**Description**

The KPS2801 series is DC-input single channel which contains a light emitting diode optically coupled to a phototransistor. It is packaged in a 4-pin SSOP package. The input-output isolation voltage is rated at 3750Vrms.

**Features**

1. Pb free and RoHS compliant
2. High isolation voltage ($V_{ISO}=3750Vrms$)
3. Small and thin package (4pin SSOP, pin pitch 1.27mm)
4. High collector to emitter voltage ($V_{CEO}=80V$)
5. High-speed switching $t_r = 3\mu s$ (typ.), $t_f = 5\mu s$ (typ.)
6. MSL class 1
7. Agency Approvals:
   - UL Approved (No. E169586): UL1577
   - c-UL Approved (No. E169586)
   - VDE Approved (No. 40010469): DIN EN60747-5-5
   - FIMKO Approved: EN60065, EN60950
   - SEMKO Approved: EN60065, EN60950
   - CQC Approved: GB8898-2011, GB4943.1-2011

**Applications**

- Programmable logic controllers
- Measuring instruments
- Power supply
- Hybrid IC

**Schematic**

1. Anode
2. Cathode
3. Emitter
4. Collector
KPS2801 Series
4PIN SSOP PHOTOTRANSISTOR
PHOTOCOUPLER

● Outside Dimension

Unit: mm

TOLERANCE: ±0.2mm

● Device Marking

Notes:
2801
YWY
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>Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward current</td>
<td>$I_F$</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Peak forward current (*1)</td>
<td>$I_{FP}$</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>$V_R$</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>$P_D$</td>
<td>60</td>
<td>mW</td>
</tr>
<tr>
<td>Power dissipation derating</td>
<td>$P_{D/}^\circ C$</td>
<td>0.6</td>
<td>mW/$^\circ C$</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-Emitter voltage</td>
<td>$V_{CEO}$</td>
<td>80</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-Collector voltage</td>
<td>$V_{ECO}$</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>$I_C$</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Collector power dissipation</td>
<td>$P_C$</td>
<td>160</td>
<td>mW</td>
</tr>
<tr>
<td>Collector power dissipation derating</td>
<td>$P_{C/}^\circ C$</td>
<td>1.2</td>
<td>mW/$^\circ C$</td>
</tr>
<tr>
<td>Isolation voltage 1 minute (*2)</td>
<td>$V_{iso}$</td>
<td>3750</td>
<td>Vrms</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>$T_{opr}$</td>
<td>-55 to +115</td>
<td>$^\circ C$</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td>-55 to +125</td>
<td>$^\circ C$</td>
</tr>
</tbody>
</table>

*1 PW=100μs, Duty Cycle=1%.
*2 AC voltage for 1 minute at $T=25^\circ C$, RH=60% between input and output.

### 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</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward voltage</td>
<td>$V_F$</td>
<td>$I_F=5mA$</td>
<td></td>
<td>1.1</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>Reverse current</td>
<td>$I_R$</td>
<td>$V_R=5V$</td>
<td></td>
<td>5</td>
<td></td>
<td>μA</td>
</tr>
<tr>
<td>Terminal capacitance</td>
<td>$Ct$</td>
<td>$V=0, f=1MHz$</td>
<td></td>
<td>60</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector dark current</td>
<td>$I_{CEO}$</td>
<td>$V_{CE}=80V, I_F=0mA$</td>
<td></td>
<td>100</td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>Current transfer ratio</td>
<td>$CTR$</td>
<td>$I_F=5mA, V_{CE}=5V$</td>
<td>50</td>
<td>600</td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Collector-Emitter saturation voltage</td>
<td>$V_{CE(sat)}$</td>
<td>$I_F=1mA, V_{CE}=5V$</td>
<td>15</td>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>$R_{iso}$</td>
<td>DC500V</td>
<td>5x10$^{10}$</td>
<td>10$^{11}$</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>Floating capacitance</td>
<td>$C_f$</td>
<td>$V=0, f=1MHz$</td>
<td></td>
<td>0.4</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Response time (Rise) (*3)</td>
<td>$tr$</td>
<td>$V_{CE}=5V, I_F=2mA, R_L=100\Omega$</td>
<td></td>
<td>3</td>
<td>18</td>
<td>μs</td>
</tr>
<tr>
<td>Response time (Fall) (*3)</td>
<td>$tf$</td>
<td></td>
<td></td>
<td>5</td>
<td>18</td>
<td>μs</td>
</tr>
</tbody>
</table>

*3 Test Circuit for Switching Time
Classification table of current transfer ratio is shown below.

<table>
<thead>
<tr>
<th>CTR Rank.</th>
<th>CTR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPS28010A</td>
<td>80 TO 160</td>
</tr>
<tr>
<td>KPS28010B</td>
<td>130 TO 260</td>
</tr>
<tr>
<td>KPS28010C</td>
<td>200 TO 400</td>
</tr>
<tr>
<td>KPS28010D</td>
<td>300 TO 600</td>
</tr>
<tr>
<td>KPS28010E</td>
<td>50 TO 600</td>
</tr>
</tbody>
</table>

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**Fig.1 Current Transfer Ratio vs. Forward Current**

**Fig.2 Collector Power Dissipation vs. Ambient Temperature**

**Fig.3 Collector Dark Current vs. Ambient Temperature**

**Fig.4 Forward Current vs. Ambient Temperature**

**Fig.5 Forward Current vs. Forward Voltage**
Fig. 6 Collector Current vs. Collector-Emitter Voltage

 Collector Current $I_C$ (mA)

 Collector-Emitter Voltage $V_{CE}$ (V)

 $I_F = 30mA$  $20mA$  $10mA$  $5mA$

 $Ta = 25°C$

Fig. 7 Relative Current Transfer Ratio vs. Ambient Temperature

 Relative Current Transfer Ratio (%)

 Ambient Temperature $Ta$ (°C)

 $I_F = 5mA$  $V_{ce} = 5V$

Fig. 8 Collector-Emitter Saturation Voltage vs. Ambient Temperature

 Collector-Emitter Saturation Voltage $V_{CE}$ (V)

 Ambient Temperature $Ta$ (°C)

 $I_F = 10mA$

 $Ic = 2mA$

Fig. 9 Collector-Emitter Saturation Voltage vs. Forward Current

 Collector-Emitter Saturation Voltage $V_{CE}$ (V)

 Forward Current $I_F$ (mA)

 $Ta = 25°C$

 $Ic = 0.5mA$

 $Ic = 1mA$

 $Ic = 3mA$

 $Ic = 5mA$

 $Ic = 7mA$

Fig. 10 Response Time (Rise) vs. Load Resistance

 Response Rise Time (us)

 Load Resistance $R_L$ (KΩ)

 $V_{ce} = 5V$

 $Ic = 2mA$

 $Ta = 25°C$

Fig. 11 Response Time (Fall) vs. Load Resistance

 Response Fall Time (us)

 Load Resistance $R_L$ (KΩ)

 $V_{ce} = 5V$

 $Ic = 2mA$

 $Ta = 25°C$
Test Circuit for Response Time

\[ V_{ce} \]

\[ I_r \]

\[ R_L \]

\[ V_{cc} \]

\[ I_f \]

\[ V_{ce} \]

\[ tr \]

\[ tf \]

90%

10%
● 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.
**Numbering System**

**KPS2801 Y (Z)**

**Notes:**
KPS2801 = Part No.
Y = CTR rank option (A ~ E)
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
4-pin SSOP Carrier Tape & Reel

TOLERANCE : ±0.2mm

Direction of feed from reel
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