

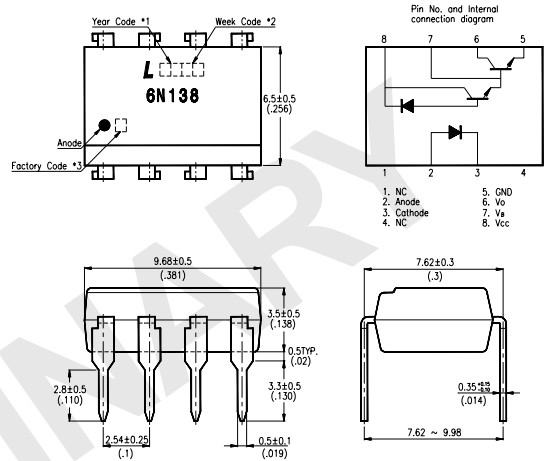
### Features

- High current transfer ratio  
(CTR : MIN. 300% at  $I_F = 1.6\text{mA}$ )
- High speed response  
( $t_{PHL}$  : TYP.  $2 \mu\text{s}$  at  $R_L = 2.2\text{k}\Omega$ )
- Instantaneous common mode rejection voltage  
( $CM_H$  : TYP.  $500\text{V}/\mu\text{s}$ )
- TTL compatible output
- Options Available :
  - Leads with 0.4" (10.16mm) Spacing (M Type)
  - Lead Bends for Surface Mounting (S Type)
  - Tape and Reel of Type I for SMD (Add "-TA" Suffix)
  - Tape and Reel of Type II for SMD (Add "-TA1" Suffix)
  - VDE 0884 Approvals (Add "-V" Suffix)

### Applications

1. Interfaces for computer peripherals
2. Electronic calculators, measuring instruments, control equipment
3. Telephone sets
4. Signal transmission between circuits of different potentials and impedances

### Package Dimensions



#### NOTES :

1. Year date code.
2. 2-digit work week.
3. Factory code shall be marked (Z : Taiwan, Y : Thailand).
4. All dimensions are in millimeters (inches).
5. Tolerance is  $\pm 0.25\text{mm}$  ( $0.010''$ ) unless otherwise noted.
6. Specifications are subject to change without notice.

### Ordering Information

Part Number	Package	Application part number
6N138 6N138M 6N138S 6N138S-TA 6N138S-TA1	8-pin DIP 8-pin (leads with 0.4" spacing) 8-pin (lead bends for surface mount) 8-pin (tape and reel packaging of type I) 8-pin (tape and reel packaging of type II)	6N138
6N138-V 6N138M-V 6N138S-V 6N138STA-V 6N138STA1-V	8-pin DIP 8-pin (leads with 0.4" spacing) 8-pin (lead bends for surface mount) 8-pin (tape and reel packaging of type I) 8-pin (tape and reel packaging of type II)	6N138

## Ratings and Characteristics

### Absolute Maximum Ratings

(Ta=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward Current	IF	20	mA
	Reverse Voltage	VR	5	V
	Power Dissipation	P	35	mW
Output	Supply Voltage	VCC	-0.5~+7	V
	Output Voltage	Vo	-0.5~+7	V
	Emitter-base Reverse Withstand Voltage (pin 5 to 7)	VEBO	0.5	V
	Average Output Current	Io	60	mA
	Power Dissipation	Po	100	mW
*1.Isolation Voltage		Viso	2,500	Vrms
Operating Temperature		Topr	0~+70	°C
Storage Temperature		Tstg	-55~+125	°C
*2.Soldering Temperature		Tsol	260	°C

\*1. AC for 1 minute, R.H. = 40 ~ 60%

Isolation voltage shall be measured using the following method.

- (1) Short between anode and cathode on the primary side and between collector and emitter 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 seconds

## Electrical / Optical Characteristics

( Ta = 0 ~ +70°C unless otherwise specified )

Parameter	Symbol	Min.	Typ.	Max.	unit	Conditions
Input Forward Voltage	VF	—	1.1	1.7	V	Ta=25°C, IF=1.6mA
Input Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T_a$	—	-1.9	—	mV/°C	IF=1.6mA
Input Reverse Voltage	BVR	5.0	—	—	V	Ta=25°C, IR=10 $\mu$ A
Input Capacitance	CIN	—	60	—	pF	VF=0, f=1MHz
*1 Current Transfer Ratio	CTR	300	1600	—	%	IF=1.6mA, Vo=0.4V VCC=4.5V
Logic (0) Output Voltage	VOL	—	0.1	0.4	V	IF=1.6mA VCC=4.5V Io=4.8mA
Logic (1) Output Current	IOH	—	0.1	250	$\mu$ A	IF=0, VCC=Vo=7V
Logic (0) Supply Current	ICCL	—	0.4	1.5	mA	IF=1.6mA, VCC=5V Vo=open
Logic (1) Supply Current	ICCH	—	0.01	10	$\mu$ A	IF=0, VCC=5V, Vo=open
*2 Leak Current (Input-Output)	II-O	—	—	1.0	$\mu$ A	Ta=25°C, 45%RH t=5s, VI-O=3kV DC
*2 Isolation Resistance (Input-Output)	RI-O	—	10 <sup>12</sup>	—	$\Omega$	VI-O=500V DC
Capacitance (Input-Output)	CI-O	—	0.6	—	pF	f=1MHz
Propagation Delay time Output (1)→(0)	tPHL	—	5	10	$\mu$ s	IF=1.6mA, RL=2.2k $\Omega$
Propagation Delay time Output (0)→(1)	tPLH	—	14	35		
*3 Instantaneous common mode rejection voltage "output(1)"	CMH	—	500	—	V/ $\mu$ s	IF=0, VCM=10VP-P RL=2.2k $\Omega$
*3 Instantaneous common mode rejection voltage "output(0)"	CML	—	-500	—	V/ $\mu$ s	VCM=10VP-P, IF=1.6mA RL=2.2k $\Omega$

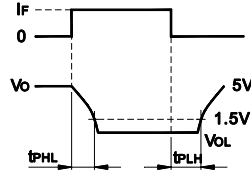
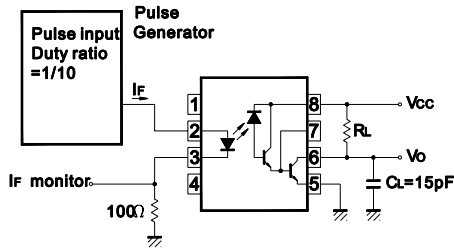
\*1. Current transfer ratio is the ratio of input current and output current expressed in %.

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

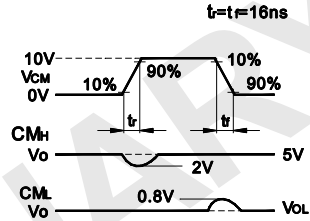
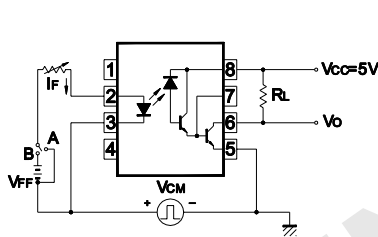
\*3 Instantaneous common mode rejection voltage "output (1)" represents a common mode voltage variation that can hold the output above (1) level (Vo>2.0V).

Instantaneous common mode rejection voltage "output (0)" represents a common mode voltage variation that can hold the output above (0) level (Vo<0.8V).

### Test Circuit for Propagation Delay Time



### Test Circuit for Instantaneous Common Mode Rejection Voltage



## Typical Electrical/Optical Characteristic Curves (25°C Ambient Temperature Unless Otherwise Noted)

Fig.1 Forward Current vs. Ambient Temperature

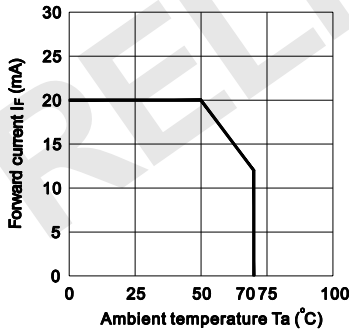


Fig.2 Power Dissipation vs. Ambient Temperature

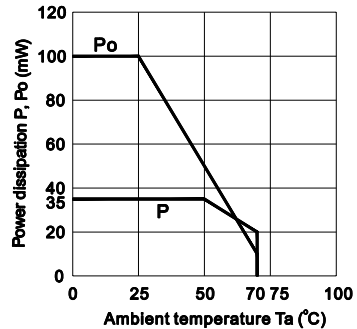


Fig.3 Forward Current vs. Forward Voltage

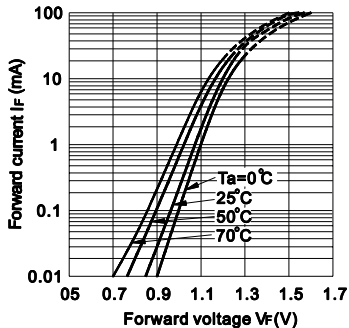
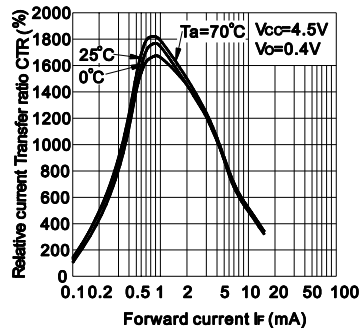
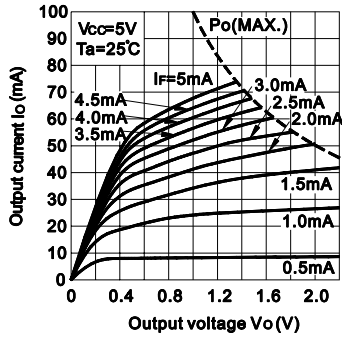


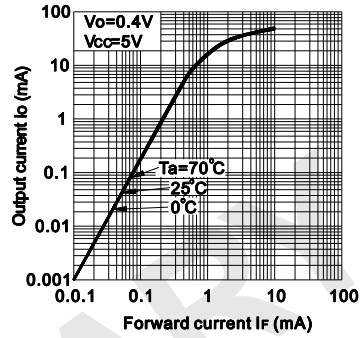
Fig.4 Relative Current Transfer Ratio vs. Forward Current



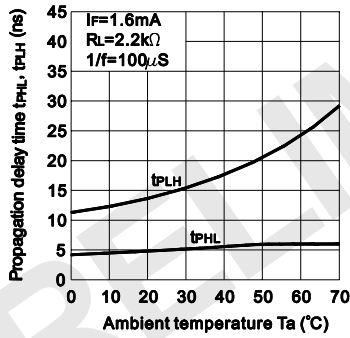
**Fig.5 Output Current vs. Output Voltage**



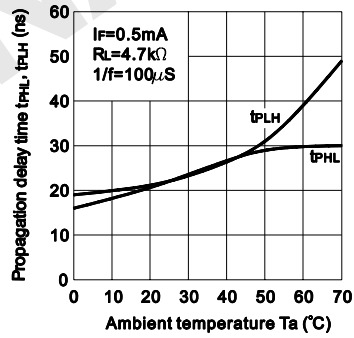
**Fig.6 Output Current vs. Forward Current**



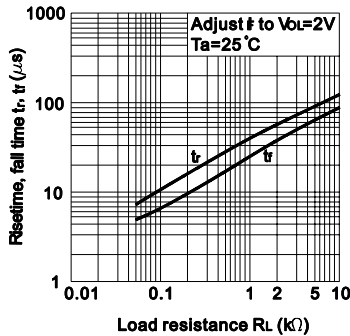
**Fig.7-a Propagation Delay Time vs. Ambient Temperature**



**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**

