TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

TLP620, TLP620−2, TLP620−4

Programmable Controllers

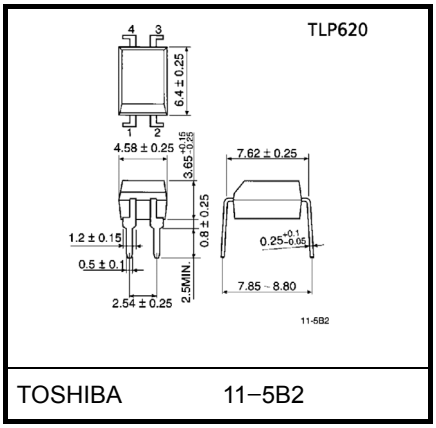
AC / DC−Input Module

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.

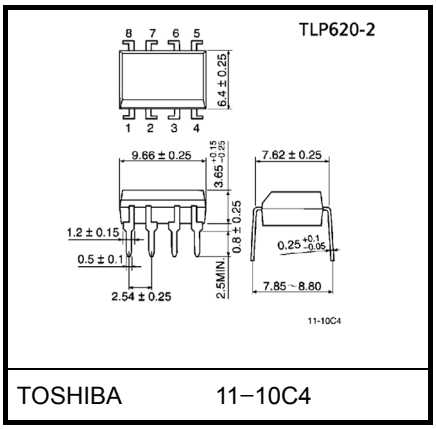
- Collector−emitter voltage: 55V (min.)
- Current transfer ratio: 50% (min.)
  Rank GB: 100% (min.)

Unit in mm



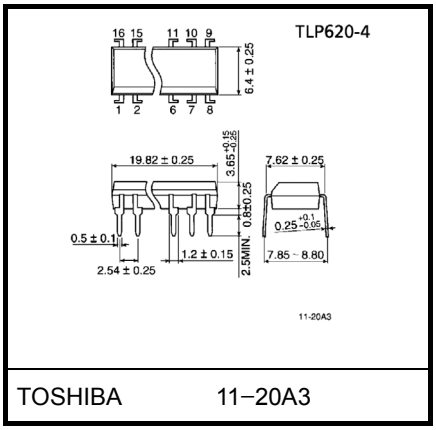
TOSHIBA 11−5B2

Weight: 0.26 g



TOSHIBA 11−10C4

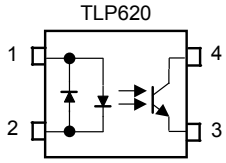
Weight: 0.54 g



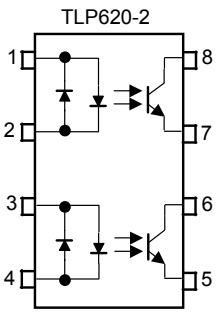
TOSHIBA 11−20A3

Weight: 1.1 g

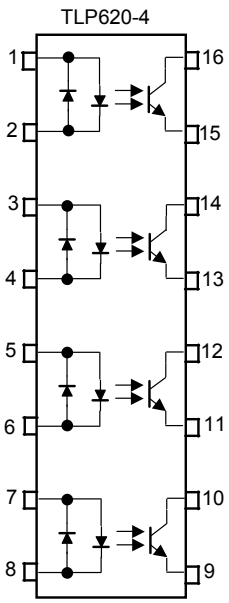
Pin Configurations (top view)



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

	Made In Japan		Made In Thailand	
UL recognized	E67349	*1	E152349	*1
BSI approved	7426, 7427	*2	7426, 7427	*2

*1 UL1577

*2 BS EN60065: 2002, BS EN60950-1: 2002

- Isolation voltage: 5000V_{rms} (min.)
- Option (D4) type
  VDE approved: DIN EN 60747-5-2, certificate no.40009302
  Maximum operating insulation voltage: 890V_{PK}
  Highest permissible over voltage: 8000V_{PK}

  (Note) When an EN 60747-5-2 approved type is needed, please designate the "Option(D4)".

- Creepage distance: 6.4mm (min.)
  Clearance: 6.4mm (min.)
  Insulation thickness: 0.4mm (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	ΔP_D / °C	−1.0	−0.7	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		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		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).

Recommended Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	$I_{F\ (RMS)}$	—	16	20	mA
Collector current	IC	—	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 = 0, 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} = 0, 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	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	I_C / $I_{F\ (sat)}$	IF = ±1mA, V_{CE} = 0.4V	—	60	—	%
		Rank GB	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	—	0.2	—	
		Rank GB	—	—	0.4	
Off−state collector current	$I_{C\ (off)}$	V_F = ± 0.7V, V_{CE} = 24V	—	1	10	μA
CTR symmetry	$I_{C\ (ratio)}$	I_C (I_F = −5mA) / I_C (I_F = +5mA)	0.33	1	3	—

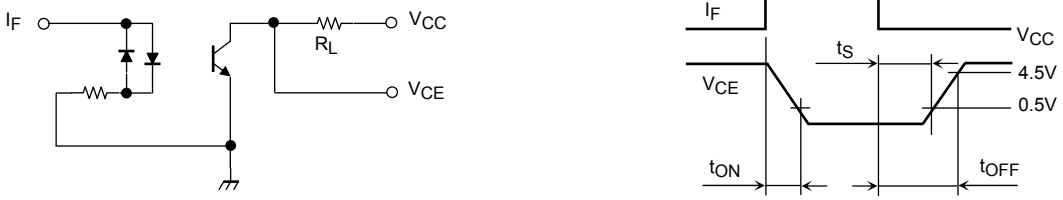
Isolation Characteristics (Ta = 25°C)

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	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}

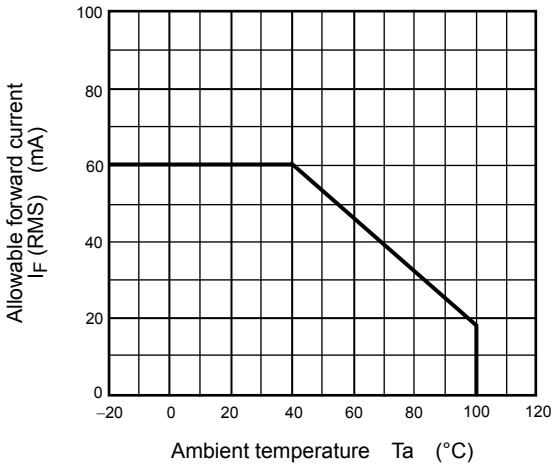
Switching Characteristics (Ta = 25°C)

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	—	

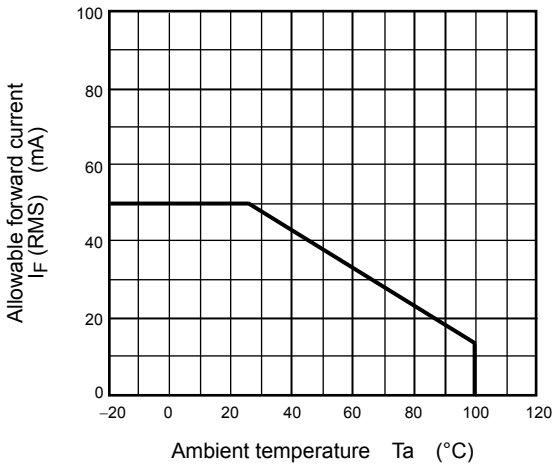
Fig. 1 Switching time test circuit



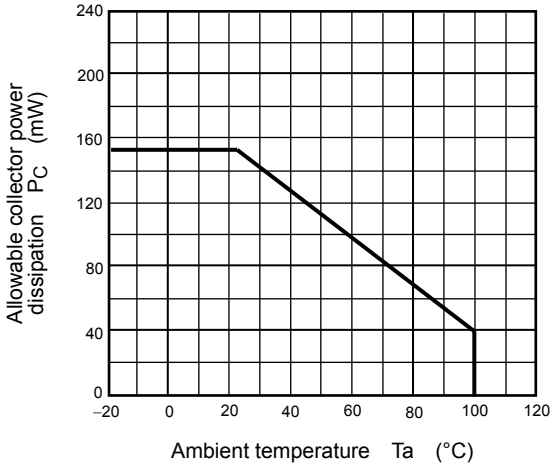
TLP620 I_F – Ta



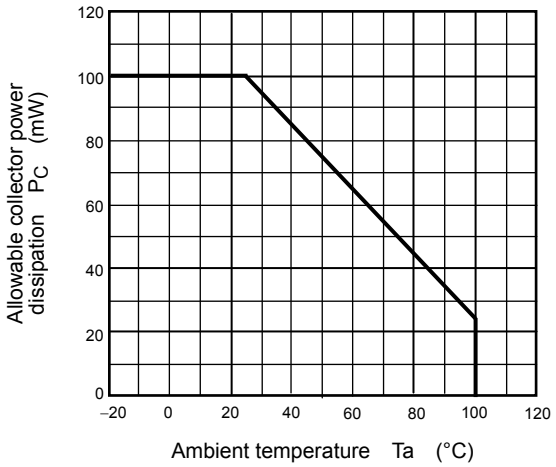
TLP620-2
TLP620-4 I_F – Ta



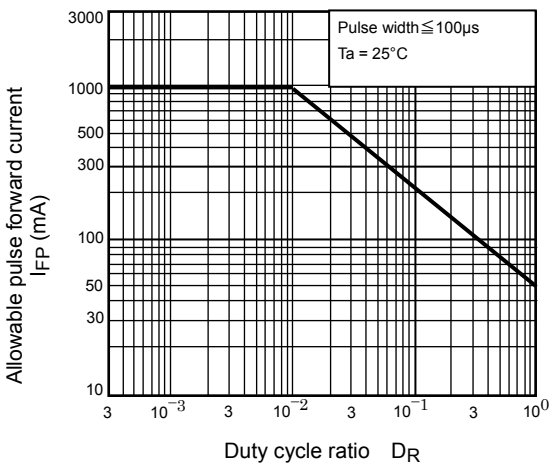
TLP620 P_C – Ta



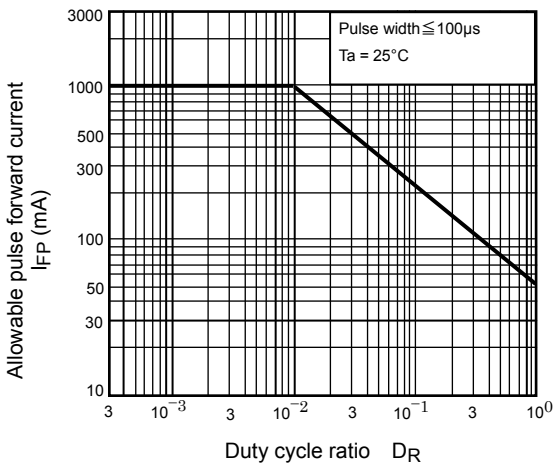
TLP620-2
TLP620-4 P_C – Ta



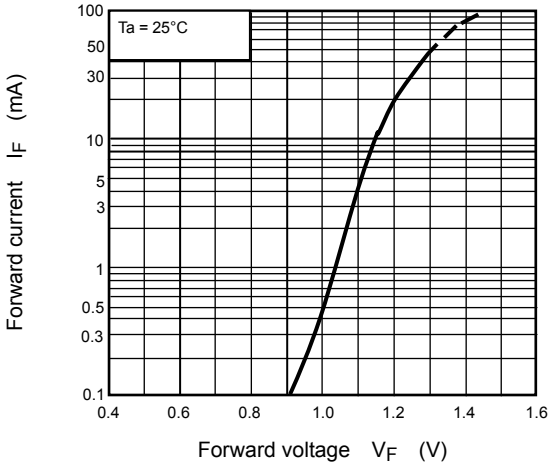
TLP620 I_{FP} – D_R



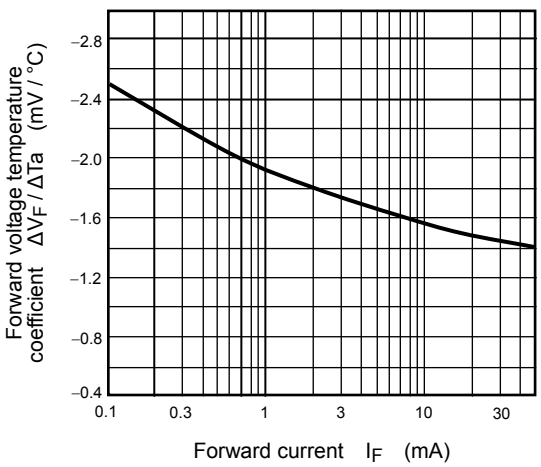
TLP620-2
TLP620-4 I_{FP} – D_R



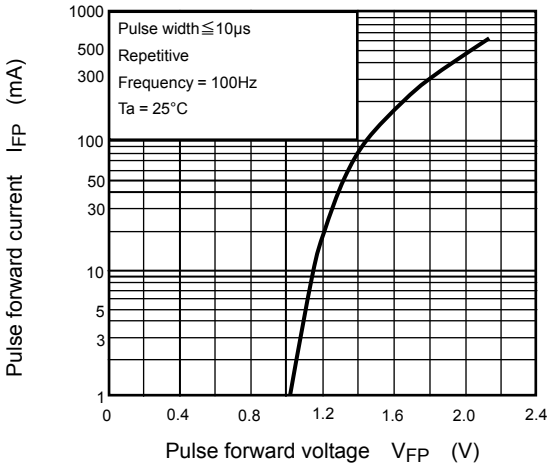
$I_F - V_F$



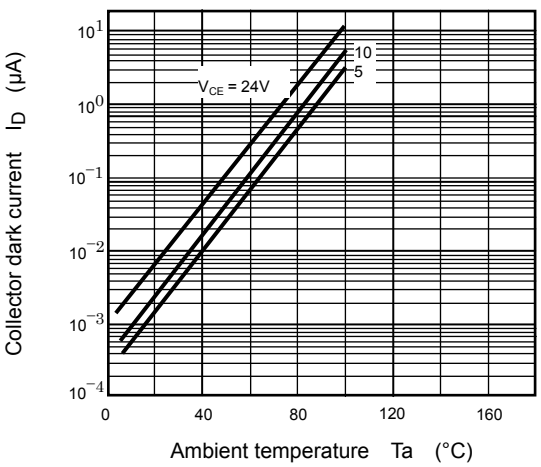
$\Delta V_F / \Delta Ta - I_F$



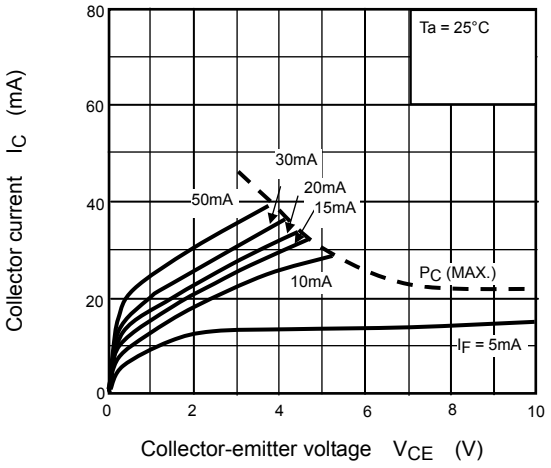
$I_{FP} - V_{FP}$



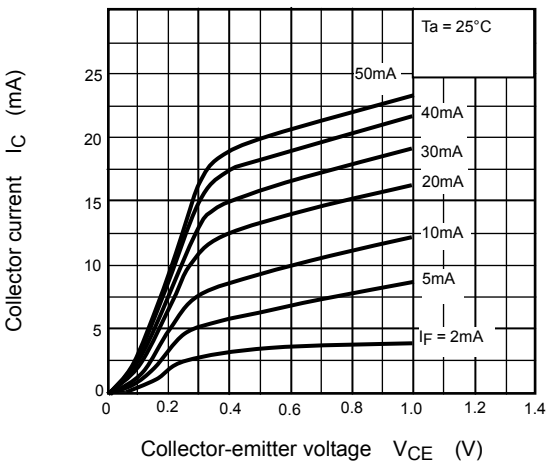
$I_D - T_a$



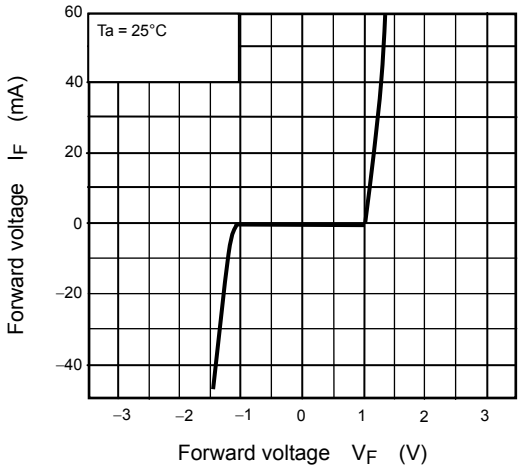
$I_C - V_{CE}$



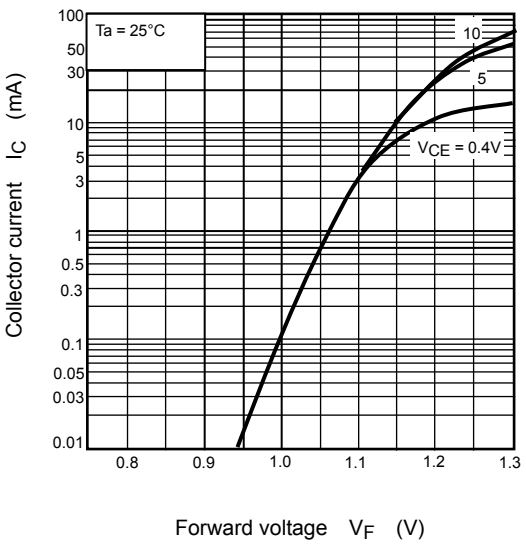
$I_C - V_{CE}$



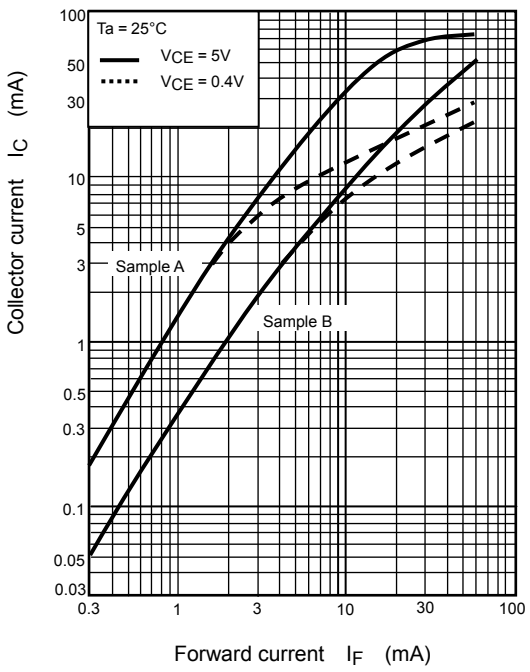
$V_F - I_F$



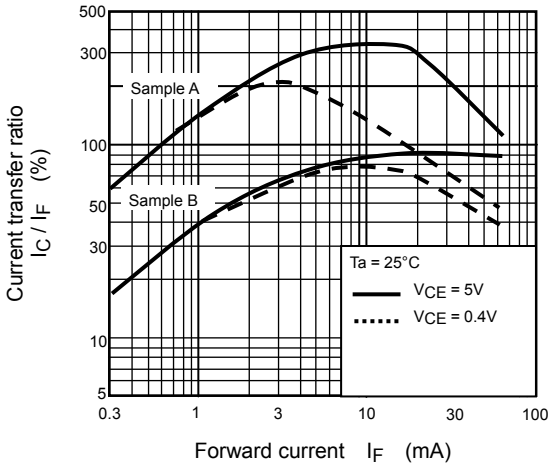
$I_C - V_F$



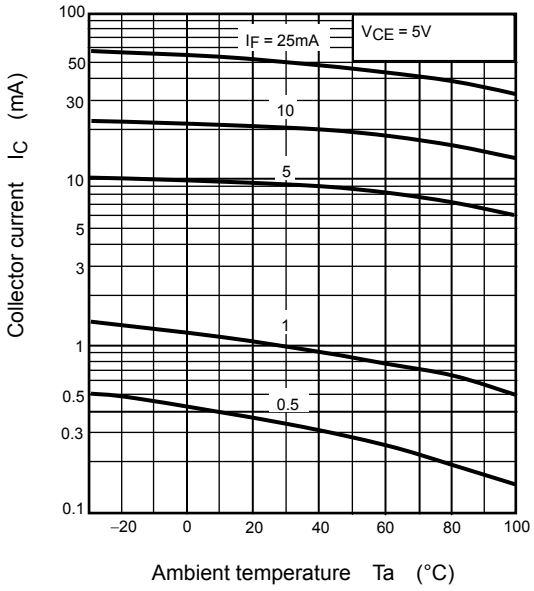
$I_C - I_F$



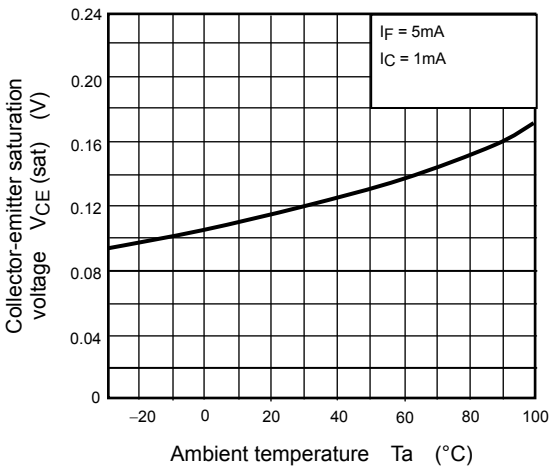
$I_C / I_F - I_F$

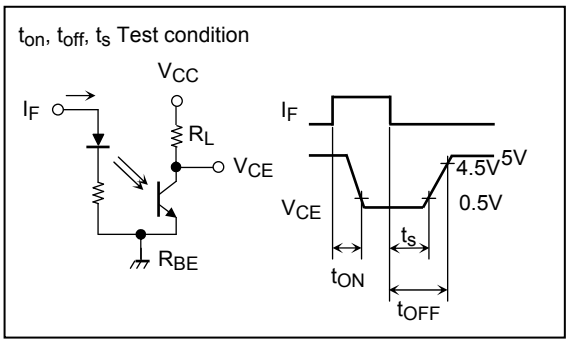


I_C – Ta

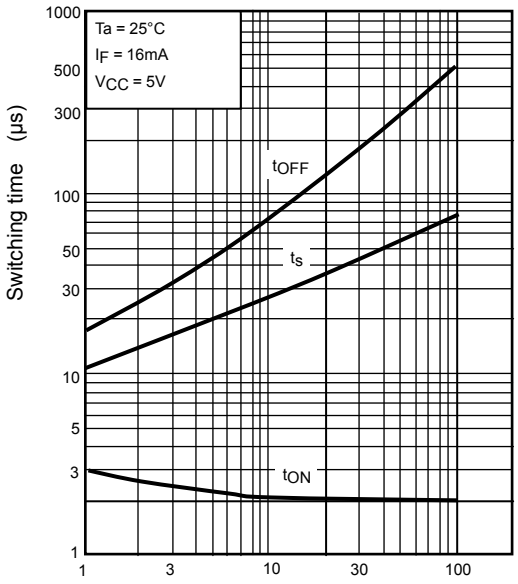


V_{CE} (sat) – Ta





R_L – Switching Time



RESTRICTIONS ON PRODUCT USE

20070701-EN

- The information contained herein is subject to change without notice.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc.
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.).These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in his document shall be made at the customer’s own risk.
- The products described in this document shall not be used or embedded to any downstream products of which manufacture, use and/or sale are prohibited under any applicable laws and regulations.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patents or other rights of TOSHIBA or the third parties.
- GaAs(Gallium Arsenide) is used in this product. The dust or vapor is harmful to the human body. Do not break, cut, crush or dissolve chemically.
- Please contact your sales representative for product-by-product details in this document regarding RoHS compatibility. Please use these products in this document in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances. Toshiba assumes no liability for damage or losses occurring as a result of noncompliance with applicable laws and regulations.