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.

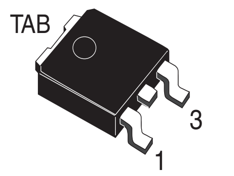


Figure 1. Internal schematic diagram

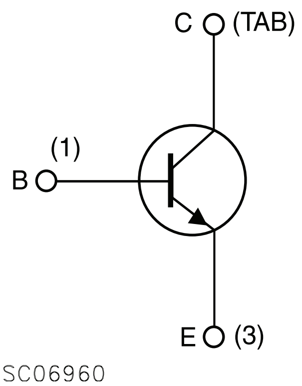


Table 1. Device summary

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 ($t_P < 5ms$)	20	A
I_B	Base current	1	A
P_{tot}	Total dissipation at $T_a = 25$ °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_{case} = 25°C unless otherwise specified).

Table 4. Electrical characteristics

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

1. Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

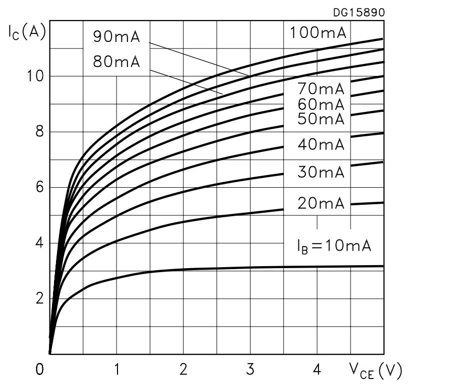


Figure 3. DC current gain

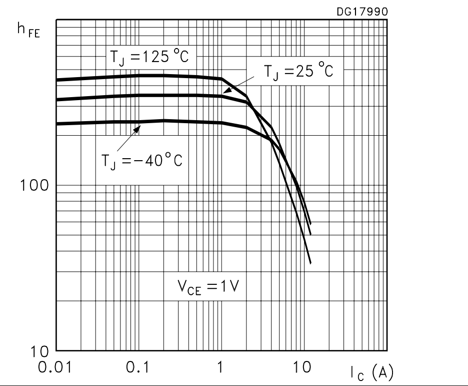


Figure 4. Collector-emitter saturation voltage - (h_{FE} = 20)

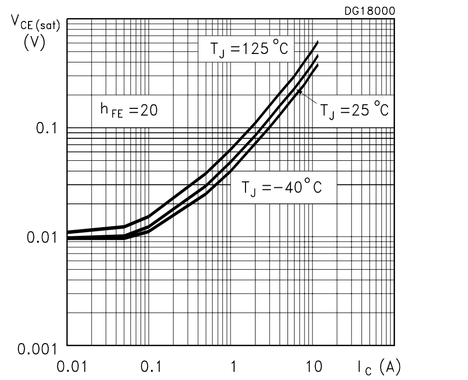


Figure 5. Collector-emitter saturation voltage - (h_{FE} = 40)

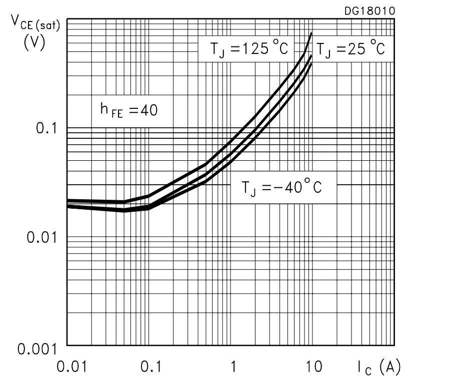


Figure 6. Base-emitter saturation voltage

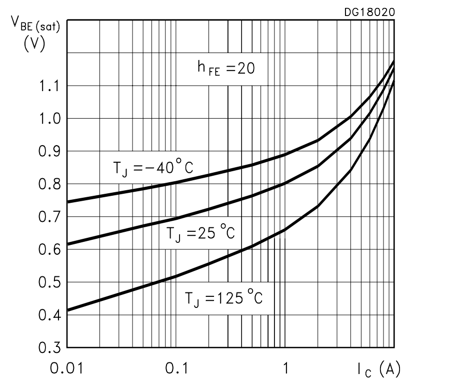


Figure 7. Base-emitter on voltage

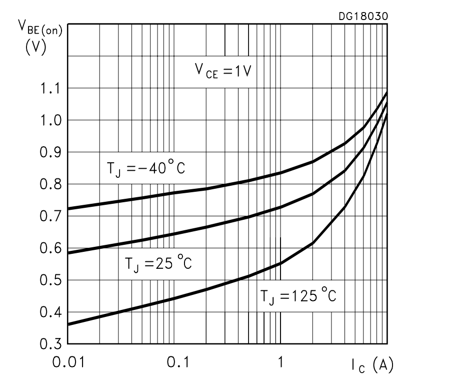


Figure 8. Resistive load switching off

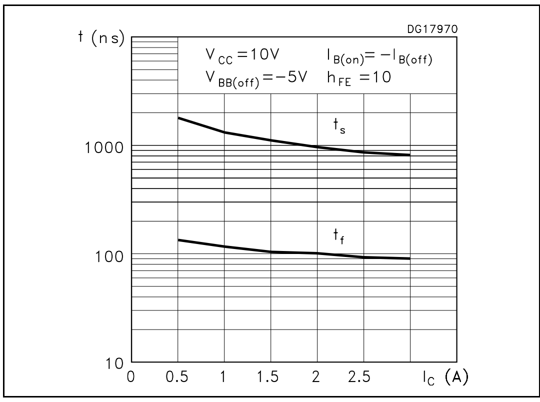


Figure 9. Resistive load switching on

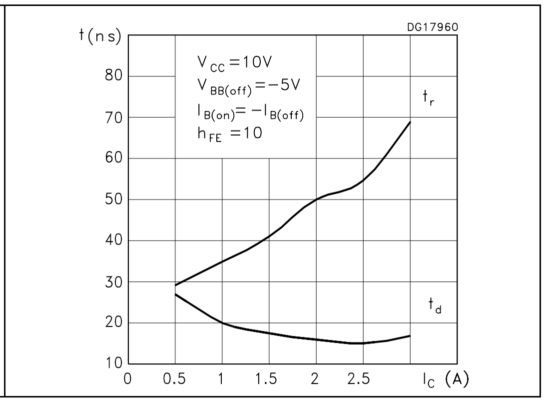
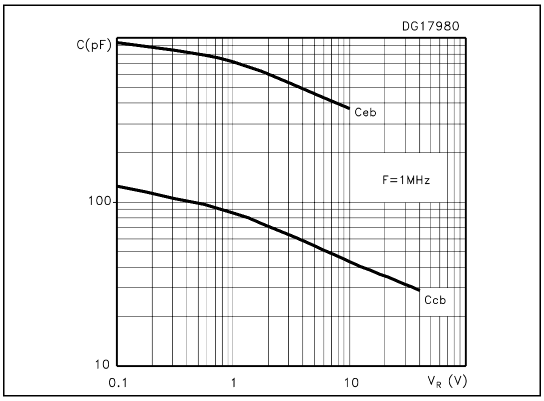
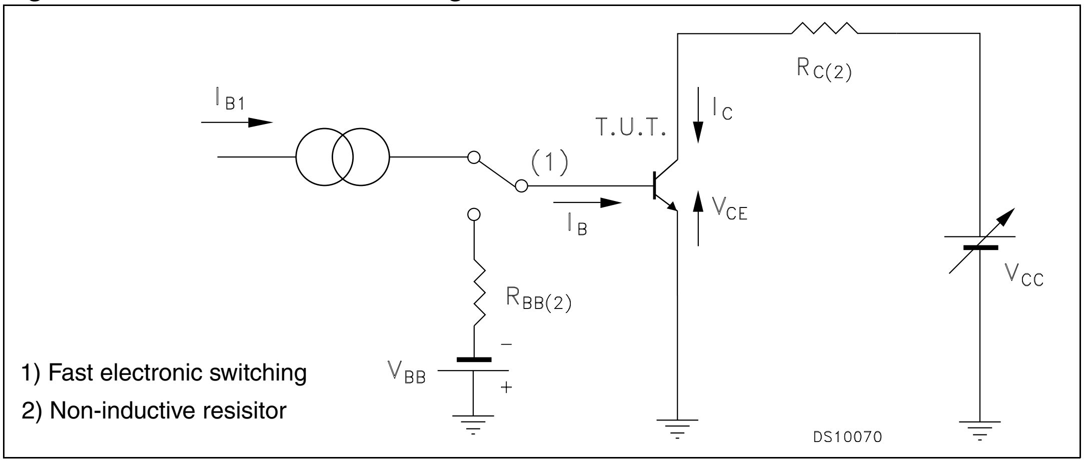


Figure 10. Capacitance



2.2 Test circuit

Figure 11. Resistive load switching time



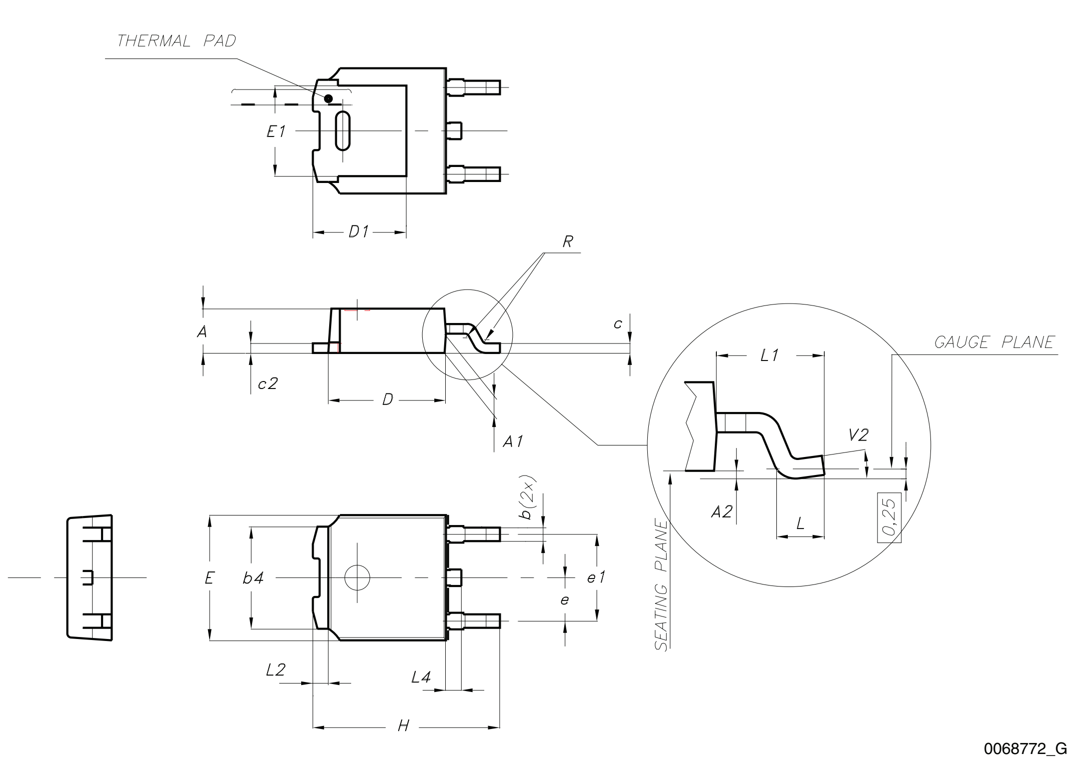
3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

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*