

N-channel 650 V, 0.185 Ω typ., 16 A MDmesh M2 Power MOSFET in D2PAK, TO-220FP and TO-220 packages

Datasheet - production data

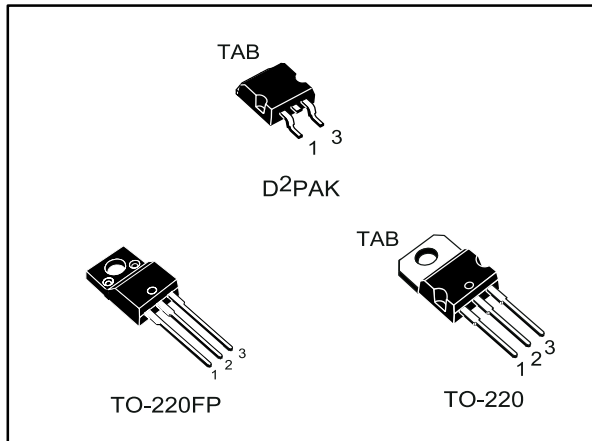
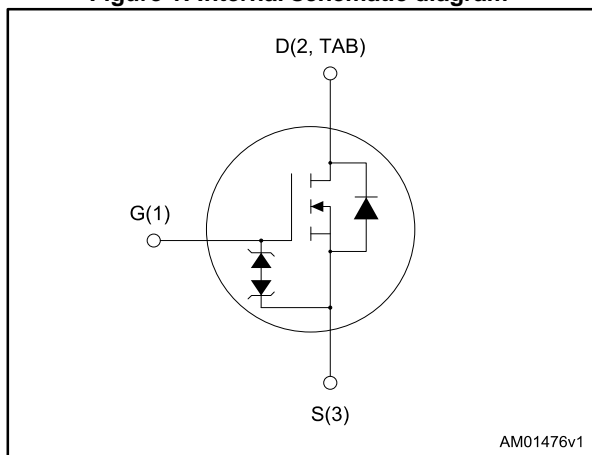


Figure 1: Internal schematic diagram



Features

Order codes	V _{DS}	R _{DS(on)} max	I _D
STB24N65M2	650 V	0.23 Ω	16 A
STF24N65M2			
STP24N65M2			

- Extremely low gate charge
- Excellent output capacitance (C_{oss}) profile
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications

Description

These devices are N-channel Power MOSFETs developed using MDmesh™ M2 technology. Thanks to their strip layout and improved vertical structure, the devices exhibit low on-resistance and optimized switching characteristics, rendering them suitable for the most demanding high efficiency converters.

Table 1: Device summary

Order codes	Marking	Package	Packaging
STB24N65M2	24N65M2	D ² PAK	Tape and reel
STF24N65M2		TO-220FP	Tube
STP24N65M2		TO-220	

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves).....	6
3	Test circuits	9
4	Package mechanical data	10
	4.1 D2PAK package information	10
	4.2 TO-220FP package information	13
	4.3 TO-220 type A package information.....	15
5	Packaging mechanical data.....	17
6	Revision history	19

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value		Unit
		D ² PAK TO-220	TO-220FP	
V _{GS}	Gate-source voltage	± 25		V
I _D	Drain current (continuous) at T _C = 25 °C	16	16 ⁽¹⁾	A
I _D	Drain current (continuous) at T _C = 100 °C	10	10 ⁽¹⁾	A
I _{DM} ⁽²⁾	Drain current (pulsed)	64	64 ⁽¹⁾	A
P _{TOT}	Total dissipation at T _C = 25 °C	150	30	W
dv/dt ⁽³⁾	Peak diode recovery voltage slope	15		V/ns
dv/dt ⁽⁴⁾	MOSFET dv/dt ruggedness	50		V/ns
V _{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; T _C = 25 °C)		2500	V
T _{stg}	Storage temperature	- 55 to 150		°C
T _j	Max. operating junction temperature			

Notes:

⁽¹⁾Limited by maximum junction temperature.

⁽²⁾Pulse width limited by safe operating area.

⁽³⁾I_{SD} ≤ 16 A, di/dt ≤ 400 A/μs; V_{DS(peak)} < V_{(BR)DSS}, V_{DD} = 80% V_{(BR)DSS}.

⁽⁴⁾V_{DS} ≤ 520 V

Table 3: Thermal data

Symbol	Parameter	Value			Unit
		D ² PAK	TO-220	TO-220FP	
R _{thj-case}	Thermal resistance junction-case max	0.83		4.2	°C/W
R _{thj-pcb}	Thermal resistance junction-pcb max ⁽¹⁾	30			°C/W
R _{thj-amb}	Thermal resistance junction-ambient max		62.5		°C/W

Notes:

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

Table 4: Avalanche characteristics

Symbol	Parameter	Value	Unit
I _{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T _{jmax})	2.2	A
E _{AS}	Single pulse avalanche energy (starting T _j =25°C, I _D = I _{AR} ; V _{DD} =50V)	650	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	$I_D = 1\text{ mA}$, $V_{GS} = 0$	650			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 650\text{ V}$			1	μA
		$V_{DS} = 650\text{ V}$, $T_C = 125\text{ °C}$			100	μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 25\text{ V}$			± 10	μA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$, $I_D = 8\text{ A}$		0.185	0.23	Ω

Table 6: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$	-	1060	-	pF
C_{oss}	Output capacitance		-	47.5	-	pF
C_{riss}	Reverse transfer capacitance		-	1.65	-	pF
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{DS} = 0\text{ to }520\text{ V}$, $V_{GS} = 0$	-	229	-	pF
R_G	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0$	-	7	-	Ω
Q_g	Total gate charge	$V_{DD} = 520\text{ V}$, $I_D = 16\text{ A}$, $V_{GS} = 10\text{ V}$	-	29	-	nC
Q_{gs}	Gate-source charge		-	3.8	-	nC
Q_{gd}	Gate-drain charge		-	14	-	nC

Notes:

(1) $C_{oss\text{ eq.}}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}

Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 325\text{ V}$, $I_D = 8\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	10	-	ns
t_r	Rise time		-	9.5	-	ns
$t_{d(off)}$	Turn-off delay time		-	68	-	ns
t_f	Fall time		-	25.5	-	ns

Table 8: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		16	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		64	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 16 \text{ A}$, $V_{GS} = 0$	-		1.6	V
t_{rr}	Reverse recovery time	$I_{SD} = 16 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 60 \text{ V}$	-	350		ns
Q_{rr}	Reverse recovery charge		-	4.5		μC
I_{RRM}	Reverse recovery current		-	26		A
t_{rr}	Reverse recovery time	$I_{SD} = 16 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 60 \text{ V}$, $T_j = 150 \text{ }^\circ\text{C}$	-	496		ns
Q_{rr}	Reverse recovery charge		-	6.5		μC
I_{RRM}	Reverse recovery current		-	25.5		A

Notes:

(1)Pulse width limited by safe operating area.

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

2.1 Electrical characteristics (curves)

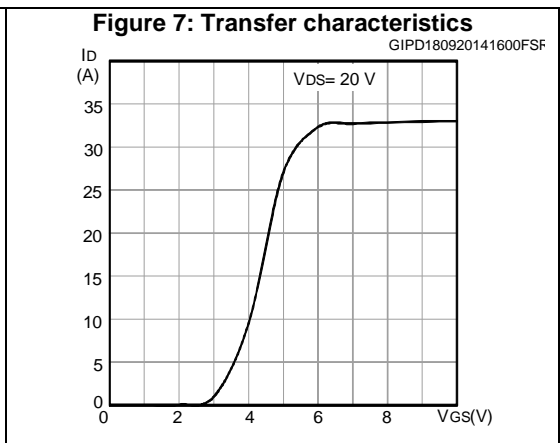
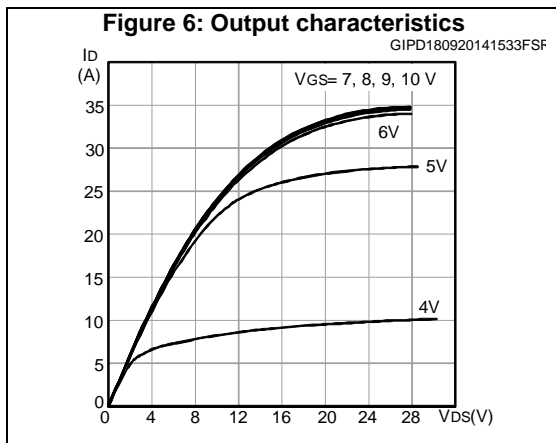
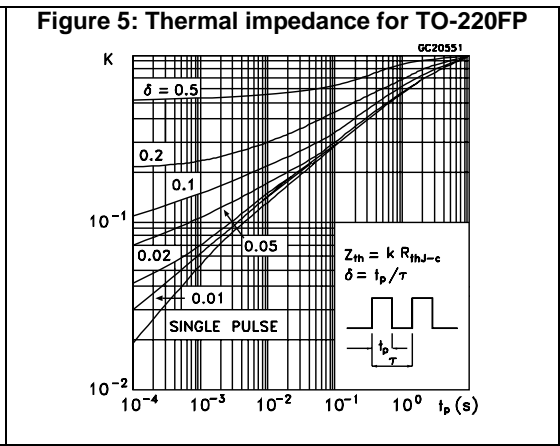
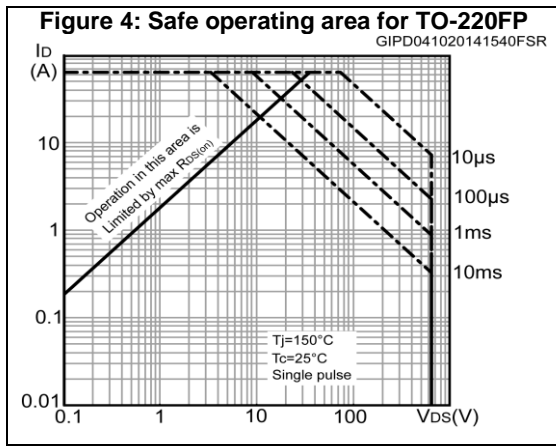
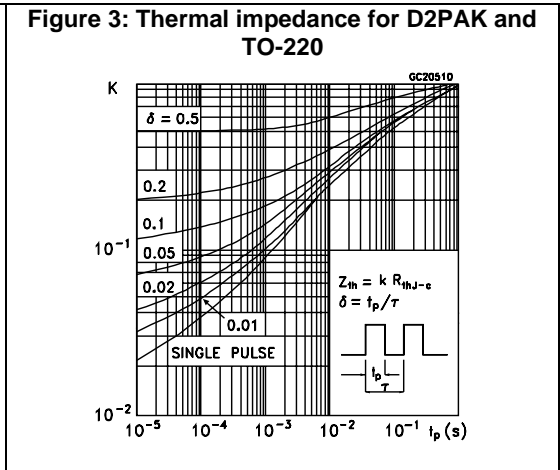
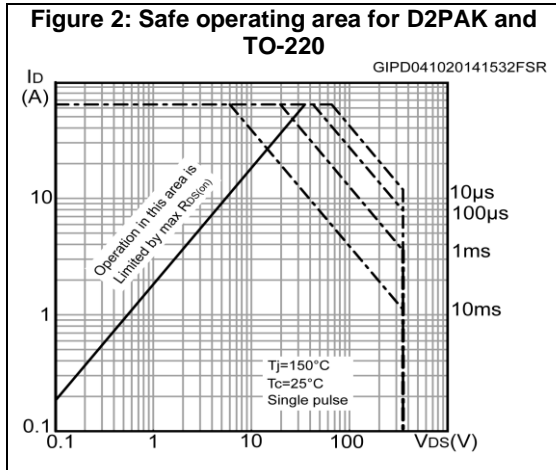


Figure 8: Gate charge vs gate-source voltage

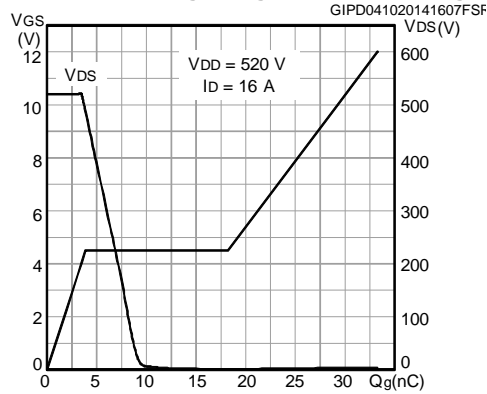


Figure 9: Static drain-source on-resistance

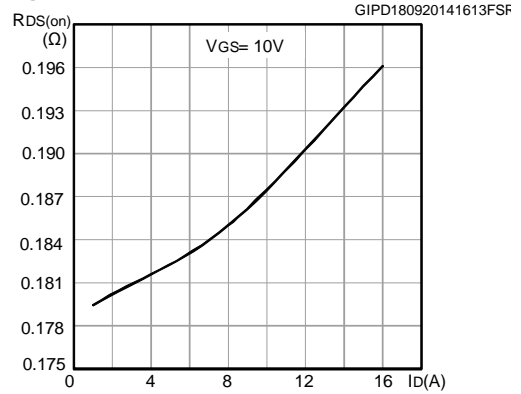


Figure 10: Capacitance variations

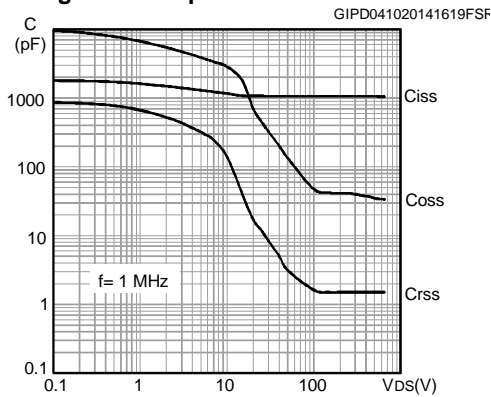


Figure 11: Normalized gate threshold voltage vs temperature

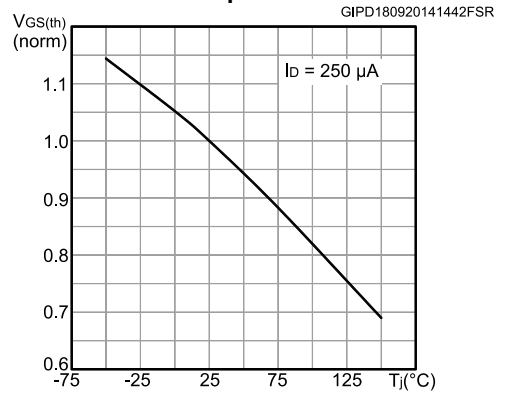


Figure 12: Normalized on-resistance

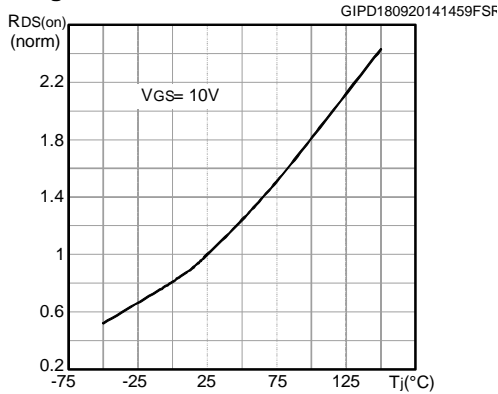


Figure 13: Normalized V(BR)DSS vs temperature

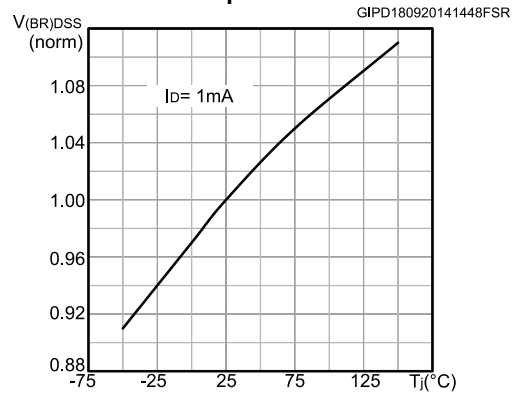


Figure 14: Source-drain diode forward characteristics

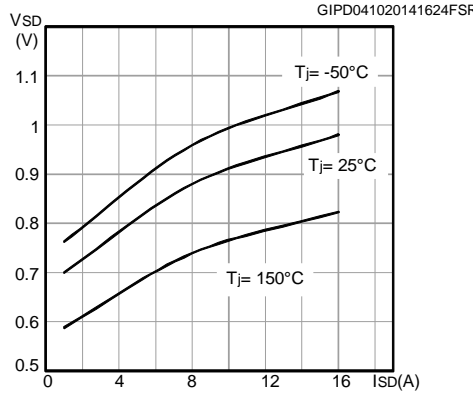
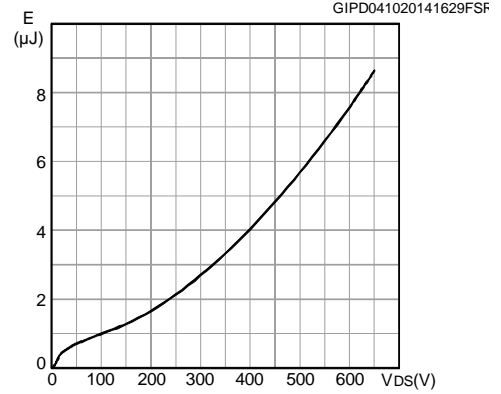
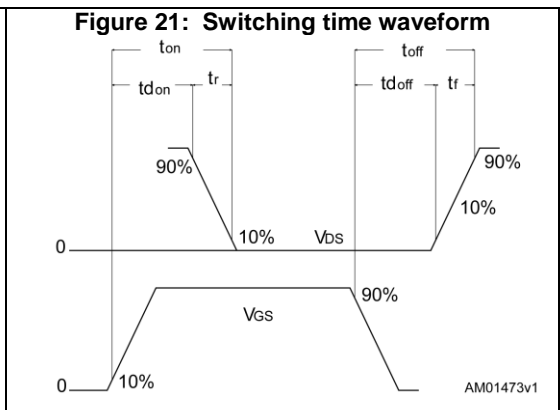
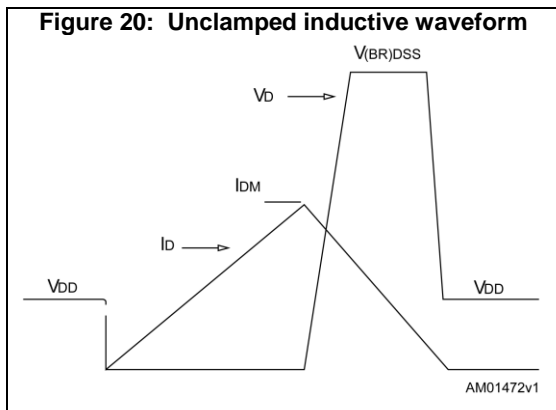
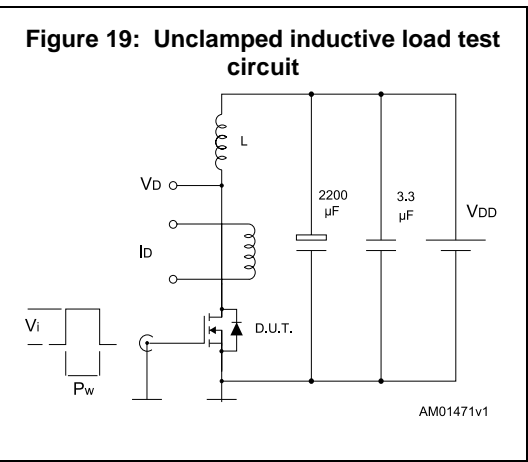
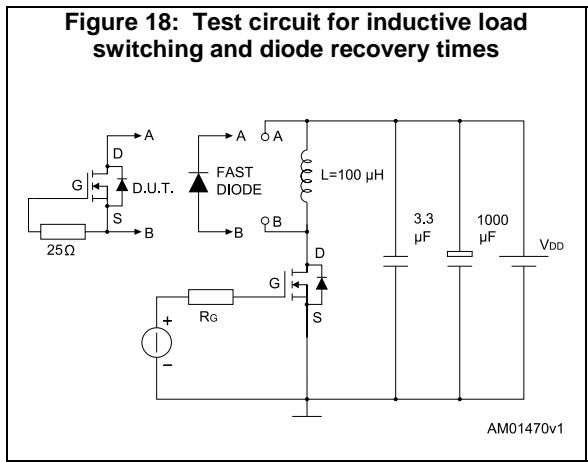
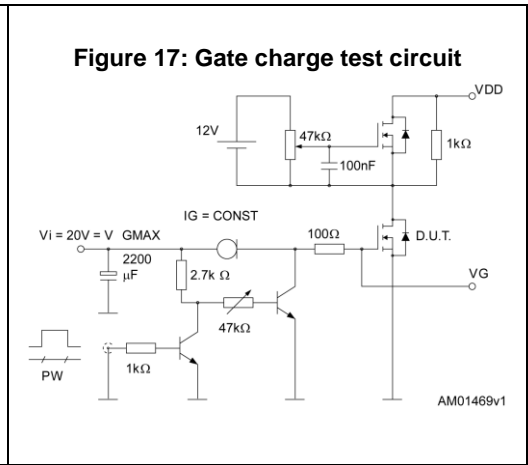
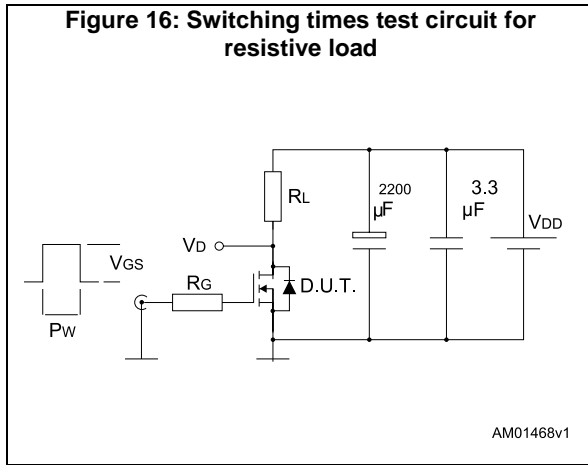


Figure 15: Output capacitance stored energy



3 Test circuits



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.

4.1 D2PAK package information

Figure 22: D²PAK (TO-263) drawing

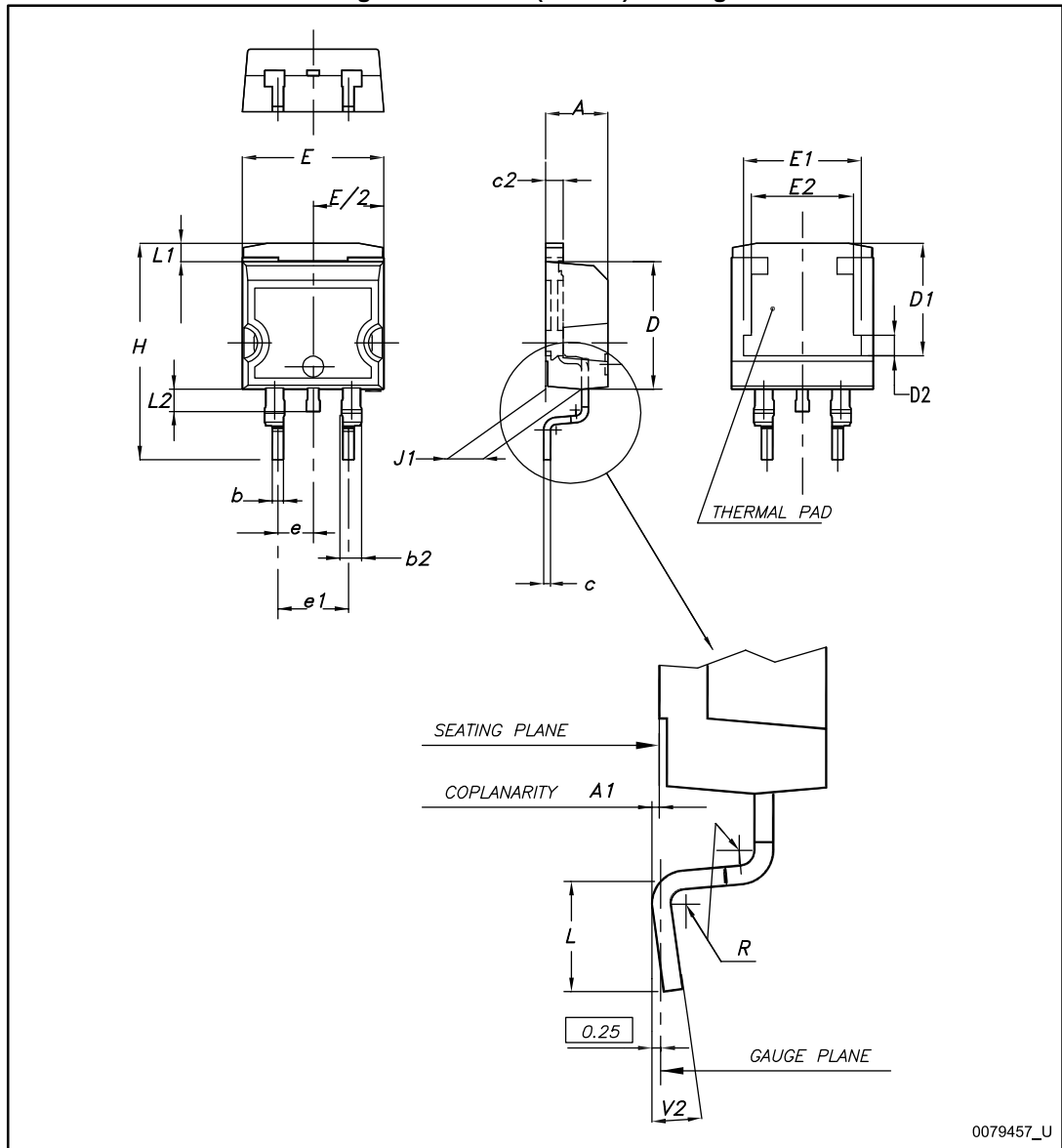
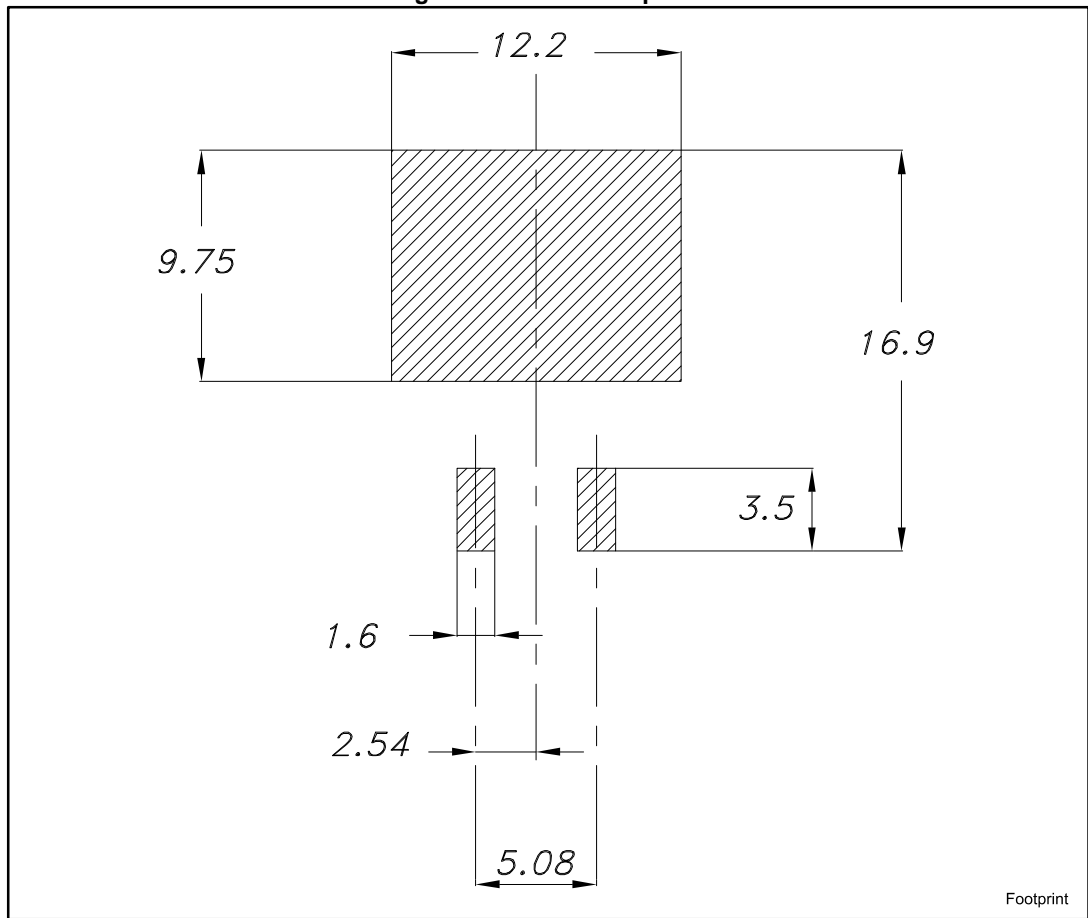


Table 9: D²PAK (TO-263) mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
A1	0.03		0.23
b	0.70		0.93
b2	1.14		1.70
c	0.45		0.60
c2	1.23		1.36
D	8.95		9.35
D1	7.50	7.75	8.00
D2	1.10	1.30	1.50
E	10		10.40
E1	8.50	8.70	8.90
E2	6.85	7.05	7.25
e		2.54	
e1	4.88		5.28
H	15		15.85
J1	2.49		2.69
L	2.29		2.79
L1	1.27		1.40
L2	1.30		1.75
R		0.4	
V2	0°		8°

Figure 23: D²PAK footprint



All the dimensions are in millimeters.

4.2 TO-220FP package information

Figure 24: TO-220FP package outline

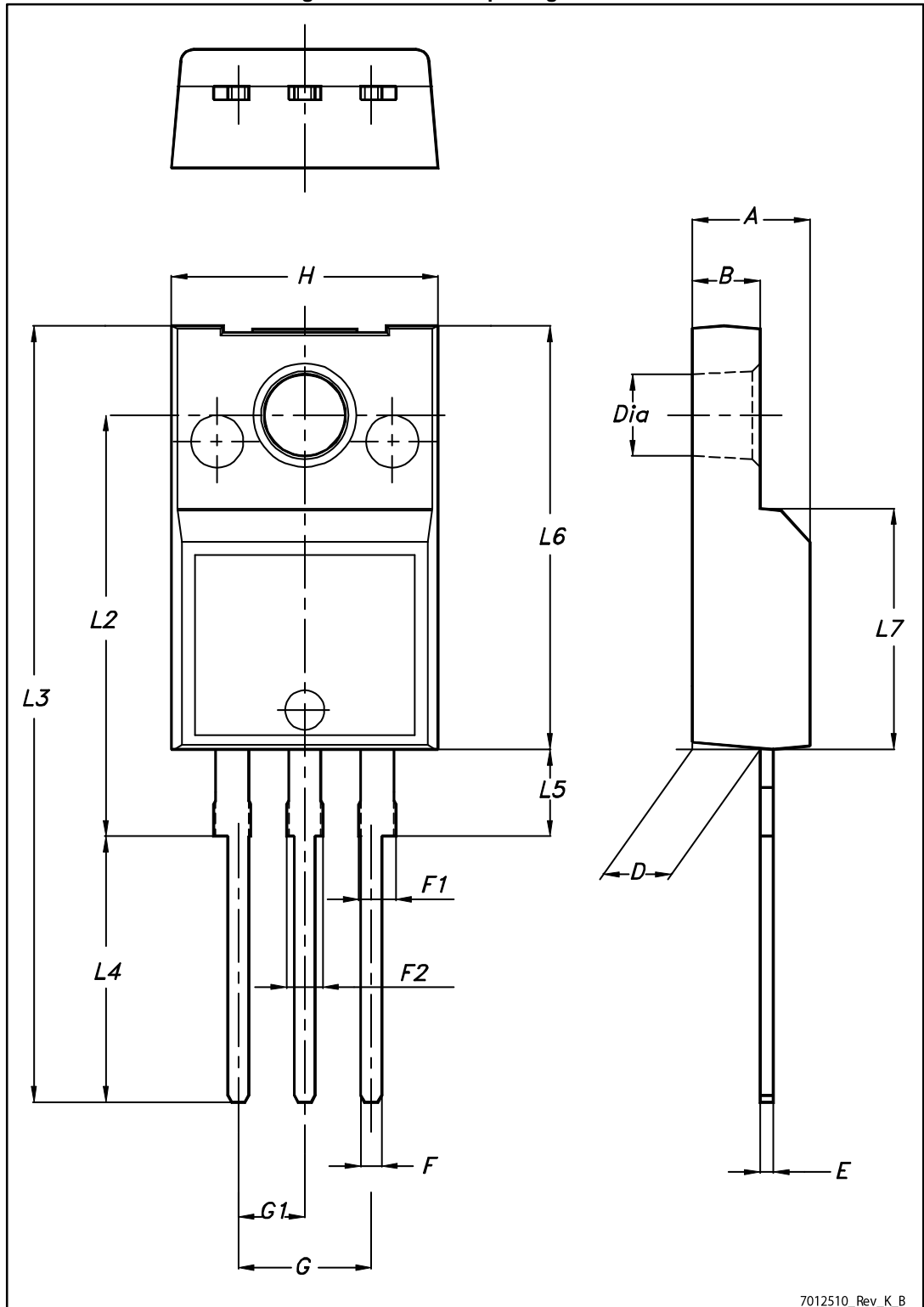


Table 10: TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	0.45		0.7
F	0.75		1
F1	1.15		1.70
F2	1.15		1.70
G	4.95		5.2
G1	2.4		2.7
H	10		10.4
L2		16	
L3	28.6		30.6
L4	9.8		10.6
L5	2.9		3.6
L6	15.9		16.4
L7	9		9.3
Dia	3		3.2

4.3 TO-220 type A package information

Figure 25: TO-220 type A package outline

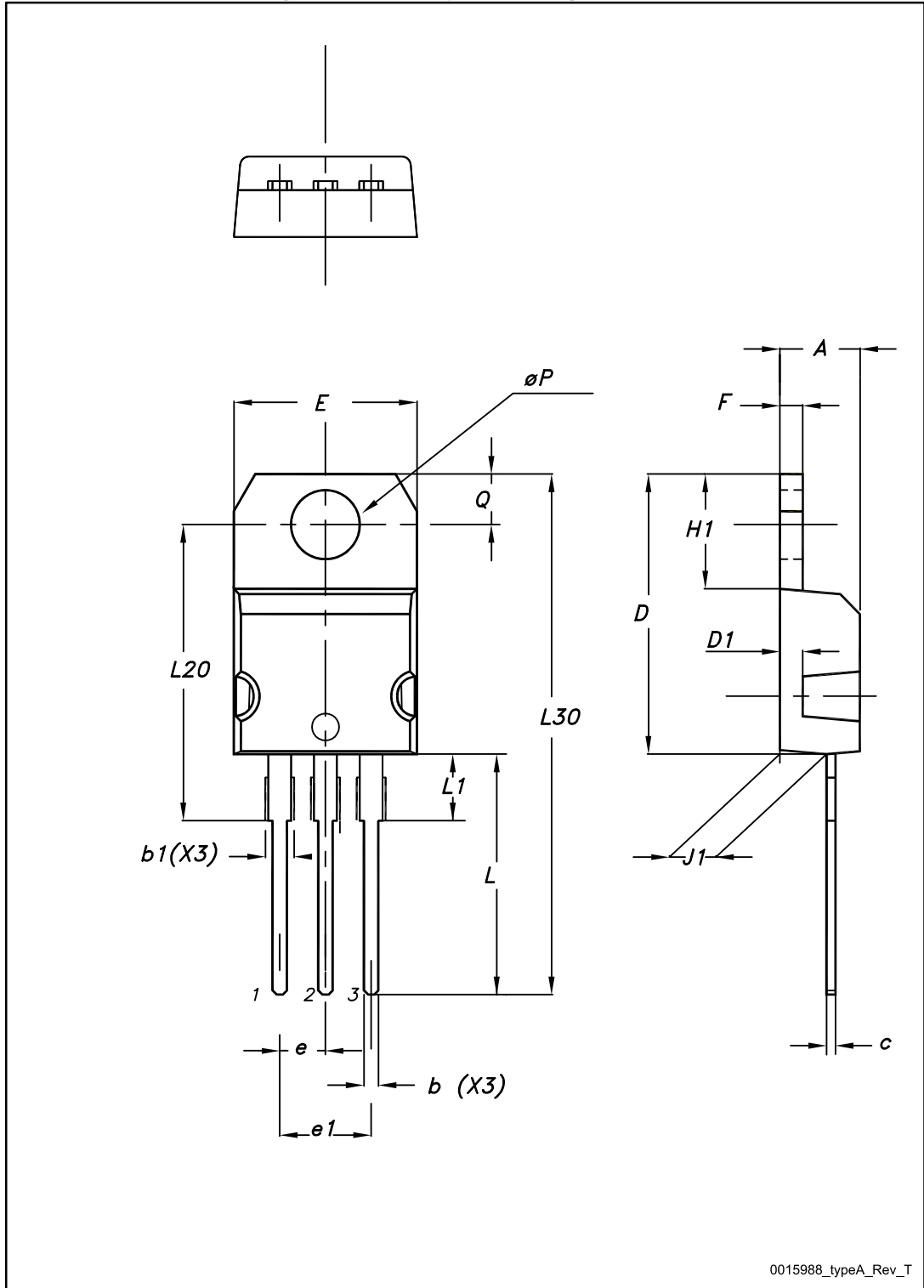


Table 11: TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

5 Packaging mechanical data

Figure 26: Tape

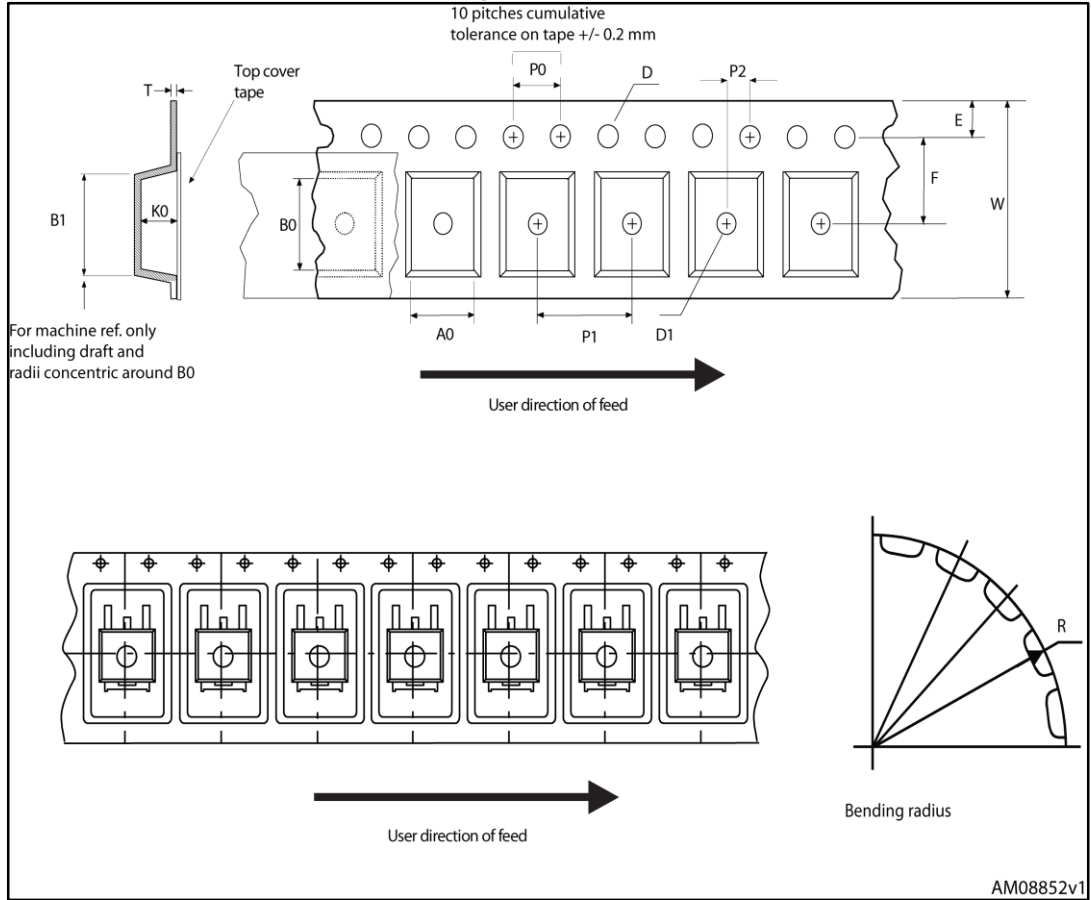


Figure 27: Reel

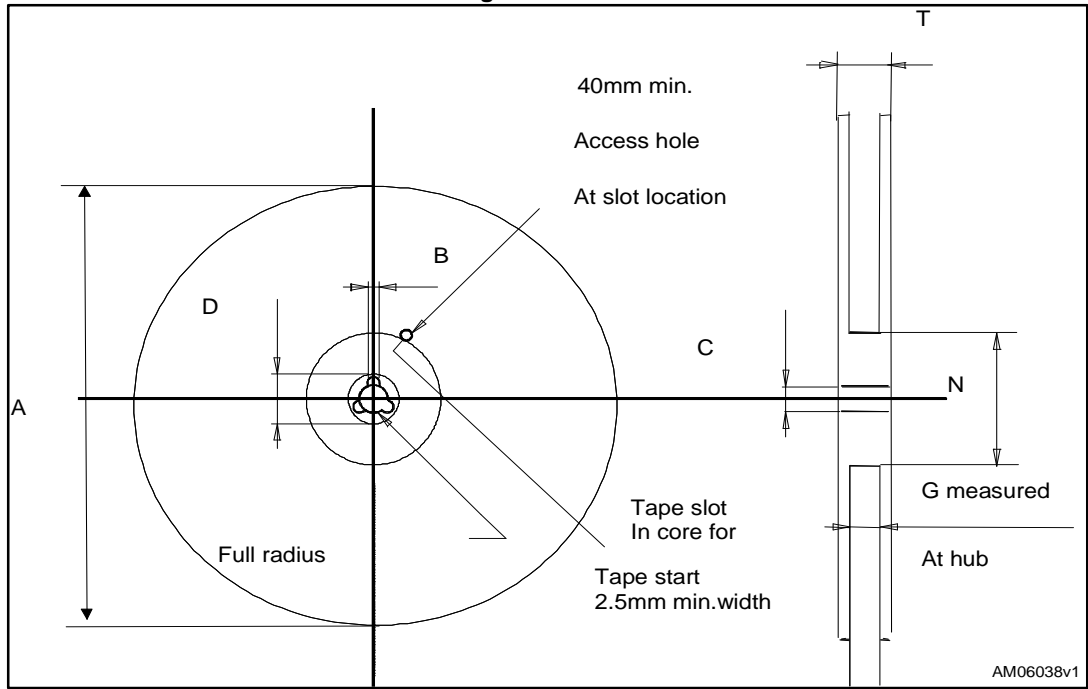


Table 12: D²PAK (TO-263) tape and reel mechanical data

Tape			Reel		
Dim.	mm		Dim.	mm	
	Min.	Max.		Min.	Max.
A0	10.5	10.7	A		330
B0	15.7	15.9	B	1.5	
D	1.5	1.6	C	12.8	13.2
D1	1.59	1.61	D	20.2	
E	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	T		30.4
P0	3.9	4.1			
P1	11.9	12.1	Base qty		1000
P2	1.9	2.1	Bulk qty		1000
R	50				
T	0.25	0.35			
W	23.7	24.3			

6 Revision history

Table 13: Document revision history

Date	Revision	Changes
09-Jun-2014	1	First release.
11-Nov-2014	2	Document status promoted from preliminary to production data.

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.

© 2014 STMicroelectronics – All rights reserved

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9