



# ORIENT

## Photo coupler

### Product Data Sheet

Part Number: OR-354

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

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

**SHENZHEN ORIENT COMPONENTS CO.,LTD.**

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## 1. Features

- (1) Current transfer ratio(CTR : MIN. 20% at  $I_F = \pm 1\text{mA}$ ,  $V_{CE} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ )
- (2) High input -output isolation voltage ( $V_{ISO} = 3,750\text{V}_{\text{rms}}$ )
- (3) High collector-emitter voltage ( $V_{CEO} = 80\text{V}$ )
- (4) SOP-4 package
- (5) Operating Temperature  $-55^\circ\text{C}$  to  $125^\circ\text{C}$
- (1) ESD pass HBM 8000V/MM 2000V
- (6) Safety approval
  - UL approved(No.E323844)
  - VDE approved(No.40029733)
  - CQC approved (No.CQC19001231256)
- (7) In compliance with RoHS, REACH standards
- (8) MSL Class I



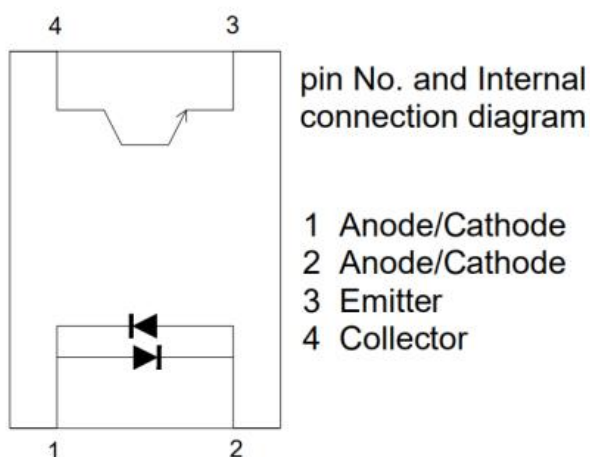
## 2. Instruction

- The OR-354 series device consists of two infrared emitting diode, connected in inverse parallel, optically coupled to a photo transistor detector. They are encapsulated in a 4 pin SOP encapsulation.
- Pin pitch of OR-354 is 2.54mm

## 3. Application Range

- (1) Hybrid substrates that require high density mounting.
- (2) Programmable controllers
- (3) System appliance, measuring instruments

## 4. Functional Diagram



**5. Max Absolute rated Value (Normal Temperature=25°C)**

| Parameter                |                               | Symbol    | Rated Value  | Unit |
|--------------------------|-------------------------------|-----------|--------------|------|
| Input                    | Forward Current               | $I_F$     | ±50          | mA   |
|                          | Junction Temperature          | $T_J$     | 125          | °C   |
|                          | Consume Power                 | P         | 70           | mW   |
| Output                   | Collector and emitter Voltage | $V_{CEO}$ | 80           | V    |
|                          | Emitter and collector Voltage | $V_{ECO}$ | 7            |      |
|                          | Collector Current             | $I_C$     | 50           | mA   |
|                          | Consume Power                 | $P_C$     | 150          | mW   |
|                          | Junction Voltage              | $T_J$     | 125          | °C   |
| Total Consume Power      |                               | $P_{tot}$ | 170          | mW   |
| *1 Insulation Voltage    |                               | $V_{iso}$ | 3750         | Vrms |
| Working Temperature      |                               | $T_{opr}$ | -55 to + 125 | °C   |
| Deposit Temperature      |                               | $T_{stg}$ | -55 to + 150 |      |
| *2 Soldering Temperature |                               | $T_{sol}$ | 260          |      |

\*1. AC Test, 1 minute, humidity = 40~60% Insulation test method as below:

- (1) Short circuit both terminals of photo coupler.
- (2) No Current when testing insulation voltage.
- (3) Adding sine wave voltage when testing.

\*2. soldering time is 10 seconds.

## 6. Opto-electronic Characteristics

| Parameter |                                           | Symbol        | Min                | Typ.*              | Max | Unit          | Condition                                         |
|-----------|-------------------------------------------|---------------|--------------------|--------------------|-----|---------------|---------------------------------------------------|
| Input     | Forward Voltage                           | $V_F$         | ---                | 1.2                | 1.4 | V             | $I_F = \pm 20\text{mA}$                           |
|           | Collector capacitance                     | $C_t$         | ---                | 30                 | 250 | pF            | $V=0, f=1\text{KHz}$                              |
| Output    | Collector to emitter Current              | $I_{CEO}$     | ---                | ---                | 100 | nA            | $V_{CE}=20\text{V}, I_F=0\text{mA}$               |
|           | Collector and Emitter attenuation Voltage | $BV_{CEO}$    | 80                 | ---                | --- | V             | $I_C=0.1\text{mA}, I_F=0\text{mA}$                |
|           | Emitter and Collector attenuation Voltage | $BV_{ECO}$    | 7                  | ---                | --- | V             | $I_E=0.1\text{mA}, I_F=0\text{mA}$                |
|           | *1 Current Transfer Ratio                 | CTR           | 20                 | ---                | 400 | %             | $I_F = \pm 1\text{mA}$<br>$V_{CE}=5\text{V}$      |
|           | Collector Current                         | $I_C$         | 2                  | ---                | 40  | mA            |                                                   |
|           | Collector and Emitter Saturation Voltage  | $V_{CE(sat)}$ | ---                | ---                | 0.2 | V             | $I_F = \pm 20\text{mA}$<br>$I_C = 1\text{mA}$     |
|           | Insulation Impedance                      | $R_{iso}$     | $5 \times 10^{10}$ | $1 \times 10^{11}$ | --- | $\Omega$      | DC500V<br>40~60%R.H.                              |
|           | Floating Capacitance                      | $C_f$         | ---                | 0.6                | 1   | pF            | $V=0, f=1\text{MHz}$                              |
|           | Response Time                             | $t_r$         | ---                | 4                  | 18  | $\mu\text{s}$ | $V_{CC}=2\text{V}, I_C=2\text{mA}, R_L=100\Omega$ |
|           | Descend Time                              | $t_f$         | ---                | 3                  | 18  | $\mu\text{s}$ |                                                   |

- Current Conversion Ratio =  $I_C / I_F \times 100\%$

## 7. Rank table of current transfer ratio CTR

| CTR Rank | Min. | Max. | Condition                                                          | Unit |
|----------|------|------|--------------------------------------------------------------------|------|
| A        | 50   | 150  | $I_F = \pm 1\text{mA}, V_{CE} = 5\text{V}, T_a = 25^\circ\text{C}$ | %    |
| B        | 80   | 400  |                                                                    |      |
| C        | 100  | 200  |                                                                    |      |
| No mark  | 20   | 400  |                                                                    |      |
| GR       | 100  | 300  | $I_F = \pm 5\text{mA}, V_{CE} = 5\text{V}, T_a = 25^\circ\text{C}$ |      |

- Current Conversion Ratio =  $I_C / I_F \times 100\%$

## 8. Order Information

Part Number

**OR-354X-W-Y-Z**

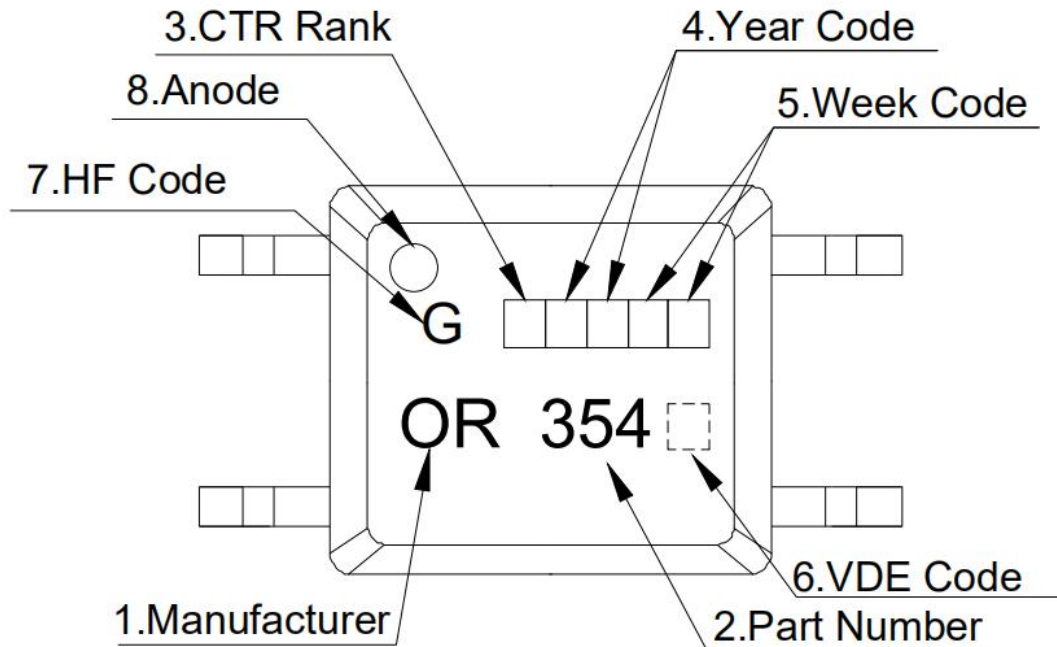
### Note

X = CTR Rank (A, B, C, GR or none)  
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 |

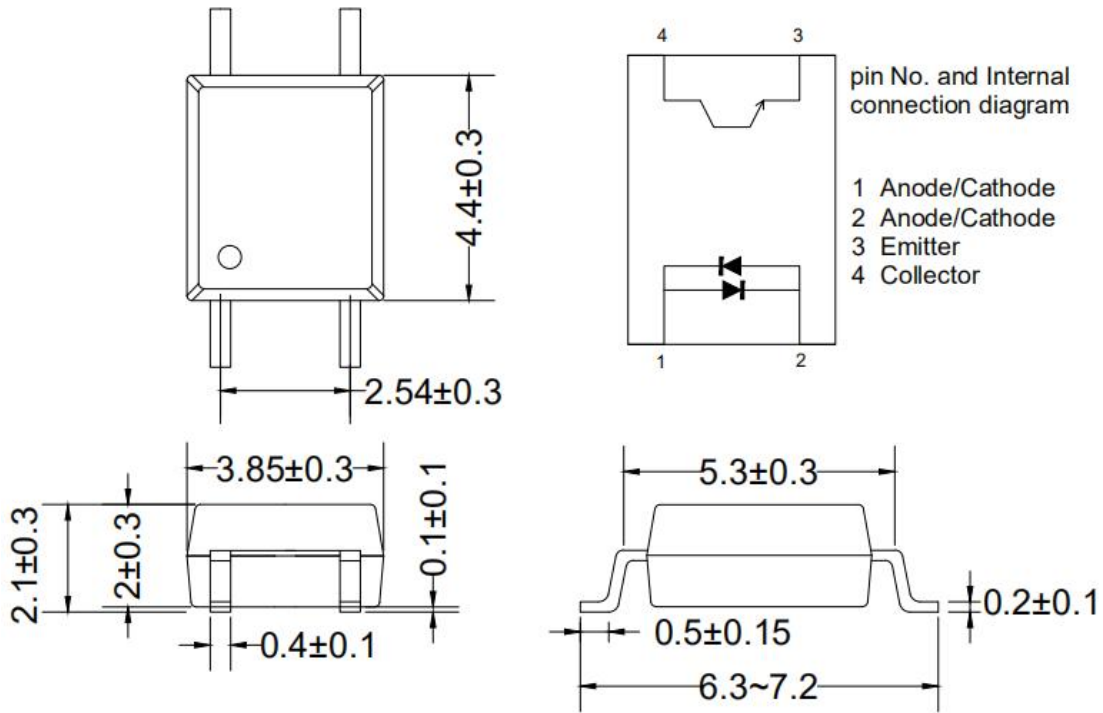
## 9. Naming Rule



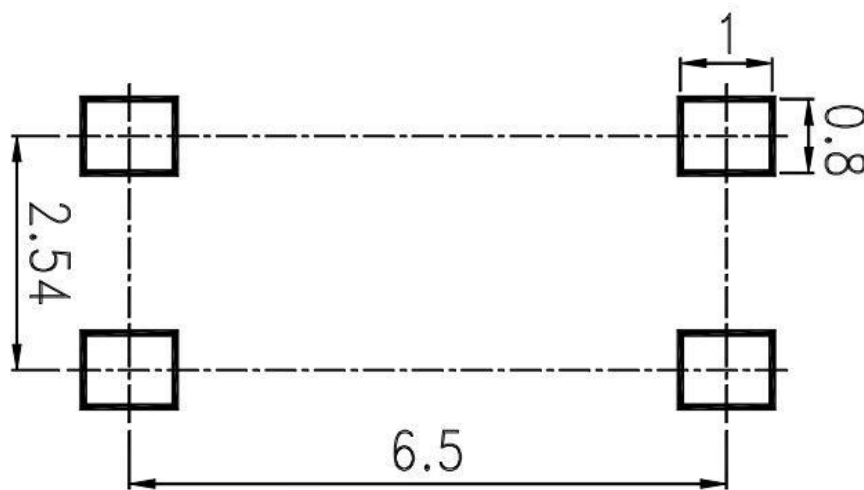
1. Manufacturer : ORIENT.
2. Part Number : 354.
3. Rank Code  : CTR Rank
4. Year Code  : '21' means '2021' and so on.
5. Week Code  : 01 means the first week, 02 means the second week and so on.
6. VDE Code  . (Optional)
7. HF Code 'G': Halogen Free.
8. Anode.

\* VDE Code can be selected.

### 10. Outer Dimension



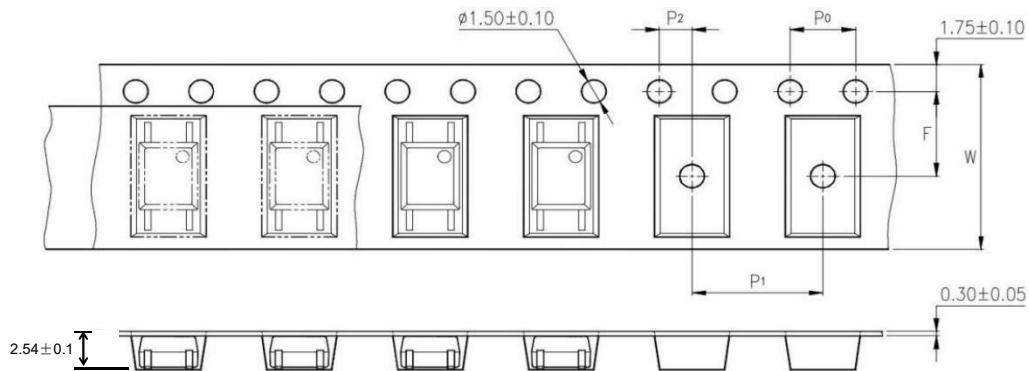
### 11. Recommended Foot Print Patterns (Mount Pad)



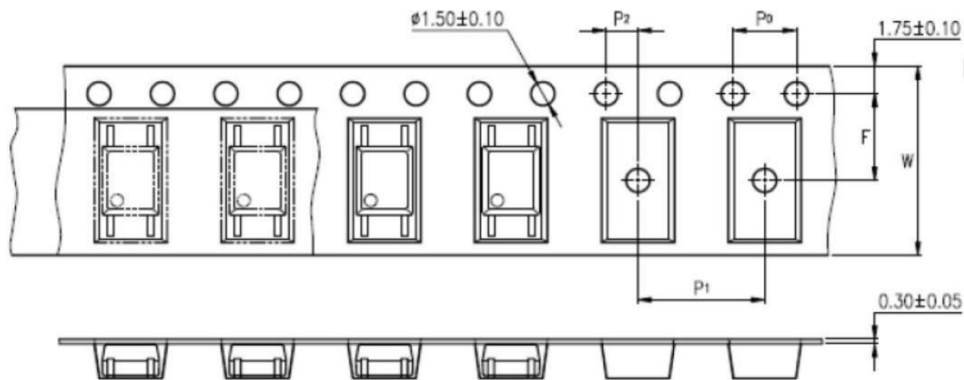
unit: mm

## 12. Taping Dimensions

### (1) OR-354-TP



### (2) OR-354-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   |



### 13. 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. Material Code :Product ID.
2. P/N :Contents with "Order Information" in the specification.
3. Lot No. :Product data.
4. D/C :Product weeks.
5. Quantity :Packaging quantity.

**14. Reliability Test**

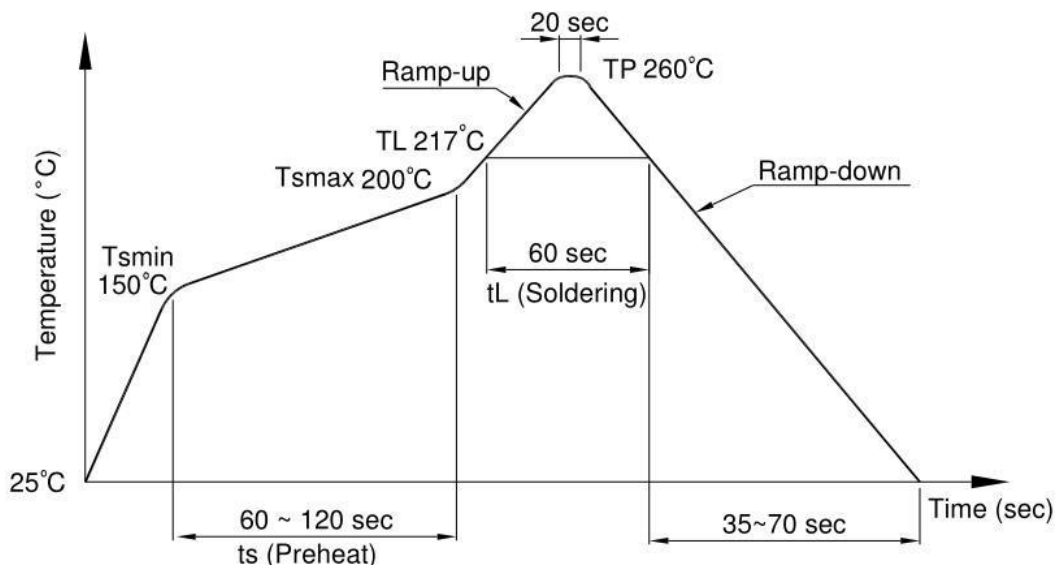
| NO. | ITEMS                      | Reliability Testing |                                        |              |                       |             |
|-----|----------------------------|---------------------|----------------------------------------|--------------|-----------------------|-------------|
|     |                            | QTY.<br>(Pcs)       | Condition                              | Process      | Device                | Standard    |
| 1   | RSH<br>耐焊接热                | 22                  | 260±5℃                                 | 10s/3 次      | 锡炉                    | JESD22-A106 |
| 2   | HTSL<br>高温存储               | 77                  | 125℃                                   | 168 hrs      | 高温烤箱<br>测试仪           | JESD22-A103 |
|     |                            |                     |                                        | 500 hrs      |                       |             |
|     |                            |                     |                                        | 1000 hrs     |                       |             |
| 3   | LTSL<br>低温存储               | 77                  | -55℃                                   | 168 hrs      | 低温箱<br>测试仪            | JESD22-A119 |
|     |                            |                     |                                        | 500 hrs      |                       |             |
|     |                            |                     |                                        | 1000 hrs     |                       |             |
| 4   | TC<br>温度循环                 | 77                  | H:125℃ 15min<br>∫ 5min<br>L:-55℃ 15min | 300<br>cycle | 冷热冲击机                 | JESD22-A104 |
| 5   | TS<br>温度冲击                 | 77                  | H:100℃ 5min<br>∫ 15s<br>L:-40℃ 5min    | 300<br>cycle | 冷热冲击机                 | JESD22-A106 |
| 6   | HTOL<br>高温操作               | 77                  | 110℃<br>IF=10mA<br>Vce=5V              | 168 hrs      | 高温烤箱<br>测试仪、老<br>化电路板 | JESD22-A108 |
|     |                            |                     |                                        | 500 hrs      |                       |             |
|     |                            |                     |                                        | 1000 hrs     |                       |             |
| 7   | ESD-HBM<br>人体模式            | 22                  | ≥8KV 1Cycle                            | 1次           | ESD静电测<br>试仪          | JESD22-A114 |
| 8   | SD<br>可焊性                  | 22                  | Pb-free<br>245±5℃                      | 5S/1次        | 锡炉                    | JESD22-B102 |
| 9   | HTRB<br>高温反向偏压             | 77                  | HTRB<br>@125℃<br>Vce=80v               | 168 hrs      | 高温烤箱<br>, 测试仪         | JESD22-A103 |
|     |                            |                     |                                        | 500 hrs      |                       |             |
|     |                            |                     |                                        | 1000 hrs     |                       |             |
| 10  | H3TRB<br>温湿度反向偏<br>压, 寿命试验 | 77                  | H3TRB<br>85℃,85%RH<br>Vce=80v          | 168 hrs      | 恒温恒湿<br>机, 测试仪        | JESD22-A101 |
|     |                            |                     |                                        | 500 hrs      |                       |             |
|     |                            |                     |                                        | 1000 hrs     |                       |             |
| 11  | Autoclave<br>压力锅           | 77                  | Ta=121<br>℃,100%RH,2atm                | 96hrs        | 压力锅                   | JESD22-A102 |

## 15. 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.

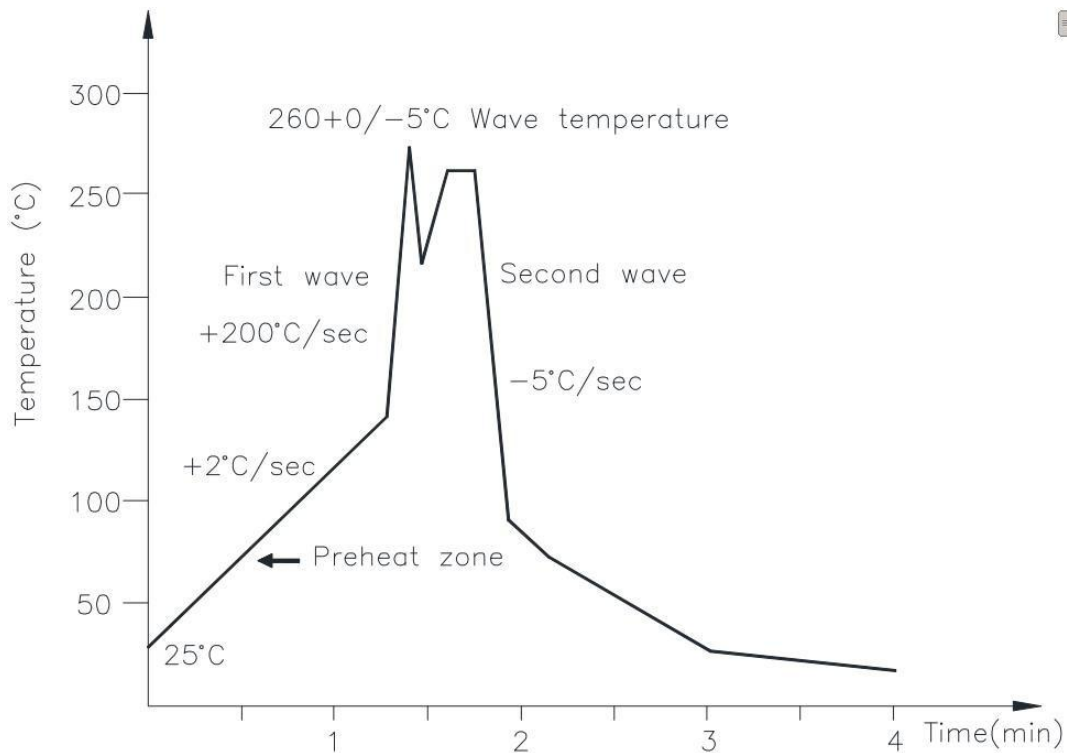
| Profile item                         | Conditions     |
|--------------------------------------|----------------|
| Preheat                              |                |
| - Temperature Min (T Smin )          | 150°C          |
| - Temperature Max (T Smax )          | 200°C          |
| - Time (min 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 | 25 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  |

## 16. Characteristics Curves

Fig.1 Forward current vs Ambient temperature

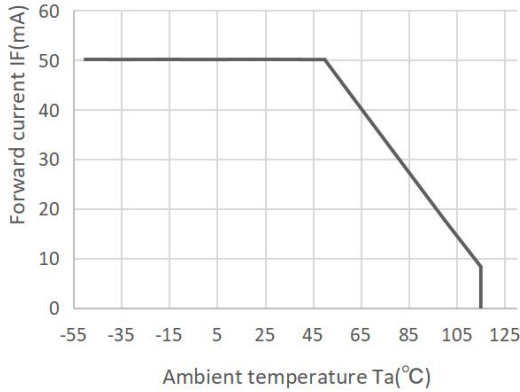


Fig.2 Collector Power Dissipation vs. Ambient temperature

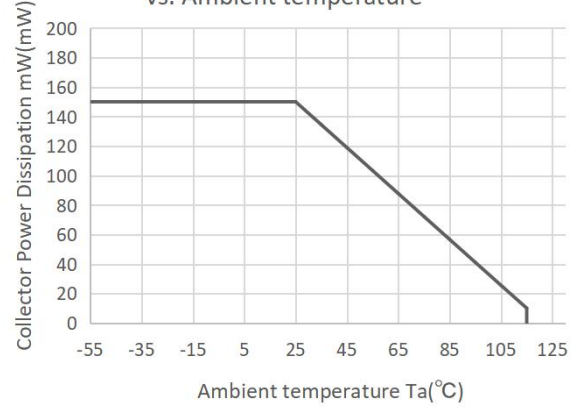


Fig.3 Collector-emitter Saturation Voltage vs. Forward Current

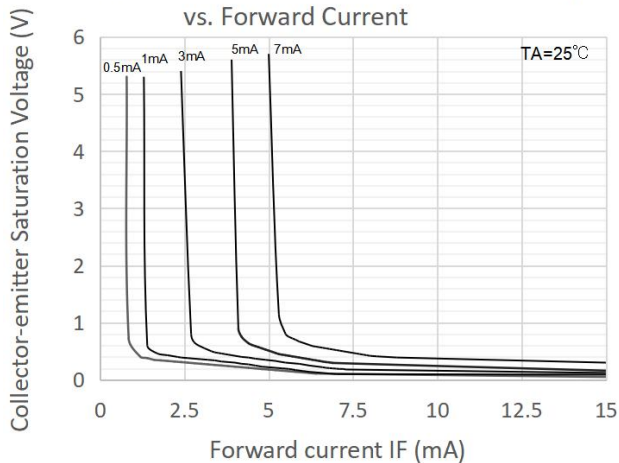


Fig.4 Forward Current vs. Forward Voltage

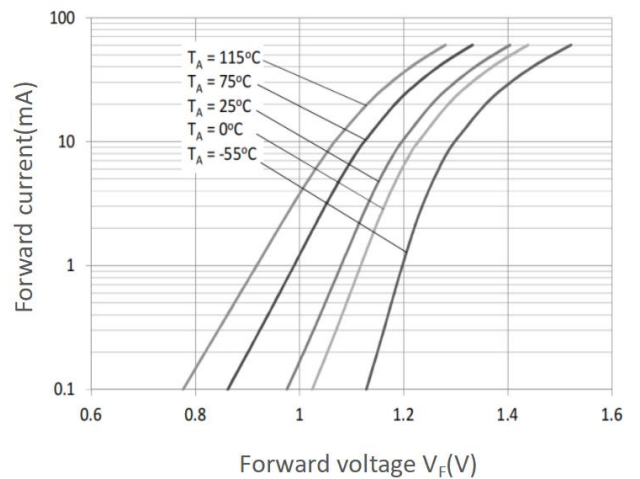


Fig.5 Forward Current vs. Current Transfer Ratio

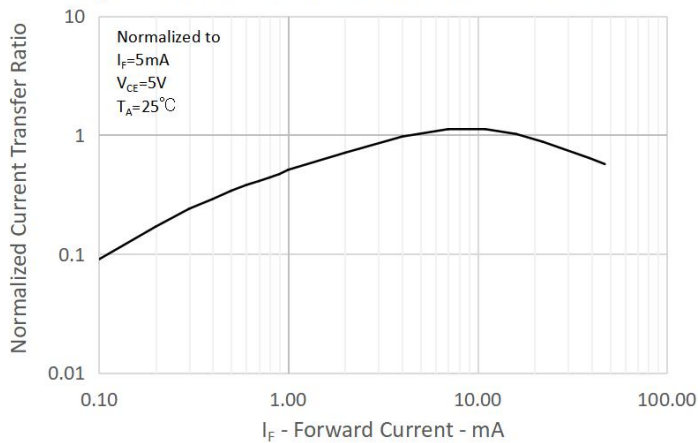


Fig.6 Collector Current vs. Collector-emitter Voltage

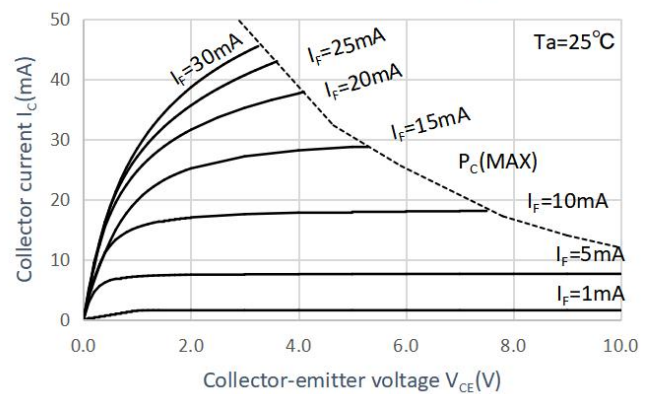


Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

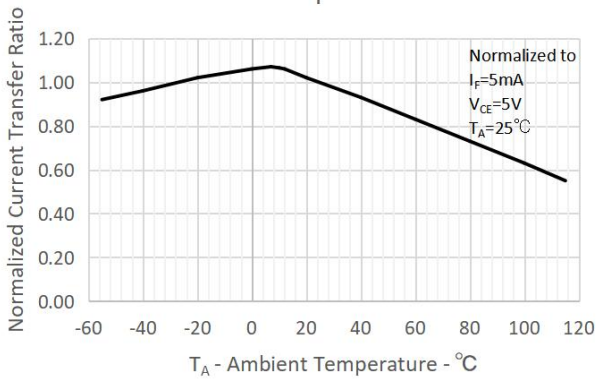


Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

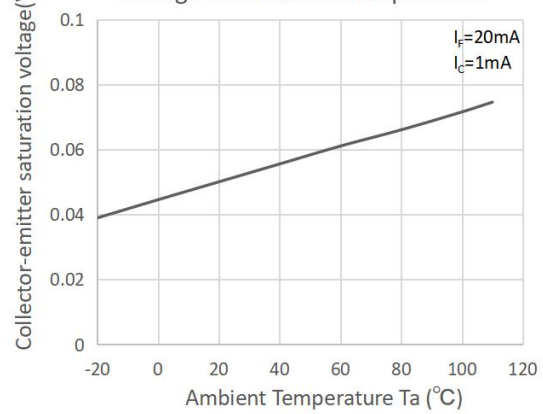


Fig.9 Collector Dark Current vs. Ambient Temperature

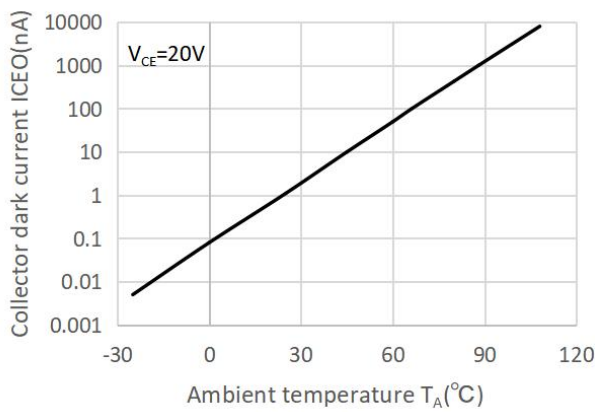


Fig.10 Respinse Time vs. Load Resistance

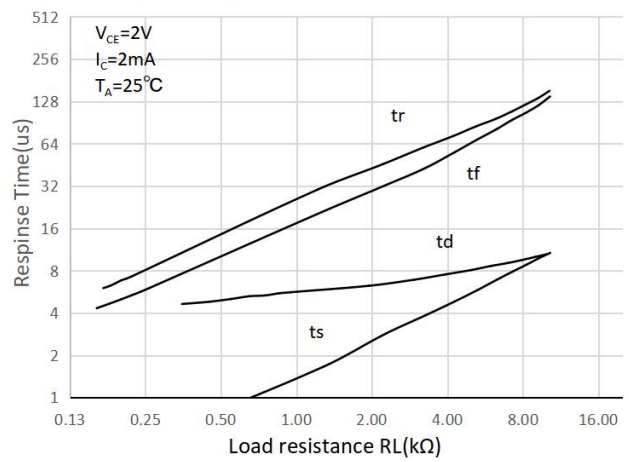
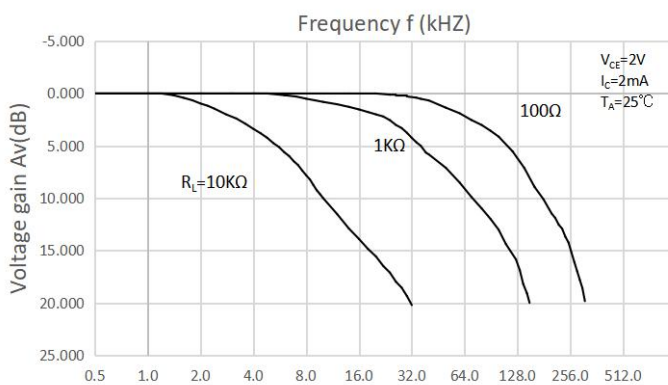
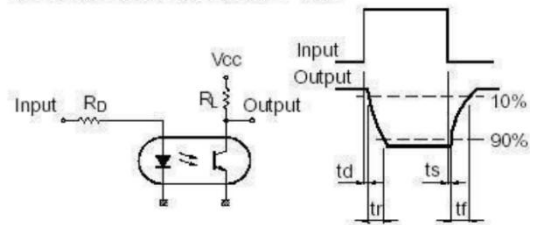


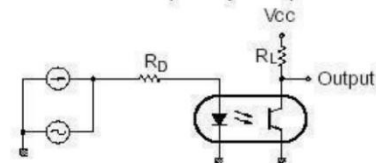
Fig.11 Frequency Response



Test Circuit for Response Time



Test Circuit for Frequency Response



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