

**TENTATIVE** TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

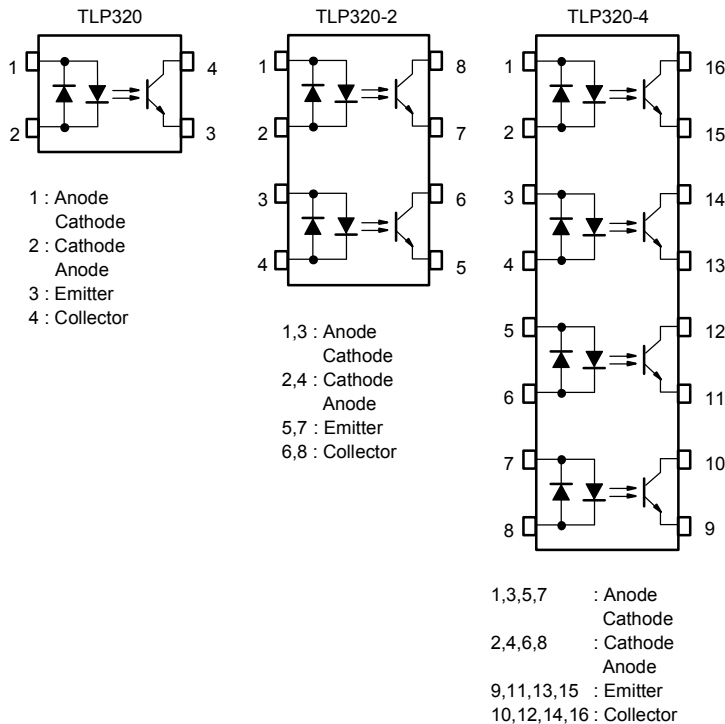
# TLP320, TLP320-2, TLP320-4

Telecommunication  
Office Machine  
Telephone Use Equipment

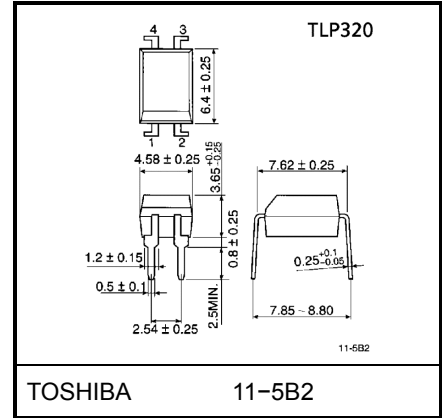
The TOSHIBA TLP320, -2 and -4 consists of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode. The TLP320-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP320-4 provides four isolated channels in a sixteen plastic DIP package. This is suitable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

- I<sub>F</sub> maximum rating: ±150mA
- Collector-emitter voltage: 55V (min.)
- Current transfer ratio: 25% (min.) (I<sub>F</sub> = 20mA)
- Isolation voltage: 5000V<sub>rms</sub> (min.)
- UL recognized: file No. E67349

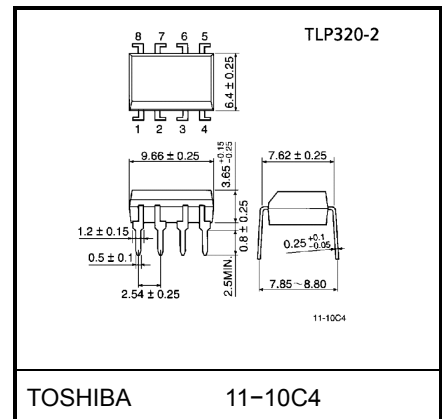
## Pin Configurations (top view)



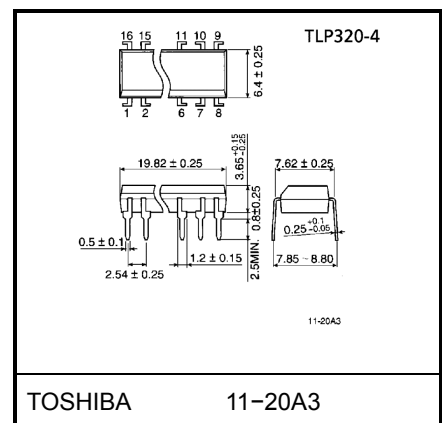
Unit in mm



Weight: 0.26g



Weight: 0.54g



Weight: 1.1g

## Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating		Unit
		TLP320	TLP320-2 TLP320-4	
LED	Forward current	±150		mA
	Forward current derating	-1.5 (Ta ≥ 25°C)		mA / °C
	Pulse forward current	±1 (100µs pulse, 100pps)		A
	Junction temperature	125		°C
Detector	Collector-emitter voltage	55		V
	Emitter-collector voltage	7		V
	Collector current	80		mA
	Collector power dissipation (1 circuit)	150	100	mW
	Collector power dissipation derating (1 circuit, Ta ≥ 25°C)	-1.5	-1.0	mW / °C
	Junction temperature	125		°C
Storage temperature range	T <sub>stg</sub>	-55~125		°C
Operating temperature range	T <sub>opr</sub>	-55~100		°C
Lead soldering temperature	T <sub>sol</sub>	260 (10s)		°C
Total package power dissipation	P <sub>T</sub>	250	200	mW
Total package power dissipation derating (Ta ≥ 25°C)	ΔP <sub>T</sub> / °C	-2.5	2.0	mW / °C
Isolation voltage (Note 1)	BV <sub>S</sub>	5000 (AC, 1min., R.H. ≤ 60%)		V <sub>rms</sub>

(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 <sub>CC</sub>	—	5	24	V
Forward current	I <sub>F</sub>	—	20	120	mA
Collector current	I <sub>C</sub>	—	1	10	mA
Operating temperature	T <sub>opr</sub>	-25	—	85	°C

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

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = \pm 100 \text{ mA}$	—	1.4	1.7	V
	Forward current	$I_F$	$V_F = \pm 0.7 \text{ V}$	—	2.5	20	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5 \text{ mA}$	55	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector dark current	$I_{CEO}$	$V_{CE} = 24 \text{ V}$	—	10	100	nA
			$V_{CE} = 24 \text{ V}, T_a = 85^\circ\text{C}$	—	2	50	$\mu\text{A}$
Capacitance collector to emitter	$C_{CE}$	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF	

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

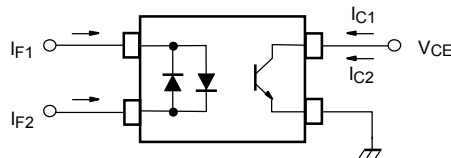
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = \pm 20 \text{ mA}, V_{CE} = 1 \text{ V}$	25	—	—	%
	$I_C / I_F$ (high)	$I_F = \pm 100 \text{ mA}, V_{CE} = 1 \text{ V}$	20	—	80	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 2.4 \text{ mA}, I_F = \pm 20 \text{ mA}$	—	—	0.4	V
		$I_C = 2.4 \text{ mA}, I_F = \pm 100 \text{ mA}$	—	—	0.4	
Off-state collector current	$I_{C(off)}$	$V_F = \pm 0.7 \text{ V}, V_{CE} = 24 \text{ V}$	—	1	10	$\mu\text{A}$
CTR symmetry (Note)	$I_C$ (ratio)	$I_C (I_F = -20\text{mA}) / I_C (I_F = +20\text{mA})$ (Note)	0.5	1	2	—

## Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	$C_S$	$V_S = 0, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	5000	—	—	$V_{rms}$
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	$V_{dc}$

(Note)

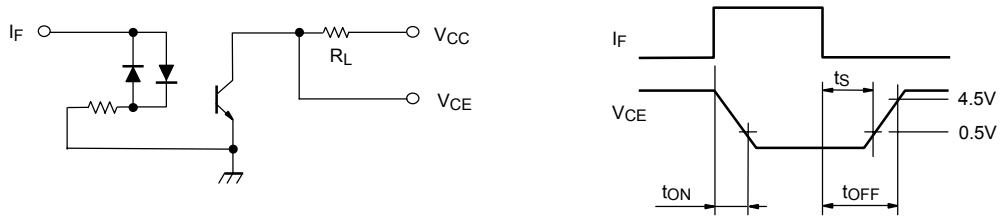
$$I_C(\text{ratio}) = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 1\text{V})}{I_{C1}(I_F = I_{F1}, V_{CE} = 1\text{V})}$$

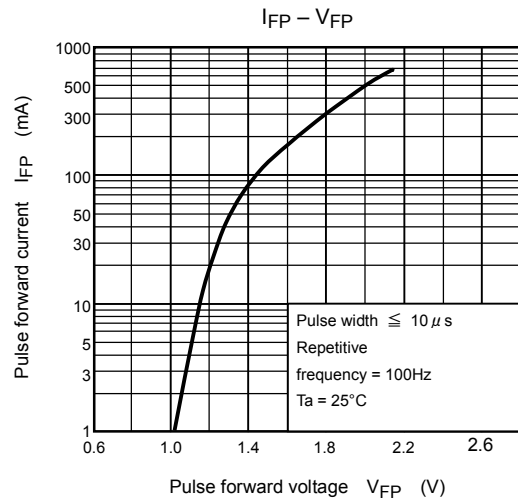
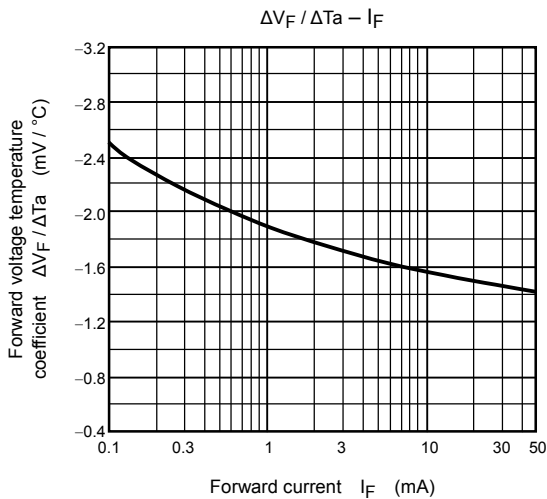
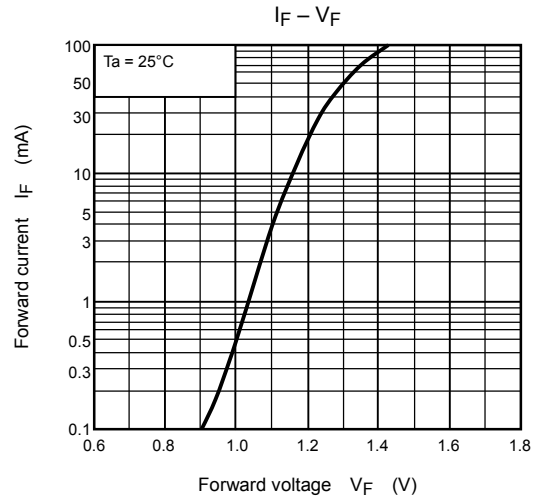
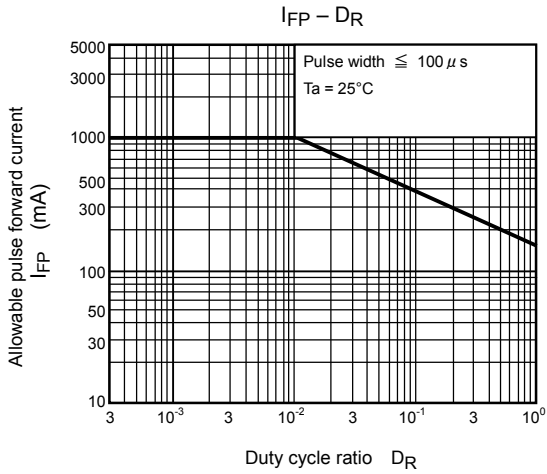
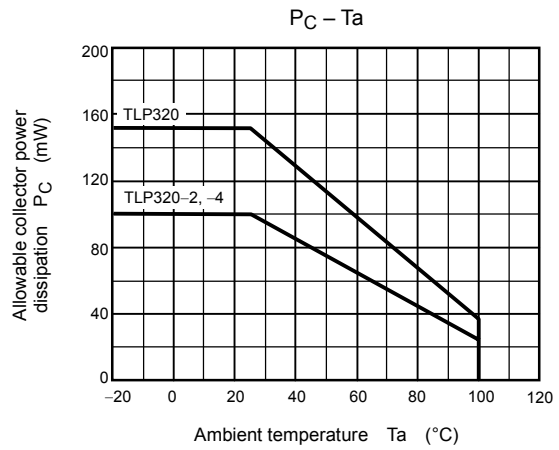
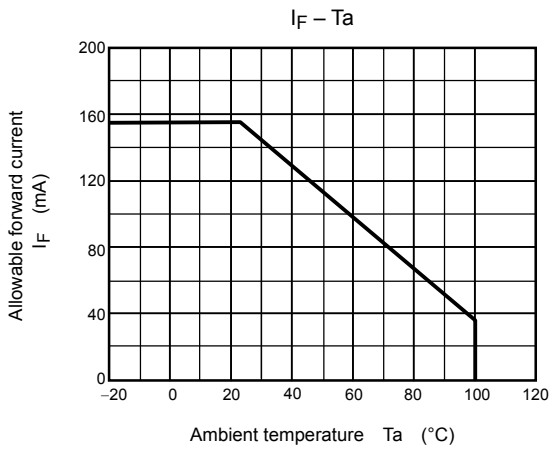


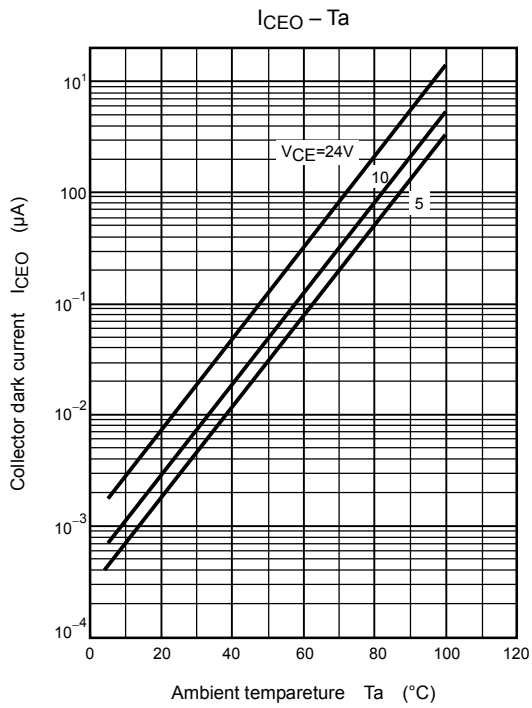
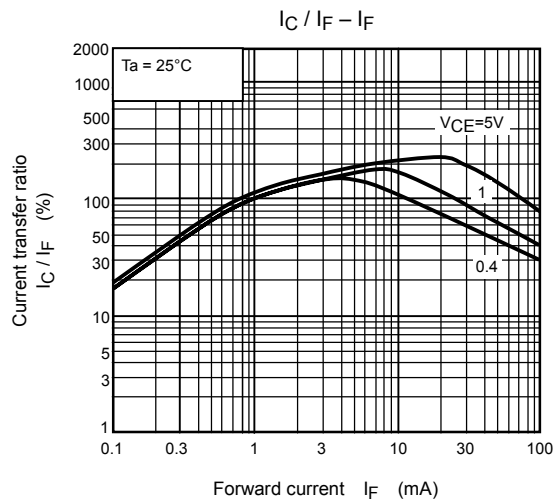
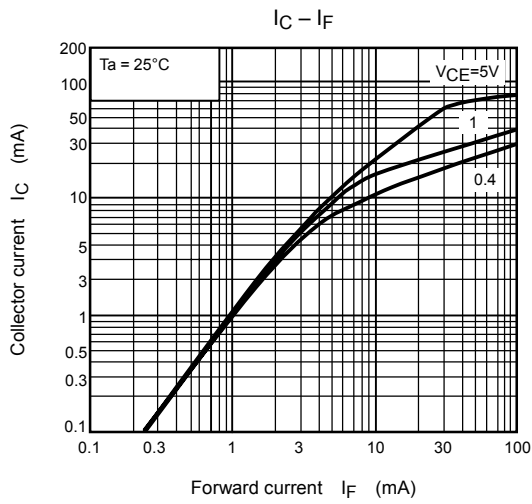
**Switching Characteristics (Ta = 25°C)**

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







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