

TOSHIBA Photocoupler GaAs IRed & Photo-Transistor

TLP631, TLP632

Programmable Controllers

AC/DC-Input Module

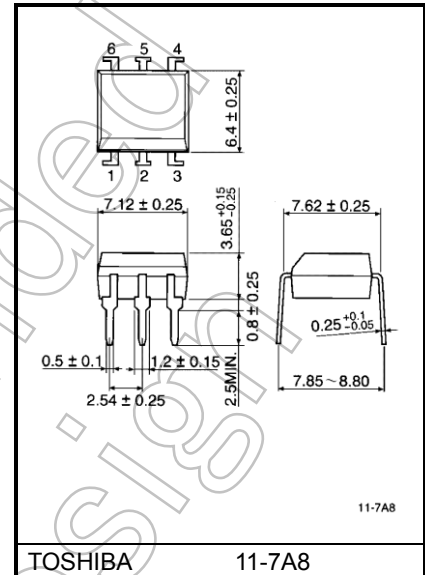
Solid State Relay

Unit: mm

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.

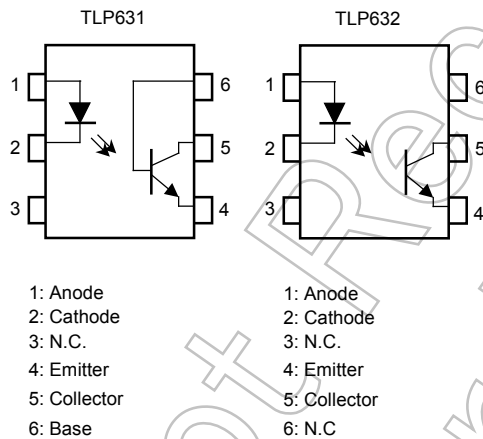
TLP632 has no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55 V (min)
- Current transfer ratio: 50% (min)
Rank GB: 100% (min)
- Isolation voltage: 5000 Vrms (min)
- UL recognized: UL1577, file no. E67349
- cUL approved : CSA Component Acceptance Service
No. 5A, File No.E67349



Weight: 0.4 g (typ.)

Pin Configurations (top view)



Start of commercial production
1983-05

Current Transfer Ratio

Classification (Note 1)	Current Transfer Ratio (%) (Ic/I _F)		Marking Of Classification
	I _F = 5 mA, V _{CE} = 5 V, T _a = 25°C		
	Min	Max	
Blank	50	600	Blank, Y [■] , YE, G, G [■] , GR, B, BL, GB
Rank Y	50	150	YE, Y [■]
Rank GR	100	300	GR, G, G [■]
Rank BL	200	600	BL, B
Rank GB	100	600	GB, GR, G, G [■] , BL, B
Rank YH	75	150	Y [■]
Rank GRL	100	200	G
Rank GRH	150	300	G [■]
Rank BLL	200	400	B

Note 1: Ex, rank GB: TLP631 (GB)

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

TLP631 (GB): TLP631

TLP632 (GB): TLP632

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I _F	60	mA
	Forward current derating (Ta ≥ 39°C)	ΔI _F /°C	-0.7	mA/°C
	Peak forward current (100 μs pulse, 100 pps)	I _{FP}	1	A
	Reverse voltage	V _R	5	V
	Diode power dissipation	P _D	70	mW
	Diode power dissipation derating (Ta ≥ 39 °C)	ΔP _D /°C	-0.82	mW/°C
Detector	Collector-emitter voltage	V _{CEO}	55	V
	Collector-base voltage (TLP631)	V _{CBO}	80	V
	Emitter-collector voltage	V _{ECO}	7	V
	Emitter-base voltage (TLP631)	V _{EBO}	7	V
	Collector current	I _C	50	mA
	Power dissipation	P _C	150	mW
	Power dissipation derating (Ta ≥ 25°C)	ΔP _C /°C	-1.5	mW/°C
Storage temperature range		T _{stg}	-55 to 125	°C
Operating temperature range		T _{opr}	-55 to 100	°C
Lead soldering temperature (10s)		T _{sol}	260	°C
Total package power dissipation		P _T	250	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP _T /°C	-2.5	mW/°C
Isolation voltage (AC, 60 s, R.H. ≤ 60%) (Note 1)		BVs	5000	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}	—	5	24	V
Forward current	I _F	—	16	25	mA
Collector current	I _C	—	1	10	mA
Operating temperature	T _{opr}	-25	—	85	°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.

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	μA
	Capacitance	C_T	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	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	μA
	Capacitance collector to emitter	C_{CE}	$V = 0 \text{ V}, f = 1 \text{ MHz}$	—	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

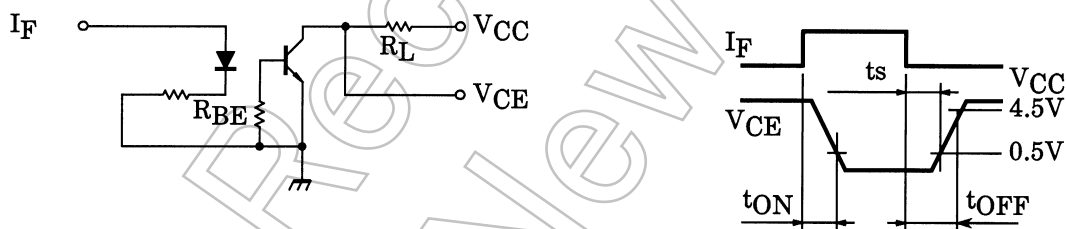
Isolation Characteristics (Ta = 25°C)

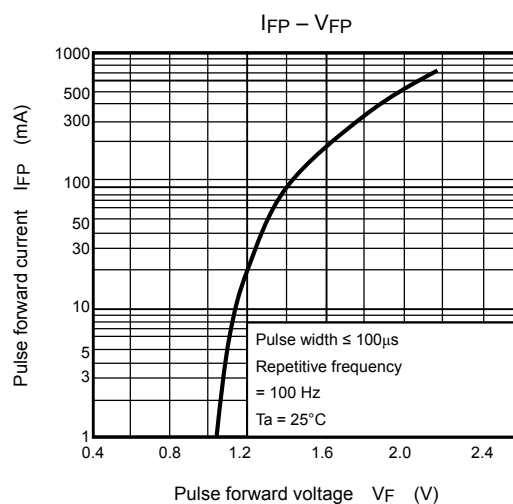
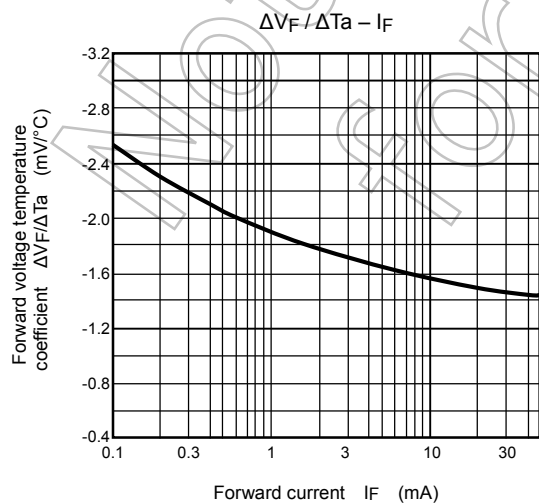
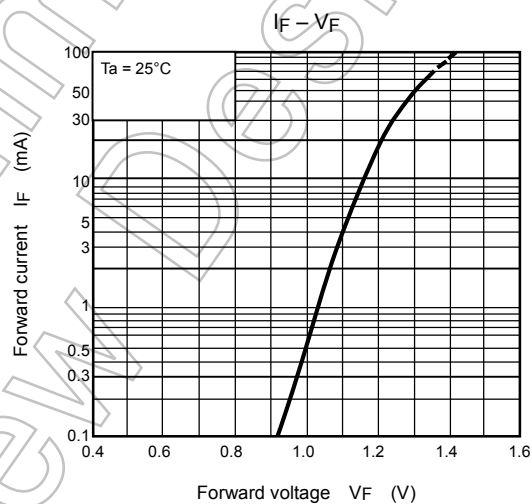
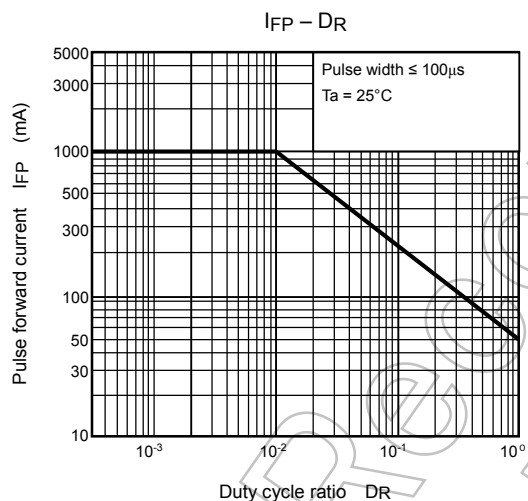
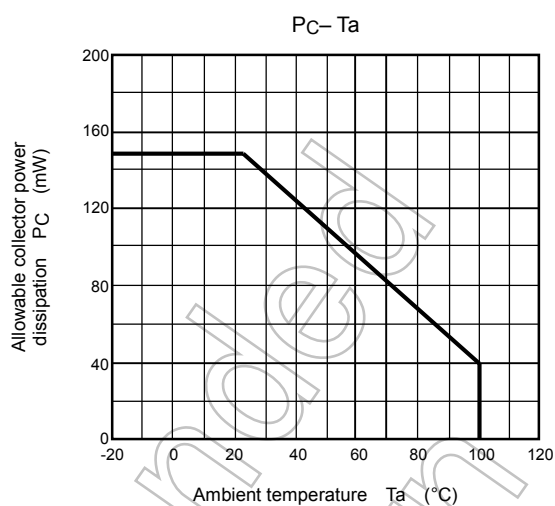
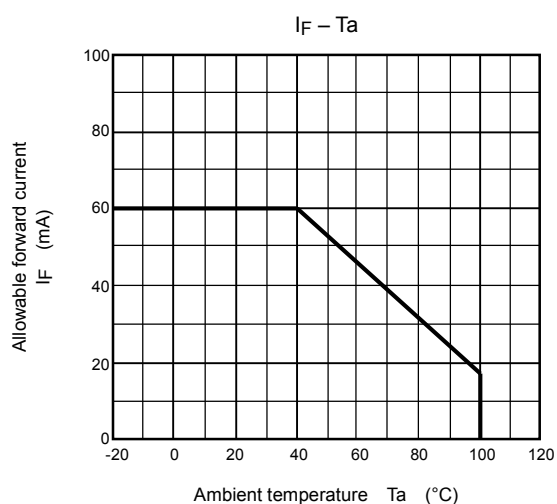
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	CS	VS = 0 V, f = 1 MHz	—	0.8	—	pF
Isolation resistance	RS	VS = 500 V, R.H. ≤ 60%	5×10 ¹⁰	10 ¹⁴	—	Ω
Isolation voltage	BVS	AC, 60 s	5000	—	—	Vrms
		AC, 1 s, in oil	—	10000	—	
		DC, 60 s, in oil	—	10000	—	Vdc

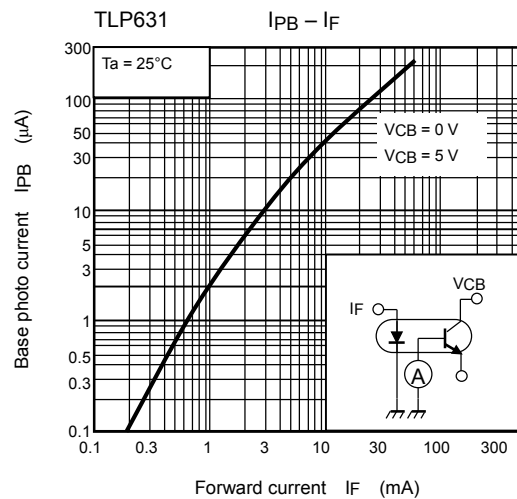
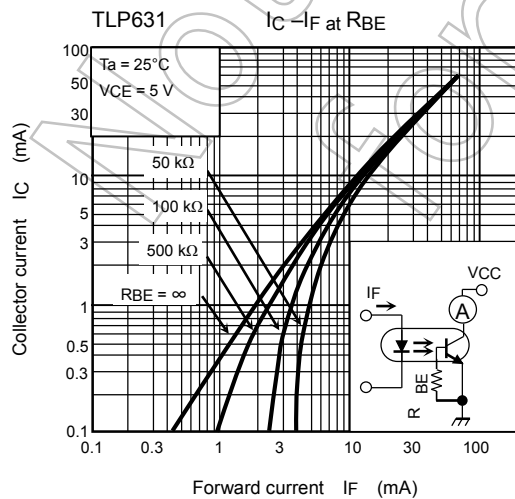
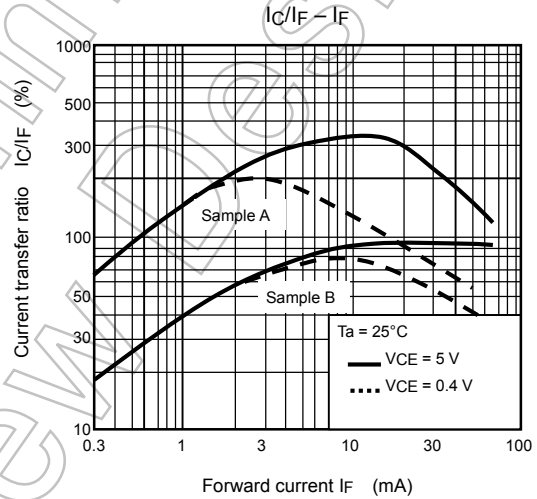
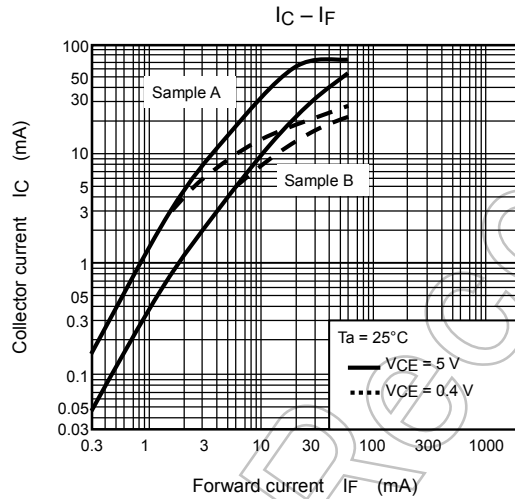
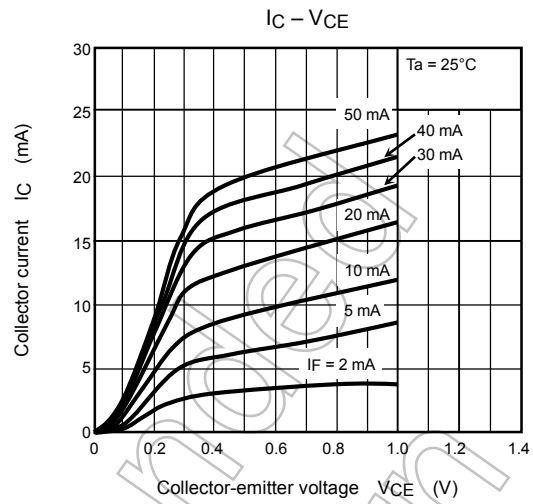
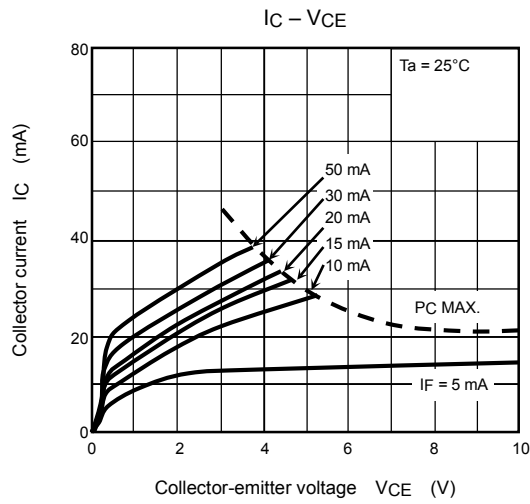
Switching Characteristics (Ta = 25°C)

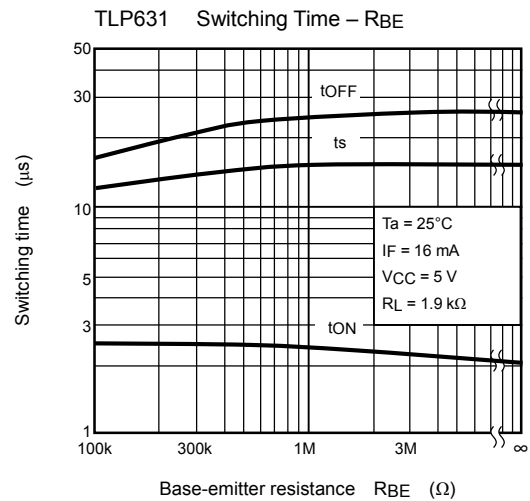
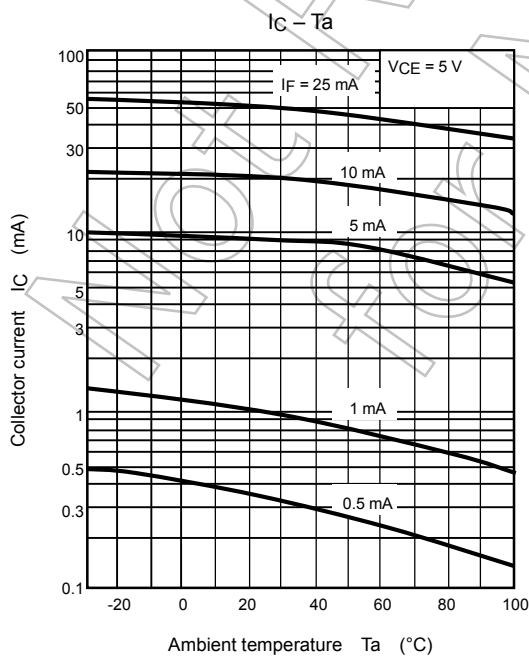
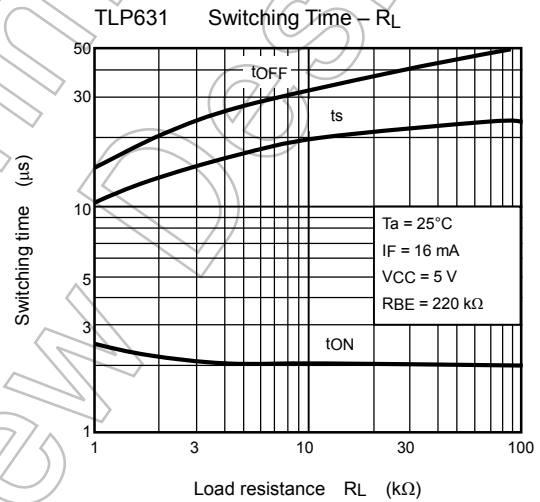
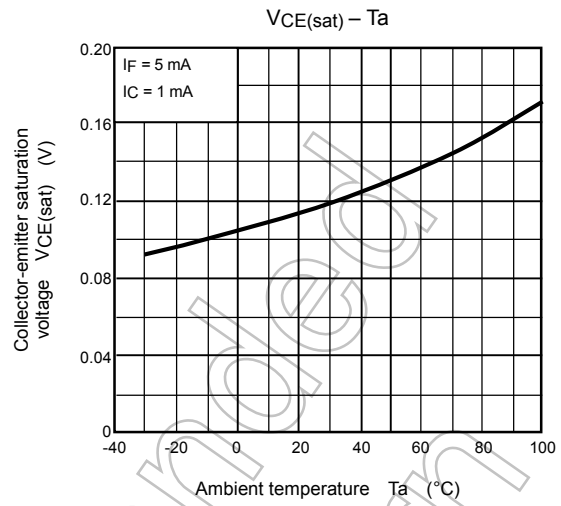
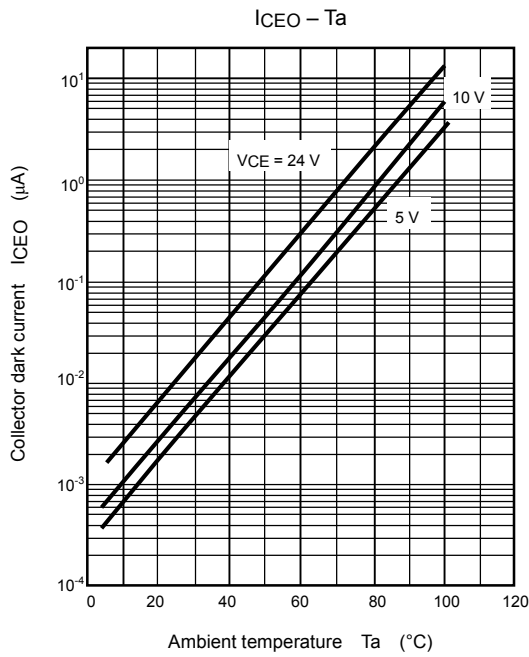
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	tr	VCC = 10 V, IC = 2 mA RL = 100Ω	—	2	—	μs
Fall time	tf		—	3	—	
Turn-on time	ton		—	3	—	
Turn-off time	toff		—	3	—	
Turn-on time	ton	RL = 1.9 kΩ (Fig.1) RBE = OPEN VCC = 5 V, IF = 16 mA	—	2	—	μs
Storage time	ts		—	15	—	
Turn-off time	toff		—	25	—	
Turn-on time	ton	RL = 1.9 kΩ (Fig.1) RBE = 220 kΩ (TLP631) VCC = 5 V, IF = 16 mA	—	2	—	μs
Storage time	ts		—	12	—	
Turn-off time	toff		—	20	—	

Fig. 1 Switching time test circuit









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