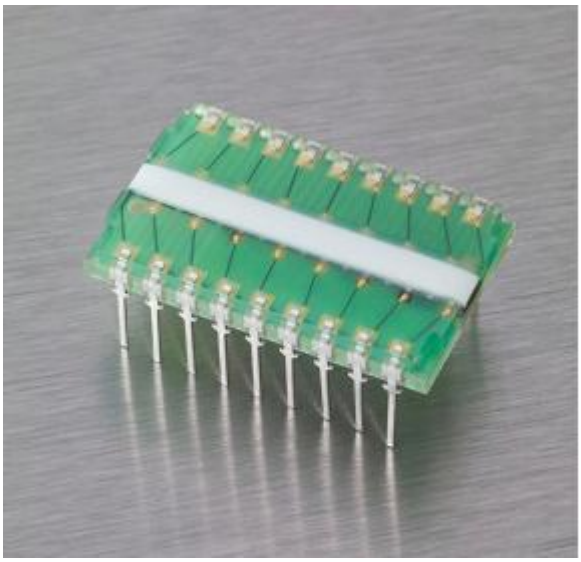
VTA1616H Series

Linear Photodiode Array (PDA) for X-ray Scanning



VTA1616H-L-SC-08-1

The VTA1616H series is a 16-channel High Resolution Photodiode Array (PDA). There are 16 single element photodiodes mounted directly on an FR-4 PCB. The pitch (sensor-to-sensor spacing of adjacent chips) for this series is 1.6 mm; other pitches are available as off the shelf or as custom devices.

A molded encapsulant of X-ray radiation hard, transparent material protects the device from damage and environmental influences. These parts are available with or without a scintillator material mounted over the photodiode active area to convert X-rays into visible photons of light.

These devices can be used as single energy detectors with a range of available scintillator crystals. They can also be used in dual-energy systems in a stacked configuration for simultaneous detection of low and high energy radiation for better atomic number discrimination. This technique is particularly useful in security applications such as luggage scanning in airports or at critical infrastructure locations (train stations, sports stadiums, courthouses, etc.).

Key Features

- Photodiodes with extremely low dark current
- High signal to noise ratio
- Scintillator crystals available on demand to convert incident X-rays into visible photons
- X-ray hard structure – no aging
- Extremely durable against humidity
- 16 channels at 1.6 mm pitch

Applications

- Luggage Scanning
- Food inspection
- Cargo/container screening
- Non-destructive testing
- Industrial inspection

EXCELITAS TECHNOLOGIES

Nomenclature

VTA1616H series part numbers are in the following format: **VTA1616H-W-XX-YY-Z**

W: Energy type (H-High, L-Low)
XX: Scintillator (NC-No scintillator, SC-With scintillator)
YY: Scintillator type (see *Scintillator Selection Guide* section below for all standard scintillator types)
Z: Photodiode type (0-Regular capacitance, 1-Low capacitance)

Scintillator Selection Guide*

High Energy Scintillator		Low Energy Scintillator	
Type no.	**Characteristics**	**Type no.**	**Characteristics**
VTA1616H-H-NC-00	No scintillator	VTA1616H-L-NC-00	No scintillator
VTA1616H-H-SC-01	CsI-Tl, 3 mm thick, segmented	VTA1616H-L-SC-03	Gd_2O_2S:Tb sheet, 310 µm thick, DRZ-High
VTA1616H-H-SC-05	Gd_2O_2S:Pr, 1.5 mm thick, segmented	VTA1616H-L-SC-08	Gd_2O_2S:Pr sheet, 200 µm thick

* Scintillators are available using other materials and geometries upon request.

Typical Scintillator Characteristics*

Parameter	SC-01	SC-05	SC-03	SC-08	Unit
Composition	CsI-Tl	Gd_2O_2S:Pr	Gd_2O_2S:Tb sheet	Gd_2O_2S:Pr sheet	
Emission peak	550	512	545	512	nm
Decay time (@ 1/e)	1	4	600	3	µs
Decay time to 10 % peak	5	7	1500	7	µs
Afterglow	0.500 (after 20 ms)	0.015 (after 100 ms)	-	0.020 (after 100 ms)	%
Density	4.51	7.33	7.33	7.33	gm/cm^3

* These characteristics are typical, specifications will vary from manufacturer.

Electro-Optical Characteristics

			VTA1616H-W-XX-YY-0			VTA1616H-W-XX-YY-1			
Parameter	**Symbol**	**Conditions**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Unit**
Short circuit current	I_{SC}	25 ° C / 1000 lx 2850 K	15	16	19	15	16	19	µA
Open circuit voltage	V_{OC}	25 ° C / 1000 lx 2850 K	380			380			mV
Forward voltage	V_F	25 ° C / 10 mA	0.4		1.2	0.4		1.2	mV
Dark current	I_D	25 ° C/ 0 lx ±10 mV applied		3	15		10	40	pA
Junction capacitance	C_J	25 ° C / 0 lx 0 V applied		270	350		50	65	pF
Breakdown voltage	V_{BR}	25 ° C / 0 lx	20			20			V
Responsivity @ 550 nm	λ_{550}	25 ° C ± 10 mV applied	0.28	0.34		0.28	0.34		A/W
Responsivity @ 950 nm	λ_{950}	25 ° C ± 10 mV applied	0.45	0.55		0.45	0.55		A/W
Peak spectral sensitivity	λ_{max}			950			950		nm
Spectral response	λ_{range}		400		1100	400		1100	nm
Effective sensitive area (per element)	A		2.68			2.68			mm^2
Chip size	l * w		3.15 x 1.56			3.15 x 1.56			mm^2
Element pitch			1.58			1.58			mm
Number of elements			16			16			element

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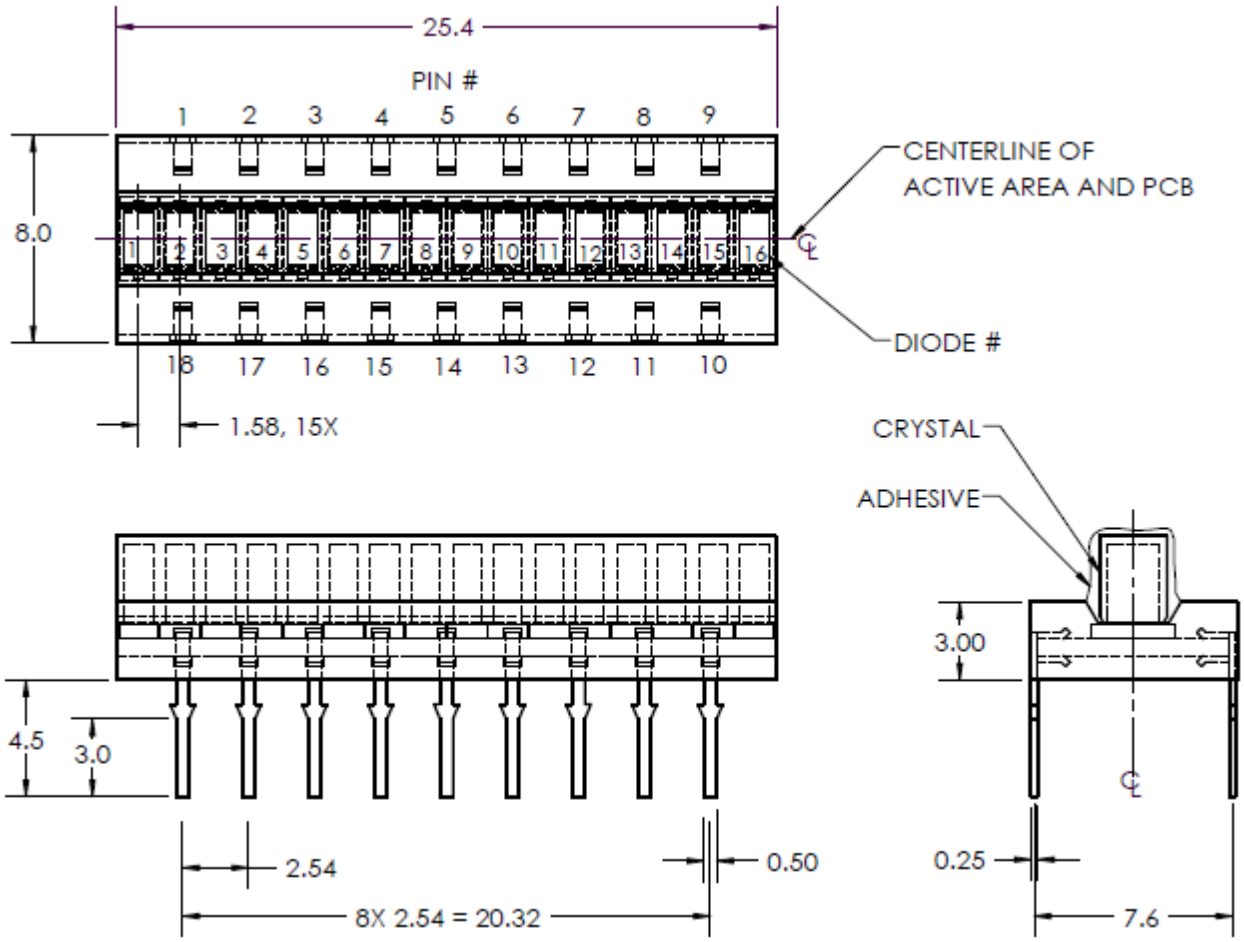
Physical Configuration

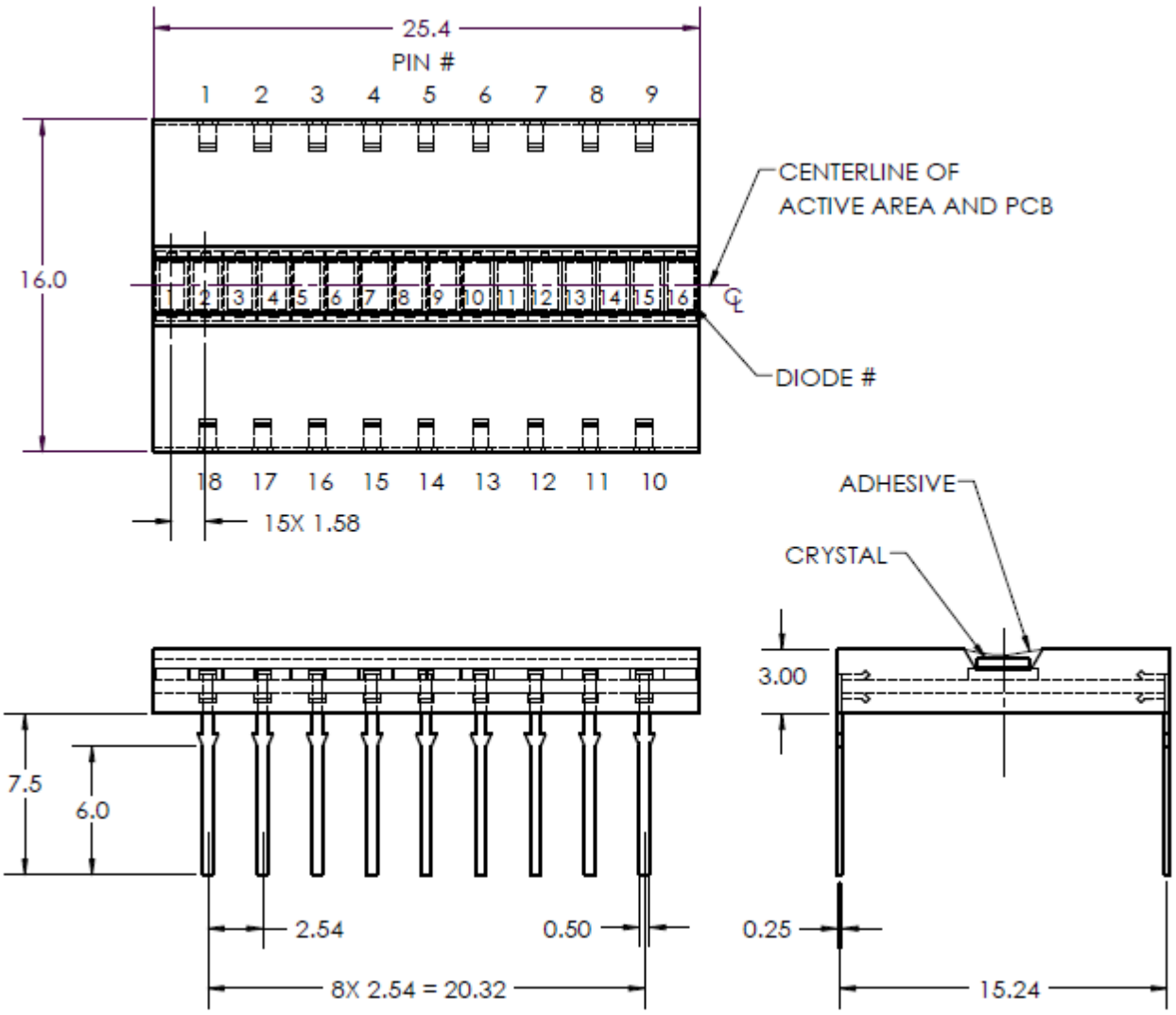
VTA1616H-H (Dimensions are in mm)



PIN#	Electrical Connection	PIN#	Electrical Connection
1	Anode 1	10	Anode 16
2	Anode 3	11	Anode 14
3	Anode 5	12	Anode 12
4	Anode 7	13	Anode 10
5	Anode 9	14	Anode 8
6	Anode 11	15	Anode 6
7	Anode 13	16	Anode 4
8	Anode 15	17	Anode 2
9	Common Cathode	18	Common Cathode

Linear Photodiode Array (PDA) for X-ray Scanning

VTA1616H-L (Dimensions are in mm)



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