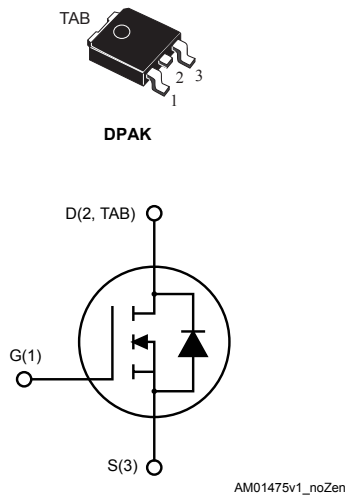


N-channel 100 V, 25 mΩ typ., 50 A, STripFET™ II Power MOSFET in a DPAK package



Features

Type	V _{DS}	R _{DS(on)} max.	I _D
STD40NF10	100 V	28 mΩ	50 A

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

Applications

- Switching applications

Description

This Power MOSFET series 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.

Product status link

[STD40NF10](#)

Product summary

Order code	STD40NF10
Marking	D40NF10
Package	DPAK
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	100	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	50	A
	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	35	A
$I_{DM}^{(2)}$	Drain current (pulsed)	200	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	125	W
$E_{AS}^{(3)}$	Single-pulse avalanche energy	385	mJ
$dv/dt^{(4)}$	Peak diode recovery voltage slope	27	V/ns
T_{stg}	Storage temperature range	-55 to 175	$^\circ\text{C}$
T_J	Operating junction temperature range		

1. This value is limited by wire bonding.
2. Pulse width limited by safe operating area.
3. Starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = 50\text{ A}$, $V_{DD} = 25\text{ V}$
4. $I_{SD} \leq 50\text{ A}$, $di/dt \leq 600\text{ A}/\mu\text{s}$, $V_{DS} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.2	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	50	$^\circ\text{C}/\text{W}$

1. When mounted on an FR-4 board of 1 inch², 2 oz Cu.

2 Electrical characteristics

$T_{CASE} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	100			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$			1	μA
		$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $T_C = 125\text{ }^{\circ}\text{C}^{(1)}$			10	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	$V_{DD} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$		25	28	m Ω

1. Defined by design, not subject to production test.

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	2180		pF
C_{oss}	Output capacitance		-	298		pF
C_{rss}	Reverse transfer capacitance		-	83.7		pF
Q_g	Total gate charge	$V_{DD} = 50\text{ V}$, $I_D = 40\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	46.5	62	nC
Q_{gs}	Gate-source charge		-	9		nC
Q_{gd}	Gate-drain charge		-	19	25	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}$, $I_D = 25\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times and Figure 17. Switching time waveform)	-	21	-	ns
t_r	Rise time		-	46	-	ns
$t_{d(off)}$	Turn-off delay time		-	54	-	ns
t_f	Fall time		-	13	-	ns

Table 6. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		50	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		200	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 50\text{ A}$, $V_{GS} = 0\text{ V}$	-		1.5	V

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$I_{SD} = 50\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 25\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	80		ns
Q_{rr}	Reverse recovery charge		-	250		nC
I_{RRM}	Reverse recovery current		-	6.4		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

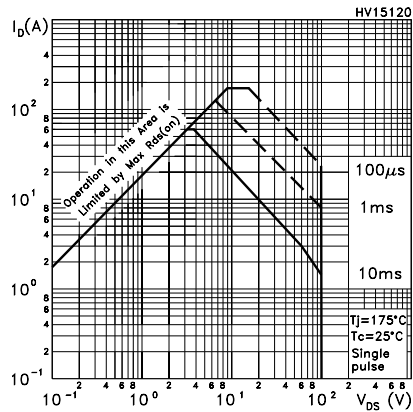
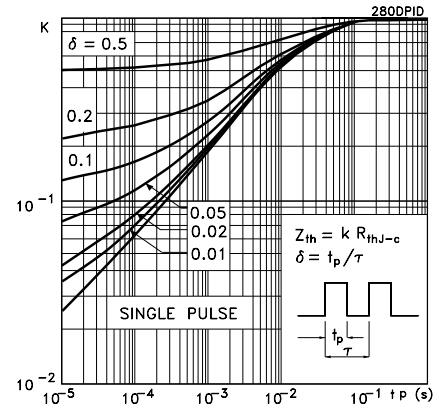
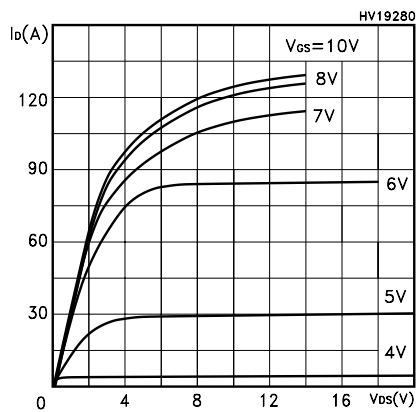
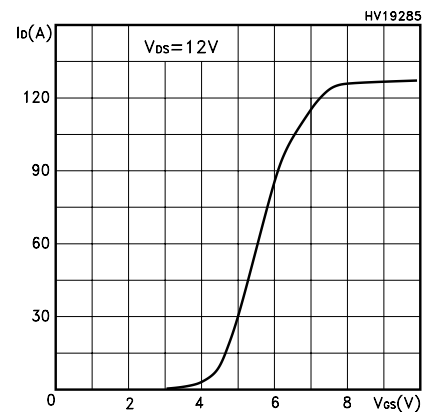
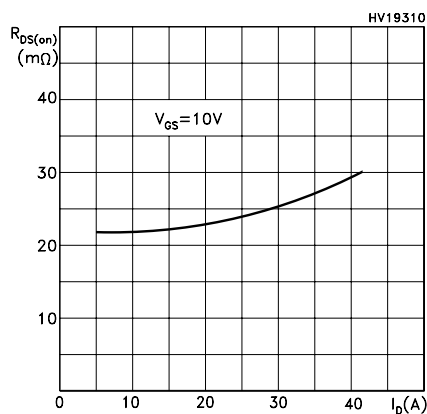
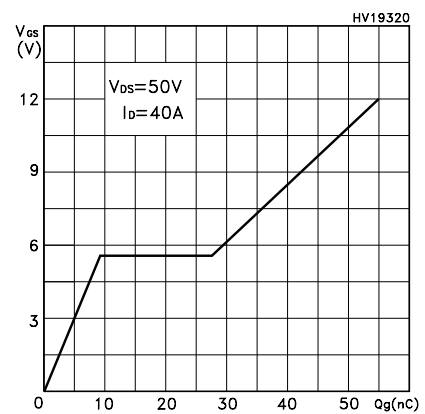
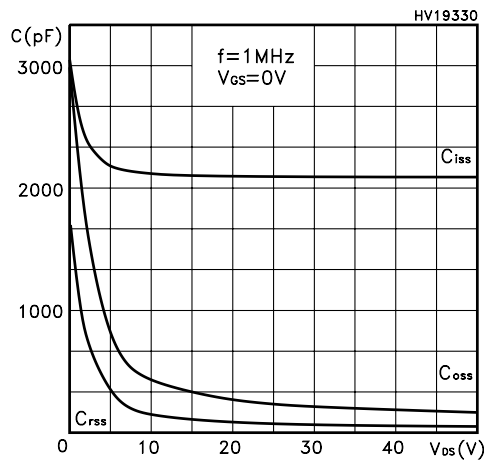
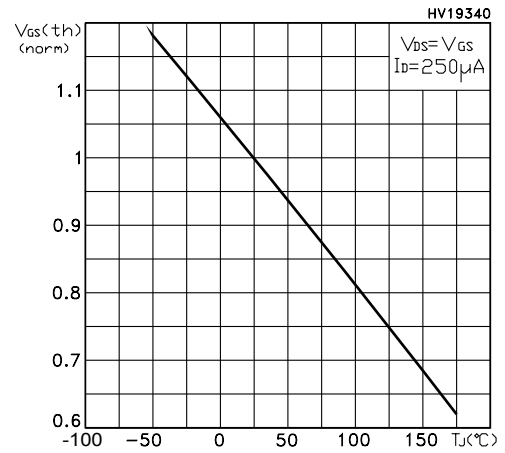
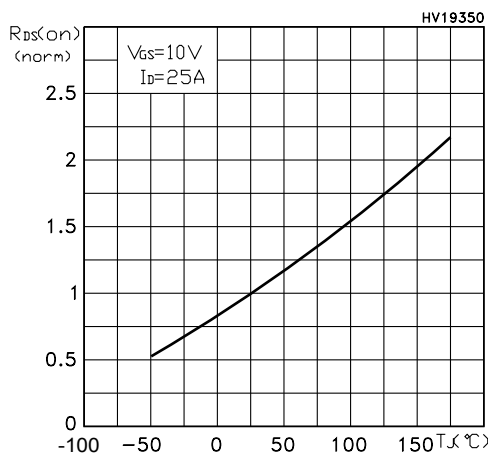
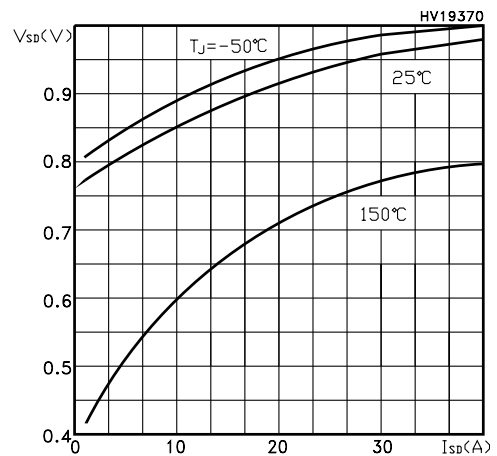
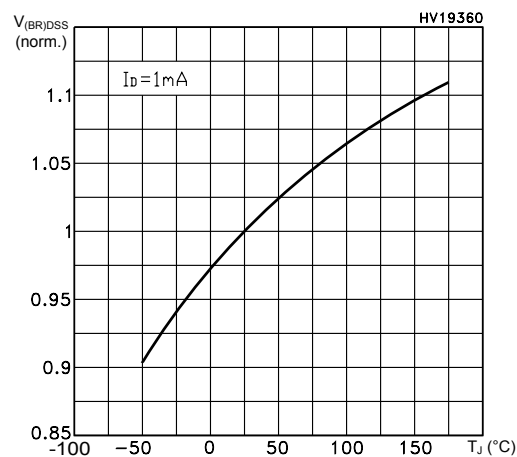
Figure 1. Safe operating area

Figure 2. Thermal impedance

Figure 3. Output characteristics

Figure 4. Transfer characteristics

Figure 5. Static drain-source on-resistance

Figure 6. Gate charge vs gate-source voltage


Figure 7. Capacitance variations

Figure 8. Normalized gate threshold voltage vs temperature

Figure 9. Normalized on-resistance vs temperature

Figure 10. Source-drain diode forward characteristics

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


3 Test circuits

Figure 12. Test circuit for resistive load switching times

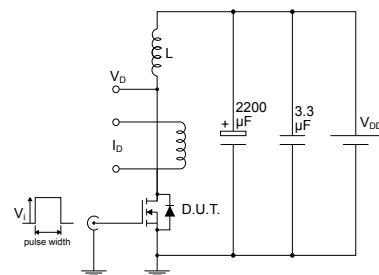

AM01468v1

Figure 13. Test circuit for gate charge behavior

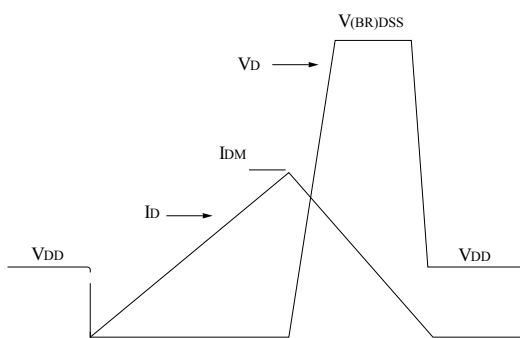

AM01469v1

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


AM01470v1

Figure 15. Unclamped inductive load test circuit


AM01471v1

Figure 16. Unclamped inductive waveform


AM01472v1

Figure 17. Switching time waveform

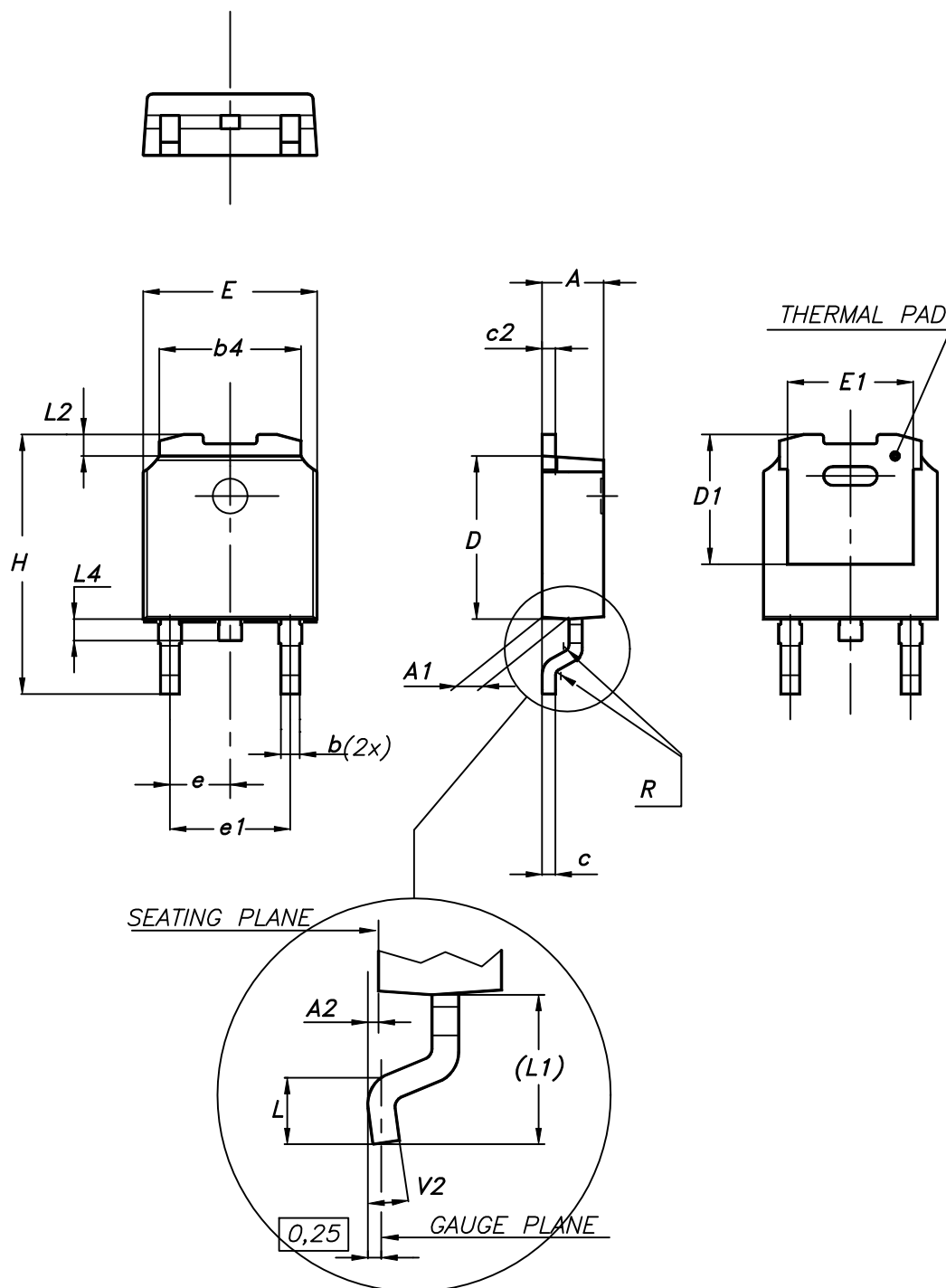

AM01473v1

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 A2 package information

Figure 18. DPAK (TO-252) type A2 package outline



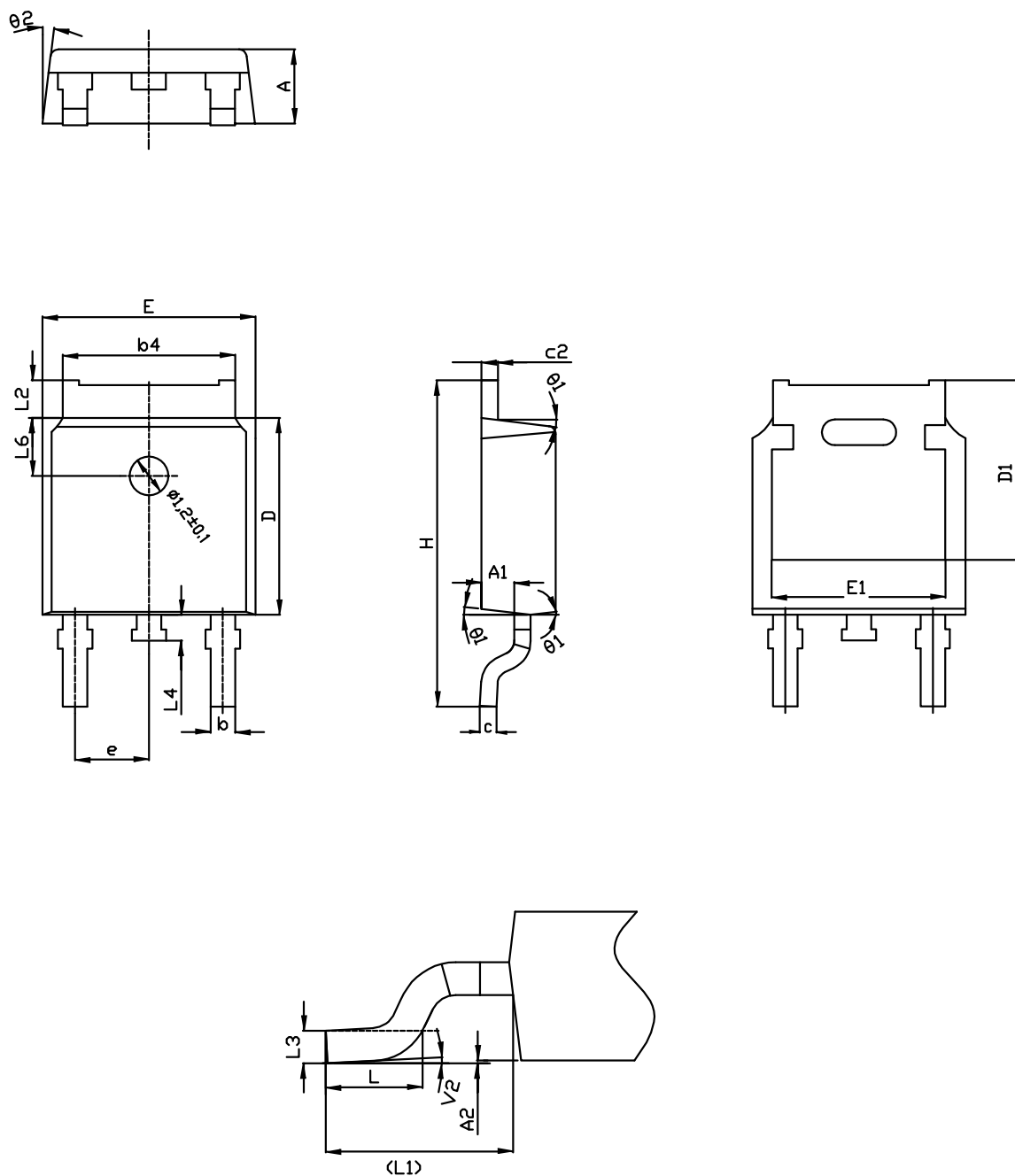
0068772_type-A2_rev25

Table 7. 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	2.159	2.286	2.413
e1	4.445	4.572	4.699
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°

4.2 DPAK (TO-252) type C2 package information

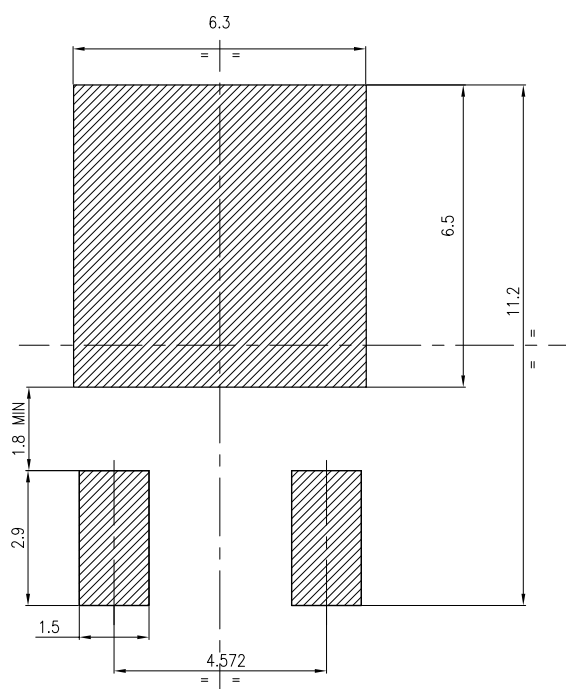
Figure 19. DPAK (TO-252) type C2 package outline



0068772_C2_25

Table 8. DPAK (TO-252) type C2 mechanical data

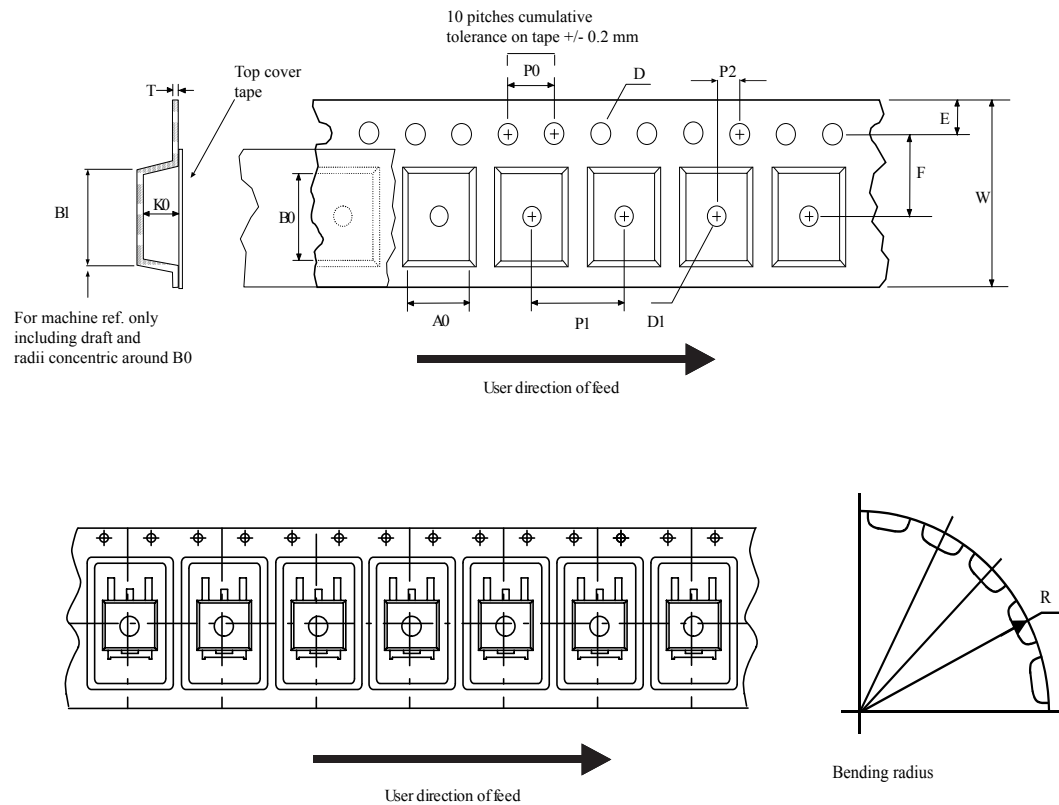
Dim.	mm		
	Min.	Typ.	Max.
A	2.20	2.30	2.38
A1	0.90	1.01	1.10
A2	0.00		0.10
b	0.72		0.85
b4	5.13	5.33	5.46
c	0.47		0.60
c2	0.47		0.60
D	6.00	6.10	6.20
D1	5.10		5.60
E	6.50	6.60	6.70
E1	5.20		5.50
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.90		1.25
L3	0.51 BSC		
L4	0.60	0.80	1.00
L6	1.80 BSC		
θ1	5°	7°	9°
θ2	5°	7°	9°
V2	0°		8°

Figure 20. DPAK (TO-252) recommended footprint (dimensions are in mm)


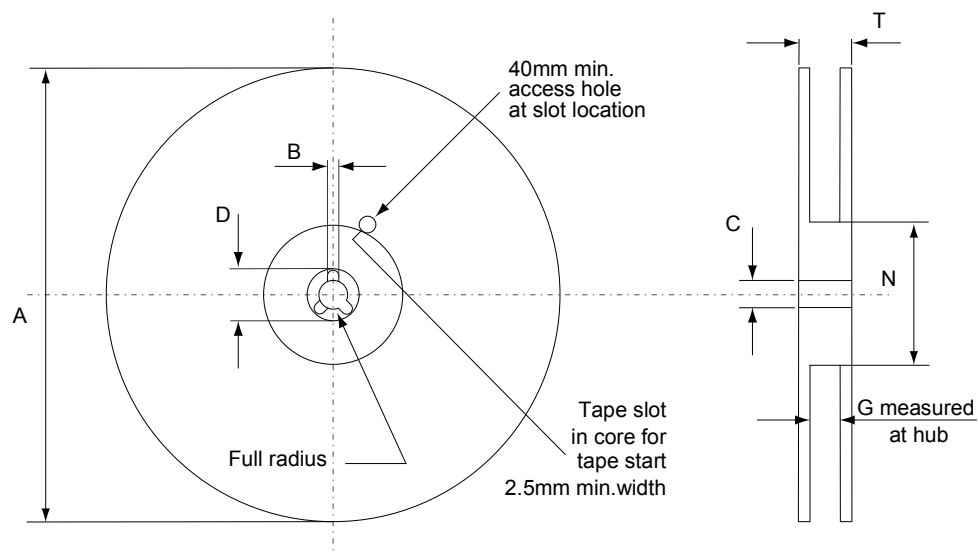
FP_0068772_25

4.3 DPAK (TO-252) packing information

Figure 21. DPAK (TO-252) tape outline



AM08852v1

Figure 22. DPAK (TO-252) reel outline


AM06038v1

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			

Revision history

Table 10. Document revision history

Date	Version	Changes
19-Nov-2010	1	First issue.
09-Aug-2018	2	Updated Section 2 Electrical characteristics . Updated Section 4 Package information . Minor text changes

Contents

1	Electrical ratings	2
2	Electrical characteristics.....	3
2.1	Electrical characteristics (curves)	5
3	Test circuits	7
4	Package information.....	8
4.1	DPAK (TO-252) type A2 package information	8
4.2	DPAK (TO-252) type C2 package information	10
4.3	DPAK (TO-252) packing information.....	13
	Revision history	16

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[STD40NF10](#)