TOSHIBA PHOTOCOUPLER GaAℓAs IRED & PHOTO-IC

TLP113

ISOLATED LINE RECEIVER

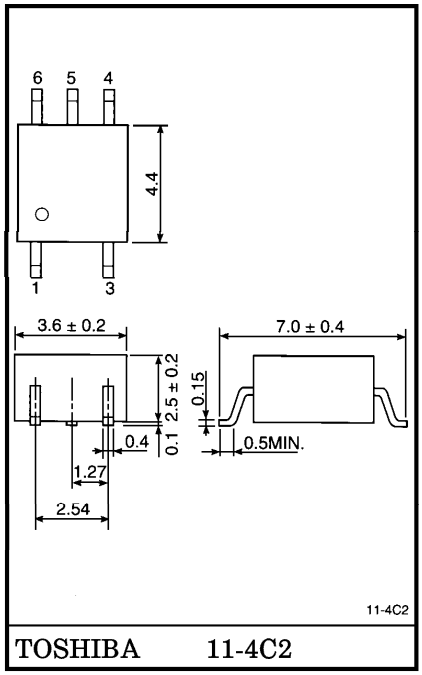
SIMPLEX / MULTIPLEX DATA TRANSMISSION

COMPUTER-PERIPHERAL INTERFACE

MICROPROCESSOR SYSTEM INTERFACE

DIGITAL ISOLATION FOR A / D, D / A CONVERSION

Unit in mm



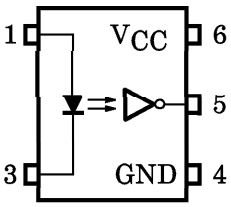
TOSHIBA 11-4C2

Weight : 0.09g

The TOSHIBA MINI FLAT COUPLER TLP113 is a small outline coupler, suitable for surface mount assembly.
TLP113 consists of a GaAℓAs light emitting diode, optically coupled to an integrated high gain, high speed photodetector whose output is an open collector, schottky clamped transistor.

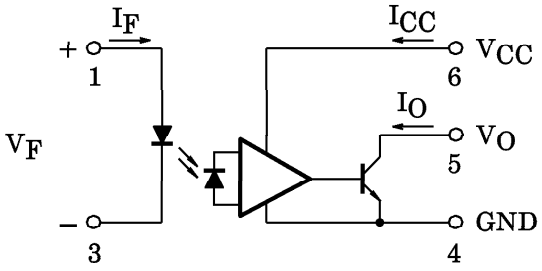
- Input Current Thresholds : I_F = 10mA (Max.)
- Switching Speed : 10MBd (Typ.)
- TTL / LSTTL Compatible : V_{CC} = 5V
- Guaranteed Performance Over Temp. : 0~70°C
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577 File No. E67349

PIN CONFIGURATION (TOP VIEW)



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

SCHEMATIC



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

TRUTH TABLE (Positive Logic)

INPUT	OUTPUT
H	L
L	H

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	I_F	20	mA
	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
DETECTOR	Output Current	I_O	25	mA
	Output Voltage	V_O	7	V
	Supply Voltage (1 Minute Maximum)	V_{CC}	7	V
	Output Power Dissipation	Po	40	mW
Operating Temperature Range		T_{opr}	−40~85	°C
Storage Temperature Range		T_{stg}	−55~125	°C
Lead Solder Temperature (10s)		T_{sol}	260	°C
Isolation Voltage (AC, 1 min., RH≦60%, Note 4)		BV_S	2500	Vrms

(Note 1) 50% duty cycle, 1ms pulse width.
(Note 2) Pulse width≦1μs, 300pps.

RECOMMENDE OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage, Low Level	V_{FL}	−3	0	1.0	V
Input Current, High Level	I_{FH}	13 *	16	20	mA
Supply Voltage	V_{CC}	4.5	5	5.5	V
Fan Out (TTL Load, Each Channel)	N	—	—	8	—
Operating Temperature	T_{opr}	0	—	70	°C

* 13mA is a guard banded value which allows for at least 20% CTR degradation. Initial input current threshold value is 10mA or less.

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta = 0~70°C, V_{CC} = 4.5~5.5V, V_{FL} ≦ 1.0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Voltage	V_F	I_F = 10mA, Ta = 25°C	—	1.65	1.80	V
Forward Voltage Temperature Coefficient	V_F / Ta	I_F = 10mA	—	−2	—	mV / °C
Reverse Current	I_R	V_R = 5V, Ta = 25°C	—	—	10	μA
Capacitance Between Terminals	C_T	V_F = 0, f = 1MHz, Ta = 25°C	—	45	—	pF
High Level Output Current	I_{OH}	V_F = 1.0, V_O = 5.5V	—	—	250	μA
		V_F = 1.0, V_O = 5.5V, Ta = 25°C	—	0.5	10	
Low Level Output Voltage	V_{OL}	I_F = 10mA I_{OL} = 13mA (Sinking)	—	0.4	0.6	V
"H Level Output→L Level Output" Input Current	I_{FH}	I_{OL} = 13mA (Sinking) V_{OL} = 0.6V	—	—	10	mA
High Level Supply Current	I_{CCH}	V_{CC} = 5.5V, I_F = 0	—	7	15	mA
Low Level Supply Current	I_{CCL}	V_{CC} = 5.5V, I_F = 16mA	—	12	18	mA
Input-Output Insulation Leakage Current	I_S	V_S = 3540V, t = 5s Ta = 25°C (Note 4)	—	—	100	μA
Isolation Resistance	R_S	R.H.≦60%, V_S = 500V DC Ta = 25°C (Note 4)	5×10^{10}	10^{14}	—	Ω
Stray Capacitance Between Input to Output	C_S	V_S = 0, f = 1MHz Ta = 25°C (Note 4)	—	0.8	—	pF

* All typical values are V_{CC} = 5V, Ta = 25°C

SWITCHING CHARACTERISTICS (V_{CC} = 5V, Ta = 25°C)

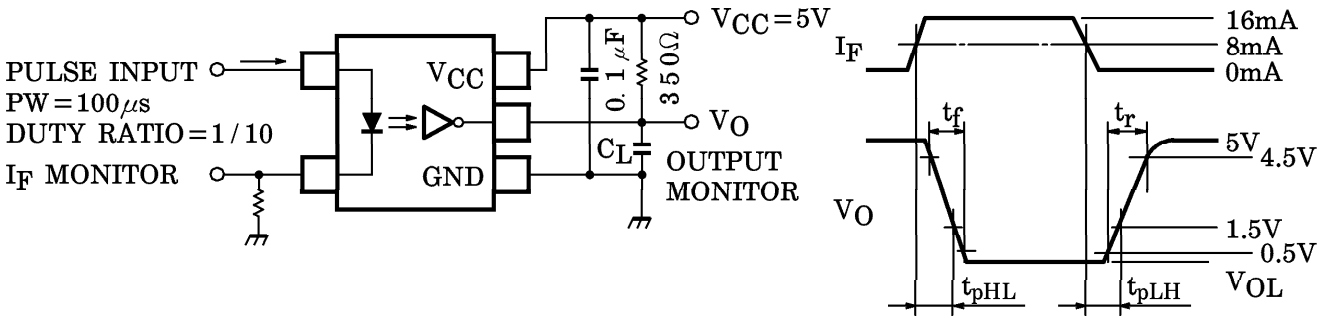
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Propagation Delay Time (H→L)	t_{pHL}	1	I_F = 0→16mA C_L = 15pF, R_L = 350Ω	—	60	120	ns
Propagation Delay Time (L→H)	t_{pLH}	1	I_F = 16→0mA C_L = 15pF, R_L = 350Ω	—	60	120	ns
Output Rise-Fall Time (10-90%)	t_r, t_f	2	R_L = 350Ω, C_L = 15pF I_F = 0⇄16mA	—	30	—	ns
Common Mode Transient Imunity at High Output Level	CM_H	2	I_F = 0mA, V_{CM} = 200V_{p-p} $V_{O(MIN)}$ = 2V, R_L = 350Ω	—	200	—	V / μs
Common Mode Transient Imunity at Low Output Level	CM_L	2	I_F = 16mA, V_{CM} = 200V_{p-p} $V_{O(MAX)}$ = 0.8V, R_L = 350Ω	—	−500	—	V / μs

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

(Note 5) The V_{CC} supply voltage to each TLP113 isolator must be bypassed by 0.1μF capacitor, This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to package V_{CC} and GND pins of each device.

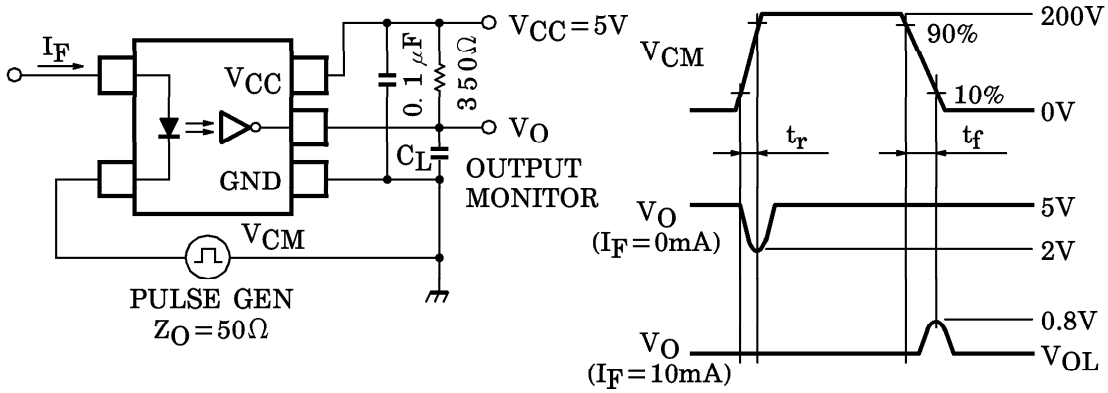
(Note 6) Maximum electrostatic discharge voltage for any pins : 180V (C = 200pF, R = 0)

TEST CIRCUIT 1 : Switching Time Test Circuit



C_L is approximately 15pF which includes probe and stray wiring capacitance.

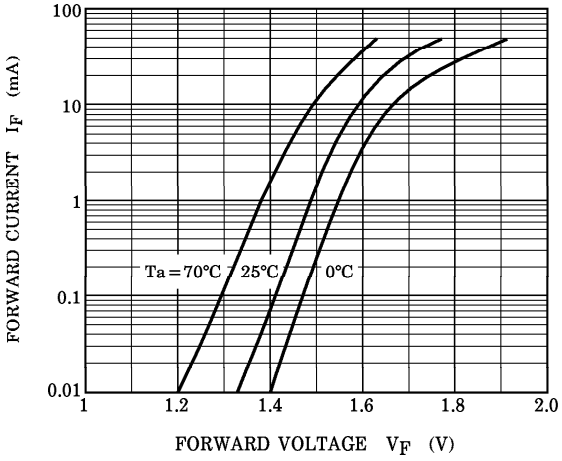
TEST CIRCUIT 2 : Common Mode Transient Immunity Test Circuit



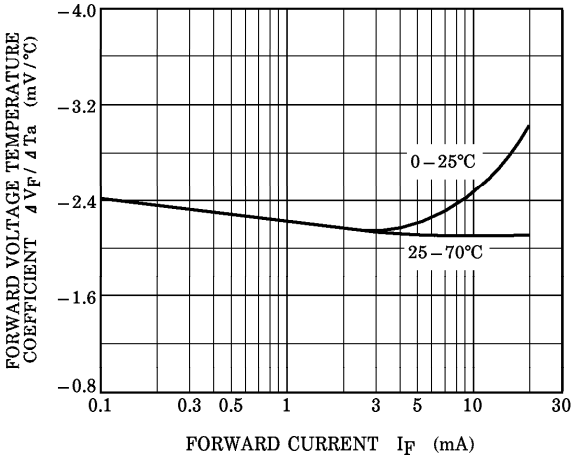
$$CM_H = \frac{160\ (V)}{t_r\ (\mu s)},\ CM_L = \frac{160\ (V)}{t_f\ (\mu s)}$$

C_L is approximately 15pF which includes probe and stray wiring capacitance.

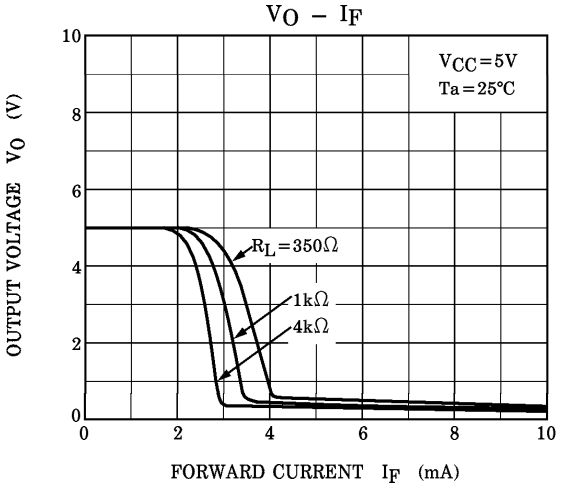
$I_F - V_F$



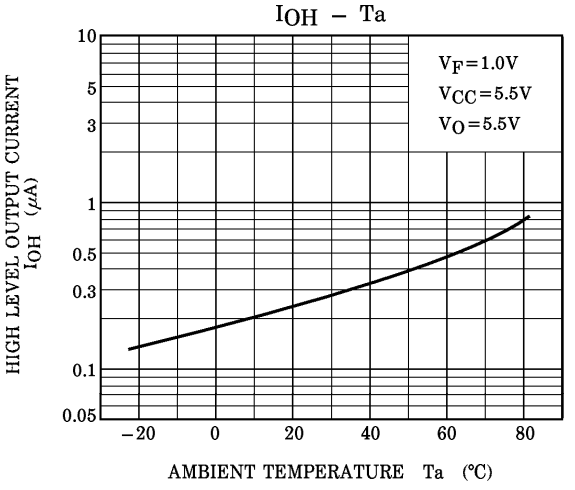
$\Delta V_F / \Delta Ta - I_F$



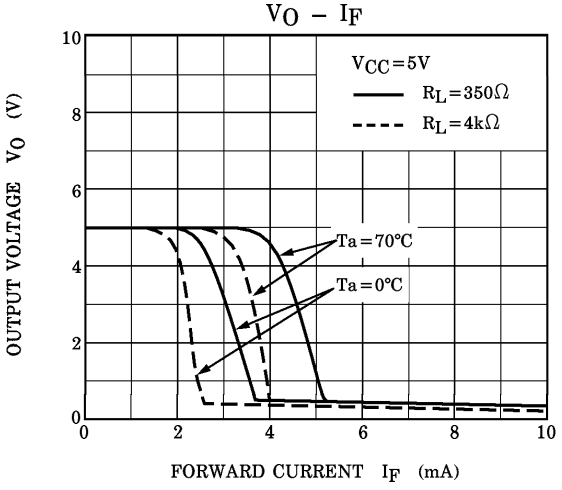
$V_O - I_F$



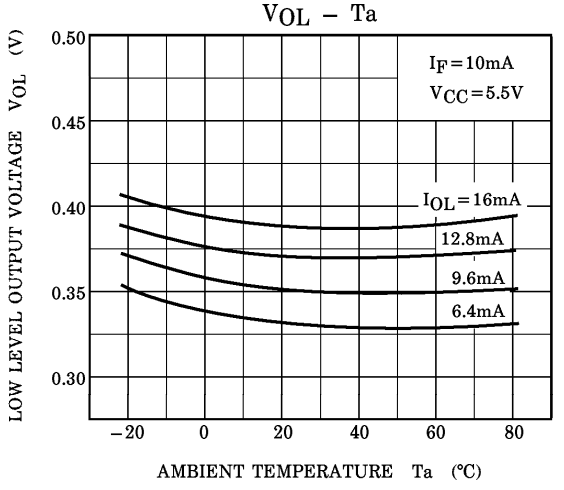
$I_{OH} - Ta$



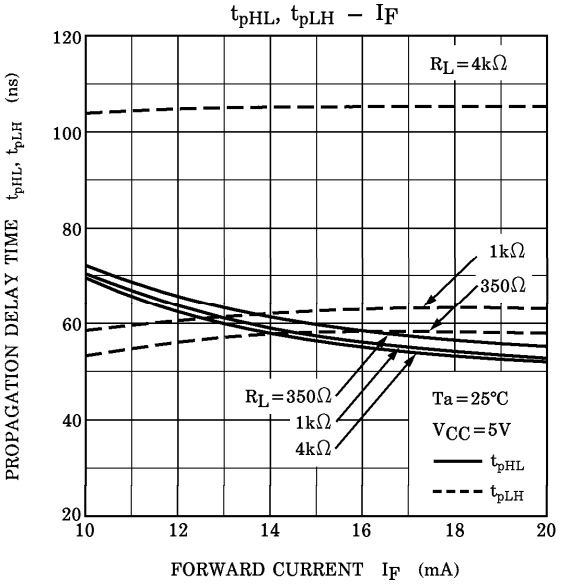
$V_O - I_F$



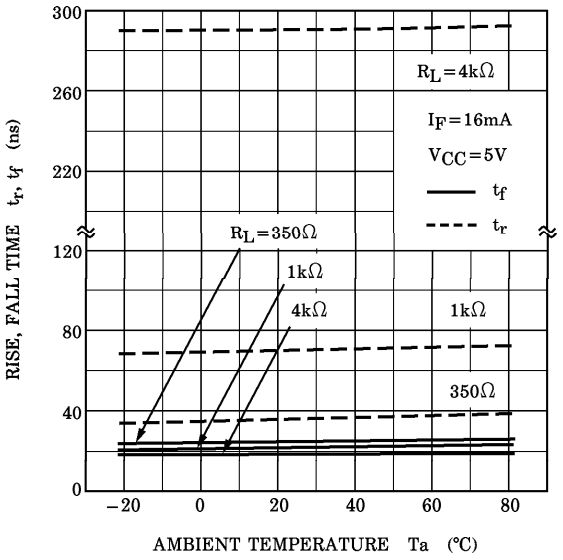
$V_{OL} - Ta$



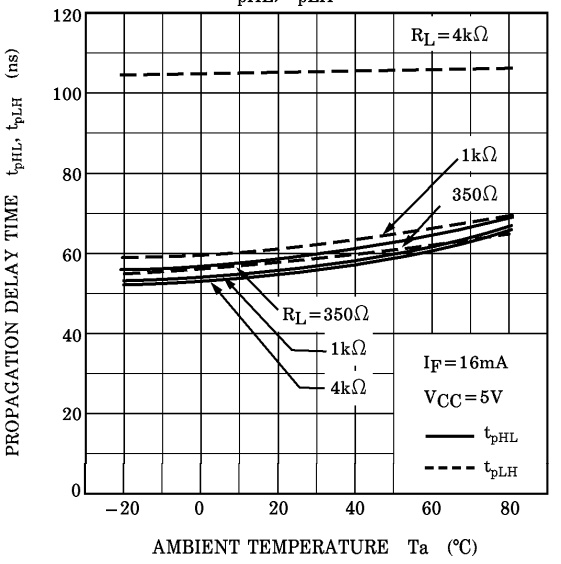
t_{pHL}, t_{pLH} – I_F



t_r, t_f – Ta



t_{pHL}, t_{pLH} – Ta



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