

## P-channel 30 V, 0.048 $\Omega$ typ., 5 A STripFET™ H6 DeepGATE™ Power MOSFET in an SO-8 package

Datasheet - preliminary data

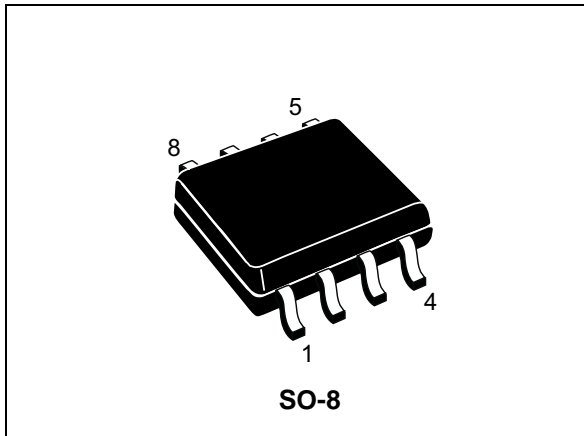
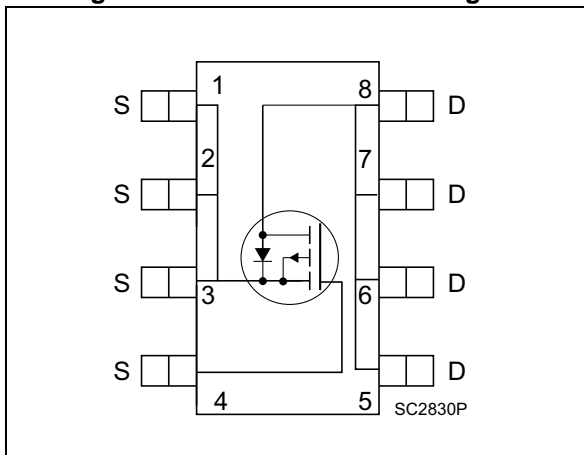


Figure 1. Internal schematic diagram



### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max	$I_D$
STS5P3LLH6	30 V	0.056 $\Omega$ at 10 V	5 A

- Very low on-resistance  $R_{DS(on)}$
- Very low gate charge
- High avalanche ruggedness
- 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 code	Marking	Package	Packaging
STS5P3LLH6	5K3L	SO-8	Tape and reel

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

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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 $T_{amb} = 25\text{ }^\circ\text{C}$	5	A
$I_D$	Drain current (continuous) at $T_{amb} = 100\text{ }^\circ\text{C}$	3.2	A
$I_{DM}^{(1)}$	Drain current (pulsed)	20	A
$P_{TOT}$	Total dissipation at $T_{amb} = 25\text{ }^\circ\text{C}$	2.7	W
$T_J$	Operating junction temperature	150	$^\circ\text{C}$
$T_{stg}$	Storage temperature	-55 to 150	$^\circ\text{C}$

1. Pulse width limited by safe operating area

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-amb}^{(1)}$	Thermal resistance junction-amb	47	$^\circ\text{C/W}$

1. When mounted on 1 inch<sup>2</sup> FR-4 board, 2 oz. Cu.,  $t \leq 10\text{ sec}$

*Note:* For the P-channel Power MOSFET 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. On/off states**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V},$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V},$ $T_J = 125\text{ °C}$			10	
$I_{GSS}$	Gate body leakage current	$V_{DS} = 0, V_{GS} = \pm 20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 2.5\text{ A}$		0.048	0.056	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 2.5\text{ A}$		0.075	0.09	

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}$ $V_{GS} = 0$	-	639	-	$\text{pF}$
$C_{oss}$	Output capacitance		-	79	-	
$C_{rss}$	Reverse transfer capacitance		-	52	-	
$Q_g$	Total gate charge	$V_{DD} = 15\text{ V}, I_D = 5\text{ A}$ $V_{GS} = 4.5\text{ V}$	-	6	-	nC
$Q_{gs}$	Gate-source charge		-	1.9	-	
$Q_{gd}$	Gate-drain charge		-	2.1	-	

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}, I_D = 5\text{ A},$ $R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$	-	5.4	-	ns
$t_r$	Rise time		-	5	-	
$t_{d(off)}$	Turn-off delay time		-	19.2	-	
$t_f$	Fall time		-	3.4	-	

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ	Max	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 5 \text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 5 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ , $V_{DD} = 16 \text{ V}$ , $T_J = 150 \text{ }^\circ\text{C}$	-	11.2		ns
$Q_{rr}$	Reverse recovery charge		-	3.5		nC
$I_{RRM}$	Reverse recovery current		-	0.6		A

1. Pulsed: pulse duration=300 $\mu\text{s}$ , duty cycle 1.5%

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

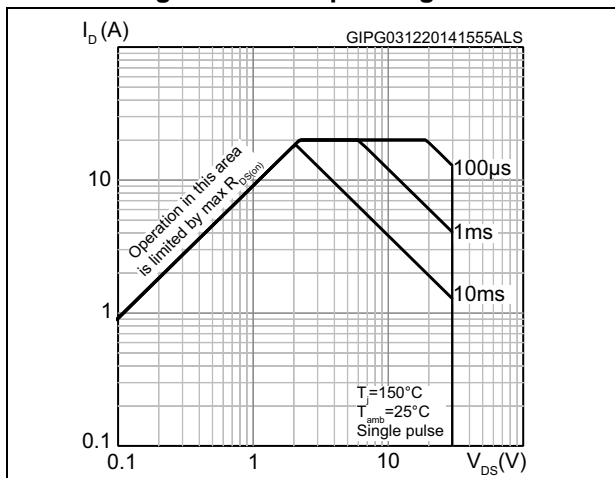


Figure 3. Thermal impedance

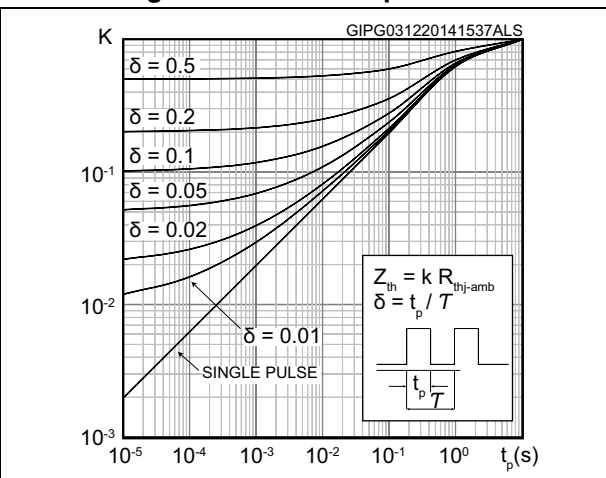


Figure 4. Output characteristics

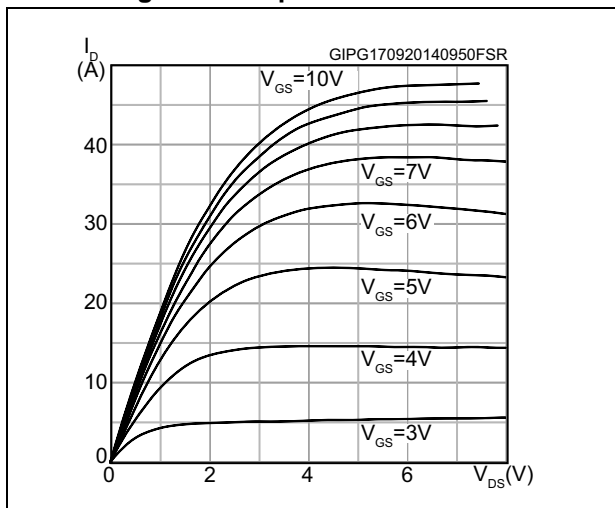


Figure 5. Transfer characteristics

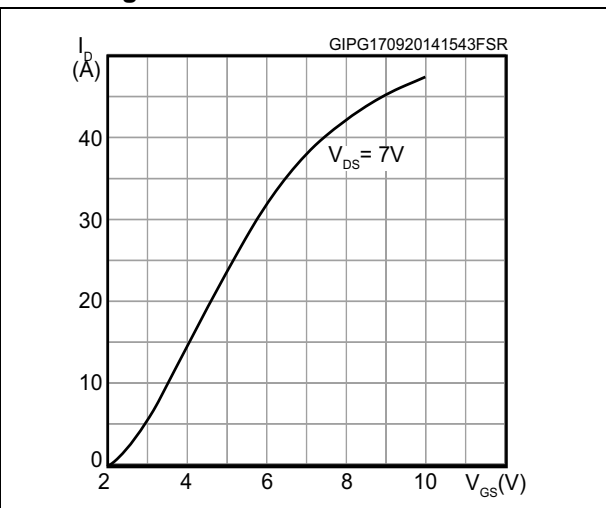


Figure 6. Gate charge vs gate-source voltage

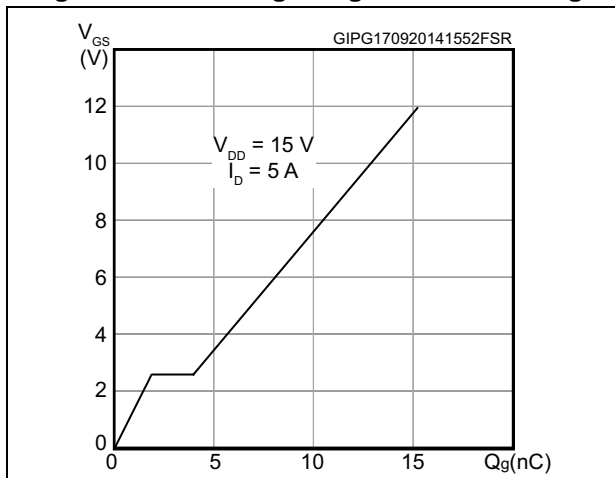


Figure 7. Static drain-source on-resistance

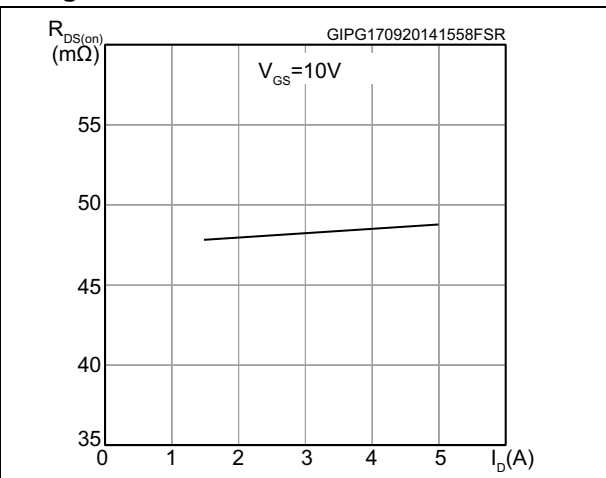


Figure 8. Normalized  $V_{(BR)DSS}$  vs temperature

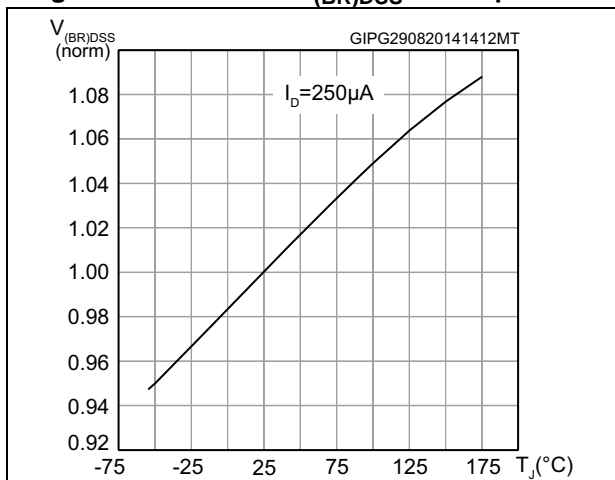


Figure 9. Capacitance variations

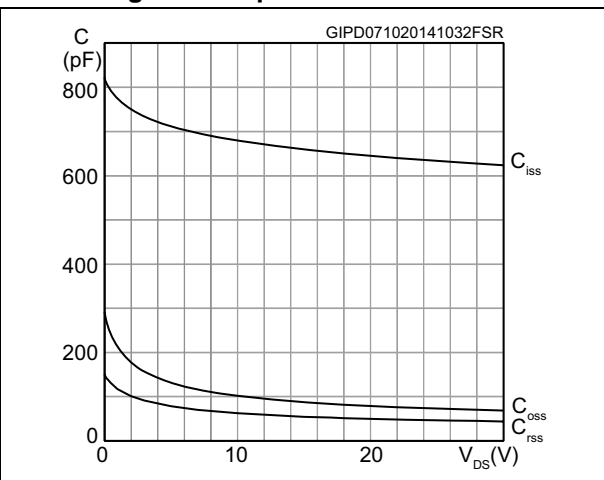


Figure 10. Normalized gate threshold voltage vs. temperature

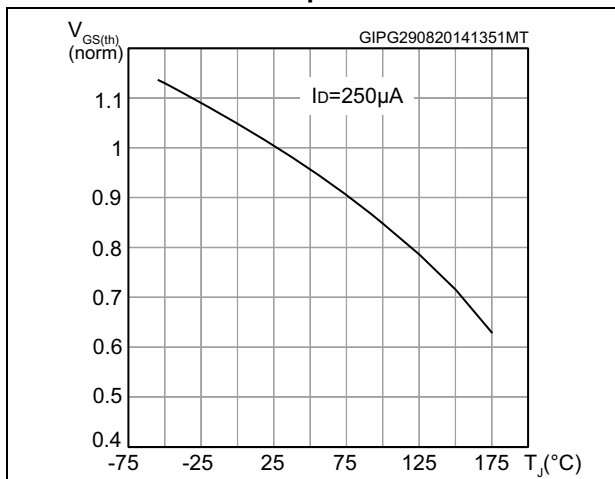


Figure 11. Normalized on-resistance vs. temperature

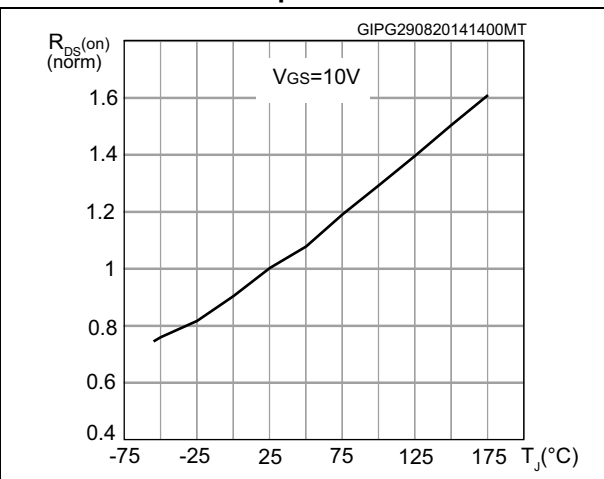
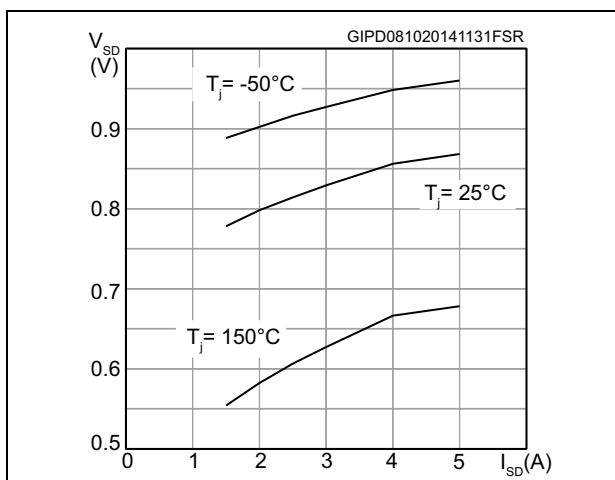
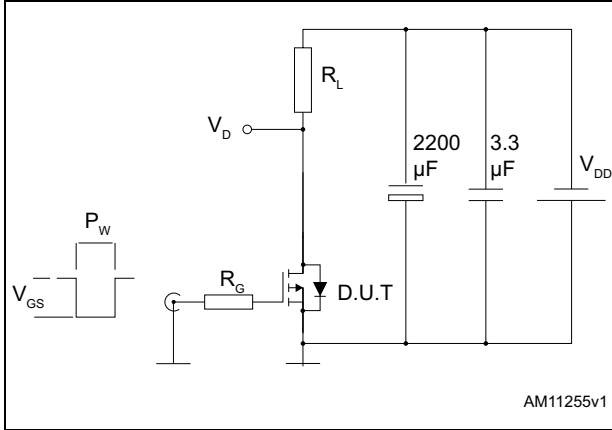


Figure 12. Source-drain diode forward characteristics

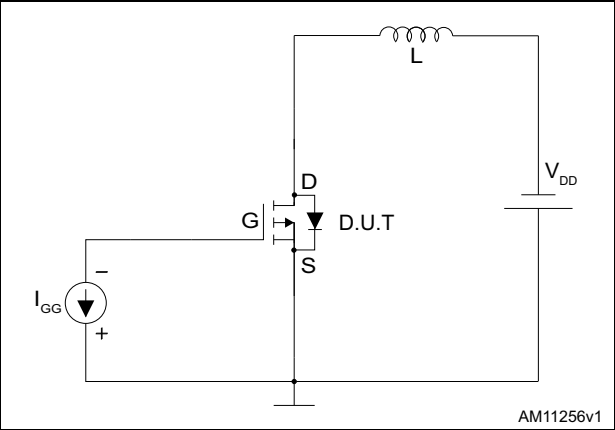


### 3 Test circuits

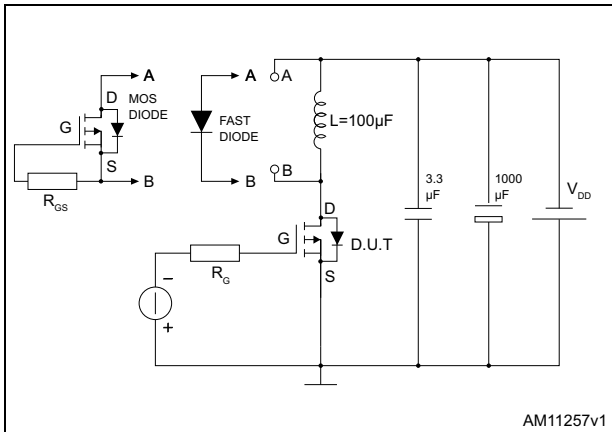
**Figure 13. Switching times test circuit for resistive load**



**Figure 14. Gate charge test circuit**



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





# 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](http://www.st.com). ECOPACK® is an ST trademark.

Figure 16. SO-8 drawing

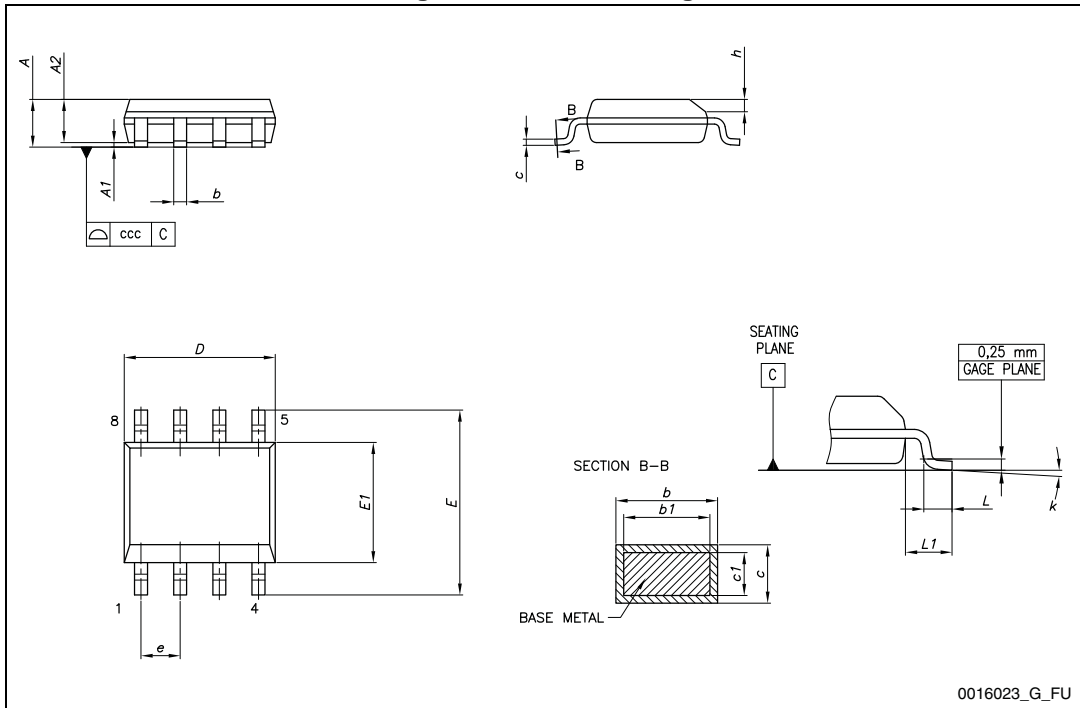
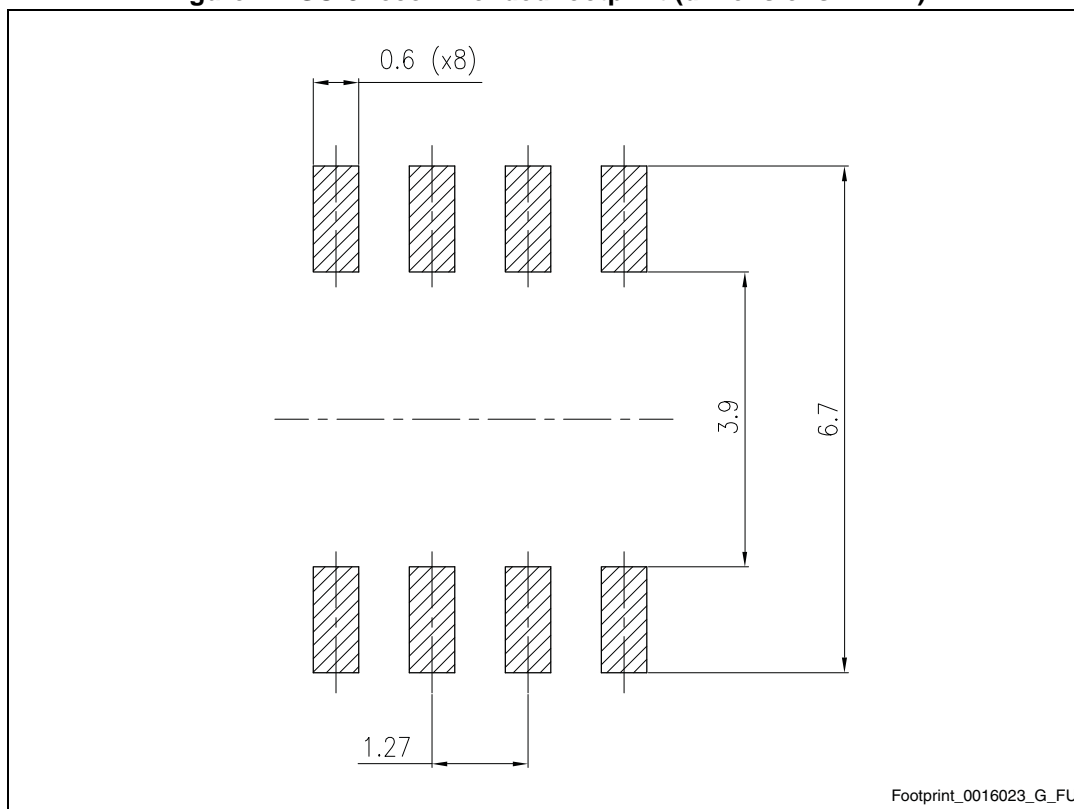


Table 8. SO-8 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.75
A1	0.10		0.25
A2	1.25		
b	0.31		0.51
b1	0.28		0.48
c	0.10		0.25
c1	0.10		0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e		1.27	
h	0.25		0.50
L	0.40		1.27
L1		1.04	
L2		0.25	
k	0°		8°
ccc			0.10

Figure 17. SO-8 recommended footprint (dimensions in mm)

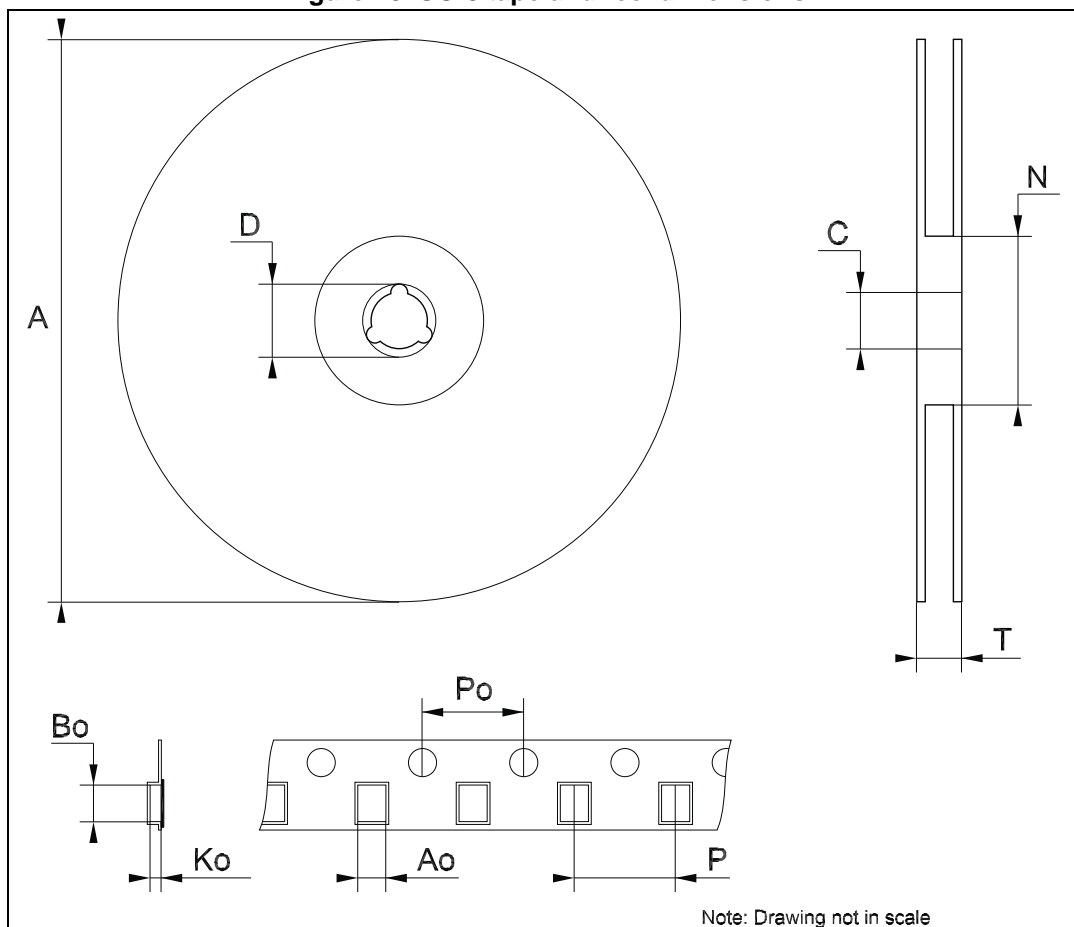


## 5 Packaging mechanical data

**Table 9. SO-8 tape and reel mechanical data**

Dim	mm		
	Min	Typ	Max
A			330
C	12.8		13.2
D	20.2		
N	60		
T			22.4
Ao	8.1		8.5
Bo	5.5		5.9
Ko	2.1		2.3
Po	3.9		4.1
P	7.9		8.1

Figure 18. SO-8 tape and reel dimensions



## 6 Revision history

**Table 10. Revision history**

Date	Revision	Changes
09-May-2013	1	First revision.
11-Dec-2014	2	Text edits throughout document On cover page: – changed title description – updated <i>Features</i> – updated <i>Description</i> In <a href="#">Table 4</a> , changed $R_{DS(on)}$ values In <a href="#">Table 5</a> , changed values and test conditions In <a href="#">Table 6</a> , changed values and test conditions In <a href="#">Table 7</a> , changed values and test conditions Added <a href="#">Section 2.1: Electrical characteristics (curves)</a> Updated <a href="#">Section 3: Test circuits</a> Updated <a href="#">Section 4: Package mechanical data</a>

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