

TENTATIVE

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP320, TLP320-2, TLP320-4

TELECOMMUNICATION

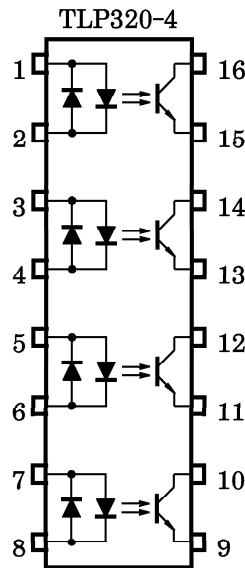
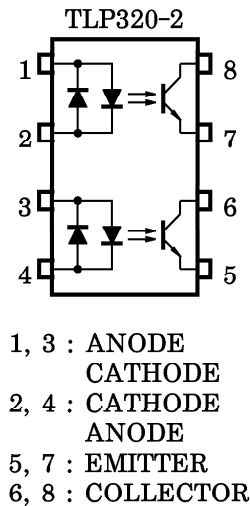
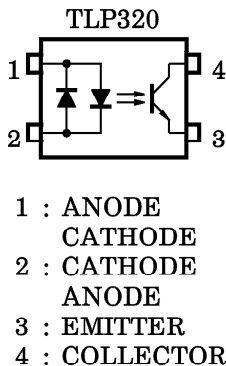
OFFICE MACHINE

TELEPHONE USE EQUIPMENT

The TOSHIBA TLP320, -2 and -4 consists of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode. The TLP320-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP320-4 provides four isolated channels in a sixteen plastic DIP package. This is suitable for application of AC input current up to 150mA.

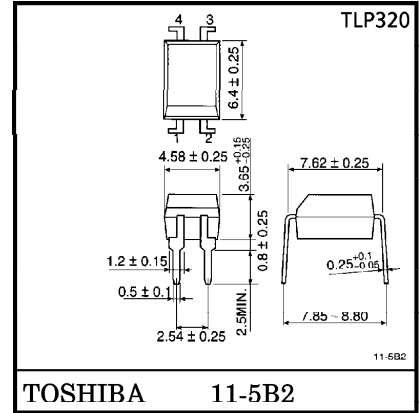
- $I_F$  Maximum Rating :  $\pm 150\text{mA}$
- Collector-Emitter Voltage : 55V (Min.)
- Current Transfer Ratio : 25% (Min.) ( $I_F=20\text{mA}$ )
- Isolation Voltage : 5000V<sub>rms</sub> (Min.)
- UL Recognized : File No. E67349

PIN CONFIGURATIONS (TOP VIEW)

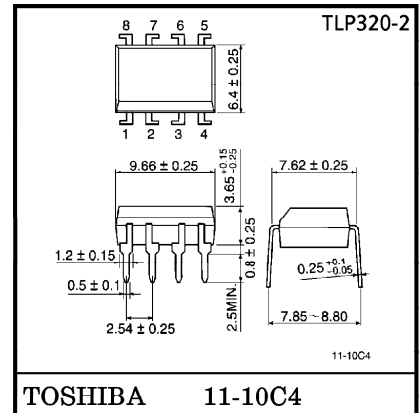


- 1, 3, 5, 7 : ANODE
- 2, 4, 6, 8 : CATHODE
- 9, 11, 13, 15 : EMITTER
- 10, 12, 14, 16 : COLLECTOR

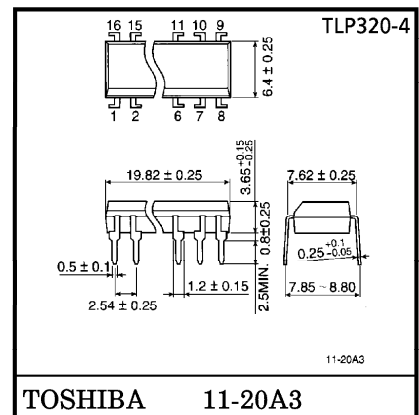
Unit in mm



Weight : 0.26g



Weight : 0.54g



Weight : 1.1g

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● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING		UNIT
			TLP320	TLP320-2 TLP320-4	
LED	Forward Current	$I_F$	$\pm 150$		mA
	Forward Current Derating	$\Delta I_F / ^\circ C$	$-1.5 (T_a \geq 25^\circ C)$		mA / °C
	Pulse Forward Current	$I_{FP}$	$\pm 1 (100 \mu s \text{ pulse, } 100 \text{ pps})$		A
	Junction Temperature	$T_j$	125		°C
DETECTOR	Collector-Emitter Voltage	$V_{CEO}$	55		V
	Emitter-Collector Voltage	$V_{ECO}$	7		V
	Collector Current	$I_C$	80		mA
	Collector Power Dissipation (1 Circuit)	$P_C$	150	100	mW
	Collector Power Dissipation Derating (1 Circuit, $T_a \geq 25^\circ C$ )	$\Delta P_C / ^\circ C$	-1.5	-1.0	mW / °C
	Junction Temperature	$T_j$	125		°C
Storage Temperature Range		$T_{stg}$	$-55 \sim 125$		°C
Operating Temperature Range		$T_{opr}$	$-55 \sim 100$		°C
Lead Soldering Temperature		$T_{sol}$	260 (10s)		°C
Total Package Power Dissipation		$P_T$	250	200	mW
Total Package Power Dissipation Derating ( $T_a \geq 25^\circ C$ )		$\Delta P_T / ^\circ C$	-2.5	2.0	mW / °C
Isolation Voltage (Note 1)		$BV_S$	5000 (AC, 1min., R.H. $\leq 60\%$ )		$V_{rms}$

(Note 1) Device consider a two terminal : LED side pins shorted together and DETECTOR side pins shorted together.

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	$V_{CC}$	—	5	24	V
Forward Current	$I_F$	—	20	120	mA
Collector Current	$I_C$	—	1	10	mA
Operating Temperature	$T_{opr}$	-25	—	85	°C

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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.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
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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> = ±100mA	—	1.4	1.7	V
	Forward Current	I <sub>F</sub>	V <sub>F</sub> = ±0.7V	—	2.5	20	μA
	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	55	—	—	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> = 24V	—	10	100	nA
			V <sub>CE</sub> = 24V, Ta = 85°C	—	2	50	μA
Capacitance Collector to Emitter	C <sub>CCE</sub>	V = 0, f = 1MHz	—	10	—	pF	

COUPLED ELECTRICAL CHARACTERISTICS (Ta = 25°C)

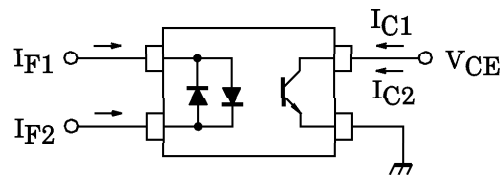
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current Transfer Ratio		I <sub>C</sub> / I <sub>F</sub>	I <sub>F</sub> = ±20mA, V <sub>CE</sub> = 1V	25	—	—	%
		I <sub>C</sub> / I <sub>F</sub> (High)	I <sub>F</sub> = ±100mA, V <sub>CE</sub> = 1V	20	—	80	
Collector-Emitter Saturation Voltage		V <sub>CE</sub> (sat)	I <sub>C</sub> = 2.4mA, I <sub>F</sub> = ±20mA	—	—	0.4	V
			I <sub>C</sub> = 2.4mA, I <sub>F</sub> = ±100mA	—	—	0.4	
Off-State Collector Current		I <sub>C</sub> (off)	V <sub>F</sub> = ±0.7V, V <sub>CE</sub> = 24V	—	1	10	μA
CTR Symmetry (Note)		I <sub>C</sub> (ratio)	I <sub>C</sub> (I <sub>F</sub> = -20mA) / I <sub>C</sub> (I <sub>F</sub> = +20mA) (Note)	0.5	1	2	—

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	5000	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

(Note)

$$I_C \text{ (ratio)} = \frac{I_{C2} (I_F = I_{F2}, V_{CE} = 1V)}{I_{C1} (I_F = I_{F1}, V_{CE} = 1V)}$$



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	$t_s$		—	15	—	
Turn-off Time	$t_{OFF}$		—	25	—	

Fig.1 SWITCHING TIME TEST CIRCUIT

