

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.

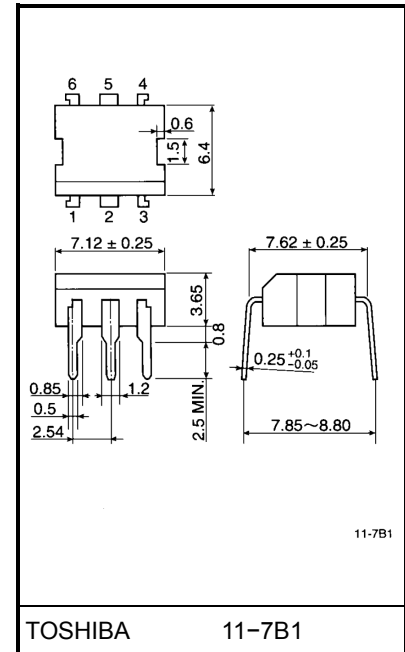
TLP732 is no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55V (min.)
- Current transfer ratio: 50% (min.)  
Rank GB: 100% (min.)
- UL recognized: UL1577, file No. E67349
- BSI approved: BS EN60065: 1994  
Certificate No. 6617  
BS EN60950: 1992  
Certificate No. 7366  
Isolation voltage: 4000V<sub>rms</sub> (min.)
- Option (D4) type  
VDE approved: DIN VDE0884 / 08.87,  
Certificate No. 65640  
Maximum operating insulation voltage: 630V<sub>PK</sub>  
Highest permissible over voltage: 6000V<sub>PK</sub>

**(Note)** When a VDE0884 approved type is needed, please designate the "Option (D4)"

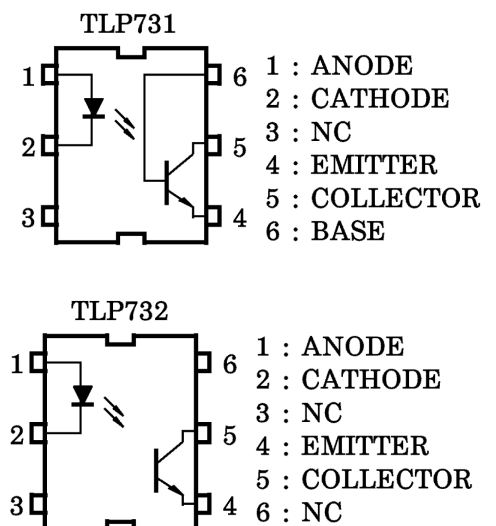
	7.62mm pich standard type	10.16mm pich (LF2) type
Creepage distance	: 7.0mm (min.)	8.0 mm (min.)
Clearance	: 7.0 mm (min.)	8.0 mm (min.)
Insulation thickness	: 0.5 mm (min.)	0.5 mm (min.)

Unit in mm



Weight: 0.35 g

### Pin Configurations (top view)



**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		$T_{stg}$	-55~125	°C
Operating temperature range		$T_{opr}$	-55~100	°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, 1min., R.H. ≤ 60%)		$BV_S$	4000	V <sub>rms</sub>

**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

**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	$I_{CEO}$	$V_{CE} = 24\text{V}$	—	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	$V_{CE} (\text{sat})$	$I_C = 2.4\text{mA}, I_F = 8\text{mA}$	—	—	0.4	V
		$I_C = 0.2\text{mA}, I_F = 1\text{mA}$ Rank GB	—	0.2	—	
			—	—	0.4	

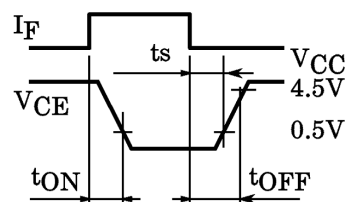
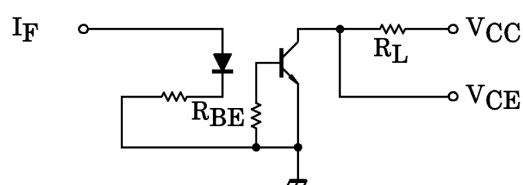
## Isolation Characteristics (Ta = 25°C)

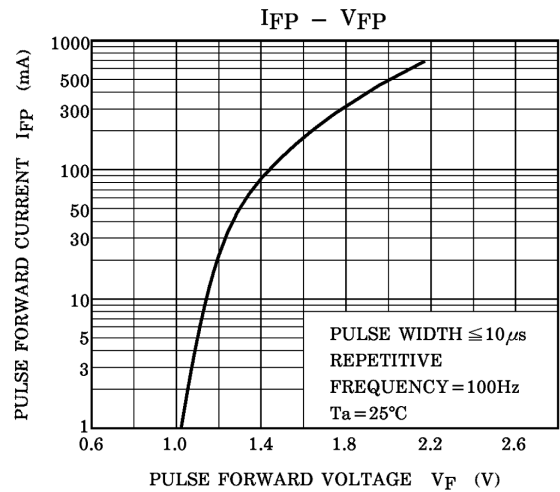
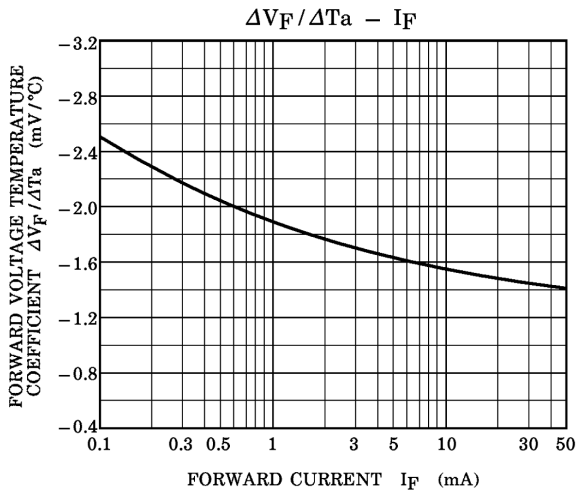
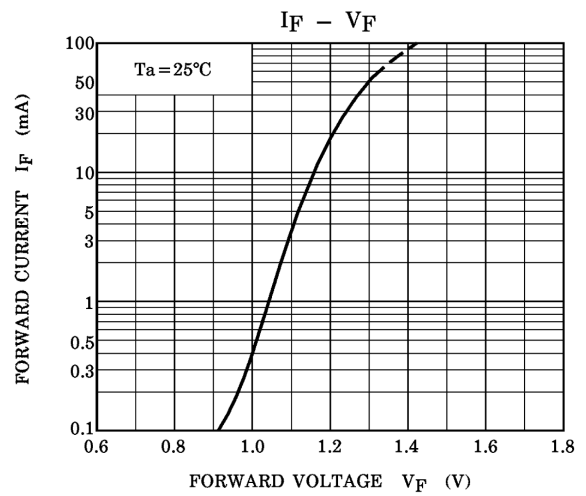
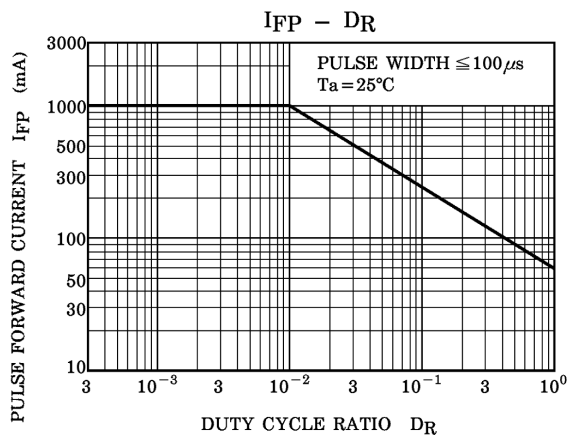
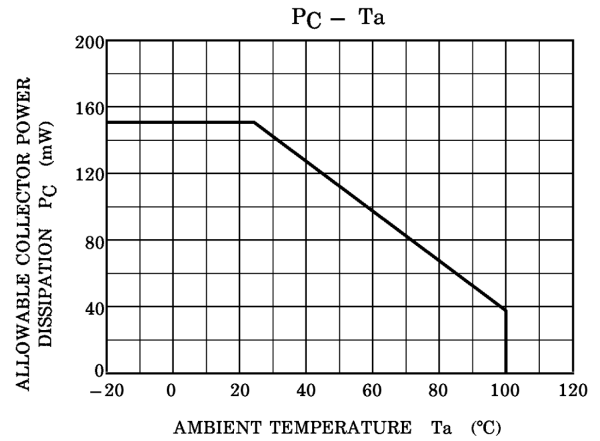
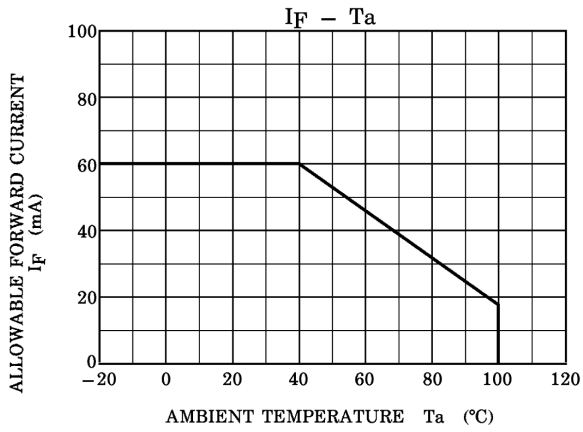
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V	1×10 <sup>12</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	4000	—	—	V <sub>rms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

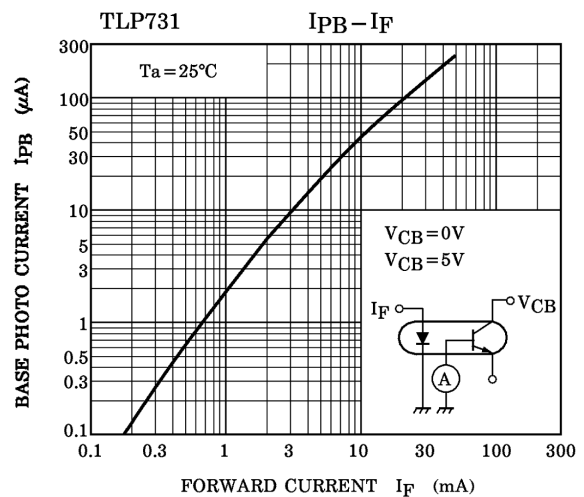
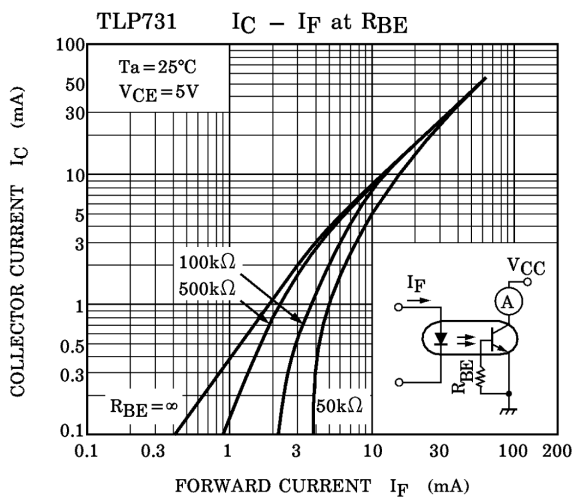
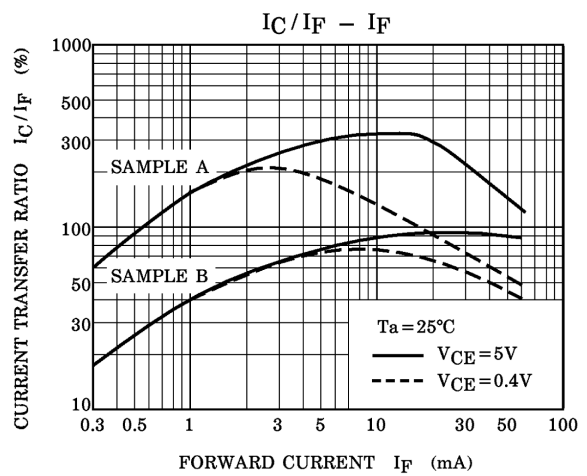
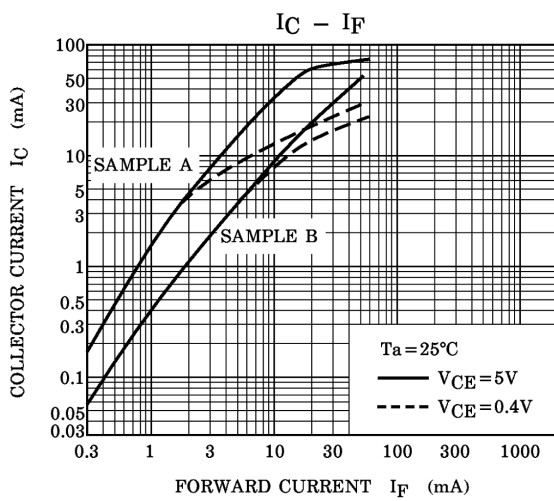
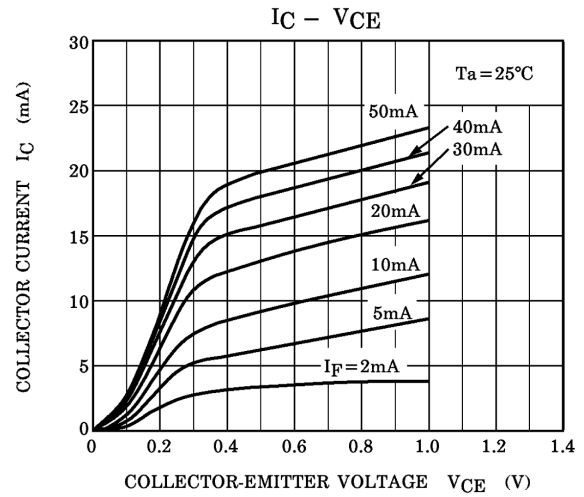
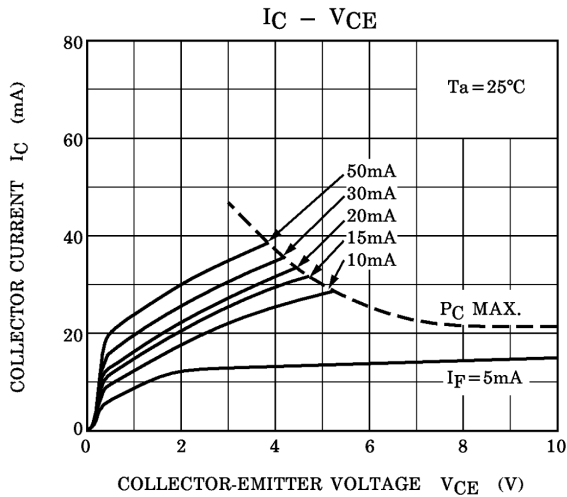
## Switching Characteristics (Ta = 25°C)

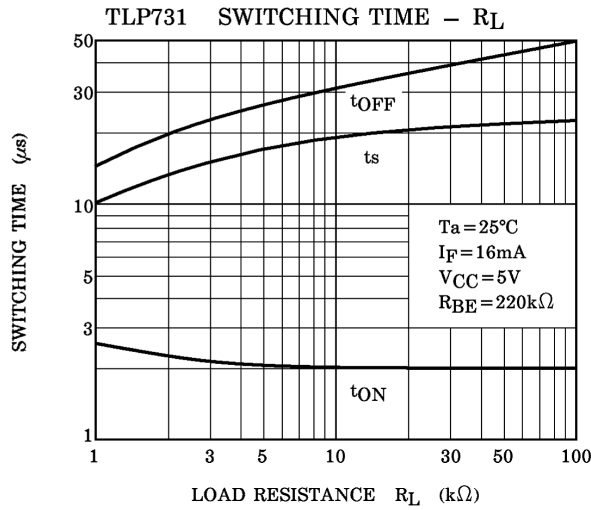
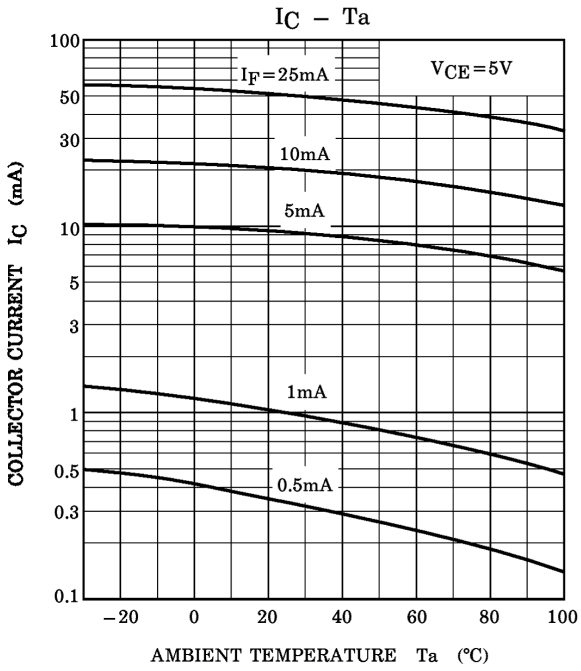
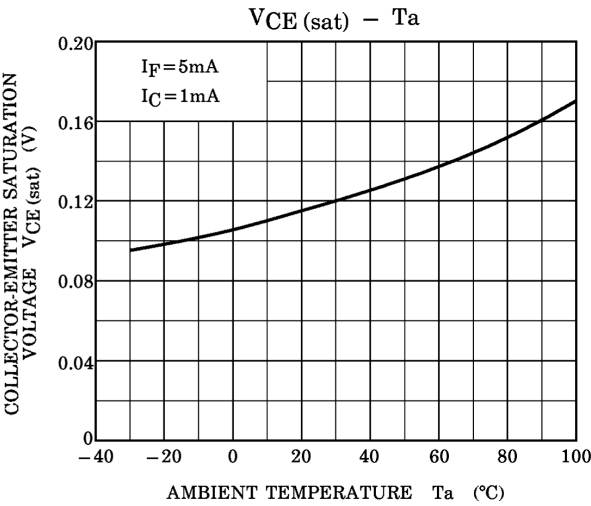
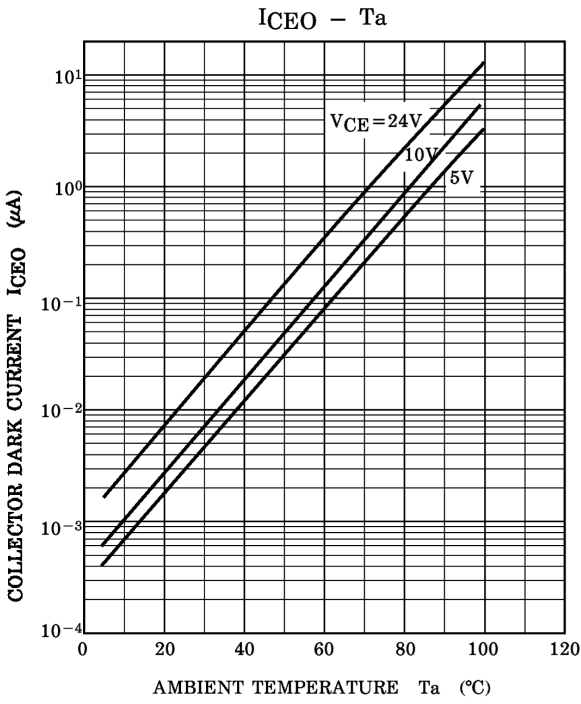
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V, I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	10	
Turn-off time	t <sub>off</sub>		—	3	10	
Turn-on time	t <sub>ON</sub>	R <sub>L</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	—	

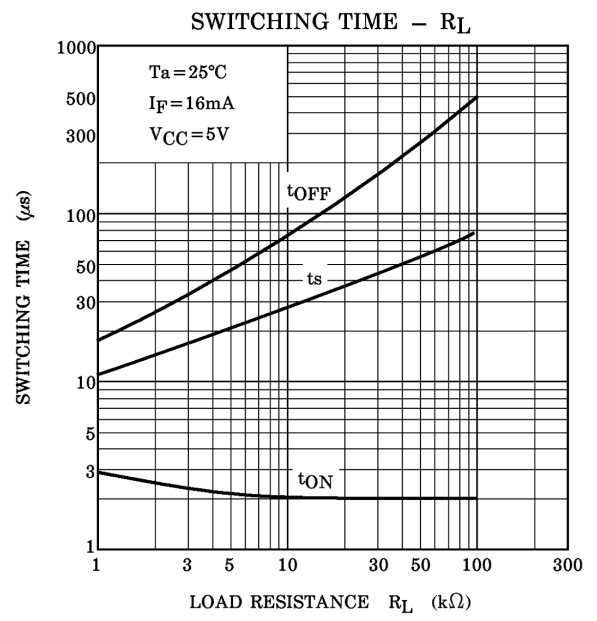
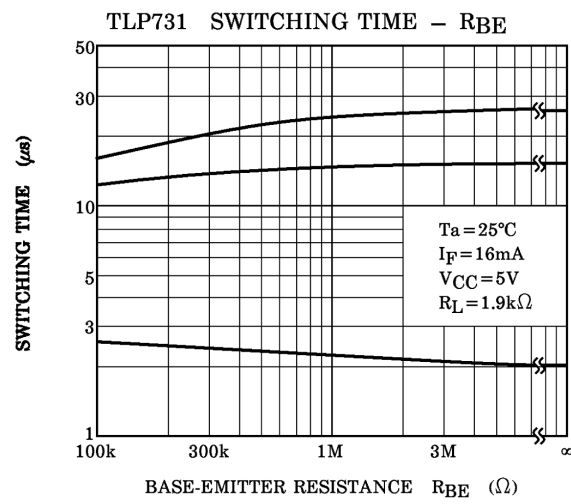
Fig. 1 Switching time test circuit













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