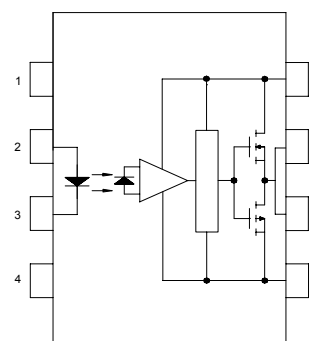


### ● Description

The KTLP350 series consists of an GaAlAs light emitter diode and an integrated. This unit is 8-lead DIP package. KTLP350 series is suitable for gate driving circuit of IGBT or power MOSFET.

### ● Schematic



- |            |                        |
|------------|------------------------|
| 1. N.C.    | 5. GND                 |
| 2. Anode   | 6. Vo (Voltage Output) |
| 3. Cathode | 7. Vo (Voltage Output) |
| 4. N.C.    | 8. Vcc                 |

### ● Features

1. This unit is 8.lead DIP package.
2. Input threshold current:  $I_F=5\text{mA}(\text{max.})$
3. Supply current ( $I_{CC}$ ): 3 mA (max.)
4. Supply voltage ( $V_{CC}$ ): 10 – 30V
5. Output current (IO):  $\pm 2.5\text{A}(\text{max.})$
6. Switching time ( $t_{pLH}/t_{pHL}$ ): 0.5 $\mu\text{s}(\text{max.})$
7. Isolation voltage: 5000Vrms(min.)
8. Agency Approvals:
  - UL1577 / CUL C22.2 No.1 & NTC No.5, File No. E169586
  - VDE EN 60747-5-2, File No. 40020973

### ● Applications

- Transistor inverter
- Inverter for air conditioner
- IGBT gate drive
- Power MOSFET gate drive
- IH(Induction Heating)

### ● Truth Table

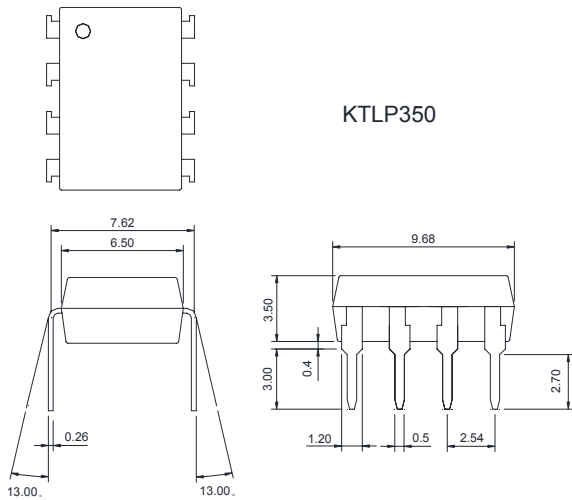
LED	OUTPUT	Q1	Q2
ON	HIGH LEVEL	ON	OFF
OFF	LOW LEVEL	OFF	ON

\* The use of a 0.1 $\mu\text{F}$  bypass capacitor must be connected between pins 8 and 5 is recommended.

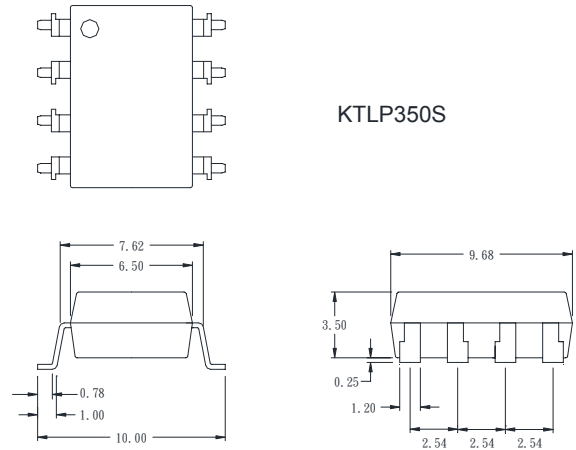
● **Outside Dimension**

Unit : mm

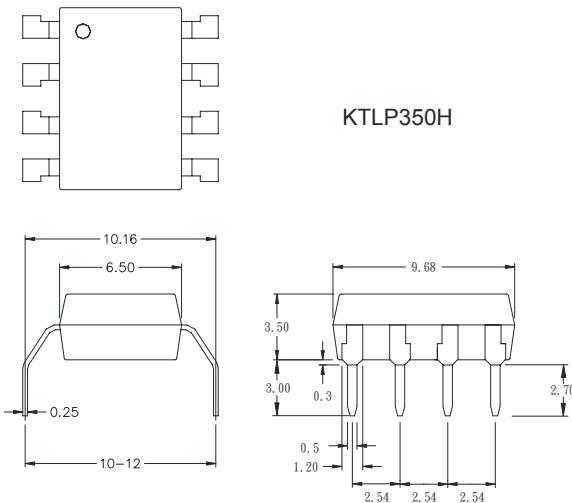
1. Dual-in-line type



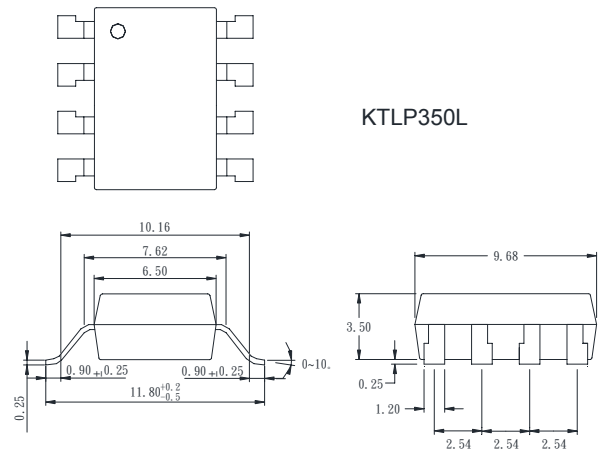
2. Surface mount type



3. Long creepage distance type

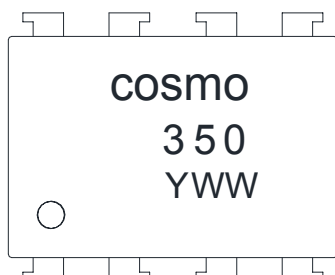


4. Long creepage distance for surface mount type



TOLERANCE: ±0.2mm

● **Device Marking**



**Notes:**

cosmo  
350  
YWW      Y: Year code / WW: Week code

### ● Absolute Maximum Ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit	
Input	Forward current	$I_F$	20	mA	
	Forward current derating(Ta ≥ 70°C)	$\Delta I_F / \Delta Ta$	-0.54	mA / °C	
	Peak transient forward current (*Note 1)	$I_{FPT}$	1	A	
	Reverse voltage	$V_R$	5	V	
	Junction temperature	$T_j$	125	°C	
Output	"H" Peak output current (*Note 2)		$I_{OPH}$	-2.5	A
	"L" Peak output current (*Note 2)		$I_{OPL}$	+2.5	A
	Output voltage	(Ta < 95°C)	$V_O$	35	V
	Supply voltage	(Ta < 95°C)	$V_{CC}$	35	V
	Output voltage derating (Ta ≥ 95°C)		$\Delta V_O / \Delta Ta$	-1.0	V / °C
	Supply Voltage derating(Ta ≥ 95°C)		$\Delta V_{CC} / \Delta Ta$	-1.0	V / °C
	Junction temperature		$T_j$	125	°C
Operating frequency (*Note 3)		$f$	50	KhZ	
Operating temperature range		$T_{opr}$	-40~115	°C	
Storage temperature range		$T_{stg}$	-55~125	°C	
Lead soldering temperature(10s) (*Note 4)		$T_{sol}$	260	°C	
Isolation voltage (AC, 1min., R.H ≤ 60%) (*Note 5)		$BVs$	5000	Vrms	

\*Note1: Pulse width  $Pw \leq 1\mu s, 300pps$ .

\*Note2: Exponential waveform pulse width  $Pw \leq 0.3\mu s, f \leq 15kHz$ .

\*Note3: Exponential waveform,  $I_{OPH} \geq -2.0A (\leq 0.3\mu s), I_{OPL} \leq +2.0A (\leq 0.3\mu s)$ .

\*Note4: It is 2 mm or more from a lead root.

\*Note5: Device is considered as a two terminal device: Pin1,2,3 and 4 shorted together, and pins 5,6,7 and 8 shorted together.

### ● Electrical Characteristics

(Ta = 25°C)

Parameter	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit	
Input forward voltage	$V_F$	—	$I_F=10mA, Ta=25^\circ C$	—	1.6	1.8	V	
Temperature coefficient of forward voltage	$\Delta V_F / \Delta Ta$	—	$I_F=10mA$	—	-2.0	—	mV / °C	
Input reverse current	$I_R$	—	$V_R=5V, Ta=25^\circ C$	—	—	10	μA	
Input capacitance	$C_T$	—	$V=0, f=1MHz, Ta=25^\circ C$	—	45	250	pF	
Output current	"H" level	$I_{OPH}$	3	$V_{CC}=30V, I_F=5mA$	—	-1.6	-1.0	A
				$V_{CC}=15V, I_F=5mA$	—	—	-2.0	
				$V_b=3.5V$				
				$V_b=7.0V$				

	“L” level	$I_{OPL}$	2	$V_{CC}=30V, I_F=0mA$ $V_a=2.5V$	1.0	1.6	—	
				$V_{CC}=15V, I_F=0mA$ $V_a=7.5V$	2.0	—	—	
Output voltage	“H” level	$V_{OH}$	4	$V_{CC1}=15V, V_{EE1}=-15V$ $R_L=200\Omega, I_F=5mA$	11	13.7	—	V
	“L” level	$V_{OL}$	5	$V_{CC1}=15V, V_{EE1}=-15V$ $R_L=200\Omega, V_F=0.8V$	—	-14.9	-12.5	
Supply current	“H” level	$I_{CCH}$	—	$V_{CC}=30V, I_F=10mA,$ $T_a=25^\circ C$	—	2	3.0	mA
	“L” level	$I_{CCL}$	—	$V_{CC}=30V, I_F=0mA,$ $T_a=25^\circ C$	—	2	3.0	
Threshold input current	“Output L→H”	$I_{FLH}$	—	$V_{CC1}=15V,$ $V_o>1V, I_o=0mA$	—	1.8	5	mA
Threshold input voltage	“Output H→L”	$V_{FHL}$	—	$V_{CC1}=15V,$ $V_o>1V, I_o=0mA$	0.8	—	—	V
Supply voltage		$V_{CC}$	—		10	—	30	V
Capacitance (input-output)		$C_s$	—	$V_s=0, f=1MHz, T_a=25^\circ C$	—	1.0	2.0	pF
Resistance (input-output)		$R_s$	—	$V_s=500V, T_a=25^\circ C,$ $R.H. \leq 60\%$	$1 \times 10^{12}$	$10^{14}$	—	$\Omega$

\* All typical values are at  $T_a=25^\circ C$  (\*A): Duration of  $I_o$  time  $\leq 50\mu s$ (1 Pulse)

### ● Switching Characteristics

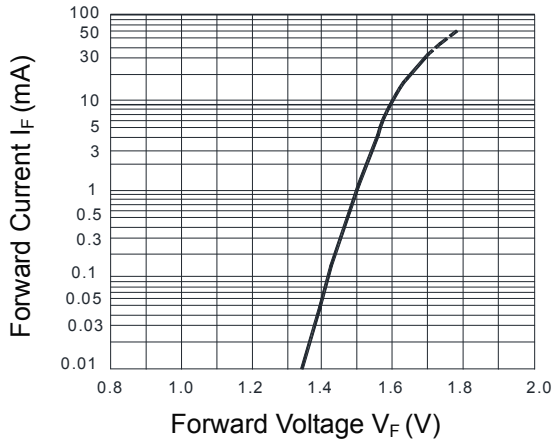
( $T_a = 25^\circ C$ )

Parameter	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time	“L→H”	6	$I_F=5mA$ (Note8) $V_{CC}=30V$ $R_g=20\Omega, C_g=10nF$	50	260	500	ns
	“H→L”			50	260	500	
Output rise time	$t_r$			—	15	—	
Output fall time	$t_f$			—	8	—	
Common mode transient immunity at high level output	$C_{MH}$	7	$V_{CM}=1000Vp-p, I_F=5mA$ $V_{CC}=30V, V_o(\min)=26V$ $T_a=25^\circ C$	-15	—	—	KV / $\mu s$
Common mode transient immunity at low level output	$C_{ML}$	7	$V_{CM}=1000Vp-p, I_F=0$ $V_{CC}=30V, V_o(\max)=1V$ $T_a=25^\circ C$	15	—	—	KV / $\mu s$

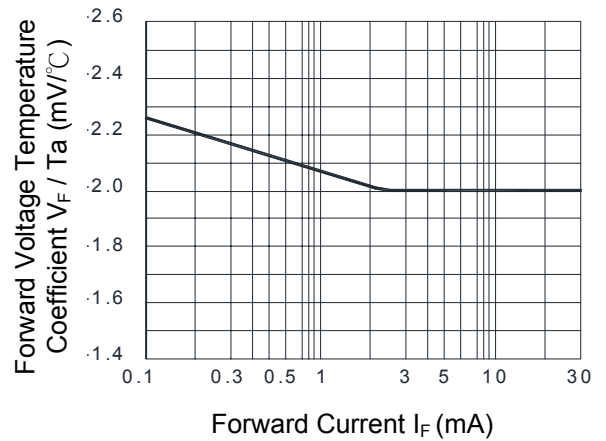
\* All typical values are at  $T_a=25^\circ C$ .

\*Note 8: Input signal rise time (fall time)  $< 0.5\mu s$ .

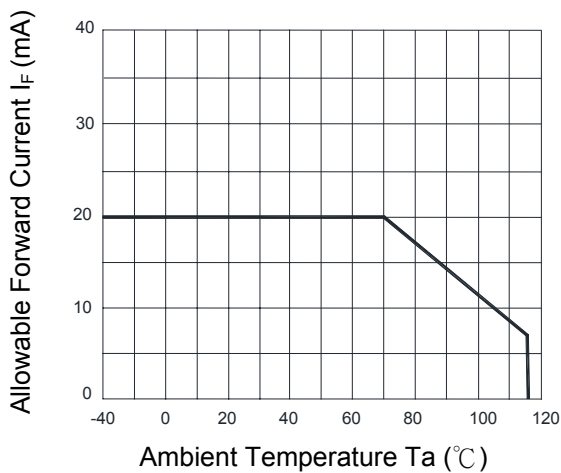
**Fig.1 Forward Current vs. Forward Voltage**



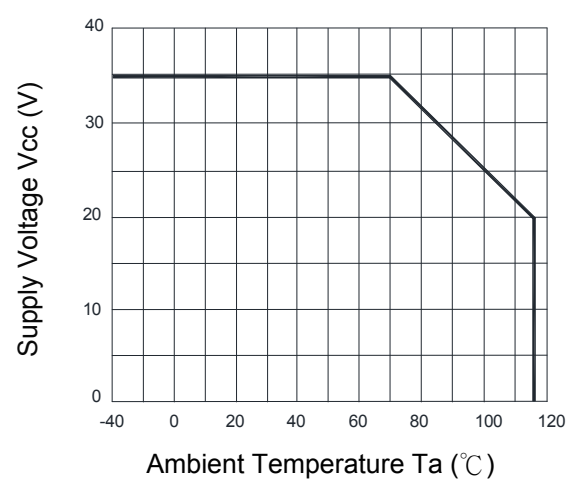
**Fig.2 Output Voltage vs. Forward Current**



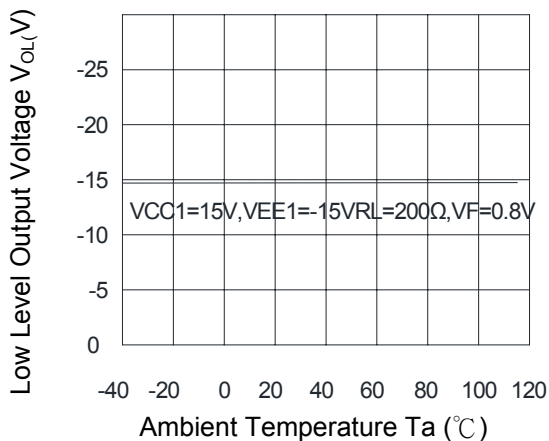
**Fig.3 Allowable Forward Current vs. Ambient Temperature**



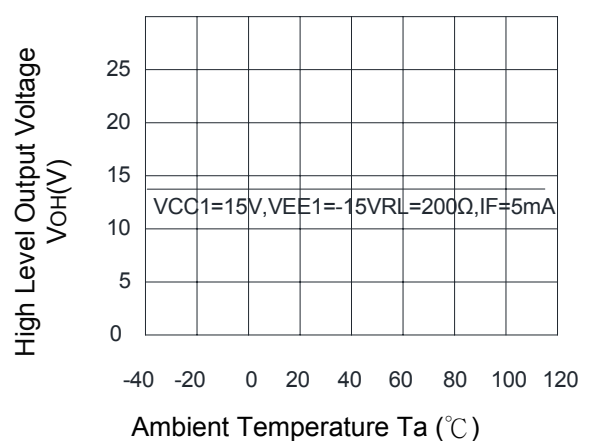
**Fig.4 Supply Voltage vs. Ambient Temperature**



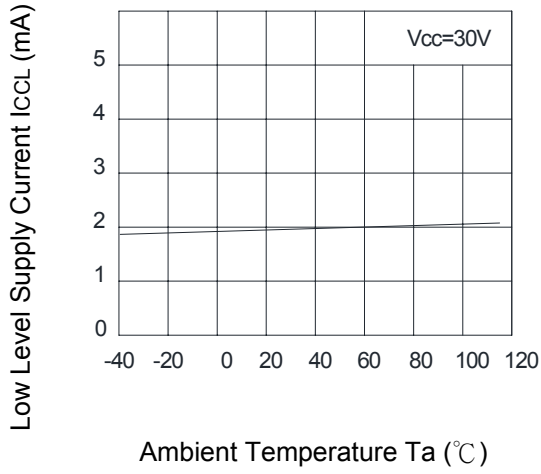
**Fig.5 Low Level Output Voltage vs. Ambient Temperature**



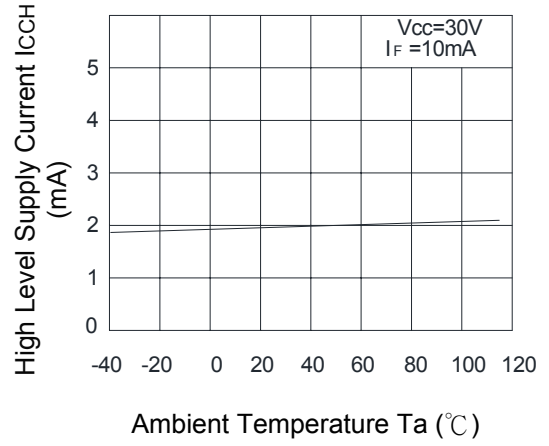
**Fig.6 High Level Output Voltage vs. Ambient Temperature**



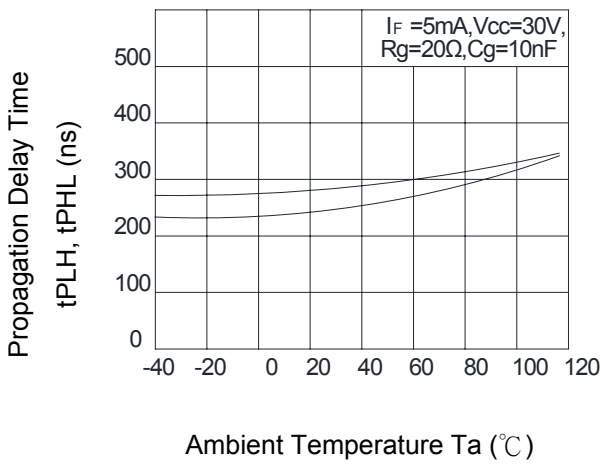
**Fig.7 Low Level Supply Current vs. Ambient Temperature**



**Fig.8 High Level Supply Current vs. Ambient Temperature**

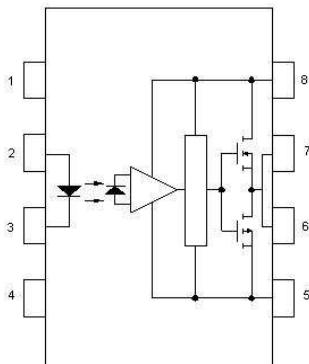


**Fig.9 Propagation Delay Time vs. Ambient Temperature**

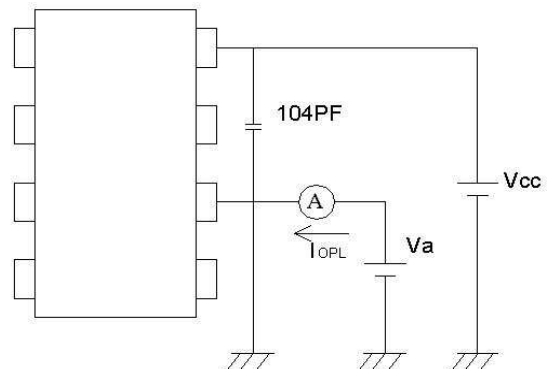


● **Test Circuit**

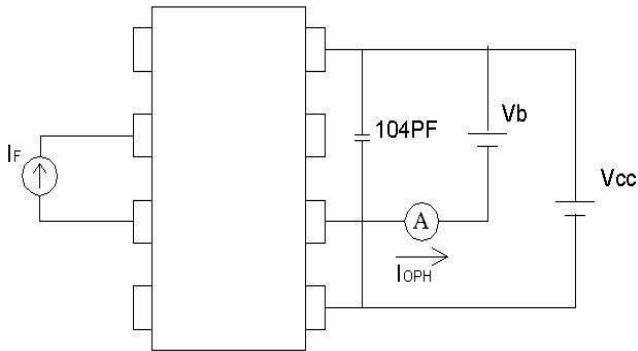
**1. Top View**



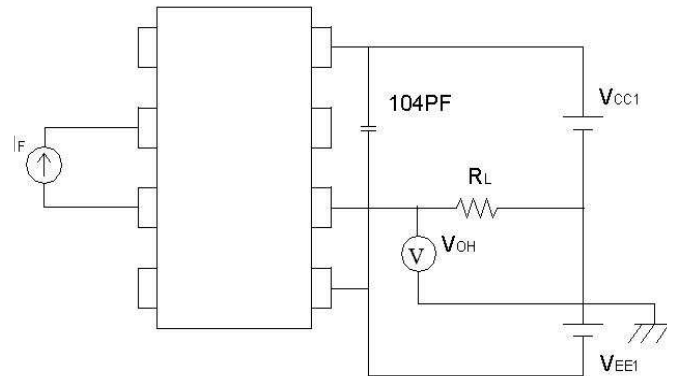
**2. IOPL Measure**



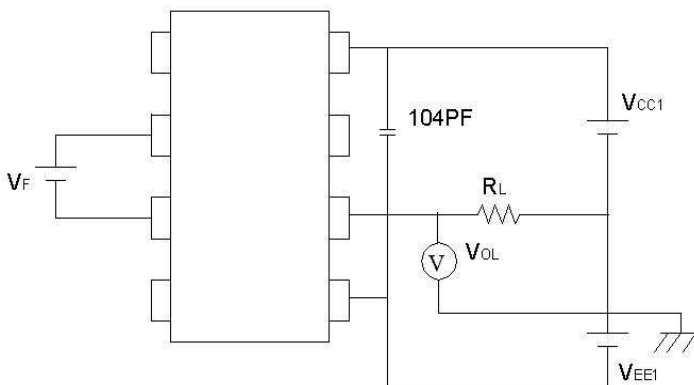
### 3. $I_{OPH}$ Measure



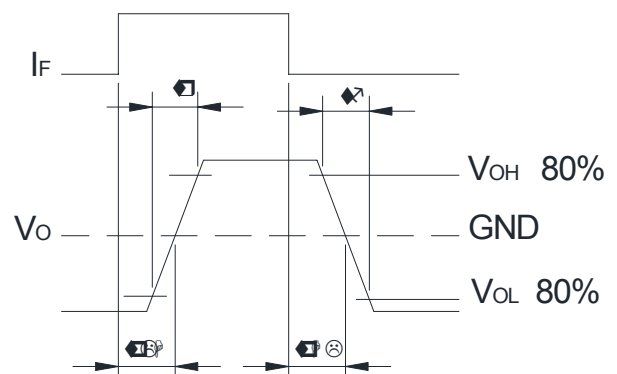
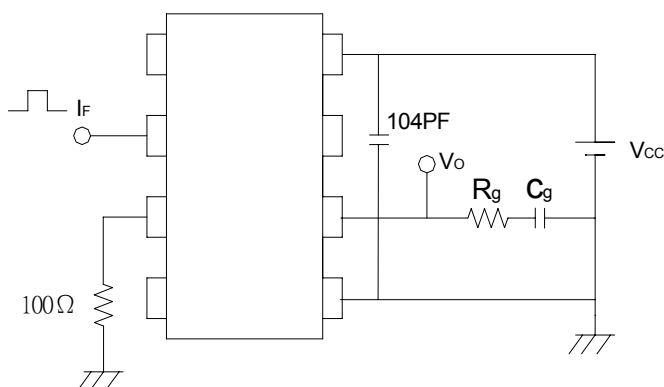
### 4. $V_{OH}$ Measure



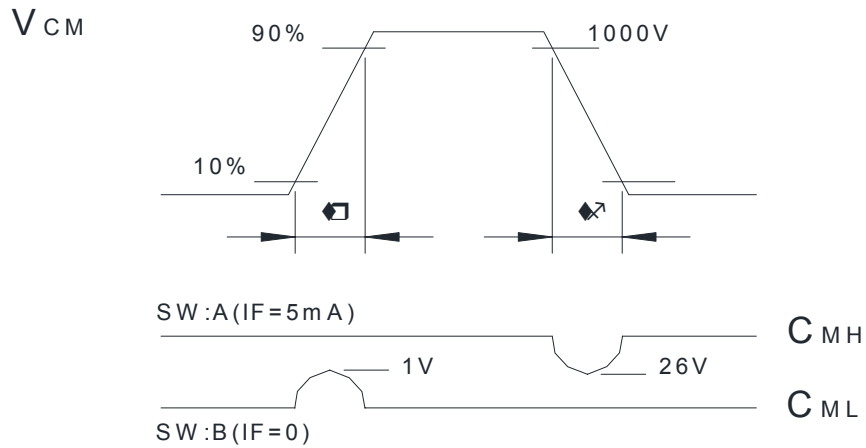
### 5. $V_{OL}$ Measure



### 6. $t_{pLH}$ , $t_{pHL}$ , $t_r$ , $t_f$ Measure



## 7. $C_{MH}$ , $C_{ML}$ Measure



$$C_{ML} = \frac{800(V)}{t_r (\mu s)} \quad ; \quad C_{MH} = \frac{800(V)}{t_f (\mu s)}$$

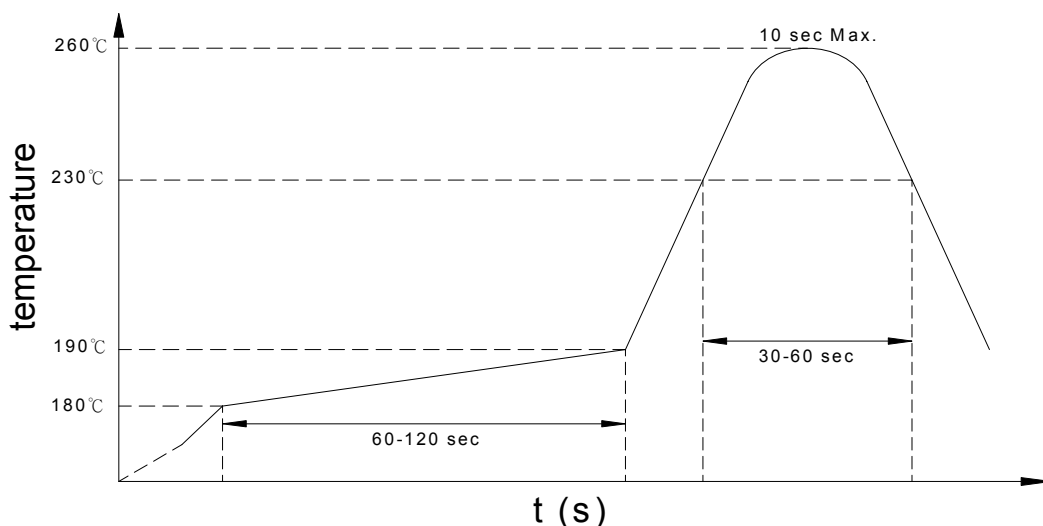
\* $C_{ML}$ ( $C_{MH}$ ) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

## ● Recommended Soldering Conditions

### (a) Infrared reflow soldering :

- Peak reflow soldering : 260°C or below (package surface temperature)
- Time of peak reflow temperature : 10 sec
- Time of temperature higher than 230°C : 30-60 sec
- Time to preheat temperature from 180~190°C : 60-120 sec
- Time(s) of reflow : Two
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

### Recommended Temperature Profile of Infrared Reflow



### (b) Wave soldering :

- Temperature : 260°C or below (molten solder temperature)
- Time : 10 seconds or less
- Preheating conditions : 120°C or below (package surface temperature)
- Time(s) of reflow : One
- Flux : Rosin flux containing small amount of chlorine (The flux with a maximum chlorine content of 0.2 Wt% is recommended.)

### (c) Cautions :

- Fluxes : Avoid removing the residual flux with freon-based and chlorine-based cleaning solvent.
- Avoid shorting between portion of frame and leads.

- **Numbering System**

## KTLP350 X (Y)

**Notes:**

KTLP350 = Part No.

X = Lead form option (blank · S · H · L )

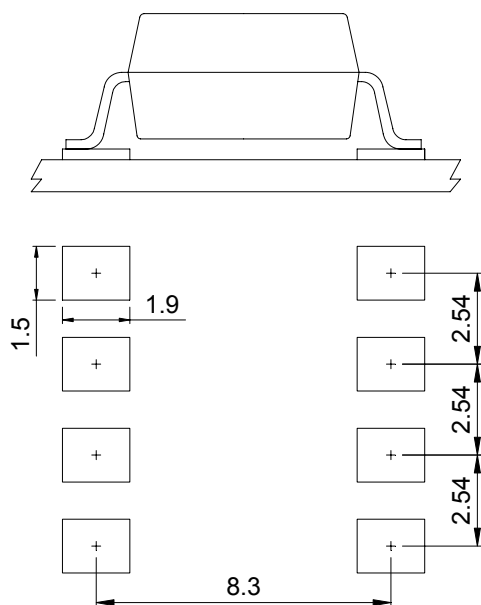
Y = Tape and reel option (TL · TR · TLD · TRU)

Option	Description	Packing quantity
S (TL)	surface mount type package + TL tape & reel option	1000 units per reel
S (TR)	surface mount type package + TR tape & reel option	1000 units per reel
L (TLD)	long creepage distance for surface mount type package + TLD tape & reel option	800 units per reel
L (TRU)	long creepage distance for surface mount type package + TRU tape & reel option	800 units per reel

- **Recommended Pad Layout for Surface Mount Lead Form**

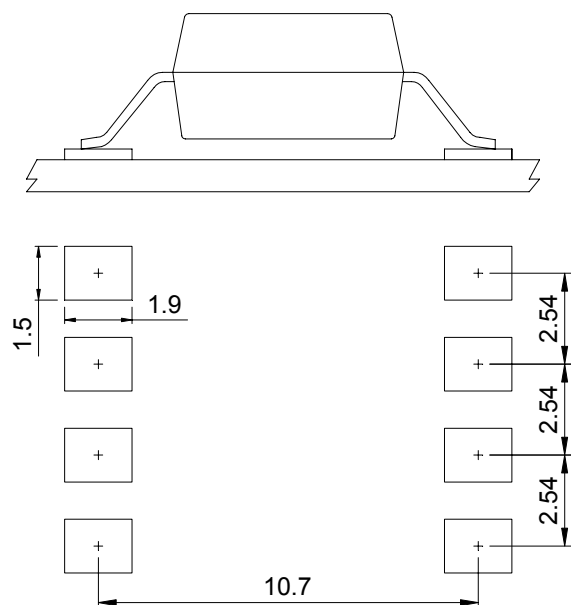
### 1.Surface mount type

8-pin SMD



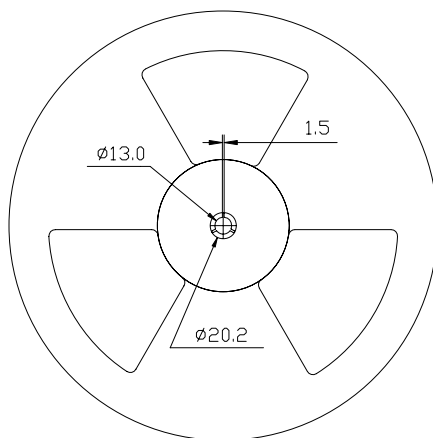
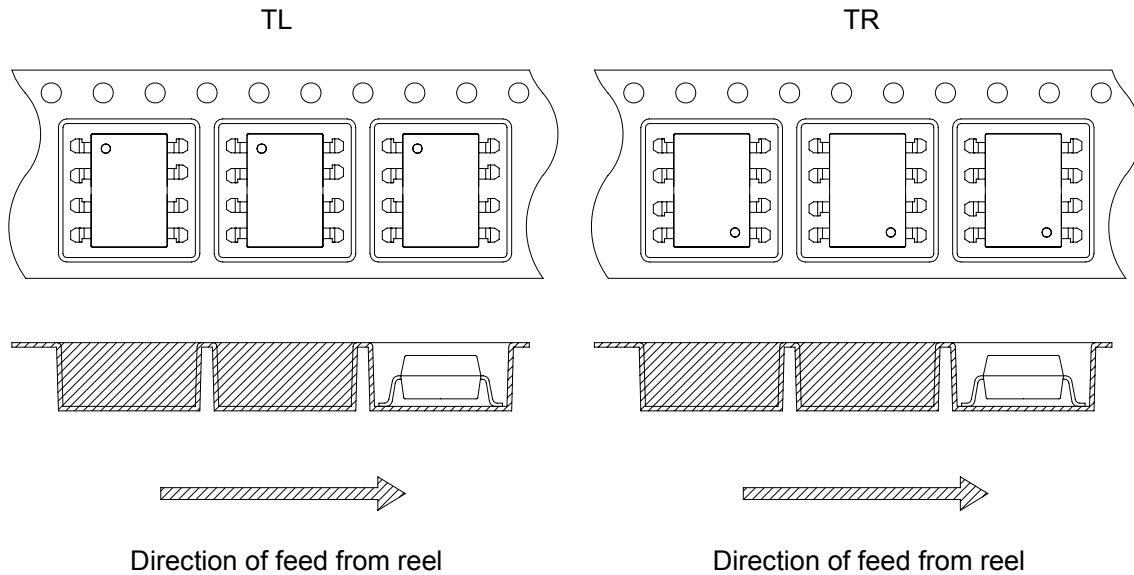
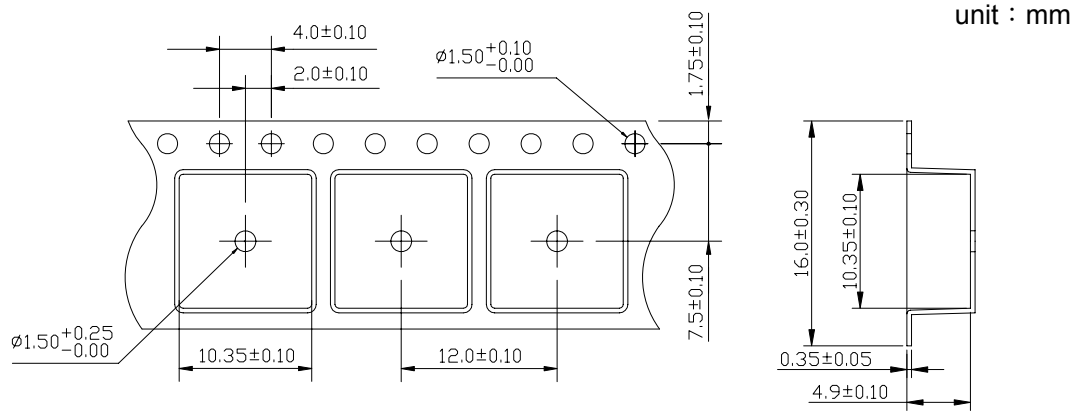
### 2.Long creepage distance for surface mount type

8-pin L

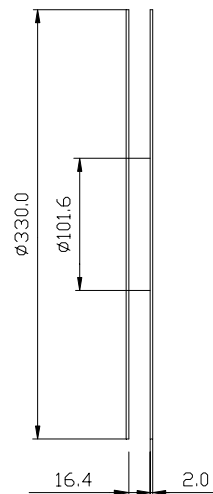


Unit :mm

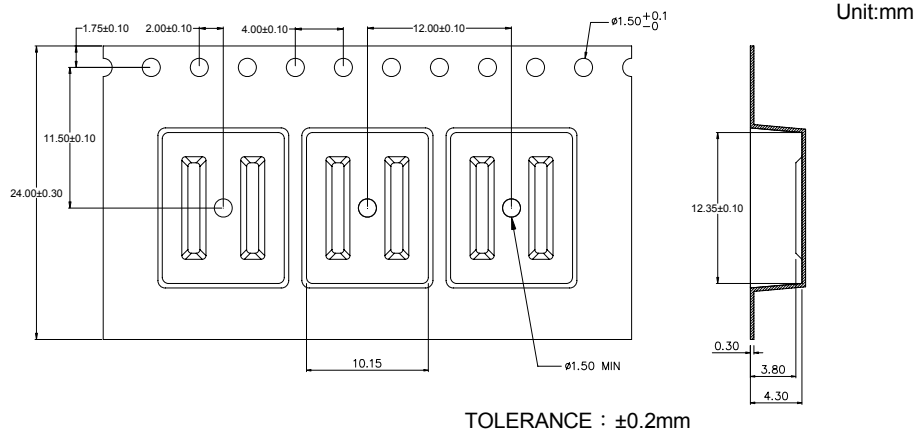
● 8-pin SMD Carrier Tape & Reel



Quantity : 1000pcs/reel

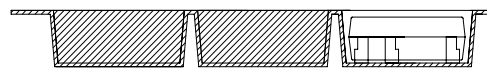
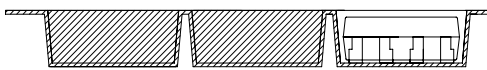
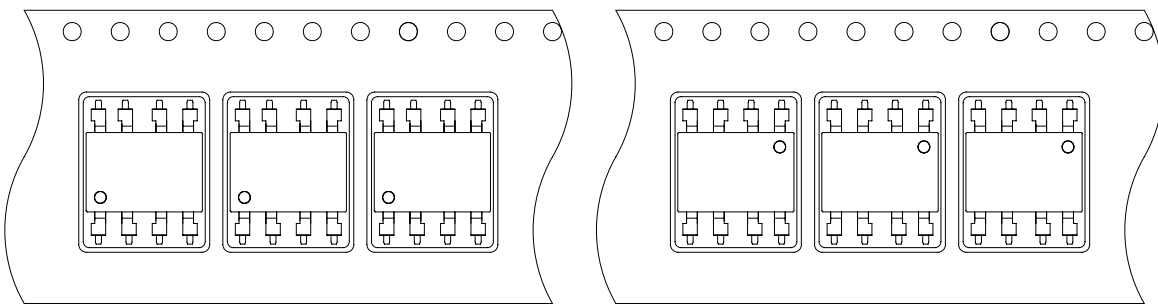


● 8-pin L Carrier Tape & Reel



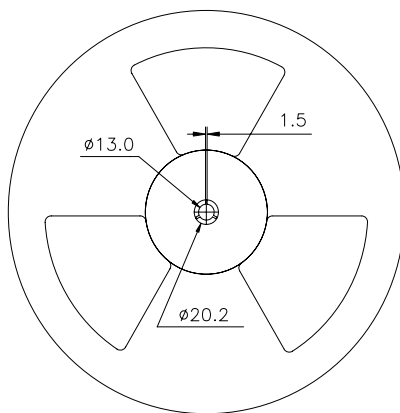
TLD

TRU

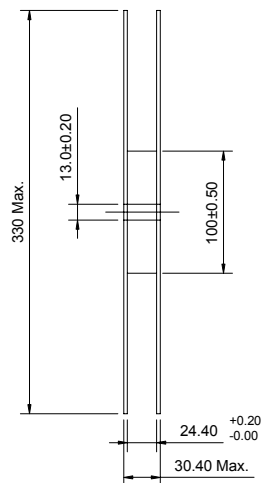


Direction of feed from reel

Direction of feed from reel



Quantity : 800pcs/reel



- **Application Notice**

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- f. Measurement equipment
- g. Consumer electronics
- h. Telecommunication

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