

(TLP251)

INVERTER FOR AIR CONDITIONOR
INDUCTION HEATING
TRANSISTOR INVERTER
POWER MOS FET GATE DRIVE
IGBT GATE DRIVE

The Toshiba TLP251 consists of a GaAlAs light emitting diode and a integrated photodetector.

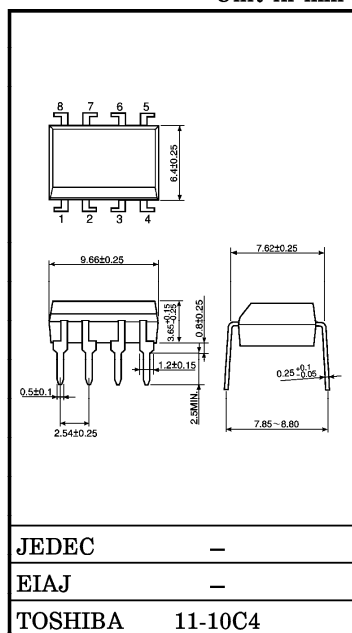
This unit is 8-lead DIP package.

TLP251 is suitable for gate driving circuit of IGBT or power MOS FET. Especially TLP251 is capable of "direct" gate drive of lower power IGBTs. (~15A)

*** Target Specifications ***

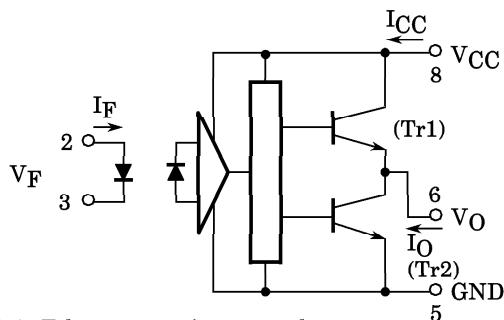
- Input Threshold Current : $I_F = 5\text{mA (Max.)}$
- Supply Current (I_{CC}) : 11mA (Max.)
- Supply Voltage (V_{CC}) : $10\text{--}35\text{V}$
- Output Current (I_O) : $\pm 0.1\text{A (Min.)}$
- Switching Time (t_{pLH}/t_{pHL}) : $1\mu\text{s (Max.)}$
- Isolation Voltage : 2500Vrms (Min.)

Unit in mm



Weight : 0.54g

SCHMATIC

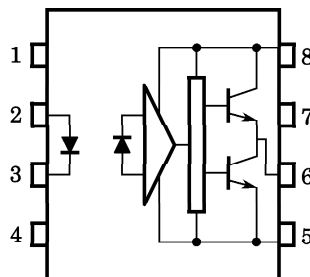


A $0.1\mu\text{F}$ bypass capacitor must be connected between pin 8 and 5 (See note 5).

TRUTH TABLE

		Tr1	Tr2
Input LED	ON	ON	OFF
	OFF	OFF	ON

PIN CONFIGURATION (TOP VIEW)



- 1 : N.C.
- 2 : ANODE
- 3 : CATHODE
- 4 : N.C.
- 5 : GND
- 6 : V_O (OUTPUT)
- 7 : N.C.
- 8 : V_{CC}

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ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC			SYMBOL	RATING	UNIT
LED	Forward Current		I _F	20	mA
	Forward Current Derating (Ta≥ 70°C)		ΔI _F / ΔTa	−0.36	mA / °C
	Peak Transient Forward Curent (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 ≤2.0μs, f≤15kHz)(Note 2)		I _{OPH}	−0.4	A
	“L” Peak Output Current (P _W ≤2.0μs, f≤15kHz)(Note 2)		I _{OPL}	+0.4	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)		ΔV _O / ΔTa	−0.73	V / °C
	Supply Voltage Derating (Ta≥ 70°C)		ΔV _{CC} / ΔTa	−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 Solder 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, $I_{OPH} \leq -0.25A (\leq 2.0\mu s)$, $I_{OPL} \leq +0.25A (\leq 2.0\mu s)$

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}	10	—	30 20	V
Peak Output Current	I_{OPH} / I_{OPL}	—	—	±0.1	A
Operating Temperature	Topr	-20	25	70 85	°C

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

CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.*	MAX.	UNIT
Input Forward Voltage		V _F	—	I _F =10mA, Ta=25°C		—	1.6	1.8	V
Temperature Coefficient of Forward Voltage		ΔV _F /ΔTa	—	I _F =10mA		—	−2.0	—	mV/°C
Input Reverse Current		I _R	—	V _R =5V, Ta=25°C		—	—	10	μA
Input Capacitance		C _T	—	V=0, f=1MHz, Ta=25°C		—	45	250	pF
Output Current	“H” Level	I _{OPH}	3	V _{CC} =30V (*1)	I _F =10mA V ₈₋₆ =4V	−0.1	−0.25	—	A
	“L” Level	I _{OPL}	2		I _F =0 V ₆₋₅ =2.5V	0.1	0.2	—	
Output Voltage	“H” Level	V _{OH}	4	V _{CC1} =+15V, V _{EE1} =−15V R _L =200Ω, I _F =5mA		11	13.2	—	V
	“L” Level	V _{OL}	5	V _{CC1} =+15V, V _{EE1} =−15V R _L =200Ω, V _F =0.8V		—	−14.5	−12.5	
Supply Current	“H” Level	I _{CCH}	—	V _{CC} =30V, I _F =10mA Ta=25°C		—	7.5	—	mA
				V _{CC} =30V, I _F =10mA		—	—	11	
	“L” Level	I _{CCCL}	—	V _{CC} =30V, I _F =0mA Ta=25°C		—	8	—	
				V _{CC} =30V, I _F =0mA		—	—	11	
Threshold Input Current	“Output L→H”	I _{FLH}	—	V _{CC1} =+15V, V _{EE1} =−15V R _L =200Ω, V _O >0V		—	1.2	5	mA
Threshold Input Voltage	“Output H→L”	V _{FHL}		V _{CC1} =+15V, V _{EE1} =−15V R _L =200Ω, V _O <0V		0.8	—	—	V
Supply Voltage		V _{CC}	—			10	—	35	V
Capacitance (Input-Output)		C _S	—	Vs=0, f=1MHz Ta=25°C		—	1.0	2.0	pF
Resistance (Input-Output)		R _S	—	Vs=500V, Ta=25°C R.H.≤60%		5×10 ¹⁰	10 ¹²	—	Ω

* All typical values are at Ta = 25°C (*1) : Duration of I_O time ≤ 50μs

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SWITCHING CHARACTERISTICS ($T_a = -20 \sim 70^\circ\text{C}$, Unless otherwise specified)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.*	MAX.	UNIT
Propagation Delay Time	L→H	t_{pLH}	6	$I_F = 8\text{mA}$ $V_{CC1} = +15\text{V}$, $V_{EE1} = -15\text{V}$ $R_L = 200\Omega$	—	0.25	1.0	μs
	H→L	t_{pHL}			—	0.25	1.0	
Output Rise Time		t_r			—	—	—	
Output Fall Time		t_f			—	—	—	
Common Mode Transient Immunity at High Level Output		C_{MH}	7	$V_{CM} = 600\text{V}$, $I_F = 8\text{mA}$ $V_{CC} = 30\text{V}$, $T_a = 25^\circ\text{C}$	−5000	—	—	$\text{V} / \mu\text{s}$
Common Mode Transient Immunity at Low Level Output		C_{ML}	7	$V_{CM} = 600\text{V}$, $I_F = 0\text{mA}$ $V_{CC} = 30\text{V}$, $T_a = 25^\circ\text{C}$	5000	—	—	$\text{V} / \mu\text{s}$

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

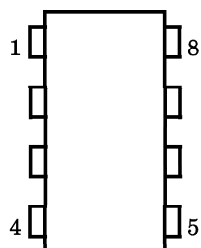
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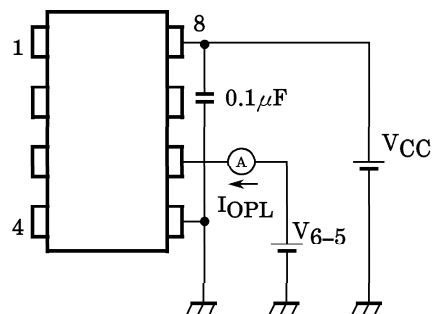
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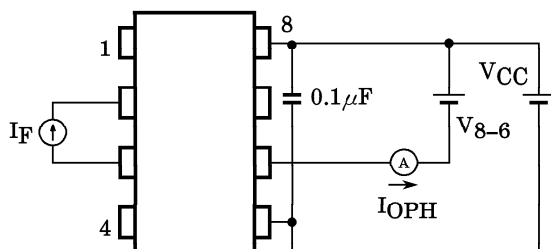
TEST CIRCUIT 1 :



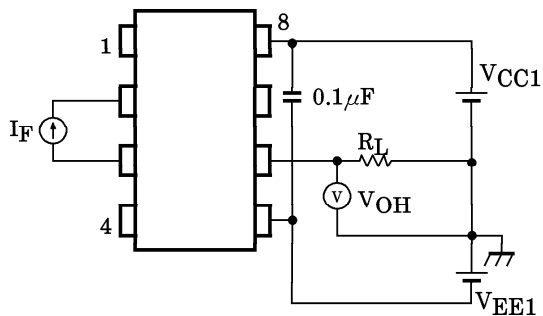
TEST CIRCUIT 2 : I_{OPL}



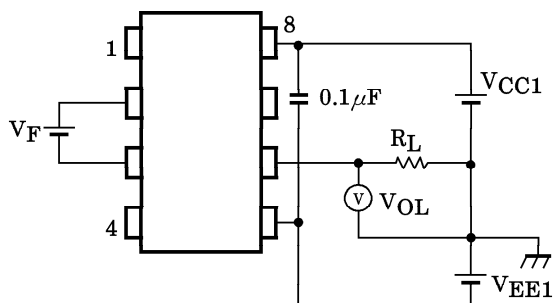
TEST CIRCUIT 3 : I_{OPH}



TEST CIRCUIT 4 : V_{OH}



TEST CIRCUIT 5 : V_{OL}



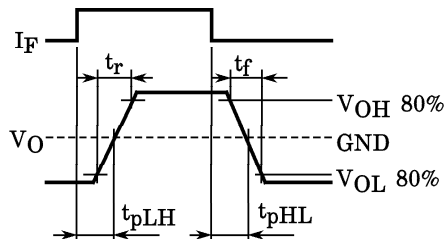
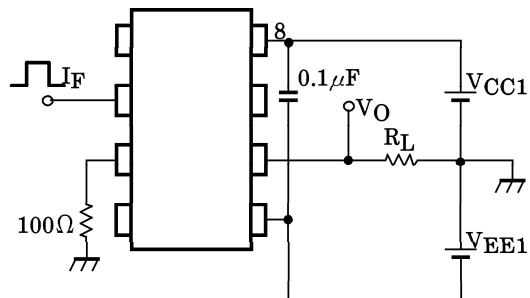
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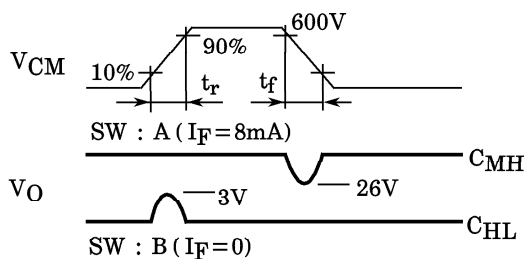
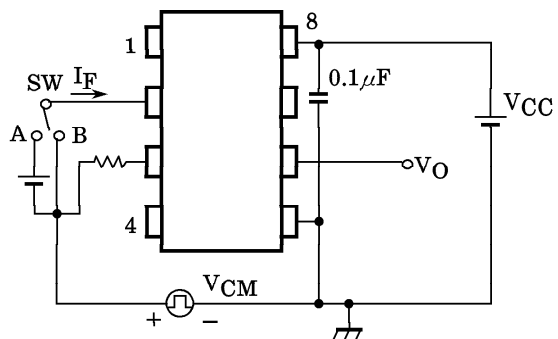
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TEST CIRCUIT 6 : t_{pLH} , t_{pHL} , t_r , t_f



TEST CIRCUIT 7 : C_{MH} , C_{ML}



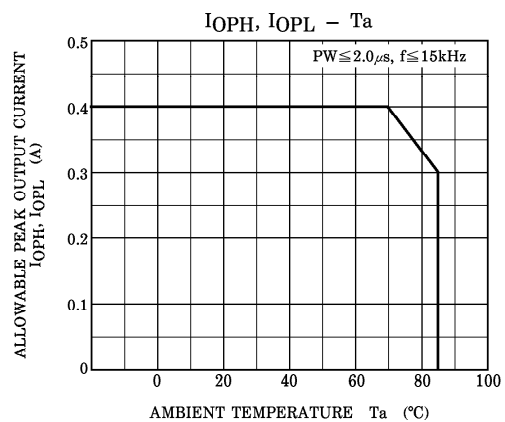
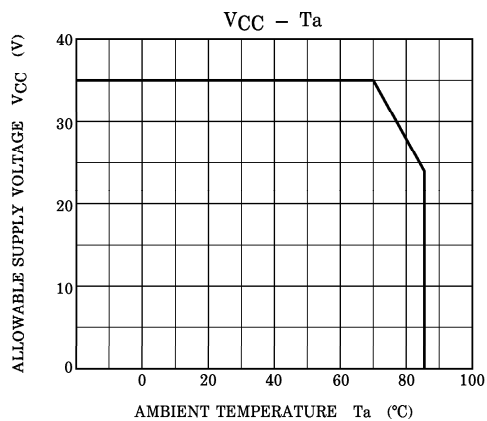
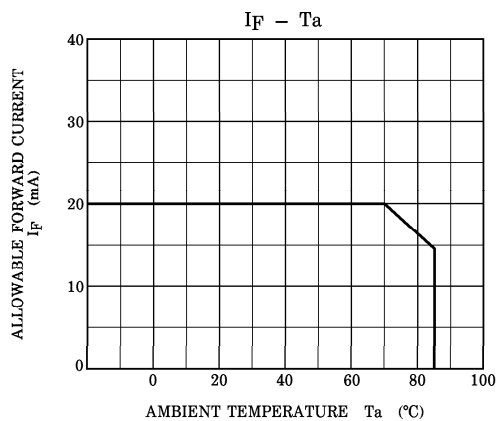
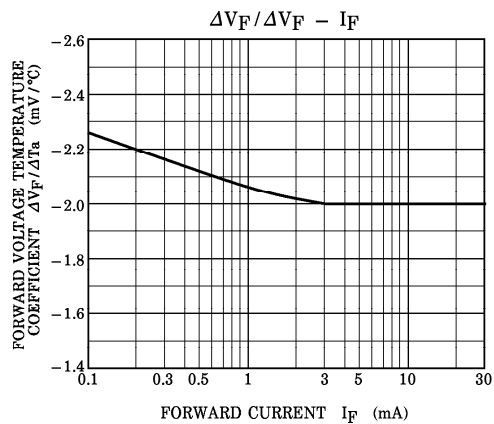
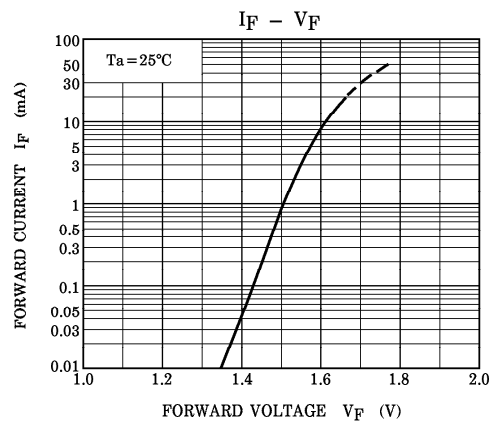
$$C_{ML} = \frac{480(V)}{t_r(\mu s)}$$

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

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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