

6N137

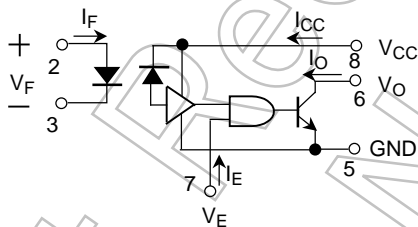
Digital Logic Isolation
 Tele-Communication
 Analog Data Equipment Control

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

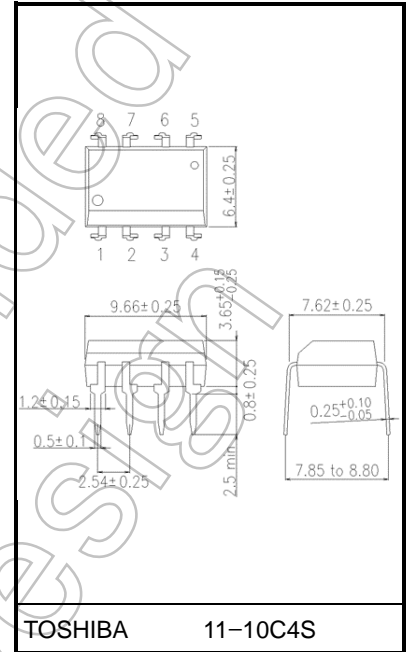
- LSTTL / TTL compatible: 5V Supply
- Ultra high speed: 10MBd
- Guaranteed performance over temperature: 0°C to 70°C
- High isolation voltage: 2500Vrms (min)
- UL-recognized: UL 1577, File No.E67349

Truth Table

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

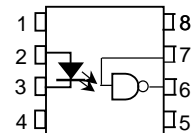


Unit: mm



Weight: 0.54 g (typ.)

Pin Configurations (top view)



- 1 : N.C.
- 2 : Anode
- 3 : Cathode
- 4 : N.C.
- 5 : GND
- 6 : Output(Open collector)
- 7 : Enable
- 8 : Vcc

Start of commercial production
 1982-11

Absolute Maximum Ratings

Characteristics		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
	Diode power dissipation	P_D	40	mW
	Input power dissipation derating ($T_a \geq 70^\circ\text{C}$)	$\Delta P_D/^\circ\text{C}$	-0.73	mW/ $^\circ\text{C}$
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
	Output power dissipation derating ($T_a \geq 85^\circ\text{C}$)	$\Delta P_O/^\circ\text{C}$	-2.2	mW/ $^\circ\text{C}$
Operating temperature range		T_{opr}	0 to 70	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 125	$^\circ\text{C}$
Lead solder temperature (10 s) (Note 2)		T_{sol}	260	$^\circ\text{C}$

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

Characteristics	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	T_a	0	70	$^\circ\text{C}$

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 (0.1 μF) 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 ($T_a = 0$ to 70°C unless otherwise noted)

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

(**) All typical values are at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$

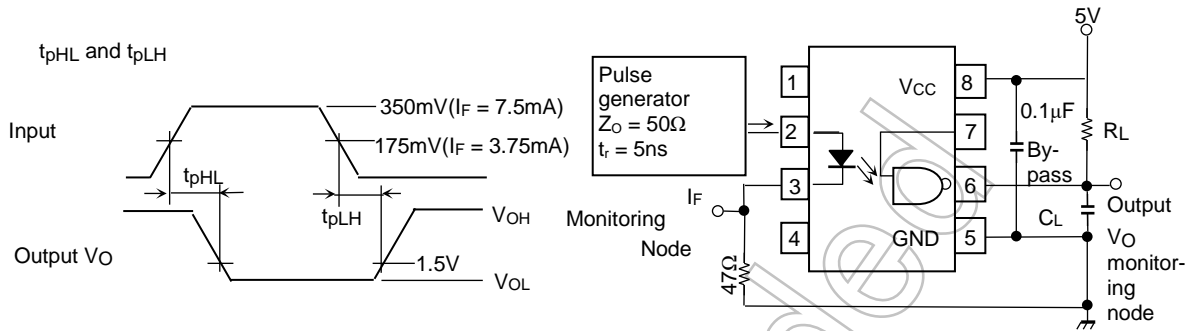
Note 3: Pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

Switching Characteristics (Ta = 25°C, Vcc = 5V)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time to high output level	t _{pLH}	1	R _L = 350 Ω, C _L = 15 pF I _F = 7.5 mA	—	60	75	ns
Propagation delay time to low output level	t _{pHL}	1	R _L = 350 Ω, C _L = 15 pF I _F = 7.5 mA	—	60	75	ns
Output rise–fall time (10–90%)	t _r , t _f	—	R _L = 350 Ω, C _L = 15 pF I _F = 7.5 mA	—	30	—	ns
Propagation delay time of enable from V _{EH} to V _{EL}	t _{ELH}	2	R _L = 350 Ω, C _L = 15 pF I _F = 7.5 mA V _{EH} = 3.0 V V _{EL} = 0.5 V	—	25	—	ns
Propagation delay time of enable from V _{EL} to V _{EH}	t _{EHL}	2	R _L = 350 Ω, C _L = 15 pF I _F = 7.5 mA V _{EH} = 3.0 V V _{EL} = 0.5 V	—	25	—	ns
Common mode transient immunity at logic high output level	CMH	3	V _{CM} = 10 V R _L = 350 Ω V _{O(min)} = 2V I _F = 0 mA	—	200	—	V / μs
Common mode transient Immunity at logic low output level	CML	3	V _{CM} = 10 V R _L = 350 Ω V _{O(max)} = 0.8 V I _F = 5 mA	—	-500	—	V / μs

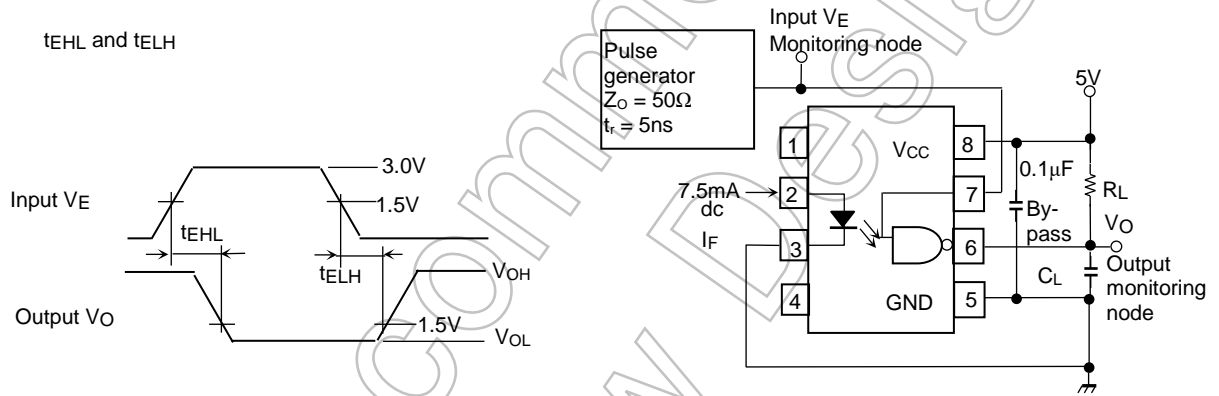
Not Recommended for New Design

Test Circuit 1.



- CL is approximately 15pF which includes probe and stray wiring capacitance.

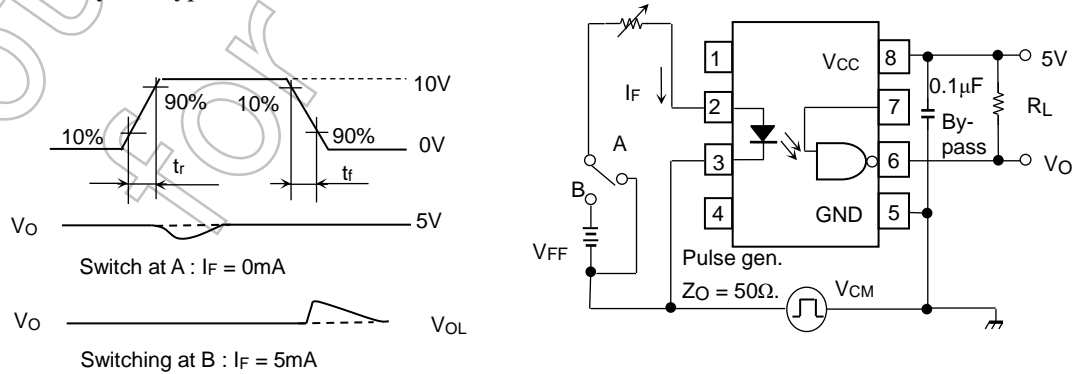
Test Circuit 2.

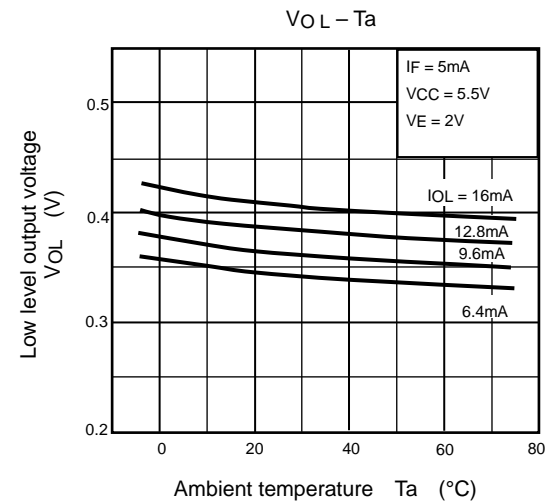
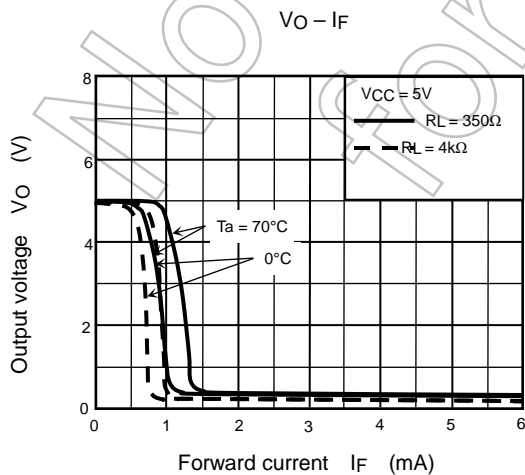
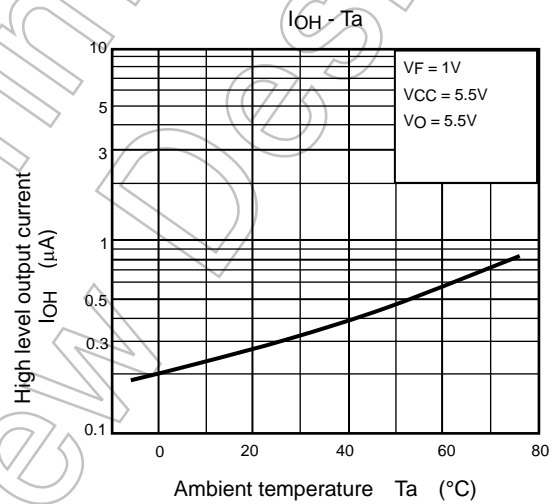
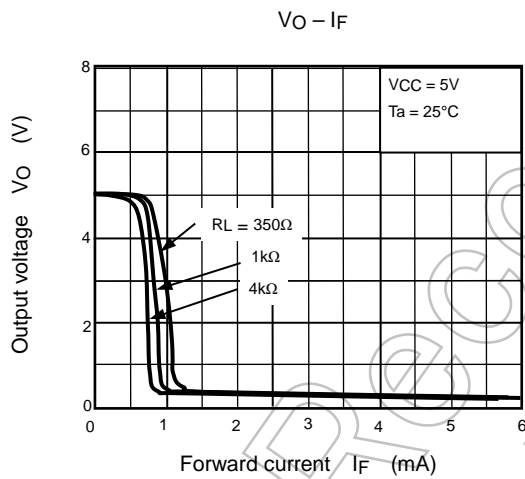
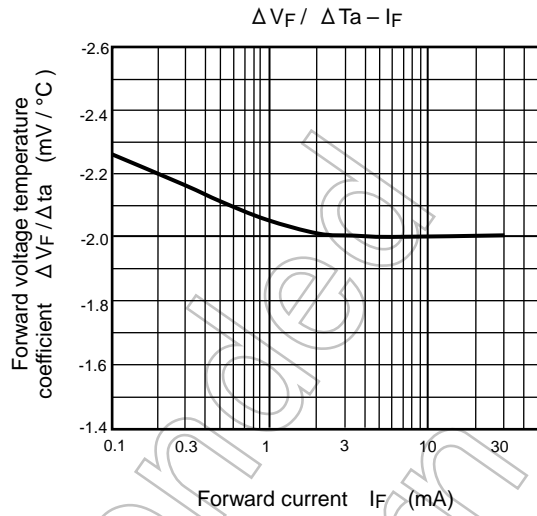
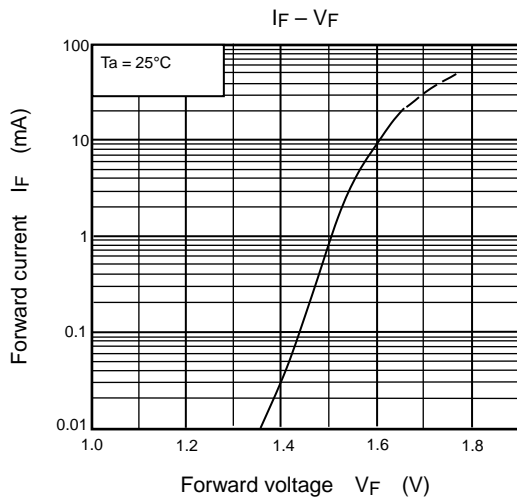


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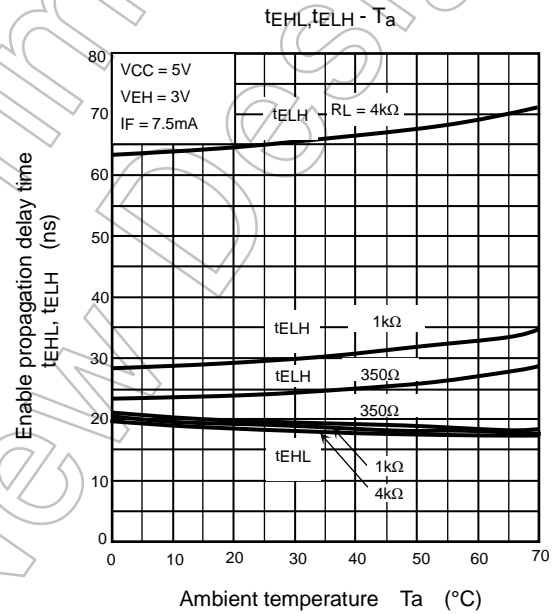
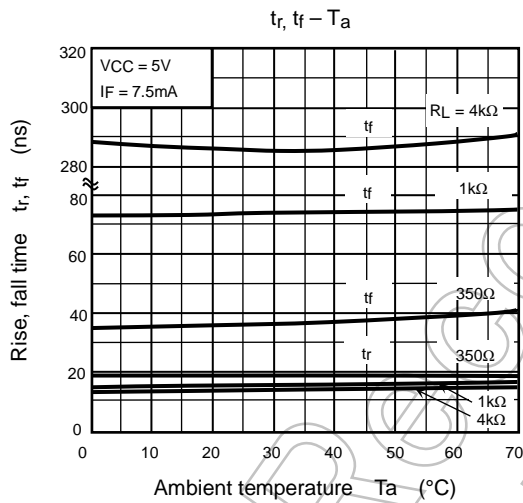
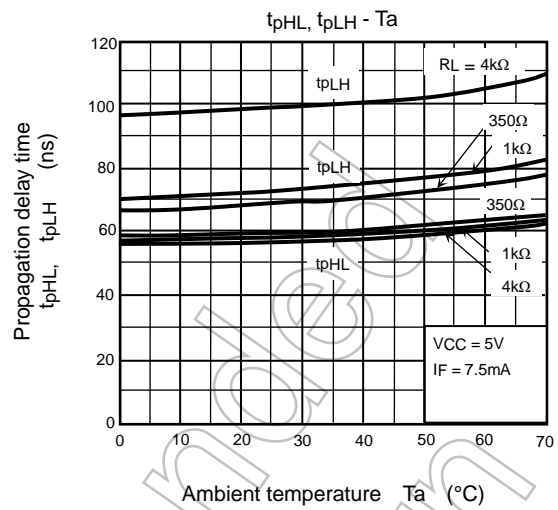
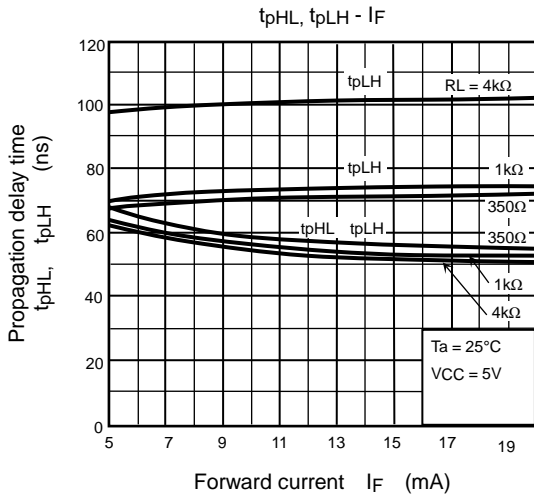
Test Circuit 3.

Transient immunity and typical waveforms





NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



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