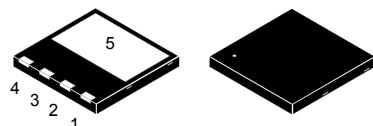
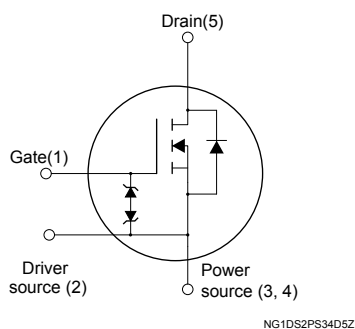


N-channel 600 V, 0.278 Ω typ., 11 A MDmesh™ M2 Power MOSFET in a PowerFLAT™ 8x8 HV package



PowerFLAT™ 8x8 HV



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STL19N60M2	600 V	0.308 Ω	11 A

- Extremely low gate charge
- Excellent output capacitance (C_{oss}) profile
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications

Description

This very high voltage N-channel Power MOSFET is designed using MDmesh™ K5 technology based on an innovative proprietary vertical structure. The result is a dramatic reduction in on-resistance and ultra-low gate charge for applications requiring superior power density and high efficiency.

Product status link

[STL19N60M2](#)

Product summary

Order code	STL19N60M2
Marking	19N60M2
Package	PowerFLAT™ 8x8 HV
Packing	Tape and reel

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 $T_C = 25\text{ }^{\circ}\text{C}$	11	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	6.9	A
$I_{DM}^{(1)}$	Drain current (pulsed)	44	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	90	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
$dv/dt^{(3)}$	MOSFET dv/dt ruggedness	50	V/ns
T_{stg}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$
T_j	Operating junction temperature range		

1. Pulse width limited by safe operating area.
2. $I_{SD} \leq 11\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$; $V_{DS(peak)} < V_{(BR)DSS}$, $V_{DD} = 400\text{ V}$.
3. $V_{DS} \leq 480\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.39	$^{\circ}\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	45	$^{\circ}\text{C}/\text{W}$

1. When mounted on FR-4 board of inch^2 , 2oz Cu.

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_{jmax})	3	A
E_{AS}	Single pulse avalanche energy (starting $T_j = 25\text{ }^{\circ}\text{C}$, $I_D = I_{AR}$; $V_{DD} = 50\text{ V}$)	135	mJ

2 Electrical characteristics

$T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$	600			V
I_{DSS}	Zero gate voltage Drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$			± 10	μA
$V_{GS(th)}$	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	$V_{GS} = 10\text{ V}$, $I_D = 5.5\text{ A}$		0.278	0.308	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	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	791	-	pF
C_{oss}	Output capacitance		-	40	-	pF
C_{rss}	Reverse transfer capacitance		-	1.3	-	pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{DS} = 0\text{ to }480\text{ V}$, $V_{GS} = 0\text{ V}$	-	164.5	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	5.6	-	Ω
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 13\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior and Figure 18. Switching time waveform)	-	21.5	-	nC
Q_{gs}	Gate-source charge		-	3.2	-	nC
Q_{gd}	Gate-drain charge		-	11.3	-	nC

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	$V_{DD} = 300\text{ V}$, $I_D = 6.5\text{ A}$ $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13. Switching times test circuit for resistive load)	-	12	-	ns
t_r	Rise time		-	9	-	ns
$t_{d(off)}$	Turn-off delay time		-	47	-	ns
t_f	Fall time		-	10.6	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		11	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		44	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 11\text{ A}$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 13\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	305		ns
Q_{rr}	Reverse recovery charge		-	3.3		μC
I_{RRM}	Reverse recovery current		-	22		A
t_{rr}	Reverse recovery time	$I_{SD} = 13\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	417		ns
Q_{rr}	Reverse recovery charge		-	4.6		μC
I_{RRM}	Reverse recovery current		-	22		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

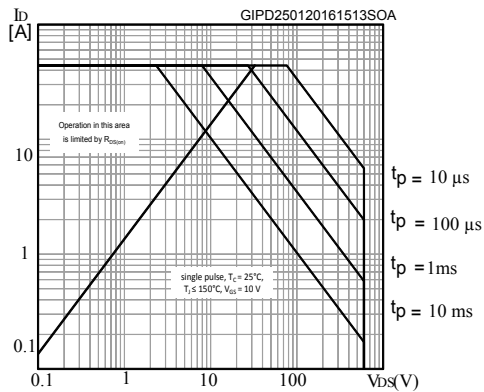


Figure 2. Thermal impedance

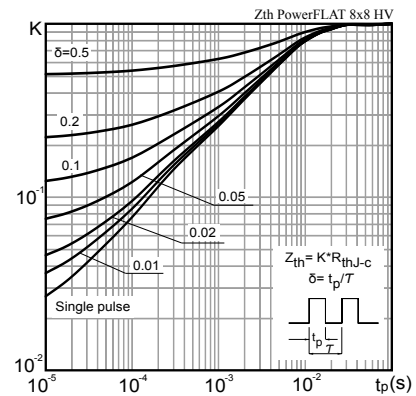


Figure 3. Output characteristics

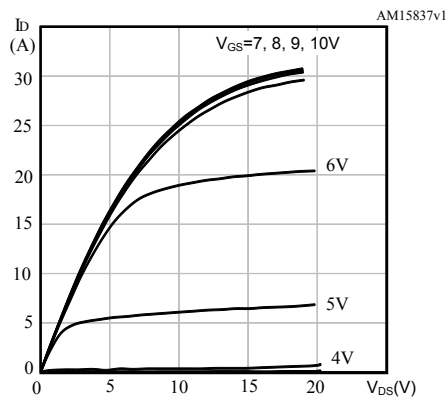


Figure 4. Transfer characteristics

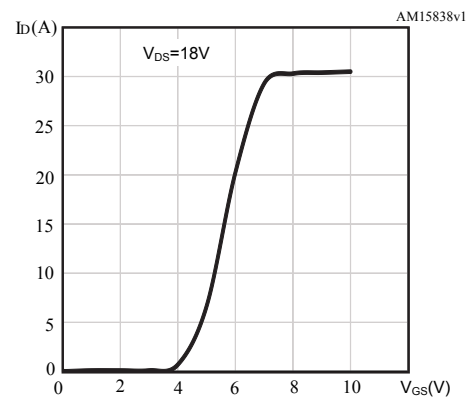


Figure 5. Gate charge vs gate-source voltage

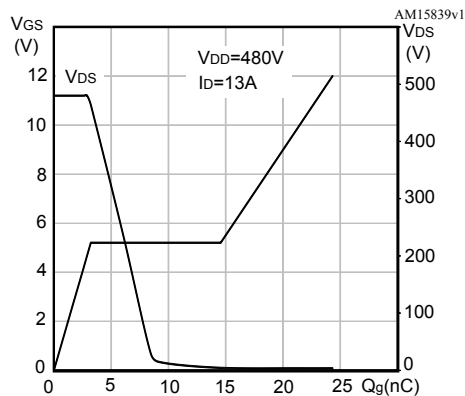


Figure 6. Static drain-source on-resistance

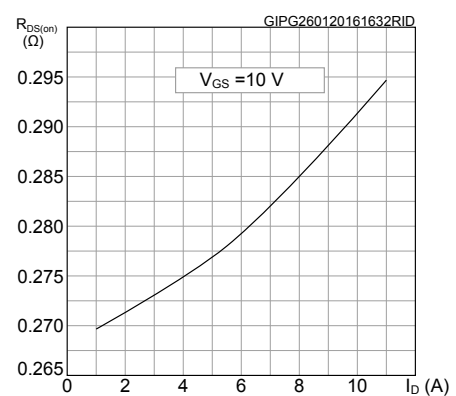


Figure 7. Capacitance variations

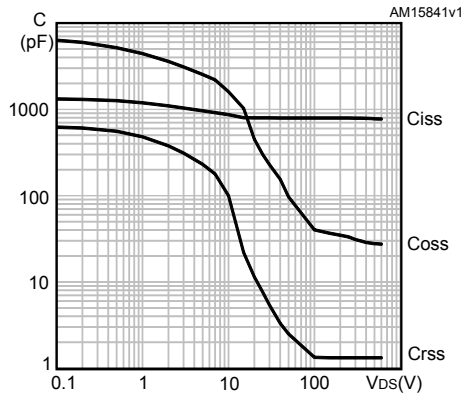


Figure 8. Normalized gate threshold voltage vs temperature

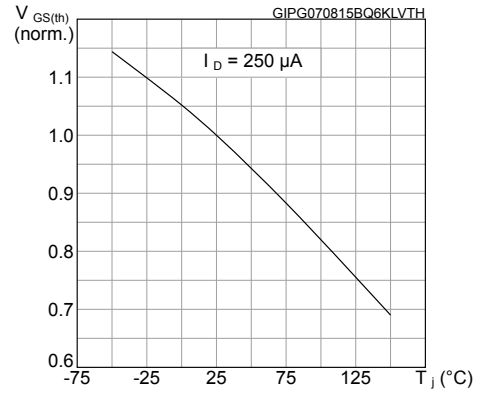


Figure 9. Normalized on-resistance vs temperature

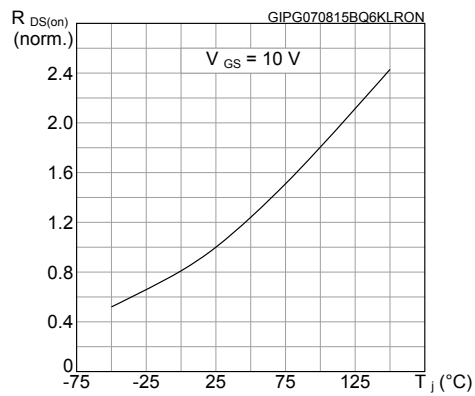


Figure 10. Normalized V(BR)DSS vs temperature

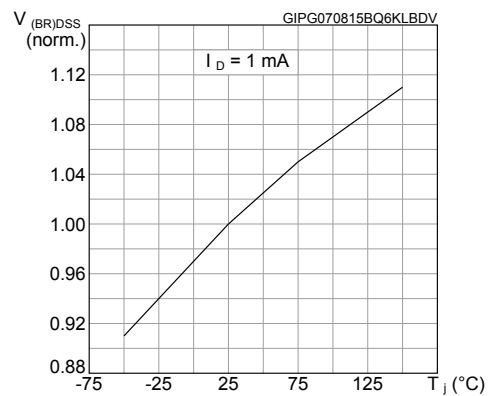


Figure 11. Output capacitance stored energy

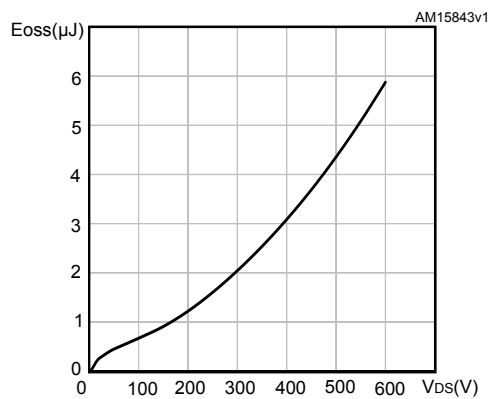
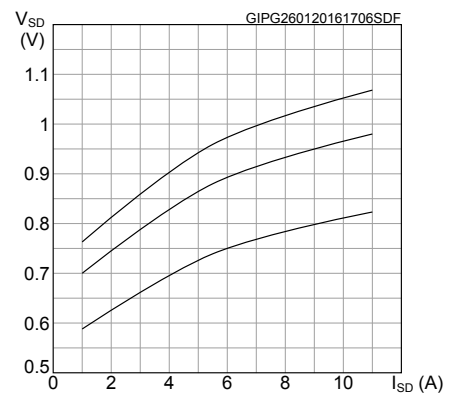
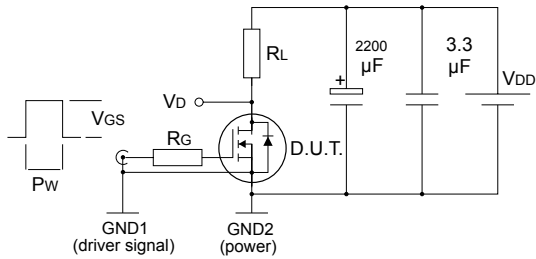


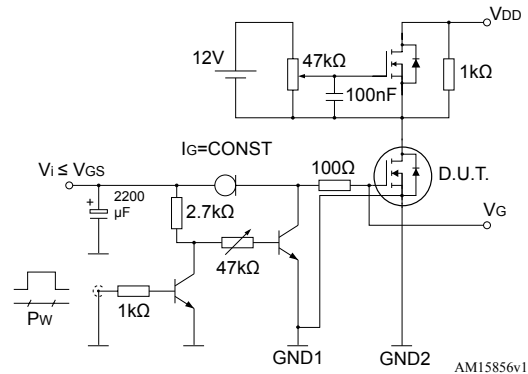
Figure 12. Source-drain diode forward characteristics



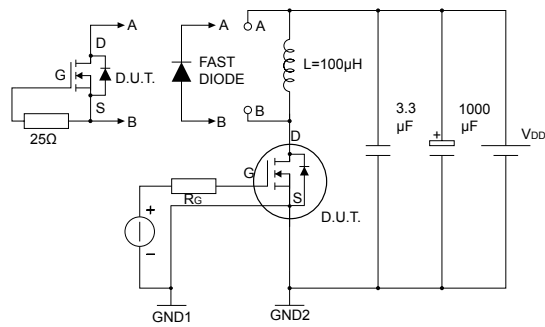
3 Test circuits

Figure 13. Switching times test circuit for resistive load


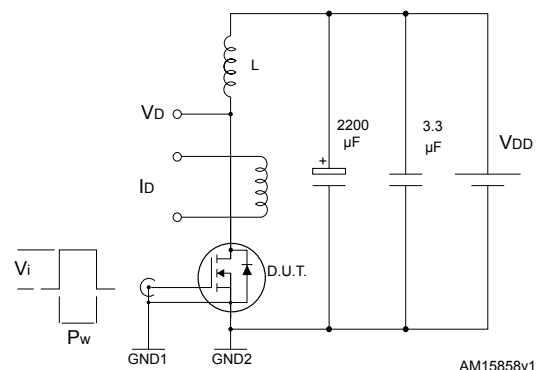
AM15855v1

Figure 14. Test circuit for gate charge behavior


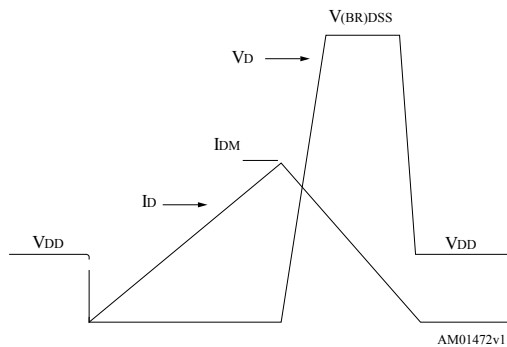
AM15856v1

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


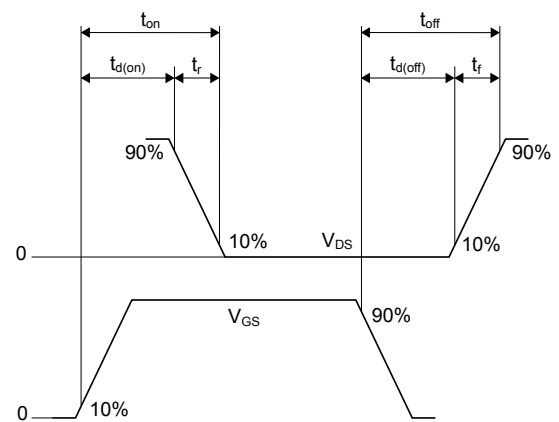
AM15857v1

Figure 16. Unclamped inductive load test circuit


AM15858v1

Figure 17. Unclamped inductive waveform


AM01472v1

Figure 18. Switching time waveform


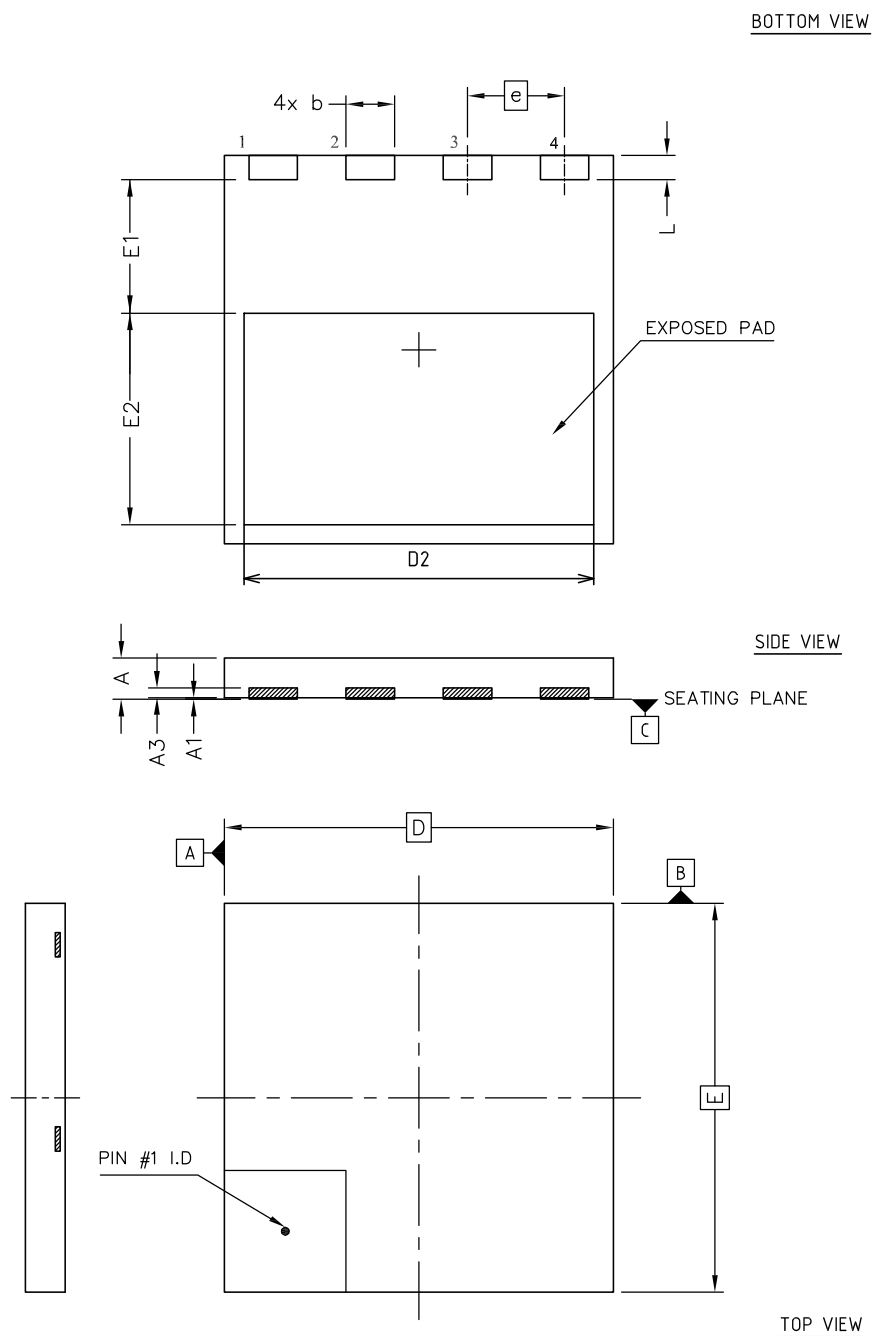
AM01473v1

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

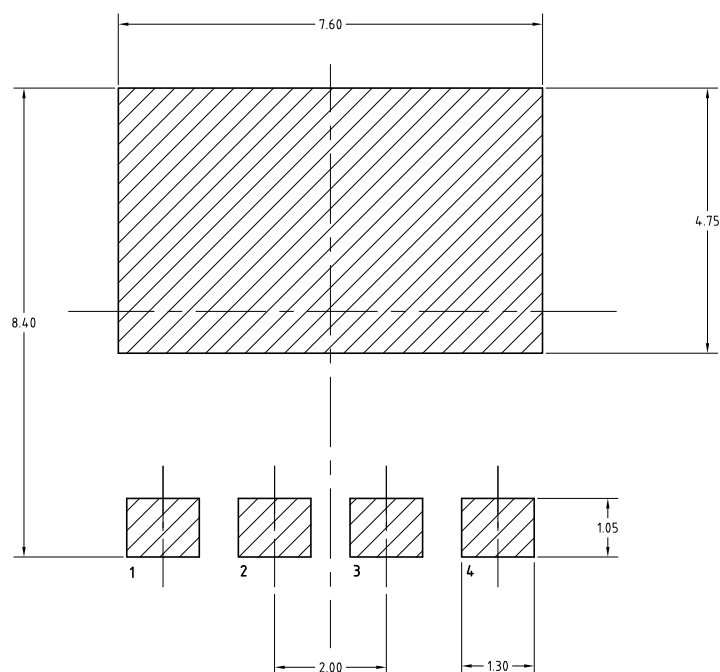


8222871_Rev_4

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

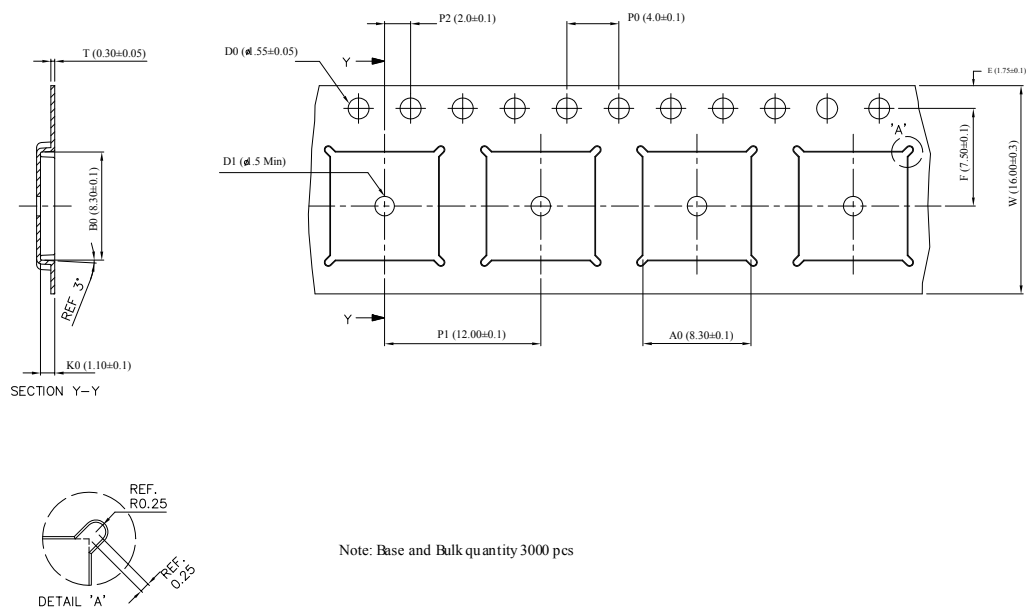


8222871_REV_4_footprint

Note: All dimensions are in millimeters.

4.2 PowerFLAT™ 8x8 HV packing information

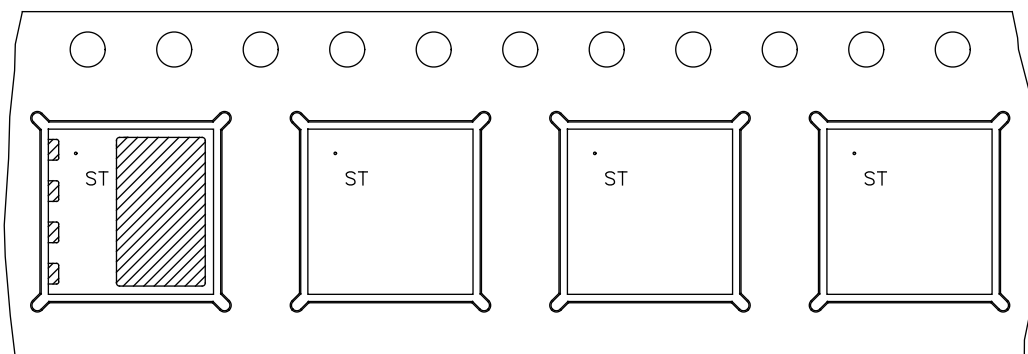
Figure 21. PowerFLAT™ 8x8 HV tape



8229819 Tape revA

Note: All dimensions are in millimeters.

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



Revision history

Table 9. Document revision history

Date	Revision	Changes
27-Jan-2016	1	First release.
15-Nov-2018	2	Updated Table 1. Absolute maximum ratings, Table 2. Thermal data, Table 4. On/off states, Table 5. Dynamic, Table 6. Switching times, Table 7. Source drain diode and Figure 7. Capacitance variations.

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