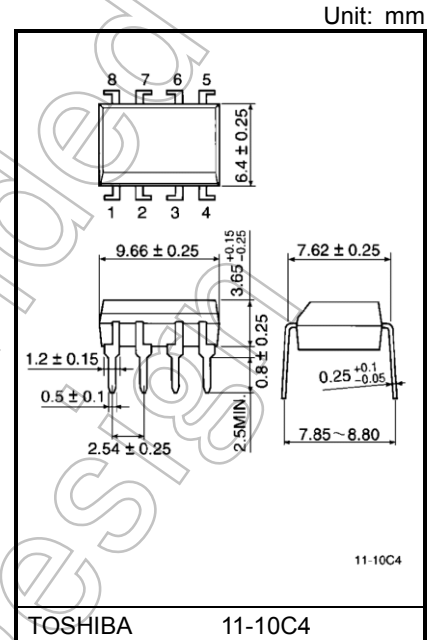


# TLP250

Industrial Inverter  
 Inverter For Air Conditioner  
 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.

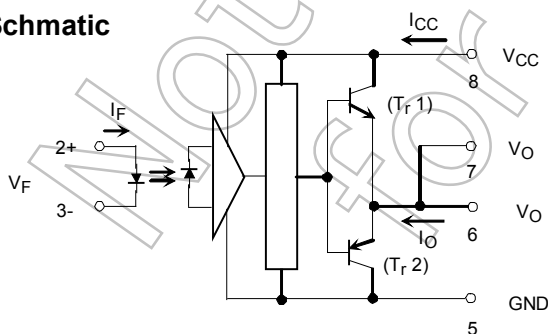
- Input threshold current: 5mA(max)
- Supply current : 11mA(max)
- Supply voltage : 10-35V
- Output current :  $\pm 1.5A$  (max)
- Switching time  $t_{pLH}/t_{pHL}$ : 0.5 $\mu$ s(max)
- Isolation voltage: 2500Vrms(min)
- UL recognized: UL1577, file No.E67349
- c-UL approved : CSA Component Acceptance Service  
 No. 5A, File No.E67349
- Option(D4)  
 VDE Approved : EN60747-5- 5  
**Note: When a EN60747-5-5 approved type is needed,  
 Please designate "Option(D4)"**



### Truth Table

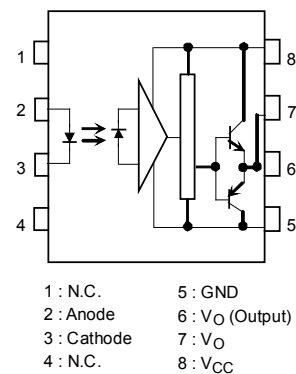
		Tr1	Tr2
Input LED	On	On	Off
	Off	Off	On

### Schematic



A 0.1 $\mu$ F bypass capacitor must be connected between pin 8 and 5

### Pin Configuration (top view)



Start of commercial production  
 1990-11

**Absolute Maximum Ratings (Ta = 25°C)**

Characteristic		Symbol	Rating	Unit	
LED	Forward current	IF	20	mA	
	Forward current derating (Ta ≥ 70°C)	ΔIF / ΔTa	-0.36	mA / °C	
	Peak transient forward current (Note 1)	IFPT	1	A	
	Reverse voltage	VR	5	V	
	Diode power dissipation	PD	40	mW	
	Diode power dissipation derating (Ta ≥ 70°C)	ΔPD / °C	-0.72	mW / °C	
	Junction temperature	TJ	125	°C	
Detector	"H" peak output current (PW ≤ 2.5μs, f ≤ 15kHz) (Note 2)	IOPH	-1.5	A	
	"L" peak output current (PW ≤ 2.5μs, f ≤ 15kHz) (Note 2)	IOPL	+1.5	A	
	Output voltage	(Ta ≤ 70°C)	VO	35	V
		(Ta ≤ 85°C)		24	
	Supply voltage	(Ta ≤ 70°C)	VCC	35	V
		(Ta ≤ 85°C)		24	
	Output voltage derating (Ta ≥ 70°C)	ΔVO / ΔTa	-0.73	V / °C	
	Supply voltage derating (Ta ≥ 70°C)	ΔVCC / ΔTa	-0.73	V / °C	
	Power dissipation	PC	800	mW	
	Power dissipation derating (Ta ≥ 70°C)	ΔPC / °C	-14.5	mW / °C	
	Junction temperature	TJ	125	°C	
Operating frequency (Note 3)	f	25	kHz		
Operating temperature range	Topr	-20 to 85	°C		
Storage temperature range	Tstg	-55 to 125	°C		
Lead soldering temperature (10 s)	Tsol	260	°C		
Isolation voltage (AC, 60 s., R.H. ≤ 60%) (Note 4)	BVS	2500	Vrms		

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.

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: Pulse width PW ≤ 1μs, 300pps

Note 2: Exponential waveform

Note 3: Exponential waveform, IOPH ≤ -1.0A (≤ 2.5μs), IOPL ≤ +1.0A (≤ 2.5μs)

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.

**Recommended Operating Conditions**

Characteristic	Symbol	Min	Typ.	Max	Unit
Input current, on	IF(ON)	7	8	10	mA
Input voltage, off	VF(OFF)	0	—	0.8	V
Supply voltage	VCC	15	—	30	V
Peak output current	IOPH/IOPL	—	—	±0.5	A
Operating temperature	Topr	-20	25	85	°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.

Note : 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.

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

## Electrical Characteristics (Ta = -20 to 70°C, unless otherwise specified)

Characteristic		Symbol	Test Circuit	Test Condition	Min	Typ.*	Max	Unit	
Input forward voltage		V <sub>F</sub>	—	I <sub>F</sub> = 10 mA, Ta = 25°C	—	1.6	1.8	V	
Temperature coefficient of forward voltage		ΔV <sub>F</sub> / ΔTa	—	I <sub>F</sub> = 10 mA	—	-2.0	—	mV / °C	
Input reverse current		I <sub>R</sub>	—	V <sub>R</sub> = 5V, Ta = 25°C	—	—	10	μA	
Input capacitance		C <sub>T</sub>	—	V = 0 V, f = 1MHz, Ta = 25°C	—	45	250	pF	
Output current	"H" level	I <sub>OPH</sub>	1	V <sub>CC</sub> = 30V (Note 1)	I <sub>F</sub> = 10 mA V <sub>8-6</sub> = 4V	-0.5	-1.5	—	A
	"L" level	I <sub>OPL</sub>	2		I <sub>F</sub> = 0 mA V <sub>6-5</sub> = 2.5V	0.5	2	—	
Output voltage	"H" level	V <sub>OH</sub>	3	V <sub>CC1</sub> = +15V, V <sub>EE1</sub> = -15V R <sub>L</sub> = 200Ω, I <sub>F</sub> = 5mA	11	12.8	—	V	
	"L" level	V <sub>OL</sub>	4	V <sub>CC1</sub> = +15V, V <sub>EE1</sub> = -15V R <sub>L</sub> = 200Ω, V <sub>F</sub> = 0.8V	—	-14.2	-12.5		
Supply current	"H" level	I <sub>CCH</sub>	—	V <sub>CC</sub> = 30V, I <sub>F</sub> = 10mA Ta = 25°C	—	7	—	mA	
				V <sub>CC</sub> = 30V, I <sub>F</sub> = 10mA	—	—	11		
	"L" level	I <sub>CCL</sub>	—	V <sub>CC</sub> = 30V, I <sub>F</sub> = 0mA Ta = 25°C	—	7.5	—		
				V <sub>CC</sub> = 30V, I <sub>F</sub> = 0mA	—	—	11		
Threshold input current	"Output L→H"	I <sub>FLH</sub>	—	V <sub>CC1</sub> = +15V, V <sub>EE1</sub> = -15V R <sub>L</sub> = 200Ω, V <sub>O</sub> > 0V	—	1.2	5	mA	
Threshold input voltage	"Output H→L"	V <sub>FHL</sub>	—	V <sub>CC1</sub> = +15V, V <sub>EE1</sub> = -15V R <sub>L</sub> = 200Ω, V <sub>O</sub> < 0V	0.8	—	—	V	
Supply voltage		V <sub>CC</sub>	—	—	10	—	35	V	
Capacitance (input-output)		C <sub>S</sub>	—	V <sub>S</sub> = 0 V, f = 1MHz Ta = 25°C	—	1.0	2.0	pF	
Resistance(input-output)		R <sub>S</sub>	—	V <sub>S</sub> = 500V, Ta = 25°C R.H. ≤ 60%	1×10 <sup>12</sup>	10 <sup>14</sup>	—	Ω	

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

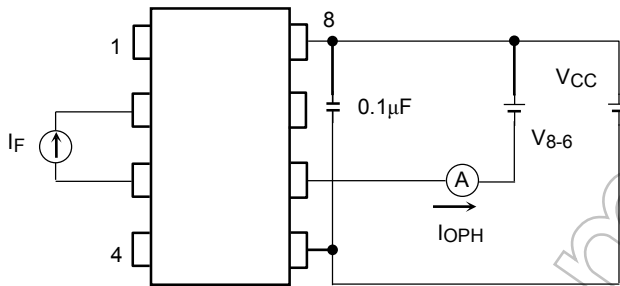
Note 1: Duration of I<sub>O</sub> time ≤ 50μs

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

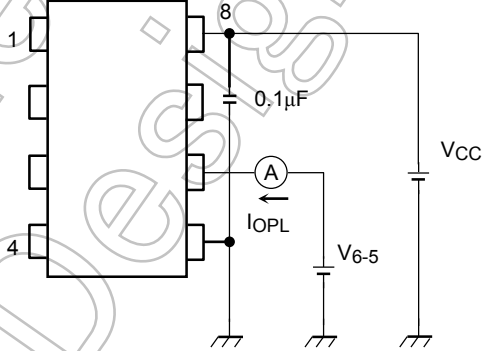
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time	L→H	5	I <sub>F</sub> = 8mA V <sub>CC1</sub> = +15V, V <sub>EE1</sub> = -15V R <sub>L</sub> = 200Ω	—	0.15	0.5	μs
	H→L			—	0.15	0.5	
Common mode transient immunity at high level output	CMH	6	V <sub>CM</sub> = 600V, I <sub>F</sub> = 8mA V <sub>CC</sub> = 30V, Ta = 25°C	-5000	—	—	V / μs
Common mode transient immunity at low level output	CML		V <sub>CM</sub> = 600V, I <sub>F</sub> = 0mA V <sub>CC</sub> = 30V, Ta = 25°C	5000	—	—	V / μs

Note: All typical values are at Ta = 25°C

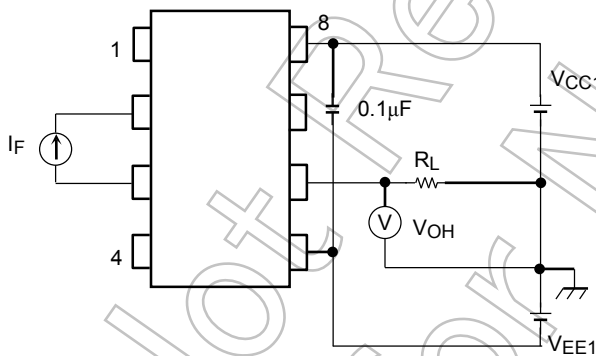
Test Circuit 1 : I<sub>OPH</sub>



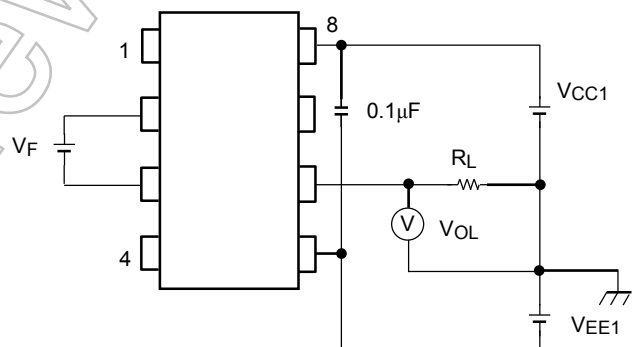
Test Circuit 2 : I<sub>OPL</sub>



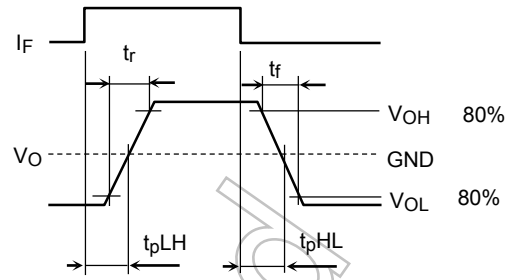
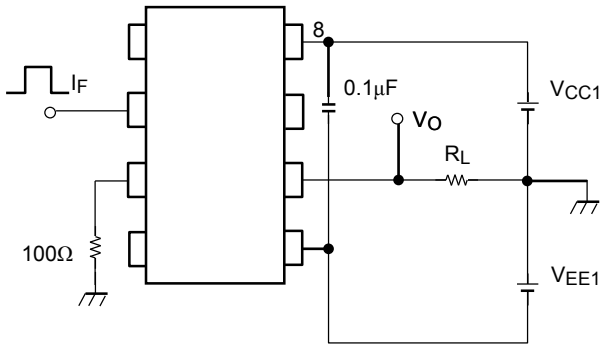
Test Circuit 3 : V<sub>OH</sub>



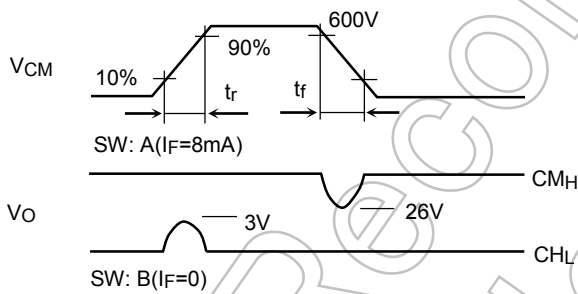
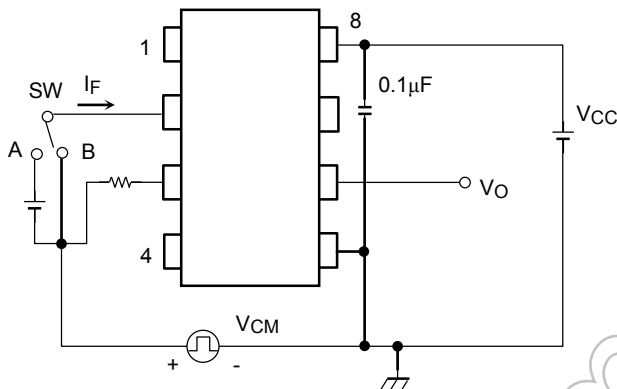
Test Circuit 4 : V<sub>OL</sub>



Test Circuit 5:  $t_{pLH}$ ,  $t_{pHL}$ ,  $t_r$ ,  $t_f$



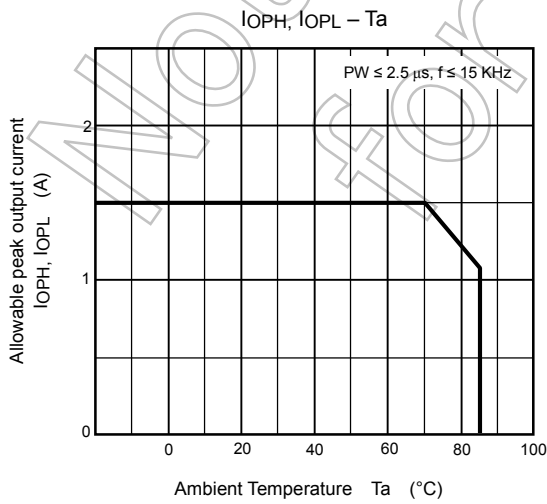
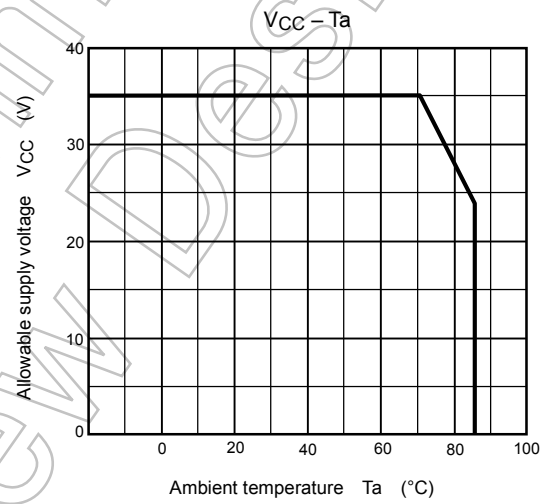
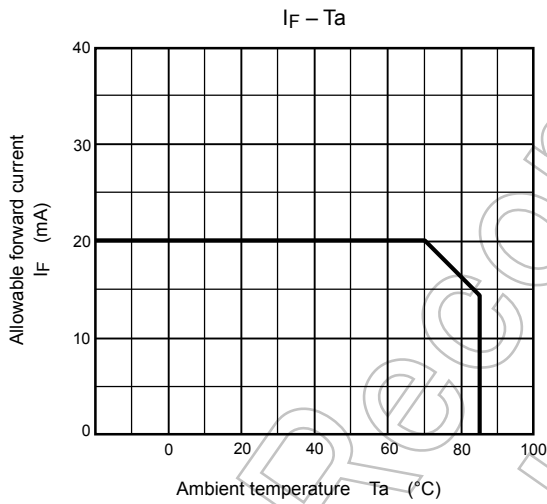
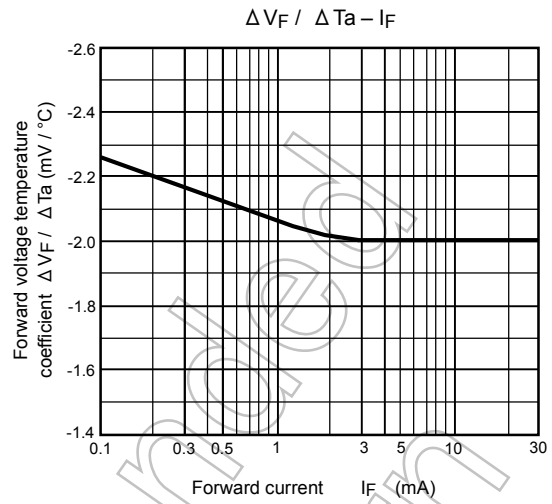
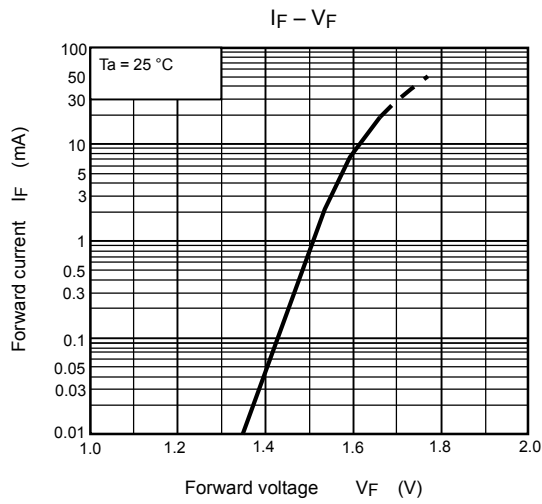
Test Circuit 6:  $CM_H$ ,  $CM_L$



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

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

$CM_L$ ( $CM_H$ ) 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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