

## N-channel 20 V, 0.025 $\Omega$ typ., 5 A STripFET™ V Power MOSFET in a SOT23-6L package

Datasheet — production data

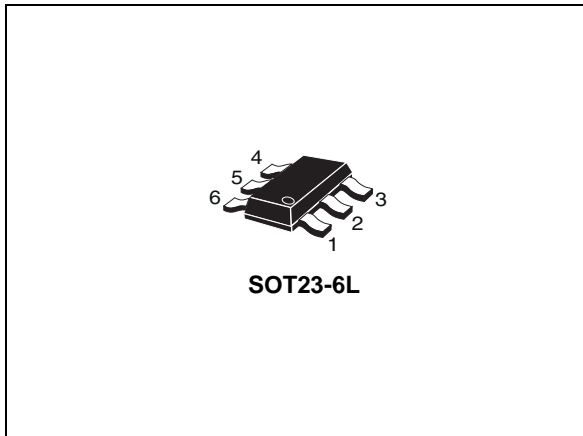
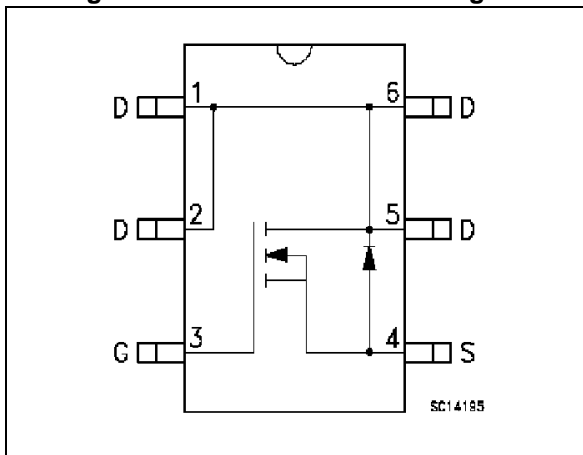


Figure 1. Internal schematic diagram



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max	I <sub>D</sub>	P <sub>TOT</sub>
STT5N2VH5	20 V	0.04 $\Omega$ (V <sub>GS</sub> =2.5 V)	5 A	1.6 W

- Very low profile package
- Conduction losses reduced
- Switching losses reduced
- 2.5 V gate drive
- Very low threshold device

### Applications

- Switching applications

### Description

This device is an N-channel Power MOSFET developed using STMicroelectronics' STripFET™ V technology. The device has been optimized to achieve very low on-state resistance, contributing to a FOM that is among the best in its class.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STT5N2VH5	STD1	SOT23-6L	Tape and reel

# Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	20	V
$V_{GS}$	Gate-source voltage	$\pm 8$	V
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 25\text{ }^\circ\text{C}$	5	A
$I_D^{(1)}$	Drain current (continuous) at $T_{pcb} = 100\text{ }^\circ\text{C}$	3.1	A
$I_{DM}^{(1)(2)}$	Drain current (pulsed)	20	A
$P_{TOT}^{(1)}$	Total dissipation at $T_{pcb} = 25\text{ }^\circ\text{C}$	1.6	W
$T_{stg}$	Storage temperature	- 55 to 150	$^\circ\text{C}$
$T_j$	Max. operating junction temperature		$^\circ\text{C}$

1. This value is rated according to  $R_{thj-pcb}$
2. Pulse width is limited by safe operating area

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	78	$^\circ\text{C/W}$

1. When mounted on 1 inch<sup>2</sup> FR-4, 2 Oz Cu,  $t < 10$  sec.

## 2 Electrical characteristics

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

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1\text{ mA}$ , $V_{GS} = 0$	20			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 20\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 20\text{ V}$ , $T_C = 125\text{ °C}$			10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 8\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	0.7			V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 4.5\text{ V}$ , $I_D = 2\text{ A}$		0.025	0.03	$\Omega$
		$V_{GS} = 2.5\text{ V}$ , $I_D = 2\text{ A}$		0.031	0.04	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 16\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	367	-	pF
$C_{oss}$	Output capacitance		-	92	-	pF
$C_{rss}$	Reverse transfer capacitance		-	16	-	pF
$Q_g$	Total gate charge	$V_{DD} = 16\text{ V}$ , $I_D = 2\text{ A}$ , $V_{GS} = 4.5\text{ V}$ (see <a href="#">Figure 14</a> )	-	4.6	-	nC
$Q_{gs}$	Gate-source charge		-	0.9	-	nC
$Q_{gd}$	Gate-drain charge		-	1	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Voltage delay time	$V_{DD} = 16\text{ V}$ , $I_D = 2\text{ A}$ , $R_G = 4.7\text{ }\Omega$ , $V_{GS} = 4.5\text{ V}$ (see <a href="#">Figure 15</a> and <a href="#">Figure 18</a> )	-	4.8	-	ns
$t_r (V)$	Voltage rise time		-	14.4	-	ns
$t_d (off)$	Current fall time		-	17	-	ns
$t_f$	Crossing time		-	4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		20	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 2 \text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 2 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 16 \text{ V}$ , $T_j = 150 \text{ }^\circ\text{C}$ (see <a href="#">Figure 18</a> )	-	10		ns
$Q_{rr}$	Reverse recovery charge		-	24		nC
$I_{RRM}$	Reverse recovery current		-	4.8		A

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

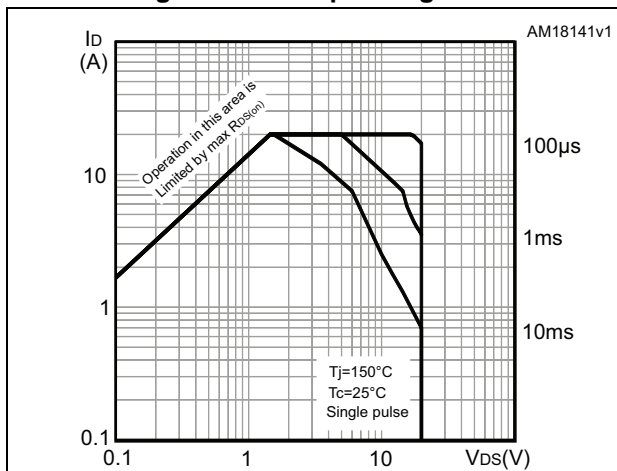


Figure 3. Thermal impedance

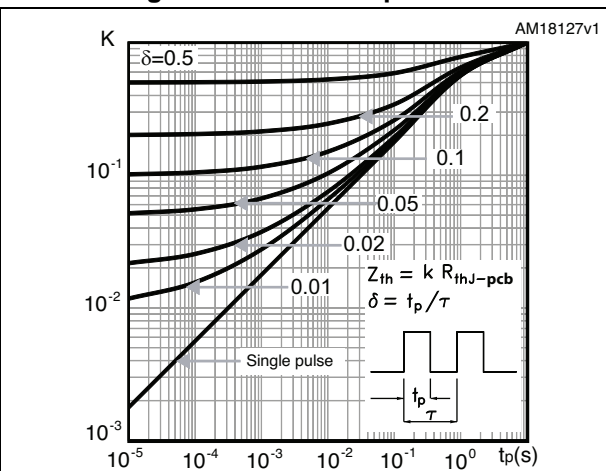


Figure 4. Output characteristics

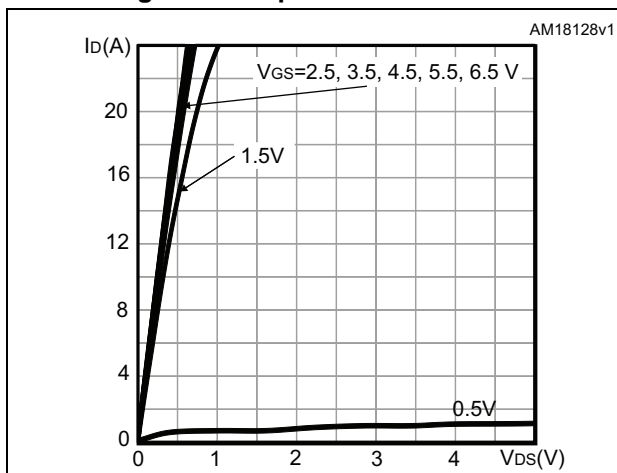


Figure 5. Transfer characteristics

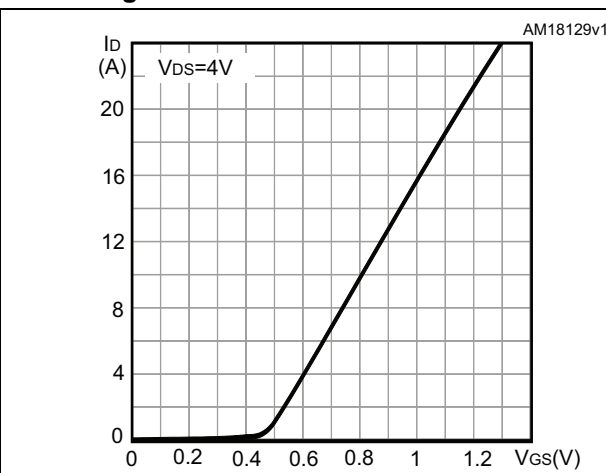


Figure 6. Gate charge vs gate-source voltage

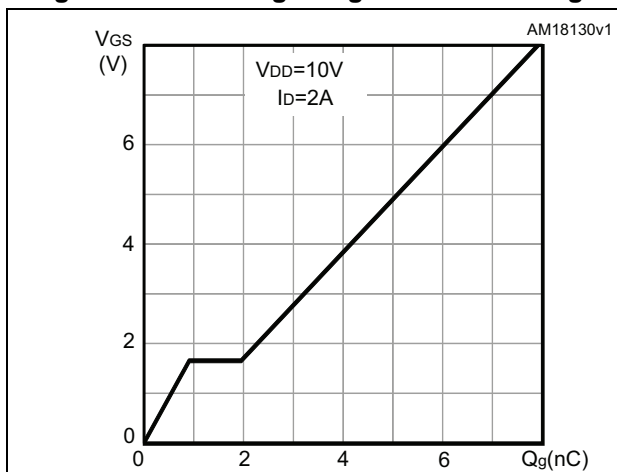


Figure 7. Static drain-source on-resistance

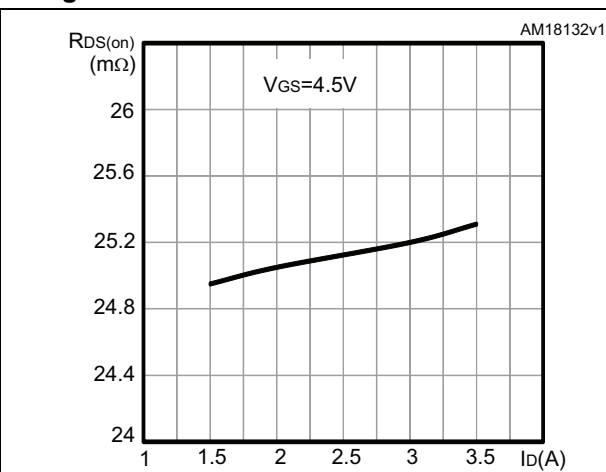


Figure 8. Capacitance variations

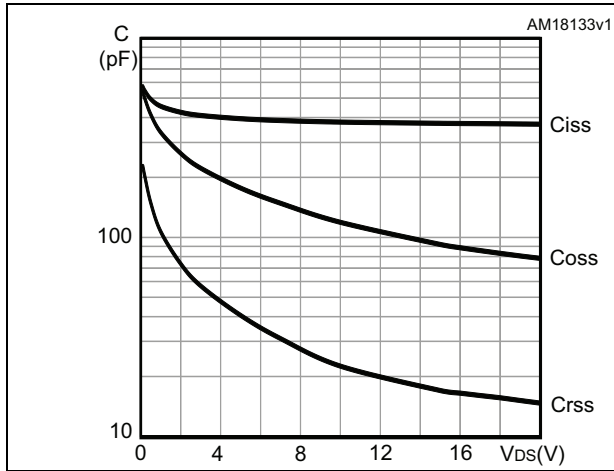


Figure 9. Normalized gate threshold voltage vs temperature

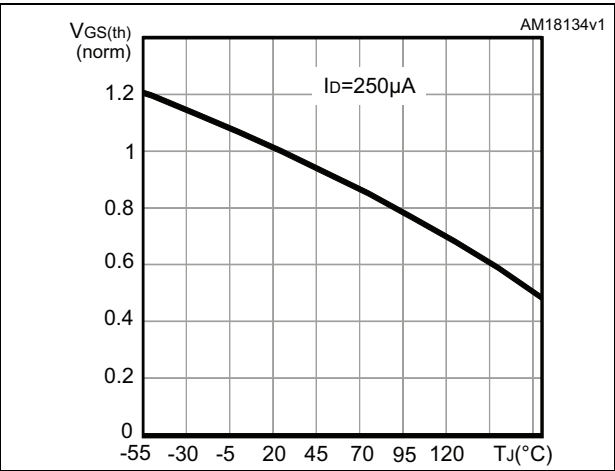


Figure 10. Normalized on-resistance vs temperature

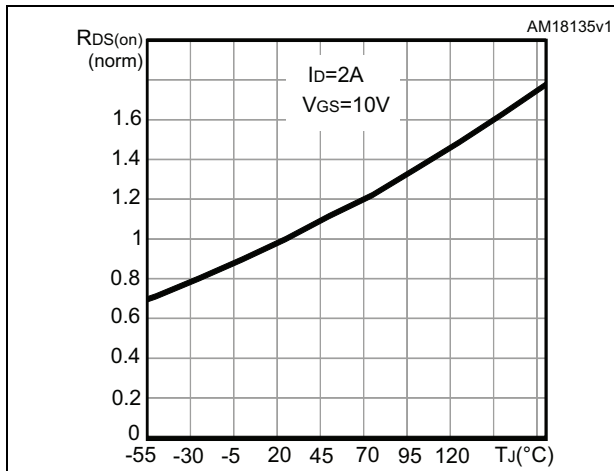


Figure 11. Normalized V<sub>(BR)DSS</sub> vs temperature

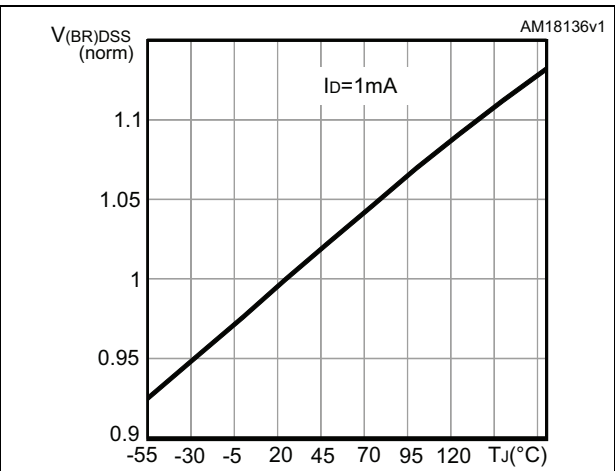
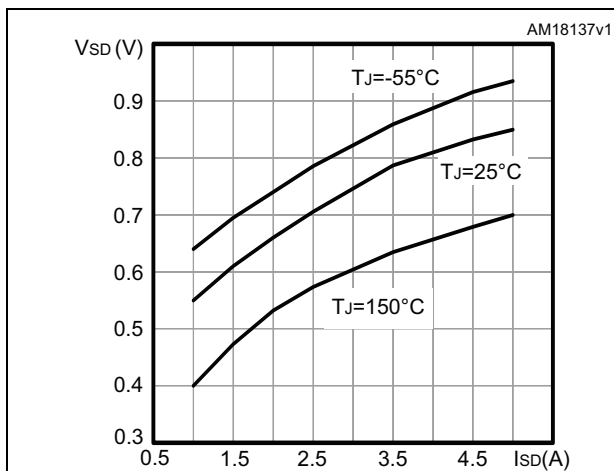


Figure 12. Source-drain diode forward characteristics

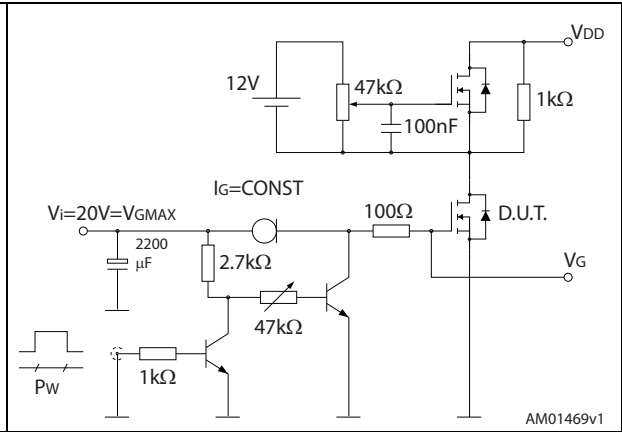


### 3 Test circuits

**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**

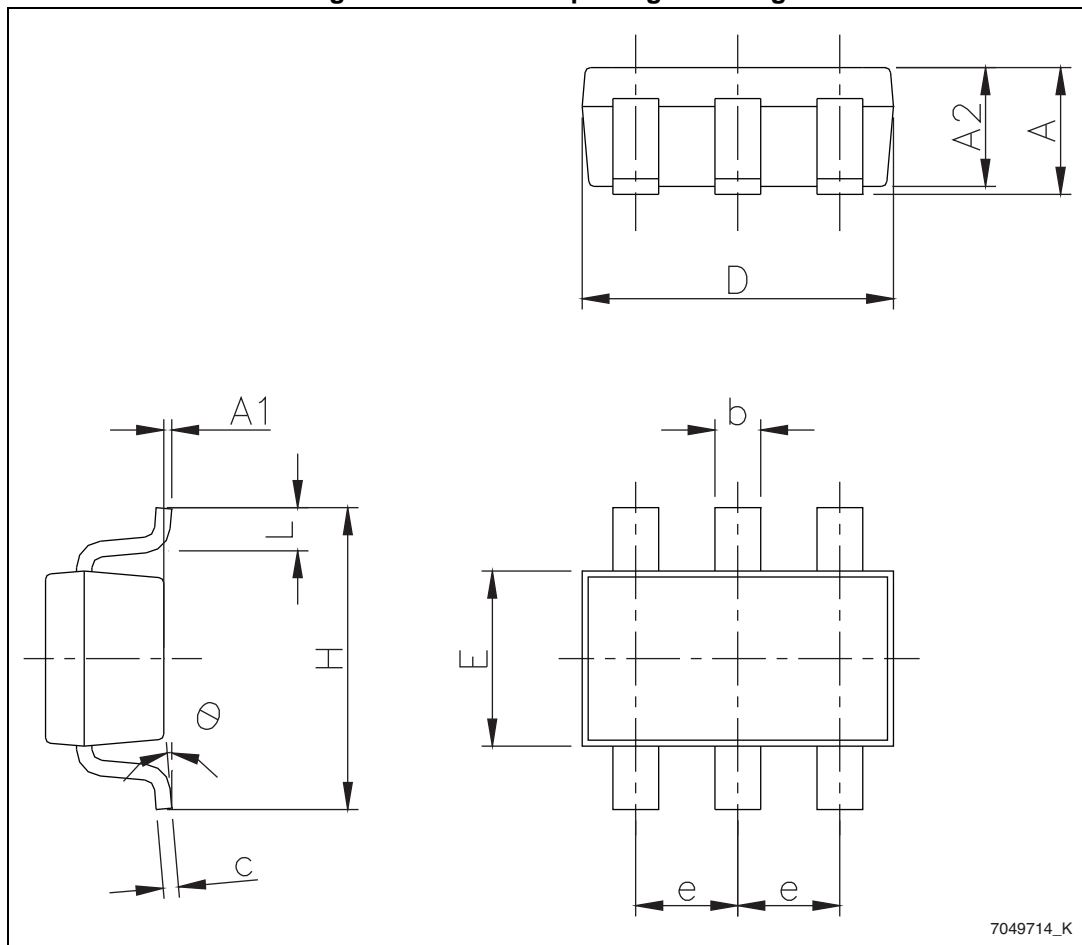




## 4 Package mechanical data

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.

Figure 19. SOT23-6L package drawing

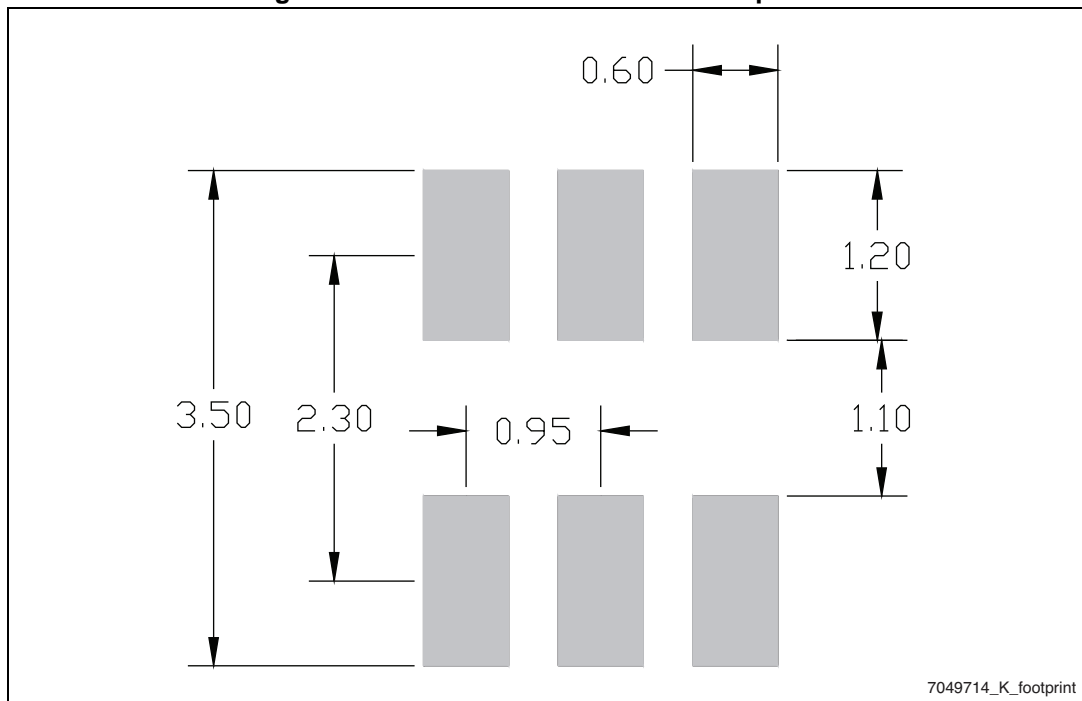


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Table 8. SOT23-6L package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.25
A1	0.00		0.15
A2	1.00	1.10	1.20
b	0.36		0.50
C	0.14		0.20
D	2.826	2.926	3.026
E	1.526	1.626	1.726
e	0.90	0.95	1.00
H	2.60	2.80	3.00
L	0.35	0.45	0.60
$\theta$	0 °C		8 °C

Figure 20. SOT23-6L recommended footprint<sup>(a)</sup>



a. All dimensions are in millimeters

## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
20-Mar-2014	1	First release. Part number previously included in datasheet DocID023799

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