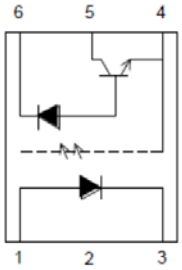
KT050L Series

LSOP 6 High Speed 1MBit/s PHOTOCOUPLER

Description

The KT050L series consists of a high efficient AlGaAs Light Emitting Diode and a high speed optical detector. This design provides excellent AC and DC isolation between the input and output sides of the photo coupler. The output of the optical detector features an open collector Schottky clamped transistor. The internal shield ensures high common mode transient immunity. A guaranteed common mode transient immunity is up to 15KV/μs (min.). The photo coupler operational parameters are guaranteed over the temperature range from -55°C ~ +110°C.

Schematic



1. Anode
2. N.C.
3. Cathode
4. GND
5. Vo (Voltage Output)
6. Vcc

Features

1. High speed – 1MBd typical
2. Package creepage at 8mm
3. Compatible with infrared vapor phase reflow and wave soldering process
4. Very high common mode transient immunity:
   15K V/μs at VCM = 1500 V
5. Guarantee performance from temperature range: -55°C to 110°C
6. TTL compatible
7. Open collector output
8. Approved
   UL1577, File No.E169586
   DIN EN IEC 60747-5-5 (VDE 0884-5):2021-10; EN IEC 60747- 5-5:2020, Certificate No.40055228
   CQC GB4943.1-2022

Applications

- Digital signal isolation
- Communications interface
- Micro-controller interface
- Feedback elements in switching power supplies
- Digital isolation for A/D, D/A conversion Digital field

Truth Table

LED	OUT
ON	L
OFF	H

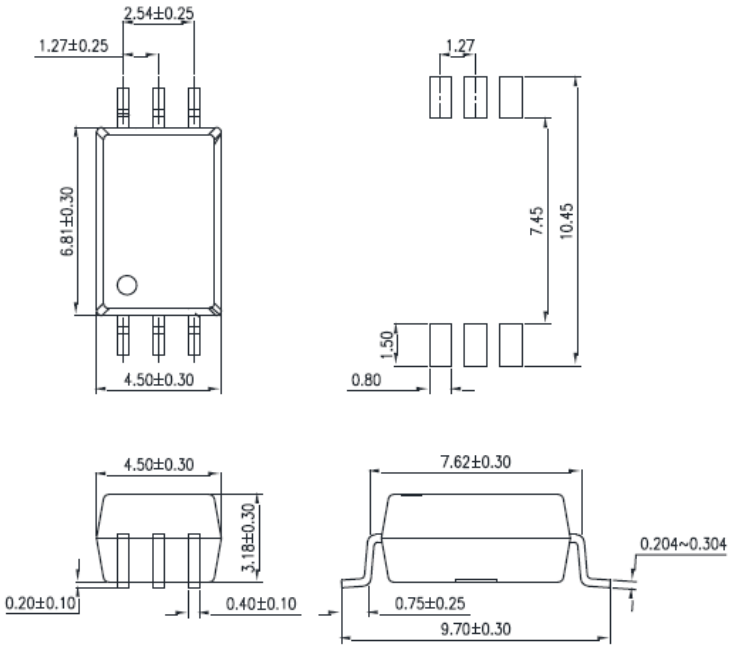
Note: A 0.1μF bypass capacitor must be connected between Pin 4 and 6.

Outside Dimension

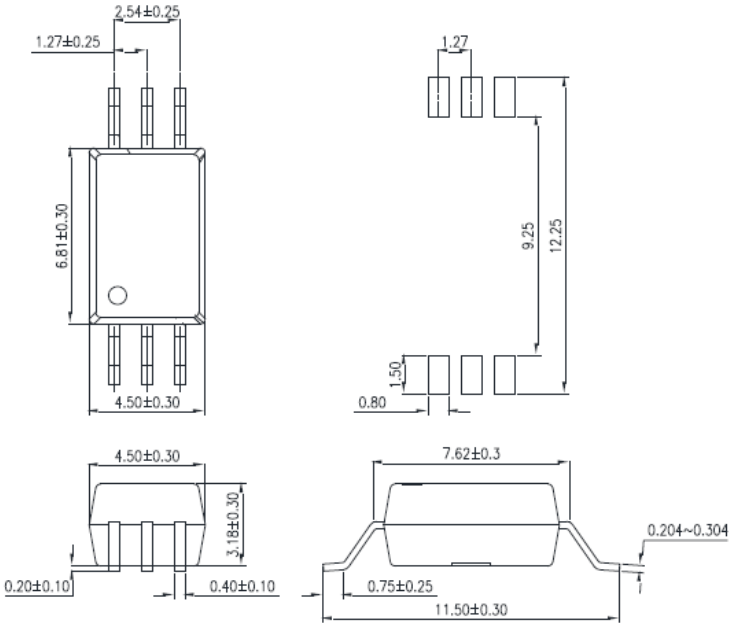
Surface Mount Lead Forming

1. P Type

Unit : mm



2. W Type



Device Marking

Notes:

cosmo
050L
YWW
Y: Year code / WW: Week code
□ □ V or None : VDE option

Absolute Maximum Ratings

(Ta = 25°C)

Parameter			Symbol	Rating	Unit
Input	Forward current		I_F	25	mA
	Reverse voltage		V_R	5	V
	Input power dissipation		P_I	45	mW
Output	Output current		I_O	8	mA
	Output voltage		V_O	20	V
	Output power dissipation		P_O	100	mW
	Supply Voltage		Vcc	30	V
Junction temperature			T_j	125	°C
Storage Temperature			T_{stg}	125	°C
Operating Temperature			T_{opr}	110	°C
Lead soldering temperature(10s)		(Note 2)	T_{sol}	260	°C
Isolation voltage (AC,1min.,R.H≦60%)		(Note 3)	BVs	5000	Vrms

Note 1: Pulse width Pw ≦ 1μs,300pps.
Note 2: It is 2 mm or more from a lead root.
Note 3: Device is considered as a two terminal device: Pin1,2 and 3 shorted together, and pins 4,5 and 6 shorted together.

● Electrical Characteristics

(Ta = 25℃)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input Forward Voltage	V_F	I_F =16mA, T_A=25 °C	1.6	2.0	2.4	V
Input Reverse Voltage	BV_R	I_R = 10μA	5	-	-	V
Logic high supply current	I_{CCH}	I_F = 0mA, V_O = open ; T_A = 25°C (V_{CC} = 30V)	-	0.002	1	μA
Logic low supply current	I_{CCL}	I_F = 16mA, V_O = open (V_{CC}=30V)	-	230	-	μA
Logic high output current	I_{OH}	I_F = 0mA, V_O = V_{CC} = 5.5V, T_A = 25°C	-	0.002	0.5	μA
		I_F = 0mA, V_O = V_{CC} = 15V T_A = 25°C	-	0.013	1	μA
		T_A = 0 ~ 70°C	-	-	50	μA
Logic low output voltage output voltage	V_{OL}	I_F = 16mA;V_{CC} = 4.5V; I_O = 3.0mA; T_A = 25°C	-	0.1	0.4	V
		I_F = 16mA;V_{CC} = 4.5V; I_O = 2.4mA; T_A = 25°C	-	-	0.5	V
Current transfer ratio	CTR	I_F = 16mA; V_{CC} = 4.5V; T_A = 25 °C; V_O = 0.4V	20	100	-	%
		I_F = 16mA; V_{CC} = 4.5V; T_A = 25°C; V_O = 0.5V	15	110	-	

Specified over recommended temperature (TA = -40°C to +110°C, +4.5V ≤ VCC ≤ 30V), IF(ON) = 1.6mA to 5mA, VF(OFF) = 0V to 0.8V, unless otherwise specified. All typicals at TA = 25°C.

Note 1: Duration of output short circuit time should not exceed 10 μs.

Note 2: Input capacitance is measured between pin 1 and pin 3.

● Switching Characteristics

(Ta = 25°C)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Propagation Delay Time to Output Low Level	t_{PHL}	TA=25°C, RL=1.9KΩ	-	250	800	ns
		TA=0~100°C, RL=1.9KΩ	-	-	800	
Propagation Delay Time to Output High Level	t_{PLH}	TA=25°C, RL=1.9KΩ	-	650	800	
		TA=0~100°C, RL=1.9KΩ	-	-	800	
Common mode transient immunity at high level output	$\|C_{MH}\|$	IF = 0 mA, CL=15pF, RL = 1.9KΩ, VCM = 1500V	15	25	-	KV / μs
Common mode transient immunity at low level output	$\|C_{ML}\|$	IF = 16 mA, CL=15pF, RL = 1.9KΩ, VCM = 1500V	15	25	-	KV / μs

Over recommended operating conditions TA = -40° C to 105° C, VCC = +4.5 V to 30 V, IF(ON) = 1.6 mA to 5 mA, VF(OFF) = 0 V to 0.8 V,unless otherwise specified. All typicals at TA = 25°C.

Note 1: The tPLH propagation delay is measured from the 50% point on the leading edge of the input pulse to the 1.3 V point on the leading edge of the output pulse. The tPHL propagation delay is measured from the 50% point on the trailing edge of the input pulse to the 1.3 V point on the trailing edge of the output pulse.

Note 2: Pulse Width Distortion (PWD) is defined as |tPHL - tPLH | for any given device.

Note 3: The difference of tPLH and tPHL between any two devices under the same test condition.

Note 4: CMH is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic high state, VO > 2.0 V. CML is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic low state, VO < 0.8 V. Note: Equal value split resistors (Rin/2) must be used at both ends of the LED.

TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

Fig.1 DC and Pulsed Transfer Characteristics

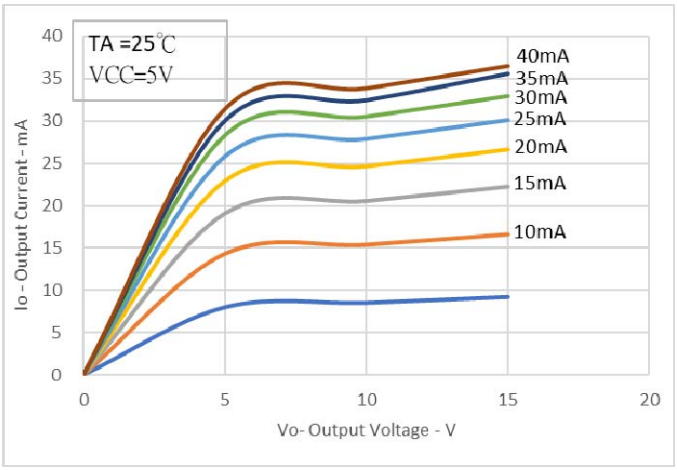


Fig.2 Input Current vs. Forward Voltage

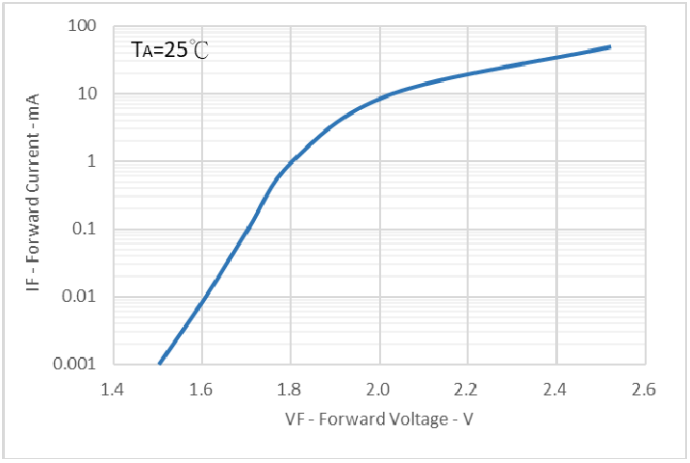


Fig.3 Propagation Delay vs. Load Resistance

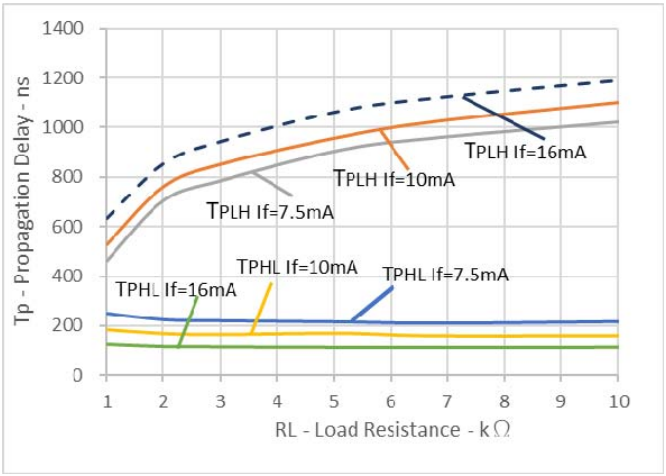


Fig.4 Current Transfer Ratio vs. Input Current

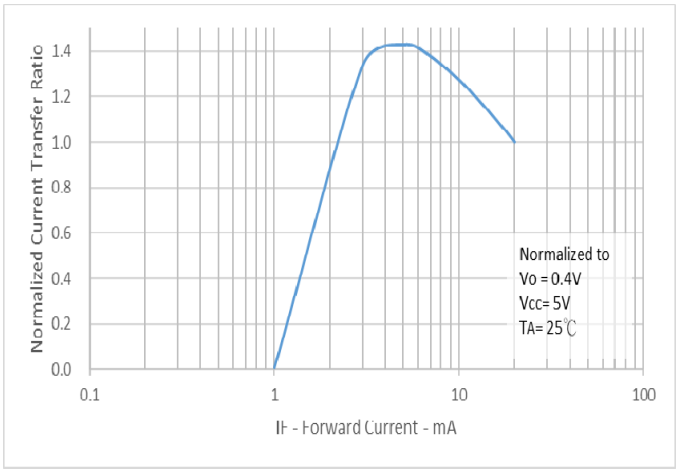


Fig.5 Current Transfer Ration vs. Temperature

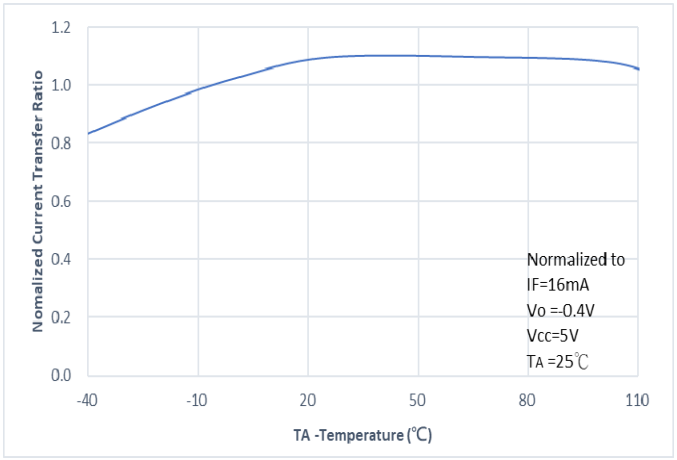


Fig.6 Propagation Delay Time vs. Temperature

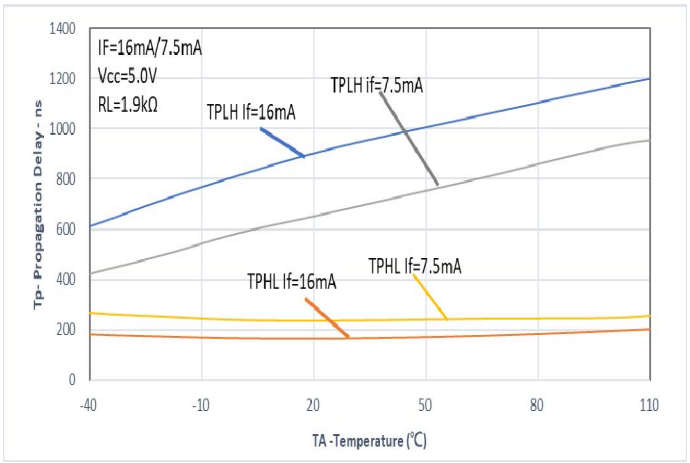


Fig.7 Logic High Output Current vs. Temperature

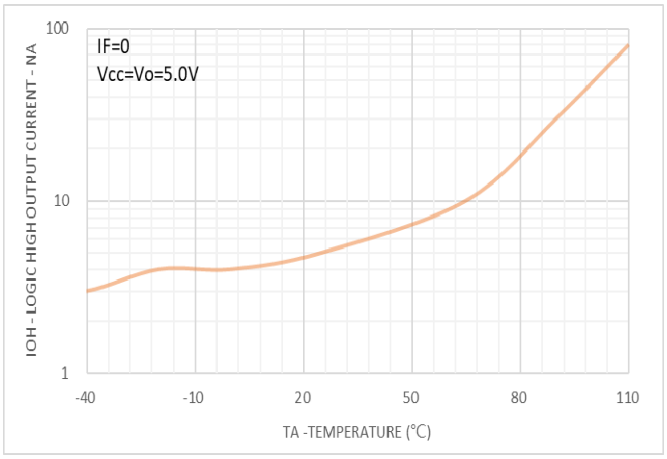
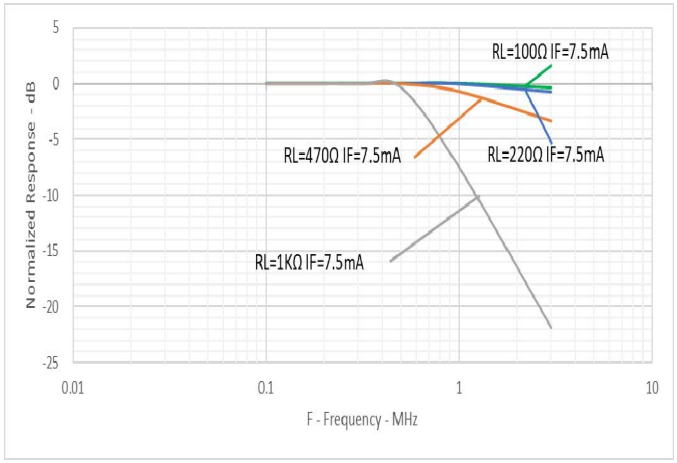
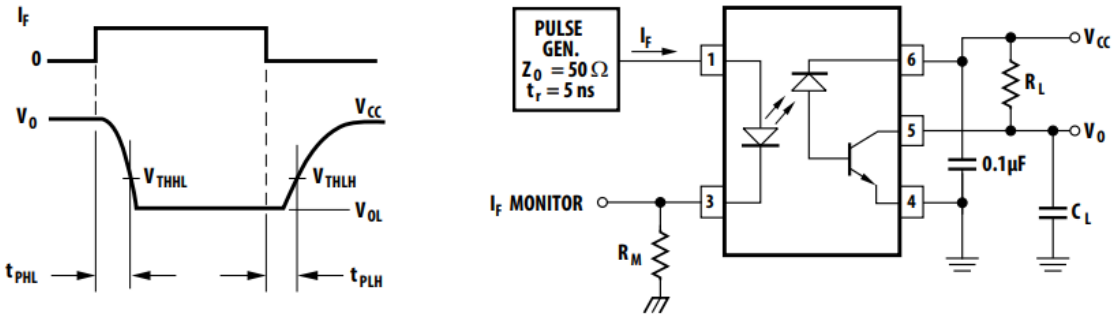


Fig.8 Frequency Response

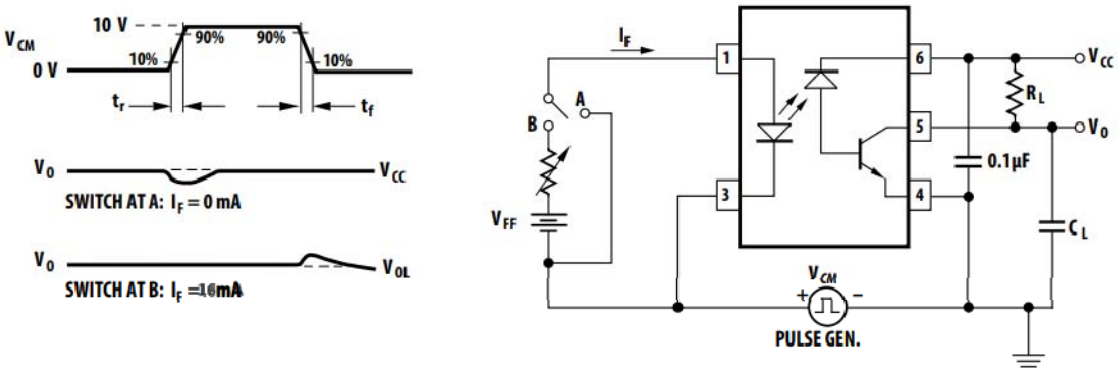


- **Test Circuit**

Propagation delay time tPLH、tPHL、and rise time tr, fall time tf



Common Mode Transient Immunity Test Circuit and Typical Waveforms



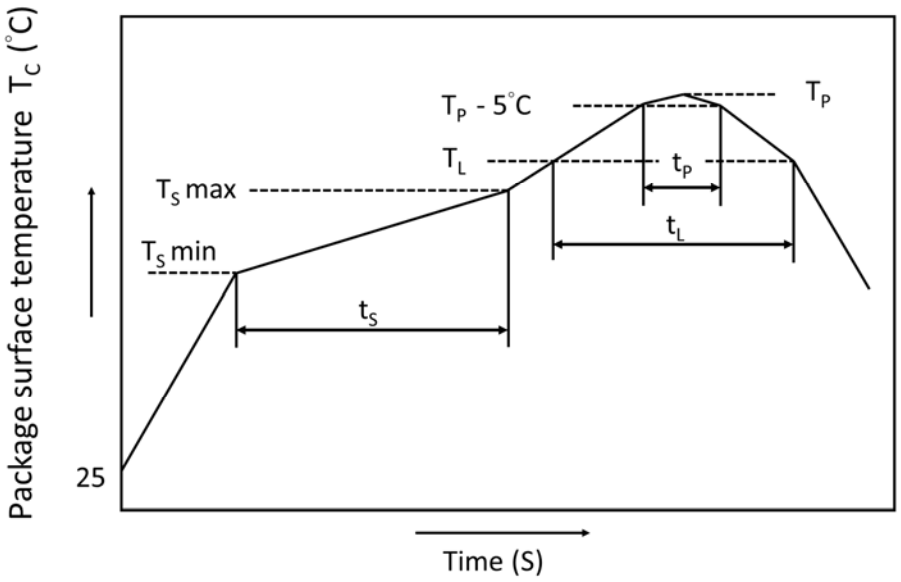
*C_{ML}(C_{MH}) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

Recommended Soldering Conditions

IR Reflow soldering

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

Recommended Temperature Profile of Infrared Reflow



	Symbol	Min	Max	Unit
Preheat temperature	T_S	150	200	°C
Preheat time	t_S	60	120	s
Ramp-up rate (T_L to T_P)			3	°C/s
Liquidus temperature	T_L	217		°C
Time above T_L	t_L	60	100	s
Peak Temperature	T_P		260	°C
Time during which T_C is between (T_P - 5) and T_P	t_P		20	s
Ramp-down rate			6	°C/s

Numbering System

KT050L X (Y)-(Z)

Notes:

KT050 = Part No.

X = Lead form option (P or W)

Y = Tape and reel option (TLD or TRU)

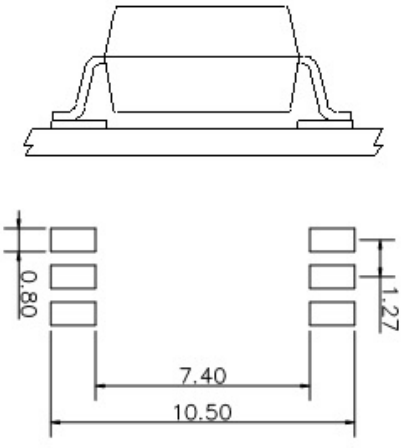
Z = VDE option (V or None)

Option	Description	Packing quantity
P (TLD)	surface mount type package + TL tape & reel option	3000 units per reel
P (TRU)	surface mount type package + TR tape & reel option	3000 units per reel
W (TLD)	long creepage distance for surface mount type package + TLD tape & reel option	3000 units per reel
W (TRU)	long creepage distance for surface mount type package + TRU tape & reel option	3000 units per reel

Recommended Pad Layout for Surface Mount Lead Form

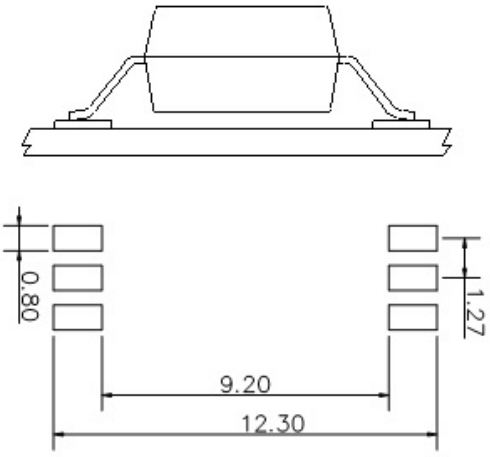
1. Surface mount type

6LSOP-P type



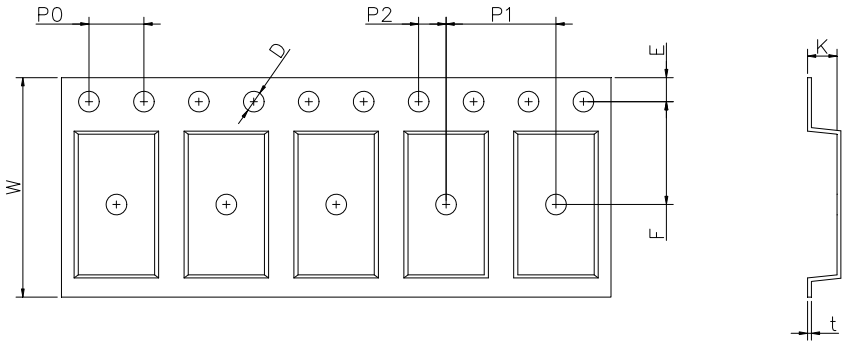
2.Long creepage distance for surface mount type

6LSOP-W type



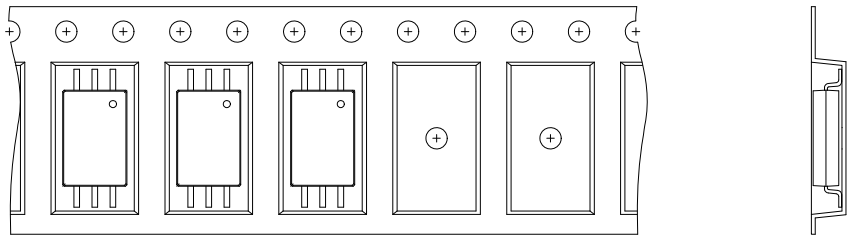
Unit :mm

● LSOP 6 Carrier Tape & Reel

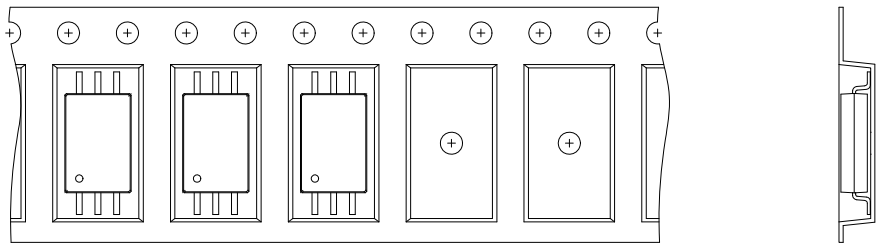


Dimension Symbol	D	E	F	P0	P1	P2	t	W	K
P type Dimension (mm)	1.5±0.1	1.75±0.1	7.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	16.0±0.3	2.15±0.1
W type Dimension (mm)	1.5±0.1	1.75±0.1	11.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	24.0±0.3	2.52±0.1

TRU



TLD



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 equipments, personal computers, test and measurement equipments, 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 equipments, 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.