

### Features

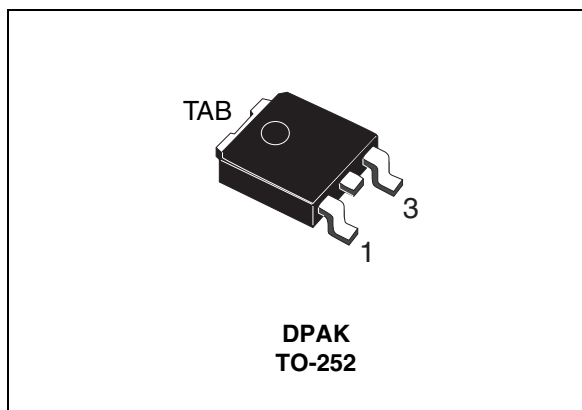
- This device is qualified for automotive application
- Surface-mounting TO-252 power package in tape and reel
- Complementary to the PNP type MJD32C

### Application

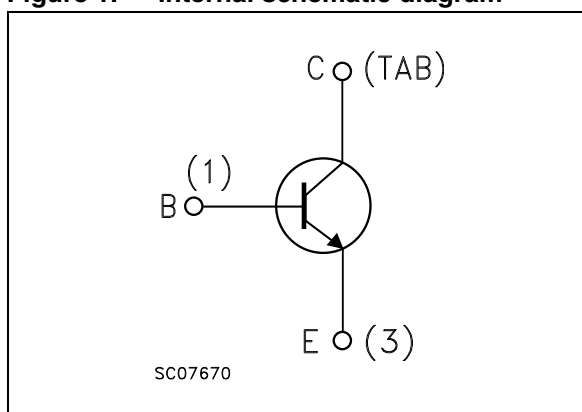
- General purpose linear and switching equipment

### 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-A | 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.

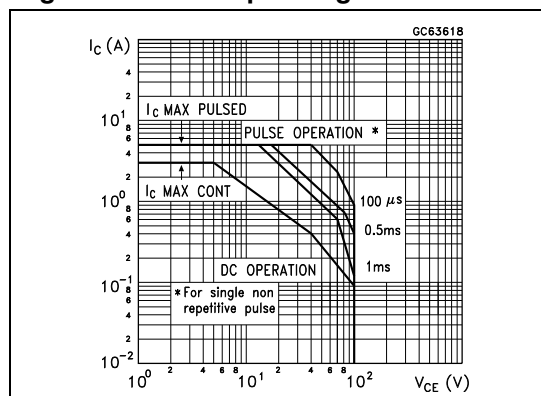
**Table 4. Electrical characteristics**

| Symbol                      | Parameter                                                         | Test conditions                                                                                                      | Min.     | Typ. | Max. | Unit          |
|-----------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------|------|------|---------------|
| $I_{\text{CES}}$            | Collector cut-off current<br>( $V_{\text{BE}} = 0$ )              | $V_{\text{CE}} = 100\text{ V}$                                                                                       |          | -    | 20   | $\mu\text{A}$ |
| $I_{\text{CEO}}$            | Collector cut-off current<br>( $I_{\text{B}} = 0$ )               | $V_{\text{CB}} = 60\text{ V}$                                                                                        |          | -    | 50   | $\mu\text{A}$ |
| $I_{\text{EBO}}$            | Emitter cut-off current<br>( $I_{\text{C}} = 0$ )                 | $V_{\text{EB}} = 5\text{ V}$                                                                                         |          | -    | 0.1  | $\text{mA}$   |
| $V_{\text{CEO(sus)}}^{(1)}$ | Collector-emitter<br>sustaining voltage<br>( $I_{\text{B}} = 0$ ) | $I_{\text{C}} = 30\text{ mA}$                                                                                        | 100      | -    |      | $\text{V}$    |
| $V_{\text{CE(sat)}}^{(1)}$  | Collector-emitter<br>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                                                   | $I_{\text{C}} = 1\text{ A}$ $V_{\text{CE}} = 4\text{ V}$<br>$I_{\text{C}} = 3\text{ A}$ $V_{\text{CE}} = 4\text{ V}$ | 25<br>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**

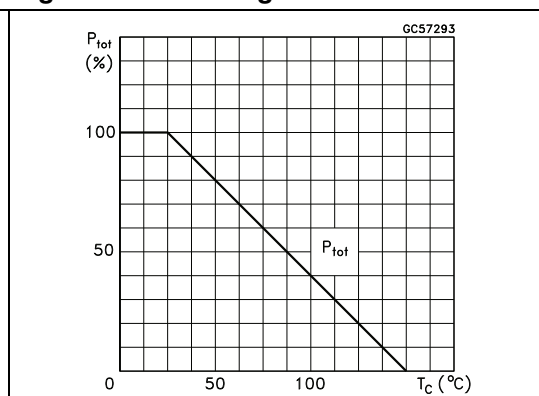


Figure 4. DC current gain ( $V_{CE} = 2\text{ V}$ )

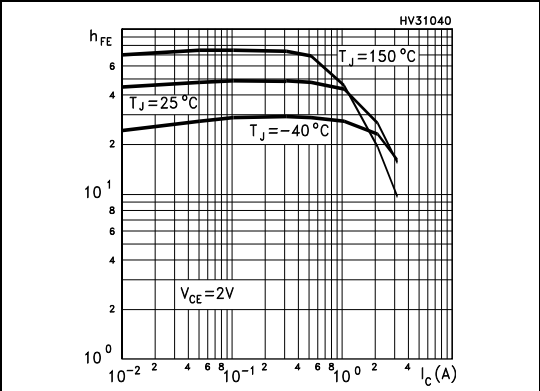


Figure 5. DC current gain ( $V_{CE} = 4\text{ V}$ )

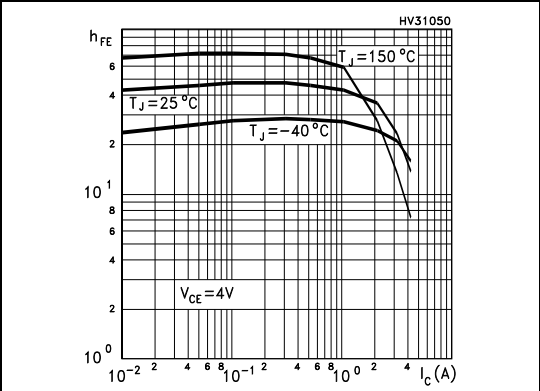


Figure 6. Collector-emitter saturation voltage

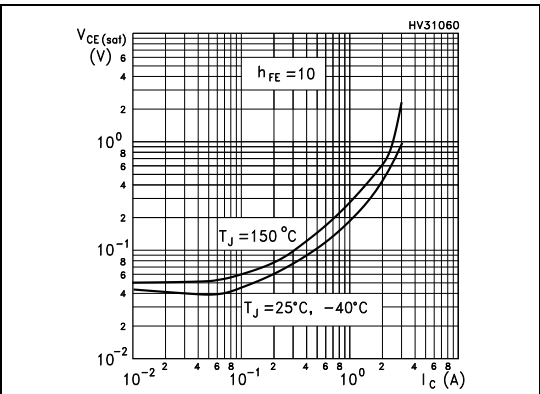


Figure 7. Base-emitter saturation voltage

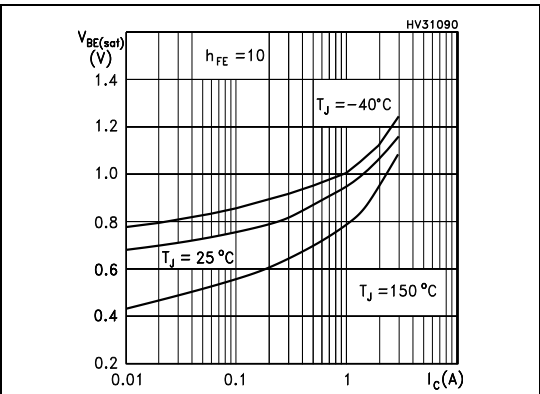


Figure 8. Base-emitter on voltage

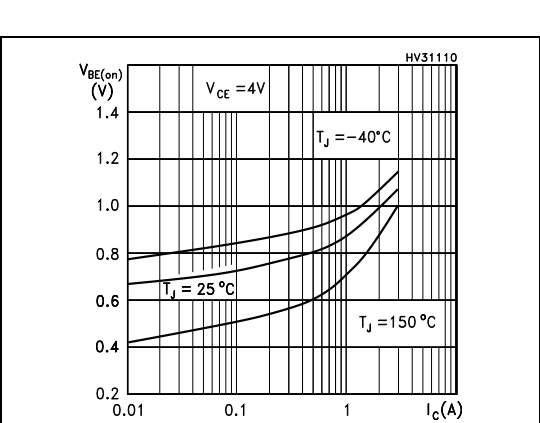
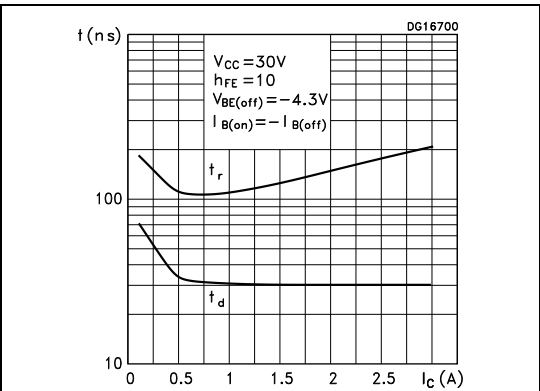
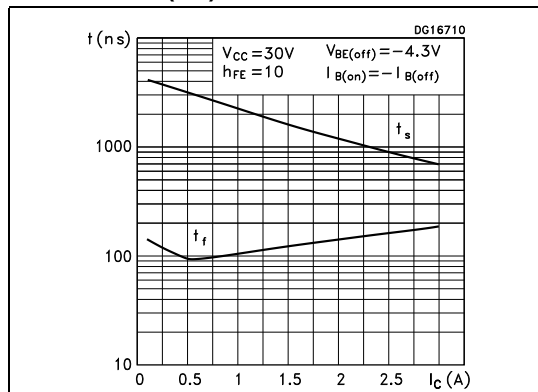


Figure 9. Resistive load switching time (on)

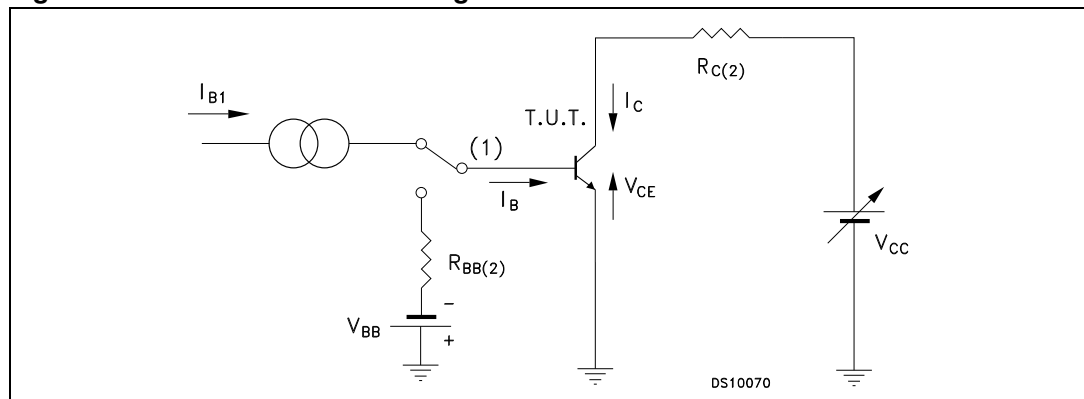


**Figure 10. Resistive load switching time (off)**



## 2.2 Test circuits

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



1. Fast electronic switch
2. Non-inductive resistor



### 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

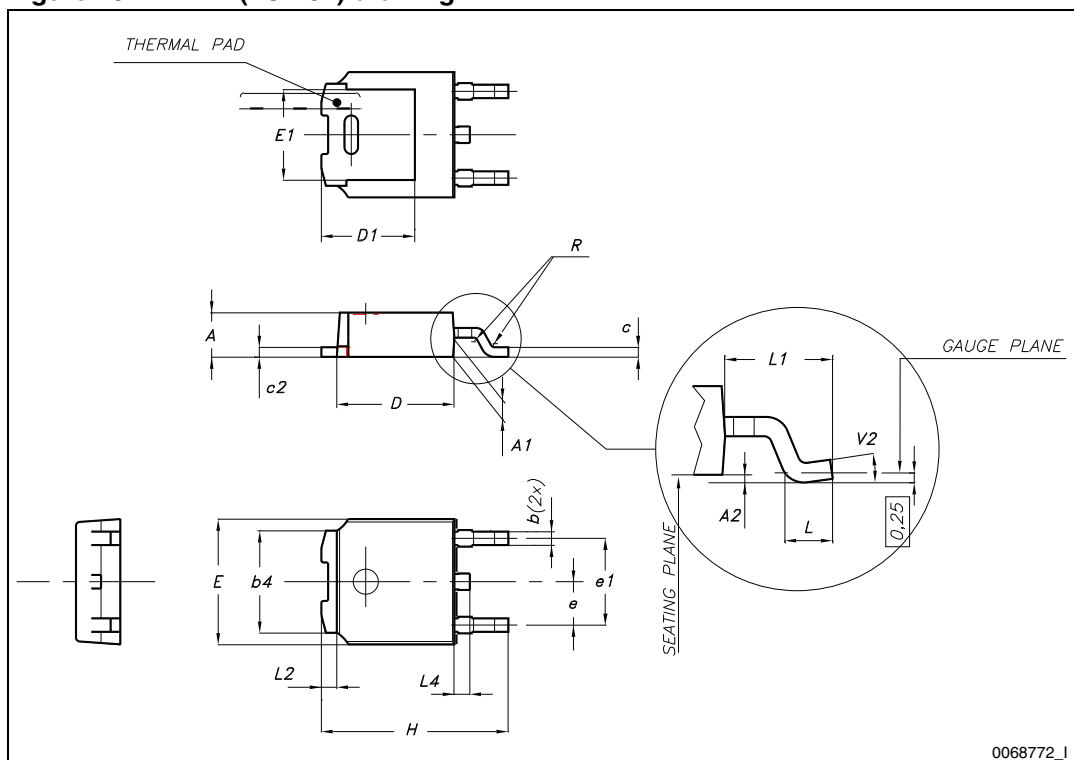
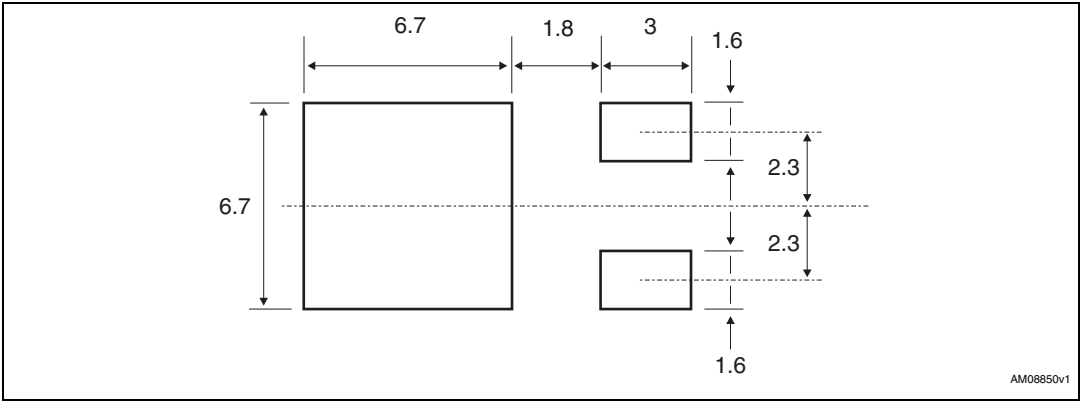


Table 6. DPAK (TO-252) tape and reel mechanical data

| 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)

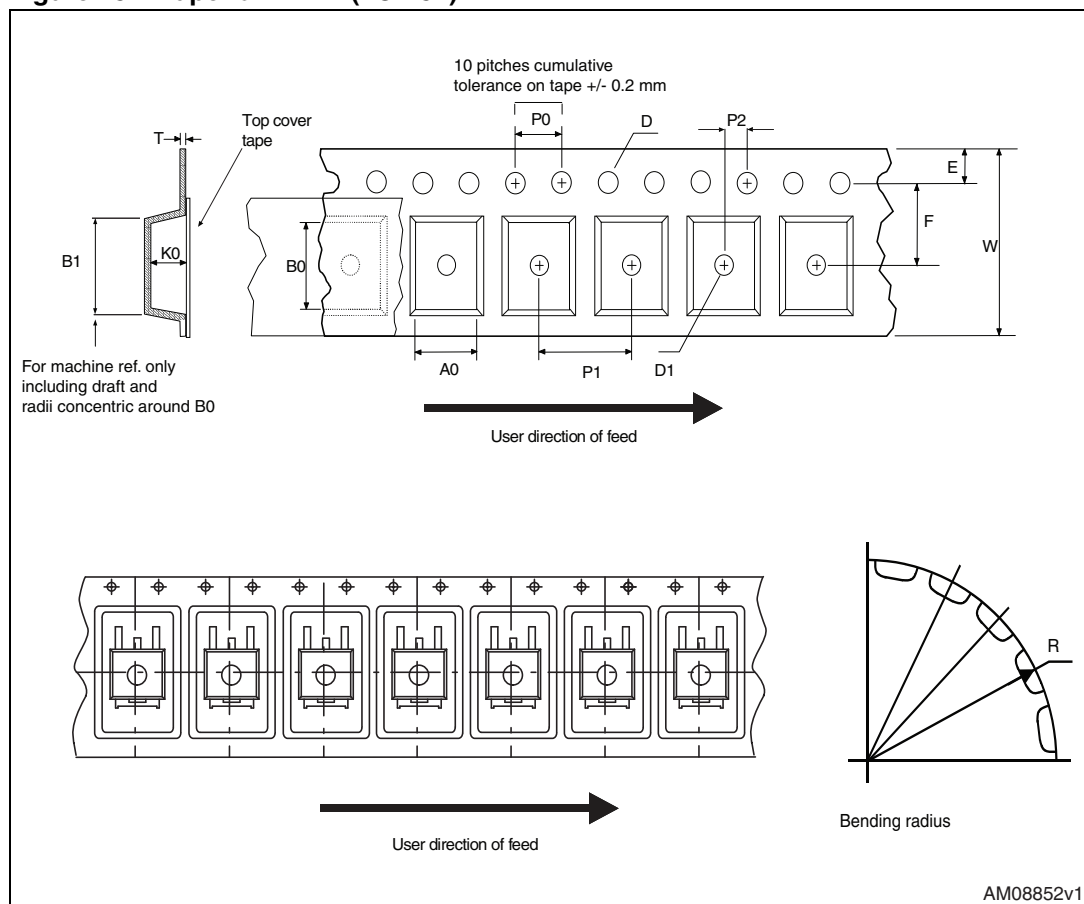
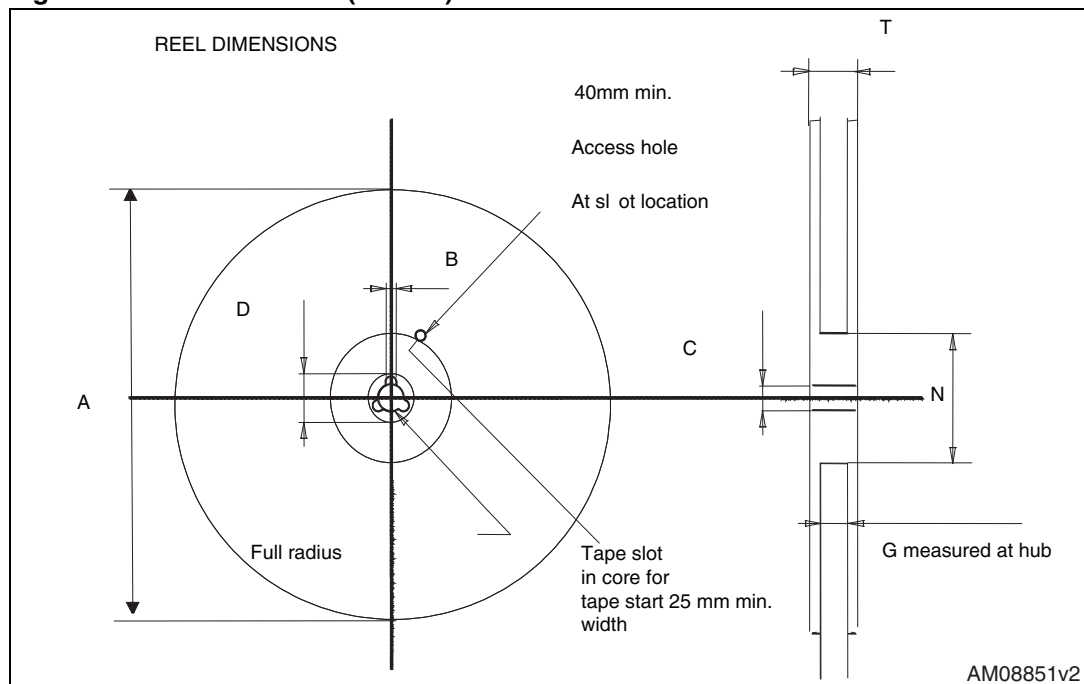


Figure 16. Reel for DPAK (TO-252)



## 4 Revision history

**Table 7. Document revision history**

| Date        | Revision | Changes                                      |
|-------------|----------|----------------------------------------------|
| 24-Apr-2007 | 1        | Initial release.                             |
| 09-Nov-2009 | 2        | Updated package mechanical data.             |
| 14-Jan-2010 | 3        | Modified <a href="#">Table 3 on page 2</a> . |
| 19-Jun-2012 | 4        | Modified: mechanical data                    |

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