
Features

- 25 element APD array
- High QE >80% for $\lambda = 760-910$ nm
- High gain, high speed, low noise
- High uniformity, low cross talk

Description

Analog evaluation board for 25 element matrix APD array including temperature compensated power control, amplifiers and comparators.

Application

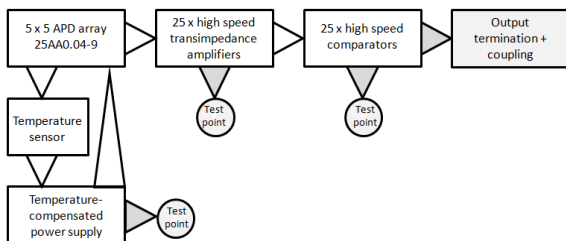
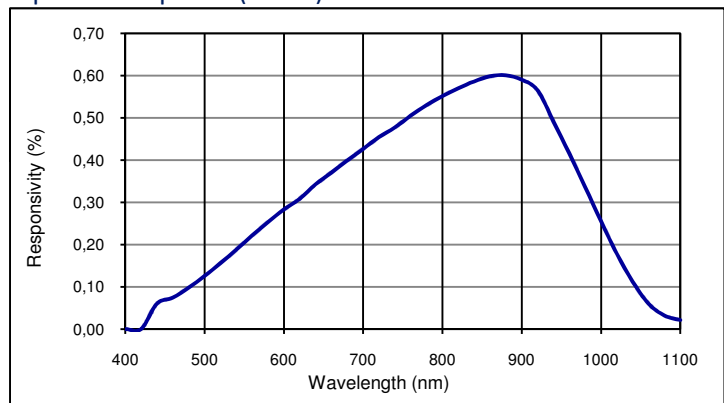
- LIDAR applications
- Shape recognition
- Collision warning

RoHS

2002/95/EC


Absolute maximum ratings

Symbol	Parameter	Min	Max	Unit
T_{STG}	Storage temp	-40	125	°C
T_{OP}	Operating temp	-25	70	°C
M_{max}	Overall gain		1E+07	

Spectral response (M = 1)

Electro-optical characteristics of APD chip @ 23 °C

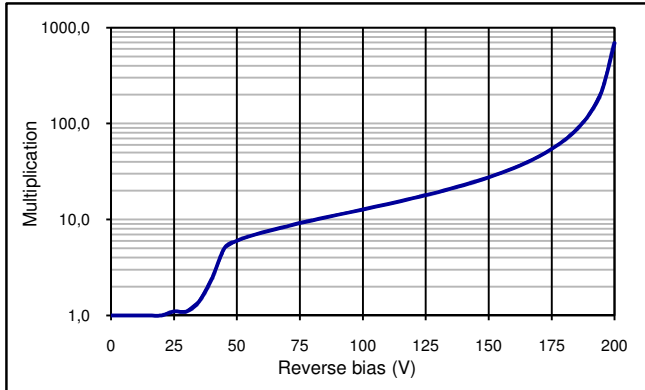
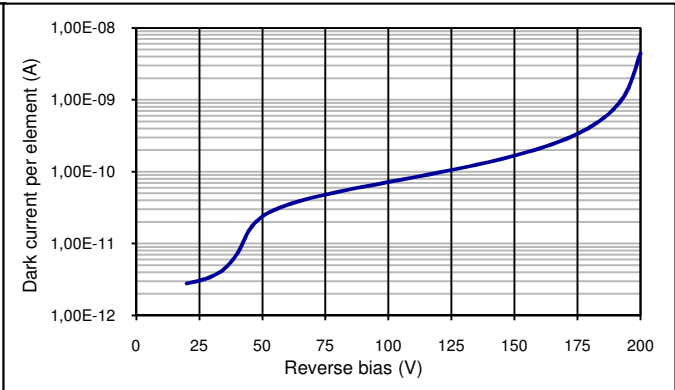
Symbol	Characteristic	Test Condition	Min	Typ	Max	Unit
	No of elements		25			
	Active area		205 x 205			μm
	Gap; Pitch		95 ; 300			μm
I_D	Dark current	M = 100, per element		0.6		nA
C	Capacitance	M = 100, per element		1		pF
	Responsivity	M = 100; $\lambda = 905$ nm	55	60		A/W
t_R	Rise time	M = 100; $\lambda = 905$ nm; $R_L = 50 \Omega$		1		ns
V_{BR}	Breakdown voltage	$I_R = 2 \mu A$	120	200	280	V
	Temperature coefficient			1.45		V/K
	Cross talk	$\lambda = 905$ nm		50		dB
	Photo current uniformity	M = 50		± 5	± 20	%
	Dark current uniformity	M = 50		± 5	± 20	%

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APD multiplication as fct of reverse bias (23 °C)

APD Dark current as fct of reverse bias (23 °C)

Characteristics of evaluation board @ 23 °C

Part	Characteristic	Test Condition	Min	Typ	Max	Unit
Module	Supply voltage			+/- 5		V
Module	Supply current			428		mA
Amplifiers						
Amplifier	Supply voltage	all 25 TIAs	+/- 4.5	+/- 5	+/- 5.5	V
Amplifier	Supply current	all 25 TIAs		370		mA
Amplifier	Transimpedance*			100		kΩ
Amplifier	Output impedance			50		Ω
Amplifier	Differential output voltage				7 (+/-3.5)	V
Amplifier	Rise time	1 Volt Step		1.6		ns
Amplifier	Voltage noise	1 MHz		3.1		nV/√Hz
Amplifier	Current noise	1 MHz		1.6		pAV/√Hz
Amplifier	Bandwidth*	-3 db		5.3		MHz
Amplifier	Power supply rejection ratio			73		db
Amplifier	Offset voltage typical			0.8		mV
Amplifier	Coupling		AC (DC upon special request)			
Comparitors						
Compar.	Supply voltage			+/- 5		V
Compar.	Supply current	no load		28		mA
Compar.	Output voltage	logic high/low	4.5/0	5/0	5.5/0	V
Compar.	Output short circuit current				68	mA
Compar.	Max. differential output voltage			1		mV
Compar.	Rise time			1.3		ns
Compar.	Voltage noise			7		ns
Power Supply						
Power Sup.	Output to APD (user adjustable)	DC	88		384	V
Power Sup.	Supply current			30		mA
Power Sup.	Temperature compensated			yes		
Detector head						
D. H.	Field of view			+/- 30°		°
T-Sensor	PTC	R ₂₅	9.5	10	10.5	kOhm
		B _{25/85}	3366	3435	3504	K
Connector						
Maker	Samtec (www.samtec.com)	Type	QSE-040-01-L-D-A			
		Pitch	0.8			mm
		Mating cable	EQCD series (Samtec)			

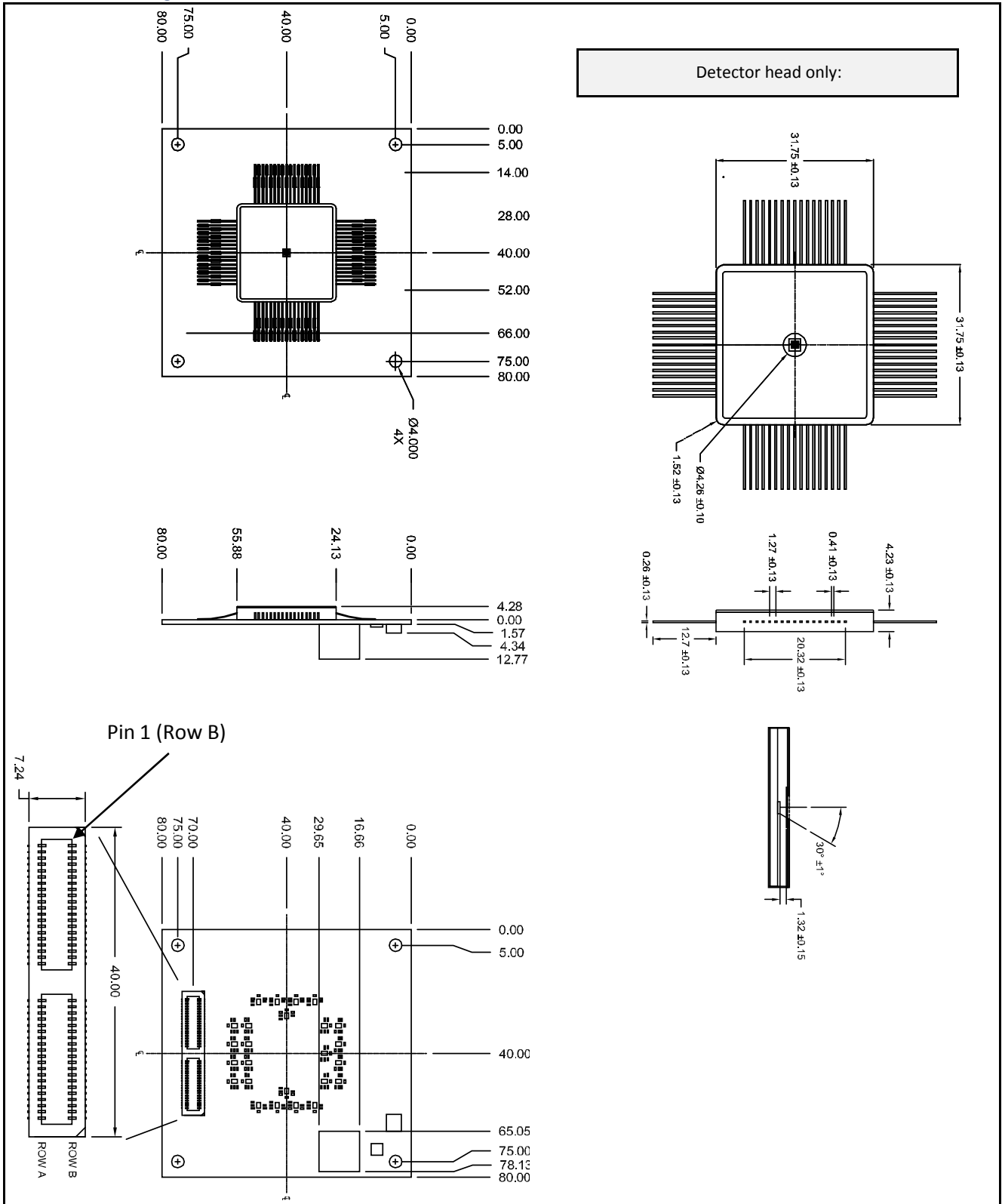
* Transimpedance and bandwidth can be altered upon special request. A lower transimpedance with higher bandwidth is possible.

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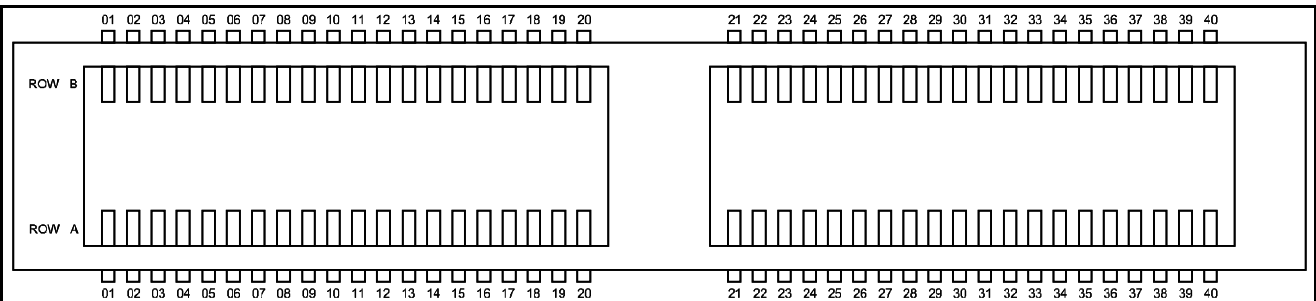

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Technical Drawing

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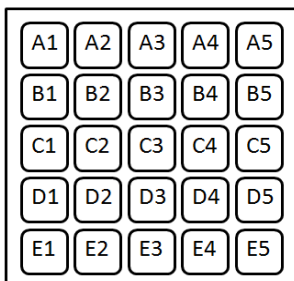
Connector schedule


Connector row A [Power]			
PIN	Designator	PIN	Designator
1	+10 to +12 V DC	21	+5V DC
2	+10 to +12 V DC	22	
3		23	+5V DC
4		24	
5		25	+5V DC
6		26	
7		27	GROUND
8		28	
9		29	GROUND
10		30	
11		31	GROUND
12		32	
13		33	-5V DC
14		34	
15		35	-5V DC
16		36	
17		37	-5V DC
18		38	
19		39	T 1*
20		40	T 2*

Connector row B [Signal]			
PIN	Designator	PIN	Designator
1	APD C4	21	APD E1
2	APD C5	22	APD E2
3	APD D5	23	
4	APD E5	24	
5	APD D4	25	APD D2
6	APD A5	26	
7	APD A4	27	
8	APD B5	28	
9		29	APD D1
10	APD D3	30	
11	APD E4	31	
12		32	APD B4
13		33	APD B3
14		34	APD A2
15		35	APD A3
16	APD E3	36	APD B1
17		37	APD C2
18	APD C3	38	APD C1
19		39	APD B2
20		40	APD A1

*T1; T2... Contacts for temperature sensor (PTC) with 10kOhm, monitoring only

APD - Array (common anode):


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Temperature Sensor (PTC)

Temp [°C]	Resistance [kΩ] min	Resistance [kΩ] typ	Resistance [kΩ] max	Temp [°C]	Resistance [kΩ] min	Resistance [kΩ] typ	Resistance [kΩ] max	Temp [°C]	Resistance [kΩ] min	Resistance [kΩ] typ	Resistance [kΩ] max	Temp [°C]	Resistance [kΩ] min	Resistance [kΩ] typ	Resistance [kΩ] max
-40	183,5	205,2	228,9	6	19,98	21,35	22,76	52	3,638	3,902	4,175	97	0,942	1,038	1,14
-39	173,5	193,8	215,9	7	19,17	20,47	21,8	53	3,52	3,778	4,045	98	0,916	1,01	1,11
-38	164,1	183,1	203,8	8	18,4	19,63	20,89	54	3,406	3,658	3,919	99	0,891	0,983	1,081
-37	155,3	173,1	192,4	9	17,66	18,83	20,02	55	3,297	3,543	3,798	100	0,867	0,956	1,052
-36	147,0	163,6	181,7	10	16,96	18,06	19,19	56	3,191	3,432	3,682	105	0,756	0,836	0,922
-35	139,2	154,8	171,7	11	16,29	17,34	18,41	57	3,09	3,325	3,569	110	0,66	0,732	0,81
-34	131,9	146,5	162,3	12	15,65	16,64	17,65	58	2,992	3,222	3,461	115	0,577	0,642	0,712
-33	125,0	138,7	153,5	13	15,04	15,98	16,94	59	2,898	3,123	3,356	120	0,507	0,565	0,628
-32	118,5	131,3	145,2	14	14,46	15,35	16,25	60	2,807	3,027	3,255	125	0,446	0,499	0,556
-31	112,4	124,4	137,4	15	13,9	14,74	15,6	61	2,72	2,934	3,157				
-30	106,6	117,9	130,1	16	13,36	14,17	14,98	62	2,636	2,845	3,063				
-29	101,2	111,8	123,2	17	12,86	13,62	14,38	63	2,554	2,759	2,972				
-28	96,1	106	116,7	18	12,37	13,09	13,82	64	2,476	2,676	2,885				
-27	91,28	100,6	110,6	19	11,9	12,59	13,28	65	2,4	2,595	2,8				
-26	86,73	95,51	104,9	20	11,46	12,11	12,76	66	2,327	2,518	2,718				
-25	82,44	90,69	99,52	21	11,03	11,65	12,27	67	2,256	2,443	2,639				
-24	78,39	86,15	94,44	22	10,62	11,21	11,79	68	2,188	2,371	2,562				
-23	74,56	81,86	89,64	23	10,23	10,79	11,34	69	2,123	2,301	2,488				
-22	70,95	77,81	85,12	24	9,858	10,38	10,91	70	2,059	2,233	2,416				
-21	67,53	73,99	80,86	25	9,5	10	10,5	71	1,998	2,168	2,347				
-20	64,3	70,37	76,83	26	9,143	9,632	10,12	72	1,939	2,105	2,281				
-19	61,24	66,96	73,04	27	8,802	9,279	9,758	73	1,882	2,045	2,216				
-18	58,35	63,74	69,45	28	8,476	8,942	9,41	74	1,827	1,986	2,154				
-17	55,61	60,69	66,06	29	8,163	8,619	9,076	75	1,773	1,929	2,094				
-16	53,02	57,8	62,86	30	7,864	8,309	8,757	76	1,722	1,874	2,035				
-15	50,56	55,07	59,83	31	7,578	8,012	8,45	77	1,672	1,821	1,979				
-14	48,24	52,49	56,97	32	7,303	7,727	8,155	78	1,624	1,77	1,924				
-13	46,03	50,04	54,26	33	7,04	7,454	7,873	79	1,578	1,72	1,871				
-12	43,94	47,72	51,7	34	6,788	7,192	7,602	80	1,533	1,672	1,82				
-11	41,95	45,52	49,27	35	6,546	6,941	7,341	81	1,489	1,625	1,77				
-10	40,07	43,44	46,97	36	6,314	6,7	7,091	82	1,446	1,58	1,721				
-9	38,29	41,46	44,79	37	6,092	6,468	6,851	83	1,405	1,536	1,674				
-8	36,59	39,59	42,73	38	5,878	6,246	6,62	84	1,365	1,493	1,628				
-7	34,98	37,81	40,78	39	5,673	6,033	6,399	85	1,327	1,451	1,584				
-6	33,45	36,13	38,92	40	5,477	5,828	6,185	86	1,289	1,411	1,541				
-5	32	34,53	37,16	41	5,288	5,631	5,98	87	1,252	1,372	1,499				
-4	30,61	33	35,49	42	5,107	5,441	5,783	88	1,217	1,334	1,458				
-3	29,3	31,56	33,91	43	4,932	5,259	5,594	89	1,182	1,297	1,418				
-2	28,05	30,19	32,4	44	4,765	5,084	5,411	90	1,149	1,261	1,38				
-1	26,86	28,88	30,97	45	4,604	4,916	5,235	91	1,117	1,226	1,342				
0	25,73	27,64	29,62	46	4,449	4,754	5,066	92	1,085	1,192	1,306				
1	24,65	26,46	28,33	47	4,301	4,598	4,903	93	1,055	1,159	1,271				
2	23,62	25,33	27,1	48	4,158	4,448	4,747	94	1,025	1,127	1,237				
3	22,65	24,26	25,93	49	4,02	4,304	4,596	95	0,997	1,097	1,204				
4	21,71	23,24	24,82	50	3,888	4,165	4,45	96	0,969	1,067	1,171				
5	20,82	22,27	23,77	51	3,76	4,031	4,31	97	0,942	1,038	1,14				

R25 [kOhm]	9.5	10	10.5
B25/85 [K]	3366	3435	3504

$$T = \frac{B \cdot T_N}{B + \ln\left(\frac{R_T}{R_N}\right) \cdot T_N}$$

Handling: Please consider ESD protection while handling.

Disclaimer: Due to our strive for continuous improvement, specifications are subject to change within our PCN policy according to JESD46C.

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