

TOSHIBA Photocoupler GaAs Ired &amp; Photo-Transistor

# TLP628,TLP628-2,TLP628-4

Programmable Controllers

DC-Output Module

Telecommunication

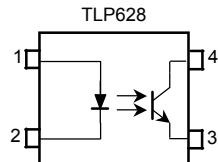
Unit in mm

The TOSHIBA TLP628, -2, and -4 consists of a gallium arsenide infrared emitting diode optically coupled to a phototransistor which has a 350V high voltage of collector-emitter breakdown voltage.

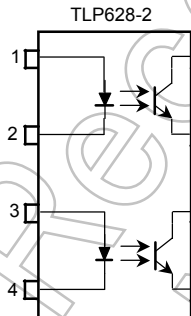
The TLP628-2 offers two isolated channels in a eight lead plastic DIP package, while the TLP628-4 provide four isolated channels per package.

- Collector-emitter voltage: 350 V (min.)
- Current transfer ratio: 50% (min.)
- Isolation voltage: 5000Vrms (min.)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN60065:2002, certificate no.7426  
BS EN60950-1:2002, certificate no.7427

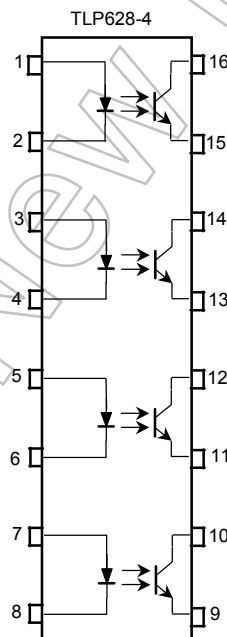
## Pin Configurations (top view)



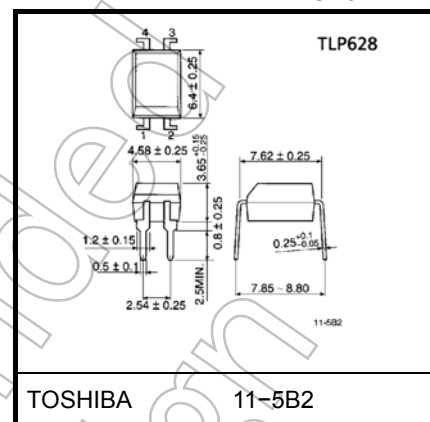
1: Anode  
2: Cathode  
3: Emitter  
4: Collector



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

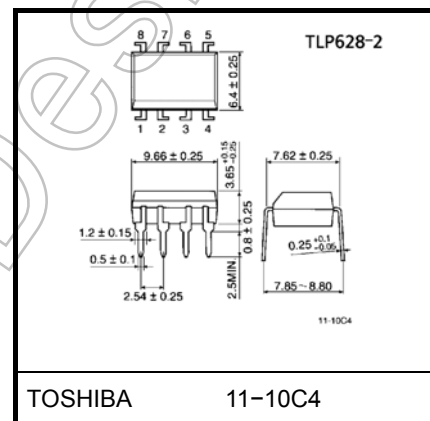


1, 3, 5, 7: Anode  
2, 4, 6, 8: Cathode  
9, 11, 13, 15: Emitter  
10, 12, 14, 16: Collector



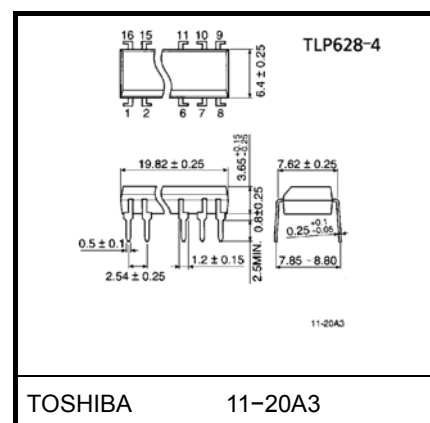
TOSHIBA 11-5B2

Weight: 0.26 g (typ.)



TOSHIBA 11-10C4

Weight: 0.54 g (typ.)



TOSHIBA 11-20A3

Weight: 1.1 g (typ.)

## Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP628	TLP628-2 TLP628-4	
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 $\mu\text{s}$ pulse, 100pps)		A
	Reverse voltage	$V_R$	5		V
	Junction temperature	$T_j$	125		$^\circ\text{C}$
Detector	Collector-emitter voltage	$V_{CEO}$	350		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 (Ta $\geq 25^\circ\text{C}$ , 1 circuit)	$\Delta P_C / ^\circ\text{C}$	-1.5	-1.0	mW / $^\circ\text{C}$
	Junction temperature	$T_j$	125		$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55~125		$^\circ\text{C}$
Operating temperature range		$T_{opr}$	-55~100		$^\circ\text{C}$
Lead soldering temperature		$T_{sol}$	260 (10s)		$^\circ\text{C}$
Total package power dissipation (1 circuit)		$P_T$	200	150	mW
Total package power dissipation derating (Ta $\geq 25^\circ\text{C}$ , 1 circuit)		$\Delta P_T / ^\circ\text{C}$	-2.0	-1.5	mW / $^\circ\text{C}$
Isolation voltage		$BV_S$	5000 (AC, 1min., R.H. $\leq 60\%$ ) (Note 1)		Vrms

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

(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	$V_{CC}$	—	—	200	V
Forward current	$I_F$	—	16	25	mA
Collector current	$I_C$	—	—	10	mA
Operating temperature	$T_{opr}$	-25	—	85	$^\circ\text{C}$

Note: Recommended operating conditions are given as a design guideline to obtain expected performance of the device. Additionally, each item is an independent guideline respectively. In developing designs using this product, please confirm specified characteristics shown in this document.

**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	$V_{(BR) \text{ CEO}}$	$I_C = 0.1 \text{ mA}$	350	—	—	V
	Emitter–collector breakdown voltage	$V_{(BR) \text{ ECO}}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector dark current	$I_{\text{CEO}}$	$V_{\text{CE}} = 300 \text{ V}$	—	10	200	nA
			$V_{\text{CE}} = 300 \text{ V}, T_a = 85^\circ\text{C}$	—	—	50	$\mu\text{A}$
	Capacitance collector to emitter	$C_{\text{CE}}$	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF

**Coupled Electrical Characteristics (Ta = 25°C)**

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 5 \text{ mA}, V_{\text{CE}} = 5 \text{ V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_F (\text{sat})$	$I_F = 1 \text{ mA}, V_{\text{CE}} = 0.4 \text{ V}$ Rank GB	—	60	—	%
			30	—	—	
Collector-emitter saturation voltage	$V_{\text{CE}} (\text{sat})$	$I_C = 2.4 \text{ mA}, I_F = 8 \text{ mA}$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}, I_F = 1 \text{ mA}$ Rank GB	—	0.2	—	
			—	—	0.4	

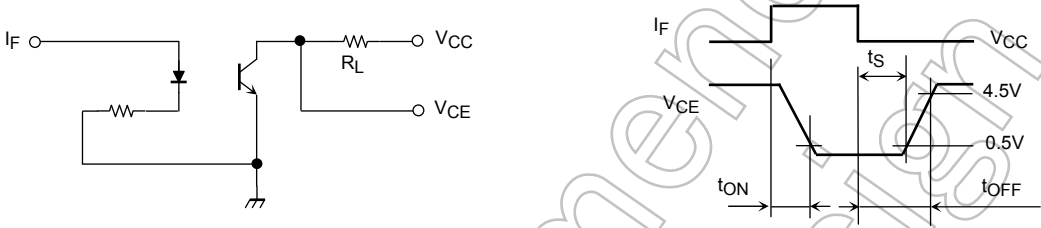
**Isolation Characteristics (Ta = 25°C)**

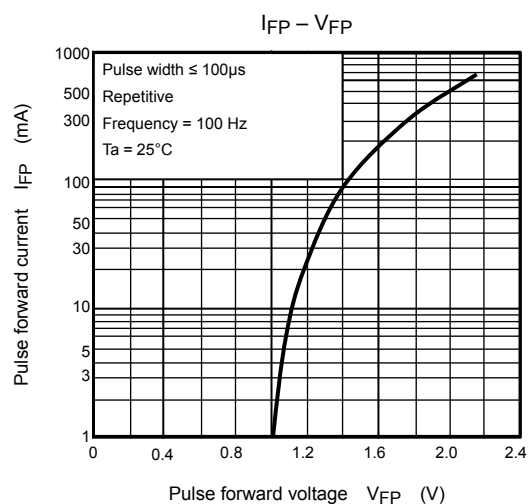
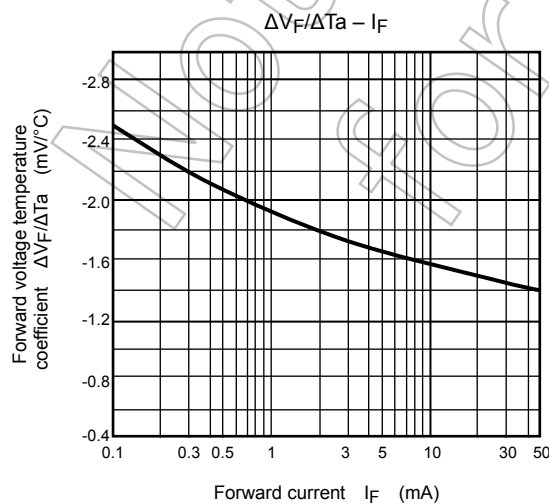
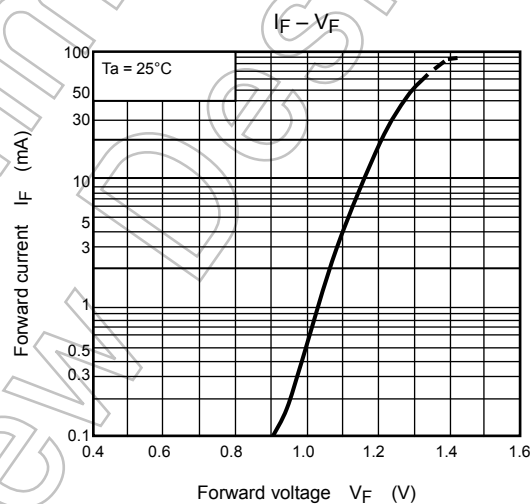
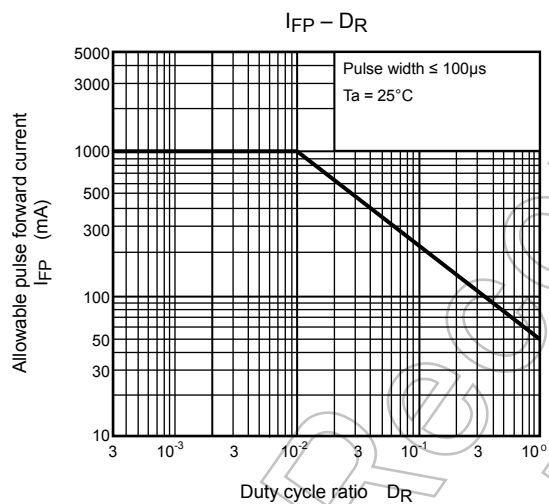
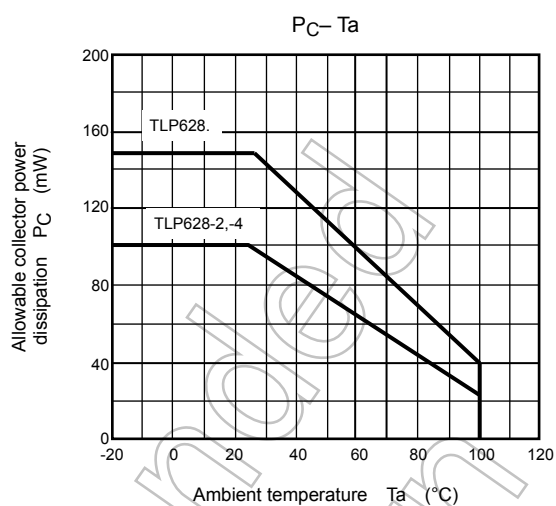
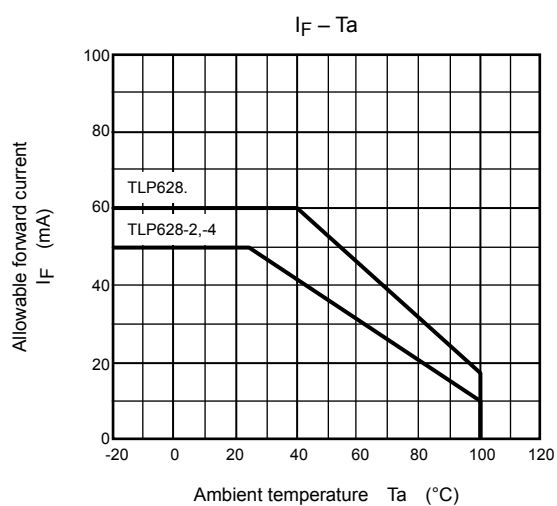
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	$C_S$	$V_S = 0, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	5000	—	—	$V_{\text{rms}}$
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	$V_{\text{dc}}$

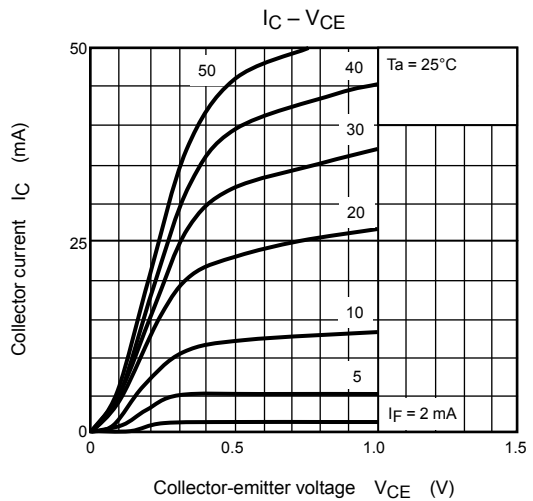
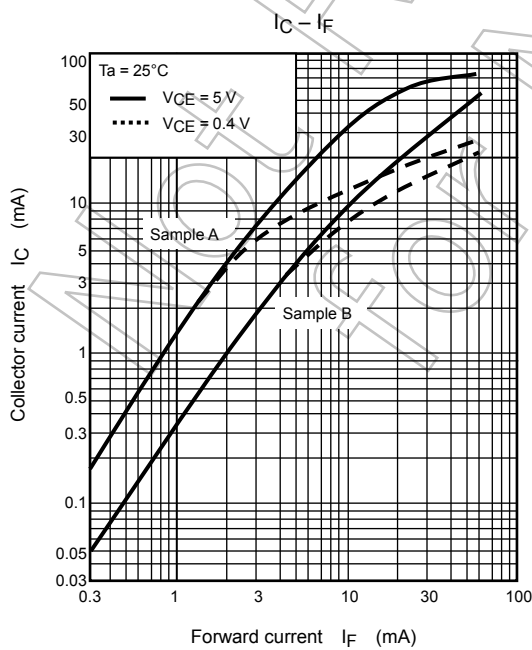
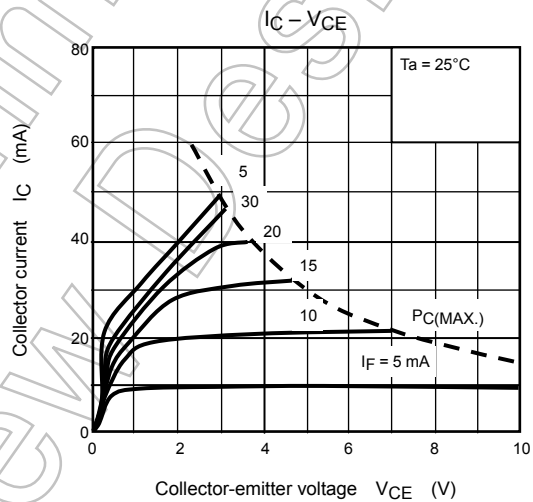
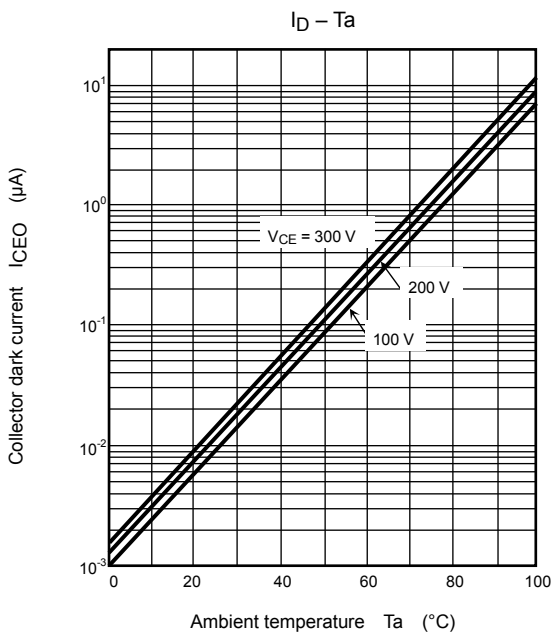
Switching Characteristics (Ta = 25°C)

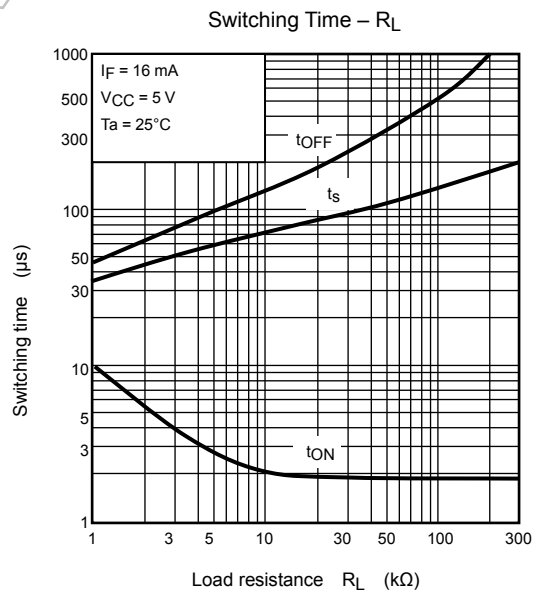
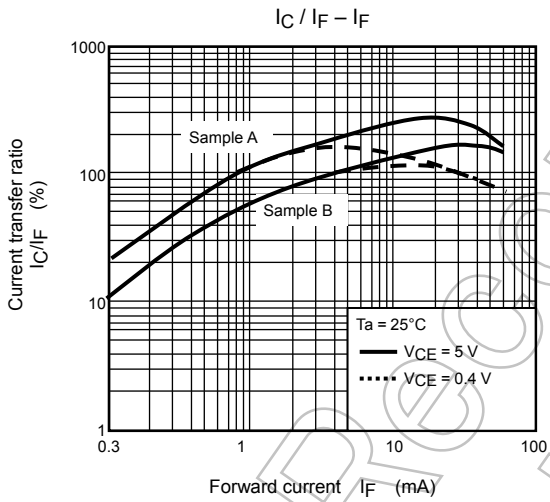
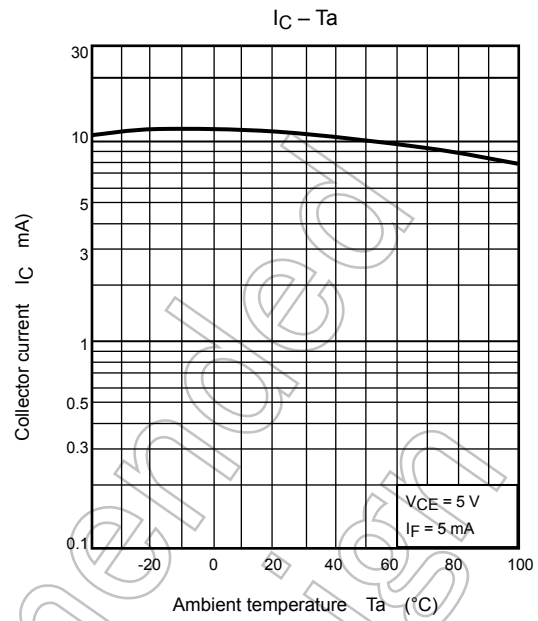
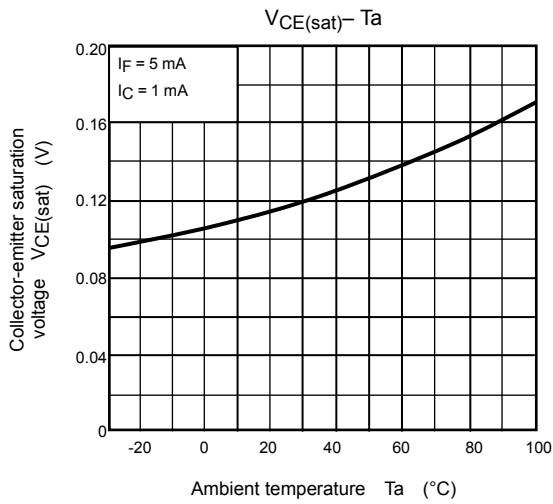
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	$t_r$	$V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$ $A R_L = 100\Omega$	—	2	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{on}$		—	3	—	
Turn-off time	$t_{off}$		—	3	—	
Turn-on time	$t_{ON}$	$R_L = 1.9\text{ k}\Omega$ (Fig.1) $V_{CC} = 5\text{ V}, I_F = 16\text{ mA}$	—	3	—	$\mu\text{s}$
Storage time	$t_s$		—	40	—	
Turn-off time	$t_{OFF}$		—	90	—	

Fig. 1 Switching time test circuit









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