TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

TLP504A, TLP504A-2

PROGRAMMABLE CONTROLLERS

AC / DC-INPUT MODULE

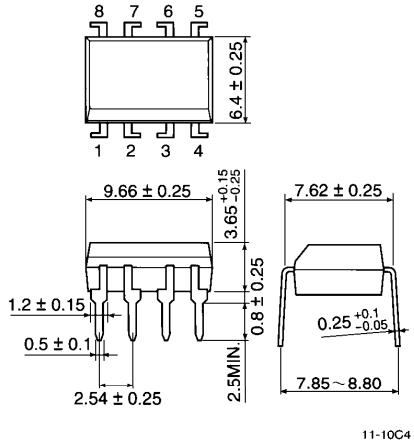
SOLID STATE RELAY

Unit in mm

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 : 55V (Min.)
- Current Transfer Ratio : 50% (Min.)
  Rank GB : 100% (Min.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized : UL1577,
  File No. E67349

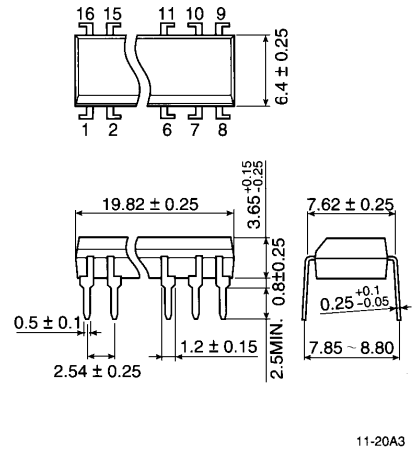
TLP504A



TOSHIBA	11-10C4

Weight : 0.54g

TLP504A-2

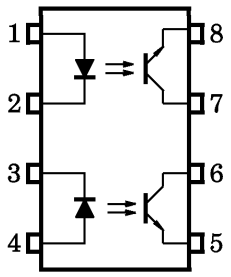


TOSHIBA	11-20A3

Weight : 1.1g

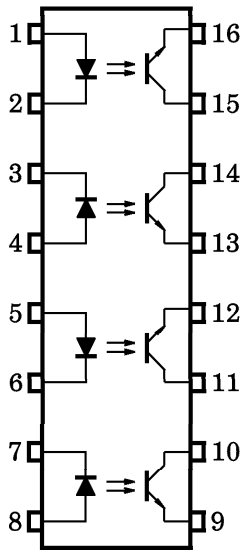
PIN CONFIGURATIONS (TOP VIEW)

TLP504A



1, 4 : ANODE
2, 3 : CATHODE
5, 8 : EMITTER
6, 7 : COLLECTOR

TLP504A-2



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 (10s)		°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

CHARACTERISTIC	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 = 10mA	1.0	1.15	1.3	V
	Reverse Current	I_R	V_R = 5V	—	—	10	μA
	Capacitance	C_T	V = 0, f = 1MHz	—	30	—	pF
DETECTOR	Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 0.5mA	55	—	—	V
	Emitter-Collector Breakdown Voltage	$V_{(BR)ECO}$	I_E = 0.1mA	7	—	—	V
	Collector Dark Current	I_{CEO}	V_{CE} = 24V	—	10	100	nA
			V_{CE} = 24V, Ta = 85°C	—	2	50	μA
	Capacitance Collector to Emitter	C_{CE}	V = 0, f = 1MHz	—	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 = 5mA, V_{CE} = 5V	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	$I_C / I_{F(sat)}$	I_F = 1mA, V_{CE} = 0.4V	—	60	—	%
		Rank GB	30	—	—	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 2.4mA, I_F = 8mA	—	—	0.4	V
		I_C = 0.2mA, I_F = 1mA	—	0.2	—	
		Rank GB	—	—	0.4	

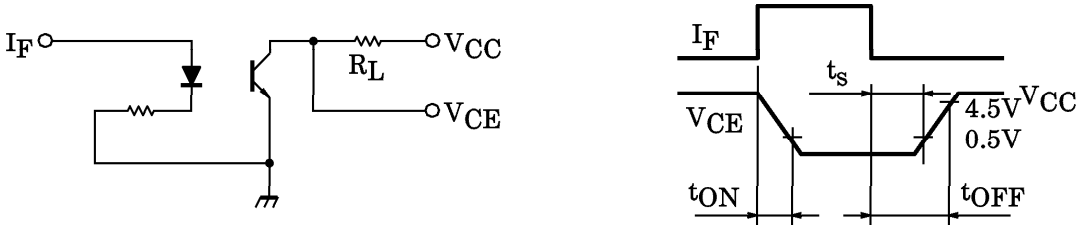
ISOLATION CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Capacitance Input to Output	C_S	V_S = 0, f = 1MHz	—	0.8	—	pF
Isolation Resistance	R_S	V_S = 500V	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

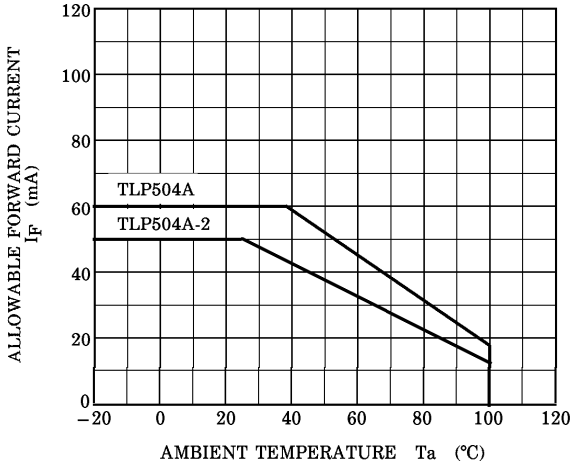
SWITCHING CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	t_r	V_{CC} = 10V, I_C = 2mA 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 = 1.9kΩ (Fig.1) V_{CC} = 5V, I_F = 16mA	—	2	—	μs
Storage Time	t_s		—	15	—	
Turn-off Time	t_{OFF}		—	25	—	

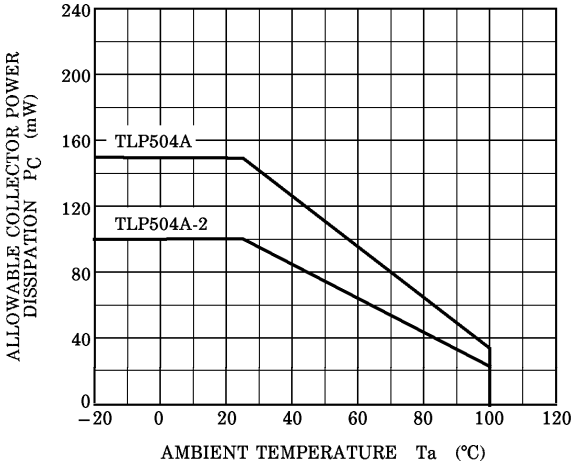
Fig.1 Switching Time Test Circuit



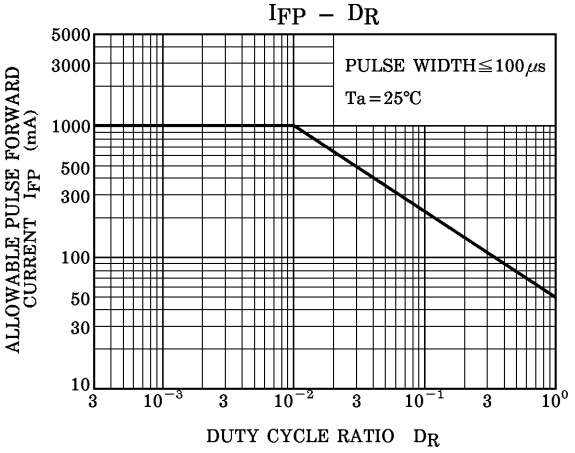
I_F – Ta



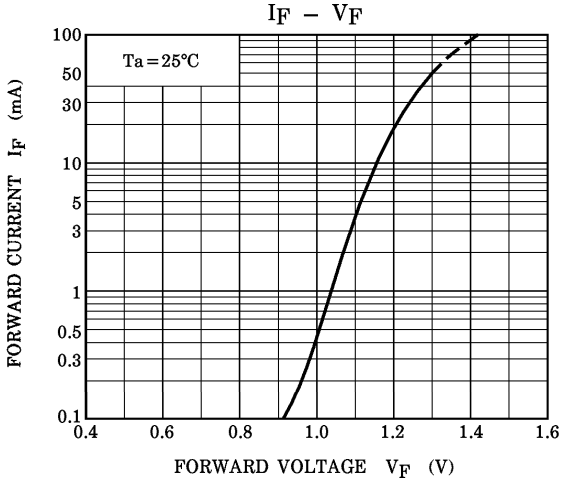
P_C – Ta



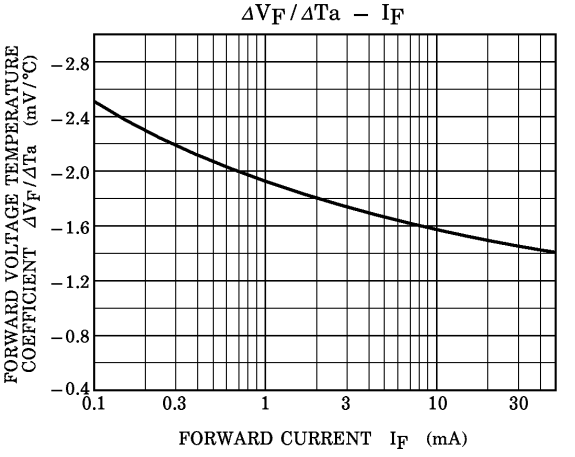
I_{FP} – D_R



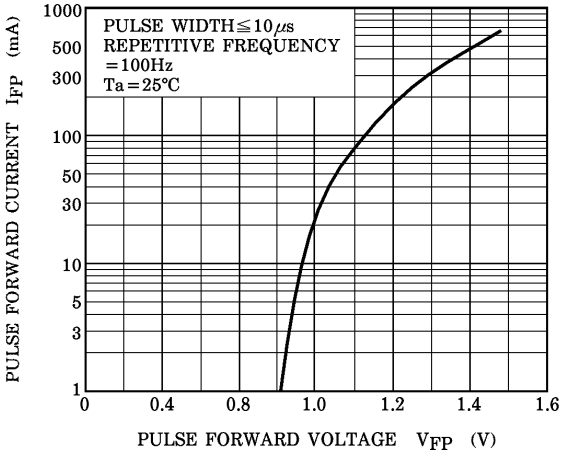
I_F – V_F



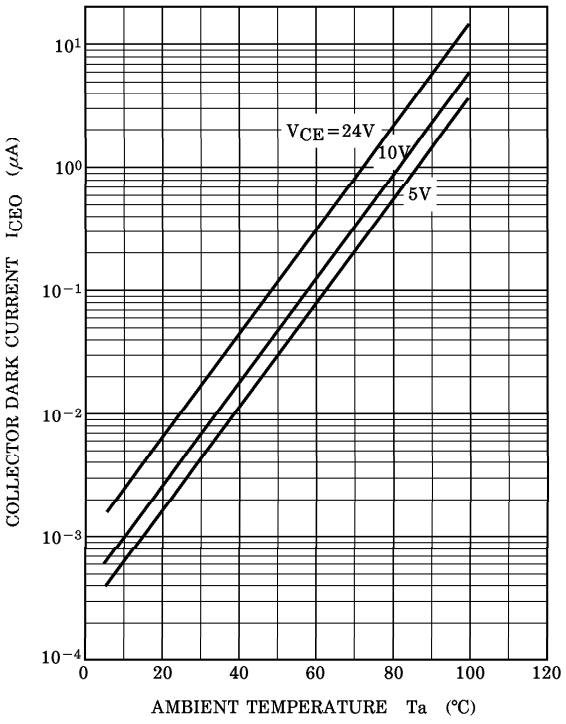
$\Delta V_F / \Delta Ta$ – I_F



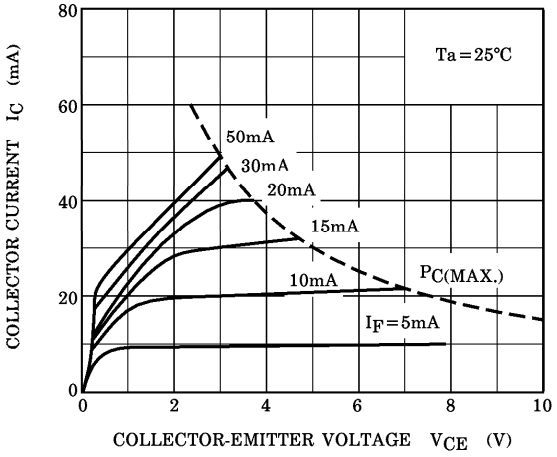
I_{FP} – V_{FP}



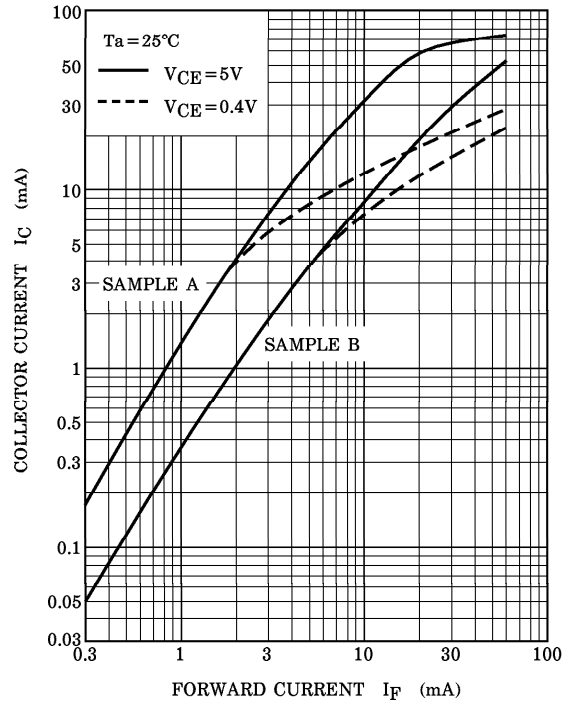
I_{CEO} – Ta



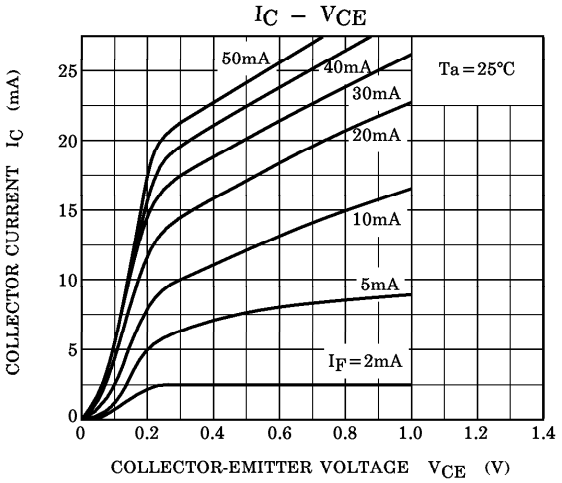
I_C – V_{CE}



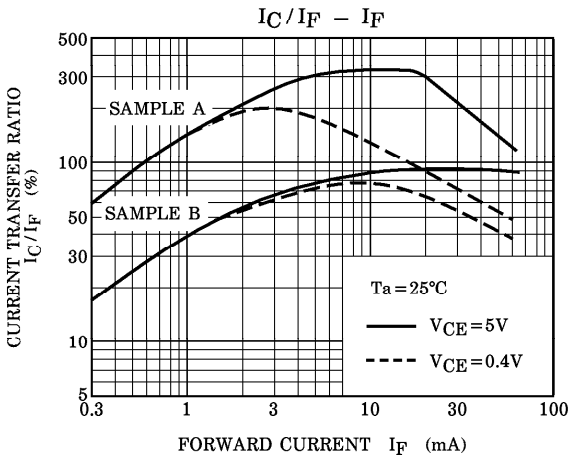
I_C – I_F



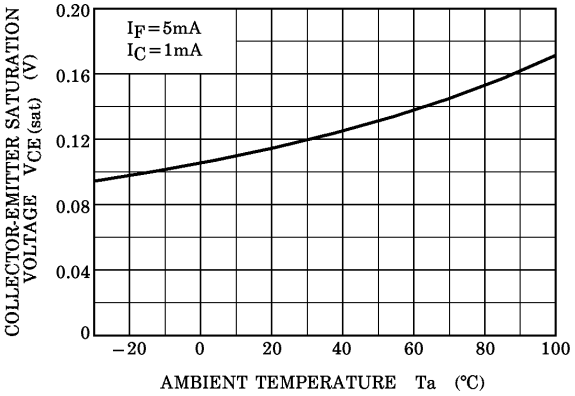
I_C – V_{CE}



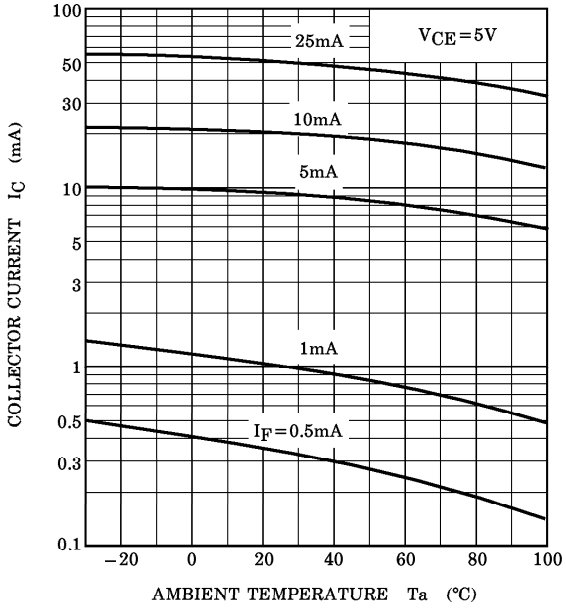
I_C / I_F – I_F



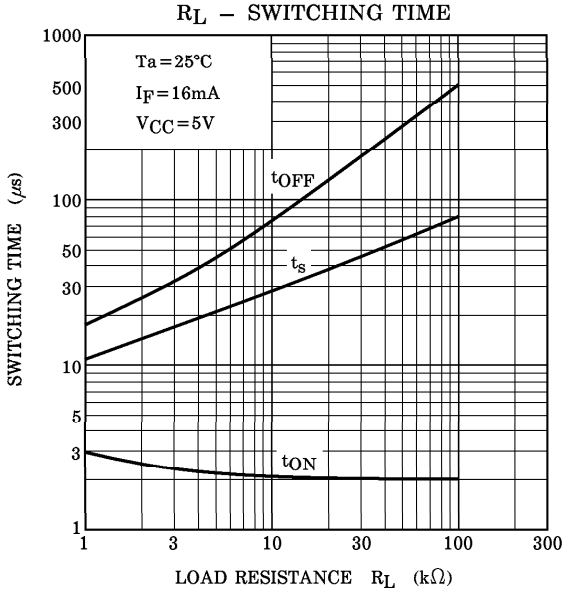
$V_{CE\,(sat)}$ – Ta



I_C – Ta



R_L – SWITCHING TIME



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000707EBC

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