

N-channel 60 V, 0.022 Ω typ., 35 A STripFET™ II Power MOSFET in a DPAK package

Datasheet - production data

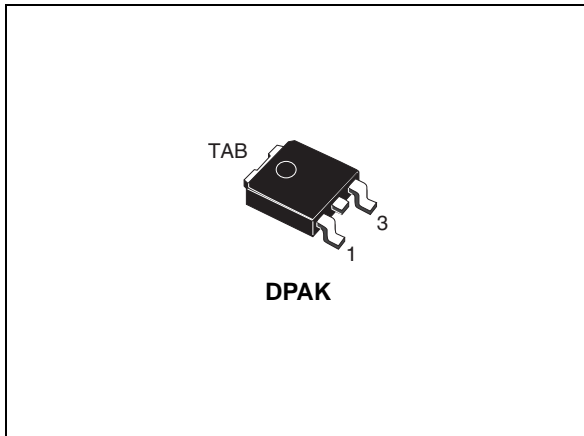
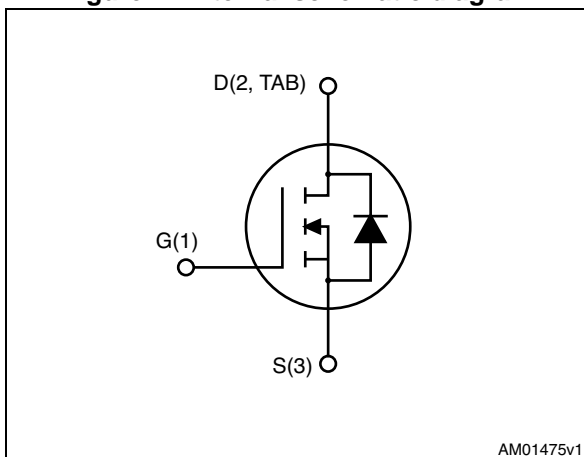


Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STD30NF06LT4	60 V	0.028 Ω	35 A

- Low threshold drive
- Gate charge minimized

Applications

- Switching applications

Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STD30NF06LT4	D30NF06L	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	60	V
V_{GS}	Gate-source voltage	± 20	V
V_{DGR}	Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	60	V
I_D	Drain current (continuous) at $T_C = 25 \text{ }^\circ\text{C}$	35	A
I_D	Drain current (continuous) at $T_C = 100 \text{ }^\circ\text{C}$	25	A
$I_{DM}^{(1)}$	Drain current (pulsed)	140	A
P_{TOT}	Total dissipation at $T_C = 25 \text{ }^\circ\text{C}$	70	W
	Derating factor	0.47	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	25	V/ns
T_{stg}	Storage temperature	- 55 to 175	$^\circ\text{C}$
T_j	Max. operating junction temperature		

1. Pulse width limited by safe operating area

2. $I_{SD} \leq 35 \text{ A}$, $di/dt \leq 400 \text{ A}/\mu\text{s}$, $V_{DS(\text{peak})} \leq V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-case}}$	Thermal resistance junction-case max	2.14	$^\circ\text{C}/\text{W}$
$R_{thj\text{-amb}}$	Thermal resistance junction-amb max	100	$^\circ\text{C}/\text{W}$

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by $T_{j\text{max}}$)	35	A
E_{AS}	Single pulse avalanche energy (starting $T_j=25^\circ\text{C}$, $I_D=I_{AR}$; $V_{DD}=50 \text{ V}$)	150	mJ

2 Electrical characteristics

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

Table 5. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ($V_{GS} = 0$)	$I_D = 250\ \mu A$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 60\text{ V}$			1	μA
		$V_{DS} = 60\text{ V}, T_C = 125\text{ °C}$			10	μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu A$	1	1.7	2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 18\text{ A}$		0.022	0.028	Ω
		$V_{GS} = 5\text{ V}, I_D = 18\text{ A}$		0.025	0.03	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$	-	1600		pF
C_{oss}	Output capacitance		-	215		pF
C_{riss}	Reverse transfer capacitance		-	60		pF
Q_g	Total gate charge	$V_{DD} = 48\text{ V}, I_D = 35\text{ A}, V_{GS} = 5\text{ V}$ (see Figure 14)	-	23	31	nC
Q_{gs}	Gate-source charge		-	7		nC
Q_{gd}	Gate-drain charge		-	10		nC

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30\text{ V}, I_D = 18\text{ A}, R_G = 4.7\ \Omega, V_{GS} = 4.5\text{ V}$ (see Figure 13)	-	30	-	ns
t_r	Rise time		-	105	-	ns
$t_{d(off)}$	Turn-off-delay time		-	65	-	ns
t_f	Fall time		-	25	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		35	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		140	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 35\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 35\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	-	70		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 15\text{ V}$, $T_j = 150^\circ\text{C}$ (see Figure 18)	-	140		nC
I_{RRM}	Reverse recovery current		-	4		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

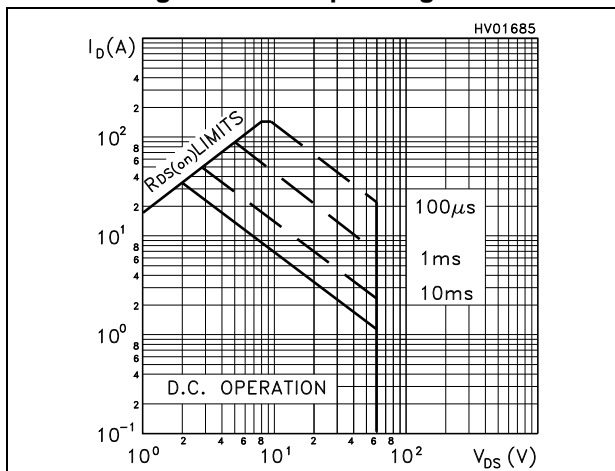


Figure 3. Thermal impedance

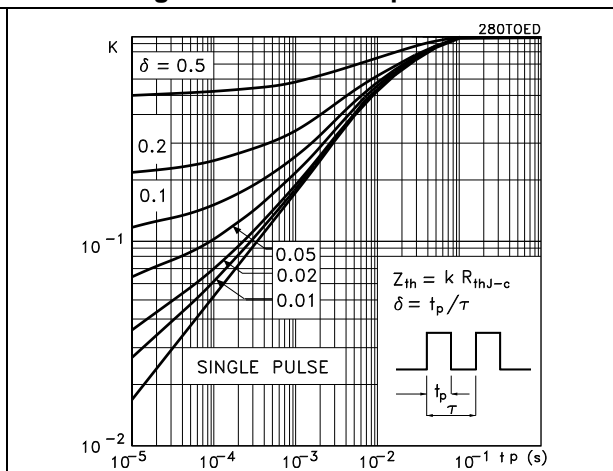


Figure 4. Output characteristics

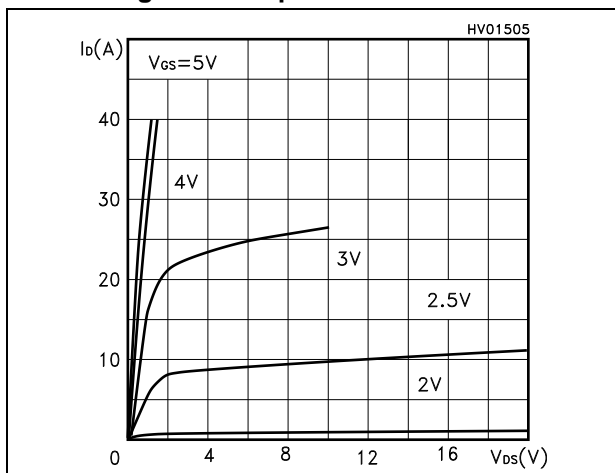


Figure 5. Transfer characteristics

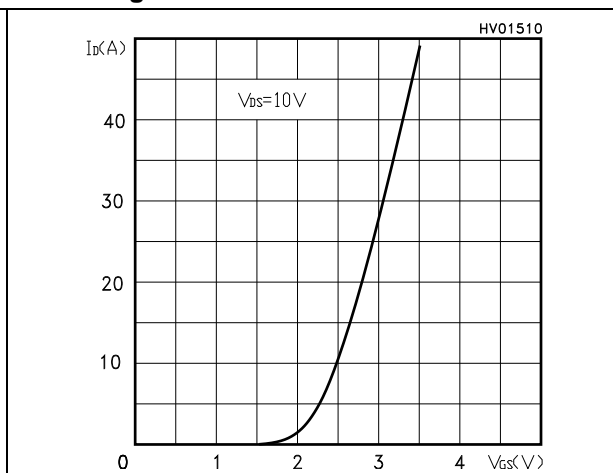


Figure 6. Gate charge vs gate-source voltage

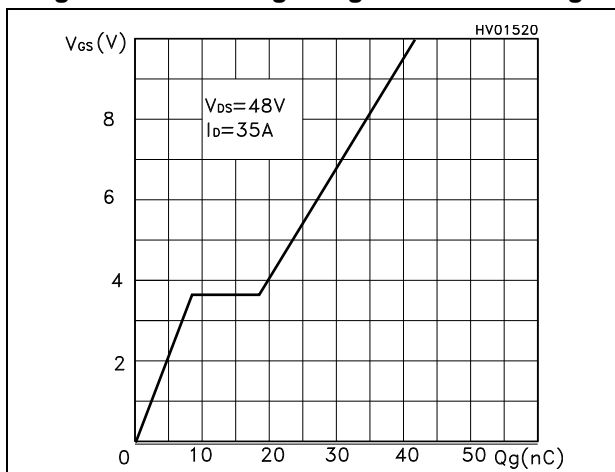


Figure 7. Static drain-source on-resistance

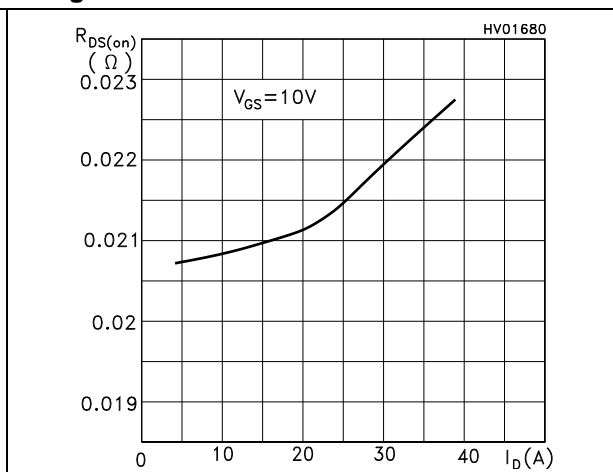


Figure 8. Capacitance variations

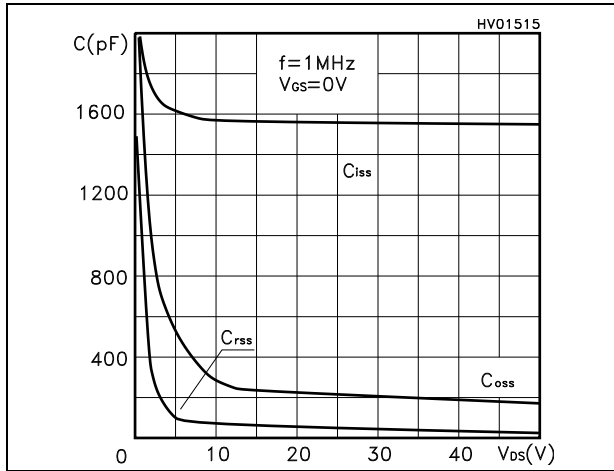


Figure 9. Normalized gate threshold voltage vs temperature

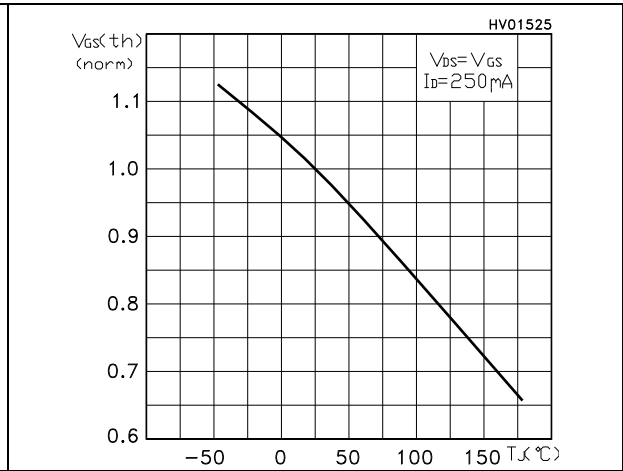


Figure 10. Normalized on-resistance vs temperature

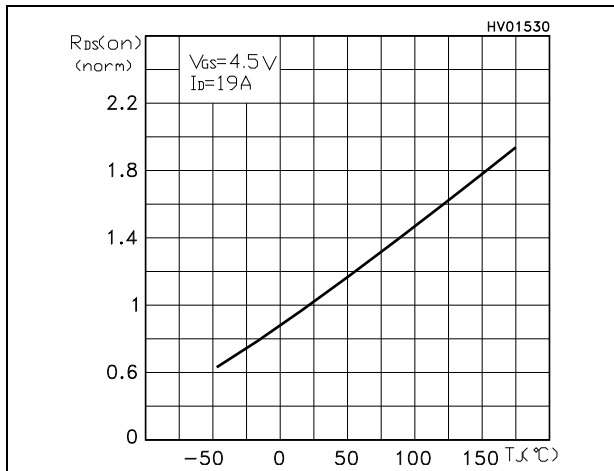


Figure 11. Normalized $V_{(BR)DSS}$ vs temperature

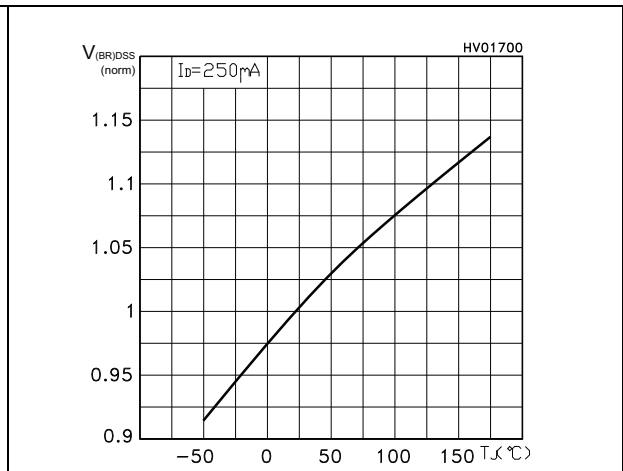
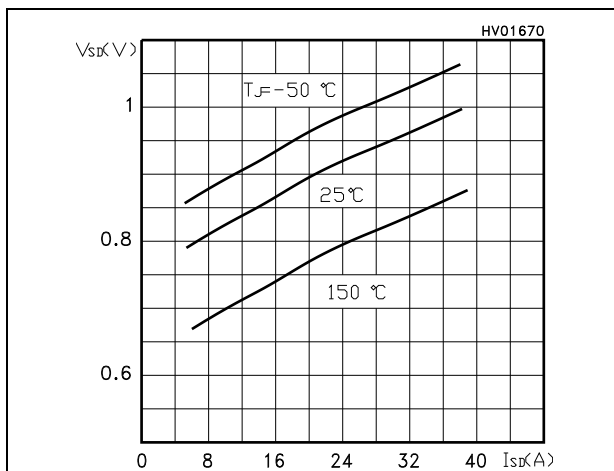


Figure 12. Source-drain diode forward characteristics



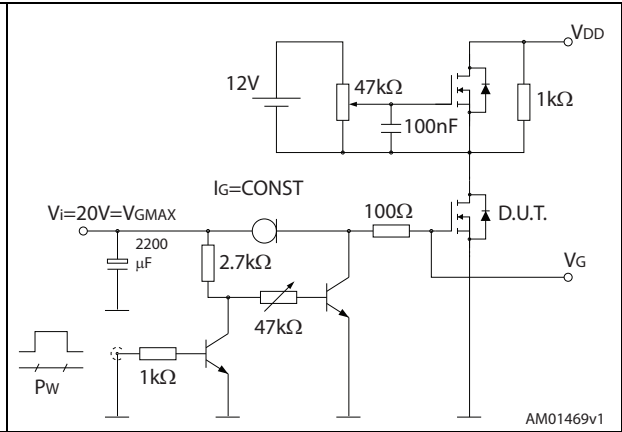
3 Test circuits

Figure 13. Switching times test circuit for resistive load



AM01468v1

Figure 14. Gate charge test circuit



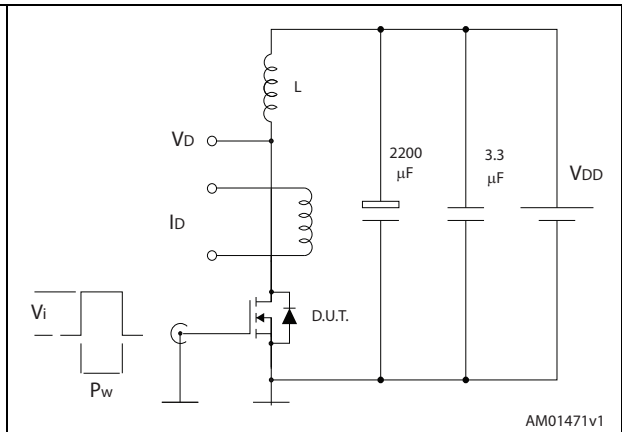
AM01469v1

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



AM01470v1

Figure 16. Unclamped inductive load test circuit



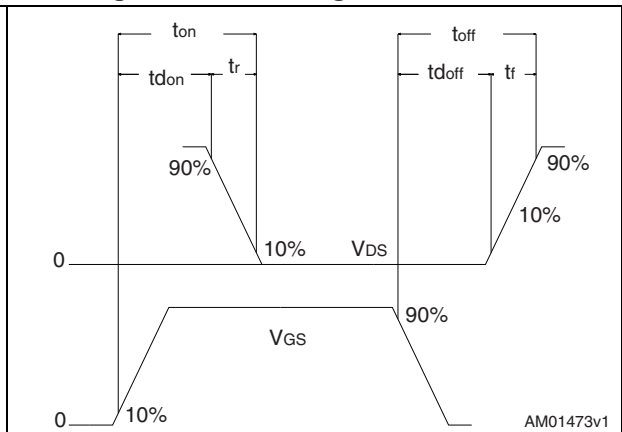
AM01471v1

Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1

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.

Figure 19. DPAK (TO-252) type A drawing

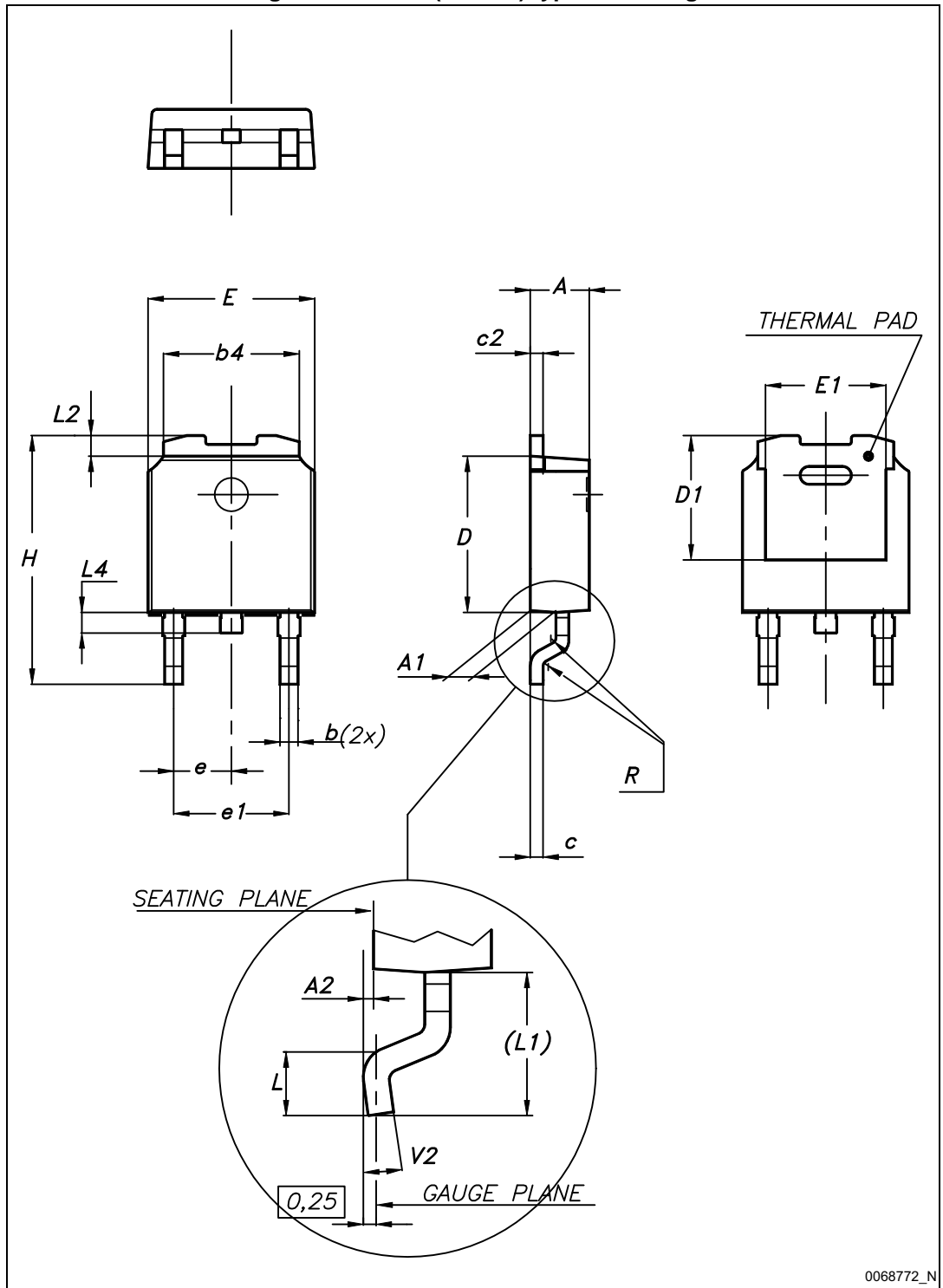
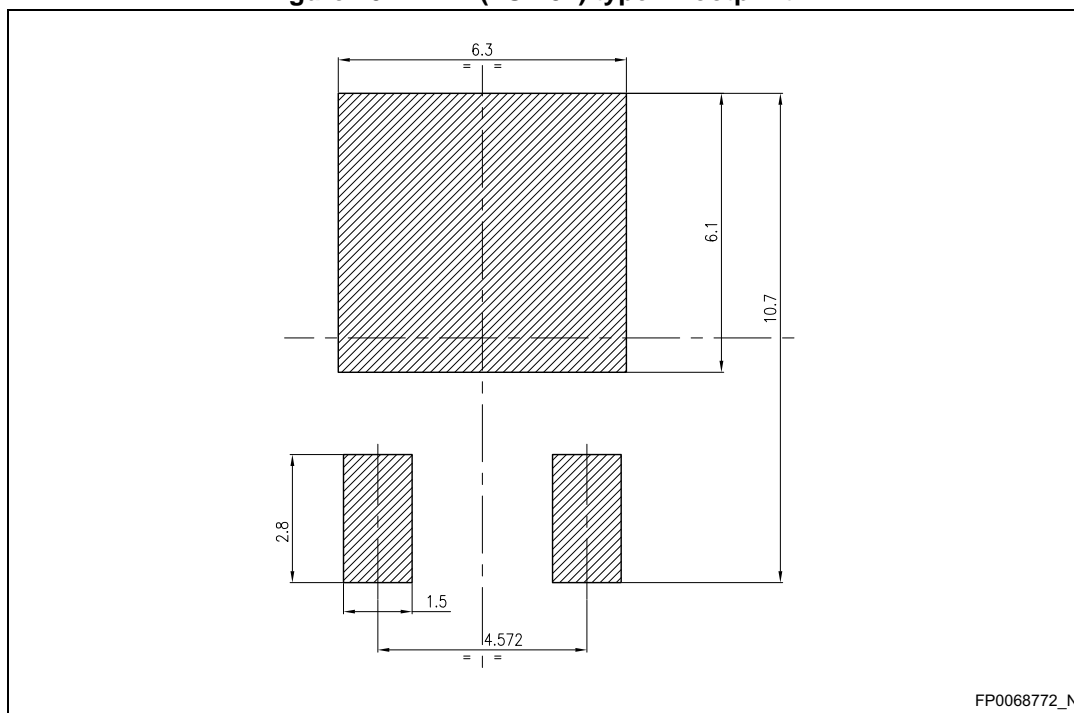


Table 9. DPAK (TO-252) type A mechanical data

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		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 (TO-252) type A footprint (a)



a. All dimensions are in millimeters

Figure 21. DPAK (TO-252) type C drawing

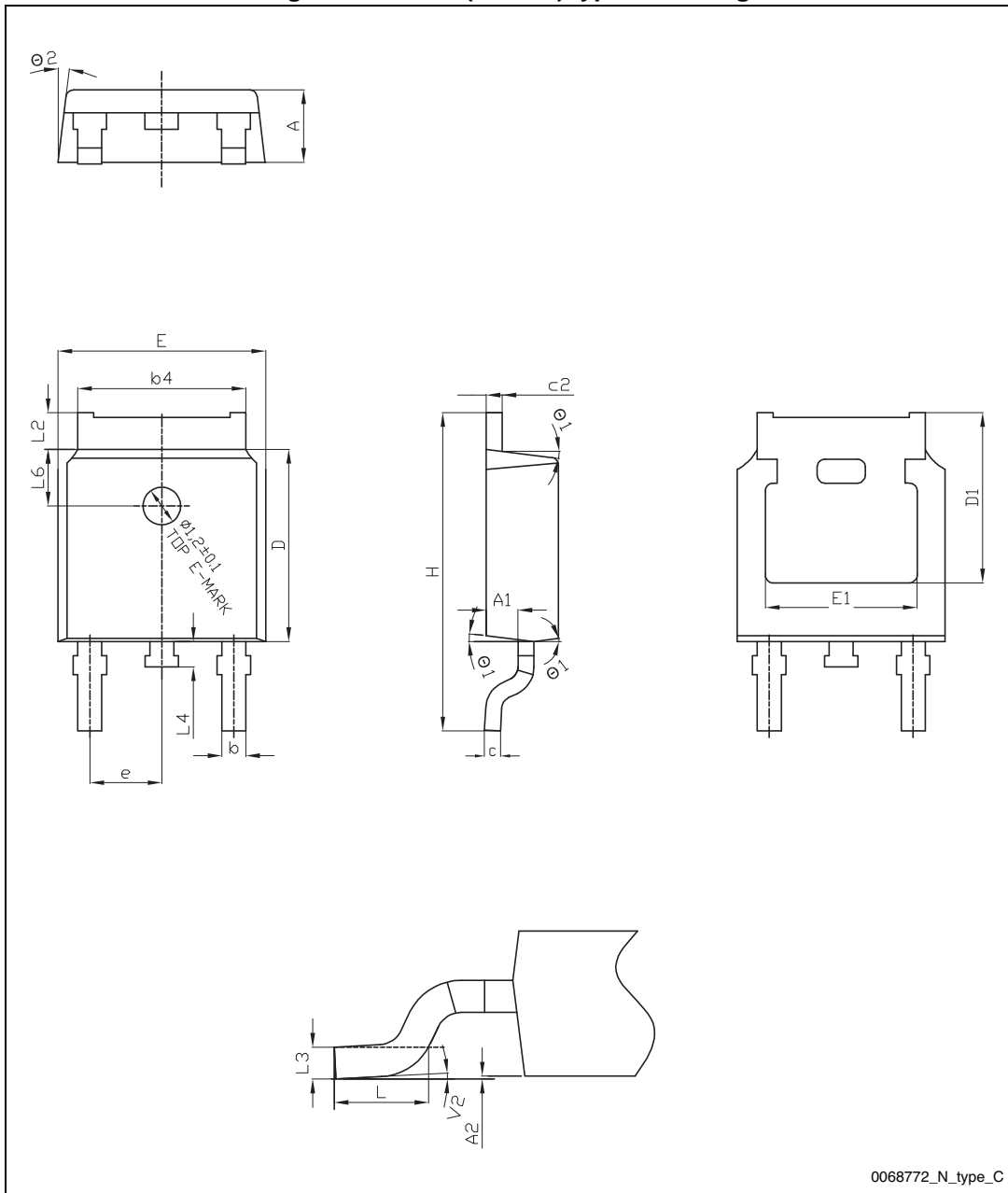
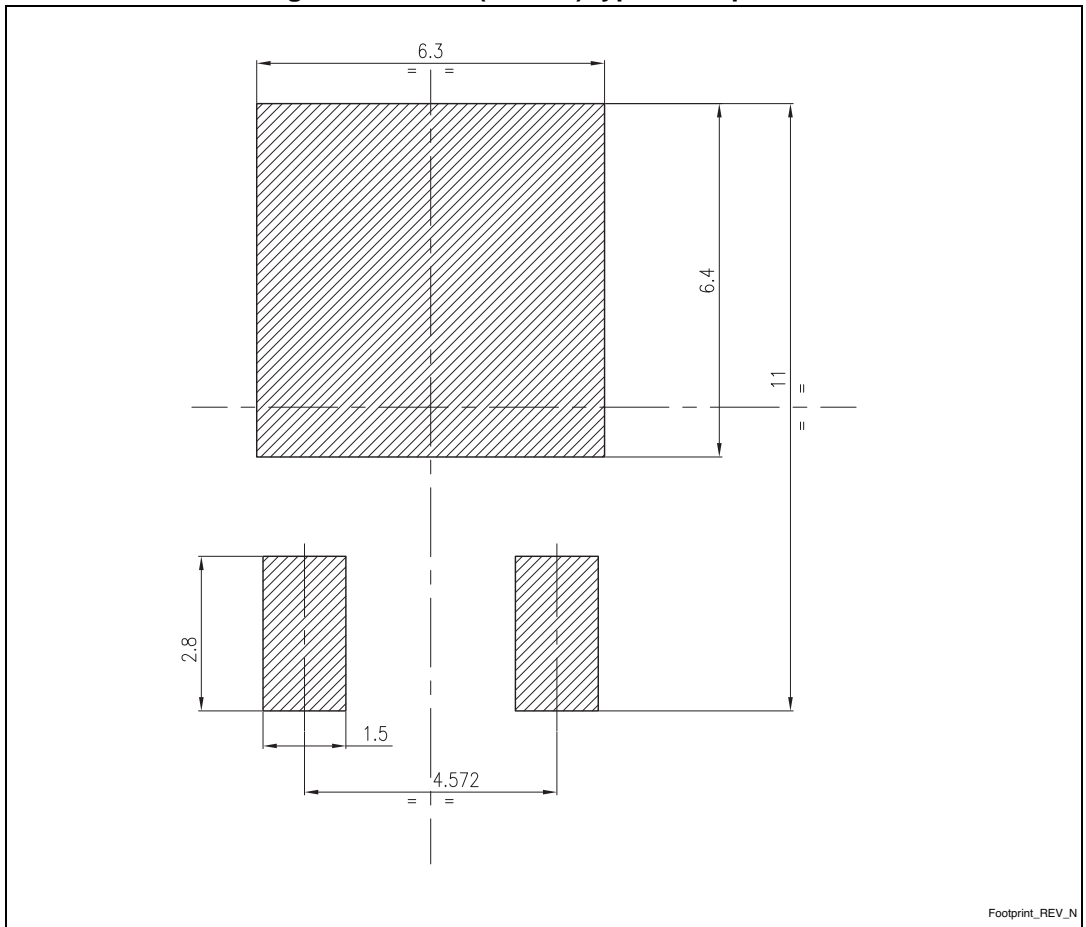


Table 10. DPAK (TO-252) type C mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.25		
E	6.50	6.60	6.70
E1	4.70		
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L2	0.90		1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L6	1.80 BSC		
Ø1	5°	7°	9°
Ø2	5°	7°	9°
V2	0		8°

Figure 22. DPAK (TO-252) type A footprint (b)



b. All dimensions are in millimeters

5 Packaging mechanical data

Figure 23. Tape for DPAK (TO-252)

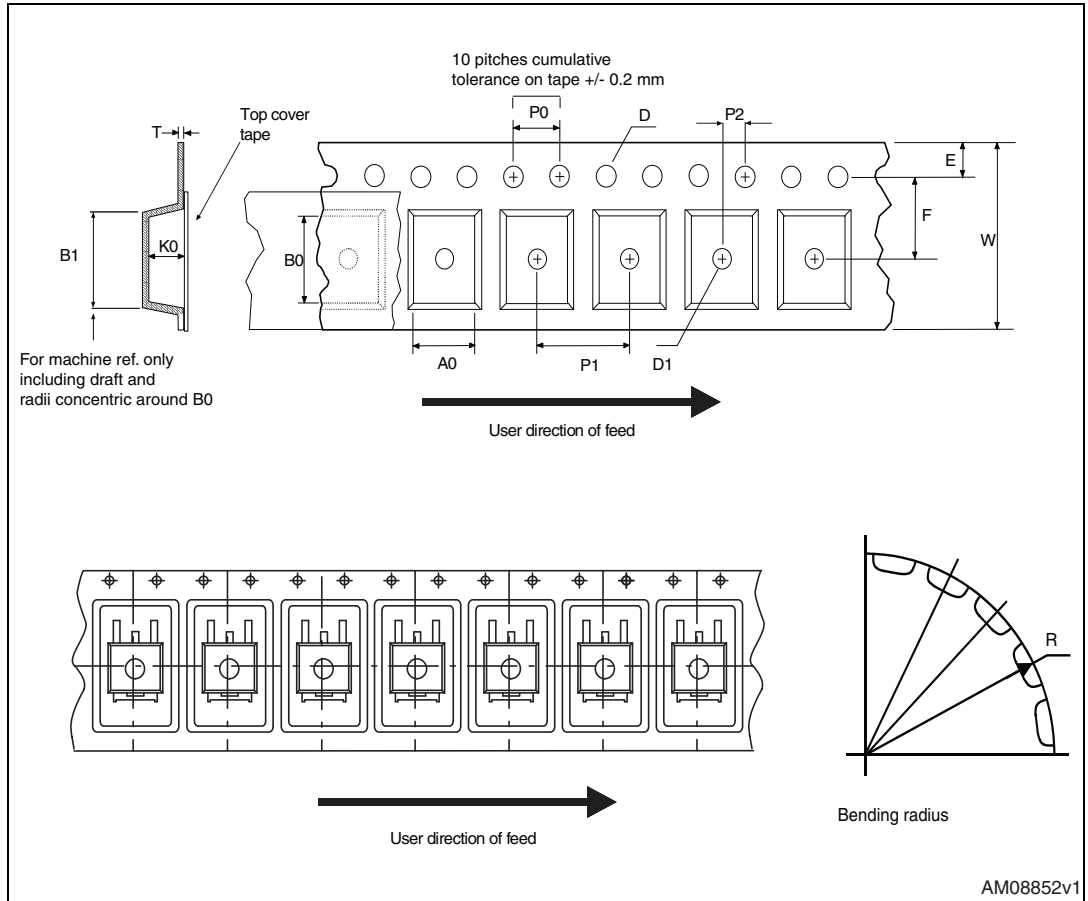


Figure 24. Reel for DPAK (TO-252)

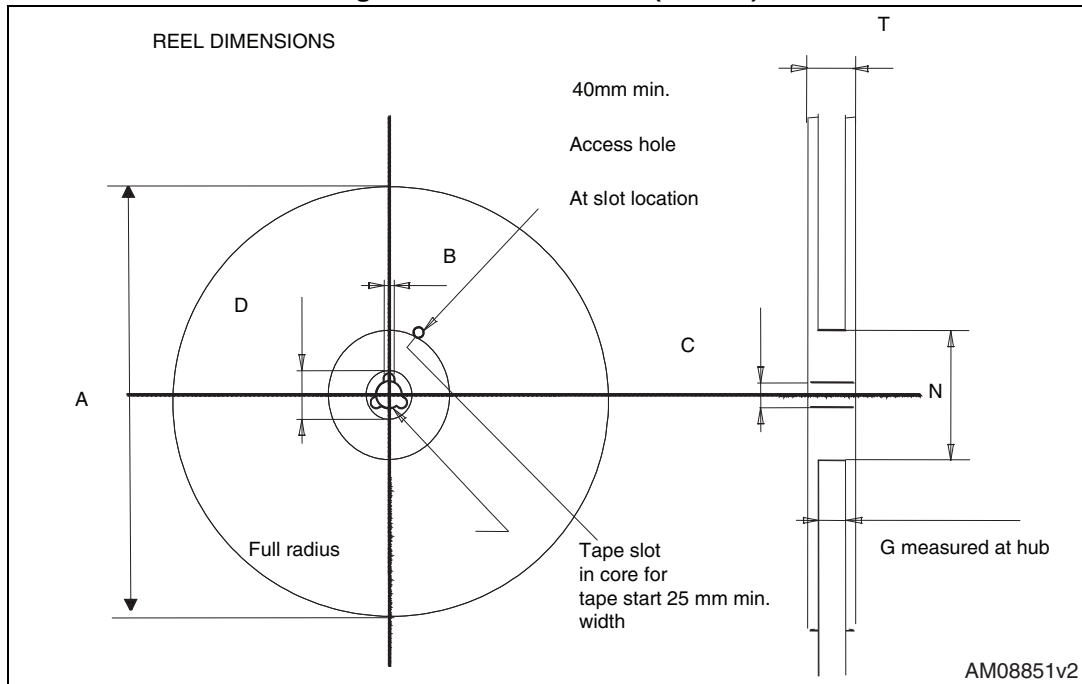


Table 11. DPAK (TO-252) tape and reel mechanical data

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 12. Document revision history

Date	Revision	Changes
07-May-2014	1	Initial release.

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