

N-channel 500 V, 0.40 Ω typ., 8.5 A MDmesh™ II Power MOSFET in a DPAK package

Datasheet - production data

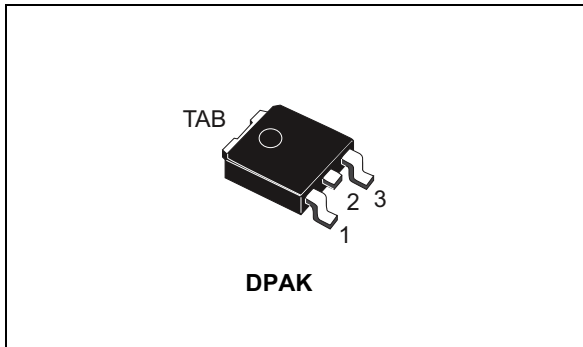
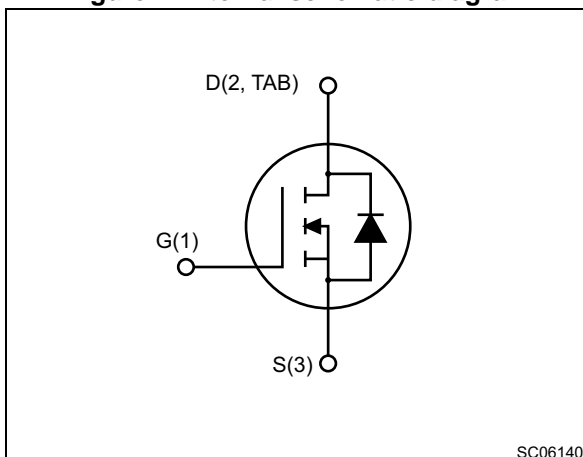


Figure 1. Internal schematic diagram



Features

Order code	$V_{DS} @ T_J \text{ max}$	$R_{DS(on)} \text{ max}$	I_D
STD11NM50N	550 V	0.47 Ω	8.5 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
STD11NM50N	11NM50N	DPAK	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	500	V
V_{GS}	Gate-source voltage	± 25	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	8.5	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	6	A
$I_{DM}^{(1)}$	Drain current (pulsed)	34	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	70	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
T_{stg}	Storage temperature	- 55 to 150	$^\circ\text{C}$
T_j	Max. operating junction temperature	150	$^\circ\text{C}$

1. Pulse width limited by safe operating area .
2. $I_{SD} \leq 8.5\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DSpeak} \leq V_{(BR)DSS}$, $V_{DD} = 80\% V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.79	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}$	Thermal resistance junction-pcb max ⁽¹⁾	50	$^\circ\text{C}/\text{W}$

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

Table 4. 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 $T_J=25\text{ }^\circ\text{C}$, $I_D=I_{AR}$, $V_{DD}=50\text{ V}$)	150	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	500			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = 500 V V _{DS} = 500 V, T _C = 125 °C			1 100	μA μA
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	V _{GS} = ± 25 V			±100	μA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	2	3	4	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 4.5 A		0.40	0.47	Ω

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	-	547	-	pF
C _{oss}	Output capacitance		-	42	-	pF
C _{rss}	Reverse transfer capacitance		-	2	-	pF
C _{oss eq. (1)}	Equivalent output capacitance	V _{GS} = 0, V _{DS} = 0 to 400 V	-	210	-	pF
Q _g	Total gate charge	V _{DD} = 400 V, I _D = 8.5 A, V _{GS} = 10 V (see Figure 14)	-	19	-	nC
Q _{gs}	Gate-source charge		-	3.7	-	nC
Q _{gd}	Gate-drain charge		-	10	-	nC
R _G	Gate input resistance	f=1 MHz, I _D =0	-	5.8	-	Ω

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

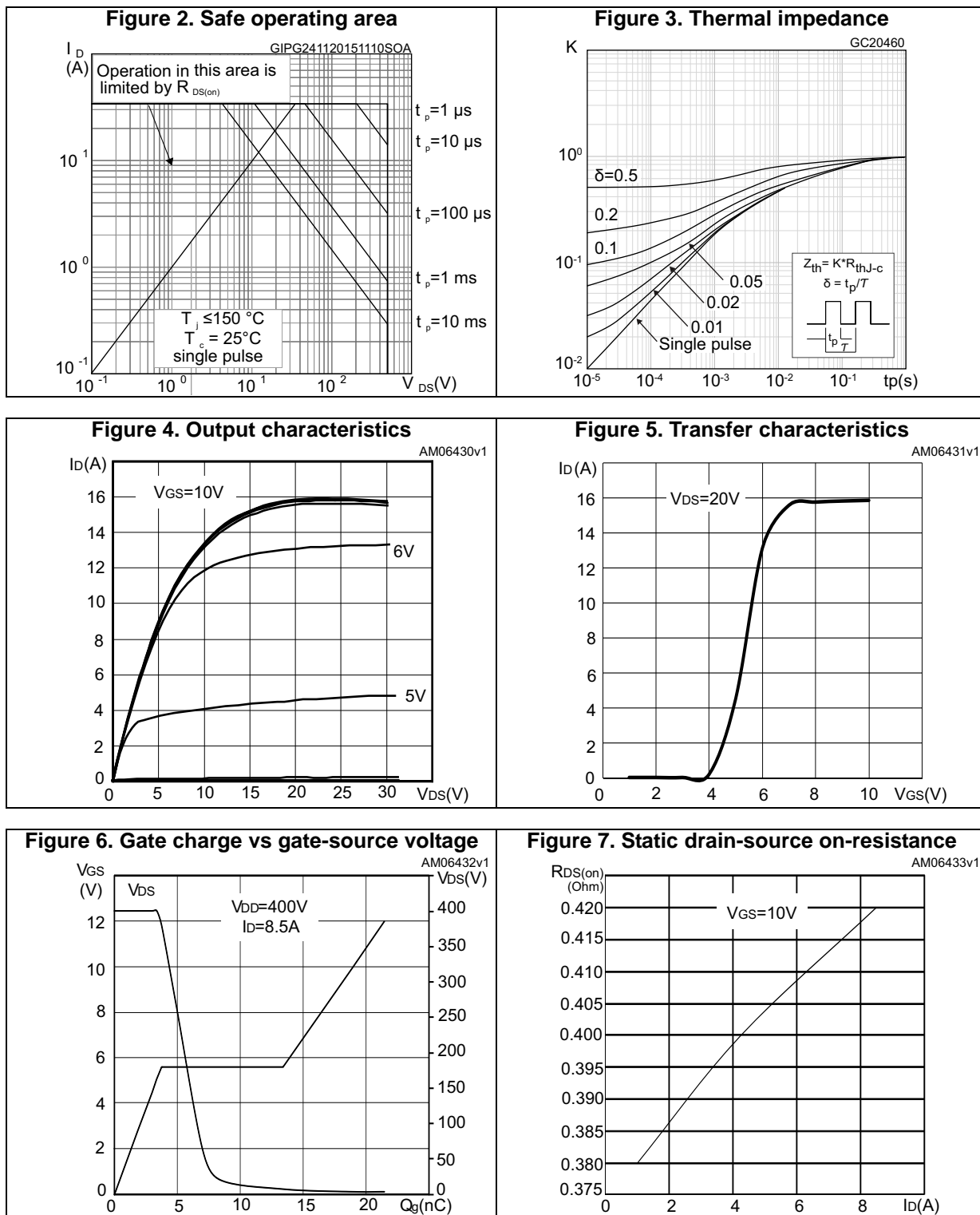
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 250\text{ V}$, $I_D = 4.25\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 15 and Figure 18)	-	8	-	ns
t_r	Rise time		-	10	-	ns
$t_{d(off)}$	Turn-off delay time		-	33	-	ns
t_f	Fall time		-	10	-	ns

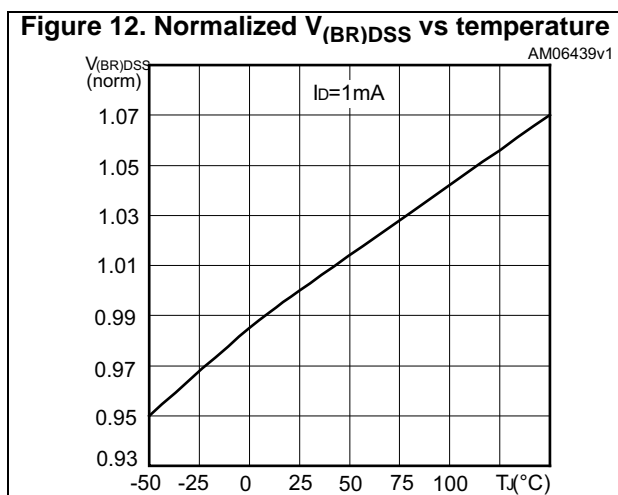
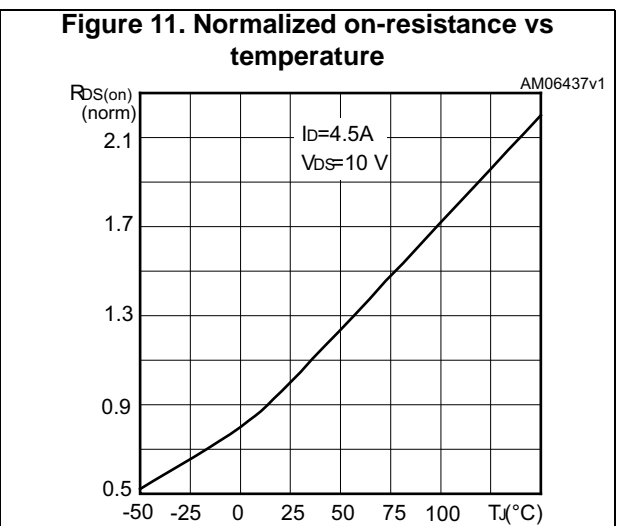
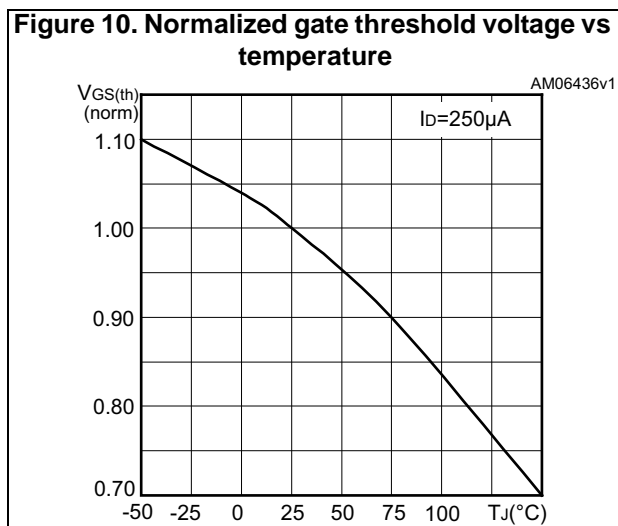
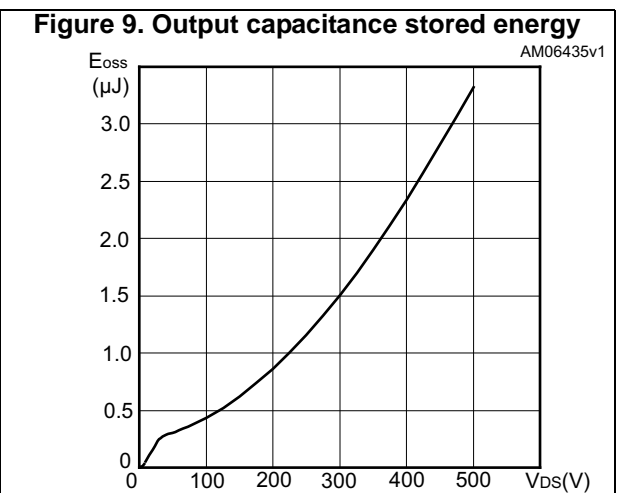
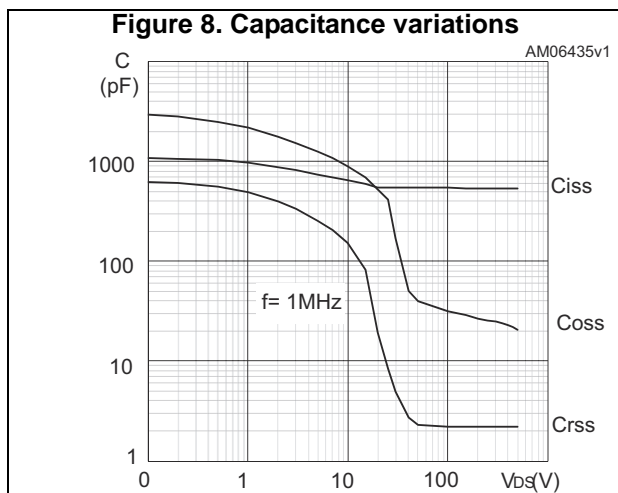
Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		8.5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				34	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 8.5\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 8.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	-	230		ns
Q_{rr}	Reverse recovery charge		-	2.1		μC
I_{RRM}	Reverse recovery current	$V_{DD} = 60\text{ V}$ (see Figure 15)	-	18		A
t_{rr}	Reverse recovery time	$I_{SD} = 8.5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	-	275		ns
Q_{rr}	Reverse recovery charge		-	2.5		μC
I_{RRM}	Reverse recovery current	$V_{DD} = 60\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15)	-	18		A

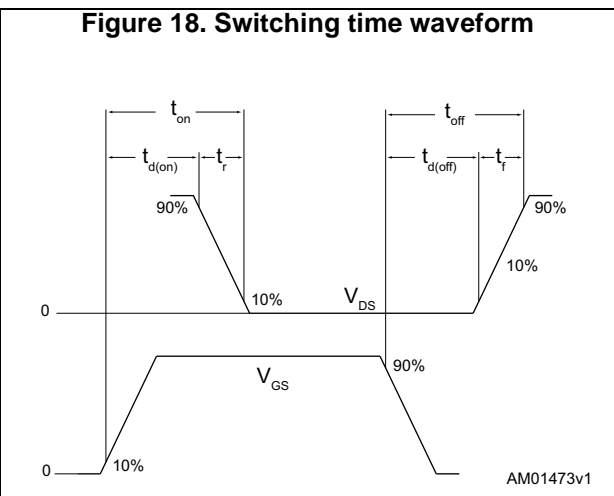
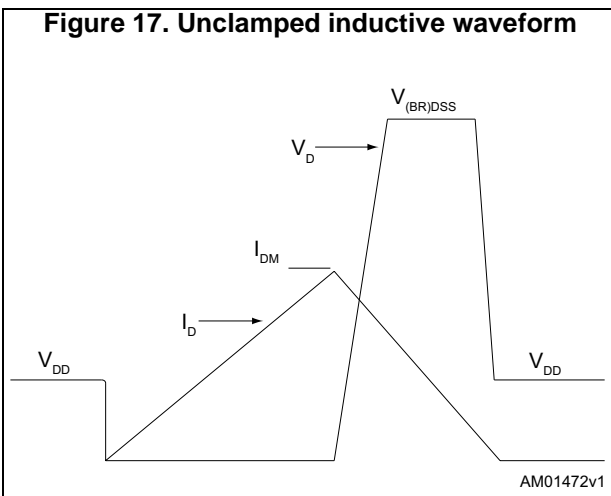
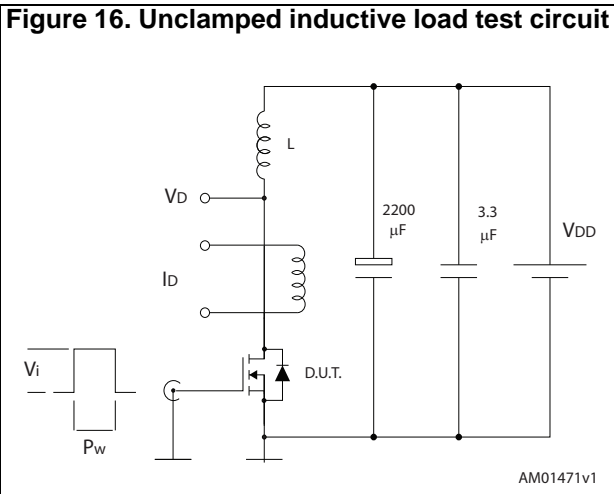
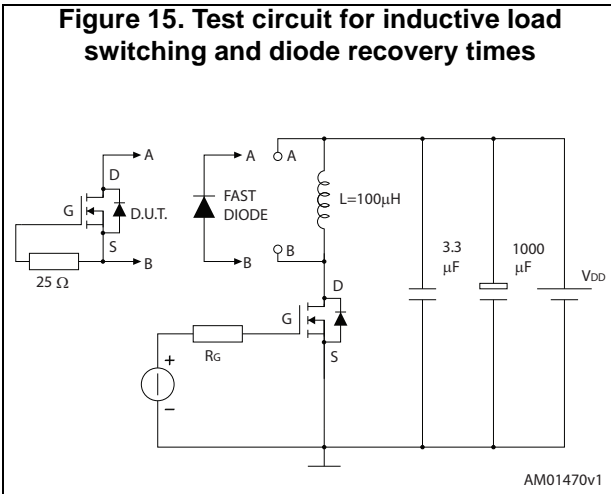
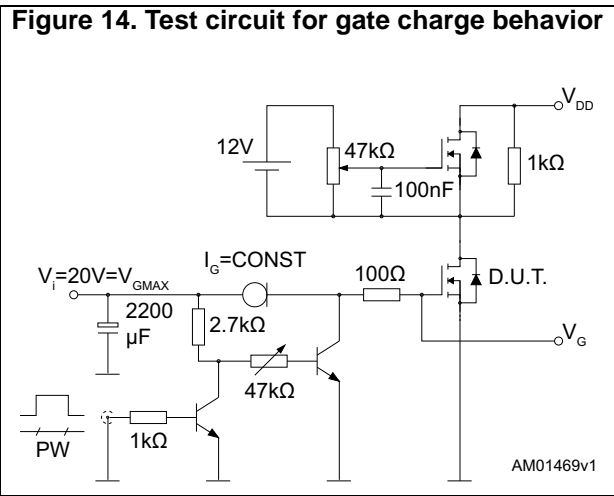
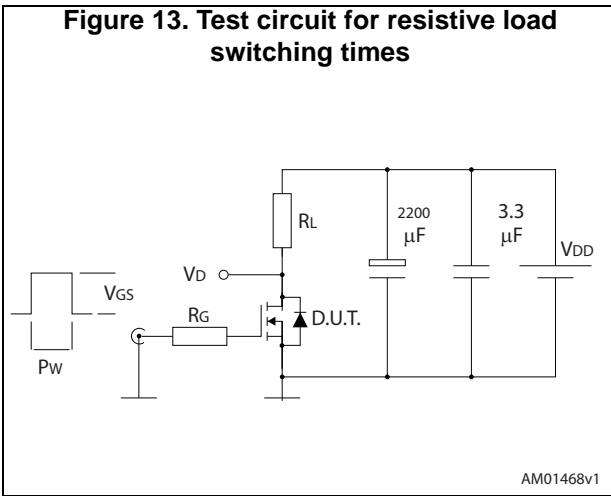
1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)





3 Test circuits



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 type A package information

Figure 19. DPAK (TO-252) type A package outline

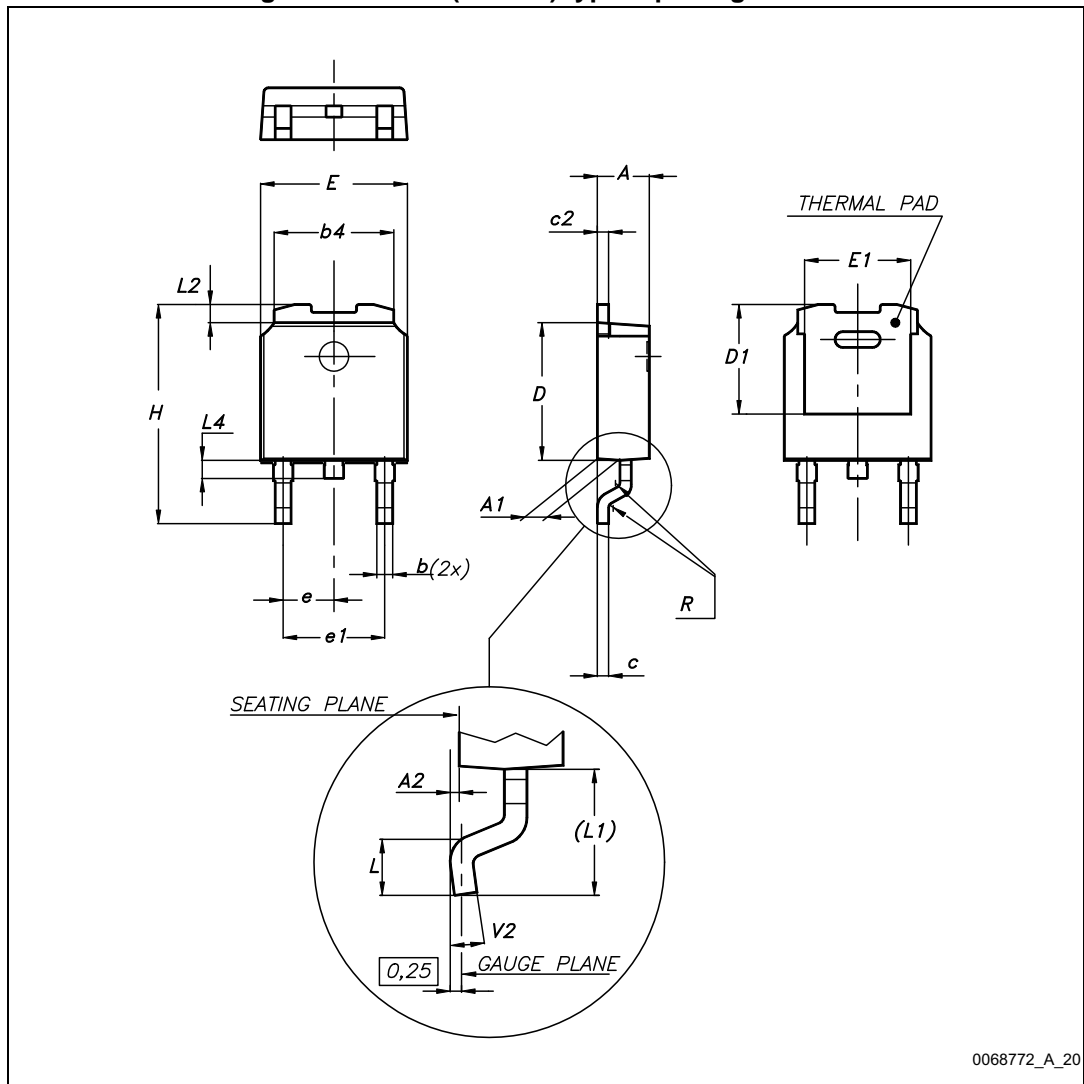


Table 9. DPAK (TO-252) type A mechanical data

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	4.60	4.70	4.80
e	2.16	2.28	2.40
e1	4.40		4.60
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 type E package information

Figure 20. DPAK (TO-252) type E outline

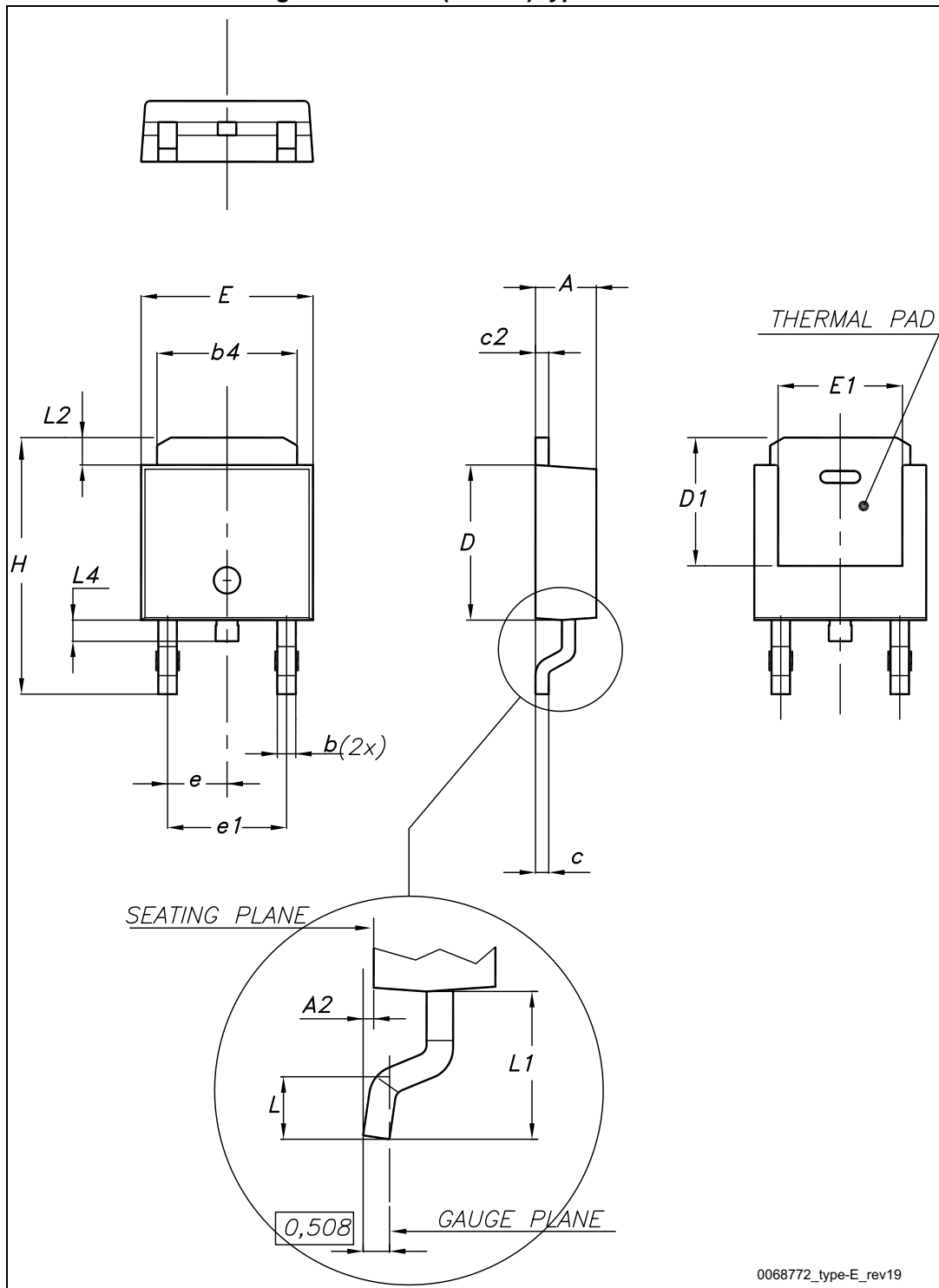
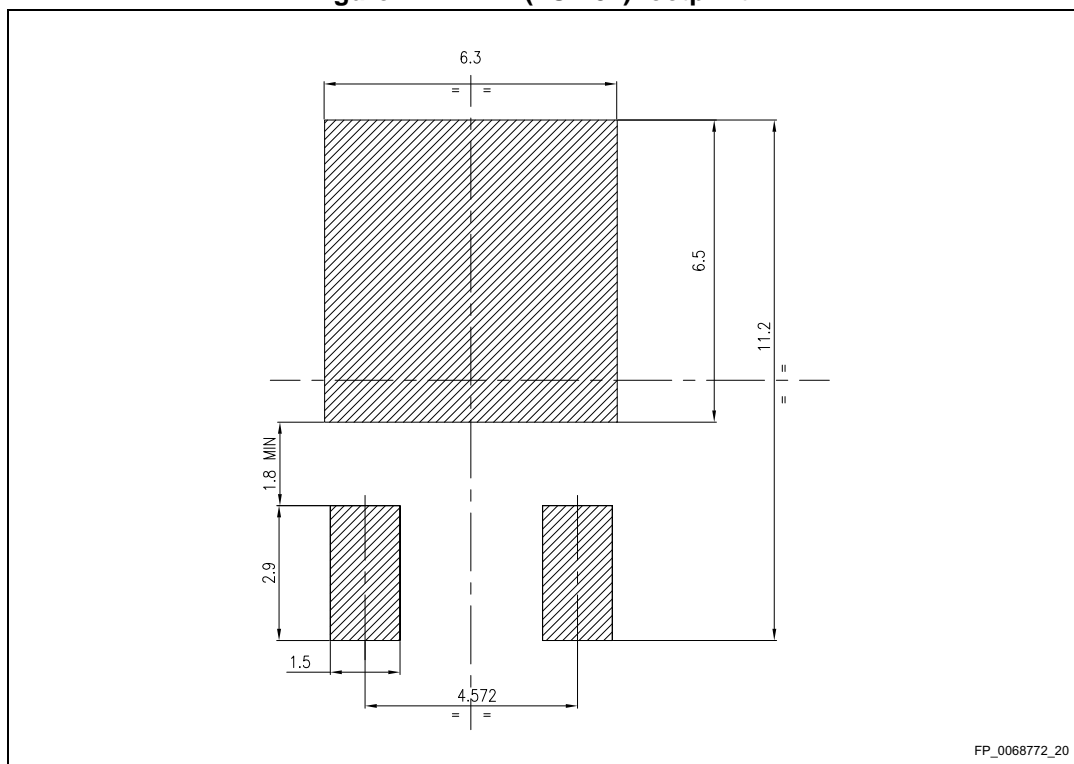


Table 10. DPAK (TO-252) type E mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.18		2.39
A2			0.13
b	0.65		0.884
b4	4.95		5.46
c	0.46		0.61
c2	0.46		0.60
D	5.97		6.22
D1	5.21		
E	6.35		6.73
E1	4.32		
e		2.286	
e1		4.572	
H	9.94		10.34
L	1.50		1.78
L1		2.74	
L2	0.89		1.27
L4			1.02

Figure 21. DPAK (TO-252) footprint (a)



a. All dimensions are in millimeters

5 Revision history

Table 11. Document revision history

Date	Revision	Changes
25-Nov-2015	1	First release. Part number previously included in datasheet DocID17156

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Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331