

Low voltage fast-switching NPN power transistor

Features

- Very low collector to emitter saturation voltage
- High current gain characteristic
- Fast-switching speed

Applications

- Voltage regulators
- High efficiency low voltage switching applications

Description

The device is a low voltage NPN transistor with exceptional high gain performance coupled with very low saturation voltage. It is designed in planar technology with "base island" layout.

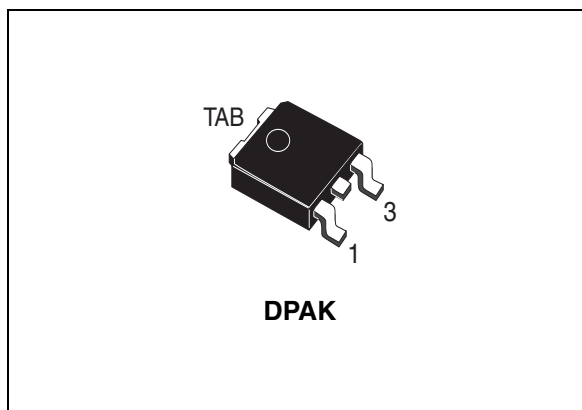


Figure 1. Internal schematic diagram

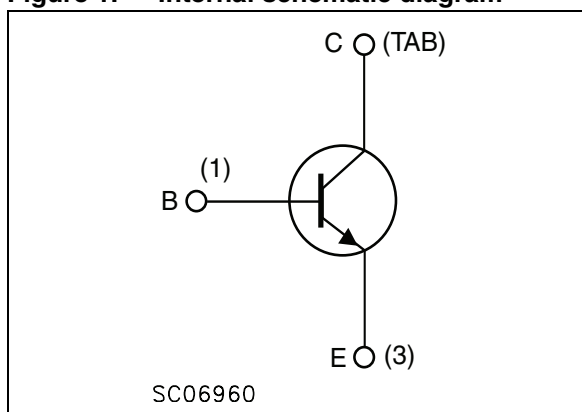


Table 1. Device summary

Order code	Marking	Packages	Packaging
2STD1665T4	D1665	DPAK	Tape and reel

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base voltage ($I_E = 0$)	150	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	65	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	7	V
I_C	Collector current	6	A
I_{CM}	Collector peak current ($t_P < 5\text{ms}$)	20	A
I_B	Base current	1	A
P_{tot}	Total dissipation at $T_a = 25\text{ °C}$	15	W
T_{stg}	Storage temperature	-65 to 150	°C
T_J	Max. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-a}^{(1)}$	Thermal resistance junction-ambient	max 8.33	°C/W

1. Device mounted on a PCB area of 1 cm^2

2 Electrical characteristics

($T_{\text{case}} = 25^{\circ}\text{C}$ unless otherwise specified).

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cut-off current ($I_{\text{E}} = 0$)	$V_{\text{CB}} = 120 \text{ V}$ $V_{\text{CB}} = 120 \text{ V} \quad T_{\text{C}} = 100^{\circ}\text{C}$			50 1	nA μA
I_{EBO}	Emitter cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 7 \text{ V}$			10	nA
$V_{(\text{BR})\text{CBO}}^{(1)}$	Collector-base breakdown voltage ($I_{\text{E}} = 0$)	$I_{\text{C}} = 100 \mu\text{A}$	150			V
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ($I_{\text{B}} = 0$)	$I_{\text{C}} = 10 \text{ mA}$	65			V
$V_{(\text{BR})\text{EBO}}^{(1)}$	Emitter-base breakdown voltage ($I_{\text{C}} = 0$)	$I_{\text{E}} = 100 \mu\text{A}$	7			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 100 \text{ mA} \quad I_{\text{B}} = 5 \text{ mA}$ $I_{\text{C}} = 1 \text{ A} \quad I_{\text{B}} = 50 \text{ mA}$ $I_{\text{C}} = 2 \text{ A} \quad I_{\text{B}} = 50 \text{ mA}$ $I_{\text{C}} = 6 \text{ A} \quad I_{\text{B}} = 150 \text{ mA}$ $I_{\text{C}} = 6 \text{ A} \quad I_{\text{B}} = 300 \text{ mA}$		50 100 260 230	120 200 600 380	mV mV mV mV
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 4 \text{ A} \quad I_{\text{B}} = 200 \text{ mA}$		1	1.15	V
$V_{\text{BE}(\text{on})}^{(1)}$	Base-emitter on voltage	$I_{\text{C}} = 4 \text{ A} \quad V_{\text{CE}} = 1 \text{ V}$		0.85	1	V
h_{FE}	DC current gain	$I_{\text{C}} = 10 \text{ mA} \quad V_{\text{CE}} = 1 \text{ V}$ $I_{\text{C}} = 2 \text{ A} \quad V_{\text{CE}} = 1 \text{ V}$ $I_{\text{C}} = 5 \text{ A} \quad V_{\text{CE}} = 1 \text{ V}$ $I_{\text{C}} = 10 \text{ A} \quad V_{\text{CE}} = 1 \text{ V}$	150 150 90 30	320 310 175 65	350	
C_{CBO}	Collector-base capacitance ($I_{\text{E}}=0$)	$V_{\text{CB}} = 10 \text{ V} \quad f = 1 \text{ MHz}$		45		pF
t_{on} t_{s} t_{f}	Resistive load Turn-on time Storage time Fall time	$I_{\text{C}} = 3 \text{ A} \quad V_{\text{CC}} = 10 \text{ V}$ $I_{\text{B}(\text{on})} = -I_{\text{B}(\text{off})} = 300 \text{ mA}$ $V_{\text{BB}(\text{off})} = -5 \text{ V}$		90 800 90		ns ns ns

1. Pulse test: pulse duration $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

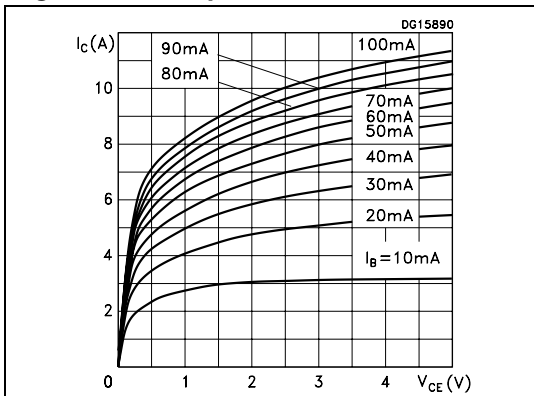


Figure 3. DC current gain

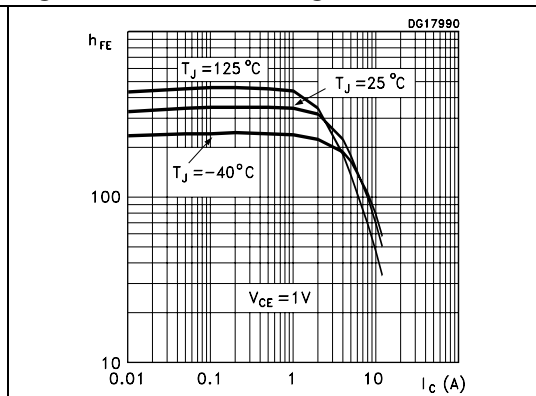


Figure 4. Collector-emitter saturation voltage - ($h_{FE} = 20$)

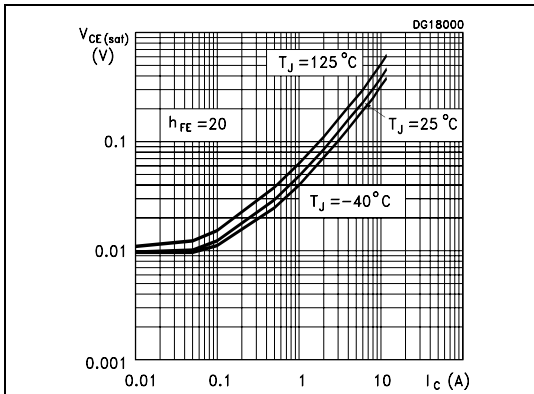


Figure 5. Collector-emitter saturation voltage - ($h_{FE} = 40$)

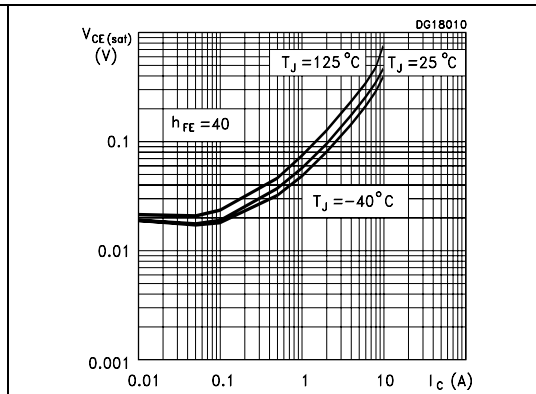


Figure 6. Base-emitter saturation voltage

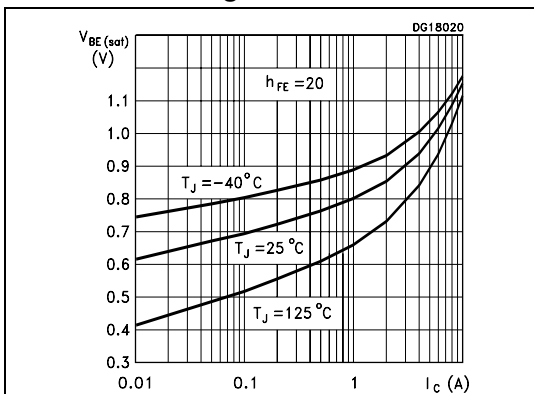


Figure 7. Base-emitter on voltage

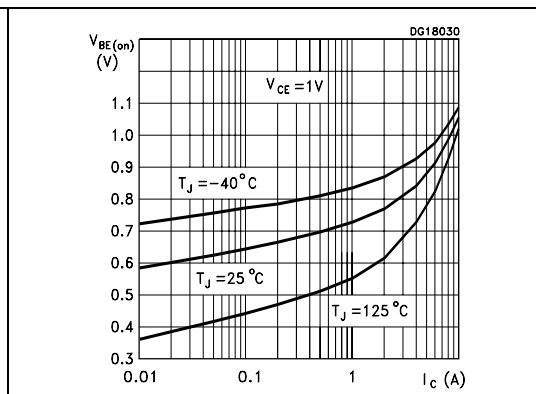


Figure 8. Resistive load switching off **Figure 9. Resistive load switching on**

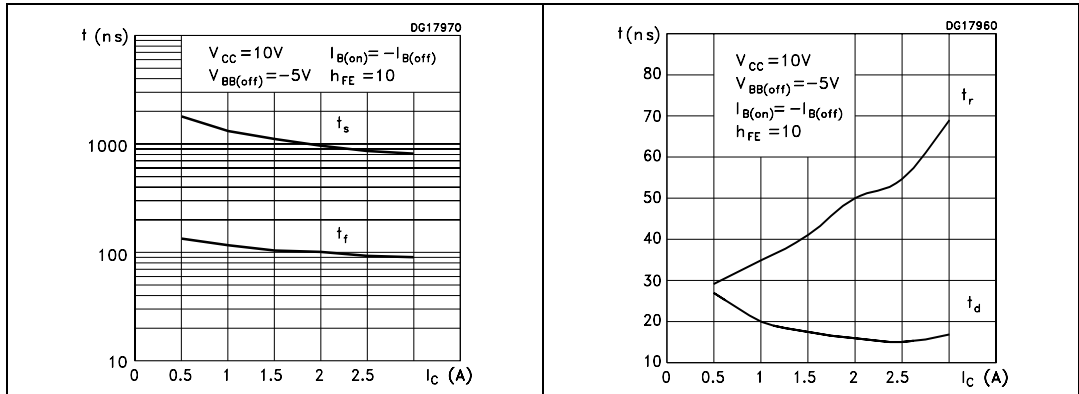
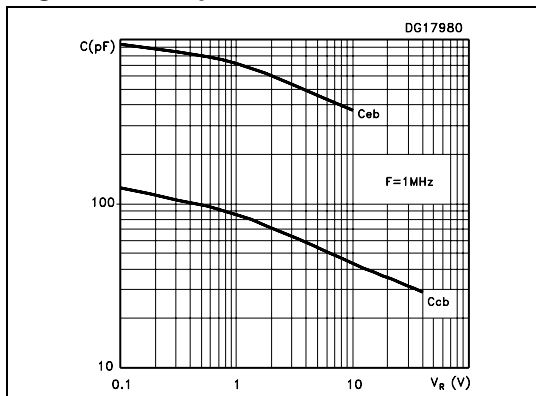
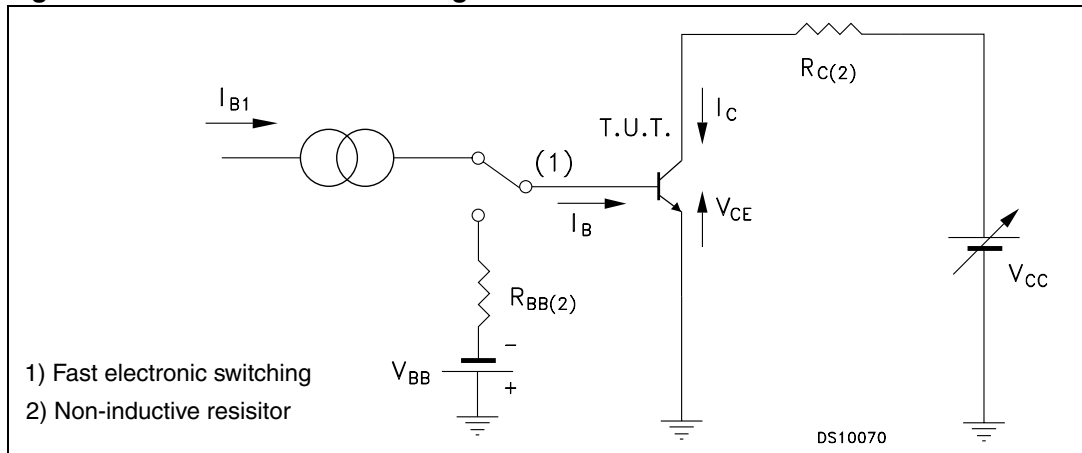


Figure 10. Capacitance



2.2 Test circuit

Figure 11. Resistive load switching time



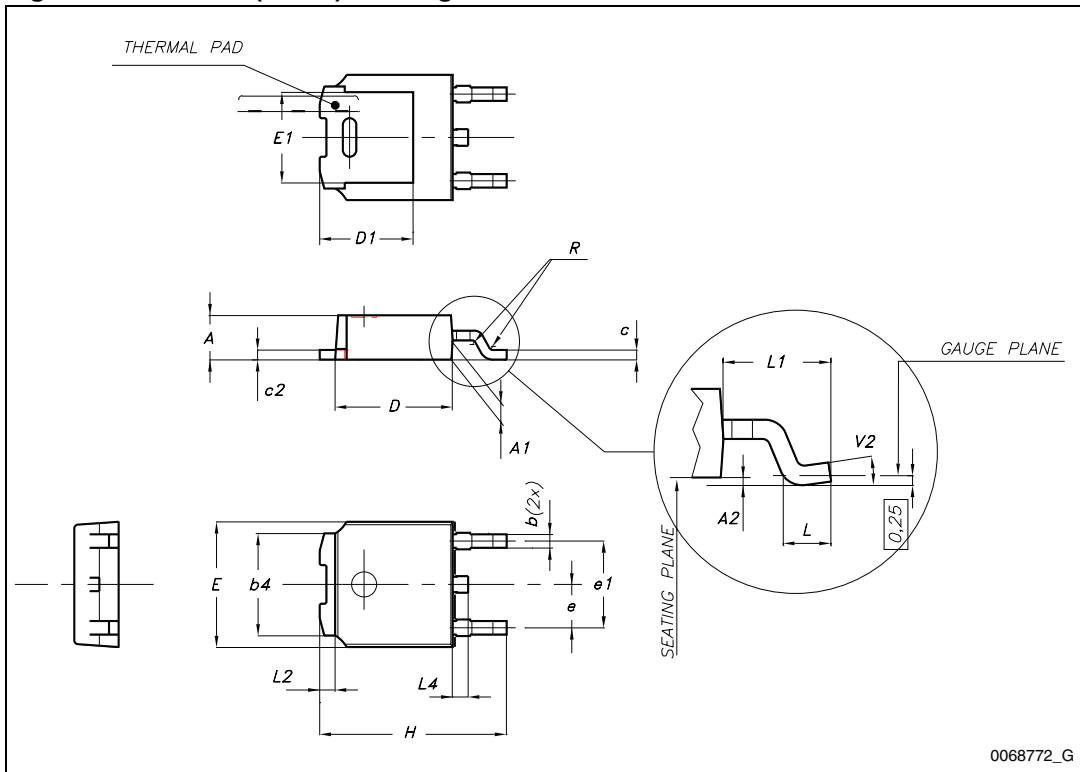
3 Package mechanical data

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Table 5. DPAK (TO-252) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

Figure 12. TO-252 (DPAK) drawings



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
08-May-2006	1	Initial release
27-Mar-2008	2	New graphics
08-Feb-2011	3	Updated Table 2 and 3

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