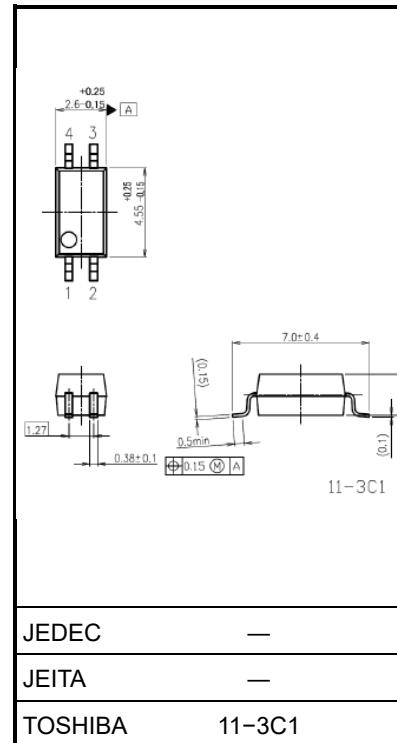


# TLX9000

- Various Controllers
- Signal transmission between different circuit potential
- HEV (Hybrid Electric Vehicle) and  
EV (Electric Vehicle) Applications

Unit: mm

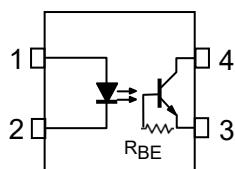


The TOSHIBA TLX9000 mini-flat photocoupler is suitable for surface-mount assembly. The TLX9000 consists of an infrared LED optically coupled to a photo-transistor.

This photocoupler can be used to the extensive applications.  
It is generic speed transistor output.

- Collector-emitter voltage: 40 V (min)
- Current transfer ratio: 100 % (min) to 900 % (max)
- Isolation voltage: 3750 Vrms (min)
- AEC-Q101 qualified

## Pin Configuration



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

Weight: 0.05 g (typ.)

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

Characteristic	Symbol	Rating	Unit
LED	Forward current	IF	30
	Forward current (Ta=125°C)	IF	18
	Forward current derating (Ta ≥ 108 °C)	ΔIF / °C	-0.7
	Pulse forward current (Note 1)	IFP	1
	Input Power Dissipation	PD	50
	Input Power Dissipation Derating (Ta≥50°C)	ΔPD/°C	-0.5
Detector	Reverse voltage	VR	5
	Collector-emitter voltage	VCEO	40
	Emitter-collector voltage	VECO	5
	Collector current	IC	50
	Collector power dissipation	PC	150
	Collector power dissipation derating (Ta ≥ 50°C)	ΔPC / °C	-1.5
Operating temperature range		Topr	-40 to 125
Storage temperature range		Tstg	-55 to 150
Lead soldering temperature (10 s)		Tsol	260
Total package power dissipation		PT	200
Total package power dissipation derating (Ta ≥ 50°C)		ΔPT / °C	-2.0
Isolation voltage (R.H.≤60%, AC 60 s) (Note 2)		BVs	3750
			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: Pulse width PW ≤ 100μs, 100 Hz

Note 2: This device is considered as a two terminal device: Pins 1 and 2 are shorted together, and pins 3 and 4 are shorted together.

## Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	Vcc	—	5	24	V
Forward current	IF	—	10	15	mA
Collector current	IC	—	1	10	mA
Operating temperature	Topr	-40	—	125	°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.

Electrical Characteristics (Unless otherwise specified  $T_a = -40$  to  $125^\circ C$ )

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}, T_a = 25^\circ C$	1.1	1.25	1.4	V
			$I_F = 10 \text{ mA}$	1.0	—	1.55	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	$\mu\text{A}$
Detector	Capacitance	$C_T$	$V = 0 \text{ V}, f = 1 \text{ MHz}, T_a = 25^\circ C$	—	35	—	pF
	Collector-emitter breakdown voltage	$V_{(\text{BR}) \text{ CEO}}$	$I_C = 0.5 \text{ mA}$	40	—	—	V
	Emitter-collector breakdown voltage	$V_{(\text{BR}) \text{ ECO}}$	$I_E = 0.5 \text{ mA}$	5	—	—	V
	Collector dark current	$I_{\text{CEO}}$	$V_{CE} = 24 \text{ V}, T_a = 25^\circ C$	—	—	100	nA
			$V_{CE} = 24 \text{ V}, T_a = 105^\circ C$	—	0.1	5	$\mu\text{A}$
			$V_{CE} = 24 \text{ V}, T_a = 125^\circ C$	—	1	10	$\mu\text{A}$
	Capacitance (collector to emitter)	$C_{CE}$	$V = 0 \text{ V}, f = 1 \text{ MHz}, T_a = 25^\circ C$	—	10	—	pF

Coupled Electrical Characteristics (Unless otherwise specified  $T_a = -40$  to  $125^\circ C$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$	20	—	900	%
		$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}, T_a = 25^\circ C$	100	—	900	
Saturated CTR	$I_C / I_F \text{ (sat)}$	$I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V}, T_a = 25^\circ C$	30	—	—	%
Collector-emitter saturation voltage	$V_{CE} \text{ (sat)}$	$I_C = 2.4 \text{ mA}, I_F = 8 \text{ mA}, T_a = 25^\circ C$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}, I_F = 1 \text{ mA}, T_a = 25^\circ C$	—	—	0.4	
Off-state collector current	$I_C \text{ (off)}$	$V_F = 0.7 \text{ V}, V_{CE} = 24 \text{ V}, T_a = 25^\circ C$	—	—	10	$\mu\text{A}$

Isolation Characteristics ( $T_a = 25^\circ C$ )

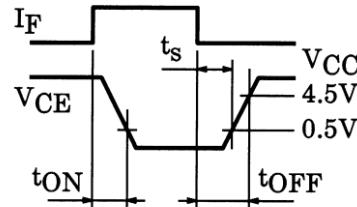
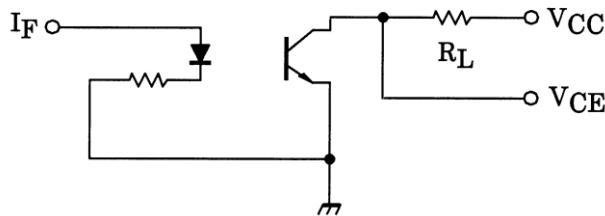
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	$C_S$	$V_S = 0 \text{ V}, f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	$R_S$	$V_S = 500 \text{ V}, \text{R.H.} \leq 60 \%$	$5 \times 10^{10}$	$10^{14}$	—	$\Omega$
Isolation voltage	$B_{VS}$	AC, 60 s	3750	—	—	Vrms

Note : Device considered a two terminal device: Pins 1 and 2 shorted together, and pins 3 and 4 shorted together.

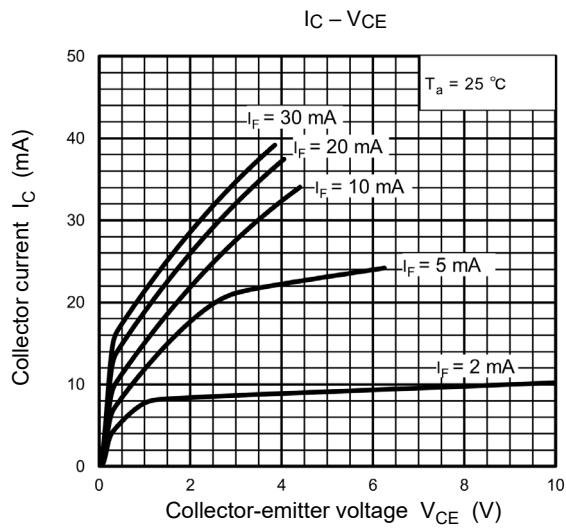
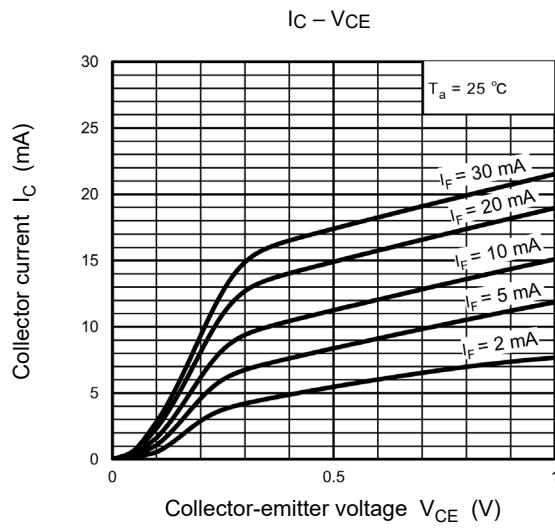
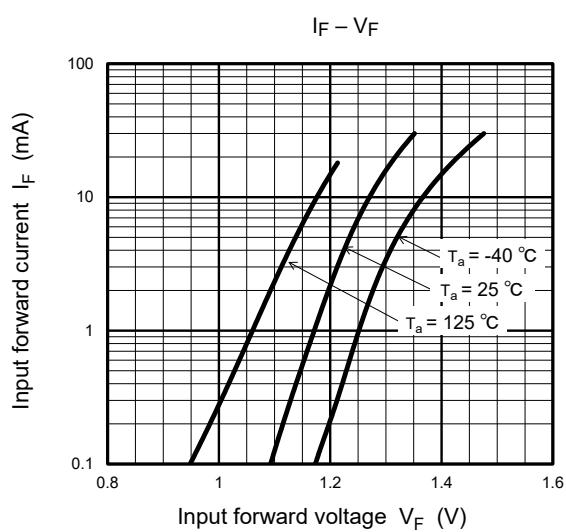
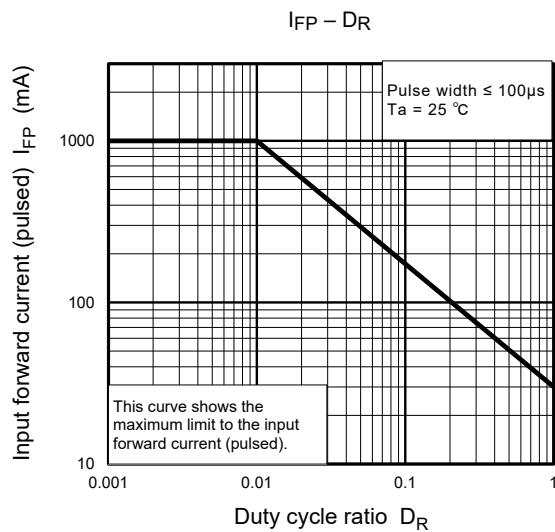
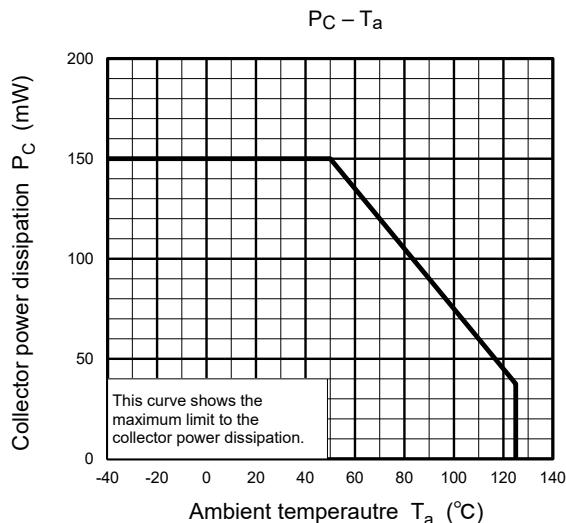
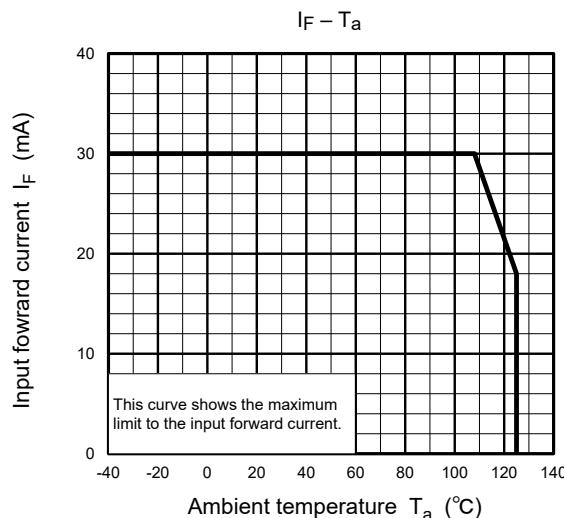
**Switching Characteristics (Unless otherwise specified  $T_a = -40$  to  $125^\circ\text{C}$ )**

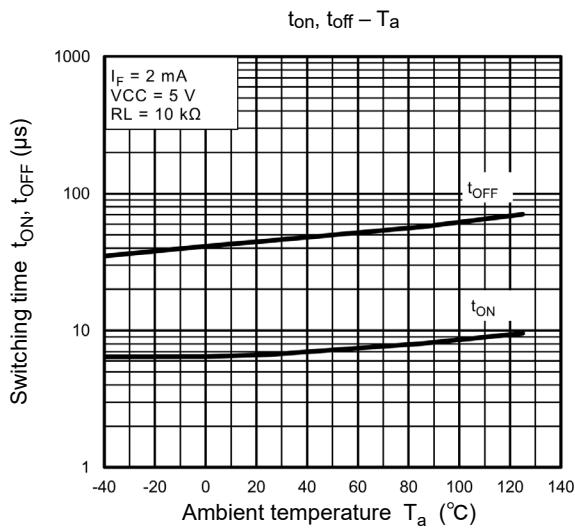
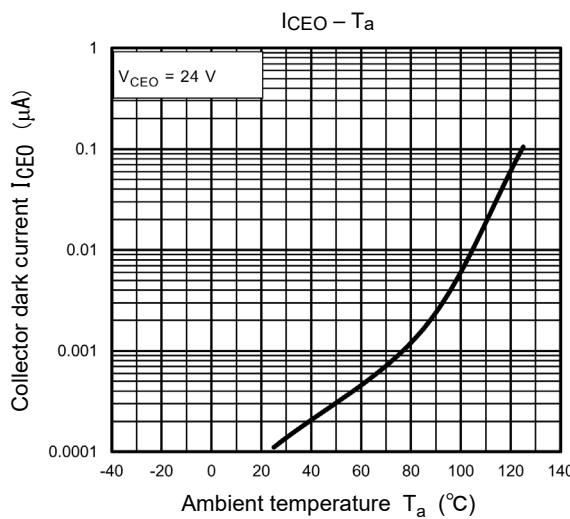
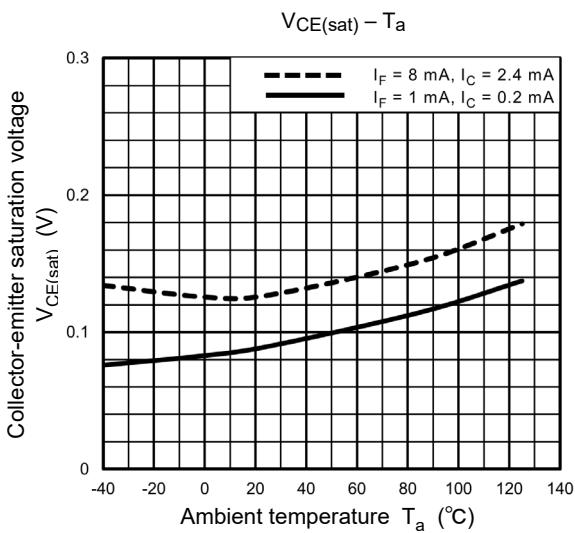
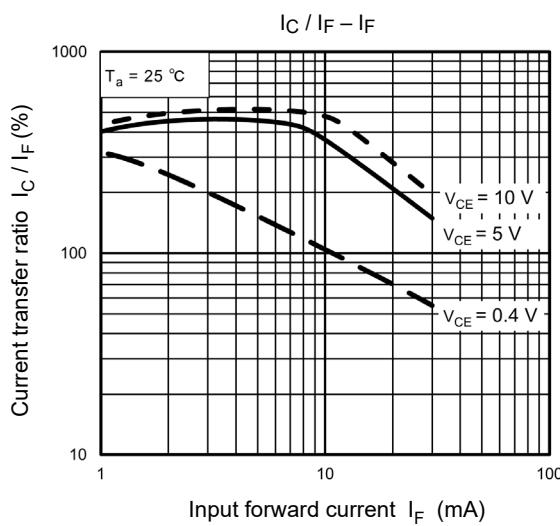
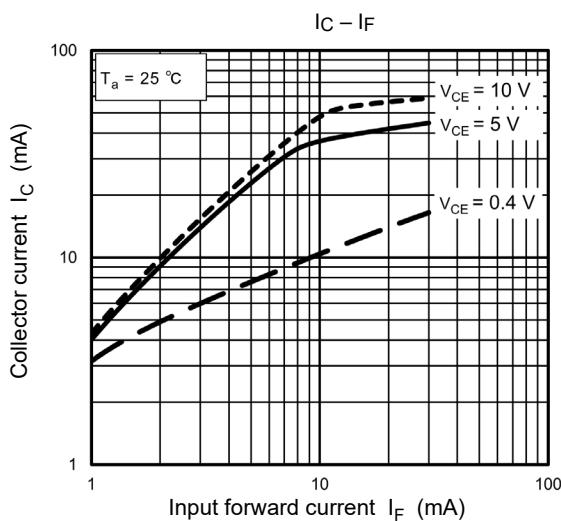
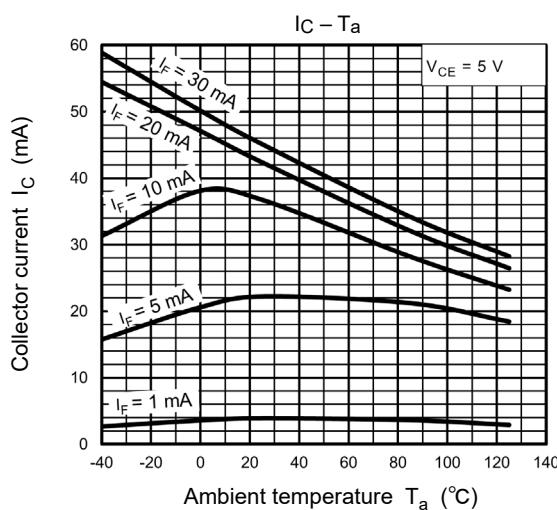
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	$t_{ON}$	$R_L = 10 \text{ k}\Omega$ $V_{CC} = 5 \text{ V}$ , $I_F = 2 \text{ mA}$	1	15	100	$\mu\text{s}$
Storage time	$t_s$		—	20	200	
Turn-off time	$t_{OFF}$		1	50	300	

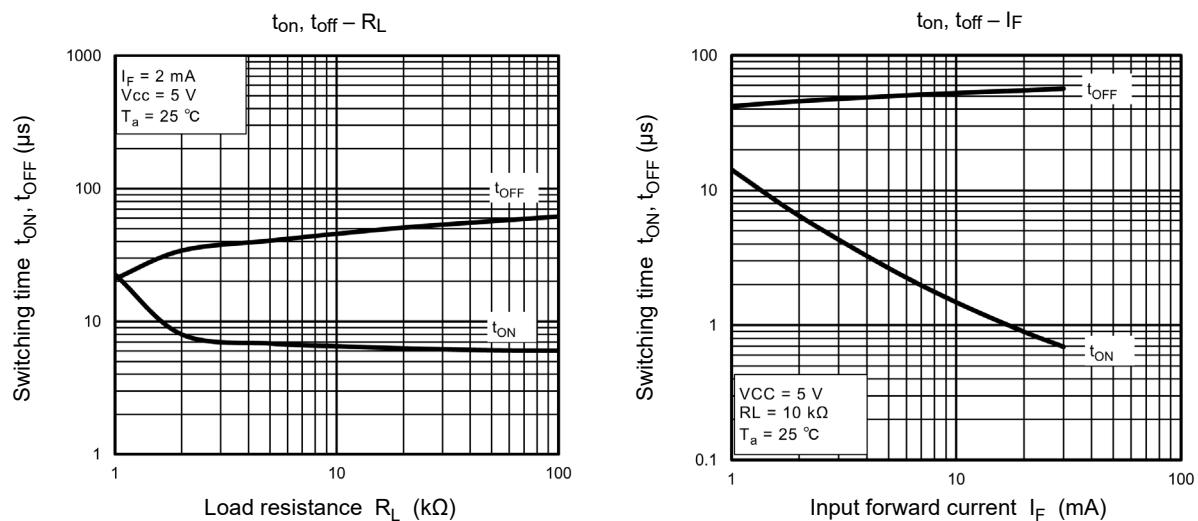
Note 1: Switching time test circuit



## Characteristic Curves (Note)







Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise specified.

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