CTM600, CTM601, CTM611

10Mbit/s 5-Pin Mini-Flat Logic Gate Optocoupler

Features

- High speed 10MBit/s
- High isolation voltage between input and output (Viso=3750 Vrms)
- Guaranteed CTR performance from 0°C to 70°C
- Wide operating temperature range of -40°C to 85°C
- Green Package
- Regulatory Approvals
  - UL - UL1577 (E364000)
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898
  - IEC60065, IEC60950

Description

The CTM600, CTM601, and CTM611 optocouplers consist of an AlGaAS LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobe able output. The output of the detect IC is a high speed logic gate integrated with a photo detector. The switching parameters are guaranteed over the temperature range of -40°C to +85°C. A maximum input signal of 5mA will provide a minimum output sink current of 13mA (fan out of 8).

Applications

- Line receivers
- Telecommunication equipment
- High speed logic ground isolation
- Feedback loop in switch-mode power supplies
- Home appliances

Package Outline

Schematic

Note: Different bending options available. See package dimension.
### Absolute Maximum Rating at 25°C

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Ratings</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISO</td>
<td>Isolation voltage</td>
<td>3750</td>
<td>V_{RMS}</td>
<td>1</td>
</tr>
<tr>
<td>T_{OPR}</td>
<td>Operating temperature</td>
<td>-40 ~ +85</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T_{STG}</td>
<td>Storage temperature</td>
<td>-55 ~ +150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T_{SOL}</td>
<td>Soldering temperature</td>
<td>260</td>
<td>°C</td>
<td>2</td>
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</tbody>
</table>

**Emitter**

| | Forward current | 50 | mA | |
| | Reverse voltage | 5  | V  | |
| | Power dissipation | 100 | mW | |

**Detector**

| | Power dissipation | 85 | mW | |
| | Average Output current | 50 | mA | |
| | Supply voltage | 7  | V  | |
| | Output voltage | 7  | V  | |

**Notes**

1. AC for 1 minute, RH = 40 ~ 60%.
2. For 10 second peak
## Electrical Characteristics

$T_A = 0 \text{ - } 70^{\circ}C$ (unless otherwise specified). Typical values are measured at $T_A = 25^{\circ}C$ and $V_{CC}=5V$

### Emitter Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_F$</td>
<td>Forward voltage</td>
<td>$I_F = 10mA$</td>
<td></td>
<td>1.4</td>
<td>1.6</td>
<td>V</td>
<td></td>
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<tr>
<td>$V_R$</td>
<td>Reverse Voltage</td>
<td>$I_R = 5\mu A$</td>
<td>5.0</td>
<td>-</td>
<td>-</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$\Delta V_F/\Delta T_A$</td>
<td>Temperature coefficient of forward voltage</td>
<td>$I_F = 10mA$</td>
<td></td>
<td>-1.6</td>
<td>-</td>
<td>mV/°C</td>
<td></td>
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</table>

### Detector Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{CCCL}$</td>
<td>Logic Low Supply Current</td>
<td>$I_F=10mA, \ V_O=Open, \ V_{CC}=5V$</td>
<td></td>
<td>9</td>
<td>13</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$I_{CCCH}$</td>
<td>Logic High Supply Current</td>
<td>$I_F=0mA, \ V_O=Open, \ V_{CC}=5V$</td>
<td></td>
<td>6</td>
<td>9</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>$R_{IO}$</td>
<td>Isolation Resistance</td>
<td>$V_{IO}= 500V_{dc}$</td>
<td>$5x10^{10}$</td>
<td>-</td>
<td>-</td>
<td>Ω</td>
<td></td>
</tr>
<tr>
<td>$C_{IO}$</td>
<td>Isolation Capacitance</td>
<td>$f= 1MHz$</td>
<td></td>
<td>0.5</td>
<td>1.2</td>
<td>pF</td>
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### Transfer Characteristics

<table>
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<tr>
<th>Symbol</th>
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<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{OH}$</td>
<td>Logic High Output Current</td>
<td>$I_F=250\mu A, \ V_O= 5.5V,$</td>
<td>2</td>
<td>100</td>
<td>-</td>
<td>uA</td>
<td></td>
</tr>
<tr>
<td>$I_{FT}$</td>
<td>Input Threshold Current</td>
<td>$V_{CC}=5.5V, \ V_O=0.6V,$</td>
<td>-</td>
<td>3.3</td>
<td>5</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_O=13mA$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{OL}$</td>
<td>Logic Low Output Voltage</td>
<td>$I_F=5mA, \ I_O=13mA,$</td>
<td>-</td>
<td>0.35</td>
<td>0.6</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC}=5.5V,$</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
## Switching Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T_{PHL})</td>
<td>Propagation Delay Time Logic High to Logic Low</td>
<td>(C_L=15,\text{pF}, R_L=350,\Omega)</td>
<td>-</td>
<td>40</td>
<td>75</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td>(T_{PLH})</td>
<td>Propagation Delay Time Logic Low to Logic High</td>
<td>(I_F=7.5,\text{mA}, V_{OH}=2.0,\text{V}, R_L=350,\Omega, T_A=25^\circ\text{C}, V_{CM}=10,\text{Vp-p})</td>
<td>5000</td>
<td>-</td>
<td>-</td>
<td>V/\mu\text{s}</td>
<td></td>
</tr>
<tr>
<td>(T_{PLH})</td>
<td>Propagation Delay Time Logic Low to Logic High</td>
<td>(I_F=7.5,\text{mA}, V_{OH}=2.0,\text{V}, R_L=350,\Omega, T_A=25^\circ\text{C}, V_{CM}=50,\text{Vp-p})</td>
<td>20000</td>
<td>-</td>
<td>-</td>
<td>V/\mu\text{s}</td>
<td></td>
</tr>
<tr>
<td>(T_{PLH})</td>
<td>Propagation Delay Time Logic Low to Logic High</td>
<td>(I_F=7.5,\text{mA}, V_{OH}=2.0,\text{V}, R_L=350,\Omega, T_A=25^\circ\text{C}, V_{CM}=1000,\text{Vp-p})</td>
<td>20000</td>
<td>-</td>
<td>-</td>
<td>V/\mu\text{s}</td>
<td></td>
</tr>
<tr>
<td>(T_{PLH})</td>
<td>Propagation Delay Time Logic Low to Logic High</td>
<td>(I_F=0,\text{mA}, V_{OL}=0.8,\text{V}, R_L=350,\Omega, T_A=25^\circ\text{C}, V_{CM}=10,\text{Vp-p})</td>
<td>5000</td>
<td>-</td>
<td>-</td>
<td>V/\mu\text{s}</td>
<td></td>
</tr>
<tr>
<td>(T_{PLH})</td>
<td>Propagation Delay Time Logic Low to Logic High</td>
<td>(I_F=0,\text{mA}, V_{OL}=0.8,\text{V}, R_L=350,\Omega, T_A=25^\circ\text{C}, V_{CM}=50,\text{Vp-p})</td>
<td>20000</td>
<td>-</td>
<td>-</td>
<td>V/\mu\text{s}</td>
<td></td>
</tr>
<tr>
<td>(T_{PLH})</td>
<td>Propagation Delay Time Logic Low to Logic High</td>
<td>(I_F=0,\text{mA}, V_{OL}=0.8,\text{V}, R_L=350,\Omega, T_A=25^\circ\text{C}, V_{CM}=1000,\text{Vp-p})</td>
<td>20000</td>
<td>-</td>
<td>-</td>
<td>V/\mu\text{s}</td>
<td></td>
</tr>
</tbody>
</table>
Typical Characteristic Curves

**Figure 1**
Forward Current vs. Forward Voltage

- $T_a = 70^\circ C$
- $T_a = 85^\circ C$
- $T_a = 90^\circ C$

**Figure 2**
Input Threshold Current vs. Ambient Temperature

- $V_C = 5V$
- $V_C = 0.6V$

**Figure 3**
Low Level Output Voltage vs. Ambient Temperature

- $I_{C}=5mA$
- $V_C=5V$
- $I_{IO}=13mA$

**Figure 4**
Logic High Output Current vs. Ambient Temperature

- $I_{C}=250mA$
- $V_C=5V$

**Figure 5**
Typical Logic Low Output Supply Current vs. Ambient Temperature

- $I_{C}=10mA$
- $V_C=6V$

**Figure 6**
Typical Logic High Output Supply Current vs. Ambient Temperature

- $I_{C}=5mA$
- $V_C=6V$
CTM600, CTM601, CTM611

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*Typical Logic Output Supply Current vs. Output Supply Voltage*

*Propagation Delay vs. Ambient Temperature*

*Pulse Width Distortion vs. Ambient Temperature*

*Rise And Fall Time vs. Ambient Temperature*

*Pulse Width Distortion vs. Ambient Temperature*
Test Circuits

Pulse Generator

\( \text{tr} = 5\text{ns} \)
\( \text{Zo} = 50 \text{ Ohm} \)

Input Monitor

\( 47 \)

Figure 11

Figure 12
Test Circuits

Figure 13

CMR Test Circuit

Figure 14
CTM600, CTM601, CTM611
10Mbit/s 5-Pin Mini-Flat Logic Gate Optocoupler

Package Dimension Dimensions in mm unless otherwise stated

Recommended Solder Mask Dimensions in mm unless otherwise stated
CTM600, CTM601, CTM611
10Mbit/s 5-Pin Mini-Flat Logic Gate Optocoupler

Device Marking

CTM600

CT : Denotes “CT Micro”
M600 : Product Number
V : VDE Option
Y : Fiscal Year
WW : Work Week
K : Production Code

Ordering Information

CTM6XX(V)(Z)

X = Part No. (00, 01, or 11)
V = VDE option (V or none)
Z = Tape and reel option (T1 or T2)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Surface Mount Lead Forming – With Option 1 Taping</td>
<td>3000 Units/Reel</td>
</tr>
<tr>
<td>T2</td>
<td>Surface Mount Lead Forming – With Option 2 Taping</td>
<td>3000 Units/Reel</td>
</tr>
</tbody>
</table>
Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

**Option T1**

**Option T2**
Reflow Profile

Profile Feature | Pb-Free Assembly Profile
--- | ---
Temperature Min. (Tsmin) | 150°C
Temperature Max. (Tmax) | 200°C
Time (ts) from (Tsmin to Tmax) | 60-120 seconds
Ramp-up Rate (tl to tp) | 3°C/second max.
Liquidous Temperature (Tl) | 217°C
Time (tl) Maintained Above (Tl) | 60 – 150 seconds
Peak Body Package Temperature | 260°C ±0°C / -5°C
Time (tp) within 5°C of 260°C | 30 seconds
Ramp-down Rate (tp to tl) | 6°C/second max
Time 25°C to Peak Temperature | 8 minutes max.
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