TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

TLP504A,TLP504A−2

Programmable Controllers

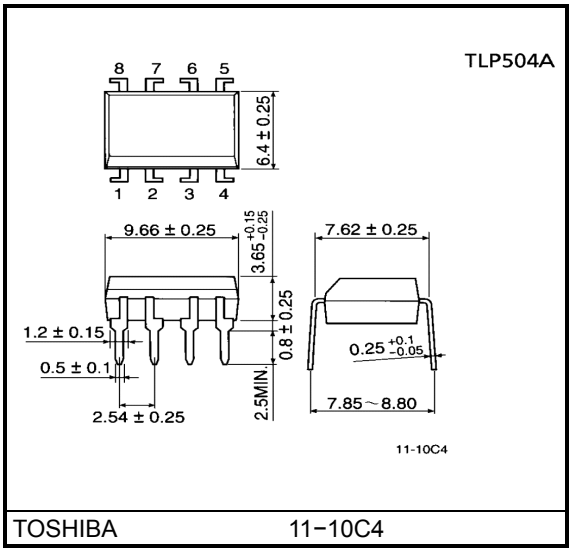
AC / DC−Input Module

Solid State Relay

The TOSHIBA TLP504A and TLP504A−2 consists of a photo−transistor optically coupled to a gallium arsenide infrared emitting diode.
The TLP504A offers two isolated channels in a eight lead plastic DIP package, while the TLP504A−2 provides four isolated channels in a sixteen plastic DIP package.

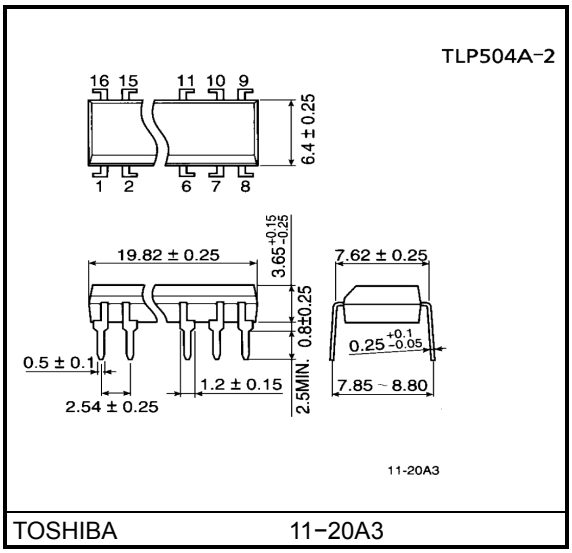
- Collector−emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)
  Rank GB: 100% (min.)
- Isolation voltage: 2500 Vrms (min.)
- UL recognized: UL1577,
  File no. E67349

Unit in mm



TOSHIBA	11−10C4

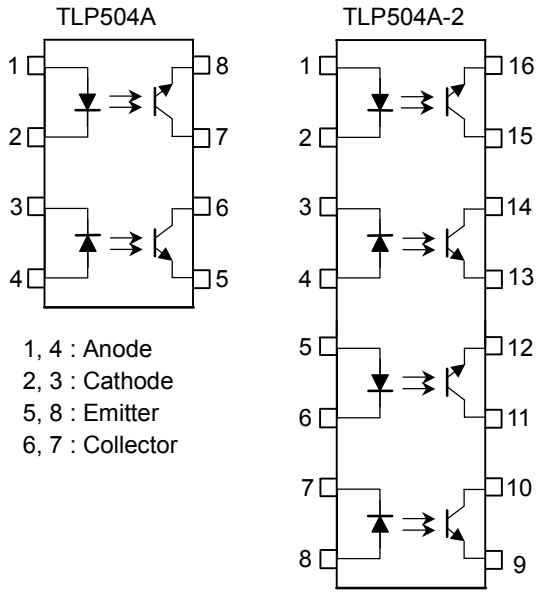
Weight: 0.54 g



TOSHIBA	11−20A3

Weight: 1.1 g

Pin Configurations (top view)



1, 4 : Anode
2, 3 : Cathode
5, 8 : Emitter
6, 7 : Collector

1, 4, 5, 8 : Anode
2, 3, 6, 7 : Cathode
9, 12, 13, 16 : Emitter
10, 11, 14, 15 : Collector

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP504A	TLP504A−2	
LED	Forward current	I_F	60	50	mA
	Forward current derating	ΔI_F / °C	−0.7 (Ta ≥ 39°C)	−0.5 (Ta ≥ 25°C)	mA /°C
	Pulse forward current	I_{FP}	1 (100μs pulse, 100pps)		A
	Reverse voltage	V_R	5		V
	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	50		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}	−55~150		°C
Operating temperature range		T_{opr}	−55~100		°C
Lead soldering temperature		T_{sol}	260 (10 s)		°C
Total package power dissipation		R_T	250	150	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP_T / °C	−2.5	−1.5	mW / °C
Isolation voltage		BV_S	2500 (AC, 1min., R.H.≤ 60%) (Note 1)		Vrms

(Note 1) Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

Recommended Operating Conditions

Characteristics	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	I_F	—	16	20	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	1.15	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	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 = 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	

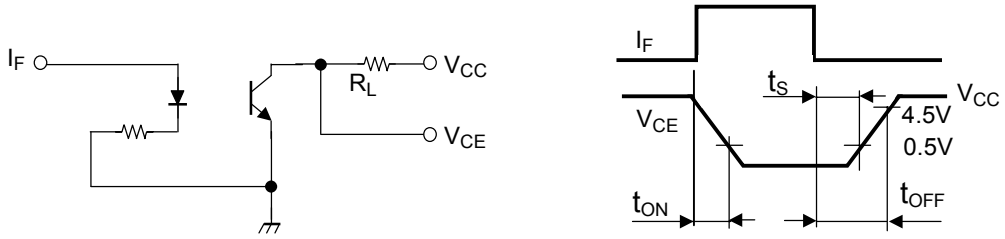
Isolation Characteristics (Ta = 25°C)

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	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	2500	—	—	Vrms
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	Vdc

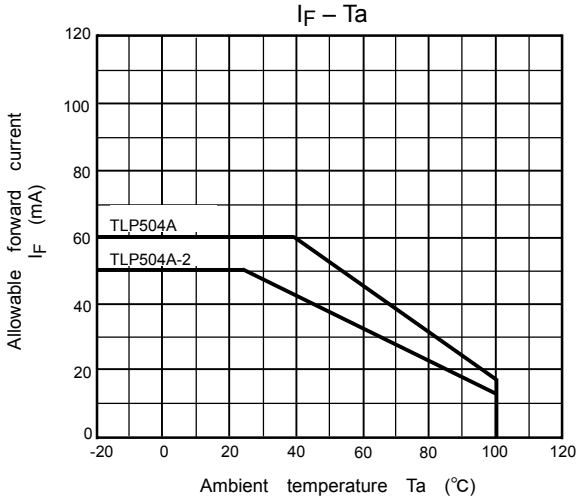
Switching Characteristics (Ta = 25°C)

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	—	

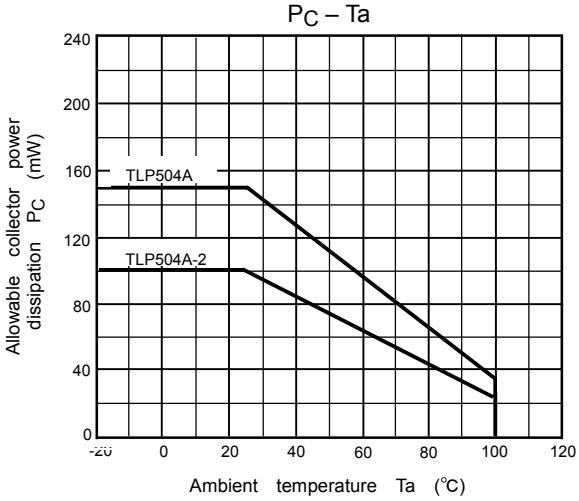
Fig. 1 Switching time test circuit



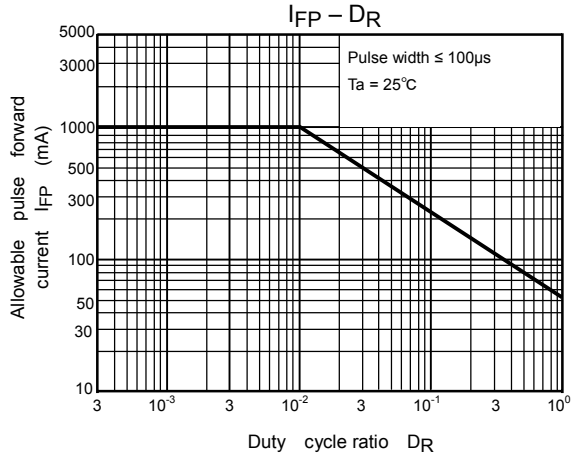
I_F – Ta



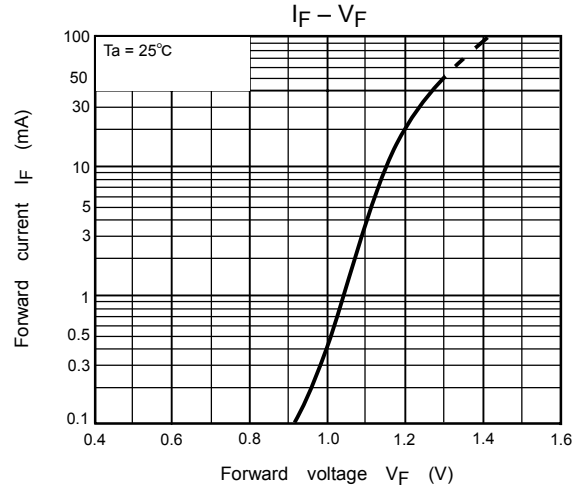
P_C – Ta



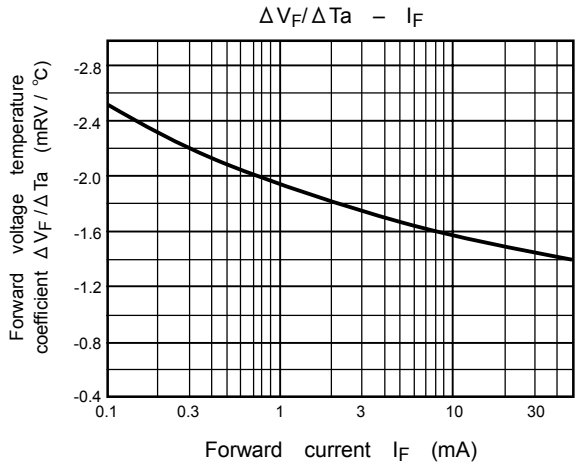
I_{FP} – D_R



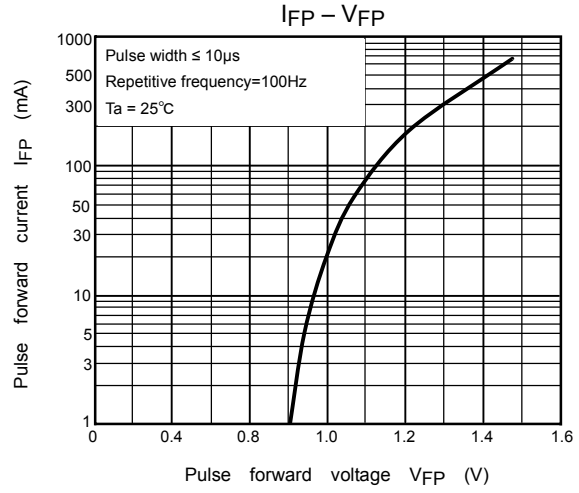
I_F – V_F



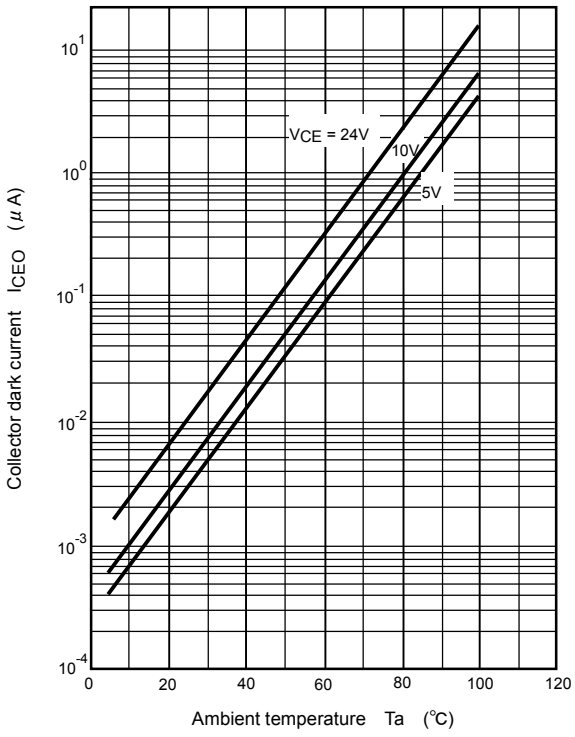
$\Delta V_F / \Delta Ta$ – I_F



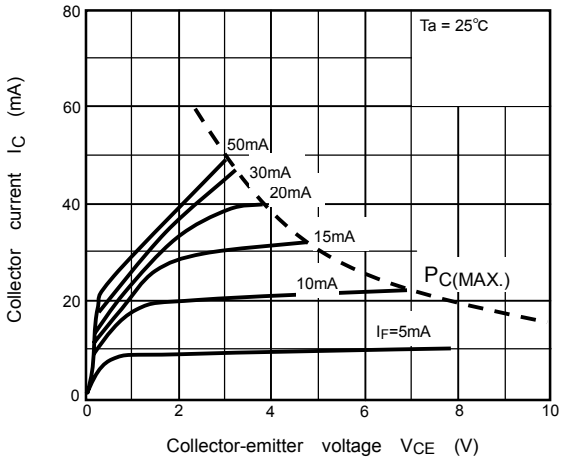
I_{FP} – V_{FP}



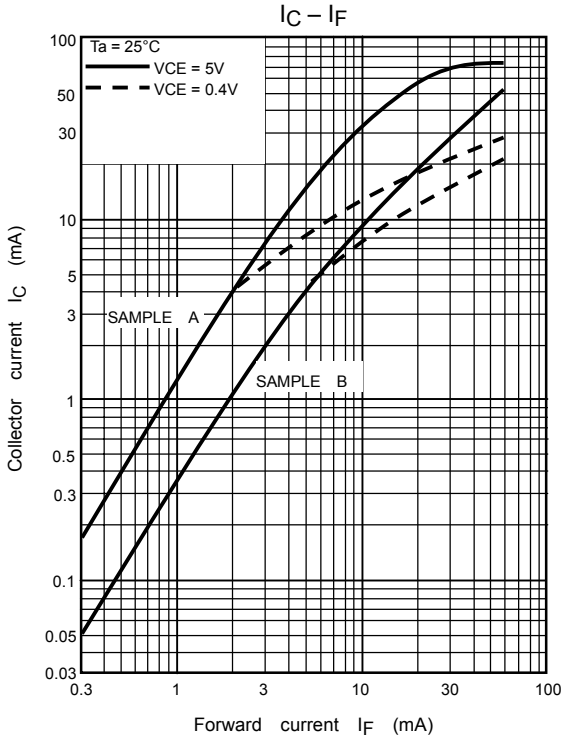
I_{CEO} – Ta



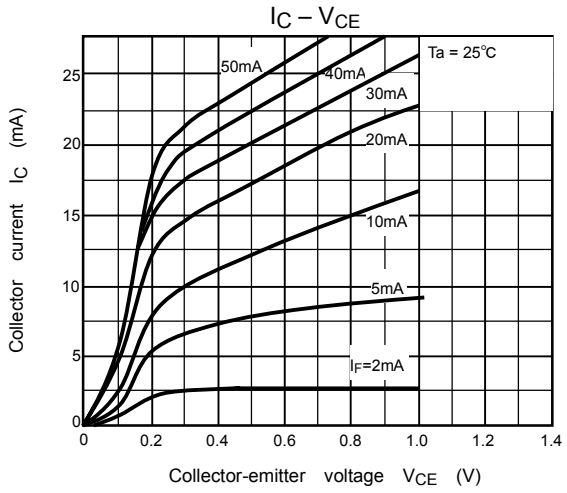
I_C – V_{CE}



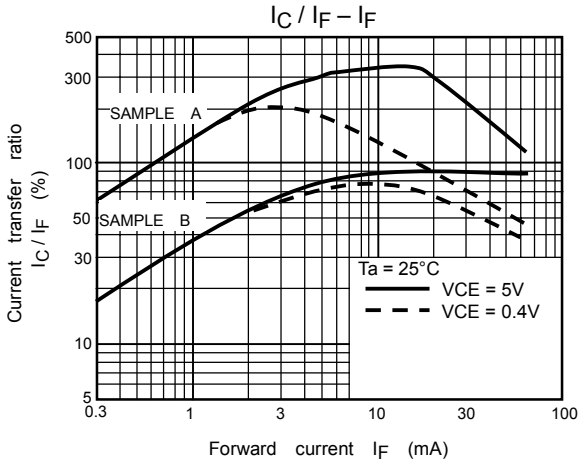
I_C – I_F



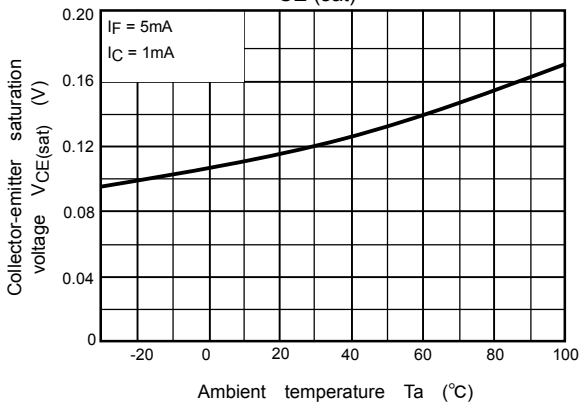
I_C – V_{CE}



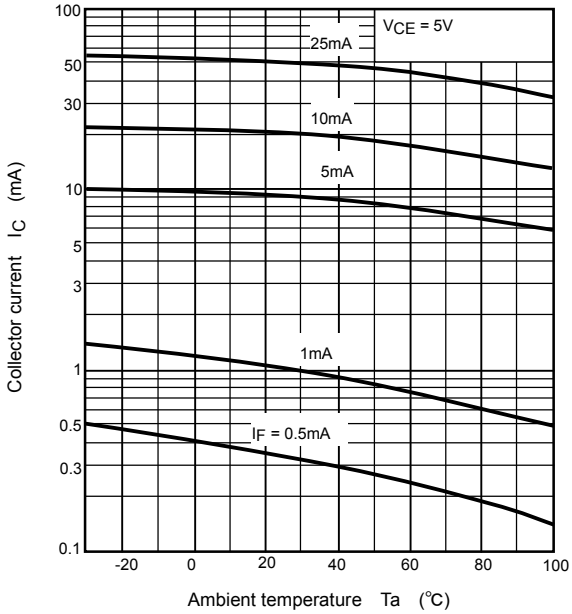
I_C / I_F – I_F



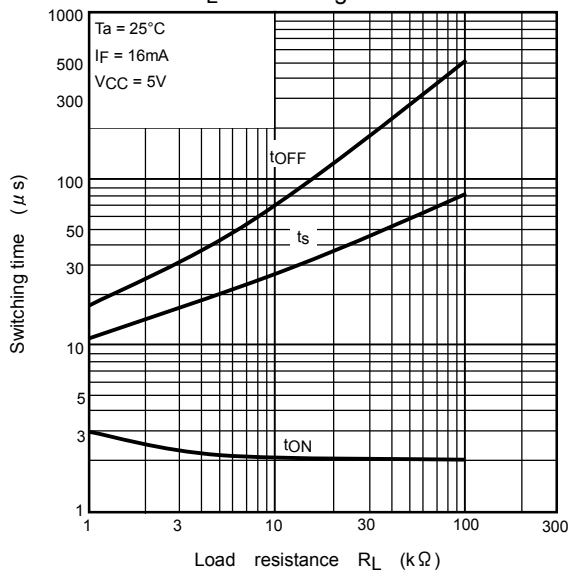
$V_{CE\ (sat)}$ – Ta



I_C – Ta



R_L – Switching Time



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