

TOSHIBA Photocoupler GaAs Ired & Photo-Transistor

# TLP321, TLP321-2, TLP321-4

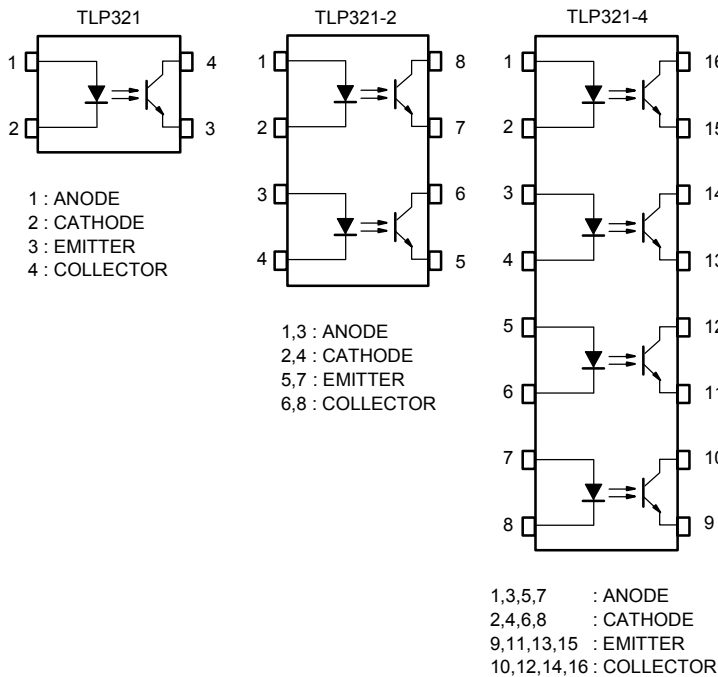
Programmable Controllers  
 DC-Output Module  
 Telecommunication

The TOSHIBA TLP321, -2 and -4 consist of a photo-transistor optically coupled to a gallium arsenide infrared emitting diode. The TLP321-2 offers two isolated channels in an eight lead plastic DIP package, while the TLP321-4 provides four isolated channels in a sixteen plastic DIP package.

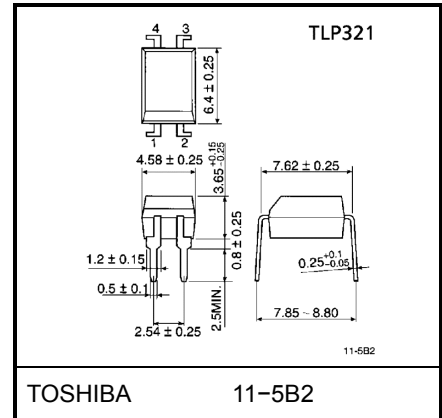
TLP321 / -2 / -4 have high VCEO voltage (VCEO = 80V).

- Collector-emitter voltage: 80V (min.)
- Current transfer ratio: 50% (min.)  
 Rank GB: 100% (min.)
- Isolation voltage: 5000Vrms (min.)
- UL recognized: UL1577, file no. E67349

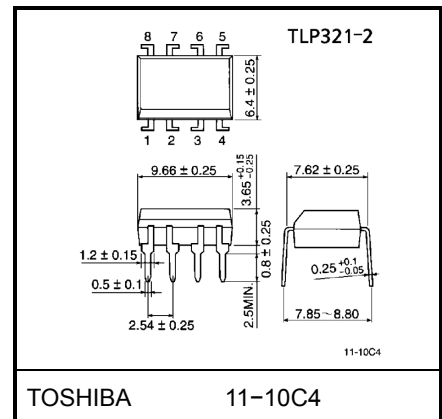
## Pin Configurations (top view)



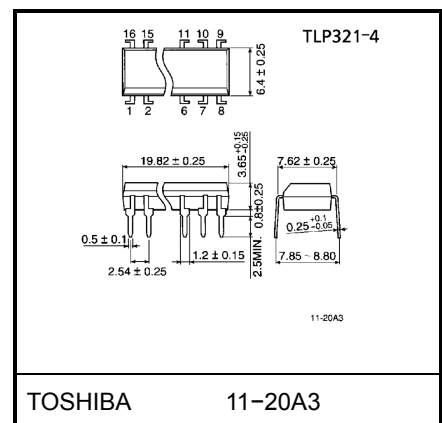
Unit in mm



Weight: 0.26g



Weight: 0.54g



Weight: 1.1g

## Current Transfer Ratio

Type	Classification *1	Current Transfer Ratio (%) ( $I_C / I_F$ )		Marking Of Classification
		$I_F = 5\text{mA}, V_{CE} = 5\text{V}, T_a = 25^\circ\text{C}$		
		Min.	Max.	
TLP321	(None)	50	600	BLANK, Y, Y <sup>■</sup> , G, G <sup>■</sup> , B, B <sup>■</sup> , GB
	Rank Y	50	150	Y, Y <sup>■</sup>
	Rank GR	100	300	G, G <sup>■</sup>
	Rank BL	200	600	B, B <sup>■</sup>
	Rank GB	100	600	G, G <sup>■</sup> , B, B <sup>■</sup> , GB
TLP321-2 TLP321-4	(None)	50	600	BLANK, GR, BL, GB
	Rank GB	100	600	GR, BL, GB

\*1: Ex. Rank GB: TLP321 (GB)

(Note) Application type name for certification test, please use standard product type name, i. e.  
 TLP321 (GB): TLP321  
 TLP321-2 (GB): TLP321-2

## Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating		Unit	
		TLP321-1	TLP321-2 TLP321-4		
LED	Forward current	I <sub>F</sub>	60	50	mA
	Forward current derating	ΔI <sub>F</sub> / °C	-0.7 (Ta ≥ 39°C)	-0.5 (Ta ≥ 25°C)	mA / °C
	Pulse forward current	I <sub>FP</sub>	1 (100μs pulse, 100pps)		A
	Reverse voltage	V <sub>R</sub>	5		V
	Junction temperature	T <sub>j</sub>	125		°C
Detector	Collector-emitter voltage	V <sub>CEO</sub>	80		V
	Emitter-collector voltage	V <sub>ECO</sub>	7		V
	Collector current	I <sub>C</sub>	50		mA
	Collector power dissipation (1 Circuit)	P <sub>C</sub>	150	100	mW
	Collector power dissipation derating (1 Circuit, Ta ≥ 25°C)	ΔP <sub>C</sub> / °C	-1.5	-1.0	mW / °C
	Junction temperature	T <sub>j</sub>	125		°C
Storage temperature range	T <sub>stg</sub>	-55~125		°C	
Operating temperature range	T <sub>opr</sub>	-55~100		°C	
Lead soldering temperature	T <sub>sol</sub>	260 (10s)		°C	
Total package power dissipation	R <sub>T</sub>	250	150	mW	
Total package power dissipation derating (Ta ≥ 25°C)	ΔP <sub>T</sub> / °C	-2.5	-1.5	mW / °C	
Isolation voltage (Note 1)	BV <sub>S</sub>	5000 (AC, 1min., RH ≤ 60%)		V <sub>rms</sub>	

(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	$V_{CC}$	—	12	48	V
Forward current	$I_F$	—	16	20	mA
Collector current	$I_C$	—	1	10	mA
Operating temperature	$T_{opr}$	-25	—	85	°C

## Individual Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Condition	Min.	Typ.	Max.	Unit
LED	Forward voltage	$V_F$	$I_F = 10 \text{ mA}$	1.0	1.15	1.3	V
	Reverse current	$I_R$	$V_R = 5 \text{ V}$	—	—	10	μA
	Capacitance	$C_T$	$V = 0, f = 1 \text{ MHz}$	—	30	—	pF
Detector	Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = 0.5 \text{ mA}$	80	—	—	V
	Emitter-collector breakdown voltage	$V_{(BR)ECO}$	$I_E = 0.1 \text{ mA}$	7	—	—	V
	Collector dark current	$I_{CEO}$	$V_{CE} = 48 \text{ V}$	—	10	100	nA
			$V_{CE} = 48 \text{ V}, T_a = 85^\circ \text{ C}$	—	2	50	μA
Capacitance (collector to emitter)	$C_{CE}$	$V = 0, f = 1 \text{ MHz}$	—	10	—	pF	

## Coupled Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Current transfer ratio	$I_C / I_F$	$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$ Rank GB	50	—	600	%
			100	—	600	
Saturated CTR	$I_C / I_F (\text{sat})$	$I_F = 1 \text{ mA}, V_{CE} = 0.4 \text{ V}$ Rank GB	—	60	—	%
			30	—	—	
Collector-emitter saturation voltage	$V_{CE} (\text{sat})$	$I_C = 2.4 \text{ mA}, I_F = 8 \text{ mA}$	—	—	0.4	V
		$I_C = 0.2 \text{ mA}, I_F = 1 \text{ mA}$ Rank GB	—	0.2	—	
			—	—	0.4	

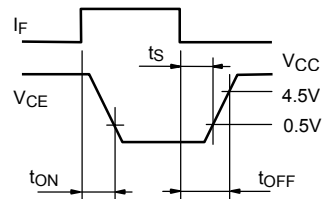
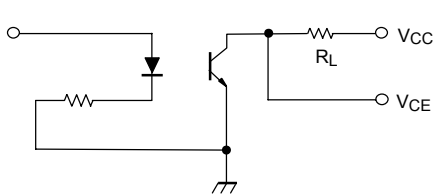
## Isolation Characteristics (Ta = 25°C)

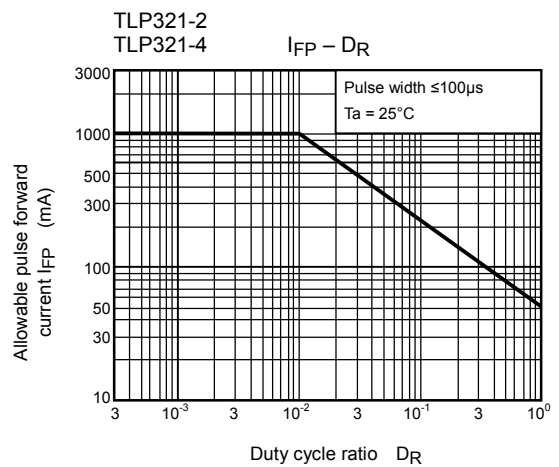
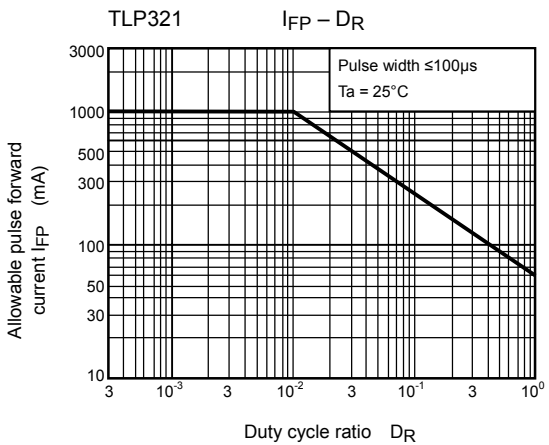
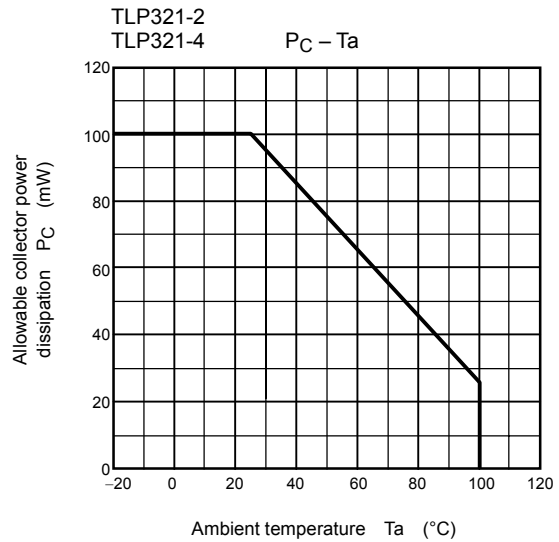
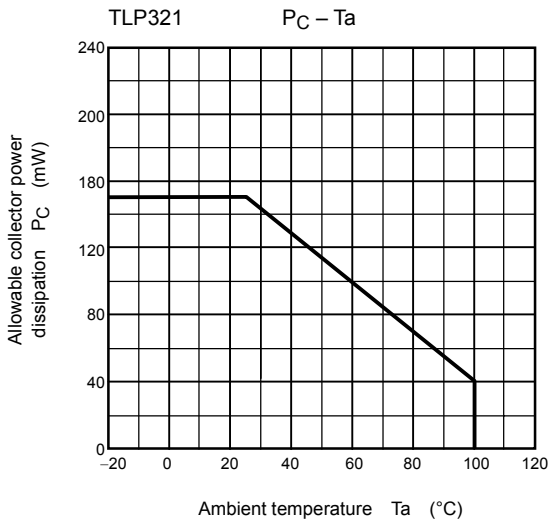
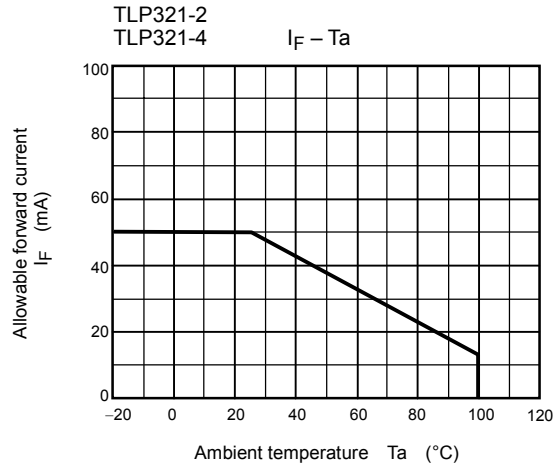
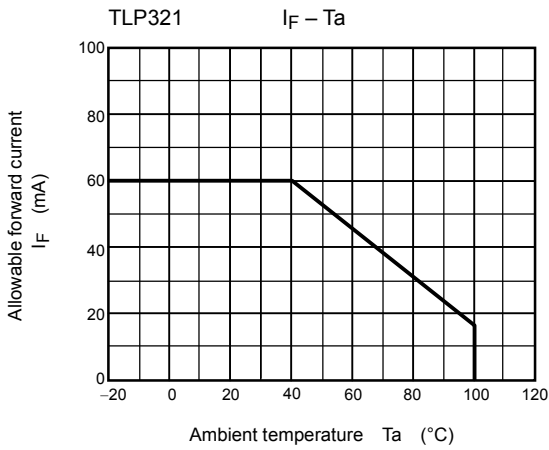
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Capacitance (input to output)	C <sub>S</sub>	V <sub>S</sub> = 0, f = 1MHz	—	0.8	—	pF
Isolation resistance	R <sub>S</sub>	V <sub>S</sub> = 500V, R.H. ≤ 60%	5×10 <sup>10</sup>	10 <sup>14</sup>	—	Ω
Isolation voltage	BV <sub>S</sub>	AC, 1 minute	5000	—	—	V <sub>rms</sub>
		AC, 1 second, in oil	—	10000	—	
		DC, 1 minute, in oil	—	10000	—	V <sub>dc</sub>

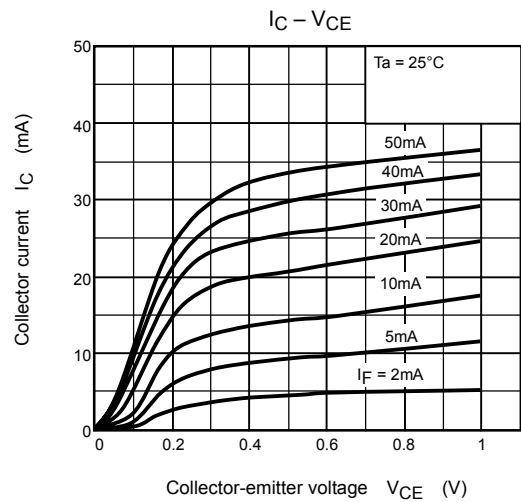
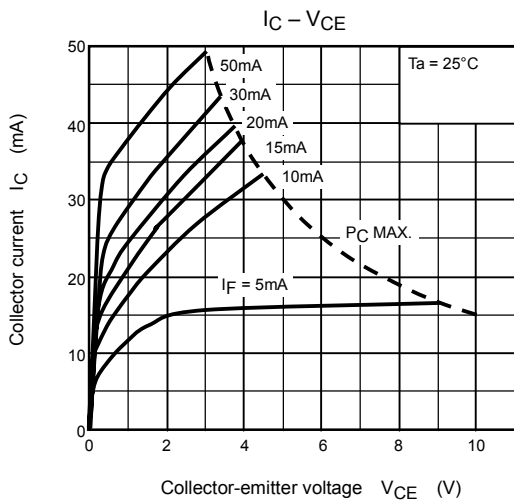
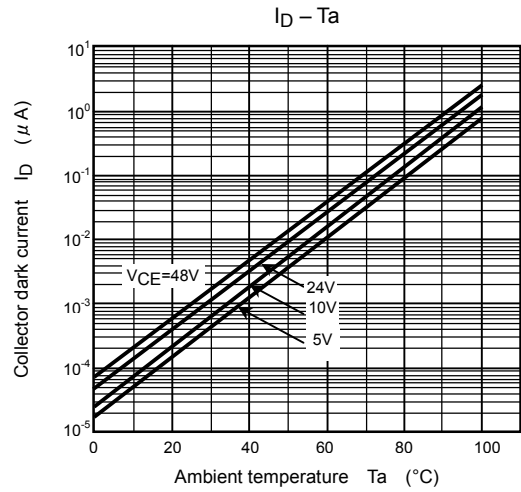
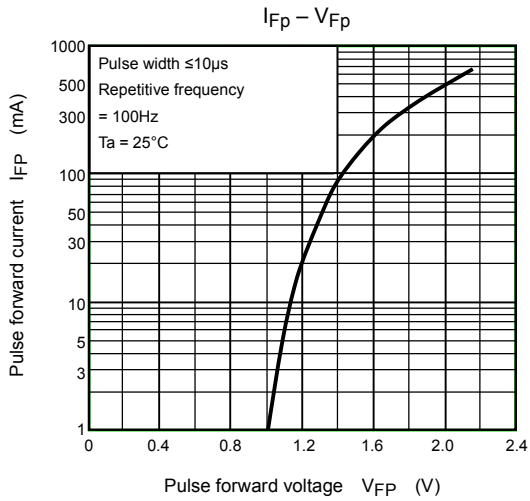
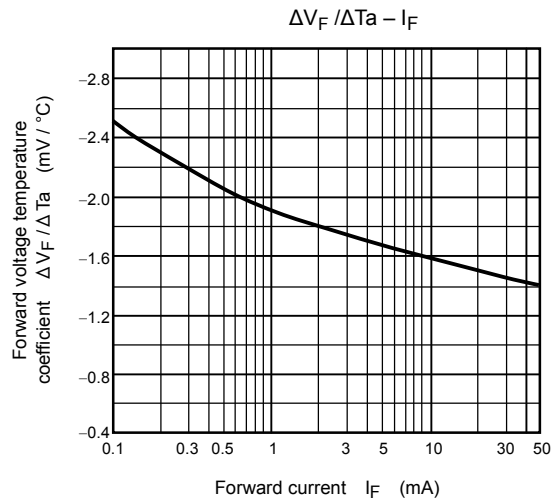
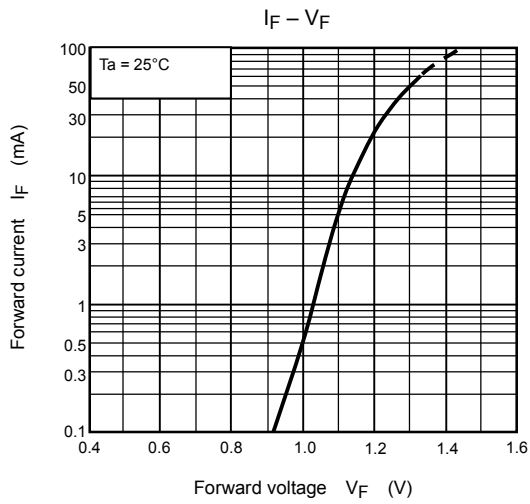
## Switching Characteristics (Ta = 25°C)

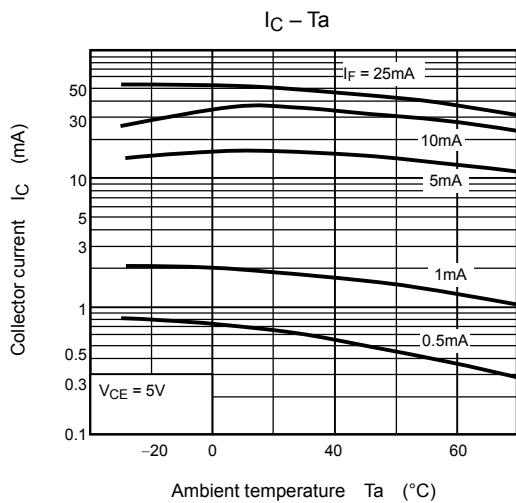
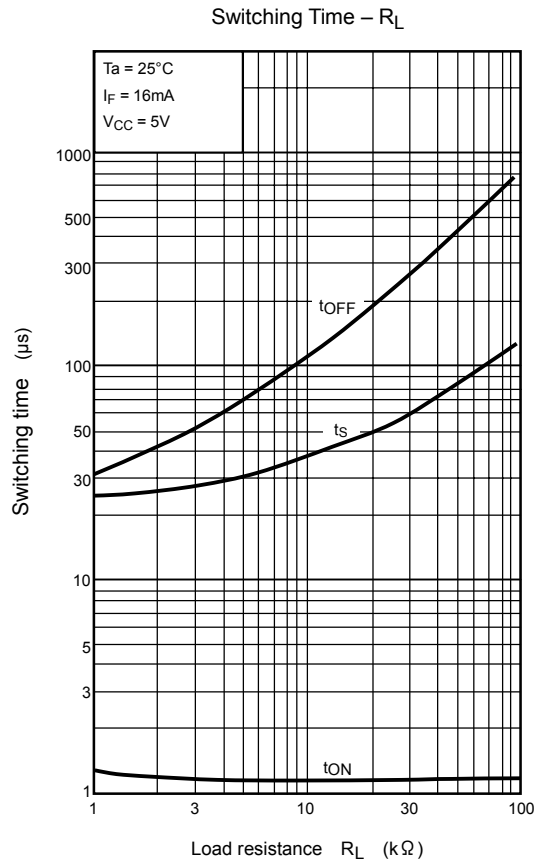
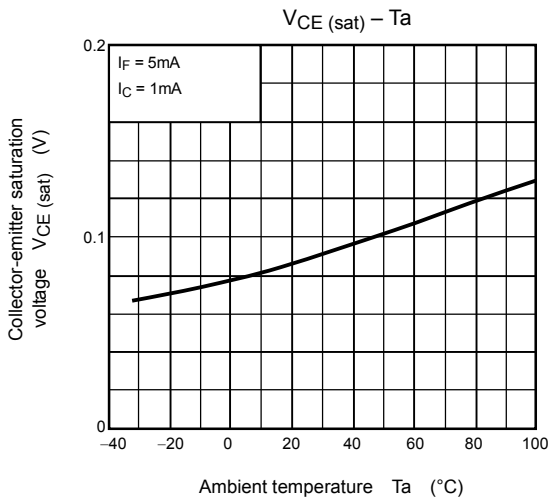
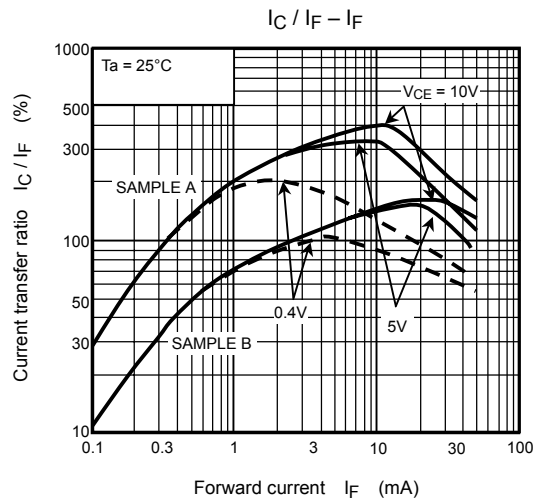
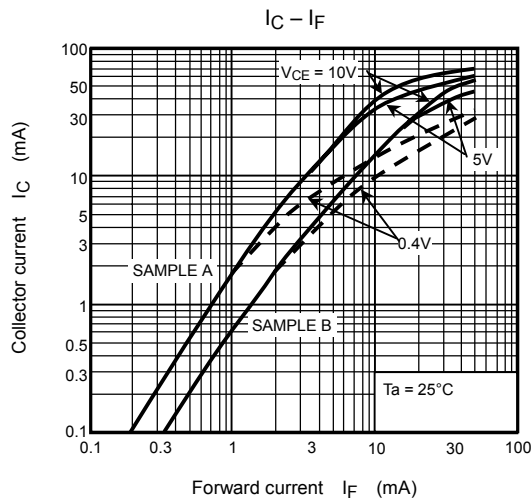
Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10V I <sub>C</sub> = 2mA R <sub>L</sub> = 100Ω	—	2	—	μs
Fall time	t <sub>f</sub>		—	3	—	
Turn-on time	t <sub>on</sub>		—	3	—	
Turn-off time	t <sub>off</sub>		—	3	—	
Turn-on time	t <sub>ON</sub>	R <sub>L</sub> = 1.9kΩ (Fig.1) V <sub>CC</sub> = 5V, I <sub>F</sub> = 16mA	—	2	—	μs
Storage time	t <sub>s</sub>		—	15	—	
Turn-off time	t <sub>OFF</sub>		—	25	—	

Fig. 1 Switching time test circuit











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