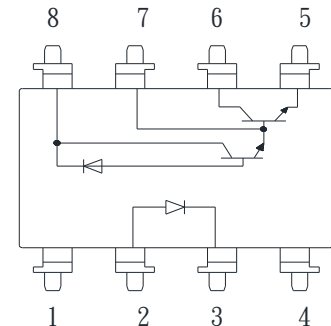


● Description

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: EN60065, EN60950

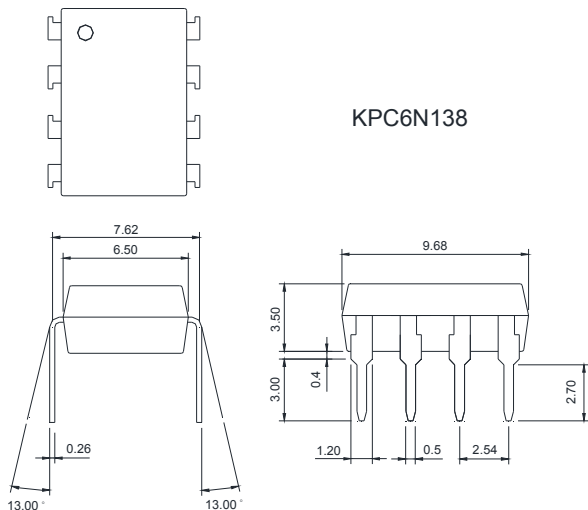
● Applications

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

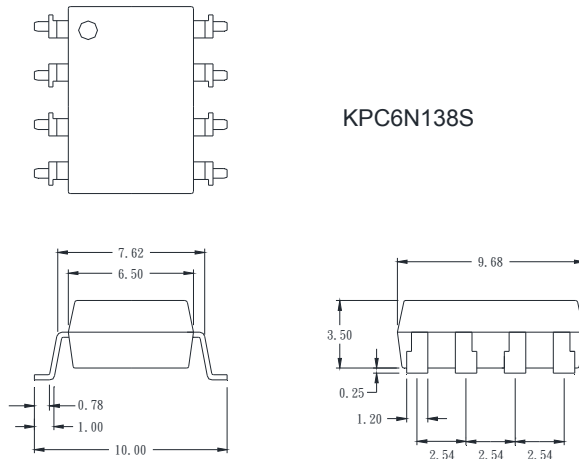
● Outside Dimension

Unit : mm

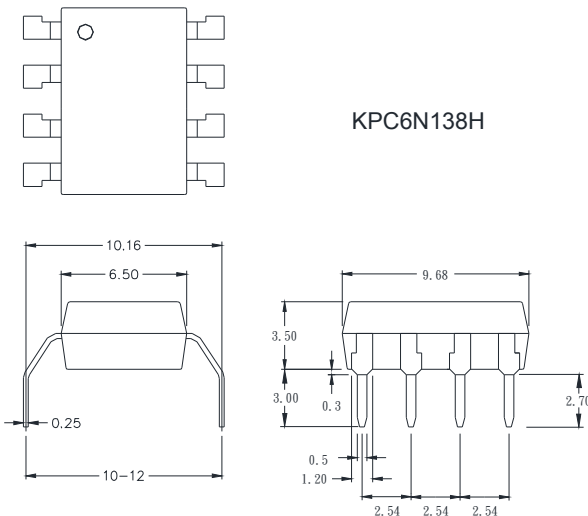
1. Dual-in-line type



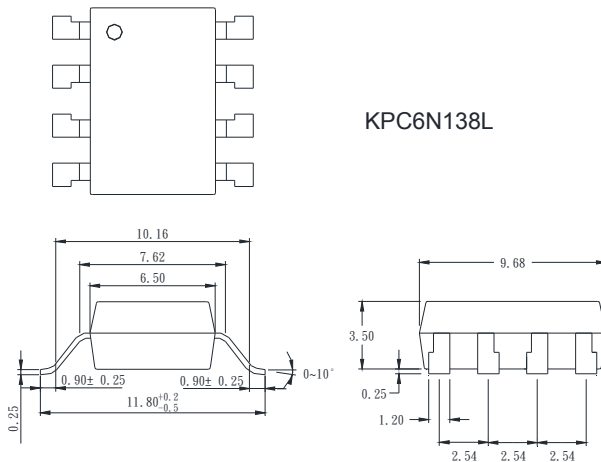
2. Surface mount type



3. Long creepage distance type

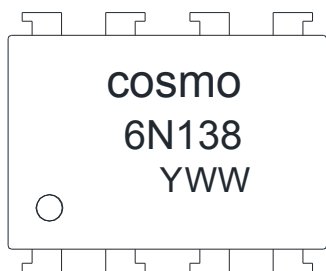


4. Long creepage distance for surface mount type



TOLERANCE: ±0.2mm

● Device Marking



Notes:

cosmo
6N138
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 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

($T_a=25^{\circ}\text{C}$, $V_{CC}=5\text{V}$)

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

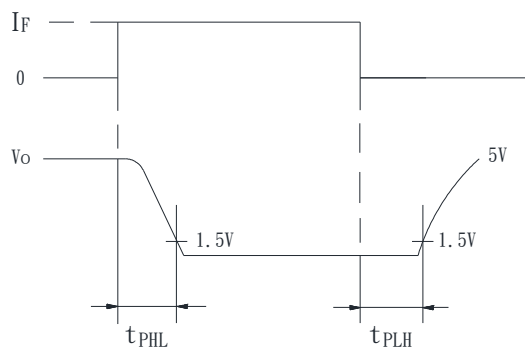
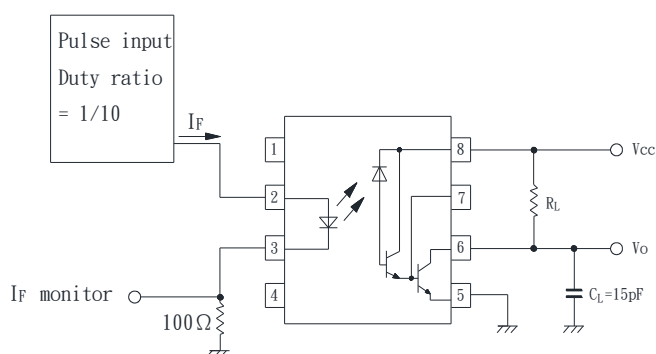
*9 Instantaneous common mode rejection voltage "output (1)" represents

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

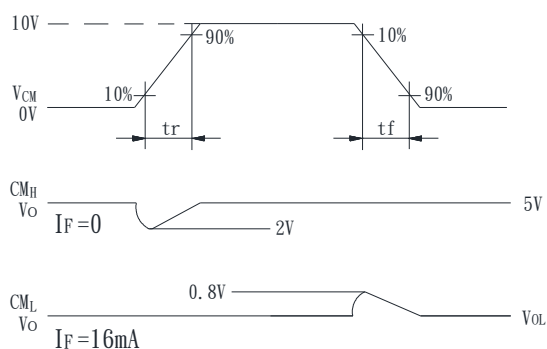
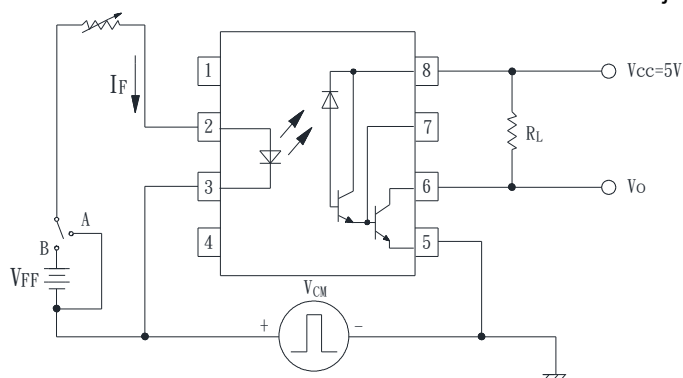
*10 Instantaneous common mode rejection voltage "output (0)" represents

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

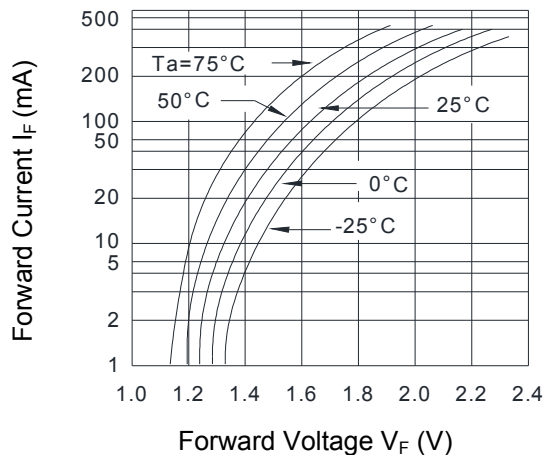
*8 Test Circuit Propagation Delay Time



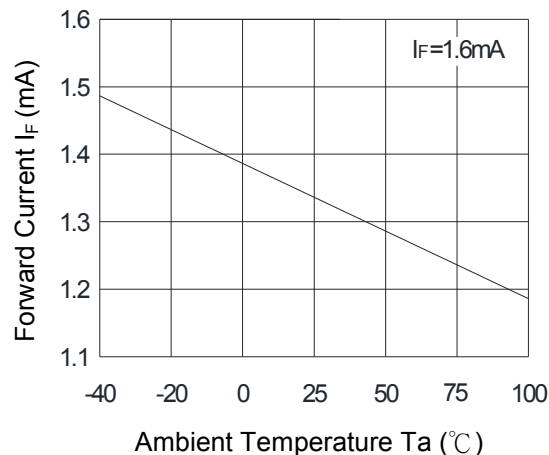
*10 Test Circuit for Instantaneous Common Mode Rejection Voltage



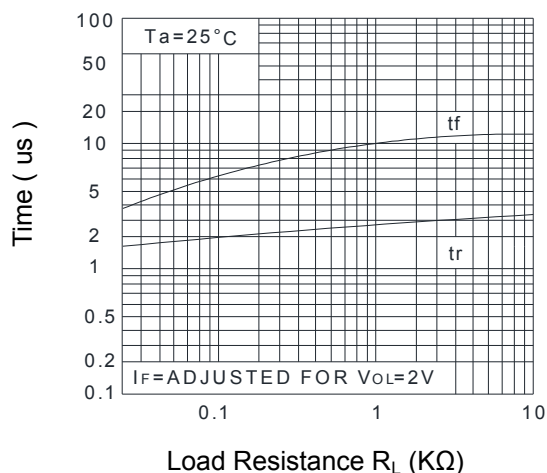
**Fig.1 Forward Current
vs. Forward Voltage**



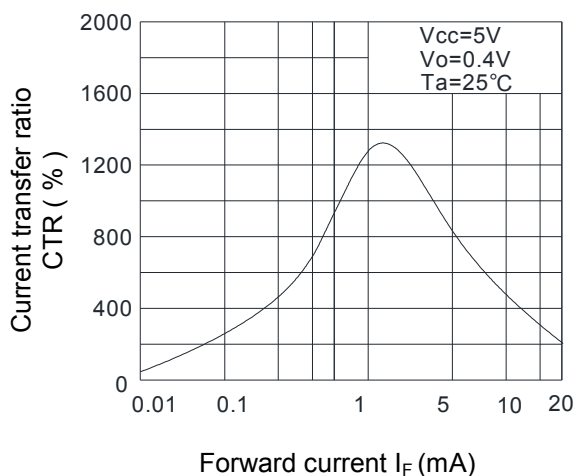
**Fig.2 Forward Current
vs. Ambient Temperature**



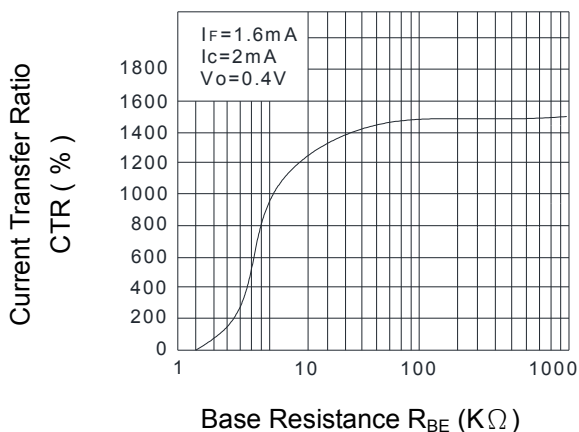
**Fig.3 Response and Fall Time
vs. Load Resistance**



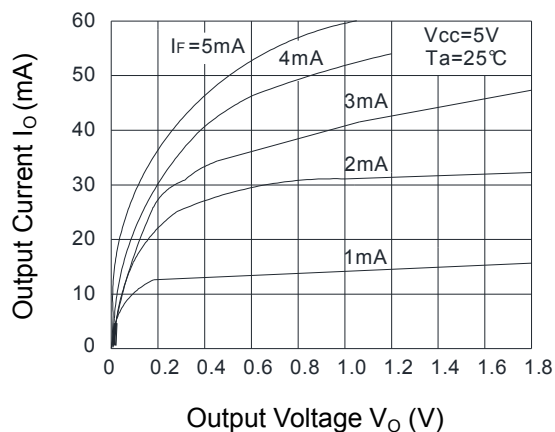
**Fig.4 Current Transfer Ratio
vs. Forward Current**



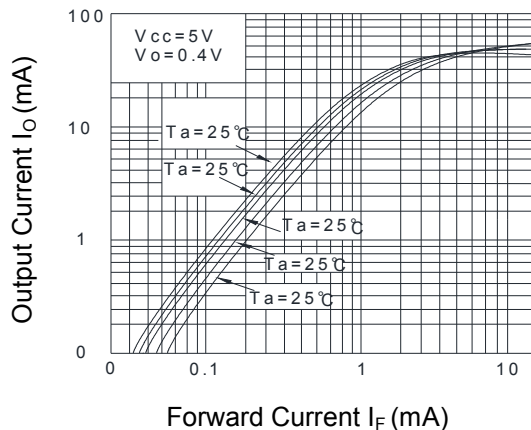
**Fig.5 Current Transfer Ratio
vs. Base-Emitter Resistance**



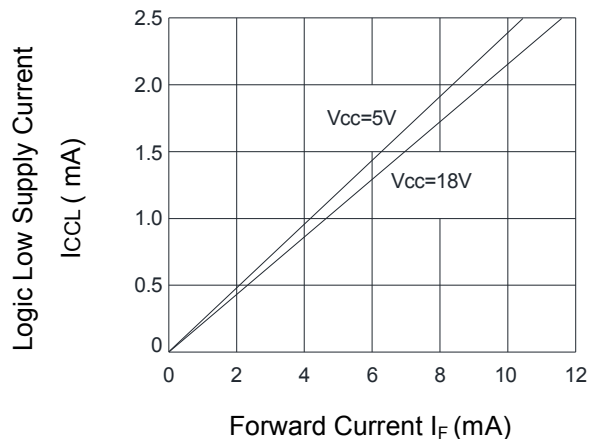
**Fig.6 Output Current
vs. Output Voltage**



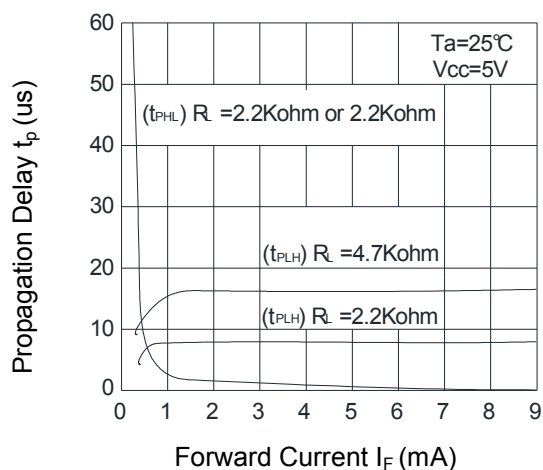
**Fig.7 Output Current
vs. Forward Current**



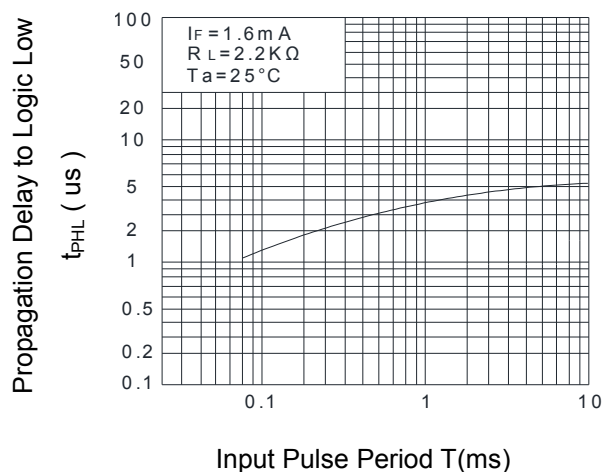
**Fig.8 Logic Low Supply Current
vs. Forward Current**



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



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

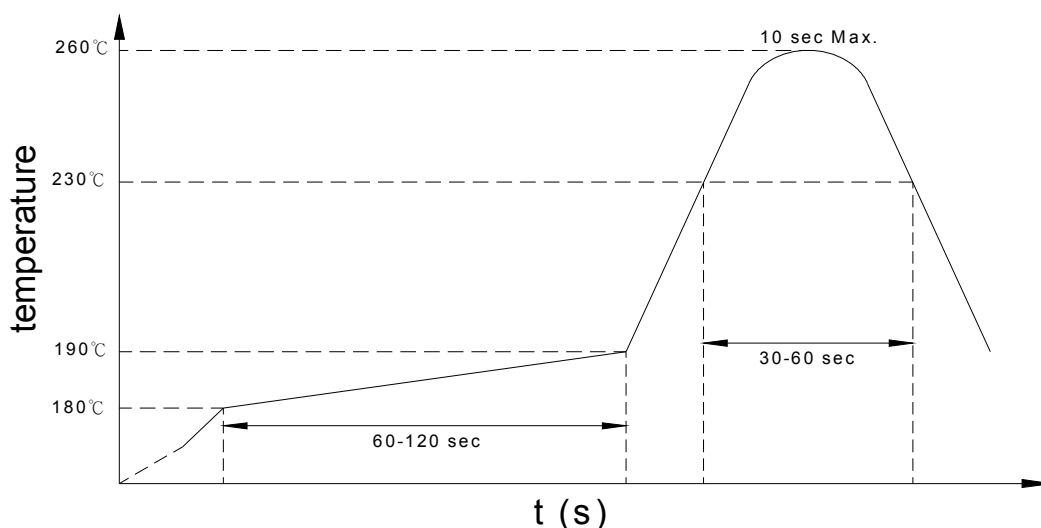


● Recommended Soldering Conditions

(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)

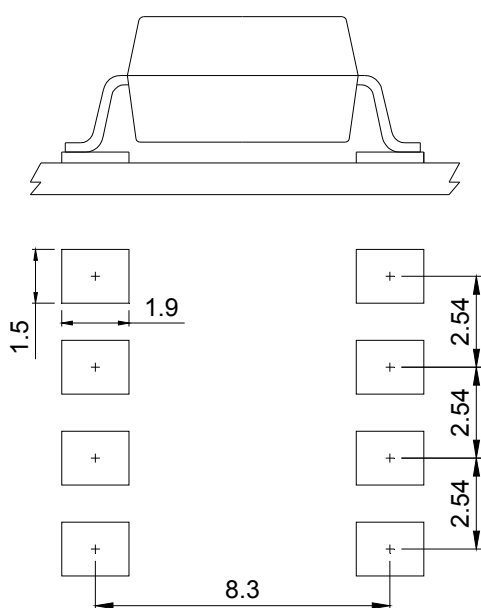
Y = Tape and reel option (TL 、 TR 、 TLD 、 TRU)

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

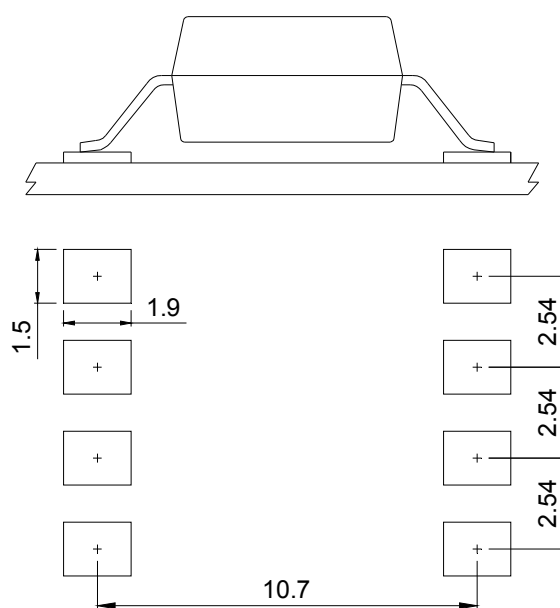
1.Surface mount type

8-pin SMD



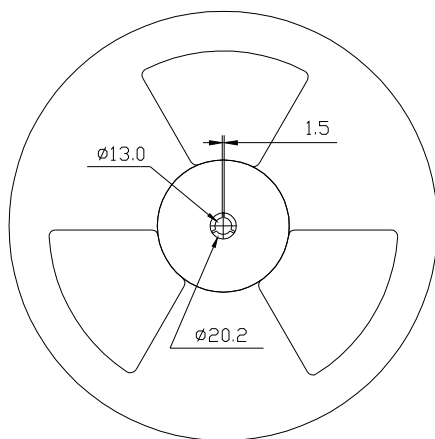
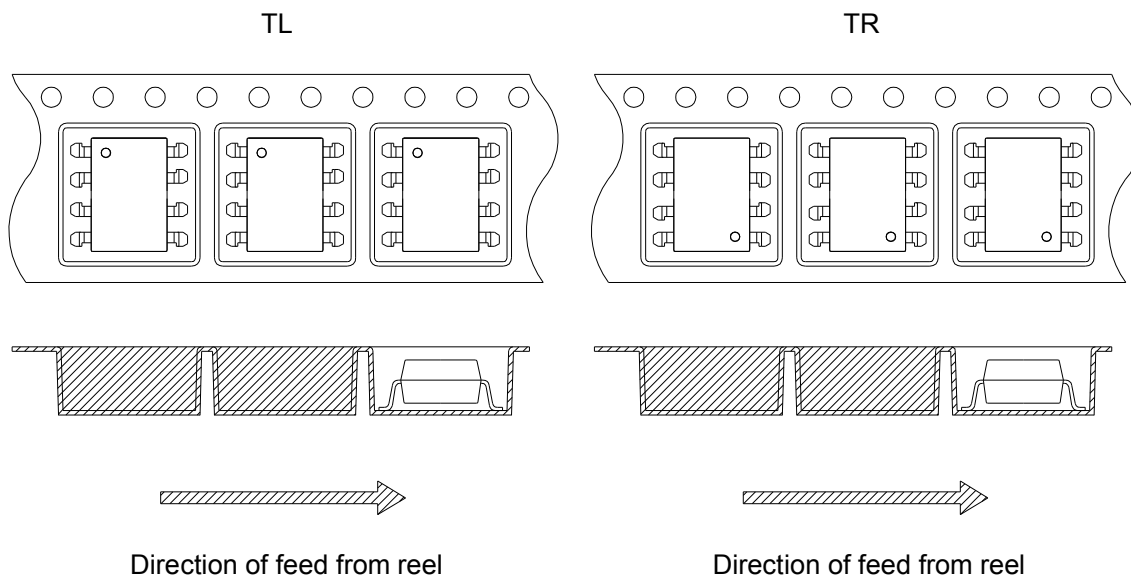
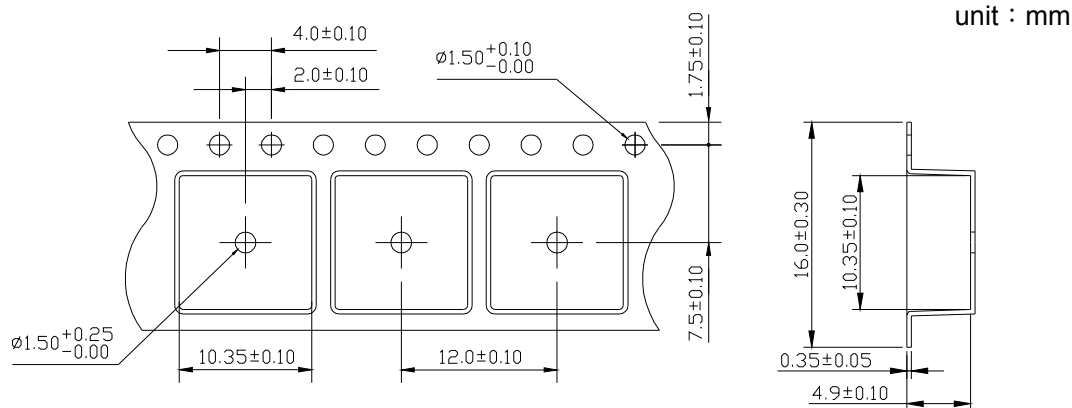
2.Long creepage distance for surface mount type

8-pin L

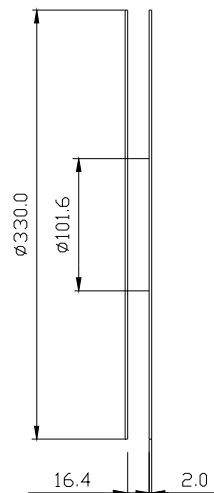


Unit :mm

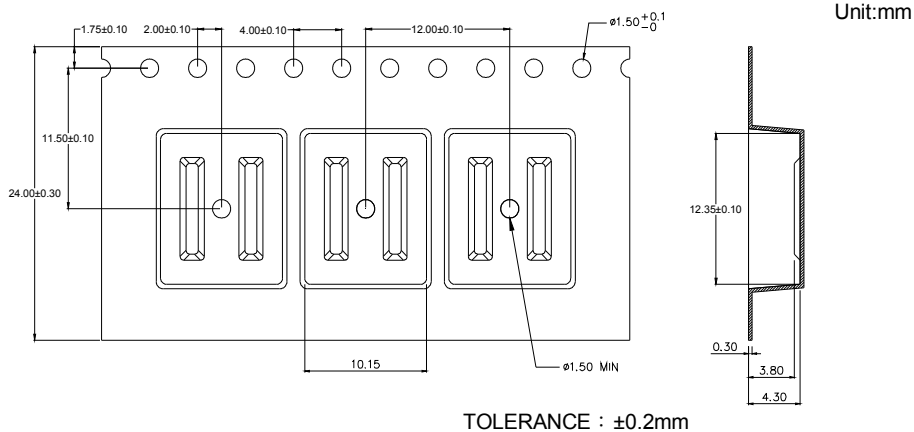
● 8-pin SMD Carrier Tape & Reel



Quantity : 1000pcs/reel

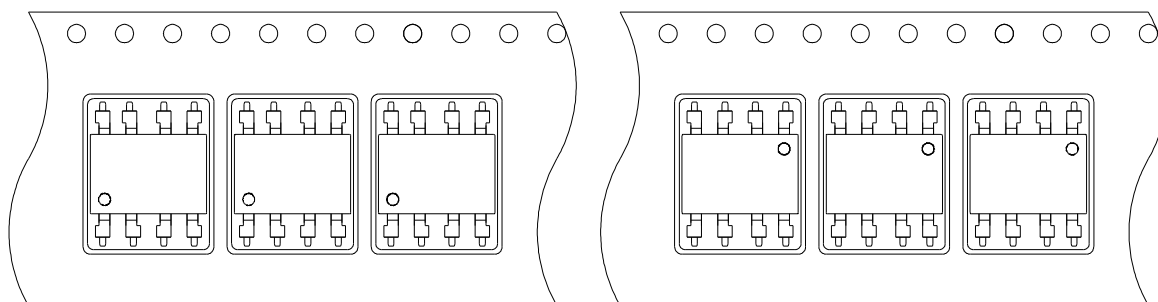


● 8-pin L Carrier Tape & Reel



TLD

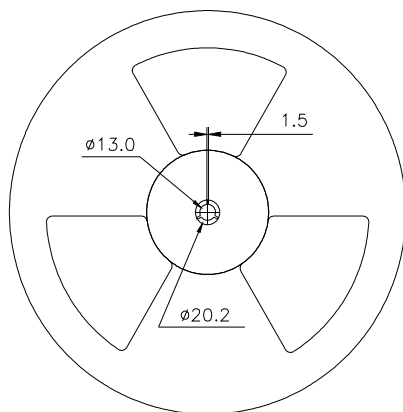
TRU



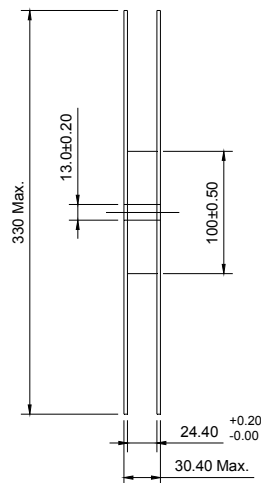
Direction of feed from reel



Direction of feed from reel



Quantity : 800pcs/reel





KPC6N138 Series

8PIN HIGH-SPEED DARLINGTON OUTPUT PHOTOCOUPLER

● Application Notice

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- g. Consumer electronics
- h. Telecommunication

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- c. Telecommunication equipment (trunk lines)
- d. Nuclear power control
- e. Equipment used for automotive vehicles, trains, ships...etc.

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