TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

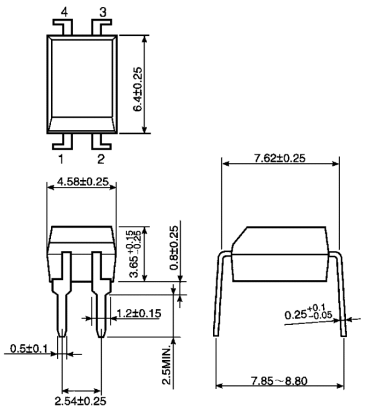
TLP421

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: 1994
  Approved no.8411
  BS EN60950: 1992
  Approved no.8412
- SEMKO approved: EN60065, EN60950, EN60335
  Approved no.9910249/01

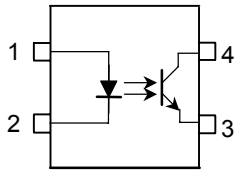
Unit in mm



TOSHIBA	11−5B2

Weight: 0.26 g

Pin Configurations (top view)



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

- Option(D4)type
  TÜV approved: DIN VDE0884
  Approved no.R9950202
  Maximum operating insulation voltage: 890V_{PK}
  Maximu permissible overvoltage: 8000V_{PK}

  (Note): When a VDE0884 approved type is needed, please designate the "Option(D4)"

  Making the VDE applocation: DIN VDE0884
- Construction mechanical rating

	7.62mm Pich Typical Type	10.16mm Pich 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	Classi−fication (*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

Maximum Ratings (Ta = 25°C)

Characteristic			Stmbol	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 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

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	—	

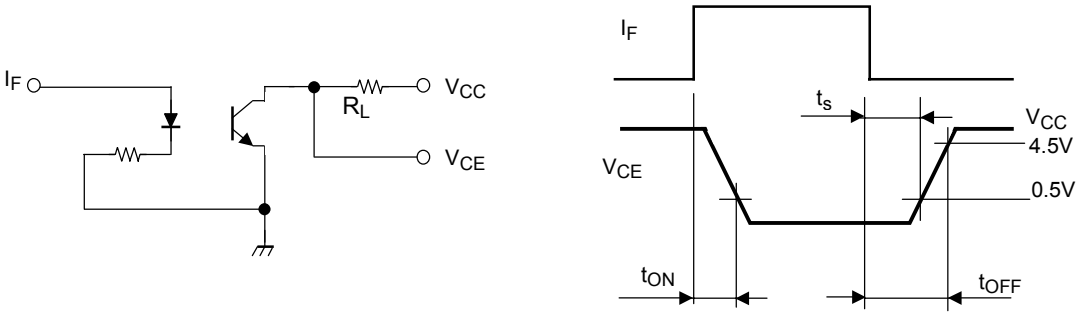
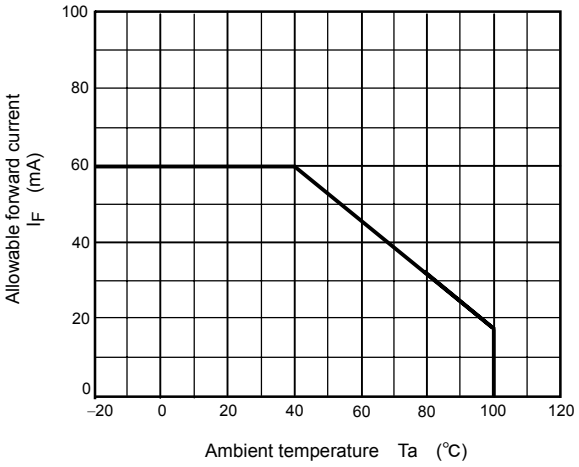
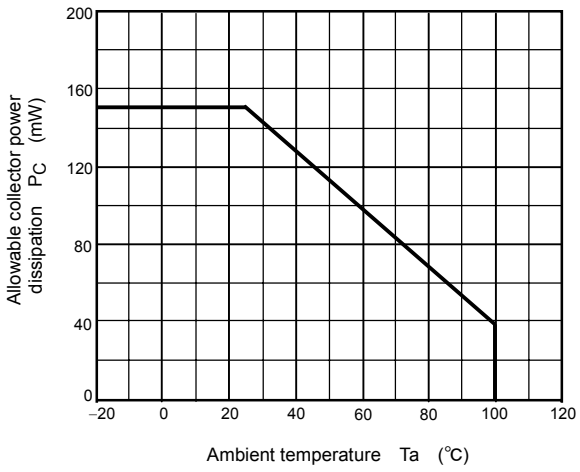


Fig.1 Switching time test circuit

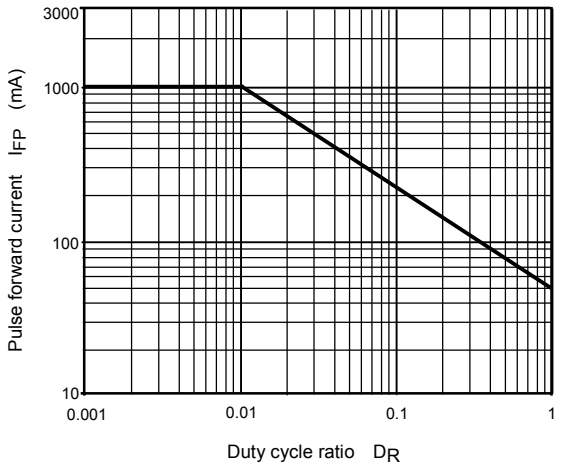
I_F – Ta



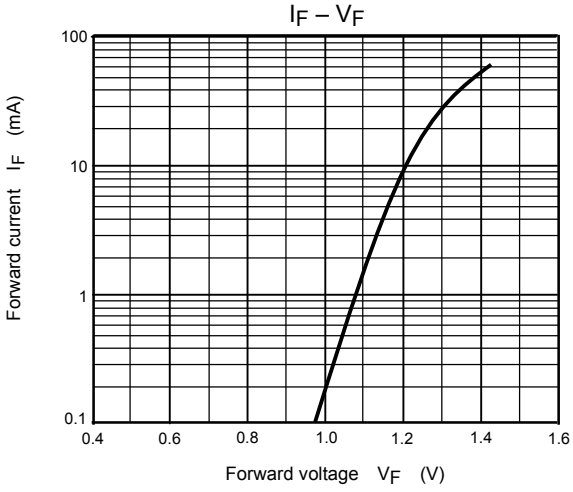
P_C – Ta



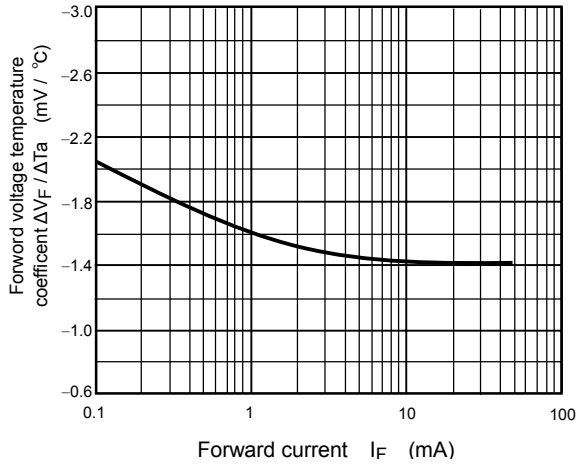
I_{FP} – D_R



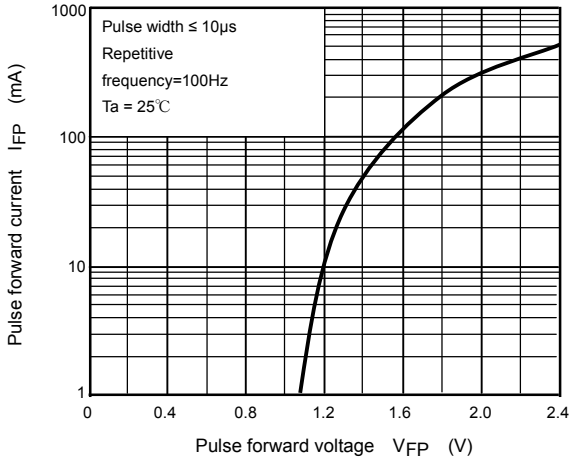
I_F – V_F



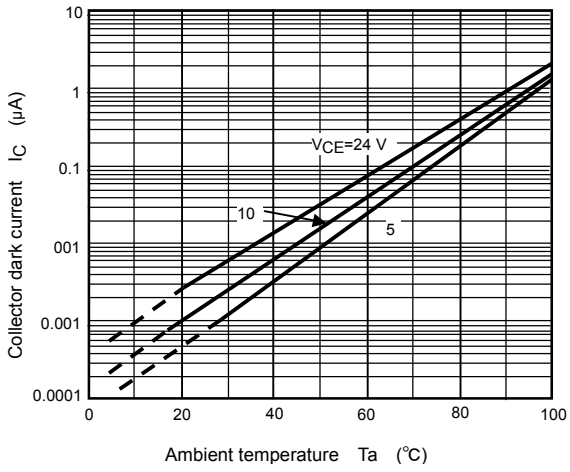
$\Delta V_F / \Delta Ta$ – I_F



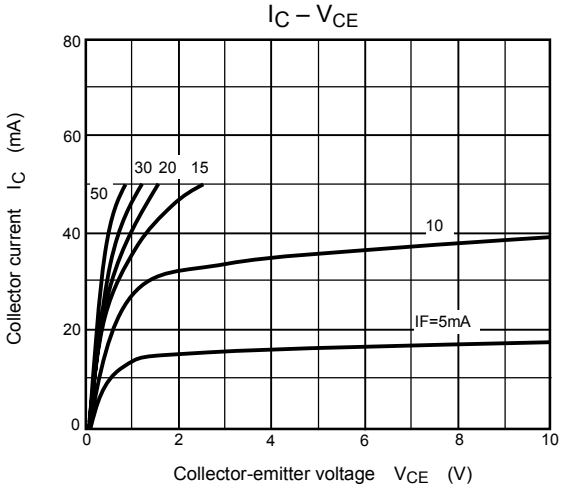
I_{FP} – V_{FP}



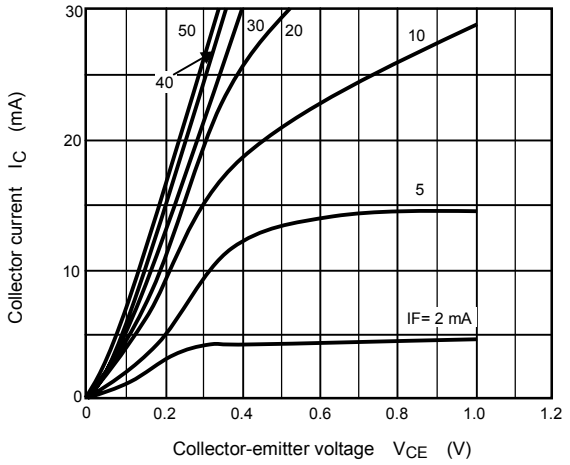
I_D – Ta



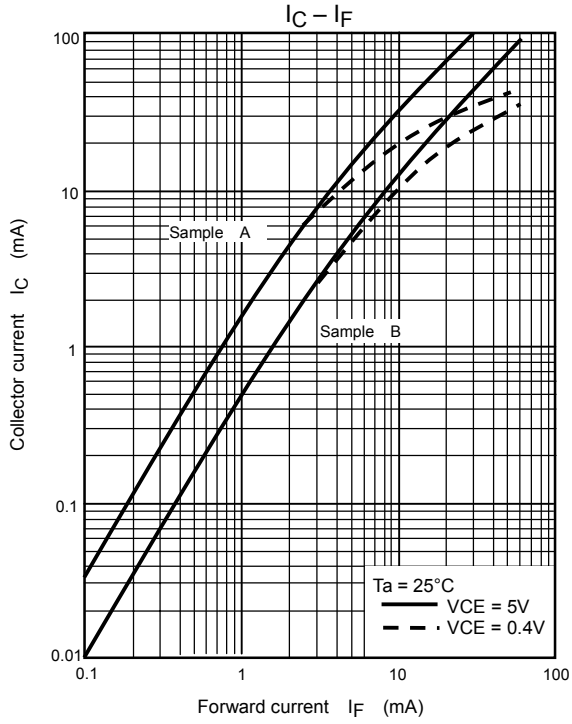
I_C – V_{CE}



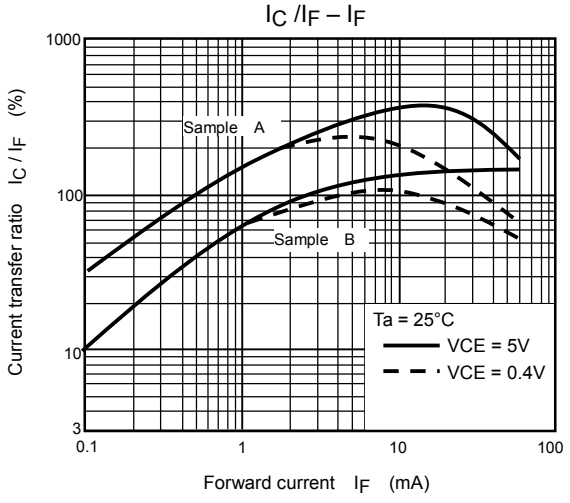
I_C – V_{CE}



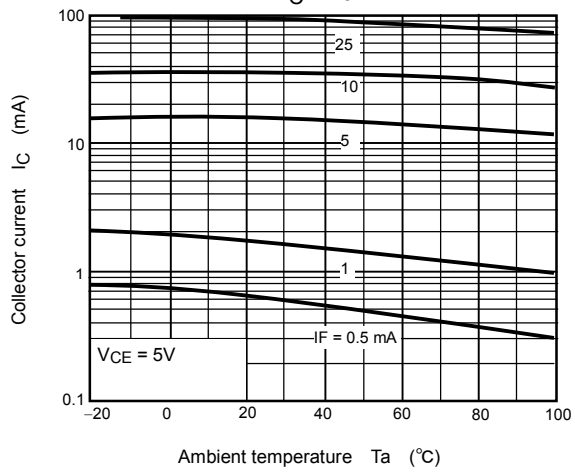
I_C – I_F



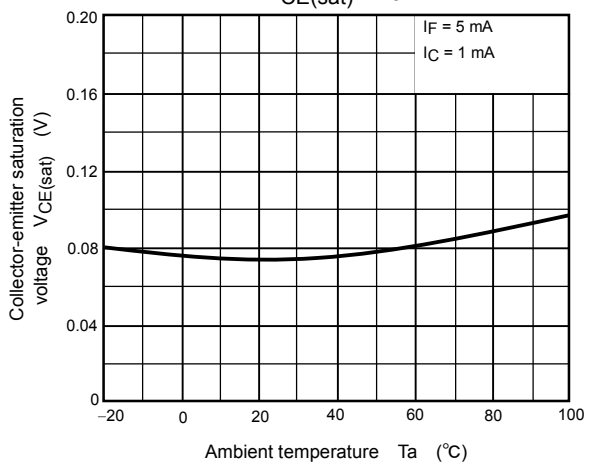
I_C /I_F – I_F



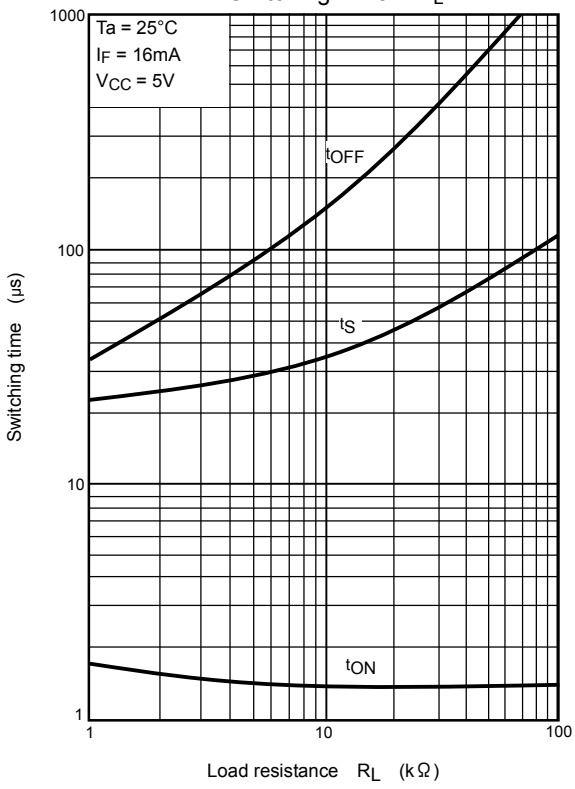
I_C – Ta



$V_{CE(sat)}$ – Ta



Switching Time – R_L



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