

## Excellent Integrated System Limited

Stocking Distributor

Click to view price, real time Inventory, Delivery & Lifecycle Information:

[STMicroelectronics](#)  
[STP3N62K3](#)

For any questions, you can email us directly:

[sales@integrated-circuit.com](mailto:sales@integrated-circuit.com)



# STB3N62K3, STD3N62K3, STF3N62K3 STP3N62K3, STU3N62K3

N-channel 620 V, 2.2 Ω, 2.7 A SuperMESH3™ Power MOSFET  
D<sup>2</sup>PAK, DPAK, TO-220FP, TO-220, IPAK

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>	P <sub>D</sub>
STB3N62K3	620 V	< 2.5 Ω	2.7 A	45 W
STD3N62K3	620 V	< 2.5 Ω	2.7 A	45 W
STF3N62K3	620 V	< 2.5 Ω	2.7 A <sup>(1)</sup>	20 W
STP3N62K3	620 V	< 2.5 Ω	2.7 A	45 W
STU3N62K3	620 V	< 2.5 Ω	2.7 A	45 W

1. Limited by package

- 100% avalanche tested
- Extremely high dv/dt capability
- Very low intrinsic capacitances
- Improved diode reverse recovery characteristics
- Zener-protected

## Application

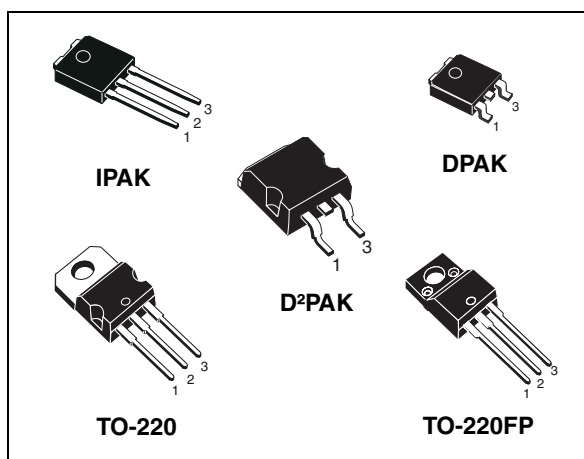
- Switching applications

## Description

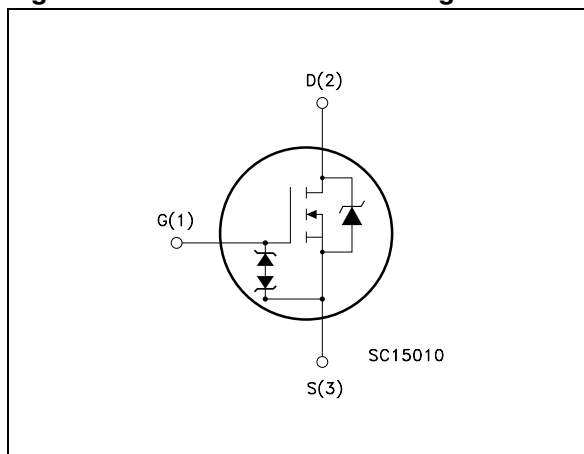
The new SuperMESH3™ series is obtained through the combination of a further fine tuning of ST's well established strip-based PowerMESH™ layout with a new optimization of the vertical structure. In addition to reducing on-resistance significantly versus previous generation, special attention has been taken to ensure a very good dv/dt capability and higher margin in breakdown voltage for the most demanding application.

**Table 1. Device summary**

Order codes	Marking	Package	Packaging
STB3N62K3	3N62K3	D <sup>2</sup> PAK	Tape and reel
STD3N62K3	3N62K3	DPAK	Tape and reel
STF3N62K3	3N62K3	TO-220FP	Tube
STP3N62K3	3N62K3	TO-220	Tube
STU3N62K3	3N62K3	IPAK	Tube



**Figure 1. Internal schematic diagram**



## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>5</b>
2.1	Electrical characteristics (curves) .....	7
<b>3</b>	<b>Test circuits</b> .....	<b>10</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>11</b>
<b>5</b>	<b>Package mechanical data</b> .....	<b>17</b>
<b>6</b>	<b>Revision history</b> .....	<b>19</b>

**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**
**Electrical ratings**

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value			Unit
		TO-220 D <sup>2</sup> PAK	DPAK IPAK	TO-220FP	
V <sub>DS</sub>	Drain-source voltage (V <sub>GS</sub> = 0)	620			V
V <sub>GS</sub>	Gate- source voltage	± 30			V
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25 °C	2.7		2.7 <sup>(1)</sup>	A
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 100 °C	1.7		1.7 <sup>(1)</sup>	A
I <sub>DM</sub> <sup>(2)</sup>	Drain current (pulsed)	10.8		10.8 <sup>(1)</sup>	A
P <sub>TOT</sub>	Total dissipation at T <sub>C</sub> = 25 °C	45		20	W
	Derating factor	0.36		0.16	W/°C
V <sub>ESD(G-S)</sub>	Gate source ESD (HBM-C = 100 pF, R = 1.5 kΩ)	2500			V
dv/dt <sup>(3)</sup>	Peak diode recovery voltage slope	9			V/ns
V <sub>ISO</sub>	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; T <sub>C</sub> = 25 °C)	--		2500	V
T <sub>stg</sub>	Storage temperature	-55 to 150			°C
T <sub>j</sub>	Max. operating junction temperature	150			°C

1. Limited by package

2. Pulse width limited by safe operating area

 3. I<sub>SD</sub> ≤ 2.7 A, di/dt ≤ 200 A/μs, V<sub>DD</sub> = 80% V<sub>(BR)DSS</sub>
**Table 3. Thermal data**

Symbol	Parameter	TO-220	D <sup>2</sup> PAK	DPAK	IPAK	TO-220FP	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case max	2.78				6.25	°C/W
R <sub>thj-pcb</sub>	Thermal resistance junction-pcb max	--	50		--	--	°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

**Electrical ratings**

**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

**Table 4. Avalanche characteristics**

Symbol	Parameter	Max value	Unit
$I_{AR}$	Avalanche current, repetitive or not-repetitive (pulse width limited by $T_j$ max)	2.7	A
$E_{AS}$	Single pulse avalanche energy (starting $T_j = 25\text{ }^\circ\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 50\text{ V}$ )	100	mJ

**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**
**Electrical characteristics**

## 2 Electrical characteristics

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

**Table 5. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$ , $V_{GS} = 0$	620			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}$ , $T_C = 125\text{ °C}$			1 50	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 10$	$\mu\text{A}$
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 50\text{ }\mu\text{A}$	3	3.75	4.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$ , $I_D = 1.4\text{ A}$		2.2	2.5	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs(1)}$	Forward transconductance	$V_{DS} = 15\text{ V}$ , $I_D = 1.4\text{ A}$	-	2.1	-	S
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	385 55 6	-	pF pF pF
$C_{OSS\ eq}^{(1)}$	Equivalent output capacitance	$V_{GS} = 0$ , $V_{DS} = 0\text{ to }496\text{ V}$	-	32.3	-	pF
$R_G$	Intrinsic gate resistance	$f = 1\text{ MHz}$ open drain	-	10	-	$\Omega$
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 496\text{ V}$ , $I_D = 2.7\text{ A}$ , $V_{GS} = 10\text{ V}$ (see <a href="#">Figure 17</a> )	-	13 2.5 7.5	-	nC nC nC

1.  $C_{OSS\ eq}$  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 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$	Turn-on delay time Rise time Turn-off-delay time Fall time	$V_{DD} = 310\text{ V}$ , $I_D = 1.7\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 10\text{ V}$ (see <a href="#">Figure 16</a> )	-	9 6.8 22 15.6	-	ns ns ns ns

**Electrical characteristics      STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**
**Table 8. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		2.7	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		10.8	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 2.7 \text{ A}, V_{GS} = 0$	-		1.6	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 2.7 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 60 \text{ V}$ (see <a href="#">Figure 21</a> )	-	190		ns
$Q_{rr}$	Reverse recovery charge			825		nC
$I_{RRM}$	Reverse recovery current			9		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 2.7 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 60 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$ (see <a href="#">Figure 21</a> )	-	255		ns
$Q_{rr}$	Reverse recovery charge			1100		nC
$I_{RRM}$	Reverse recovery current			10		A

1. Pulse width limited by safe operating area

2. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

**Table 9. Gate-source Zener diode**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$BV_{GSO}^{(1)}$	Gate-source breakdown voltage	$I_{gs} = \pm 1 \text{ mA}$ (open drain)	30			V

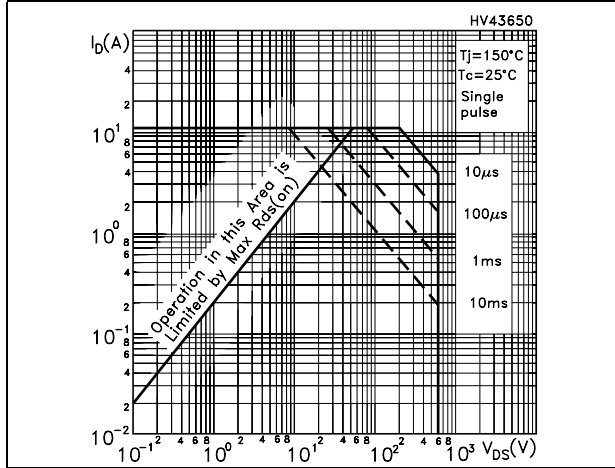
1. The built-in back-to-back Zener diodes have specifically been designed to enhance not only the device's ESD capability, but also to make them safely absorb possible voltage transients that may occasionally be applied from gate to source. In this respect the Zener voltage is appropriate to achieve an efficient and cost-effective intervention to protect the device's integrity. These integrated Zener diodes thus avoid the usage of external components

**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

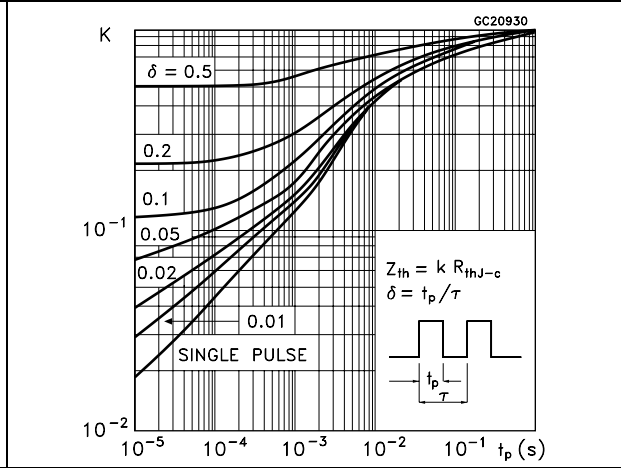
**Electrical characteristics**

**2.1 Electrical characteristics (curves)**

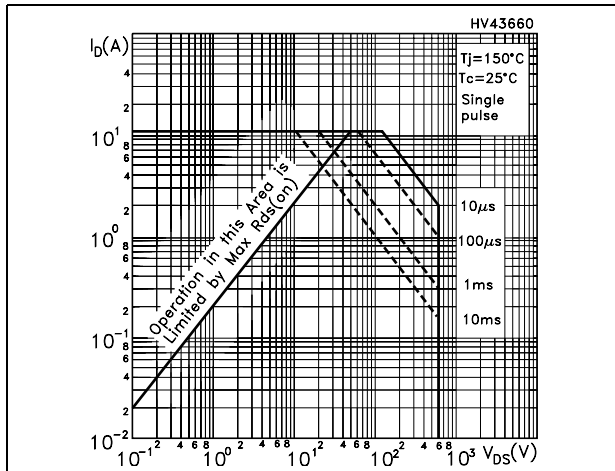
**Figure 2. Safe operating area for TO-220, IPAK, DPAK, D<sup>2</sup>PAK**



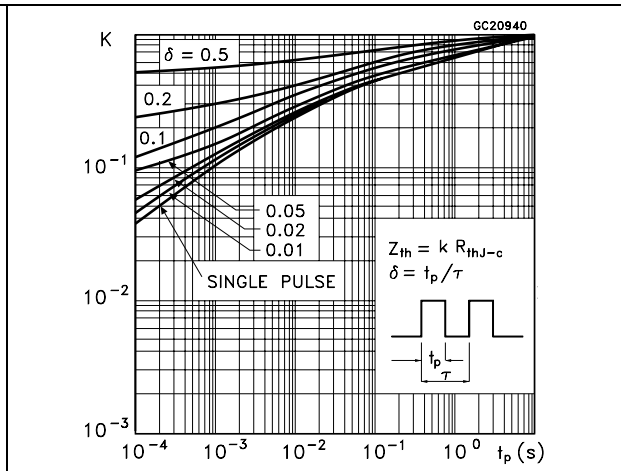
**Figure 3. Thermal impedance for TO-220, IPAK, DPAK, D<sup>2</sup>PAK**



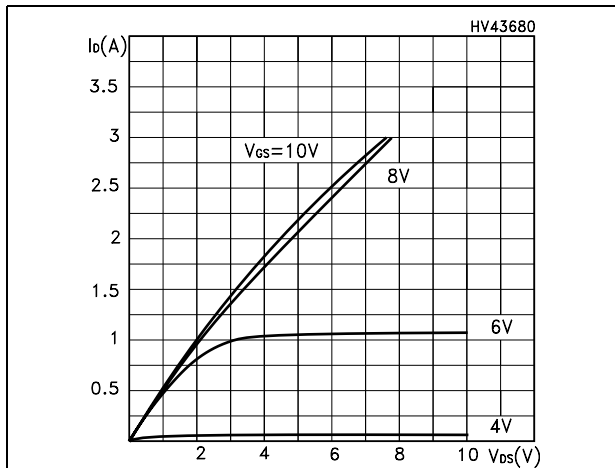
**Figure 4. Safe operating area for TO-220FP**



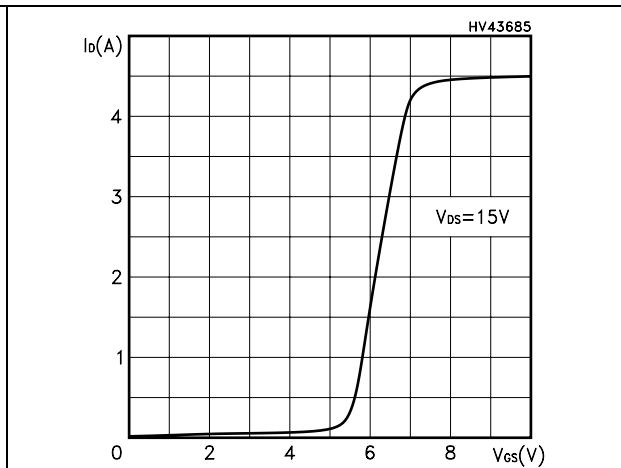
**Figure 5. Thermal impedance for TO-220FP**



**Figure 6. Output characteristics**



**Figure 7. Transfer characteristics**

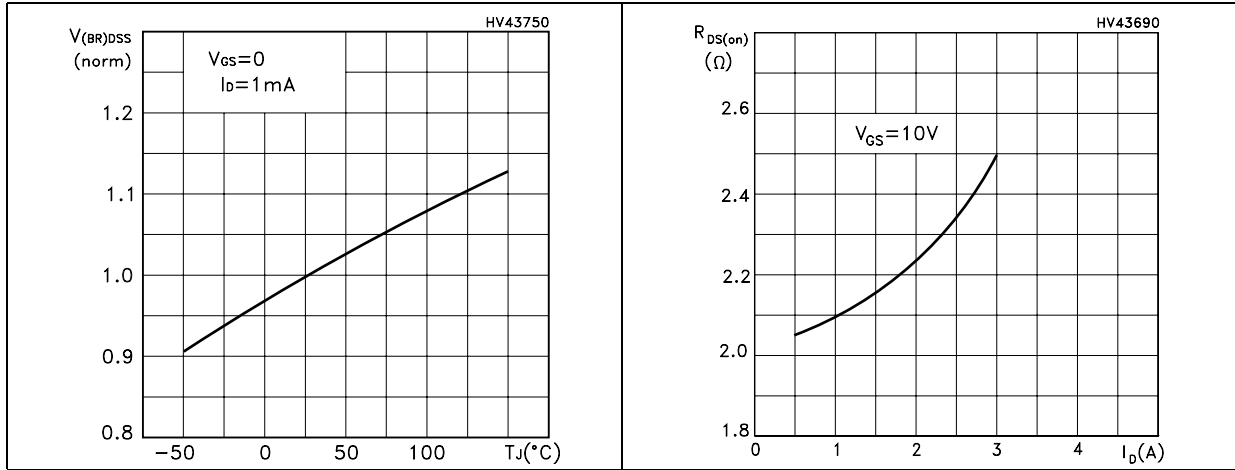




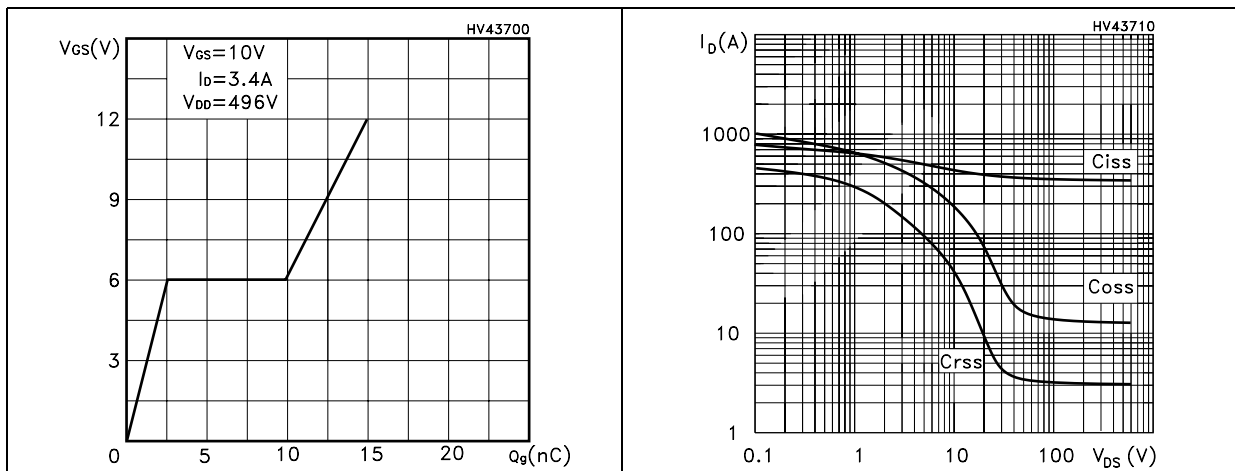
**Electrical characteristics**

**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

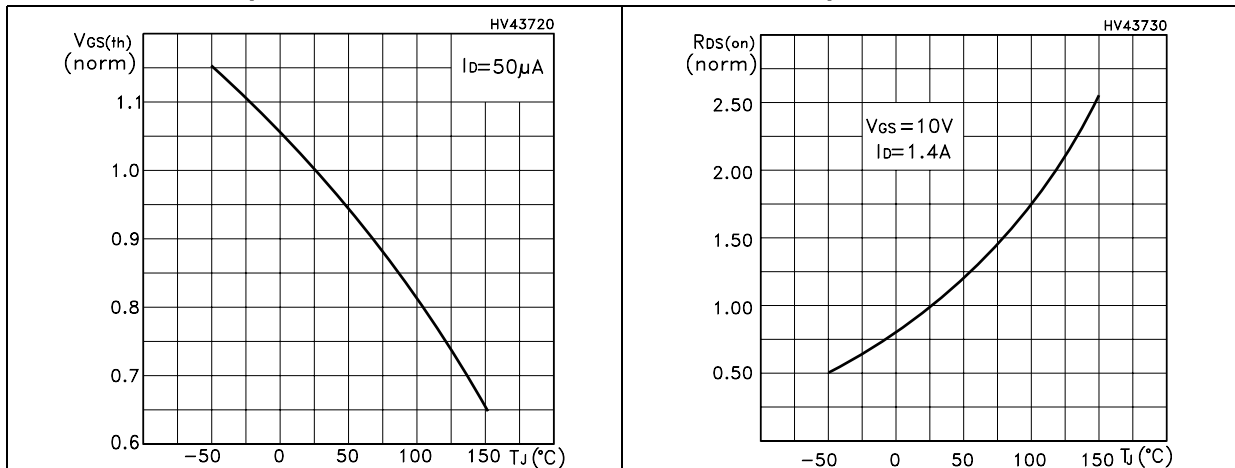
**Figure 8. Normalized  $BV_{DSS}$  vs temperature**      **Figure 9. Static drain-source on resistance**



**Figure 10. Gate charge vs gate-source voltage**      **Figure 11. Capacitance variations**



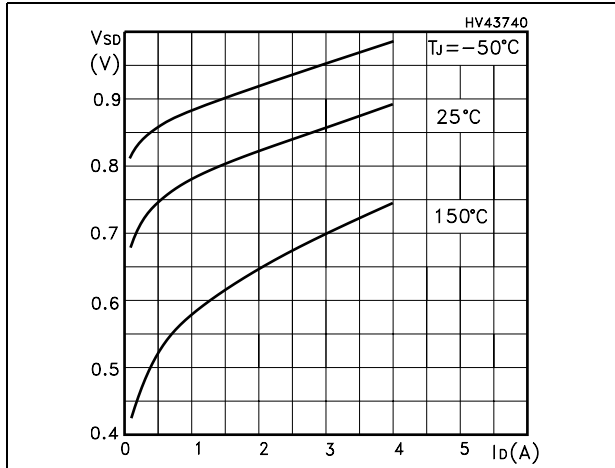
**Figure 12. Normalized gate threshold voltage vs temperature**      **Figure 13. Normalized on resistance vs temperature**



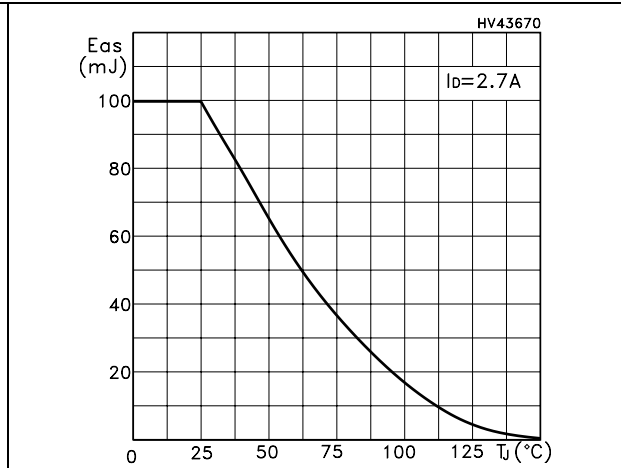
**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

**Electrical characteristics**

**Figure 14. Source-drain diode forward characteristics**



**Figure 15. Maximum avalanche energy vs temperature**

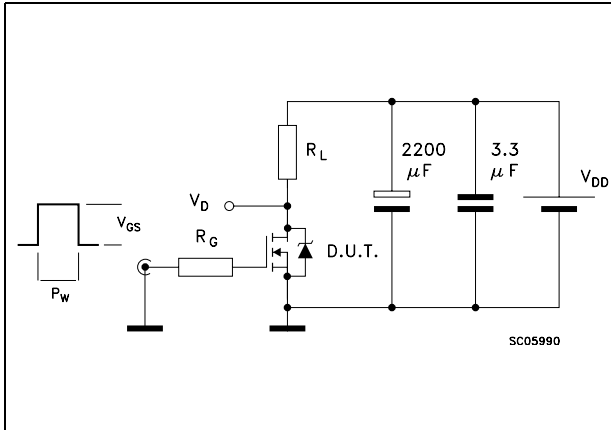


**Test circuits**

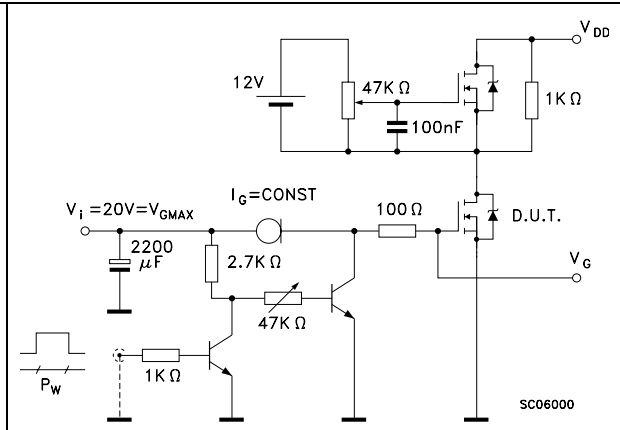
**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

**3 Test circuits**

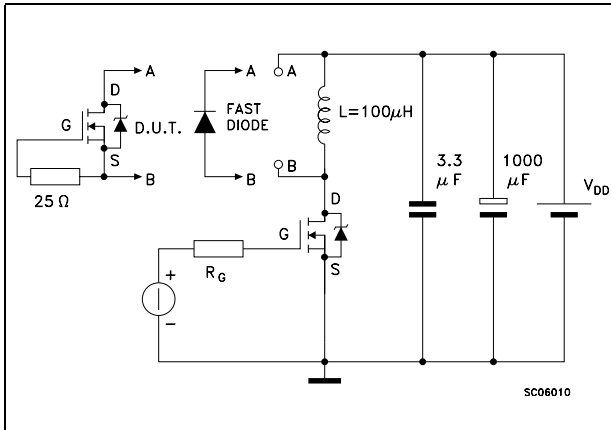
**Figure 16. Switching times test circuit for resistive load**



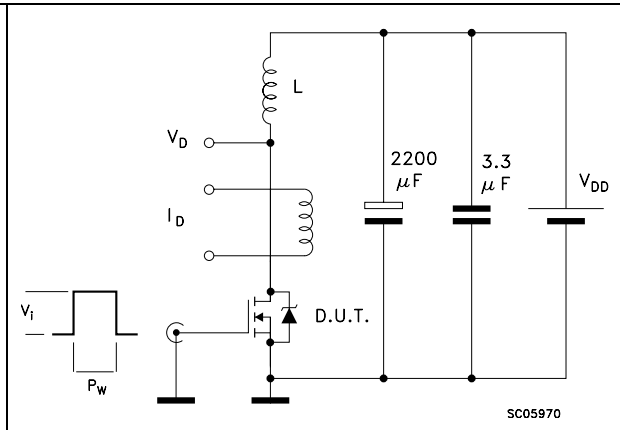
**Figure 17. Gate charge test circuit**



**Figure 18. Test circuit for inductive load switching and diode recovery times**

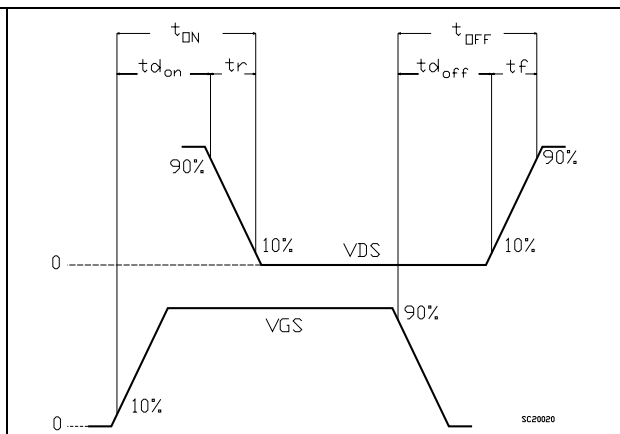
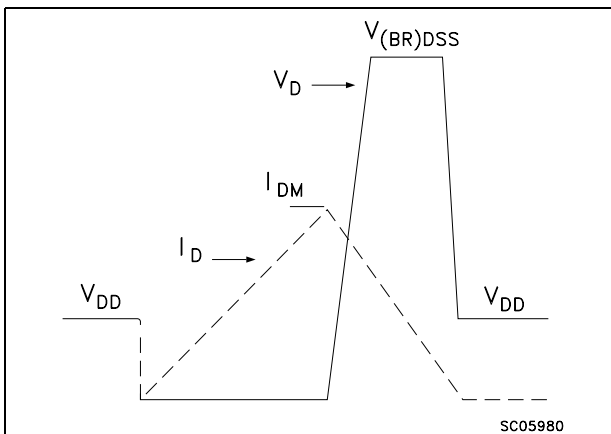


**Figure 19. Unclamped Inductive load test circuit**



**Figure 20. Unclamped inductive waveform**

**Figure 21. Switching time waveform**



## **4 Package mechanical data**

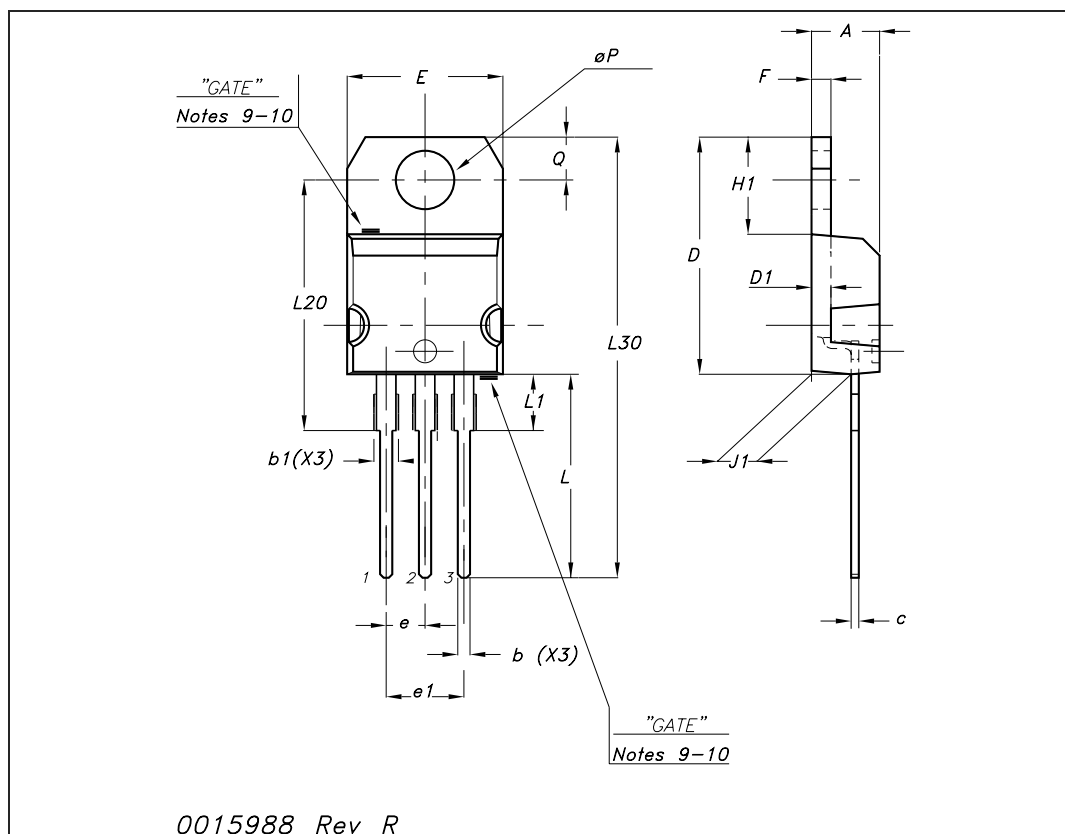
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

Package mechanical data

STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3

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

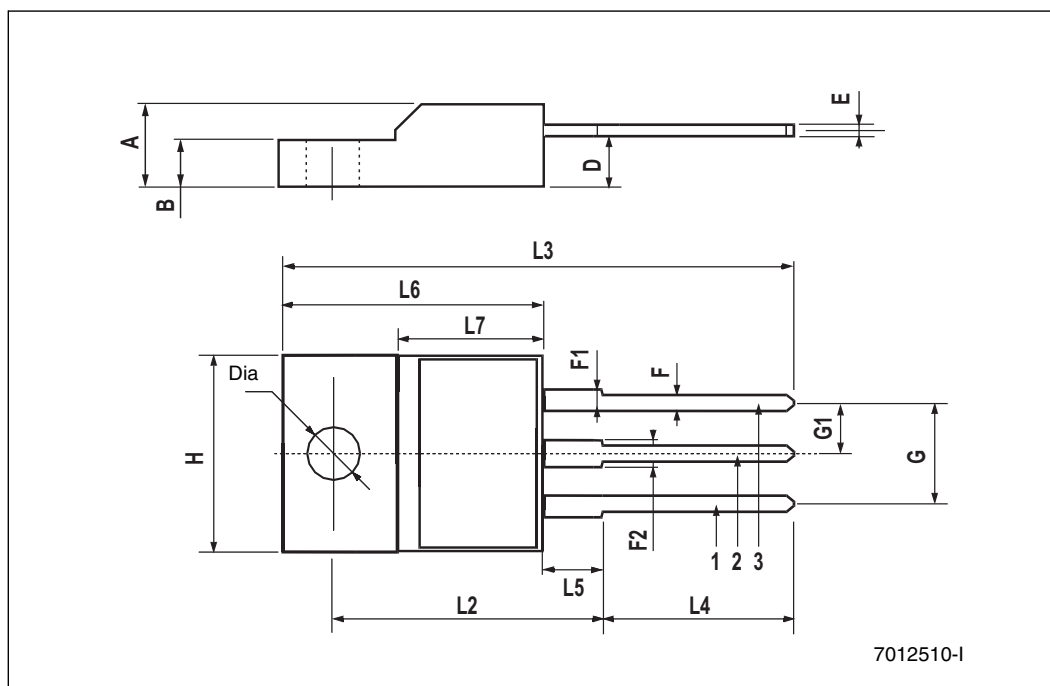


**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

**Package mechanical data**

**TO-220FP mechanical data**

Dim.	mm.			inch		
	Min.	Typ	Max.	Min.	Typ.	Max.
A	4.40		4.60	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		0.70	0.017		0.027
F	0.75		1.00	0.030		0.039
F1	1.15		1.50	0.045		0.067
F2	1.15		1.50	0.045		0.067
G	4.95		5.20	0.195		0.204
G1	2.40		2.70	0.094		0.106
H	10		10.40	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.80		10.60	0.385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.90		16.40	0.626		0.645
L7	9		9.30	0.354		0.366
Dia	3		3.2	0.118		0.126

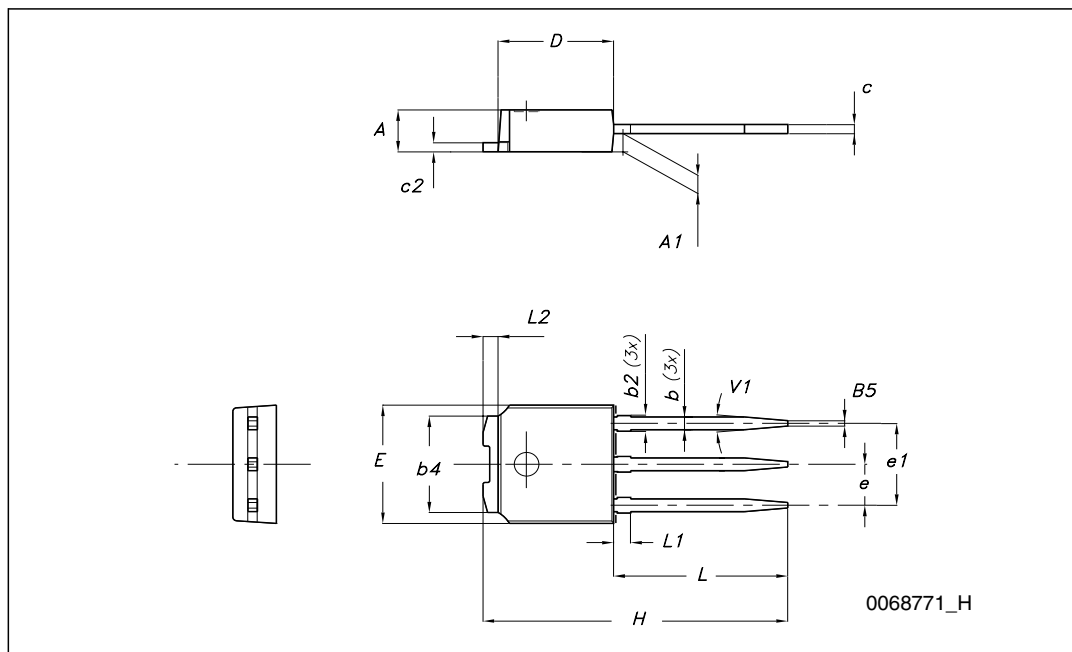


Package mechanical data

STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3

TO-251 (IPAK) mechanical data

DIM.	mm.		
	min.	typ	max.
A	2.20		2.40
A1	0.90		1.10
b	0.64		0.90
b2			0.95
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
E	6.40		6.60
e		2.28	
e1	4.40		4.60
H		16.10	
L	9.00		9.40
(L1)	0.80		1.20
L2		0.80	
V1		10°	

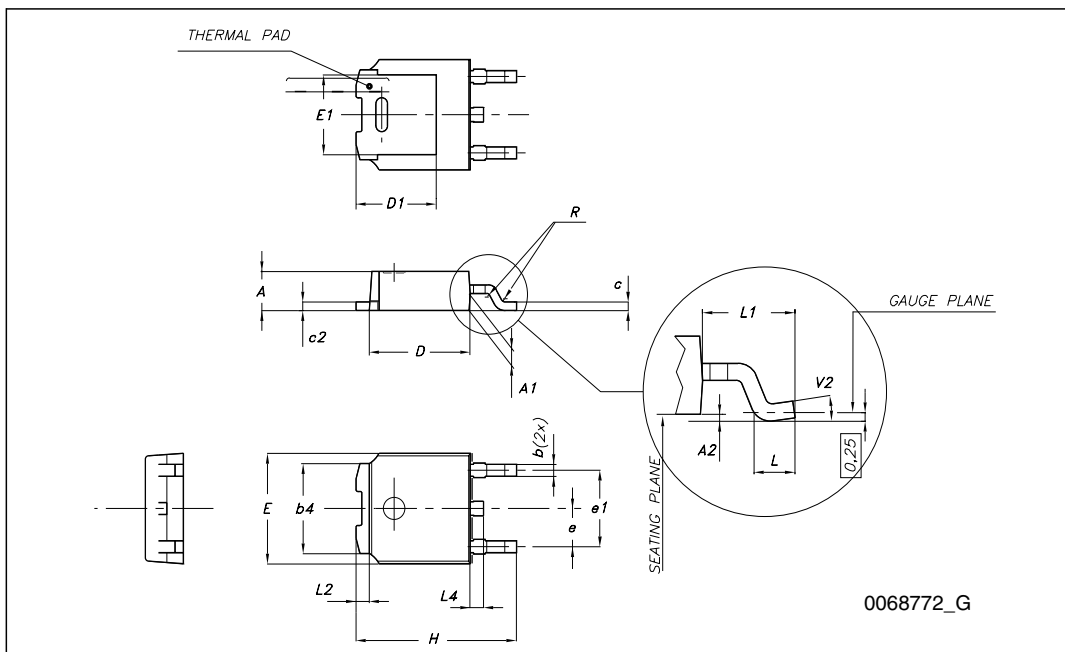


**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

**Package mechanical data**

**TO-252 (DPAK) mechanical data**

DIM.	mm.		
	min.	typ	max.
A	2.20		2.40
A1	0.90		1.10
A2	0.03		0.23
b	0.64		0.90
b4	5.20		5.40
c	0.45		0.60
c2	0.48		0.60
D	6.00		6.20
D1		5.10	
E	6.40		6.60
E1		4.70	
e		2.28	
e1	4.40		4.60
H	9.35		10.10
L	1		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°



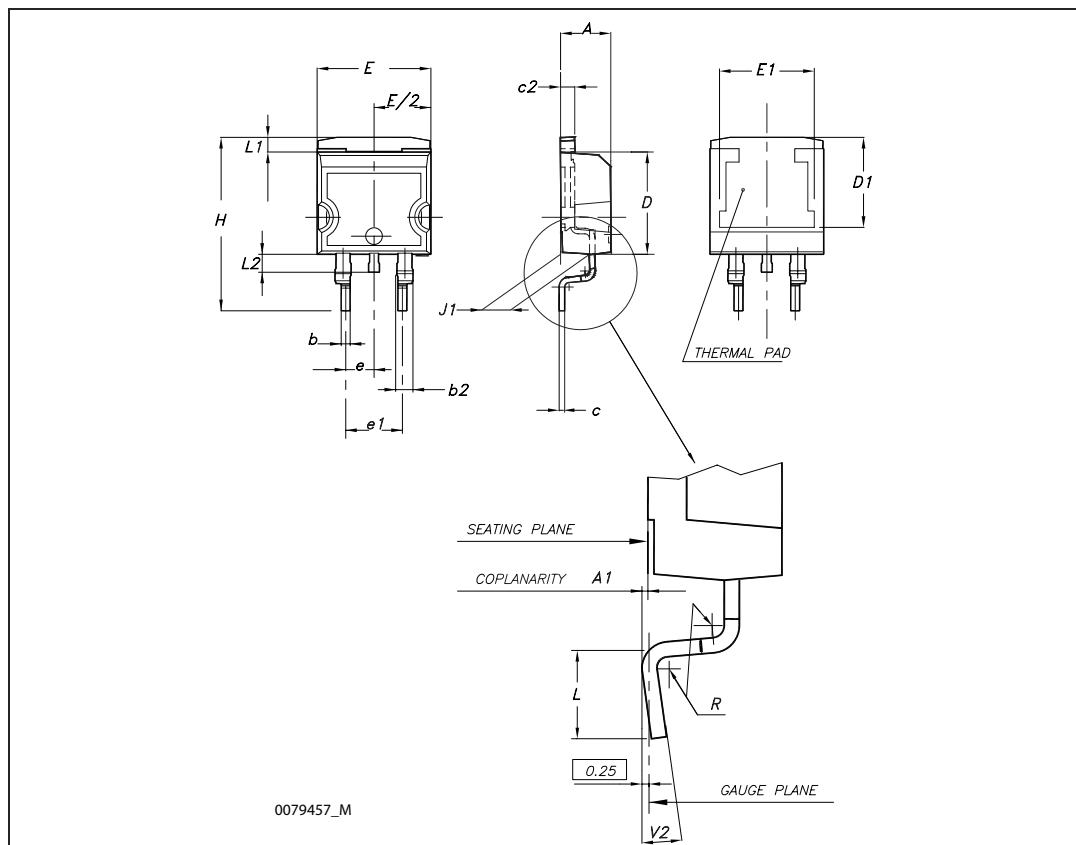


Package mechanical data

STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3

D<sup>2</sup>PAK (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°

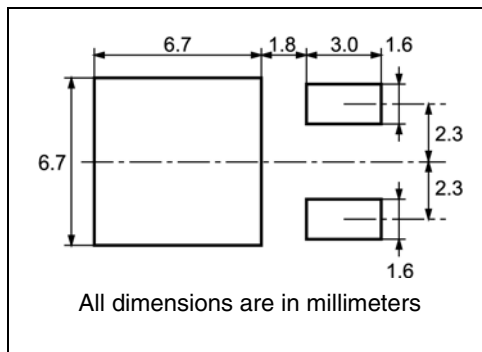


STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3

Package mechanical data

## 5 Package 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

#### 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	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

#### TAPE MECHANICAL DATA

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

User Direction of Feed

Center line of cavity

Bending radius R min.

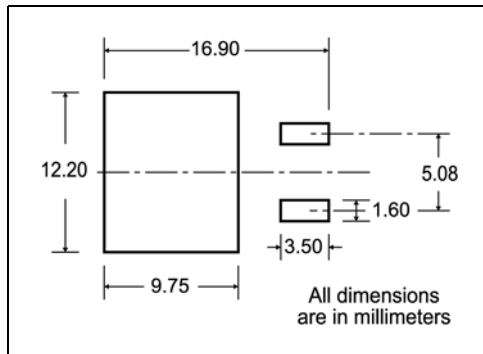
TRL

FEED DIRECTION

Package mechanical data

STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3

D<sup>2</sup>PAK 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

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

TOP COVER TAPE

Center line of cavity

User Direction of Feed

FEED DIRECTION

Bending radius R min.

10 pitches cumulative tolerance on tape +/- 0.2 mm

\* on sales type

## 6 Revision history

Table 10. Document revision history

Date	Revision	Changes
10-Jul-2008	1	First release
17-Aug-2009	2	Modified: marking of the <a href="#">Table 1</a>

---

**STB3N62K3, STD3N62K3, STF3N62K3, STP3N62K3, STU3N62K3**

---

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