

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP120

PROGRAMMABLE CONTROLLERS

AC/DC-INPUT MODULE

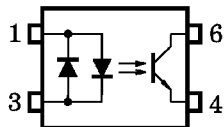
TELECOMMUNICATION

The TOSHIBA MINI FLAT COUPLER TLP120 is a small outline coupler, suitable for surface mount assembly.

TLP120 consists of a photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and can operate directly by AC input current.

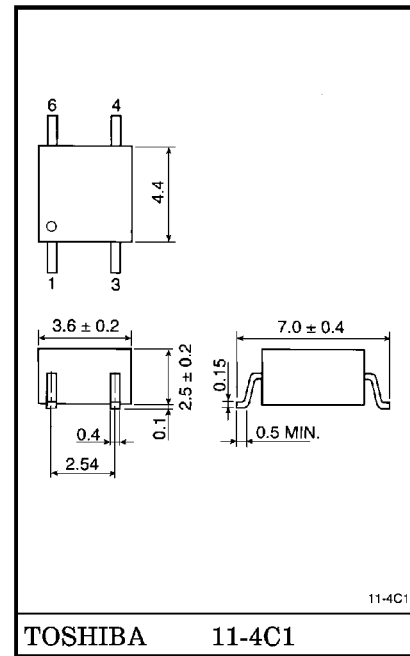
- Collector-Emitter Voltage : 80V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- Isolation Voltage : 3750Vrms (Min.)
- UL Recognized : UL1577, File No. E67349

PIN CONFIGURATIONS (TOP VIEW)



- 1 : ANODE
- CATHODE
- 3 : CATHODE
- ANODE
- 4 : EMITTER
- 6 : COLLECTOR

Unit in mm



Weight : 0.09g

961001EBC2

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## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
LED	Forward Current	$I_{F(RMS)}$	50	mA
	Forward Current Derating	$\Delta I_F / ^\circ C$	-0.7 (Ta $\geq$ 53°C)	mA / °C
	Pulse Forward Current	$I_{FP}$	1 (100 $\mu$ s pulse, 100pps)	A
	Reverse Voltage	$V_R$	5	V
	Junction Temperature	$T_j$	125	°C
DETECTOR	Collector-Emitter Voltage	$V_{CEO}$	80	V
	Emitter-Collector Voltage	$V_{ECO}$	7	V
	Collector Current	$I_C$	50	mA
	Collector Power Dissipation	$P_C$	150	mW
	Collector Power Dissipation Derating (Ta $\geq$ 25°C)	$\Delta P_C / ^\circ C$	-1.5	mW / °C
	Junction Temperature	$T_j$	125	°C
	Storage Temperature Range	$T_{stg}$	-55~125	°C
Operating Temperature Range	$T_{opr}$	-55~100	°C	
Lead Soldering Temperature	$T_{sol}$	260 (10s)	°C	
Total Package Power Dissipation	$P_T$	200	mW	
Total Package Power Dissipation Derating (Ta $\geq$ 25°C)	$\Delta P_T / ^\circ C$	-2.0	mW / °C	
Isolation Voltage (Note 1)	$BV_S$	3750 (AC, 1min., R.H. $\leq$ 60%)	$V_{rms}$	

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

## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	$V_{CC}$	—	5	48	V
Forward Current	$I_F (RMS)$	—	16	20	mA
Collector Current	$I_C$	—	1	10	mA
Operating Temperature	$T_{opr}$	-25	—	85	°C

## INDIVIDUAL ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
LED	Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = ±10mA	1.0	1.15	1.3	V
	Capacitance	C <sub>T</sub>	V = 0, f = 1MHz	—	60	—	pF
DETECTOR	Collector-Emitter Breakdown Voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 0.5mA	80	—	—	V
	Emitter-Collector Breakdown Voltage	V <sub>(BR)ECO</sub>	I <sub>E</sub> = 0.1mA	7	—	—	V
	Collector Dark Current	I <sub>CEO</sub>	V <sub>CE</sub> = 48V	—	10	100	nA
			V <sub>CE</sub> = 48V, Ta = 85°C	—	2	50	μA
Capacitance (Collector to Emitter)	C <sub>CE</sub>	V = 0, f = 1MHz	—	10	—	pF	

## COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Transfer Ratio	I <sub>C</sub> / I <sub>F</sub>	I <sub>F</sub> = ±5mA, V <sub>CE</sub> = 5V Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	I <sub>C</sub> / I <sub>F(sat)</sub>	I <sub>F</sub> = ±1mA, V <sub>CE</sub> = 0.4V Rank GB	—	60	—	%
			30	—	—	
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 2.4mA, I <sub>F</sub> = ±8mA I <sub>C</sub> = 0.2mA, I <sub>F</sub> = ±1mA Rank GB	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	
Off-State Collector Current	I <sub>C(off)</sub>	V <sub>F</sub> = ±0.7V, V <sub>CE</sub> = 48V	—	1	10	μA
CTR Symmetry	I <sub>C(ratio)</sub>	I <sub>C</sub> (I <sub>F</sub> = -5mA) / I <sub>C</sub> (I <sub>F</sub> = 5mA)	0.33	1	3	—

## ISOLATION CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance (Input to Output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz	—	0.8	—	pF
Isolation Resistance	R <sub>S</sub>	V <sub>S</sub> = 500V, R.H. ≤ 60%	5 × 10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation Voltage	BV <sub>S</sub>	AC, 1 minute	3750	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

SWITCHING CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	$t_r$	$V_{CC} = 10V, I_C = 2mA$ $R_L = 100\Omega$	—	2	—	$\mu s$
Fall Time	$t_f$		—	3	—	
Turn-on Time	$t_{on}$		—	3	—	
Turn-off Time	$t_{off}$		—	3	—	
Turn-on Time	$t_{ON}$	$R_L = 1.9k\Omega$ (Fig.1) $V_{CC} = 5V, I_F = \pm 16mA$	—	2	—	$\mu s$
Storage Time	$t_s$		—	25	—	
Turn-off Time	$t_{OFF}$		—	40	—	

Fig.1 SWITCHING TIME TEST CIRCUIT

