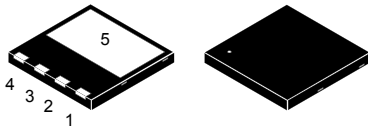
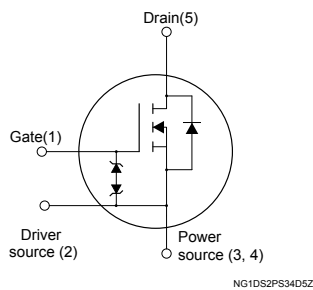


N-channel 600 V, 300 mΩ typ., 10 A, MDmesh™ M6 Power MOSFET in a PowerFLAT™ 8x8 HV package


PowerFLAT™ 8x8 HV

Product status link
[STL17N60M6](#)
Product summary

| | |
|-------------------|-------------------|
| Order code | STL17N60M6 |
| Marking | 17N60M6 |
| Package | PowerFLAT™ 8x8 HV |
| Packing | Tape and reel |

Features

| Order code | V _{DS} | R _{DS(on)} max. | I _D |
|------------|-----------------|--------------------------|----------------|
| STL17N60M6 | 600 V | 350 mΩ | 10 A |

- Reduced switching losses
- Lower R_{DS(on)} per area vs previous generation
- Low gate input resistance
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications
- LLC converters
- Boost PFC converters

Description

The new MDmesh™ M6 technology incorporates the most recent advancements to the well-known and consolidated MDmesh family of SJ MOSFETs. STMicroelectronics builds on the previous generation of MDmesh devices through its new M6 technology, which combines excellent R_{DS(on)} per area improvement with one of the most effective switching behaviors available, as well as a user-friendly experience for maximum end-application efficiency.

1 Electrical ratings

Table 1. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|--|------------|------------------|
| V_{GS} | Gate-source voltage | ± 25 | V |
| I_D | Drain current (continuous) at $T_{case} = 25\text{ }^\circ\text{C}$ | 10 | A |
| | Drain current (continuous) at $T_{case} = 100\text{ }^\circ\text{C}$ | 6.3 | |
| $I_{DM}^{(1)}$ | Drain current (pulsed) | 32 | A |
| P_{TOT} | Total power dissipation at $T_{case} = 25\text{ }^\circ\text{C}$ | 90 | W |
| $dv/dt^{(2)}$ | Peak diode recovery voltage slope | 15 | V/ns |
| $dv/dt^{(3)}$ | MOSFET dv/dt ruggedness | 100 | |
| T_{stg} | Storage temperature range | -55 to 150 | $^\circ\text{C}$ |
| T_j | Operating junction temperature range | | |

1. Pulse width is limited by safe operating area.
2. $I_{SD} \leq 10\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS(peak)} < V_{(BR)DSS}$, $V_{DD} = 400\text{ V}$
3. $V_{DS} \leq 480\text{ V}$

Table 2. Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|----------------------------------|-------|---------------------------|
| $R_{thj-case}$ | Thermal resistance junction-case | 1.4 | $^\circ\text{C}/\text{W}$ |
| $R_{thj-pcb}^{(1)}$ | Thermal resistance junction-pcb | 50 | $^\circ\text{C}/\text{W}$ |

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

Table 3. Avalanche characteristics

| Symbol | Parameter | Value | Unit |
|----------|--|-------|------|
| I_{AR} | Avalanche current, repetitive or non-repetitive (pulse width limited by T_{Jmax}) | 2.5 | A |
| E_{AS} | Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$) | 110 | mJ |

2 Electrical characteristics

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

Table 4. On/off states

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------------|-----------------------------------|--|------|------|---------|------------------|
| $V_{(\text{BR})\text{DSS}}$ | Drain-source breakdown voltage | $V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 1\text{ mA}$ | 600 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 600\text{ V}$ | | | 1 | μA |
| | | $V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 600\text{ V}$, $T_{\text{case}} = 125\text{ }^{\circ}\text{C}^{(1)}$ | | | 100 | |
| I_{GSS} | Gate-body leakage current | $V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 25\text{ V}$ | | | ± 5 | μA |
| $V_{\text{GS}(\text{th})}$ | Gate threshold voltage | $V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$ | 3.25 | 4 | 4.75 | V |
| $R_{\text{DS}(\text{on})}$ | Static drain-source on-resistance | $I_{\text{D}} = 6\text{ A}$, $V_{\text{GS}} = 10\text{ V}$ | | 300 | 350 | $\text{m}\Omega$ |

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

Table 5. Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------------------|-------------------------------|--|------|------|------|-------------|
| C_{iss} | Input capacitance | $V_{\text{DS}} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$ | - | 575 | - | pF |
| C_{oss} | Output capacitance | | - | 33 | - | |
| C_{riss} | Reverse transfer capacitance | | - | 3 | - | |
| $C_{\text{oss eq.}}^{(1)}$ | Equivalent output capacitance | $V_{\text{DS}} = 0\text{ to }480\text{ V}$, $V_{\text{GS}} = 0\text{ V}$ | - | 104 | - | pF |
| R_{G} | Intrinsic gate resistance | $f = 1\text{ MHz}$, $I_{\text{D}} = 0\text{ A}$ | - | 5.2 | - | Ω |
| Q_{g} | Total gate charge | $V_{\text{DD}} = 480\text{ V}$, $I_{\text{D}} = 12\text{ A}$, $V_{\text{GS}} = 0\text{ to }10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior) | - | 16.7 | - | nC |
| Q_{gs} | Gate-source charge | | - | 3.5 | - | |
| Q_{gd} | Gate-drain charge | | - | 9.4 | - | |

1. $C_{\text{oss eq.}}$ 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 |
|----------------------------|---------------------|---|------|------|------|-------------|
| $t_{\text{d}(\text{on})}$ | Turn-on delay time | $V_{\text{DD}} = 300\text{ V}$, $I_{\text{D}} = 6\text{ A}$, $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 13. Switching times test circuit for resistive load and Figure 18. Switching time waveform) | - | 13 | - | ns |
| t_{r} | Rise time | | - | 7.6 | - | |
| $t_{\text{d}(\text{off})}$ | Turn-off delay time | | - | 19.8 | - | |
| t_{f} | Fall time | | - | 6.8 | - | |

Table 7. Source-drain diode

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------|-------------------------------|--|------|------|------|---------------|
| I_{SD} | Source-drain current | | - | | 8 | A |
| $I_{SDM}^{(1)}$ | Source-drain current (pulsed) | | - | | 32 | A |
| $V_{SD}^{(2)}$ | Forward on voltage | $I_{SD} = 8\text{ A}$, $V_{GS} = 0\text{ V}$ | - | | 1.6 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ | - | 210 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 1.7 | | μC |
| I_{RRM} | Reverse recovery current | (see Figure 15. Test circuit for inductive load switching and diode recovery times) | - | 13.8 | | A |
| t_{rr} | Reverse recovery time | $I_{SD} = 12\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times) | - | 290 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 2.9 | | μC |
| I_{RRM} | Reverse recovery current | | - | 20 | | A |

1. Pulse width is 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

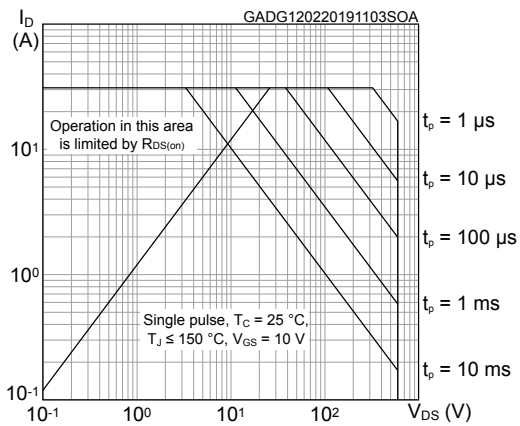


Figure 2. Thermal impedance

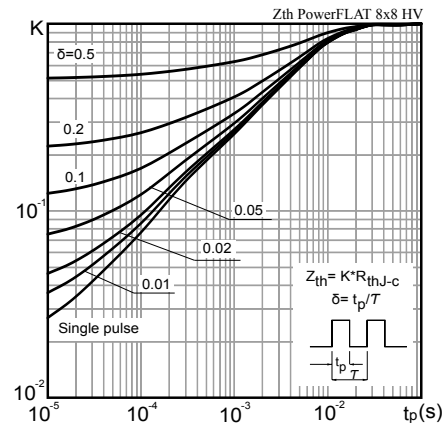


Figure 3. Output characteristics

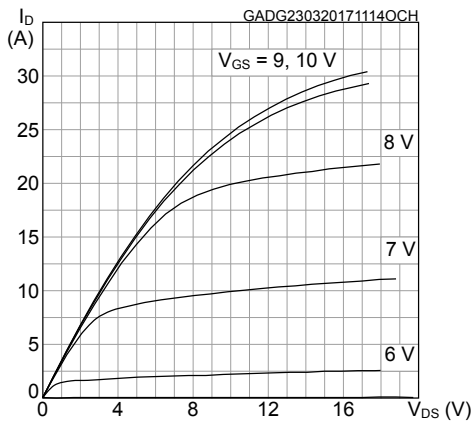


Figure 4. Transfer characteristics

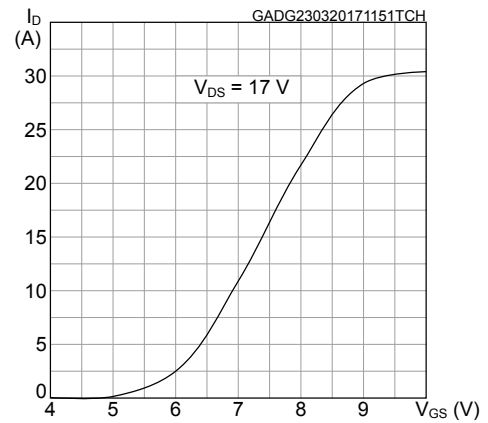


Figure 5. Gate charge vs gate-source voltage

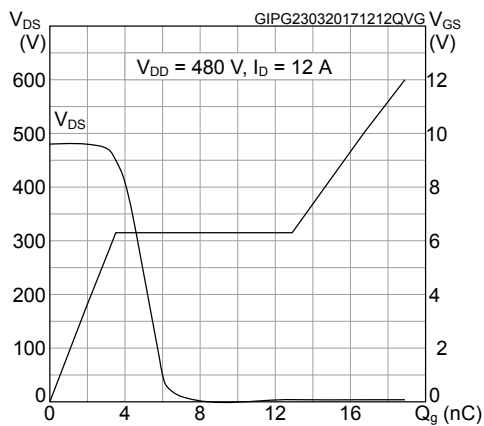


Figure 6. Static drain-source on-resistance

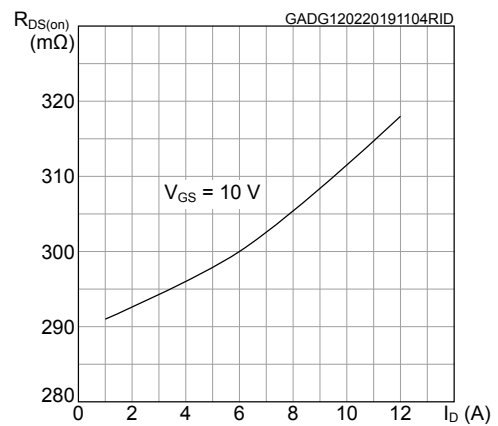


Figure 7. Capacitance variations

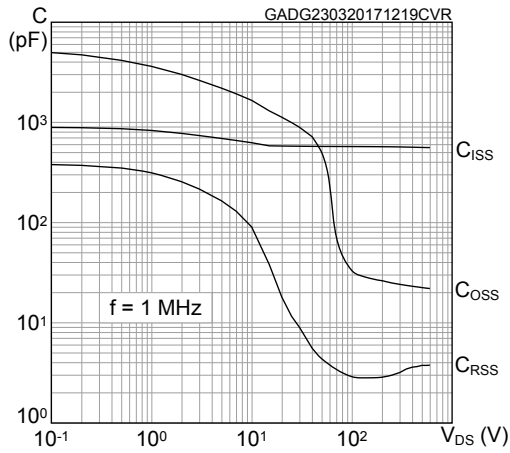


Figure 8. Normalized gate threshold voltage vs temperature

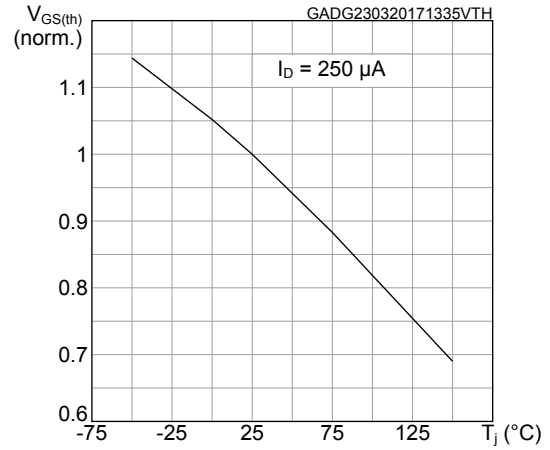


Figure 9. Normalized on-resistance vs temperature

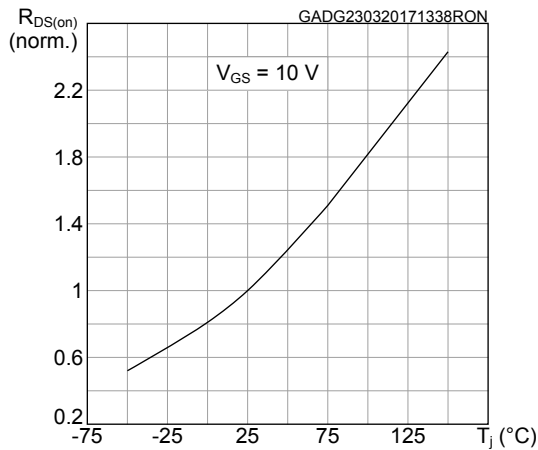


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

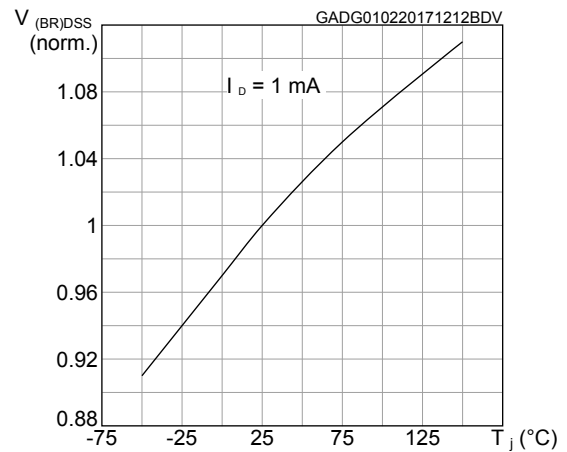


Figure 11. Output capacitance stored energy

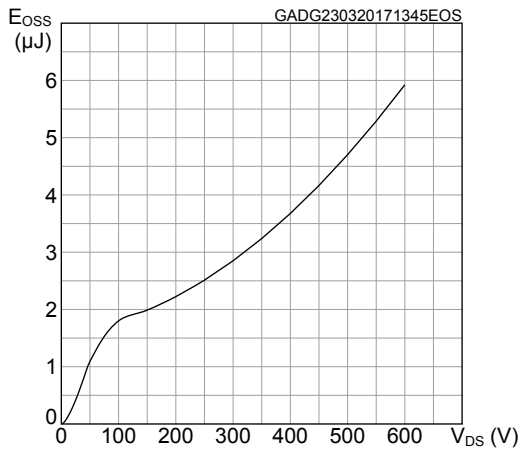
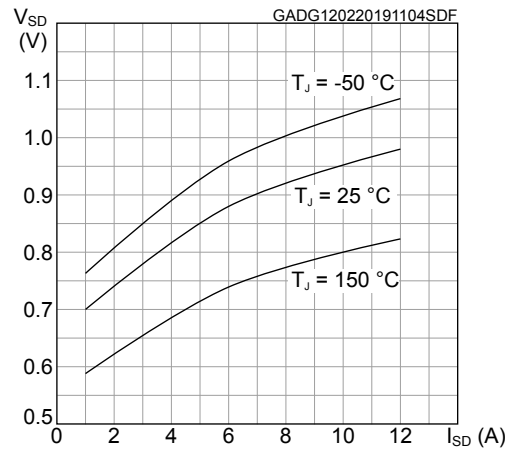
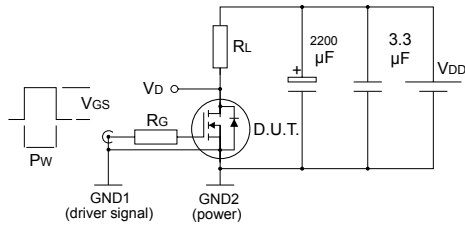


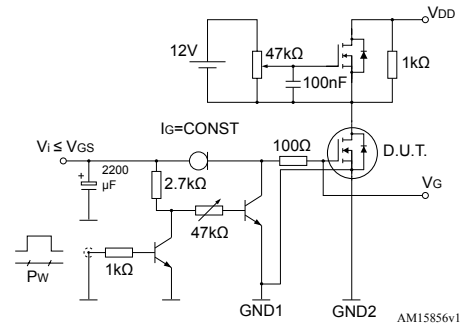
Figure 12. Source-drain diode forward characteristics



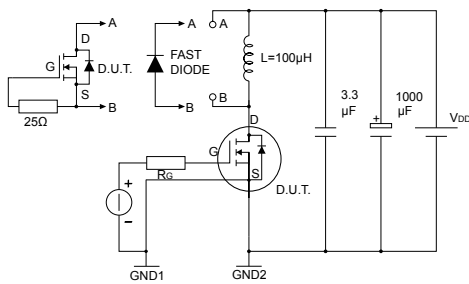
3 Test circuits

Figure 13. Switching times test circuit for resistive load


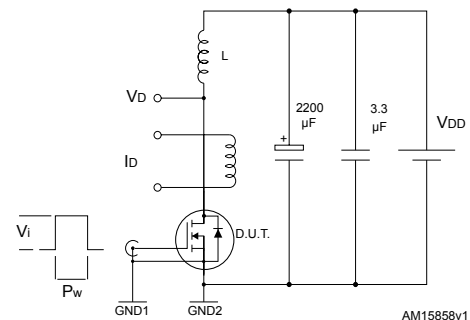
AM15855v1

Figure 14. Test circuit for gate charge behavior


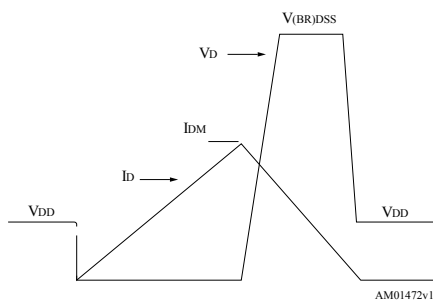
AM15856v1

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


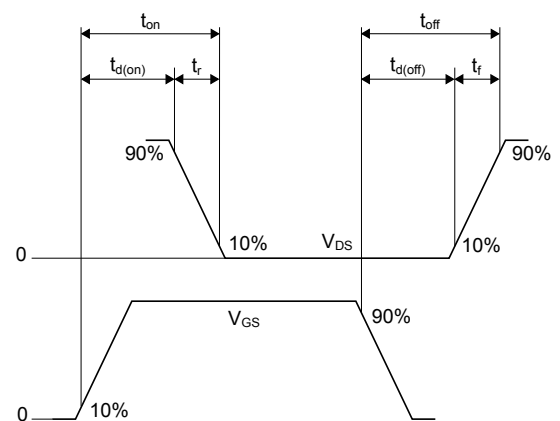
AM15857v1

Figure 16. Unclamped inductive load test circuit


AM15858v1

Figure 17. Unclamped inductive waveform


AM01472v1

Figure 18. Switching time waveform


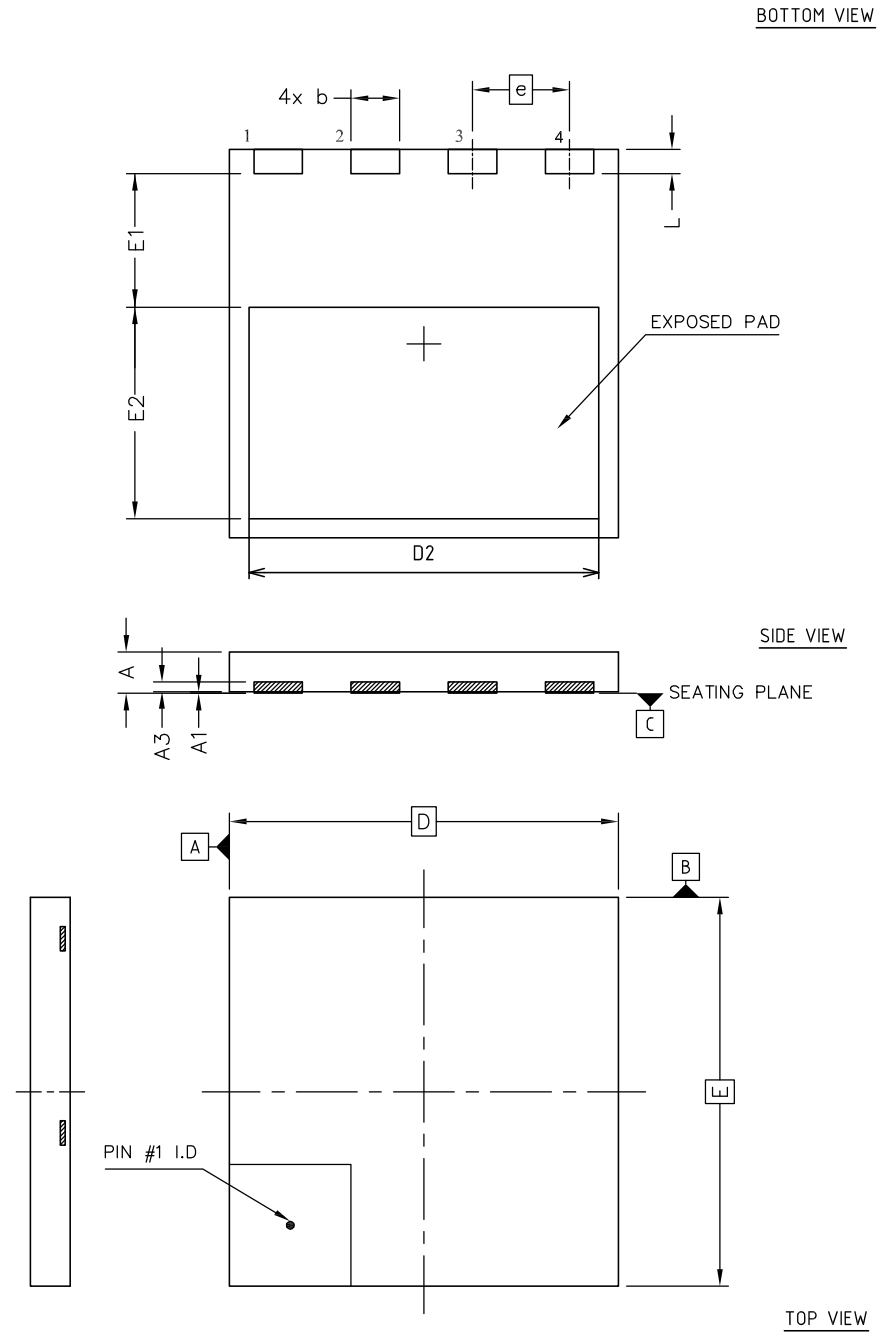
AM01473v1

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 PowerFLAT™ 8x8 HV package information

Figure 19. PowerFLAT™ 8x8 HV package outline

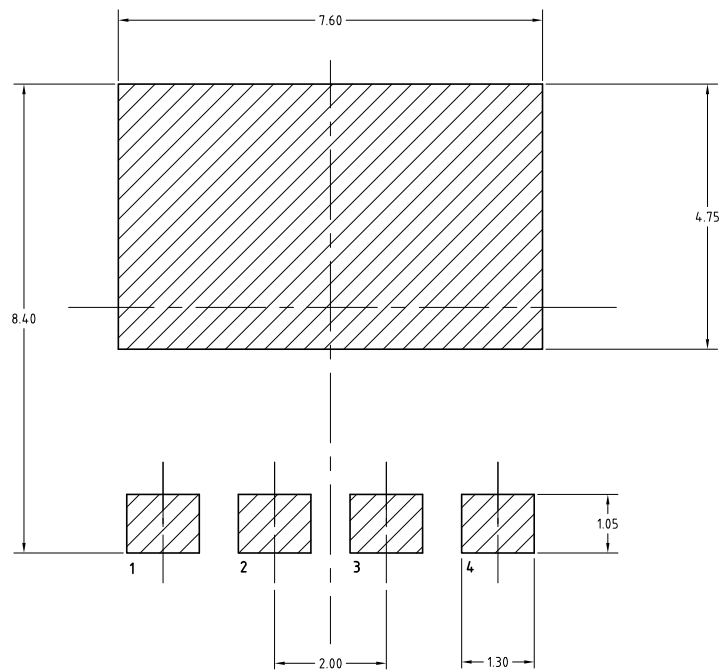


8222871_Rev_4

Table 8. PowerFLAT™ 8x8 HV mechanical data

| Ref. | Dimensions (in mm) | | |
|------|--------------------|------|------|
| | Min. | Typ. | Max. |
| A | 0.75 | 0.85 | 0.95 |
| A1 | 0.00 | | 0.05 |
| A3 | 0.10 | 0.20 | 0.30 |
| b | 0.90 | 1.00 | 1.10 |
| D | 7.90 | 8.00 | 8.10 |
| E | 7.90 | 8.00 | 8.10 |
| D2 | 7.10 | 7.20 | 7.30 |
| E1 | 2.65 | 2.75 | 2.85 |
| E2 | 4.25 | 4.35 | 4.45 |
| e | 2.00 BSC | | |
| L | 0.40 | 0.50 | 0.60 |

Figure 20. PowerFLAT™ 8x8 HV footprint

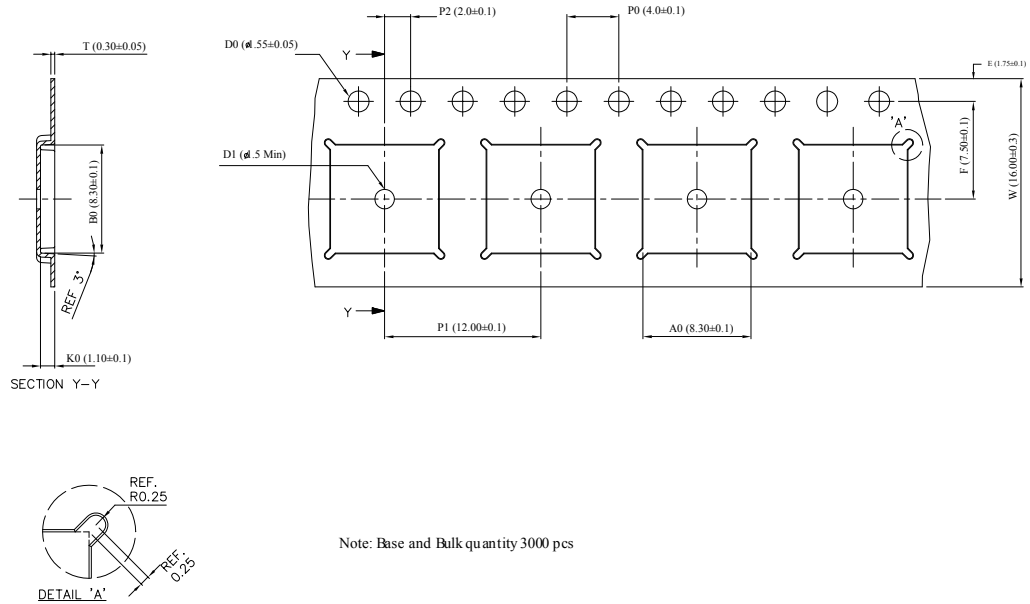


8222871_REV_4_footprint

Note: All dimensions are in millimeters.

4.2 PowerFLAT™ 8x8 HV packing information

Figure 21. PowerFLAT™ 8x8 HV tape



8229819_Tape_revA

Note: All dimensions are in millimeters.

Figure 22. PowerFLAT™ 8x8 HV package orientation in carrier tape

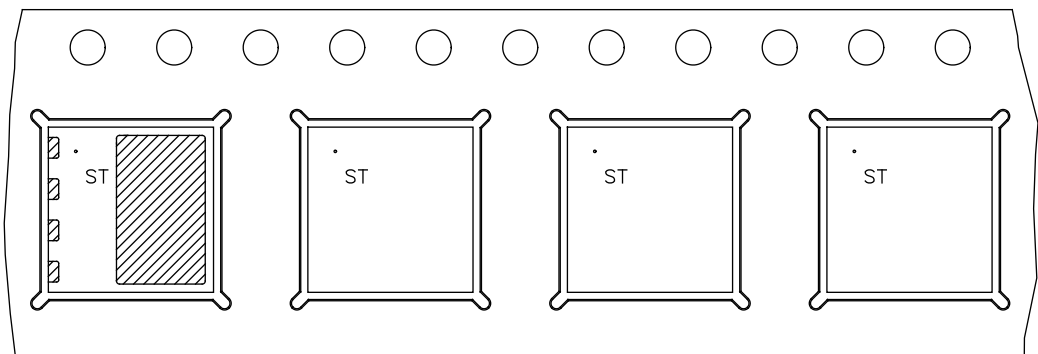
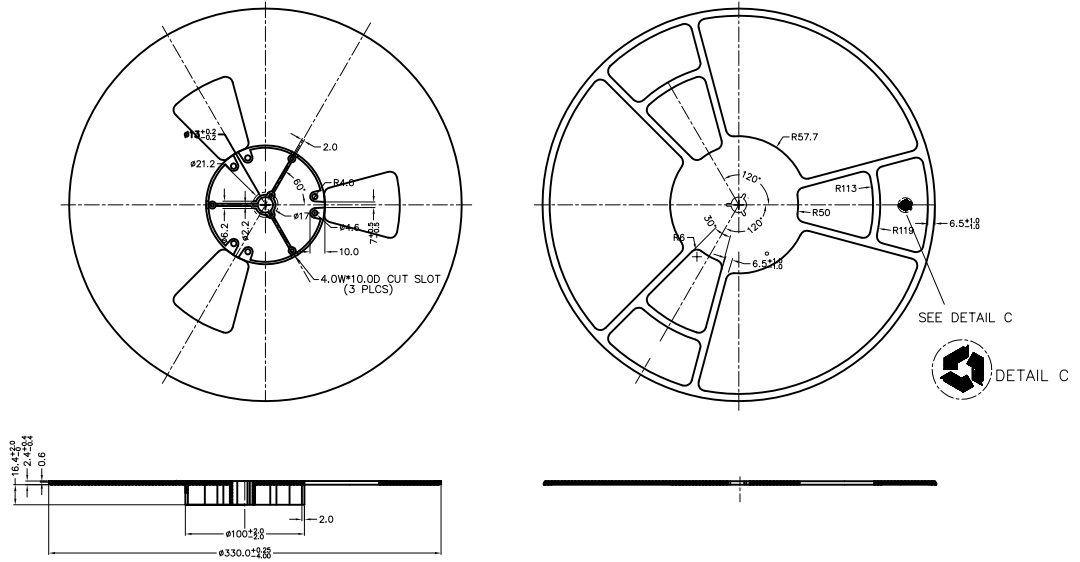


Figure 23. PowerFLAT™ 8x8 HV reel



8229819_Reel_revA

Note: All dimensions are in millimeters.

Revision history

Table 9. Document revision history

| Date | Version | Changes |
|-------------|---------|----------------|
| 14-Feb-2019 | 1 | First release. |

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