



# ORIENT

## Photo coupler

### Product Data Sheet

Part Number: OR-M302X/OR-M305X

Customer: \_\_\_\_\_

Date: \_\_\_\_\_

**SHENZHEN ORIENT COMPONENTS CO., LTD**

Block A 3rd Floor No.4 Building, Tian'an Cyber Park, Huangge Rd, LongGang Dist, Shenzhen, GD

TEL: 0755-29681816

FAX: 0755-29681200

[www.orient-opto.com](http://www.orient-opto.com)

**1. Features**

- (1) High isolation voltage between input and output (Viso:3750 V rms )
- (2) 4pin non zero-cross optoisolators triac driver output
- (3) High repetitive peak off-state voltage VDRM :  
302X: Max. 400V , 305X: Max. 600V
- (4) High critical rate of rise of off-state voltage dv/dt :  
302X: Typ. 10V / s , 305X:MIN. 1000V / s
- (5) Tape and reel packaging.
- (6) Operating temperature -40 °Cto +110 °C
- (7) Safety approval  
UL approved(No.E323844)  
VDE approved(No.40029733)  
CQC approved (No.CQC09001029446 )
- (8) In compliance with RoHS, REACH standards
- (9) MSL Class I



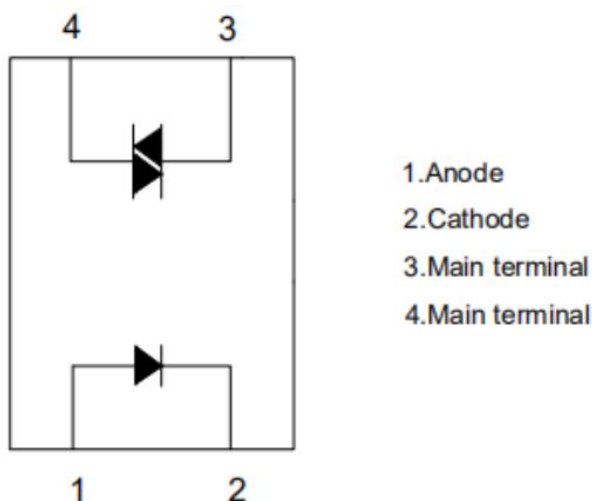
**2. Description**

The OR-M302X,OR-M305X consists of a non zero crossing photo triac, optically coupled to a gallium arsenide infrared emitting diode. They are housed in the SOP-4 package and guarantees insulation thickness. Therefore, they meet the reinforced insulation class requirements of international safety standards.

**3. Application Range**

- AC Motor Drives
- AC Motor Starters
- Static power switch
- Lighting Controls
- Solenoid/Valve Controls
- Solid State Relays
- Temperature Controls

**4. Functional Diagram**



**5. Absolute Maximum Ratings (Ta=25°C)**

| Parameter                |   | Symbol       | Rated Value | Unit    |   |
|--------------------------|---|--------------|-------------|---------|---|
| Input                    | Forward Current                                 | $I_F$        | 50          | mA      |   |
|                          | Junction Temperature                            | $T_J$        | 125         | °C      |   |
|                          | Reverse Voltage                                 | $V_R$        | 6           | V       |   |
|                          | Power Dissipation                               | P            | 100         | mW      |   |
| Output                   | Off-State Output Terminal Voltage               | OR-M302X     | $V_{DRM}$   | 400     | V |
|                          |   | OR-M305X     |             | 600     |   |
|                          | On state RMS current                            | $I_{T(RMS)}$ | 70          | mA(RMS) |   |
|                          | Peak Repetitive Surge Current (PW=1ms, 120 pps) | $I_{TSM}$    | 1           | A       |   |
|                          | Junction Temperature                            | $T_J$        | 125         | °C      |   |
|                          | Collector Power Dissipation                     | $P_C$        | 300         | mW      |   |
|                          | Total Power Dissipation                         | $P_{tot}$    | 330         | mW      |   |
| *1 Insulation Voltage    | $V_{iso}$                                       | 3750         | Vrms        |         |   |
| Working Temperature      | $T_{opr}$                                       | -40 ~ + 110  | °C          |         |   |
| Deposit Temperature      | $T_{stg}$                                       | -55 ~ + 125  |             |         |   |
| *2 Soldering Temperature | $T_{sol}$                                       | 260          |             |         |   |

Notes:

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2&3 are shorted together, and pins 4, 6 are shorted together.

\* 2 For 10 seconds

## 6. Electrical Optical Characteristics at Ta=25°C

| Parameter                |  | Symbol               | Min             | Typ.* | Max | Unit          | Condition                                       |   |
|--------------------------|--|----------------------|-----------------|-------|-----|---------------|---|---|
| Input                    | Forward Voltage  | $V_F$                | ---             | 1.2   | 1.6 | V             | $I_F=10\text{mA}$                               |   |
|                          | Reverse Current  | $I_R$                | ---             | ---   | 5   | $\mu\text{A}$ | $V_R=6\text{V}$                                 |   |
| Output                   | *1.Peak Blocking Current, Either Direction                                 | $I_{\text{DRM}}$     | ---             | 10    | 100 | nA            | $V_{\text{DRM}} = \text{Rated } V_{\text{DRM}}$ |   |
|                          | Peak On-State Voltage, Either Direction                                    | $V_{\text{TM}}$      | ---             | ---   | 2.5 | V             | $I_{\text{TM}}=100\text{mA}$<br>Peak            |   |
|                          | *2.Critical rate of Rise of Off-State Voltage                              | OR-M302X             | $dv/dt$         | ---   | 10  | ---           | $\text{V}/\mu\text{s}$                          | $V_{\text{in}}=240\text{V}_{\text{rms}}$                |
| OR-M305X                 |  | 1000                 |                 | ---   | --- |               |   |   |
| Transfer Characteristics | *3.Led Trigger Current, Current Required to Latch Output, Either Direction | OR-M3020<br>OR-M3050 | $I_{\text{FT}}$ | ---   | --- | 30            | mA  | Main Terminal Voltage = 3V                              |
|                          |  | OR-M3021<br>OR-M3051 |                 | ---   | --- | 15            |   |   |
|                          |  | OR-M3022<br>OR-M3052 |                 | ---   | --- | 10            |   |   |
|                          |  | OR-M3023<br>OR-M3053 |                 | ---   | --- | 5             |   |   |
|                          |  | OR-M3024<br>OR-M3054 |                 | ---   | --- | 3             |   |   |
|                          | Holding Current, Either Direction  |                      | $I_H$           | ---   | 3   | 5             | mA  |   |
|                          | Turn-On Time   |                      | $T_{\text{on}}$ | ---   | --- | 100           | $\mu\text{s}$                                   | $V_D=6\text{V}$<br>$R_L=100\Omega$<br>$I_F=20\text{mA}$ |

\*1. Test voltage must be applied within  $dv/dt$  rating.

\*2. This is static  $dv/dt$ . Commutating  $dv/dt$  is a function of the load-driving thyristor(s) only.

\*3. All devices are guaranteed to trigger at an  $I_F$  value less than or equal to max  $I_{\text{FT}}$ . Therefore, recommended operating  $I_F$  lies between max  $I_{\text{FT}}$ , 30 mA for OR-M3020 and OR-M3050, 15 mA for OR-M3021 and OR-M3051, 10 mA for OR-M3022 and OR-M3052, 5 mA for OR-M3023 and OR-M3053, 3 mA for OR-M3024 and OR-M3054, and absolute max  $I_F$  (50mA).



## 7. Order Information

Part Number

**OR-M302X-W-Y-Z**

Or **OR-M305X-W-Y-Z**

Note

X = Part Number(0,1,2,3 or 4)

W = Tape and reel option (TP or TP1).

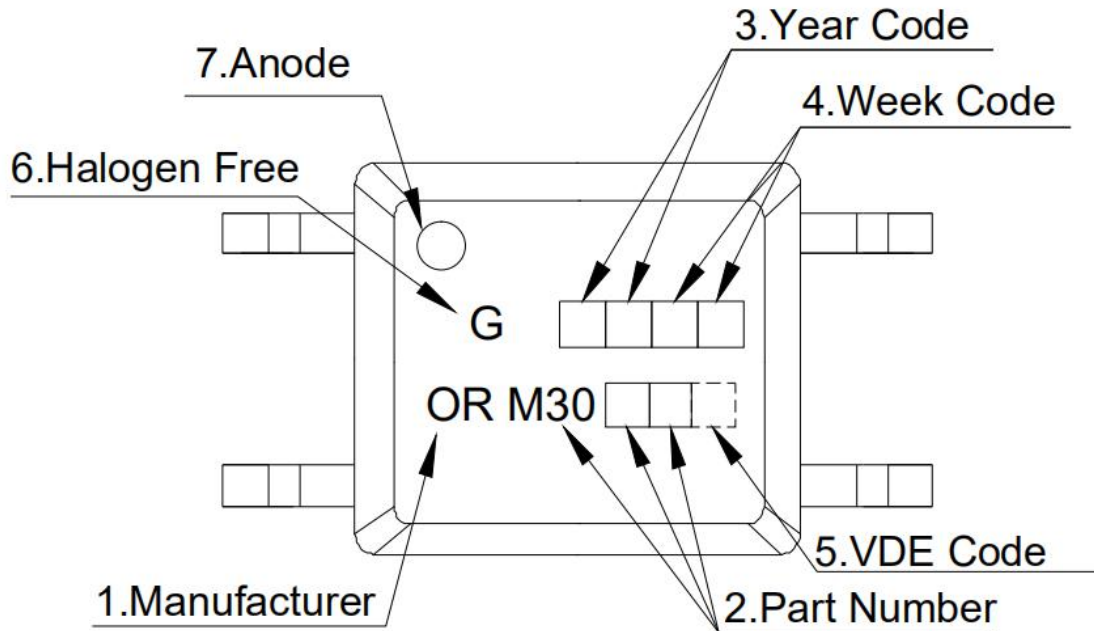
Y = 'V' code for VDE safety (This options is not necessary).

Z = 'G' code for Halogen free.

\* VDE Code can be selected.

| Option | Description  | Packing quantity    |
|--------|--|---------------------|
| TP     | Surface mount lead form (low profile) + TP tape & reel option  | 3000 units per reel |
| TP1    | Surface mount lead form (low profile) + TP1 tape & reel option | 3000 units per reel |

### 8. Naming Rule

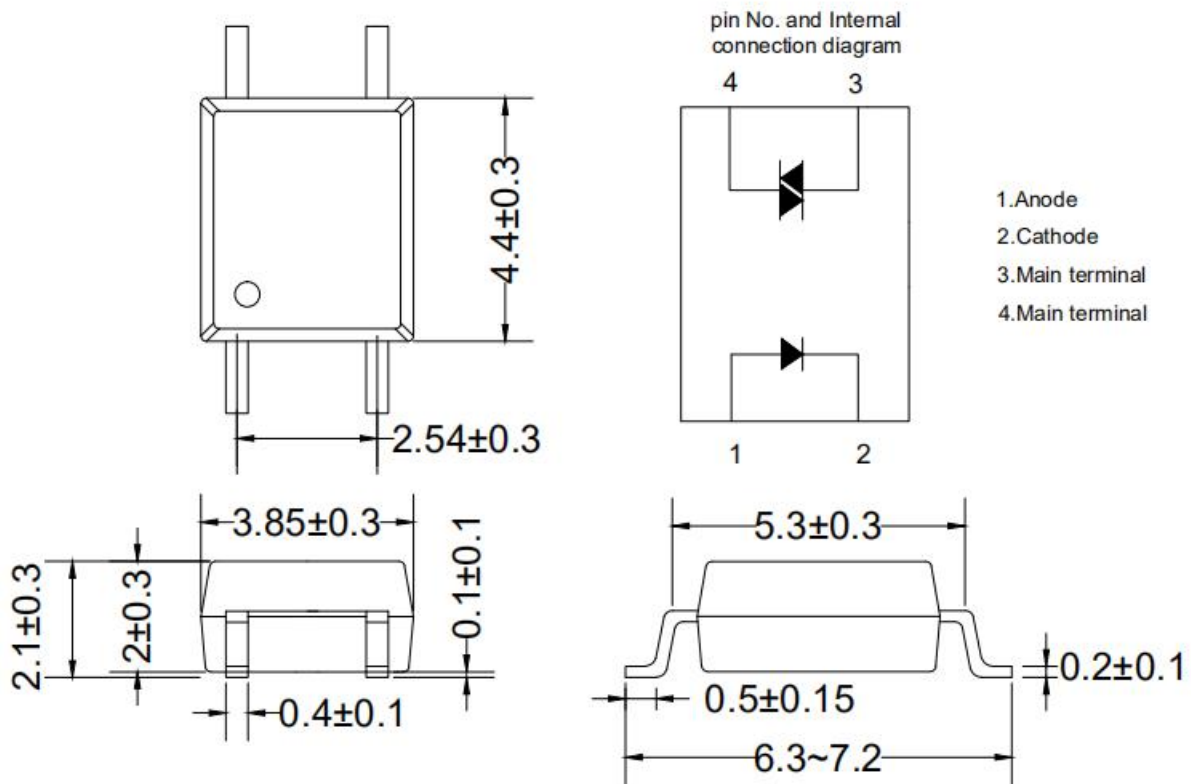


1. Manufacturer : ORIENT.
2. Part Number : M30□□.
3. Year Code □□ : '21' means '2021' and so on.
4. Week Code □□: 01 means the first week, 02 means the second week and so on.
5. VDE Code □.
6. HF Code 'G': Halogen Free.
7. Anode.

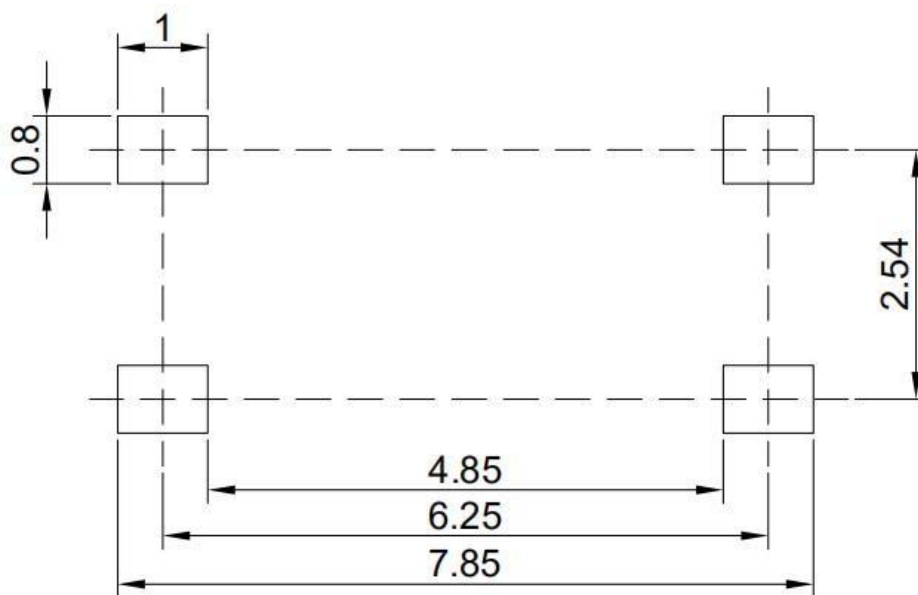
\* VDE Code can be selected.

### 9. Package Dimension

OR-M30XX



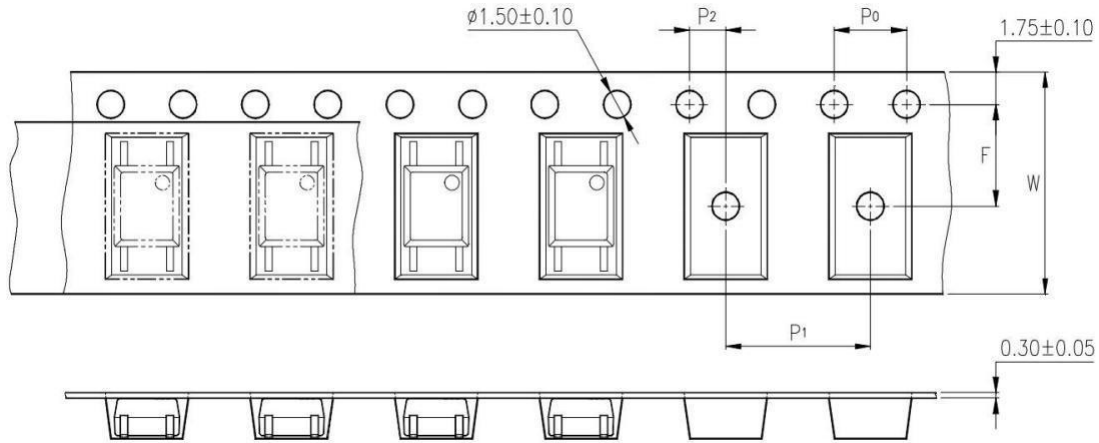
### 10. Recommended Foot Print Patterns (Mount Pad)



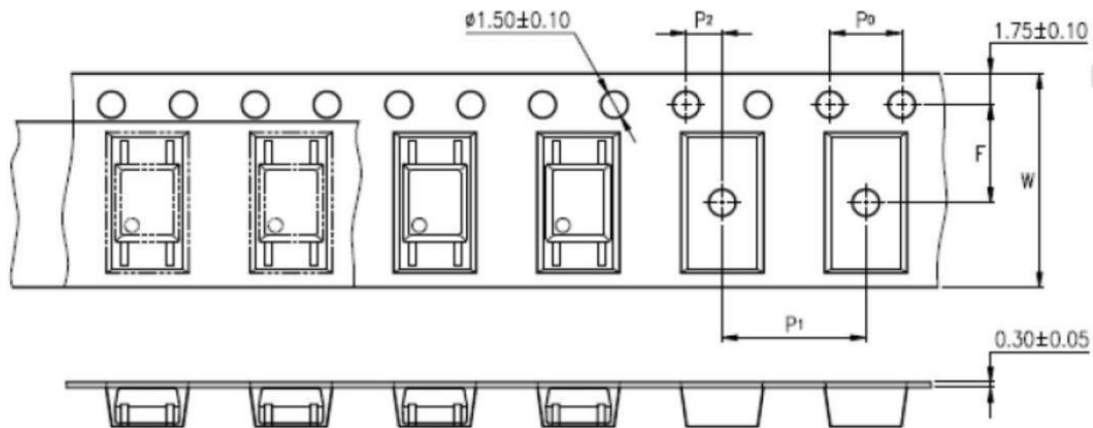
unit: mm

### 11. Taping Dimensions

(1)OR-M30XX-TP



(2)OR-M30XX-TP1



| Description                            | Symbol | Dimension in mm (inch) |
|--|--------|------------------------|
| Tape wide                              | W      | 12±0.3 (0.472)         |
| Pitch of sprocket holes                | P0     | 4±0.1 (0.157)          |
| Distance of compartment                | F      | 5.5±0.1 (0.217)        |
|  | P2     | 2±0.1 (0.079)          |
| Distance of compartment to compartment | P1     | 8±0.1 (0.315)          |

|                 |        |
|-----------------|--------|
| Package Type    | TP/TP1 |
| Quantities(pcs) | 3000   |



## 12. Package Dimension

### (1) package dimension

| Packing Information         |               |
|-----------------------------|---------------|
| Packing type                | Reel type     |
| Tape Width                  | 12mm          |
| Qty per Reel                | 3,000pcs      |
| Small box (inner) Dimension | 345*345*45mm  |
| Large box (Outer) Dimension | 480x360x360mm |
| Max qty per small box       | 6,000pcs      |
| Max qty per large box       | 60,000pcs     |

### (2)Packing Label Sample



#### Note:

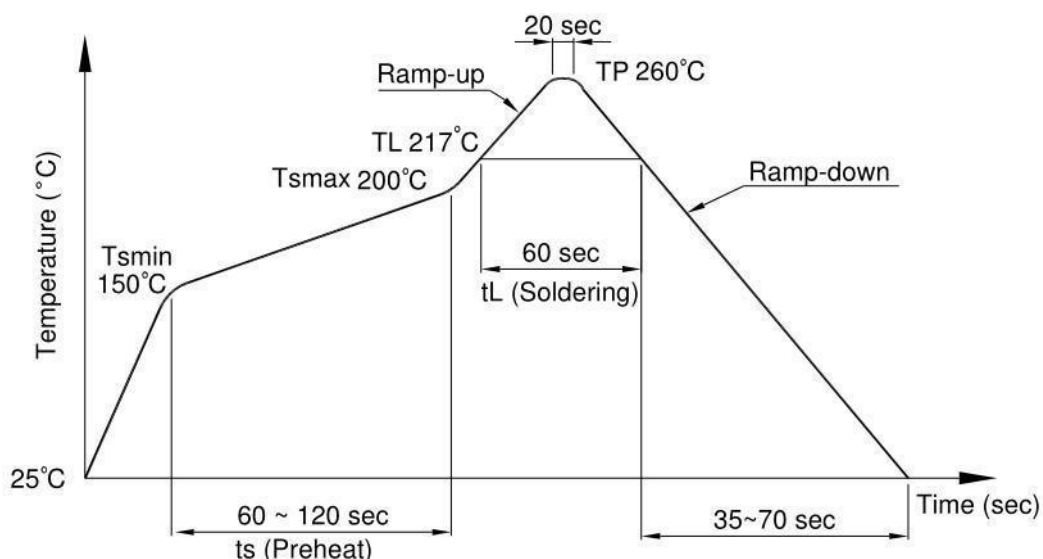
1. P/N :Contents with "Order Information" in the specification.
2. LOT NO : The production lot.
3. BATCH : The Electrical rank.
4. Quantity :Packaging quantity.
5. Product Data :Date of manufacture.

### 13. Temperature Profile Of Soldering

(1) IR Reflow soldering (JEDEC-STD-020C compliant)

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

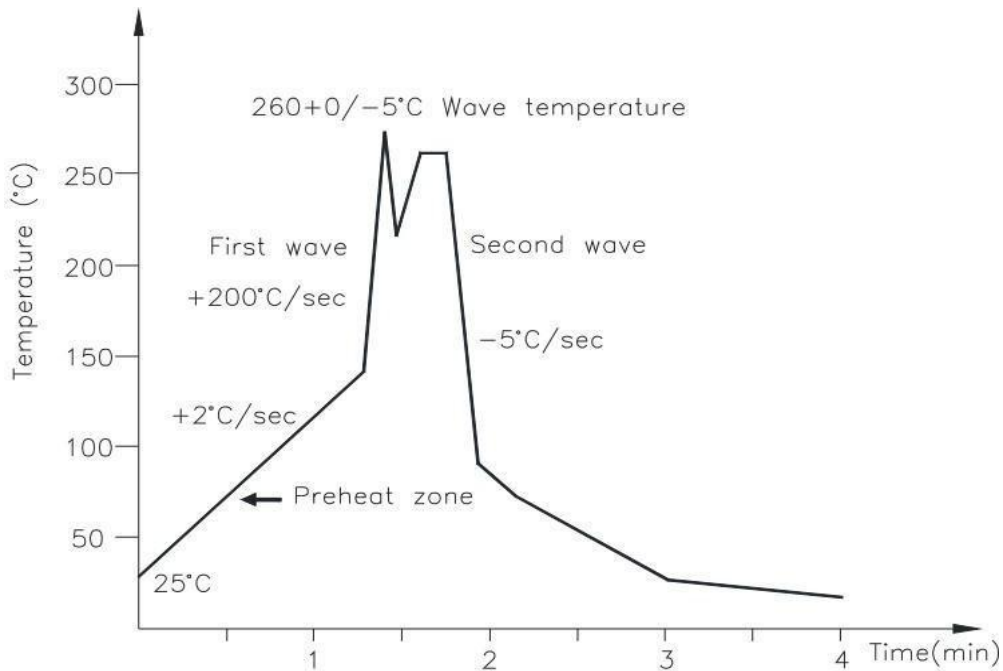
| Profile item                         | Conditions     |
|--------------------------------------|----------------|
| Preheat                              |                |
| - Temperature Min (T Smin )          | 150°C          |
| - Temperature Max (T Smax )          | 200°C          |
| - Time (min to max) (ts)             | 90±30 sec      |
| Soldering zone                       |                |
| - Temperature (TL )                  | 217°C          |
| - Time (t L )                        | 60 sec         |
| Peak Temperature                     | 260°C          |
| Peak Temperature time                | 20 sec         |
| Ramp-up rate                         | 3°C / sec max. |
| Ramp-down rate from peak temperature | 3~6°C / sec    |
| Reflow times                         | ≤3             |



(2) Wave soldering (JEDEC22A111 compliant)

One time soldering is recommended within the condition of temperature.

|                     |              |
|---------------------|--------------|
| Temperature         | 260+0/-5°C   |
| Time                | 10 sec       |
| Preheat temperature | 5 to 140°C   |
| Preheat time        | 30 to 80 sec |



(3) Hand soldering by soldering iron

Allow single lead soldering in every single process. One time soldering is recommended.

|             |            |
|-------------|------------|
| Temperature | 380+0/-5°C |
| Time        | 3 sec max  |

14. CHARACTERISTICS CURVES (TYPICAL PERFORMANCE)

Fig.1 Forward current vs Ambient temperature

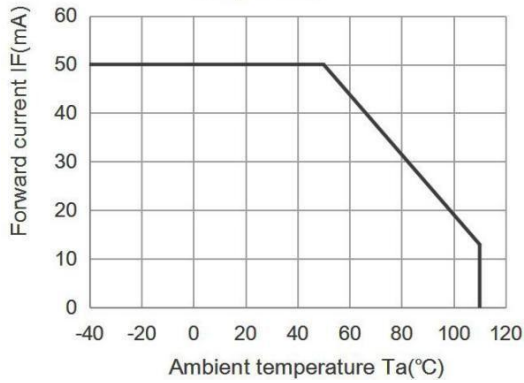


Fig.2 On-state current vs. Ambient temperature

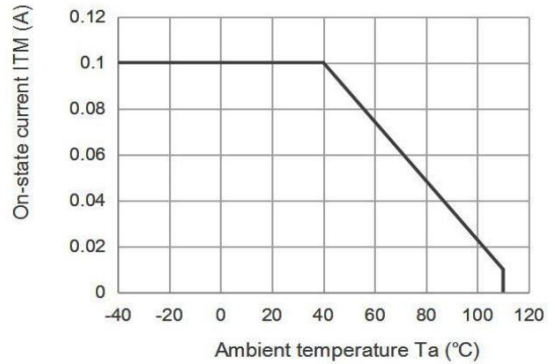


Fig.3 Minimum Trigger Current vs. Ambient temperature

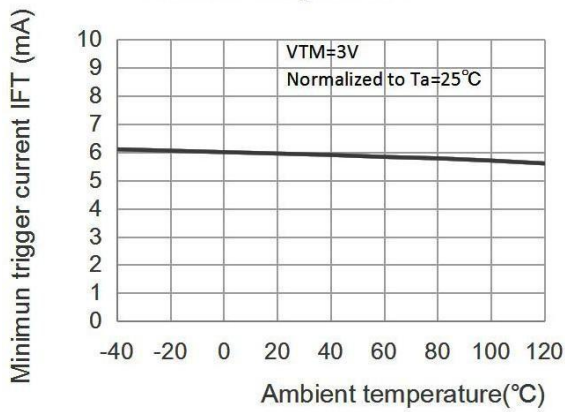


Fig.4 Forward current vs. Forward voltage

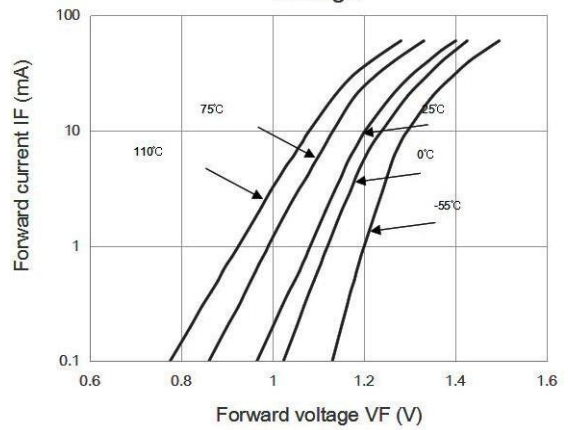


Fig.5 On-state voltage vs. Ambient temperature

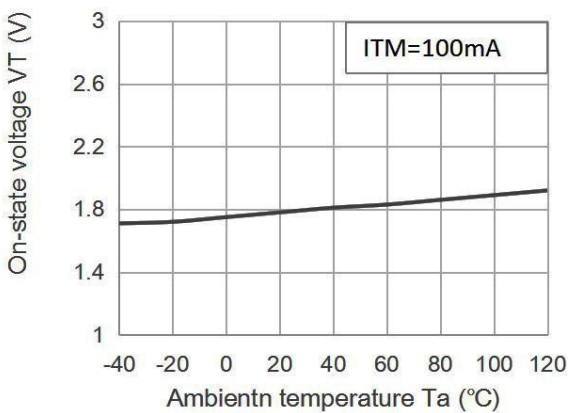


Fig.6 Holding current vs. Ambient temperature

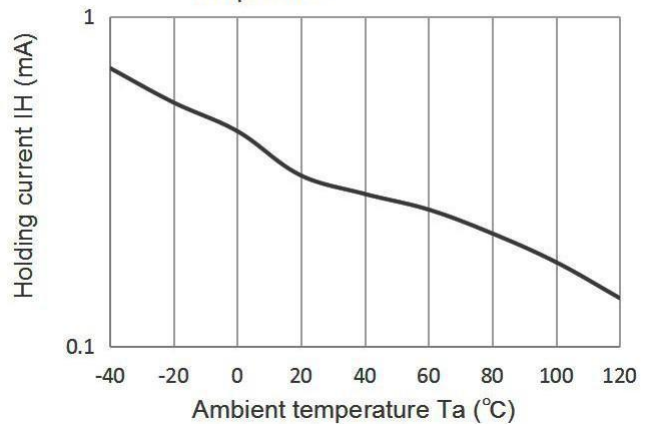


Fig.7 Repetitive peak off-state current vs. Temperature

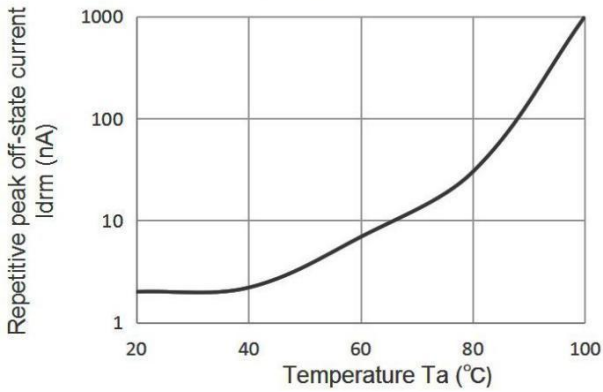


Fig.8 On-state current vs. On-state voltage

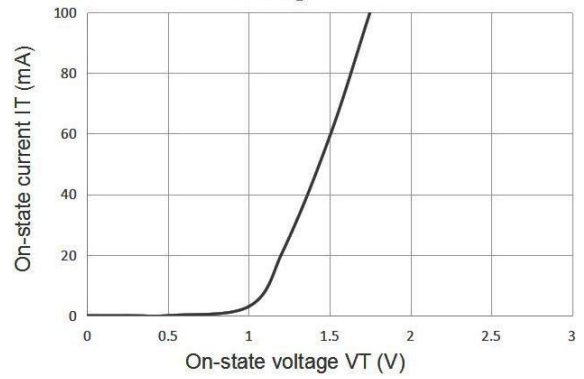


Fig9. Basic Operation Circuit Medium/High Power Triac Drive Circuit

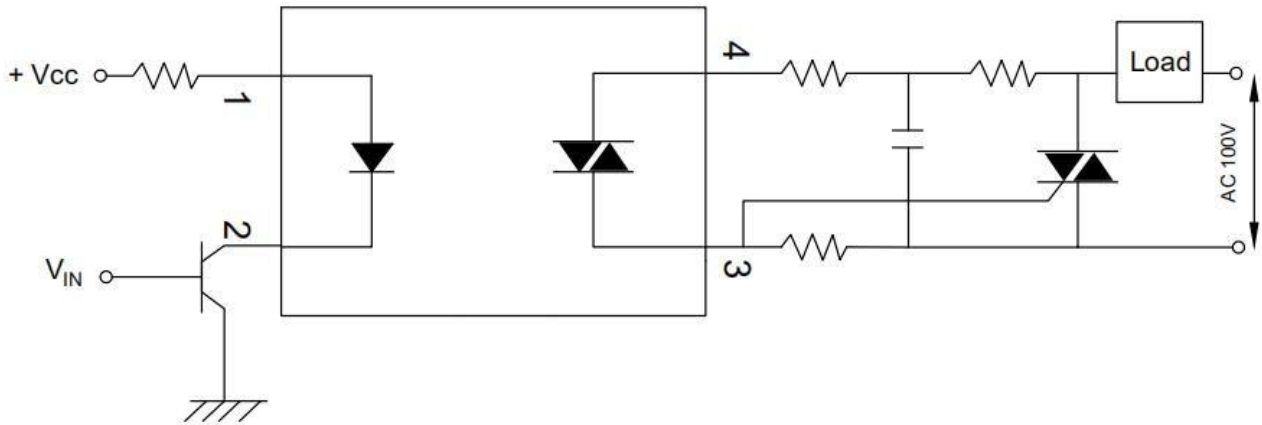
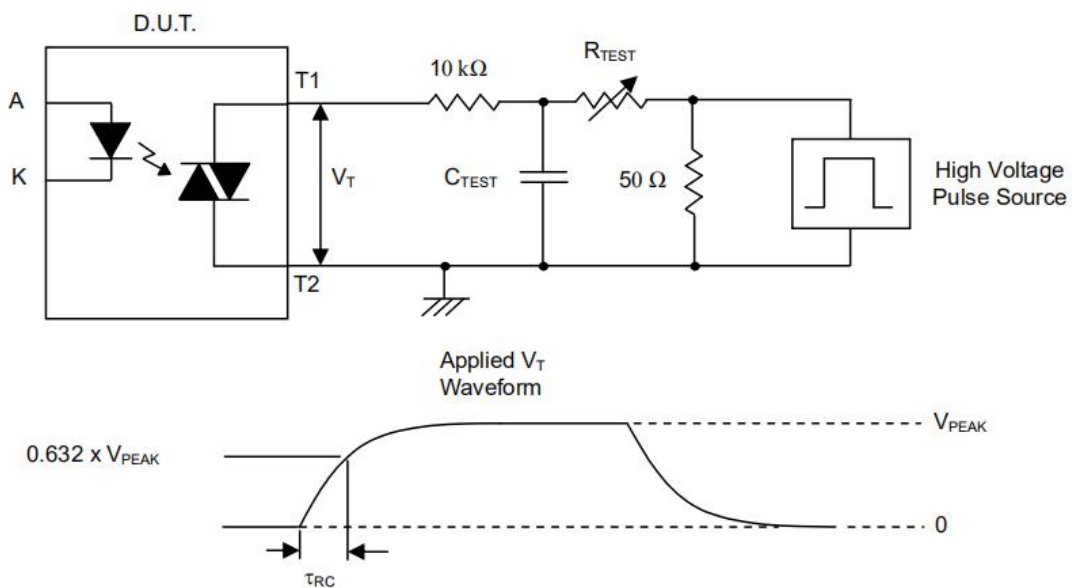


Fig10. Static dv/dt Test Circuit & Waveform



## Measurement Method

The high voltage pulse is set to the required  $V_{PEAK}$  value and applied to the D.U.T. output side through the RC circuit above. LED current is not applied. The waveform  $V_T$  is monitored using a x100 scope probe. By varying  $R_{TEST}$ , the  $dv/dt$  (slope) is increased, until the D.U.T. is observed to trigger (waveform collapses). The  $dv/dt$  is then decreased until the D.U.T. stops triggering. At this point,  $\tau_{RC}$  is recorded and the  $dv/dt$  calculated.

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

For example,  $V_{PEAK} = 600V$  for EL306X series. The  $dv/dt$  value is calculated as follows:

$$dv/dt = \frac{0.63 \times 600}{\tau_{RC}} = \frac{378}{\tau_{RC}}$$

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