

**Description**

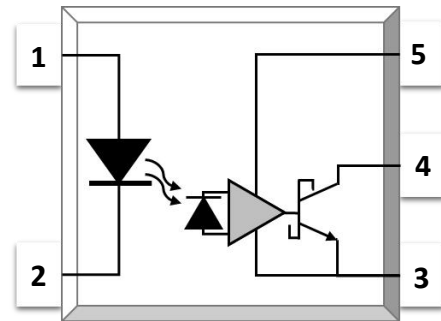
The TWSM601 series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon high speed integrated photo-detector logic gate with a strobable output in a plastic SOP5 package. With the robust coplanar double mold structure, TWSM601 series provide the most stable isolation feature.

**Features**

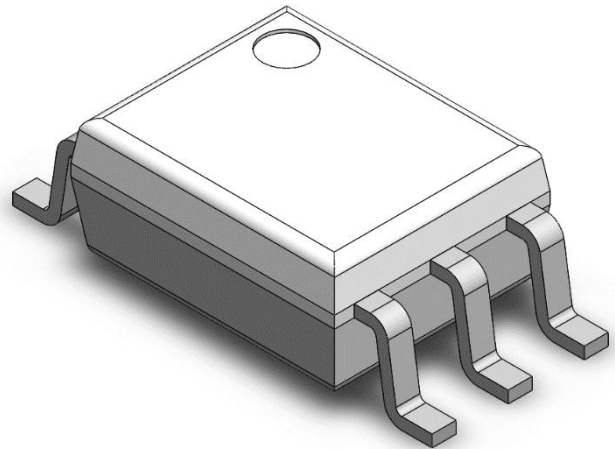
- High isolation 3750 VRMS
- DC input with logic gate output
- Operating temperature range - 40 °C to 100 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC - GB4943.1, GB8898

**Applications**

- Ground loop elimination
- LSTTL to TTL, LSTTL or CMOS
- Line receiver, data transmission
- Data multiplexing
- Switching power supply
- Pulse transformer replacement
- Computer-peripheral interface

**SCHEMATIC****PIN DEFINITION**

|                 |              |
|-----------------|--------------|
| <b>1.Anode</b>  | <b>5.VCC</b> |
|                 | <b>4.VO</b>  |
| <b>2.Cathod</b> | <b>3.GND</b> |

**PACKAGE OUTLINE**

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                | SYMBOL         | VALUE   | UNIT             | Note |
|--------------------------|----------------|---------|------------------|------|
| INPUT                    |                |         |                  |      |
| Forward Current          | $I_F$          | 25      | mA               |      |
| Peak Forward Current     | $I_{FP}$       | 50      | mA               | 1    |
| Peak Transient Current   | $I_{F(trans)}$ | 1       | A                | 2    |
| Reverse Voltage          | $V_R$          | 5       | V                |      |
| Input Power Dissipation  | $P_I$          | 100     | mW               |      |
| OUTPUT                   |                |         |                  |      |
| Supply Voltage           | $V_{CC}$       | 7       | V                |      |
| Output Voltage           | $V_O$          | 7       | V                |      |
| Output Current           | $I_O$          | 50      | mA               |      |
| Output Power Dissipation | $P_O$          | 85      | mW               |      |
| COMMON                   |                |         |                  |      |
| Total Power Dissipation  | $P_{tot}$      | 200     | mW               |      |
| Isolation Voltage        | $V_{iso}$      | 3750    | V <sub>rms</sub> | 3    |
| Operating Temperature    | $T_{opr}$      | -55~100 | °C               |      |
| Storage Temperature      | $T_{stg}$      | -55~125 | °C               |      |
| Soldering Temperature    | $T_{sol}$      | 260     | °C               | 4    |
| Forward Current          | $I_F$          | 25      | mA               |      |

Note 1. 50% duty, 1ms P.W

Note 2.  $\leq 1\mu s$  P.W, 300pps

Note 3. AC For 1 Minute, R.H. = 40 ~ 60%

Note 4. For 10 seconds

**SOP5, 10Mbit/s High Speed Logic Gate Photo Coupler****RECOMMENDED OPERATION CONDITIONS**

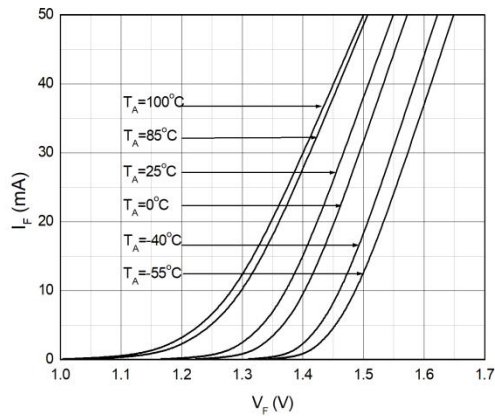
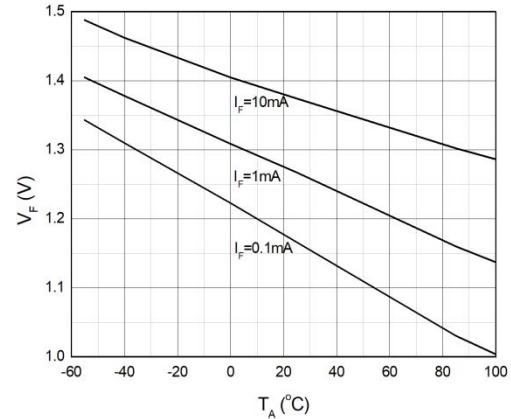
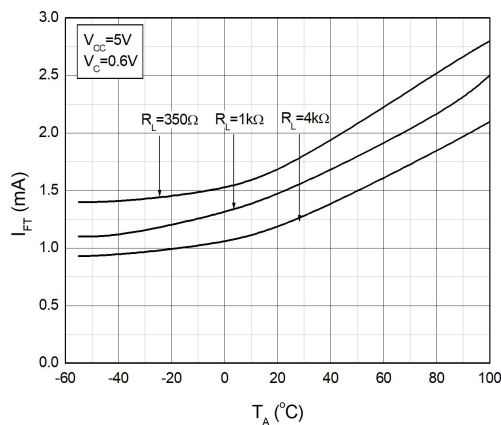
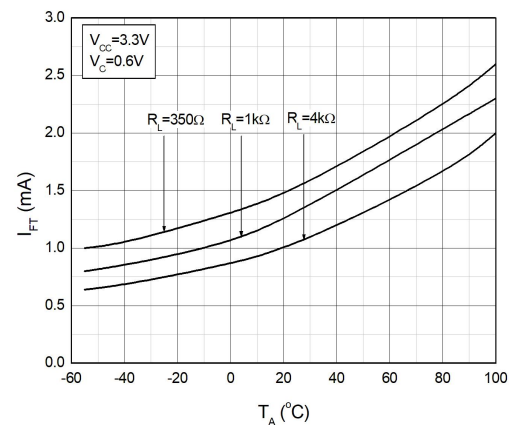
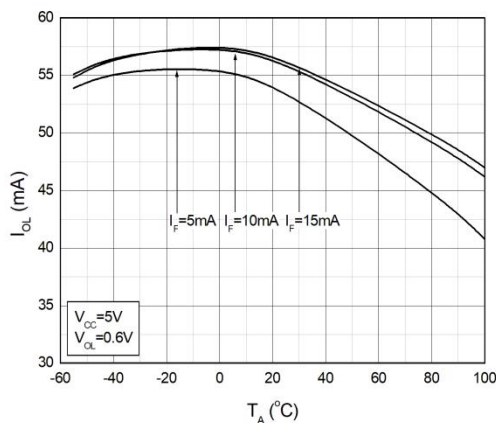
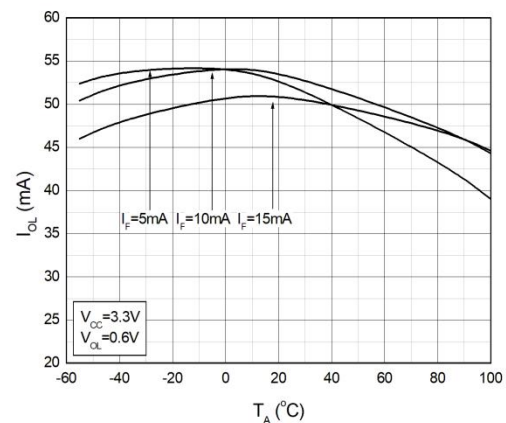
| PARAMETER                       | SYMBOL | MIN. | MAX. | UNIT      |
|---------------------------------|--------|------|------|-----------|
| Operating Temperature           | TA     | -40  | 100  | °C        |
| Supply Voltage                  | VCC    | 2.7  | 3.6  | V         |
|                                 | VCC    | 4.5  | 5.5  | V         |
| Low Level Input Current         | IFL    | 0    | 250  | μA        |
| High Level Input Current        | IFH    | 5    | 15   | mA        |
| Output Pull-up Resistor         | RL     | 330  | 4k   | Ω         |
| Fan Out (at RL=1kΩ per channel) | N      | -    | 5    | TTL Loads |

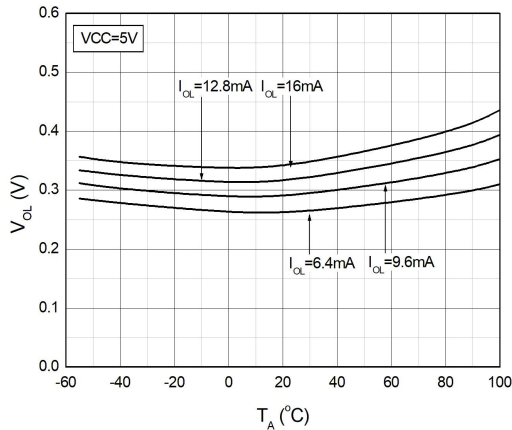
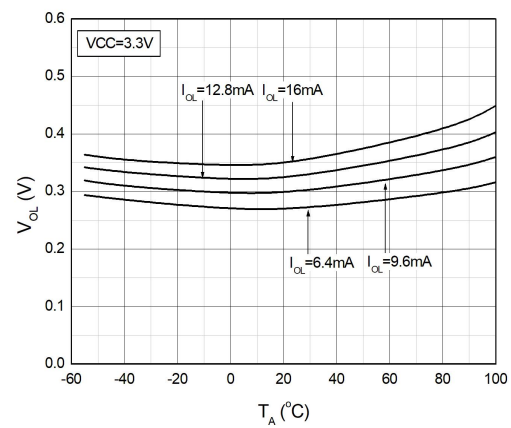
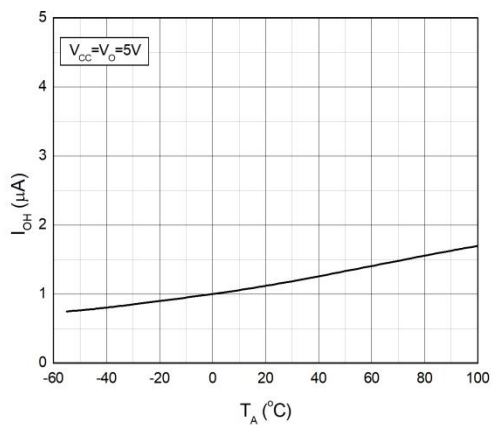
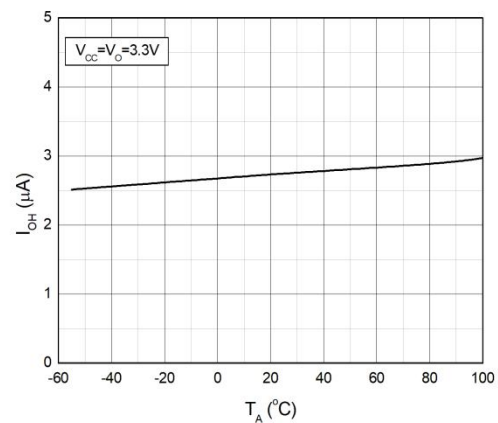
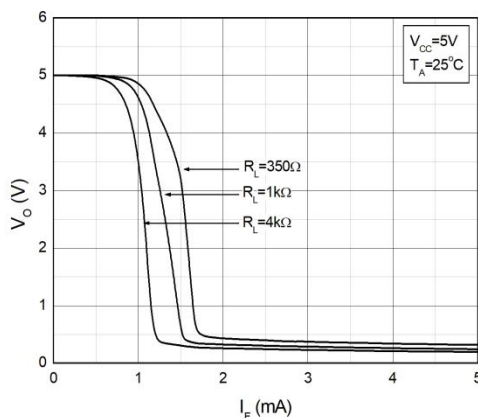
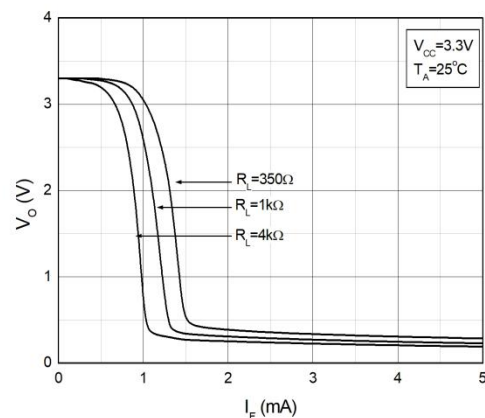
**ELECTRICAL OPTICAL CHARACTERISTICS at Ta=25°C**

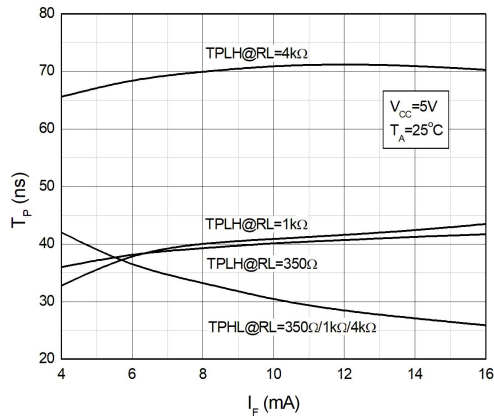
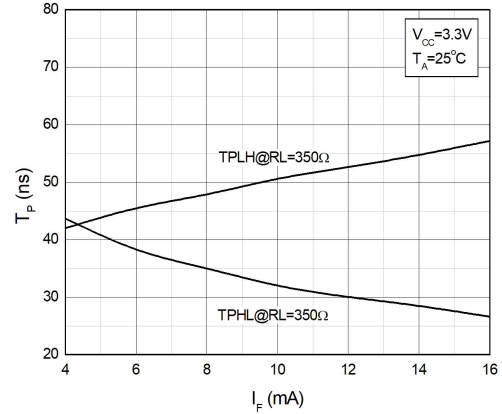
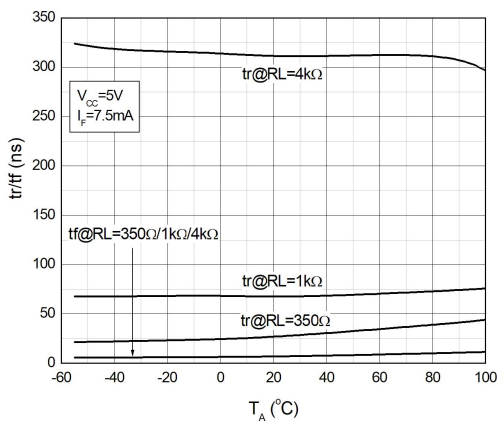
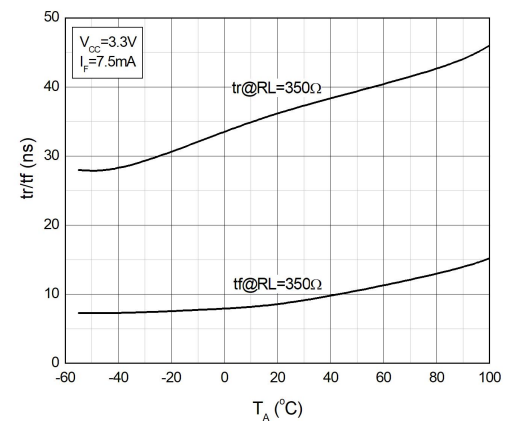
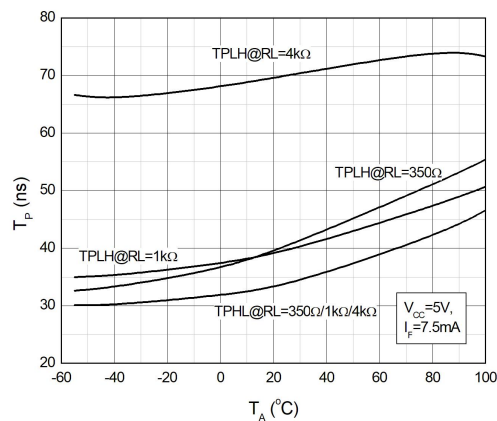
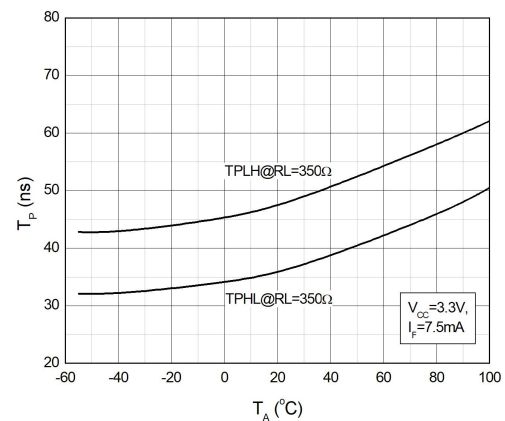
| PARAMETER                                 | SYMBOL           | MIN.             | TYP.             | MAX. | UNIT | TEST CONDITION                                                         | NOTE |
|-------------------------------------------|------------------|------------------|------------------|------|------|------------------------------------------------------------------------|------|
| INPUT                                     |                  |                  |                  |      |      |                                                                        |      |
| Forward Voltage                           | V <sub>F</sub>   | -                | 1.38             | 1.8  | V    | I <sub>F</sub> =10mA                                                   |      |
| Reverse Current                           | I <sub>R</sub>   | -                | -                | 10   | μA   | V <sub>R</sub> =5V                                                     |      |
| Input Capacitance                         | C <sub>in</sub>  | -                | 13               | -    | pF   | V=0, f=1MHz                                                            |      |
| OUTPUT                                    |                  |                  |                  |      |      |                                                                        |      |
| High Level Supply Current                 | I <sub>CCH</sub> | -                | 6.3              | 10   | mA   | I <sub>F</sub> =0mA, V <sub>CC</sub> =5.5V                             |      |
| Low Level Supply Current                  | I <sub>CCL</sub> | -                | 8.3              | 13   | mA   | I <sub>F</sub> =10mA, V <sub>CC</sub> =5.5V                            |      |
| TRANSFER CHARACTERISTICS (Ta=-40 to 85°C) |                  |                  |                  |      |      |                                                                        |      |
| High Level Output Current                 | I <sub>OH</sub>  | -                | 0.73             | 100  | μA   | V <sub>CC</sub> =5.5V, V <sub>O</sub> =5.5V,<br>I <sub>F</sub> =250μA, |      |
| Low Level Output Voltage                  | V <sub>OL</sub>  | -                | 0.28             | 0.6  | V    | V <sub>CC</sub> =5.5V, I <sub>F</sub> =5mA,<br>I <sub>OL</sub> =13mA   |      |
| Input Threshold Current                   | I <sub>FT</sub>  | -                | 2.5              | 5    | mA   | V <sub>CC</sub> =5.5V, V <sub>O</sub> =0.6V,<br>I <sub>OL</sub> =13mA  |      |
| Isolation Resistance                      | R <sub>iso</sub> | 10 <sup>12</sup> | 10 <sup>14</sup> | -    | Ω    | DC500V, 40 ~ 60% R.H.                                                  |      |
| Floating Capacitance                      | C <sub>IO</sub>  | -                | 1.0              | -    | pF   | V=0, f=1MHz                                                            |      |

**ELECTRICAL OPTICAL CHARACTERISTICS**

| PARAMETER                                                                                                         | SYMBOL    | MIN.  | TYP. | MAX. | UNIT | TEST CONDITION                                                                                               | NOTE   |
|-------------------------------------------------------------------------------------------------------------------|-----------|-------|------|------|------|--------------------------------------------------------------------------------------------------------------|--------|
| SWITCHING CHARACTERISTICS (Ta=-40 to 85°C, V <sub>CC</sub> =5V, I <sub>F</sub> =7.5mA unless specified otherwise) |           |       |      |      |      |                                                                                                              |        |
| Propagation Delay Time to Output Low Level                                                                        | TPHL      | -     | 35   | 75   | ns   | C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω, Ta=25°C                                                          | Fig.23 |
| Propagation Delay Time to Output High Level                                                                       | TPLH      | -     | 40   | 75   | ns   | C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω, Ta=25°C                                                          | Fig.23 |
| Pulse Width Distortion                                                                                            | TPHL-TPLH | -     | 5    | 35   | ns   | C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω                                                                   | Fig.23 |
| Rise Time                                                                                                         | tr        | -     | 27   | -    | ns   | C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω                                                                   | Fig.23 |
| Fall Time                                                                                                         | tf        | -     | 7    | -    | ns   | C <sub>L</sub> =15pF, R <sub>L</sub> =350Ω                                                                   | Fig.23 |
| Common Mode Transient Immunity at Logic High                                                                      | CMH       | 10000 | -    | -    | V/μs | I <sub>F</sub> = 7.5mA , V <sub>OH</sub> =2.0V,<br>R <sub>L</sub> =350Ω, Ta=25°C<br>V <sub>CM</sub> =400Vp-p | Fig.24 |
| Common Mode Transient Immunity at Logic Low                                                                       | CML       | 10000 | -    | -    | V/μs | I <sub>F</sub> = 0mA , V <sub>OH</sub> =0.8V,<br>R <sub>L</sub> =350Ω, Ta=25°C<br>V <sub>CM</sub> =400Vp-p   | Fig.24 |

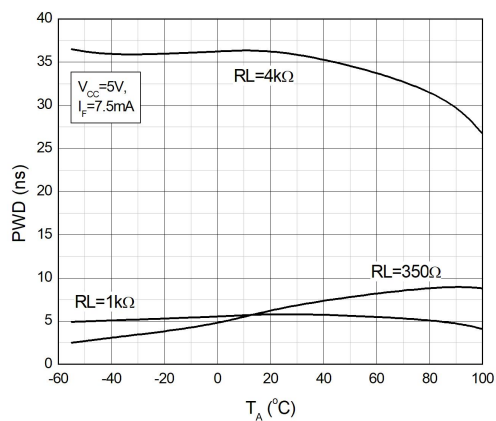
**CHARACTERISTIC CURVES****Fig.1 Forward Current vs. Forward Voltage****Fig.2 Forward Voltage vs. Ambient Temperature****Fig.3 Input Threshold Current vs. Ambient Temperature****Fig.4 Input Threshold Current vs. Ambient Temperature****Fig.5 Low Level Output Current vs. Ambient Temperature****Fig.6 Low Level Output Current vs. Ambient Temperature**

**CHARACTERISTIC CURVES****Fig.7 Low Level Output Voltage  
vs. Ambient Temperature****Fig.8 Low Level Output Voltage  
vs. Ambient Temperature****Fig.9 High Level Output Current  
vs. Ambient Temperature****Fig.10 High Level Output Current  
vs. Ambient Temperature****Fig.11 Output Voltage  
vs. Forward Current****Fig.12 Output Voltage  
vs. Forward Current**

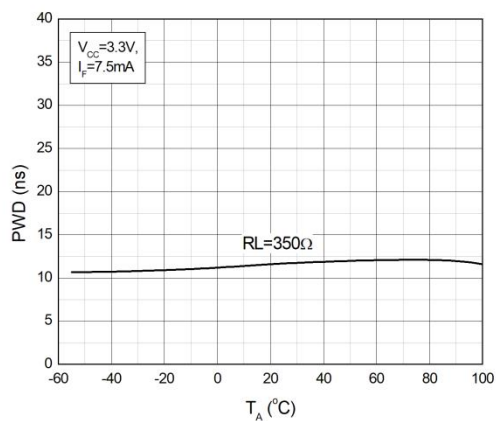
**CHARACTERISTIC CURVES****Fig.13 Propagation Delay  
vs. Forward Current****Fig.14 Propagation Delay  
vs. Forward Current****Fig.15 Rise and Fall Time  
vs. Ambient Temperature****Fig.16 Rise and Fall Time  
vs. Ambient Temperature****Fig.17 Propagation Delay  
vs. Ambient Temperature****Fig.18 Propagation Delay  
vs. Ambient Temperature**

## CHARACTERISTIC CURVES

**Fig.19 Pulse Width Distortion vs. Ambient Temperature**



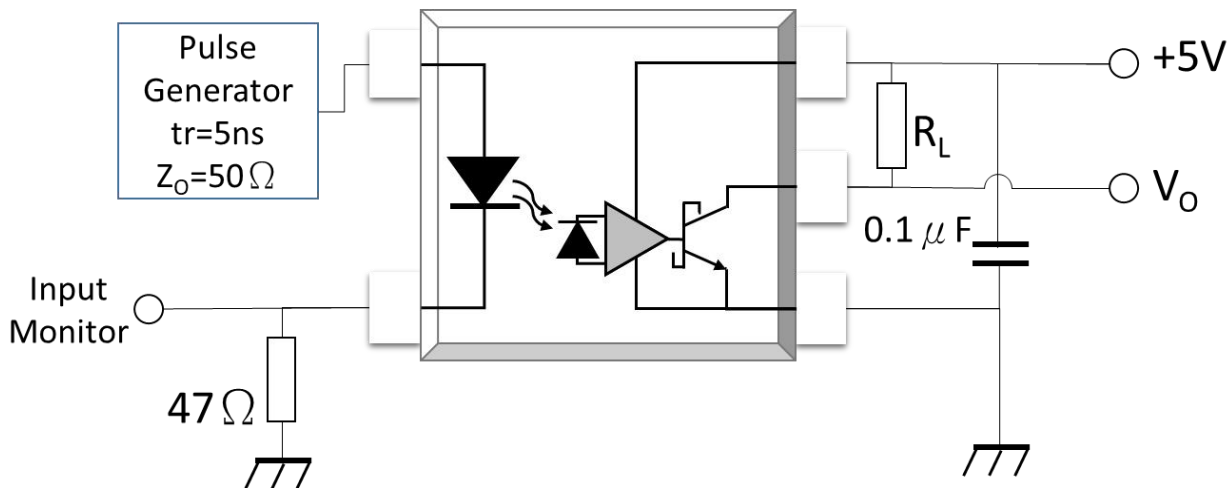
**Fig.20 Pulse Width Distortion vs. Ambient Temperature**



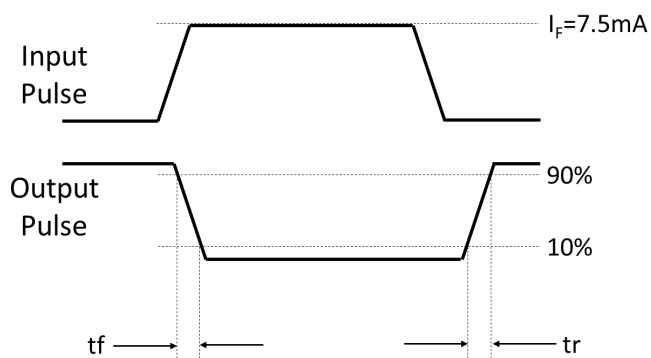
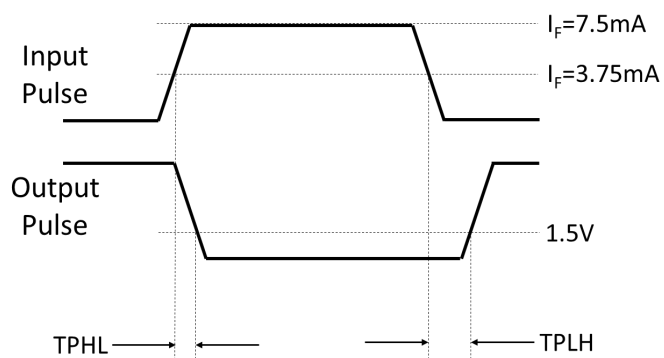


**TEST CIRCUITS**

**Fig.23 Test Circuits for TPHL, TPLH, tr, tf**

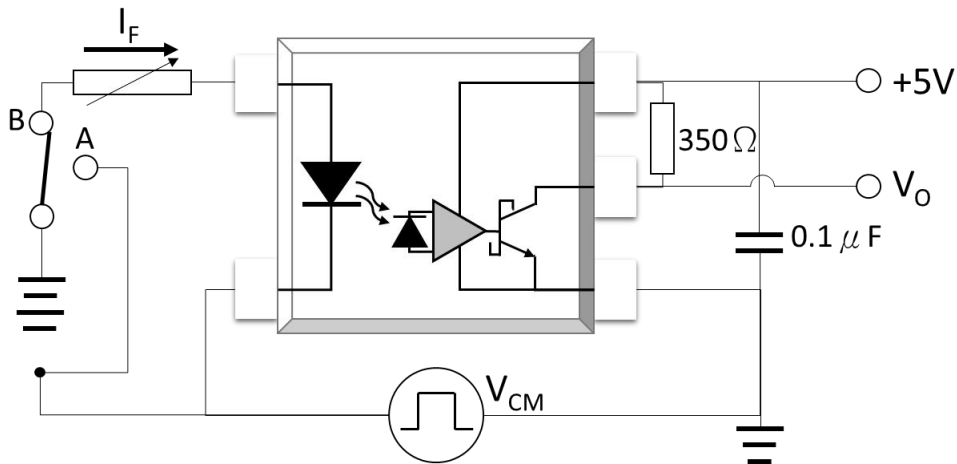


**Fig.24 Waveforms of TPHL, TPLH, tr, tf**

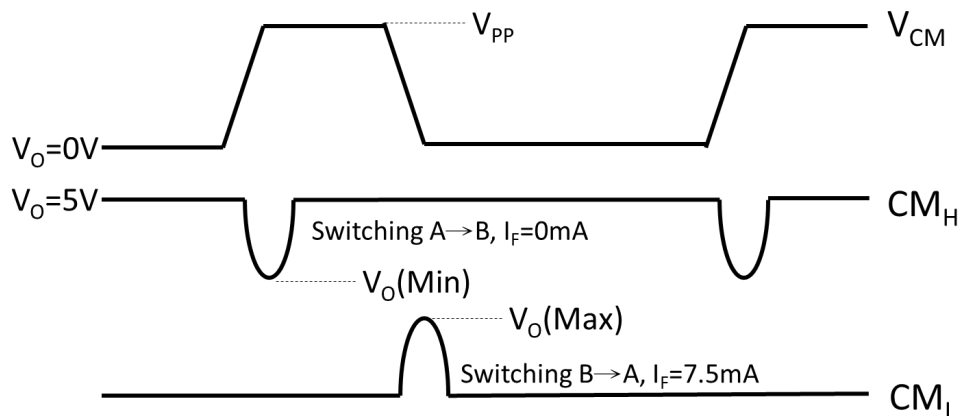


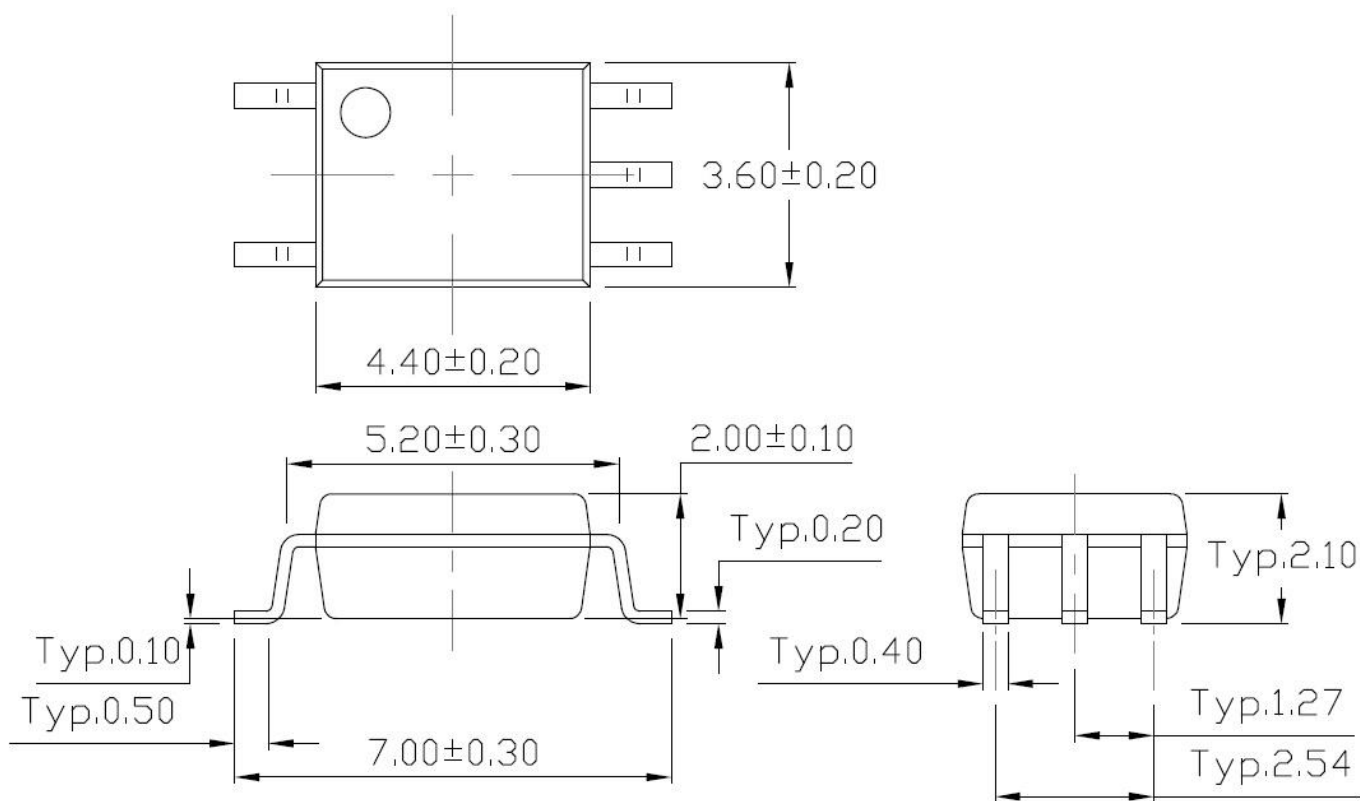
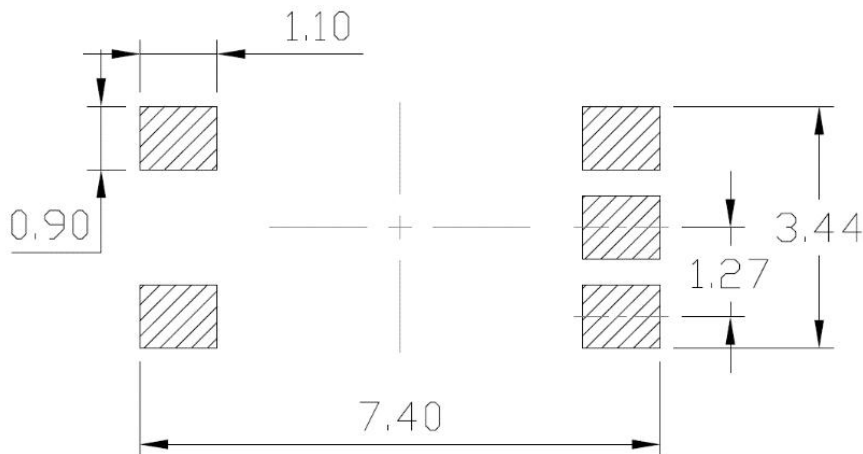
### TEST CIRCUITS

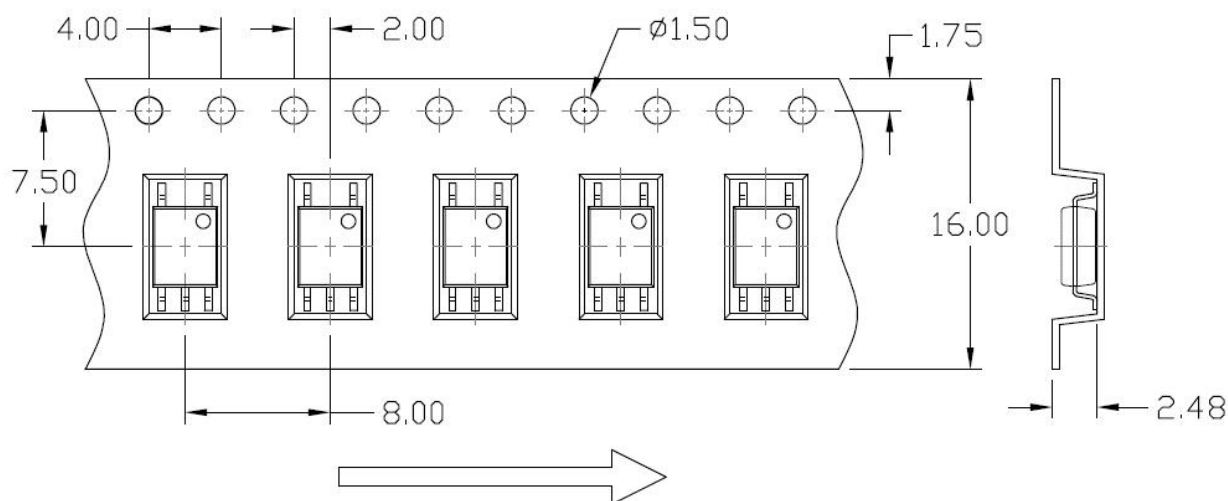
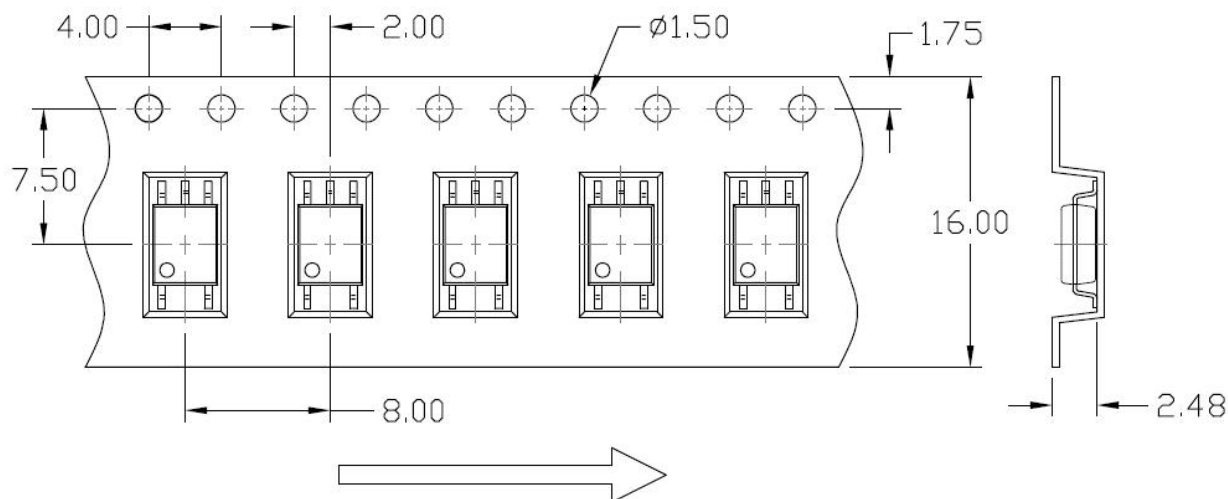
**Fig.24 Test Circuits for Common Mode Transient Immunity**



**Fig.26 Waveforms of Common Mode Transient Immunity**

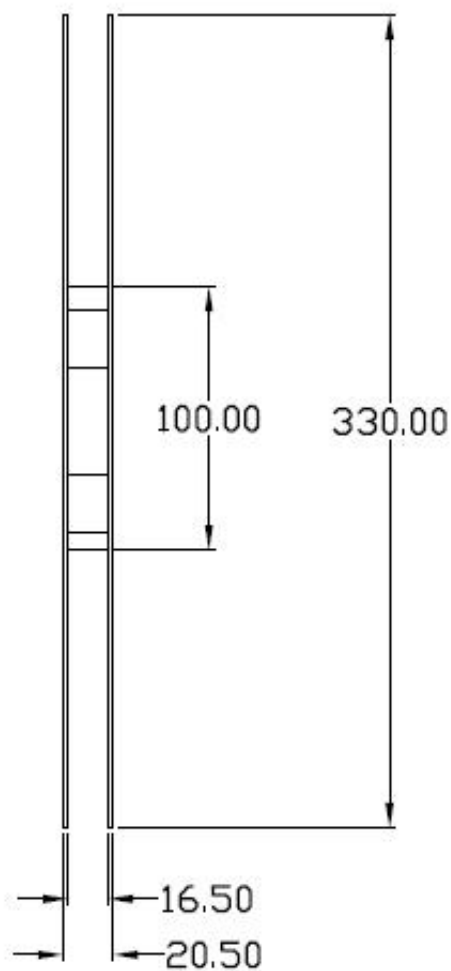
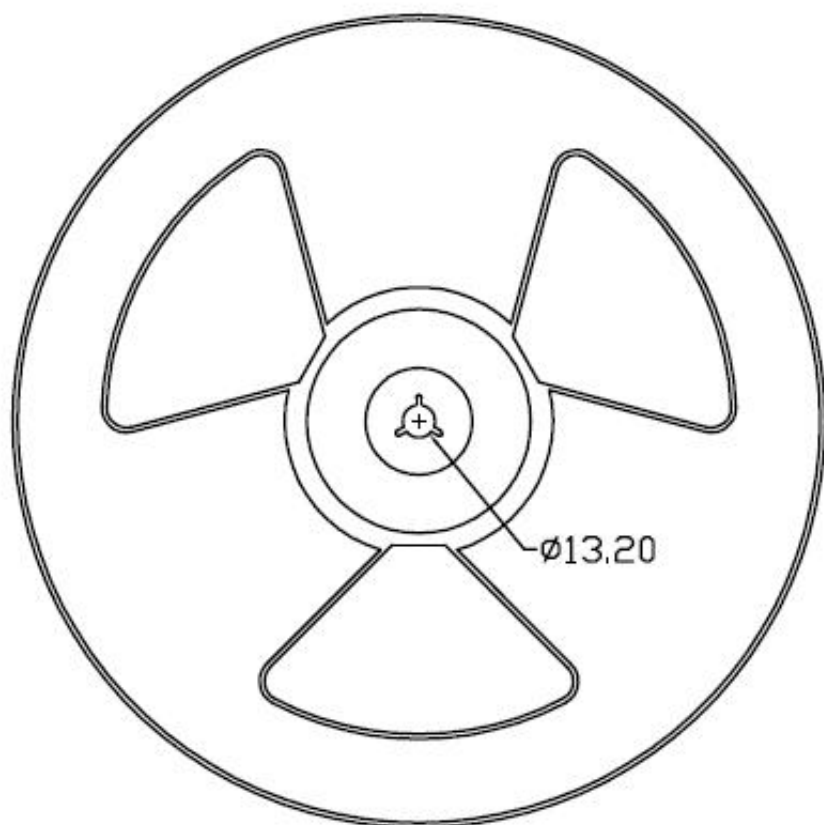


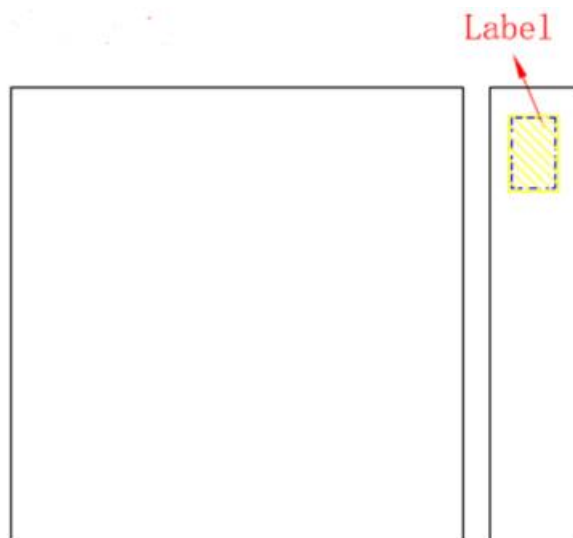
**PACKAGE DIMENSIONS** (Dimensions in mm unless otherwise stated)**Recommended Solder Mask** (Dimensions in mm unless otherwise stated)

**CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)****Option T1****Option T2**

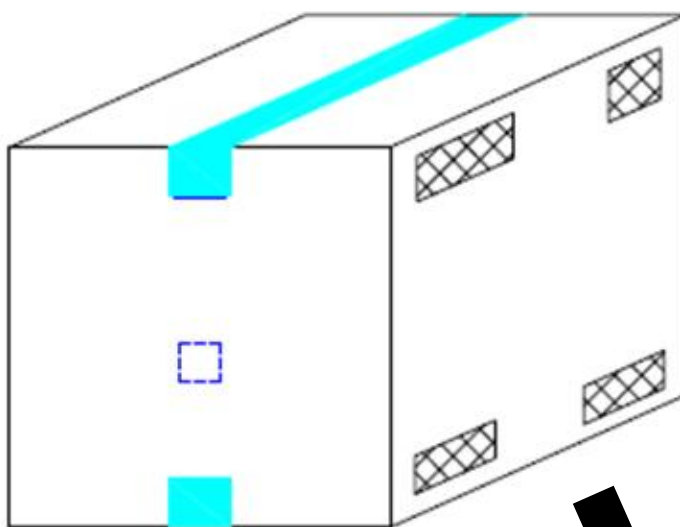
**REEL SPECIFICATIONS** (Dimensions in mm unless otherwise stated)

Option T1 &amp; T2

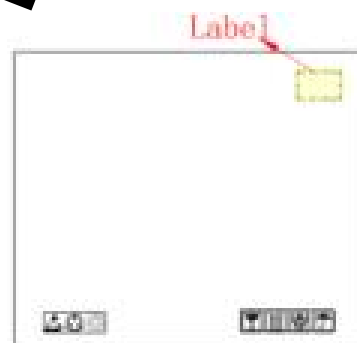


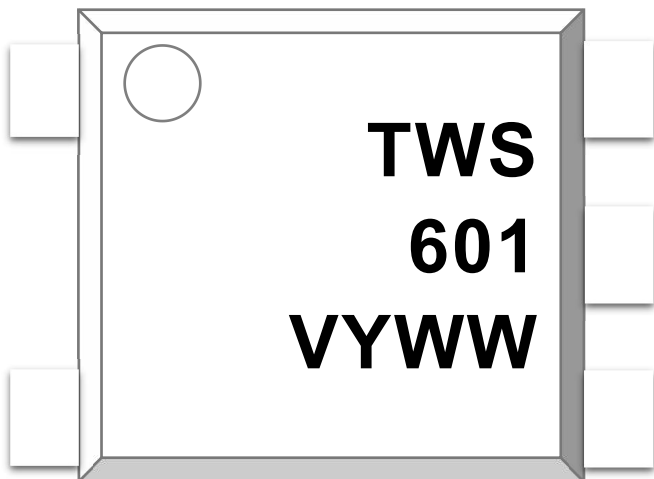
**BOX SPECIFICATIONS (Reel Type)****Inner Box**

- L x W x H = 36cm x 36cm x 6.9cm

**Outer Box**

- Option1: L x W x H = 45cm x 38cm x 38cm
- Option2: L x W x H = 39cm x 38cm x 38cm

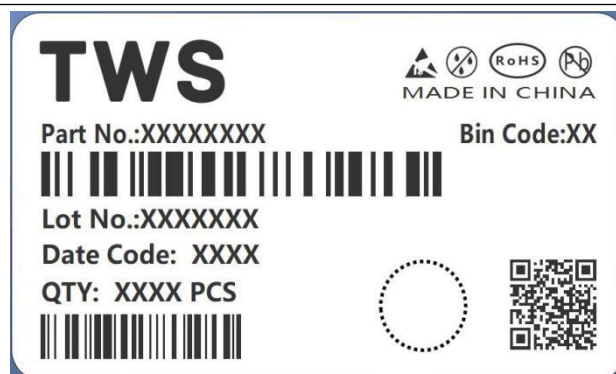


**ORDERING AND MARKING INFORMATION**
**MARKING INFORMATION**


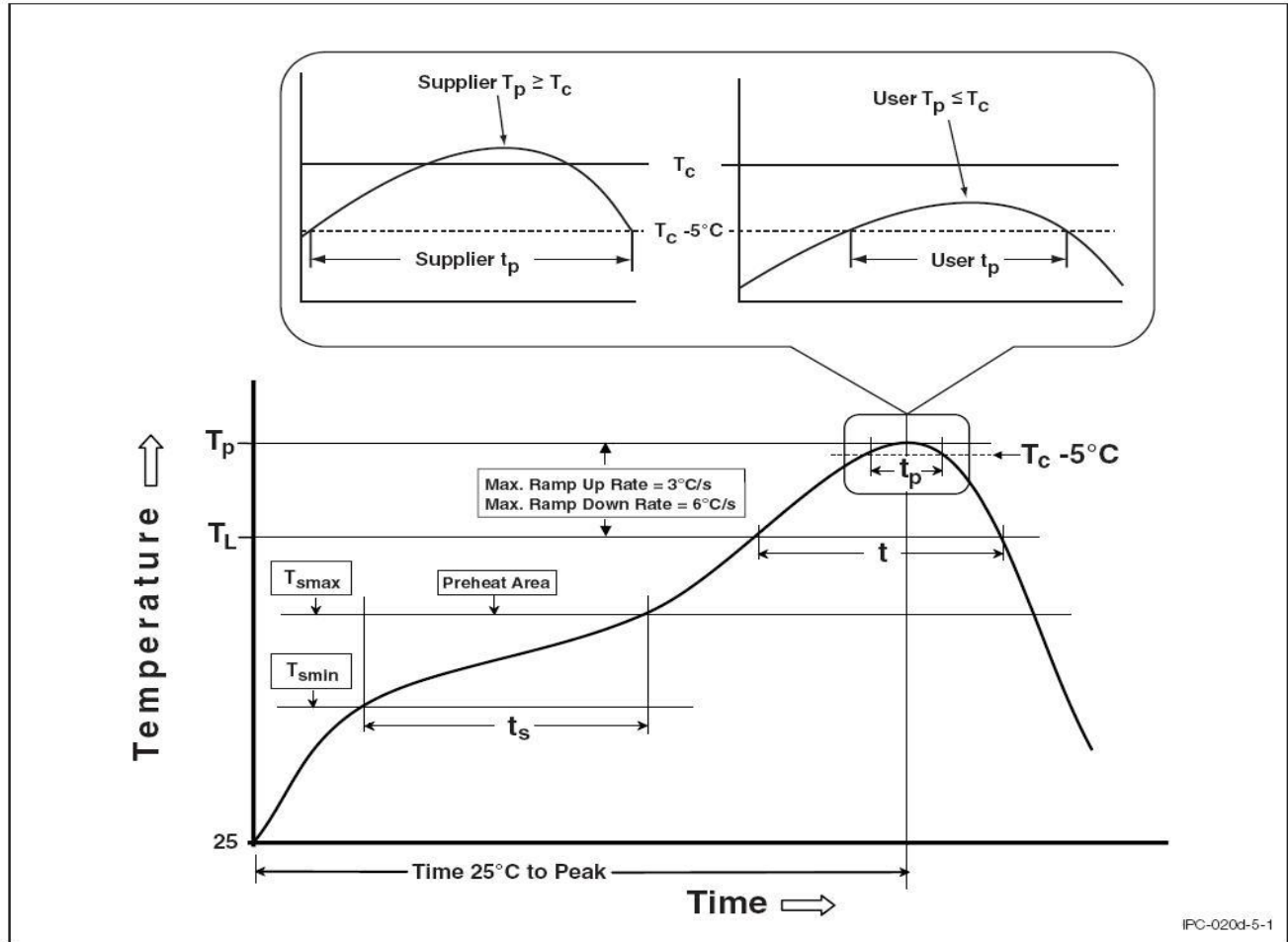
**TWS** : Company Abbr.  
**601** : Part Number  
**V** : VDE Option  
**Y** : Fiscal Year  
**WW** : Work Week

**ORDERING INFORMATION**
**TWSM601(Z)-GV**

TWS – Company Abbr.  
 M601 – Part Number  
 Z – Tape and Reel Option (T1/T2)  
 G – Green  
 V – VDE Option (V or None)

**LABEL INFORMATION**

**PACKING QUANTITY**

| Option | Quantity        | Quantity – Inner box | Quantity – Outer box              |
|--------|-----------------|----------------------|-----------------------------------|
| T1     | 3000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 45k Units |
| T2     | 3000 Units/Reel | 3 Reels/Inner box    | 5 Inner box/Outer box = 45k Units |

**REFLOW INFORMATION****REFLOW PROFILE**

| Profile Feature                                                     | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|---------------------------------------------------------------------|------------------------|--------------------------|
| Temperature Min. (T <sub>min</sub> )                                | 100                    | 150°C                    |
| Temperature Max. (T <sub>max</sub> )                                | 150                    | 200°C                    |
| Time (t <sub>s</sub> ) from (T <sub>min</sub> to T <sub>max</sub> ) | 60-120 seconds         | 60-120 seconds           |
| Ramp-up Rate (t <sub>L</sub> to t <sub>P</sub> )                    | 3°C/second max.        | 3°C/second max.          |
| Liquidous Temperature (T <sub>L</sub> )                             | 183°C                  | 217°C                    |
| Time (t <sub>L</sub> ) Maintained Above (T <sub>L</sub> )           | 60 – 150 seconds       | 60 – 150 seconds         |
| Peak Body Package Temperature                                       | 235°C +0°C / -5°C      | 260°C +0°C / -5°C        |
| Time (t <sub>P</sub> ) within 5°C of 260°C                          | 20 seconds             | 30 seconds               |
| Ramp-down Rate (T <sub>P</sub> to T <sub>L</sub> )                  | 6°C/second max         | 6°C/second max           |
| Time 25°C to Peak Temperature                                       | 6 minutes max.         | 8 minutes max.           |



**DISCLAIMER**

- TWS is continually improving the quality, reliability, function and design. TWS reserves the right to make changes without further notices.
- The characteristic curves shown in this datasheet are representing typical performance which are not guaranteed.
- TWS makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, TWS disclaims (a) any and all liability arising out of the application or use of any product, (b) any and all liability, including without limitation special, consequential or incidental damages, and (c) any and all implied warranties, including warranties of fitness for particular
- The products shown in this publication are designed for the general use in electronic applications such as office automation, equipment, communications devices, audio/visual equipment, electrical application and instrumentation purpose, non-infringement and merchantability.
- This product is not intended to be used for military, aircraft, automotive, medical, life sustaining or lifesaving applications or any other application which can result in human injury or death.
- Please contact TWS sales agent for special application request.
- Immerge unit's body in solder paste is not recommended.
- Parameters provided in datasheets may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated in each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify TWS's terms and conditions of purchase, including but not limited to the warranty expressed therein.
- Discoloration might be occurred on the package surface after soldering, reflow or long-time use. It neither impacts the performance nor reliability.