TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

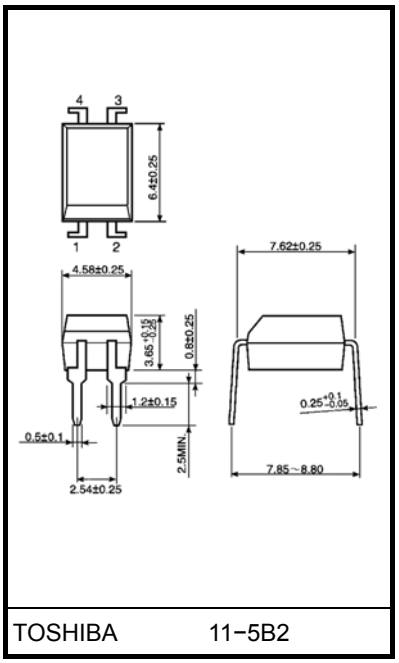
TLP421

Office Equipment
Household Appliances
Solid State Relays
Switching Power Supplies
Various Controllers
Signal Transmission Between Different Voltage Circuits

The TOSHIBA TLP421 consists of a silicone photo−transistor optically coupled to a gallium arsenide infrared emitting diode in a four lead plastic DIP (DIP4) with having high isolation voltage (AC: 5kV$_{RMS}$ (min)).

- Collector-emitter voltage: 80V (min.)
- Current transfer ratio: 50% (min.)
  Rank GB: 100% (min.)
- Isolation voltage: 5000V$_{rms}$ (min.)
- UL recognized: UL1577
- BSI approved: BS EN60065: 2002
  Approved no.8411
  BS EN60950-1: 2002
  Approved no.8412
- SEMKO approved: EN60065, EN60950, EN60335
  Approved no.9910249/01

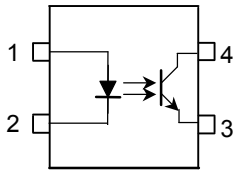
Unit in mm



TOSHIBA 11−5B2

Weight: 0.26 g (typ.)

Pin Configurations (top view)



1 : Anode
2 : Cathode
3 : Emitter
4 : Collector

- Option(D4)type
  TÜV approved: DIN EN 60747-5-2
  Approved no. R9950202
  Maximum operating insulation voltage: 890V_{PK}
  Maximum permissible overvoltage: 8000V_{PK}

  (Note): When a EN 60747-5-2 approved type is needed, please designate the "Option(D4)"

  Making the VDE application: DIN EN 60747-5-2
- Construction mechanical rating

	7.62mm Pitch Typical Type	10.16mm Pitch TLPxxxF Type
Creepage distance	7.0mm(min)	8.0mm(min)
Clearance	7.0mm(min)	8.0mm(min)
Insulation thickness	0.4mm(min)	0.4mm(min)

Current Transfer Ratio

Type	Classification (*1)	Current Transfer Ratio (%) (I_C / I_F) I_F = 5mA, V_{CE} = 5V, Ta = 25°C		Marking Of Classification
		Min	Max	
TLP421	(None)	50	600	Blank, Y, Y+, G, G+, B, B+, GB
	Rank Y	50	150	Y, Y+
	Rank GR	100	300	G, G+
	Rank BL	200	600	B, B+
	Rank GB	100	600	G, G+, B, B+, GB

(*1): Ex. rank GB: TLP421 (GB)

(Note): Application type name for certification test, please use standard product type name, i. e.
TLP421 (GB): TLP421

Absolute Maximum Ratings (Ta = 25°C)

Characteristic			Symbol	Rating	Unit
LED	Forward current		I_F	60	mA
	Forward current derating(Ta ≥ 39°C)		ΔI_F / °C	−0.7	mA / °C
	Pulse forward current	(Note 2)	I_{FP}	1	A
	Power dissipation		P_D	100	mW
	Power dissipation derating		ΔP_D / °C	−1.0	mW / °C
	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
	Power dissipation(single circuit)		P_C	150	mW
	Power dissipation derating (Ta ≥ 25°C)(single circuit)		ΔP_C / °C	−1.5	mW / °C
	Junction temperature		T_j	125	°C
Operating temperature range			T_{opr}	−55~100	°C
Storage temperature range			T_{stg}	−55~125	°C
Lead soldering temperature (10s)			T_{sol}	260	°C
Total package power dissipation			P_T	250	mW
Total package power dissipation derating (Ta ≥ 25°C)			ΔP_T / °C	−2.5	mW / °C
Isolation voltage		(Note 3)	BV_S	5000	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 2): 100μs pulse, 100Hz frequency

(Note 3): AC, 1 min., R.H.≤ 60%. Apply voltage to LED pin and detector pin together.

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	I_F	—	16	25	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 = 10 mA	1.0	1.2	1.3	V
	Reverse current	I_R	V_R = 5 V	—	—	10	μA
	Capacitance	C_T	V = 0, f = 1 MHz	—	30	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)\ CEO}$	I_C = 0.5 mA	80	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)\ ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current	$I_D(I_{CEO})$	V_{CE} = 24 V (ambient light below 1000 ℓx)	—	0.01 (0.1)	0.1 (10)	μA
			V_{CE} = 24 V (ambient light Ta = 85°C below 1000 ℓx)	—	0.6 (1)	50 (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 = 5 mA, V_{CE} = 5 V	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	I_C / $I_{F\ (sat)}$	IF = 1 mA, V_{CE} = 0.4 V	—	60	—	%
		Rank GB	30	—	—	
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 2.4 mA, I_F = 8 mA	—	—	0.4	V
		I_C = 0.2 mA, I_F = 1 mA	—	0.2	—	
		Rank GB	—	—	0.4	

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	1×10^{12}	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	—	Vdc

Switching Characteristics (Ta = 25°C)

Characteristics	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		—	25	—	
Turn−off time	t_{OFF}		—	50	—	

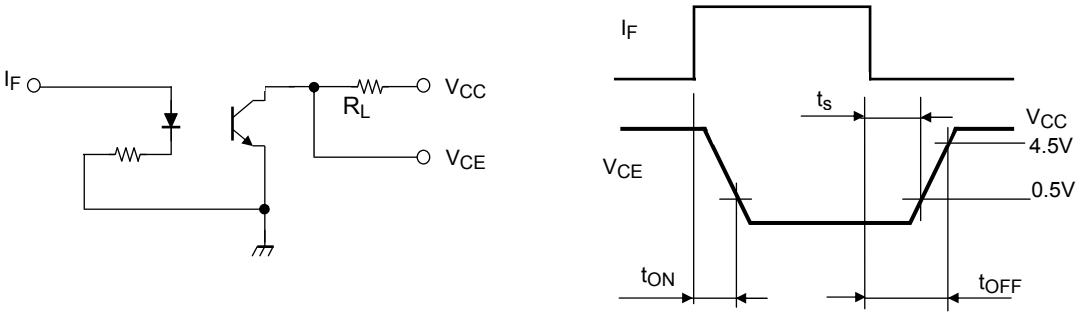
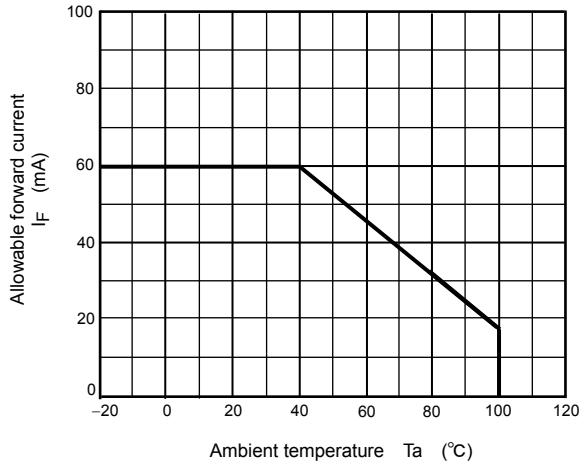
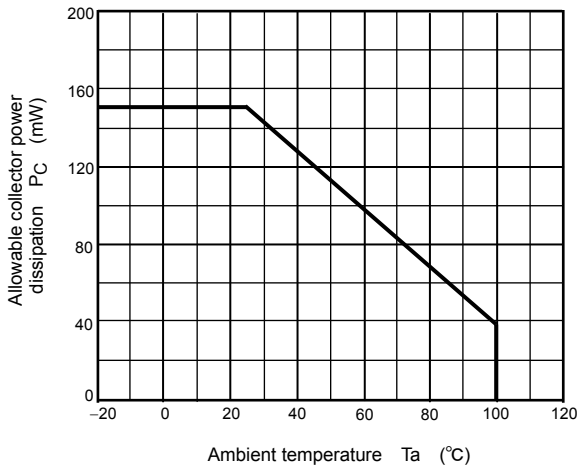


Fig.1 Switching time test circuit

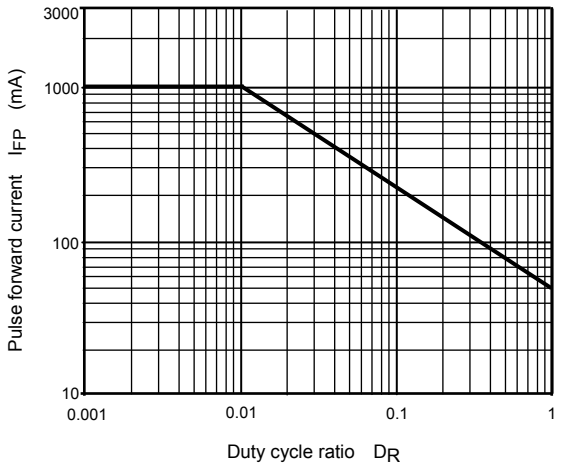
I_F – Ta



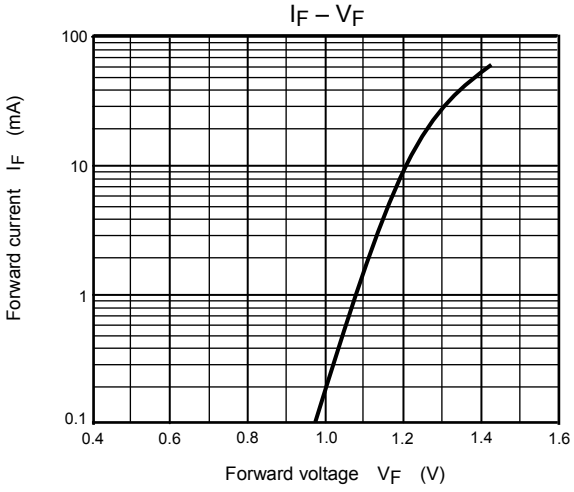
P_C – Ta



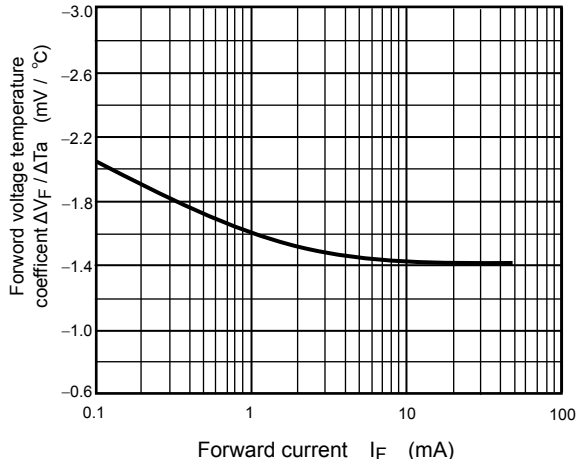
I_{FP} – D_R



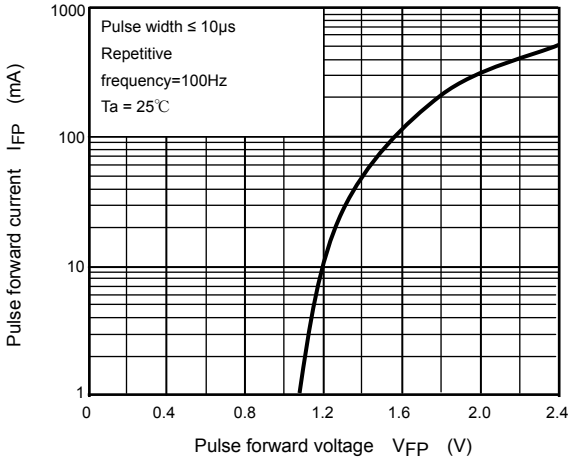
I_F – V_F



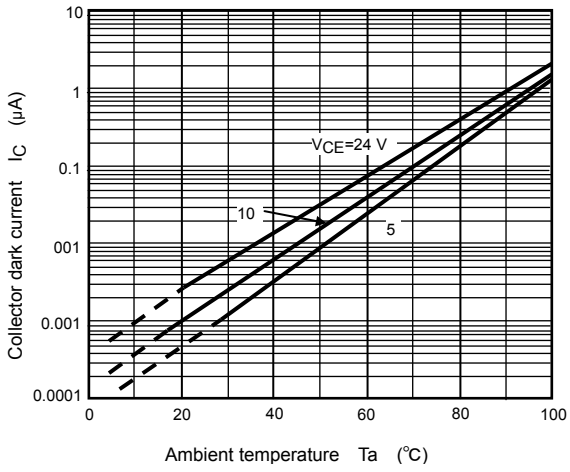
$\Delta V_F / \Delta Ta$ – I_F



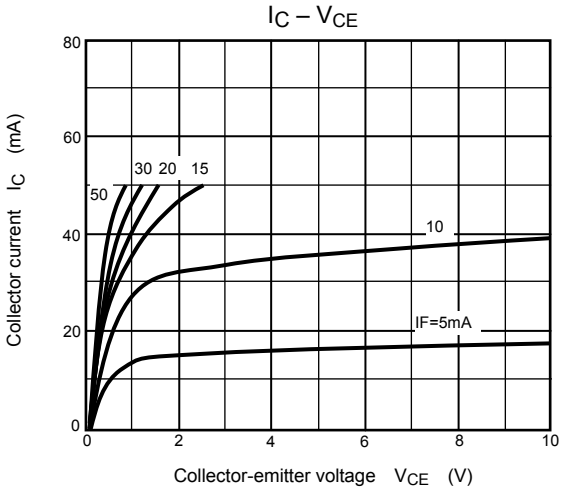
I_{FP} – V_{FP}



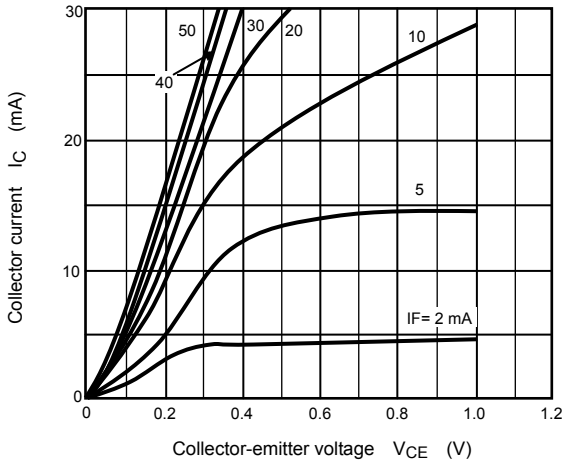
I_D – Ta



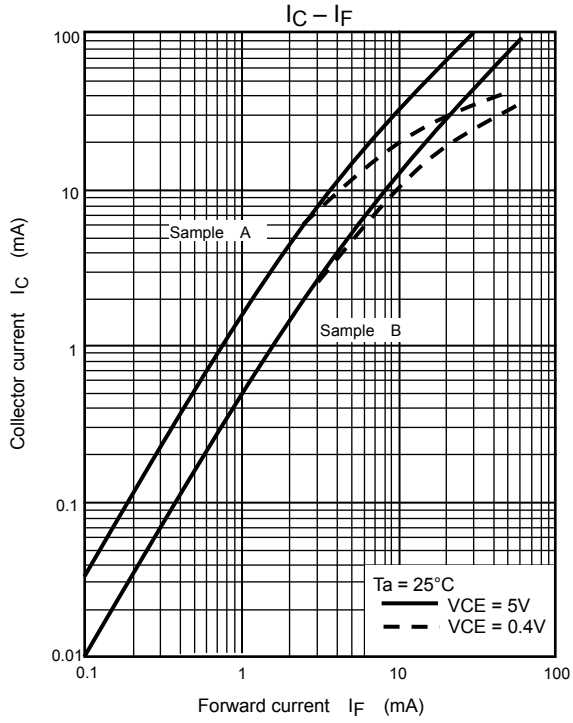
I_C – V_{CE}



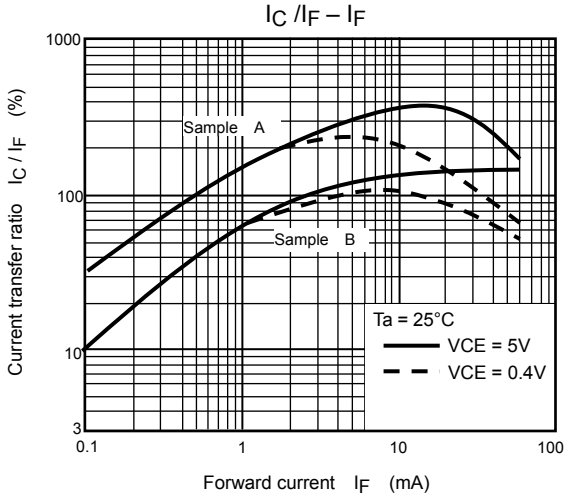
I_C – V_{CE}



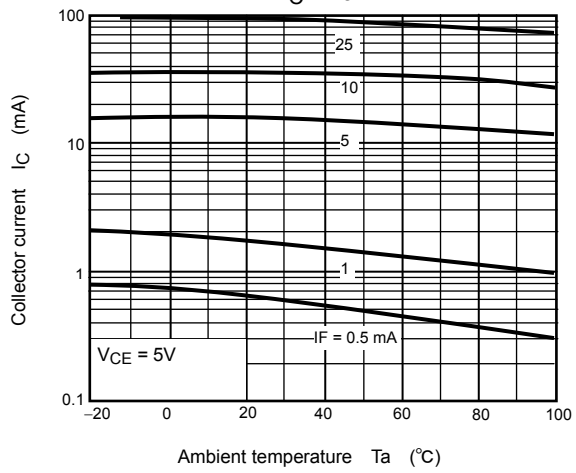
I_C – I_F



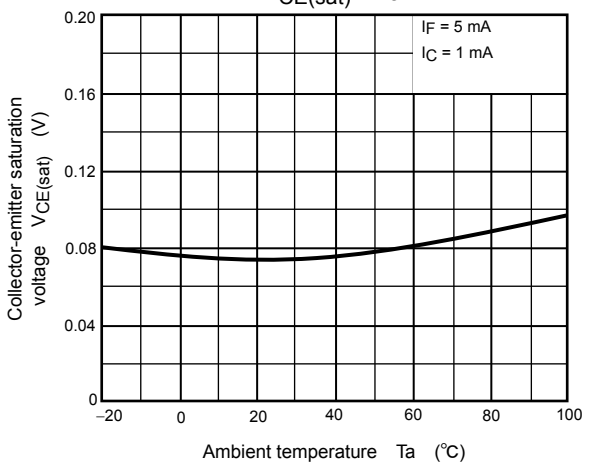
I_C /I_F – I_F



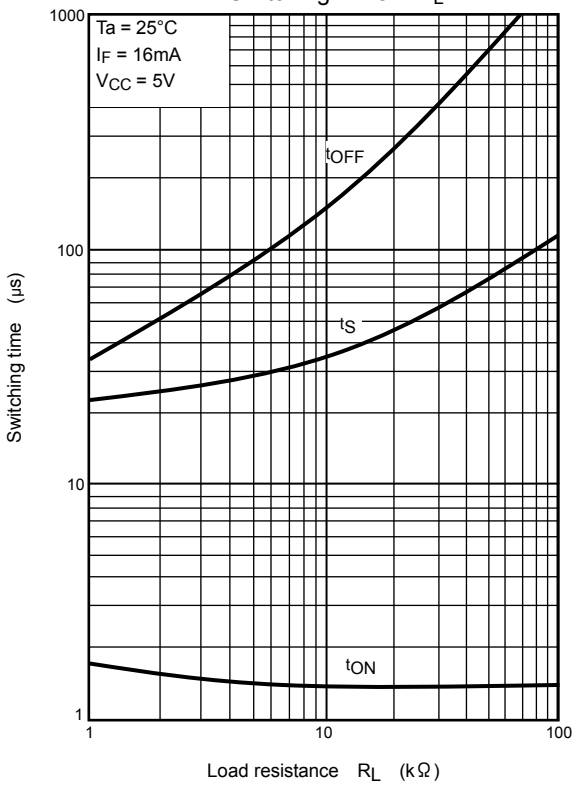
I_C – Ta



$V_{CE(sat)}$ – Ta



Switching Time – R_L



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