TOSHIBA Photocoupler GaAℓAs Ired & Photo IC

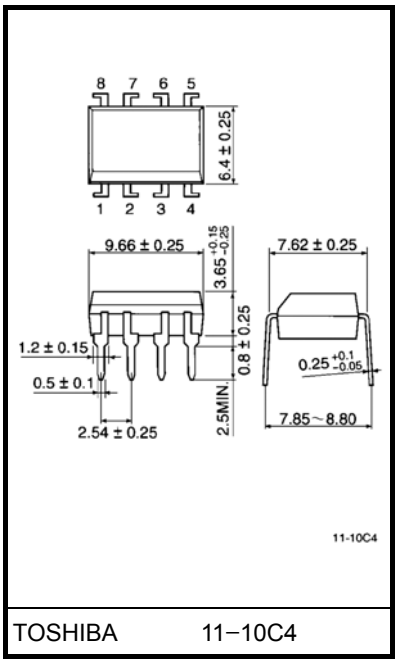
6N137

Degital Logic Isolation
Tele-Communication
Analog Data Equipment Control

The TOSHIBA 6N137 consist of a high emitting diode and a one chip photo IC. This unit is 8-lead DIP package.

- LSTTL / TTL compatible: 5V Supply
- Ultra high speed: 10MBd
- Guaranteed performance over temperature: 0°C to 70°C
- High isolation voltage: 2500Vrms min.
- UL recognized: UL1577, file no. E67349

Unit in mm

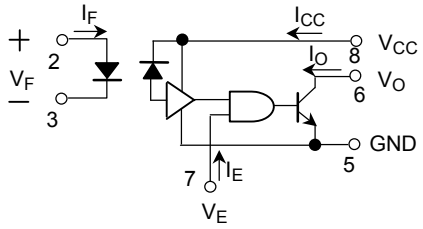


TOSHIBA 11−10C4

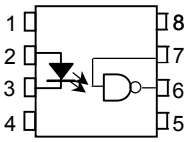
Weight: 0.54 g (typ.)

Truth Table

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



Pin Configurations (top view)



1 : N.C.
2 : Anode
3 : Cathode
4 : N.C.
5 : GND
6 : Output(Open collector)
7 : Enable
8 : V_{CC}

Absolute Maximum Ratings

Characteristic			Symbol	Rating	Unit
LED	Forward current		I_F	20	mA
	Pulse forward current	(Note 1)	I_{FP}	40	mA
	Reverse voltage		V_R	5	V
Detector	Output current		I_O	50	mA
	Output voltage		V_O	7	V
	Supply voltage (1 minute maximum)		V_{CC}	7	V
	Enable input voltage (not to exceed V_{CC} by more than 500mV)		V_{EH}	5.5	V
	Output collector power dissipation		P_O	85	mW
Operating temperature range			T_{opr}	0~70	°C
Storage temperature range			T_{stg}	−55~125	°C
Lead solder temperature (10 s)		(Note 2)	T_{sol}	260	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

(Note 1) 50% duty cycle, 1ms pulse width.

(Note 2) Soldering portion of lead: Up to 2mm from the body of the device.

Recommended Operating Conditions

Characteristic	Symbol	Min.	Max.	Unit
Input current, low level each channel	I_{FL}	0	250	μA
Input current, high level each channel	I_{FH}	7	20	mA
High level enable voltage	V_{EH}	2.0	V_{CC}	V
Low level enable voltage (output high)	V_{EL}	0	0.8	V
Supply voltage, output*	V_{CC}	4.5	5.5	V
Fan out (TTL load)	N	—	8	—
Operating temperature	Ta	0	70	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.
*This item denotes operating ranges, not meaning of recommended operating conditions.

Precaution

Please be careful of the followings.
A ceramic capacitor(0.1μF)should be connected from pin 8 to pin 5 to stabilize the operation of the high gain linear amplifier. Failure to provide the bypassing may impair the switching property. The total lead length between capacitor and coupler should not exceed 1cm.

Electrical Characteristics
Over Recommended Temperature (Ta = 0~70°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	(**)Typ.	Max.	Unit
High level output current	I_{OH}	V_{CC}=5.5V, V_O=5.5V I_F=250μA, V_E = 2.0V	—	1	250	μA
Low level output voltage	V_{OL}	V_{CC}=5.5V, I_F=5mA V_{EH}=2.0V I_{OL}(sinking)=13mA	—	0.4	0.6	V
High level enable current	I_{EH}	V_{CC}=5.5V, V_E=2.0V	—	−1.0	—	mA
Low level enable current	I_{EL}	V_{CC}=5.5V, V_E=0.5V	—	−1.6	−2.0	mA
High level supply current	I_{CCH}	V_{CC}=5.5V, I_F=0, V_E=0.5V	—	7	15	mA
Low level supply current	I_{CCL}	V_{CC}=5.5V, I_F=10mA V_E=0.5V	—	12	18	mA
Resistance (input−output) (Note 3)	R_{I-O}	V_{I-O}=500V, Ta=25°C R.H.≤60%	—	10^{12}	—	Ω
Capacitance (input−output) (Note 3)	C_{I-O}	f=1MHz, Ta=25°C	—	0.6	—	pF
Input forward voltage	V_F	I_F=10mA, Ta=25°C	—	1.65	1.75	V
Input reverse breakdown voltage	BV_R	I_R=10μA, Ta=25°C	5	—	—	V
Input capacitance	C_{IN}	V_F=0, f=1MHz	—	45	—	pF
Current transfer ratio	CTR	I_F=5.0mA, R_L=100Ω	—	1000	—	%

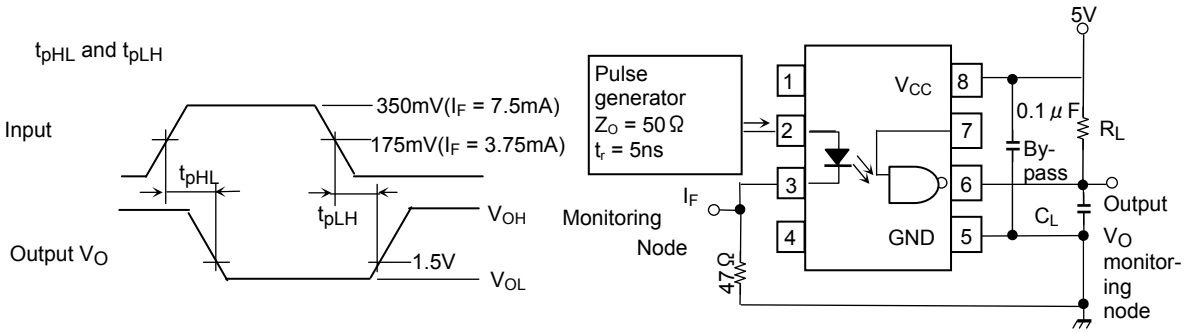
(**) All typical values are at V_{CC}=5V, Ta=25°C

(Note 3) Pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

Switching Characteristics (Ta = 25°C, V_{CC} = 5V)

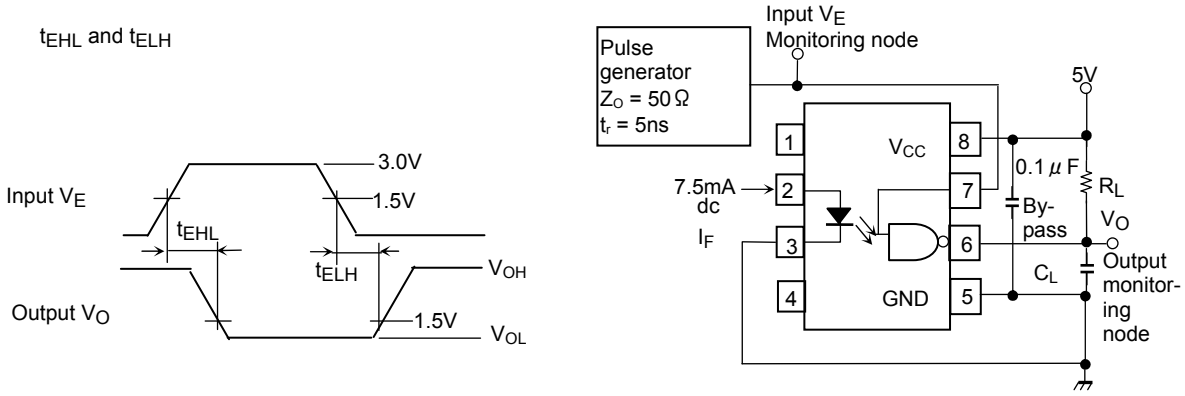
Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time to high output level	t_pLH	1	R_L=350Ω, C_L=15pF I_F=7.5mA	—	60	75	ns
Propagation delay time to low output level	t_pHL	1	R_L=350Ω, C_L=15pF I_F=7.5mA	—	60	75	ns
Output rise−fall time (10−90%)	t_r, t_f	—	R_L=350Ω, C_L=15pF I_F=7.5mA	—	30	—	ns
Propagation delay time of enable from V_{EH} to V_{EL}	t_{ELH}	2	R_L=350Ω, C_L=15pF I_F=7.5mA V_{EH}=3.0V V_{EL}=0.5V	—	25	—	ns
Propagation delay time of enable from V_{EL} to V_{EH}	t_{EHL}	2	R_L=350Ω, C_L=15pF I_F=7.5mA V_{EH}=3.0V V_{EL}=0.5V	—	25	—	ns
Common mode transient immunity at logic high output level	CM_H	3	V_{CM}=10V R_L=350Ω $V_{O(min.)}$=2V I_F=0mA	—	200	—	V / μs
Common mode transient Immunity at logic low output level	CM_L	3	V_{CM}=10V R_L=350Ω $V_{O(max.)}$=0.8V I_F=5mA	—	−500	—	V / μs

Test Circuit 1.



・ C_L is approximately 15pF which includes probe and stray wiring capacitance.

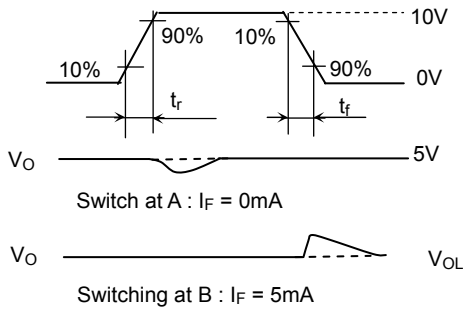
Test Circuit 2.

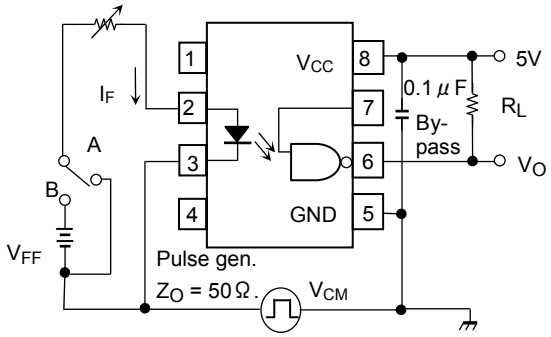


・ C_L is approximately 15pF which includes prove and stray wiring capacitance.

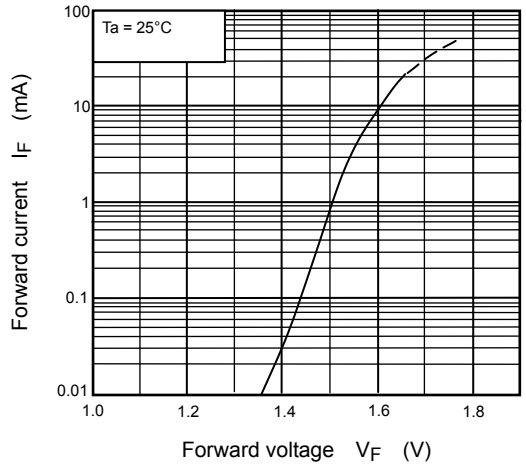
Test Circuit 3.

Transient immunity and typical waveforms

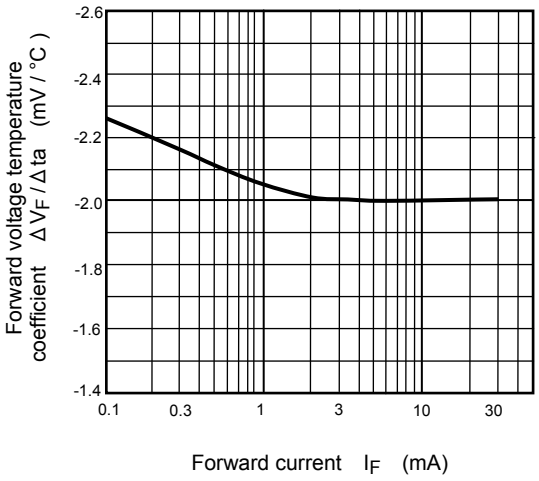




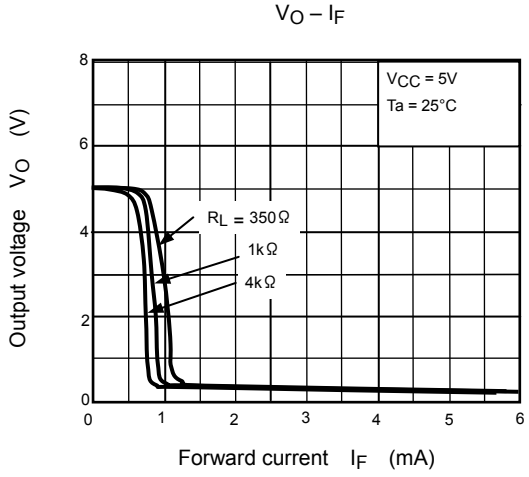
$I_F - V_F$



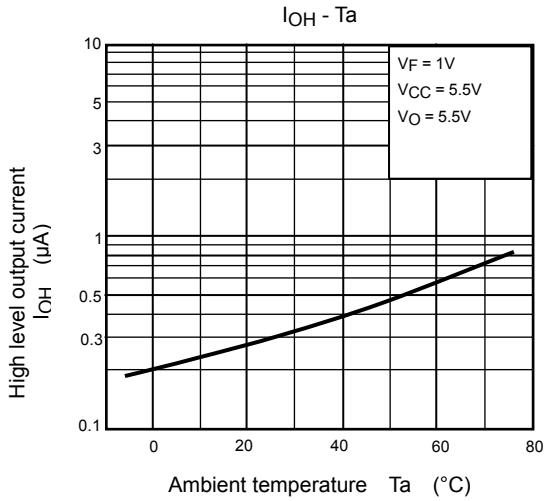
$\Delta V_F / \Delta Ta - I_F$



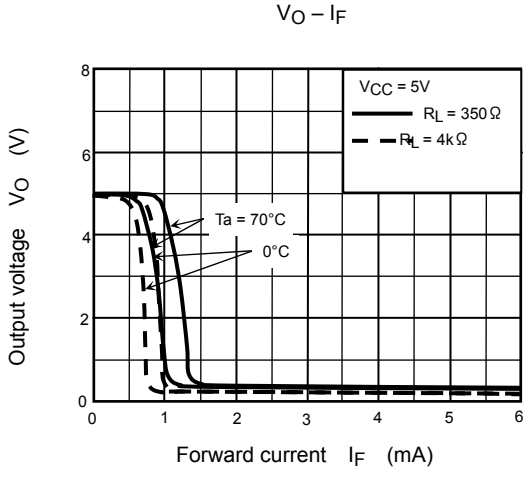
$V_O - I_F$



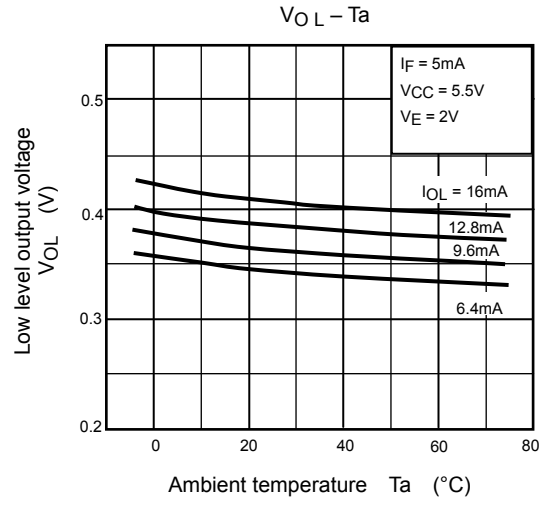
I_{OH} - Ta



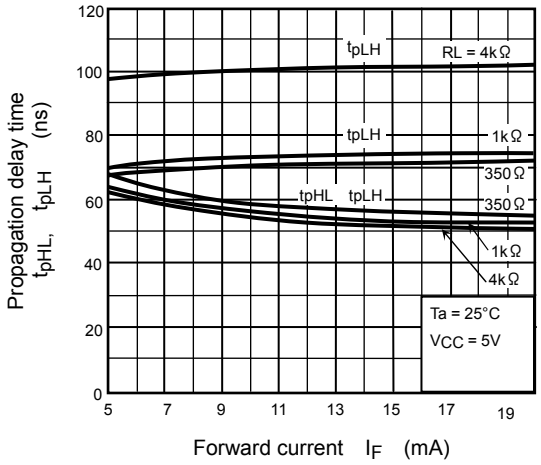
$V_O - I_F$



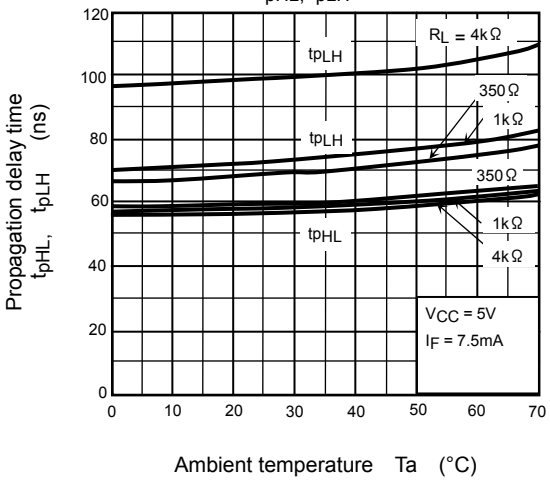
$V_{O\,L} - Ta$



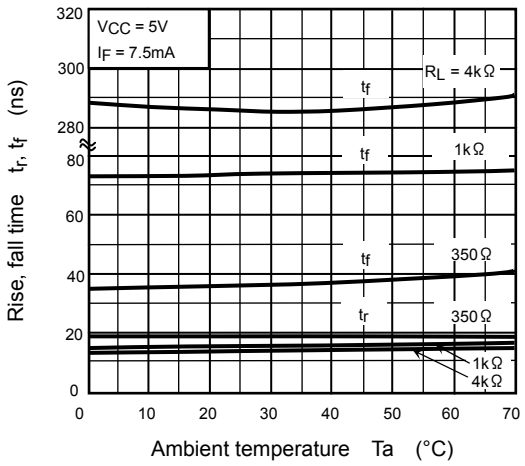
t_{pHL}, t_{pLH} - I_F



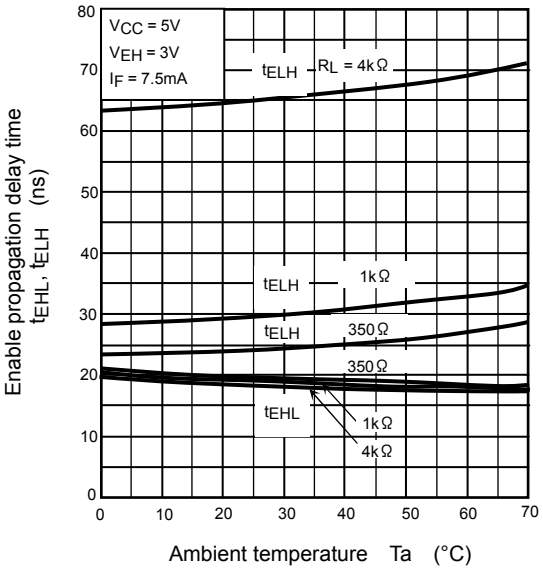
t_{pHL}, t_{pLH} - Ta



t_r, t_f – T_a



t_{EHL},t_{ELH} - T_a



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