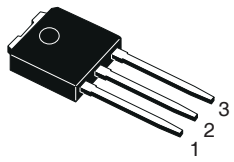
2STD1665

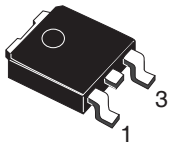
Low voltage fast-switching NPN power transistor

General 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")



IPAK
TO251
(Suffix "-1")

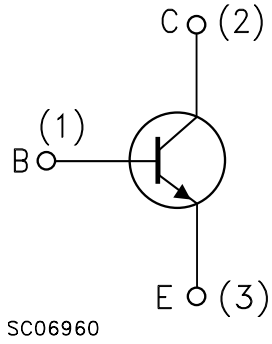


DPAK
TO252
(Suffix "T4")

Applications

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

Internal schematic diagrams



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.

Order codes

Part Number	Marking	Package	Packing
2STD1665T4	D1665	DPAK	Tape & reel
2STD1665-1	D1665	IPAK	Tube

Contents

1 Electrical ratings

Table 1. 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 2. Thermal data

Symbol	Parameter		Value	Unit
$R_{thj\text{-}amb}$	Thermal resistance junction-amb	max	8.33	°C/W

2 Electrical characteristics

(T_{case} = 25°C unless otherwise specified)

Table 3. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cut-off current (I_E = 0)	V_{CB} = 120V V_{CB} = 120V T_J = 100°C			50 1	nA µA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 7V			10	nA
$V_{(BR)CBO}$ (1)	Collector-base breakdown voltage (I_E = 0)	I_C = 100µA	150			V
$V_{(BR)CEO}$ (1)	Collector-emitter breakdown voltage (I_B = 0)	I_C = 10mA	65			V
$V_{(BR)EBO}$ (1)	Emitter-base breakdown voltage (I_C = 0)	I_E = 100µA	7			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 100mA I_B = 5mA I_C = 1A I_B = 50mA I_C = 2A I_B = 50mA I_C = 6A I_B = 150mA I_C = 6A I_B = 300mA		50 70 140 290 320	 350 380 	V V V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 4A I_B = 200mA		1	1.15	V
$V_{BE(on)}$ (1)	Base-emitter On voltage	I_C = 4A V_{CE} = 1V		0.89	1	V
h_{FE}	DC current gain	I_C = 10mA V_{CE} = 1V I_C = 2A V_{CE} = 1V I_C = 5A V_{CE} = 1V I_C = 10A V_{CE} = 1V	150 150 90 30	300 270 140 50	350	
C_{CBO}	Collector-base capacitance	V_{CB} = 10V f = 1MHz		47		pF
t_{ON} t_s t_f	Resistive load Turn-on time Storage time Fall time	I_C = 3A V_{CC} = 10V I_{B1} = -I_{B2} = 0.3A		90 800 90		ns ns ns

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

2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

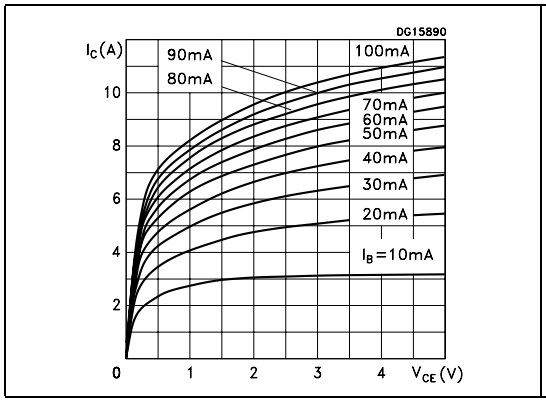


Figure 2. Derating Curve

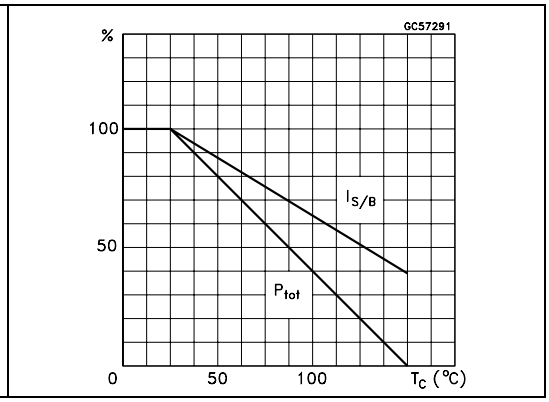


Figure 3. DC current gain

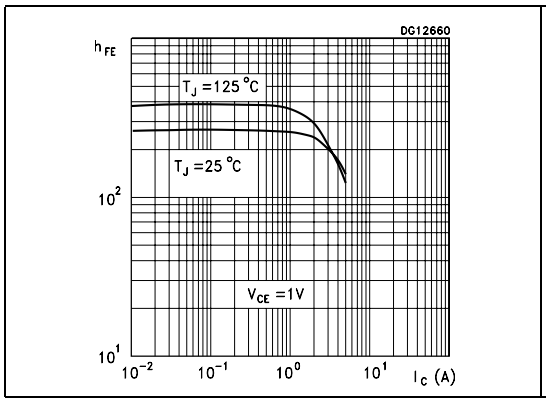


Figure 4. Collector-emitter saturation voltage

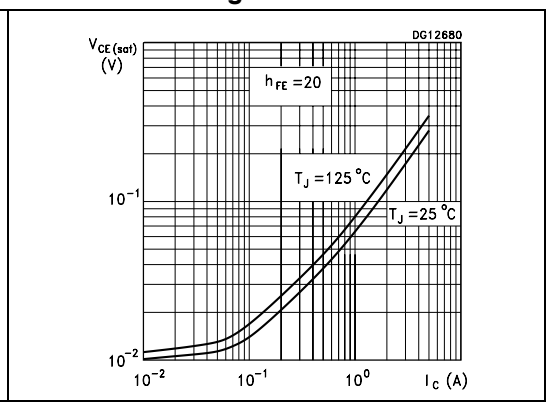


Figure 5. Collector-emitter saturation voltage

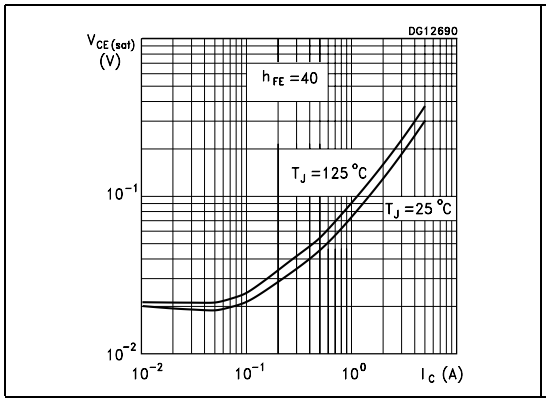


Figure 6. Base-emitter saturation voltage

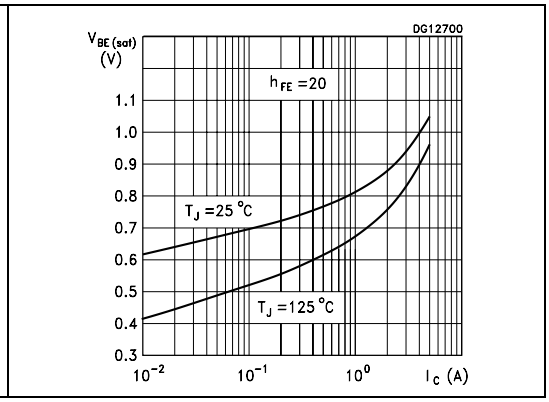


Figure 7. Base-emitter on voltage

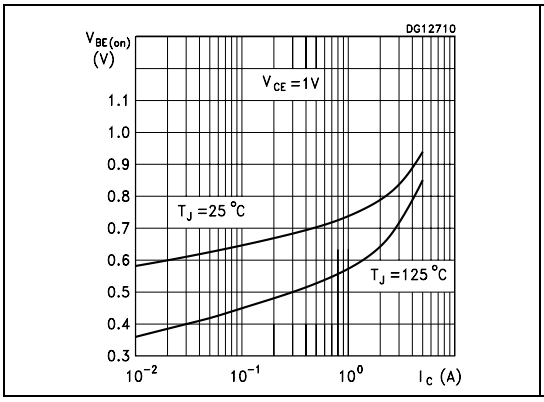


Figure 8. Switching times resistive load

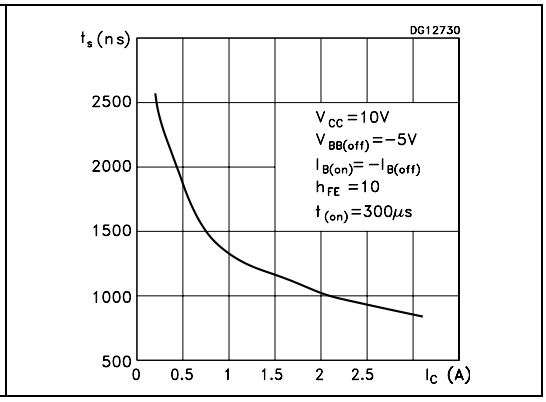


Figure 9. Switching times resistive load

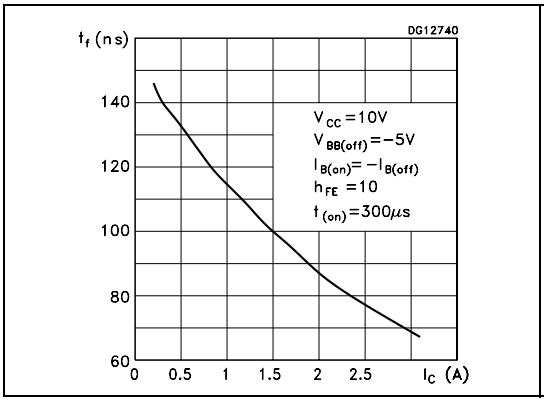


Figure 10. Switching times resistive load

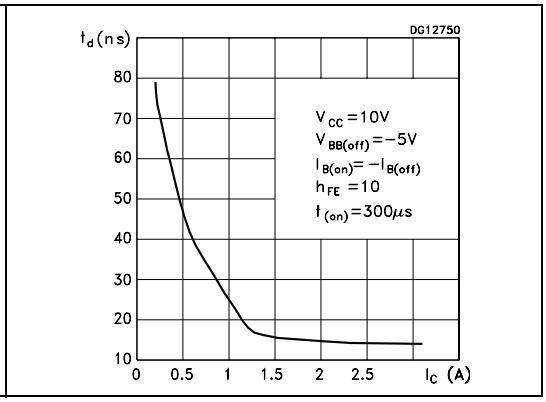


Figure 11. Switching times inductive load

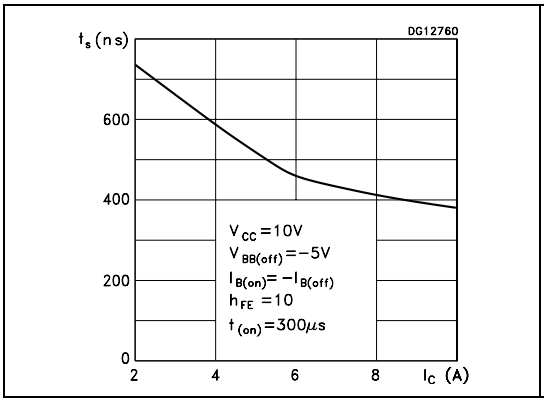
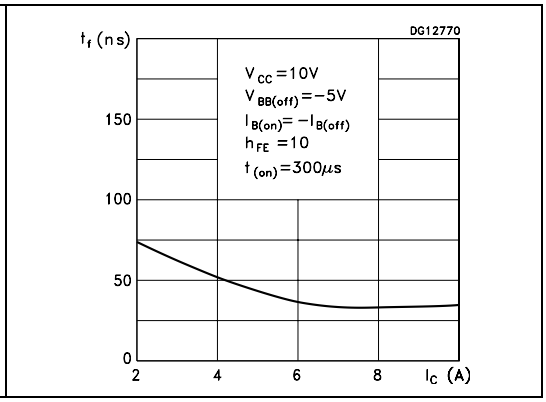
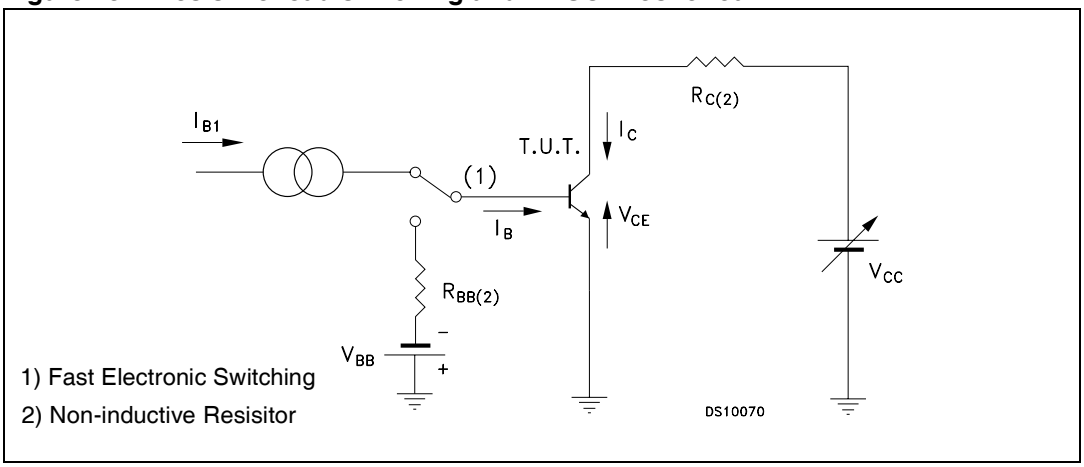


Figure 12. Switching times inductive load



2.2 Test circuits

Figure 13. Resistive load switching and RBSOA test circuit



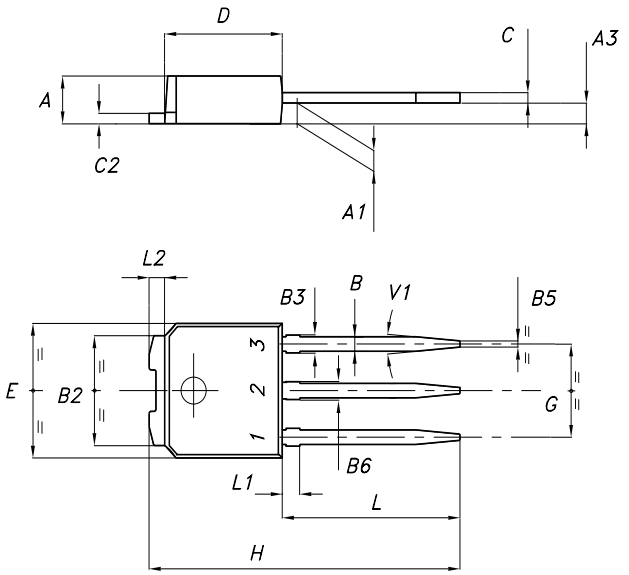
1) Fast Electronic Switching
2) Non-inductive Resisitor

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-251 (IPAK) MECHANICAL DATA

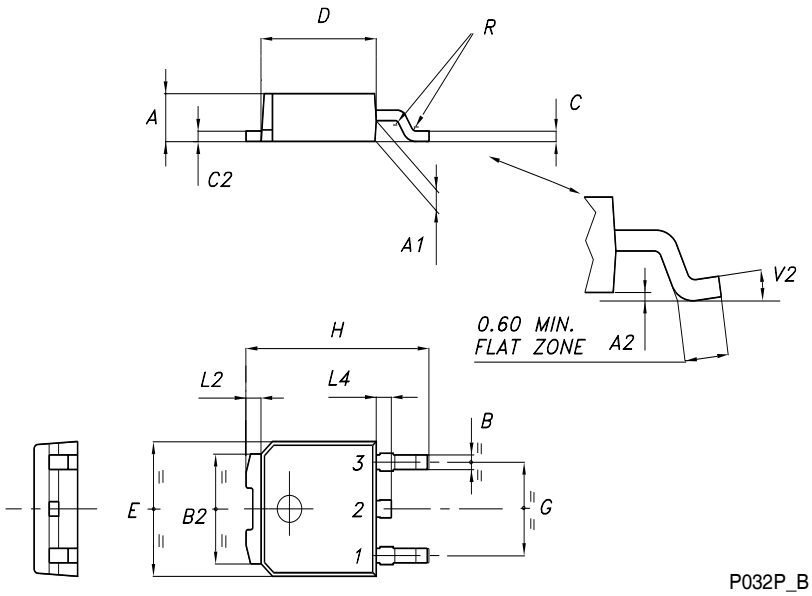
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A3	0.70		1.30	0.028		0.051
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
B3			0.85			0.033
B5		0.30			0.012	
B6			0.95			0.037
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.237		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	15.90		16.30	0.626		0.642
L	9.00		9.40	0.354		0.370
L1	0.80		1.20	0.031		0.047
L2		0.80	1.00		0.031	0.039
V1		10°			10°	



P032N_E

TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°



P032P_B

4 Revision history

Table 4. Revision history

Date	Revision	Changes
08-May-2006	1	Initial release.

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