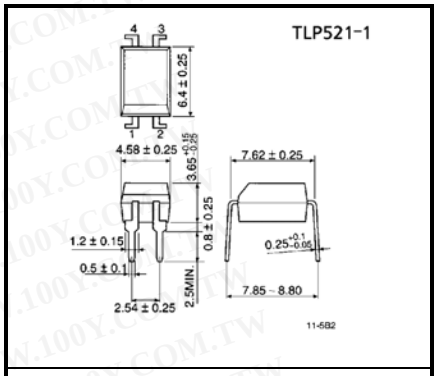
TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

TLP521−1,TLP521−2,TLP521−4

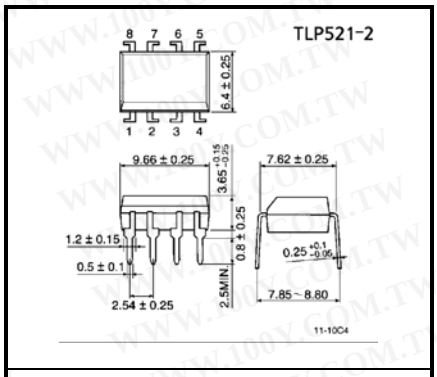
Programmable Controllers
AC/DC−Input Module
Solid State Relay

Unit in mm



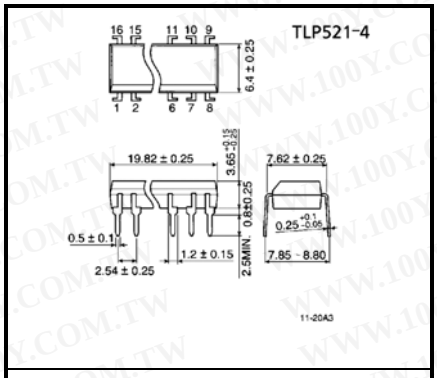
TOSHIBA 11−5B2

Weight: 0.26 g



TOSHIBA 11−10C4

Weight: 0.54 g



TOSHIBA 11−20A3

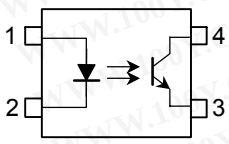
Weight: 1.1 g

- Collector−emitter voltage: 55 V (min)
- Current transfer ratio: 50% (min)
  Rank GB: 100% (min)
- Isolation voltage: 2500 Vrms (min)
- UL recognized
  made in Japan: UL1577, file No. E67349
  made in Thailand: UL1577, file No. E152349

The TOSHIBA TLP521−1, −2 and −4 consist of a photo−transistor optically coupled to a gallium arsenide infrared emitting diode.
The TLP521−2 offers two isolated channels in an eight lead plastic DIP package, while the TLP521−4 provides four isolated channels in a sixteen plastic DIP package.

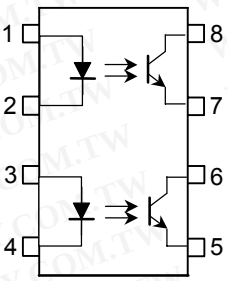
Pin Configurations (top view)

TLP521-1



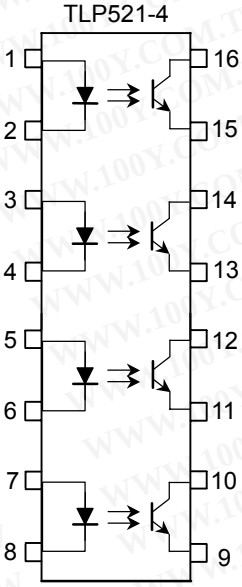
1 : Anode
2 : Cathode
3 : Emitter
4 : Collector

TLP521-2



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

TLP521-4



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

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Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating		Unit
			TLP521−1	TLP521−2 TLP521−4	
LED	Forward current	I_F	70	50	mA
	Forward current derating	ΔI_F /°C	−0.93 (Ta ≥ 50°C)	−0.5 (Ta ≥ 25°C)	mA /°C
	Pulse forward current	I_{FP}	1 (100μ pulse, 100pps)		A
	Reverse voltage	V_R	5		V
	Junction temperature	T_j	125		°C
Detector	Collector−emitter voltage	V_{CEO}	55		V
	Emitter−collector valtage	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_{sol}	260 (10 s)		°C
Total package power dissipation		P_T	250	150	mW
Total package power dissipation derating (Ta ≥ 25°C)		ΔP_T /°C	−2.5	−1.5	mW /°C
Isolation voltage		BV_S	2500 (AC, 1min., R.H.≤ 60%) (Note 1)		Vrms

(Note 1): Device considered a two terminal device: LED side pins shorted together and detector side pins shorted together.

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	5	24	V
Forward current	I_F	—	16	25	mA
Collector current	I_C	—	1	10	mA
Operating temperature	T_{opr}	−25	—	85	°C

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Type	Classi−fication (*1)	Current Transfer Ratio (%) (I_C / I_F) I_F = 5mA, V_{CE} = 5V, Ta = 25°C		Marking Of Classification
		Min	Max	
TLP521	A	50	600	Blank, Y, Y■, G, G■, B, B■, GB
	Rank Y	50	150	Y, Y■
	Rank GR	100	300	G, G■
	Rank BL	200	600	B, B■
	Rank GB	100	600	G, G■, B, B■, GB
TLP521−2 TLP521−4	A	50	600	Blank, GR, BL, GB
	Rank GB	100	600	GR, BL, GB

*1: Ex. rank GB: TLP521−1 (GB)

(Note): Application type name for certification test, please use standard product type name, i.e.
TLP521−1 (GB): TLP521−1, TLP521−2 (GB): TLP521−2

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Individual Electrical Characteristics (Ta = 25°C)

	Characteristic	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, f = 1 MHz	—	30	—	pF
Detector	Collector−emitter breakdown voltage	$V_{(BR)\ CEO}$	I_C = 0.5 mA	55	—	—	V
	Emitter−collector breakdown voltage	$V_{(BR)\ ECO}$	I_E = 0.1 mA	7	—	—	V
	Collector dark current	I_{CEO}	V_{CE} = 24 V	—	10	100	nA
			V_{CE} = 24 V, Ta = 85°C	—	2	50	μA
	Capacitance (collector to emitter)	C_{CE}	V = 0, f = 1 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 = 5 mA, V_{CE} = 5 V Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	I_C / $I_{F\ (sat)}$	IF = 1 mA, V_{CE} = 0.4 V Rank GB	—	60	—	%
			30	—	—	
Collector−emitter saturation voltage	$V_{CE\ (sat)}$	I_C = 2.4 mA, I_F = 8 mA	—	—	0.4	V
		I_C = 0.2 mA, I_F = 1 mA Rank GB	—	0.2	—	
			—	—	0.4	

Isolation Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Capacitance (input to output)	C_S	V_S = 0, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500 V, R.H.≤ 60%	—	10^{11}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	2500	—	—	Vrms
		AC, 1 second, in oil	—	5000	—	
		DC, 1 minute, in oil	—	5000	—	Vdc

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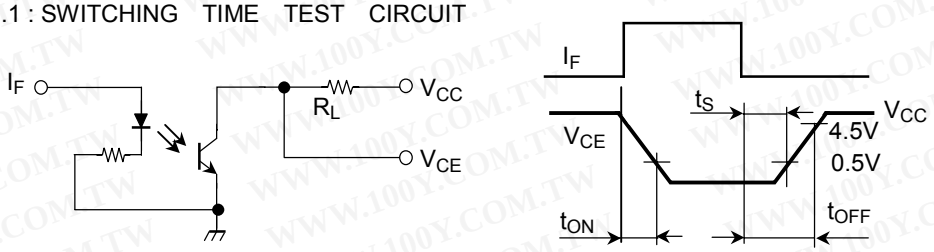
Switching Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Rise time	t_r	V_{CC} = 10 V I_C = 2 mA 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 = 1.9 kΩ (Fig.1) V_{CC} = 5 V, I_F = 16 mA	—	2	—	μs
Storage time	t_s		—	15	—	
Turn−off time	t_{OFF}		—	25	—	

Fig.1 : SWITCHING TIME TEST CIRCUIT



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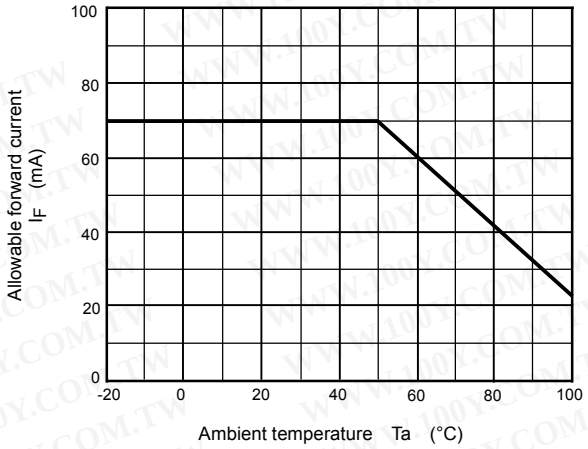
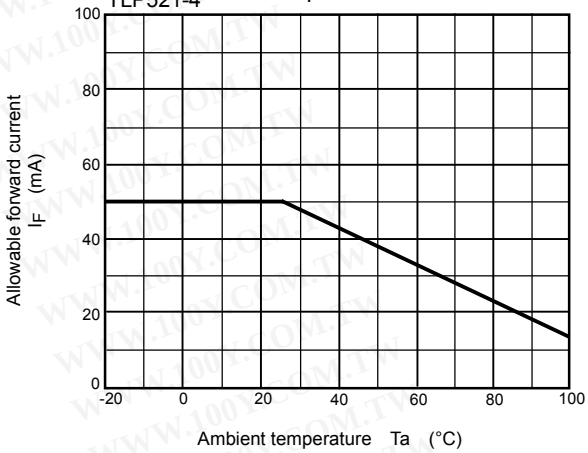
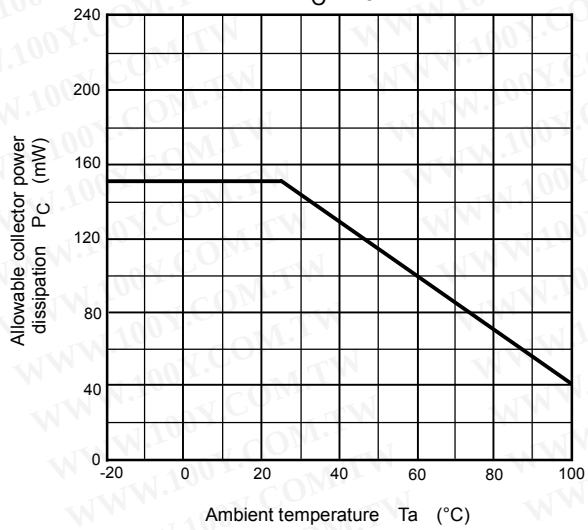
TLP521-1 I_F – Ta



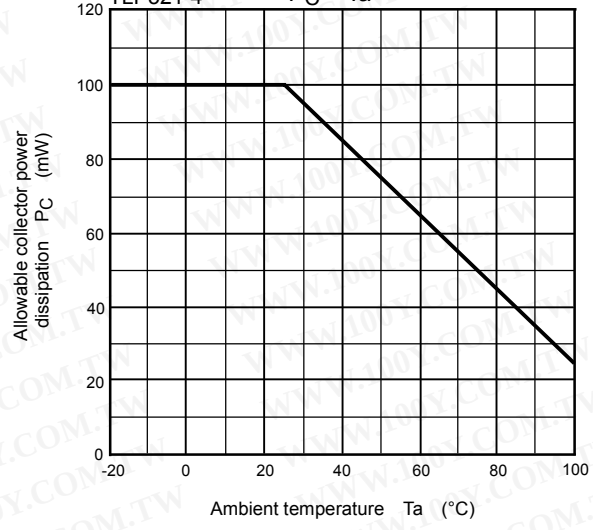
TLP521-2
TLP521-4 I_F – Ta



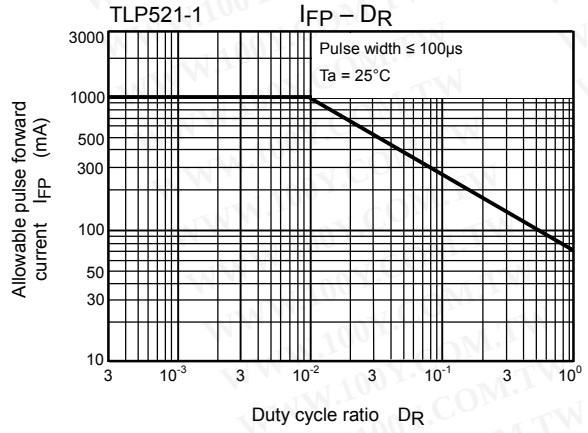
TLP521-1 P_C – Ta



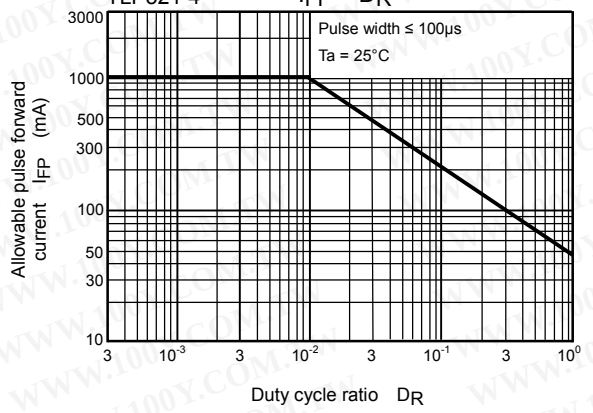
TLP521-2
TLP521-4 P_C – Ta



TLP521-1 I_{FP} – D_R



TLP521-2
TLP521-4 I_{FP} – D_R



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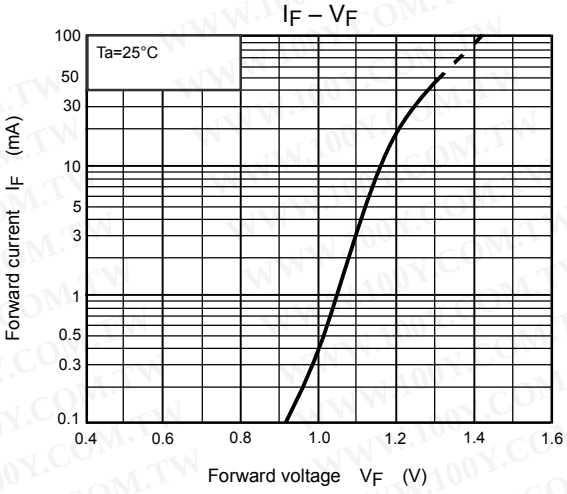
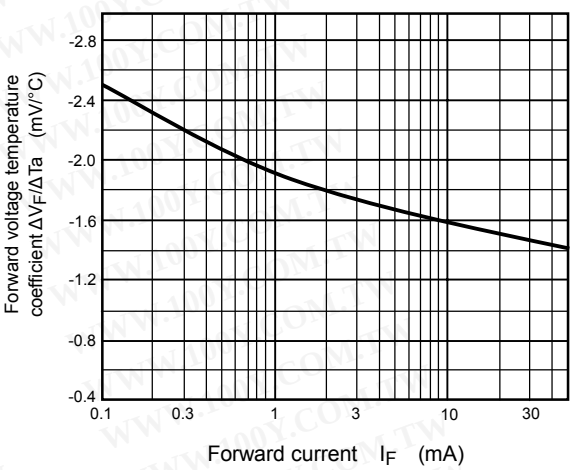
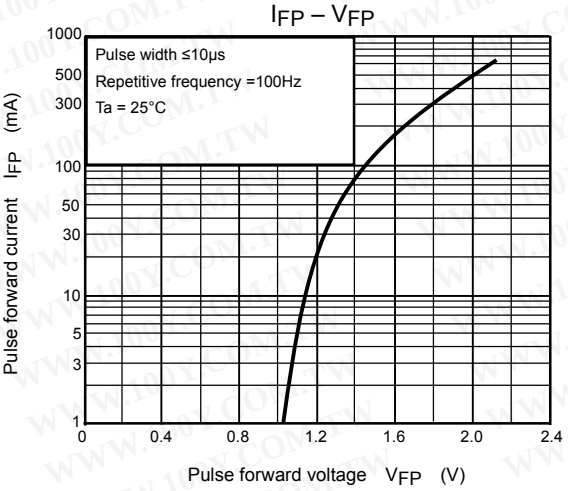
$I_F - V_F$



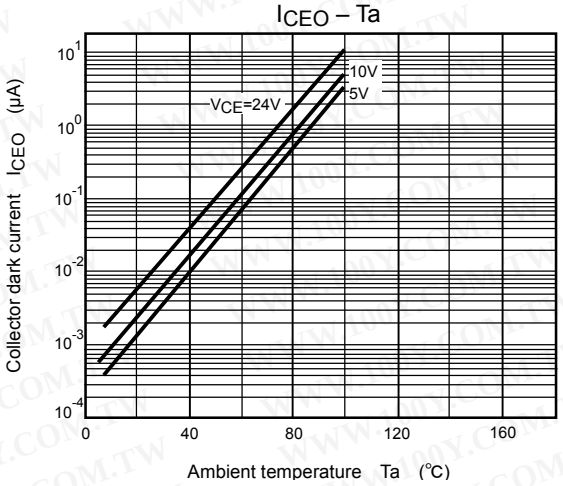
$\Delta V_F/\Delta Ta - I_F$



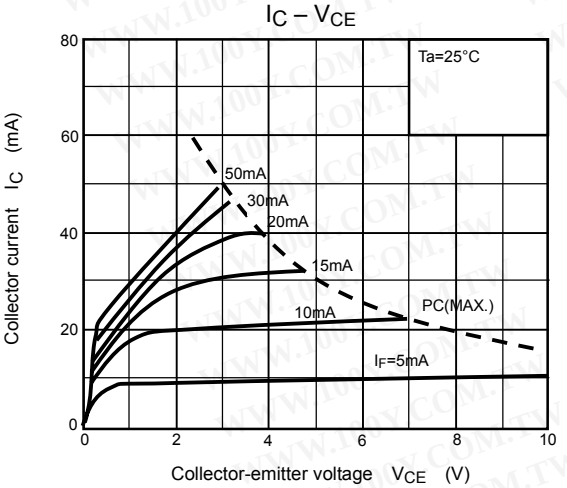
$I_{FP} - V_{FP}$



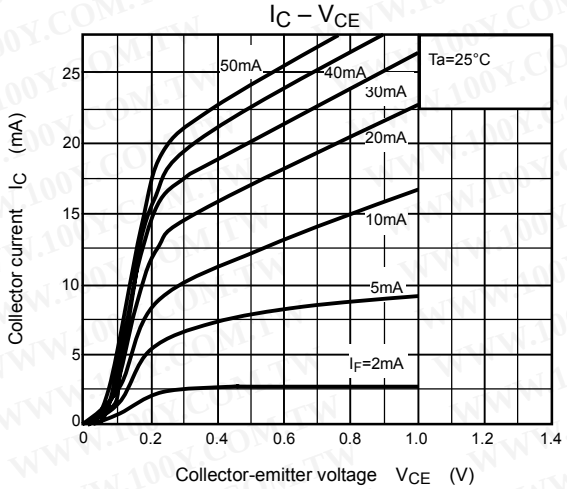
$I_{CEO} - Ta$



$I_C - V_{CE}$



$I_C - V_{CE}$



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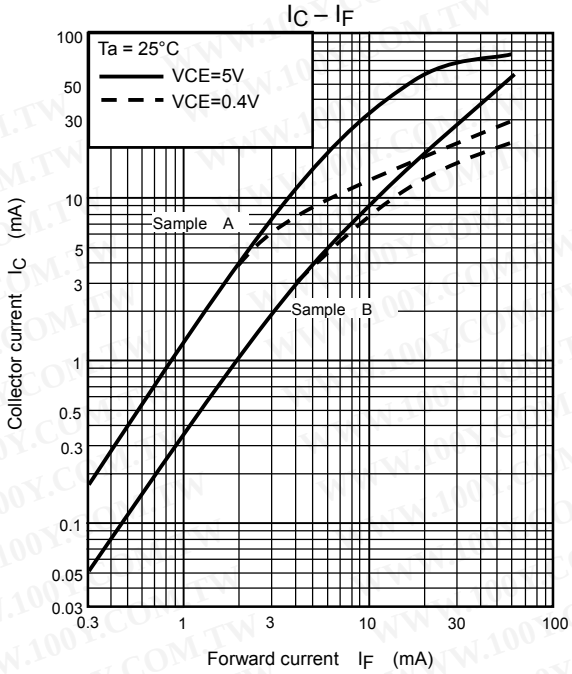
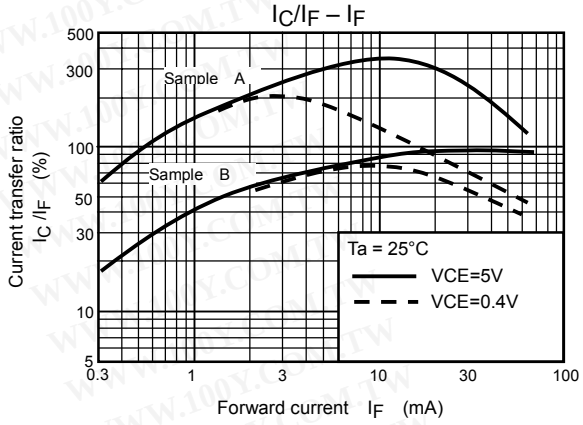
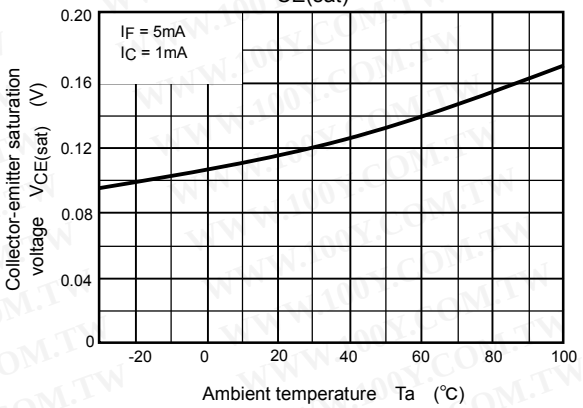
$I_C - I_F$



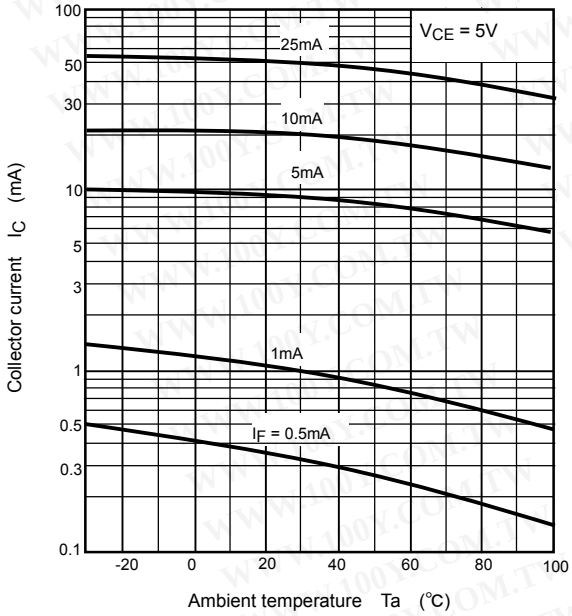
$I_C/I_F - I_F$



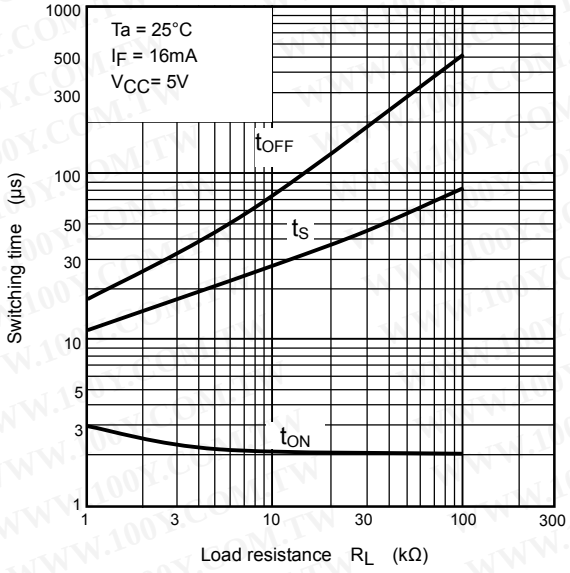
$V_{CE(sat)} - Ta$



$I_C - Ta$



R_L – Switching Time



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