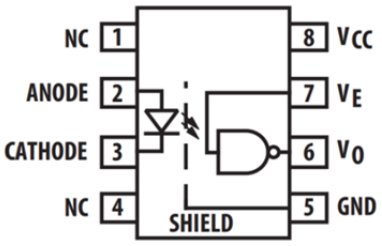
KPC2611 Series

8PIN DIP High Speed Photo couplers

Description

The KPC2611 series consist of an LED optically coupled to an OPIC chip. It is a high-speed digital output type photo coupler designed specifically for low circuit current. And it is packaged in a 8pin DIP type.

Schematic



1. N.C.
2. Anode
3. Cathode
4. N.C.
5. GND
6. Vo
7. V_E
8. Vcc

Features

1. Dual voltage operation (3.3V/5V)
2. 15 kV/μs minimum Common Mode Rejection (CMR) at V_{CM} = 1000V (3.3V operating voltage)
3. High speed: 10 MBd typical
4. LVTTL/LVCMOS compatible
5. Low input current capability: 5 mA
6. Guaranteed AC and DC performance over temperature: –40°C to +110°C
7. Safety approval

Applications

- Communication interfaces: RS485, CANBus, and I2C
- Microprocessor system interfaces
- Line receiver – eliminate noise and transient problems
- PLC, ATE input /output isolation
- High speed A/D and D/A conversion
- Digital control power supply

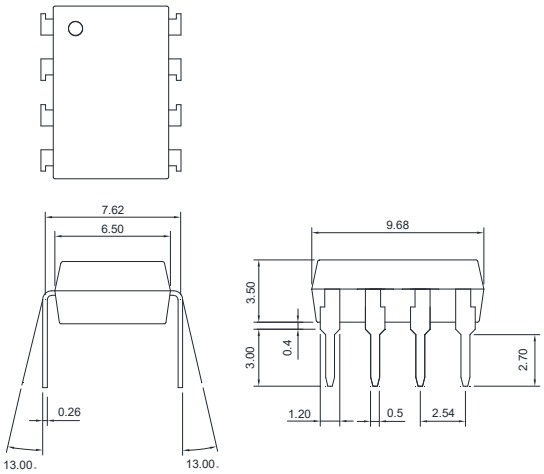
Truth Table

Input	Enable	Output
ON	H	L
OFF	H	H
ON	L	H
OFF	L	H
ON	NC	L
OFF	NC	H

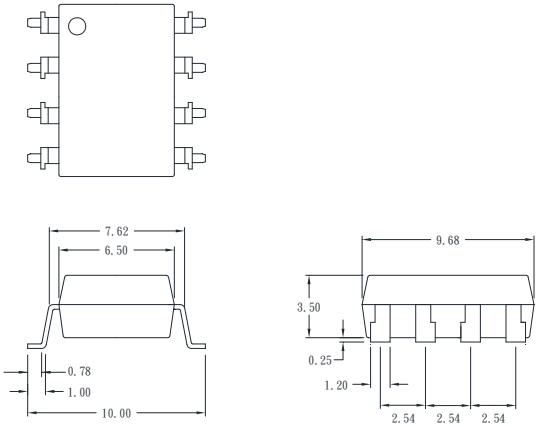
Outside Dimension

Unit : mm

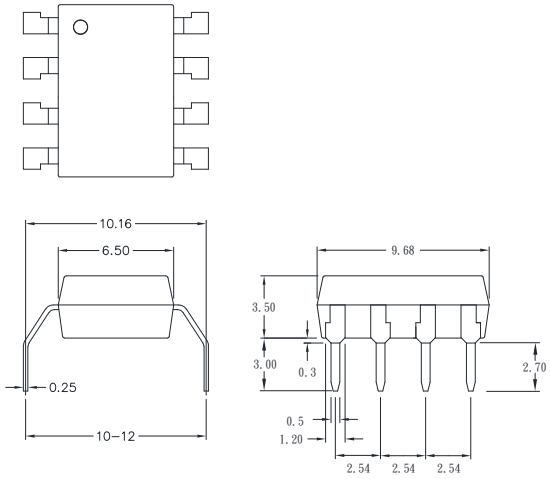
1.Dual-in-line type



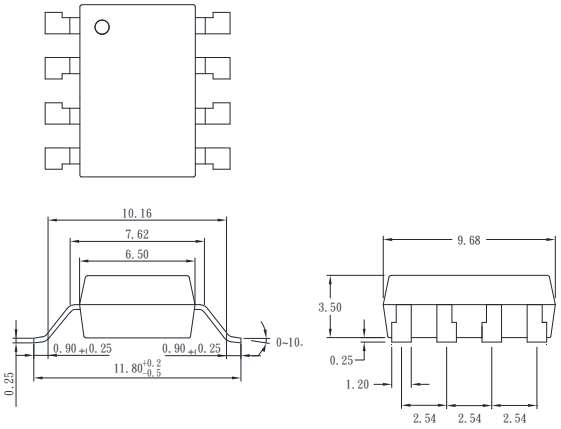
2.Surface mount type



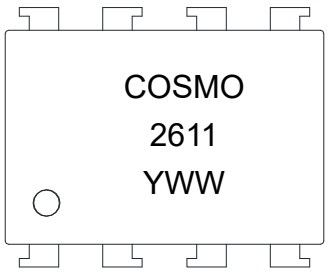
3.Long creepage distance type



4.Long creepage distance for surface mount type



Device Marking



Notes:

cosmo
2611
YWW

Y: Year code / WW: Week code

● Absolute Maximum Ratings

(Ta = 25°C)

Parameter		Symbol	Rating	Unit
Input	Average Forward Input Current	I_F	20	mA
	Reverse Input Voltage	V_R	5	V
	Input Power Dissipation	P_I	40	mW
	Enable Input Current	I_E	5	mA
	Enable Input Voltage	V_E	V_{CC}+0.5	V
Output	Supply Voltage	V_{CC}	7	V
	Output Collector Current	I_O	50	mA
	Output Collector Voltage	V_O	7	V
	Output Collector Power Dissipation	P_O	85	mW
Isolation voltage 1 minute *1		Viso	5000	Vrms
Operating temperature		Topr	-40 to +110	℃
Storage temperature		Tstg	-55 to +125	℃
Soldering temperature 10 seconds		Tsol	260	℃

Note 1: This device is considered as a two-terminal device: Pins 1 and 3 are shorted together, and pins 4, 5 and 6 are shorted together.

● Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Low level input current	I_{FL}	0	250	uA
High level input current	I_{FH}	5.0	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}	2.7	3.6	V
		4.5	5.5	
Fanout (TTL load)	N	-	5	-
Output Pull up Resistor	R_L	330	4K	Ω

Electro-optical Characteristics

Over recommended operating condition (TA = –40°C to +110°C, 2.7V ≤ VDD≤ 3.6) unless otherwise specified.
All Typical specifications at VCC = 3.3V, TA = 25°C.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input forward voltage (*4)	V_F	I_F=10mA	-	1.35	1.6	V
Input reverse voltage	BV_R	I_R=10uA	5	-	-	V
Input capacitance	C_{IN}	V_F=0, f=1MH$_Z$	-	60	-	pF
Logic (1) output current	I_{OH}	V_{CC}=3.3V,V_O=3.3V,I_F=250uA,V_E=2.0V	-	5.5	100	uA
Input Threshold Current	I_{TH}	V_{CC} = 3.3V, V_E = 2.0V, V_O = 0.6V, $I_{OL\ (Sinking)}$ = 13 mA	-	2	5	mA
Logic (0) output voltage	V_{OL}	V_{CC}=3.3V,V_E=2V,I_F=5mA, I_{OL}(Sinking)=13mA	-	0.3	0.6	V
Logic (1) enable current	I_{EH}	V_{CC}=3.3V,V_E=2.0V	-	-0.7	-1.6	mA
Logic (0) enable current	I_{EL}	V_{CC}=3.3V,V_E=0.5V	-	-0.9	-1.6	mA
High Level Enable Voltage	V_{EH}	-	2.0	-	-	V
Low Level Enable	V_{EL}	-	-	-	0.8	V
Logic (1) supply current	I_{CCH}	V_{CC}=3.3V,V_E=0.5V,I_F=0mA	-	4	10	mA
		V_{CC}=3.3V,V_E= V_{CC},I_F=0mA	-	-	-	mA
Logic (0) supply current	I_{CCL}	V_{CC}=3.3V,V_E=0.5V,I_F=10mA	-	4	13	mA
		V_{CC}=3.3V,V_E= V_{CC},I_F=10mA	-	-	-	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=1MH$_Z$, Ta=25℃	-	0.6	-	pF
Input Diode Temperature Coefficient	$\triangle V_F/\triangle T_A$	I_F = 10 mA	-	-1.6	-	m V/℃

Over recommended operating condition (TA = –40°C to +110°C, 4.5V ≤ VDD≤ 5.5) unless otherwise specified.
All Typical specifications at VCC = 5V, TA = 25°C.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input forward voltage (*4)	V_F	I_F=10mA,Ta=25℃	1.4	1.5	1.75	V
Input reverse voltage	BV_R	I_R=10uA,Ta=25℃	5	-	-	V
Input capacitance	C_{IN}	V_F=0, f=1MH$_Z$	-	60	-	pF
Logic (1) output current	I_{OH}	V_{CC}=5.5V,V_O=5.5V,I_F=250uA,V_E=2.0V	-	5.5	100	uA
Input Threshold Current	I_{TH}	V_{CC} = 5.5V, V_E = 2.0V, V_O = 0.6V, $I_{OL\ (Sinking)}$ = 13 mA	-	2	5	mA
Logic (0) output voltage	V_{OL}	V_{CC}=5.5V,V_E=2V,I_F=5mA, I_{OL}(Sinking)=13mA	-	0.35	0.6	V
Logic (1) enable current	I_{EH}	V_{CC}=5.5V,V_E=2.0V	-	-0.7	-1.6	mA
Logic (0) enable current	I_{EL}	V_{CC}=5.5V,V_E=0.5V	-	-0.9	-1.6	mA
High Level Enable Voltage	V_{EH}	-	2.0	-	-	V
Low Level Enable Voltage	V_{EL}	-	-	-	0.8	V
Logic (1) supply current	I_{CCH}	V_{CC}=5.5V,V_E=0.5V,I_F=0mA	-	4	10	mA
		V_{CC}=5.5V,V_E= V_{CC},I_F=0mA	-		-	mA
Logic (0) supply current	I_{CCL}	V_{CC}=5.5V,V_E=0.5V,I_F=10mA	-	4	13	mA
		V_{CC}=5.5V,V_E= V_{CC},I_F=10mA	-		-	mA
Isolation resistance (input-output)	R_{I-O}	V_{I-O}=500V, Ta=25℃	-	10^{12}	-	Ω
Capacitance (input-output) (*5)	C_{I-O}	f=1MH$_Z$, Ta=25℃	-	0.6	-	pF
Input Diode Temperature Coefficient	$\triangle V_F/\triangle T_A$	I_F = 10 mA	-	-1.6	-	m V/℃

● Switching Specifications

Over recommended temperature (TA = –40°C to +110°C), VCC = 3.3V, IF = 7.5 mA unless otherwise specified.
All Typical specifications at TA = 25°C, Vcc=3.3V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Propagation delay time to high output level	t_{PLH}	R_L=350Ω, C_L=15pF	-	100	150	ns
Propagation delay time to low output level	t_{PHL}		-	65	100	ns
Pulse Width Distortion	|tPHL – tPLH		-	-	50	ns
Propagation Delay Skew	tPSK		-	-	50	ns
Rise time	t_r	R_L=350Ω, C_L=15pF	-	45	-	ns
Fall time	t_f		-	35	-	ns
Propagation delay time to high output level	t_{ELH}	R_L=350Ω, C_L=15pF V_{EH}=3V, V_{EL}=0V	-	27	-	ns
Propagation delay time to low output level	t_{EHL}		-	9	-	Ns
High level Common Mode Transient Immunity	CM_H	I_F=0mA,Vcc=3.3V V_{CM}=1,000V, V_O(Min)=2.0V R_L=350Ω	10,000	-	-	V/us
Low level Common Mode Transient Immunity	CM_L	I_F=7.5mA, Vcc=3.3V V_{CM}=1,000V, V_O(Max)=0.8V R_L=350Ω	10,000	-	-	V/us

● Switching Specifications

Over recommended temperature (TA = –40°C to +110°C), VCC = 5V, IF = 7.5 mA unless otherwise specified.
All Typical specifications at TA = 25°C, Vcc=5V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Propagation delay time to high output level	t_{PLH}	R_L=350Ω, C_L=15pF	-	100	150	ns
Propagation delay time to low output level	t_{PHL}		-	65	100	ns
Pulse Width Distortion	|tPHL – tPLH		-	-	50	ns
Propagation Delay Skew	tPSK		-	-	50	ns
Rise time	t_r	R_L=350Ω, C_L=15pF	-	50	-	ns
Fall time	t_f		-	40	-	ns
Propagation delay time to high output level	t_{ELH}	R_L=350Ω, C_L=15pF V_{EH}=3V, V_{EL}=0V	-	28	-	ns
Propagation delay time to low output level	t_{EHL}		-	13	-	ns
High level Common Mode Transient Immunity	CM_H	I_F=0mA, Vcc=5V V_{CM}=1,000V,V_O(Min)=2.0V R_L=350Ω	15,000	-	-	V/us
Low level Common Mode Transient Immunity	CM_L	I_F=7.5mA,Vcc=5V V_{CM}=1,000V,V_O(Max)=0.8V R_L=350Ω	15,000	-	-	V/us

Notes
1. Peaking driving circuit may be used to speed up the LED. The peak drive current of LED may go up to 50mA and maximum pulse width 50ns, as long as average current doesn't exceed 20mA.
2. tPLH (propagation delay) is measured from the 3.75 mA point on the falling edge of the input pulse to the 1.5 V point on the rising edge of the output pulse.
3. tPHL (propagation delay) is measured from the 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse.
4. The tELH enable propagation delay is measured from the 1.5 V point on the falling edge of the enable input pulse to the 1.5 V point on the rising edge of the output pulse.
5. The tEHL enable propagation delay is measured from the 1.5 V point on the rising edge of the enable input pulse to the 1.5 V point on the falling edge of the output pulse.
6. CMH is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (i.e., VO > 2.0 V).
7. CML is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state (i.e., VO < 0.8 V).

Fig.1 Low-Level Output Voltage V.S. Ambient Temperature Characteristics

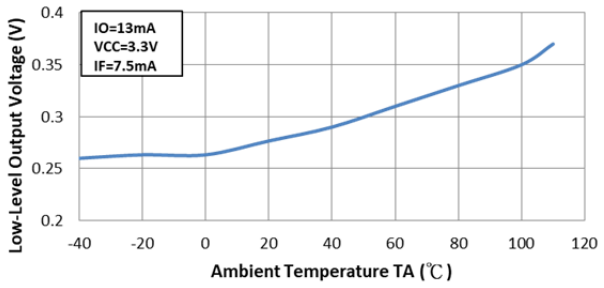


Fig.2 Low-Level Output Voltage V.S. Ambient Temperature Characteristics

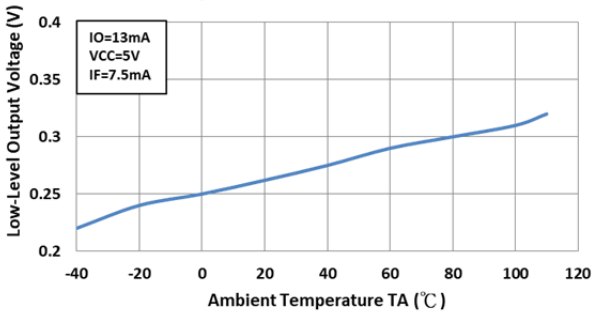


Fig.3 Input Threshold Current IFLH V.S. Ambient Temperature

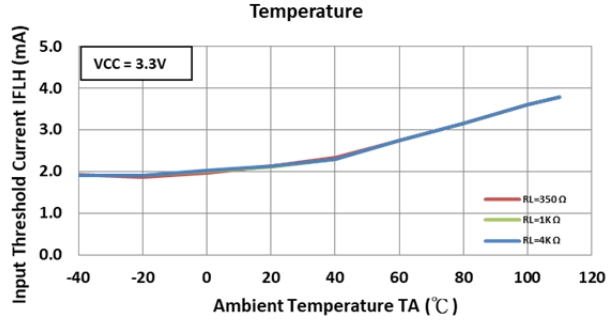


Fig.4 Input Threshold Current IFLH V.S. Ambient Temperature

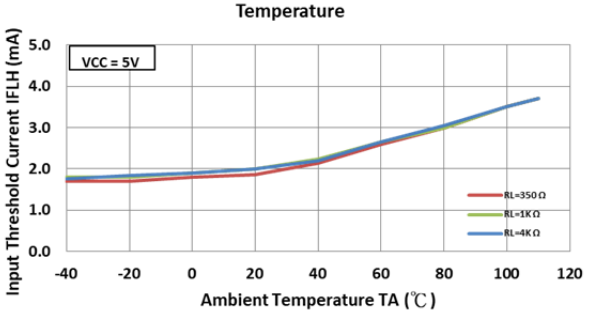


Fig.5 Output Voltage V.S. Input Forward Current

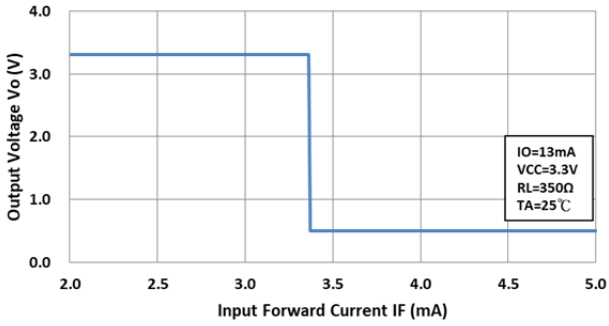


Fig.6 Output Voltage V.S. Input Forward Current

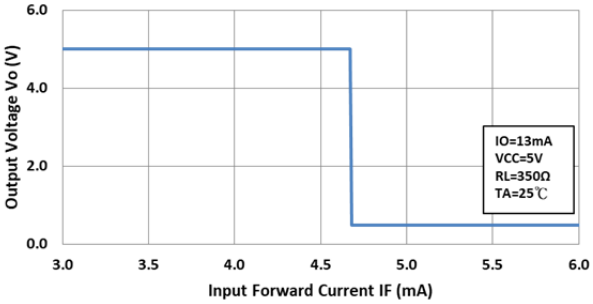


Fig.7 Propagation Delay Time V.S. Ambient Temperature

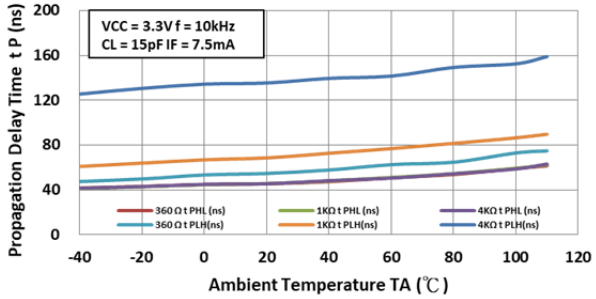


Fig.8 Pulse Width Distortion V.S. Ambient Temperature

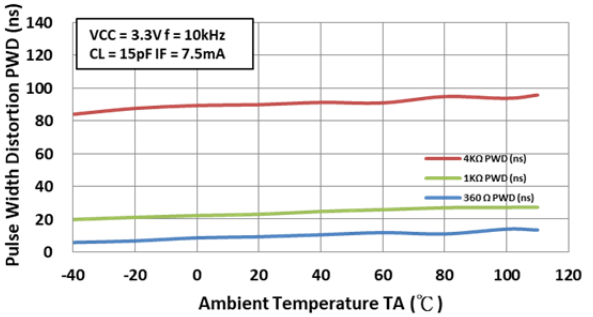


Fig.9 Propagation Delay Time V.S. Ambient Temperature

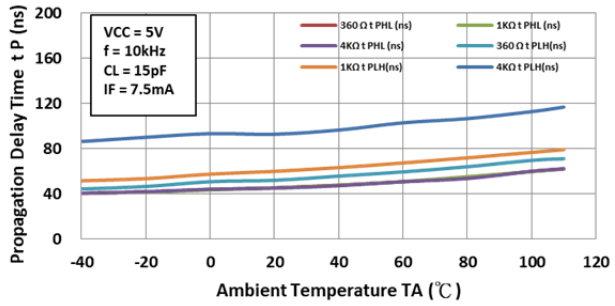


Fig.10 Pulse Width Distortion V.S. Ambient Temperature

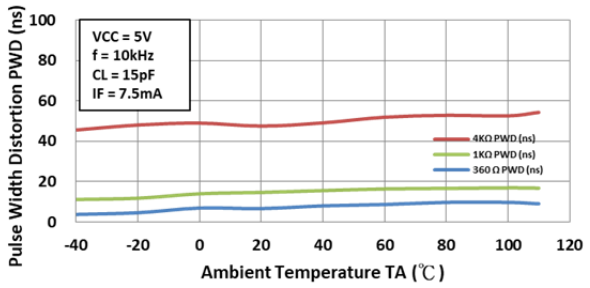


Fig.11 Propagation Delay Time V.S. Forward Current

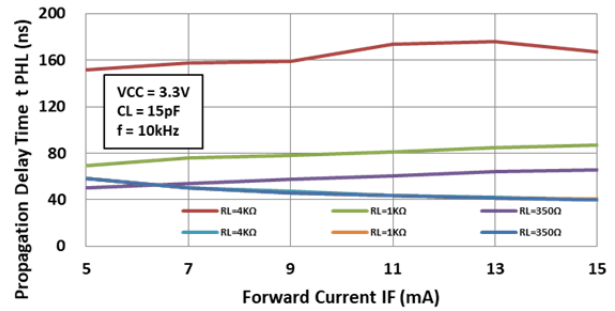


Fig.12 Propagation Delay Time V.S. Forward Current

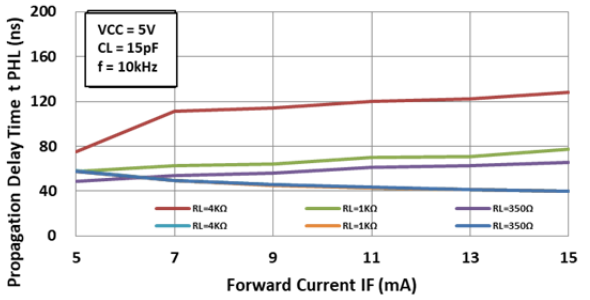


Fig.13 Propagation Delay Time V.S. Ambient Temperature

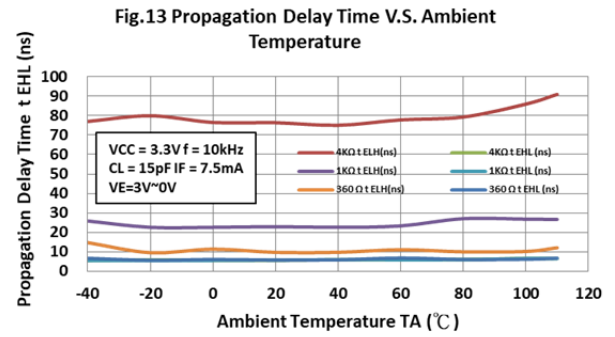


Fig.14 Propagation Delay Time V.S. Ambient Temperature

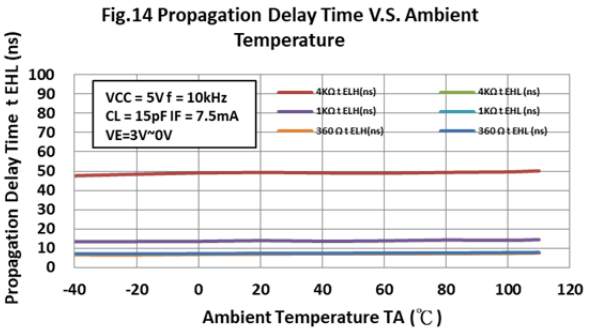
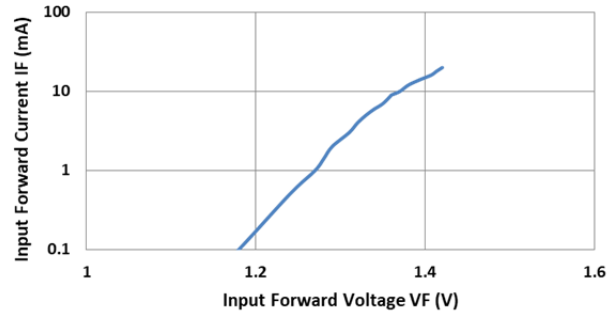
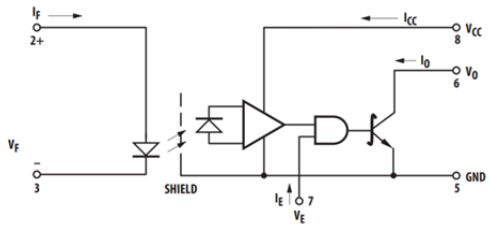


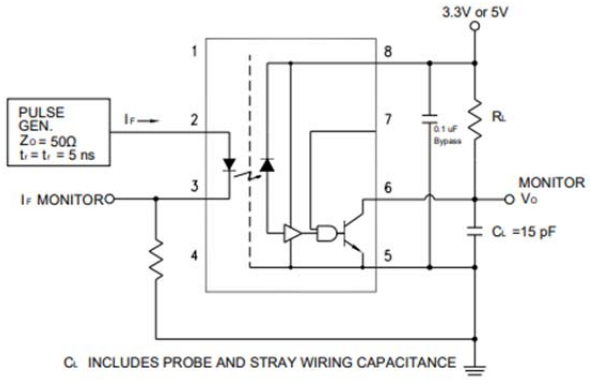
Fig.15 Input Forward Current V.S. Input Forward Voltage

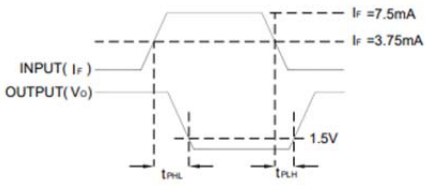


Circuit Block Diagram

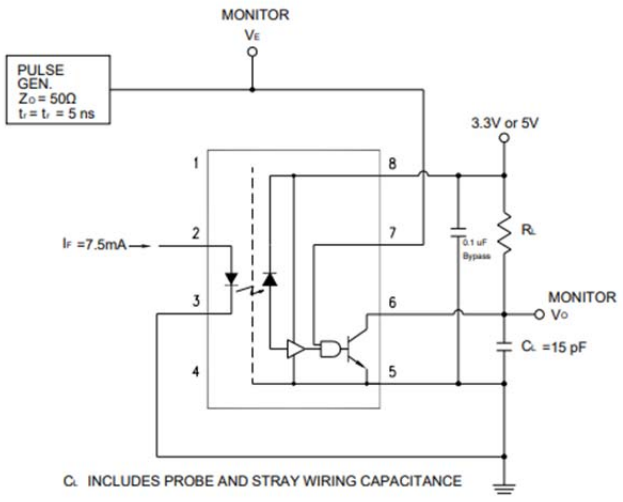


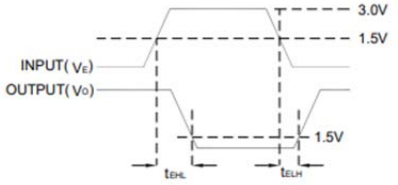
- **Test Circuit for Propagation Delay time t_{PHL} and t_{PLH}**



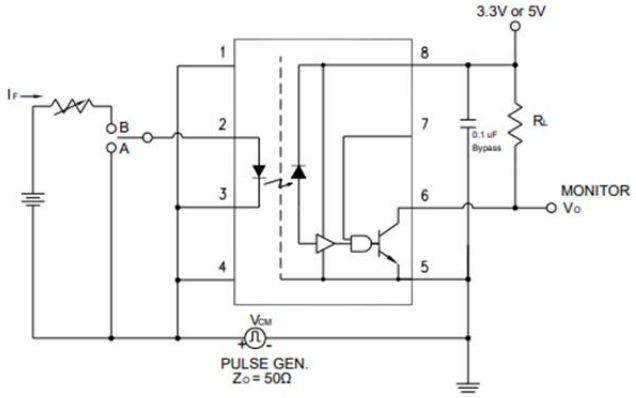


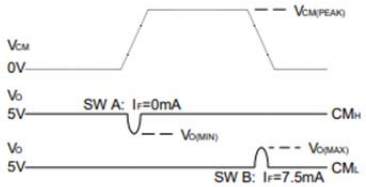
- **Test Circuit for Propagation Delay time t_{EHL} and t_{ELH}**





- **Test Circuit for Instantaneous Common Mode Rejection Voltage**



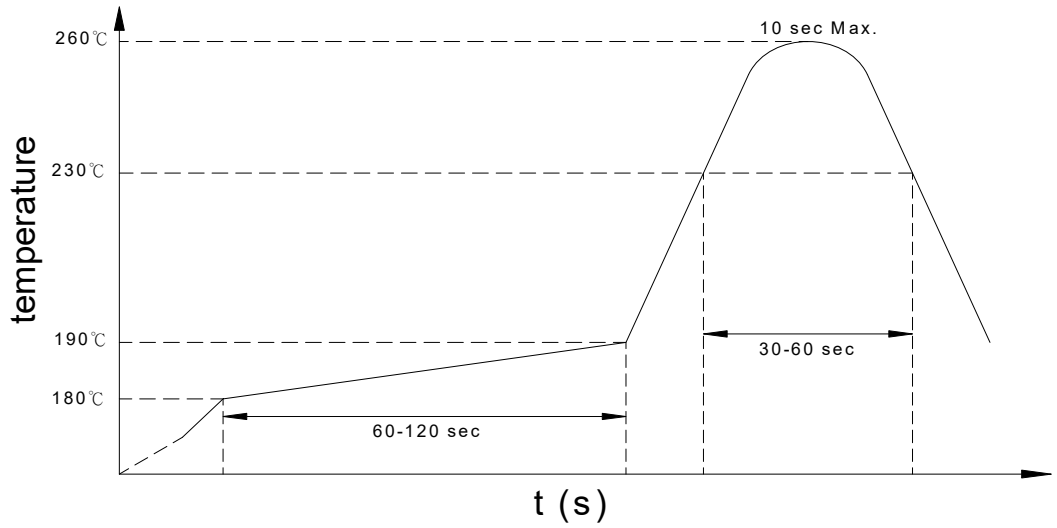


Recommended Soldering Conditions

(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

KPC2611 X (Y)

Notes:

KPC2611 = Part No.

X = Lead form option (blank、S、H、L)

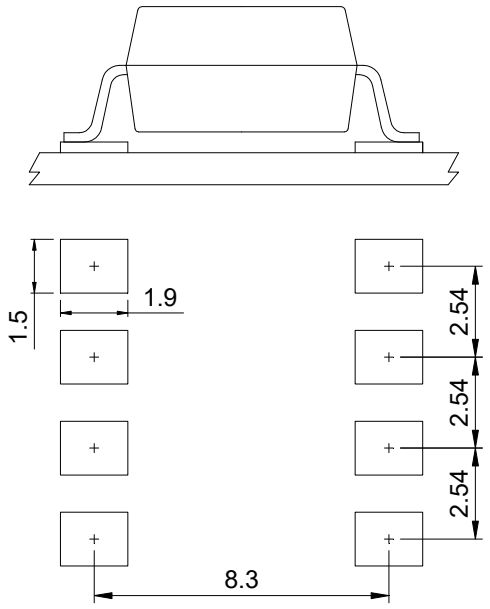
Y = Tape and reel option (TL、TR、TLD、TRU)

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

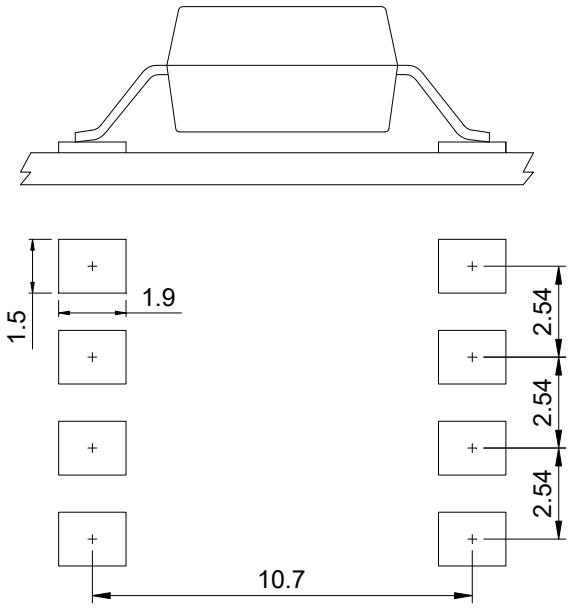
1.Surface mount type

8-pin SMD



2.Long creepage distance for surface mount type

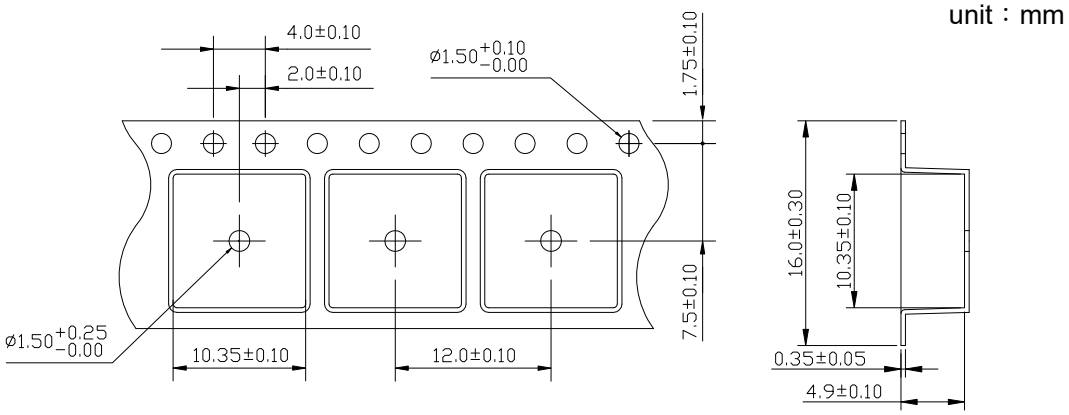
8-pin L



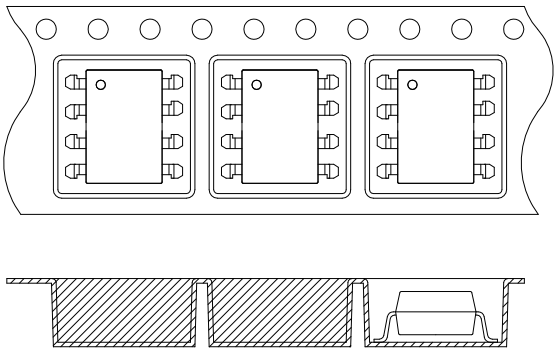
Unit :mm

● 8-pin SMD Carrier Tape & Reel

unit：mm

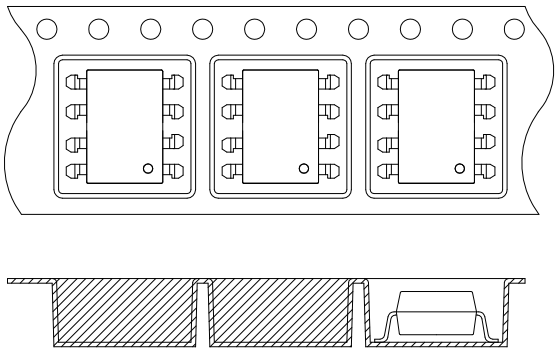


TL

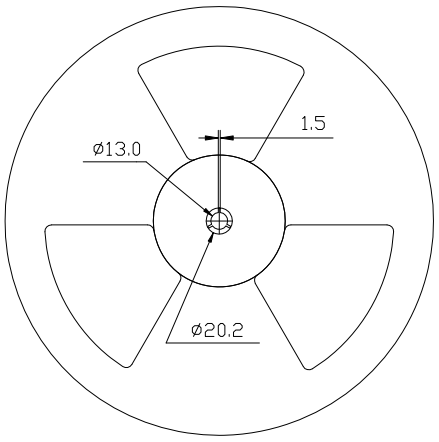


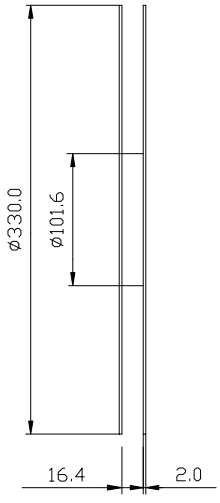
Direction of feed from reel

TR



Direction of feed from reel

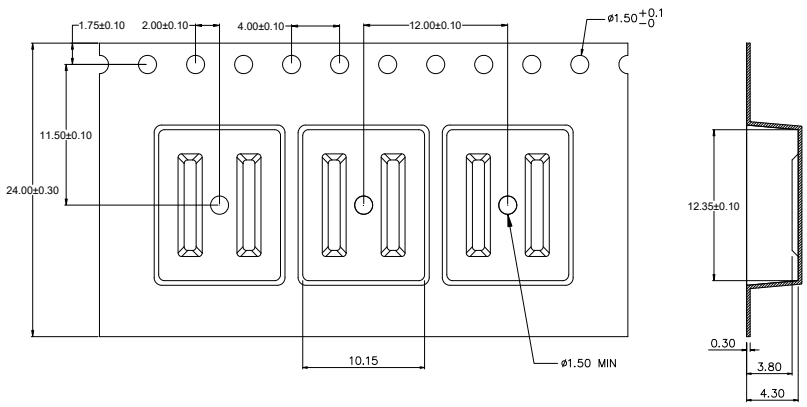




Quantity：1000pcs/reel

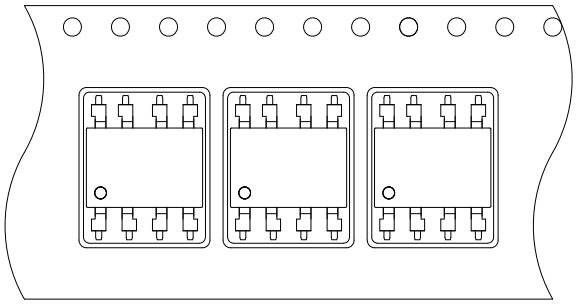
● 8-pin L Carrier Tape & Reel

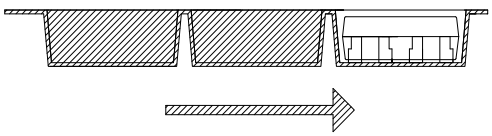
Unit:mm



TOLERANCE：±0.2mm

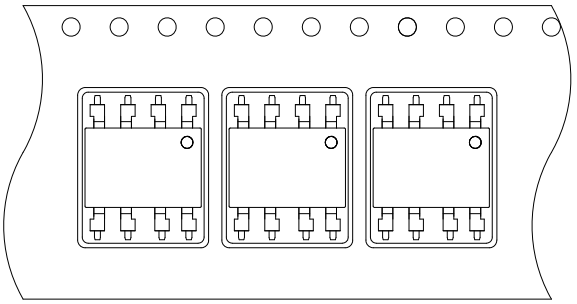
TLD

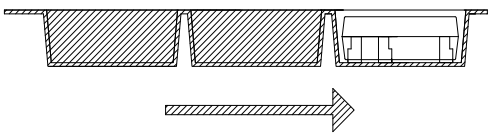




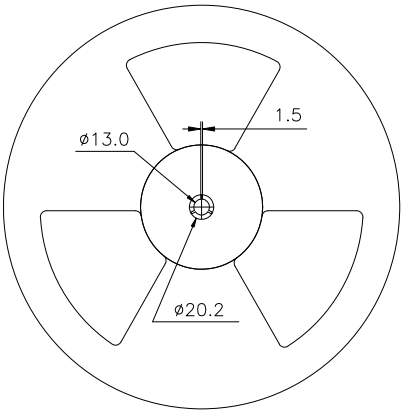
Direction of feed from reel

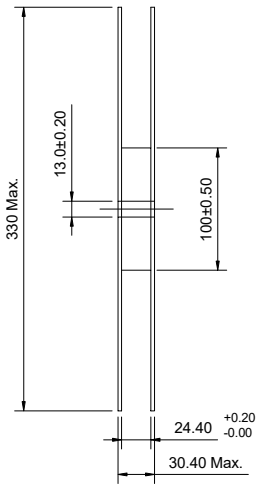
TRU





Direction of feed from reel





Quantity：800pcs/reel

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