

● **Description**

The KT060L is an optically coupled gate that combines a light emitting diode and an integrated high gain photo detector. The output of the detector IC is an open collector Schottky clamped transistor. The internal shield provides a guaranteed common mode transient immunity specification of 10,000 V/μs for the KT060L. This unique design provides maximum AC and DC circuit isolation while achieving TTL compatibility. The KT060L is suitable for high-speed logic interfacing, input/output buffering, as line receivers in environments that conventional line receivers cannot tolerate and are recommended for use in extremely high ground or induced noise environments.

● **Features**

1. 10 kV/μs minimum Common Mode Rejection (CMR) at VCM = 1000V
2. High speed: 10 MBd typical
3. Guaranteed ac and dc performance over -40°C ~+110°C

● **Applications**

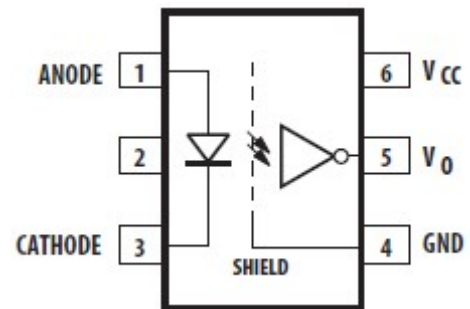
- Isolated line receiver
- Computer-peripheral interfaces
- Digital isolation for A/D, D/A conversion
- Isolation of high speed logic systems

● **Truth Table**

LED	OUT
ON	L
OFF	H

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

● **Schematic**

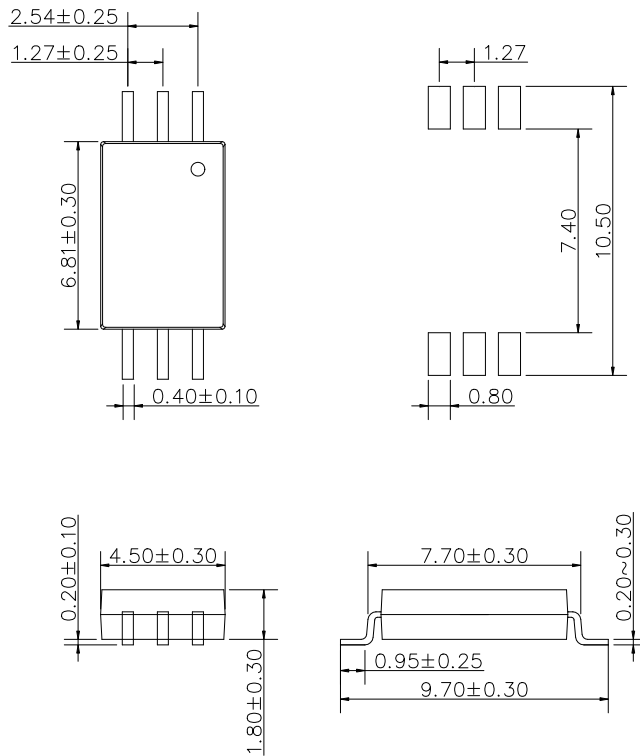


- |            |                        |
|------------|------------------------|
| 1. Anode   | 4. GND                 |
| 2. N.C.    | 5. Vo (Voltage Output) |
| 3. Cathode | 6. Vcc                 |

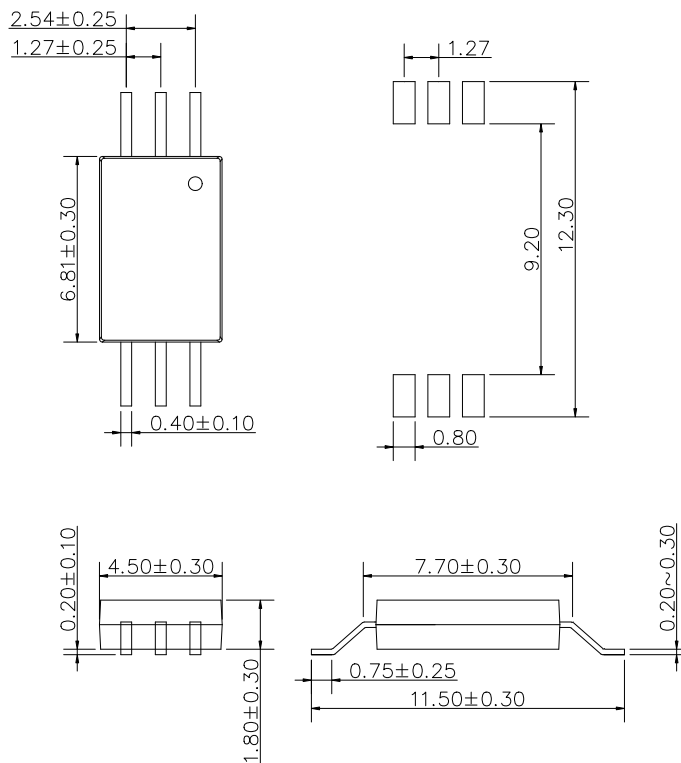
● **Outside Dimension**

Unit : mm

**P Type**



**W Type**



● **Device Marking**



**Notes:**

**COSMO**

**060L**

**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 <sub>F</sub>	20	mA
	Peak transient forward current (Note 1)	I <sub>FPT</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
Output	Output current	I <sub>O</sub>	50	mA
	Output voltage	V <sub>O</sub>	7	V
	Supply Voltage	V <sub>CC</sub>	7	V
Junction temperature		T <sub>j</sub>	125	°C
Storage Temperature		T <sub>stg</sub>	-55~125	°C
Operating Temperature		T <sub>opr</sub>	-40~110	°C
Total Package Power Dissipation		P <sub>T</sub>	130	mW
Lead soldering temperature(10s) (Note 2)		T <sub>sol</sub>	260	°C
Isolation voltage (AC,1min.,R.H≤60%) (Note 3)		BVs	5000	Vrms
Input-Output Resistance (V <sub>I-O</sub> = 500V DC) (Note 3)		R <sub>I-O</sub>	10 <sup>12</sup>	Ω

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.

● **Recommend Operation Conditions**

Parameter	Symbol	Min.	Max.	Unit
Operating Temperature	TA	-40	110	°C
Supply Voltage	VCC	4.5	5.5	V
Input Current High Level	IFLH	5	15	mA
Input Voltage Low Level	VFHL	-3.0	0.8	V
Fan Out (at RL = 1 KΩ)	N		5	TTL Loads
Output Pull-up Resistor	RL	330	4K	Ω

Note 1: Detector requires a VCC of 4.5 V or higher for stable operation as output might be unstable if VCC is lower than 4.5 V. Be sure to check the power ON/OFF operation other than the supply current.

Note 2: The initial switching threshold is 1.6 mA or less. It is recommended that 2.2 mA be used to permit at least a 20% LED degradation guard band.

● **Electrical Characteristics**

(Ta = 25°C)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Input Forward Voltage	VF	IF=10mA	1.6	2.0	2.4	V	
Input Reverse Voltage	BVR	IR = 10μA	5	-	-	V	
Input Threshold Current	ITH	VCC = 5.5V, VO = 0.6V, IOL > 13 mA	-	1.0	5.0	mA	
Input Capacitance	CIN	f = 1 MHz, VF = 0 V	-	60	-	pF	
Supply Current	High Level	ICCH	VCC = 5.5V, IF = 0 mA	-	5.6	7.5	mA
	Low Level	ICCL	VCC = 5.5V, IF = 10 mA	-	5.2	10.5	
Output current	High level	IOH	VCC = 5.5V, VO = 5.5V, VF = 0.8V	-	0.35	100	uA
Output voltage	Low level	VOL	VCC = 5.5V, IF = 5 mA, IOL(Sinking) = 13 mA	-	0.25	0.6	V

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	$t_{PHL}$	VCC = 5V, IF = 7.5 mA, RL = 350Ω, CL = 15 pF	-	35	75	ns
Propagation Delay Time to Output High Level	$t_{PLH}$		-	60	75	
Pulse Width Distortion	PWD		-	25	40	
Rise Time	$t_r$		-	30	-	
Fall Time	$t_f$		-	3	-	
Common mode transient immunity at high level output	$ C_{MH} $	VCC = 5V, IF = 0 mA, VO(MIN) = 2V, RL = 350Ω, VCM = 1000V	10	15	-	KV / μs
Common mode transient immunity at low level output	$ C_{ML} $	VCC = 5V, IF = 7.5 mA, VO(MAX) = 0.8V, RL = 350Ω, VCM = 1000V	10	15	-	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.

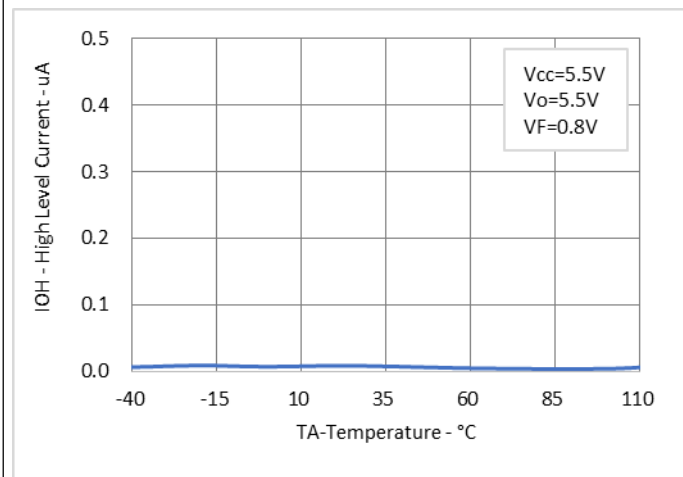
Note 2: Pulse Width Distortion (PWD) is defined as  $|t_{PHL} - t_{PLH}|$  for any given device.

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

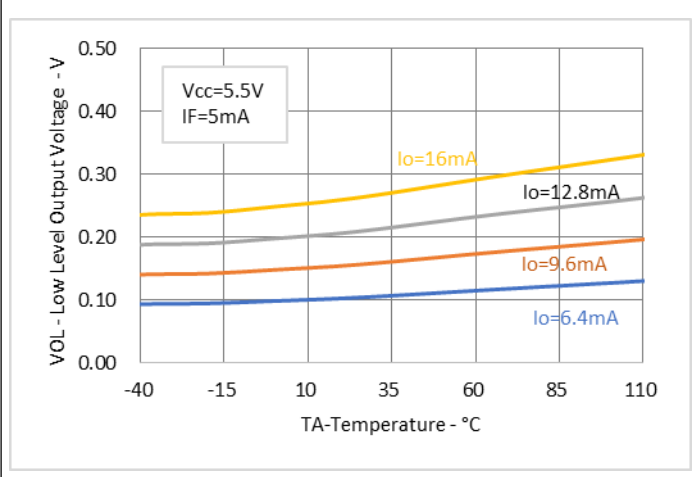
Note 4: CMH is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic high state, VO > 2.0 V. CML is the maximum slew rate of the common mode voltage that can be sustained with the output voltage in the logic low state, VO < 0.8 V. Note: Equal value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

## TYPICAL PERFORMANCE CURVES & TEST CIRCUITS

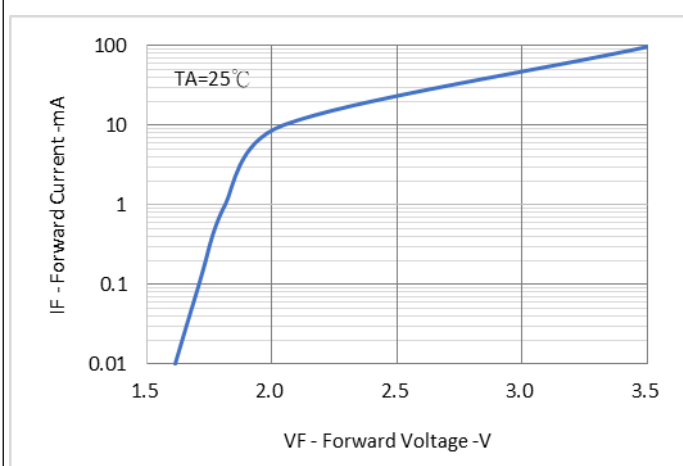
**Fig.1 High Level Output Current vs. Temp**



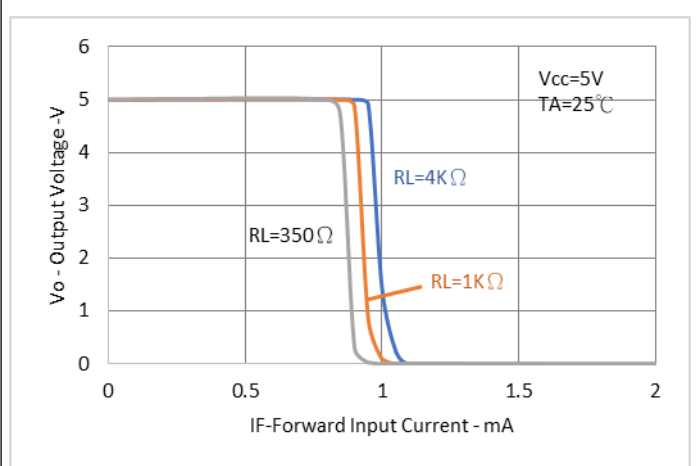
**Fig.2 Low Level Output Voltage vs. Temp**



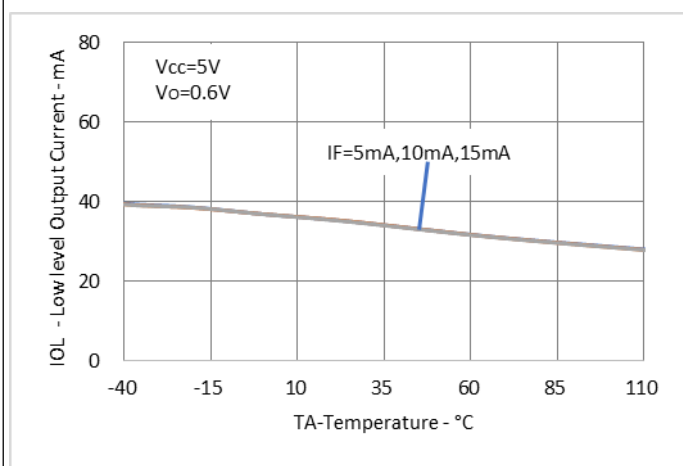
**Fig.3 Input Diode Forward Characteristic**



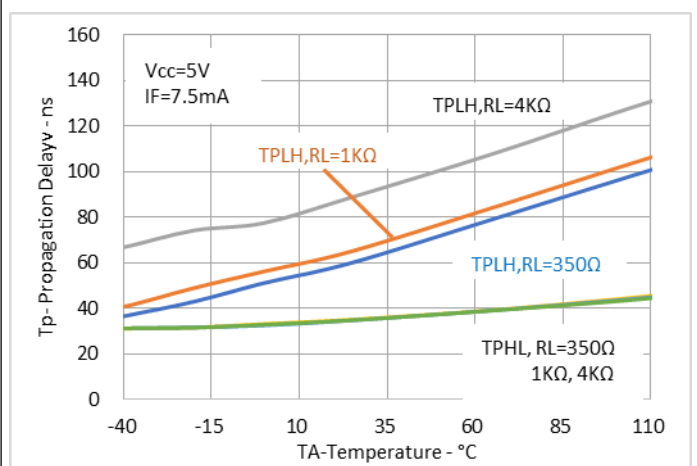
**Fig.4 Output Voltage vs. Input Current**



**Fig.5 Low Level Output Current vs. Temp**

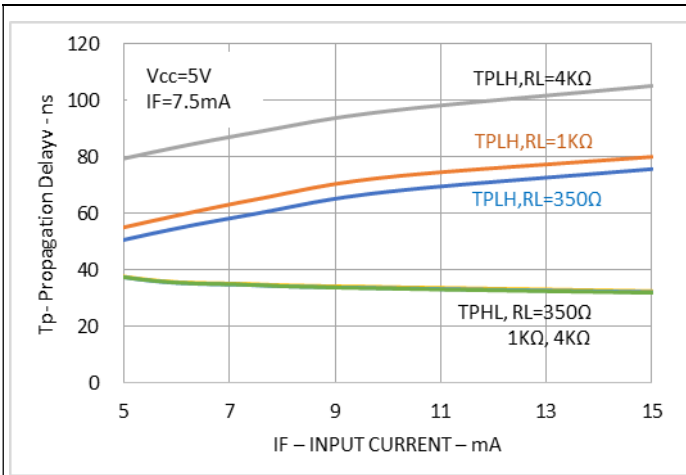


**Fig.6 Propagation Delay vs. Temperature**

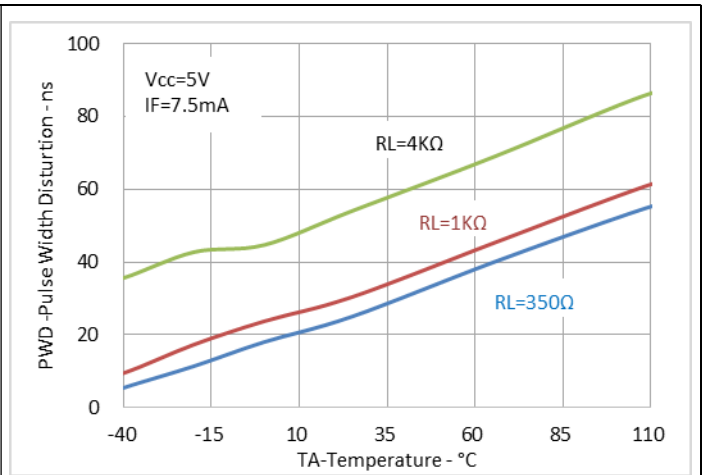


**Fig.7 Propagation Delay vs. Input Current**

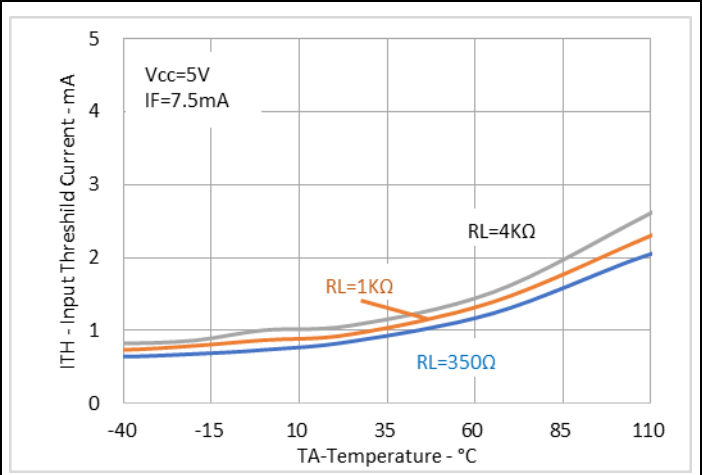
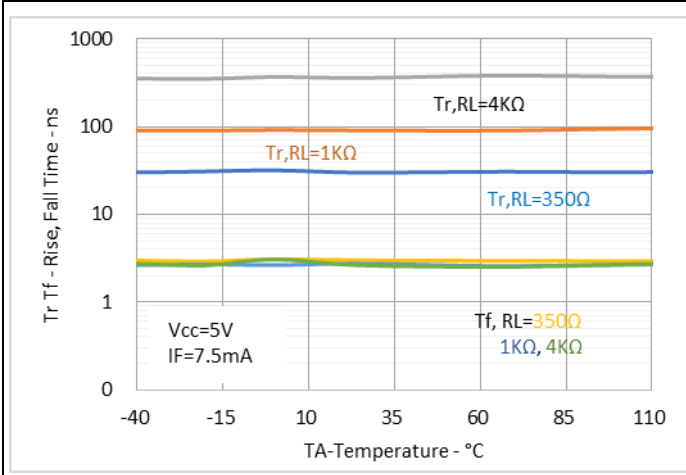
**Fig.8 Pulse Width Distortion vs. Temperature**



**Fig.9 Rise and Fall Time vs. Temperature**

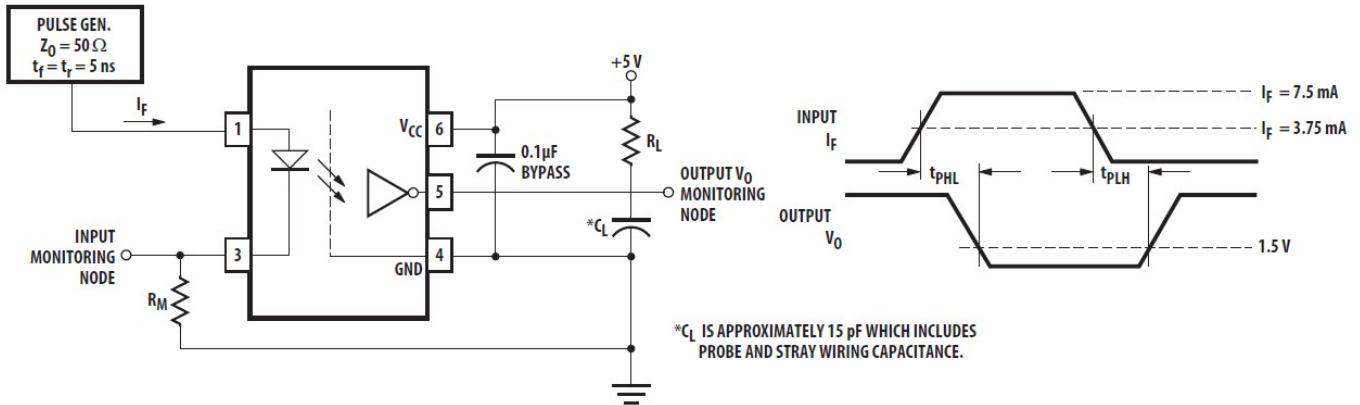


**Fig.10 Input Threshold Current vs. Temp**

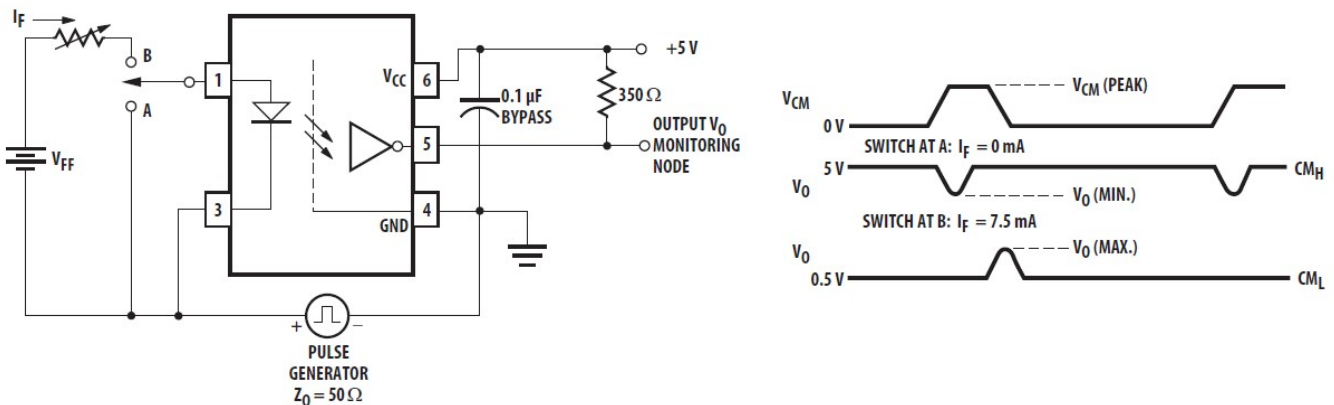


● **Test Circuit**

**Propagation delay time  $t_{PLH}$ 、 $t_{PHL}$ 、and rise time  $t_r$ , fall time  $t_f$**



**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.

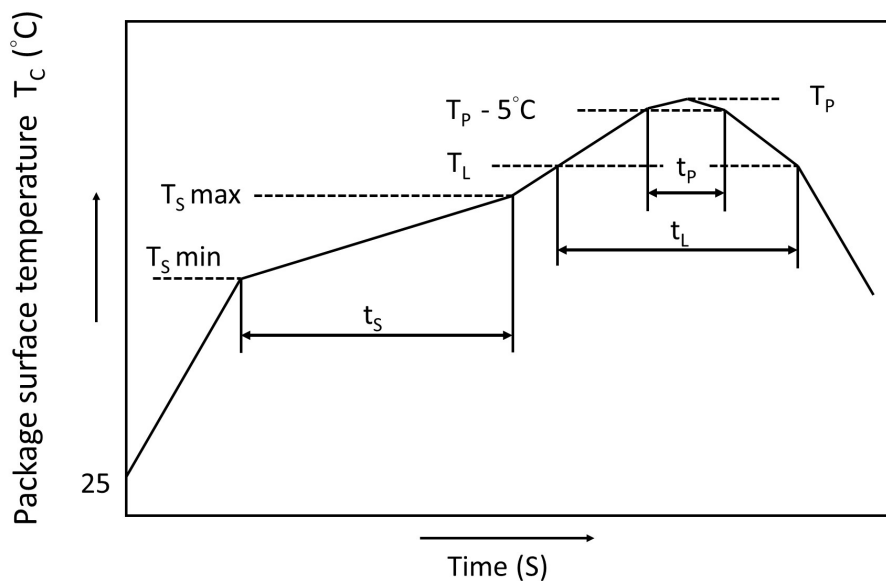


● **Recommended Soldering Conditions**

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**

### KT060L X (Y)-(Z)

**Notes:**

KT060 = Part No.

X = Lead form option (P or W )

Y = Tape and reel option (TLD or TRU)

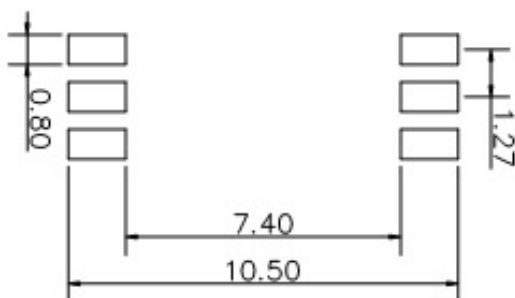
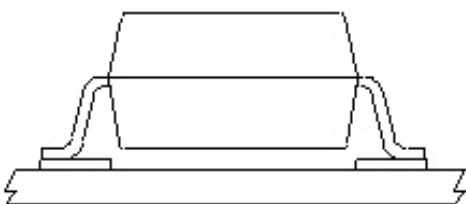
Z = VDE option (V or None)

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**

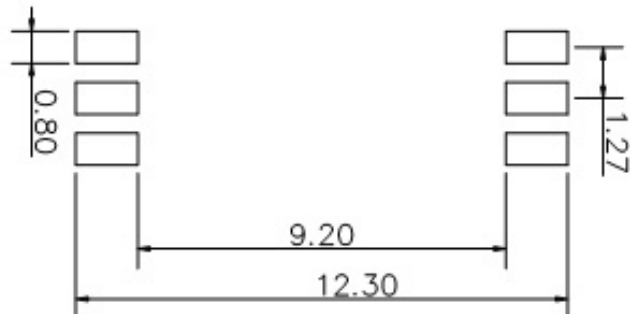
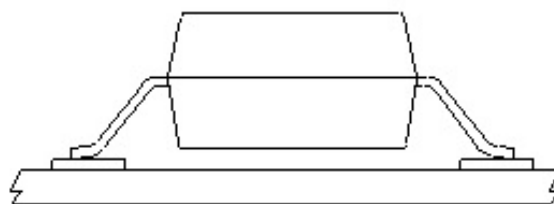
**1. Surface mount type**

6LSOP-P type



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

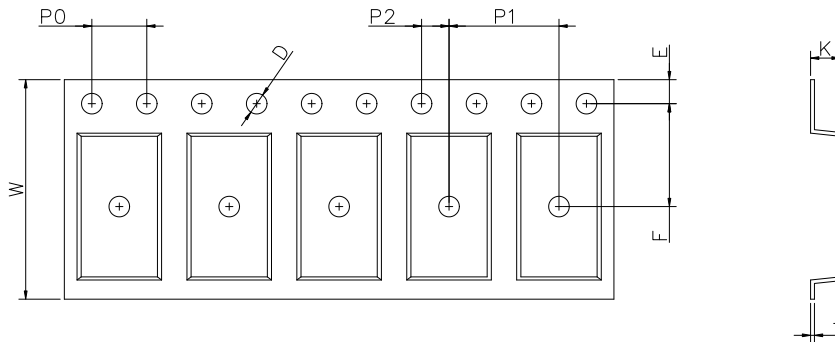
6LSOP-W type



Unit :mm

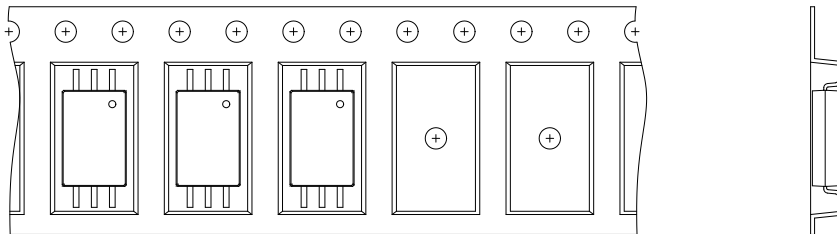
<http://www.cosmo-ic.com>

● LSOP 6 Carrier Tape & Reel

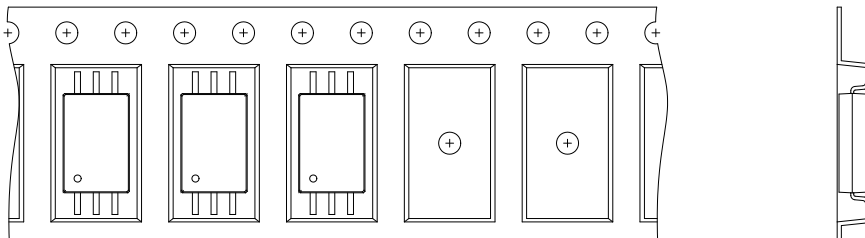


Dimension Symbol	D	E	F	P0	P1	P2	t	W	K
P type Dimension (mm)	1.5±0.1	1.75±0.1	7.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	16.0±0.3	2.15±0.1
W type Dimension (mm)	1.5±0.1	1.75±0.1	11.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	24.0±0.3	2.52±0.1

TRU



TLD



- **Application Notice**

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