STS7P4LLF6

P-channel 40 V, 0.0175 Ω typ.,7 A, STripFET™ F6 Power MOSFET in an SO-8 package

Datasheet - production data

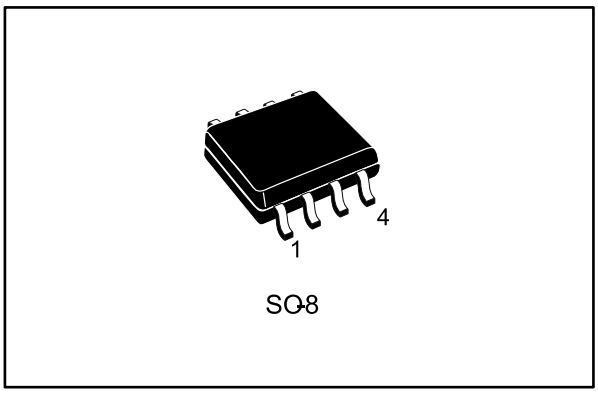
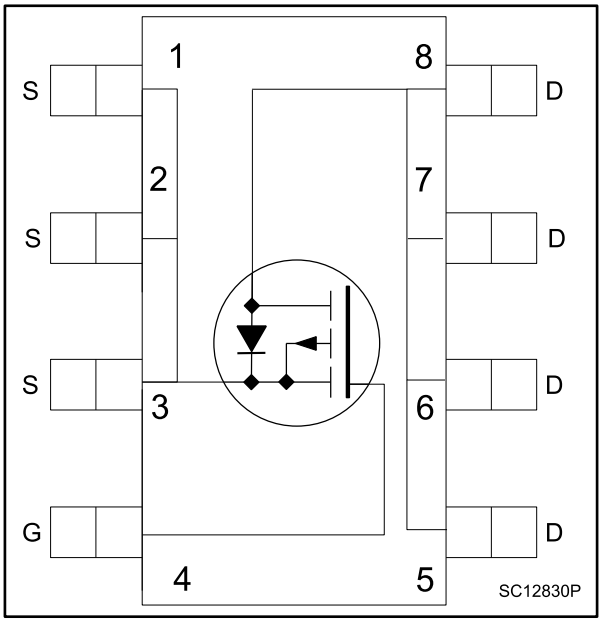


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STS7P4LLF6	40 V	0.0205 Ω	7 A

- 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.

For the P-channel Power MOSFET, current polarity of voltages and current have to be reversed.

Table 1: Device summary

Order code	Marking	Package	Packaging
STS7P4LLF6	7K4L	SO-8	Tape and reel

This is information on a product in full production.

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	40	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at T_{amb} = 25 °C	7	A
I_D	Drain current (continuous) at T_{amb} = 100 °C	4.2	A
I_{DM}(1)	Drain current (pulsed)	28	A
P_{TOT}	Total dissipation at T_{amb} = 25 °C	2.7	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Maximum junction temperature	150	°C

Notes:

(1)Pulse width limited by safe operating area.

Table 3: Thermal data

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

Notes:

(1)When mounted on 1 inch² FR-4 board, 2 oz. Cu., t ≤ 10 s

For the P-channel Power MOSFET, current polarity of voltages and current have to be reversed.

2 Electrical characteristics

(T_C = 25 °C unless otherwise specified)

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V, I_D = 250 µA	40			V
I_{DSS}	Zero gate voltage Drain current	V_{GS} = 0 V, V_{DS} = 40 V			1	µA
		V_{GS} = 0 V, V_{DS} = 40 V, T_C = 125 °C			10	µA
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = ± 20 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	1			V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 3.5 A		0.0175	0.0205	Ω
		V_{GS} = 4.5 V, I_D= 3.5 A		0.0205	0.029	

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V	-	2850	-	pF
C_{oss}	Output capacitance		-	270	-	pF
C_{rss}	Reverse transfer capacitance		-	180	-	pF
Q_g	Total gate charge	V_{DD} = 20 V, I_D = 7 A, V_{GS} = 4.5 V (see *Figure 14: "Gate charge test circuit"*)	-	22	-	nC
Q_{gs}	Gate-source charge		-	9.4	-	nC
Q_{gd}	Gate-drain charge		-	7.3	-	nC
R_G	Gate input resistance	I_D = 0 A, gate DC bias = 0 V, f = 1 MHz, magnitude of alternative signal = 20 mV	-	1.4	-	Ω

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 20 V, I_D = 3.5 A R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 13: "Switching times test circuit for resistive load"*)	-	43	-	ns
t_r	Rise time		-	47	-	ns
$t_{d(off)}$	Turn-off-delay time		-	148	-	ns
t_f	Fall time		-	19	-	ns

For the P-channel Power MOSFET, current 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	V_{GS} = 0 V, I_{SD} = 3.5 A	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 3.5 A, di/dt = 100 A/µs, V_{DD} = 32 V, T_j = 150 °C (see *Figure 15: "Test circuit for inductive load switching and diode recovery times"*)	-	26		ns
Q_{rr}	Reverse recovery charge		-	21		nC
I_{RRM}	Reverse recovery current		-	1.7		A

Notes:

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

For the P-channel Power MOSFET, current polarity of voltages and current have to be reversed.

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

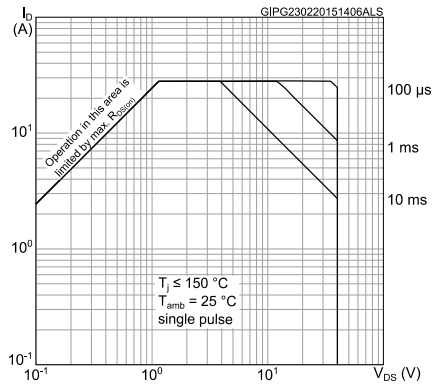


Figure 3: Thermal impedance

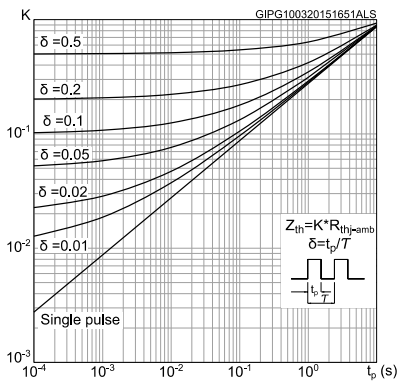


Figure 4: Output characteristics

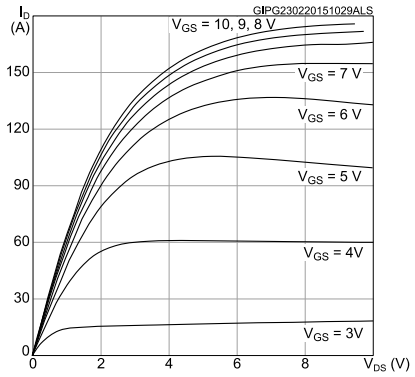


Figure 5: Transfer characteristics

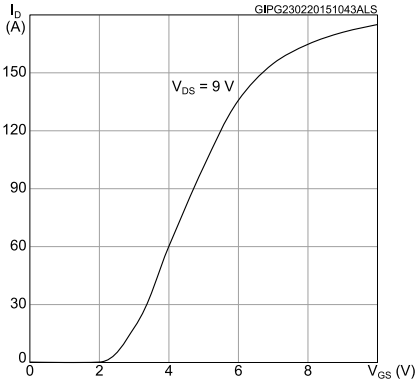


Figure 6: Normalized gate threshold voltage vs temperature

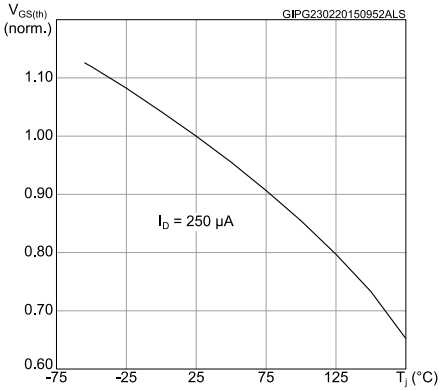


Figure 7: Normalized V(BR)DSS vs temperature

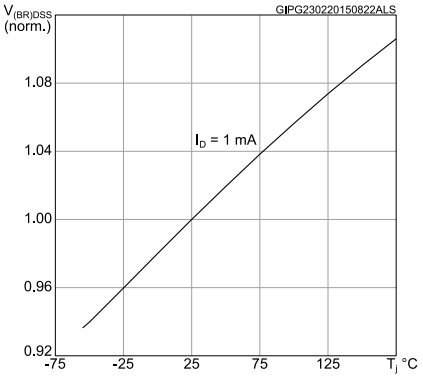


Figure 8: Static drain-source on-resistance

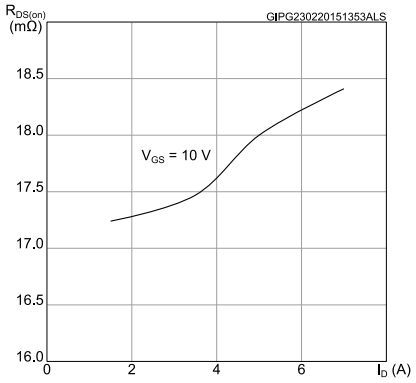


Figure 9: Normalized on-resistance vs. temperature

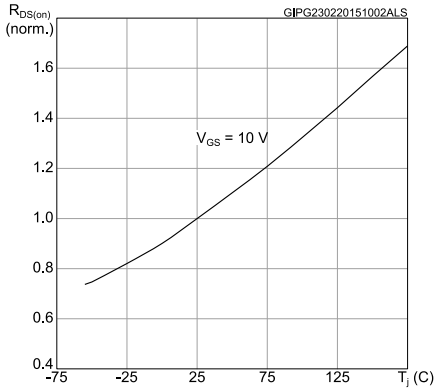


Figure 10: Gate charge vs gate-source voltage

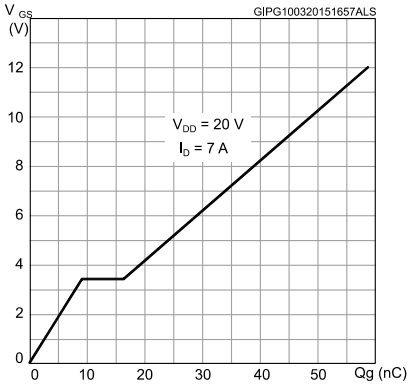


Figure 11: Capacitance variations voltage

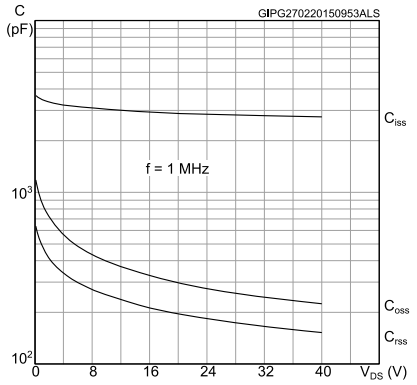
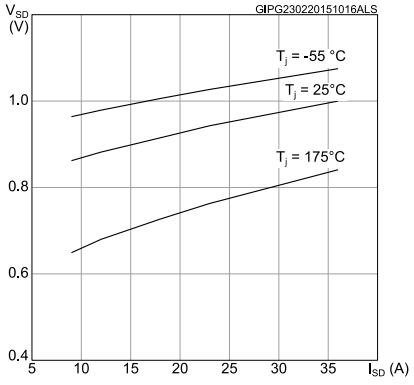


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

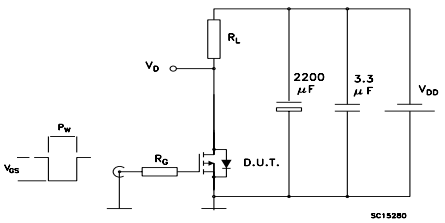


Figure 14: Gate charge test circuit

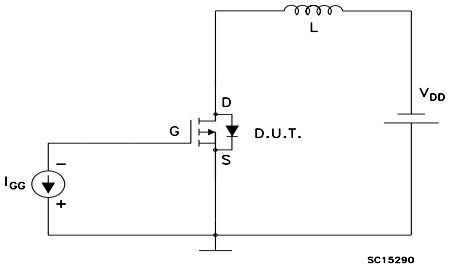
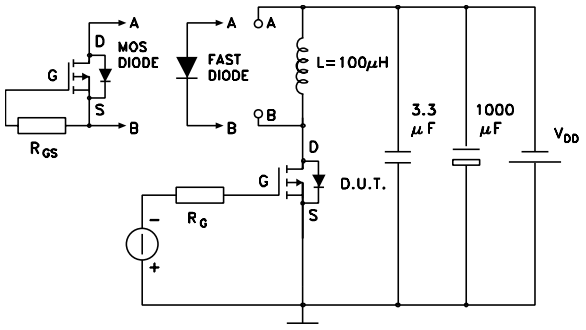


Figure 15: Test circuit for inductive load switching and diode recovery times



4 Package 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 SO-8 package information

Figure 16: SO-8 package outline

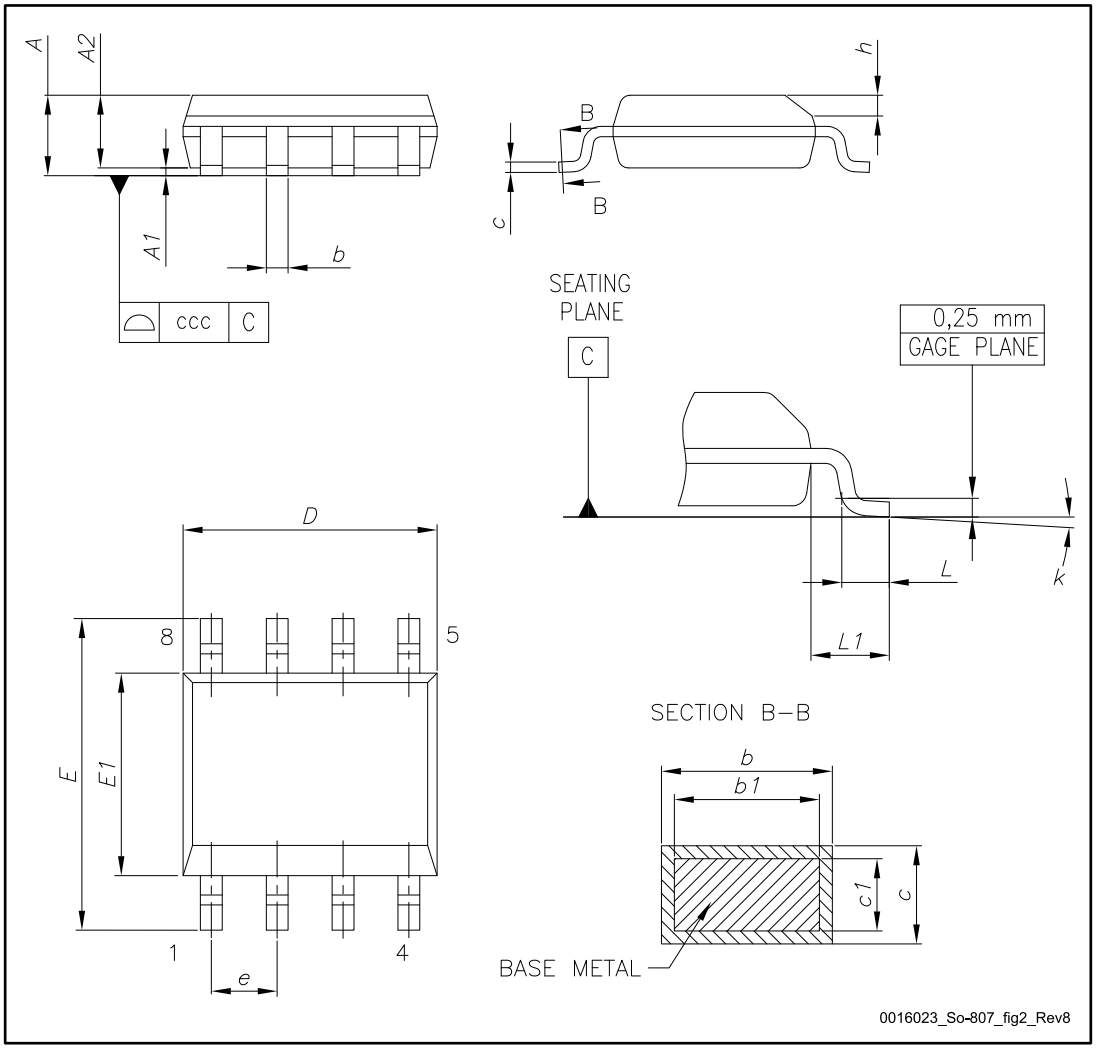
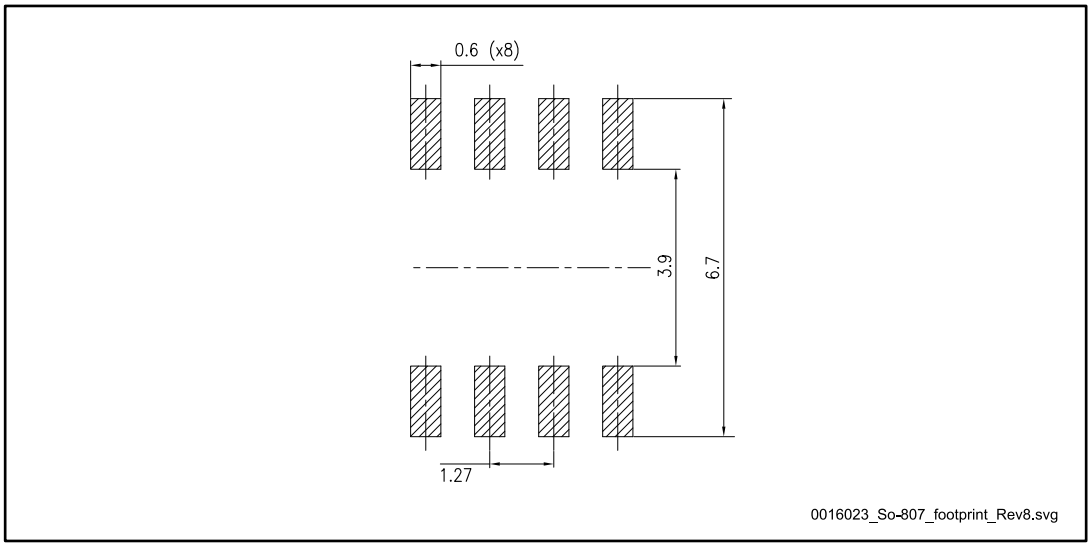


Table 8: SO-8 mechanical data

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



4.2 Packing information

Figure 18: SO-8 tape and reel dimensions

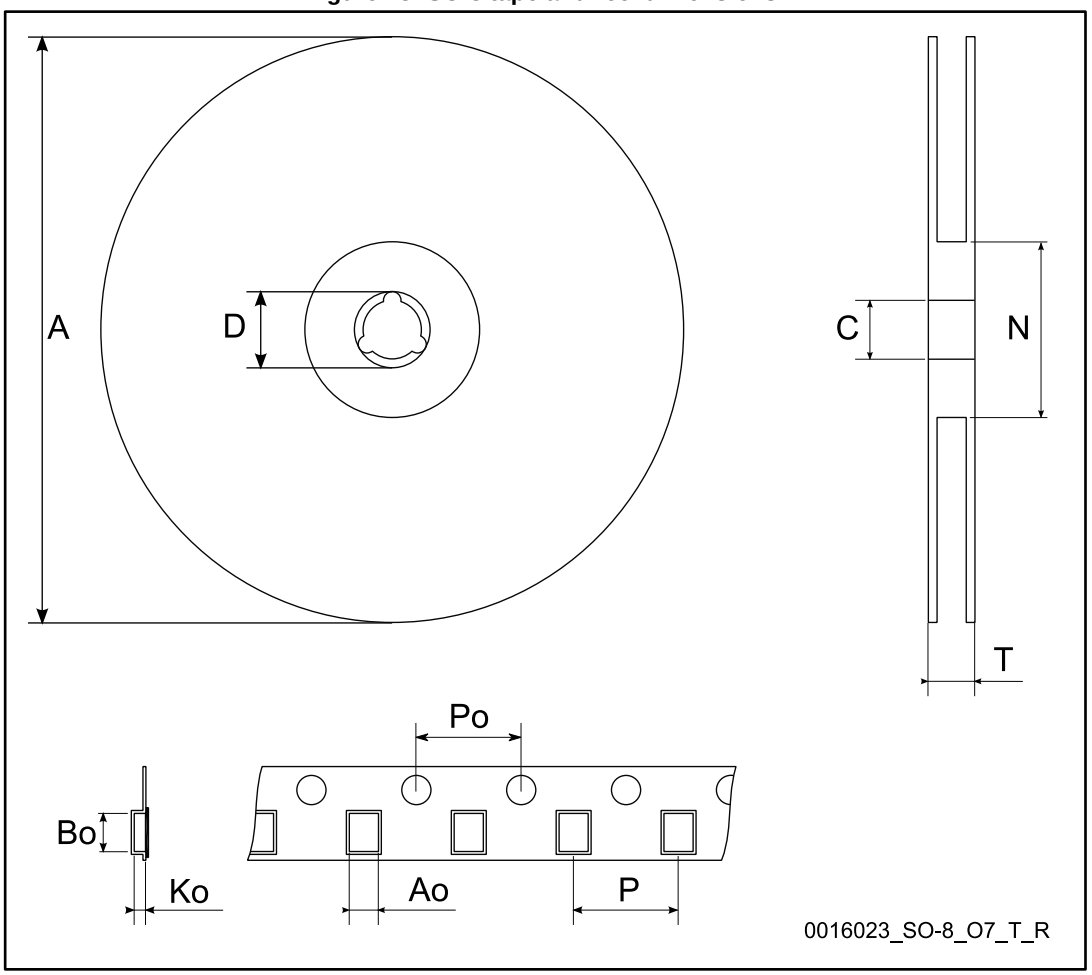


Table 9: SO-8 tape and reel mechanical data

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

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
10-Dec-2013	1	First revision.
10-Mar-2015	2	Text edits throughout document On cover page, updated title, description and features table Updated and renamed Table 4: Static Updated Table 5: Dynamic Updated Table 6: Switching times Updated Table 7: Source-drain diode Added Section 2.1: Electrical characteristics (curves) Minor text changes

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