NANOCOM

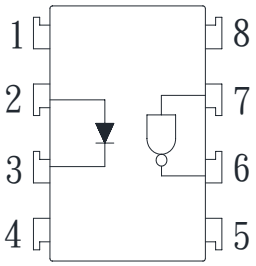
NPC6N137 Series

8PIN HIGH-SPEED OUTPUT PHOTOCOUPLER

Description

The NPC6N137 series consist of an LED. It is a super high-speed digital output type photocoupler 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_E
4. N.C.	8. Vcc

Features

1. Pb free and RoHS compliant
2. Super high-speed response (tPLH,tPHL:typ.45ns at RL=350Ω)
3. Instantaneous common mode rejection voltage(CMH:typ. 500V/us)
4. High isolation voltage between input and output (Viso:5000Vrms)
5. Low input current drive (IFHL: Max. 5mA)
6. LSTTL and TTL compatible output
7. MSL class 1
8. Agency Approvals:
   - UL Approved (No. E169586): UL1577
   - c-UL Approved (No. E169586)
   - VDE Approved (No. 40020973): DIN EN60747-5-5

Applications

- High speed interfaces for computer peripherals, microcomputer systems
- High speed line receivers
- Noise reduction
- Interfaces for data transmission equipment

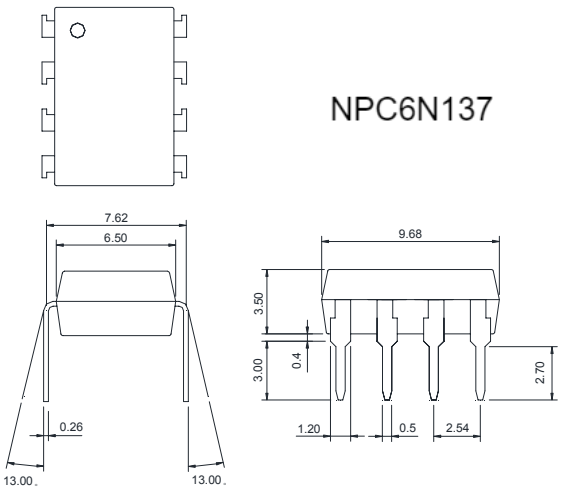
Truth Table

Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H
H	NC	L
L	NC	H

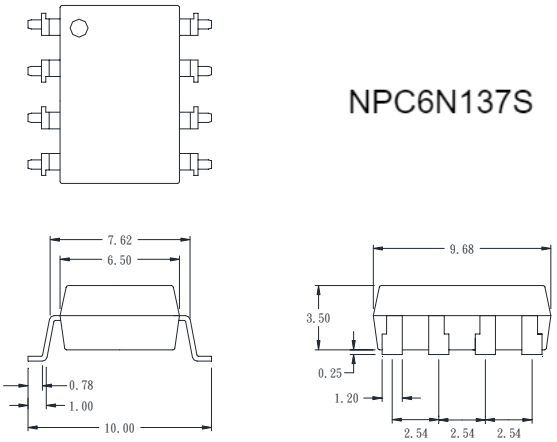
● Outside Dimension

Unit : mm

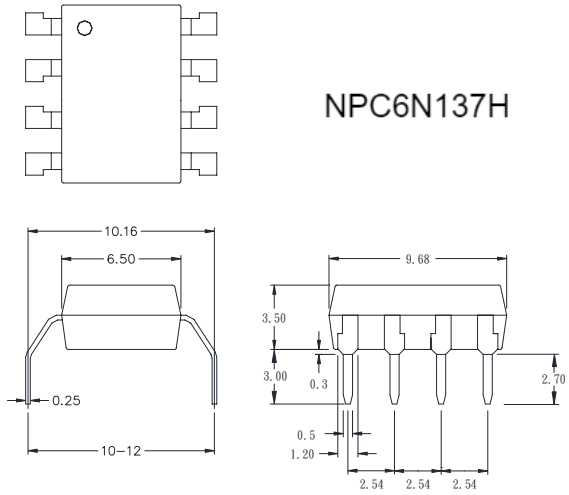
1.Dual-in-line type



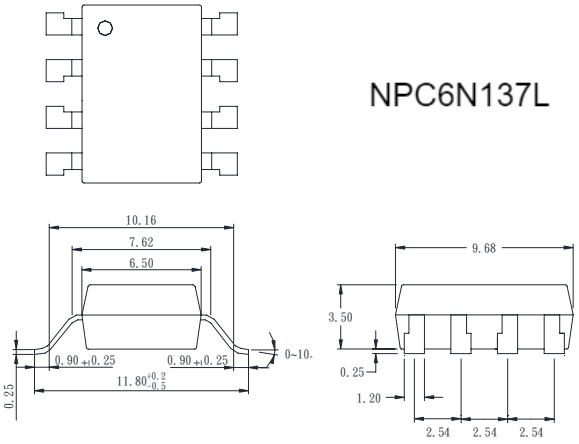
2.Surface mount type



3.Long creepage distance type

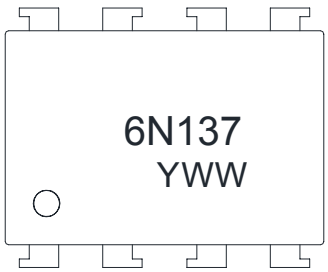


4.Long creepage distance
for surface mount type



TOLERANCE: ±0.2mm

● Device Marking



Notes:

6N137
YWW Y: Year code / WW: Week code

● Absolute Maximum Ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current (*1)	I_F	25	mA
	Peak forward current (*2)	I_{FM}	40	mA
	Reverse voltage	V_R	5	V
	Power dissipation	P_D	45	mW
Output	Supply voltage	Vcc	7	V
	Enable voltage	V_E	5.5	V
	High level output voltage	V_{OIL}	7	V
	Low level output current	I_{OL}	50	mA
	Output collector power dissipation	P_C	85	mW
Isolation voltage 1 minute (*3)		Viso	5000	Vrms
Operating temperature		Topr	-40 to +85	℃
Storage temperature		Tstg	-55 to +125	℃
Soldering temperature 10 seconds		Tsol	260	℃

● Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Low level input current	I_{FL}	0	250	uA
High level input current	I_{FH}	7.0	15	mA
High level enable voltage	V_{EH}	2.0	Vcc	V
Low level enable voltage	V_{EL}	0	0.8	V
Supply voltage	V_{CC}	4.5	5.5	V
Fanout (TTL load)	N	-	8	-

● Electro-optical Characteristics

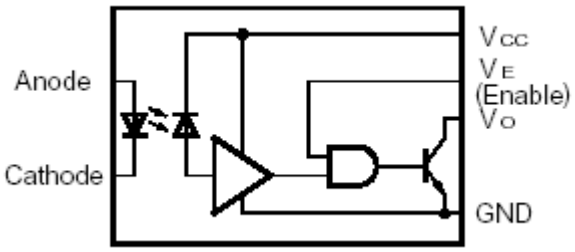
(Ta = 25℃)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input forward voltage (*4)	V_F	I_F=10mA,Ta=25℃	-	1.6	1.75	V
Input reverse voltage	BV_R	I_R=10uA,Ta=25℃	5	-	-	V
Input capacitance	C_{IN}	V_F=0, f=1MHz	-	60	-	pF
Logic (1) output current	I_{OH}	V_{CC}=5.5V,V_O=5.5V,I_F=250uA,V_E=2.0V	-	2	250	uA
Logic (0) output voltage	V_{OL}	V_{CC}=5.5V,V_{EH}=2V,I_F=5mA, I_{OL}(Sinking)=13mA	-	0.4	0.6	V
Logic (1) enable current	I_{EH}	V_{CC}=5.5V,V_E=2.0V	-	-0.8	-	mA
Logic (0) enable current	I_{EL}	V_{CC}=5.5V,V_E=0.5V	-2.0	-1.2	-	mA
Logic (1) supply current	I_{CCH}	V_{CC}=5.5V,V_E=0.5V,I_F=0mA	-	7	15	mA
Logic (0) supply current	I_{CCL}	V_{CC}=5.5V,V_E=0.5V,I_F=10mA	-	13	18	mA
Leak current (*5)	I_{I-O}	45%RH,Ta=25℃,t=5s,V_{I-O}=3000VDC	-	-	1.0	mA
Isolation resistance (input-output) (*5)	R_{I-O}	V_{I-O}=500V, Ta=25℃	-	10^{12}	-	Ω
Capacitance (input-output) (*5)	C_{I-O}	f=1MHz, Ta=25℃	-	0.6	-	pF

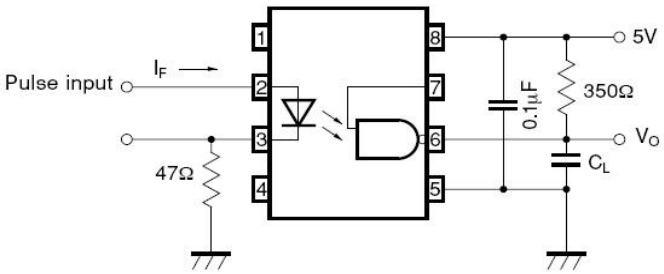
Propagation delay time Output (0)→(1) (*7)	t_{PLH}	I_F=7.5mA,V_{CC}=5V,R_L=350Ω, C_L=15pF,Ta=25℃	-	45	75	ns
Propagation delay time Output (1)→(0) (*7)	t_{PHL}		-	45	75	ns
Output rise-fall time (10 to 90%)	tr,tf	I_F=7.5mA,VCC=5V,R_L=350Ω,C_L=15pF	-	30	-	ns
Enable propagation delay time Output (1)→(0) (*8)	t_{ELH}	I_F=7.5mA,R_L=350Ω,C_L=15pF, V_{EH}=3.0V, V_{EL}=0.5V	-	40	-	ns
Enable propagation delay time Output (0)→(1) (*8)	t_{EHL}		-	15	-	ns
Instantaneous common mode rejection voltage “output(0)” (*9)	C_{MH}	I_F=0mA, V_{CM}=10V,V_O(Min)=2.0V R_L=350Ω	-	500	-	V/us
Instantaneous common mode rejection voltage “output(1)” (*9)	C_{ML}	I_F=5mA, V_{CM}=10V,V_O(Max)=0.8V R_L=350Ω	-	-500	-	V/us

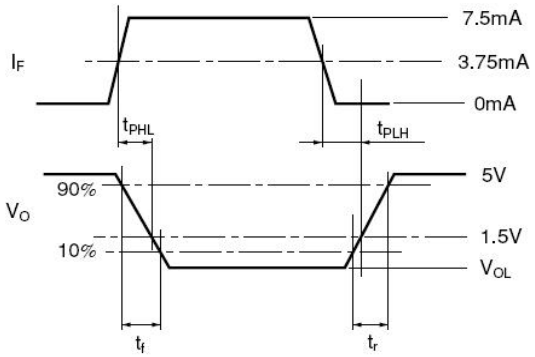
Note) Typical values are all at Vcc = 5V, Ta= 25°C
*1 Ta=0 to 70°C.
*2 Pulse width <= 1ms
*3 40 to 80%RH AC for 1 minute ,f=60HZ.
*4 At Iin =10mA, V_F decreases at the rate of 1.6mV/°C if the temperature goes up.*6 Ta=0 to 70°C.
*5 Measured as 2-pin element. Connect pins 2 and 3, connect pins 5, 6, 7 and 8.
*6 DC current transfer ratio is defined as the ratio of output collector current to forward bias input current.
*7 Refer to the Fig. 1.
*8 Refer to the Fig. 2.
*9 C_{MH} represents a common mode voltage ignorable rise time ratio that can hold logic (1) state in output.
C_{ML} represents a common mode voltage ignorable fall time ratio that can hold logic (0) state in output.

● Circuit Block Diagram

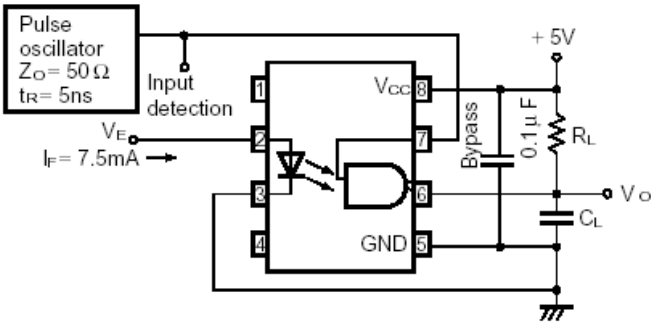


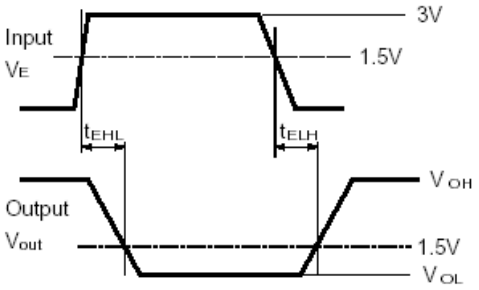
● Test Circuit for Propagation Delay time



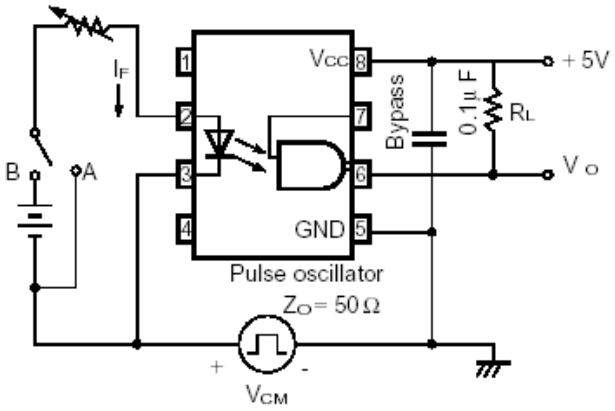


● Test Circuit for Enable Propagation Delay Time





● Test Circuit for Instantaneous Common Mode Rejection Voltage



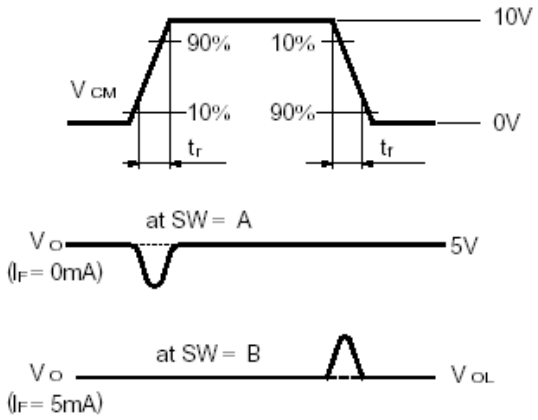


Fig.1 Low Level Output Voltage vs. Ambient Temperature

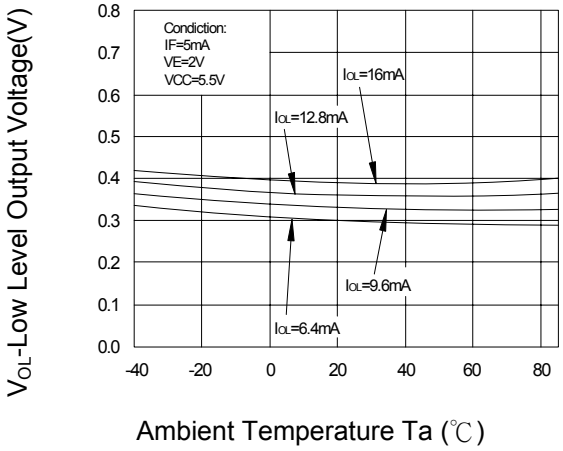


Fig.2 Forward Current vs. Input Diode Forward Voltage

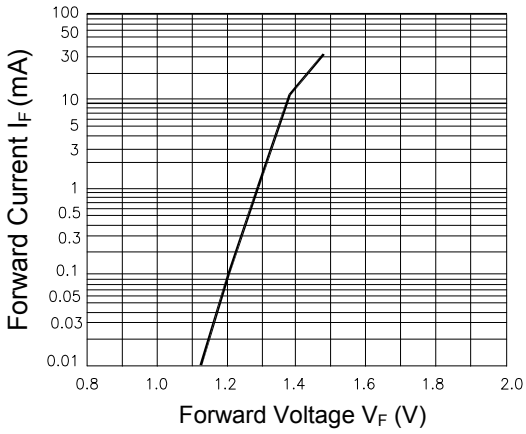


Fig.3 Switching Time vs. Forward Current

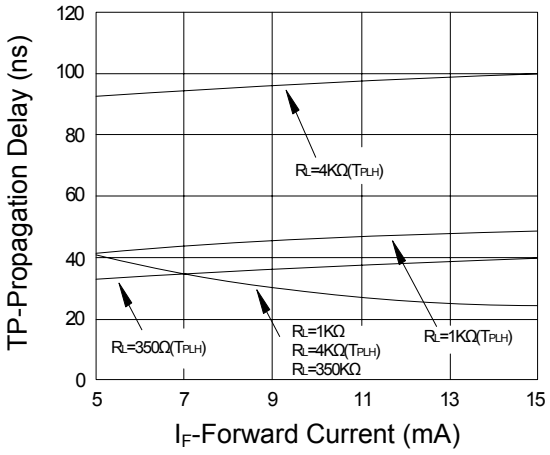


Fig.4 Low Level Output Current vs. Ambient Temperature

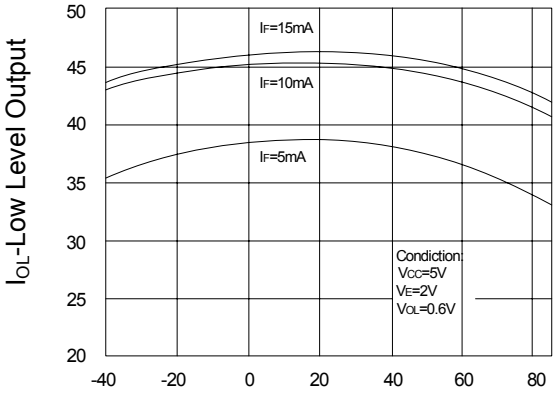


Fig.5 Input Threshold Current vs. Ambient Temperature

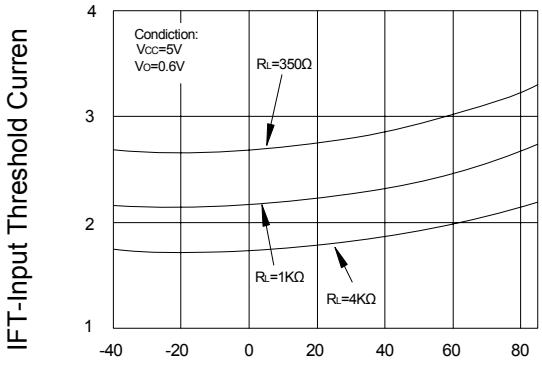


Fig.6 Output Voltage vs. Input Forward Current

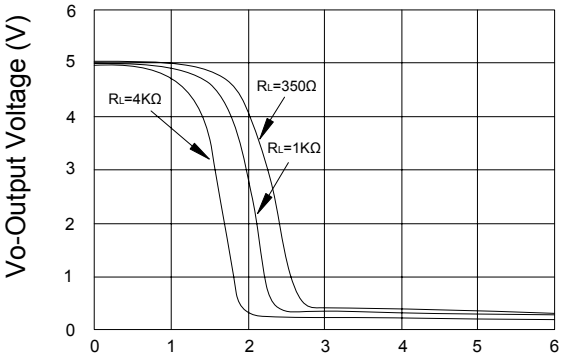


Fig.7 Pulse Width Distortion vs. Ambient Temperature

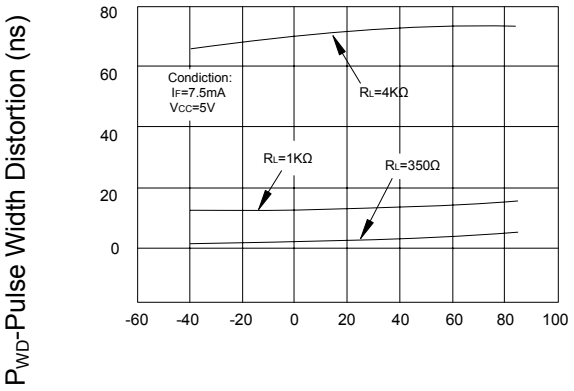


Fig.8 Rise and Fall Time vs. Ambient Temperature

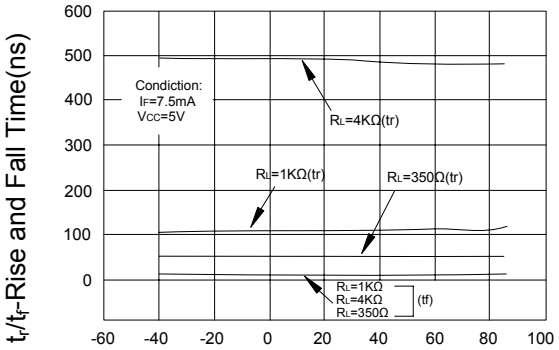


Fig.9 Switch Time vs. Ambient Temperature

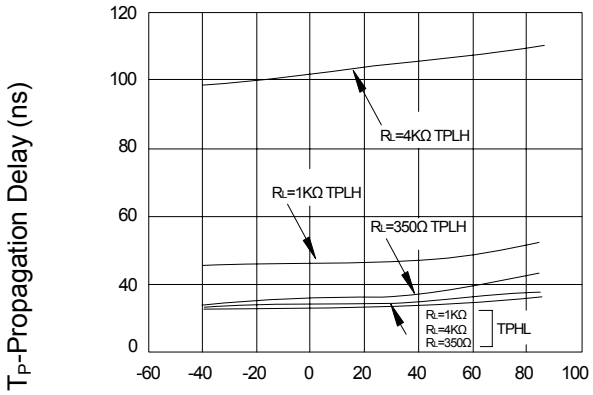
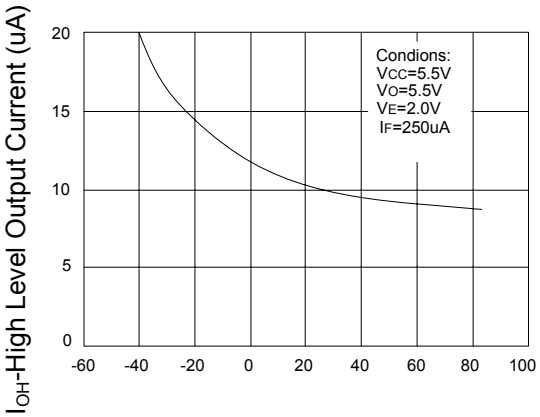


Fig.10 High Level Output Current vs. Ambient Temperature

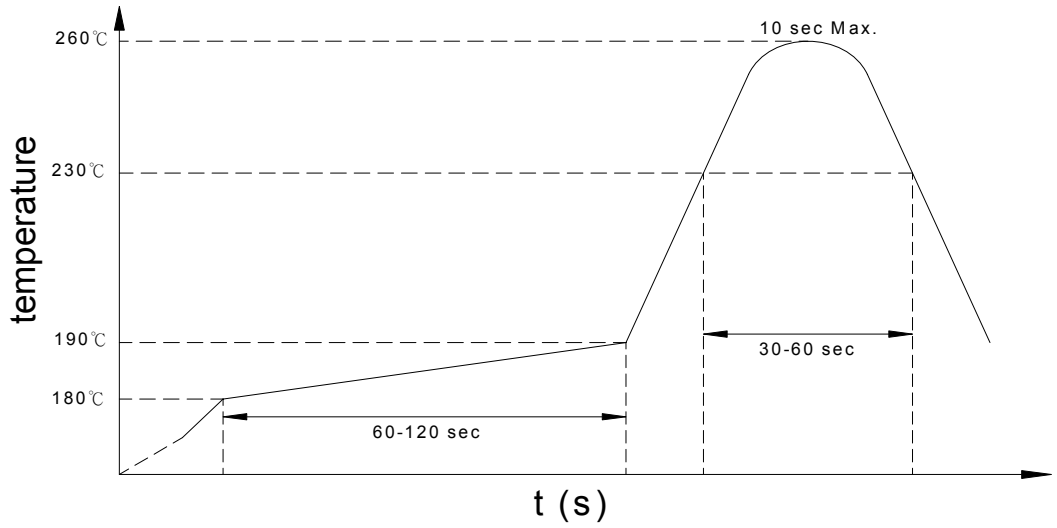


● Recommended Soldering Conditions

(a) Infrared reflow soldering：

- ■ Peak reflow soldering： 260℃ or below (package surface temperature)
- ■ Time of peak reflow temperature： 10 sec
- ■ Time of temperature higher than 230℃： 30-60 sec
- ■ Time to preheat temperature from 180~190℃： 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℃ or below (molten solder temperature)
- ■ Time： 10 seconds or less
- ■ Preheating conditions： 120℃ 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**

NPC6N137 X (Y)

Notes:

NPC6N137 = Part No.

X = Lead form option (blank、S、H、L)

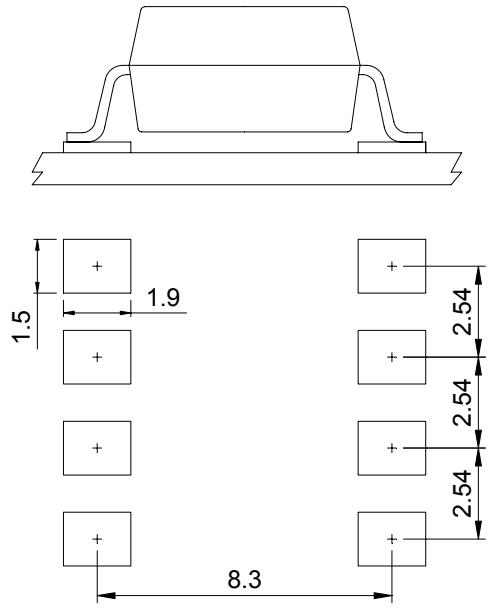
Y = Tape and reel option (TL、TR、TLD、TRU)

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**

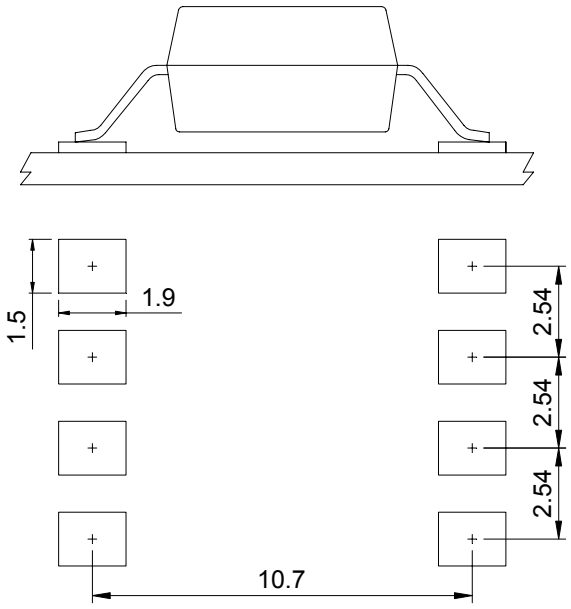
1.Surface mount type

8-pin SMD



2.Long creepage distance for surface mount type

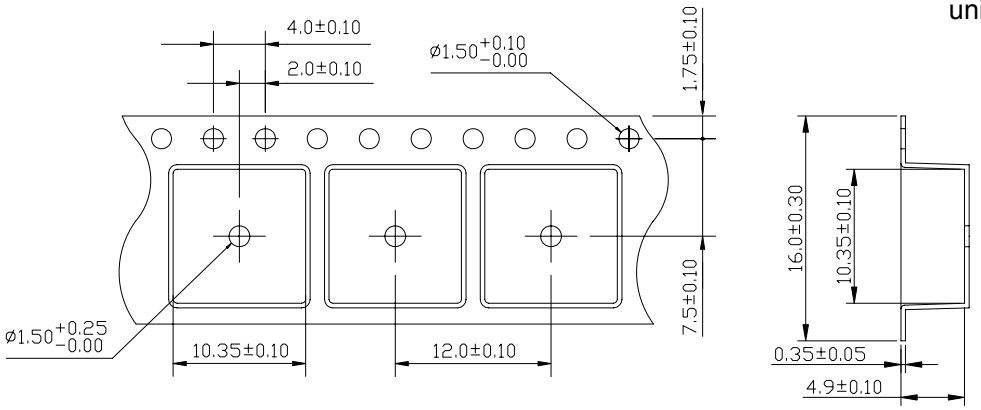
8-pin L



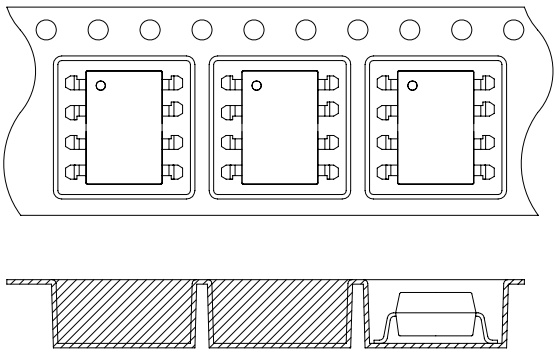
Unit :mm

● 8-pin SMD Carrier Tape & Reel

unit：mm

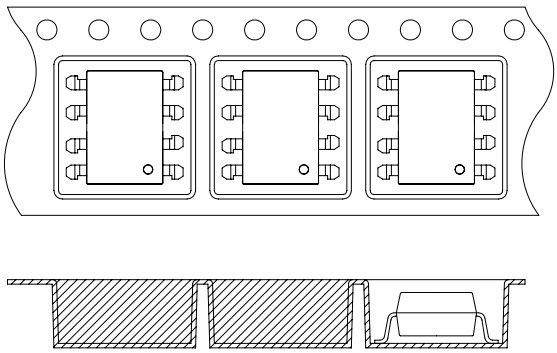


TL

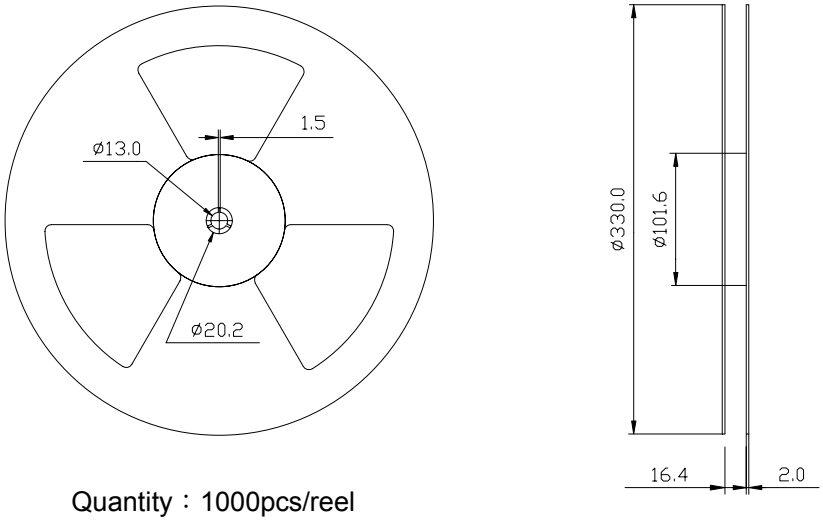


Direction of feed from reel

TR



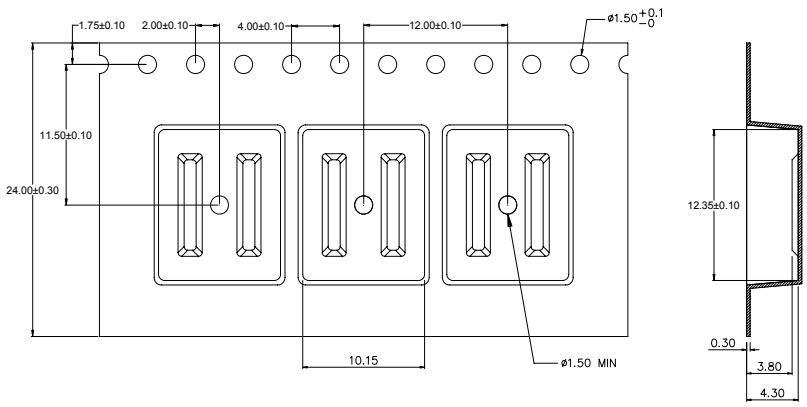
Direction of feed from reel



Quantity：1000pcs/reel

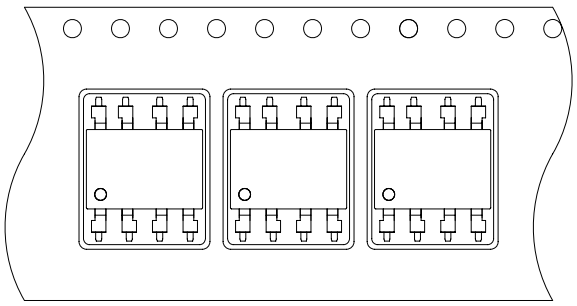
● 8-pin L Carrier Tape & Reel

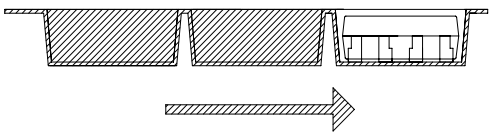
Unit:mm



TOLERANCE：±0.2mm

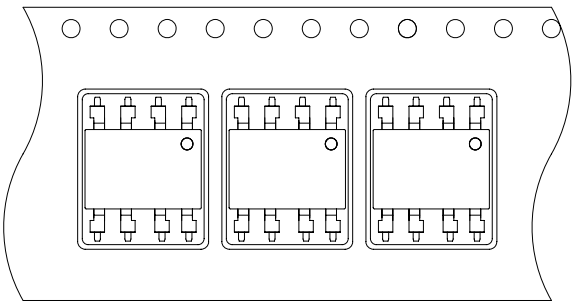
TLD

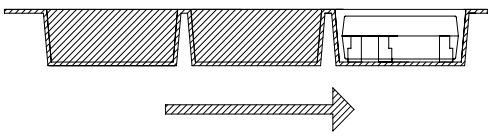




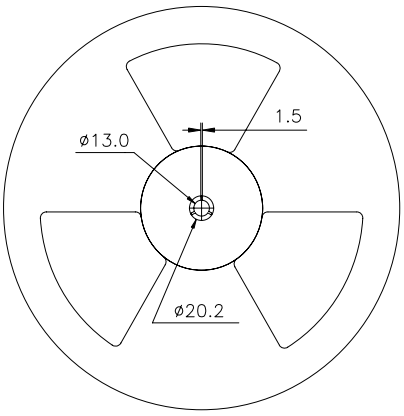
Direction of feed from reel

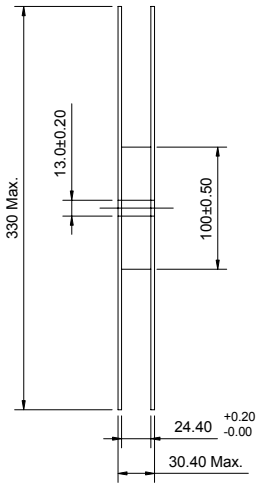
TRU





Direction of feed from reel





Quantity：800pcs/reel