

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

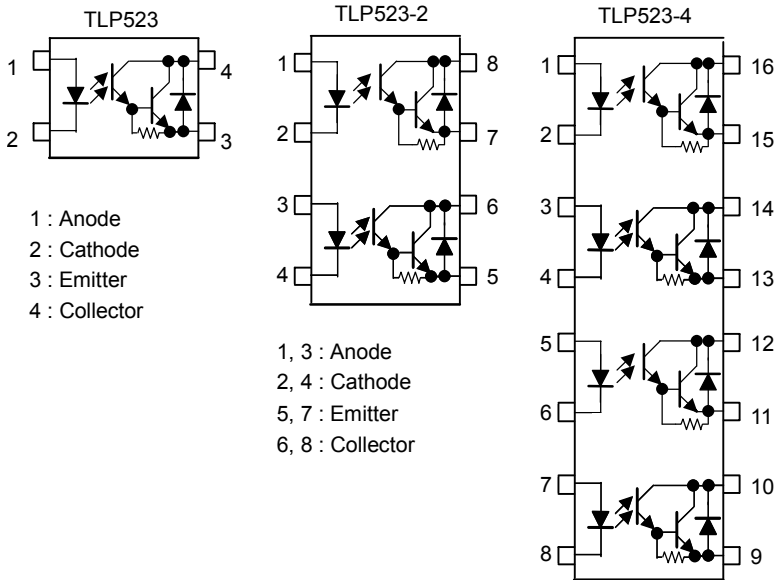
# TLP523, TLP523-2, TLP523-4

Programmable Controllers  
DC-Output Module  
Solid State Relay

The TOSHIBA TLP523, -2 and -4 consists of a gallium arsenide infrared emitting diode coupled with a silicon, darlington connected, phototransistor which has an integral base-emitter resistor to optimize switching speed and elevated temperature characteristics. The TLP523-2 offers two isolated channels in a eight lead plastic DIP package, while the TLP523-4 provide four isolated channels per package.

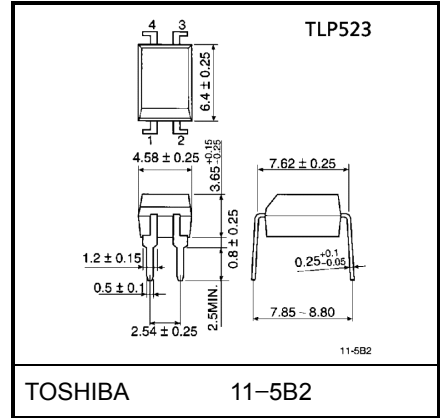
- Current transfer ratio: 500% (min.) ( $I_F = 1 \text{ mA}$ )
- Isolation voltage: 2500 Vrms (min.)
- Collector-emitter voltage: 55 V (min.)
- Leakage current: 10 $\mu\text{A}$  (max.) ( $T_a = 85^\circ\text{C}$ )
- UL recognized: UL1577, file no. E67349

## Pin Configurations (top view)



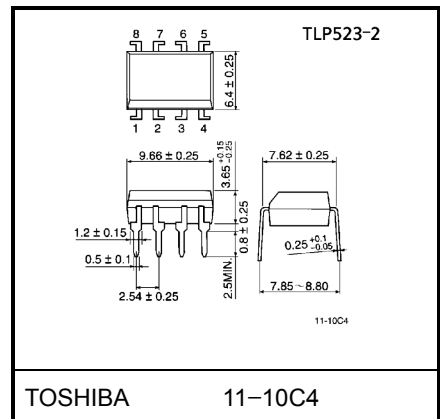
1, 3, 5, 7 : Anode  
2, 4, 6, 8 : Cathode  
9, 11, 13, 15 : Emitter  
10, 12, 14, 16: Collector

Unit in mm



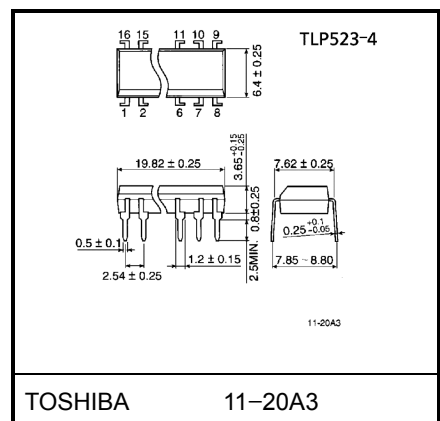
TOSHIBA 11-5B2

Weight: 0.26 g



TOSHIBA 11-10C4

Weight: 0.54 g



TOSHIBA 11-20A3

Weight: 1.1 g

## Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating		Unit	
		TLP523	TLP523-2 TLP523-4		
LED	Forward current	I <sub>F</sub>	60	50	mA
	Forward current derating	ΔI <sub>F</sub> /°C	-0.7 (Ta ≥ 39°C)	-0.5 (Ta ≥ 25°C)	mA /°C
	Pulse forward current	I <sub>FP</sub>	1 (100μs pulse, 100pps)		A
	Reverse voltage	V <sub>R</sub>	5		V
Detector	Collector-emitter voltage	V <sub>CEO</sub>	55		V
	Emitter-collector voltage	V <sub>ECO</sub>	0.3		V
	Collector current	I <sub>C</sub>	150		mA
	Collector power dissipation (1 circuit)	P <sub>C</sub>	150	100	mW
	Collector power dissipation derating (1 circuit (Ta ≥ 25°C))	ΔP <sub>C</sub> /°C	-1.5	-1.0	mW /°C
Operating temperature range	T <sub>opr</sub>	-55~100		°C	
Storage temperature range	T <sub>stg</sub>	-55~125		°C	
Lead soldering temperature (10 s)	T <sub>sol</sub>	260		°C	
Total power dissipation	P <sub>T</sub>	250	150	mW	
Total power dissipation derating (Ta ≥ 25°C)	ΔP <sub>T</sub> /°C	-2.5	-1.5	mW /°C	
Isolation voltage (Note 1)	BV <sub>S</sub>	2500 (AC, 1min., R.H.≤ 60%)		V <sub>rms</sub>	

(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 <sub>CC</sub>	—	5	24	V
Forward current	I <sub>F</sub>	—	16	20	mA
Operating temperature range	T <sub>opr</sub>	-25	—	85	°C

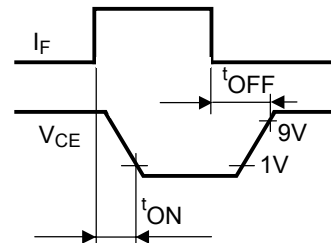
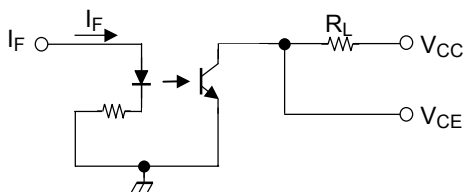
## Electrical Characteristics (Ta = 25°C)

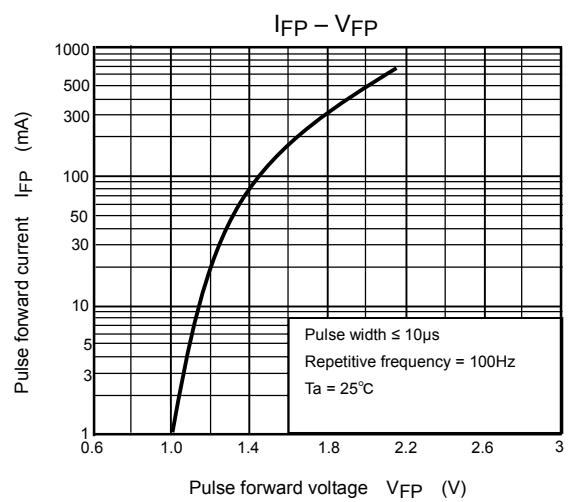
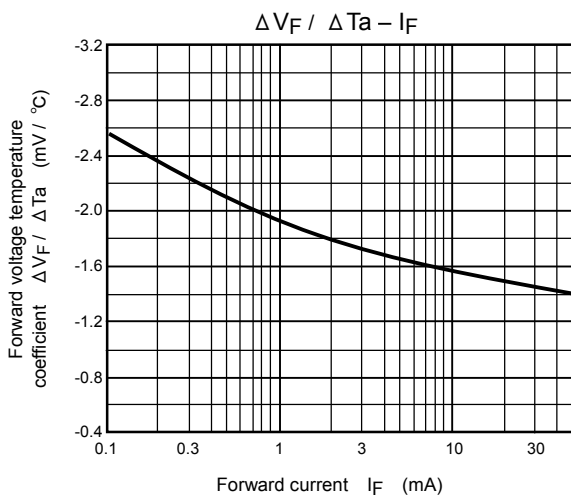
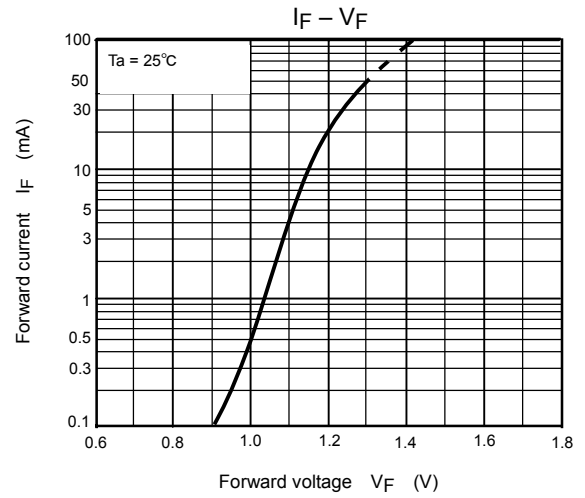
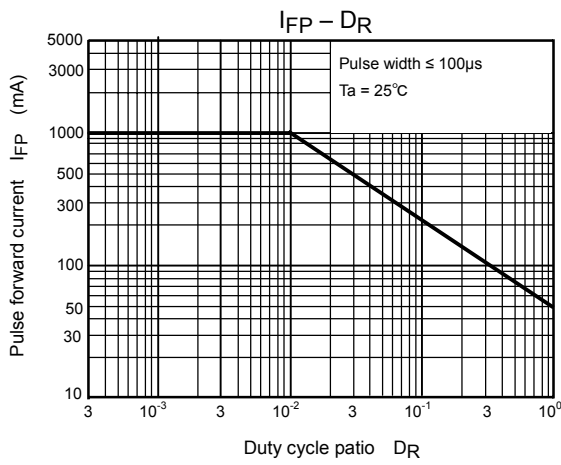
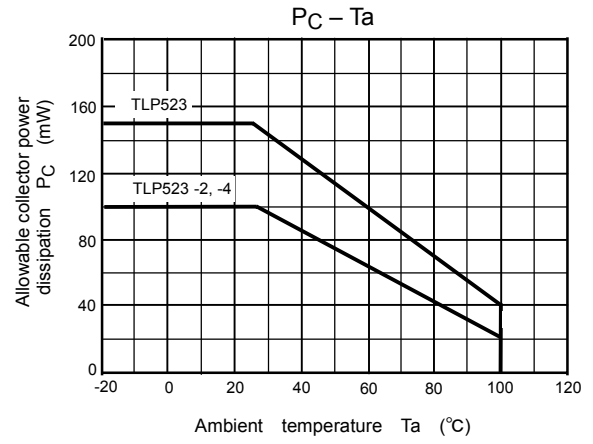
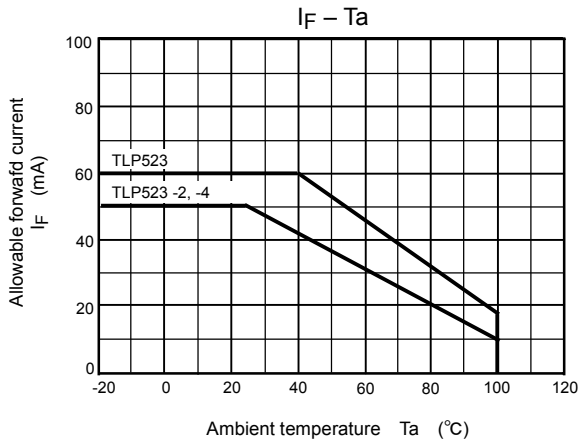
Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	$\mu\text{A}$
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 1 \text{ mA}$	55	—	—	V
	Collector dark current	$I_{CEO}$	$V_{CE} = 24 \text{ V}$	—	10	200	nA
			$V_{CE} = 24 \text{ V}, T_a = 85^\circ\text{C}$	—	0.5	10	$\mu\text{A}$
Capacitance collector to emitter	$C_{CE}$	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF	
Coupled	Current transfer ratio	$I_C / I_F$	$I_F = 1 \text{ mA}, V_{CE} = 1 \text{ V}$	500	2000	—	%
	Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 50 \text{ mA}, I_F = 10 \text{ mA}$	—	—	1	V
	Capacitance input to output	$C_S$	$V_S = 0, f = 1 \text{ MHz}$	—	0.8	—	pF
	Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$

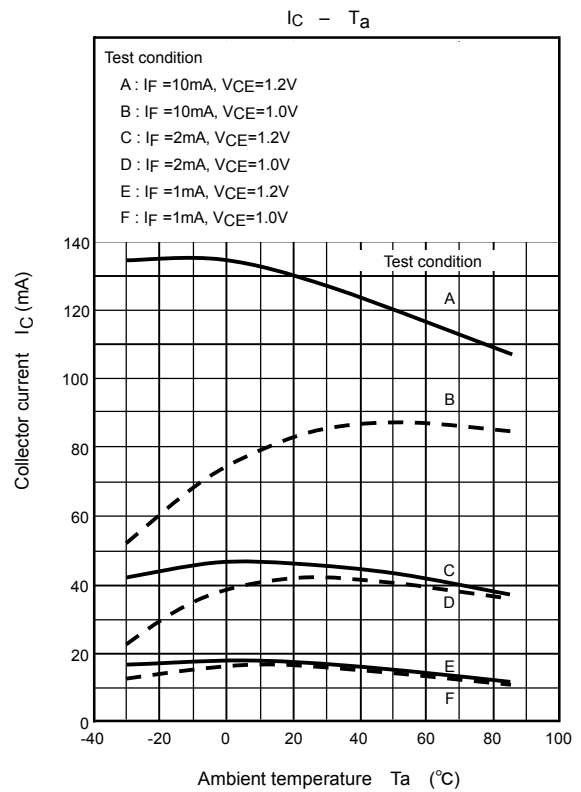
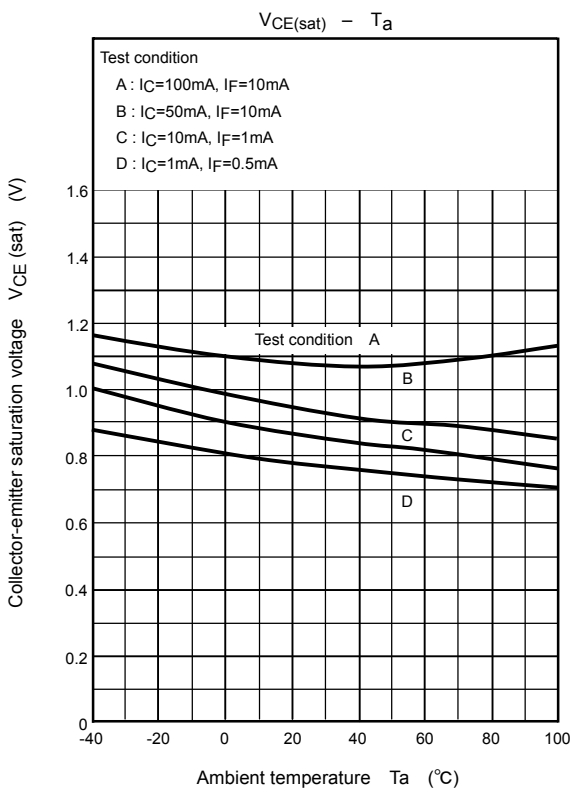
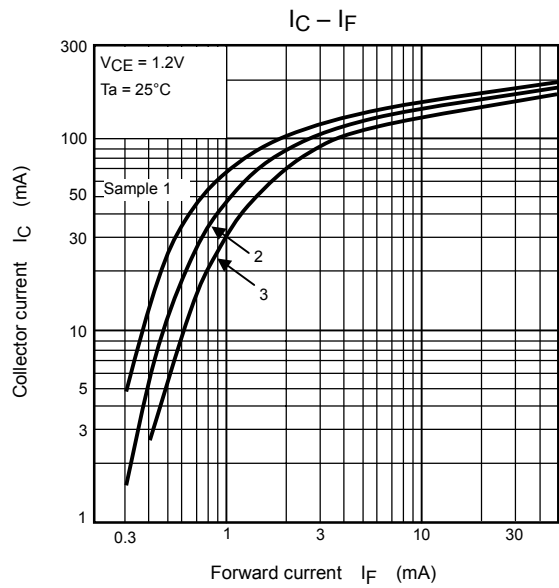
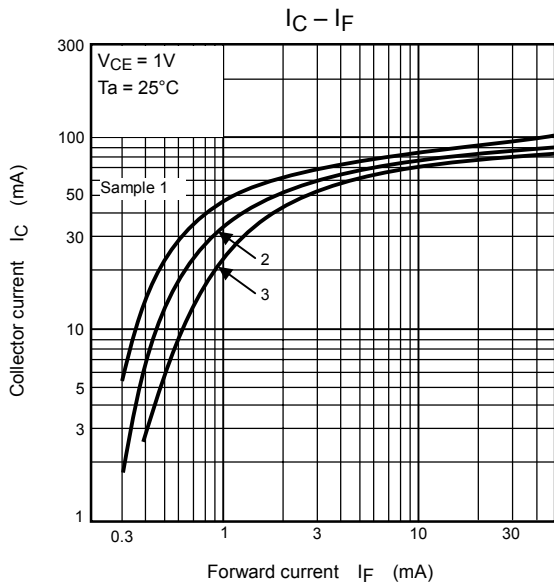
## Switching Characteristics (Ta = 25°C)

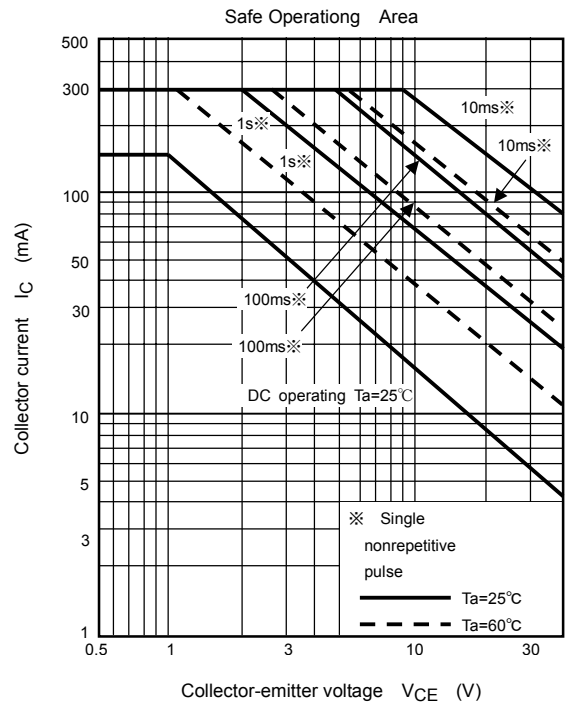
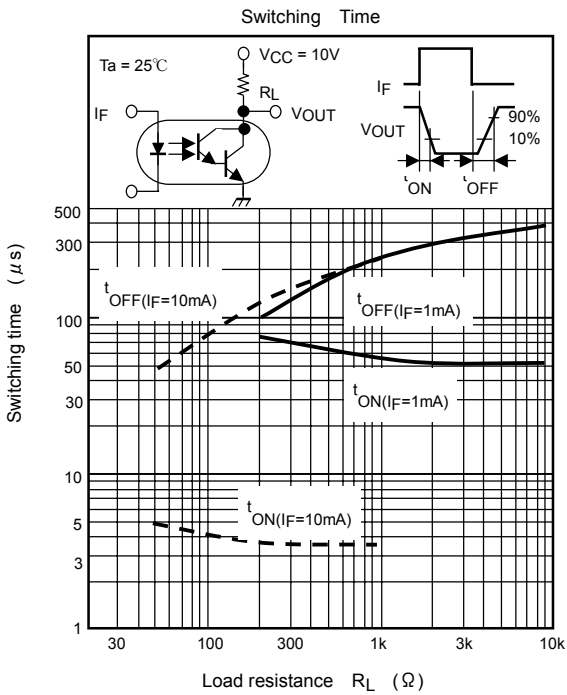
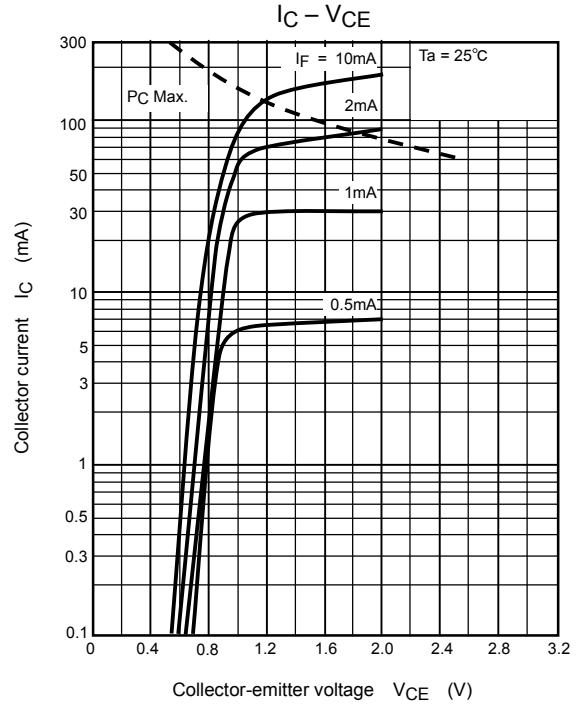
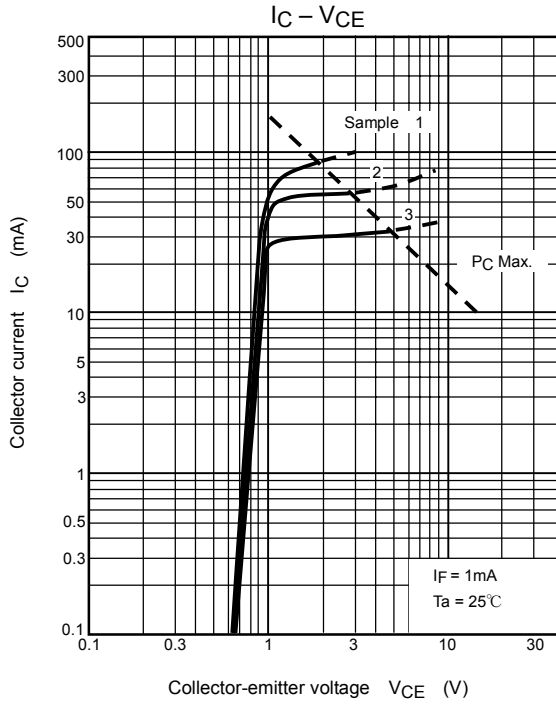
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Turn-on time	$t_{ON}$	$V_{CC} = 10 \text{ V}, R_L = 180 \Omega$	—	3	—	$\mu\text{s}$
Turn-off time	$t_{OFF}$	$I_F = 16 \text{ mA}$	—	80	—	$\mu\text{s}$

## Switching Time Test Circuit









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Datasheets for electronics components.