**OVERVIEW**

The C13953-01 is a photomultiplier module that consists of a 13 mm diameter head-on photomultiplier tube coupled to a plastic scintillator, a high voltage power supply circuit, and a photon counting circuit. The C13953-01 operates at ±5 V input and outputs logic pulses proportional to the incident radiation dose.

**FEATURES**

- Including a plastic scintillator
- High sensitivity
- ±5 V operation
- Compact and lightweight
- Logic pulse output

**APPLICATIONS**

- β-ray detection
- Soft X-ray detection
- Dust particle measurement (e.g. PM2.5)

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description / Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>±5</td>
<td>V</td>
</tr>
<tr>
<td>Maximum input voltage</td>
<td>±5.5</td>
<td>V</td>
</tr>
<tr>
<td>Input current *1</td>
<td>+100/-30</td>
<td>mA</td>
</tr>
<tr>
<td>Effective area</td>
<td>12</td>
<td>mm</td>
</tr>
<tr>
<td>Light-shielding film</td>
<td>Aluminum deposited film</td>
<td>—</td>
</tr>
<tr>
<td>Scintillator</td>
<td>Plastic scintillator (thickness: 0.5 mm)</td>
<td>—</td>
</tr>
<tr>
<td>Pulse-pair resolution</td>
<td>10</td>
<td>ns</td>
</tr>
<tr>
<td>Input / output division ratio</td>
<td>1/2, 1/4, 1/8, 1/16, 1/32 (Initial setting: 1/8)</td>
<td>—</td>
</tr>
<tr>
<td>Count linearity *2</td>
<td>$1 \times 10^7$</td>
<td>s⁻¹</td>
</tr>
<tr>
<td>Maximum number of output pulses (when divided by 8)</td>
<td>$1.25 \times 10^6$</td>
<td>s⁻¹</td>
</tr>
<tr>
<td>Output format</td>
<td>Open collector</td>
<td></td>
</tr>
<tr>
<td>Maximum output withstand voltage</td>
<td>+15</td>
<td>V</td>
</tr>
<tr>
<td>Input / output connector</td>
<td>MZW-1-1-2PM (MAC8)</td>
<td></td>
</tr>
<tr>
<td>Operating ambient temperature / humidity *3</td>
<td>0 °C to +40 °C / Below 80%</td>
<td>—</td>
</tr>
<tr>
<td>Storage ambient temperature / humidity *3</td>
<td>-15 °C to +50 °C / Below 85%</td>
<td>—</td>
</tr>
<tr>
<td>Weight</td>
<td>63</td>
<td>g</td>
</tr>
</tbody>
</table>

*1: When open collector output is not connected
*2: Random pulse, at 10 % count loss
*3: No condensation
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**BLOCK DIAGRAM**

- **SCINTIL-ATOR**
- **PHOTOMULTIPLIER TUBE**
- **AMPLIFIER**
- **COMPARATOR**
- **PRESCALER** (open collector output)
- **HIGH-VOLTAGE POWER SUPPLY CIRCUIT**

+5 V  -5 V  GND

100 Ω to 1 kΩ

15 V (Max.)

**OUTPUT WAVEFORM EXAMPLE**

- **OUTPUT VOLTAGE (V)**
- **TIME (µs)**
- **VOLTAGE PULL-UP RESISTOR**
- **INPUT / OUTPUT DIVISION RATIO**
- **RISE TIME**
- **FALL TIME**

+5 V  EQUIVALENT TO 100 Ω/0.5 W

1/8

27 ns

7 ns

PULSE WIDTH DEPENDS ON THE INPUT FREQUENCY OF RADIATION.

**PLASTIC SCINTILLATOR LIGHT OUTPUT**

- **ENERGY (MeV)**
- **RELATIVE LIGHT OUTPUT**

<table>
<thead>
<tr>
<th>Energy (MeV)</th>
<th>Relative Light Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>0.1</td>
</tr>
<tr>
<td>20-40</td>
<td>0.2</td>
</tr>
<tr>
<td>40-60</td>
<td>0.3</td>
</tr>
<tr>
<td>60-80</td>
<td>0.4</td>
</tr>
<tr>
<td>80-100</td>
<td>0.5</td>
</tr>
</tbody>
</table>

- **ELECTRONS**
- **β-RAY**
- **α-RAY**

- **HIGH-VOLTAGE**
- **POWER SUPPLY**
- **COMPARATOR**
- **PRESCALER (open collector output)**

**DIMENSIONAL OUTLINE (Unit: mm)**

- **ALUMINUM HOUSING**
- **CONNECTOR FOR VOLTAGE INPUT AND SIGNAL OUTPUT**

- **M22-W-1-1-2PW (MA6.5, PIN RECEPTACLE: MEW-1-1-2PW)**

- **PIN ASSIGNMENT**
  - No.1: -5 V
  - No.2: +5 V
  - No.3: OUTPUT (OPEN COLLECTOR)
  - No.4: GND

- **PIN DIAMETER: 0.45 mm**