TOSHIBA Photocoupler GaAs Ired & Photo−Transistor

TLP621,TLP621−2,TLP621−4

Programmable Controller

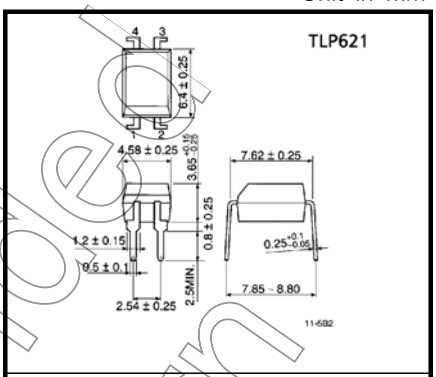
AC / DC−Input Module

Solid State Relay

The TOSHIBA TLP621, −2 and −4 consists of a photo−transistor optically coupled to a gallium arsenide infrared emitting diode.
The TLP621−2 offers two isolated channels in an eight lead plastic DIP, which the TLP621−4 provides four isolated channels in a sixteen plastic DIP.

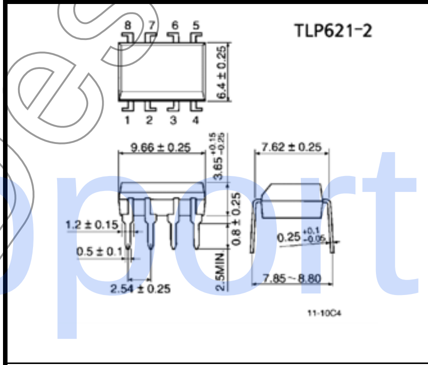
- Collector−emitter voltage: 55 V (min.)
- Current transfer ratio: 50% (min.)
  Rank GB: 100% (min.)

Unit in mm



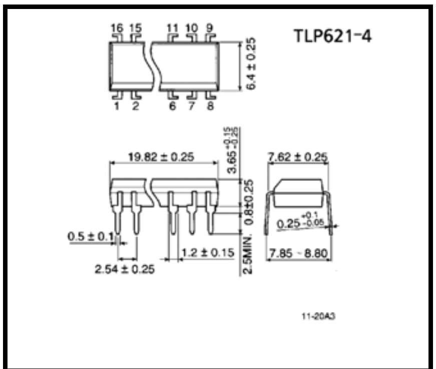
TOSHIBA 11−5B2

Weight: 0.26 g (typ.)



TOSHIBA 11−10C4

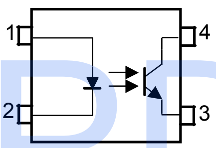
Weight: 0.54 g (typ.)



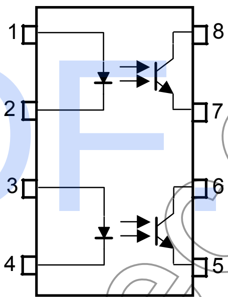
TOSHIBA 11−20A3

Weight: 1.1 g (typ.)

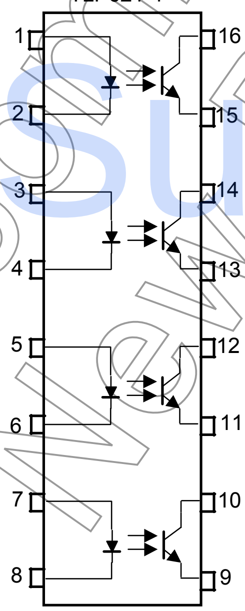
Pin Configurations (top view)



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



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



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

● Current Transfer Ratio

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.	
TLP621	(None)	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
TLP621−2 TLP621−4	(None)	50	600	Blank, GR, BL, GB
	Rank GB	100	600	GR, BL, GB

*1: Ex. rank GB: TLP621 (GB)

(Note) Application type name for certification test, please use standard product type name, i.e.
TLP621 (GB): TLP621
TLP621−2 (GB): TLP621−2

	Made In Japan	Made In Thailand
UL recognized	E67349 *2	E152349 *2
BSI approved	6508, 7445 *3	6505, 7445 *3
SEMKO approved	9735090 / 01 *4	—

*2 UL1577
*3 BS EN60065: 2002, BS EN60950-1: 2002
*4 EN60950 (approved is TLP621 only)

- Option (D4) type
  VDE approved: DIN EN 60747-5-2, certificate no. 40009302
  Maximum operating insulation voltage: 890 V_{PK}
  Highest permissible over voltage: 8000 V_{PK}

(Note) When a EN 60747-5-2 approved type is needed, please designate the “Option (D4)”

	7.62 mm pich standard type	10.16 mm pich (LF2) type
• Creepage distance	: 6.4 mm (min.)	8.0 mm (min)
Clearance	: 6.4 mm (min.)	8.0 mm (min)
Insulation thickness	: 0.4 mm (min.)	0.4 mm (min)

Absolute Maximum Ratings (Ta = 25°C)

	Characteristic	Symbol	Rating TLP621	Rating TLP621−2 TLP621−4	Unit
LED	Forward current	I_F	60	50	mA
LED	Forward current derating	ΔI_F /°C	−0.7 (Ta > 39°C)	−0.5 (Ta = 25°C)	mA /°C
LED	Pulse forward current	I_{FP}	1 (100μs pulse, 100pps)		A
LED	Power dissipation	P_D	100	70	mW
LED	Power dissipation derating	ΔP_D /°C	−1.0	−0.7	mW /°C
LED	Reverse voltage	V_R	5		V
LED	Junction temperature	T_j	125		°C
Detector	Collector−emitter voltage	V_{CEO}	55		V
Detector	Emitter−collector voltage	V_{ECO}	7		V
Detector	Collector current	I_C	50		mA
Detector	Collector power dissipation (1 circuit)	P_C	150	100	mW
Detector	Collector power dissipation derating (1 circuit, Ta ≥ 25°C)	ΔP_C /°C	−1.5	−1.0	mW /°C
Detector	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 (Note 1)		BV_S	5000 (AC, 1min., R.H.≤ 60%)		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) Device considered a two terminal: 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	20	mA
Collector current	I_C	—	1	10	mA
Operating temperature	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.

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	50	—	600	%
		Rank GB	100	—	600	
Saturated CTR	I_C / $I_{F\ (sat)}$	I_F = 1 mA, V_{CE} = 0.4 V	—	60	—	%
		Rank GB	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	—	0.2	—	
		Rank GB	—	—	0.4	

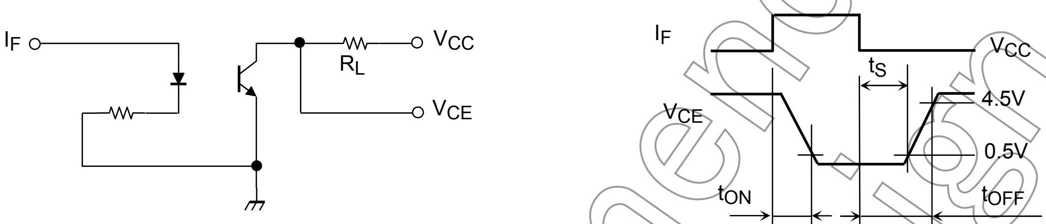
Isolation Characteristics (Ta = 25°C)

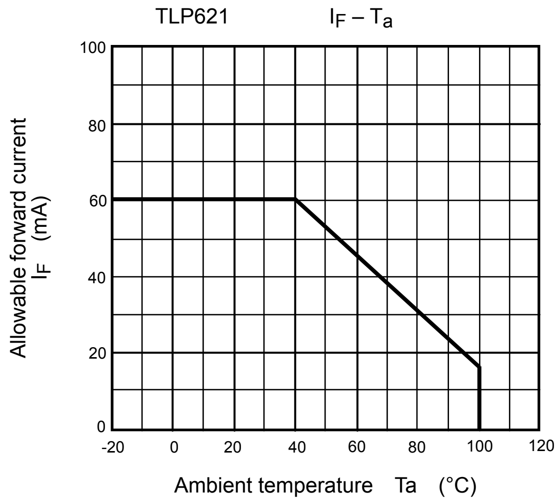
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C_S	V_S = 0, f = 1 MHz	—	0.8	—	pF
Isolation resistance	R_S	V_S = 500 V	1×10^{12}	10^{14}	—	Ω
Isolation voltage	BV_S	AC, 1 minute	5000	—	—	V_{rms}
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V_{dc}

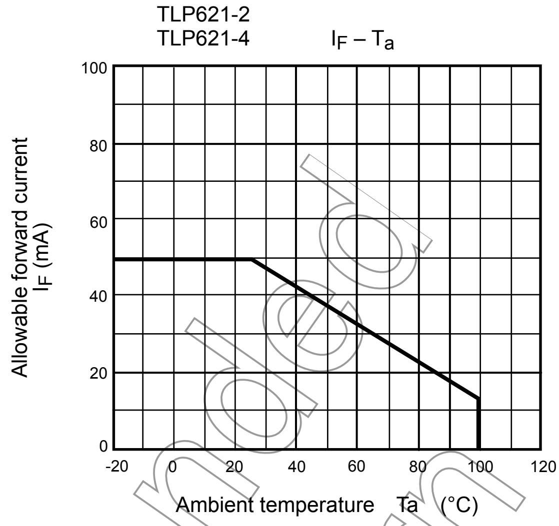
Switching Characteristics (Ta = 25°C)

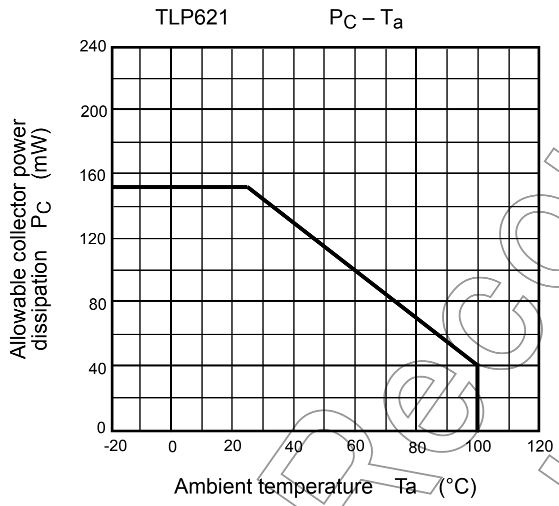
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t_r	V_{CC} = 10 V, I_C = 2 mA R_L = 100Ω	—	2	—	µs
Fall time	t_f		—	3	—	
Turn−on time	t_{on}		—	3	—	
Turn−off time	t_{off}		—	3	—	
Turn−on time	t_{ON}	R_L = 1.9 kΩ (Fig.1) V_{CC} = 5 V, I_F = 16 mA	—	2	—	µs
Storage time	t_S		—	15	—	
Turn−off time	t_{OFF}		—	25	—	

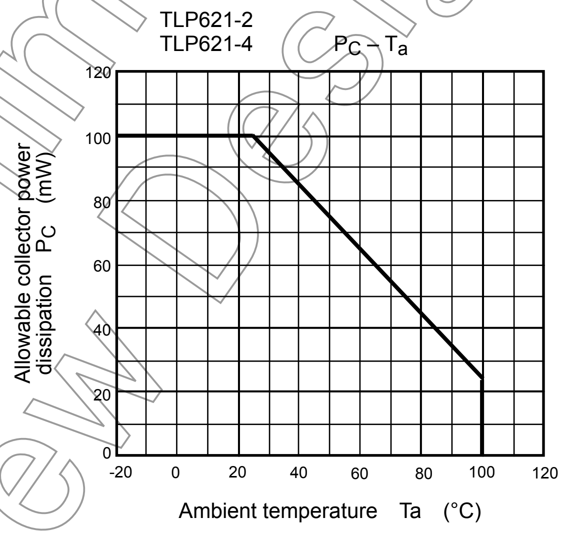
Fig. 1 Switching time test circuit

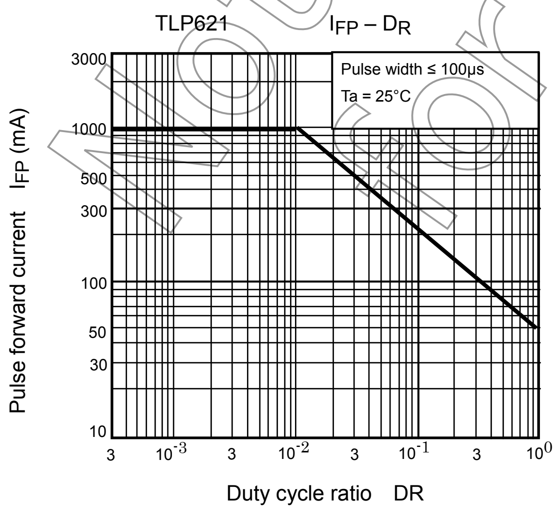


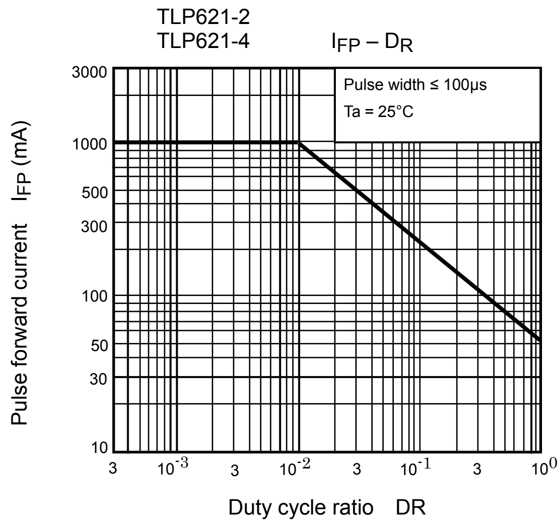

TLP621
$I_F – T_a$
Allowable forward current I_F (mA)
100
80
60
40
20
0
-20
0
20
40
60
80
100
120
Ambient temperature Ta (°C)


TLP621-2
TLP621-4
$I_F – T_a$
Allowable forward current I_F (mA)
100
80
60
40
20
0
-20
0
20
40
60
80
100
120
Ambient temperature Ta (°C)

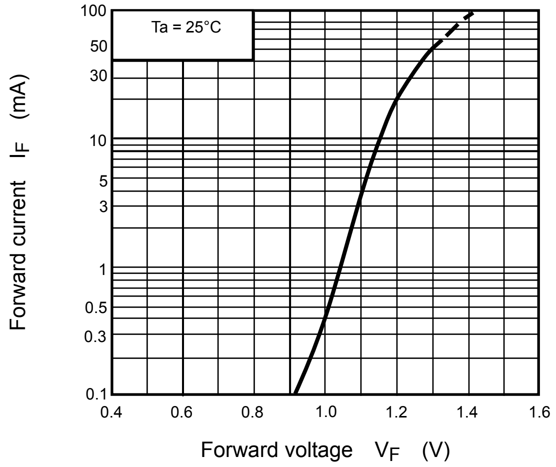

TLP621
$P_C – T_a$
Allowable collector power dissipation P_C (mW)
240
200
160
120
80
40
0
-20
0
20
40
60
80
100
120
Ambient temperature Ta (°C)


TLP621-2
TLP621-4
$P_C – T_a$
Allowable collector power dissipation P_C (mW)
120
100
80
60
40
20
0
-20
0
20
40
60
80
100
120
Ambient temperature Ta (°C)

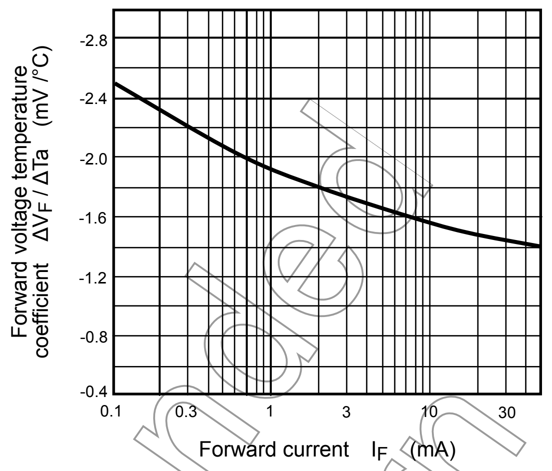

TLP621
$I_{FP} – D_R$
Pulse width ≤ 100μs
Ta = 25°C
Pulse forward current I_{FP} (mA)
3000
1000
500
300
100
50
30
10
3
10^{-3}
3
10^{-2}
3
10^{-1}
3
10^{0}
Duty cycle ratio DR


TLP621-2
TLP621-4
$I_{FP} – D_R$
Pulse width ≤ 100μs
Ta = 25°C
Pulse forward current I_{FP} (mA)
3000
1000
500
300
100
50
30
10
3
10^{-3}
3
10^{-2}
3
10^{-1}
3
10^{0}
Duty cycle ratio DR

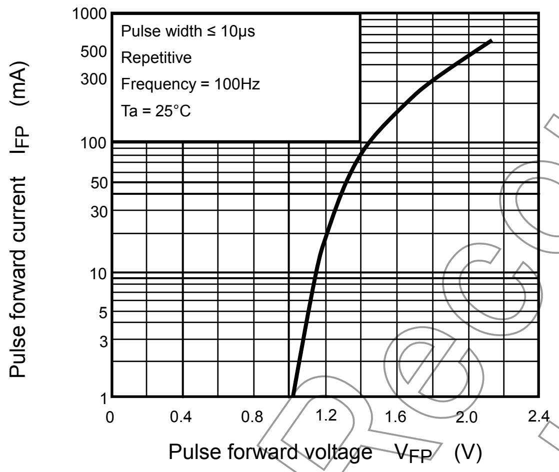
I_F – V_F



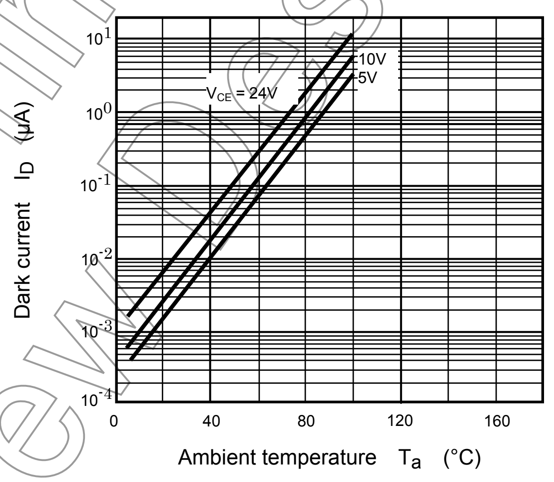
ΔV_F / ΔTa – I_F



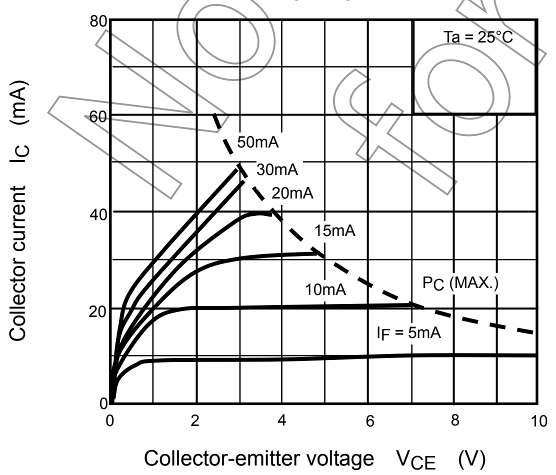
I_{FP} – V_{FP}



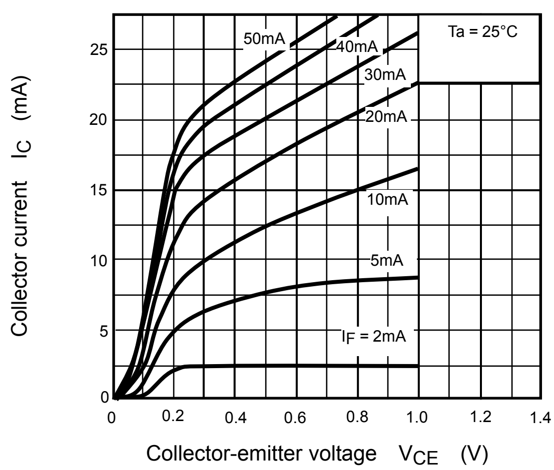
I_D – T_a



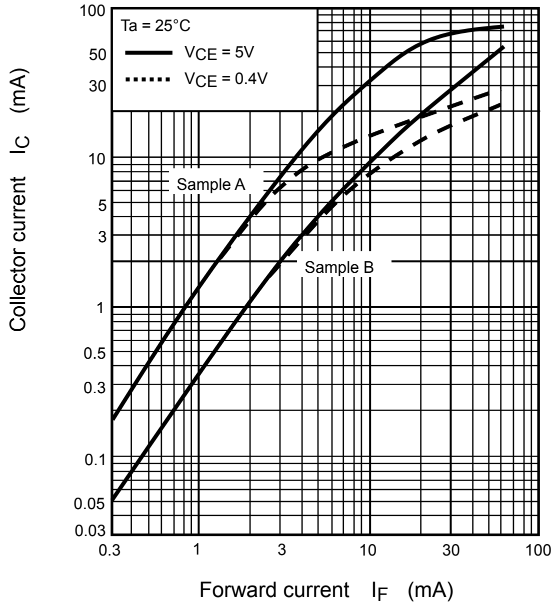
I_C – V_{CE}



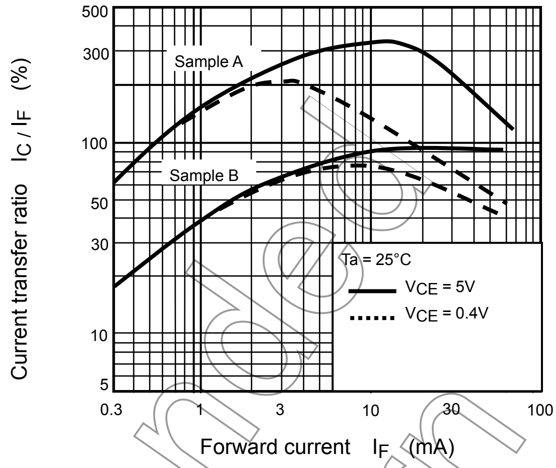
I_C – V_{CE}



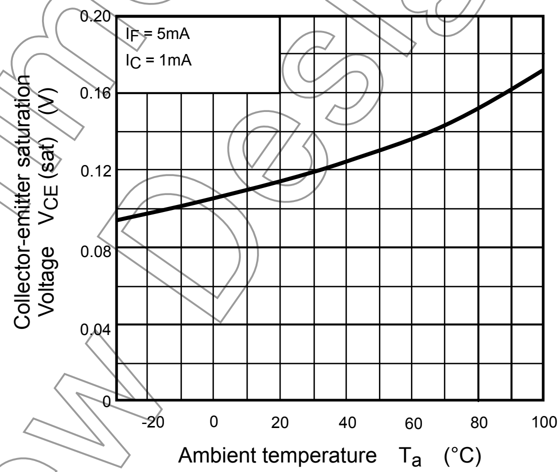
I_C – I_F



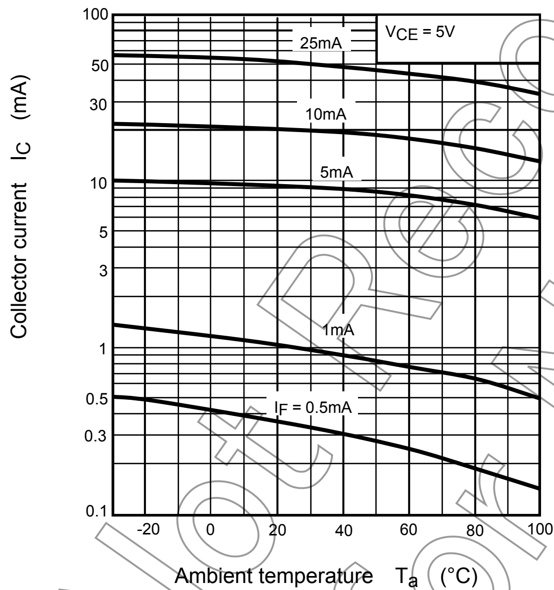
I_C / I_F – I_F



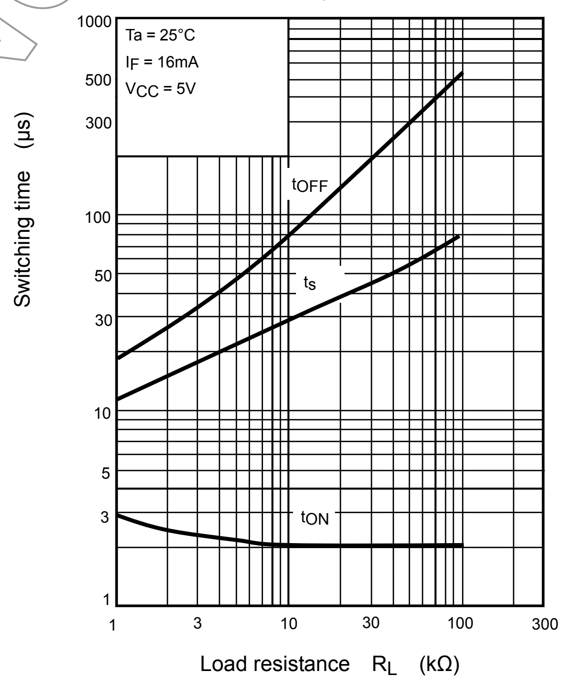
V_{CE} (sat) – T_a



I_C – T_a



Switchingtime – R_L



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