

N-channel 60 V, 4.2 mΩ typ., 80 A STripFET™ F7 Power MOSFET in a DPAK package

Datasheet - production data

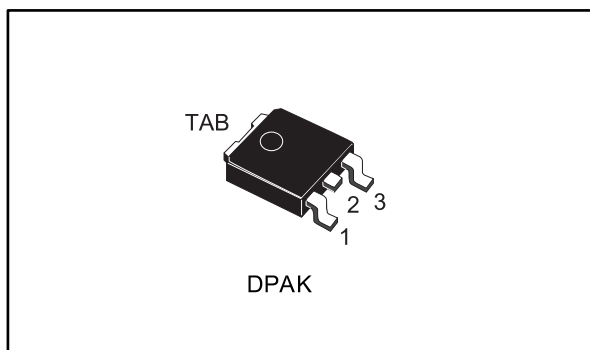
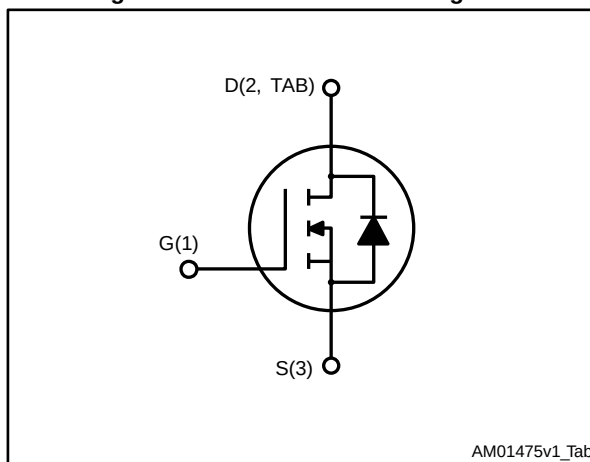


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STD130N6F7	60 V	5.0 mΩ	80 A	134 W

- Among the lowest R_{DS(on)} on the market
- Excellent FoM (figure of merit)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packing
STD130N6F7	130N6F7	DPAK	Tape and reel

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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	±20	V
$I_D^{(1)}$	Drain current (continuous) at $T_{case} = 25\text{ °C}$	80	A
	Drain current (continuous) at $T_{case} = 100\text{ °C}$	80	
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_{case} = 25\text{ °C}$	134	W
$E_{AS}^{(3)}$	Single pulse avalanche energy	200	mJ
$dV/dt^{(4)}$	Drain-body diode dynamic dV/dt ruggedness	5.0	V/ns
T_{stg}	Storage temperature range	-55 to 175	°C
T_j	Operating junction temperature range		

Notes:

- (1) Current is limited by package.
 (2) Pulse width is limited by safe operating area.
 (3) starting $T_j = 25\text{ °C}$, $I_D = 20\text{ A}$, $V_{DD} = 30\text{ V}$.
 (4) $I_{SD} = 80\text{ A}$; $di/dt = 600\text{ A/}\mu\text{s}$; $V_{DD} = 48\text{ V}$; $T_j < T_{jmax}$

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb	50	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	1.12	

Notes:

- (1) When mounted on FR-4 board of 1 inch², 2oz Cu, $t < 10\text{ sec}$

2 Electrical characteristics

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

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 1\text{ mA}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 60\text{ V}$			1	μA
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = 20\text{ V}$			100	nA
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	2		4	V
$R_{\text{DS(on)}}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 40\text{ A}$		4.2	5.0	m Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iSS}	Input capacitance	$V_{\text{DS}} = 30\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	2600	-	pF
C_{oSS}	Output capacitance		-	1200	-	
C_{rSS}	Reverse transfer capacitance		-	115	-	
Q_{g}	Total gate charge	$V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 80\text{ A}$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior")	-	42	-	nC
Q_{gs}	Gate-source charge		-	13.6	-	
Q_{gd}	Gate-drain charge		-	13	-	

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d(on)}}$	Turn-on delay time	$V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 40\text{ A}$, $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	24	-	ns
t_{r}	Rise time		-	44	-	
$t_{\text{d(off)}}$	Turn-off delay time		-	62	-	
t_{f}	Fall time		-	24	-	

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{\text{SD}}^{(1)}$	Forward on voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{SD}} = 80\text{ A}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{\text{SD}} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{\text{DD}} = 48\text{ V}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	50		ns
Q_{rr}	Reverse recovery charge		-	56		nC
I_{RRM}	Reverse recovery current		-	2.2		A

Notes:

(1) Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

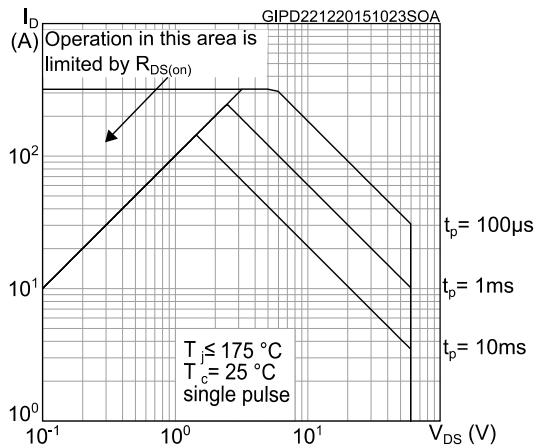


Figure 3: Thermal impedance

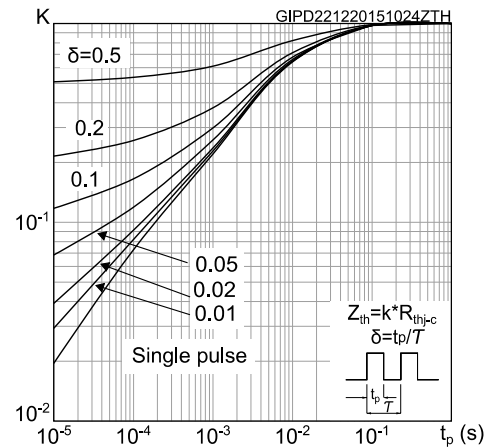


Figure 4: Output characteristics

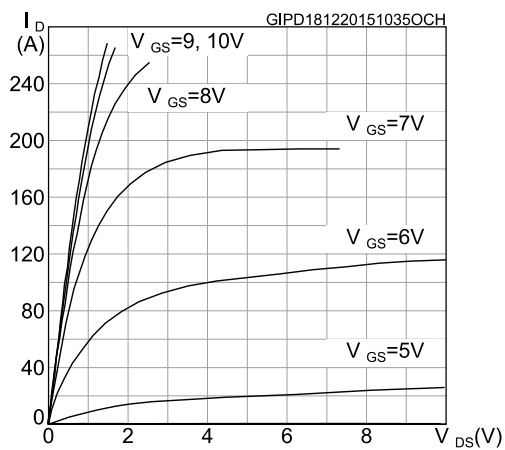


Figure 5: Transfer characteristics

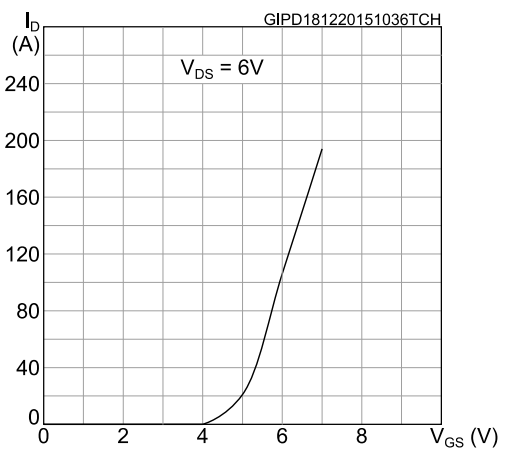


Figure 6: Gate charge vs gate-source voltage

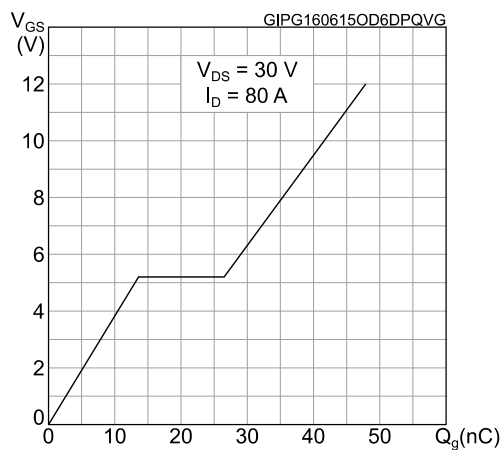


Figure 7: Static drain-source on-resistance

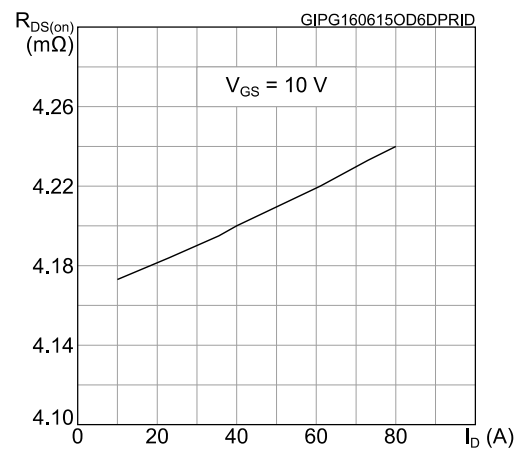


Figure 8: Capacitance variations

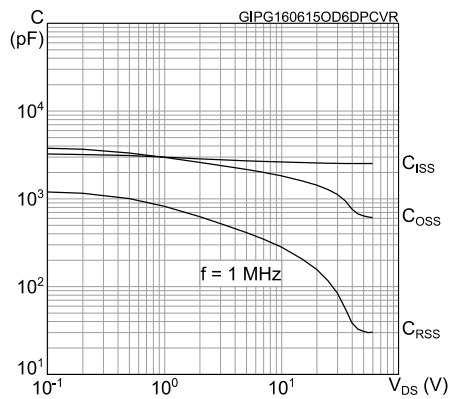


Figure 9: Normalized gate threshold voltage vs temperature

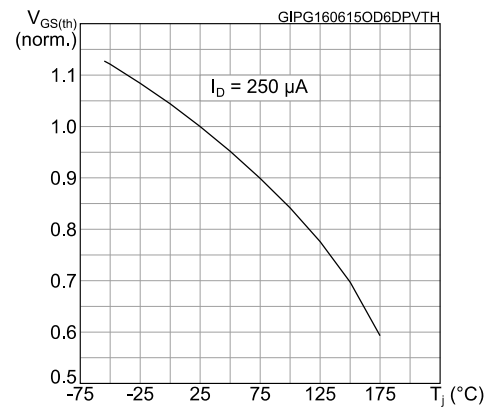


Figure 10: Normalized on-resistance vs temperature

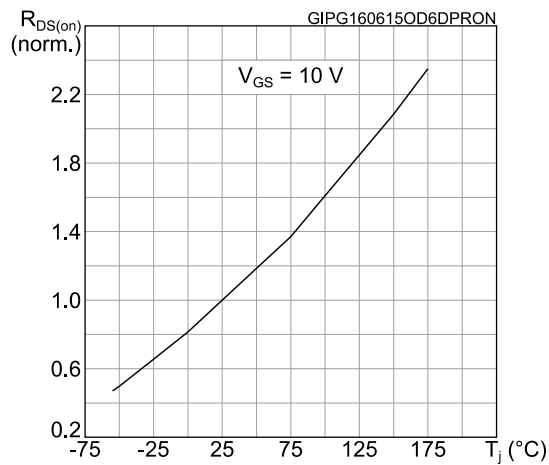


Figure 11: Normalized V(BR)DSS vs temperature

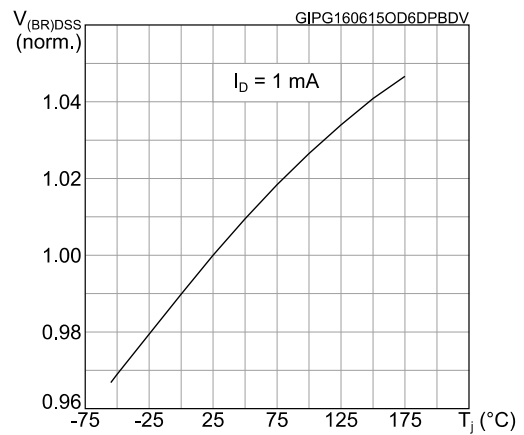
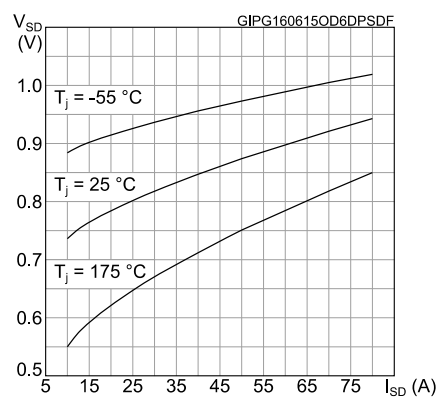
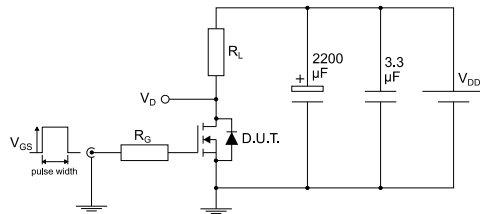


Figure 12: Source-drain diode forward characteristics



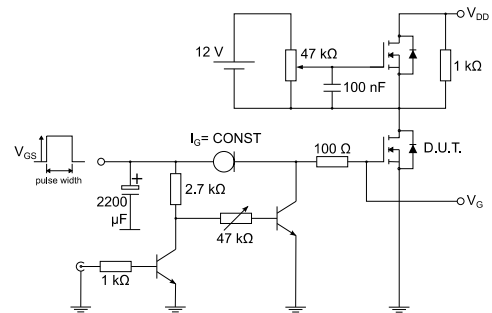
3 Test circuits

Figure 13: Test circuit for resistive load switching times



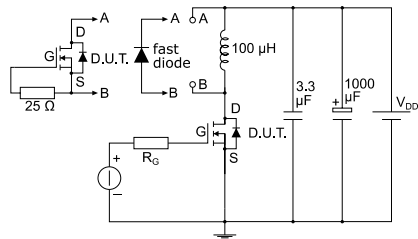
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Figure 14: Test circuit for gate charge behavior



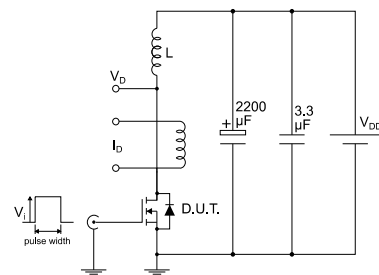
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Figure 15: Test circuit for inductive load switching and diode recovery times



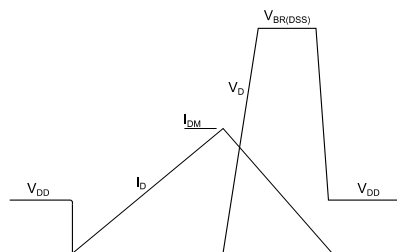
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Figure 16: Unclamped inductive load test circuit



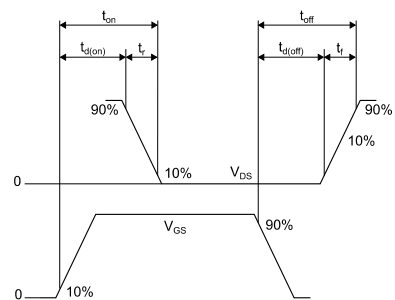
AM01471v1

Figure 17: Unclamped inductive waveform



AM01472v1

Figure 18: Switching time waveform



AM01473v1

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 DPAK package information

Figure 19: DPAK (TO-252) type A2 package outline

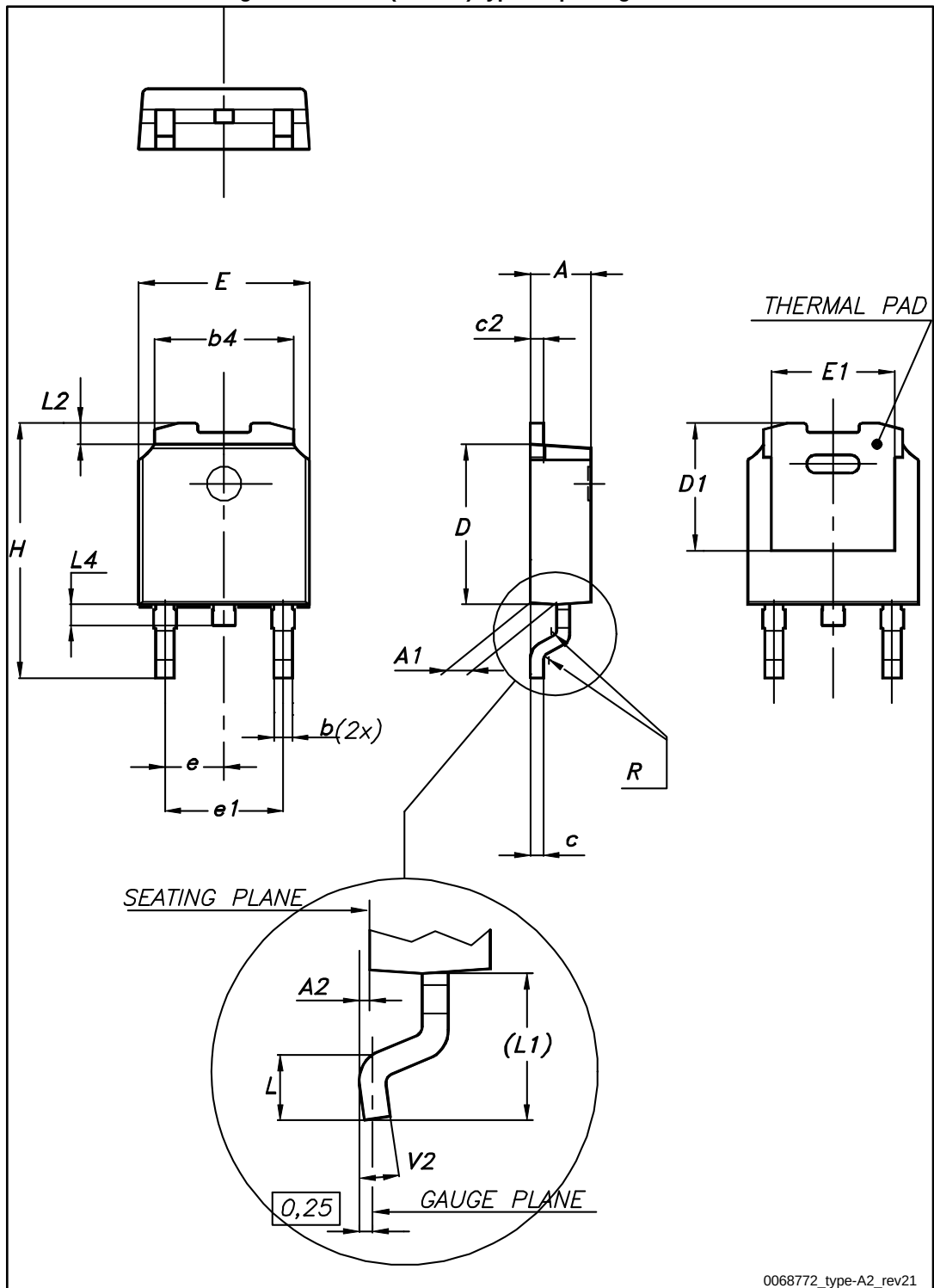
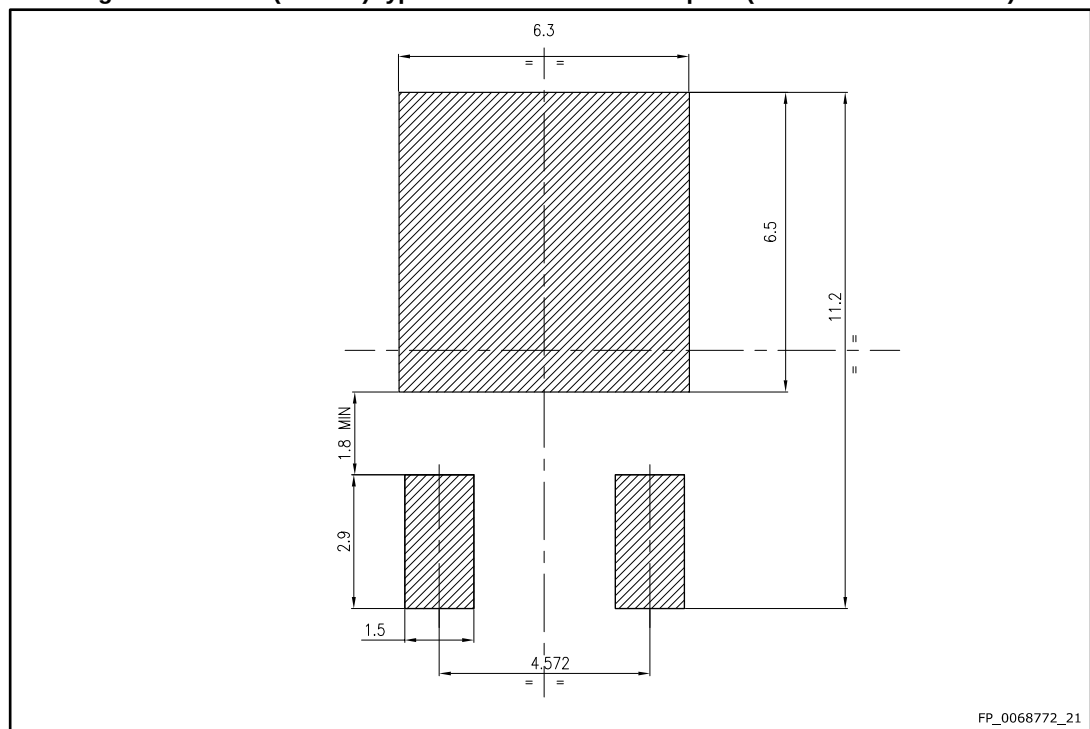


Table 8: DPAK (TO-252) type A2 mechanical data

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	4.95	5.10	5.25
E	6.40		6.60
E1	5.10	5.20	5.30
e	2.16	2.28	2.40
e1	4.40		4.60
H	9.35		10.10
L	1.00		1.50
L1	2.60	2.80	3.00
L2	0.65	0.80	0.95
L4	0.60		1.00
R		0.20	
V2	0°		8°

Figure 20: DPAK (TO-252) type A2 recommended footprint (dimensions are in mm)



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
17-Dec-2015	1	First release.
10-Oct-2016	2	Document status changed from preliminary to production data. Minor text changes.

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