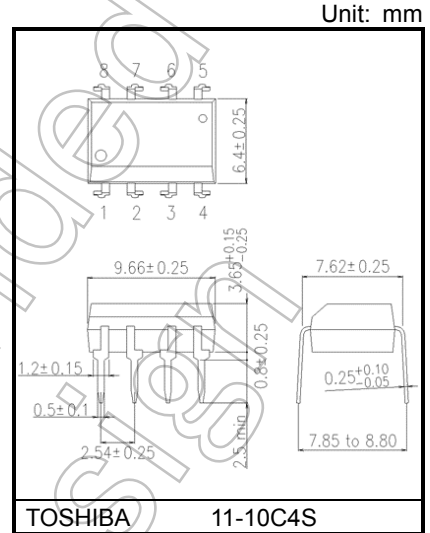


TLP557

Industrial Inverter
 Inverter for Air Conditioner
 Power Transistor Base Drive

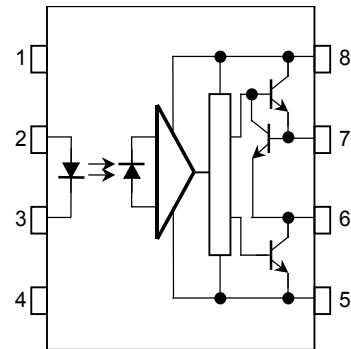
The TOSHIBA TLP557 consists of an infrared emitting diode and an integrated photodetector.
 This unit is 8-lead DIP package.
 TLP557 is suitable for base driving circuit of power transistor module up to 20A.
 External resistor needs to connect between pin 6 and pin 7.
 This is for constant current driving.

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



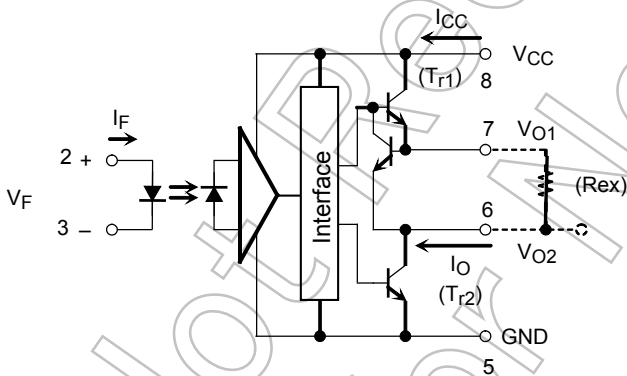
Weight: 0.54 g (typ.)

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	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 ($P_W \leq 1 \mu\text{s}$, 300 pps)	I_{FPT}	1	A
	Reverse voltage	V_R	5	V
	Diode power dissipation	P_D	45	mW
	Junction temperature	T_j	125	$^{\circ}\text{C}$
Detector	Output current ($f \leq 5\text{kHz}$, Duty $\leq 50\%$)	I_O	+0.32/-0.32	A
	Peak output current ($P_W \leq 10\mu\text{s}$, $f \leq 5\text{kHz}$)	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 ($T_a > 50^{\circ}\text{C}$)	$\Delta P_O/\Delta T_a$	-6.7	mW/ $^{\circ}\text{C}$
	Junction temperature	T_j	125	$^{\circ}\text{C}$
Total package power dissipation		P_{OT}	0.55	W
Total package power dissipation derating ($T_a > 50^{\circ}\text{C}$)		$\Delta P_{OT}/\Delta T_a$	-7.4	mW/ $^{\circ}\text{C}$
Operating temperature range		T_{opr}	-30 to 70	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-55 to 125	$^{\circ}\text{C}$
Lead solder temperature (10 s)		T_{sol}	260	$^{\circ}\text{C}$
Isolation voltage (AC, 60 s, R.H. $\leq 60\%$, $T_a=25^{\circ}\text{C}$) (Note 1)		BV_S	2500	V_{rms}

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).

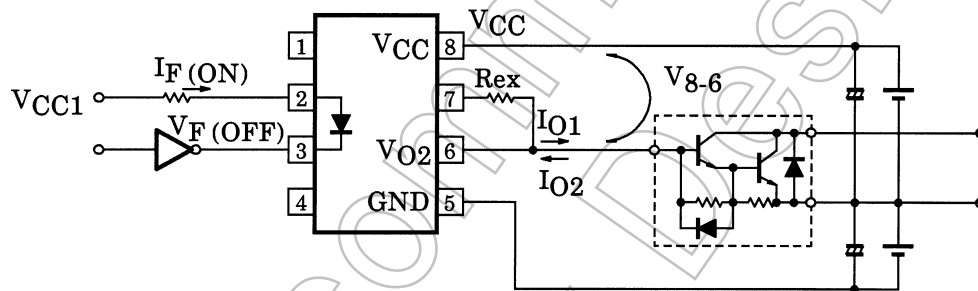
Note 1: Device considered a two terminal device: Pins 1, 2, 3 and 4 shorted together, and pins 5, 6, 7 and 8 shorted together.

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
IB1 Drive current	I_{O1}	—	0.15	0.25	A
IB2 Drive current	I_{O2}	—	—	0.5	A
External resistance	R_{ex}	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	T_{opr}	-30	25	70	$^{\circ}C$

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	ΔV _F /ΔTa	—	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 ₈₋₆ = 2.3 V R _{ex} = 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, R _{ex} = 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, R _{ex} = 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, R _{ex} = 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 R _{ex} = 2.7 Ω, Ta = 25 °C	—	3.8	10	mA	
			V _{CC} = 6 V, I _F = 5 mA, R _{ex} = 2.7 Ω	—	—	13		
			V _{CC} = 16 V, I _F = 5 mA, R _{ex} = 2.7 Ω	—	5.2	17		
Low level supply current	I _{CCL}	—	V _{CC} = 6 V, I _F = 0 mA R _{ex} = 2.7 Ω, Ta = 25 °C	—	11	17	mA	
			V _{CC} = 6 V, I _F = 0 mA, R _{ex} = 2.7 Ω	—	—	22		
			V _{CC} = 16 V, I _F = 0 mA, R _{ex} = 2.7 Ω	—	13	25		
“Output L→H” threshold input current	I _{FLH}	—	R _{ex} = 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}	—	R _{ex} = 2.7 Ω I _O = 0.25 A V _{O2} < 0.4 V	V _{CC} = 6 V	0.8	—	—	V
				V _{CC} = 16 V	0.8	—	—	
Input current hysteresis	I _{HYS}	—	V _{CC} = 6 V, R _{ex} = 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

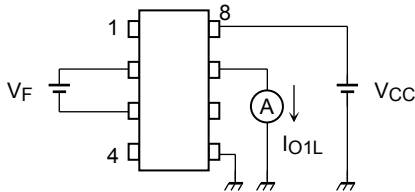
Note 1: Duration of I_O time ≤ 100 μs

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

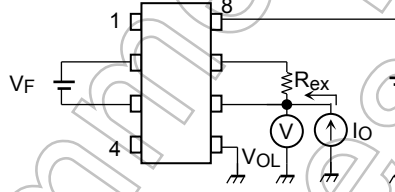
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time, L→H	t_{pLH}	6	$V_{CC} = 6\text{ V}$, $I_F = 8\text{ mA}$ $R_{ex} = 2.7\ \Omega$ $f = 5\text{ kHz}$, Duty = 10 %	—	1	5	μs
Propagation delay time, H→L	t_{pHL}			—	1	5	μs
Output rise time	t_r			—	0.05	—	μs
Output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

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

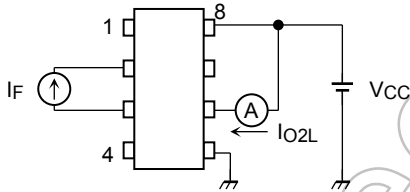
Test Circuit 1: I_{O1L}



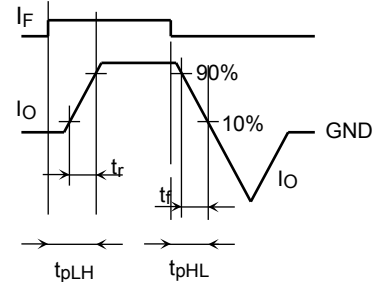
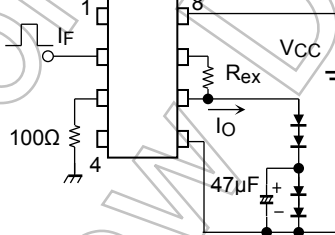
Test Circuit 5: V_{OL}



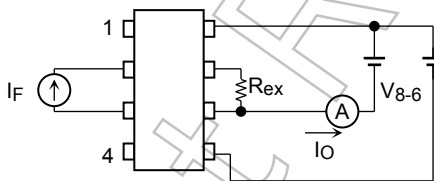
Test Circuit 2: I_{O2L}



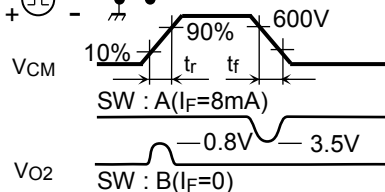
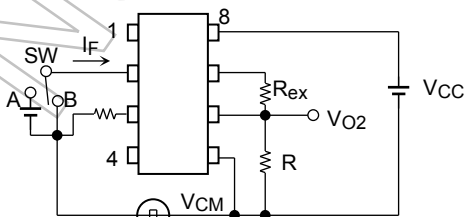
Test Circuit 6: t_{pLH} , t_{pHL} , t_r , t_f



Test Circuit 3: I_O



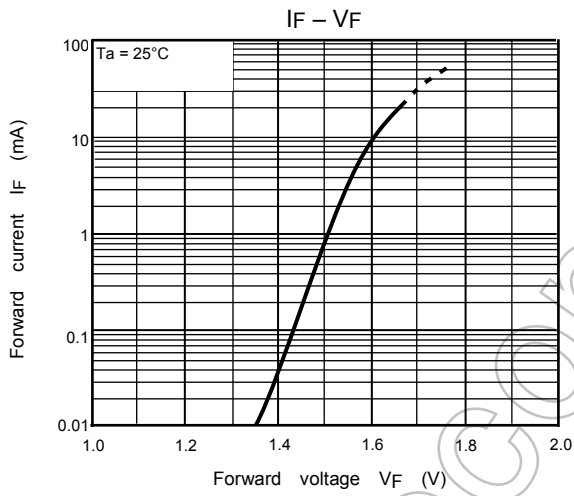
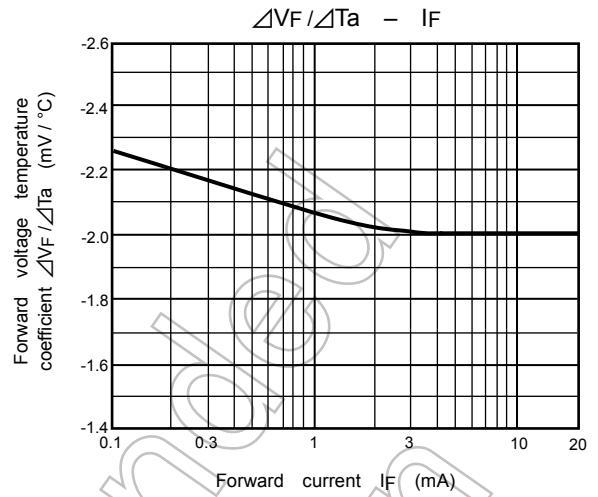
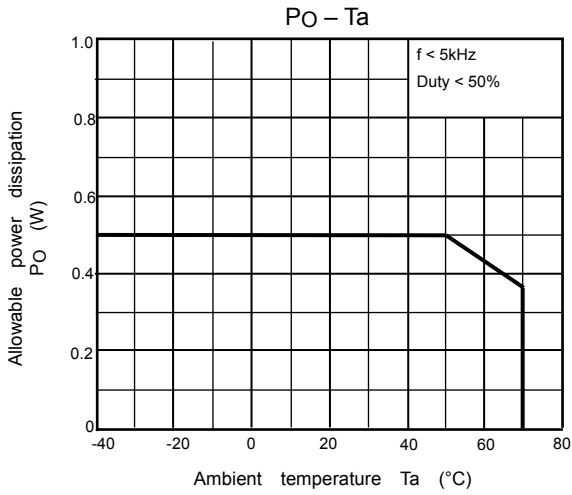
Test Circuit 7: CM_H , CM_L



$$CM_L = \frac{480(\text{V})}{t_r (\mu\text{s})}$$

$$CM_H = \frac{480(\text{V})}{t_f (\mu\text{s})}$$

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.



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

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