STD26P3LLH6

P-channel 30 V, 0.024 Ω typ., 12 A, STripFET™ VI DeepGATE™ Power MOSFET in a DPAK package

Datasheet - production data

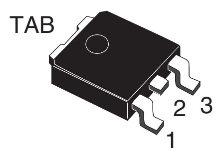
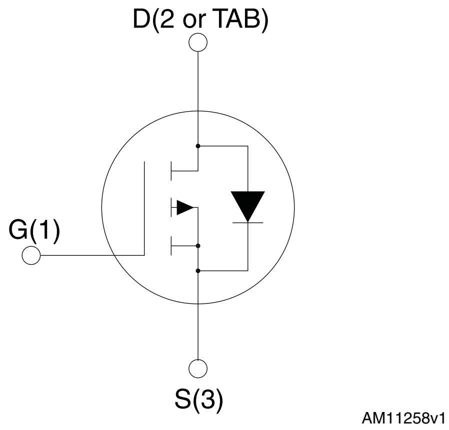


Figure 1. Internal schematic diagram



Features

Order code	V_{DSS}	$R_{DS(on)}$ max	I_D	P_{TOT}
STD26P3LLH6	30 V	0.030 Ω(1)	12 A	40 W

1. @ V_{GS}= 10 V

- $R_{DS(on)}$ * Q_g industry benchmark
- Extremely low on-resistance $R_{DS(on)}$
- High avalanche ruggedness
- Low gate input resistance

Applications

- Switching applications
- LCC converters, resonant converters

Description

This device is a P-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages

Table 1. Device summary

Order code	Marking	Package	Packaging
STD26P3LLH6	26P3LLH6	DPAK	Tape and reel

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Contents

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	±20	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	12	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	8.5	A
I_{DM} (1)(2)	Drain current (pulsed)	48	A
P_{TOT} (1)	Total dissipation at T_C = 25 °C	40	W
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Max. operating junction temperature	175	°C

1. Limited by wire bonding.
2. Pulse width limited by safe operating area.

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	3.75	°C/W

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
E_{AS}	Single pulse avalanche energy (starting T_J=25 °C, I_D=6 A, I_{AS}=12 A, V_{DD}=25 V, V_{gs}=10 V)	350	mJ

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 5. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	I_D = 250 μA, V_{GS}= 0	30			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 30 V			1	μA
		V_{DS} = 30 V, Tc = 125 °C			10	μA
I_{GSS}	Gate body leakage current	V_{GS} = ± 20 V, (V_{DS} = 0)			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 μA	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 6 A		0.024	0.03	Ω
		V_{GS} = 4.5 V, I_D = 6 A		0.038	0.045	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f=1 MHz, V_{GS} = 0	-	1450	-	pF
C_{oss}	Output capacitance		-	178	-	pF
C_{rss}	Reverse transfer capacitance		-	120	-	pF
Q_g	Total gate charge	V_{DD} = 24 V, I_D = 12 A V_{GS} = 4.5 V (see *Figure 14*)	-	12	-	nC
Q_{gs}	Gate-source charge		-	4.4	-	nC
Q_{gd}	Gate-drain charge		-	5	-	nC
R_g	Gate input resistance	f = 1 MHz, gate DC Bias = 0, test signal level = 20 mV, I_D = 0	-	1.8	-	Ω

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

Table 7. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 24 V, I_D = 1.5 A, R_G = 4.7 Ω, V_{GS} = 10 V *(see Figure 13)*	-	15	-	ns
t_r	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
t_f	Fall time		-	21	-	ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		12	A
I_{SDM} (1)	Source-drain current (pulsed)		-		48	A
V_{SD} (2)	Forward on voltage	I_{SD} = 12 A, V_{GS} = 0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 12 A, di/dt = 100 A/µs, V_{DD} = 16 V *(see Figure 15)*	-	15		ns
Q_{rr}	Reverse recovery charge		-	6.5		nC
I_{RRM}	Reverse recovery current		-	0.9		A

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

Note: For the P-channel Power MOSFETs the actual polarity of the voltages and the current must be reversed.

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

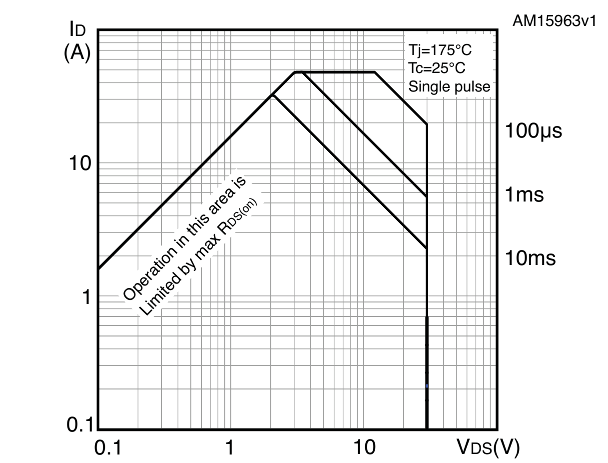


Figure 3. Thermal impedance

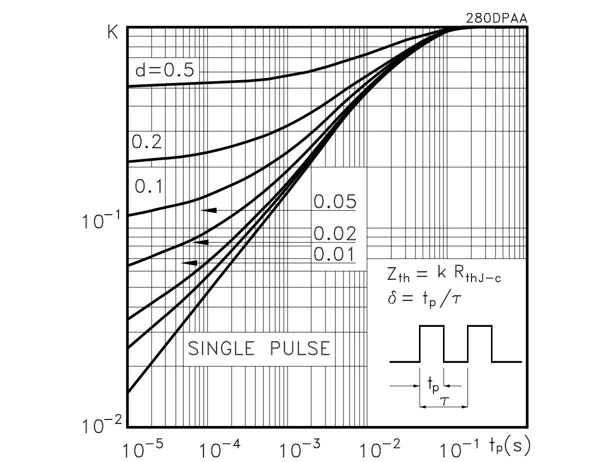


Figure 4. Output characteristics

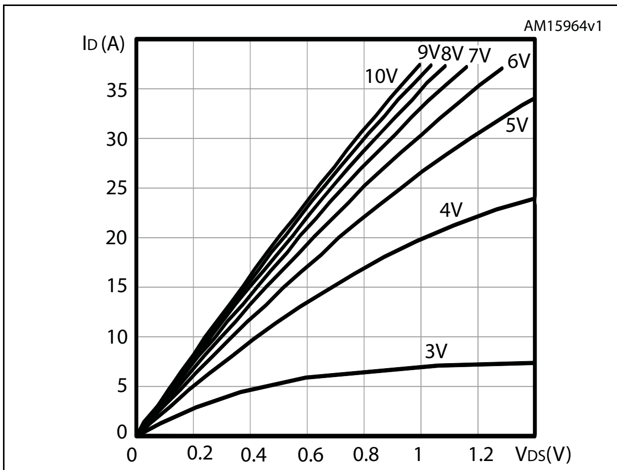


Figure 5. Transfer characteristics

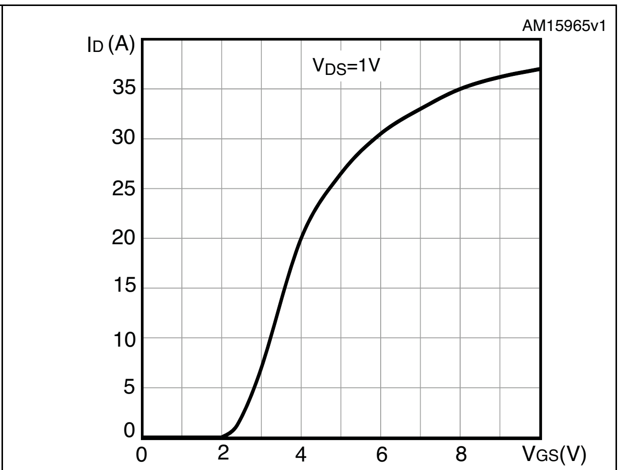


Figure 6. Gate charge vs gate-source voltage

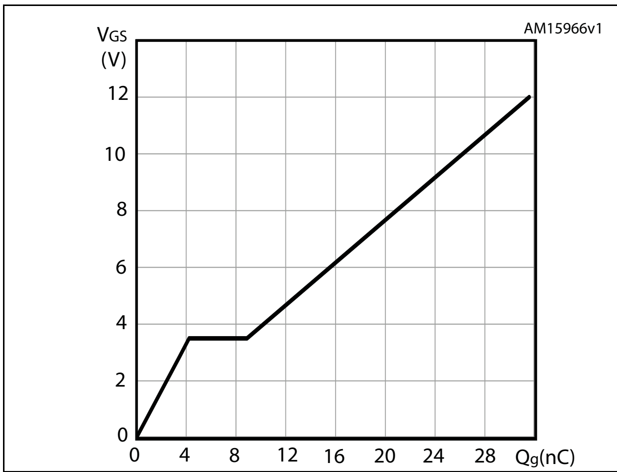


Figure 7. Static drain-source on-resistance

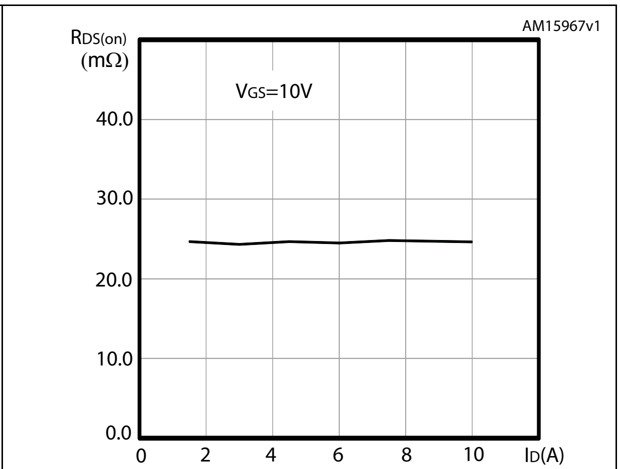


Figure 8. Capacitance variations

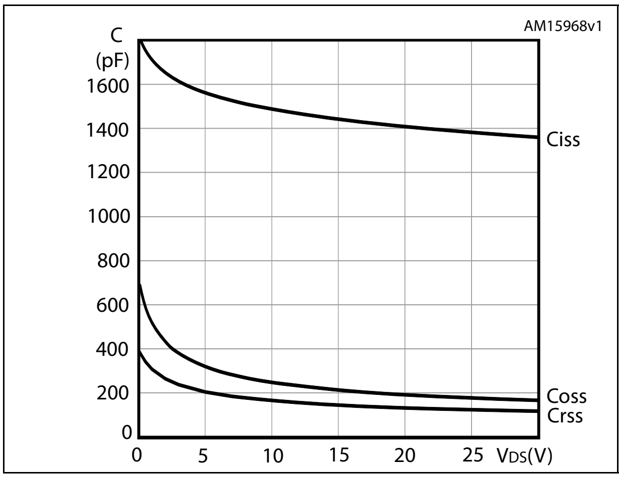


Figure 9. Normalized gate threshold voltage vs temperature

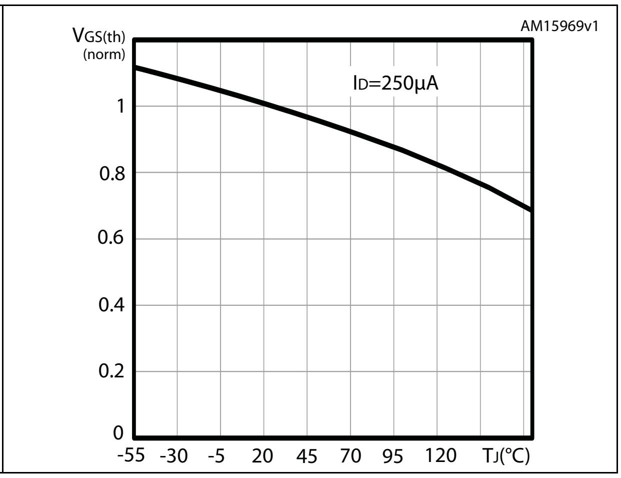


Figure 10. Normalized on-resistance vs temperature

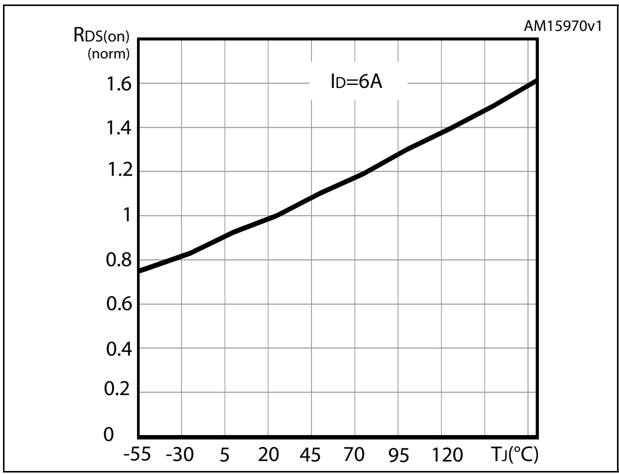


Figure 11. Normalized V_{DS} vs temperature

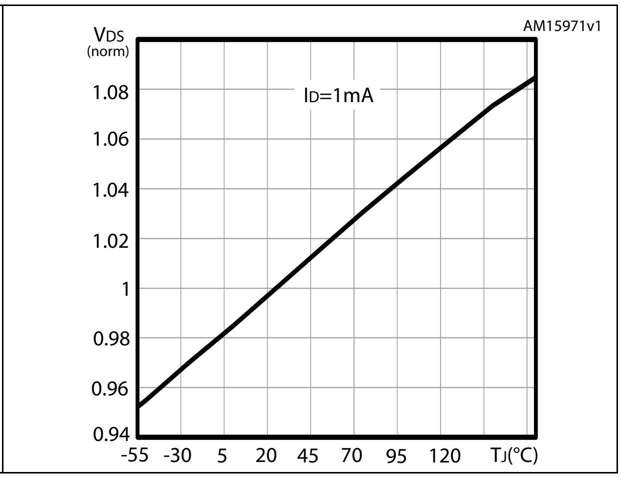
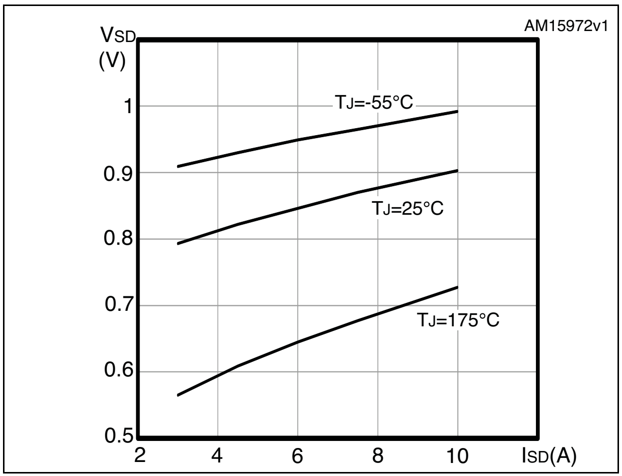


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

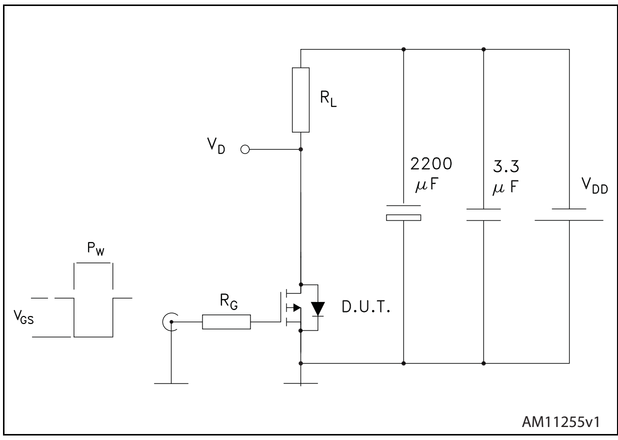


Figure 14. Gate charge test circuit

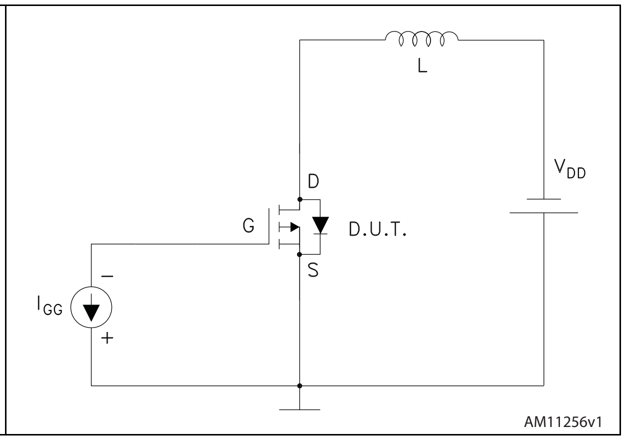


Figure 15. Test circuit for diode recovery behavior

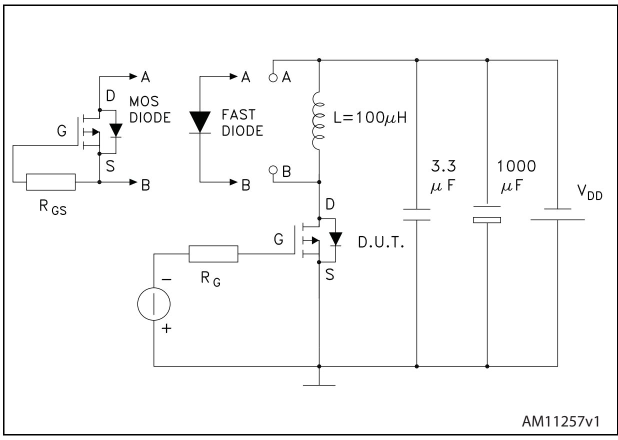


Figure 16. Unclamped inductive load test circuit

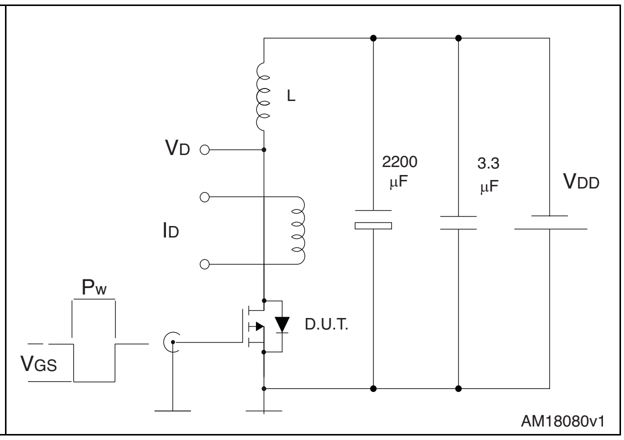


Figure 17. Unclamped inductive waveform

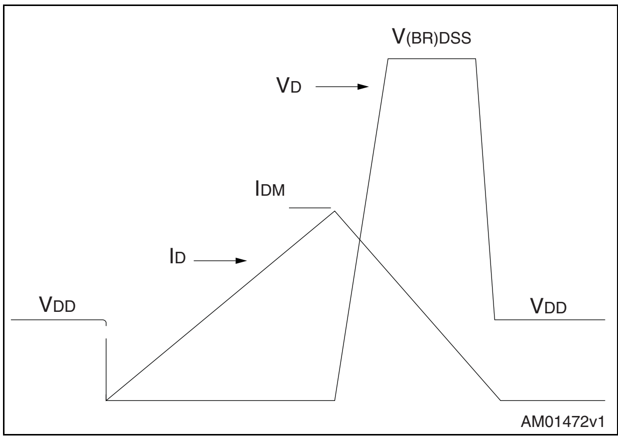
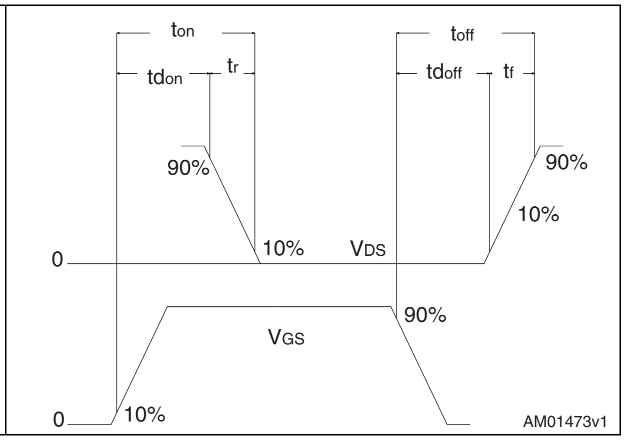


Figure 18. Switching time waveform



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

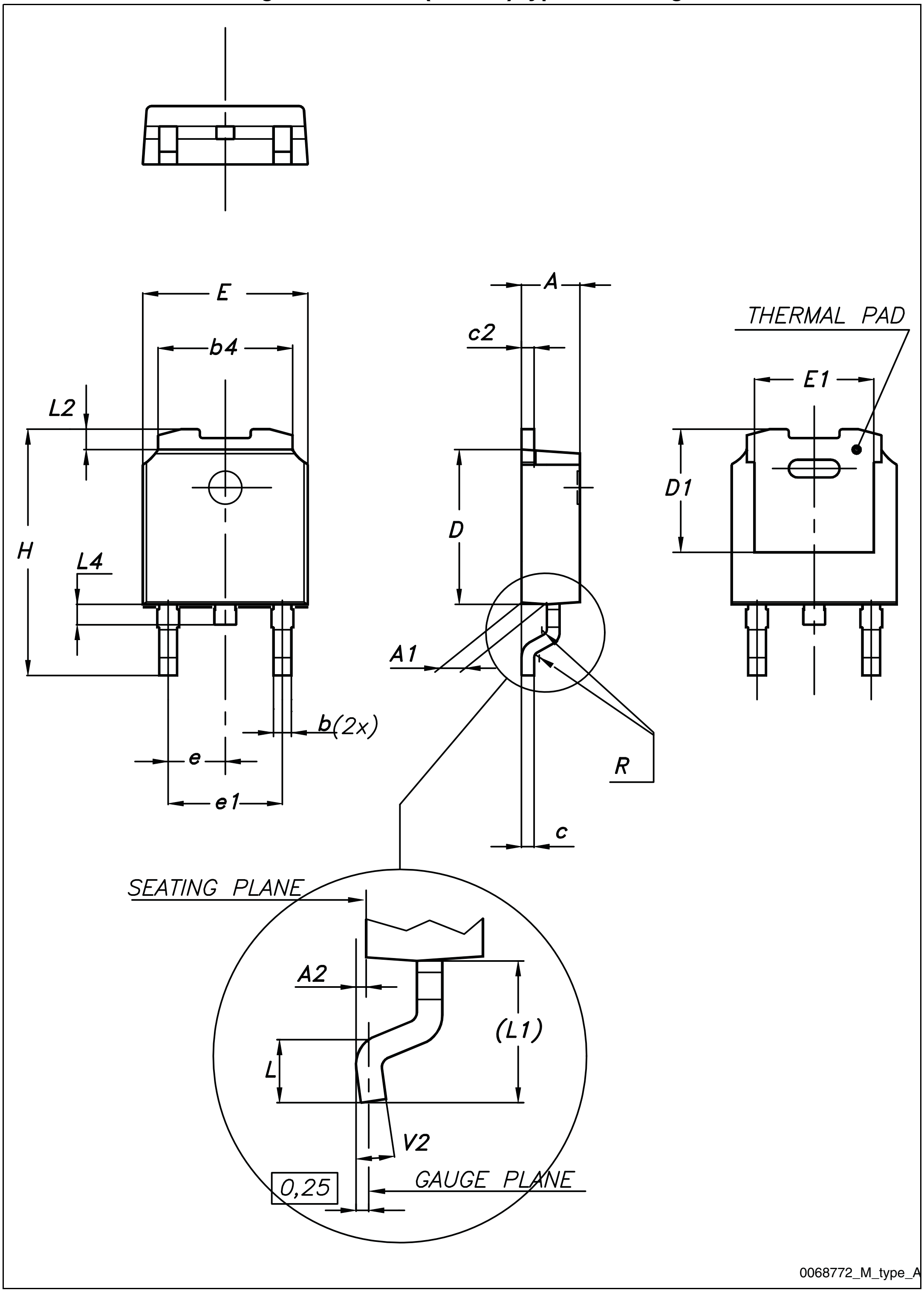
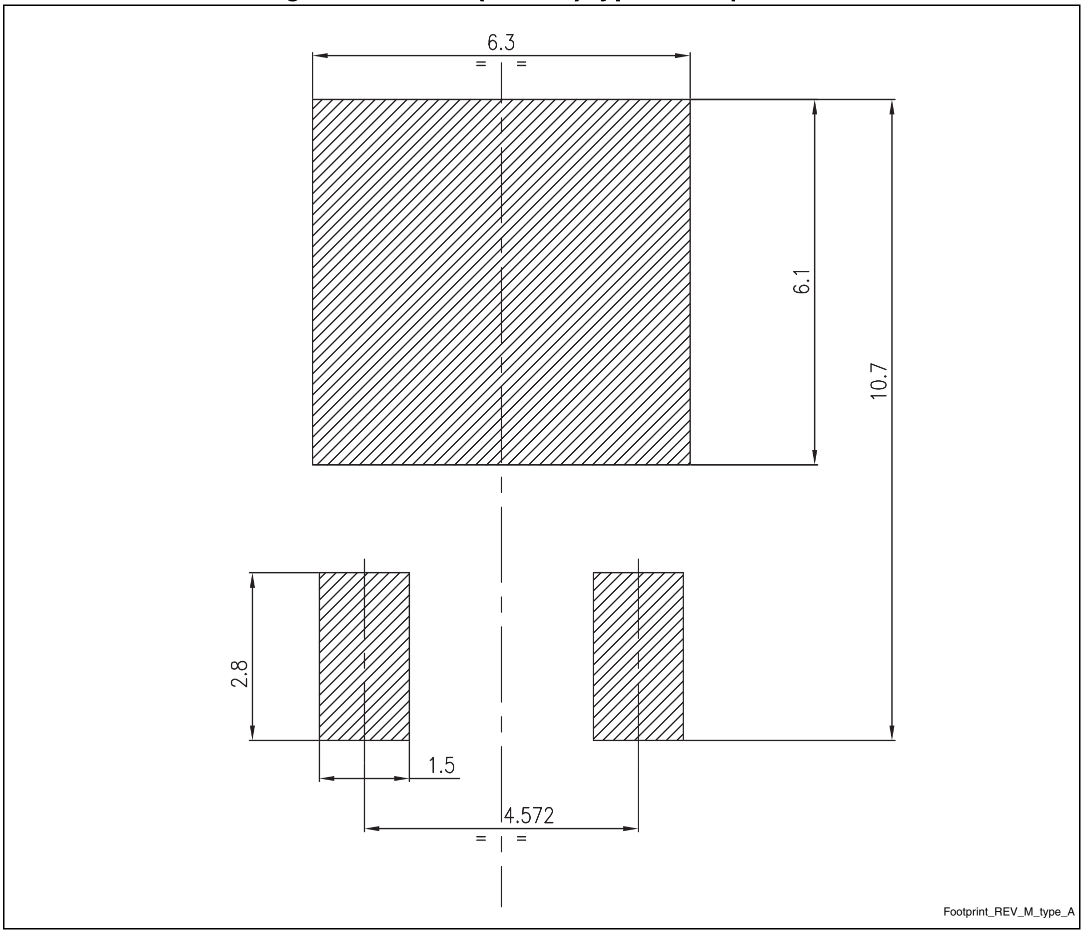


Table 9. DPAK (TO-252) type A mechanical data

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

5 Packaging mechanical data

Figure 21. Tape for DPAK (TO-252)

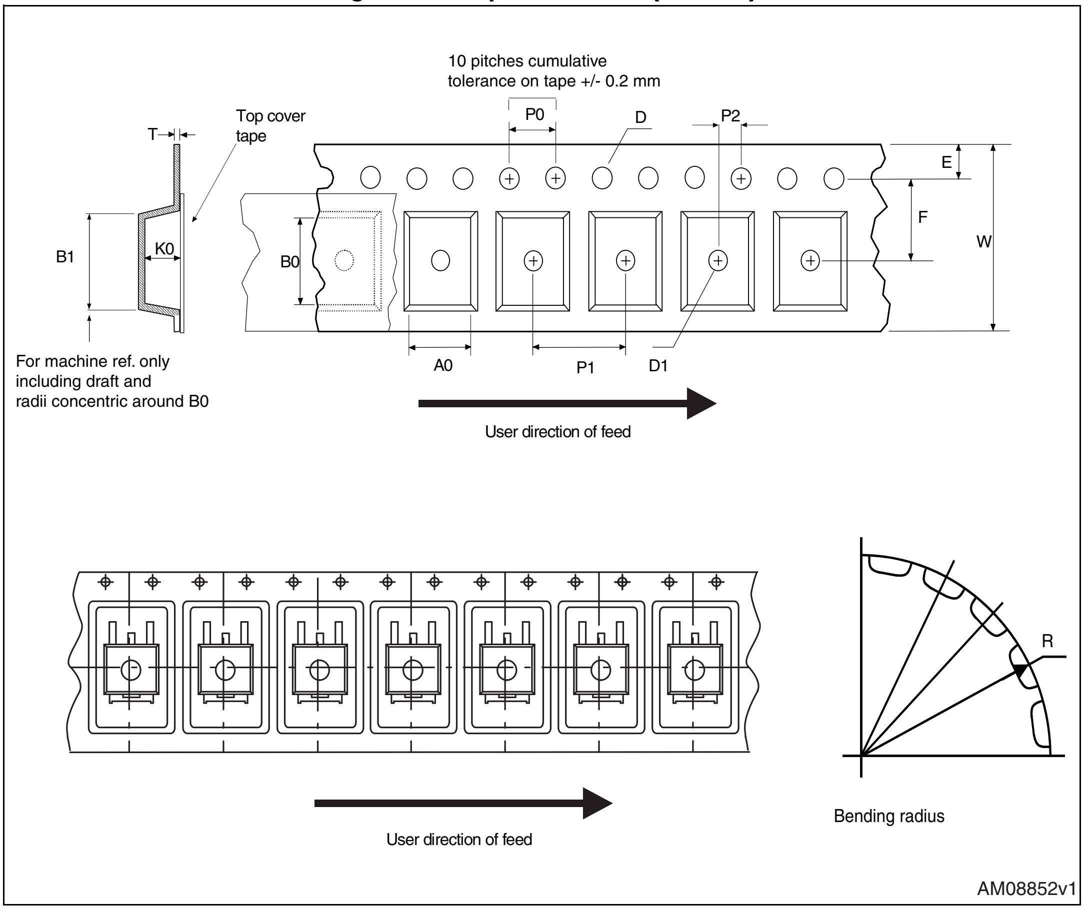


Figure 22. Reel for DPAK (TO-252)

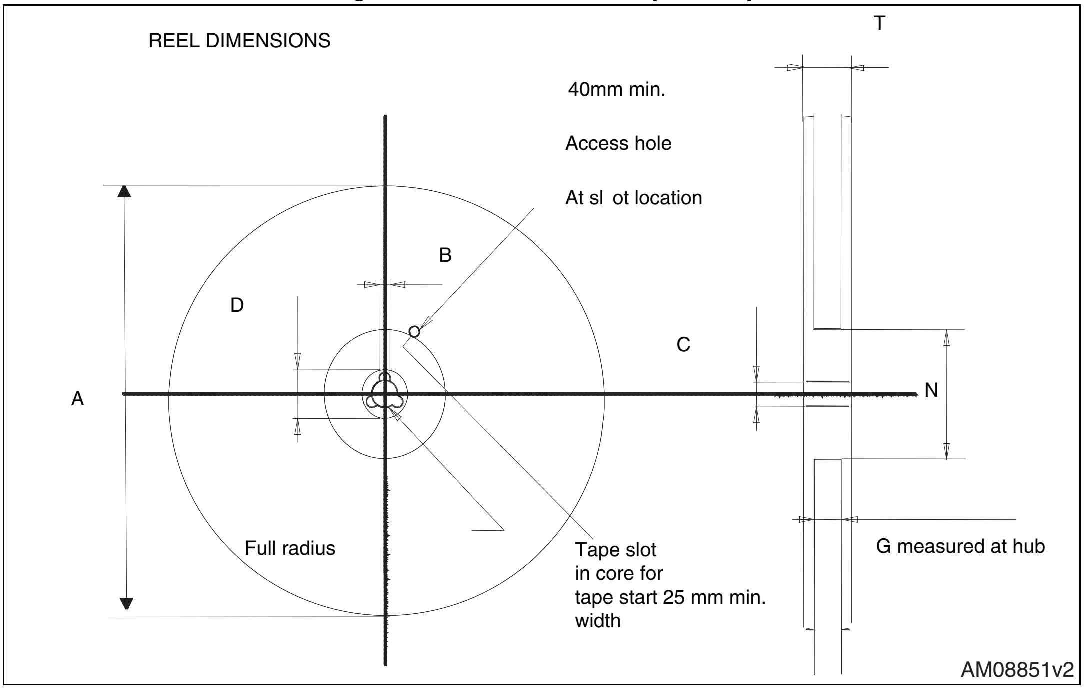


Table 10. DPAK (TO-252) tape and reel mechanical data

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 11. Document revision history

Date	Revision	Changes
22-Aug-2012	1	First release
31-Jan-2013	2	– Modified: $R_{DS(on)}$ on the title, *Features* table and *Table 5* – Modified: typical values on *Table 6*, *7*, *8* – Modified: V_{SD} max value on *Table 8* – Updated: *Section 4: Package mechanical data*
16-Jul-2013	3	– Modified: V_{GS} and I_D=100 °C values in *Table 2* – Modified: $R_{DS(on)}$ max value in *Table 5*, *Figure 13*, *14* and *15* – Inserted: *Section 2.1: Electrical characteristics (curves)*
10-Sep-2013	4	– Updated Q_g value in *Table 6: Dynamic*.
06-Feb-2014	5	– Added: *Table 4: Avalanche characteristics* – Modified: *Figure 2*, *5* and *12* – Updated: *Section 4: Package mechanical data* – Added: *Figure 16*, *17* and *18* – Minor text changes

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