

TLP114A(IGM)

Industrial Inverter
Inverter For Air Conditioner
Line Receiver
IPM(intelligent power module) Interfaces

The TOSHIBA mini flat coupler TLP114A(IGM) is a small outline coupler, suitable for surface mount assembly.

TLP114A(IGM) consists of a high output power infrared emitting diode, optically coupled to a high speed detector of one chip photo diode-transistor.

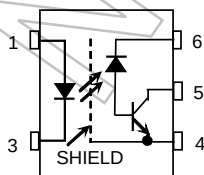
TLP114A(IGM) has no internal base connection, and a faraday shield integrated on the photodetector chip provides an effective common mode noise transient immunity.

TLP114A(IGM) guarantees minimum and maximum of propagation delay time, switching time dispersion, and high common mode transient immunity. There for TLP114A(IGM) is suitable for isolation interface between IPM(intelligent power module) and control IC circuits in motor control application.

- Isolation voltage: 3750V_{rms}(min.)
- Common mode transient immunity: $\pm 10\text{kV}/\mu\text{s}$ (min)
@V_{CM}=1500V
- Switching time: t_{pHL}, t_{pLH}=0.1 μs (min), 0.8 μs (max)
@I_F=10mA, V_{CC}=15V, R_L=20k Ω , T_a=25°C
- Switching time dispersion: 0.7 μs (max)
(|t_{pLH}-t_{pHL}|)
- TTL compatible by connecting external resistance.
- 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)

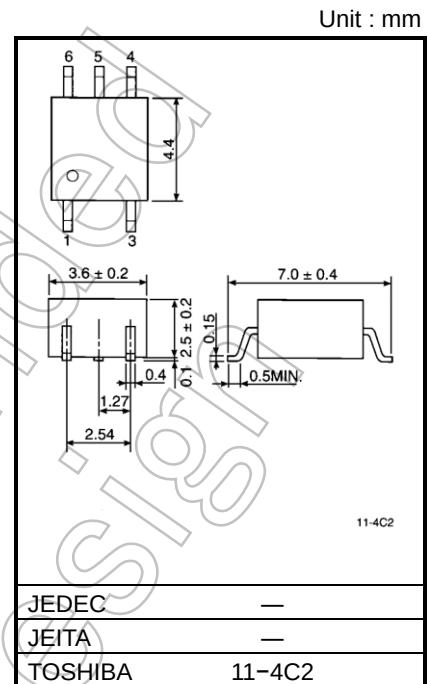
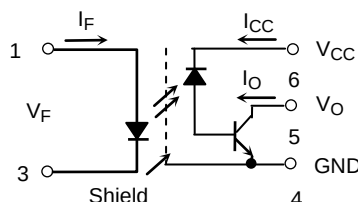
Note 1 : When a VDE approved type is needed,
please designate the **Option(V4)**.

Pin Configuration (top view)



- 1 : Anode
- 3 : Cathode
- 4 : Emitter (GND)
- 5 : Collector (Output)
- 6 : V_{CC}

Schematic



Weight: 0.09g (typ.)

Start of commercial production
1995-01

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I _F	20	mA
	Forward current derating (Ta ≥ 70 °C)	Δ I _F /°C	-0.36	mA/°C
	Pulse forward current (Note 1)	I _{FP}	40	mA
	Peak transient forward current (Note 2)	I _{FPT}	1	A
	Reverse voltage	V _R	5	V
	Input power dissipation	P _D	45	mW
	Diode power dissipation derating (Ta ≥ 70 °C)	Δ P _D /°C	-0.82	mW/°C
Detector	Output current	I _O	8	mA
	Output current derating (Ta ≥ 70 °C)	Δ I _O /°C	-0.3	mA/°C
	Peak output current	I _{OP}	16	mA
	Supply voltage	V _{CC}	-0.5 to 30	V
	Output voltage	V _O	-0.5 to 20	V
	Output power dissipation	P _O	100	mW
	Power dissipation derating (Ta ≥ 70 °C)	Δ P _O / °C	-1.82	mW / °C
Operating temperature range		T _{opr}	-55 to 100	°C
Storage temperature range		T _{stg}	-55 to 125	°C
Lead solder temperature(10 s)		T _{sol}	260	°C
Isolation Voltage (AC,60 s, R.H.≤ 60 %)		BV _S	3750	V _{rms}

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): 50 % duty cycle, 1 ms pulse width. Derate 0.72 mA / °C above 70 °C.

(Note 2): Pulse width ≤ 1 μs, 300 pps.

(Note 3): Device considered a two-terminal device: Pins 1 and 3 shorted together, and pins 4, 5 and 6 shorted together.

Electrical Characteristics(Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	$I_F = 16 \text{ mA}$	1.22	1.42	1.72	V
	Forward voltage temperature coefficient	$\Delta V_F / \Delta T_a$	$I_F = 16 \text{ mA}$	—	-2	—	mV / °C
	Reverse current	I_R	$V_R = 3 \text{ V}$	—	—	10	μA
	Capacitance between terminal	C_T	$V_F = 0 \text{ V}, f = 1 \text{ MHz}$	—	30	—	pF
Detector	High level output current	$I_{OH(1)}$	$I_F = 0 \text{ mA}, V_{CC} = V_O = 5.5 \text{ V}$	—	3	500	nA
		$I_{OH(2)}$	$I_F = 0 \text{ mA}, V_{CC} = 30 \text{ V}$ $V_O = 20 \text{ V}$	—	—	5	μA
		I_{OH}	$I_F = 0 \text{ mA}, V_{CC} = 30 \text{ V}$ $V_O = 20 \text{ V}, T_a = 70 \text{ °C}$	—	—	50	
	High level supply current	I_{CCH}	$I_F = 0 \text{ mA}, V_{CC} = 30 \text{ V}$	—	0.01	1	μA
	Supply voltage	V_{CC}	$I_{CC} = 0.01 \text{ mA}$	30	—	—	V
	Output voltage	V_O	$I_O = 0.5 \text{ mA}$	20	—	—	V

Coupled Electrical Characteristics(Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_O / I_F	$I_F = 10 \text{ mA}, V_{CC} = 4.5 \text{ V}$ $V_O = 0.4 \text{ V}$	25	35	75	%
		$I_F = 16 \text{ mA}, V_{CC} = 4.5 \text{ V}$ $V_O = 0.4 \text{ V}, T_a = -25 \text{ to } 100 \text{ °C}$	15	—	—	
Low level output voltage	V_{OL}	$I_F = 10 \text{ mA}, V_{CC} = 4.5 \text{ V}$ $I_O = 2.4 \text{ mA}$	—	—	0.4	V

Isolation Characteristics(Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	R_S	R.H. ≤ 60 %, $V_S = 500 \text{ V}$	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 60 s	3750	—	—	Vrms

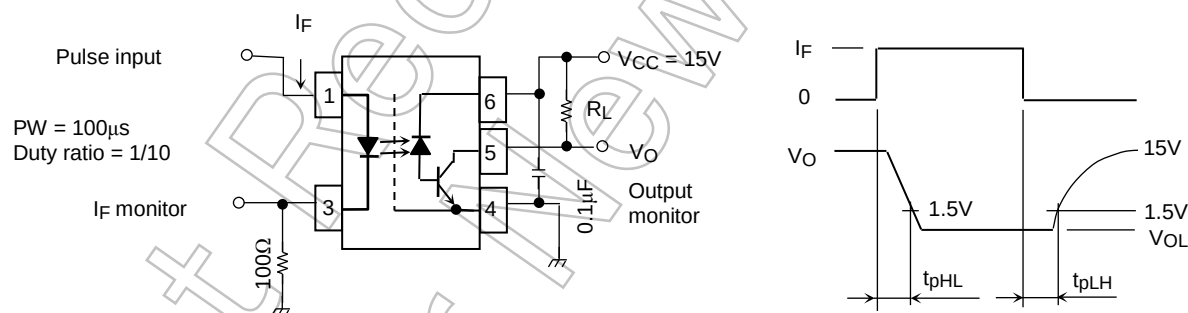
Switching Characteristics(Ta = 25°C, Vcc = 15V)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Propagation delay time (H→ L)	t _{pHL}	1	I _F = 0→ 10 mA, R _L = 20 kΩ	0.1	0.45	0.8	μs
Propagation delay time (L→ H)	t _{pLH}		I _F = 0→ 10 mA, R _L = 20 kΩ Ta = 0 to 85 °C	0.1	0.45	0.9	
			I _F = 0→ 10 mA, R _L = 20 kΩ Ta = -25 to 100 °C	0.1	0.45	1.0	
Switching time dispersion between on and off	t _{pLH} -t _{pHL}		I _F = 10→ 0 mA, R _L = 20 kΩ	—	0.15	0.7	μs
			I _F = 10→ 0 mA, R _L = 20 kΩ Ta = 0 to 85 °C	—	0.25	0.8	
			I _F = 10→ 0 mA, R _L = 20 kΩ Ta = -25 to 100 °C	—	0.25	0.9	
Common mode transient immunity at logic high output (Note 4)	CMH	2	I _F = 0 mA V _{CM} = 1500 V _{p-p} R _L = 20 kΩ	10000	15000	—	V / μs
Common mode transient immunity at logic low output (Note 4)	CML		I _F = 10 mA V _{CM} = 1500 V _{p-p} R _L = 20 kΩ	-10000	-15000	—	V / μs

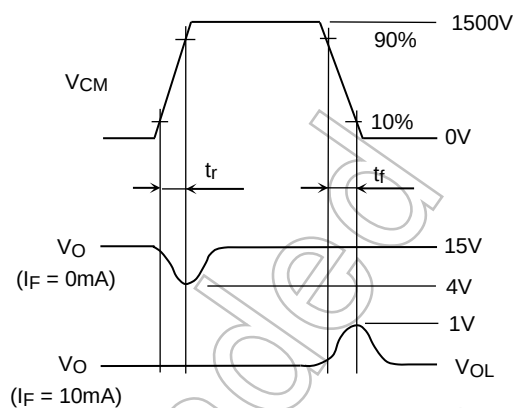
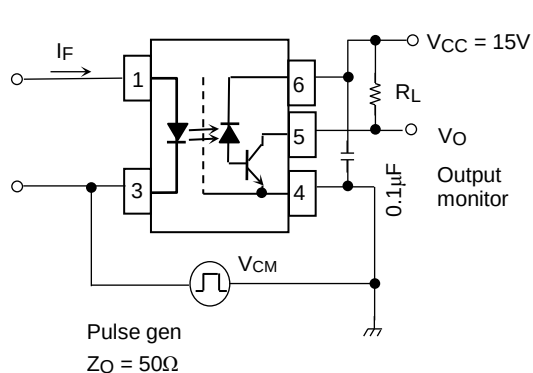
(Note 4): CML is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state ($V_O < 1 \text{ V}$).

CMH is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state ($V_O > 4 \text{ V}$).

Test Circuit 1: Switching Time Test Circuit



Test Circuit 2: Common Mode Noise Immunity Test Circuit



$$CM_H = \frac{1200(V)}{t_r(\mu s)}, CM_L = \frac{1200(V)}{t_f(\mu s)}$$

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