# TOSHIBA

## GaAs IRED & PHOTO-IC

**Transistor Inverter** 

Inverter for Air Conditioner

## **IGBT Gate Drive**

## **Power MOSFET Gate Drive**

The Toshiba TLP250 consists of a GaA $\ell$ As light emitting diode and an integrated photodetector. This unit is in an 8-lead DIP package. TLP250 is suitable for the gate driving circuit of an IGBT or power MOSFET.

- Input Threshold Current  $: I_F = 5mA (Max.)$
- Supply Current (I<sub>CC</sub>) : 11mA (Max.)
- Supply Voltage (V<sub>CC</sub>) : 10-35V
- Output Current (I<sub>O</sub>)
- Switching Time (t<sub>pLH</sub>/t<sub>pHL</sub>)
- Isolation VoltageUL Recognized
- : 0.5µs (Max.) : 2500V<sub>rms</sub> (Min.)

: ±0.5A (Min.)

: UL1577, File No. E67349

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

• Option (D4) type VDE Approved: DIN VDE0884/06.92, Certificate No. 76823 Maximum Operating Insulation Voltage: 630  $V_{PK}$  Highest Permissible Over Voltage : 4000  $V_{PK}$ 

<ul> <li>Creepage Distance</li> </ul>	: 6.4mm (Min.)
Clearance	: 6.4mm (Min.)

TOSHIBA CORPORATION

The information contained here is subject to change without notice.

9.66±0.25	0.25 - 0.00
JEDEC -	-
EIAJ -	-
TOSHIBA 11-1	0C4
Weight: 0.54g	

Supplementary Information	Page (s)
Lead Form Options	31-32
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#### Unit in mm

**TLP250** 

#### Schematic



Pin Configuration (Top View)



#### **Truth Table**

		Tr1	Tr2
Input LED	ON	ON	OFF
	OFF	OFF	ON

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

CHARACTERISTIC			SYMBOL	RATING	UNIT	
Forward Current				20	mA	
	Forward Current Derating (Ta $\ge$ 70°C)		∆I <sub>F</sub> /∆Ta	-0.36	mA/°C	
LED	Peak Transient Forward Current	(Note 1)	I <sub>PFT</sub>	1	A	
	Reverse Voltage		V <sub>R</sub>	5	V	
	Junction Temperature		Tj	125	°C	
	"H" Peak Output Current (P <sub>W</sub> ≤2.5µs, f≤15kHz)	(Note 2)	I <sub>OPH</sub>	-1.5	A	
	"L" Peak Output Current (P <sub>W</sub> ≤2.5μs, f≤15kHz)	(Note 2)	I <sub>OPL</sub>	+1.5	A	
		(Ta ≤ 70°C)	V.	35	V	
		(Ta = 85°C)	O	24	v	
DETECTOR	Supply Voltage	(Ta ≤ 70°C)	Vaa	35	V	
	Supply voltage	(Ta = 85°C)	V CC	24	v	
	Output Voltage Derating (Ta $\ge$ 70°C)	ΔV <sub>O</sub> /ΔTa	-0.73	V/°C		
	Supply Voltage Derating (Ta $\ge$ 70°C)		ΔV <sub>CC</sub> /ΔTa	-0.73	V/°C	
	Junction Temperature		(T <sub>j</sub> )	125	°C	
Operating Frequency (Note 3)		(Note 3)	f	25	kHz	
Operating Temperature Range			T <sub>opr</sub>	-20~85	°C	
Storage Temperature Range		T <sub>stg</sub>	-55~125	°C		
Lead Solder Temperature (10s)			T <sub>sol</sub>	260	°C	
Isolation Voltag	ge (AC, 1 min., R.H. ≤ 60%, Ta = 25°C)	(Note 4)	BVS	2500	V <sub>rms</sub>	

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

Note 2: Exporential Waveform

Note 3: Exporential Waveform,  $I_{OPH} \le -1.0A$  ( $\le 2.5\mu s$ ),  $I_{OPL} \le + 1.0A$  ( $\le 2.5\mu s$ )

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 betwene capacitor and coupler should not exceed 1 cm.

#### **Recommended Operating Conditions**

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MX.		UNIT
Input Current, ON	I <sub>F(ON)</sub>	7	8	1	mA	
Input Voltage, OFF	V <sub>F(OFF)</sub>	0	_	0.8		V
Supply Voltage	V <sub>CC</sub>	15	_	30 20		V
Peak Output Current	I <sub>OPH</sub> /I <sub>OPL</sub>	_	_	±0.5		А
Operating Temperature	T <sub>opr</sub> -20		25	70	85	°C

### Electrical Characteristics (Ta = -20~70°C, Unless otherwise specified)

CHARACTE	RISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.*	MX.	UNIT	
Input Forward Volt	tage	V <sub>F</sub>	_	I <sub>F</sub> = 10mA, Ta = 25°C	-	1.6	1.8	V	
Temperature Coef ward Voltage	ficient of For-	ΔV <sub>F</sub> /ΔTa	_	I <sub>F</sub> = 10mA	_	-2.0	_	mV/°C	
Input Reverse Cu	rrent	I <sub>R</sub>	-	V <sub>R</sub> = 5V, Ta = 25°C	-	-	10	μA	
Input Capacitance	)	CT	-	V = 0, f = 1MHz, Ta = 25°C	-	45	250	pF	
	"H" Level	I <sub>OPH</sub>	3	$V_{8-6} = 30V(*1)$ $I_F = 10mA$ $V_{8-6} = 4V$	-0.5	-1.5	_	- A - V	
Output Outrent	"L" Level	I <sub>OPL</sub>	2	$I_{\rm F} = 0$ $V_{6-5} = 2.5V$	0.5	2	_		
	"H" Level	V <sub>OH</sub>	4	$V_{CC1}$ = +15V, $V_{EE1}$ = -15V R <sub>L</sub> = 200 $\Omega$ , I <sub>F</sub> = 5mA	11	12.8	_		
Output voltage	"L" Level	V <sub>OL</sub>	5	$V_{CC1} = +15V, V_{EE1} = -15V$ $R_L = 200\Omega, V_F = 0.8V$	-	-14.2	-12.5		
"H" Level	"H" Level	Іссн	_	$V_{CC} = 30V$ , $I_F = 10mA$ Ta = 25°C	-	7	-		
				$V_{CC} = 30V, I_F = 10mA$	-	-	11		
Supply Current	"L" Level	I <sub>CCL</sub>	_	$V_{CC} = 30V, I_F = 0mA$ 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>	_	$V_{CC1} = +15V, V_{EE1} = -15V$ $R_{L} = 200\Omega, V_{O} \ge 0V$	-	1.2	5	mA	
Threshold Input Voltage	"Output H→L"	V <sub>FHL</sub>	-	$V_{CC1} = +15V, V_{EE1} = -15V$ $R_L = 200\Omega, V_O \le 0V$	0.8	-	-	V	
Supply Voltage	Supply Voltage V <sub>CC</sub> –			10	-	35	V		
Capacitance (Inpu	ut-Output)	CS	_	V <sub>S</sub> = 0, 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%	5 x 10 <sup>10</sup>	10 <sup>14</sup>	_	Ω	

\*All typical values are at Ta =  $25^{\circ}C$ 

(\*1) : Duration of  $I_0$  time  $\leq 50\mu s$ 

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

CHARACTERI	CHARACTERISTIC		SYMBOL TEST CONDITION		MIN.	TYP.*	MX.	UNIT	
Propagation Delay	L→H	t <sub>pLH</sub>	$I_{F} = 8mA$			_	0.15	0.5	
Time	H→L	t <sub>pHL</sub>		_	0.15	0.5			
Output Rise Time	tput Rise Time $t_r$ $V_{CC1} = +15V, V_{EE1} = -15V$ $R_1 = 200\Omega$		_	_	_	μο			
Output Fall Time		t <sub>f</sub>		-	_	_	_		
Common Mode Trans Immunity at High Leve	Common Mode Transient mmunity at High Level Output $C_{MH}$ 7 $V_{CM} = 600V$ , $I_F = 8mA$ $V_{CC} = 30V$ , $Ta = 25^{\circ}C$		-5000	_	_	V/µs			
Common Mode Transient Immunity at Low Level Output		C <sub>ML</sub>	7	$V_{CM} = 600V$ , $I_F = 0mA$ $V_{CC} = 30V$ , $Ta = 25^{\circ}C$	5000	_	-	V/µs	

\*All typical values are at Ta =  $25^{\circ}$ C

TEST CIRCUIT 1 :

TEST CIRCUIT 2 : IOPL





TEST CIRCUIT 3 : IOPH

TEST CIRCUIT 4 : VOH





TEST CIRCUIT 5 : VOL



TEST CIRCUIT 6 : tpLH, tpHL, tr, tf





TEST CIRCUIT 7 : CMH, CML



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



