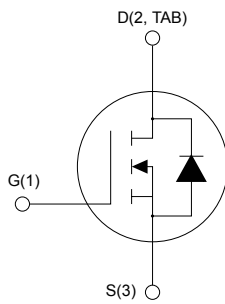
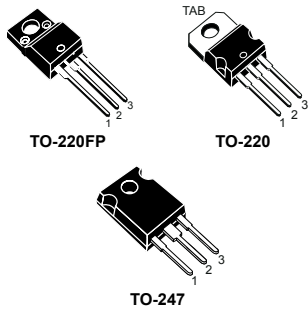




# STF19NM50N, STP19NM50N, STW19NM50N

Datasheet

N-channel 500 V, 200 mΩ typ., 14 A MDmesh II Power MOSFET in a TO-220FP, TO-220 and TO-247 packages



AM01475v1\_noZen



## Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
STF19NM50N	500 V	250 mΩ	14 A
STP19NM50N			
STW19NM50N			

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

## Applications

- Switching applications

## Description

These devices are N-channel Power MOSFETs developed using the second generation of MDmesh technology. These revolutionary Power MOSFETs associate a vertical structure to the company's strip layout to yield one of the world's lowest on-resistance and gate charge. They are therefore suitable for the most demanding high-efficiency converters.

### Product status links

[STF19NM50N](#)

[STP19NM50N](#)

[STW19NM50N](#)

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		TO-220 TO-247	TO-220FP	
$V_{DS}$	Drain-source voltage	500		V
$V_{GS}$	Gate-source voltage	±25		V
$I_D$	Drain current (continuous) at $T_C = 25\text{ °C}$	14		A
	Drain current (continuous) at $T_C = 100\text{ °C}$	10		
$I_{DM}^{(1)}$	Drain current (pulsed)	56		A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ °C}$	110	30	W
$V_{ISO}$	Insulation withstand voltage (RMS) from all,three leads to external heat sink ( $t = 1\text{ s}$ ; $T_C = 25\text{ °C}$ )	-	2.5	kV
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15		V/ns
°C	Storage temperature range	-55 to 150		°C
$T_J$	Maximum operating junction temperature	150		°C

1. Pulse width limited by safe operating area.

2.  $I_{SD} \leq 14\text{ A}$ ,  $di/dt \leq 400\text{ A}/\mu\text{s}$ ,  $V_{DS}(\text{peak}) \leq V_{(BR)DSS}$ ,  $V_{DD} = 400\text{ V}$ .

**Table 2. Thermal data**

Symbol	Parameter	Value			Unit
		TO-220	TO-247	TO-220FP	
$R_{thJC}$	Thermal resistance, junction-to-case	1.14		4.17	°C/W
$R_{thJA}$	Thermal resistance, junction-to-ambient	62.5	50	62.5	°C/W

**Table 3. Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AR}$	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_J$ max.)	6	A
$E_{AS}$	Single pulse avalanche energy (starting $T_J = 25\text{ °C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	208	mJ

## 2 Electrical characteristics

( $T_C = 25\text{ °C}$  unless otherwise specified)

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$ , $V_{GS} = 0\text{ V}$	500	-	-	V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$ , $V_{DS} = 500\text{ V}$	-	-	1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}$ , $V_{DS} = 500\text{ V}$ , $T_C = 125\text{ °C}^{(1)}$	-	-	100	
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 25\text{ V}$	-	-	$\pm 100$	nA
$V_{GS(th)}$	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	$V_{GS} = 10\text{ V}$ , $I_D = 7\text{ A}$	-	200	250	m $\Omega$

1. Specified by design, not tested in production.

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 50\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$	-	1000	-	pF
$C_{oss}$	Output capacitance		-	72	-	pF
$C_{rSS}$	Reverse transfer capacitance		-	3	-	pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }400\text{ V}$ , $V_{GS} = 0\text{ V}$	-	202	-	pF
$Q_g$	Total gate charge	$V_{DD} = 400\text{ V}$ , $I_D = 14\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$ (see the Figure 16. Test circuit for gate charge behavior)	-	34	-	nC
$Q_{gs}$	Gate-source charge		-	5	-	nC
$Q_{gd}$	Gate-drain charge		-	18	-	nC
$R_g$	Intrinsic gate resistance		$f = 1\text{ MHz}$ , $I_D = 0\text{ A}$	-	4.4	-

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%  $V_{DSS}$ .

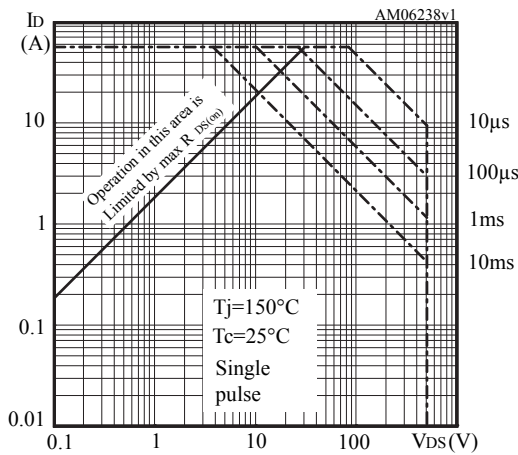
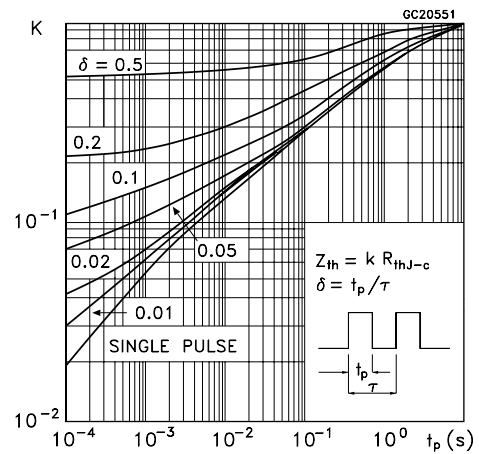
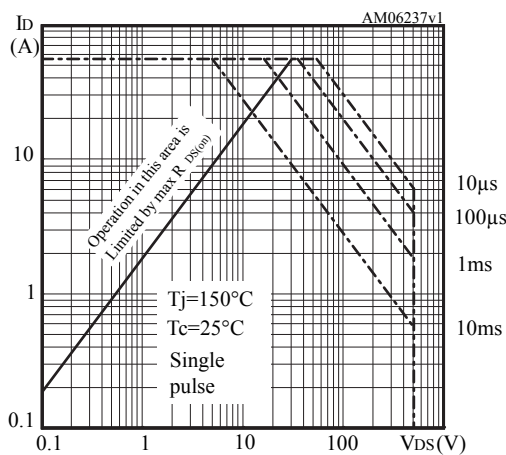
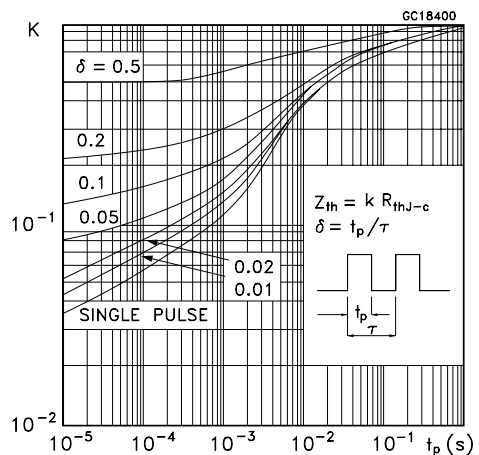
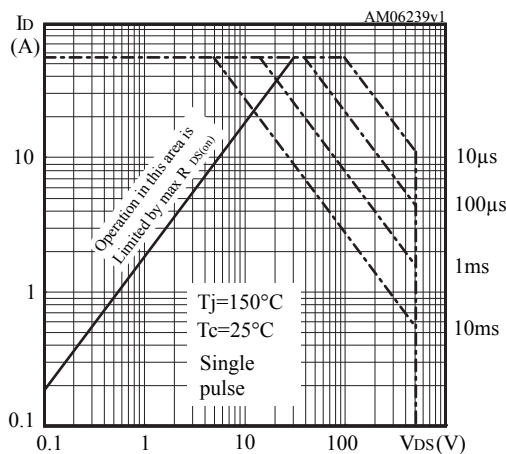
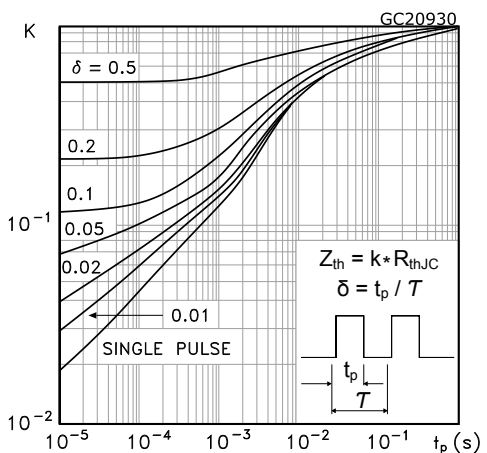
**Table 6. Switching times**

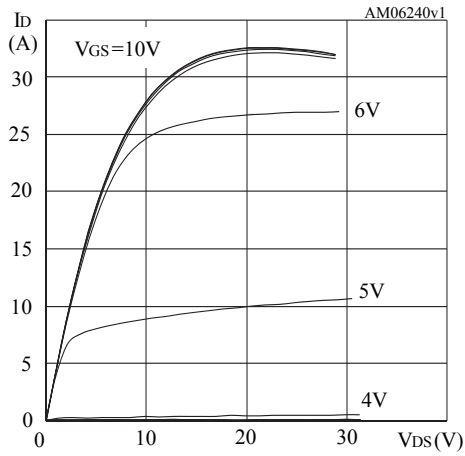
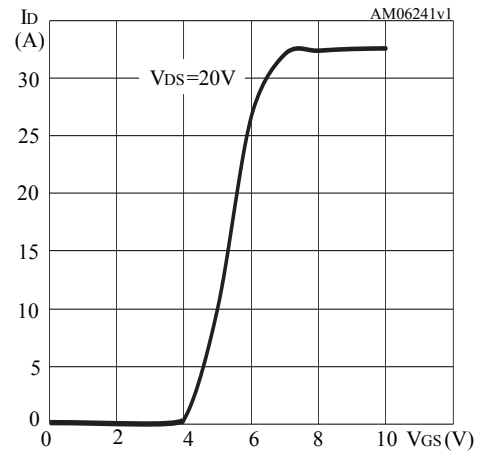
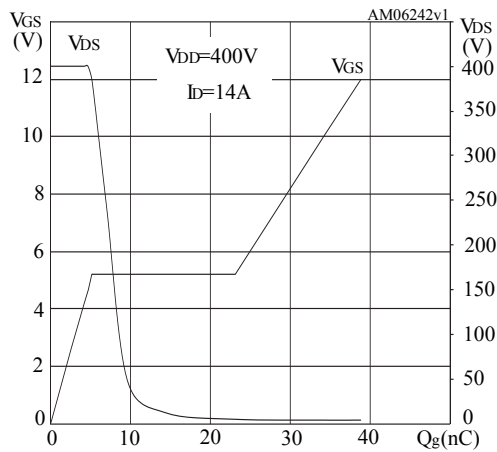
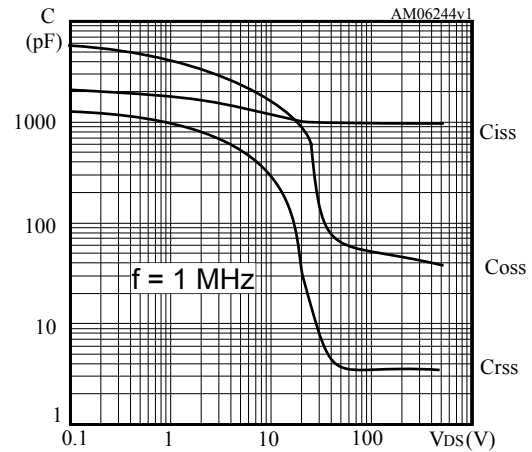
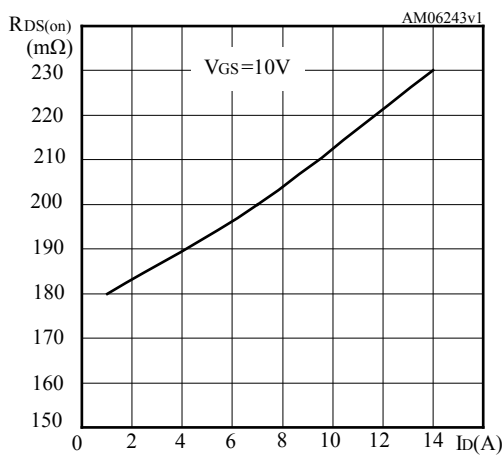
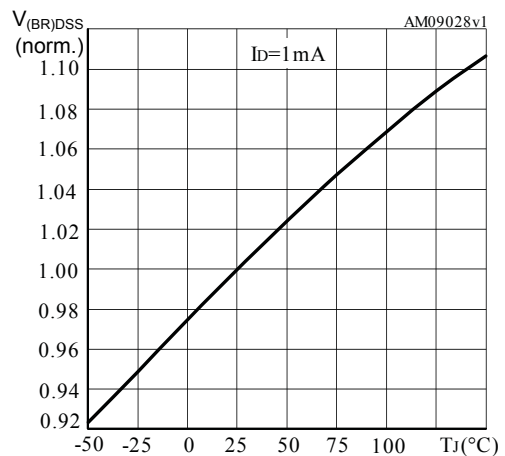
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 250\text{ V}$ , $I_D = 7\text{ A}$ ,	-	12	-	ns
$t_r$	Rise time	$R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$	-	16	-	ns
$t_{d(off)}$	Turn-off delay time	(see the Figure 15. Test circuit for resistive load switching times and Figure 20. Switching time waveform)	-	61	-	ns
$t_f$	Fall time		-	17	-	ns

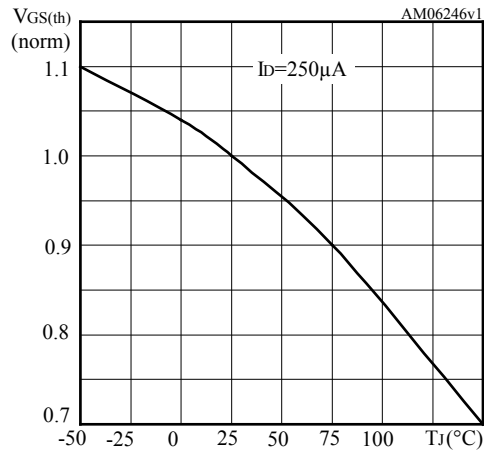
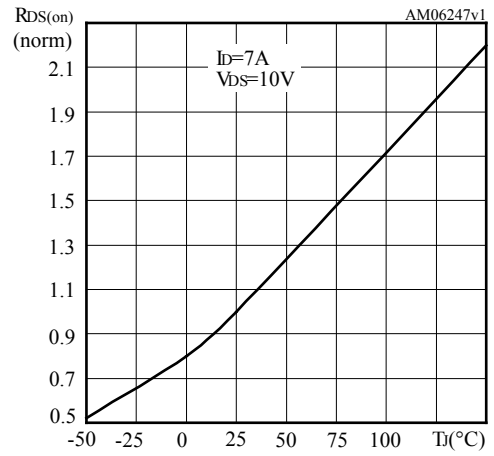
**Table 7. Source-drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-	-	14	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-	-	56	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 14\text{ A}$ , $V_{GS} = 0\text{ V}$	-	-	1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 14\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 60\text{ V}$	-	296	-	ns
$Q_{rr}$	Reverse recovery charge	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	3.5	-	$\mu\text{C}$
$I_{RRM}$	Reverse recovery current		-	23	-	A
$t_{rr}$	Reverse recovery time	$I_{SD} = 14\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,	-	346	-	ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 60\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$	-	4	-	$\mu\text{C}$
$I_{RRM}$	Reverse recovery current	(see the Figure 17. Test circuit for inductive load switching and diode recovery times)	-	24	-	A

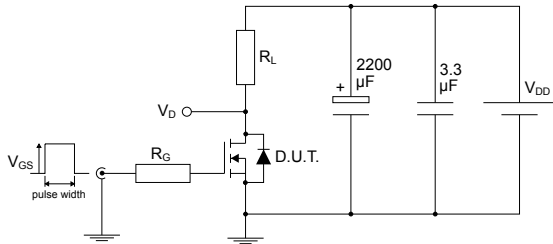
1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

**2.1 Electrical characteristics (curves)**
**Figure 1. Safe operating area for TO-220FP**

**Figure 2. Normalized transient thermal impedance for TO-220FP**

**Figure 3. Safe operating area for TO-220**

**Figure 4. Normalized transient thermal impedance for TO-220**

**Figure 5. Safe operating area for TO-247**

**Figure 6. Normalized transient thermal impedance for TO-247**


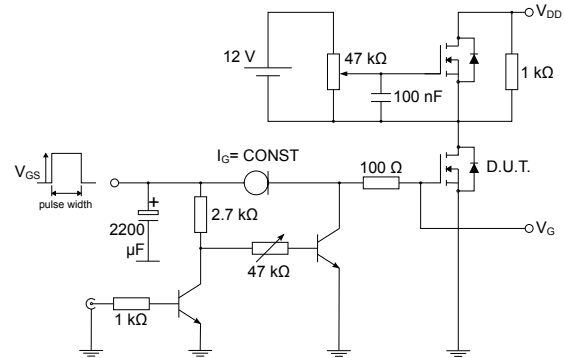
**Figure 7. Typical output characteristics**

**Figure 8. Typical transfer characteristics**

**Figure 9. Typical gate charge characteristics**

**Figure 10. Typical capacitance characteristics**

**Figure 11. Typical drain-source on-resistance**

**Figure 12. Normalized breakdown voltage vs temperature**


**Figure 13. Normalized gate threshold vs temperature**

**Figure 14. Normalized on-resistance vs temperature**


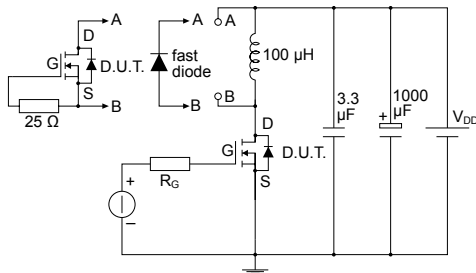
### 3 Test circuits

**Figure 15. Test circuit for resistive load switching times**


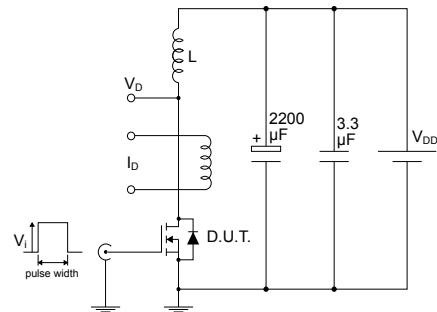
AM01468v1

**Figure 16. Test circuit for gate charge behavior**


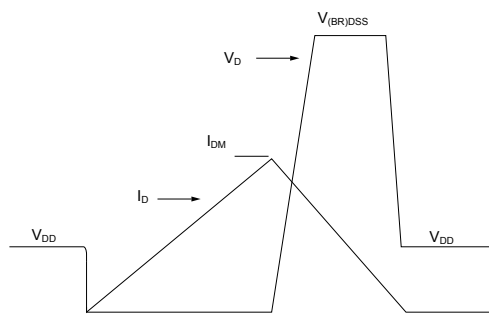
AM01469v1

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


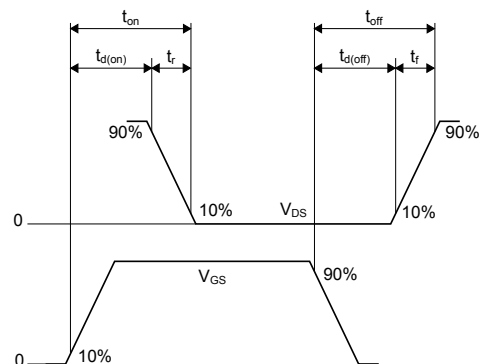
AM01470v1

**Figure 18. Unclamped inductive load test circuit**


AM01471v1

**Figure 19. Unclamped inductive waveform**


AM01472v1

**Figure 20. Switching time waveform**


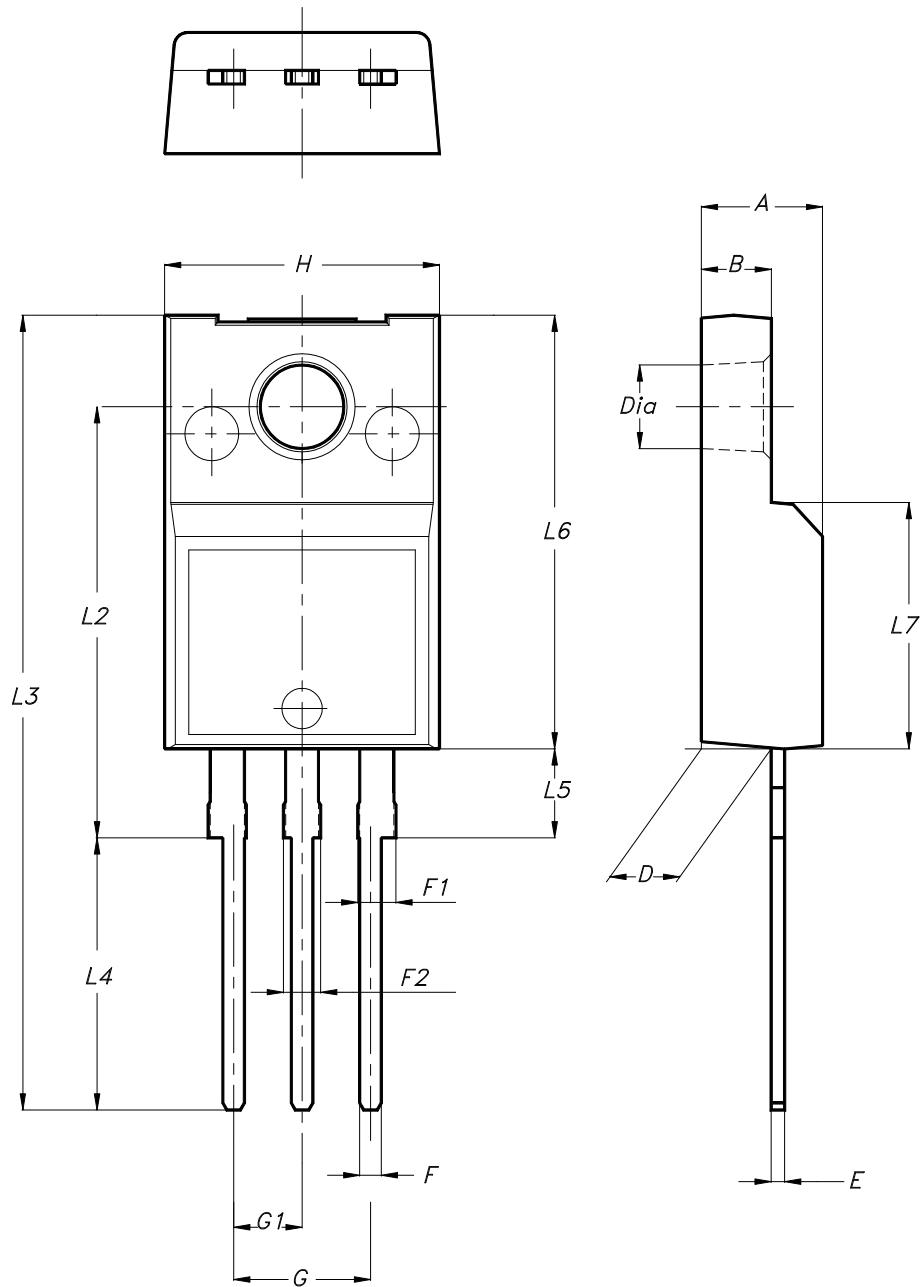
AM01473v1

## 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](http://www.st.com). ECOPACK is an ST trademark.

### 4.1 TO-220FP type B package information

Figure 21. TO-220FP type B package outline



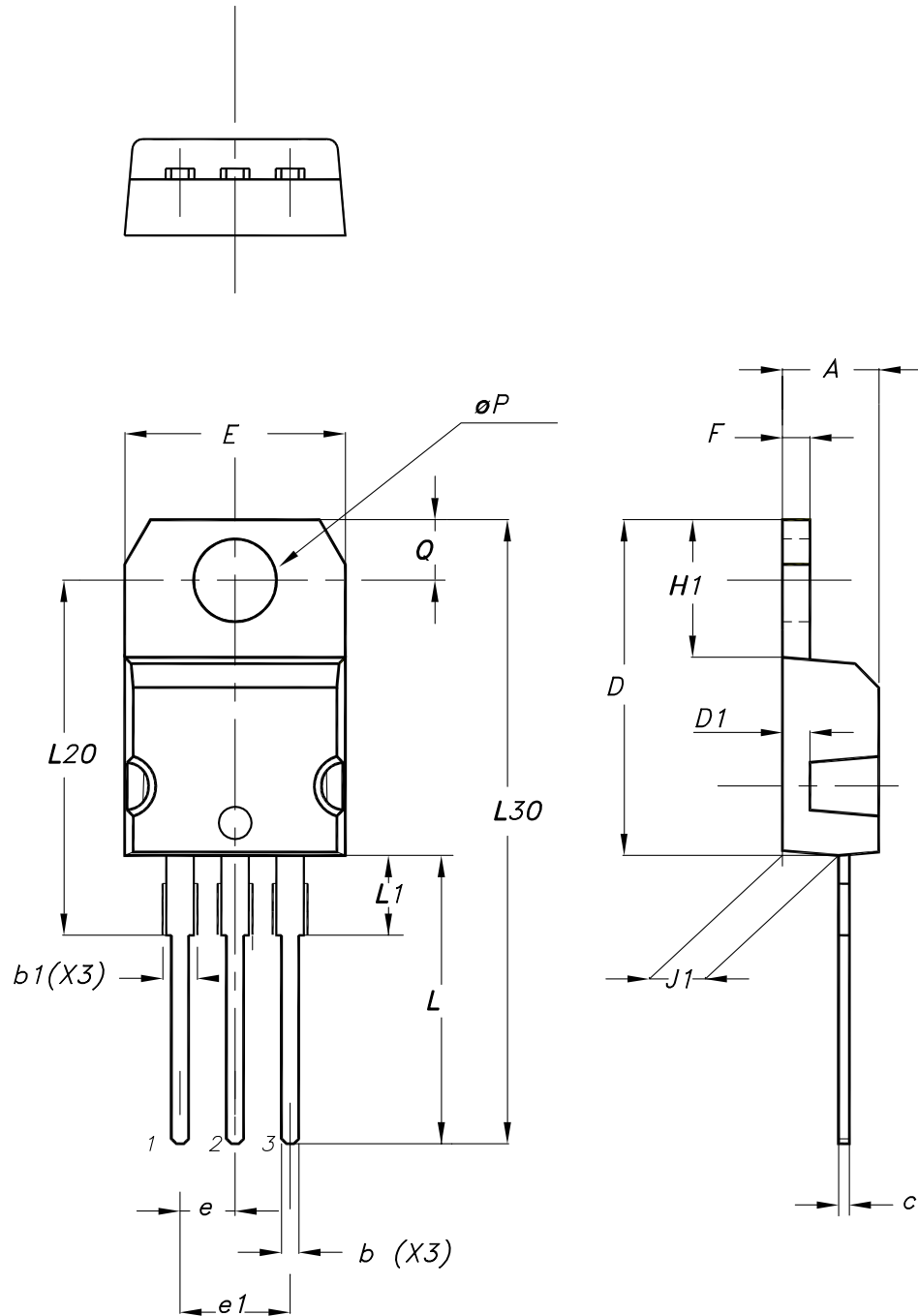
7012510\_B\_rev.14

**Table 8. TO-220FP type B package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
B	2.50		2.70
D	2.50		2.75
E	0.45		0.70
F	0.75		1.00
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.20
G1	2.40		2.70
H	10.00		10.40
L2		16.00	
L3	28.60		30.60
L4	9.80		10.60
L5	2.90		3.60
L6	15.90		16.40
L7	9.00		9.30
Dia	3.00		3.20

## 4.2 TO-220 type A package information

Figure 22. TO-220 type A package outline



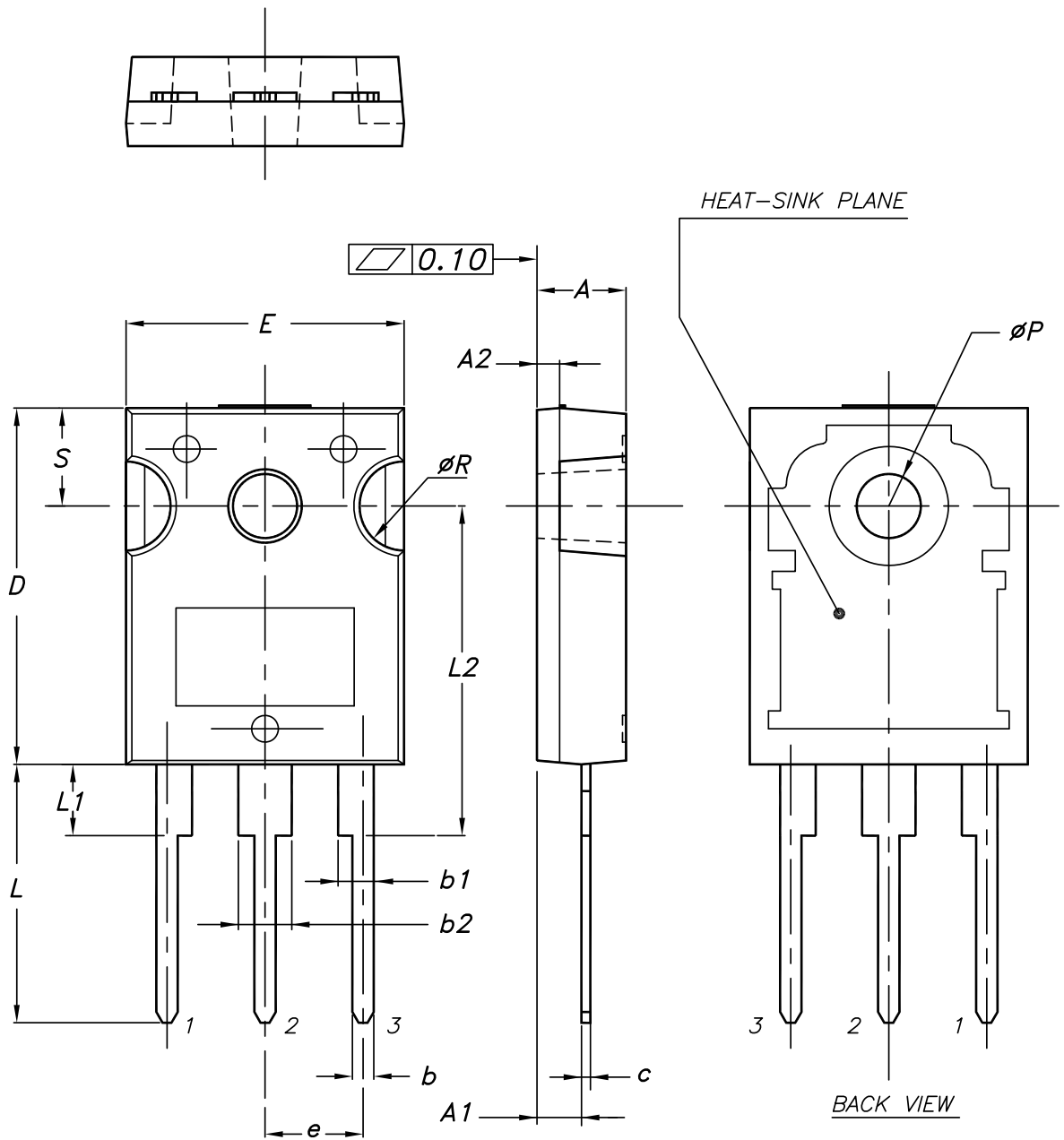
0015988\_typeA\_Rev\_24

**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 23. TO-247 package outline



0075325\_11

**Table 10. TO-247 package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
A2		1.27	
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



## 5 Ordering information

Table 11. Order codes

Order codes	Marking	Package	Packing
STF19NM50N	19NM50N	TO-220FP	Tube
STP19NM50N		TO-220	
STW19NM50N		TO-247	

## Revision history

**Table 12. Document revision history**

Date	Revision	Changes
09-Feb-2010	1	First release.
03-Sep-2013	2	Updated: <i>Section 2.1: Electrical characteristics (curves)</i> . Updated: <i>Section 4: Package mechanical data</i> . Minor text changes.
29-Jan-2026	3	Updated <i>Section 4: Package information</i> . Minor text changes.



## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>2</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>3</b>
<b>2.1</b>	Electrical characteristics (curves) .....	<b>5</b>
<b>3</b>	<b>Test circuits</b> .....	<b>8</b>
<b>4</b>	<b>Package information</b> .....	<b>9</b>
<b>4.1</b>	TO-220FP type B package information .....	<b>9</b>
<b>4.2</b>	TO-220 type A package information .....	<b>11</b>
<b>4.3</b>	TO-247 package information .....	<b>13</b>
<b>5</b>	<b>Ordering information</b> .....	<b>15</b>
	<b>Revision history</b> .....	<b>16</b>



**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](http://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.

© 2026 STMicroelectronics – All rights reserved