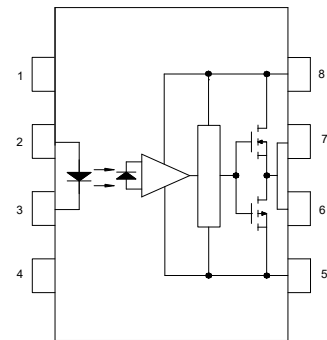


● Description

The KTLP350 contain a GaAlAs light emitter diode optically coupled to an integrated circuit with a power output stage.

. KTLP350 series photo coupler is ideally suited for driving IGBT and power MOSFET used in motor control inverter application and inverter power system.

● 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. Input threshold current: $I_f=5\text{mA}(\text{max.})$
2. Supply current (I_{cc}): 3 mA (max.)
3. Supply voltage (V_{cc}): 10 – 30V
4. Output current (I_O): $\pm 2.5\text{A}(\text{max.})$
5. Switching time (t_{pLH}/t_{pHL}): $0.5\mu\text{s}(\text{max.})$
6. Isolation voltage: $5000\text{V}_{\text{rms}}(\text{min.})$
7. Agency Approvals:
 - UL Approved (No. E169586): UL1577
 - c-UL Approved (No. E169586)
 - VDE Approved (No. 40020973): DIN EN60747-5-5

● Applications

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

● Truth Table

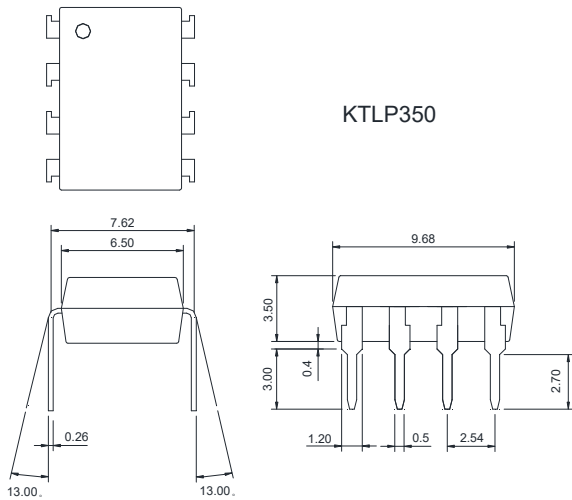
| LED | OUTPUT | Q1 | Q2 |
|-----|------------|-----|-----|
| ON | HIGH LEVEL | ON | OFF |
| OFF | LOW LEVEL | OFF | ON |

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

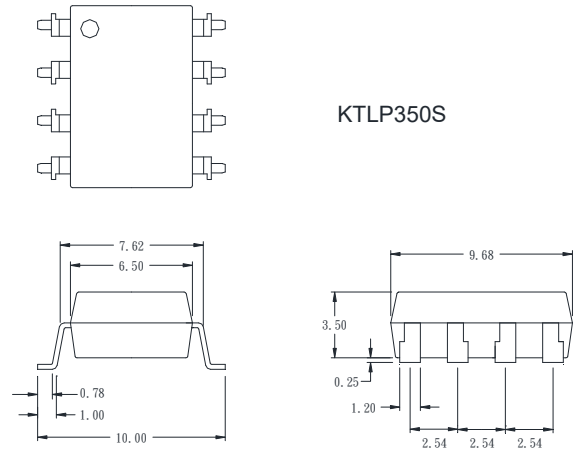
● **Outside Dimension**

Unit : mm

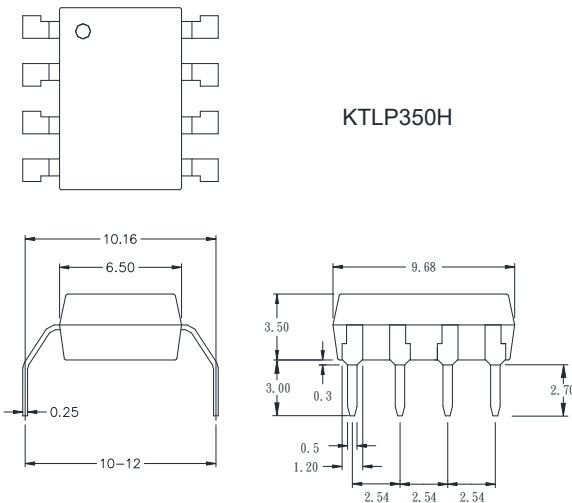
1. Dual-in-line type



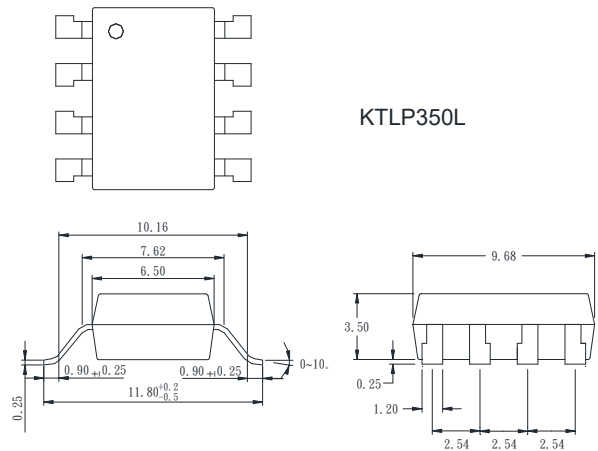
2. Surface mount type



3. Long creepage distance type

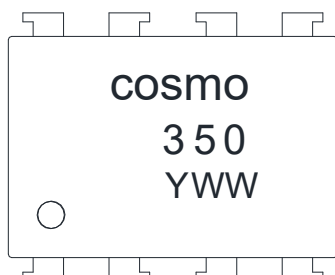


4. Long creepage distance for surface mount type



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 |
| | 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 | V_O | 35 | V |
| | Supply voltage | V_{CC} | 35 | V |
| | Junction temperature | T_j | 125 | °C |
| Operating frequency (*Note 3) | | f | 50 | KhZ |
| Operating temperature range | | T_{opr} | -40~110 | °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.

● Recommend Operation Conditions

| Parameter | Symbol | Min. | Max. | Unit |
|-----------------------|--------------|------|------|------|
| Operating Temperature | T_A | -40 | 110 | °C |
| Supply Voltage | V_{CC} | 10 | 30 | V |
| Input Current (ON) | $I_{F(ON)}$ | 7 | 16 | mA |
| Input Voltage (OFF) | $V_{F(OFF)}$ | 0 | 0.8 | V |

● Electrical Characteristics

(Ta = 25°C)

| Parameter | Symbol | Test Circuit | Test Condition | Min. | Typ. | Max. | Unit | |
|-----------------------|-----------|--------------|------------------------------|-------------------------------------|------|------|---------|---|
| Input forward voltage | V_F | — | $I_F=10mA, Ta=25^\circ C$ | — | 1.4 | 1.8 | V | |
| 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 | $V_{CC}=30V, I_F=5mA$ $V_b=3.5V$ | — | -1.6 | -1.0 | A |
| | | | | $V_{CC}=15V, I_F=5mA$ $V_b=7.0V$ | — | — | -2.0 | |

| | | | | | | | | |
|-------------------------|--------------|-----------|---|---|------|-------|-----|----|
| | "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 | $I_F=10mA, I_O=-100mA$ | 29.7 | 29.88 | — | V |
| | "L" level | V_{OL} | 5 | $I_F=0mA, I_O=100mA$ | — | 0.1 | 0.3 | |
| Supply current | "H" level | I_{CCH} | — | $V_{CC}=30V, I_F=10mA,$ $T_a=25^\circ C$ | — | 1.7 | 3.0 | mA |
| | "L" level | I_{CCL} | — | $V_{CC}=30V, I_F=0mA,$ $T_a=25^\circ C$ | — | 2.1 | 3.0 | |
| Threshold input current | "Output L→H" | I_{FLH} | — | $V_{CC1}=15V,$ $V_o>1V, I_o=0mA$ | — | 2.6 | 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 |

*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" | t_{PLH} | $I_F=5mA$ (Note8) $V_{CC}=30V$ $R_g=20\Omega, C_g=10nF$ | 50 | 120 | 500 | ns |
| | "H→L" | t_{PHL} | | 50 | 120 | 500 | |
| Output rise time | t_r | 6 | | — | 20 | — | |
| Output fall time | t_f | | | — | 15 | — | |
| Common mode transient immunity at high level output | $ C_{MH} $ | 7 | $V_{CM}=1000Vp-p, I_F=5mA$ $V_{CC}=30V, V_o(\min)=26V$ $T_a=25^\circ C$ | 20 | — | — | KV / μs |
| Common mode transient immunity at low level output | $ C_{ML} $ | 7 | $V_{CM}=1000Vp-p, I_F=0$ $V_{CC}=30V, V_o(\max)=1V$ $T_a=25^\circ C$ | 20 | — | — | KV / μs |

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

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

TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

Fig.1 High output rail voltage vs. Temperature

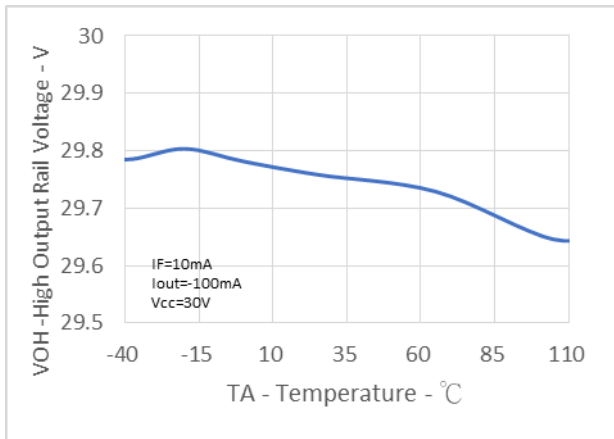


Fig.2 V_{OH} vs. Temperature

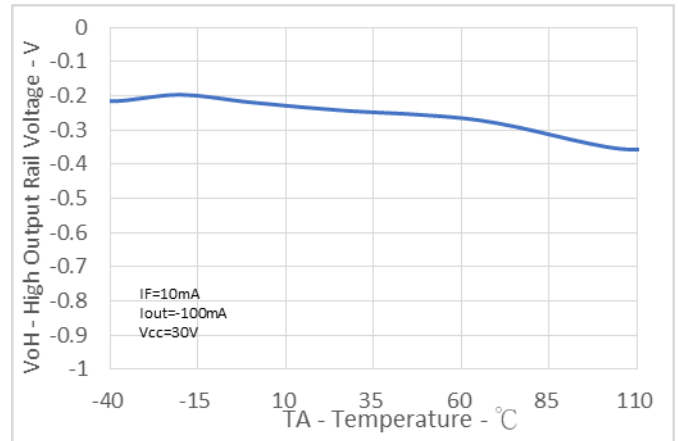


Fig.3 VOL vs. Temperature

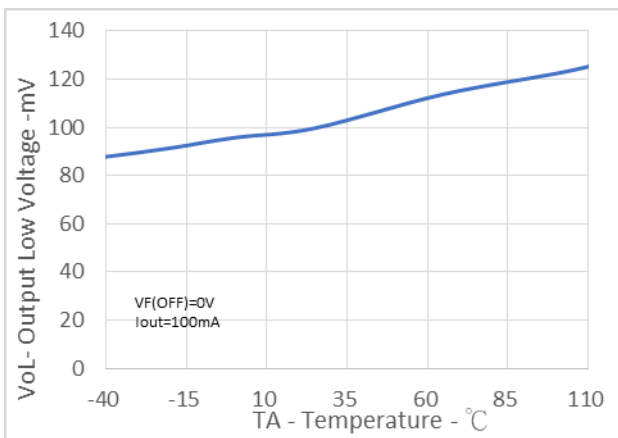


Fig.4 ICC vs. Temperature

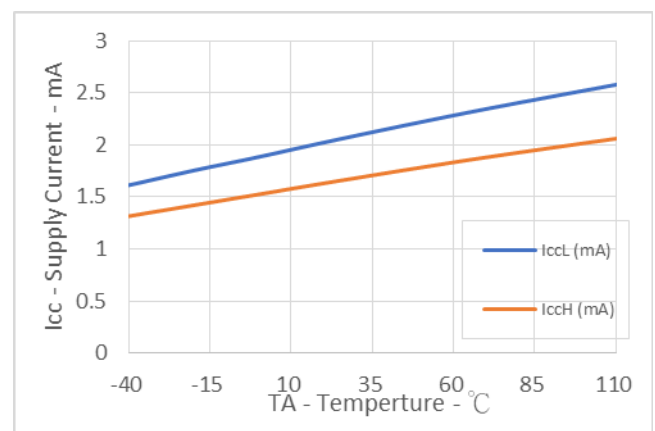


Fig.5 ICC vs. VCC

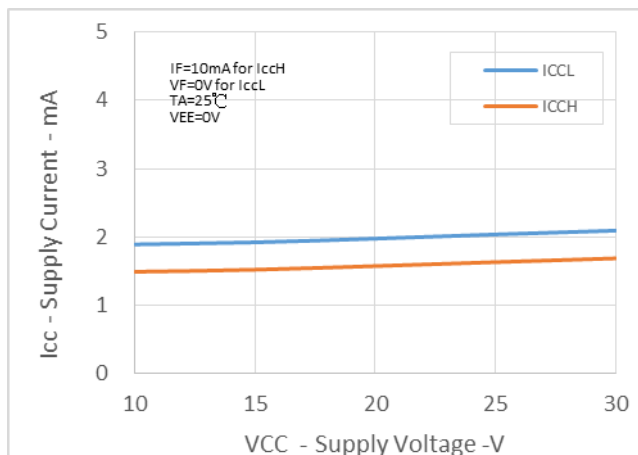


Fig. 6 IFLH Hysteresis

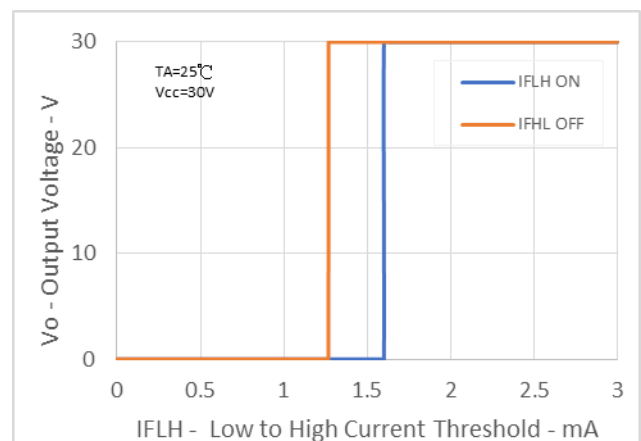


Fig.7 IFLH vs. Temperature

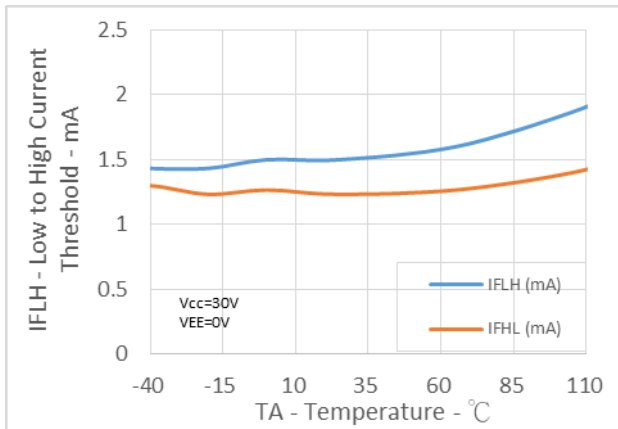


Fig.8 Propagation Delays vs. VCC

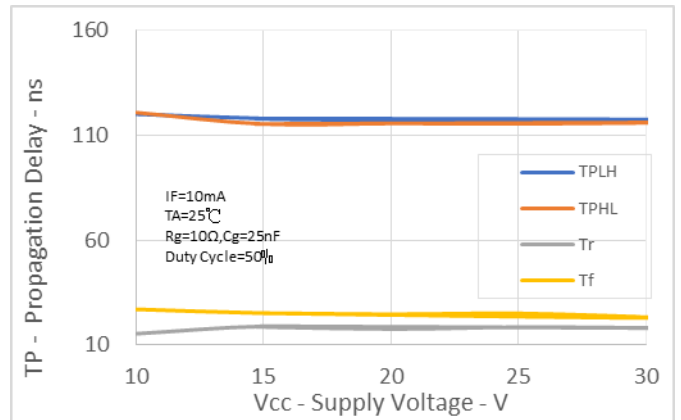


Fig.9 Propagation Delays vs. IF

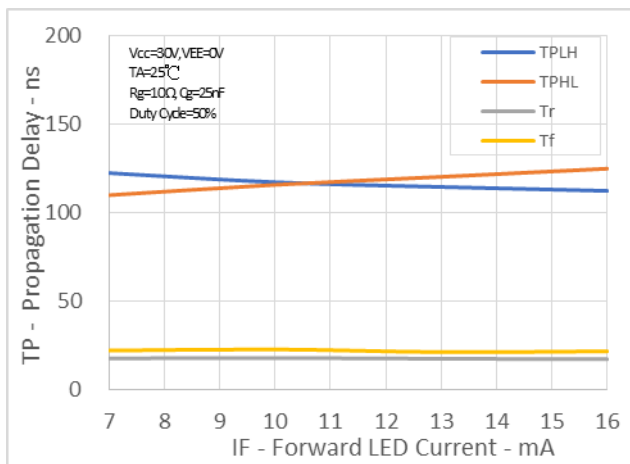


Fig.10 Propagation Delays vs. Temperature

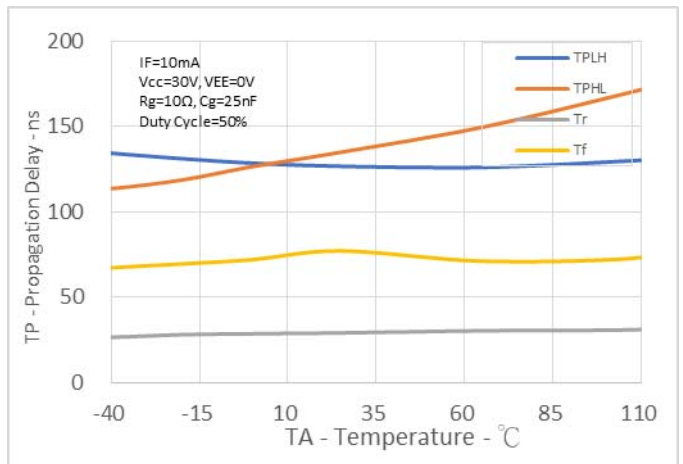


Fig.11 Propagation Delay vs Rg

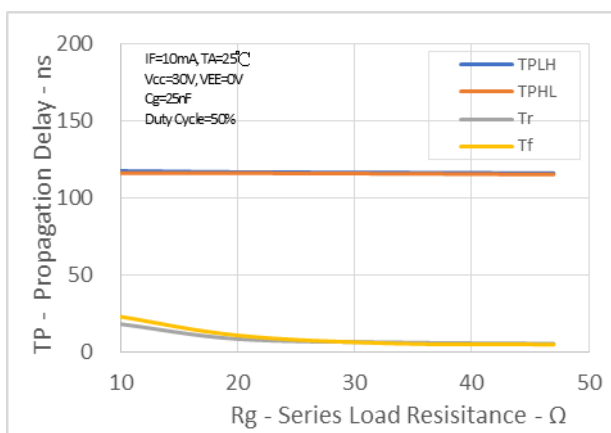


Fig. 12 Propagation Delay vs. Cg

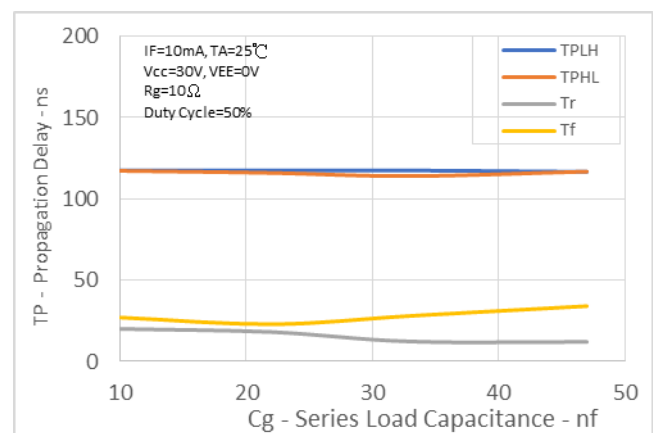
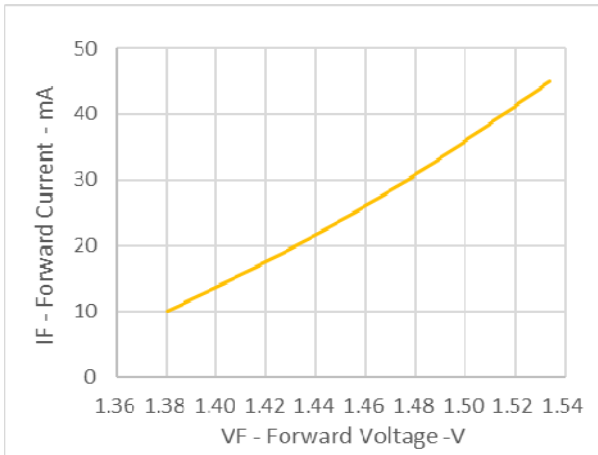
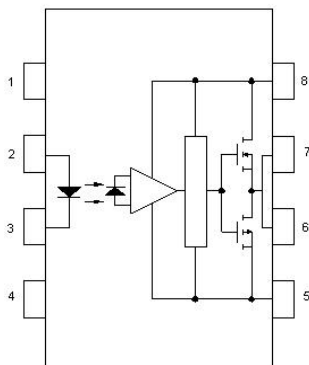


Fig.13 Input Current vs. Forward Voltage

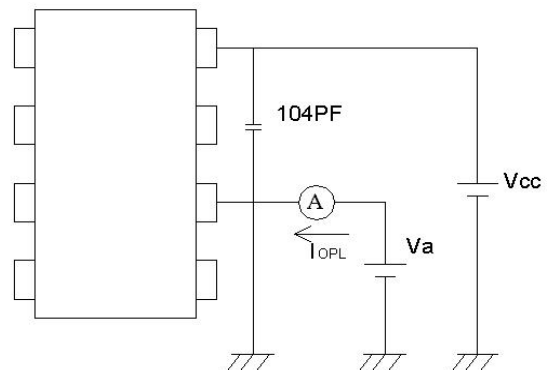


● **Test Circuit**

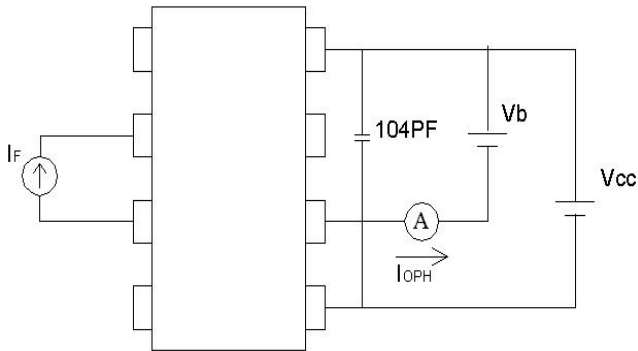
1. Top View



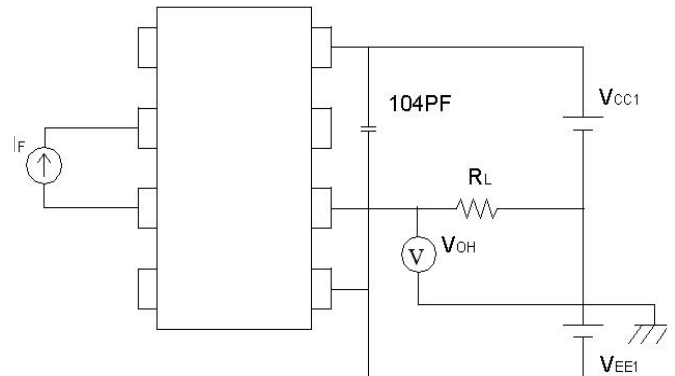
2. I_{OPL} Measure



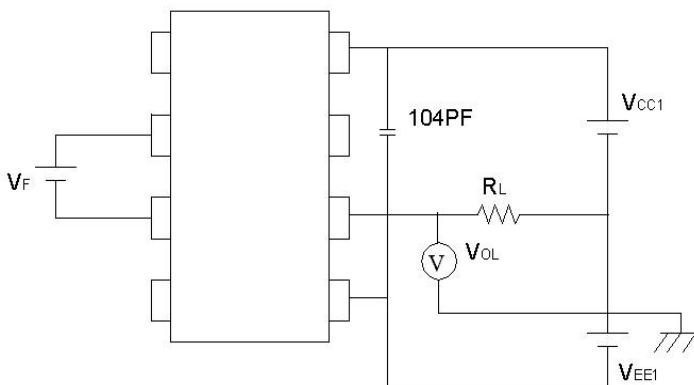
3. I_{OPH} Measure



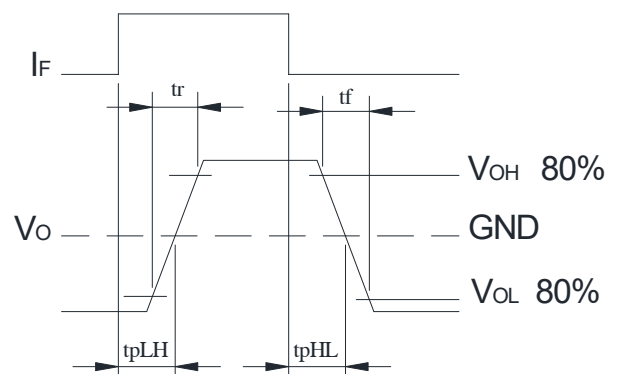
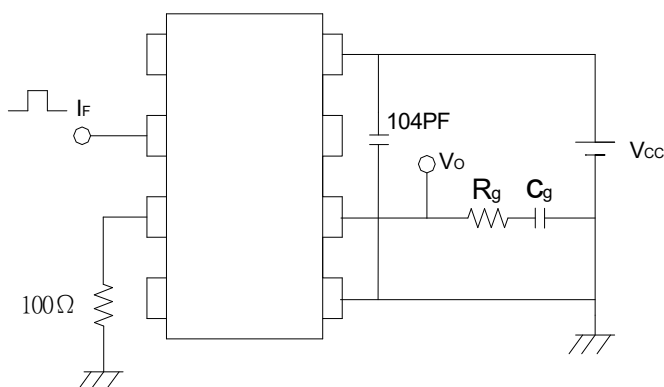
4. V_{OH} Measure



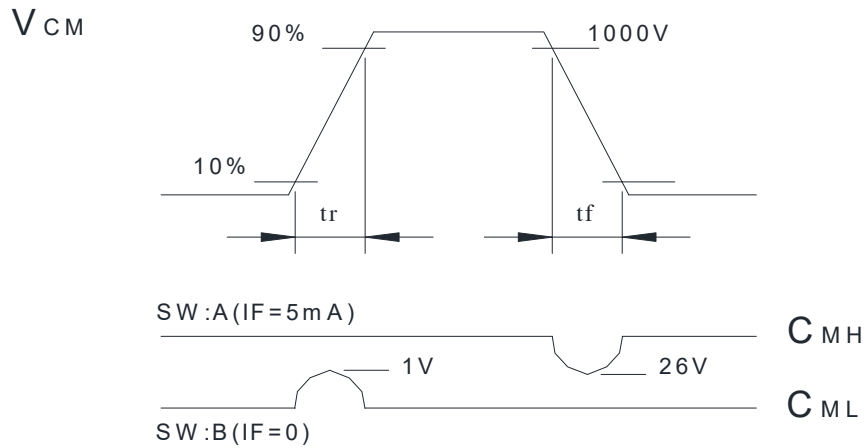
5. V_{OL} Measure



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



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



$$C_{ML} = \frac{1000(v)}{t_r(\mu s)} \quad ; \quad C_{MH} = \frac{1000(v)}{t_f(\mu s)}$$

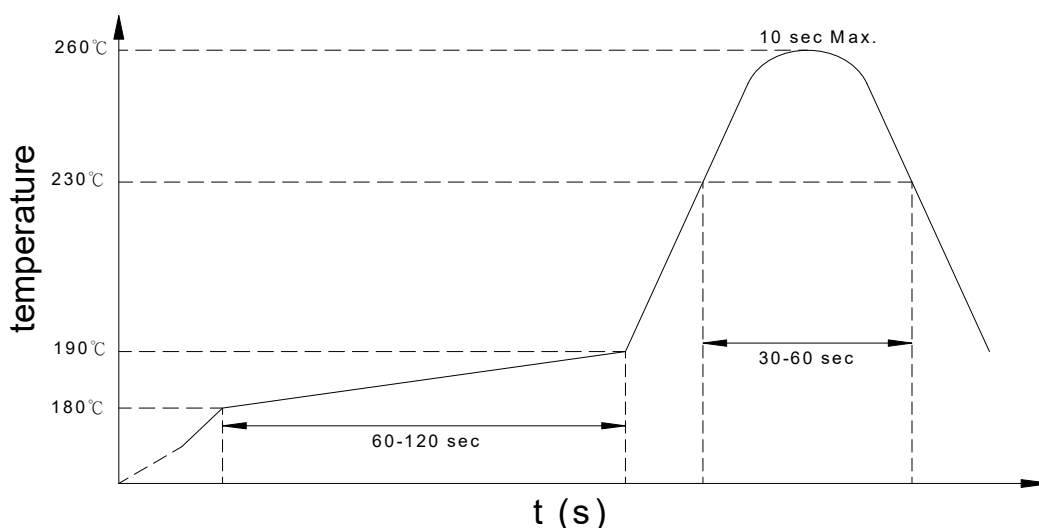
* $C_{ML}(C_{MH})$ is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

● **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)

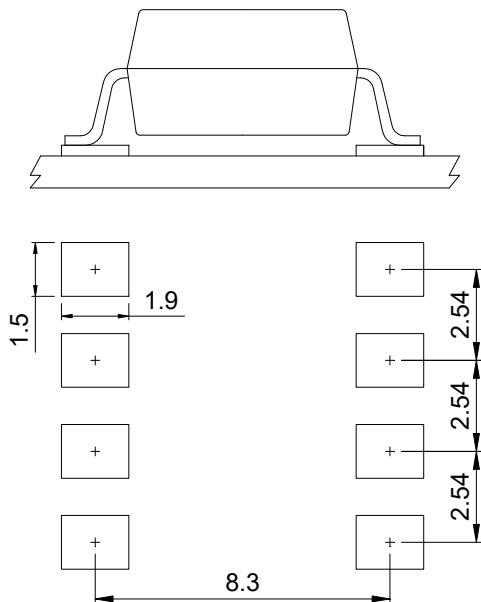
Y = Tape and reel option (TL · TR)

| 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 |

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

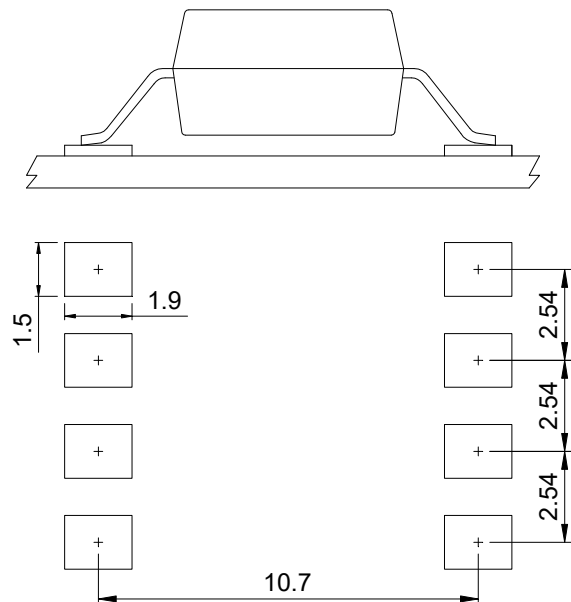
1.Surface mount type

8-pin SMD



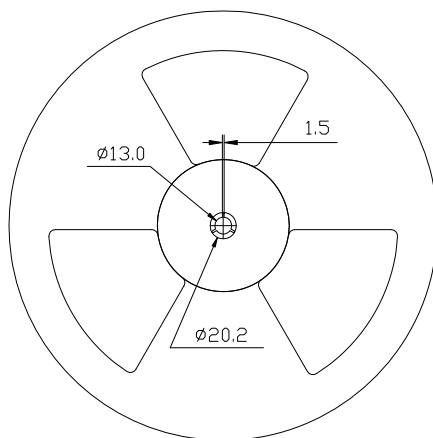
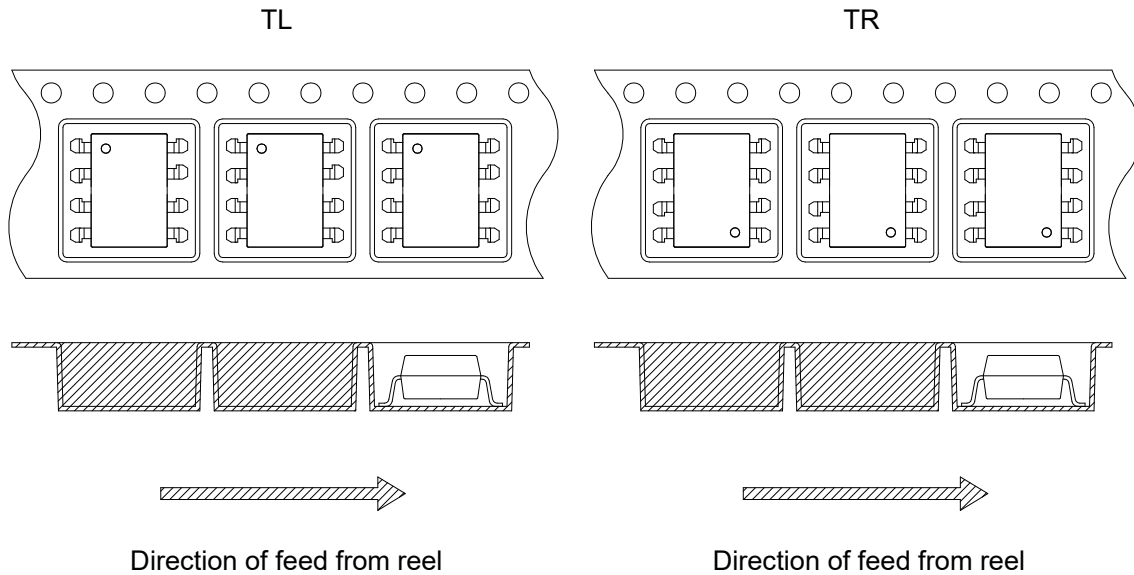
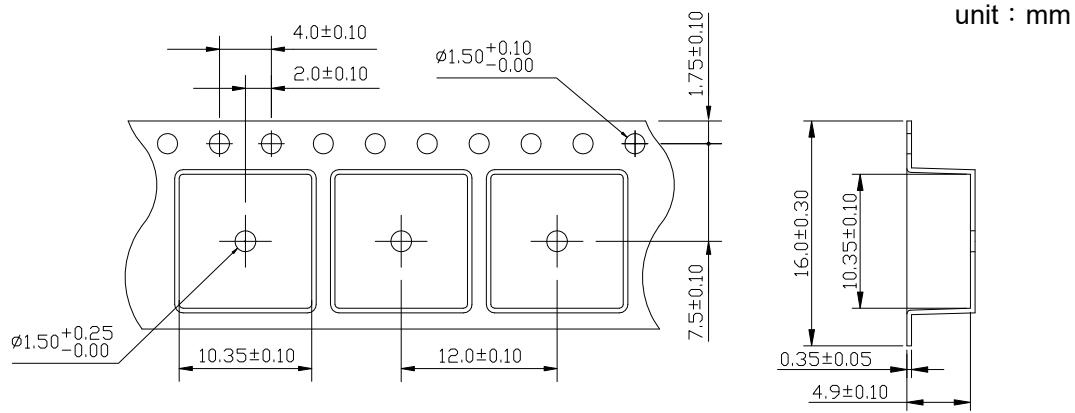
2.Long creepage distance for surface mount type

8-pin L

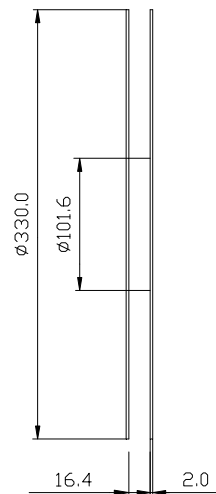


Unit : mm

● 8-pin SMD Carrier Tape & Reel



Quantity : 1000pcs/reel



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