



# HK357x (White)

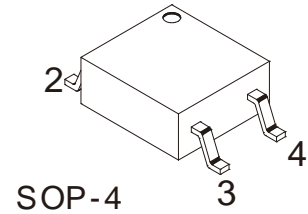
## 4-Pin SOP Phototransistor Optocouplers

### Description

The HK357x are optically coupled isolators containing an infrared light emitting diode and an NPN silicon phototransistor. They are packaged in a 4-pin small outline package (SOP-4).

### Features

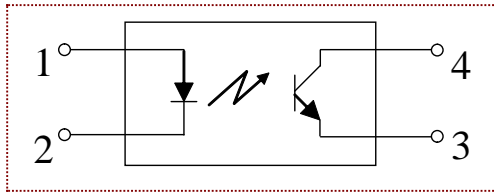
- Current transfer ratio (CTR) : MIN. 50% @  $I_F=5\text{mA}$ ,  $V_{CE}=5\text{V}$
- High isolation voltage between input and output ( $V_{iso}=3750\text{Vrms}$ )
- Minimum  $BV_{CEO}$  of 80V guaranteed
- UL approved
- VDE approved



### Applications

- Feedback circuit in power supply
- Programmable controllers
- Telecommunication equipments

### Block Diagram and Package



#### Pin Configuration

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

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ )

Parameter		Symbol	Rating	Unit
Input	Forward Current	$I_F$	50	mA
	Peak Forward Current (1 $\mu\text{s}$ , pulse)	$I_{FP}$	1	A
	Reverse Voltage	$V_R$	6	V
	Power Dissipation	$P_D$	70	mW
Output	Collector Power Dissipation	$P_C$	150	mW
	Collector Current	$I_C$	50	mA
	Collector-Emitter Voltage	$V_{CEO}$	80	V
	Emitter-Collector Voltage	$V_{ECO}$	7	V
Total Power Dissipation		$P_{tot}$	200	mW
Isolation Voltage *		$V_{iso}$	3750	$V_{rms}$
Operating Temperature		$T_{opr}$	-55~+110	$^\circ\text{C}$
Storage Temperature		$T_{stg}$	-55~+125	$^\circ\text{C}$
Soldering Temperature **		$T_{sol}$	260	$^\circ\text{C}$

\* AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2 are shorted together, and pins 3, 4 are shorted together.

\*\* For 10 seconds



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## 4-Pin SOP Phototransistor Optocouplers

### Electro-optical Characteristics (T<sub>A</sub>=25°C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Input	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> =20mA	-	1.2	1.4	V
	Reverse Current	I <sub>R</sub>	V <sub>R</sub> =4V	-	-	10	μA
	Input Capacitance	C <sub>in</sub>	V=0, f=1kHz	-	30	250	pF
Output	Collector Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> =20V, I <sub>F</sub> =0	-	-	100	nA
	Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	I <sub>C</sub> =0.1mA, I <sub>F</sub> =0	80	-	-	V
	Emitter-Collector Breakdown Voltage	BV <sub>ECO</sub>	I <sub>E</sub> =10μA, I <sub>F</sub> =0	7	-	-	V
Transfer Characteristics	Current Transfer Ratio *	CTR	I <sub>F</sub> =5mA, V <sub>CE</sub> =5V	50	-	600	%
	Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> =20mA, I <sub>C</sub> =1mA	-	0.1	0.2	V
	Isolation Resistance	R <sub>ISO</sub>	DC500V, 40~60% R.H.	5x10 <sup>10</sup>	-	-	Ω
	Floating Capacitance	C <sub>f</sub>	V=0, f=1MHz	-	0.6	1.0	pF
	Rise Time	Tr	V <sub>CE</sub> =10V, I <sub>C</sub> =2mA, R <sub>L</sub> =100Ω	-	3	18	μs
	Fall Time	Tf	V <sub>CE</sub> =10V, I <sub>C</sub> =2mA, R <sub>L</sub> =100Ω	-	4	18	μs

\* CTR=I<sub>C</sub>/I<sub>F</sub> x 100%

### Rank Table of CTR

CTR Classification						
A	B	C	D	E	F	-
80~160	130~260	200~400	300~600	100~200	150~300	50~600



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## 4-Pin SOP Phototransistor Optocouplers

### Typical Performance Curves

Fig.1 Forward Current vs. Forward Voltage

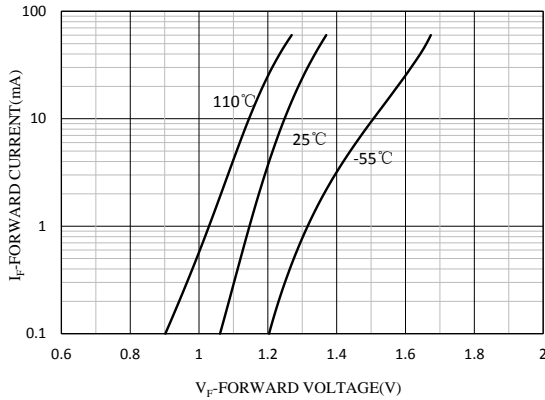


Fig.2 Normalized CTR vs. Forward Current

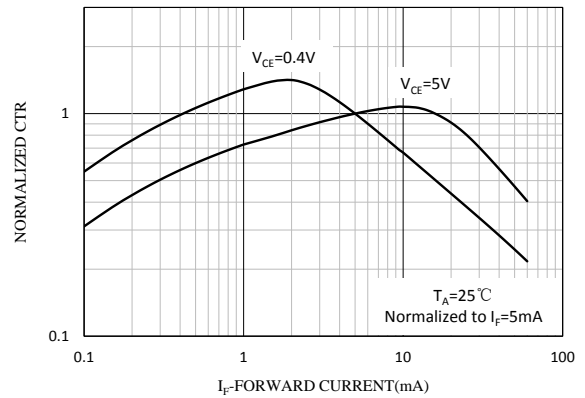


Fig.3 Normalized CTR vs. Ambient Temperature

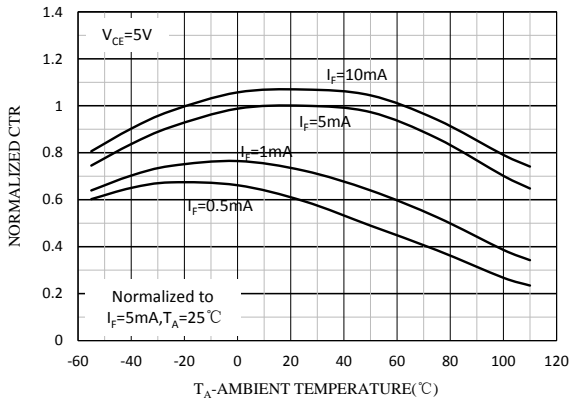


Fig.4 Normalized CTR vs. Ambient Temperature

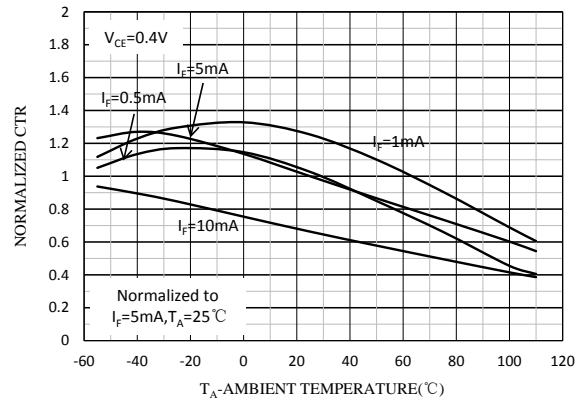


Fig.5 Collector-emitter Current vs. Collector-emitter Voltage

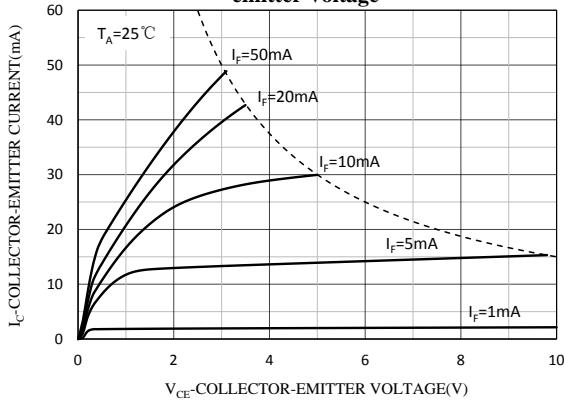
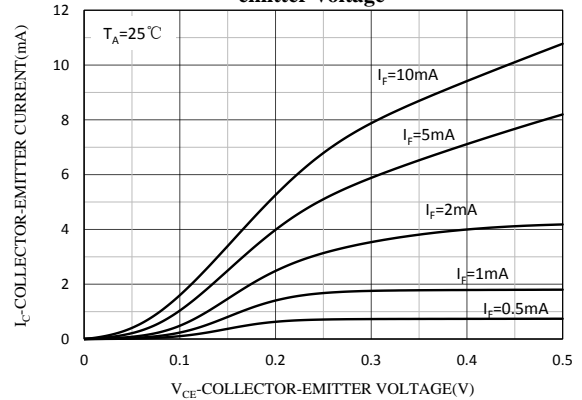


Fig.6 Collector-emitter Current vs. Collector-emitter Voltage

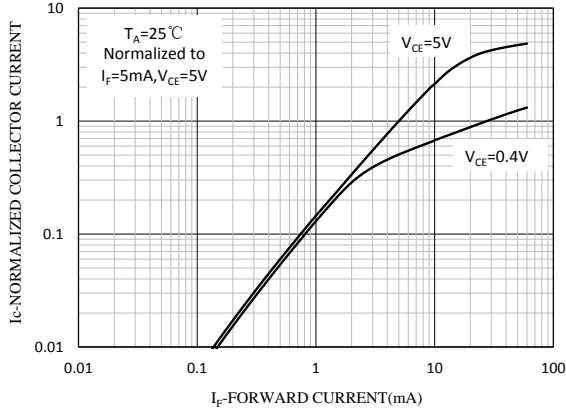




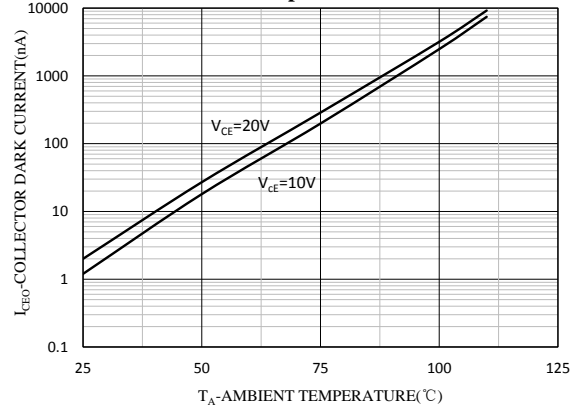
# HK357x (White)

## 4-Pin SOP Phototransistor Optocouplers

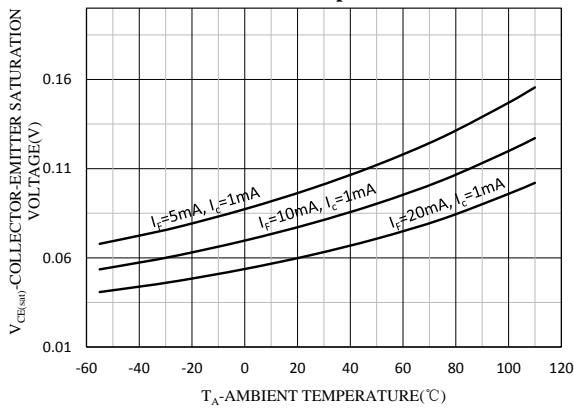
**Fig.7 Normalized Collector Current vs. Forward Current**



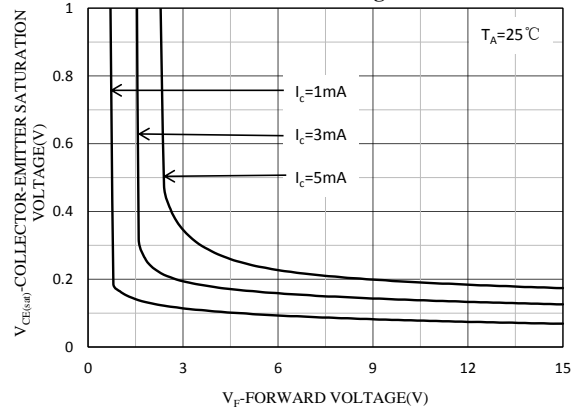
**Fig.8 Collector Dark Current vs. Ambient Temperature**



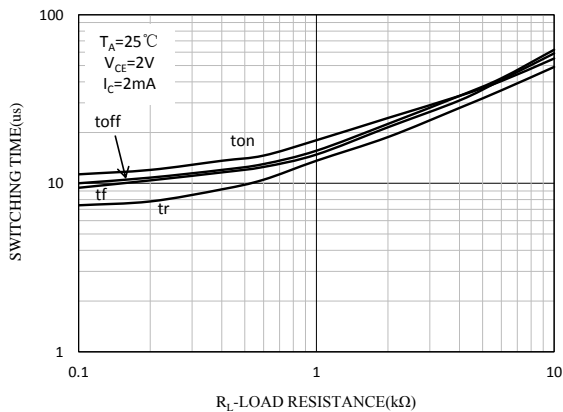
**Fig.9 Collector-emitter Saturation Voltage vs. Ambient Temperature**



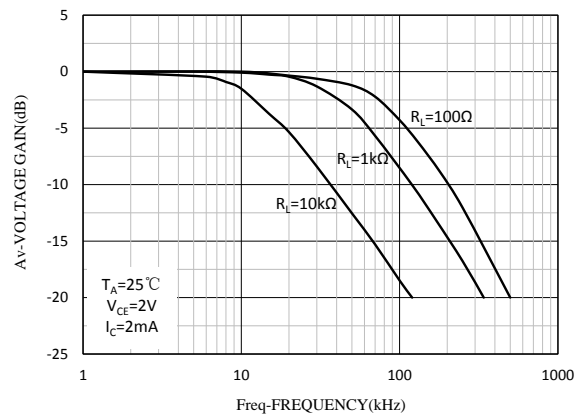
**Fig.10 Collector-emitter Saturation Voltage vs. Forward Voltage**



**Fig.11 Switch Time vs. Load Resistance**



**Fig.12 Frequency Response**





# HK357x (White)

## 4-Pin SOP Phototransistor Optocouplers

### Test Circuits

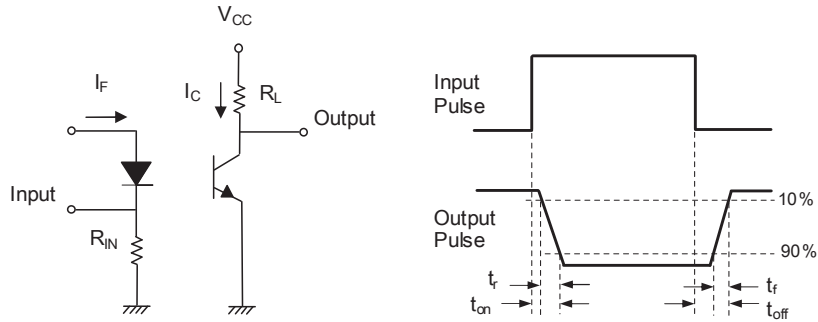
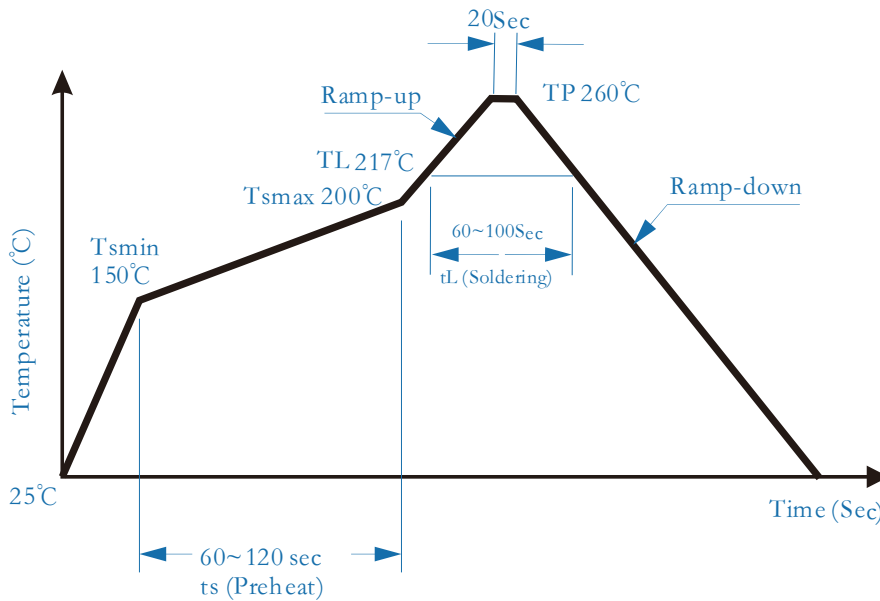


Fig.13 Switching Time Test Circuit and Waveforms

### Solder Reflow Profile



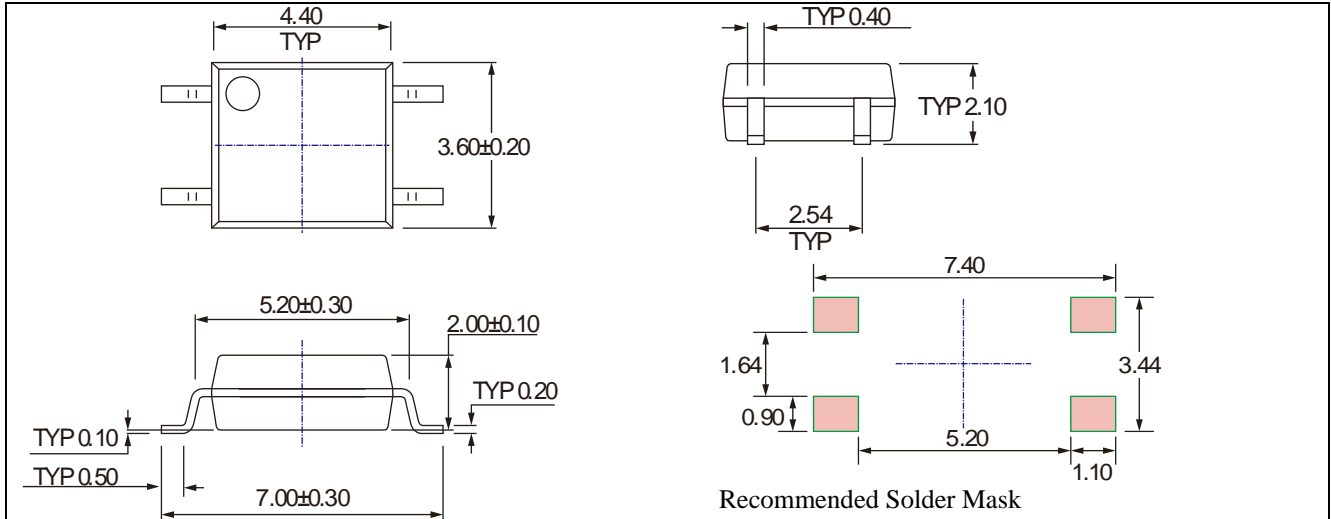


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## 4-Pin SOP Phototransistor Optocouplers

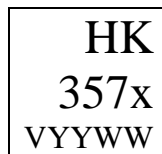
### Outline Dimensions

Unit: mm



SOP-4

### Marking



- “x” denotes the classification A, B, C, D, E, F or none
- “V” denotes VDE approved or none
- “YY” denotes YEAR; “WW” denotes WEEK

### Order Code

## HK357x(Z)-GV U

- HK = Company Brand Mark
- x = CTR Classification (A, B, C, D, E, F or none)
- Z = Tape & Reel Option (T1 or T2)
- G = Epoxy (G = halogen-free, none = with halogen)
- V = VDE approved or none
- U = Factory Code (T, etc)

For example,

Order Code	Description	Main Marking
HK357A(T1)-GV T	Classification A, T1 packing, Halogen-free, VDE approved, by T factory	HK357A
HK357(T2) T	Classification in Full Range, T2 packing, Halogen, by T factory	HK357
HK357B(T2)-GV T	Classification B, T2 packing, Halogen-free, VDE approved, by T factory	HK357B

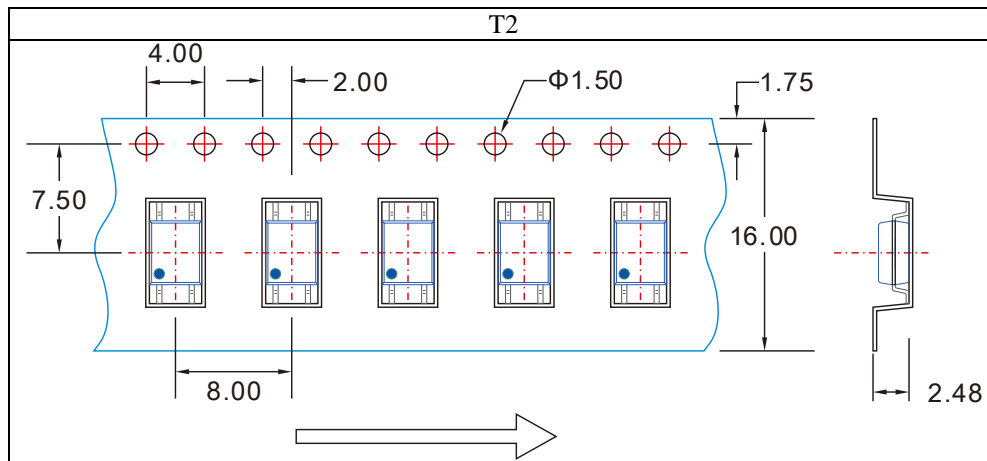
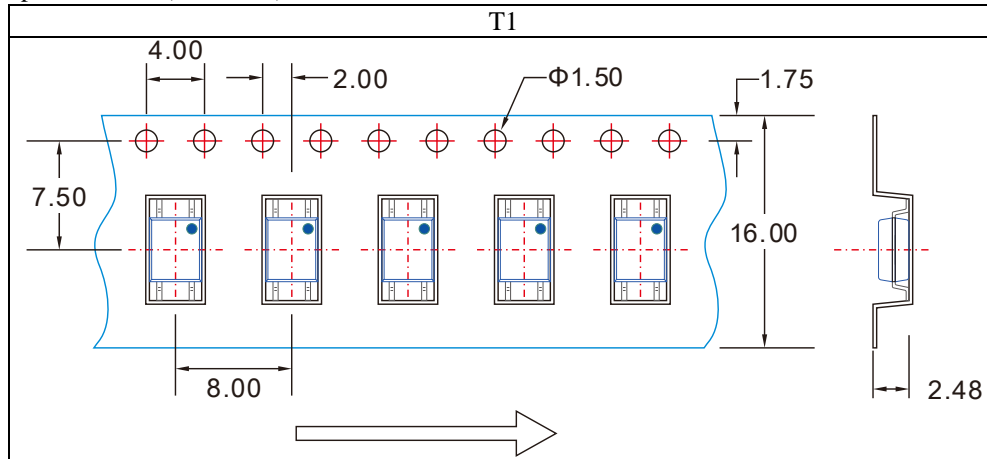


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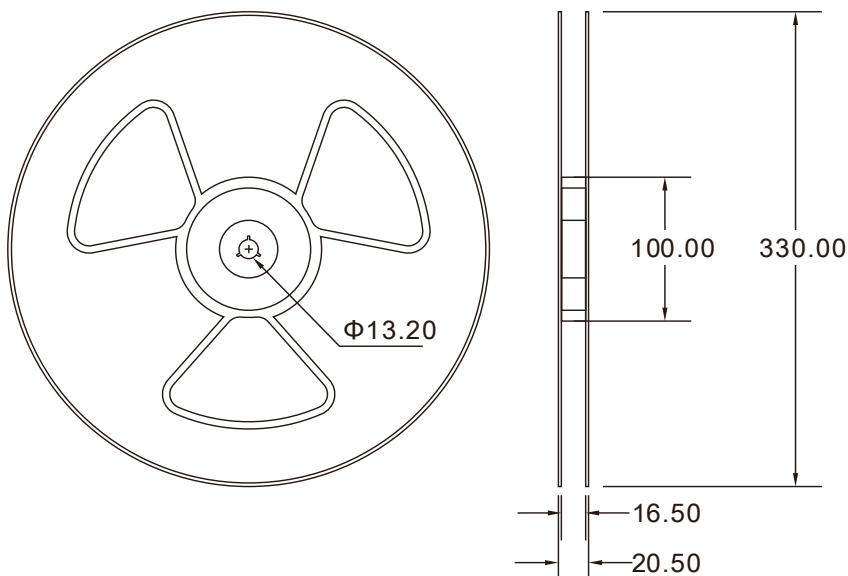
## 4-Pin SOP Phototransistor Optocouplers

### Packing

■ Carrier tape specifications (Unit: mm)



■ Reel dimensions (Unit: mm)

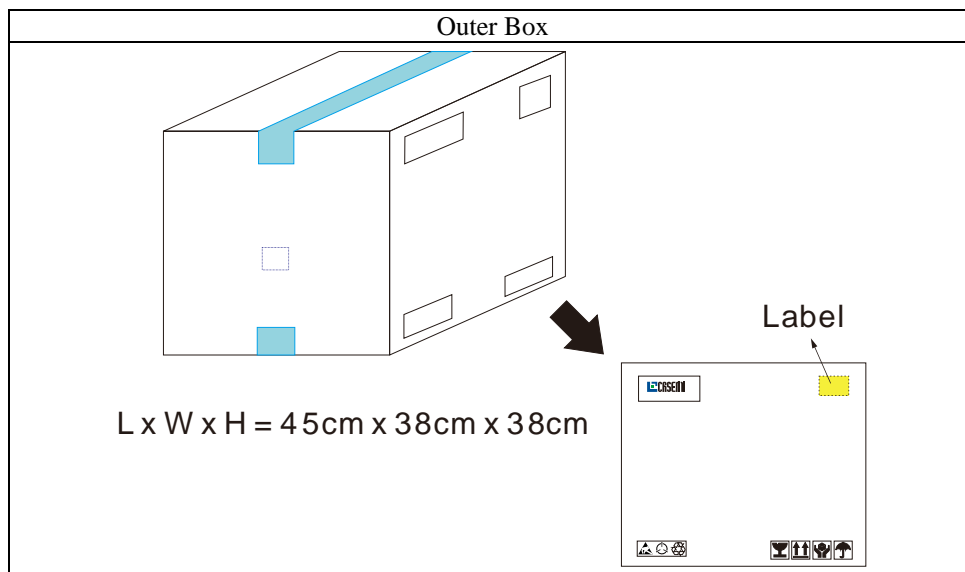
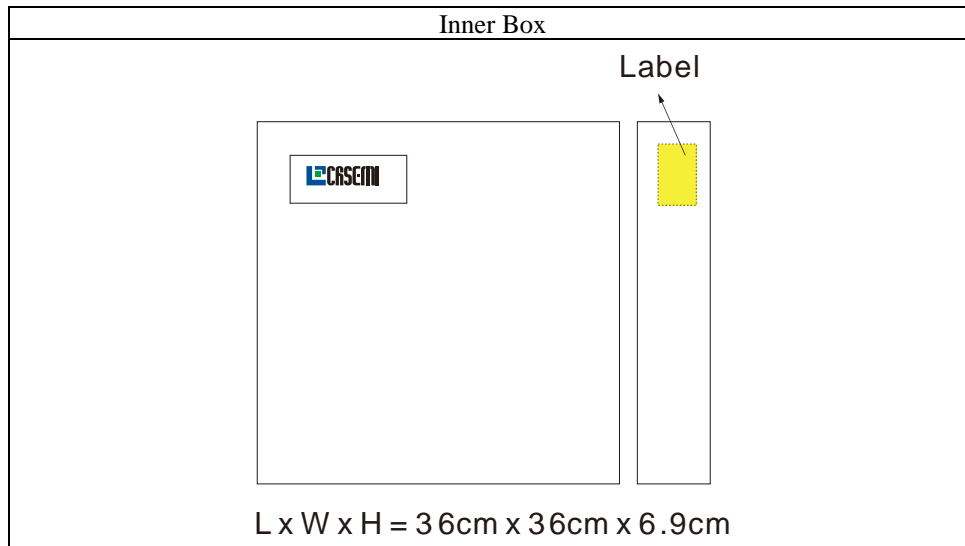




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## 4-Pin SOP Phototransistor Optocouplers

### Box Specifications



### 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





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## 4-Pin SOP Phototransistor Optocouplers

### Label Information



ITEM:HK357x(Z)-GV T



PKG:SOP-4



LOT:TXXXXXXXXXX



CTR:xxx-xxx



TC:XXXXXXXX-XXX



QTY:XXXX PCS





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## 4-Pin SOP Phototransistor Optocouplers

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