

TOSHIBA PHOTOCOUPLER GaAlAs IRED & PHOTO-IC

TLP2200

- ISOLATED BUSS DRIVER
- HIGH SPEED LINE RECEIVER
- MICROPROCESSOR SYSTEM INTERFACES
- MOS FET GATE DRIVER
- DIRECT REPLACEMENT FOR HCPL-2200

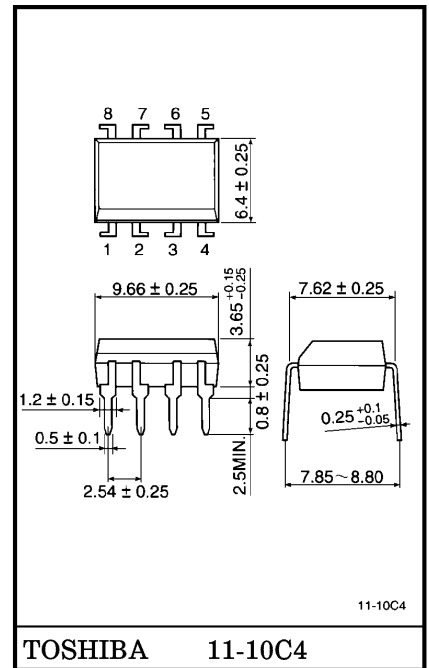
The Toshiba TLP2200 consists of a GaAlAs light emitting diode and integrated high gain, high speed photodetector. This unit is 8-lead DIP package. The detector has a three state output stage that eliminates the need for pull-up resistor, and built-in Schmitt trigger. The detector IC has an internal shield that provides a guaranteed common mode transient immunity of 1000V/μs.

- Input Current : $I_F = 1.6\text{mA}$
- Power Supply Voltage : $V_{CC} = 4.5 \sim 20\text{V}$
- Switching Speed : 2.5MBd Guaranteed
- Common Mode Transient Immunity : $\pm 1000\text{V} / \mu\text{s}$ (Min.)
- Guaranteed Performance Over Temp : $0 \sim 85^\circ\text{C}$
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

TRUTH TABLE (Positive logic)

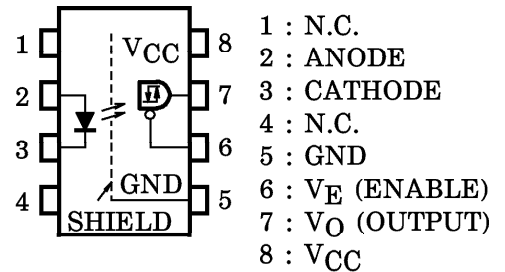
INPUT	ENABLE	OUTPUT
H	H	Z
L	H	Z
H	L	H
L	L	L

Unit in mm

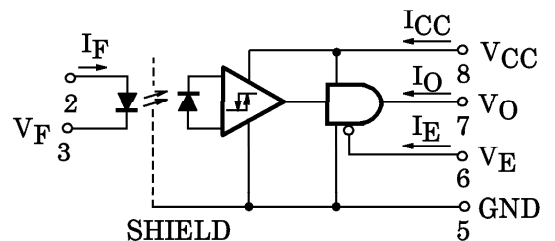


Weight : 0.54g

PIN CONFIGURATION (Top view)



SCHEMATIC



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current, ON	I _F (ON)	1.6	—	5	mA
Input Current, OFF	I _F (OFF)	0	—	0.1	mA
Supply Voltage	V _{CC}	4.5	—	20	V
Enable Voltage High	V _{EH}	2.0	—	20	V
Enable Voltage Low	V _{EL}	0	—	0.8	V
Fan Out (TTL Load)	N	—	—	4	—
Operating Temperature	T _{opr}	0	—	85	°C

ABSOLUTE MAXIMUM RATINGS (No derating required up to 70°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	I _F	10	mA
	Peak Transient Forward Current (Note 1)	I _{FPT}	1	A
	Reverse Voltage	V _R	5	V
DETECTOR	Output Current	I _O	25	mA
	Supply Voltage	V _{CC}	-0.5~20	V
	Output Voltage	V _O	-0.5~20	V
	Three State Enable Voltage	V _E	-0.5~20	V
	Total Package Power Dissipation (Note 2)	P _T	210	mW
	Operating Temperature Range	T _{opr}	-40~85	°C
	Storage Temperature Range	T _{stg}	-55~125	°C
Lead Solder Temperature (10s) (**)	T _{sol}	260	°C	
Isolation Voltage (AC 1min., R.H. ≤ 60%, T _a = 25°C) (Note 3)	BV _S	2500	V _{rms}	

(Note 1) Pulse width 1μs 300pps.

(Note 2) Derate 4.5mW/°C above 70°C ambient temperature.

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

(**) 1.6mm below seating plane.

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $T_a = 0 \sim 85^\circ\text{C}$, $V_{CC} = 4.5 \sim 20\text{V}$,
 $I_F(\text{ON}) = 1.6 \sim 5\text{mA}$, $I_F(\text{OFF}) = 0 \sim 0.1\text{mA}$, $V_{EL} = 0 \sim 0.8\text{V}$, $V_{EH} = 2.0 \sim 20\text{V}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.*	MAX.	UNIT
Output Leakage Current ($V_O > V_{CC}$)	I_{OHH}	$I_F = 5\text{mA}$, $V_{CC} = 4.5\text{V}$	$V_O = 5.5\text{V}$	—	—	100	μA
			$V_O = 20\text{V}$	—	2	500	
Logic Low Output Voltage	V_{OL}	$I_{OL} = 6.4\text{mA}$ (4 TTL load)		—	0.32	0.5	V
Logic High Output Voltage	V_{OH}	$I_{OH} = -2.6\text{mA}$		2.4	3.4	—	V
Logic Low Enable Current	I_{EL}	$V_E = 0.4\text{V}$		—	-0.13	-0.32	mA
Logic High Enable Current	I_{EH}	$V_E = 2.7\text{V}$		—	—	20	μA
		$V_E = 5.5\text{V}$		—	—	100	
		$V_E = 20\text{V}$		—	0.01	250	
Logic Low Enable Voltage	V_{EL}	—		—	—	0.8	V
Logic High Enable Voltage	V_{EH}	—		2.0	—	—	V
Logic Low Supply Current	I_{CCL}	$I_F = 0\text{mA}$ $V_E = \text{Don't care}$	$V_{CC} = 5.5\text{V}$	—	5	6.0	mA
			$V_{CC} = 20\text{V}$	—	5.6	7.5	
Logic High Supply Current	I_{CCH}	$I_F = 5\text{mA}$ $V_E = \text{Don't care}$	$V_{CC} = 5.5\text{V}$	—	2.5	4.5	mA
			$V_{CC} = 20\text{V}$	—	2.8	6.0	
High Impedance State Output Current	I_{OZL}	$I_F = 5\text{mA}$ $V_E = 2\text{V}$	$V_O = 0.4\text{V}$	—	1	-20	μA
			$V_O = 2.4\text{V}$	—	—	20	
	I_{OZH}	$I_F = 0\text{mA}$ $V_E = 2\text{V}$	$V_O = 5.5\text{V}$	—	—	100	
			$V_O = 20\text{V}$	—	0.01	500	
Logic Low Short Circuit Output Current (Note 4)	I_{OSL}	$I_F = 0\text{mA}$	$V_O = V_{CC} = 5.5\text{V}$	25	55	—	mA
			$V_O = V_{CC} = 20\text{V}$	40	80	—	
Logic High Short Circuit Output Current (Note 4)	I_{OSH}	$I_F = 5\text{mA}$ $V_O = \text{GND}$	$V_{CC} = 5.5\text{V}$	-10	-25	—	mA
			$V_{CC} = 20\text{V}$	-25	-60	—	
Input Current Hysteresis	I_{HYS}	$V_{CC} = 5\text{V}$		—	0.05	—	mA
Input Forward Voltage	V_F	$I_F = 5\text{mA}$, $T_a = 25^\circ\text{C}$		—	1.55	1.7	V
Temperature Coefficient of Forward Voltage	$\Delta V_F / \Delta T_a$	$I_F = 5\text{mA}$		—	-2.0	—	mV / °C
Input Reverse Breakdown Voltage	BV_R	$I_R = 10\mu\text{A}$, $T_a = 25^\circ\text{C}$		5	—	—	V
Input Capacitance	C_{IN}	$V_F = 0\text{V}$, $f = 1\text{MHz}$, $T_a = 25^\circ\text{C}$		—	45	—	pF
Resistance (Input-Output)	R_{I-O}	$V_{I-O} = 500\text{V}$ R.H. $\leq 60\%$ (Note 3)		5×10^{10}	10^{14}	—	Ω
Capacitance (Input-Output)	C_{I-O}	$V_{I-O} = 0\text{V}$, $f = 1\text{MHz}$ (Note 3)		—	0.6	—	pF

(**) All typ. values are at $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F(\text{ON}) = 3\text{mA}$ unless otherwise specified.

SWITCHING CHARACTERISTICS

(Unless otherwise specified, $T_a = 0 \sim 85^\circ\text{C}$, $V_{CC} = 4.5 \sim 20\text{V}$, $I_F(\text{ON}) = 1.6 \sim 5\text{mA}$, $I_F(\text{OFF}) = 0 \sim 0.1\text{mA}$)

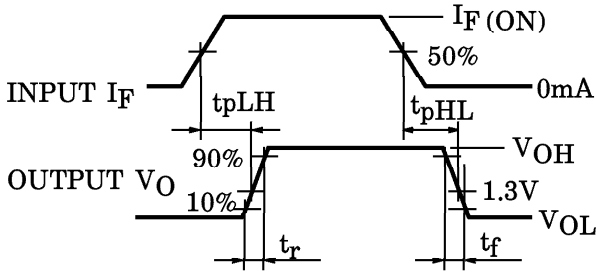
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time to Logic High Output Level (Note 5)	t_{pLH}	1	Without peaking capacitor C_1	—	235	—	ns
			With peaking capacitor C_1	—	—	400	
Propagation Delay Time to Logic Low Output Level (Note 5)	t_{pHL}		Without peaking capacitor C_1	—	250	—	ns
			With peaking capacitor C_1	—	—	400	
Output Rise Time (10-90%)	t_r		—	—	35	—	ns
Output Fall Time (90-10%)	t_f		—	—	20	—	ns
Output Enable Time to Logic High	t_{pZH}	2	—	—	—	ns	
Output Enable Time to Logic Low	t_{pZL}		—	—	—	ns	
Output Disable Time from Logic High	t_{pHZ}		—	—	—	ns	
Output Disable Time from Logic Low	t_{pLZ}		—	—	—	ns	
Common Mode Transient Immunity at Logic High Output (Note 6)	CM_H	3	$I_F = 1.6\text{mA}$, $V_{CM} = 50\text{V}$, $T_a = 25^\circ\text{C}$	-1000	—	—	$\text{V} / \mu\text{s}$
Common Mode Transient Immunity at Logic Low Output (Note 6)	CM_L		$I_F = 0\text{mA}$, $V_{CM} = 50\text{V}$, $T_a = 25^\circ\text{C}$	1000	—	—	$\text{V} / \mu\text{s}$

(*) ALL Typ. values are at $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $I_F(\text{ON}) = 3\text{mA}$ unless otherwise specified.

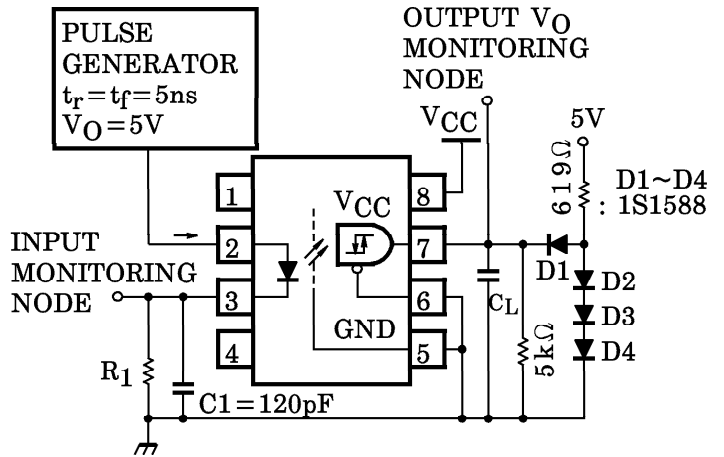
(Note 4) Duration of output short circuit time should not exceed 10ms.

(Note 5) The t_{pLH} propagation delay is measured from the 50% point on the leading edge of the input pulse to the 1.3V point on the leading edge of the output pulse.
The t_{pHL} propagation delay is measured from the 50% point on the trailing edge of the input pulse to the 1.3V point on the trailing edge of the output pulse.(Note 6) CM_L is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic low state ($V_O \leq 0.8\text{V}$).
 CM_H is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic high state ($V_O \leq 2.0\text{V}$).

TEST CIRCUIT 1 t_{pHL} , t_{pLH} , t_r and t_f



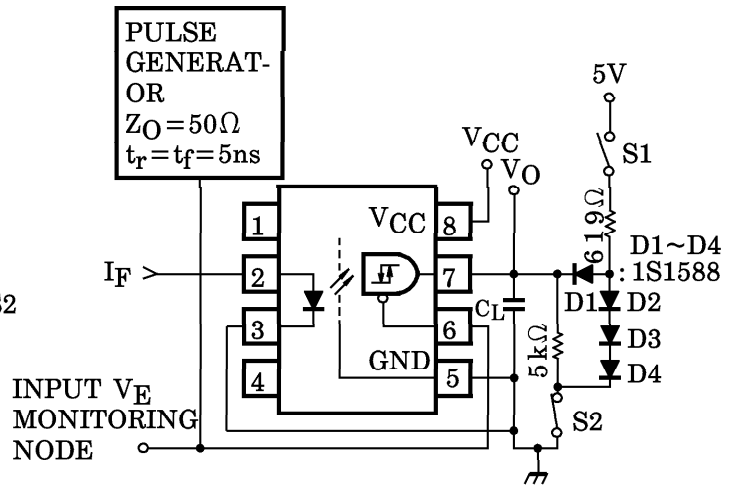
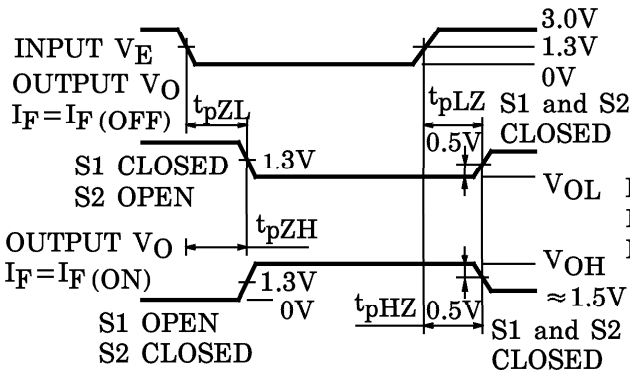
R_1	2.15k Ω	1.1k Ω	681 Ω
I_F (ON)	1.6mA	3mA	5mA



C_1 is peaking capacitor. The probe and jig capacitances are include in C_1 .

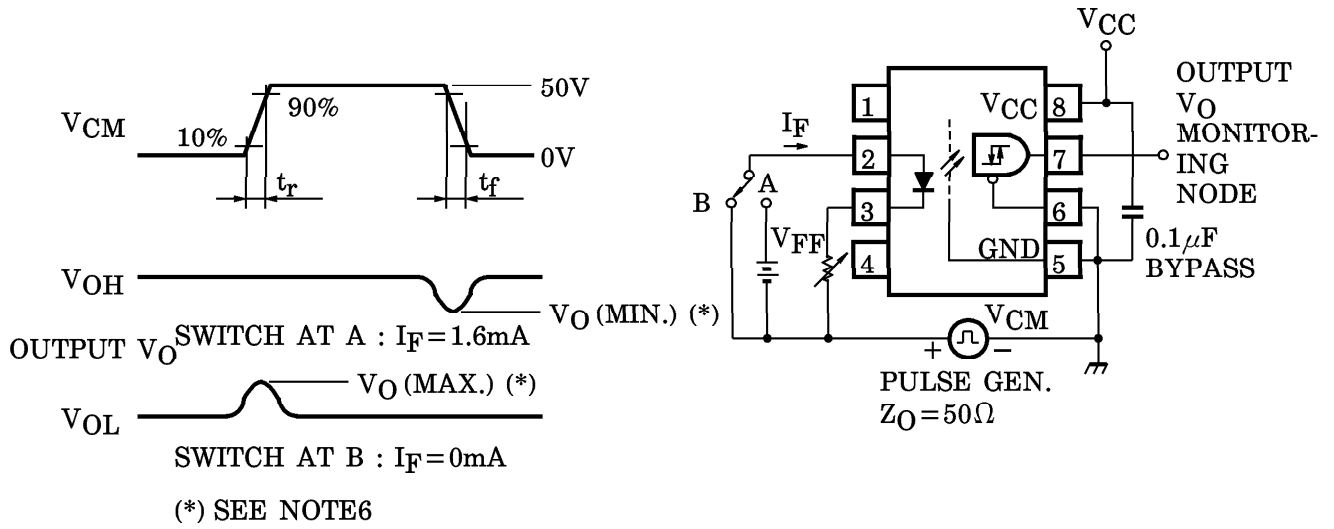
C_L is approximately 15pF which includes probe and stray wiring capacitance.

TEST CIRCUIT 2 t_{pHZ} , t_{pZH} , t_{pLZ} and t_{pZL}



C_L is approximately 15pF which includes probe and stray wiring capacitance.

TEST CIRCUIT 3 Common mode transient immunity



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