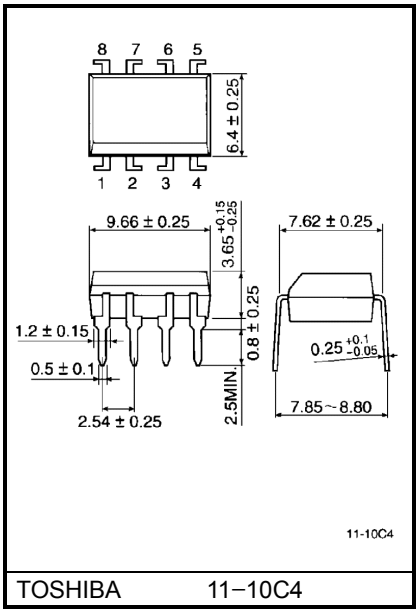
TOSHIBA Photocoupler GaAℓAs Ired & Photo−IC

TLP557

Transistor Invertor
Inverter For Air Conditionor
Power Transistor Base Drive

Unit in mm



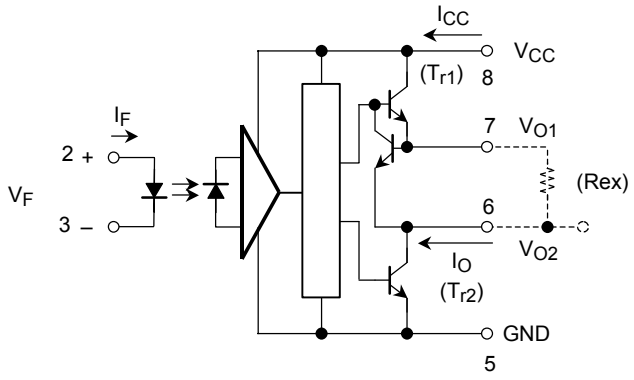
TOSHIBA 11−10C4

Weight: 0.54g

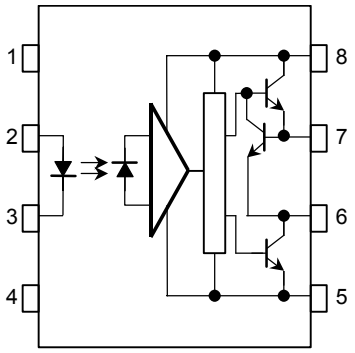
The TOSHIBA TLP557 consists of a GaAℓAs light emitting diode and a integrated photodetector.
This unit is 8−lead DIP package.
TLP557 is suitable for base driving circuit of power transistor module up to 20A.
External resistor needs to connect between pin 6 and pin 7.
This is for constant current driving.

- 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

Schmatic



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}

Truth Table

		Tr1	Tr2
Input LED	On	On	Off
	Off	Off	On

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 (10 s)			T_{sol}	260	°C
Isolation voltage (AC, 1 min., 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)

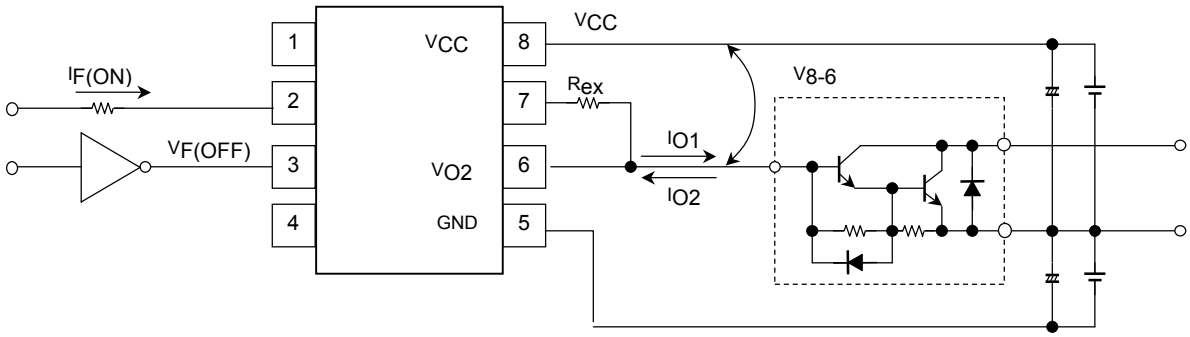
(Note 3) ΔP_{OT} / °C=−7.4mW / °C (Ta ≥ 50°C)

(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	

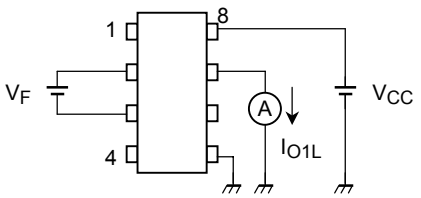
* All typical values are at Ta = 25°C (*1): Duration of I_O time ≤ 100μs

Switching Characteristics (Ta = −30~70°C unless otherwise specified)

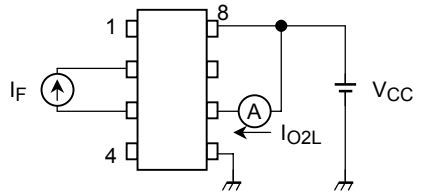
Characteristic	Symbol	Test Condition	Min.	Typ.*	Max.	Unit	Test Cir−cuit
Propagation delay time, L→H	tpLH	V_{CC} = 6V, I_F = 8mA Rex = 2.7Ω f = 5kHz, Duty = 10%	—	1	5	μs	6
Propagation delay time, H→L	tpHL		—	1	5	μs	
Output rise time	t_r		—	0.05	—	μs	
Output fall time	t_f		—	0.05	—	μs	
Common mode transient 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.

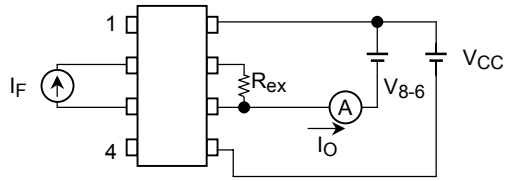
Test Circuit 1: I_{O1L}



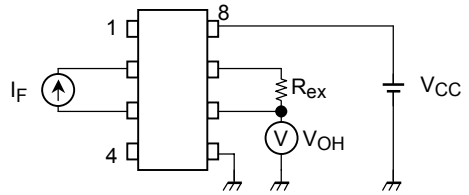
Test Circuit 2: I_{O2L}



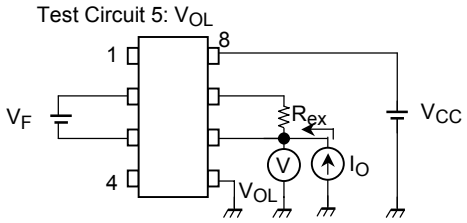
Test Circuit 3: I_O



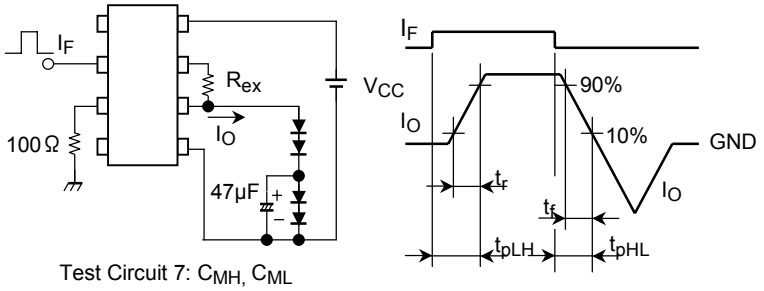
Test Circuit 4: V_{OH}



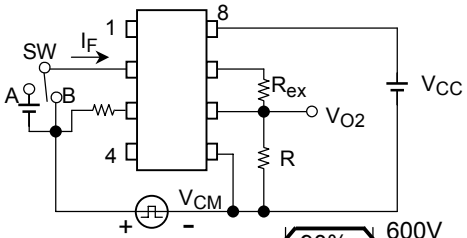
Test Circuit 5: V_{OL}

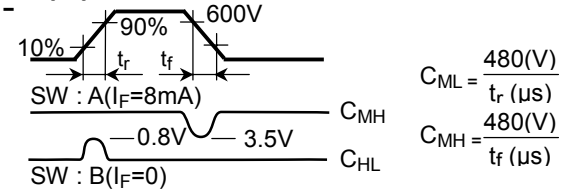


Test Circuit 6: t_{pLH}, t_{pHL}, t_r, t_f



Test Circuit 7: C_{MH}, C_{ML}



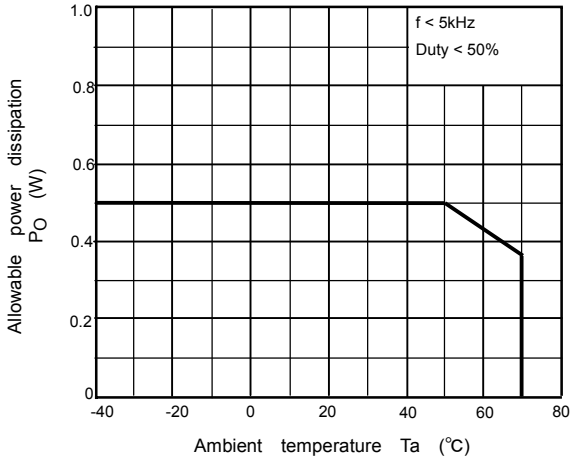


$$C_{ML} = \frac{480(V)}{t_r\ (\mu s)}$$

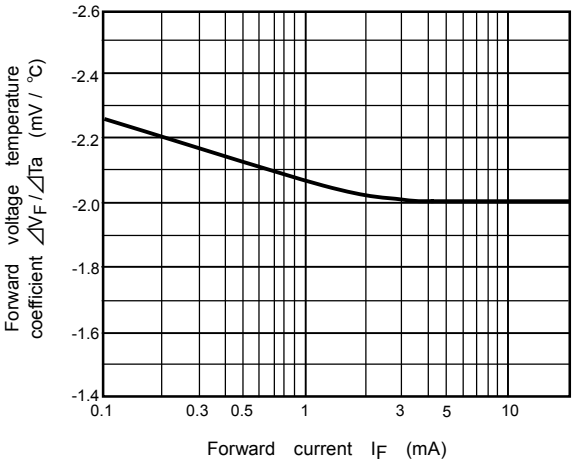
$$C_{MH} = \frac{480(V)}{t_f\ (\mu s)}$$

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.

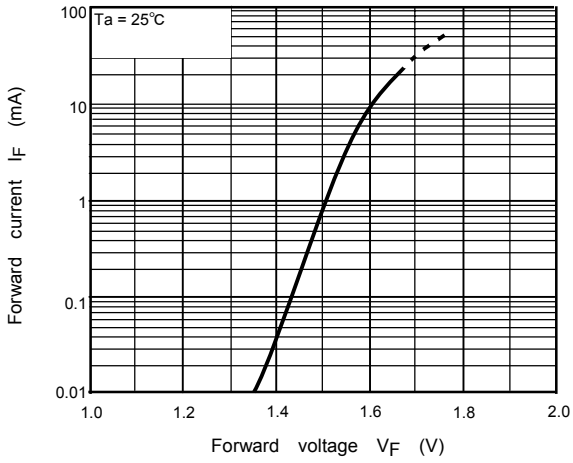
P_O – Ta



$\Delta V_F / \Delta Ta$ – I_F



I_F – V_F



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