



# STB80NF55-06 - STB80NF55-06-1 STP80NF55-06 - STP80NF55-06FP

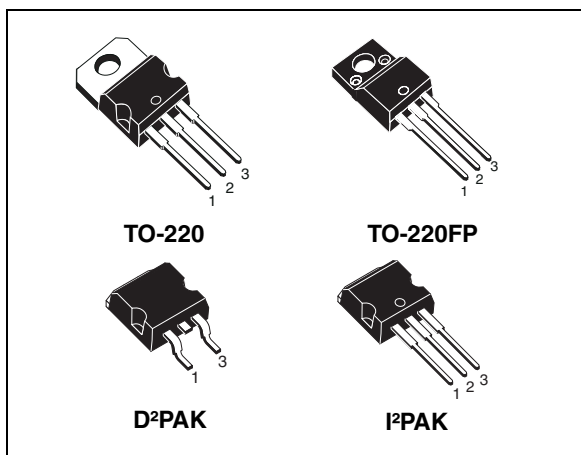
N-channel 55V - 0.005Ω - 80A - TO-220 /FP - I<sup>2</sup>PAK - D<sup>2</sup>PAK  
STripFET™ II Power MOSFET

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STB80NF55-06	55V	<0.0065Ω	80A <sup>(1)</sup>
STB80NF55-06-1	55V	<0.0065Ω	80A <sup>(1)</sup>
STP80NF55-06	55V	<0.0065Ω	80A <sup>(1)</sup>
STP80NF55-06FP	55V	<0.0065Ω	60A <sup>(1)</sup>

1. Limited by package

- Exceptional dv/dt capability
- 100% avalanche tested
- Application oriented characterization



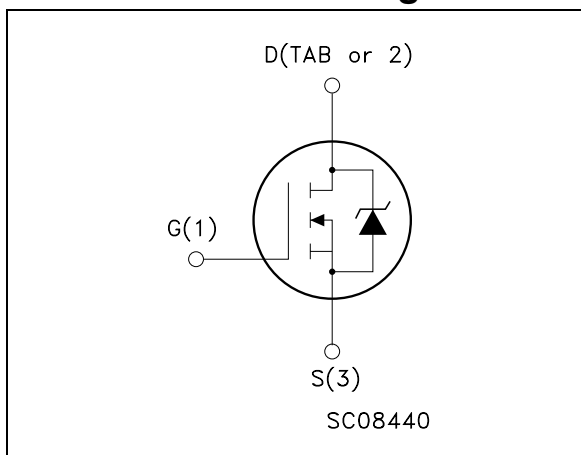
## Description

This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

## Applications

- Switching application

## Internal schematic diagram



## Order codes

Part number	Marking	Package	Packaging
STB80NF55-06T4	B80NF55-06	D <sup>2</sup> PAK	Tape & reel
STB80NF55-06-1	B80NF55-06-1	I <sup>2</sup> PAK	Tube
STP80NF55-06	P80NF55-06	TO-220	Tube
STP80NF55-06FP	P80NF55-06FP	TO-220FP	Tube

# Contents

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		TO-220 / D <sup>2</sup> / I <sup>2</sup> PAK	TO-220FP	
V <sub>DS</sub>	Drain-source voltage (V <sub>GS</sub> = 0)	55		V
V <sub>GS</sub>	Gate-source voltage	± 20		V
I <sub>D</sub> <sup>(1)</sup>	Drain current (continuous) at T <sub>C</sub> = 25°C	80	60 <sup>(2)</sup>	A
I <sub>D</sub> <sup>(1)</sup>	Drain current (continuous) at T <sub>C</sub> =100°C	80	42 <sup>(2)</sup>	A
I <sub>DM</sub> <sup>(3)</sup>	Drain current (pulsed)	320	240 <sup>(2)</sup>	A
P <sub>TOT</sub>	Total dissipation at T <sub>C</sub> = 25°C	300	45	W
	Derating factor	2	0.30	W/°C
dv/dt <sup>(4)</sup>	Peak diode recovery voltage slope	7		V/ns
E <sub>AS</sub> <sup>(5)</sup>	Single pulse avalanche energy	1.3		J
V <sub>ISO</sub>	Insulation withstand voltage (DC)	--	2500	V
T <sub>J</sub> T <sub>stg</sub>	Operating junction temperature Storage temperature	-55 to 175		°C

- Limited by Package
- Limited only by maximum temperature allowed
- Pulse width limited by safe operating area
- ) I<sub>SD</sub> ≤ 80A, di/dt ≤ 400A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>J</sub> ≤ T<sub>JMAX</sub>
- Starting T<sub>J</sub> = 25 °C, I<sub>D</sub> = 40A, V<sub>DD</sub> = 45V

**Table 2. Thermal data**

Symbol	Parameter	Value		Unit
		TO-220 / D <sup>2</sup> / I <sup>2</sup> PAK	TO-220FP	
R <sub>thJC</sub>	Thermal resistance junction-case max	0.5	3.33	°C/W
R <sub>thJA</sub>	Thermal resistance junction-ambient max	62.5		°C/W
T <sub>l</sub>	Maximum lead temperature for soldering purpose	300		°C

## 2 Electrical characteristics

(T<sub>CASE</sub>=25°C unless otherwise specified)

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 250µA, V <sub>GS</sub> = 0	55			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max rating, V <sub>DS</sub> = Max rating @ 125°C			1 10	µA µA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±20V			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250µA	2	3	4	V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 40A		0.005	0.0065	Ω

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> <sup>(1)</sup>	Forward transconductance	V <sub>DS</sub> = 15V, I <sub>D</sub> = 40A		150		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		4400 1020 350		pF pF pF
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total gate charge Gate-source charge Gate-drain charge	V <sub>DD</sub> = 44V, I <sub>D</sub> = 80A V <sub>GS</sub> = 10V		142 29 60.5	189	nC nC nC

1. Pulsed: pulse duration=300µs, duty cycle 1.5%

**Table 5. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 40A, R <sub>G</sub> = 4.7Ω, V <sub>GS</sub> = 10V (see <a href="#">Figure 15</a> )		27		ns
t <sub>r</sub>	Rise time			155		ns
t <sub>d(off)</sub>	Turn-off delay time			125		ns
t <sub>f</sub>	Fall time			65		ns

**Table 6. Source drain diode**

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current				80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=80A, V_{GS}=0$			1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD}=80A,$		100		ns
$Q_{rr}$	Reverse recovery charge	$di/dt = 100A/\mu s,$		0.32		$\mu C$
$I_{RRM}$	Reverse recovery current	$V_{DD}=35V, T_J = 150^\circ C$		6.5		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300 $\mu s$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220/  
D<sup>2</sup>PAK/ I<sup>2</sup>PAK

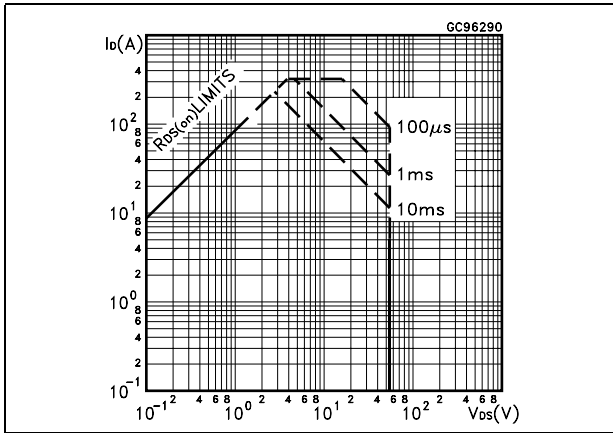


Figure 2. Thermal impedance for TO-220/  
D<sup>2</sup>PAK/ I<sup>2</sup>PAK

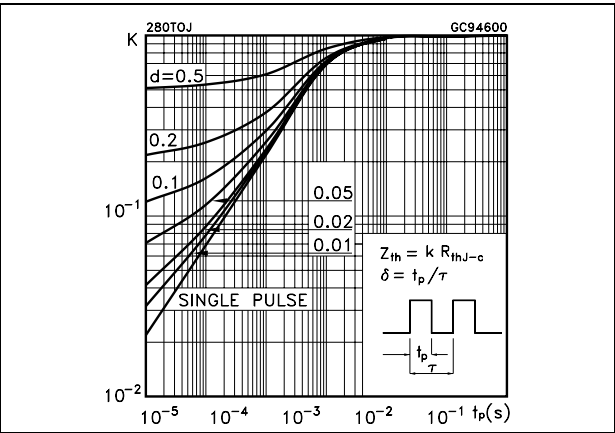


Figure 3. Safe operating area for TO-220FP

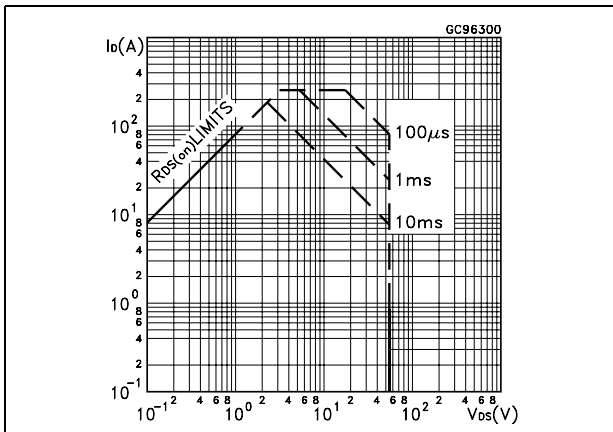


Figure 4. Thermal impedance for TO-220FP

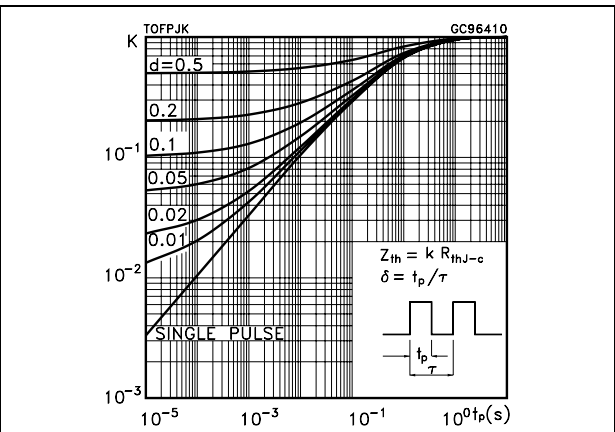


Figure 5. Output characteristics

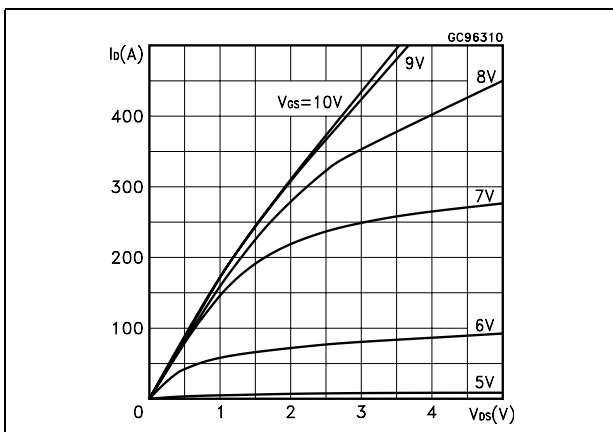


Figure 6. Transfer characteristics

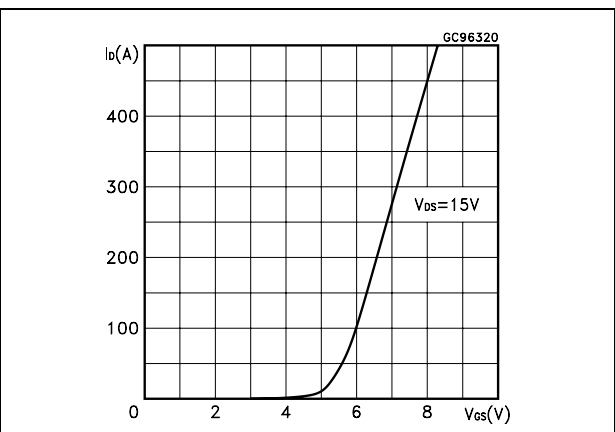


Figure 7. Transconductance

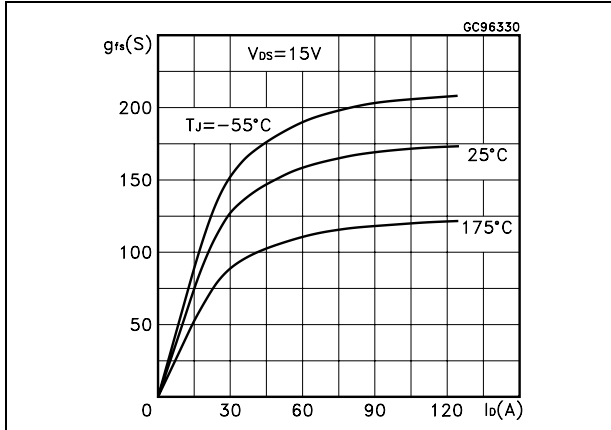


Figure 8. Static drain-source on resistance

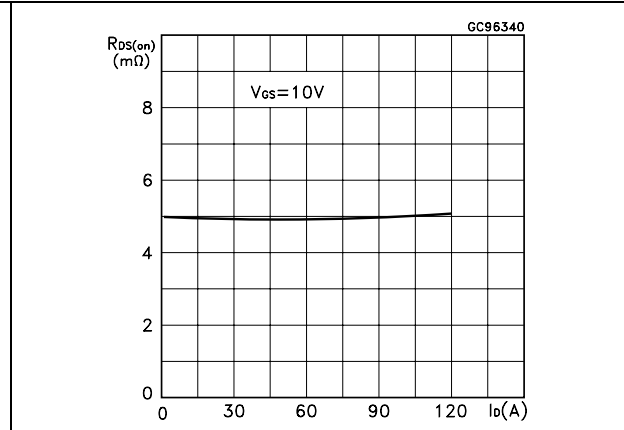


Figure 9. Gate charge vs gate-source voltage

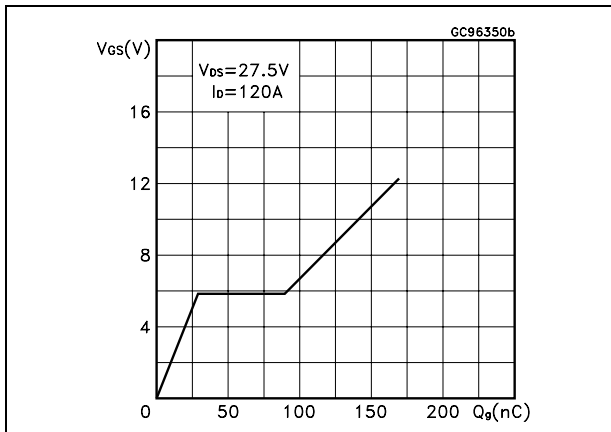


Figure 10. Capacitance variations

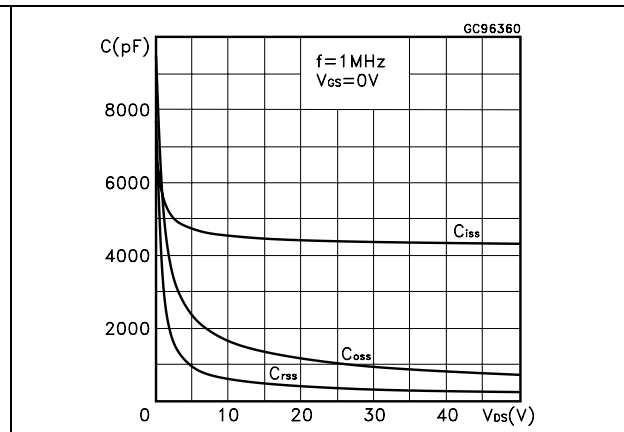


Figure 11. Normalized gate threshold voltage vs temperature

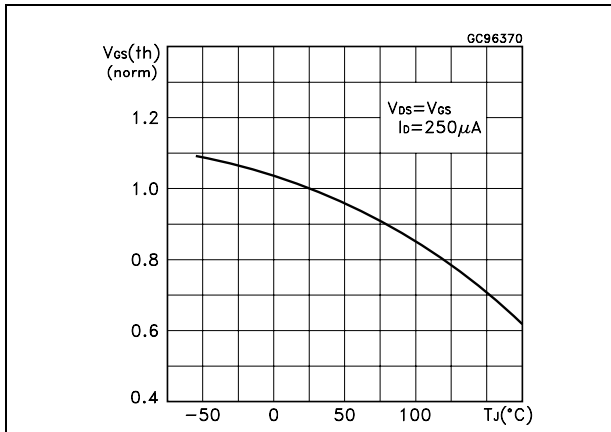


Figure 12. Normalized on resistance vs temperature

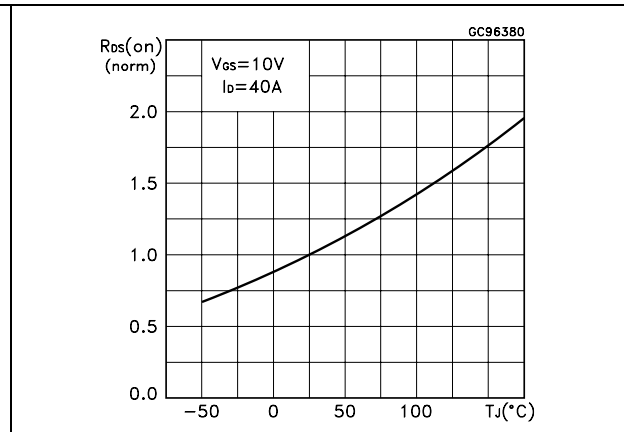


Figure 13. Source-drain diode forward characteristics

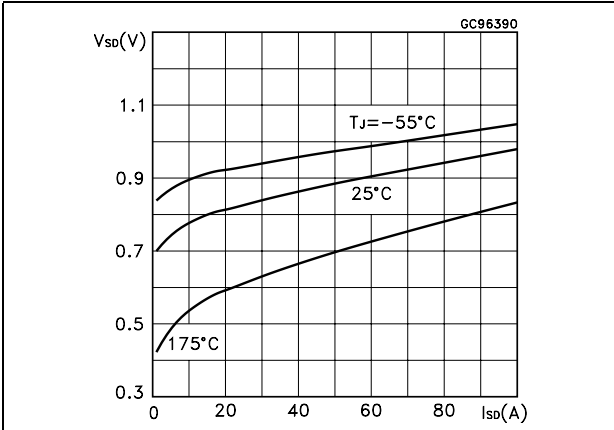
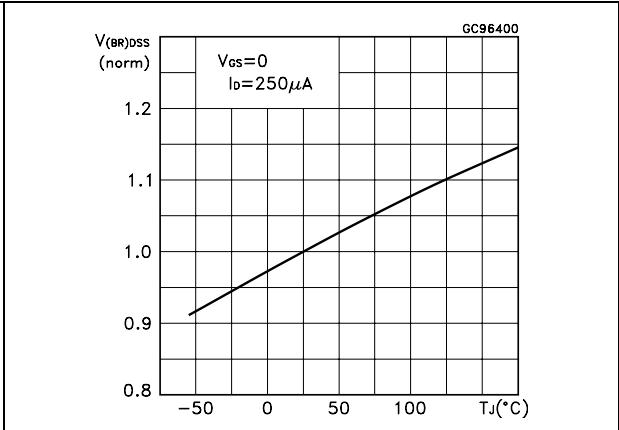


Figure 14. Normalized  $B_{VDSS}$  vs temperature





### 3 Test circuit

Figure 15. Switching times test circuit for resistive load

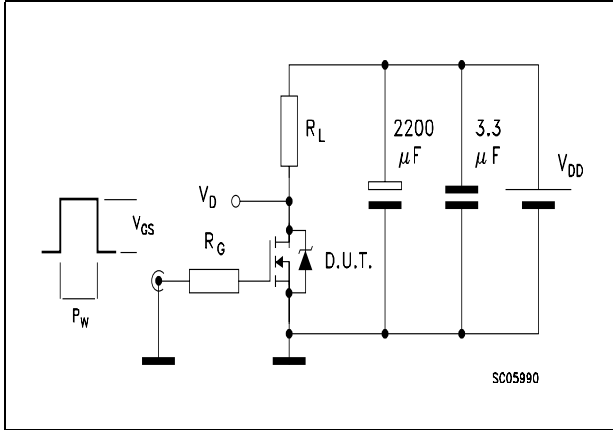


Figure 16. Gate charge test circuit

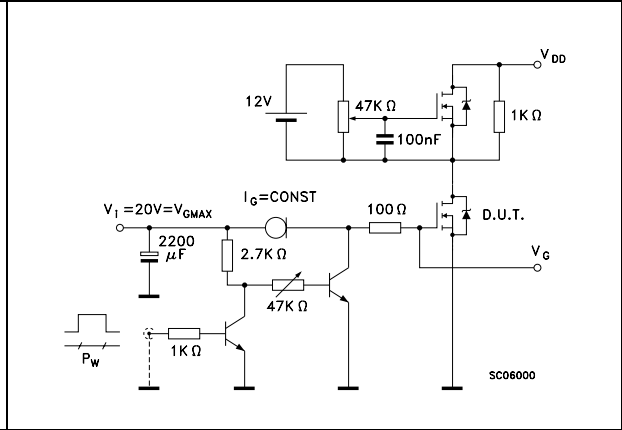


Figure 17. Test circuit for inductive load switching and diode recovery times

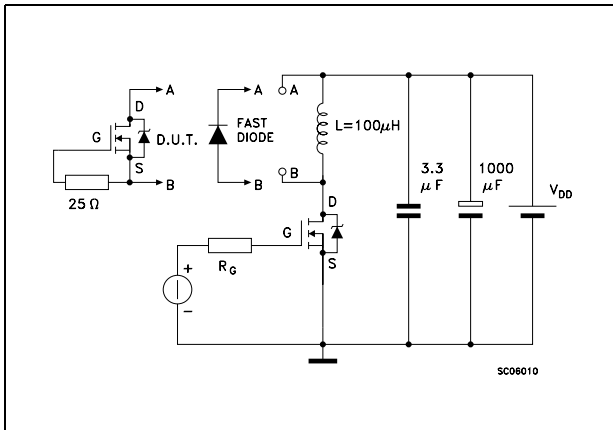


Figure 18. Unclamped Inductive load test circuit

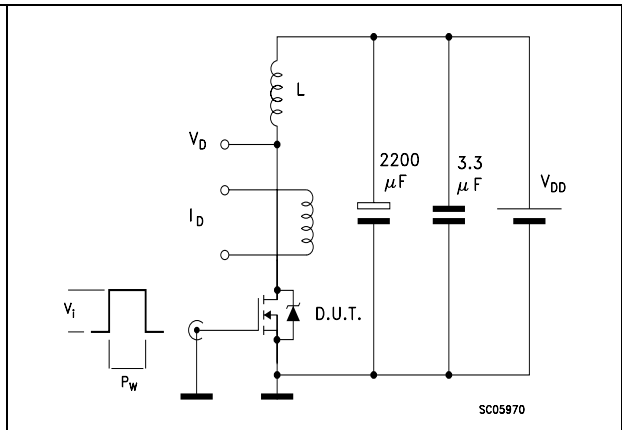
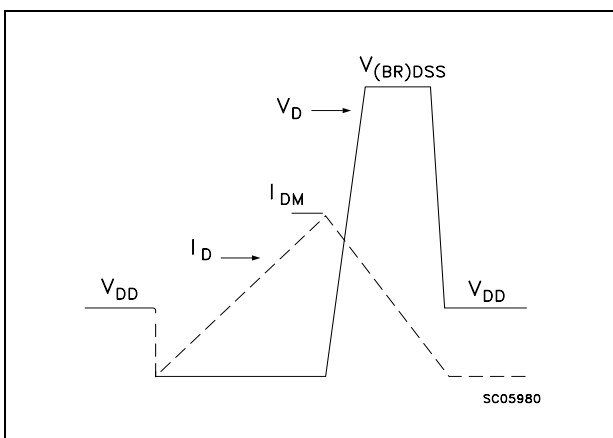


Figure 19. Unclamped inductive waveform

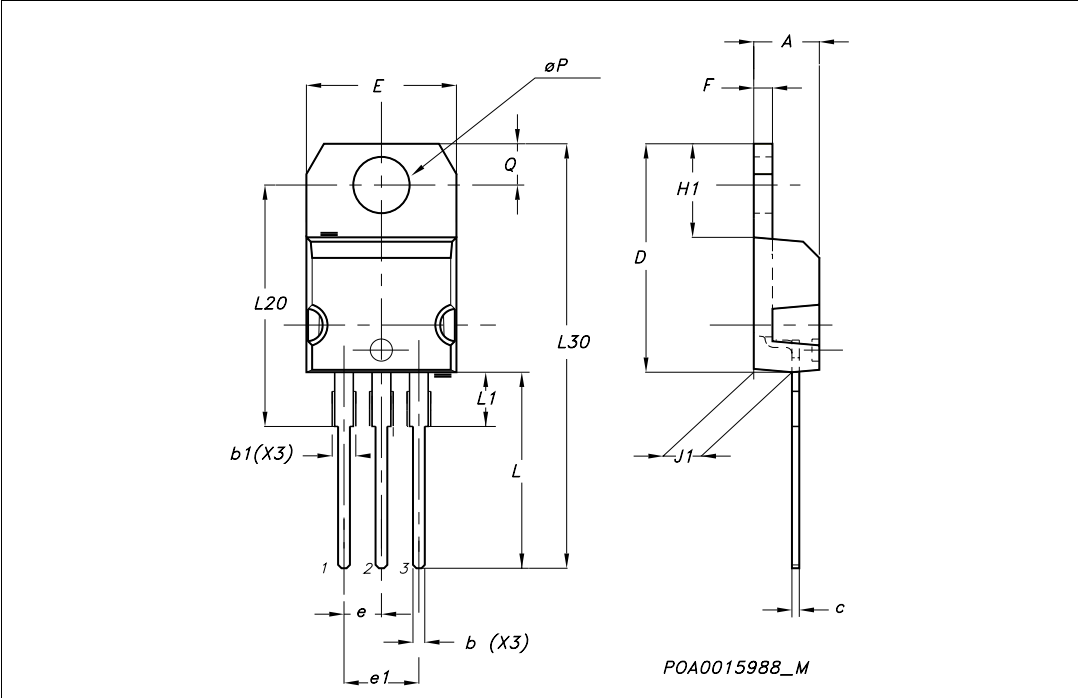


## 4 Package mechanical data

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)

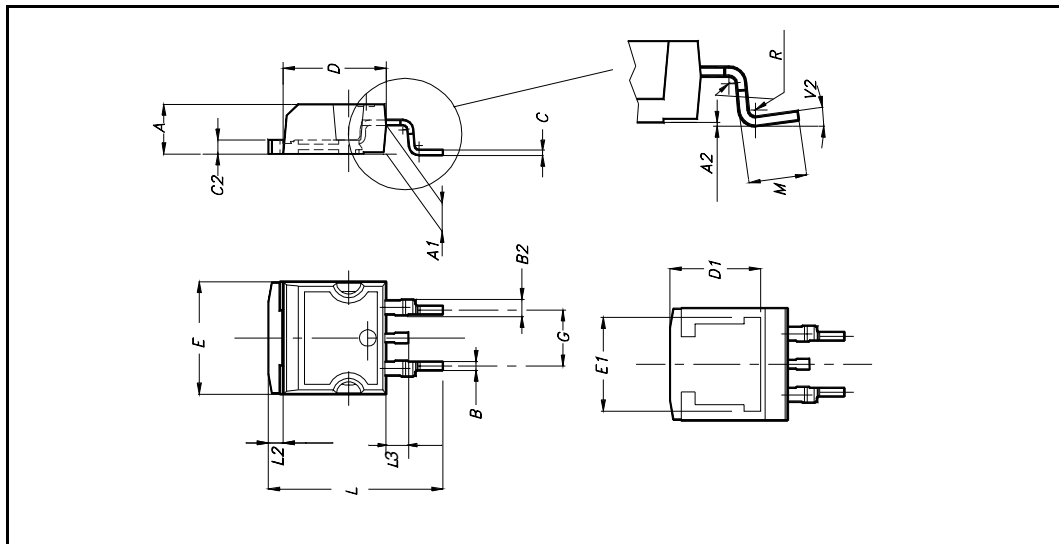
**TO-220 MECHANICAL DATA**

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



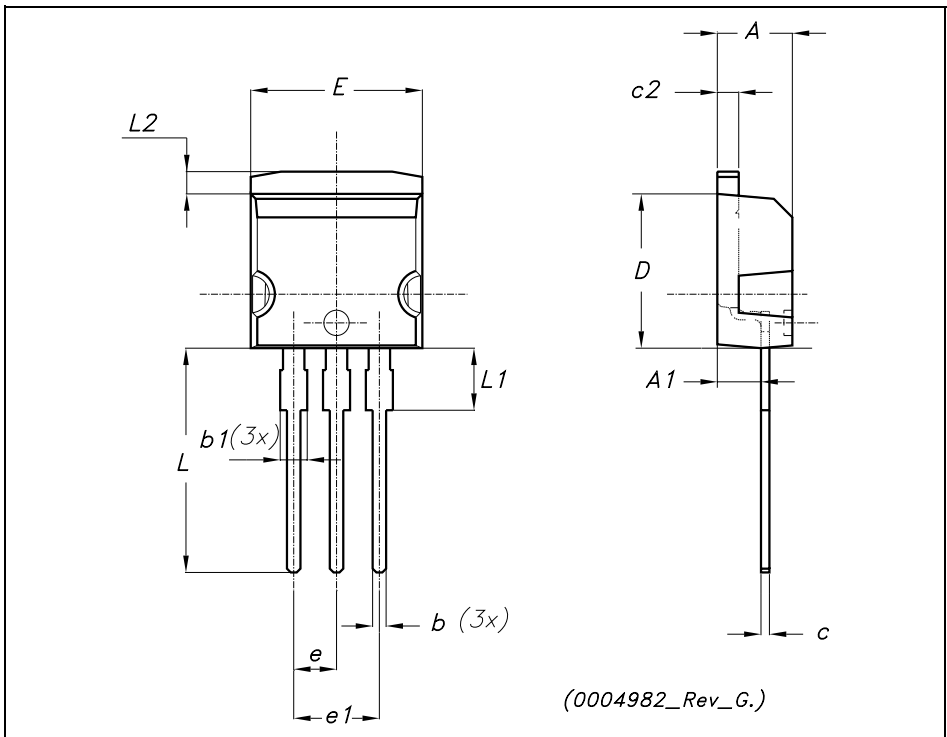
### D<sup>2</sup>PAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		4°			



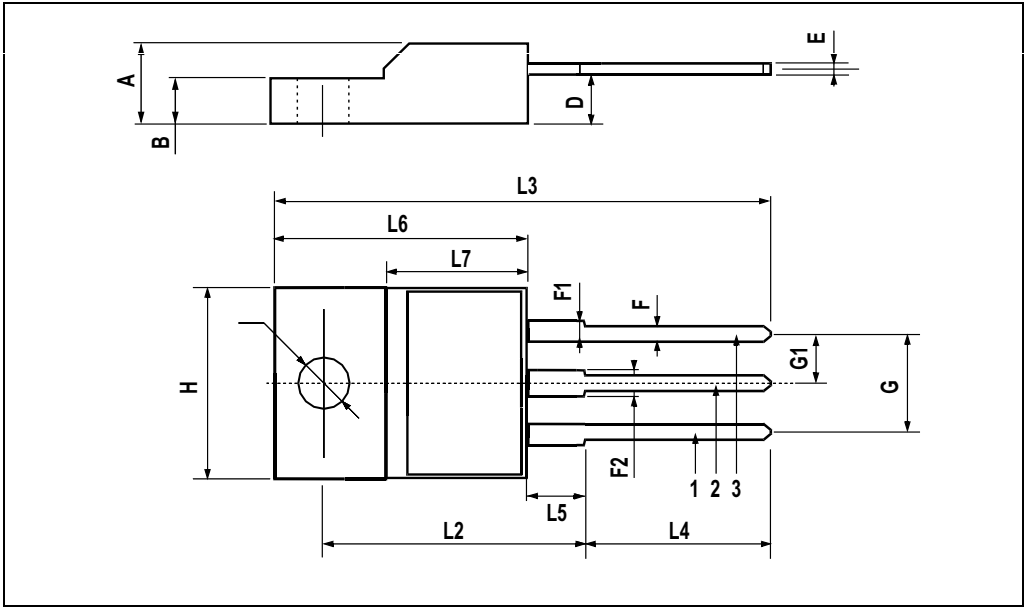
**TO-262 (I<sup>2</sup>PAK) MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
A1	2.40		2.72	0.094		0.107
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
c2	1.23		1.32	0.048		0.052
D	8.95		9.35	0.352		0.368
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
E	10		10.40	0.393		0.410
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L2	1.27		1.40	0.050		0.055



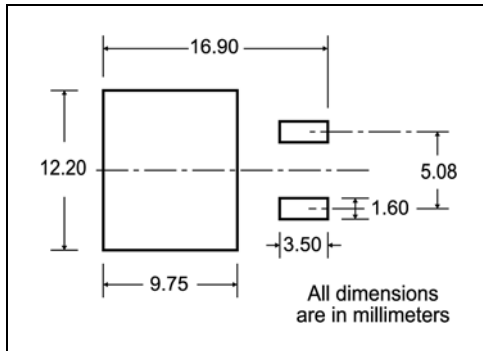
**TO-220FP MECHANICAL DATA**

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

### D<sup>2</sup>PAK FOOTPRINT



### TAPE AND REEL SHIPMENT

40 mm min. Access hole at slot location

Tape slot in core for tape start 25mm min. width

Full radius

G measured at hub

#### 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

#### 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

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

FEED DIRECTION

TRL

Bending radius R min.

\* on sales type

## 6 Revision history

**Table 7. Revision history**

Date	Revision	Changes
21-Jun-2004	5	Complete version
13-Mar-2005	6	Package inserted: I <sup>2</sup> PAK
20-Jul-2006	7	New template, no content change
24-Oct-2006	8	Corrected value on <a href="#">Table 1.: Absolute maximum ratings</a>



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