

## P-channel 30 V, 0.01 $\Omega$ typ., 52 A, STripFET™ H6 Power MOSFET in a DPAK package

Datasheet - preliminary data

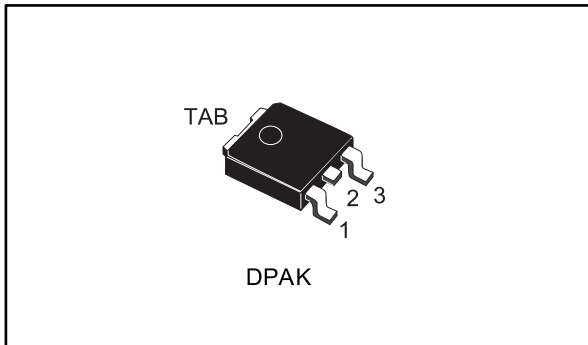
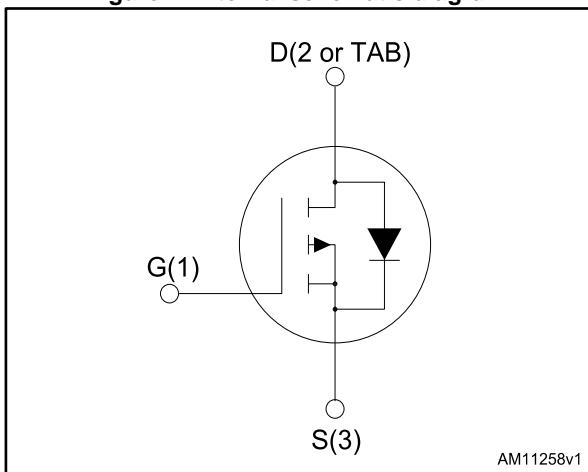


Figure 1: Internal schematic diagram



- Very low on-resistance
- Very low gate charge
- High avalanche
- Low gate drive power loss

### Applications

- Switching applications

### Description

This device is a P-channel Power MOSFET developed using the STripFET™ H6 technology, with a new trench gate structure. The resulting Power MOSFET exhibits very low  $R_{DS(on)}$  in all packages.

Table 1: Device summary

Order codes	Marking	Package	Packaging
STD52P3LLH6	52P3LLH6	DPAK	Tape and reel



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

### Features

Order codes	$V_{DSS}$	$R_{DS(on)}$ max	$I_D$	$P_{TOT}$
STD52P3LLH6	30 V	0.012 $\Omega$	52 A	70 W

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# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	30	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	52	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	37.5	A
$I_{DM}^{(1)}$	Drain current (pulsed)	208	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	70	W
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_j$	Max. operating junction temperature	175	$^\circ\text{C}$

**Notes:**

<sup>(1)</sup>Pulse width limited by safe operating area.

**Table 3: Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	2.14	$^\circ\text{C/W}$



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

## 2 Electrical characteristics

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

**Table 4: Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0$ , $V_{DS} = 30\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0$ , $V_{DS} = 30\text{ V}$ , $T_C = 125\text{ °C}$			10	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 26\text{ A}$		0.01	0.012	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 26\text{ A}$		0.014	0.017	$\Omega$

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	3350	-	pF
$C_{oss}$	Output capacitance		-	414	-	pF
$C_{rss}$	Reverse transfer capacitance		-	287	-	pF
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}$ , $I_D = 52\text{ A}$ $V_{GS} = 4.5\text{ V}$ (see <a href="#">Figure 14: "Gate charge test circuit"</a> )	-	33	-	nC
$Q_{gs}$	Gate-source charge		-	14	-	nC
$Q_{gd}$	Gate-drain charge		-	11	-	nC
$R_g$	Gate input resistance	$I_D = 0$ Gate bias = 0 Test signal level = 20 mV $f = 1\text{ MHz}$	-	1.5		$\Omega$



For the P-channel Power MOSFETs 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	$V_{DD} = 24\text{ V}$ , $I_D = 15\text{ A}$ , $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ ( see <a href="#">Figure 13</a> : "Switching times test circuit for resistive load")	-	12.8	-	ns
$t_r$	Rise time		-	112	-	ns
$t_{d(off)}$	Turn-off delay time		-	61	-	ns
$t_f$	Fall time		-	45	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 52\text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 52\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 24\text{ V}$ (see <a href="#">Figure 15</a> : "Source-drain diode forward characteristics")	-	25.2		ns
$Q_{rr}$	Reverse recovery charge		-	17.4		nC
$I_{RRM}$	Reverse recovery current		-	1.4		A

**Notes:**

<sup>(1)</sup>Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%



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

## 2.1 Electrical characteristics (curves)

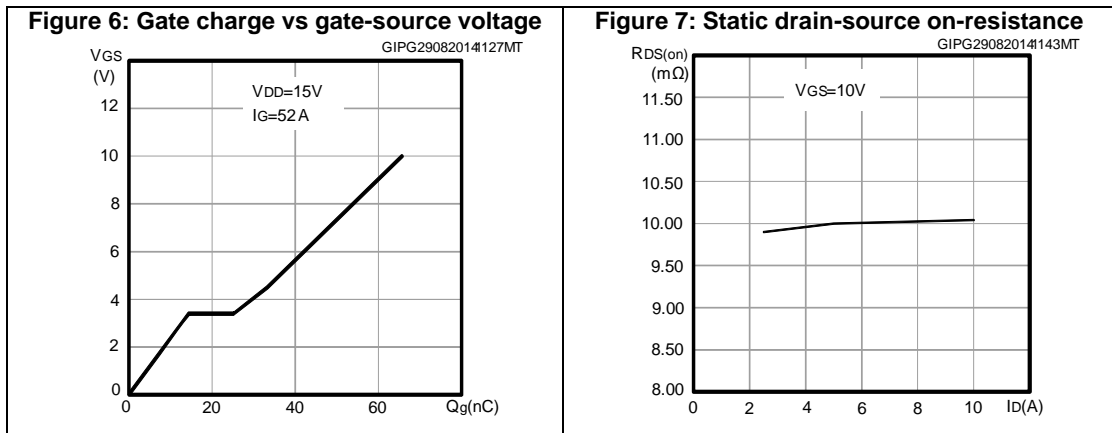
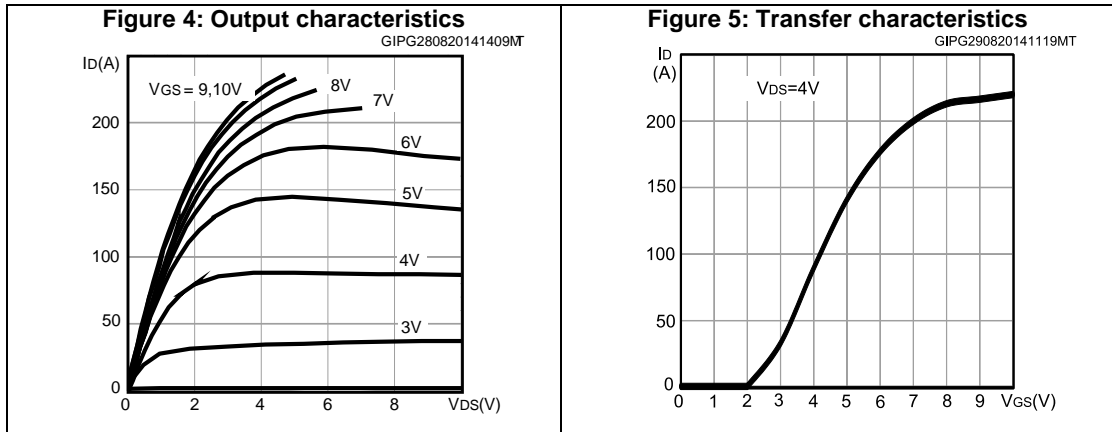
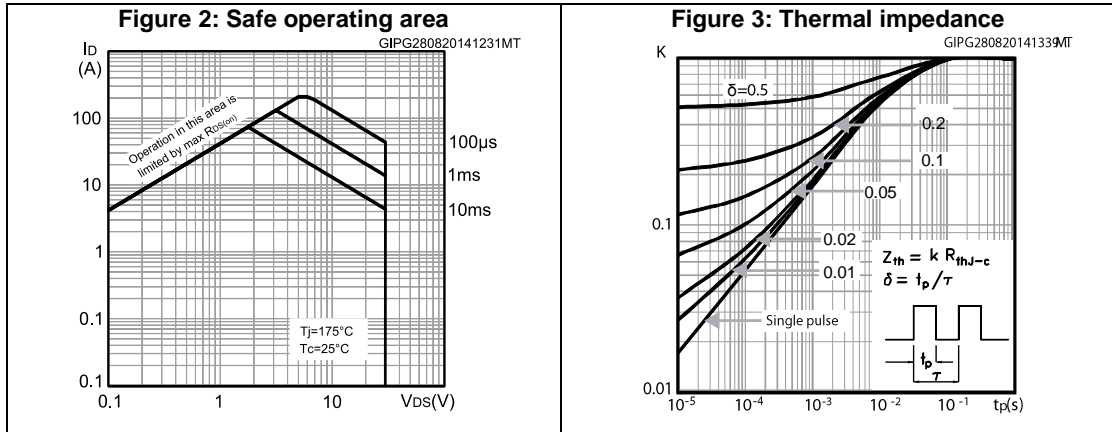


Figure 8: Capacitance variations

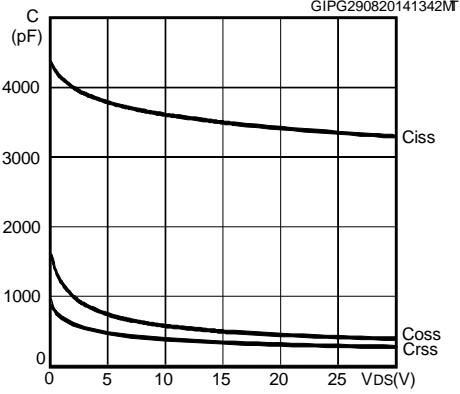


Figure 9: Normalized gate threshold voltage vs temperature

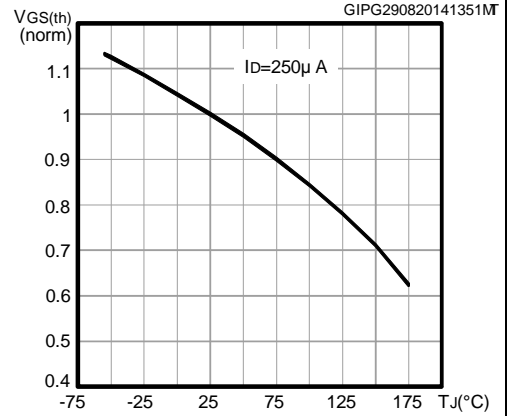


Figure 10: Normalized on-resistance vs temperature

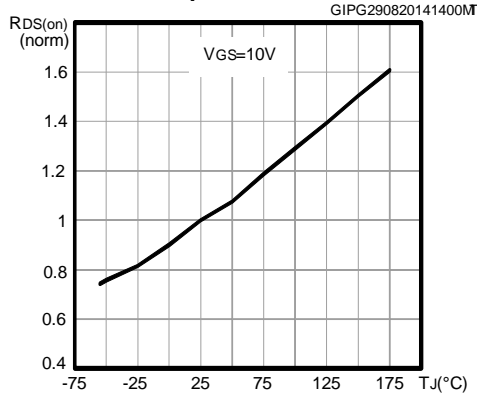


Figure 11: Normalized V(BR)DSS vs temperature

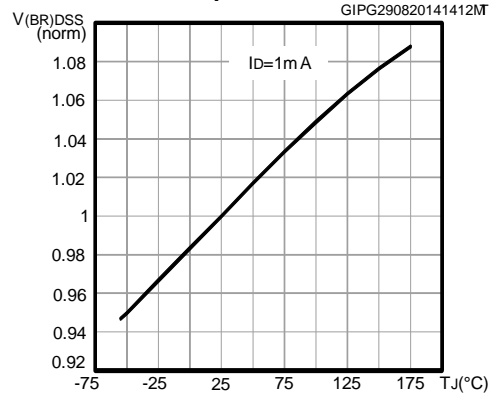
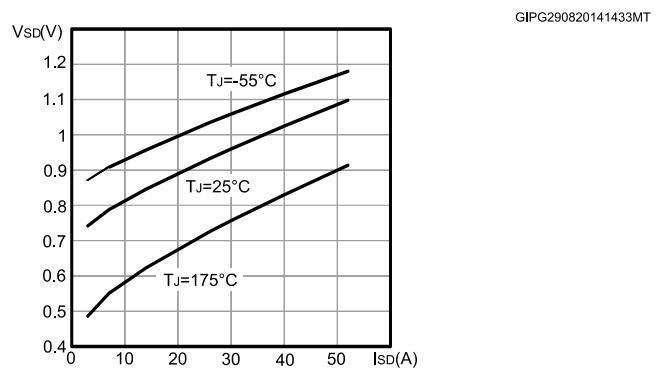
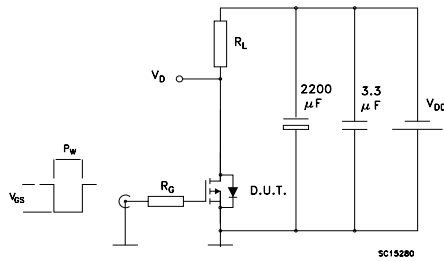


Figure 12: Source-drain diode forward characteristics

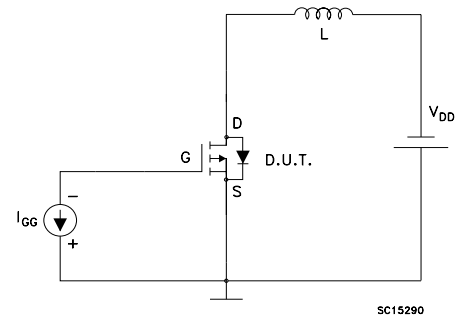


### 3 Test circuits

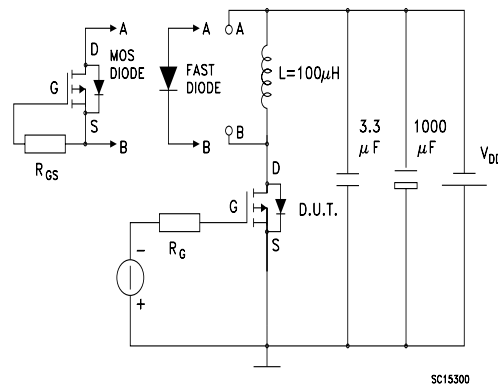
**Figure 13: Switching times test circuit for resistive load**



**Figure 14: Gate charge test circuit**



**Figure 15: Source-drain diode forward characteristics**





## 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.

### 4.1 DPAK (TO-252) mechanical data

Figure 16: DPAK (TO-252) type A drawings

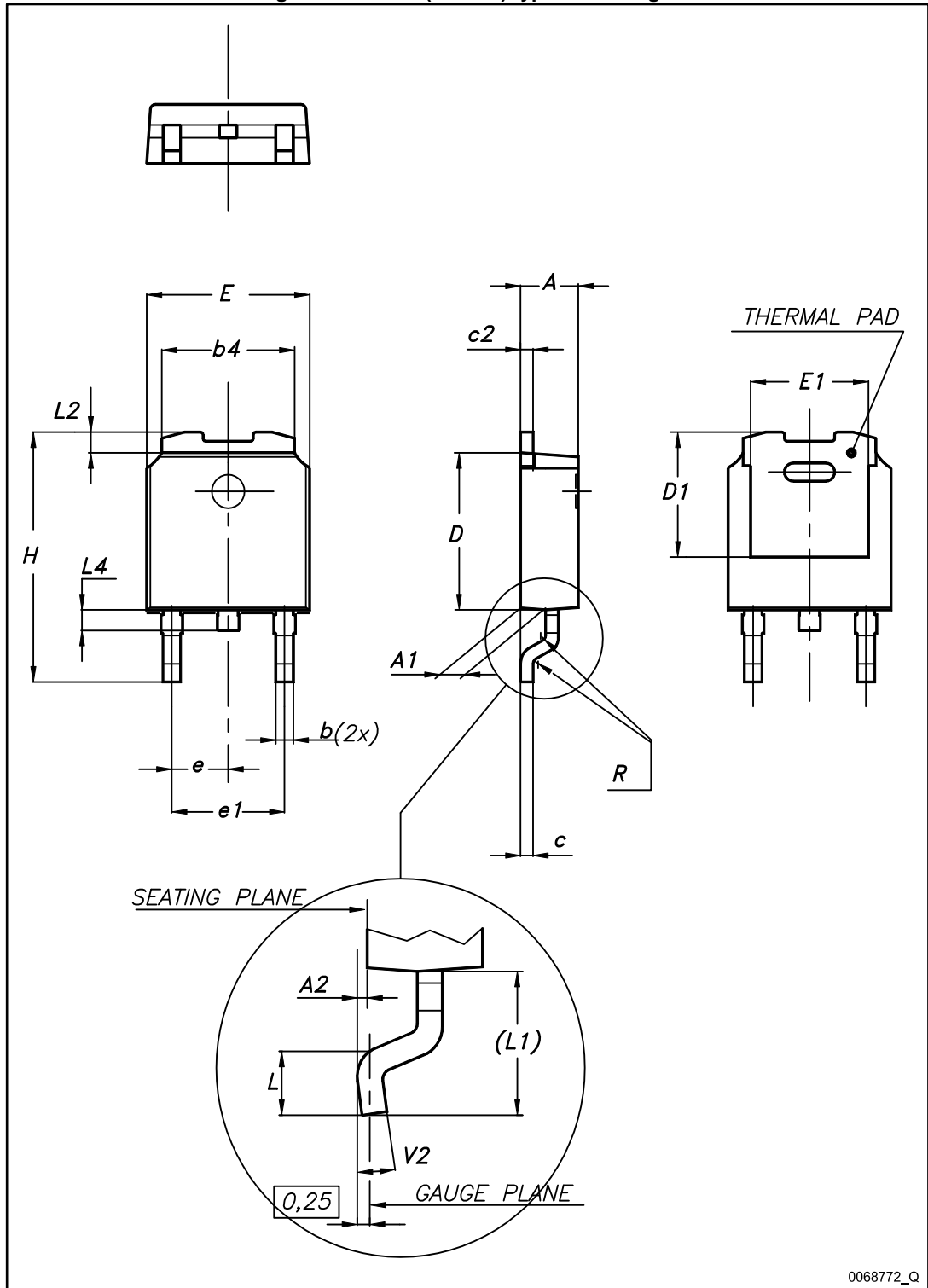
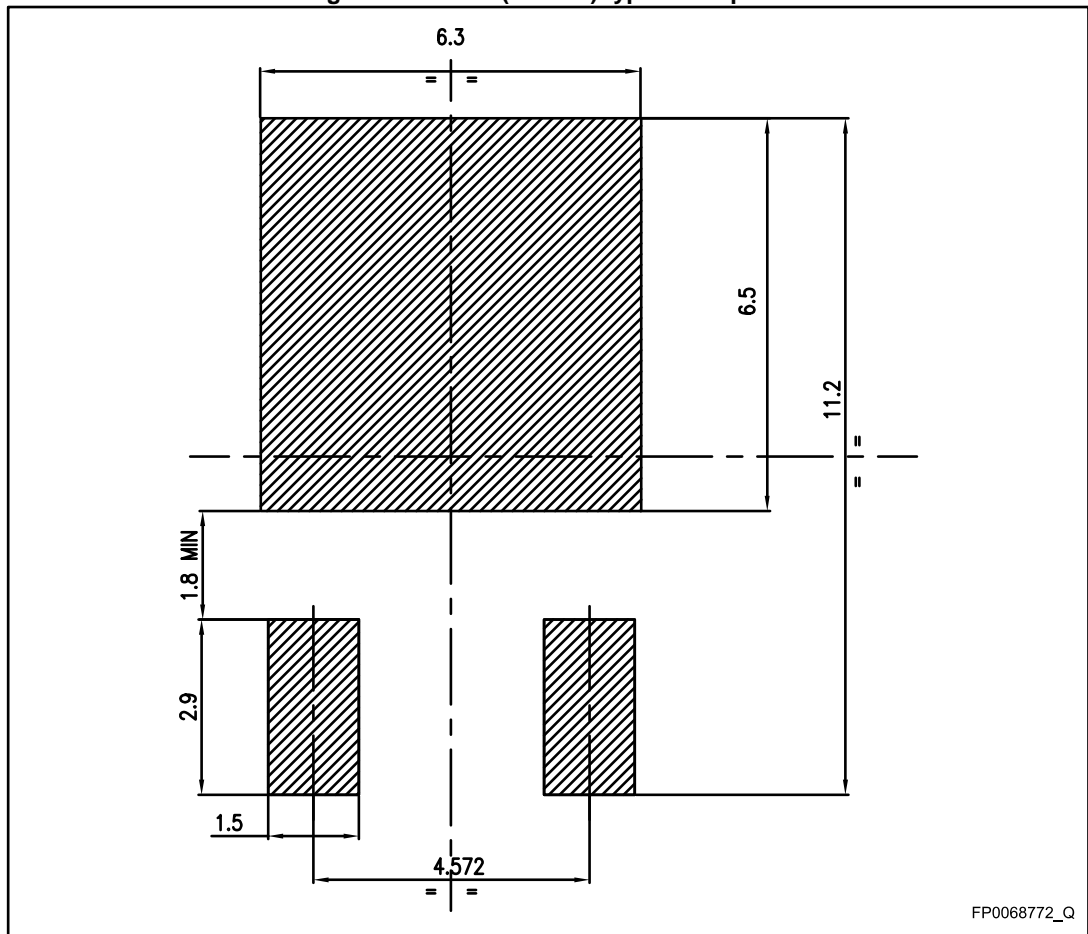


Table 8: DPAK (TO-252) type A mechanical data

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 17: DPAK (TO-252) type A footprint



All dimensions are in mm

# 5 Packaging mechanical data

## 5.1 DPAK (TO-252) tape and reel mechanical data

Figure 18: Tape for DPAK (TO-252)

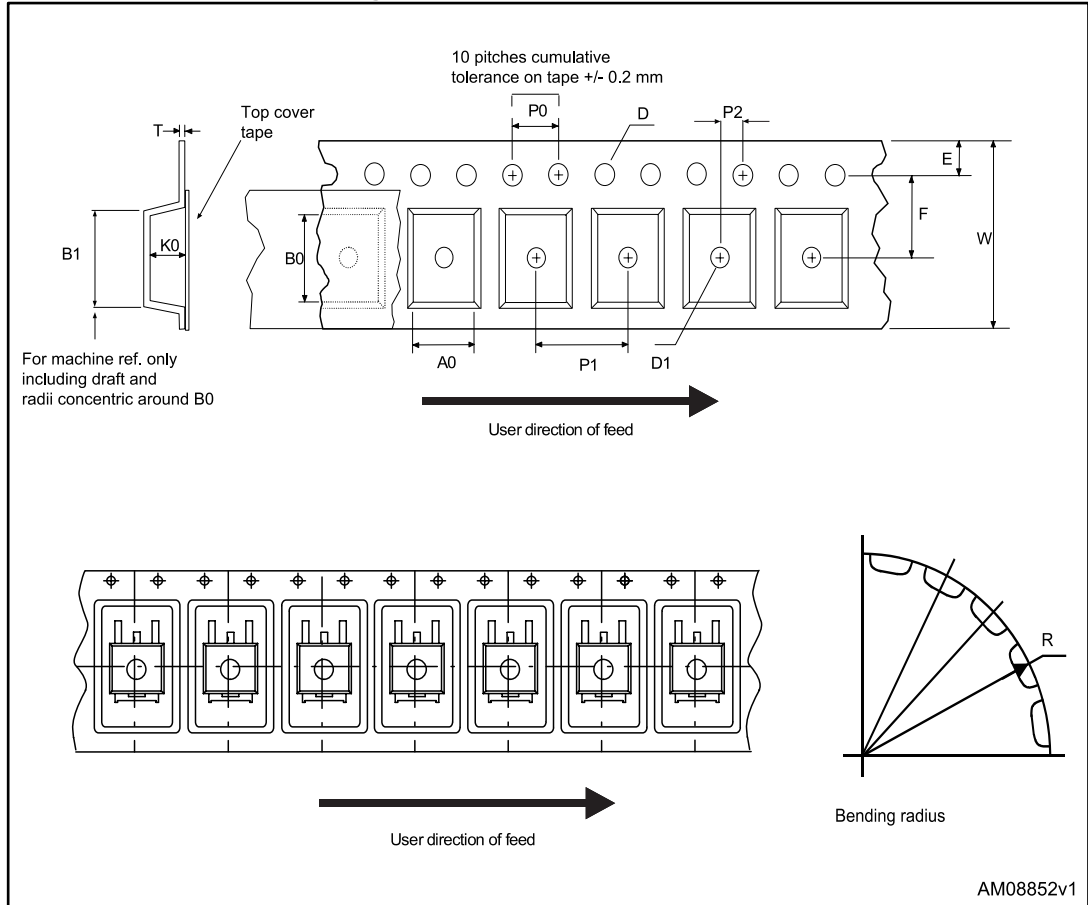


Figure 19: Reel for DPAK (TO-252)

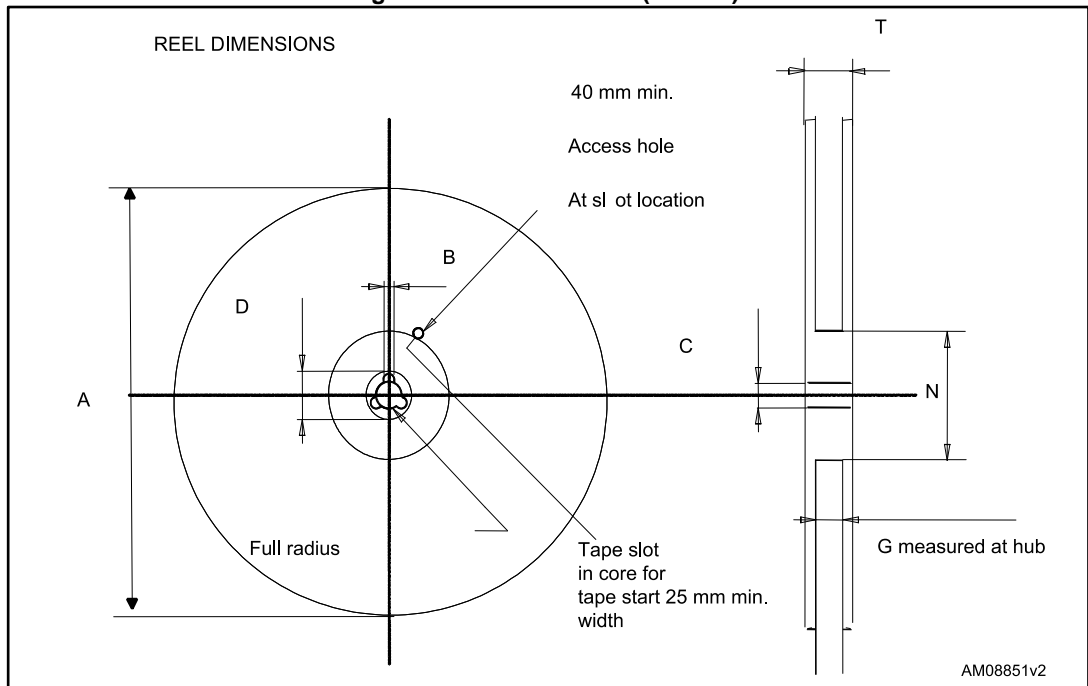


Table 9: DPAK (TO-252) tape and reel mechanical data

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 10: Document revision history

Date	Revision	Changes
02-Jun-2014	1	First release
24-Sep-2014	2	Updated the title, the features and the description in cover page. Updated <i>Table 2: "Absolute maximum ratings"</i> , <i>Section 2: "Electrical characteristics"</i> . Added <i>Section 2.1: "Electrical characteristics (curves)"</i> . Minor text changes.

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