

## TLP250(INV)

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

The TOSHIBA TLP250(INV) consists of a GaAlAs 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 :  $I_F=5\text{mA}(\text{MAX})$
- Supply Current( $I_{CC}$ ) :  $11\text{mA}(\text{MAX})$
- Supply Voltage( $V_{CC}$ ) :  $10\sim 35\text{V}$
- Output Current( $I_O$ ) :  $\pm 2.0\text{A}(\text{MAX})$
- Switching Time( $t_{pLH}/t_{pHL}$ ) :  $0.5\mu\text{s}(\text{MAX})$
- Isolation Voltage :  $2500\text{V}_{\text{rms}}$
- UL Recognized : UL1577,File No.E67349
- Option(D4)

VDE Approved : DIN VDE0884/06.92 Certificate No.76823

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

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

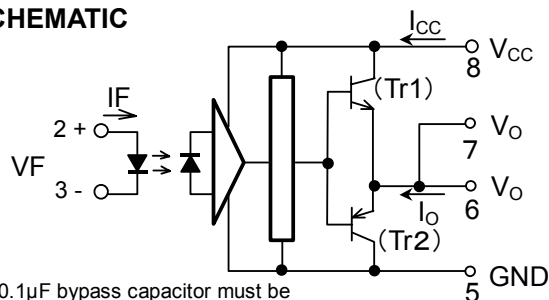
**(Note):When a VDE0884 approved type is needed,  
Please designate the "Option(D4)"**

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

### TRUTH TABLE

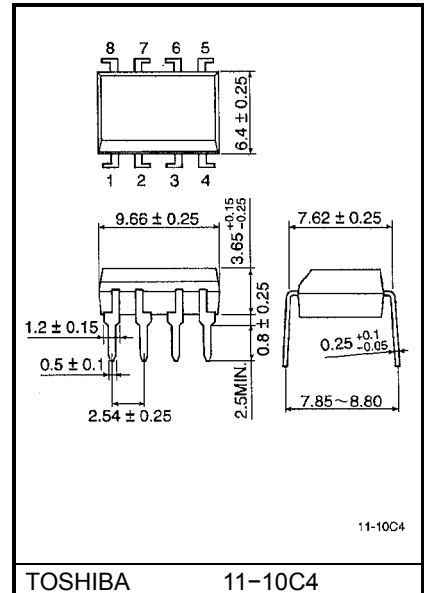
		Tr 1	Tr 2
INPUT LED	ON	ON	OFF
	OFF	OFF	ON

### SCHEMATIC



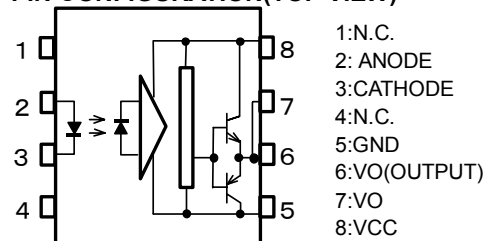
A  $0.1\mu\text{F}$  bypass capacitor must be  
Connected between pin 8 and 5(See Note 5).

Unit in mm



Weight: 0.54 g

### PIN CONFIGURATION(TOP VIEW)



## MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC				SYMBOL	RATING	UNIT	
LED	Forward Current			I <sub>F</sub>	20	mA	
	Forward Current Derating (Ta≥70℃)			ΔI <sub>F</sub> /ΔTa	−0.36	mA /℃	
	Peak Transient Forward Current (Note 1)			I <sub>FPT</sub>	1	A	
	Reverse Voltage			V <sub>R</sub>	5	V	
	Junction Temperature			T <sub>j</sub>	125	℃	
DETECTOR	“H” Peak Output Current		PW ≤2.5μs , f≤15 kHz	(Note 2)	I <sub>OPH</sub>	−1.5	A
			PW≤1.0μs , f≤15 kHz			−2.0	
	“L” Peak Output Current		PW≤2.5μs , f≤15 kHz		I <sub>OPL</sub>	+1.5	A
			PW ≤1.0μs , f≤15 kHz			+2.0	
	Output Voltage		(Ta≤70℃)	V <sub>O</sub>	35	V	
			(Ta=85℃)		24		
	Supply Voltage		(Ta≤70℃)	V <sub>CC</sub>	35	V	
			(Ta=85℃)		24		
	Output Voltage Derating (Ta≥70℃)			ΔV <sub>O</sub> /ΔTa	−0.73	V /℃	
	Supply Voltage Derating (Ta≥70℃)			ΔV <sub>CC</sub> /ΔTa	−0.73	V /℃	
	Junction Temperature			T <sub>j</sub>	125	℃	
Operating Frequency (Note 3)				f	25	kHz	
Operating Temperature Range				T <sub>opr</sub>	−20~85	℃	
Storage Temperature Range				T <sub>stg</sub>	−55~125	℃	
Lead Soldering Temperature(10s)				T <sub>sol</sub>	260	℃	
Isolation Voltage (AC,1min., R.H. ≤60%,Ta=25℃) (Note 4)				BV <sub>S</sub>	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 <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> = 5 V, Ta = 25°C		—	—	10	μA
Input Capacitance		C <sub>T</sub>	—	V = 0, f = 1 MHz, Ta = 25°C		—	45	250	pF
Output Current	“H” Level	I <sub>OPH</sub>	2	V <sub>CC</sub> = 30 V  (*1)	I <sub>F</sub> = 10 mA V <sub>8-6</sub> = 4 V	-1.0	-1.5	—	A
	“L” Level	I <sub>OPL</sub>	1		I <sub>F</sub> = 0 V <sub>6-5</sub> = 2.5 V	1.0	2	—	
Output Voltage	“H” Level	V <sub>OH</sub>	3	V <sub>CC1</sub> = +15 V V <sub>EE1</sub> = -15 V R <sub>L</sub> = 200Ω, I <sub>F</sub> = 5 mA		11	12.8	—	V
	“L” Level	V <sub>OL</sub>	4	V <sub>CC1</sub> = +15 V V <sub>EE1</sub> = -15 V R <sub>L</sub> = 200Ω, V <sub>F</sub> = 0.8 V		—	-14.2	-12.5	
Supply Current	“H” Level	I <sub>CCH</sub>	—	V <sub>CC</sub> = 30 V	I <sub>F</sub> = 10 mA Ta = 25°C	—	7	—	mA
					I <sub>F</sub> = 10 mA	—	—	11	
	“L” Level	I <sub>CCL</sub>	—		I <sub>F</sub> = 0 mA Ta = 25°C	—	7.5	—	mA
					I <sub>F</sub> = 0 mA	—	—	11	
Threshold Input Current	L→H	I <sub>FLH</sub>	—	V <sub>CC1</sub> = +15 V V <sub>EE1</sub> = -15 V R <sub>L</sub> = 200Ω, V <sub>O</sub> > 0V		—	1.2	5	mA
Threshold Input Voltage	H→L	V <sub>FHL</sub>		V <sub>CC1</sub> = +15 V V <sub>EE1</sub> = -15 V 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, f = 1 MHz, Ta = 25°C		—	1.0	2.0	pF
Resistance (Input-Output)		R <sub>S</sub>	—	V <sub>S</sub> = 500 V, Ta = 25°C R.H.≤60%		1×10 <sup>12</sup>	10 <sup>14</sup>	—	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		$CM_L$		$V_{CM} = 1000\text{ V}$ , $I_F = 0\text{ mA}$ $V_{CC} = 30\text{ V}$ , $T_a = 25^\circ\text{C}$	15000	—	—	$\text{V}/\mu\text{s}$

Fig.1  $I_{OPL}$  TEST CIRCUIT

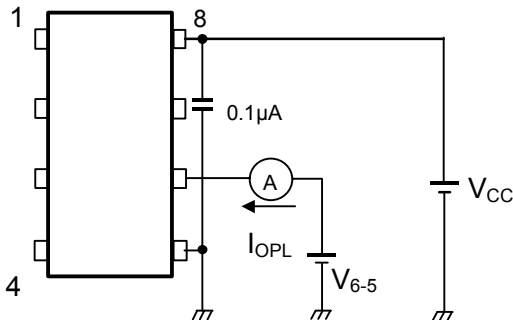


Fig.2  $I_{OPH}$  TEST CIRCUIT

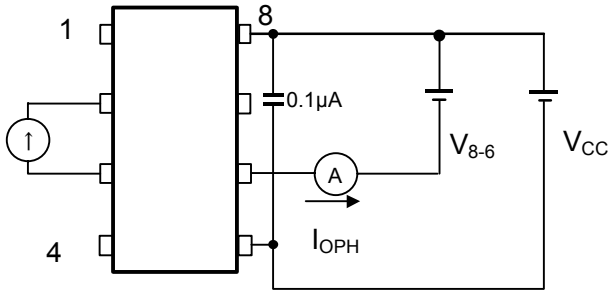


Fig.3  $V_{OH}$  TEST CIRCUIT

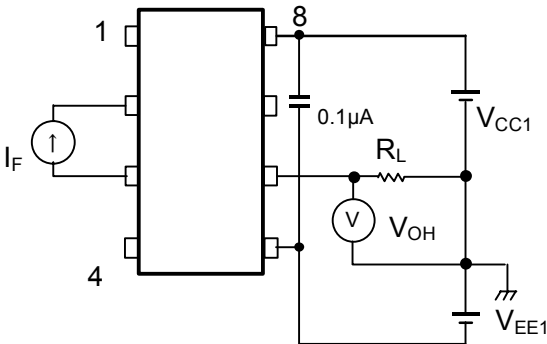


Fig.4  $V_{OL}$  TEST CIRCUIT

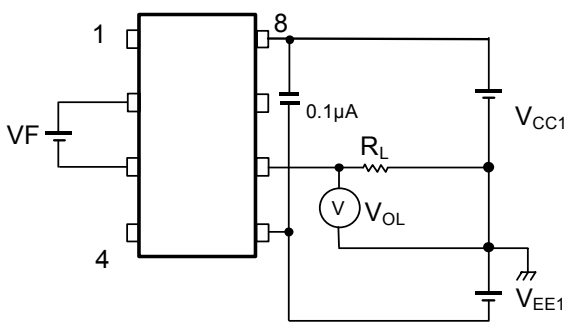


Fig.5  $t_{pLH}$ ,  $t_{pHL}$ ,  $t_r$ ,  $t_f$  TEST CIRCUIT

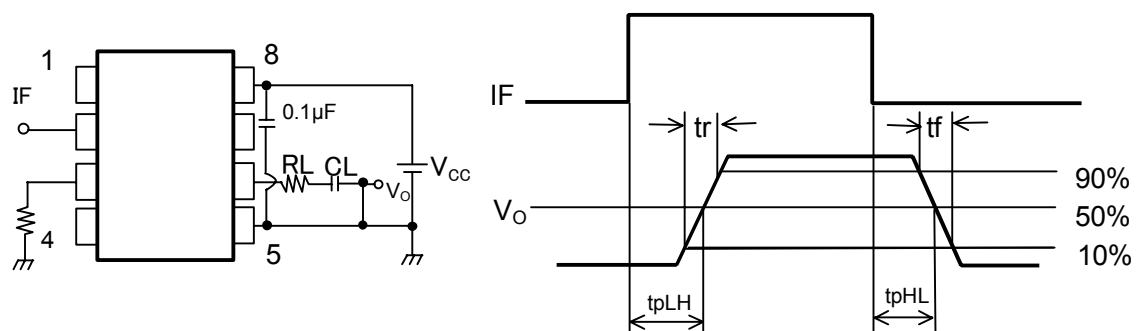
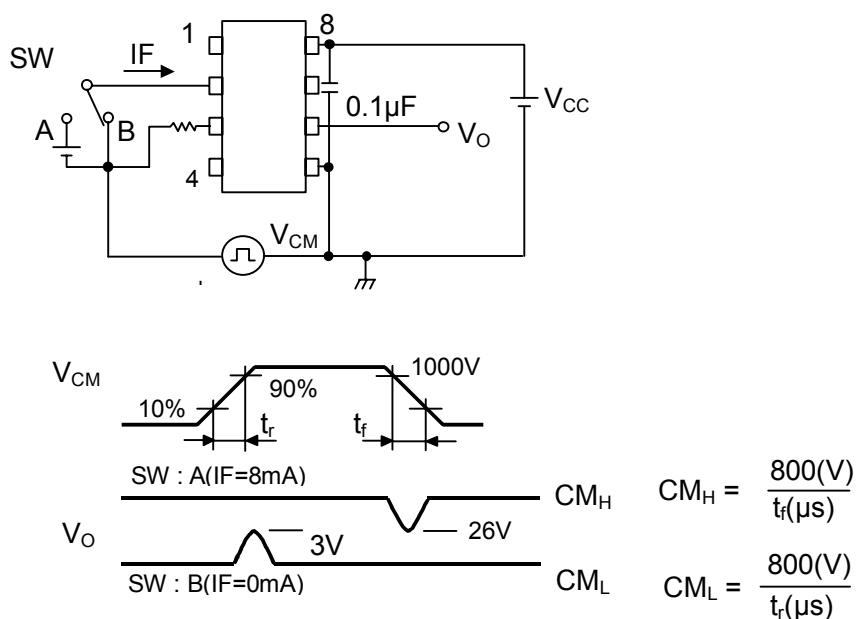


Fig.6  $CM_H$ ,  $CM_L$  TEST CIRCUIT



$CM_L(CM_H)$  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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