APPLICATION NOTE

7PIN DIP PHOTO POWER TRIAC

ELRX213、ELRX223 Series

1. Description

Photo Power TRIAC is a photoelectric isolation switch device, which can used a small signals to control the internal high current bidirectional thyristor (Power TRIAC) turn on and turn off. The input and the output is isolated by photoelectric. When the input is DC or pulse signals, the output terminal can be transit from off state to conductive. Directly driving a high current load with a small control signal. Figure 1-1. is the common application circuits, Figure 1-2. Is ELRX213 series (Zero Cross type)，Figure 1-3 is ELRX223 series (Random Phase type) internal schematic diagram.

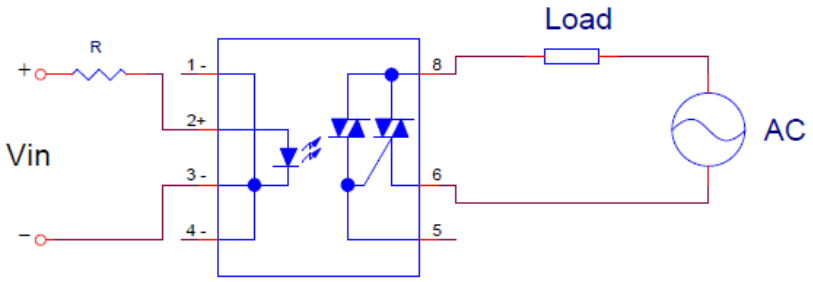

Figure 1-1 Normal Applications Circuit

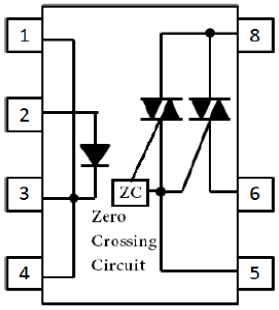

Figure1-2 ELRX213 Series(Zero Cross)

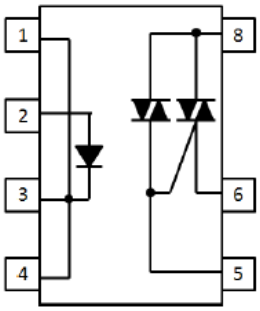

Figure1-3 ELRX223 Series(Random Phase)

According to the control mode of Photo Power TRIAC, Photo Power TRIAC can be categorize into Zero Cross and Random Phase products. Zero Cross series (ELRX213) only

when the input signal is ON and the output voltage is 0 degrees or 180 degrees phase, then the output will be turned on. When the input signal is OFF, due to the blocking effect of Power TRIAC, the load current will be cut off while the current is near to zero, as shown in Figure 2-1.

About Random Phase series (ELRX223), once the input signal is ON, then the output will be turned on immediately. When the input signal is OFF, due to the blocking effect of Power TRIAC, the load current will be cut off while the current is near to zero, as shown in Figure 2-2.

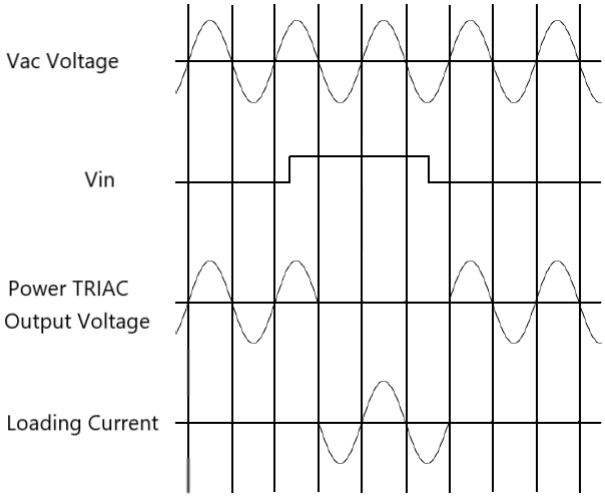

Figure 2-1 Zero Cross Timing diagram

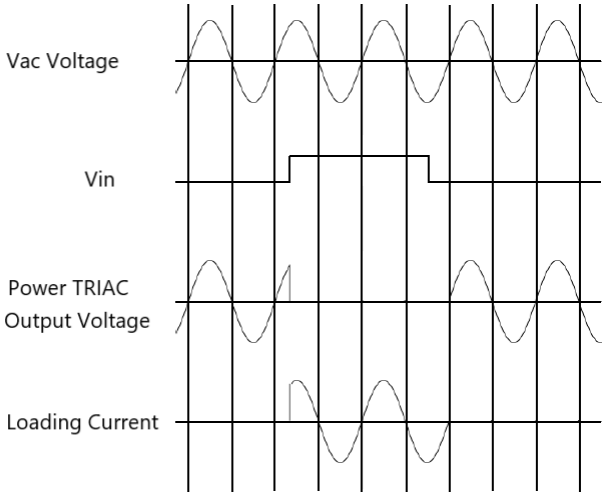

Figure 2-2 Random phase Timing diagram

2. Photo Power TRIACI Input characteristics:

ELRX213 and ELRX223 are using infrared LED to control the output trigger circuit by light transmission, to achieve the controlling of the power TRIAC gate turn on or turn off. Higher drive current can speed up the turn on time, the relative variation of I_F and Turn on time as shown in Figure 3.

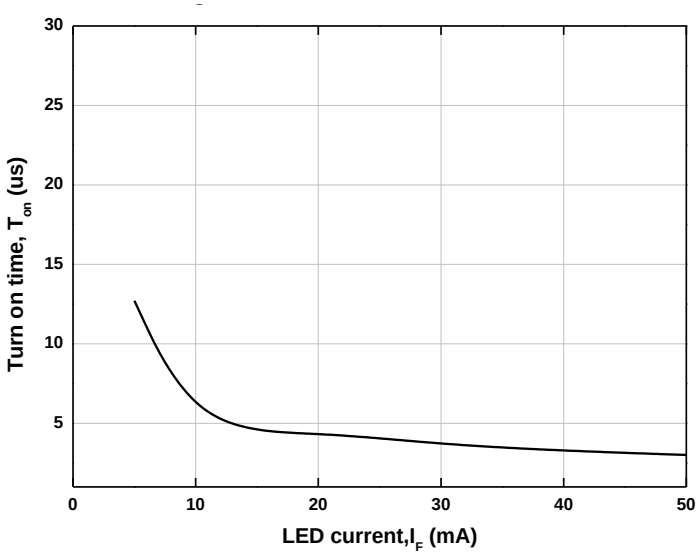

Figure 3. Turn on time vs LED current

The Input LED current and temperature will affect VF characteristics, the relative variation of temperature and VF as shown in Figure 4.

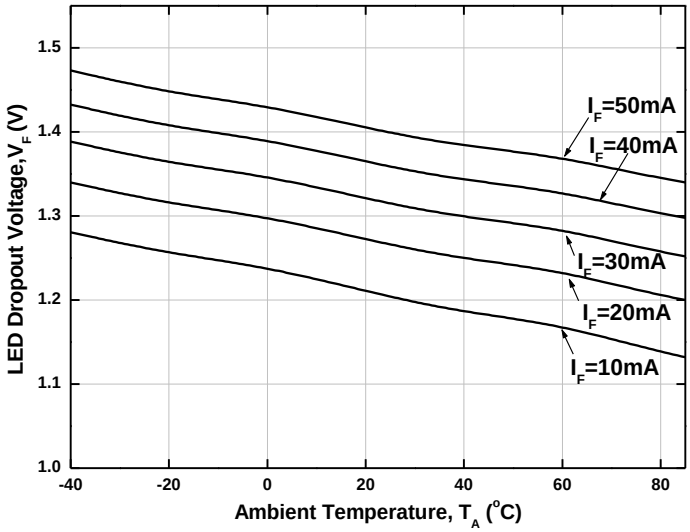

Figure 4. LED Dropout Voltage vs Ambient Temperature

3. Photo Power TRIAC Output characteristics

Power TRIAC On-state current rating will be decreased while the ambient is over 40 ºC, the relative variation of ON-state Current and temperature as shown in Figure 5.

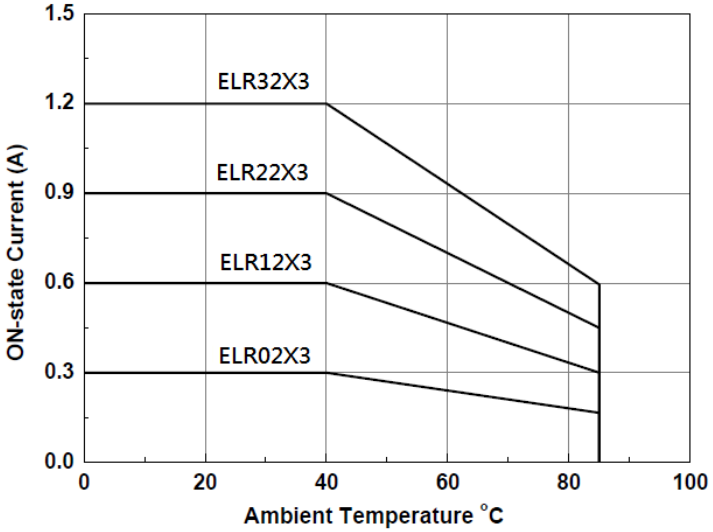

Figure 5. ON-state Current vs Ambient

The Power TRIAC forward voltage will be decreased while the temperature is increased, the relative variation of on voltage and ambient temperature as shown in Figure 6.

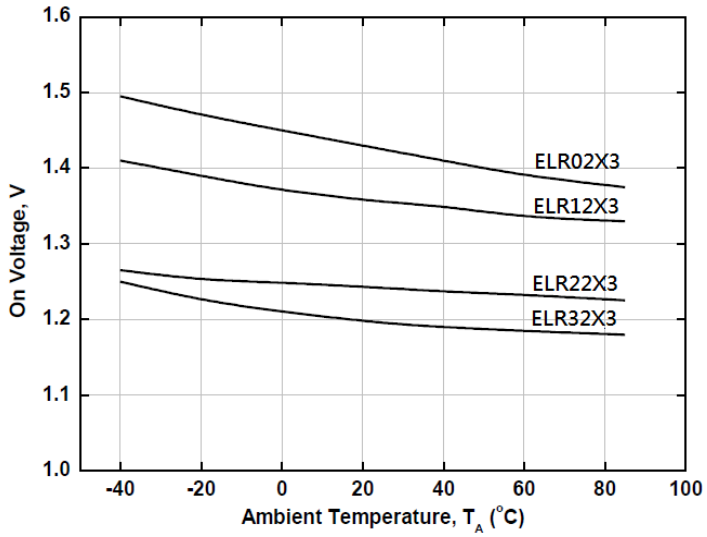

Figure 6. On Voltage vs Ambient Temperature

When the Power TRIAC is at off state, its leakage current will increase while the output voltage is increases, the relative variation of leakage current and load voltage as shown in Figure 7.

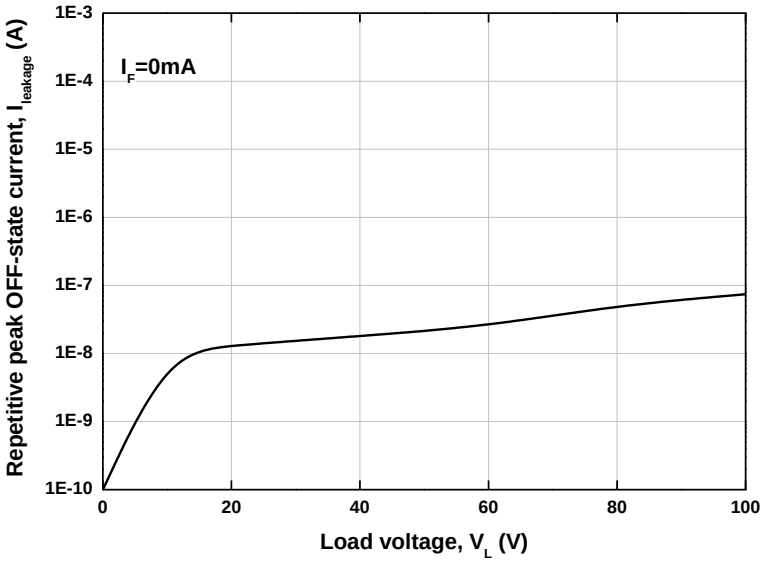

Figure7. Off state leakage Current vs Load voltage

The ELRX213 series (Zero Cross) will be conduct only when the output voltage is 0 degrees or 180 degrees. If the voltage between the Power TRIAC MT1-MT2 is greater than the Inhibit Voltage, the Power TRIAC will not be triggered to be conductive, the relative variation of inhibit voltage and temperature as shown in Figure 7.

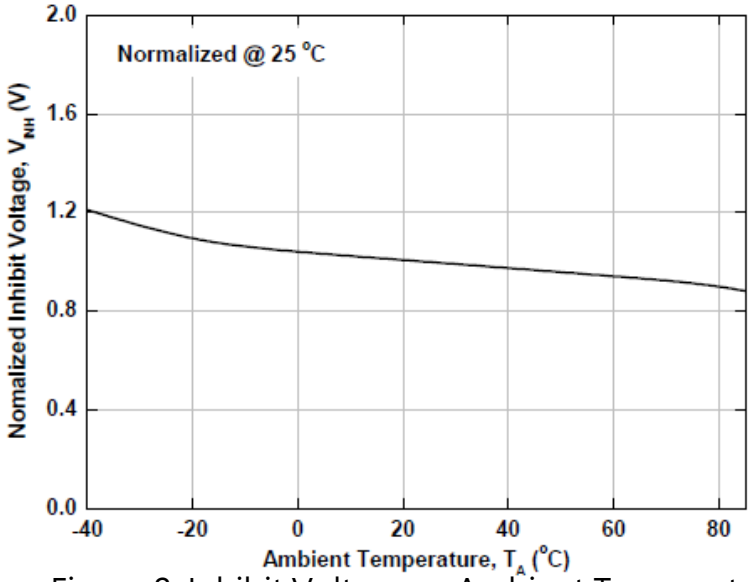

Figure 8. Inhibit Voltage vs Ambient Temperature

4. Precautions for use

- Input voltage noise prevention.

  The Power TRIAC operated power consumption is very low and fast transient of response, thus input interference noise will cause operating abnormal, adding a low-pass RC filter on the input side to absorbed voltage noise is recommended as shown in Figure 9.

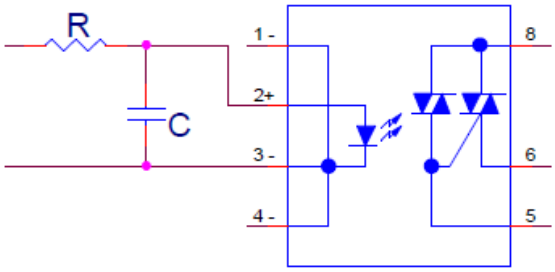

Figure 9. C、R Filter Circuit

- Output voltage noise prevention.

  For Power TRIAC drive circuit. Noise will be generated while the power turn on or turn off, which may cause the output to malfunction or cause damage. it's recommended to add a snubber circuit and varistor to absorbed voltage spike as shown in Figure 9. But if the output wire or trace is too long, thus will increase parasitic inductance and induced higher voltage spike, here recommend to shorten the length of output wire to reduce the parasitic inductance. The snubber circuit will be explained in the next chapter.

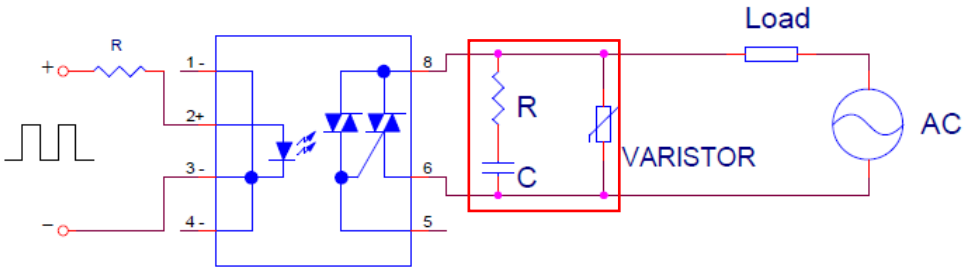

Figure 10. Snubber circuit and varistor

Note)Pin5 does not need to connect to resistor...etc.。

5. Snubber Circuit

- Reduce dv/dt

  Even the Power TRIAC load voltage is less than the voltage rating if the output is inductive load, like motor. the slope of voltage spikes will rising very fast (dv/dt is larger), so the snubber circuit should be added to reduce dv/dt, as shown in Figure 11.

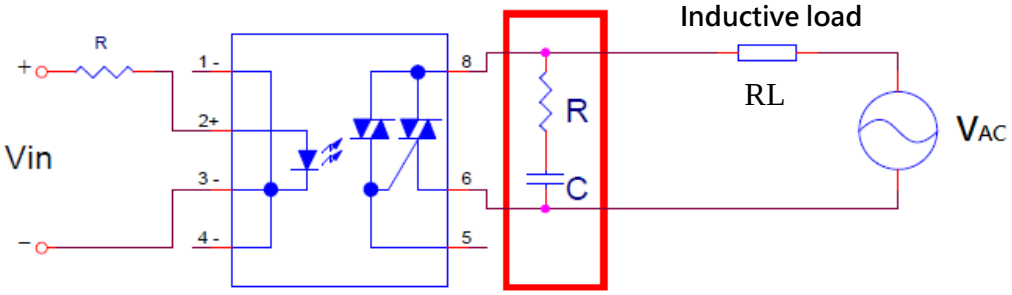

Figure 11. Snubber Circuit

- Snubber Recommendations :

I. C Selection

For the Power TRIAC circuit, by setting C = 0.1 to 0.2 μF, dv/dt can be controlled to between number to dozens V/μs or lower. For the capacitor, suggest to choose either an MPP (metallized polyester film) capacitor. For the 110 V line application, choosing capacitor which voltage rating is between 250V and 400 V, and for the 220 V line application, using capacitor which voltage rating between 400V and 600 V.

II. R Selection

If there is no resistor R, once turn-on of the TRIAC, there will be a sharp rise in dv/dt and the high peak value discharge current will flow through the circuit. This may cause damage to the internal elements of the TRIAC. Therefore, it is always necessary to insert a resistance R. In normal applications, here is a suggestion for the 100V line application, have R = 10Ω to 100 Ω and for the 200V line application, have R = 20Ω to 100 Ω. Caused by the discharge current and charging current from C will cause R power loss. For the 110 V line, Choosing resistor which power rating is 1/2 W, and for the 220V line application, choosing resistor which power rating is above 2 W.

Carbon film resistors or metal film resistors are often used in appliation. The recommended values are C = 0.1 μF and R = 20Ω to 100 Ω. If the load is inductive load that resonance might occur. so the appropriate R,C must be considered in your design.

The information in this application note provides for customers design reference only. Please verify the actual application of the product. If you have any other questions, please contact Everlight Electronics for advanced technical support.