

TLP705

Plasma Display Panel.
Industrial Inverter
IGBT/Power MOS FET Gate Drive

TLP705 consists of a GaAlAs light emitting diode and a integrated photodetector.
This unit is 6-lead SDIP package. TLP705 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.
TLP705 is suitable for gate driving circuit of IGBT or power MOS FET.
Especially TLP705 is capable of "direct" gate drive of lowr Power IGBTs.

- Peak output current : ± 0.45 A (max)
- Operating frequency : 250kHz (max)
- Guaranteed performance over temperature : -40 to 100°C
- Supply current : 3mA (max)
- Power supply voltage : 10 to 20 V
- Threshold input current : $I_{FLH} = 8$ mA (max)
- Switching time (t_{pLH} / t_{pHL}) : 200 ns (max)
- Common mode transient immunity : ± 10 kV/ μs (min)
- Isolation voltage : 5000 Vrms(min)
- UL Recognized : UL1577, File No.E67349
- Construction Mechanical Rating

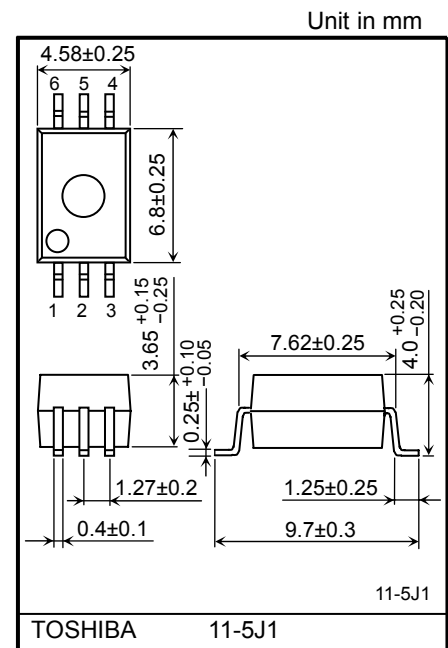
	7.62-mm pitch standard type	10.16-mm pitch TLPXXXF type
Creepage Distance	7.0 mm (min)	8.0 mm (min)
Clearance	7.0 mm (min)	8.0 mm (min)
Insulation Thickness	0.4 mm (min)	0.4 mm (min)

- Option (D4)
TÜV approved : EN60747-5-2
Certificate No. R50033433
Maximum operating insulation voltage : 890 Vpk
Highest permissible over voltage : 8000 Vpk

(Note) When a EN60747-5-2 approved type is needed, please designate the "Option(D4)"

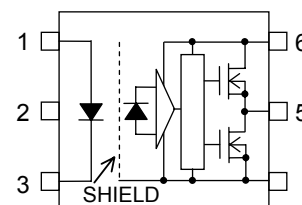
Truth Table

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

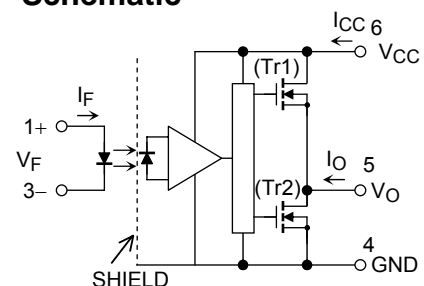


Weight : 0.26 g (typ.)

Pin Configuration (Top View)



Schematic



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

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
LED	Forward current	I_F	20	mA
	Forward current derating (Ta ≥ 85°C)	$\Delta I_F / \Delta T_a$	-0.54	mA/°C
	Peak transient forward current (Note 1)	I_{FP}	1	A
	Reverse voltage	V_R	5	V
	Junction temperature	T_j	125	°C
Detector	"H" peak output current (Note 2)	I_{OPH}	-0.45	A
	"L" peak output current (Note 2)	I_{OPL}	0.45	A
	Output voltage	V_O	25	V
	Supply voltage	V_{CC}	25	V
	Junction temperature	T_j	125	°C
Operating frequency (Note 3)	f	250	kHz	
Storage temperature range	T_{stg}	-55 to 125	°C	
Operating temperature range	T_{opr}	-40 to 100	°C	
Lead soldering temperature (10 s) (Note 4)	T_{sol}	260	°C	
Isolation voltage (AC, 1 minute, R.H. ≤ 60%) (Note 5)	BV_S	5000	Vrms	

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

Note 2: Exponential waveform pulse width $P_W \leq 10\mu s$, $f \leq 15$ kHz

Note 3: Exponential waveform $I_{OPH} \leq -0.25$ A (≤ 80 ns), $I_{OPL} \leq +0.25$ A (≤ 80 ns), $T_a = 100$ °C

Note 4: It is effective soldering area of Lead.

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

Note 6: 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.

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Input current, ON (Note 7)	I_F (ON)	10	—	15	mA
Input voltage, OFF	V_F (OFF)	0	—	0.8	V
Supply voltage	V_{CC}	10	—	20	V
Peak output current	I_{OPH} / I_{OPL}	—	—	± 0.15	A
Operating temperature	T_{opr}	-40	—	100	°C

Note 7: Input signal rise time (fall time) < 0.5 μs .

Note 8: If the rising slope of the supply voltage (V_{CC}) for the detector is steep, stable operation of the internal circuits cannot be guaranteed.

Be sure to set 3.0V/ μs or less for a rising slope of the V_{CC} .

Electrical Characteristics (Ta = -40 to 100°C, unless otherwise specified)

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.*	Max	Unit		
Forward voltage		V _F	—	I _F = 10 mA, Ta = 25°C	—	1.6	1.8	V		
Temperature coefficient of forward voltage		ΔV _F /ΔTa	—	I _F = 10 mA	—	-2.0	—	mV/°C		
Input reverse current		I _R	—	V _R = 5 V, Ta = 25°C	—	—	10	μA		
Input capacitance		C _T	—	V = 0 V, f = 1 MHz, Ta = 25°C	—	45	—	pF		
Output current (Note 9)	"H" Level	I _{OPH1}	1	V _{CC} = 15 V I _F = 10 mA	V ₆₋₅ = 4 V	-0.15	-0.35	—	A	
		I _{OPH2}			V ₆₋₅ = 10 V	-0.3	-0.6			
	"L" Level	I _{OPL1}	2	V _{CC} = 15 V I _F = 0 mA	V ₅₋₄ = 2 V	0.15	0.36	—		
		I _{OPL2}			V ₅₋₄ = 10 V	0.3	0.62	—		
Output voltage	"H" Level	V _{OH}	3	V _{CC} = 10 V	I _O = -100 mA, I _F = 10 mA	6.0	8.5	—	V	
	"L" Level	V _{OL}			4	I _O = 100 mA, V _F = 0.8 V	—	0.4		1.0
Supply current	"H" Level	I _{CCH}	5	V _{CC} = 10 to 20 V V _O open	I _F = 10 mA	—	2.0	3.0	mA	
	"L" Level	I _{CCL}			6	I _F = 0 mA	—	2.0		3.0
Threshold input current		L → H	I _{FLH}	—	V _{CC} = 15 V, V _O > 1 V		—	2.5	8	mA
Threshold input voltage		H → L	V _{FHL}	—	V _{CC} = 15 V, V _O < 1 V		0.8	—	—	V
Supply voltage		V _{CC}	—	—	10	—	20	V		

*: All typical values are at Ta = 25°C

Note 9: Duration of I_O time ≤ 50 μs

Note 10: This product is more sensitive than the conventional product to static electricity (ESD) because of a lowest power consumption design.

General precaution to static electricity (ESD) is necessary for handling this component.

Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	C _S	V = 0 V, f = 1MHz (Note 5)	—	1.0	—	pF
Isolation resistance	R _S	R.H. ≤ 60%, V _S = 500V (Note 5)	1×10 ¹²	10 ¹⁴	—	Ω
Isolation voltage	BV _S	AC, 1 minute	5000	—	—	V _{rms}
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V _{dc}

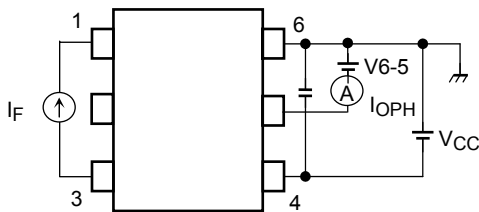
Switching Characteristics (Ta = -40 to 100°C, unless otherwise specified)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.*	Max	Unit	
Propagation delay time	L → H	7	$V_{CC} = 20\text{ V}$ $R_g = 30\ \Omega$ $C_g = 1\text{ nF}$ $f = 250\text{ kHz}$ Duty Cycle = 50%	Ta = 25 If = 0 10 mA	70	95	170	ns
	H → L			Ta = 25 If = 10 → 0 mA	70	105	170	
Propagation delay time	L → H			Ta = -40 to 100 If = 0 10 mA	50	—	200	
	H → L			Ta = -40 to 100 If = 10 0 mA	50	—	200	
Propagation delay skew (Note 11)	tpsk			Ta = -40 to 100 If = 10 mA	-90	—	90	
Switching time dispersion between ON and OFF	t _{pHL} - t _{pLH}			Ta = -40 to 100 If = 10 mA	-65	—	65	
Output rise time (10-90%)	t _r			If = 0 → 10 mA	—	—	—	
Output fall time (90-10%)	t _f			If = 10 → 0 mA	—	—	—	
Common mode transient immunity at high level output	CM _H	8	$V_{CM} = 1000\text{ Vp-p}$ $V_{CC} = 20\text{ V}$ Ta = 25°C	If = 10 mA V _O (min) = 16 V	-10000	—	—	V/μs
Common mode transient immunity at low level output	CM _L			If = 0 mA V _O (max) = 1 V	10000	—	—	

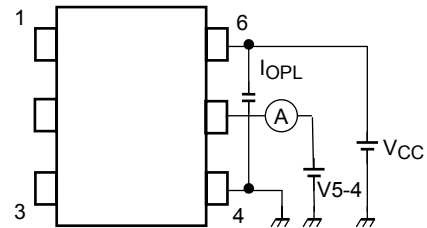
*: All typical values are at Ta = 25°C

Note 11: Propagation delay difference between any two parts.

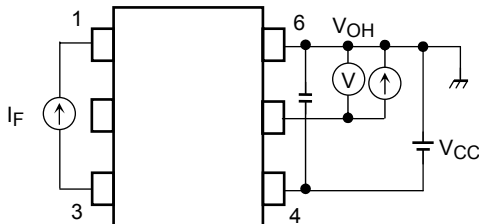
Test Circuit 1: I_{OPH}



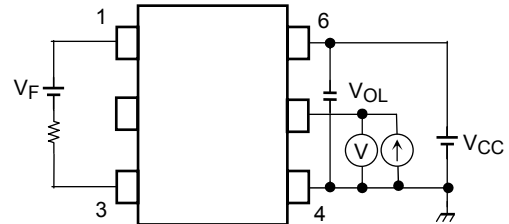
Test Circuit 2: I_{OPL}



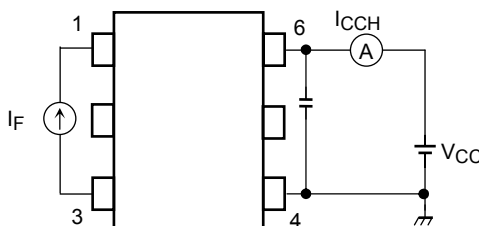
Test Circuit 3: V_{OH}



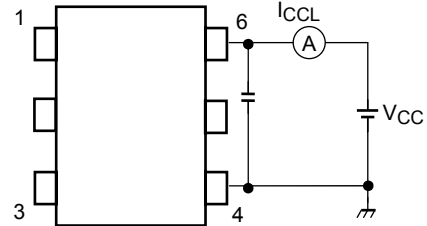
Test Circuit 4: V_{OL}



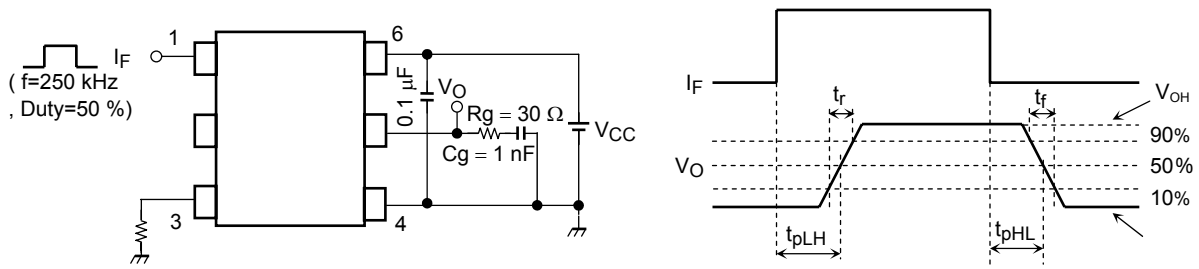
Test Circuit 5: I_{CCH}



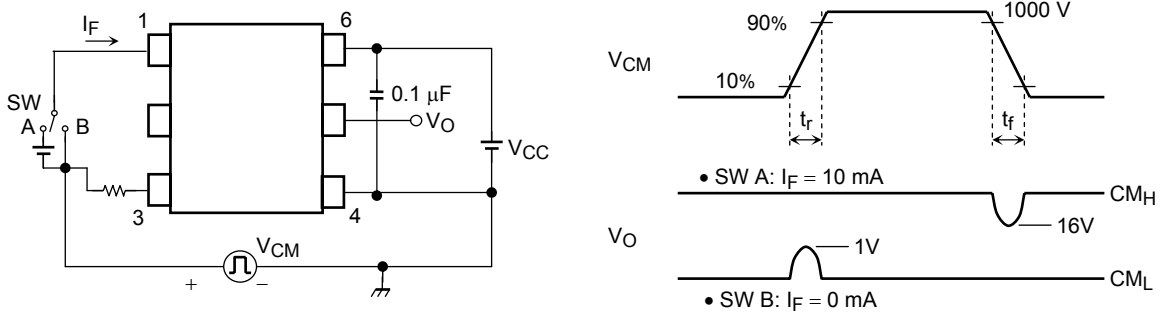
Test Circuit 6: I_{CCL}



Test Circuit 7 : t_{pLH} , t_{pHL} , t_r , t_f , PWD



Test Circuit 8: CM_H , CM_L



$$CM_L = \frac{800 \text{ V}}{t_r (\mu\text{s})}$$

$$CM_H = -\frac{800 \text{ V}}{t_f (\mu\text{s})}$$

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

RESTRICTIONS ON PRODUCT USE

030619EBC

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- 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 are subject to the foreign exchange and foreign trade laws.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law 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.