



STB18NM60N, STF18NM60N STP18NM60N, STW18NM60N

N-channel 600 V, 13 A, TO-220, TO-220FP, TO-247, D²PAK
second generation MDmesh™ Power MOSFET

Preliminary data

Features

Type	V _{DSS} (@T _{Jmax})	R _{DS(on)} max	I _D	P _W
STB18NM60N	600 V	< 0.285 Ω	13 A	80 W
STF18NM60N	600 V	< 0.285 Ω	13 A	30 W
STP18NM60N	600 V	< 0.285 Ω	13 A	80 W
STW18NM60N	600 V	< 0.285 Ω	13 A	80 W

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

Application

- Switching applications

Description

MDmesh™ technology applies the benefits of the multiple drain process to STMicroelectronics' well-known PowerMESH™ horizontal layout structure. The resulting product offers low on-resistance, high dv/dt capability and excellent avalanche characteristics.

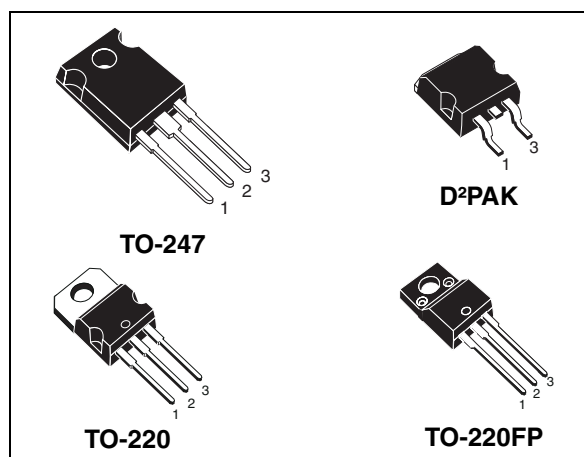
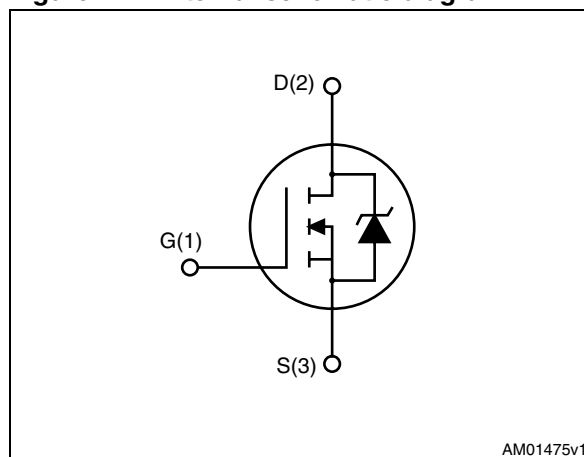


Figure 1. Internal schematic diagram



AM01475v1

Table 1. Device summary

Order codes	Marking	Package	Packaging
STB18NM60N	18NM60N	D ² PAK	Tape and reel
STF18NM60N	18NM60N	TO-220FP	Tube
STP18NM60N	18NM60N	TO-220	Tube
STW18NM60N	18NM60N	TO-247	Tube

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
3	Test circuits	6
4	Package mechanical data	7
5	Packaging mechanical data	12
6	Revision history	13

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		D ² PAK, TO-220,TO-247	TO-220FP	
V _{GS}	Gate- source voltage	600		V
I _D	Drain current (continuous) at T _C = 25 °C	13	13 ⁽¹⁾	A
I _D	Drain current (continuous) at T _C = 100 °C	8.2	8.2 ⁽¹⁾	A
I _{DM} ⁽²⁾	Drain current (pulsed)	52	52 ⁽¹⁾	A
P _{TOT}	Total dissipation at T _C = 25 °C	80	30	W
I _{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T _J max)	TBD		A
E _{AS}	Single pulse avalanche energy (starting T _J = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	TBD		mJ
dv/dt ⁽³⁾	Peak diode recovery voltage slope	15		V/ns
V _{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t=1 s; T _C =25 °C)		2500	V
T _J T _{stg}	Operating junction temperature Storage temperature	-55 to 150		°C

- Limited only by maximum temperature allowed
- Pulse width limited by safe operating area
- I_{SD} ≤ 13 A, di/dt ≤ 400 A/μs, peak V_{DS} ≤ V_{(BR)DSS}

Table 3. Thermal data

Symbol	Parameter	D ² PAK	TO-220	TO-247	TO-220FP	Unit
R _{thj-case}	Thermal resistance junction-case max	1.56			4.17	°C/W
R _{thj-amb}	Thermal resistance junction-amb max		62.5	50	62.5	°C/W
T _l	Maximum lead temperature for soldering purpose	300				°C

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}, V_{GS} = 0$	600			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}, T_J = 125\text{ }^{\circ}\text{C}$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 25\text{ V}; V_{DS} = 0$			0.1	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 100\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}, I_D = 6.5\text{ A}$			0.285	W

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 0, I_D = 0$	-	TBD	-	S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 50\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0$	-	1000 70 3	-	pF pF pF
$C_{o(tr)}^{(2)}$	Eq. capacitance time related	$V_{DS} = 0, \text{ to } 480\text{ V } V_{GS} = 0$	-	TBD	-	pF
$C_{o(er)}^{(3)}$	Eq. capacitance energy relate	$V_{DS} = 0, \text{ to } 480\text{ V } V_{GS} = 0$	-	TBD	-	pF
R_g	Intrinsic resistance	$f = 1\text{ MHz}$ open drain	-	4	-	W
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 480\text{ V}, I_D = 13\text{ A}$ $V_{GS} = 10\text{ V}$ (see Figure 3)	-	35 TBD TBD	-	nC nC nC

1. Pulsed: pulse duration=300is, duty cycle 1.5%
2. $C_{oss\text{ eq}}$ time related 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}
3. $C_{oss\text{ eq}}$ energy related is defined as a constant equivalent capacitance giving the same stored energy 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	$V_{DD} = 300\text{ V}$, $I_D = 13\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (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

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	$I_{SD} = 13\text{ A}$, $V_{GS} = 0$	-		TBD	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 Figure 4)	-	TBD		ns
Q_{rr}	Reverse recovery charge			TBD		μC
I_{RRM}	Reverse recovery current			TBD		A
t_{rr}	Reverse recovery time	$V_{DD} = 60\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$, $I_{SD} = 13\text{ A}$ $T_j = 150^\circ\text{C}$ (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%

Test circuits

3 Test circuits

Figure 2. Switching times test circuit for resistive load

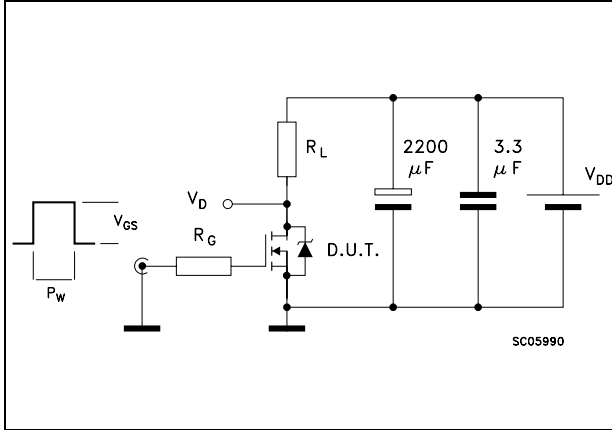


Figure 3. Gate charge test circuit

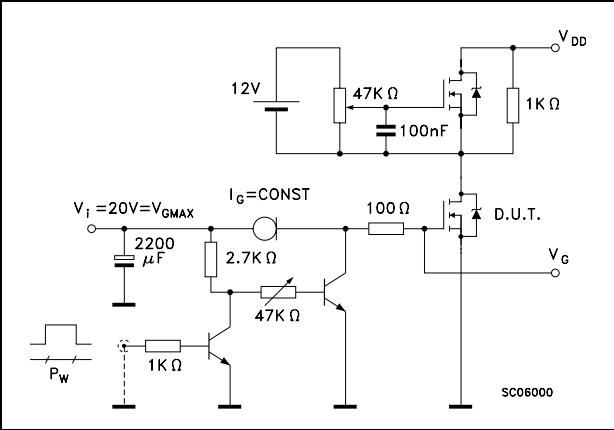


Figure 4. Test circuit for inductive load switching and diode recovery times

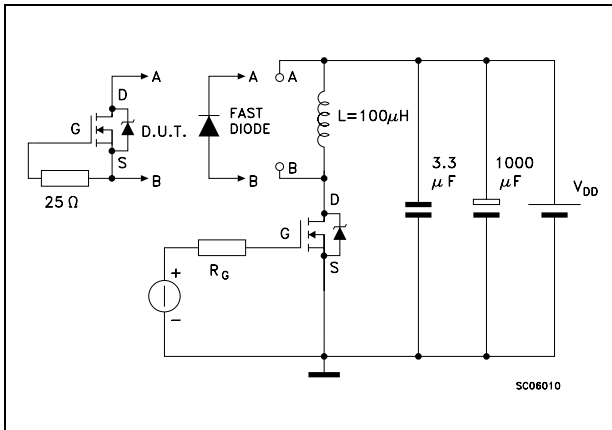


Figure 5. Unclamped inductive load test circuit

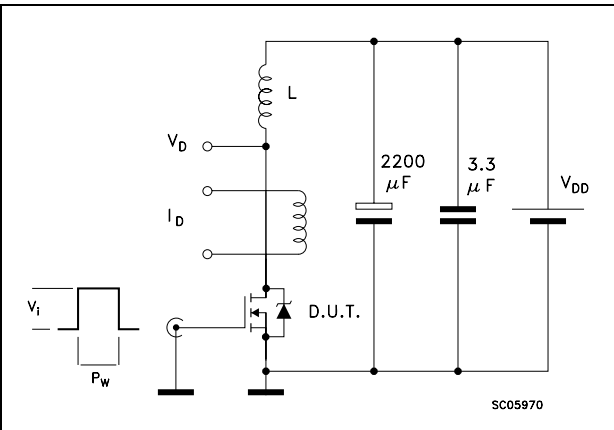


Figure 6. Unclamped inductive waveform

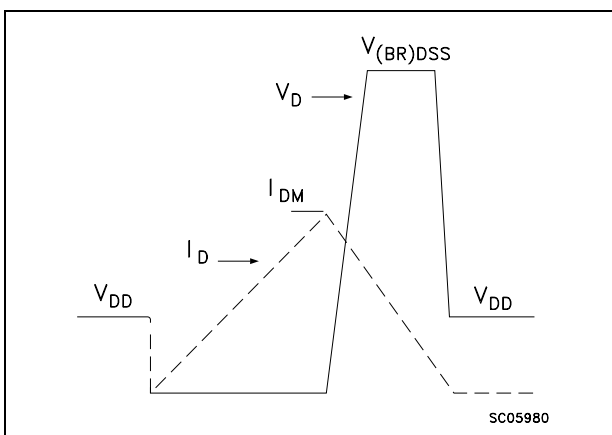
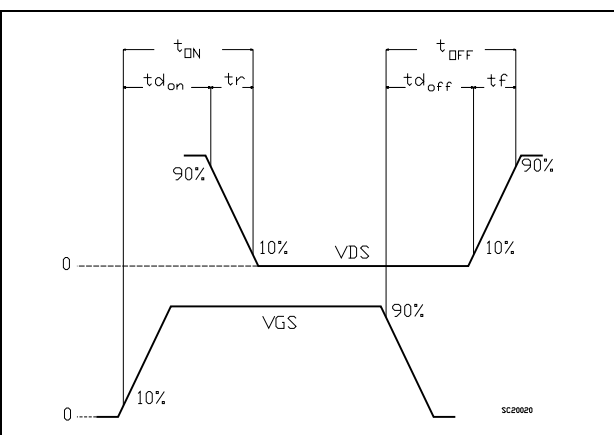


Figure 7. Switching time waveform

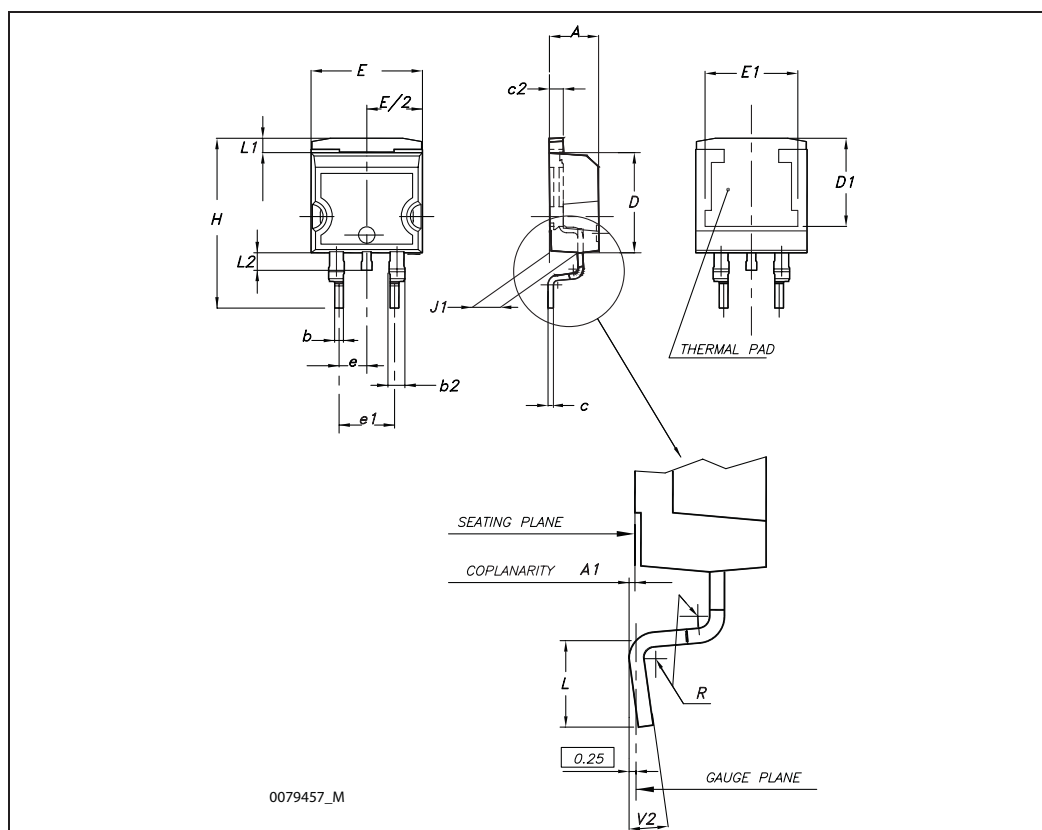


4 Package mechanical data

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.

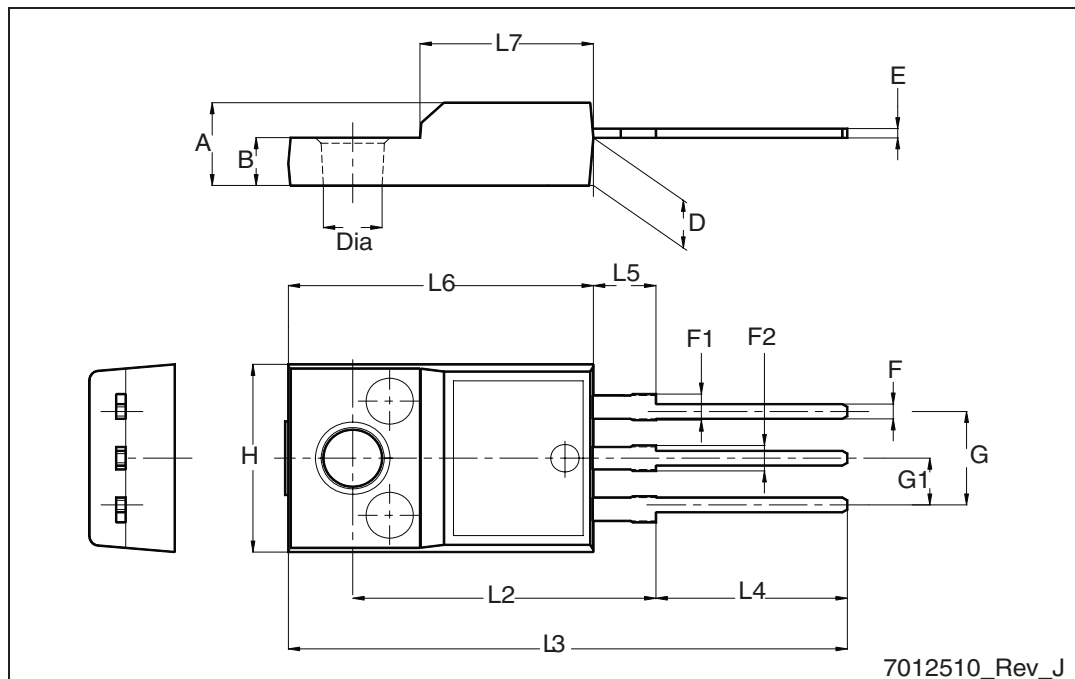
D²PAK (TO-263) mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
A1	0.03		0.23	0.001		0.009
b	0.70		0.93	0.027		0.037
b2	1.14		1.70	0.045		0.067
c	0.45		0.60	0.017		0.024
c2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1	7.50			0.295		
E	10		10.40	0.394		0.409
E1	8.50			0.334		
e		2.54			0.1	
e1	4.88		5.28	0.192		0.208
H	15		15.85	0.590		0.624
J1	2.49		2.69	0.099		0.106
L	2.29		2.79	0.090		0.110
L1	1.27		1.40	0.05		0.055
L2	1.30		1.75	0.051		0.069
R		0.4			0.016	
V2	0°		8°	0°		8°



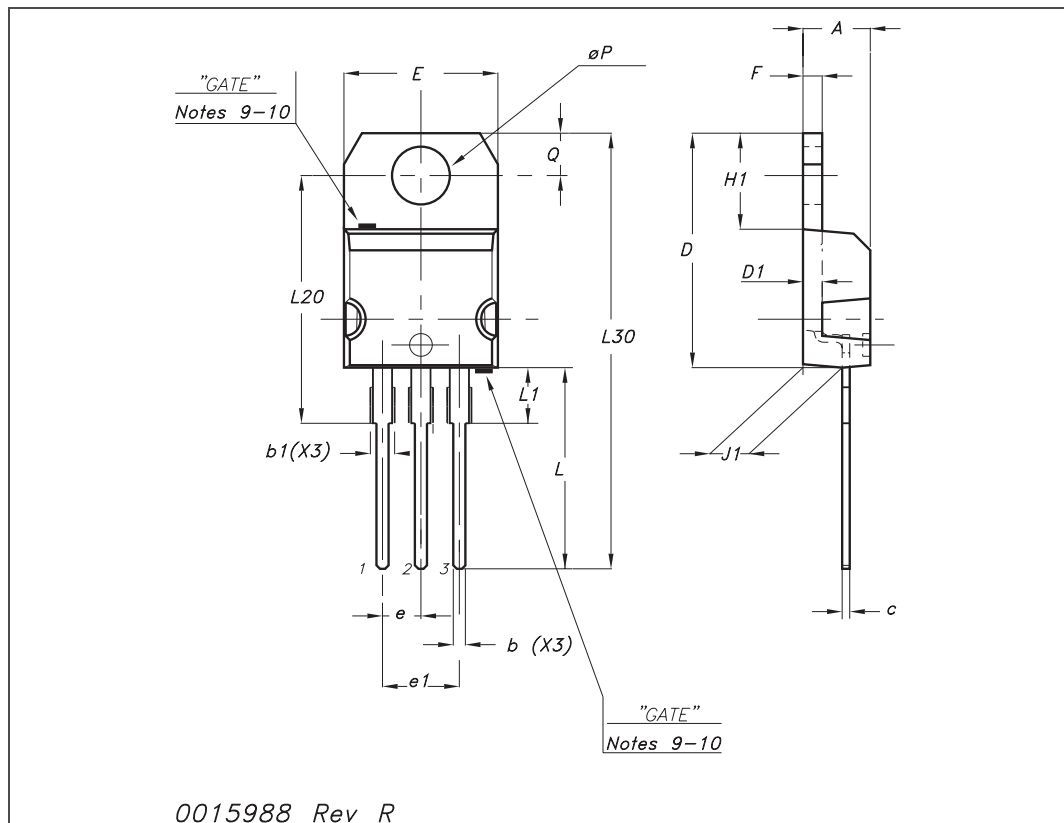
TO-220FP mechanical data

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		1.5
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



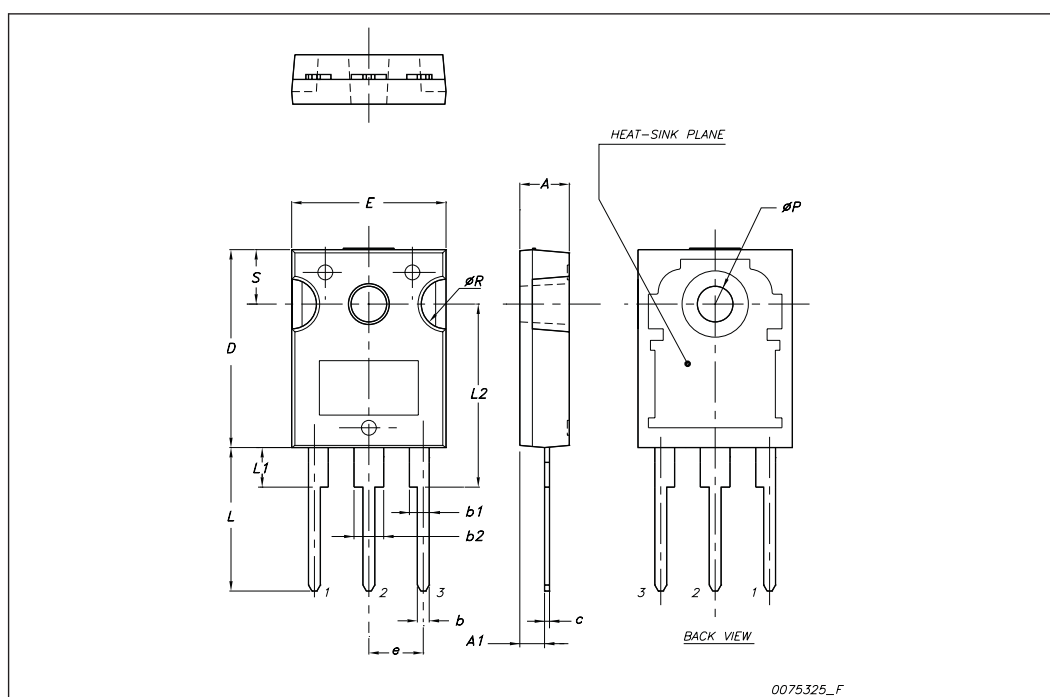
TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.48		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



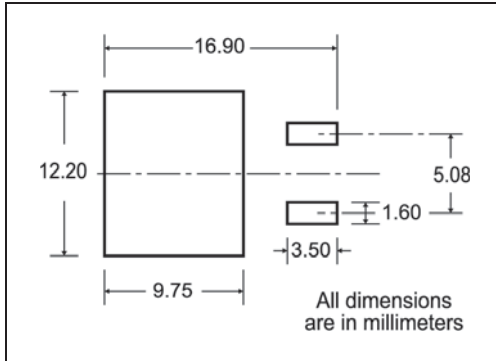
TO-247 mechanical data

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	
ϕP	3.55		3.65
ϕR	4.50		5.50
S		5.50	



5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956

REEL MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

BASE QTY	BULK QTY
1000	1000

6 Revision history

Table 8. Document revision history

Date	Revision	Changes
15-Jun-2009	1	First release

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2009 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com