



STB76NF75, STI76NF75 STP76NF75

N-channel 75 V, 0.0095 Ω , 80 A TO-220, D²PAK, I²PAK
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.

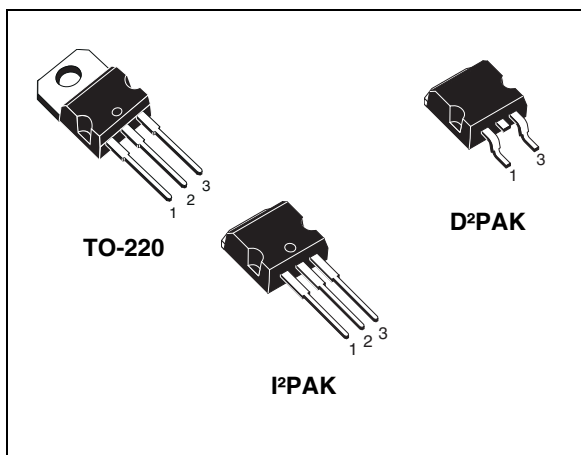


Figure 1. Internal schematic diagram

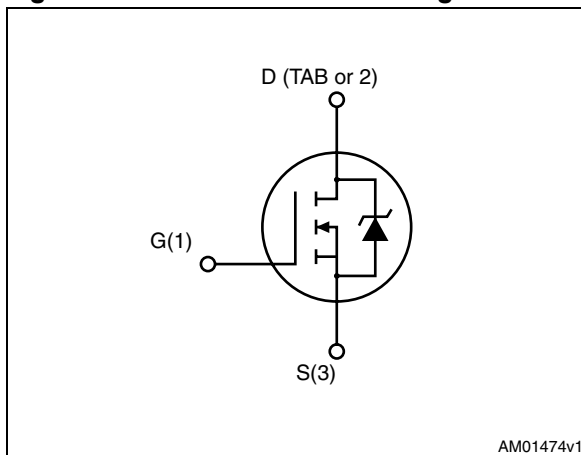


Table 1. Device summary

Order codes	Marking	Package	Packaging
STB76NF75	B76NF75	D ² PAK	Tape and reel
STI76NF75	I76NF75	I ² PAK	Tube
STP76NF75	P76NF75	TO-220	Tube

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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 ($R_{GS} = 20\text{ k}\Omega$)	75	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	70	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	300	W
	Derating factor	2.0	W/ $^\circ\text{C}$
$dv/dt^{(3)}$	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	$^\circ\text{C}$

1. Current limited by package

2. Pulse width limited by safe operating area

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

4. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 40\text{ A}$, $V_{DD} = 37.5\text{ V}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max	0.5	$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose ⁽¹⁾	300	$^\circ\text{C}$

1. 1.6mm from case for 10 sec

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	75			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$, $V_{DS} = \text{Max rating @ } 125\text{ }^{\circ}\text{C}$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 40\text{ A}$		0.0095	0.011	W

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15\text{ V}$, $I_D = 40\text{ A}$	-	20		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	3700 730 240		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 60\text{ V}$, $I_D = 80\text{ A}$ $V_{GS} = 10\text{ V}$	-	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
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 37.5\text{ V}$, $I_D = 45\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ <i>Figure 14 on page 8</i>	-	25	-	ns
t_r	Rise time			100		ns
$t_{d(off)}$	Turn-off delay time			66		ns
t_f	Fall time			30		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	$I_{SD} = 80\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_J = 150\text{ }^\circ\text{C}$ <i>Figure 16 on page 8</i>	-	132		ns
Q_{rr}	Reverse recovery charge			660		nC
I_{RRM}	Reverse recovery current			10		A

1. Pulse width limited by safe operating area

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

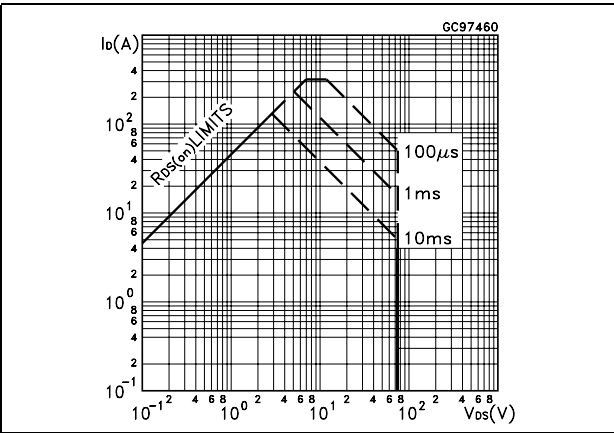


Figure 3. Thermal impedance

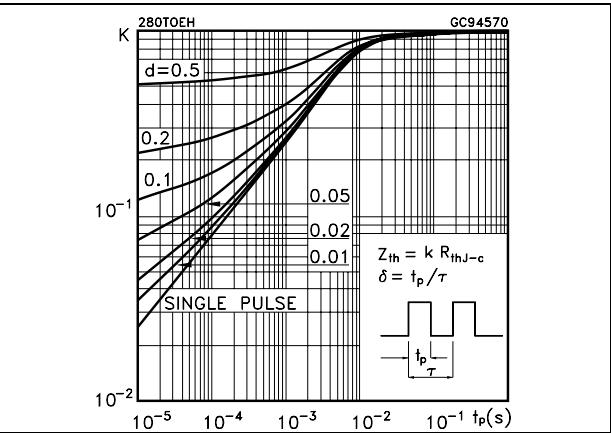


Figure 4. Output characteristics

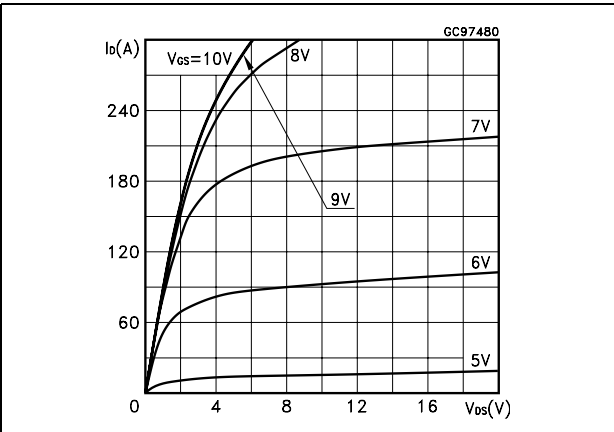


Figure 5. Transfer characteristics

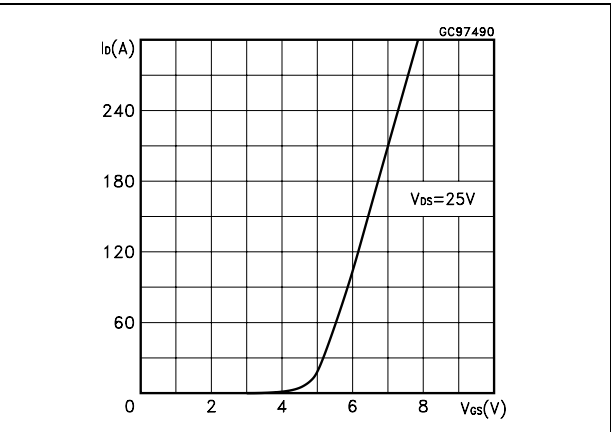


Figure 6. Transconductance

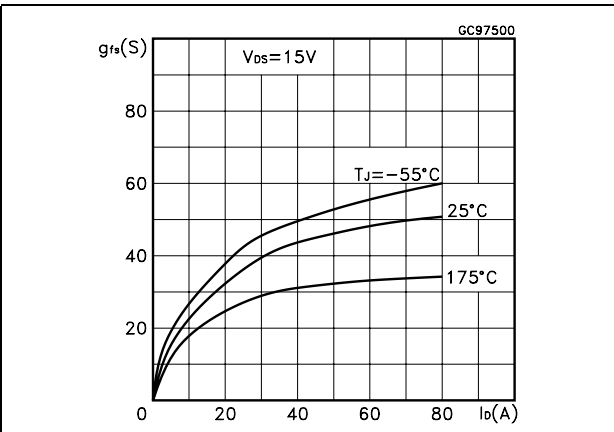


Figure 7. Static drain-source on resistance

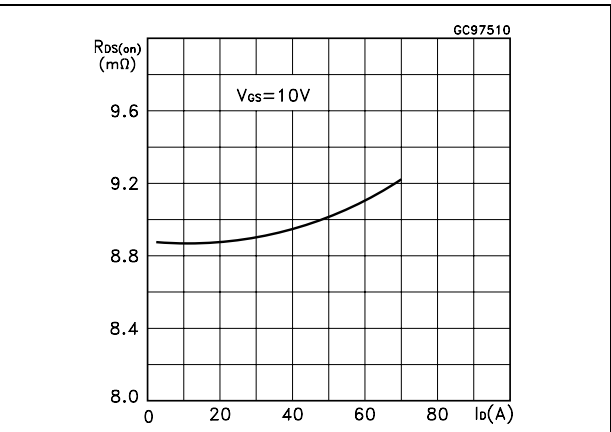


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

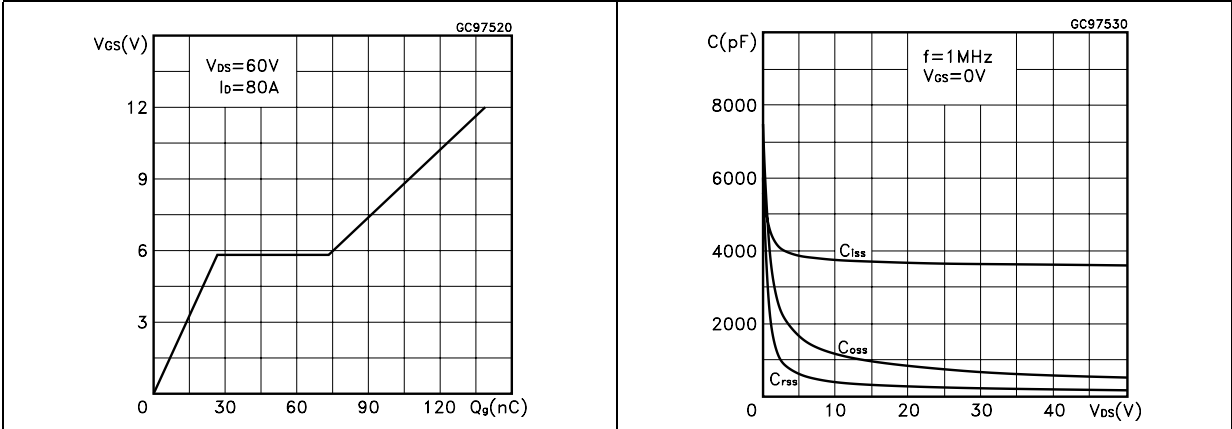


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

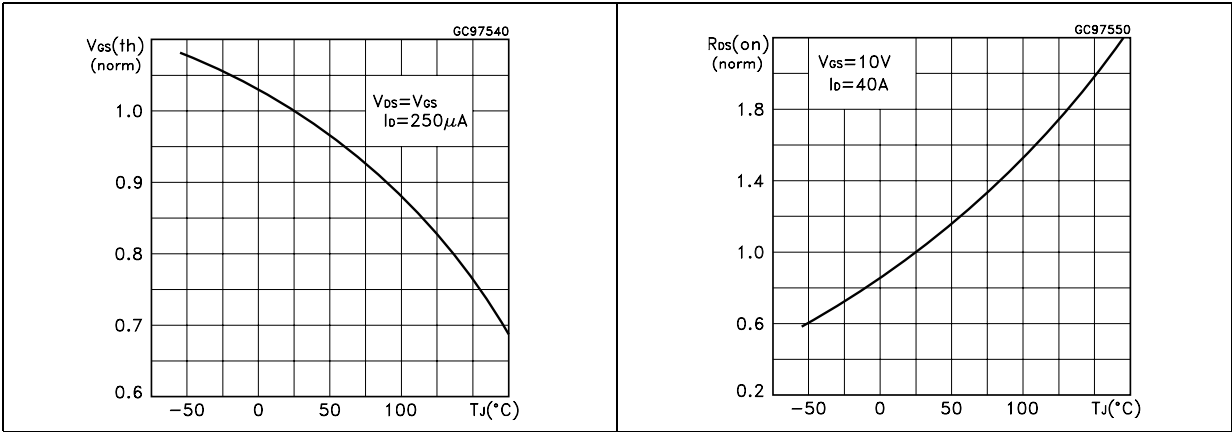
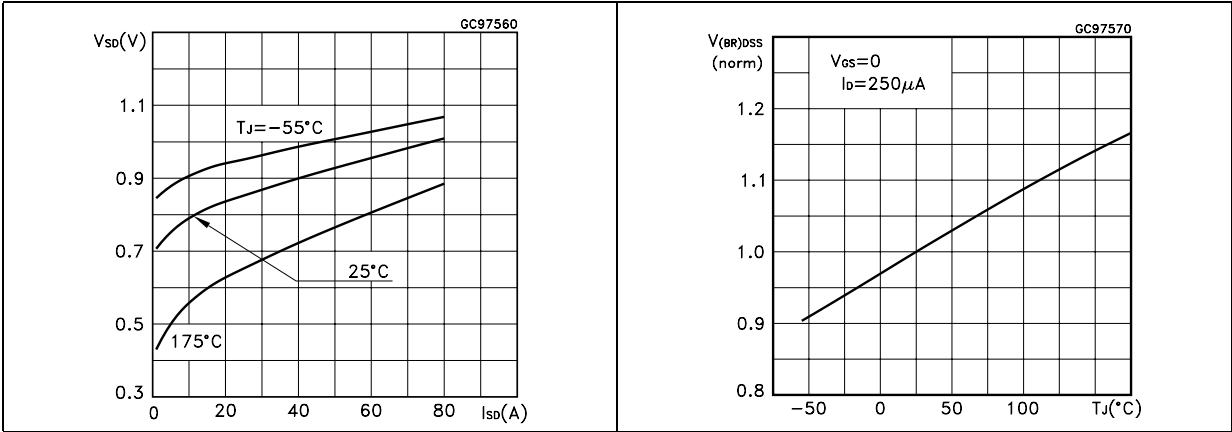


Figure 12. Source-drain diode forward characteristics Figure 13. Normalized $B_{V_{DS}}$ vs temperature



3 Test circuits

Figure 14. Switching times test circuit for resistive load

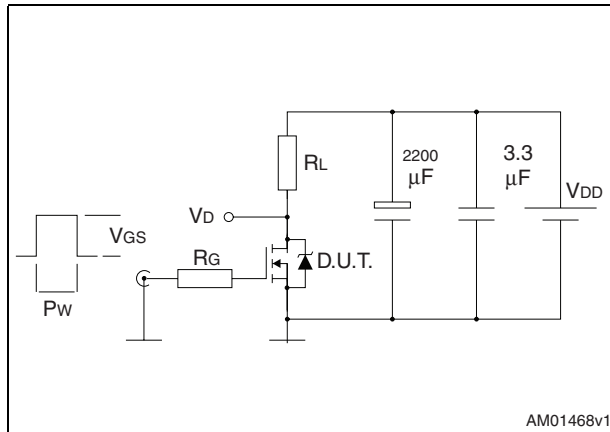


Figure 15. Gate charge test circuit

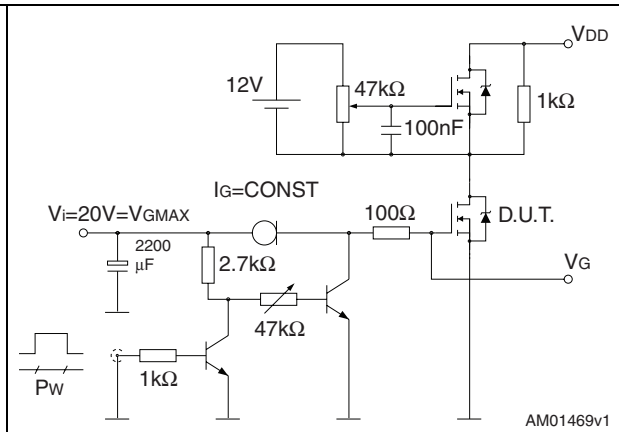


Figure 16. Test circuit for inductive load switching and diode recovery times

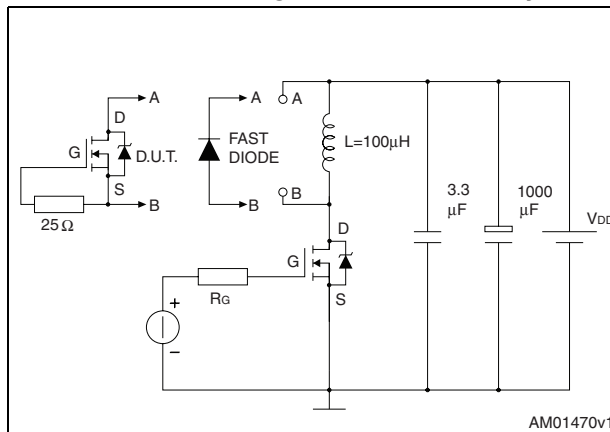


Figure 17. Unclamped inductive load test circuit

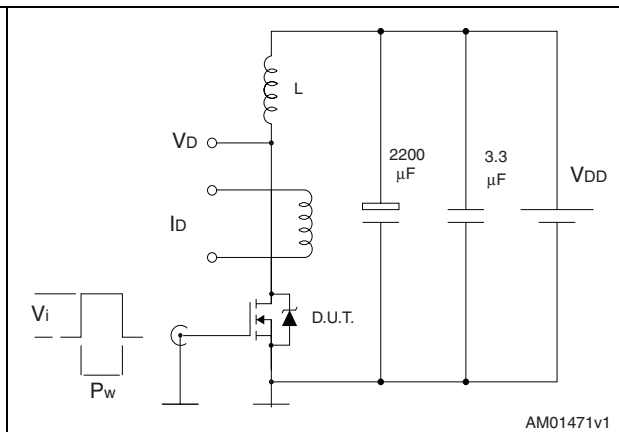
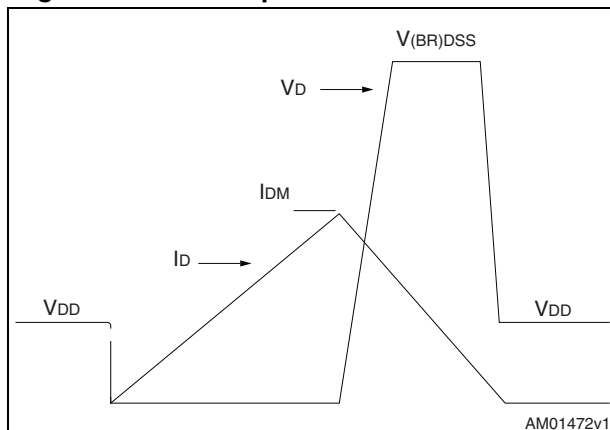


Figure 18. Unclamped inductive waveform

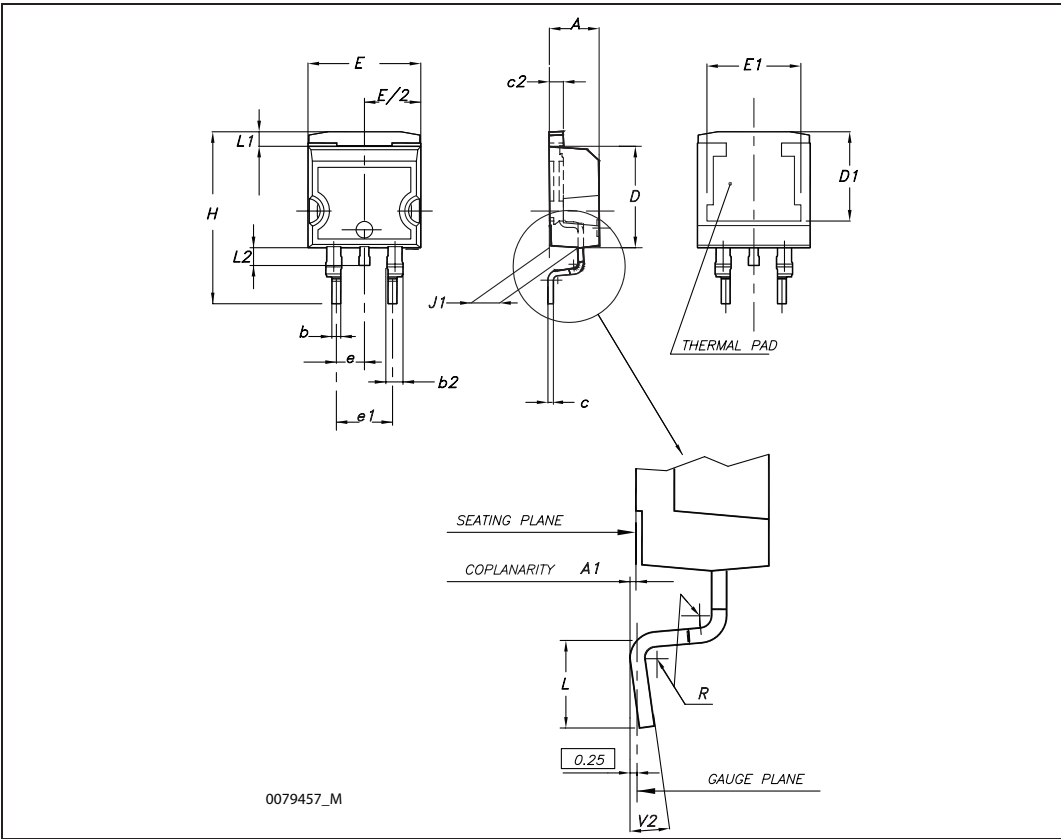


4 Package mechanical data

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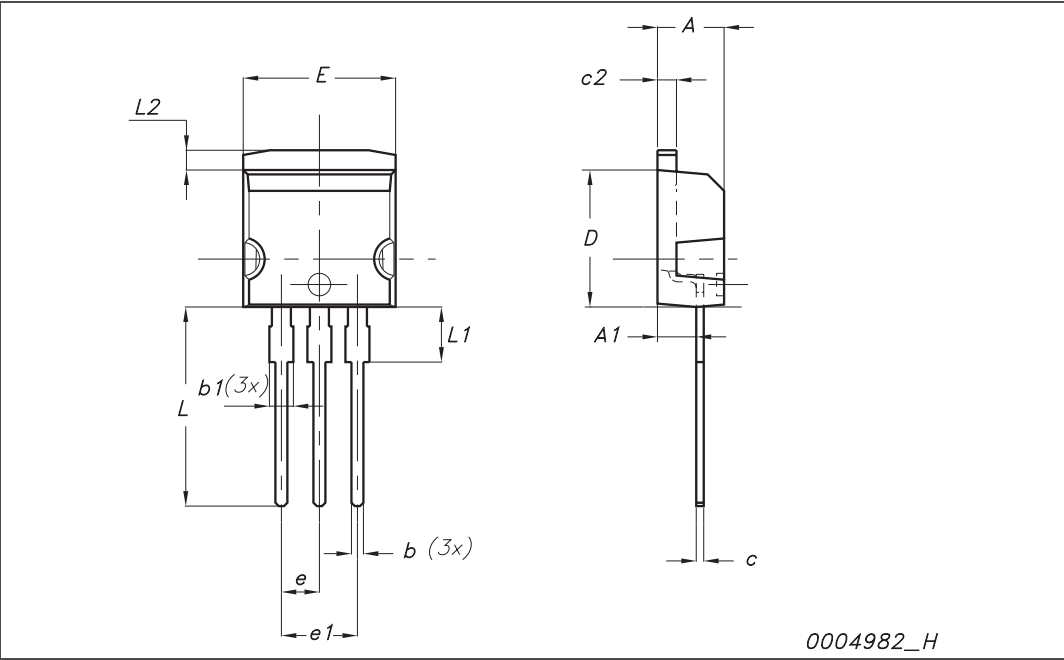
D²PAK (TO-263) mechanical data

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°



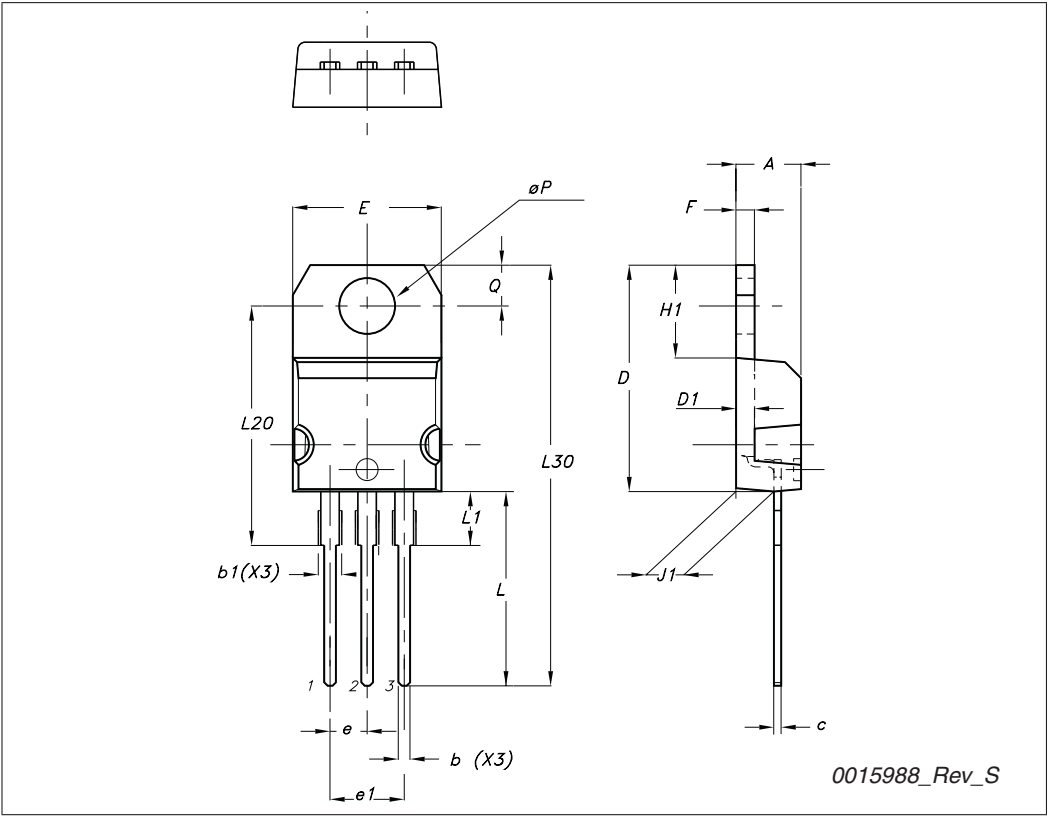
I²PAK (TO-262) mechanical data

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



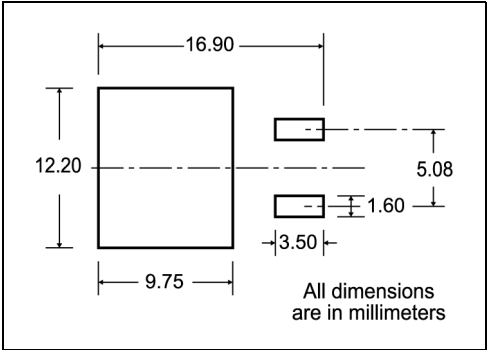
TO-220 type A mechanical data

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	
ØP	3.75		3.85
Q	2.65		2.95

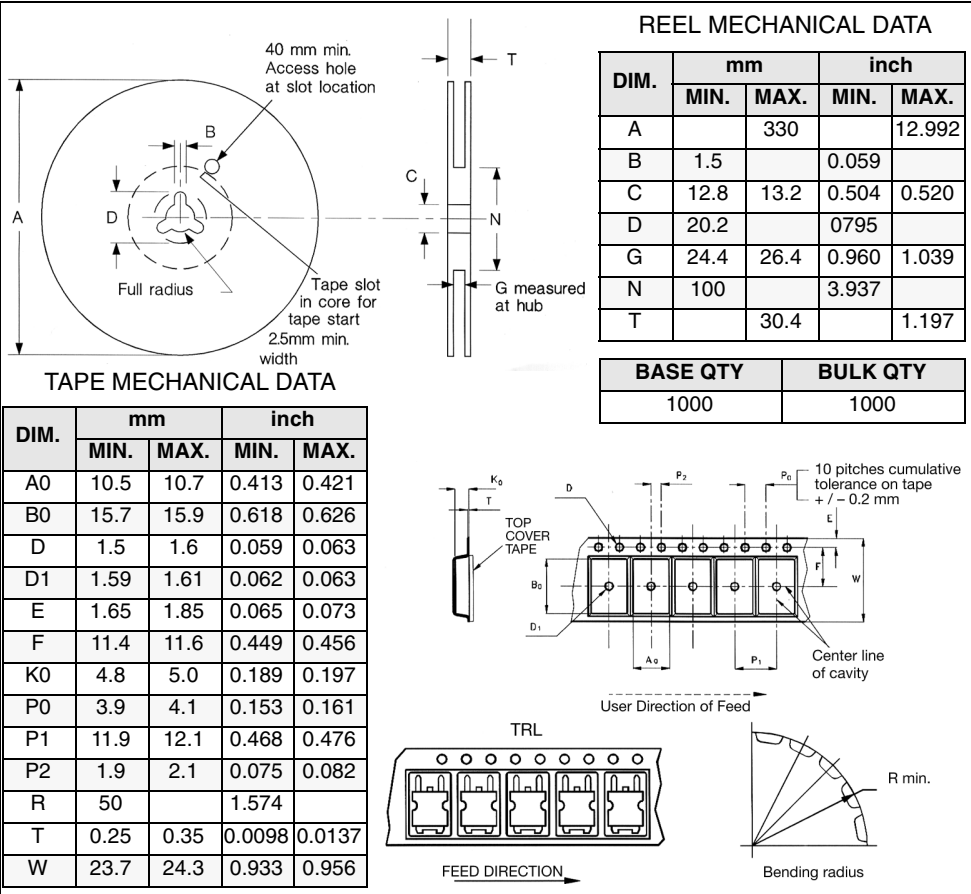


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



* 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: I ² PAK

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