**Description**

The KPC410 series consist of an LED optically coupled to an OPIC chip. It is a high-speed digital output type photocoupler designed specifically for low circuit current. And it is packaged in a 5pin mini-flat package.

**Features**

1. Pb free and RoHS compliant
2. 5 pin mini-flat package
3. Super high speed response ($t_{PLH}, t_{PHL}$:typ.45ns at $R_L=350$ ohm)
4. Instantaneous common mode rejection voltage ($CM_{hi}$: typ. 500V/us)
5. High isolation voltage between input and output ($Viso$: 3750Vrms)
6. Low input current drive ($I_{FHL}$: Max. 5mA)
7. LSTTL and TTL compatible output
8. MSL class 1
9. **Agency Approvals:**
   - UL Approved (No. E169586): UL1577
   - c-UL Approved (No. E169586)
   - VDE Approved (No. 40020973): DIN EN60747-5-5

**Applications**

- High speed interfaces for computer peripherals, microcomputer systems
- High speed line receivers
- Noise reduction
- Interfaces for data transmission equipment.
- Inverter

**Schematic**

1. Anode
2. Cathode
3. GND
4. Vo
5. Vcc
6. Vcc
KPC410 Series
5PIN HIGH-SPEED OUTPUT PHOTOCOUPLER

- Outside Dimension

Unit: mm

- Device Marking

Notes:

cosmo
410
YWW  Y: Year code / WW: Week code
# Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward current (*1)</td>
<td>IF</td>
<td>25</td>
<td>mA</td>
</tr>
<tr>
<td>Peak forward current (*2)</td>
<td>IFM</td>
<td>40</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>VR</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>PD</td>
<td>45</td>
<td>mW</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>VCC</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>High level output voltage</td>
<td>VOIL</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>Low level output current</td>
<td>IOL</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Output collector power dissipation</td>
<td>PC</td>
<td>85</td>
<td>mW</td>
</tr>
<tr>
<td>Isolation voltage 1 minute (*3)</td>
<td>Viso</td>
<td>3750</td>
<td>Vrms</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>Topr</td>
<td>-40 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg</td>
<td>-55 to +125</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature 10 seconds</td>
<td>Tsol</td>
<td>260</td>
<td>°C</td>
</tr>
</tbody>
</table>

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# Electro-optical Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input forward voltage (*4)</td>
<td>VF</td>
<td>IF=10mA, Ta=25 °C</td>
<td>–</td>
<td>1.6</td>
<td>1.75</td>
<td>V</td>
</tr>
<tr>
<td>Input reverse voltage</td>
<td>VB_R</td>
<td>IR=10uA, Ta=25 °C</td>
<td>5</td>
<td>–</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>Input capacitance</td>
<td>C_IN</td>
<td>VF=0, f=1MHz</td>
<td>–</td>
<td>60</td>
<td>–</td>
<td>pF</td>
</tr>
<tr>
<td>Logic (1) output current</td>
<td>IO_H</td>
<td>Vcc=5.5V, VO=5.5V, IF=250μA</td>
<td>-</td>
<td>2</td>
<td>250</td>
<td>μA</td>
</tr>
<tr>
<td>Logic (0) output voltage</td>
<td>VO</td>
<td>Vcc=5.5V, IF=5mA, IOL(Sinking)=13mA</td>
<td>-</td>
<td>0.4</td>
<td>0.6</td>
<td>V</td>
</tr>
<tr>
<td>Logic (1) supply current</td>
<td>IO_C</td>
<td>Vcc=5.5V, IF=0mA</td>
<td>-</td>
<td>7</td>
<td>15</td>
<td>mA</td>
</tr>
<tr>
<td>Logic (0) supply current</td>
<td>I_CCL</td>
<td>Vcc=5.5V, IF=10mA</td>
<td>-</td>
<td>13</td>
<td>18</td>
<td>mA</td>
</tr>
<tr>
<td>Leak current (*5)</td>
<td>I_{IO}</td>
<td>45%RH, Ta=25 °C</td>
<td>-</td>
<td>13</td>
<td>18</td>
<td>mA</td>
</tr>
<tr>
<td>Isolation resistance (input-output) (*5)</td>
<td>R_{IO}</td>
<td>V_{IO}=500V, Ta=25 °C</td>
<td>-</td>
<td>10^12</td>
<td>-</td>
<td>Ω</td>
</tr>
<tr>
<td>Capacitance (input-output) (*5)</td>
<td>C_{IO}</td>
<td>f=1MHz, Ta=25 °C</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>Propagation delay time Output (0)→(1) (*6)</td>
<td>t_{PLH}</td>
<td>IF=7.5mA, Vcc=5V, RL=350Ω</td>
<td>-</td>
<td>45</td>
<td>75</td>
<td>ns</td>
</tr>
<tr>
<td>Propagation delay time Output (1)→(0) (*6)</td>
<td>t_{PHL}</td>
<td>CI=15pF, Ta=25 °C</td>
<td>-</td>
<td>45</td>
<td>75</td>
<td>ns</td>
</tr>
<tr>
<td>Output rise-fall time (10 to 90%)</td>
<td>tr, tf</td>
<td>IF=7.5mA, Vcc=5V, RL=350Ω, CL=15pF</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>Instantaneous common mode rejection voltage “output(0)” (*7)</td>
<td>CM_H</td>
<td>IF=0mA, VCM=10V, VO(Min)=2.0V, RL=350Ω</td>
<td>-</td>
<td>500</td>
<td>-</td>
<td>V/us</td>
</tr>
<tr>
<td>Instantaneous common mode rejection voltage “output(1)” (*7)</td>
<td>CM_L</td>
<td>IF=5mA, VCM=10V, VO(Max)=0.8V, RL=350Ω</td>
<td>-</td>
<td>-500</td>
<td>-</td>
<td>V/us</td>
</tr>
</tbody>
</table>

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KPC410 Series
5PIN HIGH-SPEED OUTPUT
PHOTOCOUPLER

Note ) Typical values are all at Vcc = 5V, Ta = 25°C
*1 Ta=25°C.
*2 Pulse width <= 1ms
*3 40 to 80%RH AC for 1 minute, f=60HZ.
*4 At Iin =10mA, VF decreases at the rate of 1.6mV/°C if the temperature goes up.
*5 Measured as 2-pin element. Connect pins 2 and 3, connect pins 5, 6, 7 and 8.
*6 Refer to the Fig. 1.
*7 CMH represents a common mode voltage ignorable rise time ratio that can hold logic (1) state in output.
CMl represents a common mode voltage ignorable fall time ratio that can hold logic (0) state in output.

- Recommended Operating Conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low level input current</td>
<td>IFL</td>
<td>0</td>
<td>250</td>
<td>μA</td>
</tr>
<tr>
<td>High level input current</td>
<td>IFH</td>
<td>7.0</td>
<td>15</td>
<td>mA</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>VCC</td>
<td>4.5</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Fanout (TTL load)</td>
<td>N</td>
<td>-</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>Topr</td>
<td>-40</td>
<td>+85</td>
<td>°C</td>
</tr>
</tbody>
</table>

- Test Circuit for Propagation Delay time

- Test Circuit for Instantaneous Common Mode Rejection Voltage
Fig. 1 Low Level Output Voltage vs. Ambient Temperature

Fig. 2 Forward Current vs. Input Diode Forward Voltage

Fig. 3 Switching Time vs. Forward Current

Fig. 4 Low Level Output Current vs. Ambient Temperature

Fig. 5 Input Threshold Current vs. Ambient Temperature

Fig. 6 Output Voltage vs. Input Forward Current
KPC410 Series
5PIN HIGH-SPEED OUTPUT PHOTOCOUPLER

Fig.7 Pulse Width Distortion vs. Ambient Temperature

Ambient Temperature $T_a$ (°C)
Fig.8 Rise and Fall Time vs. Ambient Temperature

Ambient Temperature $T_a$ (°C)

Fig.9 Switch Time vs. Ambient Temperature

Ambient Temperature $T_a$ (°C)
Fig.10 High Level Output Current vs. Ambient Temperature

Ambient Temperature $T_a$ (°C)

Conditions:
$V_{CC} = 5.5V$
$V_o = 5.5V$
$V_{EE} = 2.0V$
$I_{F} = 250uA$
• Recommended Soldering Conditions

(a) Infrared reflow soldering :
- Peak reflow soldering : 260°C or below (package surface temperature)
- Time of peak reflow temperature : 10 sec
- Time of temperature higher than 230°C : 30-60 sec
- Time to preheat temperature from 180~190°C : 60-120 sec
- Time(s) of reflow : Two
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

Recommended Temperature Profile of Infrared Reflow

(b) Wave soldering :
- Temperature : 260°C or below (molten solder temperature)
- Time : 10 seconds or less
- Preheating conditions : 120°C or below (package surface temperature)
- Time(s) of reflow : One
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

(c) Cautions :
- Fluxes : Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.
- Avoid shorting between portion of frame and leads.
KPC410 Series
5PIN HIGH-SPEED OUTPUT PHOTOCOUPLER

● Numbering System

KPC410 (Z)

Notes:
KPC410 = Part No.
Z = Tape and reel option (TLD, TRU)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Packing quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLD</td>
<td>TLD tape &amp; reel option</td>
<td>3000 units per reel</td>
</tr>
<tr>
<td>TRU</td>
<td>TRU tape &amp; reel option</td>
<td>3000 units per reel</td>
</tr>
</tbody>
</table>

● Recommended Pad Layout for Surface Mount Lead Form

![Recommended Pad Layout](image)

Unit: mm
KPC410 Series
5PIN HIGH-SPEED OUTPUT PHOTOCOUPLER

- SOP Carrier Tape & Reel

Unit: mm

TOLERANCE ±0.2mm

Direction of feed from reel
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