

TOSHIBA PHOTOCOUPLER GaAlAs IRED & PHOTO-IC

TLP251

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

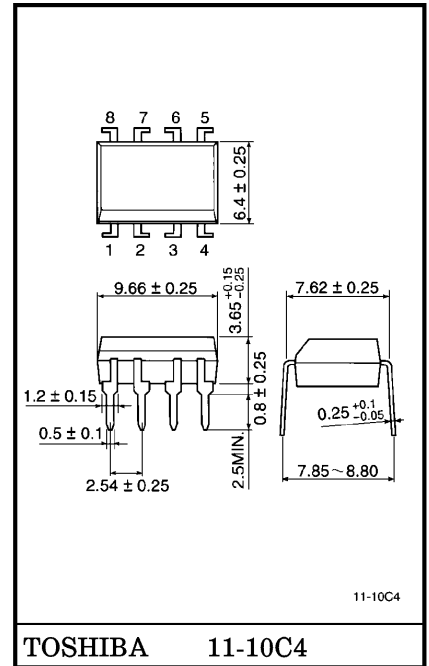
The TOSHIBA TLP251 consists of a GaAlAs light emitting diode and a integrated photodetector.

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)

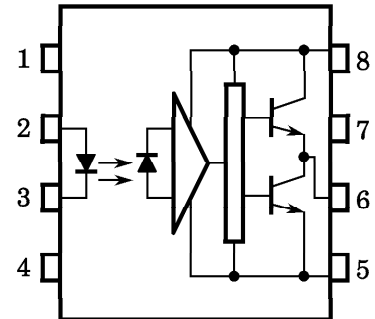
- Input Threshold Current : $I_F = 5\text{mA}$ (Max.)
- Supply Current (I_{CC}) : 11mA (Max.)
- Supply Voltage (V_{CC}) : 10-35V
- Output Current (I_O) : $\pm 0.4\text{A}$ (Max.)
- Switching Time (t_{pLH}/t_{pHL}) : $1\mu\text{s}$ (Max.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577,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

Unit in mm



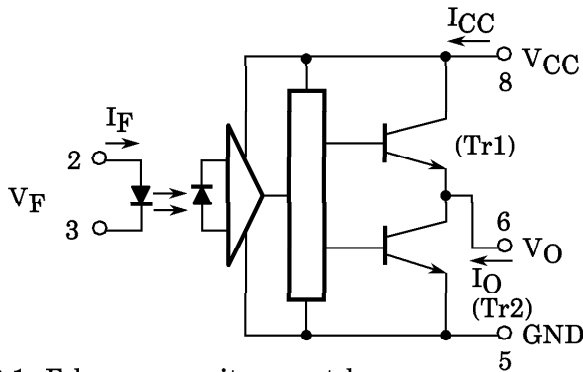
Weight : 0.54g

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}

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

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT	
LED	Forward Current	I_F	20	mA	
	Forward Current Derating (Ta ≥ 70°C)	$\Delta I_F / \Delta Ta$	-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)	$\Delta V_O / \Delta Ta$	-0.73	V / °C	
	Supply Voltage Derating (Ta ≥ 70°C)	$\Delta V_{CC} / \Delta Ta$	-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 (0.1 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 (Ta = -20~70°C, Unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.*	MAX.	UNIT	
Input Forward Voltage	V _F	—	I _F =10mA, Ta=25°C	—	1.6	1.8	V	
Temperature Coefficient of Forward Voltage	ΔV _F /ΔTa	—	I _F =10mA	—	-2.0	—	mV/°C	
Input Reverse Current	I _R	—	V _R =5V, Ta=25°C	—	—	10	μA	
Input Capacitance	C _T	—	V=0, f=1MHz, Ta=25°C	—	45	250	pF	
Output Current	“H” Level	I _{OPH}	V _{CC} =30V (*1) I _F =10mA V ₈₋₆ =4V	-0.1	-0.25	—	A	
	“L” Level	I _{OPL}		2	I _F =0 V ₆₋₅ =2.5V	0.1		0.2
Output Voltage	“H” Level	V _{OH}	4	V _{CC1} =+15V, V _{EE1} =-15V R _L =200Ω, I _F =5mA	11	13.2	—	V
	“L” Level	V _{OL}	5	V _{CC1} =+15V, V _{EE1} =-15V R _L =200Ω, V _F =0.8V	—	-14.5	-12.5	
Supply Current	“H” Level	I _{CCH}	—	V _{CC} =30V, I _F =10mA Ta=25°C	—	7.5	—	mA
				V _{CC} =30V, I _F =10mA	—	—	11	
	“L” Level	I _{CCL}	—	V _{CC} =30V, I _F =0mA Ta=25°C	—	8	—	
				V _{CC} =30V, I _F =0mA	—	—	11	
Threshold Input Current	“Output L→H”	I _{FLH}	—	V _{CC1} =+15V, V _{EE1} =-15V R _L =200Ω, V _O >0V	—	1.2	5	mA
Threshold Input Voltage	“Output H→L”	V _{FHL}	—	V _{CC1} =+15V, V _{EE1} =-15V R _L =200Ω, V _O <0V	0.8	—	—	V
Supply Voltage	V _{CC}	—		10	—	35	V	
Capacitance (Input-Output)	C _s	—	V _s =0, f=1MHz Ta=25°C	—	1.0	2.0	pF	
Resistance (Input-Output)	R _s	—	V _s =500V, Ta=25°C R.H. ≤ 60%	1×10 ¹²	10 ¹⁴	—	Ω	

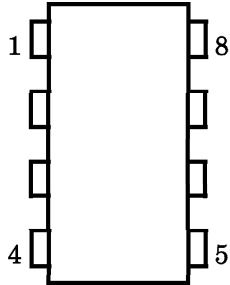
* All typical values are at Ta=25°C (*1) : Duration of I_O time ≤ 50μs

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

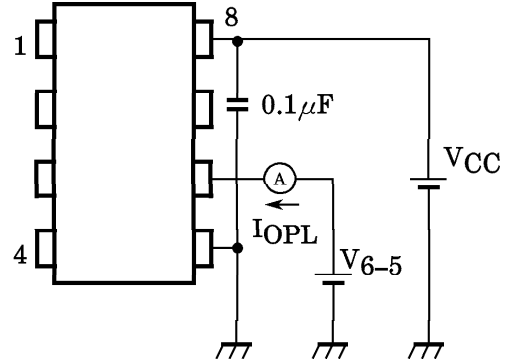
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.*	MAX.	UNIT
Propagation Delay Time	L→H	t _{pLH}	6	I _F = 8mA V _{CC1} = +15V, V _{EE1} = -15V R _L = 200Ω	—	0.25	1.0	μs
	H→L	t _{pHL}			—	0.25	1.0	
Output Rise Time		t _r			—	—	—	
Output Fall Time		t _f			—	—	—	
Common Mode Transient Immunity 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

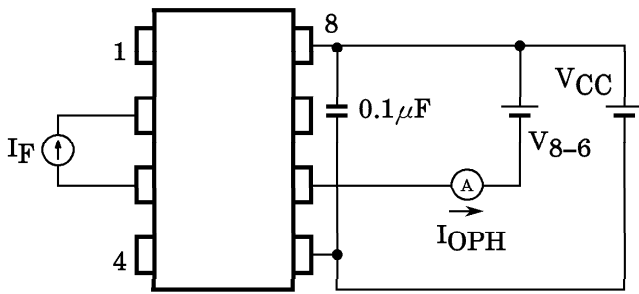
TEST CIRCUIT 1 :



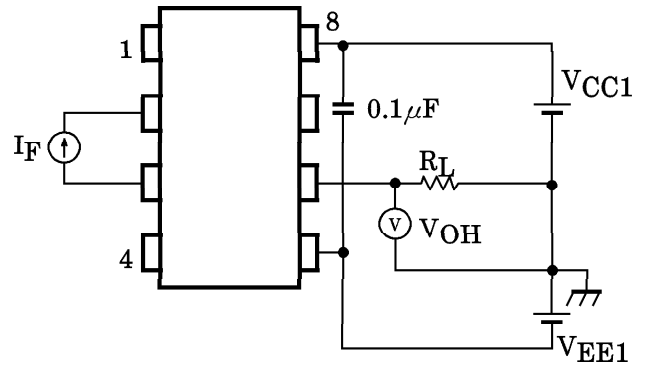
TEST CIRCUIT 2 : I_{OPL}



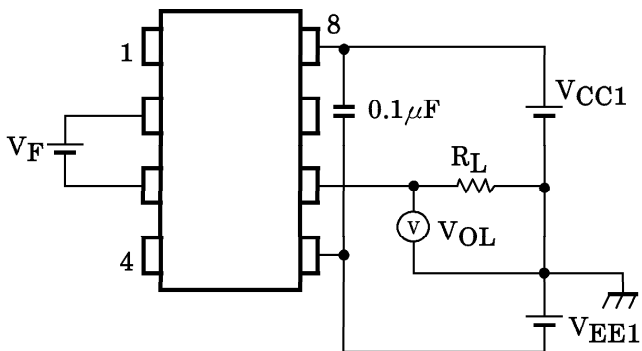
TEST CIRCUIT 3 : I_{OPH}



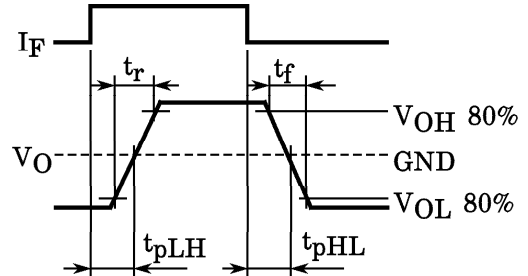
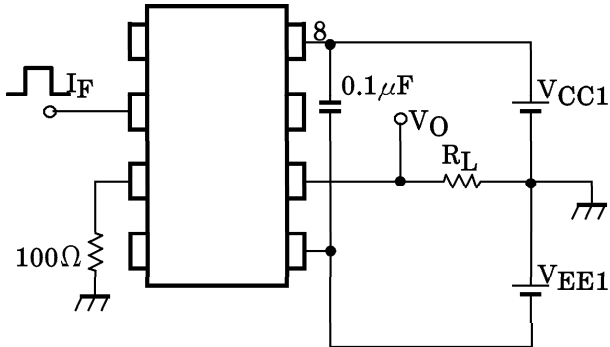
TEST CIRCUIT 4 : V_{OH}



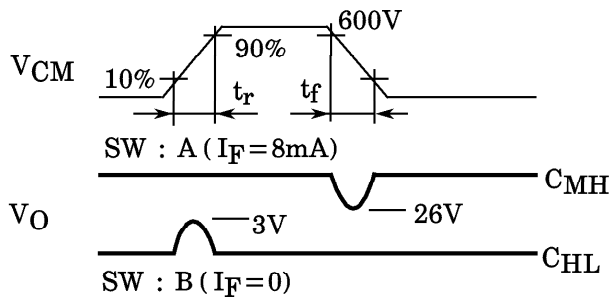
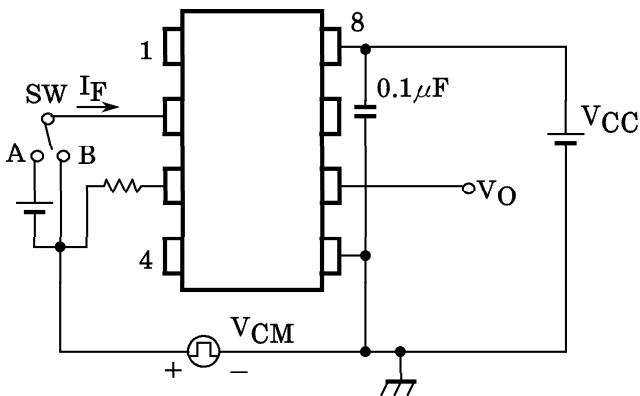
TEST CIRCUIT 5 : V_{OL}



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



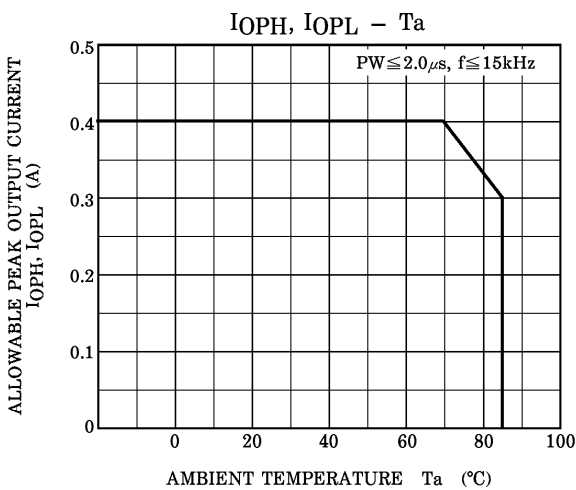
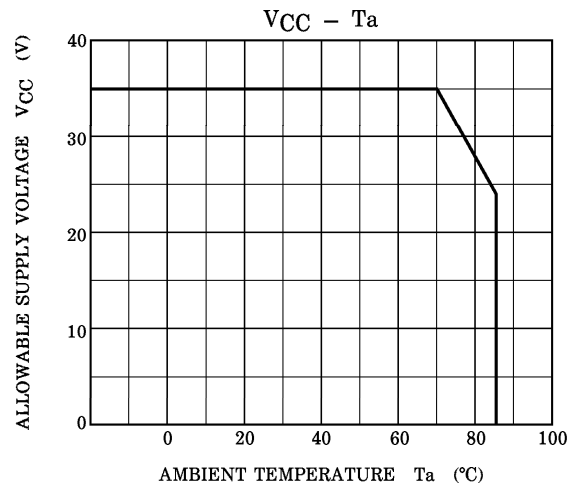
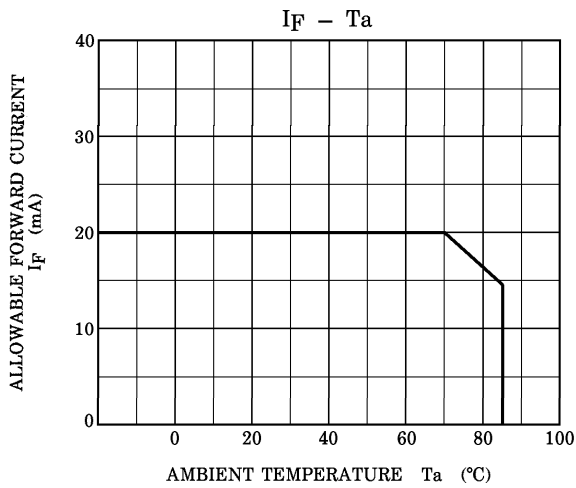
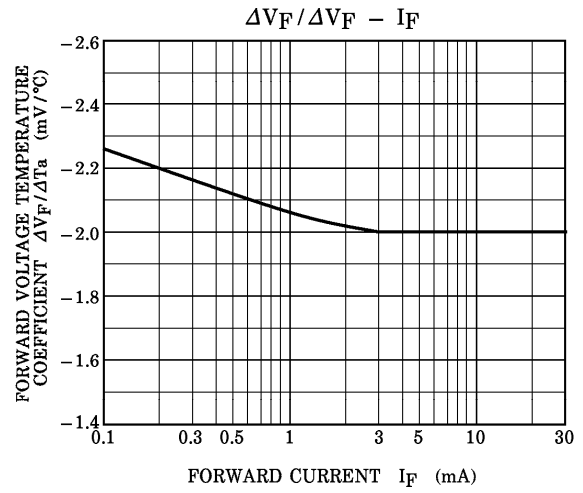
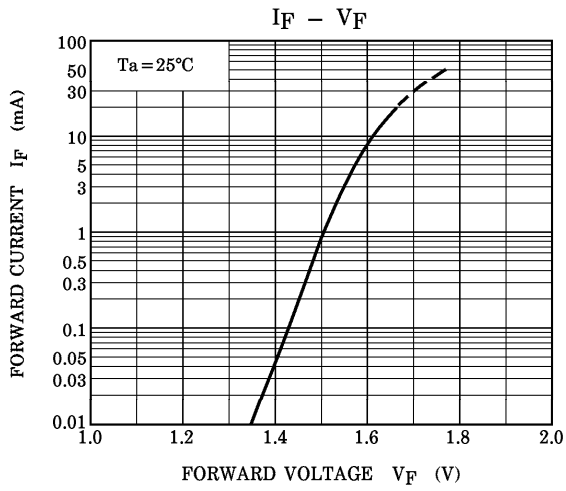
TEST CIRCUIT 7 : C_{MH} , C_{ML}



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

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

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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