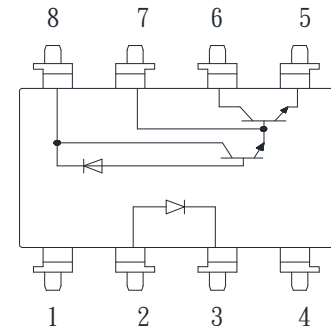


● Description

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 _B |
| 4. N.C. | 8. Vcc |

● Features

1. Pb free and RoHS compliant
2. High current transfer ratio (CTR:Min.300% at I_F =1.6mA)
3. High-speed response (t_{PLH},t_{PHL}: typ.2us at R_L=2.2KΩ)
4. Instantaneous common mode rejection voltage(CMH:typ. 500V/us)
5. TTL compatible output
6. Compact surface mount type package
7. MSL class 1
8. Agency Approvals:
 - UL Approved (No. E169586): UL1577
 - c-UL Approved (No. E169586)
 - FIMKO Approved: EN62368-1, EN60601-1
 - VDE Approved (No. 40020973): DIN EN60747-5-5

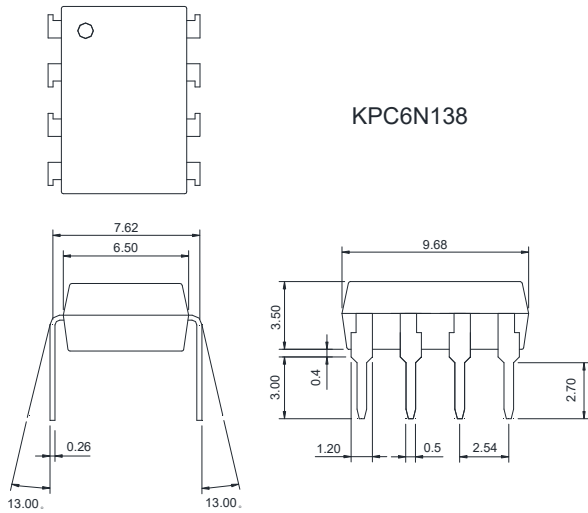
● Applications

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

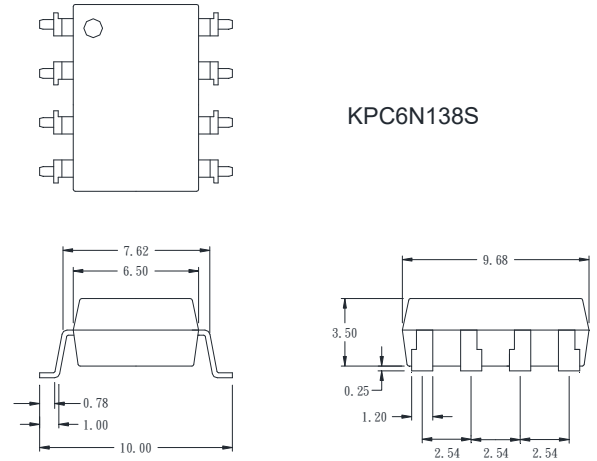
● **Outside Dimension**

Unit : mm

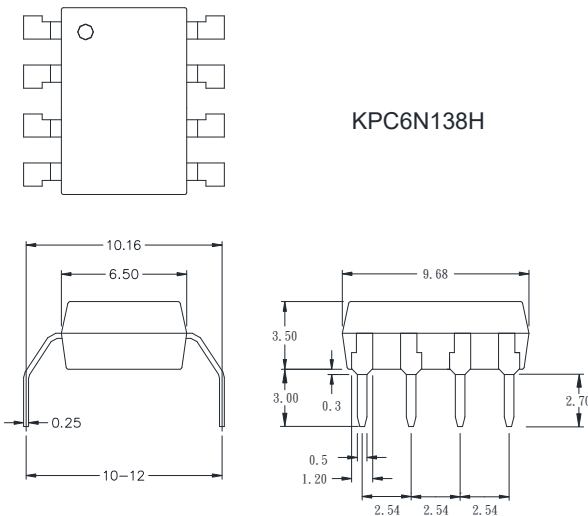
1. Dual-in-line type



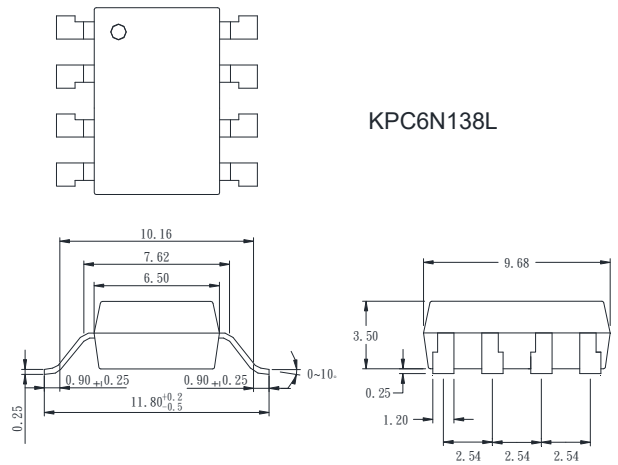
2. Surface mount type



3. Long creepage distance type

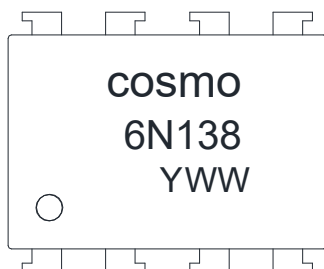


4. Long creepage distance for surface mount type



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 voltage	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	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}	$I_F=0, V_O=open, V_{CC}=5V$	-	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	$T_a=25°C, I_R=10\mu A$	5.0	-	-	V
Input capacitance	C_{IN}	$V_F=0, f=1MHz$	-	60	-	pF
*7 Leak current(input-output)	I_{I-O}	$T_a=25°C, 45\% RH, V_{I-O}=3kVDC, t=5s$	-	-	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 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

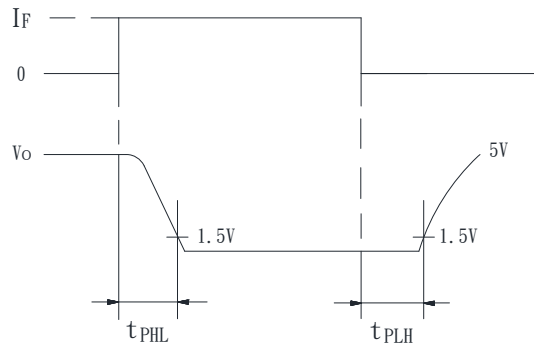
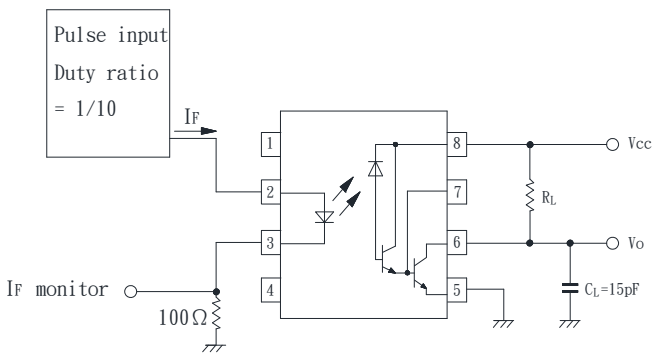
(Ta=25°C, Vcc=5V)

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	μS
*8 Propagation delay time Output (0)-->(1)	t_{PLH}	$R_L=2.2k\Omega, I_F=1.6mA$	-	7	35	μS
*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/ μS
*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/ μS

*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

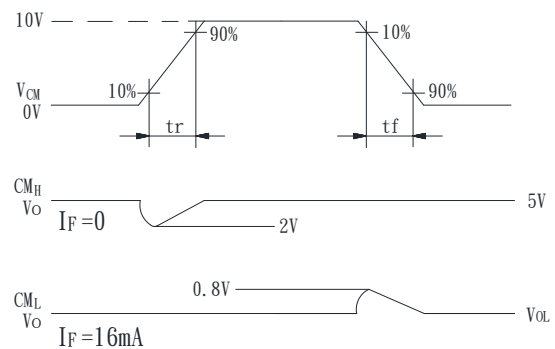
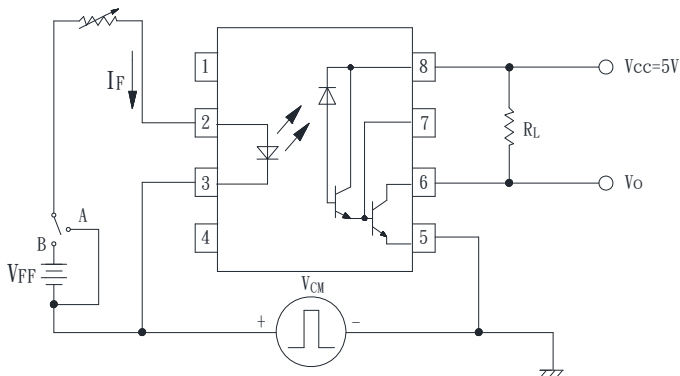


Fig.1 Forward Current vs. Forward Voltage

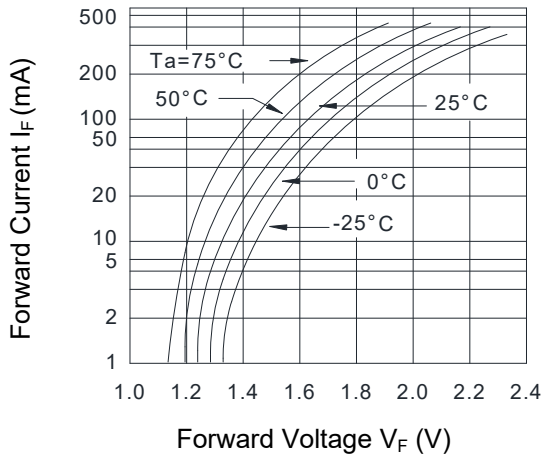


Fig.2 Forward Current vs. Ambient Temperature

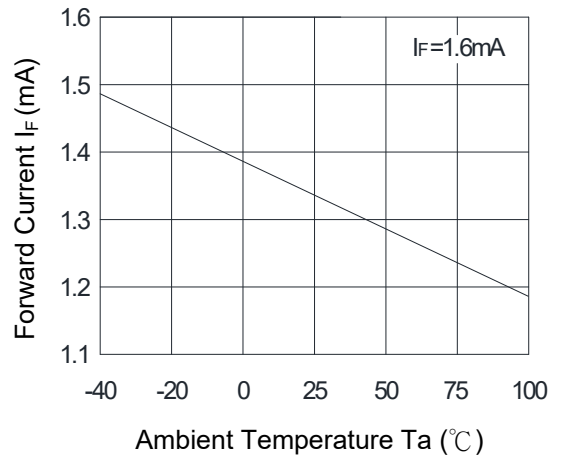


Fig.3 Response and Fall Time vs. Load Resistance

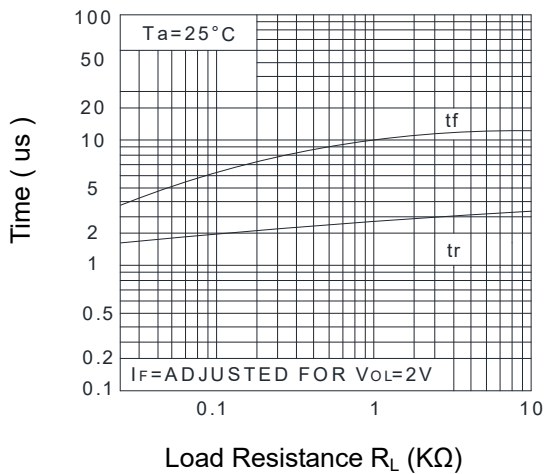


Fig.4 Current Transfer Ratio vs. Forward Current

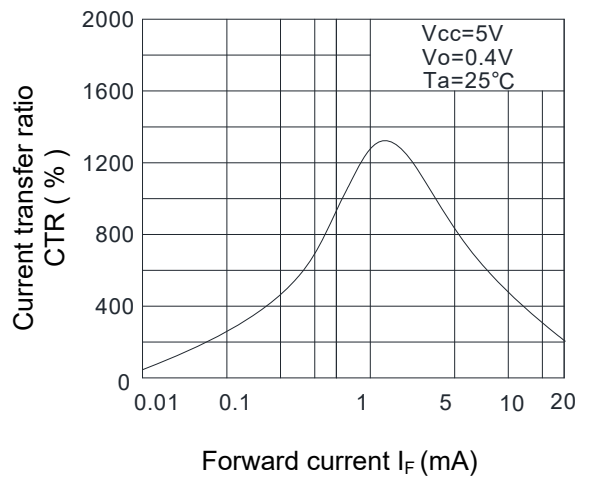


Fig.5 Current Transfer Ratio vs. Base-Emitter Resistance

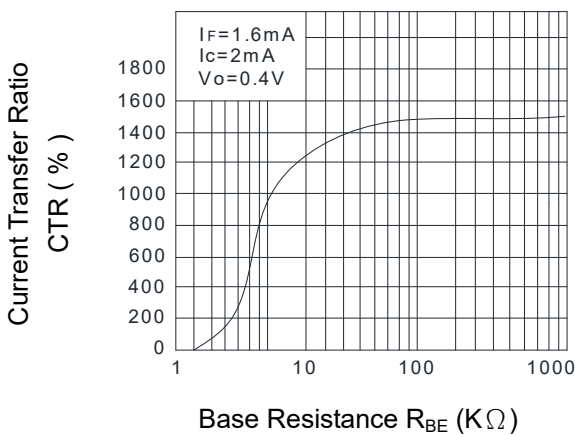


Fig.6 Output Current vs. Output Voltage

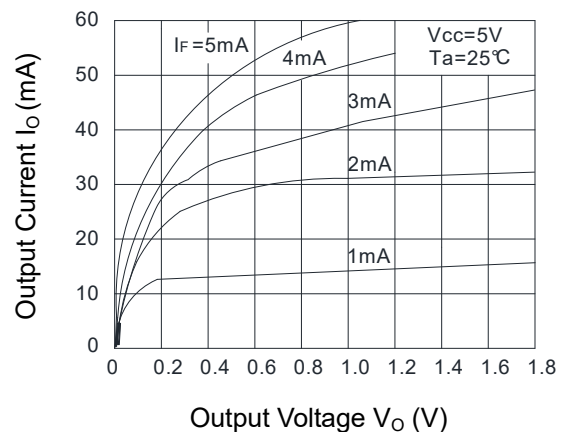


Fig.7 Output Current vs. Forward Current

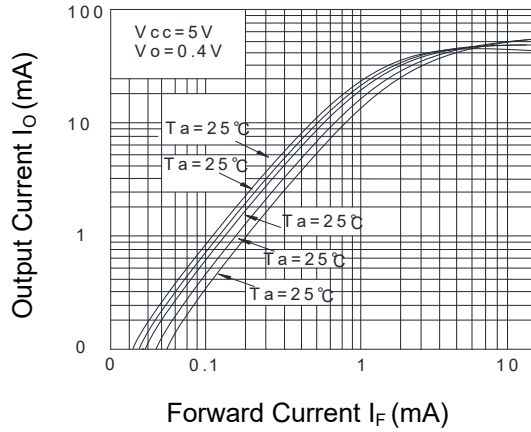


Fig.8 Logic Low Supply Current vs. Forward Current

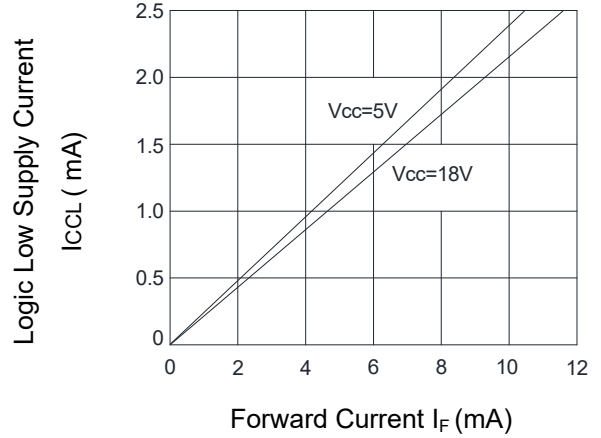


Fig.9 Propagation Delay vs. Forward Current

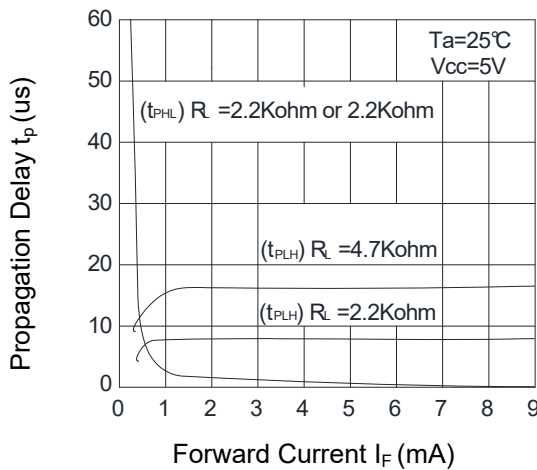
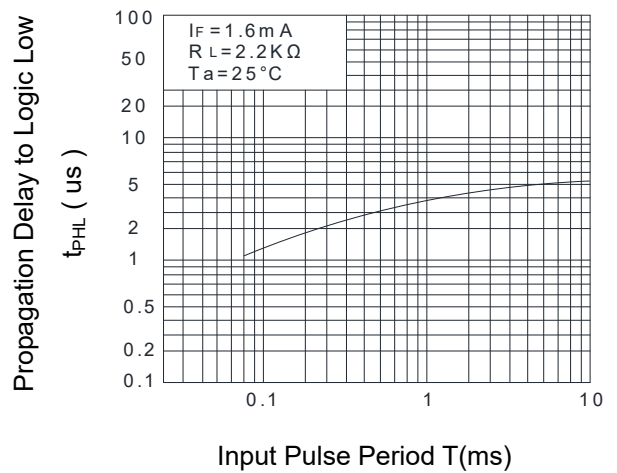


Fig.10 Propagation Delay to Logic Low vs. Pulse Period

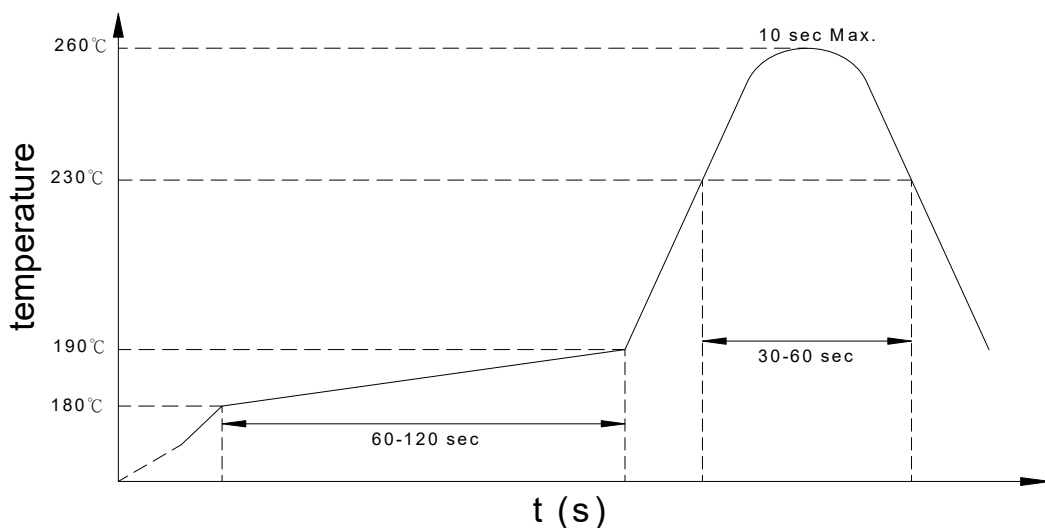


● **Recommended Soldering Conditions**

(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)

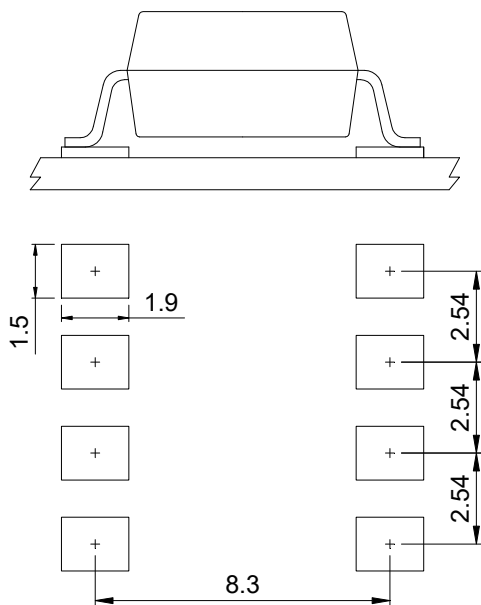
Y = Tape and reel option (TL · TR · TLD · TRU)

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**

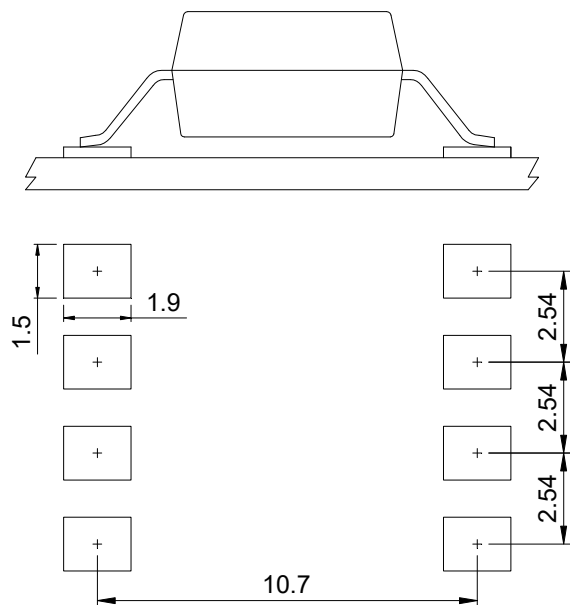
1.Surface mount type

8-pin SMD



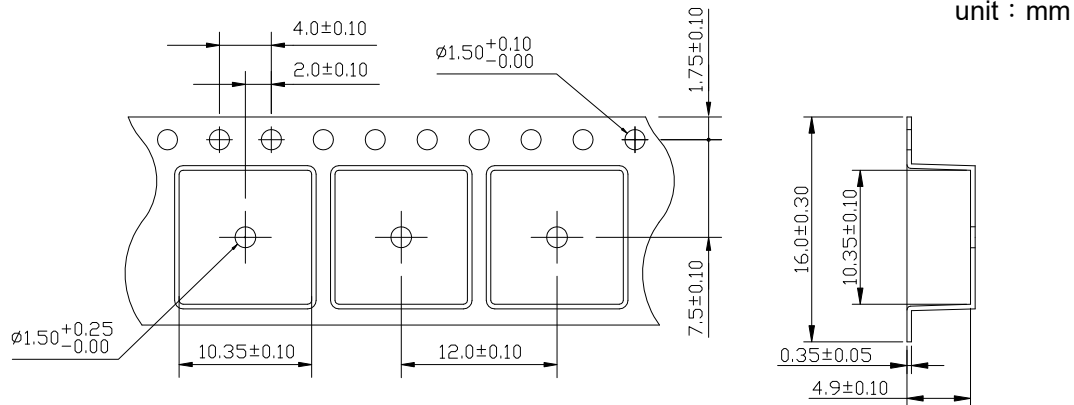
2.Long creepage distance for surface mount type

8-pin L



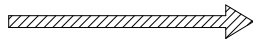
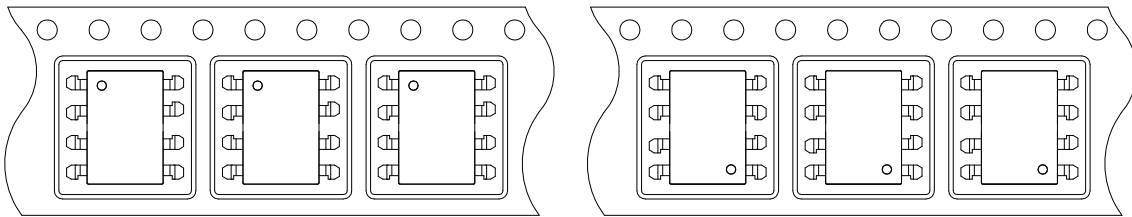
Unit :mm

● 8-pin SMD Carrier Tape & Reel

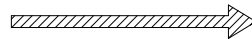


TL

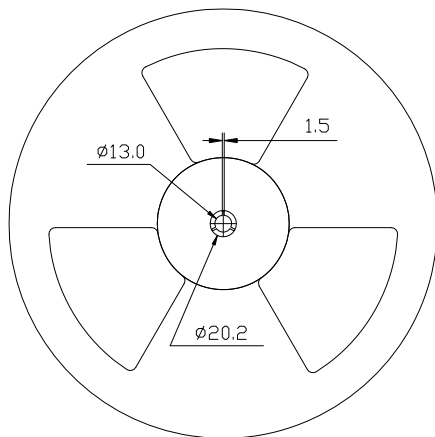
TR



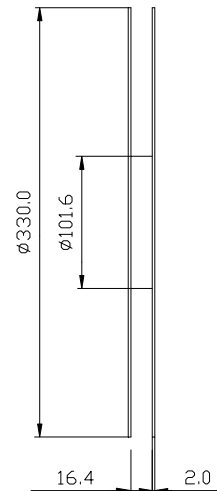
Direction of feed from reel



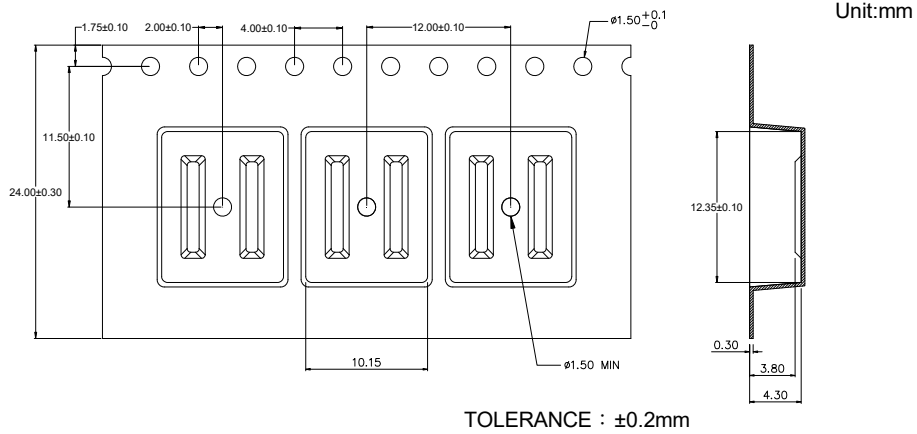
Direction of feed from reel



Quantity : 1000pcs/reel

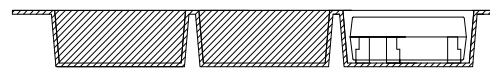
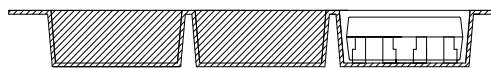
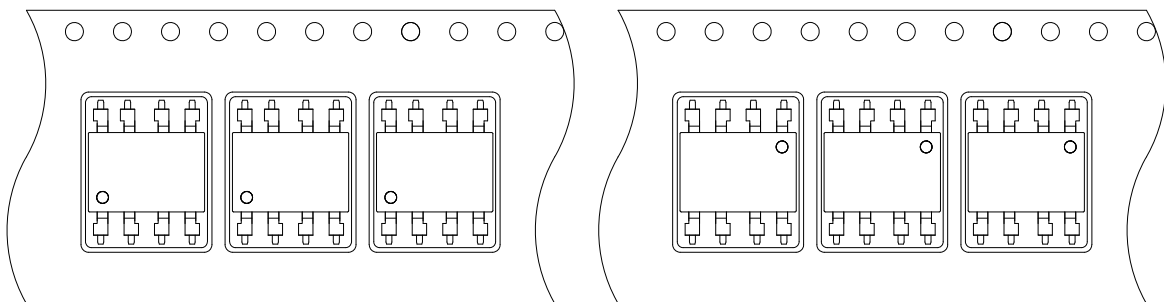


● 8-pin L Carrier Tape & Reel



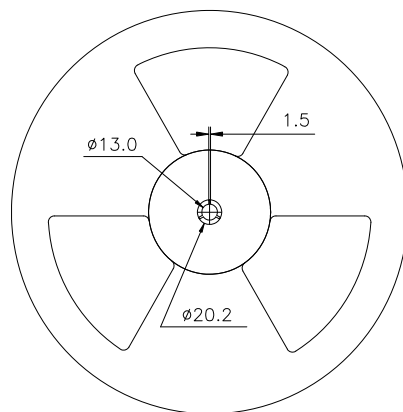
TLD

TRU

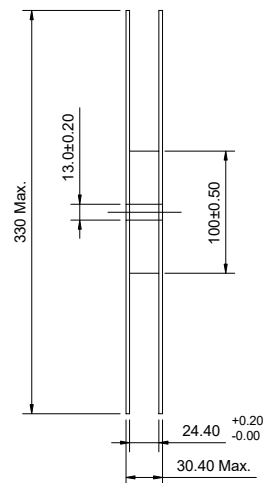


Direction of feed from reel

Direction of feed from reel



Quantity : 800pcs/reel



- **Application Notice**

The statements regarding the suitability of products for certain types of applications are based on cosmo's knowledge of general applications of cosmo products. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to verify the specifications are suitable for use in a particular application. Customers are solely responsible for all aspects of their own product design or applications. The parameters provided in the datasheet may vary in different applications and performance may vary over time. All operating parameters (including typical parameters) must be validated by customer's technical experts for different applications. cosmo assumes no liability for customer' product design or applications. Product specifications do not expand or otherwise change cosmo's terms and conditions of purchase, including but not limited to the warranty expressed therein.

When using cosmo products, please comply with safety standards and instructions. cosmo has no liability and responsibility to the damage caused by improper use of the instructions specified in the specifications.

cosmo products are designed for use in general electronic equipment such as telecommunications, office automation equipment, personal computers, test and measurement equipment, consumer electronics, industrial control, instrumentation, audio, video.

cosmo devices shall not be used in equipment that requires higher level of reliability and safety, such as nuclear power control equipment, telecommunication equipment(trunk lines), space application, medical and other life supporting equipment, and equipment for aircraft, military, automotive or any other application that can cause human injury or death.

cosmo reserves the right to change the specifications, data, characteristics, structure, materials and other contents at any time without notice. Please contact cosmo to obtain the latest specification.

cosmo disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.