

## Low voltage NPN power transistor

Datasheet — production data

### Features

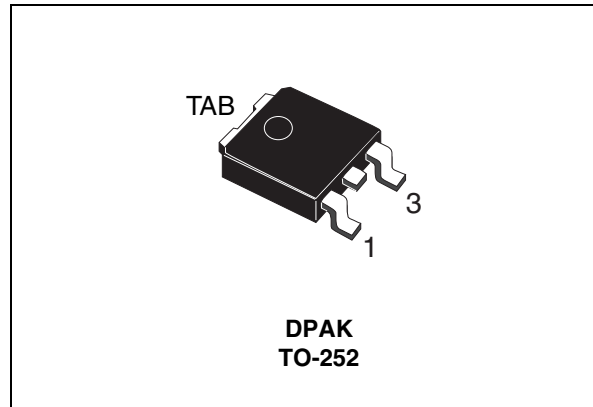
- Surface-mounting TO-252 power package in tape and reel
- Complementary to the PNP type MJD32C

### Application

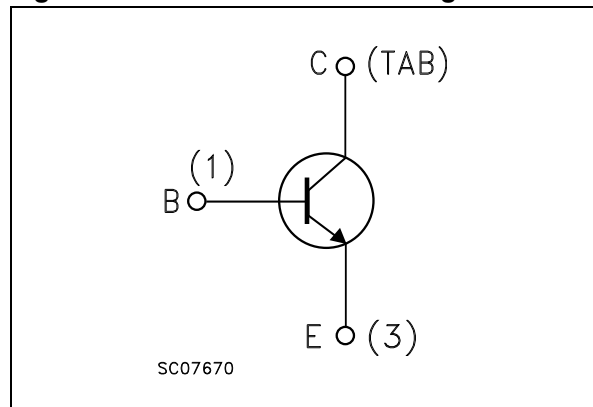
- General purpose linear and switching equipment

### Description

The device is manufactured in planar technology with “base island” layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
MJD31CT4	MJD31C	DPAK	Tape and reel

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	100	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	100	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	5	V
$I_C$	Collector current	3	A
$I_{CM}$	Collector peak current	5	A
$I_B$	Base current	1	A
$P_{TOT}$	Total dissipation at $T_c = 25\text{ °C}$	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
$R_{thJC}$	Thermal resistance junction-case max	8.3	°C/W
$R_{thJPCB}^{(1)}$	Thermal resistance junction-pcb max	50	°C/W

1. When mounted on FR-4 board of 1 inch<sup>2</sup>, 2 oz Cu.

## 2 Electrical characteristics

$T_{\text{case}} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

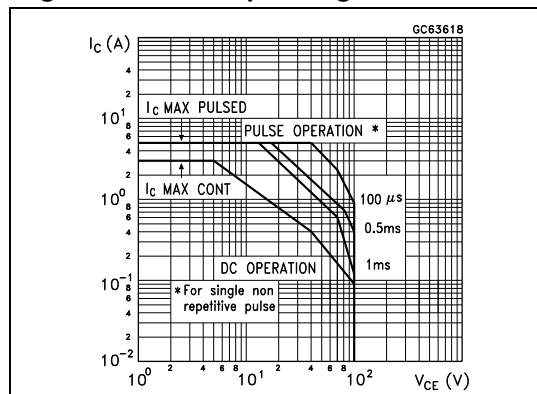
**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 100\text{ V}$		-	20	$\mu\text{A}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CB}} = 60\text{ V}$		-	50	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 5\text{ V}$		-	0.1	$\text{mA}$
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 30\text{ mA}$	100	-		$\text{V}$
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 3\text{ A}$ $I_{\text{B}} = 375\text{ mA}$		-	1.2	$\text{V}$
$V_{\text{BE(on)}}^{(1)}$	Base-emitter on voltage	$I_{\text{C}} = 3\text{ A}$ $V_{\text{CE}} = 4\text{ V}$		-	1.8	$\text{V}$
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 4\text{ V}$ $I_{\text{C}} = 3\text{ A}$ $V_{\text{CE}} = 4\text{ V}$	25 10	-	50	

1. Pulse test: pulse duration  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

### 2.1 Electrical characteristic (curves)

**Figure 2. Safe operating area**



**Figure 3. Derating curve**

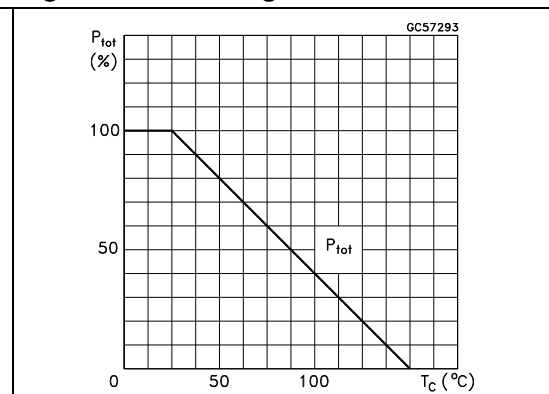


Figure 4. DC current gain ( $V_{CE} = 2\text{ V}$ )

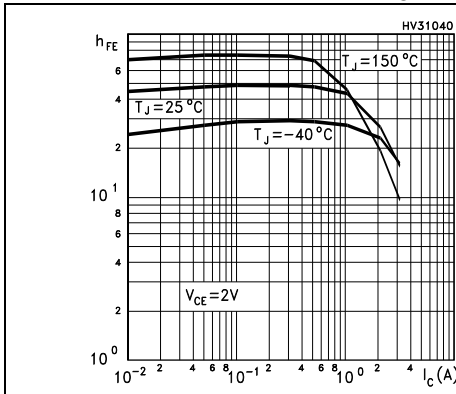


Figure 5. DC current gain ( $V_{CE} = 4\text{ V}$ )

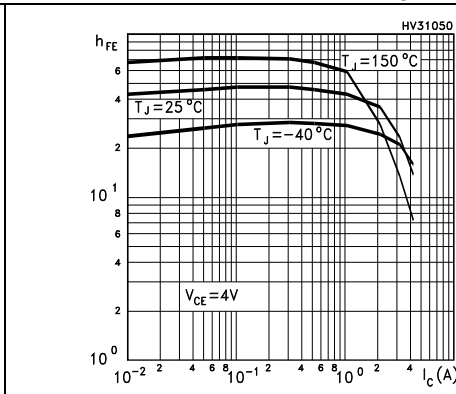


Figure 6. Collector-emitter saturation voltage

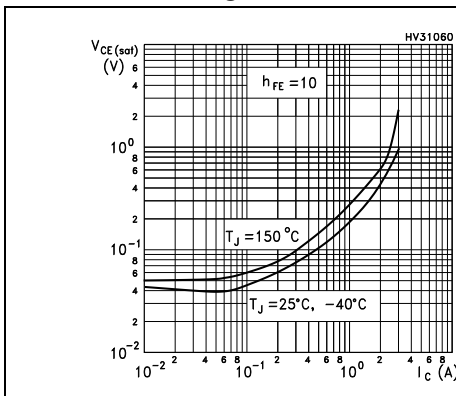


Figure 7. Base-emitter saturation voltage

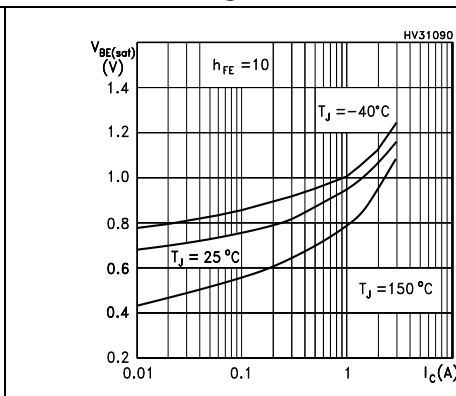


Figure 8. Base-emitter on voltage

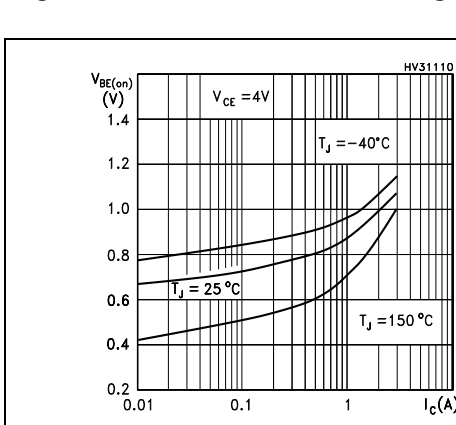
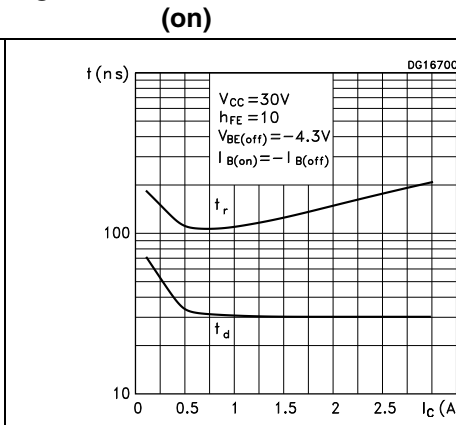
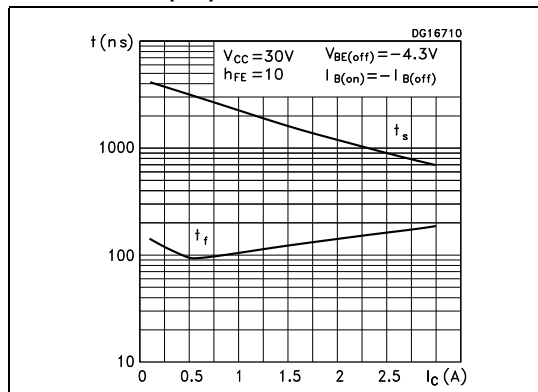


Figure 9. Resistive load switching time (on)

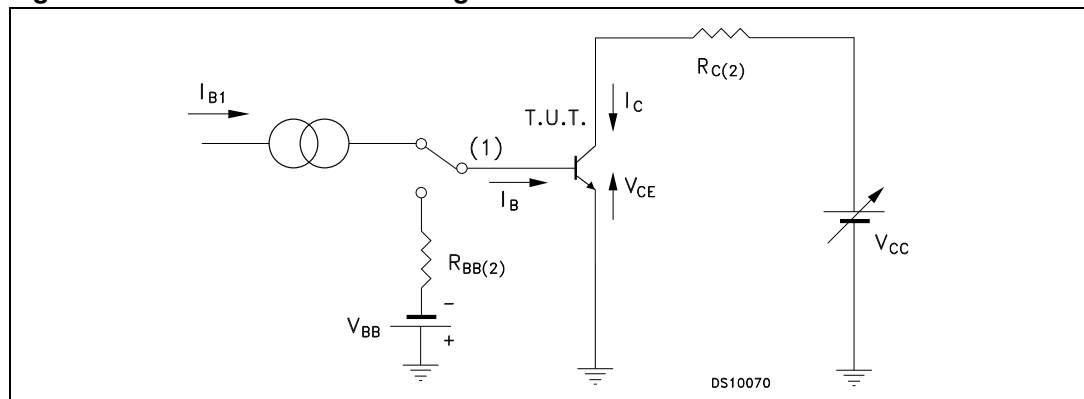


**Figure 10. Resistive load switching time (off)**

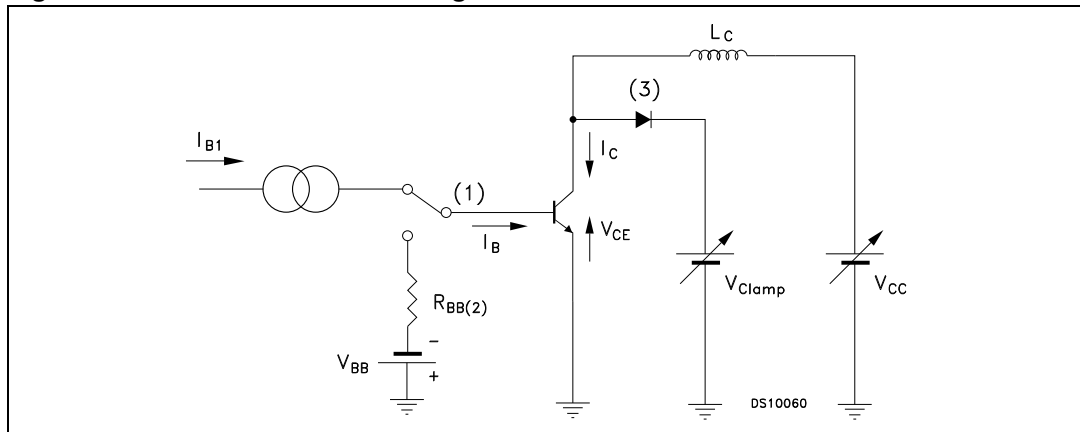


## 2.2 Test circuits

**Figure 11. Resistive load switching test circuit**



1. Fast electronic switch
2. Non-inductive resistor

**Figure 12. Inductive load switching test circuit**

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

### 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> 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		1.50
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°



Figure 13. DPAK (TO-252) drawing

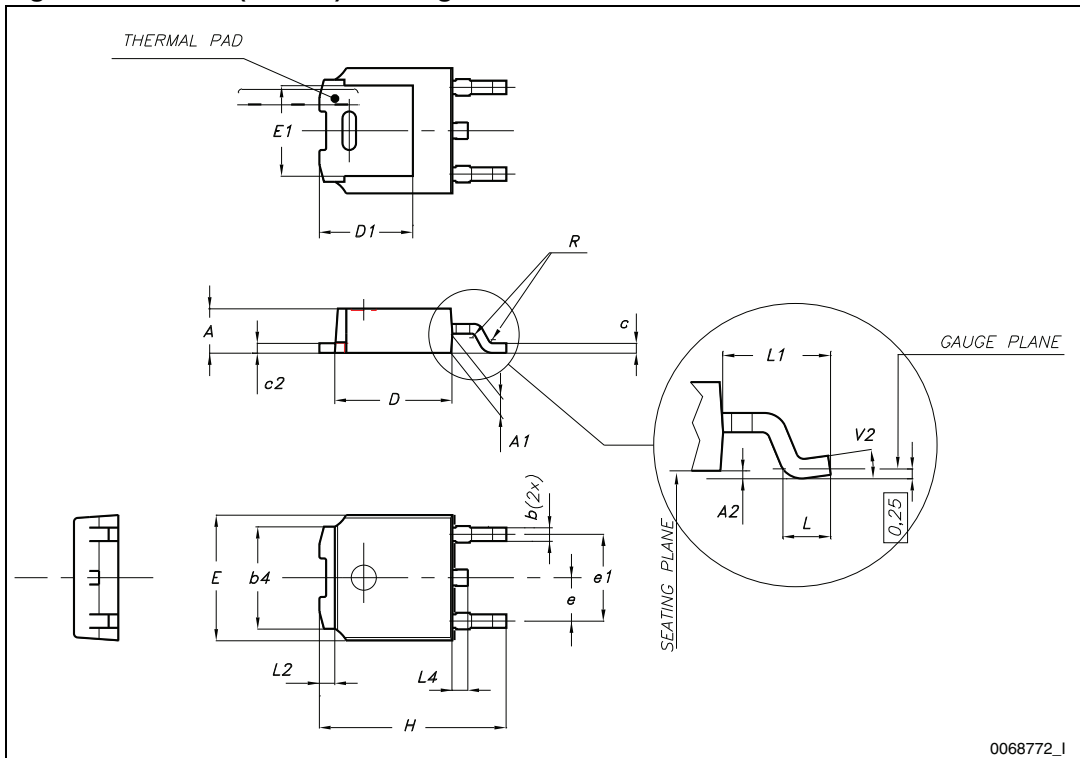
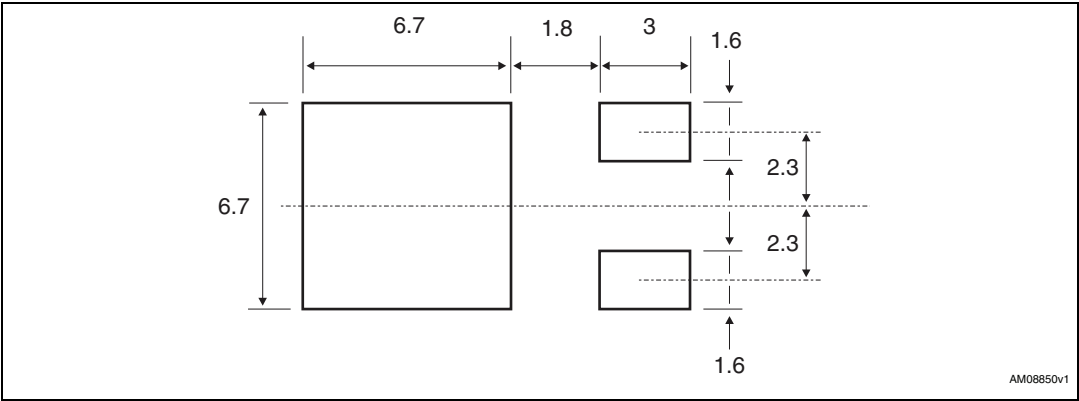


Table 6. DPAK (TO-252) tape and reel mechanical data

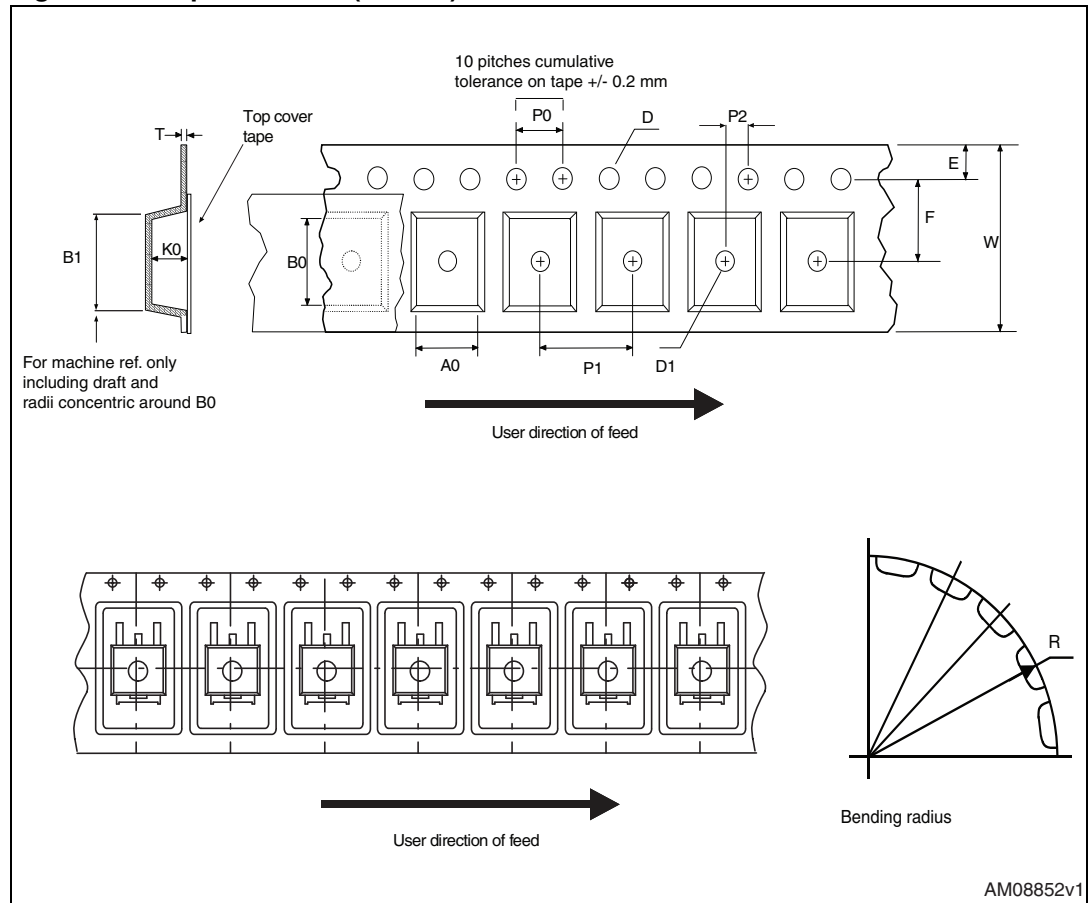
Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Figure 14. DPAK footprint<sup>(a)</sup>

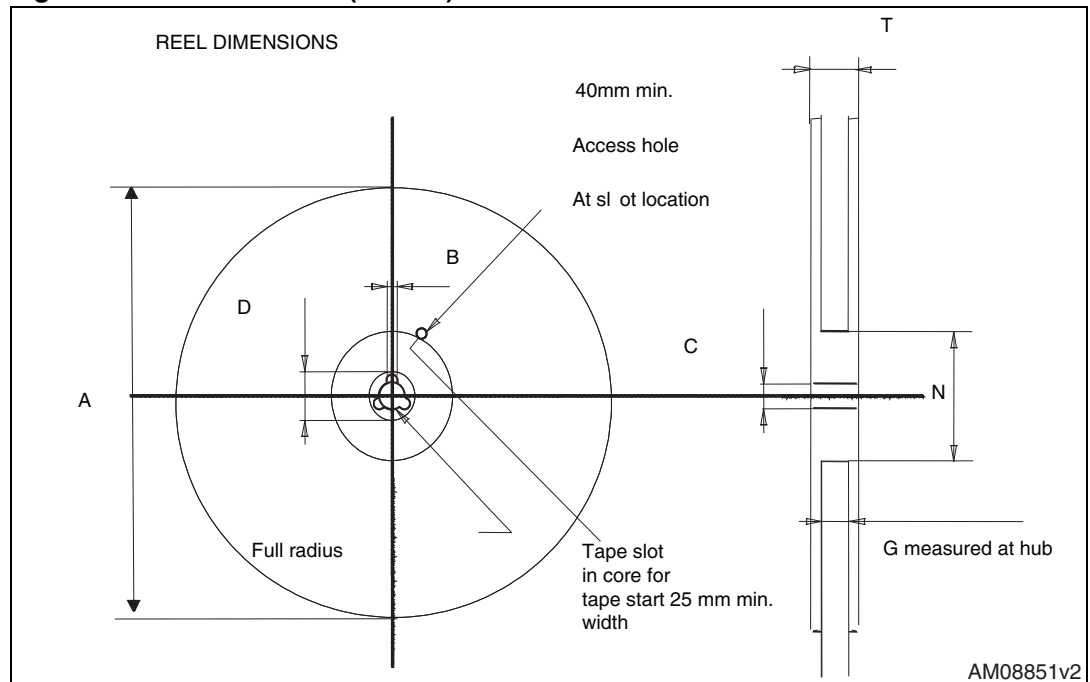


a. All dimensions are in millimeters

**Figure 15. Tape for DPAK (TO-252)**



**Figure 16. Reel for DPAK (TO-252)**



## 4 Revision history

**Table 7. Document revision history**

Date	Revision	Changes
01-Dec-2000	1	Initial release.
20-Apr-2007	2	Added new graphics.
09-Nov-2009	3	Updated package mechanical data.
14-Jan-2010	4	Modified <a href="#">Table 3 on page 2</a> .
19-Jun-2012	5	Updated: mechanical data

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