



# STD10P6F6, STP10P6F6

P-channel 60 V, 0.15  $\Omega$  typ., 10 A STripFET™ VI DeepGATE™  
Power MOSFET in DPAK and TO-220 packages

Datasheet — preliminary data

## Features

Order codes	V <sub>DSS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>
STD10P6F6	60 V	0.18 $\Omega$	10 A
STP10P6F6	60 V	0.18 $\Omega$	10 A

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- High avalanche ruggedness
- Low gate drive power losses

## Applications

- Switching applications

## Description

These devices are P-channel Power MOSFETs developed using the 6<sup>th</sup> generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFETs exhibits the lowest R<sub>DS(on)</sub> in all packages.

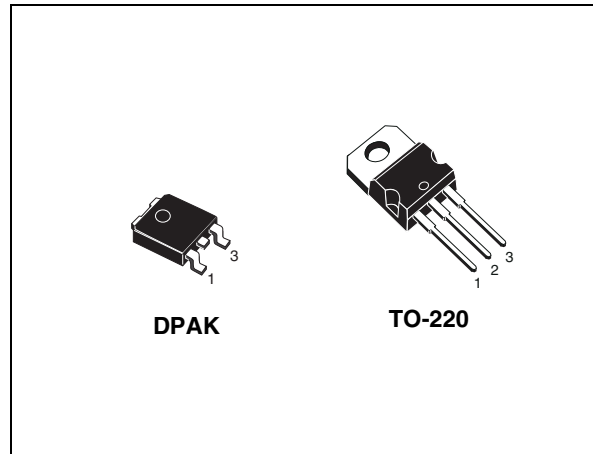


Figure 1. Internal schematic diagram

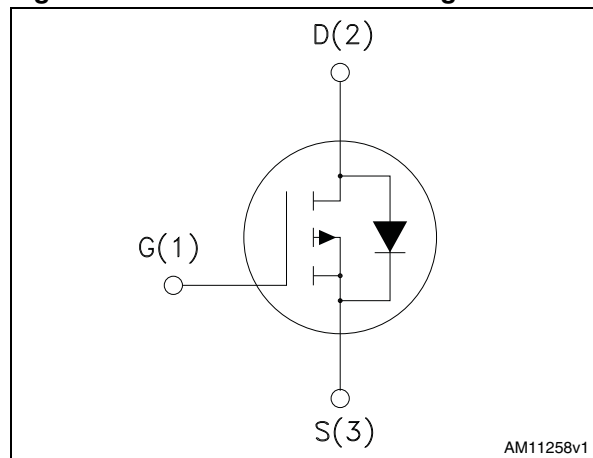


Table 1. Device summary

Order codes	Marking	Package	Packaging
STD10P6F6	10P6F6	DPAK	Tape and reel
STP10P6F6	10P6F6	TO-220	Tube

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

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	60	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	10	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	7.2	A
$I_{DM}^{(2)}$	Drain current (pulsed)	40	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	35	W
	Derating factor	0.23	W/ $^\circ\text{C}$
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature	175	$^\circ\text{C}$

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

**Table 3. Thermal data**

Symbol	Parameter	Value		Unit
		DPAK	TO-220	
$R_{thj-case}$	Thermal resistance junction-case max	4.29		$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	100	62.5	$^\circ\text{C}/\text{W}$
$T_l$	Maximum lead temperature for soldering purpose	275	300	$^\circ\text{C}$

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**Warning:** For the P-channel Power MOSFET the actual polarity of the voltages and the current must be reversed.

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## 2 Electrical characteristics

(T<sub>CASE</sub> = 25 °C unless otherwise specified)

**Table 4. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	60			V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = 60 V V <sub>DS</sub> = 60 V, T <sub>c</sub> = 125 °C			1 10	μA μA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20 V			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	V
R <sub>DS(on)</sub>	Static drain-source on-resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 5 A		0.15	0.18	Ω

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 48 V, f=1 MHz, V <sub>GS</sub> = 0	-	360	-	pF
C <sub>oss</sub>	Output capacitance			55		pF
C <sub>rss</sub>	Reverse transfer capacitance			28		pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 48V, I <sub>D</sub> = 10 A	-	7	-	nC
Q <sub>gs</sub>	Gate-source charge	V <sub>GS</sub> = 10 V	-	1.4	-	nC
Q <sub>gd</sub>	Gate-drain charge	<a href="#">Figure 3</a>	-	2	-	nC

**Warning:** For the P-channel Power MOSFET the actual polarity of the voltages and the current must be reversed.

**Table 6. Switching on/off (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 48\text{ V}$ , $I_D = 5\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ <i>Figure 2</i>	-	7.5	-	ns
$t_r$	Rise time			7		ns
$t_{d(off)}$	Turn-off delay time	<i>Figure 2</i>	-	16.5	-	ns
$t_f$	Fall time			10		ns

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		10	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				40	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 5\text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 10\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 48\text{ V}$ <i>Figure 4</i>	-	28		ns
$Q_{rr}$	Reverse recovery charge			28		nC
$I_{RRM}$	Reverse recovery current			2		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

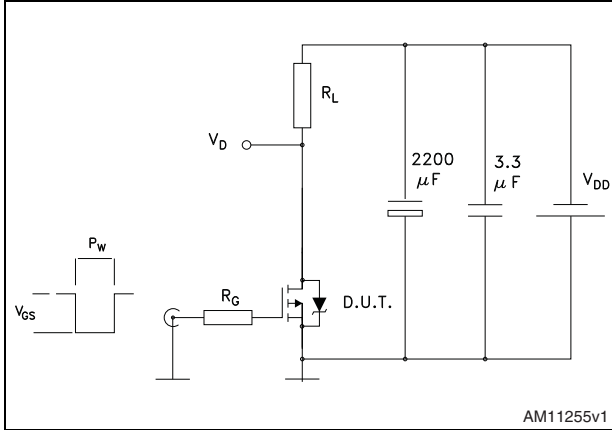
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**Warning:** For the P-channel Power MOSFET the actual polarity of the voltages and the current must be reversed.

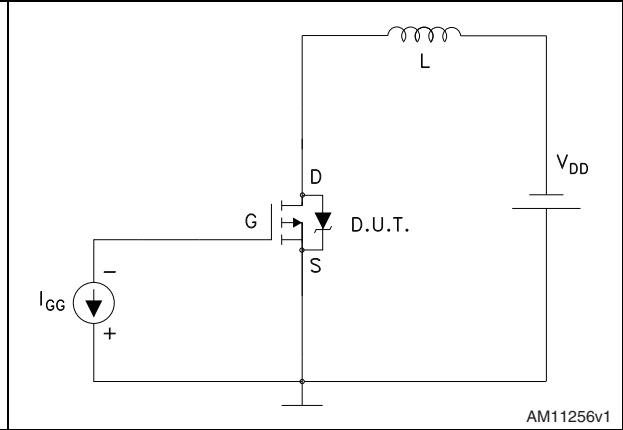
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### 3 Test circuits

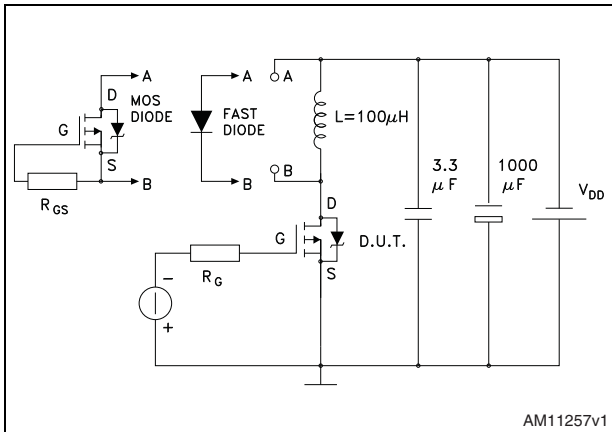
**Figure 2. Switching times test circuit for resistive load**



**Figure 3. Gate charge test circuit**



**Figure 4. Test circuit for diode recovery behaviour**



## 4 Package mechanical data

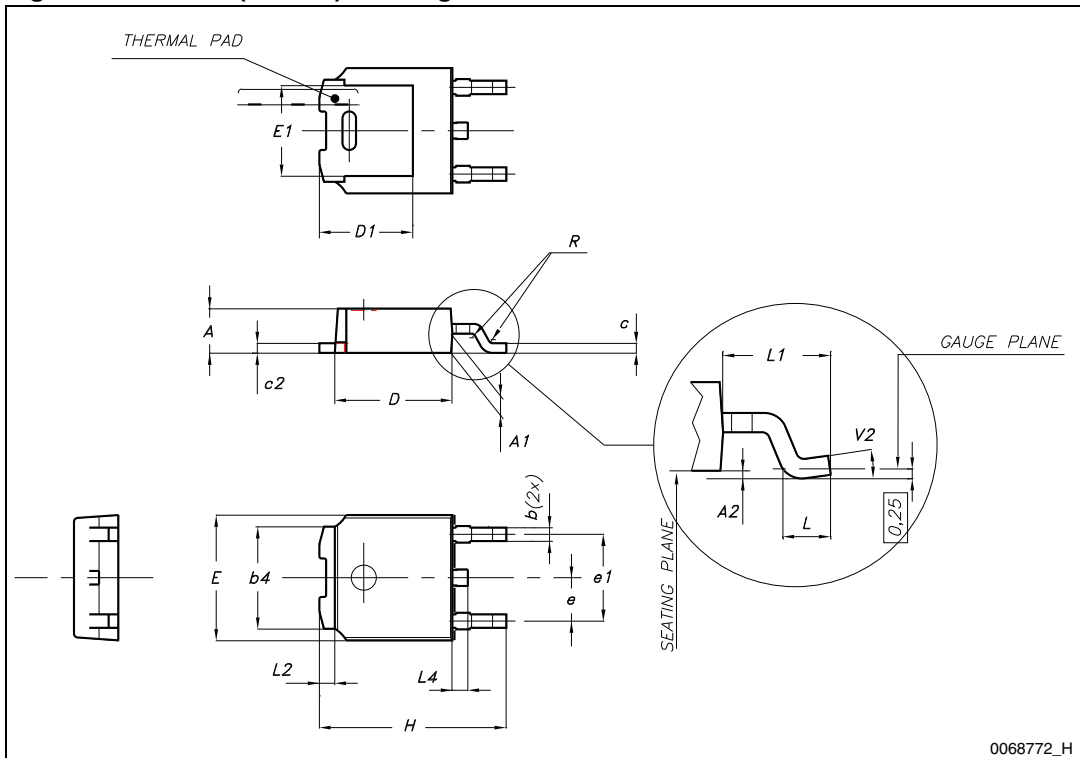
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Table 8. DPAK (TO-252) mechanical data

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		1.50
L1		2.80	
L2		0.80	
L4	0.60		1
R		0.20	
V2	0°		8°

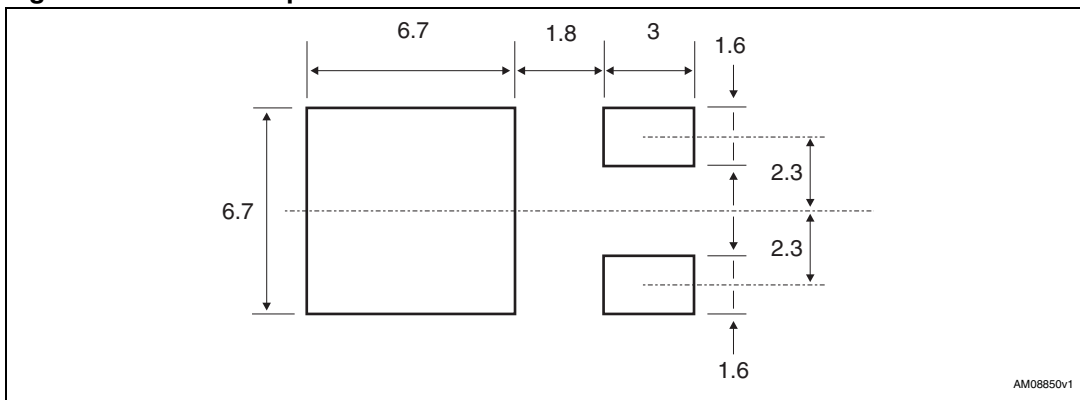


Figure 5. DPAK (TO-252) drawing



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Figure 6. DPAK footprint<sup>(a)</sup>



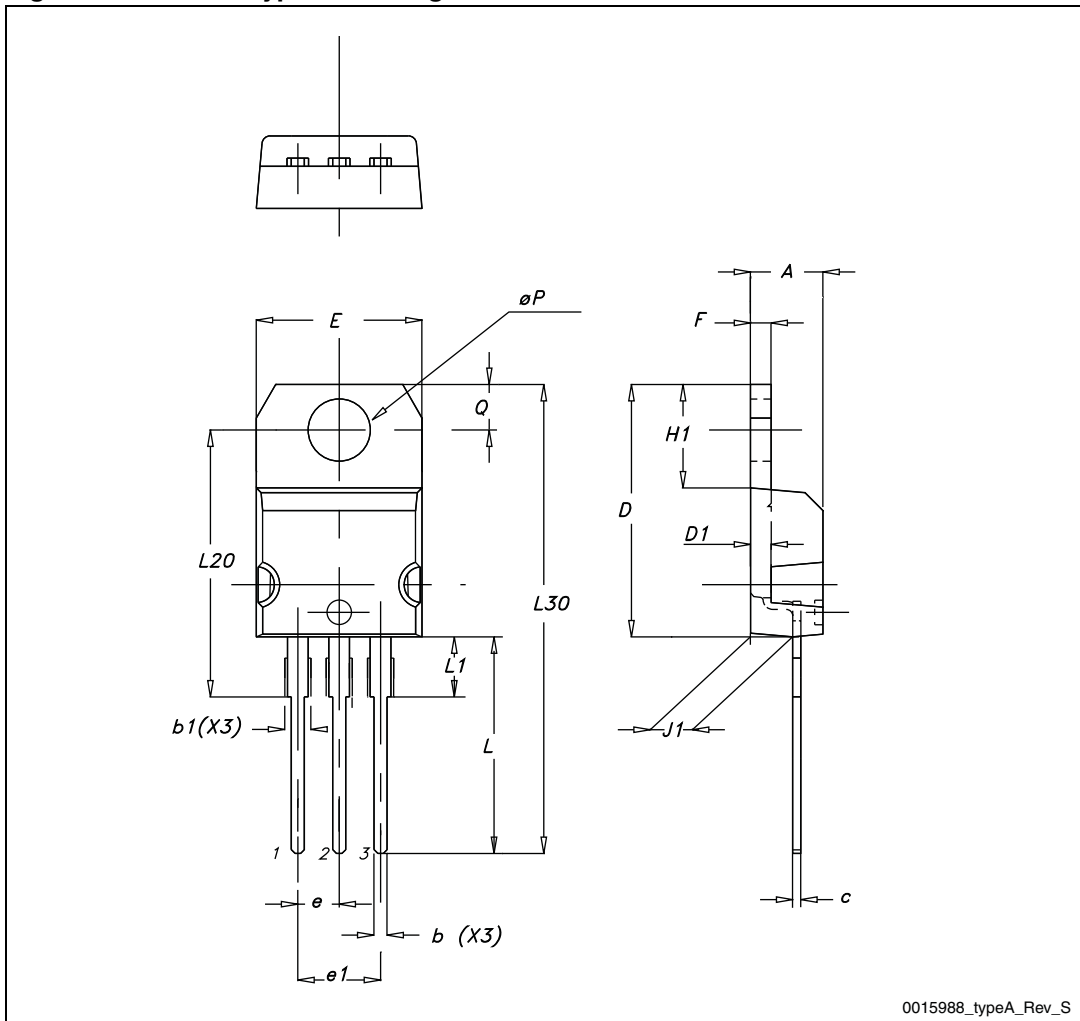
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a. All dimensions are in millimeters

Table 9. 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 7. TO-220 type A drawing



## 5 Packaging mechanical data

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			

Figure 8. Tape for DPAK (TO-252)

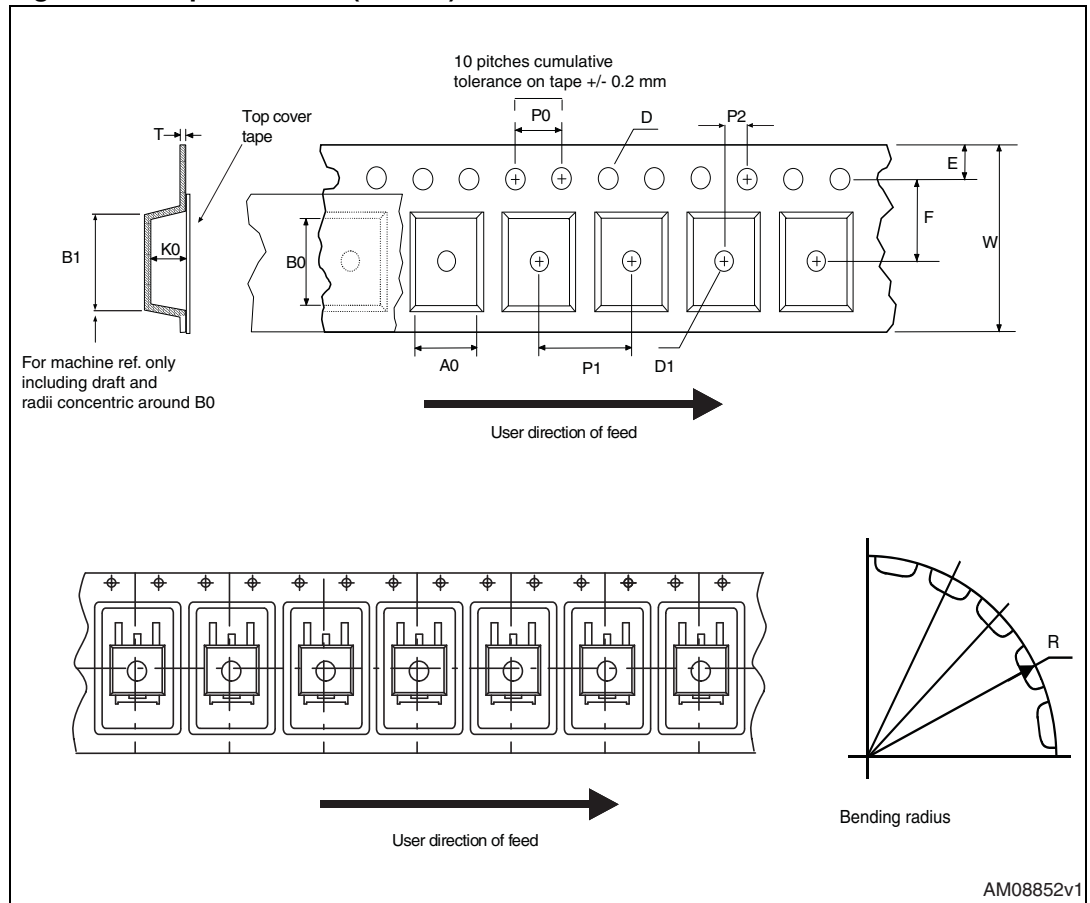
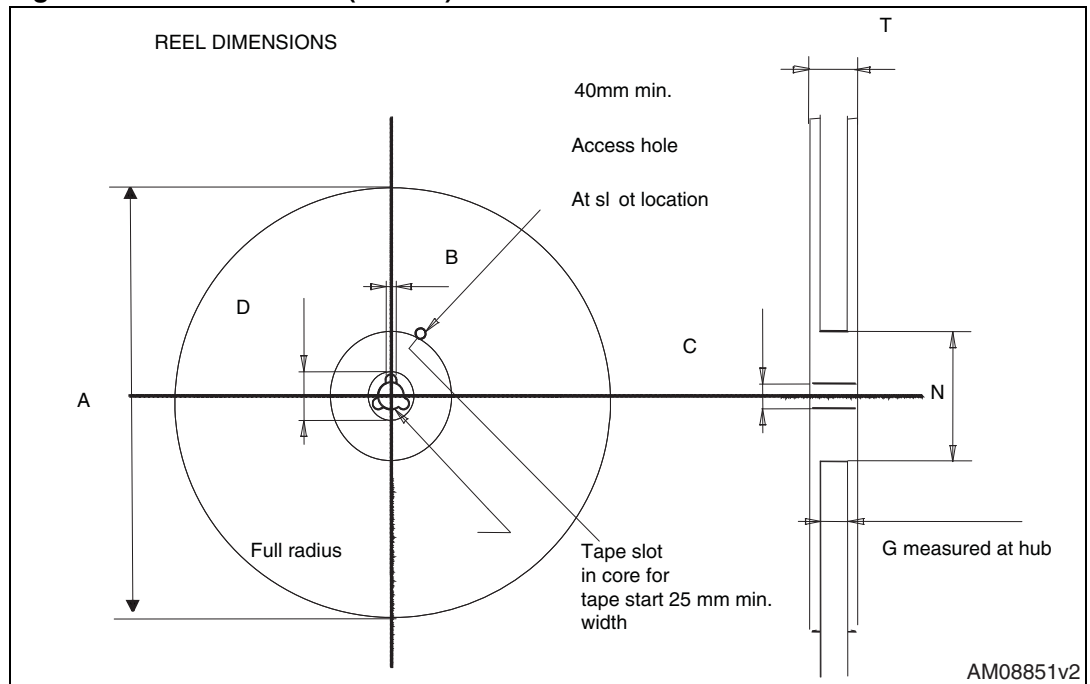


Figure 9. Reel for DPAK (TO-252)



## 6 Revision history

**Table 11. Document revision history**

Date	Revision	Changes
10-May-2012	1	First release.
20-Jun-2012	2	Updated title on the coverpage. Updated all parameter values in <a href="#">Table 5</a> , <a href="#">Table 6</a> and <a href="#">Figure 1</a> .

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