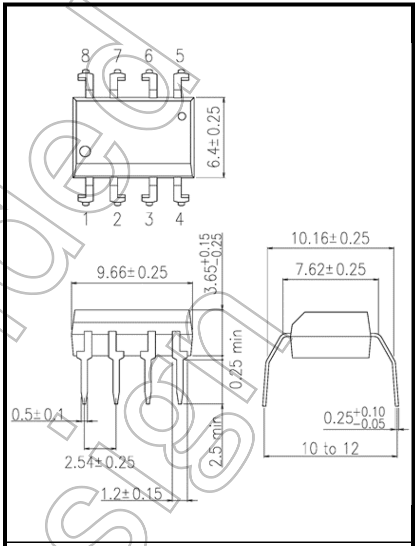
TOSHIBA

TOSHIBA Photocoupler IRED & Photo-IC

TLP250F(INV)

Transistor Inverter
Inverters for Air Conditioner
IGBT Gate Drive
Power MOS FET Gate Drive

Unit : mm



Weight: 0.54 g (typ.)

The TOSHIBA TLP250F(INV) consists of an infrared emitting diode and a integrated photodetector.
This unit is 8-lead DIP.
TLP250F(INV) is suitable for gate driving circuit of IGBT or power MOS FET.

- Input Threshold Current : I_F=5mA(max)
- Supply Current : 11mA(max)
- Supply Voltage : 10 to 35V
- Output Current : ±1.5A(max)
- Switching Time(tpLH/tpHL) : 0.5μs(max)
- Isolation Voltage : 2500Vrms(min)
- UL-recognized : UL 1577,File No.E67349
- cUL-recognized : CSA Component Acceptance Service No.5A File No.E67349
- VDE-Approved : EN 60747-5-5 (Note 1)

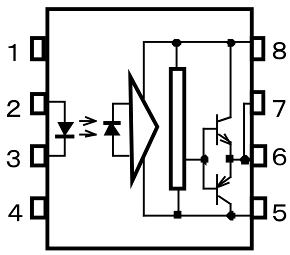
Note 1:When a VDE approved type is needed, please designate the **Option(D4)**.

- Creepage Distance : 8.0mm(min)
  Clearance : 8.0mm(min)

Truth Table

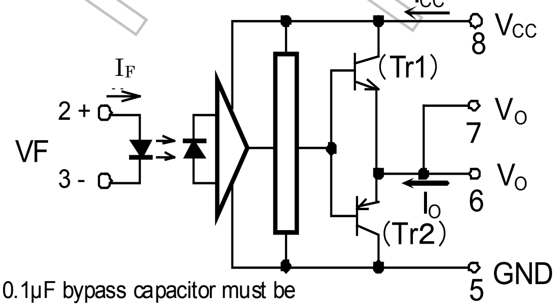
		Tr 1	Tr 2
Input LED	ON	ON	OFF
	OFF	OFF	ON

Pin Configuration (top view)



1: N.C.
2: ANODE
3: CATHODE
4: N.C.
5: GND
6: V_O (OUTPUT)
7: V_O
8: V_{CC}

Schematic



Note: A 0.1μF bypass capacitor must be Connected between pin 8 and 5(See Note 5).

Start of commercial production
1998-07

Absolute Maximum Ratings (Ta=25°C)

	Characteristics			Symbol	Rating	Unit
LED	Forward Current			I_F	20	mA
LED	Forward Current Derating (Ta≥70°C)			$\Delta I_F / \Delta Ta$	−0.36	mA /°C
LED	Peak Transient Forward Current		(Note 1)	I_{FPT}	1	A
LED	Reverse Voltage			V_R	5	V
LED	Diode power dissipation			P_D	40	mW
LED	Diode power dissipation derating (Ta≥70 °C)			ΔP_D/°C	-0.72	mW/°C
LED	Junction Temperature			Tj	125	°C
Detector	"H" Peak Output Current	PW ≤2.5μs , f≤15 kHz	(Note 2)	I_{OPH}	−1.5	A
Detector		PW≤1.0μs , f≤15 kHz			−2.0	
Detector	"L" Peak Output Current	PW≤2.5μs , f≤15 kHz		I_{OPL}	+1.5	A
Detector		PW ≤1.0μs , f≤15 kHz			+2.0	
Detector	Output Voltage		(Ta≤70°C)	V_O	35	V
Detector			(Ta≤85°C)		24	
Detector	Supply Voltage		(Ta≤70°C)	V_{CC}	35	V
Detector			(Ta≤85°C)		24	
Detector	Output Voltage Derating (Ta≥70°C)			$\Delta V_O / \Delta Ta$	−0.73	V /°C
Detector	Supply Voltage Derating (Ta≥70°C)			$\Delta V_{CC} / \Delta Ta$	−0.73	V /°C
Detector	Output Power dissipation			P_O	800	mW
Detector	Output Power dissipation derating (Ta ≥70°C)			ΔP_O / °C	-14.5	mW/°C
Detector	Junction Temperature			T_j	125	°C
Operating Frequency			(Note 3)	f	25	kHz
Operating Temperature Range				T_{opr}	−20 to 85	°C
Storage Temperature Range				T_{stg}	−55 to 125	°C
Lead Soldering Temperature(10 s)				T_{sol}	260	°C
Isolation Voltage (AC,60 s., R.H. ≤60 %)			(Note 4)	BV_S	2500	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).

(Note 1) : Pulse width PW≤1 μs,300 pps

(Note 2) : Exporenential Waveform

(Note 3) : Exporenential Waveform I_{OPH}≤−1.0 A (≤2.5 μs) , I_{OPL}≤+1.0 A (≤2.5 μs)

(Note 4) : Device considerd a two terminal device : pins 1,2,3 and 4 shorted together and pins 5,6,7 and 8 shorted together.

(Note 5) : A ceramic capacitor(0.1 μF) should be connected from pin 8 to pin 5 to stabilize the operation of the high gain linear amplifier.Failure to provide the bypassing may impair the switching proparty.The total lead length between capacitor and coupler should not exceed 1cm.

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max		Unit
Input Current, ON	$I_{F\ (ON)}$	7	8	10		mA
Input Voltage, OFF	$V_{F\ (OFF)}$	0	—	0.8		V
Supply Voltage	V_{CC}	15	—	30	20	V
Peak Output Current	I_{OPH} / I_{OPL}	—	—	±0.5		A
Operating Temperature	T_{opr}	−20	25	70	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.

Note 6: Input signal rise time(fall time)<0.5μs.

Electrical Characteristics (Ta = −20~70°C, Unless otherwise specified)

Characteristics		Symbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Input Forward Voltage		V_F	—	I_F = 10 mA, Ta = 25 °C		—	1.6	1.8	V
Temperature Coefficient of Forward Voltage		$\Delta V_F / \Delta Ta$	—	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	250	pF
Output Current	"H" Level	I_{OPH}	2	V_{CC} = 30 V (*1)	I_F = 10 mA V_{8-6} = 4 V	−1.0	−1.5	—	A
	"L" Level	I_{OPL}	1		I_F = 0 mA V_{6-5} = 2.5 V	1.0	2	—	
Output Voltage	"H" Level	V_{OH}	3	V_{CC1} = +15 V V_{EE1} = −15 V R_L = 200 Ω, I_F = 5 mA		11	12.8	—	V
	"L" Level	V_{OL}	4	V_{CC1} = +15 V V_{EE1} = −15 V R_L = 200 Ω, V_F = 0.8 V		—	−14.2	−12.5	
Supply Current	"H" Level	I_{CCH}	—	V_{CC} = 30 V	I_F = 10 mA Ta = 25 °C	—	7	—	mA
					I_F = 10 mA	—	—	11	
	"L" Level	I_{CCL}	—		I_F = 0 mA Ta = 25 °C	—	7.5	—	mA
					I_F = 0 mA	—	—	11	
Threshold Input Current	L→H	I_{FLH}	—	V_{CC1} = +15 V V_{EE1} = −15 V R_L = 200 Ω, V_O > 0 V		—	1.2	5	mA
Threshold Input Voltage	H→L	V_{FHL}		V_{CC1} = +15 V V_{EE1} = −15 V R_L = 200 Ω, V_O < 0 V		0.8	—	—	V
Supply Voltage		V_{CC}	—	—		10	—	35	V
Capacitance (Input-Output)		C_S	—	V_S = 0 V, f = 1 MHz, Ta = 25 °C		—	1.0	2.0	pF
Resistance (Input-Output)		R_S	—	V_S = 500 V, Ta = 25 °C R.H.≤ 60 %		1×10^{12}	10^{14}	—	Ω

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

(*1) : Duration of IO time ≤ 50μs

Switching Characteristics (Ta = −20~70°C,Unless otherwise specified)

Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation Delay Time	L→H	t_{pLH}	5	I_F = 8 mA, V_{CC} = 15 V R_L = 20 Ω, C_L = 10 nF	0.05	0.15	0.5	μs
	H→L	t_{pHL}			0.05	0.15	0.5	
Switching Time Dispersion between ON and OFF		|tpHL-tpLH|			—	—	0.45	
Common Mode Transient Immunity at High Level Output		CM_H	6	V_{CM} = 1000 V, I_F = 8 mA V_{CC} = 30 V, Ta = 25 °C	−15000	—	—	V /μs
Common Mode Transient Immunity at Low Level Output		CM_L		V_{CM} = 1000 V, I_F = 0 mA V_{CC} = 30 V, Ta = 25 °C	15000	—	—	V /μs

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

Fig.1 I_{OPL} Test Circuit

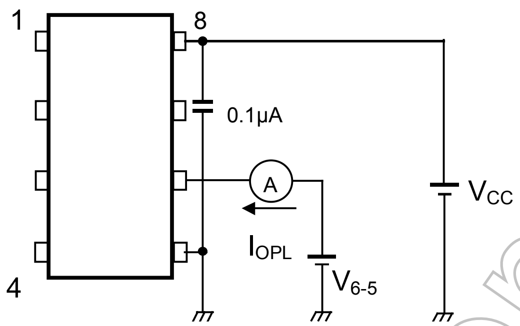


Fig.2 I_{OPH} Test Circuit

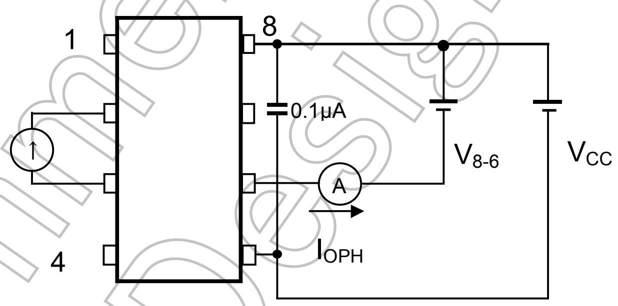


Fig.3 V_{OH} Test Circuit

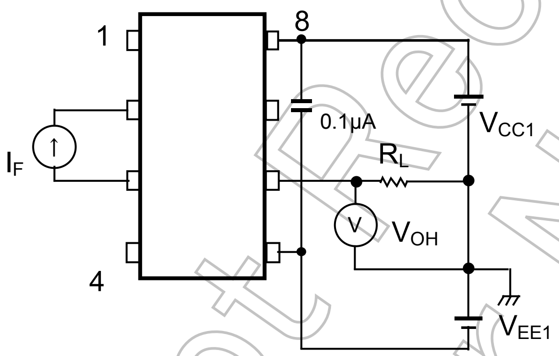


Fig.4 V_{OL} Test Circuit

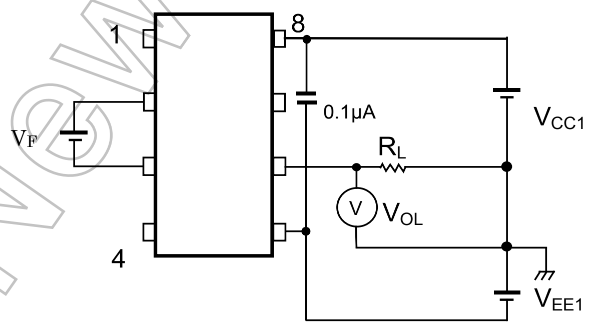


Fig.5 tpLH, tpHL, tr, tf Test Circuit

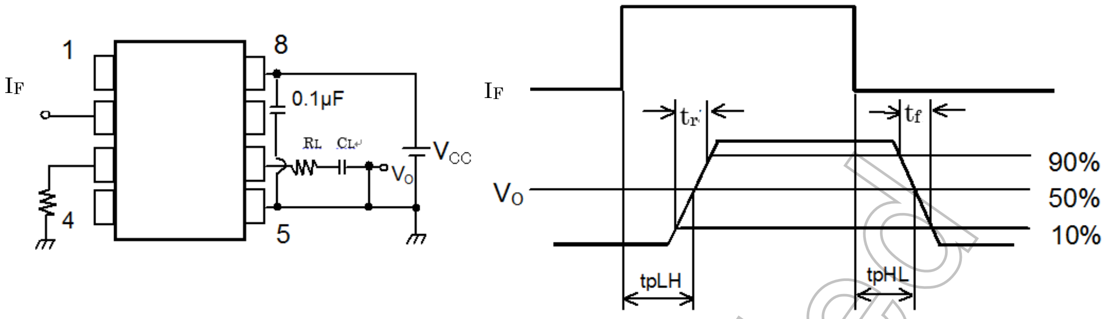
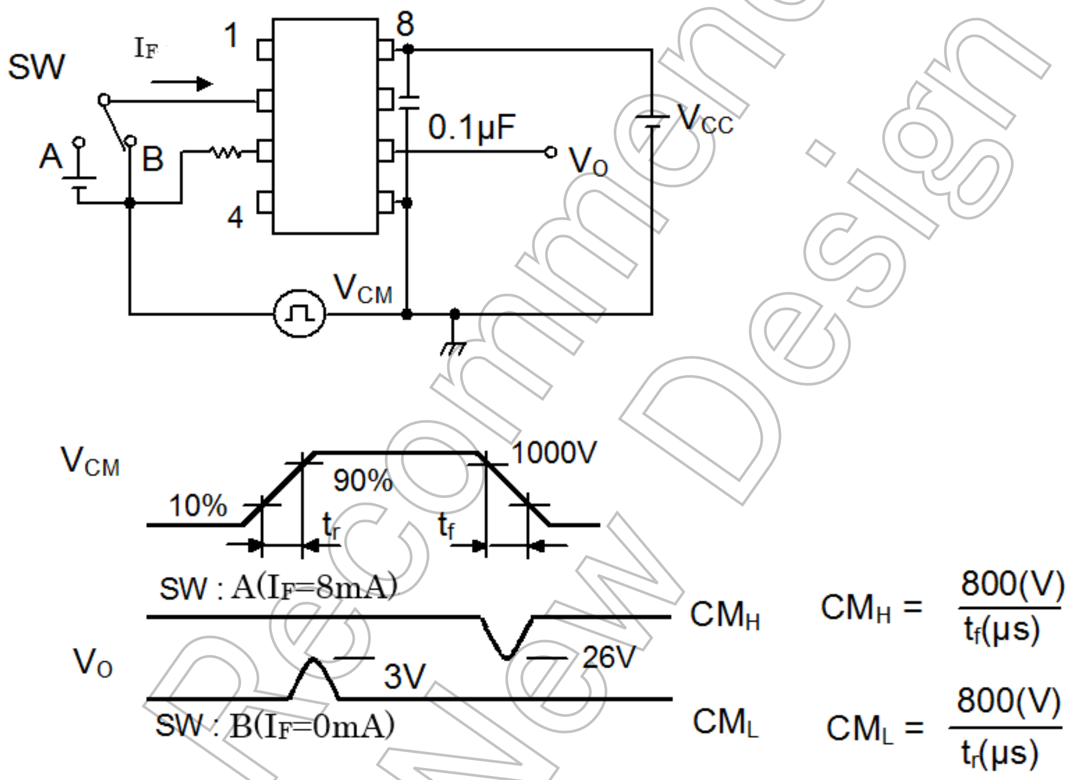
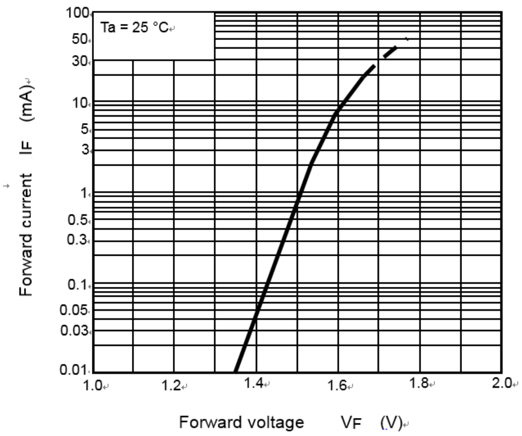


Fig.6 CM_H, CM_L Test Circuit

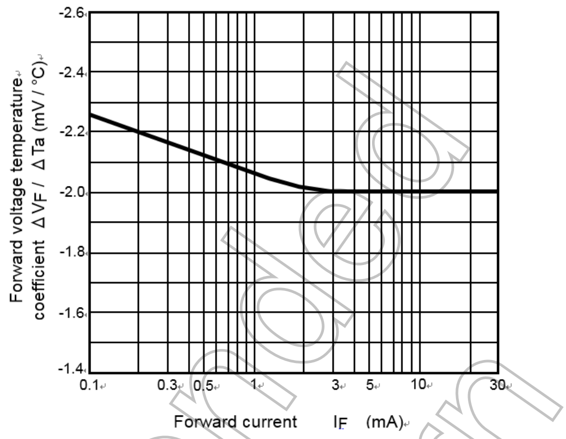


CM_L(CM_H) is the maximum rate of rise(fall) of the common mode voltage that can be sustained with the output voltage in the low(high)state.

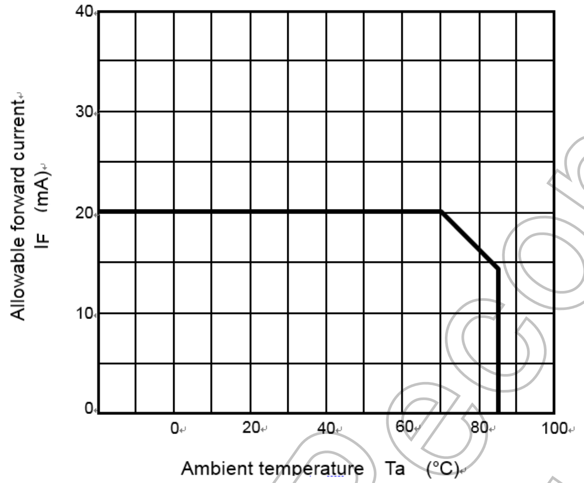
$I_F - V_F$



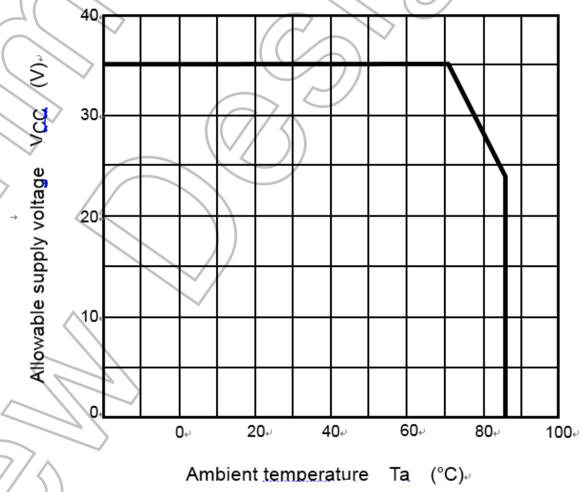
$\Delta V_F / \Delta Ta - I_F$



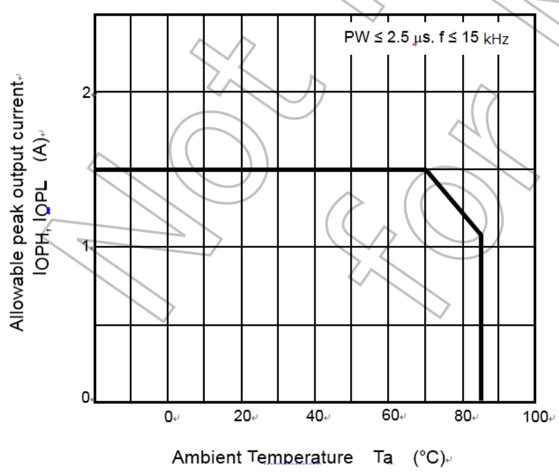
$I_F - Ta$



$V_{CC} - Ta$



$I_{OPH}, I_{OPL} - Ta$



NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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