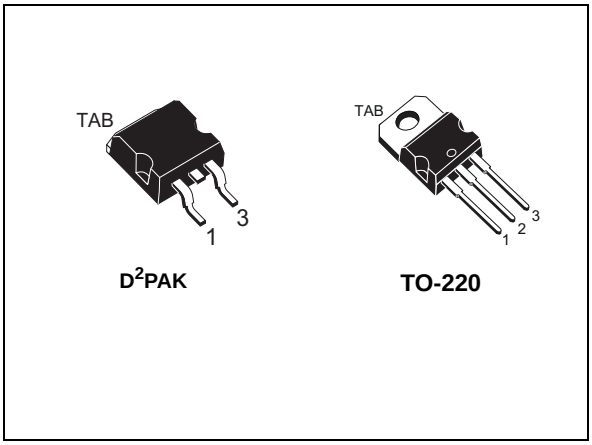
STB80NF55-08AG, STP80NF55-08AG

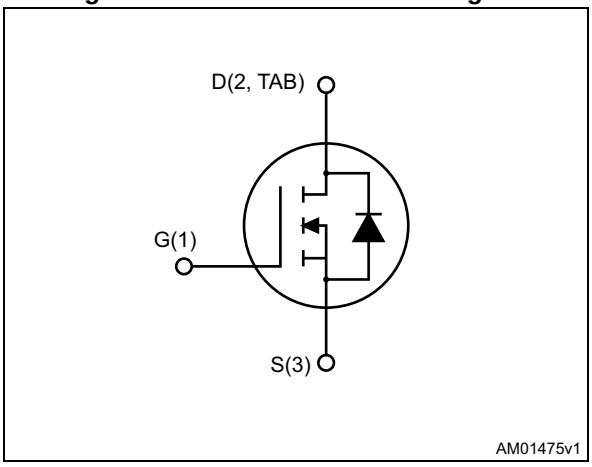
Automotive-grade N-channel 55 V, 6.5 mΩ typ.,80 A STripFET™ Power MOSFETs in D²PAK and TO-220 packages

Datasheet — production data



D²PAK TO-220

Figure 1. Internal schematic diagram



Features

Order code	V_{DSS}	$R_{DS(on)}$ max	I_D
STB80NF55-08AG	55 V	8 mΩ	80 A
STP80NF55-08AG			

- Designed for automotive applications and AEC-Q101 qualified
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

Applications

- 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.

Table 1. Device summary

Order code	Marking	Packages	Packing
STB80NF55-08AG	B80NF55-08	D²PAK	Tape and reel
STP80NF55-08AG	P80NF55-08	TO-220	Tube

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	55	V
V_{GS}	Gate-source voltage	± 20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	80	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	80	A
I_{DM} (2)	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at T_C = 25 °C	300	W
T_{stg}	Operating junction temperature range	- 55 to 175	°C
T_j	Storage temperature range		

1. Current limited package
2. Pulse width limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value		Unit
		D²PAK	TO-220	
$R_{thj\text{-}case}$	Thermal resistance junction-case	0.5		°C/W
$R_{thj\text{-}pcb}$	Thermal resistance junction-pcb	35 (1)		°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient		62.5	°C/W

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

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by Tj max)	40	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D= I_{AR}, V_{DD} = 30 V)	1000	mJ

2 Electrical characteristics

(T_{CASE} = 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 V, I_D = 250 µA	55			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 55 V			1	µA
		V_{GS} = 0 V, V_{DS} = 55 V, T_C =125 °C (1)			10	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V 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 = 40 A		6.5	8	mΩ

1. Defined by design, not subject to production test

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15 V, I_D = 18 A	-	40	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		3740		pF
C_{oss}	Output capacitance		-	830	-	pF
C_{rss}	Reverse transfer capacitance		-	265	-	pF
Q_g	Total gate charge	V_{DD} = 27 V, I_D = 80 A, V_{GS} = 10 V, (*Figure 14: Gate charge test circuit*)	-	112	155	nC
Q_{gs}	Gate-source charge		-	20	-	nC
Q_{gd}	Gate-drain charge		-	40	-	nC

1. Pulsed: pulse duration=300 µs, duty cycle 1.5%

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 27 V, I_D = 40 A R_G = 4.7 Ω, V_{GS} = 10 V (*Figure 13: Switching times test circuit for resistive load* and *Figure 18: Switching time waveform*.)	-	20	-	ns
t_r	Rise time		-	110	-	ns
$t_{d(off)}$	Turn-off delay time		-	75	-	ns
t_f	Fall time		-	35	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		80	A
I_{SDM} (1)	Source-drain current (pulsed)		-		320	A
V_{SD}	Forward on voltage	I_{SD} = 80 A, V_{GS} = 0 V	-		1.5	V
t_{rr} (2)	Reverse recovery time	I_{SD} = 80 A, V_{DD} = 25 V, di/dt = 100 A/µs T_j = 150 °C (*Figure 15: Test circuit for inductive load switching and diode recovery times*)	-	80		ns
Q_{rr}	Reverse recovery charge		-	230		nC
I_{RRM}	Reverse recovery current		-	5.7		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

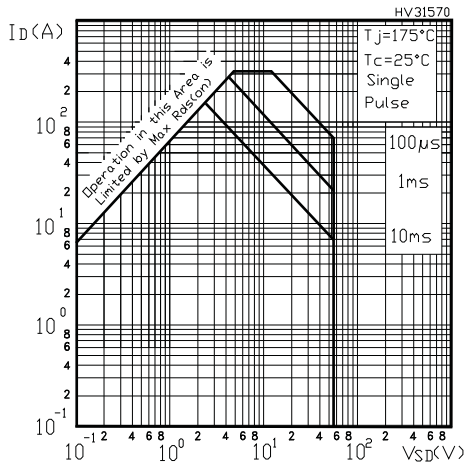


Figure 3. Thermal impedance

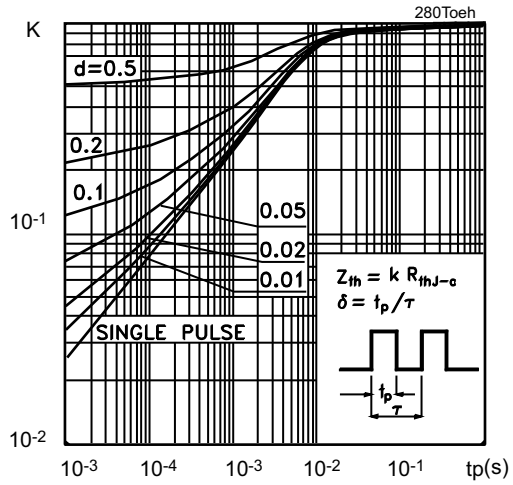


Figure 4. Output characteristics

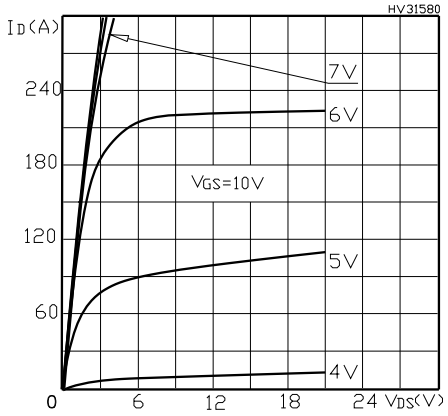


Figure 5. Transfer characteristics

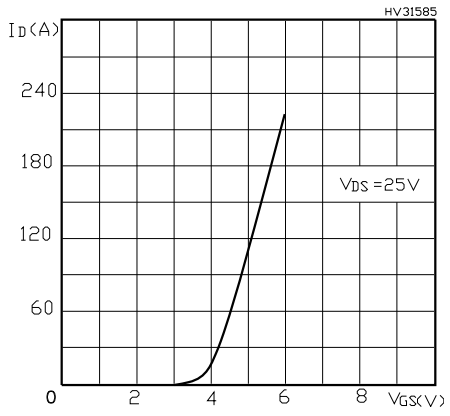


Figure 6. Normalized $V_{(BR)DSS}$ vs temperature

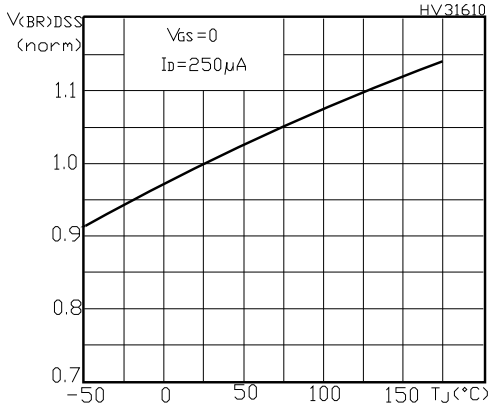


Figure 7. Static drain-source on resistance

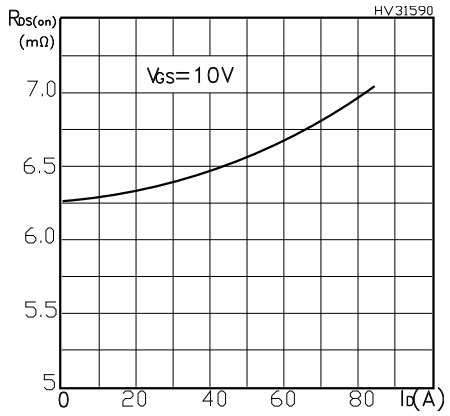


Figure 8. Gate charge vs gate-source voltage

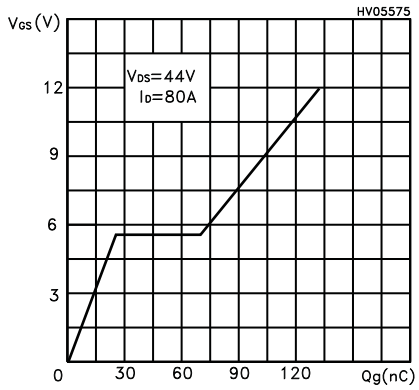


Figure 9. Capacitance variations

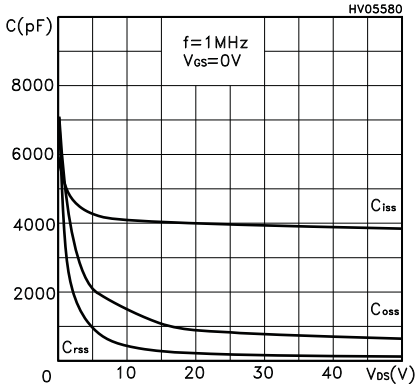


Figure 10. Normalized gate threshold voltage vs temperature

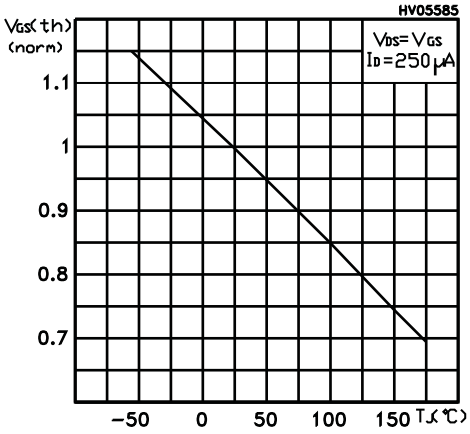


Figure 11. Normalized on resistance vs temperature

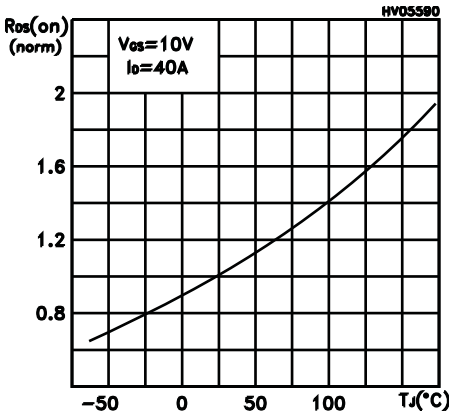
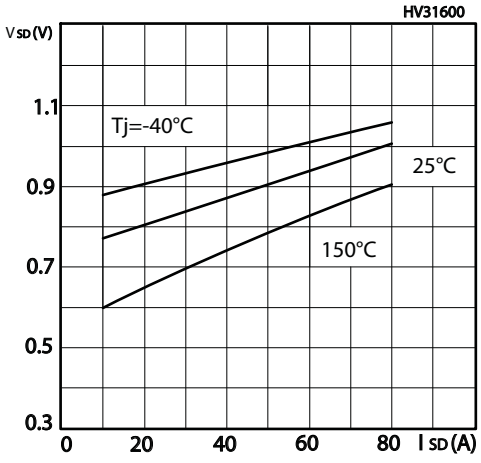


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

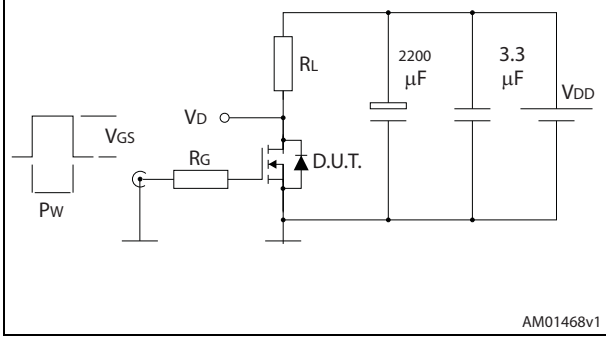


Figure 14. Gate charge test circuit

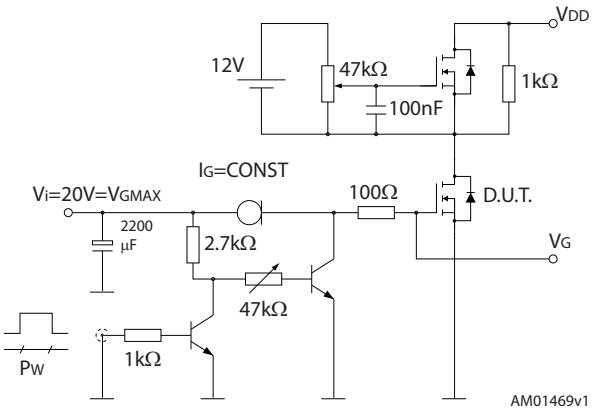


Figure 15. Test circuit for inductive load switching and diode recovery times

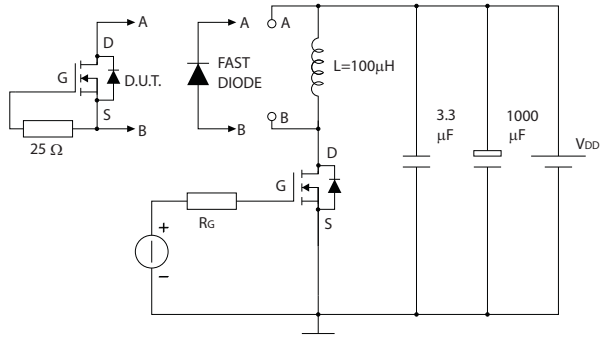


Figure 16. Unclamped inductive load test circuit

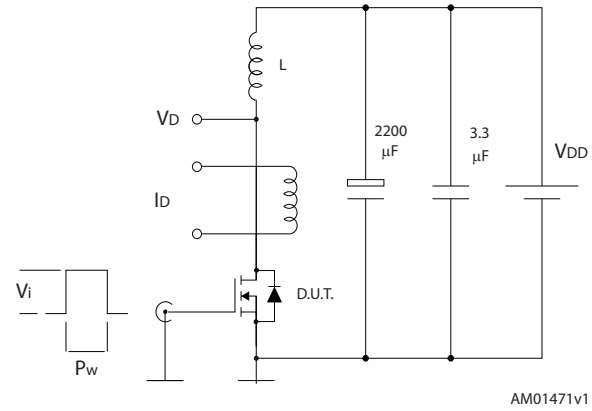


Figure 17. Unclamped inductive waveform

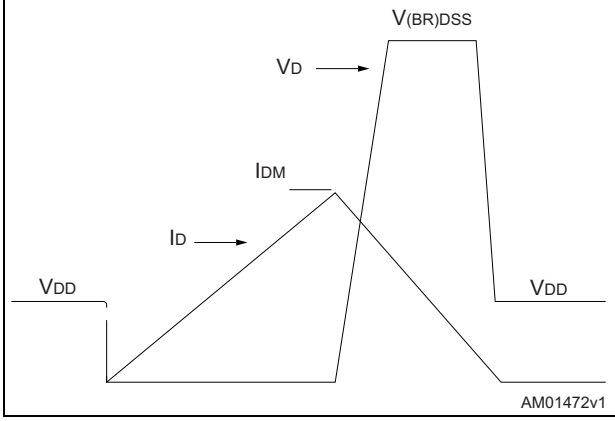
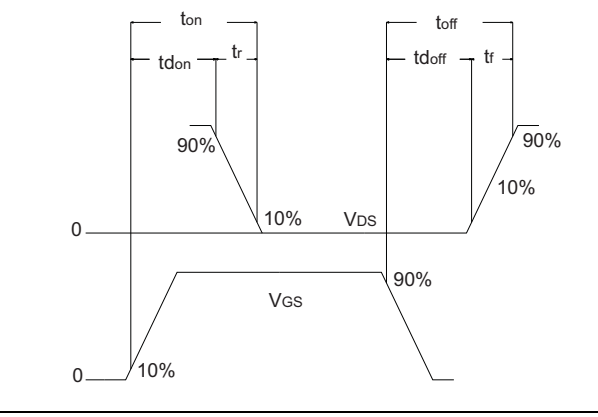


Figure 18. Switching time waveform



4 Package 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 D²PAK package information

Figure 19. D²PAK (TO-263) type A package outline

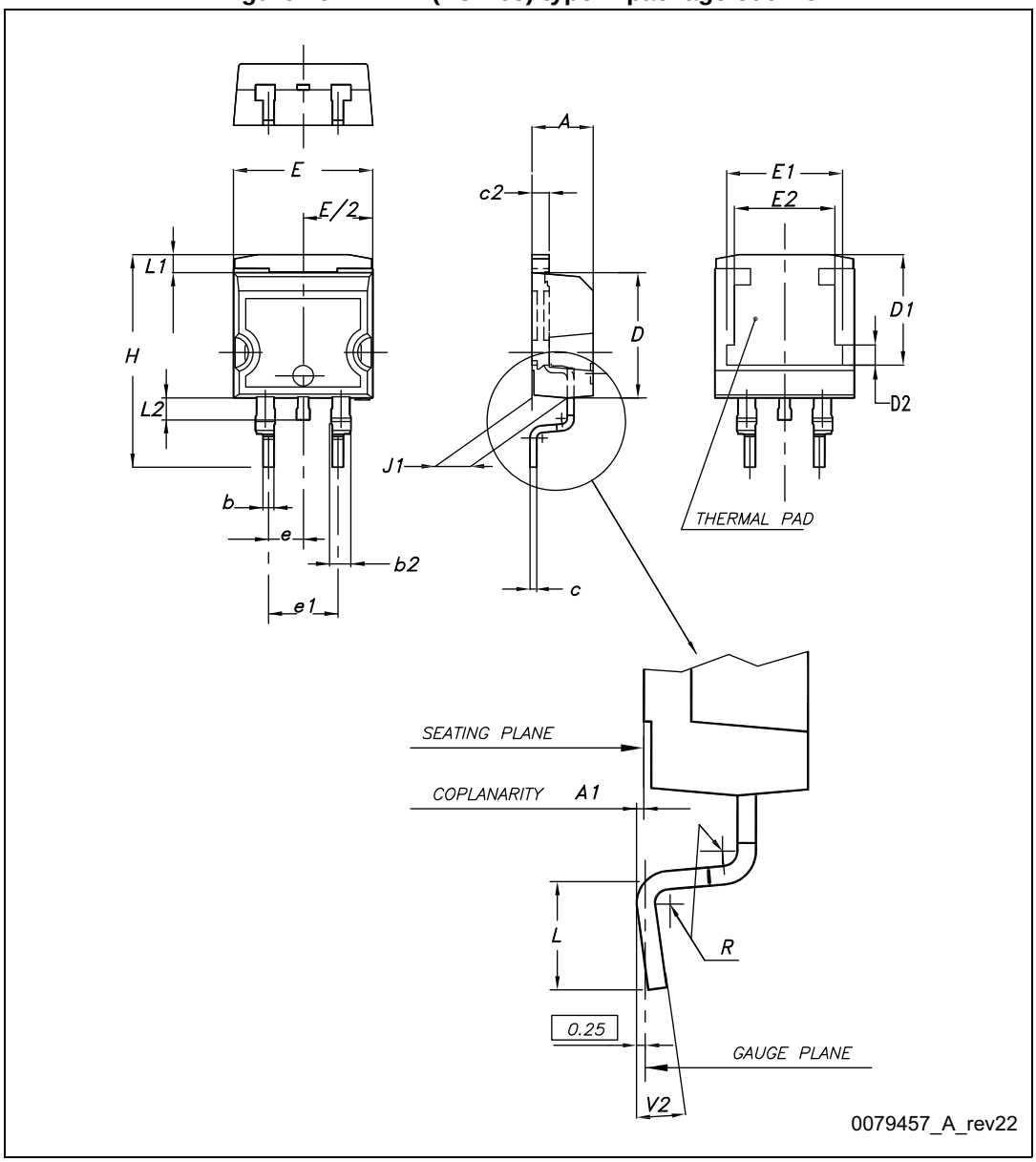
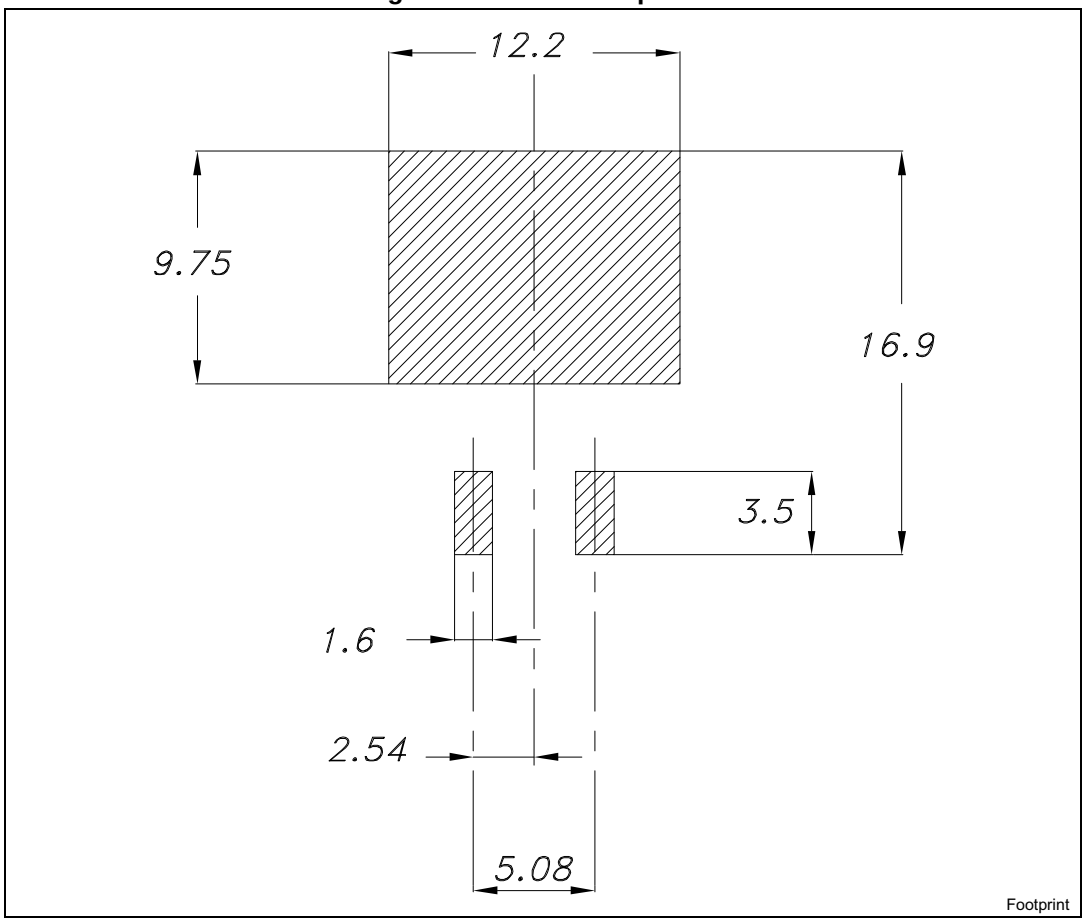


Table 9. D²PAK (TO-263) type A package mechanical data

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	10.00		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	15.00		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 20. D²PAK footprint[(a)]



a. All dimension are in millimeters

4.2 TO-220 type A package information

Figure 21. TO-220 type A package outline

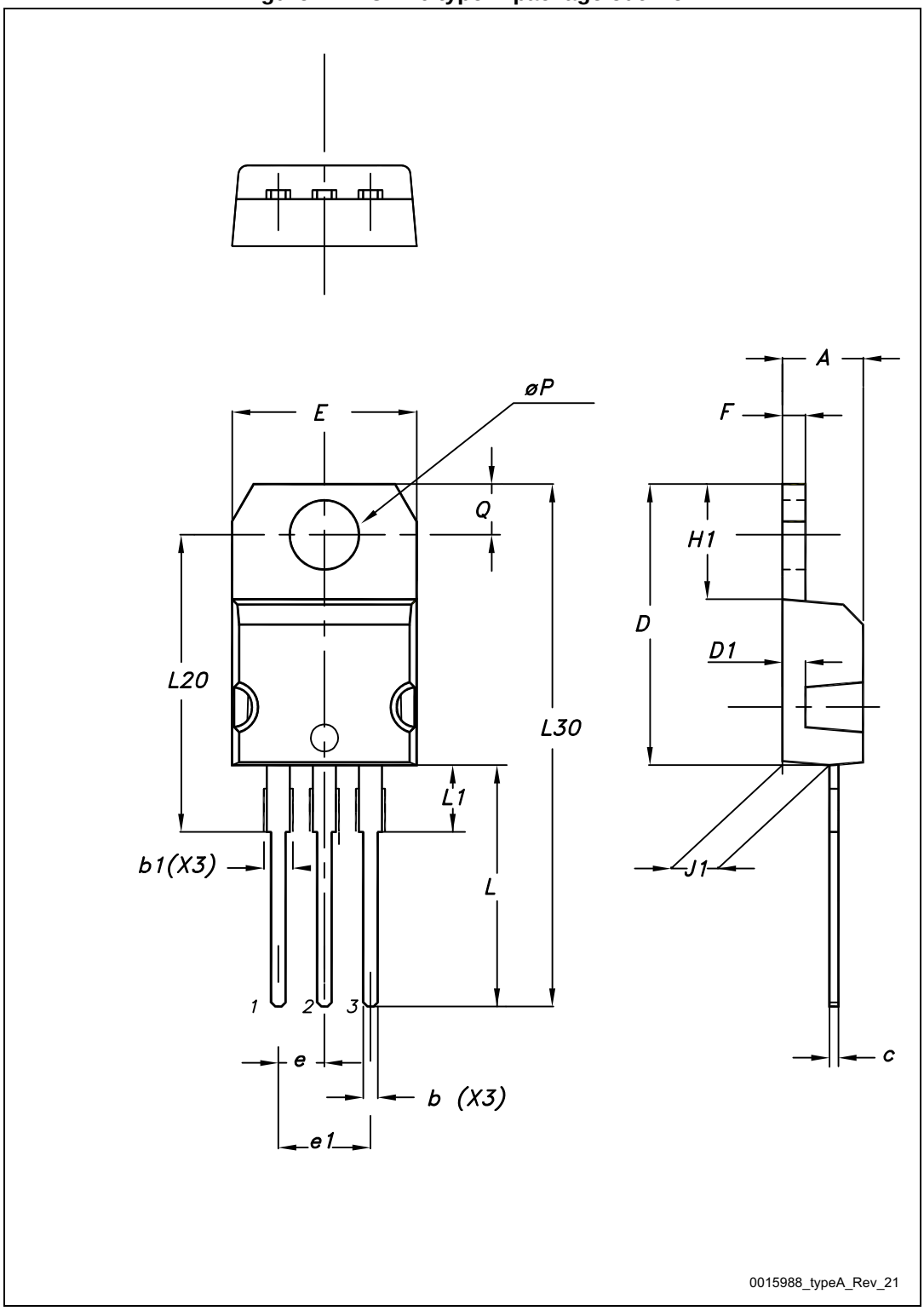


Table 10. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		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	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

5 Packing information

Figure 22. Tape

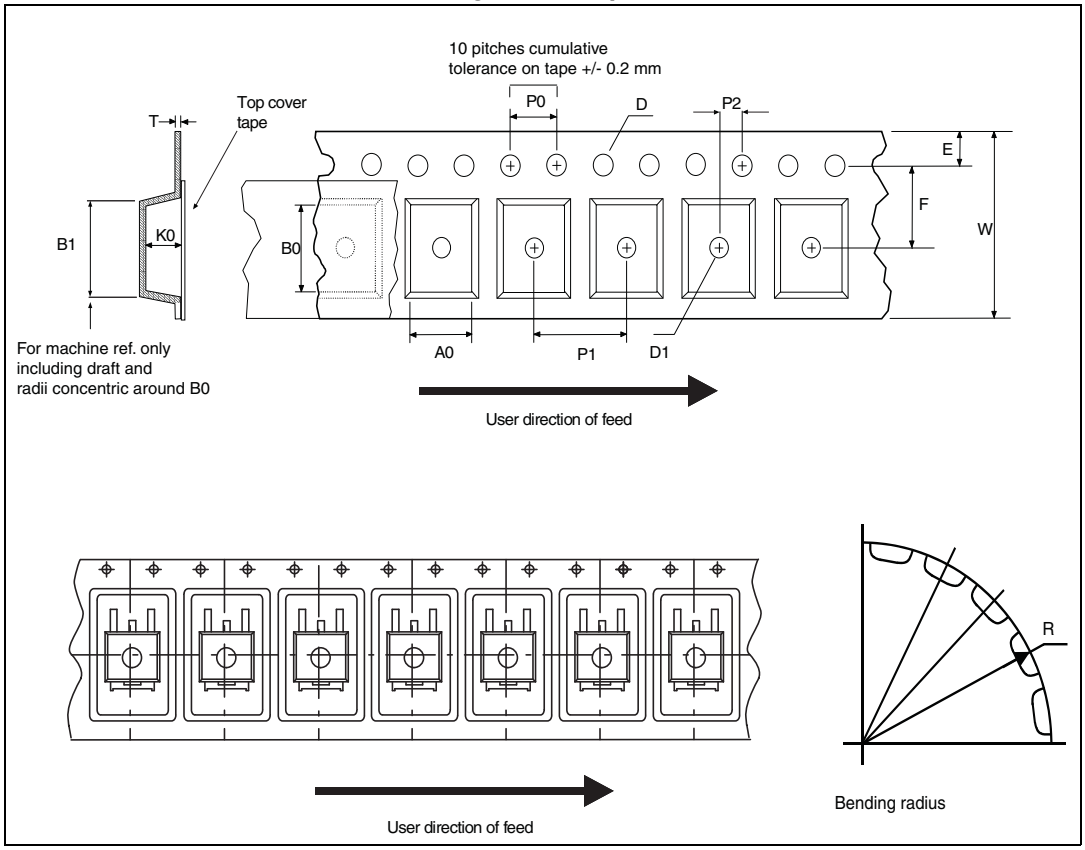


Figure 23. Reel

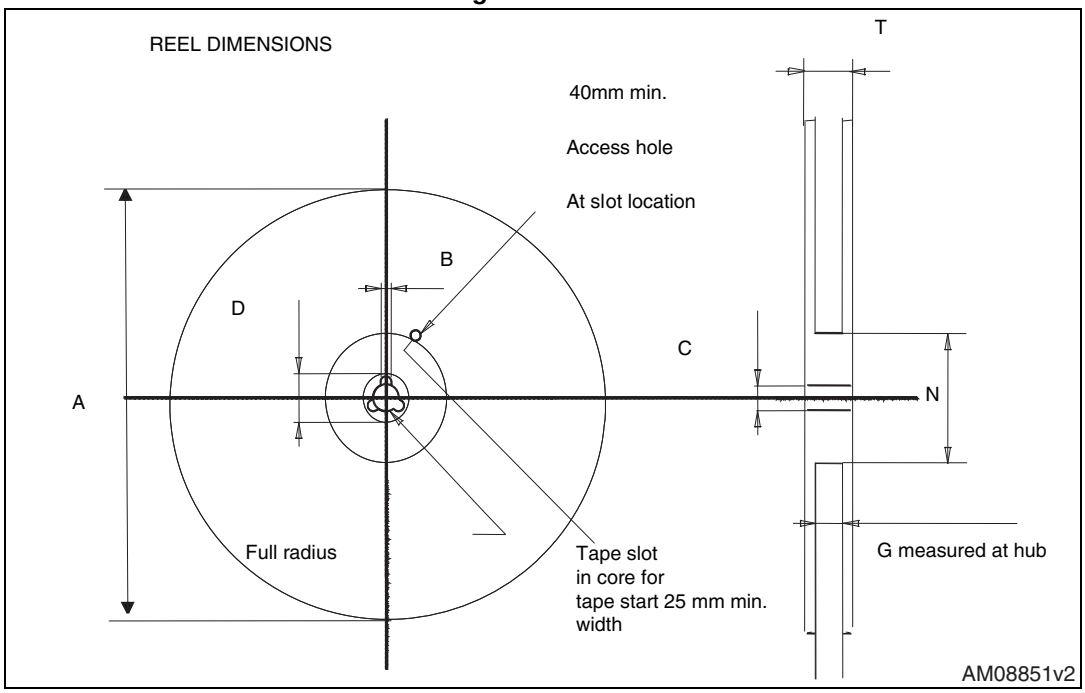


Table 11. D²PAK (TO-263) tape and reel mechanical data

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

Figure 24. Document revision history

Date	Revision	Changes
07-Sep-2016	1	First release