

Applications

Spectroscopy
Medical Diagnostics
Organic Sensing
Pollution Monitoring
Moisture Sensing
From 1000 to 4600 nm



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CHEMLEDs & CHEMSENSORS

**Semiconductor Emitters
and Detectors
for Chemical Sensing
in NIR and Mid-IR**



Telcom Devices Corp.

Telcom Devices Corporation

Telcom Devices Corporation offers semiconductor light emitters and detectors operating in the NIR and Mid-IR for chemical sensing applications, including pollution monitoring, medical diagnostics, spectroscopy, and sensing of moisture and organics. NIR components are fabricated by using established manufacturing technology for InGaAs devices. More advanced materials are used to produce the Mid-IR devices. Planar, dielectric-passivated design, micro-machining of lenses directly into LED chips, thermal and e-beam metallization, IR photolithography, and scribe & break die separation are among the advanced fabrication technologies employed. A wide range of packaging options is also offered in addition to custom foundry and packaging services. Manufacturing is carried out at the headquarters in Camarillo, CA in Class 100 cleanrooms.



CHEMLED Emitters

Parameter, 22°C	Units	Part Number								
		1.00 LED	1.07 LED	1.22 LED	1.25 LED	1.38 LED	1.43 LED	1.50 LED	1.56 LED	1.67 LED
Peak Wavelength (If = 100 mA)	nm	1000	1070	1220	1250	1380	1430	1500	1560	1670
Total Optical Power (If = 100 mA)	mW	1.2	0.9	1.8	1.6	1.7	2	1.4	1	0.6
Spectral Bandwidth (If = 100 mA)	nm	60	80	70	70	80	90	120	120	120
Maximum Continuous Operating Forward Current	mA	100	100	100	100	100	100	100	100	100
Maximum Reverse Voltage, VR	V	1	1	1	1	1	1	1	1	1
Forward Current (Vf = 1 VDC), If	mA	12	3	18	20	18	18	34	47	na
Reverse Current (Vr = 1 VDC), Ir	uA	4.4	2.6	na	4	na	4	4	6	3

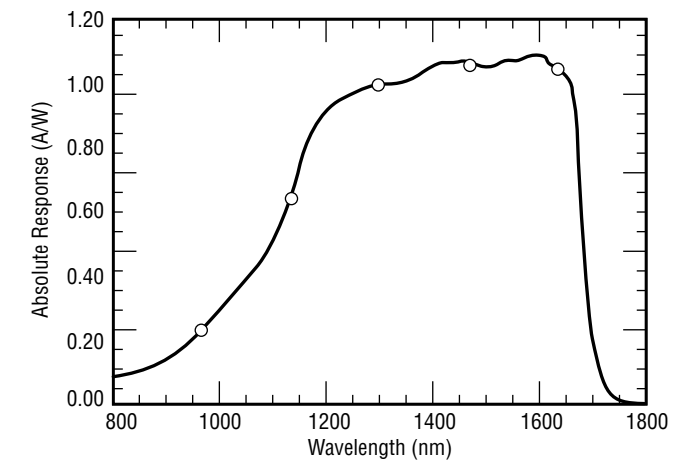
CHEMSENSE Detectors

13 (35) PD Series

Part Number	Photosensitive Diameter, m	Typical Values				Maximum Ratings		
		Dark Current (VR = 5V), nA	Capacitance (VR = 5V), pF	Responsivity (1300 nm), A/W	Rise/Fall Time, ns	Reverse Voltage, V	Reverse Current, A	Forward Current, mA
13PD55 - TO	55	0.1	0.5	0.90	0.07	30	250	5
13PD75 - TO	75	1	0.75	0.90	0.1	30	250	5
13PD75LDC - TO	75	< 0.11	0.75	0.90	0.1	30	300	5
13PD100 - TO	100	1	1.15	0.90	< 1	30	500	5
13PD150 - TO	150	2	1.5	0.90	< 2	20	1000	5
35PD300 - TO	300	3	4	0.90	< 3	20	5000	25
35PD300LDC - TO	300	< 0.51	4	0.90	< 3	20	5000	25

Part Number	Photosensitive Diameter, mm	Typical Values				Maximum Ratings		
		Dark Current, nA	Capacitance (zero bias), pF	Responsivity (1300 nm), A/W	Dynamic Impedance, MΩ	Reverse Voltage, V	Reverse Current, mA	Forward Current, mA
35PD500 - TO	0.5	<25 @ -5V	20	0.9	50	15	5	50
35PD1M - TO	1.0	50 @ -0.3V	150	0.9	Class A ≥ 50 Class B ≥ 1 Class C ≥ 0.15	2	20	100
35PD2M - TO	2.0	55 @ -3.0V	400	0.9	≥ 10	2	25	100
35PD3M - TO	3.0	50 @ -0.3V	900	0.9	Class A ≥ 1 Class B ≥ 0.1	2	25	100

Part Number	Photosensitive Diameter, mm	Dark Current (VR = 0.3V), A	Responsivity (1300 nm), A/W	Dynamic Impedance, MΩ	Maximum Ratings		
					Reverse Voltage, V	Reverse Current, mA	Forward Current, mA
35PD5M - TO	5	0.1	0.9	Class A ≥ 0.1 Class B ≥ 0.01	1	30	200
35PD10M - TO	10	2	0.9	0.006	0.5	120	800



Mid IR Components

CHEMLED Emitters

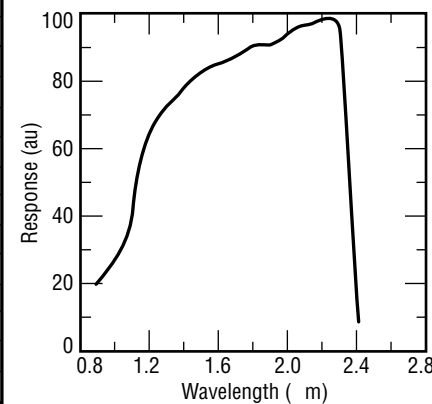
Parameter, 22°C	Units	Part Number						
		1.8 LED	1.9 LED	2.2 LED	2.9 LED	3.3 LED	4.3 LED	4.6 LED
Peak Wavelength (I _f = 50 mA)	nm	1800	1940	2200	2900	3300	4300	4600
Total Optical Power (I _f = 50 mA)	mW	0.6	0.3	0.3	0.04	0.04	0.02	0.01
Pulsed Power (100 ns, 10 KHz)	mW	5@2A	5@2A	3@2A	2@5A	2@5A	1@5A	0.5@5A
Spectral Bandwidth (I _f = 50 mA)	nm	150	150	200	400	450	500	600
Maximum Continuous Operating Forward Current	mA	30	30	30	50	50	50	50
Maximum Forward Current	mA	50	50	50	100	100	100	100
Maximum Pulsed Current (100 ns, 10 KHz)	mA	2000	2000	2000	5000	5000	5000	5000
Switching Time	ns	20	15	10	50	50	70	80
Quantum Yield	%	1	1.5	1	0.3	0.3	0.15	0.1
Temperature Dependence of Quantum Yield	%/K	6	5.5	4	7	5	4	4
Temperature Dependence of Peak Wavelength	nm/K	1	1	1.5	3	3	3	3

CHEMSENSE Detectors

2.2 PD Series

The 2.2 PD series of detectors is based on GaInAsSb/GaAlAsSb heterostructure technology. Spectral sensitivity lies between 1.0 and 2.4 μm, and peak response of 1 A/W occurs at about 2.2 μm. Operation can be photovoltaic or photoconductive, and pulsed or CW. Price/performance compared to extended wavelength InGaAs is superior due to the high resistance and low price. Standard packaging includes TO-18 and TO-5 headers.

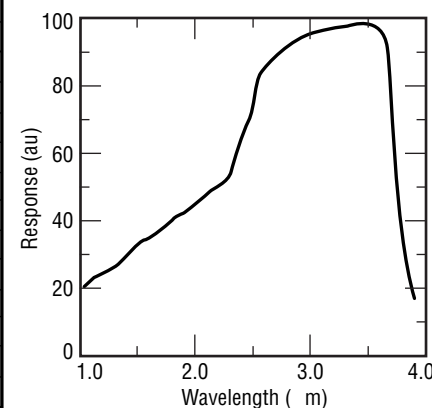
Parameter, 25°C	Units	Part Number			
		2.2PD250	2.2PD500	2.2PD1M	2.2PD2M
Active Area Diameter	mm	0.25	0.5	1.0	2.0
Peak Wavelength	μm	2.0-2.2	2.0-2.2	2.0-2.2	2.0-2.2
Detectivity	cm-Hz ^{1/2} /W	(4-6)E10	(3-5)E10	(3-5)E10	(1-5)E10
Rise & Fall Time (50%, 0.0V)	ns	1-5	10-20	40-80	300-500
Long-Wavelength Detector Cut-Off	μm	2.4 ± 0.02	2.4 ± 0.02	2.4 ± 0.02	2.4 ± 0.02
Short-Wavelength Detector Cut-Off	μm	0.9-1.0	0.9-1.0	0.9-1.0	0.9-1.0
Dark Current	A	3-15(-1V)	10-30(-1V)	10-20(-0.5V)	50-100(-0.2V)
Responsivity	A/W	0.9-1.1	0.9-1.1	0.9-1.1	0.9-1.1
Shunt Resistance	k	20-50	10-20	2-10	0.2-1.0
Capacitance, 0.0V	pF	10-20	50-100	400-800	1500-3000
Operating Temperature	°C	+25	+25	+25	+25
Package		TO-18	TO-18	TO-5	TO-5



3.4 PD Series

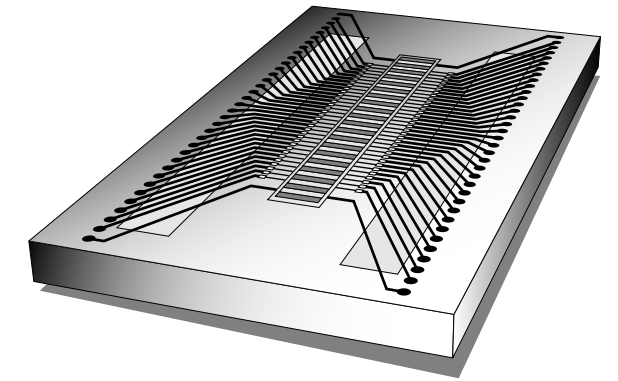
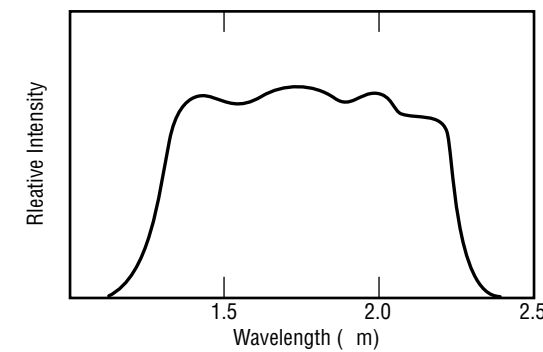
The 3.4 PD series of detectors is based on InAsSbP/InAs heterostructure technology. Spectral sensitivity lies between 1.0 and 3.8 μm, and peak response occurs at about 3.4 μm. Operation can be photovoltaic or photoconductive, and pulsed or CW. Excellent price/performance is offered. Standard packaging options include a parabolic reflector with optional calcium fluoride or sapphire window.

Parameter, 25°C	Units	Part Number	
		3.4PD-200	3.4PD-300
Active Area Diameter	mm	0.2	0.3
Peak Wavelength	μm	2.9-3.4	2.9-3.4
Detectivity	cm-Hz ^{1/2} /W	(1-3)E9	(1-3)E9
Rise & Fall Time (50%, 0.0V)	ns	150-200	180-220
Long-Wavelength Detector Cut-Off	μm	3.8 ± 0.05	3.8 ± 0.05
Short-Wavelength Detector Cut-Off	μm	0.8-1.0	0.8-1.0
Dark Current, -5.0V	A	300-500	400-600
Responsivity	A/W	1.0-1.3	1.0-1.3
Shunt Resistance	k	>130	>100
Capacitance, 0.0V	pF	1000-2000	1500-2300
Operating Temperature	°C	+25	+25
Package		TO-18	TO-18



Spectrally Selective Broadband Source

Multi-wavelength array of Chemled emitters in standard or custom configurations.



New for 1998! CHEMLED Driver

EV-2 is a dual channel current signal generator with digitally synthesized waveforms for driving CHEMLED emitters. Four waveforms are available in a lookup table stored in ROM and selected by an on-board dipswitch. The frequency of the waveform can be controlled by either an internal 24 MHz TTL master clock or through an external TTL clock accessed through an SMA port. An Analog Data Valid (ADV) signal for synchronization of data acquisition is also provided through an SMA port. A high quality 16-bit D/A converter provides 90 dB of dynamic range. EV-2 is powered by an on-board 9V battery.

EV-2 is ideally suited to chemical sensing applications as one channel can be used for monitoring and the second for a reference.

CHEMLED Evaluation Board

The EV-1 CHEMLED evaluation board is a high performance, precision, current signal generator and detection unit COMPATIBLE WITH MATLAB.*

The integration of the board with a 1 Meg x 24 bit SRAM IBM PC card permits direct digitalization of the photoelectric signal to the personal computer. Software drivers for DOS and demo M-files with GUI for MATLAB 4.x are included. Full control of the board and data processing is from directly within MATLAB environment. The system's RS-485 serial data bus guarantees fast data transfer to the IBM-PC.

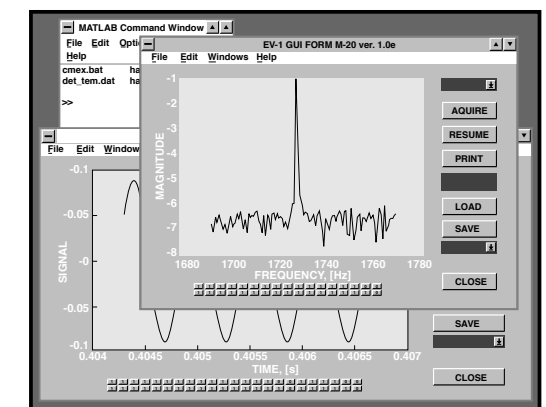
Board is fitted with following function blocks

- Photovoltaic preamplifier with differential inputs.
- Antialiasing filter.
- 18-bit analog to digital converter.
- Digital filter using 4x oversampling, boosting the data to 20-bit resolution.
- Master clock with synchronization signals for 1 Meg x 24 bit static memory card allowing phase locking or averaging.
- Two channel precision 16-bit resolution current drivers - max. 100 mA.
- On board selection of 4 x 2 preprogrammed waveforms and LED driving currents in acoustic bandwidth 0-20 kHz. Waveforms are designed for boxcar spectral window of 2ⁿ FFT.

Key Specifications

- 20 kHz maximum detection bandwidth after 4x oversampling.
- 100 db dynamic range.
- Excellent long term stability 20 ppm 10 hr in controlled environment.

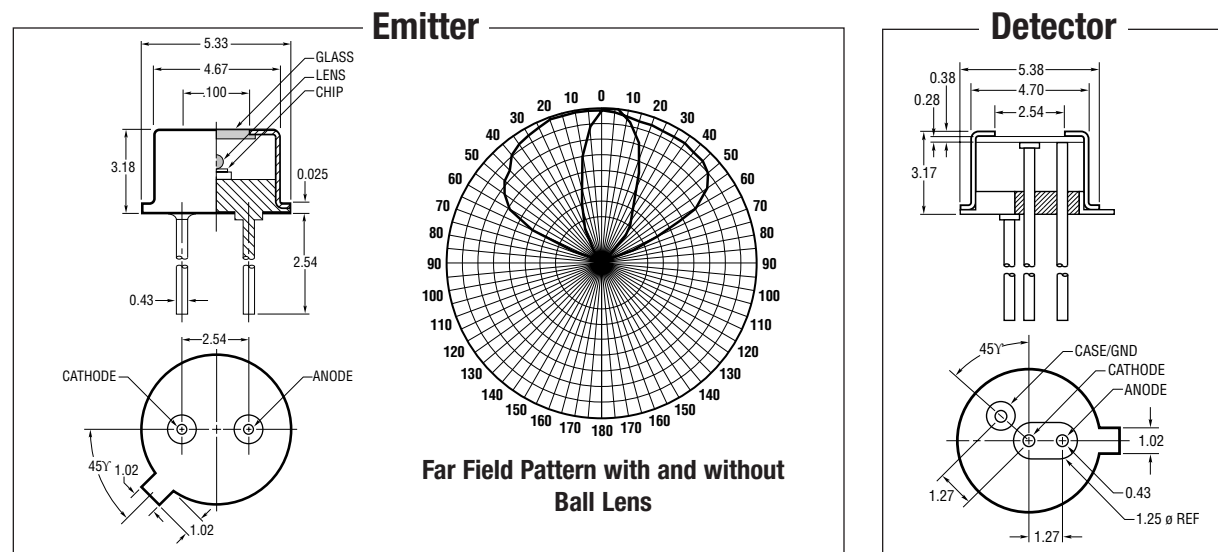
MATLAB Screen



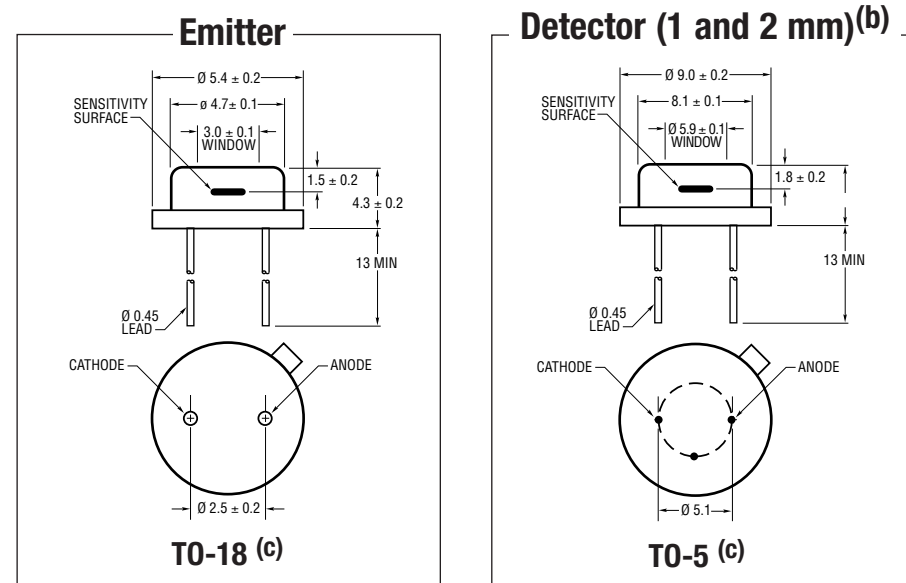
*MATLAB is a trademark of DHE Mathworks Inc.

Standard Packaging Options^(a)

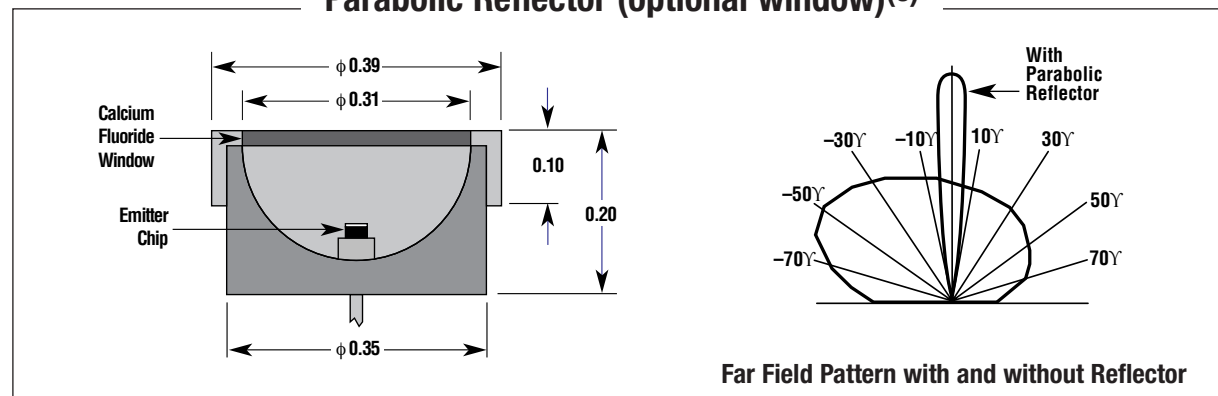
NIR



Mid-IR



Parabolic Reflector (optional window)^(c)



- (a) Dimensions in millimeters
- (b) Smaller detectors in T0-18
- (c) Sapphire or CaF₂ windows available

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