

# TLP320, TLP320-2, TLP320-4

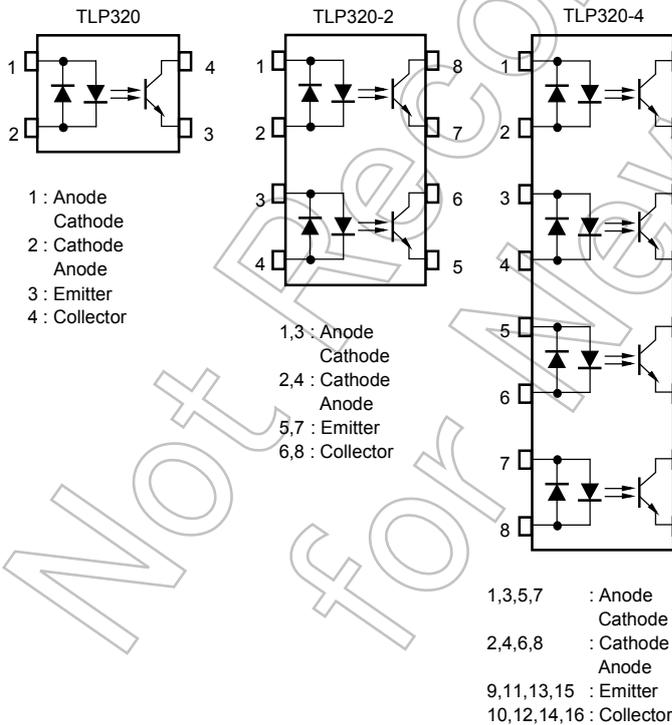
Telecommunication  
Office Machine  
Telephone Use Equipment

The TOSHIBA TLP320, -2 and -4 consists of a photo-transistor optically coupled to an infrared emitting diode.

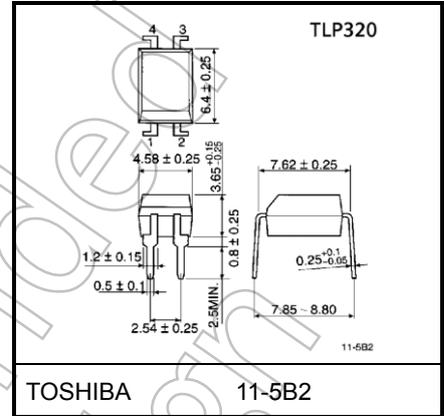
The TLP320-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP320-4 provides four isolated channels in a sixteen lead plastic DIP package. This is suitable for application of AC input current up to 150mA.

- I<sub>F</sub> maximum rating: ±150 mA
- Collector-emitter voltage: 55 V (min)
- Current transfer ratio: 25% (min)
- Isolation voltage: 5000 Vrms (min)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized: CSA Component Acceptance Service No.5A  
File No.E67349

## Pin Configurations (top view)

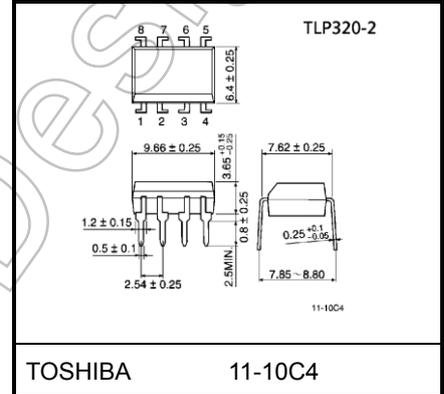


Unit: mm



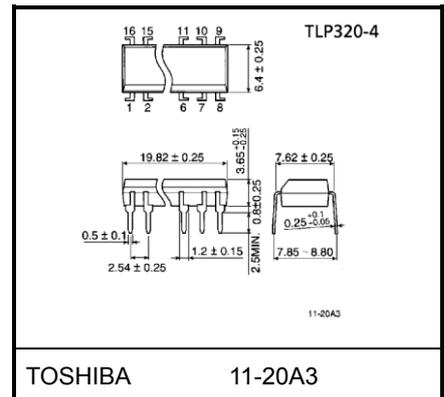
Weight: 0.26g (typ.)

Unit: mm



Weight: 0.54g (typ.)

Unit: mm



Weight: 1.1 g (typ.)

Start of commercial production  
1994-03

### Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating		Unit
			TLP320	TLP320-2 TLP320-4	
LED	Forward current	$I_F$	±150		mA
	Forward current derating (Ta ≥ 25°C)	$\Delta I_F/^\circ\text{C}$	-1.5		mA/°C
	Pulse forward current (100µs pulse, 100 pps)	$I_{FP}$	±1		A
	Diode power dissipation	$P_D$	200		mW
	Diode power dissipation derating (Ta ≥ 25°C)	$\Delta P_D/^\circ\text{C}$	-2.0		mW/°C
	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) (Ta ≥ 25°C)	$\Delta P_C/^\circ\text{C}$	-1.5	-1.0	mW/°C
	Junction temperature	$T_j$	125		°C
Storage temperature range		$T_{stg}$	-55 to 125		°C
Operating temperature range		$T_{opr}$	-55 to 100		°C
Lead soldering temperature (10 s)		$T_{sol}$	260		°C
Total package power dissipation (1 circuit)		$P_T$	250	200	mW
Total package power dissipation derating (1 circuit) (Ta ≥ 25°C)		$\Delta P_T/^\circ\text{C}$	-2.5	-2.0	mW/°C
Isolation voltage (AC, 60 s, R.H. ≤ 60 %) (Note 1)		$BVS$	5000		V <sub>rms</sub>

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: The device is considered as a two terminal device: 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

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

### Electrical Characteristics (Ta = 25°C)

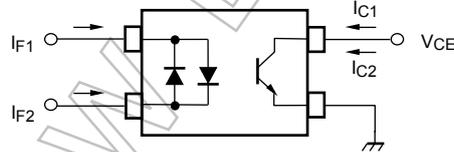
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V <sub>F</sub>	I <sub>F</sub> = ±100 mA	—	1.4	1.7	V
	Forward current	I <sub>F</sub>	V <sub>F</sub> = ±0.7 V	—	2.5	10	μA
	Capacitance	C <sub>T</sub>	V = 0 V, f = 1 MHz	—	60	—	pF
Detector	Collector-emitter breakdown voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 0.5 mA	55	—	—	V
	Emitter-collector breakdown voltage	V <sub>(BR)ECO</sub>	I <sub>E</sub> = 0.1 mA	7	—	—	V
	Collector dark current	I <sub>CEO</sub>	V <sub>CE</sub> = 24 V	—	10	100	nA
			V <sub>CE</sub> = 24 V, Ta = 85 °C	—	2	50	μA
Capacitance collector to emitter	C <sub>CE</sub>	V = 0 V, f = 1 MHz	—	10	—	pF	

### Coupled Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I <sub>C</sub> /I <sub>F</sub>	I <sub>F</sub> = ±20 mA, V <sub>CE</sub> = 1 V	25	—	—	%
	I <sub>C</sub> /I <sub>F</sub> (high)	I <sub>F</sub> = ±100 mA, V <sub>CE</sub> = 1 V	20	—	80	
Collector-emitter saturation voltage	V <sub>CE(sat)</sub>	I <sub>C</sub> = 2.4 mA, I <sub>F</sub> = ±20 mA	—	—	0.4	V
		I <sub>C</sub> = 2.4 mA, I <sub>F</sub> = ±100 mA	—	—	0.4	
Off-state collector current	I <sub>C(off)</sub>	V <sub>F</sub> = ±0.7 V, V <sub>CE</sub> = 24 V	—	1	10	μA
CTR symmetry (Note 1)	I <sub>C</sub> (ratio)	I <sub>C</sub> (I <sub>F</sub> = -20mA)/I <sub>C</sub> (I <sub>F</sub> = +20mA)	0.5	1	2	—

Note 1:

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



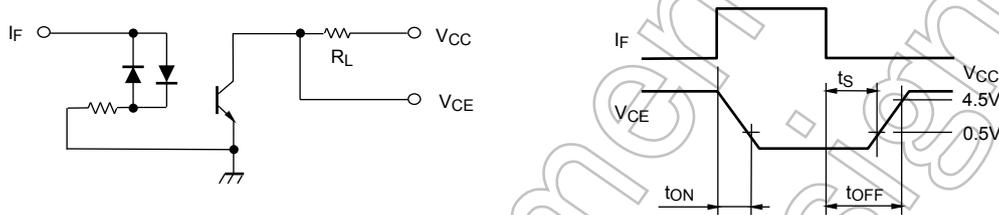
### Isolation Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C <sub>S</sub>	V <sub>S</sub> = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500 V, R.H. ≤ 60 %	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 60 s	5000	—	—	V <sub>rms</sub>

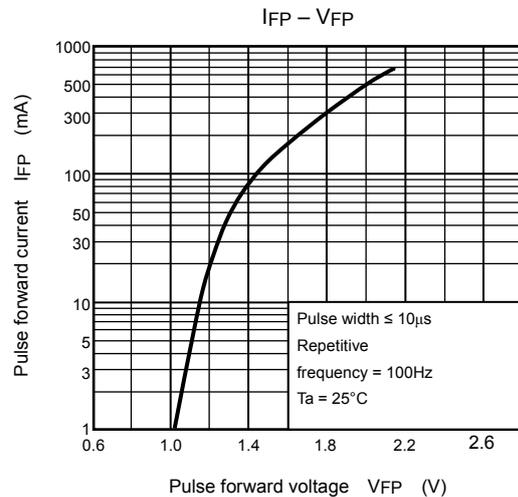
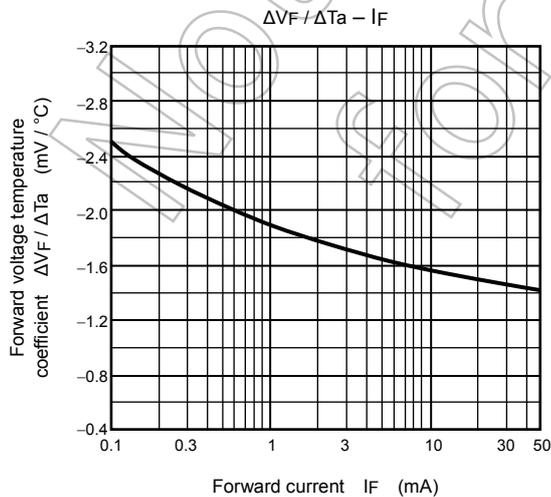
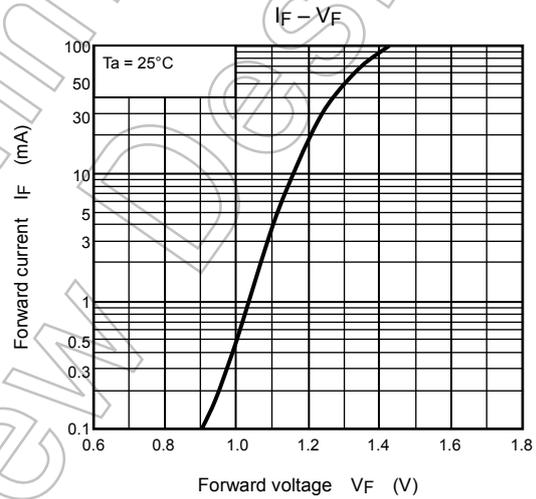
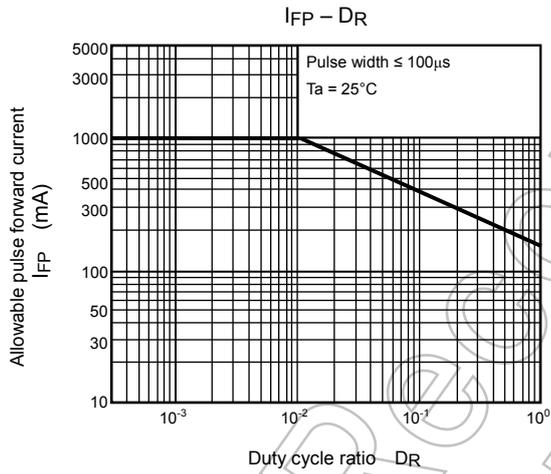
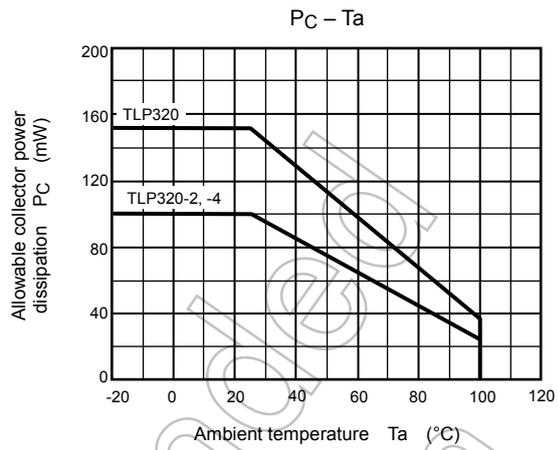
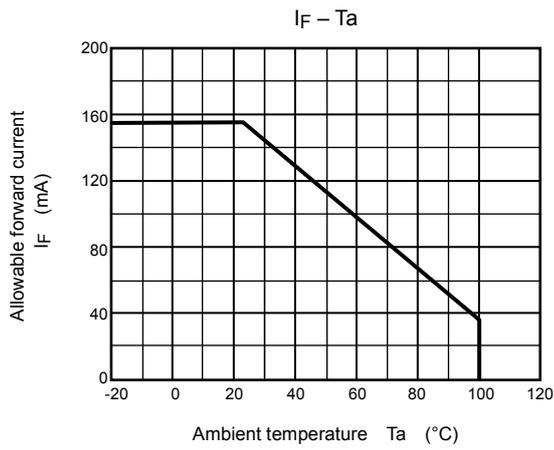
### Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	$t_r$	$V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$ $R_L = 100\ \Omega$	—	2	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{on}$		—	3	—	
Turn-off time	$t_{off}$		—	3	—	
Turn-on time	$t_{ON}$	$R_L = 1.9\text{ k}\Omega$ (Fig.1) $V_{CC} = 5\text{ V}, I_F = \pm 16\text{ mA}$	—	2	—	$\mu\text{s}$
Storage time	$t_s$		—	15	—	
Turn-off time	$t_{OFF}$		—	25	—	

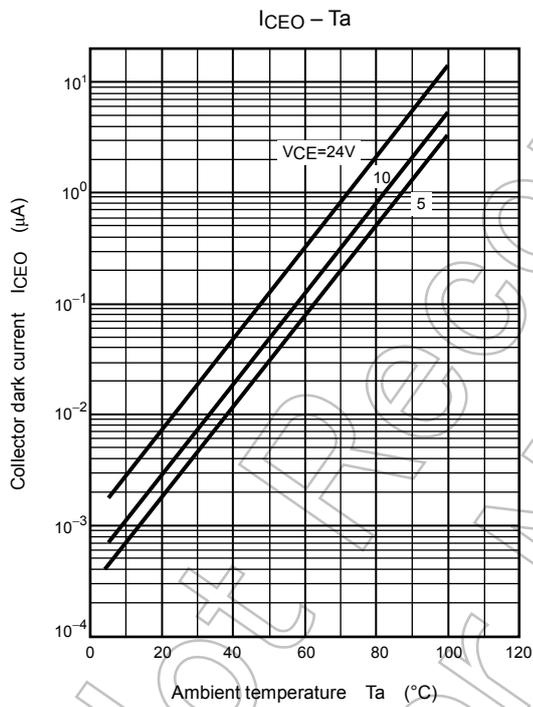
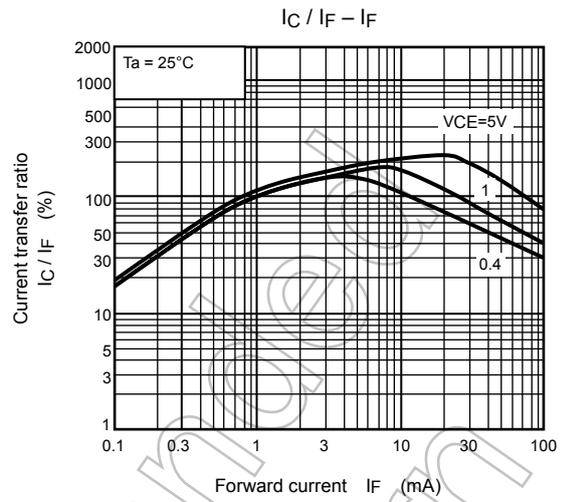
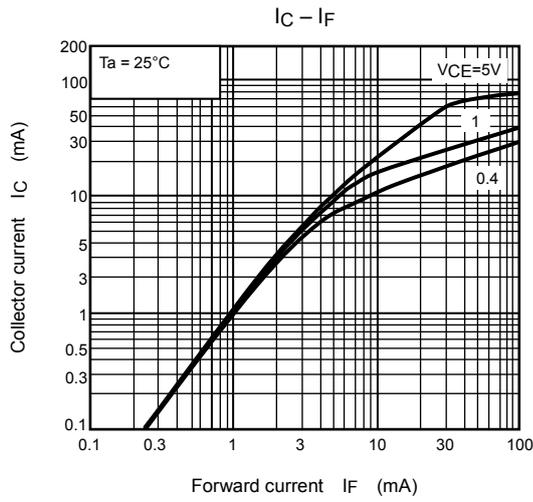
Fig. 1 Switching time test circuit



Not Recommended for New Design



NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



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