

TLP551

Controllers

Interfaces for Calculators and Control Devices

Noise Attenuation in Measurement and System Devices

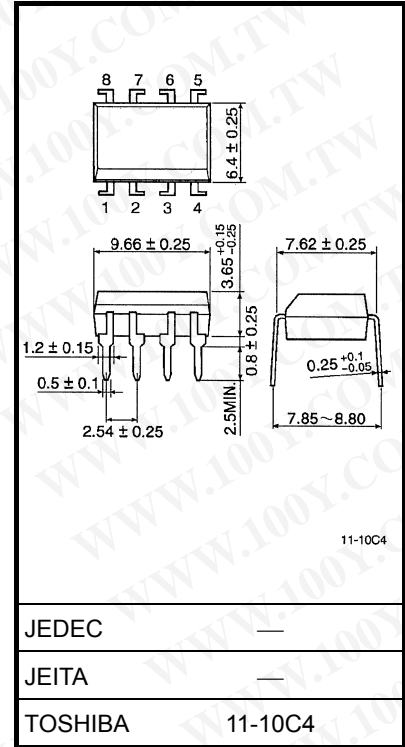
Signal Transmission between circuits of different potential

The TOSHIBA TLP551 consists of a GaAlAs high-output light emitting diode and a high speed detector of one chip photo diode-transistor. This unit is 8-lead DIP.

TLP551 has an internal base connection. This base pin should be used for analog application or enable operation.

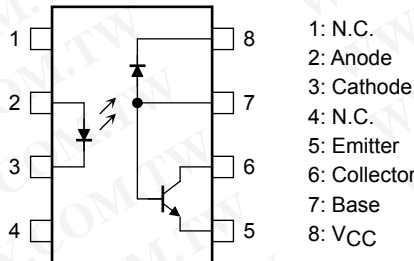
- Isolation voltage: 2500 V_{RMS} (min)
- Switching speed: $t_{pHL} = 0.5 \mu s$ (typ.)
 $t_{pLH} = 0.6 \mu s$ (typ.)
($R_L = 1.9 k\Omega$)
- TTL compatible
- If the base pin is open, external noise will cause interference to the output signal. In this scenario, TLP550 will be recommended.
- UL recognized: UL1577, file no. E67349

Unit: mm

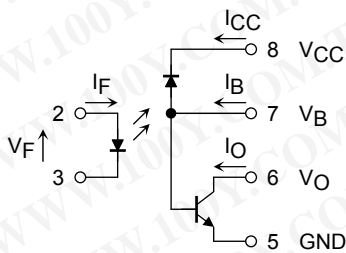


Weight: 0.54 g (typ.)

Pin Configurations (top view)



Schematic



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Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
LED	Forward current (Note 1)	I _F	25	mA
	Pulse forward current (Note 2)	I _{FP}	50	mA
	Peak transient forward current (Note 3)	I _{FPT}	1	A
	Reverse voltage	V _R	5	V
	Diode power dissipation (Note 4)	P _D	45	mW
Detector	Output current	I _O	8	mA
	Peak output current	I _{OP}	16	mA
	Output voltage	V _O	-0.5 to 15	V
	Supply voltage	V _{CC}	-0.5 to 15	V
	Base current	I _B	5	mA
	Emitter-base reverse voltage	V _{EB}	5	V
	Output power dissipation (Note 5)	P _O	100	mW
Operating temperature range		T _{opr}	-55 to 100	°C
Storage temperature range		T _{stg}	-55 to 125	°C
Lead solder temperature (10 s) (Note 6)		T _{sol}	260	°C
Isolation voltage (AC, 1 min., R.H. ≤ 60%) (Note 7)		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 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: Derate 0.8 mA/°C above 70°C

Note 2: 50% duty cycle, 1 μs pulse width.
Derate 1.6 mA/°C above 70°C

Note 3: Pulse width ≤ 1 μs, 300 pps.

Note 4: Derate 0.9 mW/°C above 70°C

Note 5: Derate 2 mW/°C above 70°C.

Note 6: Soldering portion of lead: up to 2 mm from body of the device.

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

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Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	$I_F = 16 \text{ mA}$	1.45	1.65	1.85	V
	Forward voltage temperature coefficient	$\Delta V_F / \Delta T_a$	$I_F = 16 \text{ mA}$	—	-2	—	mV/°C
	Reverse current	I_R	$V_R = 5 \text{ V}$	—	—	10	μA
	Capacitance between terminal	C_T	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$	—	60	—	pF
Detector	High level output current	$I_{OH(1)}$	$I_F = 0 \text{ mA}, V_{CC} = V_O = 5.5 \text{ V}$	—	3	500	nA
		$I_{OH(2)}$	$I_F = 0 \text{ mA}, V_{CC} = V_O = 15 \text{ V}$	—	—	5	μA
		I_{OH}	$I_F = 0 \text{ mA}, V_{CC} = V_O = 15 \text{ V}, T_a = 70^\circ\text{C}$	—	—	50	μA
	High level supply voltage	I_{CCH}	$I_F = 0 \text{ mA}, V_{CC} = 15 \text{ V}$	—	0.01	1	μA

Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_O / I_F	$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}, V_O = 0.4 \text{ V}$	10	30	—	%
		Rank: O	19	30	—	
		$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}, V_O = 0.4 \text{ V}$	5	—	—	
		$T_a = 0 \text{ to } 70^\circ\text{C}$ Rank: O	15	—	—	
Low level output voltage	V_{OL}	$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}, I_O = 1.1 \text{ mA}$ (Rank O: $I_O = 2.4 \text{ mA}$)	—	—	0.4	V

Isolation Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input-output)	C_S	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Resistance (input-output)	R_S	$V_S = 500 \text{ V}_{DC}, \text{R.H.} \leq 60\%$ (Note 8)	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	2500	—	—	V_{rms}
		AC, 1 s, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	V_{dc}

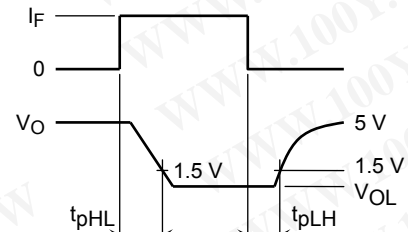
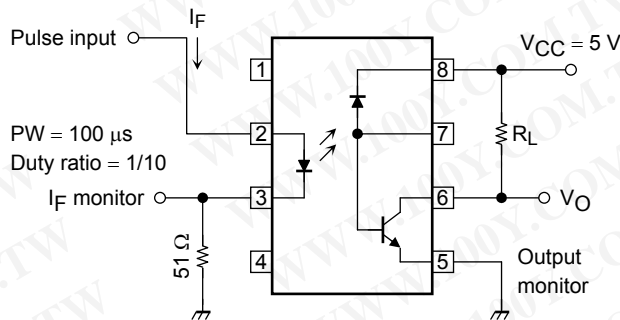
Note 8: Device considered a two-terminal device: Pins 1, 2, 3 and 4 shorted together and pins 5, 6, 7 and 8 shorted together.

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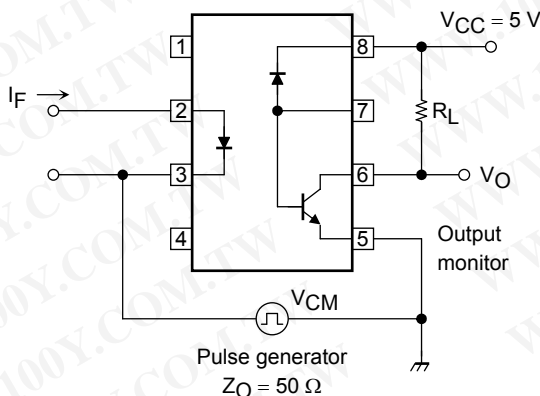
Switching Characteristics (Ta = 25°C, VCC = 5 V)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time (H → L)	t _{pHL}	1	I _F = 16 mA, R _L = 4.1 kΩ	—	0.3	0.8	μs
			I _F = 16 mA, R _L = 1.9 kΩ (Rank O)	—	0.5	0.8	
Propagation delay time (L → H)	t _{pLH}	1	I _F = 16 mA, R _L = 4.1 kΩ	—	1	2	μs
			I _F = 16 mA, R _L = 1.9 kΩ (Rank O)	—	0.6	1.2	
Common mode transient immunity at logic high output	CM _H	2	I _F = 0 mA, V _{CM} = 200 V _{p-p} R _L = 4.1 kΩ (Rank O: R _L = 1.9 kΩ)	—	400	—	V/μs
Common mode transient immunity at logic low output	CM _L	2	I _F = 16 mA, V _{CM} = 200 V _{p-p} R _L = 4.1 kΩ (Rank O: R _L = 1.9 kΩ)	—	-1000	—	V/μs

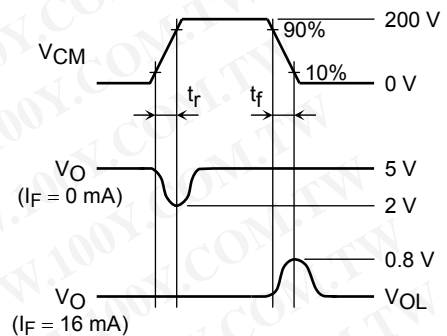
Test Circuit 1: Switching Time Test Circuit



Test Circuit 2: Common Mode Noise Immunity Test Circuit



$$CM_H = \frac{160 \text{ (V)}}{t_r \text{ (}\mu\text{s)}}, CM_L = \frac{160 \text{ (V)}}{t_f \text{ (}\mu\text{s)}}$$

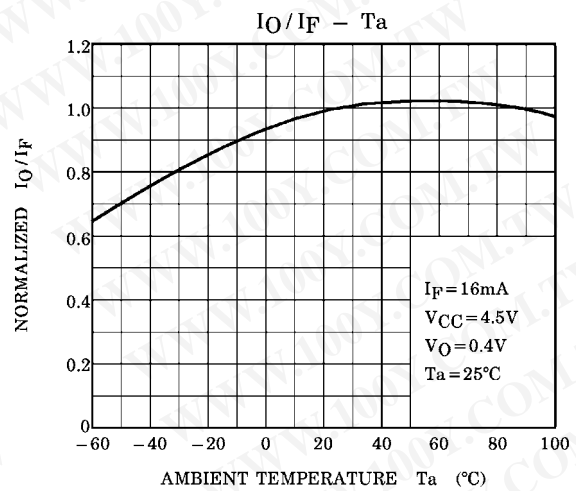
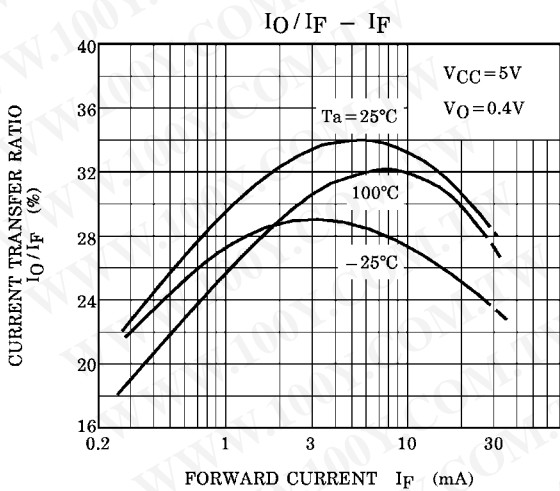
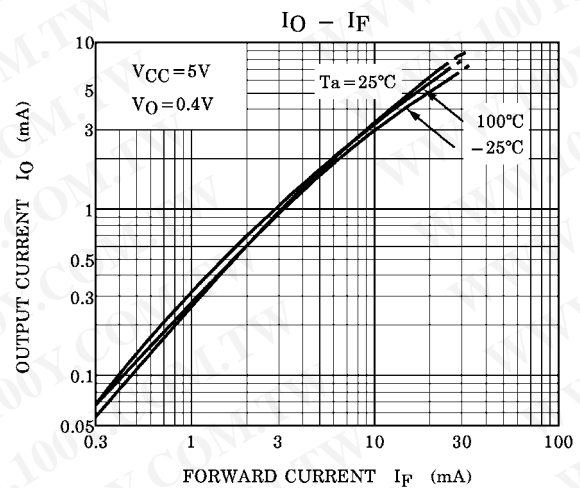
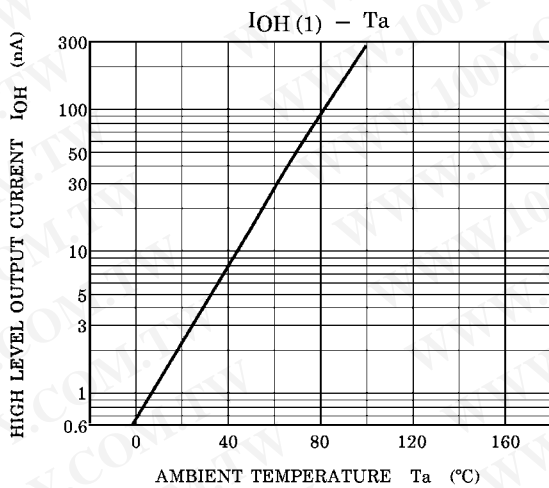
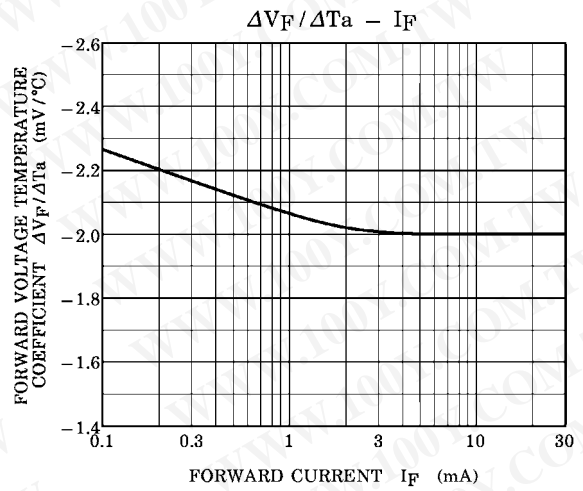
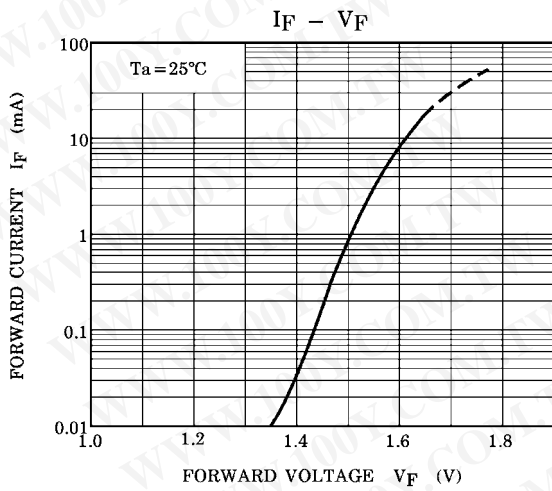


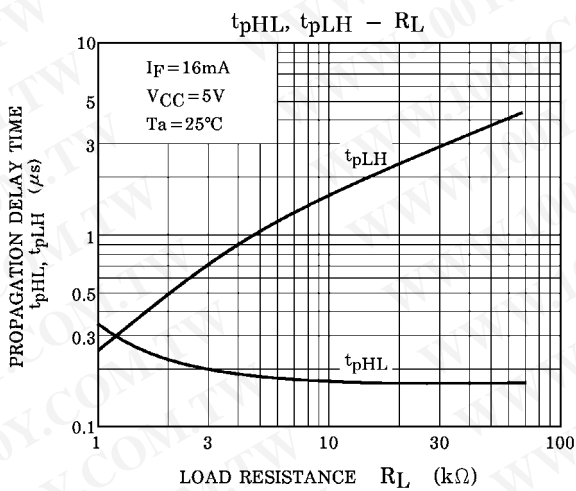
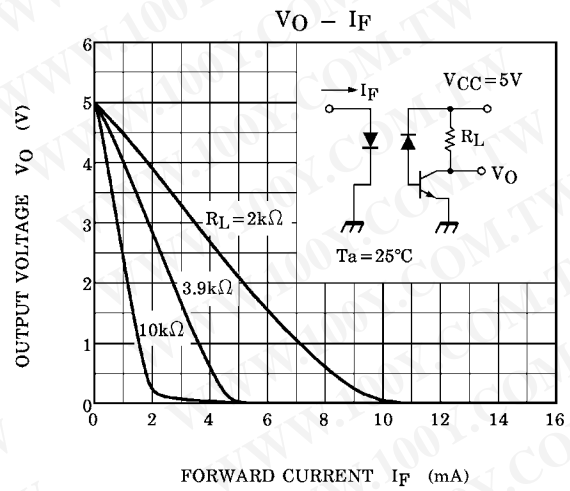
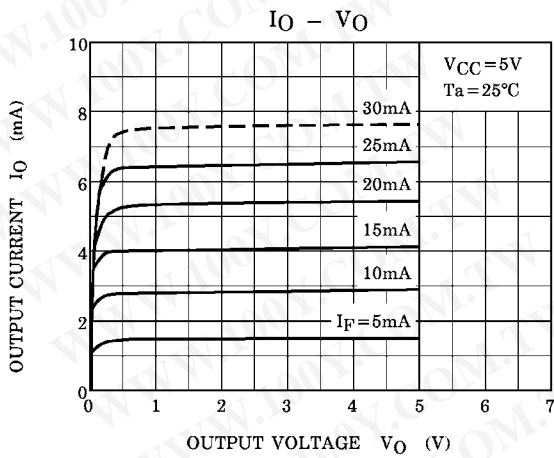
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Note: CM_H: The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the high output state (i.e., V_O > 2.0 V). Measured in volts per microsecond (V/μs).

CM_L: The maximum tolerable rate of fall of the common mode voltage to ensure that the output will remain in the low output state (i.e., V_O < 0.8 V). Measured in volts per microsecond (V/μs).

Maximum electrostatic discharge voltage for any pins: 100 V (C = 200 pF, R = 0).





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