

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP620, TLP620-2, TLP620-4

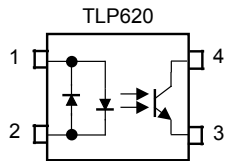
Programmable Controllers  
AC / DC-Input Module  
Telecommunication

The TOSHIBA TLP620, -2 and -4 consists of a photo-transistor optically coupled to two gallium arsenide infrared emitting diode connected in inverse parallel.

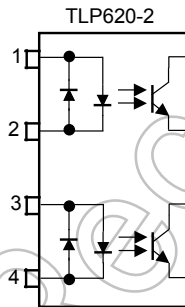
The TLP620-2 offers two isolated channels in an eight lead plastic DIP, while the TLP620-4 provides four isolated channels in a sixteen plastic DIP.

- Collector-emitter voltage: 55V (min.)
- Current transfer ratio: 50% (min.)  
Rank GB: 100% (min.)

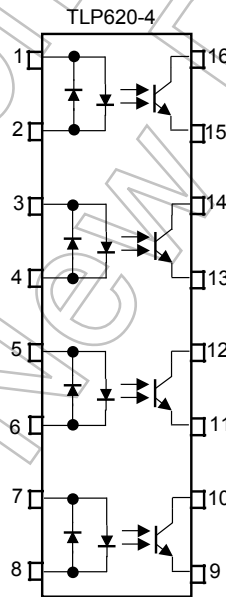
## Pin Configurations (top view)



1 : ANODE  
CATHODE  
2 : CATHODE  
ANODE  
3 : EMITTER  
4 : COLLECTOR

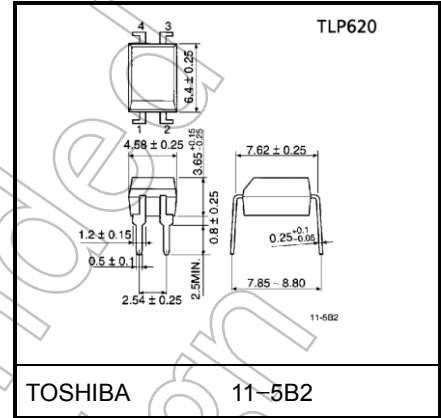


1, 3 : ANODE  
CATHODE  
2, 4 : CATHODE  
ANODE  
5, 7 : EMITTER  
6, 8 : COLLECTOR



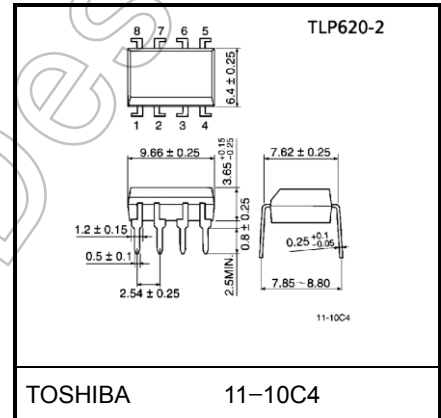
1, 3, 5, 7 : ANODE, CATHODE  
2, 4, 6, 8 : CATHODE, ANODE  
9, 11, 13, 15 : EMITTER  
10, 12, 14, 16 : COLLECTOR

Unit: mm



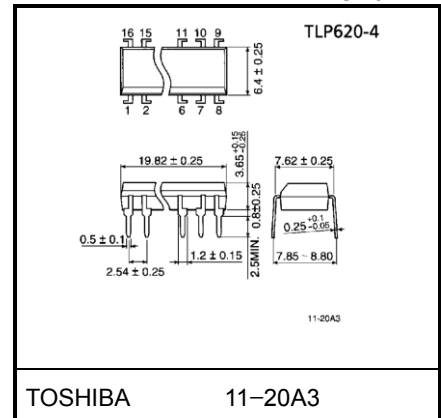
Weight: 0.26 g (typ.)

Unit: mm



Weight: 0.54 g (typ.)

Unit: mm



Weight: 1.1 g (typ.)

Start of commercial production  
1984/01

- Isolation voltage: 5000V<sub>rms</sub> (min.)
- Safety Standards
- UL recognized : UL1577, File No. E67349
- cUL recognized : CSA Component Acceptance Service No. 5A  
File No.E67349
- Option (D4) type
  - VDE approved : EN60747-5-5
  - Maximum operating insulation voltage: 890V<sub>PK</sub>
  - Highest permissible over voltage: 8000V<sub>PK</sub>

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

	<u>7.62 mm pitch standard type</u>	<u>10.16 mm pitch TLPxxxF type</u>
• Creepage distance	: 6.4 mm (min)	8.0 mm (min)
Clearance	: 6.4 mm (min)	8.0 mm (min)
Insulation thickness	: 0.4 mm (min)	0.4 mm (min)

Not Recommended for New Design

## Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating		Unit	
		TLP620	TLP620-2 TLP620-4		
LED	Forward current	I <sub>F</sub> (RMS)	60	50	mA
	Forward current derating	ΔI <sub>F</sub> / °C	-0.7 (Ta ≥ 39°C)	-0.5 (Ta ≥ 25°C)	mA / °C
	Pulse forward current	I <sub>FP</sub>	±1 (100μs pulse, 100pps)		A
	Power dissipation (1 circuit)	P <sub>D</sub>	100	70	mW
	Power dissipation derating (1 circuit)	ΔP <sub>D</sub> / °C	-1.2 (Ta ≥ 39°C)	-0.7 (Ta ≥ 25°C)	mW / °C
	Junction temperature	T <sub>j</sub>	125		°C
Detector	Collector-emitter voltage	V <sub>CEO</sub>	55		V
	Emitter-collector voltage	V <sub>ECO</sub>	7		V
	Collector current	I <sub>C</sub>	50		mA
	Collector power dissipation (1 circuit)	P <sub>C</sub>	150	100	mW
	Collector power dissipation derating (1 circuit) (Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-1.5	-1.0	mW / °C
	Junction temperature	T <sub>j</sub>	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	T <sub>sold</sub>	260 (10s)		°C	
Total package power dissipation (1 circuit)	P <sub>T</sub>	250	150	mW	
Total package power dissipation derating (Ta ≥ 25°C, 1 circuit)	ΔP <sub>T</sub> / °C	-2.5	-1.5	mW / °C	
Isolation voltage (Note1)	B <sub>Vs</sub>	5000 (AC, 1 min., RH ≤ 60%)		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).

Note1: 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> (RMS)	—	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.

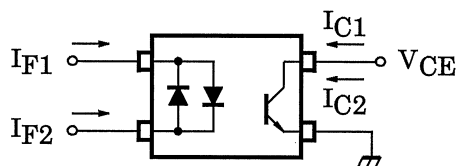
## Individual Electrical Characteristics (T<sub>a</sub> = 25°C)

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
	Forward current	I <sub>F</sub>	V <sub>F</sub> = ±0.7V	—	2.5	20	μA
	Capacitance	C <sub>T</sub>	V = 0V, f = 1MHz	—	60	—	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 dark current	I <sub>CEO</sub>	V <sub>CE</sub> = 24V	—	10	100	nA
			V <sub>CE</sub> = 24V, T <sub>a</sub> = 85°C	—	2	50	μA
Capacitance (collector to emitter)	C <sub>CE</sub>	V <sub>CE</sub> = 0V, f = 1MHz	—	10	—	pF	

## Coupled Electrical Characteristics (T<sub>a</sub> = 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	—	—	
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	I <sub>C</sub> = 2.4mA, I <sub>F</sub> = ±8mA I <sub>C</sub> = 0.2 mA, I <sub>F</sub> = ±1 mA Rank GB	—	—	0.4	V
			—	0.2	—	
Off-state collector current	I <sub>C</sub> (off)	V <sub>F</sub> = ±0.7V, V <sub>CE</sub> = 24V	—	1	10	μA
CTR symmetry (Note.)	I <sub>C</sub> (ratio)	I <sub>C</sub> (I <sub>F</sub> = -5mA) / I <sub>C</sub> (I <sub>F</sub> = +5mA)	0.33	—	3	—

Note :  $I_{C(ratio)} = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 5V)}{I_{C1}(I_F = I_{F1}, V_{CE} = 5V)}$



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

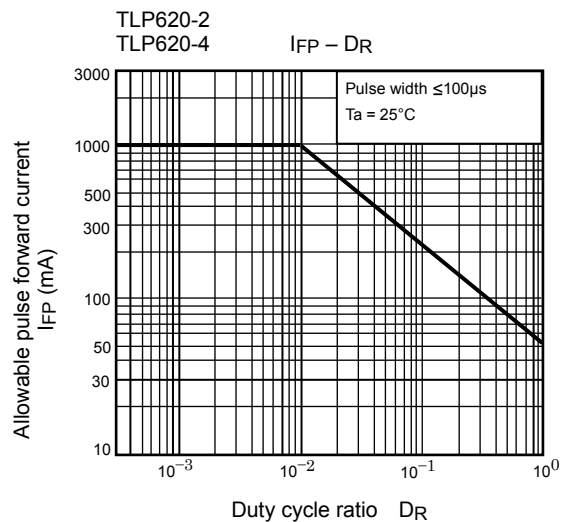
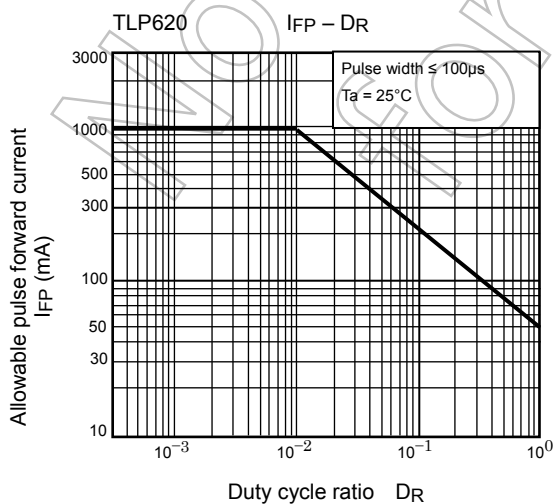
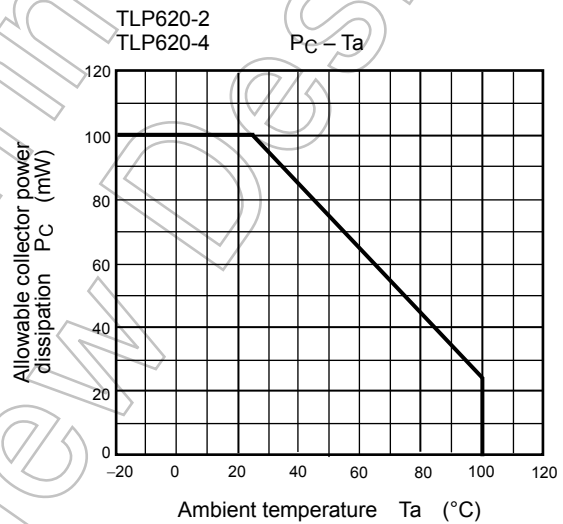
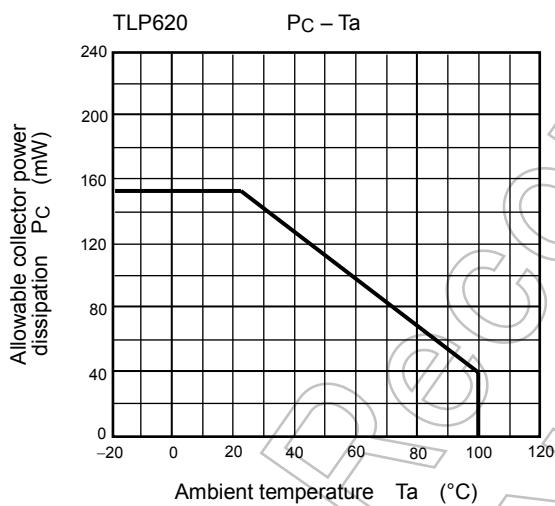
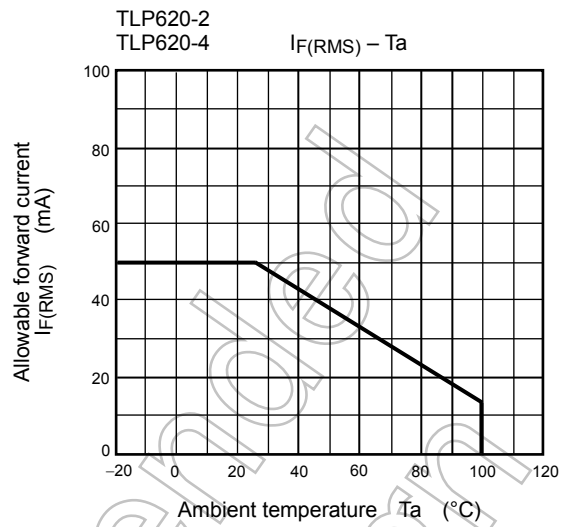
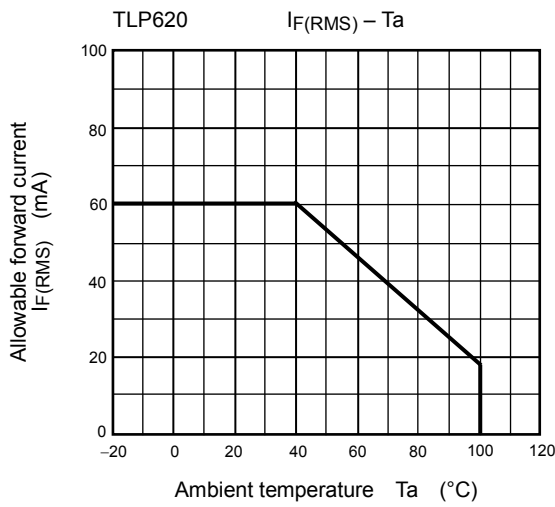
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C <sub>S</sub>	V <sub>S</sub> = 0 V, f = 1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V, R.H. ≤ 60%	1×10 <sup>12</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	5000	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

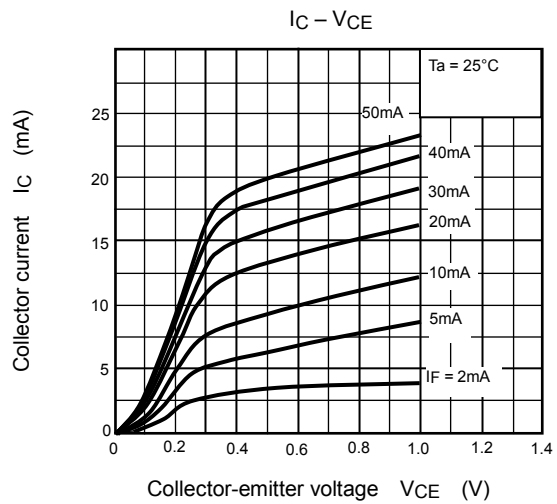
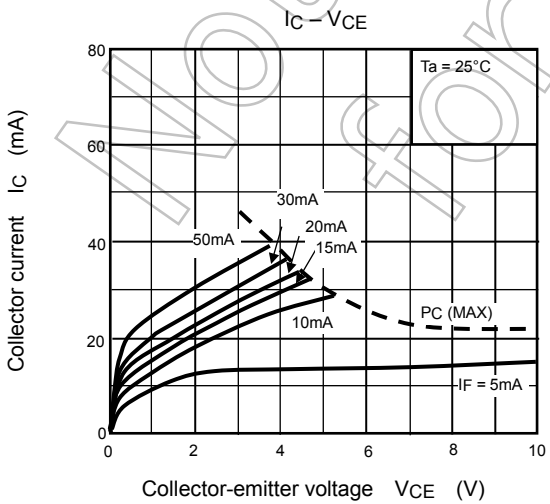
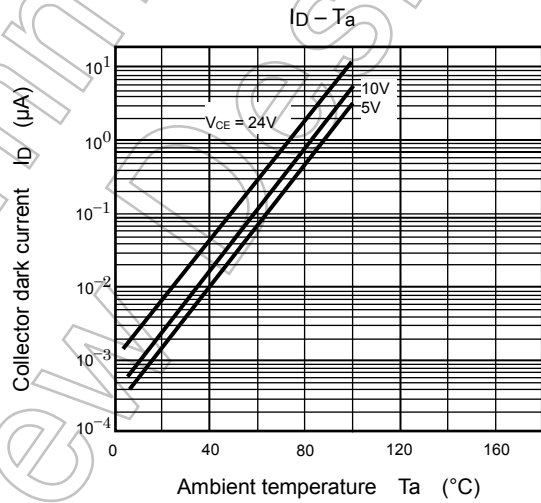
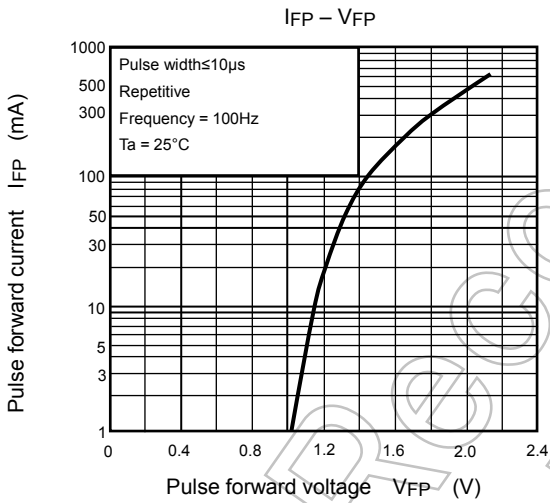
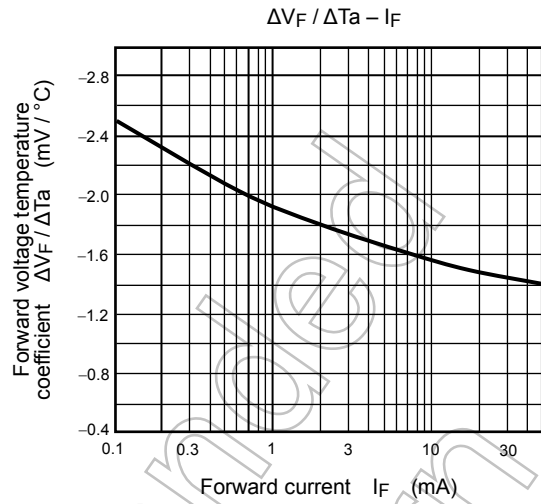
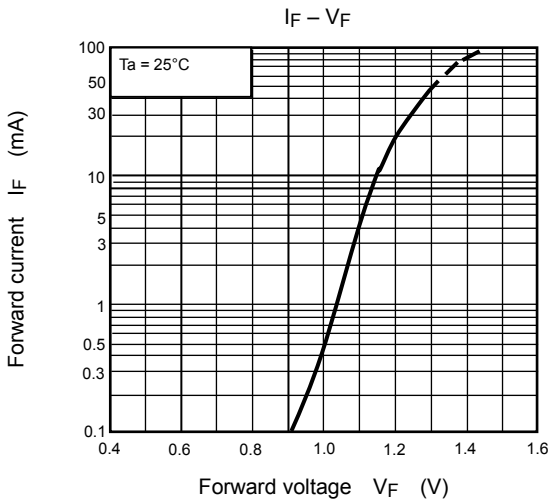
**Switching Characteristics (Ta = 25°C)**

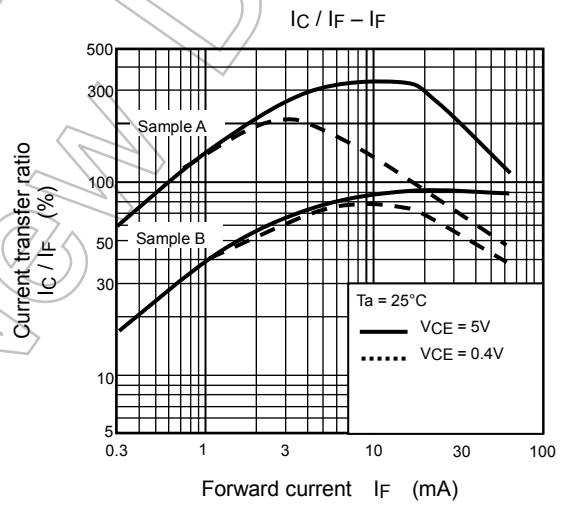
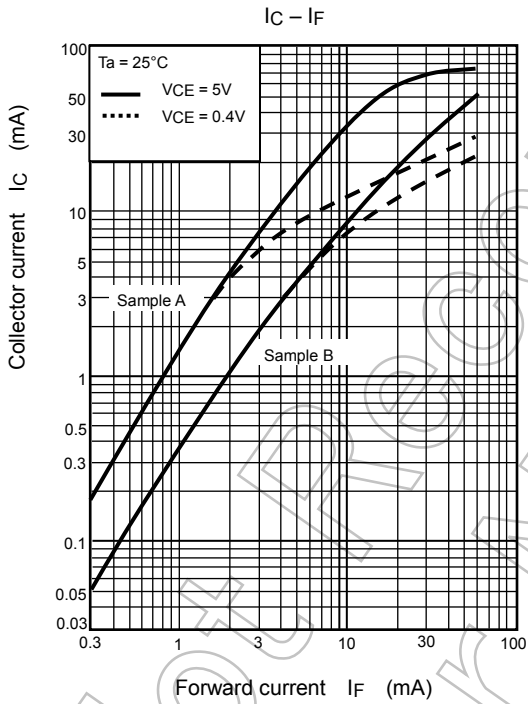
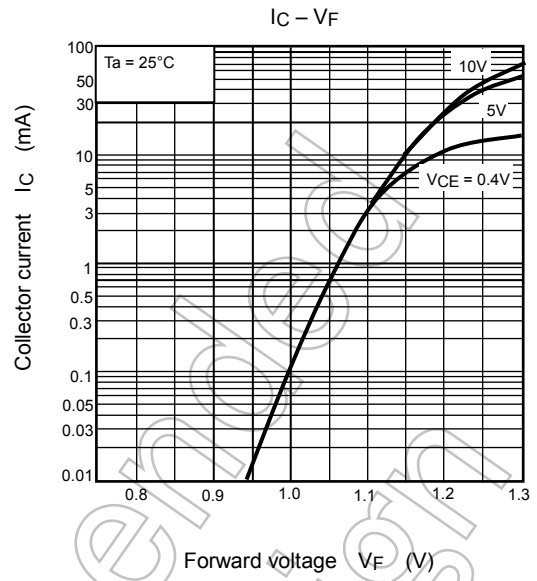
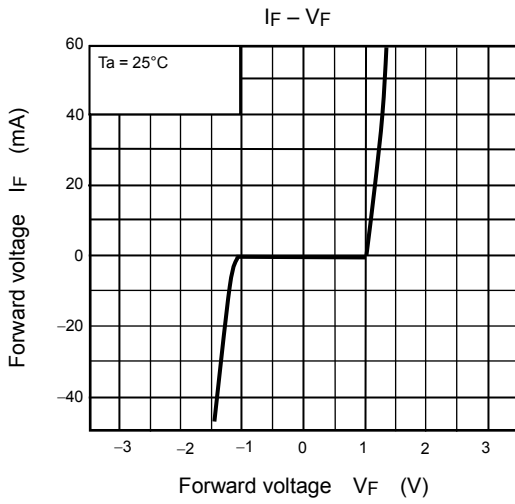
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	2	—	μs	
Fall time	t <sub>f</sub>		—	3	—		
Turn-on time	t <sub>on</sub>		—	3	—		
Turn-off time	t <sub>off</sub>		—	3	—		
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ V <sub>CC</sub> = 5V, I <sub>F</sub> = ±16mA	—	2	—	μs	
Storage time	t <sub>s</sub>		(Fig.1)	—	15		—
Turn-off time	t <sub>OFF</sub>		—	—	25		—

Fig. 1 Switching time test circuit













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