FIBER OPTIC RECEIVING MODULE

TORX1355(V,F)

GENERAL PURPOSE OPTICAL RECEIVING MODULE

- For JIS F05 Optical Connector
- CMOS level Interface
- +5 V Single Power Supply
- ATC (Automatic Threshold Control) circuit built-in
- Low current consumption 1.5 mA max (Active) / 70 μA max (Standby)
- Vertical mounting type

1. Absolute Maximum Ratings (Ta = 25°C)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>T_{stg}</td>
<td>−40 to 95°C</td>
<td>°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>T_{opr}</td>
<td>−40 to 85°C</td>
<td>°C</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>V_{CC}</td>
<td>−0.5 to 6 V</td>
<td></td>
</tr>
<tr>
<td>High Level Output Current</td>
<td>I_{OH}</td>
<td>−5 mA</td>
<td></td>
</tr>
<tr>
<td>Low Level Output Current</td>
<td>I_{OL}</td>
<td>5 mA</td>
<td></td>
</tr>
<tr>
<td>Soldering Temperature</td>
<td>T_{sol}</td>
<td>260 (Note 1)</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note 1: Soldering time ≤ 10 s (More than 1 mm apart from the package).

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/ current/ voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

2. Operating Ranges

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>V_{CC}</td>
<td>4.75</td>
<td>5.0</td>
<td>5.25</td>
<td>V</td>
</tr>
<tr>
<td>Data Rate</td>
<td>DC</td>
<td>-</td>
<td>10</td>
<td></td>
<td>Mb/s</td>
</tr>
<tr>
<td>High Level Output Current</td>
<td>I_{OH}</td>
<td>-</td>
<td>-</td>
<td>−0.4</td>
<td>mA</td>
</tr>
<tr>
<td>Low Level Output Current</td>
<td>I_{OL}</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
<td>mA</td>
</tr>
</tbody>
</table>

Start of commercial production 2015-05
3. Electrical and Optical Characteristics (Ta = 25°C, Vcc = 5 V)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Symbol</th>
<th>Test Condition</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Rate</td>
<td>NRZ Code (Note 2)</td>
<td>DC - 10 Mb / s</td>
<td></td>
<td></td>
<td></td>
<td>Mb / s</td>
</tr>
<tr>
<td>Transmission Distance (Note 4)</td>
<td>Using APF (Note 3) and TOTX1350(V,F)</td>
<td>- 10 m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission Distance (Note 5)</td>
<td>Using TOTX1350(V,F) and TOCA1300</td>
<td>- 23.6 - mm</td>
<td></td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td>Using TOTX1350(V,F) and TOCA1301</td>
<td>- 34.0 - mm</td>
<td></td>
<td></td>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>Pulse Width Distortion (Note 4)</td>
<td>Δtw</td>
<td>Using APF (Note 3), DC to 10 Mb / s</td>
<td>-30</td>
<td>-</td>
<td>30</td>
<td>%</td>
</tr>
<tr>
<td>Maximum Receivable Power (Note 7)</td>
<td>PMAX</td>
<td>Using APF (Note 3), DC to 10 Mb / s</td>
<td>0</td>
<td></td>
<td>-</td>
<td>dBm</td>
</tr>
<tr>
<td>Minimum Receivable Power (Note 7)</td>
<td>PMIN</td>
<td>Using APF (Note 3), DC to 10 Mb / s</td>
<td>-</td>
<td>-</td>
<td>-19</td>
<td>dBm</td>
</tr>
<tr>
<td>Current Consumption</td>
<td>Active (Optical flux on)</td>
<td>ICC(1) Vcc = 5.25 V, Ci = 10 pF</td>
<td>-</td>
<td>0.6</td>
<td>1.5</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>Standby (No optical flux on)</td>
<td>ICC(2) Vcc = 5.25 V, Ci = 10 pF</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>μA</td>
</tr>
<tr>
<td>High Level Output Voltage</td>
<td>VOH</td>
<td>Vcc = 4.75 V, Ioh = -0.4 mA</td>
<td>4.2</td>
<td>4.6</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Low Level Output Voltage</td>
<td>VOL</td>
<td>Vcc = 4.75 V, Iol = 0.4 mA</td>
<td>-</td>
<td>0.1</td>
<td>0.4</td>
<td>V</td>
</tr>
</tbody>
</table>

Note 2: High level output when optical flux is received. Low level output when it is not received.
Note 3: All Plastic Fiber (980 μm core / 1000 μm cladding, NA = 0.5), Polished surface.
Note 4: A value changes with LED drive circuits.
Note 5: A distance between fixing pin of TOTX1350(V,F) and fixing pin of TORX1355(V,F) when they connect with optical adapter (TOCA1300 or TOCA1301).
Note 6: Between input of driver circuit of TOTX1350(V,F) and output of TORX1355(V,F).
Note 7: BER \( \leq 10^{-9} \), Valued by peak.

4. Application Circuit

Fiber optic connector or optical adapter insertion side

![Application Circuit Diagram]

5. Applicable Optical Fiber with Fiber Optic Connectors

All Plastic Fiber (980 μm core / 1000 μm cladding, NA = 0.5).
F05 type optical connector with polished surface.
6. Applicable Optical Adapters

TOCA1300, TOCA1301

7. Precautions during use

(1) Absolute maximum rating
The absolute maximum ratings are the limit values which must not be exceeded during operation of
device. Any rating value must not be exceeded. If the maximum rating value is exceeded, the
characteristics of devices may never be recovered properly. In extreme cases, the device may be
permanently damaged.

(2) Operating Range
The operating range is the range of conditions necessary for the device to operate as specified in
individual technical datasheets and data books. Care must be exercised in the design of the equipment.
If a device is used under conditions that do not exceed absolute maximum ratings but exceed the
operating range, the specifications related to device operation and electrical characteristics may not be
met, resulting in a decrease in reliability.
If greater reliability is required, derate the device’s operating ranges for voltage, current, power and
temperature before use.

(3) Soldering
Optical modules are comprised of internal semiconductor devices. However, in principle, optical modules
are optical components. During soldering, ensure that flux dose not contact with the emitting surface or
detecting surface. Also ensure that proper flux removal is conducted after soldering.
This optical module comes with a protective cap. The protective cap is used to avoid malfunction when the
optical module is not in use. Not that it is not dust or waterproof.
As mentioned before, optical modules are optical component. Thus, in principle, soldering where there
may be flux residue or flux removal after soldering are not recommended. Toshiba recommends that
soldering be performed without the optical module mounted on the board. Then, after the board is cleaned,
solder the optical module manually. Do not perform any further cleaning.
If the optical module cannot be soldered manually, use non−halogen (chlorine−free) flux and make sure,
without cleaning, there is no residue such as chlorine.

(4) Noise resistance
Use a simple noise filter on the fiber optic receiving module power line. If the ripple in power supply used is
high, further reinforce the filter.
When locating the optical module in an area susceptible to radiated noise, increase shielding by covering
the optical module and the power line filter using a metallic cover.

(5) Vibration and shock
This module is resin−molded construction with wire fixed by resin. This structure is relatively resistant to
vibration or shock. In actual equipment, there are some cases where vibration, shock, or stress is applied
to soldered parts or connected parts, resulting in line cut. Attention must be paid to the design of the
mechanism for applications which are subject to large amounts of vibration.

(6) Fixing fiber optical receiving module
Solder the fixing pin (pins 4 and 5) of fiber optic receiving module TORX1355(V,F) to the printed circuit
board to fix the module to the board.

(7) Solvent
When using solvent for flux removal, do not use a high acid or high alkali solvent. Be careful not to pour
solvent into the optical connector ports. If solvent is inadvertently poured into them, clean it off using cotton
tips.

(8) Protective cap
When the fiber optic receiving module TORX1355(V,F) is not in use, use the protective cap.
(9) Supply voltage
Use the supply voltage within the operating ranges (VCC = 5 ± 0.25 V). Make sure that supply voltage does not exceed the absolute maximum rating value of 6 V, even instantaneously.

(10) Output
When the receiver output is at low level and connected to the power supply, or when the output is at high level and connected to GND, the internal IC may be destroyed.

(11) Soldering condition
Solder at 260°C or less within ten seconds.

(12) An influence of flash or strong light
Do not emit a flash or a strong light to the optical module directly. They may cause an error in data transmission.

(13) Precaution on waste
When discarding devices and packing materials, follow procedures stipulated by local regulations in order to protect the environment against contamination.
8. Package Outline drawing

Pin Connection

1. OUTPUT
2. GND
3. Vcc
4. NC
5. NC

Weight: 2.4g (typ.)
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