6N137

Super High Speed Response *OPIC Photocoupler

■ Features

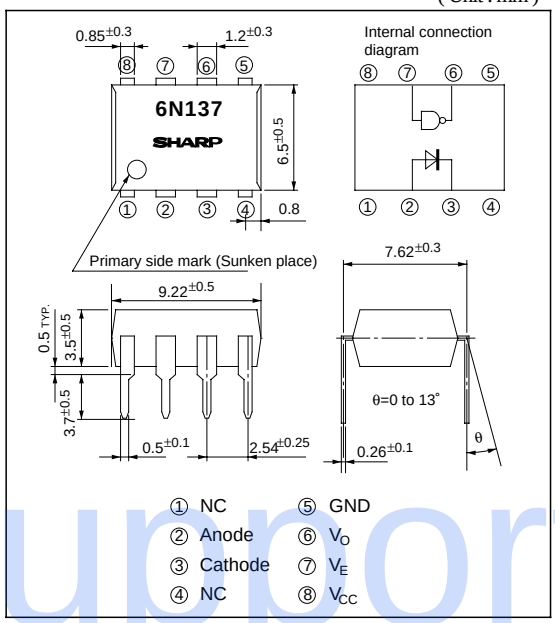
1. Super high speed response
   (t_{PHL}, t_{PLH} : TYP. 45ns at R_L=350Ω)
2. Isolation voltage between input and output
   Viso(rms) : 2.5kV
3. Instantaneous common mode rejection voltage
   CM_H : TYP. 500V/μs
4. LSTTL and TTL compatible output
5. Recognized by UL, file No. E64380

■ Applications

1. High speed interfaces for computer peripherals, microcomputer systems
2. High speed line receivers
3. Noise reduction
4. Interfaces for data transmission equipment

■ Outline Dimensions

(Unit : mm)



* "OPIC" (Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.

■ Absolute Maximum Ratings

(Ta=25˚C)

Parameter		Symbol	Rating	Unit
Input	*1 Forward current	I_F	20	mA
	*2 Peak forward current	I_{FM}	40	mA
	Reverse voltage	V_R	5	V
Output	*3 Supply voltage	V_{CC}	7	V
	*4 Enable voltage	C_E	5.5	V
	Output voltage	V_O	7	V
	Output current	I_O	50	mA
	Output collector power dissipation	P_C	85	mW
*5 Isolation voltage		$V_{iso(rms)}$	2.5	kV
Operating temperature		T_{opr}	0 to +70	˚C
Storage temperature		T_{stg}	−55 to +125	˚C
*6 Soldering temperature		T_{sol}	260	˚C

*1 Ta=0 to 70˚C
*2 Pulse width≤1ms
*3 For 1 minute MAX.
*4 Not exceed 500mV or more than supply voltage (V_{CC})
*5 AC for 1 minute, 40 to 60% RH
Apply the specific voltage between all the input electrode pins connected together and all the output electrode pins connected together.
*6 2mm or more away from the lead base for 10 seconds

■ Electro-optical Characteristics

(Ta=0 to +70˚C unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Logic (1) output current	I_{OH}	V_{CC}=5.5V, V_O=5.5V, I_F=250μA, V_E=2.0V	–	2	250	μA
Logic (0) output voltage	V_{OL}	V_{CC}=5.5V, I_F=5mA, V_{EH}=2.0V, I_{OL} (Sinking)=13mA	–	0.4	0.6	V
Logic (1) enable current	I_{EH}	V_{CC}=5.5V, V_E=2.0V	–	–0.8	–	mA
Logic (0) enable current	I_{EL}	V_{CC}=5.5V, V_E=0.5V	–	–1.2	–2.0	mA
Logic (1) supply current	I_{CCH}	V_{CC}=5.5V, I_F=0mA, V_E=0.5V	–	7	15	mA
Logic (0) supply current	I_{CCL}	V_{CC}=5.5V, I_F=10mA, V_E=0.5V	–	13	18	mA
*7 Leak current	I_{I-O}	45%RH, Ta=25˚C, t=5s, V_{I-O}=3.0kV DC	–	–	1.0	μA
*7 Isolation resistance (input-output)	R_{I-O}	V_{I-O}=500V, Ta=25˚C	–	1×10^{12}	–	Ω
*7 Capacitance (input-output)	C_{I-O}	f=1MHz, Ta=25˚C	–	0.6	–	pF
*8 Input forward voltage	V_F	I_F=10mA, Ta=25˚C	–	1.6	1.75	V
Input reverse voltage	BV_R	I_R=10μA, Ta=25˚C	5	–	–	V
Input capacitance	C_{IN}	V_F=0, f=1MHz	–	60	–	pF

*7 Measured as 2-pin element. Connect pins 2 and 3 connect pins 5,6,7 and 8.

*8 At I_F=10mA, V_F decreases at the rate of 1.6mV/˚C if the temperature goes up.

■ Switching Characteristics

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*9 Propagation delay time Output (0) → (1)	t_{PLH}	Ta=25˚C, R_L=350Ω, C_L=15pF, I_F=7.5mA	–	45	75	ns
*9 Propagation delay time Output (1) → (0)	t_{PHL}	Ta=25˚C, R_L=350Ω, C_L=15pF, I_F=7.5mA	–	45	75	ns
Output rise-fall time (10 to 90%)	t_r, t_f	R_L=350Ω, C_L=15pF, I_F=7.5mA	–	20, 30	–	ns
*10 Enable propagation delay time (1) → (0)	t_{ELH}	R_L=350Ω, C_L=15pF, I_F=7.5mA, V_{EH}=3.0V, V_{EL}=0.5V	–	40	–	ns
*10 Enable propagation delay time (0) → (1)	t_{EHL}	R_L=350Ω, C_L=15pF, I_F=7.5mA, V_{EH}=3.0V, V_{EL}=0.5V	–	15	–	ns
*11 Instantaneous common mode rejection voltage "Output (1)"	CM_H	V_{CM}=10V, R_L=350Ω, V_O (min.)=2V, I_F=0mA	–	500	–	V/μs
*11 Instantaneous common mode rejection voltage "Output (0)"	CM_L	V_{CM}=10V, R_L=350Ω, V_O (max.)=0.8V, I_F=5mA	–	–500	–	V/μs

Note) Typical values are all at V_{CC}=5V, Ta=25˚C

*9 Refer to the Fig. 1.

*10 Refer to the Fig. 2.

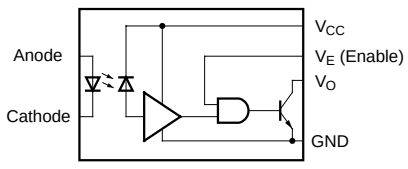
*11 CM_H represents a common mode voltage variation that can hold the output above (1) level (V_O>2.0V).
CM_L represents a common mode voltage variation that can hold the output above (0) level (V_O<0.8V)

■ Recommended Operating Conditions

Parameter	Symbol	MIN.	MAX.	Unit
Low level input current	I_{FL}	0	250	μA
High level input current	I_{FH}	7.0	15	mA
High level enable voltage	V_{EH}	2.0	V_{CC}	V
Low level enable voltage	V_{EL}	0	0.8	V
Supply voltage	V_{CC}	4.5	5.5	V
Fanout (TTL load)	N	–	8	–
Operating temperature	T_{opr}	0	70	˚C

1. No necessary external pull-up resistor to hold enable input at high level.
2. Connect a ceramic by-pass capacitor (0.01 to 0.1μF) between V_{CC} and GND at the position within 1cm from pin.

Circuit Block Diagram

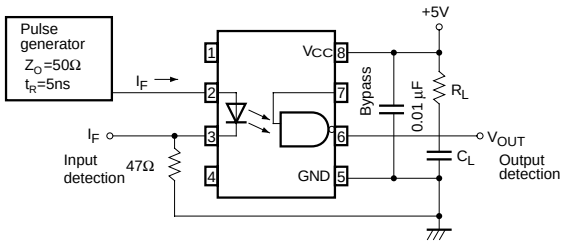


Truth Table

Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H

L : Logic (0) H : Logic (1)

Fig.1 Test Circuit for Propagation Delay Time



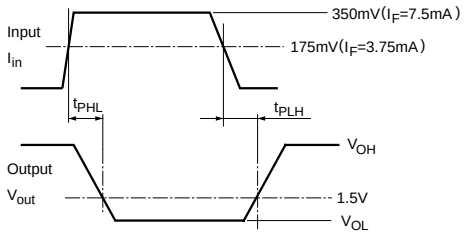
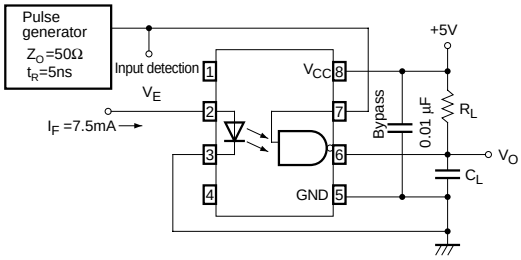


Fig.2 Test Circuit for Enable Propagation Delay Time



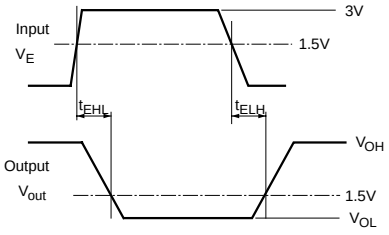
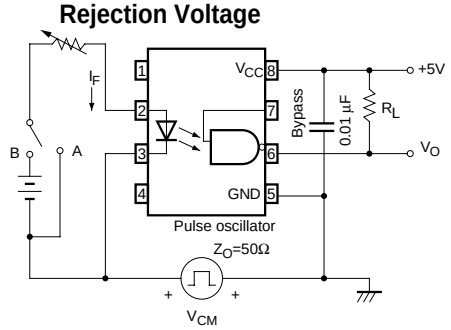


Fig.3 Test Circuit for Instantaneous Common Mode Rejection Voltage



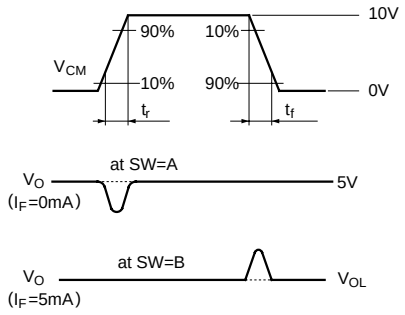


Fig. 4 Output Collector Power Dissipation vs. Ambient Temperature

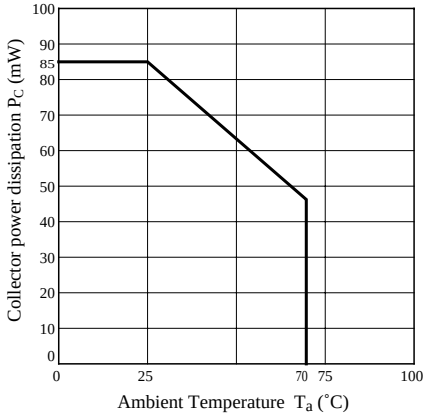


Fig. 5 Forward Current vs. Forward Voltage

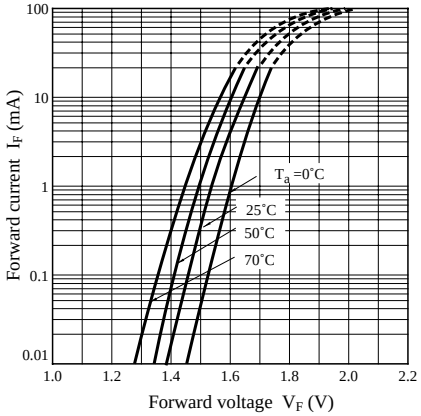


Fig. 6 High Level Output Current vs. Ambient Temperature

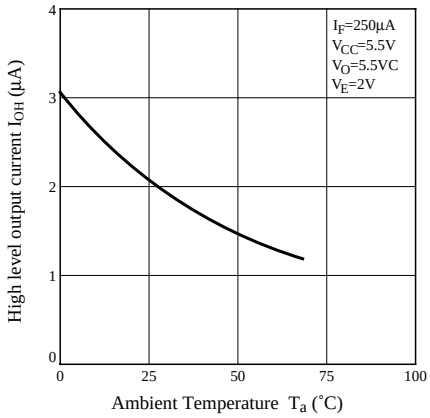


Fig. 7 Low Level Output Voltage vs. Ambient Temperature

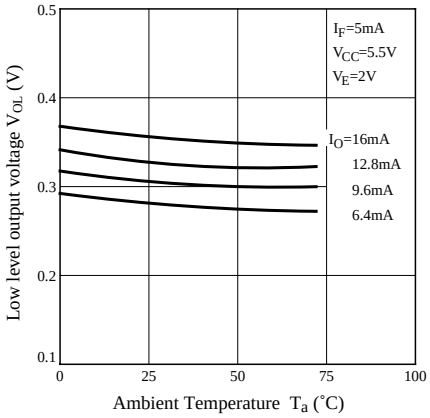


Fig. 8-a Output Voltage vs. Forward Current

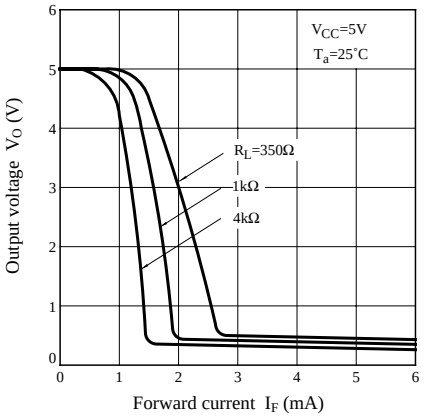


Fig. 8-b Output Voltage vs. Forward Current (Ambient Temp. Characteristics)

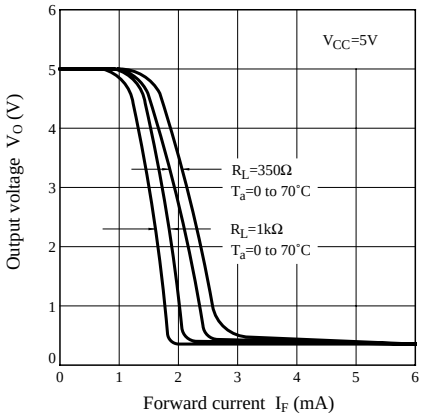


Fig. 9 Propagation Delay Time vs. Forward Current

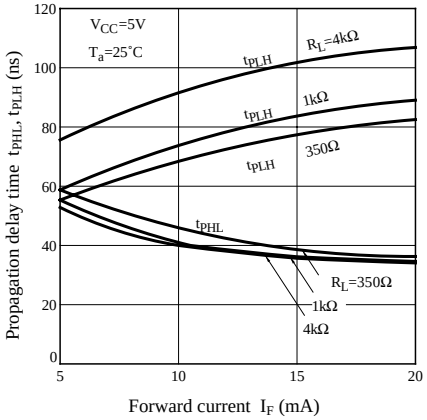


Fig. 10 Propagation Delay Time vs. Ambient Temperature

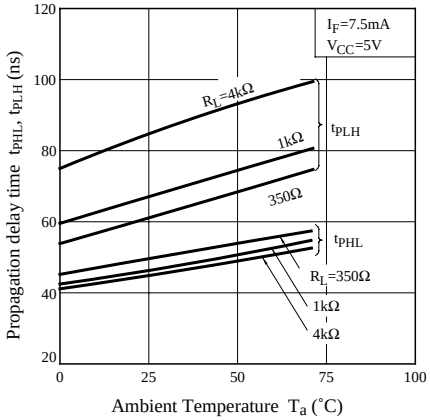


Fig. 11 Rise Time, Fall Time vs. Ambient Temperature

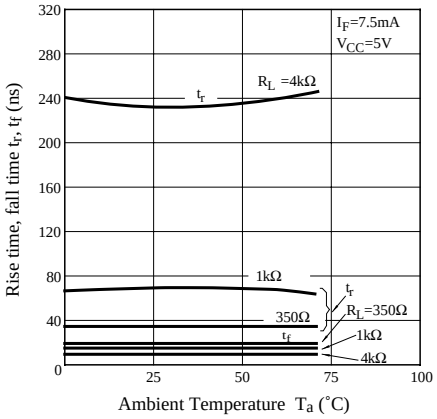
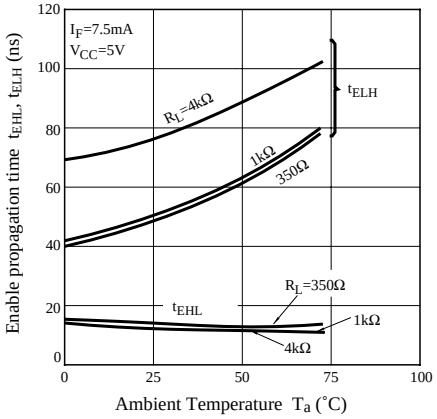


Fig. 12 Enable Propagation Time vs. Ambient Temperature



■ Precaution for Use

(1) Handle this product the same as with other integrated circuits against static electricity.

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— Telecommunication equipment [terminal]
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— Consumer electronics

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— Gas leakage sensor breakers
— Alarm equipment
— Various safety devices, etc.

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