6N135/6N136 General Purpose Type Photocoupler

T-41-83

■ Features

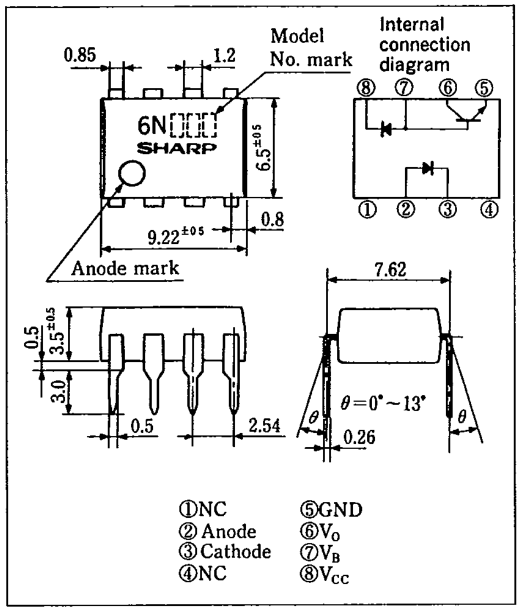
1. High speed response t_{PHL}, t_{PLH}
   (6N135: MAX. 1.5μs at R_L=4.1kΩ)
   (6N136: MAX. 0.8μs at R_L=1.9kΩ)
2. High common mode rejection voltage
   (CM_H: TYP. 1kV/μs)
3. Standard dual-in-line package
4. UL recognized, file No. E64380

■ Applications

1. Computers, measuring instruments, control equipment
2. High speed line receivers, high speed logic
3. Telephone sets
4. Signal transmission between circuits of different potentials and impedances

■ Outline Dimensions

(Unit : mm)



※OPIC is a registered trademark of Sharp and stands for Optical IC. It has a light detecting element and signal processing circuitry integrated onto a single chip.

■ Absolute Maximum Ratings

(Ta=25°C)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	25	mA
	*1Peak forward current	I_F	50	mA
	*2Peak transient forward current	I_{FM}	1	A
	Reverse voltage	V_R	5	V
	Power dissipation	P	45	mW
Output	Supply voltage	V_{CC}	−0.5~+15	V
	Output voltage	V_O	−0.5~+15	V
	Emitter-base reverse withstand voltage (Pin 5~7)	V_{EBO}	5	V
	Average output current	I_O	8	mA
	Peak output current	I_{OP}	16	mA
	Base current (Pin 7)	I_B	5	mA
	Power dissipation	P_O	100	mW
*3Isolation voltage		V_{iso}	2,500	Vrms
Operating temperature		T_{opr}	−55~+100	°C
Storage temperature		T_{stg}	−55~+125	°C
*4Soldering temperature		T_{sol}	260	°C

*1 50% duty cycle, Pulse width=1ms
Decreases at the rate of 1.6mA/°C if the external temperature is 70°C or more.
*2 Pulse width≦1μs, 300P/s
*3 RH=40~60%, AC for 1 minute
*4 For 10 seconds

■ **Electro-optical Characteristics** (T_a=0~70°C unless otherwise specified)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*5 Current transfer ratio	6N135	CTR(1)	Ta=25°C, I_F=16mA	7.0	40	—	%
	6N136	CTR(1)	V_O=0.4V, V_{CC}=4.5V	19	40	—	%
	6N135	CTR(2)	I_F=16mA, V_O=0.5V	5.0	43	—	%
	6N136	CTR(2)	V_{CC}=4.5V	15	43	—	%
Logic (0) output voltage		V_{OL}	*7 I_F=16mA, V_{CC}=4.5V	—	0.1	0.4	V
Logic (1) output current		I_{OH}(1)	T_a=25°C, I_F=0 V_{CC}=V_O=5.5V	—	3.0	500	nA
		I_{OH}(2)	T_a=25°C, I_F=0 V_{CC}=V_O=15V	—	0.01	1.0	μA
		I_{OH}(3)	I_F=0, V_{CC}=V_O=15V	—	—	50	μA
Logic (0) supply current		I_{CCL}	I_F=16mA, V_{CC}=15V V_O=open	—	200	—	μA
Logic (1) supply current		I_{CCH}(1)	T_a=25°C, V_{CC}=15V V_O=open, I_F=0	—	0.02	1.0	μA
		I_{CCH}(2)	V_{CC}=15V V_O=open, I_F=0	—	—	2.0	μA
Input forward voltage		V_F	T_a=25°C, I_F=16mA	—	1.7	1.95	V
Input forward voltage temperture coefficient		$\Delta V_F/\Delta T_a$	I_F=16mA	—	−1.9	—	mV/°C
Input reverse voltage		BV_R	T_a=25°C, I_R=10μA	5.0	—	—	V
Input capacitance		C_{IN}	V_F=0, f=1MHz	—	60	—	PF
*6 Leak current (input-output)		I_{I-O}	T_a=25°C, RH=45%, t=5s V_{I-O}=3kVDC	—	—	1.0	μA
*6 Isolation resistance (input-output)		R_{I-O}	V_{I-O}=500VDC	—	10^{12}	—	Ω
*6 Capacitance (input-output)		C_{I-O}	f=1MHz	—	0.6	—	PF
Transistor current amplification factor		h_{FE}	V_O=5V, I_O=3mA	—	70	—	

Note) Typical value : at Ta=25°C

*5 Current transfer ratio is the ratio of input current and output current expressed in %.
*6 Measured as 2-pin element (Short 1,2,3,4 and 5,6,7,8)
*7 6N135 : I_O=1.1mA, 6N136 : I_O=2.4mA

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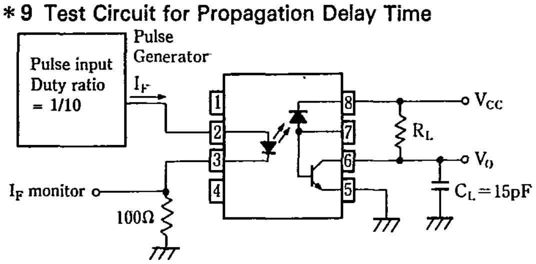
■ Switching Characteristics

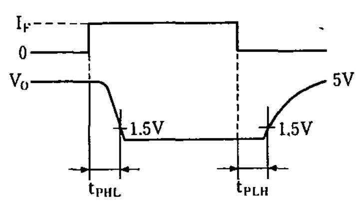
(Ta=25°C, V_{CC}=5V, I_F=16mA)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*8Propagation *9delay time Output (1)→(0)	6N135	t_{PHL}	R_L=4.1kΩ	—	0.3	1.5	μs
	6N136	t_{PHL}	R_L=1.9kΩ	—	0.3	0.8	μs
*8Propagation *9delay time Output (0)→(1)	6N135	t_{PLH}	R_L=4.1kΩ	—	0.4	1.5	μs
	6N136	t_{PLH}	R_L=1.9kΩ	—	0.3	0.8	μs
*10,11Instantaneous common mode rejection voltage "output (1)"		CM_H	*12I_F=0, V_{CM}=10V_{P-P}	—	1000	—	V/μs
*10,11Instantaneous common mode rejection voltage "output (0)"		CM_L	*12V_{CM}=10V_{P-P}, I_F=16mA	—	−1000	—	V/μs
*13Bandwidth		BW	R_L=100Ω	—	2.0	—	MHz

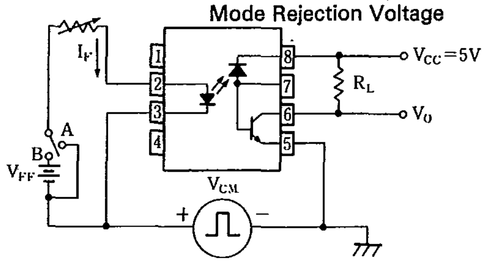
*8 R_L=4.1kΩ is equivalent to one LSTTL and 6.1kΩ pull-up resistor.
*10 Instantaneous common mode rejection voltage "output (1)" represents a common mode voltage variation that can hold the output above (1) level (V_O>2.0V).
Instantaneous common mode rejection voltage "output (0)" represents a common mode voltage variation that can hold the output above (0) level (V_O<0.8V).
*12 6N135 : R_L=4.1kΩ 6N136 : R_L=1.9kΩ
*13 Bandwidth represents a point where AC input goes down by 3dB.

*9 Test Circuit for Propagation Delay Time





*11 Test Circuit for Instantaneous Common Mode Rejection Voltage



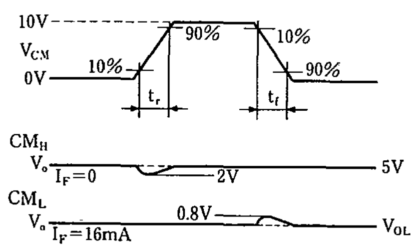


Fig. 1 Forward Current vs. Ambient Temperature

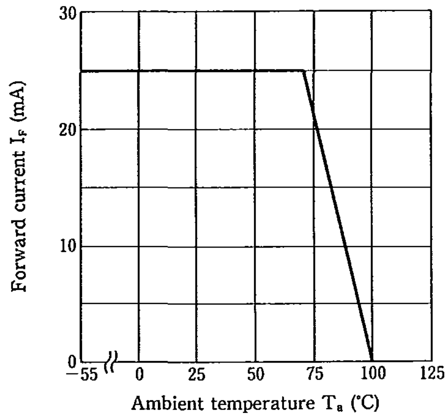


Fig. 2 Power Dissipation vs. Ambient Temperature

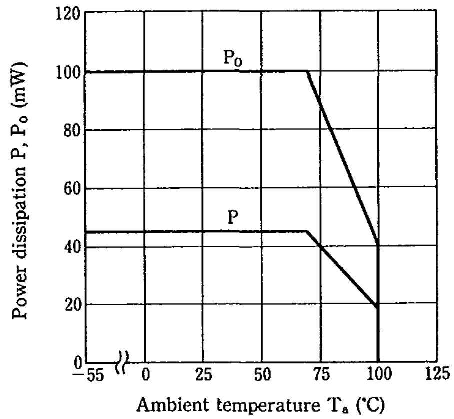


Fig. 3 Forward Current vs. Forward Voltage

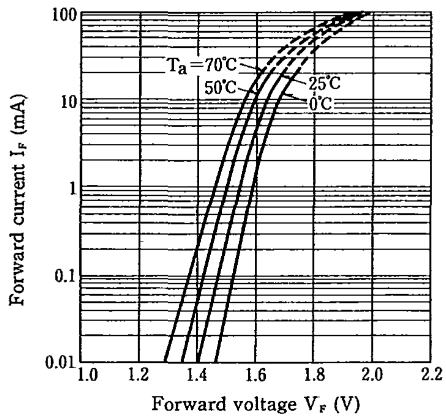


Fig. 4 Relative Current Transfer Ratio vs. Forward Current

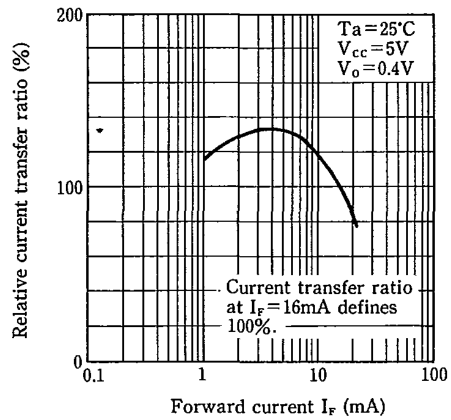
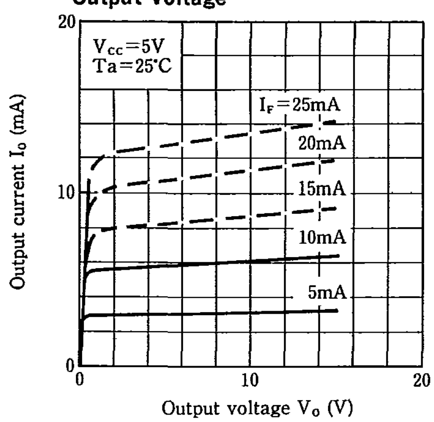


Fig. 5 Output Current vs. Output Voltage



Dotted line : driven by pulse current

Fig. 6 Relative Current Transfer Ratio vs. Ambient Temperature

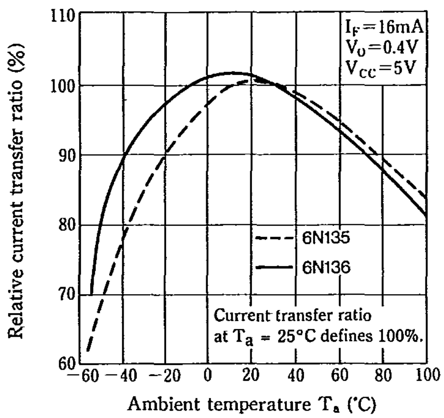


Fig. 7 Propagation Delay Time vs. Ambient Temperature

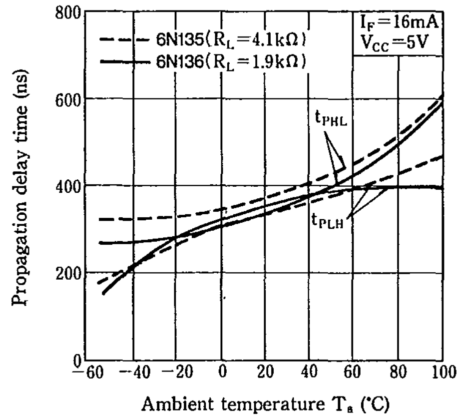


Fig. 8 Logic (1) Output Current vs. Ambient Temperature

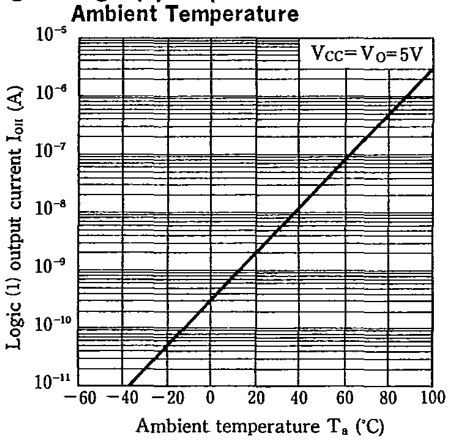
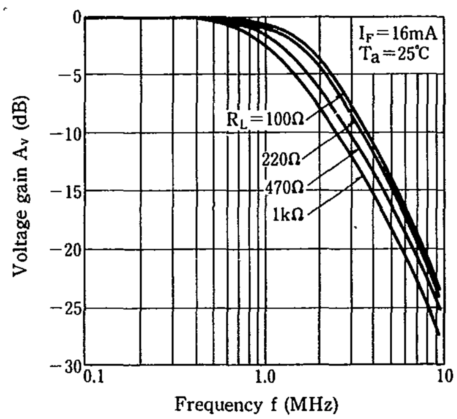
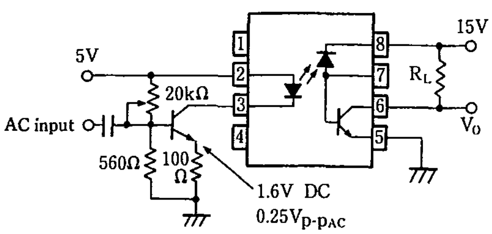


Fig. 9 Frequency Response



Test Circuit for Frequency Response



■ Precaution for Use

The minute design makes the transistor on the bipolar structumed detector vulnerable to static electricity.

To prevent damages and degradation in characteristics due to static electricity, take general measures against static electricity.