STY100NM60N

N-channel 600 V, 0.028 Ω typ., 98 A MDmesh™ II Power MOSFET in a Max247 package

Datasheet — production data

Features

Type	V_{DSS} @ T_{Jmax}	$R_{DS(on)}$ max	I_D
STY100NM60N	650 V	< 0.029 Ω	98 A

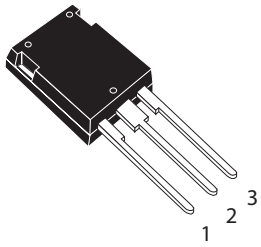
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

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.



Max247

Figure 1. Internal schematic diagram

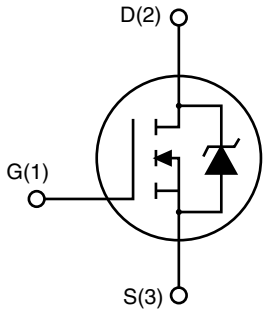


Table 1. Device summary

Order code	Marking	Package	Packaging
STY100NM60N	100NM60N	Max247	Tube

This is information on a product in full production. www.st.com

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate- source voltage	25	V
I_D	Drain current (continuous) at T_C = 25 °C	98	A
I_D	Drain current (continuous) at T_C = 100 °C	62	A
I_{DM} (1)	Drain current (pulsed)	392	A
P_{TOT}	Total dissipation at T_C = 25 °C	625	W
dv/dt(2)	Peak diode recovery voltage slope	15	V/ns
T_{stg}	Storage temperature	- 55 to 150	°C
T_j	Max. operating junction temperature		°C

1. Pulse width limited by safe operating area.
2. I_{SD} ≤98 A, di/dt ≤400 A/µs, V_{DS} peak ≤$V_{(BR)DSS}$, V_{DD} = 80% $V_{(BR)DSS}$.

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	0.2	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max	30	°C/W
T_j	Maximum lead temperature for soldering purpose	300	°C

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetetive or not repetetive (pulse width limited by T_{jmax})	15	A
E_{AS}	Single pulse avalanche energy (starting T_j=25 °C, I_D=I_{ar}, V_{DD}=50)	757	mJ

2 Electrical characteristics

(T_C = 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 (V_{GS} = 0)	I_D = 1 mA	600			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 600 V V_{DS} = 600 V, T_C=125 °C			10 150	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 25 V			±100	nA
$V_{GS(th)}$	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 = 49 A		0.028	0.029	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 50 V, f = 1 MHz, V_{GS} = 0	-	9600 850 50	-	pF pF pF
$C_{oss(eq)}$(1)	Equivalent output capacitance	V_{DS} = 0 to 480 V V_{GS} = 0	-	1602	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz open drain	-	1.3	-	Ω
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 480 V, I_D = 98 A, V_{GS} = 10 V (see *Figure 15*)	-	330 40 174	-	nC nC nC

1. $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as Coss when V_{DS} increases from 0 to 80% V_{DS}

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD} = 300 V, I_D = 49 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 16*) and (see *Figure 19*)	-	45 52 372 81	-	ns ns ns ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)		-		98 392	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 98 A, V_{GS} = 0	-		1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 98 A, di/dt = 100 A/µs V_{DD} = 60 V (see *Figure 16*)	-	622 16.5 52.5		ns µC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 98 A, di/dt = 100 A/µs V_{DD} = 60 V, T_j = 150 °C (see *Figure 16*)	-	820 27 66		ns µC 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 2. Safe operating area

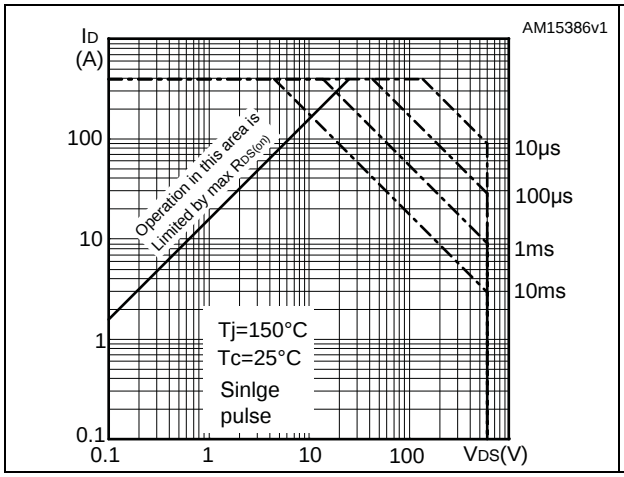


Figure 3. Thermal impedance

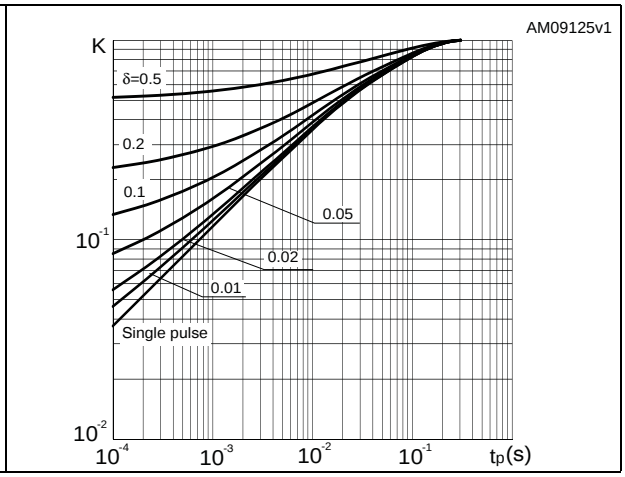


Figure 4. Output characteristics

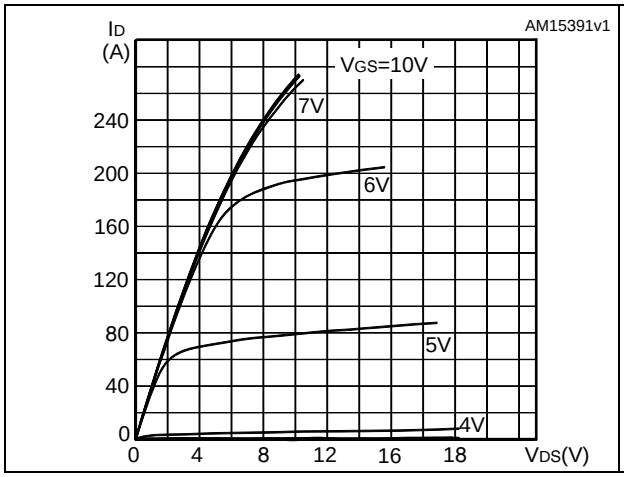


Figure 5. Transfer characteristics

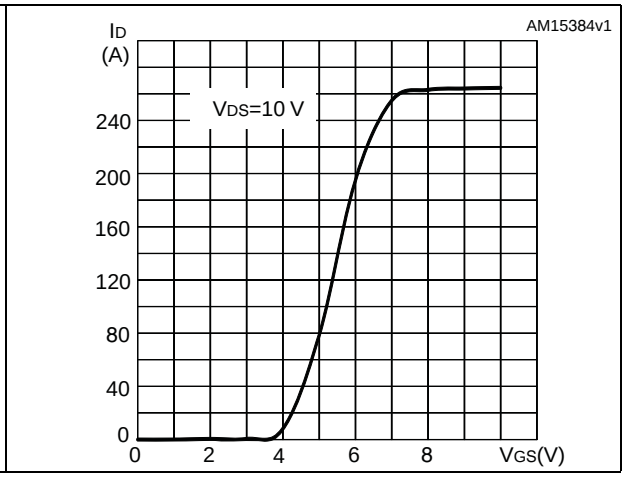


Figure 6. Gate charge vs gate-source voltage

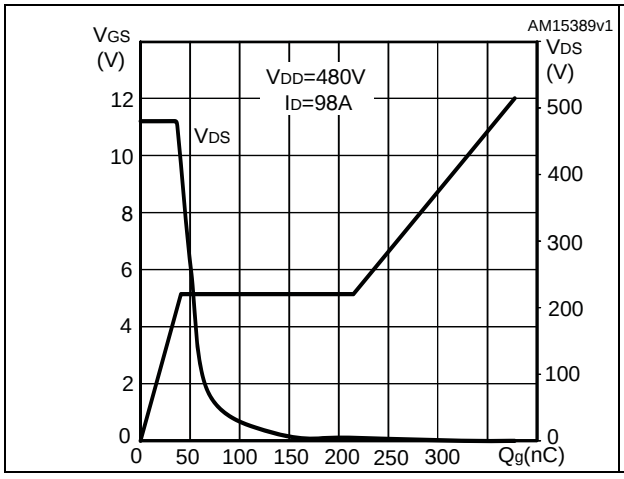


Figure 7. Static drain-source on-resistance

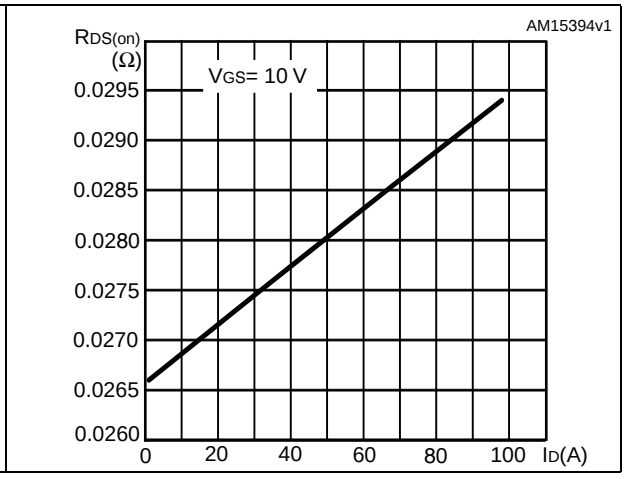


Figure 8. Capacitance variations

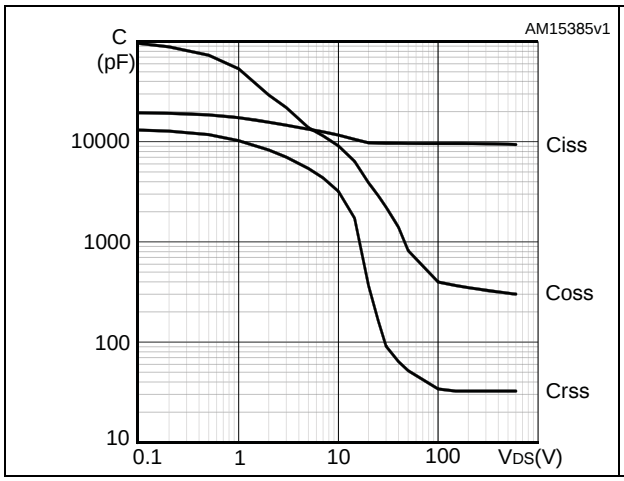


Figure 9. Normalized on-resistance vs temperature

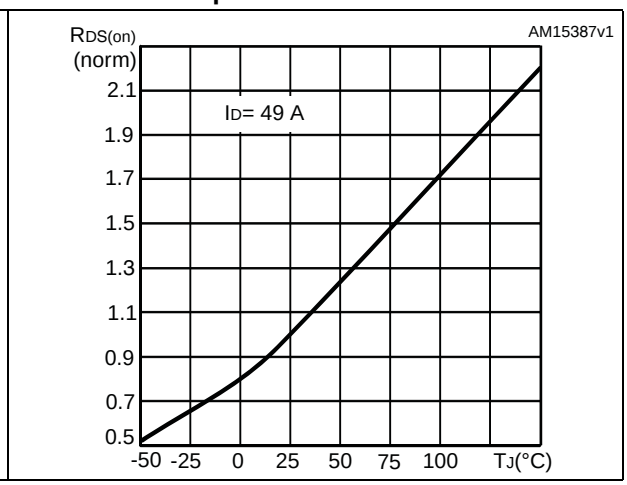


Figure 10. Normalized gate threshold voltage vs temperature

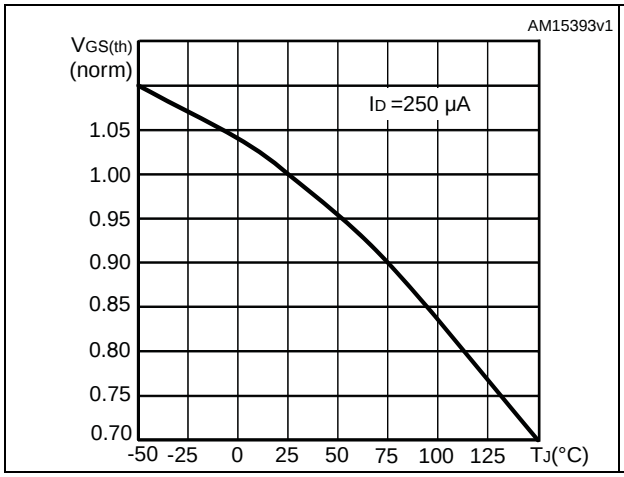


Figure 11. Normalized B_{VDSS} vs temperature

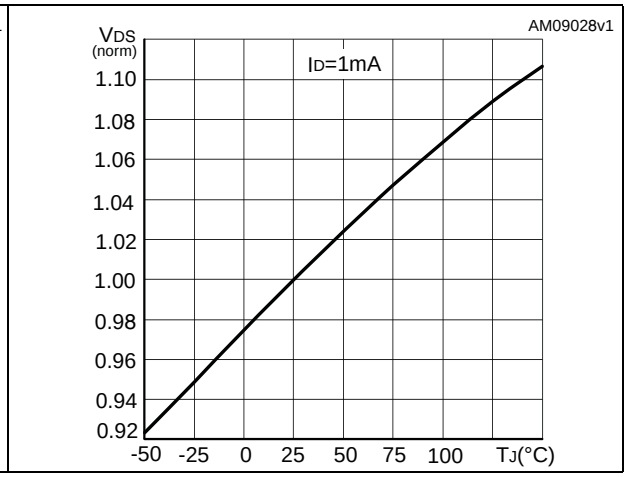


Figure 12. Source-drain diode forward characteristics

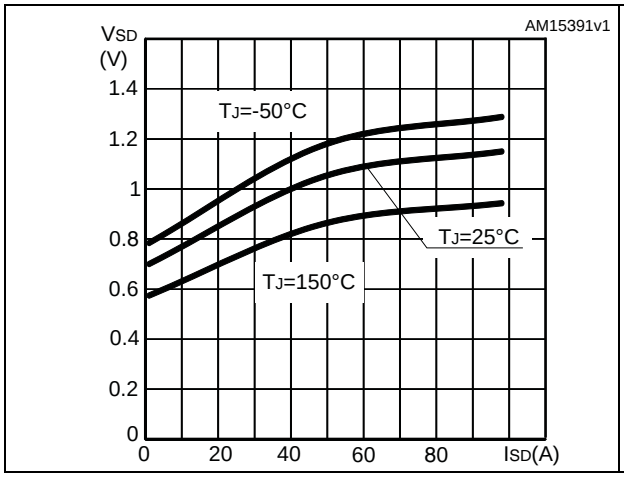
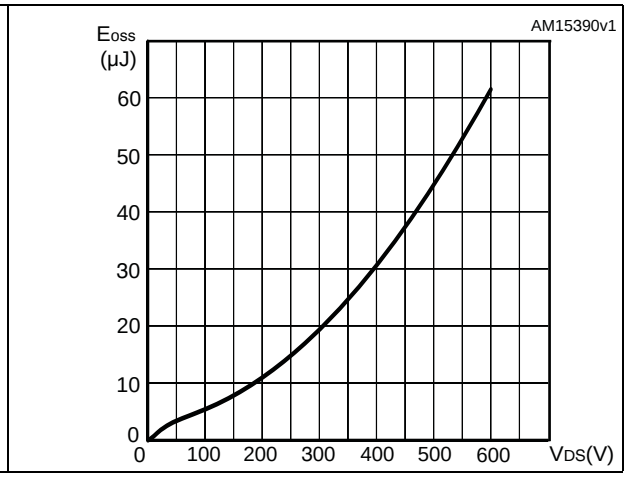


Figure 13. Output capacitance stored energy



3 Test circuits

Figure 14. Switching times test circuit for resistive load

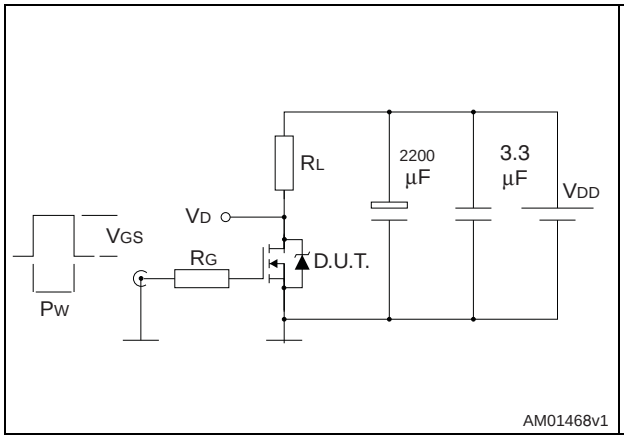


Figure 15. Gate charge test circuit

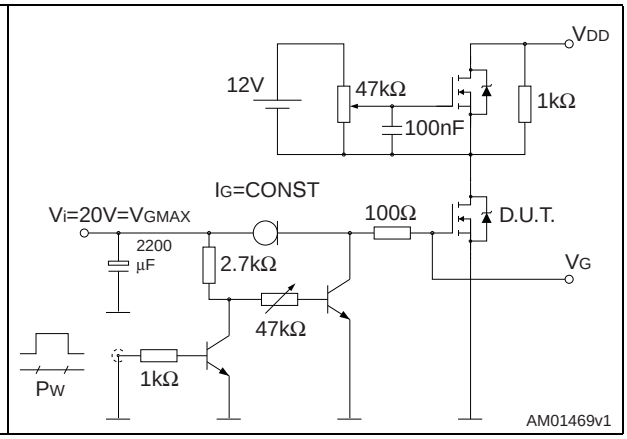


Figure 16. Test circuit for inductive load switching and diode recovery times

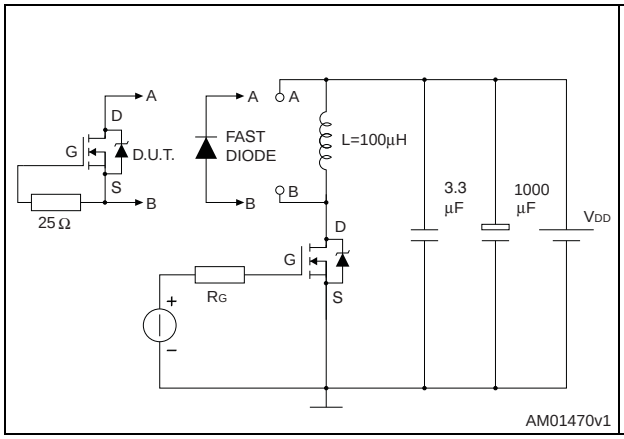


Figure 17. Unclamped inductive load test circuit

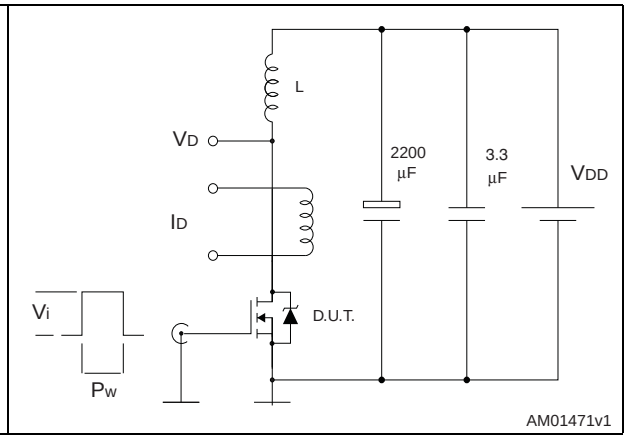


Figure 18. Unclamped inductive waveform

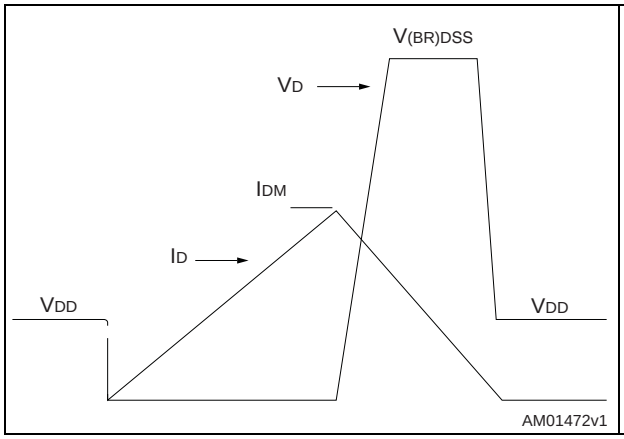
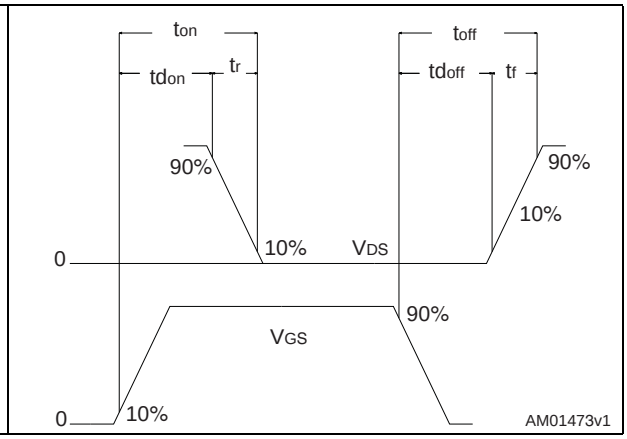


Figure 19. Switching time waveform



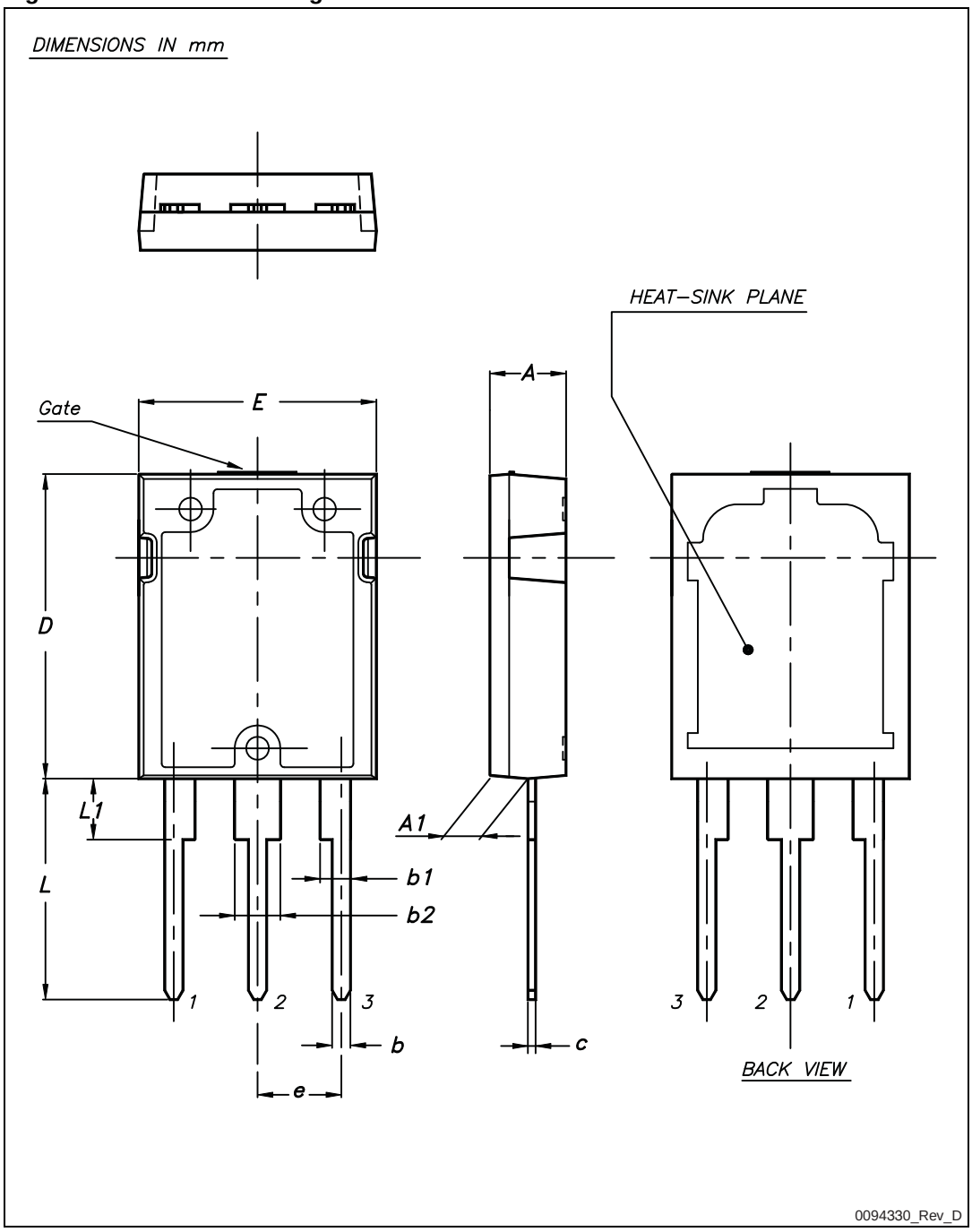
4 Package mechanical data

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.

Table 9. Max247 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.70		5.30
A1	2.20		2.60
b	1.00		1.40
b1	2.00		2.40
b2	3.00		3.40
c	0.40		0.80
D	19.70		20.30
e	5.35		5.55
E	15.30		15.90
L	14.20		15.20
L1	3.70		4.30

Figure 20. Max247 drawing



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
14-Sep-2011	1	First release.
05-Nov-2012	2	Document status promoted from preliminary to production data. Added *Section 2.1: Electrical characteristics (curves)*. Minor text changes.

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