

N-channel 600 V, 0.160 Ω typ., 19 A MDmesh™ II Power MOSFET in a PowerFLAT 8x8 HV package

Datasheet - production data

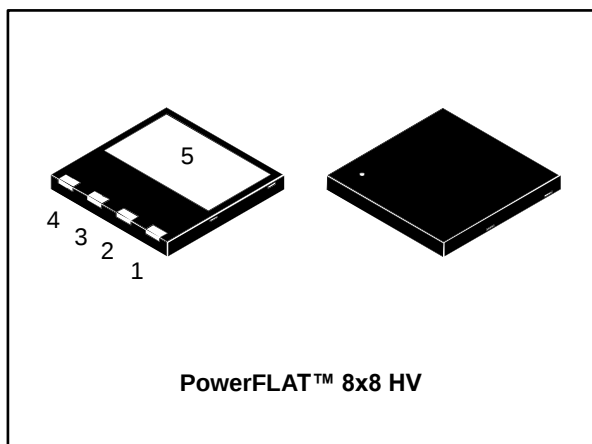
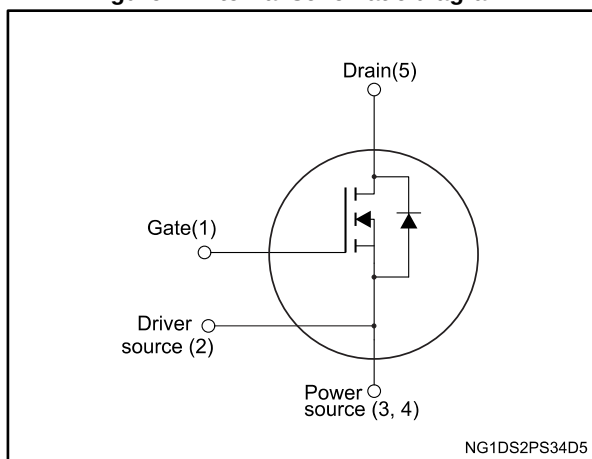


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D
STL26NM60N	600 V	0.185 Ω	19 A

- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the second generation of MDmesh™ technology. This revolutionary Power MOSFET associates a vertical structure to the company's strip layout to yield one of the world's lowest on-resistance and gate charge. It is therefore suitable for the most demanding high efficiency converters.

Table 1: Device summary

Order code	Marking	Package	Packaging
STL26NM60N	26NM60N	PowerFLAT™ 8x8 HV	Tape and reel

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	600	V
V_{GS}	Gate-source voltage	± 30	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	19	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	12	A
$I_{DM}^{(1)}$	Drain current (pulsed)	76	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	125	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
T_{stg}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$
T_j	Operating junction temperature range		

Notes:

⁽¹⁾Pulse width limited by safe operating area.

⁽²⁾ $I_{SD} \leq 19\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS(\text{peak})} \leq V_{(BR)DSS}$, $V_{DD} \leq 80\% V_{(BR)DSS}$

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1	$^{\circ}\text{C}/\text{W}$
$R_{thj-amb}^{(1)}$	Thermal resistance junction-ambient	45	$^{\circ}\text{C}/\text{W}$

Notes:

⁽¹⁾When mounted on 1inch² FR-4 board, 2 oz Cu.

Table 4: Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AS}	Single pulse avalanche current (pulse width limited by T_{jmax})	6	A
E_{AS}	Single pulse avalanche energy (starting $T_J=25\text{ }^{\circ}\text{C}$, $I_D=I_{AS}$, $V_{DD}=50\text{ V}$)	400	mJ

2 Electrical characteristics

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

Table 5: On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	I _D = 1 mA, V _{GS} = 0 V	600			V
I _{DSS}	Zero gate voltage drain current	V _{GS} = 0 V, V _{DS} = 600 V			1	μA
		V _{GS} = 0 V, V _{DS} = 600 V, T _C = 125 °C ⁽¹⁾			100	
I _{GSS}	Gate-body leakage current	V _{DS} = 0 V, V _{GS} = ±25 V			±0.1	μA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	3	4	5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 10 A		0.160	0.185	Ω

Notes:

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

Table 6: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 50 V, f = 1 MHz, V _{GS} = 0 V	-	1800	-	pF
C _{oss}	Output capacitance		-	115	-	pF
C _{rss}	Reverse transfer capacitance		-	6	-	pF
C _{oss eq.} ⁽¹⁾	Equivalent output capacitance	V _{GS} = 0 V, V _{DS} = 0 to 480 V	-	310	-	pF
Q _g	Total gate charge	V _{DD} = 480 V, I _D = 19 A, V _{GS} = 10 V (see Figure 14: "Gate charge test circuit")	-	60	-	nC
Q _{gs}	Gate-source charge		-	8.5	-	nC
Q _{gd}	Gate-drain charge		-	30	-	nC
R _G	Gate input resistance	f = 1 MHz, I _D = 0 A	-	2.8	-	Ω

Notes:

⁽¹⁾C_{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_{DS}

Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 300 V, I _D = 10 A, R _G = 4.7 Ω, V _{GS} = 10 V (see Figure 13: "Switching times test circuit for resistive load" and Figure 18: "Switching time waveform")	-	13	-	ns
t _r	Rise time		-	25	-	ns
t _{d(off)}	Turn-off delay time		-	85	-	ns
t _f	Fall time		-	50	-	ns

Table 8: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		19	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		76	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 19\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 19\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	370		ns
Q_{rr}	Reverse recovery charge		-	5.8		μC
I_{RRM}	Reverse recovery current		-	31.6		A
t_{rr}	Reverse recovery time	$I_{SD} = 19\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	450		ns
Q_{rr}	Reverse recovery charge		-	7.5		μC
I_{RRM}	Reverse recovery current		-	32.5		A

Notes:

⁽¹⁾Pulse width limited by safe operating area.

⁽²⁾Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

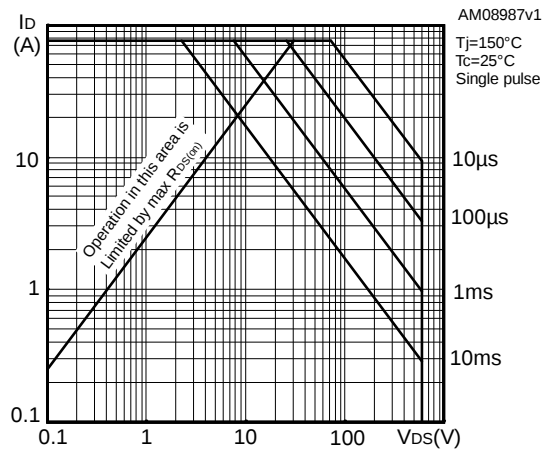


Figure 3: Thermal impedance

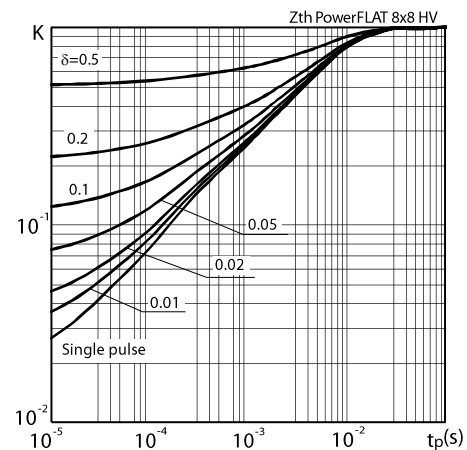


Figure 4: Output characteristics

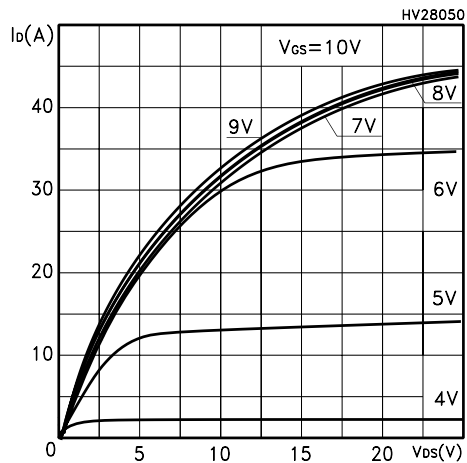


Figure 5: Transfer characteristics

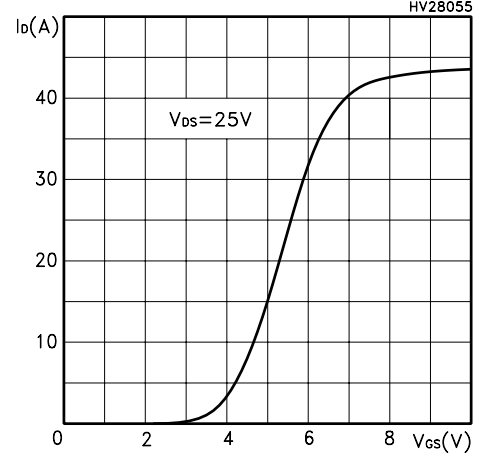


Figure 6: Gate charge vs gate-source voltage

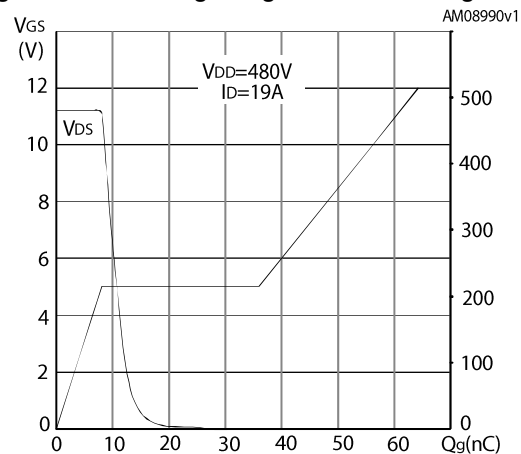


Figure 7: Static drain-source on-resistance

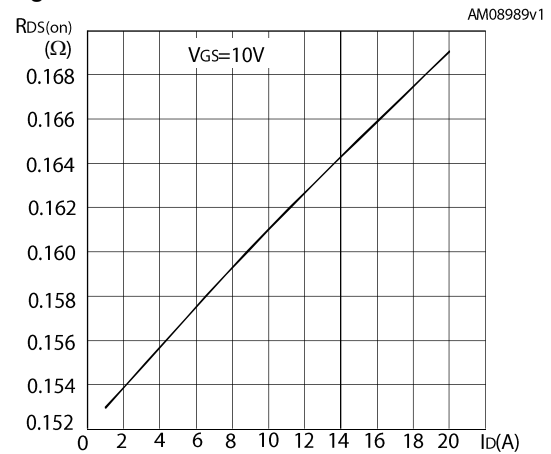


Figure 8: Capacitance variations

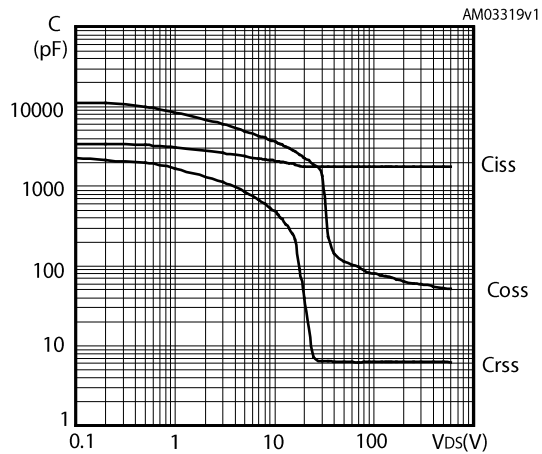


Figure 9: Source-drain diode forward characteristics

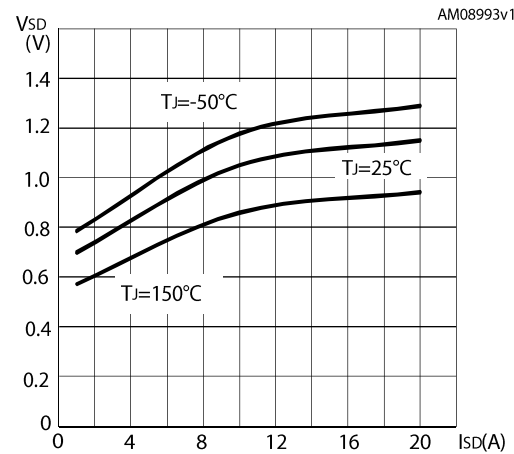


Figure 10: Normalized gate threshold voltage vs temperature

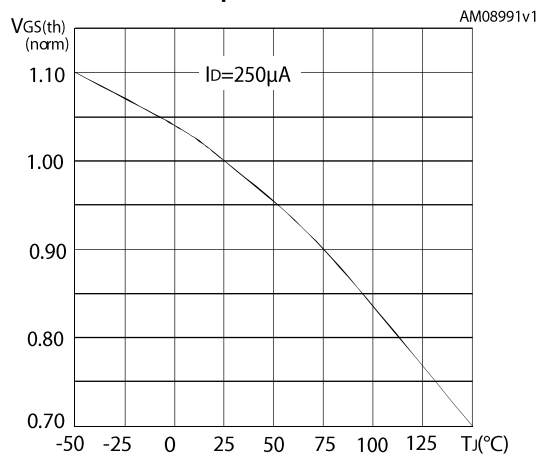
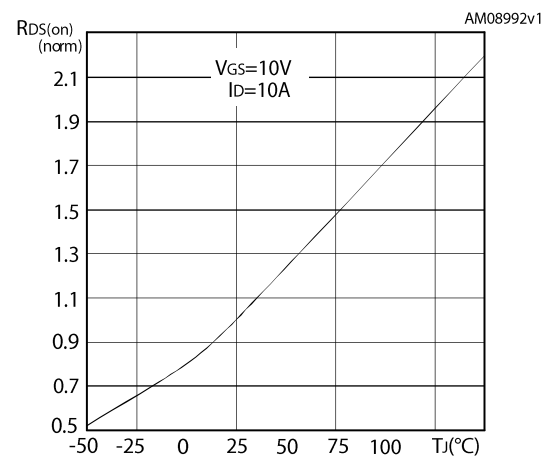
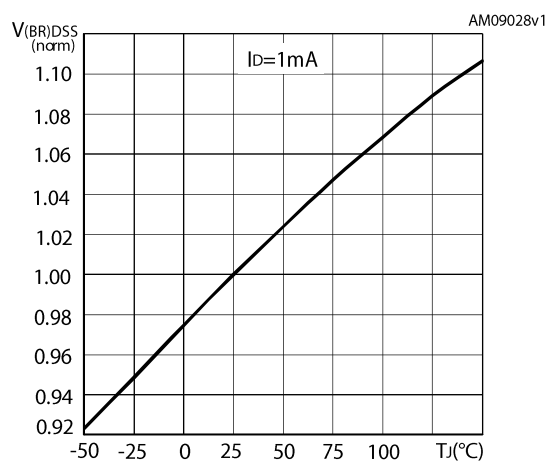
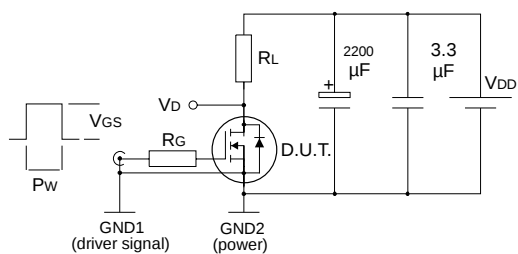


Figure 11: Normalized on-resistance vs temperature

Figure 12: Normalized $V_{(BR)DSS}$ vs temperature

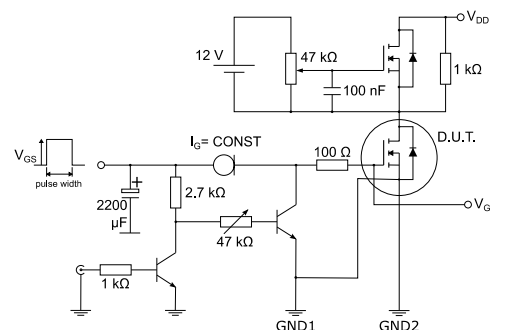
3 Test circuits

Figure 13: Switching times test circuit for resistive load



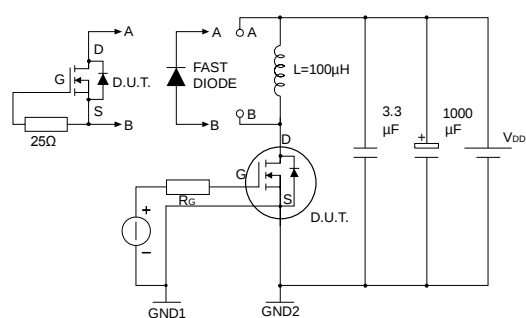
AM15855v1

Figure 14: Gate charge test circuit



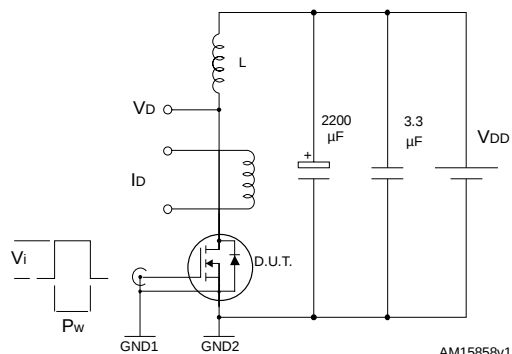
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Figure 15: Test circuit for inductive load switching and diode recovery times



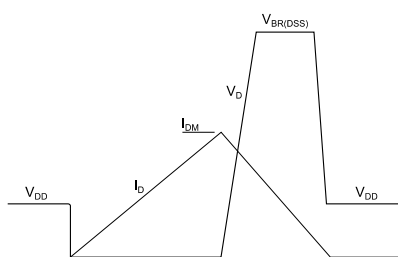
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Figure 16: Unclamped inductive load test circuit



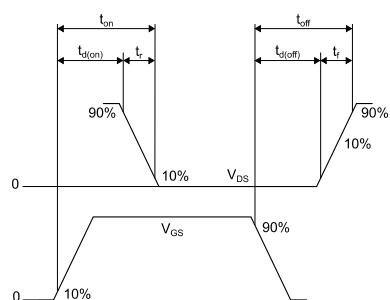
AM15858v1

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

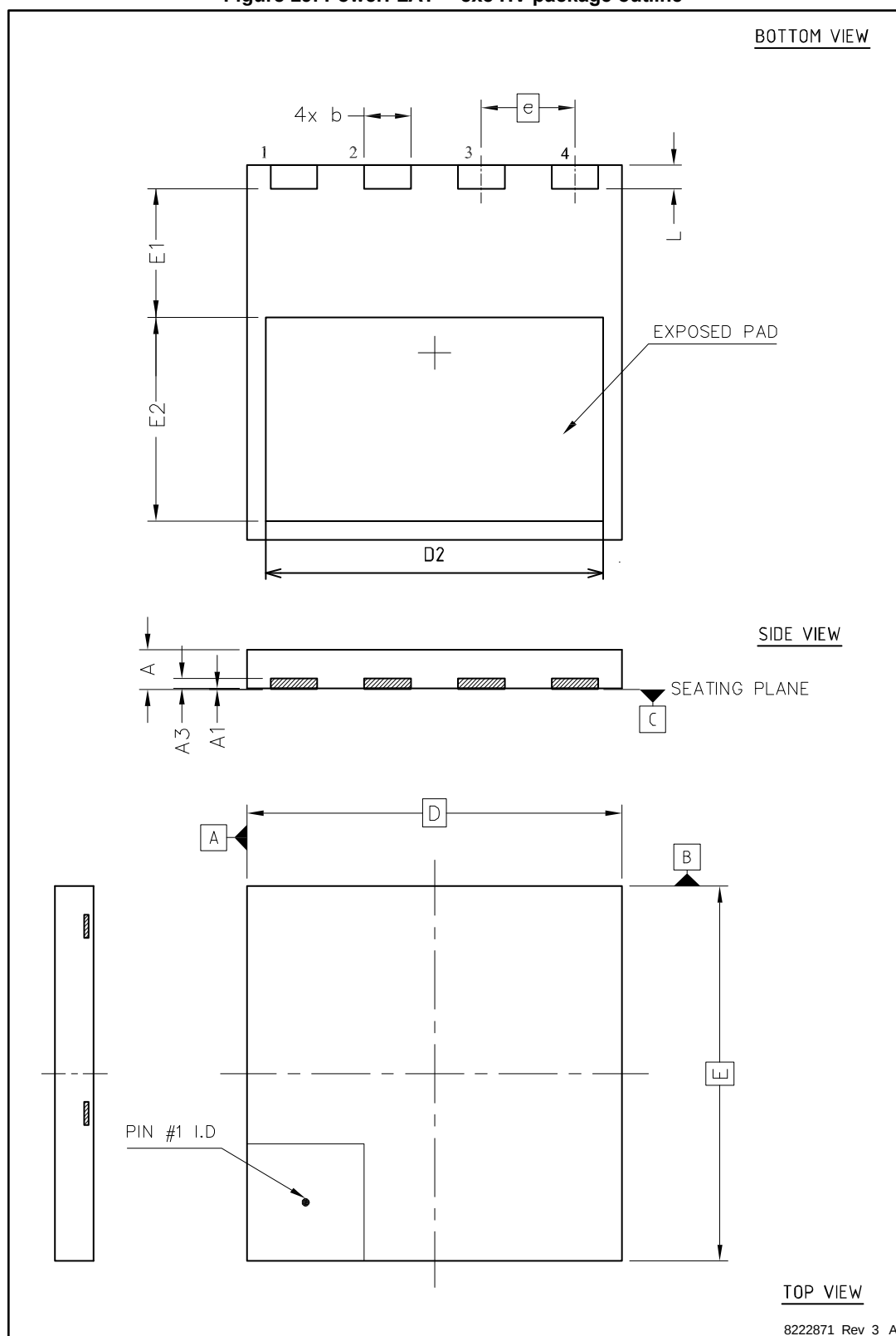
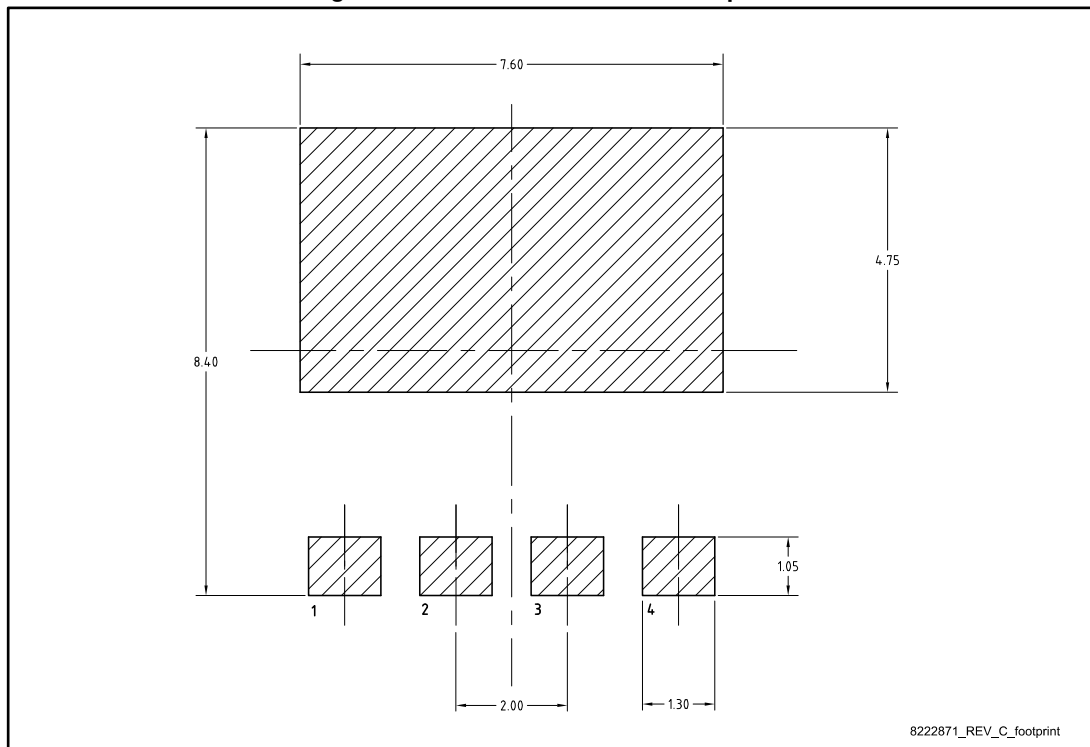


Table 9: PowerFLAT™ 8x8 HV mechanical data

Dim.	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	
L	0.40	0.50	0.60

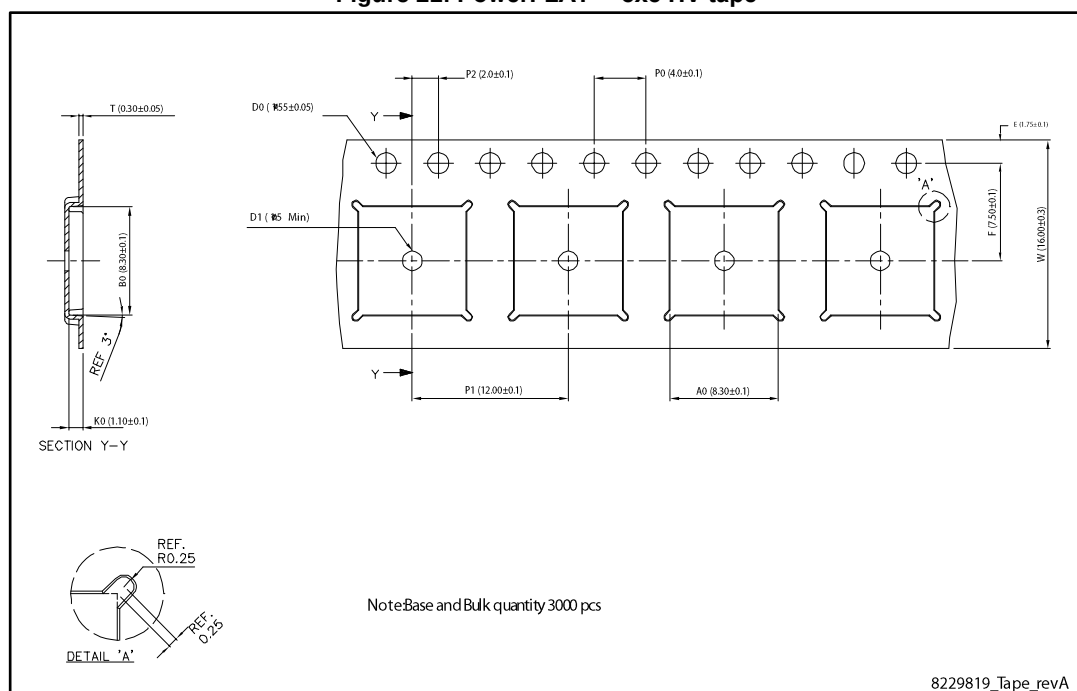
Figure 20: PowerFLAT™ 8x8 HV footprint



All dimensions are in millimeters.

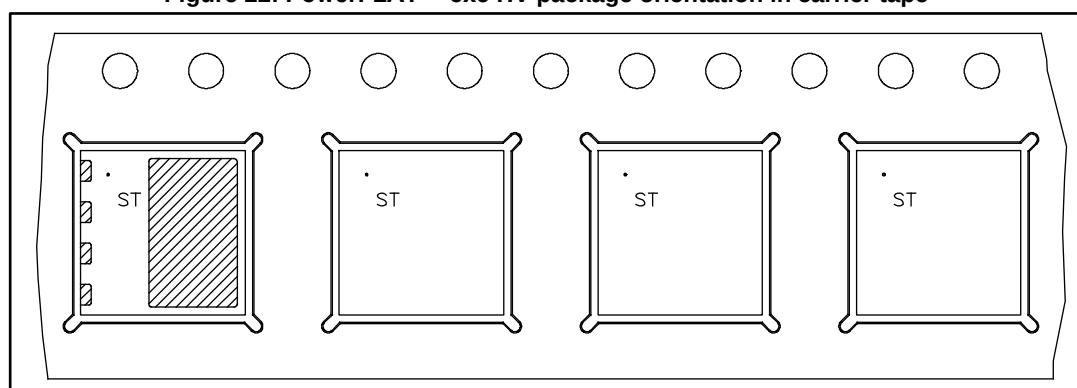
4.2 PowerFLAT 8x8 HV packing information

Figure 21: PowerFLAT™ 8x8 HV tape



All dimensions are in millimeters.

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



5 Revision history

Table 10: Document revision history

Date	Revision	Changes
14-Feb-2011	1	First release.
03-Nov-2011	2	<i>Section 4: Package mechanical data</i> has been updated. Minor text changes.
14-Dec-2016	3	Updated title, silhouette, features, description and internal schematic diagram on cover page. Modified <i>Table 2: "Absolute maximum ratings"</i> , <i>Table 3: "Thermal data"</i> , <i>Table 5: "On/off states"</i> , <i>Table 6: "Dynamic"</i> , <i>Table 7: "Switching times"</i> and <i>Table 8: "Source-drain diode"</i> . Minor text changes.

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