

TOSHIBA Photocoupler GaAs IRed & Photo-Transistor

# TLP531, TLP532

Programmable Controllers

AC / DC-Input Module

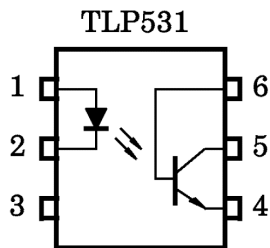
Solid State Relay

The TOSHIBA TLP531 and TLP532 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode in a six lead plastic DIP.

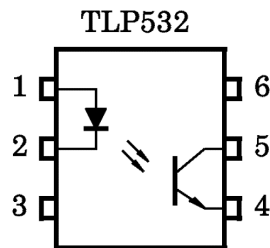
TLP532 is no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)  
Rank GB: 100% (min.)
- Isolation voltage: 2500 V<sub>rms</sub> (min.)
- UL recognized: UL1577, file no. E67349

## Pin Configurations (top view)

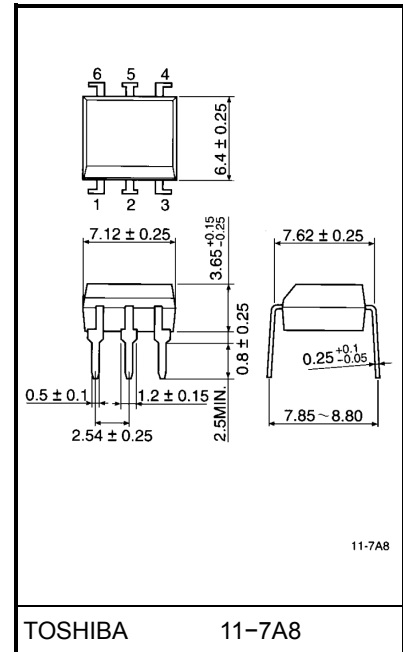


- 1 : ANODE
- 2 : CATHODE
- 3 : N.C.
- 4 : EMITTER
- 5 : COLLECTOR
- 6 : BASE



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Unit in mm



TOSHIBA 11-7A8

Weight: 0.4g

## Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_F$	70	mA
	Forward current derating (Ta ≥ 50°C)	$\Delta I_F / ^\circ\text{C}$	0.93	mA / °C
	Peak forward current (100 μs pulse, 100pps)	$I_{FP}$	1	A
	Reverse voltage	$V_R$	5	V
	Junction temperature	$T_j$	125	°C
Detector	Collector-emitter voltage	$V_{CEO}$	55	V
	Collector-base voltage (TLP531)	$V_{CBO}$	80	V
	Emitter-collector voltage	$V_{ECO}$	7	V
	Emitter-base voltage (TLP531)	$V_{EBO}$	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%)		$BV_S$	2500	$V_{rms}$

## Recommends 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 (TLP531)	$V_{(BR)CBO}$	$I_C = 0.1\text{mA}$	80	—	—	V
	Emitter-base breakdown voltage (TLP531)	$V_{(BR)EBO}$	$I_E = 0.1\text{mA}$	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	$I_C / I_F$	$I_F = 5\text{mA}, V_{CE} = 5\text{V}$	50	200	600	%
		Rank Y	50	—	150	
		Rank YG	50	—	300	
		Rank GR	100	—	300	
		Rank GB	100	—	600	
		Rank BL	200	—	600	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$I_C = 2.4\text{mA}, I_F = 8\text{mA}$	—	—	0.4	V

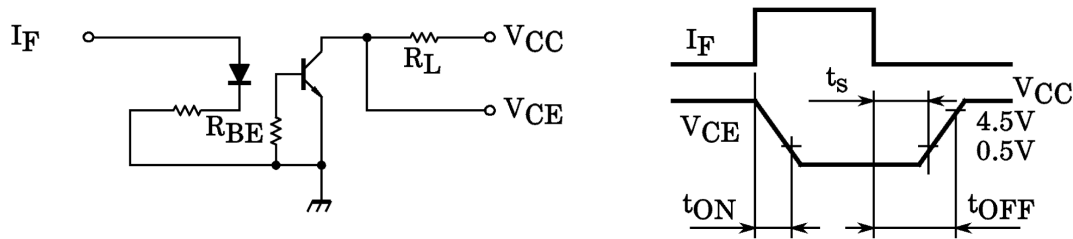
**Isolation Characteristics (Ta = 25°C)**

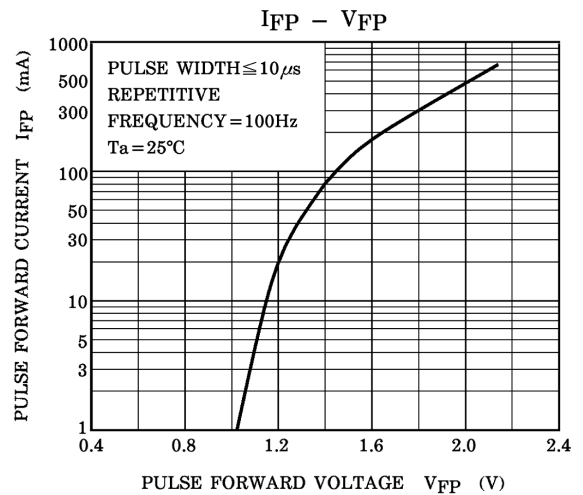
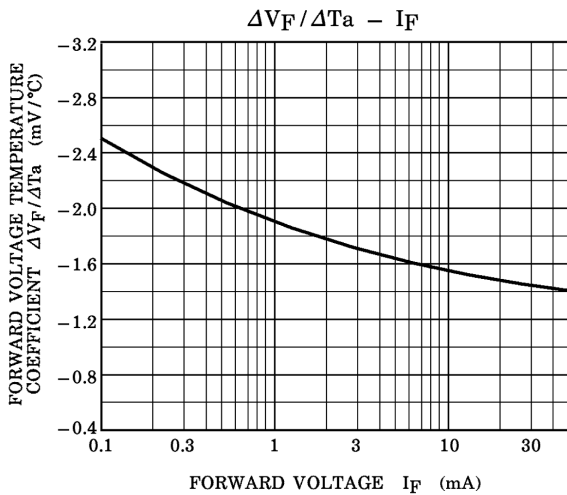
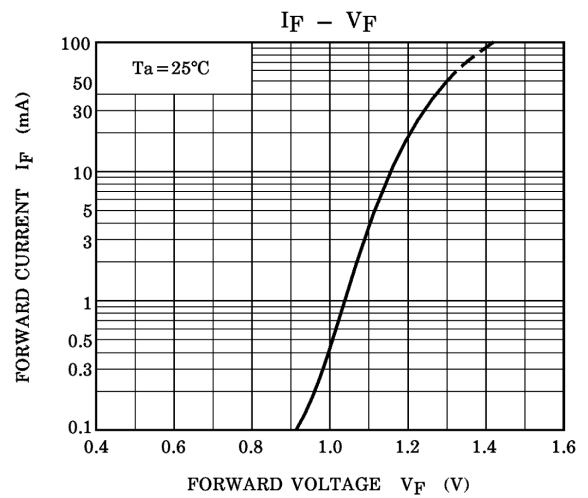
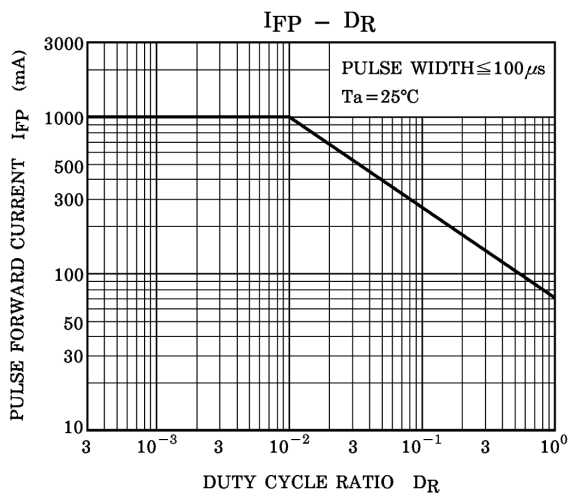
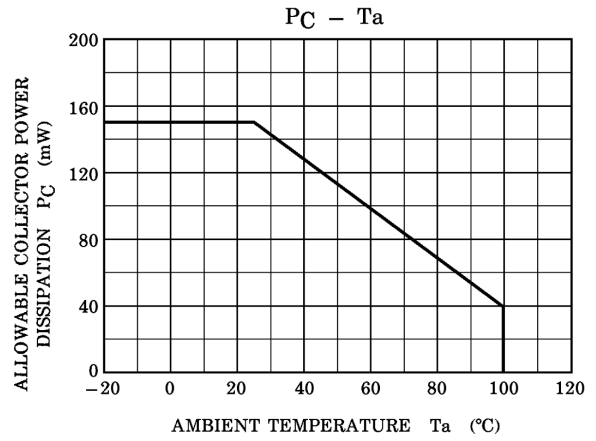
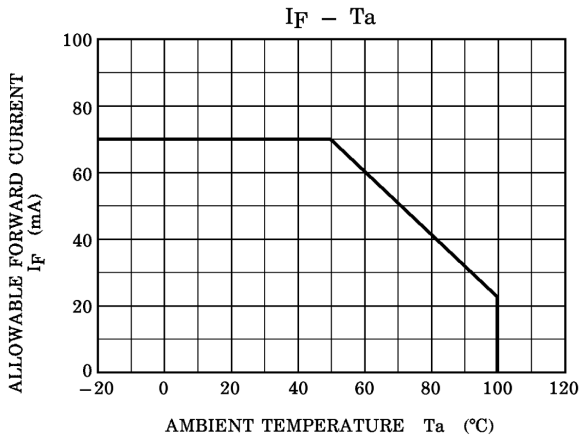
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V, R.H. ≤ 60%	5 × 10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	2500	—	—	V <sub>rms</sub>

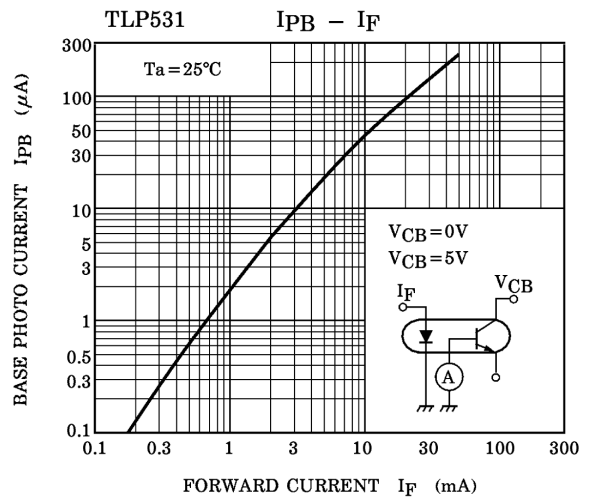
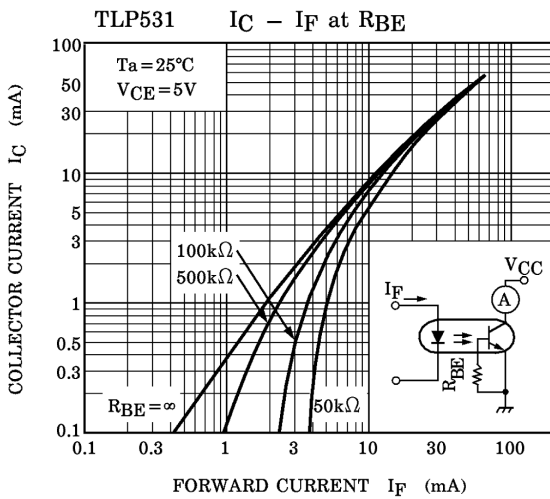
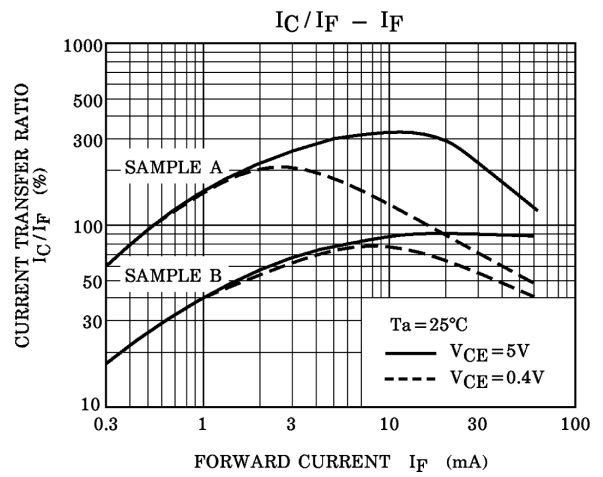
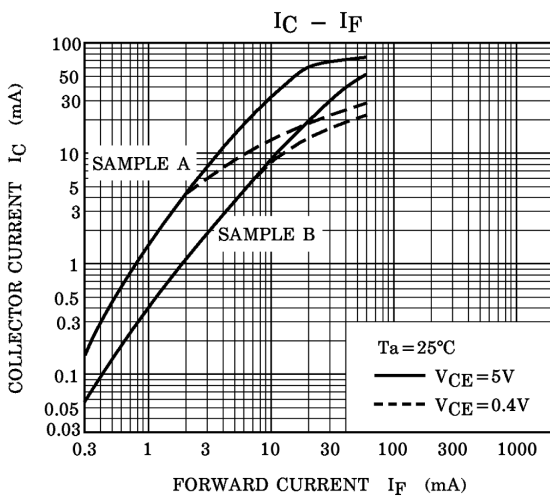
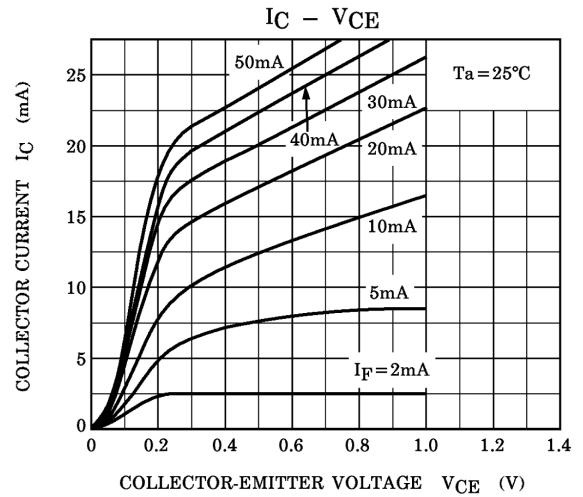
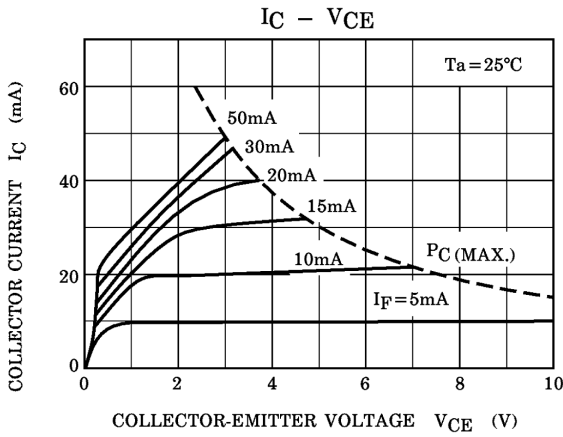
**Switching Characteristics (Ta = 25°C)**

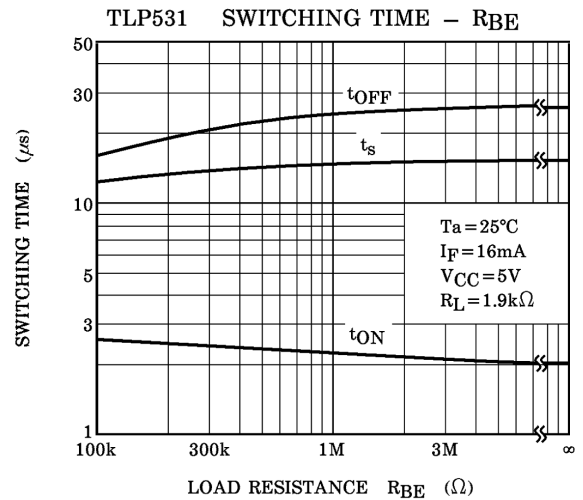
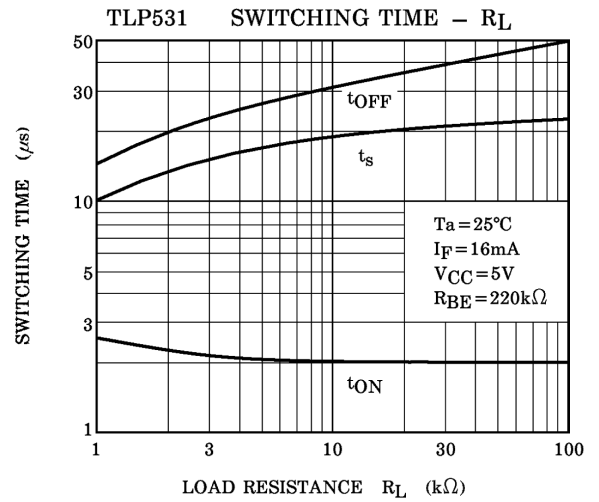
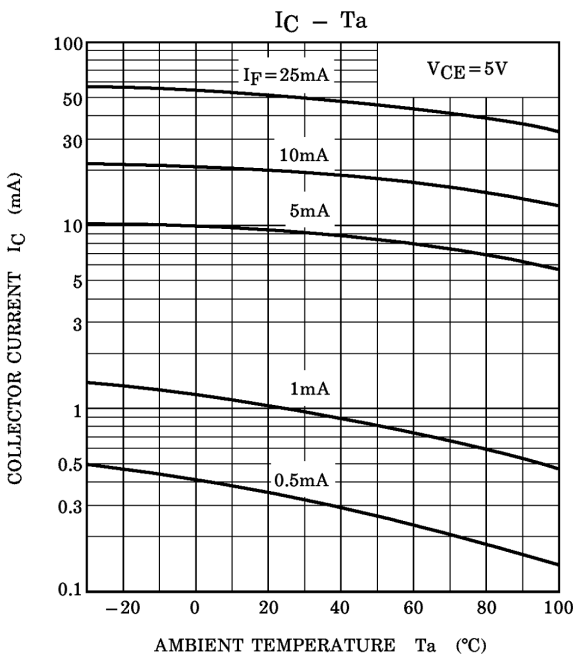
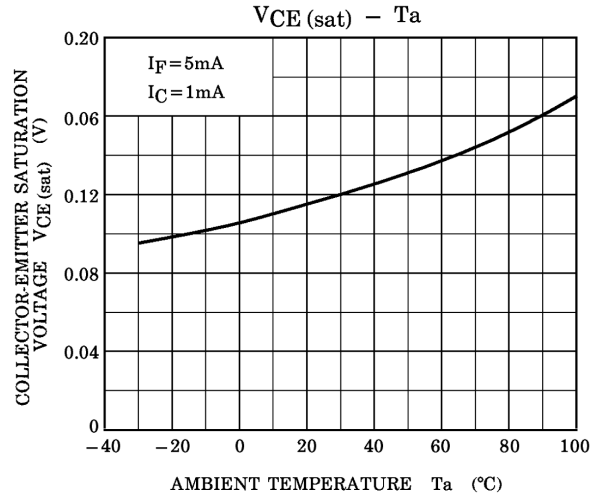
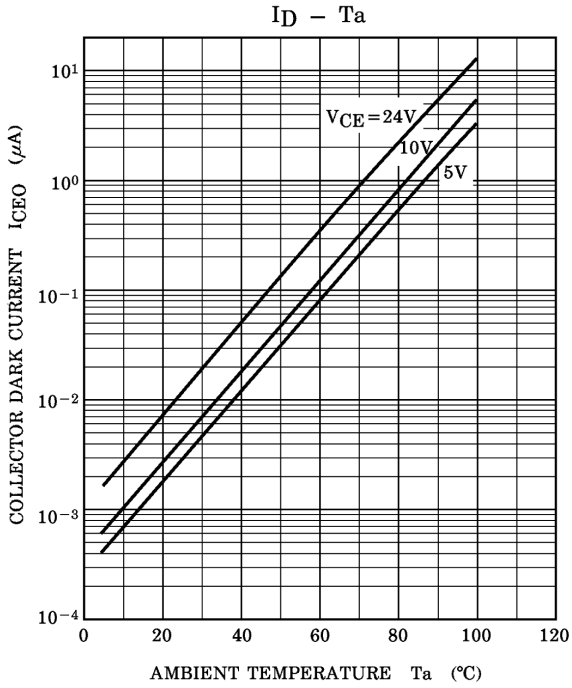
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	2	—	μs	
Fall time	t <sub>f</sub>		—	3	—		
Turn-on time	t <sub>ON</sub>		—	3	—		
Turn-off time	t <sub>OFF</sub>		—	3	—		
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ R <sub>BE</sub> = open V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	(Fig.1)	—	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> = 1.9Ω R <sub>BE</sub> = 220kΩ (TLP531) V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	(Fig.1)	—	2	—	μs
Storage time	t <sub>s</sub>		—	12	—		
Turn-off time	t <sub>OFF</sub>		—	20	—		

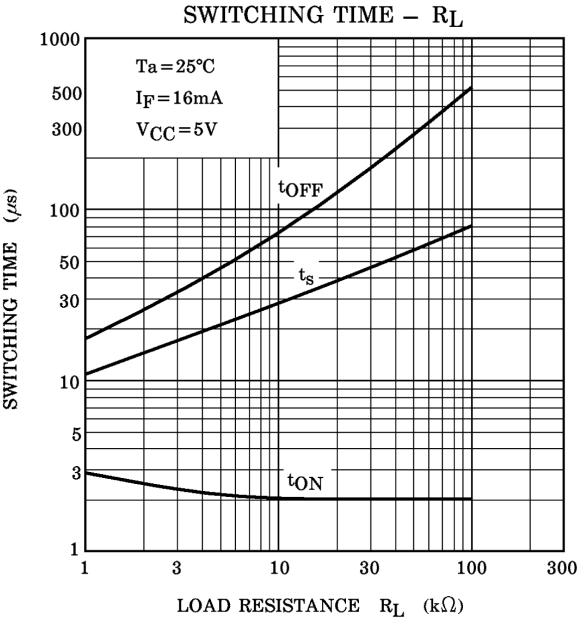
Fig. 1 Switching time test circuit













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