



# STGF100N30 STGP100N30, STGW100N30

90 A - 330 V - fast IGBT

## Features

- Optimized for sustain and energy recovery circuits in PDP applications.
- State-of-the-art STripFET™ technology
- Peak collector current  $I_{RP} = 330\text{ A}$  @  $T_C = 25\text{ °C}$  (see [Table 2](#))
- Very low-on voltage drop ( $V_{CE(sat)}$ ) and energy per pulse for improved panel efficiency
- High repetitive peak current capability

## Description

Advanced high-density and high-current IGBT technology with low-drop companion diode adapted to various functions in PDP sets.

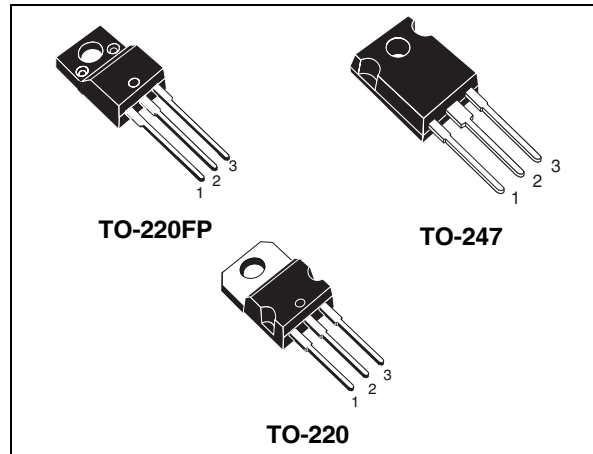


Figure 1. Internal schematic diagram

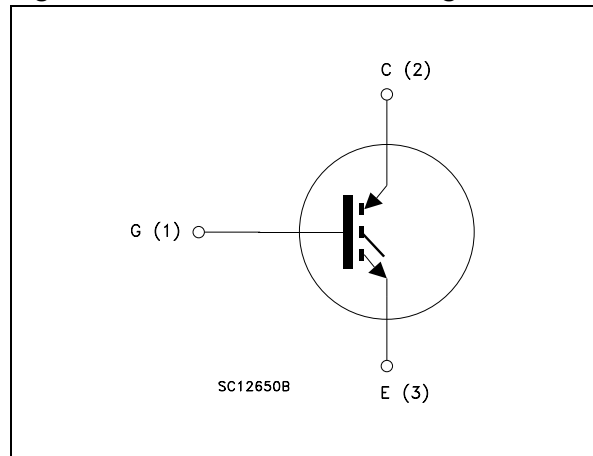


Table 1. Device summary

Order codes	Marking	Package	Packaging
STGF100N30	GF100N30	TO-220FP	Tube
STGP100N30	GP100N30	TO-220	Tube
STGW100N30	GW100N30	TO-247	Tube

# Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
	2.1 Electrical characteristics (curves) .....	5
<b>3</b>	<b>Test circuits</b> .....	<b>7</b>
<b>4</b>	<b>Package mechanical data</b> .....	<b>8</b>
<b>5</b>	<b>Revision history</b> .....	<b>12</b>

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value			Unit
		TO-220	TO-247	TO-220FP	
V <sub>CES</sub>	Collector-emitter voltage (V <sub>GE</sub> = 0)	330			V
I <sub>C</sub> <sup>(1)</sup>	Collector current (continuous) at T <sub>C</sub> = 25 °C	90		20	A
I <sub>C</sub> <sup>(1)</sup>	Collector current (continuous) at T <sub>C</sub> = 100 °C	45		10	A
I <sub>CL</sub> <sup>(2)</sup>	Turn-off latching current	330			A
I <sub>RP</sub>	Repetitive peak current at T <sub>C</sub> = 25 °C	330 <sup>(3)</sup>			A
V <sub>GE</sub>	Gate-emitter voltage (continuous)	±20			V
ESD (HBM)	Electrostatic sensitive discharge, human body model applied to all three pins (C = 100 pF, R = 1.5 kΩ)	3			KV
ESD (MM)	Electrostatic sensitive discharge, machine model applied to all three pins (C = 200 pF, R = 0)	300			V
P <sub>TOT</sub>	Total dissipation at T <sub>C</sub> = 25 °C	250		40	W
T <sub>j</sub>	Operating junction temperature	- 55 to 150			°C

1. Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{j(max)} - T_C}{R_{thj-c} \times V_{CE(sat)(max)}(T_{j(max)}, I_C(T_C))}$$

2. V<sub>clamp</sub> = 300 V, T<sub>j</sub> = 150 °C, R<sub>G</sub> = 10 Ω, V<sub>GE</sub> = 15 V

3. Half sine wave with duty cycle = 1%, t<sub>on</sub> > 1 μs

**Table 3. Thermal resistance**

Symbol	Parameter	Value			Unit
		TO-220	TO-247	TO-220FP	
R <sub>thj-case</sub>	Thermal resistance junction-case max	0.5		3.2	°C/W
R <sub>thj-amb</sub>	Thermal resistance junction-ambient max	62.5	50	62.5	°C/W

## 2 Electrical characteristics

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

**Table 4. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage ( $V_{GE} = 0$ )	$I_C = 1\text{ mA}$	330			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{ V}$ , $I_C = 50\text{ A}$ $V_{GE} = 15\text{ V}$ , $I_C = 100\text{ A}$ , $T_C = 125\text{ °C}$		1.9 2.6	2.5	V V
$V_{GE(th)}$	Gate threshold voltage	$V_{CE} = 10\text{ V}$ , $I_C = 1\text{ mA}$	3.0		5.5	V
$I_{CES}$	Collector cut-off current ( $V_{GE} = 0$ )	$V_{CE} = 330\text{ V}$ $V_{CE} = 330\text{ V}$ , $T_C = 125\text{ °C}$		1	3 200	$\mu\text{A}$ $\mu\text{A}$
$I_{GES}$	Gate-emitter leakage current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20\text{ V}$			$\pm 1$	$\mu\text{A}$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$R_{ies}$	Input resistance			2		$\Omega$
$C_{ies}$	Input capacitance	$V_{CE} = 25\text{ V}$ , $f = 1\text{ MHz}$ ,		3550		pF
$C_{oes}$	Output capacitance	$V_{GE} = 0$		35		pF
$C_{res}$	Reverse transfer capacitance			335		pF

**Table 6. Switching on/off (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{rise}$	Turn-off voltage rise time	$V_{GE} = 15\text{ V}$ , $I_C = 25\text{ A}$ ,		25		ns
$t_{doff}$	Turn-off delay time	$V_{CC} = 180\text{ V}$		134		ns
$t_{fall}$	Turn-off current fall time	$R_G = 10\ \Omega$ , $L = 25\ \mu\text{H}$ ,		57		ns
$t_{rise}$	Turn-off voltage rise time	$V_{GE} = 15\text{ V}$ , $I_C = 25\text{ A}$ ,		60		ns
$t_{doff}$	Turn-off delay time	$V_{CC} = 180\text{ V}$		200		ns
$t_{fall}$	Turn-off current fall time	$R_G = 10\ \Omega$ , $L = 25\ \mu\text{H}$ , $T_C = 150\text{ °C}$		110		ns
E/p	Energy per pulse	$V_{CC} = 240\text{ V}$ , $V_{GE} = 15\text{ V}$ , $R_G = 5.1\ \Omega$ , $L = 250\text{ nH}$ $C = 0.40\ \mu\text{F}$ (see Figure 15)		490		$\mu\text{J}$

## 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

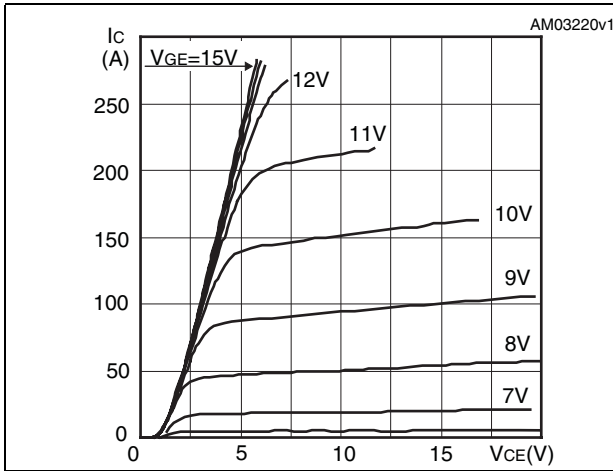


Figure 3. Transfer characteristics

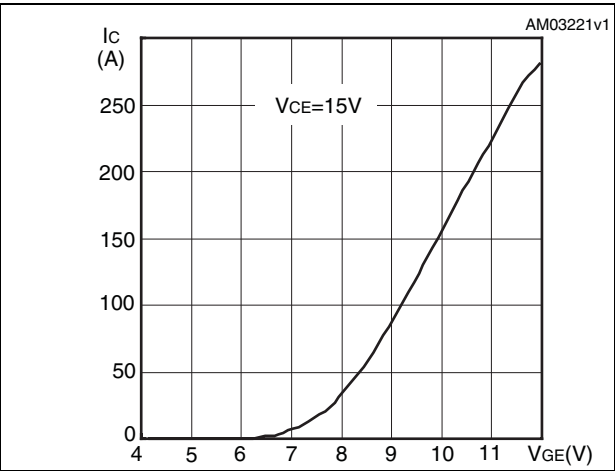


Figure 4. Transconductance

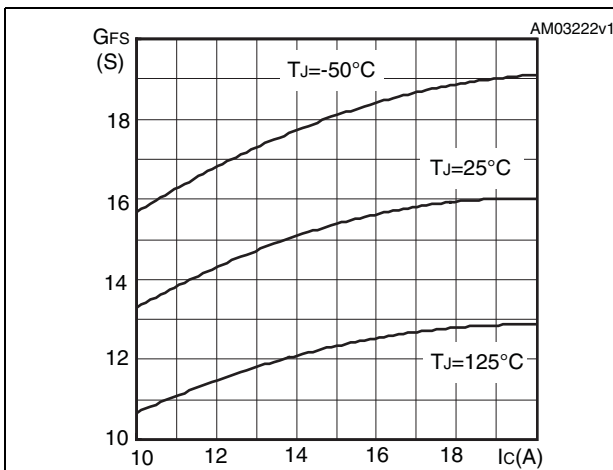


Figure 5. Collector-emitter on voltage vs. temperature

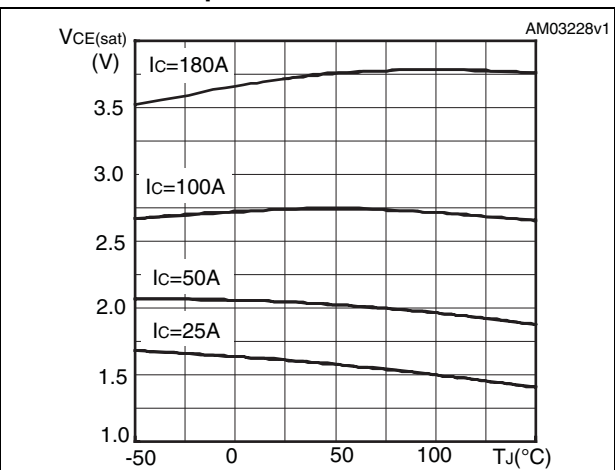


Figure 6. Gate charge vs. gate-source voltage

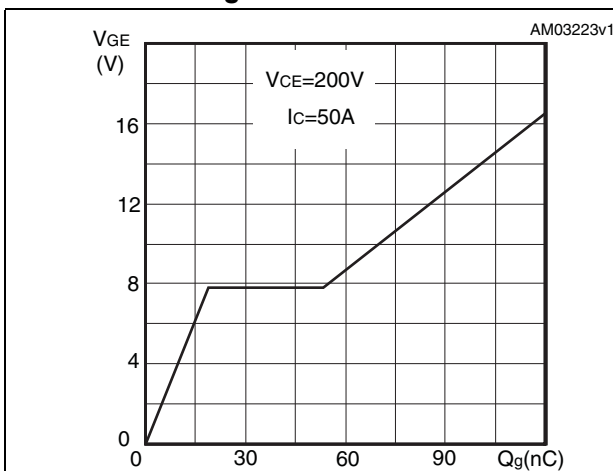
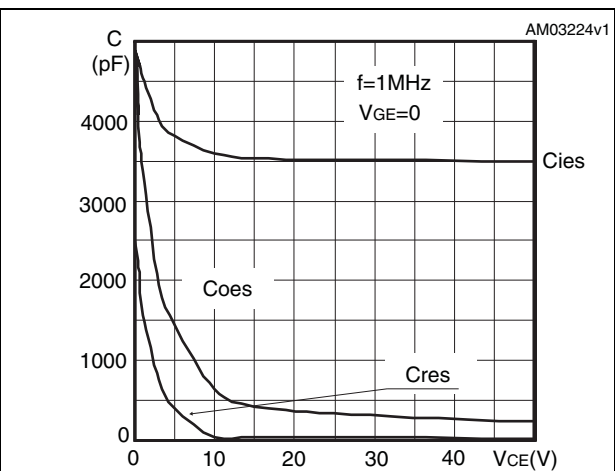
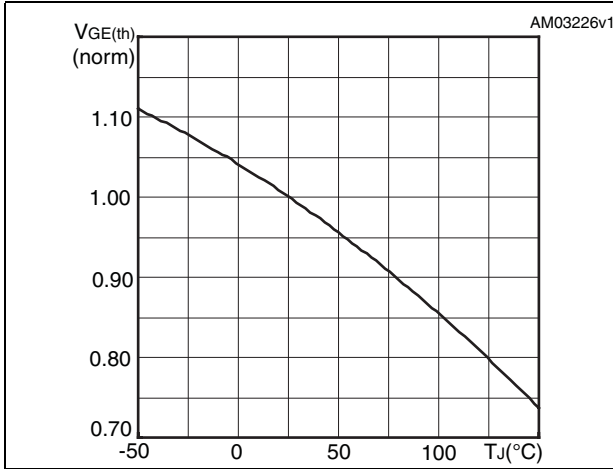


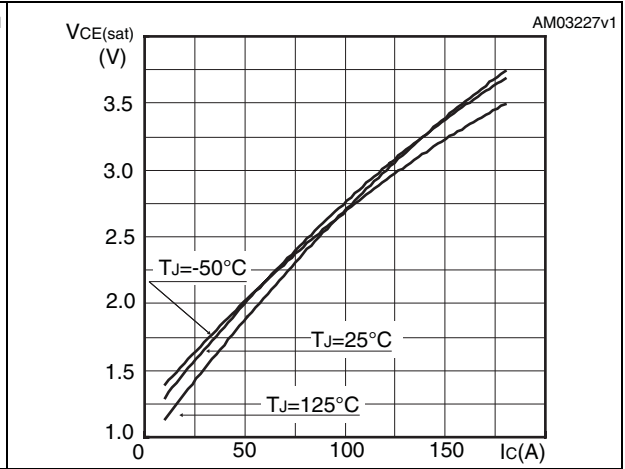
Figure 7. Capacitance variations



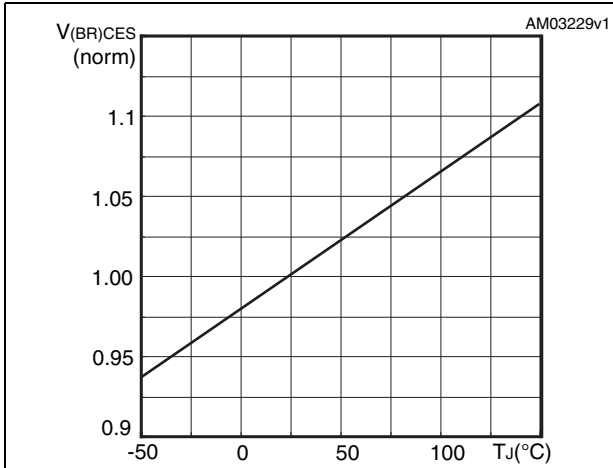
**Figure 8. Normalized gate threshold voltage vs. temperature**



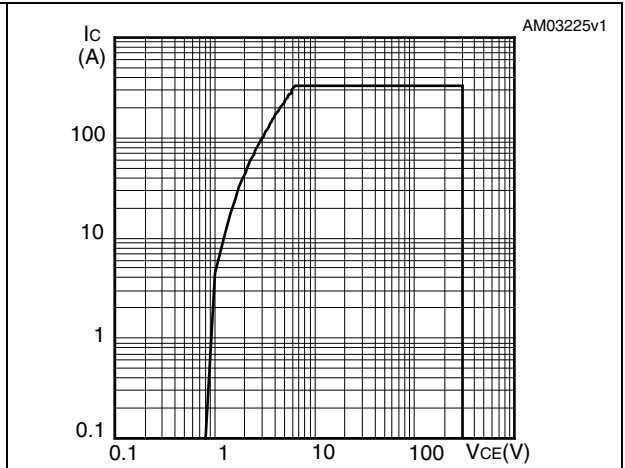
**Figure 9. Collector-emitter on voltage vs. collector current**



**Figure 10. Normalized breakdown voltage vs. temperature**



**Figure 11. Turn-off SOA**



### 3 Test circuits

Figure 12. Test circuit for inductive load switching

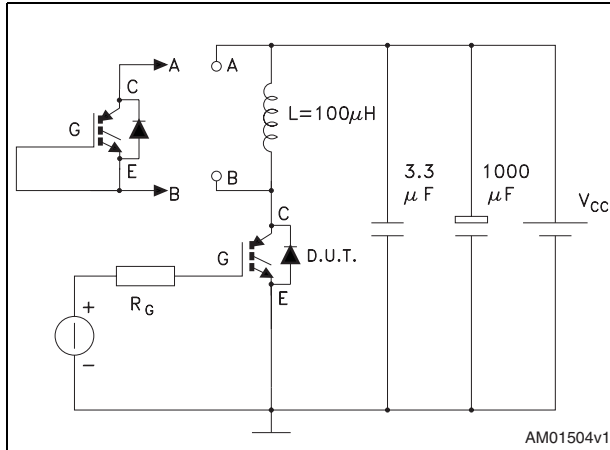


Figure 13. Gate charge test circuit

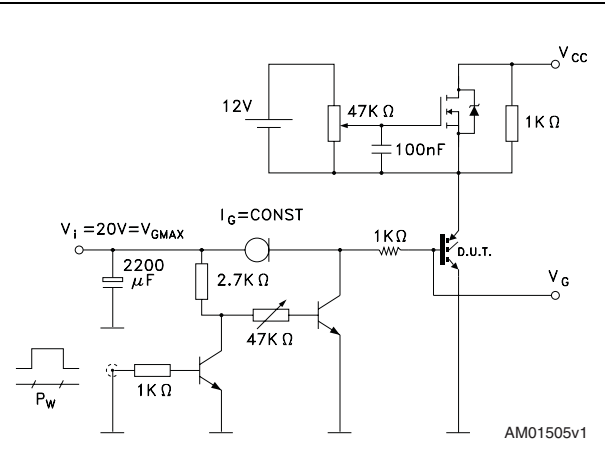


Figure 14. Switching waveforms

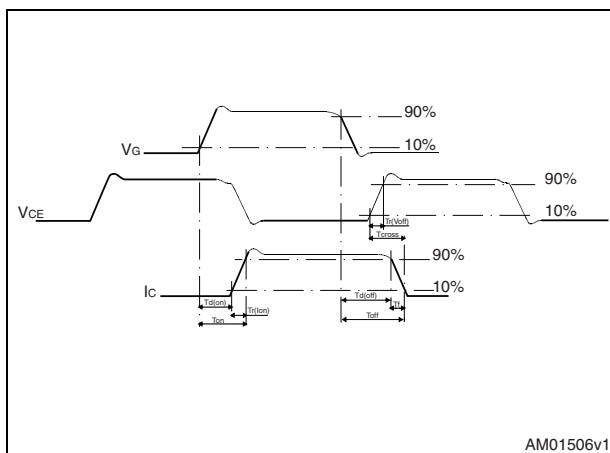
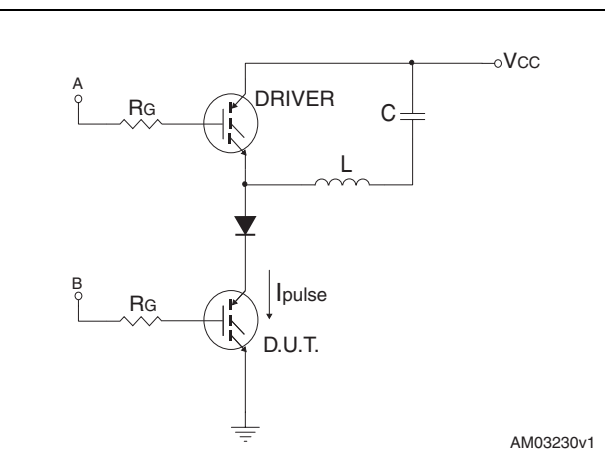


Figure 15. Energy per pulse test circuit



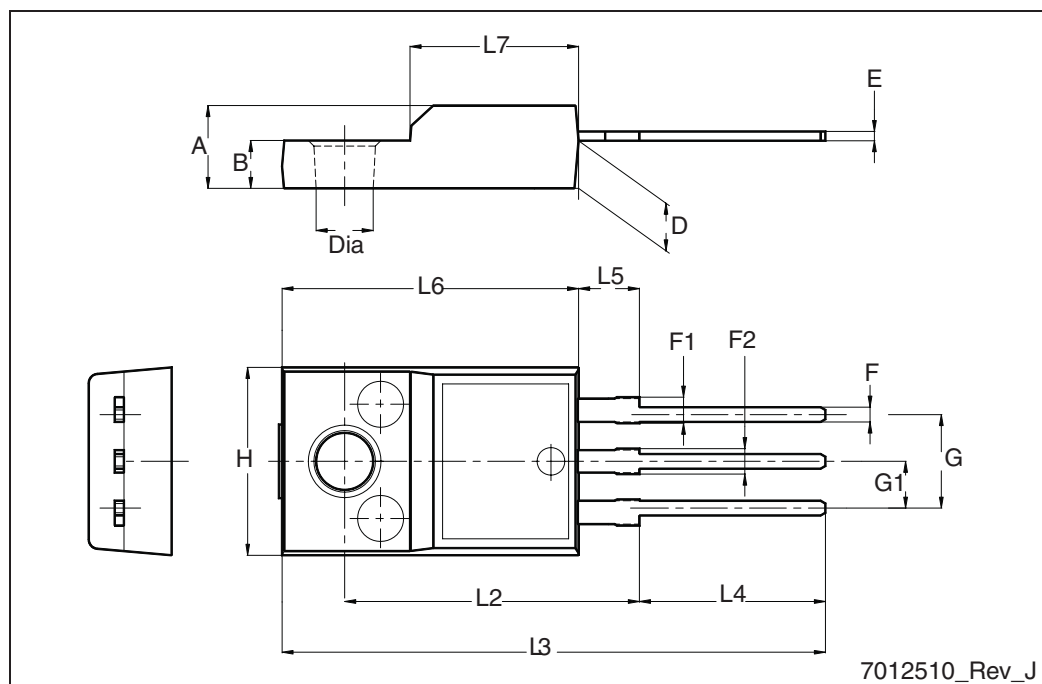
## 4 Package mechanical data

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](http://www.st.com). ECOPACK is an ST trademark.



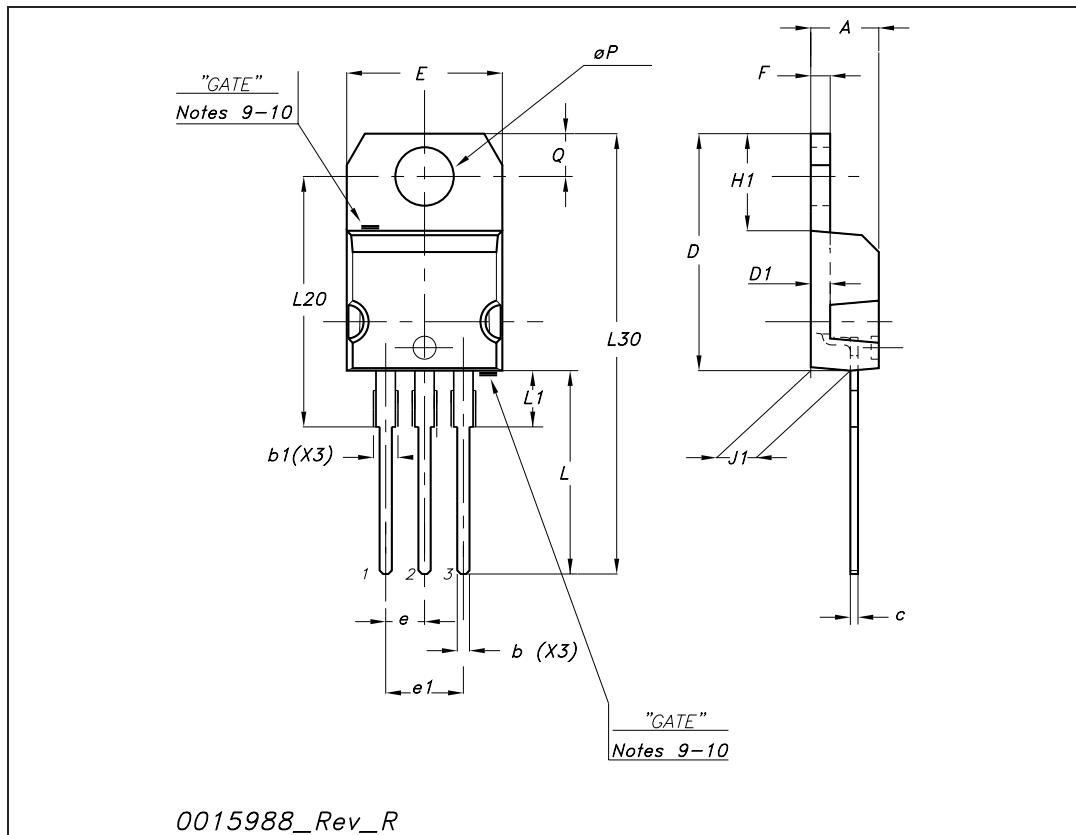
## TO-220FP mechanical data

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



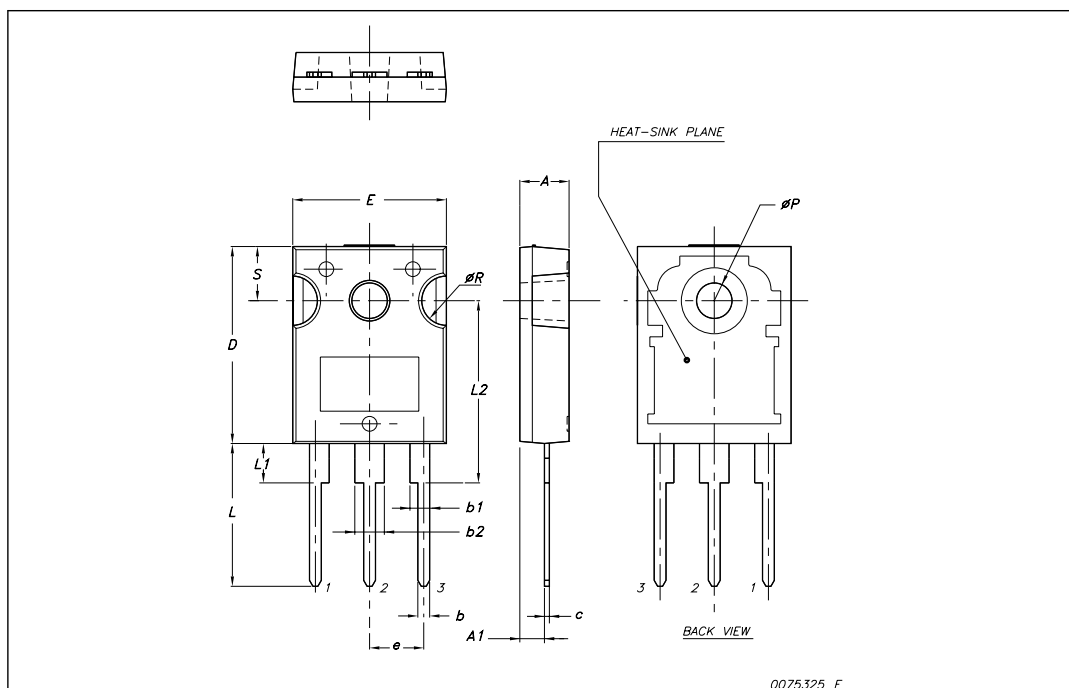
TO-220 mechanical data

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	
øP	3.55		3.65
øR	4.50		5.50
S		5.50	



## 5 Revision history

Table 7. Document revision history

Date	Revision	Changes
11-Feb-2009	1	Initial 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 - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

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