

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

Datasheet - production data

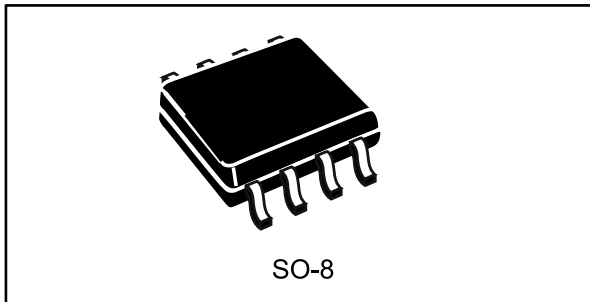
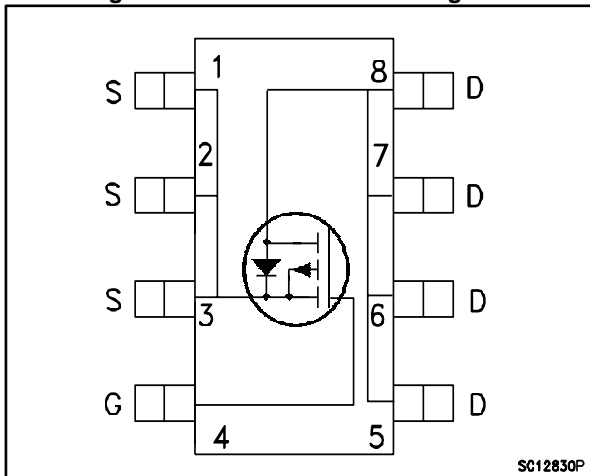


Figure 1: Internal schematic diagram



- 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	$^{\circ}\text{C/W}$

**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

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

**Table 4: On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$	40			V V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 40\ \text{V}$			1	$\mu\text{A}$
		$V_{DS} = 30\ \text{V}$ , $T_C = 125\text{ °C}$			10	
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\ \text{V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	1			V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}$ , $I_D = 3\ \text{A}$		0.0125	0.015	$\Omega$
		$V_{GS} = 4.5\ \text{V}$ , $I_D = 3\ \text{A}$		0.017	0.02	$\Omega$

**Table 5: Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\ \text{V}$ , $f = 1\ \text{MHz}$ , $V_{GS} = 0$	-	3525	-	pF
$C_{oss}$	Output capacitance		-	344	-	pF
$C_{rss}$	Reverse transfer capacitance		-	238.5	-	pF
$Q_g$	Total gate charge	$V_{DD} = 20\ \text{V}$ , $I_D = 10\ \text{A}$ $V_{GS} = 4.5\ \text{V}$	-	34	-	nC
$Q_{gs}$	Gate-source charge		-	11.3	-	nC
$Q_{gd}$	Gate-drain charge		-	13.8	-	nC

**Table 6: Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 20\ \text{V}$ , $I_D = 5\ \text{A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\ \text{V}$	-	49.4	-	ns
$t_r$	Rise time			60.6		
$t_{d(off)}$	Turn-off delay time			170		
$t_f$	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)

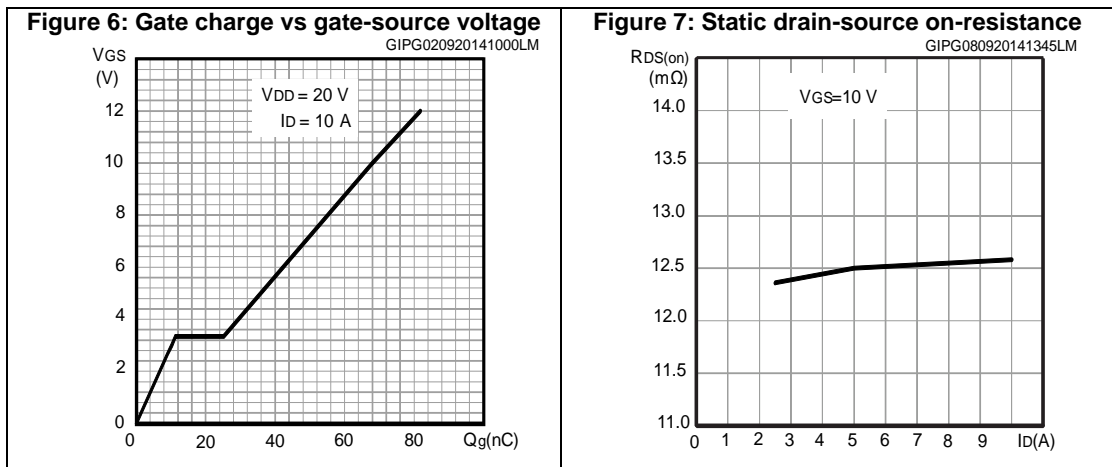
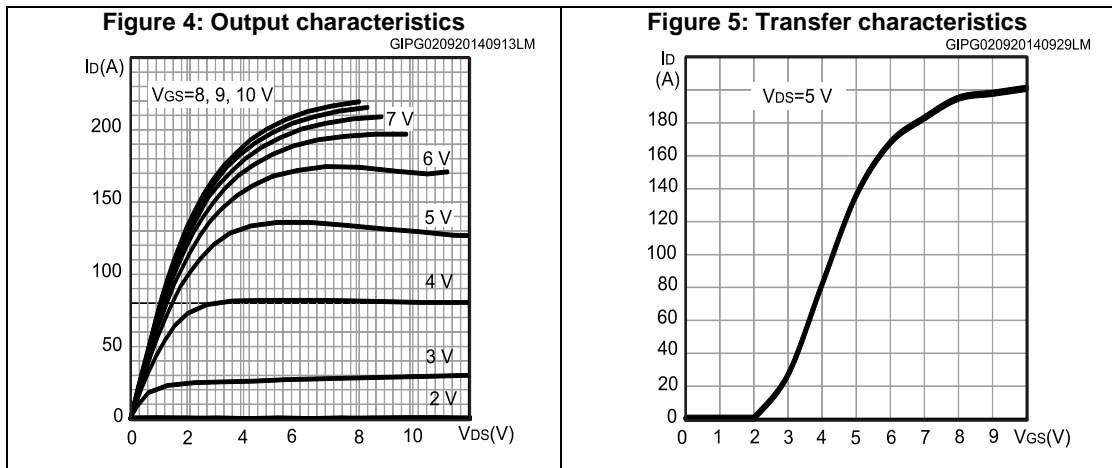
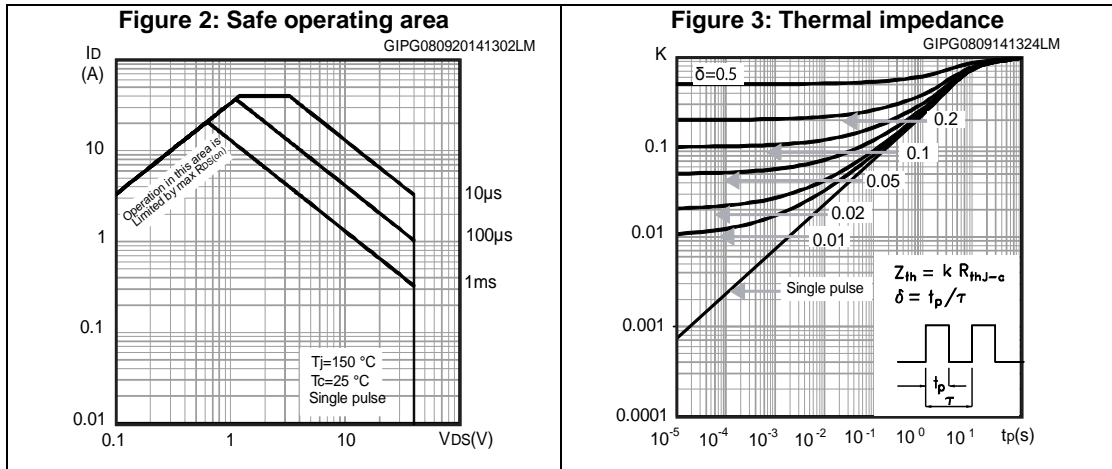


Figure 8: Capacitance variation

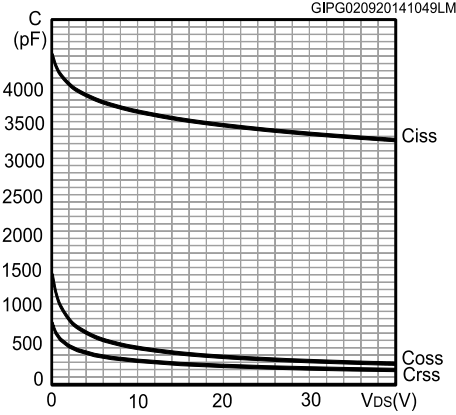


Figure 9: Normalized gate threshold voltage vs temperature

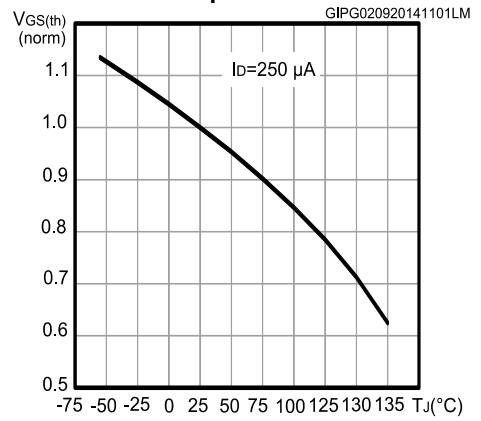


Figure 10: Normalized on-resistance vs temperature

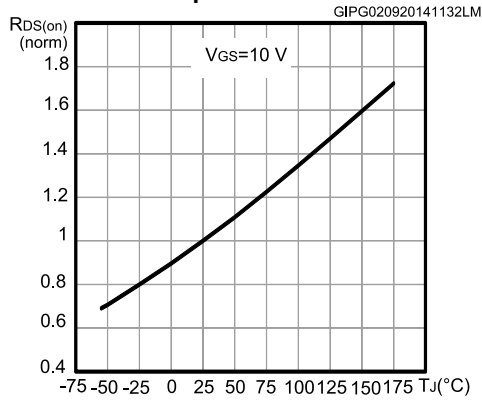


Figure 11: Normalized VBR(DSS) vs temperature

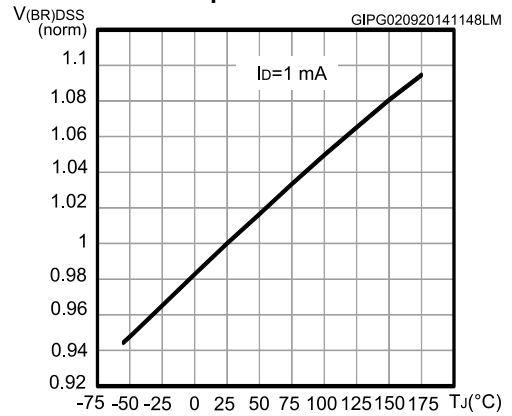
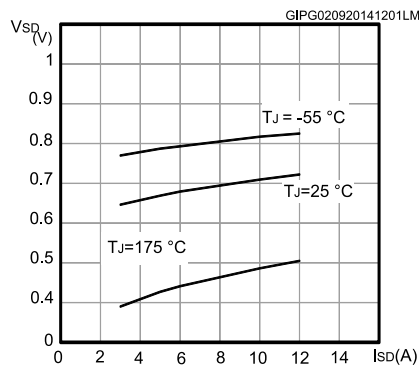
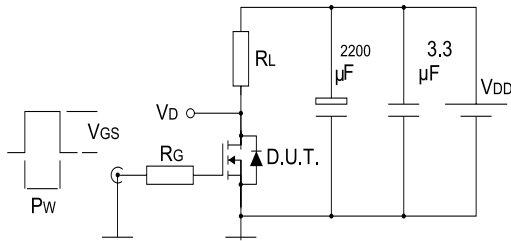


Figure 12: Source-drain diode forward characteristics



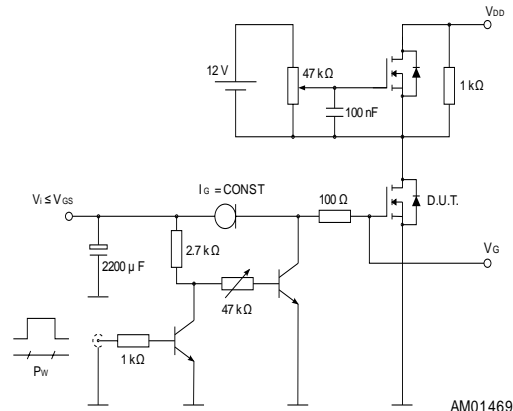
# 4 Test circuits

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



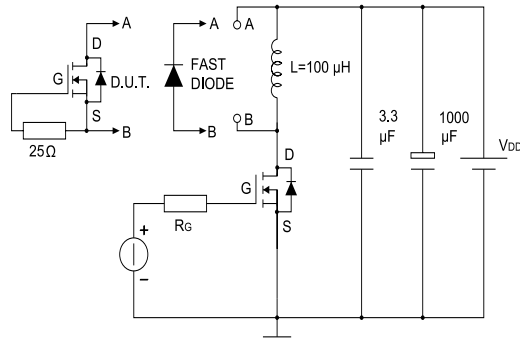
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**Figure 14: Gate charge test circuit**



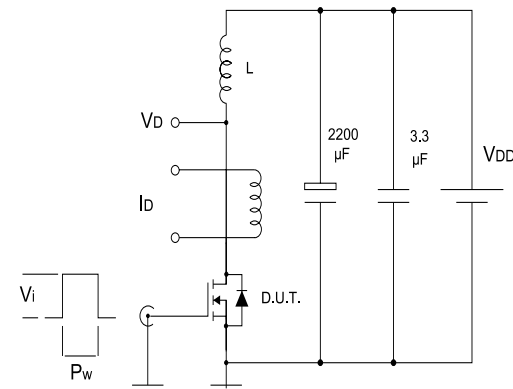
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**Figure 15: Test circuit for inductive load switching and diode recovery times**



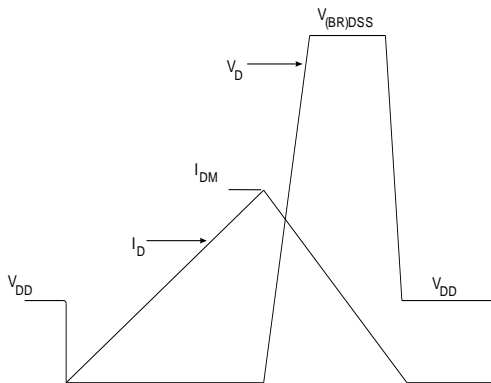
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**Figure 16: Unclamped inductive load test circuit**



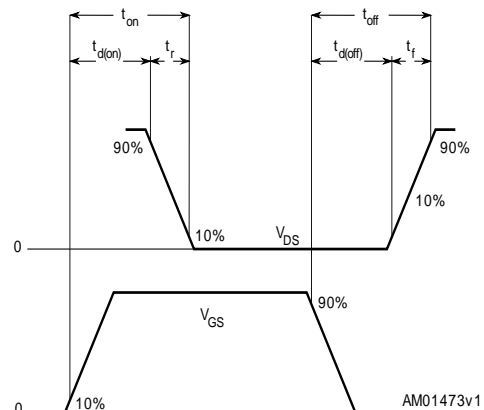
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**Figure 17: Unclamped inductive waveform**



AM01472v1

**Figure 18: Switching time waveform**



AM01473v1



## 5 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.

### 5.1 SO-8 package mechanical data

Figure 19: SO-8 drawings

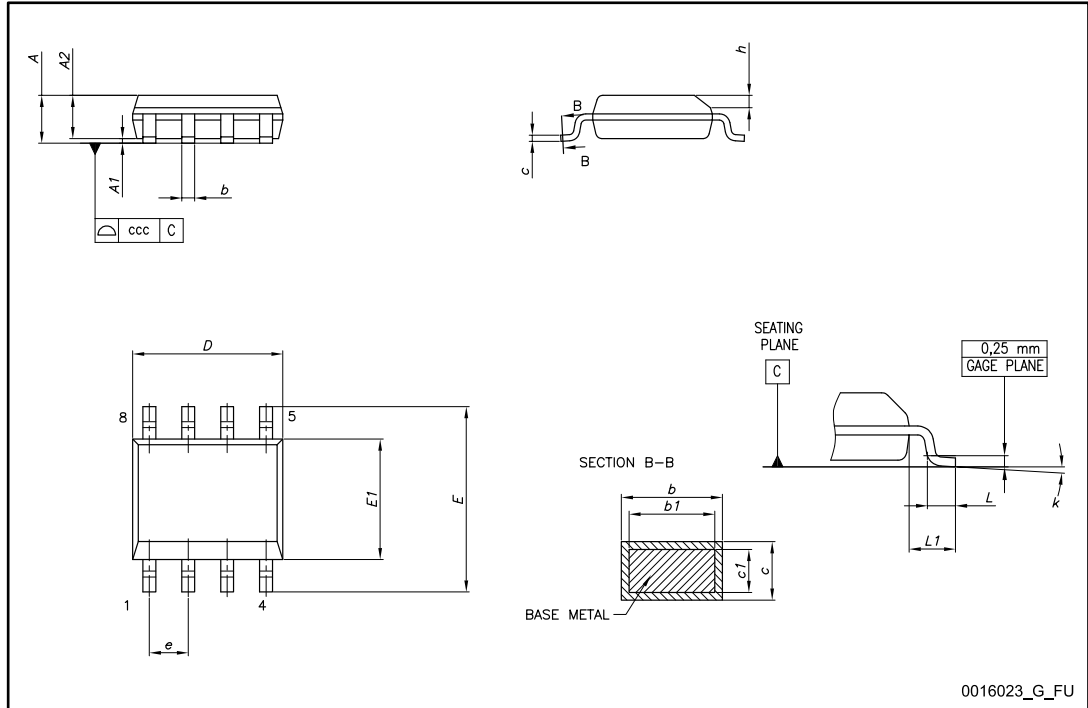
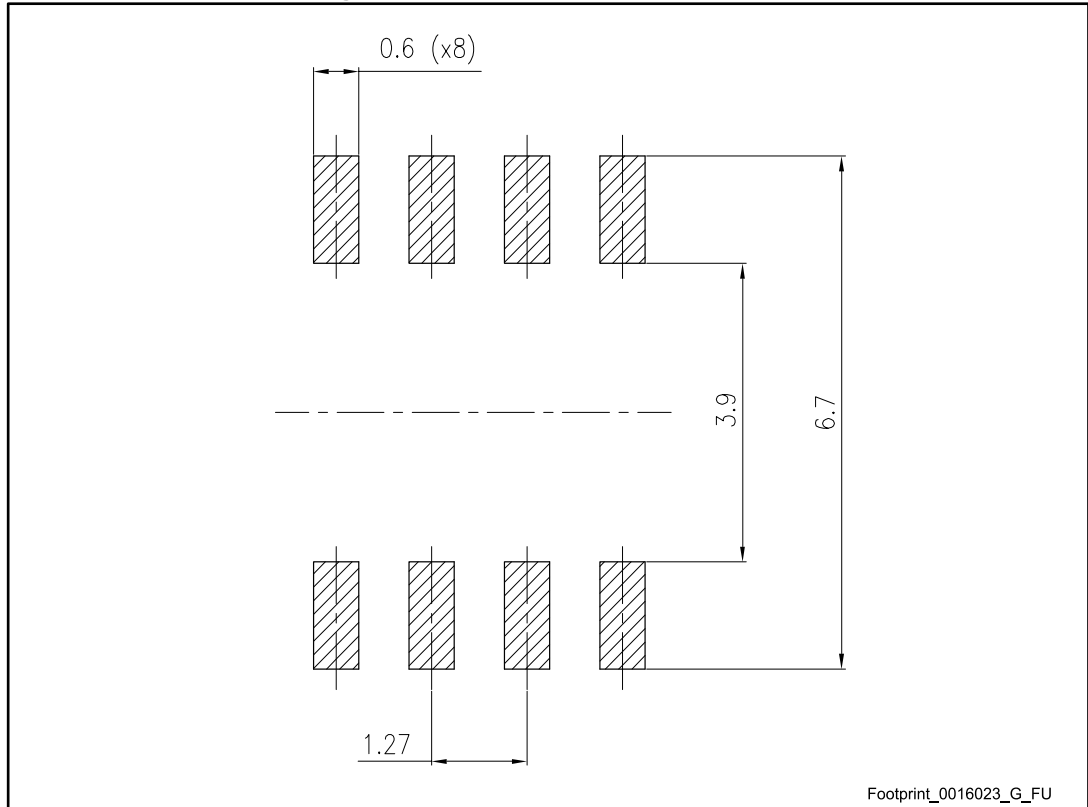


Table 8: SO-8 mechanical data

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

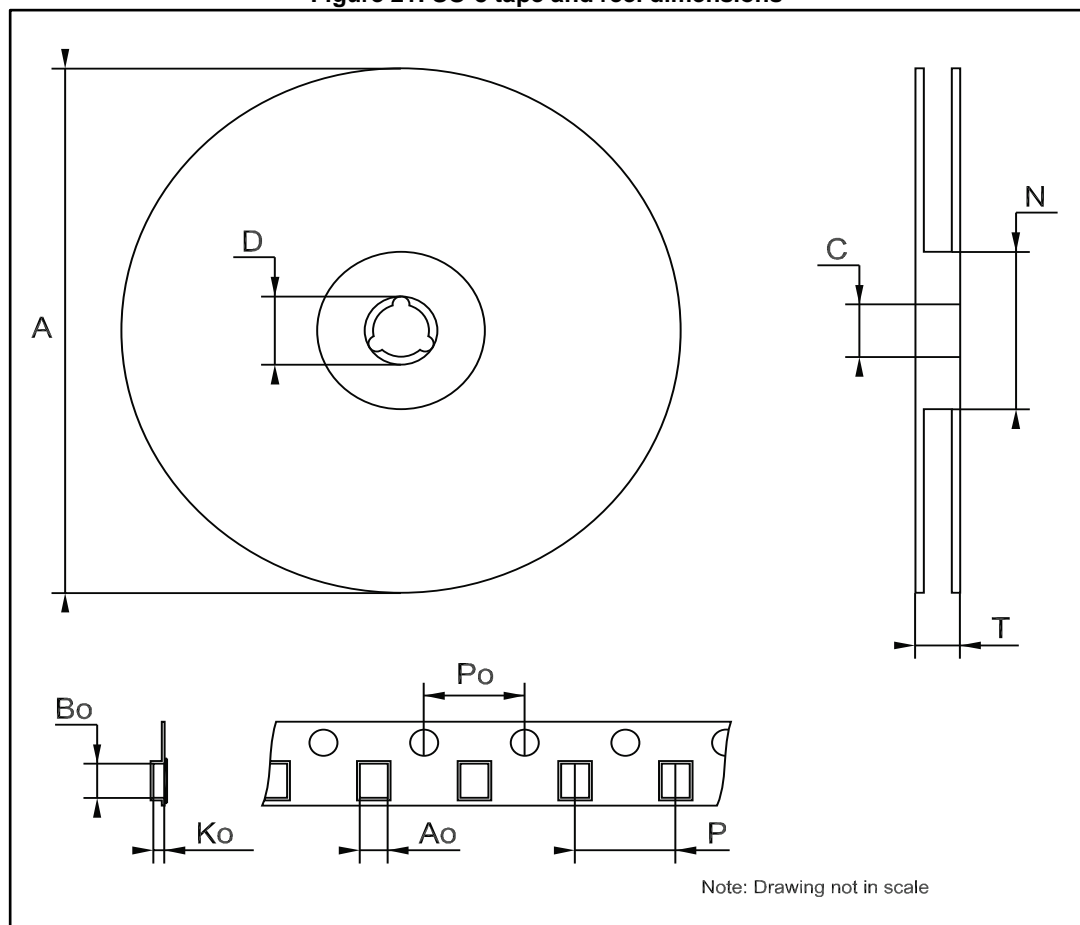


Table 9: SO-8 tape and reel mechanical data

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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