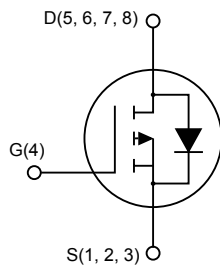
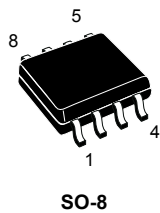


P-channel -30 V, 12 mΩ typ., -9 A, STripFET H6 Power MOSFET in an SO-8 package



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STS9P3LLH6	-30 V	15 mΩ	-9 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 H6 technology with a new trench gate structure. The resulting Power MOSFET exhibits very low $R_{DS(on)}$ in all packages.



Product status link

[STS9P3LLH6](#)

Product summary

Order code	STS9P3LLH6
Marking	9K3L
Package	SO-8
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	-30	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_{amb} = 25^\circ\text{C}$	-9	A
	Drain current (continuous) at $T_{amb} = 100^\circ\text{C}$	-5.6	
$I_{DM}^{(2)}$	Drain current (pulsed)	-36	A
$P_{TOT}^{(1)}$	Total power dissipation at $T_{amb} = 25^\circ\text{C}$	2.7	W
T_{stg}	Storage temperature range	-55 to 150	$^\circ\text{C}$
T_J	Operating junction temperature range		$^\circ\text{C}$

1. This value is rated according to R_{thJA} .
2. Pulse width limited by safe operating area.

Table 2. Thermal data

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

1. When mounted on 1 inch² FR-4 board, 2 oz. Cu., $t \leq 10$ s.

2 Electrical characteristics

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

Table 3. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = -1\text{ mA}$	-30			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = -30\text{ V}$			-1	μA
		$V_{GS} = 0, V_{DS} = -30\text{ V}, T_C = 125\text{ °C}^{(1)}$			-10	μA
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	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = -10\text{ V}, I_D = -4.5\text{ A}$		12	15	$\text{m}\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -4.5\text{ A}$		18.0	22.5	$\text{m}\Omega$

1. Defined by design, not subject to production test.

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = -25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$	-	2615	-	pF
C_{oss}	Output capacitance		-	340	-	pF
C_{rss}	Reverse transfer capacitance		-	235	-	pF
Q_g	Total gate charge	$V_{DD} = -15\text{ V}, I_D = -9\text{ A}, V_{GS} = -4.5\text{ V}$ (see Figure 13. Gate charge test circuit)	-	24	-	nC
Q_{gs}	Gate-source charge		-	9	-	nC
Q_{gd}	Gate-drain charge		-	8	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = -15\text{ V}, I_D = -4.5\text{ A},$ $R_G = 4.7\text{ }\Omega, V_{GS} = -10\text{ V}$ (see Figure 12. Switching times test circuit for resistive load)	-	13.2	-	ns
t_r	Rise time		-	93	-	ns
$t_{d(off)}$	Turn-off delay time		-	50	-	ns
t_f	Fall time		-	18	-	ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = -4.5\text{ A}, V_{GS} = 0$	-		-1.1	V
t_{rr}	Reverse recovery time	$V_{DD} = -24\text{ V}, T_J = 150\text{ °C},$	-	20		ns
Q_{rr}	Reverse recovery charge	$I_{SD} = -4.5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$	-	16		nC
I_{RRM}	Reverse recovery current	(see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	-1.6		A

1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

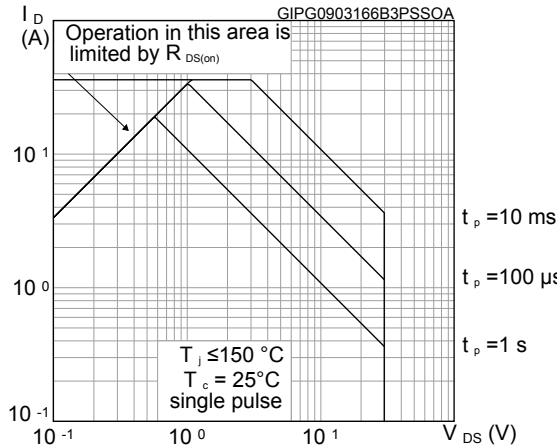


Figure 2. Thermal impedance

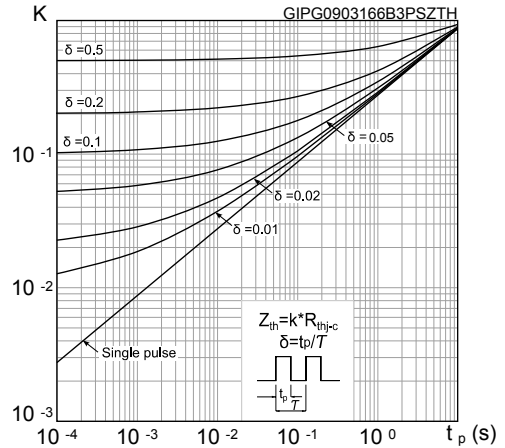


Figure 3. Output characteristics

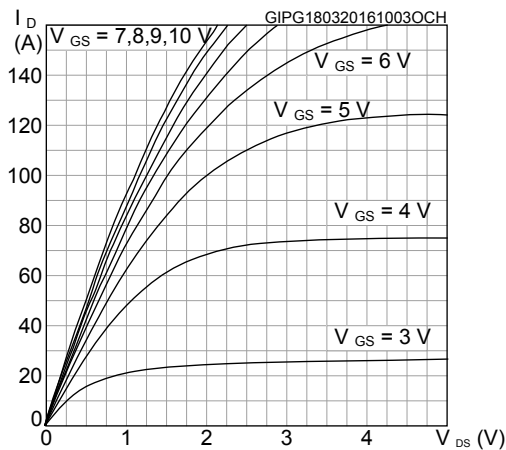


Figure 4. Transfer characteristics

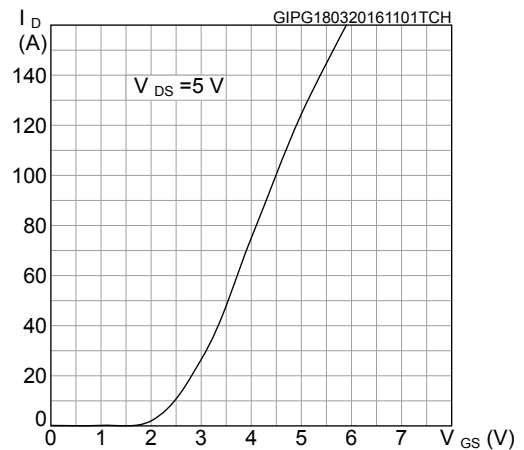


Figure 5. Gate charge vs gate-source voltage

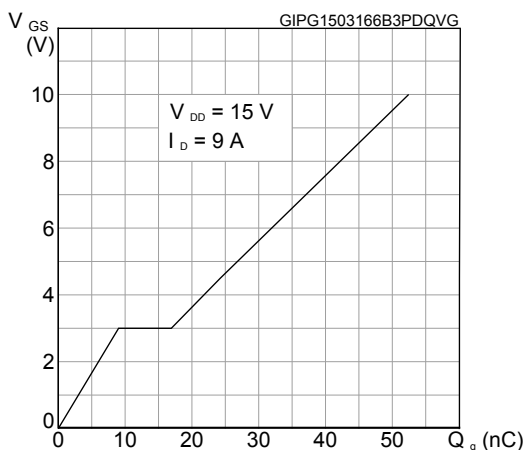


Figure 6. Static drain-source on-resistance

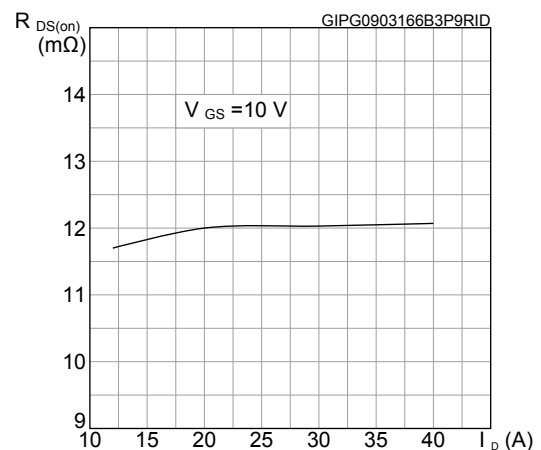


Figure 7. Capacitance variations

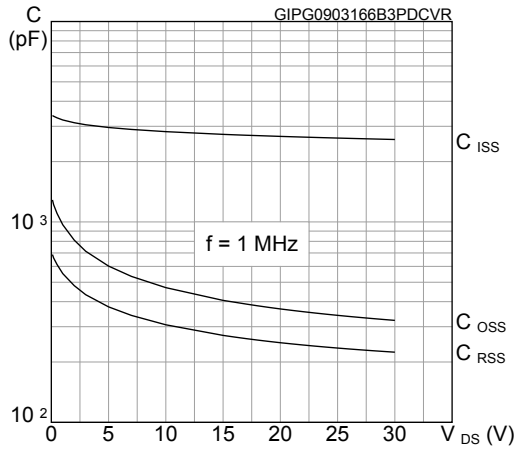


Figure 8. Normalized gate threshold voltage vs temperature

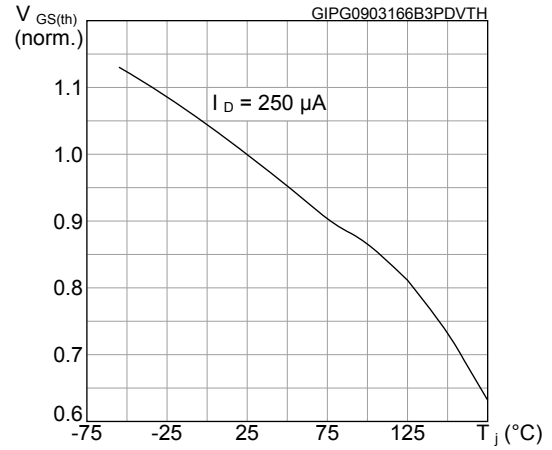


Figure 9. Normalized on-resistance vs temperature

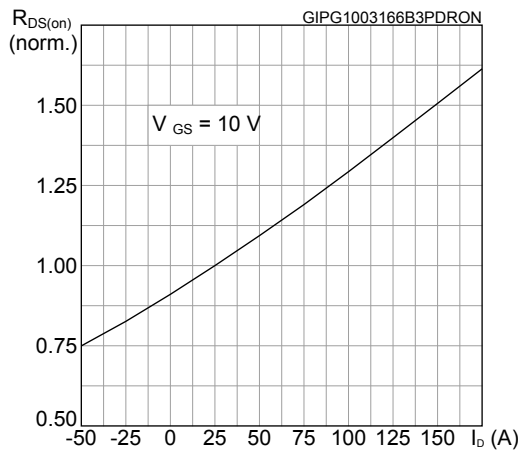


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

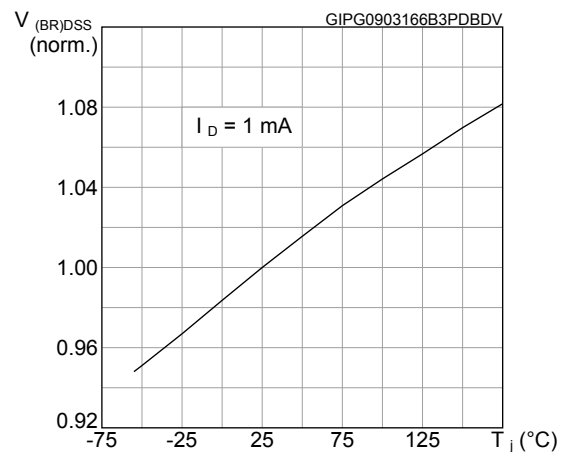
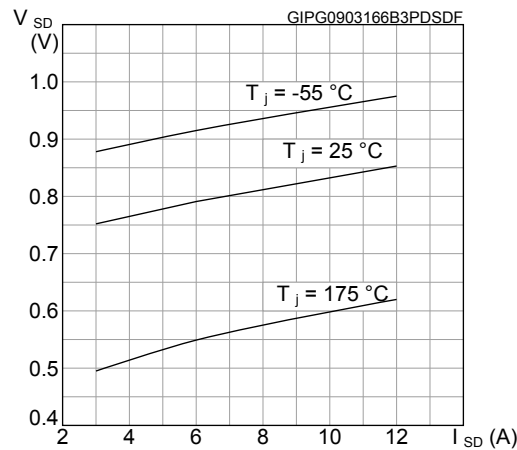


Figure 11. Source-drain diode forward characteristics



Note: For the P-channel Power MOSFET, current and voltage polarities are reversed.

3 Test circuits

Figure 12. Switching times test circuit for resistive load

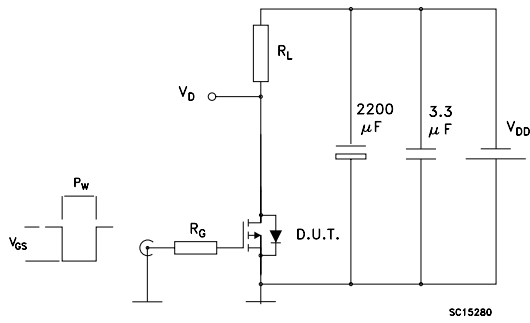


Figure 13. Gate charge test circuit

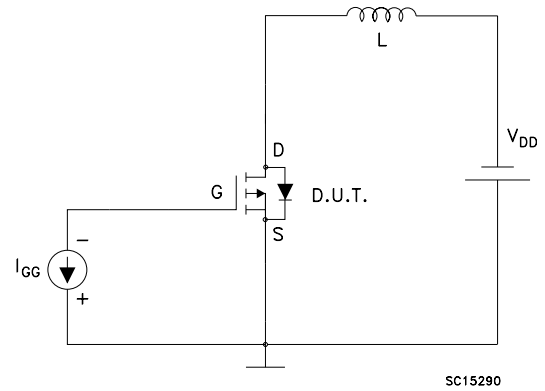
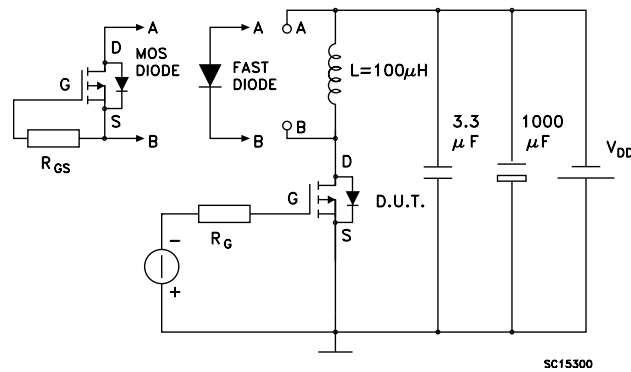


Figure 14. Test circuit for inductive load switching and diode recovery times

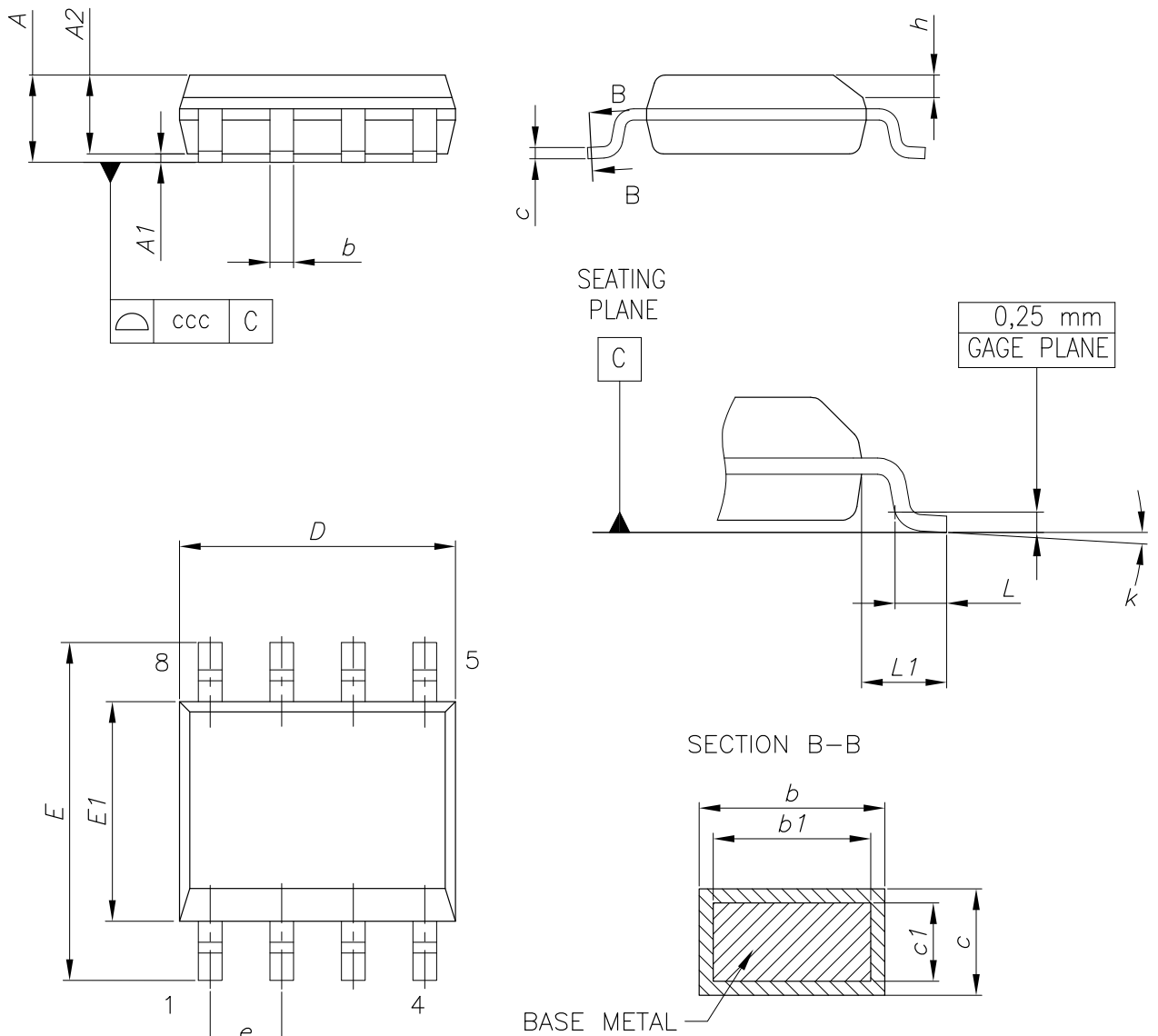


4 Package information

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 15. SO-8 package outline

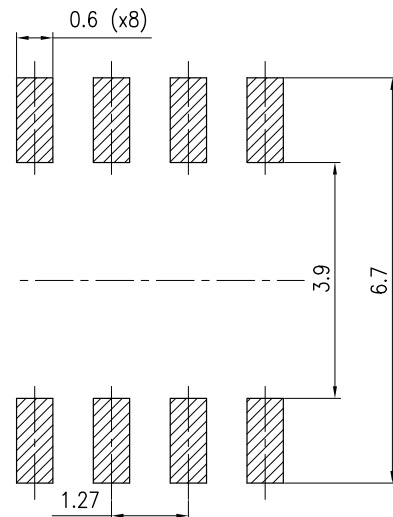


0016023_So-807_fig2_Rev10

Table 7. 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 16. SO-8 recommended footprint (dimensions are in mm)



0016023_So-807_footprint_Rev10

4.2 SO-8 packing information

Figure 17. SO-8 tape and reel dimensions

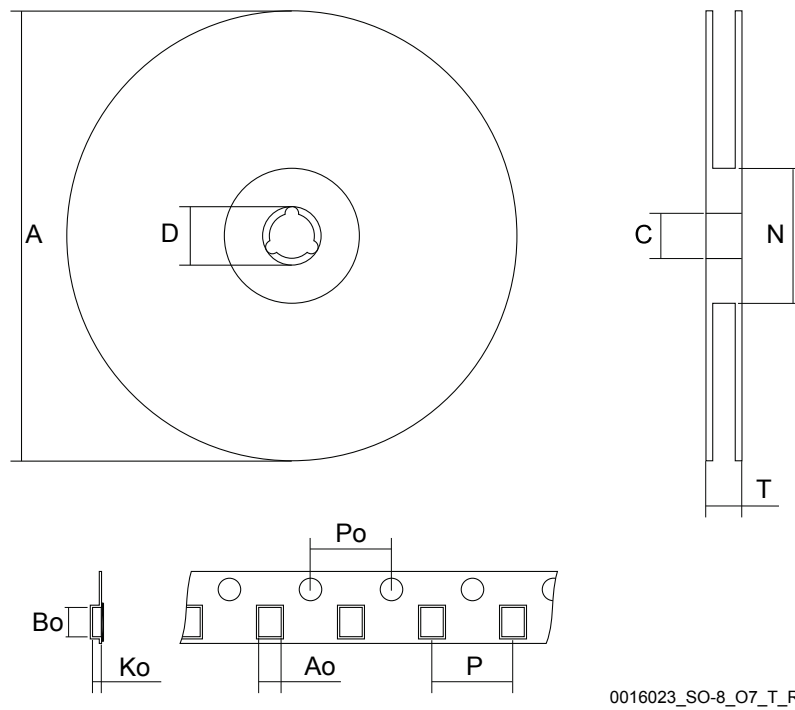


Figure 18. Tape orientation

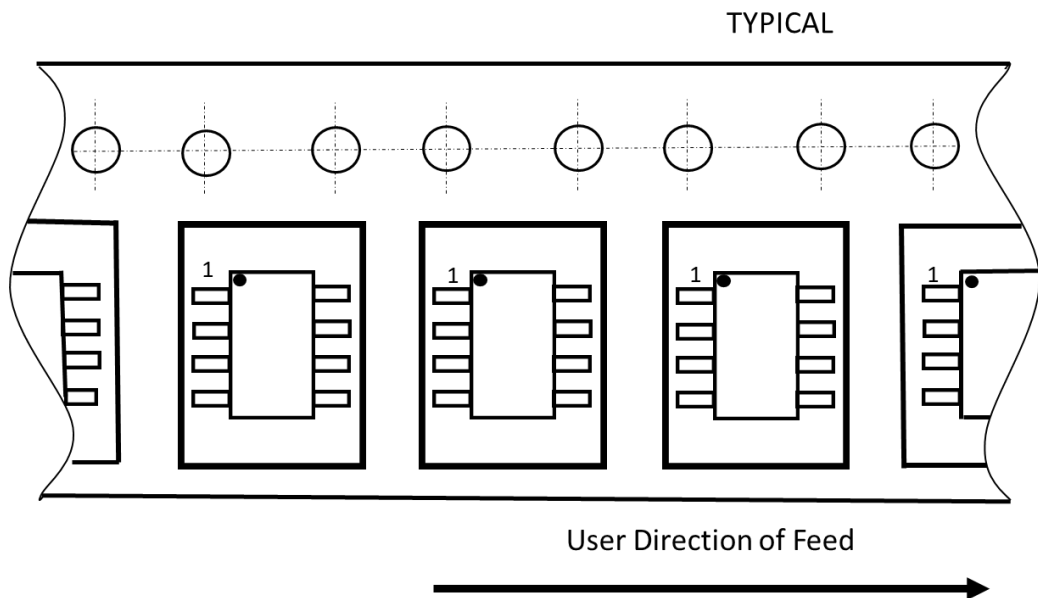


Table 8. SO-8 tape and reel mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			330
C	12.8		13.2
D	20.2		
N	60		
T			22.4
Ao	6.5	-	6.7
Bo	5.4		5.6
Ko	2.0		2.2
Po	3.9		4.1
P	7.9		8.1

Revision history

Table 9. Document revision history

Date	Revision	Changes
22-Jan-2014	1	Initial release.
15-Mar-2016	2	Modified: title and $R_{DS(on)}$ max value in cover page. Modified: <i>Table 4: "On/off states"</i> , <i>Table 5: "Dynamic"</i> , <i>Table 6: "Switching times"</i> and <i>Table 7: "Source drain diode"</i> . Minor text changes.
17-Feb-2021	3	Updated Internal schematic . Updated Section 4.2 SO-8 packing information . Minor text changes.

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