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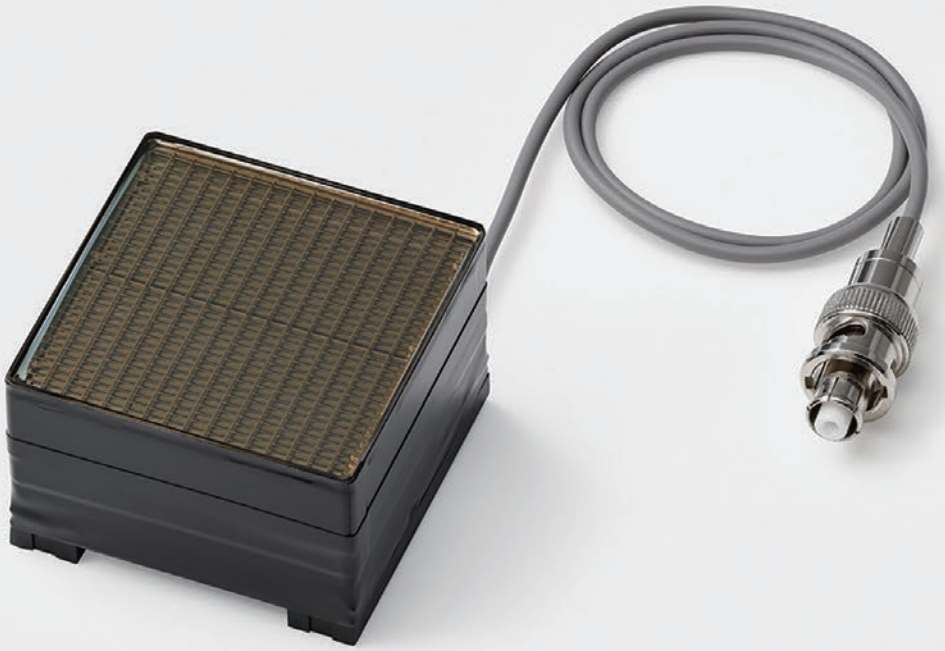
Flat panel type multianode PMT assembly
H13700 series



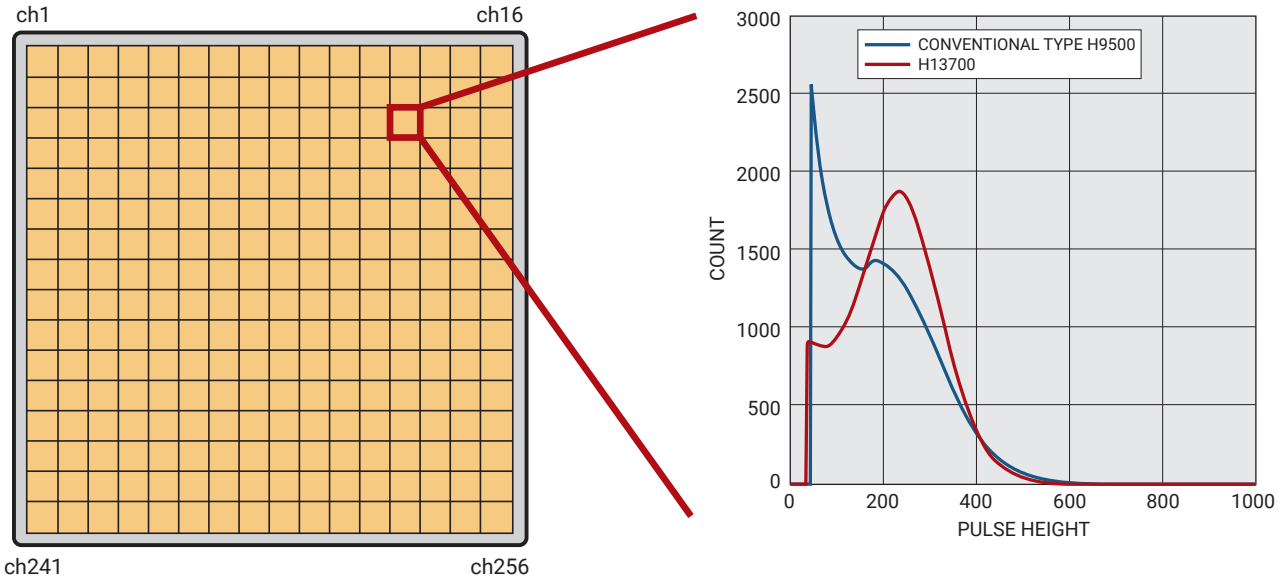
Features

- Wide effective area: 48.5 mm × 48.5 mm
- Packing density: 88 %
- 16 × 16 multianode, pixel size: 3 mm × 3 mm / anode
- High quantum efficiency: 33 % Typ.
- Small dead space
- Fast time response
- Cable HV input type

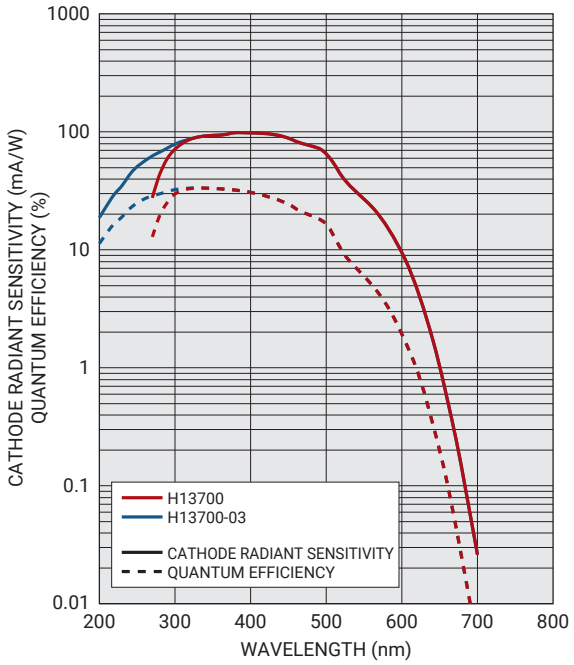
Applications

- Academic research (RICH, gamma ray telescope, etc.)
- Nuclear medicine equipment (PET, gamma camera, etc.)
- Neutron imaging

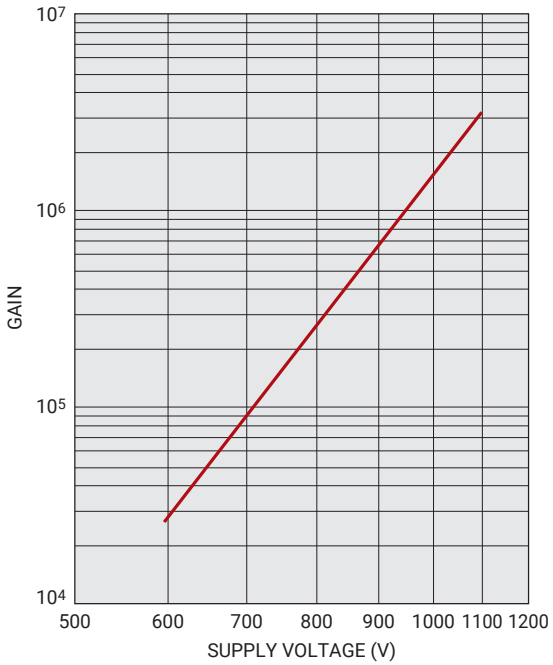
Single photon counting (example)



Typical spectral response



Typical gain



Specifications

Parameter				H13700	H13700-03	Unit
Spectral response range				300 to 650	185 to 650	nm
Peak wavelength				400		
Photocathode material				Bialkali		–
Window material				Borosilicate	UV	–
Dynode	Structure			Metal channel		–
	Stage			10		–
Maximum ratings	Supply voltage between anode and cathode			-1100		V
	Average anode output current in total			100		μA
	Divider current at -1100 V			185		
Cathode	Luminous sensitivity ①		Min.	60		μA/lm
			Typ.	75		
	Blue sensitivity index ②		Typ.	12		–
Anode to cathode supply voltage				-1000		V
Anode	Luminous sensitivity ③		Typ.	110		A/lm
	Gain ③		Typ.	1.5×10^6		–
	Dark current per channel ④		Typ.	0.02		nA
	Dark current in total ④		Typ.	5		nA
			Max.	50		
	Time response ⑤	Rise time ⑥	Typ.	0.45		ns
		Transit time ⑦	Typ.	5.2		
		Transit time spread ⑧	Typ.	0.38		
Pulse linearity per channel at ±2 % deviation			Typ.	0.15		mA
Uniformity between each anode			Typ.	1 : 3		–
			Max.	1 : 5		–

①The light source is a tungsten filament lamp operated at a distribution temperature of 2856 K. Supply voltage is 150 V between the cathode and all other electrodes connected together as anode.
②The value is cathode output current when a blue filter is interposed between the light source and the tube under the same condition as Note ①.
③Measured with the same light source as Note ① and with the anode-to-cathode supply voltage and voltage distribution ratio shown in "Voltage distribution ratio and supply voltage" below.
④Measured with the same supply voltage and voltage distribution ratio as Note ③ after 30 min storage in darkness.
⑤Those are test data when a signal from a central channel (P120) of 256 anodes is used, while all photocathode are illuminated by pulsed light source.
⑥The rise time is the time for the output pulse to rise from 10 % to 90 % of the peak amplitude when the whole photocathode is illuminated by a delta function light pulse.
⑦The electron transit time is the interval between the arrival of delta function light pulse at the entrance window of the tube and the time when the anode output reaches the peak amplitude. In measurement, the whole photocathode is illuminated.
⑧Also called transit time jitter. This is the fluctuation in electron transit time between individual pulses in the single photoelectron event, and defined as the FWHM of the frequency distribution of electron transit time.

Voltage distribution ratio and supply voltage

Electrodes	K	Dy1	Dy2	Dy3	Dy4	Dy5	Dy6	Dy7	Dy8	Dy9	Dy10	GR	P
Distribution ratio	2	1	1	1	1	1	1	1	1	1	1	0.5	

Supply voltage: -1000 V, K: Cathode, Dy: Dynode, GR: Guard ring P: Anode

Characteristics

Anode uniformity (Example)

P1 → P16

51	67	72	71	66	73	75	78	85	90	92	95	92	90	100	64
78	84	77	74	73	75	78	80	85	86	87	88	91	86	100	74
81	85	78	76	76	76	76	77	84	85	87	89	91	84	99	70
79	83	76	79	78	75	74	75	82	84	87	92	89	90	97	71
79	81	71	74	76	73	71	69	79	82	84	85	87	88	95	69
79	81	73	73	74	73	70	67	76	82	82	84	84	88	96	71
80	81	73	71	70	71	68	63	74	77	81	84	85	88	97	70
78	81	71	69	67	69	66	63	72	77	79	84	86	89	96	72
80	77	70	68	67	67	66	61	71	78	80	83	86	87	96	69
79	77	69	69	68	66	66	63	72	79	82	86	84	86	95	71
76	75	68	68	68	66	65	63	72	79	85	85	82	84	93	68
72	73	67	69	71	70	67	66	74	81	86	87	82	84	91	68
74	73	67	69	70	70	70	67	76	82	85	87	84	85	93	65
73	75	68	67	65	67	69	71	75	80	84	87	87	92	96	65
65	72	69	57	48	64	69	74	81	81	85	88	87	91	94	60
42	51	64	62	55	68	70	69	61	89	90	96	82	69	81	46

P16 → P256

TOP VIEW

Supply voltage: -1000 V
Light source: Tungsten lamp with blue filter (DC Light)
Spot illumination (Aperture size): 3 mm square on each channel

Anode cross-talk (Example)

P1 → P16

100	2.7	–	–	–	–	–	6.3	100	2.8	–	–	–	–	4.0	100
3.3	0.6	–	–	–	–	–	0.8	3.4	0.5	–	–	–	–	0.8	3.8
–	–	–	–	–	–	–	–	–	–	0.4	2.3	0.3	–	–	–
–	–	–	0.4	2.0	0.3	–	–	–	–	3.4	100	1.8	–	–	–
–	–	–	3.3	100	1.7	–	–	–	–	0.5	2.6	0.3	–	–	–
–	–	–	0.5	2.4	0.3	–	–	–	–	–	–	–	–	–	–
2.3	0.3	–	–	–	–	–	0.4	2.2	0.3	–	–	–	–	0.4	2.2
100	1.7	–	–	–	–	–	3.0	100	2.0	–	–	–	–	3.3	100
2.1	0.3	–	–	–	–	–	0.6	2.8	0.4	–	–	–	–	0.5	2.9
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
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–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

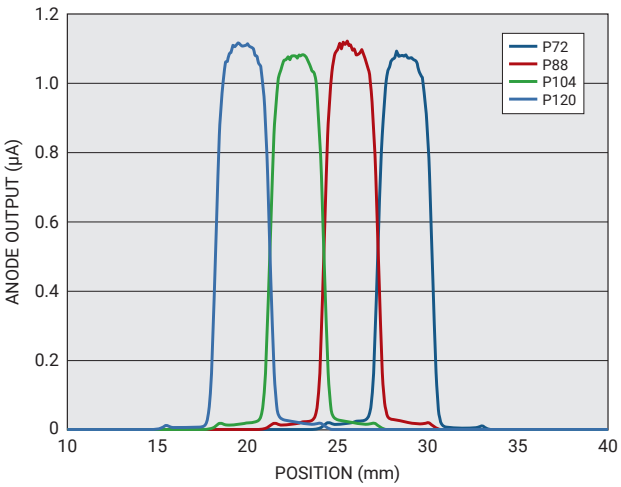
P16 → P256

TOP VIEW

Supply voltage: -1000 V
Light source: Tungsten lamp with blue filter (DC Light)
Fiber size: Φ1.0 mm (Kuraray: clear fiber NA=0.72)

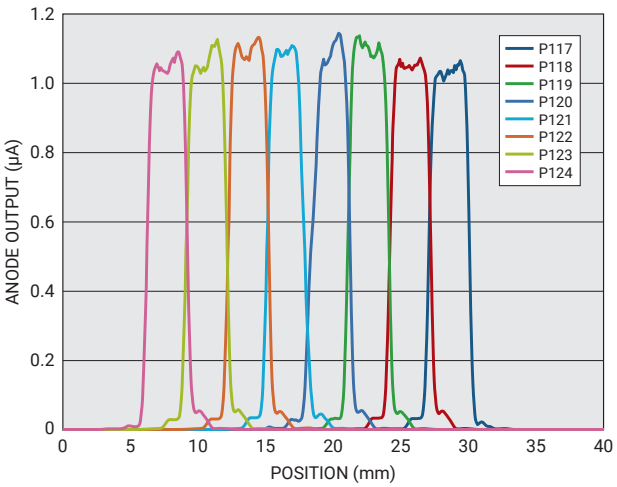
Cross uniformity (Example)

■ X-axis



Supply voltage: -1000 V
Spot size: Φ1.0 mm

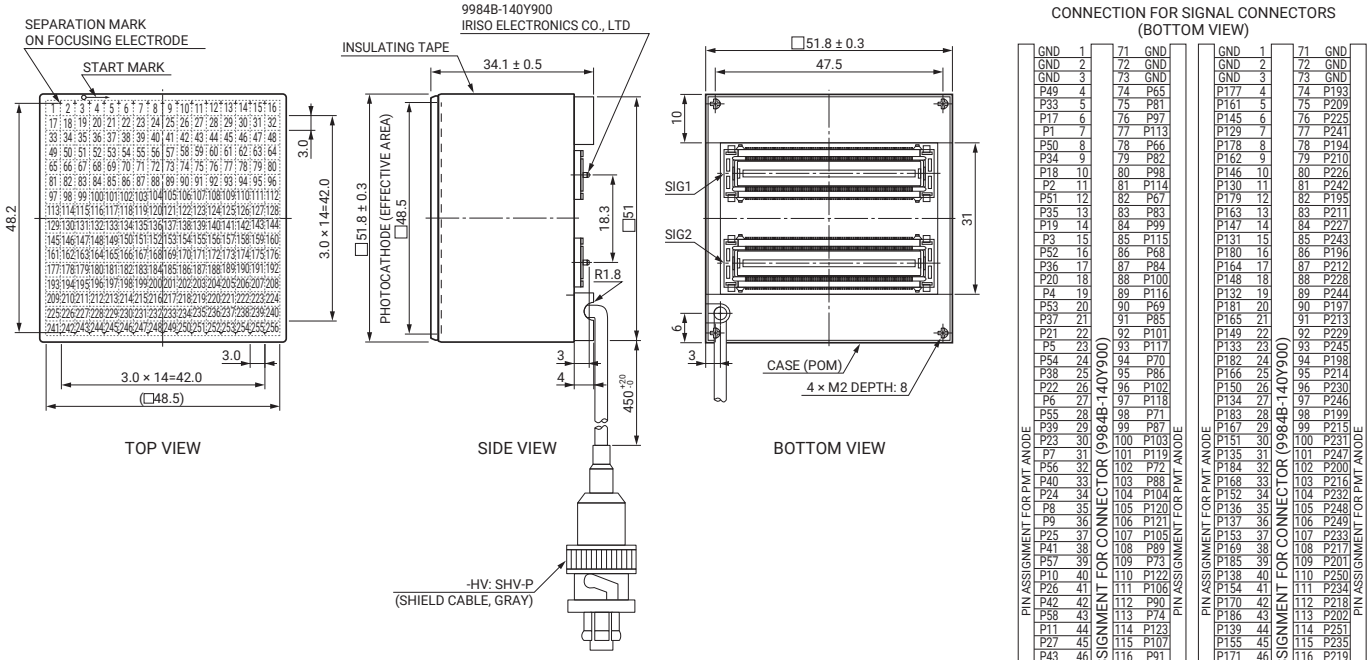
■ Y-axis



Supply voltage: -1000 V
Spot size: Φ1.0 mm

Dimensional outline and circuit

Dimensional outline (Unit:mm)



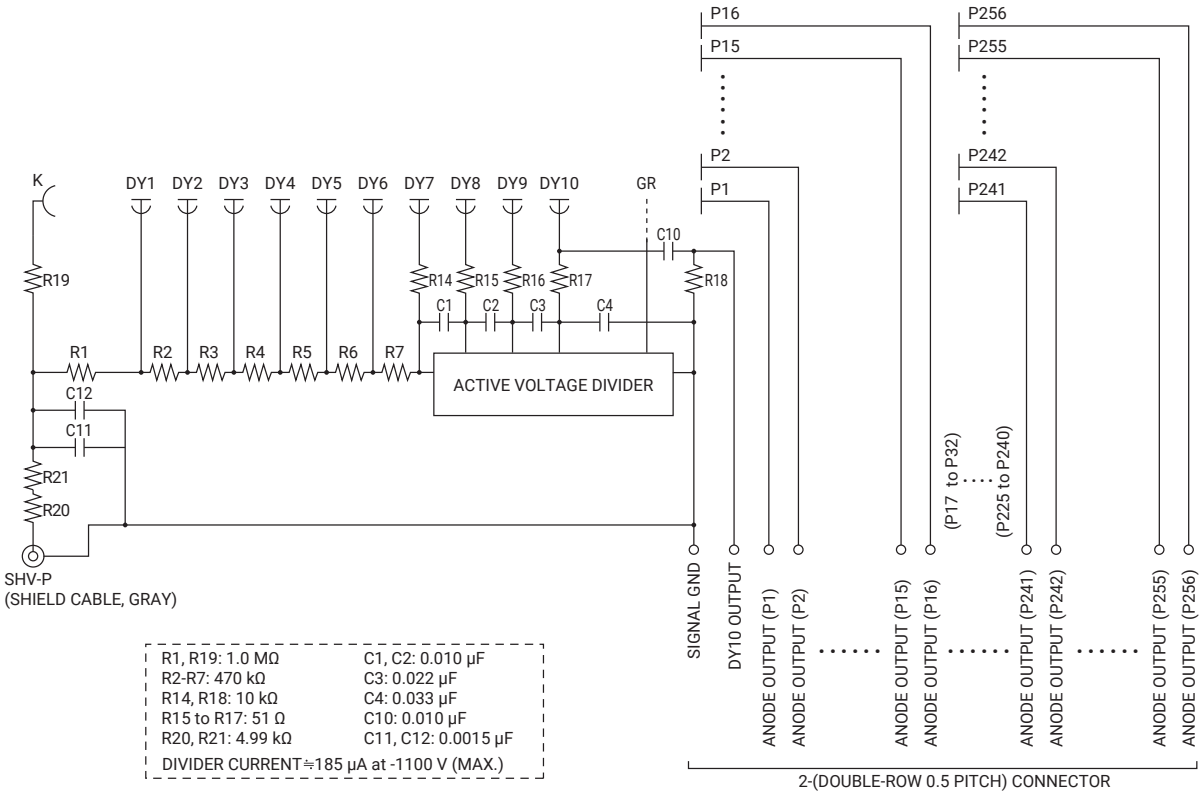
CONNECTION FOR SIGNAL CONNECTORS
(BOTTOM VIEW)

SIG1			SIG2		
GND	1	71 GND	GND	1	71 GND
GND	2	72 GND	GND	2	72 GND
GND	3	73 GND	GND	3	73 GND
P49	4	74 P65	P177	4	74 P193
P33	5	75 P81	P161	5	75 P209
P17	6	76 P97	P145	6	76 P225
P1	7	77 P113	P129	7	77 P241
P50	8	78 P66	P178	8	78 P194
P34	9	79 P82	P162	9	79 P210
P18	10	80 P98	P146	10	80 P226
P2	11	81 P114	P130	11	81 P242
P51	12	82 P67	P179	12	82 P195
P35	13	83 P83	P163	13	83 P211
P19	14	84 P99	P147	14	84 P227
P3	15	85 P115	P131	15	85 P243
P52	16	86 P68	P180	16	86 P196
P36	17	87 P84	P164	17	87 P212
P20	18	88 P100	P148	18	88 P228
P4	19	89 P116	P132	19	89 P244
P53	20	90 P69	P181	20	90 P197
P37	21	91 P85	P165	21	91 P213
P21	22	92 P101	P149	22	92 P229
P5	23	93 P117	P133	23	93 P245
P54	24	94 P70	P182	24	94 P198
P38	25	95 P86	P166	25	95 P214
P22	26	96 P102	P150	26	96 P230
P6	27	97 P118	P134	27	97 P246
P55	28	98 P71	P183	28	98 P199
P39	29	99 P87	P167	29	99 P215
P23	30	100 P103	P151	30	100 P231
P7	31	101 P119	P135	31	101 P247
P56	32	102 P72	P184	32	102 P200
P40	33	103 P88	P168	33	103 P216
P24	34	104 P104	P152	34	104 P232
P8	35	105 P120	P136	35	105 P248
P9	36	106 P121	P137	36	106 P249
P25	37	107 P105	P153	37	107 P233
P41	38	108 P89	P169	38	108 P217
P57	39	109 P73	P185	39	109 P201
P10	40	110 P122	P138	40	110 P250
P26	41	111 P106	P154	41	111 P234
P42	42	112 P90	P170	42	112 P218
P58	43	113 P74	P186	43	113 P202
P11	44	114 P123	P139	44	114 P251
P27	45	115 P107	P155	45	115 P235
P43	46	116 P91	P171	46	116 P219
P59	47	117 P75	P187	47	117 P203
P12	48	118 P124	P140	48	118 P252
P28	49	119 P108	P156	49	119 P236
P44	50	120 P92	P172	50	120 P220
P60	51	121 P76	P188	51	121 P204
P13	52	122 P125	P141	52	122 P253
P29	53	123 P109	P157	53	123 P237
P45	54	124 P93	P173	54	124 P221
P61	55	125 P77	P189	55	125 P205
P14	56	126 P126	P142	56	126 P254
P30	57	127 P110	P158	57	127 P238
P46	58	128 P94	P174	58	128 P222
P62	59	129 P78	P190	59	129 P206
P15	60	130 P127	P143	60	130 P255
P31	61	131 P111	P159	61	131 P239
P47	62	132 P95	P175	62	132 P223
P63	63	133 P79	P191	63	133 P207
P16	64	134 P128	P144	64	134 P256
P32	65	135 P112	P160	65	135 P240
P48	66	136 P96	P176	66	136 P224
P64	67	137 P80	P192	67	137 P208
GND	68	138 GND	GND	68	138 GND
GND	69	139 GND	GND	69	139 GND
DY10	70	140 GND	GND	70	140 GND

PIN ASSIGNMENT FOR PMT ANODE
PIN ASSIGNMENT FOR CONNECTOR (9984B-140Y900)

* 2 set of socket will be attached. (9984S-140Y943, IRISO ELECTRONICS CO., LTD)

Internal circuit



R1, R19: 1.0 MΩ	C1, C2: 0.010 μF
R2-R7: 470 kΩ	C3: 0.022 μF
R14, R18: 10 kΩ	C4: 0.033 μF
R15 to R17: 51 Ω	C10: 0.010 μF
R20, R21: 4.99 kΩ	C11, C12: 0.0015 μF
DIVIDER CURRENT≒185 μA at -1100 V (MAX.)	

MEMO

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