TOSHIBA Photocoupler IRED & Photo-Transistor

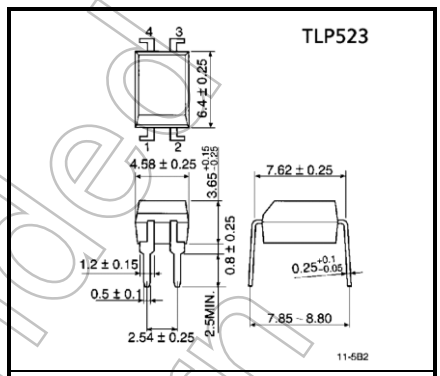
TLP523, TLP523-2, TLP523-4

Unit: mm

Programmable Controllers
DC-Output Module
Solid State Relay

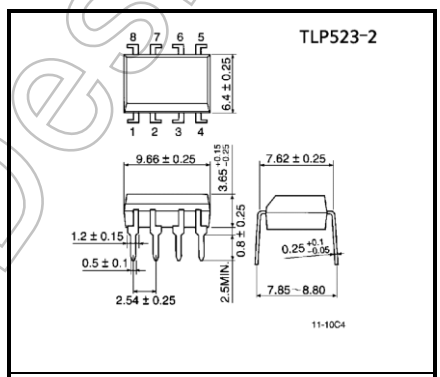
The TOSHIBA TLP523, -2 and -4 consist of an infrared emitting diode coupled with a silicon, Darlington connected, phototransistor which has an integral base-emitter resistor to optimize switching speed and elevated temperature characteristics.
The TLP523-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP523-4 provides four isolated channels per package.

- Current transfer ratio: 500 % (min) (I_F = 1 mA)
- Isolation voltage: 2500 Vrms (min)
- Collector-emitter voltage: 55 V (min)
- Leakage current: 10 μA (max) (Ta = 85°C)
- UL-recognized: UL 1577, File No.E67349
- cUL-recognized :CSA Component Acceptance Service No.5A
  File No.E67349



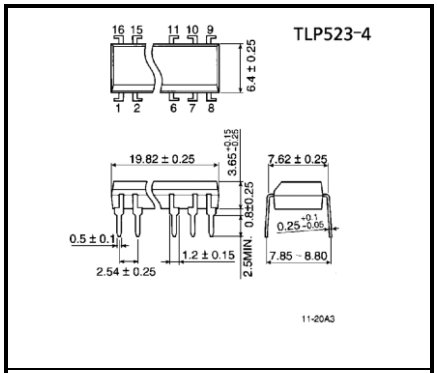
TOSHIBA	11-5B2

Weight: 0.26 g (typ.)



TOSHIBA	11-10C4

Weight: 0.54 g (typ.)



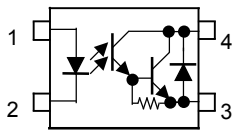
TOSHIBA	11-20A3

Weight: 1.1 g (typ.)

Start of commercial production
1984-08

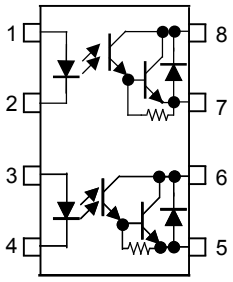
Pin Configurations (top view)

TLP523



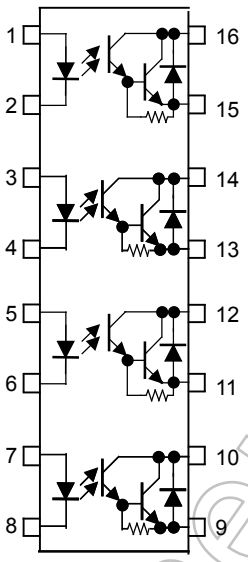
1 : Anode
2 : Cathode
3 : Emitter
4 : Collector

TLP523-2



1, 3 : Anode
2, 4 : Cathode
5, 7 : Emitter
6, 8 : Collector

TLP523-4



1, 3, 5, 7 : Anode
2, 4, 6, 8 : Cathode
9, 11, 13, 15 : Emitter
10, 12, 14, 16: Collector

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating		Unit
			TLP523	TLP523-2 TLP523-4	
LED	Forward current	I_F	60	50	mA
	Forward current derating	ΔI_F/°C	-0.7 (Ta ≥ 39°C)	-0.5 (Ta ≥ 25°C)	mA/°C
	Pulse forward current (100 μs pulse, 100 pps)	I_{FP}	1		A
	Diode power dissipation	P_D	70	60	mW
	Diode power dissipation derating	ΔP_D/°C	-0.8 (Ta ≥ 39°C)	-0.6 (Ta ≥ 25°C)	mW/°C
	Reverse voltage	V_R	5		V
Detector	Collector-emitter voltage	V_{CEO}	55		V
	Emitter-collector voltage	V_{ECO}	0.3		V
	Collector current	I_C	150		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
Operating temperature range		T_{opr}	-55 to 100		°C
Storage temperature range		T_{stg}	-55 to 125		°C
Lead soldering temperature (10 s)		T_{sol}	260		°C
Total power dissipation (1 circuit)		P_T	250	150	mW
Total power dissipation derating (Ta ≥ 25°C) (1 circuit)		ΔP_T/°C	-2.5	-1.5	mW/°C
Isolation voltage (AC, 60 s, R.H.≤ 60 %) (Note 1)		BV_S	2500		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: Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

Recommended Operating Conditions

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	I_F	—	16	20	mA
Collector current	Ic	—	—	40	mA
Operating temperature range	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.

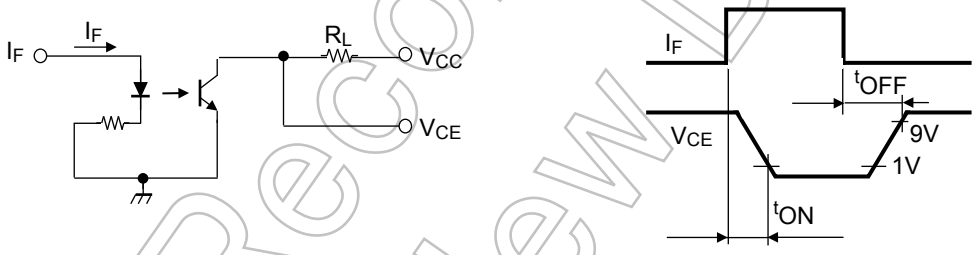
Electrical Characteristics (Ta = 25°C)

	Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
LED	Forward voltage	V_F	I_F = 10 mA	1.0	1.15	1.3	V
	Reverse current	I_R	V_R = 5 V	—	—	10	μA
	Capacitance	C_T	V = 0 V, f = 1 MHz	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)\ CEO}$	I_C = 1 mA	55	—	—	V
	Collector dark current	I_{CEO}	I_F = 0 mA, V_{CE} = 24 V	—	10	200	nA
			I_F = 0 mA, V_{CE} = 24 V, Ta = 85 °C	—	0.5	10	μA
	Capacitance collector to emitter	C_{CE}	V = 0 V, f = 1 MHz	—	10	—	pF
Coupled	Current transfer ratio	I_C/I_F	I_F = 1 mA, V_{CE} = 1 V	500	2000	—	%
	Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 50 mA, I_F = 10 mA	—	—	1	V
	Capacitance input to output	C_S	V_S = 0 V, f = 1 MHz	—	0.8	—	pF
	Isolation resistance	R_S	V_S = 500 V, R.H.≤ 60 %	5×10^{10}	10^{14}	—	Ω

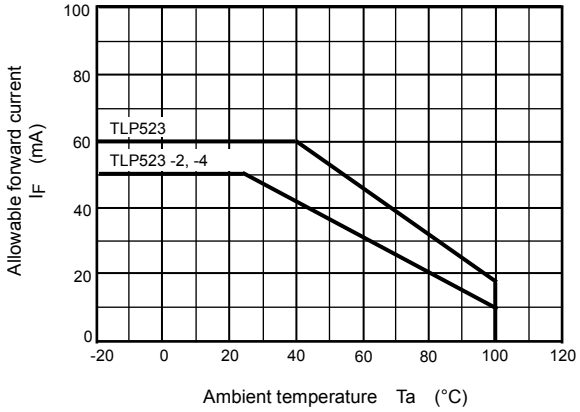
Switching Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Turn-on time	t_{ON}	V_{CC} = 10 V, R_L = 180 Ω (Fig. 1) I_F = 16 mA	—	3	—	μs
Turn-off time	t_{OFF}		—	80	—	μs

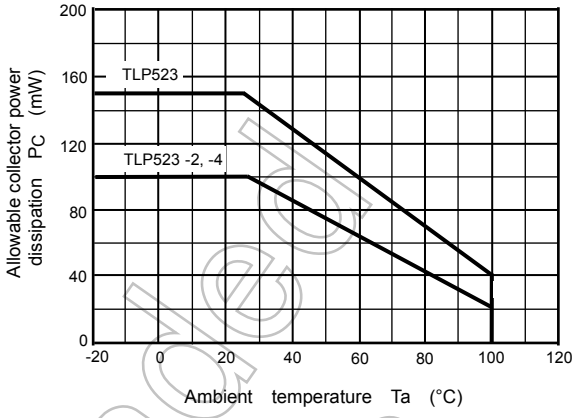
Fig. 1: Switching Time Test Circuit



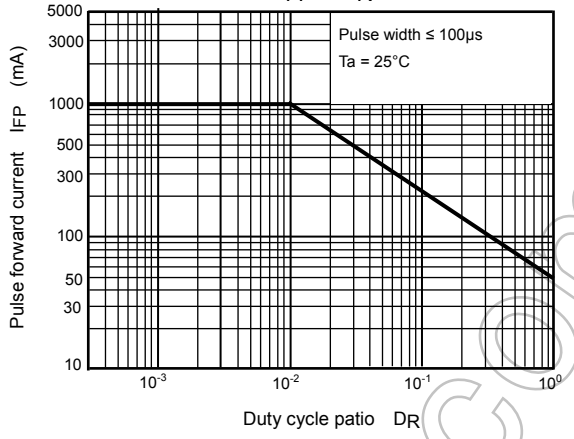
I_F – Ta



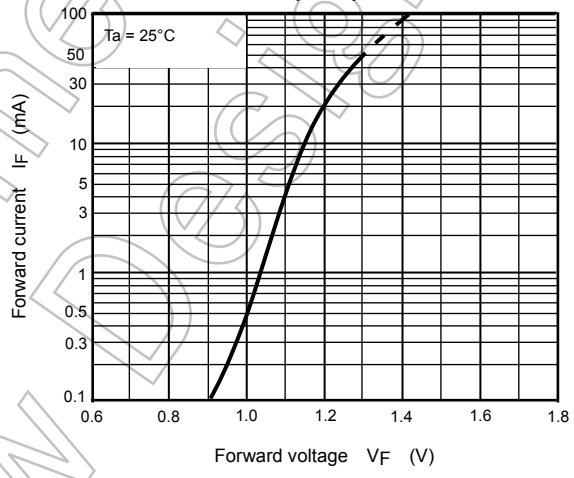
P_C – Ta



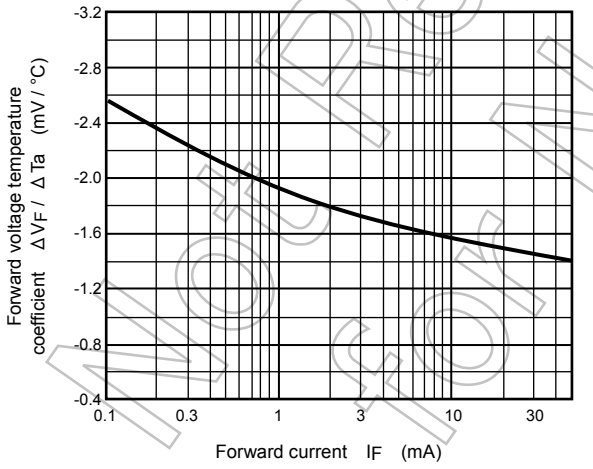
I_{FP} – D_R



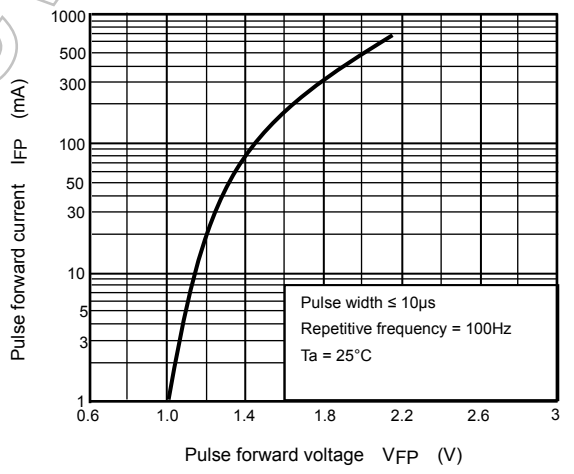
I_F – V_F



ΔV_F / Δ Ta – I_F

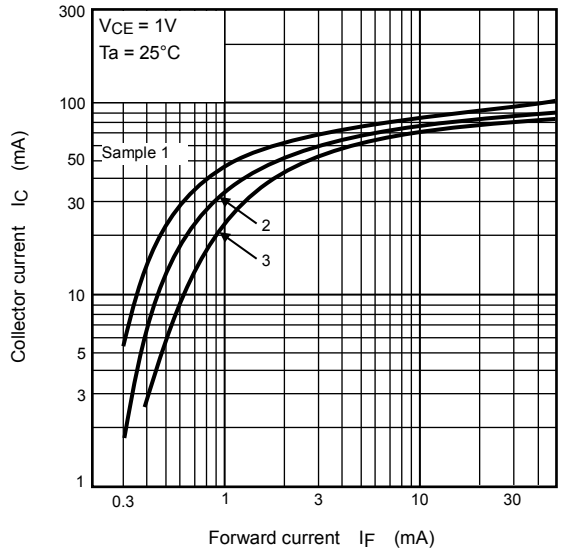


I_{FP} – V_{FP}

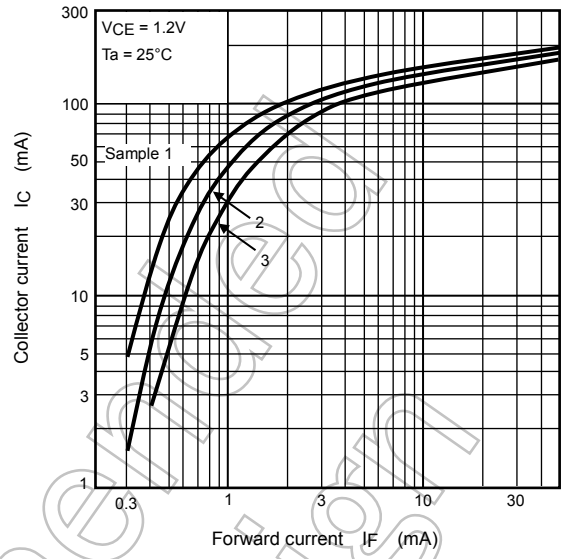


NOTE: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

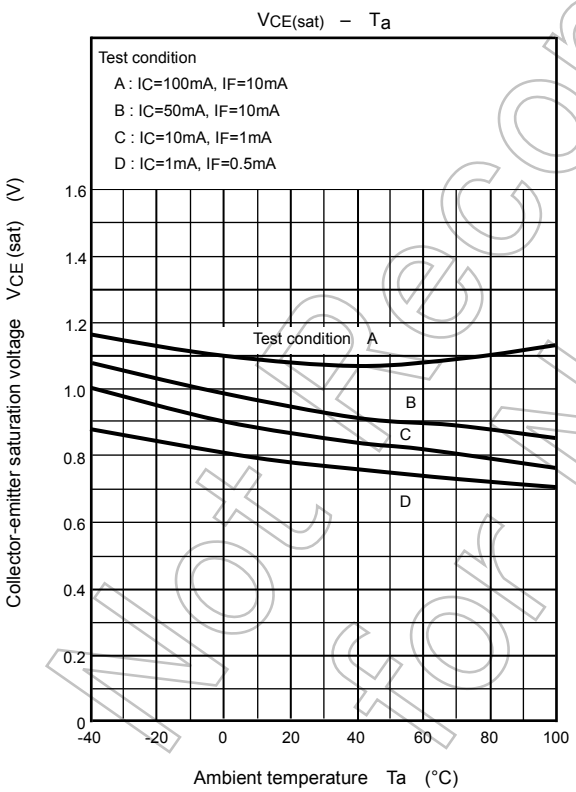
$I_C - I_F$



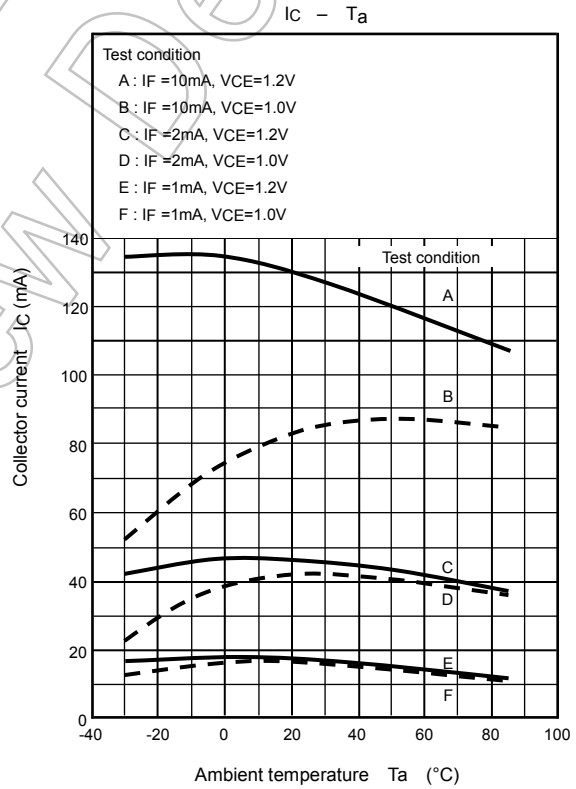
$I_C - I_F$



$V_{CE(sat)} - T_a$



$I_C - T_a$



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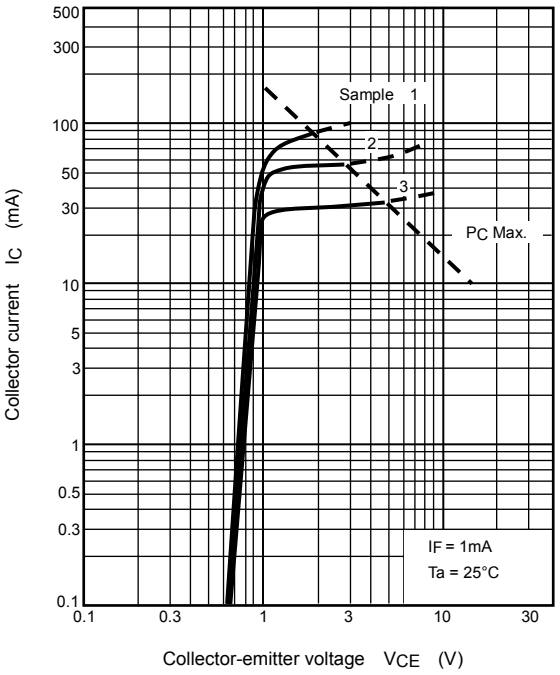
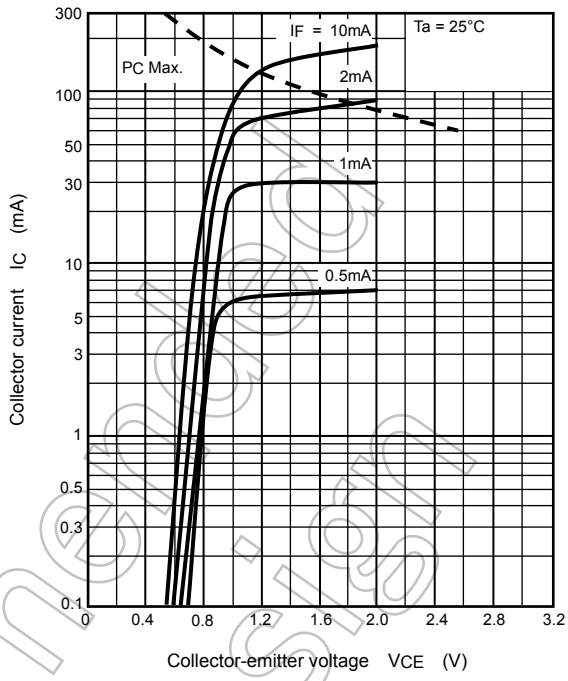
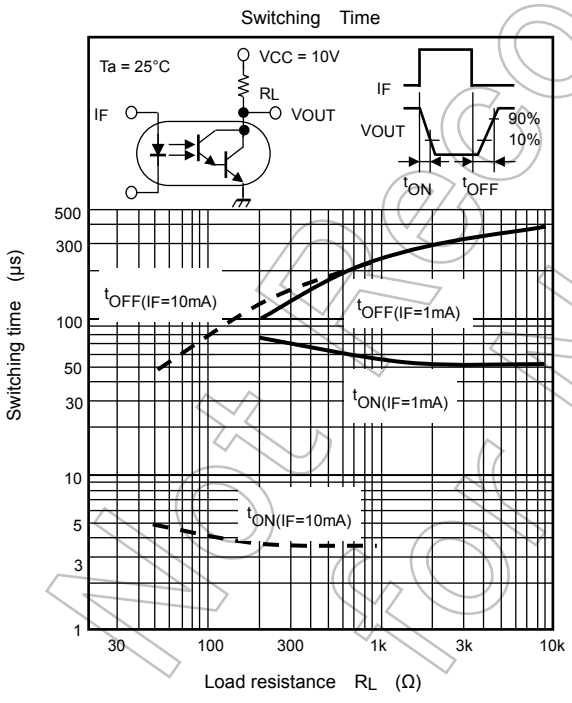
$I_C - V_{CE}$



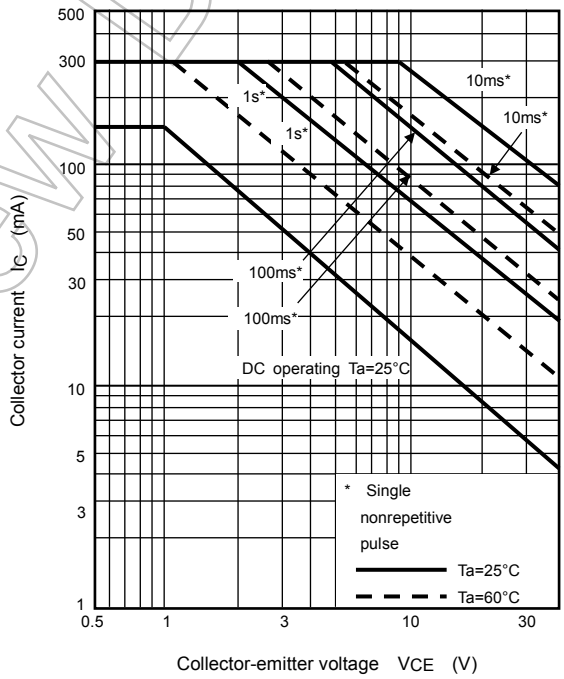
$I_C - V_{CE}$



Switching Time



Safe Operating Area



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