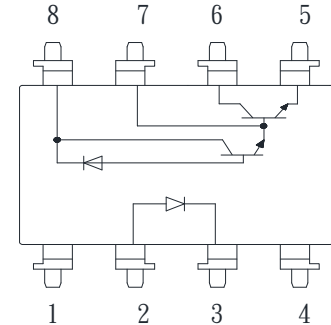


### ● Description

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. 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

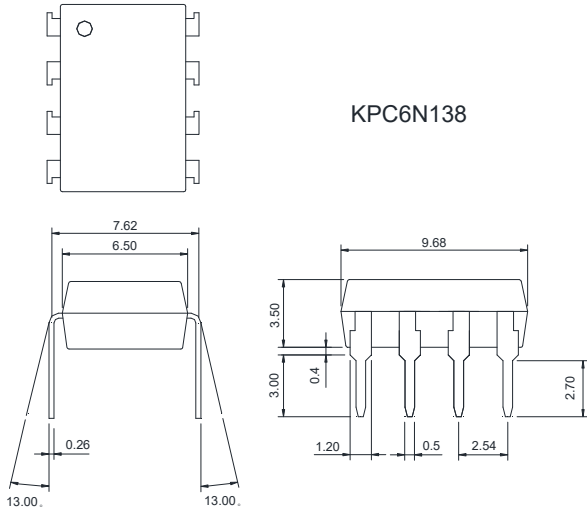
### ● Applications

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

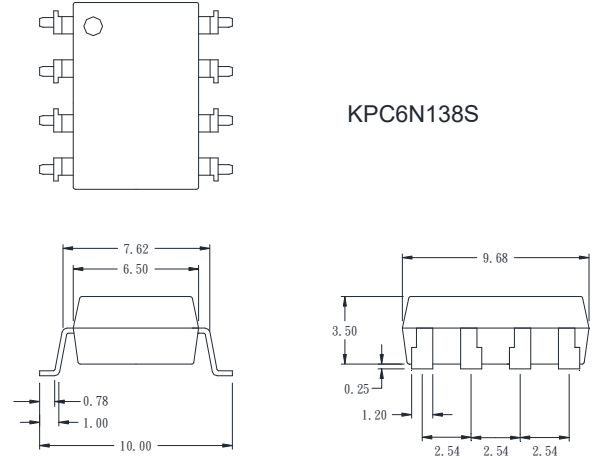
● **Outside Dimension**

Unit : mm

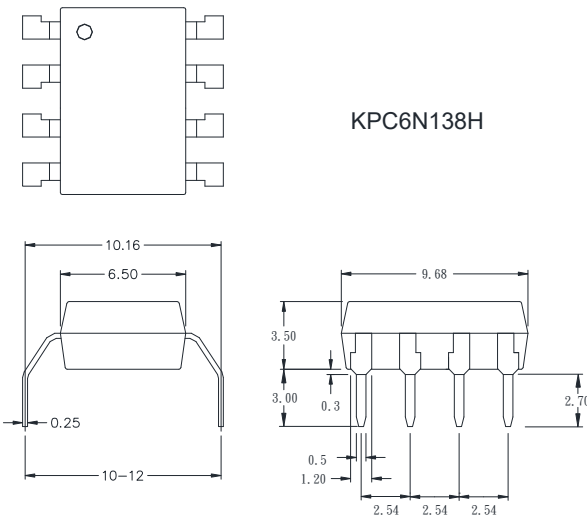
1. Dual-in-line type



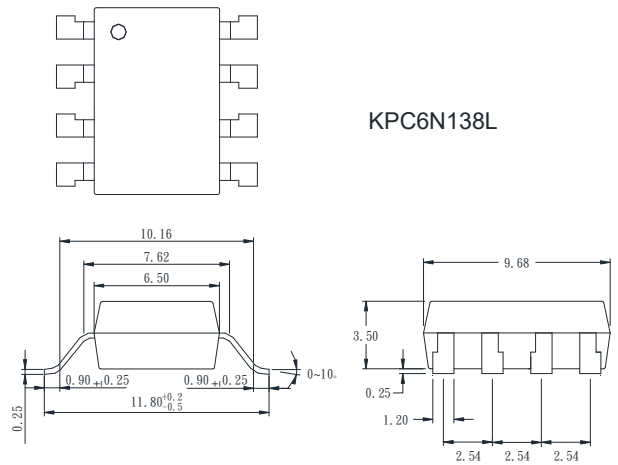
2. Surface mount type



3. Long creepage distance type

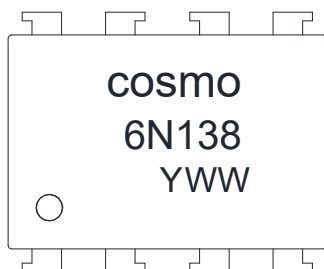


4. Long creepage distance for surface mount type



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

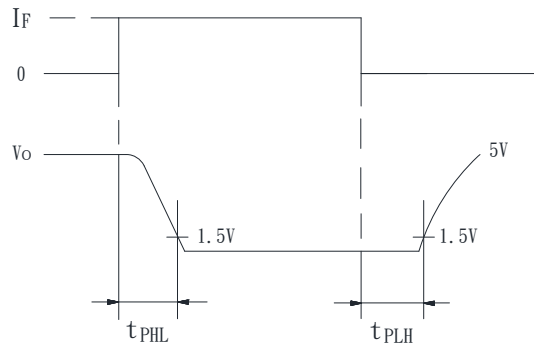
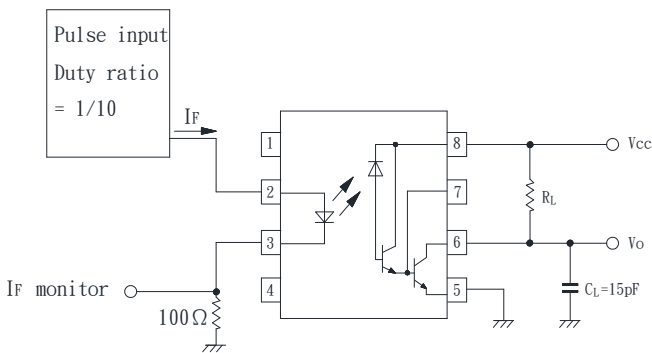
(Ta=25°C ,Vcc=5V)

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	$\mu S$
*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/ $\mu S$

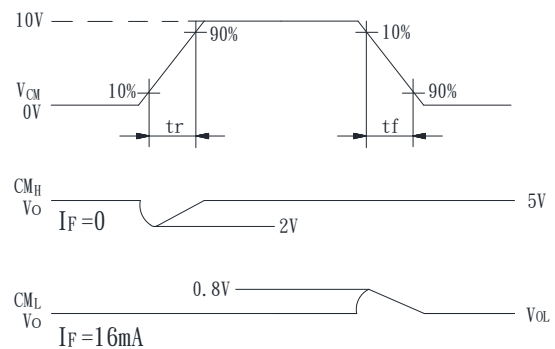
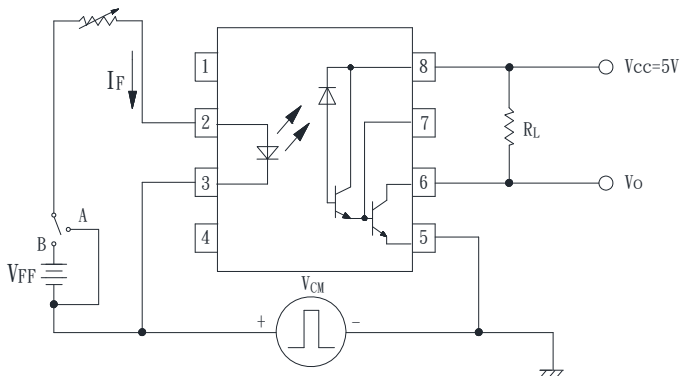
\*9 Instantaneous common mode rejection voltage " output (1) " represents a common mode voltage variation that can hold the output above (1) level (  $V_o > 2.0V$  )

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

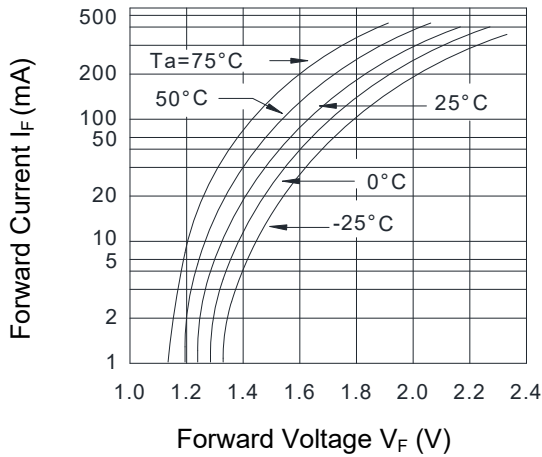
#### \*8 Test Circuit Propagation Delay Time



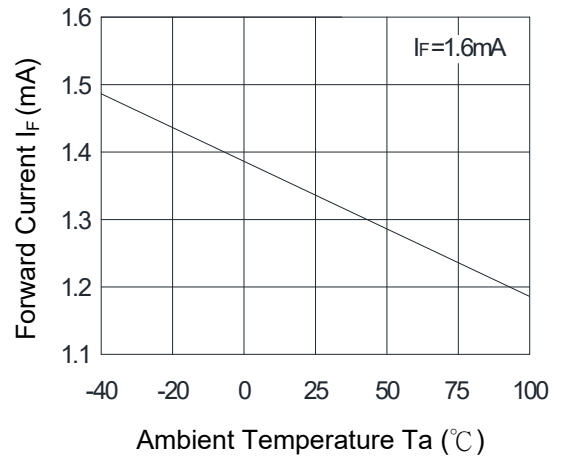
#### \*10 Test Circuit for Instantaneous Common Mode Rejection Voltage



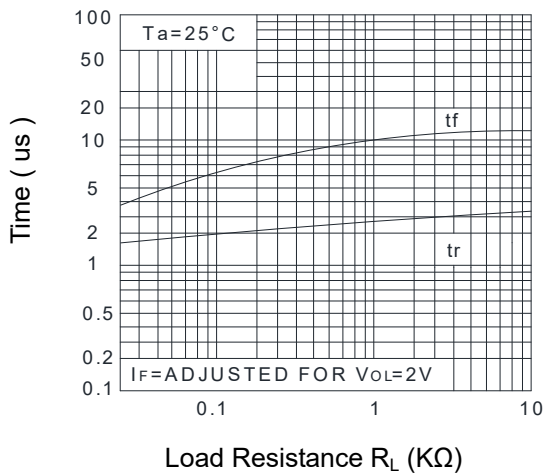
**Fig.1 Forward Current vs. Forward Voltage**



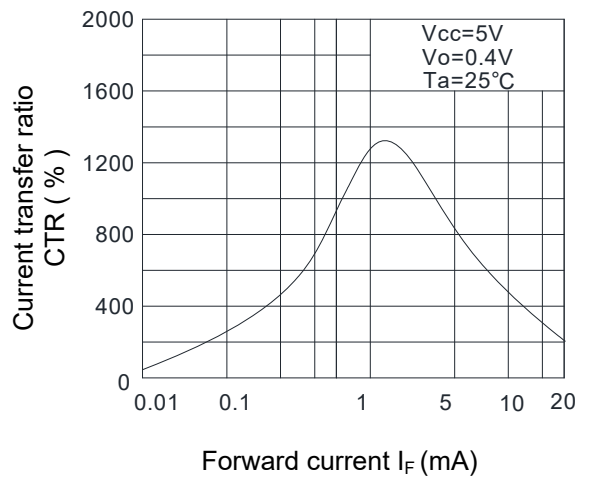
**Fig.2 Forward Current vs. Ambient Temperature**



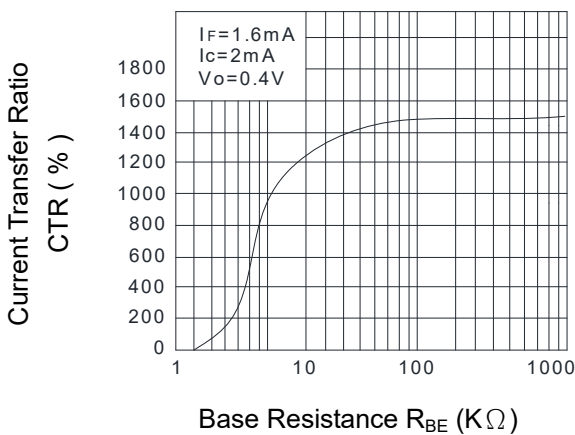
**Fig.3 Response and Fall Time vs. Load Resistance**



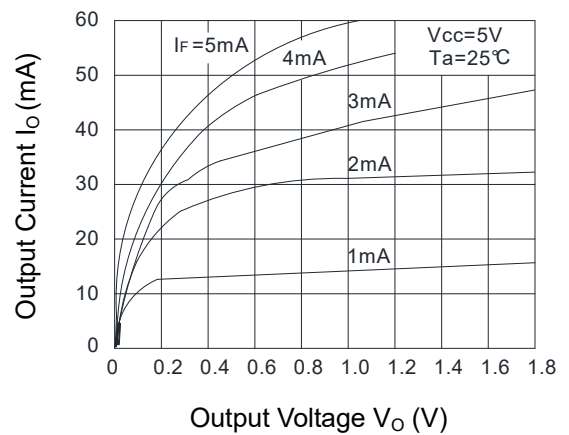
**Fig.4 Current Transfer Ratio vs. Forward Current**



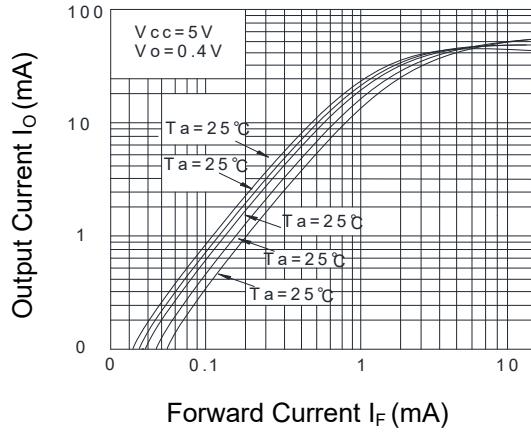
**Fig.5 Current Transfer Ratio vs. Base-Emitter Resistance**



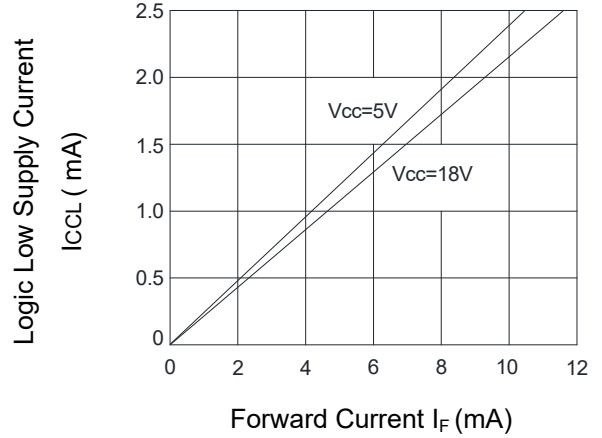
**Fig.6 Output Current vs. Output Voltage**



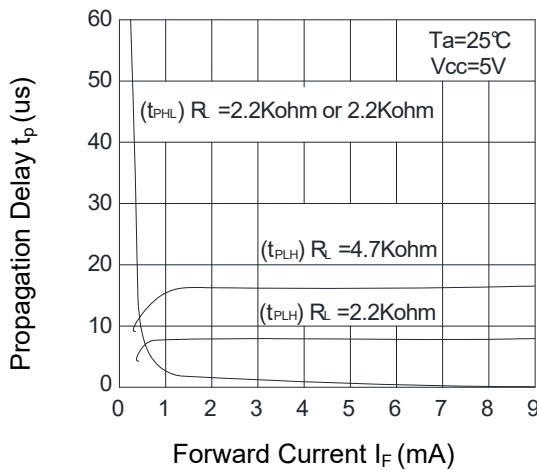
**Fig.7 Output Current vs. Forward Current**



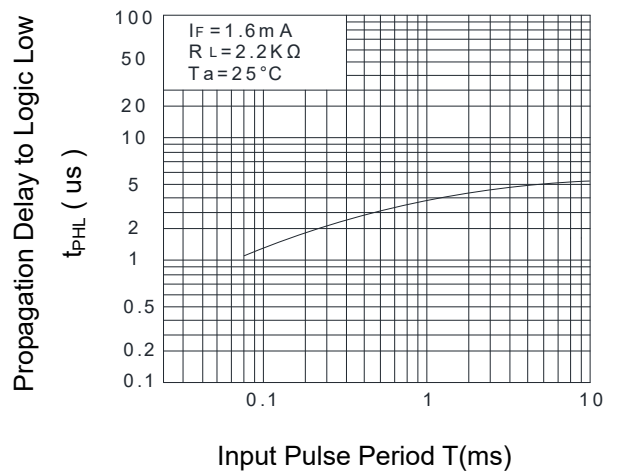
**Fig.8 Logic Low Supply Current vs. Forward Current**



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



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

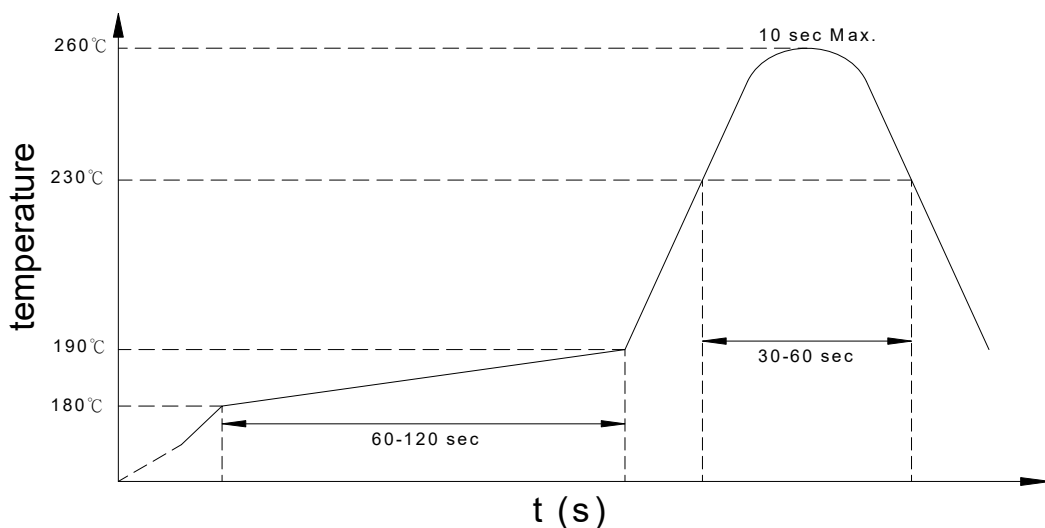


### ● Recommended Soldering Conditions

#### (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 )

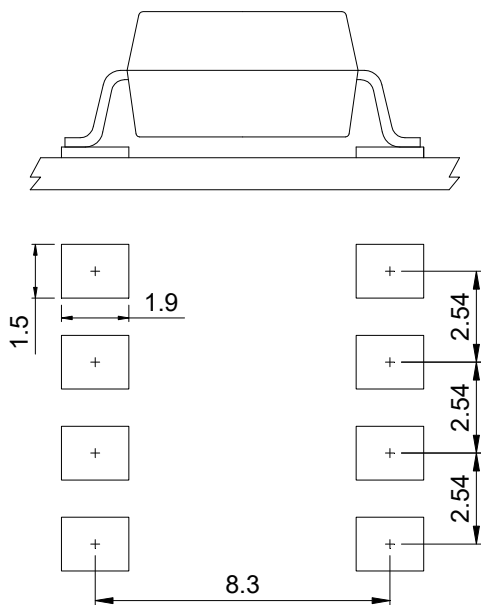
Y = Tape and reel option (TL · TR · TLD · TRU)

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**

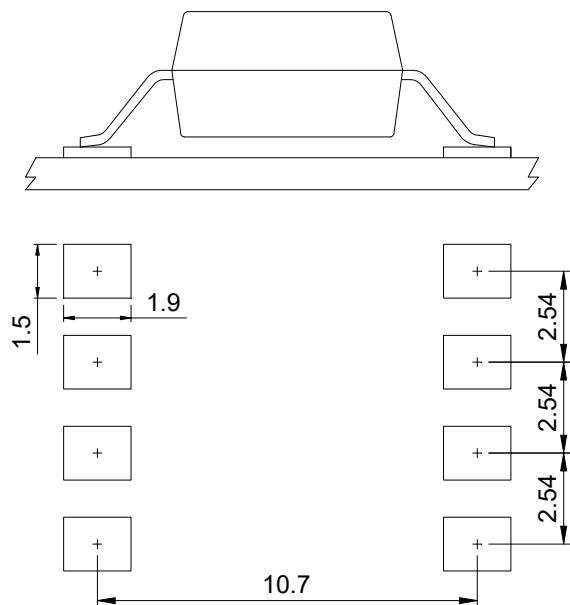
**1.Surface mount type**

8-pin SMD



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

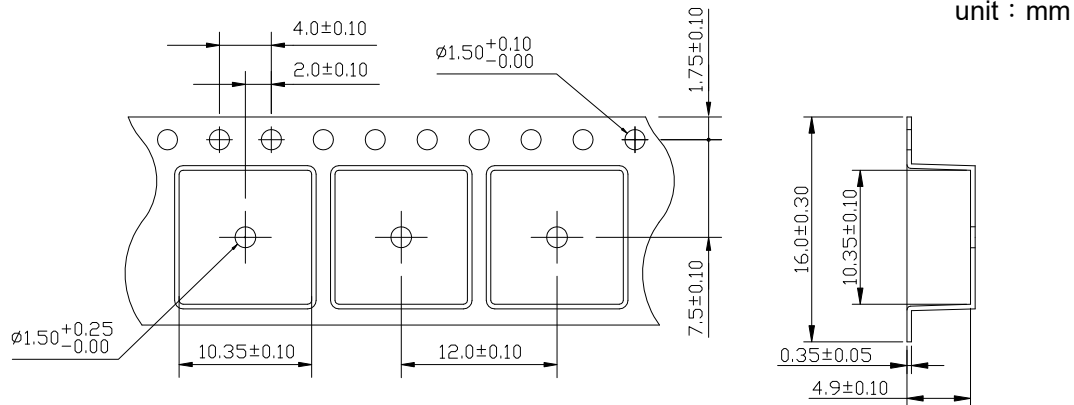
8-pin L



Unit :mm

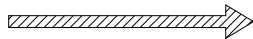
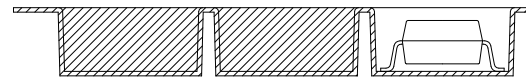
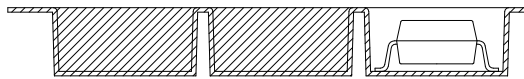
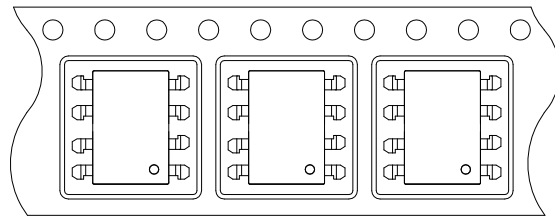
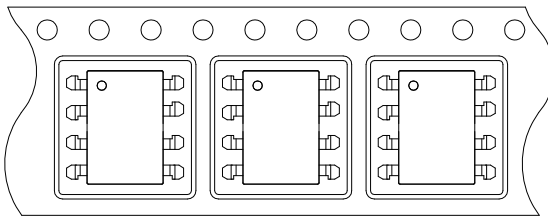


● 8-pin SMD Carrier Tape & Reel

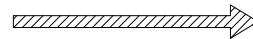


TL

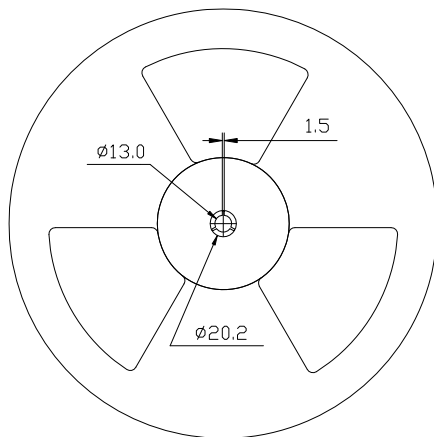
TR



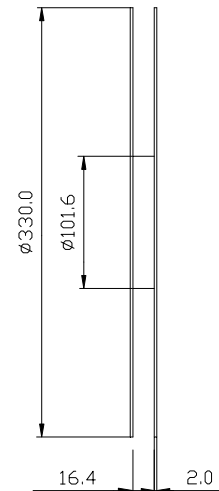
Direction of feed from reel



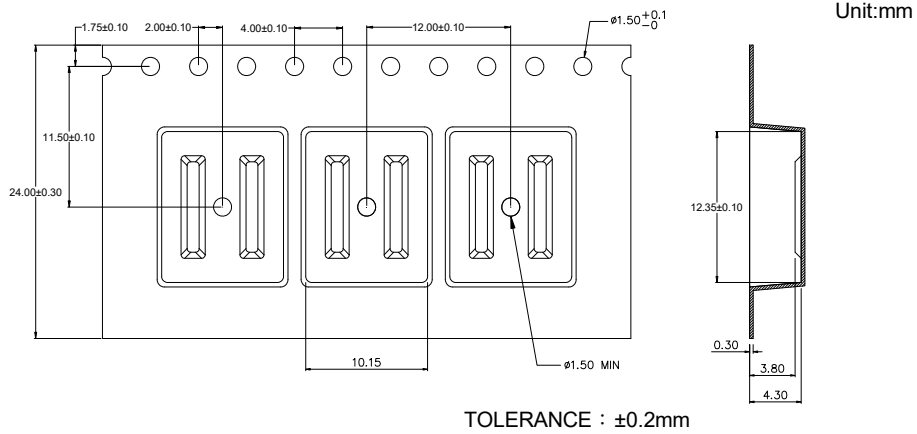
Direction of feed from reel



Quantity : 1000pcs/reel

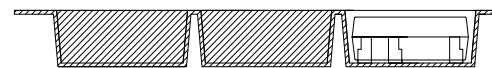
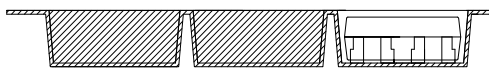
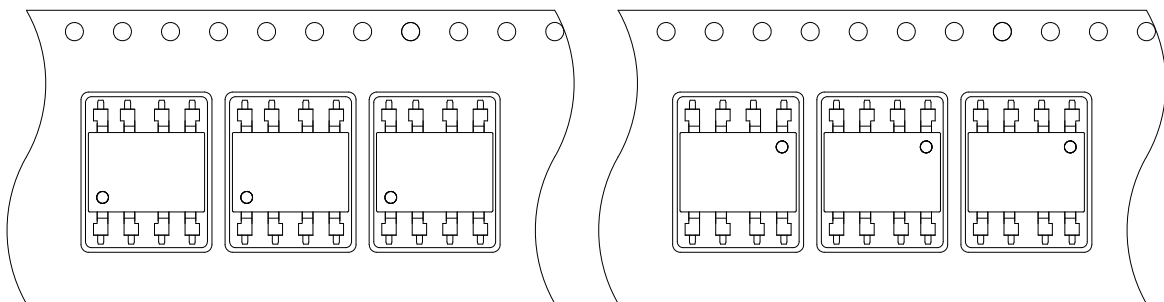


● 8-pin L Carrier Tape & Reel



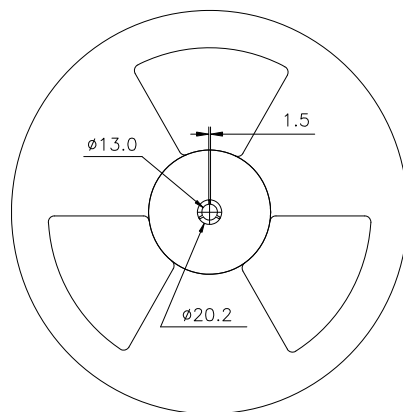
TLD

TRU

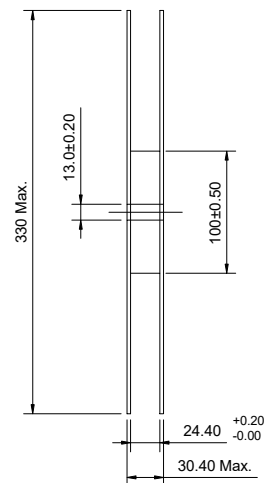


Direction of feed from reel

Direction of feed from reel



Quantity : 800pcs/reel





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