

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
- Isolation voltage: 4000 Vrms (min)
- c-UL recognized: CSA Component Acceptance Service No. 5A  
File No.E67349
- Option (D4) type  
VDE approved: EN 60747-5-5,  
Certificate No. 40009302

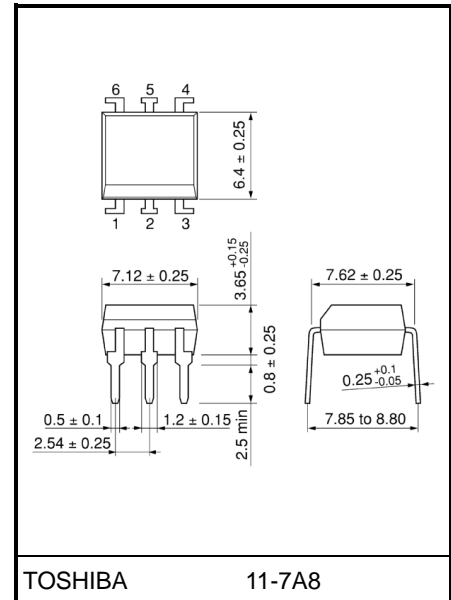
Maximum operating insulation voltage: 630V<sub>PK</sub>

Highest permissible over voltage: 6000V<sub>PK</sub>

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

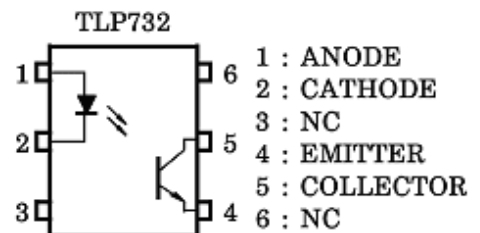
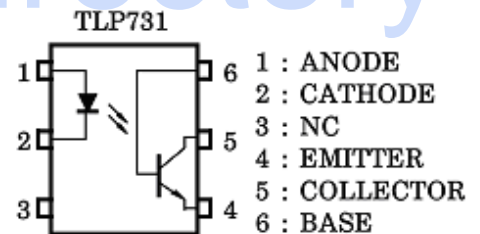
- Creepage distance : 7.0mm (min)
- Clearance : 7.0 mm (min)
- Insulation thickness : 0.5 mm (min)

Unit: mm



Weight: 0.35 g (typ.)

### Pin Configurations (top view)



Start of commercial production  
1985-02

## Current Transfer Ratio

Classification (Note 1)	Current Transfer Ratio (%) ( $I_C / I_F$ )		Marking Of Classification
	$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}, T_a = 25^\circ\text{C}$		
	Min	Max	
Blank	50	600	Blank, Y <sup>■</sup> , YE, G, G <sup>■</sup> , GR, B, BL, GB
Rank Y	50	150	YE, Y <sup>■</sup>
Rank GR	100	300	GR, G, G <sup>■</sup>
Rank BL	200	600	BL, B
Rank GB	100	600	GB, GR, G, G <sup>■</sup> , BL, B,

Note: The product with the Rank Y and BL are limited in production.

For details, please contact your nearest Toshiba sales representative.

Note 1: Ex. rank GB: TLP731 (GB)

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

TLP731(GB): TLP731

TLP732(GB): TLP732

## Absolute 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
	Power dissipation	P <sub>D</sub>	70	mW
	Power dissipation derating (Ta ≥ 39°C)	ΔP <sub>D</sub> / °C	-0.82	mW / °C
	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 (TLP731)	V <sub>CB0</sub>	80	V
	Emitter-collector voltage	V <sub>ECO</sub>	7	V
	Emitter-base voltage (TLP731)	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 to 125	°C
Operating temperature range		T <sub>opr</sub>	-55 to 100	°C
Lead soldering temperature (10 s)		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, 60 s, R.H. ≤ 60%) (Note 1)		BV <sub>S</sub>	4000	V <sub>rms</sub>

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 <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

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 <sub>F</sub>	I <sub>F</sub> = 10mA	1.0	1.15	1.3	V
	Reverse current	I <sub>R</sub>	V <sub>R</sub> = 5V	—	—	10	μA
	Capacitance	C <sub>T</sub>	V = 0 V, f = 1MHz	—	30	—	pF
Detector	Collector-emitter breakdown voltage	V <sub>(BR)CEO</sub>	I <sub>C</sub> = 0.5mA	55	—	—	V
	Emitter-collector breakdown voltage	V <sub>(BR)ECO</sub>	I <sub>E</sub> = 0.1mA	7	—	—	V
	Collector-base breakdown voltage (TLP731)	V <sub>(BR)CBO</sub>	I <sub>C</sub> = 0.1mA	80	—	—	V
	Emitter-base breakdown voltage (TLP731)	V <sub>(BR)EBO</sub>	I <sub>E</sub> = 0.1mA	7	—	—	V
	Collector dark current	I <sub>CEO</sub>	V <sub>CE</sub> = 24V	—	10	100	nA
			V <sub>CE</sub> = 24V, Ta = 85°C	—	2	50	μA
	Collector dark current (TLP731)	I <sub>CER</sub>	V <sub>CE</sub> = 24V, Ta = 85°C R <sub>BE</sub> = 1MΩ	—	0.5	10	μA
	Collector dark current (TLP731)	I <sub>CBO</sub>	V <sub>CB</sub> = 10V	—	0.1	—	nA
	DC forward current gain (TLP731)	h <sub>FE</sub>	V <sub>CE</sub> = 5V, I <sub>C</sub> = 0.5mA	—	400	—	—
Capacitance collector to emitter	C <sub>CE</sub>	V = 0 V, f = 1MHz	—	10	—	pF	

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

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I <sub>C</sub> / I <sub>F</sub>	I <sub>F</sub> = 5mA, V <sub>CE</sub> = 5V Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	I <sub>C</sub> / I <sub>F</sub> (sat)	I <sub>F</sub> = 1mA, V <sub>CE</sub> = 0.4V Rank GB	—	60	—	%
			30	—	—	
Base photo-current (TLP731)	I <sub>PB</sub>	I <sub>F</sub> = 5mA, V <sub>CB</sub> = 5V	—	10	—	μA
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> = 2.4mA, I <sub>F</sub> = 8mA	—	—	0.4	V
		I <sub>C</sub> = 0.2mA, I <sub>F</sub> = 1mA Rank GB	—	0.2	—	
			—	—	0.4	

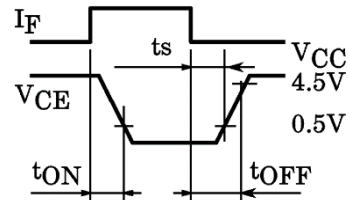
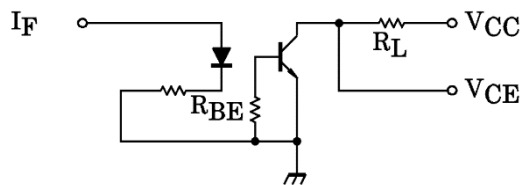
## Isolation Characteristics (Ta = 25°C)

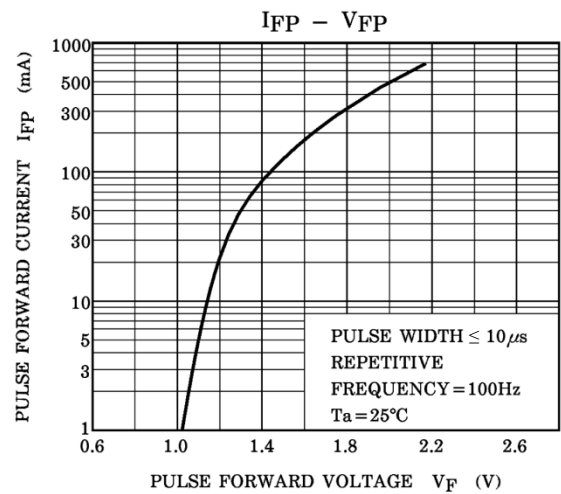
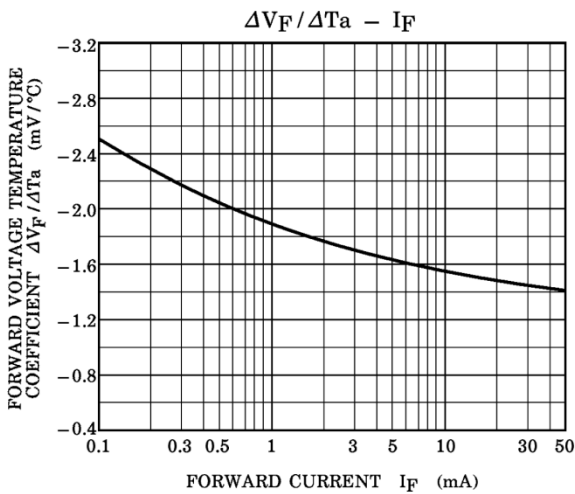
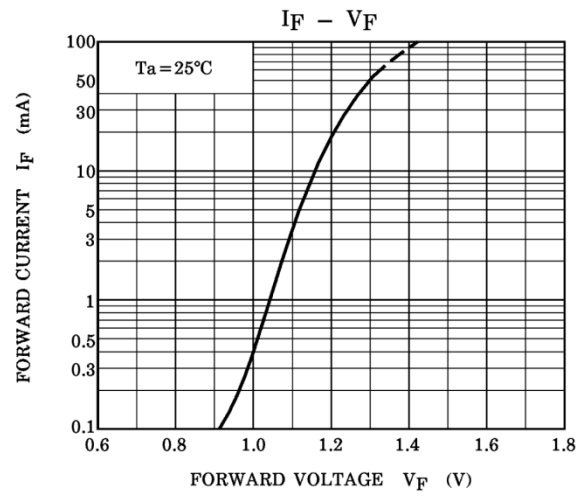
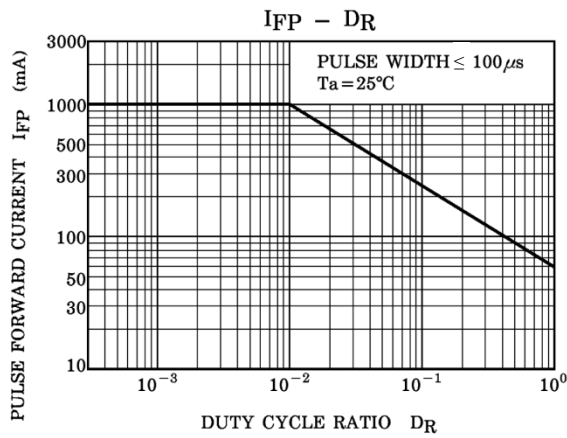
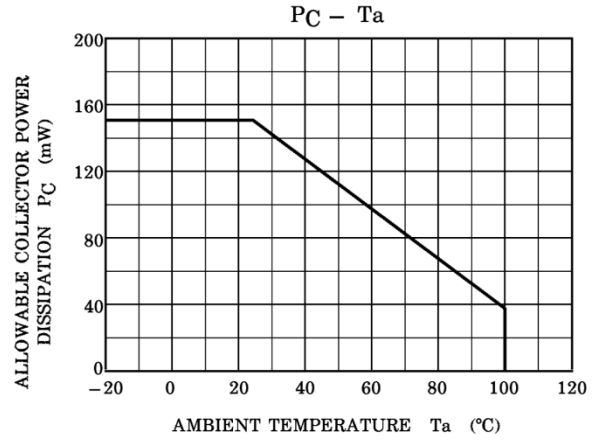
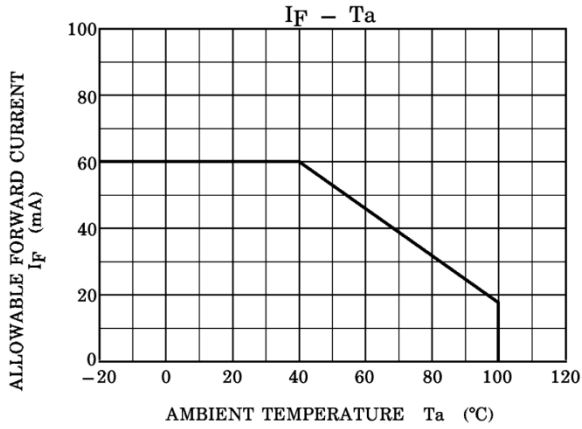
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	Cs	Vs = 0 V, f = 1MHz	—	0.8	—	pF
Isolation resistance	Rs	Vs = 500V, R.H.≤60%	1×10 <sup>12</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BVs	AC, 60 s	4000	—	—	Vrms
		AC, 1 s, in oil	—	10000	—	
		DC, 60 s, in oil	—	10000	—	Vdc

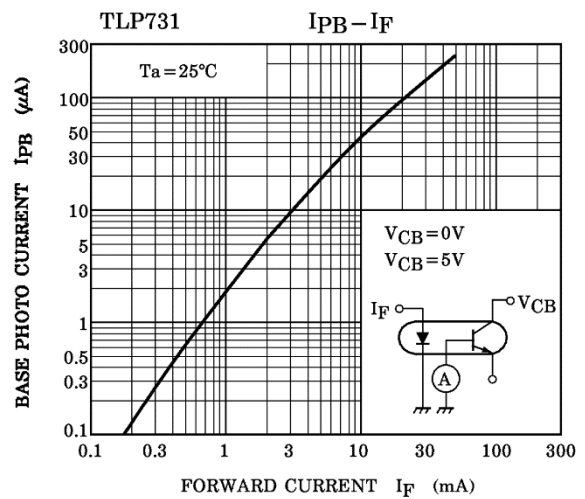
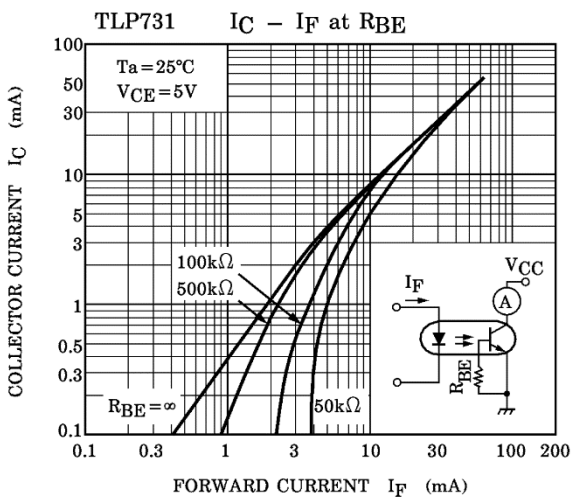
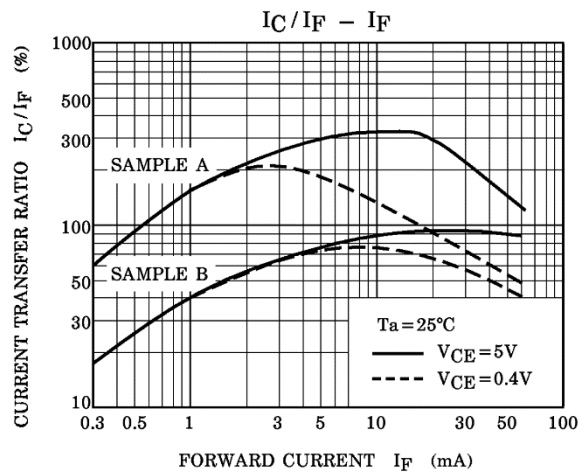
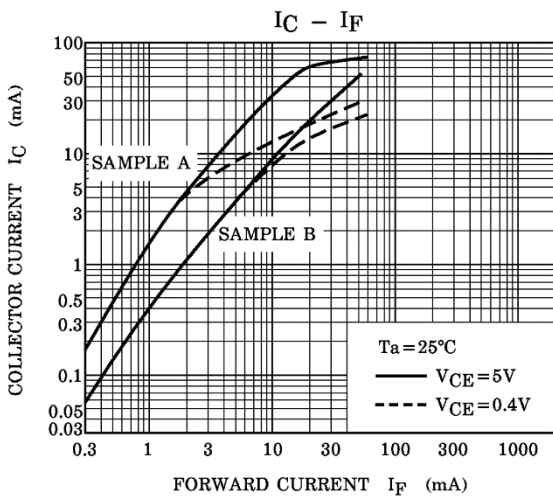
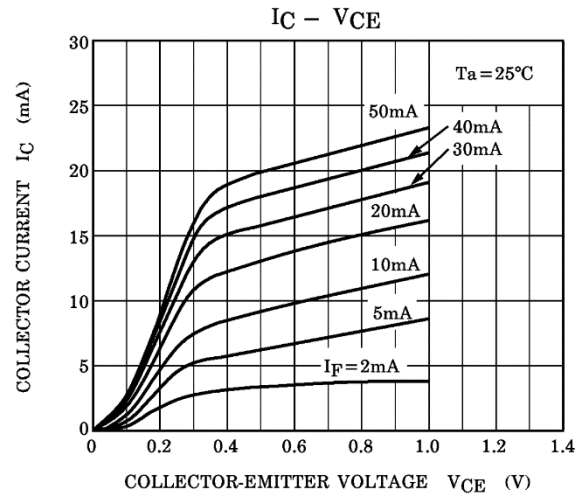
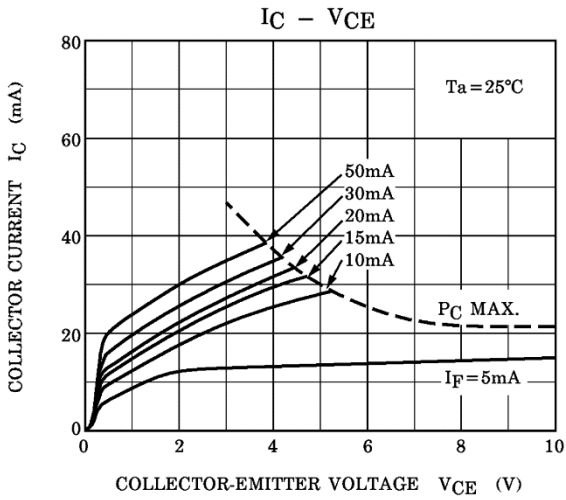
## Switching Characteristics (Ta = 25°C)

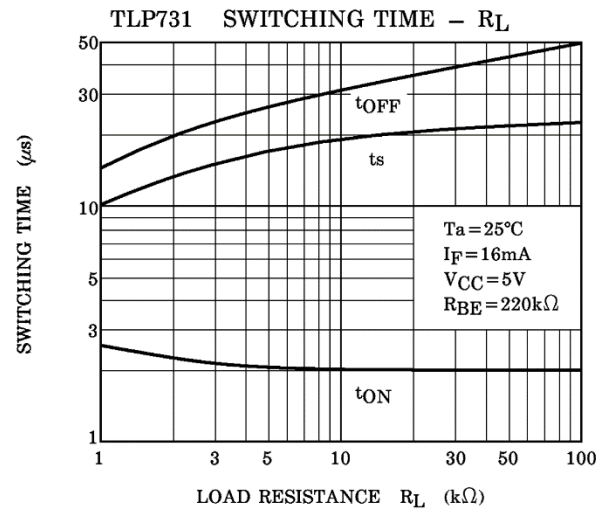
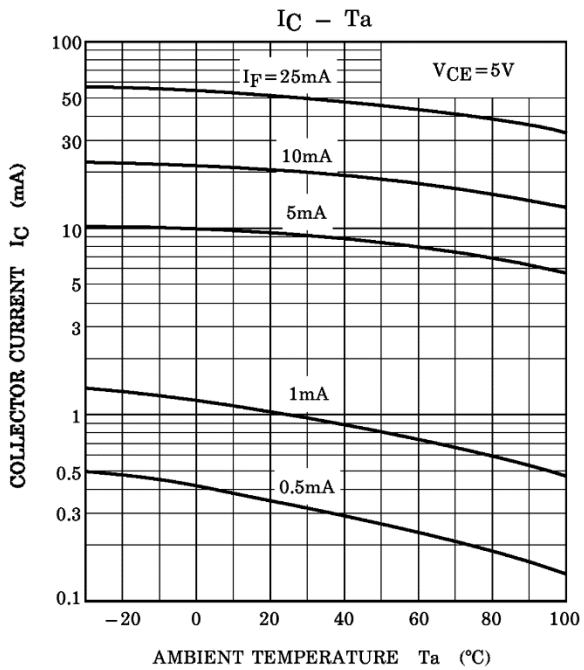
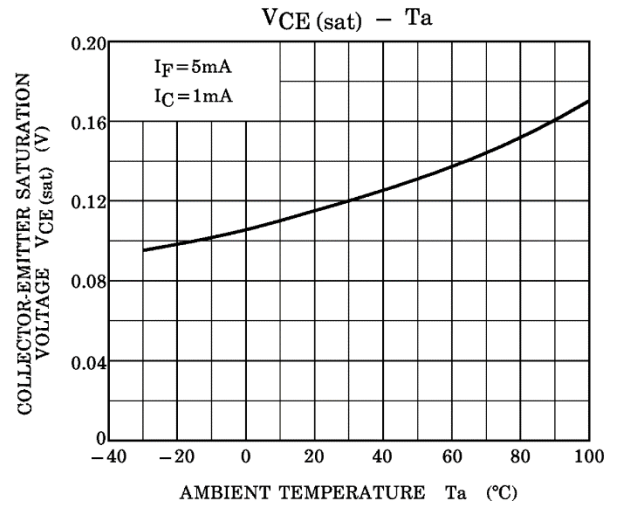
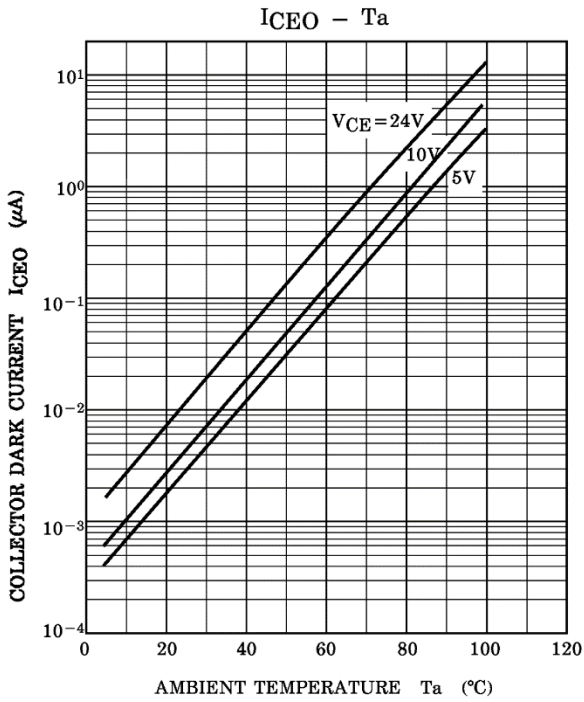
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	tr	VCC = 10V, IC = 2mA RL = 100Ω	—	2	—	μs
Fall time	tf		—	3	—	
Turn-on time	ton		—	3	10	
Turn-off time	toff		—	3	10	
Turn-on time	tON	RL = 1.9kΩ (Fig.1) RBE = open VCC = 5V, IF = 16mA	—	2	—	μs
Storage time	ts		—	15	—	
Turn-off time	tOFF		—	25	—	
Turn-on time	tON	RL = 1.9kΩ (Fig.1) RBE = 220kΩ (TLP731) VCC = 5V, IF = 16mA	—	2	—	μs
Storage time	ts		—	12	—	
Turn-off time	tOFF		—	20	—	

Fig. 1 Switching time test circuit

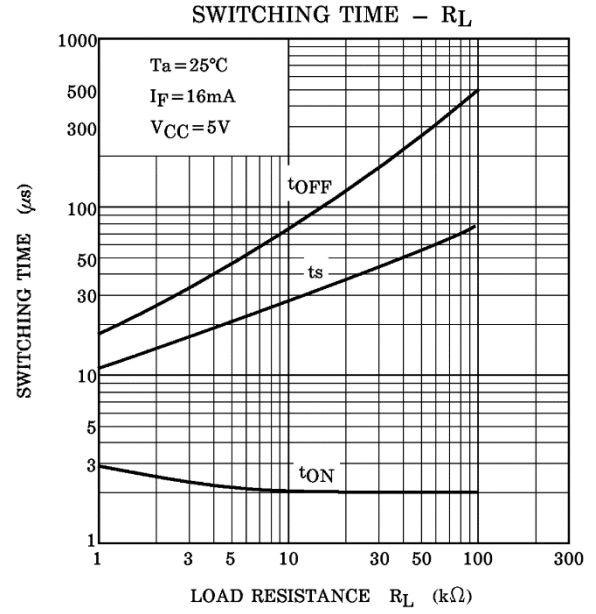
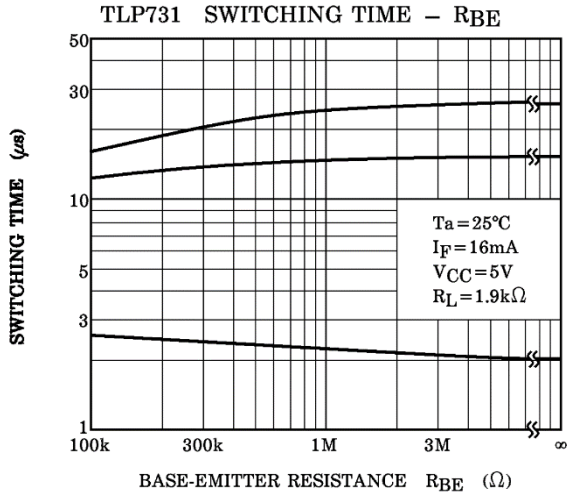












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