



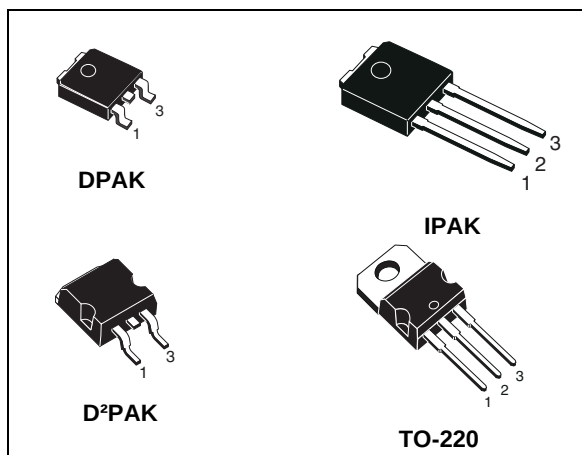
STB95N3LLH6, STD95N3LLH6 STP95N3LLH6, STU95N3LLH6

N-channel 30 V, 0.0037 Ω , 80 A, D²PAK, DPAK, IPAK, TO-220
STripFET™ VI DeepGATE™ Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	I _D
STB95N3LLH6	30 V	0.0042 Ω	80 A
STD95N3LLH6	30 V	0.0042 Ω	80 A
STP95N3LLH6	30 V	0.0042 Ω	80 A
STU95N3LLH6	30 V	0.0047 Ω	80 A

- R_{DS(on)} * Q_g industry benchmark
- Extremely low on-resistance R_{DS(on)}
- High avalanche ruggedness
- Low gate drive power losses



Application

- Switching applications

Description

This product utilizes the 6th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Figure 1. Internal schematic diagram

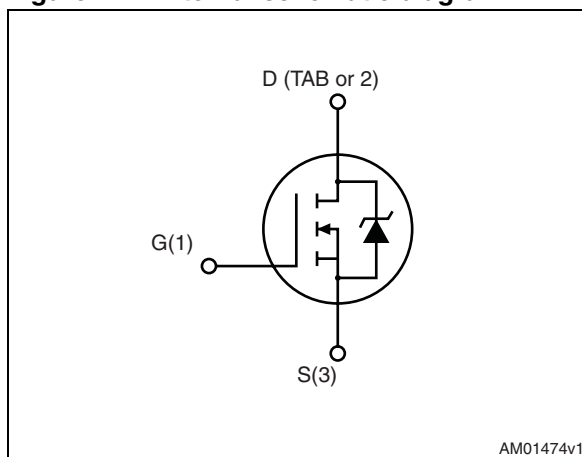


Table 1. Device summary

Order codes	Marking	Package	Packaging
STB95N3LLH6	95N3LLH6	D ² PAK	Tape and reel
STD95N3LLH6	95N3LLH6	DPAK	Tape and reel
STP95N3LLH6	95N3LLH6	TO-220	Tube
STU95N3LLH6	95N3LLH6	IPAK	Tube

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	30	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	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	61	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	70	W
	Derating factor	0.47	W/ $^{\circ}\text{C}$
$E_{AS}^{(3)}$	Single pulse avalanche energy	150	mJ
T_{stg}	Storage temperature	-55 to 175	$^{\circ}\text{C}$
T_j	Max. operating junction temperature	175	$^{\circ}\text{C}$

1. Limited by wire bonding
2. Pulse width limited by safe operating area
3. Starting $T_j = 25\text{ }^{\circ}\text{C}$, $I_{AV} = 55\text{ A}$, $L = 0.1\text{ mH}$

Table 3. Thermal data

Symbol	Parameter	Value				Unit
		D ² PAK	DPAK	IPAK	TO-220	
$R_{thj-case}$	Thermal resistance junction-case max	2.14				$^{\circ}\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max		100		62.5	$^{\circ}\text{C/W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	35	35			$^{\circ}\text{C/W}$
T_l	Maximum lead temperature for soldering purpose	275			300	$^{\circ}\text{C}$

1. When mounted on FR-4 board of 1 inch², 2 oz Cu.

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 30\text{ V}$ $V_{DS} = 30\text{ V}$, $T_c = 125\text{ }^{\circ}\text{C}$			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	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 40\text{ A}$ SMD version		0.0037	0.0042	Ω
		$V_{GS} = 10\text{ V}$, $I_D = 40\text{ A}$		0.0042	0.0047	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 40\text{ A}$ SMD version		0.0055	0.007	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 40\text{ A}$		0.006	0.0075	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	2200 400 280	-	pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 15\text{ V}$, $I_D = 80\text{ A}$ $V_{GS} = 4.5\text{ V}$ Figure 13	-	20 8.2 7.5	-	nC nC nC
Q_{gs1} Q_{gs2}	Pre V_{th} gate-to-source charge Post V_{th} gate-to-source charge	$V_{DD} = 15\text{ V}$, $I_D = 80\text{ A}$ Figure 18	-	3.4 6.2	-	nC nC
R_G	Gate input resistance	$f = 1\text{ MHz}$ gate bias Bias = 0 test signal level = 20 mV open drain	-	1	-	Ω

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD} = 15\text{ V}$, $I_D = 40\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 5\text{ V}$ Figure 12	-	19 91	-	ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD} = 15\text{ V}$, $I_D = 40\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 5\text{ V}$ Figure 12	-	24.5 23.4	-	ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		80 320	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 40\text{ A}$, $V_{GS} = 0$	-		1.1	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 24\text{ V}$ Figure 14	-	28.6 22.8 1.6		ns nC 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

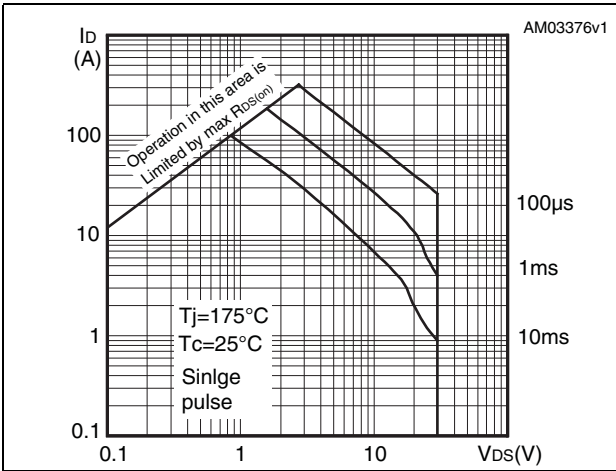


Figure 3. Thermal impedance

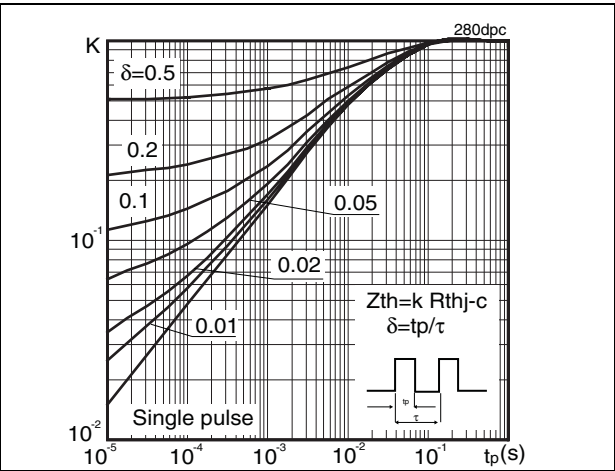


Figure 4. Output characteristics

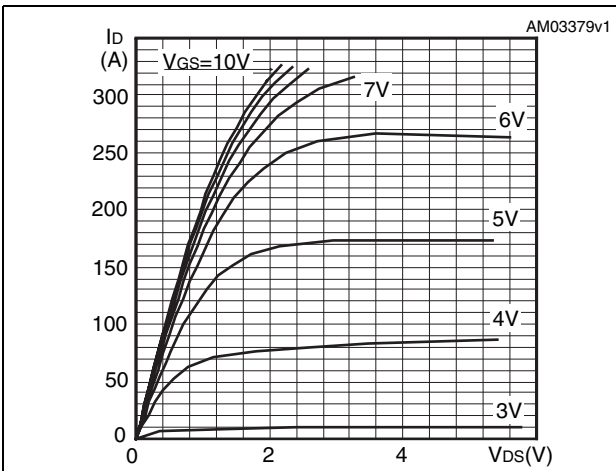


Figure 5. Transfer characteristics

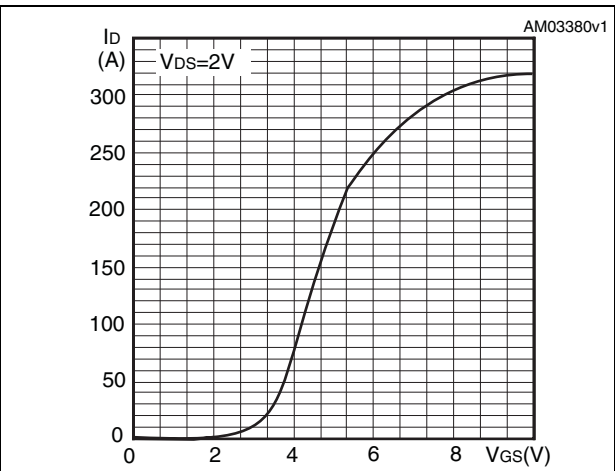


Figure 6. Normalized BV_{DSS} vs temperature

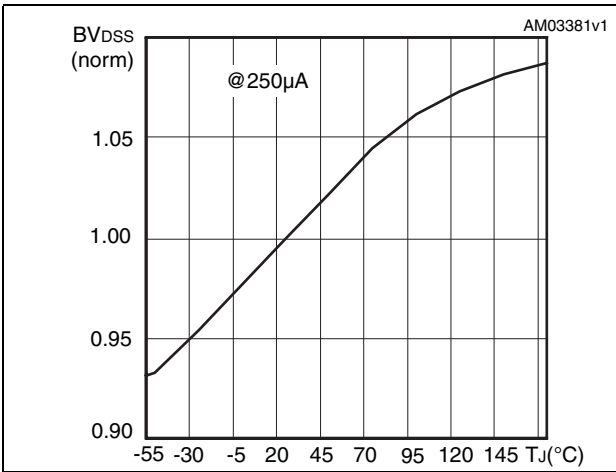


Figure 7. Static drain source on resistance

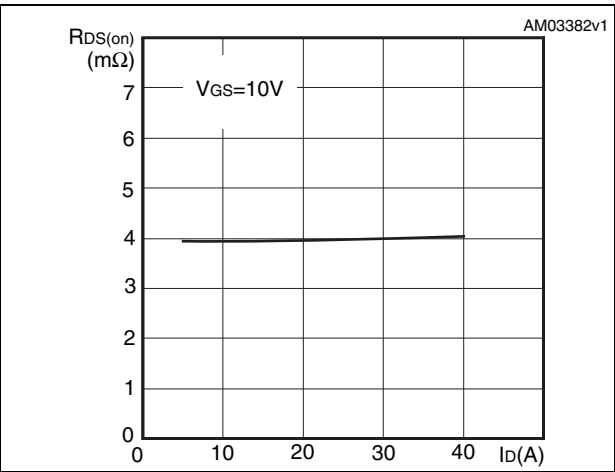


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

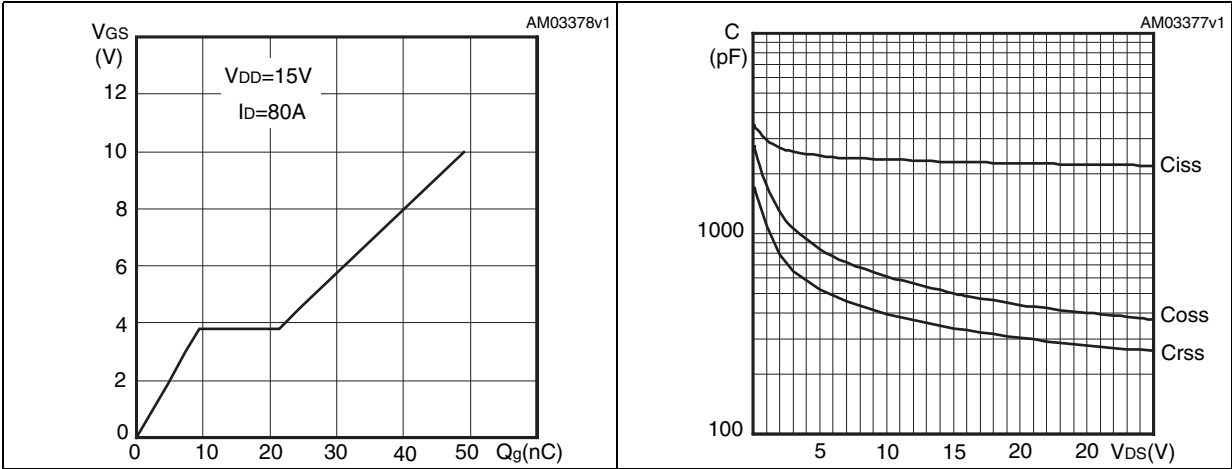


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

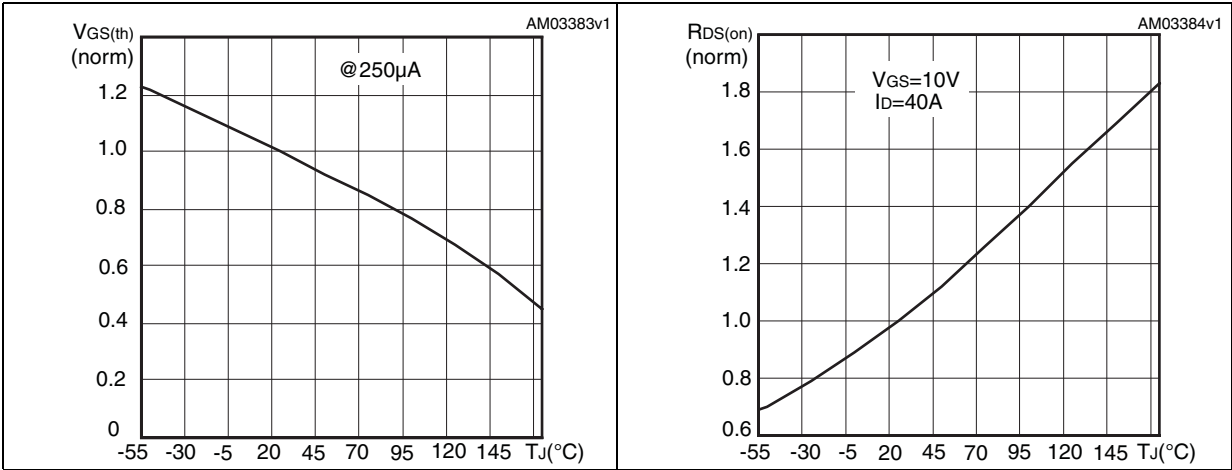
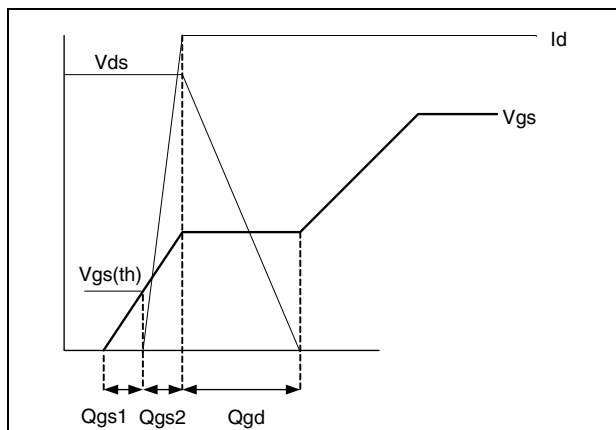


Figure 18. Gate charge waveform

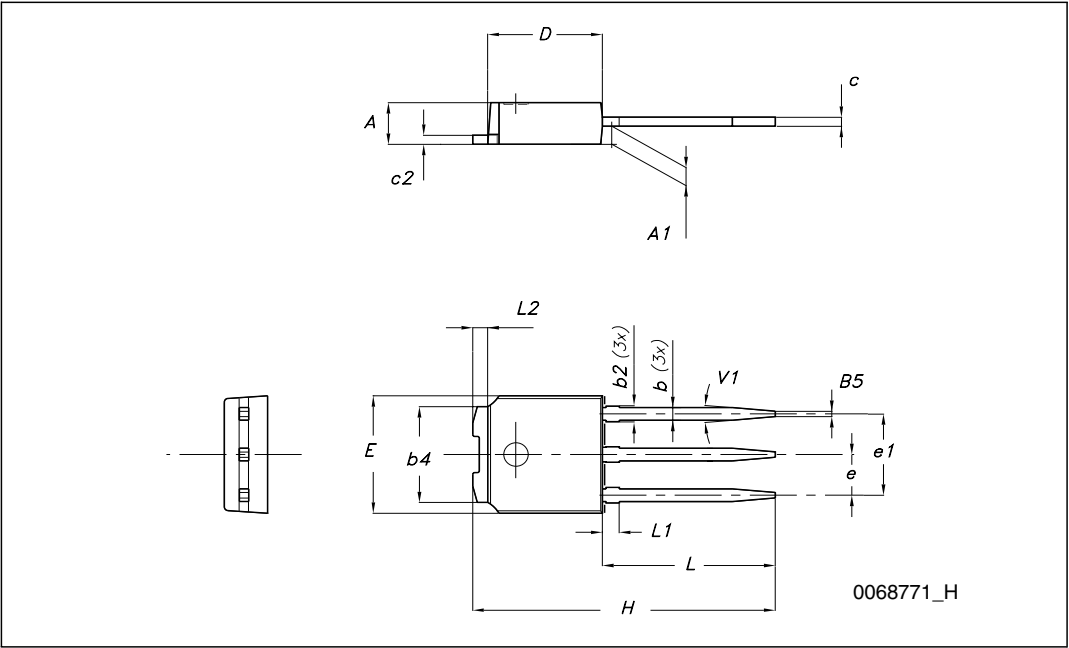


4 **Package mechanical data**

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.

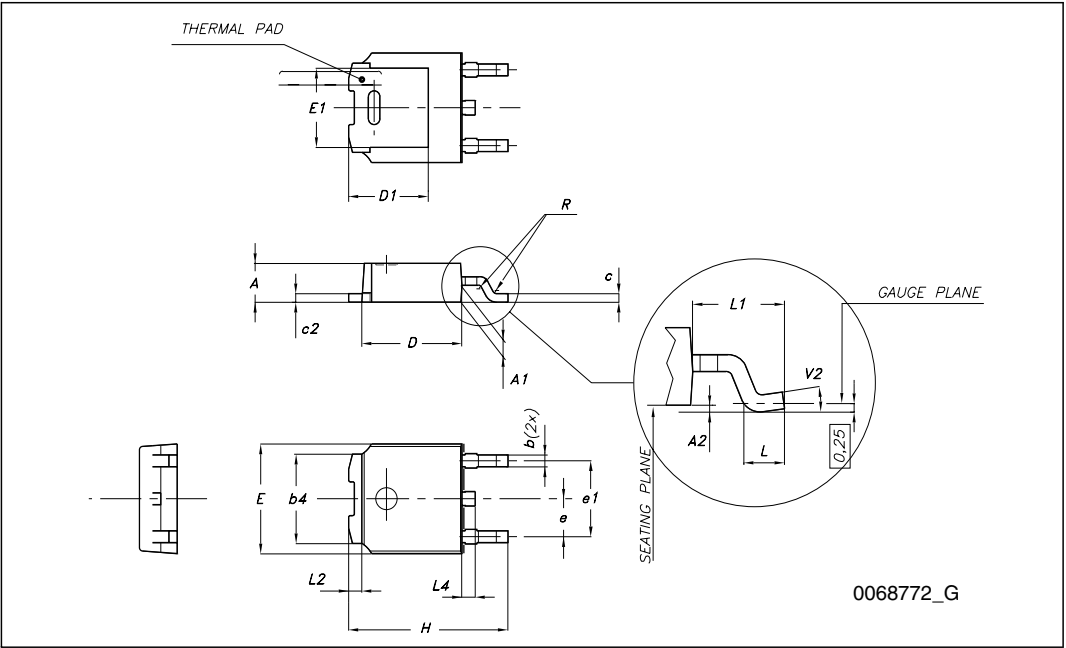
TO-251 (IPAK) mechanical data

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°	



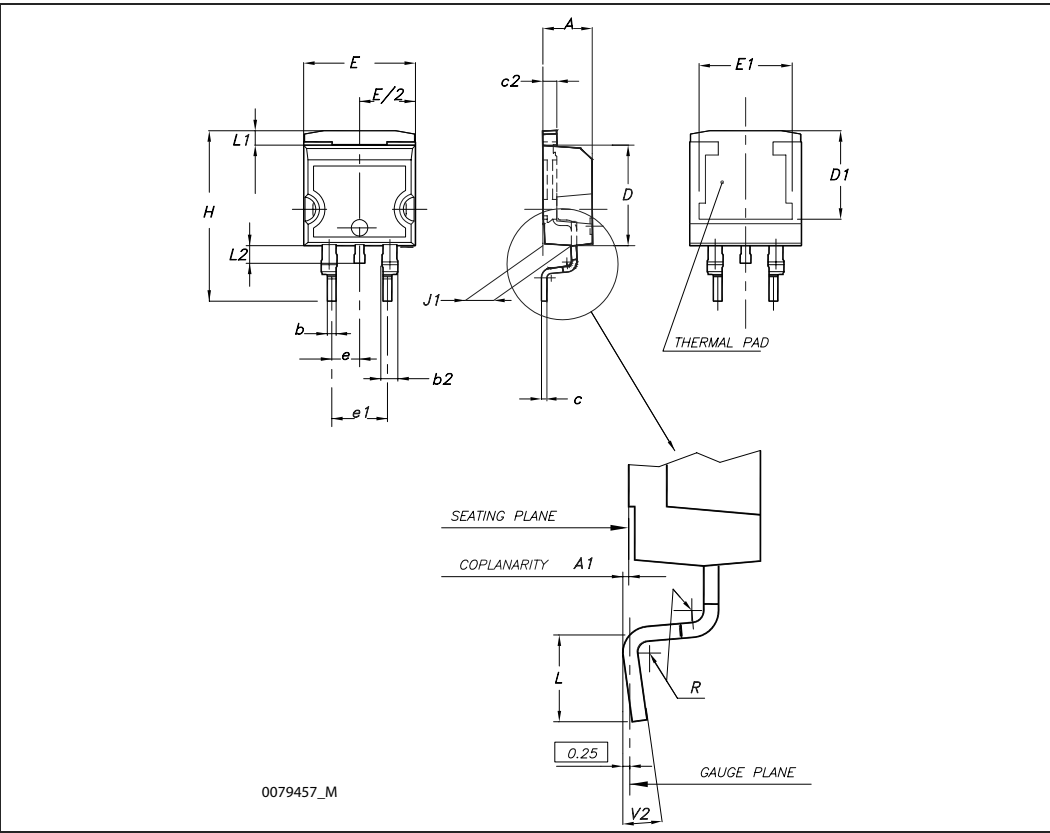
TO-252 (DPAK) mechanical data

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°



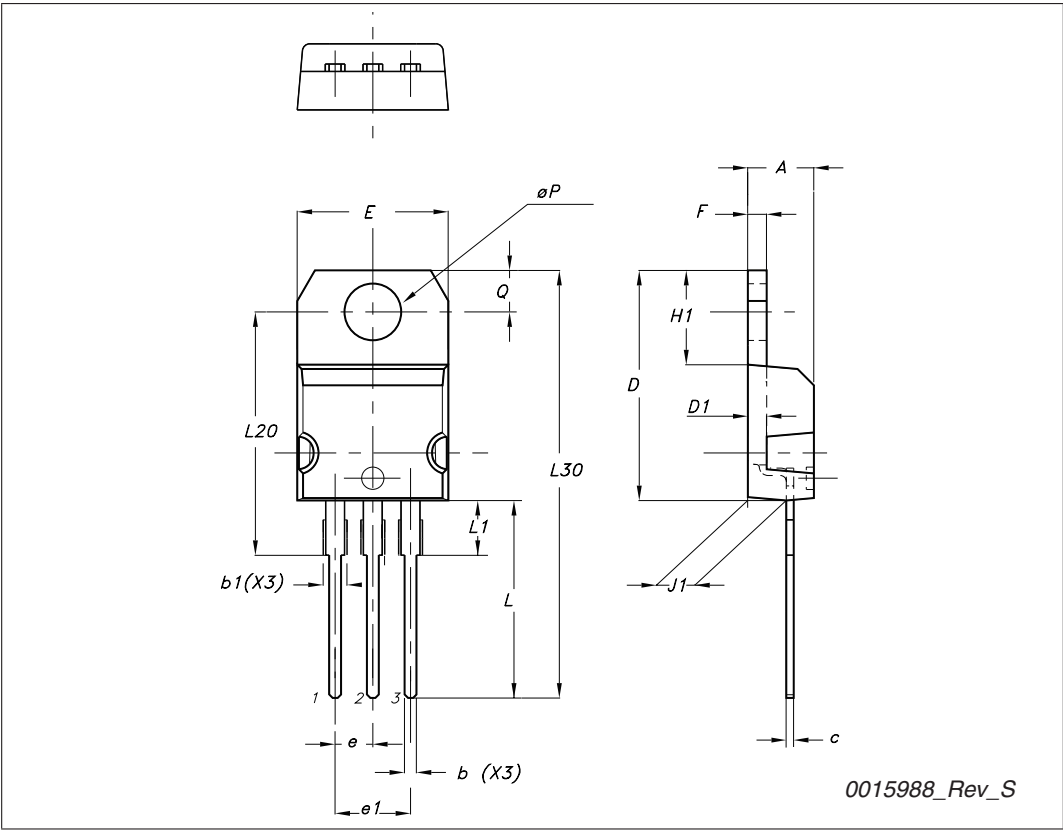
D²PAK (TO-263) mechanical data

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°



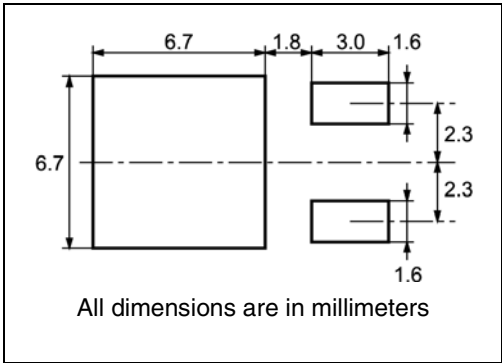
TO-220 type A mechanical data

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

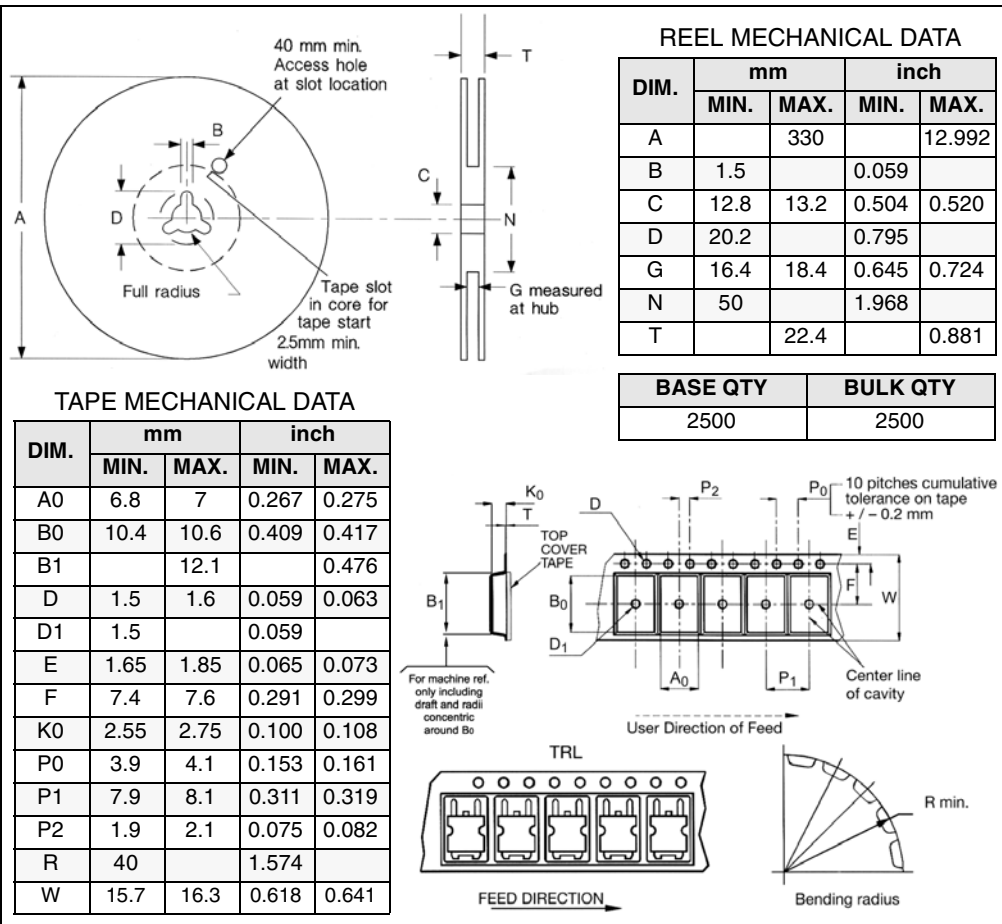


5 Packaging mechanical data

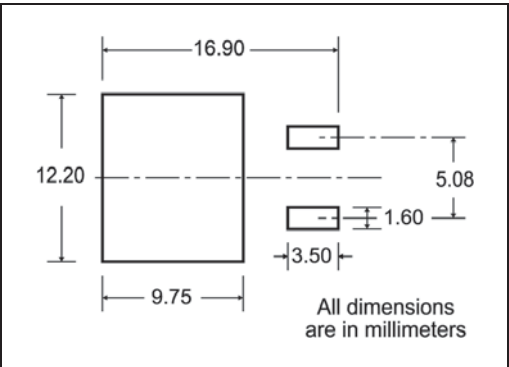
DPAK FOOTPRINT



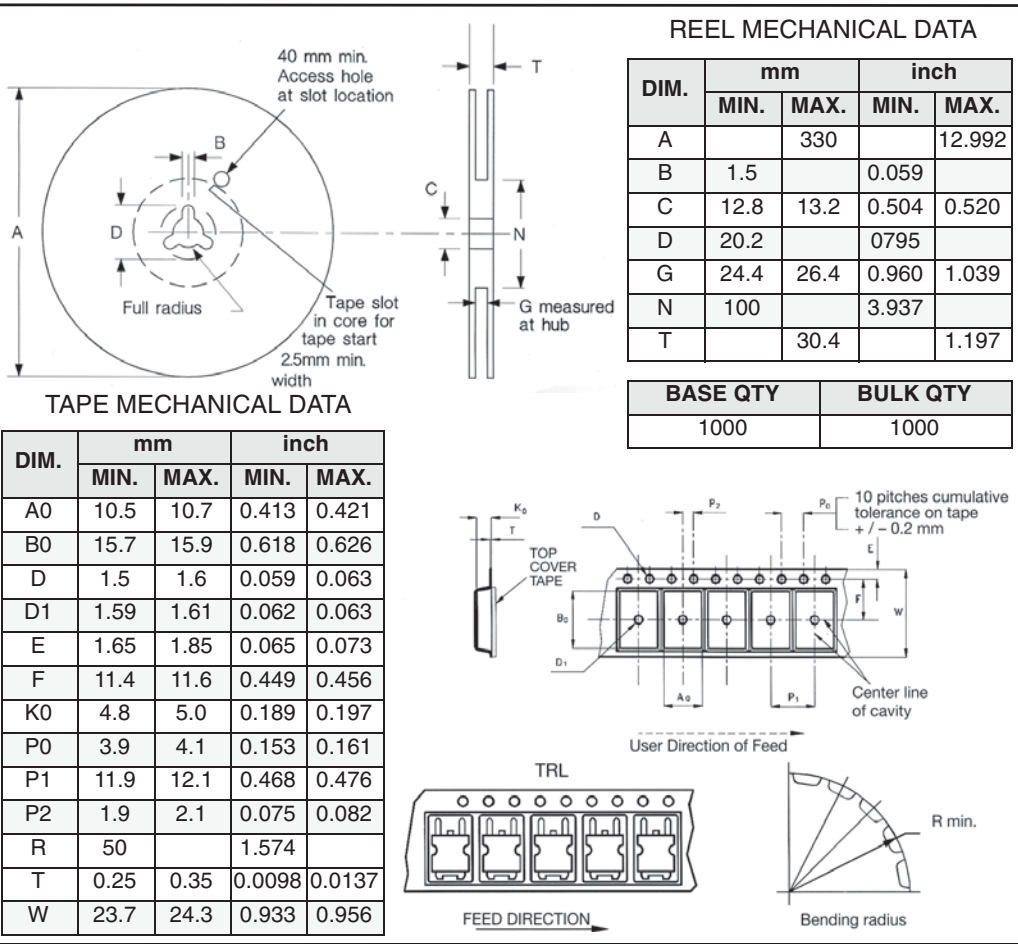
TAPE AND REEL SHIPMENT



D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



6 Revision history

Table 8. Document revision history

Date	Revision	Changes
01-Dec-2008	1	First release
20-May-2009	2	– Document status promoted from preliminary data to datasheet. – Added new package, mechanical data: D ² PAK
10-Nov-2009	3	Added new device in TO-220

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