TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

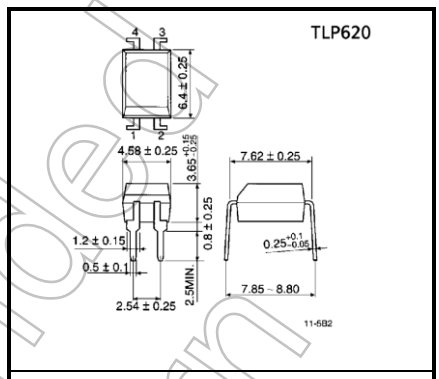
TLP620, TLP620−2, TLP620−4

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.)

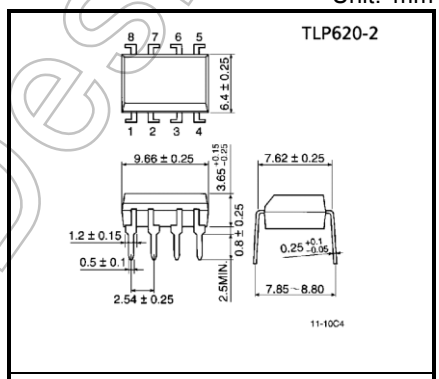
Unit: mm



TOSHIBA	11−5B2

Weight: 0.26 g (typ.)

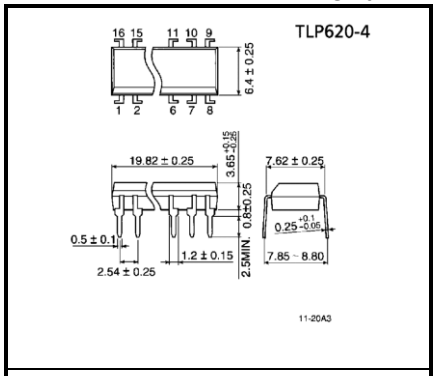
Unit: mm



TOSHIBA	11−10C4

Weight: 0.54 g (typ.)

Unit: mm

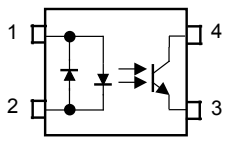


TOSHIBA	11−20A3

Weight: 1.1 g (typ.)

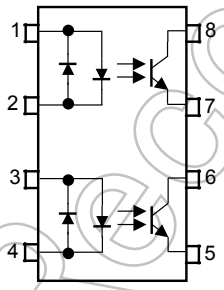
Pin Configurations (top view)

TLP620



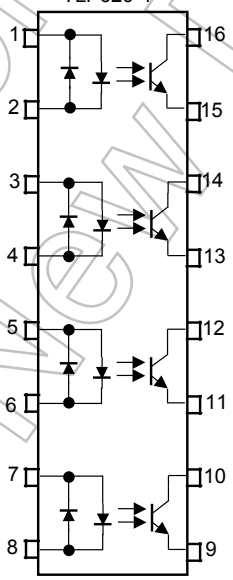
1 : ANODE
CATHODE
2 : CATHODE
ANODE
3 : EMITTER
4 : COLLECTOR

TLP620-2



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

TLP620-4



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

Start of commercial production
1984/01

- Isolation voltage: 5000V_{rms} (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_{PK}

  Highest permissible over voltage: 8000V_{PK}

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

	7.62 mm pitch standard type	10.16 mm pitch TLP×××F type
• 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)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP620	TLP620−2 TLP620−4	
LED	Forward current	$I_{F\ (RMS)}$	60	50	mA
	Forward current derating	ΔI_F / °C	−0.7 (Ta ≥ 39°C)	−0.5 (Ta ≥ 25°C)	mA / °C
	Pulse forward current	I_{FP}	±1 (100μs pulse, 100pps)		A
	Power dissipation (1 circuit)	P_D	100	70	mW
	Power dissipation derating (1 circuit)	ΔP_D / °C	−1.2 (Ta ≥ 39°C)	−0.7 (Ta ≥ 25°C)	mW / °C
	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 (1 circuit) (Ta ≥ 25°C)	ΔP_C / °C	−1.5	−1.0	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		T_{sold}	260 (10s)		°C
Total package power dissipation (1 circuit)		P_T	250	150	mW
Total package power dissipation derating (Ta ≥ 25°C, 1 circuit)		ΔP_T / °C	−2.5	−1.5	mW / °C
Isolation voltage (Note1)		BV_S	5000 (AC, 1 min., RH ≤ 60%)		V_{rms}

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_{CC}	—	5	24	V
Forward current	$I_{F\ (RMS)}$	—	16	25	mA
Collector current	I_C	—	1	10	mA
Operating temperature	T_{opr}	−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.

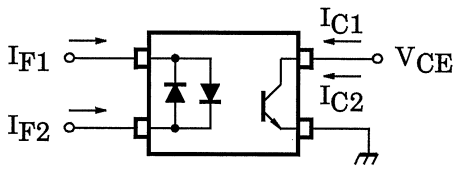
Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = ±10mA	1.0	1.15	1.3	V
	Forward current	I_F	V_F = ±0.7V	—	2.5	20	μA
	Capacitance	C_T	V = 0V, f = 1MHz	—	60	—	pF
Detector	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 dark current	I_{CEO}	V_{CE} = 24V	—	10	100	nA
			V_{CE} = 24V, Ta = 85°C	—	2	50	μA
	Capacitance (collector to emitter)	C_{CE}	V_{CE} = 0V, f = 1MHz	—	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 = ±5mA, V_{CE} = 5V Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	I_C / $I_{F\ (sat)}$	IF = ±1mA, V_{CE} = 0.4V Rank GB	—	60	—	%
			30	—	—	
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 2.4mA, I_F = ±8mA	—	—	0.4	V
		I_C = 0.2 mA, I_F = ±1 mA Rank GB	—	0.2	—	
			—	—	0.4	
Off−state collector current	$I_{C\ (off)}$	V_F = ± 0.7V, V_{CE} = 24V	—	1	10	μA
CTR symmetry (Note.)	$I_{C\ (ratio)}$	I_C (I_F = −5mA) / I_C (I_F = +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)

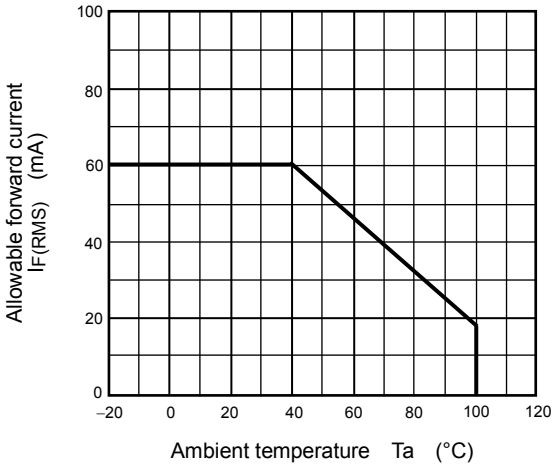
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance input to output	C_S	V_S = 0 V, f = 1MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500V, R.H. ≤ 60%	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	5000	—	—	V_{rms}
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V_{dc}

Switching Characteristics (Ta = 25°C)

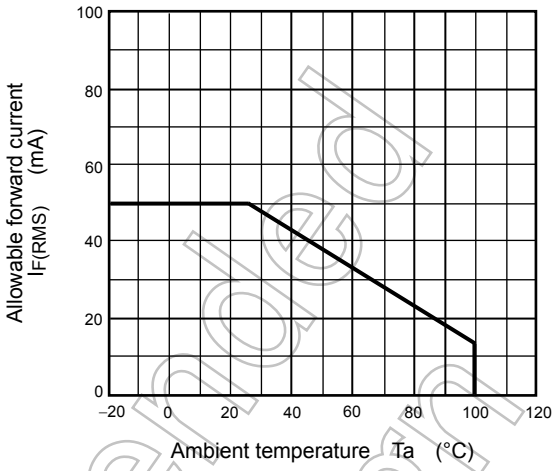
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	V_{CC} = 10V I_C = 2mA R_L = 100Ω	—	2	—	μs
Fall time	t_f		—	3	—	
Turn−on time	t_{on}		—	3	—	
Turn−off time	t_{off}		—	3	—	
Turn−on time	t_{ON}	R_L = 1.9kΩ (Fig.1) V_{CC} = 5V, I_F = ±16mA	—	2	—	μs
Storage time	t_s		—	15	—	
Turn−off time	t_{OFF}		—	25	—	

Fig. 1 Switching time test circuit

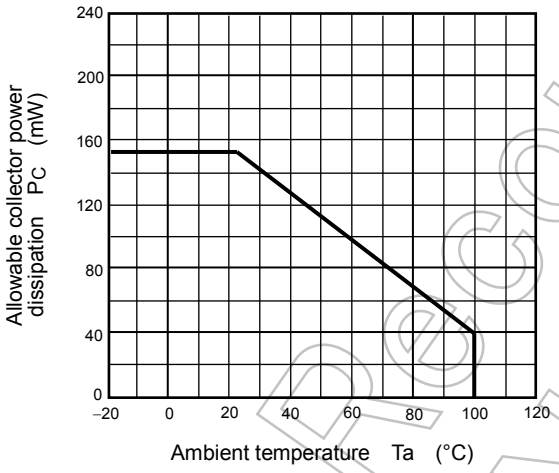
TLP620 $I_{F(RMS)}$ – Ta



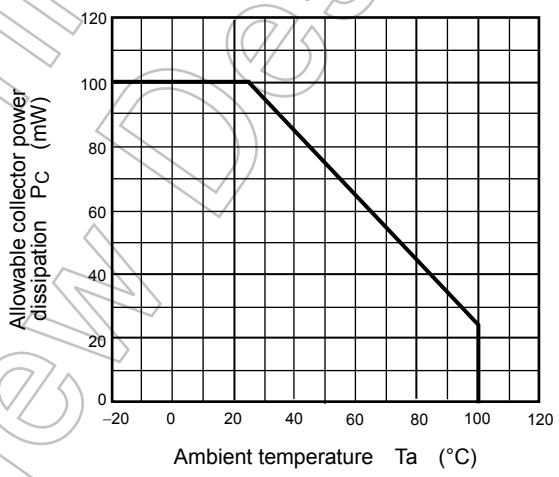
TLP620-2
TLP620-4 $I_{F(RMS)}$ – Ta



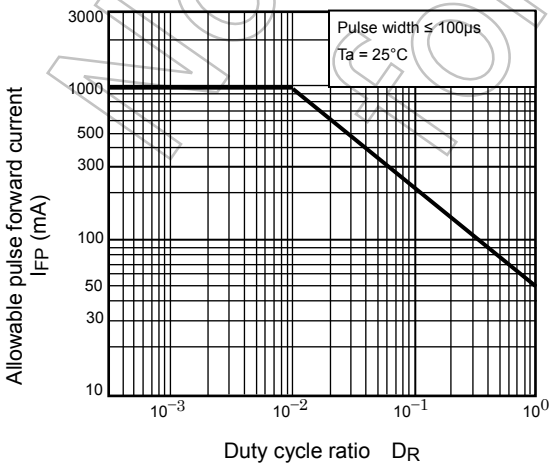
TLP620 P_C – Ta



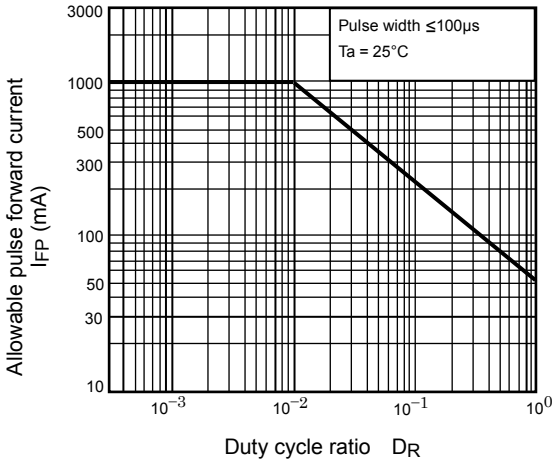
TLP620-2
TLP620-4 P_C – Ta



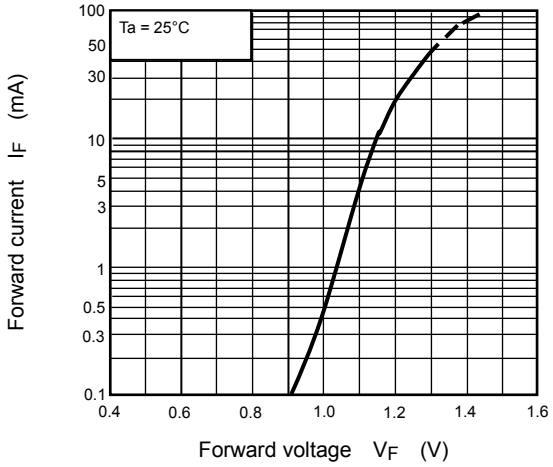
TLP620 I_{FP} – D_R



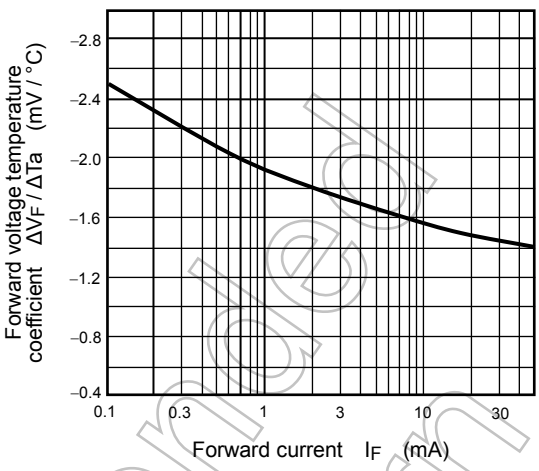
TLP620-2
TLP620-4 I_{FP} – D_R



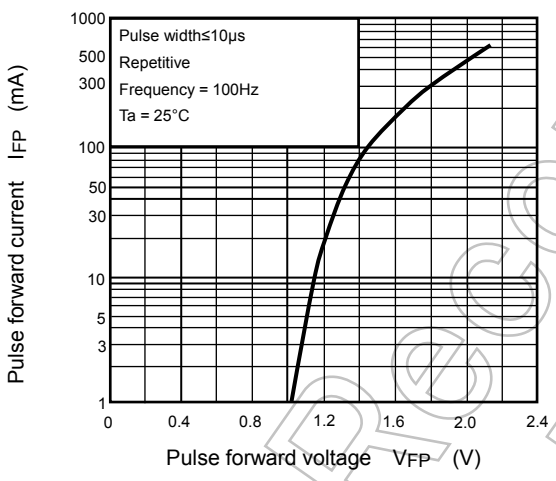
$I_F - V_F$



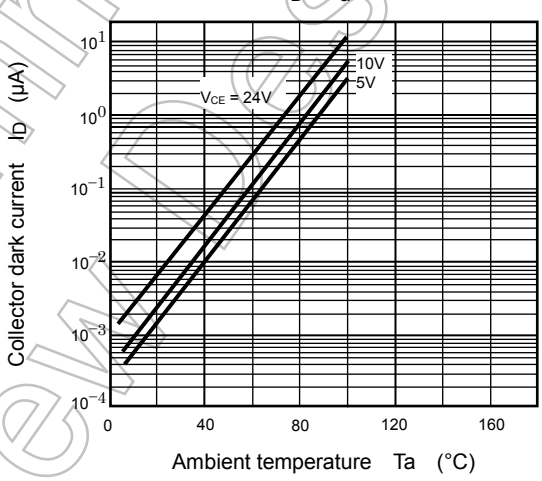
$\Delta V_F / \Delta Ta - I_F$



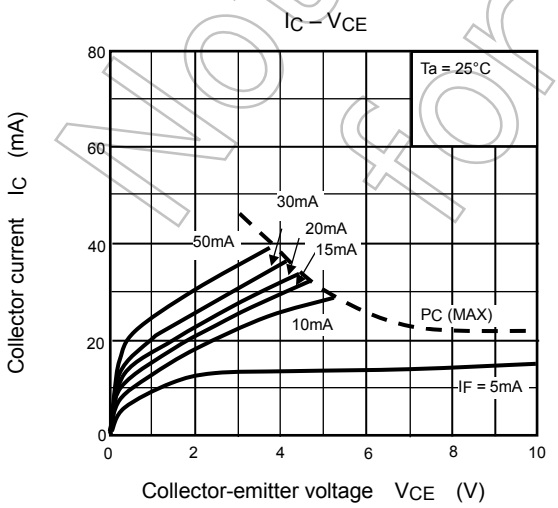
$I_{FP} - V_{FP}$



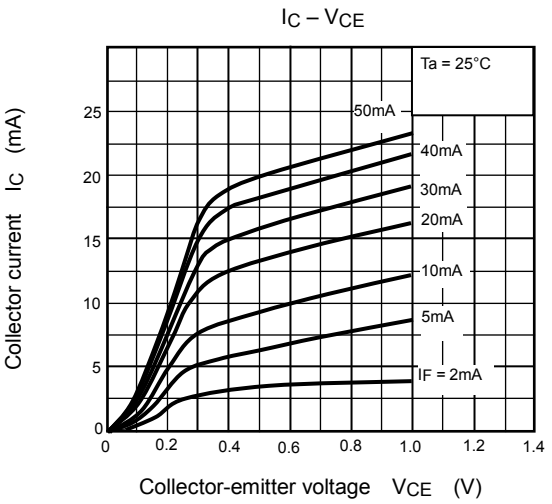
$I_D - Ta$



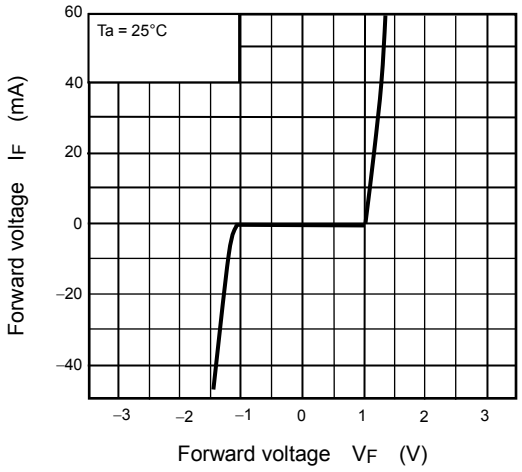
$I_C - V_{CE}$



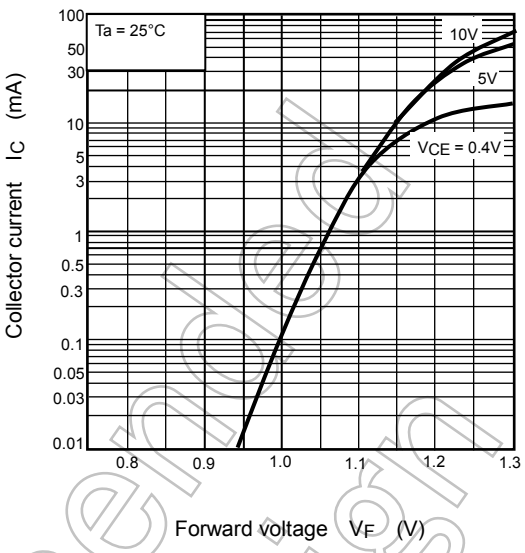
$I_C - V_{CE}$



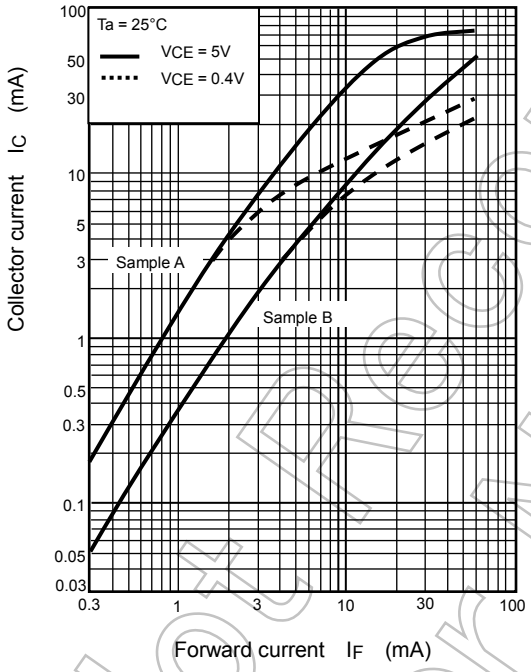
$I_F - V_F$



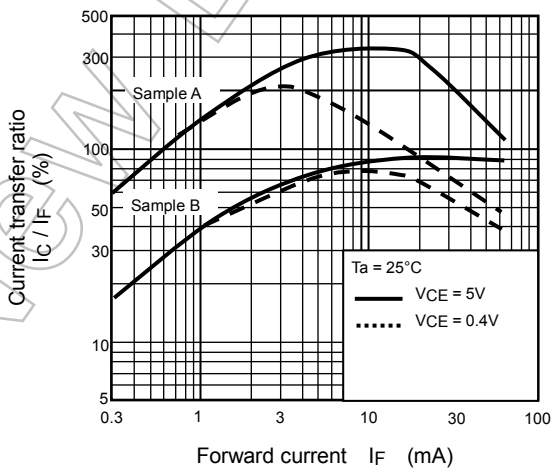
$I_C - V_F$



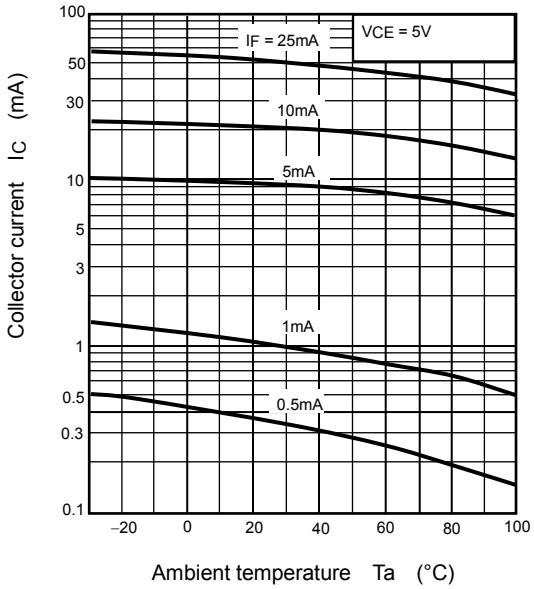
$I_C - I_F$



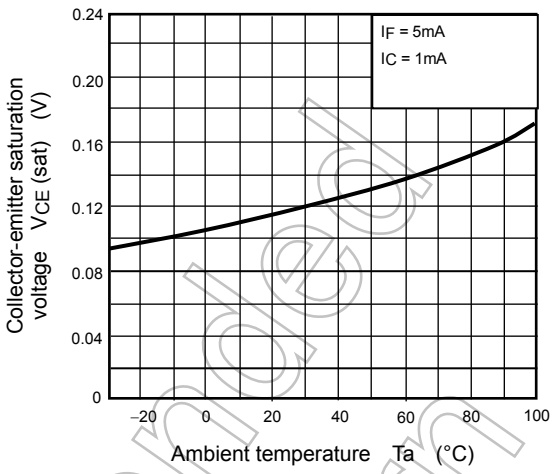
$I_C / I_F - I_F$



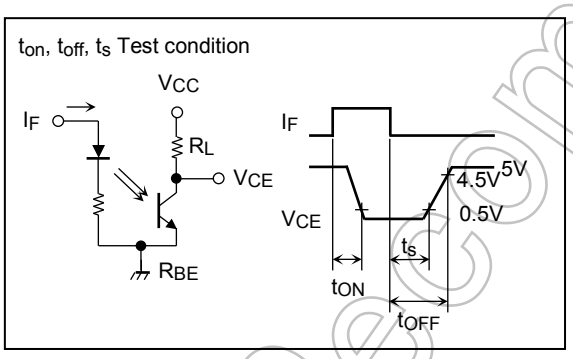
I_C – Ta



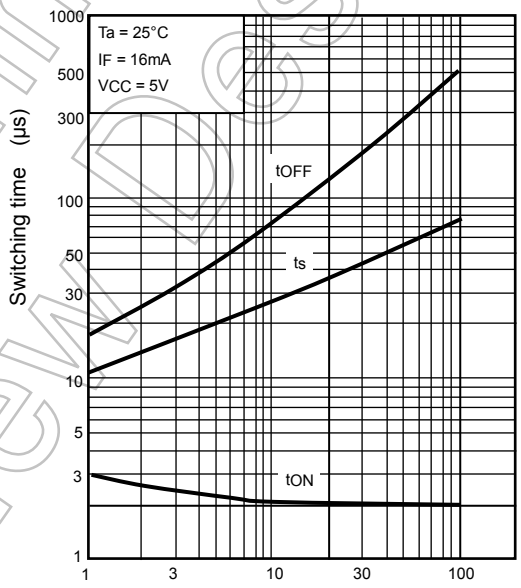
V_{CE} (sat) – Ta



t_{on}, t_{off}, t_s Test condition



Switching Time – R_L



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