

### Description

The TWS357X1(S) series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a silicon planar phototransistor detector in a plastic SOP4 package.

With the robust coplanar double mold structure, TWS357X1(S) series provide the most stable isolation feature.

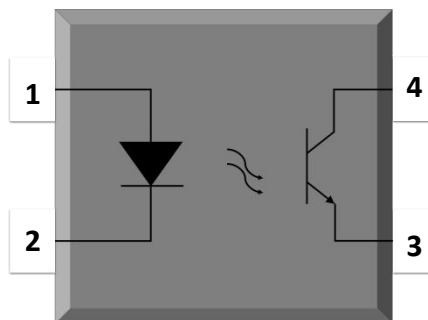
### Features

- High isolation 3750 VRMS
- CTR flexibility available see order information
- DC input with transistor output
- Operating temperature range - 55 °C to 110 °C
- REACH compliance
- Halogen free
- MSL class 1
- Regulatory Approvals
  - UL - UL1577
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC - GB4943.1, GB8898

### Applications

- Switch mode power supplies
- Programmable controllers
- Household appliances
- Office equipment

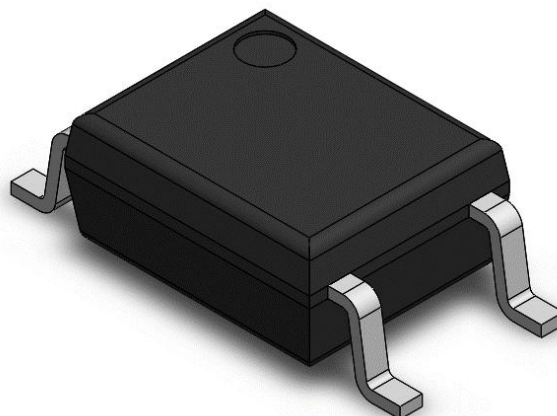
#### SCHEMATIC



#### PIN DEFINITION

1. Anode
2. Cathode
3. Emitter
4. Collector

#### PACKAGE OUTLINE



**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                   | SYMBOL    | VALUE   | UNIT             | NOTE |
|-----------------------------|-----------|---------|------------------|------|
| INPUT                       |           |         |                  |      |
| Forward Current             | $I_F$     | 60      | mA               |      |
| Peak Forward Current        | $I_{FP}$  | 1       | A                | 1    |
| Reverse Voltage             | $V_R$     | 6       | V                |      |
| Input Power Dissipation     | $P_I$     | 100     | mW               |      |
| OUTPUT                      |           |         |                  |      |
| Collector - Emitter Voltage | $V_{CEO}$ | 35      | V                |      |
| Emitter - Collector Voltage | $V_{ECO}$ | 6       | V                |      |
| Collector Current           | $I_C$     | 50      | mA               |      |
| Output Power Dissipation    | $P_O$     | 150     | mW               |      |
| COMMON                      |           |         |                  |      |
| Total Power Dissipation     | $P_{tot}$ | 200     | mW               |      |
| Isolation Voltage           | $V_{iso}$ | 3750    | V <sub>rms</sub> | 2    |
| Operating Temperature       | $T_{opr}$ | -55~110 | °C               |      |
| Storage Temperature         | $T_{stg}$ | -55~125 | °C               |      |

Note 1. 100μs pulse, 100Hz frequency

Note 2. AC For 1 Minute, R.H. = 40 ~ 60%

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

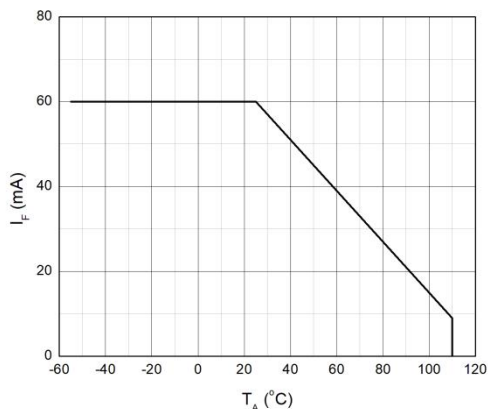
| PARAMETER                            | SYMBOL        | MIN       | TYP.      | MAX. | UNIT          | TEST CONDITION                                                     | NOTE |
|--------------------------------------|---------------|-----------|-----------|------|---------------|--------------------------------------------------------------------|------|
| INPUT                                |               |           |           |      |               |                                                                    |      |
| Forward Voltage                      | $V_F$         | -         | 1.24      | 1.4  | V             | $I_F=10\text{mA}$                                                  |      |
| Reverse Current                      | $I_R$         | -         | -         | 10   | $\mu\text{A}$ | $V_R=6\text{V}$                                                    |      |
| Input Capacitance                    | $C_{in}$      | -         | 10        | -    | pF            | $V=0, f=1\text{kHz}$                                               |      |
| OUTPUT                               |               |           |           |      |               |                                                                    |      |
| Collector Dark Current               | $I_{CEO}$     | -         | -         | 100  | nA            | $V_{CE}=20\text{V}, I_F=0$                                         |      |
| Collector-Emitter Breakdown Voltage  | $BV_{CEO}$    | 35        | -         | -    | V             | $I_C=0.1\text{mA}, I_F=0$                                          |      |
| Emitter-Collector Breakdown Voltage  | $BV_{ECO}$    | 6         | -         | -    | V             | $I_E=0.1\text{mA}, I_F=0$                                          |      |
| TRANSFER CHARACTERISTICS             |               |           |           |      |               |                                                                    |      |
| Current Transfer Ratio               | TWS357        | CTR       | 50        | -    | 600           | $I_F=5\text{mA}, V_{CE}=5\text{V}$                                 |      |
|                                      | TWS357A1      |           | 80        | -    | 160           |                                                                    |      |
|                                      | TWS357B1      |           | 130       | -    | 260           |                                                                    |      |
|                                      | TWS357C1      |           | 200       | -    | 400           |                                                                    |      |
|                                      | TWS357D1      |           | 300       | -    | 600           |                                                                    |      |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | -         | 0.06      | 0.2  | V             | $I_F=20\text{mA}, I_C=1\text{mA}$                                  |      |
| Isolation Resistance                 | $R_{ISO}$     | $10^{12}$ | $10^{14}$ | -    | $\Omega$      | DC500V, 40 ~ 60% R.H.                                              |      |
| Floating Capacitance                 | $C_{IO}$      | -         | 0.4       | 1    | pF            | $V=0, f=1\text{MHz}$                                               |      |
| Response Time (Rise)                 | $t_r$         | -         | 3         | 18   | $\mu\text{s}$ | $V_{CE}=2\text{V}, I_C=2\text{mA}$<br>$R_L=100\Omega$              | 3    |
| Response Time (Fall)                 | $t_f$         | -         | 4         | 18   | $\mu\text{s}$ |                                                                    | 3    |
| Cut-off Frequency                    | $f_c$         | -         | 80        | -    | kHz           | $V_{CE}=2\text{V}, I_C=2\text{mA}$<br>$R_L=100\Omega, -3\text{dB}$ | 4    |

Note 3. Fig.12&amp;13

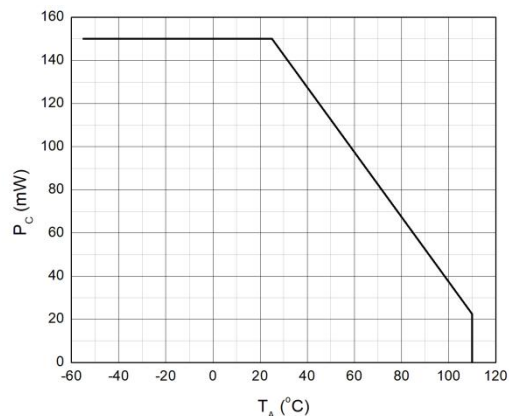
Note 4. Fig.14

**CHARACTERISTIC CURVES**

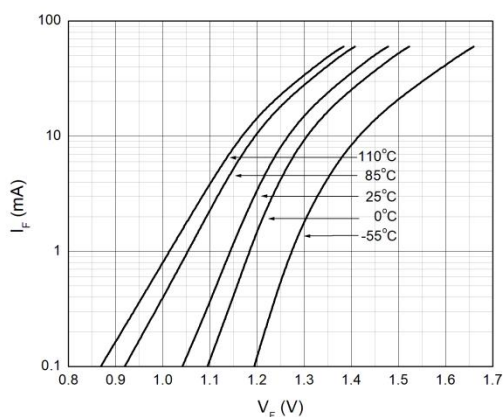
**Fig.1 Forward Current vs. Ambient Temperature**



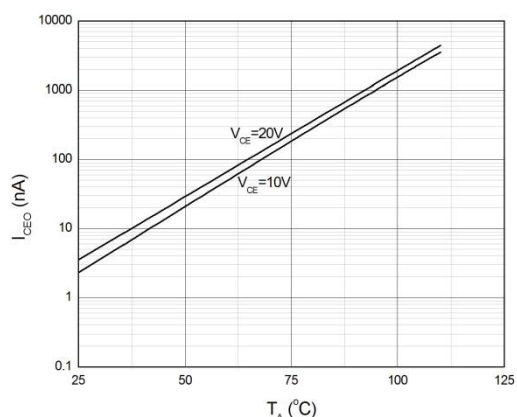
**Fig.2 Collector Power Dissipation vs. Ambient Temperature**



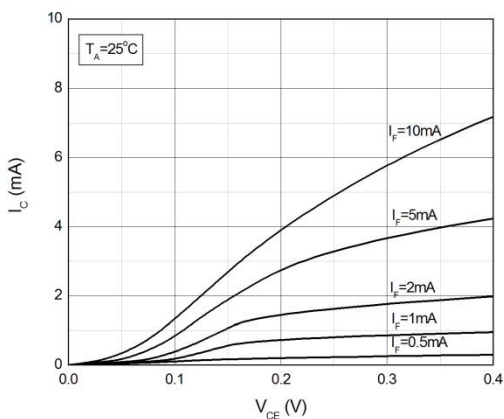
**Fig.3 Forward Current vs. Forward Voltage**



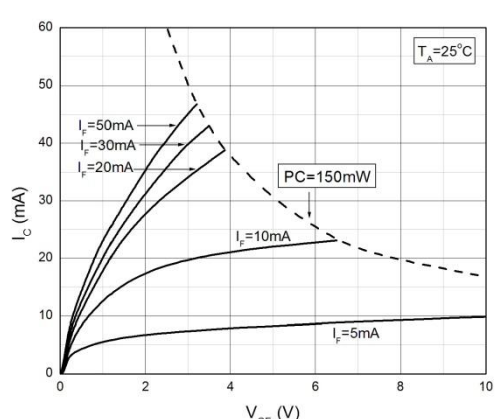
**Fig.4 Collector Dark Current vs. Ambient Temperature**



**Fig.5 Collector Current vs. Collector-emitter Voltage**

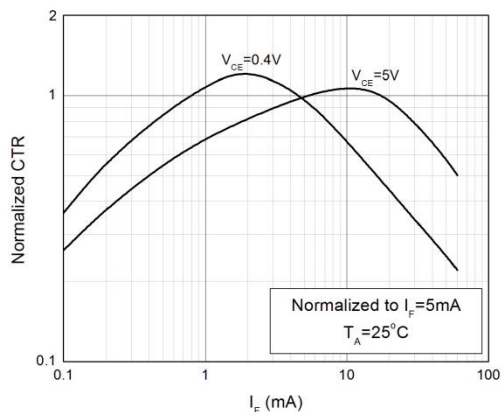


**Fig.6 Collector Current vs. Collector-emitter Voltage**

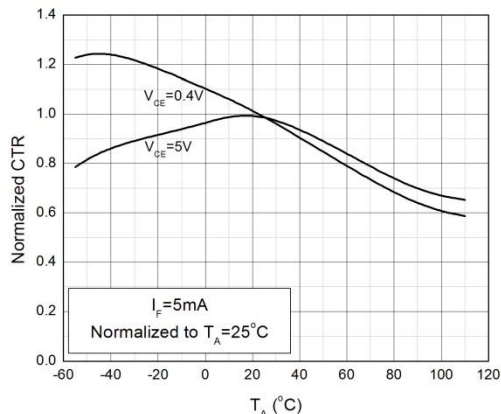


# CHARACTERISTIC CURVES

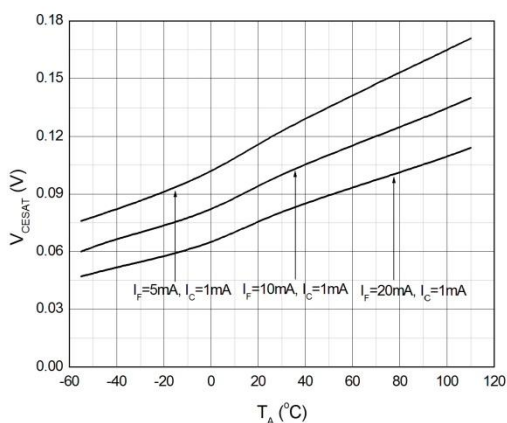
**Fig.7 Normalized Current Transfer Ratio vs. Forward Current**



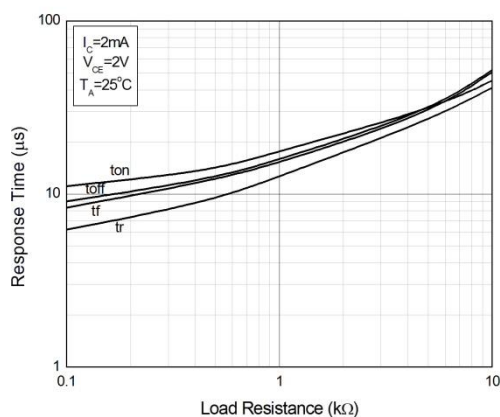
**Fig.8 Normalized Current Transfer Ratio vs. Ambient Temperature**



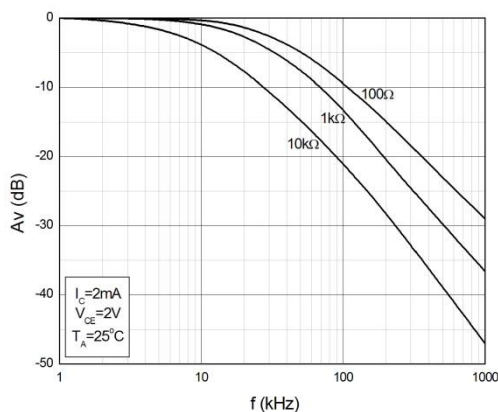
**Fig.9 Collector-emitter Saturation Voltage vs. Ambient Temperature**



**Fig.10 Switching Time vs. Load Resistance**



**Fig.11 Frequency Response**



# TWS357X1(S) Series

## SOP4, DC Input Photo Transistor Coupler

### TEST CIRCUITS

Fig.12 Test Circuits of Response Time

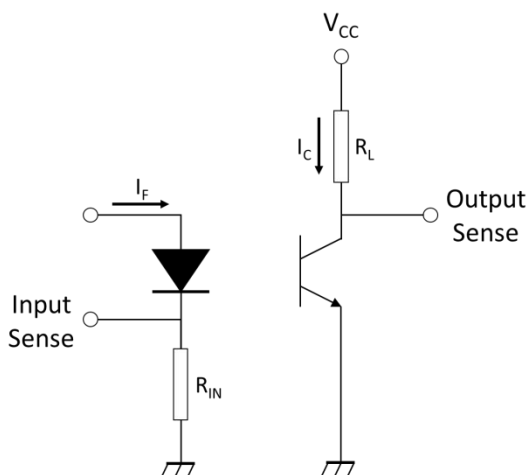


Fig.13 Curves of Response Time

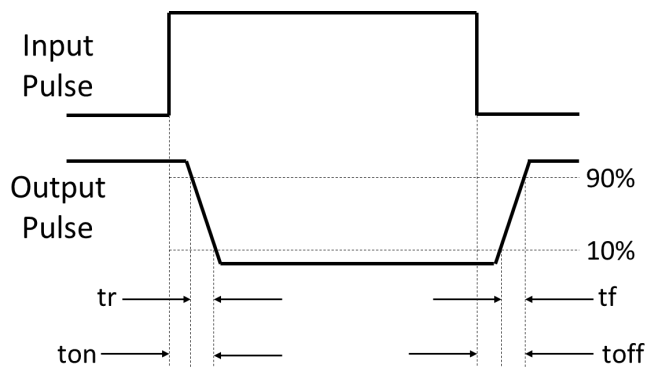
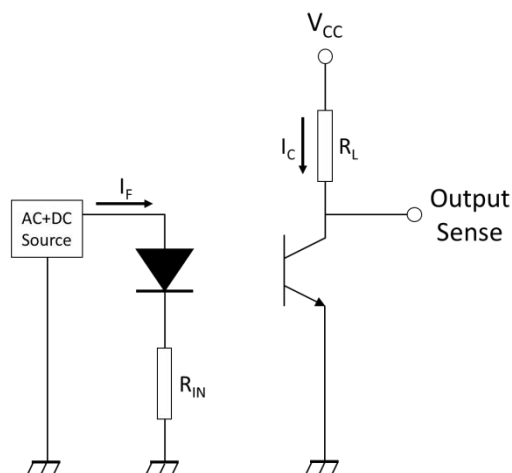
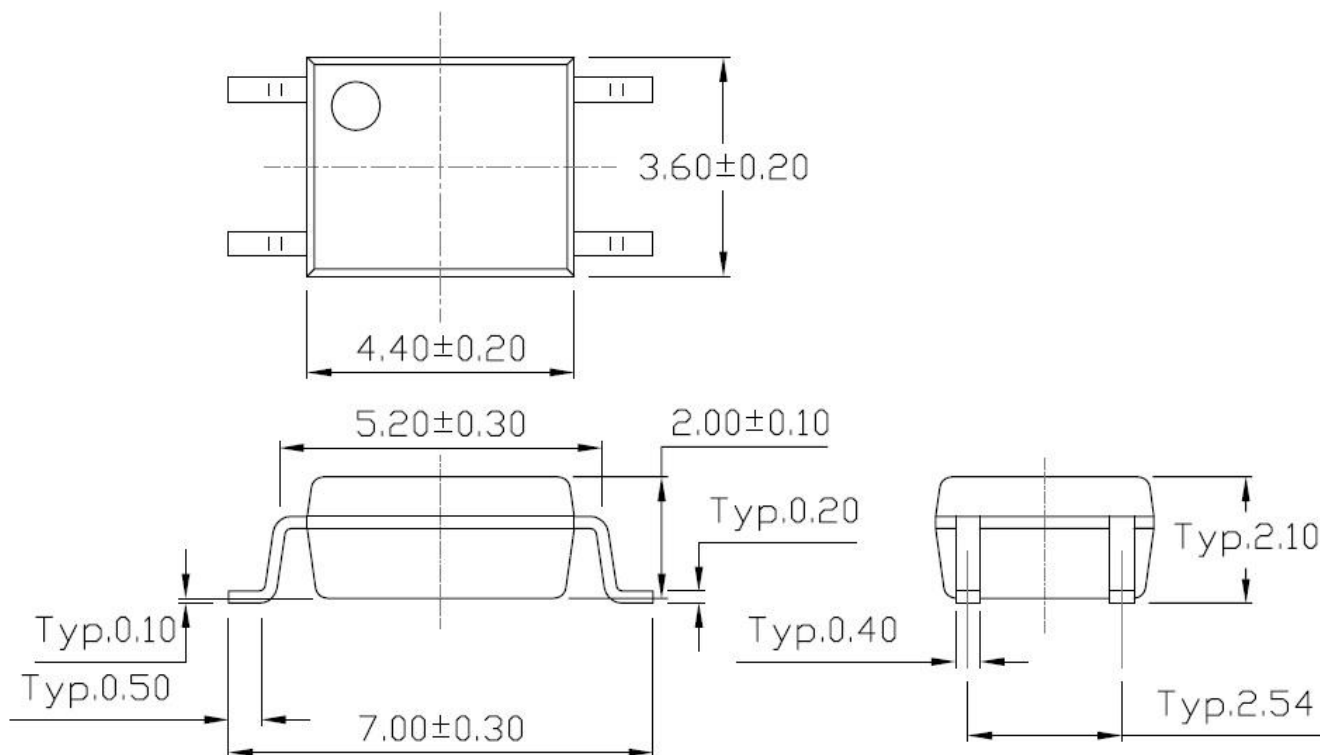


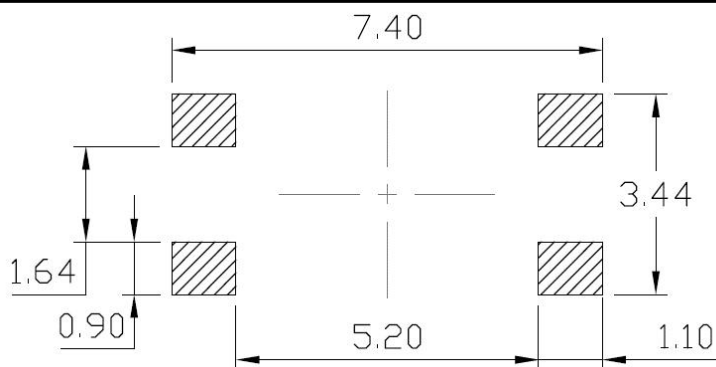
Fig.14 Test Circuits of Frequency Response



**PACKAGE DIMENSIONS** (Dimensions in mm unless otherwise stated)



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

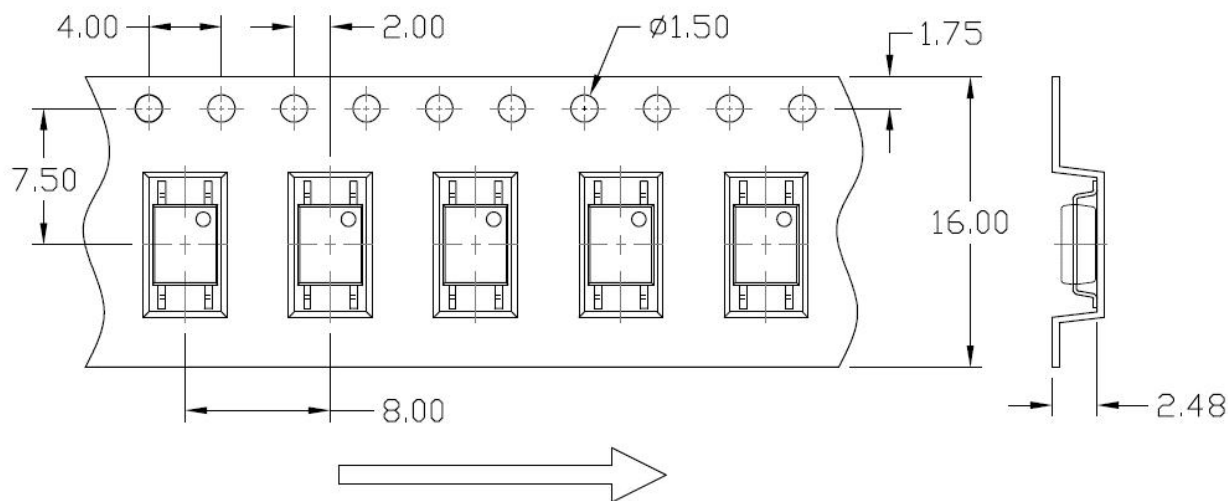


# TWS357X1(S) Series

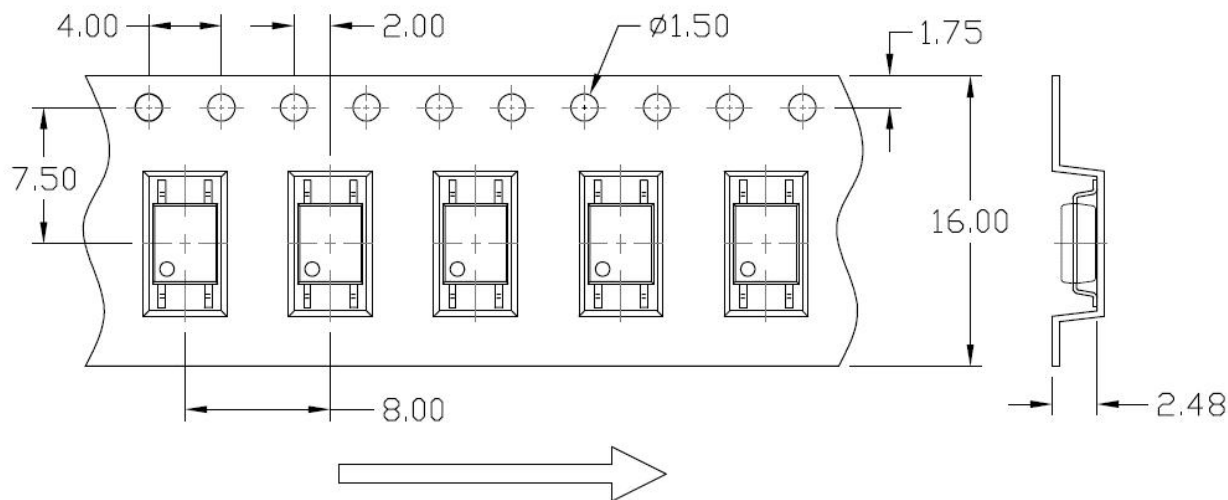
## SOP4, DC Input Photo Transistor Coupler

### CARRIER TAPE SPECIFICATIONS (Dimensions in mm unless otherwise stated)

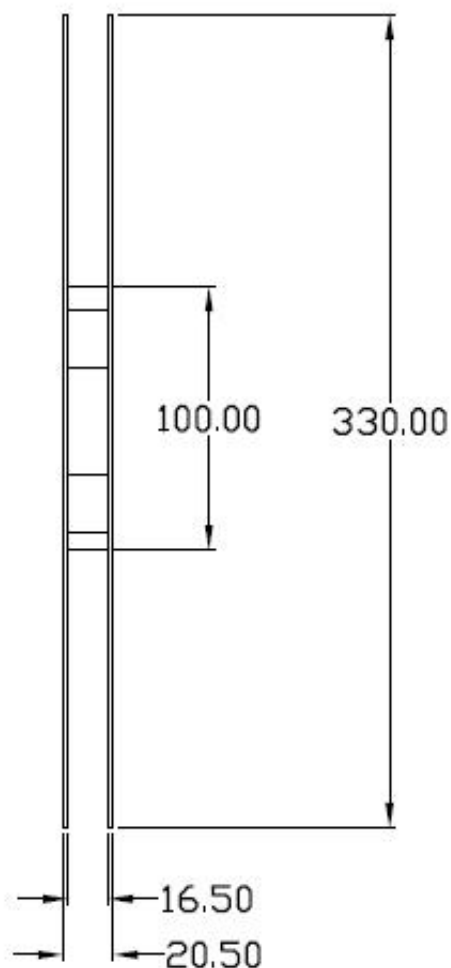
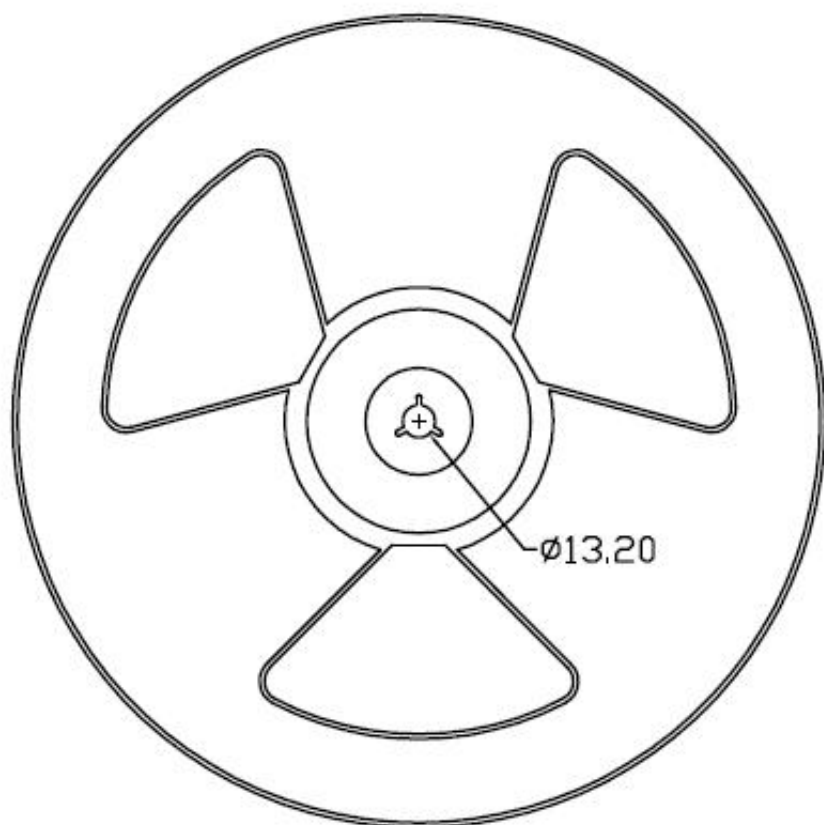
#### Option T1



#### Option T2





**REEL SPECIFICATIONS (Dimensions in mm unless otherwise stated)****Option T1 & T2**

# ***TWS357X1(S) Series***

## ***SOP4, DC Input Photo Transistor Coupler***

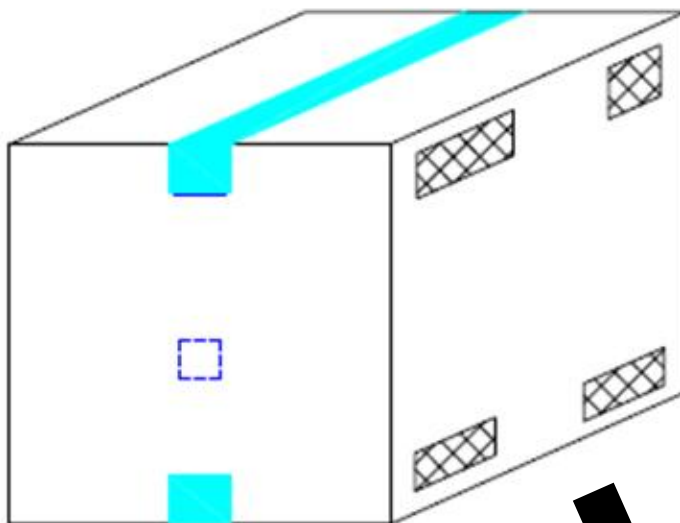
### **BOX SPECIFICATIONS (Reel Type)**

#### **Inner Box**

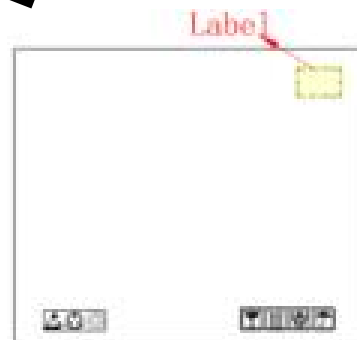


- L x W x H = 36cm x 36cm x 6.9cm

#### **Outer Box**

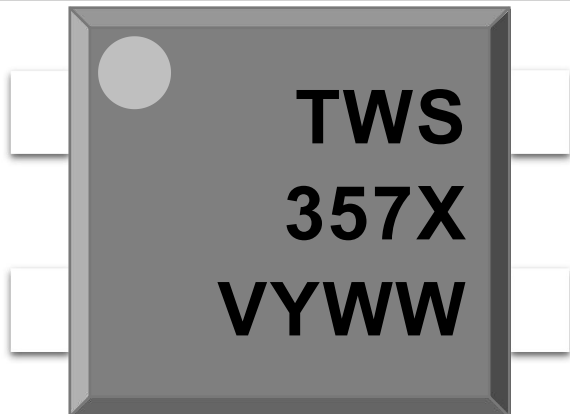


- Option1: L x W x H = 45cm x 38cm x 38cm
- Option2: L x W x H = 39cm x 38cm x 38cm



### ORDERING AND MARKING INFORMATION

#### MARKING INFORMATION



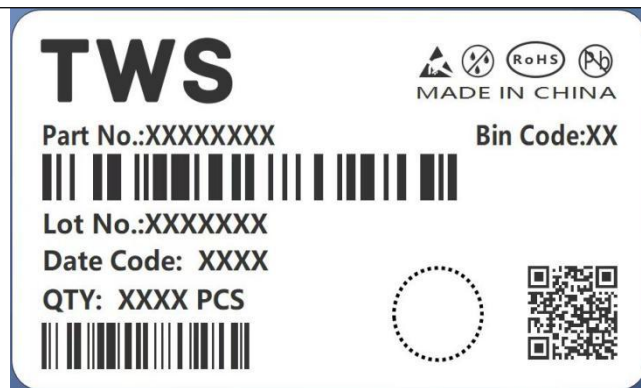
**TWS** : Company Abbr.  
**357** : Part Number  
**X** : CTR Rank  
**V** : VDE Option  
**Y** : Fiscal Year  
**WW** : Work Week

#### ORDERING INFORMATION

### TWS357X1(Z)-GV(S)

TWS – Company Abbr.  
 357 – Part Number  
 X1 – Rank (A1/B1/C1/D1 or None)  
 Z – Tape and Reel Option (T1/T2)  
 G – Green  
 V – VDE Option (V or None)  
 S – Silver Alloy Wire

#### LABEL INFORMATION

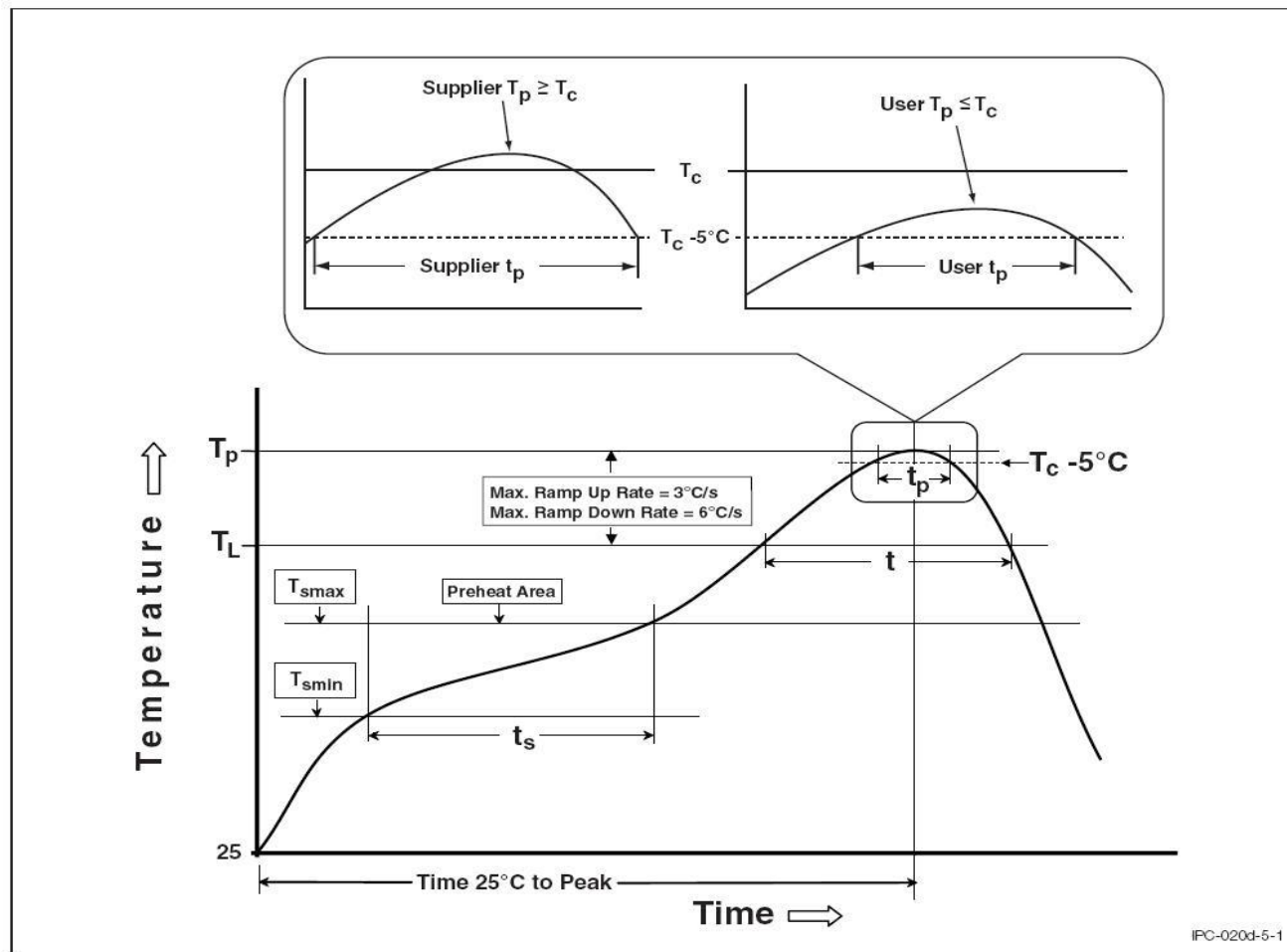


#### PACKING QUANTITY

| 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**



IPC-020d-5-1

| Profile Feature                                                       | Sn-Pb Assembly Profile | Pb-Free Assembly Profile |
|-----------------------------------------------------------------------|------------------------|--------------------------|
| Temperature Min. (T <sub>smin</sub> )                                 | 100                    | 150°C                    |
| Temperature Max. (T <sub>smax</sub> )                                 | 150                    | 200°C                    |
| Time (t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</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.           |

# ***TWS357X1(S) Series***

## ***SOP4, DC Input Photo Transistor Coupler***

### **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.