

● 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/ μ s 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/ μ s 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
- Approved

UL1577, File No.E169586

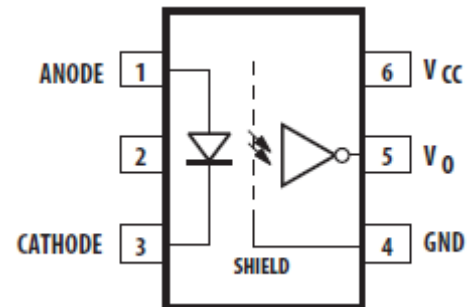
DIN EN IEC 60747-5-5 (VDE 0884-5):2021-10; EN IEC 60747- 5-5:2020, Certificate No.40055228

● Truth Table

LED	OUT
ON	L
OFF	H

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

● Schematic

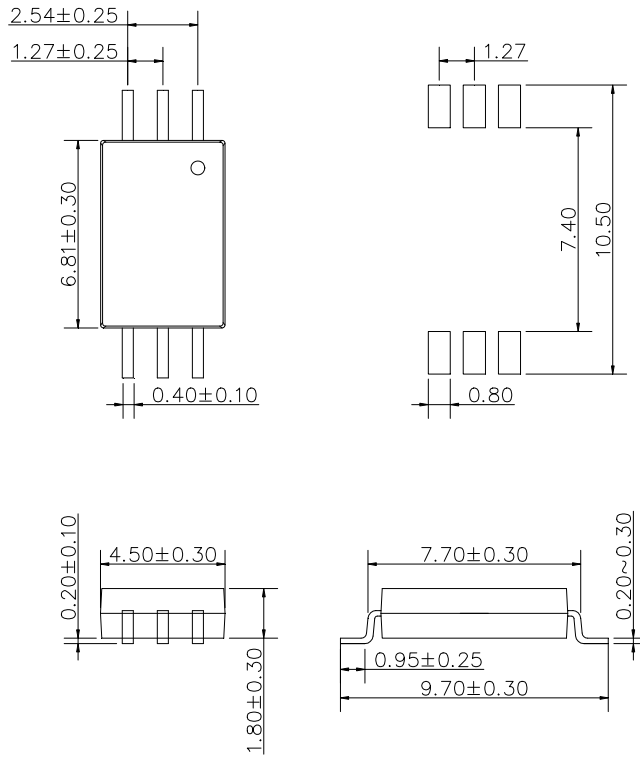


- | | |
|------------|------------------------|
| 1. Anode | 4. GND |
| 2. N.C. | 5. Vo (Voltage Output) |
| 3. Cathode | 6. Vcc |

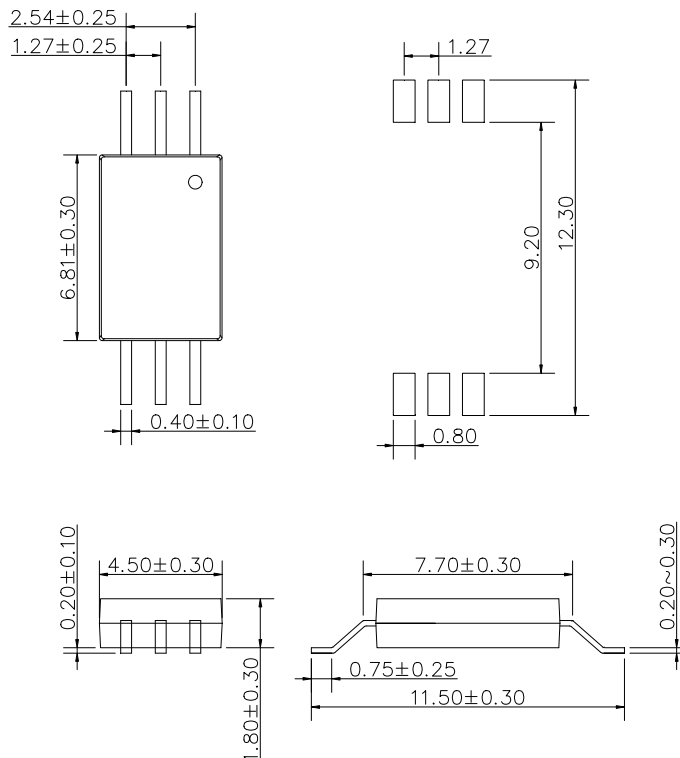
● **Outside Dimension**

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 _F	20	mA
	Peak transient forward current (Note 1)	I _{FPT}	1	A
	Reverse voltage	V _R	5	V
Output	Output current	I _O	50	mA
	Output voltage	V _O	7	V
	Supply Voltage	V _{CC}	7	V
Junction temperature		T _j	125	°C
Storage Temperature		T _{stg}	-55~125	°C
Operating Temperature		T _{opr}	-40~110	°C
Total Package Power Dissipation		P _T	130	mW
Lead soldering temperature(10s) (Note 2)		T _{sol}	260	°C
Isolation voltage (AC,1min.,R.H≤60%) (Note 3)		BVs	5000	Vrms
Input-Output Resistance (V _{I-O} = 500V DC) (Note 3)		R _{I-O}	10 ¹²	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	2.7	3.6	V
		4.5	5.5	
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

Over recommended operating conditions unless otherwise specified.

(Ta = 25°C)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Input Forward Voltage	V _F	I _F = 10mA	1.6	2.0	2.4	V	
Input Reverse Voltage	BV _R	I _R = 10μA	5	-	-	V	
Input Threshold Current	I _{TH}	VCC = 3.3V, VO = 0.6V, IOL > 13 mA	-	1.0	5.0	mA	
Input Capacitance	C _{IN}	f = 1 MHz, V _F = 0 V	-	60	-	pF	
Supply Current	High Level	ICCH	VCC = 3.3V, IF = 0 mA	-	4.8	7	mA
	Low Level	ICCL	VCC = 3.3V, IF = 10 mA	-	4.4	10	
Output current	High level	IOH	VCC = 3.3V, VO = 3.3V, VF = 0.8V	-	0.2	100	uA
Output voltage	Low level	VOL	VCC = 5.5V, IF = 5 mA, IOL(Sinking) = 13 mA	-	0.28	0.6	V

Over recommended operating conditions unless otherwise specified.

(Ta = 25°C.)

Parameter		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Input Forward Voltage		V _F	I _F =10mA	1.6	2.0	2.4	V
Input Reverse Voltage		BV _R	I _R = 10μA	5	-	-	V
Input Threshold Current		I _{TH}	VCC = 5.5V, VO = 0.6V, IOL > 13 mA	-	1.0	5.0	mA
Input Capacitance		C _{IN}	f = 1 MHz, V _F = 0 V	-	60	-	pF
Supply Current	High Level	I _{CCH}	VCC = 5.5V, I _F = 0 mA	-	5.6	7.5	mA
	Low Level	I _{CCL}	VCC = 5.5V, I _F = 10 mA	-	5.2	10.5	
Output current	High level	I _{OH}	VCC = 5.5V, VO = 5.5V, V _F = 0.8V	-	0.35	100	uA
Output voltage	Low level	V _{OL}	VCC = 5.5V, I _F = 5 mA, IOL(Sinking) = 13 mA	-	0.25	0.6	V

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

Over recommended operating conditions TA = -40°C to 100°C, VCC = 3.3V, I_F = 7.5 mA unless otherwise specified.

(Ta = 25°C)

Parameter		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Propagation Delay Time to Output Low Level		t _{PHL}	VCC = 3.3V, I _F = 7.5 mA, RL = 350Ω, CL = 15 pF	-	35	75	ns
Propagation Delay Time to Output High Level		t _{PLH}		-	60	90	
Pulse Width Distortion		PWD		-	25	40	
Propagation Delay Skew		t _{PSK}		-	-	50	
Rise Time		t _r		-	30	-	
Fall Time		t _f		-	3	-	
Common mode transient immunity at high level output		C _{MH}	VCC = 3.3V, I _F = 0 mA, VO(MIN) = 2V, RL = 350Ω, VCM = 1000V	10	15	-	KV / μs
Common mode transient immunity at low level output		C _{ML}	VCC = 3.3V, I _F = 7.5 mA, VO(MAX) = 0.8V, RL = 350Ω, VCM = 1000V	10	15	-	KV / μs

Over recommended operating conditions TA = -40°C to 100°C, VCC = 5V, IF = 7.5 mA unless otherwise specified.

(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}		-	55	75	
Pulse Width Distortion	PWD		-	20	40	
Propagation Delay Skew	t _{PSK}		-	-	50	
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	
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

Note 1: The t_{PLH} 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 t_{PHL} 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 t_{PLH} and t_{PHL} between any two devices under the same test condition.

Note 4: C_{MH} 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. C_{ML} 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

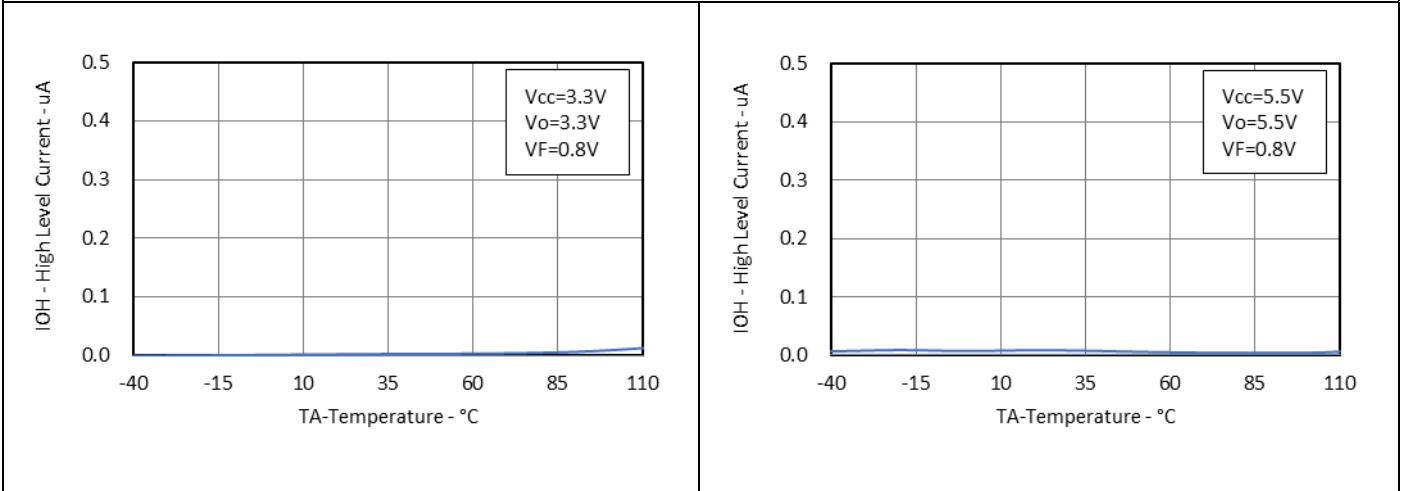


Fig.2 Input Threshold Current vs. Temp

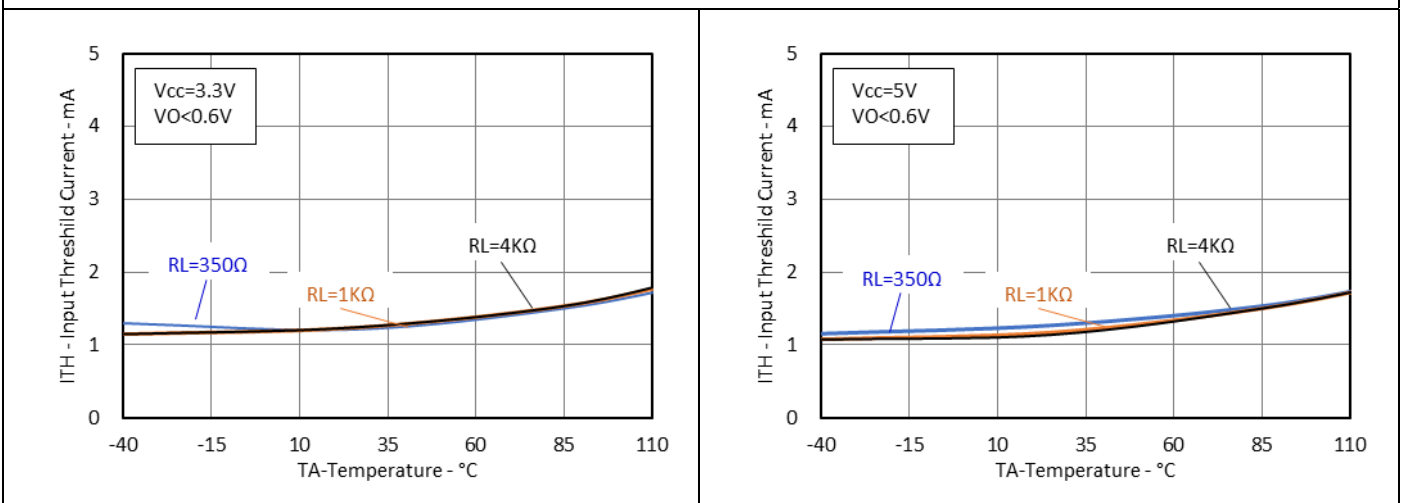


Fig.3 Low Level Output Voltage vs. Temp

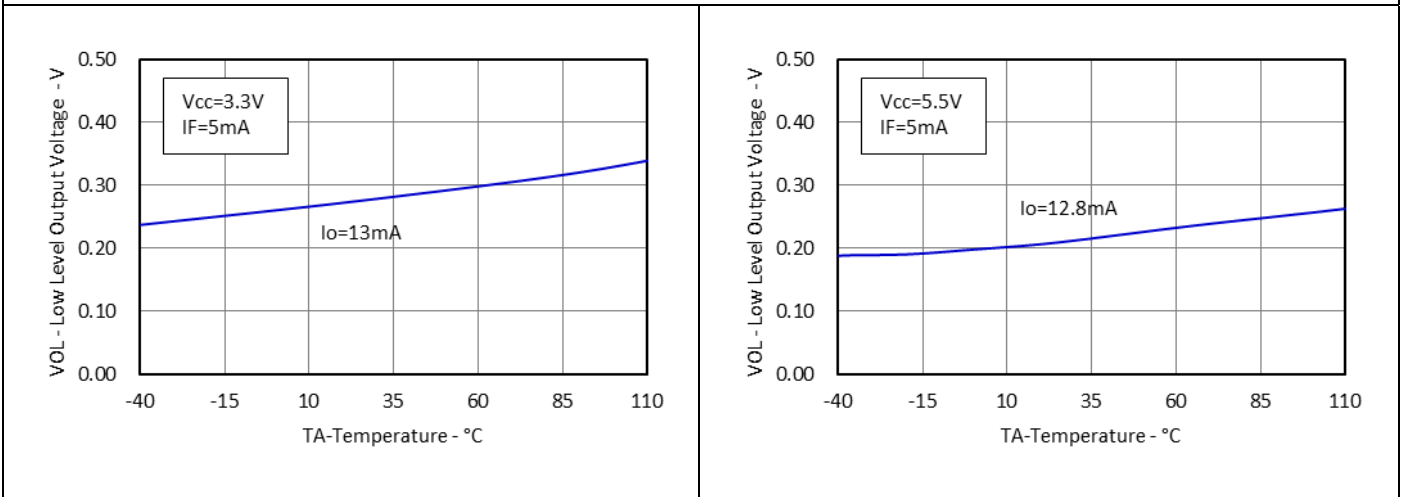


Fig.4 Low Level Output Current vs. Temp

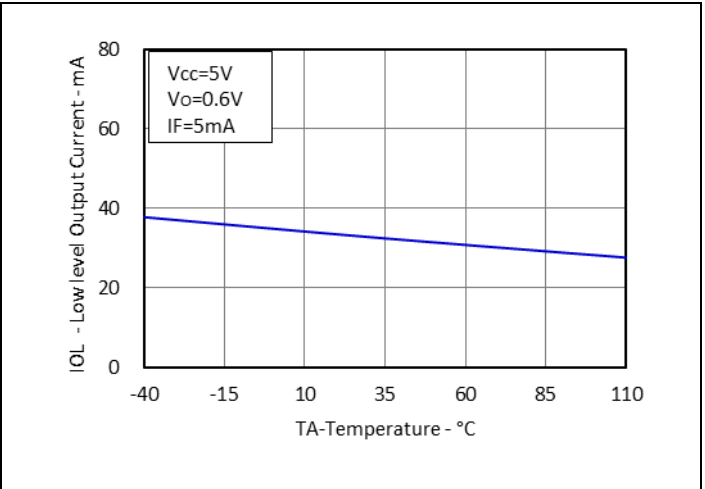
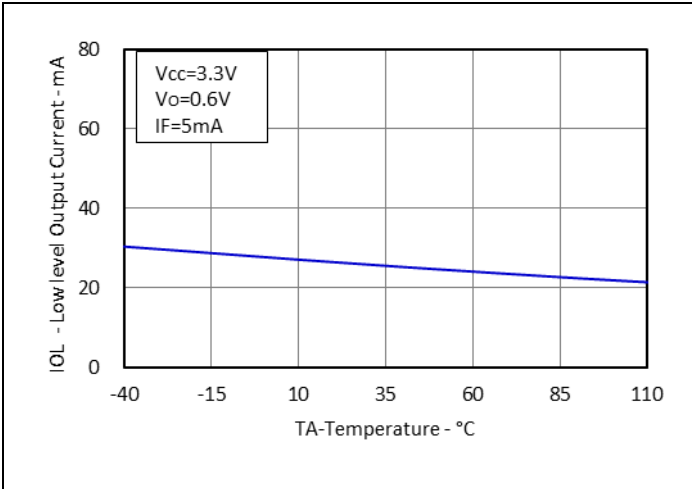


Fig.5 Propagation Delay vs. Temperature

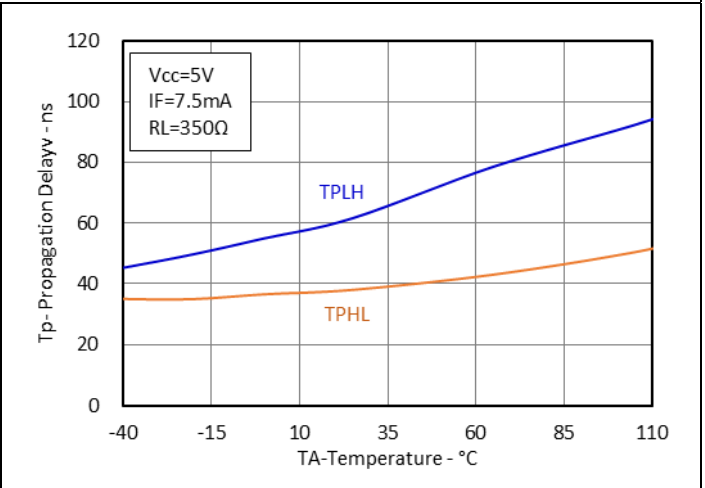
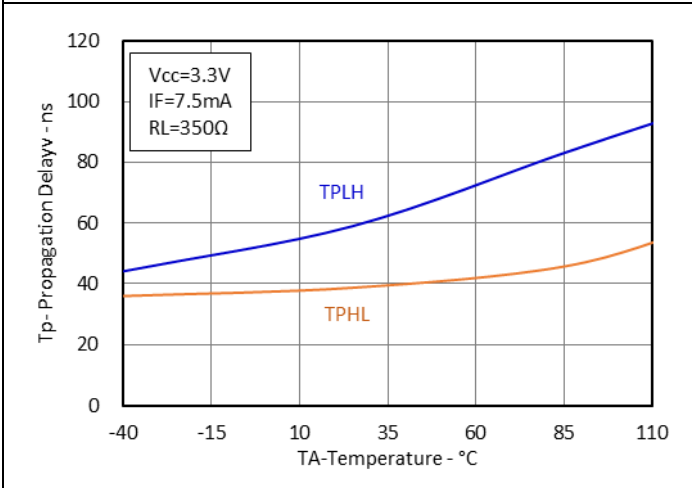
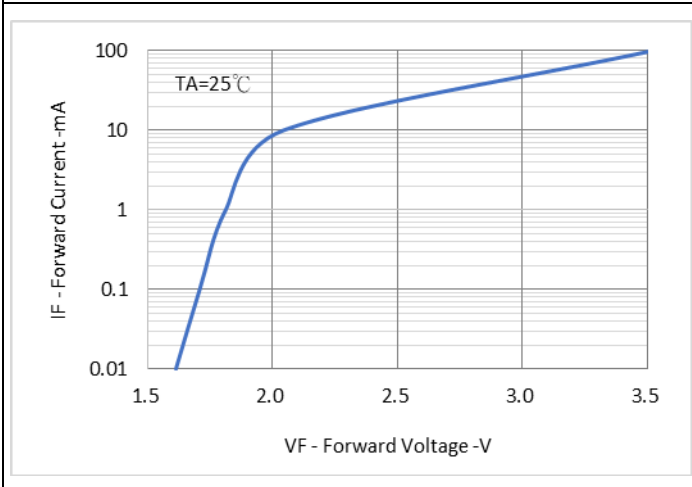
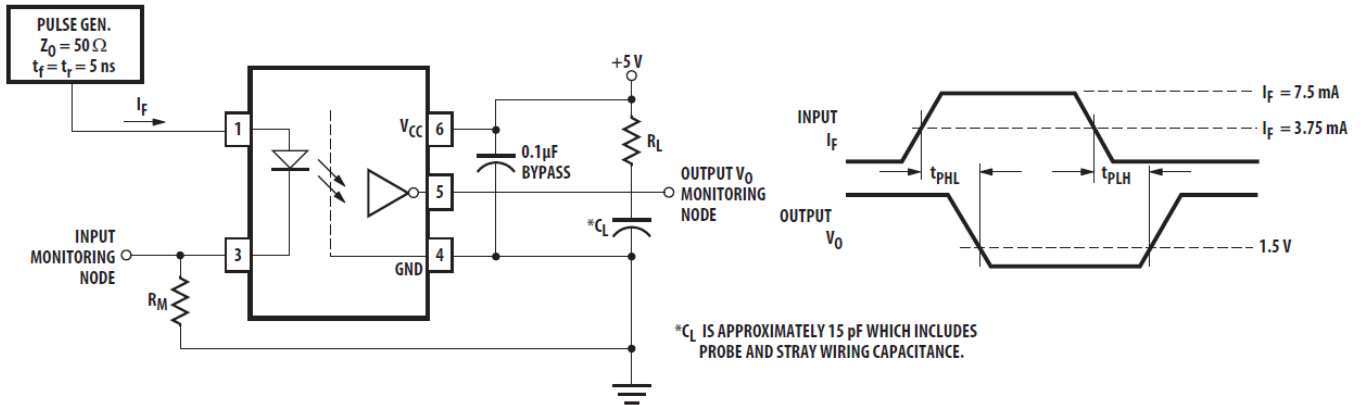


Fig.6 Input Diode Forward Characteristic

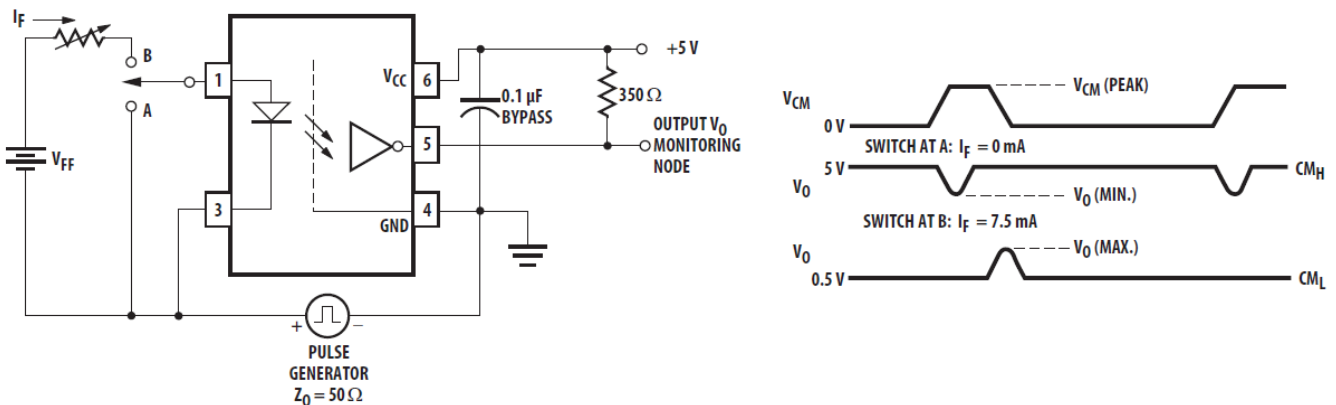


● **Test Circuit**

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



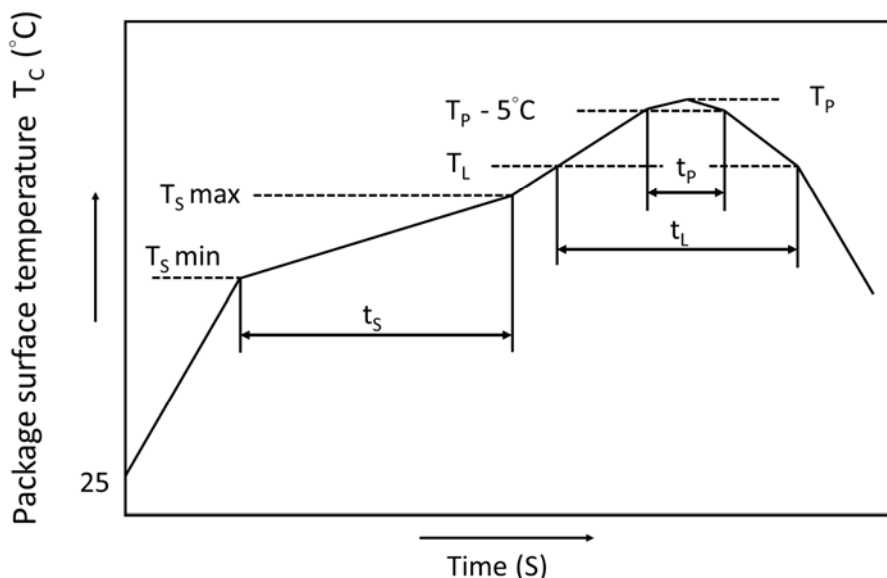
* $C_{ML}(C_{MH})$ is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

● **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	$^\circ\text{C}$
Preheat time	t_s	60	120	s
Ramp-up rate (T_L to T_P)			3	$^\circ\text{C/s}$
Liquidus temperature	T_L	217		$^\circ\text{C}$
Time above T_L	t_L	60	100	s
Peak Temperature	T_P		260	$^\circ\text{C}$
Time during which T_C is between ($T_P - 5$) and T_P	t_p		20	s
Ramp-down rate			6	$^\circ\text{C/s}$

● **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)

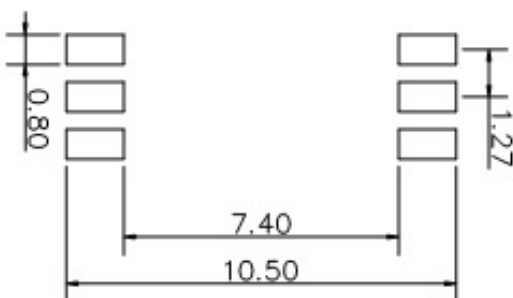
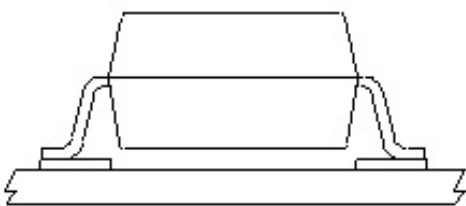
Z = VDE option (V or None)

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**

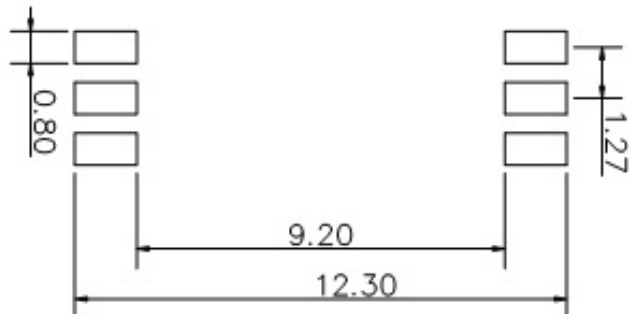
1. Surface mount type

6LSOP-P type



2. Long creepage distance for surface mount type

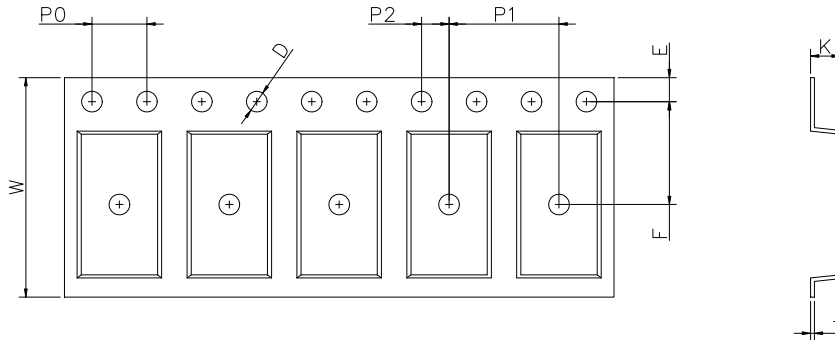
6LSOP-W type



Unit :mm

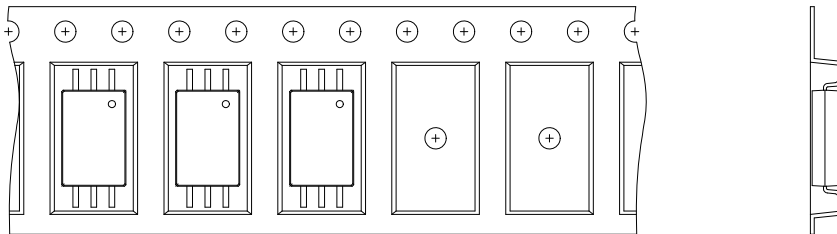
<http://www.cosmo-ic.com>

● LSOP 6 Carrier Tape & Reel

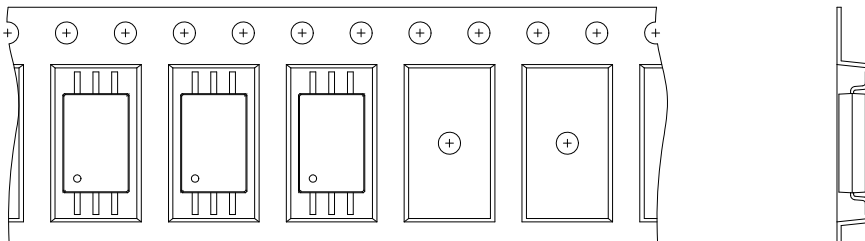


Dimension Symbol	D	E	F	P0	P1	P2	t	W	K
P type Dimension (mm)	1.5±0.1	1.75±0.1	7.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	16.0±0.3	2.15±0.1
W type Dimension (mm)	1.5±0.1	1.75±0.1	11.5±0.1	4.0±0.1	8.0±0.1	2.0±0.1	0.3±0.1	24.0±0.3	2.52±0.1

TRU



TLD



- **Application Notice**

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