

# TLP250

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

The TOSHIBA TLP250 consists of a GaAlAs light emitting diode and a integrated photodetector.

This unit is 8-lead DIP package.

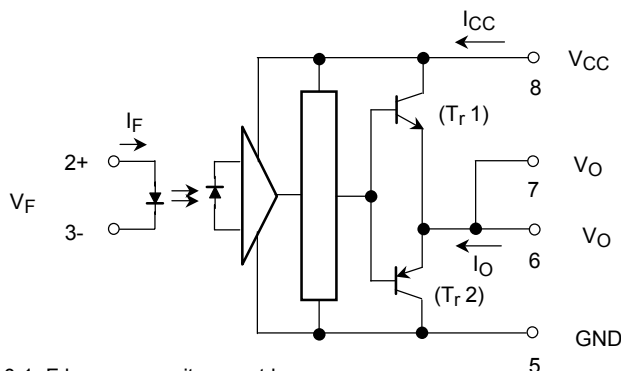
TLP250 is suitable for gate driving circuit of IGBT or power MOS FET.

- Input threshold current:  $I_F=5\text{mA}(\text{max.})$
- Supply current ( $I_{CC}$ ):  $11\text{mA}(\text{max.})$
- Supply voltage ( $V_{CC}$ ):  $10\text{--}35\text{V}$
- Output current ( $I_O$ ):  $\pm 1.5\text{A}(\text{max.})$
- Switching time ( $t_{pLH}/t_{pHL}$ ):  $1.5\mu\text{s}(\text{max.})$
- Isolation voltage:  $2500V_{\text{rms}}(\text{min.})$
- UL recognized: UL1577, file No.E67349
- Option (D4) type  
 VDE approved: DIN VDE0884/06.92,certificate No.76823  
 Maximum operating insulation voltage:  $630\text{VPK}$   
 Highest permissible over voltage:  $4000\text{VPK}$

**(Note) When a VDE0884 approved type is needed, please designate the "option (D4)"**

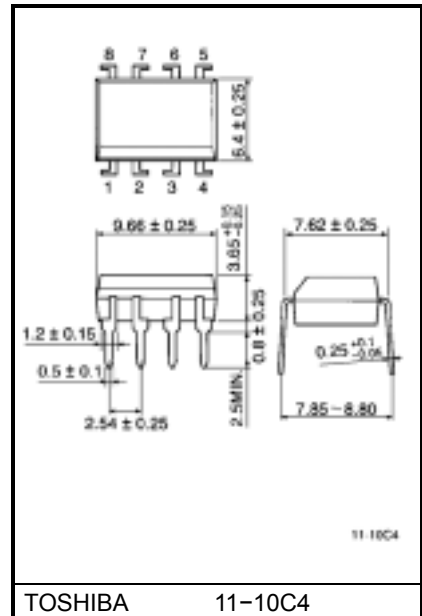
- Creepage distance:  $6.4\text{mm}(\text{min.})$   
 Clearance:  $6.4\text{mm}(\text{min.})$

## Schematic



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

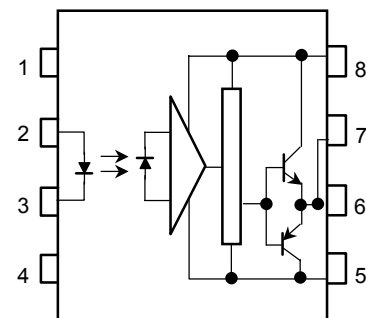
Unit in mm



TOSHIBA 11-10C4

Weight: 0.54 g

## Pin Configuration (top view)



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

## Truth Table

		Tr1	Tr2
Input LED	On	On	Off
	Off	Off	On

## Absolute 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 ( $P_W \leq 2.5\mu s, f \leq 15kHz$ ) (Note 2)	$I_{OPH}$	-1.5	A	
	"L" peak output current ( $P_W \leq 2.5\mu s, f \leq 15kHz$ ) (Note 2)	$I_{OPL}$	+1.5	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 (10 s) (Note 4)		$T_{sol}$	260	°C	
Isolation voltage (AC, 1 min., R.H. ≤ 60%) (Note 5)		$BV_S$	2500	Vrms	

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

Note 2: Exponential waveform

Note 3: Exponential waveform,  $I_{OPH} \leq -1.0A (\leq 2.5\mu s)$ ,  $I_{OPL} \leq +1.0A (\leq 2.5\mu s)$

Note 4: It is 2 mm or more from a lead root.

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

Note 6: 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.

## Recommended Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Input current, on (Note 7)	$I_{F(ON)}$	7	8	10	mA
Input voltage, off	$V_{F(OFF)}$	0	—	0.8	V
Supply voltage	$V_{CC}$	15	—	30   20	V
Peak output current	$I_{OPH}/I_{OPL}$	—	—	±0.5	A
Operating temperature	$T_{opr}$	-20	25	70   85	°C

Note 7: Input signal rise time (fall time) < 0.5 μs.

## Electrical Characteristics (Ta = -20~70°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	$\mu\text{A}$	
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)	$I_F = 10 \text{ mA}$ $V_{8-6} = 4\text{V}$	-0.5	-1.5	—	A
	"L" level	$I_{OPL}$	2		$I_F = 0$ $V_{6-5} = 2.5\text{V}$	0.5	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	12.8	—	V	
	"L" level	$V_{OL}$	5	$V_{CC1} = +15\text{V}$ , $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$ , $V_F = 0.8\text{V}$	—	-14.2	-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	—	mA	
				$V_{CC} = 30\text{V}$ , $I_F = 10\text{mA}$	—	—	11		
	"L" level	$I_{CCL}$	—	$V_{CC} = 30\text{V}$ , $I_F = 0\text{mA}$ $T_a = 25^\circ\text{C}$	—	7.5	—		
				$V_{CC} = 30\text{V}$ , $I_F = 0\text{mA}$	—	—	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"	$I_{FHL}$	—	$V_{CC1} = +15\text{V}$ , $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$ , $V_O < 0\text{V}$	0.8	—	—	V	
Supply voltage		$V_{CC}$	—		10	—	35	V	
Capacitance (input-output)		$C_S$	—	$V_S = 0$ , $f = 1\text{MHz}$ $T_a = 25$	—	1.0	2.0	pF	
Resistance(input-output)		$R_S$	—	$V_S = 500\text{V}$ , $T_a = 25^\circ\text{C}$ $R.H. \leq 60\%$	$1 \times 10^{12}$	$10^{14}$	—	$\Omega$	

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

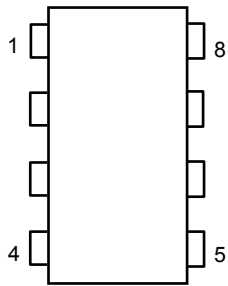
## Switching Characteristics (Ta = -20~70°C , unless otherwise specified)

Characteristic	Symbol	Test Circuit	Test Condition	Min.	Typ.*	Max.	Unit
Propagation delay time	L→H	t <sub>pLH</sub>	I <sub>F</sub> = 8mA (Note 7) V <sub>CC1</sub> = +15V, V <sub>EE1</sub> = -15V R <sub>L</sub> = 200Ω	—	0.15	0.5	μs
	H→L	t <sub>pHL</sub>		—	0.15	0.5	
Output rise time	t <sub>r</sub>	6		—	—	—	
Output fall time	t <sub>f</sub>			—	—	—	
Common mode transient immunity at high level output	C <sub>MH</sub>	7	V <sub>CM</sub> = 600V, I <sub>F</sub> = 8mA V <sub>CC</sub> = 30V, Ta = 25°C	-5000	—	—	V / μs
Common mode transient immunity at low level output	C <sub>ML</sub>	7	V <sub>CM</sub> = 600V, I <sub>F</sub> = 0mA V <sub>CC</sub> = 30V, Ta = 25°C	5000	—	—	V / μs

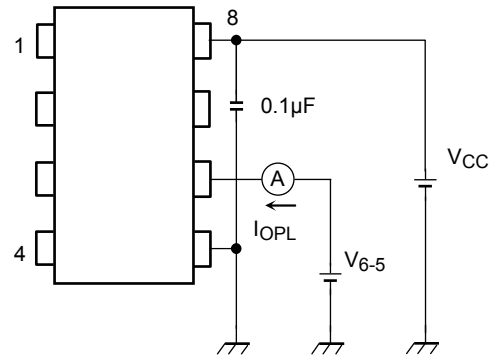
\* All typical values are at Ta = 25°C

Note 7: Input signal rise time (fall time) < 0.5 μs.

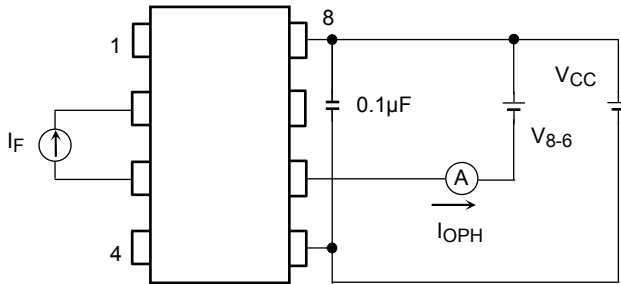
Test Circuit 1 :



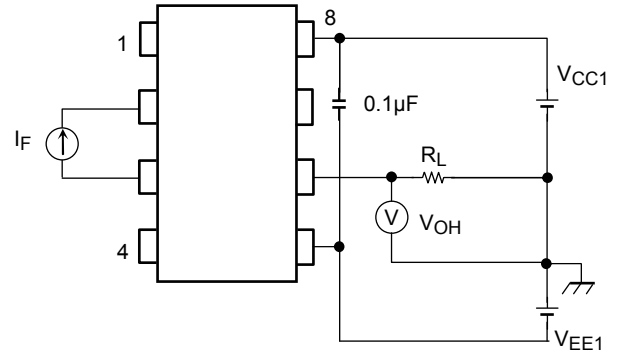
Test Circuit 2 : IOPL



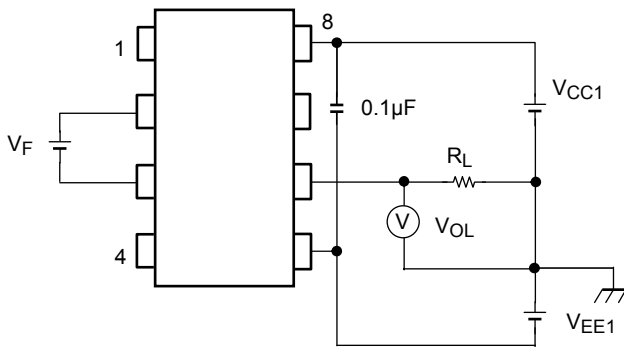
Test Circuit 3 : IOPH



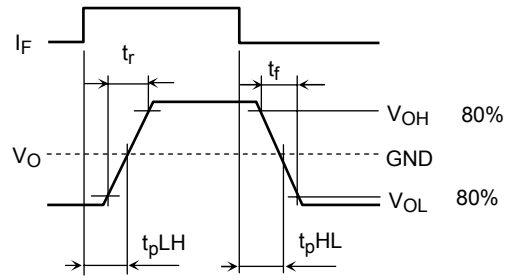
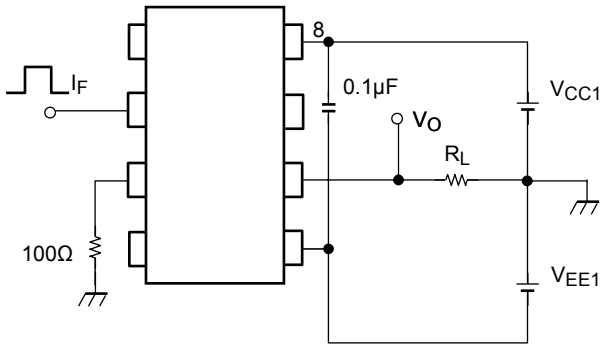
Test Circuit 4 : VOH



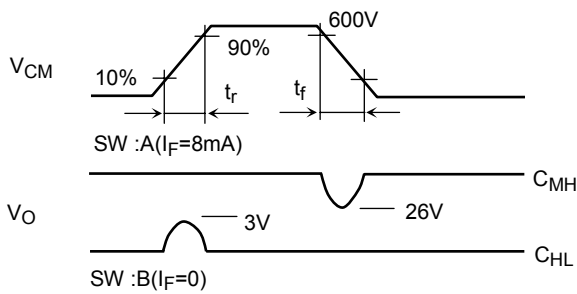
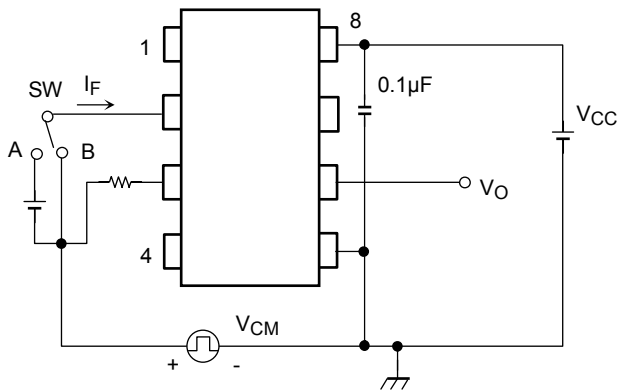
Test Circuit 5 : VOL



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



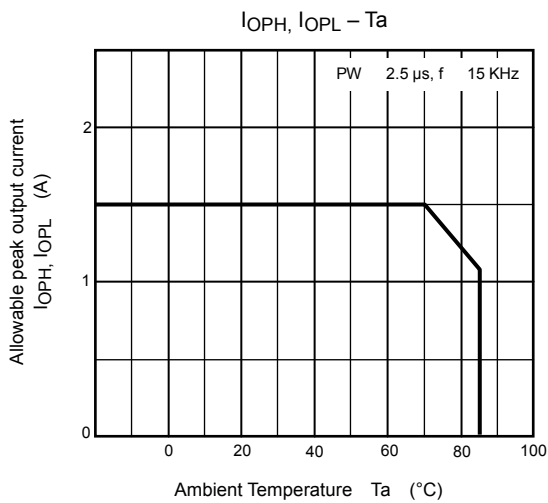
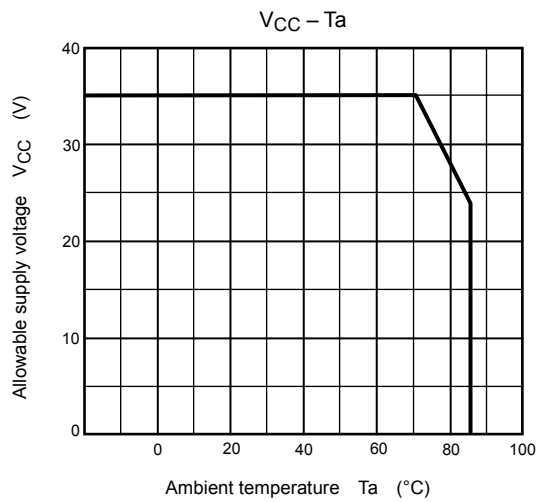
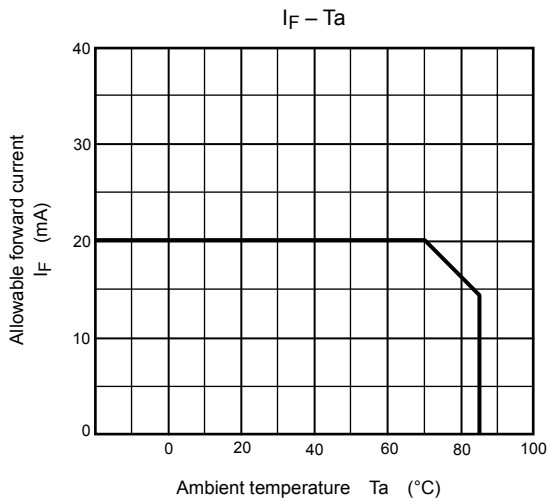
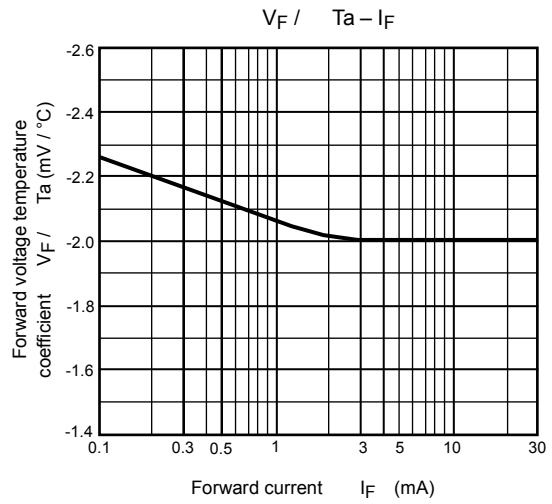
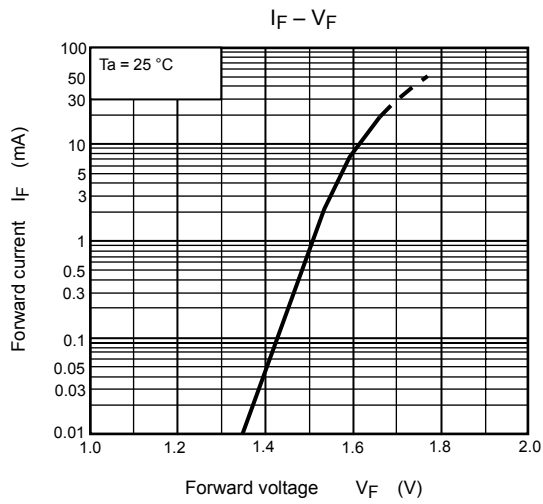
Test Circuit 7:  $C_{MH}$ ,  $C_{ML}$



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

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

$C_{ML}(C_{MH})$  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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