

6N138

High Sensitivity, High Speed *OPIC Photocoupler

Features

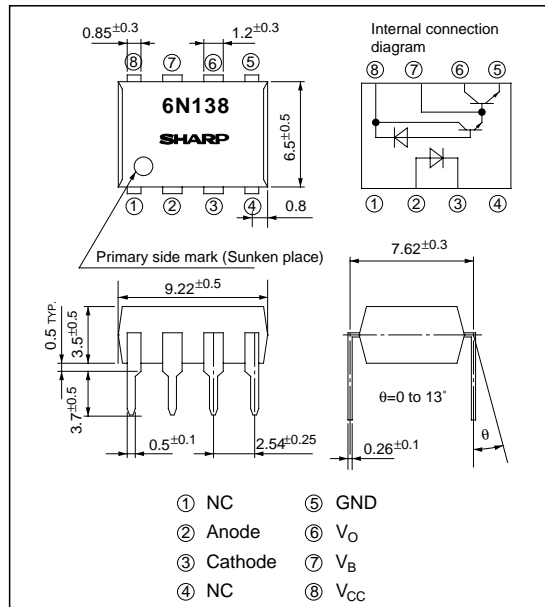
1. High current transfer ratio
(CTR : MIN. 300% at $I_F=1.6\text{mA}$)
2. High speed response
(t_{PHL1} : TYP. $2\mu\text{s}$ at $R_L=2.2\text{k}\Omega$)
3. Instantaneous common mode rejection voltage
(CM_H : TYP. $500\text{V}/\mu\text{s}$)
4. TTL compatible output
5. Recognized by UL, file No. E64380

Applications

1. Interfaces for computer peripherals
2. Measuring instruments, Control equipment
3. Telephone sets
4. Signal transmission between circuits of different potentials and impedances

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

($T_a=25^\circ\text{C}$)

	Parameter	Symbol	Rating	Unit
Input	Forward current	I_F	20	mA
	*1 Peak forward current	I_F	40	mA
	*2 Peak transient forward current	I_{FM}	1	A
	Reverse voltage	V_R	5	V
	Power dissipation	P	35	mW
Output	Supply voltage	V_{CC}	-0.5 to +7	V
	Output voltage	V_O	-0.5 to +7	V
	Emitter-base reverse withstand voltage (Pin 5 to 7)	V_{EBO}	0.5	V
	*3 Average output current	I_O	60	mA
	Power dissipation	P_O	100	mW
	*4 Isolation voltage	$V_{iso(rms)}$	2.5	kV
	Operating temperature	T_{opr}	0 to +70	$^\circ\text{C}$
	Storage temperature	T_{sg}	-55 to +125	$^\circ\text{C}$
	*5 Soldering temperature	T_{sol}	260	$^\circ\text{C}$

*1 50% duty cycle, Pulse width=1ms

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

*3 Decreases at the rate of $0.7\text{mA}/^\circ\text{C}$ if the external temperature is 25°C or more.

*4 40 to 60% RH, AC for 1 minute

*5 For 10 seconds

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 Internet Internet address for Electronic Components Group <http://www.sharp.co.jp/ecg/>

■ Electro-optical Characteristics

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

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*6 Current transfer ratio	CTR	I _F =1.6mA, V _O =0.4V, V _{CC} =4.5V	300	1 600	–	%
Logic (0) output voltage	V _{OL}	I _O =4.8mA, V _{CC} =4.5V, I _F =1.6mA	–	0.1	0.4	V
Logic (1) output current	I _{OH}	I _F =0, V _{CC} =V _O =7V	–	0.1	250	μA
Logic (0) supply current	I _{CC1}	I _F =1.6mA, V _{CC} =5V, V _O =open	–	0.5	–	mA
Logic (1) supply current	I _{CC2}	I _F =0, V _{CC} =5V, V _O =open	–	10	–	nA
Input forward voltage	V _F	I _F =1.6mA, Ta=25°C	–	1.5	1.7	V
Input forward voltage temperature coefficient	*7	I _F =1.6mA	–	-1.9	–	mV/°C
Input reverse voltage	BV _R	I _R =10μA, Ta=25°C	5.0	–	–	V
Input capacitance	C _{IN}	V _F =0, f=1MHz	–	60	–	pF
*8 Leak current (input-output)	I _{I-O}	Ta=25°C, 45%RH, t=5s V _{I-O} =3kV DC	–	–	1.0	μA
*8 Isolation resistance (input-output)	R _{I-O}	V _{I-O} =500V DC	–	10 ¹²	–	Ω
*8 Capacitance (input-output)	C _{I-O}	f=1MHz	–	0.6	–	pF

*6 Current transfer ratio is the ratio of input current and output current expressed in %.

Note) Type value : at Ta=25°C

*7 ΔV_F / ΔT_a

*8 Measured as 2-pin element (Short 1, 2, 3, 4 and 5, 6, 7, 8)

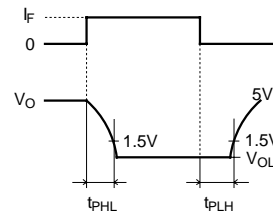
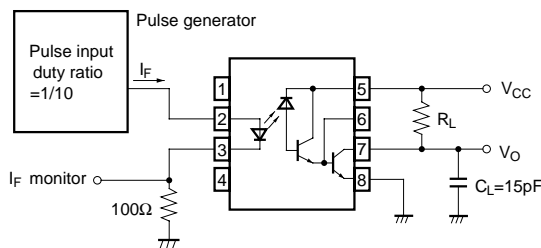
■ Switching Characteristics

(Ta=25°C, V_{CC} =5V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
*9 Propagation delay time Output (1) → (0)	t _{PHL}	I _F = 1.6mA R _L = 2.2kΩ	–	2	10	μs
*9 Propagation delay time Output (0) → (1)	t _{PLH}	I _F = 1.6mA R _L = 2.2kΩ	–	7	35	μs
*10 Instantaneous common mode rejection voltage " output (1) "	CM _H	I _F = 0, V _{CM} = 10V P-P R _L = 2.2kΩ	–	500	–	V/μs
*10 Instantaneous common mode rejection voltage " output (0) "	CM _L	I _F = 1.6mA, V _{CM} = 10V P-P R _L = 2.2kΩ	–	-500	–	V/μs

*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)

*9 Test Circuit for Propagation Delay Time



***11 Test Circuit for Instantaneous Common Mode Rejection Voltage**

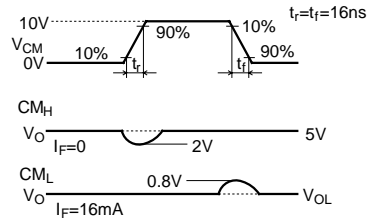
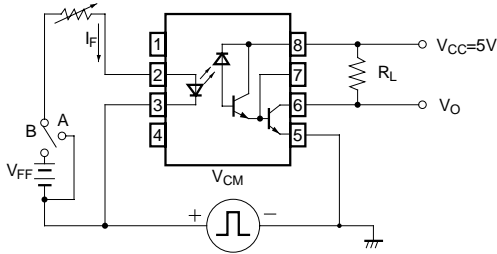


Fig. 1 Forward Current vs. Ambient Temperature

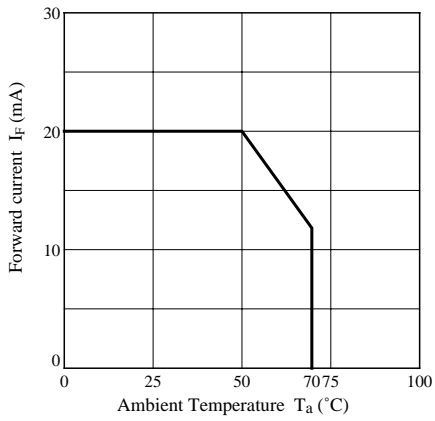


Fig. 2 Power Dissipation vs. Ambient Temperature

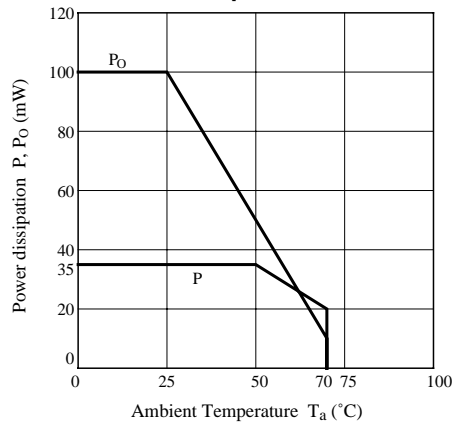


Fig. 3 Forward Current vs. Forward Voltage

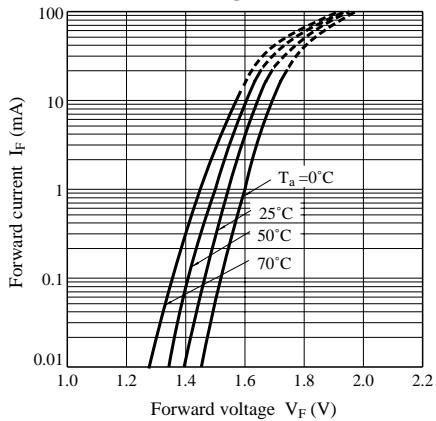


Fig. 4 Output Current vs. Output Voltage

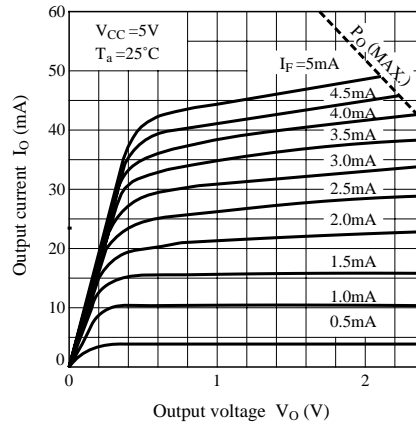


Fig. 5 Current Transfer Ratio vs. Forward Current

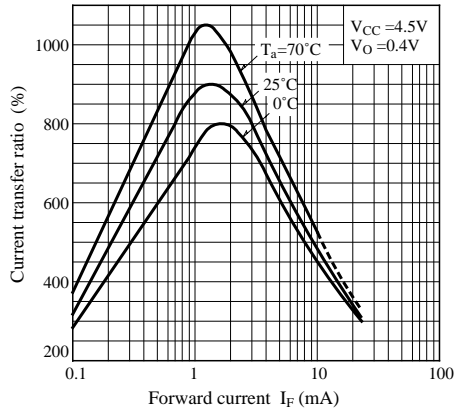


Fig. 6 Output Current vs. Forward Current

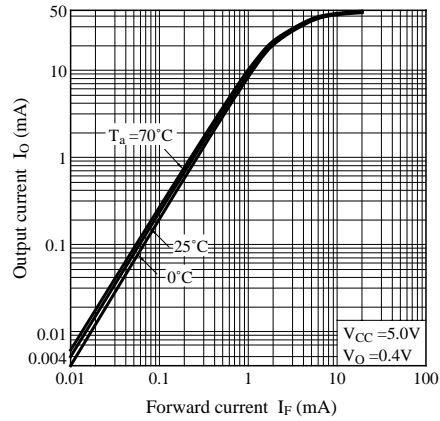


Fig. 7-a Propagation Delay Time vs. Ambient Temperature

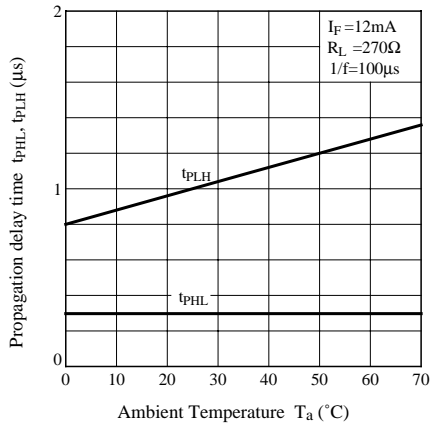


Fig. 7-b Propagation Delay Time vs. Ambient Temperature

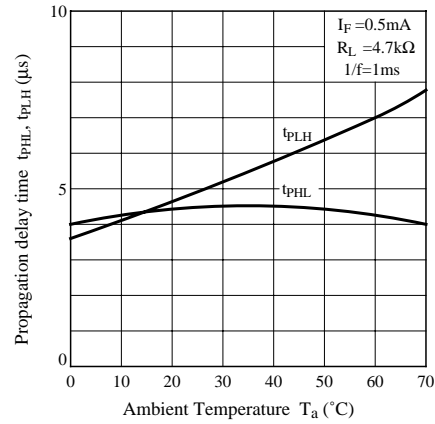


Fig. 8 Rise Time, Fall Time vs. Load Resistance

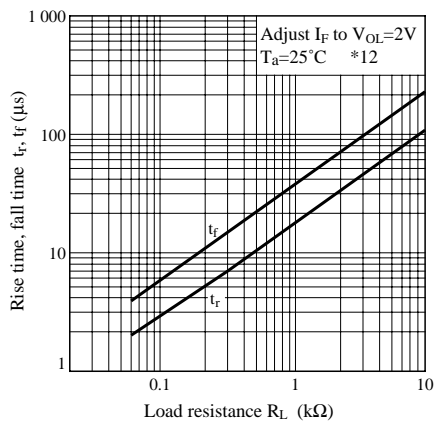
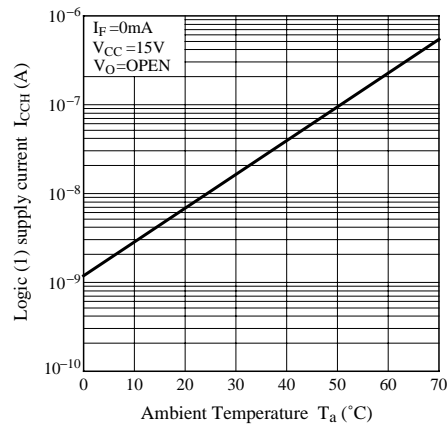
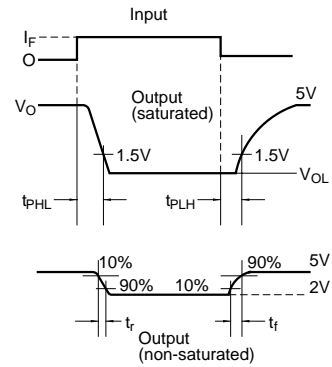
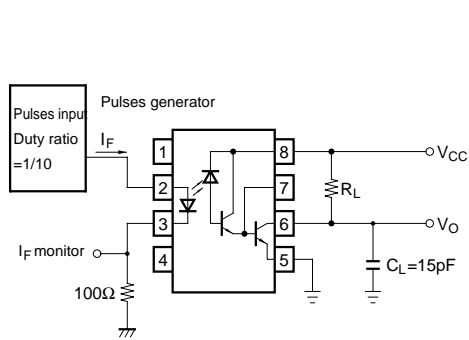


Fig. 9 Logic (1) Supply Current vs. Ambient Temperature



*12 Test Circuit for Rise Time, Fall Time vs. Load Resistance



■ 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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