TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP331,TLP332

Office Machine Household Use Equipment Programmable Controllers AC / DC–Input Module Telecommunication

The TOSHIBA TLP331 and TLP332 consists of a gallium arsenide infrared emitting diode optically coupled to a photo-transistor in a six lead plastic DIP package.

This photocoupler provides the unique feature of high current transfer ratio at both low output voltage and low input current. This makes it ideal for use in low power logic circuits, telecommunications equipment and portable electronics isolation applications.

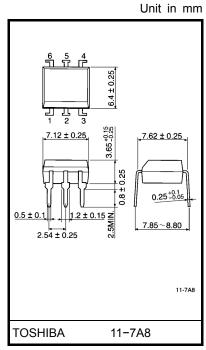
TLP332 is no-base internal connection for high-EMI environments.

- Collector-emitter voltage: 55V (min.)
- Isolation voltage: 5000Vrms (min.)
- UL recognized: UL1577, file no. E67349
- Current transfer ratio

Classi– fication	Curr	Marking		
	Ta =	25°C	Ta = -25~75°C	Of
(*)	I _F = 1mA V _{CE} = 0.5V	I _F = 0.5mA	I _F = 1mA	Classi-
()	V _{CE} = 0.5V	V _{CE} = 1.5V	V _{CE} = 0.5V	Fication
Rank BV	200%	100%	100%	BV
Standard	100%	50%	50%	BV, blank

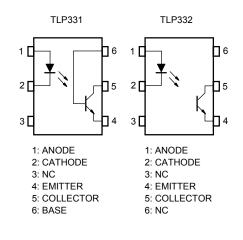
(*) Ex. Standard: TLP331 Rank BV: TLP331(BV)

(Note) Application type name for certification test, please use standard product type name, i.e. TLP331(BV): TLP331



Weight: 0.4 g

Pin Configurations (top view)



Absolute Maximum Ratings (Ta = 25°C)

	Characteristic		Symbol	Rating	Unit
	Forward current		١ _F	50	mA
	Forward current derating (Ta ≥ 39°C)		ΔI _F /°C	-0.7	mA / °C
LED	Peak forward current (100µs pulse, 100pps)		I _{FP}	1	A
	Reverse Voltage		V _R	5	V
	Junction temperature		Tj	125	°C
	Collector-emitter voltage		V _{CEO}	55	V
	Collector-base voltage (TLP331)		V _{CBO}	80	V
	Emitter-collector voltage		V _{ECO}	7	V
ctor	Emitter-base voltage (TLP331)		V _{EBO}	7	V
Detector	Collector current		Ι _C	50	mA
	Power dissipation		PC	150	mW
	Power dissipation derating (Ta ≥ 25°C)		ΔP _C / °C	-1.5	mW / °C
	Junction temperature		Tj	125	°C
Stor	age temperature range		T _{stg}	-55~125	°C
Ope	erating temperature range		T _{opr}	-55~100	°C
Lea	d soldering temperature (10s)		T _{sol}	260	°C
Tota	al package power dissipation		Ρ _T	250	mW
Tota	al package power dissipation derating (Ta≥25°C)		P _T /°C	-2.5	mW / °C
Isola	ation voltage (AC, 1min., RH ≤ 60%)	(Note 1)	BVS	5000	Vrms

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: Pins 1, 2 and 3 shorted together and pins 4, 5 and 6 shorted together.

Recommended Operating Conditions

Characteristic	Symbol	Min.	Тур.	Max.	Unit
Supply voltage	V _{CC}	—	5	25	V
Forward current	١ _F	—	1.6	25	mA
Collector current	Ι _C	_	1	10	mA
Operating temperature	T _{opr}	-25		75	°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.	Тур.	Max.	Unit
	Forward voltage	VF	I _F = 10mA	1.0	1.15	1.3	V
LED	Reverse current	I _R	V _R = 5V	_	_	10	μA
	Capacitance	CT	V = 0, f = 1MHz	_	30	—	pF
	Collector–emitter breakdown voltage	V _{(BR)CEO}	I _C = 0.5mA	55	_	_	V
	Emitter–collector breakdown voltage	V _{(BR)ECO}	I _E = 0.1mA	7	_	_	V
	Collector-base breakdown voltage (TLP331)	V _{(BR)CBO}	I _C = 0.1mA	80	_	_	V
L	Emitter–base breakdown voltage (TLP331)	V _{(BR)EBO}	I _E = 0.1mA	7	_	_	V
Detector	Collector dark current	lana	V _{CE} = 24V		10	100	nA
Det		ICEO	V _{CE} = 24V, Ta = 85°C	_	2	50	μA
	Collector dark current (TLP331)	ICER	V _{CE} = 24V, Ta = 85°C R _{BE} = 1MΩ	_	0.5	10	μA
	Collector dark current (TLP331)	I _{CBO}	V _{CB} = 10V	_	0.1	_	nA
	DC forward current gain (TLP331)	h _{FE}	V _{CE} = 5V, I _C = 0.5mA		1000	_	—
	Capacitance (collector to emitter)	C _{CE}	V = 0 , f = 1MHz	_	12	_	pF

Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Current transfer ratio	IC / IF	I _F = 1mA, V _{CE} = 0.5V Rank BV	100	_	1200	%
	IC / IF		200	_	1200	/0
	I _C / I _{F(low)}	I _F = 0.5mA, V _{CE} = 1.5V	50		-	%
Low input CTR		Rank BV	100		_	
Base photo-current (TLP331)	I _{PB}	I _F = 1mA, V _{CB} = 5V	-	10	-	μA
Collector-emitter saturation voltage		I _C = 0.5mA I _F = 1mA	_	_	0.4	
	V _{CE(sat)}	I _C = 1mA I _F = 1mA	_	0.2	_	V
		Rank BV	_	_	0.4	

Coupled Electrical Characteristics (Ta = 25~75°C)

Characteristic	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Current transfer ratio	IC / IF	I _F = 1mA, V _{CE} = 0.5V	50	_	_	%
		Rank BV	100	_	_	
Low input CTR	I _C / I _{F(low)}	I _F = 0.5mA, V _{CE} = 1.5V		50		%
		Rank BV		100		70

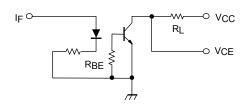
Isolation Characteristics (Ta = 25°C)

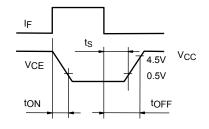
Characteristic	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Capacitance (input to output)	CS	V _S = 0, f = 1MHz	_	0.8	_	pF
Isolation resistance	R _S	V = 500V	5×10 ¹⁰	10 ¹⁴	-	Ω
		AC, 1 minute	5000	_	-	Vrms
Isolation voltage	BVS	AC, 1 second, in oil	_	10000	-	VIIIS
-		DC, 1 minute, in oil	-	10000		Vdc

Switching Characteristics (Ta = 25°C)

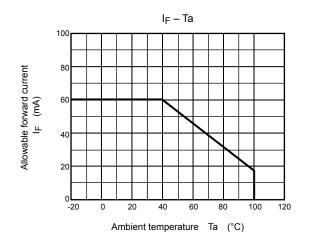
Characteristic	Symbol	Test Condition	Min.	Тур.	Max.	Unit
Rise time	tr		_	8	—	
Fall time	t _f	V _{CC} = 10V I _C = 2mA	_	8	_	
Turn-on time	t _{on}	$R_L = 100\Omega$	_	10	_	μs
Turn-off time	t _{off}		_	8	_	
Turn-on time	t _{ON}	$\begin{array}{l} R_{L} = 4.7 \mathrm{k} \Omega \qquad (Fig.1) \\ R_{BE} = OPEN \\ V_{CC} = 5V, \ I_{F} = 1.6mA \end{array}$	_	10	_	
Storage time	ts		_	50	_	μs
Turn-off time	tOFF		_	300	_	
Turn-on time	t _{ON}	R _L = 4.7kΩ (Fig.1) R _{BE} = 470kΩ (TLP331)	_	12	_	
Storage time	ts		—	30	—	μs
Turn-off time	tOFF	V _{CC} = 5V, I _F = 1.6mA	-	100	—	

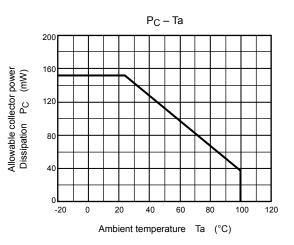
Fig. 1 Switching time test circuit

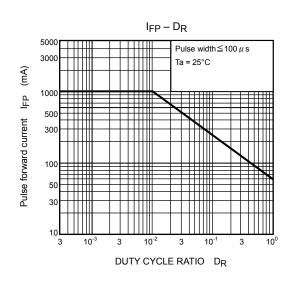


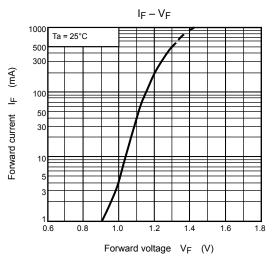


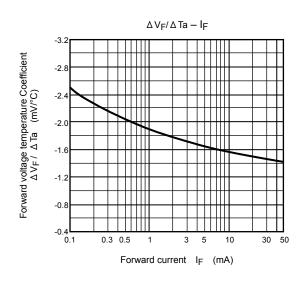
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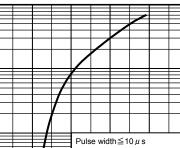




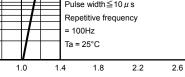








IFP - VFP



Pulse forward voltage V_{FP} (V)

1000

500

300

100

50

30

10

1 0.6

(mA)

Ē

Pulse forward current

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0.8mA

0.6mA

0.5mA

0.4mA

0.2mA

3 5

V_{CE} = 1.5V

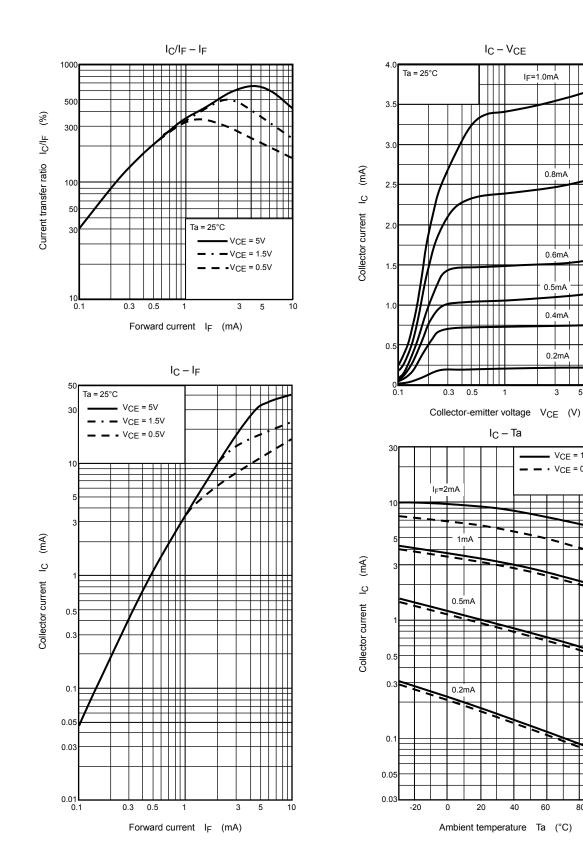
80

100

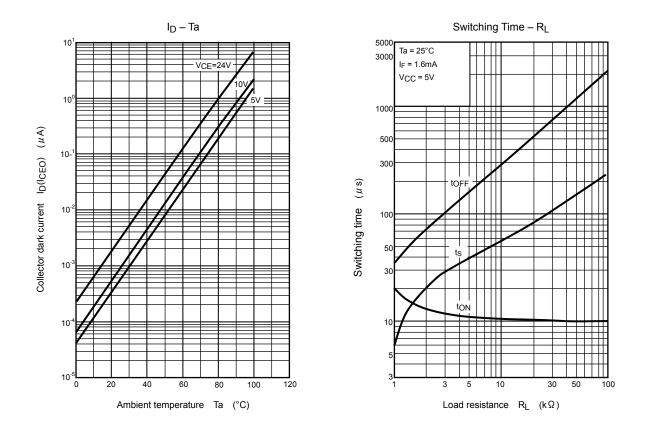
60

• VCE = 0.5V

10



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