



## Description

The HL101x is a photoelectric coupler composed of light-emitting diode and phototransistor. It is packaged in a 4-pin LSOP 4package.

## Features

- Current transfer ratio(CTR:MIN.50% at  $I_F=5mA, V_{CE}=5V$ )
- High input-output isolation voltage ( $V_{iso}=5,000V_{rms}$ )
- Operating Temperature:-55°C~100°C
- Safety approval (UL 1577, VDE DIN EN60747-5-5(VDE 0884-5), CQC11-471543-2022)
- RoHS
- MSL1

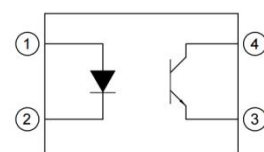
## Applications

- Programmable controllers
- Switching power supply, intelligent meter
- Home appliances: such as air conditioners, fans, water heaters, etc



LSOP-4

Schematic



Pin Configuration

- 1 Anode
- 2 Cathode
- 3 Emitter
- 4 Collector

## Rank Table Of Current Transfer Ratio (CTR= $I_C/I_F \times 100\%$ )

Rank Code	Symbol	Min	Max	Conditon
HL1010	CTR	50	600	$I_F=5mA,$ $V_{CE}=5V,$ $T_a=25^\circ C$
HL1017		80	160	
HL1018		130	260	
HL1019		200	400	
HL1012	CTR	63	125	$I_F=10mA,$ $V_{CE}=5V,$ $T_a=25^\circ C$
HL1013		100	200	
HL1014		160	320	
HL1012	CTR	22		$I_F=1mA,$ $V_{CE}=5V,$ $T_a=25^\circ C$
HL1013		34		
HL1014		56		



### Absolute Ratings(Tamb = 25°C)

	Parameter	Symbol	Values	Unit
Input	Forward Current	I <sub>F</sub>	50	mA
	Reverse Voltage	V <sub>R</sub>	6	V
	Power Dissipation	P	70	mW
	Peak Forward Current (100μs pulse, 100Hz)	I <sub>FP</sub>	1	A
	Thermal Resistance Junction-Ambient	R <sub>thJ-A</sub>	325	°C/W
	Thermal Resistance Junction-Case	R <sub>thJ-C</sub>	200	°C/W
Output	Collector - Emitter Voltage	V <sub>CEO</sub>	80	V
	Emitter - Collector Voltage	V <sub>ECO</sub>	6	V
	Collector Current	I <sub>C</sub>	50	mA
	Collector Power Dissipation	P <sub>C</sub>	150	mW
Operating temperature range		T <sub>op</sub>	-55 ~ 110	°C
Storage temperature range		T <sub>stg</sub>	-55 ~ 125	°C
Total Power consumption		P(W)	200	mW
Isolation Voltage <sup>(1)</sup>		V <sub>ISO</sub>	5000	V <sub>rms</sub>
Soldering Temperature <sup>(2)</sup>		T <sub>SOL</sub>	260	°C

Notes:

(1). AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2 are shorted together, and pins 3, 4 are shorted together.

(2).For 10 seconds

### Electrical Characteristics (Ratings at 25°C)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditon
Input	Forward Voltage	V <sub>F</sub>	-	1.2	1.4	V	I <sub>F</sub> =20mA
	Reverse Current	I <sub>R</sub>	-	-	10	μA	V <sub>R</sub> =4V
	Terminal Capacitance	C <sub>t</sub>	-	30	250	pF	V=0, f=1KHz
Output	Collector Dark Current	I <sub>CEO</sub>	-	-	100	nA	V <sub>CE</sub> =20V, I <sub>F</sub> =0
	Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	80			V	I <sub>C</sub> =0.1mA, I <sub>F</sub> =0
	Emitter-Collector Breakdown Voltage	BV <sub>ECO</sub>	7			V	I <sub>E</sub> =10μA, I <sub>F</sub> =0
Collector-Emitter Saturation Voltage		V <sub>CE(sat)</sub>			0.3	V	I <sub>F</sub> =10mA, I <sub>C</sub> =1mA
Isolation Resistance		R <sub>iso</sub>	5 × 10 <sup>10</sup>	1 × 10 <sup>11</sup>	-	Ω	DC500V, 40 ~ 60% R.H.
Floating Capacitance		C <sub>f</sub>		0.6	1	pF	V=0, f=1MHz
Response Time (Rise)		tr			18	μs	V <sub>CE</sub> =5V, I <sub>C</sub> =5mA RL=100Ω,
Response Time (Fall)		tf			18	μs	



## Characteristics Curves

Fig.1 Relative Current Transfer Ratio vs. Forward Current Fig.2 Forward Current vs. Forward Voltage

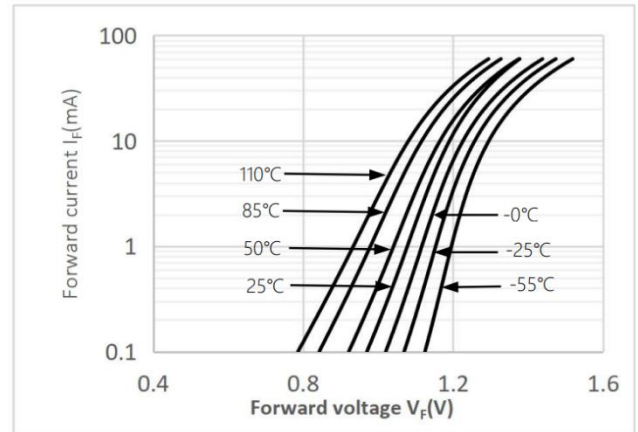
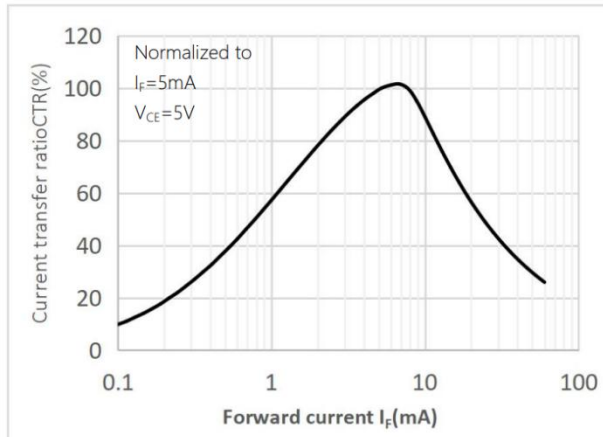


Fig.3 Collector Current vs. Collector-emitter Voltage

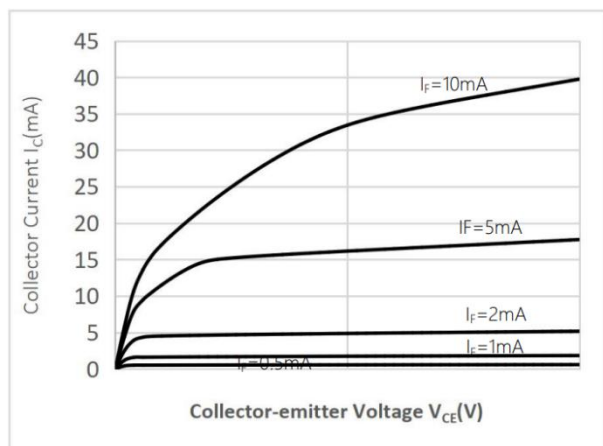


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

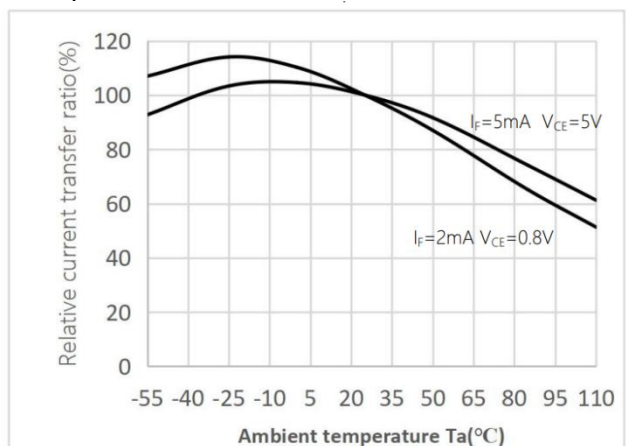


Fig.5 Collector-emitter Saturation Voltage vs. Ambient Temperature

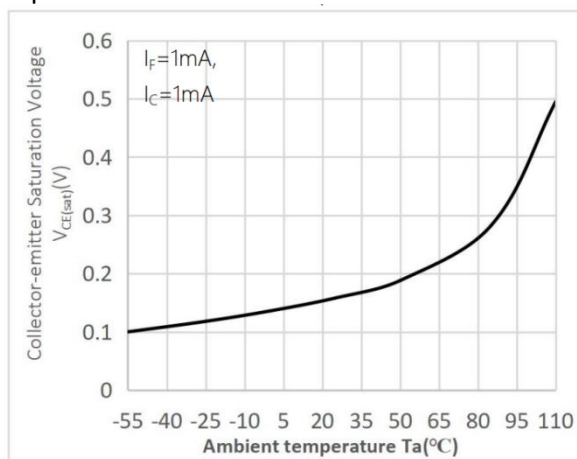


Fig.6 Collector Dark Current vs Ambient Temperature

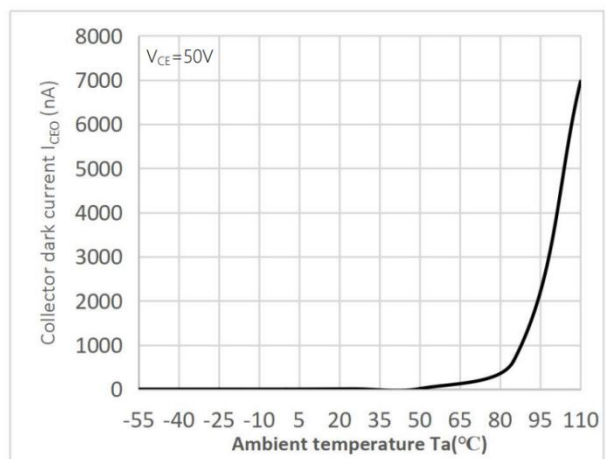




Fig.7 Response Time vs. Load Resistance

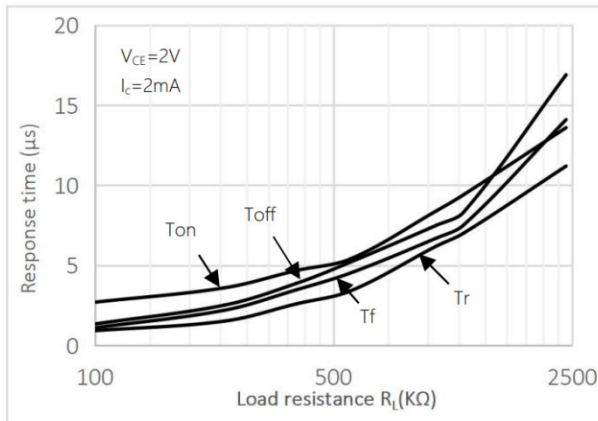


Fig.8 Frequency Response

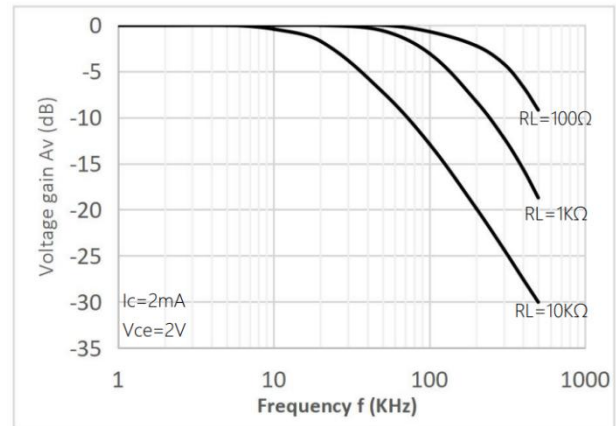


Fig.9 Collector-emitter Saturation Voltage vs Forward Current

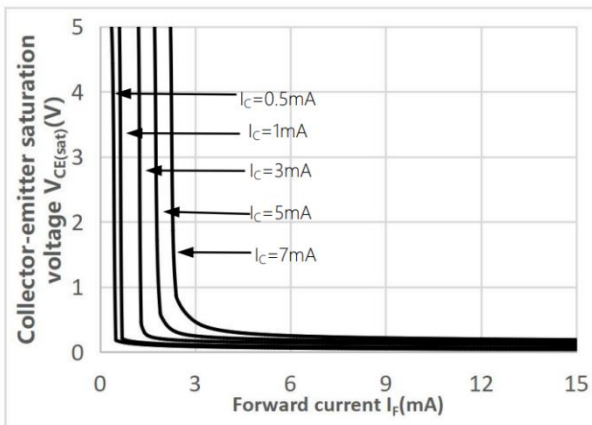
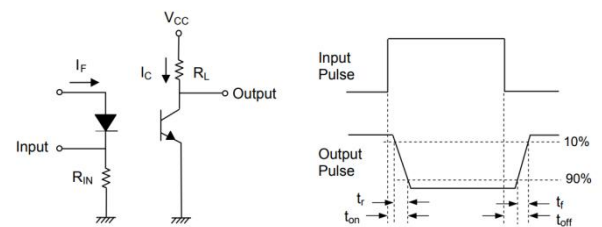
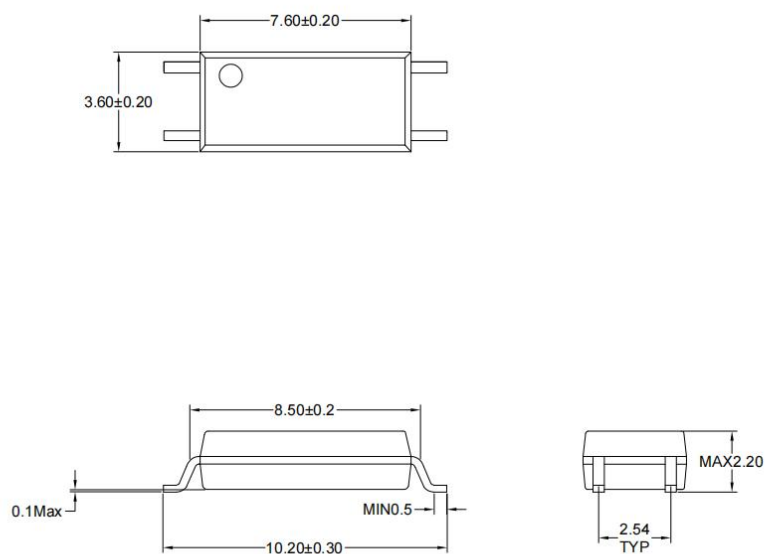


Fig.10 Switching Time Test Circuit & Waveforms





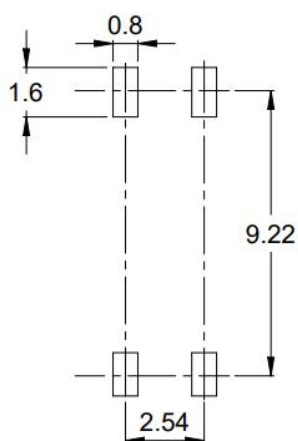
## Outline Dimension



Unit: mm

Tolerance:  $\pm 0.1\text{mm}$

## Recommended solder pad Design



Unit: mm

Tolerance:  $\pm 0.1\text{mm}$

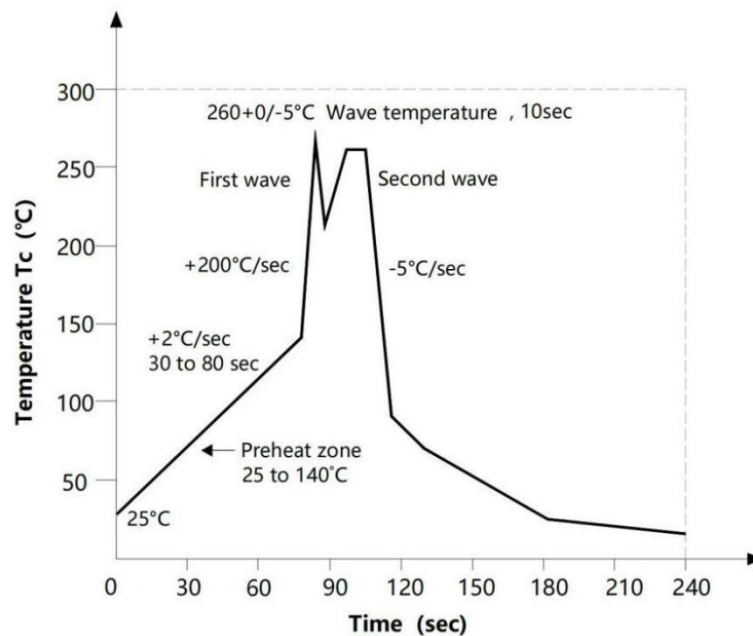


## Temperature Profile Of Soldering

### 1.IR Reflow soldering

**(JEDEC-STD-020 compliant)**

Profile item	Conditon
Preheat	
-Temperature Min (TSmin)	150°C
-Temperature Max (TSmax)	200°C
-Time (min to max) (ts)	90±30 sec
Soldering zone	
-Temperature (TL)	217°C
-Time (tL)	60sec
Peak Temperature (TP)	260°C
Ramp-up rate	3°C / sec max
Ramp-down rate	3~6°C/ sec

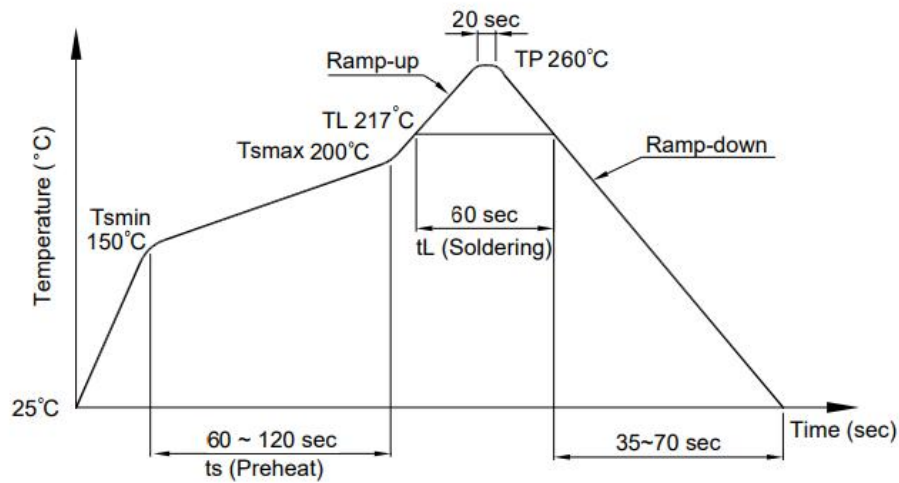


#### Notes:

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



## 2. Wave soldering (JEDEC22A111 compliant)



## 3. Hand soldering by soldering iron

Allow single lead soldering in every single process. One time soldering is recommended.

Temperature: 380 +0/-5°C

Time: 3 sec max.



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