

TOSHIBA Photocoupler IRLED & Photo-Transistor

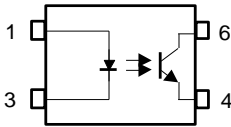
TLX9188

- Signal transmission between different circuit potential
- HEV (Hybrid Electric Vehicle) and EV (Electric Vehicle) Applications
- Battery management System (BMS)

TLX9188 consists of phototransistors optically coupled to an infrared LED. TLX9188 is housed in the very small and thin SO6(4pin) package and that guarantees high temperature operation(Ta=125 °C max). With the high breakdown voltage between the collector and emitter (V_{CEO}=200 V), TLX9188 is suitable for use in battery management system.

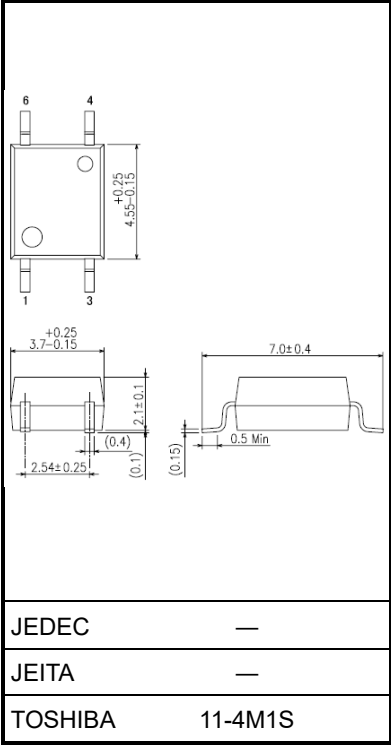
- Collector-emitter voltage: 200 V (min)
- Current transfer ratio: 50% (min) to 600%(max)
Rank GB: 100% (min) to 600%(max)
- Isolation voltage: 3750 Vrms (min)
- Operating temperature: -40 to 125 °C
- AEC-Q101 qualified

Pin Configuration



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

Unit: mm



Weight: 0.08 g (typ.)

Absolute Maximum Ratings (Note) (Unless otherwise specified, Ta = 25°C)

Characteristic		Symbol	Rating	Unit
LED	Forward current	I _F	30	mA
	Forward current derating (Ta ≥ 108 °C)	ΔI _F /°C	-0.7	mA/°C
	Pulse forward current (Note 1)	I _{FP}	1	A
	Reverse voltage	V _R	5	V
	Input Power Dissipation	PD	50	mW
	Input Power Dissipation Derating (Ta ≥ 50°C)	ΔPD/°C	-0.5	mW/°C
	Junction temperature	T _j	135	°C
Detector	Collector-emitter voltage	V _{CEO}	200	V
	Emitter-collector voltage	V _{ECO}	7	V
	Collector current	I _C	50	mA
	Collector power dissipation	P _C	150	mW
	Collector power dissipation derating (Ta ≥ 25°C)	ΔP _C /°C	-1.37	mW/°C
	Junction temperature	T _j	135	°C
Operating temperature range		T _{opr}	-40 to 125	°C
Storage temperature range		T _{stg}	-55 to 150	°C
Lead soldering temperature (10 s)		T _{sol}	260	°C
Total package power dissipation		P _T	200	mW
Isolation voltage (AC, 60 s, R.H. ≤ 60 %) (Note 2)		BV _S	3750	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).

Note 1: Pulse width PW ≤ 100 μs, f = 100 Hz

Note 2: This device is considered as a two terminal device: Pins 1 and 3 are shorted together, and pins 4 and 6 are shorted together.

Electrical Characteristics (Unless otherwise specified, Ta = -40 to 125°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	$I_F = 10 \text{ mA}$, $T_a = 25^\circ\text{C}$	1.0	1.27	1.55	V
	Reverse current	I_R	$V_R = 5 \text{ V}$	—	—	10	μA
	Capacitance	C_T	$V = 0 \text{ V}$, $f = 1 \text{ MHz}$, $T_a = 25^\circ\text{C}$	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR) \text{ CEO}}$	$I_C = 0.1 \text{ mA}$	200	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR) \text{ ECO}}$	$I_E = 0.01 \text{ mA}$	7	—	—	V
	Collector dark current	I_{CEO}	$V_{\text{CE}} = 200 \text{ V}$, $T_a = 25^\circ\text{C}$	—	0.01	0.2	μA
			$V_{\text{CE}} = 200 \text{ V}$, $T_a = 85^\circ\text{C}$	—	-	5	
			$V_{\text{CE}} = 200 \text{ V}$, $T_a = 105^\circ\text{C}$	—	-	50	
	Capacitance (collector to emitter)	C_{CE}	$V = 0 \text{ V}$, $f = 1 \text{ MHz}$, $T_a = 25^\circ\text{C}$	—	10	—	pF

Coupled Electrical Characteristics (Unless otherwise specified, Ta = -40 to 125°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Current transfer ratio	I_C / I_F	$I_F = 5 \text{ mA}$, $V_{\text{CE}} = 5 \text{ V}$	20	—	600	%
		$I_F = 5 \text{ mA}$, $V_{\text{CE}} = 5 \text{ V}$, $T_a = 25^\circ\text{C}$	50	—	600	
		$I_F = 5 \text{ mA}$, $V_{\text{CE}} = 5 \text{ V}$, $T_a = 25^\circ\text{C}$ Rank GB	100	—	600	
Saturated CTR	$I_C / I_F (\text{sat})$	$I_F = 1 \text{ mA}$, $V_{\text{CE}} = 0.4 \text{ V}$, $T_a = 25^\circ\text{C}$	—	60	—	
		$I_F = 1 \text{ mA}$, $V_{\text{CE}} = 0.4 \text{ V}$, $T_a = 25^\circ\text{C}$ Rank GB	30	—	—	
Collector-emitter saturation voltage	$V_{\text{CE}} (\text{sat})$	$I_C = 2.4 \text{ mA}$, $I_F = 8 \text{ mA}$, $T_a = 25^\circ\text{C}$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}$, $I_F = 1 \text{ mA}$, $T_a = 25^\circ\text{C}$	—	—	0.4	
			—	0.1	0.4	
Off-state collector current	$I_C (\text{off})$	$V_F = 0.7 \text{ V}$, $V_{\text{CE}} = 200 \text{ V}$, $T_a = 25^\circ\text{C}$	—	—	10	μA

Isolation Characteristics (Unless otherwise specified, Ta = 25°C)

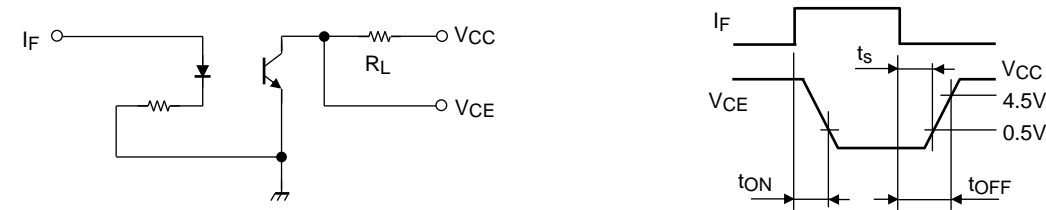
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C_S	$V_S = 0 \text{ V}$, $f = 1 \text{ MHz}$	—	0.8	—	pF
Isolation resistance	R_S	$V_S = 500 \text{ V}$, R.H. $\leq 60\%$	10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 60 s	3750	—	—	Vrms

Note : This device is considered as a two terminal device: Pins 1 and 3 are shorted together, and pins 4 and 6 are shorted together.

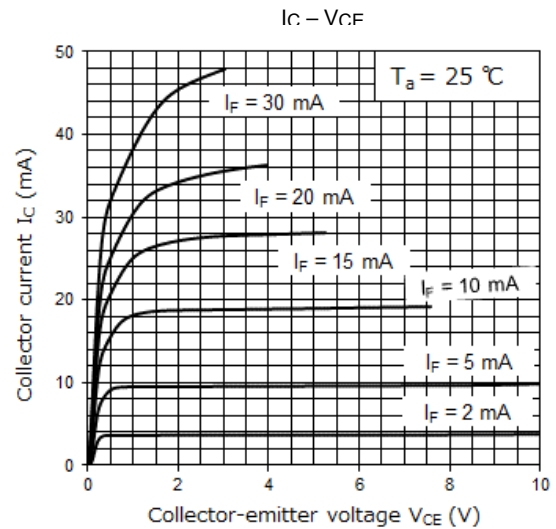
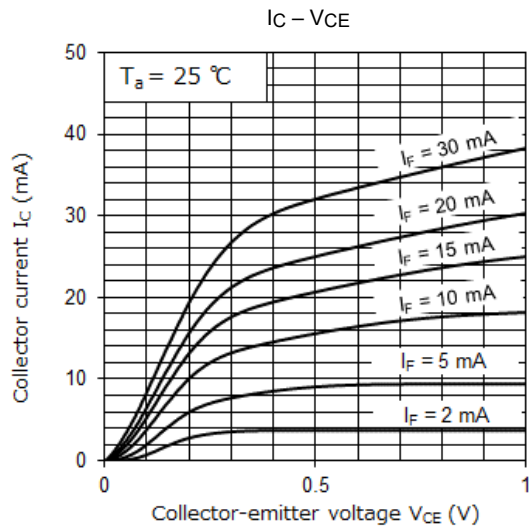
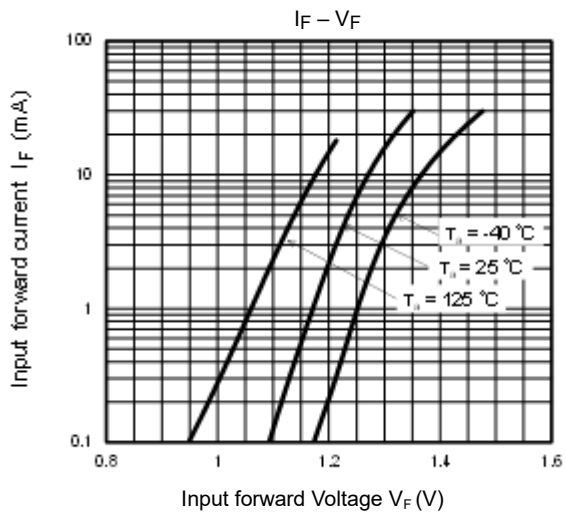
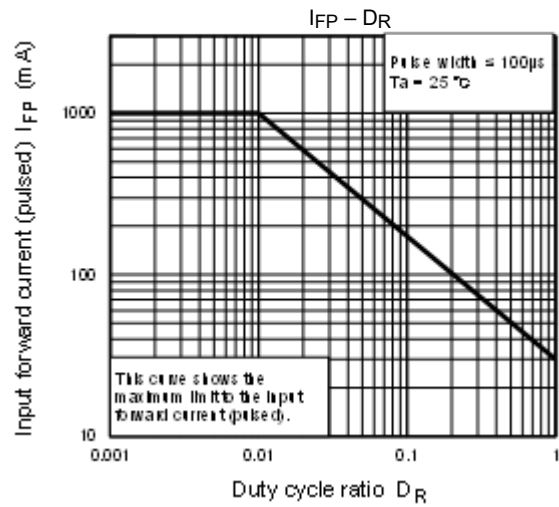
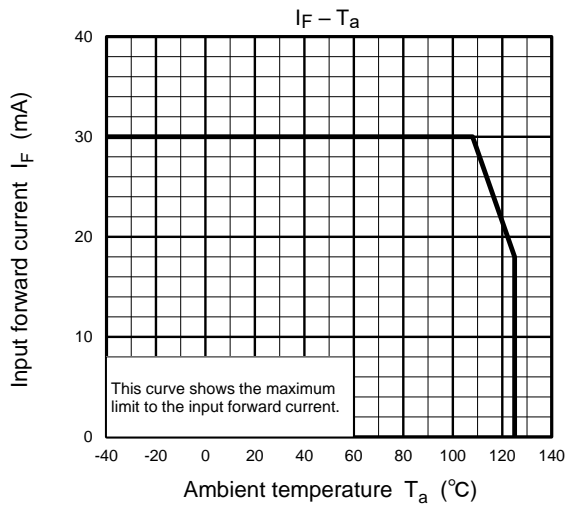
Switching Characteristics (Ta = 25°C)

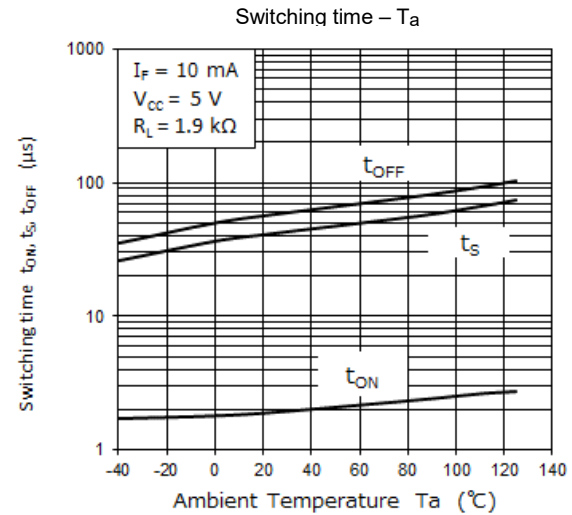
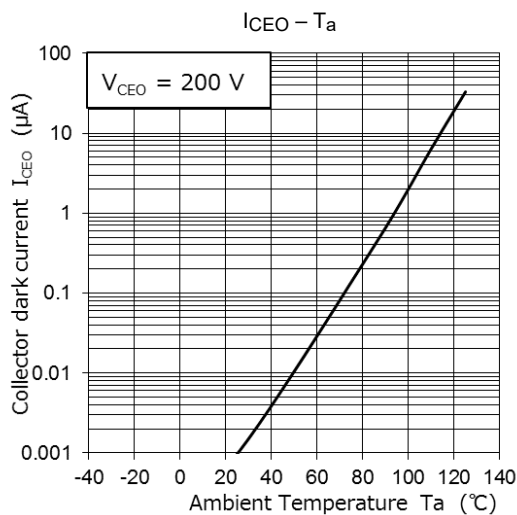
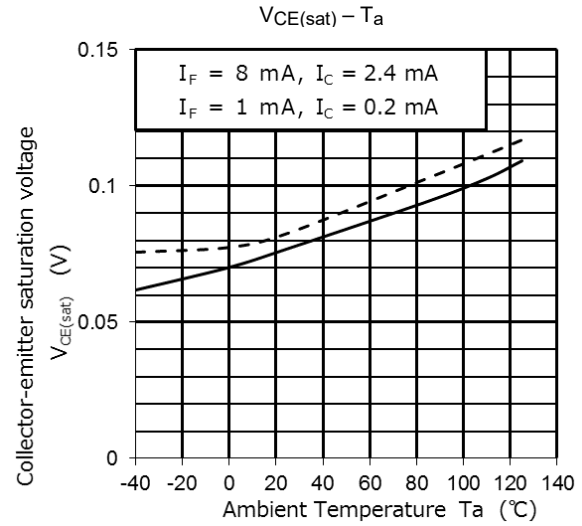
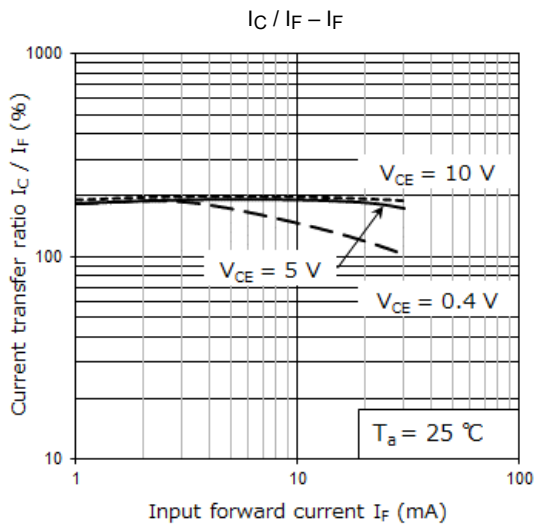
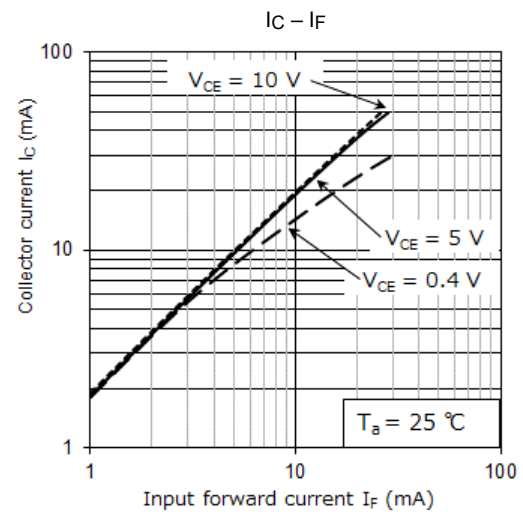
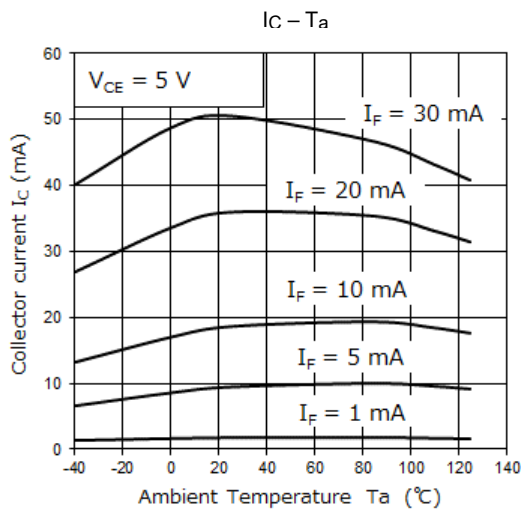
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	$V_{CC} = 10\text{ V}, I_C = 2\text{ mA}$ $R_L = 100\ \Omega$	—	2	—	μs
Fall time	t_f		—	3	—	
Turn-on time	t_{on}		—	3	—	
Turn-off time	t_{off}		—	3	—	
Turn-on time	t_{ON}	$R_L = 1.9\text{ k}\Omega$ $V_{CC} = 5\text{ V}, I_F = 10\text{ mA}$ (Note 1)	—	3	100	
Storage time	t_s		—	40	300	
Turn-off time	t_{OFF}		—	60	500	

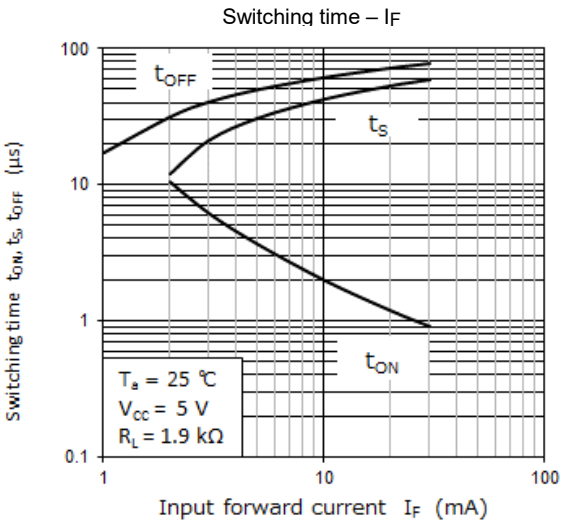
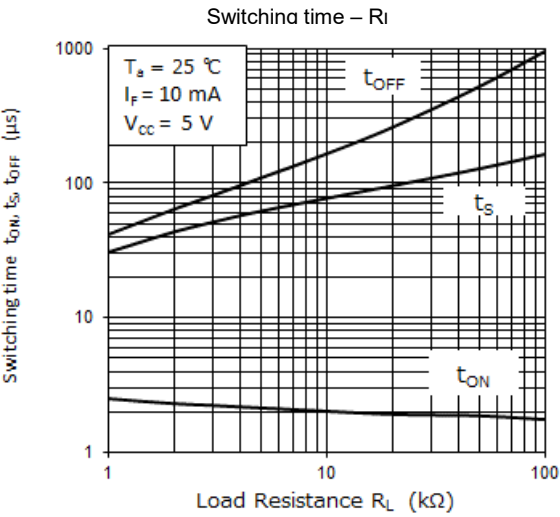
Note 1: Switching time test circuit



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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