

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP504A, TLP504A-2

Programmable Controllers

AC / DC—Input Module

Solid State Relay

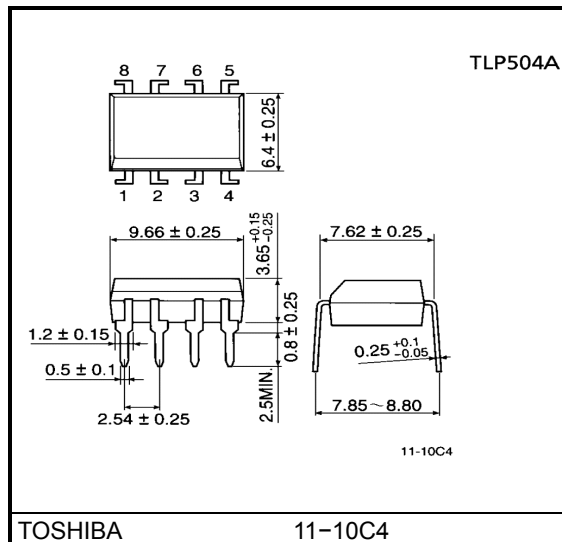
The TOSHIBA TLP504A and TLP504A-2 consists of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode.

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,

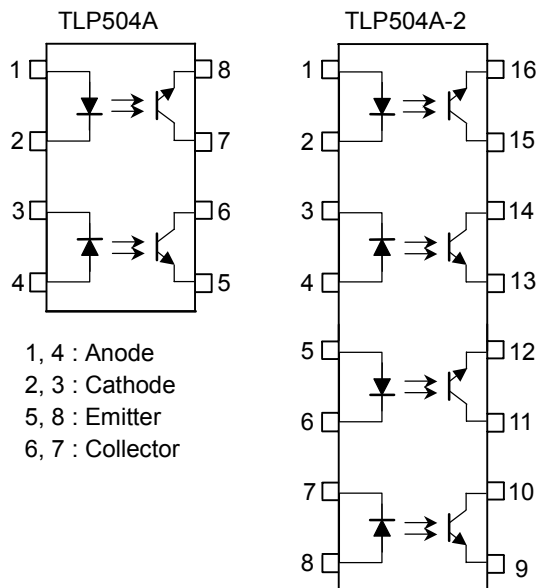
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Unit in mm

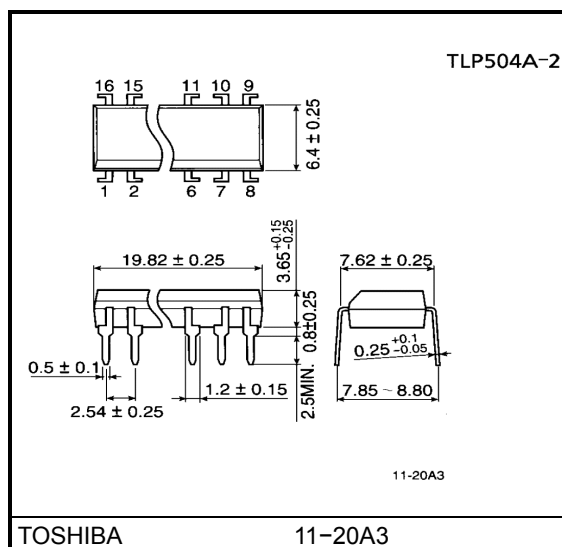


Weight: 0.54 g

Pin Configurations (top view)



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



Weight: 1.1 g

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP504A	TLP504A-2	
LED	Forward current	I_F	60	50	mA
	Forward current derating	$\Delta I_F / ^\circ\text{C}$	-0.7 (Ta $\geq 39^\circ\text{C}$)	-0.5 (Ta $\geq 25^\circ\text{C}$)	mA / $^\circ\text{C}$
	Pulse forward current	I_{FP}	1 (100 μs pulse, 100pps)		A
	Reverse voltage	V_R	5		V
	Junction temperature	T_j	125		$^\circ\text{C}$
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 $\geq 25^\circ\text{C}$)	$\Delta P_C / ^\circ\text{C}$	-1.5	-1.0	mW / $^\circ\text{C}$
	Junction temperature	T_j	125		$^\circ\text{C}$
Storage temperature range		T_{stg}	-55~150		$^\circ\text{C}$
Operating temperature range		T_{opr}	-55~100		$^\circ\text{C}$
Lead soldering temperature		T_{sol}	260 (10 s)		$^\circ\text{C}$
Total package power dissipation		R_T	250	150	mW
Total package power dissipation derating (Ta $\geq 25^\circ\text{C}$)		$\Delta P_T / ^\circ\text{C}$	-2.5	-1.5	mW / $^\circ\text{C}$
Isolation voltage		BV_S	2500 (AC, 1min., R.H. $\leq 60\%$) (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	$^\circ\text{C}$

Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	V_F	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Reverse current	I_R	$V_R = 5 \text{ V}$	—	—	10	μA
	Capacitance	C_T	$V = 0, f = 1 \text{ MHz}$	—	30	—	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	μA
	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	$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_F (\text{sat})$	$I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$ Rank GB	—	60	—	%
			30	—	—	
Collector-emitter saturation voltage	$V_{CE (\text{sat})}$	$I_C = 2.4 \text{ mA}, I_F = 8 \text{ mA}$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}, I_F = 1 \text{ mA}$ Rank GB	—	0.2	—	
			—	—	0.4	

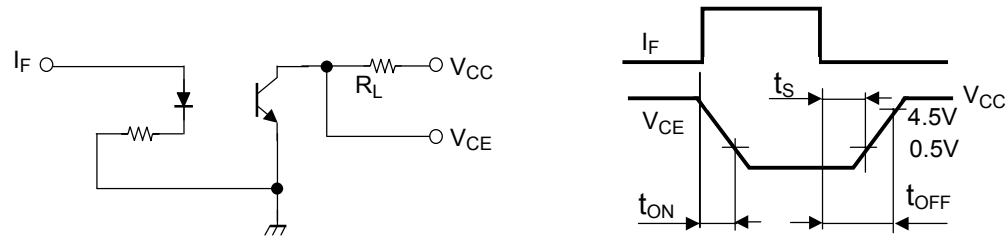
Isolation Characteristics (Ta = 25°C)

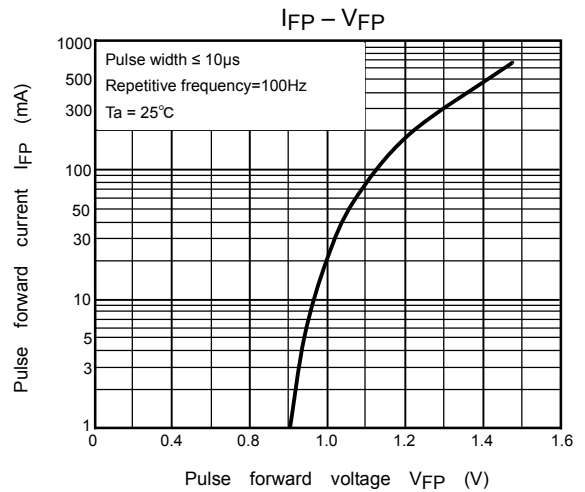
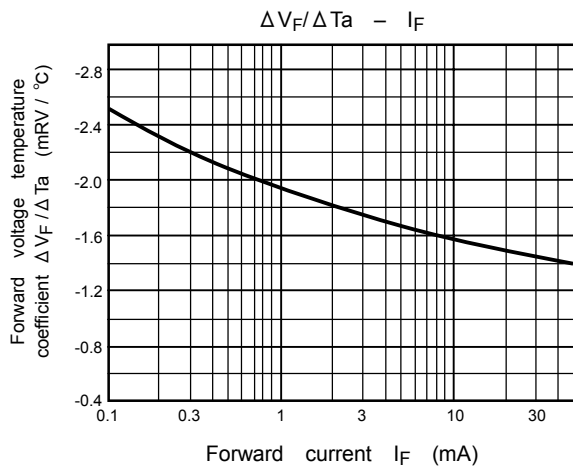
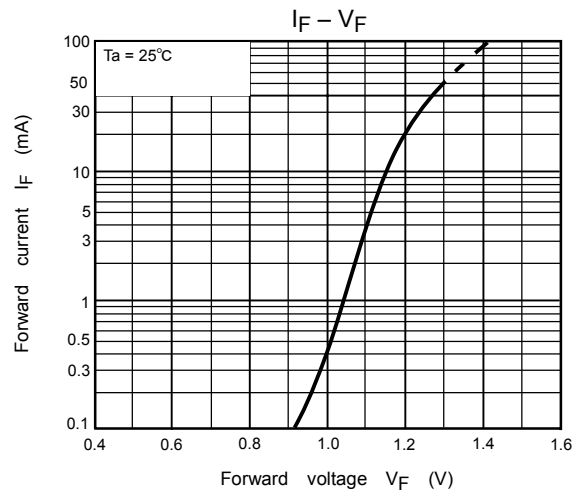
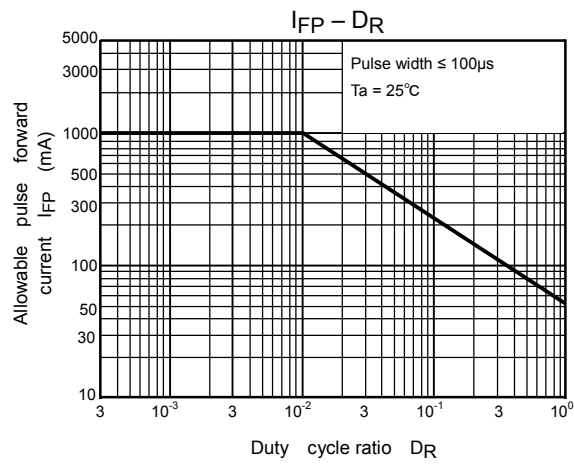
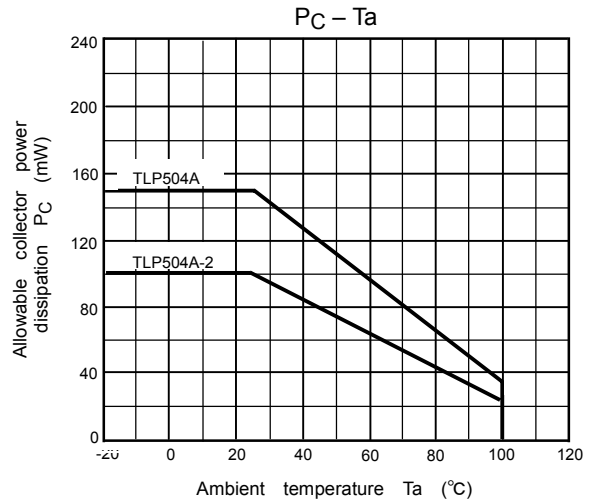
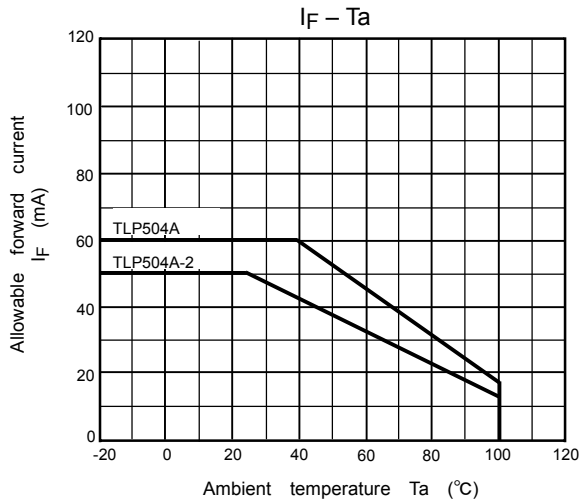
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	C_S	$V_S = 0, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	R_S	$V_S = 500 \text{ V}$	5×10^{10}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	2500	—	—	Vrms
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	Vdc

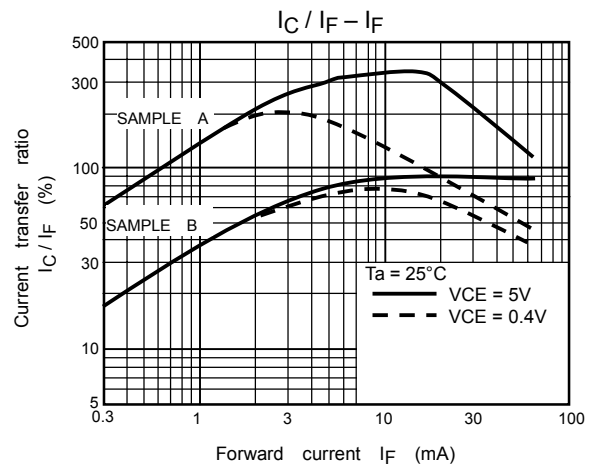
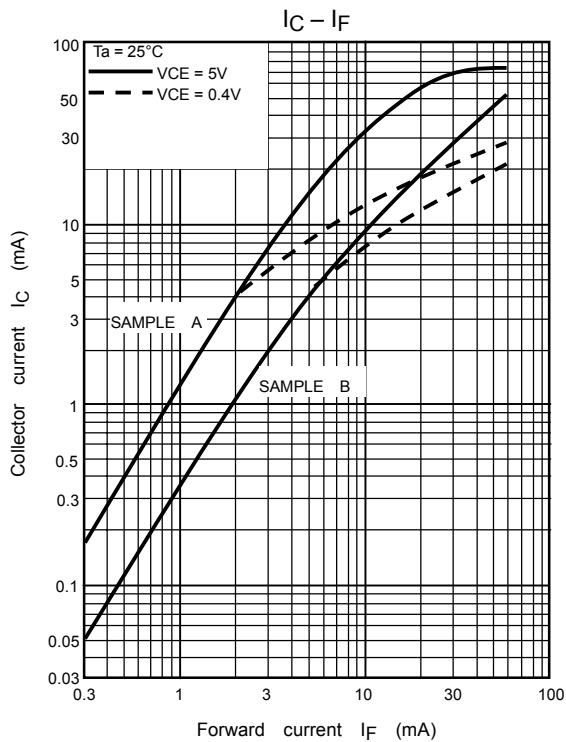
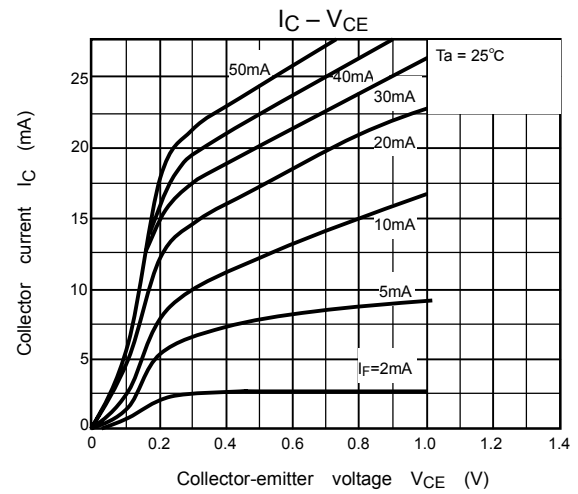
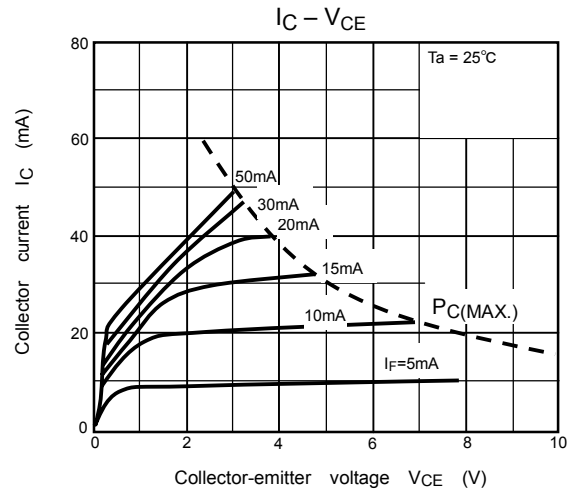
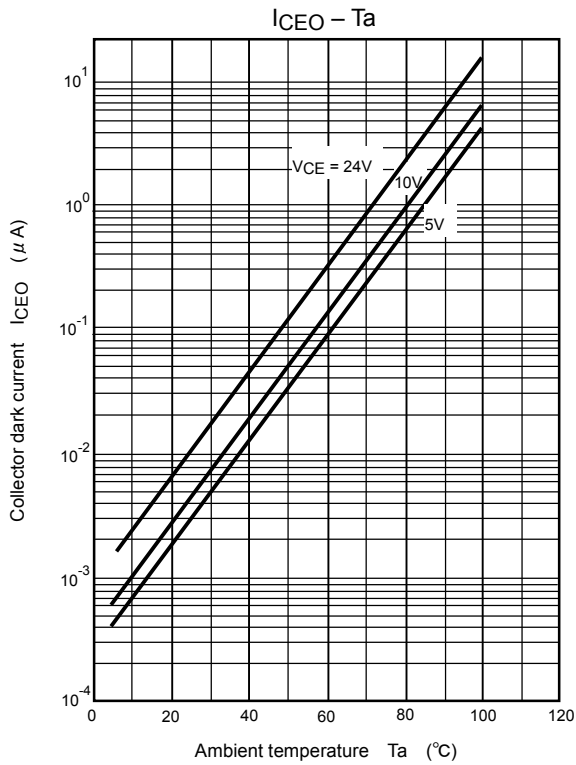
Switching Characteristics (Ta = 25°C)

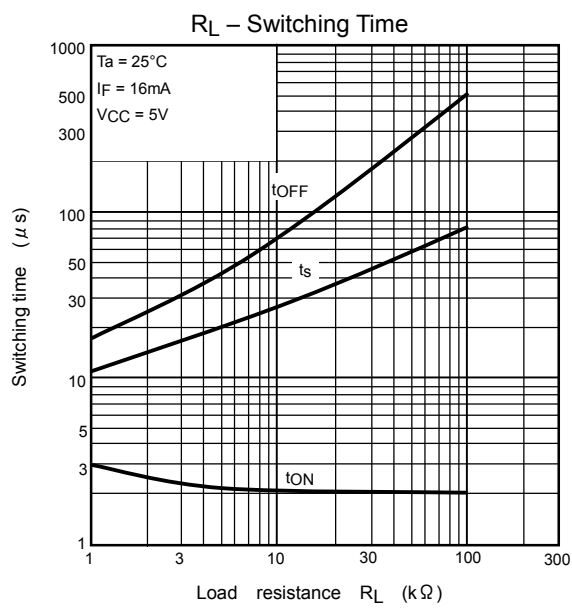
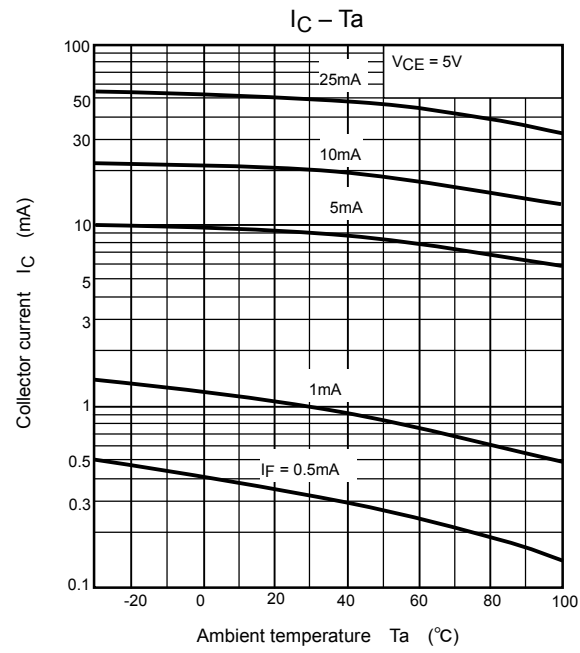
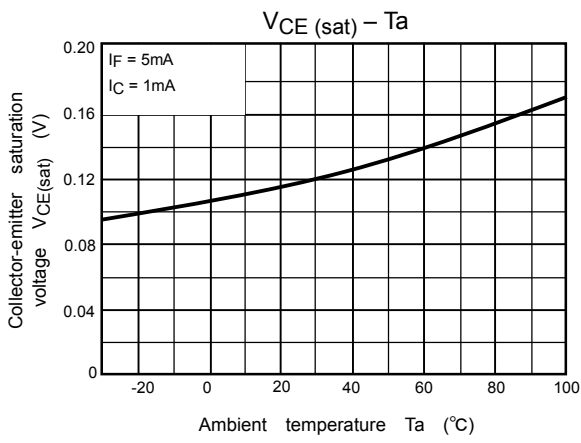
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t_r	$V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$ $R_L = 100\Omega$	—	2	—	μs
Fall time	t_f		—	3	—	
Turn-on time	t_{on}		—	3	—	
Turn-off time	t_{off}		—	3	—	
Turn-on time	t_{ON}	$R_L = 1.9\text{ k}\Omega$ $V_{CC} = 5\text{ V}, I_F = 16\text{ mA}$ (Fig.1)	—	2	—	μs
Storage time	t_s		—	15	—	
Turn-off time	t_{OFF}		—	25	—	

Fig. 1 Switching time test circuit









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