

## 6N137 – High Speed 10MBd Optocouplers

Aug 2008

### DESCRIPTION

These diode-transistor photocouplers consist of an AlGaAs LED optically coupled to a high speed photodetector. The output features is an open collector and coupler parameters are guaranteed over the temperature range from  $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$ . The internal shield provides a guaranteed Common Mode Transient Immunity (typical)  $10\text{KV}/\mu\text{s}$

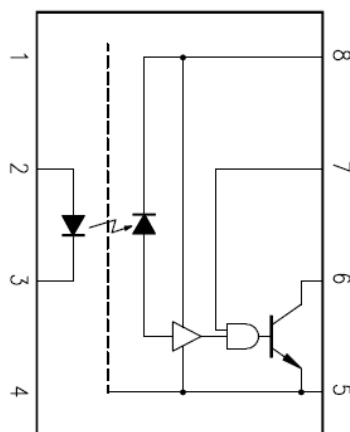
### FEATURES

- \* High speed – 10MBd
- \* Common mode rejection -  $10\text{KV}/\mu\text{s}$
- \* UL, CSA, IEC/EN/DIN EN60747-5-2 – Pending
- \* Dual-in-line package- 6N137
- \* Wide lead spacing package- 6N137M
- \* Surface mounting package- 6N137S
- \* Tape and reel packaging- 6N137S-TA/6N137S-TA1

### APPLICATIONS

- \* High Voltage Isolation
- \* Line receivers
- \* Feedback Element in Switching Mode Power Supplies
- \* High Speed Logic Ground Isolation – TTL/TTL, TTL/CMOS, TTL/LSTTL
- \* Pulse transformer replacement
- \* Power transistor isolation in motor drives
- \* Microprocessor system interfaces
- \* Ground loop elimination

### Schematic



### Pin Define

1. NC
2. Anode
3. Cathode
4. NC
5. GND
6. Vo
7. VE
8. Vcc

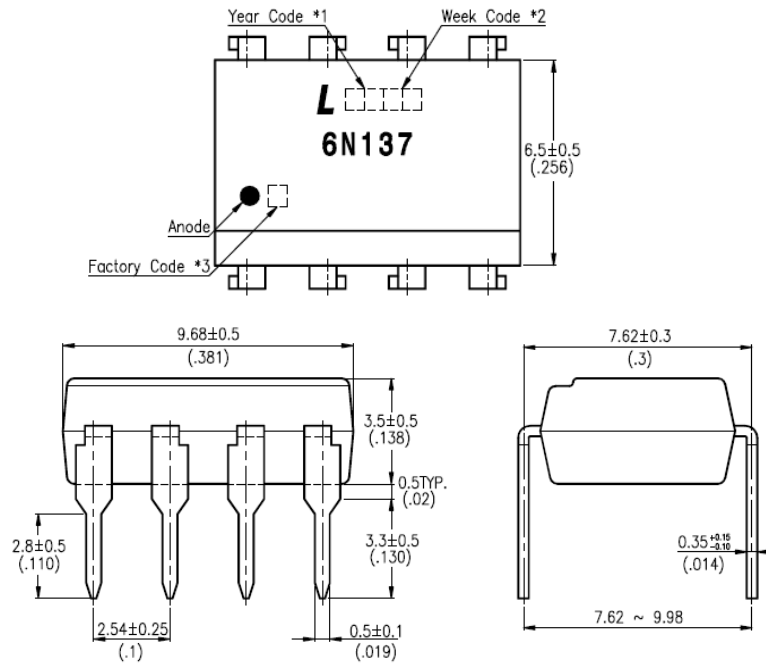
### Truth Table (Positive Logic)

Input	EN	Output
ON	H	L
OFF	H	H
ON	L	H
OFF	L	H
ON	NC	L
OFF	NC	H

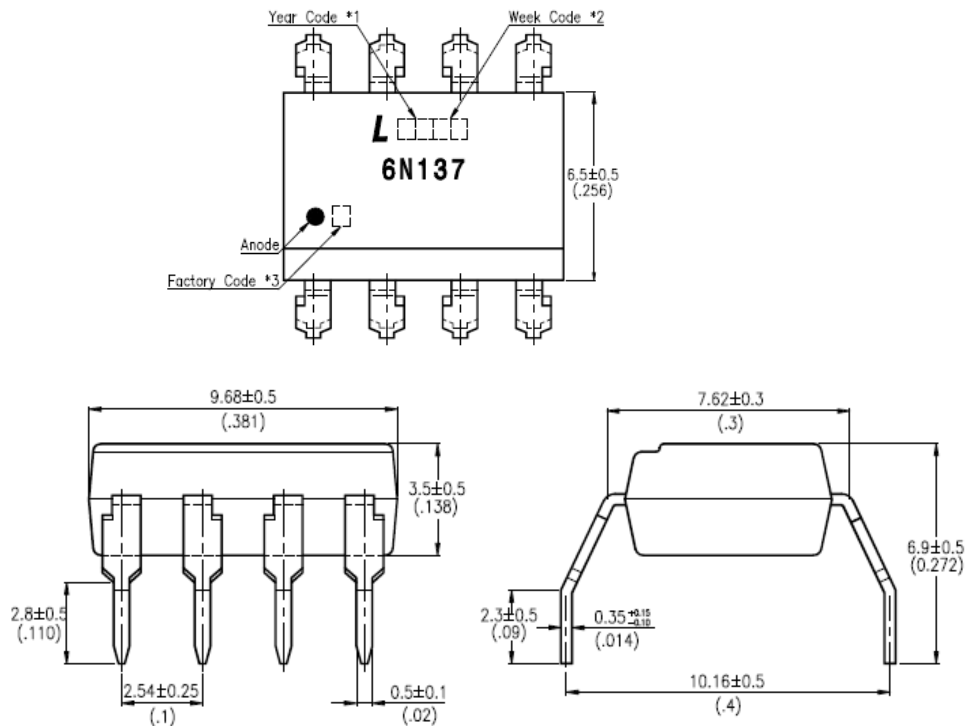
A 0.1uF bypass capacitor must be connected between pin8 and pin5.

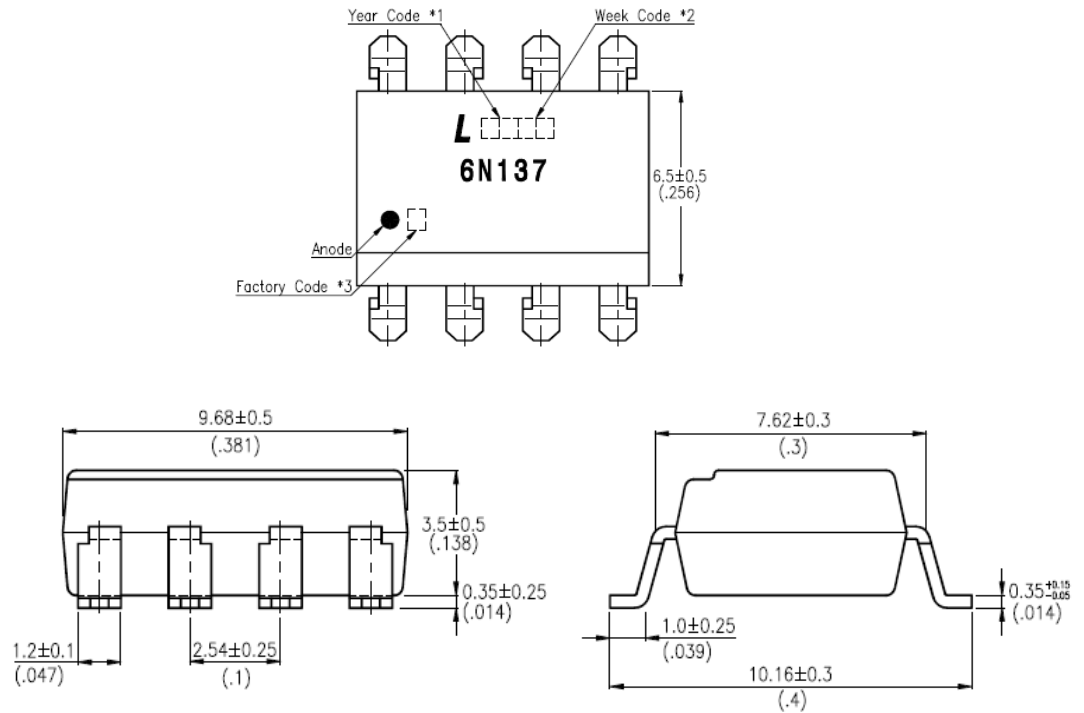
## OUTLINE DIMENSIONS

### 6N137:



### 6N137M



**OUTLINE DIMENSIONS****6N137S**

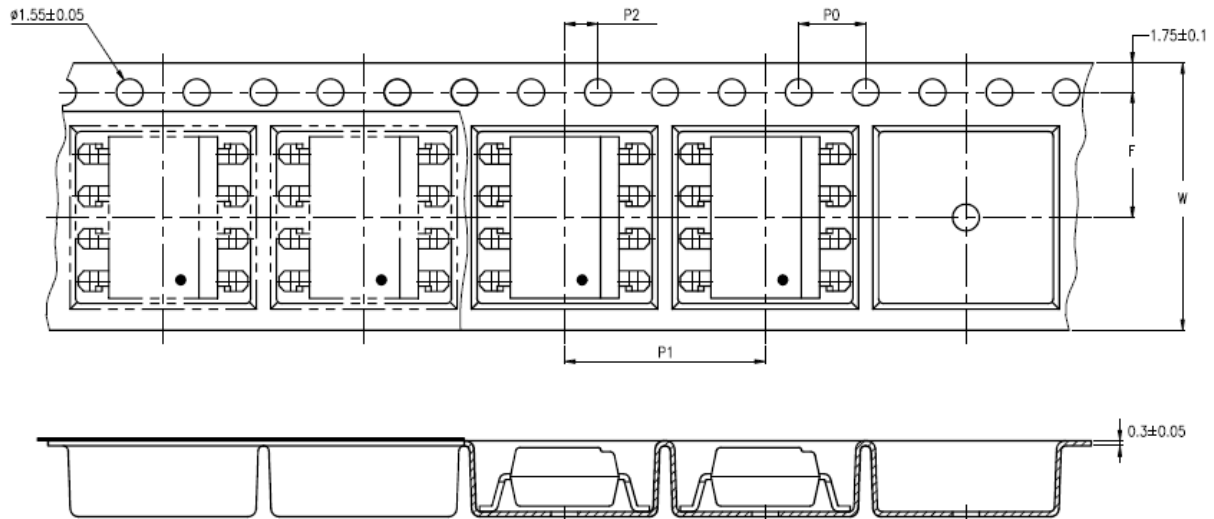
\*1. Year date code.

\*2. 2-digit work week.

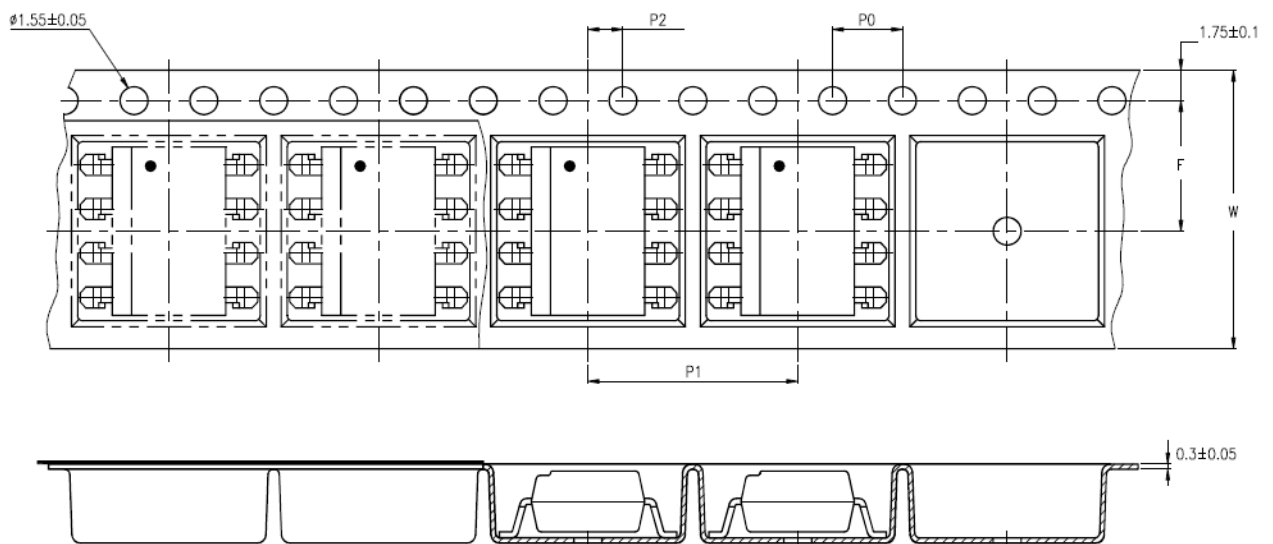
\*3. Factory identification mark shall be marked (Z: Taiwan, Y: Thailand).

## TAPING DIMENSIONS

### 6N137S-TA



### 6N137S-TA1



Description	Symbol	Dimensions in mm ( inches )
Tape wide	W	$16 \pm 0.3$ ( .63 )
Pitch of sprocket holes	$P_0$	$4 \pm 0.1$ ( .15 )
Distance of compartment	F	$7.5 \pm 0.1$ ( .295 )
Distance of compartment to compartment	$P_2$	$2 \pm 0.1$ ( .079 )
Distance of compartment to compartment	$P_1$	$12 \pm 0.1$ ( .472 )

## ABSOLUTE MAXIMUM RATING

( Ta = 25°C unless otherwise specified)

PARAMETER		SYMBOL	RATING	UNIT
INPUT	Forward Current	I <sub>F</sub>	25	mA
	Reverse Voltage	V <sub>R</sub>	5	V
	Power Dissipation	P	40	mW
OUTPUT	Supply Voltage (1minute max)	V <sub>CC</sub>	7	V
	Output Voltage	V <sub>O</sub>	7	V
	Output Current	I <sub>O</sub>	50	mA
	Power Dissipation	P <sub>O</sub>	85	mW
	Isolation Voltage	V <sub>iso</sub>	5000	V <sub>rms</sub>
	Operating Temperature	T <sub>opr</sub>	-40 ~ +85	°C
	Storage Temperature	T <sub>stg</sub>	-55 ~ +125	°C
	Soldering Temperature	T <sub>sol</sub>	260 for 10 sec	°C

### Note

1. AC For 1 Minute, R.H. = 40 ~ 60%  
 Isolation voltage shall be measured using the following method.
  - (1) Short Pin 1 to Pin4 on the primary side and Pin 5 to Pin 8 on the secondary side.
  - (2) The isolation voltage tester with zero-cross circuit shall be used.
  - (3) The waveform of applied voltage shall be a sine wave.
2. For 10 sec.

### ELECTRICAL - OPTICAL CHARACTERISTICS

( T<sub>A</sub> = 0~70°C, unless otherwise specified )

PARAMETER	SYMBOL	MIN.	TYP.**	MAX.	UNIT	CONDITIONS
<b>Input</b>						
Input Forward Voltage	V <sub>F</sub>	—	1.45	1.7	V	T <sub>a</sub> =25°C, I <sub>F</sub> =10mA
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T_a$	—	-1.6	—	mV/°C	I <sub>F</sub> =10mA
Input Reverse Voltage	BV <sub>R</sub>	5.0	—	—	V	T <sub>a</sub> =25°C, I <sub>R</sub> =10 μA
<b>Output</b>						
High Level Supply Current	I <sub>CCH</sub>	—	7	10	mA	I <sub>F</sub> =0mA, V <sub>E</sub> =0.5V V <sub>CC</sub> =5.5V
Low Level Supply Current	I <sub>CCL</sub>	—	9	13	mA	I <sub>F</sub> =10mA, V <sub>E</sub> =0.5V V <sub>CC</sub> =5.5V
Low Level Enable Current	I <sub>EL</sub>	—	-0.8	-1.6	mA	V <sub>CC</sub> =5.5V, V <sub>E</sub> =0.5V
High Level Enable Current	I <sub>EH</sub>	—	-0.6	-1.6	mA	V <sub>CC</sub> =5.5V, V <sub>E</sub> =2.0V
High Level Enable Voltage	V <sub>EH</sub>	2.0			V	I <sub>F</sub> =10mA, V <sub>CC</sub> =5.5V
Low Level Enable Voltage	V <sub>EL</sub>			0.8	V	I <sub>F</sub> =10mA, V <sub>CC</sub> =5.5V

\*\* All typical at T<sub>A</sub> = 25°C

### SWITCHING SPECIFICATIONS (AC)

(  $T_A = -40\sim 85^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$ ,  $I_F = 7.5\text{mA}$  unless otherwise specified )

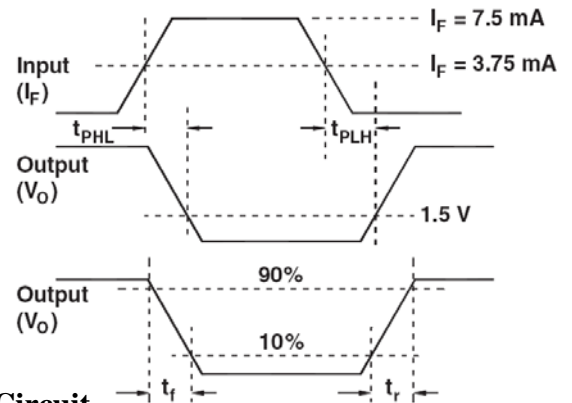
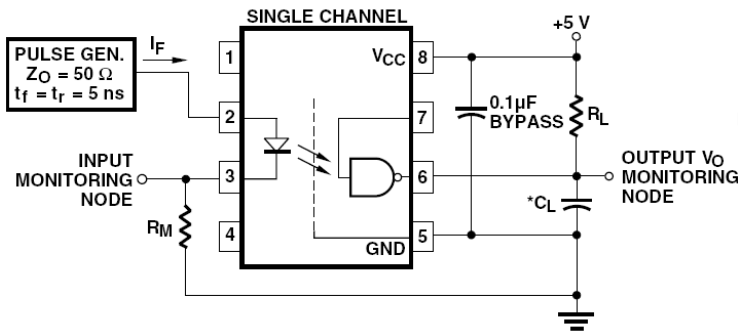
PARAMETER	SYM.	MIN.	TYP**	MAX.	UNIT	CONDITIONS
Propagation Delay time to Logic Low Output (1)→(0)	$t_{PHL}$	25	30	75	ns	$R_L = 350\Omega$ $C_L = 15\text{pF}$
				100		
Propagation Delay time to Logic High Output (0)→(1)	$t_{PLH}$	25	40	75	ns	$R_L = 350\Omega$ $C_L = 15\text{pF}$
				100		
Pulse Width Distortion	$  t_{PHL} - t_{PLH}  $		10		ns	$R_L = 350\Omega$ $C_L = 15\text{pF}$
Output Rise Time (10%~90%)	$t_r$		50		ns	$R_L = 350\Omega$ $C_L = 15\text{pF}$
Output Fall time (90%~10%)	$t_f$		12		ns	$R_L = 350\Omega$ $C_L = 15\text{pF}$
Enable Propagation Delay Time at high level output(1)	$t_{ELH}$		20		ns	$I_F = 7.5\text{mA}$ $V_{EH} = 3.5\text{V}$ $R_L = 350\Omega$ $C_L = 15\text{pF}$
Enable Propagation Delay Time at low level output(0)	$t_{EHL}$		20		ns	$I_F = 7.5\text{mA}$ $V_{EH} = 3.5\text{V}$ $R_L = 350\Omega$ $C_L = 15\text{pF}$
Instantaneous common mode rejection at high logic output (1)	$  CM_H  $	1	10	—	KV / $\mu\text{s}$	$I_F = 0\text{mA}$ $V_{OH}(\text{Min}) = 2.0\text{V}$ $  V_{CM}   = 50\text{V}_{P-P}$ $R_L = 350\Omega$
Instantaneous common mode rejection at low logic output (0)	$  CM_L  $	1	10	—	KV / $\mu\text{s}$	$I_F = 7.5\text{mA}$ $V_{OH}(\text{Max}) = 0.8\text{V}$ $  V_{CM}   = 50\text{V}_{P-P}$ $R_L = 350\Omega$

\*\* All typical at  $T_A = 25^\circ\text{C}$

## SWITCHING TEST CIRCUITS (AC)

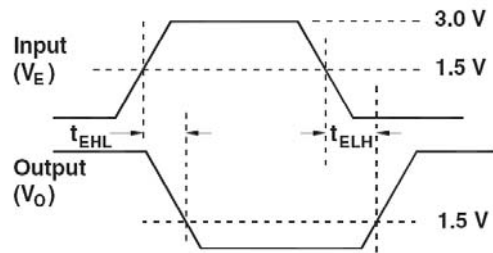
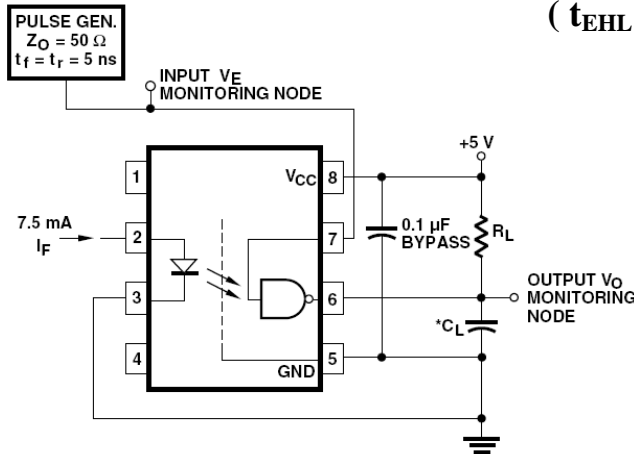
### Switching Time Test Circuit

( $t_{PHL}$ ,  $t_{PLH}$ ,  $t_r$  and  $t_f$ )

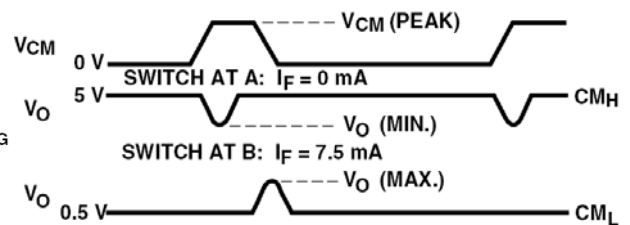
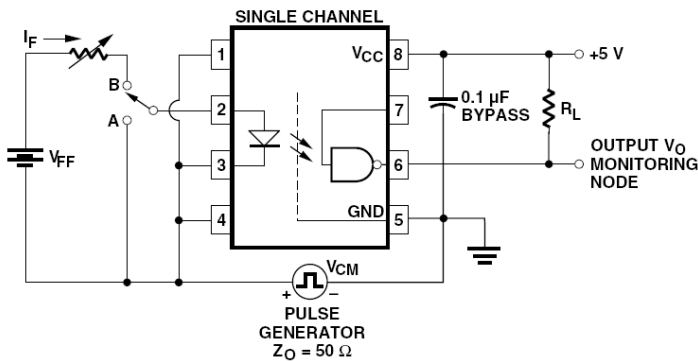


### Switching Time Test Circuit

( $t_{EHL}$ ,  $t_{ELH}$ )



### Common Mode Immunity Test Circuit





### ISOLATION CHARACTERISTICS

( $T_A = -40\sim 85^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$ ,  $I_F = 7.5\text{mA}$  unless otherwise specified)

PARAMETER	SYMBOL	MIN.	TYP.**	MAX.	UNIT	CONDITIONS
Isolation Resistance (Input-output) Note4.	$R_{I-O}$	—	$10^{12}$	—		$T_a=25^\circ\text{C}$ , $RH<45\%$ , $V_{I-O}=500\text{V DC}$
Capacitance (Input-output) Note4.	$C_{I-O}$	—	0.6	—	pF	$f=1\text{MHz}$

### TRANSFER CHARACTERISTICS(DC)

( $T_A = -40\sim 85^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$ ,  $I_F = 7.5\text{mA}$  unless otherwise specified)

PARAMETER	SYMBOL	MIN.	TYP.**	MAX.	UNIT	CONDITIONS
High Level Output Current	$I_{OH}$			100	$\mu\text{A}$	$V_{CC}=5.5\text{V}$ , $V_o=0.5\text{V}$ $I_F=250\mu\text{A}$ , $V_E=2.0\text{V}$
Low Level Output Voltage	$V_{OL}$		0.35	0.6	V	$V_{CC}=5.5\text{V}$ , $I_F=5\text{mA}$ , $V_E=2.0\text{V}$ $I_{OL}=13\text{mA}$
Input Threshold Current	$I_{FTH}$		3	5	mA	$V_{CC}=5.5\text{V}$ , $V_o=0.5\text{V}$ $I_{OL}=13\text{mA}$ , $V_E=2.0\text{V}$

\*\* All typical at  $V_{CC}=5\text{V}$ ,  $T_A = 25^\circ\text{C}$

#### Note:

- AC For 1 Minute, R.H. = 40 ~ 60%  
Isolation voltage shall be measured using the following method.  
(1) Considered a two-terminal device: Pin 1,2,3,4 shorted together and Pin 5,6,7,8 shorted together.  
(2) The isolation voltage tester with zero-cross circuit shall be used.  
(3) The waveform of applied voltage shall be a sine wave.
- For 10 sec.
- Pin5 and Pin8 must connect a bypass 0.1 $\mu\text{F}$  capacitor.

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