

TLP2200

Isolated Bus Driver
High Speed Line Receiver
Microprocessor System Interfaces
MOS FET Gate Driver
Direct Replacement for HCPL-2200

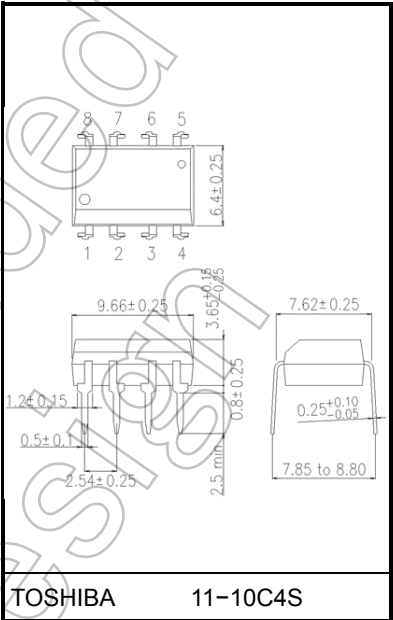
The TOSHIBA TLP2200 consists of an infrared emitting diode and integrated high gain, high speed photodetector. This unit is 8-lead DIP package. The detector has a three state output stage that eliminates the need for pull-up resistor, and built-in Schmitt trigger. The detector IC has an internal shield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

- Input current: $I_F = 1.6\text{ mA}$
- Power supply voltage: $V_{CC} = 4.5\text{ to }20\text{ V}$
- Switching speed: 2.5MBd guaranteed
- Common mode transient immunity: $\pm 1000\text{V} / \mu\text{s}$ (min)
- Guaranteed performance over temperature: 0 to 85°C
- Isolation voltage: 2500 Vrms (min)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A File No.E67349

Truth Table (positive logic)

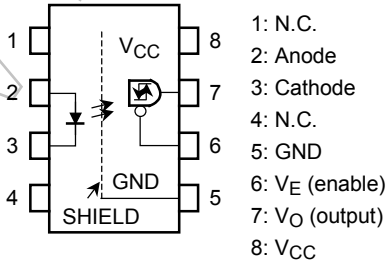
Input	Enable	Output
H	H	Z
L	H	Z
H	L	H
L	L	L

Unit: mm

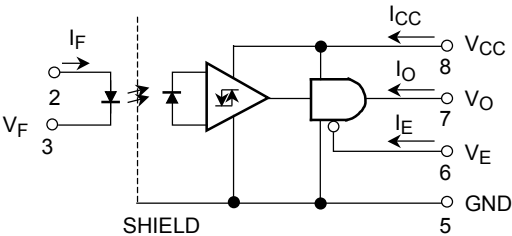


Weight: 0.54 g (typ.)

Pin Configuration (top view)



Schematic



Start of commercial production
1986-07

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

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.

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
	Input Power Dissipation	P _D	45	mW
	Input power dissipation derating (Ta ≥ 70°C)	ΔP _D /ΔTa	-0.86	mW/°C
Detector	Output current	I _O	25	mA
	Supply voltage	V _{CC}	-0.5 to 20	V
	Output voltage	V _O	-0.5 to 20	V
	Three state enable voltage	V _E	-0.5 to 20	V
	Output Power Dissipation	P _O	100	mW
	Output Power Dissipation Derating (Ta ≥ 70°C)	ΔP _O /°C	-1.9	mW/°C
	Total package power dissipation (Note 2)	P _T	210	mW
Operating temperature range		T _{opr}	-40 to 85	°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 3)		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) Pulse width 1 μs, 300 pps.

(Note 2) Derate 4.5 mW / °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

(**) 1.6 mm below seating plane.

**Electrical Characteristics (unless otherwise specified, Ta = 0 to 85 °C, VCC = 4.5 to 20 V,
IF(ON) = 1.6 to 5 mA, IF(OFF) = 0 to 0.1 mA, VEL = 0 to 0.8 V,
VEH = 2.0 to 20 V)**

Characteristic	Symbol	Test Condition		Min	Typ.*	Max	Unit
Output leakage current (VO > VCC)	IOHH	IF = 5 mA, VCC = 4.5 V	VO = 5.5 V	—	—	100	μA
			VO = 20 V	—	2	500	
Logic low output voltage	VOL	IOL = 6.4 mA (4 TTL load)		—	0.32	0.5	V
Logic high output voltage	VOH	IOH = -2.6 mA		2.4	3.4	—	V
Logic low enable current	IEL	VE = 0.4 V		—	-0.13	-0.32	mA
Logic high enable current	IEH	VE = 2.7 V		—	—	20	μA
		VE = 5.5 V		—	—	100	
		VE = 20 V		—	0.01	250	
Logic low enable voltage	VEL	—		—	—	0.8	V
Logic high enable voltage	VEH	—		2.0	—	—	V
Logic low supply current	ICCL	IF = 0 mA VE = don't care	VCC = 5.5 V	—	5	6.0	mA
			VCC = 20 V	—	5.6	7.5	
Logic high supply current	ICCH	IF = 5 mA VE = don't care	VCC = 5.5 V	—	2.5	4.5	mA
			VCC = 20 V	—	2.8	6.0	
High impedance state output current	IOZL	IF = 5 mA VE = 2 V	VO = 0.4 V	—	1	-20	μA
	IOZH	IF = 0 mA VE = 2 V	VO = 2.4 V	—	—	20	
			VO = 5.5 V	—	—	100	
			VO = 20 V	—	0.01	500	
Logic low short circuit output current (Note 4)	IOSL	IF = 0 mA	VO = VCC = 5.5 V	25	55	—	mA
			VO = VCC = 20 V	40	80	—	
Logic high short circuit output current (Note 4)	IOSH	IF = 5 mA VO = GND	VCC = 5.5 V	-10	-25	—	mA
			VCC = 20 V	-25	-60	—	
Input current hysteresis	IHYS	VCC = 5 V		—	0.05	—	mA
Input forward voltage	VF	IF = 5 mA, Ta = 25 °C		—	1.55	1.7	V
Temperature coefficient of forward voltage	ΔVF / ΔTa	IF = 5 mA		—	-2.0	—	mV / °C
Input reverse breakdown voltage	BVR	IR = 10 μA, Ta = 25 °C		5	—	—	V
Input capacitance	CIN	VF = 0 V, f = 1 MHz, Ta = 25 °C		—	45	—	pF
Resistance (input-output)	RI-O	VI-O = 500 V R.H. ≤ 60 % (Note 3)		5×10 ¹⁰	10 ¹⁴	—	Ω
Capacitance (input-output)	CI-O	VI-O = 0 V, f = 1 MHz (Note 3)		—	0.6	—	pF

(**) All typ. values are at Ta = 25 °C, VCC = 5 V, IF(ON) = 3 mA unless otherwise specified.

Switching Characteristics

(unless otherwise specified, $T_a = 0$ to $85\text{ }^{\circ}\text{C}$, $V_{CC} = 4.5$ to 20 V , $I_{F(ON)} = 1.6$ to 5 mA ,
 $I_{F(OFF)} = 0$ to 0.1 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	3	—	—	35	—	ns
Output fall time (90–10%)	t_f			—	20	—	ns
Common mode transient immunity at logic high output (Note 6)	CM_H		$I_F = 1.6\text{ mA}$, $V_{CM} = 50\text{ V}$, $T_a = 25\text{ }^{\circ}\text{C}$	–1000	—	—	$\text{V} / \mu\text{s}$
Common mode transient immunity at logic low output (Note 6)	CM_L		$I_F = 0\text{ mA}$, $V_{CM} = 50\text{ V}$, $T_a = 25\text{ }^{\circ}\text{C}$	1000	—	—	$\text{V} / \mu\text{s}$

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

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

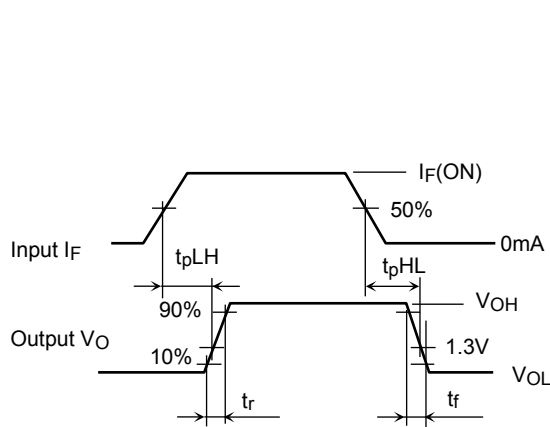
(Note 5) The t_{pLH} propagation delay is measured from the 50 % point on the leading edge of the input pulse to the 1.3 V point on the leading edge of the output pulse.

The t_{pHL} propagation delay is measured from the 50 % point on the trailing edge of the input pulse to the 1.3 V point on the trailing edge of the output pulse.

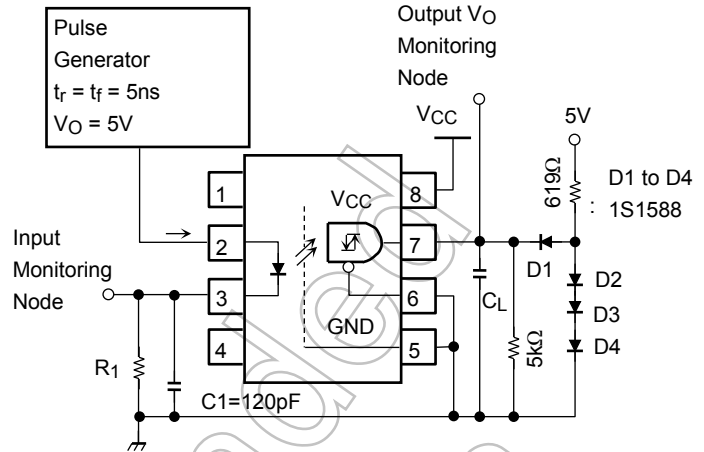
(Note 6) CM_L is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic low state ($V_O < 0.8\text{ V}$).

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 ($V_O > 2.0\text{ V}$).

Test Circuit 1 t_{pHL} , t_{pLH} , t_r and t_f

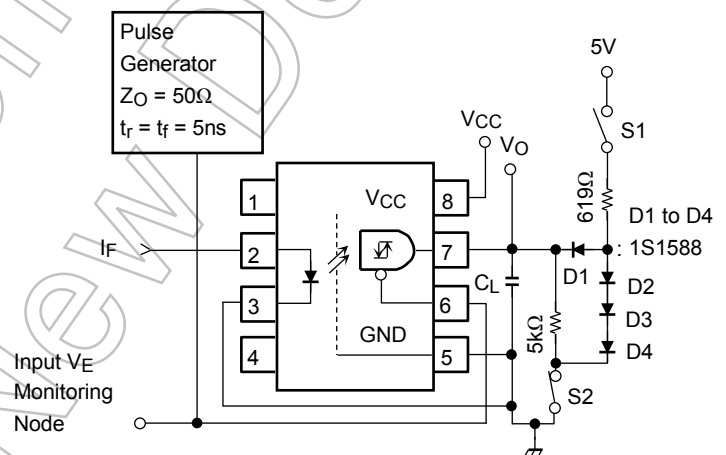
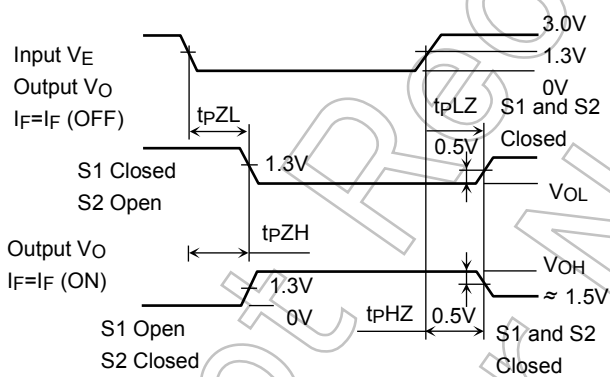


R1	2.15k Ω	1.1k Ω	681 Ω
I _{F(ON)}	1.6mA	3mA	5mA



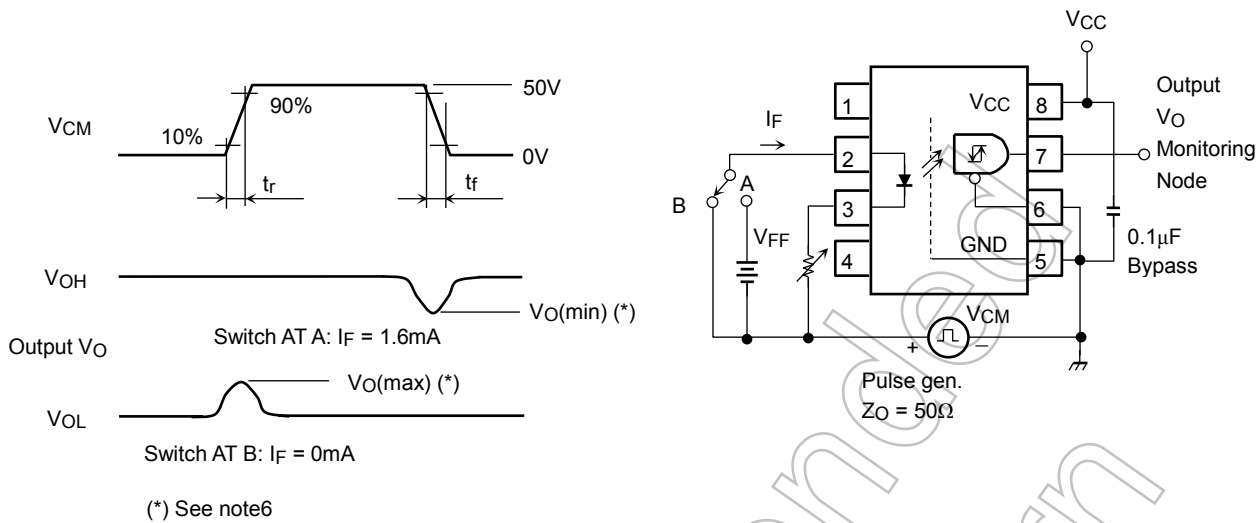
C1 is peaking capacitor. The probe and jig capacitances are included in C1.
C_L is approximately 15pF which includes probe and stray wiring capacitance.

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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