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.

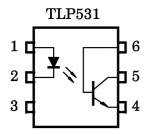
TLP532 is no-base internal connection for high-EMI environments.

- 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

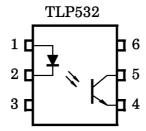
2: CATHODE

3: N.C.

4 : EMITTER

5 : COLLECTOR

6: BASE



1: ANODE

2: CATHODE

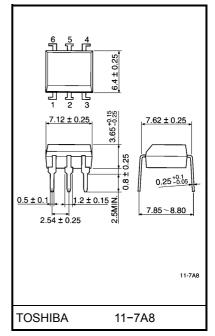
3 : N.C.

4 : EMITTER

5 : COLLECTOR

6 : N.C.

Unit in mm



Weight: 0.4g



# Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit	
	Forward current	I <sub>F</sub>	70	mA	
	Forward current derating (Ta ≥ 50°C)	ΔI <sub>F</sub> / °C	0.93	mA / °C	
LED	Peak forward current (100 µs pulse, 100pps)	I <sub>FP</sub>	1	Α	
_	Reverse voltage	V <sub>R</sub>	5	V	
	Junction temperature	Tj	125	°C	
	Collector-emitter voltage	V <sub>CEO</sub>	55	V	
	Collector-base voltage (TLP531)	V <sub>CBO</sub>	80	V	
	Emitter-collector voltage	V <sub>ECO</sub>	7	V	
ctor	Emitter-base voltage (TLP531)	V <sub>EBO</sub>	7	V	
Detector	Collector current	IC	50	mA	
	Power dissipation	PC	150	mW	
	Power dissipation derating (Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-1.5	mW / °C	
	Junction temperature	Tj	125	°C	
Storage temperature range		T <sub>stg</sub>	-55~125	°C	
Operating temperature range		T <sub>opr</sub>	-55~100	°C	
Lead soldering temperature (10s)		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	
Isolatio	on voltage (AC, 1min., R.H.≤ 60%)	BV <sub>S</sub>	2500	V <sub>rms</sub>	

# **Recommends Operating Conditions**

Characteristic	Symbol	Min.	Тур.	Max.	Unit
Supply voltage	V <sub>CC</sub>	_	5	24	V
Forward current	I <sub>F</sub>	_	16	25	mA
Collector current	Ic	_	1	10	mA
Operating temperature	T <sub>opr</sub>	-25	_	85	°C

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# Individual Electrical Characteristics (Ta = 25°C)

	Characteristic	Symbol	Test Condition	Min.	Тур.	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, f = 1MHz	1	30	_	pF
Detector	Collector-emitter breakdown voltage	V (BR) CEO	I <sub>C</sub> = 0.5mA	55	_	_	V
	Emitter–collector breakdown voltage	V (BR) ECO	I <sub>E</sub> = 0.1mA	7	_	_	V
	Collector-base breakdown voltage (TLP531)	V (BR) CBO	I <sub>C</sub> = 0.1mA	80	_	_	V
	Emitter-base breakdown voltage (TLP531)	V (BR) EBO	I <sub>E</sub> = 0.1mA	7	_	_	V
	Collector dark current	1	V <sub>CE</sub> = 24V	_	10	100	nA
	Collector dark current	ICEO	V <sub>CE</sub> = 24V, Ta = 85°C	_	2	50	μA
	Capacitance (collector to emitter)	C <sub>CE</sub>	V = 0, f = 1MHz	_	10		pF

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

Characteristic	Symbol	Test Condition	on	Min.	Тур.	Max.	Unit
	I <sub>C</sub> /I <sub>F</sub>	I <sub>F</sub> = 5mA, V <sub>CE</sub> = 5V		50	200	600	
			Rank Y	50	-	150	
Current transfer ratio			Rank YG	50	-	300	%
Current transfer fatto			Rank GR	100	-	300	70
			Rank GB	100	-	600	
			Rank BL	200	-	600	
Collector–emitter saturation voltage	V <sub>CE (sat)</sub>	I <sub>C</sub> = 2.4mA, I <sub>F</sub> = 8mA		_		0.4	V



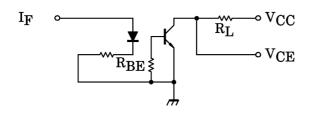
# Isolation Characteristics (Ta = 25°C)

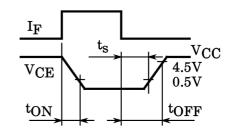
Characteristic	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Capacitance (input to output)	CS	V <sub>S</sub> = 0, f = 1MHz	_	0.8	_	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V, R.H.≤ 60%	5 × 10 <sup>10</sup>	10 <sup>14</sup>	_	Ω
Isolation voltage	BVS	AC, 1 minute	2500	_	_	V <sub>rms</sub>

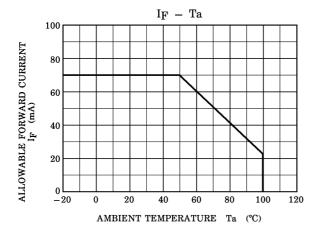
### **Switching Characteristics (Ta = 25°C)**

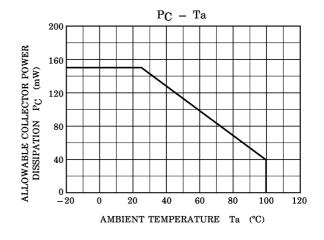
Characteristic	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Rise time	t <sub>r</sub>		_	2	_	
Fall time	t <sub>f</sub>	V <sub>CC</sub> = 10V I <sub>C</sub> = 2mA	_	3	_	
Turn-on time	t <sub>ON</sub>	$R_L = 100\Omega$	_	3	_	μs
Turn-off time	t <sub>OFF</sub>		_	3	_	
Turn-on time	t <sub>ON</sub>	$R_L = 1.9k\Omega$ (Fig.1)	_	2	_	
Storage time	t <sub>s</sub>	R <sub>BE</sub> = open	_	15	_	μs
Turn-off time	t <sub>OFF</sub>	V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	_	25	_	
Turn-on time	t <sub>ON</sub>	$R_L = 1.9\Omega$ (Fig.1)	_	2	_	
Storage time	t <sub>s</sub>	$R_{BE} = 220k\Omega (TLP531)$	_	12	_	μs
Turn-off time	t <sub>OFF</sub>	V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	_	20	_	

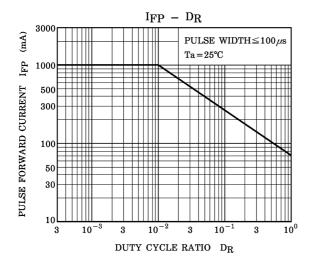
Fig. 1 Switching time test circui

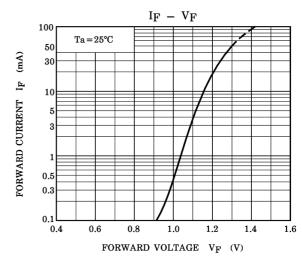


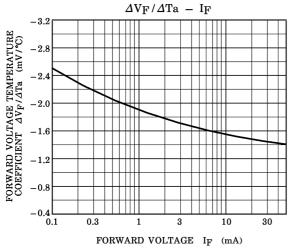


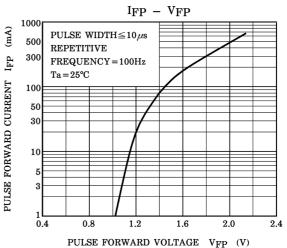


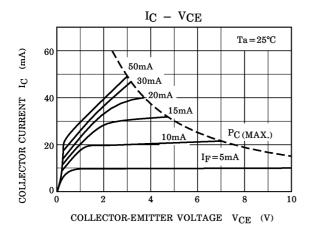


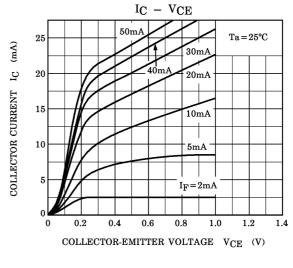


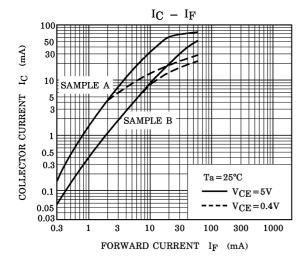


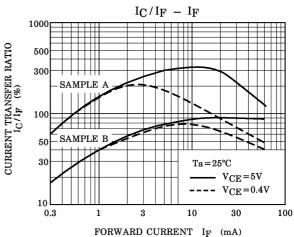


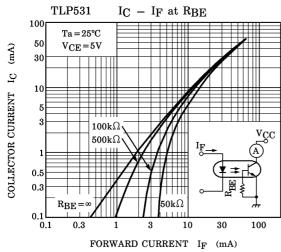


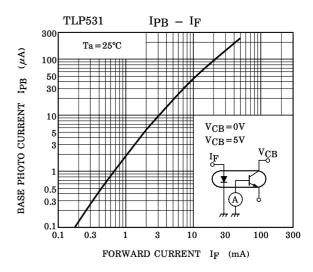




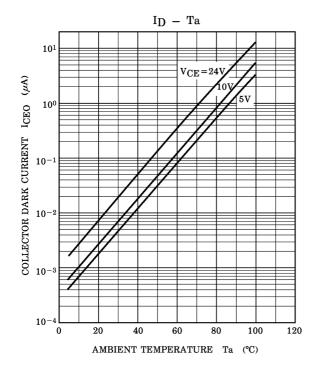


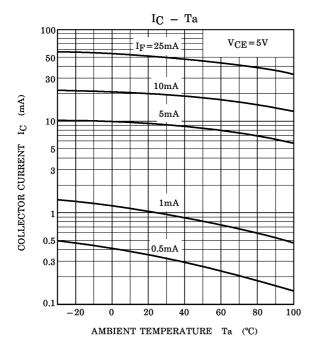


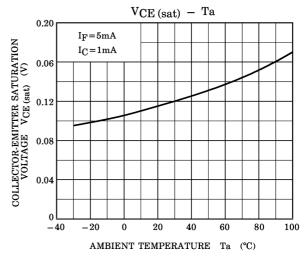


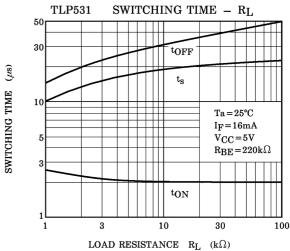


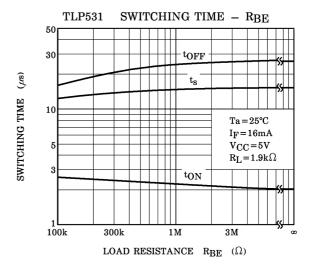
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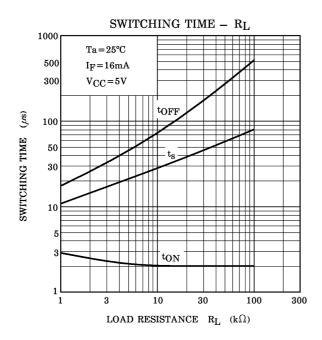












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