



# ORIENT

## Photo coupler

### Product Data Sheet

Part Number: OR-357-S-(GK)

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

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

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

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**Preliminary**

This datasheet is a preliminary design specification, and the formal specifications are subject to the recognition letter with jointly signed

## 1. Features

- (1) Current transfer ratio(CTR : MIN. 50% at  $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ )
- (2) High input -output isolation voltage (  $V_{ISO} = 3,750\text{V}_{rms}$  )
- (3) High collector-emitter voltage (  $V_{CEO} = 80\text{V}$  )
- (4) SOP-4 package
- (5) Operating Temperature  $-55^\circ\text{C}$  to  $125^\circ\text{C}$
- (6) ESD pass HBM 8000V/MM 2000V
- (7) Safety approval
  - UL approved(No.E323844)
  - VDE approved(No.40029733)
  - CQC approved (No.CQC19001231256)
- (8) In compliance with RoHS, REACH standards
- (9) MSL Class I

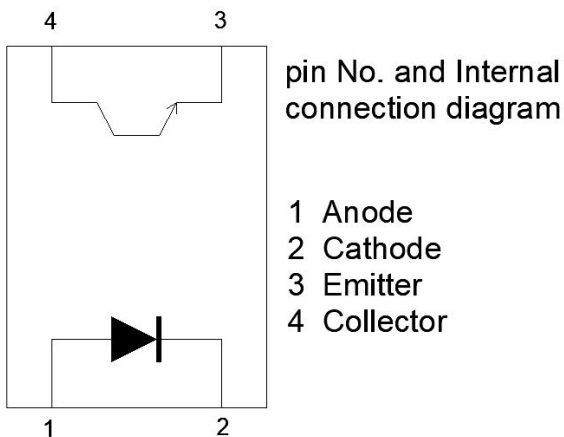
## 2. Instructions

- The OR-357-S-(GK) series device consists of an infrared led, photo transistor detector. They are encapsulated in a 4 pin SOP encapsulation.
- Pin pitch of OR-357-S-(GK) 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
	Reverse Voltage	$V_R$	6	V
	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
Total Consume Power		$P_{tot}$	200	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	$I_F=20\text{mA}$
	Reverse Current	$I_R$	---	---	5	$\mu\text{A}$	$V_R=5\text{V}$
	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	$I_E=0.1\text{mA}, I_F=0\text{mA}$
Transforming Characteristics	*1.Current conversion ratio	CTR	50	---	600	%	$I_F=5\text{mA}, V_{CE}=5\text{V}$
	Collector Current	$I_C$	2.5	---	30	mA	
	Collector and Emitter Saturation Voltage	$V_{CE(sat)}$	---	---	0.2	V	$I_F=20\text{mA}, I_C=1\text{mA}$
	Insulation Impedance	$R_{iso}$	$5 \times 10^{10}$	$1 \times 10^{11}$	---	$\Omega$	DC500V 40~60%R.H.
	Floating Capacitance	$C_f$	---	0.6	1	pF	$V=0, f=1\text{MHz}$
	Response Time	$t_r$	---	2.9	10	$\mu\text{s}$	$V_{CC}=2\text{V}, I_C=2\text{mA}, R_L=100\Omega$
	Descend Time	$t_f$	---	4.5	10	$\mu\text{s}$	

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

### 7. Rank table of current transfer ratio CTR

CTR BIN	Min (%)	Max (%)	Condition
A	80	160	$V_{CE} = 5V / I_F = 5mA, T_a=25^{\circ}C$
	40	100	$V_{CE} = 5V / I_F = 1mA, T_a=25^{\circ}C$
B	130	260	$V_{CE} = 5V / I_F = 5mA, T_a=25^{\circ}C$
	50	150	$V_{CE} = 5V / I_F = 1mA, T_a=25^{\circ}C$
C	200	400	$V_{CE} = 5V / I_F = 5mA, T_a=25^{\circ}C$
	80	300	$V_{CE} = 5V / I_F = 1mA, T_a=25^{\circ}C$
D	300	600	$V_{CE} = 5V / I_F = 5mA, T_a=25^{\circ}C$
	120	400	$V_{CE} = 5V / I_F = 1mA, T_a=25^{\circ}C$

### 8. Order Information

Part Number

**OR-357X-S-W-Y-Z-(GK)**

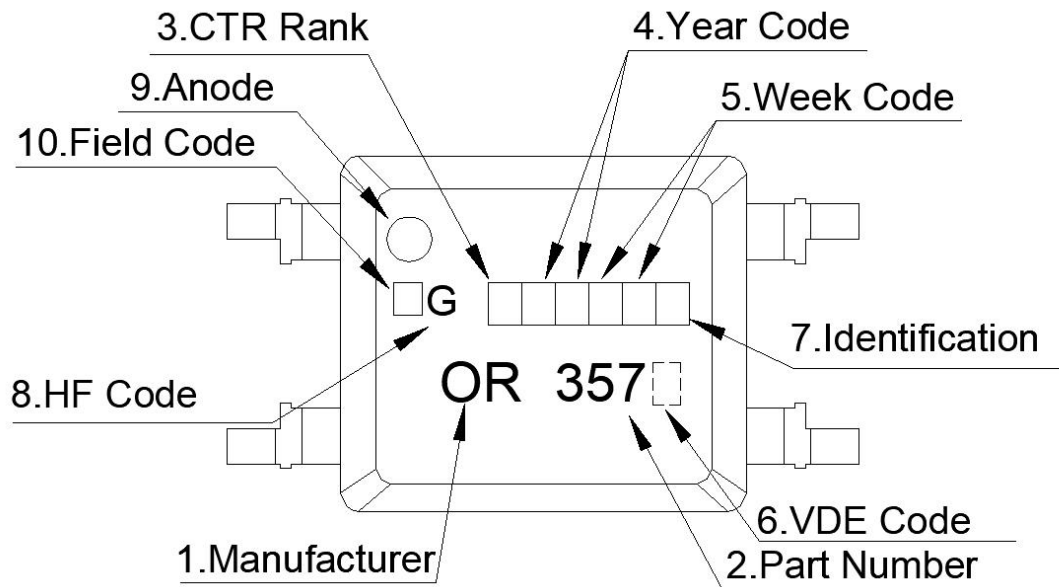
**Note**

- X = CTR Rank (A, B, C, D or none)
- S = Identification.
- 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 .
- GK = Field Code.

\* 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

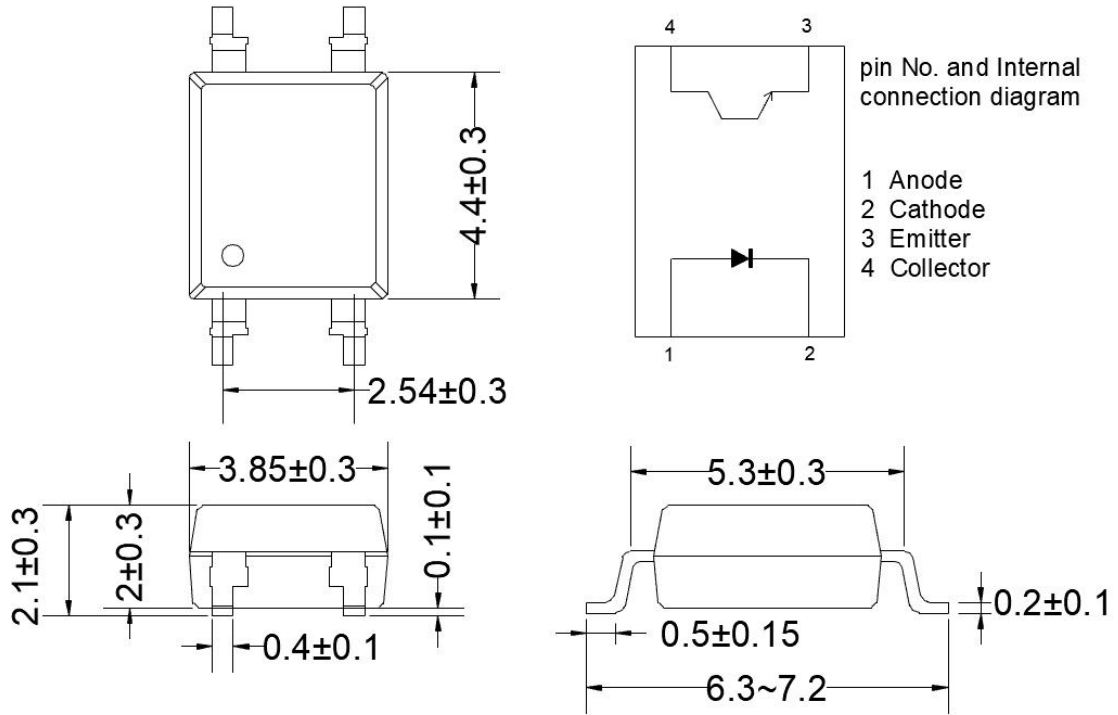
## 9. Naming Rule



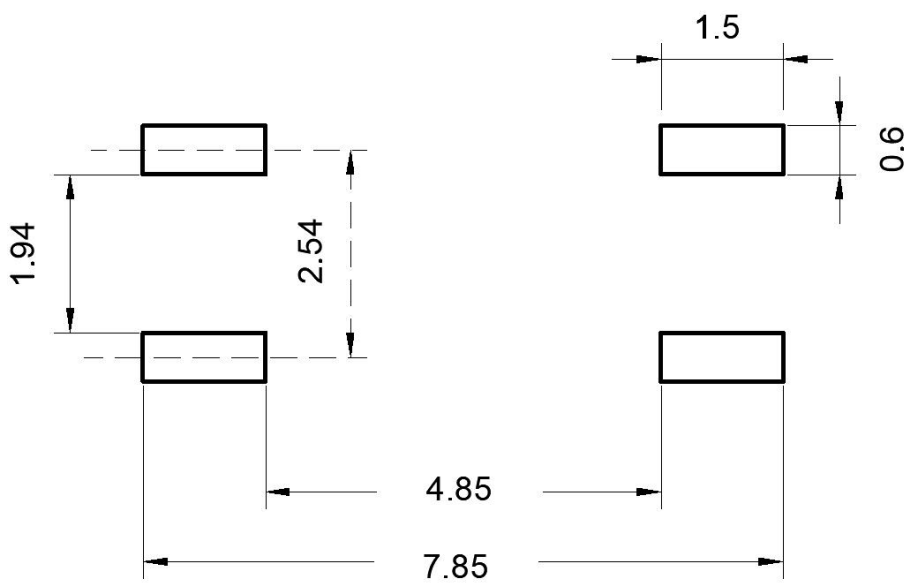
1. Manufacturer : ORIENT.
2. Part Number : 357.
3. Rank Code  : CTR Rank
4. Year Code  : '21' means '2021' and so on.
5. Week Code  : 01 means the first week, 02 means the second week and so on.
6. VDE Code . (Optional)
7. Identification.
8. HF Code.
9. Anode.
10. Field Code.

\* VDE Code can be selected.

### 10. Outer Dimension



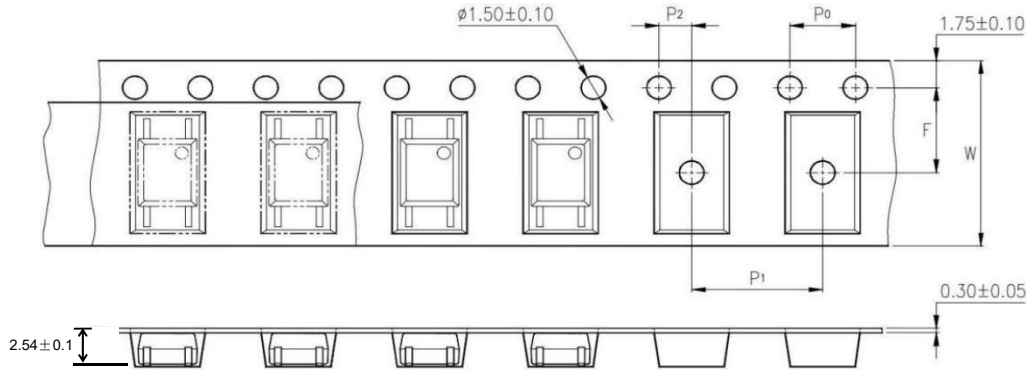
### 11. Recommended Foot Print Patterns (Mount Pad)



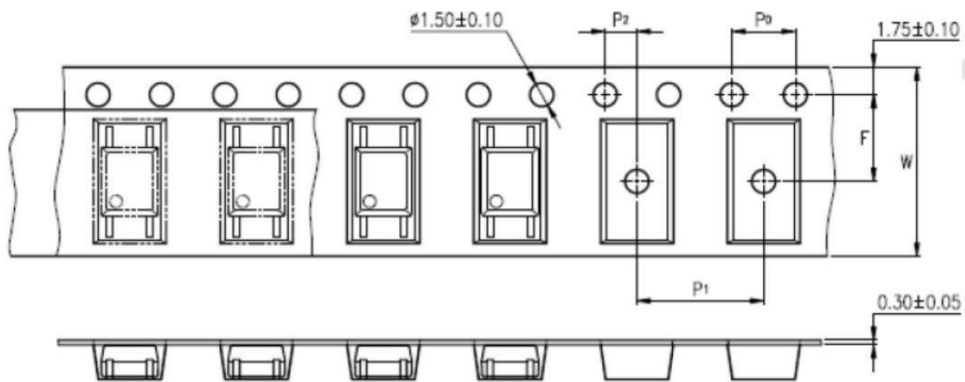
unit: mm

## 12. Taping Dimensions

### (1) TP type



### (2) TP1 type



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

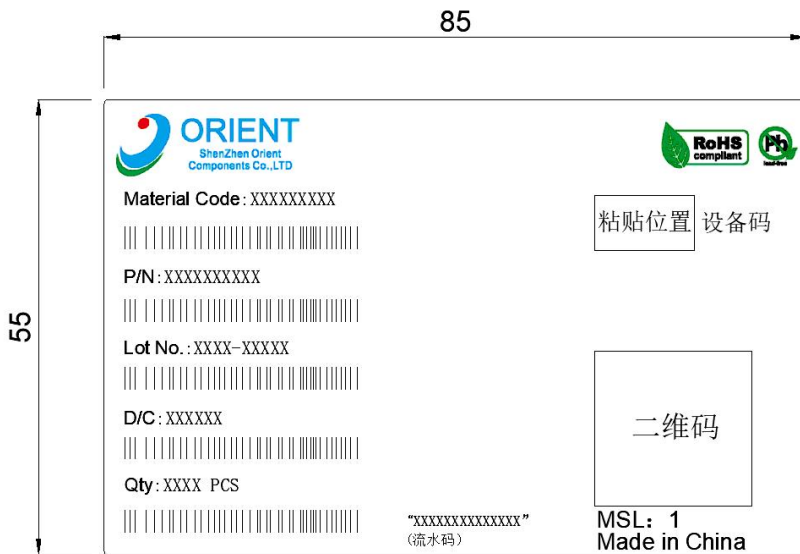


### 13. Package Dimension

#### (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 weeks.
4. D/C :Product data.
5. Quantity :Packaging quantity.

**14. Reliability Test**

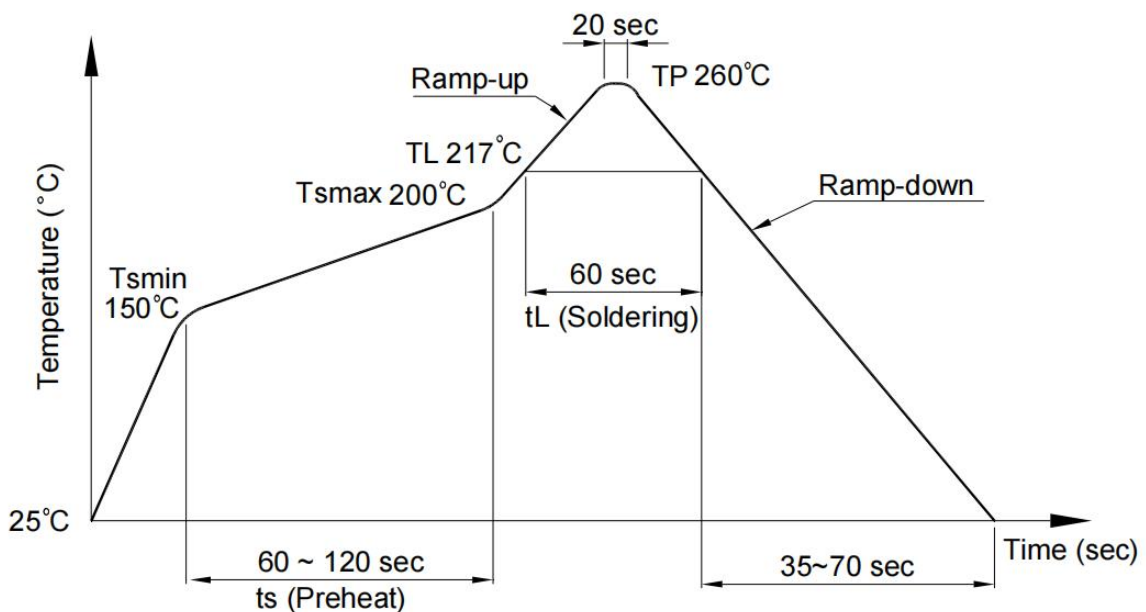
No.	Item	Condition	Cycle	Standard
1	PCT 压力锅	Ta=121°C, 100%RH,2atm	96hrs	JESD22-A102
2	RSH 耐焊接热	DIP: solder bath: 260±5°C SOP: reflow, 260±5°C,	DIP:20±5s SOP:20±5s 3times	JESD22-B106
3	HTSL 高温存储	150°C	1000 hrs	JESD22-A103
4	LTSL 低温存储	-55°C	1000 hrs	JESD22-A119
5	TC *1 温度循环	H:125°C 15min ↓5min L:-55°C 15min	500 cycle	JESD22-A104
6	TS *1 温度冲击	H:105°C 5min ↓15s L:-40°C 5min	500 cycle	JESD22-A106
7	HTOL *3 高温老化	125°C IF=10mA,Vce=5V	1000 hrs	JESD22-A108
8	HTOL *3 高温老化	100°C IC=50mA	24 hrs	JESD22-A108
9	HAST 高加速湿热应力	130°C,85%RH IF=10mA,Vce=5V	96 hrs	JESD22-A118
10	HTRB *2 高温反向偏压	@125°C Vce=80%Rate	1000 hrs	JESD22-A103
11	H3TRB *2 温湿度反向偏压	85°C,85%RH Vce=80%Rate	1000 hrs	JESD22-A101
12	ESD-HBM 人体模式	≥8KV 1Cycle	1 times	JESD22-A114
13	SD 可焊性	DIP: 245±5°C SOP: 245±3°C Pb-free	DIP:5±0.5s SOP:3±0.3s 1times	JESD22-B102
14	Salt spray 盐雾试验	PH 6.5~7.2 35±2°C	24hrs	GB/T 2423.17
15	Vibration 振动实验	n=150r/min; T≥95min	1 times	JESD22-B103
16	bending 引脚弯曲	2.5N, 旋转 0°~90°~0°	3 times	GB/T 2423.60
17	pull 引脚拉力	≥50N, 180°水平引脚直拉	1 times	GB/T 2423.60

### 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.

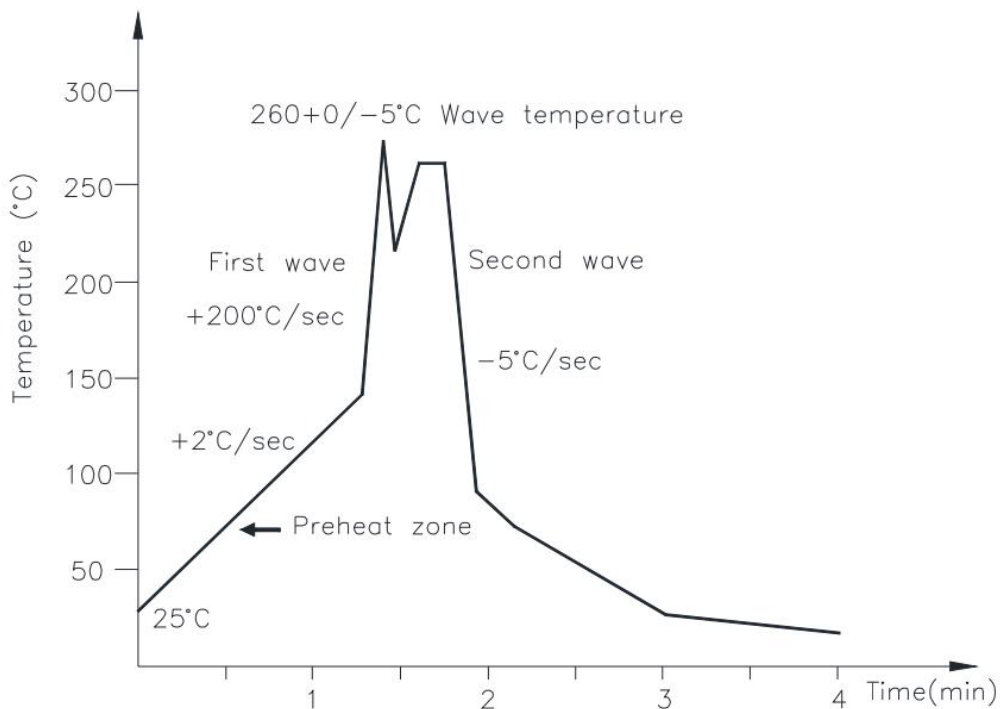
Profile item	Conditions
Preheat	
- Temperature Min (T Smin )	150°C
- Temperature Max (T Smax )	200°C
- Time (min to max) (ts)	90±30 sec
Soldering zone	
- Temperature (TL )	217°C
- Time (t L )	60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak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

Fig.1 Forward Current vs. Ambient Temperature

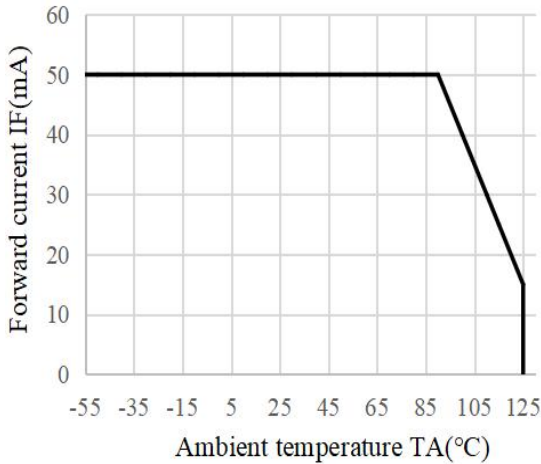


Fig.2 Collector Power Dissipation vs. Ambient Temperature

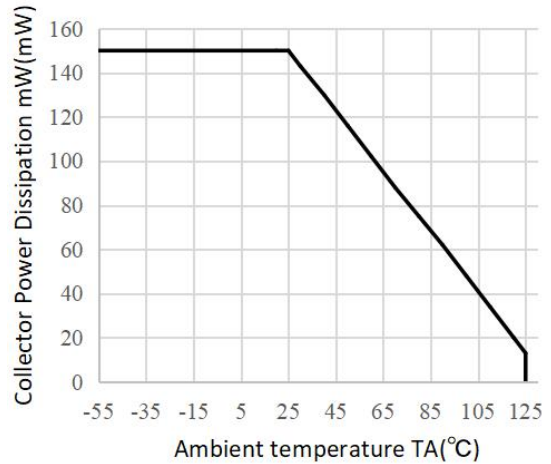


Fig.3 Collector-emitter Saturation Voltage vs. Forward Current

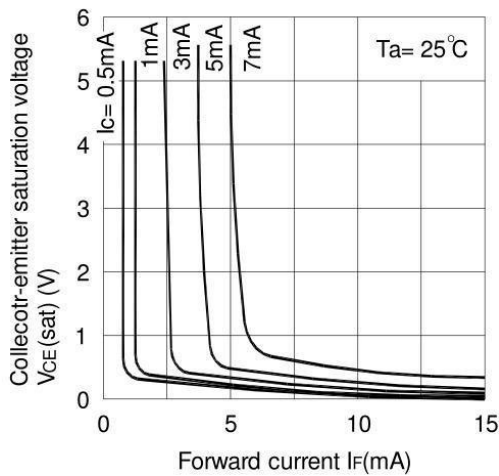


Fig.4 Forward Current vs. Forward Voltage

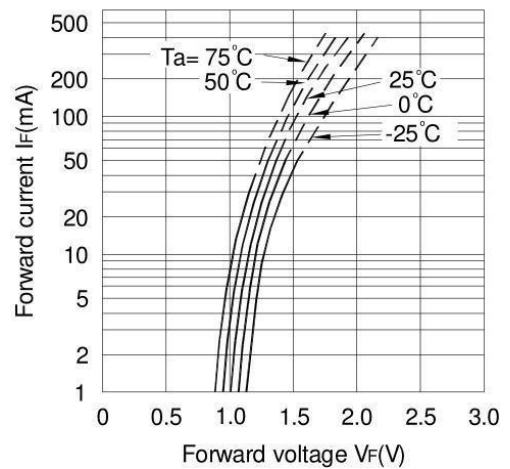


Fig.5 Current Transfer Ratio vs. Forward Current

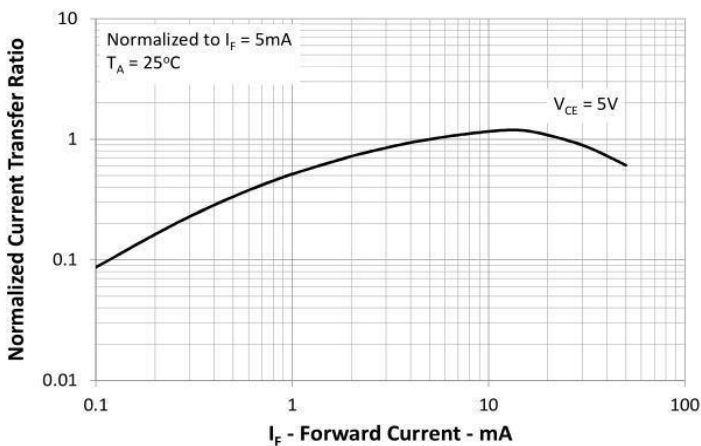


Fig.6 Collector Current vs. Collector-emitter Voltage

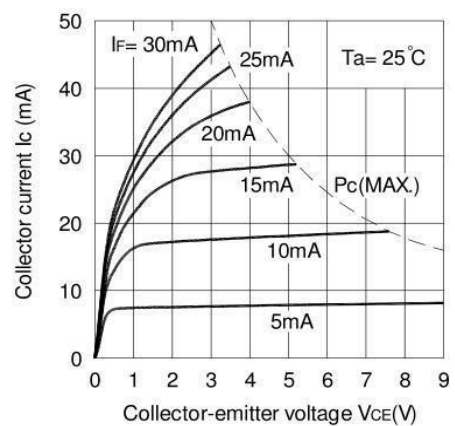


Fig.7 Relative Current Transfer Ratio vs. Ambient Temperature

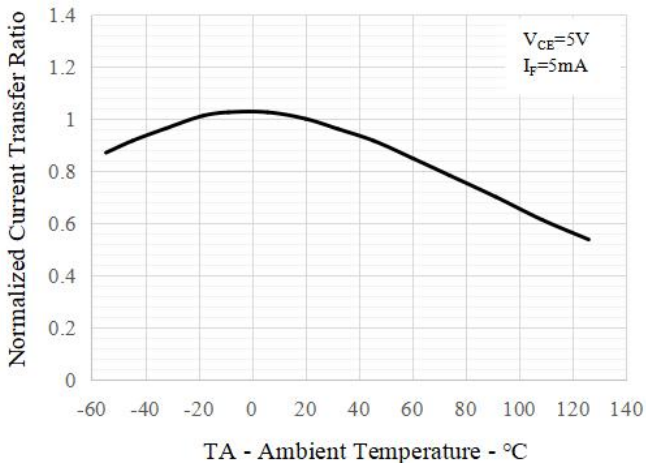


Fig.8 Collector-emitter Saturation Voltage vs. Ambient Temperature

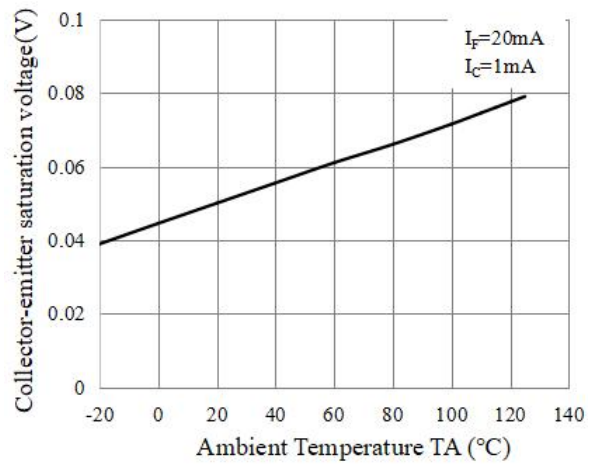


Fig.9 Collector Dark Current vs. Ambient Temperature

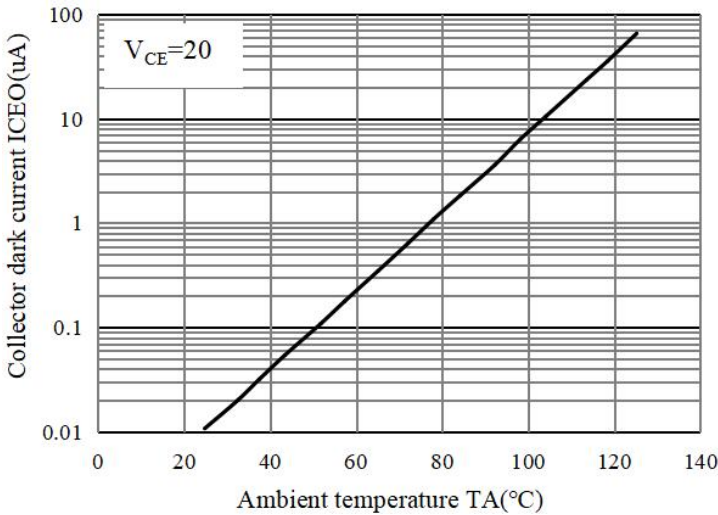


Fig.10 Response Time vs. Load Resistance

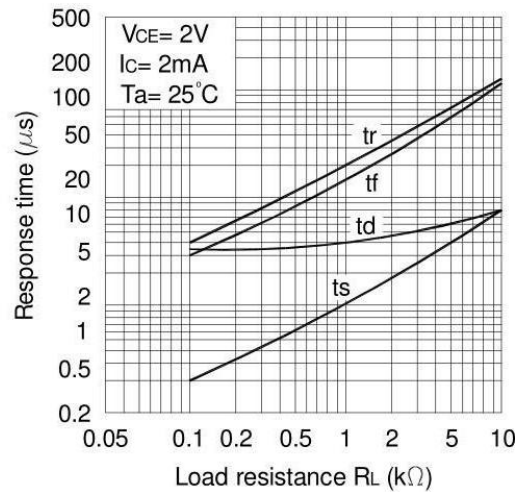
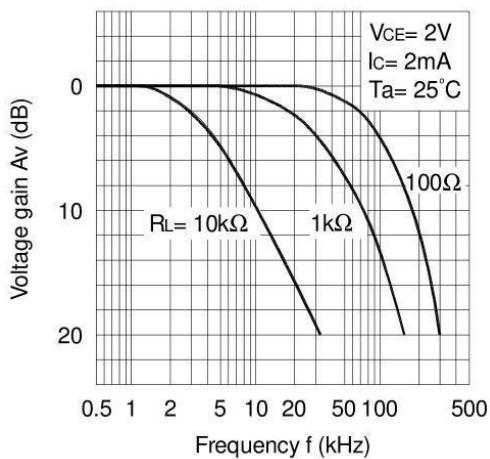
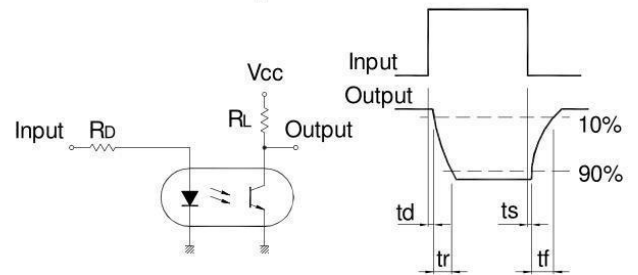


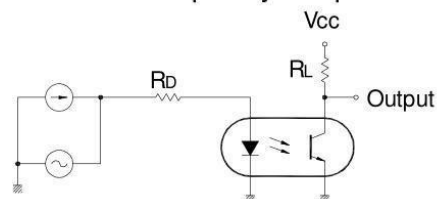
Fig.11 Frequency Response



Test Circuit for Response Time



Test Circuit for Frequency Response





## 17. NOTES

1. Orient is continually improving the quality, reliability, function or design and Orient reserves the right to make changes without further notices.
2. 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.
3. For equipment/devices where high reliability or safety is required, such as space applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.
4. When requiring a device for any “specific” application, please contact our sales in advice.
5. If there are any questions about the contents of this publication, please contact us at your convenience.
6. The contents described herein are subject to change without prior notice.
7. Immerge unit’s body in solder paste is not recommended.