

TOSHIBA**TLP251**

TOSHIBA PHOTOCOUPLER GaAlAs IRED & PHOTO-IC

TLP251

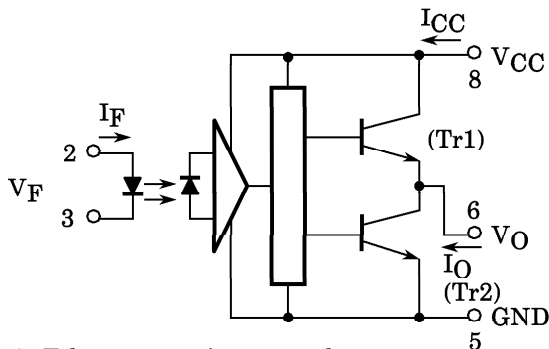
INVERTER FOR AIR CONDITIONOR
INDUCTION HEATING
TRANSISTOR INVERTER
POWER MOS FET GATE DRIVE
IGBT GATE DRIVE

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 : $I_F = 5\text{mA}$ (Max.)
- Supply Current (I_{CC}) : 11mA (Max.)
- Supply Voltage (V_{CC}) : 10–35V
- Output Current (I_O) : $\pm 0.4\text{A}$ (Max.)
- Switching Time (t_{pLH}/t_{pHL}) : $1\mu\text{s}$ (Max.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

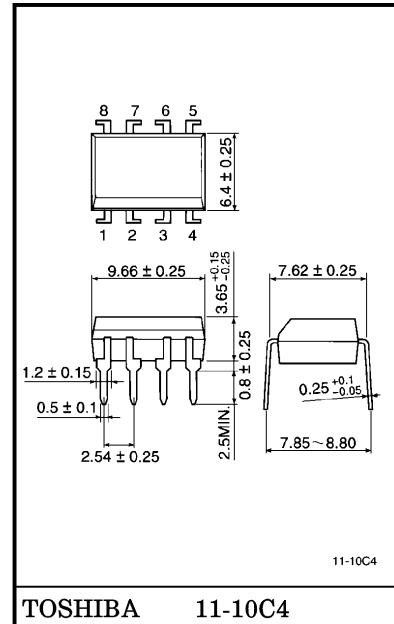
SCHMATIC

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

TRUTH TABLE

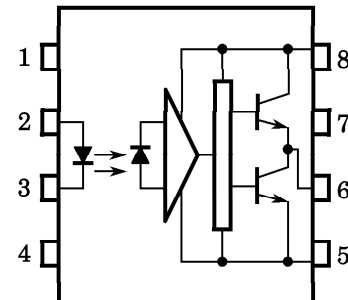
		Tr1	Tr2
Input LED	ON	ON	OFF
	OFF	OFF	ON

Unit in mm



TOSHIBA 11-10C4

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 (Ta ≥ 70°C)	$\Delta I_F / \Delta T_a$	-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 ($P_W \leq 2.0 \mu s$, $f \leq 15 \text{kHz}$) (Note 2)		I_{OPH}	-0.4	A
	“L” Peak Output Current ($P_W \leq 2.0 \mu s$, $f \leq 15 \text{kHz}$) (Note 2)		I_{OPL}	0.4	A
	Output Voltage	(Ta ≤ 70°C)	V_O	35	V
		(Ta = 85°C)		24	
	Supply Voltage	(Ta ≤ 70°C)	V_{CC}	35	V
		(Ta = 85°C)		24	
	Output Voltage Derating (Ta ≥ 70°C)		$\Delta V_O / \Delta T_a$	-0.73	V / °C
	Supply Voltage Derating (Ta ≥ 70°C)		$\Delta V_{CC} / \Delta T_a$	-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)		BVS	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 (0.1 μ F) 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.

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)	$I_F = 10\text{mA}$ $V_{8-6} = 4\text{V}$	-0.1	-0.25	—	A
	“L” Level	I_{OPL}	2			$I_F = 0$ $V_{6-5} = 2.5\text{V}$	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→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→L”	V_{FHL}	—	$V_{CC1} = +15\text{V}$, $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$, $V_O < 0\text{V}$	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	

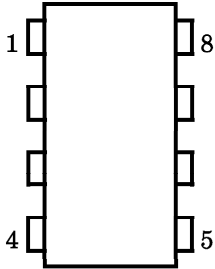
* All typical values are at $T_a = 25^\circ\text{C}$ (*1) : Duration of I_O time $\leq 50\mu\text{s}$

SWITCHING CHARACTERISTICS (Ta = -20~70°C, Unless otherwise specified)

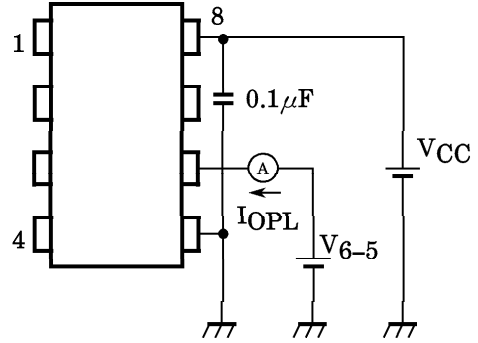
CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.*	MAX.	UNIT
Propagation Delay Time	L→H	t _{pLH}	6	I _F = 8mA V _{CC1} = +15V, V _{EE1} = -15V R _L = 200Ω	—	0.25	1.0	μs
	H→L	t _{pHL}			—	0.25	1.0	
Output Rise Time		t _r			—	—	—	
Output Fall Time		t _f			—	—	—	
Common Mode Transient Immunity 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 _M L	7	V _{CM} = 600V, I _F = 0mA V _{CC} = 30V, Ta = 25°C	5000	—	—	V / μs

* All typical values are at Ta = 25°C

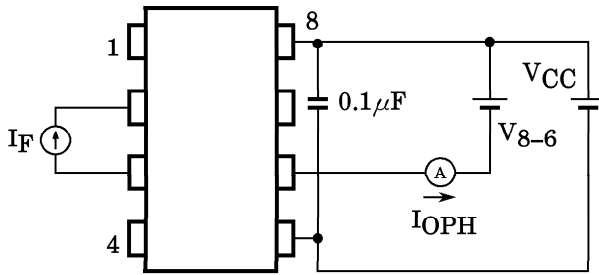
TEST CIRCUIT 1 :



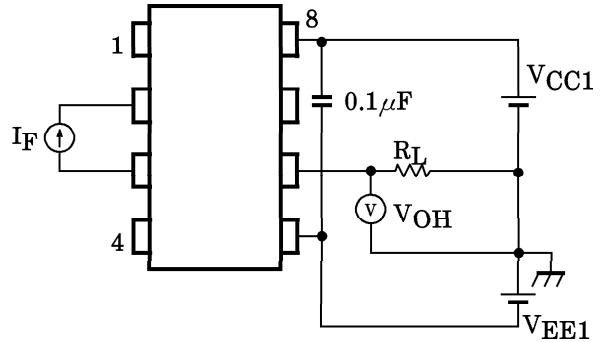
TEST CIRCUIT 2 : I_{OPL}



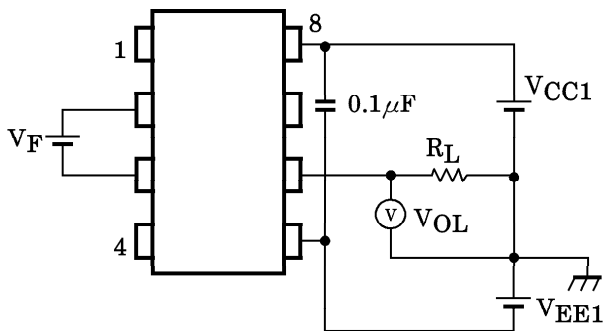
TEST CIRCUIT 3 : I_{OPH}



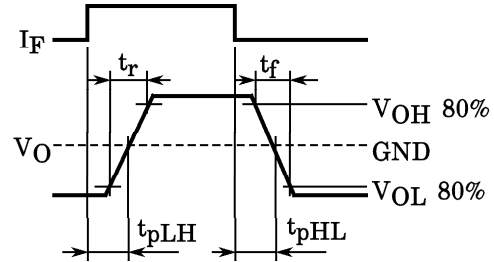
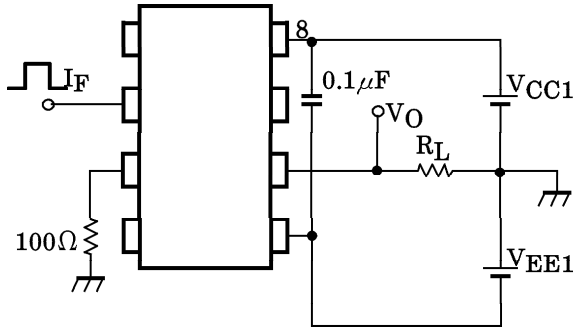
TEST CIRCUIT 4 : V_{OH}



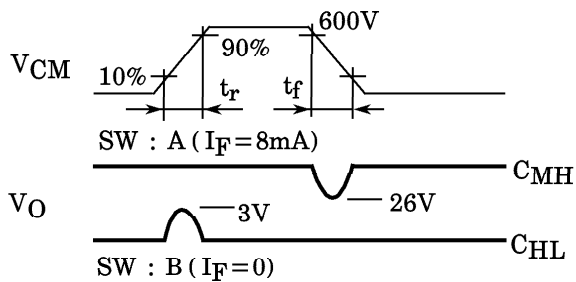
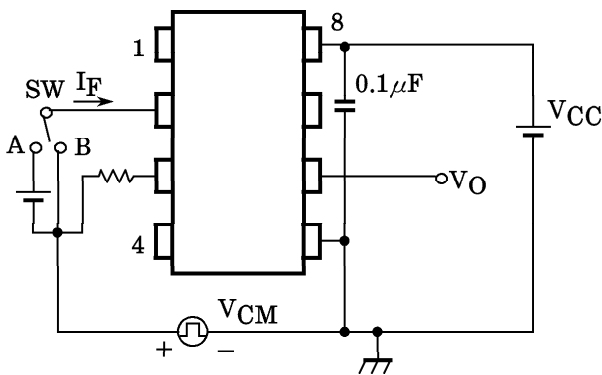
TEST CIRCUIT 5 : V_{OL}



TEST CIRCUIT 6 : t_{pLH} , t_{pHL} , t_r , t_f



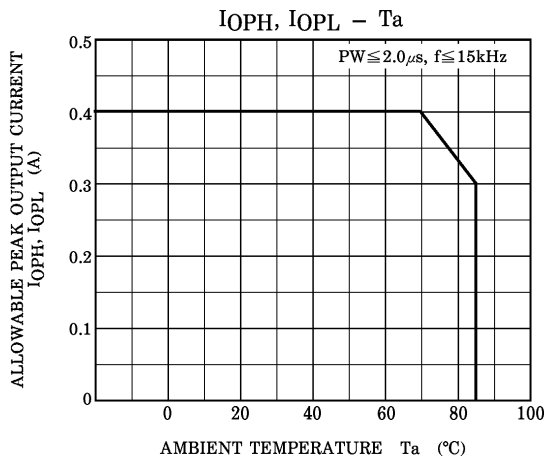
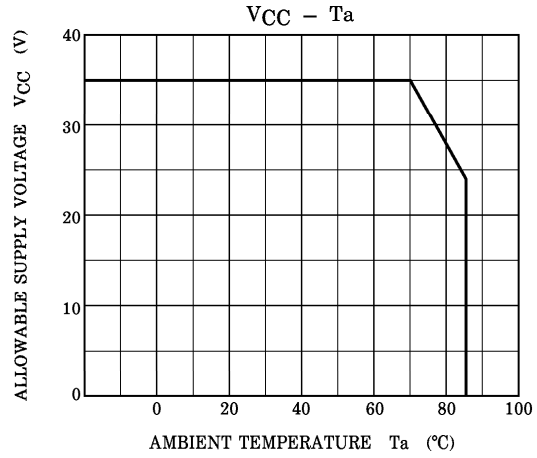
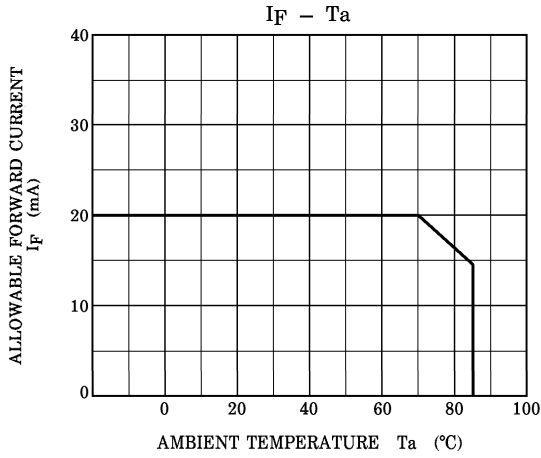
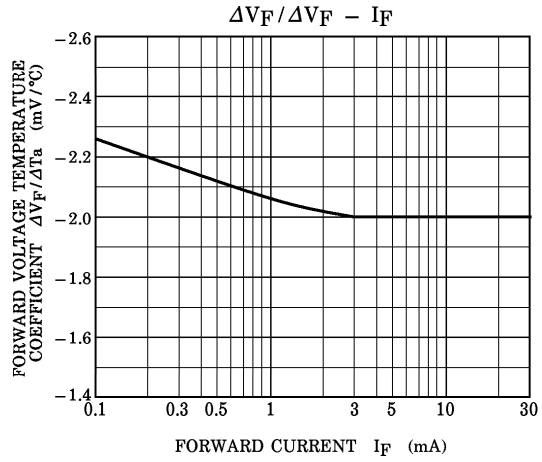
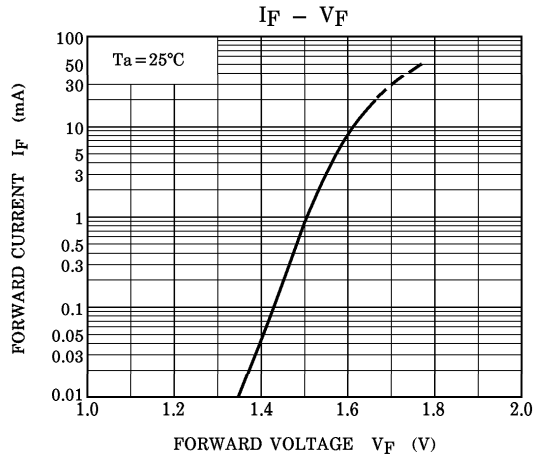
TEST CIRCUIT 7 : C_{MH} , C_{ML}



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

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

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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