TOSHIBA SEMICONDUCTOR TECHNICAL DATA

TOSHIBA PHOTOCOUPLER

TLP251

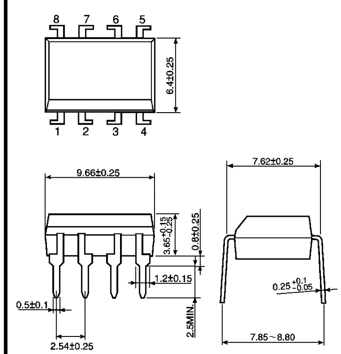
GaAℓAs IRED & PHOTO-IC

(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)

Unit in mm



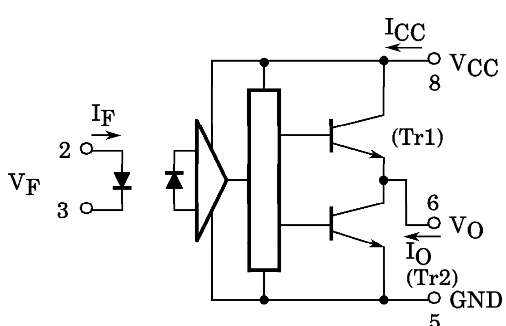
JEDEC	–
EIAJ	–
TOSHIBA	11-10C4

Weight : 0.54g

* Target Specifications *

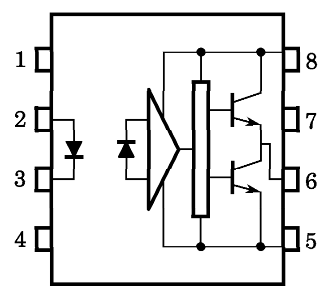
- Input Threshold Current : I_F = 5mA (Max.)
- Supply Current (I_{CC}) : 11mA (Max.)
- Supply Voltage (V_{CC}) : 10–35V
- Output Current (I_O) : ±0.1A (Min.)
- Switching Time (t_{pLH}/t_{pHL}) : 1μs (Max.)
- Isolation Voltage : 2500Vrms (Min.)

SCHMATIC



A 0.1μF bypass capcitor must be connected between pin 8 and 5 (See note 5).

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}

TRUTH TABLE

		Tr1	Tr2
Input LED	ON	ON	OFF
	OFF	OFF	ON

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ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

	CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current		I_F	20	mA
LED	Forward Current Derating (Ta≧70°C)		$\Delta I_F / \Delta Ta$	−0.36	mA / °C
LED	Peak Transient Forward Curent (Note 1)		I_{FPT}	1	A
LED	Reverse Voltage		V_R	5	V
LED	Junction Temperature		(T_j)	125	°C
DETECTOR	"H" Peak Output Current (P_W≦2.0μs, f≦15kHZ)(Note 2)		I_{OPH}	−0.4	A
DETECTOR	"L" Peak Output Current (P_W≦2.0μs, f≦15kHZ)(Note 2)		I_{OPL}	+0.4	A
DETECTOR	Output Voltage	(Ta≦70°C)	V_O	35	V
DETECTOR		(Ta=85°C)		24	
DETECTOR	Supply Voltage	(Ta≦70°C)	V_{CC}	35	V
DETECTOR		(Ta=85°C)		24	
DETECTOR	Output Voltage Derating (Ta≧70°C)		$\Delta V_O / \Delta Ta$	−0.73	V / °C
DETECTOR	Supply Voltage Derating (Ta≧70°C)		$\Delta V_{CC} / \Delta Ta$	−0.73	V / °C
DETECTOR	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 P_W≦1μs, 300pps

Note 2 : Exporential Waveform

Note 3 : Exporential Waveform, I_{OPH}≦−0.25A (≦2.0μs), I_{OPL}≦+0.25A (≦2.0μs)

Note 4 : Device considerd 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	T_{opr}	−20	25	70	85	°C

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

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION		MIN.	TYP.*	MAX.	UNIT
Input Forward Voltage		V_F	—	$I_F = 10mA$, $Ta = 25°C$		—	1.6	1.8	V
Temperature Coefficient of Forward Voltage		$\Delta V_F / \Delta Ta$	—	$I_F = 10mA$		—	−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)	$I_F = 10mA$, $V_{8\text{-}6} = 4V$	−0.1	−0.25	—	A
	"L" Level	I_{OPL}	2		$I_F = 0$, $V_{6\text{-}5} = 2.5V$	0.1	0.2	—	
Output Voltage	"H" Level	V_{OH}	4	$V_{CC1} = +15V$, $V_{EE1} = -15V$, $R_L = 200\Omega$, $I_F = 5mA$		11	13.2	—	V
	"L" Level	V_{OL}	5	$V_{CC1} = +15V$, $V_{EE1} = -15V$, $R_L = 200\Omega$, $V_F = 0.8V$		—	−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_{CCL}	—	$V_{CC} = 30V$, $I_F = 0mA$, $Ta = 25°C$		—	8	—	
				$V_{CC} = 30V$, $I_F = 0mA$		—	—	11	
Threshold Input Current	"Output L→H"	I_{FLH}	—	$V_{CC1} = +15V$, $V_{EE1} = -15V$, $R_L = 200\Omega$, $V_O > 0V$		—	1.2	5	mA
Threshold Input Voltage	"Output H→L"	V_{FHL}		$V_{CC1} = +15V$, $V_{EE1} = -15V$, $R_L = 200\Omega$, $V_O < 0V$		0.8	—	—	V
Supply Voltage		V_{CC}	—			10	—	35	V
Capacitance (Input-Output)		C_S	—	$V_S = 0$, $f = 1MHz$, $Ta = 25°C$		—	1.0	2.0	pF
Resistance (Input-Output)		R_S	—	$V_S = 500V$, $Ta = 25°C$, 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 (Ta = −20~70°C, Unless otherwise specified)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.*	MAX.	UNIT
Propagation Delay Time	L→H	t_{pLH}	6	$I_F = 8mA$, $V_{CC1} = +15V$, $V_{EE1} = -15V$, $R_L = 200\Omega$	—	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	$V_{CM} = 600V$, $I_F = 8mA$, $V_{CC} = 30V$, $Ta = 25°C$	−5000	—	—	V / μs
Common Mode Transient Immunity at Low Level Output		C_{ML}	7	$V_{CM} = 600V$, $I_F = 0mA$, $V_{CC} = 30V$, $Ta = 25°C$	5000	—	—	V / μs

* All typical values are at Ta = 25°C

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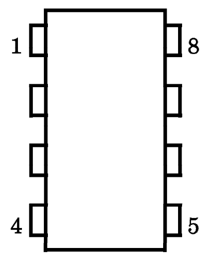
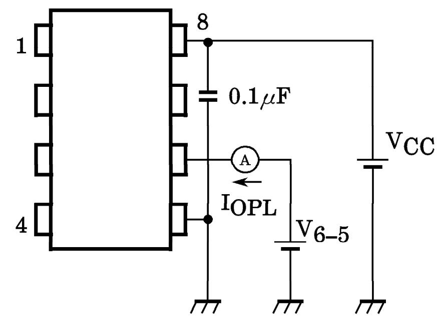
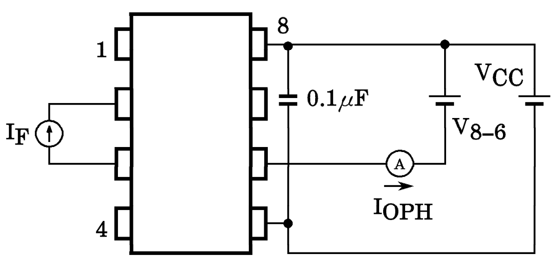
TEST CIRCUIT 1 :



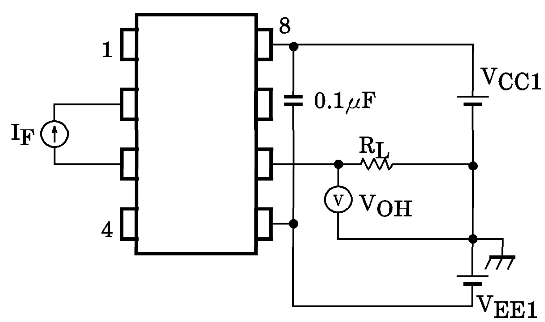
TEST CIRCUIT 2 : I_{OPL}



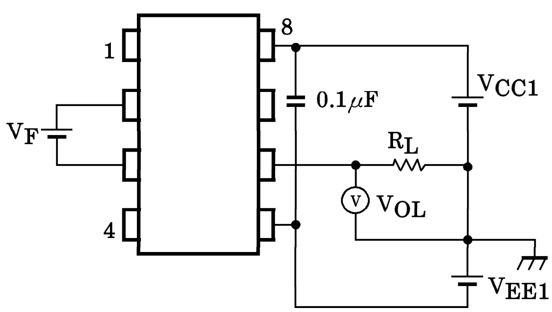
TEST CIRCUIT 3 : I_{OPH}



TEST CIRCUIT 4 : V_{OH}



TEST CIRCUIT 5 : V_{OL}



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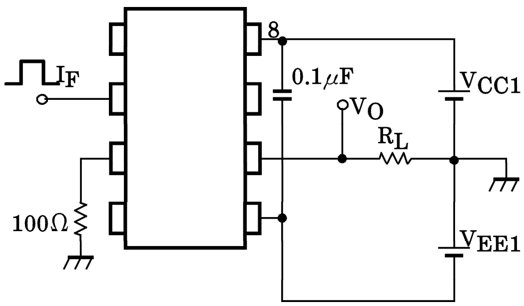
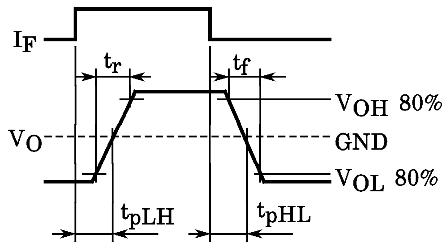
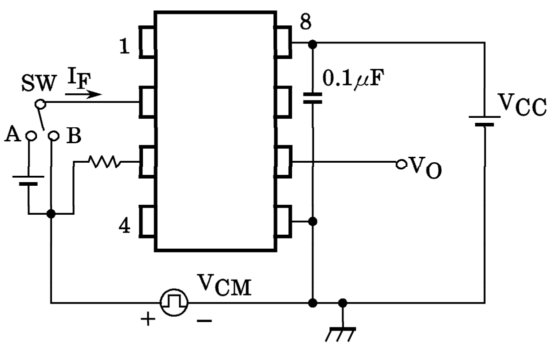
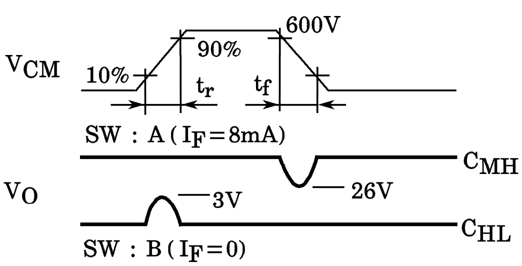
TEST CIRCUIT 6 : t_{pLH}, t_{pHL}, t_r, t_f





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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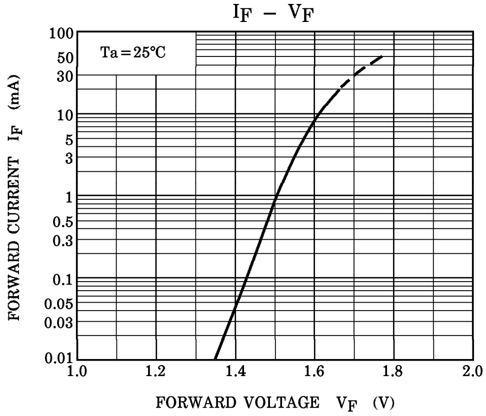
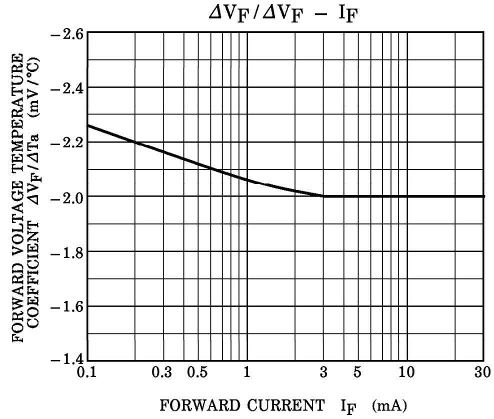
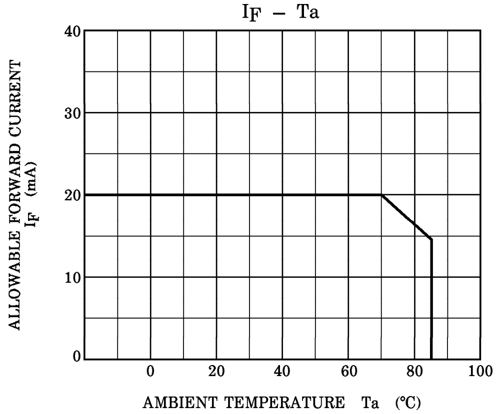
I_F – V_F



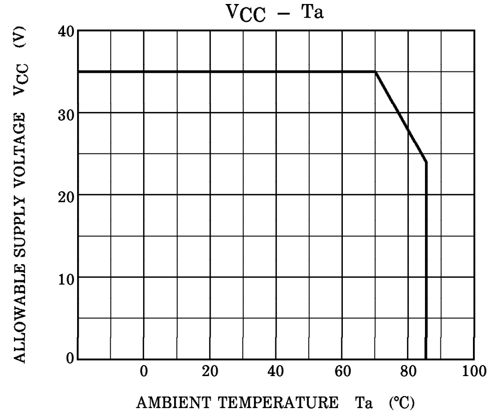
$\Delta V_F / \Delta V_F$ – I_F



I_F – Ta



V_{CC} – Ta



I_{OPH}, I_{OPL} – Ta