TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

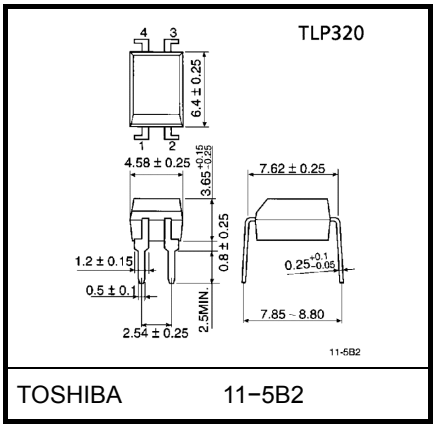
TLP320, TLP320-2, TLP320-4

Telecommunication

Office Machine

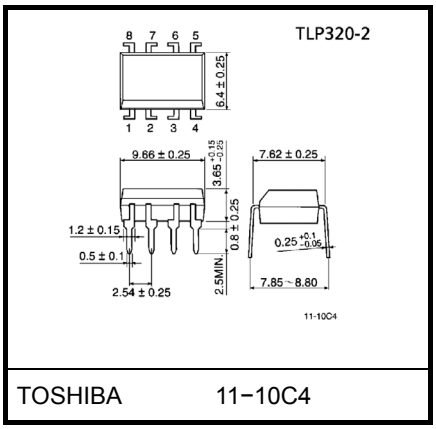
Telephone Use Equipment

Unit in mm



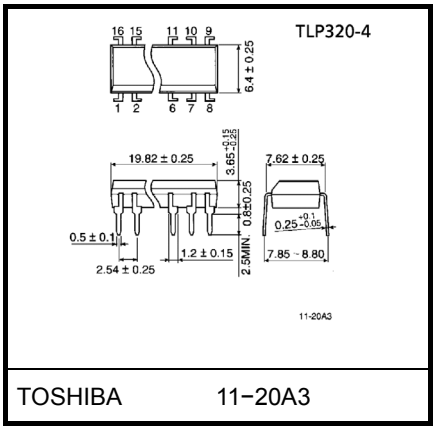
TOSHIBA 11−5B2

Weight: 0.26g



TOSHIBA 11−10C4

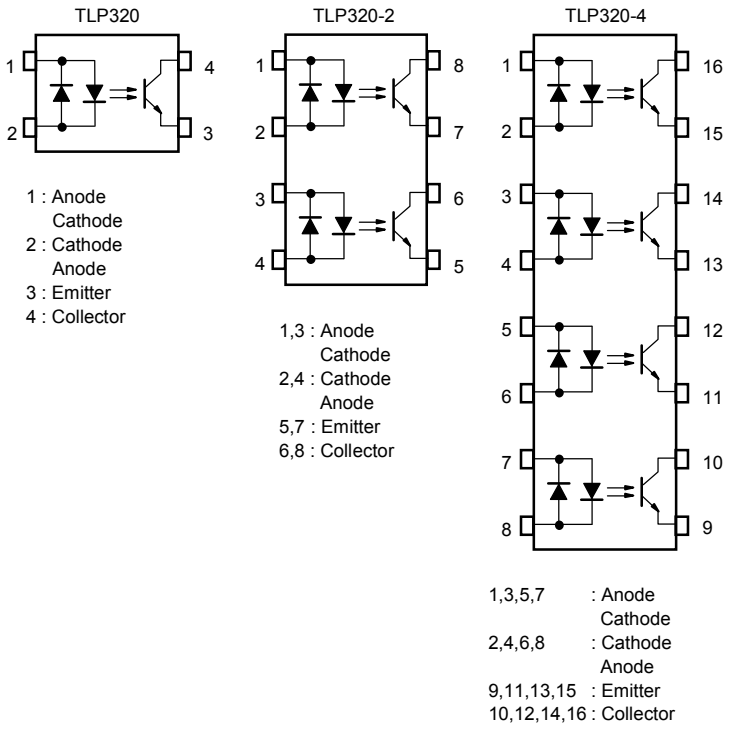
Weight: 0.54g



TOSHIBA 11−20A3

Weight: 1.1g

Pin Configurations (top view)



- I_F maximum rating: ±150mA
- Collector−emitter voltage: 55V (min.)
- Current transfer ratio: 25% (min.) (I_F = 20mA)
- Isolation voltage: 5000V_{rms} (min.)
- UL recognized: file No. E67349
- BSI approved: BS EN60065:2002, certificate no.7426
  BS EN60950-1:2002, certificate no.7427

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.

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP320	TLP320−2 TLP320−4	
LED	Forward current	I_F	±150		mA
	Forward current derating	ΔI_F /°C	−1.5 (Ta ≥ 25°C)		mA / °C
	Pulse forward current	I_{FP}	±1 (100μs pulse, 100pps)		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, Ta ≥ 25°C)	ΔP_C / °C	−1.5	−1.0	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	250	200	mW
Total package power dissipation derating (Ta≥25°C)		ΔP_T / °C	−2.5	2.0	mW / °C
Isolation voltage	(Note 1)	BV_S	5000 (AC, 1min., R.H. ≤ 60%)		V_{rms}

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) 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

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.

Individual Electrical Characteristics (Ta = 25°C)

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

Coupled Electrical Characteristics (Ta = 25°C)

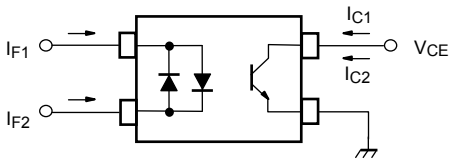
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	I_C / I_F	I_F = ±20 mA, V_{CE} = 1 V	25	—	—	%
	I_C / I_F (high)	I_F = ±100 mA, V_{CE} = 1 V	20	—	80	
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 2.4 mA, I_F = ±20 mA	—	—	0.4	V
		I_C = 2.4 mA, I_F = ±100 mA	—	—	0.4	
Off−state collector current	$I_{C(off)}$	V_F = ± 0.7V, V_{CE} = 24 V	—	1	10	μA
CTR symmetry (Note)	$I_{C\ (ratio)}$	I_C (I_F = −20mA) / I_C (I_F = +20mA) (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 MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500 V, R.H. ≤ 60%	5×10^{10}	10^{14}	—	Ω
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)

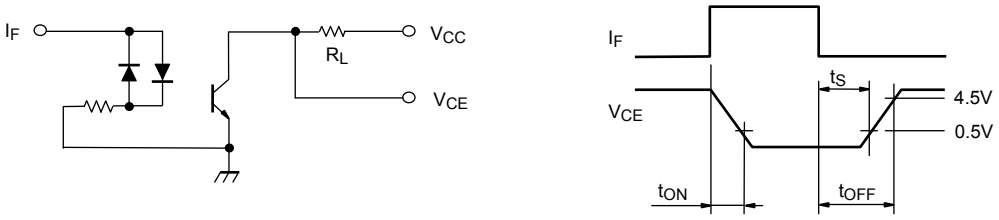
$$I_{C(ratio)} = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 1V)}{I_{C1}(I_F = I_{F1}, V_{CE} = 1V)}$$



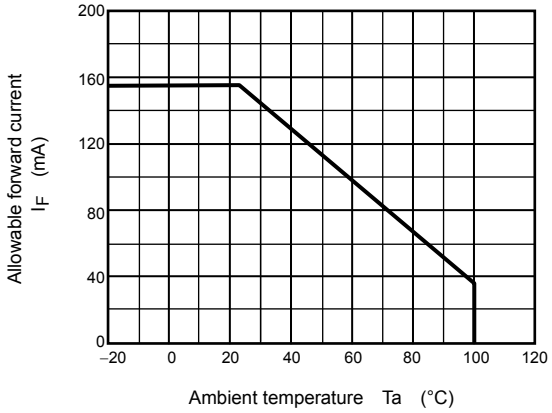
Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t_r	V_{CC} = 10 V, I_C = 2 mA R_L = 100Ω	—	2	—	μs
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 kΩ (Fig.1) V_{CC} = 5 V, I_F = ±16 mA	—	2	—	μs
Storage time	t_s		—	15	—	
Turn−off time	t_{OFF}		—	25	—	

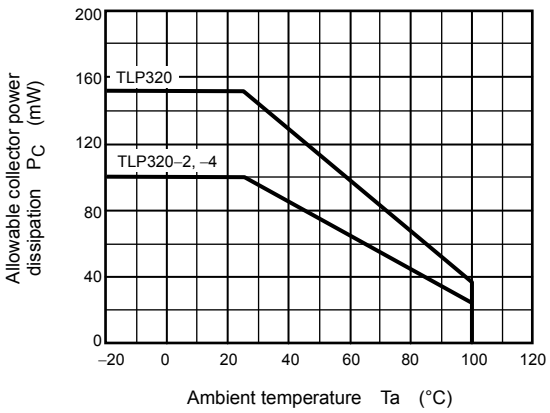
Fig. 1 Switching time test circuit



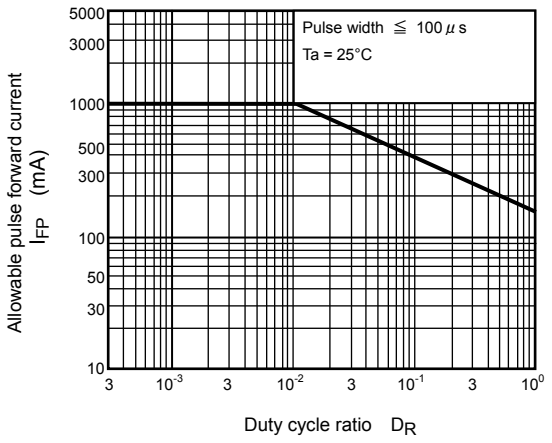
I_F – Ta



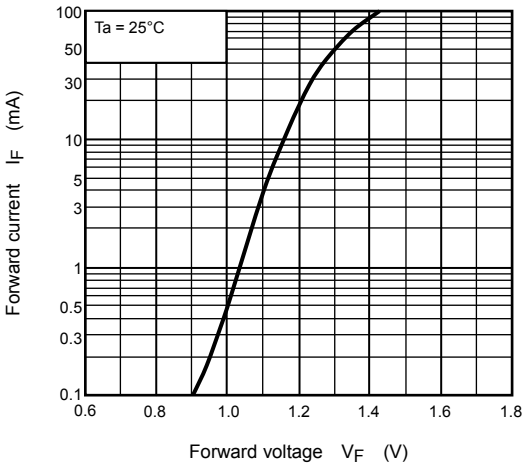
P_C – Ta



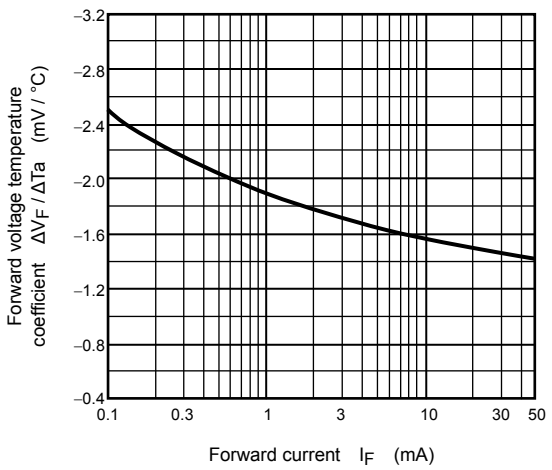
I_{FP} – D_R



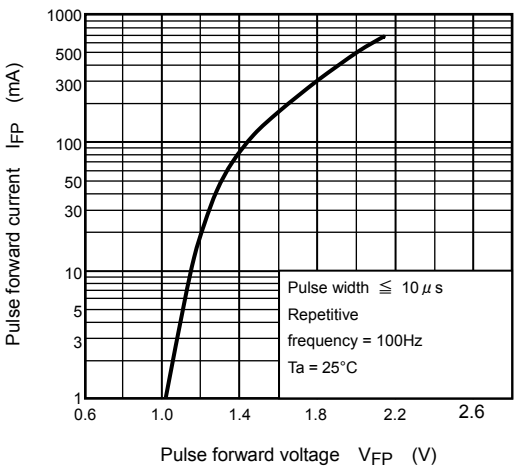
I_F – V_F



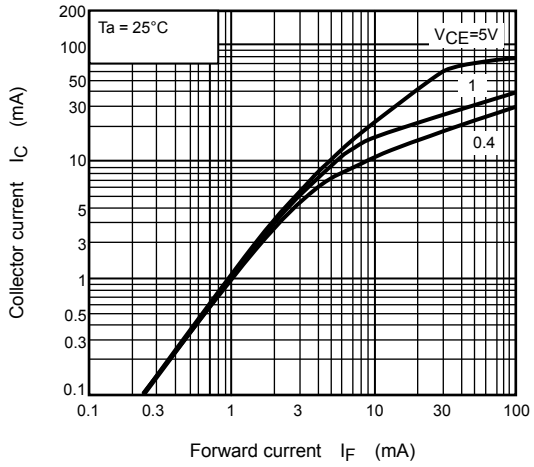
$\Delta V_F / \Delta Ta$ – I_F



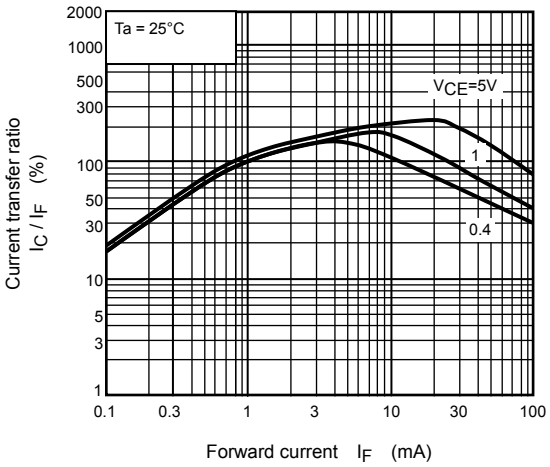
I_{FP} – V_{FP}



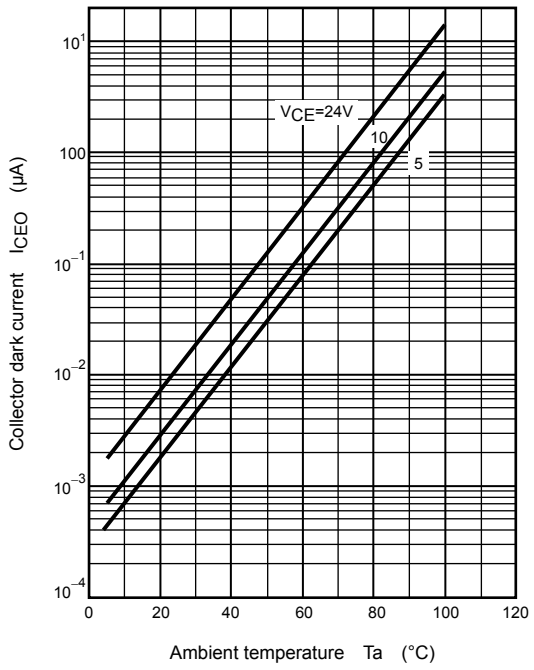
$I_C - I_F$



$I_C / I_F - I_F$



$I_{CEO} - Ta$



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20070701-EN

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