Random Phase Bidirectional Thyristor Drive Optocoupler

Description

The SL301X, SL302X, and SL305X series devices consist of a random phase optocoupler comprising a GaAs infrared emitting diode and a monolithic silicon chip bidirectional thyristor.

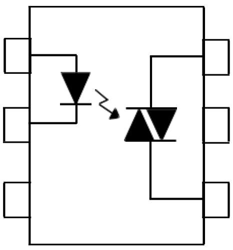
Features

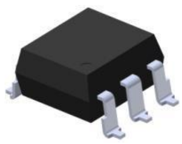
- Peak breakdown voltage
- 250V:SL301X 400V:SL302X 600V: SL305X
- High isolation voltage between input and output（Viso=5000Vrms）
- Lead-free, RoHS compliant

Applications

- Electromagnetic valve control
- Ballast
- Static AC power switch
- Microprocessor peripheral interface for 115 to 240V_{AC}
- Incandescent lamp dimmer
- Temperature control
- Motor control

Structural schematics and packaging





SMD-6

Absolute Maximum Ratings (T_A=25°C)

Parameter			Symbol	Value	Unit
Input	Forward current		I_F	60	mA
	Reverse voltage		V_R	6	V
	Power dissipation		P_D	100	mW
	Derating Factor(Above T_A=85°C)			3.8	mW/°C
Output	Off-state output voltage	SL301X	V_{DRM}	250	V
		SL302X		400	
		SL305X		600	
	Peak repetitive surge current(pw=100μs,120pps)		I_{TSM}	1	A
	Root mean square (RMS) on-state current		$I_{T(RMS)}$	100	mA
	Power consumption		P_C	300	mW
	Derating Factor(Above T_A =85°C)			7.4	mW/°C
Total power dissipation			P_{tot}	330	mW
Isolation voltage*			V_{iso}	5000	V_{rms}
Operating temperature			T_{opr}	-55~+100	°C
Storage temperature			T_{stg}	-55~+125	°C
Soldering temperature（10s）			T_{sol}	260	°C

Electrical characteristics (TA=25°C, unless otherwise specified)

<table>
<tr><th colspan="3">Parameter</th><th>Symbol</th><th>Conditions</th><th>Min</th><th>Typ</th><th>Max</th><th>Unit</th></tr>
<tr><td rowspan="2">Input</td><td colspan="2">Forward voltage</td><td>V_F</td><td>I_F=20mA</td><td>-</td><td>1.18</td><td>1.5</td><td>V</td></tr>
<tr><td colspan="2">Reverse current</td><td>I_R</td><td>V_R=6V</td><td>-</td><td>-</td><td>10</td><td>μA</td></tr>
<tr><td rowspan="5">Output</td><td colspan="2">Off-state peak current</td><td>I_{DRM}</td><td>V_{DRM} = rated V_{DRM},I_F= 0mA</td><td>-</td><td>-</td><td>100</td><td>nA</td></tr>
<tr><td colspan="2">On-state peak voltage</td><td>V_{TM}</td><td>I_{TM}=100mA$_{peak}$, I_F= rated I_{FT}</td><td>-</td><td>-</td><td>2.5</td><td>V</td></tr>
<tr><td rowspan="3">Off-state-voltage critical rise rate</td><td>SL301X</td><td rowspan="3">d_v/d_t</td><td rowspan="2">V_{PEAK}=rated V_{DRM},I_F=0</td><td rowspan="2">-</td><td rowspan="2">100</td><td rowspan="2">-</td><td rowspan="3">V/μs</td></tr>
<tr><td>SL302X</td></tr>
<tr><td>SL305X</td><td>V_{PEAK} =400V, I_F=0</td><td>1000</td><td>-</td><td>-</td></tr>
<tr><td rowspan="11">Transmiss -ion characteri stics</td><td rowspan="10">LED trigger current</td><td>SL3020</td><td rowspan="10">I_{FT}</td><td rowspan="10">Primary terminal voltage=3V</td><td>-</td><td>-</td><td>30</td><td rowspan="10">mA</td></tr>
<tr><td>SL3010</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">15</td></tr>
<tr><td>SL3021</td></tr>
<tr><td>SL3051</td></tr>
<tr><td>SL3011</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">10</td></tr>
<tr><td>SL3022</td></tr>
<tr><td>SL3052</td></tr>
<tr><td>SL3012</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">5</td></tr>
<tr><td>SL3023</td></tr>
<tr><td>SL3053</td></tr>
<tr><td colspan="2">Holding current</td><td>I_H</td><td></td><td>-</td><td>250</td><td>-</td><td>μA</td></tr>
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Typical photoelectric characteristic curves

Fig.1 Forward Voltage Vs Forward Current Of LED

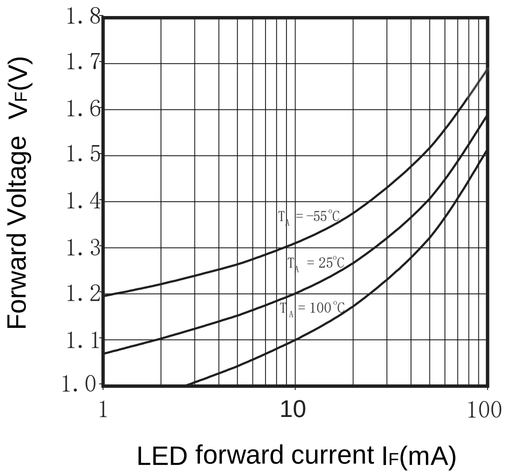


Fig.2 Characteristic Curve Of On-State

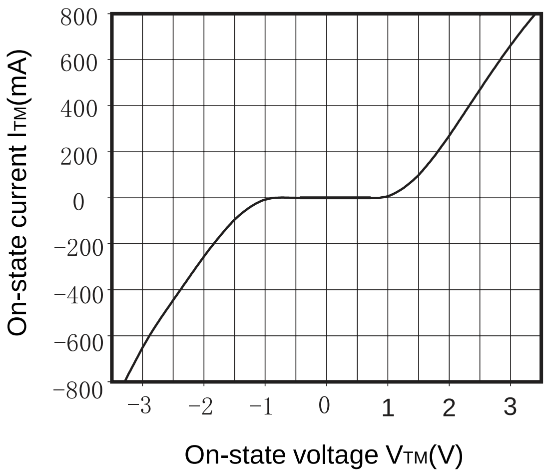


Fig.3 Trigger Current vs Ambient Temperature

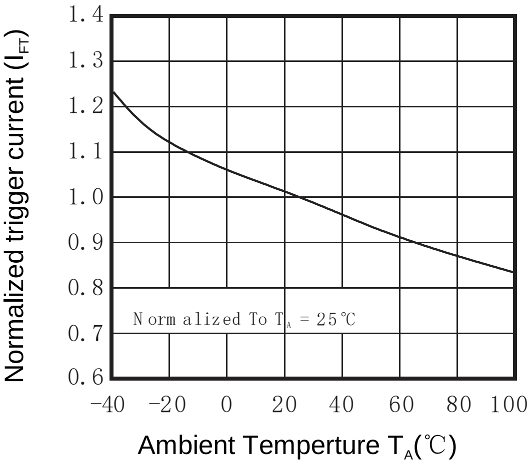


Fig.4 LED Trigger Current vs LED Pulse Width

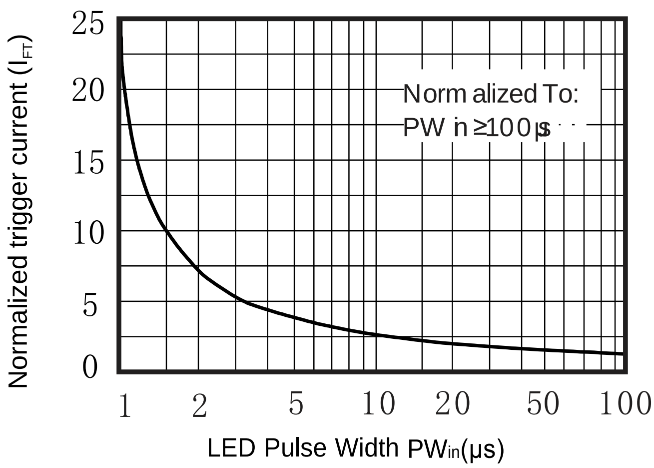


Fig.5 Holding Current vs Ambient Temperature

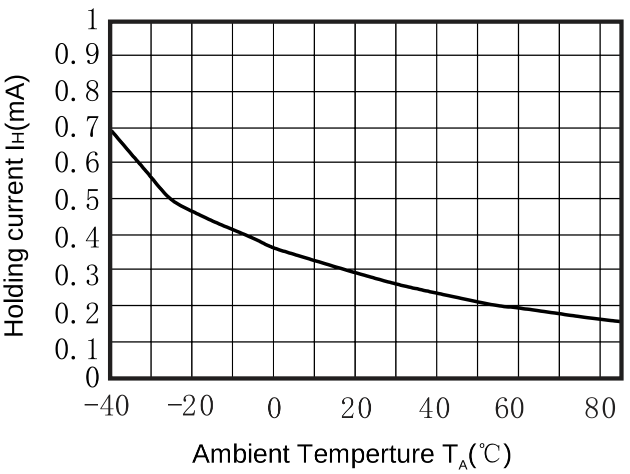


Fig.6 Leakage Current vs Ambient Temperature

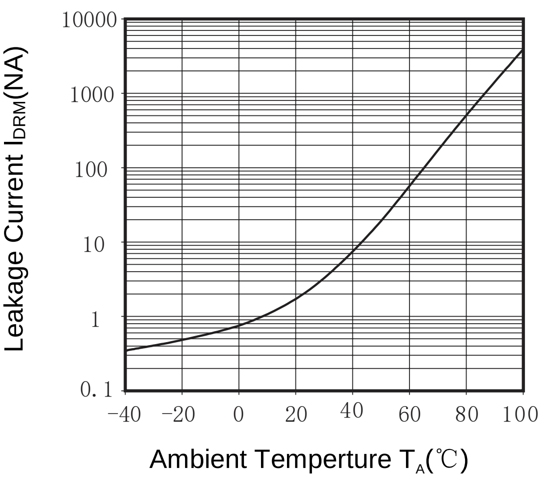
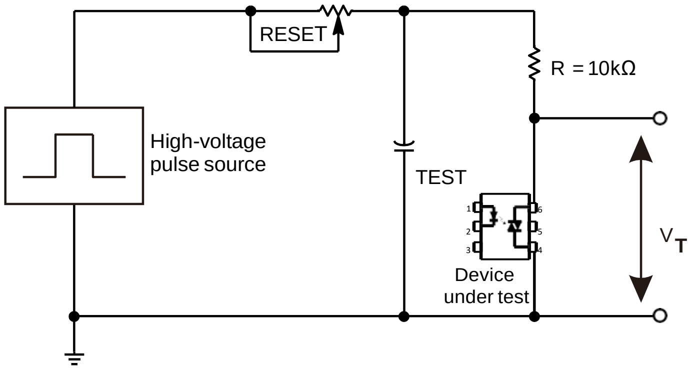
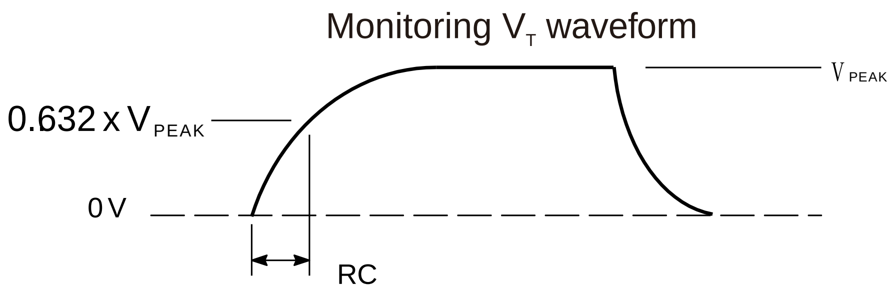


Fig.7 Static d_v/d_t Test Circuit and Waveform





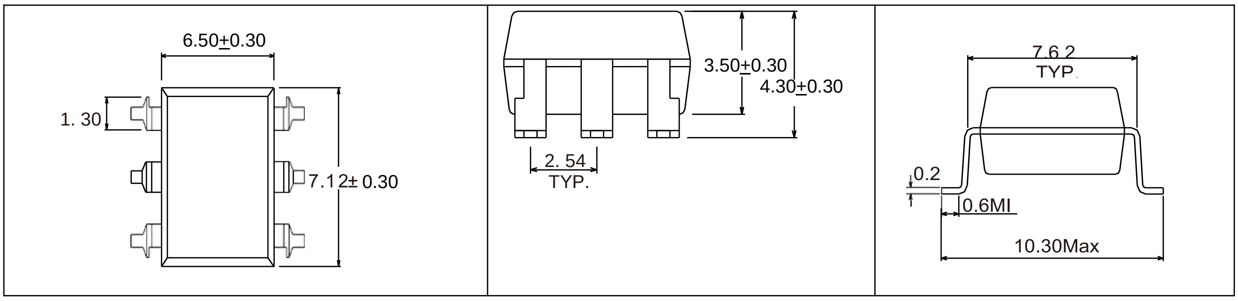
A high-voltage pulse applied to the output of the device under test (DUT) through an R_C circuit is set to the required V_{PEAK} value. No LED current needs to be applied. The V_T waveform is monitored using a X100 probe. By adjusting the RTEST value, the d_v/d_t (slope) increases until the DUT is observed to trigger (waveform breakdown). Then, d_v/d_t is decreased until the DUT stops triggering. At this point, the τrc value is recorded and d_v/d_t can be calculated.

$$d_v/d_t = \frac{0.632 \times V_{PEAK}}{I_{RC}}$$

For example, for the SL302X series with V_{PEAK}=400V, the d_v/d_t value is calculated as follows:

$$d_v/d_t = \frac{0.632 \times 400}{I_{RC}} = \frac{252}{I_{RC}}$$

Package dimensions



6-pin SMD