

TOSHIBA Photocoupler GaAs IRed & Photo-Transistor

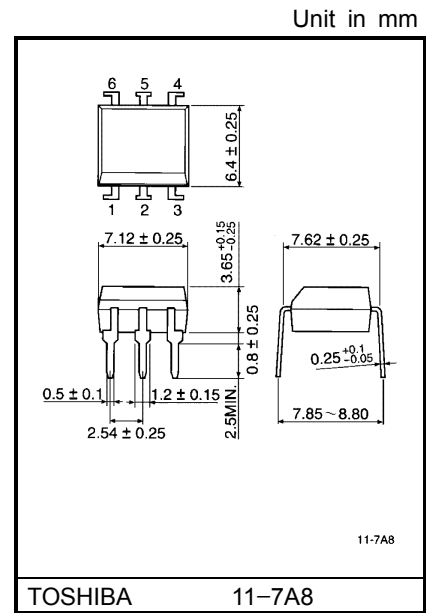
# TLP631, TLP632

Programmable Controllers  
 AC / DC-Input Module  
 Solid State Relay

The TOSHIBA TLP631 and TLP632 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP.

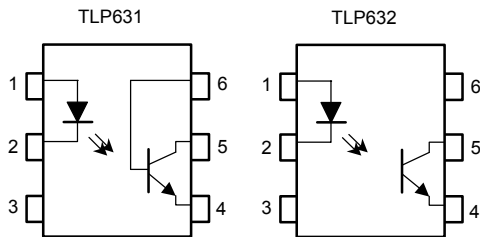
TLP632 is no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)  
 Rank GB: 100% (min.)
- Isolation voltage: 5000V<sub>rms</sub> (min.)
- UL recognized: UL1577, file no. E67349



Weight: 0.4 g

## Pin Configurations (top view)



1: Anode  
 2: Cathode  
 3: N.C.  
 4: Emitter  
 5: Collector  
 6: Base

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## Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I <sub>F</sub>	60	mA
	Forward current derating (Ta ≥ 39°C)	ΔI <sub>F</sub> / °C	-0.7	mA / °C
	Peak forward current (100μs pulse, 100pps)	I <sub>FP</sub>	1	A
	Reverse voltage	V <sub>R</sub>	5	V
	Junction temperature	T <sub>j</sub>	125	°C
Detector	Collector-emitter voltage	V <sub>CEO</sub>	55	V
	Collector-base voltage (TLP631)	V <sub>CBO</sub>	80	V
	Emitter-collector voltage	V <sub>ECO</sub>	7	V
	Emitter-base voltage (TLP631)	V <sub>EBO</sub>	7	V
	Collector current	I <sub>C</sub>	50	mA
	Power dissipation	P <sub>C</sub>	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-1.5	mW / °C
	Junction temperature	T <sub>j</sub>	125	°C
Storage temperature range		T <sub>stg</sub>	-55~125	°C
Operating temperature range		T <sub>opr</sub>	-55~100	°C
Lead soldering temperature (10s)		T <sub>sol</sub>	260	°C
Total package power dissipation		P <sub>T</sub>	250	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP <sub>T</sub> / °C	-2.5	mW / °C
Isolation voltage (AC, 1 min., R.H. ≤ 60%)		BV <sub>S</sub>	5000	V <sub>rms</sub>

## 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	25	mA
Collector current	I <sub>C</sub>	—	1	10	mA
Operating temperature	T <sub>opr</sub>	-25	—	85	°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	$\mu\text{A}$
	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-base breakdown voltage (TLP631)	$V_{(BR)CBO}$	$I_C = 0.1 \text{ mA}$	80	—	—	V
	Emitter-base breakdown voltage (TLP631)	$V_{(BR)EBO}$	$I_E = 0.1 \text{ mA}$	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	$I_C / I_F (\text{sat})$	$I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$ 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

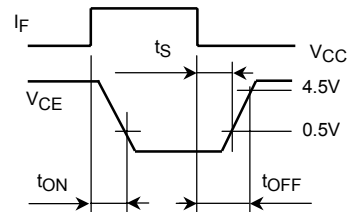
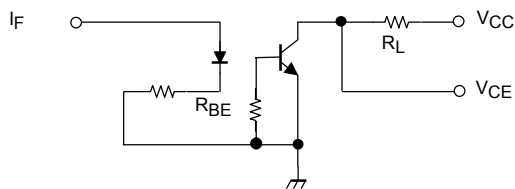
## Isolation Characteristics (Ta = 25°C)

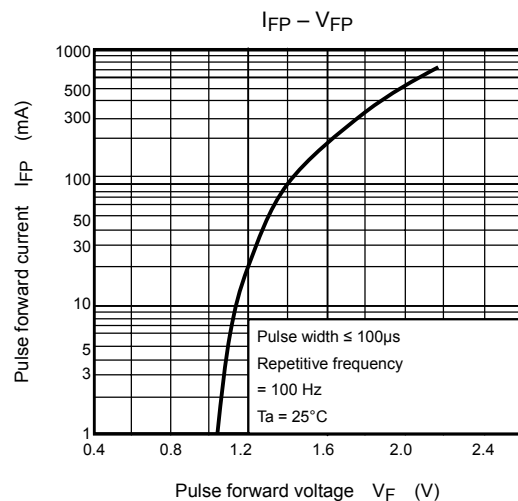
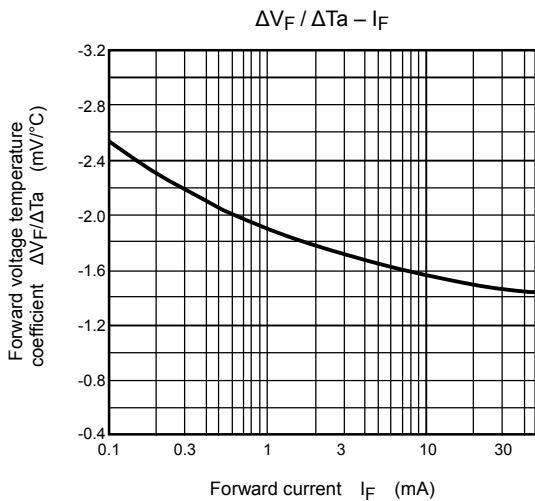
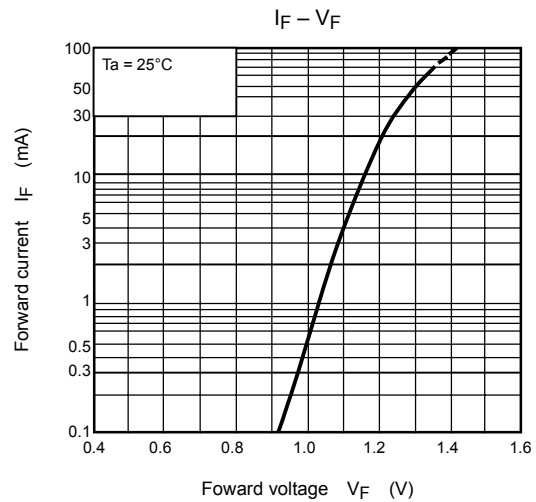
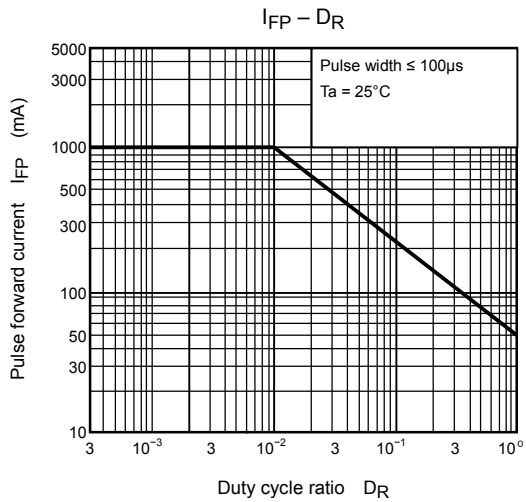
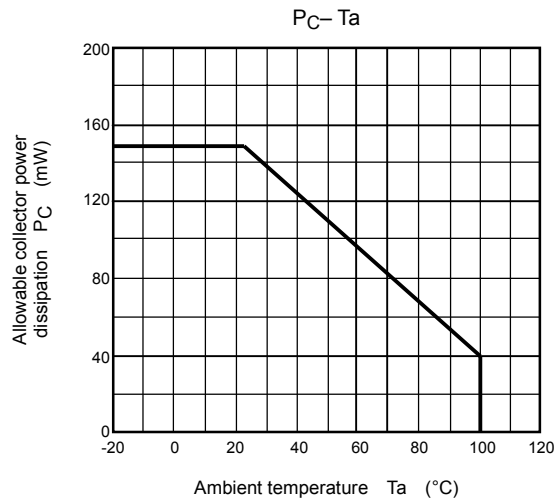
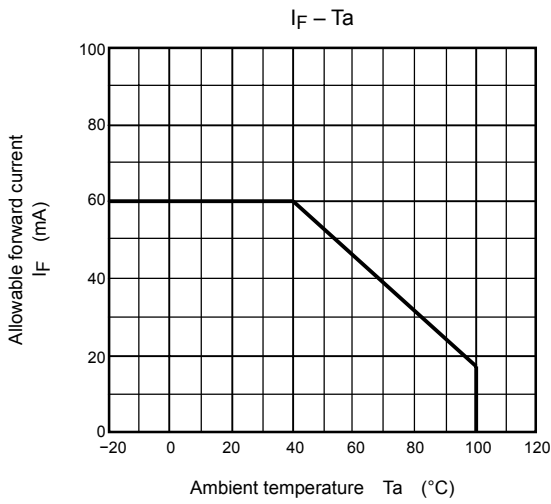
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	$C_S$	$V_S = 0, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60\%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$BV_S$	AC, 1 minute	5000	—	—	$V_{\text{rms}}$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

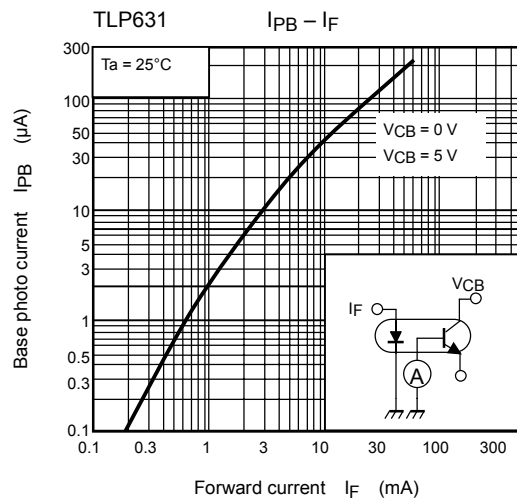
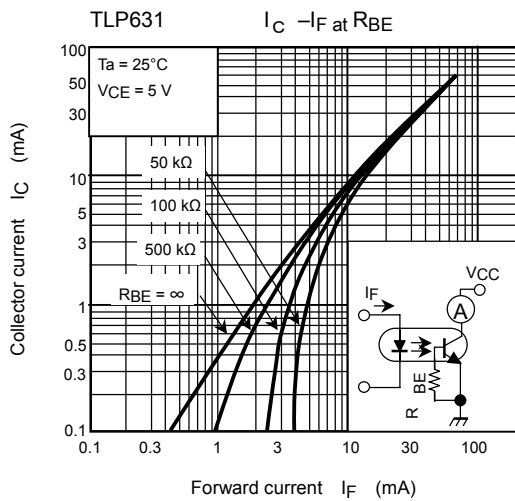
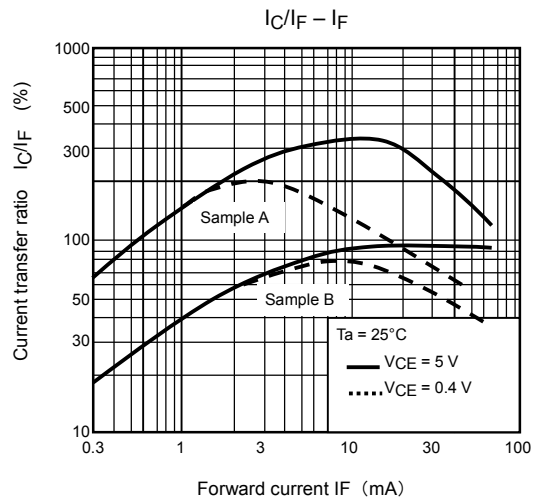
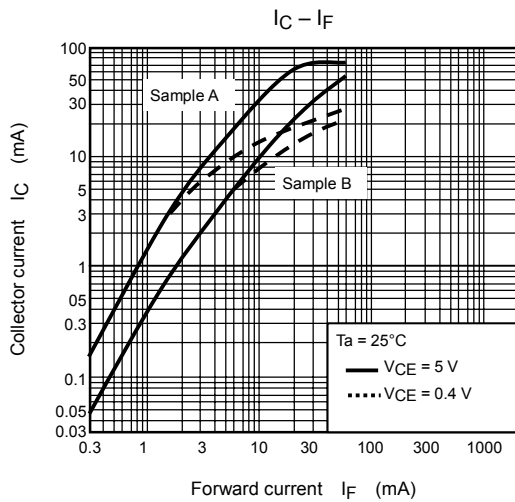
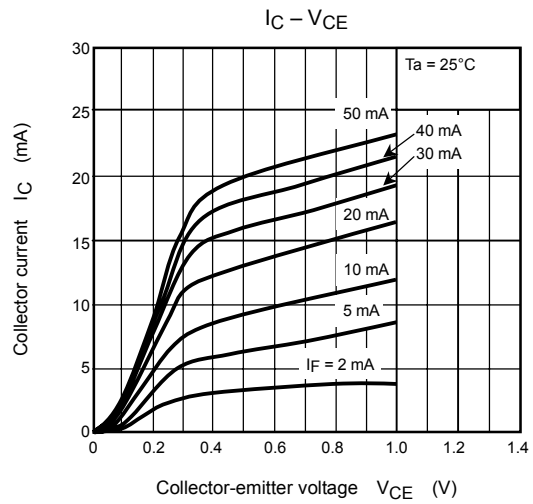
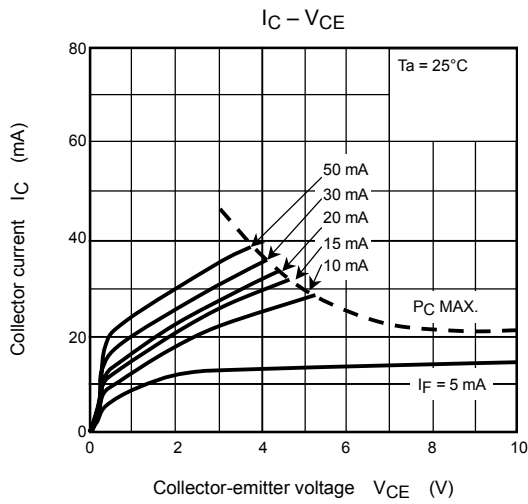
## Switching Characteristics (Ta = 25°C)

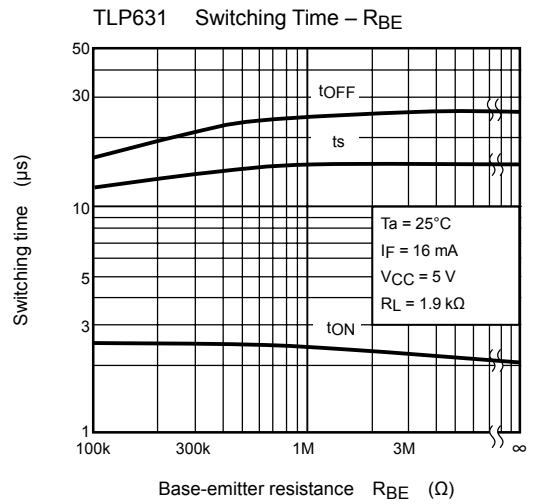
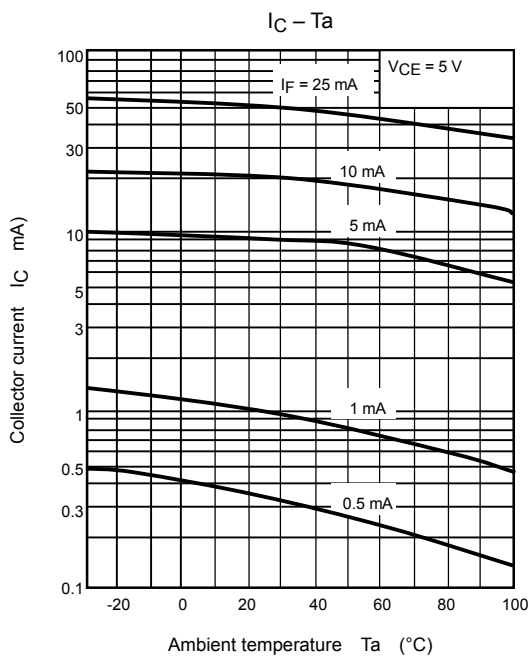
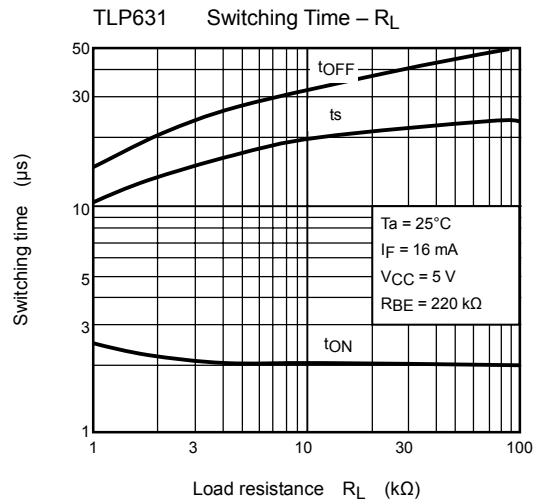
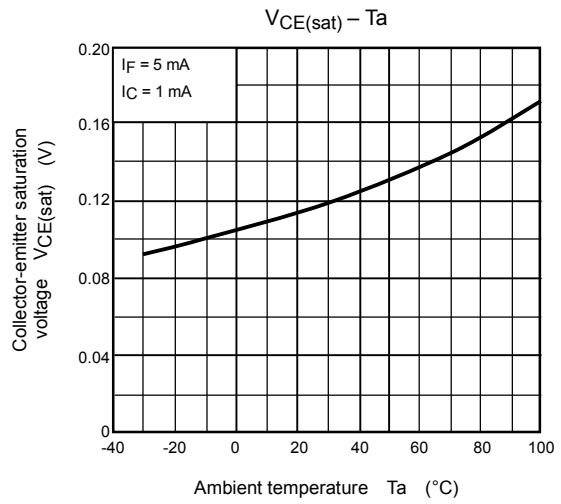
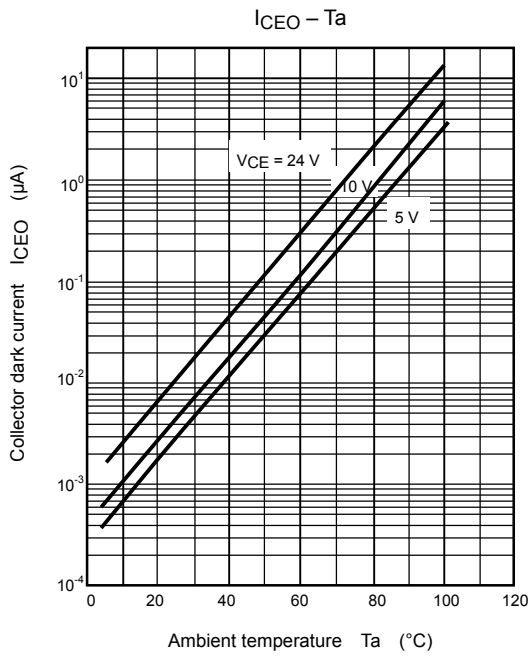
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	$t_r$	$V_{CC} = 10 \text{ V}, I_C = 2 \text{ mA}$ $R_L = 100 \Omega$	—	2	—	$\mu\text{s}$
Fall time	$t_f$		—	3	—	
Turn-on time	$t_{\text{on}}$		—	3	—	
Turn-off time	$t_{\text{off}}$		—	3	—	
Turn-on time	$t_{\text{ON}}$	$R_L = 1.9 \text{ k}\Omega$ (Fig.1) $R_{BE} = \text{OPEN}$ $V_{CC} = 5 \text{ V}, I_F = 16 \text{ mA}$	—	2	—	$\mu\text{s}$
Storage time	$t_s$		—	15	—	
Turn-off time	$t_{\text{OFF}}$		—	25	—	
Turn-on time	$t_{\text{ON}}$	$R_L = 1.9 \text{ k}\Omega$ (Fig.1) $R_{BE} = 220 \text{ k}\Omega$ (TLP631) $V_{CC} = 5 \text{ V}, I_F = 16 \text{ mA}$	—	2	—	$\mu\text{s}$
Storage time	$t_s$		—	12	—	
Turn-off time	$t_{\text{OFF}}$		—	20	—	

Fig. 1 Switching time test circuit









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