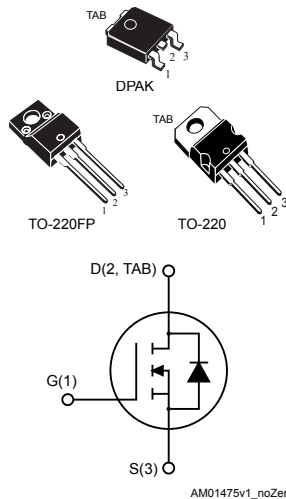


N-channel 250 V, 0.140 Ω typ., 17 A STripFET™ II Power MOSFETs in DPAK, TO-220FP and TO-220 packages



Features

| Order code | V_{DS} | $R_{DS(on)max.}$ | I_D | P_{TOT} |
|------------|----------|------------------|-------|-----------|
| STD17NF25 | 250 V | 0.165 Ω | 17 A | 90 W |
| STF17NF25 | | | | 25 W |
| STP17NF25 | | | | 90 W |

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

Applications

- Switching applications

Description

These Power MOSFETs have been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the devices 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

[STD17NF25](#)
[STF17NF25](#)
[STP17NF25](#)

1 Electrical ratings

Table 1. Absolute maximum ratings

| Symbol | Parameter | Value | | Unit |
|-------------------------|---|--------------|-------------------|------|
| | | TO-220, DPAK | TO-220FP | |
| V_{DS} | Drain-source voltage | 250 | | V |
| V_{GS} | Gate-source voltage | ± 20 | | V |
| I_D | Drain current (continuous) at $T_C = 25\text{ °C}$ | 17 | 17 ⁽¹⁾ | A |
| I_D | Drain current (continuous) at $T_C = 100\text{ °C}$ | 10 | 10 ⁽¹⁾ | A |
| I_{DM} ⁽²⁾ | Drain current (pulsed) | 68 | 68 ⁽¹⁾ | A |
| P_{TOT} | Total dissipation at $T_C = 25\text{ °C}$ | 90 | 25 | W |
| dv/dt ⁽³⁾ | Peak diode recovery voltage slope | 10 | | V/ns |
| V_{ISO} | Insulation withstand voltage (RMS) from all three leads to external heat sink ($t = 1\text{ s}$; $T_C = 25\text{ °C}$) | 2.5 | | kV |
| T_j | Operating junction temperature range | -55 to 150 | | °C |
| T_{stg} | Storage temperature range | | | |

- Limited by maximum junction temperature.
- Pulse width limited by safe operating area.
- $I_{SD} \leq 17\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DSpeak} \leq V_{(BR)DSS}$, $V_{DD} = 80\% V_{(BR)DSS}$.

Table 2. Thermal data

| Symbol | Parameter | Value | | | Unit |
|------------------------------|-------------------------------------|-------|----------|--------|------|
| | | DPAK | TO-220FP | TO-220 | |
| $R_{thj-case}$ | Thermal resistance junction-case | 1.38 | 5 | 1.38 | °C/W |
| $R_{thj-amb}$ | Thermal resistance junction-ambient | 62.5 | | | |
| $R_{thj-pcb}$ ⁽¹⁾ | Thermal resistance junction-pcb | 50 | | | |

- When mounted on 1inch² FR-4, 2 Oz copper board.

Table 3. Avalanche characteristics

| Symbol | Parameter | Value | Unit |
|----------|--|-------|------|
| I_{AR} | Avalanche current, repetitive or not-repetitive (pulse width limited by T_j Max) | 17 | A |
| E_{AS} | Single pulse avalanche energy (starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$) | 100 | mJ |

2 Electrical characteristics

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

Table 4. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|--|------|-------|-----------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$ | 250 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$, $V_{DS} = 250\text{ V}$ | | | 1 | μA |
| | | $V_{GS} = 0\text{ V}$, $V_{DS} = 250\text{ V}$, $T_C = 125\text{ °C}$ ⁽¹⁾ | | | 10 | μA |
| I_{GSS} | Gate body leakage current | $V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 2 | 3 | 4 | V |
| $R_{DS(on)}$ | Static drain-source on resistance | $V_{GS} = 10\text{ V}$, $I_D = 8.5\text{ A}$ | | 0.140 | 0.165 | Ω |

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

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------------------|-------------------------------|--|------|------|------|---------------|
| C_{iss} | Input capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 1000 | - | μF |
| C_{oss} | Output capacitance | | | 178 | | |
| C_{rSS} | Reverse transfer capacitance | | | 28 | | |
| $C_{oss\text{ eq.}}^{(1)}$ | Equivalent output capacitance | $V_{DS} = 0\text{ to }200\text{ V}$, $V_{GS} = 0\text{ V}$ | - | 135 | - | μF |
| R_g | Gate input resistance | $f = 1\text{ MHz}$, $I_D = 0\text{ A}$ | - | 2 | - | Ω |
| Q_g | Total gate charge | $V_{DD} = 200\text{ V}$, $I_D = 17\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 15. Test circuit for gate charge behavior) | - | 29.5 | - | nC |
| Q_{gs} | Gate-source charge | | | 4.8 | | |
| Q_{gd} | Gate-drain charge | | | 15.6 | | |

1. $C_{oss\text{ eq.}}$ 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} .

Table 6. Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|---|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 125\text{ V}$, $I_D = 8.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 14. Test circuit for resistive load switching times and Figure 19. Switching time waveform) | - | 8.8 | - | ns |
| t_r | Rise time | | | 17.2 | | |
| $t_{d(off)}$ | Turn-off delay time | | | 21 | | |
| t_f | Fall time | | | 8.8 | | |

Table 7. Source drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|---|------|------|------|---------------|
| I_{SD} | Source-drain current | | | | 17 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 68 | |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 17\text{ A}$, $V_{GS} = 0\text{ V}$ | - | | 1.6 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 17\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ | | 157 | | ns |
| Q_{rr} | Reverse recovery charge | $V_{DD} = 50\text{ V}$ (see Figure 16. Test circuit for inductive load switching and diode recovery times) | - | 0.91 | | μC |
| I_{RRM} | Reverse recovery current | | | 11.6 | | A |
| t_{rr} | Reverse recovery time | $I_{SD} = 17\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ | | 196 | | ns |
| Q_{rr} | Reverse recovery charge | $V_{DD} = 50\text{ V}$ (see Figure 16. Test circuit for inductive load switching and diode recovery times) | - | 1.34 | | μC |
| I_{RRM} | Reverse recovery current | | | 13.7 | | A |

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%.

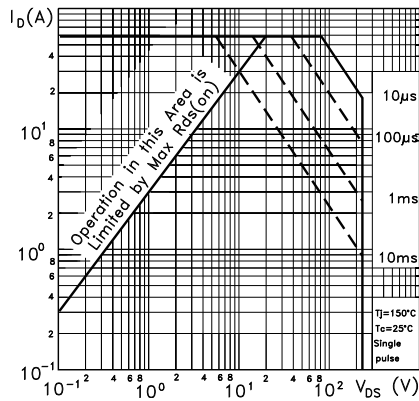
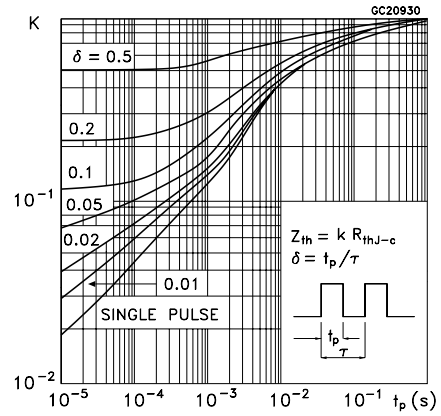
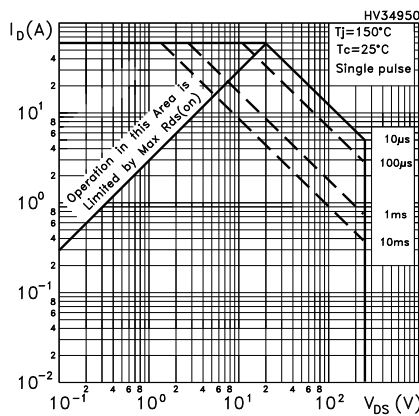
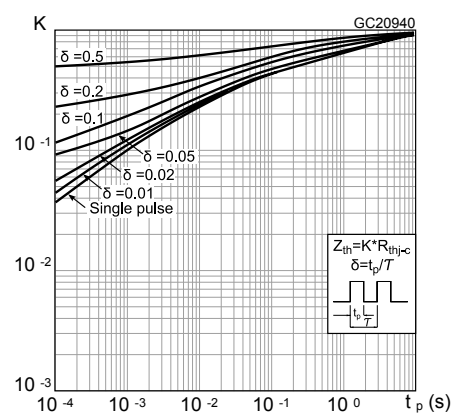
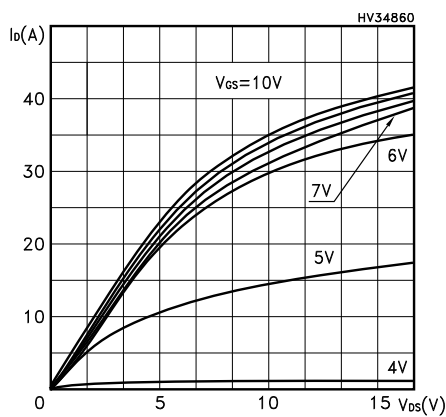
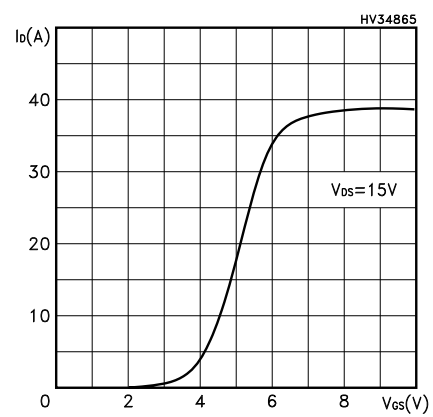
2.1 Electrical characteristics curves
Figure 1. Safe operating area for DPAK, TO-220

Figure 2. Thermal impedance for DPAK, TO-220

Figure 3. Safe operating area for TO-220FP

Figure 4. Thermal impedance for TO-220FP

Figure 5. Output characteristics

Figure 6. Transfer characteristics


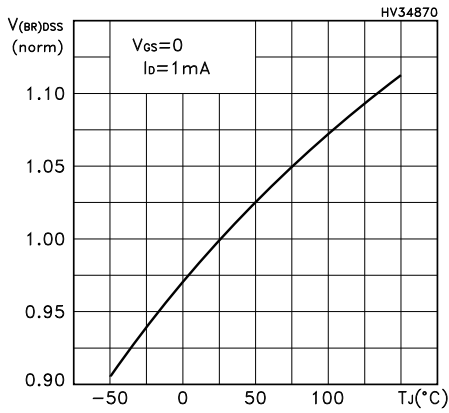
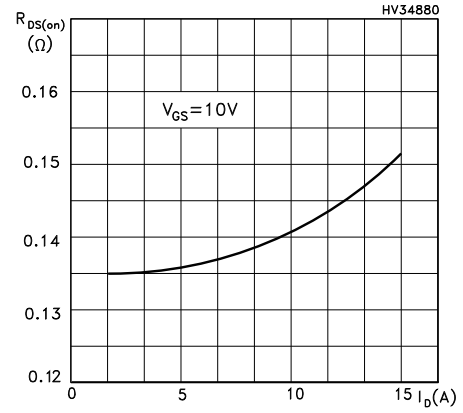
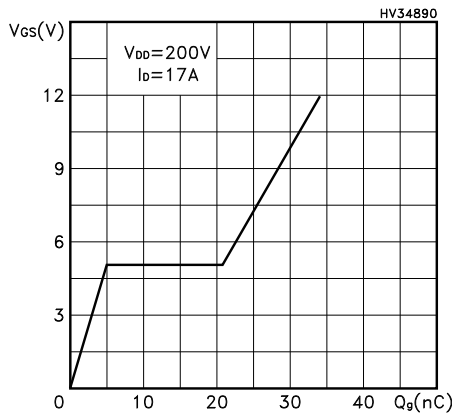
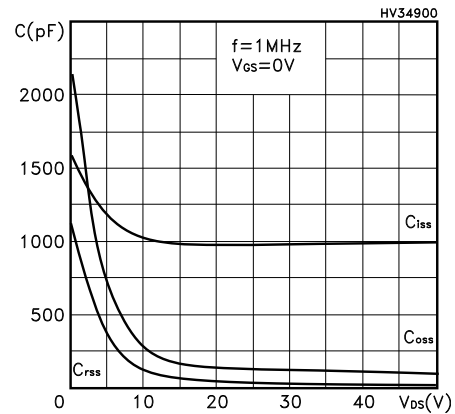
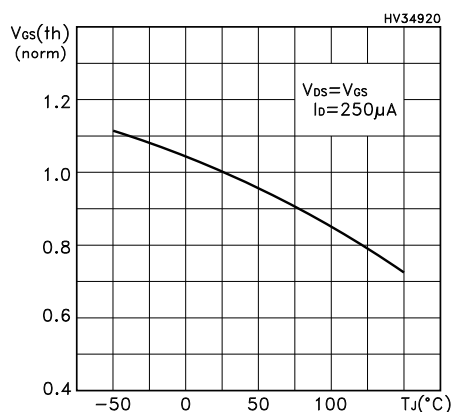
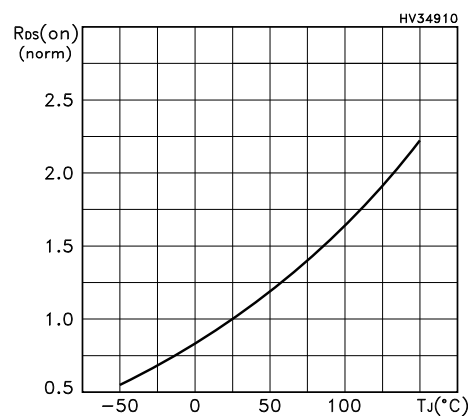
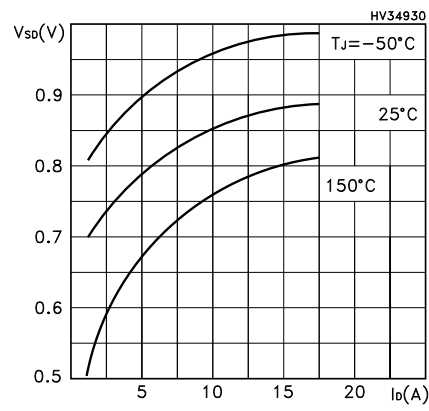
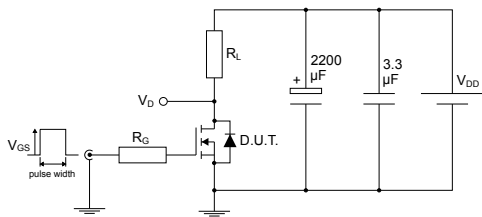
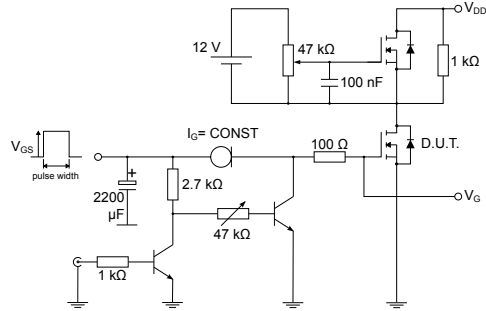
Figure 7. Normalized $V_{(BR)DSS}$ vs temperature

Figure 8. Static drain-source on resistance

Figure 9. Gate charge vs gate-source voltage

Figure 10. Capacitance variations

Figure 11. Normalized gate threshold voltage vs temperature

Figure 12. Normalized on resistance vs temperature


Figure 13. Source-drain diode forward characteristics


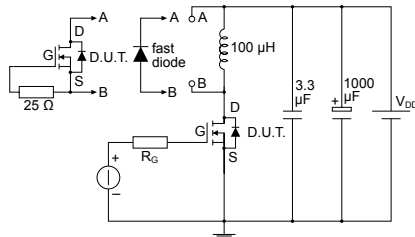
3 Test circuits

Figure 14. Test circuit for resistive load switching times


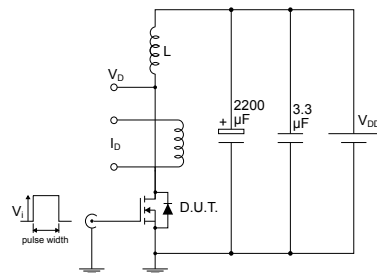
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Figure 15. Test circuit for gate charge behavior


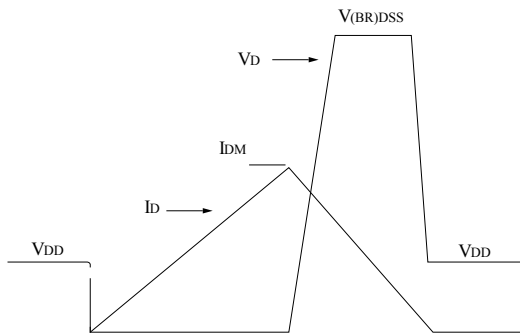
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Figure 16. Test circuit for inductive load switching and diode recovery times


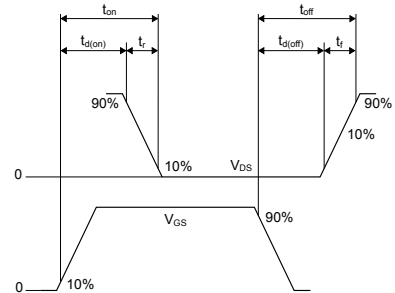
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Figure 17. Unclamped inductive load test circuit


AM01471v1

Figure 18. Unclamped inductive waveform


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Figure 19. Switching time waveform


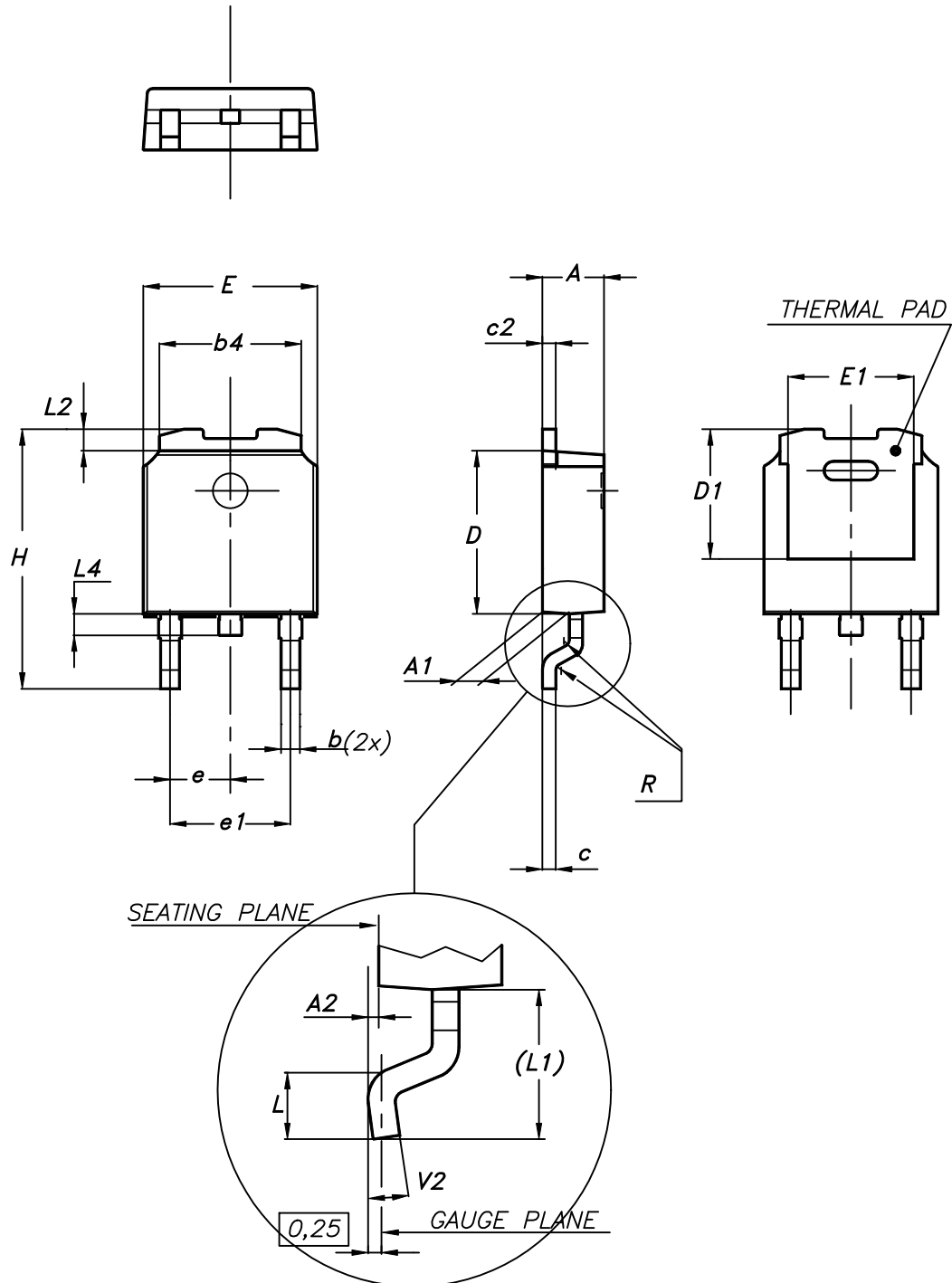
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4 Package information

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. ECOPACK® is an ST trademark.

4.1 DPAK (TO-252) type A2 package information

Figure 20. DPAK (TO-252) type A2 package outline



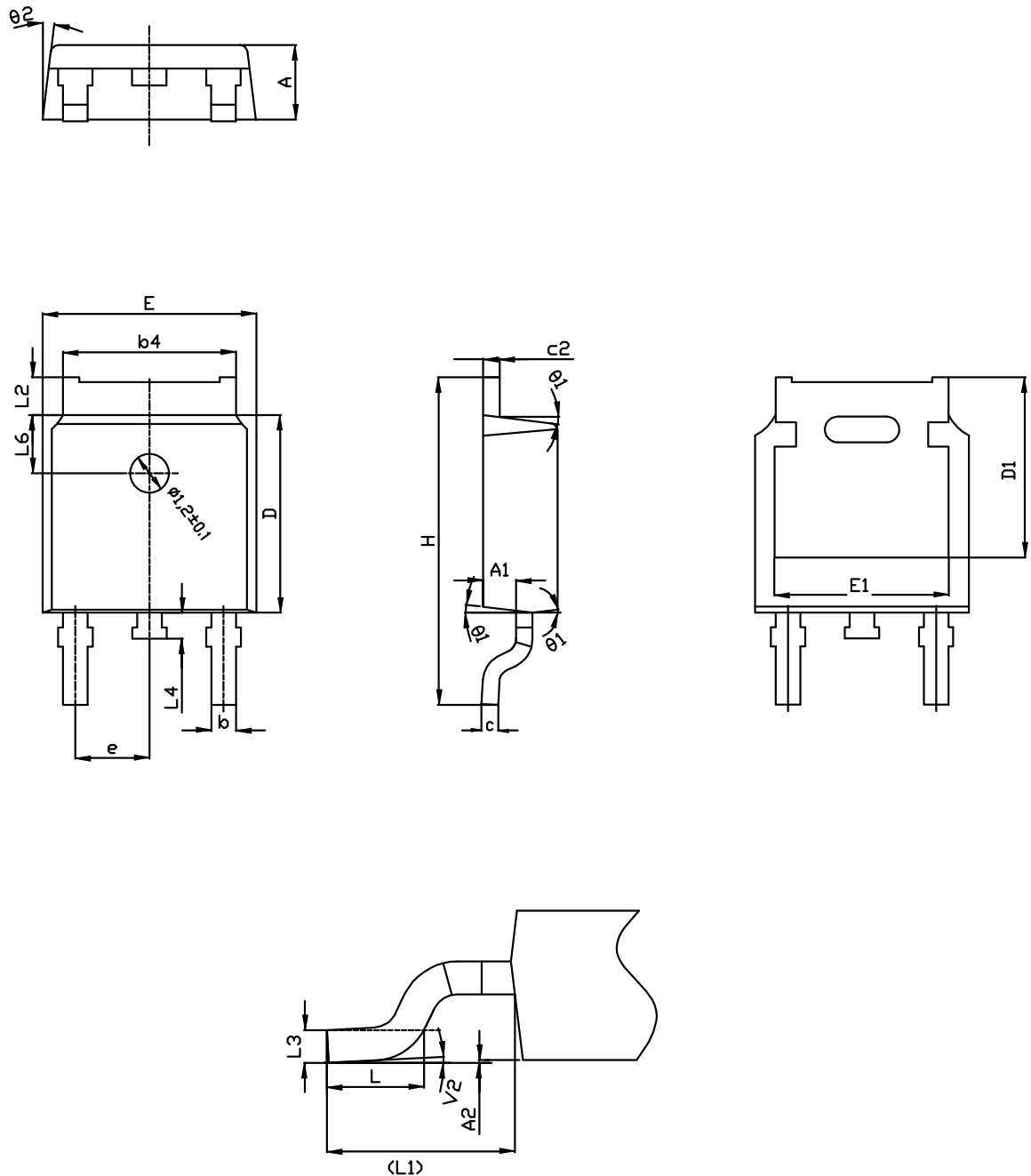
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Table 8. DPAK (TO-252) type A2 mechanical data

| 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 | 5.10 | 5.20 | 5.30 |
| 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 21. DPAK (TO-252) type C2 package outline

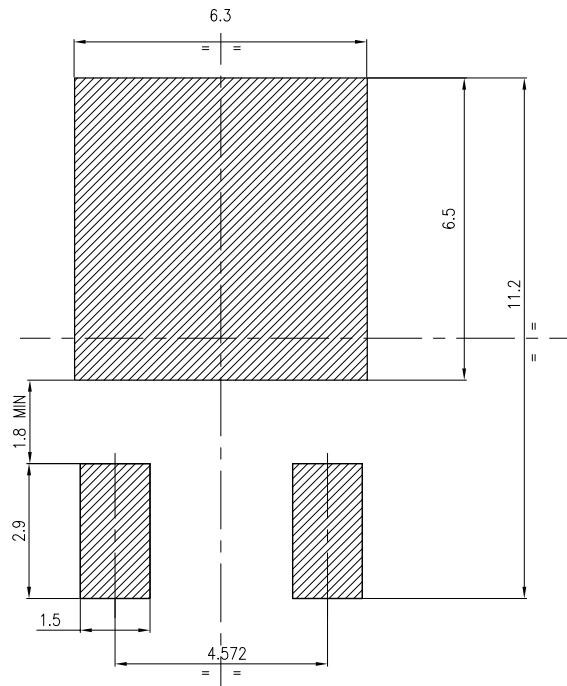


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Table 9. DPAK (TO-252) type C2 mechanical data

| 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° |

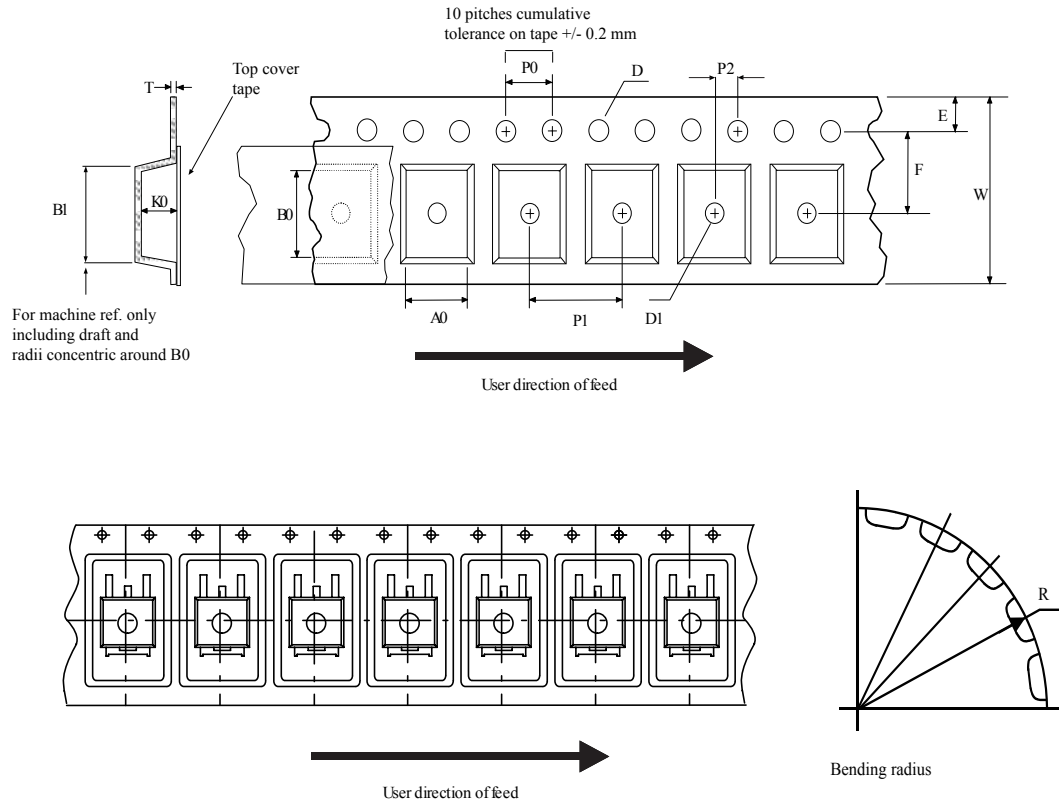
Figure 22. DPAK (TO-252) recommended footprint (dimensions are in mm)



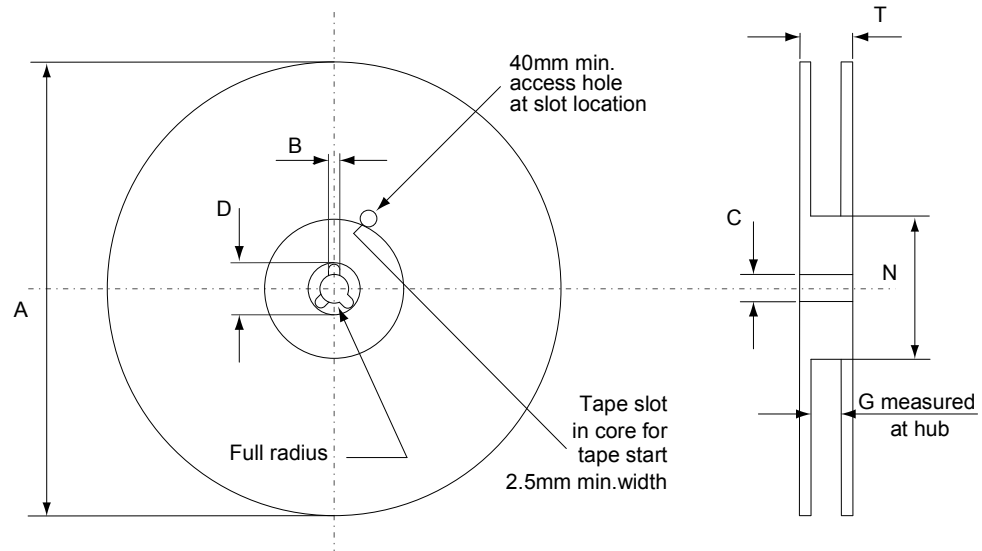
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4.3 DPAK (TO-252) packing information

Figure 23. DPAK (TO-252) tape outline



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Figure 24. DPAK (TO-252) reel outline


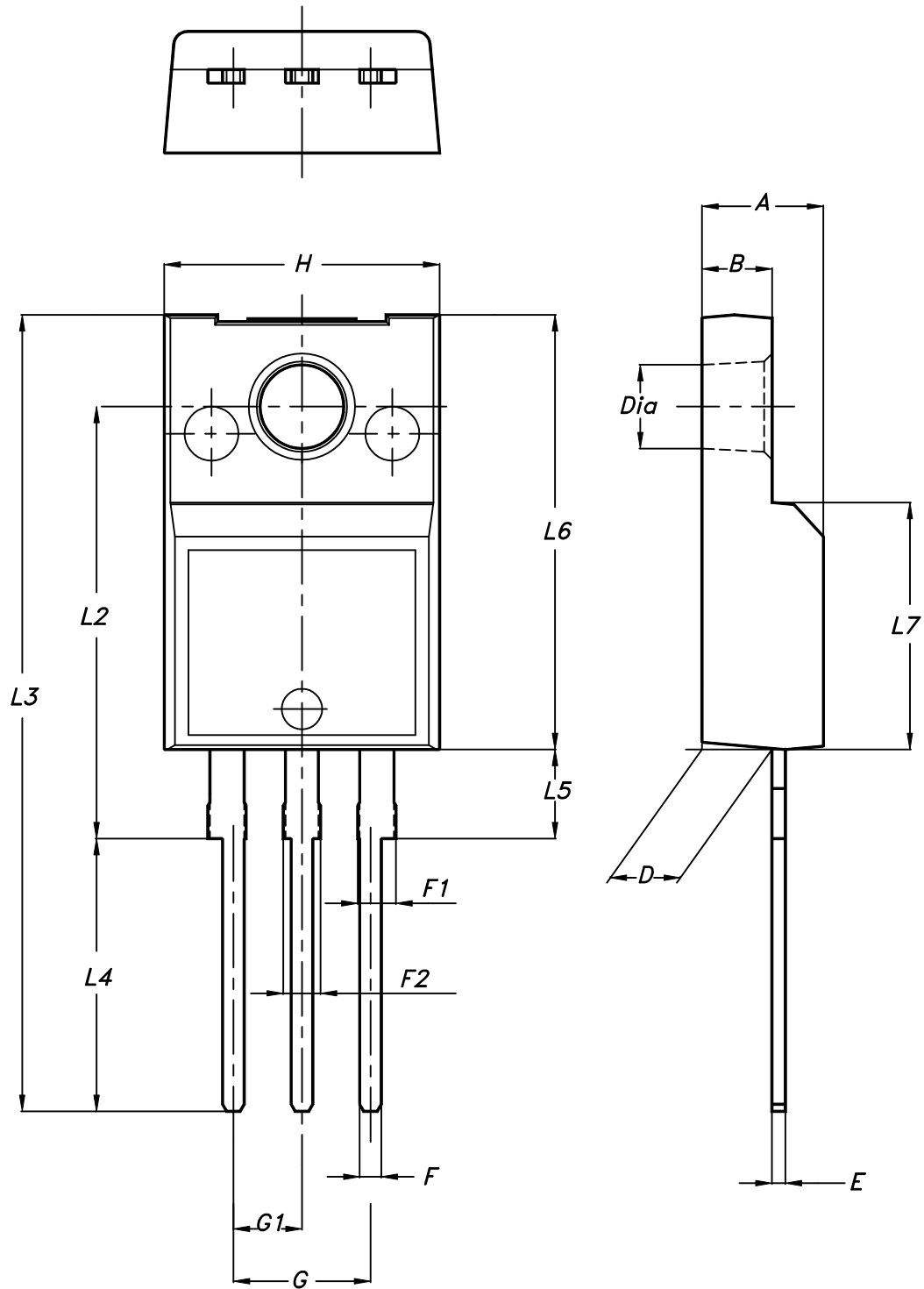
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Table 10. DPAK (TO-252) tape and reel mechanical data

| 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 | | | |

4.4 TO-220FP package information

Figure 25. TO-220FP package outline



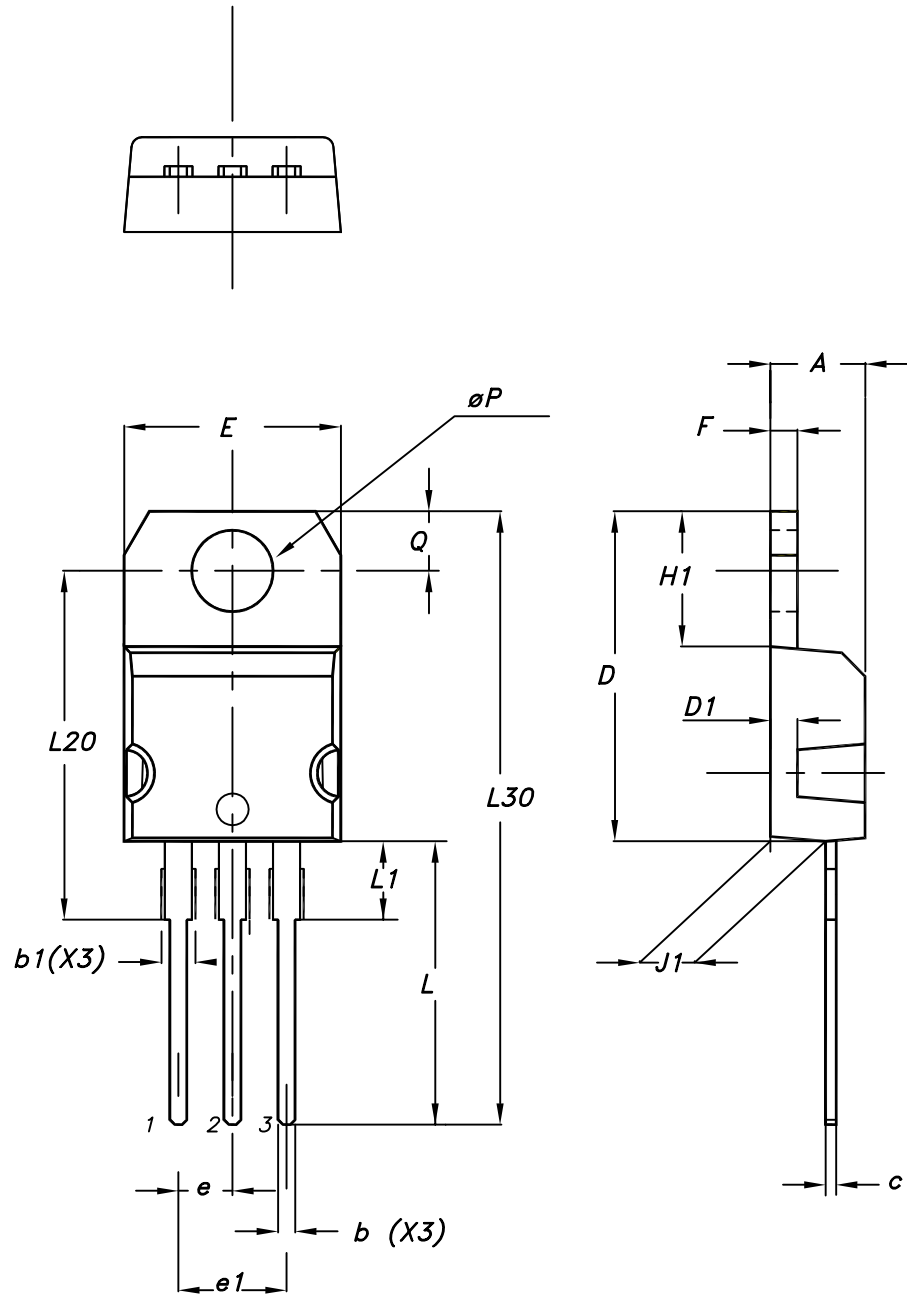
7012510_Rev_12_B

Table 11. 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 |

4.5 TO-220 type A package information

Figure 26. TO-220 type A package outline



0015988_typeA_Rev_21

Table 12. 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 13. Order codes

| Order code | Marking | Package | Packing |
|------------|---------|----------|---------------|
| STD17NF25 | 17NF25 | DPAK | Tape and reel |
| STF17NF25 | | TO-220FP | Tube |
| STP17NF25 | | TO-220 | |

Revision history

Table 14. Document revision history

| Date | Version | Changes |
|-------------|---------|---|
| 01-Feb-2007 | 1 | First release. |
| 07-Nov-2012 | 2 | Minor text changes. The part number STI17NF25 has been moved to a separate datasheet. <i>Section 4: Package mechanical data</i> and <i>Section 5: Packaging mechanical data</i> have been updated. |
| 28-May-2018 | 3 | Removed maturity status indication from cover page. The document status is production data. Updated title in cover page, Section 1 Electrical ratings , Section 2 Electrical characteristics and Section 4 Package information . Minor text changes |

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| 4.3 | DPAK (TO-252) packing information | 14 |
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| | Revision history | 22 |

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