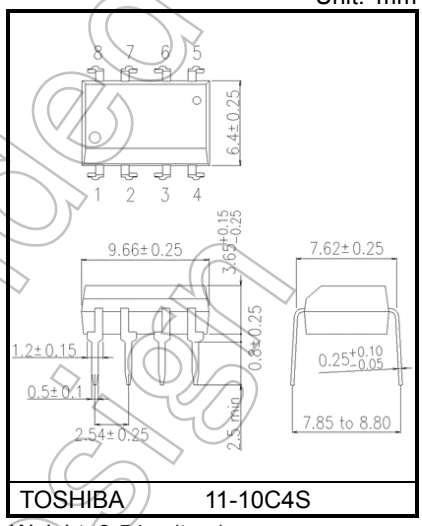
TOSHIBA Photocoupler IRED & Photo-IC

TLP557

Industrial Inverter
Inverter for Air Conditioner
Power Transistor Base Drive

Unit: mm



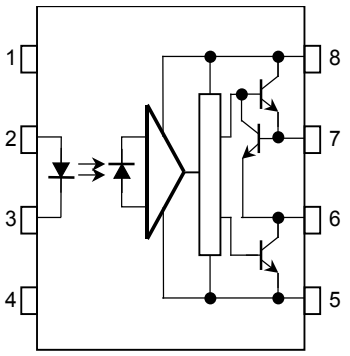
TOSHIBA 11-10C4S

Weight: 0.54 g (typ.)

The TOSHIBA TLP557 consists of an infrared emitting diode and an 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.

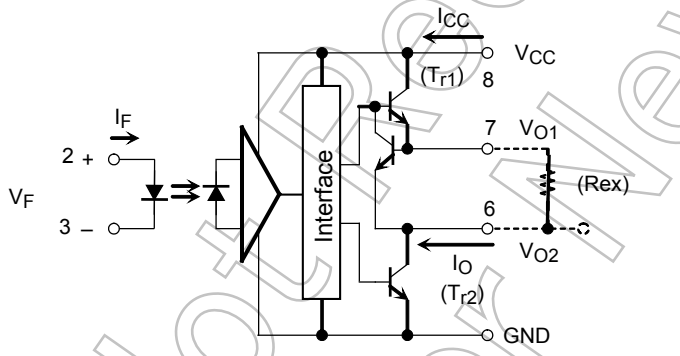
- Input threshold current: I_F = 5 mA (max)
- Guaranteed performance temperature range: -30 to 70°C
- Supply voltage: 16 V (max)
- Output current: ±0.3 A (max)
- Switching time (t_{pLH}/t_{pHL}): 5 μs (max)
- Isolation voltage: 2500 Vrms (min)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A
  File No.E67349

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}

Schematic



Truth Table

		Tr1	Tr2
Input LED	ON	ON	OFF
	OFF	OFF	ON

Start of commercial production
1987-06

Absolute Maximum Ratings

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	25	mA
	Peak transient forward current (Pw ≤ 1 μs, 300 pps)	I_{FPT}	1	A
	Reverse voltage	V_R	5	V
	Diode power dissipation	P_D	45	mW
	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	P_O	0.5	W
	Power dissipation derating (Ta > 50 °C)	$\Delta P_O/\Delta Ta$	-6.7	mW/°C
	Junction temperature	T_j	125	°C
Total package power dissipation		P_{OT}	0.55	W
Total package power dissipation derating (Ta > 50 °C)		ΔPOT/ΔTa	-7.4	mW/°C
Operating temperature range		T_{opr}	-30 to 70	°C
Storage temperature range		T_{stg}	-55 to 125	°C
Lead solder temperature (10 s)		T_{sol}	260	°C
Isolation voltage (AC, 60 s, R.H.≤ 60 %, Ta=25°C) (Note 1)		BV_S	2500	Vrms

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

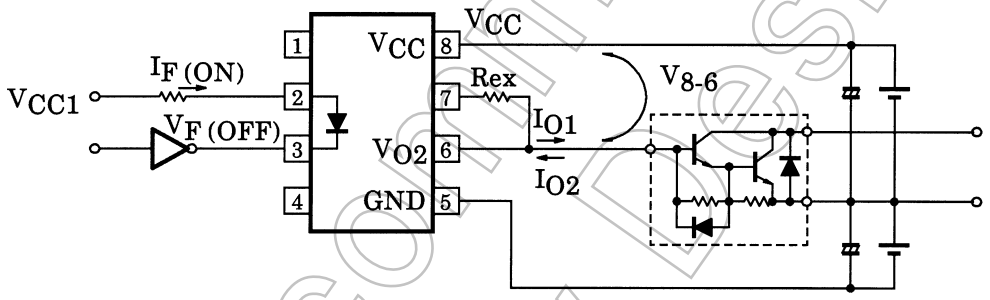
Note 1: Device considered a two terminal device: Pins 1, 2, 3 and 4 shorted together, and pins 5, 6, 7 and 8 shorted together.

Recommended Operating Conditions

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 (Note 1)	V_{8-6}	2.3	3 (I_{O1} = 0.15A)	2.5 (I_{O1} = 0.25A)	V
Operating temperature	Topr	-30	25	70	°C

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

Note 1:



Electrical Characteristics (Ta = -30 to 70°C, unless otherwise specified)

Characteristic	Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Input forward voltage	V_F	—	I_F = 5 mA , Ta = 25 °C		—	1.55	1.7	V
Temperature coefficient of forward voltage	$\Delta V_F/\Delta Ta$	—	I_F = 5 mA		—	-2.0	—	mV/°C
Input reverse current	I_R	—	V_R = 5 V, Ta = 25 °C		—	—	10	μA
Input capacitance	C_T	—	V = 0 V, f = 1 MHz , Ta = 25 °C		—	—	250	pF
O_1 Output leakage current	I_{O1L}	1	V_{CC} = 16 V, V_{O1} = 0 V, V_F = 0.8 V		—	0.01	200	μA
O_2 Output leakage current	I_{O2L}	2	V_{CC} = 16 V, V_{O2} = 16 V, I_F = 5 mA		—	0.2	200	μA
O_1 Output current	I_O	3	$V_{8\text{-}6}$ = 2.3 V Rex = 2.7 Ω I_F = 5 mA, Ta = 25 °C	V_{CC} = 6 V	0.22	0.27	0.32	A
				V_{CC} = 16 V	0.22	0.27	0.32	
O_2 High level output voltage	V_{OH}	4	V_{CC} = 6 V, Rex = 2.7 Ω I_F = 5 mA		3.5	5.5	—	V
O_2 Low level output voltage	V_{OL}	5	V_F = 0.8 V, Rex = 2.7 Ω I_O = 0.25 A, Ta = 25 °C	V_{CC} = 6 V	—	0.2	0.4	V
				V_{CC} = 16 V	—	0.2	0.4	
			V_F = 0.8 V, Rex = 2.7 Ω I_O = 0.5 A (Note 1) Ta = 25 °C	V_{CC} = 6 V	—	0.4	—	V
				V_{CC} = 16 V	—	0.4	—	
High level supply current	I_{CCH}	—	V_{CC} = 6 V, I_F = 5 mA Rex = 2.7 Ω, Ta = 25 °C		—	3.8	10	mA
			V_{CC} = 6 V, I_F = 5 mA, Rex = 2.7 Ω		—	—	13	
			V_{CC} = 16 V, I_F = 5 mA, Rex = 2.7 Ω		—	5.2	17	
Low level supply current	I_{CCL}	—	V_{CC} = 6 V, I_F = 0 mA Rex = 2.7 Ω, Ta = 25 °C		—	11	17	mA
			V_{CC} = 6 V, I_F = 0 mA, Rex = 2.7 Ω		—	—	22	
			V_{CC} = 16 V, I_F = 0 mA, Rex = 2.7 Ω		—	13	25	
"Output L→H" threshold input current	I_{FLH}	—	Rex = 2.7 Ω I_O = 0.25 A V_{O2} > 3 V	V_{CC} = 6 V	—	2.5	5	mA
				V_{CC} = 16 V	—	—	5	
"Output H→L" threshold input current	V_{FHL}	—	Rex = 2.7Ω I_O = 0.25A V_{O2} < 0.4V	V_{CC} = 6 V	0.8	—	—	V
				V_{CC} = 16 V	0.8	—	—	
Input current hysteresis	I_{HYS}	—	V_{CC} = 6 V, Rex = 2.7 Ω, Ta = 25 °C		—	0.05	—	mA
Supply voltage	V_{CC}	—	—		5	—	16	V
Capacitance (input-output)	C_S	—	V_S = 0 V, f = 1 MHz, Ta = 25 °C		—	1.0	2.0	pF
Resistance (input-output)	R_S	—	V_S = 500 V , Ta = 25 °C, R.H.≤ 60 %		5×10^{10}	10^{12}	—	Ω

Note: All typical values are at Ta = 25 °C

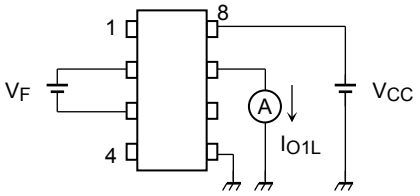
Note 1: Duration of I_O time ≤ 100 μs

Switching Characteristics (Ta = -30 to 70°C unless otherwise specified)

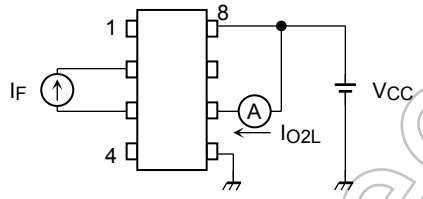
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time, L→H	t_{pLH}	6	V_{CC} = 6 V, I_F = 8 mA Rex = 2.7 Ω f = 5 kHz, Duty = 10 %	—	1	5	μs
Propagation delay time, H→L	t_{pHL}			—	1	5	μs
Output rise time	t_r			—	0.05	—	μs
Output fall time	t_f			—	0.05	—	μs
Common mode transient immunity at high level output	CM_H	7	V_{CM} = 600 V, I_F = 8 mA V_{CC} = 6 V, Rex = 270 Ω R = 1 kΩ, Ta = 25 °C	-2000	—	—	V/μs
Common mode transient immunity at low level output	CM_L	7	V_{CM} = 600 V, I_F = 0 mA V_{CC} = 6 V, Rex = 270 Ω R = 1 kΩ, Ta = 25 °C	2000	—	—	V/μs

Note: All typical values are at Ta = 25 °C.

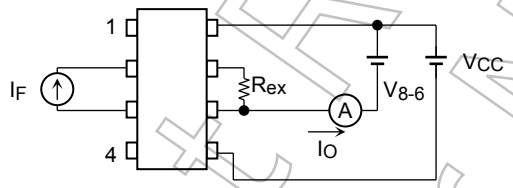
Test Circuit 1: I_{O1L}



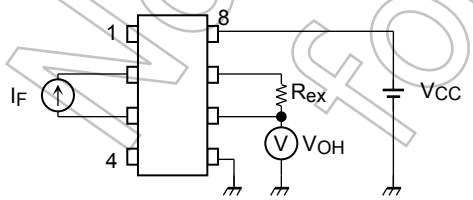
Test Circuit 2: I_{O2L}



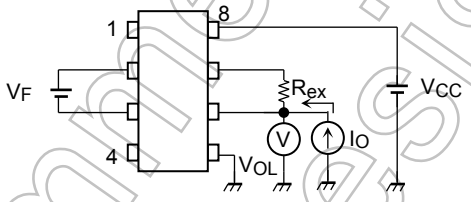
Test Circuit 3: I_O



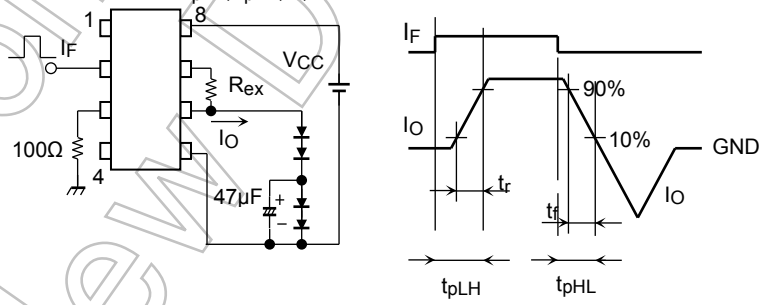
Test Circuit 4: V_{OH}



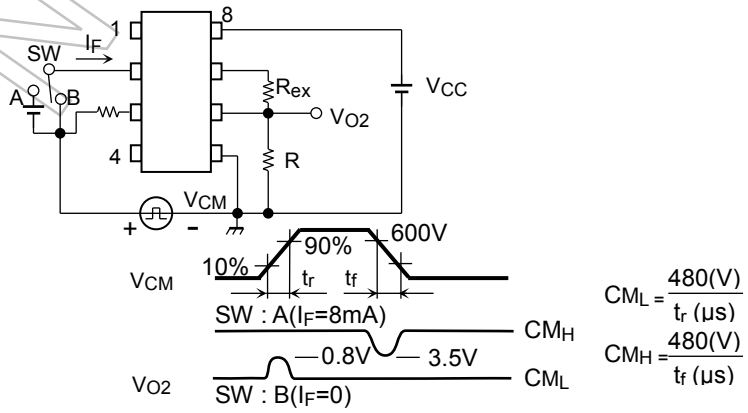
Test Circuit 5: V_{OL}



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

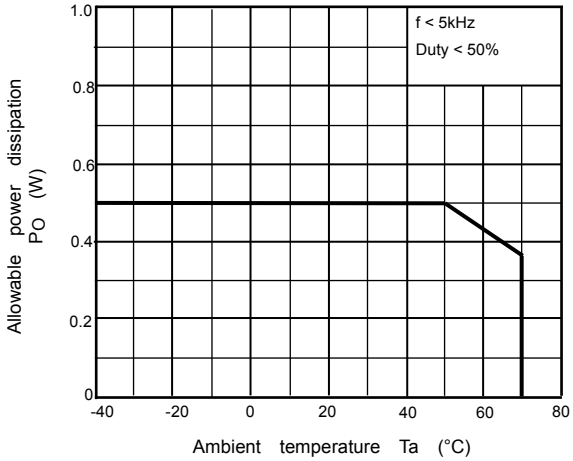


Test Circuit 7: CM_H, CM_L

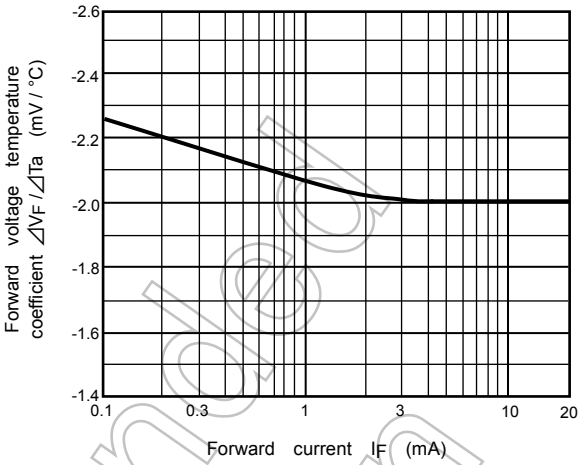


Note: CM_L (CM_H) is the maximum rate of rise (fall) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

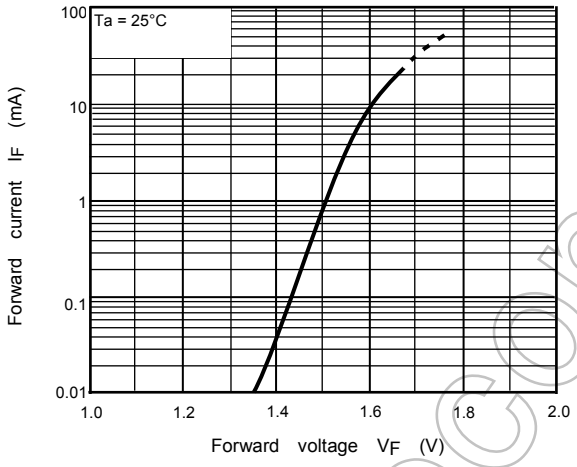
P_O – Ta



$\Delta V_F / \Delta Ta$ – I_F



I_F – V_F



NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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