

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

## TLP731, TLP732

Office Machine  
Household Use Equipment  
Solid State Relay  
Switching Power Supply

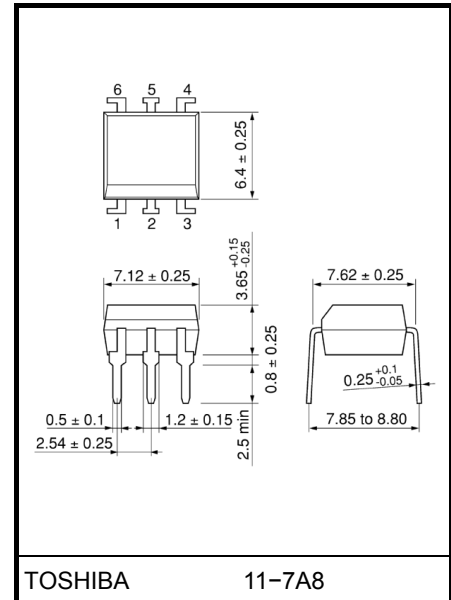
The TOSHIBA TLP731 and TLP732 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP package.  
TLP732 is no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55V (min)
- Current transfer ratio: 50% (min)  
Rank GB: 100% (min)
- UL recognized: UL1577, file No. E67349
- c-UL recognized: CSA Component Acceptance Service No. 5A  
File No. E67349
- BSI approved: BS EN60065: 2002  
Certificate No. 8877  
BS EN60950-1: 2002  
Certificate No. 8878
- Isolation voltage: 4000 V<sub>rms</sub> (min)
- Option (D4) type  
VDE approved: DIN EN 60747-5-2,  
Certificate No. 40009302  
Maximum operating insulation voltage: 630V<sub>PK</sub>  
Highest permissible over voltage: 6000V<sub>PK</sub>

**(Note)** When a EN 60747-5-2 approved type is needed, please designate the "Option (D4)"

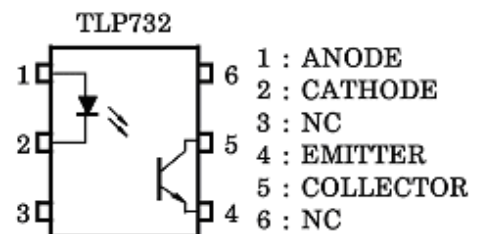
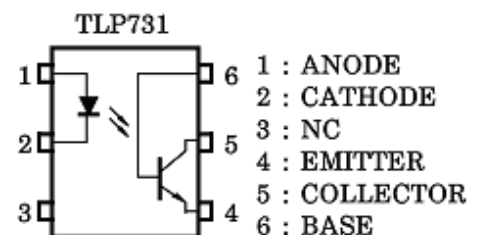
	7.62mm pich standard type	10.16mm pich (LF2) type
• Creepage distance	: 7.0mm (min)	8.0 mm (min)
Clearance	: 7.0 mm (min)	8.0 mm (min)
Insulation thickness	: 0.5 mm (min)	0.5 mm (min)

Unit: mm



Weight: 0.35 g (typ.)

### Pin Configurations (top view)



Start of commercial production  
1985/02

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

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_F$	60	mA
	Forward current derating (Ta ≥ 39°C)	$\Delta I_F / ^\circ\text{C}$	-0.7	mA / °C
	Peak forward current (100µs pulse, 100pps)	$I_{FP}$	1	A
	Power dissipation	$P_D$	100	mW
	Power dissipation derating (Ta ≥ 25°C)	$\Delta P_D / ^\circ\text{C}$	-1.0	mW / °C
	Reverse voltage	$V_R$	5	V
	Junction temperature	$T_j$	125	°C
Detector	Collector-emitter voltage	$V_{CEO}$	55	V
	Collector-base voltage (TLP731)	$V_{CBO}$	80	V
	Emitter-collector voltage	$V_{ECO}$	7	V
	Emitter-base voltage (TLP731)	$V_{EBO}$	7	V
	Collector current	$I_C$	50	mA
	Power dissipation	$P_C$	150	mW
	Power dissipation derating (Ta ≥ 25°C)	$\Delta P_C / ^\circ\text{C}$	-1.5	mW / °C
	Junction temperature	$T_j$	125	°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)		$\Delta P_T / ^\circ\text{C}$	-2.5	mW / °C
Isolation voltage (AC, 1minute, R.H. ≤ 60%)		$BV_S$	4000	$V_{rms}$

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).

## 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.

## 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 (TLP731)	$V_{(BR)CBO}$	$I_C = 0.1\text{mA}$	80	—	—	V	
	Emitter-base breakdown voltage (TLP731)	$V_{(BR)EBO}$	$I_E = 0.1\text{mA}$	7	—	—	V	
	Collector dark current	$I_{CEO}$	$V_{CE} = 24\text{V}$	$V_{CE} = 24\text{V}, T_a = 25^\circ\text{C}$	—	10	100	nA
				$V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$	—	2	50	$\mu\text{A}$
	Collector dark current (TLP731)	$I_{CER}$	$V_{CE} = 24\text{V}, T_a = 85^\circ\text{C}$ $R_{BE} = 1\text{M}\Omega$	—	0.5	10	$\mu\text{A}$	
	Collector dark current (TLP731)	$I_{CBO}$	$V_{CB} = 10\text{V}$	—	0.1	—	nA	
	DC forward current gain (TLP731)	$h_{FE}$	$V_{CE} = 5\text{V}, I_C = 0.5\text{mA}$	—	400	—	—	
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	—	—	
Base photo-current (TLP731)	$I_{PB}$	$I_F = 5\text{mA}, V_{CB} = 5\text{V}$	—	10	—	$\mu\text{A}$	
Collector-emitter saturation voltage	$V_{CE} (\text{sat})$	$I_C = 2.4\text{mA}, I_F = 8\text{mA}$	Rank GB	—	—	0.4	V
				—	0.2	—	
				—	—	0.4	

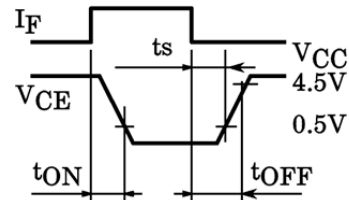
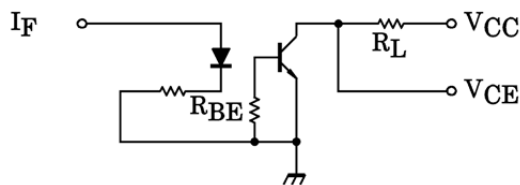
## Isolation Characteristics (Ta = 25°C)

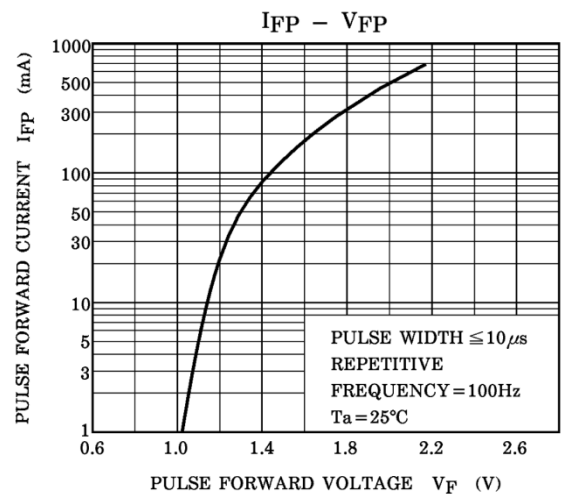
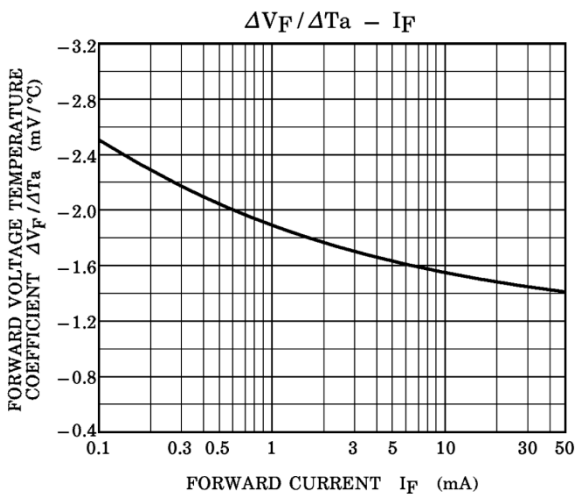
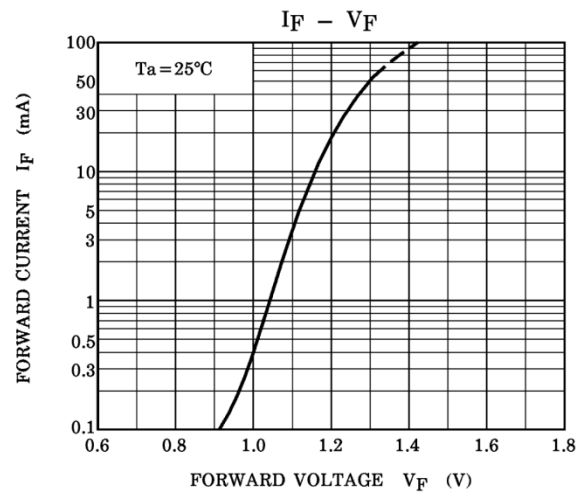
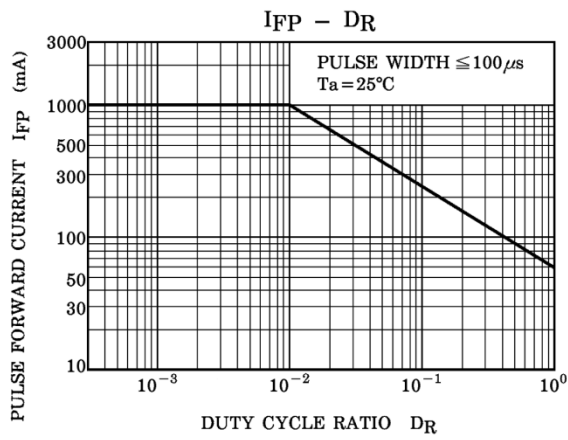
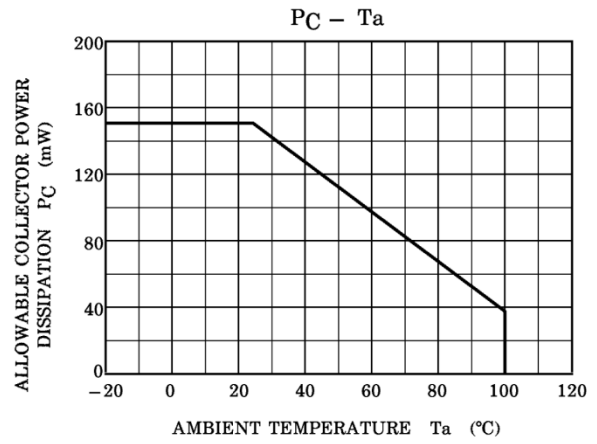
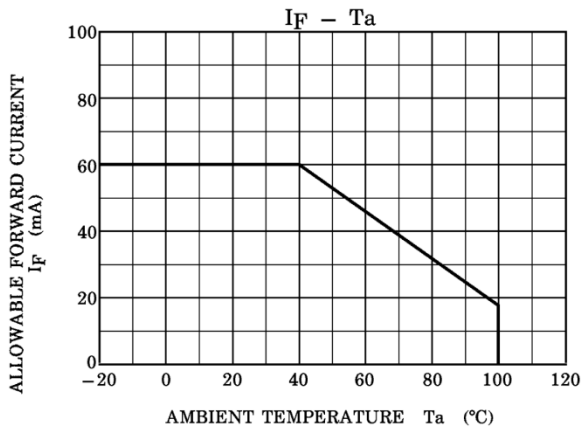
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V, R.H. ≤ 60%	1×10 <sup>12</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	4000	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

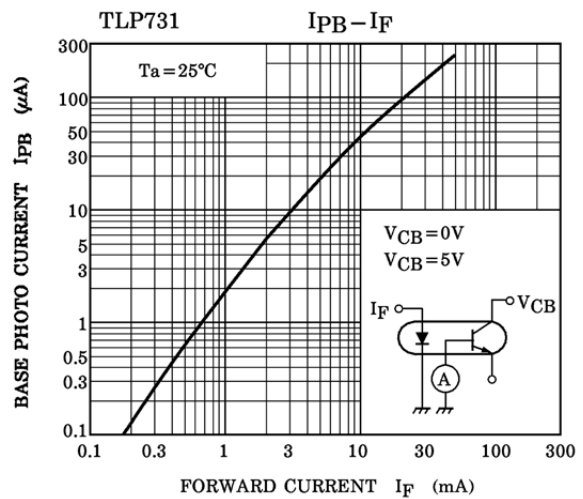
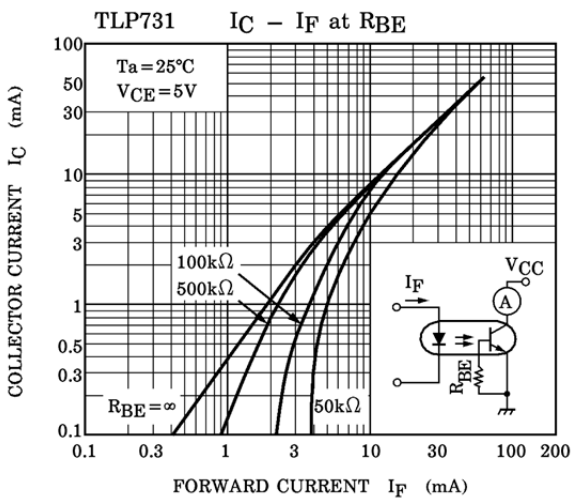
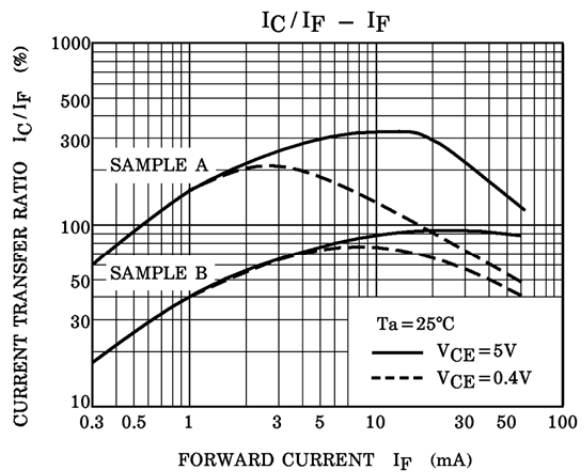
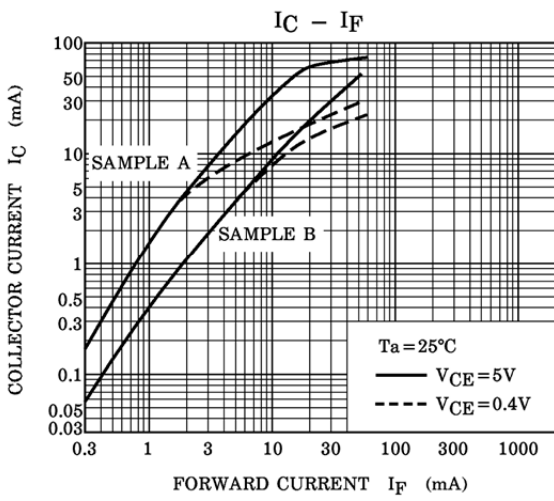
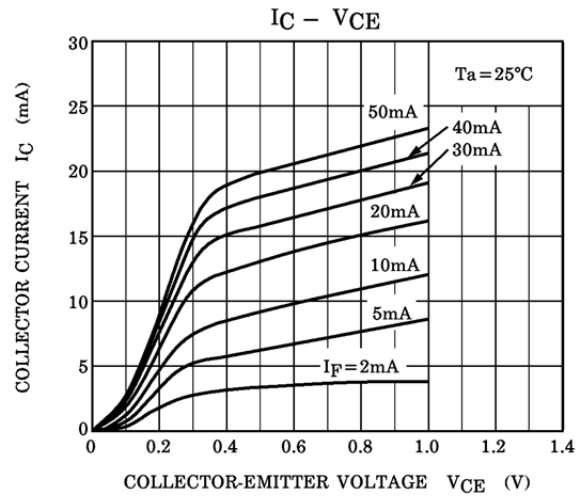
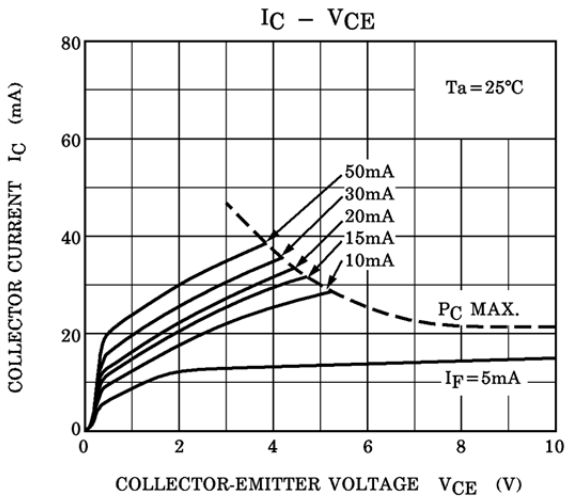
## Switching Characteristics (Ta = 25°C)

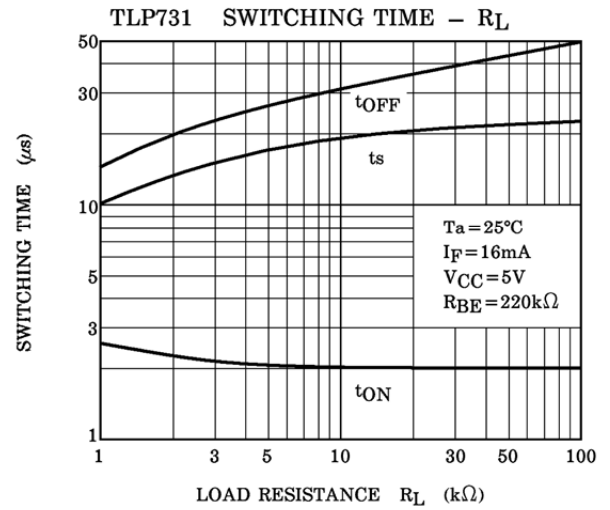
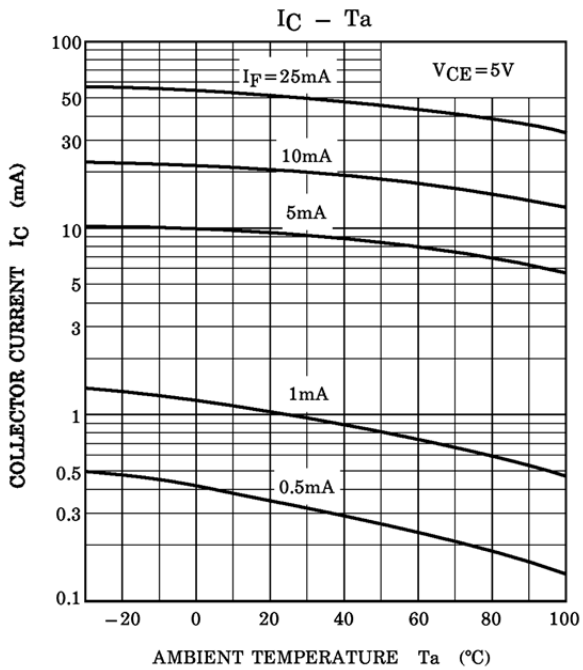
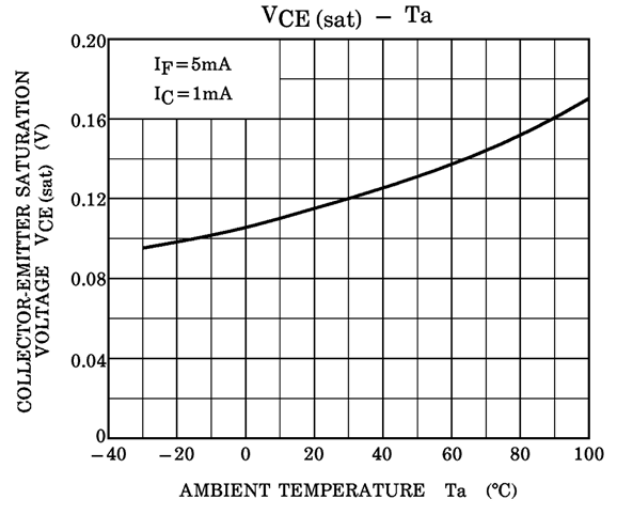
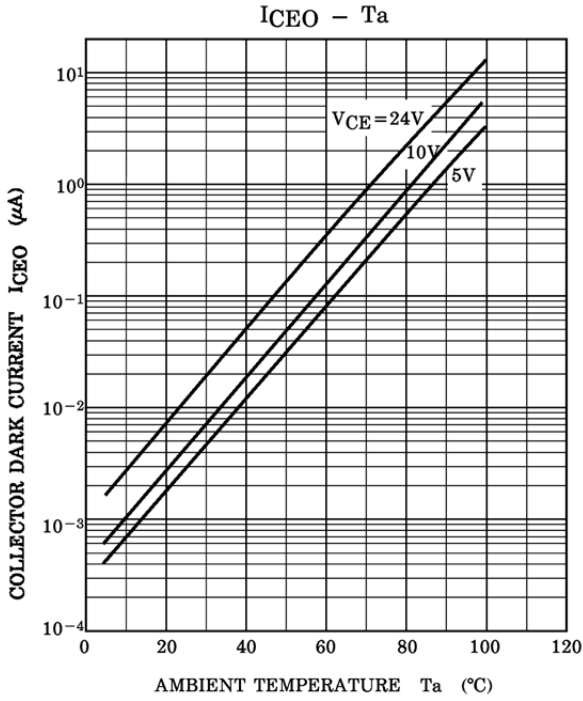
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V, I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	10	
Turn-off time	t <sub>off</sub>		—	3	10	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ (Fig.1) R <sub>BE</sub> = open V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	—	2	—	μs
Storage time	t <sub>s</sub>		—	15	—	
Turn-off time	t <sub>OFF</sub>		—	25	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ (Fig.1) R <sub>BE</sub> = 220kΩ (TLP731) V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	—	2	—	μs
Storage time	t <sub>s</sub>		—	12	—	
Turn-off time	t <sub>OFF</sub>		—	20	—	

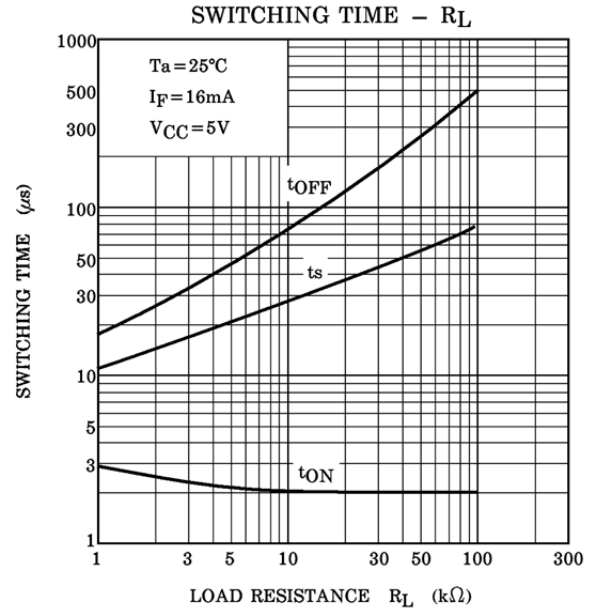
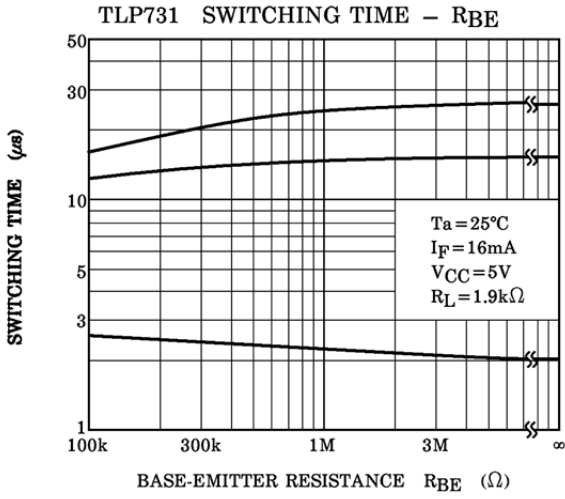
Fig. 1 Switching time test circuit













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