STD90NS3LLH7

N-channel 30 V, 2.8 mΩ typ., 80 A STripFET™ H7 Power MOSFET plus monolithic Schottky in a DPAK package

Datasheet - production data

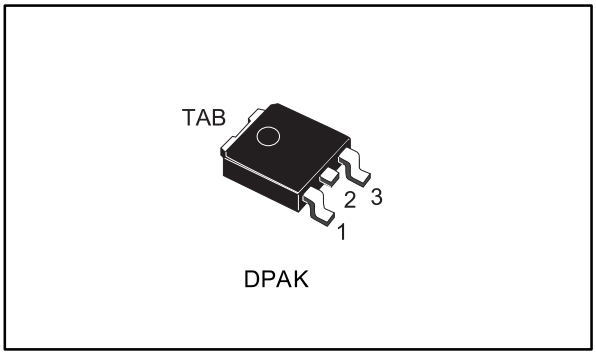
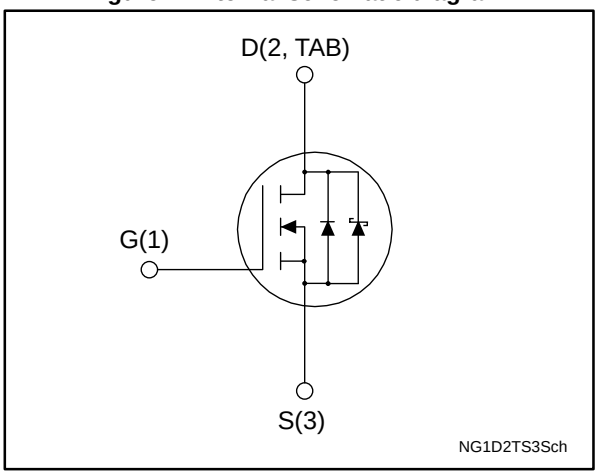


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STD90NS3LLH7	30 V	3.4 mΩ	80 A	57 W

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Embedded Schottky diode

Applications

- Switching applications

Description

This device exhibits low on-state resistance and capacitance for improved conduction and switching performance.

Table 1: Device summary

Order code	Marking	Package	Packing
STD90NS3LLH7	90NS3LLH7	DPAK	Tape and reel

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	±20	V
I_D(1)	Drain current (continuous) at T_C = 25 °C	80	A
	Drain current (continuous) at T_C = 100 °C	65	A
I_{DM}(1)(2)	Drain current (pulsed)	320	A
P_{TOT}(1)	Total dissipation at T_C = 25 °C	57	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Operating junction temperature		

Notes:

(1)This value is rated according to $R_{thj\text{-}c}$ and limited by wire bonding

(2)Pulse width limited by safe operating area.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}pcb}$(1)	Thermal resistance junction-pcb max	50	°C/W
$R_{thj\text{-}case}$	Thermal resistance junction-case max	2.2	

Notes:

(1)When mounted on a 1 inch², FR-4 board, 2oz Cu

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1 mA, V_{GS} = 0 V	30			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 24 V			500	µA
I_{GSS}	Gate-body leakage current	V_{GS} = ±20 V, V_{DS} = 0 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 1 mA	1.2			V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 40 A		2.8	3.4	mΩ
		V_{GS} = 4.5 V, I_D = 40 A		4.1	5.3	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	2110	-	pF
C_{oss}	Output capacitance		-	640	-	
C_{rss}	Reverse transfer capacitance		-	42	-	
Q_g	Total gate charge	V_{DD} = 15 V, I_D = 80 A, V_{GS} = 4.5 V (see *Figure 13: "Test circuit for gate charge behavior"*	-	13.7	-	nC
Q_{gs}	Gate-source charge		-	7.5	-	
Q_{gd}	Gate-drain charge		-	3.3	-	
R_g	Gate input resistance	f = 1 MHz, gate DC; Bias = 0, test signal level = 20 mV, I_D = 0 A	0.4	0.7	2	Ω

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 15 V, I_D = 40 A, R_G = 4.7 Ω, V_{GS} = 4.5 V (see *Figure 12: "Test circuit for resistive load switching times"* and *Figure 17: "Switching time waveform"*)	-	26.4	-	ns
t_r	Rise time		-	10.4	-	
$t_{d(off)}$	Turn-off delay time		-	31.8	-	
t_f	Fall time		-	12.5	-	

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	I_{SD} = 2 A, V_{GS} = 0 V	-	0.4	0.7	V
t_{rr}	Reverse recovery time	I_D = 40 A, di/dt = 100 A/µs, V_{DD} = 20 V (see *Figure 14: "Test circuit for inductive load switching and diode recovery times"*)	-	35.2		ns
Q_{rr}	Reverse recovery charge		-	26.4		nC
I_{RRM}	Reverse recovery current		-	1.5		A

Notes:

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

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

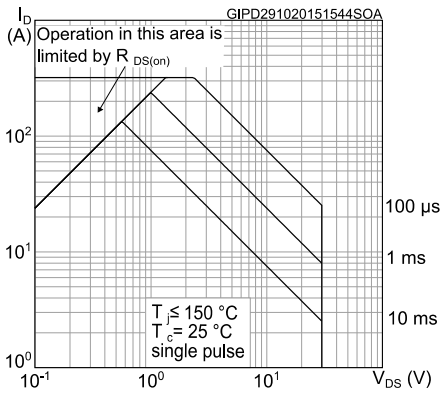


Figure 3: Thermal impedance

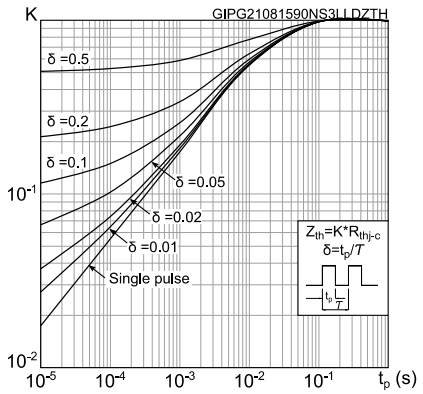


Figure 4: Output characteristics

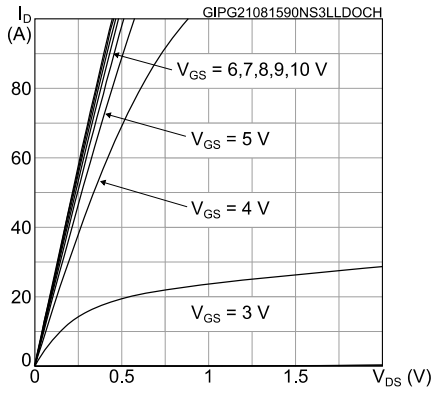


Figure 5: Transfer characteristics

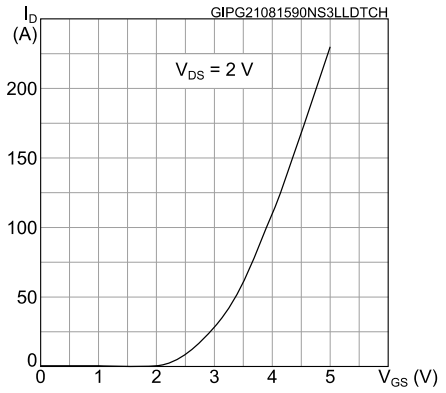


Figure 6: Gate charge vs gate-source voltage

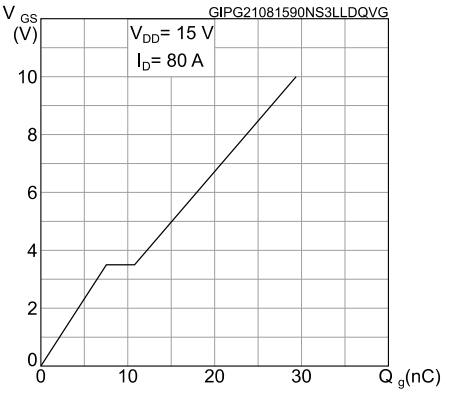


Figure 7: Static drain-source on-resistance

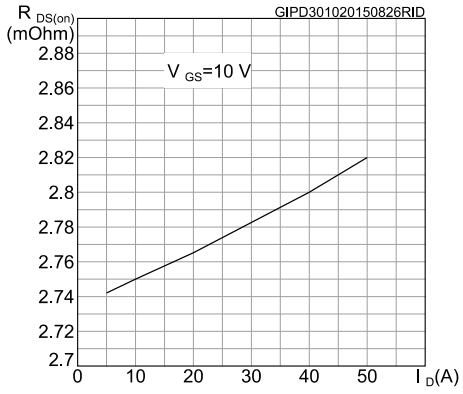


Figure 8: Capacitance variations

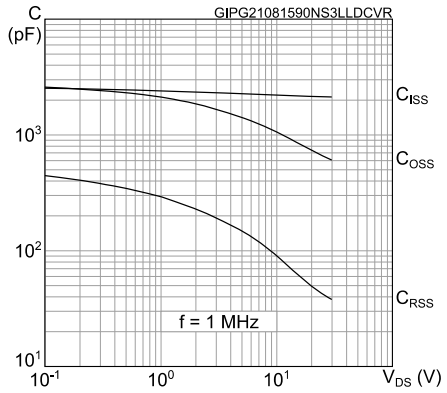


Figure 9: Normalized gate threshold voltage vs temperature

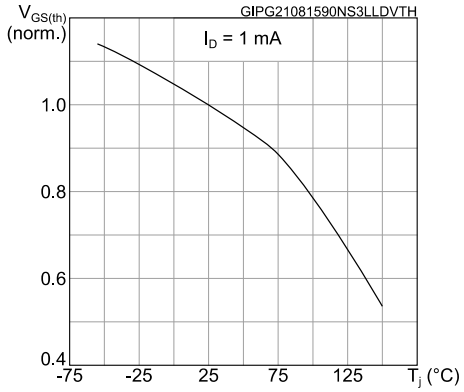


Figure 10: Normalized on-resistance vs temperature

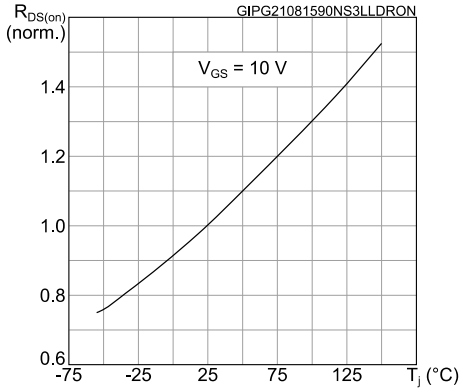
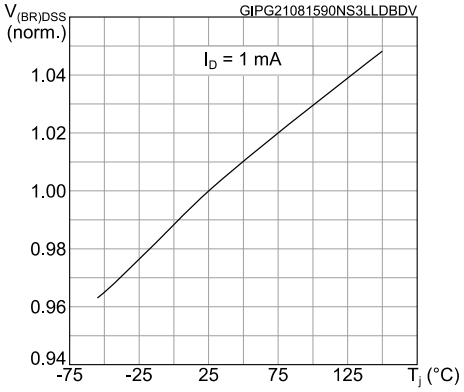


Figure 11: Normalized V(BR)DSS vs temperature



3 Test circuits

Figure 12: Test circuit for resistive load switching times

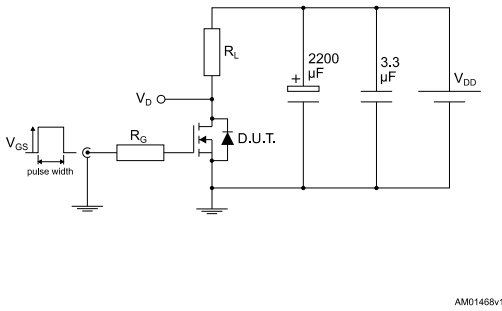


Figure 13: Test circuit for gate charge behavior

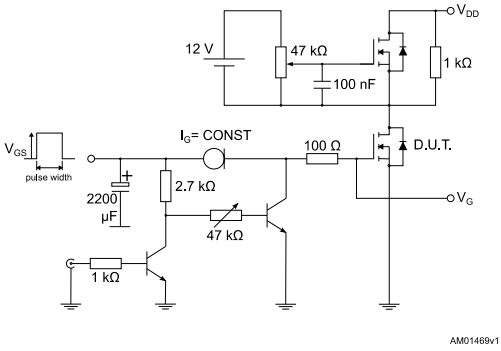


Figure 14: Test circuit for inductive load switching and diode recovery times

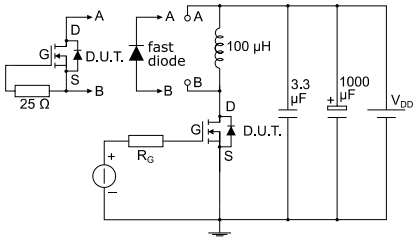


Figure 15: Unclamped inductive load test circuit

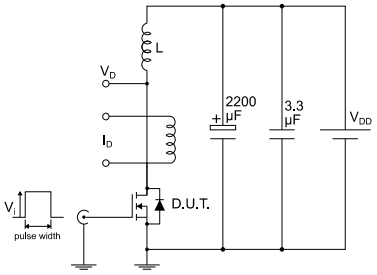


Figure 16: Unclamped inductive waveform

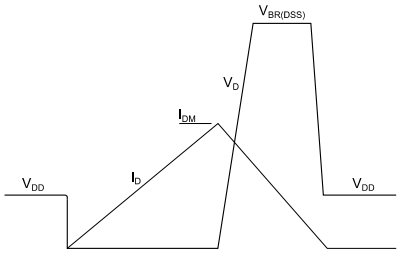
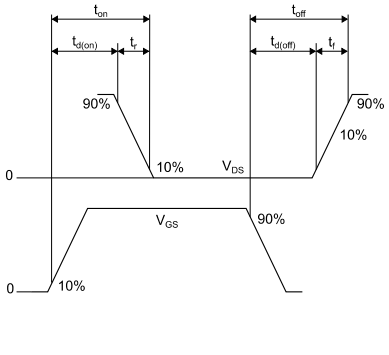


Figure 17: Switching time waveform



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.

4.1 DPAK (TO-252) type A package information

Figure 18: DPAK (TO-252) type A package outline

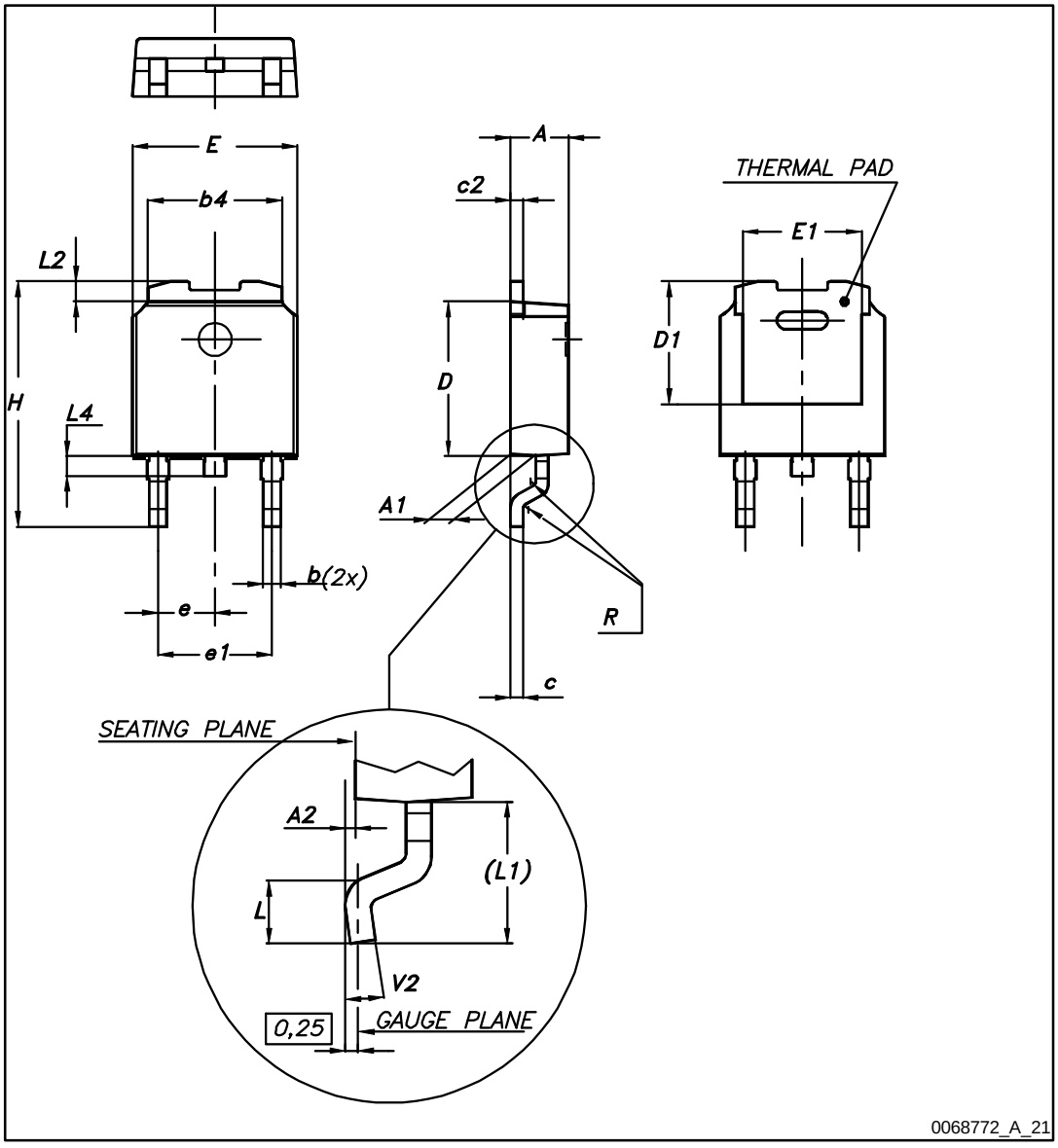
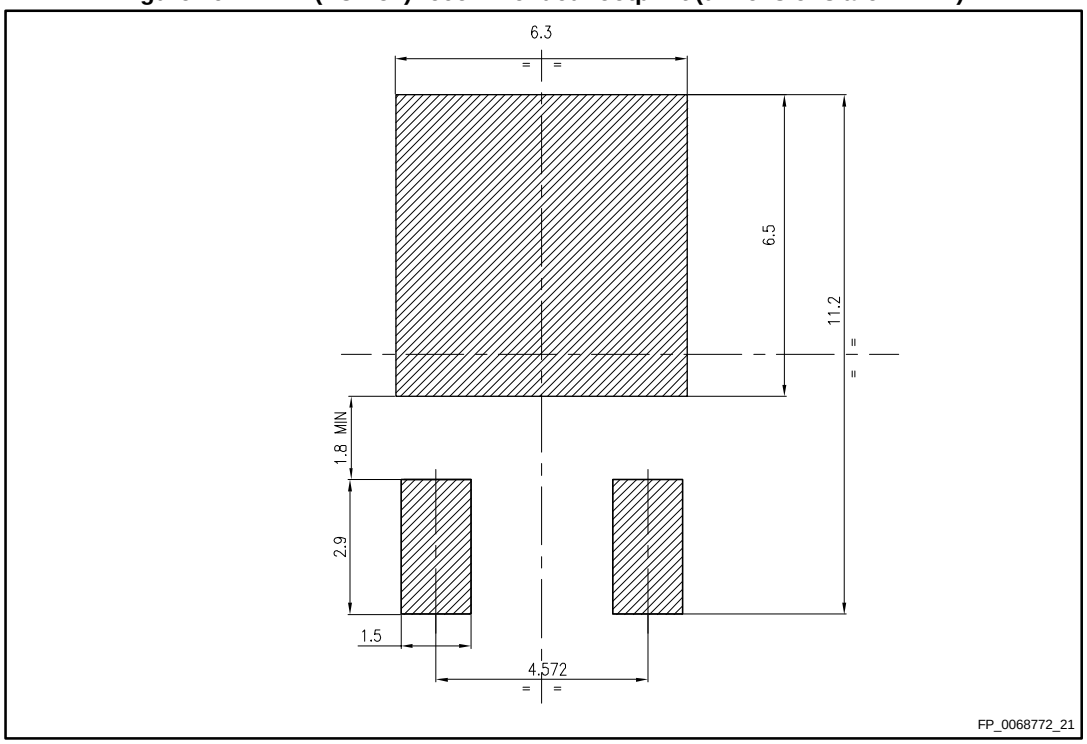


Table 8: DPAK (TO-252) type A mechanical data

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	4.60	4.70	4.80
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 19: DPAK (TO-252) recommended footprint (dimensions are in mm)



4.2 DPAK (TO-252) packing information

Figure 20: DPAK (TO-252) tape outline

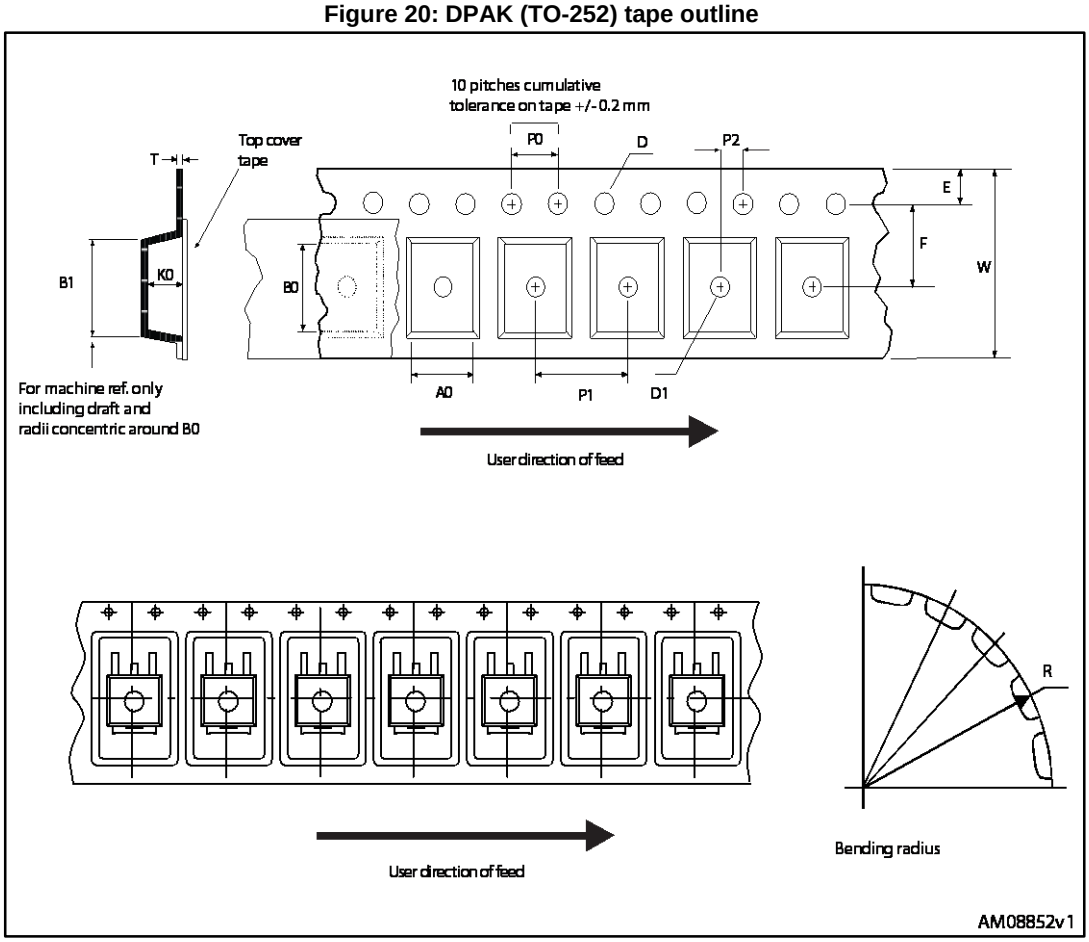


Figure 21: DPAK (TO-252) reel outline

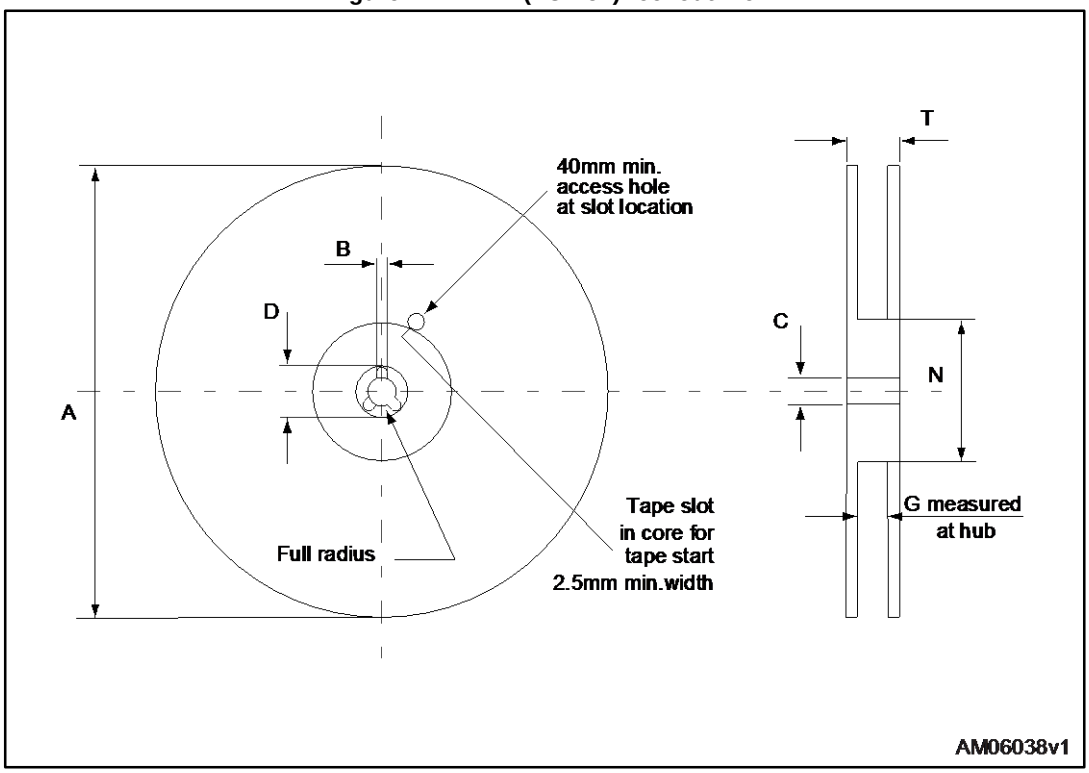


Table 9: DPAK (TO-252) tape and reel mechanical data

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			

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
17-Apr-2014	1	First release.
07-Sep-2015	2	Text and formatting changes throughout document Removed all TO-220 (STP90NS3LLH7) package references and data On cover page: - updated title and Features In section Electrical ratings updated table Absolute maximum ratings In section Electrical characteristics - updated and renamed table Static (was On /off states) - updated tables Dynamic and Source drain diode Added section Electrical characteristics (curves) Updated and renamed section Package information (was Package mechanical data)
29-Oct-2015	3	Updated title and features in cover page. Updated Table 2: "Absolute maximum ratings", Table 5: "Dynamic" and Figure 2: "Safe operating area". Minor text changes.
10-Feb-2016	4	Document status promoted from preliminary to production data.

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