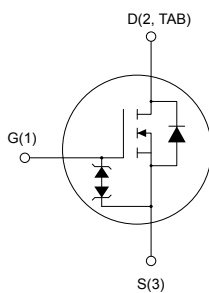
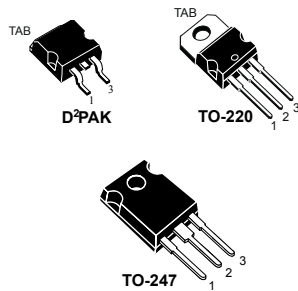




N-channel 600 V, 175 mΩ typ., 18 A MDmesh DM2 Power MOSFETs
in a D²PAK, TO-220 and TO-247 packages



AM01476v1_tab

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STB24N60DM2	600 V	200 mΩ	18 A
STP24N60DM2			
STW24N60DM2			

- Fast-recovery body diode
- Extremely low gate charge and input capacitance
- Low on-resistance
- 100% avalanche tested
- Extremely high dv/dt ruggedness
- Zener-protected

Applications

- Switching applications

Description

These high-voltage N-channel Power MOSFET are part of the MDmesh DM2 fast-recovery diode series. They offer very low recovery charge (Q_{rr}) and time (t_{rr}) combined with low R_{DS(on)}, rendering them suitable for the most demanding high-efficiency converters and ideal for bridge topologies and ZVS phase-shift converters.



Product status link

[STB24N60DM2](#)

[STP24N60DM2](#)

[STW24N60DM2](#)

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	600	V
V_{GS}	Gate-source voltage	± 25	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	18	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	11	
$I_{DM}^{(1)}$	Drain current (pulsed)	72	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	150	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	40	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		$^\circ\text{C}$

1. Pulse width is limited by safe operating area.
2. $I_{SD} \leq 18\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS}(\text{peak}) < V_{(BR)DSS}$, $V_{DD} = 400\text{ V}$.
3. $V_{DS} \leq 480\text{ V}$.

Table 2. Thermal data

Symbol	Parameter	Value			Unit
		D ² PAK	TO-220	TO-247	
R_{thJC}	Thermal resistance, junction-to-case	0.83			$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance, junction-to-ambient	30 ⁽¹⁾	62.5	50	$^\circ\text{C}/\text{W}$

1. When mounted on a standard 1 inch² area of FR-4 PCB with 2-oz copper.

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J max.)	3.5	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	180	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	$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$	-	-	1.5	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	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$	-	-	± 10	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	3	4	5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 9\text{ A}$	-	175	200	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	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1055	-	pF
C_{oss}	Output capacitance		-	56	-	pF
C_{rss}	Reverse transfer capacitance		-	2.4	-	pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{GS} = 0\text{ V}$, $V_{DS} = 0\text{ to }480\text{ V}$	-	259	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	7	-	Ω
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 18\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see the Figure 16. Test circuit for gate charge behavior)	-	29	-	nC
Q_{gs}	Gate-source charge		-	6	-	nC
Q_{gd}	Gate-drain charge		-	12	-	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	$V_{DD} = 300\text{ V}$, $I_D = 9\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	15	-	ns
t_r	Rise time		-	8.7	-	ns
$t_{d(off)}$	Turn-off delay time	(see the Figure 15. Test circuit for resistive load switching times and Figure 20. Switching time waveform)	-	60	-	ns
t_f	Fall time		-	15	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-	-	18	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	72	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 18\text{ A}$, $V_{GS} = 0\text{ V}$	-	-	1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 18\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$	-	155	-	ns
Q_{rr}	Reverse recovery charge		-	0.956	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	12.5	-	A
t_{rr}	Reverse recovery time	$I_{SD} = 18\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$	-	200	-	ns
Q_{rr}	Reverse recovery charge		-	1.45	-	μC
I_{RRM}	Reverse recovery current	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	13	-	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)

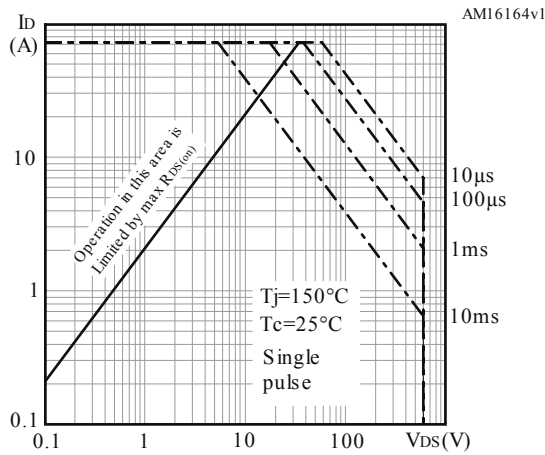
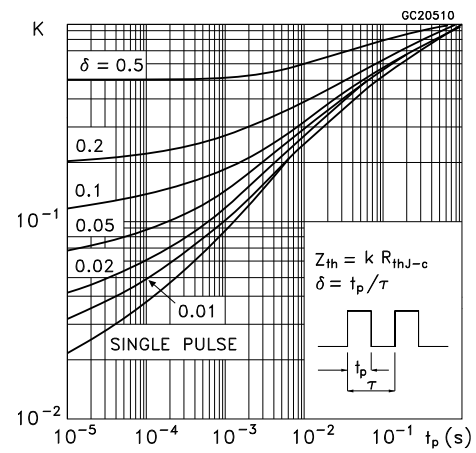
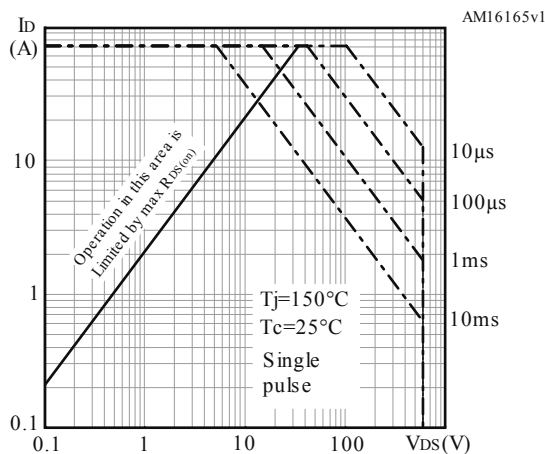
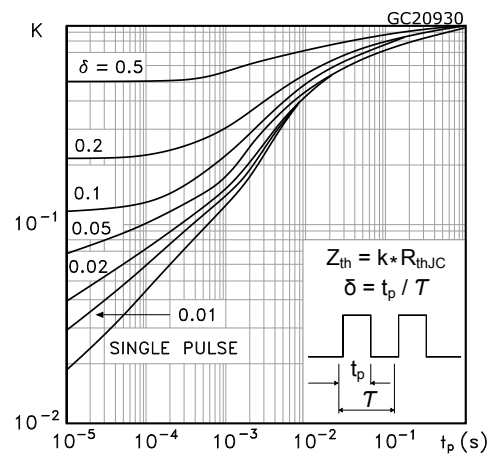
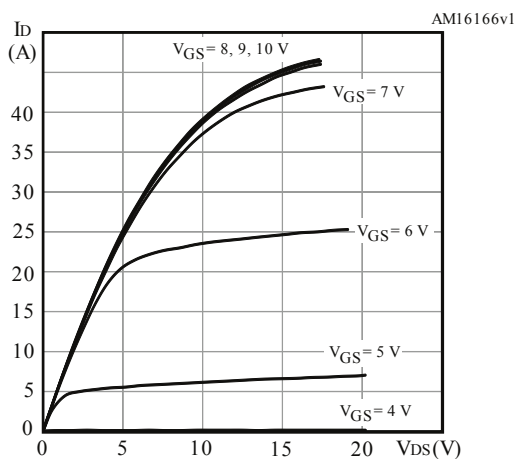
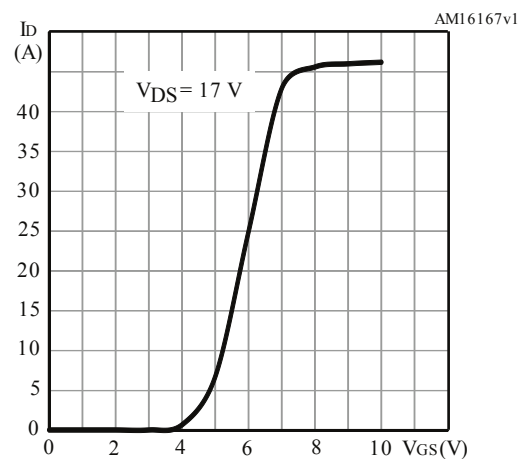
Figure 1. Safe operating area for D²PAK and TO-220

Figure 2. Thermal impedance for D²PAK and TO-220

Figure 3. Safe operating area for TO-247

Figure 4. Thermal impedance for TO-247

Figure 5. Output characteristics

Figure 6. Transfer characteristics


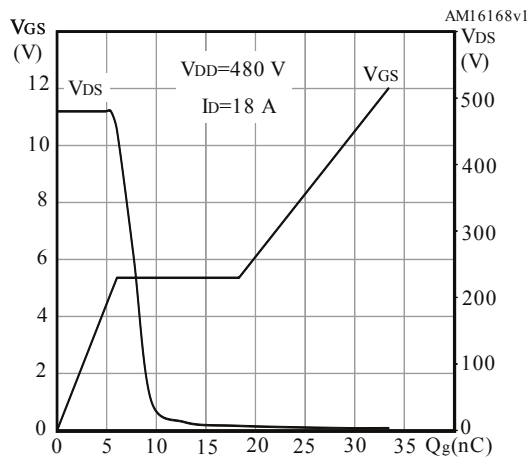
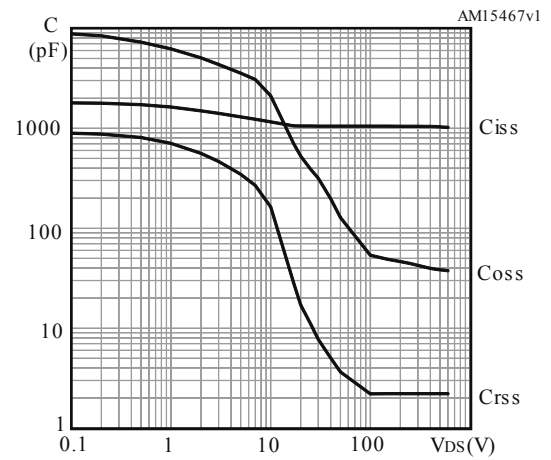
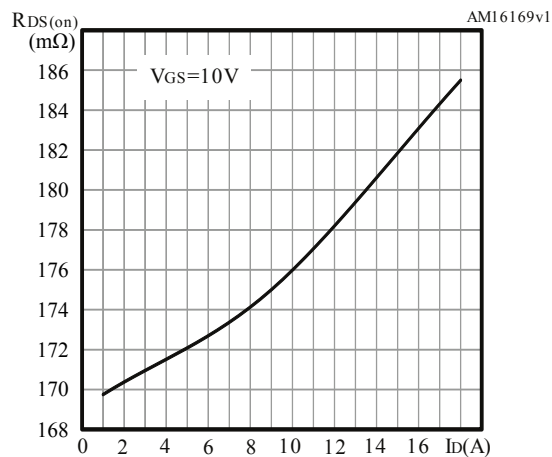
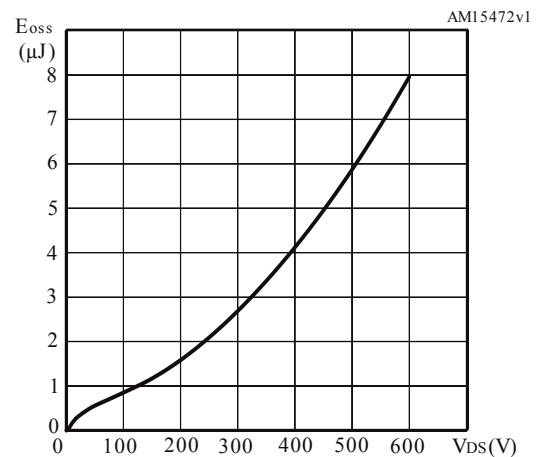
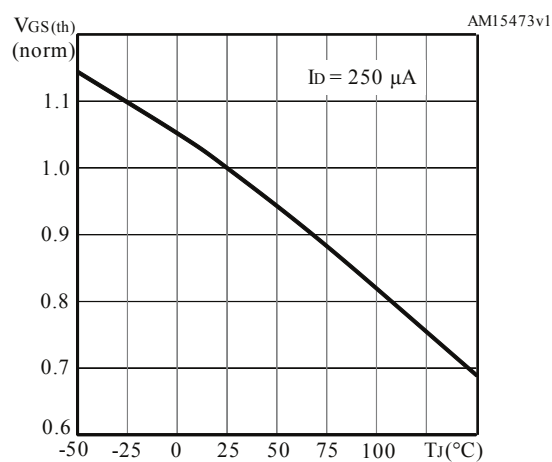
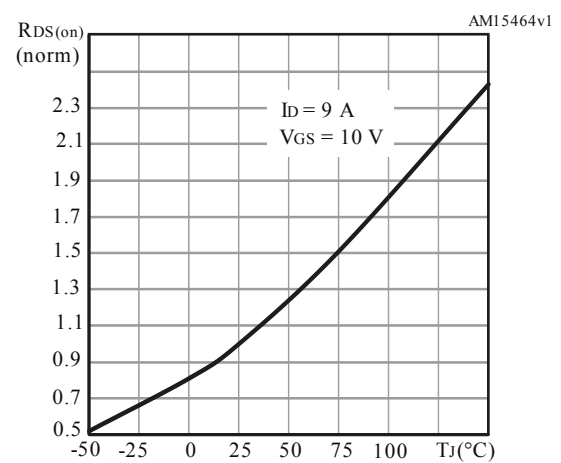
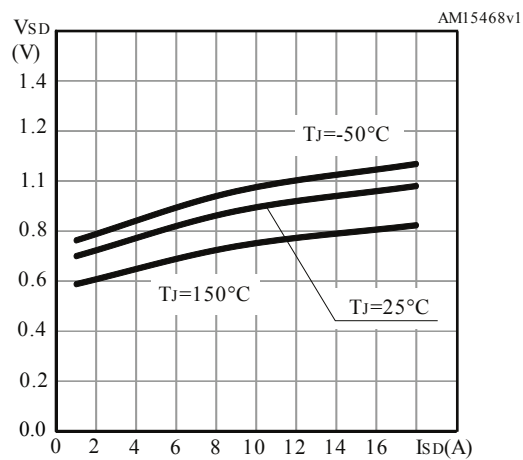
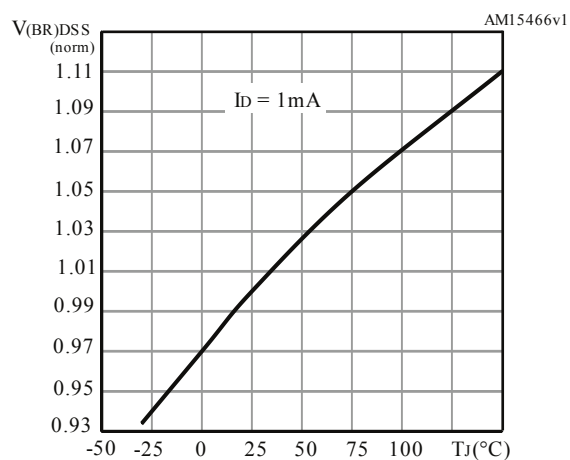
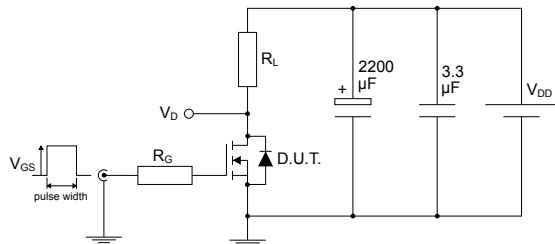
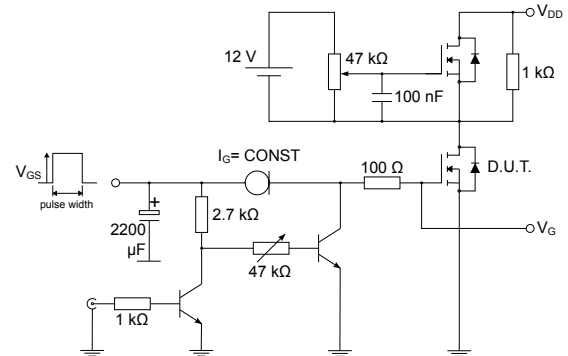
Figure 7. Gate charge vs gate-source voltage

Figure 8. Capacitance variations

Figure 9. Static drain-source on resistance

Figure 10. Output capacitance stored energy

Figure 11. Normalized gate threshold voltage vs temperature

Figure 12. Normalized on resistance vs temperature


Figure 13. Typical reverse diode forward characteristics

Figure 14. Normalized $V_{(BR)DSS}$ vs temperature


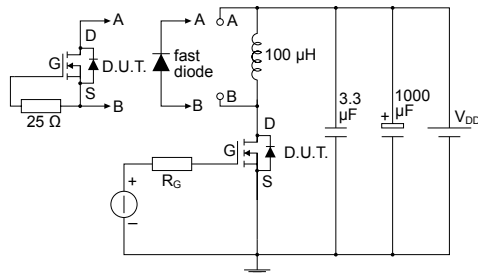
3 Test circuits

Figure 15. Test circuit for resistive load switching times


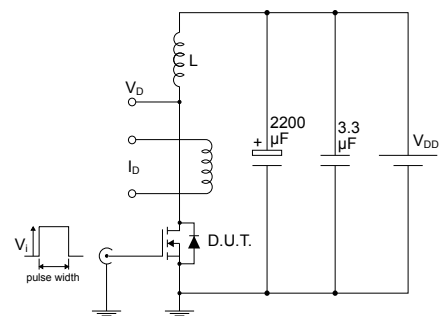
AM01468v1

Figure 16. Test circuit for gate charge behavior


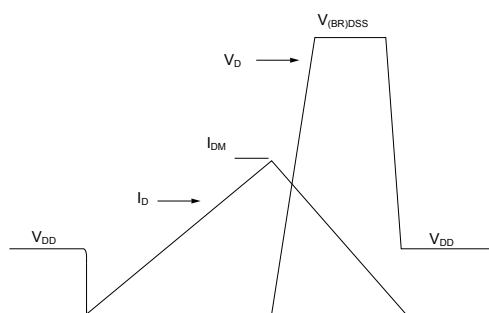
AM01469v1

Figure 17. Test circuit for inductive load switching and diode recovery times


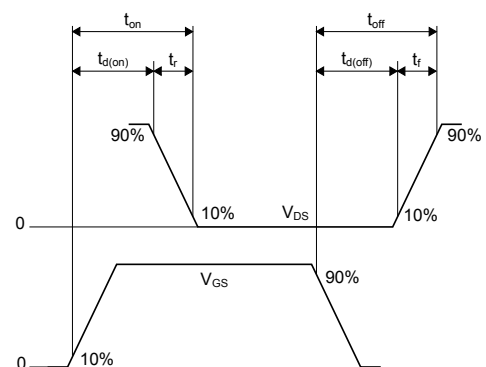
AM01470v1

Figure 18. Unclamped inductive load test circuit


AM01471v1

Figure 19. Unclamped inductive waveform


AM01472v1

Figure 20. Switching time waveform


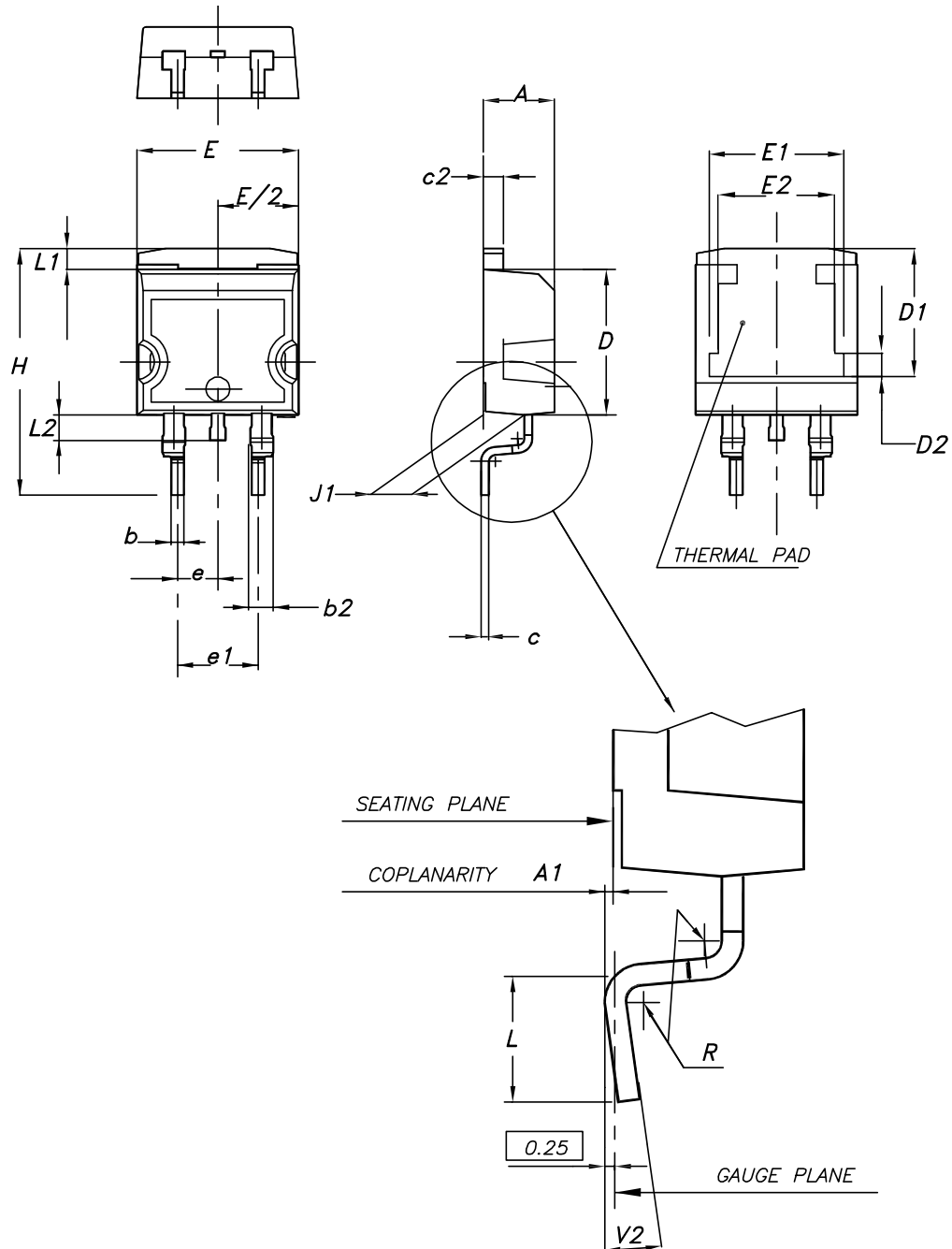
AM01473v1

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 D²PAK (TO-263) type A package information

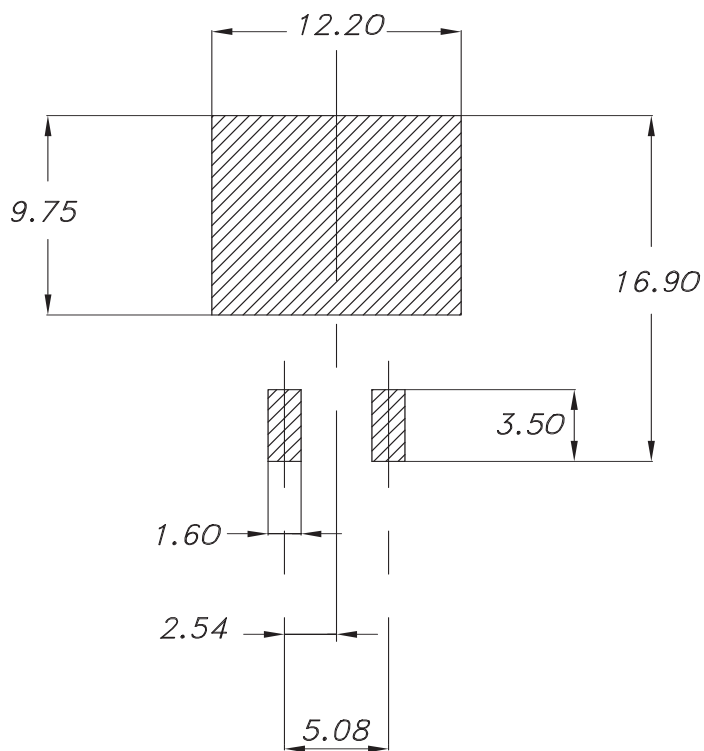
Figure 21. D²PAK (TO-263) type A package outline



0079457_27

Table 8. D²PAK (TO-263) type A package mechanical data

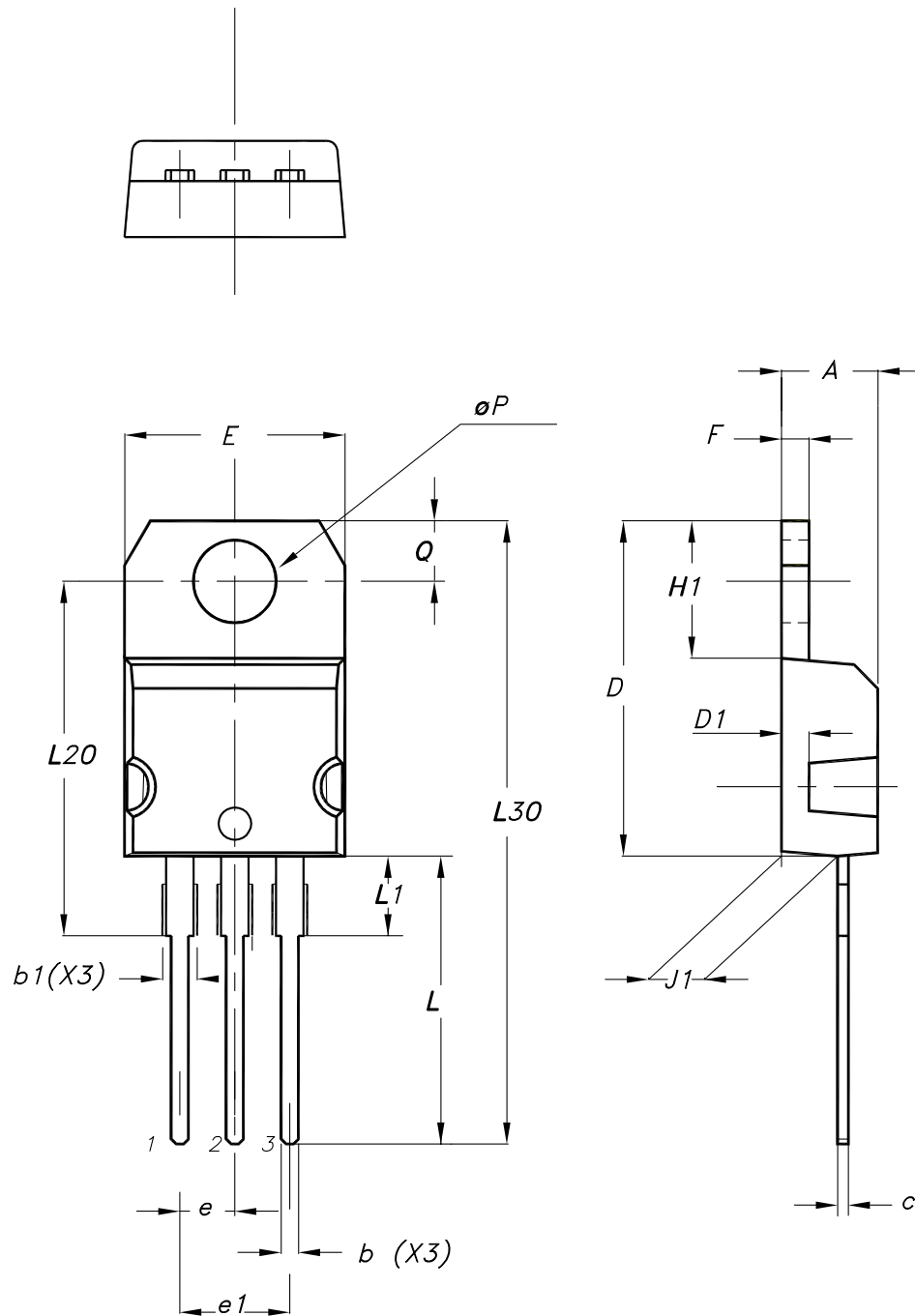
Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10.00		10.40
E1	8.30	8.50	8.70
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15.00		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.40	
V2	0°		8°

Figure 22. D²PAK (TO-263) recommended footprint (dimensions are in mm)


0079457_Rev27_footprint

4.2 TO-220 type A package information

Figure 23. TO-220 type A package outline



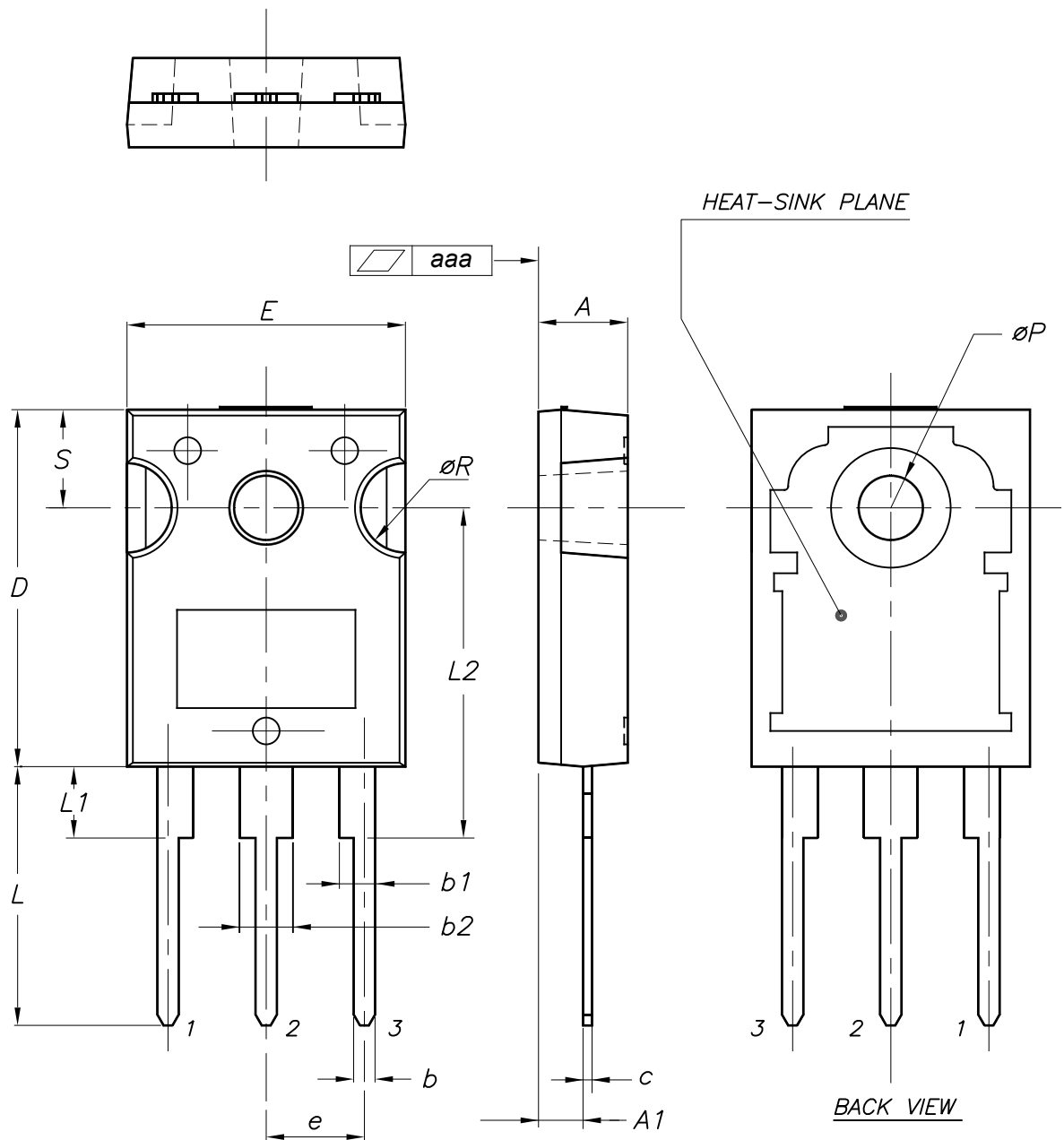
0015988_typeA_Rev_24

Table 9. TO-220 type A package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95
Slug flatness		0.03	0.10

4.3 TO-247 package information

Figure 24. TO-247 package outline

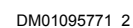


0075325_10

Table 10. TO-247 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70
aaa		0.04	0.10

Figure 25. D²PAK tape drawing (dimensions are in mm)





5 Ordering information

Table 11. Order codes

Order codes	Marking	Package	Packing
STB24N60DM2	24N60DM2	D ² PAK	Tape and reel
STP24N60DM2		TO-220	Tube
STW24N60DM2		TO-247	

Revision history

Table 12. Document revision history

Date	Version	Changes
12-Nov-2013	1	First release.
17-Jan-2014	2	Document status promoted from preliminary data to production data. Modified: dv/dt (peak diode recovery voltage slope) value in <i>Table 2</i> . Modified: IAR value in <i>Table 4</i> . Modified: IDSS and V _{GS(th)} values in <i>Table 5</i> . Minor text changes.
03-Mar-2014	3	Modified: IAR value in <i>Table 4</i> . Added: <i>note 1.: Limited by maximum junction temperature</i> . Minor text changes.
12-Aug-2025	4	Updated Section 4: Package information . Minor text changes.



Contents

1	Electrical ratings	2
2	Electrical characteristics.....	3
2.1	Electrical characteristics (curves)	5
3	Test circuits	8
4	Package information.....	9
4.1	D ² PAK (TO-263) type A package information	9
4.2	TO-220 type A package information	12
4.3	TO-247 package information	14
4.4	D ² PAK packing information	16
5	Ordering information	17
	Revision history	18



IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice.

In the event of any conflict between the provisions of this document and the provisions of any contractual arrangement in force between the purchasers and ST, the provisions of such contractual arrangement shall prevail.

The purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgment.

The purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of the purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

If the purchasers identify an ST product that meets their functional and performance requirements but that is not designated for the purchasers' market segment, the purchasers shall contact ST for more information.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2025 STMicroelectronics – All rights reserved