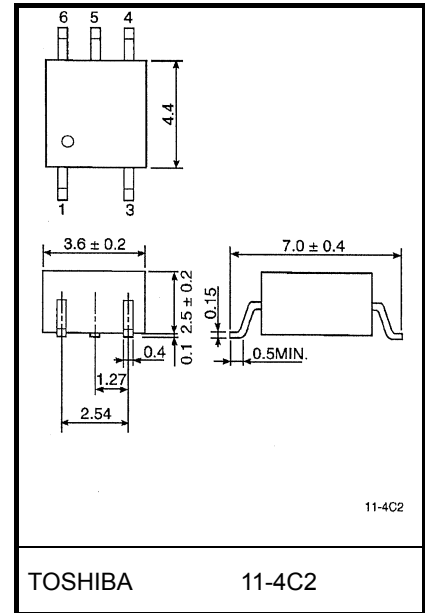


TLP117

PDP (Plasma Display Panel)
 FA (Factory Automation)
 High-Speed Interface

The Toshiba TLP117 consists of a GaAlAs light-emitting diode and an integrated high-gain, high-speed photodetector.

- Inverter logic (totempole output)
- Package type : MFSOP6
- Guaranteed performance over temperature : -40 to 105°C
- Power supply voltage : 4.5 to 5.5V
- Input thresholds current : $I_{FHL}=5mA(Max.)$
- Propagation delay time (tpHL/tpLH) : 30ns(Max.) at VL=0V
- 20ns(Max.) at VL=1.1V
- Switching speed : 50MBd(TYP.)
- Common mode transient immunity : 10kV/μs (Min.)
- Isolation voltage : 3750Vrms
- UL Recognized : UL1577,File No.E67349

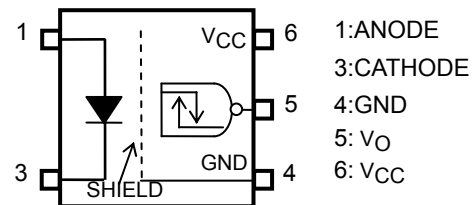


Weight: 0.09 g(Typ.)

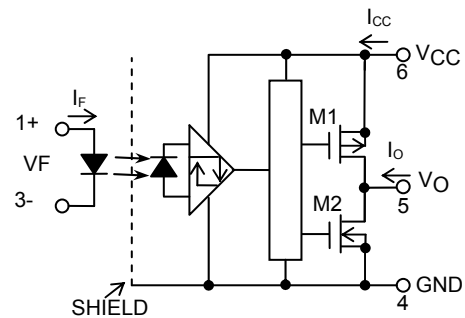
Truth Table

Input	LED	M1	M2	Output
H	ON	OFF	ON	L
L	OFF	ON	OFF	H

Pin Configuration (Top View)



Schematic



0.1μF bypass capacitor must be connected between pins 6 and 4

Absolute Maximum Ratings (Ta=25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	25	mA
	Forward current derating (Ta≥85°C)	$\Delta I_F/\Delta T_a$	-0.7	mA/°C
	Peak transient forward current (Note1)	I_{FPT}	1	A
	Reverse voltage	V_R	6	V
DETECTOR	Output current	I_O	10	mA
	Output voltage	V_O	6	V
	Supply voltage	V_{CC}	6	V
	Output power dissipation	P_O	40	mW
Operating temperature range		T_{opr}	-40 to 105	°C
Storage temperature range		T_{stg}	-55 to 125	°C
Lead solder temperature(10s)		T_{sol}	260	°C
Isolation voltage (AC, 1min., R.H.≤60%, Ta=25°C) (Note2)		BVs	3750	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.

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).

Note1: Pulse width $PW \leq 1\mu s, 300pps$.

Note2: This device is regarded as a two-terminal device: pins 1 and 3 are shorted together, and pins 4,5 and 6 are shorted together.

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Input current , ON	$I_{F(ON)}$	10	—	16	mA
Input voltage , OFF	$V_{F(OFF)}$	0	—	1.0	V
Supply voltage(*) (Note3)	V_{CC}	4.5	5.0	5.5	V

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

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.

Note3 : The detector of this product requires a power supply voltage (V_{CC}) of 4.5 V or higher for stable operation. If V_{CC} is lower than this value, I_{CC} may increase or the output may be unstable.

Be sure to use the product after checking the supply current, and the operation of a power-on/-off.

Electrical Characteristics

(Unless otherwise specified, Ta=-40 to 105°C, VCC =4.5 to 5.5V)

Characteristic		Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Input forward voltage		V _F	—	I _F =10mA, Ta=25°C	1.45	1.6	1.85	V
Temperature coefficient of forward voltage		ΔV _F /ΔTa	—	I _F =10mA	—	-2.0	—	mV/°C
Input reverse current		I _R	—	V _R =5V, Ta=25°C	—	—	10	μA
Input capacitance		C _T	—	V=0, f=1MHz, Ta=25°C	—	60	—	pF
Output voltage	“L” Level	V _{OL}	1	I _{OL} =4mA, I _F =10mA	—	—	0.6	V
	“H” Level	V _{OH}	2	I _{OH} =-4mA, V _F =1.05V, V _{CC} =4.5V V _{CC} =5.5V	3.9 4.9	—	—	V
Supply current	“L” Level	I _{CCL}	3	I _F =10mA	—	—	5.0	mA
	“H” Level	I _{CCH}	4	V _F =0V	—	—	5.0	mA
Input current	H → L	I _{FHL}	—	I _O =20μA, V _O <0.3V	—	—	5	mA
Input voltage	L → H	V _{FLH}	—	I _O =-20μA, V _O >4.0V	0.8	—	—	V

*All typical values are at Ta=25°C unless otherwise specified.

Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Capacitance input to output	C _S	V = 0, f = 1MHz (Note 2)	—	0.8	—	pF
Isolation resistance	R _S	R.H. ≤ 60%, V _S = 500V (Note 2)	1×10 ¹²	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 1 minute	3750	—	—	V _{rms}
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V _{dc}

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 bypass may impair the switching property.
The total lead length between capacitor and coupler should not exceed 1 cm.

Switching Characteristics

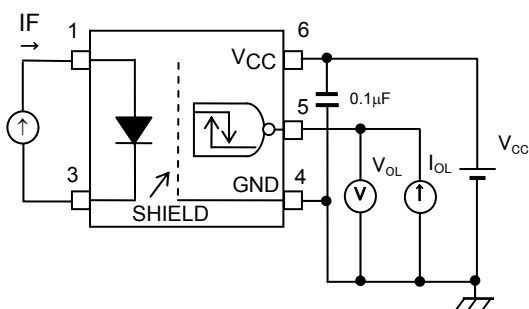
(Unless otherwise specified, $T_a = -40$ to 105°C , $V_{CC} = 4.5$ to 5.5V)

Characteristic	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit	
Propagation delay time to logic high output	tpHL	5	$V_{IN} = 0$ to 5V	—	—	30	ns	
Propagation delay time to logic low output	tpLH		$V_{IN} = 5$ to 0V	—	—	30	ns	
Switching time dispersion between ON and OFF	tpHL-tpLH		—	$R_{IN} = 360\ \Omega$ $C_{IN} = 22\text{pF}$ $V_L = 0\text{V}$ (Note 5)	—	—	10	ns
Output fall time(90-10%)	tf		$V_{IN} = 0$ to 5V	—	3	—	ns	
Output rise time(10-90%)	tr		$V_{IN} = 5$ to 0V	—	2	—	ns	
Propagation delay time to logic high output	tpHL	6	$V_{IN} = 1.1$ to 5V	—	—	20	ns	
Propagation delay time to logic low output	tpLH		$V_{IN} = 5$ to 1.1V	—	—	20	ns	
Propagation delay skew	tpsk		—	$R_{IN} = 360\ \Omega$ $C_{IN} = 22\text{pF}$ $V_L = 1.1\text{V}$ (Note 5)	—	—	16	ns
Switching time dispersion between ON and OFF	tpHL-tpLH		—	—	2	8	ns	
Output fall time(90-10%)	tf		$V_{IN} = 1.1$ to 5V	—	3	—	ns	
Output rise time(10-90%)	tr		$V_{IN} = 5$ to 1.1V	—	3	—	ns	
Data rate	T		—	—	50	—	MBd	
Common mode transient immunity at high Level output	CM _H	7	$V_{CM} = 1000\text{Vp-p}$, $T_a = 25^\circ\text{C}$ $I_F = 0\text{mA}$, $V_{CC} = 5\text{V}$, $V_O(\text{Min}) = 4\text{V}$,	10000	—	—	$\text{V}/\mu\text{s}$	
Common mode transient immunity at low level output	CM _L		$V_{CM} = 1000\text{Vp-p}$, $T_a = 25^\circ\text{C}$ $I_F = 10\text{mA}$, $V_{CC} = 5\text{V}$, $V_O(\text{Max}) = 0.4\text{V}$	-10000	—	—	$\text{V}/\mu\text{s}$	

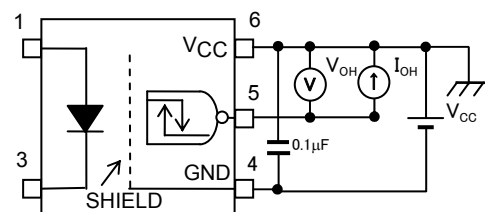
*All typical values are at $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$.

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

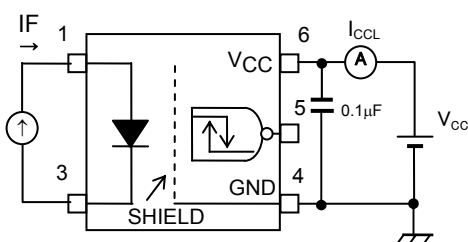
TEST CIRCUIT 1 : V_{OL}



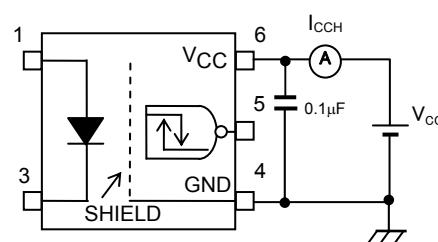
TEST CIRCUIT 2 : V_{OH}



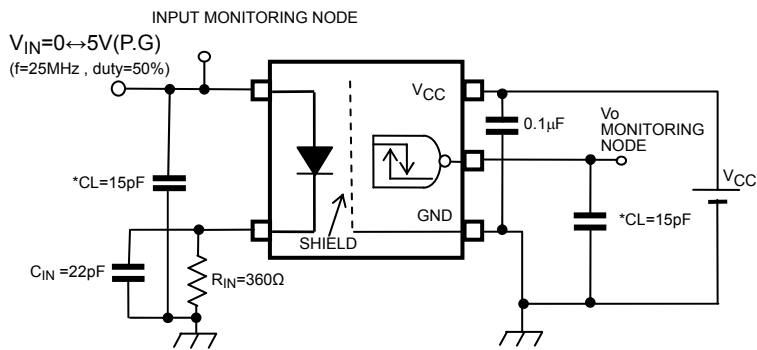
TEST CIRCUIT 3 : I_{CCL}



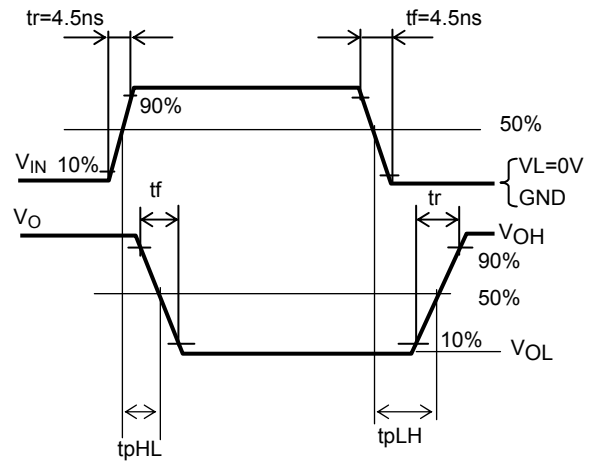
TEST CIRCUIT 4 : I_{CCH}



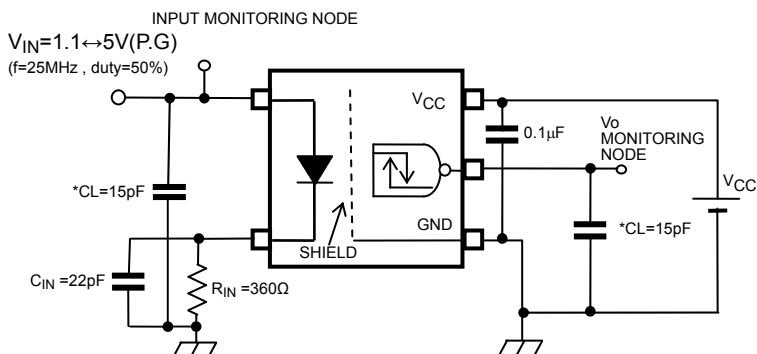
TEST CIRCUIT 5 : tpHL , tpLH



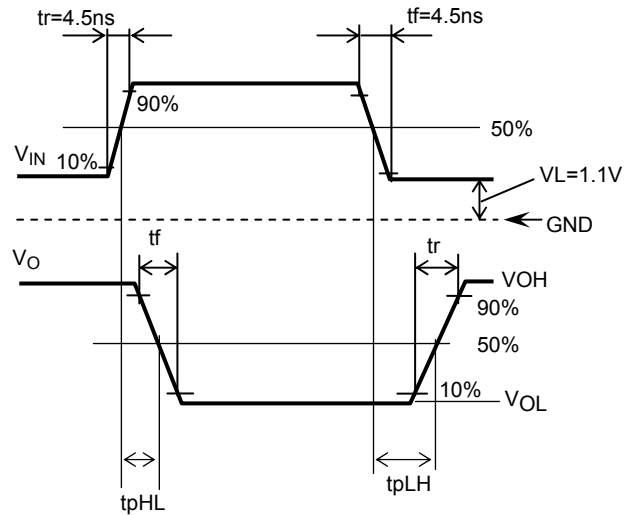
CL is capacitance of the probe and JIG.
(P.G) : Pulse Generator



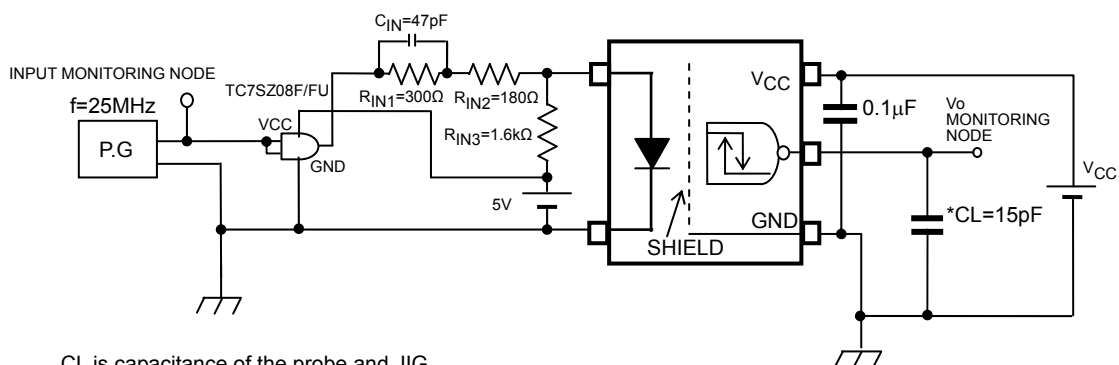
TEST CIRCUIT 6 : tpHL , tpLH



CL is capacitance of the probe and JIG.
(P.G) : Pulse Generator

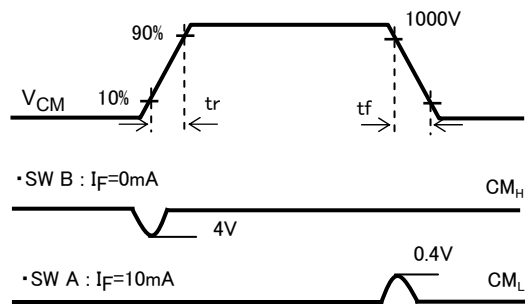
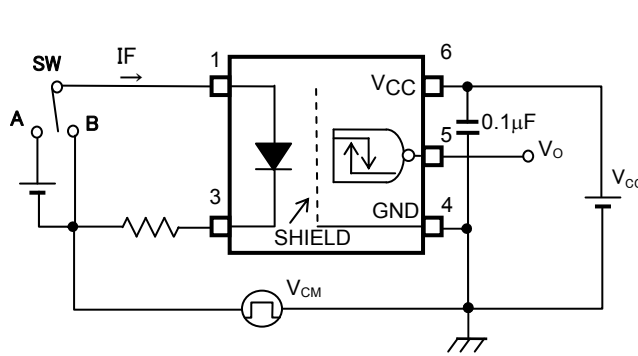


(example for LED drive circuit)



CL is capacitance of the probe and JIG.
(P.G) : Pulse Generator

TEST CIRCUIT 7 : Common-Mode Transient Immunity Test Circuit



$$CM_H = \frac{800(V)}{t_r(\mu s)} \quad CM_L = \frac{800(V)}{t_f(\mu s)}$$

RESTRICTIONS ON PRODUCT USE

20070701-EN

- The information contained herein is subject to change without notice.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc.
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document shall not be used or embedded to any downstream products of which manufacture, use and/or sale are prohibited under any applicable laws and regulations.
- GaAs(Gallium Arsenide) is used in this product. The dust or vapor is harmful to the human body. Do not break, cut, crush or dissolve chemically.
- Please contact your sales representative for product-by-product details in this document regarding RoHS compatibility. Please use these products in this document in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances. Toshiba assumes no liability for damage or losses occurring as a result of noncompliance with applicable laws and regulations.