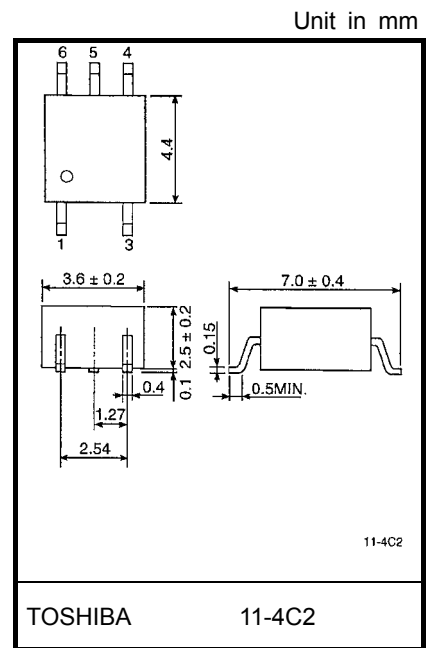


TLP116

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

The Toshiba TLP116 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 : -40~100°C
- Power supply voltage : 4.5~5.5V
- Input thresholds current : $I_{FHL}=5\text{mA}(\text{Max.})$
- Propagation delay time (tpHL/tpLH) : 60ns(Max.)
- Switching speed : 20MBd(TYP.)
- Common mode transient immunity : 10kV/us
- Isolation voltage : 3750Vrms
- UL Recognized : UL1577,File No.E67349

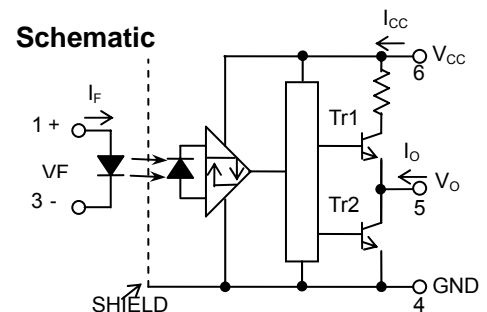
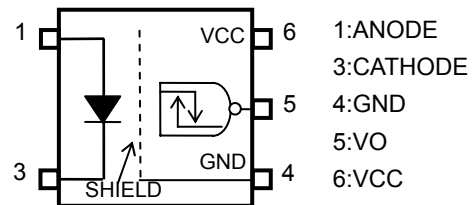


Weight: 0.09 g(Typ.)

Truth Table

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

Pin Configuration (Top View)



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

Maximum Ratings (Ta=25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I_F	20	mA
	Forward current derating (Ta≥85°C)	$\Delta I_F/\Delta T_a$	-0.5	mA/°C
	Peak transient forward current (Note1)	I_{FPT}	1	A
	Reverse voltage	V_R	5	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}	-40~100	°C
Storage temperature range		T_{stg}	-55~125	°C
Lead solder temperature(10s)		T_{sol}	260	°C
Isolation voltage (AC, 1min., R.H.≤60%, Ta=25°C) (Note2)		BVs	3750	Vrms

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Input current , ON	$I_{F(ON)}$	8	—	18	mA
Input voltage , OFF	$V_{F(OFF)}$	0	—	0.8	V
Supply voltage (Note3)	V_{CC}	4.5	5.0	5.5	V
Operating temperature	T_{opr}	-40	—	100	°C

Correlation between Input current , switching speed and drive circuit (reference information).

Input current (IF)	test Circuit	Typical switching speed
12mA	1 (Page 4)	21 – 23 MBd
8mA	1 (Page 4)	18 – 20 MBd
8mA	2 (Page 4, With Speed up capacitor)	23 – 27 MBd

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, as are pins 4,5 and 6.

Note3 : The detector of this product requires a power supply voltage (V_{CC}) of 4.5 V or higher for stable operation.

If the V_{CC} 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.

Electrical Characteristics

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

Characteristic	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Input forward voltage	V _F	—	I _F =10mA, Ta=25°C	—	1.3	1.5	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	—	70	—	pF
Logic low output voltage	V _{OL}	1	I _{OL} =1.6mA, I _F =12mA, V _{CC} =5V	—	—	0.4	V
Logic high output voltage	V _{OH}	2	I _{OH} =-0.02mA, V _F =1.05V, V _{CC} =5V	4.0	—	—	V
Logic low supply current	I _{CCL}	3	I _F =12mA	—	—	5.0	mA
Logic high supply current	I _{CCH}	4	V _F =0V	—	—	5.0	mA
Input current logic low output	I _{FHL}	—	I _O =1.6mA, V _O <0.4V	—	—	5	mA
Input voltage logic high output	V _{FLH}	—	I _O =-0.02mA, V _O >4.0V	0.8	—	—	V

*All typical values are at Ta=25°C, V_{CC}=5V, I_F(ON)=12mA 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	—	V _{dc}
		DC, 1 minute, in oil	—	10000	—	

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

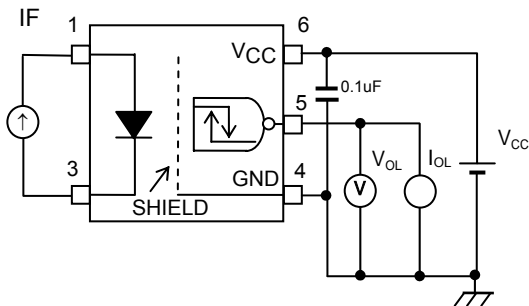
(Unless otherwise specified, $T_a = -40$ to 100°C , $V_{CC} = 4.5 \sim 5.5\text{V}$)

Characteristic	Symbol	Test Circuit	Conditions	Min.	Typ.	Max.	Unit
Propagation delay time to logic high output	t_{pHL}	5	$I_F = 0$ 12mA	—	—	60	ns
Propagation delay time to logic low output	t_{pLH}		$I_F = 12$ 0mA				
Propagation delay time to logic high output	t_{pHL}	6	$V_{IN} = 0$ 5V ($I_F = 0$ 8mA)	—	—	60	ns
Propagation delay time to logic low output	t_{pLH}		$V_{IN} = 5$ 0V ($I_F = 8$ 0mA)				
Switching time dispersion between ON and OFF	$ t_{pHL} - t_{pLH} $	5	$I_F = 12\text{mA}$, $R_{IN} = 100$, $C_L = 15\text{pF}$ (Note 5)	—	—	30	ns
Output fall time(90-10%)	t_f		$I_F = 0$ 12mA	—	15	—	ns
Output rise time(10-90%)	t_r		$I_F = 12$ 0mA	—	15	—	ns
Common mode transient immunity at high Level output	CM_H	7	$V_{CM} = 1000\text{Vp-p}$, $I_F = 0\text{mA}$, $V_o(\text{Min}) = 4\text{V}$, $T_a = 25^\circ\text{C}$	10000	—	—	V/us
Common mode transient immunity at low level output	CM_L		$V_{CM} = 1000\text{Vp-p}$, $I_F = 12\text{mA}$, $V_o(\text{Max}) = 0.4\text{V}$, $T_a = 25^\circ\text{C}$	-10000	—	—	V/us

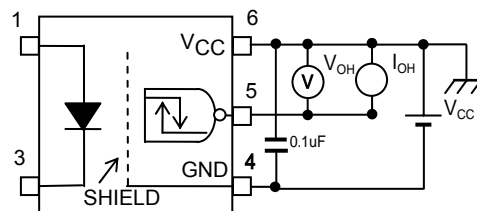
*All typical values are at $T_a = 25^\circ\text{C}$

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

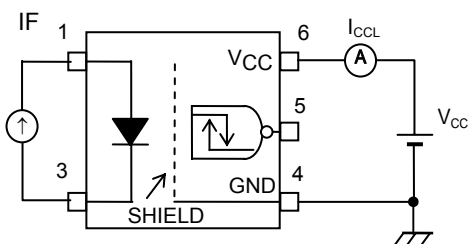
TEST CIRCUIT 1 : V_{OL}



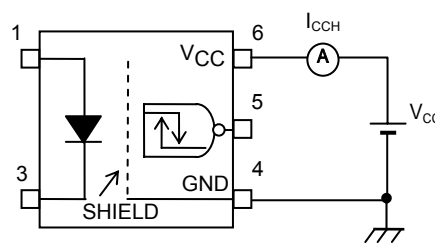
TEST CIRCUIT 2 : V_{OH}



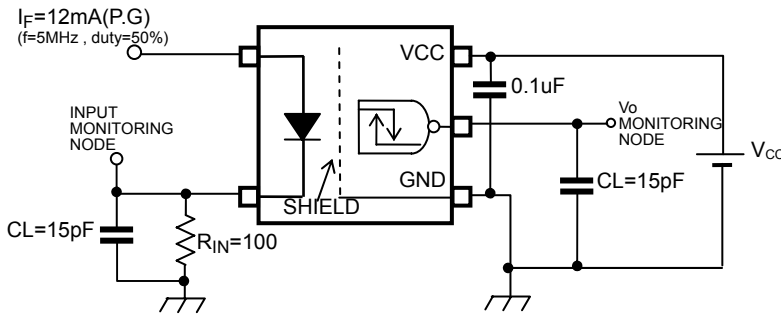
TEST CIRCUIT 3 : I_{CCL}



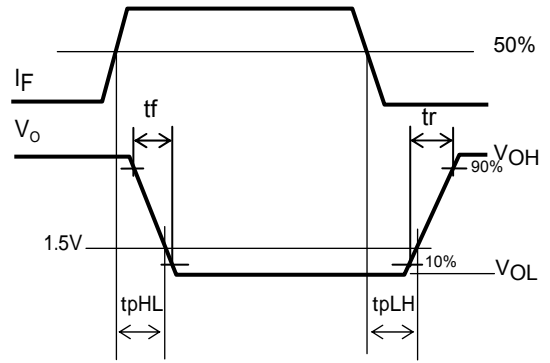
TEST CIRCUIT 4 : I_{CCH}



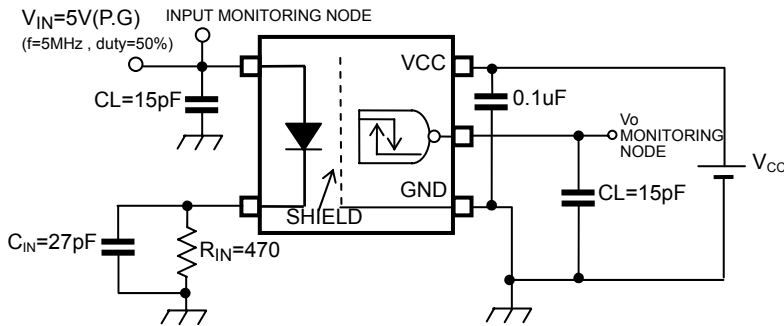
TEST CIRCUIT 5 : tpHL , tpLH



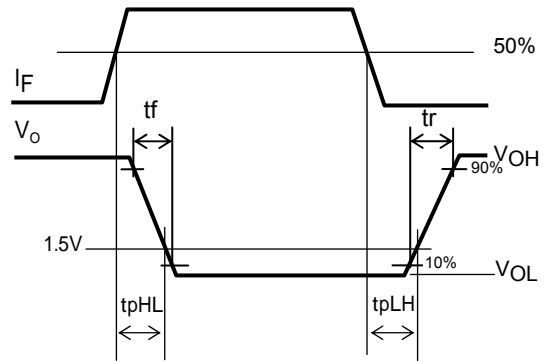
CL is capacitance of the probe and JIG.
(P.G) : Pulse Generator



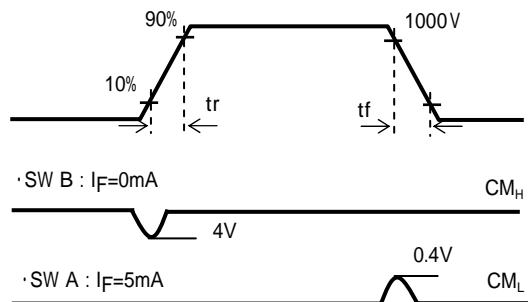
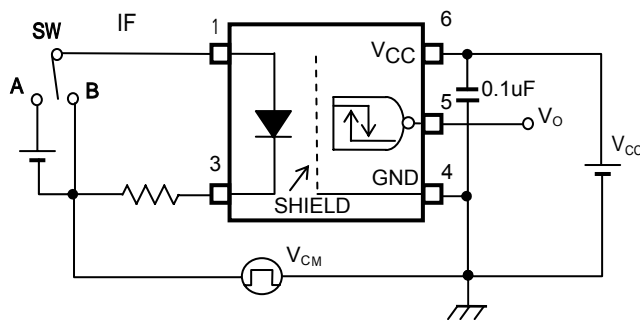
TEST CIRCUIT 6 : tpHL , tpLH



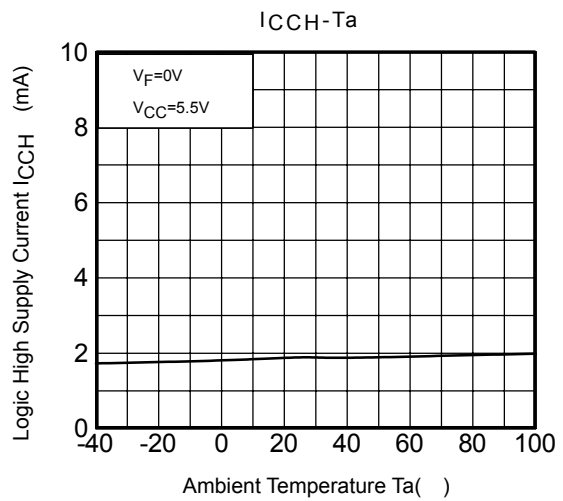
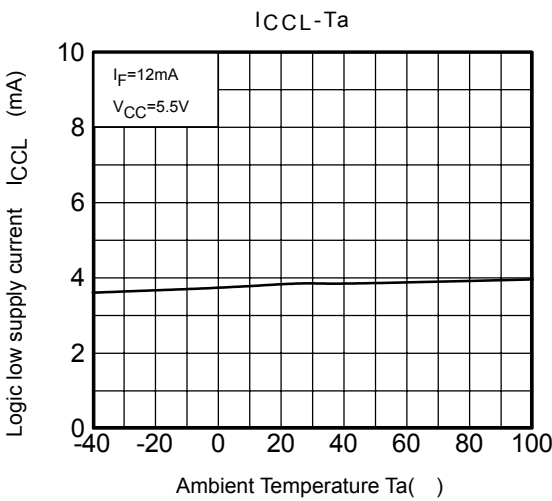
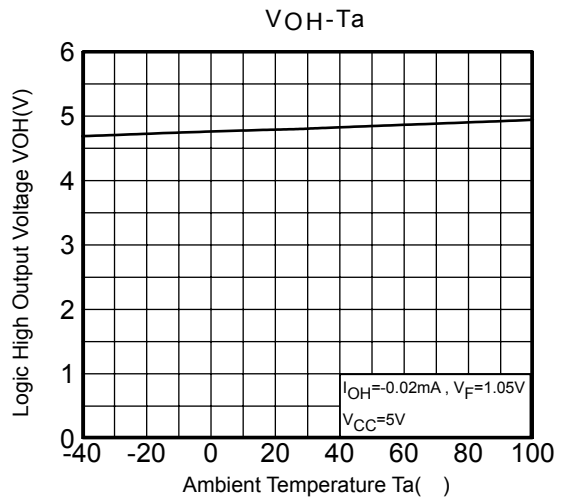
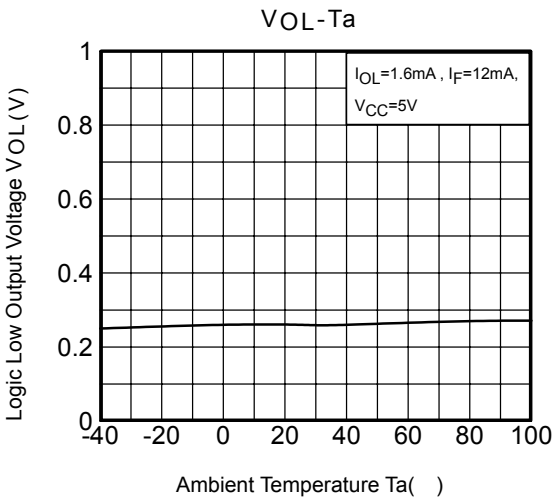
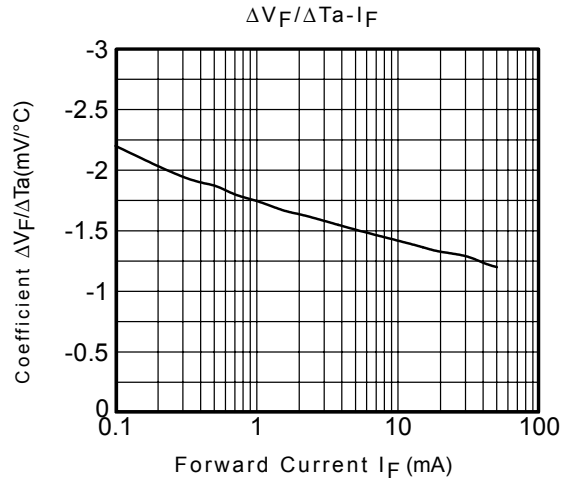
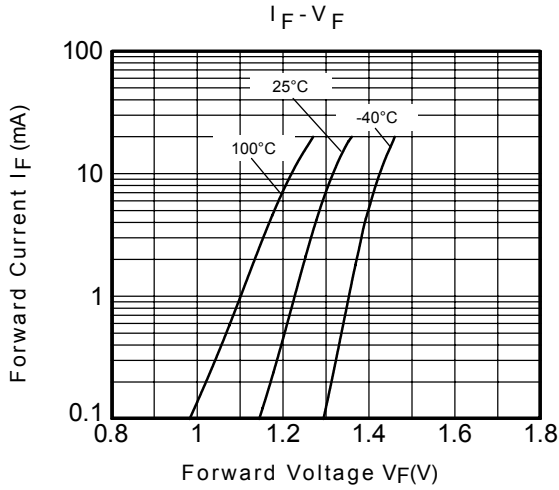
CL is capacitance of the probe and JIG.
(P.G) : Pulse Generator



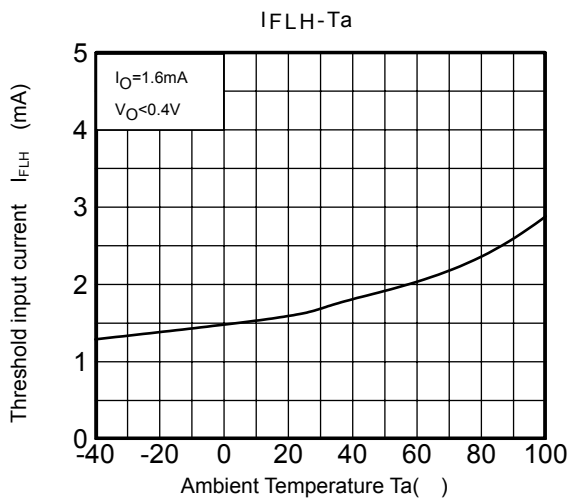
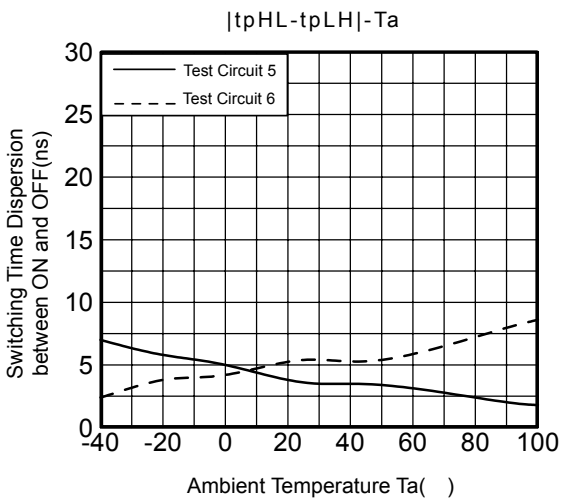
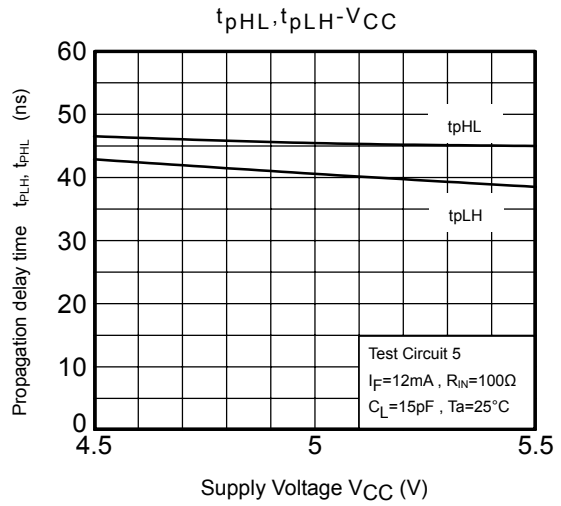
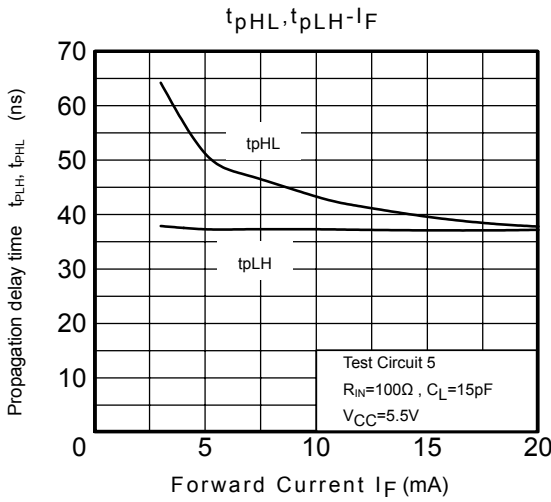
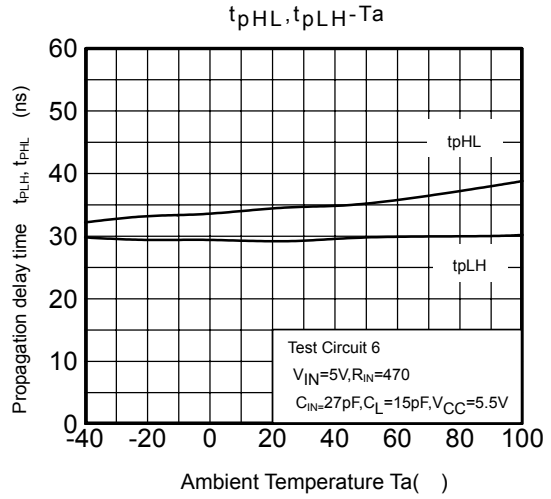
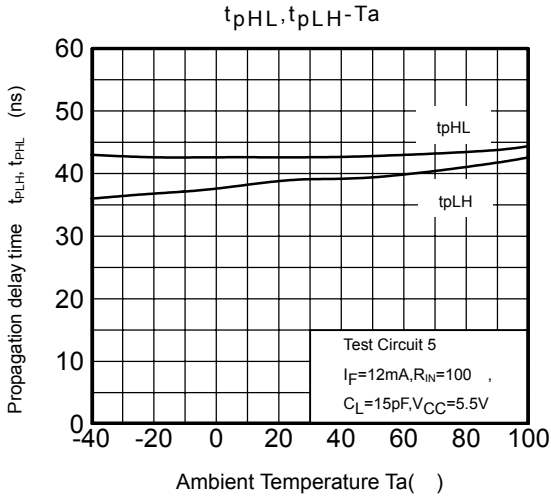
TEST CIRCUIT 7 : Common-Mode Transient Immunity Test Circuit



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



*: The above graphs show typical characteristics.



*: The above graphs show typical characteristics.

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