



# STD7NM80 - STD7NM80-1 STF7NM80 - STP7NM80

N-channel 800V - 0.85Ω - 6.5A - TO-220 - TO-220FP - IPAK - DPAK  
MDmesh™ Power MOSFET

TARGET SPECIFICATION

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STD7NM80	800V	<0.95Ω	6.5A
STD7NM80-1	800V	<0.95Ω	6.5A
STF7NM80	800V	<0.95Ω	6.5A
STP7NM80	800V	<0.95Ω	6.5A

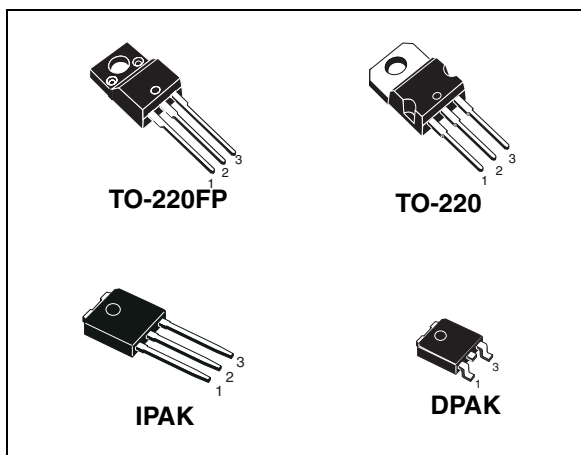
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

## Description

This product is realized thanks to the MDmesh™ Technology. This revolutionary Power MOSFET associates a new multiple drain vertical structure to the Company's PowerMESH™ horizontal 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

## Applications

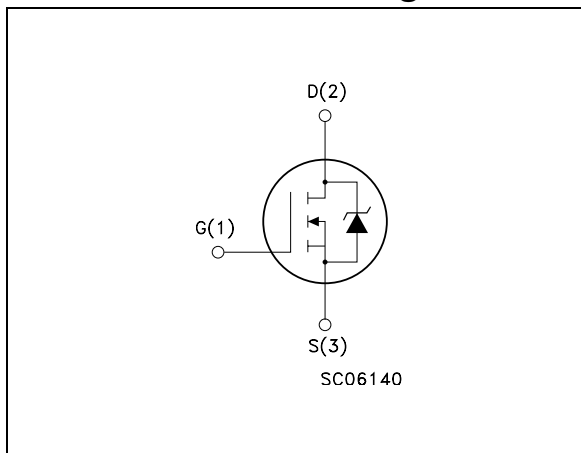
- Switching application



## Order codes

Part number	Marking	Package	Packaging
STD7NM80	D7NM60N	DPAK	Tape & reel
STD7NM80-1	D7NM60N	IPAK	Tube
STF7NM80	F7NM60N	TO-220FP	Tube
STP7NM80	P7NM80	TO-220	Tube

## Internal schematic diagram



## Contents

1	<b>Electrical ratings</b> .....	3
2	<b>Electrical characteristics</b> .....	4
3	<b>Test circuit</b> .....	6
4	<b>Package mechanical data</b> .....	7
5	<b>Packaging mechanical data</b> .....	12
6	<b>Revision history</b> .....	13

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		TO-220 / IPAK DPAK	TO-220FP	
V <sub>DS</sub>	Drain-source voltage (V <sub>GS</sub> =0)	800		V
V <sub>DGR</sub>	Drain-gate voltage (R <sub>GS</sub> =20kΩ)	800		V
V <sub>GS</sub>	Gate-source voltage	± 30		V
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25°C	6.5	6.5 <sup>(1)</sup>	A
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 100°C	4	4 <sup>(1)</sup>	A
I <sub>DM</sub> <sup>(2)</sup>	Drain current (pulsed)	26	26 <sup>(1)</sup>	A
P <sub>TOT</sub>	Total dissipation at T <sub>C</sub> = 25°C	90	25	W
dv/dt <sup>(3)</sup>	Peak diode recovery voltage slope	Tbd		V/ns
V <sub>ISO</sub>	Insulation withstand voltage (RMS) from all three leads to external heat sink (t=1s; T <sub>C</sub> =25°C)	--	2500	V
T <sub>j</sub> T <sub>stg</sub>	Operating junction temperature Storage temperature	-55 to 150		°C

1. Limited only by maximum temperature allowed
2. Pulse width limited by safe operating area
3. I<sub>SD</sub> ≤ 6.5A, di/dt ≤ 400A/μs, V<sub>DD</sub> = 80% V<sub>(BR)DSS</sub>

**Table 2. Thermal data**

Symbol	Parameter	TO-220	IPAK / DPAK	TO-220FP	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case max	1.38		5	°C/W
R <sub>thj-amb</sub>	Thermal resistance junction-amb max	62.5	100	62.5	°C/W
T <sub>l</sub>	Maximum lead temperature for soldering purpose	300			°C

**Table 3. Avalanche characteristics**

Symbol	Parameter	Max Value	Unit
I <sub>AS</sub>	Avalanche current, repetitive or not-repetitive (pulse width limited by T <sub>j</sub> max)	Tbd	A
E <sub>AS</sub>	Single pulse avalanche energy (starting T <sub>j</sub> =25°C, I <sub>D</sub> =I <sub>AS</sub> , V <sub>DD</sub> = 50V)	Tbd	mJ

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1mA, V_{GS} = 0$	800			V
$dv/dt^{(1)}$	Drain-source voltage slope	$V_{DD}=tbdV, I_D=tbdA, V_{GS}=10V$	Tbd			V/ns
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating}, V_{DS} = \text{Max rating}, T_c = 125^{\circ}C$			Tbd Tbd	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 30V$			Tbd	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	3	4	5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 3.5A$		0.85	0.95	$\Omega$

1. Characteristics value at turn off on inductive load

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15V, I_D = 3.25A$		Tbd		S
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25V, f = 1MHz, V_{GS} = 0$		Tbd Tbd Tbd		pF pF pF
Rg	Gate input resistance	f=1MHz Gate DC Bias=0 Test signal level=20mV Open drain		Tbd		$\Omega$
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 640V, I_D = 6.5A$ $V_{GS} = 10V$ (see Figure 2)		Tbd Tbd Tbd		nC nC nC

1. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 400V, I_D = 3.25A,$ $R_G=4.7\Omega, V_{GS}=10V$ <i>(see Figure 1)</i>		Tbd		ns
$t_r$	Rise time			Tbd		ns
$t_{d(off)}$	Turn-off delay time			Tbd		ns
$t_f$	Fall time			Tbd		ns

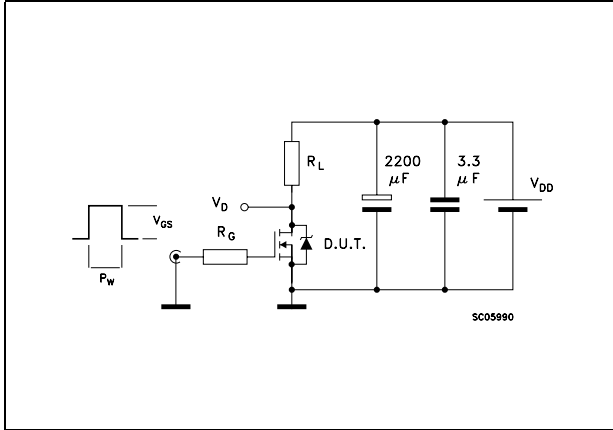
**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current				6.5	A
$I_{SDM}$	Source-drain current (pulsed)				26	A
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 6.5A, V_{GS}=0$			Tbd	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 6.5A, V_{DD}= 50V$ $di/dt=100A/\mu s, T_j=25^\circ C$ <i>(see Figure 6)</i>		Tbd		ns
$Q_{rr}$	Reverse recovery charge			Tbd		$\mu C$
$I_{RRM}$	Reverse recovery current			Tbd		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 6.5A, V_{DD}= 50V$ $di/dt=100A/\mu s, T_j=150^\circ C$ <i>(see Figure 6)</i>		Tbd		ns
$Q_{rr}$	Reverse recovery charge			Tbd		$\mu C$
$I_{RRM}$	Reverse recovery current			Tbd		A

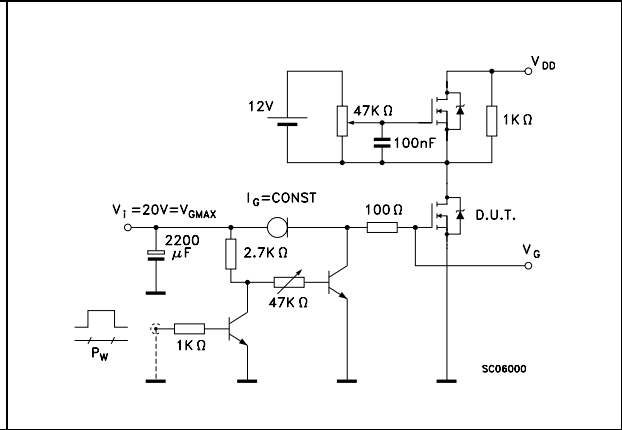
1. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

### 3 Test circuit

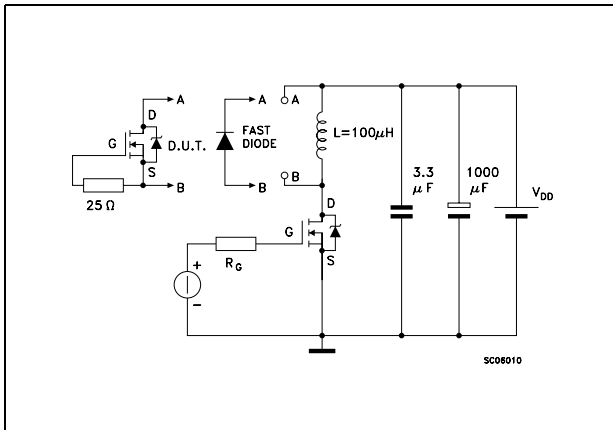
**Figure 1. Switching times test circuit for resistive load**



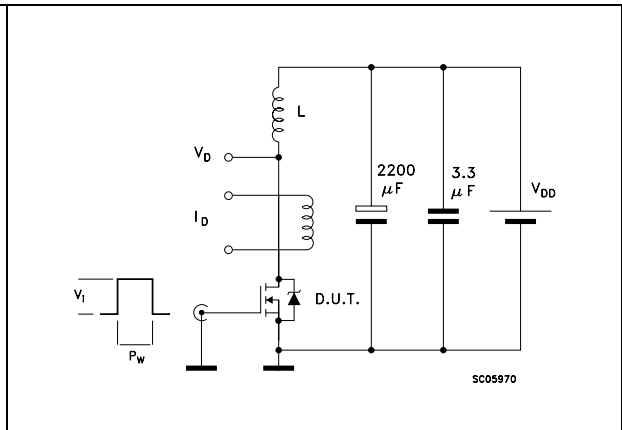
**Figure 2. Gate charge test circuit**



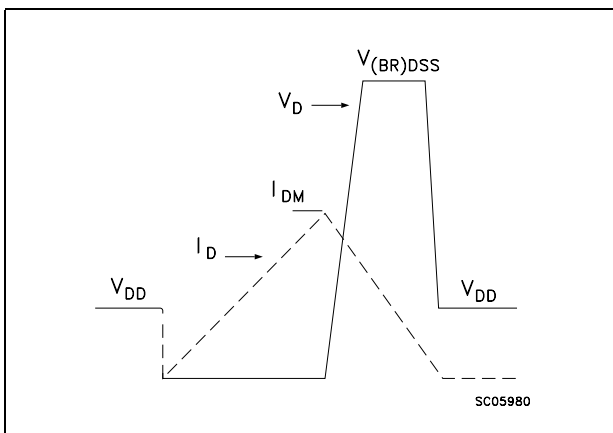
**Figure 3. Test circuit for inductive load switching and diode recovery times**



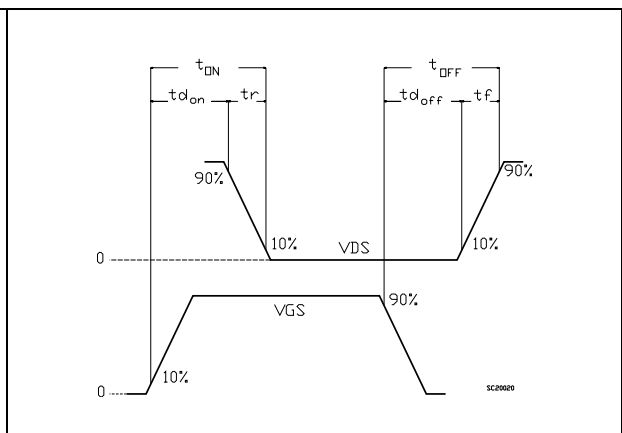
**Figure 4. Unclamped inductive load test circuit**



**Figure 5. Unclamped inductive waveform**



**Figure 6. Switching time waveform**

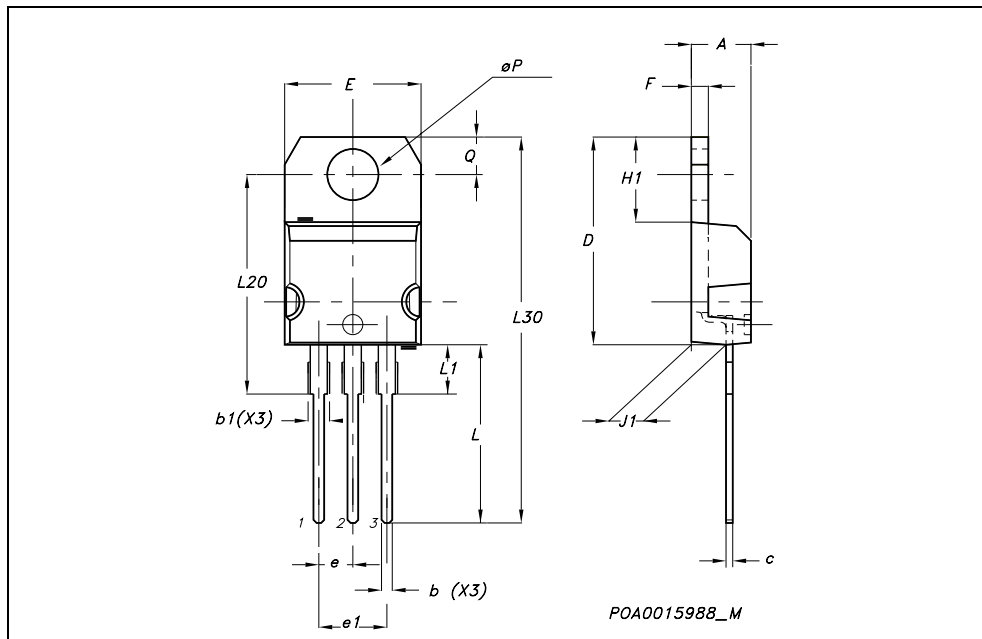


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at : [www.st.com](http://www.st.com)

**TO-220 MECHANICAL DATA**

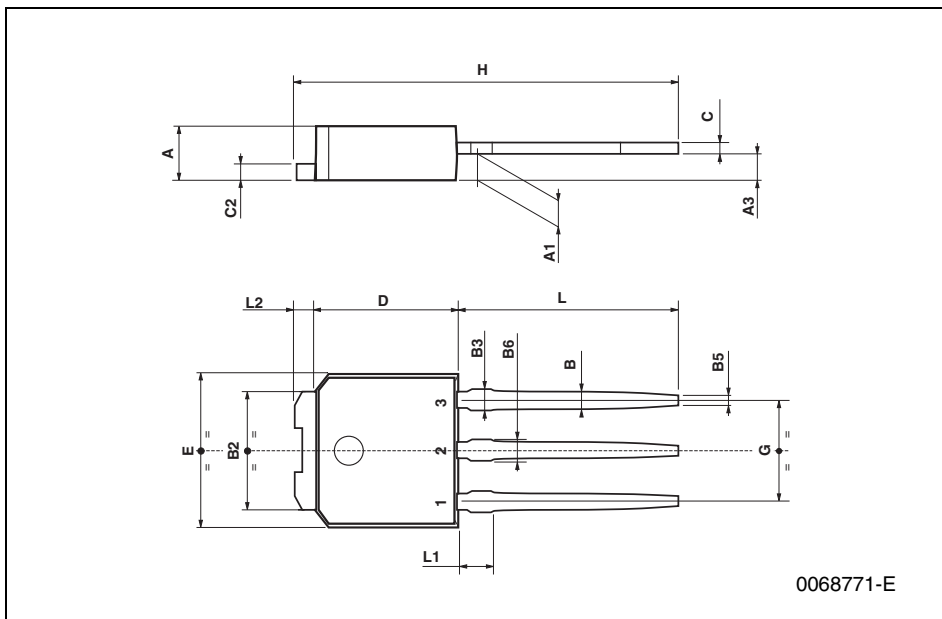
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		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	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116





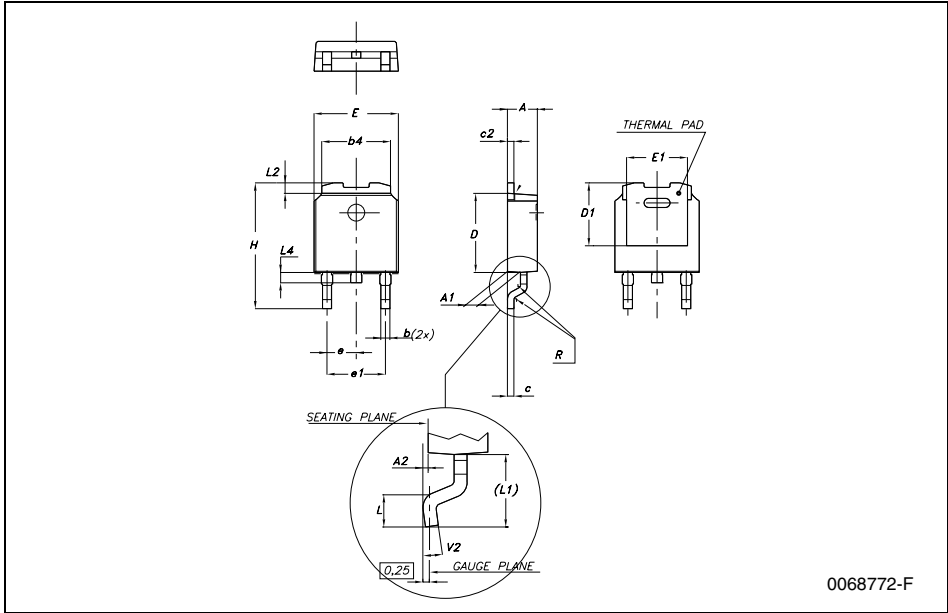
**TO-251 (IPAK) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



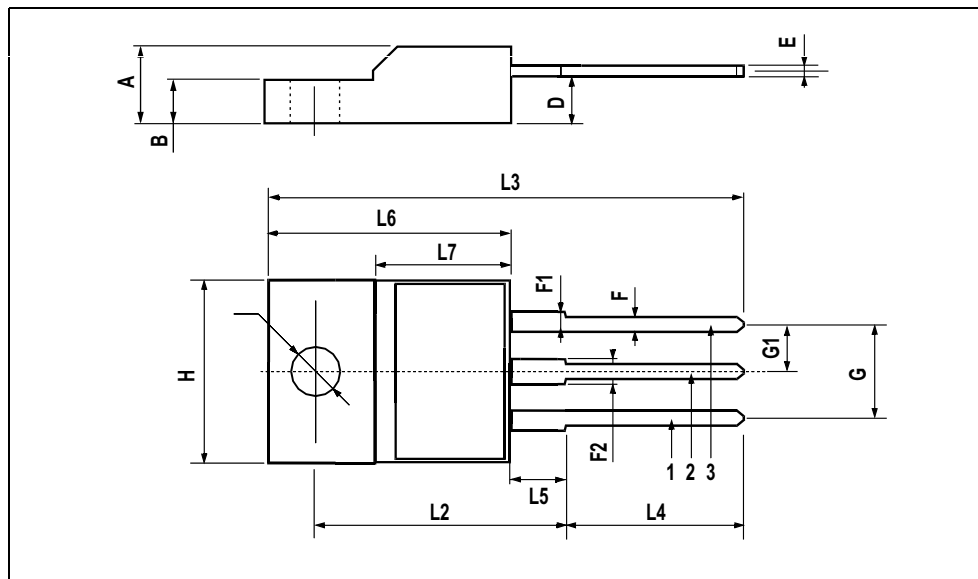
**DPAK MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°



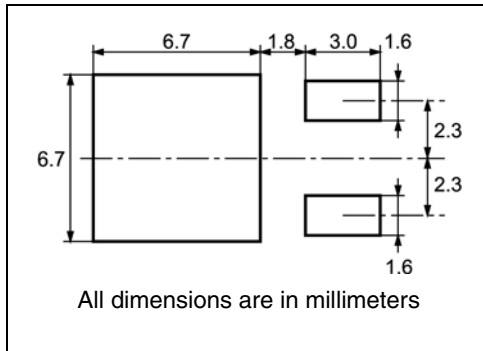
**TO-220FP MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



# 5 Packaging mechanical data

## DPAK FOOTPRINT



## TAPE AND REEL SHIPMENT

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

G measured at hub

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	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

TOP COVER TAPE

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

Bending radius R min.

FEED DIRECTION

## 6 Revision history

**Table 8. Revision history**

Date	Revision	Changes
22-Sep-2006	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.

© 2006 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 - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)