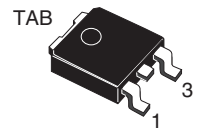
STD10NF30

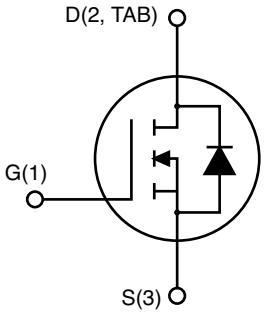
Automotive-grade N-channel 300 V, 10 A, 0.28 Ω typ., MESH OVERLAY™ Power MOSFET in a DPAK package

Datasheet - production data



DPAK

Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)max.}$	I_D
STD10NF30	300 V	0.33 Ω	10 A

- Designed for automotive applications and AEC-Q101 qualified
- Gate charge minimized
- Very low intrinsic capacitances

Applications

- Switching applications

Description

This Power MOSFET is designed using the company's consolidated strip layout-based MESH OVERLAY™ process. The result is a product that matches or improves on the performance of comparable standard parts from other manufacturers.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STD10NF30	10NF30	DPAK	Tape and reel

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	300	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at T_C = 25 °C	10	A
I_D	Drain current (continuous) at T_C = 100 °C	6.3	A
I_{DM} (1)	Drain current (pulsed)	40	A
P_{TOT}	Total dissipation at T_C = 25 °C	103	W
dv/dt (2)	Peak diode recovery voltage slope	12	V/ns
T_{stg}	Storage temperature	- 55 to 175	°C
T_j	Max. operating junction temperature		°C

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 10$ A, di/dt $\leq$ 200 A/μs, V_{DD}= 80% $V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1.45	°C/W
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb max	50	°C/W

1. When mounted on 1 inch² FR-4, 2 Oz copper board

Table 4. Thermal data

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	6	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25°C, I_D = I_{AR}, V_{DD} = 50 V)	175	mJ

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified).

Table 5. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage (V_{GS} = 0)	I_D = 1 mA	300			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 300 V			1	µA
		V_{DS} = 300 V, T_C=125 °C			10	µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 5 A		0.28	0.33	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0	-	780	-	pF
C_{oss}	Output capacitance		-	110	-	pF
C_{rss}	Reverse transfer capacitance		-	15	-	pF
Q_g	Total gate charge	V_{DD} = 240 V, I_D = 10 A, V_{GS} = 10 V (see *Figure 14*)	-	23	-	nC
Q_{gs}	Gate-source charge		-	3.5	-	nC
Q_{gd}	Gate-drain charge		-	11.3	-	nC

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 150 V, I_D = 5 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 13*)	-	13.5	-	ns
t_r	Rise time		-	9.5	-	ns
$t_{d(off)}$	Turn-off-delay time		-	32	-	ns
t_f	Fall time		-	9.5	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		10	A
I_{SDM} (1)	Source-drain current (pulsed)		-		40	A
V_{SD} (2)	Forward on voltage	I_{SD} = 10 A, V_{GS} = 0	-		1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 10 A, di/dt = 100 A/µs V_{DD} = 60 V (see *Figure 18*)	-	145		ns
Q_{rr}	Reverse recovery charge		-	0.76		µC
I_{RRM}	Reverse recovery current		-	10.3		A
t_{rr}	Reverse recovery time	I_{SD} = 10 A, di/dt = 100 A/µs V_{DD} = 60 V, T_j = 150 °C (see *Figure 18*)	-	174		ns
Q_{rr}	Reverse recovery charge		-	1.08		µC
I_{RRM}	Reverse recovery current		-	12.5		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

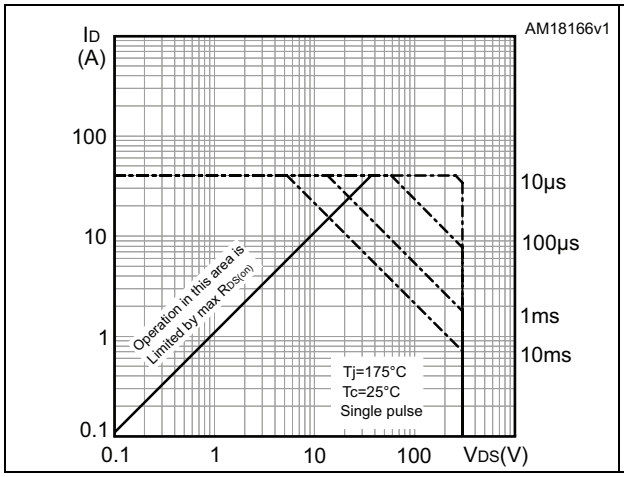


Figure 3. Thermal impedance

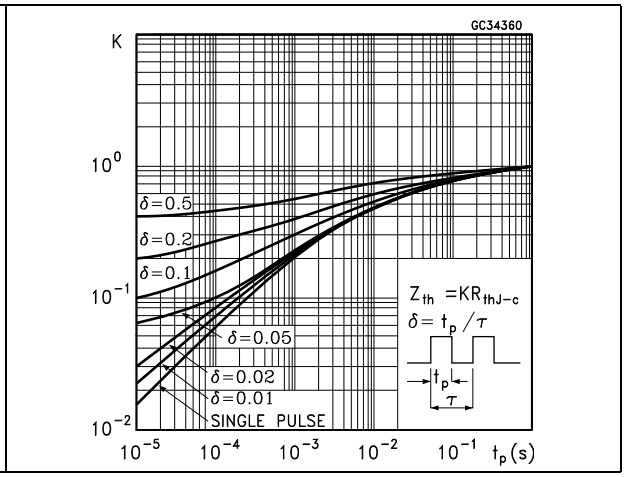


Figure 4. Output characteristics

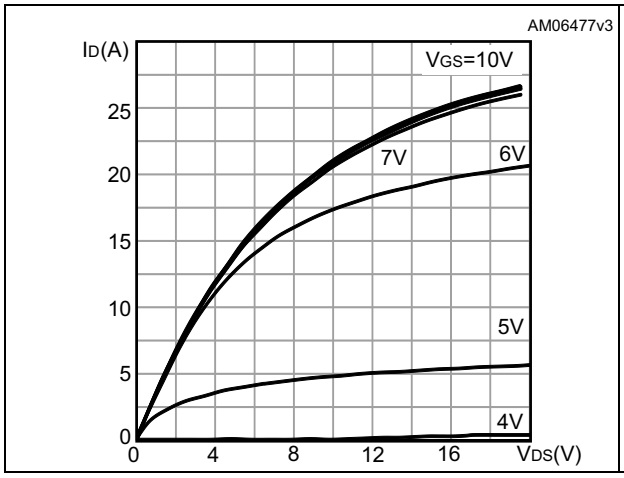


Figure 5. Transfer characteristics

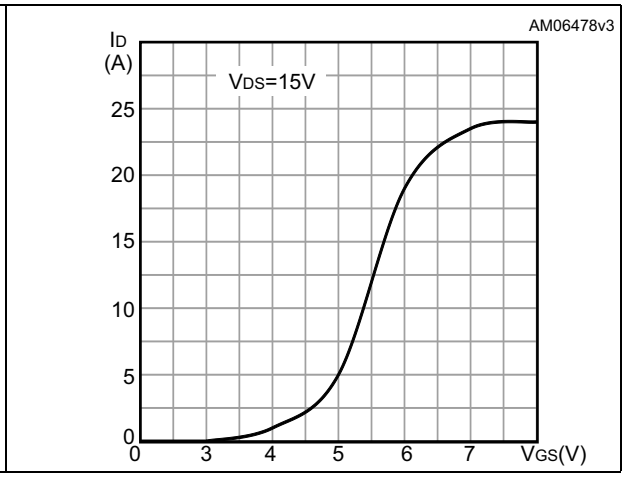


Figure 6. Gate charge vs gate-source voltage

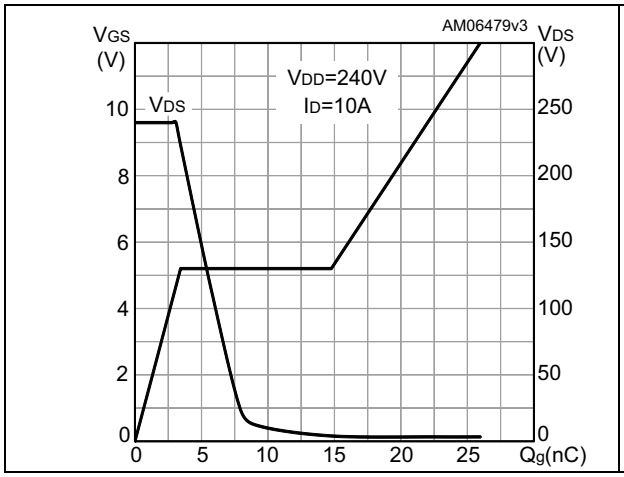


Figure 7. Static drain-source on-resistance

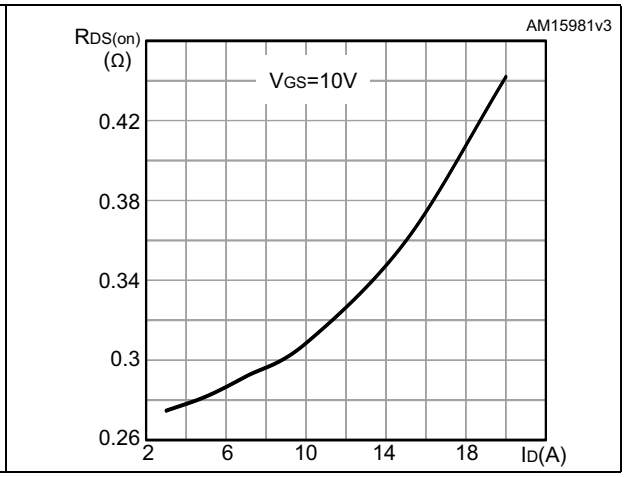


Figure 8. Capacitance variations

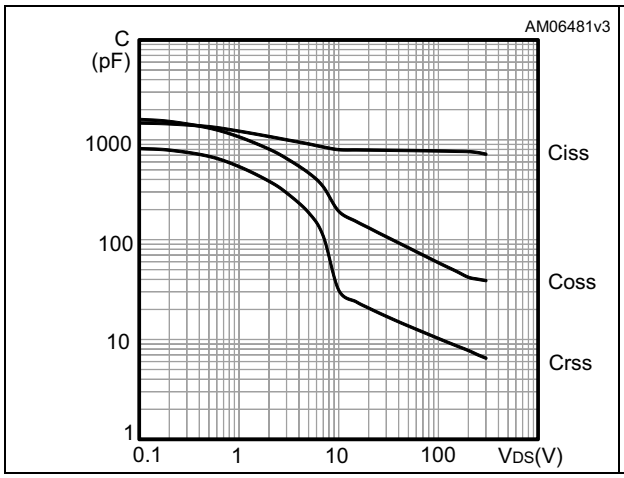


Figure 9. Normalized gate threshold voltage vs temperature

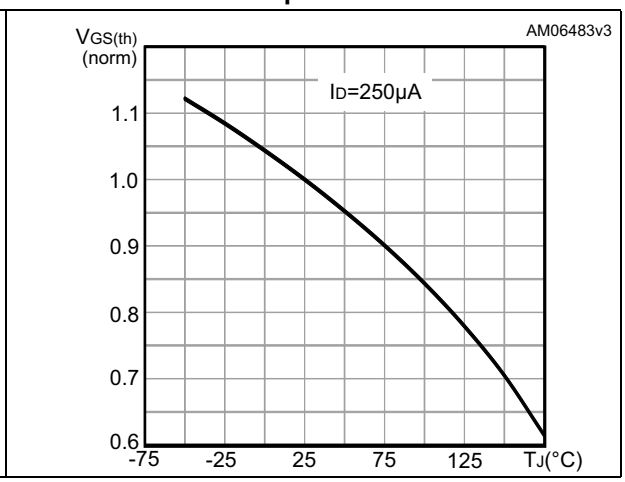


Figure 10. Normalized on-resistance vs temperature

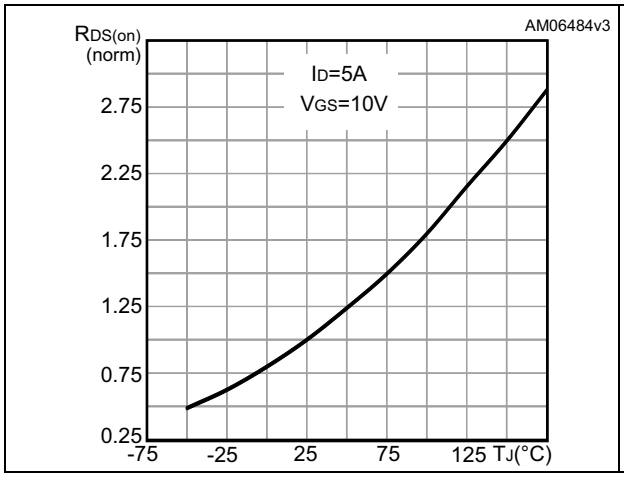


Figure 11. Normalized $V_{(BR)DSS}$ vs temperature

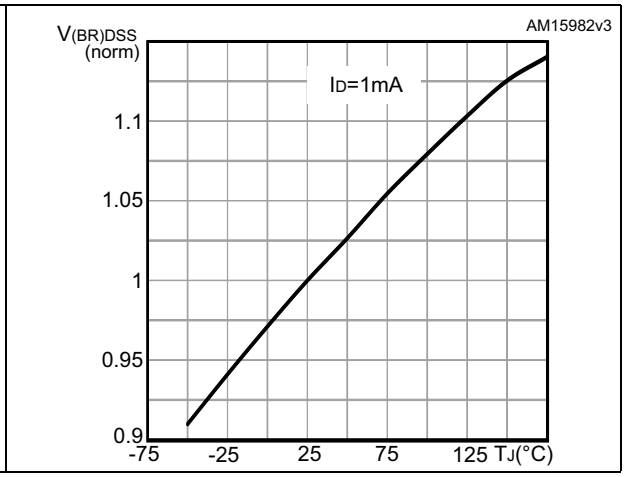
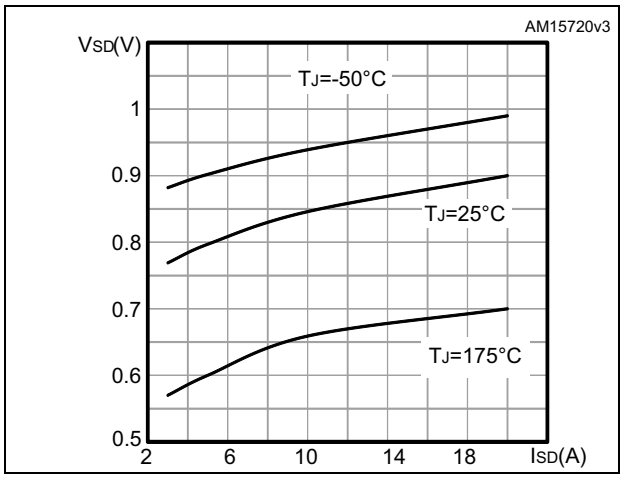


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

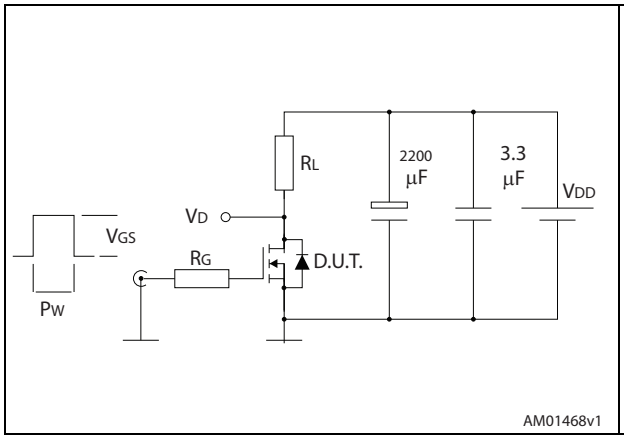


Figure 14. Gate charge test circuit

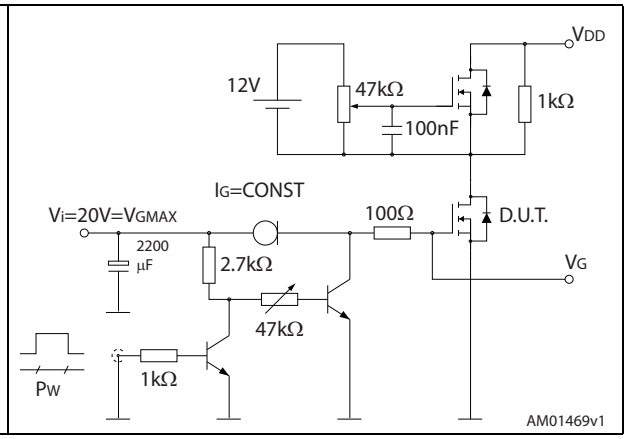


Figure 15. Test circuit for inductive load switching and diode recovery times

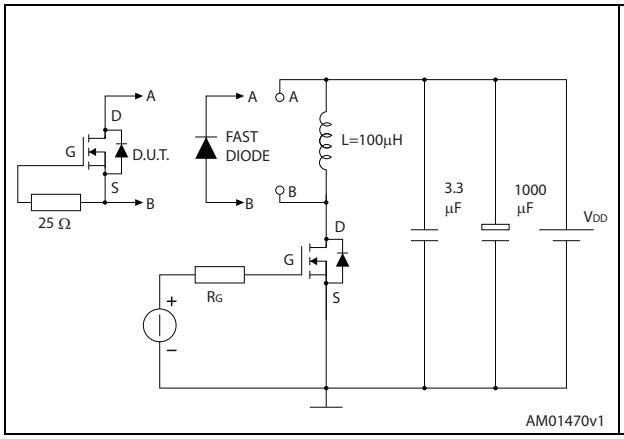


Figure 16. Unclamped inductive load test circuit

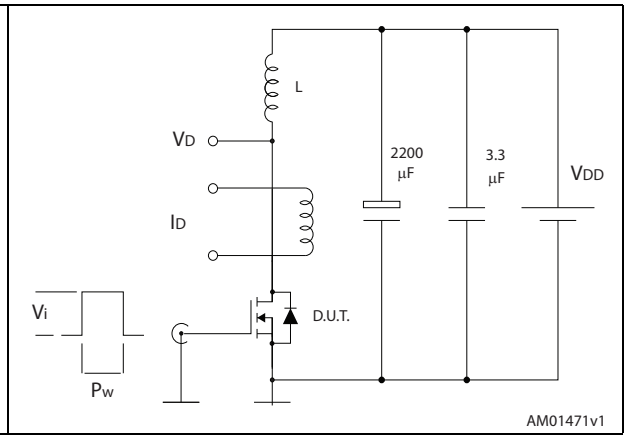


Figure 17. Unclamped inductive waveform

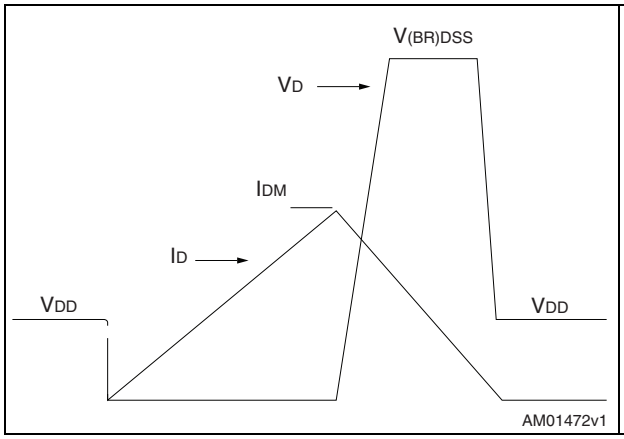
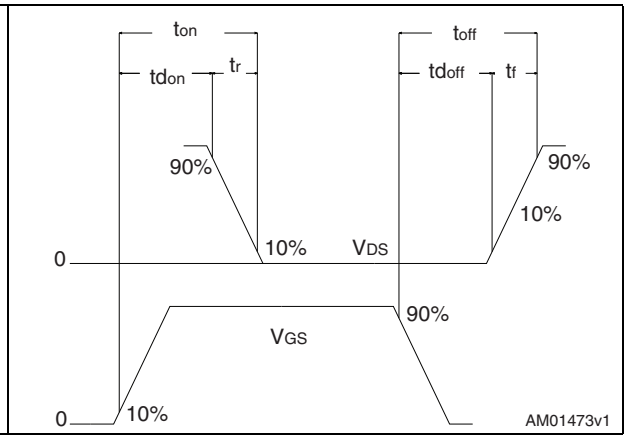


Figure 18. Switching time waveform



4 Package mechanical data

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ECOPACK® is an ST trademark.

Figure 19. DPAK (TO-252) drawing

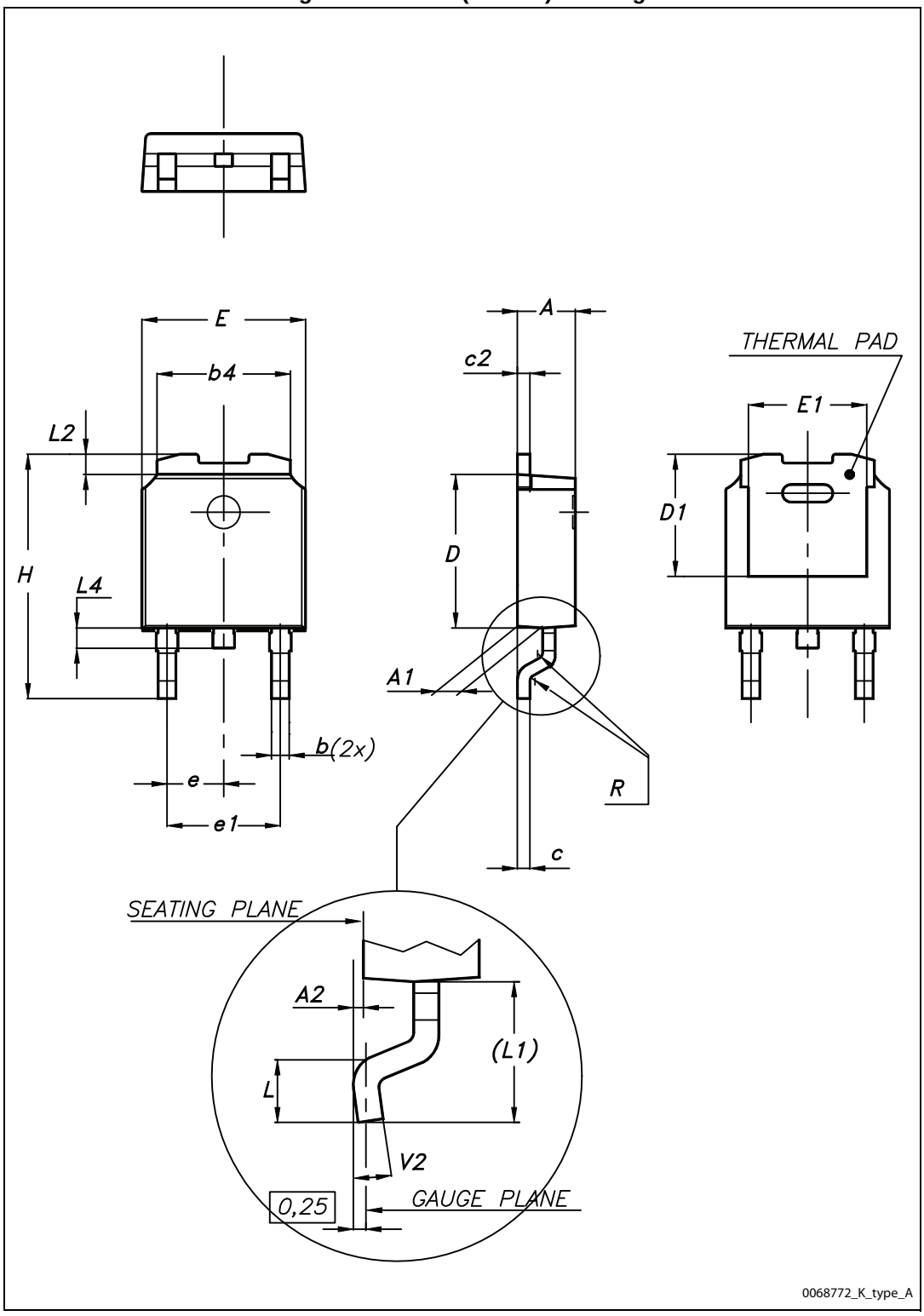
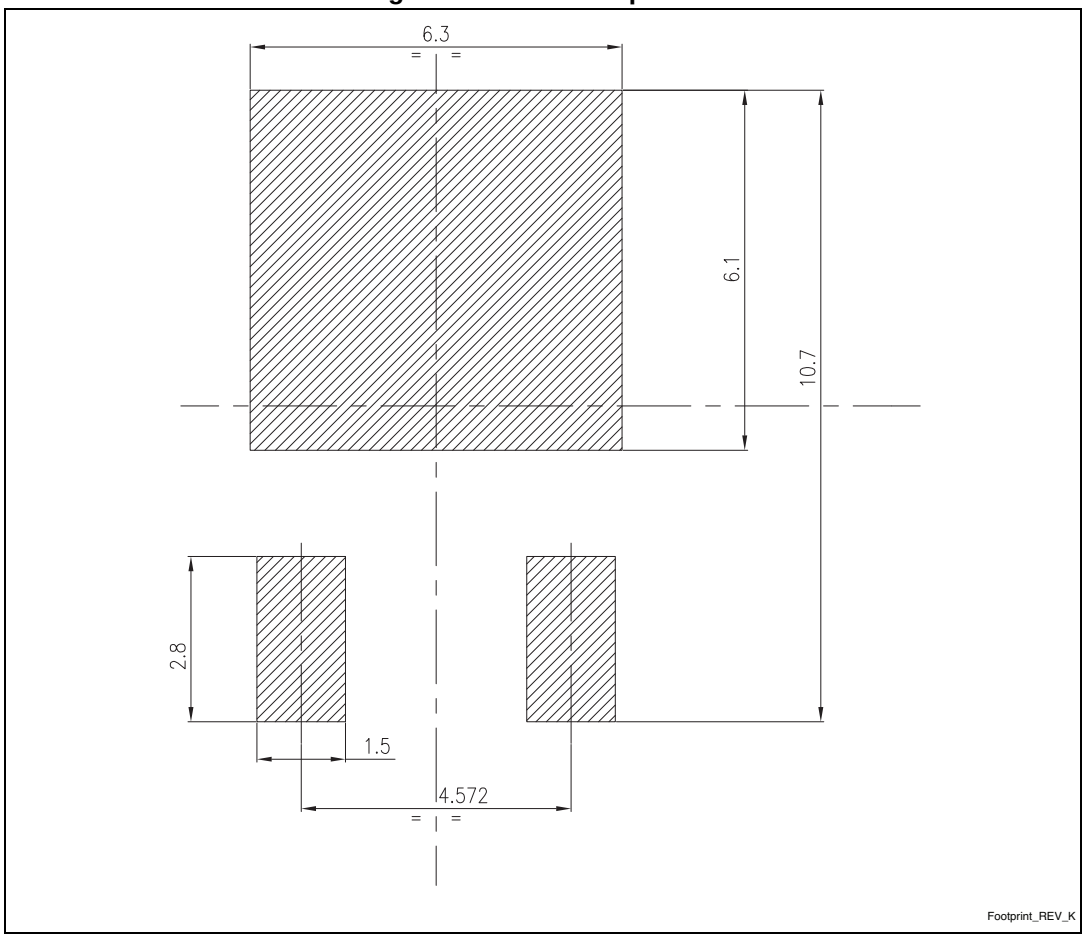


Table 9. DPAK (TO-252) mechanical data

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	1.00		1.50
(L1)		2.80	
L2		0.80	
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 20. DPAK footprint [(a)]



a. All dimensions are in millimeters.

5 Packaging mechanical data

Figure 21. Tape for DPAK (TO-252)

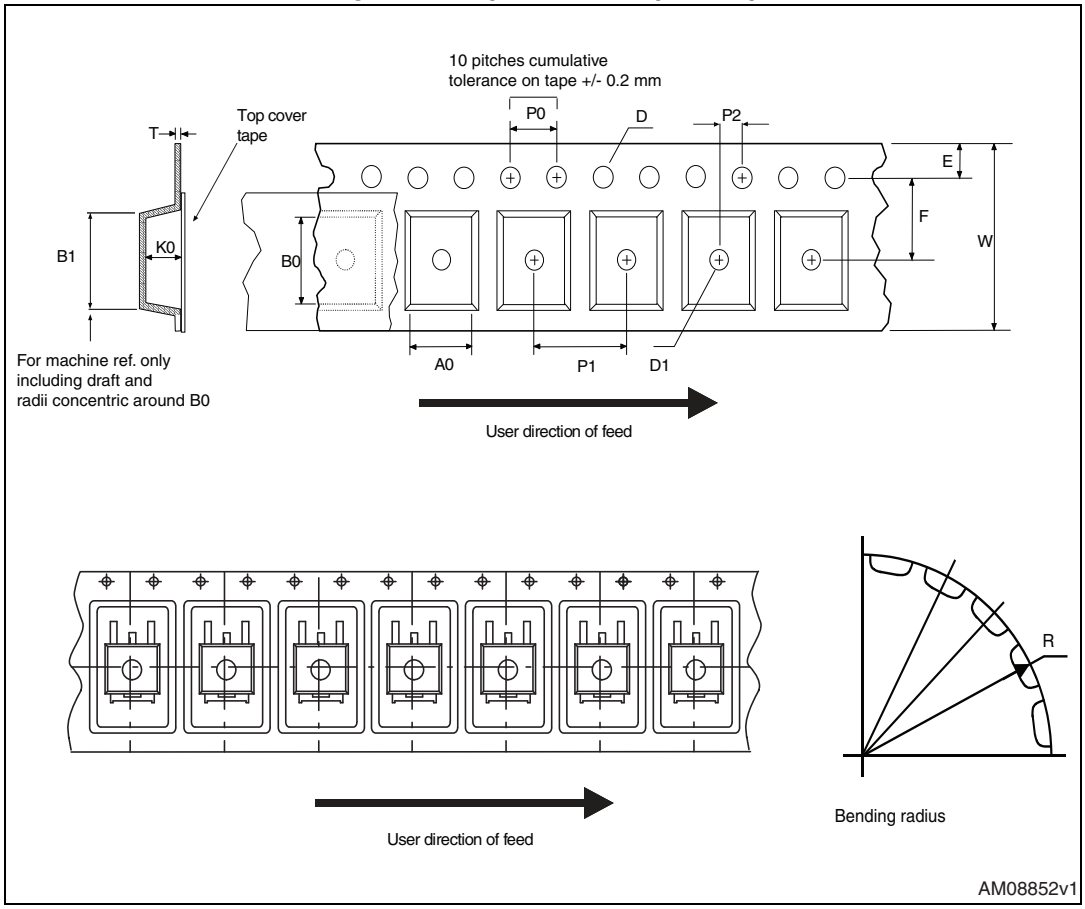


Figure 22. Reel for DPAK (TO-252)

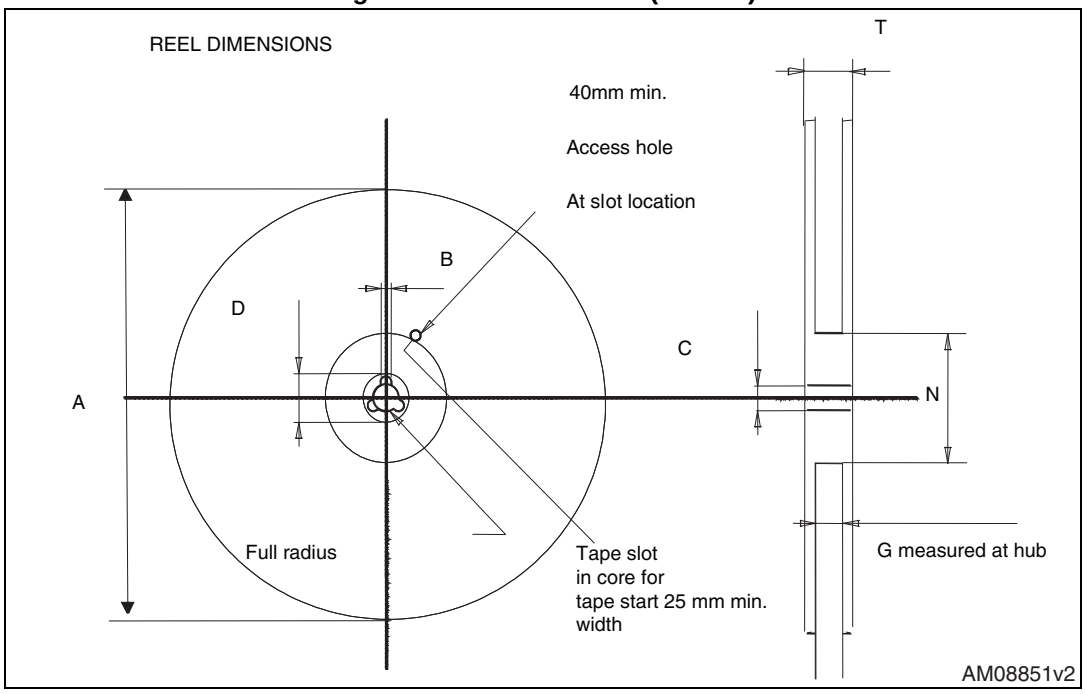


Table 10. DPAK (TO-252) tape and reel mechanical data

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			

6 Revision history

Table 11. Document revision history

Date	Revision	Changes
27-Mar-2014	1	Initial release.

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