

# 6N136

## General Purpose Type \*OPIC Photocoupler

### ■ Features

1. High speed response  
( $t_{PHL}$ ,  $t_{PLH}$  : MAX.0.8 $\mu$ s at  $R_L=1.9k\Omega$ )
2. High common mode rejection voltage  
( $CM_H$  : TYP. 1kV/ $\mu$ s)
3. Standard dual-in-line package
4. Recognized by UL, 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

### ■ Absolute Maximum Ratings

(Ta=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I <sub>F</sub>	25	mA
	*1Peak forward current	I <sub>F</sub>	50	mA
	*2Peak transient forward current	I <sub>FM</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
	Power dissipation	P	45	mW
Output	Supply voltage	V <sub>CC</sub>	-0.5 to +15	V
	Output voltage	V <sub>O</sub>	-0.5 to +15	V
	Emitter-base reverse with-stand voltage (Pin 5 to 7)	V <sub>EBO</sub>	5	V
	Average output current	I <sub>O</sub>	8	mA
	Peak output current	I <sub>OP</sub>	16	mA
	Base current (Pin 7)	I <sub>B</sub>	5	mA
Power dissipation		P <sub>O</sub>	100	mW
*3Isolation voltage		V <sub>iso(rms)</sub>	2.5	kV
Operating temperature		T <sub>opr</sub>	-55 to +100	°C
Storage temperature		T <sub>stg</sub>	-55 to +125	°C
*4Soldering temperature		T <sub>sol</sub>	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.

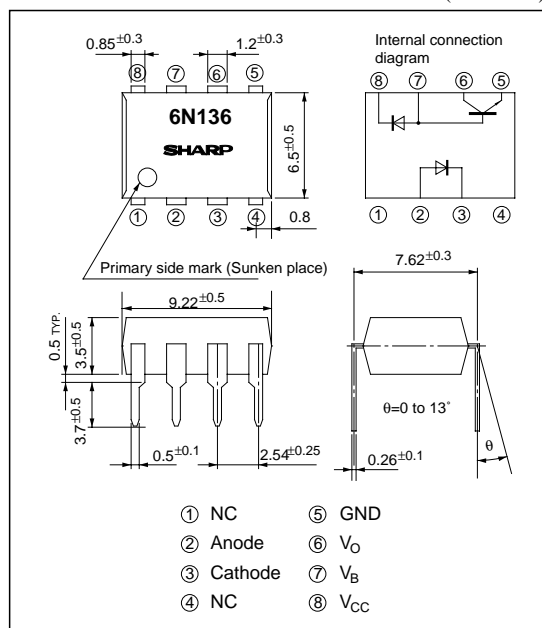
\*2 Pulse width $\leq$ 1 $\mu$ s, 300pulse/s

\*3 40 to 60% RH, AC for 1 minute

\*4 For 10 seconds

### ■ 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.

# ■ Electro-optical Characteristics

(Ta=0 to 70°C unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*5 Current transfer ratio	CTR <sub>(1)</sub>	Ta=25°C, I <sub>F</sub> =16mA V <sub>O</sub> =0.4V, V <sub>CC</sub> =4.5V	19	40	—	%
	CTR <sub>(2)</sub>	I <sub>F</sub> =16mA, V <sub>O</sub> =0.5V V <sub>CC</sub> =4.5V	15	43	—	%
Logic (0) output voltage	V <sub>OL</sub>	I <sub>F</sub> =16mA, V <sub>CC</sub> =4.5V, I <sub>O</sub> =2.4mA	—	0.1	0.4	V
Logic (1) output current	I <sub>OH(1)</sub>	Ta=25°C, I <sub>F</sub> =0 V <sub>CC</sub> =V <sub>O</sub> =5.5V	—	3.0	500	nA
	I <sub>OH(2)</sub>	Ta=25°C, I <sub>F</sub> =0 V <sub>CC</sub> =V <sub>O</sub> =15V	—	0.01	1.0	μA
	I <sub>OH(3)</sub>	I <sub>F</sub> =0, V <sub>CC</sub> =V <sub>O</sub> =15V	—	—	50	μA
Logic (0) supply current	I <sub>CCL</sub>	I <sub>F</sub> =16mA, V <sub>CC</sub> =15V V <sub>O</sub> =open	—	200	—	μA
Logic (1) supply current	I <sub>CCH(1)</sub>	Ta=25°C, V <sub>CC</sub> =15V V <sub>F</sub> =open, I <sub>O</sub> =0	—	0.02	1.0	μA
	I <sub>CCH(2)</sub>	V <sub>CC</sub> =15V V <sub>O</sub> =open, I <sub>F</sub> =0	—	—	2.0	μA
Input forward voltage	V <sub>F</sub>	Ta=25°C, I <sub>F</sub> =16mA	—	1.7	1.95	V
Input forward voltage temperature coefficient	ΔV <sub>F</sub> / ΔT <sub>a</sub>	I <sub>F</sub> =16mA	—	−1.9	—	mV / °C
Input reverse voltage	BV <sub>R</sub>	Ta=25°C, I <sub>R</sub> =10mA	5.0	—	—	V
Input capacitance	C <sub>IN</sub>	V <sub>F</sub> =0, f=1MHz	—	60	—	pF
*6 Leak current (input-output)	I <sub>I-O</sub>	Ta=25°C, 45%RH, t=5s V <sub>I-O</sub> =3kVDC	—	—	1.0	μA
*6 Isolation resistance (input-output)	R <sub>I-O</sub>	V <sub>I-O</sub> =500VDC	—	10 <sup>12</sup>	—	Ω
*6 Capacitance (input-output)	C <sub>I-O</sub>	f=1MHz	—	0.6	—	pF
Transistor current amplification factor	h <sub>FE</sub>	V <sub>O</sub> =5V, I <sub>O</sub> =3mA	—	70	—	

\*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)

## ■ Switching Characteristics

( $T_a=25^\circ\text{C}$ ,  $V_{CC}=5\text{V}$ ,  $I_F=16\text{mA}$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*8 *9 Propagation delay time Output (1) $\rightarrow$ (0)	$t_{\text{PHL}}$	$R_L=1.9\text{k}\Omega$	—	0.3	0.8	$\mu\text{s}$
*8 *9 Propagation delay time Output (0) $\rightarrow$ (1)	$t_{\text{PLH}}$	$R_L=1.9\text{k}\Omega$	—	0.3	0.8	$\mu\text{s}$
*10 *11 Instantaneous common mode rejection voltage "output (1)"	$\text{CM}_H$	$I_F=0$ , $V_{\text{CM}}=10\text{V}_{\text{P-P}}$ , $R_L=1.9\text{k}\Omega$	—	1.0	—	$\text{kV}/\mu\text{s}$
*10 *11 Instantaneous common mode rejection voltage "output (0)"	$\text{CM}_L$	$V_{\text{CM}}=10\text{V}_{\text{P-P}}$ , $I_F=16\text{mA}$ , $R_L=1.9\text{k}\Omega$	—	-1.0	—	$\text{kV}/\mu\text{s}$
*12 Bandwidth	BW	$R_L=100\Omega$	—	2.0	—	MHz

\*8  $R_L=1.9\text{k}\Omega$  is equivalent to one LS TTL and  $5.6\text{k}\Omega$  pull-up resistor.

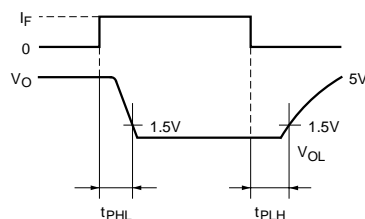
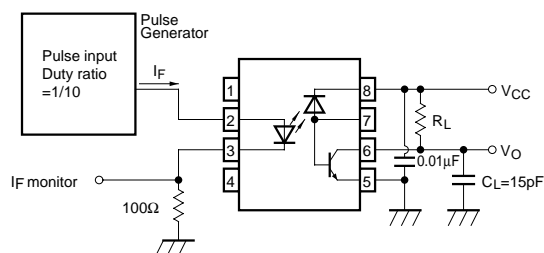
\*10 Instantaneous common mode rejection voltage "output (1)" represents a common mode voltage variation that can hold the output above (1) level ( $V_O > 2.0\text{V}$ )

Instantaneous common mode rejection voltage "output (0)" represents

a common mode voltage variation that can hold the output above (0) level ( $V_O < 0.8\text{V}$ )

\*12 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

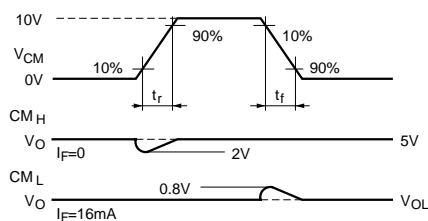
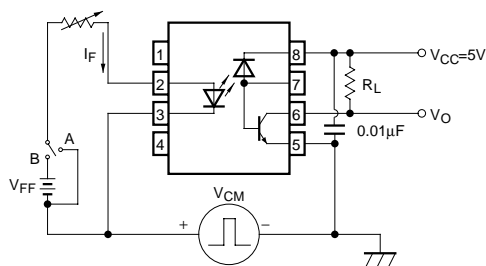


Fig. 1 Forward Current vs. Ambient Temperature

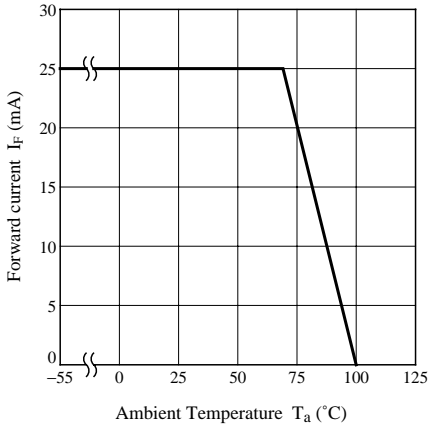


Fig. 2 Power Dissipation vs. Ambient Temperature

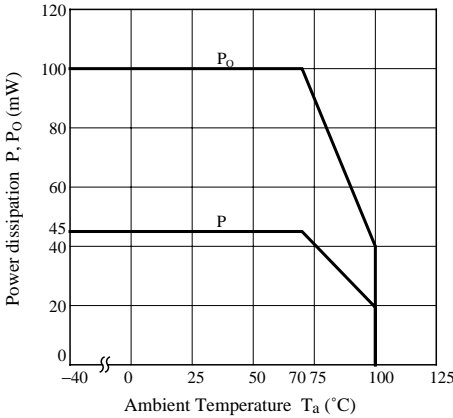


Fig. 3 Forward Current vs. Forward Voltage

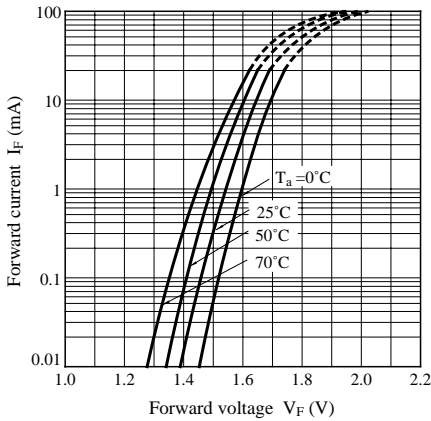


Fig. 4 Relative Current Transfer Ratio vs. Forward Current

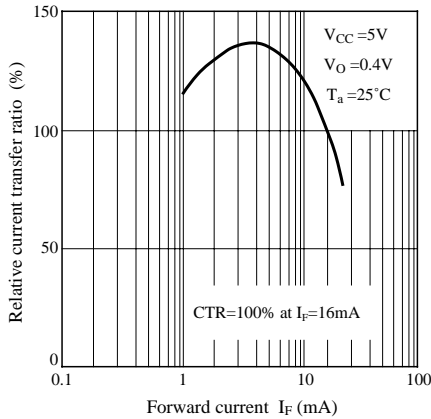


Fig. 5 Output Current vs. Output Voltage

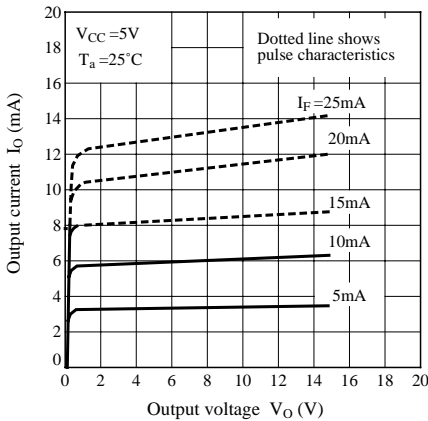
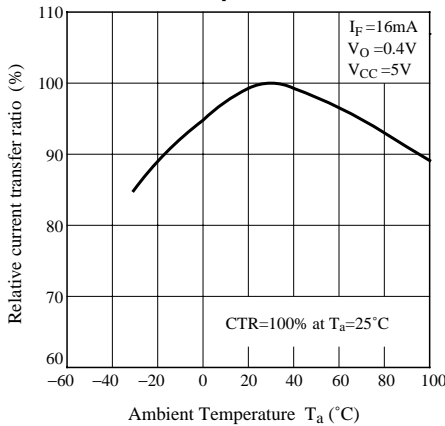
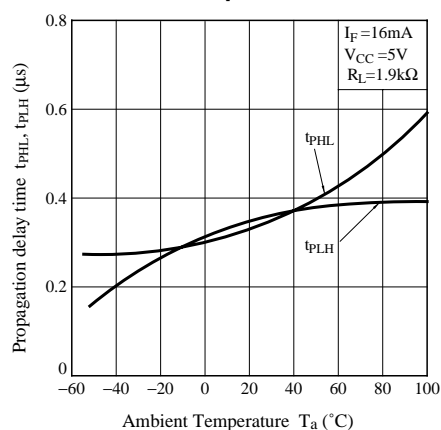


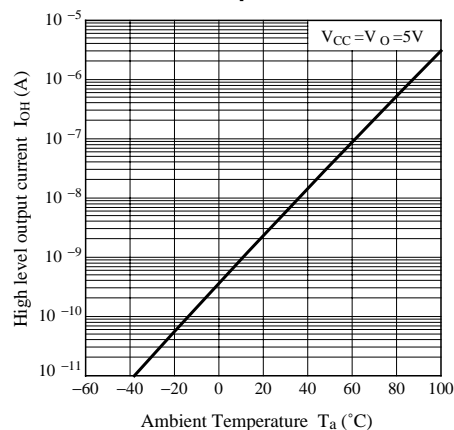
Fig. 6 Relative Current Transfer Ratio vs. Ambient Temperature



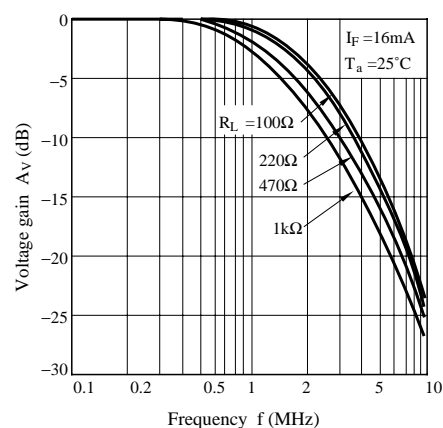
**Fig. 7 Propagation Delay Time vs. Ambient Temperature**



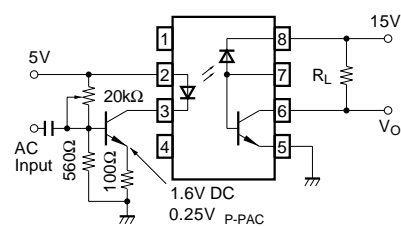
**Fig. 8 High Level Output Current vs. Ambient Temperature**



**Fig. 9 Frequency Response**



**Test Circuit for Frequency Characteristic**



#### ■ Precaution for use

- (1) It is recommended that a by-pass capacitor of more than  $0.01\mu\text{F}$  be added between  $V_{CC}$  and GND near the device in order to stabilize power supply line.
- (2) Transistor of detector side in bipolar configuration is apt to be affected by static electricity for its minute design. When handling them, general counterplan against static electricity should be taken to avoid breakdown of devices or degradation of characteristics.

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    - Various safety devices, etc.
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