



STF34NM60N STP34NM60N, STW34NM60N

N-channel 600 V, 0.092 Ω , 29 A MDmesh™ II Power MOSFET
TO-220, TO-247, TO-220FP

Preliminary data

Features

Type	V _{DSS}	R _{DS(on)} max.	I _D	P _{TOT}
STF34NM60N	600 V	0.105 Ω	29 A	40 W
STP34NM60N	600 V	0.105 Ω	29 A	210 W
STW34NM60N	600 V	0.105 Ω	29 A	210 W

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

Application

- Switching applications

Description

These devices are made using the second generation of MDmesh™ technology. This revolutionary Power MOSFET associates a new vertical structure to the company's strip layout to yield one of the world's lowest on-resistance and gate charge. It is therefore suitable for the most demanding high efficiency converters.

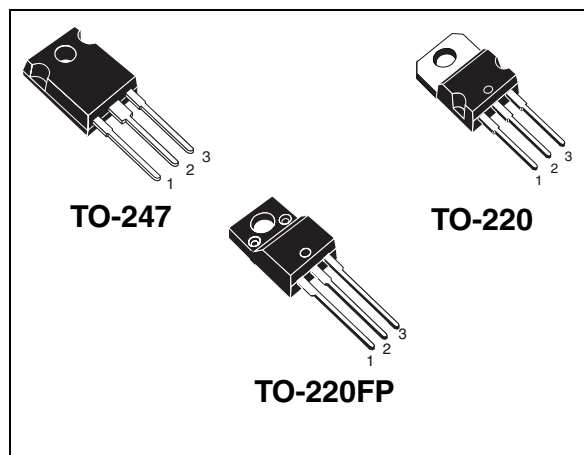


Figure 1. Internal schematic diagram

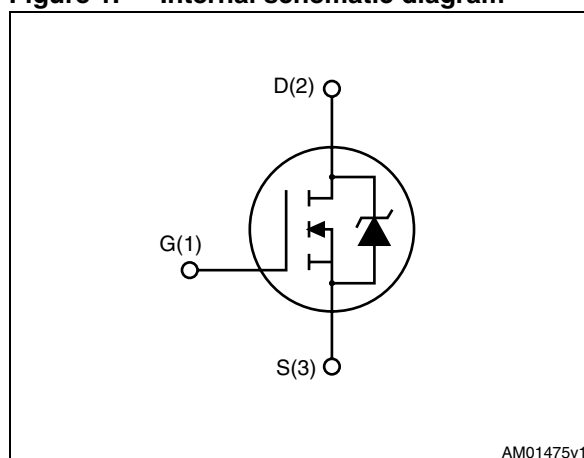


Table 1. Device summary

Order codes	Marking	Package	Packaging
STF34NM60N	34NM60N	TO-220FP	Tube
STP34NM60N		TO-220	
STW34NM60N		TO-247	

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220, TO-247	TO-220FP	
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	600		V
V_{GS}	Gate- source voltage	± 25		V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	29	29 ⁽¹⁾	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	18	18	A
$I_{DM}^{(2)}$	Drain current (pulsed)	116	116	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	210	40	W
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J max)	12		A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	345		mJ
$dv/dt^{(3)}$	Peak diode recovery voltage slope	15		V/ns
T_{stg}	Storage temperature	- 55 to 150		$^\circ\text{C}$
T_J	Max. operating junction temperature	150		

- Limited only by maximum temperature allowed.
- Pulse width limited by safe operating area.
- $I_{SD} \leq 29\text{ A}$, $di/dt \leq 600\text{ A}/\mu\text{s}$, $V_{DD} = 80\% V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	TO-220	TO-247	TO-220FP	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.60		3.13	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	50	62.5	$^\circ\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose	300			$^\circ\text{C}$

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$, $V_{GS} = 0$	600			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating @ } 125\text{ °C}$			1 100	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			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	$V_{GS} = 10\text{ V}$, $I_D = 14.5\text{ A}$		0.092	0.105	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	2722	-	pF
C_{oss}	Output capacitance			173		pF
C_{rss}	Reverse transfer capacitance			1.75		pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{GS} = 0$, $V_{DS} = 0\text{ to }480\text{ V}$	-	458	-	pF
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 300\text{ V}$, $I_D = 14.5\text{ A}$ $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 7), (see Figure 2)	-	TBD	-	ns
t_r	Rise time			TBD		ns
$t_{d(off)}$	Turn-off delay time			TBD		ns
t_f	Fall time			TBD		ns
Q_g	Total gate charge	$V_{DD} = 480\text{ V}$, $I_D = 29\text{ A}$, $V_{GS} = 10\text{ V}$, (see Figure 3)	-	80	-	nC
Q_{gs}	Gate-source charge			16		nC
Q_{gd}	Gate-drain charge			41		nC
R_g	Gate input resistance	f=1MHz Gate DC Bias=0 Test signal level=20 mV Open drain	-	2.9	-	Ω

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. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		29	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		116	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 29\text{ A}, V_{GS} = 0$	-		TBD	V
t_{rr}	Reverse recovery time	$I_{SD} = 29\text{ A}, V_{DD} = 60\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$ (see Figure 4)	-	TBD		ns
Q_{rr}	Reverse recovery charge			TBD		μC
I_{RRM}	Reverse recovery current			TBD		A
t_{rr}	Reverse recovery time	$I_{SD} = 29\text{ A}, V_{DD} = 60\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$, $T_J = 150\text{ }^\circ\text{C}$ (see Figure 4)	-	TBD		ns
Q_{rr}	Reverse recovery charge			TBD		μC
I_{RRM}	Reverse recovery current			TBD		A

1. Pulse width limited by safe operating area
2. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%.

3 Test circuits

Figure 2. Switching times test circuit for resistive load

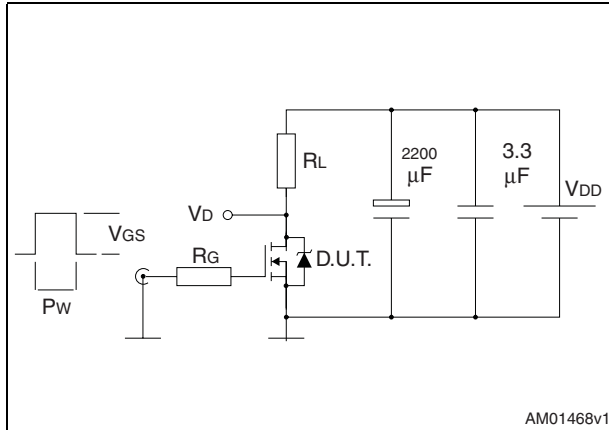


Figure 3. Gate charge test circuit

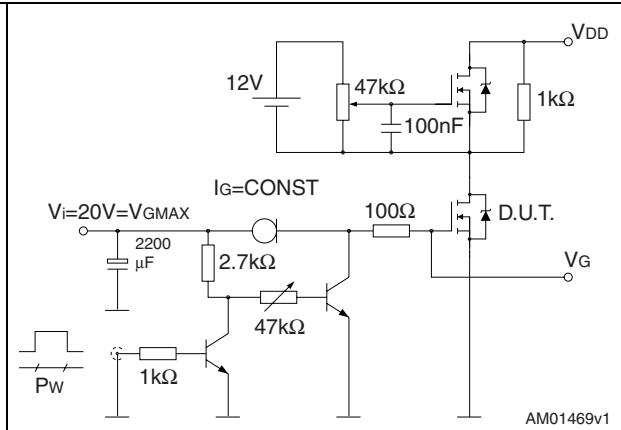


Figure 4. Test circuit for inductive load switching and diode recovery times

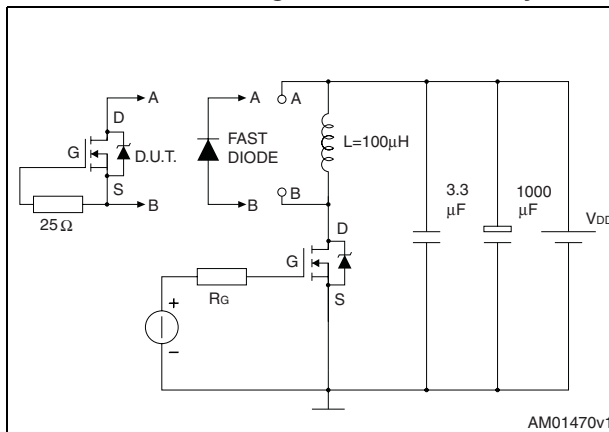


Figure 5. Unclamped inductive load test circuit

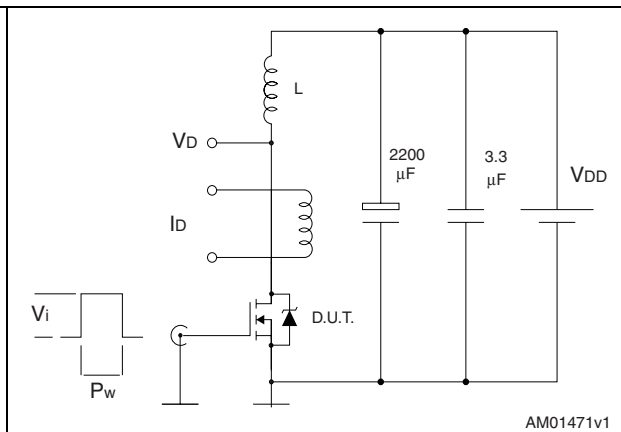


Figure 6. Unclamped inductive waveform

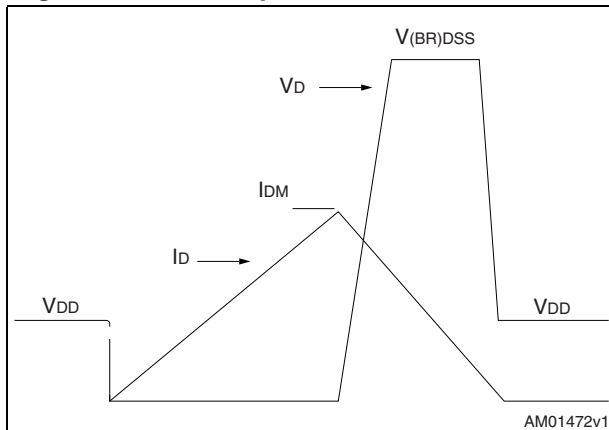
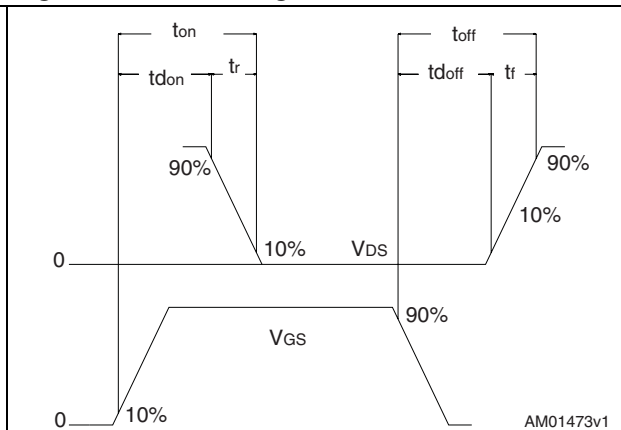


Figure 7. Switching time waveform



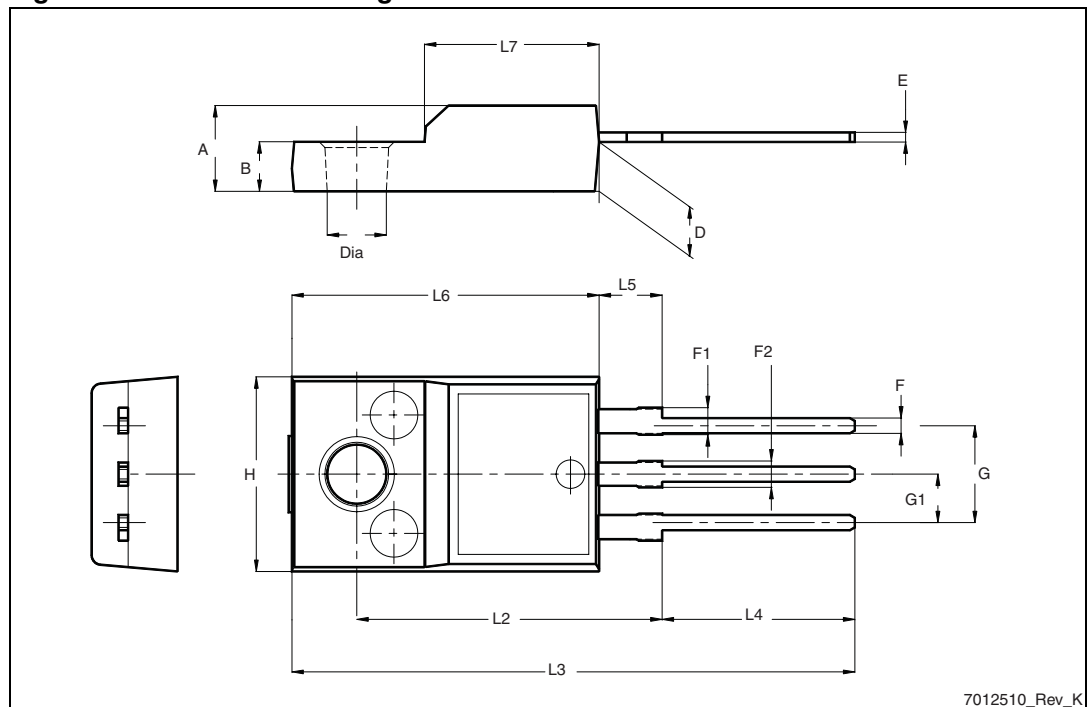
4 Package mechanical data

In order 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.

Table 7. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

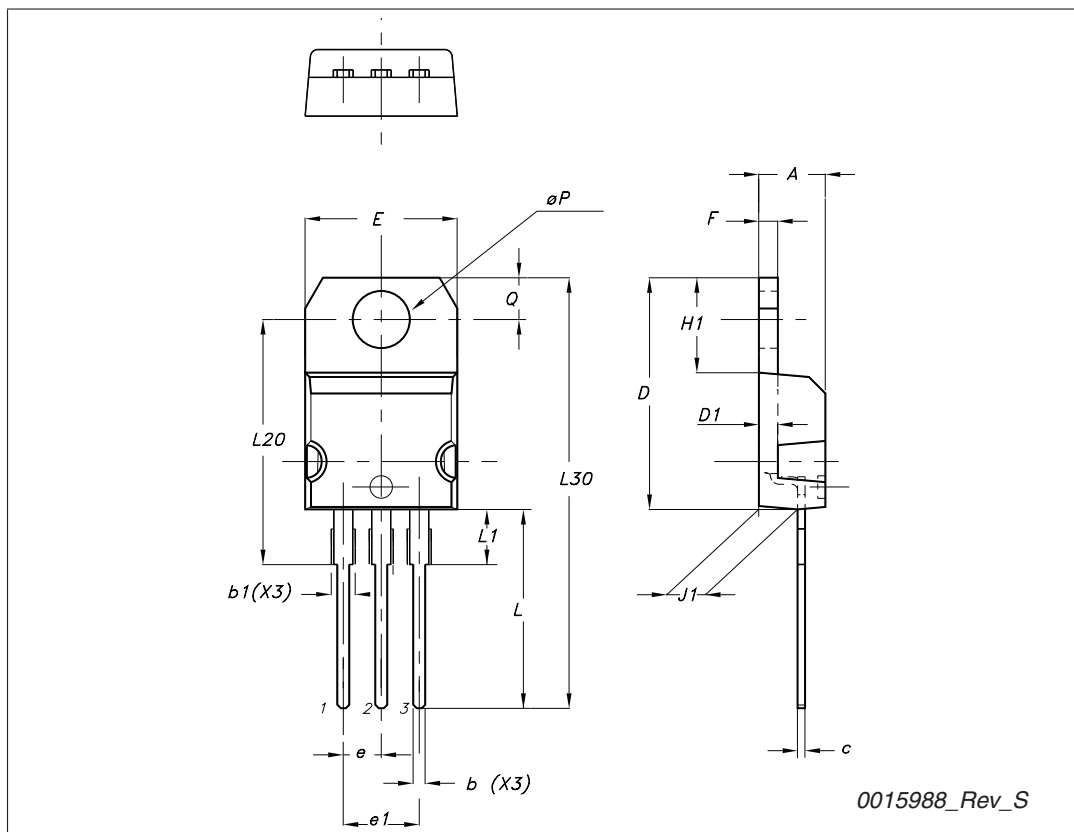
Figure 8. TO-220FP drawing



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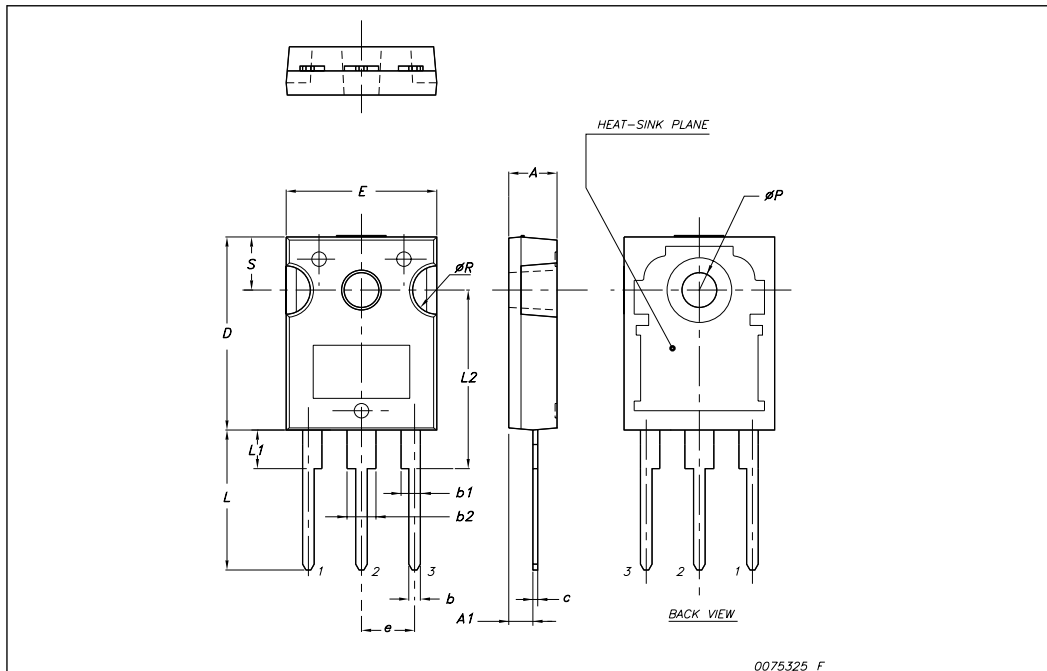
TO-220 type A mechanical data

Dim	mm		
	Min	Typ	Max
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		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		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95



TO-247 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		5.45	
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
øP	3.55		3.65
øR	4.50		5.50
S		5.50	



5 Revision history

Table 8. Document revision history

Date	Revision	Changes
05-Aug-2010	1	Initial release.
02-Sep-2010	2	Updated title on cover page and Table 4: On/off states .

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