

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

TLP624, TLP624-2, TLP624-4

Programmable Controllers
AC/DC-Input Module
Telecommunication

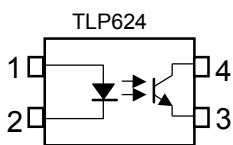
The TOSHIBA TLP624, -2 and -4 consist of a gallium arsenide infrared emitting diode optically coupled to a photo-transistor.
The TLP624-2 offers two isolated channels in an eight lead plastic DIP, while the TLP624-4 provides four isolated channels in a sixteen plastic DIP.

- Collector-emitter voltage: 55V min.
- Current transfer ratio

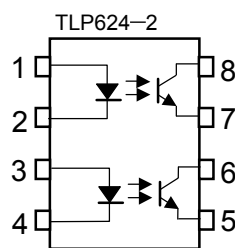
| Classification | Current Transfer Ratio(min) | | | Marking of classification |
|----------------|-----------------------------|----------------------|--------------------|---------------------------|
| | Ta = 25°C | | Ta = -25~75°C | |
| Rank BV | If=1mA VCE=0.5V | If=0.5mA VCE=1.5V | If=1mA VCE=0.5V | BV |
| Standard | 200% | 100% | 100% | BV,blank |

- Isolation voltage: 5000V_{rms} min.
- UL recognized: UL1577, file No.E67349
- BSI approved: BS EN60065: 2002 Certificate No.7426
BS EN60950-1: 2002 Certificate No.7427
- Note: Application type name for certification test, please use standard product type name, i.e.
TLP624(BV): TLP624
TLP624-2(BV): TLP624-2

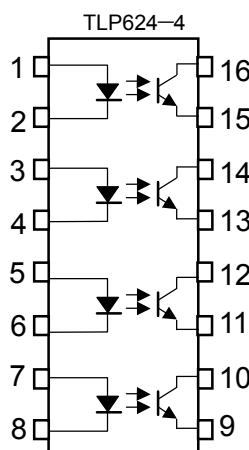
Pin Configurations (top view)



- 1. Anode
- 2. Cathode
- 3. Emitter
- 4. Collector

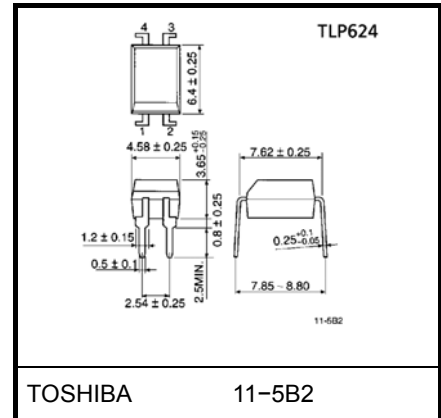


- 1,3 : Anode
- 2,4 : Cathode
- 5,7 : Emitter
- 6,8 : Collector



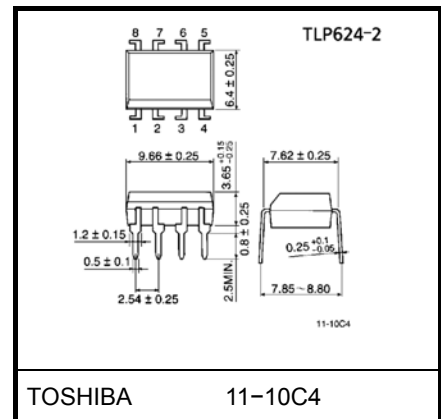
- 1,3,5,7: Anode
- 2,4,6,8: Cathode
- 9,11,13,15: Emitter
- 10,12,14,16: Collector

Unit in mm



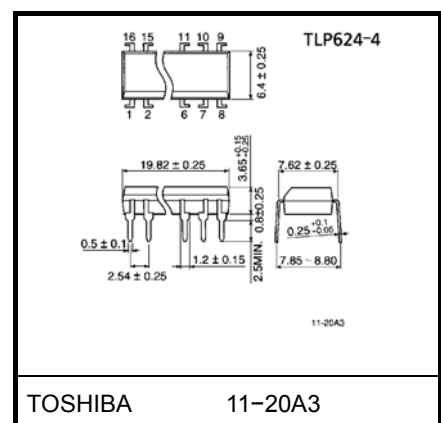
TOSHIBA 11-5B2

Weight: 0.26 g (typ.)



TOSHIBA 11-10C4

Weight: 0.54 g (typ.)



TOSHIBA 11-20A3

Weight: 1.1 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

| Characteristic | | Symbol | Rating | | Unit |
|---|---|-------------------------------|--------------------------------|----------------------|---------|
| | | | TLP624 | TLP624-2 TLP624-4 | |
| LED | Forward current | I_F | 60 | 50 | mA |
| | Forward current detating | $\Delta I_F / ^\circ\text{C}$ | -0.7(Ta \geq 39°C) | -0.5(Ta \geq 25°C) | mA / °C |
| | Pulse forward current | I_{FP} | 1(100 μ s, pulse, 100pps) | | A |
| | Power dissipation(1 Circuit) | P_D | 100 | 70 | mW |
| | Power dissipation derating (Ta \geq 25°C, 1 Circuit) | $\Delta P_D / ^\circ\text{C}$ | -1.0 | -0.7 | mW / °C |
| | Reverse voltage | V_R | 5 | | V |
| | Junction temperature | T_j | 125 | | °C |
| Detector | Collector-emitter voltage | V_{CEO} | 55 | | V |
| | Emitter-collector voltage | V_{ECO} | 7 | | V |
| | Collector current | I_C | 50 | | mA |
| | Collector power dissipation(1 circuit) | P_C | 150 | 100 | mW |
| | Collector power dissipation derating (Ta \geq 25°C, 1 Circuit) | $\Delta P_C / ^\circ\text{C}$ | -1.5 | -1.0 | mW / °C |
| | Junction temperature | T_j | 125 | | °C |
| Storage temperature range | | T_{stg} | -55~125 | | °C |
| Operating temperature range | | P_{opr} | -55~100 | | °C |
| Lead soldering temperature | | T_{sol} | 260(10s) | | °C |
| Total package power dissipation(1 Circuit) | | P_T | 250 | 150 | mW |
| Total package power dissipation derating (Ta \geq 25°C, 1 Circuit) | | $\Delta P_T / ^\circ\text{C}$ | -2.5 | -1.5 | mW / °C |
| Isolation voltage (Note 1) | | BV_S | 5000(AC, 1min., RH \leq 60%) | | 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: LED side pins shorted together, and detector side pins shorted together.

Recommended Operating Conditions

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage | V_{CC} | — | 5 | 24 | V |
| Forward current | I_F | — | 1.6 | 20 | mA |
| Collector current | I_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. | 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 | μA |
| | 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 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 | μA |
| Capacitance collector to emitter | C_{CE} | $V=0, f=1\text{MHz}$ | — | 12 | — | pF | |

Coupled Electrical Characteristics (Ta = 25°C)

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|--------------------------------------|----------------------|---|------|------|------|------|
| Current transfer ratio | I_C / I_F | $I_F = 1\text{mA}, V_{CE} = 0.5\text{V}$ Rank BV | 100 | — | 1200 | % |
| | | | 200 | — | 1200 | |
| Low input CTR | I_C / I_F (low) | $I_F = 0.5\text{mA}, V_{CE} = 1.5\text{V}$ Rank BV | 50 | — | — | % |
| | | | 100 | — | — | |
| Collector-emitter saturation voltage | V_{CE} (sat) | $I_C = 0.5\text{mA}, I_F = 1\text{mA}$ $I_C = 1\text{mA}, I_F = 1\text{mA}$ Rank BV | — | — | 0.4 | V |
| | | | — | 0.2 | — | |
| | | | — | — | 0.4 | |

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

| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|------------------------|----------------------|---|------|------|------|------|
| Current transfer ratio | I_C / I_F | $I_F = 1\text{mA}, V_{CE} = 0.5\text{V}$ Rank BV | 50 | — | — | % |
| | | | 100 | — | — | |
| Low input CTR | I_C / I_F (low) | $I_F = 0.5\text{mA}, V_{CE} = 1.5\text{V}$ Rank BV | — | 50 | — | % |
| | | | — | 100 | — | |

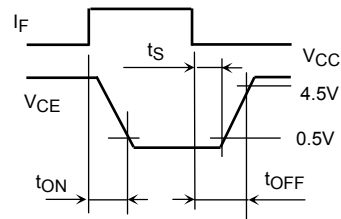
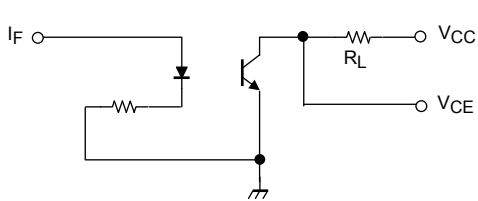
Isolation Characteristics (Ta = 25°C)

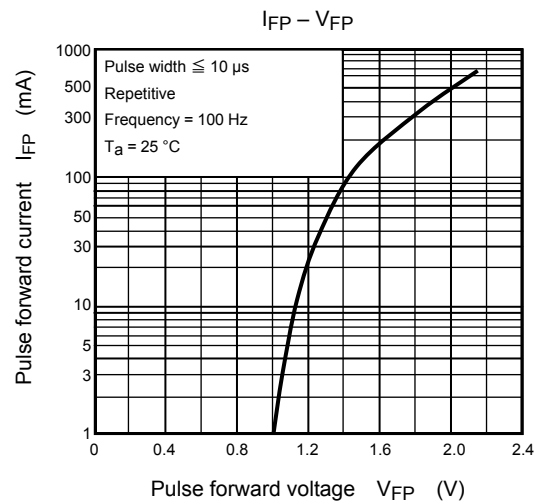
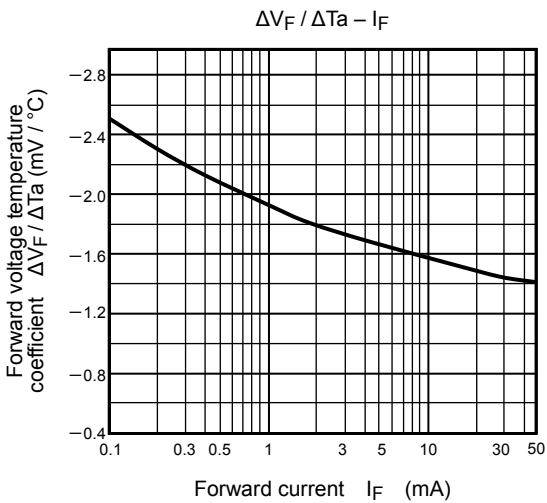
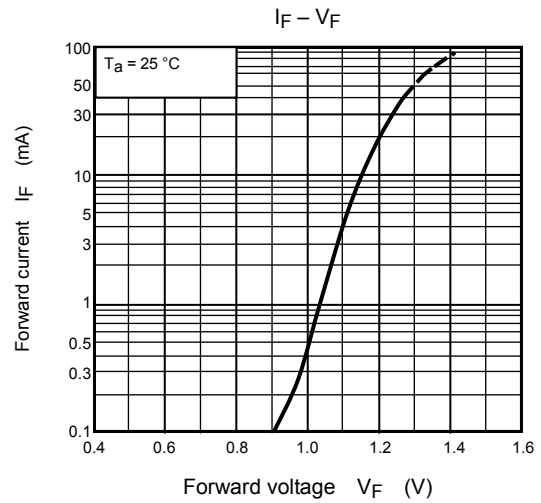
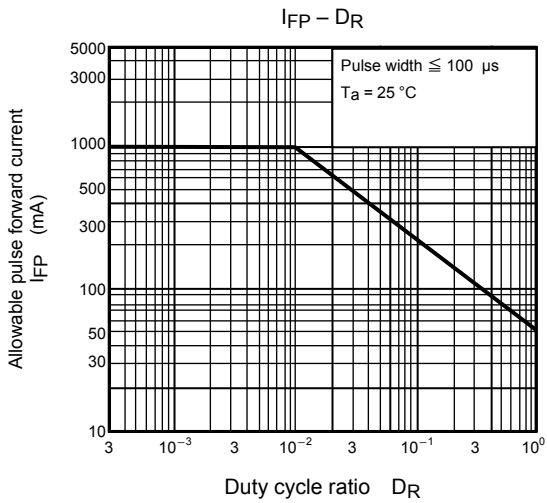
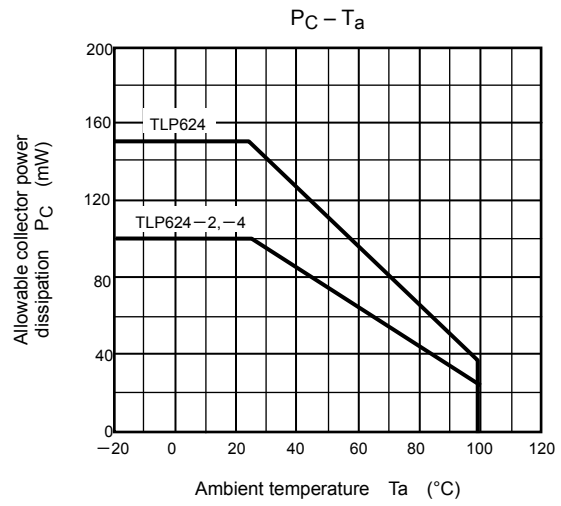
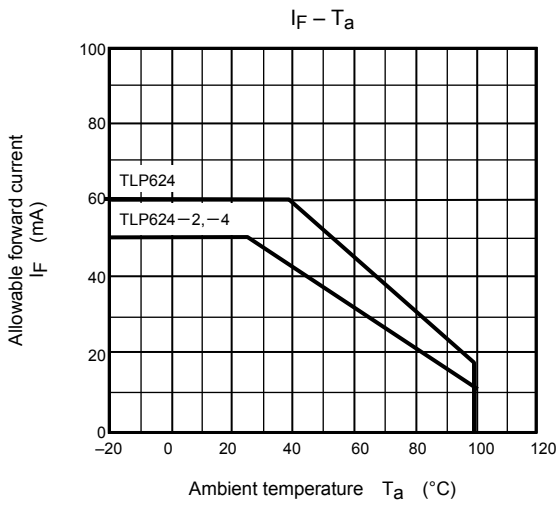
| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------------|------------------------------|--------------------|------------------|------|------------------|
| Capacitance input to output | C _S | V _S = 0, f = 1MHz | — | 0.8 | — | pF |
| Isolation resistance | R _S | V _S = 500V | 5×10 ¹⁰ | 10 ¹⁴ | — | Ω |
| Isolation voltage | BV _S | AC, 1minute | 5000 | — | — | V _{rms} |
| | | AC, 1second, in oil | — | 10000 | — | |
| | | DC, 1 minute, in oil | — | 10000 | — | V _{dc} |

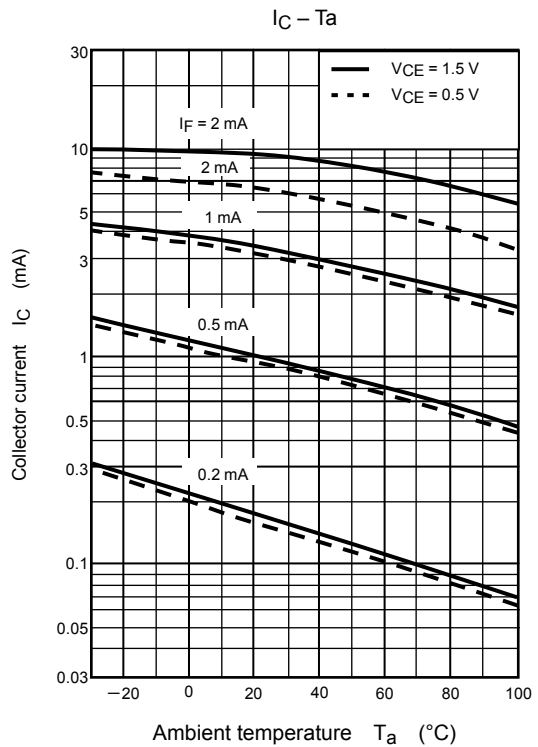
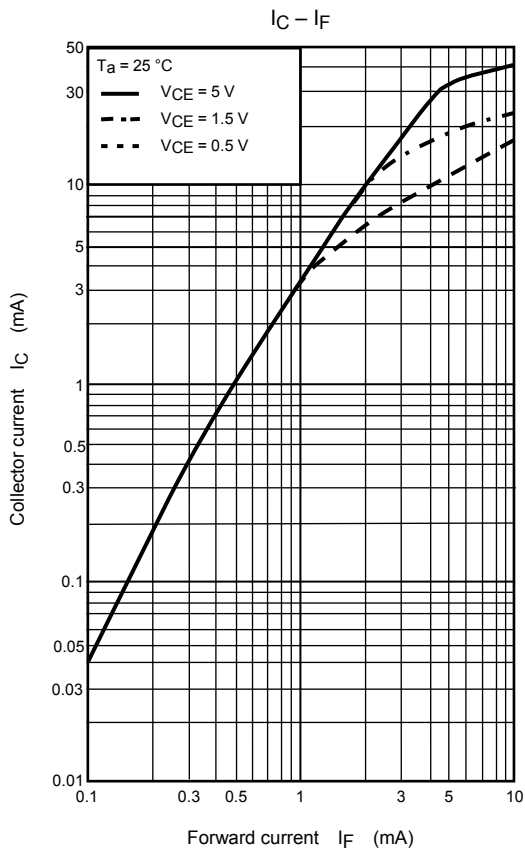
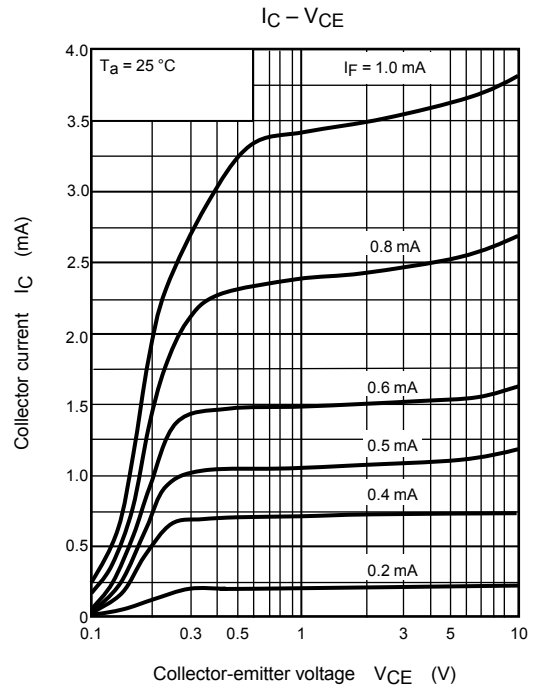
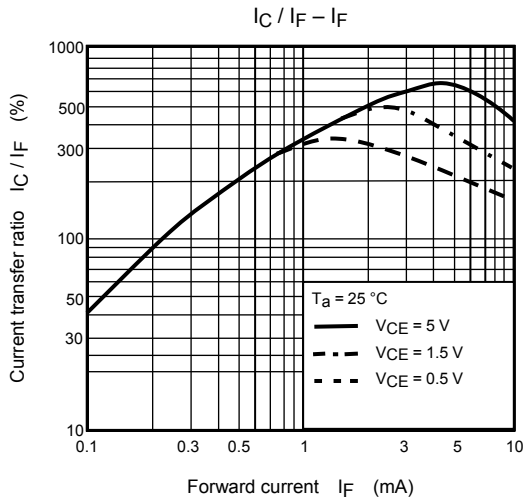
Switching Characteristics (Ta = 25°C)

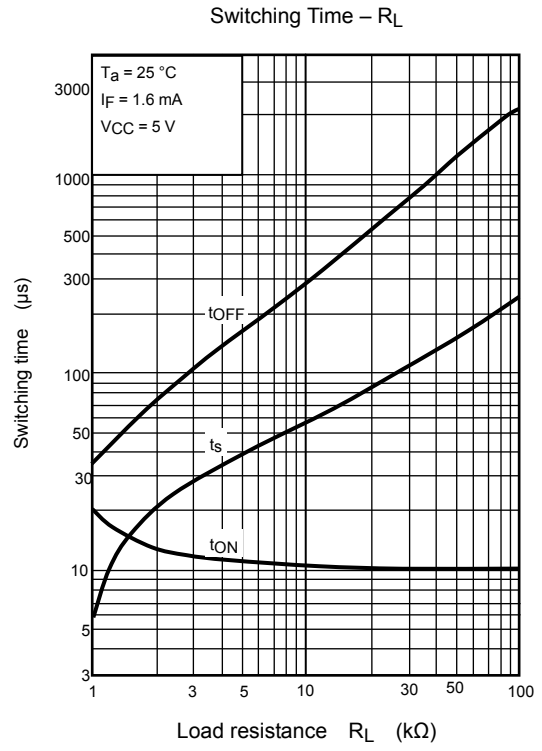
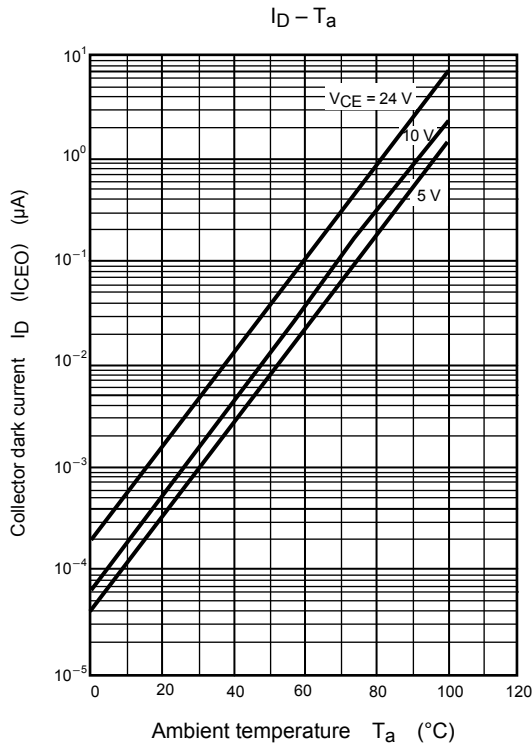
| Characteristic | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|----------------|------------------|--|------|------|------|------|
| Rise time | t _r | V _{CC} = 10V, I _C = 2mA R _L = 100Ω | — | 8 | — | μs |
| Fall time | t _f | | — | 8 | — | |
| Turn-on time | t _{on} | | — | 10 | — | |
| Turn-off time | t _{off} | | — | 8 | — | |
| Turn-on time | t _{ON} | R _L = 4.7 kΩ (Fig.1) V _{CC} = 5 V, I _F = 1.6mA | — | 10 | — | μs |
| Storage time | t _S | | — | 50 | — | |
| Turn-off time | T _{OFF} | | — | 300 | — | |

Fig. 1 Switching time test circuit









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Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru