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## P-channel 40 V, 0.0125 $\Omega$ typ., 10 A, StripFET™ F6 Power MOSFET in SO-8 package

Datasheet - production data

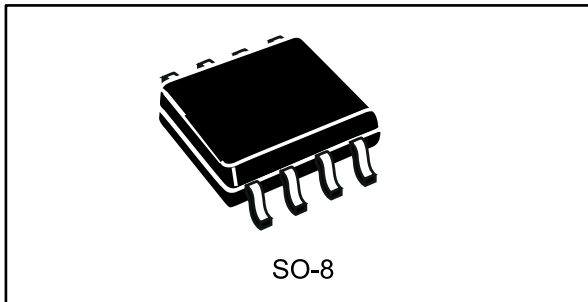
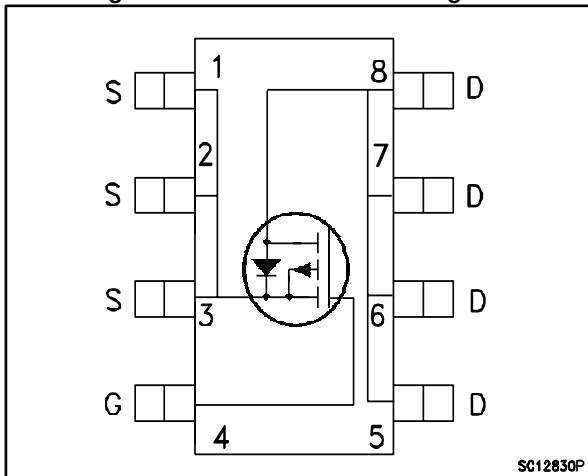


Figure 1: Internal schematic diagram



- Very low on-resistance
- 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™ F6 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
STS10P4LLF6	10K4L	SO-8	Tape and reel

 For the P-channel MOSFET actual polarity of voltages and current have to be reversed

### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$
STS10P4LLF6	40 V	0.015	10 A

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# 1 Electrical ratings

**Table 2: Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	40	V
$V_{GS}$	Gate- source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_{amb} = 25\text{ }^{\circ}\text{C}$	10	A
$I_D$	Drain current (continuous) at $T_{amb} = 100\text{ }^{\circ}\text{C}$	5.6	A
$I_{DM}^{(1)}$	Drain current (pulsed)	40	A
$P_{TOT}^{(1)}$	Total dissipation at $T_{amb} = 25\text{ }^{\circ}\text{C}$	2.7	W
$T_{stg}$	Storage temperature	-55 to 150	$^{\circ}\text{C}$
$T_j$	Operating junction temperature	150	$^{\circ}\text{C}$

**Notes:**

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

**Table 3: Thermal data**

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

**Notes:**

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



For the P-channel MOSFET actual polarity of voltages and current have to be reversed

## 2 Electrical characteristics

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

**Table 4: On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	I <sub>D</sub> = 250 μA	40			V V
I <sub>DSS</sub>	Zero gate voltage drain current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = 40 V			1	μA
		V <sub>DS</sub> = 30 V, T <sub>C</sub> = 125 °C			10	
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	1			V
R <sub>DS(on)</sub>	Static drain-source on-resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A		0.0125	0.015	Ω
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3 A		0.017	0.02	Ω

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>DS</sub> = 25 V, f = 1 MHz, V <sub>GS</sub> = 0	-	3525	-	pF
C <sub>oss</sub>	Output capacitance		-	344	-	pF
C <sub>rss</sub>	Reverse transfer capacitance		-	238.5	-	pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 20 V I <sub>D</sub> = 10 A V <sub>GS</sub> = 4.5 V	-	34	-	nC
Q <sub>gs</sub>	Gate-source charge		-	11.3	-	nC
Q <sub>gd</sub>	Gate-drain charge		-	13.8	-	nC

**Table 6: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 5 A R <sub>G</sub> = 4.7 Ω V <sub>GS</sub> = 10 V	-	49.4	-	ns
t <sub>r</sub>	Rise time			60.6		
t <sub>d(off)</sub>	Turn-off delay time			170		
t <sub>f</sub>	Fall time			20		



For the P-channel MOSFET actual polarity of voltages and current have to be reversed

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 3 \text{ A}$ , $V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 5 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 10 \text{ V}$ , $T_j = 150 \text{ }^\circ\text{C}$	-	29		ns
$Q_{rr}$	Reverse recovery charge		-	27.6		nC
$I_{RRM}$	Reverse recovery current		-	1.9		A

**Notes:**

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



For the P-channel MOSFET actual polarity of voltages and current have to be reversed

### 3 Electrical characteristics (curves)

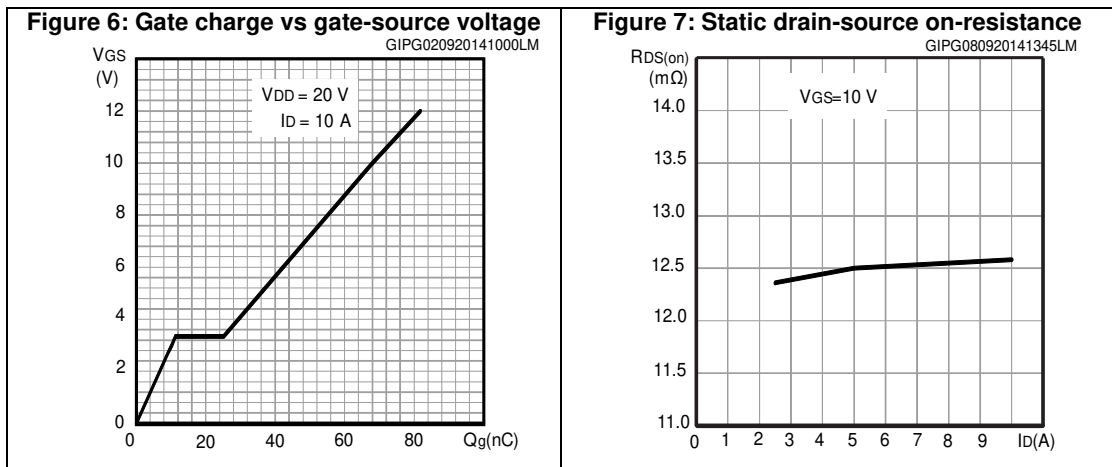
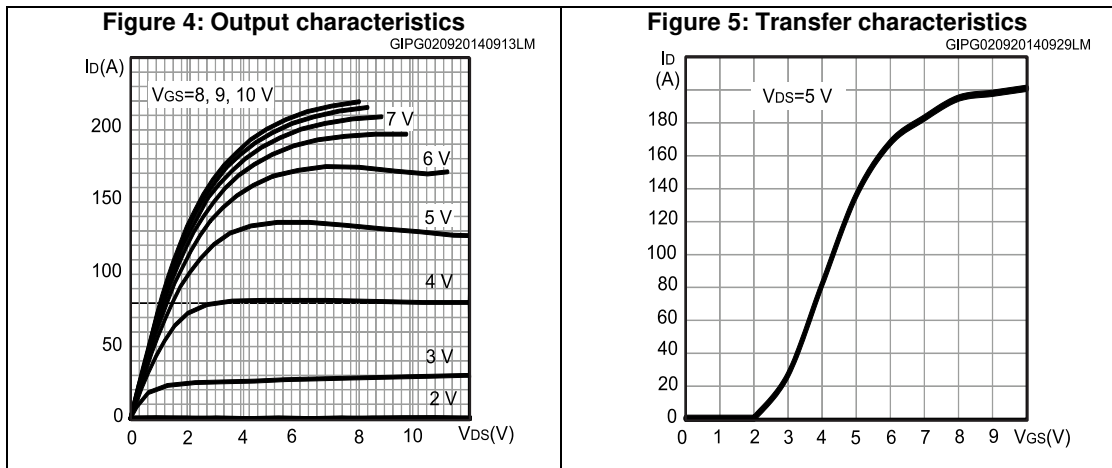
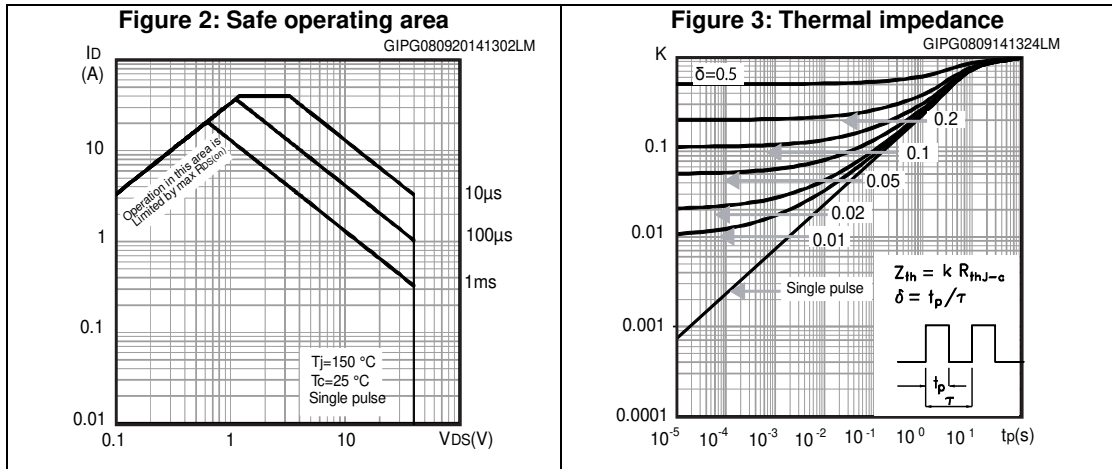


Figure 8: Capacitance variation

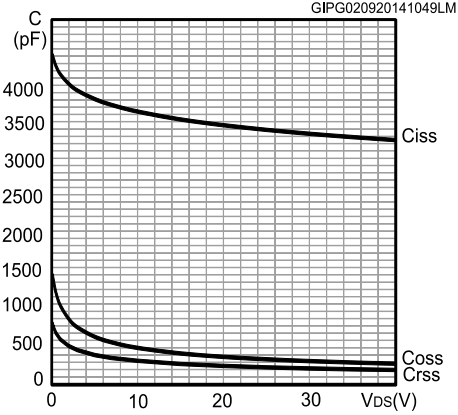


Figure 9: Normalized gate threshold voltage vs temperature

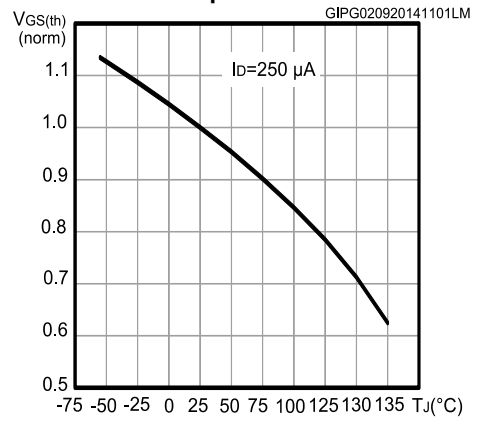


Figure 10: Normalized on-resistance vs temperature

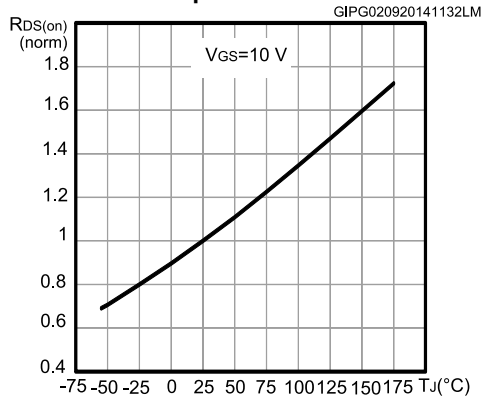


Figure 11: Normalized VBR(DSS) vs temperature

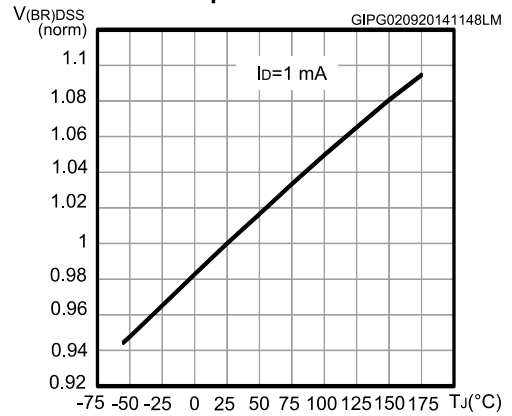
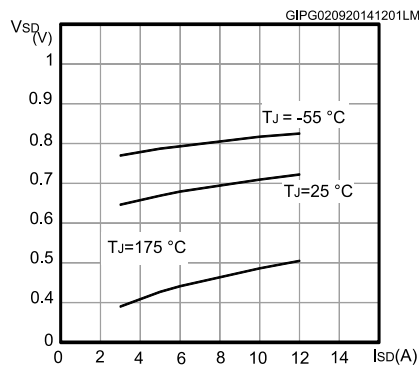
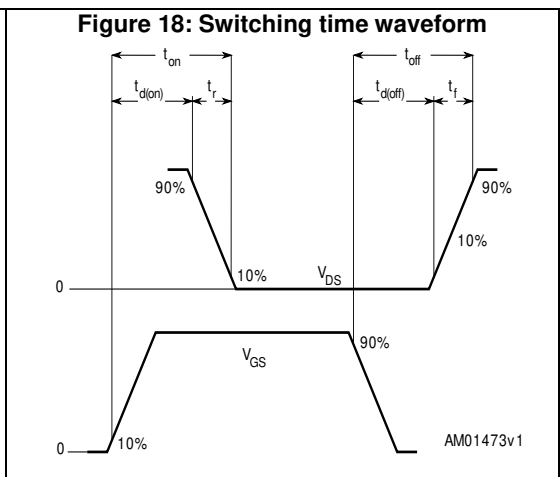
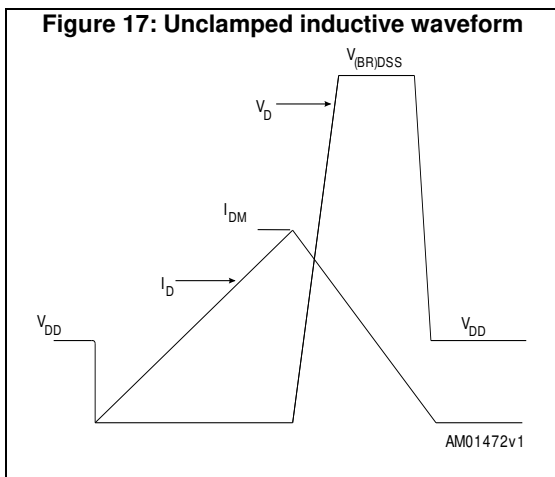
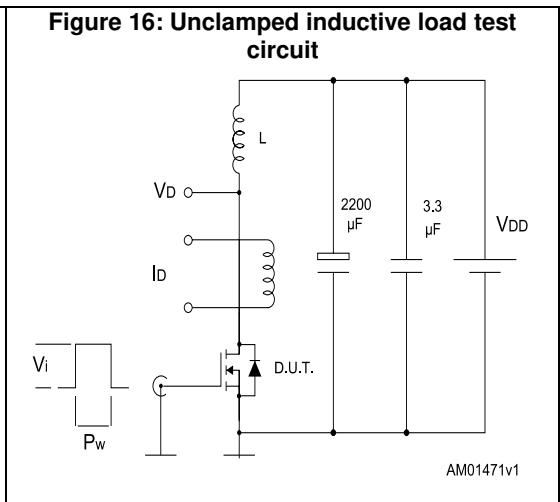
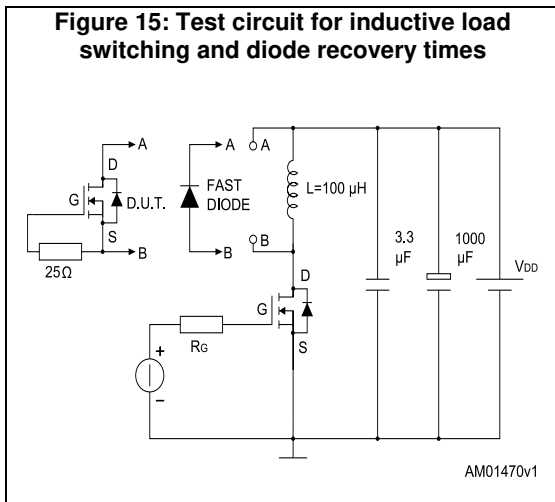
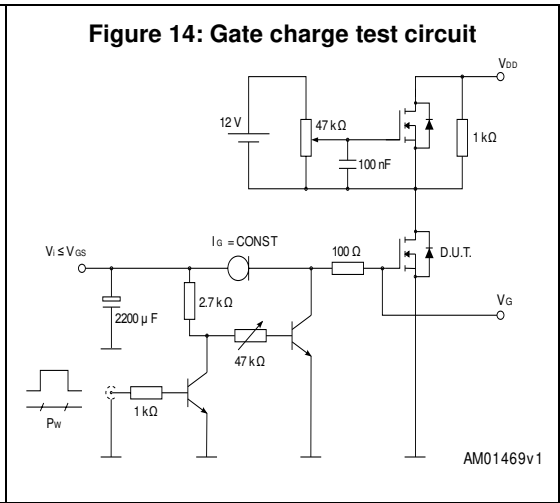
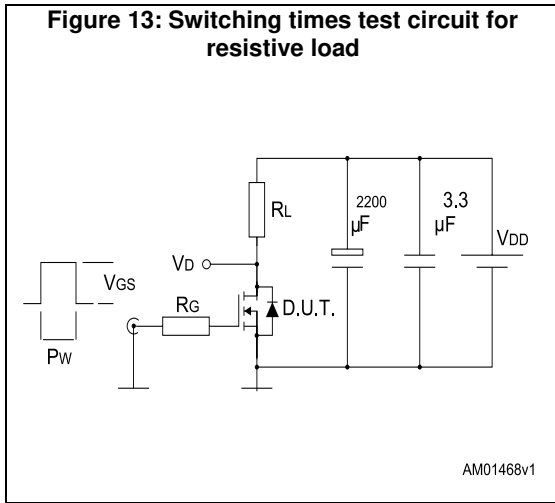


Figure 12: Source-drain diode forward characteristics





# 4 Test circuits



## 5 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.

### 5.1 SO-8 package mechanical data

Figure 19: SO-8 drawings

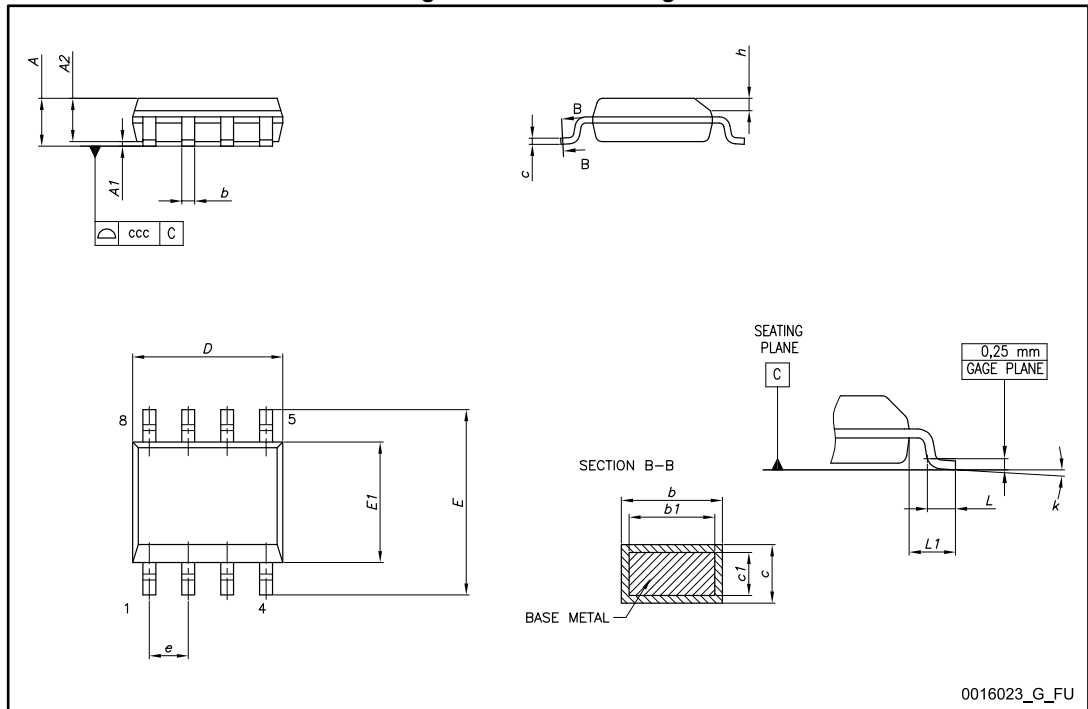
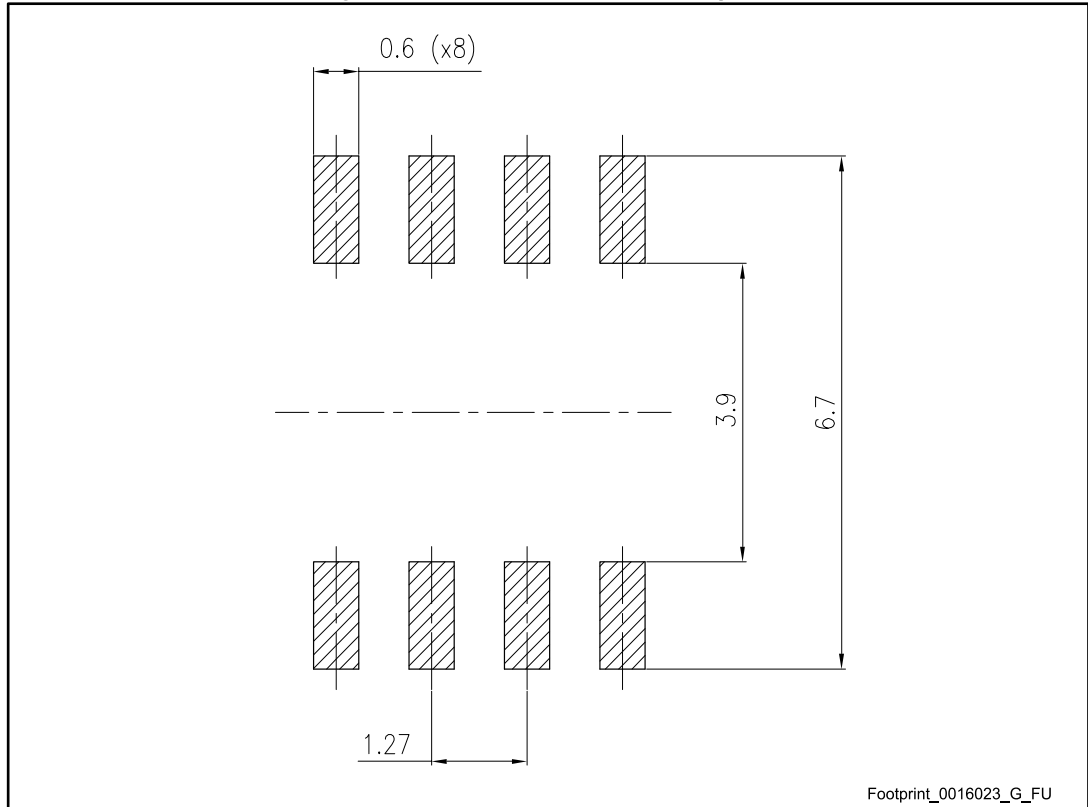


Table 8: SO-8 mechanical data

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 20: SO-8 recommended footprint



All dimensions are in mm

## 6 Packaging mechanical data

Figure 21: SO-8 tape and reel dimensions

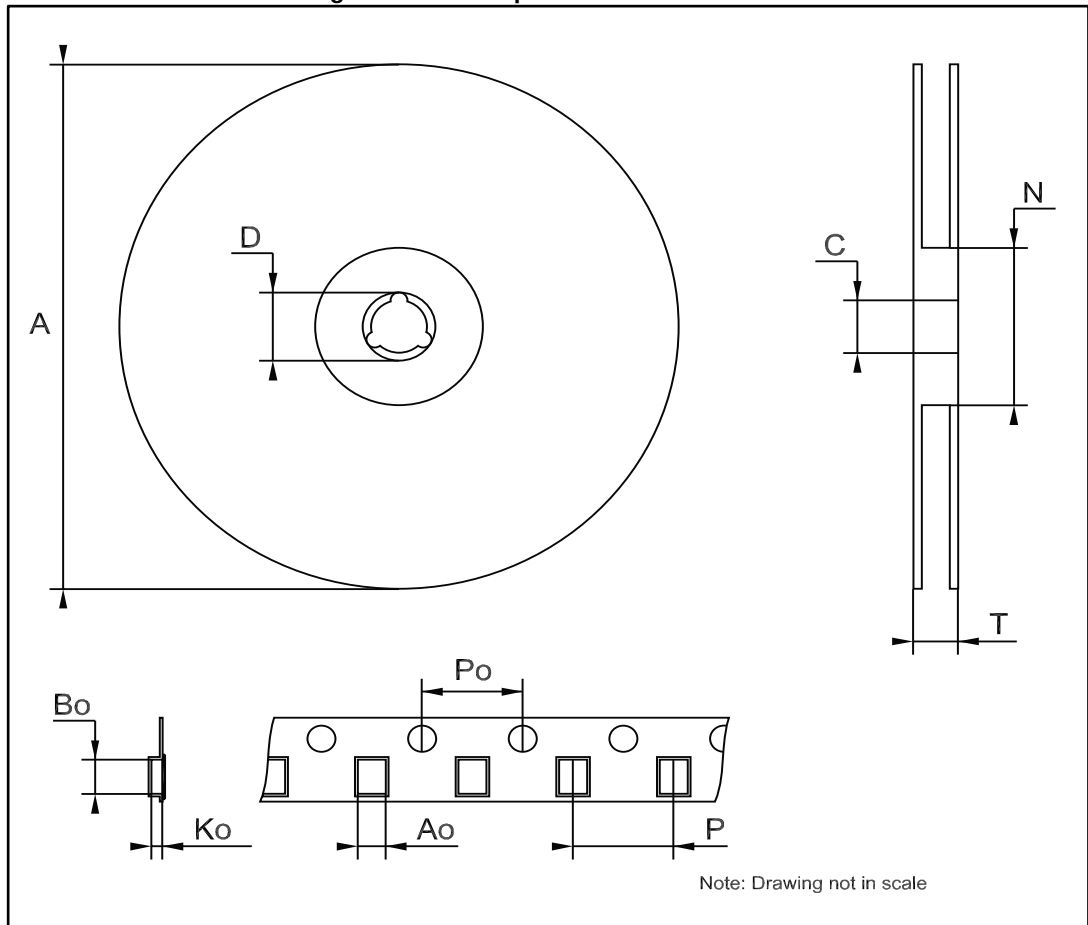


Table 9: SO-8 tape and reel mechanical data

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

## 7 Revision history

**Table 10: Revision history**

Date	Revision	Changes
20-Jan-2014	1	First revision.
09-Sep-2014	2	Changed the title. Updated <i>Section "Features"</i> and <i>Section "Description"</i> . Updated <i>Table 4: "On/off states"</i> , <i>Table 5: "Dynamic"</i> , <i>Table 6: "Switching times"</i> , <i>Table 7: "Source-drain diode"</i> . Added <i>Section 3: "Electrical characteristics (curves)"</i> .
16-Dec-2014	3	Document status promoted from preliminary data to production data. Minor text changes.

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