

TOSHIBA PHOTOCOUPLER GaAs IRED & PHOTO-TRANSISTOR

# TLP521-1, TLP521-2, TLP521-4

PROGRAMMABLE CONTROLLERS

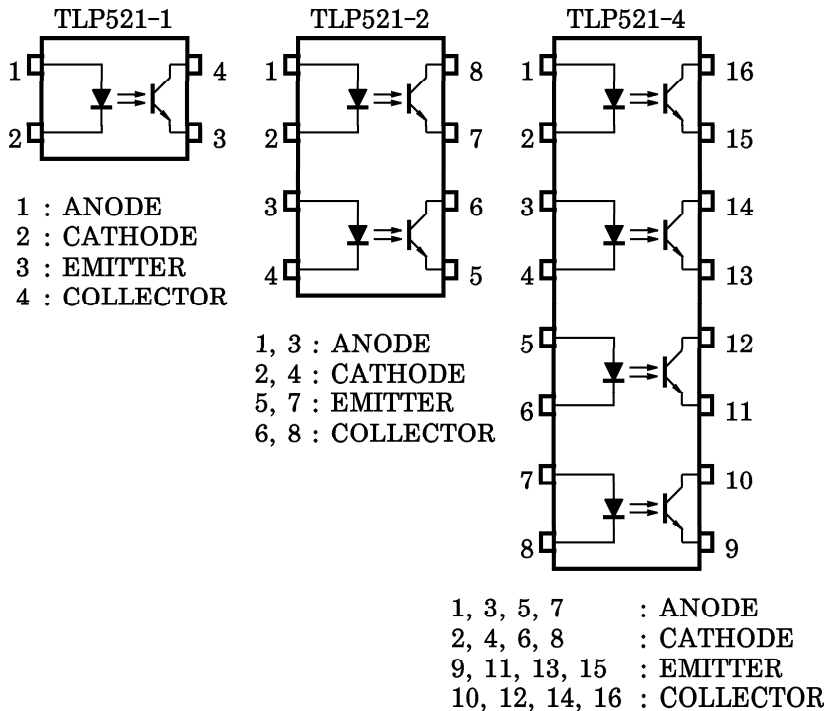
AC/DC-INPUT MODULE

SOLID STATE RELAY

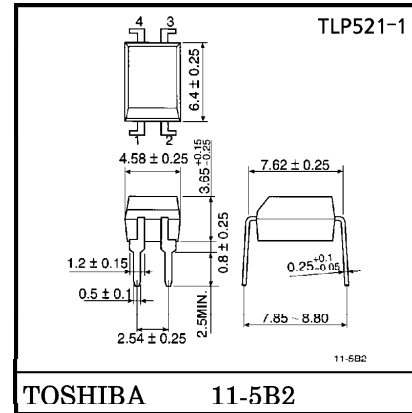
The TOSHIBA TLP521-1, -2 and -4 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode. The TLP521-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP521-4 provides four isolated channels in a sixteen plastic DIP package.

- Collector-Emitter Voltage : 55V (Min.)
- Current Transfer Ratio : 50% (Min.)  
Rank GB : 100% (Min.)
- Isolation Voltage : 2500Vrms (Min.)
- UL Recognized  
made in Japan : UL1577, File No. E67349  
made in Thailand : UL1577, File No. E152349

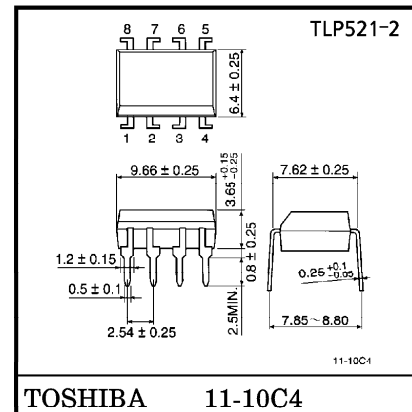
## PIN CONFIGURATIONS (TOP VIEW)



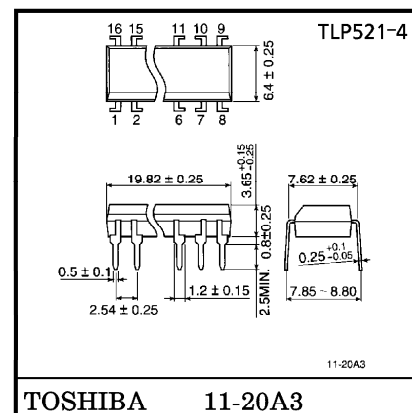
Unit in mm



Weight : 0.26g



Weight : 0.54g



Weight : 1.1g

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● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

## MAXIMUM RATINGS (Ta = 25°C)

	CHARACTERISTIC	SYMBOL	RATING		UNIT
			TLP521-1	TLP521-2 TLP521-4	
LED	Forward Current	$I_F$	70	50	mA
	Forward Current Derating	$\Delta I_F / ^\circ\text{C}$	$-0.93 (T_a \geq 50^\circ\text{C})$	$-0.5 (T_a \geq 25^\circ\text{C})$	mA / °C
	Pulse Forward Current	$I_{FP}$	1 (100 $\mu$ 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, $T_a \geq 25^\circ\text{C}$ )	$\Delta P_C / ^\circ\text{C}$	$-1.5$	$-1.0$	mW / °C
	Junction Temperature	$T_j$	125		°C
	Storage Temperature Range	$T_{stg}$	$-55 \sim 125$		°C
	Operating Temperature Range	$T_{opr}$	$-55 \sim 100$		°C
	Lead Soldering Temperature	$T_{sol}$	260 (10 sec.)		°C
	Total Package Power Dissipation	$P_T$	250	150	mW
	Total Package Power Dissipation Derating ( $T_a \geq 25^\circ\text{C}$ )	$\Delta P_T / ^\circ\text{C}$	$-2.5$	$-1.5$	mW / °C
	Isolation Voltage	$BV_S$	2500 (AC, 1 min., 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

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

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- Gallium arsenide (GaAs) is a substance used in the products described in this document. GaAs dust and fumes are toxic. Do not break, cut or pulverize the product, or use chemicals to dissolve them. When disposing of the products, follow the appropriate regulations. Do not dispose of the products with other industrial waste or with domestic garbage.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

TYPE	CLASSI- FICATION (*1)	CURRENT TRANSFER RATIO (%) (I <sub>C</sub> / I <sub>F</sub> )		MARKING OF CLASSIFICATION
		I <sub>F</sub> =5mA, V <sub>CE</sub> =5V, Ta=25°C		
		MIN.	MAX.	
TLP521	A	50	600	BLANK, Y, Y <sup>■</sup> , G, G <sup>■</sup> , B, B <sup>■</sup> , GB
	Rank Y	50	150	Y, Y <sup>■</sup>
	Rank GR	100	300	G, G <sup>■</sup>
	Rank BL	200	600	B, B <sup>■</sup>
	Rank GB	100	600	G, G <sup>■</sup> , B, B <sup>■</sup> , GB
TLP521-2	A	50	600	BLANK, GR, BL, GB
TLP521-4	Rank GB	100	600	GR, BL, GB

\*1 : Ex. Rank GB : TLP521-1 (GB)

(Note) Application type name for certification test, please use standard product type name,  
i.e.

TLP521-1 (GB) : TLP521-1, TLP521-2 (GB) : TLP521-2

## 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	$\mu\text{A}$
	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	$\mu\text{A}$
	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	$I_C / I_{F(sat)}$	$I_F = 1\text{mA}, V_{CE} = 0.4\text{V}$ Rank GB	—	60	—	%
			30	—	—	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 2.4\text{mA}, I_F = 8\text{mA}$	—	—	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	$R_S$	$V_S = 500\text{V}, R.H. \leq 60\%$	—	$10^{11}$	—	$\Omega$
Isolation Voltage	$BV_S$	AC, 1 minute	2500	—	—	$V_{rms}$
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	Vde

SWITCHING CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Rise Time	$t_r$	$V_{CC} = 10V$ $I_C = 2mA$ $R_L = 100\Omega$	—	2	—	$\mu s$
Fall Time	$t_f$		—	3	—	
Turn-on Time	$t_{on}$		—	3	—	
Turn-off Time	$t_{off}$		—	3	—	
Turn-on Time	$t_{ON}$	$R_L = 1.9k\Omega$ (Fig.1) $V_{CC} = 5V, I_F = 16mA$	—	2	—	$\mu s$
Storage Time	$t_s$		—	15	—	
Turn-off Time	$t_{OFF}$		—	25	—	

Fig.1 SWITCHING TIME TEST CIRCUIT

