2STD1665

Low voltage fast-switching NPN power transistor

Features

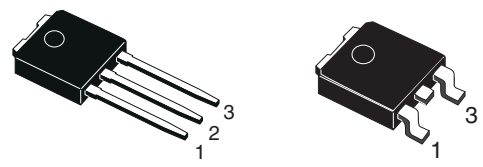
- Very low collector to emitter saturation volatage
- High current gain characteristic
- Fast-switching speed
- Through-hole IPAK (TO-251) power package in tube (suffix”-1”)
- Surface mounting DPAK (TO-252) power package in tape & reel (suffix”T4”)

Applications

- Ccfl drivers
- Voltage regulators
- Relay drivers
- High efficiency low voltage switching applications

Description

The device is manufactured in NPN Planar Technology by using a “Base Island” layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.



IPAK
TO251
(Suffix “-1”)

DPAK
TO252
(Suffix “T4”)

Figure 1. Internal schematic diagram

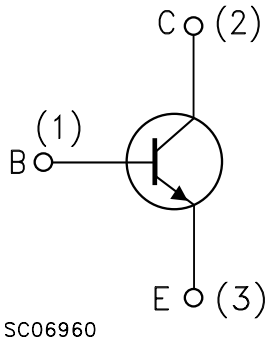


Table 1. Device summary

Order code	Marking	Package	Packing
2STD1665T4	D1665	DPAK	Tape & reel
2STD1665-1	D1665	IPAK	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum rating

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_c = 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
$R_{thj\text{-}amb}$	Thermal resistance junction-case	max	8.33	°C/W

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	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_{B1} = -I_{B2} = 0.3 A		 90 800 90		 ns ns ns

1. Pulsed duration = 300 µs, duty cycle ≤1.5%.

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

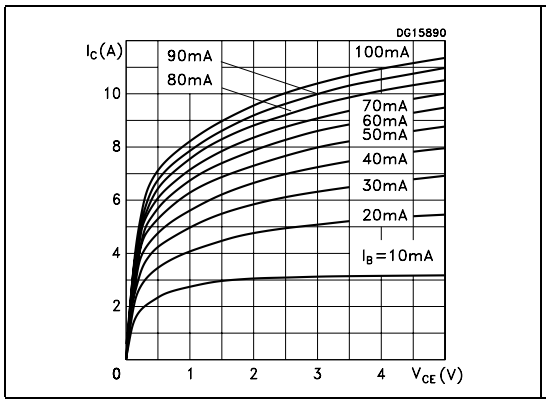


Figure 3. DC current gain

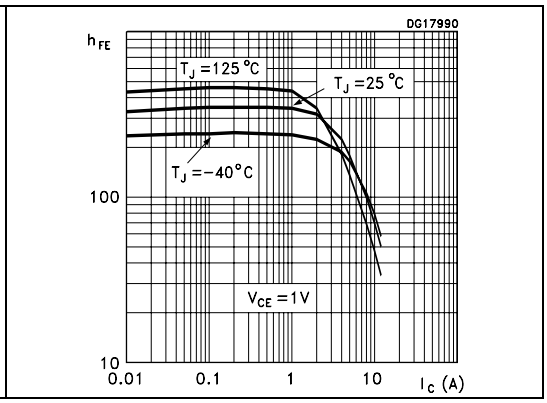


Figure 4. Collector-emitter saturation voltage

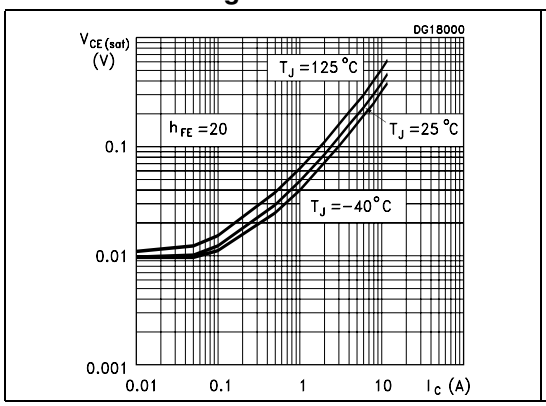


Figure 5. Collector-emitter saturation voltage

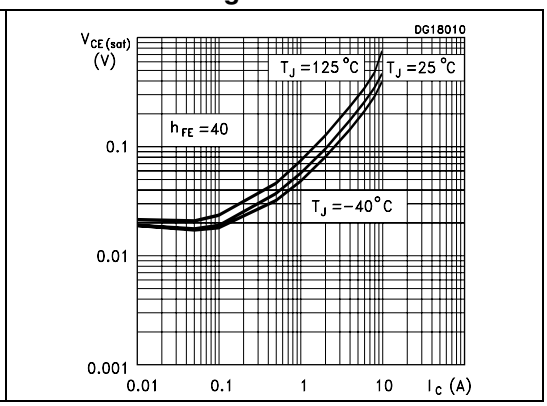


Figure 6. Base-emitter saturation voltage

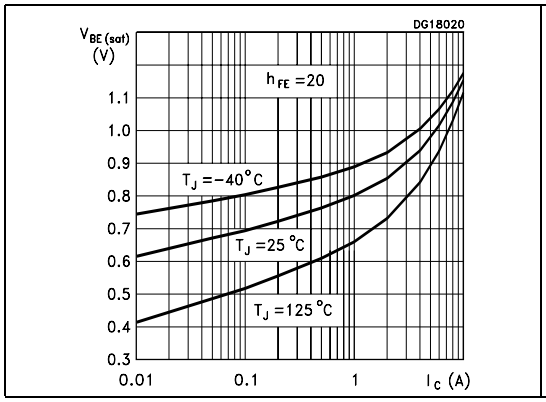


Figure 7. Base-emitter on voltage

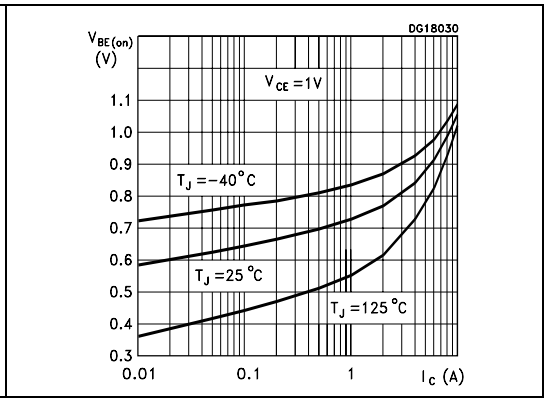


Figure 8. Switching times resistive load

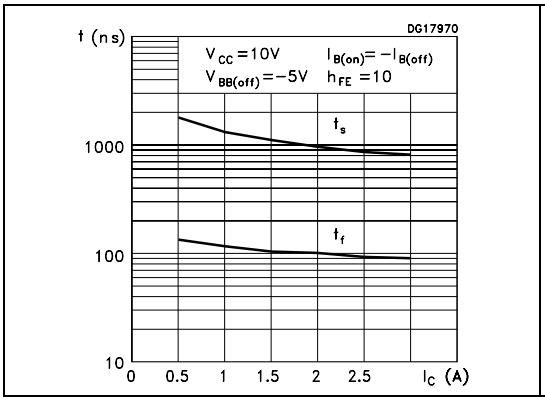


Figure 9. Switching times resistive load

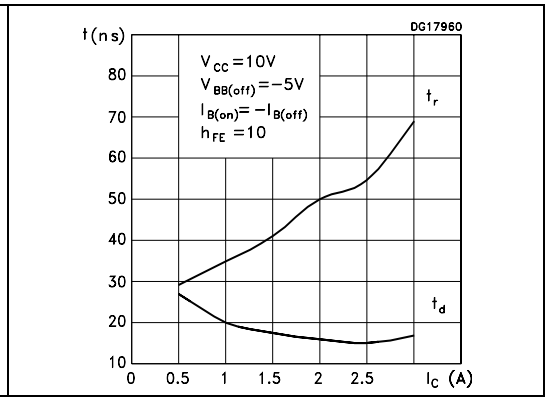
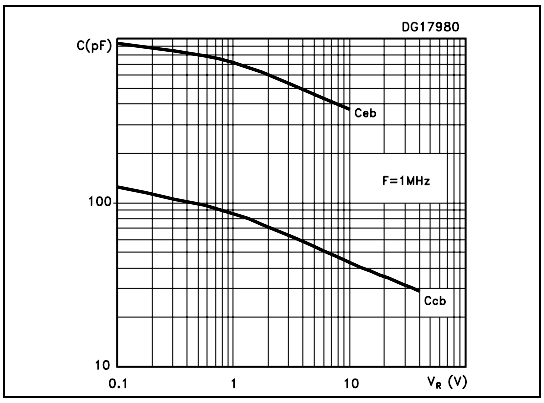
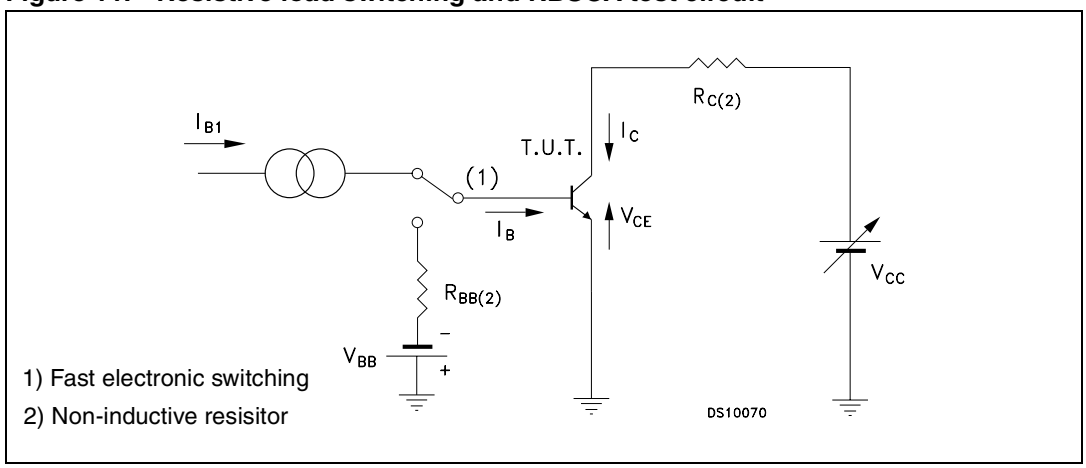


Figure 10. Capacitance



2.2 Test circuit

Figure 11. Resistive load switching and RBSOA test circuit

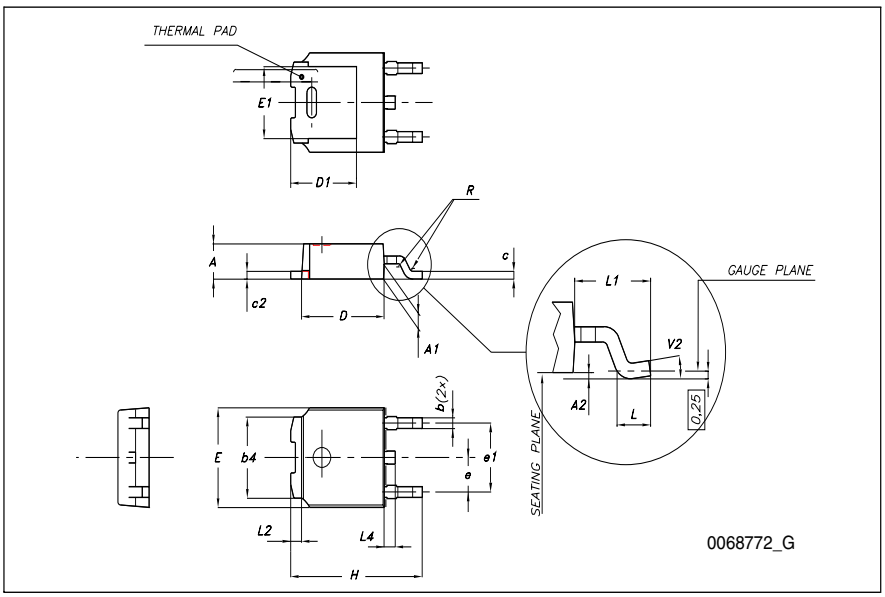


3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

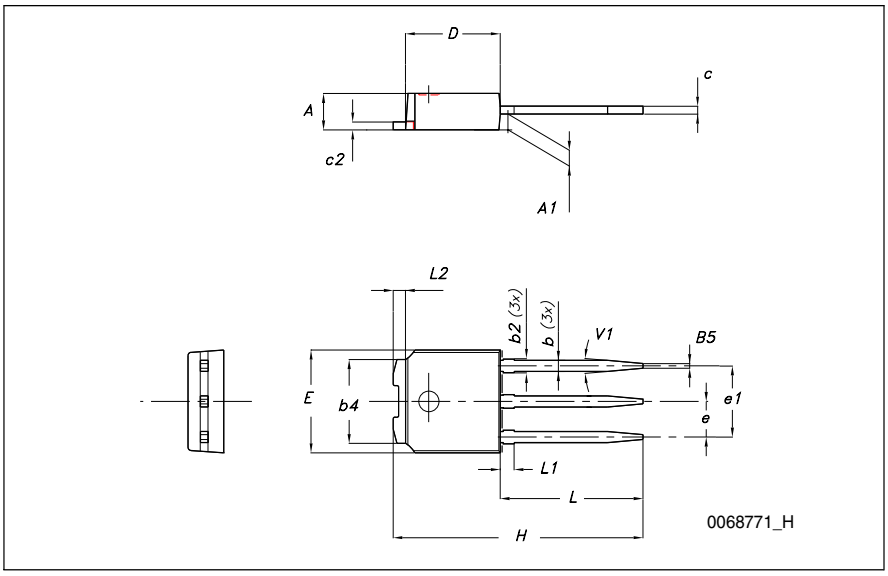
TO-252 (DPAK) mechanical data

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 °



TO-251 (IPAK) mechanical data

DIM.	mm.		
	min.	typ	max.
A	2.20		2.40
A1	0.90		1.10
b	0.64		0.90
b2			0.95
b4	5.20		5.40
B5		0.3	
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
E	6.40		6.60
e		2.28	
e1	4.40		4.60
H		16.10	
L	9.00		9.40
L1	0.80		1.20
L2		0.80	1.00
V1		10 °	



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
08-May-2006	1	Initial release
27-Mar-2008	2	New graphics

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