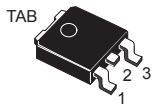
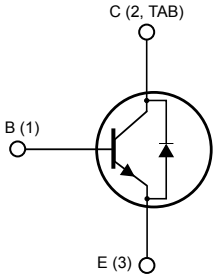
STB13007DT4

Datasheet

High voltage fast-switching NPN power transistor



DPAK



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	D²PAK
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 °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 V, V_{BE} = 0 V	-	-	0.01	mA
		V_{CE} = 700 V, V_{BE} = 0 V, T_J = 100 °C(1)	-	-	0.5	
I_{CEO}	Collector cut-off current	V_{CE} = 400 V, I_B = 0 A	-	-	100	µA
I_{EBO}	Emitter cut-off current	V_{EB} = 9 V, I_C = 0 A	-	-	100	µA
$V_{CEO(sus)}$(2)	Collector-emitter sustaining voltage	I_C = 10 mA, I_B = 0 A	400	-	-	V
$V_{CE(sat)}$(2)	Collector-emitter saturation voltage	I_C = 2 A, I_B = 0.4 A	-	-	0.8	V
		I_C = 5 A, I_B = 1 A	-	-	1.5	
		I_C = 5 A, I_B = 1 A, T_J = 100 °C(1)	-	-	3	
		I_C = 8 A, I_B = 2 A	-	-	2	
$V_{BE(sat)}$(2)	Base-emitter saturation voltage	I_C = 2 A, I_B = 0.4 A	-	-	1.2	V
		I_C = 5 A, I_B = 1 A	-	-	1.6	
		I_C = 5 A, I_B = 1 A, T_J = 100 °C(1)	-	-	1.5	
h_{FE}	DC current gain	I_C = 2 A, V_{CE} = 5 V	18	-	40	
		I_C = 5 A, V_{CE} = 5 V	8	-	25	
V_f	Diode forward voltage	I_C = 3 A	-	-	2.5	V
	Inductive load	V_{Clamp} = 250 V, I_C = 5 A,	-	-	-	
t_s	Storage time	$V_{BE(off)}$ = -5 V, I_{B1} = 1 A,	-	1.7	2.3	µs
t_f	Fall time	R_{BB}= 0 Ω, L = 200 µH (see the Figure 10. Inductive load switching test circuit)	-	90	150	ns
	Inductive load	V_{Clamp} = 250 V, I_C = 5 A,	-	-	-	
t_s	Storage time	$V_{BE(off)}$ = -5 V, I_{B1} = 1 A,	-	2.2	-	µs
t_f	Fall time	R_{BB}= 0 Ω, L = 200 µH, T_J = 125 °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 ≤ 1.5%.*

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

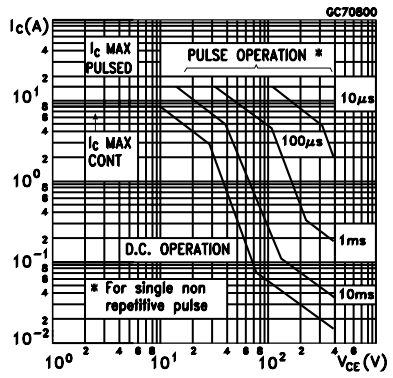


Figure 2. Derating curve

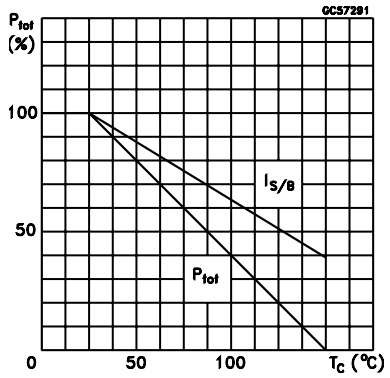


Figure 3. Diode forward voltage

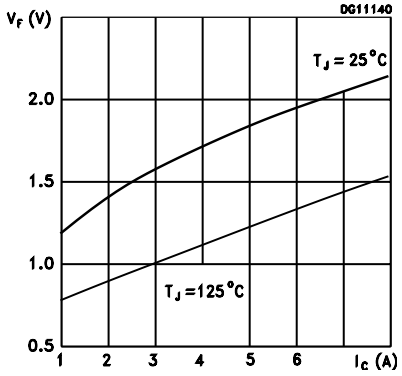


Figure 4. Reverse biased safe operating area

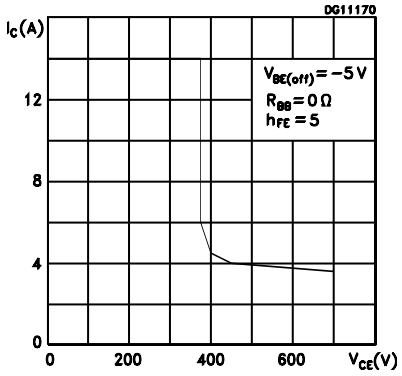


Figure 5. DC current gain (V_{CE} = 1.5 V)

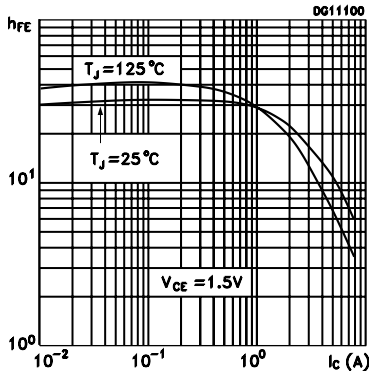


Figure 6. DC current gain (V_{CE} = 5 V)

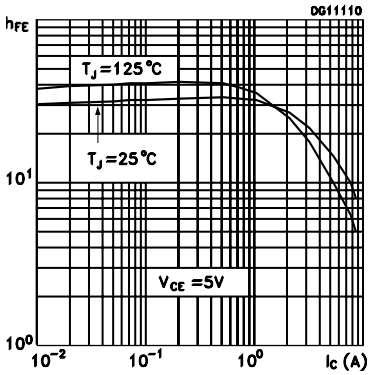


Figure 7. Base-emitter saturation voltage

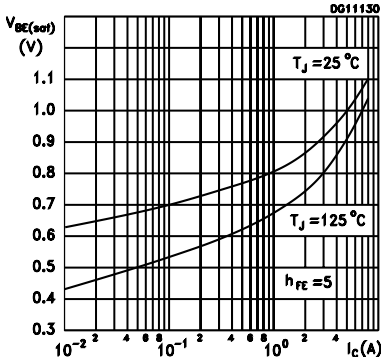


Figure 8. Collector-emitter saturation voltage

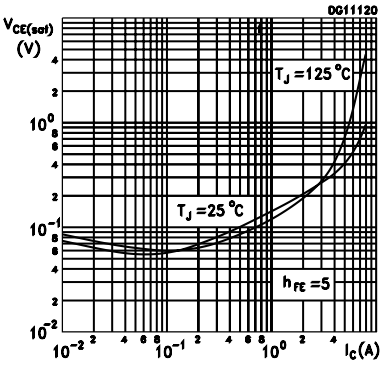
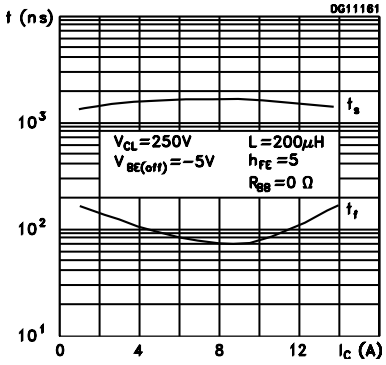
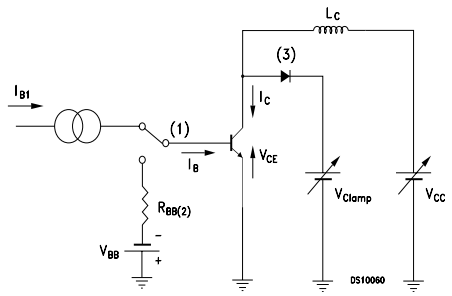


Figure 9. Inductive load switching times



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**

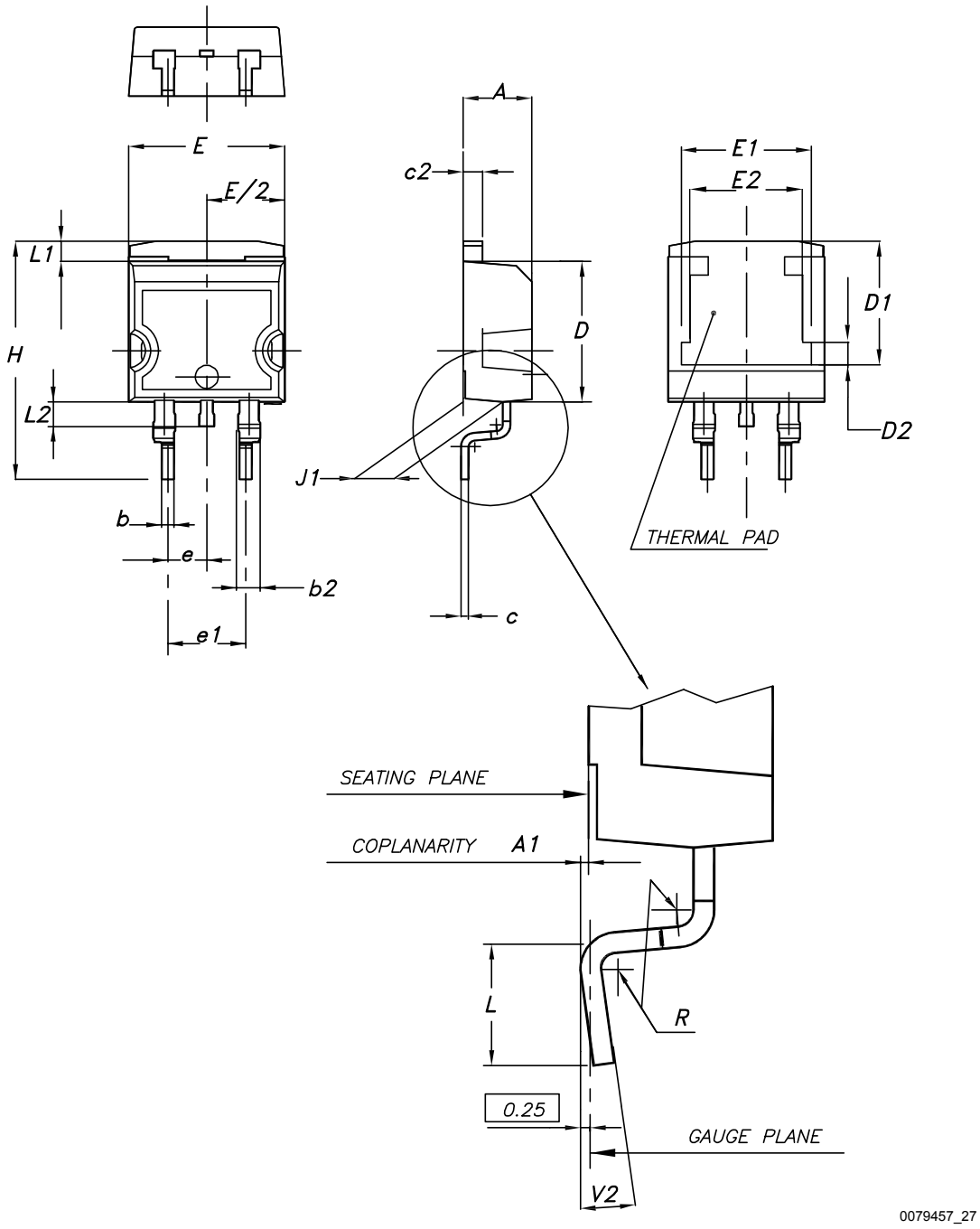
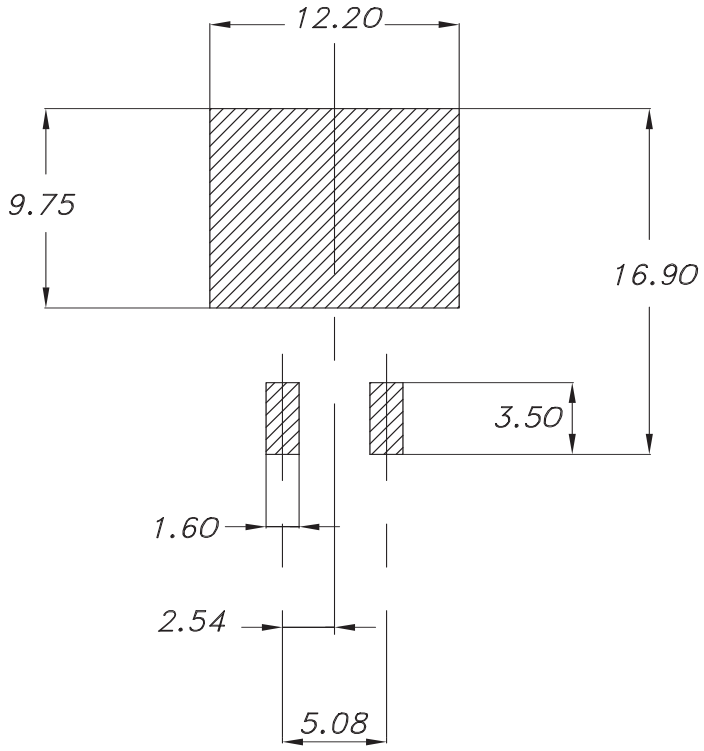


Table 4. D²PAK (TO-263) type A package mechanical data

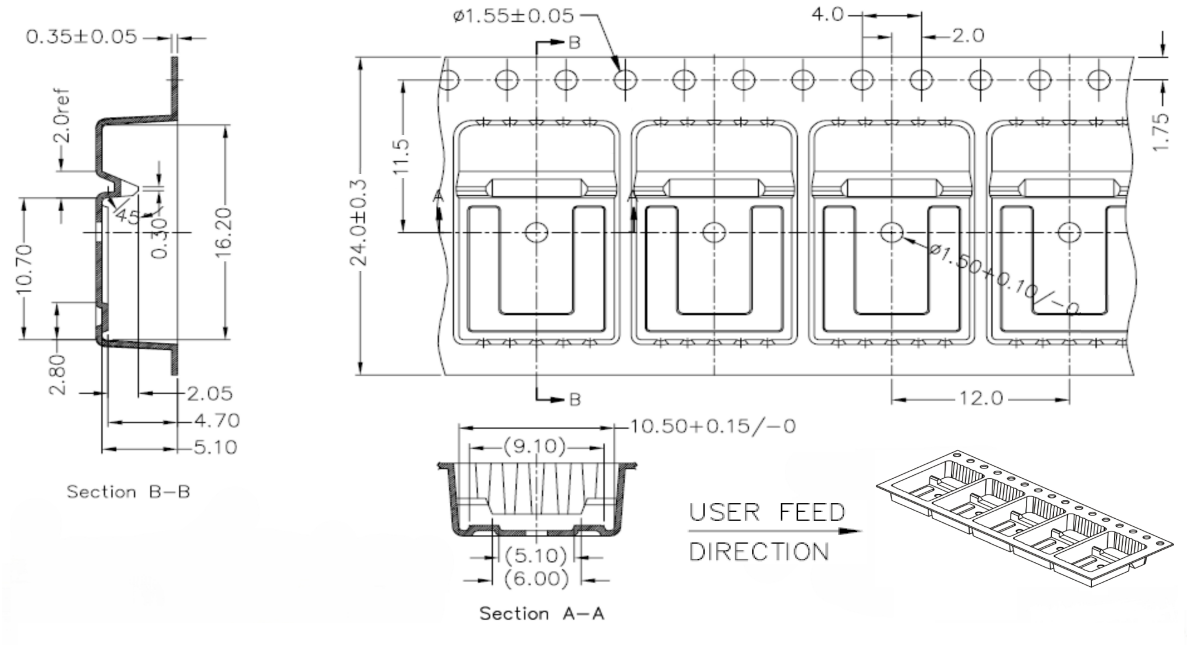
Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R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

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



4.2 D²PAK packing information

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



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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