

TENTATIVE

TOSHIBA PHOTOCOUPLER GaAs IRED + PHOTO-IC

TLP114A(IGM)

TRANSISTOR INVERTOR

INVERTER FOR AIR CONDITIONER

LINE RECEIVER

IPM INTERFACES

The TOSHIBA MINI FLAT COUPLER TLP114A is a small outline coupler, suitable for surface mount assembly.

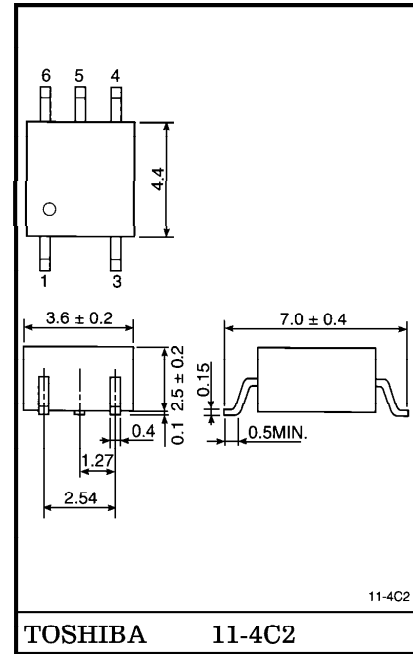
TLP114A consists of a high output power GaAs light emitting diode, optically coupled to a high speed detector of one chip photodiode-transistor.

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. Therefore TLP114A (IGM) is suitable for isolation interface between IPM (Intelligent Power Module) and control IC circuits in motor control application.

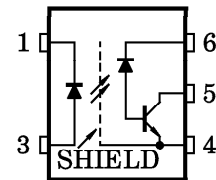
- Isolation Voltage : 3750V_{rms} (Min.)
- Common Mode Transient Immunity : ±10kV / μs (Min.)
@ V_{CM} = 1500V
- Switching Time : t_{pHL}, t_{pLH} = 0.1μs (Min.)
= 0.8μs (Max.)
@ I_F = 10mA, V_{CC} = 15V,
R_L = 20kΩ, T_a = 25°C
- Switching Time Dispersion : 0.7μs (Max.)
(t_{pLH} - t_{pHL})
- TTL Compatible
- UL Recognized : UL1577, File No.E67349

Unit in mm



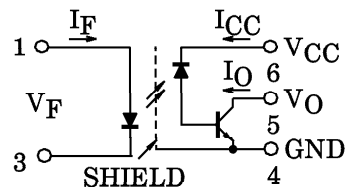
Weight : 0.09g

PIN CONFIGURATION (Top view)



- 1 : ANODE
- 3 : CATHODE
- 4 : EMITTER (GND)
- 5 : COLLECTOR (OUTPUT)
- 6 : VCC

SCHEMATIC



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● Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.

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MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current (Note 1)	I _F	20	mA
	Pulse Forward Current (Note 2)	I _{FP}	40	mA
	Peak Transient Forward Current (Note 3)	I _{FPT}	1	A
	Reverse Voltage	V _R	5	V
Detector	Output Current	I _O	8	mA
	Peak Output Current	I _{OP}	16	mA
	Output Voltage	V _O	-0.5~20	V
	Supply Voltage	V _{CC}	-0.5~30	V
	Output Power Dissipation (Note 4)	P _O	100	mW
Operating Temperature Range		T _{opr}	-55~100	°C
Storage Temperature Range		T _{stg}	-55~125	°C
Lead Soldering Temperature (10s)		T _{sol}	260	°C
Isolation Voltage (AC, 1min., R.H. ≤ 60%, Ta = 25°C) (Note 5)		BV _S	3750	V _{rms}

(Note 1) : Derate 0.36mA above 70°C.

(Note 2) : 50% duty cycle, 1ms pulse width.
Derate 0.72mA / °C above 70°C.

(Note 3) : Pulse width PW ≤ 1μs, 300pps.

(Note 4) : Derate 1.8mW / °C above 70°C.

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

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V _F	I _F = 16mA	1.22	1.42	1.72	V
	Forward Voltage Temperature Coefficient	ΔV _F /ΔTa	I _F = 16mA	—	-2	—	mV/°C
	Reverse Current	I _R	V _R = 5V	—	—	10	μA
	Capacitance between Terminal	C _T	V _F = 0, f = 1MHz	—	30	—	pF
Detector	High Level Output Current	I _{OH} (1)	I _F = 0mA, V _{CC} = V _O = 5.5V	—	3	500	nA
		I _{OH} (2)	I _F = 0mA, V _{CC} = 30V V _O = 20V	—	—	5	μA
		I _{OH}	I _F = 0mA, V _{CC} = 30V V _O = 20V, Ta = 70°C	—	—	50	
	High Level Supply Current	I _{CCH}	I _F = 0mA, V _{CC} = 30V	—	0.01	1	μA
	Supply Voltage	V _{CC}	I _{CC} = 0.01mA	30	—	—	V
	Output Voltage	V _O	I _O = 0.5mA	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 = 10mA, V _{CC} = 4.5V V _O = 0.4V	25	35	75	%
		I _F = 16mA, V _{CC} = 4.5V V _O = 0.4V, Ta = -25~100°C	15	—	—	
Low Level Output Voltage	V _{OL}	I _F = 10mA, V _{CC} = 4.5V I _O = 2.4mA	—	—	0.4	V

ISOLATION CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance Input to Output	C _S	V = 0, f = 1MHz (Note 5)	—	0.8	—	pF
Isolation Resistance	R _S	R.H. ≤ 60%, V _S = 500V (Note 5)	5 × 10 ¹⁰	10 ¹⁴	—	Ω
Isolation Voltage	BV _S	AC, 1 minute	3750	—	—	V _{rms}
		AC, 1 second, in oil	—	10000	—	Vdc
		DC, 1 minute, in oil	—	10000	—	

SWITCHING CHARACTERISTICS (Ta = 25°C, VCC = 15V)

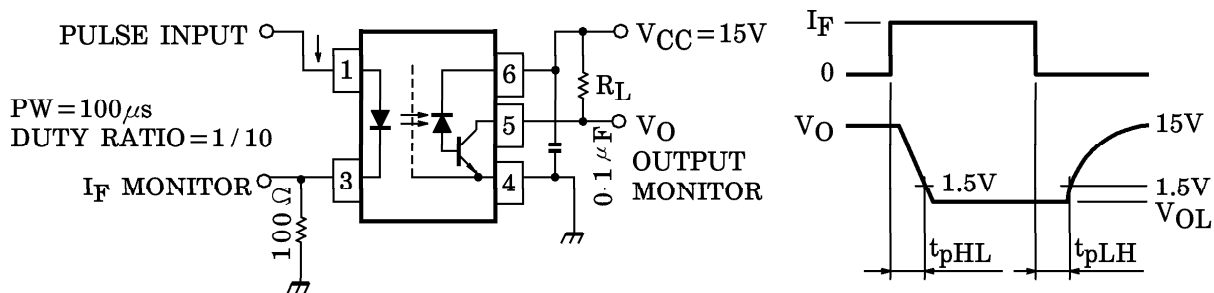
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (H→L)	t _{pHL}	1	I _F = 0 → 10mA, R _L = 20kΩ	0.1	0.45	0.8	μs
			I _F = 0 → 10mA, R _L = 20kΩ Ta = 0 ~ 85°C	0.1	0.45	0.9	
Propagation Delay Time (L→H)	t _{pLH}		I _F = 0 → 10mA, R _L = 20kΩ Ta = -25 ~ 100°C	0.1	0.45	1.0	μs
Switching Time Dispersion between ON and OFF	t _{pLH} - t _{pHL}		I _F = 10 → 0mA, R _L = 20kΩ	—	0.15	0.7	
			I _F = 10 → 0mA, R _L = 20kΩ Ta = 0 ~ 85°C	—	0.25	0.8	
Common Mode Transient Immunity at Logic High Output (Note 6)	CM _H		2	I _F = 0mA V _{CM} = 1500V _{p-p} R _L = 20kΩ	10000	15000	—
		Common Mode Transient Immunity at Logic Low Output (Note 6)		CM _L	I _F = 10mA V _{CM} = 1500V _{p-p} R _L = 20kΩ	-10000	-15000

(Note 6) : CM_L 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 < 1V).

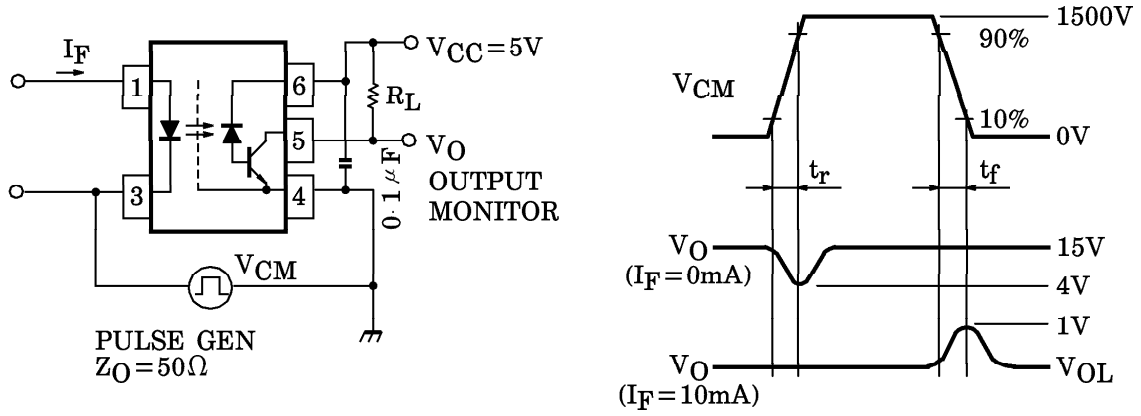
CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state (V_O < 4V).

(Note 7) : Maximum electrostatic discharge voltage for any pins : 100V (C = 200pF, R = 0).

TEST CIRCUIT 1 : Switching time test circuit



TEST CIRCUIT 2 : Common mode noise immunity test circuit



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