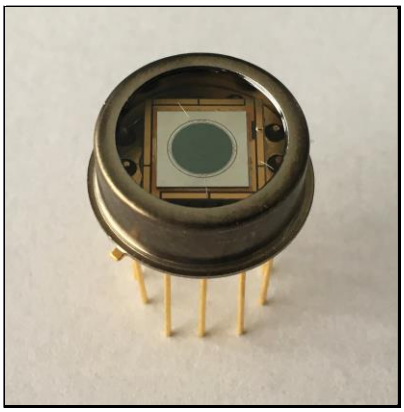
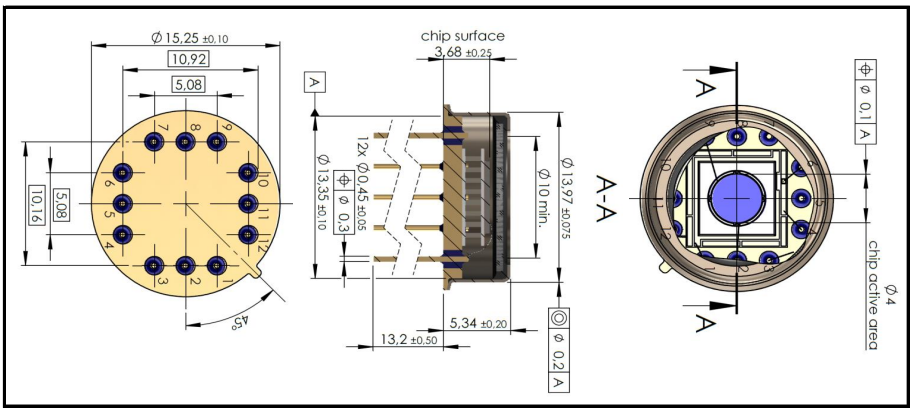
First Sensor





Features

- ø 4000 µm active area
- High QE for λ = 850-1064 nm
- Low noise
- TEC for temperature control

Description

Circular active area APD chip with IR enhanced sensitivity. Low dark current due to guard ring diode in hermetic TO type metal can including peltier element.

Application

- Pulsed 1064 nm laser detection
- Laser range finding
- Fluorescence detection

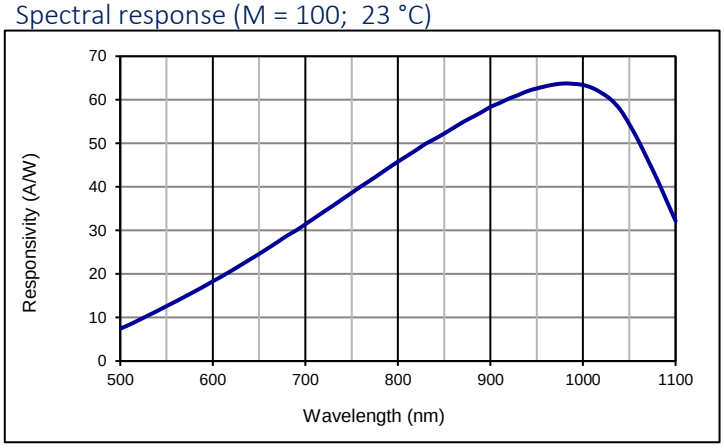
RoHS

2011/65/EU

Absolute maximum ratings

Symbol	Parameter	Min	Max	Unit
T_{STG}	Storage temp	-55	125	°C
T_{OP}	Operating temp	-40*	100	°C
M_{max}	Gain (I_{PO} = 1 nA)	1000		
I_{PEAK}	Peak DC current		0.25	mA
V_{TEC}	TEC voltage		3.9	V
I_{TEC}	TEC current		1.9	A

Spectral response (M = 100; 23 °C)

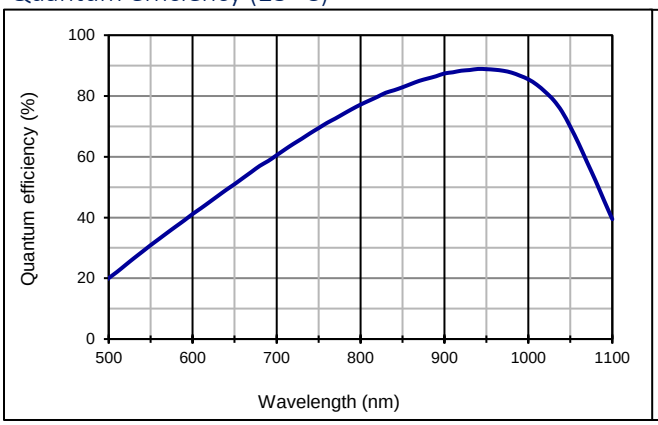


Electro-optical characteristics @ 23 °C

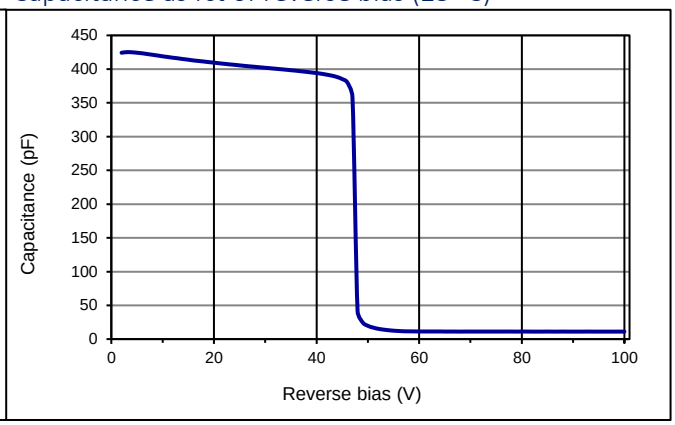
Symbol	Characteristic	Test Condition	Min	Typ	Max	Unit
	Active area			ø 4000		µm
	Active area			12.56		mm²
I_D	Dark current	M = 100		50	500	nA
C	Capacitance	M = 100		15		pF
	Responsivity	M = 100; λ = 905 nm		59		A/W
	Responsivity	M = 100; λ = 1064 nm		49		A/W
t_R	Rise time	M = 100; λ = 1064 nm; R_L = 50 Ω		6		ns
t_R	Cut-off frequency	-3dB		70		MHz
V_{BR}	Breakdown voltage	I_R = 2 µA	220	300	600	V
	Temperature coefficient			3.3		V/K
	Temp. sensor resistance	Thermistor (NTC), Beta(25°C/50°C) = 3930 K	9900	10000	10100	Ω
	Heat transported by TEC	Performance under standard conditions			4.6	W

* please note that depending on operation voltage APD operation at temperatures below -15°C may require sophisticated control circuit.

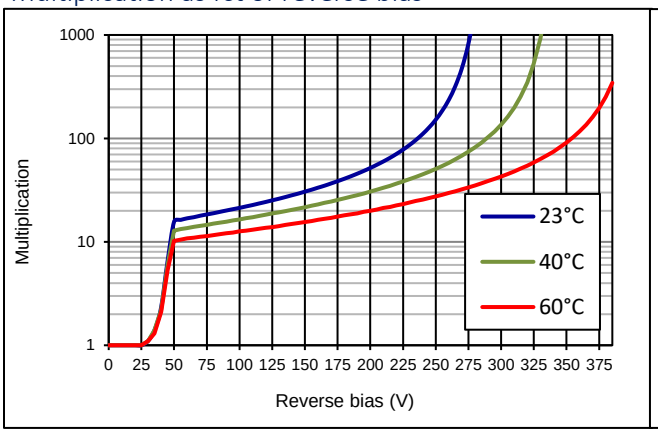
Quantum efficiency (23 °C)



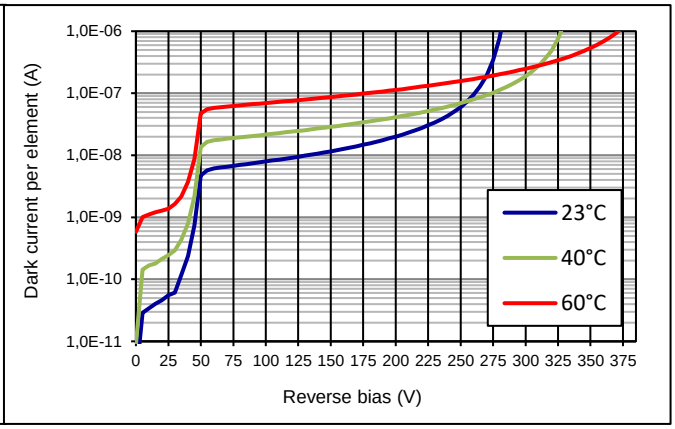
Capacitance as fct of reverse bias (23 °C)



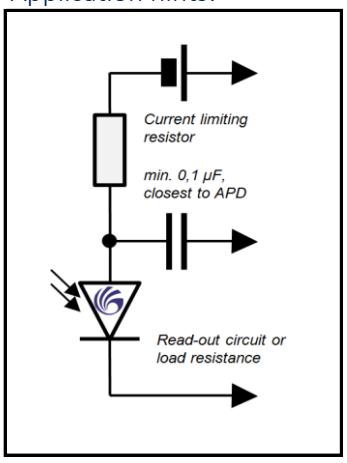
Multiplication as fct of reverse bias



Dark current as fct of reverse bias



Application hints:



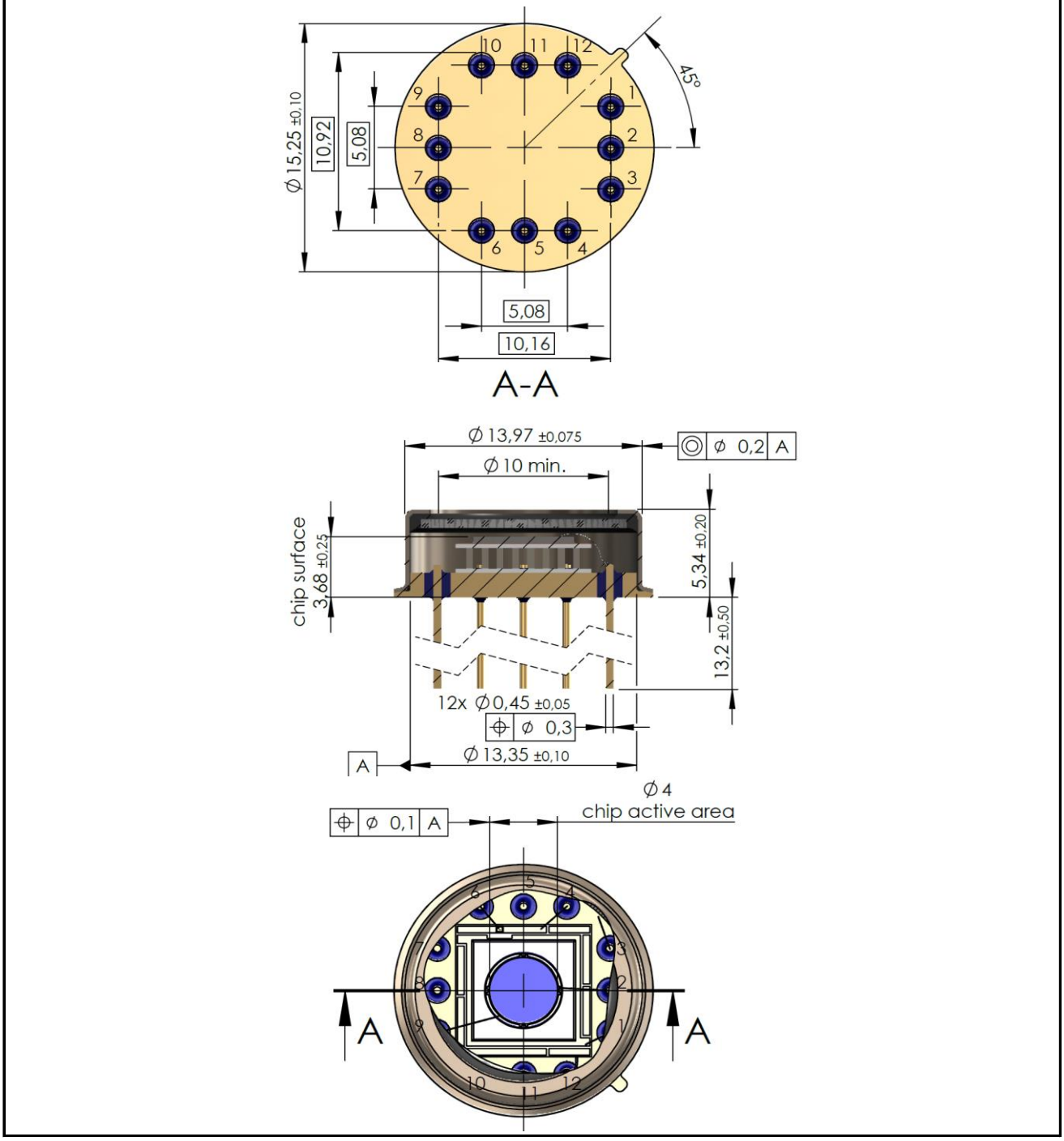
- Current should be limited by a protecting resistor or current limiting - IC inside the power supply
- Guard ring should be connected to ground
- For low light level applications blocking of ambient light should be used
- For high gain applications bias voltage should be temperature compensated
- Please consider basic ESD protection while handling
- Use low noise read-out - IC
- For further questions please refer to document "Instructions for handling and processing" and application notes for APDs and APD-Arrays

Package dimension

Small quantities: Chips on foam pad, boxed (12 cm x 16.5 cm)

Technical Drawing, Package: TO8S TEC

pin assignment												
pin	1	2	3	4	5	6	7	8	9	10	11	12
connection	anode	cathode	case	NTC 1	n. c.	NTC2	n. c.	n. c.	guard ring	TEC -	n. c.	TEC +



Temperature Sensor (NTC)

Temp		Resistance [kΩ]		
[°C]	[K]	min	typ	max
-20	253	93,98	97,18	100,50
-19	254	88,83	91,80	94,86
-18	255	83,99	86,75	89,58
-17	256	79,44	81,99	84,62
-16	257	75,15	77,52	79,96
-15	258	71,11	73,31	75,57
-14	259	67,30	69,35	71,44
-13	260	63,72	65,62	67,56
-12	261	60,34	62,10	63,91
-11	262	57,16	58,80	60,47
-10	263	54,16	55,68	57,23
-9	264	51,33	52,73	54,17
-8	265	48,66	49,96	51,30
-7	266	46,14	47,35	48,59
-6	267	43,77	44,89	46,04
-5	268	41,53	42,57	43,64
-4	269	39,42	40,39	41,37
-3	270	37,43	38,33	39,24
-2	271	35,55	36,38	37,23
-1	272	33,77	34,55	35,33
0	273	32,10	32,82	33,55
1	274	30,51	31,18	31,86
2	275	29,02	29,64	30,26
3	276	27,60	28,18	28,76
4	277	26,27	26,80	27,34
5	278	25,00	25,49	25,99
6	279	23,80	24,26	24,72
7	280	22,67	23,09	23,52
8	281	21,60	21,99	22,39
9	282	20,58	20,95	21,31
10	283	19,62	19,96	20,30
11	284	18,71	19,02	19,34
12	285	17,84	18,13	18,42
13	286	17,02	17,29	17,56
14	287	16,25	16,49	16,74
15	288	15,51	15,74	15,97
16	289	14,81	15,02	15,23
17	290	14,15	14,34	14,54
18	291	13,52	13,70	13,88
19	292	12,92	13,08	13,25

Temp		Resistance [kΩ]			
[°C]	[K]	min	typ	max	
20	293	12,35	12,50	12,66	
21	294	11,81	11,95	12,09	
22	295	11,29	11,42	11,55	
23	296	10,81	10,93	11,04	
24	297	10,34	10,45	10,56	
25	298	9,90	10,00	10,10	$R(T_N)$
26	299	9,47	9,57	9,67	
27	300	9,06	9,16	9,26	
28	301	8,68	8,78	8,87	
29	302	8,31	8,41	8,50	
30	303	7,96	8,05	8,15	
31	304	7,62	7,72	7,82	
32	305	7,30	7,40	7,50	
33	306	7,00	7,09	7,19	
34	307	6,71	6,80	6,90	
35	308	6,44	6,53	6,62	
36	309	6,17	6,26	6,36	
37	310	5,92	6,01	6,10	
38	311	5,68	5,77	5,86	
39	312	5,46	5,54	5,63	
40	313	5,24	5,33	5,41	
41	314	5,03	5,12	5,20	
42	315	4,83	4,92	5,00	
43	316	4,64	4,73	4,81	
44	317	4,46	4,54	4,63	
45	318	4,29	4,37	4,45	
46	319	4,13	4,20	4,28	
47	320	3,97	4,04	4,12	
48	321	3,82	3,89	3,97	
49	322	3,67	3,75	3,82	
50	323	3,54	3,61	3,68	
51	324	3,40	3,47	3,55	
52	325	3,28	3,35	3,42	
53	326	3,16	3,22	3,29	
54	327	3,04	3,11	3,18	
55	328	2,93	3,00	3,06	
56	329	2,82	2,89	2,95	
57	330	2,72	2,78	2,85	
58	331	2,62	2,69	2,75	
59	332	2,53	2,59	2,65	

Technical Drawing, Package: TO8S TEC

Temp		Resistance [kΩ]		
[°C]	[K]	min	typ	max
60	333	2,44	2,50	2,56
61	334	2,36	2,41	2,47
62	335	2,27	2,33	2,39
63	336	2,19	2,25	2,31
64	337	2,12	2,17	2,23
65	338	2,05	2,10	2,15
66	339	1,98	2,03	2,08
67	340	1,91	1,96	2,01
68	341	1,84	1,89	1,95
69	342	1,78	1,83	1,88
70	343	1,72	1,77	1,82
71	344	1,67	1,71	1,76
72	345	1,61	1,66	1,70
73	346	1,56	1,60	1,65
74	347	1,51	1,55	1,60
75	348	1,46	1,50	1,54
76	349	1,41	1,45	1,50

Temp		Resistance [kΩ]		
[°C]	[K]	min	typ	max
77	350	1,37	1,41	1,45
78	351	1,32	1,36	1,40
79	352	1,28	1,32	1,36
80	353	1,24	1,28	1,32
81	354	1,20	1,24	1,28
82	355	1,16	1,20	1,24
83	356	1,13	1,16	1,20
84	357	1,09	1,13	1,16
85	358	1,06	1,09	1,13

B [K]	3890,7	3930	3969,3
T_N [K]	298		

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