
Features

- 64 element APD array
- 120 MHz bandwidth
- 10 k Ω transimpedance
- Low noise

Description

Evaluation board for APD array including digital on/off switch, temperature compensated power control, amplifiers and comparators.

Application

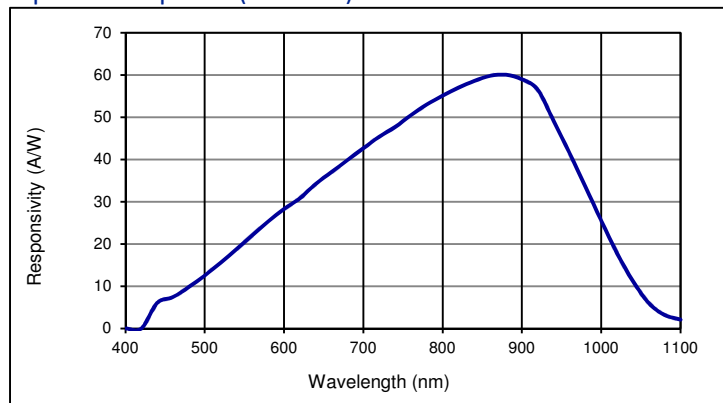
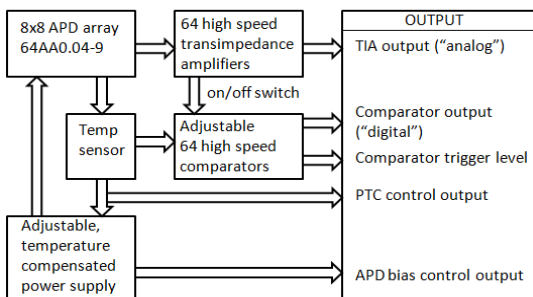
- LIDAR applications
- Shape recognition
- Collision warning

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	2E6		

Spectral response (M = 100)

Schematic

Electro-optical characteristics of APD chip @ 23 °C

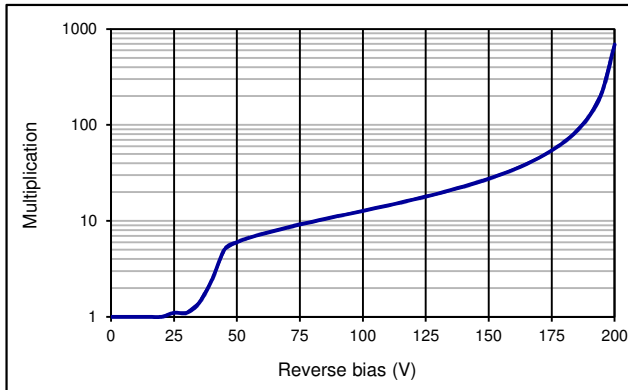
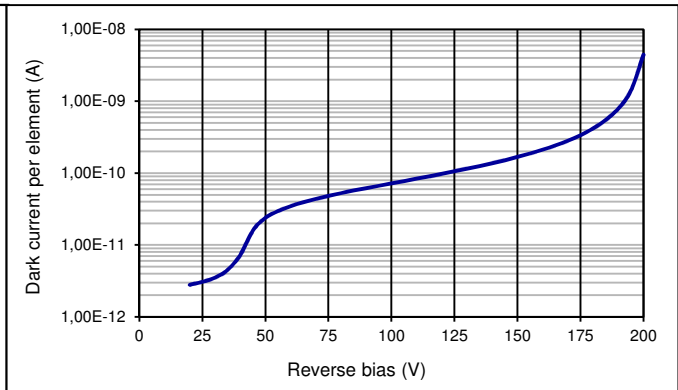
Symbol	Characteristic	Test Condition	Min	Typ	Max	Unit
	No of elements		64			
	Active area		205 x 205			μm
	Gap; Pitch		115 ; 320			μm
I _D	Dark current	M = 100; λ = 880 nm, per element		0.3		nA
C	Capacitance	M = 100, per element		1		pF
	Responsivity	M = 100; λ = 905 nm	55	60		A/W
t _R	Rise time	M = 100; λ = 905 nm; R _L = 50 Ω		2		ns
V _{BR}	Breakdown voltage	I _R = 2 μA		200		V
	Temperature coefficient			1.45		V/K
	Cross talk	λ = 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		1650	1800	2000	mA
Amplifiers						
Amplifier	Supply voltage	all 64 Channels	+/- 4.5	+/- 5	+/- 5.5	V
Amplifier	Supply current	all 64 Channels		220		mA
Amplifier	Transimpedance*			10		kΩ
Amplifier	Output impedance			0,3		Ω
Amplifier	Output voltage				5	V
Amplifier	Rise time	1 Volt Step		2.2		ns
Amplifier	Voltage noise	1 MHz		3.7		nV/√Hz
Amplifier	Current noise	1 MHz		1.1		pV/√Hz
Amplifier	Bandwidth*	-3 db	120			MHz
Amplifier	Power supply rejection ratio			73		db
Amplifier	Offset voltage typical				20	mV
Amplifier	Coupling				DC	
Comparators						
Compar.	Supply voltage		4.7	5	5.3	V
Compar.	Supply current	no load		65		mA
Compar.	Output voltage	logic high		-0.13	-0.3	V
Compar.	Output voltage	logic low		0.08	0.28	V
Compar.	Output short circuit current			68		mA
Compar.	Max. differential output voltage			8		mV
Compar.	Rise time			1.3		ns
Compar.	Voltage noise			-85		dB
Power Supply						
Power Sup.	Output to APD (user adjustable)	DC	0	250	490	V
Power Sup.	Supply current			350		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-080-01-L-D-A			
		Pitch	typ. 0.8			mm
		Mating cable	EQCD 50 Ohm, EQRF coaxial			

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

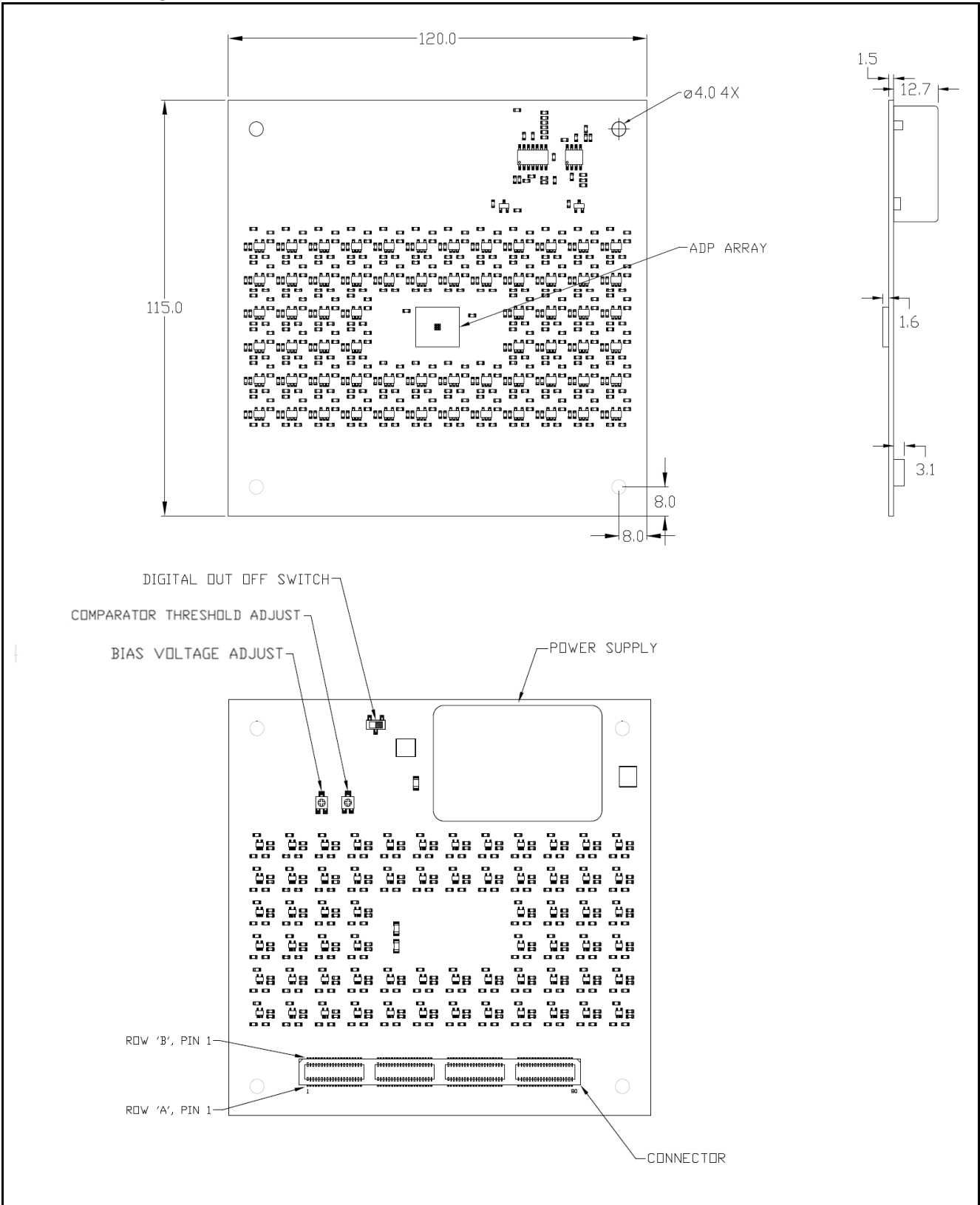
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Technical Drawing



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Connector schedule

Connector row A [outer row]			
PIN	Designator	PIN	Designator
1	G8 ANALOG	41	GROUND
2	G8 DIGITAL	42	GROUND
3	D6 ANALOG	43	GROUND
4	D6 DIGITAL	44	GROUND
5	C8 ANALOG	45	GROUND
6	C8 DIGITAL	46	GROUND
7	G4 ANALOG	47	+5VDC
8	G4 DIGITAL	48	+5VDC
9	C6 ANALOG	49	+5VDC
10	C6 DIGITAL	50	+5VDC
11	G5 ANALOG	51	+5VDC
12	G5 DIGITAL	52	+5VDC
13	H8 ANALOG	53	+5VDC
14	H8 DIGITAL	54	+5VDC
15	E5 ANALOG	55	+5VDC
16	E5 DIGITAL	56	+5VDC
17	C7 ANALOG	57	C1 ANALOG
18	C7 DIGITAL	58	C1 DIGITAL
19	B5 ANALOG	59	F2 ANALOG
20	B5 DIGITAL	60	F2 DIGITAL
21	E7 ANALOG	61	H4 ANALOG
22	E7 DIGITAL	62	H4 DIGITAL
23	C5 ANALOG	63	H1 ANALOG
24	C5 DIGITAL	64	H1 DIGITAL
25	-5VDC	65	B3 ANALOG
26	-5VDC	66	B3 DIGITAL
27	-5VDC	67	B2 ANALOG
28	-5VDC	68	B2 DIGITAL
29	-5VDC	69	D1 ANALOG
30	-5VDC	70	D1 DIGITAL
31	-5VDC	71	C2 ANALOG
32	-5VDC	72	C2 DIGITAL
33	-5VDC	73	D4 ANALOG
34	-5VDC	74	D4 DIGITAL
35	GROUND	75	H3 ANALOG
36	GROUND	76	H3 DIGITAL
37	T2	77	F1 ANALOG
38	T1	78	F1 DIGITAL
39	COMP TRIG MON	79	E1 ANALOG
40	100:1 BIAS MON	80	E1 DIGITAL

Connector row B [inner row]			
PIN	Designator	PIN	Designator
1	A7 DIGITAL	41	H5 DIGITAL
2	A7 ANALOG	42	H5 ANALOG
3	F5 DIGITAL	43	H2 DIGITAL
4	F5 ANALOG	44	H2 ANALOG
5	D8 DIGITAL	45	C4 DIGITAL
6	D8 ANALOG	46	C4 ANALOG
7	G7 DIGITAL	47	C3 DIGITAL
8	G7 ANALOG	48	C3 ANALOG
9	E8 DIGITAL	49	G3 DIGITAL
10	E8 ANALOG	50	G3 ANALOG
11	F7 DIGITAL	51	F3 DIGITAL
12	F7 ANALOG	52	F3 ANALOG
13	D7 DIGITAL	53	B4 DIGITAL
14	D7 ANALOG	54	B4 ANALOG
15	B8 DIGITAL	55	D3 DIGITAL
16	B8 ANALOG	56	D3 ANALOG
17	F8 DIGITAL	57	A4 DIGITAL
18	F8 ANALOG	58	A4 ANALOG
19	H6 DIGITAL	59	A1 DIGITAL
20	H6 ANALOG	60	A1 ANALOG
21	A8 DIGITAL	61	E3 DIGITAL
22	A8 ANALOG	62	E3 ANALOG
23	A6 DIGITAL	63	G2 DIGITAL
24	A6 ANALOG	64	G2 ANALOG
25	B7 DIGITAL	65	G1 DIGITAL
26	B7 ANALOG	66	G1 ANALOG
27	F6 DIGITAL	67	A3 DIGITAL
28	F6 ANALOG	68	A3 ANALOG
29	G6 DIGITAL	69	B1 DIGITAL
30	G6 ANALOG	70	B1 ANALOG
31	D5 DIGITAL	71	D2 DIGITAL
32	D5 ANALOG	72	D2 ANALOG
33	H7 DIGITAL	73	E2 DIGITAL
34	H7 ANALOG	74	E2 ANALOG
35	E6 DIGITAL	75	F4 DIGITAL
36	E6 ANALOG	76	F4 ANALOG
37	B6 DIGITAL	77	A2 DIGITAL
38	B6 ANALOG	78	A2 ANALOG
39	A5 DIGITAL	79	E4 DIGITAL
40	A5 ANALOG	80	E4 ANALOG

APD - Array
(common
anode):

A1	A2	A3	A4	A5	A6	A7	A8
B1	B2	B3	B4	B5	B6	B7	B8
C1	C2	C3	C4	C5	C6	C7	C8
D1	D2	D3	D4	D5	D6	D7	D8
E1	E2	E3	E4	E5	E6	E7	E8
F1	F2	F3	F4	F5	F6	F7	F8
G1	G2	G3	G4	G5	G6	G7	G8
H1	H2	H3	H4	H5	H6	H7	H8

T1; T2... PTC (10kOhm) monitor output

100:1 BIAS MON... APD bias monitor output

COMP TRIG MON... Comparitor trigger voltage monitor

D... Digital output out of comparator

A... Analog output out of TIA

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Temperature Sensor (PTC)

Temp [°C]	Resistance [kΩ]			Temp [°C]	Resistance [kΩ]			Temp [°C]	Resistance [kΩ]			Temp [°C]	Resistance [kΩ]		
	min	typ	max		min	typ	max		min	typ	max		min	typ	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				
-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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