

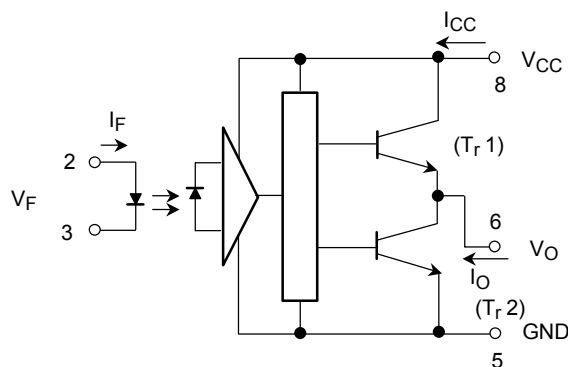
TLP251

Inverter For Air Conditionor
Induction Heating
Transistor Inverter
Power MOS FET Gate Drive
IGBT Gate Drive

The TOSHIBA TLP251 consists of a GaAlAs light emitting diode and a integrated photodetector.
This unit is 8-lead DIP package.
TLP251 is suitable for gate driving circuit of IGBT or power MOS FET.
Especially TLP251 is capable of "direct" gate drive of lower power IGBTs.
(~15A)

- Input threshold current: $I_F=5\text{mA}(\text{max.})$
- Supply current (I_{CC}): $11\text{mA}(\text{max.})$
- Supply voltage (V_{CC}): $10\sim35\text{V}$
- Output current (I_O): $\pm0.4\text{A}(\text{max.})$
- Switching time (t_{pLH} / t_{pHL}): $1\mu\text{s}(\text{max.})$
- Isolation voltage: $2500\text{Vrms}(\text{min.})$
- UL recognized: UL1577, file no.E67349

Schematic

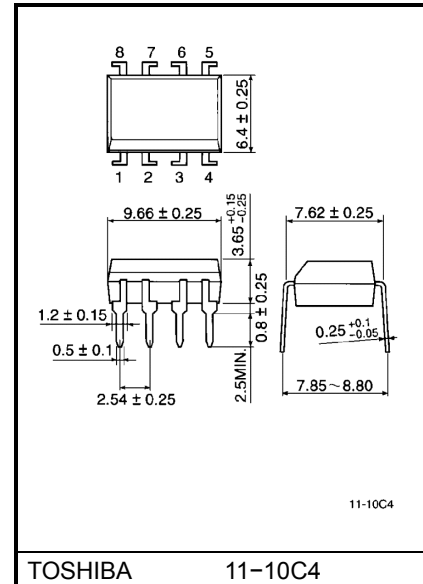


A $0.1\mu\text{F}$ bypass capacitor must be connected between pin 8 and 5(see Note 5).

Truth Table

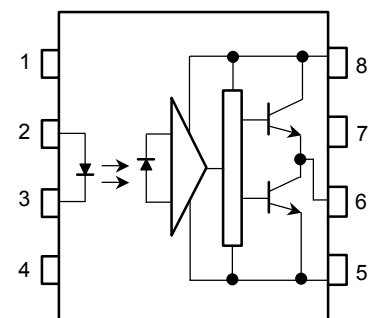
		Tr1	Tr2
Input LED	On	On	Off
	Off	Off	On

Unit in mm



Weight: 0.54g

Pin Configuration (top view)



- 1 : N.C.
- 2 : Anode
- 3 : Cathode
- 4 : N.C.
- 5 : Gnd
- 6 : V_O (Output)
- 7 : N.C.
- 8 : V_{CC}

Maximum Ratings (Ta = 25°C)

Characteristic			Symbol	Rating	Unit
LED	Forward current		I _F	20	mA
	Forward current derating (T _a ≥ 70°C)		ΔI _F / ΔT _a	– 0.36	mA / °C
	Peak transient forward current (Note 1)		I _{FPT}	1	A
	Reverse voltage		V _R	5	V
	Junction temperature		T _j	125	°C
Detector	“H” peak output current (P _W ≤ 2.0μs, f ≤ 15kHz) (Note 2)		I _{OPH}	– 0.4	A
	“L” peak output current (P _W ≤ 2.0μs, f ≤ 15kHz) (Note 2)		I _{OPL}	0.4	A
	Output voltage	(T _a ≤ 70°C)	V _O	35	V
		(T _a = 85°C)		24	
	Supply voltage	(T _a ≤ 70°C)	V _{CC}	35	V
		(T _a = 85°C)		24	
	Output voltage derating (T _a ≥ 70°C)		ΔV _O / ΔT _a	– 0.73	V / °C
	Supply voltage derating (T _a ≥ 70°C)		ΔV _{CC} / ΔT _a	– 0.73	V / °C
	Junction temperature		T _j	125	°C
	Operating frequency (Note 3)		f	25	kHz
Operating temperature range		T _{opr}	–20~85	°C	
Storage temperature range		T _{stg}	–55~125	°C	
Lead soldering temperature(10s)		T _{sol}	260	°C	
Isolation voltage (AC, 1min., R.H.≤ 60%) (Note 4)		BV _S	2500	Vrms	

(Note 1) Pulse width $P_W \leq 1\mu s$, 300pps

(Note 2) Exponential waveform

(Note 3) Exponential waveform, $I_{OPH} \leq -0.25A(\leq 2.0\mu s)$, $I_{OPL} \leq +0.25A(\leq 2.0\mu s)$

(Note 4) Device considered a two terminal device: Pins 1, 2, 3 and 4 shorted together, and pins 5, 6, 7 and 8 shorted together.

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

Recommended Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Input current, on	$I_{F(ON)}$	7	8	10	mA
Input voltage, off	$V_{F(OFF)}$	0	—	0.8	V
Supply voltage	V_{CC}	10	—	30 20	V
Peak output current	I_{OPH} / I_{OPL}	—	—	± 0.1	A
Operating temperature	T_{opr}	-20	25	70 85	°C

Electrical Characteristics ($T_a = -20 \sim 70^\circ\text{C}$, unless otherwise specified)

Characteristic		Symbol	Test Circuit	Test Condition	Min.	Typ.*	Max.	Unit
Input forward voltage		V_F	—	$I_F = 10 \text{ mA}$, $T_a = 25^\circ\text{C}$	—	1.6	1.8	V
Temperature coefficient of forward voltage		$\Delta V_F / \Delta T_a$	—	$I_F = 10 \text{ mA}$	—	-2.0	—	mV / °C
Input reverse current		I_R	—	$V_R = 5 \text{ V}$, $T_a = 25^\circ\text{C}$	—	—	10	μA
Input capacitance		C_T	—	$V = 0$, $f = 1 \text{ MHz}$, $T_a = 25^\circ\text{C}$	—	45	250	pF
Output current	"H" level	I_{OPH}	3	$V_{CC}=30\text{V}$ (*1) $I_F = 10\text{mA}$ $V_{8-6} = 4\text{V}$ $I_F = 0$ $V_{6-5} = 2.5\text{V}$	-0.1	-0.25	—	A
	"L" level	I_{OPL}	2		0.1	0.2	—	
Output voltage	"H" level	V_{OH}	4	$V_{CC1} = +15\text{V}$, $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$, $I_F = 5\text{mA}$	11	13.2	—	V
	"L" level	V_{OL}	5	$V_{CC1} = +15\text{V}$, $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$, $V_F = 0.8\text{V}$	—	-14.5	-12.5	
Supply current	"H" level	I_{CCH}	—	$V_{CC} = 30\text{V}$, $I_F = 10\text{mA}$ $T_a = 25^\circ\text{C}$	—	7.5	—	mA
				$V_{CC} = 30\text{V}$, $I_F = 10\text{mA}$	—	—	11	
	"L" level	I_{CCL}	—	$V_{CC} = 30\text{V}$, $I_F = 0\text{mA}$ $T_a = 25^\circ\text{C}$	—	8	—	
				$V_{CC} = 30\text{V}$, $I_F = 0\text{mA}$	—	—	11	
Threshold input current	"Output L $\rightarrow$ H"	I_{FLH}	—	$V_{CC1} = +15\text{V}$, $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$, $V_O > 0\text{V}$	—	1.2	5	mA
Threshold input voltage	"Output H $\rightarrow$ L"	V_{FLH}	—	$V_{CC1} = +15\text{V}$, $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$, $V_O < 0\text{V}$	0.8	—	—	V
Supply voltage		V_{CC}	—		10	—	35	V
Capacitance (input-output)		C_s	—	$V_s = 0$, $f = 1 \text{ MHz}$ $T_a = 25^\circ\text{C}$	—	1.0	2.0	pF
Resistance (input-output)		R_s	—	$V_s = 500\text{V}$, $T_a = 25^\circ\text{C}$ $R.H. \leq 60\%$	1×10^{12}	10^{14}	—	Ω

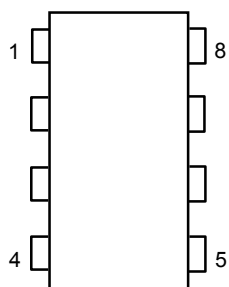
* All typical values are at $T_a=25^\circ\text{C}$ (*1): Duration of I_O time $\leq 50\mu\text{s}$

Switching Characteristics (Ta = -20~70°C, unless otherwise specified)

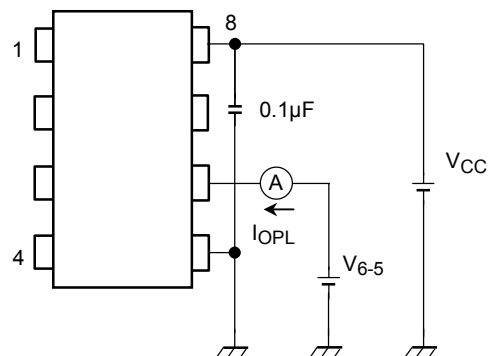
Characteristic		Symbol	Test Cir- cuit	Test Condition	Min.	Typ.*	Max.	Unit
Propagation delay time	L→H	t _{pLH}	6	I _F = 8mA V _{CC1} = +15V, V _{EE1} = -15V R _L = 200 Ω	—	0.25	1.0	μs
	H→L	t _{pHL}			—	0.25	1.0	
Output rise time		t _r			—	—	—	
Output fall time		t _f			—	—	—	
Common mode transient immunity at high level output		C _{MH}	7	V _{CM} = 600V, I _F = 8mA, V _{CC} = 30V, Ta = 25°C	-5000	—	—	V / μs
Common mode transient immunity at low level output		C _{ML}	7	V _{CM} = 600V, I _F = 0mA, V _{CC} = 30V, Ta = 25°C	5000	—	—	V / μs

*All typical values are at Ta=25°C

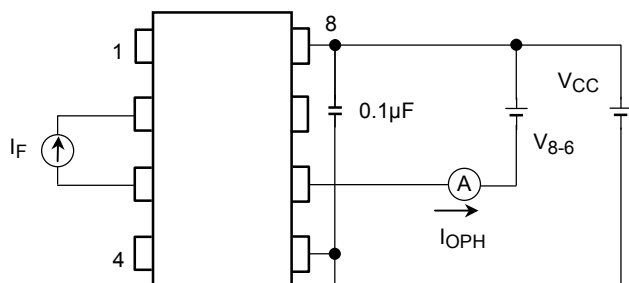
Test Circuit 1:



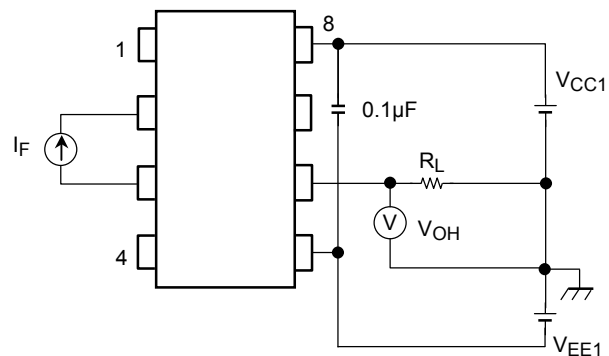
Test Circuit 2: I_{OPL}



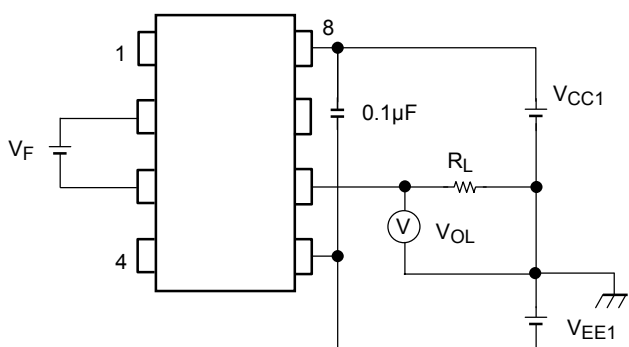
Test Circuit 3: I_{OPH}



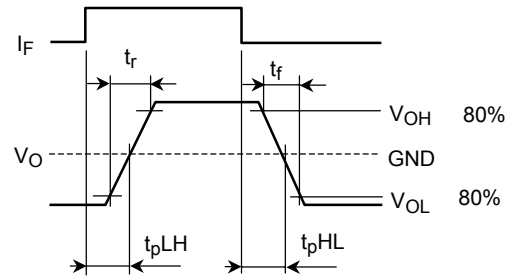
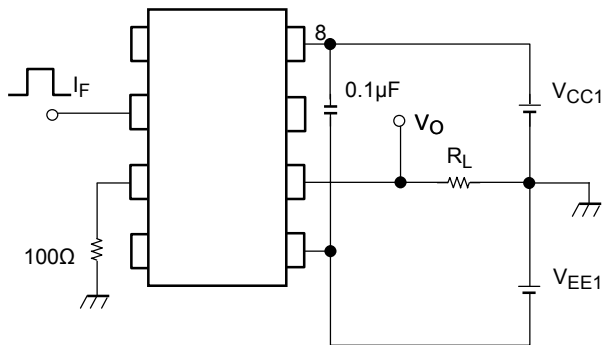
Test Circuit 4: V_{OH}



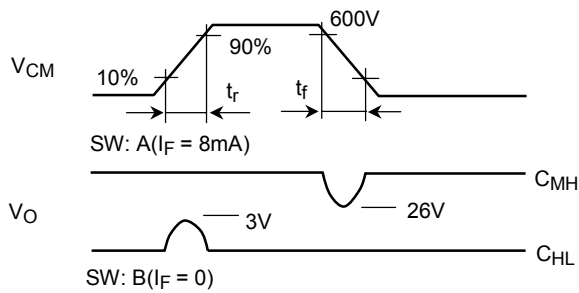
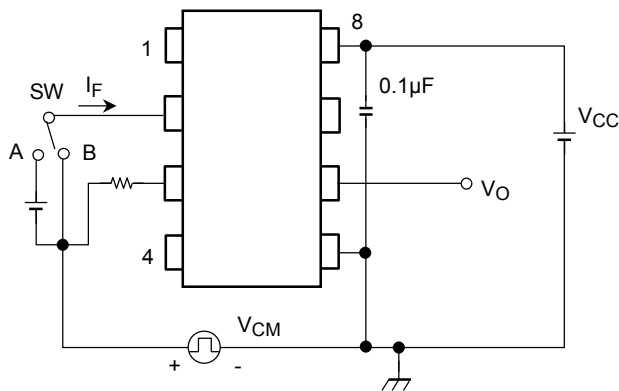
Test Circuit 5: V_{OL}



Test Circuit 6: t_{pLH} , t_{pHL} , t_r , t_f



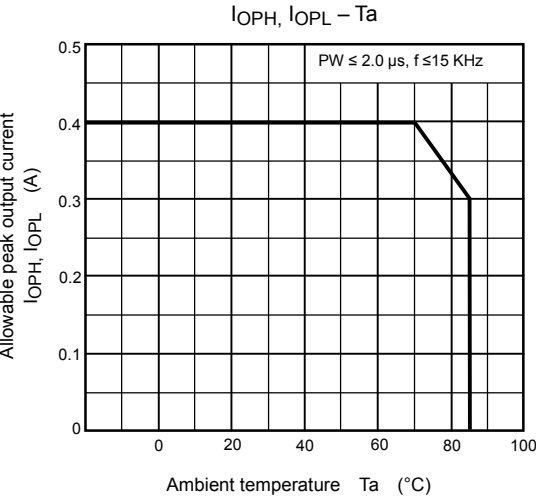
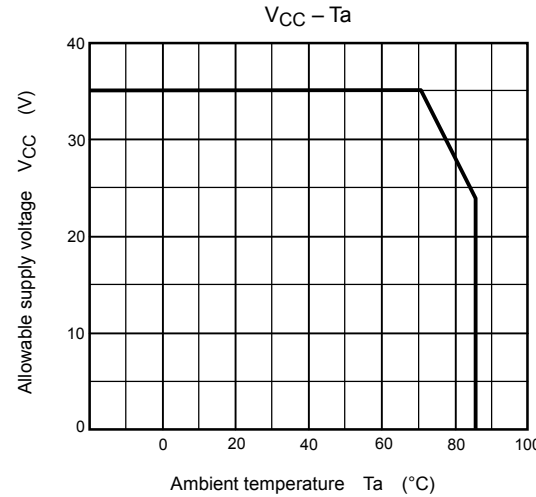
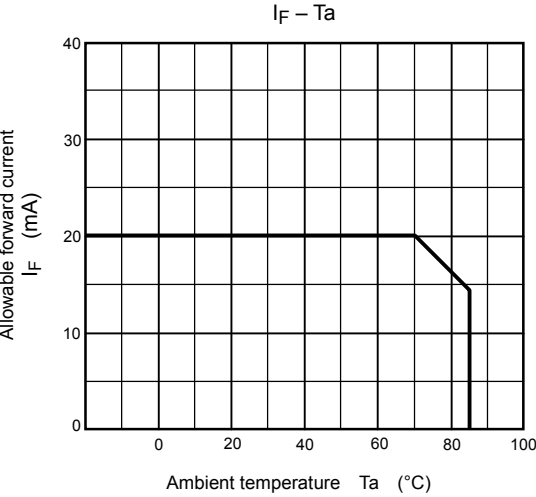
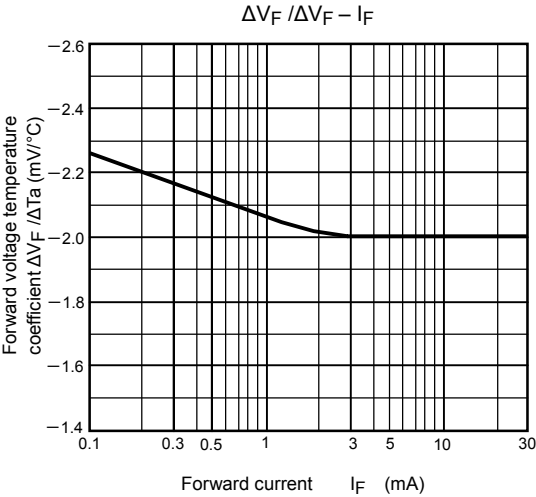
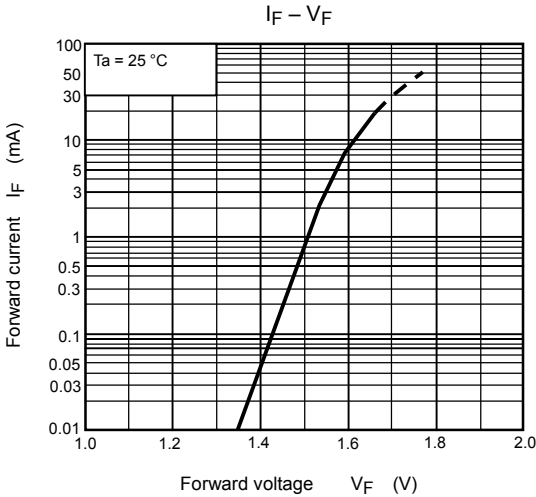
Test Circuit 7: C_{MH} , C_{ML}



$$C_{ML} = \frac{480(V)}{t_r(\mu s)}$$

$$C_{MH} = \frac{480(V)}{t_f(\mu s)}$$

C_{ML} (C_{MH}) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.



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