

TLP716

Plasma display panel.

High Speed Interface.

Factory Automation .

The TOSHIBA TLP716 consists of a GaAlAs light emitting diode and a high speed photodetector. This unit is 6-lead SDIP. TLP716 is 50% smaller than 8PIN DIP and has suited the safety standard reinforced insulation class. So, mounting area in safety standard required equipment can be reduced.

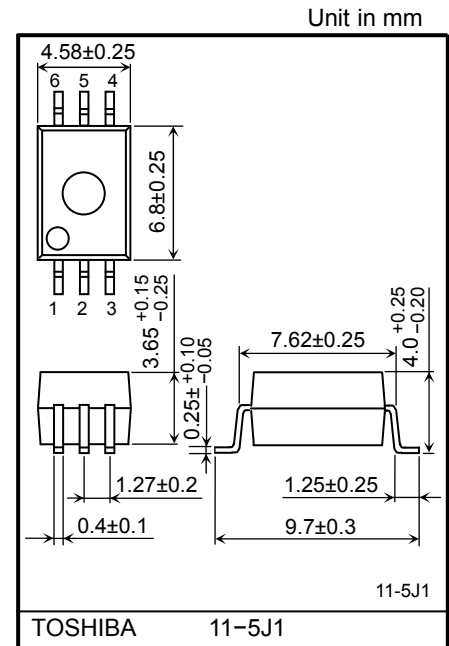
- Inverter Logic (totempole output)
- Package Type : SDIP6
- Guaranteed Performance Over Temperature : $-40\sim 100^{\circ}\text{C}$
- Power Supply Voltage : 4.5~5.5 V
- Input Thresholds Current : $\text{IFHL}=6.5\text{ mA}(\text{max.})$
- Propagation delay Time (tpHL/tpLH) : 75 ns(max.)
- Switching speed : 15 MBd(typ.) (NRZ)
- Common mode transient immunity : 10 kV/us(min.)
- Isolation voltage : 5000 Vrms(min.)
- UL Recognized :UL1577, File No.E67349
- Option (D4)
TÜV Approved : EN60747-5-2
Maximum Operating Insulation Voltage : 890 V_{PK}
Highest Permissible Over Voltage : 8000 V_{PK}
**(Note):When a EN60747-5-2 approved type is needed,
Please designate "Option(D4)"**

- Construction Mechanical Rating

	7.62 mm pitch standard type	10.16 mm pitch TLPXXXXF type
Creepage Distance	7.0 mm (min)	8.0 mm (min)
Clearance	7.0 mm (min)	8.0 mm (min)
Insulation Thickness	0.4 mm (min)	0.4 mm (min)

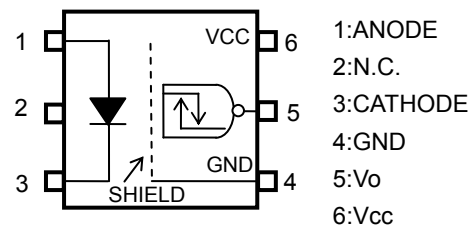
Truth Table

Input	LED	Tr1	Tr2	Output
H	ON	OFF	ON	L
L	OFF	ON	OFF	H

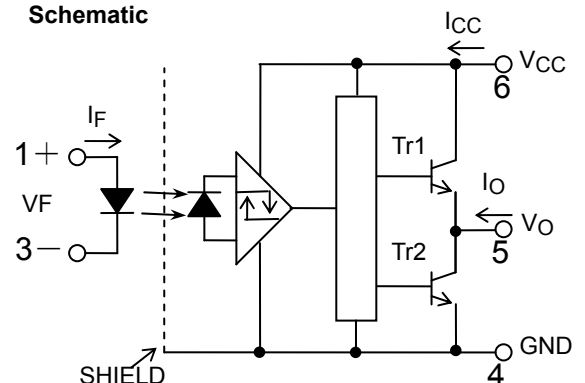


Weight : 0.26 g (typ.)

Pin Configuration (Top View)



Schematic



0.1 μF bypass capacitor must be connected between pins 6 and 4. (Note 4)

Absolute Maximum Ratings (Ta=25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current (Ta ≤ 85°C)	IF	20	mA
	Forward Current Derating (Ta > 85°C)	ΔIF/ΔTa	-0.5	mA/°C
	Peak Transient Forward Current (Note1)	IFPT	1	A
	Reverse Voltage	VR	5	V
	Junction Temperature	Tj	125	°C
DETECTOR	Output Current (Ta ≤ 85°C)	IO	10	mA
	Output Current Derating (Ta > 85°C)	ΔIO /ΔTa	-0.25	mA/°C
	Output Voltage (Vo ≤ Vcc)	VO	-0.5~6	V
	Supply Voltage	VCC	-0.5~6	V
	Power Dissipation (Ta ≤ 85°C)	PD	40	mW
	Power Dissipation Derating (Ta > 85°C)	ΔPo/ΔTa	-1	mW/°C
	Junction Temperature	Tj	125	°C
Operating Temperature Range		Topr	-40~100	°C
Storage Temperature Range		Tstg	-55~125	°C
Lead Solder Temperature(10s)		Tsol	260	°C
Isolation Voltage (AC, 1min., R.H. ≤ 60%, Ta=25°C) (Note2)		BVs	5000	Vrms

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 and the operating ranges.

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).

Recommended Operating Conditions

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Current , ON	IF(ON)	8	12	18	mA
Input Voltage , OFF	VF(OFF)	0	—	0.8	V
Supply Voltage (*) (Note3, Note4)	VCC	4.5	5	5.5	V

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.

(*) This item denotes operating ranges, not meaning of recommended operating conditions.

The correlation between input current and switching speed and drive circuit (reference information).

Input Current (IF)	TEST CIRCUIT	Typical Switching Speed
12mA	1 (Page 4)	14 – 16 MBd
8mA	1 (Page 4)	11 – 13 MBd
8mA	2 (Page 4, with Speed up capacitor)	16 – 20 MBd

Note 1: Pulse width $PW \leq 1\mu s$, 300pps.

Note 2: Device Considered a two terminal device : pins 1,2 and 3 shorted together and pins 4,5 and 6 shorted together.

Note 3: The detector of this product requires a power supply voltage (VCC) of 4.5 V or higher for stable operation. If the VCC is lower than this value, an Icc may increase, or an output may be unstable. Be sure to use the product after checking the supply current, and the operation of a power-on/-off.

Note 4: A ceramic capacitor(0.1 μF) should be connected from pin 6 to pin 4 to stabilize the operation of the high gain linear amplifier. Failure to provide the bypassing may impair the switching property. The total lead length between capacitor and coupler should not exceed 1 cm.

Electrical Characteristics

(Unless otherwise specified, Ta=-40 to 100°C, Vcc=4.5~5.5V)

CHARACTERISTIC	SYMBOL	CONDITION	MIN.	TYP. *	MAX.	UNIT
Input Forward Voltage	VF	IF=10mA, Ta=25°C	—	1.65	1.8	V
Temperature Coefficient of Forward Voltage	$\Delta VF/\Delta Ta$	IF=10mA	—	-2.0	—	mV/°C
Input Reverse Current	IR	VR=5V, Ta=25°C	—	—	10	μA
Input Capacitance	CT	V=0V, f=1MHz, Ta=25°C	—	45	—	pF
Logic Low Output Voltage	VOL	IOL=1.6mA, IF=12mA, VCC=5V	—	—	0.4	V
Logic High Output Voltage	VOH	IOH=-0.02mA, VF=1.05V, VCC=5V	4.0	—	—	V
Logic Low Supply Current	ICCL	IF=12mA	—	—	5.0	mA
Logic High Supply Current	ICCH	VF=0V	—	—	5.0	mA
Input Current Logic Low Output	IFHL	IO=1.6mA, VO<0.4V	—	—	6.5	mA
Input Voltage Logic High Output	VFLH	IO=-0.02mA, VO>4.0V	0.8	—	—	V

*All typical values are at Ta=25°C, VCC=5V, IF(ON)=12mA unless otherwise specified

Isolation Characteristics (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance input to output	CS	VS = 0V, f = 1MHz (Note 2)	—	0.8	—	pF
Isolation resistance	RS	R.H. $\leq 60\%$, VS = 500V (Note 2)	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BVS	AC, 1 minute	5000	—	—	Vrms
		AC, 1 second, in oil	—	10000	—	Vdc
		DC, 1 minute, in oil	—	10000	—	

Switching Characteristics

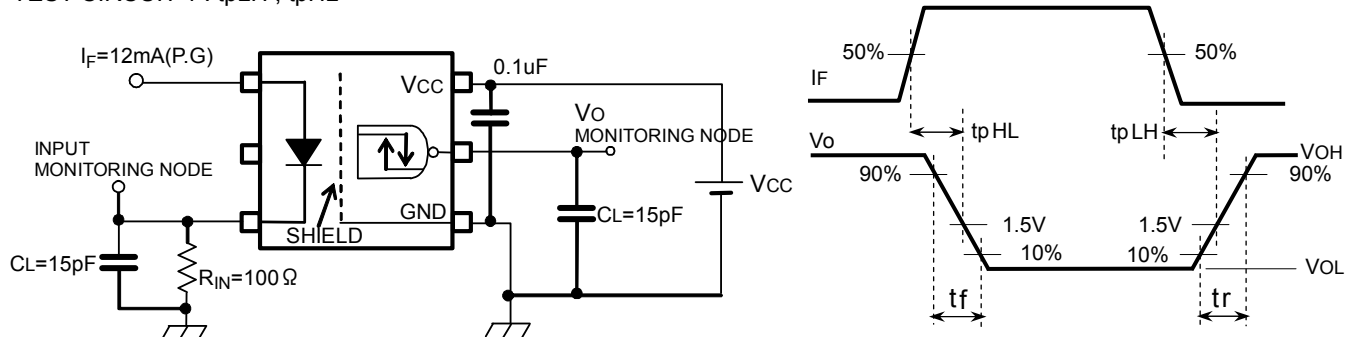
(Unless otherwise specified, $T_a = -40$ to 100°C , $V_{CC} = 4.5 \sim 5.5\text{V}$)

CHARACTERISTIC	SYMBOL	TEST -CIRCUIT	CONDITION	MIN.	TYP.	MAX.	UNIT
propagation Delay Time to Logic Low output	t_{pHL}	1	$I_F = 0 \rightarrow 12\text{mA}$	—	—	75	ns
propagation Delay Time to Logic High output	t_{pLH}		$I_F = 12 \rightarrow 0\text{mA}$	—	—	75	ns
propagation Delay Time to Logic Low output	t_{pHL}	2	$V_{IN} = 0 \rightarrow 5\text{V}$ ($I_F = 0 \rightarrow 8\text{mA}$)	—	—	65	ns
propagation Delay Time to Logic High output	t_{pLH}		$V_{IN} = 5 \rightarrow 0\text{V}$ ($I_F = 8 \rightarrow 0\text{mA}$)	—	—	65	ns
Switching Time Dispersion between ON and OFF	$ t_{pLH} - t_{pHL} $	1	$I_F = 12\text{mA}$ $R_{IN} = 100\Omega$, $C_L = 15\text{pF}$ (Note 5)	—	—	45	ns
Output Fall Time (90 ~ 10%)	t_f		$I_F = 0 \rightarrow 12\text{mA}$	—	15	—	ns
Output Rise Time (10 ~ 90%)	t_r		$I_F = 12 \rightarrow 0\text{mA}$	—	15	—	ns
Common Mode transient Immunity at High Level Output	CMH	3	$V_{CM} = 1000\text{Vp-p}$, $I_F = 0\text{mA}$, $V_O(\text{Min}) = 4\text{V}$, $T_a = 25^\circ\text{C}$	10000	—	—	V/us
Common Mode transient Immunity at Low Level Output	CML		$V_{CM} = 1000\text{Vp-p}$, $I_F = 12\text{mA}$, $V_O(\text{Max}) = 0.4\text{V}$, $T_a = 25^\circ\text{C}$	-10000	—	—	V/us

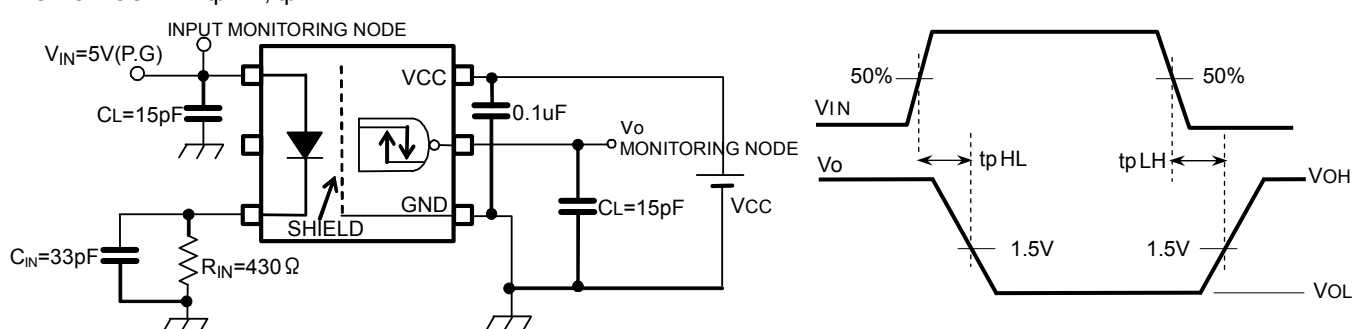
*All typical values are at $T_a = 25^\circ\text{C}$

Note 5: C_L is approximately 15pF which includes probe and jig/stray wiring capacitance.

TEST CIRCUIT 1 : t_{pLH} , t_{pHL}



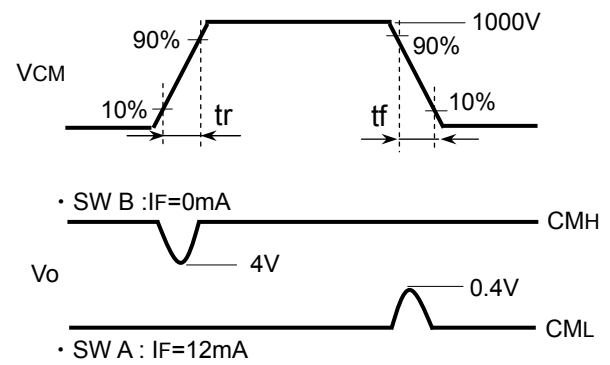
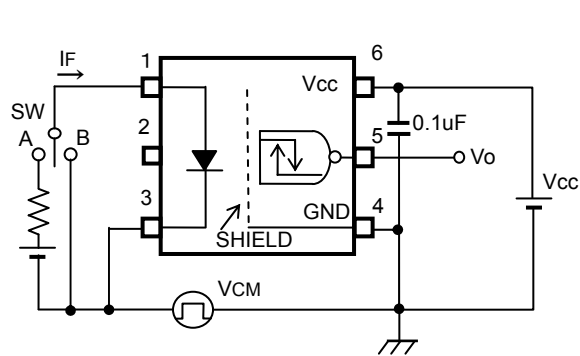
TEST CIRCUIT 2 : t_{pLH} , t_{pHL}



The PROBE and JIG capacitances are included in C_L .

(P.G) : Pulse Generator

TEST CIRCUIT 3 : Common-Mode Transient Immunity Test Circuit



$$CMH = \frac{800(V)}{tr(\mu s)}$$

$$CML = -\frac{800(V)}{tf(\mu s)}$$

CM_L (CM_H) is the maximum rate of fall (rise) of the common mode voltage that can be sustained with the output voltage in the low (high) state.

RESTRICTIONS ON PRODUCT USE

- Toshiba Corporation, and its subsidiaries and affiliates (collectively "TOSHIBA"), reserve the right to make changes to the information in this document, and related hardware, software and systems (collectively "Product") without notice.
- This document and any information herein may not be reproduced without prior written permission from TOSHIBA. Even with TOSHIBA's written permission, reproduction is permissible only if reproduction is without alteration/omission.
- Though TOSHIBA works continually to improve Product's quality and reliability, Product can malfunction or fail. Customers are responsible for complying with safety standards and for providing adequate designs and safeguards for their hardware, software and systems which minimize risk and avoid situations in which a malfunction or failure of Product could cause loss of human life, bodily injury or damage to property, including data loss or corruption. Before creating and producing designs and using, customers must also refer to and comply with (a) the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and (b) the instructions for the application that Product will be used with or for. Customers are solely responsible for all aspects of their own product design or applications, including but not limited to (a) determining the appropriateness of the use of this Product in such design or applications; (b) evaluating and determining the applicability of any information contained in this document, or in charts, diagrams, programs, algorithms, sample application circuits, or any other referenced documents; and (c) validating all operating parameters for such designs and applications. **TOSHIBA ASSUMES NO LIABILITY FOR CUSTOMERS' PRODUCT DESIGN OR APPLICATIONS.**
- Product is intended for use in general electronics applications (e.g., computers, personal equipment, office equipment, measuring equipment, industrial robots and home electronics appliances) or for specific applications as expressly stated in this document. Product is neither intended nor warranted for use in equipment or systems that require extraordinarily high levels of quality and/or reliability and/or a malfunction or failure of which may cause loss of human life, bodily injury, serious property damage or serious public impact ("Unintended Use"). Unintended Use includes, without limitation, equipment used in nuclear facilities, equipment used in the aerospace industry, medical equipment, equipment used for automobiles, trains, ships and other transportation, traffic signaling equipment, equipment used to control combustions or explosions, safety devices, elevators and escalators, devices related to electric power, and equipment used in finance-related fields. Do not use Product for Unintended Use unless specifically permitted in this document.
- Do not disassemble, analyze, reverse-engineer, alter, modify, translate or copy Product, whether in whole or in part.
- Product shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable laws or regulations.
- The information contained herein is presented only as guidance for Product use. No responsibility is assumed by TOSHIBA for any infringement of patents or any other intellectual property rights of third parties that may result from the use of Product. No license to any intellectual property right is granted by this document, whether express or implied, by estoppel or otherwise.
- **ABSENT A WRITTEN SIGNED AGREEMENT, EXCEPT AS PROVIDED IN THE RELEVANT TERMS AND CONDITIONS OF SALE FOR PRODUCT, AND TO THE MAXIMUM EXTENT ALLOWABLE BY LAW, TOSHIBA (1) ASSUMES NO LIABILITY WHATSOEVER, INCLUDING WITHOUT LIMITATION, INDIRECT, CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES OR LOSS, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS, LOSS OF OPPORTUNITIES, BUSINESS INTERRUPTION AND LOSS OF DATA, AND (2) DISCLAIMS ANY AND ALL EXPRESS OR IMPLIED WARRANTIES AND CONDITIONS RELATED TO SALE, USE OF PRODUCT, OR INFORMATION, INCLUDING WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ACCURACY OF INFORMATION, OR NONINFRINGEMENT.**
- GaAs (Gallium Arsenide) is used in Product. GaAs is harmful to humans if consumed or absorbed, whether in the form of dust or vapor. Handle with care and do not break, cut, crush, grind, dissolve chemically or otherwise expose GaAs in Product.
- Do not use or otherwise make available Product or related software or technology for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of nuclear, chemical, or biological weapons or missile technology products (mass destruction weapons). Product and related software and technology may be controlled under the Japanese Foreign Exchange and Foreign Trade Law and the U.S. Export Administration Regulations. Export and re-export of Product or related software or technology are strictly prohibited except in compliance with all applicable export laws and regulations.
- Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. Please use Product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. TOSHIBA assumes no liability for damages or losses occurring as a result of noncompliance with applicable laws and regulations.