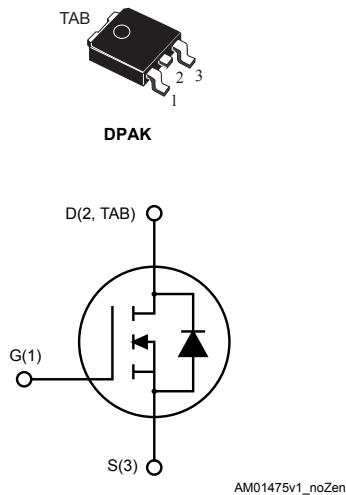


### N-channel 100 V, 30 mΩ typ., 25 A, STripFET™ II Power MOSFET in a DPAK package



#### Features

| Type         | V <sub>DS</sub> | R <sub>DS(on)</sub> max. | I <sub>D</sub> |
|--------------|-----------------|--------------------------|----------------|
| STD25NF10LT4 | 100 V           | 35 mΩ                    | 25 A           |

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

#### Applications

- Switching applications

#### Description

This Power MOSFET series has been developed using STMicroelectronics' unique STripFET™ process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

#### Product status link

[STD25NF10LT4](#)

#### Product summary

|            |               |
|------------|---------------|
| Order code | STD25NF10LT4  |
| Marking    | D25NF10L      |
| Package    | DPAK          |
| Packing    | Tape and reel |

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol         | Parameter                                                       | Value      | Unit             |
|----------------|-----------------------------------------------------------------|------------|------------------|
| $V_{DS}$       | Drain-source voltage                                            | 100        | V                |
| $V_{DGR}$      | Gate-source voltage ( $R_{GS} = 20\text{ k}\Omega$ )            | 100        | V                |
| $V_{GS}$       | Gate-source voltage                                             | $\pm 16$   | V                |
| $I_D$          | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$  | 25         | A                |
|                | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$ | 21         | A                |
| $I_{DM}^{(1)}$ | Drain current (pulsed)                                          | 100        | A                |
| $P_{TOT}$      | Total dissipation at $T_C = 25\text{ }^\circ\text{C}$           | 100        | W                |
| $E_{AS}^{(2)}$ | Single-pulse avalanche energy                                   | 450        | mJ               |
| $dv/dt^{(3)}$  | Peak diode recovery voltage slope                               | 20         | V/ns             |
| $T_{stg}$      | Storage temperature range                                       | -55 to 175 | $^\circ\text{C}$ |
| $T_J$          | Operating junction temperature range                            |            |                  |

1. Pulse width limited by safe operating area.
2. Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 12.5\text{ A}$ ,  $V_{DD} = 50\text{ V}$
3.  $I_{SD} \leq 25\text{ A}$ ,  $di/dt \leq 300\text{ A}/\mu\text{s}$ ,  $V_{DS} \leq V_{(BR)DSS}$ ,  $T_J \leq T_{JMAX}$

**Table 2. Thermal data**

| Symbol              | Parameter                        | Value | Unit                      |
|---------------------|----------------------------------|-------|---------------------------|
| $R_{thj-case}$      | Thermal resistance junction-case | 1.5   | $^\circ\text{C}/\text{W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb  | 50    | $^\circ\text{C}/\text{W}$ |

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

## 2 Electrical characteristics

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

**Table 3. On/off states**

| Symbol        | Parameter                         | Test conditions                                                                                | Min. | Typ. | Max.      | Unit          |
|---------------|-----------------------------------|------------------------------------------------------------------------------------------------|------|------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage    | $V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$                                         | 100  |      |           | V             |
| $I_{DSS}$     | Zero gate voltage drain current   | $V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$                                                |      |      | 1         | $\mu\text{A}$ |
|               |                                   | $V_{GS} = 0\text{ V}$ , $V_{DS} = 100\text{ V}$ ,<br>$T_C = 125\text{ }^{\circ}\text{C}^{(1)}$ |      |      | 10        | $\mu\text{A}$ |
| $I_{GSS}$     | Gate body leakage current         | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 16\text{ V}$                                             |      |      | $\pm 100$ | nA            |
| $V_{GS(th)}$  | Gate threshold voltage            | $V_{DD} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                             | 1    |      | 2.5       | V             |
| $R_{DS(on)}$  | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$ , $I_D = 12.5\text{ A}$                                                 |      | 30   | 35        | m $\Omega$    |
|               |                                   | $V_{GS} = 4.5\text{ V}$ , $I_D = 12.5\text{ A}$                                                |      | 35   | 40        | m $\Omega$    |

1. Defined by design, not subject to production test.

**Table 4. Dynamic**

| Symbol    | Parameter                    | Test conditions                                                                                                                               | Min. | Typ. | Max. | Unit |
|-----------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $C_{iss}$ | Input capacitance            | $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ ,<br>$V_{GS} = 0\text{ V}$                                                                        | -    | 1710 |      | pF   |
| $C_{oss}$ | Output capacitance           |                                                                                                                                               | -    | 250  |      | pF   |
| $C_{rss}$ | Reverse transfer capacitance |                                                                                                                                               | -    | 110  |      | pF   |
| $Q_g$     | Total gate charge            | $V_{DD} = 80\text{ V}$ , $I_D = 25\text{ A}$ ,<br>$V_{GS} = 0\text{ to }5\text{ V}$<br>(see Figure 13. Test circuit for gate charge behavior) | -    | 38   | 52   | nC   |
| $Q_{gs}$  | Gate-source charge           |                                                                                                                                               | -    | 8.5  |      | nC   |
| $Q_{gd}$  | Gate-drain charge            |                                                                                                                                               | -    | 21   |      | nC   |

**Table 5. Switching times**

| Symbol       | Parameter           | Test conditions                                                                                                                                                                                                  | Min. | Typ. | Max. | Unit |
|--------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(on)}$  | Turn-on delay time  | $V_{DD} = 50\text{ V}$ , $I_D = 12.5\text{ A}$ ,<br>$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 5\text{ V}$<br>(see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform) | -    | 20   | -    | ns   |
| $t_r$        | Rise time           |                                                                                                                                                                                                                  | -    | 40   | -    | ns   |
| $t_{d(off)}$ | Turn-off delay time |                                                                                                                                                                                                                  | -    | 58   | -    | ns   |
| $t_f$        | Fall time           |                                                                                                                                                                                                                  | -    | 20   | -    | ns   |

**Table 6. Source-drain diode**

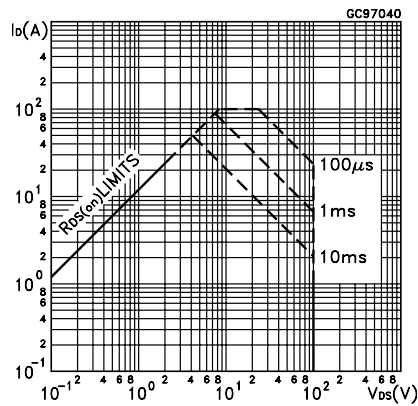
| Symbol          | Parameter                     | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|-----------------|------|------|------|------|
| $I_{SD}$        | Source-drain current          |                 | -    |      | 25   | A    |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) |                 | -    |      | 100  | A    |

| Symbol         | Parameter                | Test conditions                                               | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|---------------------------------------------------------------|------|------|------|------|
| $V_{SD}^{(2)}$ | Forward on voltage       | $I_{SD} = 25\text{ A}$ , $V_{GS} = 0\text{ V}$                | -    |      | 1.5  | V    |
| $t_{rr}$       | Reverse recovery time    | $I_{SD} = 25\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , | -    | 88   |      | ns   |
| $Q_{rr}$       | Reverse recovery charge  | $V_{DD} = 50\text{ V}$ , $T_J = 150\text{ }^{\circ}\text{C}$  | -    | 317  |      | nC   |
| $I_{RRM}$      | Reverse recovery current | (see <a href="#">Figure 17. Switching time waveform</a> )     | -    | 7.2  |      | A    |

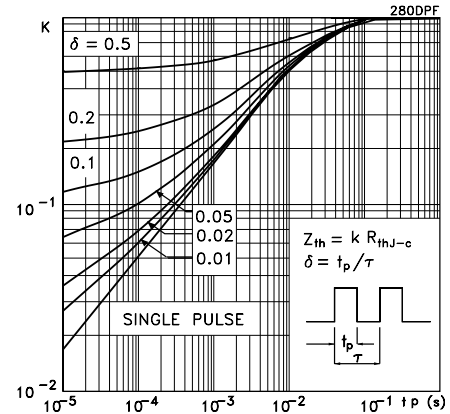
1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

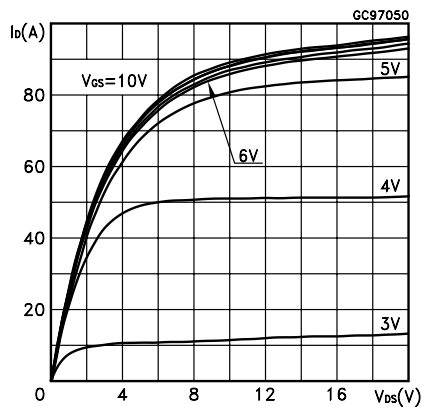
**Figure 1. Safe operating area**



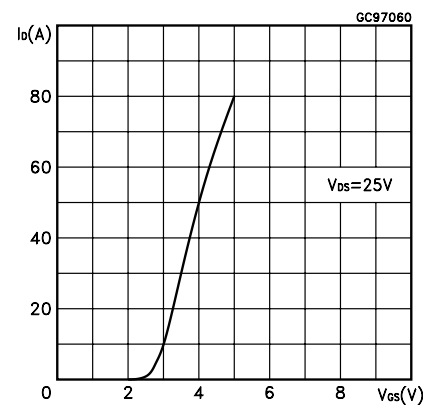
**Figure 2. Thermal impedance**



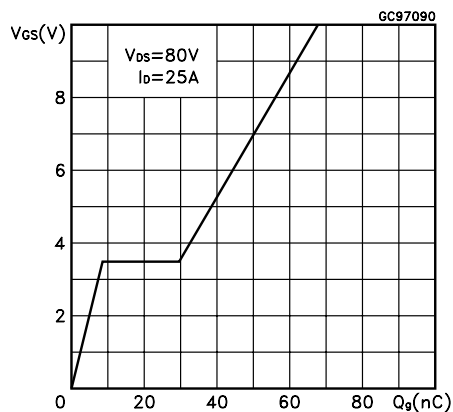
**Figure 3. Output characteristics**



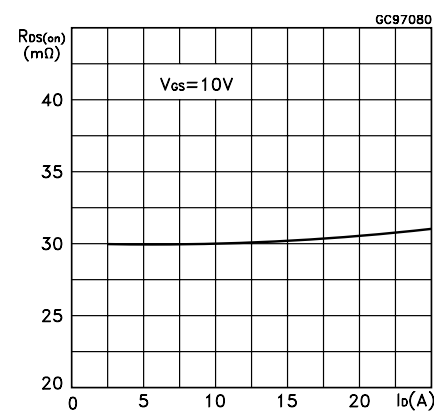
**Figure 4. Transfer characteristics**



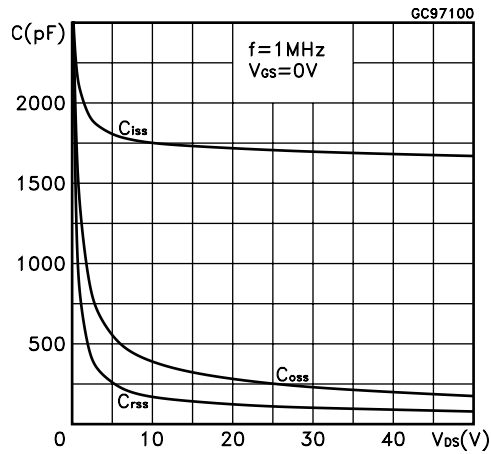
**Figure 5. Gate charge vs gate-source voltage**



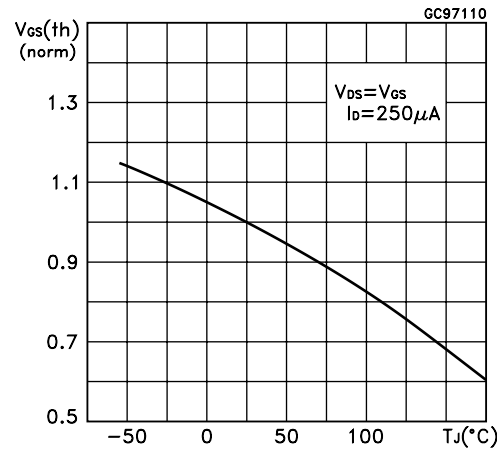
**Figure 6. Static drain-source on-resistance**



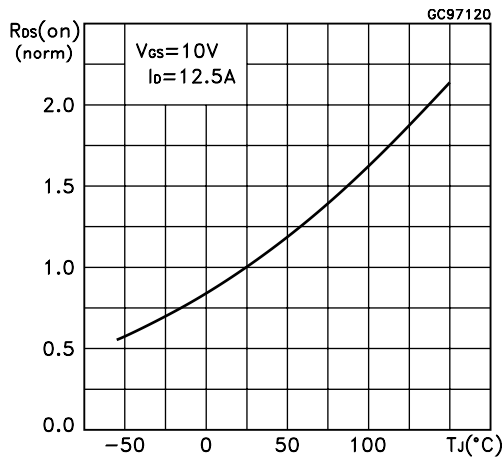
**Figure 7. Capacitance variations**



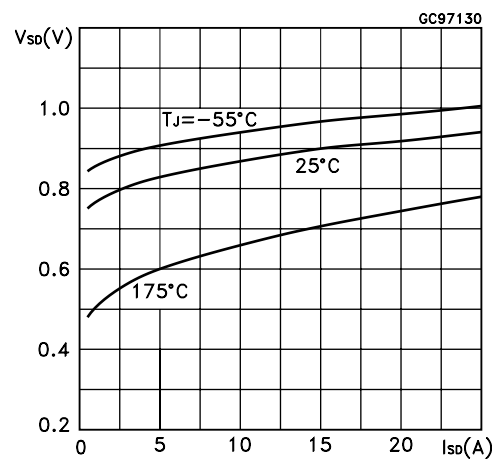
**Figure 8. Normalized gate threshold voltage vs temperature**



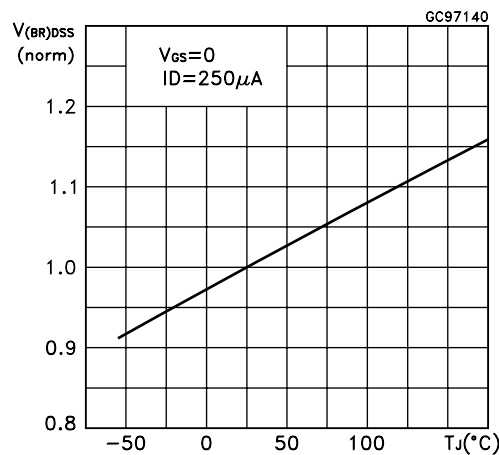
**Figure 9. Normalized on-resistance vs temperature**



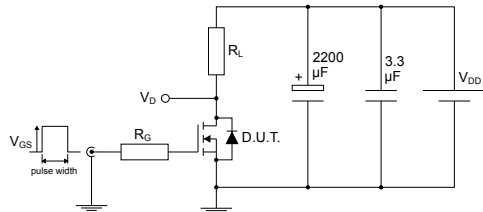
**Figure 10. Source-drain diode forward characteristics**



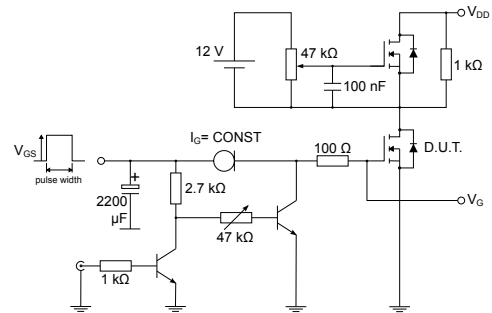
**Figure 11. Normalized V(BR)DSS vs temperature**



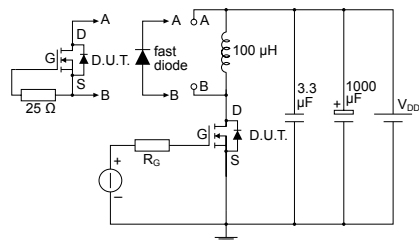
### 3 Test circuits

**Figure 12. Test circuit for resistive load switching times**


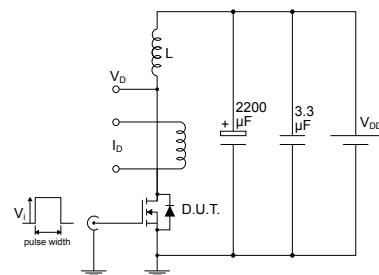
AM01468v1

**Figure 13. Test circuit for gate charge behavior**


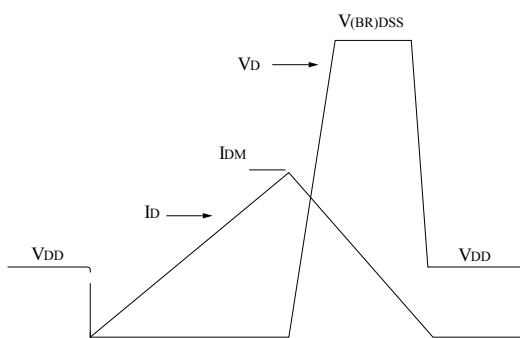
AM01469v1

**Figure 14. Test circuit for inductive load switching and diode recovery times**


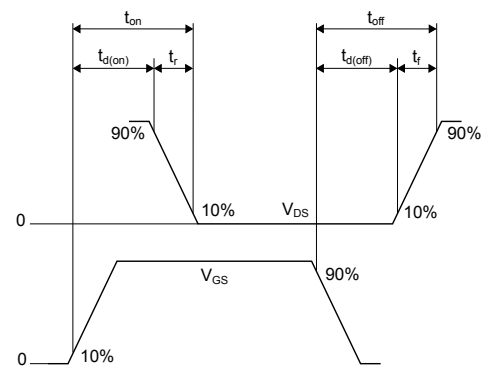
AM01470v1

**Figure 15. Unclamped inductive load test circuit**


AM01471v1

**Figure 16. Unclamped inductive waveform**


AM01472v1

**Figure 17. Switching time waveform**


AM01473v1

---

## 4 Package information

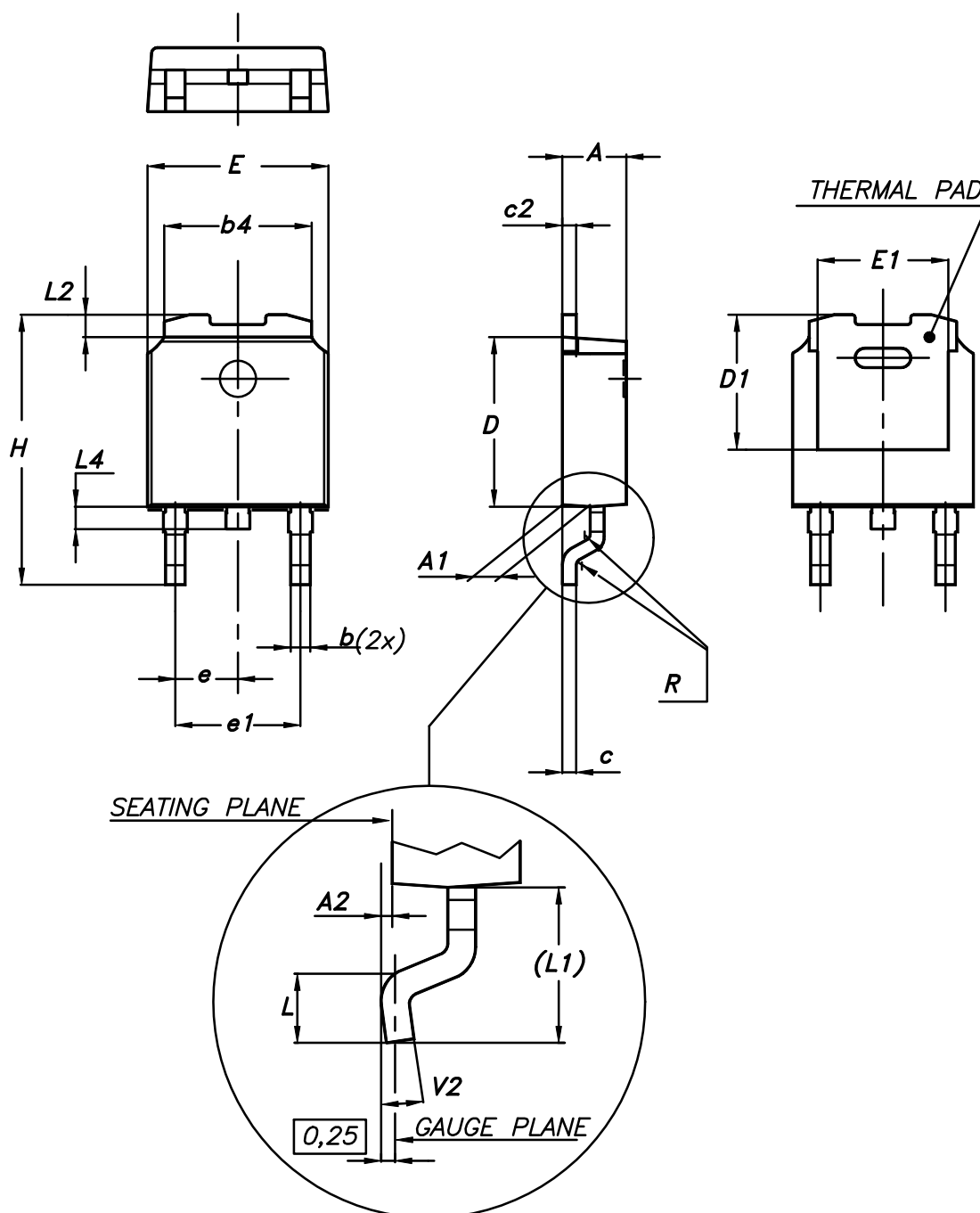
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In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.



## 4.1 DPAK (TO-252) type A package information

Figure 18. DPAK (TO-252) type A package outline



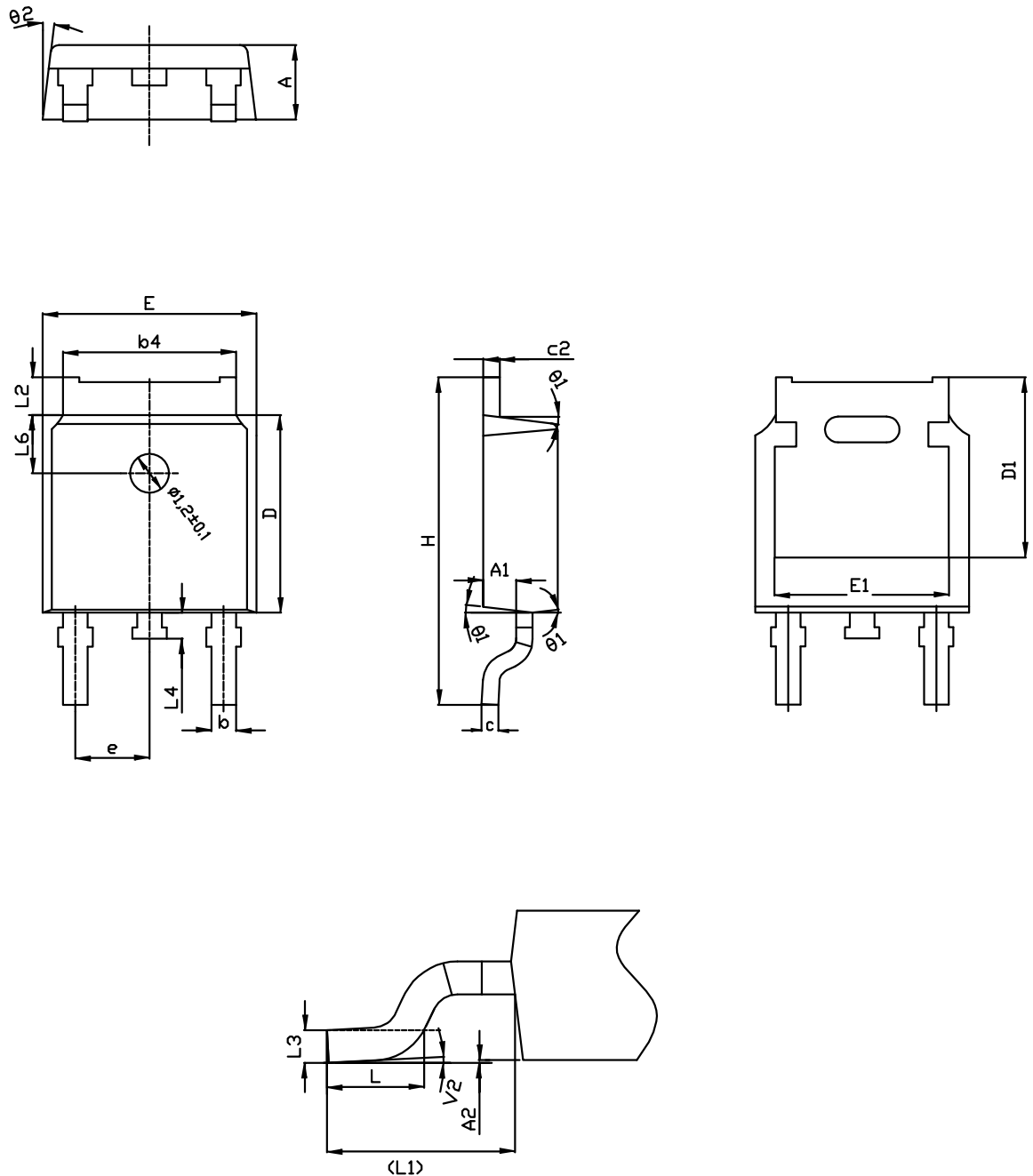
0068772\_A\_25

**Table 7. 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   | 4.95  | 5.10  | 5.25  |
| E    | 6.40  |       | 6.60  |
| E1   | 4.60  | 4.70  | 4.80  |
| e    | 2.159 | 2.286 | 2.413 |
| e1   | 4.445 | 4.572 | 4.699 |
| H    | 9.35  |       | 10.10 |
| L    | 1.00  |       | 1.50  |
| (L1) | 2.60  | 2.80  | 3.00  |
| L2   | 0.65  | 0.80  | 0.95  |
| L4   | 0.60  |       | 1.00  |
| R    |       | 0.20  |       |
| V2   | 0°    |       | 8°    |

## 4.2 DPAK (TO-252) type C2 package information

Figure 19. DPAK (TO-252) type C2 package outline

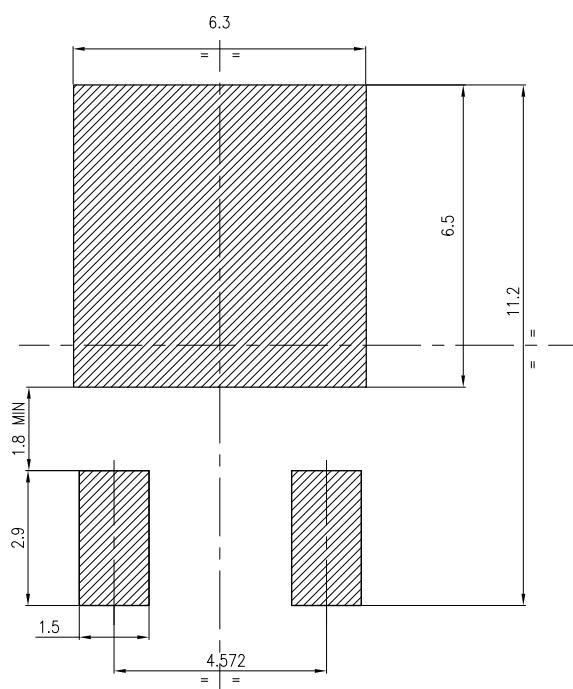


0068772\_C2\_25

**Table 8. DPAK (TO-252) type C2 mechanical data**

| Dim. | mm       |       |       |
|------|----------|-------|-------|
|      | Min.     | Typ.  | Max.  |
| A    | 2.20     | 2.30  | 2.38  |
| A1   | 0.90     | 1.01  | 1.10  |
| A2   | 0.00     |       | 0.10  |
| b    | 0.72     |       | 0.85  |
| b4   | 5.13     | 5.33  | 5.46  |
| c    | 0.47     |       | 0.60  |
| c2   | 0.47     |       | 0.60  |
| D    | 6.00     | 6.10  | 6.20  |
| D1   | 5.10     |       | 5.60  |
| E    | 6.50     | 6.60  | 6.70  |
| E1   | 5.20     |       | 5.50  |
| e    | 2.186    | 2.286 | 2.386 |
| H    | 9.80     | 10.10 | 10.40 |
| L    | 1.40     | 1.50  | 1.70  |
| L1   | 2.90 REF |       |       |
| L2   | 0.90     |       | 1.25  |
| L3   | 0.51 BSC |       |       |
| L4   | 0.60     | 0.80  | 1.00  |
| L6   | 1.80 BSC |       |       |
| θ1   | 5°       | 7°    | 9°    |
| θ2   | 5°       | 7°    | 9°    |
| V2   | 0°       |       | 8°    |

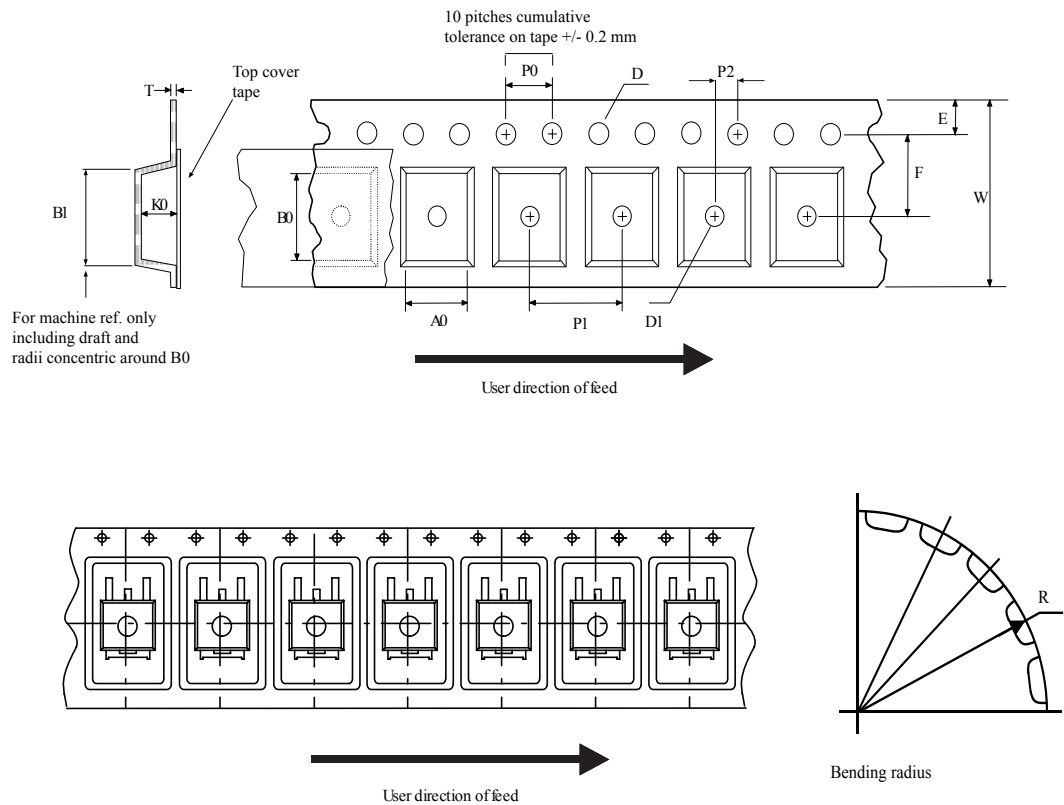
**Figure 20. DPAK (TO-252) recommended footprint (dimensions are in mm)**



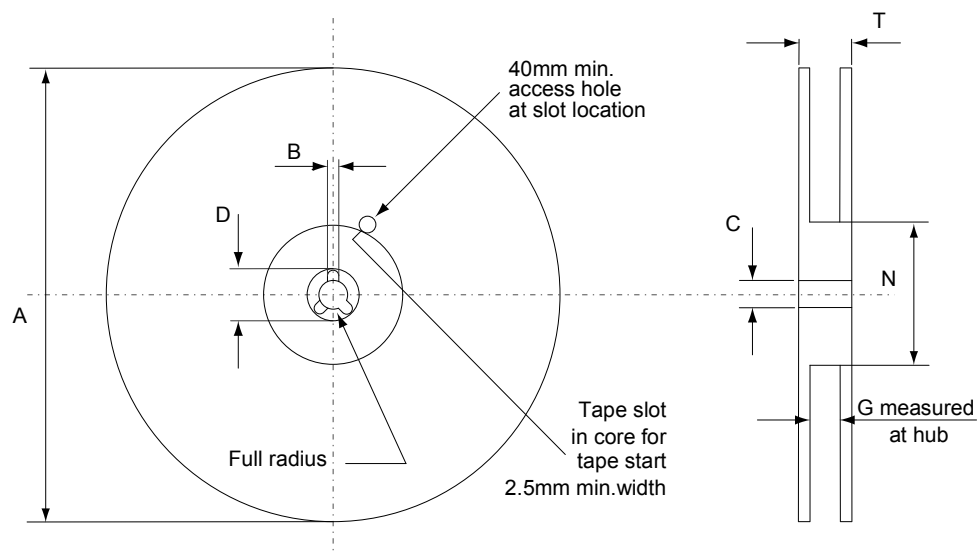
FP\_0068772\_25

### 4.3 DPAK (TO-252) packing information

**Figure 21. DPAK (TO-252) tape outline**



AM08852v1

**Figure 22. DPAK (TO-252) reel outline**


AM06038v1

**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 |           |      |      |

## Revision history

**Table 10. Document revision history**

| Date        | Version | Changes                                                                                                             |
|-------------|---------|---------------------------------------------------------------------------------------------------------------------|
| 21-Jun-2004 | 3       | Preliminary version                                                                                                 |
| 03-Jun-2006 | 4       | New template, no content change                                                                                     |
| 09-Aug-2018 | 5       | Updated information on cover page.<br>Updated <a href="#">Section 4 Package information</a> .<br>Minor text changes |



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