

## N-channel 80 V, 0.0056 $\Omega$ typ., 80 A, STripFET™ F6 Power MOSFET in a DPAK package

Datasheet - production data

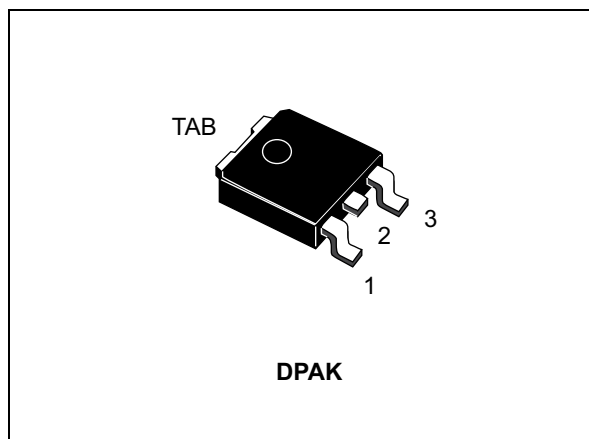
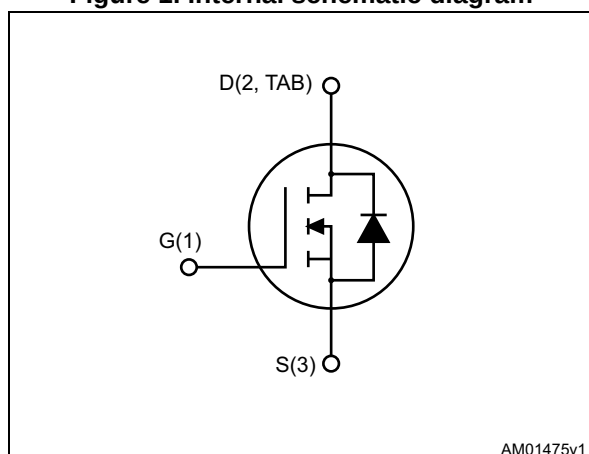


Figure 1. Internal schematic diagram



### Features

| Order code | $V_{DS}$ | $R_{DS(on)max}$ | $I_D$ | $P_{TOT}$ |
|------------|----------|-----------------|-------|-----------|
| STD110N8F6 | 80 V     | 0.0065 $\Omega$ | 80 A  | 167 W     |

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using the STripFET™ F6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low  $R_{DS(on)}$  in all packages.

Table 1. Device summary

| Order code | Marking | Package | Packing |
|------------|---------|---------|---------|
| STD110N8F6 | 110N8F6 | DPAK    | Tube    |

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

| Symbol         | Parameter                                                         | Value      | Unit               |
|----------------|-------------------------------------------------------------------|------------|--------------------|
| $V_{DS}$       | Drain-source voltage                                              | 80         | V                  |
| $V_{GS}$       | Gate-source voltage                                               | $\pm 20$   | V                  |
| $I_D$          | Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$  | 80         | A                  |
| $I_D$          | Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$ | 72         | A                  |
| $I_{DM}^{(1)}$ | Drain current (pulsed)                                            | 320        | A                  |
| $P_{TOT}$      | Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$           | 167        | W                  |
| $E_{AS}^{(2)}$ | Single pulse avalanche energy                                     | 180        | mJ                 |
| $T_J$          | Operating junction temperature                                    | -55 to 175 | $^{\circ}\text{C}$ |
| $T_{stg}$      | Storage temperature                                               |            | $^{\circ}\text{C}$ |

1. Pulse width is limited by safe operating area

2. Starting  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $I_D = 55\text{ A}$ ,  $V_{DD} = 60\text{ V}$

**Table 3. Thermal data**

| Symbol              | Parameter                             | Value | Unit                 |
|---------------------|---------------------------------------|-------|----------------------|
| $R_{thj-case}$      | Thermal resistance junction-case max. | 0.9   | $^{\circ}\text{C/W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb max.  | 50    | $^{\circ}\text{C/W}$ |

1. When mounted on 1 inch<sup>2</sup> FR-4, 2 Oz copper board.

## 2 Electrical characteristics

( $T_C = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

**Table 4. On/off-state**

| Symbol        | Parameter                          | Test conditions                                                       | Min. | Typ.   | Max.   | Unit          |
|---------------|------------------------------------|-----------------------------------------------------------------------|------|--------|--------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage     | $V_{GS} = 0, I_D = 1\text{ mA}$                                       | 80   |        |        | V             |
| $I_{DSS}$     | Zero-gate voltage drain current    | $V_{GS} = 0, V_{DS} = 80\text{ V}$                                    |      |        | 1      | $\mu\text{A}$ |
|               |                                    | $V_{GS} = 0, V_{DS} = 80\text{ V}, T_C = 125\text{ }^{\circ}\text{C}$ |      |        | 100    | $\mu\text{A}$ |
| $I_{GSS}$     | Gate-body leakage current          | $V_{DS} = 0, V_{GS} = +20\text{ V}$                                   |      |        | 100    | nA            |
| $V_{GS(th)}$  | Gate threshold voltage             | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$                       | 2.5  |        | 4.5    | V             |
| $R_{DS(on)}$  | Static drain-source on- resistance | $V_{GS} = 10\text{ V}, I_D = 40\text{ A}$                             |      | 0.0056 | 0.0065 | $\Omega$      |

**Table 5. Dynamic**

| Symbol    | Parameter                    | Test conditions                                                                                     | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|-----------------------------------------------------------------------------------------------------|------|------|------|------|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 40\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$                                                | -    | 9130 | -    | pF   |
| $C_{oss}$ | Output capacitance           |                                                                                                     | -    | 320  | -    | pF   |
| $C_{rss}$ | Reverse transfer capacitance |                                                                                                     | -    | 225  | -    | pF   |
| $Q_g$     | Total gate charge            | $V_{DD} = 40\text{ V}, I_D = 80\text{ A}, V_{GS} = 10\text{ V}$<br>(see <a href="#">Figure 14</a> ) | -    | 150  | -    | nC   |
| $Q_{gs}$  | Gate-source charge           |                                                                                                     | -    | 40   | -    | nC   |
| $Q_{gd}$  | Gate-drain charge            |                                                                                                     | -    | 30   | -    | nC   |

**Table 6. Switching times**

| Symbol       | Parameter           | Test conditions                                                                                                              | Min. | Typ. | Max. | Unit |
|--------------|---------------------|------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 40\text{ V}, I_D = 55\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$<br>(see <a href="#">Figure 13</a> ) | -    | 24   | -    | ns   |
| $t_r$        | Rise time           |                                                                                                                              | -    | 61   | -    | ns   |
| $t_{d(off)}$ | Turn-off delay time |                                                                                                                              | -    | 162  | -    | ns   |
| $t_f$        | Fall time           |                                                                                                                              | -    | 48   | -    | ns   |

Table 7. Source-drain diode

| Symbol         | Parameter                | Test conditions                                                                                                        | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage       | $I_{SD} = 80\text{ A}$ , $V_{GS} = 0$                                                                                  | -    |      | 1.2  | V    |
| $t_{rr}$       | Reverse recovery time    | $I_{SD} = 80\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 64\text{ V}$ (see <a href="#">Figure 15</a> ) | -    | 30   |      | ns   |
| $Q_{rr}$       | Reverse recovery charge  |                                                                                                                        | -    | 34   |      | nC   |
| $I_{RRM}$      | Reverse recovery current |                                                                                                                        | -    | 2.3  |      | A    |

1. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

2.1 Electrical characteristics (curves)

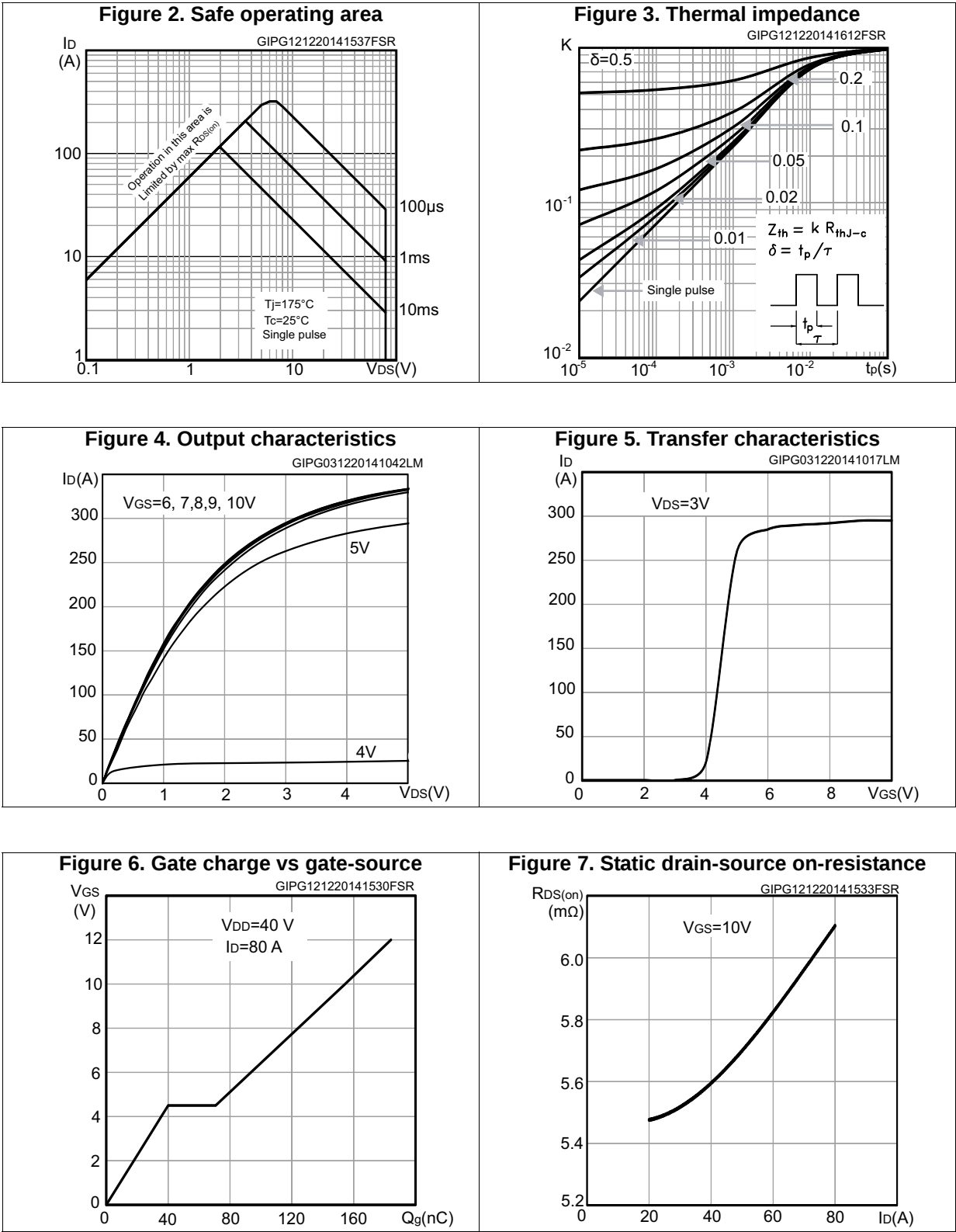


Figure 8. Capacitance variations

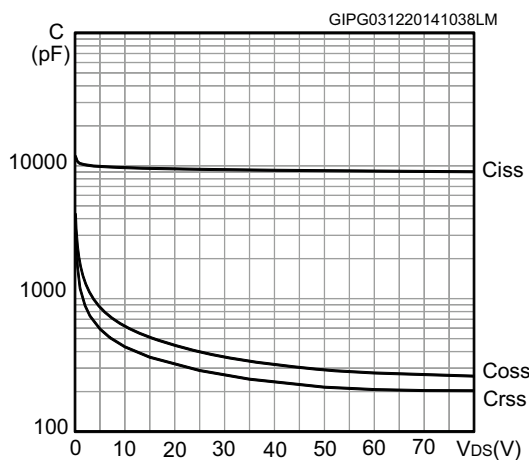


Figure 9. Normalized gate threshold voltage vs temperature

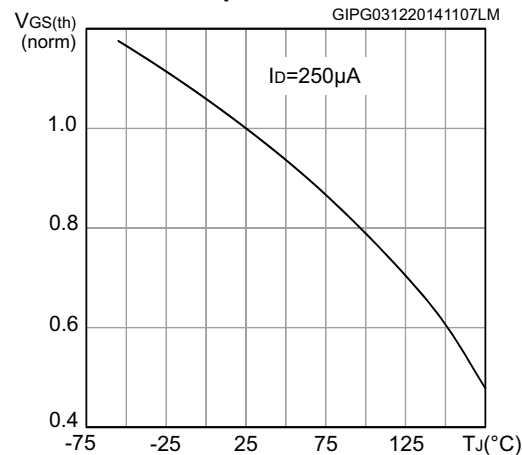


Figure 10. Normalized on-resistance

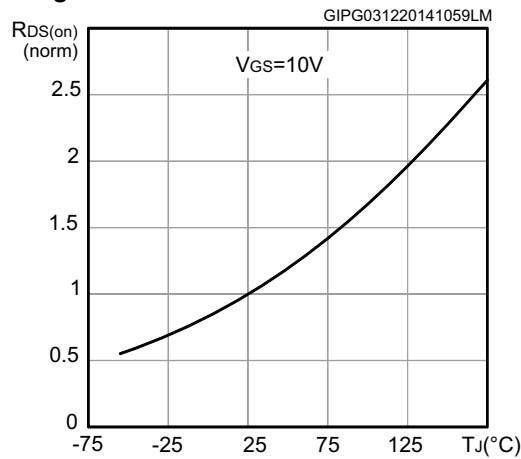


Figure 11. Normalized  $V_{(BR)DSS}$  vs temperature

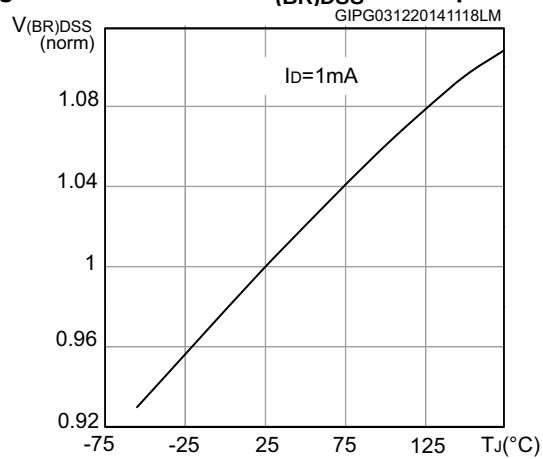
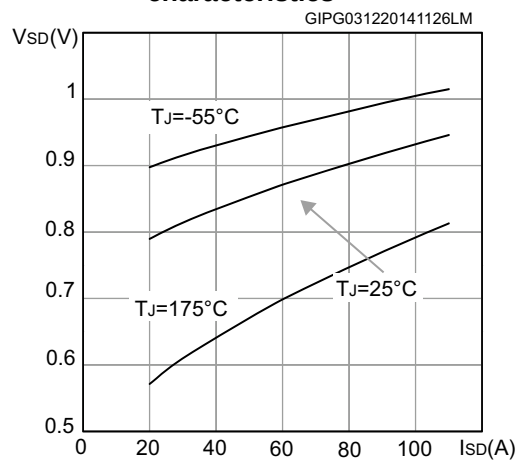
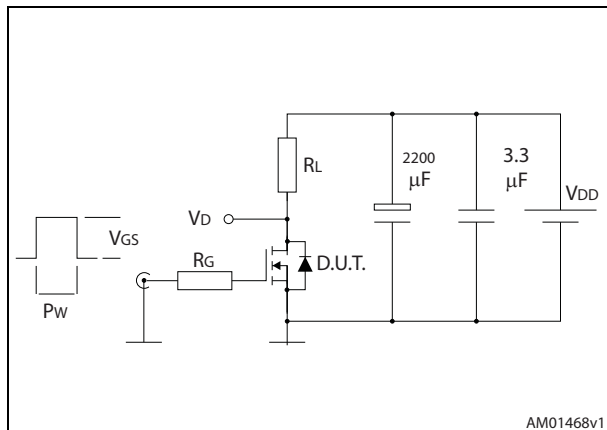


Figure 12. Drain-source diode forward characteristics

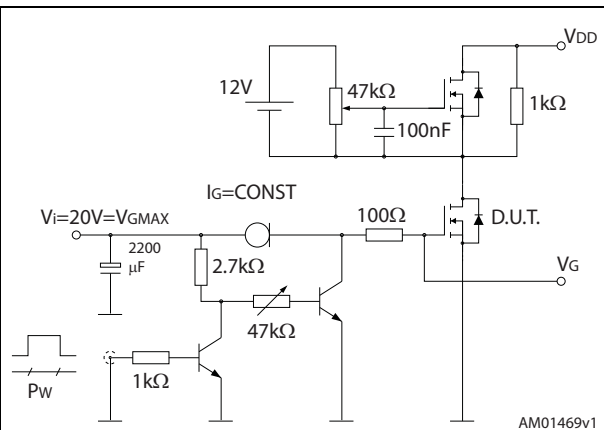


### 3 Test circuits

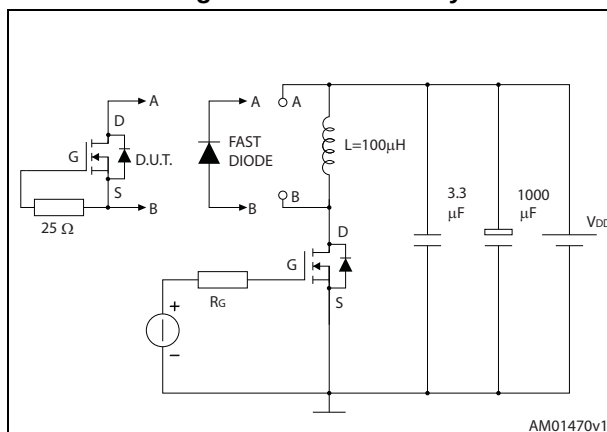
**Figure 13. Switching times test circuit for resistive load**



**Figure 14. Gate charge test circuit**



**Figure 15. Test circuit for inductive load switching and diode recovery times**



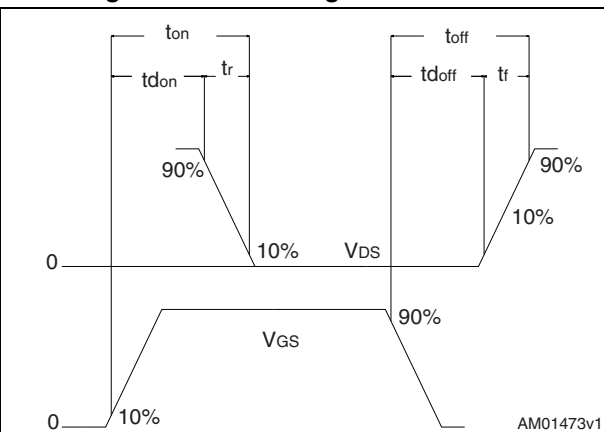
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



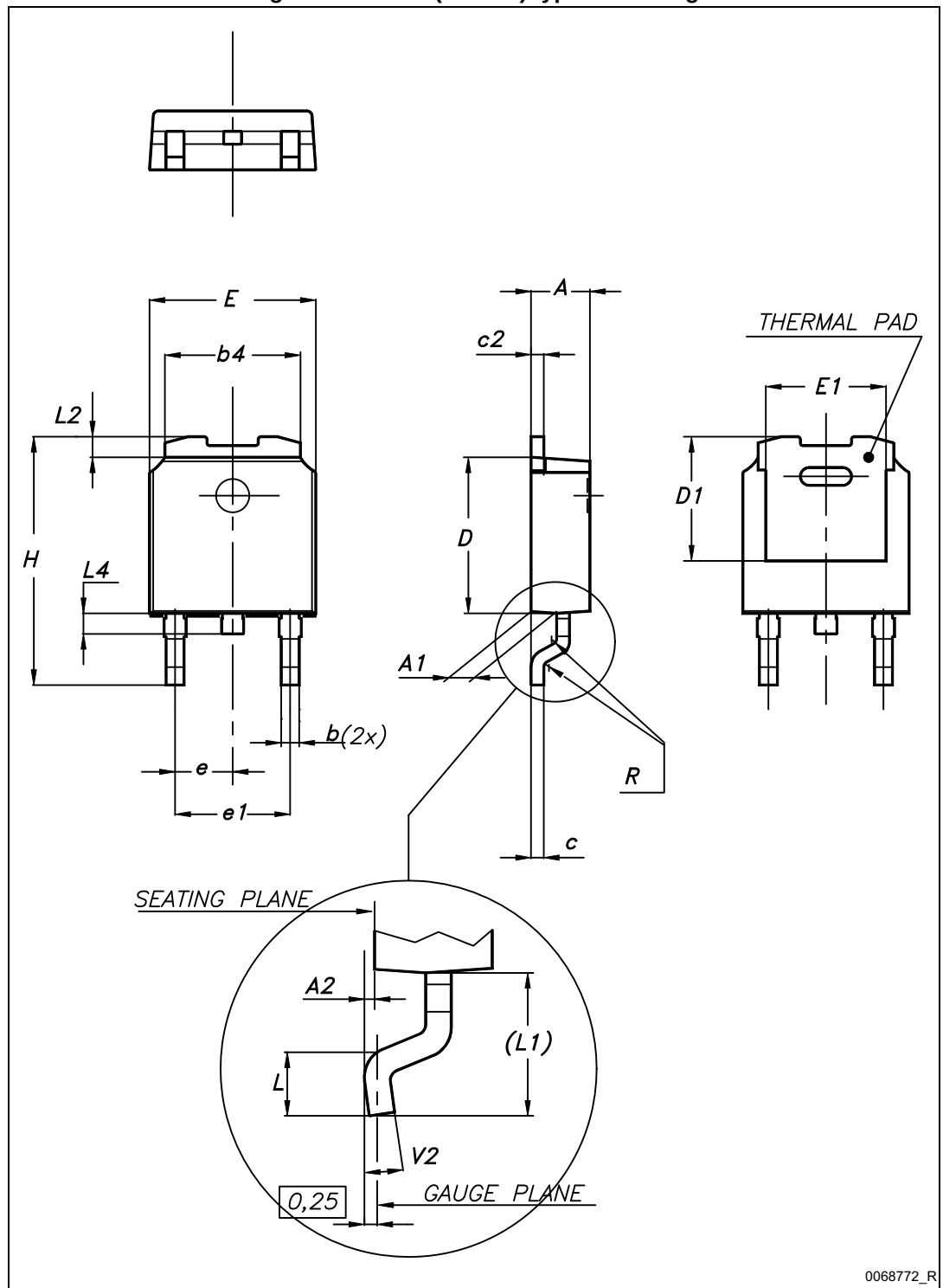
**Figure 18. Switching time waveform**



## 4 Package information

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.

Figure 19. DPAK (TO-252) type A drawing

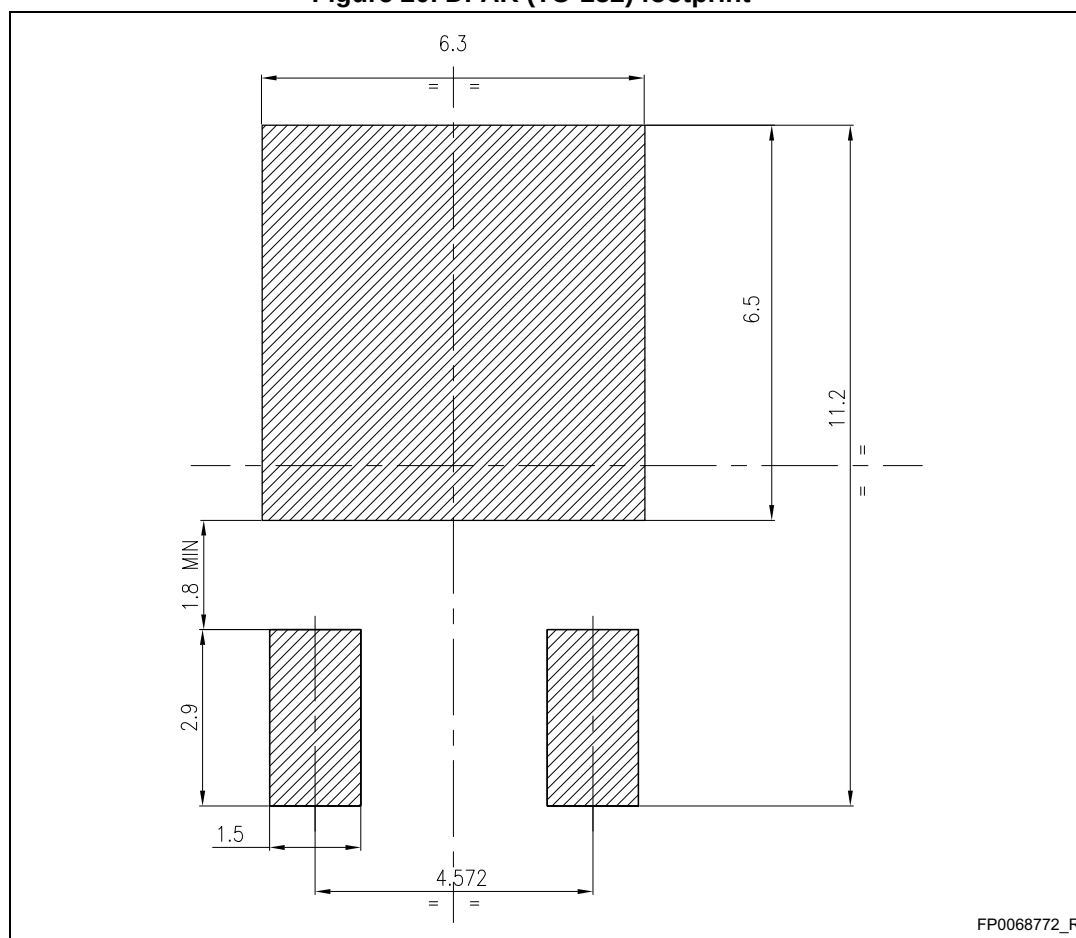


0068772\_R

Table 8. DPAK (TO-252) type A 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    | 1.00 |      | 1.50  |
| L1   |      | 2.80 |       |
| L2   |      | 0.80 |       |
| L4   | 0.60 |      | 1.00  |
| R    |      | 0.20 |       |
| V2   | 0°   |      | 8°    |

Figure 20. DPAK (TO-252) footprint (a)



a. All dimensions are in millimeters

5 Packing information

Figure 21. Tape for DPAK (TO-252)

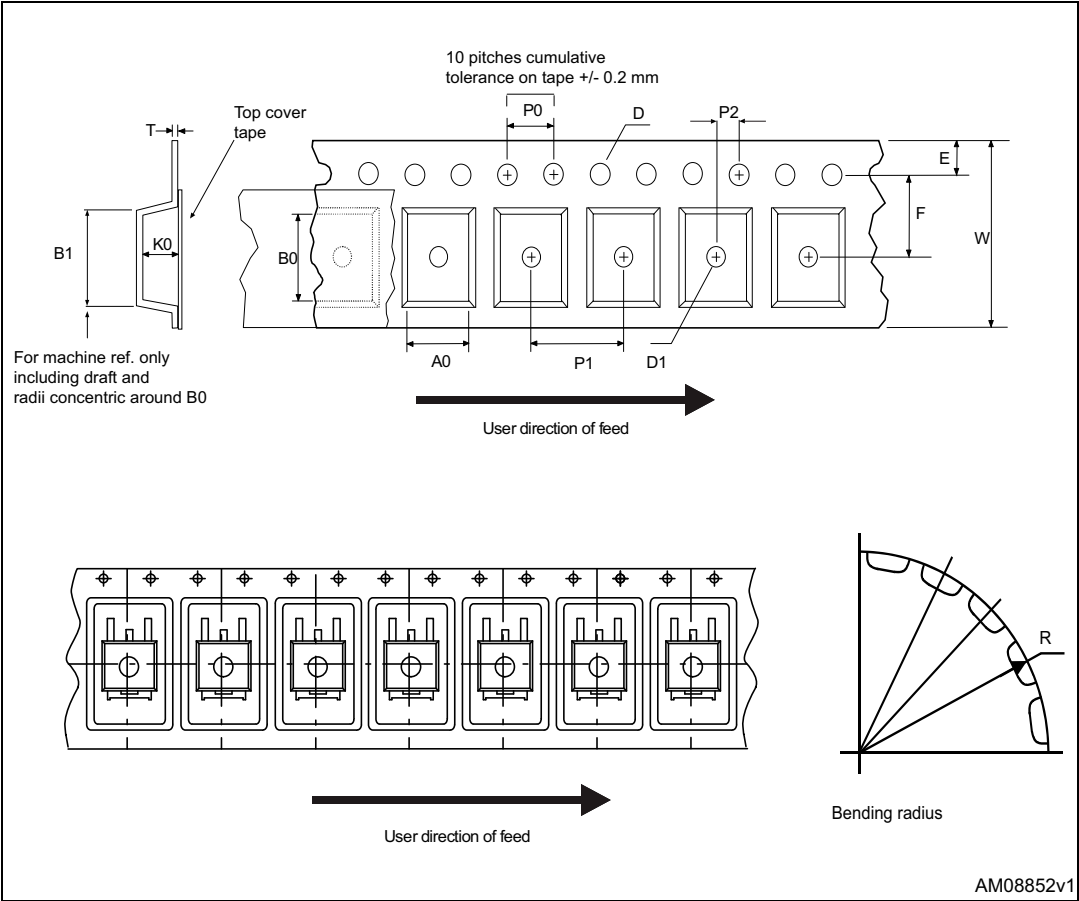


Figure 22. Reel for DPAK (TO-252)

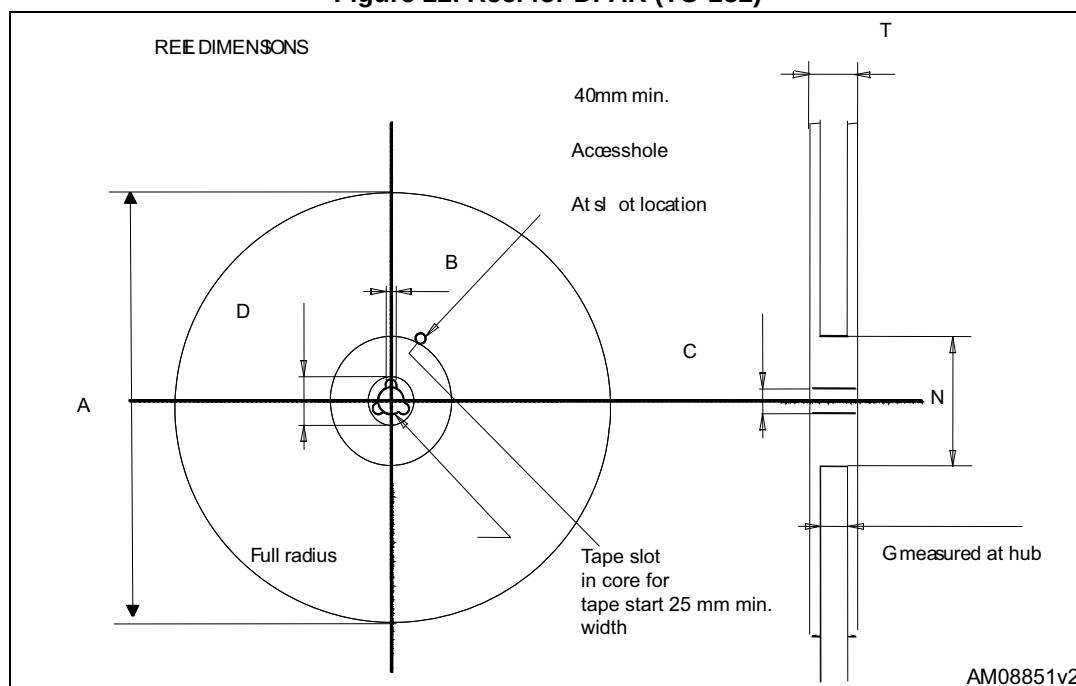


Table 9. DPAK (TO-252) tape and reel mechanical data

| 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 |           |      |      |

## 6 Revision history

Table 10. Document revision history

| Date        | Revision | Changes        |
|-------------|----------|----------------|
| 15-Dec-2014 | 1        | First release. |

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