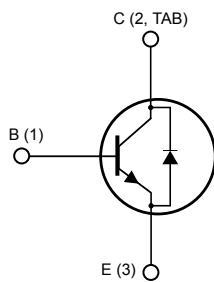
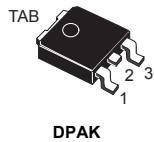


High voltage fast-switching NPN power transistor



NPNB1C2EE_D

Features

- High voltage capability
- Integrated free-wheeling diode
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- Fully characterized at 125 °C
- Large RBSOA

Applications

- Electronic ballast for fluorescent lighting
- Switch mode power supplies

Description

This device is a high voltage fast-switching NPN power transistor, manufactured using high voltage multi-epitaxial planar technology for high switching speeds. It employs a cellular emitter structure with planar edge termination to enhance switching speeds, while maintaining a wide RBSOA.



Product status link

[STB13007DT4](#)

Product summary

Order code	STB13007DT4
Marking	B13007D
Package	D ² PAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum rating

Symbol	Parameter	Value	Unit
V_{EBO}	Emitter-base voltage ($I_C = 0$ A)	9	V
V_{CEV}	Collector-emitter voltage ($V_{BE} = -1.5$ V)	700	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$ A)	400	V
I_C	Collector current	8	A
I_{CM}	Collector peak current ($t_P < 5$ ms)	16	A
I_B	Base current	4	A
I_{BM}	Base peak current ($t_P < 5$ ms)	8	A
P_{TOT}	Total power dissipation at $T_C = 25$ °C	80	W
T_{stg}	Storage temperature range	-65 to 150	°C
T_J	Maximum operating junction temperature	150	°C

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	1.56	°C/W
R_{thJA}	Thermal resistance, junction-to-ambient	62.5	°C/W

2 Electrical characteristics

$T_C = 25\text{ °C}$ unless otherwise specified.

Table 3. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current	$V_{CE} = 700\text{ V}, V_{BE} = 0\text{ V}$	-	-	0.01	mA
		$V_{CE} = 700\text{ V}, V_{BE} = 0\text{ V}, T_J = 100\text{ °C}^{(1)}$	-	-	0.5	
I_{CEO}	Collector cut-off current	$V_{CE} = 400\text{ V}, I_B = 0\text{ A}$	-	-	100	μA
I_{EBO}	Emitter cut-off current	$V_{EB} = 9\text{ V}, I_C = 0\text{ A}$	-	-	100	μA
$V_{CEO(sus)}^{(2)}$	Collector-emitter sustaining voltage	$I_C = 10\text{ mA}, I_B = 0\text{ A}$	400	-	-	V
$V_{CE(sat)}^{(2)}$	Collector-emitter saturation voltage	$I_C = 2\text{ A}, I_B = 0.4\text{ A}$	-	-	0.8	V
		$I_C = 5\text{ A}, I_B = 1\text{ A}$	-	-	1.5	
		$I_C = 5\text{ A}, I_B = 1\text{ A}, T_J = 100\text{ °C}^{(1)}$	-	-	3	
		$I_C = 8\text{ A}, I_B = 2\text{ A}$	-	-	2	
$V_{BE(sat)}^{(2)}$	Base-emitter saturation voltage	$I_C = 2\text{ A}, I_B = 0.4\text{ A}$	-	-	1.2	V
		$I_C = 5\text{ A}, I_B = 1\text{ A}$	-	-	1.6	
		$I_C = 5\text{ A}, I_B = 1\text{ A}, T_J = 100\text{ °C}^{(1)}$	-	-	1.5	
h_{FE}	DC current gain	$I_C = 2\text{ A}, V_{CE} = 5\text{ V}$	18	-	40	
		$I_C = 5\text{ A}, V_{CE} = 5\text{ V}$	8	-	25	
V_f	Diode forward voltage	$I_C = 3\text{ A}$	-	-	2.5	V
	Inductive load	$V_{Clamp} = 250\text{ V}, I_C = 5\text{ A},$	-	-	-	
t_s	Storage time	$V_{BE(off)} = -5\text{ V}, I_{B1} = 1\text{ A},$	-	1.7	2.3	μs
t_f	Fall time	$R_{BB} = 0\text{ }\Omega, L = 200\text{ }\mu\text{H}$ (see the Figure 10. Inductive load switching test circuit)	-	90	150	ns
	Inductive load	$V_{Clamp} = 250\text{ V}, I_C = 5\text{ A},$	-	-	-	
t_s	Storage time	$V_{BE(off)} = -5\text{ V}, I_{B1} = 1\text{ A},$	-	2.2	-	μs
t_f	Fall time	$R_{BB} = 0\text{ }\Omega, L = 200\text{ }\mu\text{H}, T_J = 125\text{ °C}$ (see the Figure 10. Inductive load switching test circuit)	-	150	-	ns

1. Specified by design, not tested in production.

2. Pulsed: Pulse duration = 300 μs , duty cycle $\leq 1.5\%$.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

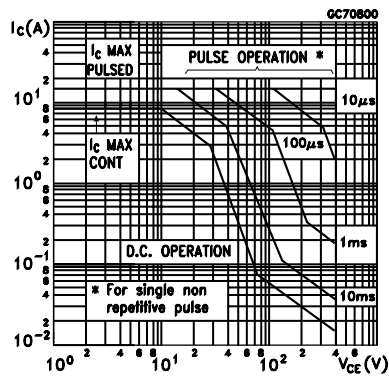


Figure 2. Derating curve

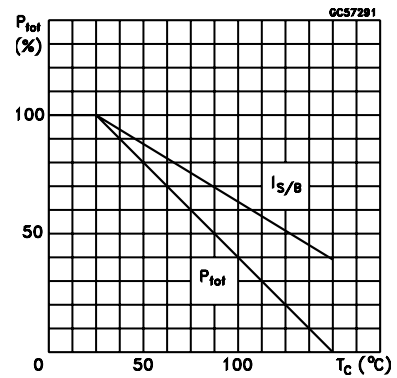


Figure 3. Diode forward voltage

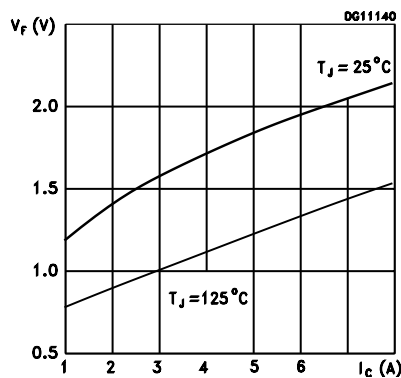


Figure 4. Reverse biased safe operating area

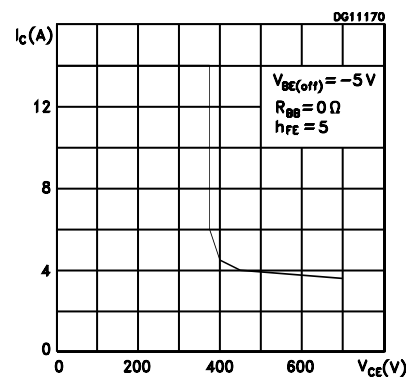


Figure 5. DC current gain ($V_{CE} = 1.5 \text{ V}$)

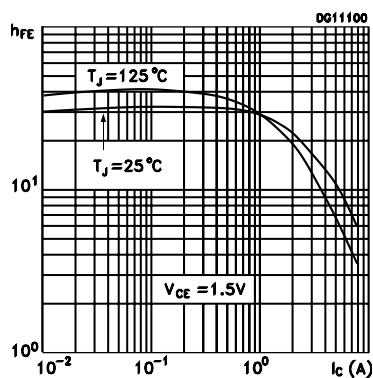


Figure 6. DC current gain ($V_{CE} = 5 \text{ V}$)

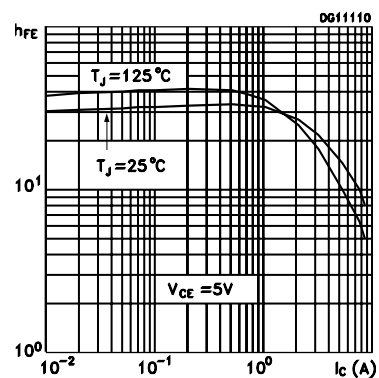
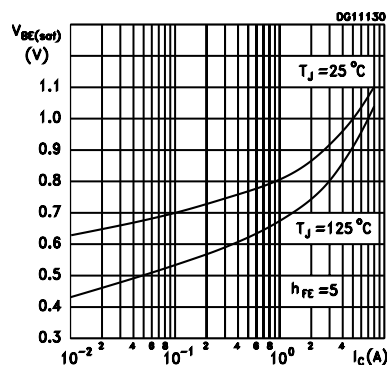
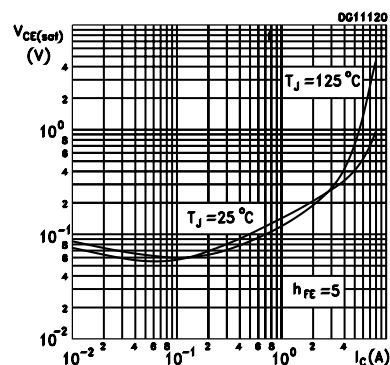
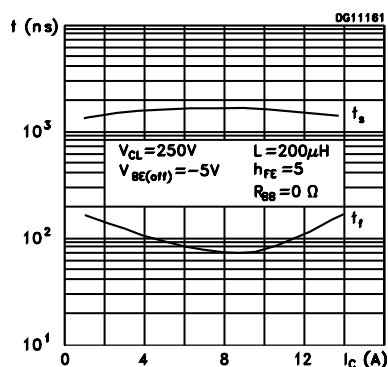
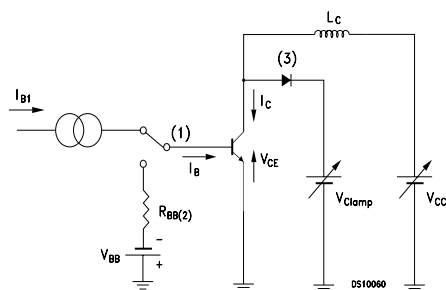


Figure 7. Base-emitter saturation voltage

Figure 8. Collector-emitter saturation voltage

Figure 9. Inductive load switching times


3 Test circuits

Figure 10. Inductive load switching test circuit



Note:

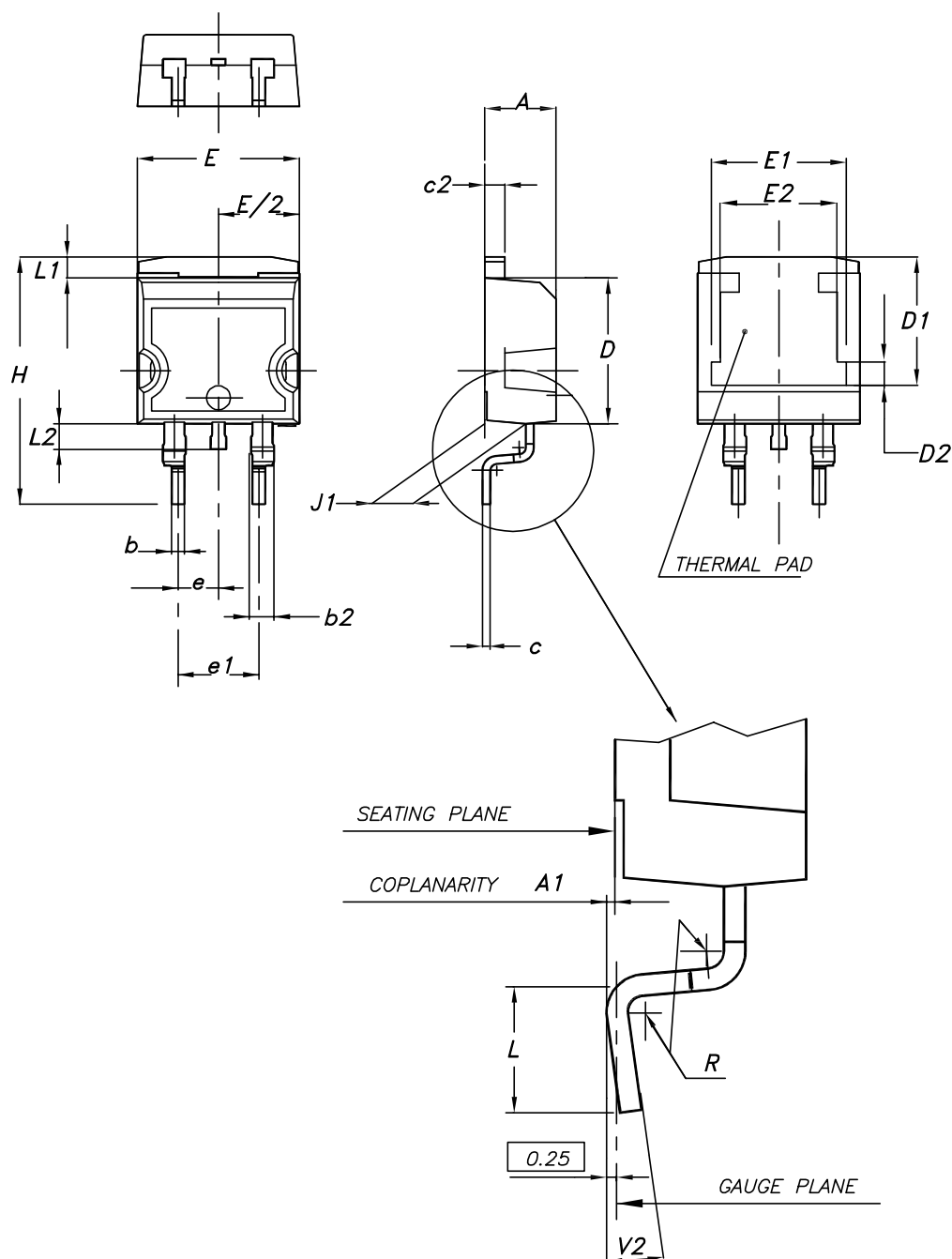
- (1) Fast electronic switch
- (2) Non-inductive resistor
- (3) Fast recovery rectifier

4 Package information

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.

4.1 D²PAK (TO-263) type A package information

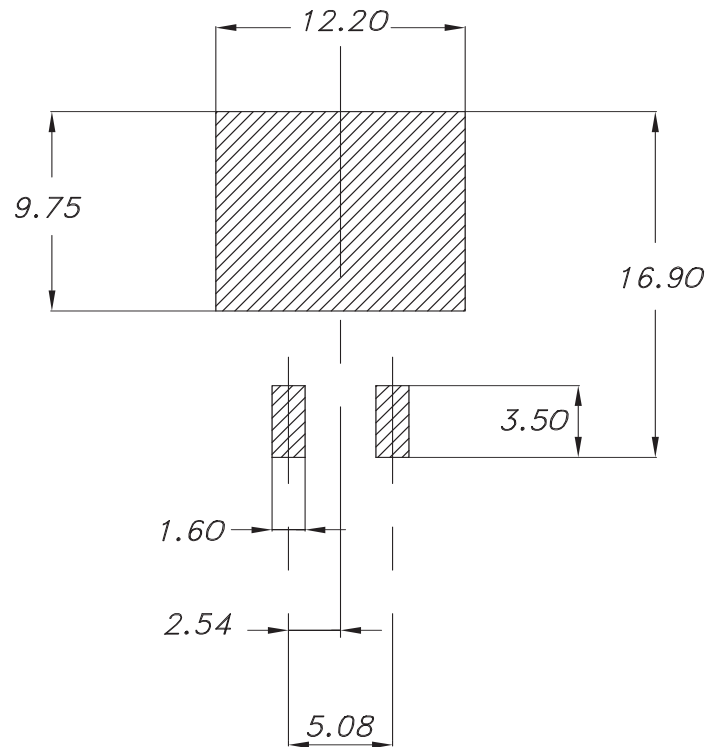
Figure 11. D²PAK (TO-263) type A package outline



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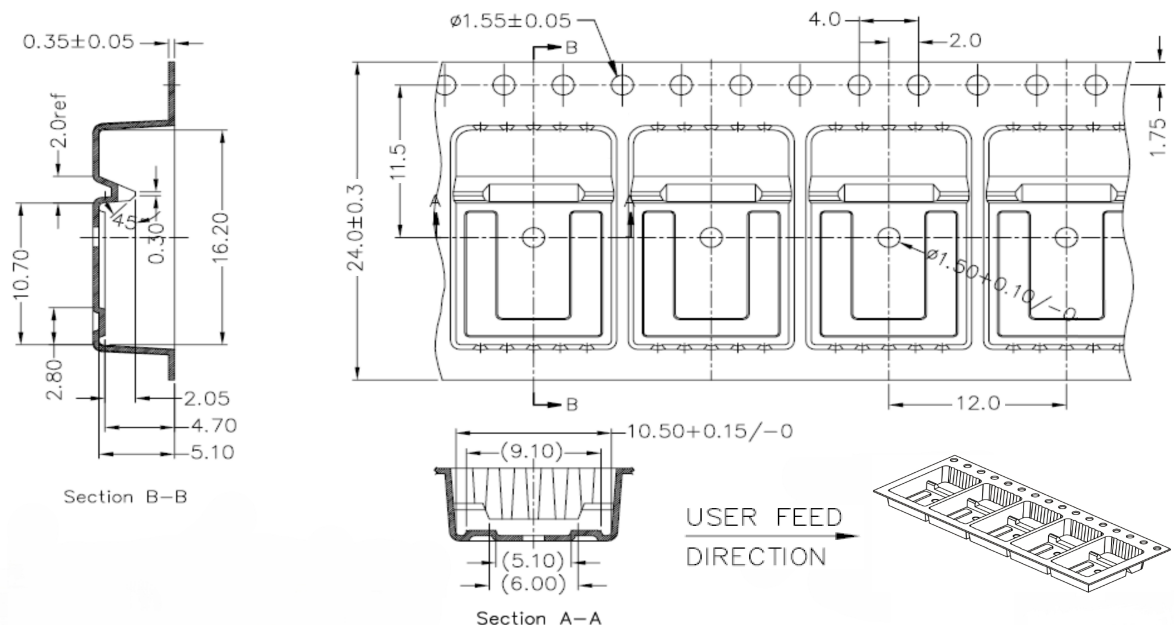
Table 4. D²PAK (TO-263) type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

Figure 12. D²PAK (TO-263) recommended footprint (dimensions are in mm)


0079457_Rev27_footprint

4.2 D²PAK packing information

Figure 13. D²PAK tape drawing (dimensions are in mm)


0079900_14

Revision history

Table 5. Document revision history

Date	Revision	Changes
19-Jun-2006	1	Initial release.
27-Apr-2007	2	The package's mechanical data has been update on page 7.
11-Jun-2025	3	Updated Section 4: Package information . Minor text changes.

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