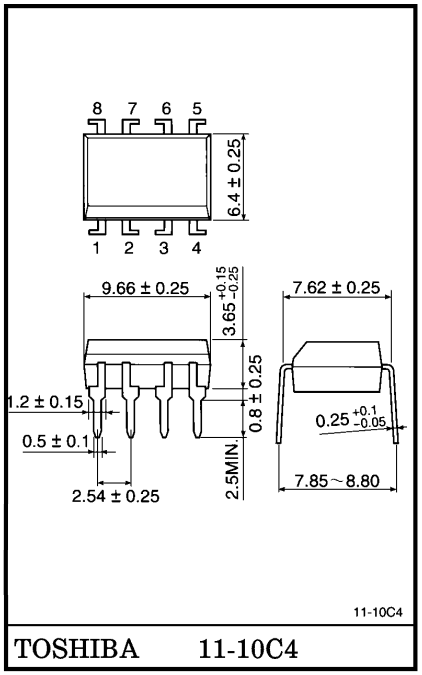
TOSHIBA PHOTOCOUPLER GaAℓAs IRED + PHOTO IC

TLP551

DIGITAL LOGIC GROUND ISOLATION
LINE RECEIVER
MICROPROCESSOR SYSTEM INTERFACES
SWITCHING POWER SUPPLY FEEDBACK CONTROL
ANALOG SIGNAL ISOLATION

Unit in mm



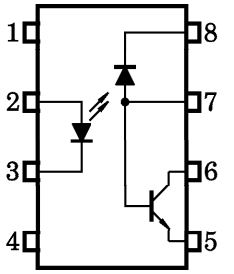
TOSHIBA 11-10C4

Weight : 0.54g

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

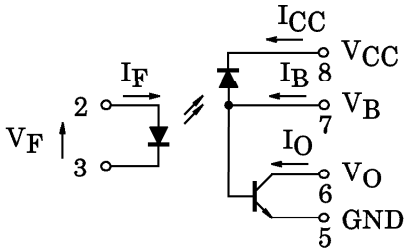
- Isolation Voltage : 2500Vrms (Min.)
- Switching Speed : $t_{pHL} = 0.5\mu s$ (Typ.)
  $t_{pLH} = 0.6\mu s$ (Typ.)
  ($R_L = 1.9k\Omega$)
- TTL Compatible
- If base pin is open, output signal will be noisy by environmental condition. For this case, TLP550 is suitable.
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATION (TOP VIEW)



1 : NC
2 : ANODE
3 : CATHODE
4 : NC
5 : EMITTER
6 : COLLECTOR
7 : BASE
8 : V_{CC}

SCHEMATIC



MAXIMUM RATINGS (Ta = 25°C)

	CHARACTERISTIC		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	−0.5~15	V
	Supply Voltage		V_{CC}	−0.5~15	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}	−55~100	°C
Storage Temperature Range			T_{stg}	−55~125	°C
Lead Solder Temperature (10s)		(Note 6)	T_{sol}	260	°C
Isolation Voltage (AC, 1min., R.H.≦60%)		(Note 7)	BV_S	2500	Vrms

Note 1 : Derate 0.8mA above 70°C

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

Note 3 : Pulse width≦1μs, 300pps.

Note 4 : Derate 0.9mW / °C above 70°C

Note 5 : Derate 2mW / °C above 70°C

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

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.

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

	CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V_F	I_F = 16mA	1.45	1.65	1.85	V
	Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta Ta$	I_F = 16mA	—	−2	—	mV / °C
	Reverse Current	I_R	V_R = 5V	—	—	10	μA
	Capacitance Between Terminal	C_T	V_F = 0, f = 1MHz	—	60	—	pF
DETECTOR	High Level Output Current	I_{OH} (1)	I_F = 0mA, V_{CC} = V_O = 5.5V	—	3	500	nA
		I_{OH} (2)	I_F = 0mA, V_{CC} = V_O = 15V	—	—	5	
		I_{OH}	I_F = 0mA, V_{CC} = V_O = 15V, Ta = 70°C	—	—	50	μA
	High Level Supply Voltage	I_{CCH}	I_F = 0mA, V_{CC} = 15V	—	0.01	1	μA

COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Current Transfer Ratio	I_O / I_F	I_F = 16mA, V_{CC} = 4.5V, V_O = 0.4V		10	30	—	%
			Rank : 0	19	30	—	
		I_F = 16mA, V_{CC} = 4.5V, V_O = 0.4V, Ta = 0~70°C		5	—	—	
			Rank : 0	15	—	—	
Low Level Output Voltage	V_{OL}	I_F = 16mA, V_{CC} = 4.5V, I_O = 1.1mA (rank O : I_O = 2.4mA)		—	—	0.4	V

ISOLATION CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance (Input-Output)	C_S	V_S = 0, f = 1MHz (Note 7)	—	0.8	—	pF
Resistance (Input-Output)	R_S	R.H. ≦ 60%, V_S = 500V_{DC} (Note 7)	5×10^{10}	10^{14}	—	Ω
Isolation Voltage	BV_S	AC, 1 minute	2500	—	—	V_{rms}
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	V_{dc}

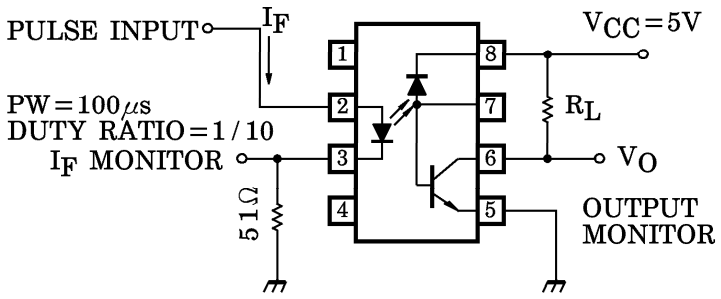
SWITCHING CHARACTERISTIC (Ta = 25°C, V_{CC} = 5V)

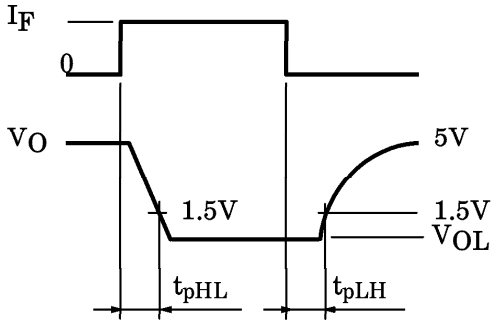
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (H→L)	t_{pHL}	I_F = 16mA, R_L = 4.1kΩ	—	0.3	0.8	μs
		I_F = 16mA, R_L = 1.9kΩ (Rank O)	—	0.5	0.8	
Propagation Delay Time (L→H)	t_{pLH}	I_F = 16mA, R_L = 4.1kΩ	—	1	2	μs
		I_F = 16mA, R_L = 1.9kΩ (Rank O)	—	0.6	1.2	
Common Mode Transient Immunity at Logic High Output	CM_H	I_F = 0mA, V_{CM} = 200V_{p-p} R_L = 4.1kΩ (Rank O : R_L = 1.9kΩ) (Note 8)	—	400	—	V / μs
Common Mode Transient Immunity at Logic Low Output	CM_L	I_F = 16mA, V_{CM} = 200V_{p-p} R_L = 4.1kΩ (Rank O : R_L = 1.9kΩ) (Note 8)	—	−1000	—	V / μs

Note 8 : CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state (V_O < 0.8V).
CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state (V_O > 2.0V).

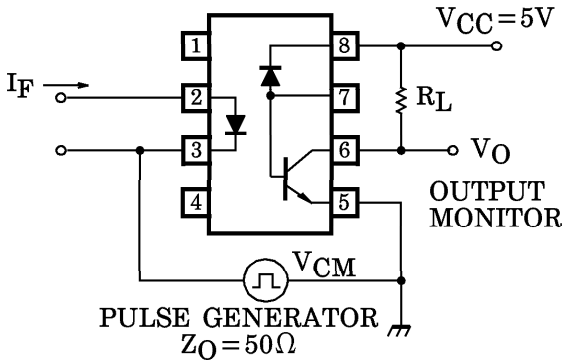
Note 9 : Maximum electrostatic discharge voltage for any pins : 100V (C = 200pF, R = 0).

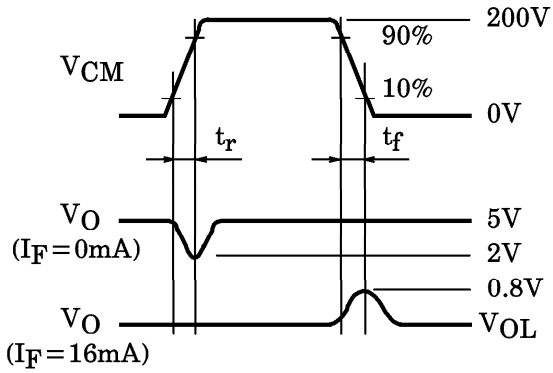
TEST CIRCUIT 1 : Switching Time Test Circuit





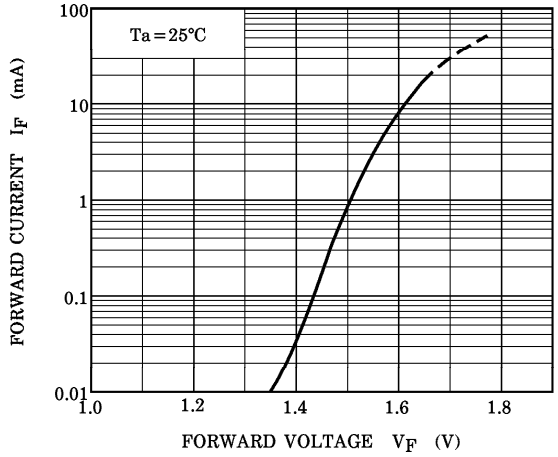
TEST CIRCUIT 2 : Common Mode Noise Immunity Test Circuit



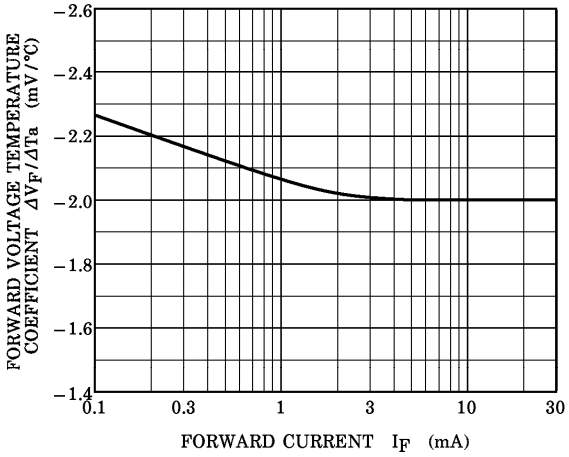


$$CM_H = \frac{160\,(V)}{t_r\,(\mu s)},\ CM_L = \frac{160\,(V)}{t_f\,(\mu s)}$$

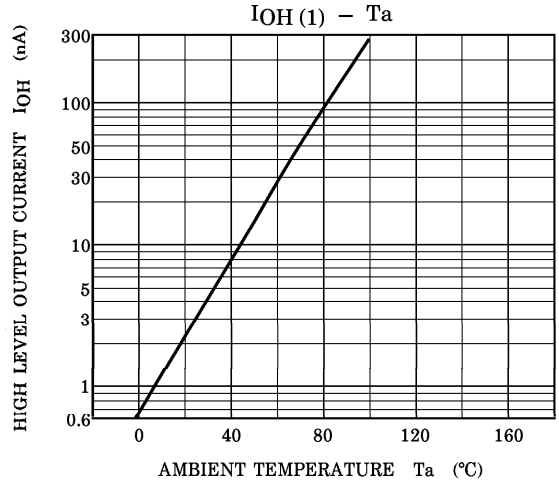
$I_F - V_F$



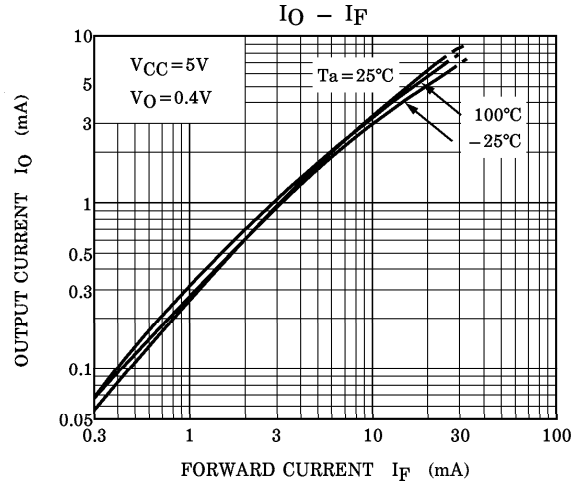
$\Delta V_F / \Delta Ta - I_F$



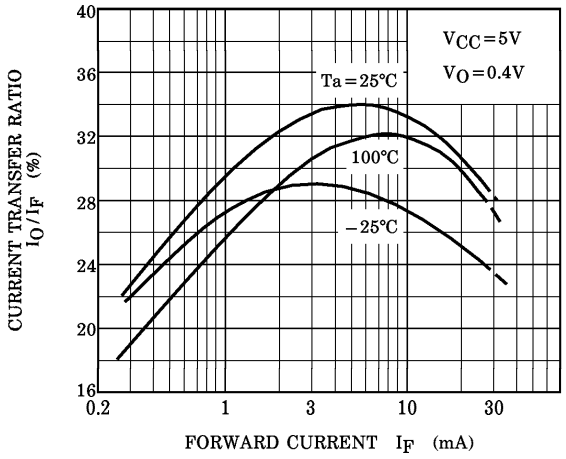
I_{OH} (1) − Ta



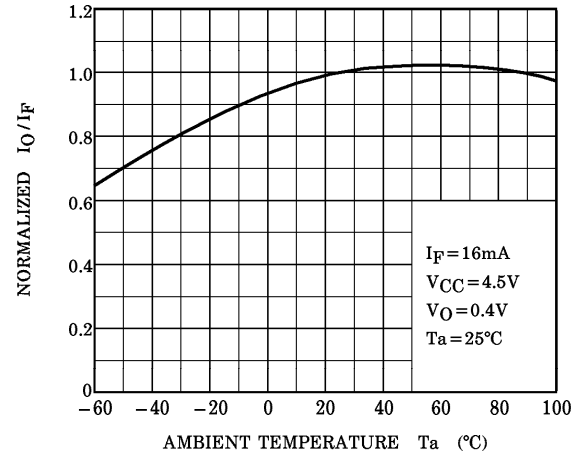
$I_O - I_F$



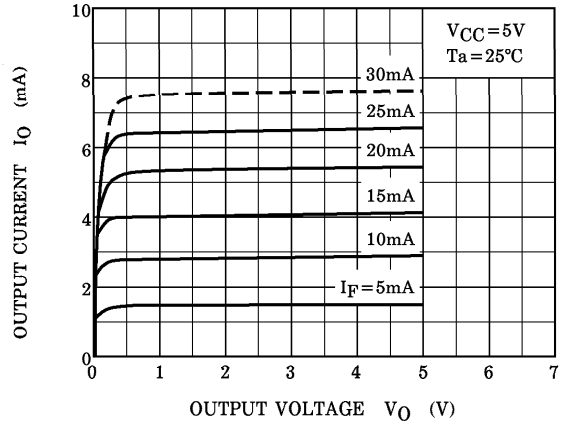
$I_O / I_F - I_F$



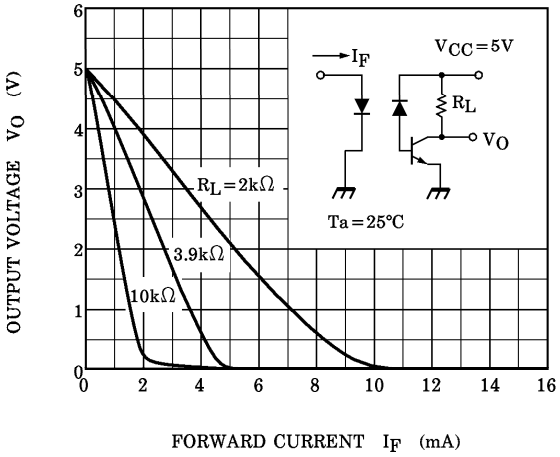
$I_O / I_F - Ta$



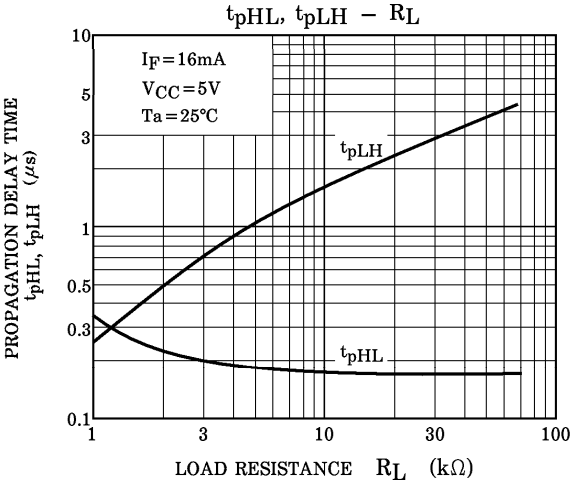
$I_O - V_O$



$V_O - I_F$



$t_{pHL}, t_{pLH} - R_L$



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