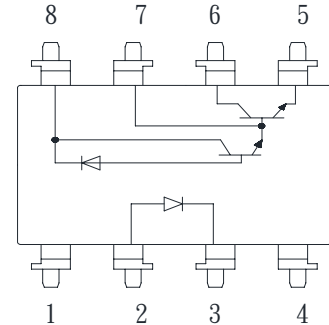


### ● Description

The KPC6N138 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. Vcc

### ● Features

1. Pb free and RoHS compliant
2. High current transfer ratio (CTR:Min.300% at I<sub>F</sub> =1.6mA)
3. High-speed response (t<sub>PLH</sub>,t<sub>PHL</sub>: typ.2us at R<sub>L</sub>=2.2KΩ)
4. Instantaneous common mode rejection voltage(CMH:typ. 500V/us)
5. TTL compatible output
6. Compact surface mount type package
7. Agency Approvals:
  - UL1577 / CUL C22.2 No.1 & NTC No.5, File No. E169586
  - VDE EN 60747, File No. 40006080
  - FIMKO EN60065, File No. FI25798
  - FIMKO EN60950, File No. FI25798

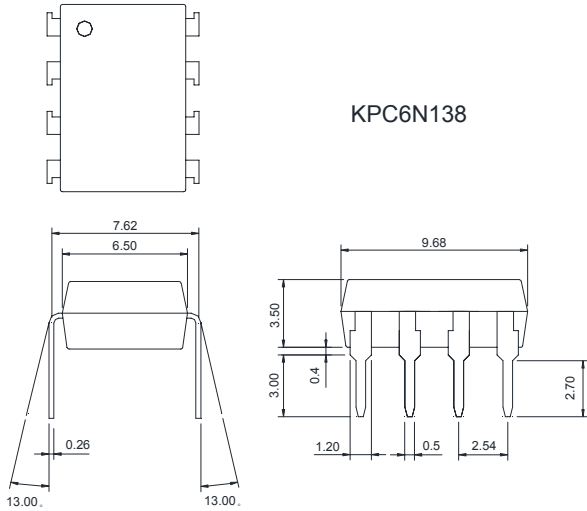
### ● Applications

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

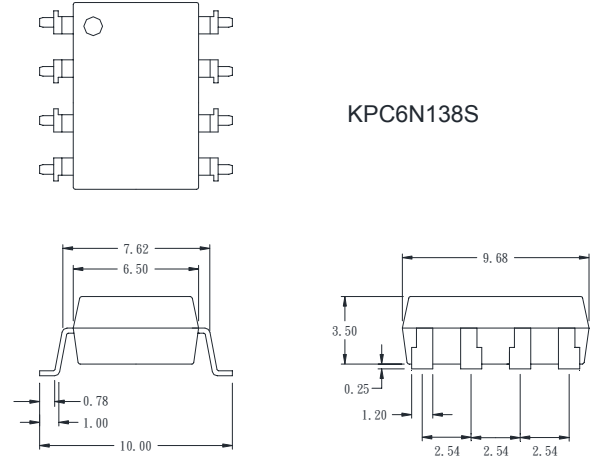
● **Outside Dimension**

Unit : mm

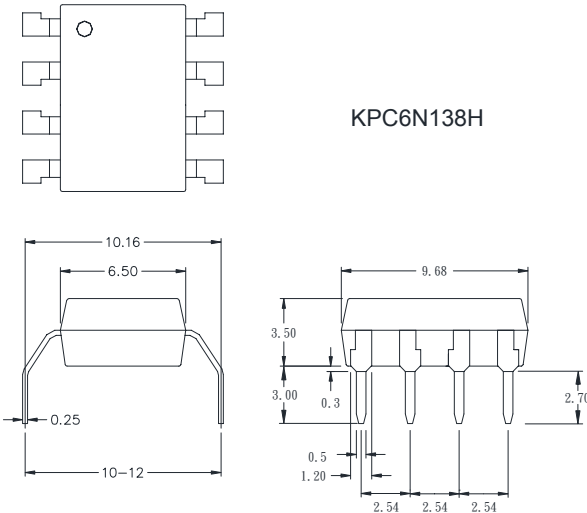
1. Dual-in-line type



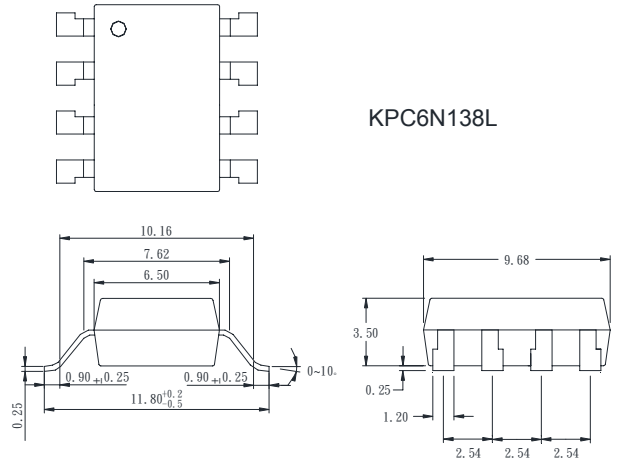
2. Surface mount type



3. Long creepage distance type

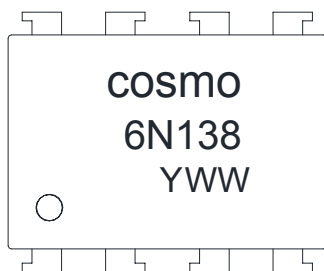


4. Long creepage distance for surface mount type



TOLERANCE: ±0.2mm

● **Device Marking**



**Notes:**

**cosmo**  
**6N138**  
**YWW**      Y: Year code / WW: Week code



# KPC6N138 Series

## 8PIN HIGH-SPEED DARLINGTON OUTPUT PHOTOCOUPLER

### ● 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 7	V
	Output voltage	$V_O$	-0.5 to 7	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	$I_F=1.6mA, V_O=0.4V, V_{CC}=4.5V$	300	1600	-	%
Logic (0) output volage	$V_{OL}$	$I_F=1.6mA, I_O=4.8mA, V_{CC}=4.5V$	-	0.1	0.4	V
Logic (1) output current	$I_{OH}$	$I_F=0, V_O=V_{CC}=7V$	-	0.1	250	uA
Logic (0) supply current	$I_{CCL}$	$I_F=1.6mA, V_O=open, V_{CC}=5V$	-	0.5	-	mA
Logic (1) supply current	$I_{CCH}$	$I_F=0, V_O=open, V_{CC}=5V$	-	10	-	nA
Input forward voltage	$V_F$	$T_a=25°C, I_F=1.6mA$	-	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	$BV_R$	$T_a=25°C, I_R=10uA$	5.0	-	-	V
Input capacitance	$C_{IN}$	$V_F=0, f=1MHz$	-	60	-	pF
*7 Leak current(input-output)	$I_{I-O}$	$T_a=25°C, 45\% RH, V_{I-O}=3kVDC, t=5s$	-	-	1.0	uA
*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 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

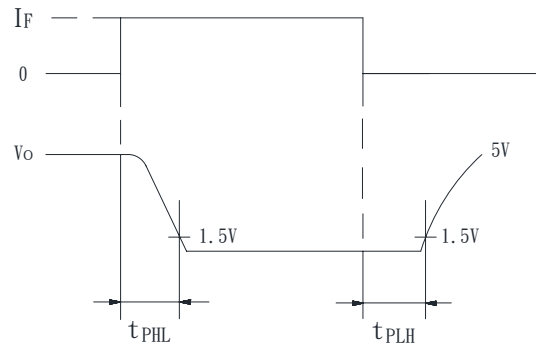
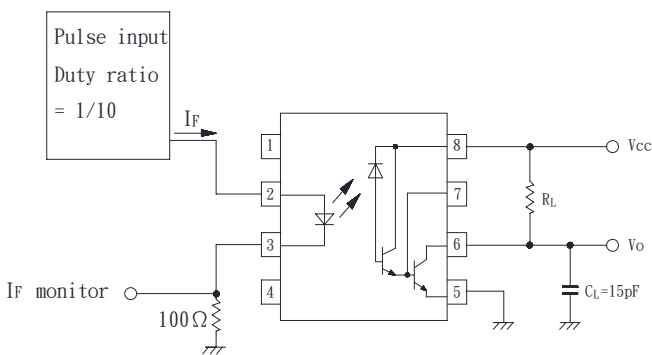
(Ta=25°C ,Vcc=5V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
*8 Propagation delay time Output (1)-->(0)	$t_{PHL}$	$R_L=2.2k\Omega, I_F=1.6mA$	-	2	10	$\mu S$
*8 Propagation delay time Output (0)-->(1)	$t_{PLH}$	$R_L=2.2k\Omega, I_F=1.6mA$	-	7	35	$\mu S$
*9 Instantaneous common *10 mode rejection voltage "Output (1)"	$C_{MH}$	$I_F=0, V_{CM}=10Vp-p, R_L=2.2k\Omega$	-	500	-	V/ $\mu S$
*9 Instantaneous common *10 mode rejection voltage "Output (0)"	$C_{ML}$	$I_F=1.6mA, V_{CM}=10Vp-p, R_L=2.2k\Omega$	-	-500	-	V/ $\mu S$

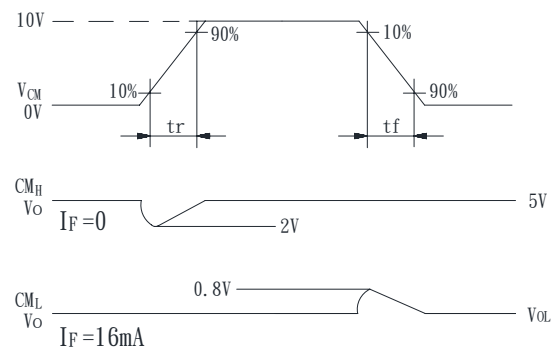
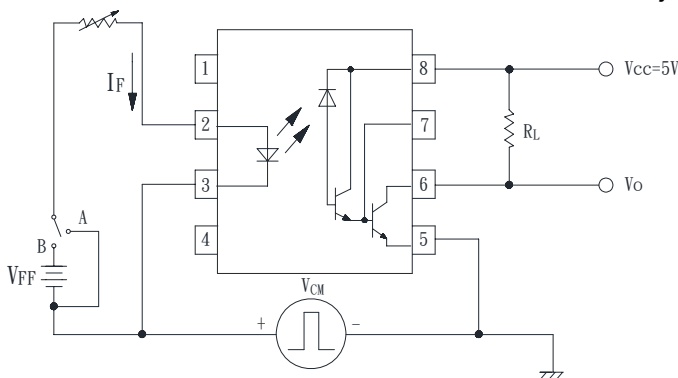
\*9 Instantaneous common mode rejection voltage " output (1) " represents a common mode voltage variation that can hold the output above (1) level (  $V_o > 2.0V$  )

\*10 Instantaneous common mode rejection voltage " output (0) " represents a common mode voltage variation that can hold the output above (0) level (  $V_o < 0.8V$  )

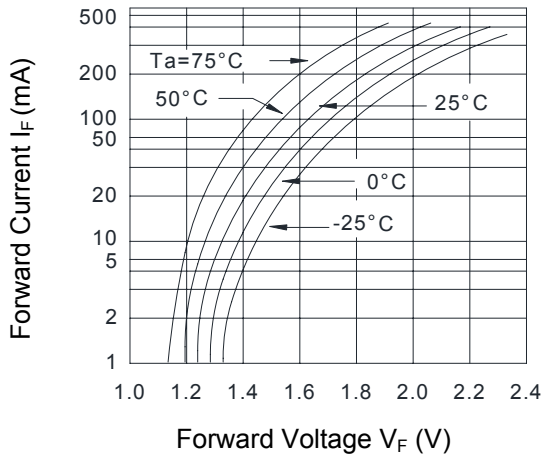
#### \*8 Test Circuit Propagation Delay Time



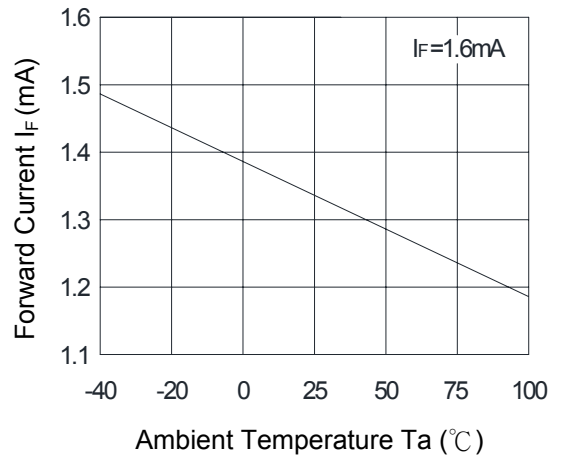
#### \*10 Test Circuit for Instantaneous Common Mode Rejection Voltage



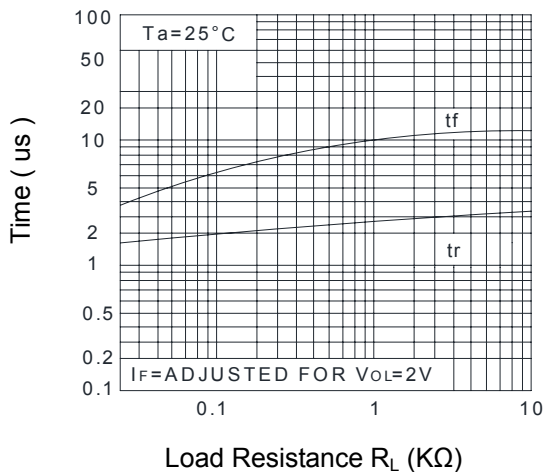
**Fig.1 Forward Current vs. Forward Voltage**



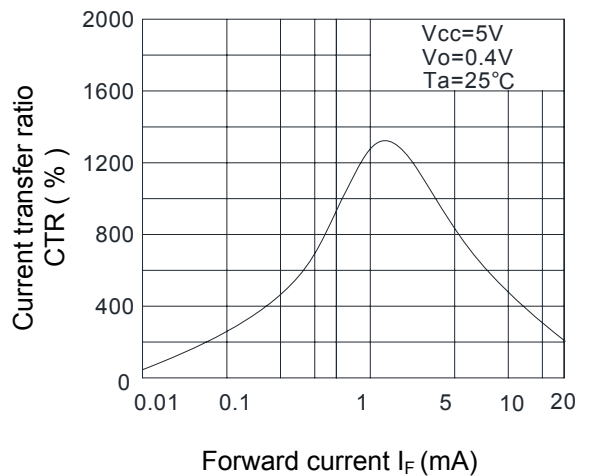
**Fig.2 Forward Current vs. Ambient Temperature**



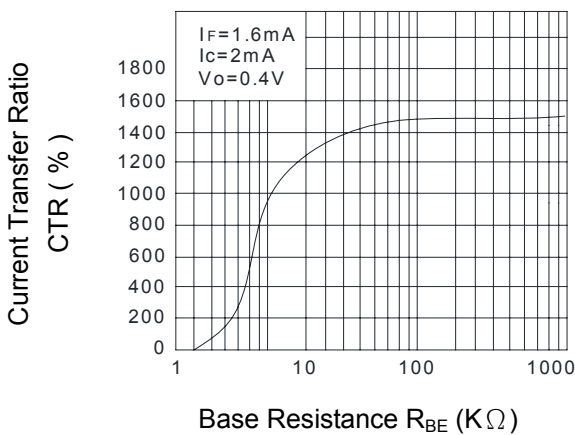
**Fig.3 Response and Fall Time vs. Load Resistance**



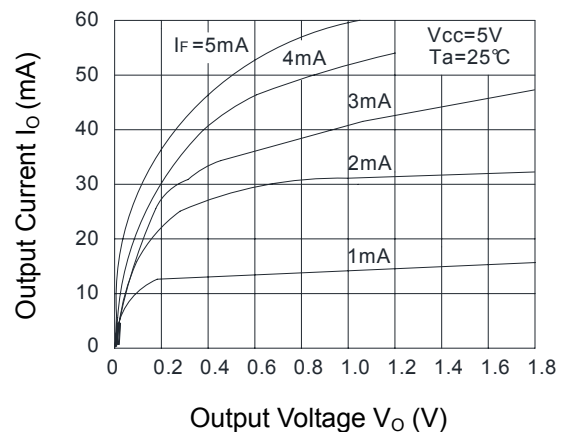
**Fig.4 Current Transfer Ratio vs. Forward Current**



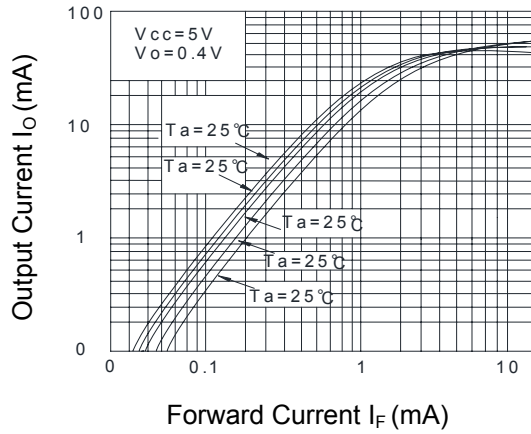
**Fig.5 Current Transfer Ratio vs. Base-Emitter Resistance**



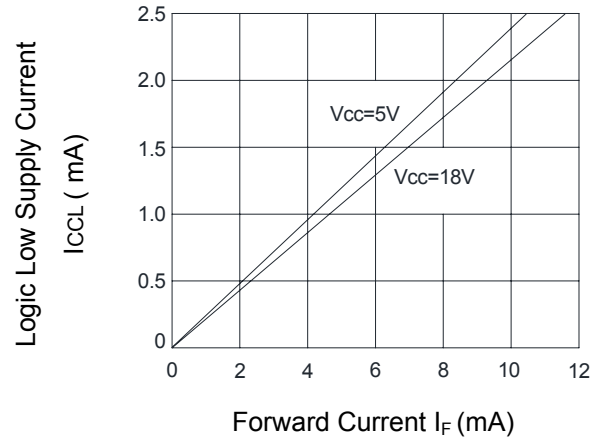
**Fig.6 Output Current vs. Output Voltage**



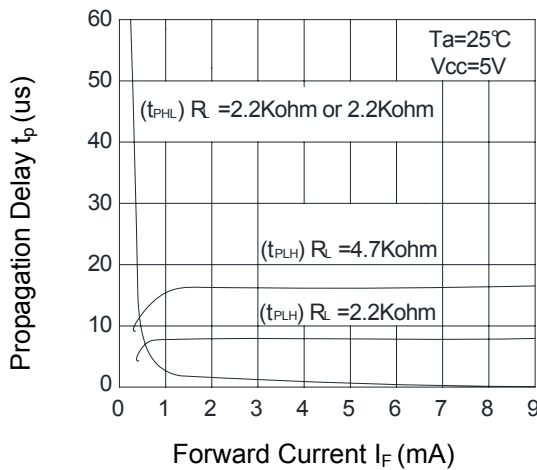
**Fig.7 Output Current vs. Forward Current**



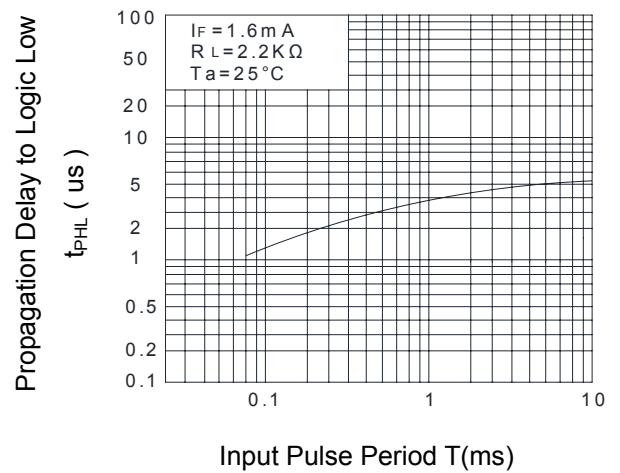
**Fig.8 Logic Low Supply Current vs. Forward Current**



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



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

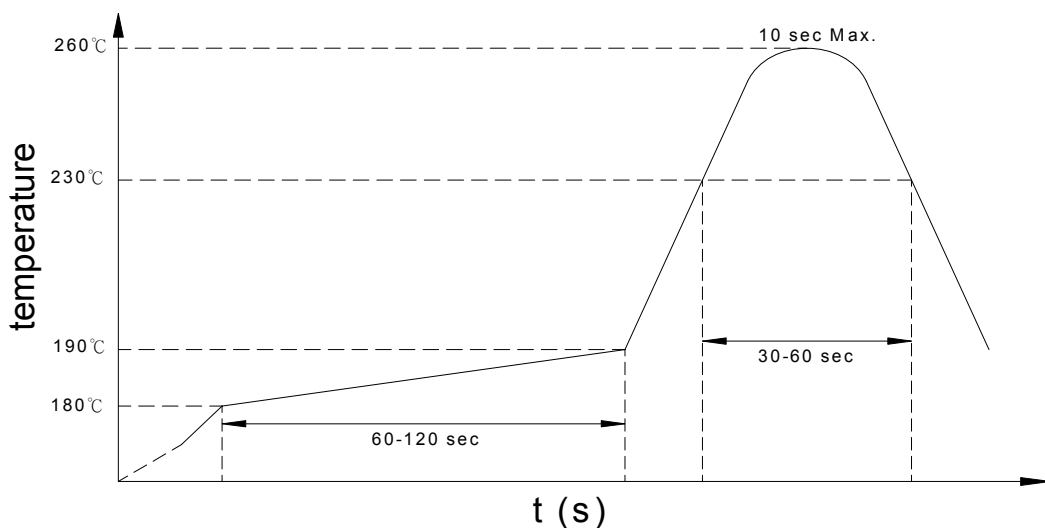


● **Recommended Soldering Conditions**

**(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**

### KPC6N138 X (Y)

**Notes:**

KPC6N138 = Part No.

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

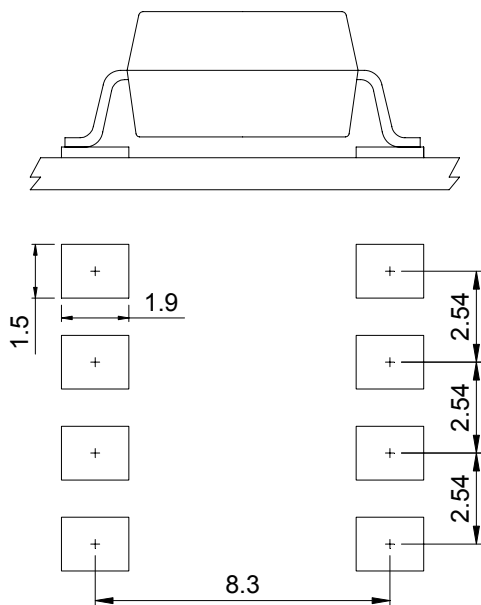
Y = Tape and reel option (TL · TR · TLD · TRU)

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**

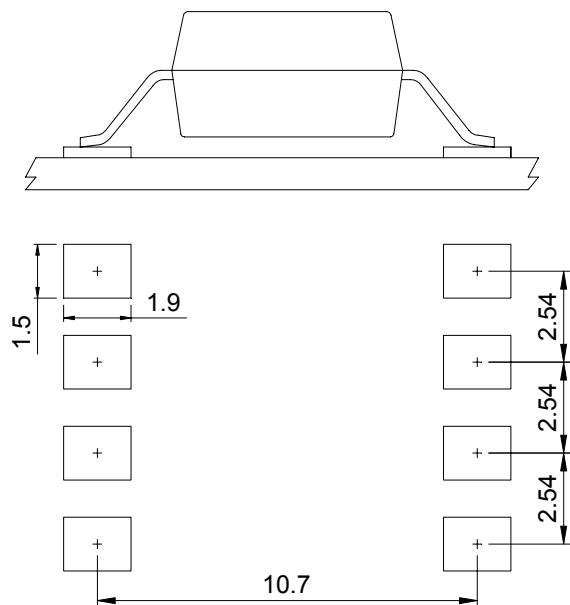
**1.Surface mount type**

8-pin SMD



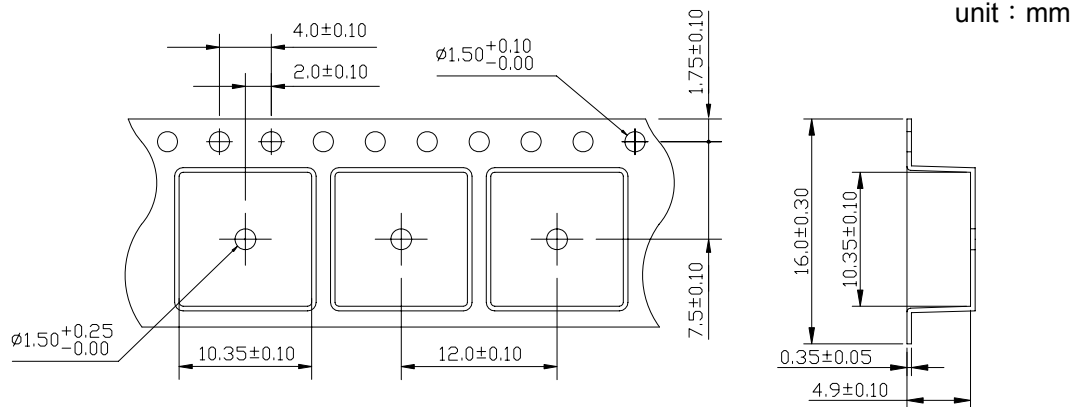
**2.Long creepage distance for surface mount type**

8-pin L



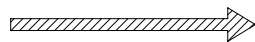
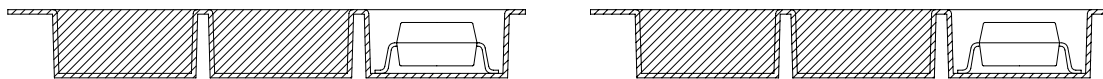
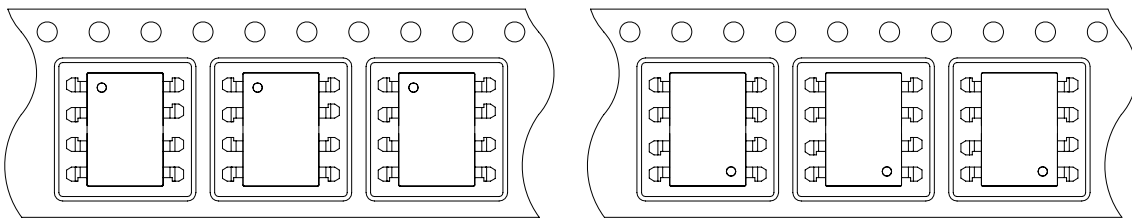
Unit :mm

● 8-pin SMD Carrier Tape & Reel

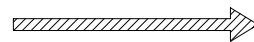


TL

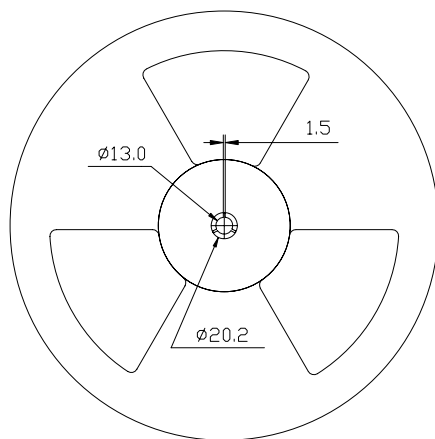
TR



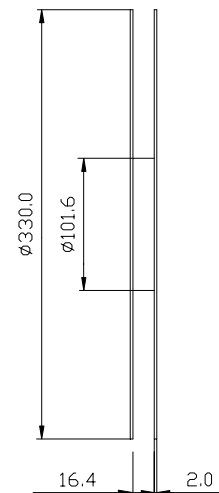
Direction of feed from reel



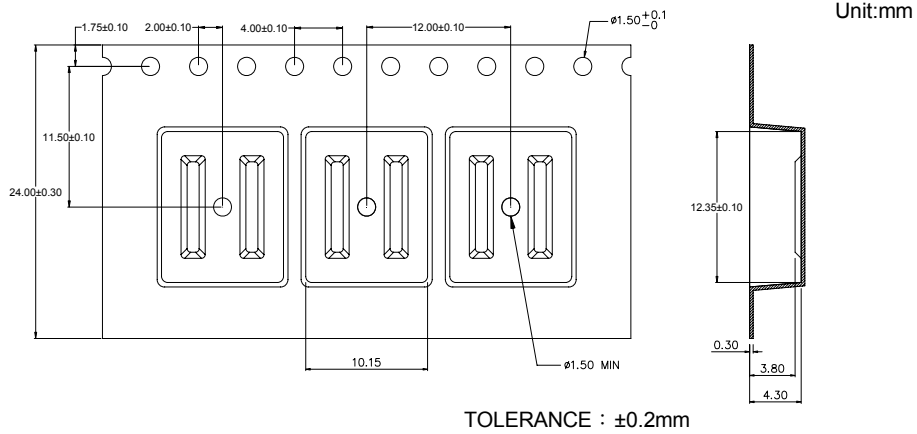
Direction of feed from reel



Quantity : 1000pcs/reel

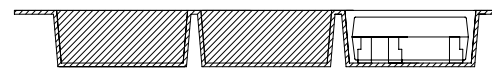
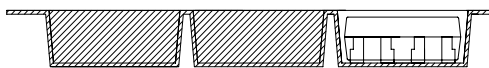
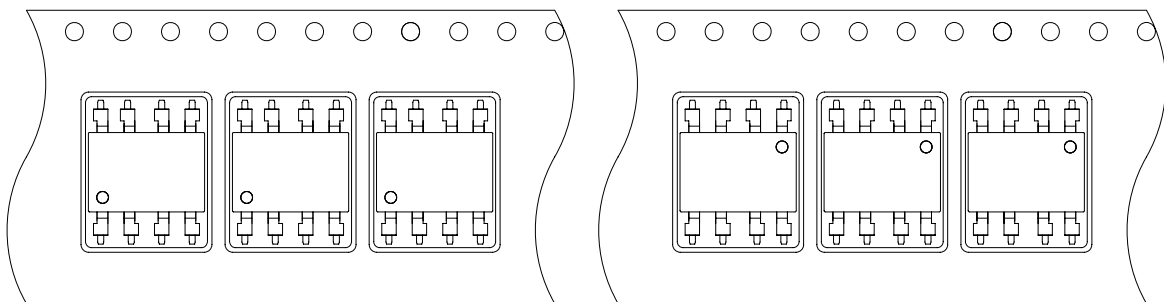


● 8-pin L Carrier Tape & Reel



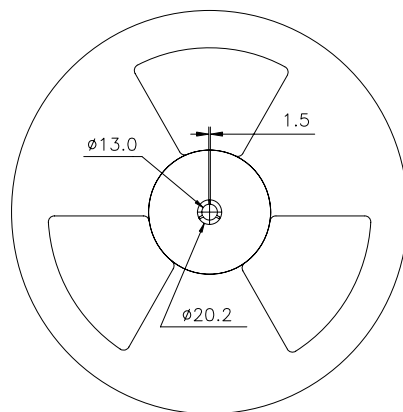
TLD

TRU

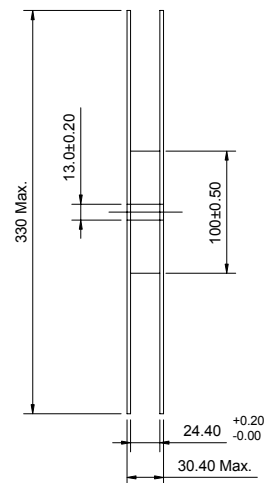


Direction of feed from reel

Direction of feed from reel



Quantity : 800pcs/reel





# KPC6N138 Series

## 8PIN HIGH-SPEED DARLINGTON OUTPUT PHOTOCOUPLER

---

### ● Application Notice

The content of datasheet is the guidance for product use only. cosmo takes no responsibility to the accuracy of the information provided here. For continuously improving all of products, including quality, reliability, function...etc., cosmo reserves the right to change the specification, characteristics, data, materials, and structure of products without notice. Please contact with cosmo to obtain the latest specification.

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.

cosmo products are intended to be designed for use in general electronics application list below:

- 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.

This publication is the property of cosmo. No part of this publication may be reproduced or copied in any form or any means electronically or mechanically for any purpose, in whole or in part without any written permission expressed from cosmo.