



STD65N3LLH5 STU65N3LLH5

N-channel 30 V, 0.0061 Ω , 65 A, DPAK, IPAK
STripFET™ V Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	I _D
STD65N3LLH5	30 V	0.0069 Ω	65 A
STU65N3LLH5	30 V	0.0073 Ω	65 A

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

Application

Switching applications

Description

This STripFET™V Power MOSFET technology is among the latest improvements, which have been especially tailored to achieve very low on-state resistance providing also one of the best-in-class figure of merit.

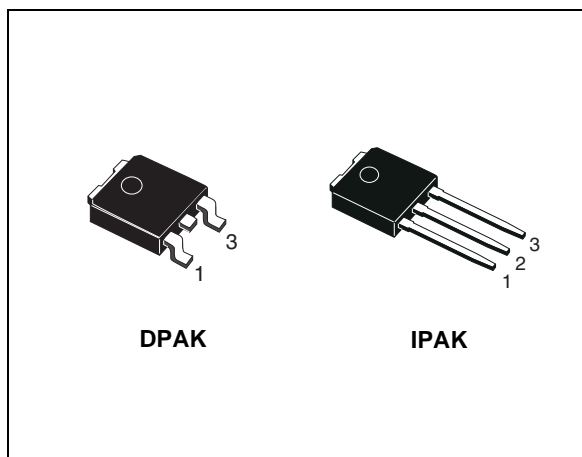


Figure 1. Internal schematic diagram

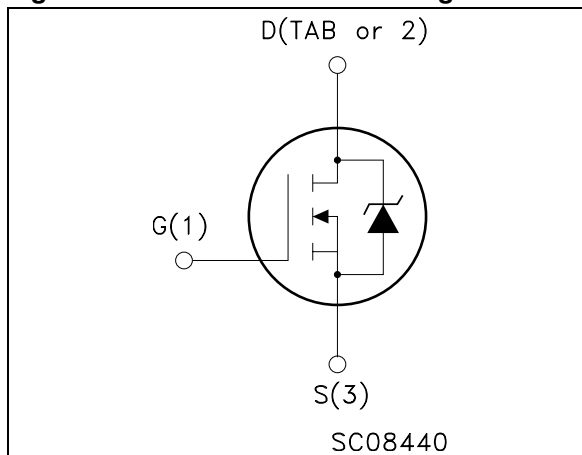


Table 1. Device summary

Order code	Marking	Package	Packaging
STD65N3LLH5	65N3LLH5	DPAK	Tape and reel
STU65N3LLH5	65N3LLH5	IPAK	Tube

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	6
3	Test circuits	8
4	Package mechanical data	9
5	Packaging mechanical data	14
6	Revision history	16

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	± 22	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	65	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	46	A
$I_{DM}^{(1)}$	Drain current (pulsed)	260	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	50	W
	Derating factor	0.3	W/ $^\circ\text{C}$
$E_{AS}^{(2)}$	Single pulse avalanche energy	TBD	mJ
T_j T_{stg}	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Pulse width limited by safe operating area.

2. Starting $T_j = 25\text{ }^\circ\text{C}$, $I_d = 32.5\text{ A}$, $V_{dd} = 12\text{ V}$.

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	3	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-case max	100	$^\circ\text{C/W}$
T_j	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

2 Electrical characteristics

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

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0$	30			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 30\text{ V}$ $V_{DS} = 30\text{ V}$, $T_c = 125\text{ °C}$			1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 22\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	1	1.8	3	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 32.5\text{ A}$ SMD version		0.0061	0.0069	Ω
		$V_{GS} = 10\text{ V}$, $I_D = 32.5\text{ A}$		0.0065	0.0073	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 32.5\text{ A}$ SMD version		0.0084	0.0093	Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 32.5\text{ A}$		0.0088	0.0097	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	1290	-	pF
C_{oss}	Output capacitance			240		pF
C_{rss}	Reverse transfer capacitance			32		pF
Q_g	Total gate charge	$V_{DD} = 15\text{ V}$, $I_D = 65\text{ A}$	-	8	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 4.5\text{ V}$		3.6		nC
Q_{gd}	Gate-drain charge	(<i>Figure 14</i>)		3.4		nC
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$ Gate DC Bias = 0 test signal level = 20 mV open drain		1.7		Ω

Table 6. Switching on/off (resistive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD}=10\text{ V}$, $I_D=65\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ (<i>Figure 13</i> and <i>Figure 18</i>)	-	8.6 11.2	-	ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD}=10\text{ V}$, $I_D=25\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ (<i>Figure 13</i> and <i>Figure 18</i>)	-	32.4 6	-	ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain current Source-drain current (pulsed) ⁽¹⁾		-		65 260	A A
V_{SD}	Forward on voltage	$I_{SD}=32.5\text{ A}$, $V_{GS}=0$	-		1.1	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=32.5\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$, $V_{DD}=20\text{ V}$, (<i>Figure 15</i>)	-	22 15 1.4		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

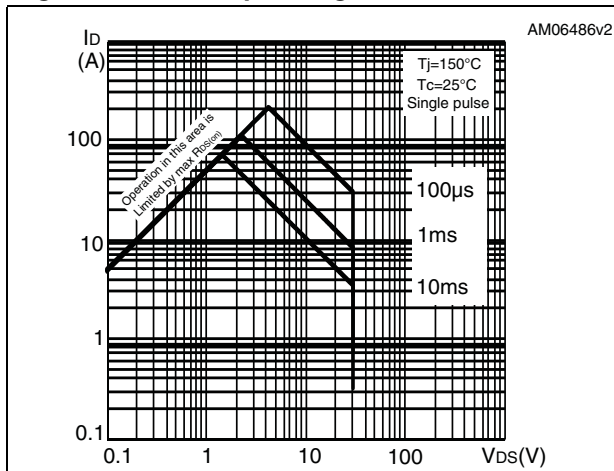


Figure 3. Thermal impedance

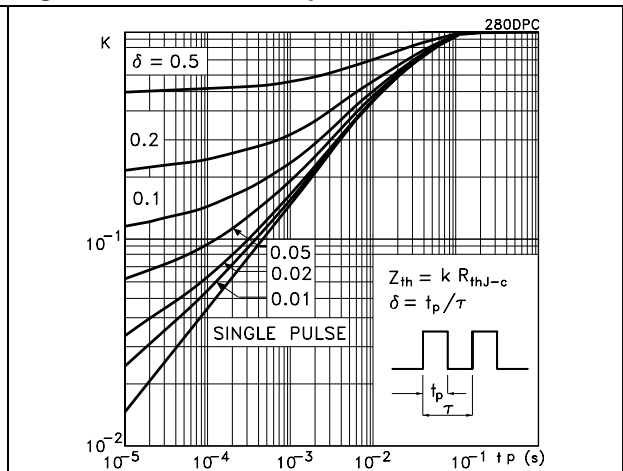


Figure 4. Output characteristics

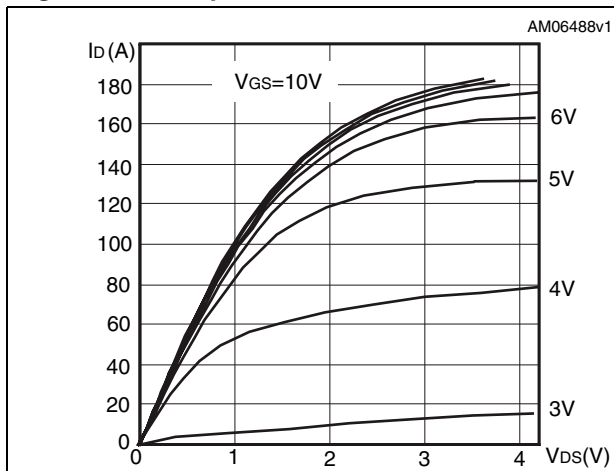


Figure 5. Transfer characteristics

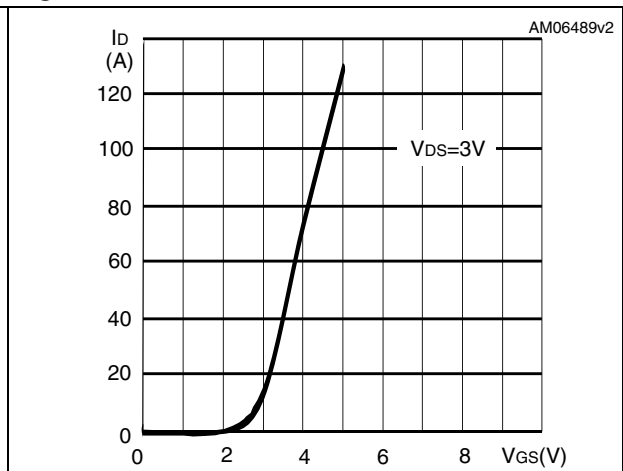


Figure 6. Normalized BV_{DSS} vs temperature

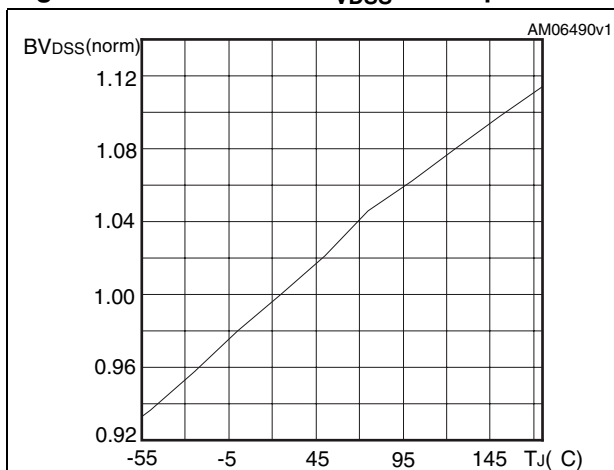


Figure 7. Static drain-source on resistance

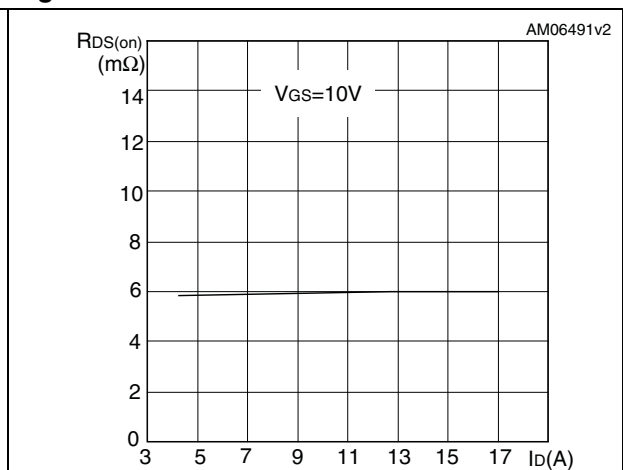


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

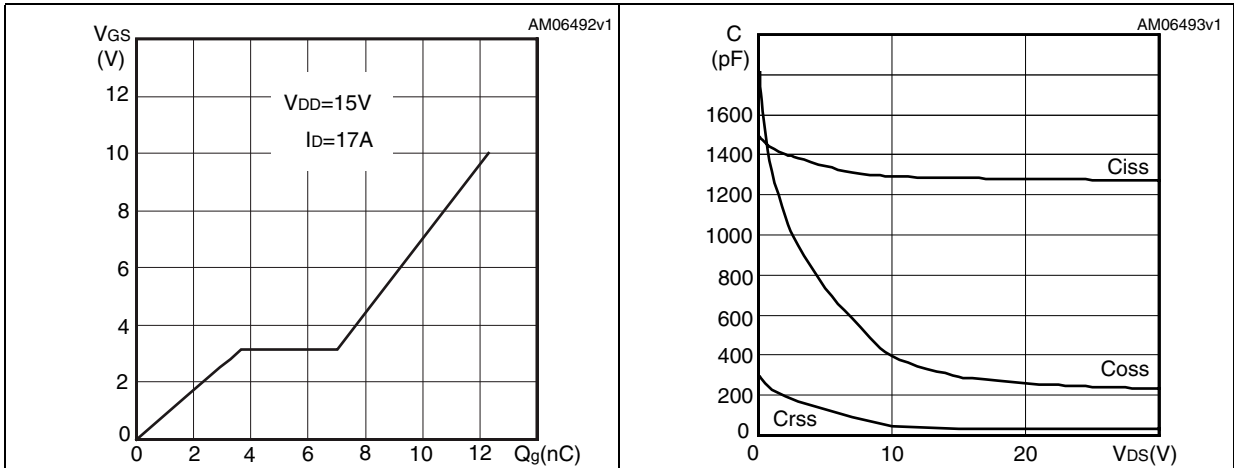


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

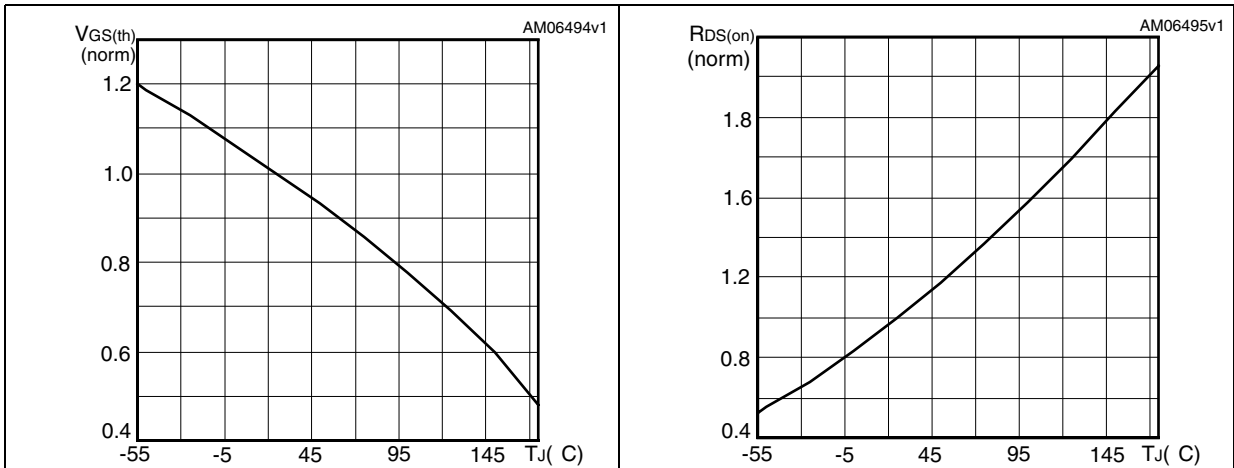
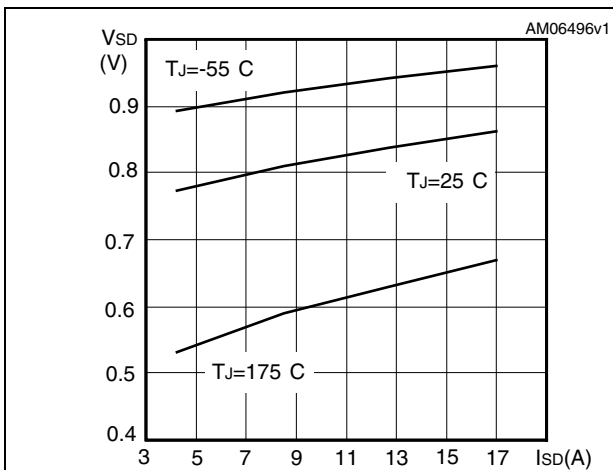


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load



Figure 14. Gate charge test circuit

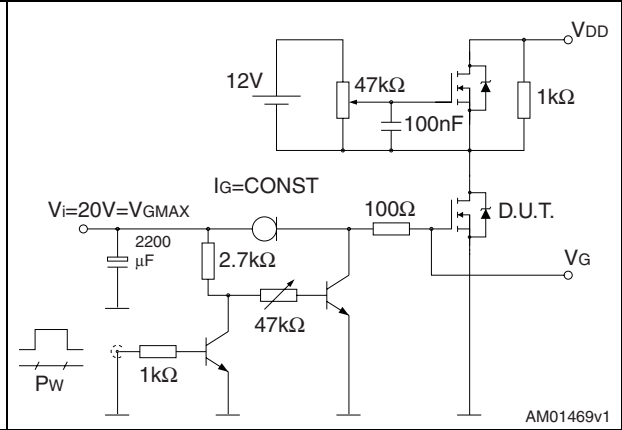


Figure 15. Test circuit for inductive load switching and diode recovery times

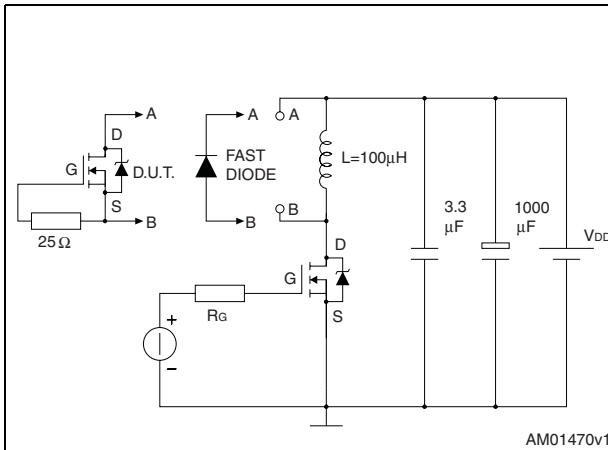


Figure 16. Unclamped inductive load test circuit

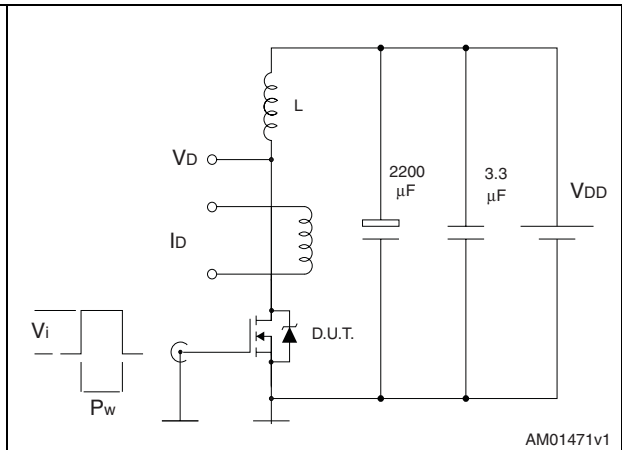


Figure 17. Unclamped inductive waveform

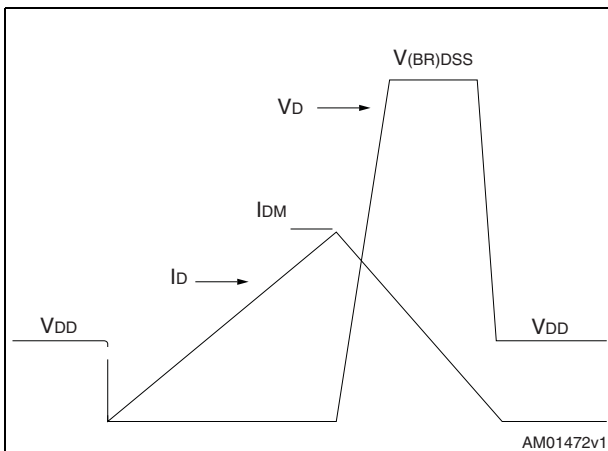
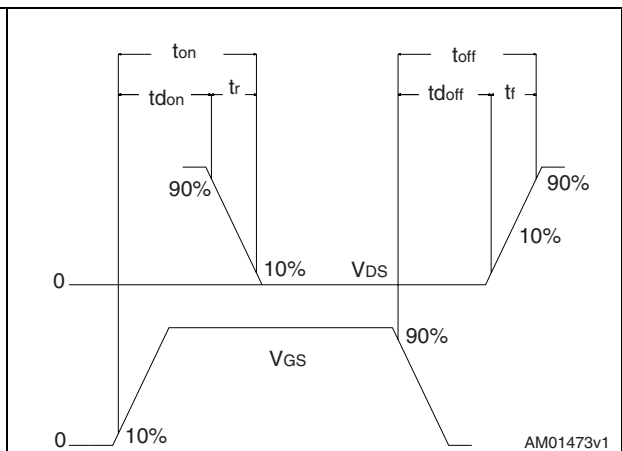


Figure 18. Switching time waveform



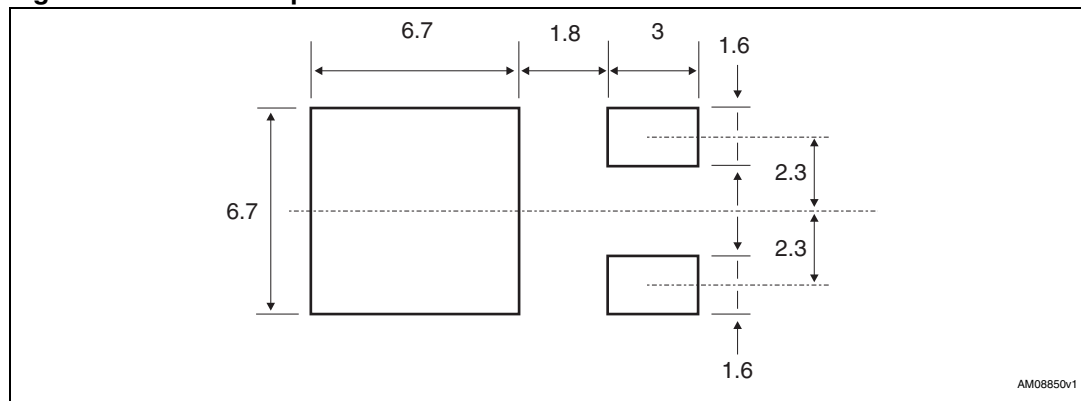
4 Package mechanical data

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.

Table 8. DPAK (TO-252) 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°

Figure 19. DPAK footprint^(a)



a. All dimension are in millimeters

Figure 20. DPAK (TO-252) drawing

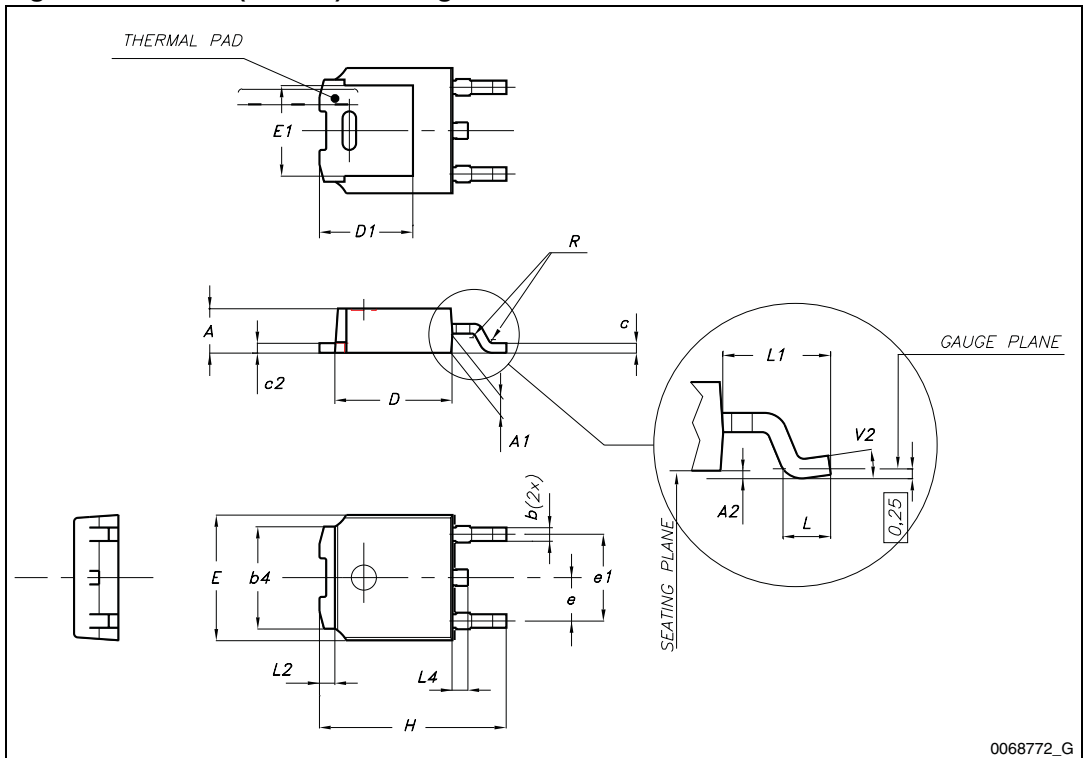
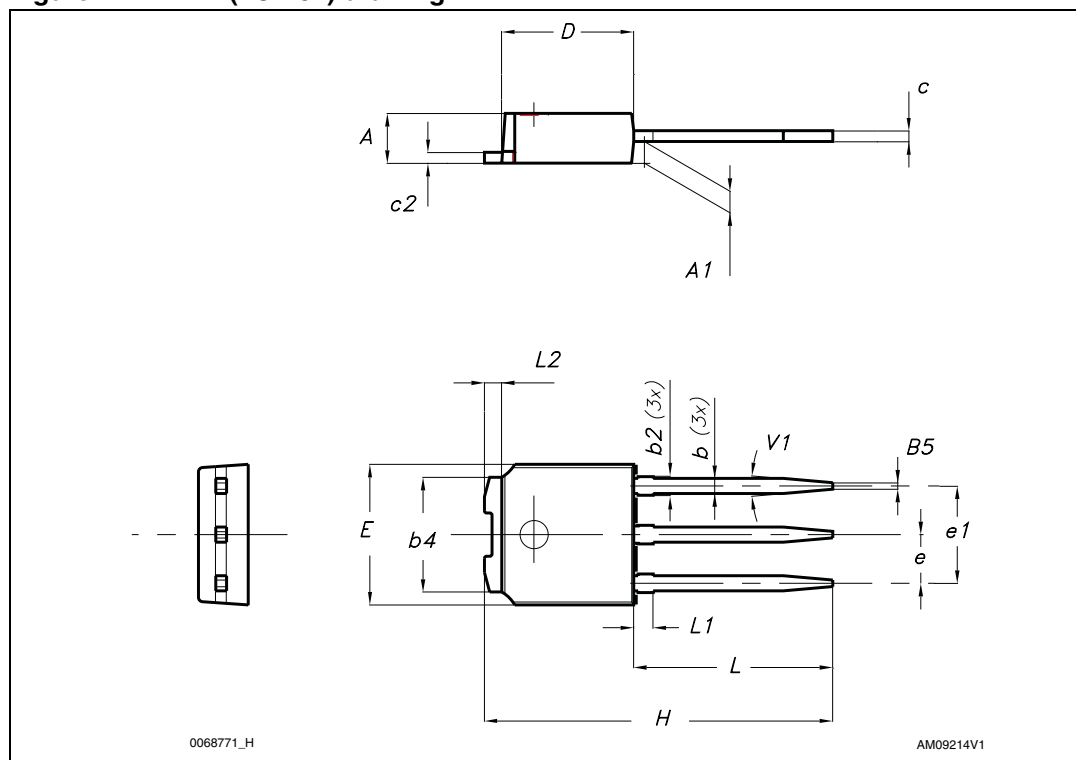


Table 9. IPAK (TO-251) mechanical data

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
B5		0.3	
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	1.00
V1		10°	

Figure 21. IPAK (TO-251) drawing



5 Packaging mechanical data

Table 10. DPAK (TO-252) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	6.8	7	A		330
B0	10.4	10.6	B	1.5	
B1		12.1	C	12.8	13.2
D	1.5	1.6	D	20.2	
D1	1.5		G	16.4	18.4
E	1.65	1.85	N	50	
F	7.4	7.6	T		22.4
K0	2.55	2.75			
P0	3.9	4.1	Base qty.		2500
P1	7.9	8.1	Bulk qty.		2500
P2	1.9	2.1			
R	40				
T	0.25	0.35			
W	15.7	16.3			

Figure 22. Tape for DPAK (TO-252)

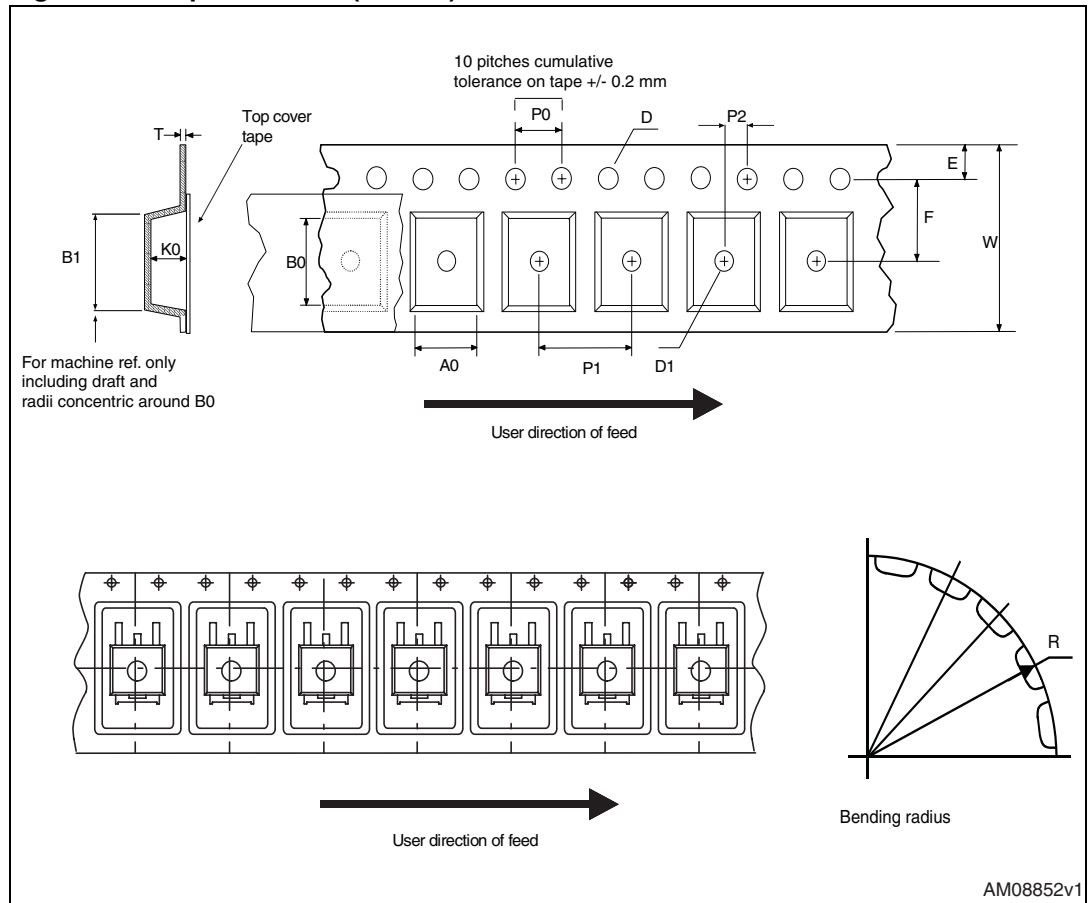
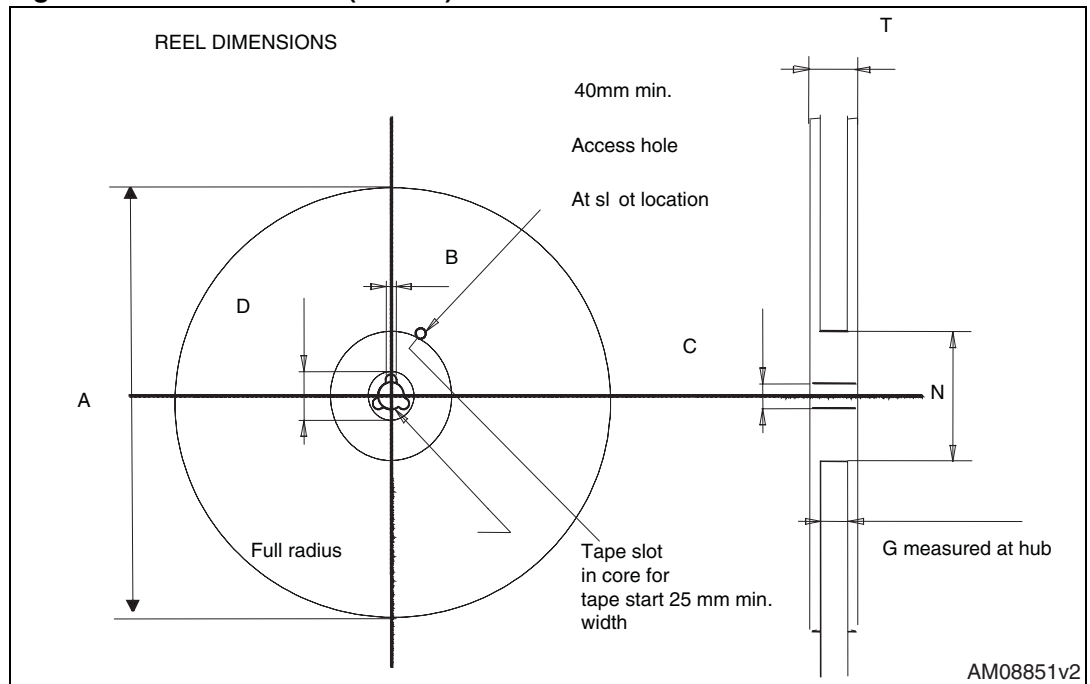


Figure 23. Reel for DPAK (TO-252)



6 Revision history

Table 11. Document revision history

Date	Revision	Changes
19-May-2011	1	First release.

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