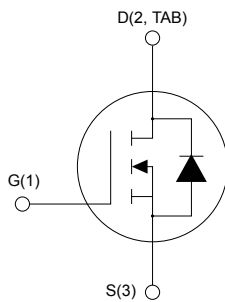
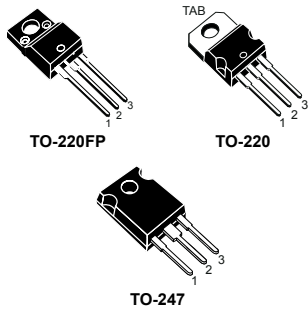




N-channel 600 V, 260 mΩ typ., 13 A MDmesh II Power MOSFETs in TO-220FP, TO-220 and TO-247 packages



AM01475v1_noZen



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STF18NM60N	600 V	285 mΩ	13 A
STP18NM60N			
STW18NM60N			

- 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

[STF18NM60N](#)

[STP18NM60N](#)

[STW18NM60N](#)

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220 TO-247	TO-220FP	
V_{DS}	Drain-source voltage	600		V
V_{GS}	Gate-source voltage	±25		V
I_D	Drain current (continuous) at $T_C = 25\text{ °C}$	13	13 ⁽¹⁾	A
	Drain current (continuous) at $T_C = 100\text{ °C}$	8.2	8.2 ⁽¹⁾	
$I_{DM}^{(2)}$	Drain current (pulsed)	52	52 ⁽¹⁾	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
$dv/dt^{(3)}$	Peak diode recovery voltage slope	15		V/ns
T_{stg}	Storage temperature range	-55 to 150		°C
T_J	Operating junction temperature range			°C

- Limited by maximum junction temperature.
- Pulse width limited by safe operating area.
- $I_{SD} \leq 13\text{ A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DS}(\text{peak}) \leq V_{(BR)DSS}$, $V_{DD} = 480\text{ V}$.

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	62.50	50	62.50	°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.)	4.5	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	350	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	$I_D = 1\text{ mA}$, $V_{GS} = 0\text{ V}$	600			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 600\text{ V}$, $T_C = 125\text{ °C}^{(1)}$			10	
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	$V_{GS} = 10\text{ V}$, $I_D = 6.5\text{ A}$		260	285	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		-	60	-	pF
C_{rSS}	Reverse transfer capacitance		-	3	-	pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent capacitance time related	$V_{DS} = 0\text{ to }480\text{ V}$, $V_{GS} = 0\text{ V}$	-	225	-	pF
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 13\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see the Figure 18. Test circuit for gate charge behavior)	-	35	-	nC
Q_{gs}	Gate-source charge		-	6	-	nC
Q_{gd}	Gate-drain charge		-	20	-	nC
R_g	Intrinsic gate resistance		$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	3.5	-

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	$V_{DD} = 300\text{ V}$, $I_D = 6.5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	12	-	ns
t_r	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time	(see the Figure 17. Test circuit for resistive load switching times and Figure 22. Switching time waveform)	-	55	-	ns
t_f	Fall time		-	25	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		13	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		52	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 13\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 13\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see the Figure 19. Test circuit for inductive load switching and diode recovery times)	-	300		ns
Q_{rr}	Reverse recovery charge		-	4.0		μC
I_{RRM}	Reverse recovery current		-	25		A
t_{rr}	Reverse recovery time	$I_{SD} = 13\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ (see the Figure 19. Test circuit for inductive load switching and diode recovery times)	-	360		ns
Q_{rr}	Reverse recovery charge		-	4.5		μC
I_{RRM}	Reverse recovery current		-	25		A

1. Pulse width limited by safe operating area.

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

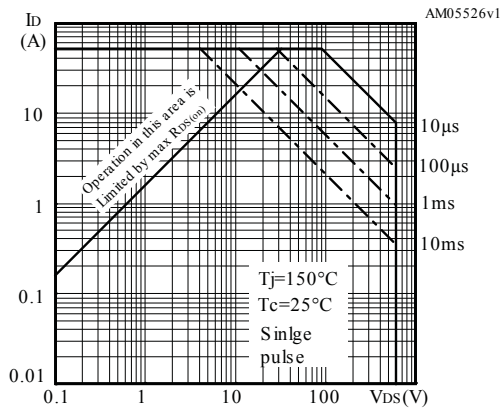
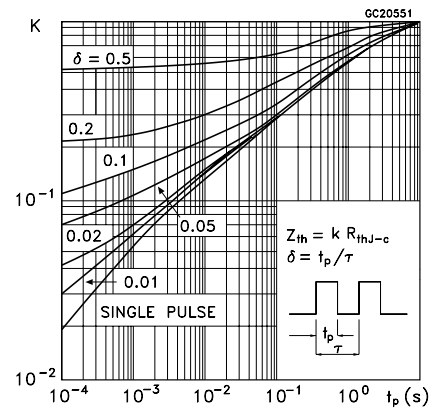
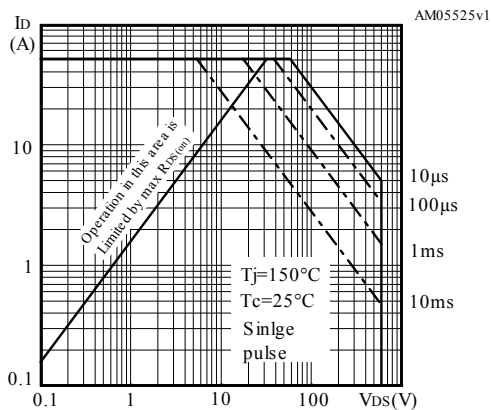
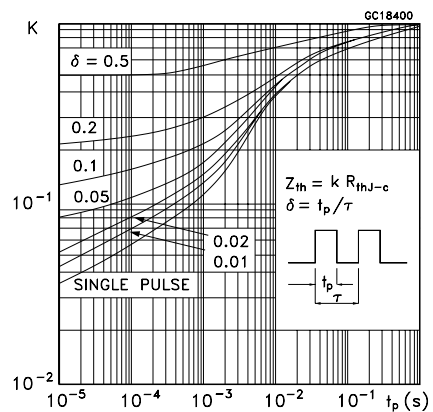
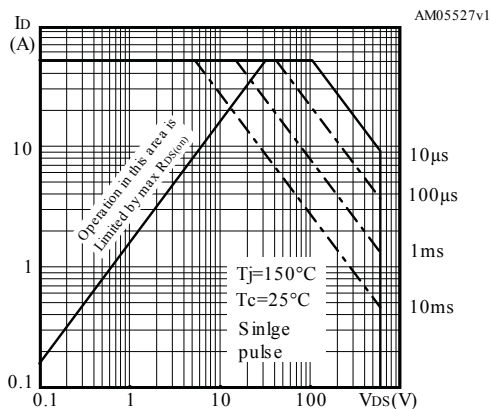
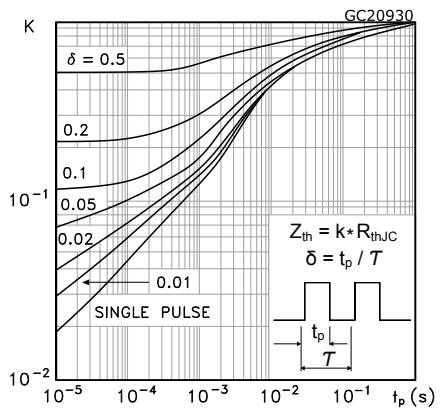
2.1 Electrical characteristics (curves)
Figure 1. Safe operating area for TO-220FP

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


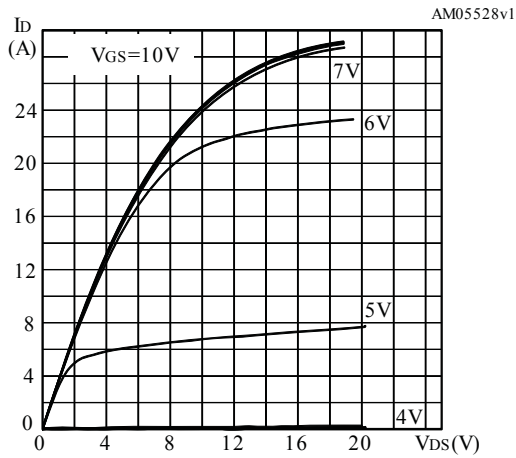
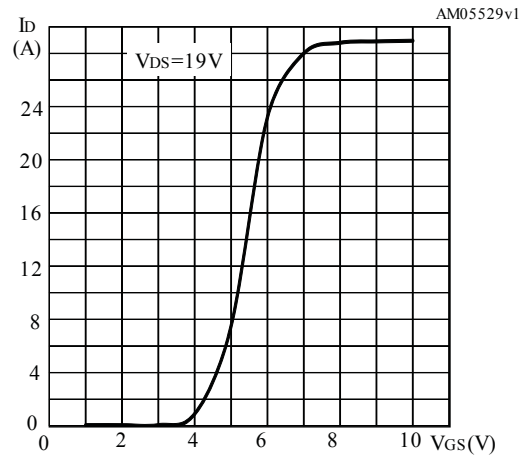
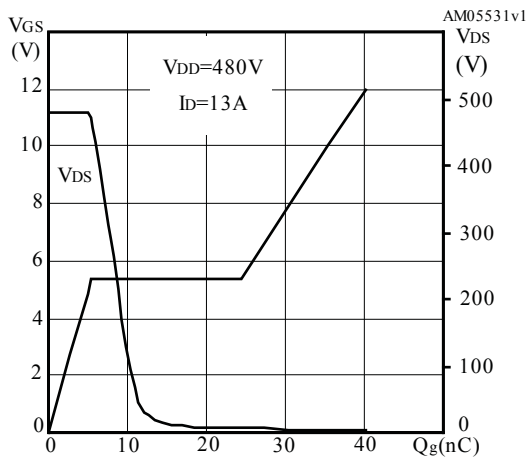
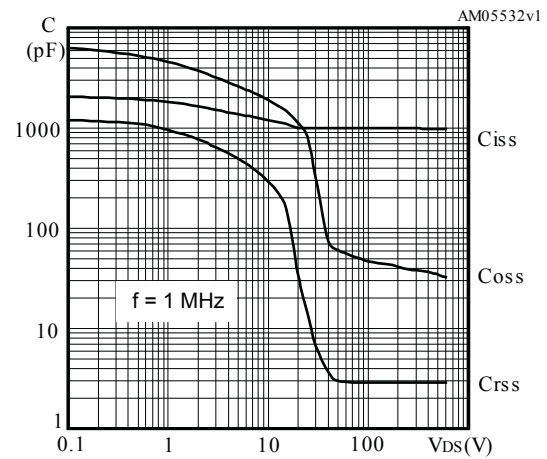
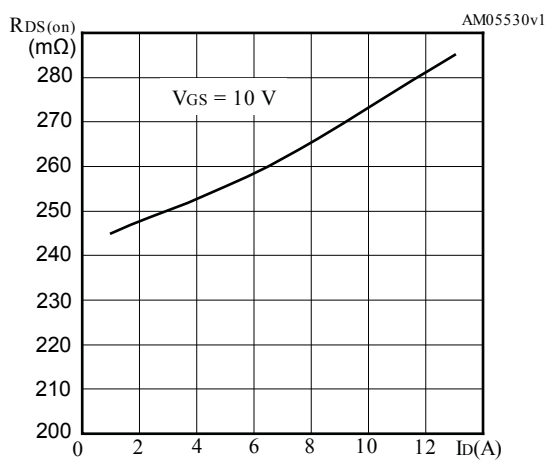
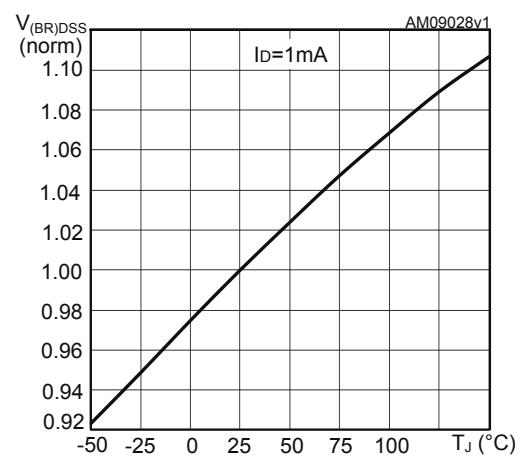
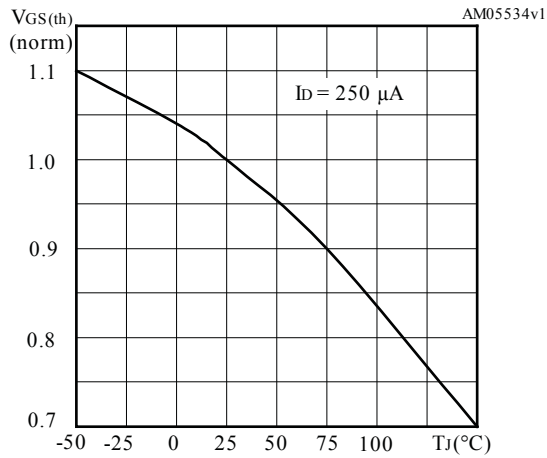
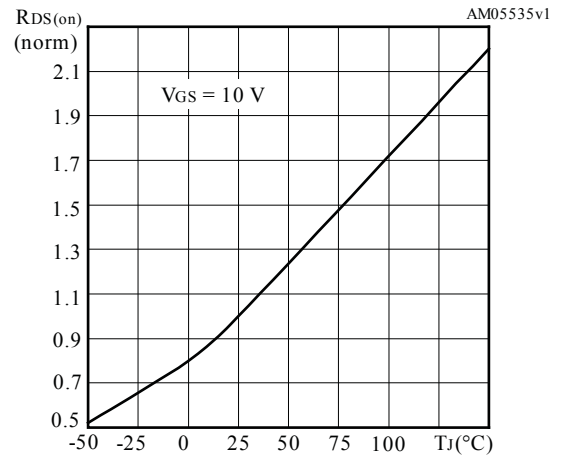
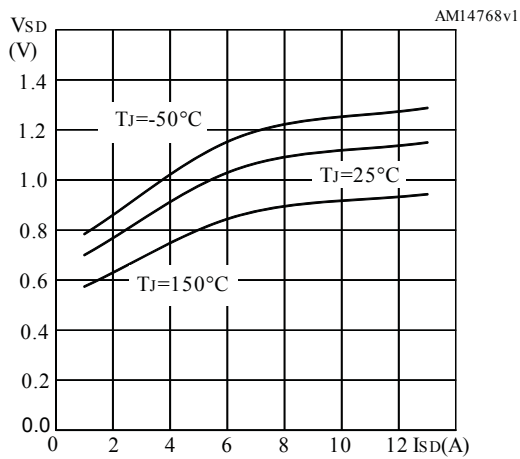
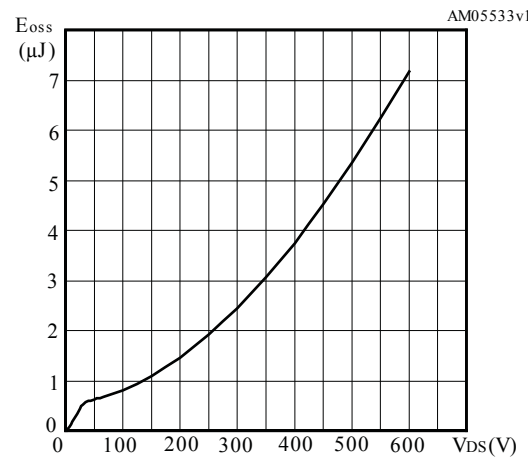
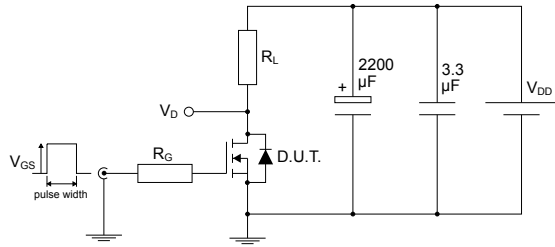
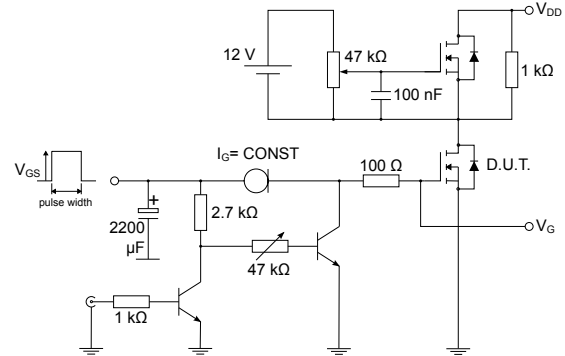
Figure 7. Typical output characteristics

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

Figure 15. Typical reverse diode forward characteristics

Figure 16. Typical output capacitance stored energy


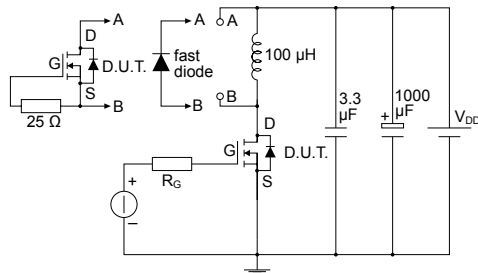
3 Test circuits

Figure 17. Test circuit for resistive load switching times


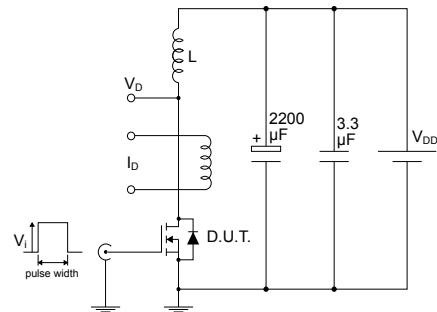
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Figure 18. Test circuit for gate charge behavior


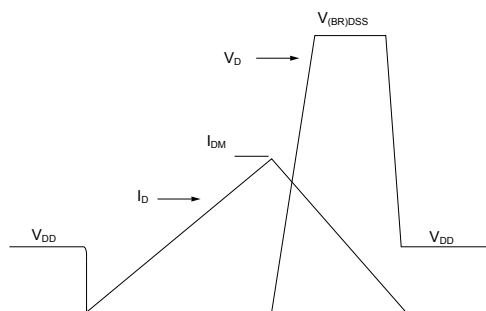
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Figure 19. Test circuit for inductive load switching and diode recovery times


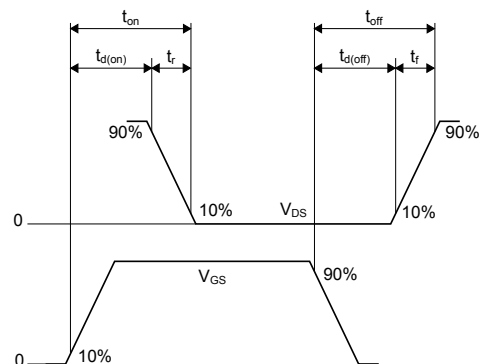
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Figure 20. Unclamped inductive load test circuit


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Figure 21. Unclamped inductive waveform


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Figure 22. Switching time waveform


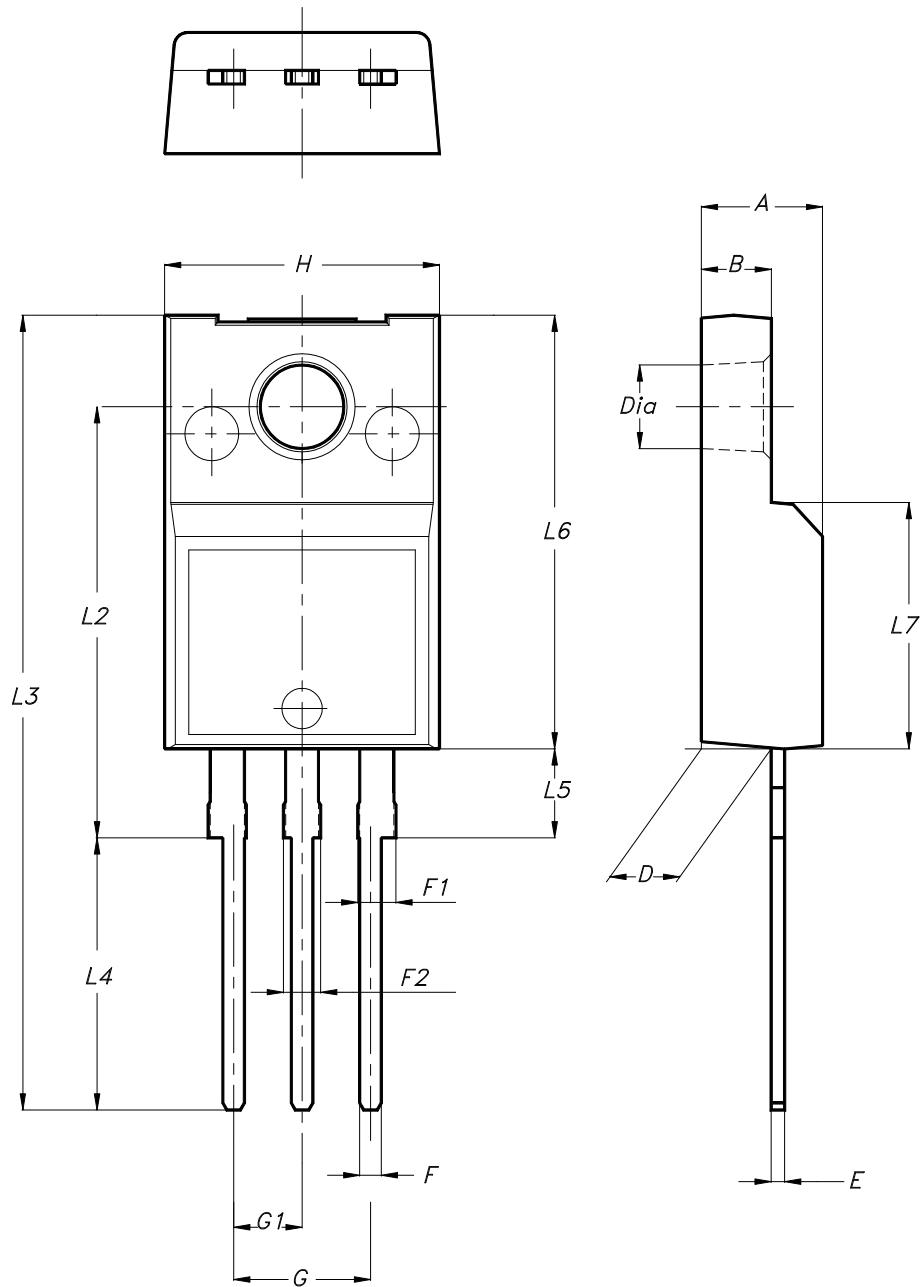
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4 Package information

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 23. TO-220FP type B package outline



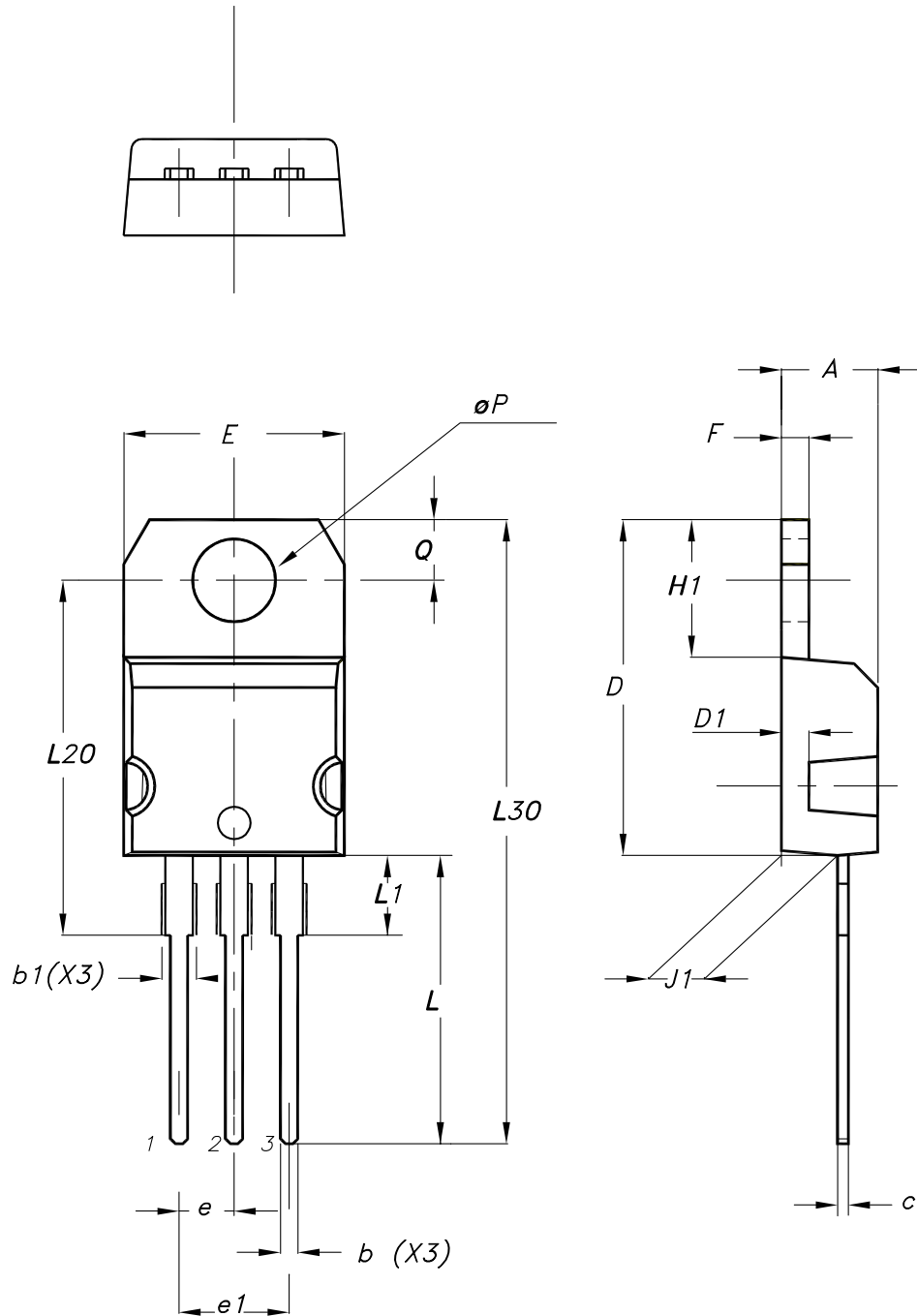
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Table 8. TO-220FP type B package mechanical data

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 24. TO-220 type A package outline



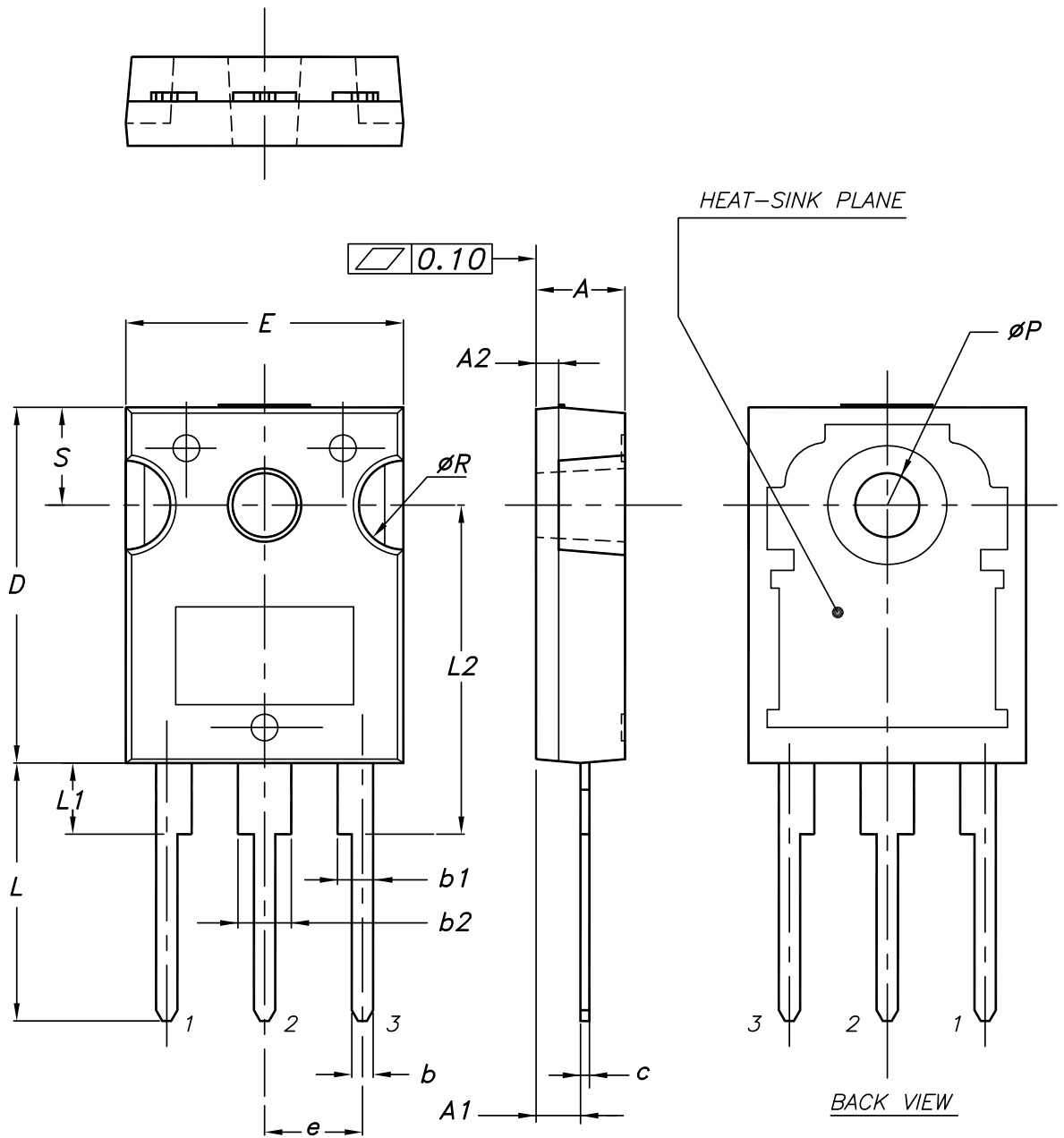
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Table 9. TO-220 type A package mechanical data

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 25. 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
STF18NM60N	18NM60N	TO-220FP	Tube
STP18NM60N		TO-220	
STW18NM60N		TO-247	

Revision history

Table 12. Document revision history

Date	Revision	Changes
15-Jun-2009	1	First release.
11-Nov-2009	2	<ul style="list-style-type: none"> – Added $R_{DS(on)}$ typical value – Added new package, mechanical data: I²PAK – Document status promoted from preliminary data to datasheet
06-Oct-2010	3	Inserted new value in <i>Table 5</i> .
01-Oct-2012	4	<p>Updated title and description on the cover page.</p> <p>Updated <i>figures 10, 11, 14, 15 and 16</i>.</p> <p>Updated <i>Section 4: Package mechanical data</i> and <i>Section 5: Packaging mechanical data</i>.</p>
09-Mar-2026	5	<p>The part number STB18NM60N have been removed and the document has been updated accordingly.</p> <p>Updated Section 4: Package information.</p> <p>Minor text changes.</p>



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