STB76NF75, STI76NF75 STP76NF75

N-channel 75 V, 0.0095 Ω, 80 A TO-220, D^{2}PAK, I^{2}PAK STripFET™ II Power MOSFET

Features

Type	V_{DSS}	$R_{DS(on)}$ max	I_D
STB76NF75	75 V	< 0.011 Ω	80 A[1]
STI76NF75	75 V	< 0.011 Ω	80 A[1]
STP76NF75	75 V	< 0.011 Ω	80 A[1]

1. Current limited by package

■ Exceptional dv/dt capability

■ 100% avalanche tested

Application

■ Switching applications
  – Automotive

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.


TO-220   D²PAK   I²PAK

Figure 1. Internal schematic diagram
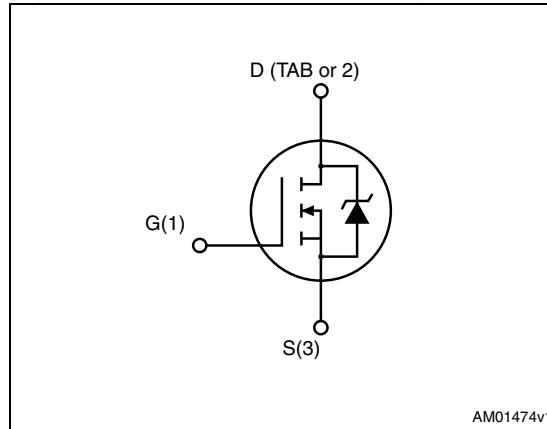
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Table 1. Device summary

Order codes	Marking	Package	Packaging
STB76NF75	B76NF75	D²PAK	Tape and reel
STI76NF75	I76NF75	I²PAK	Tube
STP76NF75	P76NF75	TO-220	Tube

Contents

1   Electrical ratings

Table 2.   Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	75	V
V_{DGR}	Drain-gate voltage (R_{GS} = 20 kΩ)	75	V
V_{GS}	Gate-source voltage	± 20	V
I_D [1]	Drain current (continuous) at T_C = 25 °C	80	A
I_D [1]	Drain current (continuous) at T_C=100 °C	70	A
I_{DM} [2]	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at T_C = 25 °C	300	W
	Derating factor	2.0	W/°C
dv/dt [3]	Peak diode recovery voltage slope	12	V/ns
E_{AS} [4]	Single pulse avalanche energy	700	mJ
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 175	°C

1. Current limited by package

2. Pulse width limited by safe operating area

3. $I_{SD} \leq$ 80 A, di/dt $\leq$ 300 A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX}$

4. Starting T_J = 25 °C, I_D = 40 A, V_{DD} = 37.5 V

Table 3.   Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max	0.5	°C/W
R_{thJA}	Thermal resistance junction-ambient max	62.5	°C/W
T_l	Maximum lead temperature for soldering purpose [1]	300	°C

1. 1.6mm from case for 10 sec

2   Electrical characteristics

(T_{CASE}=25 °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 = 250 µA, V_{GS}= 0	75			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating, V_{DS} = Max rating @125 °C			1 10	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS} , I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10 V, I_D= 40 A		0.0095	0.011	W

Table 5.   Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} [1]	Forward transconductance	V_{DS} = 15 V, I_D = 40 A	-	20		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25 V, f = 1 MHz, V_{GS} = 0	-	3700 730 240		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 60 V, I_D = 80 A V_{GS} =10 V	-	117 27 47	160	nC nC nC

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

Table 6.   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}= 37.5 V, I_D= 45 A, R_G=4.7 Ω, V_{GS}=10 V *Figure 14 on page 8*	-	25 100 66 30	-	ns ns ns ns

Table 7.   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} = 80 A, V_{GS} = 0	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 80 A, di/dt = 100 A/μs, V_{DD} = 25 V, T_J = 150 °C *Figure 16 on page 8*	-	132 660 10		ns nC A

1. Pulse width limited by safe operating area

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

2.1   Electrical characteristics (curves)

Figure 2.   Safe operating area
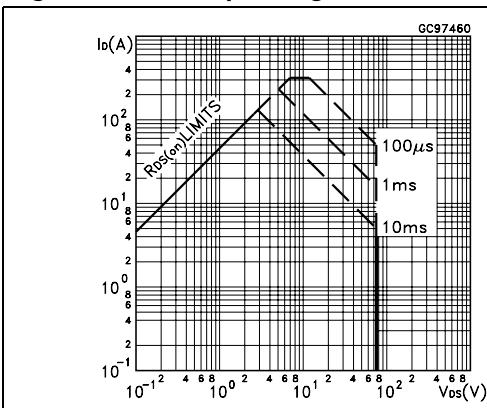

Figure 3.   Thermal impedance
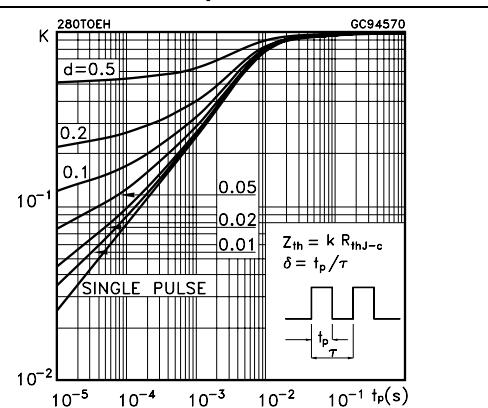
**Figure 4.   Output characteristics**
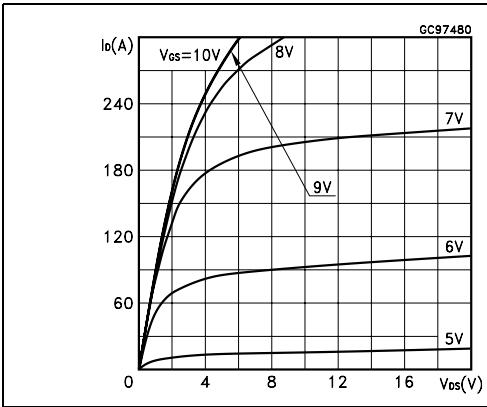
Figure 5.   Transfer characteristics
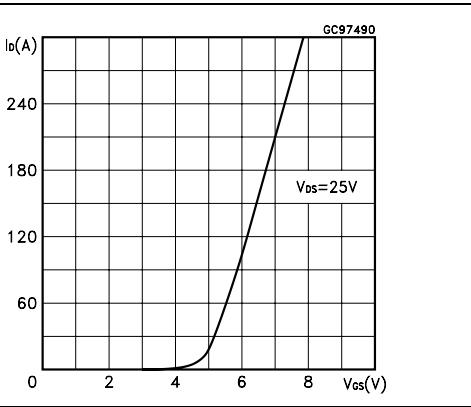

Figure 6.   Transconductance
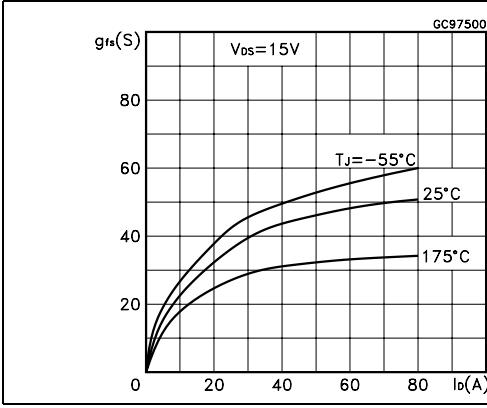

**Figure 7.   Static drain-source on resistance**
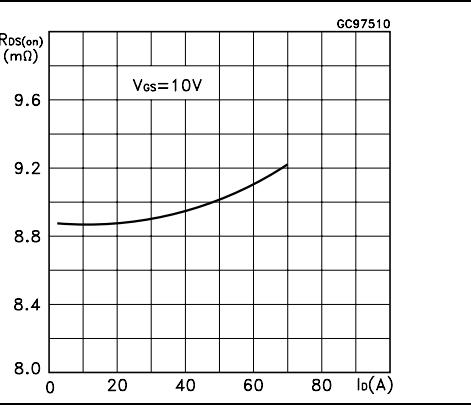
Figure 8.   Gate charge vs gate-source voltage   **Figure 9.   Capacitance variations**
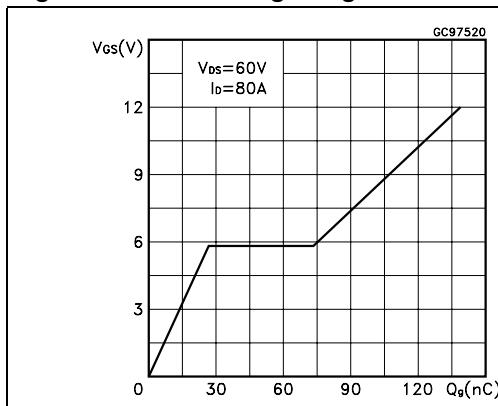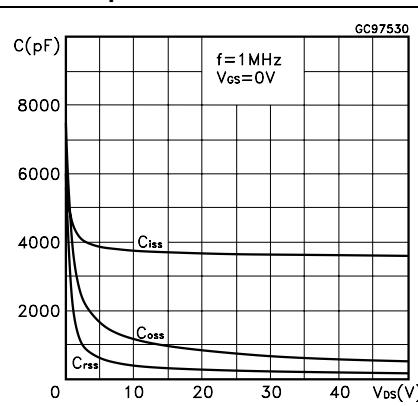

Figure 10.   Normalized gate threshold voltage vs temperature   **Figure 11.   Normalized on resistance vs temperature**
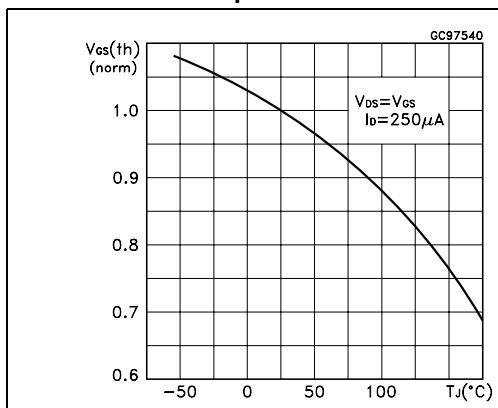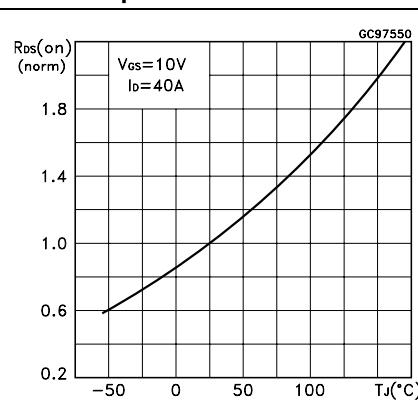

Figure 12.   Source-drain diode forward characteristics   **Figure 13.   Normalized B$_{VDSS}$ vs temperature**
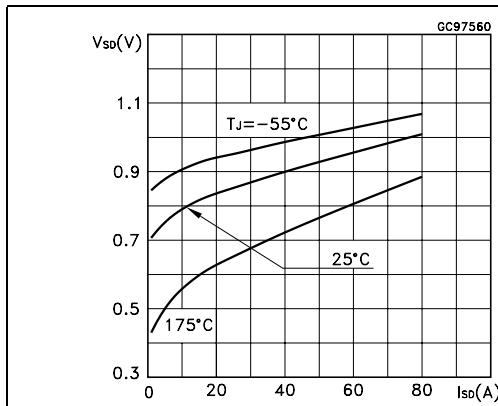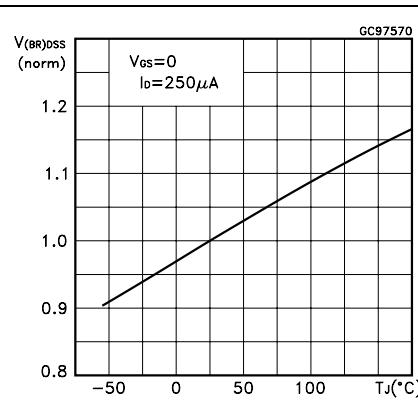
3 Test circuits

Figure 14. Switching times test circuit for resistive load
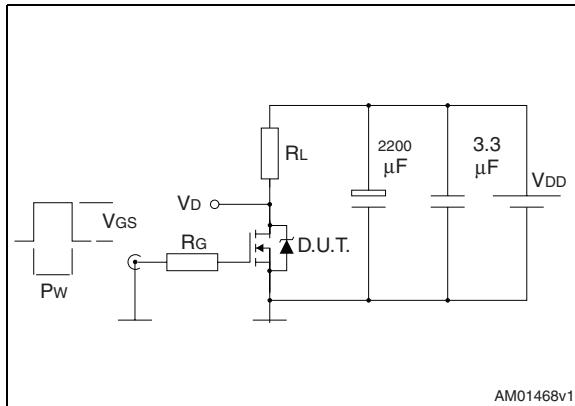
Figure 15. Gate charge test circuit


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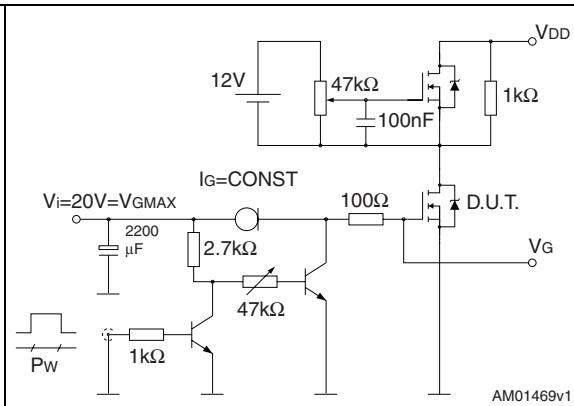
Figure 16. Test circuit for inductive load switching and diode recovery times
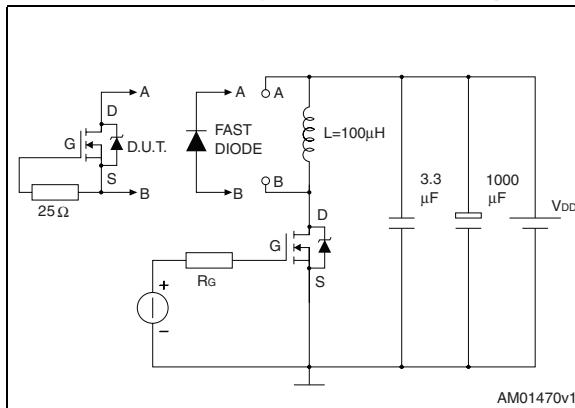
Figure 17. Unclamped inductive load test circuit

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AM01471v1
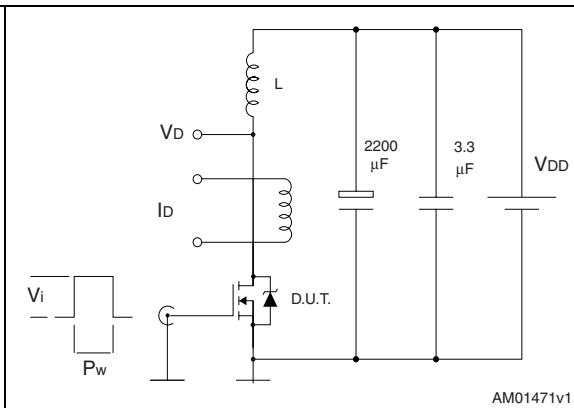
Figure 18. Unclamped inductive waveform

AM01472v1
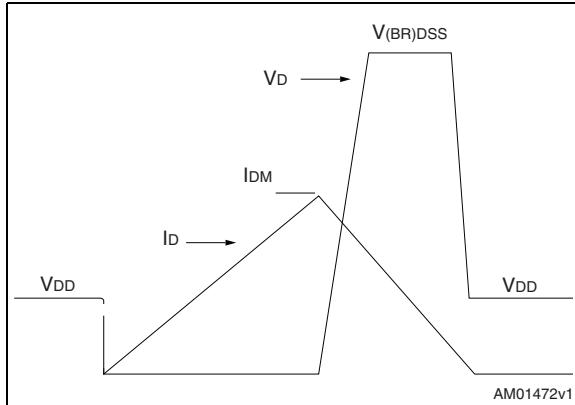
4 Package mechanical data

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.

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D²PAK (TO-263) mechanical data

</div>

| 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°

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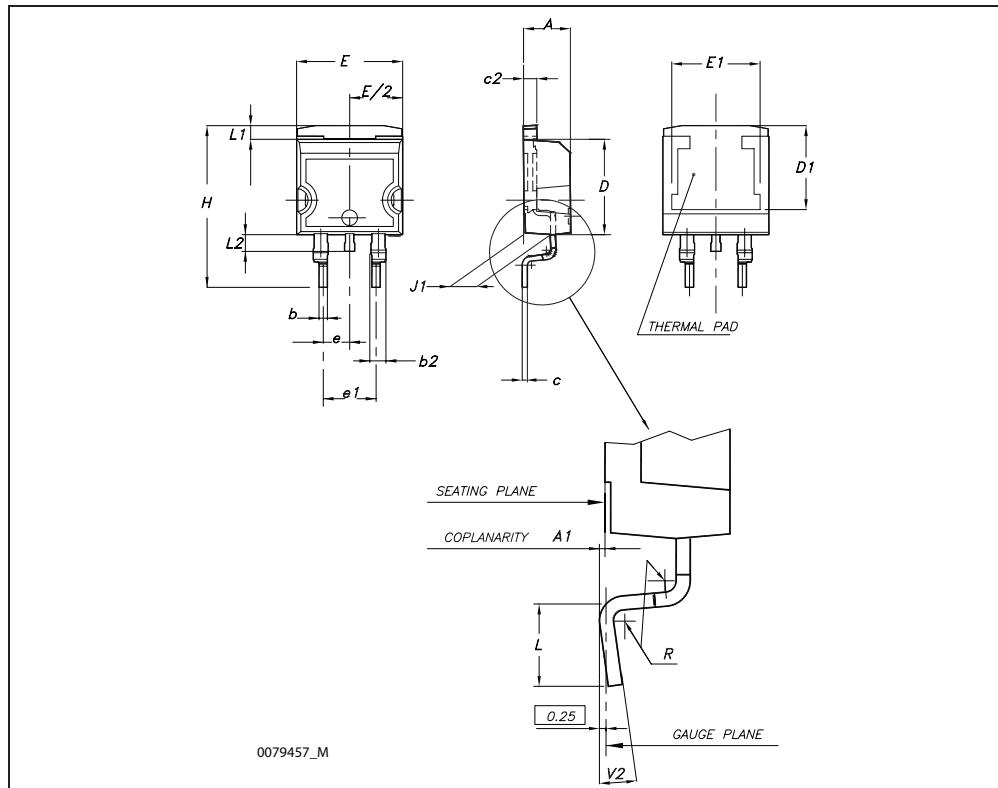
I²PAK (TO-262) mechanical data

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

0004982_H
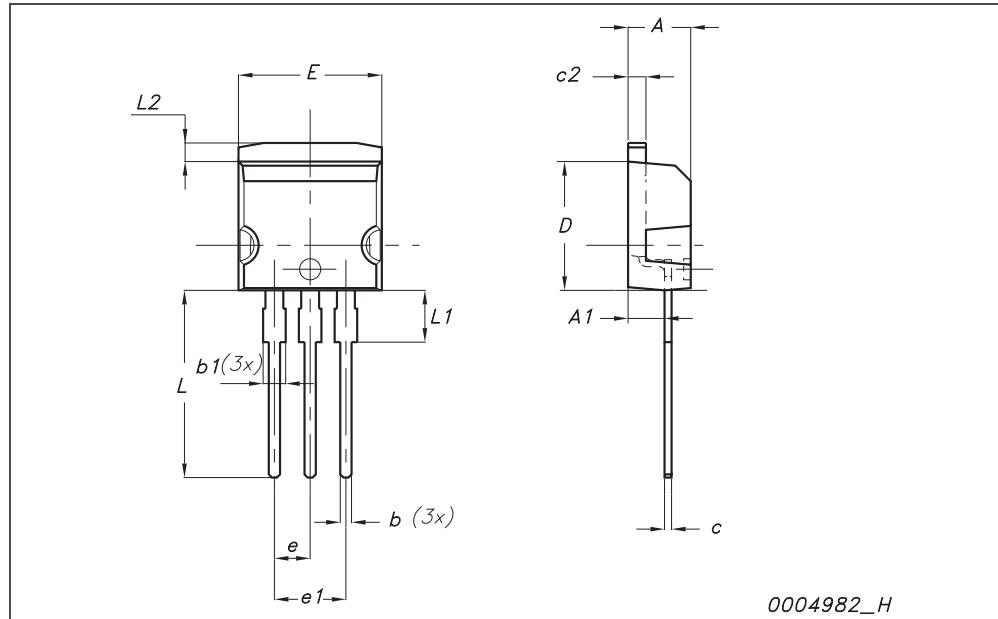
TO-220 type A mechanical data

Dim	mm		
	Min	**Typ**	**Max**
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

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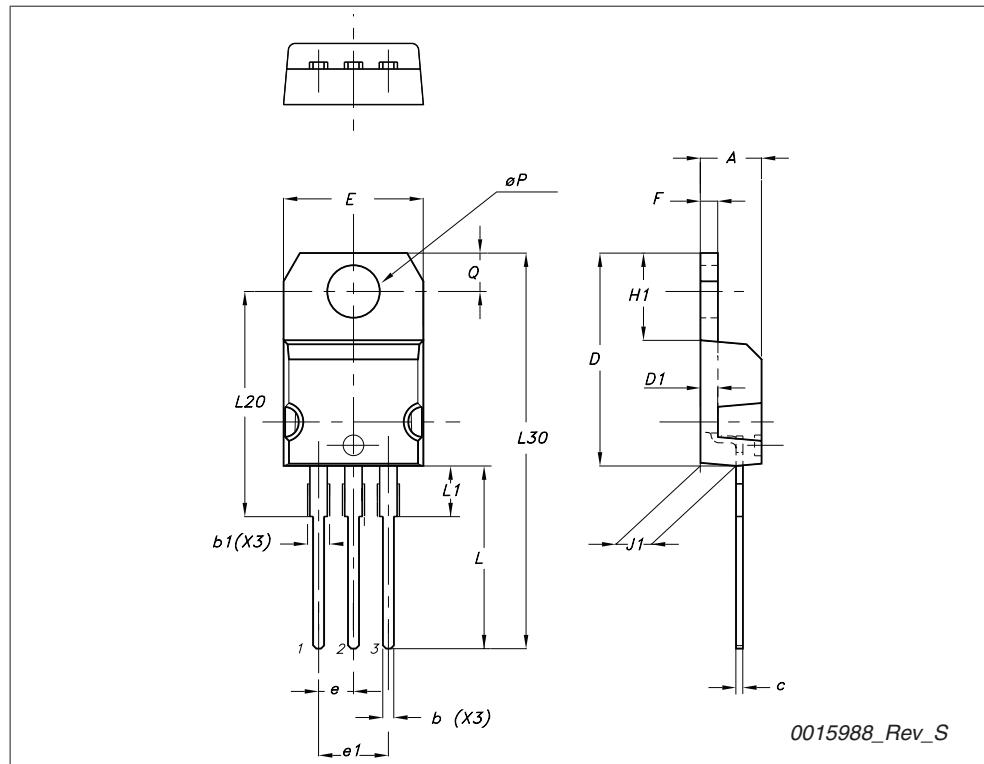
5 Packaging mechanical data

D^{2}PAK FOOTPRINT

TAPE AND REEL SHIPMENT

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		0795	
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

* on sales type

6   Revision history

Table 8.   Document revision history

Date	Revision	Changes
25-Jul-2007	1	Initial release
14-Dec-2009	2	Added new package, mechanical data: I²PAK

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