

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP130

Programmable Controllers  
AC / DC-Input Module  
Telecommunication

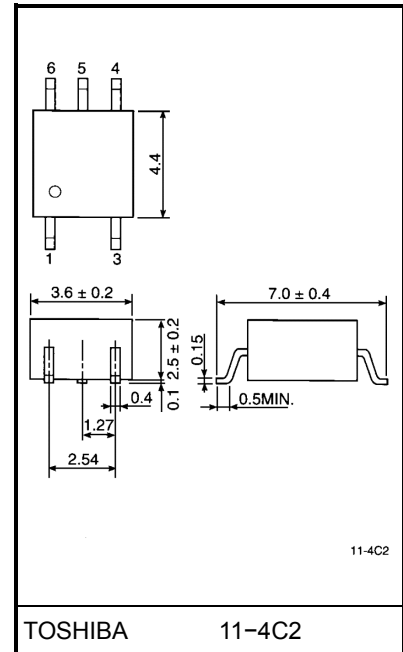
The TOSHIBA mini flat coupler TLP130 is a small outline coupler, suitable for surface mount assembly. TLP130 consists of a photo transistor, optically coupled to two gallium arsenide infrared emitting diode connected inverse parallel, and operate directly by AC input current.

- Collector-emitter voltage: 80V(min.)
- Current transfer ratio: 50%(min.)  
Rank GB: 100%(min.)
- Isolation voltage: 3750Vrms(min.)
- UL recognized: UL1577, file no.E67349
- Current transfer ratio

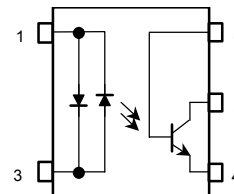
Classi- fication	Current Transfer Ratio		Marking Of Classification
	$I_F = 5\text{mA}, V_{CE} = 5\text{V}, T_a = 25^\circ\text{C}$		
	Min.	Max.	
Standard	50	600	Blank, Y, GR, GB
Rank GB	100	600	GB,GR

(Note) Application type name for certification test,  
please use standard product type name, i.e.  
TLP130(GB): TLP130

Unit in mm



Weight: 0.09 g



- 1 : Anode, Cathode
- 3 : Cathode, Anode
- 4 : Emitter
- 5 : Collector
- 6 : Base

## Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	$I_{F(RMS)}$	50	mA
	Forward current derating (Ta≥53°C)	$\Delta I_F / ^\circ C$	-0.7	mA / °C
	Peak forward current (100μs pulse, 100pps)	$I_{FP}$	1	A
	Junction temperature	$T_j$	125	°C
Detector	Collector-emitter voltage	$V_{CEO}$	80	V
	Collector-base voltage	$V_{CBO}$	80	V
	Emitter-collector voltage	$V_{ECO}$	7	V
	Emitter-base voltage	$V_{EBO}$	7	V
	Collector current	$I_C$	50	mA
	Peak collector current (10ms pulse, 100pps)	$I_{CP}$	100	mA
	Power dissipation	$P_C$	150	mW
	Power dissipation derating (Ta≥25°C)	$\Delta P_C / ^\circ C$	-1.5	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 (10s)		$T_{sol}$	260	°C
Total package power dissipation		$P_T$	200	mW
Total package power dissipation derating (Ta≥25°C)		$\Delta P_T / ^\circ C$	-2.0	mW / °C
Isolation voltage (AC, 1min., RH ≤ 60%) (Note 1)		$BV_S$	3750	Vrms

(Note 1) Device considered a two terminal device: Pins 1 and 3 shorted together and pins 4, 5 and 6 shorted together.

## Recommended Operating Conditions

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	$V_{CC}$	—	5	48	V
Forward current	$I_{F(RMS)}$	—	16	25	mA
Collector current	$I_C$	—	1	10	mA
Operating temperature	$T_{opr}$	-25	—	85	°C

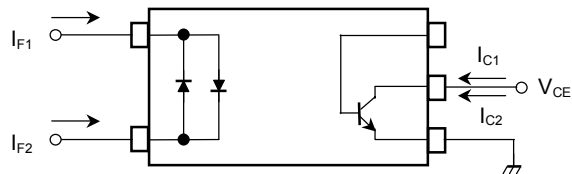
## Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = \pm 10\text{mA}$	1.0	1.15	1.3	V
	Capacitance	$C_T$	$V = 0, f = 1\text{MHz}$	—	60	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5\text{mA}$	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = 0.1\text{mA}$	80	—	—	V
	Emitter-base breakdown voltage	$V_{(BR)EBO}$	$I_E = 0.1\text{mA}$	7	—	—	V
	Collector dark current	$I_{CEO}$	$V_{CE} = 48\text{V}$	—	10	100	nA
			$V_{CE} = 48\text{V}, T_a = 85^\circ\text{C}$	—	2	50	$\mu\text{A}$
	Collector dark current	$I_{CER}$	$V_{CE} = 48\text{V}, T_a = 85^\circ\text{C}$ $R_{BE} = 1\text{M}\Omega$	—	0.5	10	$\mu\text{A}$
	Collector dark current	$I_{CBO}$	$V_{CB} = 10\text{V}$	—	0.1	—	nA
	DC forward current gain	$h_{FE}$	$V_{CE} = 5\text{V}, I_C = 0.5\text{mA}$	—	400	—	—
	Capacitance collector to emitter	$C_{CE}$	$V = 0, f = 1\text{MHz}$	—	10	—	pF

## Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = \pm 5\text{mA}, V_{CE} = 5\text{V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_{F(\text{sat})}$	$I_F = \pm 1\text{mA}, V_{CE} = 0.4\text{V}$ Rank GB	—	60	—	%
			30	—	—	
Base photo-current	$I_{PB}$	$I_F = \pm 5\text{mA}, V_{CB} = 5\text{V}$	—	10	—	$\mu\text{A}$
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$I_C = 2.4\text{mA}, I_F = \pm 8\text{mA}$ $I_C = 0.2\text{mA}, I_F = \pm 1\text{mA}$ Rank GB	—	—	0.4	V
			—	0.2	—	
			—	—	0.4	
Off-state collector current	$I_{C(\text{off})}$	$I_F = \pm 0.7\text{mA}, V_{CE} = 48\text{V}$	—	1	10	$\mu\text{A}$
CTR symmetry	$I_{C(\text{ratio})}$	$I_C(I_F = -5\text{mA}) / I_C(I_F = 5\text{mA})$ (Note 2)	0.33	—	3	—

(Note 2)  $I_{C(\text{ratio})} = \frac{I_{C2}(I_F = I_{F2}, V_{CE} = 5\text{V})}{I_{C1}(I_F = I_{F1}, V_{CE} = 5\text{V})}$



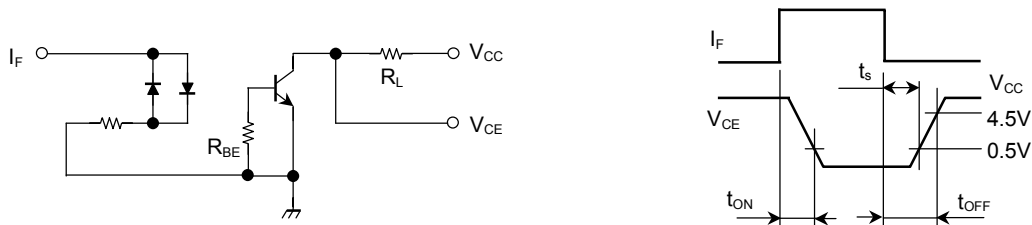
**Isolation Characteristics (Ta = 25°C)**

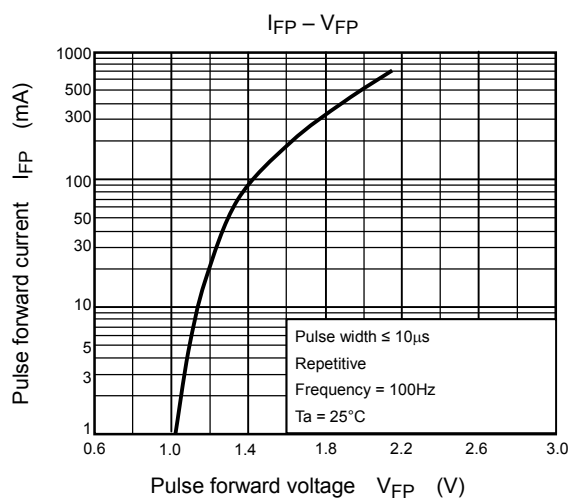
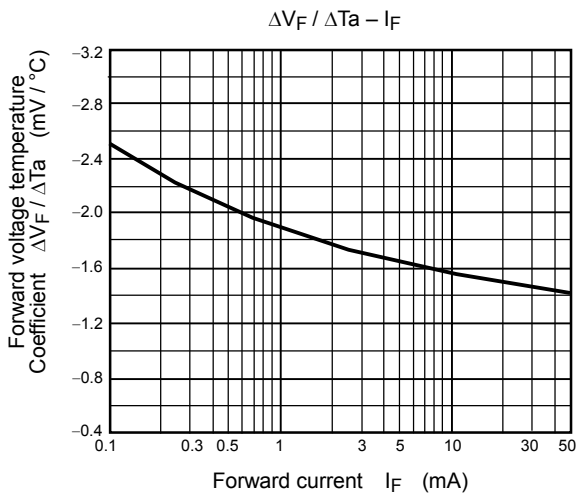
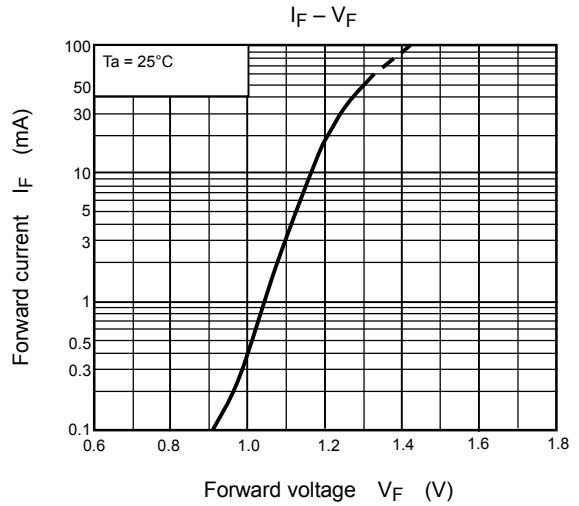
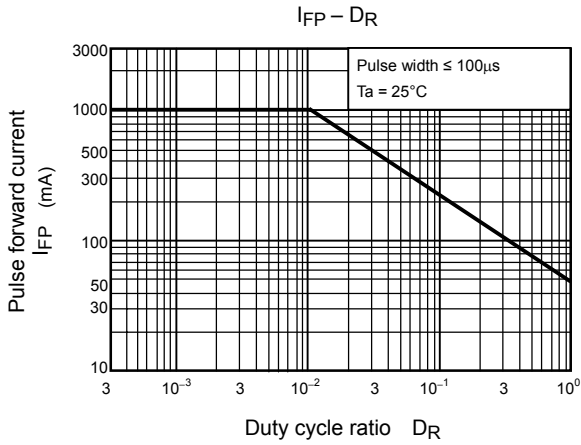
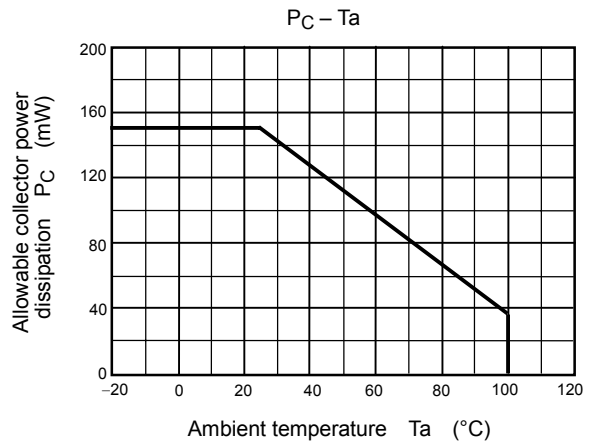
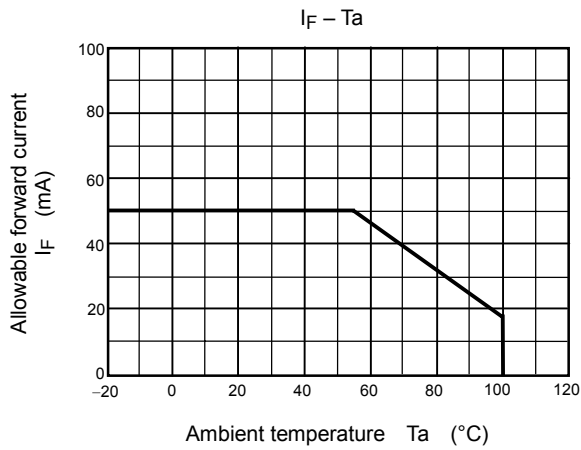
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance input to output	C <sub>S</sub>	V <sub>S</sub> =0, f=1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> =500V	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1minute	3750	—	—	V <sub>rms</sub>
		AC, 1second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

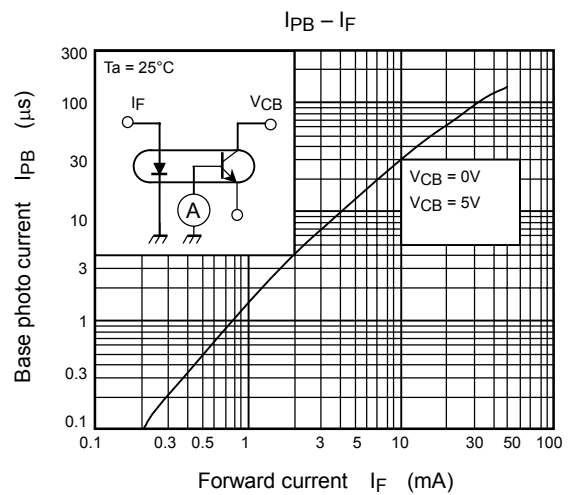
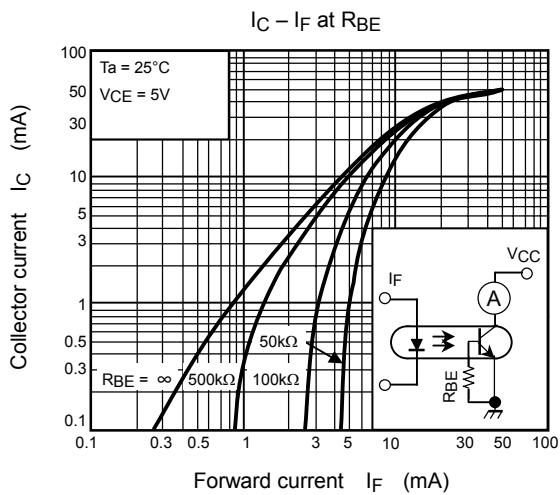
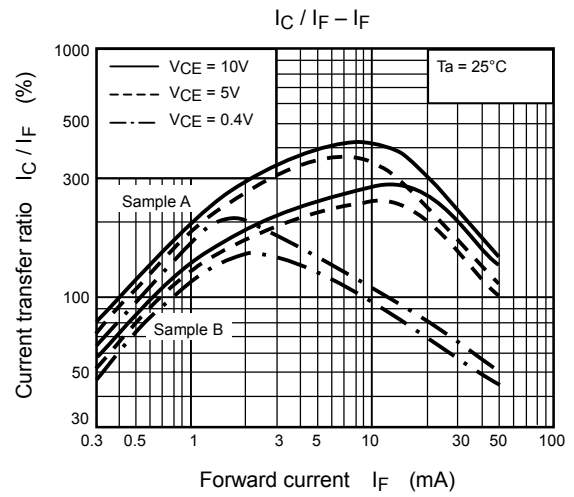
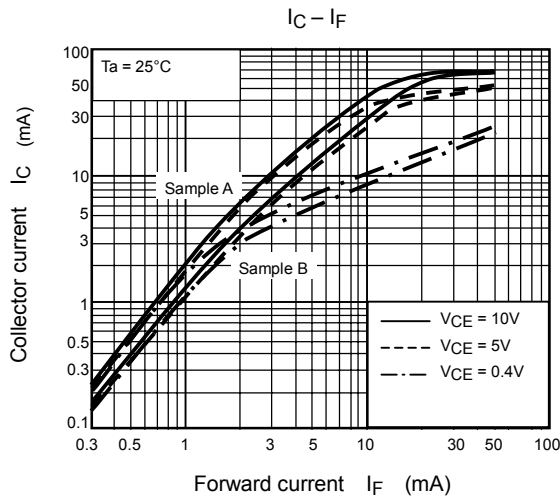
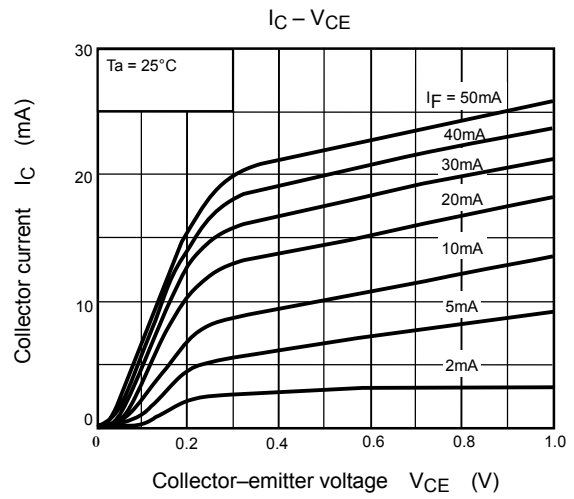
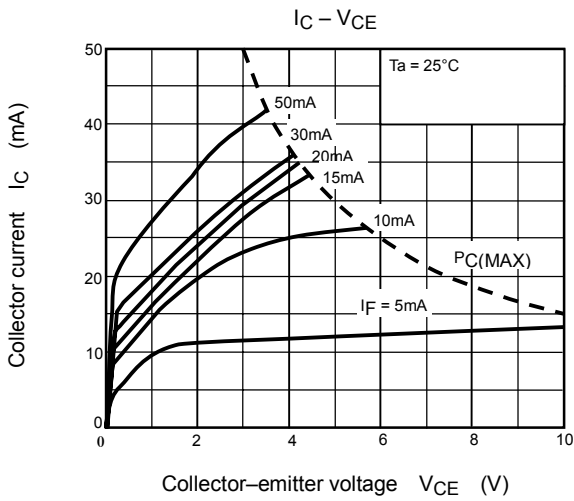
**Switching Characteristics (Ta = 25°C)**

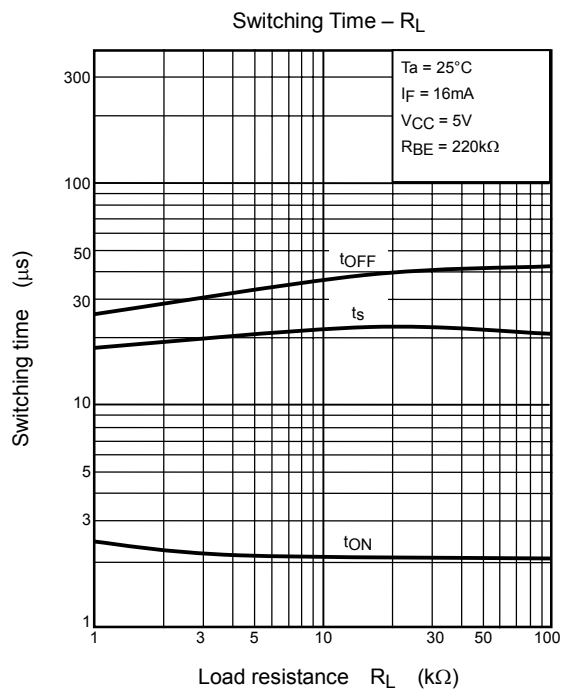
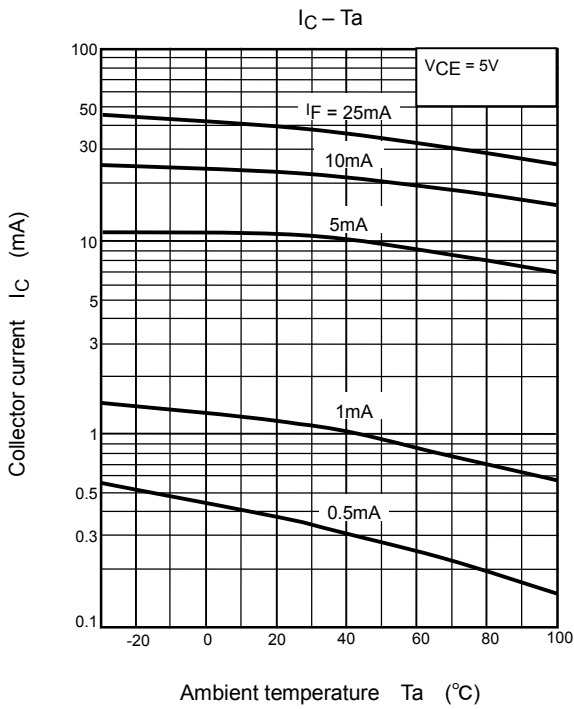
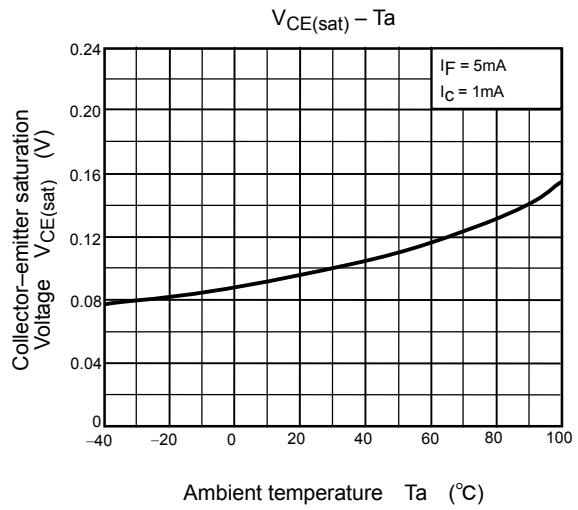
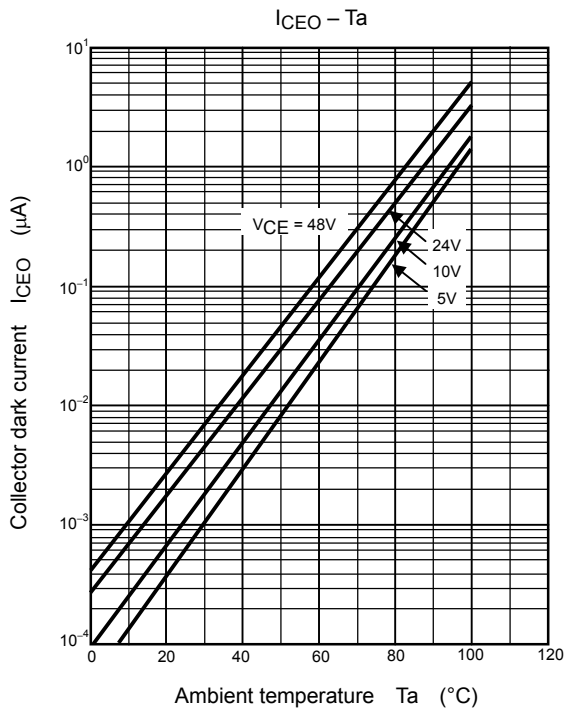
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V, I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	—	
Turn-off time	t <sub>off</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9 kΩ (Fig.1) R <sub>BE</sub> = OPEN V <sub>CC</sub> = 5 V, I <sub>F</sub> = ±16mA	—	2	—	μs
Storage time	t <sub>S</sub>		—	25	—	
Turn-off time	t <sub>OFF</sub>		—	40	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ (Fig.1) R <sub>BE</sub> = 220kΩ V <sub>CC</sub> = 5 V, I <sub>F</sub> = ±16mA	—	2	—	μs
Storage time	t <sub>S</sub>		—	20	—	
Turn-off time	t <sub>OFF</sub>		—	30	—	

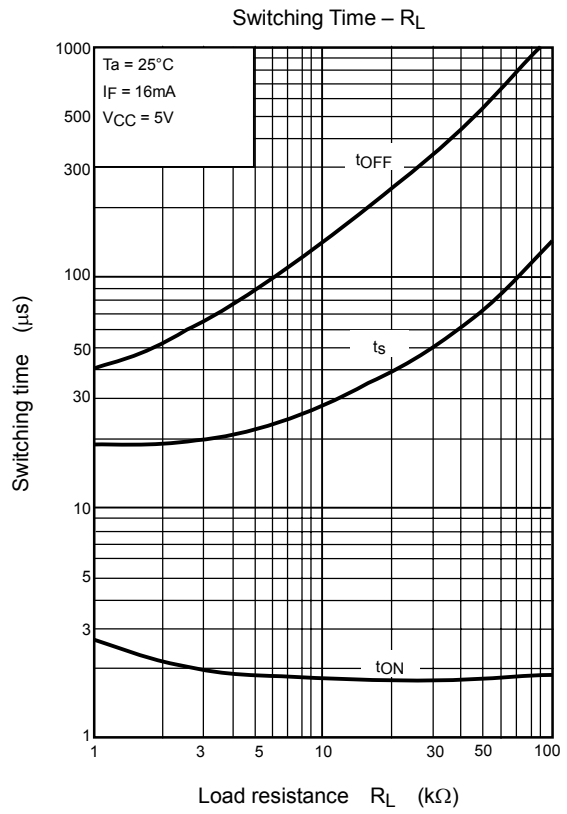
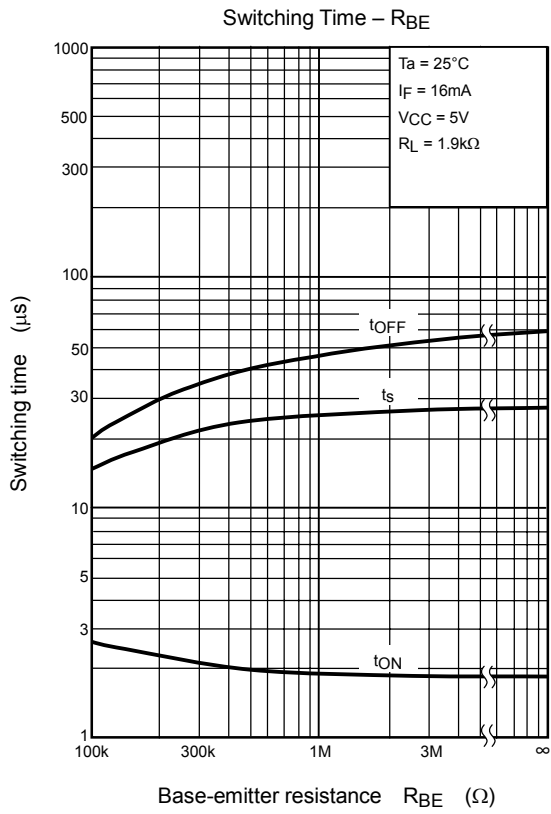
Fig. 1 Switching time test circuit













**RESTRICTIONS ON PRODUCT USE**

000707EAA

- 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 this document shall be made at the customer's own risk.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.