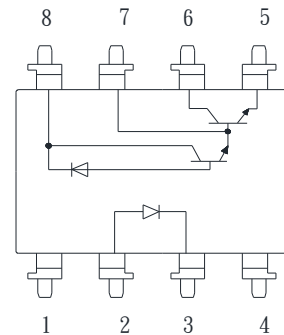


### ● Description

The KPC6N139 series consist of an LED, optically coupled to a photodarlington and high-speed digital output. It is packaged in a 8 pin DIP package and available in wide-lead spacing and SMD option.

### ● Schematic



- |            |                    |
|------------|--------------------|
| 1. N.C.    | 5. GND             |
| 2. Anode   | 6. Vo              |
| 3. Cathode | 7. V <sub>B</sub>  |
| 4. N.C.    | 8. V <sub>CC</sub> |

### ● Features

1. Pb free and RoHS compliant
2. High current transfer ratio (CTR:Min.500% at I<sub>F</sub> =1.6mA)
3. High-speed response (t<sub>PHL</sub>: typ.0.2us at R<sub>L</sub>=270Ω)
4. High common mode rejection voltage(CMH: typ. 500V/us)
5. TTL compatible output
6. MSL class 1
7. Agency Approvals:
  - UL Approved (No. E169586): UL1577
  - c-UL Approved (No. E169586)
  - FIMKO Approved: EN60065, EN60950

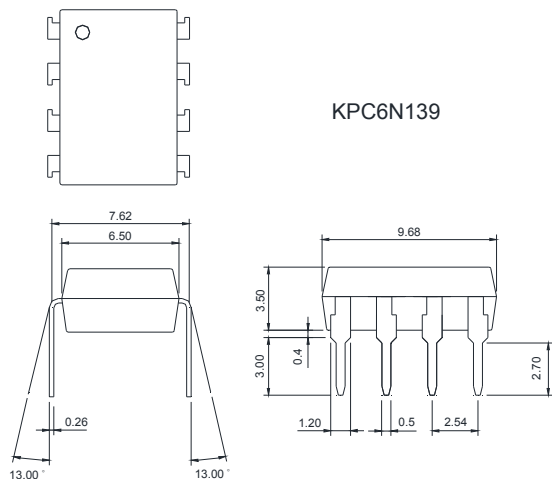
### ● Applications

- Interfaces for computer peripherals
- Electronic calculators, measuring instruments, control equipment
- Telephone sets
- Signal transmission between circuits of different potentials and impedances

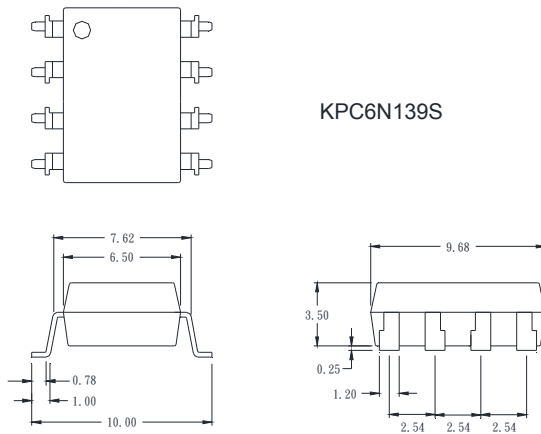
### ● Outside Dimension

Unit : mm

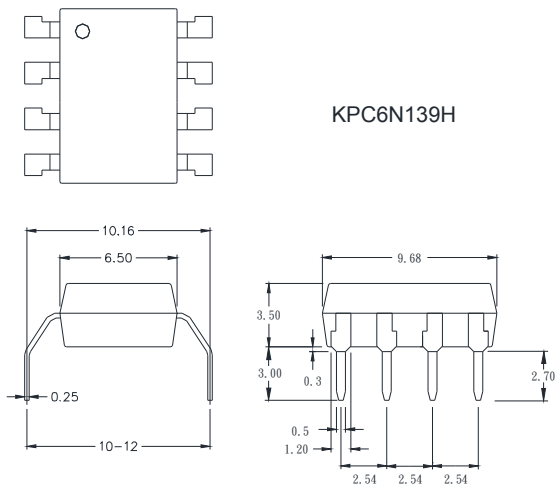
#### 1. Dual-in-line type



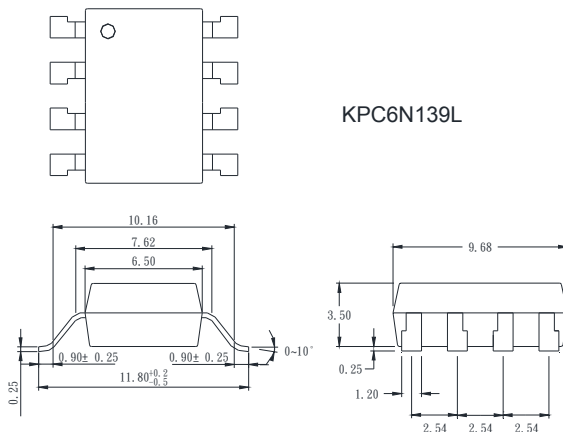
#### 2. Surface mount type



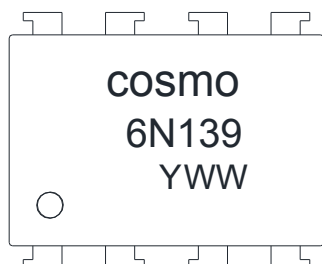
#### 3. Long creepage distance type



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



### ● Device Marking



#### Notes:

cosmo  
6N139  
YWW      Y: Year code / WW: Week code

### ● Absolute Maximum Ratings

(Ta = 25°C)

| Parameter                           |                                                      | Symbol    | Rating      | Unit |
|-------------------------------------|------------------------------------------------------|-----------|-------------|------|
| Input                               | Forward current                                      | $I_F$     | 20          | mA   |
|                                     | *1 Peak forward current                              | $I_F$     | 40          | mA   |
|                                     | *2 Peak transient forward current                    | $I_{FM}$  | 1           | A    |
|                                     | Reverse voltage                                      | $V_R$     | 5           | V    |
|                                     | Power dissipation                                    | $P_D$     | 35          | mW   |
| Output                              | Supply voltage                                       | $V_{CC}$  | -0.5 to 18  | V    |
|                                     | Output voltage                                       | $V_O$     | -0.5 to 18  | V    |
|                                     | Emitter-base reverse with-stand voltage (Pin 5 to 7) | $V_{EBO}$ | 0.5         | V    |
|                                     | *3 Average output current                            | $I_O$     | 60          | mA   |
|                                     | Power dissipation                                    | $P_O$     | 100         | mW   |
|                                     | *4 Isolation voltage 1 minute                        | $V_{ISO}$ | 5000        | Vrms |
| Operating temperature               |                                                      | $T_{opr}$ | -40 to +100 | °C   |
| Storage temperature                 |                                                      | $T_{stg}$ | -55 to +125 | °C   |
| *5 Soldering temperature 10 seconds |                                                      | $T_{sol}$ | 260         | °C   |

\*1 50% duty cycle, pulse width : 1mS

\*2 Pulse width ≤ 1μS, 300 pulse/sec

\*3 Decreases at the rate of 0.7mA/°C if the external temperature is 25°C or more

\*4 40% to 60% RH, AC for 1 minute

\*5 For 10 seconds

### ● Electro-optical Characteristics

(Ta = 25°C)

| Parameter                                     | Symbol                    | Conditions                                        | Min. | Typ.      | Max. | Unit  |
|-----------------------------------------------|---------------------------|---------------------------------------------------|------|-----------|------|-------|
| *6 Current transfer ratio                     | CTR(1)                    | $I_F=0.5mA, V_O=0.4V, V_{CC}=4.5V$                | 400  | 1800      | -    | %     |
|                                               | CTR(2)                    | $I_F=1.6mA, V_O=0.4V, V_{CC}=4.5V$                | 500  | 1600      | -    | %     |
| Logic ( 0 ) output voltage                    | $V_{OL}(1)$               | $I_F=6.4mA, I_O=1.6mA, V_{CC}=4.5V$               | -    | 0.1       | 0.4  | V     |
|                                               | $V_{OL}(2)$               | $I_F=5mA, I_O=15mA, V_{CC}=4.5V$                  | -    | 0.1       | 0.4  | V     |
|                                               | $V_{OL}(3)$               | $I_F=12mA, I_O=24mA, V_{CC}=4.5V$                 | -    | 0.1       | 0.4  | V     |
| Logic ( 1 ) output current                    | $I_{OH}$                  | $I_F=0, V_O=V_{CC}=18V$                           | -    | 0.05      | 100  | μA    |
| Logic ( 0 ) supply current                    | $I_{CCL}$                 | $I_F=1.6mA, V_O=open, V_{CC}=5V$                  | -    | 0.5       | -    | mA    |
| Logic ( 1 ) supply current                    | $I_{CCH}$                 | $I_F=0, V_F=open, V_{CC}=5V$                      | -    | 10        | -    | nA    |
| Input forward voltage                         | $V_F$                     | $T_a=25^\circ C, I_F=1.6mA$                       | -    | 1.5       | 1.7  | V     |
| Input forward voltage temperature coefficient | $\Delta V_F / \Delta T_a$ | $I_F=1.6mA$                                       | -    | -1.9      | -    | mV/°C |
| Input reverse voltage                         | $BV_R$                    | $T_a=25^\circ C, I_R=10\mu A$                     | 5.0  | -         | -    | V     |
| Input capacitance                             | $C_{IN}$                  | $V_F=0, f=1MHz$                                   | -    | 60        | -    | pF    |
| *7 Leak current ( input-output )              | $I_{I-O}$                 | $T_a=25^\circ C, 45\%RH$<br>$V_{I-O}=3KVDC, t=5s$ | -    | -         | 1.0  | μA    |
| *7 Isolation resistance ( input-output )      | $R_{I-O}$                 | $V_{I-O}=500VDC$                                  | -    | $10^{12}$ | -    | Ω     |
| *7 Capacitance ( input-output )               | $C_{I-O}$                 | $f=1MHz$                                          | -    | 0.6       | -    | pF    |

\*6 Current transfer ratio is the ratio of input current and output current expressed in %

\*7 Measured as 2-pin element (Short 1,2,3,4 and 5,6,7,8)

### ● Switching Characteristics

(Ta=25°C, Vcc=5V)

| Parameter                                                             | Symbol    | Conditions                                         | Min. | Typ. | Max. | Unit       |
|-----------------------------------------------------------------------|-----------|----------------------------------------------------|------|------|------|------------|
| *8 Propagation delay time<br>Output (1)→(0)                           | $t_{PHL}$ | $R_L=4.7K\Omega, I_F=0.5mA$                        | -    | 5    | 25   | $\mu S$    |
|                                                                       |           | $R_L=270\Omega, I_F=12mA$                          | -    | 0.3  | 1    | $\mu S$    |
| *8 Propagation delay time<br>Output (0)→(1)                           | $t_{PLH}$ | $R_L=4.7K\Omega, I_F=0.5mA$                        | -    | 10   | 60   | $\mu S$    |
|                                                                       |           | $R_L=270\Omega, I_F=12mA$                          | -    | 1.5  | 7    | $\mu S$    |
| *9 Instantaneous common<br>*10 mode rejection voltage<br>"Output (1)" | $C_{MH}$  | $I_F=0, V_{CM}=10V_{P-P},$<br>$R_L=2.2K\Omega$     | -    | 500  | -    | V/ $\mu S$ |
| *9 Instantaneous common<br>*10 mode rejection voltage<br>"Output (0)" | $C_{ML}$  | $I_F=1.6mA, V_{CM}=10V_{P-P},$<br>$R_L=2.2K\Omega$ | -    | -500 | -    | V/ $\mu S$ |

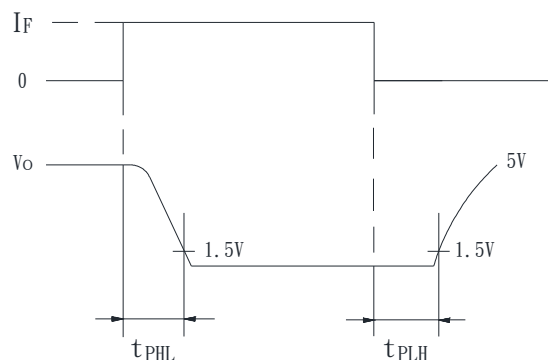
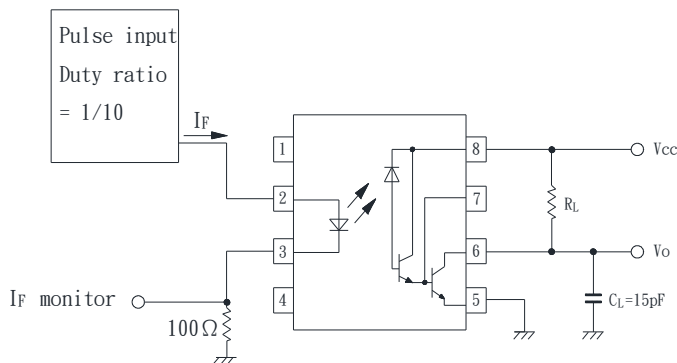
\*9 Instantaneous common mode rejection voltage " output (1) " represents

a common mode voltage variation that can hold the output above (1) level (  $V_o > 2.0V$  )

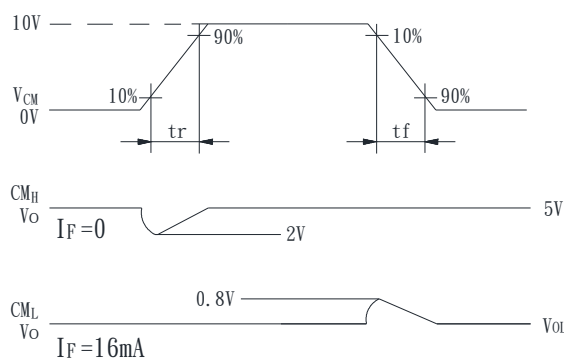
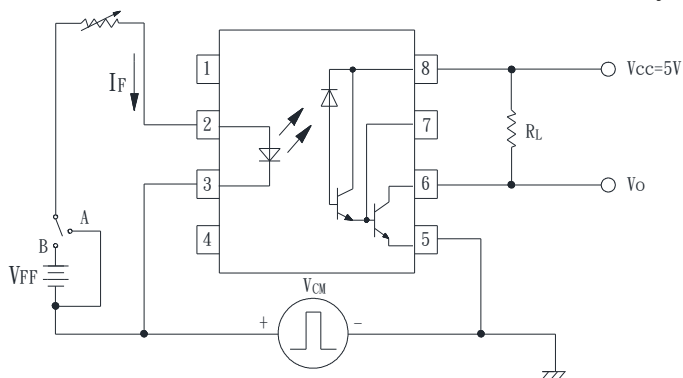
\*10 Instantaneous common mode rejection voltage " output (0) " represents

a common mode voltage variation that can hold the output above (0) level (  $V_o < 0.8V$  )

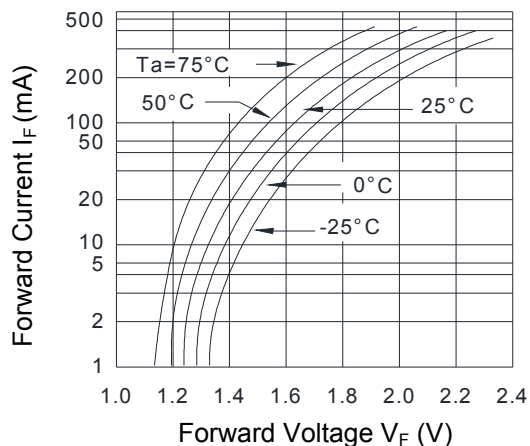
\*8 Test Circuit for Propagation Delay time



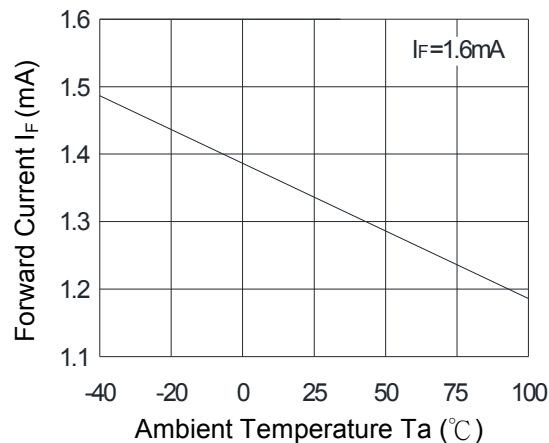
\*10 Test Circuit for Instantaneous Common Mode Rejection Voltage



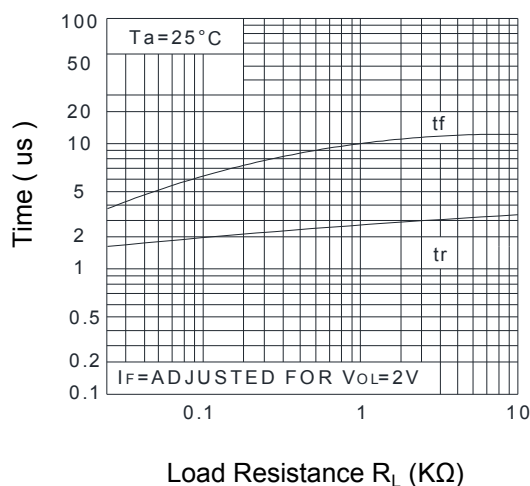
**Fig.1 Forward Current  
vs. Forward Voltage**



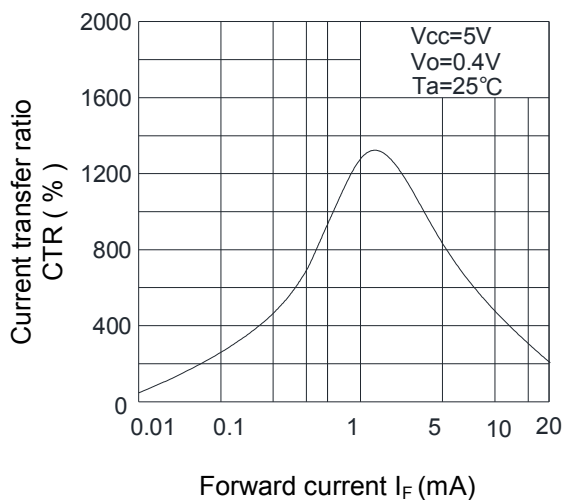
**Fig.2 Forward Current  
vs. Ambient Temperature**



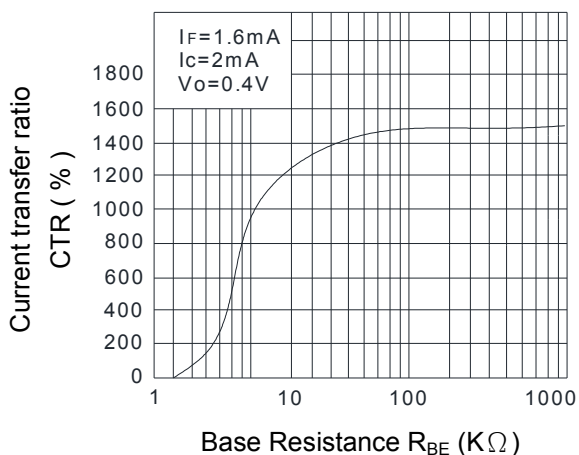
**Fig.3 Response and Fall Time  
vs. Load Resistance**



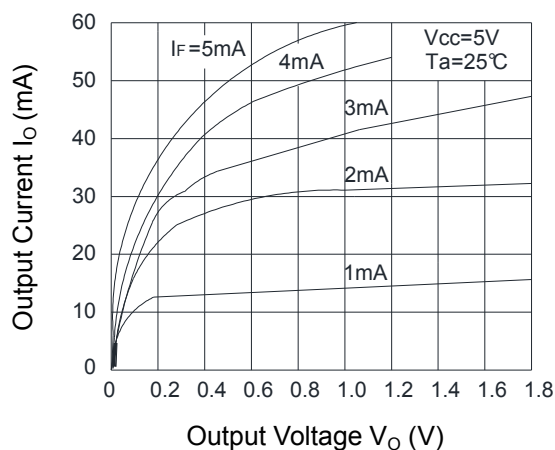
**Fig.4 Current Transfer Ratio  
vs. Forward Current**



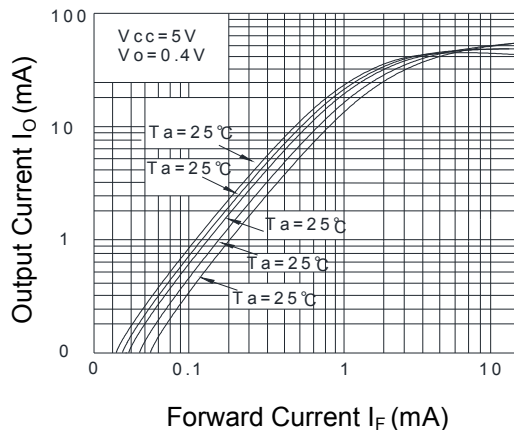
**Fig.5 Current Transfer Ratio  
vs. Base-Emitter Resistance**



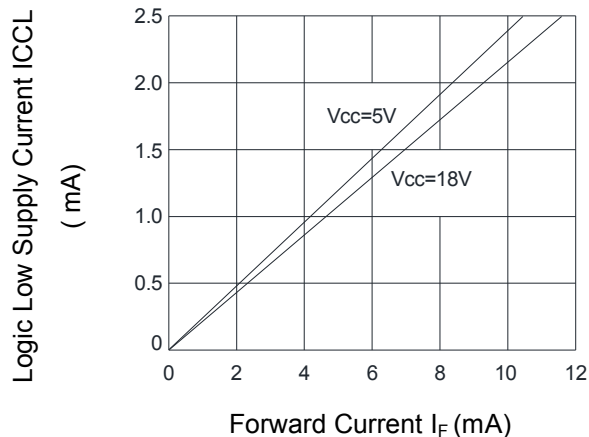
**Fig.6 Output Current  
vs. Output Voltage**



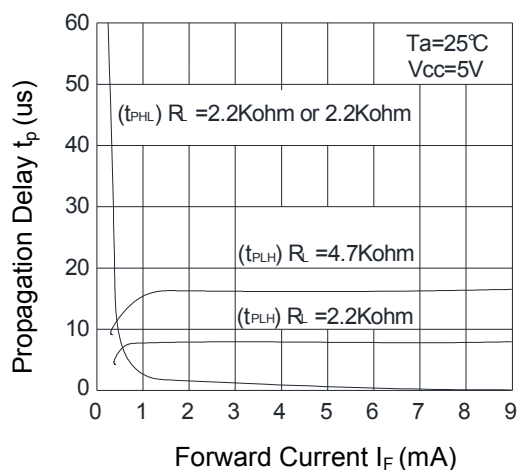
**Fig.7 Output Current  
vs. Forward Current**



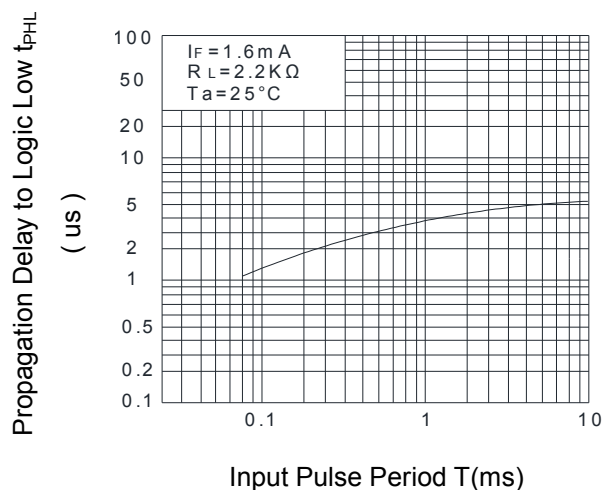
**Fig.8 Logic Low Supply Current  
vs. Forward Current**



**Fig.9 Propagation Delay  
vs. Forward Current**



**Fig.10 Propagation Delay to Logic Low  
vs. Pulse Period**

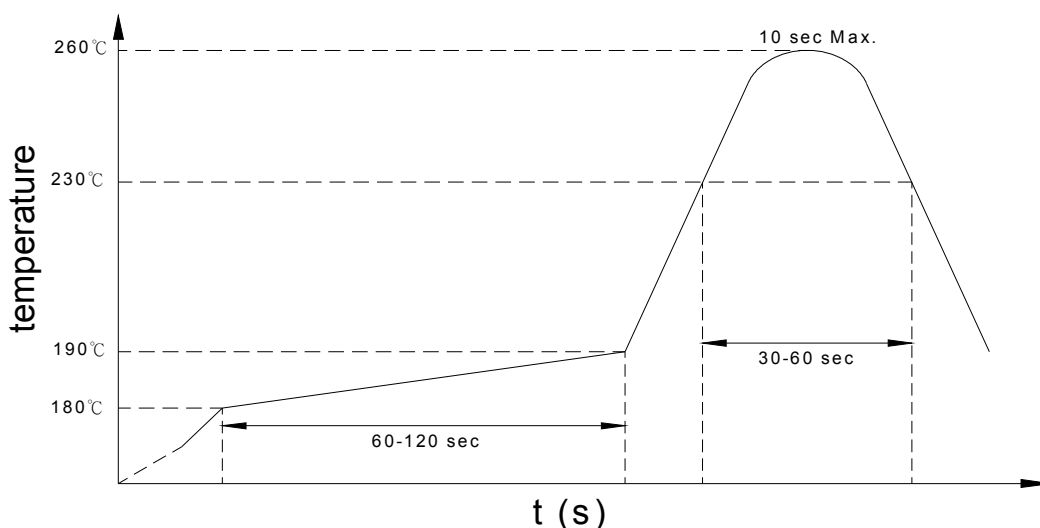


### ● Recommended Soldering Conditions

#### (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

#### KPC6N139 X (Y)

#### Notes:

KPC6N139 = Part No.

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

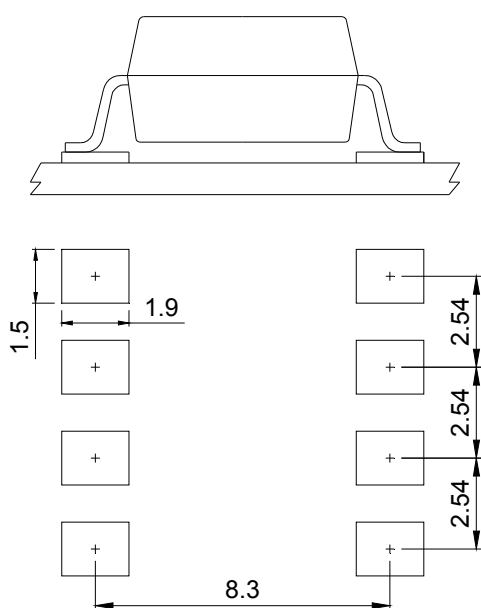
Y = Tape and reel option (TL 、 TR 、 TLD 、 TRU)

| 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

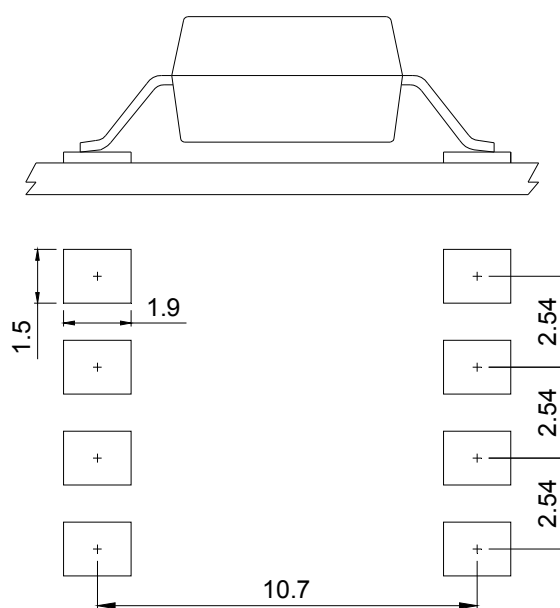
#### 1.Surface mount type

8-pin SMD



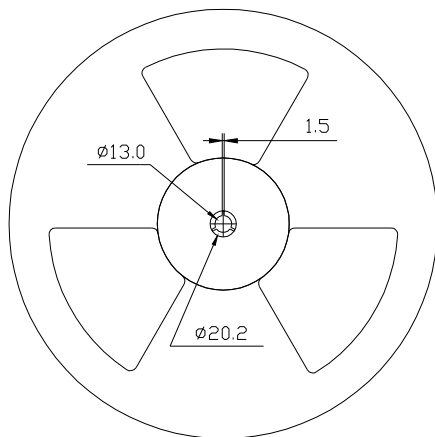
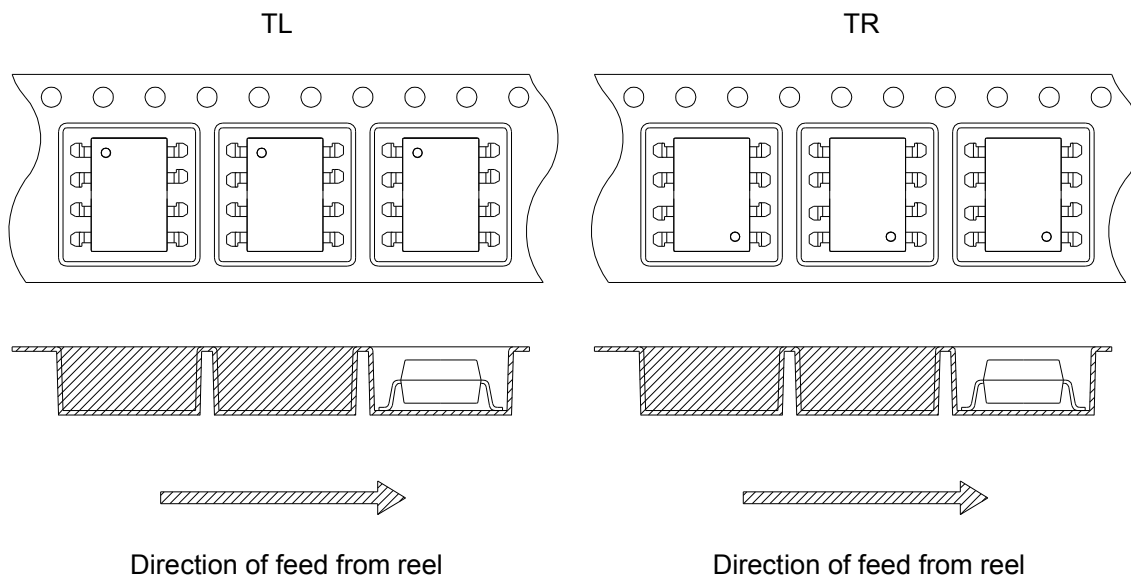
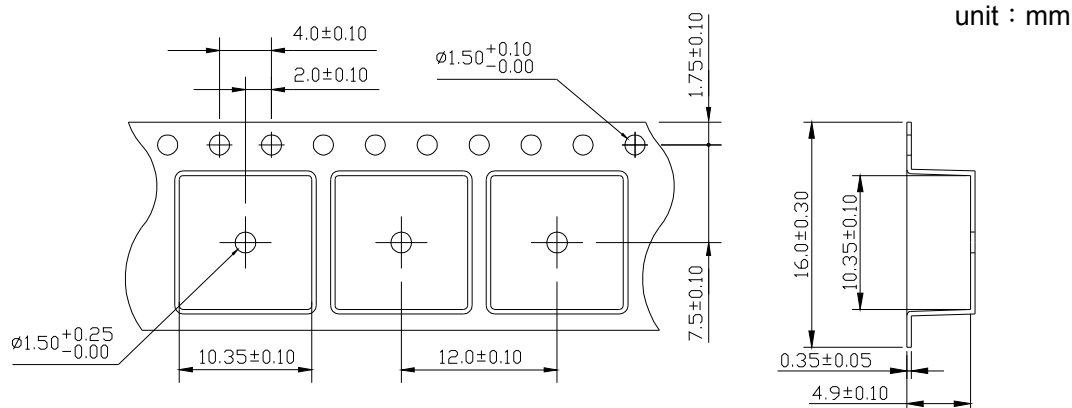
#### 2.Long creepage distance for surface mount type

8-pin L

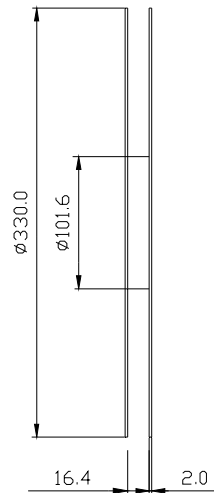


Unit :mm

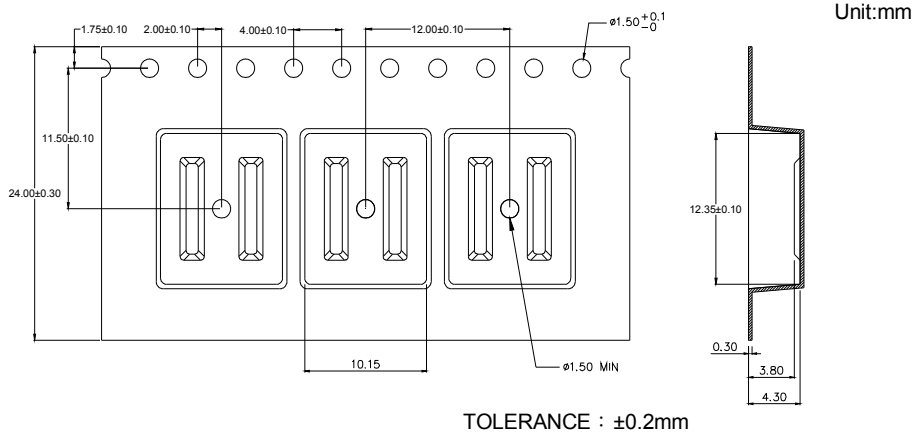
### ● 8-pin SMD Carrier Tape & Reel



Quantity : 1000pcs/reel

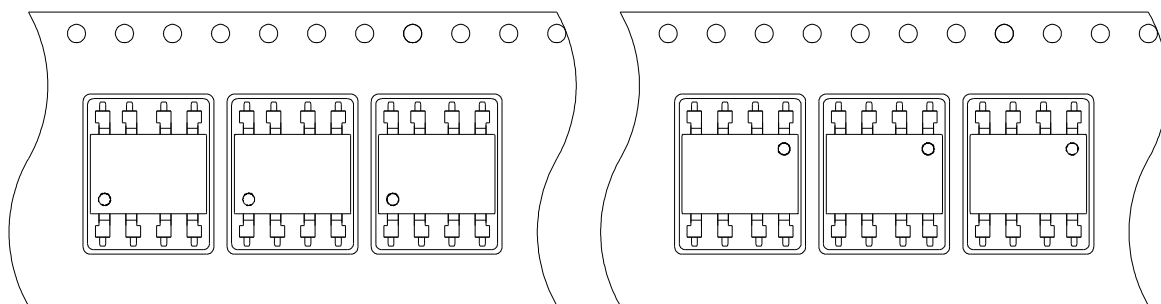


### ● 8-pin L Carrier Tape & Reel



TLD

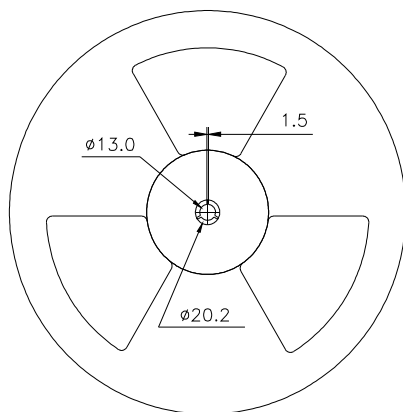
TRU



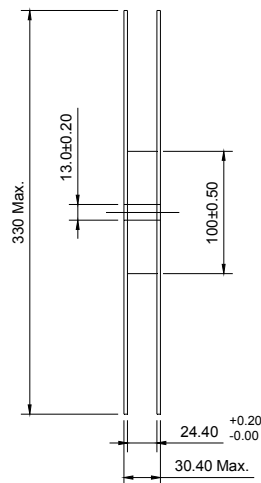
Direction of feed from reel



Direction of feed from reel



Quantity : 800pcs/reel





# KPC6N139 Series

## 8PIN HIGH-SPEED DARLINGTON OUTPUT PHOTOCOUPLER

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### ● Application Notice

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It would be required to comply with the absolute maximum ratings listed in the specification. cosmo has no liability and responsibility to the damage caused by improper use of the products.

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- a. Personal computer
- b. OA machine
- c. Audio / Video
- d. Instrumentation
- e. Electrical application
- f. Measurement equipment
- g. Consumer electronics
- h. Telecommunication

cosmo devices shall not be used or related with equipment requiring higher level of quality / reliability, or malfunction, or failure which may cause loss of human life, bodily injury, includes, without limitation:

- a. Medical and other life supporting equipments
- b. Space application
- c. Telecommunication equipment (trunk lines)
- d. Nuclear power control
- e. Equipment used for automotive vehicles, trains, ships...etc.

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