

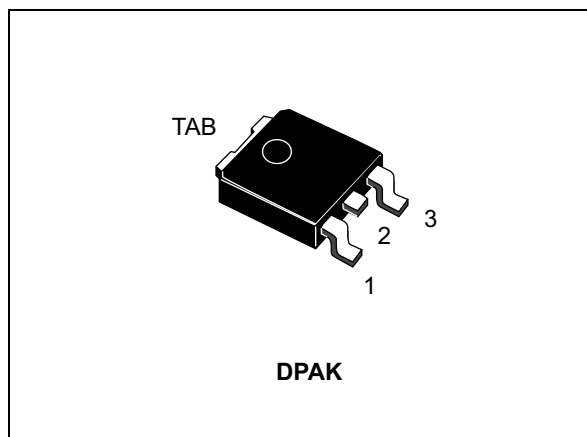
ST(意法) STD86N3LH5 PDF

深圳创唯电子有限公司

<http://www.rohm-chip.com>

Automotive-grade N-channel 30 V, 0.0045 Ω typ, 80 A STripFET H5 Power MOSFET in a DPAK package

Datasheet - production data



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STD86N3LH5	30 V	$< 0.005 \Omega$	80 A

- Designed for automotive applications and AEC-Q101 qualified
- Low on-resistance $R_{DS(on)}$
- High avalanche ruggedness
- Low gate drive power losses

Application

- Switching applications

Description

This device is an N-channel Power MOSFET developed using STMicroelectronics' STripFET™ H5 technology. The device has been optimized to achieve very low on-state resistance, contributing to a FoM that is among the best in its class.

Figure 1. Internal schematic diagram

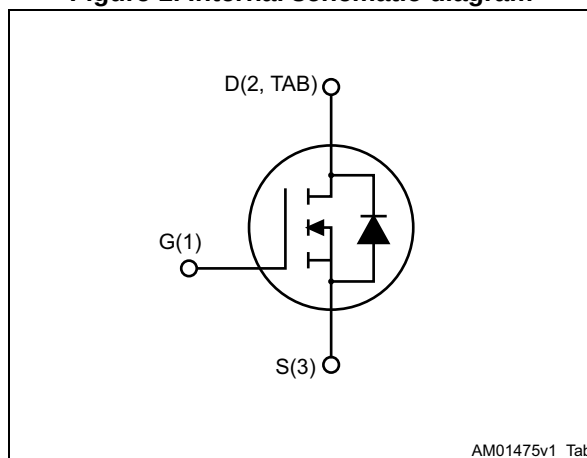


Table 1. Device summary

Order code	Marking	Package	Packaging
STD86N3LH5	86N3LH5	DPAK	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0\text{ V}$)	30	V
V_{DS}	Drain-source voltage ($V_{GS} = 0\text{ V}$) @ T_{JMAX}	35	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ °C}$	80	A
I_D	Drain current (continuous) at $T_C = 100\text{ °C}$	55	A
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ °C}$	70	W
	Derating factor	0.47	W/°C
$E_{AS}^{(3)}$	Single pulse avalanche energy	165	mJ
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Max. operating junction temperature	175	°C

1. Limited by wire bonding
2. Pulse width limited by safe operating area
3. Starting $T_j = 25\text{ °C}$, $I_D = 40\text{ A}$, $V_{DD} = 25\text{ V}$

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	2.14	°C/W
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	50	°C/W

1. When mounted on 1 inch² FR-4 Oz Cu board

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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	30	-	-	V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0\text{ V}$)	$V_{DS} = 20\text{ V}$ $V_{DS} = 20\text{ V}$, $T_c = 125\text{ °C}$	-	-	1 10	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0\text{ V}$)	$V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1	1.8	2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 40\text{ A}$	-	0.0045	0.005	Ω
		$V_{GS} = 5\text{ V}$, $I_D = 40\text{ A}$	-	0.0055	0.0065	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1850	-	pF
C_{oss}	Output capacitance		-	380	-	pF
C_{rss}	Reverse transfer capacitance		-	58	-	pF
Q_g	Total gate charge	$V_{DD} = 15\text{ V}$, $I_D = 80\text{ A}$ $V_{GS} = 5\text{ V}$ Figure 16	-	14	-	nC
Q_{gs}	Gate-source charge		-	6.8	-	nC
Q_{gd}	Gate-drain charge		-	4.7	-	nC
Q_{gs1}	Pre V_{th} gate-to-source charge	$V_{DD} = 15\text{ V}$, $I_D = 80\text{ A}$ $V_{GS} = 5\text{ V}$ Figure 16	-	2.3	-	nC
Q_{gs2}	Post V_{th} gate-to-source charge		-	4.5	-	nC
R_G	Gate input resistance	$f = 1\text{ MHz}$ gate bias Bias = 0 test signal level = 20 mV, open drain	-	1.2	-	Ω

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$, $I_D = 40\text{ A}$, $R_G = 4.7\ \Omega$, $V_{GS} = 5\text{ V}$ Figure 15	-	6	-	ns
t_r	Rise time		-	14	-	ns
$t_{d(off)}$	Turn-off delay time		-	23.6	-	ns
t_f	Fall time		-	10.8	-	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	$I_{SD} = 40\text{ A}$, $V_{GS} = 0$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 20\text{ V}$ Figure 17	-	31.8		ns
Q_{rr}	Reverse recovery charge		-	26.1		nC
I_{RRM}	Reverse recovery current		-	1.6		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

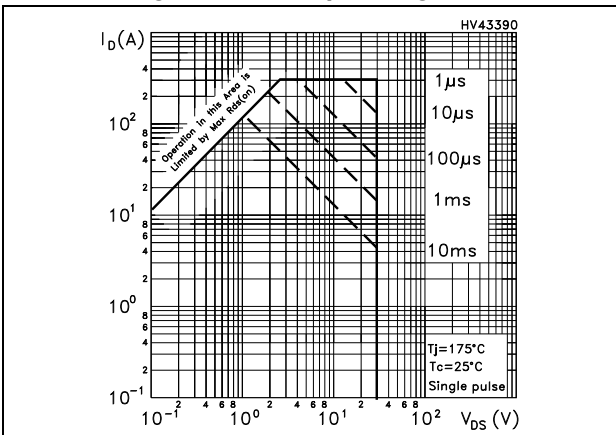


Figure 3. Thermal impedance

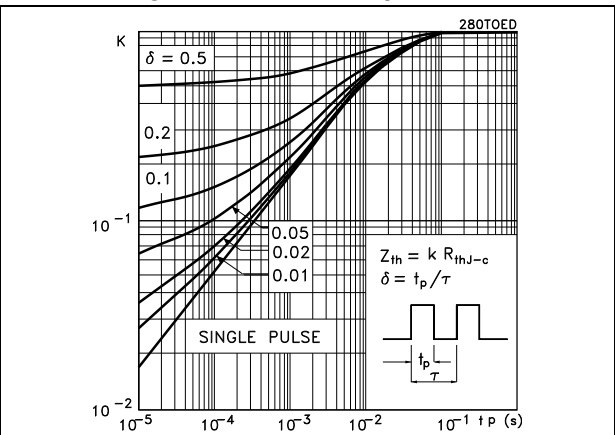


Figure 4. Output characteristics

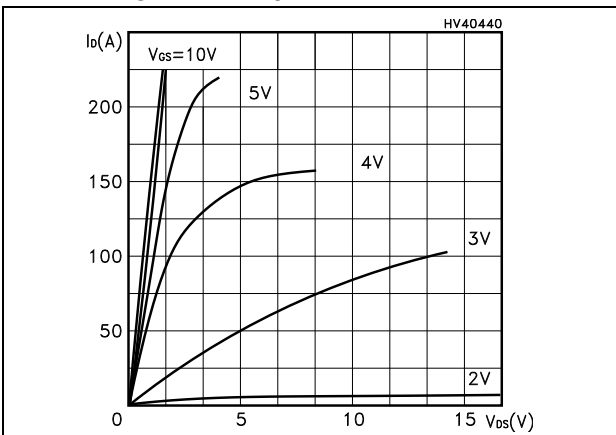


Figure 5. Transfer characteristics

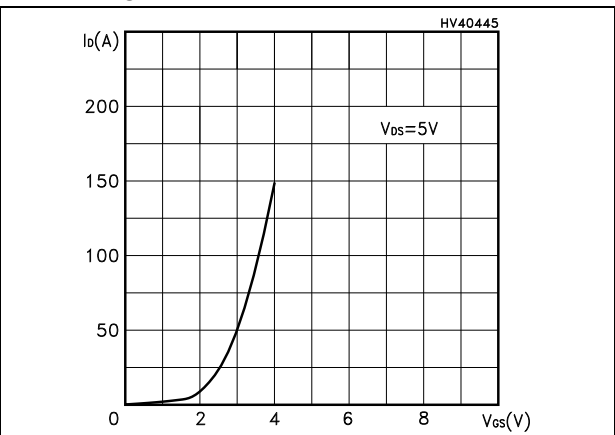


Figure 6. Normalized BvDSS vs temperature

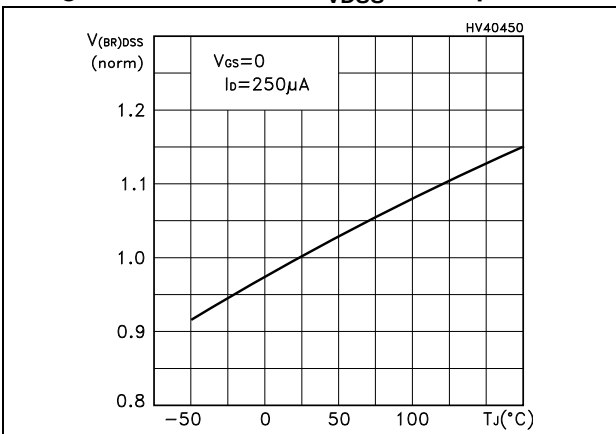


Figure 7. Static drain-source on resistance

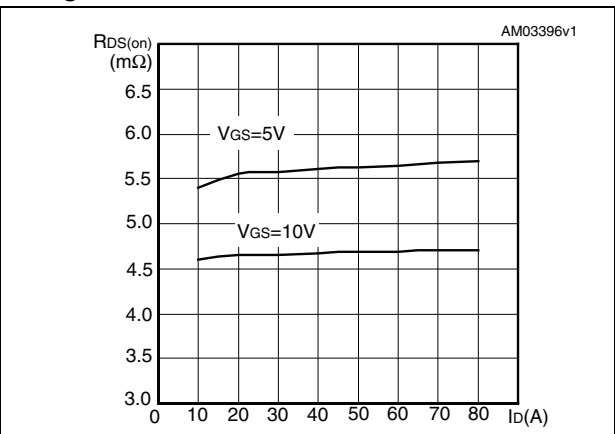


Figure 8. Gate charge vs gate-source voltage

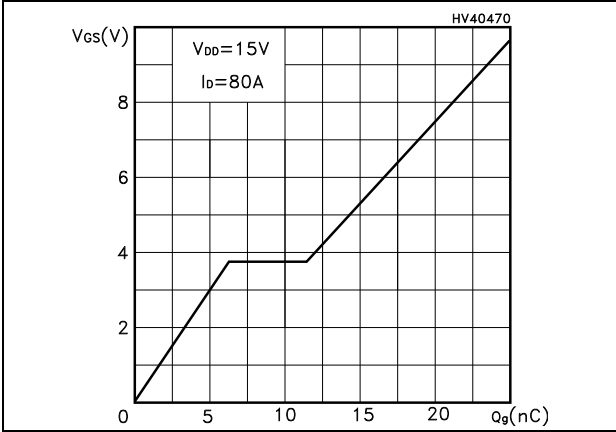


Figure 9. Capacitance variations

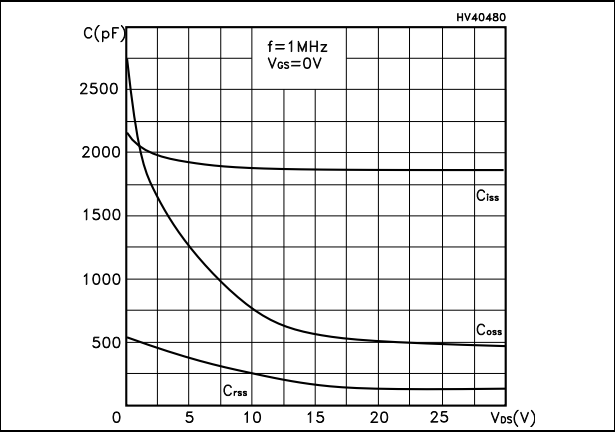


Figure 10. Normalized gate threshold voltage vs temperature

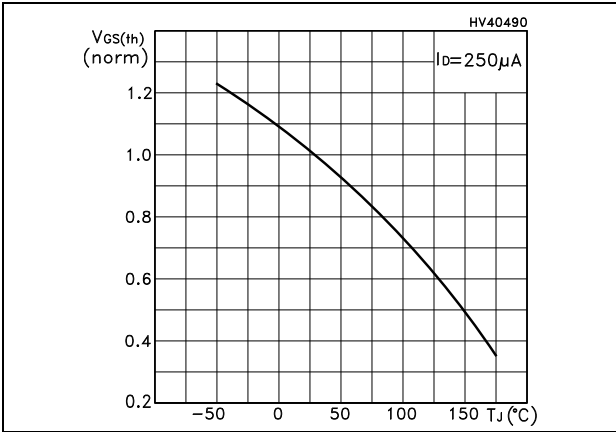


Figure 11. Normalized on resistance vs temperature

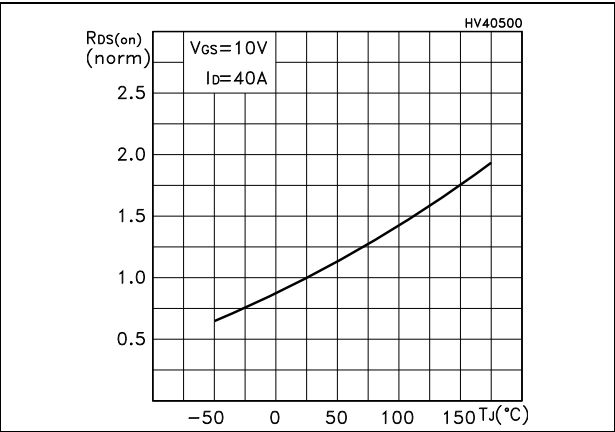


Figure 12. Source-drain diode forward characteristics

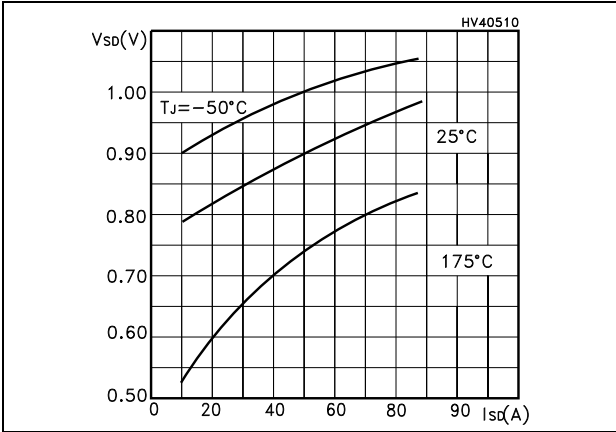
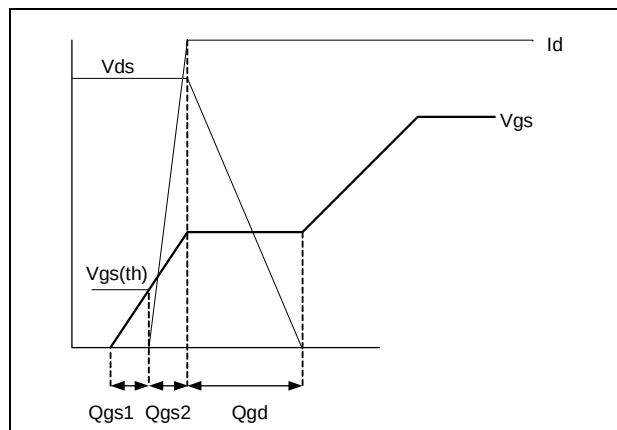


Figure 19. Gate charge waveform



4 Package information

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.

Figure 20. DPAK (TO-252) type A2 outline

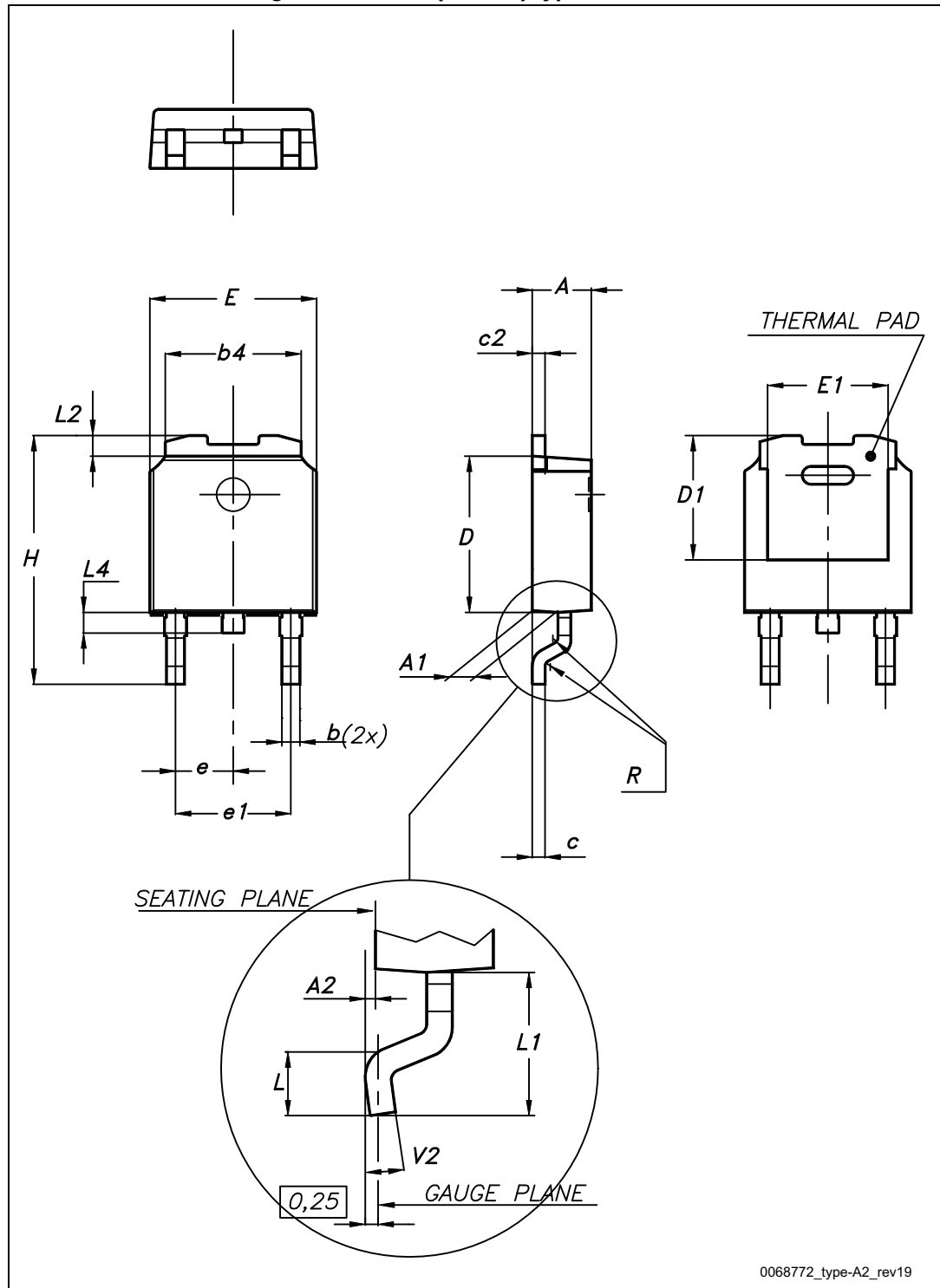
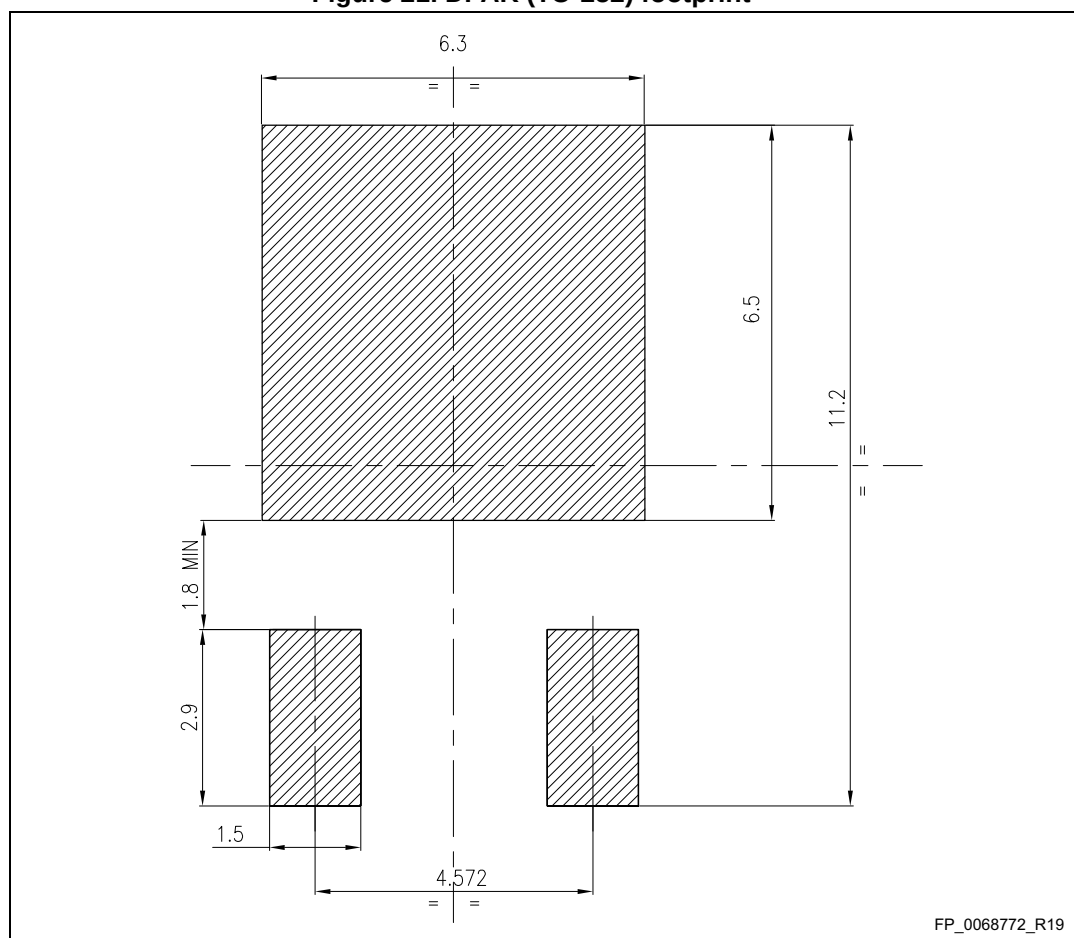


Table 8. DPAK (TO-252) type A2 mechanical data

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	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.16	2.28	2.40
e1	4.40		4.60
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 21. DPAK (TO-252) footprint (a)



a. All dimensions are in millimeters

5 Packing information

Figure 22. Tape for DPAK (TO-252)

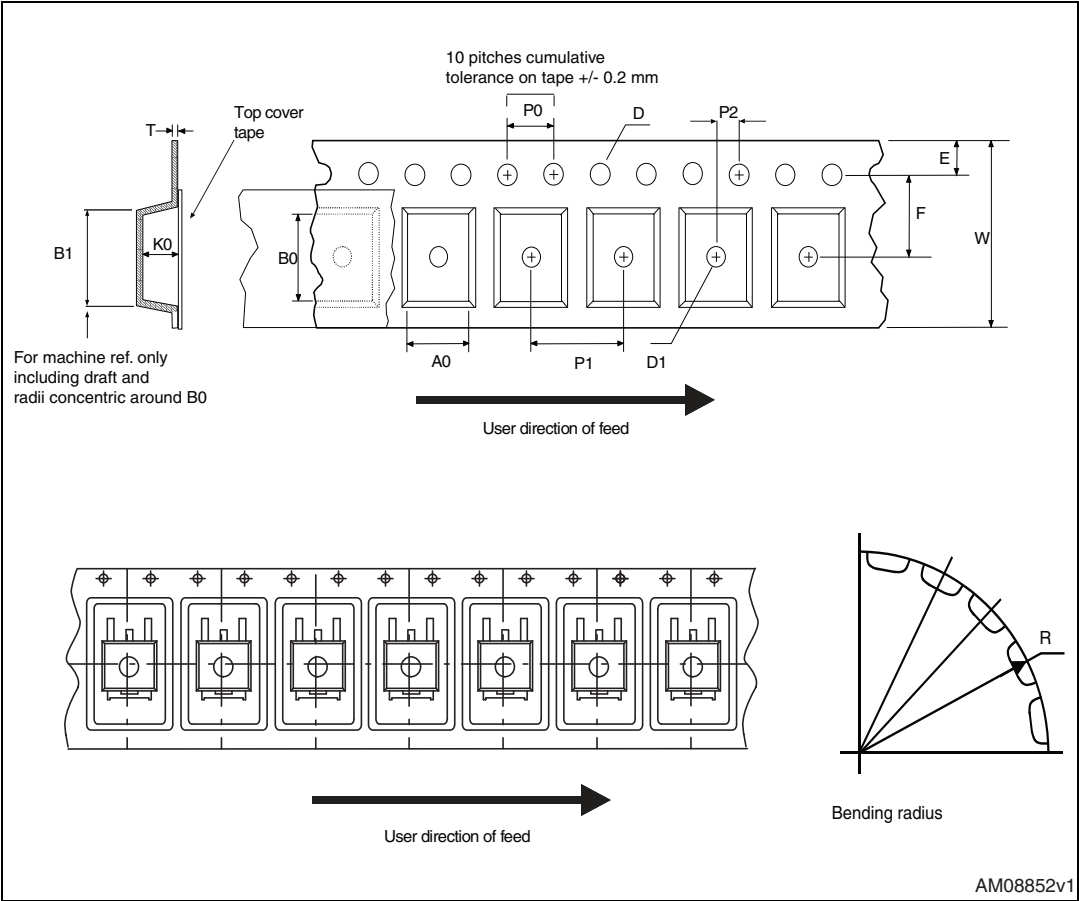


Figure 23. Reel for DPAK (TO-252)

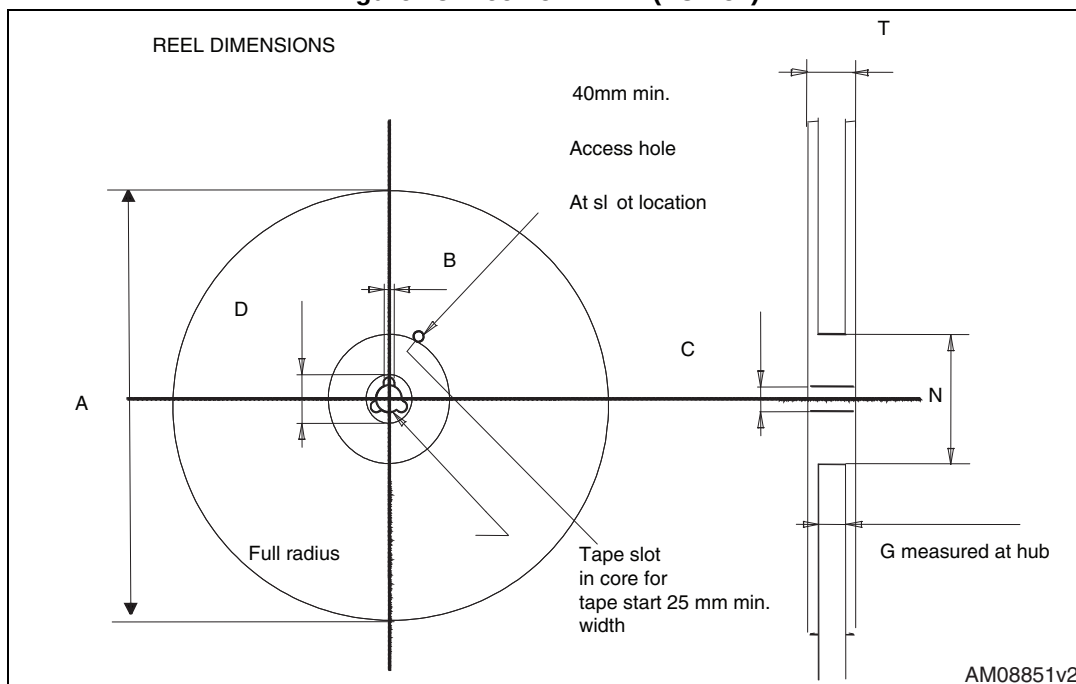


Table 9. DPAK (TO-252) tape and reel mechanical data

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			

6 Revision history

Table 10. Document revision history

Date	Revision	Changes
10-Apr-2009	1	First release.
22-Mar-2011	2	V _{GS} value has been corrected in Table 2 and Table 4 .
13-May-2015	3	Updated title, features and description in cover page. Updated Section 4: Package information .

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