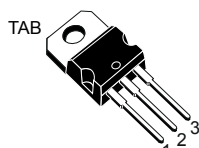
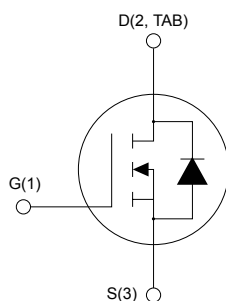


## Automotive N-channel 100 V, 3.6 mΩ typ., 110 A, STripFET F7 Power MOSFET in a TO-220 package



TO-220



AM01475v1\_noZen



### Features

| Order code    | $V_{DS}$ | $R_{DS(on)}$ max. | $I_D$ |
|---------------|----------|-------------------|-------|
| STP150N10F7AG | 100 V    | 4.2 mΩ            | 110 A |

- AEC-Q101 qualified 
- Standard level  $V_{GS(TH)}$
- 175 °C junction temperature
- 100% avalanche rated

### Applications

- Switching applications

### Description

This N-channel Power MOSFET utilizes STripFET F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

#### Product status link

[STP150N10F7AG](#)

#### Product summary

|            |               |
|------------|---------------|
| Order code | STP150N10F7AG |
| Marking    | 150N10F7AG    |
| Package    | TO-220        |
| Packing    | Tube          |

## 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol         | Parameter                                                                                                       | Value      | Unit             |
|----------------|-----------------------------------------------------------------------------------------------------------------|------------|------------------|
| $V_{DS}$       | Drain-source voltage                                                                                            | 100        | V                |
| $V_{GS}$       | Gate-source voltage                                                                                             | $\pm 20$   | V                |
| $I_D^{(1)}$    | Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$                                                  | 110        | A                |
|                | Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$                                                 |            |                  |
| $I_{DM}^{(2)}$ | Drain current (pulsed)                                                                                          | 440        | A                |
| $P_{TOT}$      | Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$                                                     | 250        | W                |
| $I_{AV}$       | Single pulse avalanche current (pulse width limited by maximum junction temperature)                            | 30         | A                |
| $E_{AS}$       | Single pulse avalanche energy<br>( $T_J = 25\text{ }^\circ\text{C}$ , $I_D = I_{AV}$ , $V_{DD} = 25\text{ V}$ ) | 650        | mJ               |
| $T_J$          | Operating junction temperature range                                                                            | -55 to 175 | $^\circ\text{C}$ |
| $T_{stg}$      | Storage temperature range                                                                                       |            |                  |

1. Current limited by package.
2. Pulse width limited by safe operating area.

**Table 2. Thermal data**

| Symbol           | Parameter                             | Value | Unit               |
|------------------|---------------------------------------|-------|--------------------|
| $R_{thJC}$       | Thermal resistance, junction-to-case  | 0.6   | $^\circ\text{C/W}$ |
| $R_{thJB}^{(1)}$ | Thermal resistance, junction-to-board | 62.5  | $^\circ\text{C/W}$ |

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

## 2 Electrical characteristics

(T<sub>CASE</sub> = 25 °C unless otherwise specified)

**Table 3. On/off-state**

| Symbol               | Parameter                         | Test conditions                                             | Min. | Typ. | Max. | Unit |
|----------------------|-----------------------------------|-------------------------------------------------------------|------|------|------|------|
| V <sub>(BR)DSS</sub> | Drain-source breakdown voltage    | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 µA              | 100  |      |      | V    |
| I <sub>DSS</sub>     | Zero gate voltage drain current   | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = max ratings        |      |      | 1    | µA   |
| I <sub>GSS</sub>     | Gate body leakage current         | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V              |      |      | 100  | nA   |
| V <sub>GS(th)</sub>  | Gate threshold voltage            | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 µA | 2.5  | 3.5  | 4.5  | V    |
| R <sub>DS(on)</sub>  | Static drain-source on-resistance | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 55 A               |      | 3.6  | 4.2  | mΩ   |

**Table 4. Dynamic**

| Symbol           | Parameter                    | Test conditions                                                                                                                  | Min. | Typ. | Max. | Unit |
|------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| C <sub>iss</sub> | Input capacitance            | V <sub>DS</sub> = 50 V, f = 1 MHz,<br>V <sub>GS</sub> = 0 V                                                                      | -    | 9000 | -    | pF   |
| C <sub>oss</sub> | Output capacitance           |                                                                                                                                  |      | 2000 |      | pF   |
| C <sub>rss</sub> | Reverse transfer capacitance |                                                                                                                                  |      | 80   |      | pF   |
| Q <sub>g</sub>   | Total gate charge            | V <sub>DD</sub> = 50 V, I <sub>D</sub> = 110 A, V <sub>GS</sub> = 10 V<br>(see Figure 13. Test circuit for gate charge behavior) | -    | 127  | -    | nC   |
| Q <sub>gs</sub>  | Gate-source charge           |                                                                                                                                  | -    | 56   | -    | nC   |
| Q <sub>gd</sub>  | Gate-drain charge            |                                                                                                                                  | -    | 32   | -    | nC   |

**Table 5. Switching times**

| Symbol              | Parameter           | Test conditions                                                                                                                                                                                                   | Min. | Typ. | Max. | Unit |
|---------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| t <sub>d(on)</sub>  | Turn-on delay time  | V <sub>DD</sub> = 50 V, I <sub>D</sub> = 55 A,<br>R <sub>G</sub> = 4.7 mΩ, V <sub>GS</sub> = 10 V<br>(see Figure 12. Test circuit for resistive load switching times and Figure 16. Unclamped inductive waveform) | -    | 37   | -    | ns   |
| t <sub>r</sub>      | Rise time           |                                                                                                                                                                                                                   | -    | 54   | -    | ns   |
| t <sub>d(off)</sub> | Turn-off delay time |                                                                                                                                                                                                                   | -    | 68   | -    | ns   |
| t <sub>f</sub>      | Fall time           |                                                                                                                                                                                                                   | -    | 33   | -    | ns   |

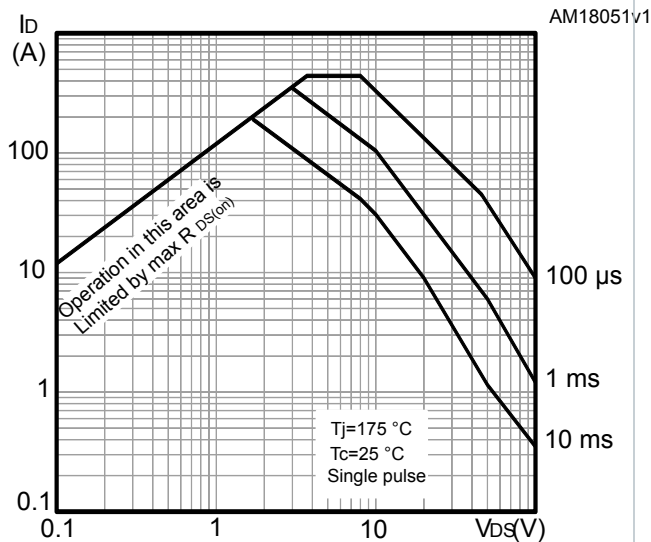
**Table 6. Source-drain diode**

| Symbol         | Parameter                | Test conditions                                                                                                                                                                                            | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage       | $I_{SD} = 110\text{ A}$ , $V_{GS} = 0$                                                                                                                                                                     | -    |      | 1.2  | V    |
| $t_{rr}$       | Reverse recovery time    | $I_{SD} = 110\text{ A}$ ,<br>$di/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{DD} = 80\text{ V}$ , $T_j = 25^\circ\text{C}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times) | -    | 60   | -    | ns   |
| $Q_{rr}$       | Reverse recovery charge  |                                                                                                                                                                                                            | -    | 83   | -    | nC   |
| $I_{RRM}$      | Reverse recovery current |                                                                                                                                                                                                            | -    | 2.75 | -    | A    |

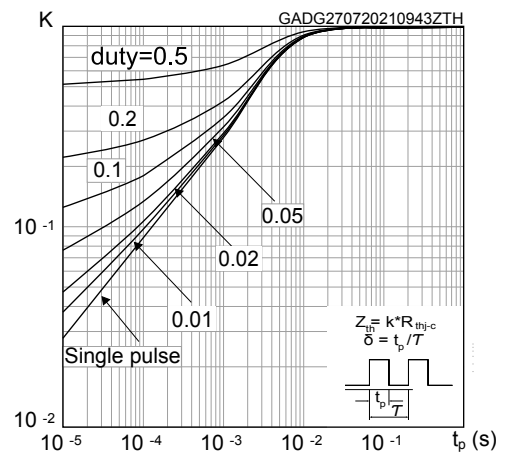
1. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

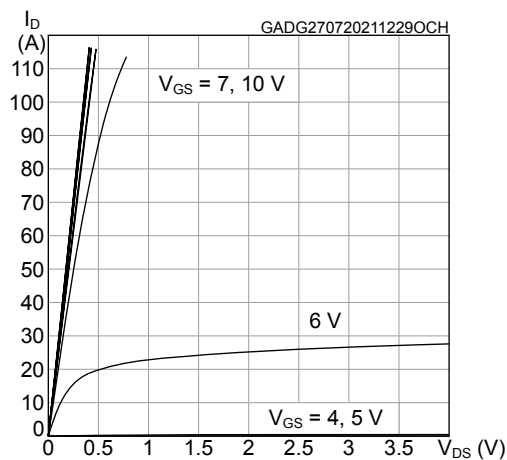
**Figure 1. Safe operating area**



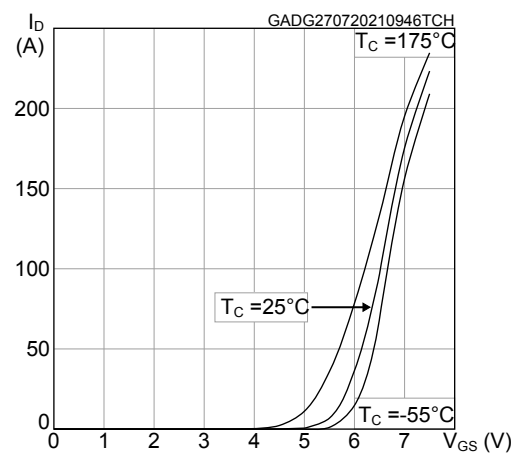
**Figure 2. Thermal impedance**

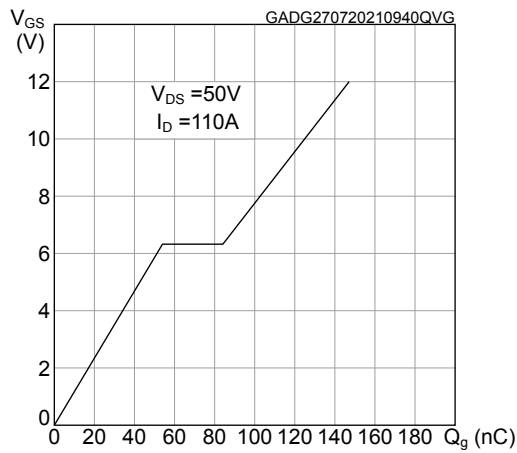
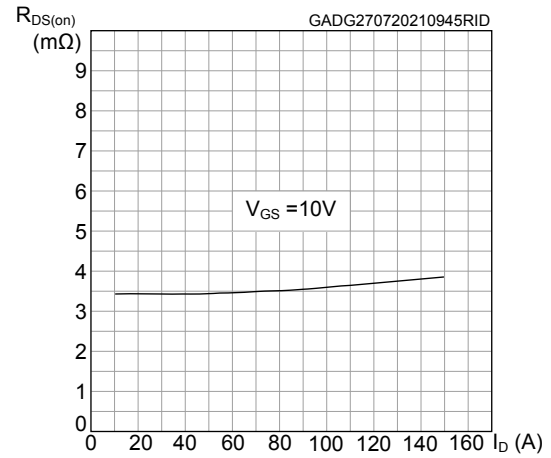
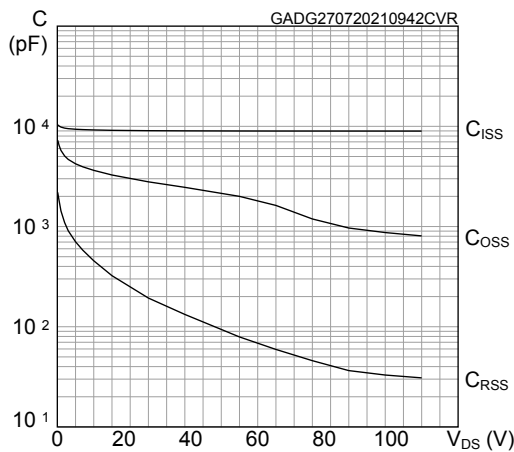
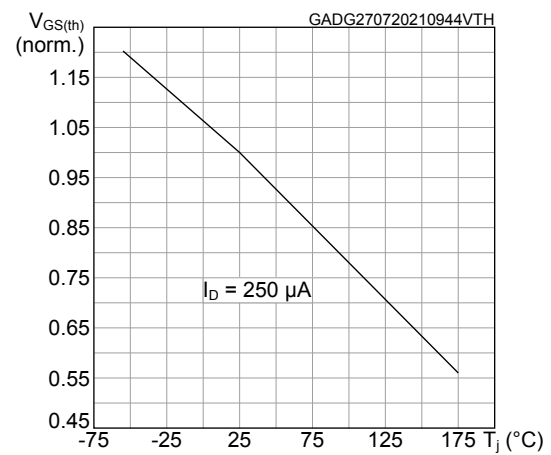
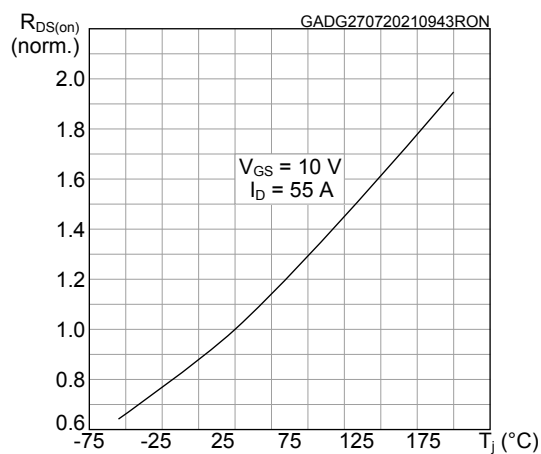
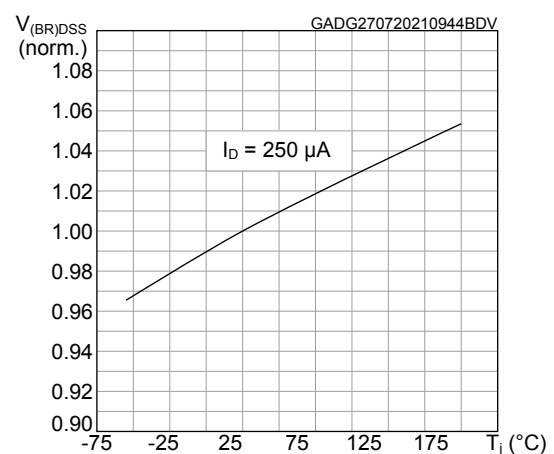


**Figure 3. Typical output characteristics**

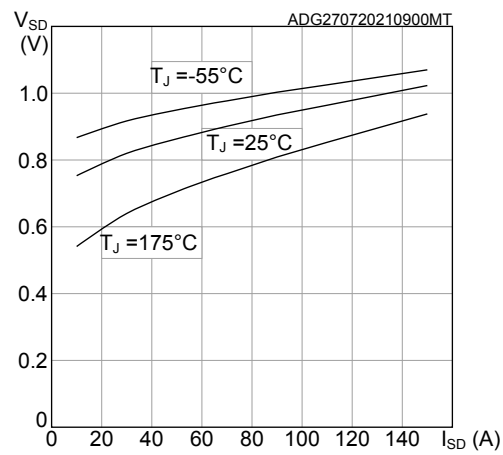


**Figure 4. Typical transfer characteristics**

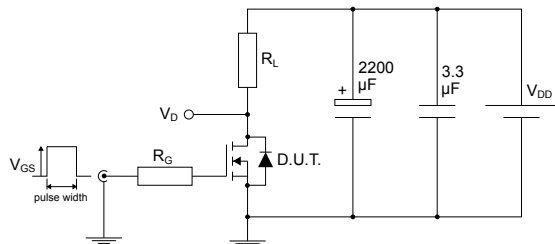


**Figure 5. Typical gate charge characteristics**

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

**Figure 7. Typical capacitance characteristics**

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

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

**Figure 10. Normalized  $V_{(BR)DSS}$  vs temperature**


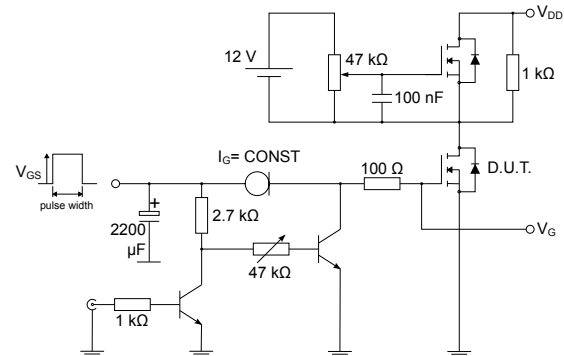
**Figure 11. Source-drain diode forward characteristics**



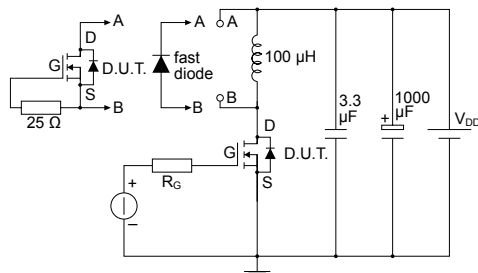
### 3 Test circuits

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


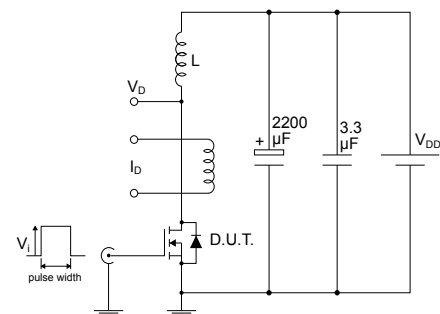
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**Figure 13. Test circuit for gate charge behavior**


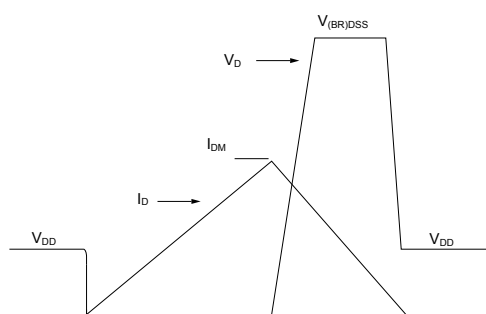
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**Figure 14. Test circuit for inductive load switching and diode recovery times**


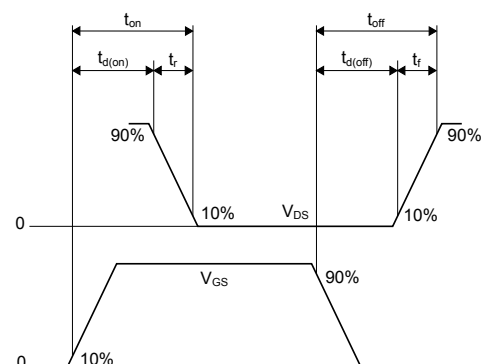
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**Figure 15. Unclamped inductive load test circuit**


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**Figure 16. Unclamped inductive waveform**


AM01472v1

**Figure 17. Switching time waveform**


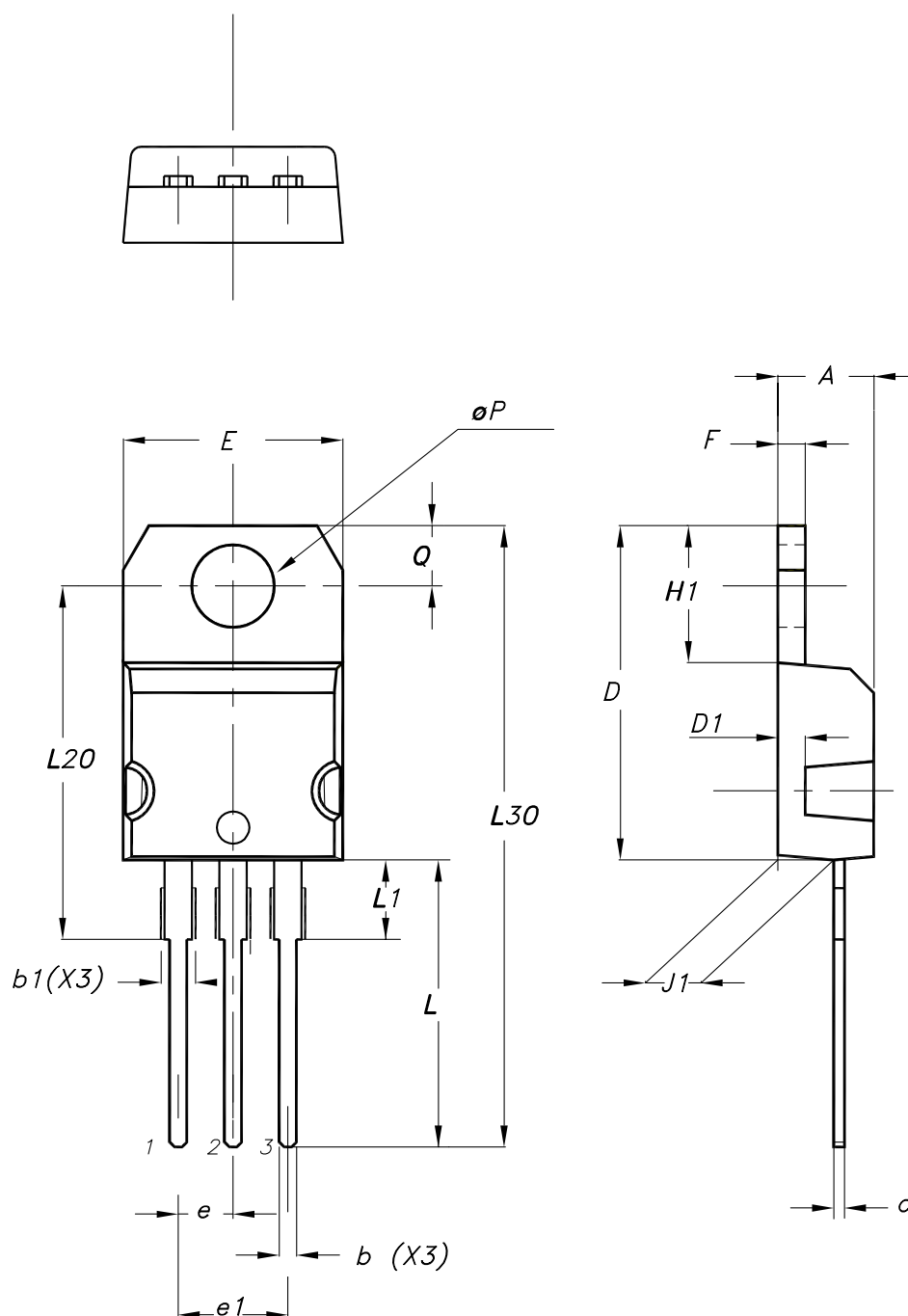
AM01473v1

## 4 Package information

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 TO-220 type A package information

**Figure 18.** TO-220 type A package outline



0015988\_typeA\_Rev\_24

**Table 7. 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  |
| Slug flatness |       | 0.03  | 0.10  |

## Revision history

**Table 8. Document revision history**

| Date        | Version | Changes                                                 |
|-------------|---------|---------------------------------------------------------|
| 27-Jul-2021 | 1       | First release                                           |
| 16-Mar-2023 | 2       | Updated title in cover page                             |
| 15-Oct-2024 | 3       | Updated <a href="#">Section Features</a> in cover page. |



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