7.45	15 @ 0.5 mW/cm <sup>2</sup> , 940 nm	30	Max 80 @ $V_R = 3\text{V}$	0.6	725-1150	940	4.8 X 10 <sup>-14</sup>	
VTD205H	SFH205	TO-92	7.41	15 @ 0.5 mW/cm <sup>2</sup> , 940 nm	30	72 @ $V_R = 0\text{V}$	0.6	800-1100	925	-	
VTD205KH	SFH205K	TO-92	7.41	50 @ 1000 Lux, 2850K	30	72 @ $V_R = 0\text{V}$	0.6	400-1100	925	-	
VTD206H	SFH206	TO-92	7.41	15 @ 0.5 mW/cm <sup>2</sup> , 940 nm	30	72 @ $V_R = 0\text{V}$	0.6	750-1100	925	-	
VTD206KH	SFH206K	TO-92	7.41	50 @ 1000 Lux, 2850K	30	72 @ $V_R = 0\text{V}$	0.6	400-1100	925	-	

Figure 1

Package Drawing – VTD Series – Mini-DIP Package

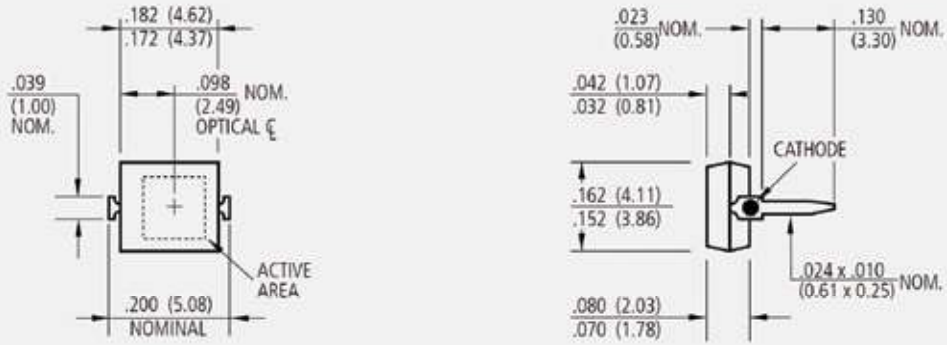


Figure 2

Package Drawing – VTD Series – SMT Package

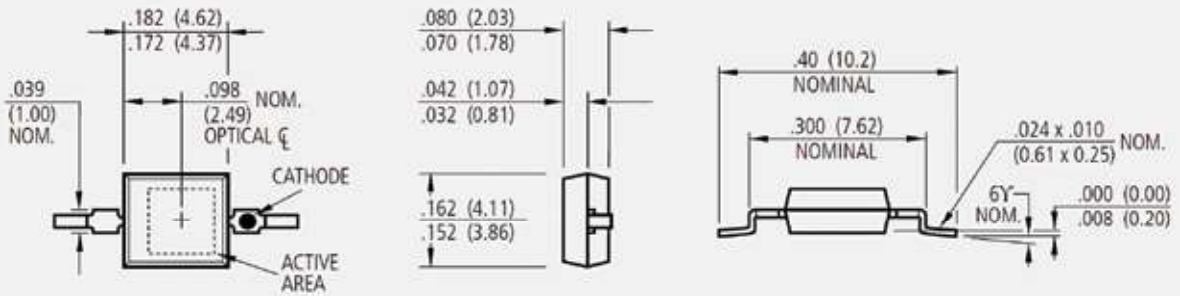


Figure 3

Package Drawing – VTD Series – TO-92 Package

