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Features

Supports the Onsemi ArrayC-30035-144P-PCB
12x12 array of 3mm SiPMs

Horizontal signal connectors located on the back,
array located on the front

- 4-side tileable installation

Hybrid multiplexed readout

- Four encoded position signals
  for event centroid calculations: X+, X-, Y+, Y-

- 12 row signals and 12 column signals

- DC-coupled signal path

- Low power consumption

Patented diode-coupled charge division readout,
superior to traditional resistive readout

- Improved spatial uniformity

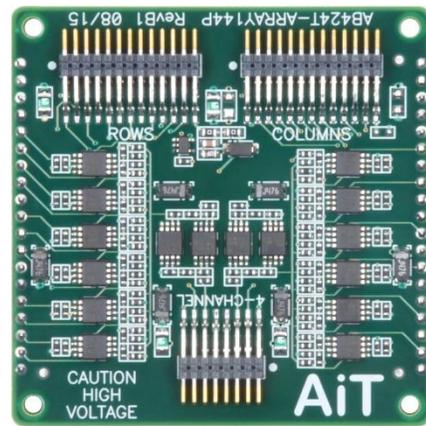- Faster rise time

- Reduced image noise

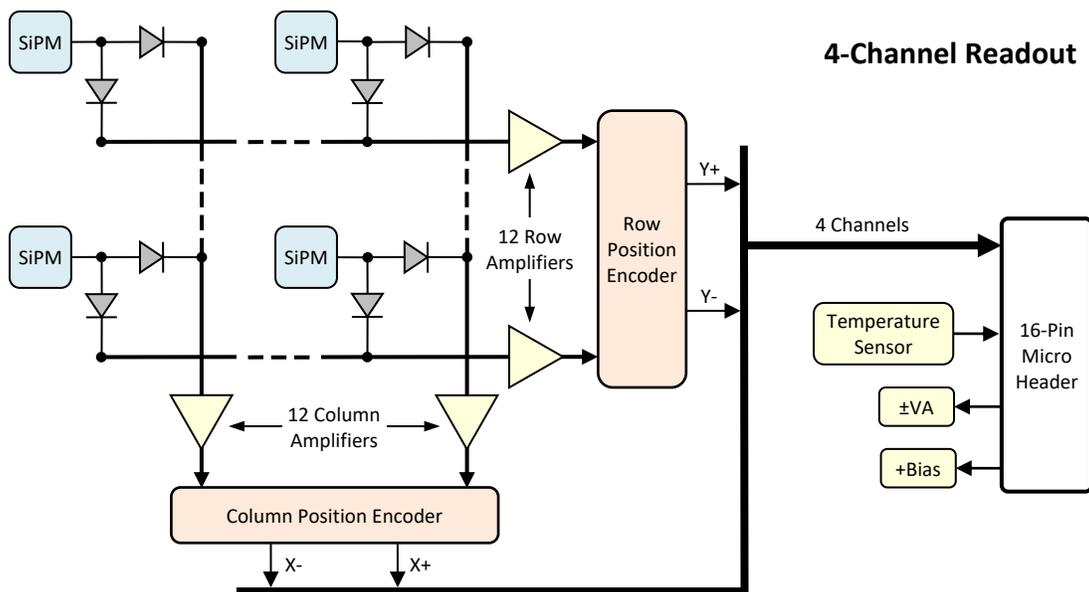Precision temperature sensor

Four mounting holes for #2 hardware

SiPM array not included
Front view

Back view

4-Channel Readout

4-Channel Readout Specifications

Position Signal Outputs

Encoding	Charge division multiplexed to 4 output channels: X+, X-, Y+, Y-
Gain	750Ω transimpedance gain
Output voltage	0 → -1V into 100Ω load
Output impedance	100Ω
Output current	50mA maximum

Temperature Sensor

Output voltage	500mV + 10mV per °C
Output current	10mA
Output impedance	100Ω
Accuracy	±0.5°C

Bias Voltage   +29V typical (refer to SiPM data)

Voltage clamp	47V Zener diode 500mW maximum

Amplifier Voltage (±VA)   ±2.8V → ±5.5V DC maximum

Current	±50mA typical (Iq, no signal, no load)

Signal Connector   Horizontal 16-pin 2-row header 0.050" pin pitch

Mating assembly	Samtec FFSD-08-D-XX.XX-01-N (XX.XX = length in inches)

Channel Map

Row 12

Front view

Row 1

Column 1   Column 12

16-Conductor FFSD Cable

Signal Connector

Side View
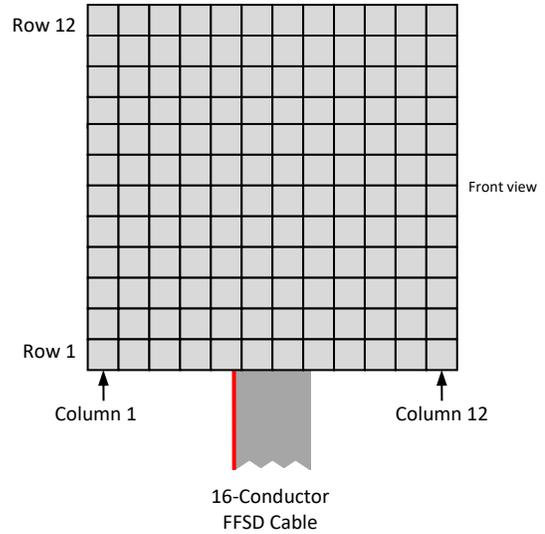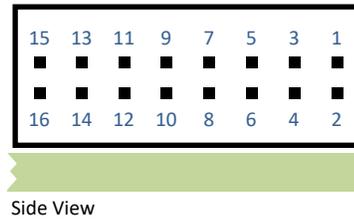
Pin	Function	Pin	Function
1	Temperature	2	Ground
3	X-	4	Ground
5	X+	6	Ground
7	-VA	8	Ground
9	+VA	10	Ground
11	Y-	12	Ground
13	Y+	14	Ground
15	+Bias	16	Ground

Row and Column Encoder Weights

Row# or Col# (for X- or Y-)	Row# or Col# (for X+ or Y+)	Fraction (ideal)	Fraction (actual)	% Error	Notes
1	12	0.0833	0.0833	0.00 %	
2	11	0.1667	0.1650	-1.02 %	
3	10	0.2500	0.2483	-0.68 %	
4	9	0.3333	0.3311	-0.66 %	
5	8	0.4167	0.4167	0.00 %	Sum of X- and X+ fractions
6	7	0.5000	0.5000	0.00 %	or Y- and Y+ fractions
7	6	0.5833	0.5882	0.84 %	= **1.0833**
8	5	0.6667	0.6637	-0.45 %	Independent of signal position
9	4	0.7500	0.7500	0.00 %	
10	3	0.8333	0.8333	0.00 %	
11	2	0.9167	0.9091	-0.83 %	
12	1	1.0000	1.0000	0.00 %	

Note: Errors exclude component tolerances

Output Signals

X- = (SiPM signal) * (encoder gain) * (X- fraction)
X+ = (SiPM signal) * (encoder gain) * (X+ fraction)
Y- = (SiPM signal) * (encoder gain) * (Y- fraction)
Y+ = (SiPM signal) * (encoder gain) * (Y+ fraction)

Typical event position calculation:
   X column   = (X+ - X-) / (X+ + X-)
   Y row   = (Y+ - Y-) / (Y+ + Y-)

Example

SiPM signal at column 4, row 3 (excluding encoder gain)

X- = (Column 4 signal) * 0.3311
X+ = (Column 4 signal) * 0.7500
Y- = (Row 3 signal) * 0.2483
Y+ = (Row 3 signal) * 0.8333

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Row and Column Readout Specifications

Position Signal Outputs

Encoding	Charge division multiplexed to 12 rows and 12 columns
Gain	750Ω transimpedance gain
Output voltage	0 → -1V into 100Ω
Output impedance	100Ω
Output current	50mA maximum

Temperature Sensor

Output voltage	500mV + 10mV per °C
Output current	10mA
Output impedance	100Ω
Accuracy	±0.5°C

Bias Voltage — +29V typical (refer to SiPM data)

Voltage clamp	47V Zener diode 500mW maximum

Amplifier Voltage (±VA) — ±2.8V → ±5.5V DC maximum

Current	±50mA typical at ±5.0V (Iq, no signal, no load)

Signal Connectors — Horizontal 26-pin 2-row header with 0.050" pin pitch

Mating assembly	Samtec FFSD-13-D-XX.XX-01-N (XX.XX = length in inches)

Channel Map

COLUMNS 26-Conductor FFSD Cable   ROWS 26-Conductor FFSD Cable

Row 12

Row 1

Column 1   Front view   Column 12

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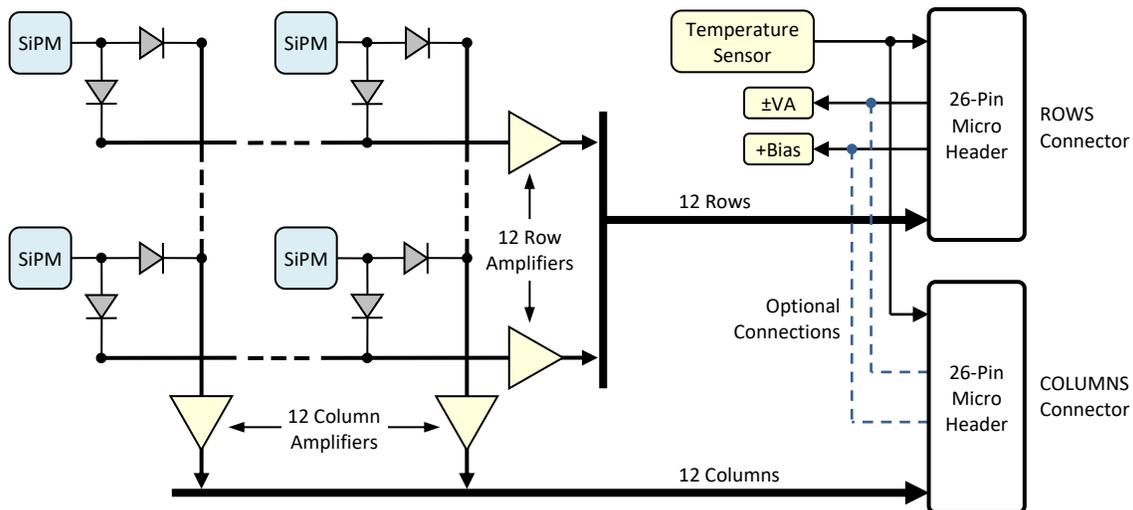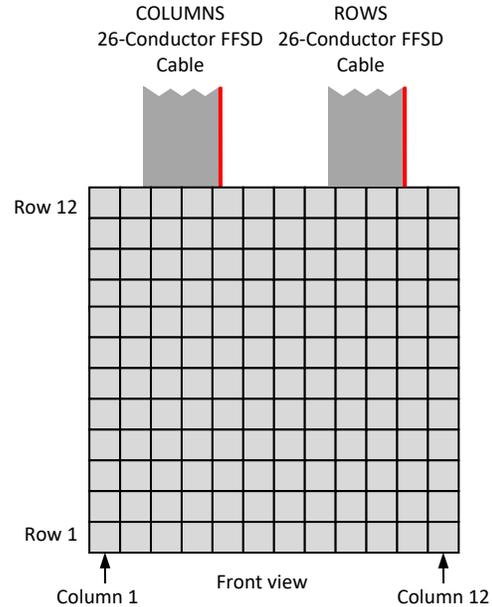
Row and Column Signal Connectors

ROWS

26-pin 0.050" horizontal header

25	23	21	19	17	15	13	11	9	7	5	3	1
26	24	22	20	18	16	14	12	10	8	6	4	2
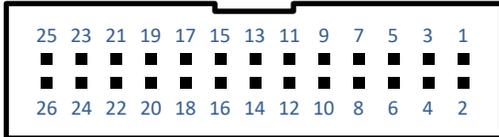
Side View

Pin	Function	Pin	Function
1	Row 1	2	Temperature
3	Row 2	4	Ground
5	Row 3	6	Ground
7	Row 4	8	Ground
9	Row 5	10	Ground
11	Row 6	12	-VA
13	Row 7	14	Ground
15	Row 8	16	+VA
17	Row 9	18	Ground
19	Row 10	20	Ground
21	Row 11	22	Ground
23	Row 12	24	Ground
25	+Bias	26	Ground

COLUMNS

26-pin 0.050" horizontal header

25	23	21	19	17	15	13	11	9	7	5	3	1
26	24	22	20	18	16	14	12	10	8	6	4	2
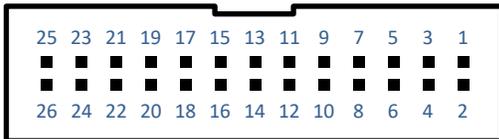
Side View

| Pin	Function	Pin	Function
1	Column 1	2	Temperature
3	Column 2	4	Ground
5	Column 3	6	Ground
7	Column 4	8	Ground
9	Column 5	10	Ground
11	Column 6	12	*NC (-VA)
13	Column 7	14	Ground
15	Column 8	16	*NC (+VA)
17	Column 9	18	Ground
19	Column 10	20	Ground
21	Column 11	22	Ground
23	Column 12	24	Ground
25	*NC (+Bias)	26	Ground

NOTE

+Bias, +VA, -VA are normally connected to the ROWS connector. These signals are not connected to the COLUMNS connector. Disconnected signals are indicated as "NC". These signals can be optionally connected to the COLUMNS connector as an assembly variant.
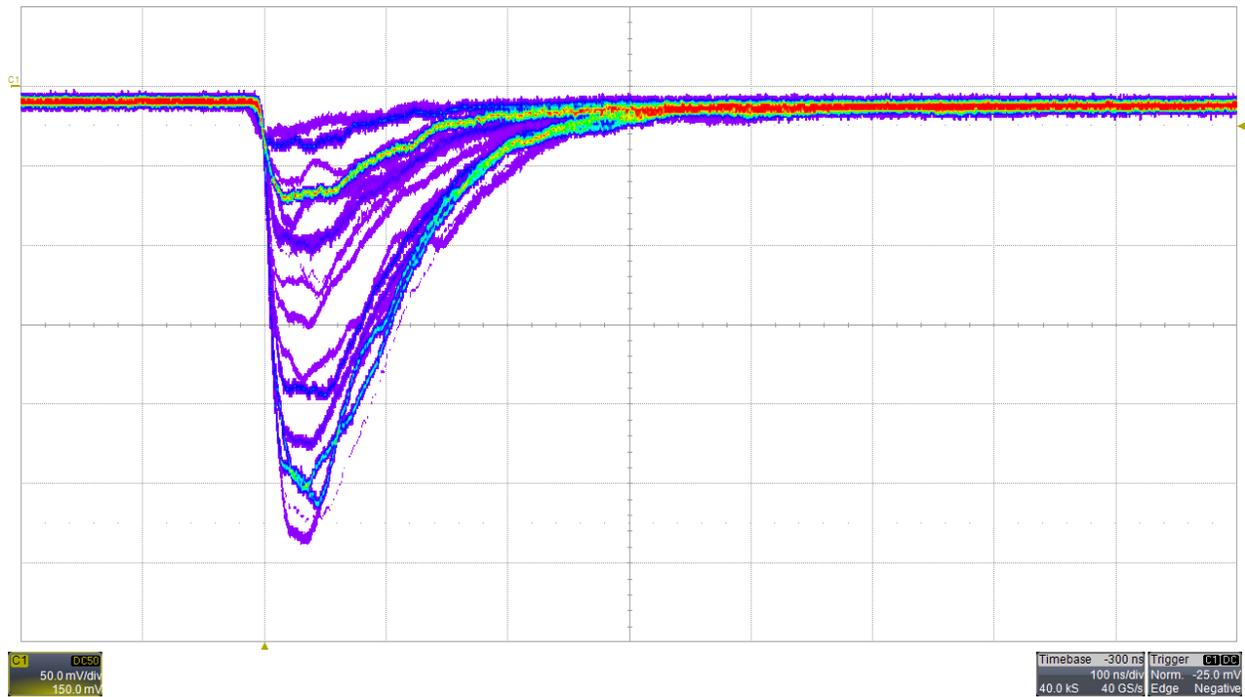
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Typical Signals   4-Channel Readout

Source = Laser; Receiver = ABR4, channel 1, minimum gain; Bias = +29V; FFSD cable = 36"
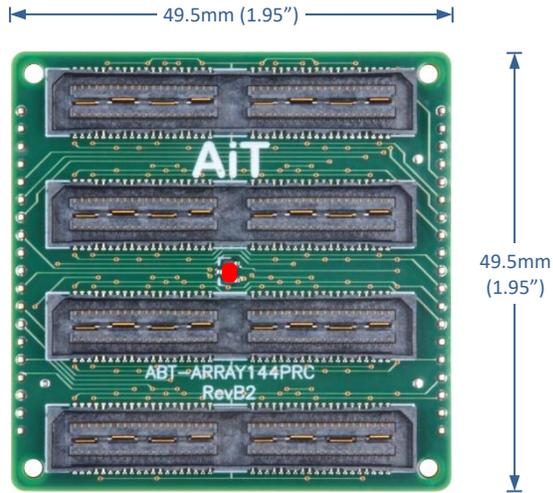

Leading edge = 3.0ns
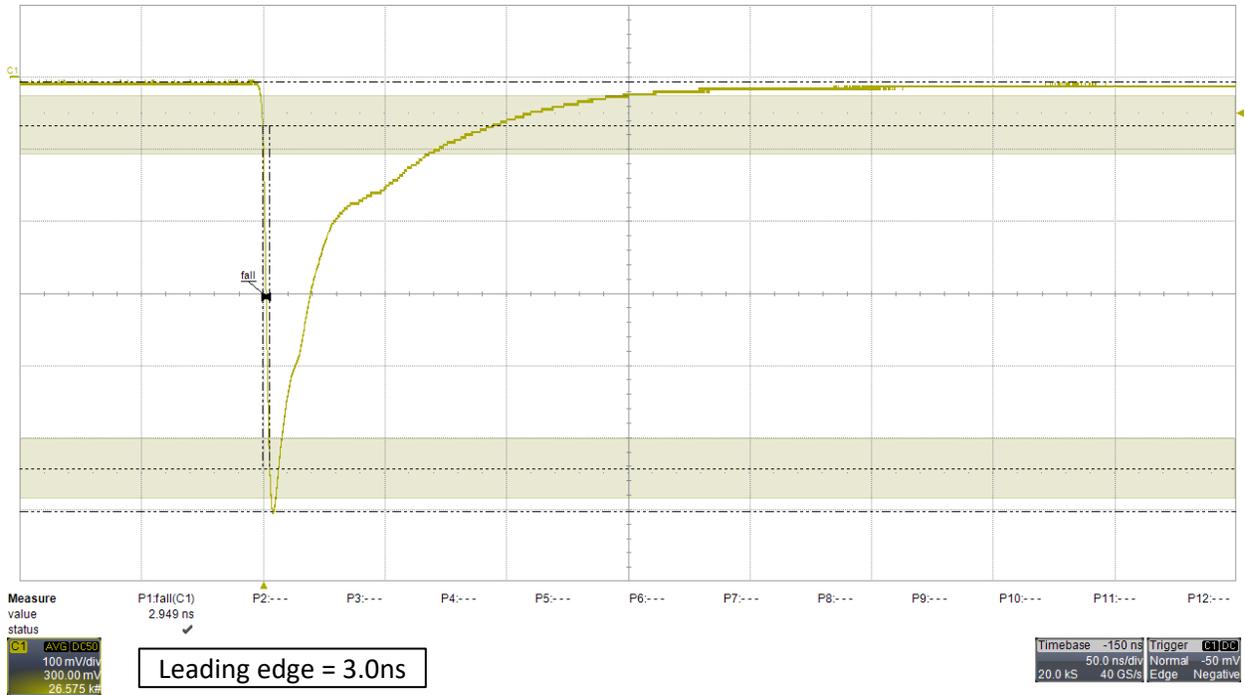
Source = LYSO emission; Receiver = ABR4, channel 1, minimum gain; Bias = +29.5V; FFSD cable = 36"; persistence display

Mechanical

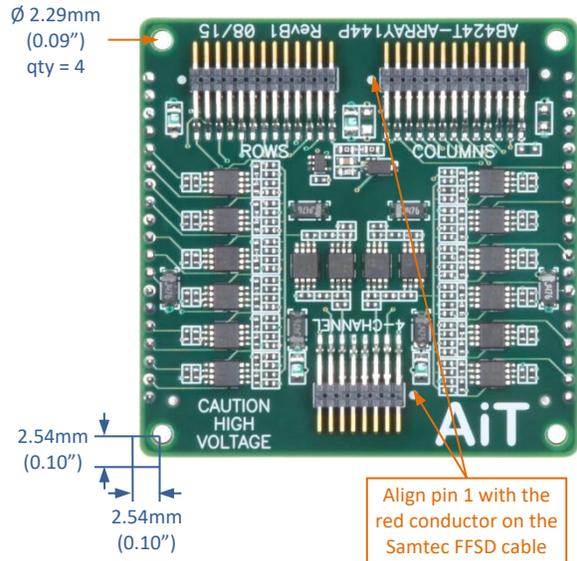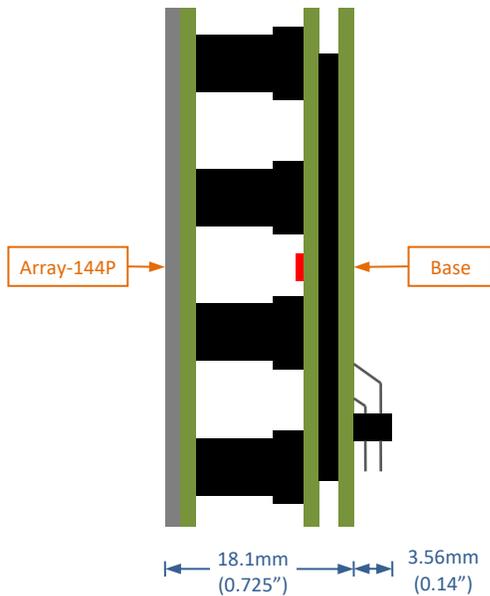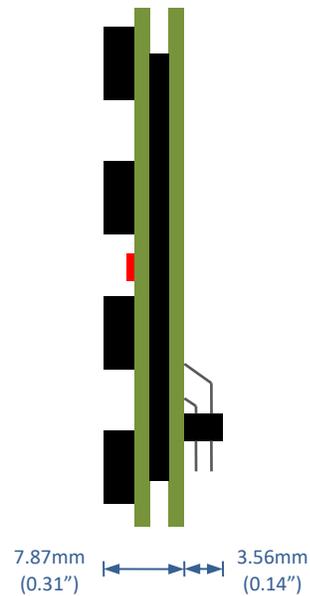**Front View**

49.5mm (1.95")

49.5mm (1.95")

Back View

Ø 2.29mm (0.09") qty = 4

2.54mm (0.10")

2.54mm (0.10")

Align pin 1 with the red conductor on the Samtec FFSD cable

🔴 Temperature sensor

Measurement tolerance: ±0.020"

Side View, Base Attached to Array

Array-144P

Base

18.1mm (0.725")

3.56mm (0.14")

Side View, Base Only

7.87mm (0.31")

3.56mm (0.14")

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4-Channel Active Base Readout Kit

+12V Desktop
Power Supply
with US or EU power cable

4-Channel
Active Base

Samtec FFSD
Ribbon Cable
914mm (36") length shown

Standard Ribbon Cable
152mm (6") length shown

Amplifier Board
Power Supply
Model ABPS shown

4-Channel Active Base Receiver
Model ABR4 with MCX connectors shown
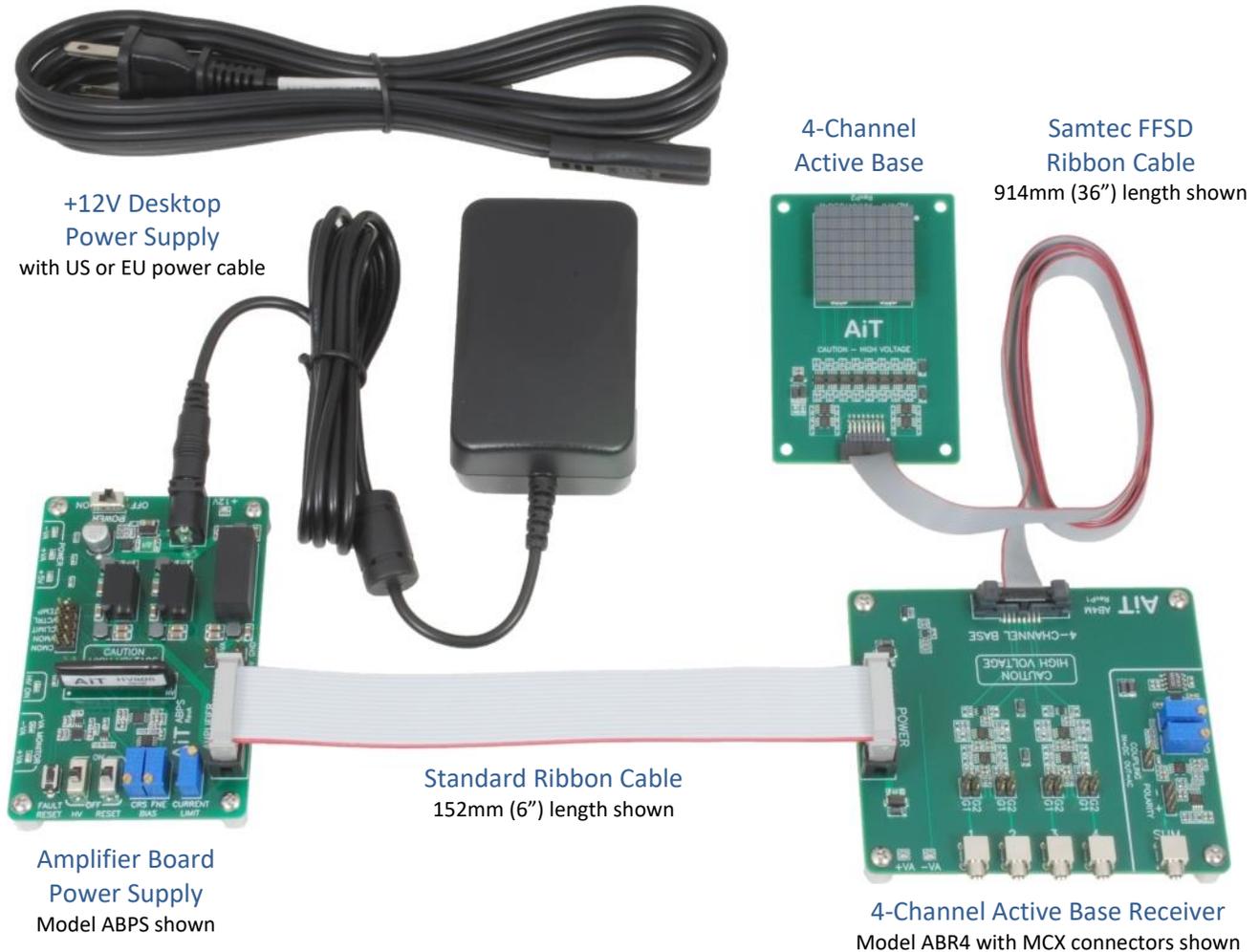
Components

Each component is available separately. Refer to each datasheet for details.

The Active Base includes a 914mm (36") Samtec FFSD micro-pitch ribbon cable.

The Amplifier Board Power Supply includes a 12V desktop power supply and a HV80 bias voltage power supply.

The 4-channel Active Base Receiver includes a 152mm (6") power supply ribbon cable and a breakout board to connect any external power supply.

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AB424T-ARRAY144P
Tileable 4+24 Channel Hybrid Active Base for the Onsemi ArrayC-30035-144P-PCB

Datasheet
Rev. A-2310

Safety Information

⚠ WARNING – High Voltage

- High voltage may be present during operation
- High voltage stored on capacitors may be present after power is removed
- Improper handling may result in personnel injury or equipment damage

This high-voltage device must be used only by personnel trained and qualified in safe handling, installation, and operation of high-voltage equipment.

CAUTION – Electrostatic Discharge (ESD) Sensitivity

The circuit board can be damaged by electrostatic discharge. Observe precautions for handling electrostatic sensitive devices. Handle only at static-safe workstations.

High-Gain Photodetectors

High-gain photodetectors such as silicon photomultipliers may conduct damaging currents if exposed to high optical signal levels while the bias voltage is applied, or if the bias voltage exceeds the recommended operating range. These devices must be operated only in low-light conditions, and only within the manufacturer's recommended bias voltage range.

Handling and Disassembly

This product may be provided with a protective enclosure. Disassembled enclosure components and circuit boards may contain sharp edges. Take appropriate safety precautions while assembling or disassembling the enclosure and handling disassembled components.

Indoor Use Only

Do not operate this product in a wet or damp environment. Do not operate in an explosive atmosphere.