# MJD31C

## Low voltage NPN power transistor

**Datasheet – production data**

## Features

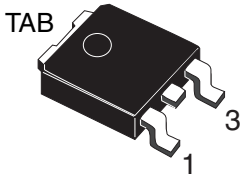
- Surface-mounting TO-252 power package in tape and reel
- Complementary to the PNP type MJD32C

## 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.




**DPAK**
**TO-252**

**Figure 1. Internal schematic diagram**

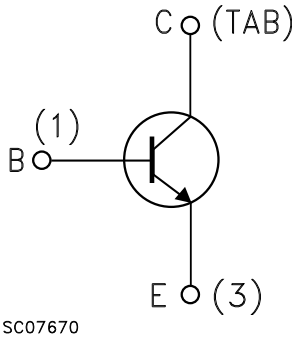



**Table 1. Device summary**

| 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 °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 inch², 2 oz Cu.

# 2 Electrical characteristics

$T_{case}$ = 25 °C unless otherwise specified.

**Table 4. Electrical characteristics**

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

1. Pulse test: pulse duration ≤300 µs, duty cycle ≤2 %

## 2.1 Electrical characteristic (curves)

**Figure 2. Safe operating area**

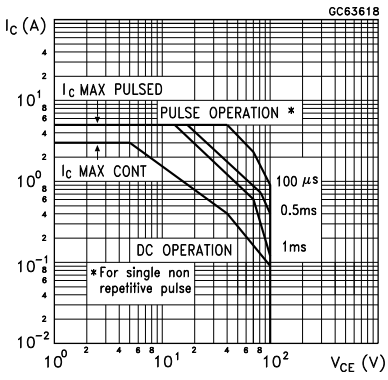



**Figure 3. Derating curve**

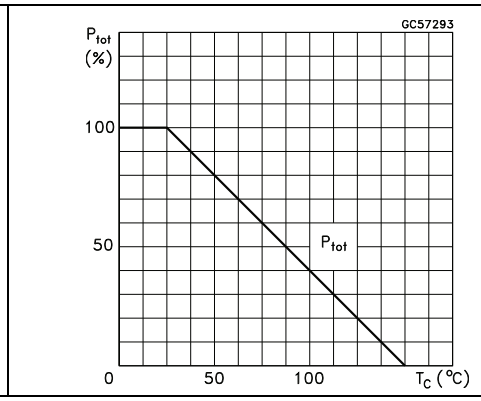


**Figure 4. DC current gain ($V_{CE}$ = 2 V)**

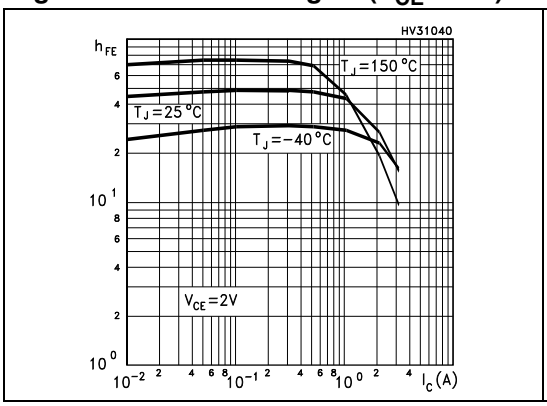



**Figure 5. DC current gain ($V_{CE}$ = 4 V)**

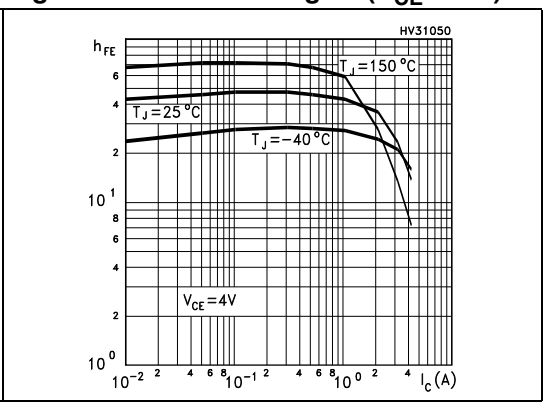



**Figure 6. Collector-emitter saturation voltage**

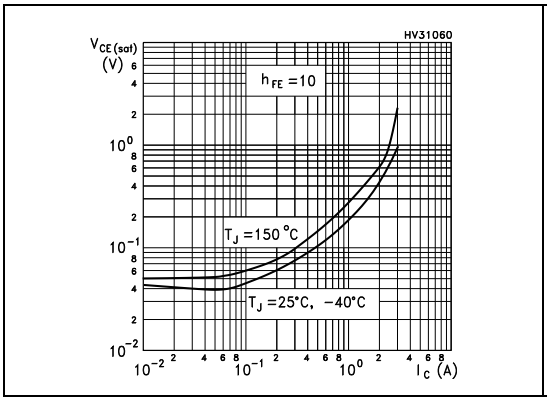



**Figure 7. Base-emitter saturation voltage**

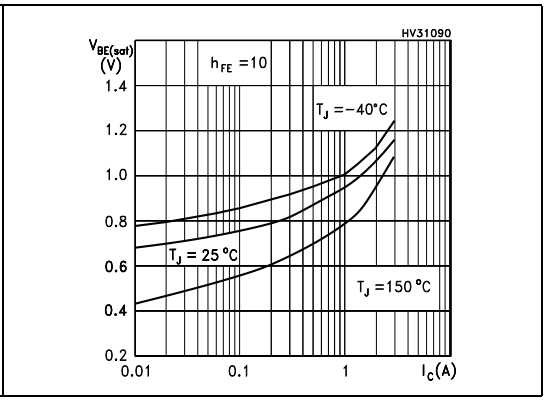



**Figure 8. Base-emitter on voltage**

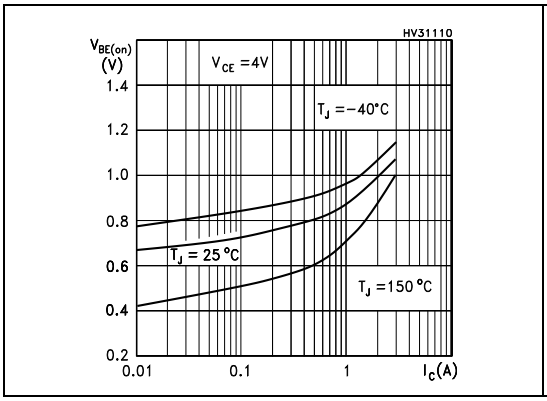



**Figure 9. Resistive load switching time (on)**

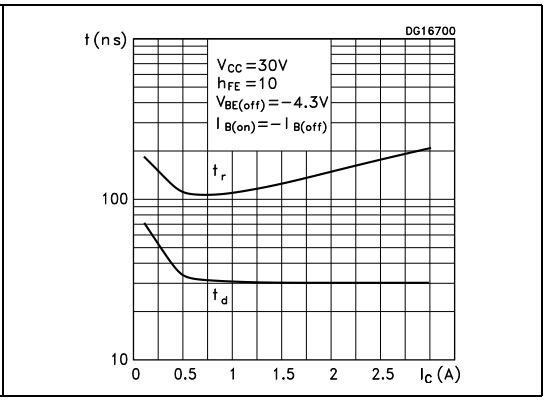
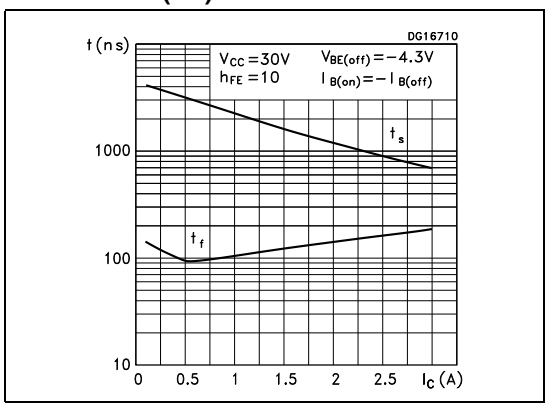
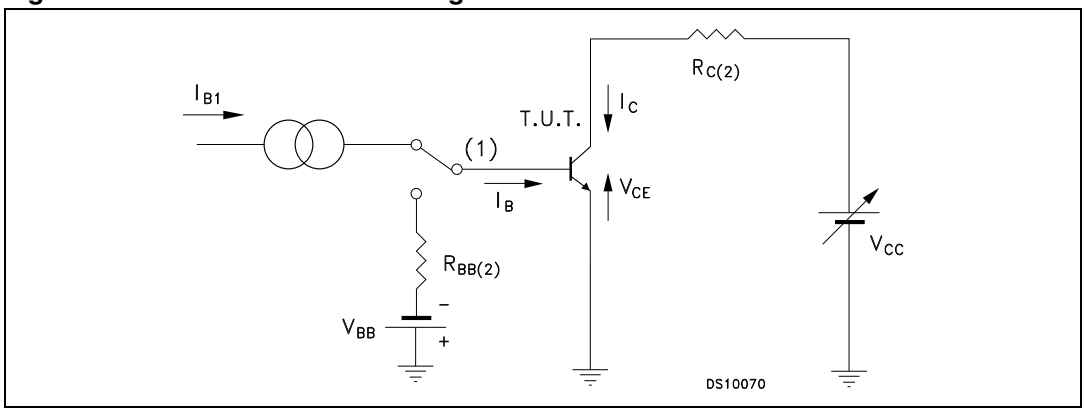


**Figure 10. Resistive load switching time (off)**



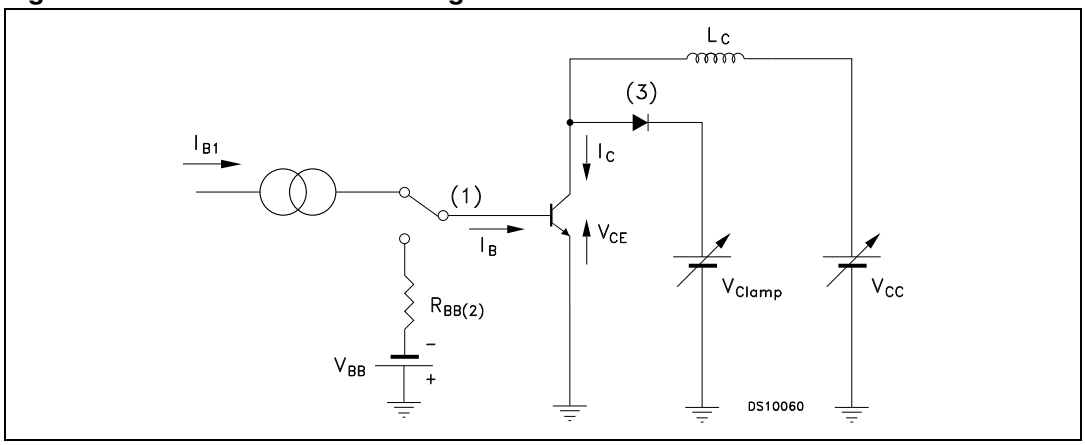

## 2.2 Test circuits

**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® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*.
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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**

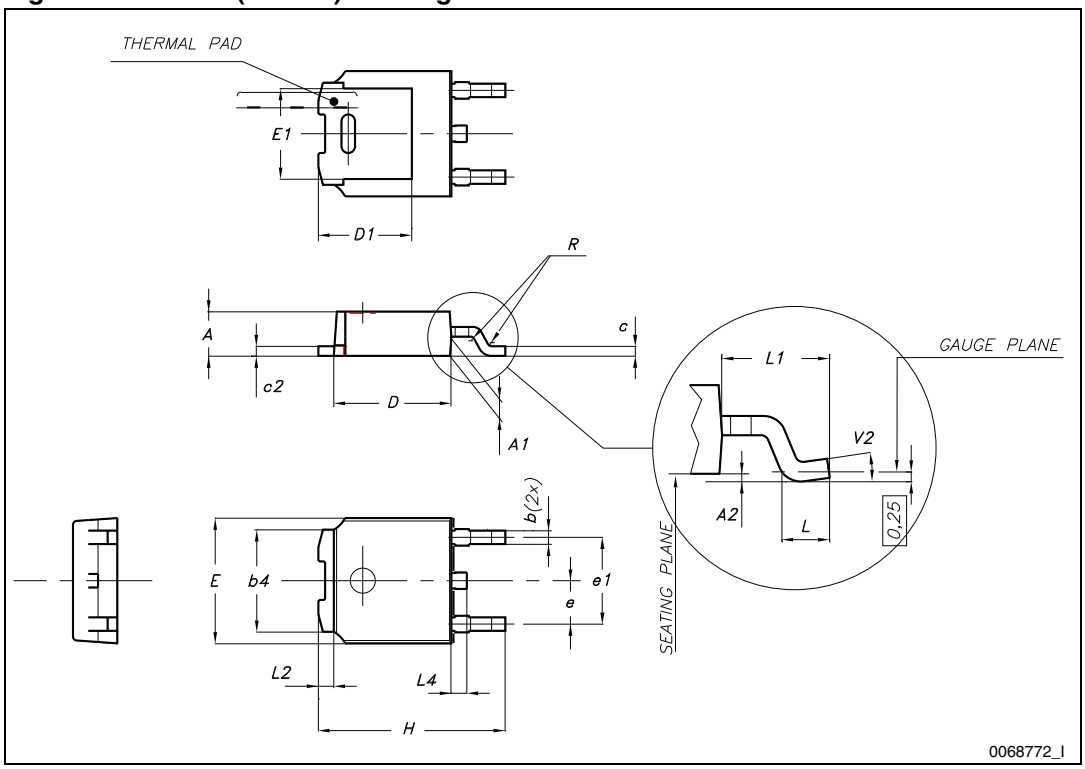
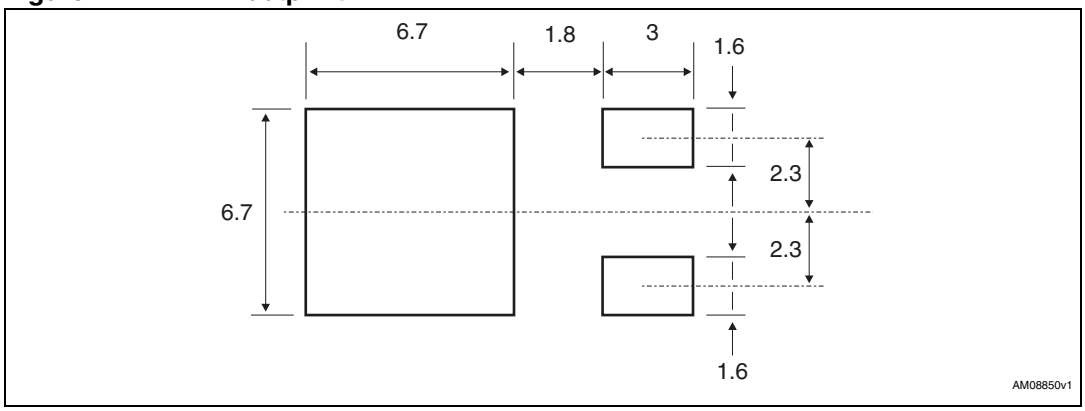


Table 6. DPAK (TO-252) tape and reel mechanical data

| 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[a]




a. All dimensions are in millimeters

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

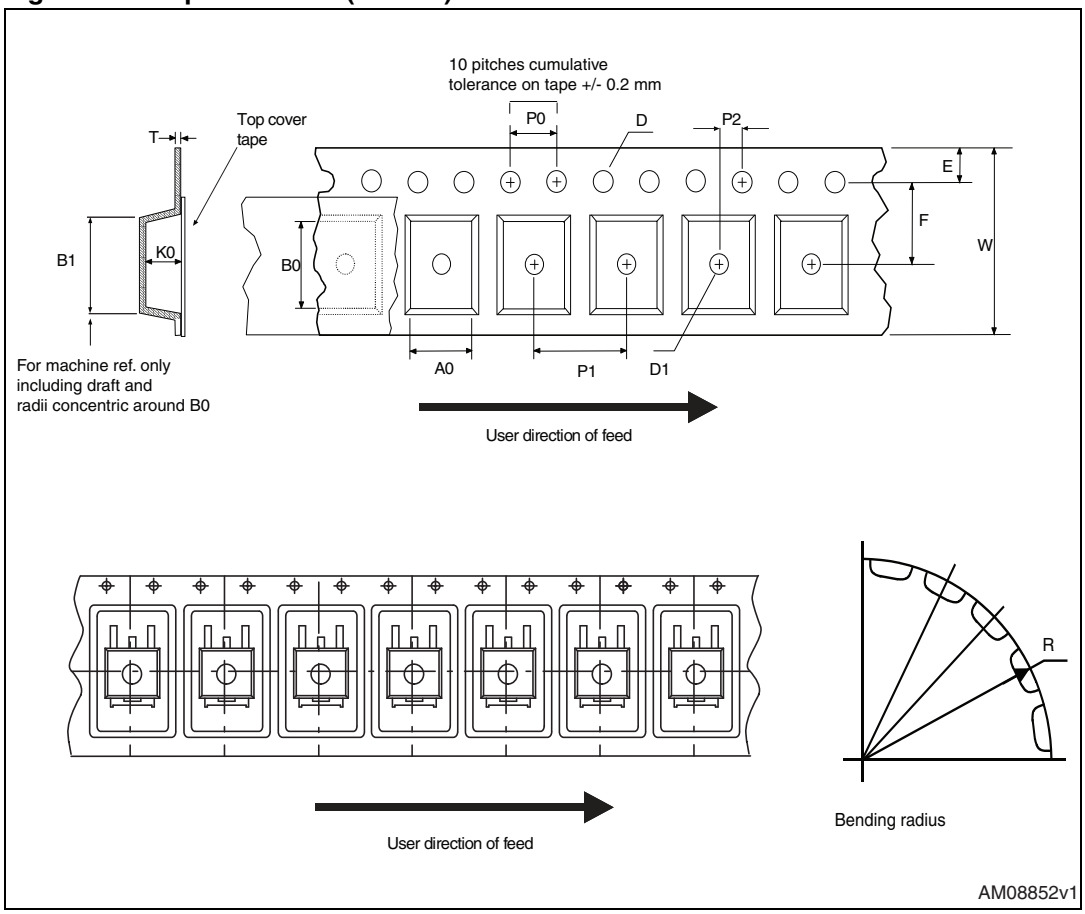
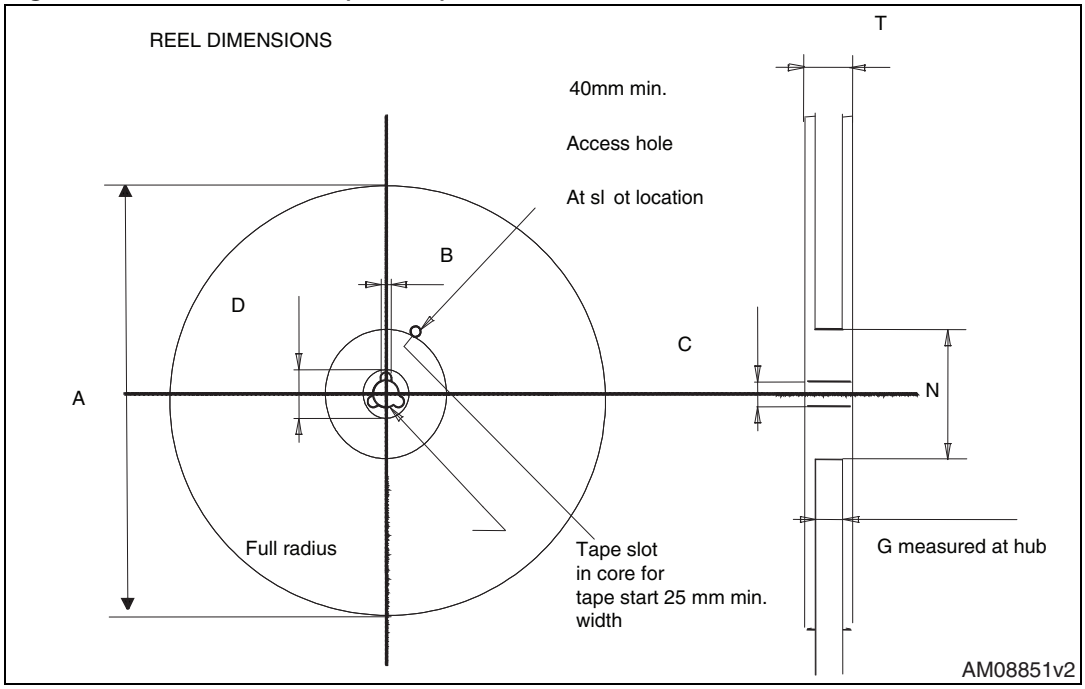



**Figure 16. Reel for DPAK (TO-252)**



# 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 *Table 3 on page 2*. |
| 19-Jun-2012 | 5 | Updated: mechanical data |

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