

TOSHIBA PHOTOCOUPLER GaAIAs IRED & PHOTO-IC

# TLP250(INV)

TRANSISTOR INVERTER  
 INVERTERS FOR AIR CONDITIONER  
 IGBT GATE DRIVE  
 POWER MOS FET GATE DRIVE

The TOSHIBA TLP250(INV) consists of a GaAIAs light emitting diode and a integrated photodetector.

This unit is 8-lead DIP.

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

- Input Threshold Current :  $I_F=5\text{mA(MAX)}$
- Supply Current( $I_{CC}$ ) :  $11\text{mA(MAX)}$
- Supply Voltage( $V_{CC}$ ) :  $10\sim 35\text{V}$
- Output Current( $I_O$ ) :  $\pm 2.0\text{A(MAX)}$
- Switching Time( $t_{pLH}/t_{pHL}$ ) :  $0.5\mu\text{s(MAX)}$
- Isolation Voltage :  $2500\text{Vrms}$
- UL Recognized : UL1577,File No.E67349
- Option(D4)

VDE Approved : DIN VDE0884/06.92 Certificate No.76823

Maximum Operating Insulation Voltage :  $630\text{V}_{PK}$

Highest Permissible Over Voltage :  $4000\text{V}_{PK}$

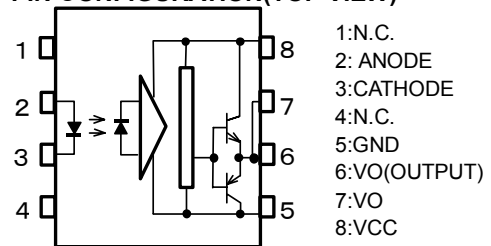
**(Note):When a VDE0884 approved type is needed,  
 Please designate the "Option(D4)"**

- Creepage Distance :  $6.4\text{mm(MIN)}$
- Clearance :  $6.4\text{mm(MIN)}$

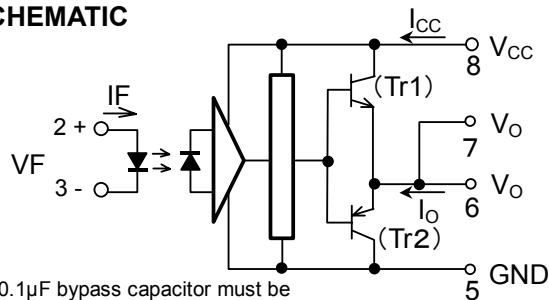
## TRUTH TABLE

		Tr 1	Tr 2
INPUT LED	ON	ON	OFF
	OFF	OFF	ON

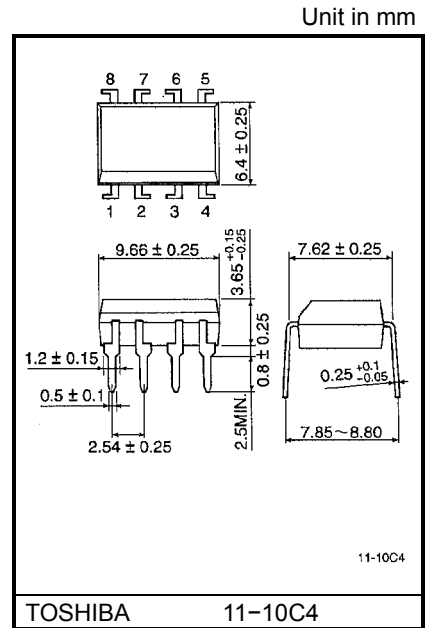
## PIN CONFIGURATION(TOP VIEW)



## SCHEMATIC



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



Weight: 0.54 g

## 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	PW ≤2.5μs , f≤15 kHz	(Note 2)	$I_{OPH}$	-1.5	A
		PW≤1.0μs , f≤15 kHz			-2.0	
	"L" Peak Output Current	PW≤2.5μs , f≤15 kHz		$I_{OPL}$	+1.5	A
		PW ≤1.0μs , f≤15 kHz			+2.0	
	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%,Ta=25°C) (Note 4)			$BV_S$	2500	Vrms	

(Note 1) : Pulse width PW≤1μs,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) : 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 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	$V_{CC}$	15	—	30   20	V
Peak Output Current	$I_{OPH} / I_{OPL}$	—	—	±0.5	A
Operating Temperature	$T_{opr}$	-20	25	70   85	°C

## 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	μA
Input Capacitance		$C_T$	—	$V = 0$ , $f = 1 \text{ MHz}$ , $T_a = 25^\circ\text{C}$	—	45	250	pF
Output Current	“H” Level	$I_{OPH}$	2	$V_{CC} = 30 \text{ V}$ (*1)	-1.0	-1.5	—	A
	“L” Level	$I_{OPL}$	1					
Output Voltage	“H” Level	$V_{OH}$	3	$V_{CC1} = +15 \text{ V}$ $V_{EE1} = -15 \text{ V}$ $R_L = 200\Omega$ , $I_F = 5 \text{ mA}$	11	12.8	—	V
	“L” Level	$V_{OL}$	4					
Supply Current	“H” Level	$I_{CCH}$	—	$V_{CC} = 30 \text{ V}$	—	7	—	mA
	“L” Level	$I_{CCL}$	—		—	7.5	—	mA
Threshold Input Current		L→H	$I_{FLH}$	—	1.2	5	mA	
Threshold Input Voltage		H→L	$V_{FHL}$	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. ≤ 60%	$1 \times 10^{12}$	$10^{14}$	—	Ω

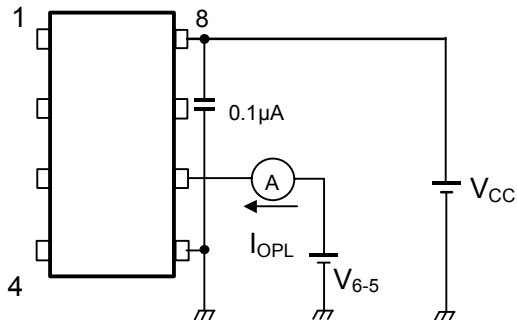
(\*) : All typical values are at  $T_a = 25^\circ\text{C}$

(\*1) : Duration of IO time ≤ 50μs

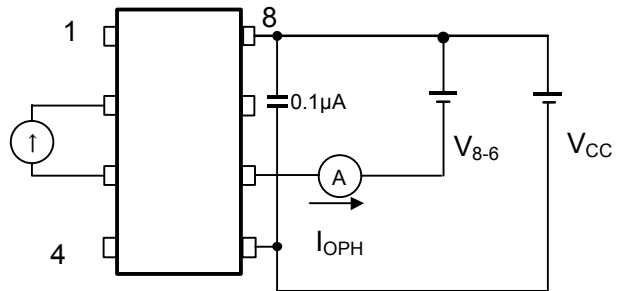
## SWITCHING CHARACTERISTICS (Ta = -20~70°C, Unless otherwise specified)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT	
Propagation Delay Time	L→H	$t_{pLH}$	5	$I_F = 8 \text{ mA}$ , $V_{CC} = 15 \text{ V}$ $R_L = 20\Omega, C_L = 10\text{nF}$	0.05	0.15	0.5	$\mu\text{s}$	
	H→L	$t_{pHL}$			0.05	0.15	0.5		
Switching Time Dispersion between ON and OFF		$ t_{pHL}-t_{pLH} $			—	—	0.45		
Output Rise Time		$t_r$			—	—	—		
Output Fall Time		$t_f$			—	—	—		
Common Mode Transient Immunity at High Level Output		$CM_H$	6	$V_{CM} = 1000 \text{ V}, I_F = 8 \text{ mA}$ $V_{CC} = 30 \text{ V}, T_a = 25^\circ\text{C}$	-15000	—	—	$\text{V}/\mu\text{s}$	
Common Mode Transient Immunity at Low Level Output		$CM_L$			15000	—	—	$\text{V}/\mu\text{s}$	

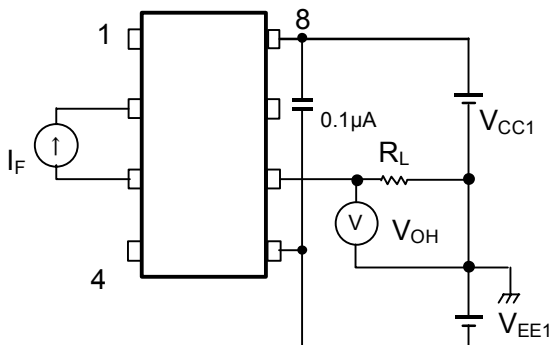
**Fig.1  $I_{OPL}$  TEST CIRCUIT**



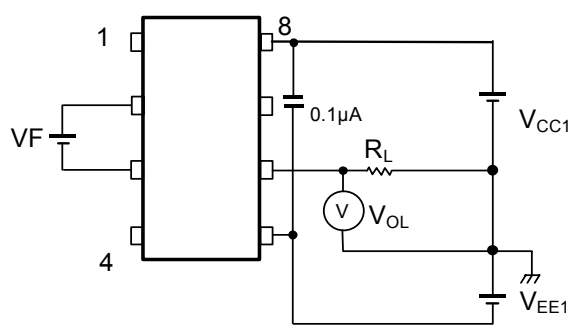
**Fig.2  $I_{OPH}$  TEST CIRCUIT**



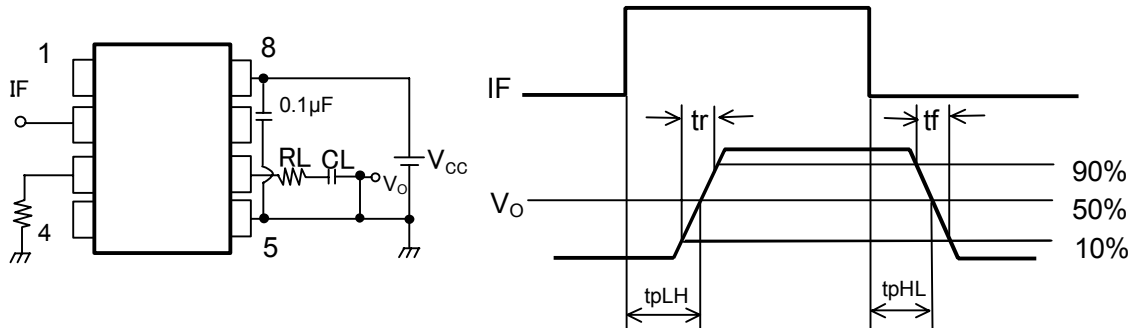
**Fig.3  $V_{OH}$  TEST CIRCUIT**



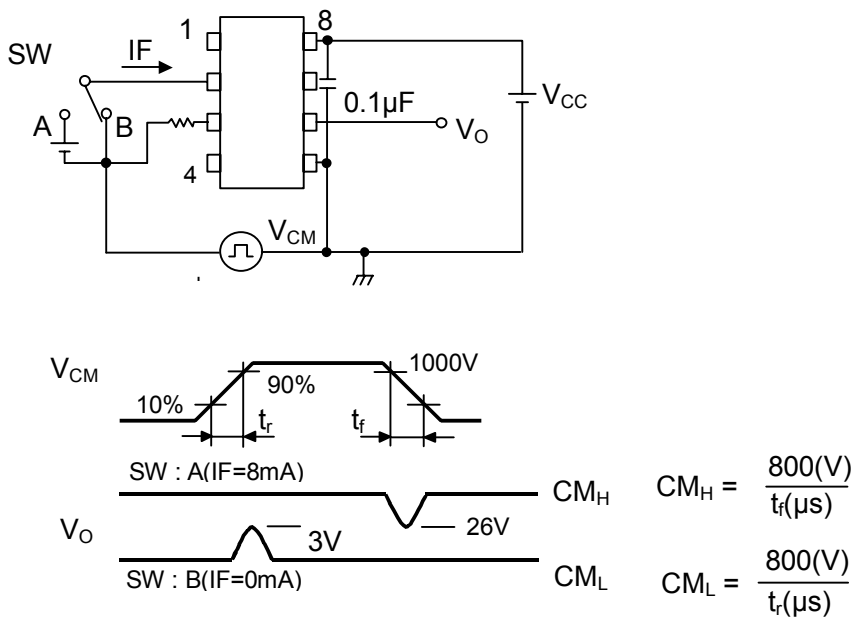
**Fig.4  $V_{OL}$  TEST CIRCUIT**



**Fig.5 tpLH, tpHL, tr, tf TEST CIRCUIT**



**Fig.6 CM<sub>H</sub>, CM<sub>L</sub> TEST CIRCUIT**



CM<sub>L</sub>(CM<sub>H</sub>) 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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