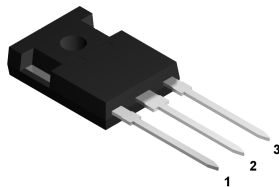
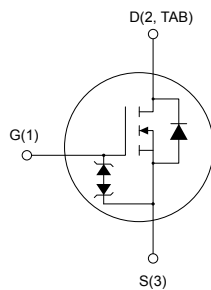


N-channel 600 V, 32 mΩ typ., 72 A, MDmesh M6 Power MOSFET in a TO-247 long leads package



TO-247 long leads



AM01476v1_tab



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STWA75N60M6	600 V	36 mΩ	72 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.

Product status link

[STWA75N60M6](#)

Product summary

Order code	STWA75N60M6
Marking	75N60M6
Package	TO-247 long leads
Packing	Tube

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 $T_C = 25\text{ }^{\circ}\text{C}$	72	A
	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	45	A
$I_{DM}^{(1)}$	Drain current (pulsed)	288	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	446	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. $I_{SD} \leq 72\text{ A}$, $di/dt = 400\text{ A}/\mu\text{s}$, $V_{DS(peak)} < V_{(BR)DSS}$, $V_{DD} = 400\text{ V}$
3. $V_{DS} \leq 480\text{ V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.28	$^{\circ}\text{C}/\text{W}$
R_{thJA}	Thermal resistance, junction-to-ambient	50	$^{\circ}\text{C}/\text{W}$

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_{Jmax})	11	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	1.4	J

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	
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$			± 5	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3.25	4	4.75	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 36\text{ A}$		32	36	m Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$	-	4850	-	pF
C_{oss}	Output capacitance		-	380	-	pF
C_{rss}	Reverse transfer capacitance		-	3.5	-	pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{GS} = 0\text{ V}$, $V_{DS} = 0\text{ to }480\text{ V}$	-	851	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$ open drain	-	1.5	-	Ω
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 72\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior)	-	106	-	nC
Q_{gs}	Gate-source charge		-	32	-	nC
Q_{gd}	Gate-drain charge		-	45	-	nC

1. $C_{oss\text{ eq.}}$ is defined as the 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
$t_d(\text{on})$	Turn-on delay time	$V_{DD} = 300\text{ V}$, $I_D = 36\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	35	-	ns
t_r	Rise time		-	38	-	ns
$t_d(\text{off})$	Turn-off delay time		-	90	-	ns
t_f	Fall time		-	12	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		72	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		288	A
$V_{SD}^{(2)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 72\text{ A}$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 72\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	367		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	6.4		μC
I_{RRM}	Reverse recovery current		-	35		A
t_{rr}	Reverse recovery time	$I_{SD} = 72\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$,	-	552		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	13.7		μC
I_{RRM}	Reverse recovery current	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	49.6		A

1. Pulse width is limited by safe operating area.

2. Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

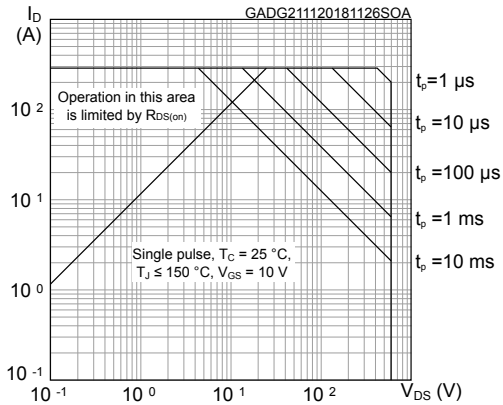


Figure 2. Thermal impedance

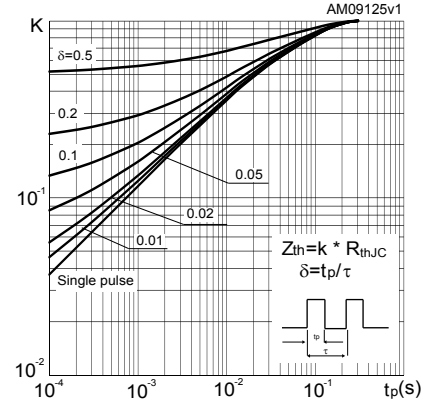


Figure 3. Output characteristics

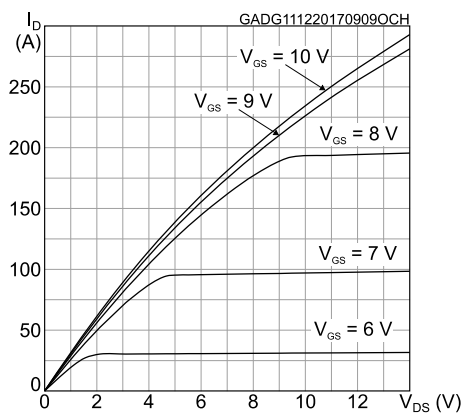


Figure 4. Transfer characteristics

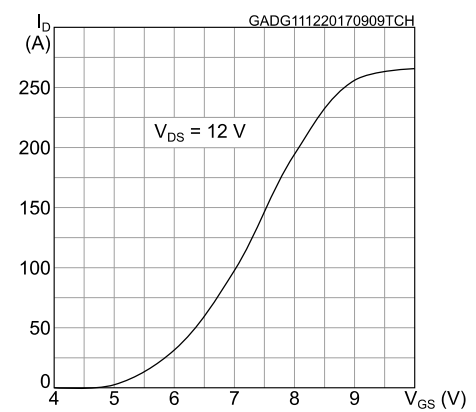


Figure 5. Gate charge vs gate-source voltage

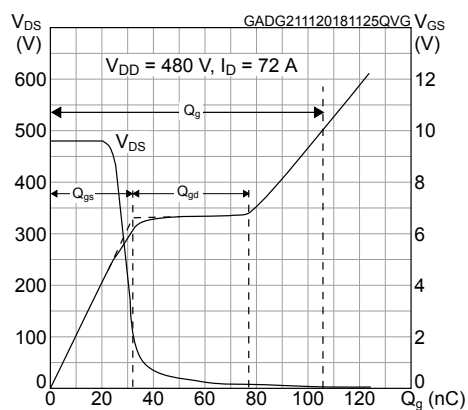


Figure 6. Static drain-source on-resistance

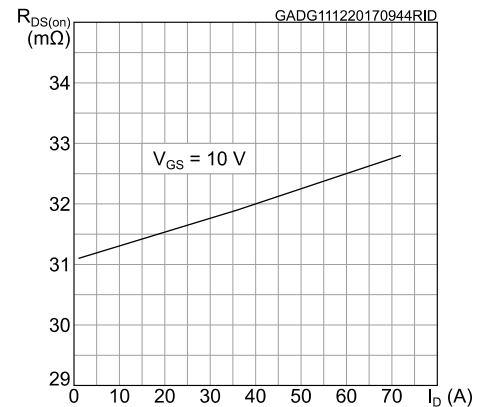
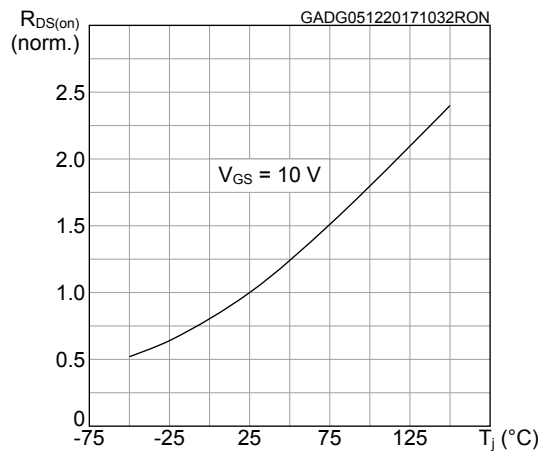
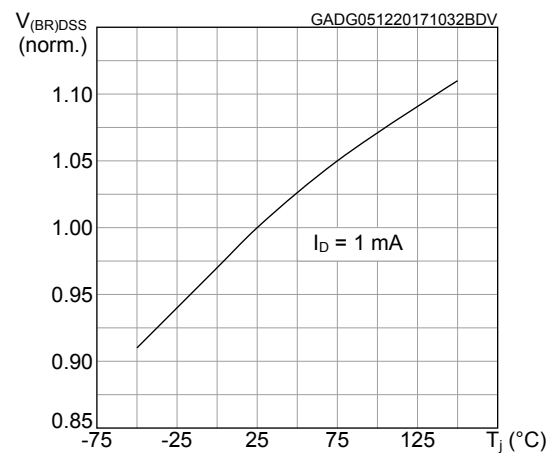
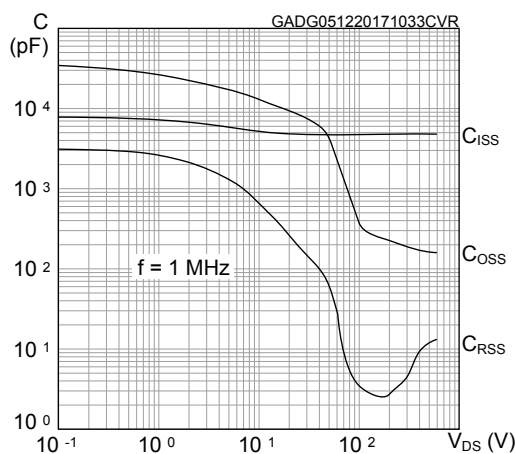
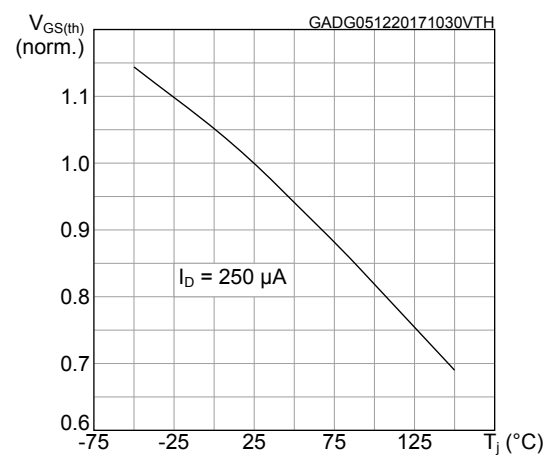
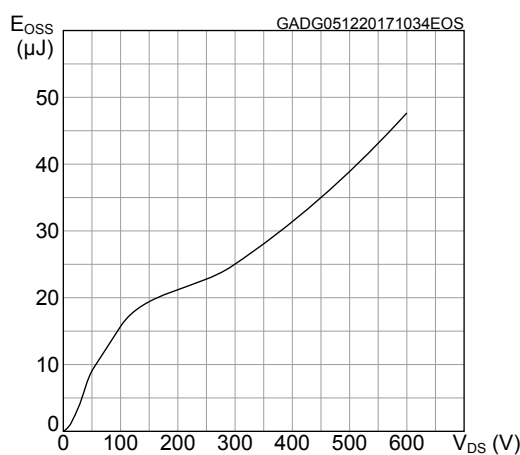
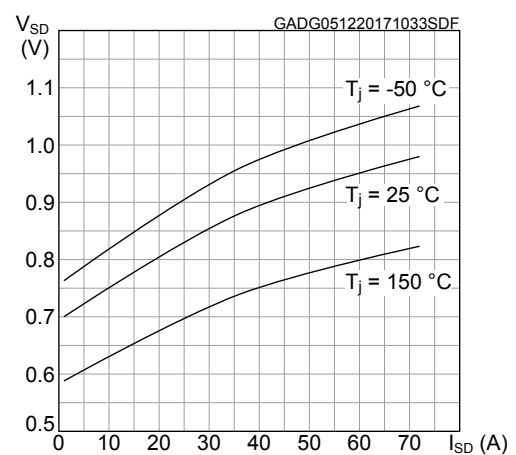
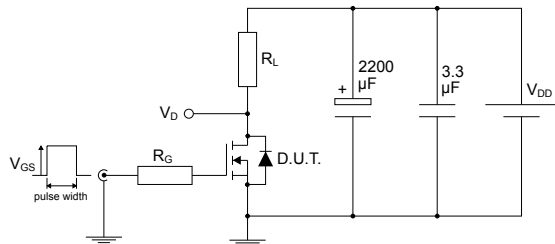
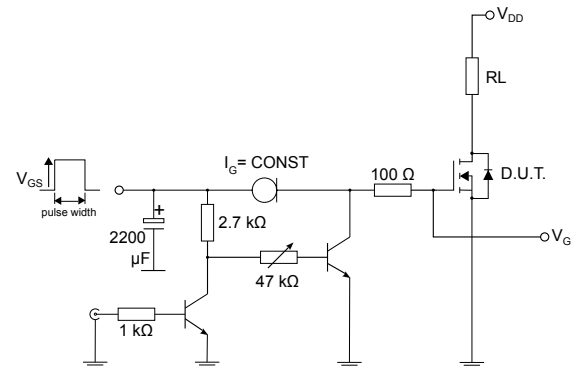


Figure 7. Normalized on-resistance vs temperature

Figure 8. Normalized $V_{(BR)DSS}$ vs temperature

Figure 9. Capacitance variations

Figure 10. Normalized gate threshold voltage vs temperature

Figure 11. Output capacitance stored energy

Figure 12. Source-drain diode forward characteristics


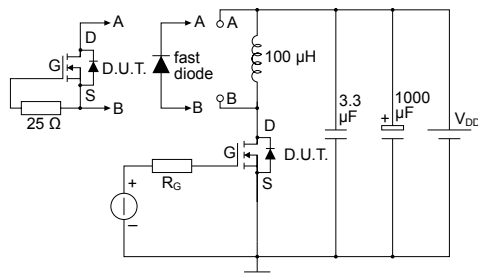
3 Test circuits

Figure 13. Test circuit for resistive load switching times


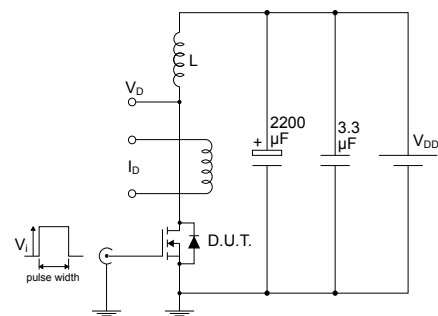
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Figure 14. Test circuit for gate charge behavior


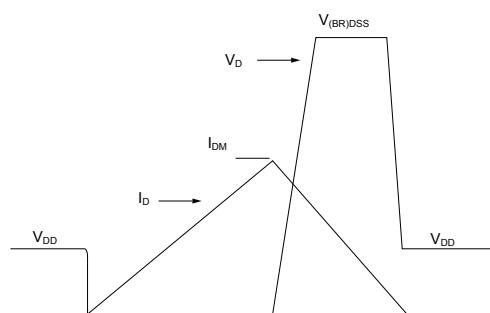
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Figure 15. Test circuit for inductive load switching and diode recovery times


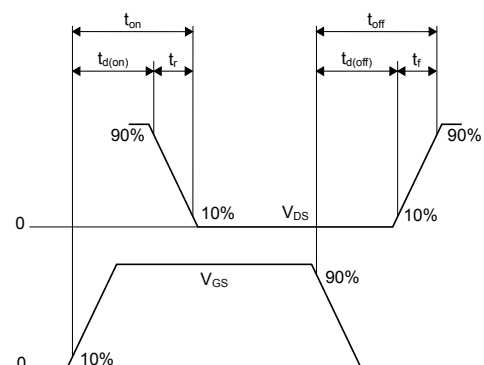
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Figure 16. Unclamped inductive load test circuit


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Figure 17. Unclamped inductive waveform


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Figure 18. Switching time waveform


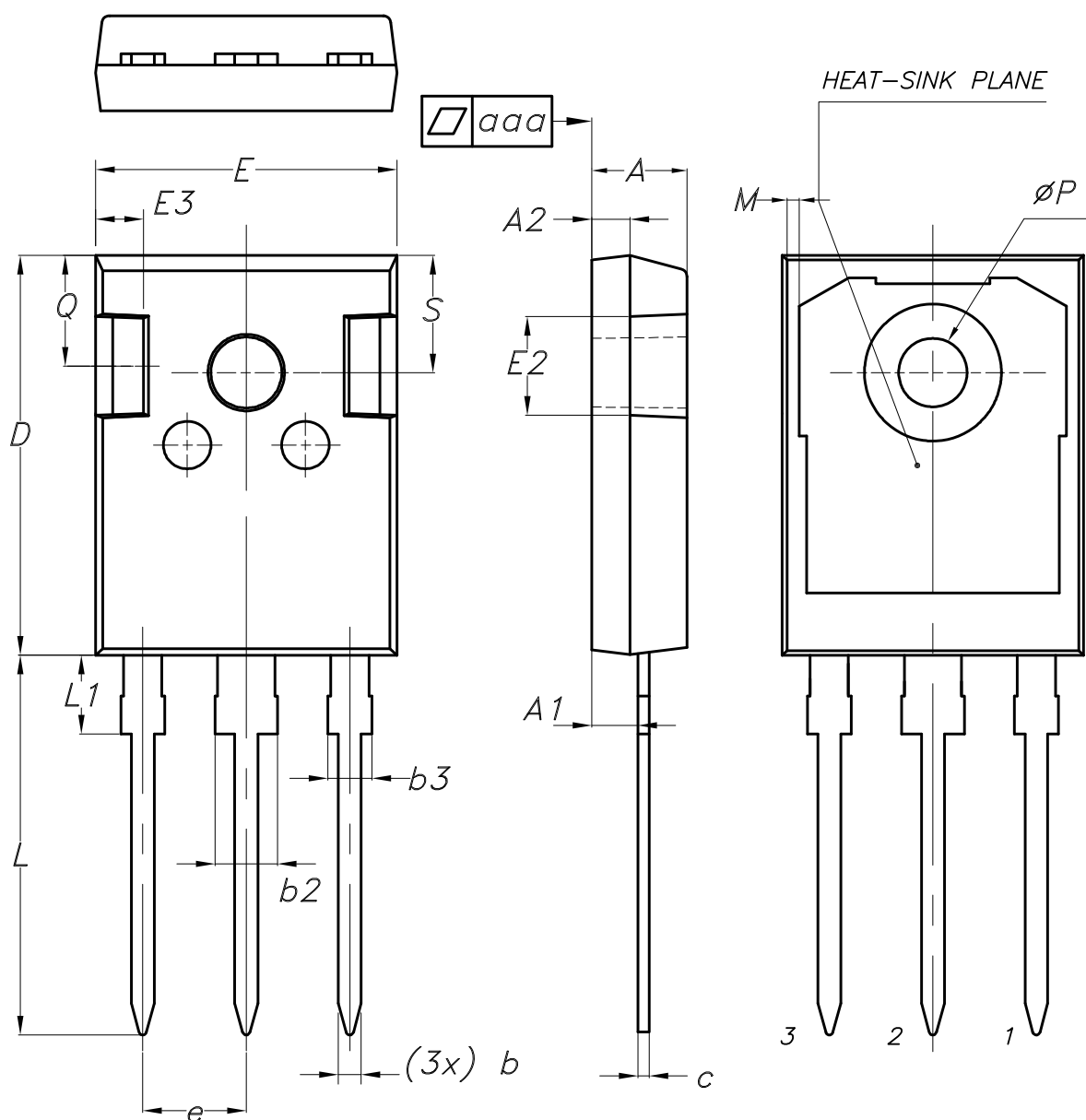
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4 Package information

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 TO-247 long leads package information

Figure 19. TO-247 long leads package outline



BACK VIEW

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Table 8. TO-247 long leads package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
c	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
e	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
M	0.35		0.95
P	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25
aaa		0.04	0.10

Revision history

Table 9. Document revision history

Date	Version	Changes
11-Dec-2017	1	Initial version
30-Nov-2018	2	Removed maturity status indication from cover page. The document status is production data. Updated <i>Table 1. Absolute maximum ratings</i> and <i>Table 5. Dynamic</i> . Updated <i>Figure 5. Gate charge vs gate-source voltage</i> and <i>Figure 14. Test circuit for gate charge behavior</i> . Minor text changes.
03-Feb-2025	3	Updated Section 4.1: TO-247 long leads package information . Minor text changes.

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