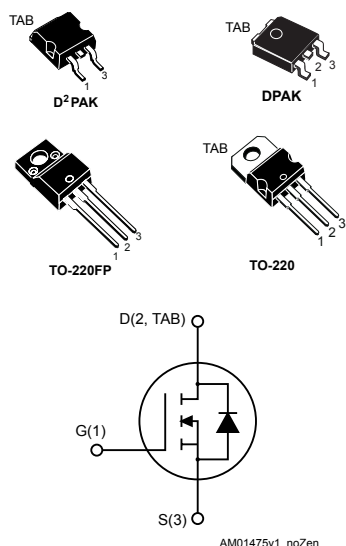


N-channel 650 V, 0.43  $\Omega$  typ., 9 A MDmesh™ M5 Power MOSFETs  
in a DPAK, D<sup>2</sup>PAK, TO-220FP and TO-220 packages



## Features

| Order code | $V_{DS}$ @<br>$T_{jmax.}$ | $R_{DS(on)max.}$ | $I_D$ |
|------------|---------------------------|------------------|-------|
| STB11N65M5 | 710 V                     | 0.48 $\Omega$    | 9 A   |
| STD11N65M5 |                           |                  |       |
| STF11N65M5 |                           |                  |       |
| STP11N65M5 |                           |                  |       |

- Extremely low  $R_{DS(on)}$
- Low gate charge and input capacitance
- Excellent switching performance
- 100% avalanche tested

## Applications

- Switching applications

## Description

These devices are N-channel Power MOSFET based on the MDmesh™ M5 innovative vertical process technology combined with the well-known PowerMESH™ horizontal layout. The resulting products offer extremely low on-resistance, making them particularly suitable for applications requiring high power and superior efficiency.

| Product status |
|----------------|
| STB11N65M5     |
| STD11N65M5     |
| STF11N65M5     |
| STP11N65M5     |

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol                         | Parameter                                                                                                       | Value                                |                    | Unit |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------|------|
|                                |                                                                                                                 | D <sup>2</sup> PAK<br>DPAK<br>TO-220 | TO-220FP           |      |
| V <sub>GS</sub>                | Gate-source voltage                                                                                             | ±25                                  |                    | V    |
| I <sub>D</sub>                 | Drain current (continuous) at T <sub>C</sub> = 25 °C                                                            | 9                                    | 9 <sup>(1)</sup>   | A    |
| I <sub>D</sub>                 | Drain current (continuous) at T <sub>C</sub> = 100 °C                                                           | 5.6                                  | 5.6 <sup>(1)</sup> | A    |
| I <sub>DM</sub> <sup>(2)</sup> | Drain current (pulsed)                                                                                          | 36                                   | 36 <sup>(1)</sup>  | A    |
| P <sub>TOT</sub>               | Total dissipation at T <sub>C</sub> = 25 °C                                                                     | 85                                   | 25                 | W    |
| dv/dt <sup>(3)</sup>           | Peak diode recovery voltage slope                                                                               | 15                                   |                    | V/ns |
| V <sub>ISO</sub>               | Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; T <sub>C</sub> = 25 °C) |                                      | 2500               | V    |
| T <sub>J</sub>                 | Operating junction temperature range                                                                            | -55 to 150                           |                    | °C   |
| T <sub>stg</sub>               | Storage temperature range                                                                                       |                                      |                    |      |

1. Limited by maximum junction temperature.
2. Pulse width limited by safe operating area.
3.  $I_{SD} \leq 9\text{ A}$ ,  $di/dt \leq 400\text{ A}/\mu\text{s}$ ;  $V_{DS\text{ peak}} < V_{(BR)DSS}$ ,  $V_{DD} = 400\text{ V}$ .

**Table 2. Thermal data**

| Symbol                              | Parameter                           | Value              |      |          |        | Unit |
|-------------------------------------|-------------------------------------|--------------------|------|----------|--------|------|
|                                     |                                     | D <sup>2</sup> PAK | DPAK | TO-220FP | TO-220 |      |
| R <sub>thj-case</sub>               | Thermal resistance junction-case    | 1.47               |      | 5.0      | 1.47   | °C/W |
| R <sub>thj-amb</sub>                | Thermal resistance junction-ambient |                    |      | 62.5     |        | °C/W |
| R <sub>thj-pcb</sub> <sup>(1)</sup> | Thermal resistance junction-pcb     | 30                 | 50   |          |        | °C/W |

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

**Table 3. Avalanche characteristics**

| Symbol          | Parameter                                                                                                                  | Value | Unit |
|-----------------|----------------------------------------------------------------------------------------------------------------------------|-------|------|
| I <sub>AR</sub> | Avalanche current, repetitive or not-repetitive (pulse width limited by T <sub>J</sub> Max)                                | 2     | A    |
| E <sub>AS</sub> | Single pulse avalanche energy (starting T <sub>J</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V) | 130   | mJ   |

## 2 Electrical characteristics

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

**Table 4. On/off states**

| Symbol        | Parameter                         | Test condition                                                                                 | Min. | Typ. | Max.      | Unit          |
|---------------|-----------------------------------|------------------------------------------------------------------------------------------------|------|------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown voltage    | $I_D = 1\text{ mA}$ , $V_{GS} = 0\text{ V}$                                                    | 650  |      |           | V             |
| $I_{DSS}$     | Zero gate voltage drain current   | $V_{GS} = 0\text{ V}$ , $V_{DS} = 650\text{ V}$                                                |      |      | 1         | $\mu\text{A}$ |
|               |                                   | $V_{GS} = 0\text{ V}$ , $V_{DS} = 650\text{ V}$ ,<br>$T_C = 125\text{ }^{\circ}\text{C}^{(1)}$ |      |      | 100       | $\mu\text{A}$ |
| $I_{GSS}$     | Gate body leakage current         | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 25\text{ V}$                                             |      |      | $\pm 100$ | nA            |
| $V_{GS(th)}$  | Gate threshold voltage            | $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$                                             | 3    | 4    | 5         | V             |
| $R_{DS(on)}$  | Static drain-source on resistance | $V_{GS} = 10\text{ V}$ , $I_D = 4.5\text{ A}$                                                  |      | 0.43 | 0.48      | $\Omega$      |

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

**Table 5. Dynamic**

| Symbol            | Parameter                             | Test condition                                                       | Min. | Typ. | Max. | Unit     |
|-------------------|---------------------------------------|----------------------------------------------------------------------|------|------|------|----------|
| $C_{iss}$         | Input capacitance                     | $V_{DS} = 100\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$ | -    | 644  | -    | pF       |
| $C_{oss}$         | Output capacitance                    |                                                                      |      | 18   |      |          |
| $C_{rss}$         | Reverse transfer capacitance          |                                                                      |      | 2.5  |      |          |
| $C_{o(tr)}^{(1)}$ | Equivalent capacitance time related   | $V_{DS} = 0\text{ to }520\text{ V}$ , $V_{GS} = 0\text{ V}$          | -    | 55   | -    | pF       |
| $C_{o(er)}^{(2)}$ | Equivalent capacitance energy related |                                                                      | -    | 17   | -    | pF       |
| $R_g$             | Gate input resistance                 | $f = 1\text{ MHz}$ open drain                                        | -    | 5    | -    | $\Omega$ |
| $Q_g$             | Total gate charge                     | $V_{DD} = 520\text{ V}$ , $I_D = 4.5\text{ A}$ ,                     | -    | 17   | -    | nC       |
| $Q_{gs}$          | Gate-source charge                    | $V_{GS} = 0\text{ to }10\text{ V}$                                   |      | 4.6  |      |          |
| $Q_{gd}$          | Gate-drain charge                     | (see Figure 20. Test circuit for gate charge behavior)               |      | 8.5  |      |          |

1. Time related is defined as a constant equivalent capacitance giving the same charging time as  $C_{oss}$  when  $V_{DS}$  increases from 0 to 80%  $V_{DSS}$ .

2. Energy related is defined as a constant equivalent capacitance giving the same stored energy as  $C_{oss}$  when  $V_{DS}$  increases from 0 to 80%  $V_{DSS}$ .

**Table 6. Switching times**

| Symbol       | Parameter          | Test condition                                                                                                                                                                                                                       | Min. | Typ. | Max. | Unit |
|--------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{d(v)}$   | Voltage delay time | $V_{DD} = 400\text{ V}$ , $I_D = 7.5\text{ A}$ ,<br>$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$<br>(see Figure 21. Test circuit for inductive load switching and diode recovery times and Figure 24. Switching time waveform) | -    | 23   | -    | ns   |
| $t_{r(v)}$   | Voltage rise time  |                                                                                                                                                                                                                                      |      | 10   |      |      |
| $t_{c(off)}$ | Crossing time      |                                                                                                                                                                                                                                      |      | 13   |      |      |
| $t_{f(i)}$   | Fall time          |                                                                                                                                                                                                                                      |      | 13.5 |      |      |

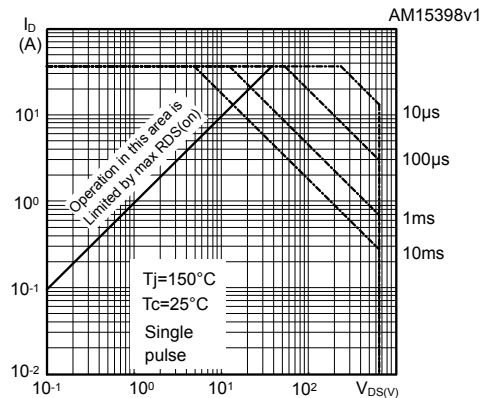
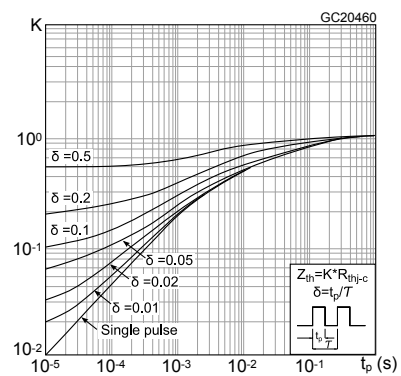
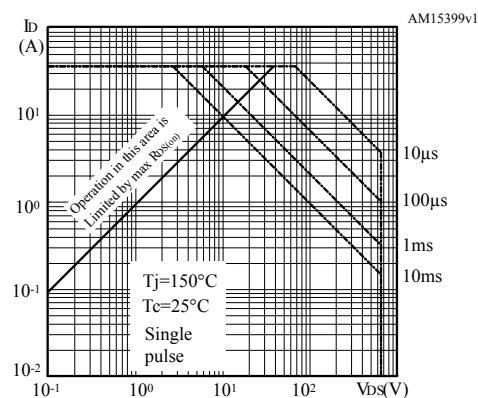
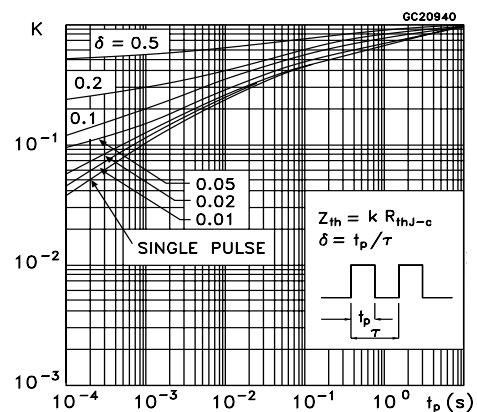
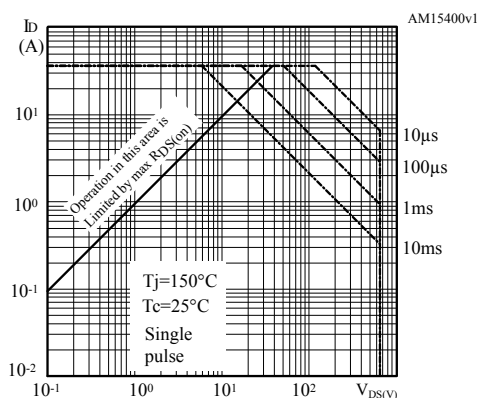
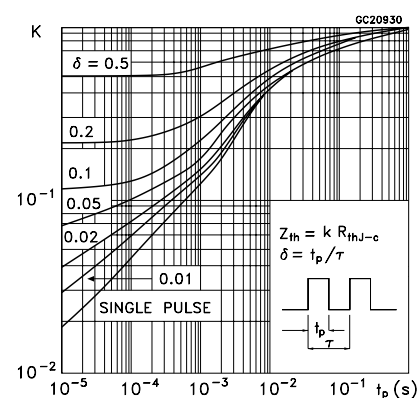
**Table 7. Source drain diode**

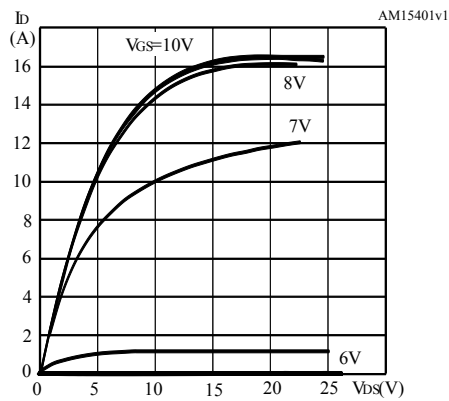
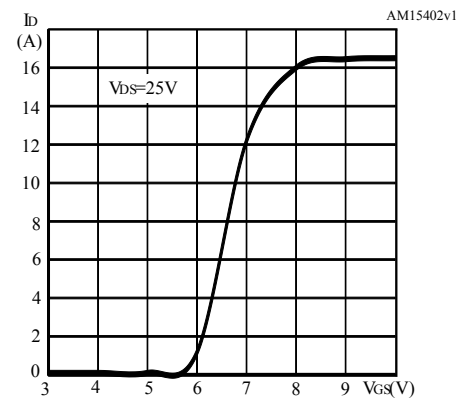
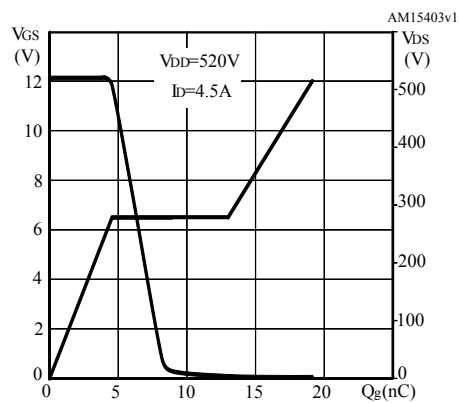
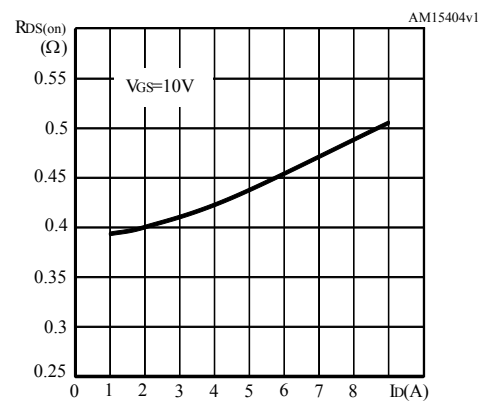
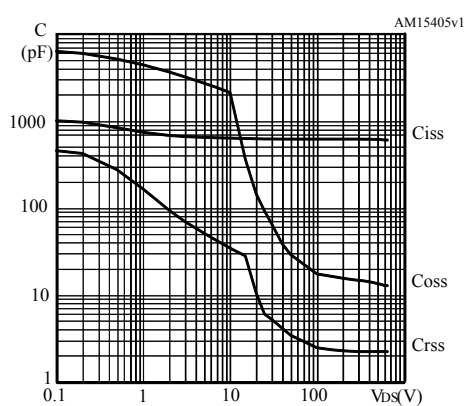
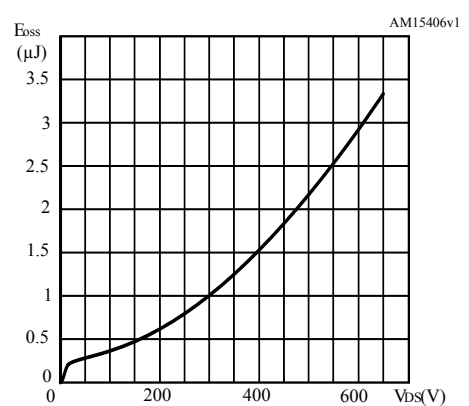
| Symbol          | Parameter                     | Test condition                                                                                                                                                                                                | Min. | Typ. | Max. | Unit          |
|-----------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{SD}$        | Source-drain current          |                                                                                                                                                                                                               | -    |      | 9    | A             |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) |                                                                                                                                                                                                               |      |      | 36   |               |
| $V_{SD}^{(2)}$  | Forward on voltage            | $I_{SD} = 9\text{ A}$ , $V_{GS} = 0\text{ V}$                                                                                                                                                                 | -    |      | 1.5  | V             |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 9\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 100\text{ V}$<br>(see Figure 21. Test circuit for inductive load switching and diode recovery times)                                  | -    | 232  |      | ns            |
| $Q_{rr}$        | Reverse recovery charge       |                                                                                                                                                                                                               |      | 2    |      | $\mu\text{C}$ |
| $I_{RRM}$       | Reverse recovery current      |                                                                                                                                                                                                               |      | 17.5 |      | A             |
| $t_{rr}$        | Reverse recovery time         | $I_{SD} = 9\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$<br>$V_{DD} = 100\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ (see Figure 21. Test circuit for inductive load switching and diode recovery times) | -    | 328  |      | ns            |
| $Q_{rr}$        | Reverse recovery charge       |                                                                                                                                                                                                               |      | 2.8  |      | $\mu\text{C}$ |
| $I_{RRM}$       | Reverse recovery current      |                                                                                                                                                                                                               |      | 17   |      | A             |

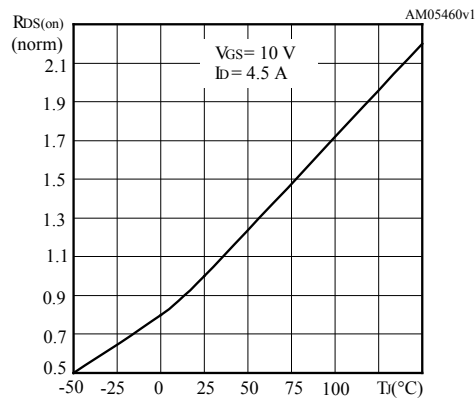
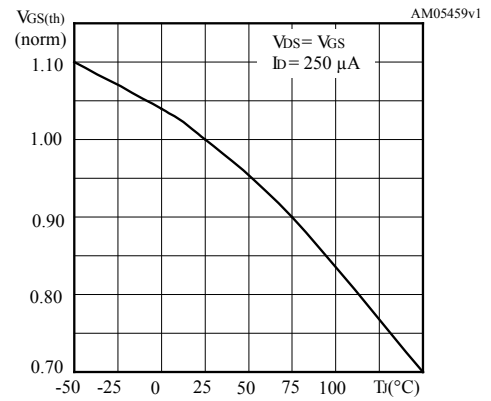
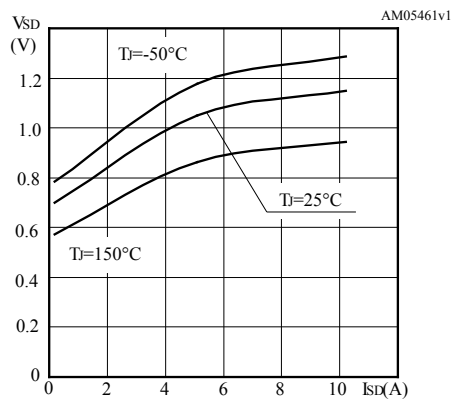
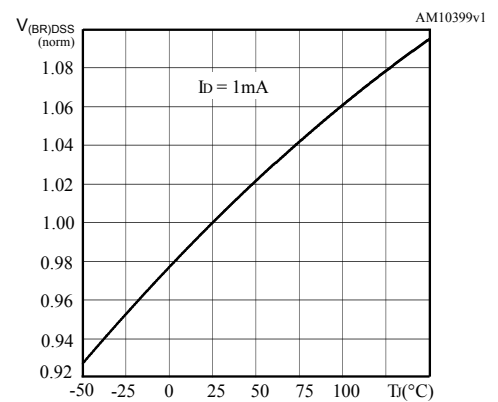
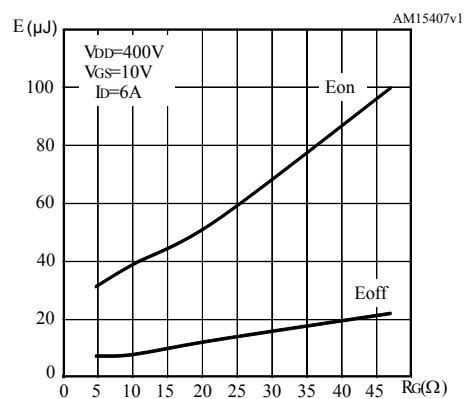
1. Pulse width limited by safe operating area.

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

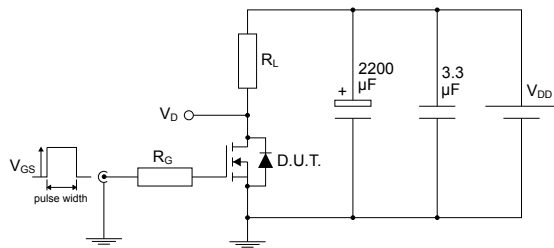
## 2.1 Electrical characteristics curves

**Figure 1. Safe operating area for DPAK**

**Figure 2. Thermal impedance DPAK**

**Figure 3. Safe operating area for TO-220FP**

**Figure 4. Thermal impedance for TO-220FP**

**Figure 5. Safe operating area for TO-220 and D<sup>2</sup>PAK**

**Figure 6. Thermal impedance for TO-220 and D<sup>2</sup>PAK**


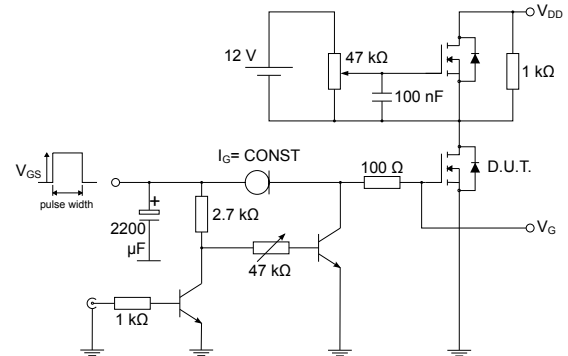
**Figure 8. Output characteristics**

**Figure 9. Transfer characteristics**

**Figure 10. Gate charge vs gate-source voltage**

**Figure 11. Static drain-source on resistance**

**Figure 12. Capacitance variations**

**Figure 13. Output capacitance stored energy**


**Figure 14. Normalized on-resistance vs temperature**

**Figure 15. Normalized gate threshold voltage vs temperature**

**Figure 16. Drain-source diode forward characteristics**

**Figure 17. Normalized  $V_{(BR)DSS}$  vs temperature**

**Figure 18. Switching energy vs gate resistance**


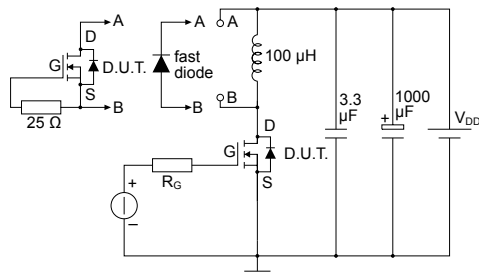
### 3 Test circuits

**Figure 19. Test circuit for resistive load switching times**


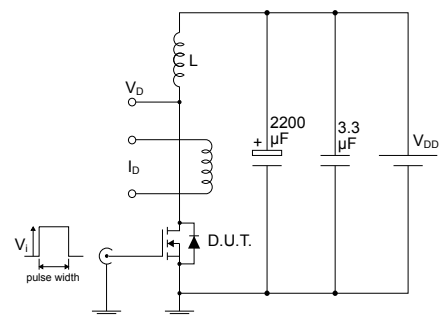
AM01468v1

**Figure 20. Test circuit for gate charge behavior**


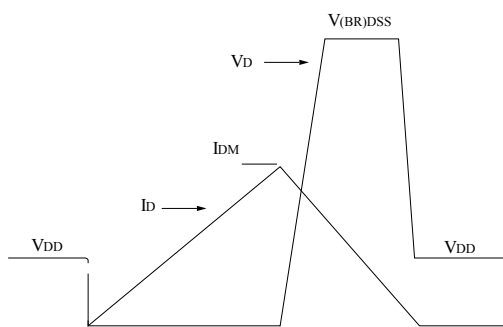
AM01469v1

**Figure 21. Test circuit for inductive load switching and diode recovery times**


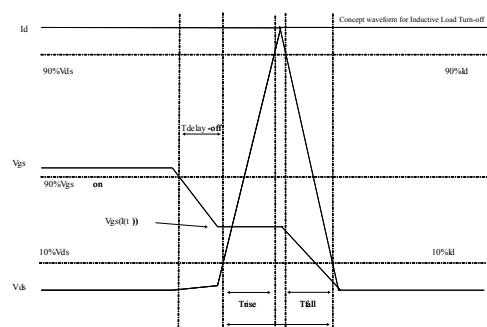
AM01470v1

**Figure 22. Unclamped inductive load test circuit**


AM01471v1

**Figure 23. Unclamped inductive waveform**


AM01472v1

**Figure 24. Switching time waveform**


AM05540v2\_for\_M5



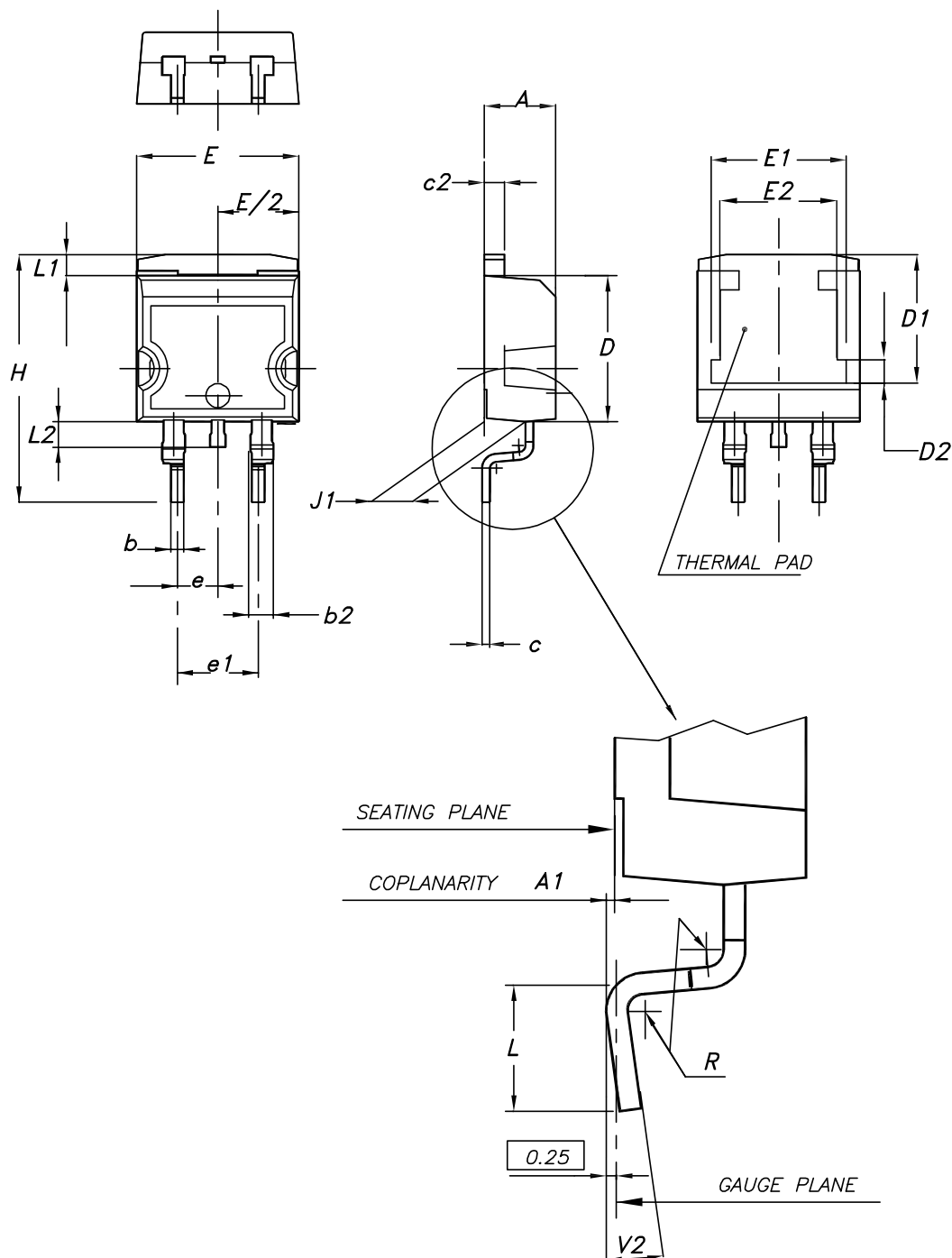
## **4 Package information**

---

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 D<sup>2</sup>PAK (TO-263) type A package information

Figure 25. D<sup>2</sup>PAK (TO-263) type A package outline

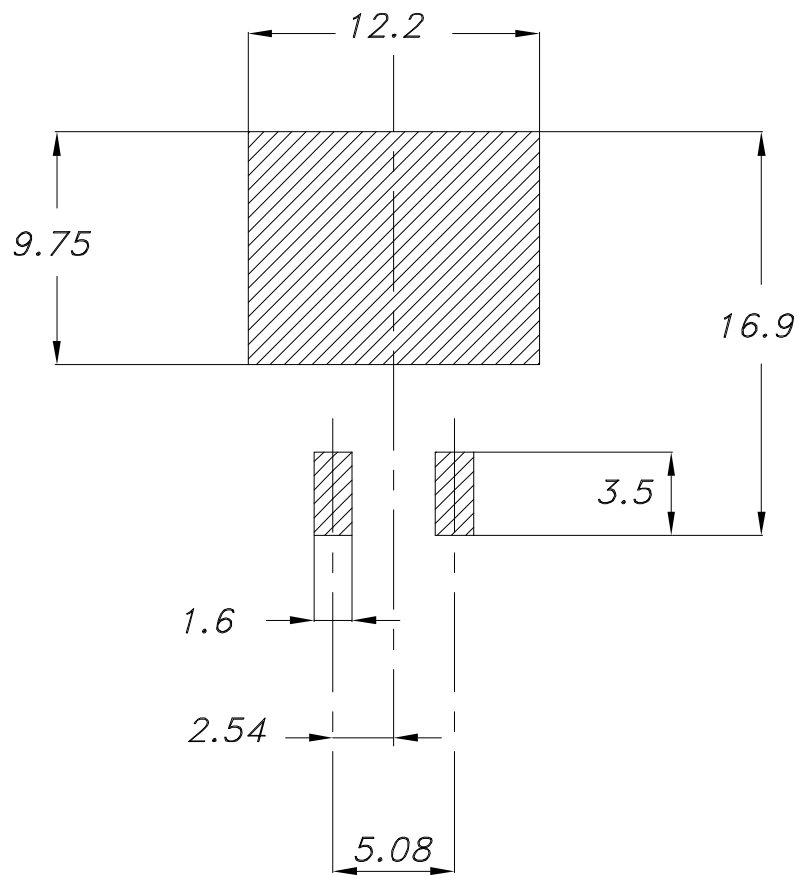


0079457\_25

**Table 8. D<sup>2</sup>PAK (TO-263) type A package mechanical data**

| Dim. | mm    |      |       |
|------|-------|------|-------|
|      | Min.  | Typ. | Max.  |
| A    | 4.40  |      | 4.60  |
| A1   | 0.03  |      | 0.23  |
| b    | 0.70  |      | 0.93  |
| b2   | 1.14  |      | 1.70  |
| c    | 0.45  |      | 0.60  |
| c2   | 1.23  |      | 1.36  |
| D    | 8.95  |      | 9.35  |
| D1   | 7.50  | 7.75 | 8.00  |
| D2   | 1.10  | 1.30 | 1.50  |
| E    | 10.00 |      | 10.40 |
| E1   | 8.30  | 8.50 | 8.70  |
| E2   | 6.85  | 7.05 | 7.25  |
| e    |       | 2.54 |       |
| e1   | 4.88  |      | 5.28  |
| H    | 15.00 |      | 15.85 |
| J1   | 2.49  |      | 2.69  |
| L    | 2.29  |      | 2.79  |
| L1   | 1.27  |      | 1.40  |
| L2   | 1.30  |      | 1.75  |
| R    |       | 0.40 |       |
| V2   | 0°    |      | 8°    |

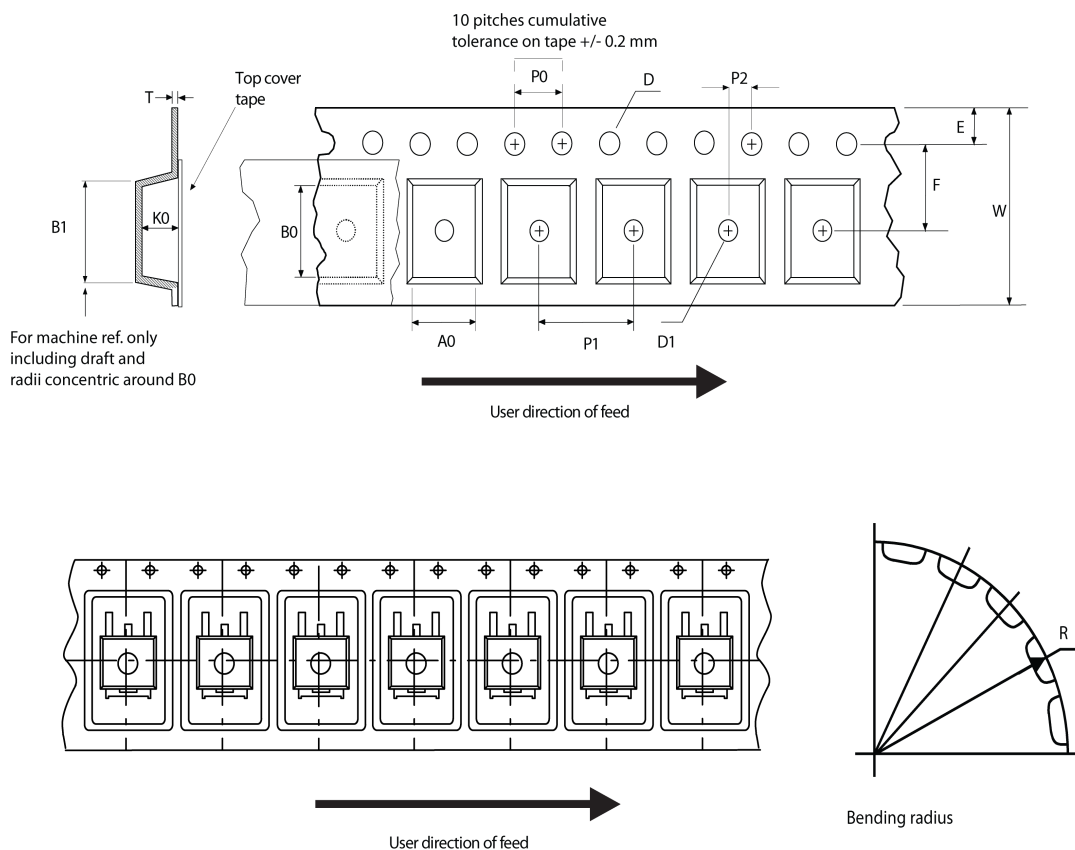
**Figure 26. D<sup>2</sup>PAK (TO-263) recommended footprint (dimensions are in mm)**



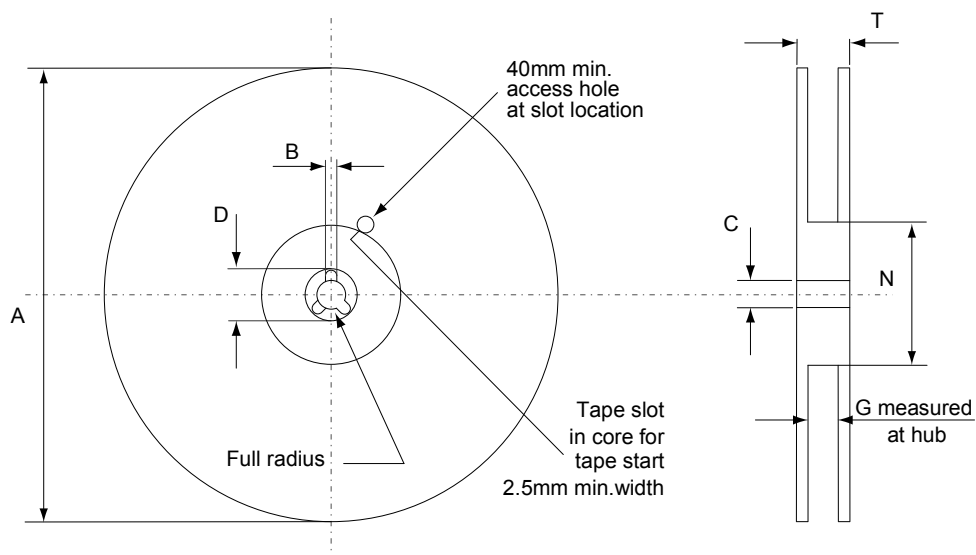
Footprint

## 4.2 D<sup>2</sup>PAK packing information

**Figure 27. D<sup>2</sup>PAK tape outline**



AM08852v1

**Figure 28. D<sup>2</sup>PAK reel outline**


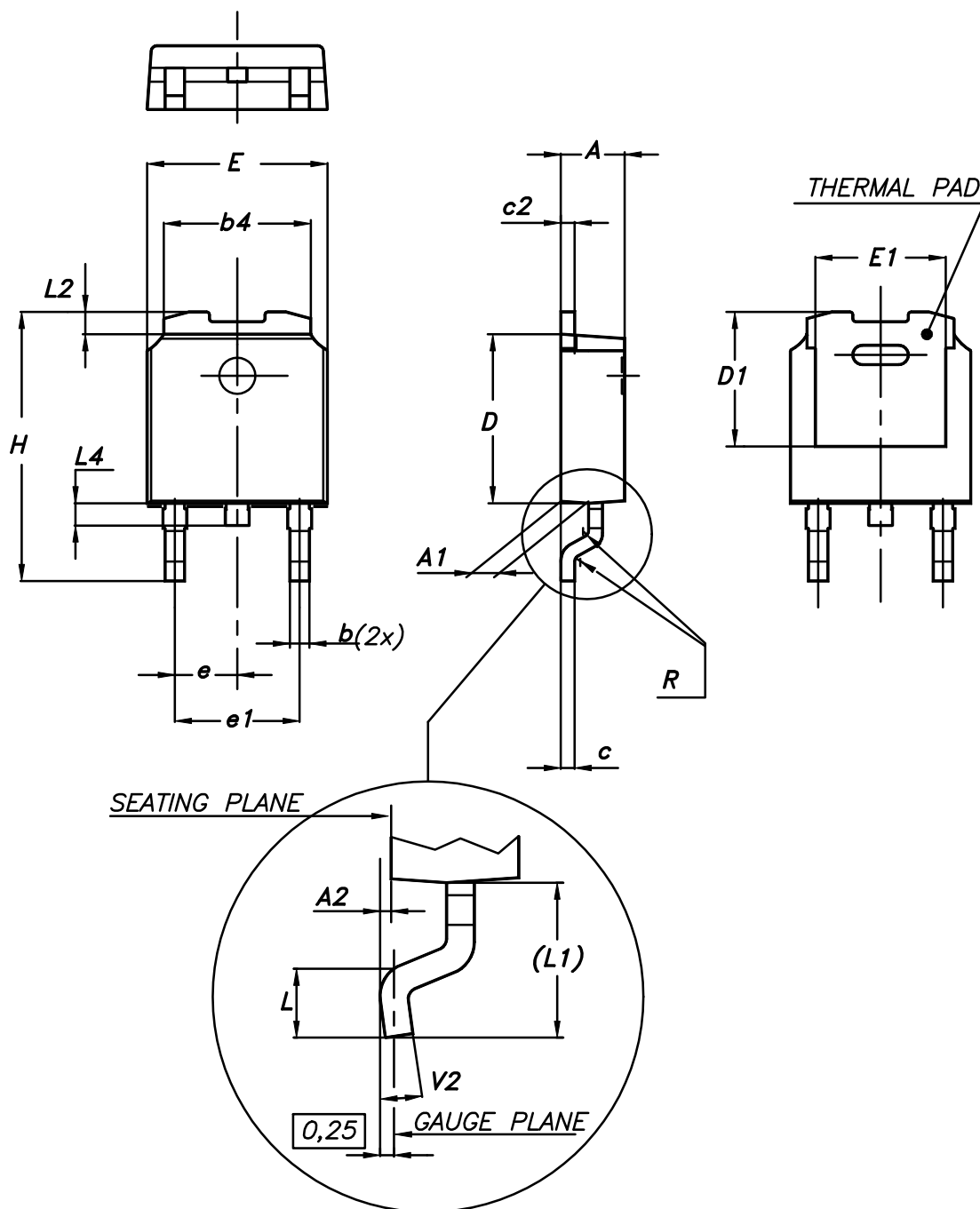
AM06038v1

**Table 9. D<sup>2</sup>PAK tape and reel mechanical data**

| Tape |      |      | Reel          |      |      |
|------|------|------|---------------|------|------|
| Dim. | mm   |      | Dim.          | mm   |      |
|      | Min. | Max. |               | Min. | Max. |
| A0   | 10.5 | 10.7 | A             |      | 330  |
| B0   | 15.7 | 15.9 | B             | 1.5  |      |
| D    | 1.5  | 1.6  | C             | 12.8 | 13.2 |
| D1   | 1.59 | 1.61 | D             | 20.2 |      |
| E    | 1.65 | 1.85 | G             | 24.4 | 26.4 |
| F    | 11.4 | 11.6 | N             | 100  |      |
| K0   | 4.8  | 5.0  | T             |      | 30.4 |
| P0   | 3.9  | 4.1  |               |      |      |
| P1   | 11.9 | 12.1 | Base quantity |      | 1000 |
| P2   | 1.9  | 2.1  | Bulk quantity |      | 1000 |
| R    | 50   |      |               |      |      |
| T    | 0.25 | 0.35 |               |      |      |
| W    | 23.7 | 24.3 |               |      |      |

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

Figure 29. DPAK (TO-252) type A package outline



0068772\_A\_25

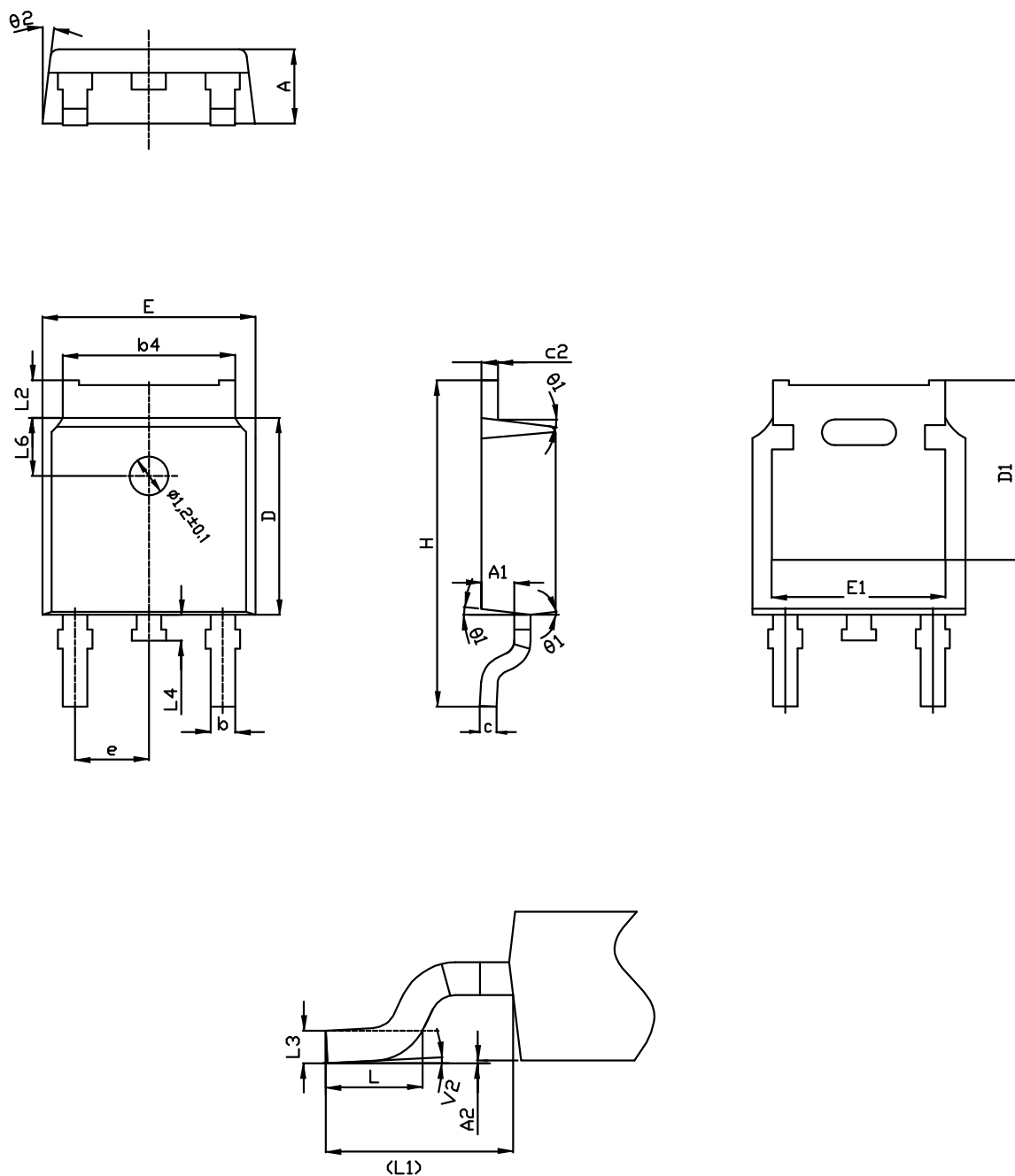
**Table 10. DPAK (TO-252) type A mechanical data**

| 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°    |



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

Figure 30. DPAK (TO-252) type C2 package outline



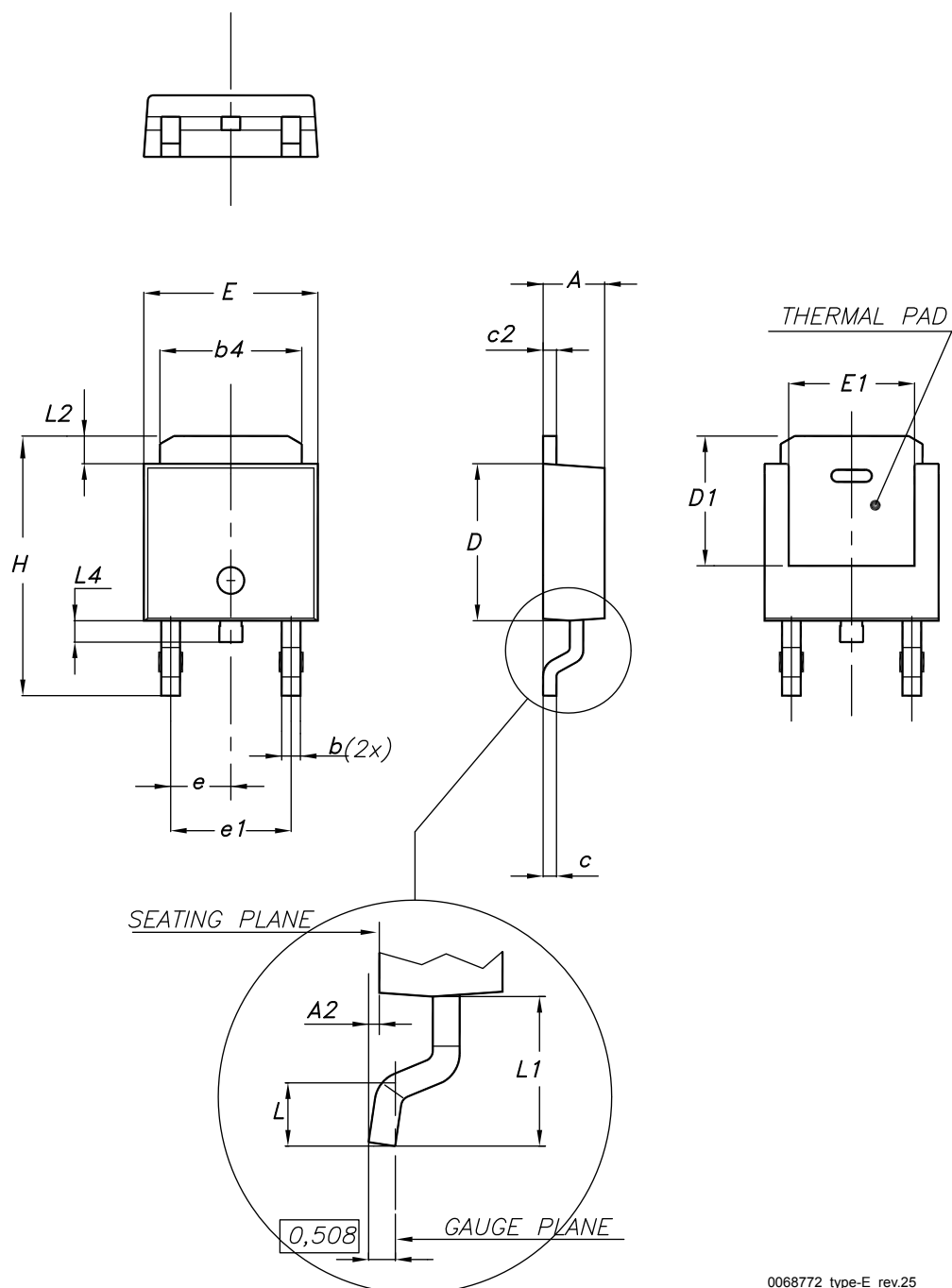
0068772\_C2\_25

**Table 11. 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°    |

## 4.5 DPAK (TO-252) type E package information

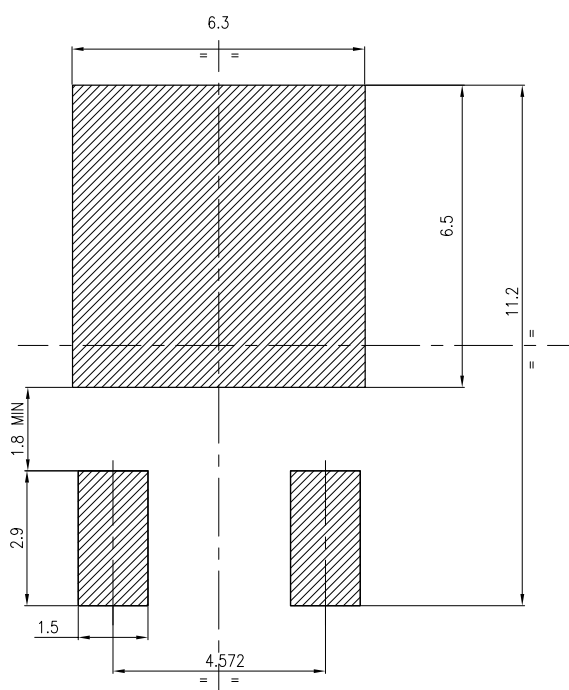
Figure 31. DPAK (TO-252) type E package outline



0068772\_type-E\_rev.25

**Table 12. DPAK (TO-252) type E mechanical data**

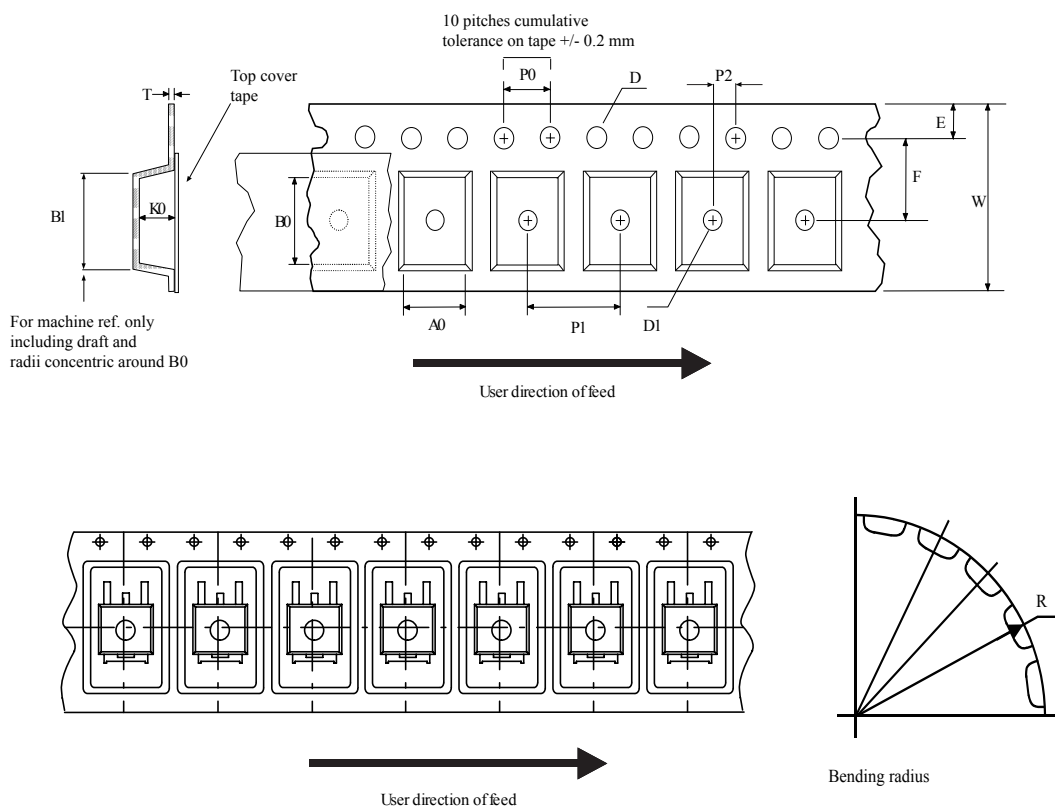
| Dim. | mm   |       |       |
|------|------|-------|-------|
|      | Min. | Typ.  | Max.  |
| A    | 2.18 |       | 2.39  |
| A2   |      |       | 0.13  |
| b    | 0.65 |       | 0.884 |
| b4   | 4.95 |       | 5.46  |
| c    | 0.46 |       | 0.61  |
| c2   | 0.46 |       | 0.60  |
| D    | 5.97 |       | 6.22  |
| D1   | 5.21 |       |       |
| E    | 6.35 |       | 6.73  |
| E1   | 4.32 |       |       |
| e    |      | 2.286 |       |
| e1   |      | 4.572 |       |
| H    | 9.94 |       | 10.34 |
| L    | 1.50 |       | 1.78  |
| L1   |      | 2.74  |       |
| L2   | 0.89 |       | 1.27  |
| L4   |      |       | 1.02  |

**Figure 32. DPAK (TO-252) recommended footprint (dimensions are in mm)**


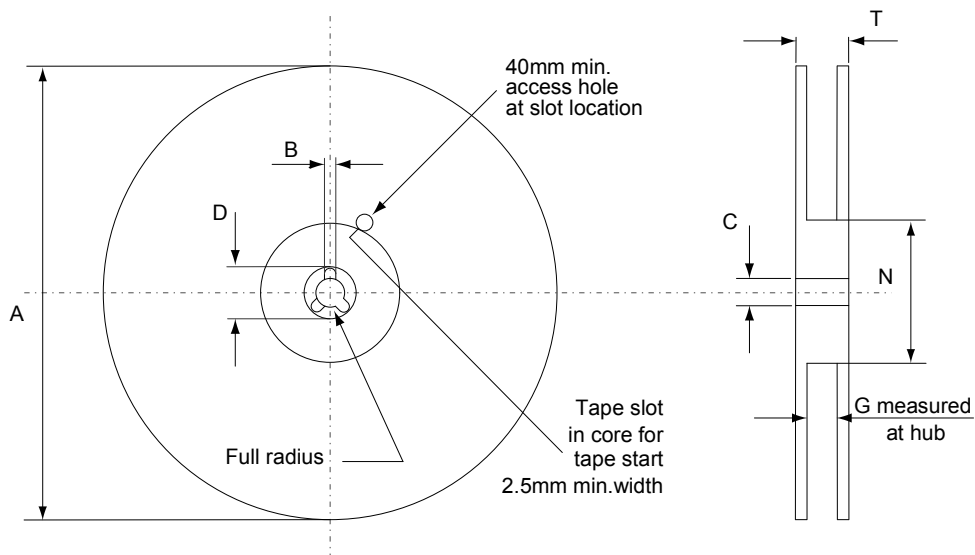
FP\_0068772\_25

## 4.6 DPAK (TO-252) packing information

**Figure 33. DPAK (TO-252) tape outline**



AM08852v1

**Figure 34. DPAK (TO-252) reel outline**


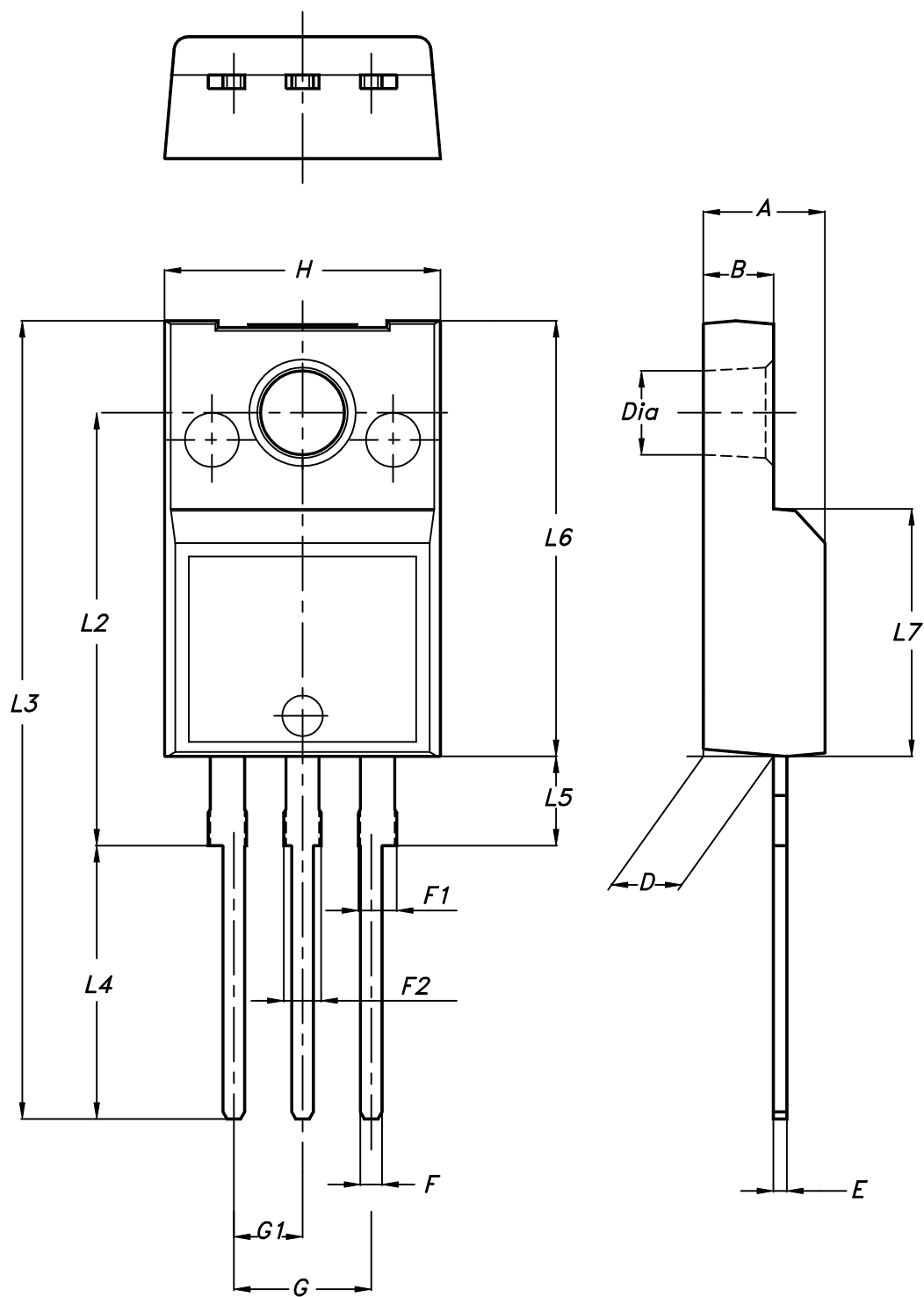
AM06038v1

**Table 13. 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 |           |      |      |

## 4.7 TO-220FP package information

Figure 35. TO-220FP package outline



7012510\_Rev\_12\_B

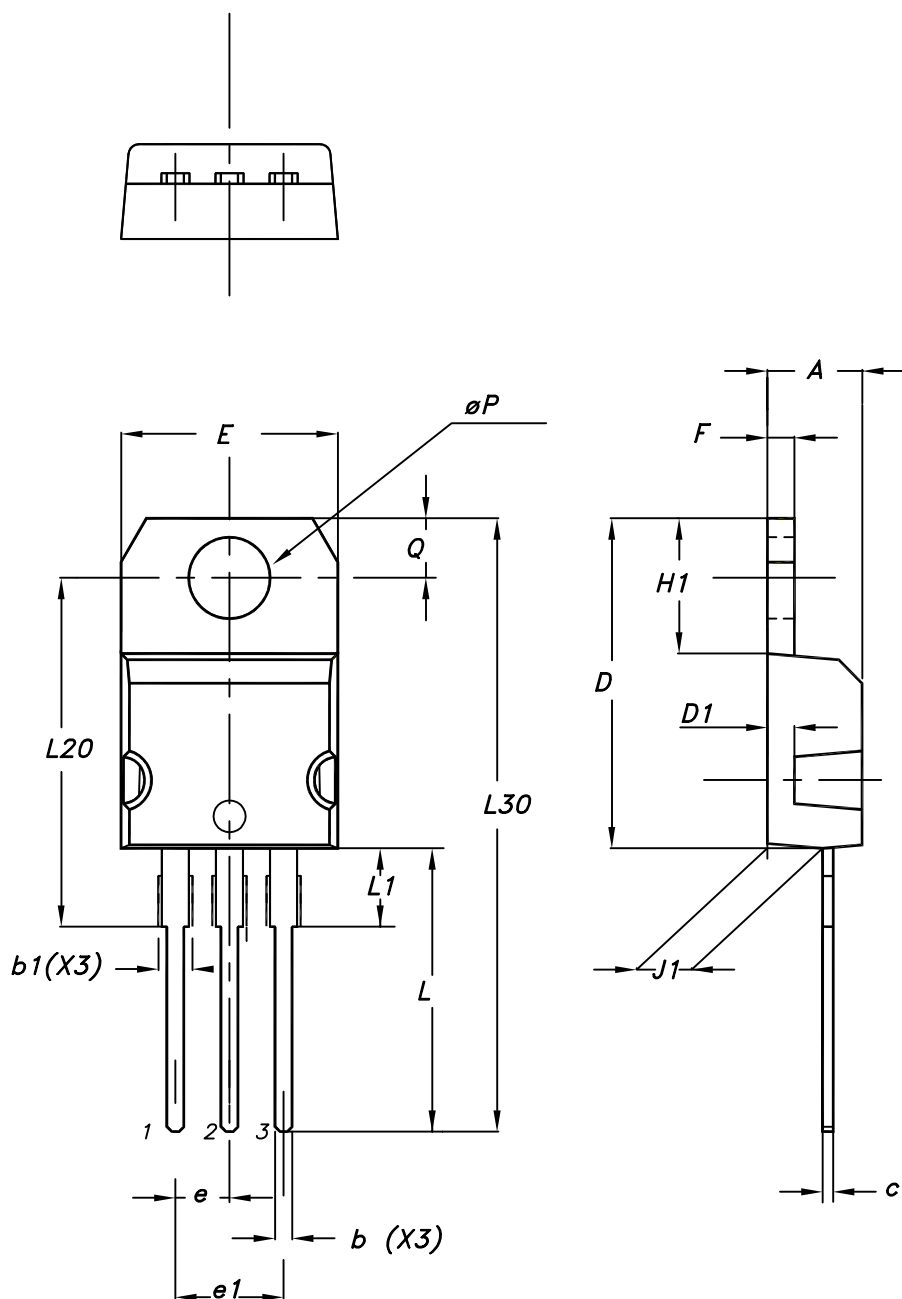
**Table 14. TO-220FP package mechanical data**

| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 4.4  |      | 4.6  |
| B    | 2.5  |      | 2.7  |
| D    | 2.5  |      | 2.75 |
| E    | 0.45 |      | 0.7  |
| F    | 0.75 |      | 1    |
| F1   | 1.15 |      | 1.70 |
| F2   | 1.15 |      | 1.70 |
| G    | 4.95 |      | 5.2  |
| G1   | 2.4  |      | 2.7  |
| H    | 10   |      | 10.4 |
| L2   |      | 16   |      |
| L3   | 28.6 |      | 30.6 |
| L4   | 9.8  |      | 10.6 |
| L5   | 2.9  |      | 3.6  |
| L6   | 15.9 |      | 16.4 |
| L7   | 9    |      | 9.3  |
| Dia  | 3    |      | 3.2  |



## 4.8 TO-220 type A package information

Figure 36. TO-220 type A package outline



0015988\_typeA\_Rev\_21

**Table 15. TO-220 type A package mechanical data**

| Dim. | mm    |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 4.40  |       | 4.60  |
| b    | 0.61  |       | 0.88  |
| b1   | 1.14  |       | 1.55  |
| c    | 0.48  |       | 0.70  |
| D    | 15.25 |       | 15.75 |
| D1   |       | 1.27  |       |
| E    | 10.00 |       | 10.40 |
| e    | 2.40  |       | 2.70  |
| e1   | 4.95  |       | 5.15  |
| F    | 1.23  |       | 1.32  |
| H1   | 6.20  |       | 6.60  |
| J1   | 2.40  |       | 2.72  |
| L    | 13.00 |       | 14.00 |
| L1   | 3.50  |       | 3.93  |
| L20  |       | 16.40 |       |
| L30  |       | 28.90 |       |
| øP   | 3.75  |       | 3.85  |
| Q    | 2.65  |       | 2.95  |

## 5 Ordering information

**Table 16. Order codes**

| Order code | Marking | Package            | Packing       |
|------------|---------|--------------------|---------------|
| STB11N65M5 | 11N65M5 | D <sup>2</sup> PAK | Tape and reel |
| STD11N65M5 |         | DPAK               |               |
| STF11N65M5 |         | TO-220FP           | Tube          |
| STP11N65M5 |         | TO-220             |               |

## Revision history

**Table 17. Document revision history**

| Date        | Version | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23-Feb-2012 | 1       | First release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 03-Dec-2012 | 2       | <ul style="list-style-type: none"> <li>– Minor text changes in cover page</li> <li>– Added IPAK packages</li> <li>– Added <i>Section 2.1: Electrical characteristics (curves)</i></li> <li>– Updated <i>Section 5: Packaging mechanical data</i></li> <li>– Modified: <i>note 2</i> on <i>Table 2</i></li> <li>– Updated: mechanical data for TO-220FP package</li> </ul>                                                                                                     |
| 02-May-2018 | 3       | <p>The part number STU11N65M5 has been moved to a separate datasheet.</p> <p>Removed maturity status indication from cover page. The document status is production data.</p> <p>Updated title and features in cover page, <a href="#">Section 1 Electrical ratings</a>, <a href="#">Section 2 Electrical characteristics</a>, <a href="#">Section 2.1 Electrical characteristics curves</a> and <a href="#">Section 4 Package information</a>.</p> <p>Minor text changes.</p> |

## Contents

|          |                                                              |           |
|----------|--------------------------------------------------------------|-----------|
| <b>1</b> | <b>Electrical ratings .....</b>                              | <b>2</b>  |
| <b>2</b> | <b>Electrical characteristics.....</b>                       | <b>3</b>  |
| 2.1      | Electrical characteristics curves .....                      | 5         |
| <b>3</b> | <b>Test circuits .....</b>                                   | <b>8</b>  |
| <b>4</b> | <b>Package information.....</b>                              | <b>9</b>  |
| 4.1      | D <sup>2</sup> PAK (TO-263) type A package information ..... | 9         |
| 4.2      | D <sup>2</sup> PAK packing information .....                 | 12        |
| 4.3      | DPAK (TO-252) type A package information .....               | 14        |
| 4.4      | DPAK (TO-252) type C2 package information.....               | 16        |
| 4.5      | DPAK (TO-252) type E package information .....               | 18        |
| 4.6      | DPAK (TO-252) packing information.....                       | 20        |
| 4.7      | TO-220FP package information .....                           | 22        |
| 4.8      | TO-220 type A package information .....                      | 24        |
| <b>5</b> | <b>Ordering information .....</b>                            | <b>27</b> |
|          | <b>Revision history .....</b>                                | <b>28</b> |

**IMPORTANT NOTICE – PLEASE READ CAREFULLY**

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9