



# ORIENT

## Photo coupler

### Product Data Sheet

Part Number: ORPC-815

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

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

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

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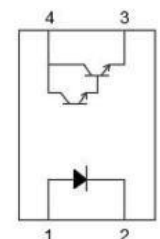
### 1. Features

- (1) High current transfer ratio ( CTR : MIN. 600% at  $I_F = 1\text{mA}$ ,  $V_{CE} = 2\text{V}$  )
- (2) High input-output isolation voltage (  $V_{iso} = 5,000\text{Vrms}$  )
- (3) Response time (  $t_r$  : TYP.  $60\mu\text{s}$  at  $V_{CE} = 2\text{V}$ ,  $I_C = 10\text{mA}$ ,  $R_L = 100\Omega$  )
- (4) Safety approval
  - UL approved (No.E323844)
  - VDE approved (No.40029733)
  - CQC approved (No.CQC09001029446)
- (5) In compliance with RoHS, REACH standards
- (6) MSL Level 1



### 2. Description

The ORPC-815 series of devices each consist of an infrared emitting diodes, optically coupled to a photo Darlington detector.They are packaged in a 4-pin DIP package and available in wide-lead spacing and SMD option.



1 Anode 2 Cathode  
3 Emitter 4 Collector

### 3. Applications

- (1) Telephone set,telephone exchangers
- (2) System appliances,measuring instruments
- (3) Sequence controllers
- (4) Signal transmission between circuits of different potentials and impedances

### 4. Absolute Maximum Ratings at $T_a=25^\circ\text{C}$

| Parameter                |  | Symbol    | Rated Value | Unit |
|--------------------------|--|-----------|-------------|------|
| Input                    | Forward Current                              | $I_F$     | 50          | mA   |
|                          | Reverse Voltage                              | $V_R$     | 6           | V    |
|                          | Consume Power                                | P         | 70          | mW   |
|                          | Peak forward current (1 $\mu\text{s}$ pulse) | $I_{FP}$  | 1           | A    |
| Output                   | Collector and emitter Voltage                | $V_{CEO}$ | 80          | V    |
|                          | Emitter and collector Voltage                | $V_{ECO}$ | 7           | V    |
|                          | Collector Current                            | $I_C$     | 80          | mA   |
|                          | Consume Power                                | $P_C$     | 150         | mW   |
| Total Consume Power      |  | $P_{tot}$ | 200         | mW   |
| *1 Insulation Voltage    |  | $V_{iso}$ | 5,000       | Vrms |
| Working Temperature      |  | $T_{opr}$ | -55 ~ + 110 | °C   |
| Deposit Temperature      |  | $T_{stg}$ | -55 ~ + 125 |      |
| *2 Soldering Temperature |  | $T_{sol}$ | 260         |      |

\*1.AC For 1 Minute, R.H. = 40 ~ 60%

Isolation voltage shall be measured using the following method.

- (1) Short between anode and cathode on the primary side and between collector and emitter on the secondary side.
- (2) The isolation voltage tester with zero-cross circuit shall be used.
- (3) The waveform of applied voltage shall be a sine wave.

\*2. Soldering time is 10 seconds

**5. Electro-Optical Characteristics (Ta=25°C unless specified otherwise)**

| Parameter                           |   | Symbol        | Min                | Typ.*              | Max  | Unit     | Condition                                     |
|-------------------------------------|---|---------------|--------------------|--------------------|------|----------|---|
| <b>Input</b>                        | Forward Voltage                           | $V_F$         | ---                | 1.2                | 1.4  | V        | $I_F=20mA$                                    |
|                                     | Reverse Current                           | $I_R$         | ---                | ---                | 5    | $\mu A$  | $V_R=5V$                                      |
|                                     | Collector Capacitance                     | $C_t$         | ---                | 30                 | 250  | pF       | $V=0, f=1KHz$                                 |
| <b>Output</b>                       | Collector to Emitter Current              | $I_{CEO}$     | ---                | ---                | 1    | $\mu A$  | $V_{CE}=10V, I_F=0mA$                         |
|                                     | Collector and Emitter attenuation Voltage | $BV_{CEO}$    | 80                 | ---                | ---  | V        | $I_C=0.1mA$<br>$I_F=0mA$                      |
|                                     | Emitter and Collector attenuation Voltage | $BV_{ECO}$    | 7                  | ---                | ---  | V        | $I_E=0.1mA$<br>$I_F=0mA$                      |
| <b>Transforming Characteristics</b> | *1 Current conversion ratio               | CTR           | 600                | ---                | 7500 | %        | $I_F=1mA$<br>$V_{CE}=2V$                      |
|                                     | Collector Current                         | $I_C$         | 6                  | ---                | 75   | mA       |   |
|                                     | Collector and Emitter Saturation Voltage  | $V_{CE(sat)}$ | ---                | 0.8                | 1    | V        | $I_F=20mA$<br>$I_C=5mA$                       |
|                                     | Insulation Impedance                      | $R_{iso}$     | $5 \times 10^{10}$ | $1 \times 10^{12}$ | ---  | $\Omega$ | DC500V<br>40~60%R.H.                          |
|                                     | Floating Capacitance                      | $C_f$         | ---                | 0.6                | 1.0  | pF       | $V=0, f=1MHz$                                 |
|                                     | Cut-off Frequency                         | $f_c$         | 1                  | 6                  | ---  | kHz      | $V_{CE}=5V, I_C=2mA$<br>$R_L=100\Omega, -3dB$ |
|                                     | Rise Time                                 | $t_r$         | ---                | 60                 | 300  | $\mu s$  | $V_{CE}=2V,$<br>$I_C=10mA$<br>$R_L=100\Omega$ |
|                                     | Descend Time                              | $t_f$         | ---                | 53                 | 250  | $\mu s$  |   |

\*1Current Conversion Ratio =  $I_C / I_F \times 100\%$  , CTR Tolerance:±3%.



## 6. Order Information

### Part Number

# ORPC-815T-W-X-Y-Z

### Note

T = Lead form option (S, M or none)

W = Tape and reel option (TP, TP1 or none).

X = Lead frame option (F: Iron, C: copper)

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

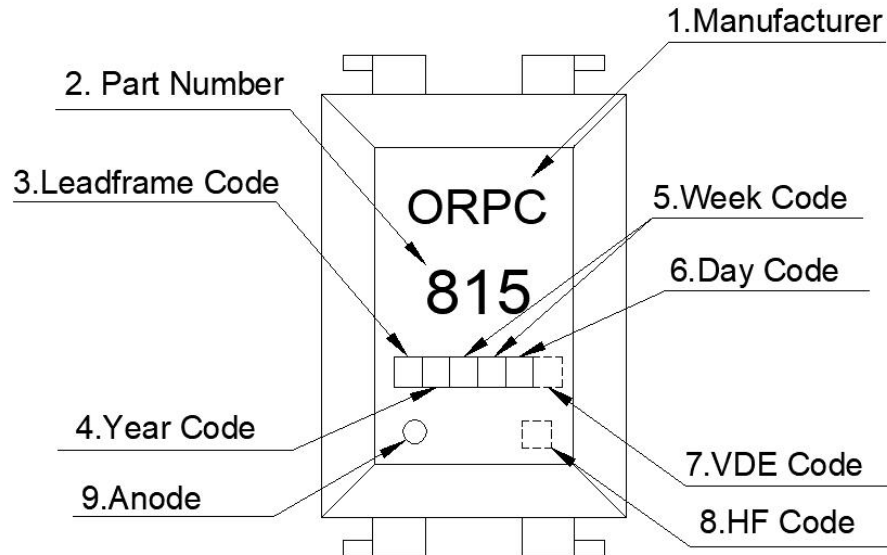
Z = 'G' code for Halogen free (This option is not necessary).

\* VDE Code can be selected.

\* Halogen Free can be selected.

| Option | Description  | Packing quantity    |
|--------|--|---------------------|
| None   | Standard DIP-4   | 100 units per tube  |
| M      | Wide lead bend (0.4 inch spacing)                              | 100 units per tube  |
| S(TP)  | Surface mount lead form (low profile) + TP tape & reel option  | 2000 units per reel |
| S(TP1) | Surface mount lead form (low profile) + TP1 tape & reel option | 2000 units per reel |

## 7. Naming Rule



(1) Manufacturer : ORIENT.

(2) 815 denotes Part Number.

(3) Lead frame Code : 'F' means Iron, 'C' means Copper.

(4) Year Code  : '1' means '2021' and so on.

(5) Week Code : 01 means the first week, 02 means the second week and so on.

(6) Day Code : "A to G" means "Monday to Sunday"

(7) VDE Code . (Optional)

(8) HF Code : Halogen Free . (Optional)

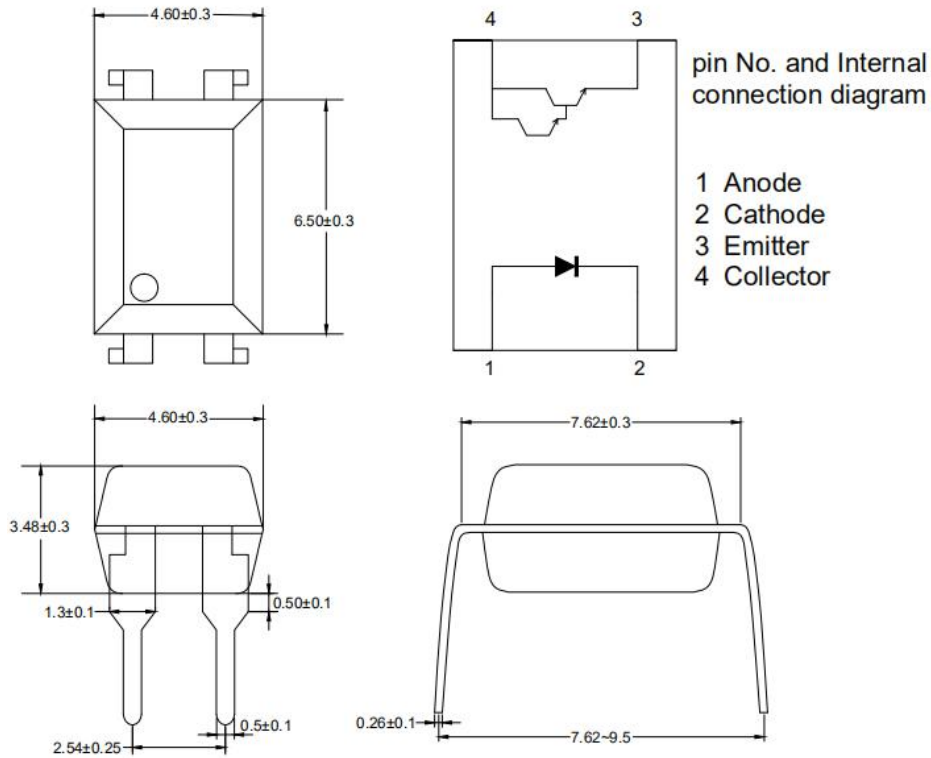
(9) Anode.

\* Halogen Free Mark can be selected.

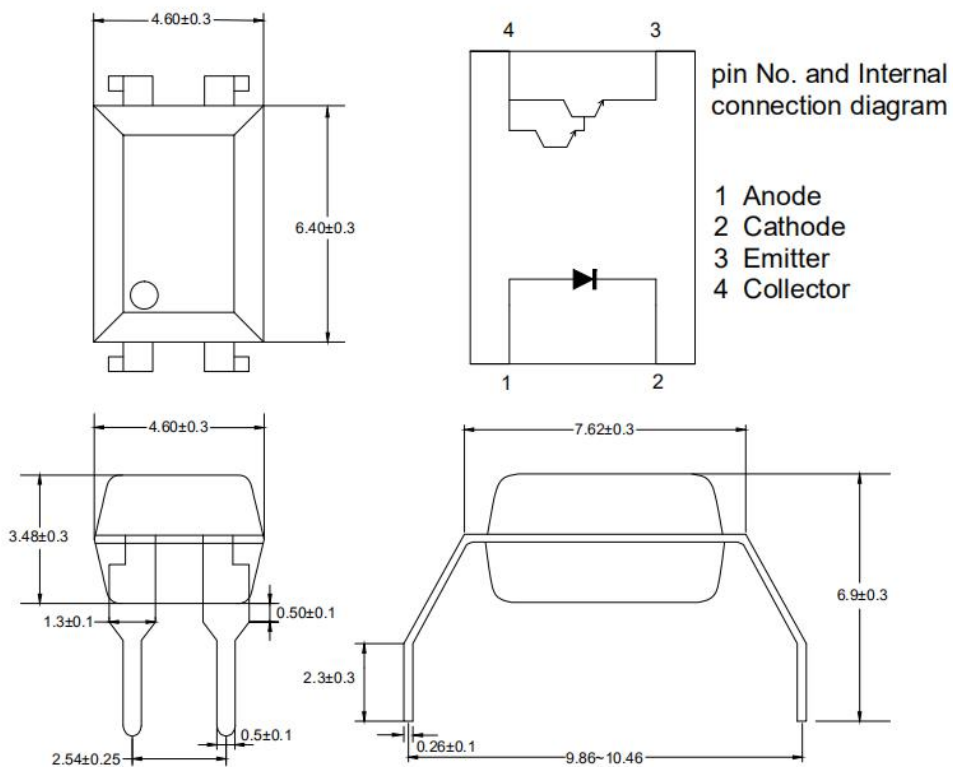
\* VDE Mark can be selected.

8. Package Dimension (Unit: mm)

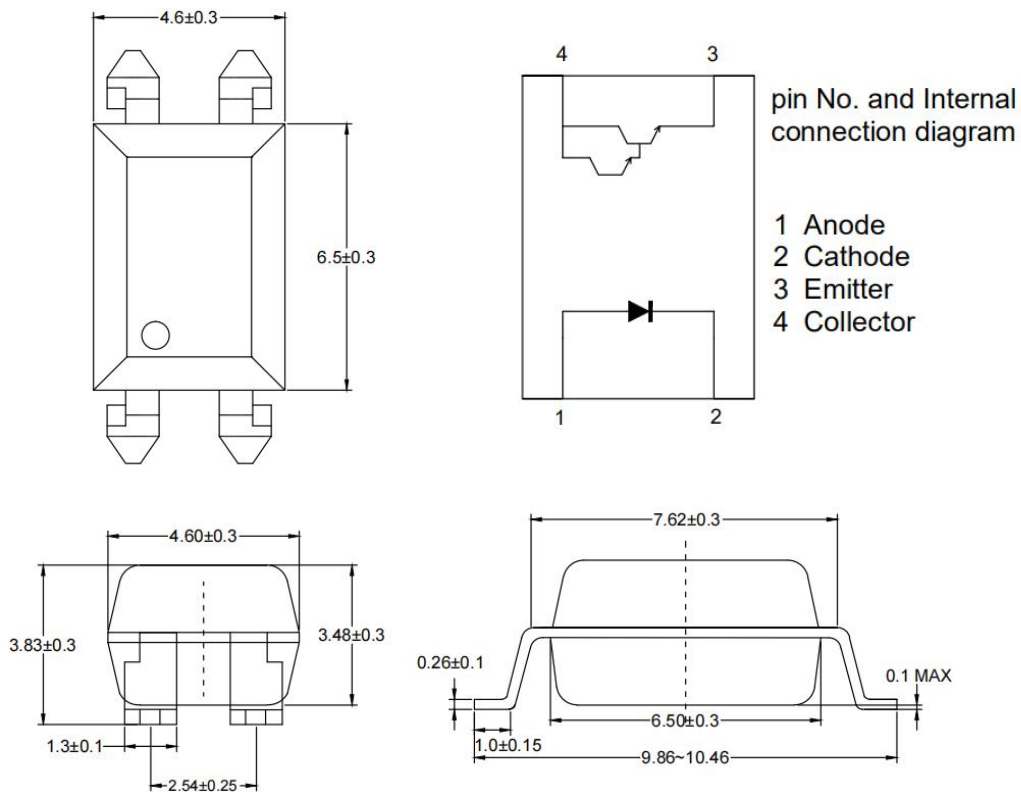
(1) ORPC-815



(2) ORPC-815M

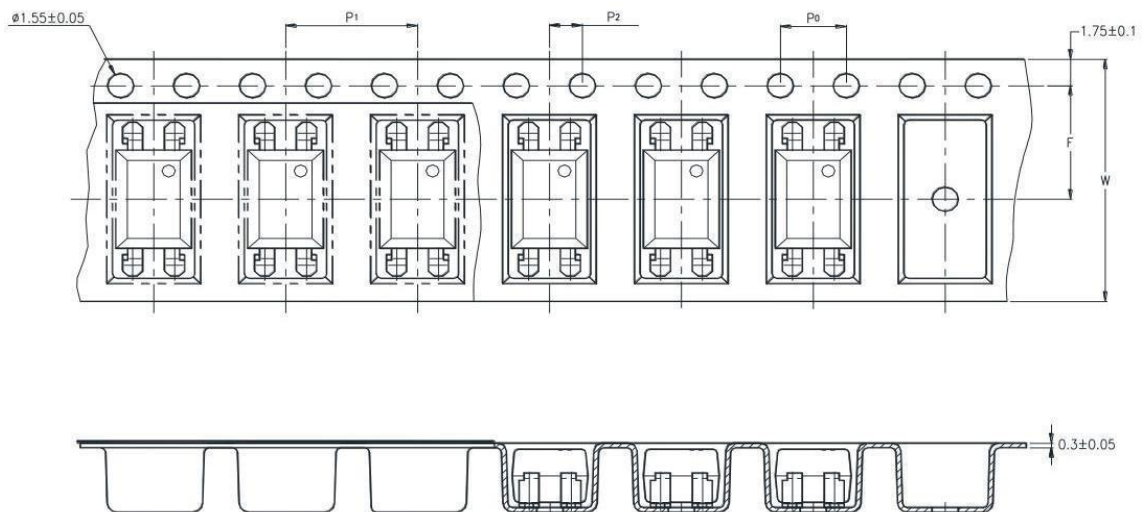


(3) ORPC-815S

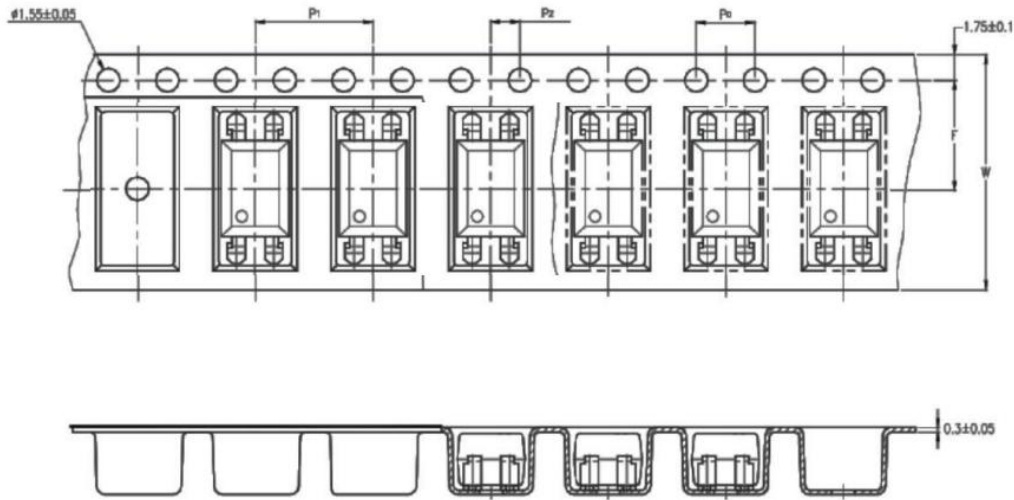


9. Taping Dimensions

(1) ORPC-815S-TP



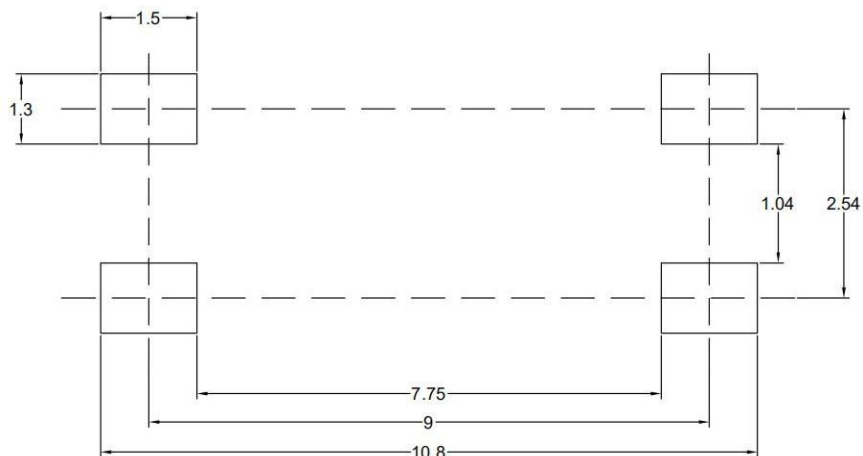
(2)ORPC-815S-TP1



| Description                            | Symbol         | Dimension in mm (inch) |
|--|----------------|------------------------|
| Tape wide                              | W              | 16±0.3 (.63)           |
| Pitch of sprocket holes                | P <sub>0</sub> | 4±0.1 (.15)            |
| Distance of compartment                | F              | 7.5±0.1 (.295)         |
|  | P <sub>2</sub> | 2±0.1 (.0079)          |
| Distance of compartment to compartment | P <sub>1</sub> | 8±0.1 (.472)           |

|                 |        |
|-----------------|--------|
| Package Type    | TP/TP1 |
| Quantities(pcs) | 2000   |

10. Recommended Foot Print Patterns (Mount Pad) (Unit: mm)





## 11. Package Dimension

### (1) package dimension




DIP Type

| Packing Information         |               |
|-----------------------------|---------------|
| Packing type                | Tube          |
| Qty per Tube                | 100pcs        |
| Small box (Inner) Dimension | 525*128*60mm  |
| Large box (Outer) Dimension | 545*290*335mm |
| The Amount per Inner Box    | 5,000pcs      |
| The Amount per Outer Box    | 50,000pcs     |

SOP Type

| Packing Information         |                |
|-----------------------------|----------------|
| Packing type                | Reel type      |
| Tape Width                  | 16mm           |
| Qty per Reel                | 2,000pcs       |
| Small box (inner) Dimension | 345*345*58.5mm |
| Large box (Outer) Dimension | 620x360x360mm  |
| Max qty per small box       | 4,000pcs       |
| Max qty per large box       | 40,000pcs      |

### (2)Packing Label Sample

|   |   |
|---|---|
|  <p>Material Code : 120PCXXXXXX<br/>      <br/> P/N:OR-XXXXXX<br/>      <br/> Lot No. :XXXXXX-XXXXX-TX-X<br/>      <br/> D/C:XXXX<br/>      <br/> Qty:XXXX PCS<br/>      </p>  |    |
| <div style="border: 1px solid black; width: 100px; height: 100px; display: flex; align-items: center; justify-content: center;"> <span>内箱码</span> </div> <div style="border: 1px solid black; width: 100px; height: 100px; display: flex; align-items: center; justify-content: center;"> <span>外箱码</span> </div> | <p>“XXXXXXXXXXXXXXXX” (一体机序列码)<br/> <b>Made in China</b></p>  |

**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.

## 12. Reliability Test

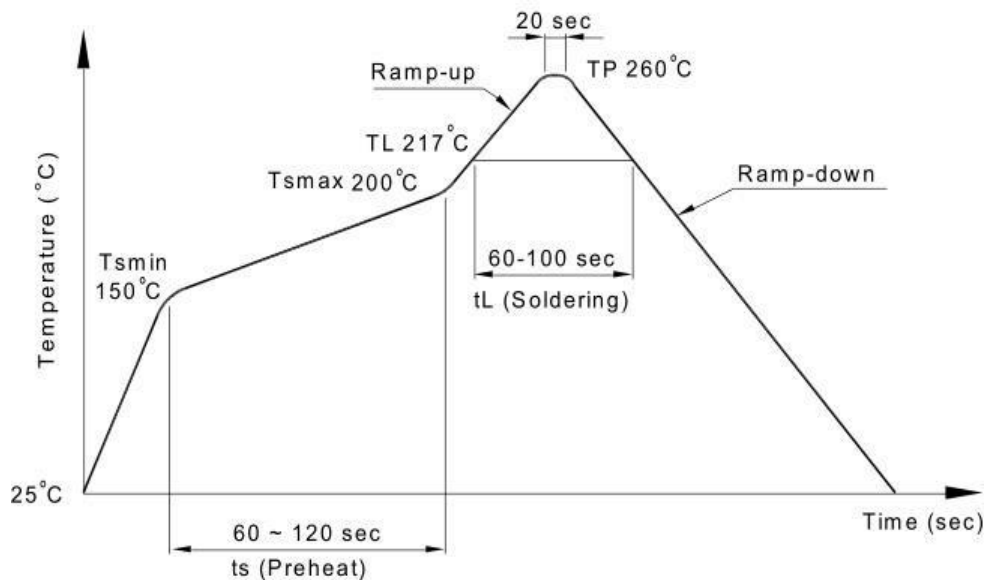
| NO. | ITEMS                      | Reliability Testing |  |              |                       |             |
|-----|----------------------------|---------------------|--|--------------|-----------------------|-------------|
|     |                            | QTY.<br>(Pcs)       | Condition                              | 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 |

### 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.

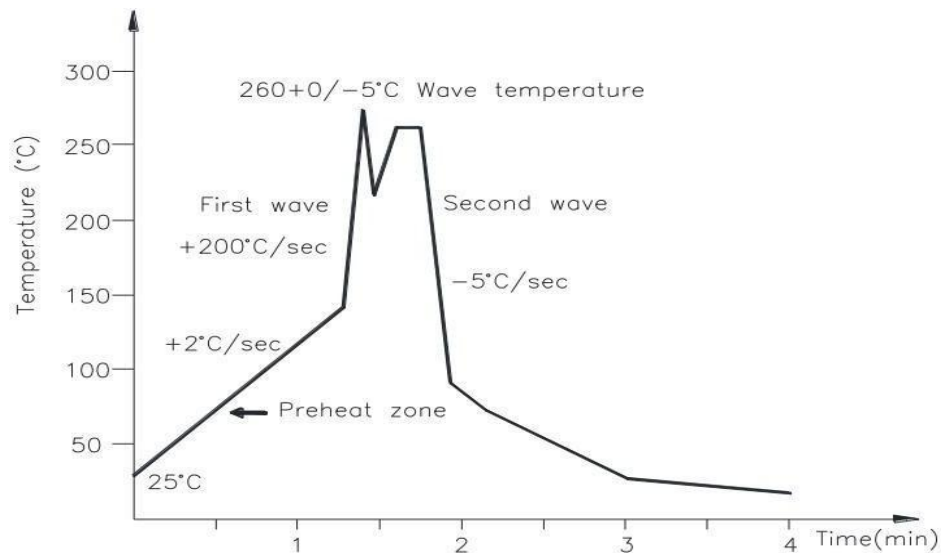
| Profile item  | Conditions                  |
|---|-----------------------------|
| Preheat<br>- Temperature Min (T Smin )<br>- Temperature Max (T Smax )<br>- Time (min to max) (ts) | 150°C<br>200°C<br>90±30 sec |
| Soldering zone<br>- Temperature (TL )<br>- Time (t L )  | 217°C<br>60 sec             |
| 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  |

14. Characteristics Curves

Fig.1 Forward Current vs. Ambient Temperature

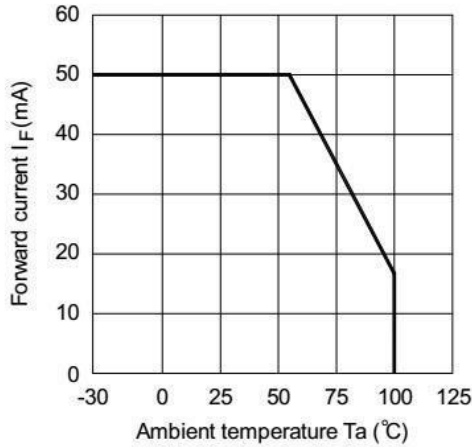


Fig.2 Collector Power Dissipation vs. Ambient Temperature

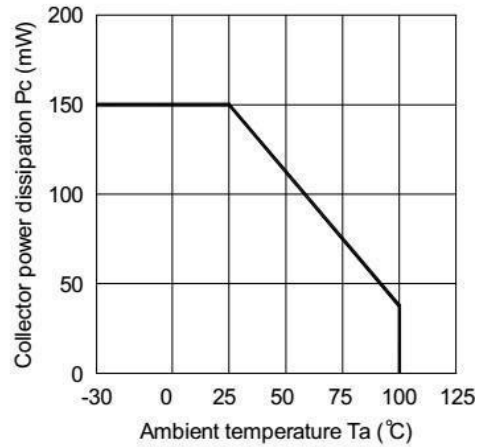


Fig.3 Collector-emitter Saturation Voltage vs. Forward Current

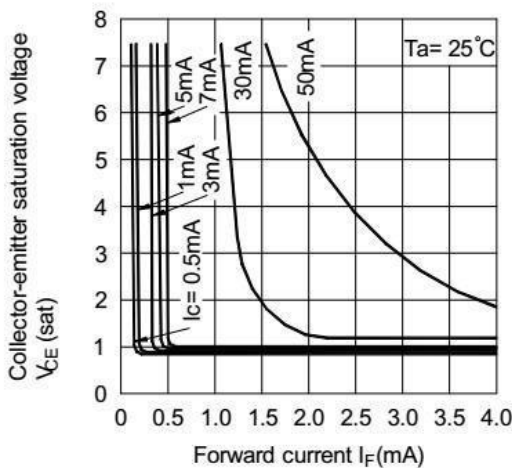


Fig.4 Forward Current vs. Forward Voltage

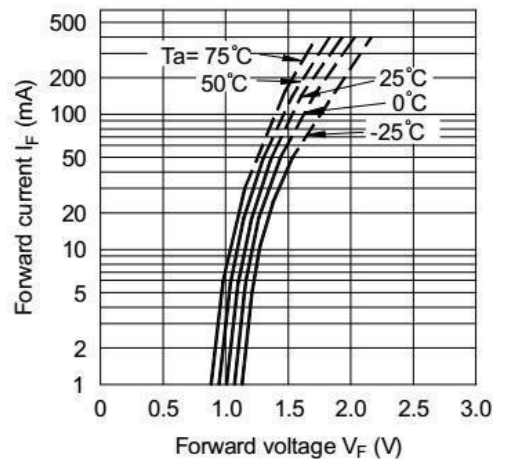


Fig.5 Current Transfer Ratio vs. Forward Current

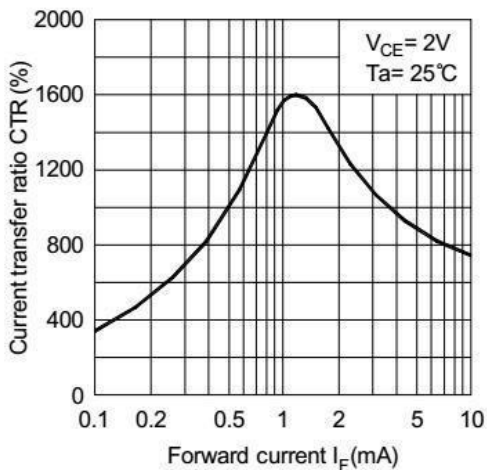


Fig.6 Collector Current vs. Collector-emitter Voltage

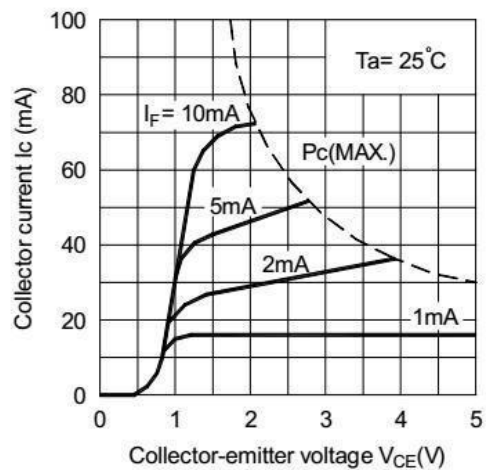


Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

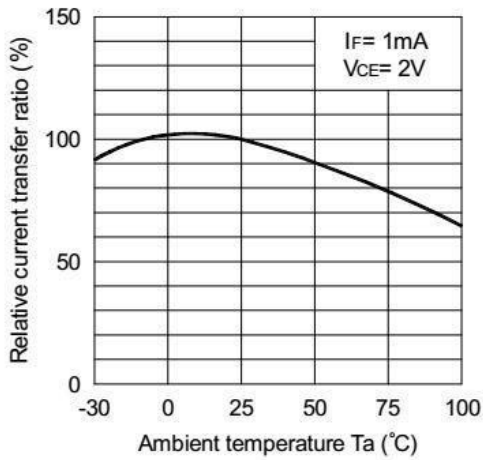


Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

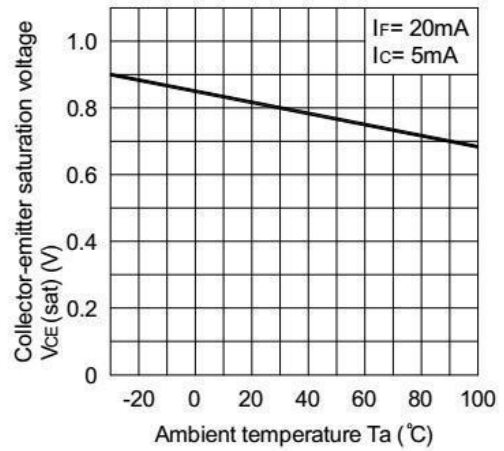


Fig.9 Collector Dark Current vs. Ambient Temperature

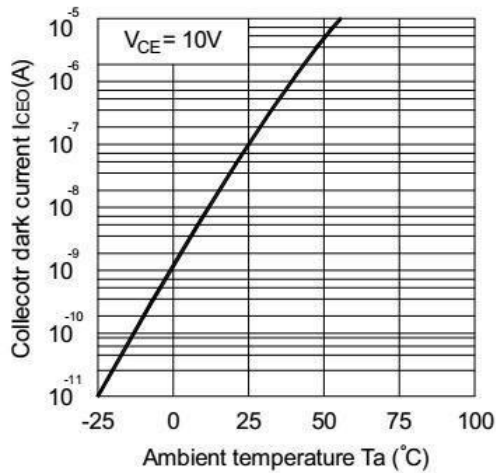


Fig.10 Response Time vs. Load Resistance

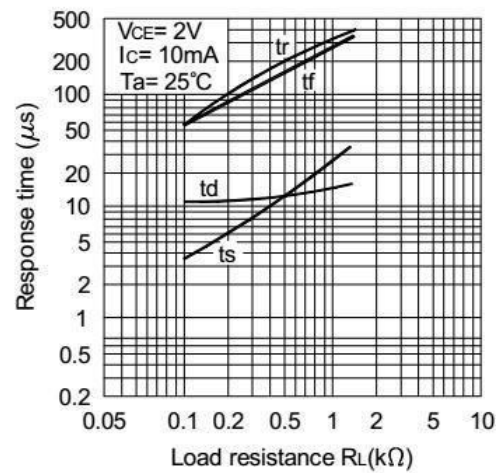
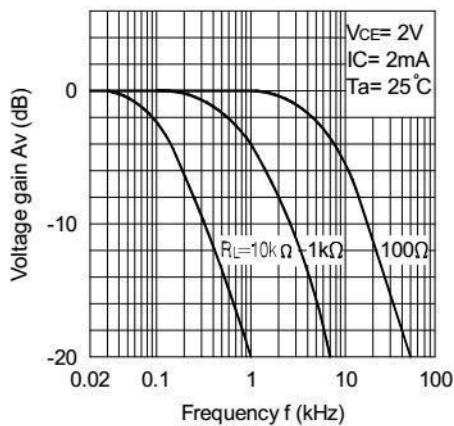
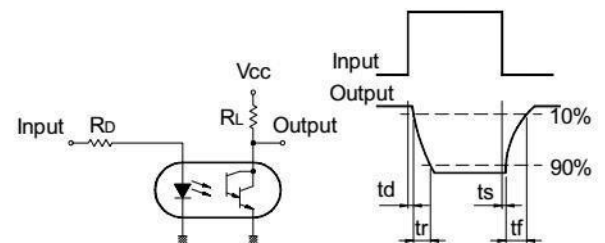


Fig.11 Frequency Response



Test Circuit for Response Time



Test Circuit for Frequency Response

