



# STD17NF25, STF17NF25, STP17NF25

N-channel 250 V 0.14  $\Omega$  typ., 17 A low gate charge STripFET™ II Power MOSFET in DPAK, TO-220FP and TO-220 packages

Datasheet — production data

## Features

Order codes	V <sub>DSS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>	P <sub>TOT</sub>
STD17NF25	250V	< 0.165 $\Omega$	17A	90W
STF17NF25	250V	< 0.165 $\Omega$	17A	25W
STP17NF25	250V	< 0.165 $\Omega$	17A	90W

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

## Application

- Switching applications

## Description

These Power MOSFETs have been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the devices 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.

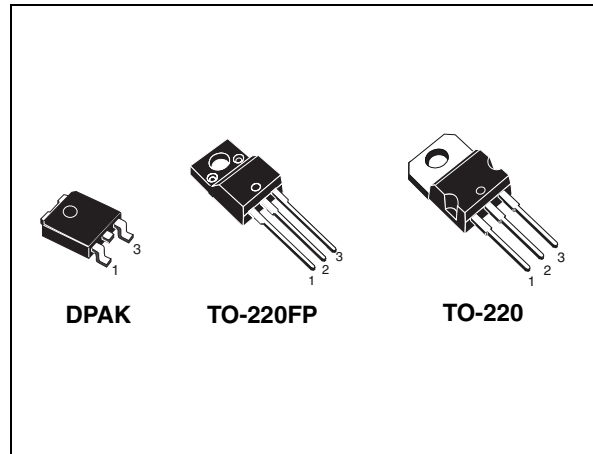


Figure 1. Internal schematic diagram

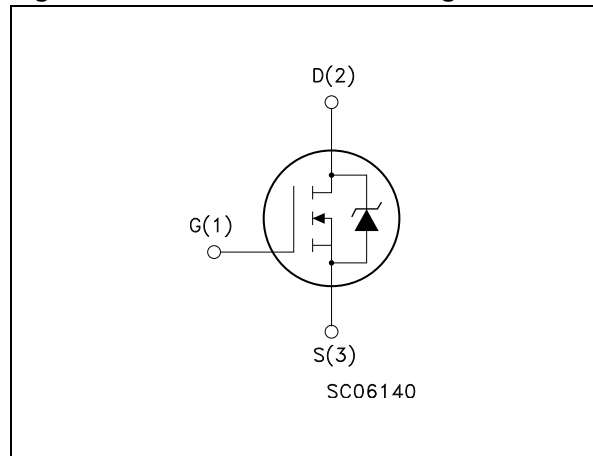


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD17NF25	17NF25	DPAK	Tape and reel
STF17NF25		TO-220FP	Tube
STP17NF25		TO-220	

# Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		TO-220, DPAK	TO-220FP	
V <sub>DS</sub>	Drain-source voltage	250		V
V <sub>GS</sub>	Gate-source voltage	±20		V
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> = 25 °C	17	17 <sup>(1)</sup>	A
I <sub>D</sub>	Drain current (continuous) at T <sub>C</sub> =100 °C	10	10 <sup>(1)</sup>	A
I <sub>DM</sub> <sup>(2)</sup>	Drain current (pulsed)	68	68 <sup>(1)</sup>	A
P <sub>TOT</sub>	Total dissipation at T <sub>C</sub> = 25 °C	90	25	W
	Derating factor	0.72	0.2	W/°C
dv/dt <sup>(3)</sup>	Peak diode recovery voltage slope	10		V/ns
T <sub>J</sub> T <sub>stg</sub>	Operating junction temperature Storage temperature	-55 to 150		°C

1. Limited only by maximum temperature allowed
2. Pulse width limited by safe operating area
3. I<sub>SD</sub> ≤ 17 A, di/dt ≤ 200 A/μs, V<sub>DD</sub> ≤ 80%V<sub>(BR)DSS</sub>

**Table 3. Thermal data**

Symbol	Parameter	DPAK	TO-220FP	TO-220	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case max	1.38	5	1.38	°C/W
R <sub>thj-amb</sub>	Thermal resistance junction-ambient max	50 <sup>(1)</sup>	62.5	62.5	°C/W

1. When mounted on 1inch<sup>2</sup> FR-4, 2 Oz copper board

**Table 4. Avalanche data**

Symbol	Parameter	Value	Unit
I <sub>AR</sub>	Avalanche current, repetitive or not repetitive (pulse width limited by T <sub>Jmax</sub> )	17	A
E <sub>AS</sub>	Single pulse avalanche energy (starting T <sub>J</sub> =25 °C, I <sub>D</sub> =I <sub>AR</sub> , V <sub>DD</sub> =50 V)	100	mJ

## 2 Electrical characteristics

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

**Table 5. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{mA}$ , $V_{GS} = 0$	250			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 250\text{V}$ , $V_{DS} = 250\text{V}$ , $T_c = 125^{\circ}\text{C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{V}$ , $I_D = 8.5\text{A}$		0.14	0.165	$\Omega$

**Table 6. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$ , $V_{GS} = 0$	-	1000	-	pF
$C_{oss}$	Output capacitance			178		pF
$C_{rss}$	Reverse transfer capacitance			28		pF
$C_{oss\ eq}$	Equivalent output capacitance	$V_{GS} = 0$ , $V_{DS} = 0$ to $200\text{V}$	-	135	-	pF
$Q_g$	Total gate charge	$V_{DD} = 200\text{V}$ , $I_D = 17\text{A}$	-	29.5	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10\text{V}$		4.8		nC
$Q_{gd}$	Gate-drain charge	(see Figure 17)		15.6		nC
$R_G$	Gate input resistance	$f = 1\text{MHz}$ gate DC bias = 0 test signal level = 20 mV open drain	-	2	-	$\Omega$

**Table 7. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD}=125\text{ V}$ , $I_D=8.5\text{ A}$ , $R_G=4.7\ \Omega$ , $V_{GS}=10\text{ V}$ (see Figure 16)	-	8.8 17.2	-	ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD}=125\text{ V}$ , $I_D=8.5\text{ A}$ , $R_G=4.7\ \Omega$ , $V_{GS}=10\text{ V}$ (see Figure 16)	-	21 8.8	-	ns ns

**Table 8. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		17 68	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=17\text{ A}$ , $V_{GS}=0$	-		1.6	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 17\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 50\text{ V}$ (see Figure 18)	-	157 0.91 11.6		ns $\mu\text{C}$ A
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 17\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 50\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$ (see Figure 18)	-	196 1.34 13.7		ns $\mu\text{C}$ A

1. Pulse width limited by safe operating area

2. Pulsed: pulse duration=300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for TO-220, DPAK

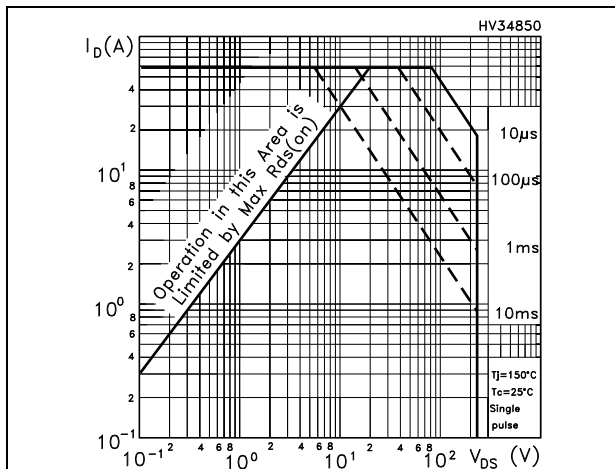


Figure 3. Thermal impedance for TO-220, DPAK

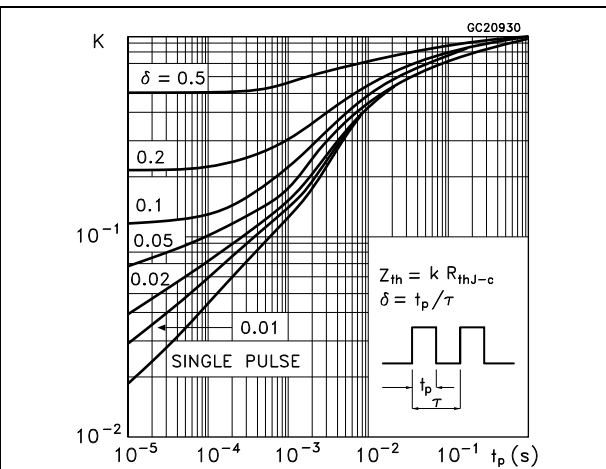


Figure 4. Safe operating area for TO-220FP

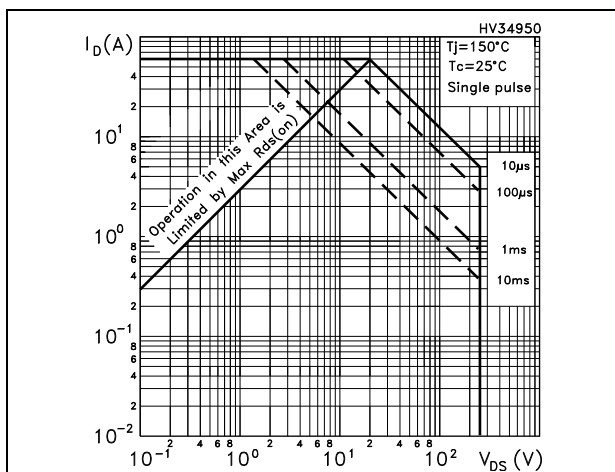


Figure 5. Thermal impedance for TO-220FP

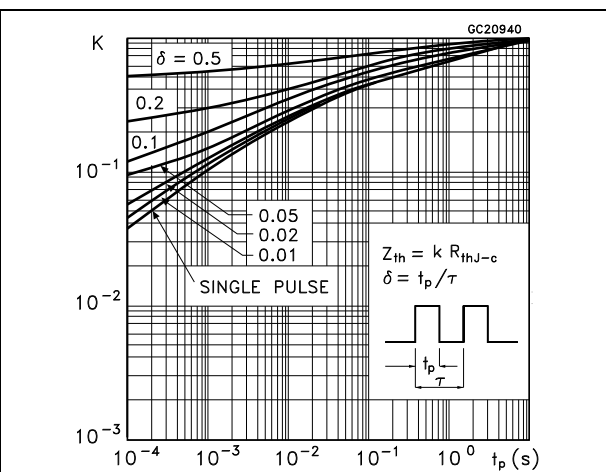


Figure 6. Output characteristics

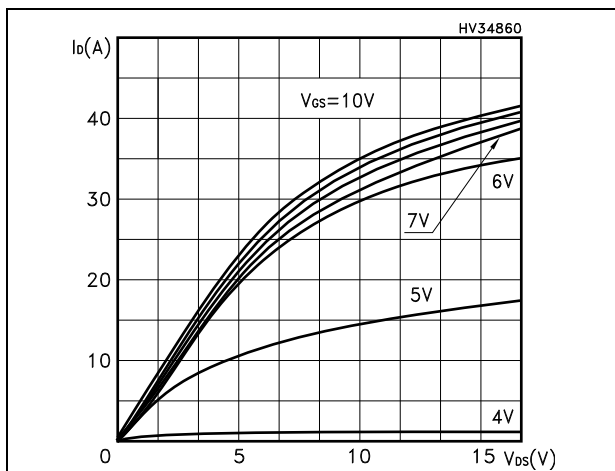


Figure 7. Transfer characteristics

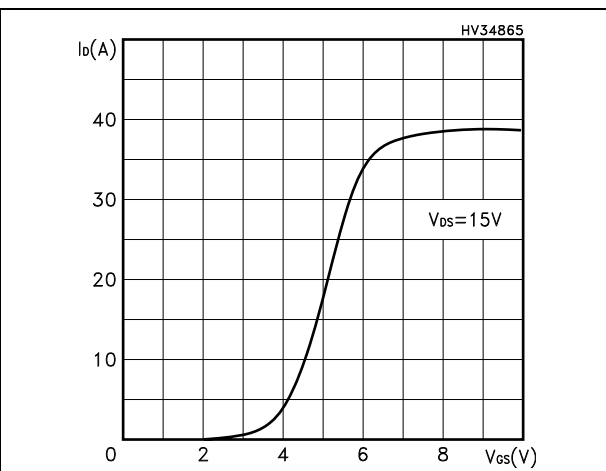


Figure 8. Normalized  $BV_{DSS}$  vs temperature      Figure 9. Static drain-source on resistance

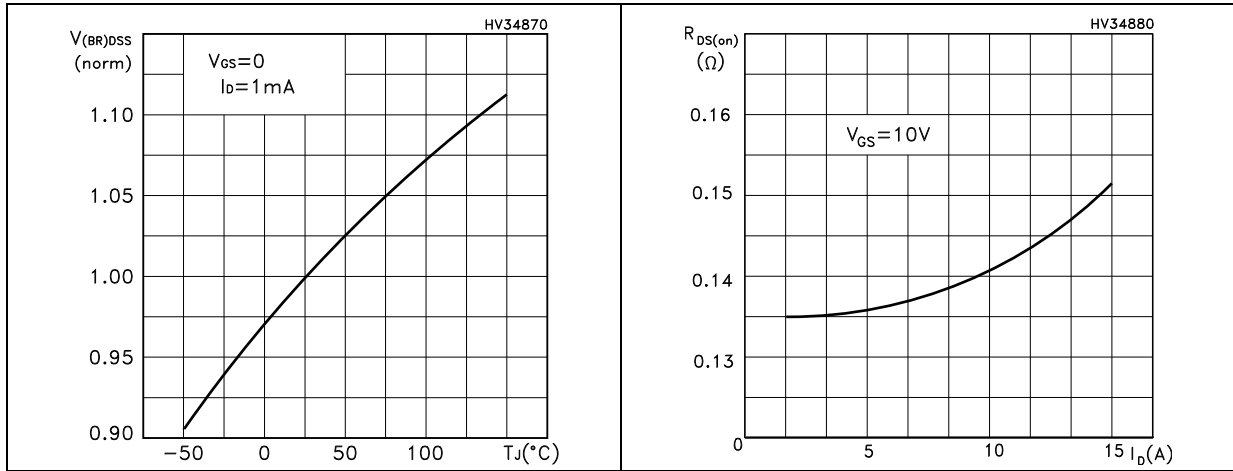


Figure 10. Gate charge vs gate-source voltage      Figure 11. Capacitance variations

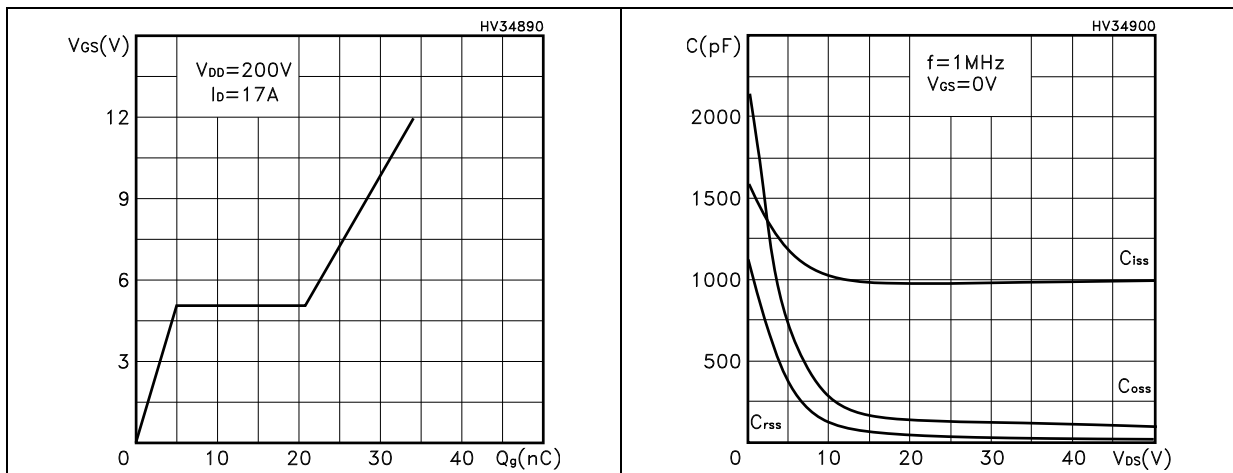


Figure 12. Normalized gate threshold voltage vs temperature      Figure 13. Normalized on resistance vs temperature

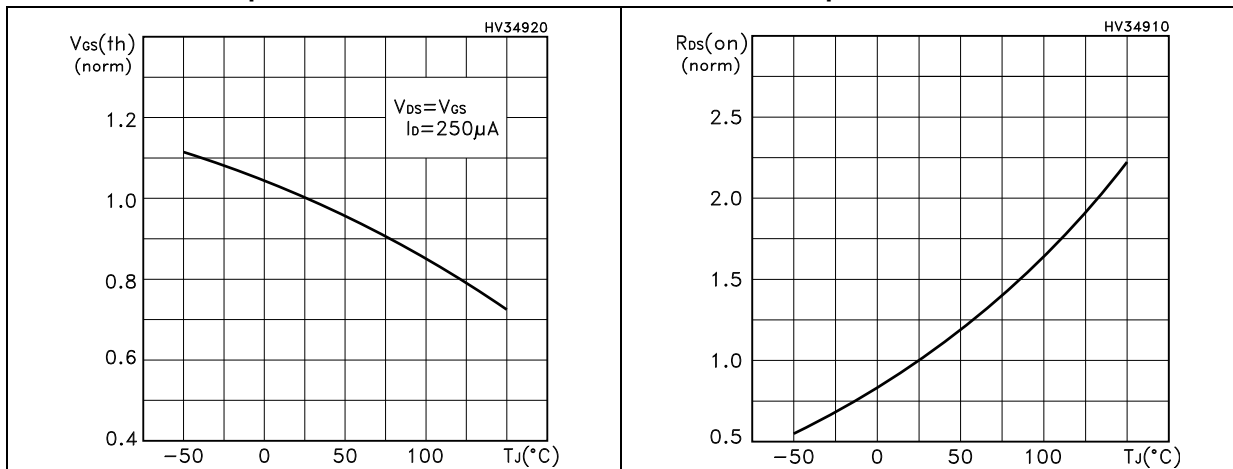


Figure 14. Source-drain diode forward characteristics

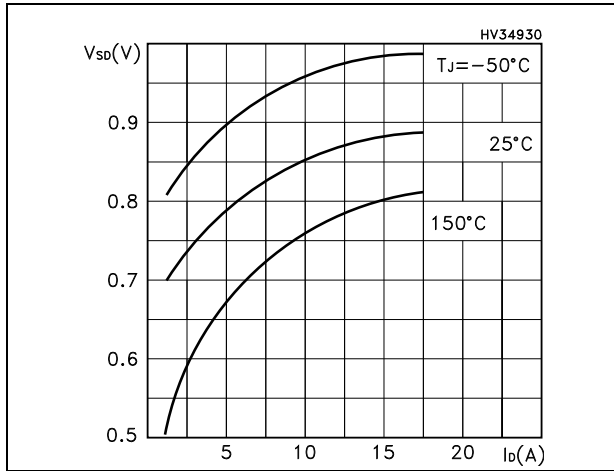
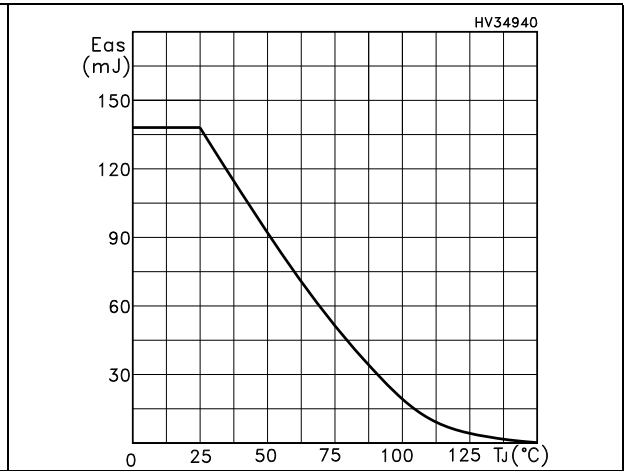


Figure 15. Maximum avalanche energy





### 3 Test circuits

Figure 16. Switching times test circuit for resistive load



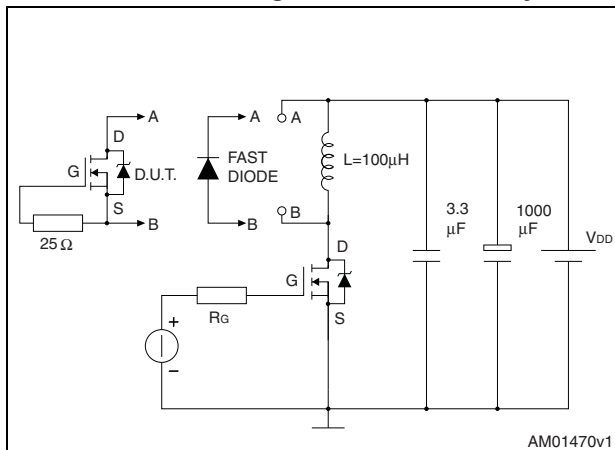
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Figure 17. Gate charge test circuit



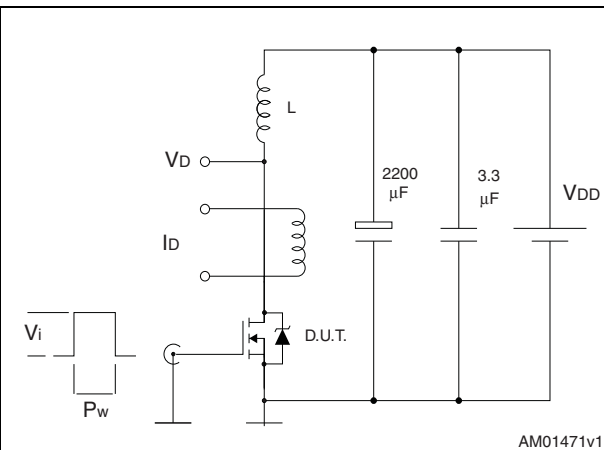
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Figure 18. Test circuit for inductive load switching and diode recovery times



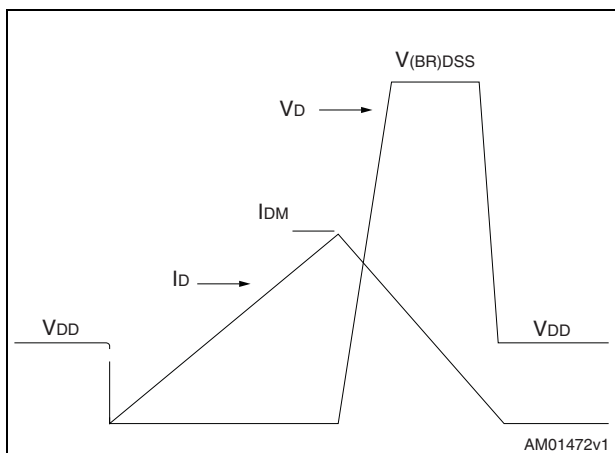
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Figure 19. Unclamped Inductive load test circuit



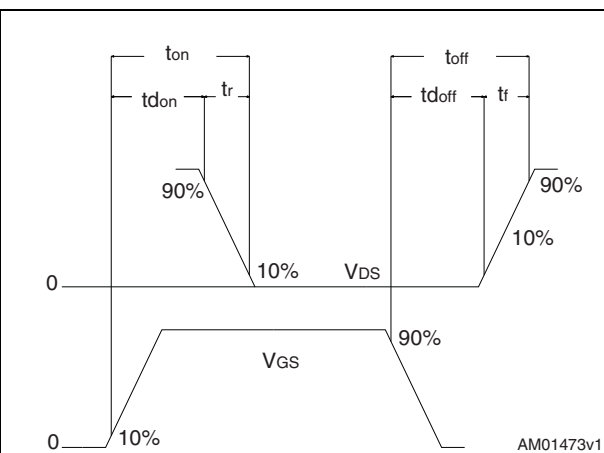
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Figure 20. Unclamped inductive waveform



AM01472v1

Figure 21. Switching time waveform



AM01473v1

## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**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		
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

Figure 22. DPAK (TO-252) drawing

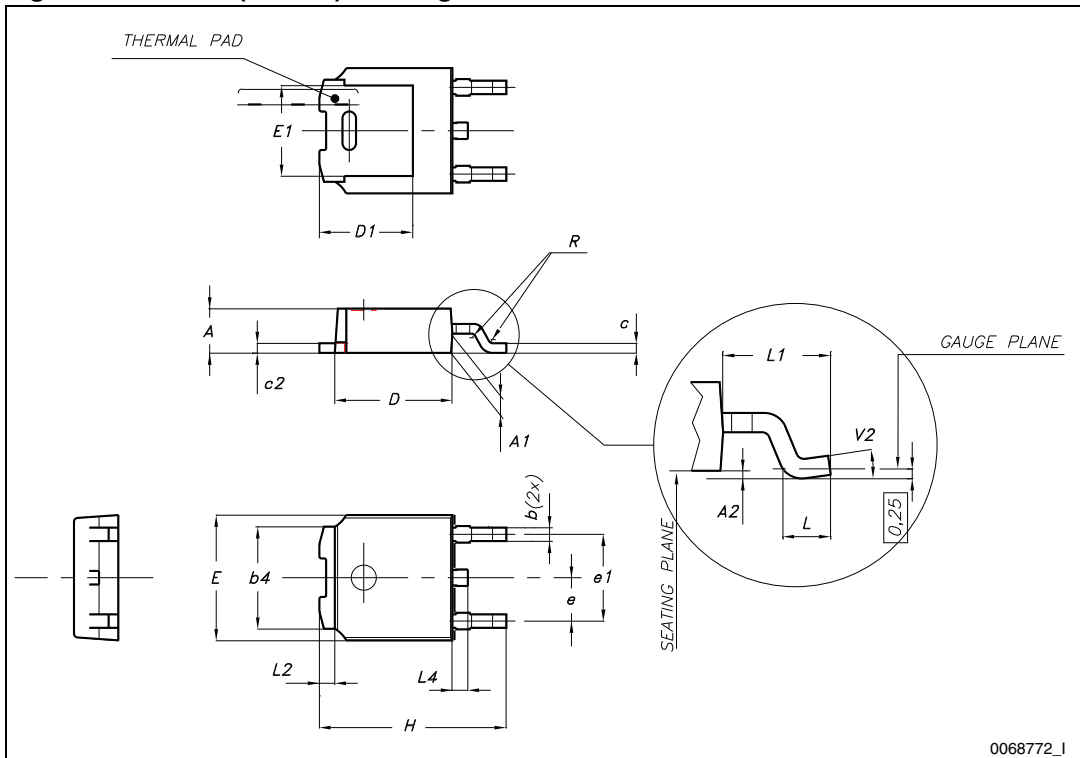
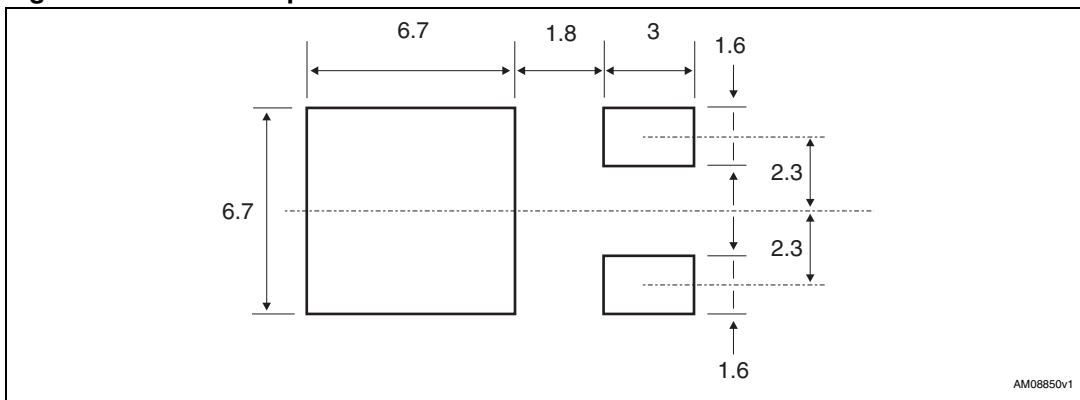


Figure 23. DPAK footprint<sup>(a)</sup>

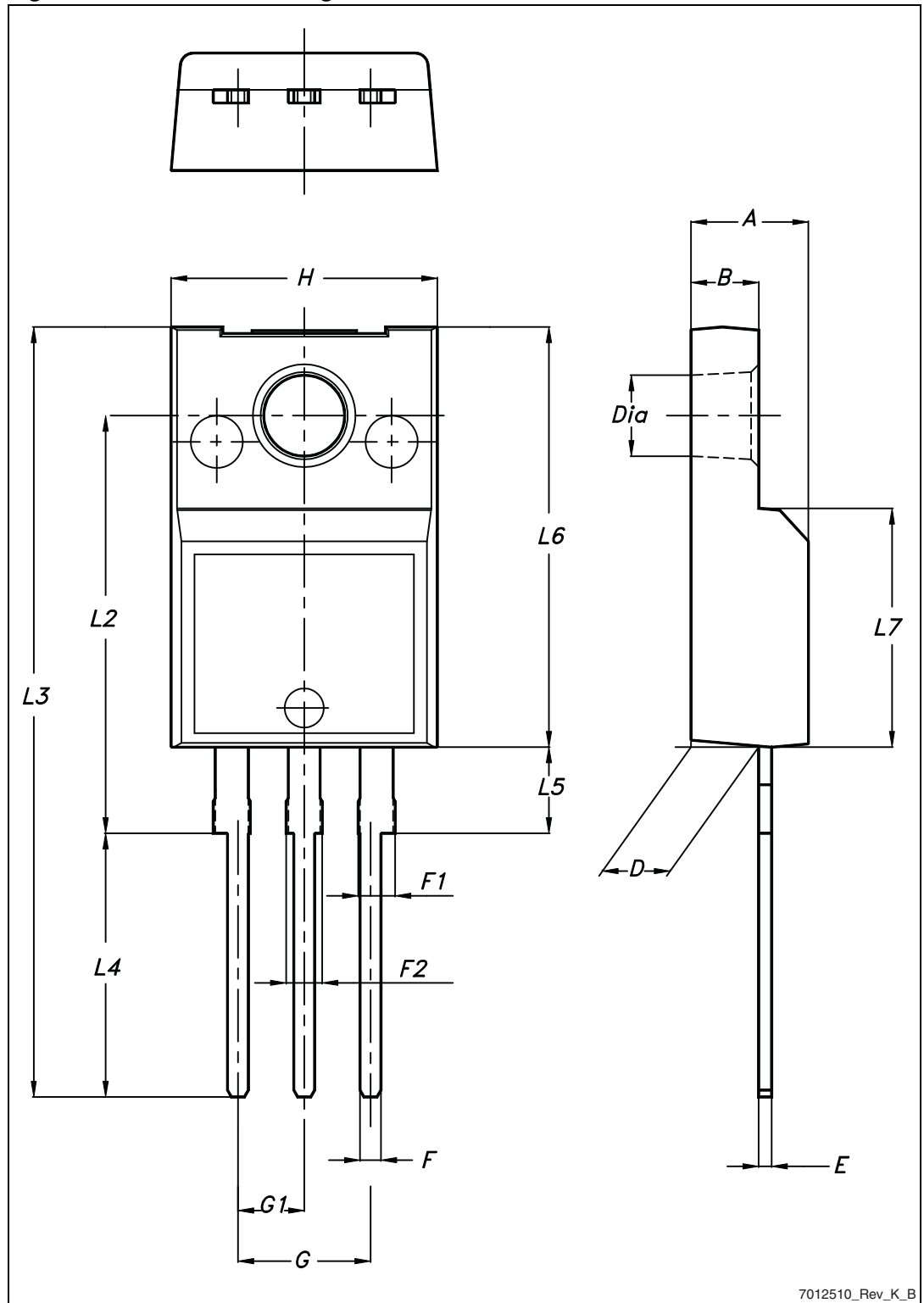


a. All dimensions are in millimeters.

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

Figure 24. TO-220FP drawing

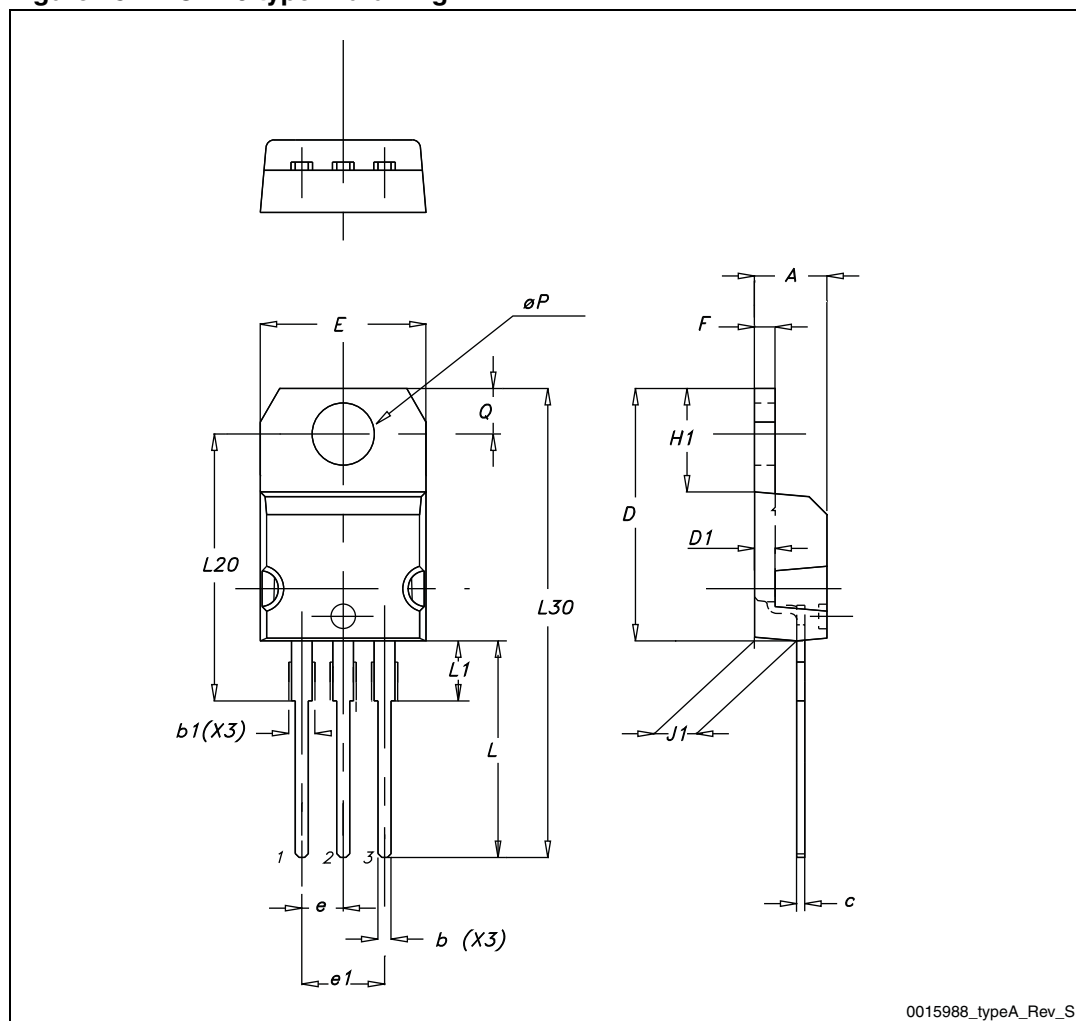


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Table 11. TO-220 type A mechanical data

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

Figure 25. TO-220 type A drawing



0015988\_typeA\_Rev\_S

## 5 Packaging mechanical data

Table 12. 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			



Figure 26. Tape for DPAK (TO-252)

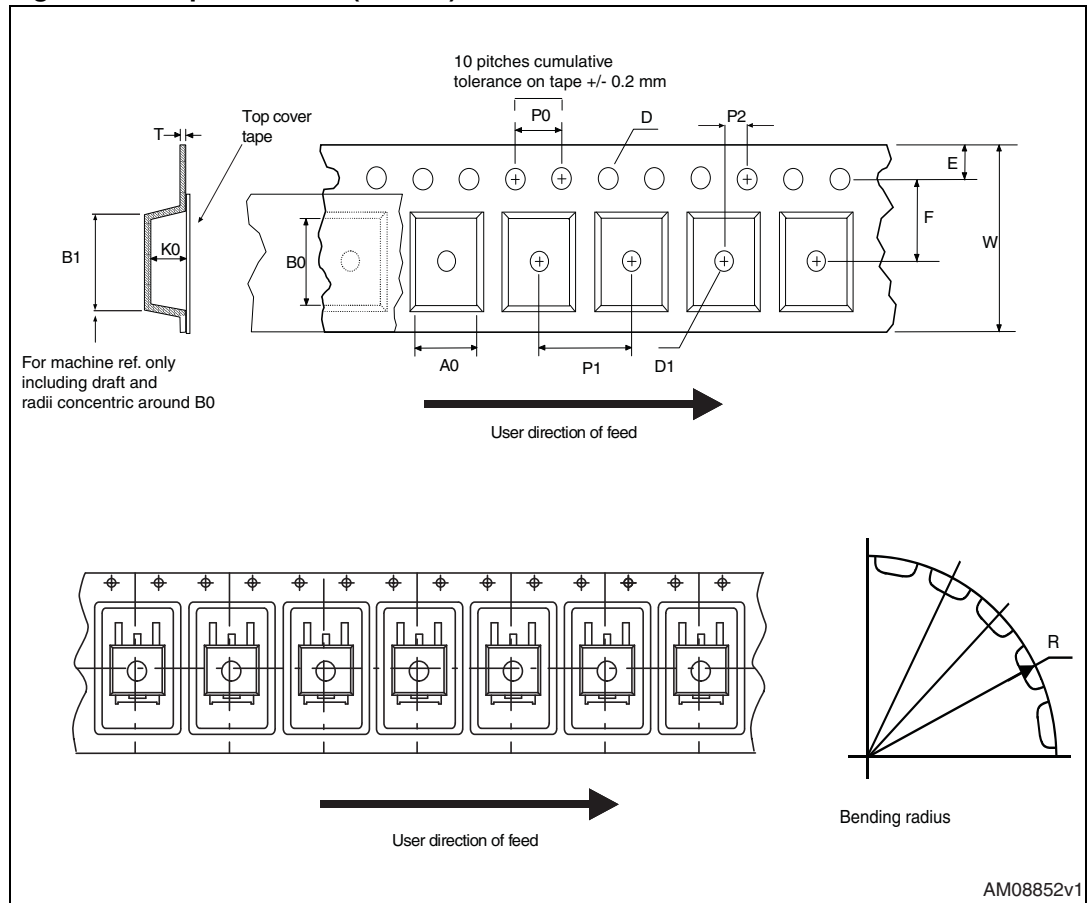
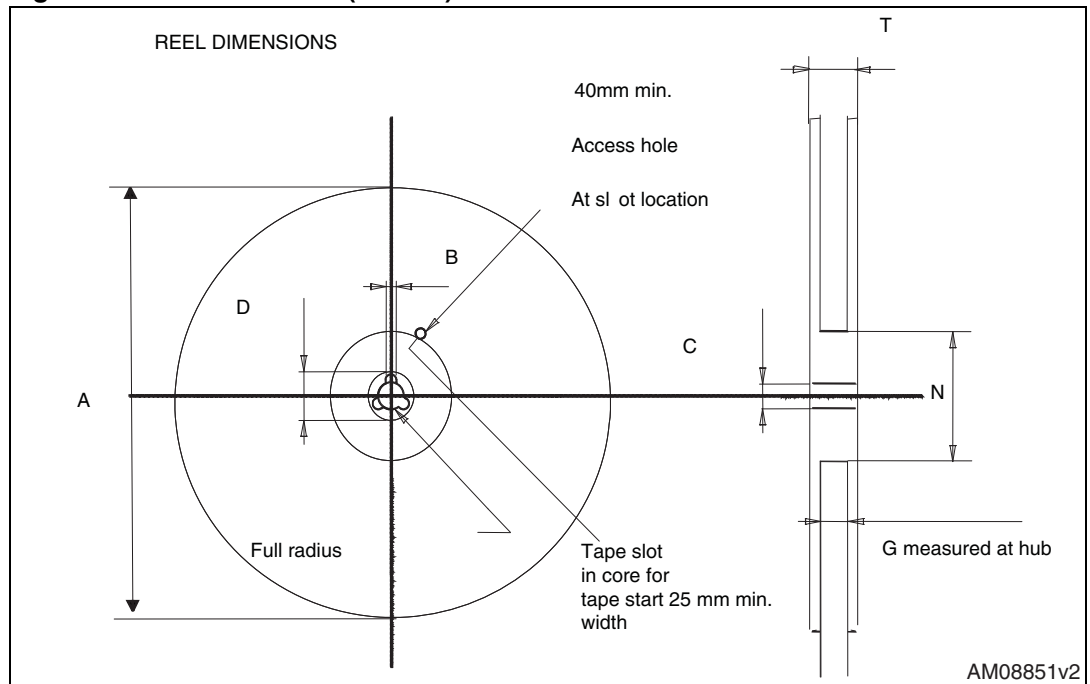


Figure 27. Reel for DPAK (TO-252)



## 6 Revision history

**Table 13. Document revision history**

Date	Revision	Changes
01-Feb-2007	1	First release.
07-Nov-2012	2	Minor text changes. The part number STI17NF25 has been moved to a separate datasheet. <i>Section 4: Package mechanical data</i> and <i>Section 5: Packaging mechanical data</i> have been updated.

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