TOSHIBA PHOTOCOUPLER GaAℓAs IRED & PHOTO-IC

TLP557

TRANSISTOR INVERTOR

INVERTER FOR AIR CONDITIONOR

POWER TRANSISTOR BASE DRIVE

The TOSHIBA TLP557 consists of a GaAℓAs light emitting diode and a integrated photodetector.

This unit is 8-lead DIP package.

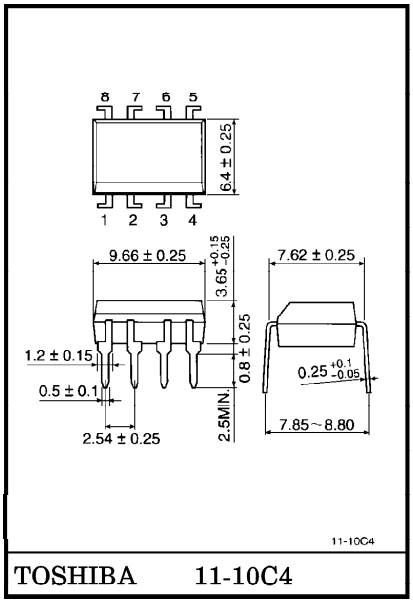
TLP557 is suitable for base driving circuit of power transistor module up to 20A.

External resistor needs to connect between pin 6 and pin 7.

This is for constant current driving.

- Input Threshold Current : I_F=5mA (Max.)
- Guaranteed Performance Temperature Range : −30~70°C
- Supply Voltage : 16V (Max.)
- Output Current : ±0.3A (Max.)
- Switching Time (t_{pLH} / t_{pHL}) : 5μs (Max.)
- Isolation Voltage : 2500V_{rms} (Min.)
- UL Recognized : UL1577, File No. E67349

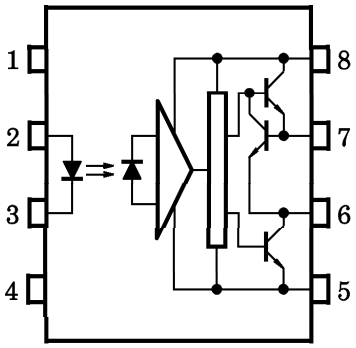
Unit in mm



TOSHIBA 11-10C4

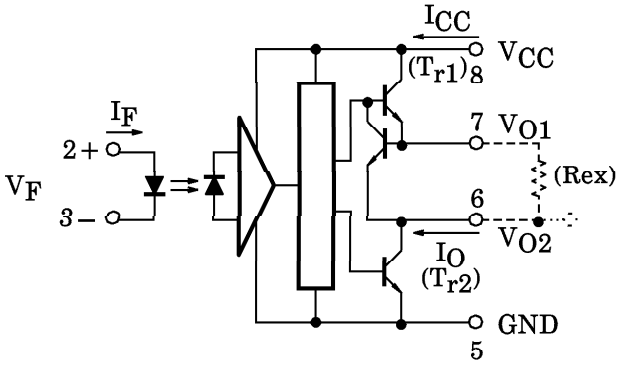
Weight : 0.54g

PIN CONFIGURATION (TOP VIEW)



1 : N.C.
2 : ANODE
3 : CATHODE
4 : N.C.
5 : GND
6 : V_{O2} (OUTPUT)
7 : V_{O1} (Rex TERMINAL)
8 : V_{CC}

SCHMATIC



TRUTH TABLE

		Tr1	Tr2
Input LED	ON	ON	OFF
	OFF	OFF	ON

961001EBC2

MAXIMUM RATINGS

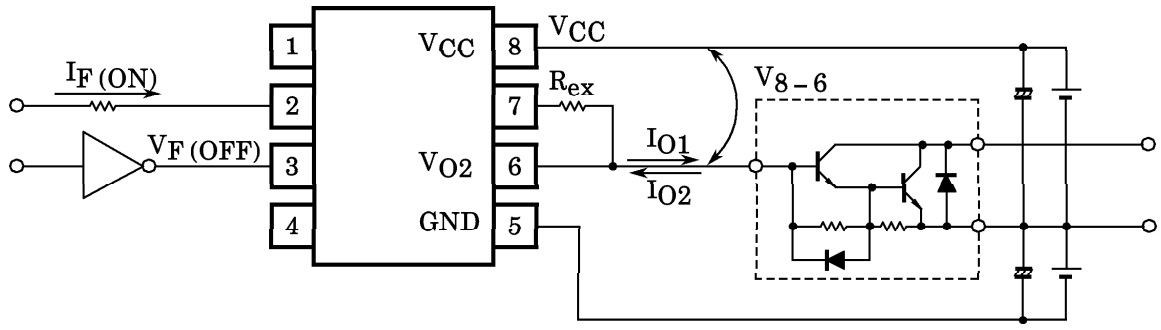
	CHARACTERISTIC	SYMBOL	RATING	UNIT
LED	Forward Current	I_F	25	mA
	Peak Transient Forward Current (Note 1)	I_{FPT}	1	A
	Reverse Voltage	V_R	5	V
	Junction Temperature	(T_j)	125	°C
DETECTOR	Output Current (f≦5kHz, Duty≦50%)	I_O	+0.32 / −0.32	A
	Peak Output Current (P_W≦10μs, f≦5kHz)	I_{OP}	+2 / −0.5	A
	Output Voltage	V_O	16	V
	Supply Voltage	V_{CC}	16	V
	O_1 Terminal to O_2 Terminal (Pin 7 – Pin 6) Voltage	V_{1-2}	1.5	V
	O_2 Terminal to O_1 Terminal (Pin 6 – Pin 7) Voltage	V_{2-1}	5	V
	Power Dissipation (Note 2)	Po	0.5	W
	Junction Temperature	(T_j)	125	°C
Total Package Power Dissipation (Note 3)		P_{OT}	0.55	W
Operating Temperature Range		T_{opr}	−30~70	°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) ΔP_o / °C = −6.7mW / °C (Ta≧50°C)
(Note 3) ΔP_{OT} / °C = −7.4mW / °C (Ta≧50°C)
(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.

RECOMMENDED OPERATING CONDITION

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current ON	I_F (ON)	7	8	20	mA
Input Voltage OFF	V_F (OFF)	0	—	0.8	V
Supply Voltage	V_{CC}	5	6	13	V
I_{B1} Drive Current	I_{O1}	—	0.15	0.25	A
I_{B2} Drive Current	I_{O2}	—	—	0.5	A
External Resistance	Rex	2.7	4.3	—	Ω
V_{CC} – V_{O2} (Pin 8 – Pin 6) ON Voltage	V_{8-6}	2.3	3 (I_{O1} = 0.15A)	2.5 (I_{O1} = 0.25A)	V
Operating Temperature	Topr	−30	25	70	°C

(Rex is for constant current driving)



ELECTRICAL CHARACTERISTICS (Ta = −30~70°C, Unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.*	MAX.	UNIT	TEST CIR-CUIT
Input Forward Voltage	V_F	I_F=5mA, Ta=25°C		—	1.55	1.7	V	
Temperature Coefficient of Forward Voltage	$\Delta V_F / \Delta Ta$	I_F=5mA		—	−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		—	—	250	pF	
O_1 Output Leakage Current	I_{O1L}	V_{CC}=16V, V_{O1}=0, V_F=0.8V		—	0.01	200	μA	1
O_2 Output Leakage Current	I_{O2L}	V_{CC}=16V, V_{O2}=16V, I_F=5mA		—	0.2	200	μA	2
O_1 Output Current	I_O	V_{8-6}=2.3V, Rex=2.7Ω, I_F=5mA, Ta=25°C	V_{CC}=6V	0.22	0.27	0.32	A	3
			V_{CC}=16V	0.22	0.27	0.32		
O_2 High Level Output Voltage	V_{OH}	V_{CC}=6V, Rex=2.7Ω, I_F=5mA		3.5	5.5	—	V	4
O_2 Low Level Output Voltage	V_{OL}	V_F=0.8V, Rex=2.7Ω, I_O=0.25A, Ta=25°C	V_{CC}=6V	—	0.2	0.4	V	5
			V_{CC}=16V	—	0.2	0.4		
		V_F=0.8V, Rex=2.7Ω, I_O=0.5A (*1), Ta=25°C	V_{CC}=6V	—	0.4	—	V	
			V_{CC}=16V	—	0.4	—		
High Level Supply Current	I_{CCH}	V_{CC}=6V, I_F=5mA, Rex=2.7Ω, Ta=25°C		—	3.8	10	mA	
		V_{CC}=6V, I_F=5mA, Rex=2.7Ω		—	—	13		
		V_{CC}=16V, I_F=5mA, Rex=2.7Ω		—	5.2	17		
Low Level Supply Current	I_{CCL}	V_{CC}=6V, I_F=0mA, Rex=2.7Ω, Ta=25°C		—	11	17	mA	
		V_{CC}=6V, I_F=0mA, Rex=2.7Ω		—	—	22		
		V_{CC}=16V, I_F=0mA, Rex=2.7Ω		—	13	25		
"Output L→H" Threshold Input Current	I_{FLH}	Rex=2.7Ω, I_O=0.25A, V_{O2}>3V	V_{CC}=6V	—	2.5	5	mA	
			V_{CC}=16V	—	—	5		
"Output H→L" Threshold Input Current	V_{FHL}	Rex=2.7Ω, I_O=0.25A, V_{O2}<0.4V	V_{CC}=6V	0.8	—	—	V	
			V_{CC}=16V	0.8	—	—		
Input Current Hysterisis	I_{HYS}	V_{CC}=6V, Rex=2.7Ω, Ta=25°C		—	0.05	—	mA	
Supply Voltage	V_{CC}			5	—	16	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	

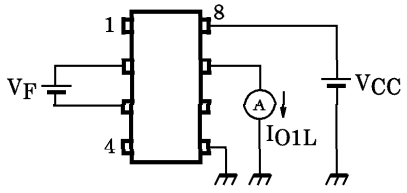
* All typical values are at Ta=25°C (*1): Duration of I_O time ≦ 100μs

SWITCHING CHARACTERISTICS (Ta = – 30~70°C Unless otherwise specified)

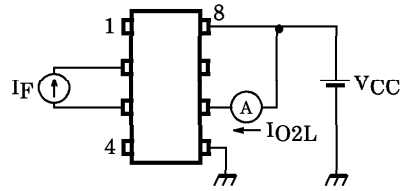
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.*	MAX.	UNIT	TEST CIR-CUIT
Propagation Delay Time, L→H	tpLH	V_{CC}=6V, I_F=8mA	—	1	5	μs	6
Propagation Delay Time, H→L	tpHL	Rex=2.7Ω	—	1	5	μs	
Output Rise Time	t_r	f=5kHz, Duty=10%	—	0.05	—	μs	
Output Fall Time	t_f		—	0.05	—	μs	
Common Mode Transient Immunity at High Level Output	C_{MH}	V_{CM}=600V, I_F=8mA V_{CC}=6V, Rex=270Ω R=1kΩ, Ta=25°C	−2000	—	—	V/μs	7
Common Mode Transient Immunity at Low Level Output	C_{ML}	V_{CM}=600V, I_F=0mA V_{CC}=6V, Rex=270Ω R=1kΩ, Ta=25°C	2000	—	—	V/μs	7

* All typical values are at Ta=25°C.

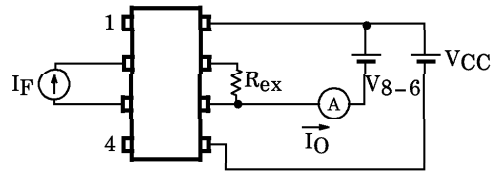
TEST CIRCUIT 1 : I_{O1L}



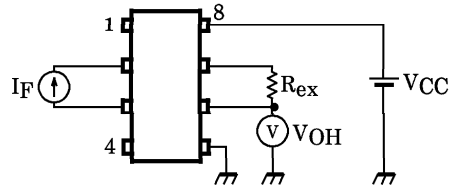
TEST CIRCUIT 2 : I_{O2L}



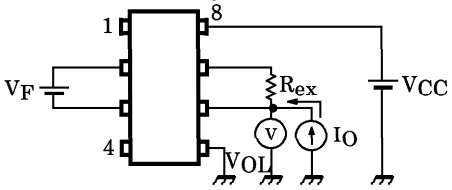
TEST CIRCUIT 3 : I_O



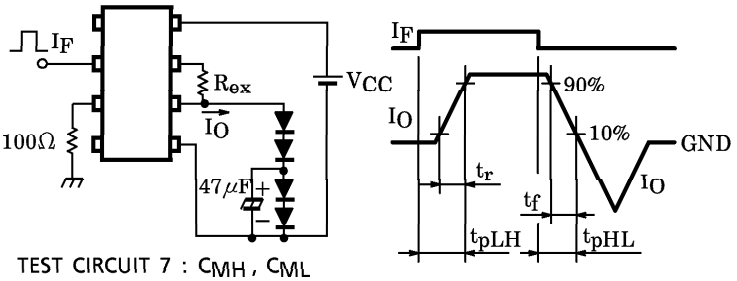
TEST CIRCUIT 4 : V_{OH}



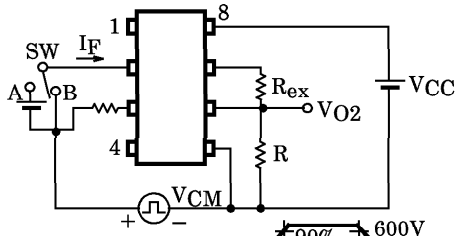
TEST CIRCUIT 5 : V_{OL}

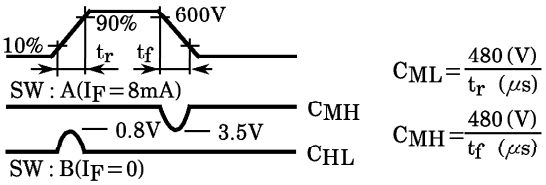


TEST CIRCUIT 6 : t_{pLH}, t_{pHL}, t_r, t_f



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



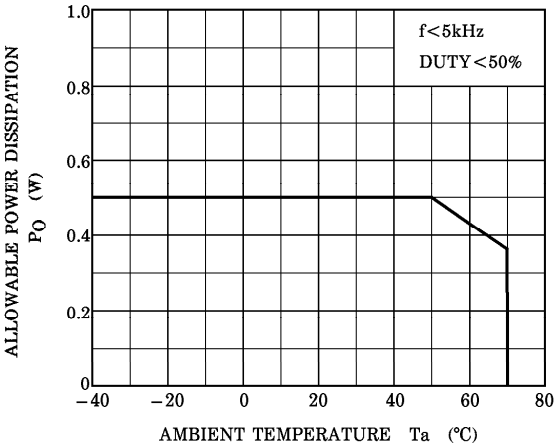


$$C_{ML}=\frac{480\,(V)}{t_r\ (\mu s)}$$

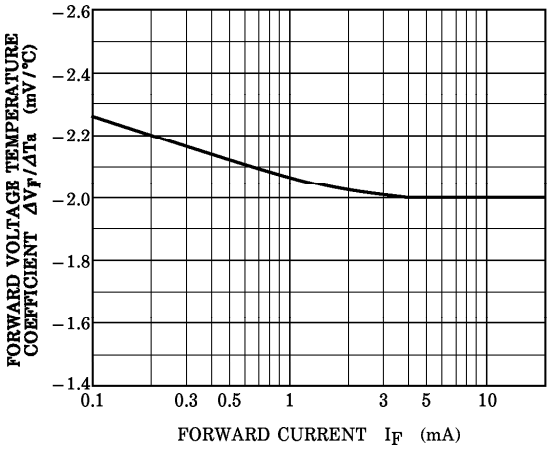
$$C_{MH}=\frac{480\,(V)}{t_f\ (\mu s)}$$

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.

P_O – Ta



$\Delta V_F / \Delta Ta$ – I_F



I_F – V_F