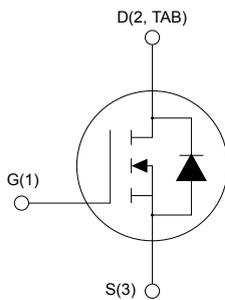
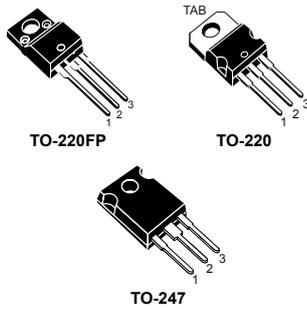




STF19NM50N, STP19NM50N, STW19NM50N

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

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	500	-	-	V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 500\text{ V}$	-	-	1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 500\text{ V}$, $T_C = 125\text{ }^\circ\text{C}^{(1)}$	-	-	100	
I_{GSS}	Gate body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 25\text{ V}$	-	-	± 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 Ω

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 50\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	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	$V_{DD} = 250\text{ V}$, $I_D = 7\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	12	-	ns
t_r	Rise time		-	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	-	μC
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	-	μC
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 μs , duty cycle 1.5%.

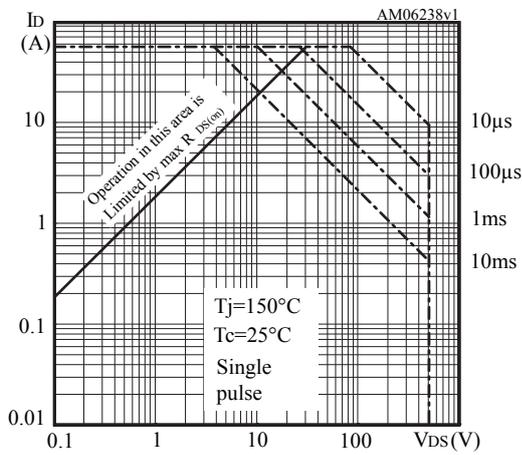
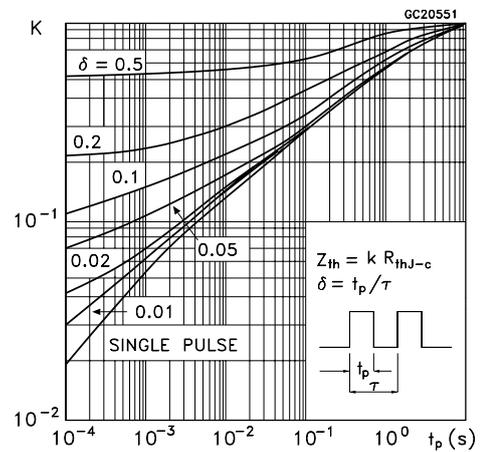
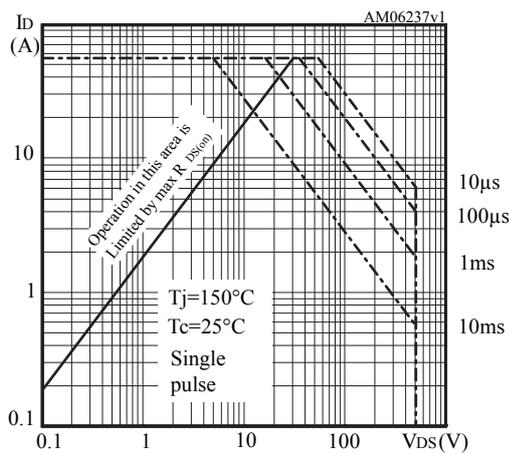
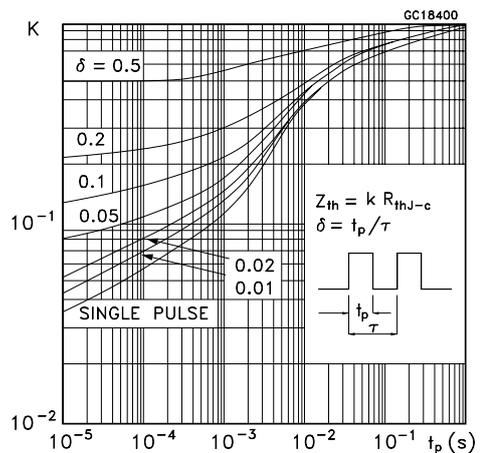
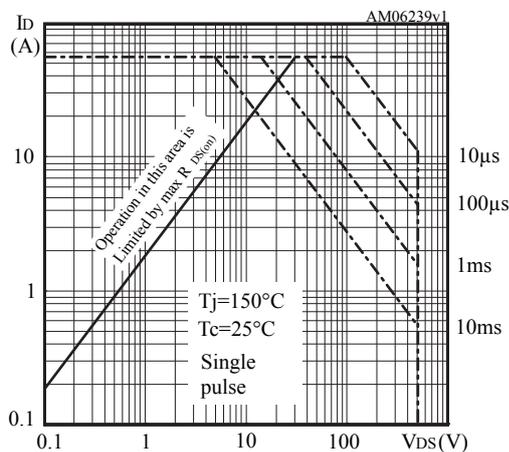
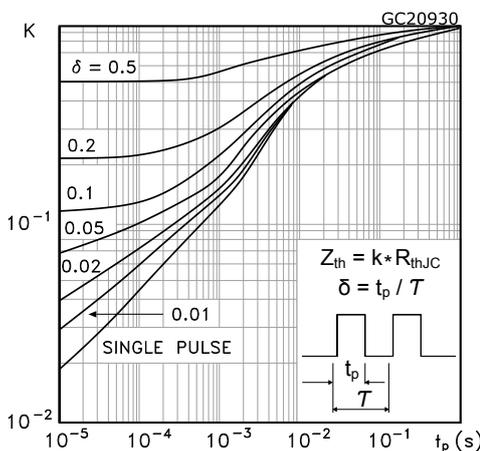
2.1 Electrical characteristics (curves)
Figure 1. Safe operating area for TO-220FP

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


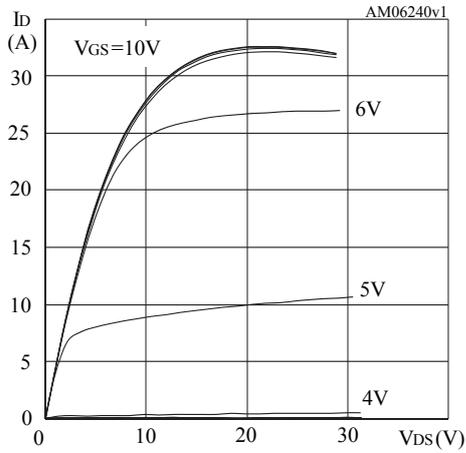
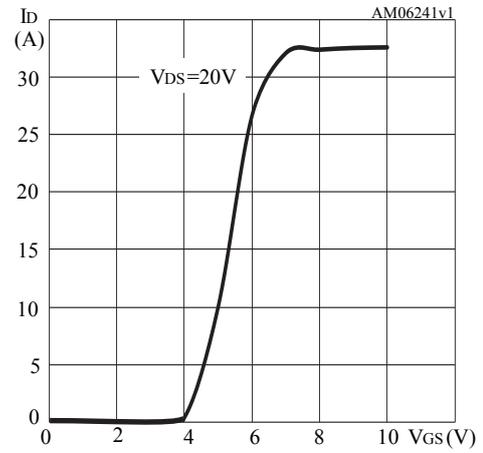
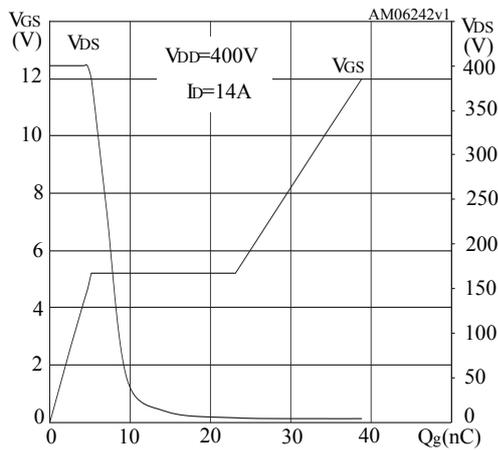
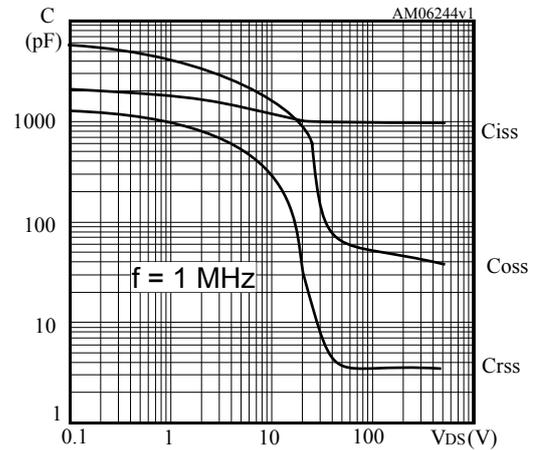
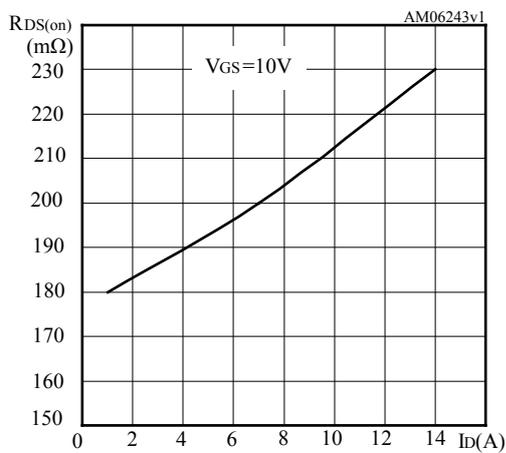
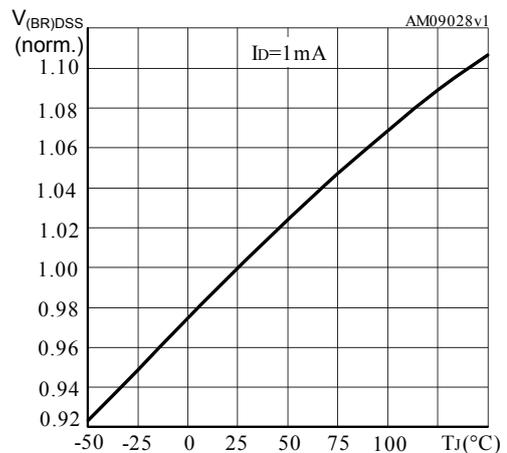
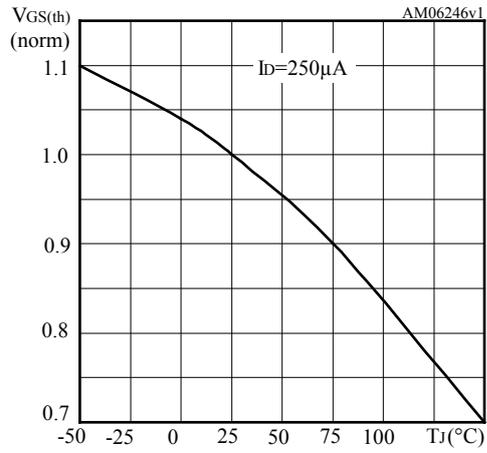
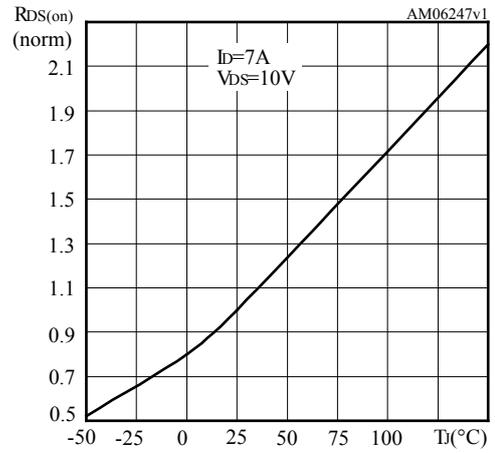
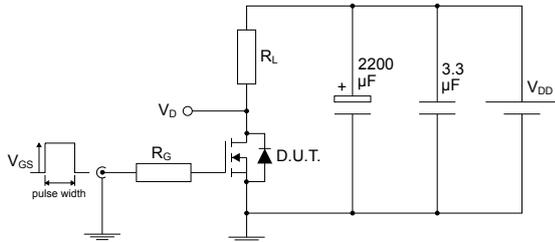
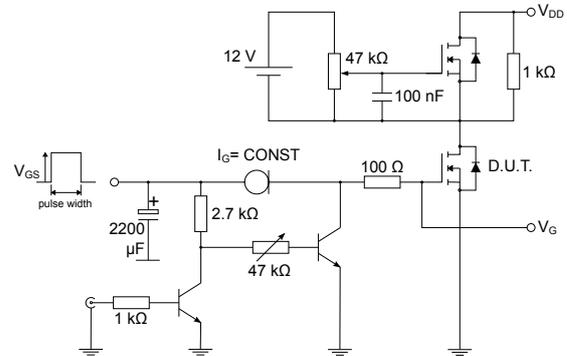
Figure 7. Typical output characteristics

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


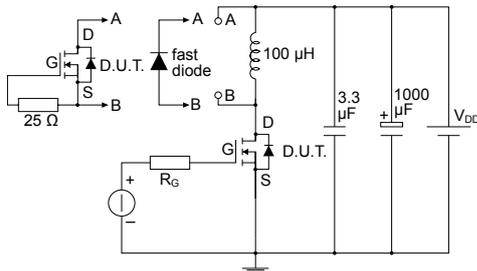
3 Test circuits

Figure 15. Test circuit for resistive load switching times


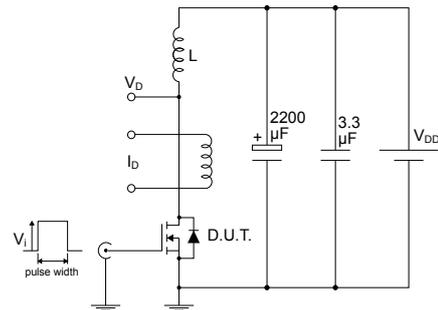
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Figure 16. Test circuit for gate charge behavior


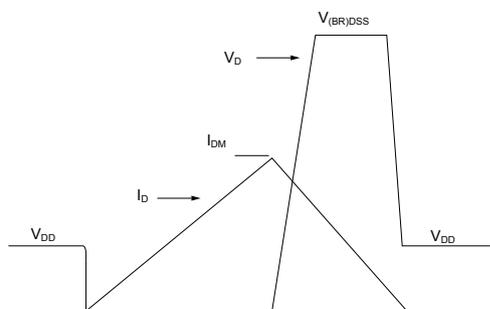
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Figure 17. Test circuit for inductive load switching and diode recovery times


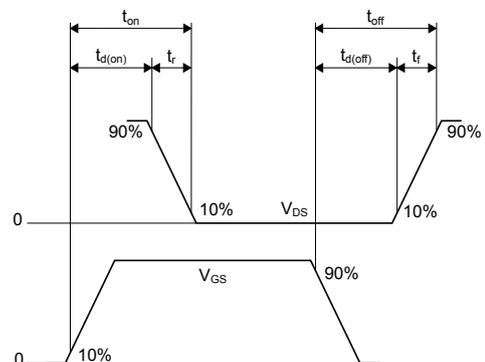
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Figure 18. Unclamped inductive load test circuit


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Figure 19. Unclamped inductive waveform


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Figure 20. Switching time waveform


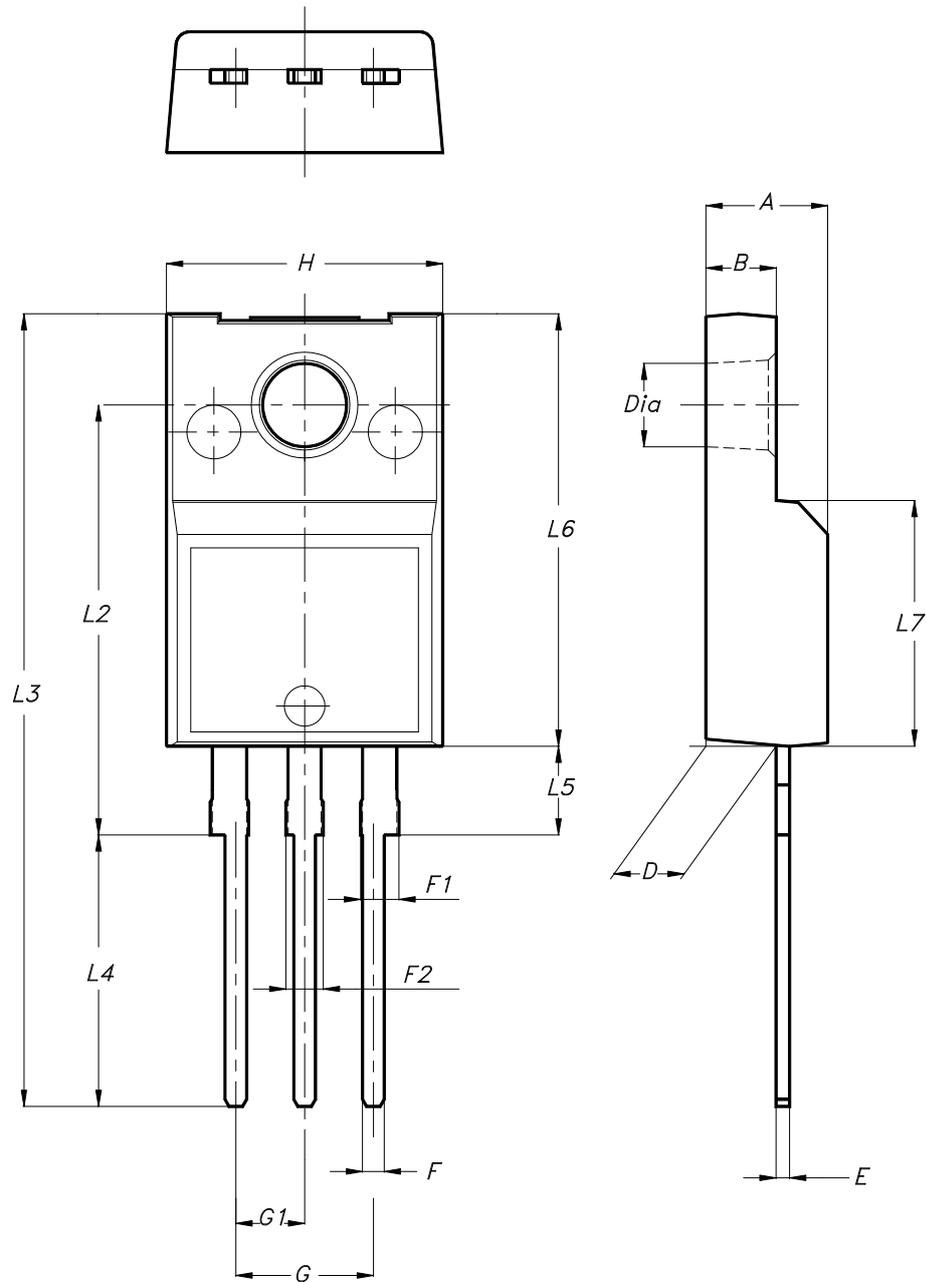
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4 Package information

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-220FP type B package information

Figure 21. TO-220FP type B package outline



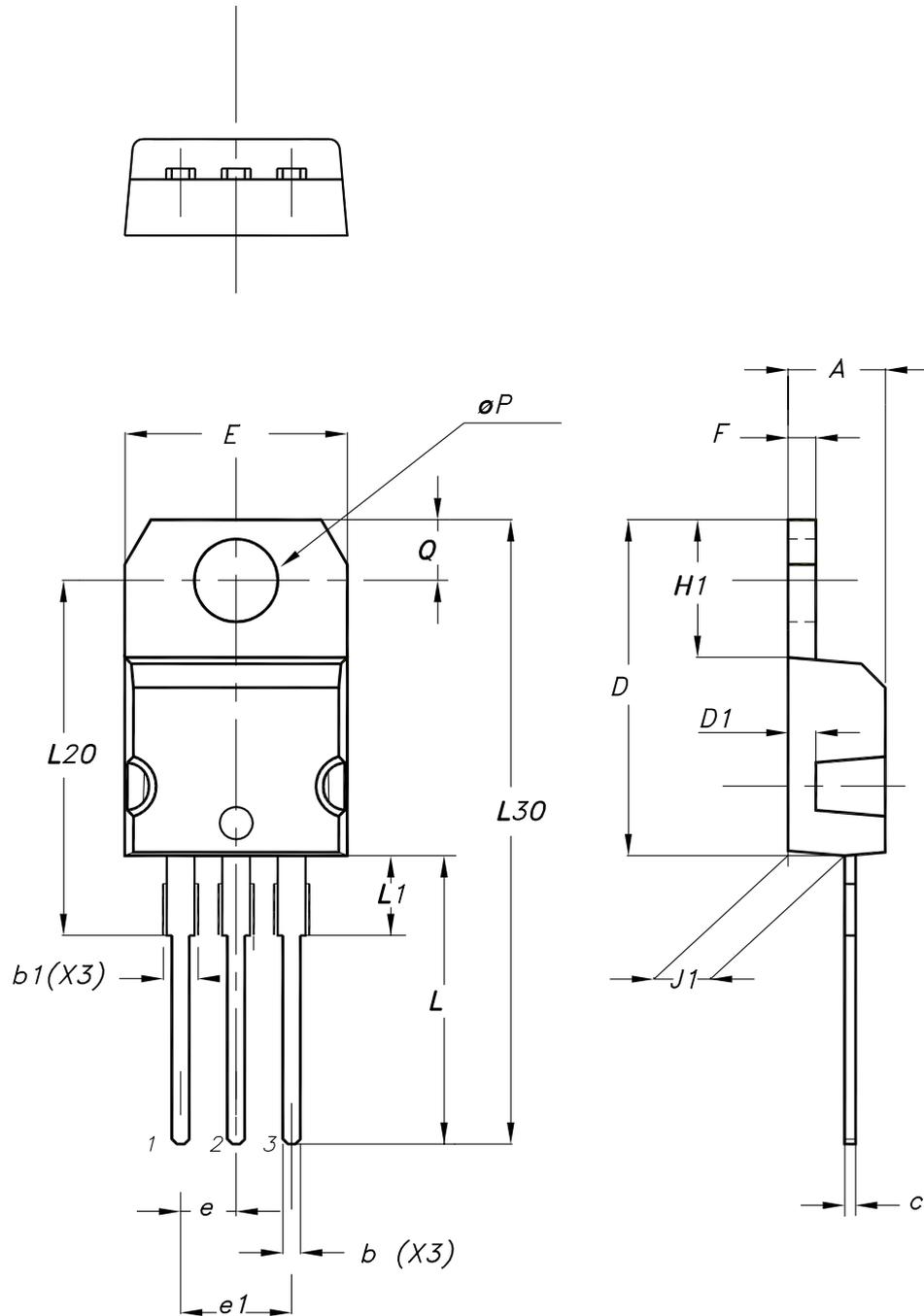
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Table 8. TO-220FP type B package mechanical data

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



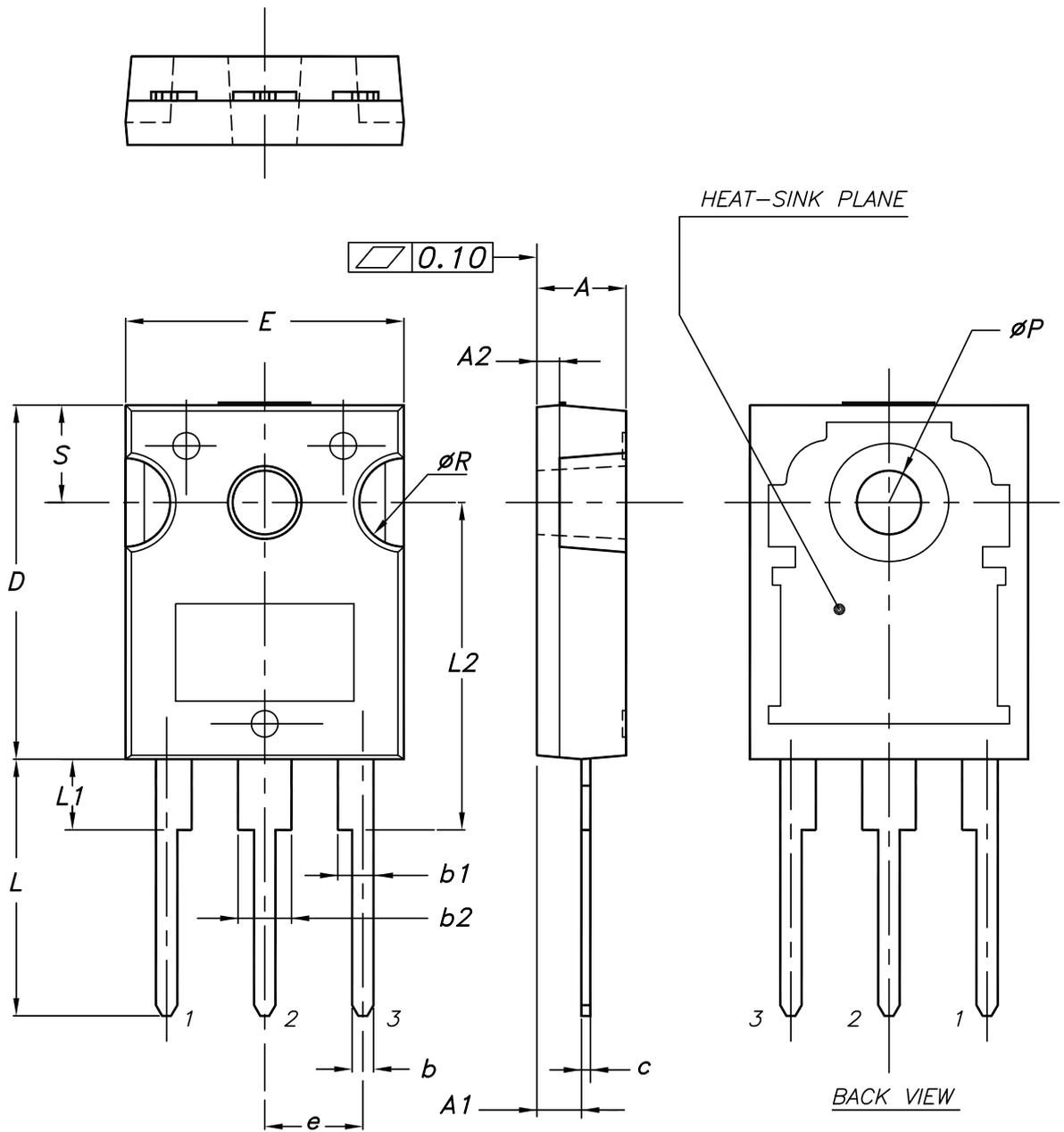
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Table 9. TO-220 type A package mechanical data

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.



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