TENTATIVE TOSHIBA PHOTOCOUPLER GaAℓAs IRED + PHOTO-IC

TLP114A(IGM)

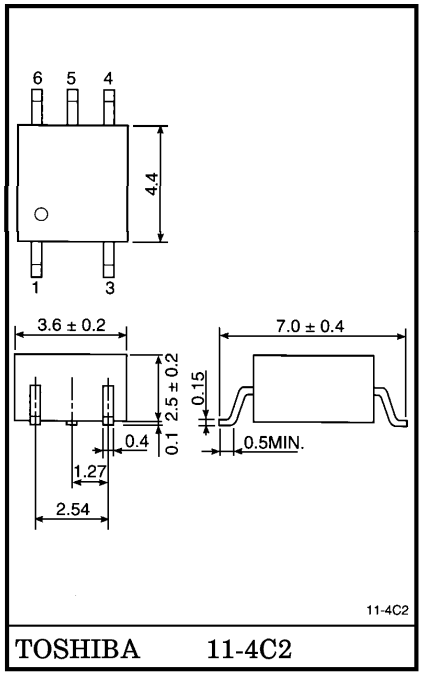
TRANSISTOR INVERTOR

INVERTER FOR AIR CONDITIONER

LINE RECEIVER

IPM INTERFACES

Unit in mm



TOSHIBA 11-4C2

Weight : 0.09g

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

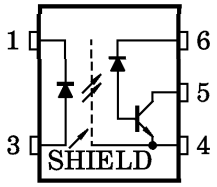
TLP114A consists of a high output power GaAℓAs light emitting diode, optically coupled to a high speed detector of one chip photodiode-transistor.

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

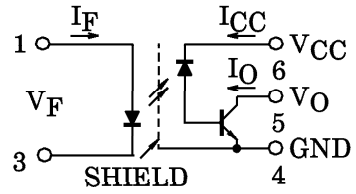
- Isolation Voltage : $3750V_{rms}$ (Min.)
- Common Mode Transient Immunity
  : $\pm 10kV/\mu s$ (Min.)
  @ $V_{CM}=1500V$
- Switching Time : t_{pHL}, t_{pLH} $=0.1\mu s$ (Min.)
  $=0.8\mu s$ (Max.)
  @ $I_F=10mA$, $V_{CC}=15V$,
  $R_L=20k\Omega$, $Ta=25°C$
- Switching Time Dispersion : $0.7\mu s$ (Max.)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

PIN CONFIGURATION (Top view)



1 : ANODE
3 : CATHODE
4 : EMITTER (GND)
5 : COLLECTOR (OUTPUT)
6 : V_{CC}

SCHEMATIC



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 considerd 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	$\Delta V_F / \Delta Ta$	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	—	

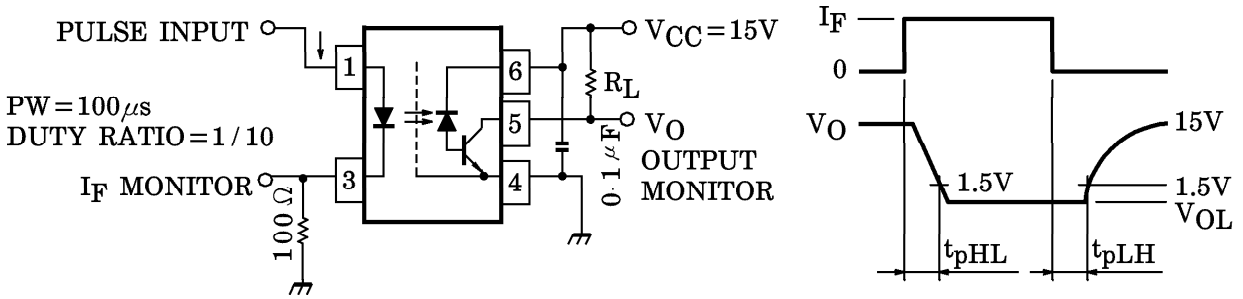
SWITCHING CHARACTERISTICS (Ta = 25°C, V_{CC} = 15V)

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	
Switching Time Dispersion between ON and OFF	$\|t_{pLH}-t_{pHL}\|$		I_F = 10→0mA, R_L = 20kΩ	—	0.15	0.7	μs
			I_F = 10→0mA, R_L = 20kΩ Ta = 0~85°C	—	0.25	0.8	
			I_F = 10→0mA, R_L = 20kΩ Ta = −25~100°C	—	0.25	0.9	
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	—	V / μs
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	—	V / μs

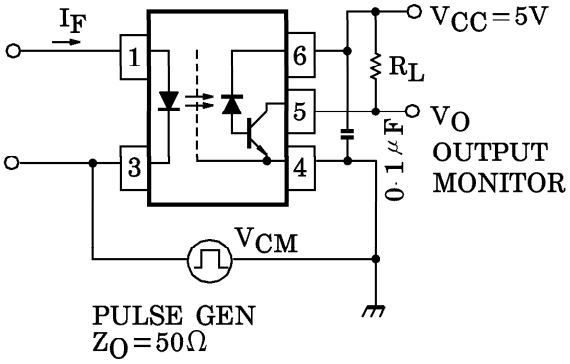
(Note 6) : CM_L is the maximum rate of fall of the common mode voltage that can be sustained with the output voltage in the logic low state (V_O < 1V).
CM_H is the maximum rate of rise of the common mode voltage that can be sustained with the output voltage in the logic high state (V_O < 4V).

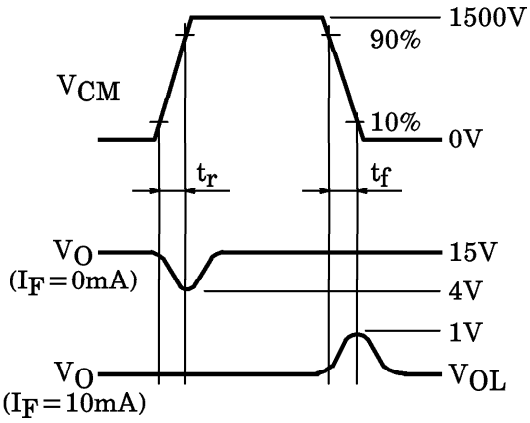
(Note 7) : Maximum electrostatic discharge voltage for any pins : 100V (C = 200pF, R = 0).

TEST CIRCUIT 1 : Switching time test circuit



TEST CIRCUIT 2 : Common mode noise immunity test circuit





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

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