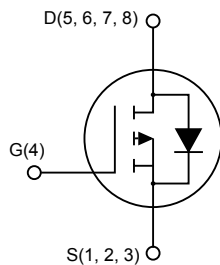
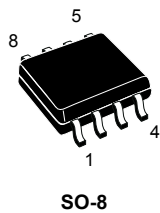


P-channel -40 V, 12.5 mΩ typ., -10 A STripFET F6 Power MOSFET in SO-8 package



AM01475v4

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STS10P4LLF6	-40 V	15 mΩ	-10 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.



Product status link

[STS10P4LLF6](#)

Product summary

Order code	STS10P4LLF6
Marking	10P4L
Package	SO-8
Packing	Tape and reel

1 Electrical ratings

Table 1. 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 $T_{amb} = 25\text{ }^\circ\text{C}$	-10	A
	Drain current (continuous) at $T_{amb} = 100\text{ }^\circ\text{C}$	-5.6	A
$I_{DM}^{(1)}$	Drain current (pulsed)	-40	A
P_{TOT}	Total power 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	$^\circ\text{C}$

1. 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., $t \leq 10$ sec.

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = -250\text{ }\mu\text{A}$	-40			V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = -40\text{ V}$			-1	μA
		$V_{DS} = -40\text{ V}$, $T_C = 125\text{ °C}$			-10	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 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	$V_{GS} = -10\text{ V}$, $I_D = -3\text{ A}$		12.5	15	m Ω
		$V_{GS} = -4.5\text{ V}$, $I_D = -3\text{ A}$		17	20	

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = -25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	3525	-	pF
C_{oss}	Output capacitance		-	344	-	pF
C_{rss}	Reverse transfer capacitance		-	238.5	-	pF
Q_g	Total gate charge	$V_{DD} = -20\text{ V}$, $I_D = -10\text{ A}$, $V_{GS} = -4.5\text{ V}$ (see Figure 13. Test circuit for gate charge behavior)	-	34	-	nC
Q_{gs}	Gate-source charge		-	11.3	-	nC
Q_{gd}	Gate-drain charge		-	13.8	-	nC

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = -20\text{ V}$, $I_D = -5\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = -10\text{ V}$ (see Figure 12. Test circuit for resistive load switching times)	-	49.4	-	ns
t_r	Rise time		-	60.6	-	ns
$t_{d(off)}$	Turn-off-delay time		-	170	-	ns
t_f	Fall time		-	20	-	ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = -3\text{ A}$	-		-1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = -5\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = -32\text{ V}$, $T_J = 150\text{ °C}$ (see Figure 14. Test circuit for inductive load switching and diode recovery times)	-	29		ns
Q_{rr}	Reverse recovery charge		-	27.6		nC
I_{RRM}	Reverse recovery current		-	-1.9		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

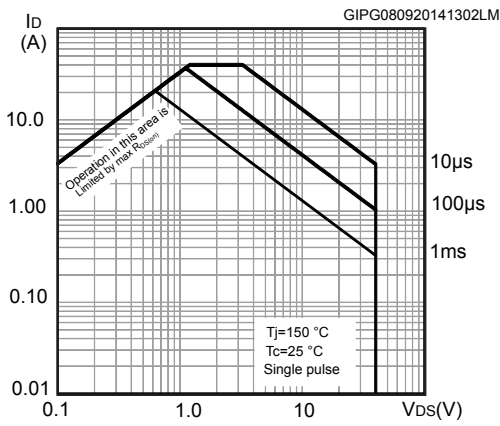


Figure 2. Thermal impedance

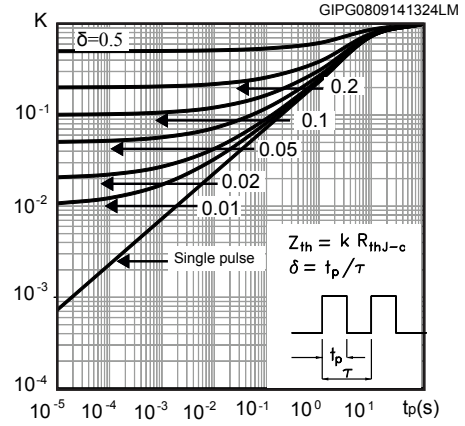


Figure 3. Output characteristics

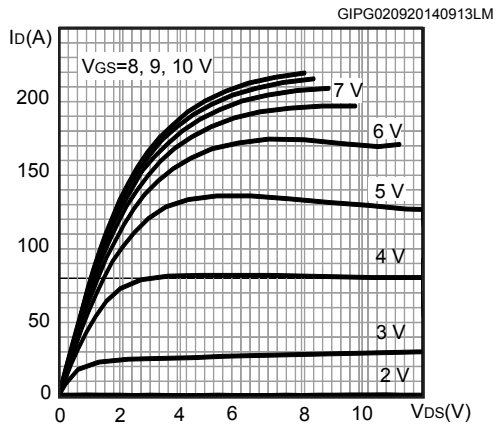


Figure 4. Transfer characteristics

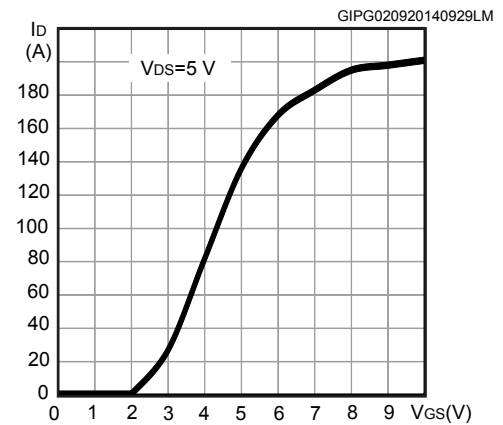


Figure 5. Gate charge vs gate-source voltage

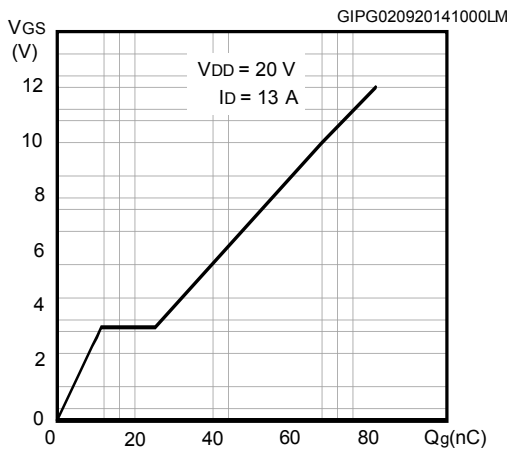
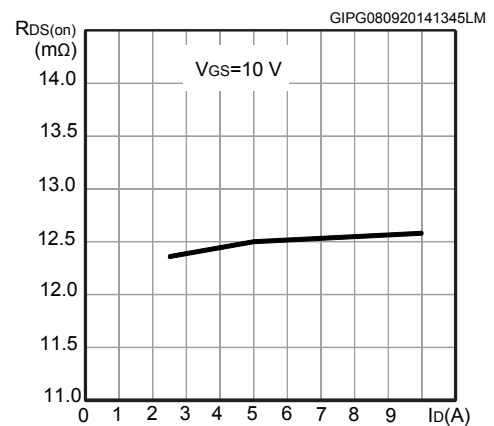


Figure 6. Static drain-source on-resistance



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

Figure 7. Capacitance variation

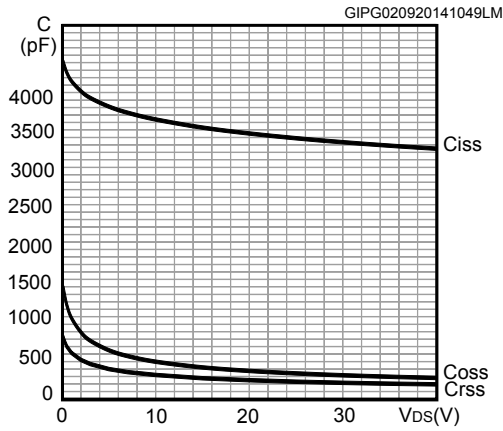


Figure 8. Normalized gate threshold voltage vs temperature

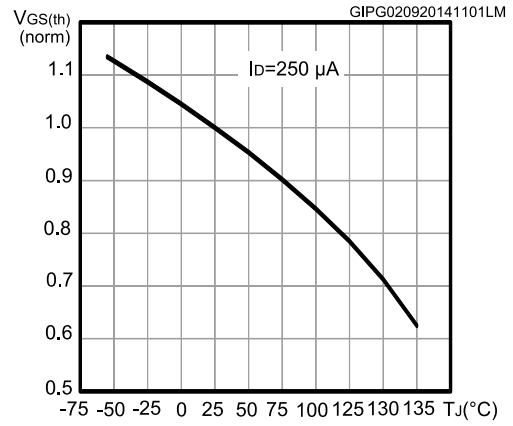


Figure 9. Normalized on-resistance vs temperature

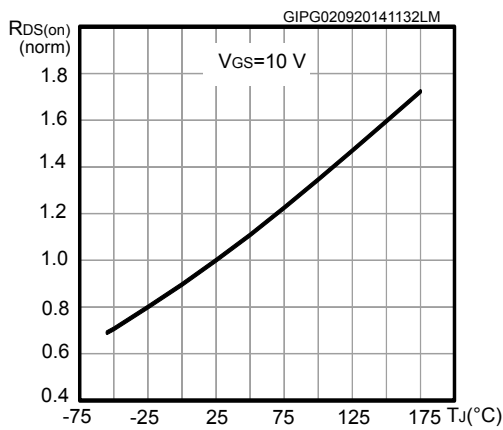


Figure 10. Normalized VBR(DSS) vs temperature

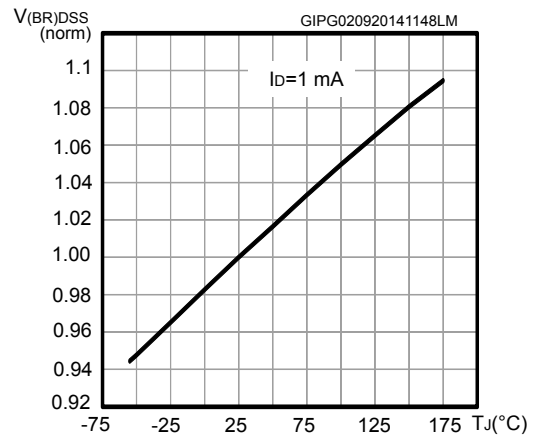
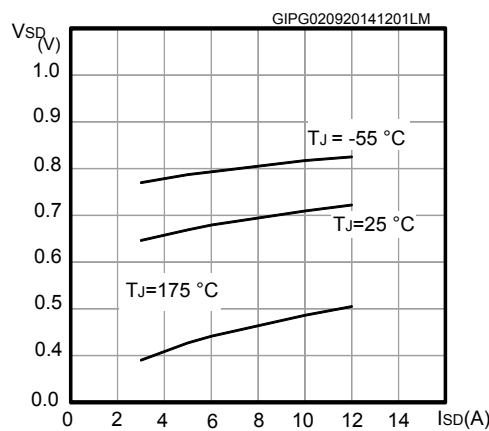


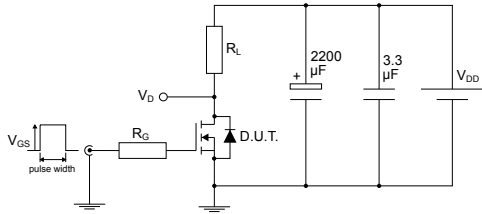
Figure 11. Source-drain diode forward characteristics



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

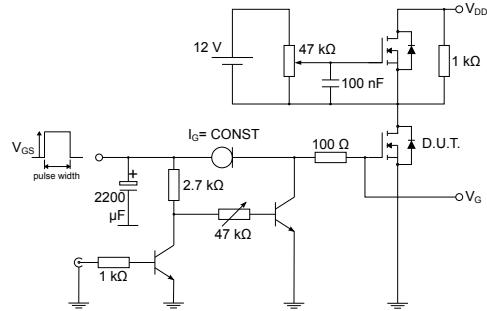
3 Test circuits

Figure 12. Test circuit for resistive load switching times



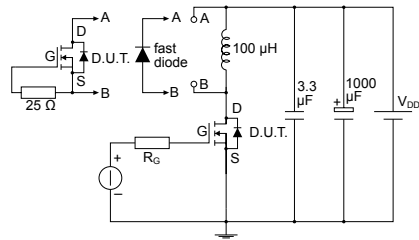
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Figure 13. Test circuit for gate charge behavior



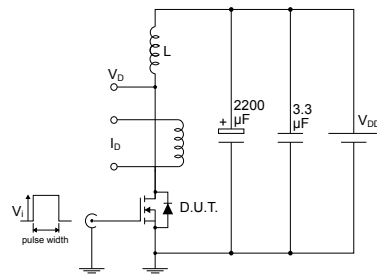
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Figure 14. Test circuit for inductive load switching and diode recovery times



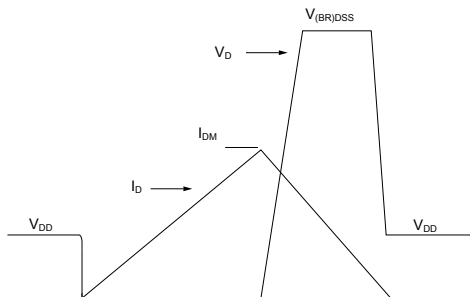
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Figure 15. Unclamped inductive load test circuit



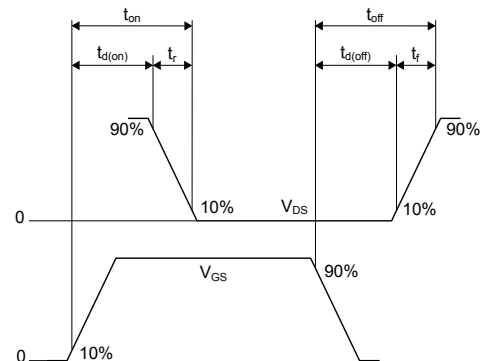
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Figure 16. Unclamped inductive waveform



AM01472v1

Figure 17. Switching time waveform



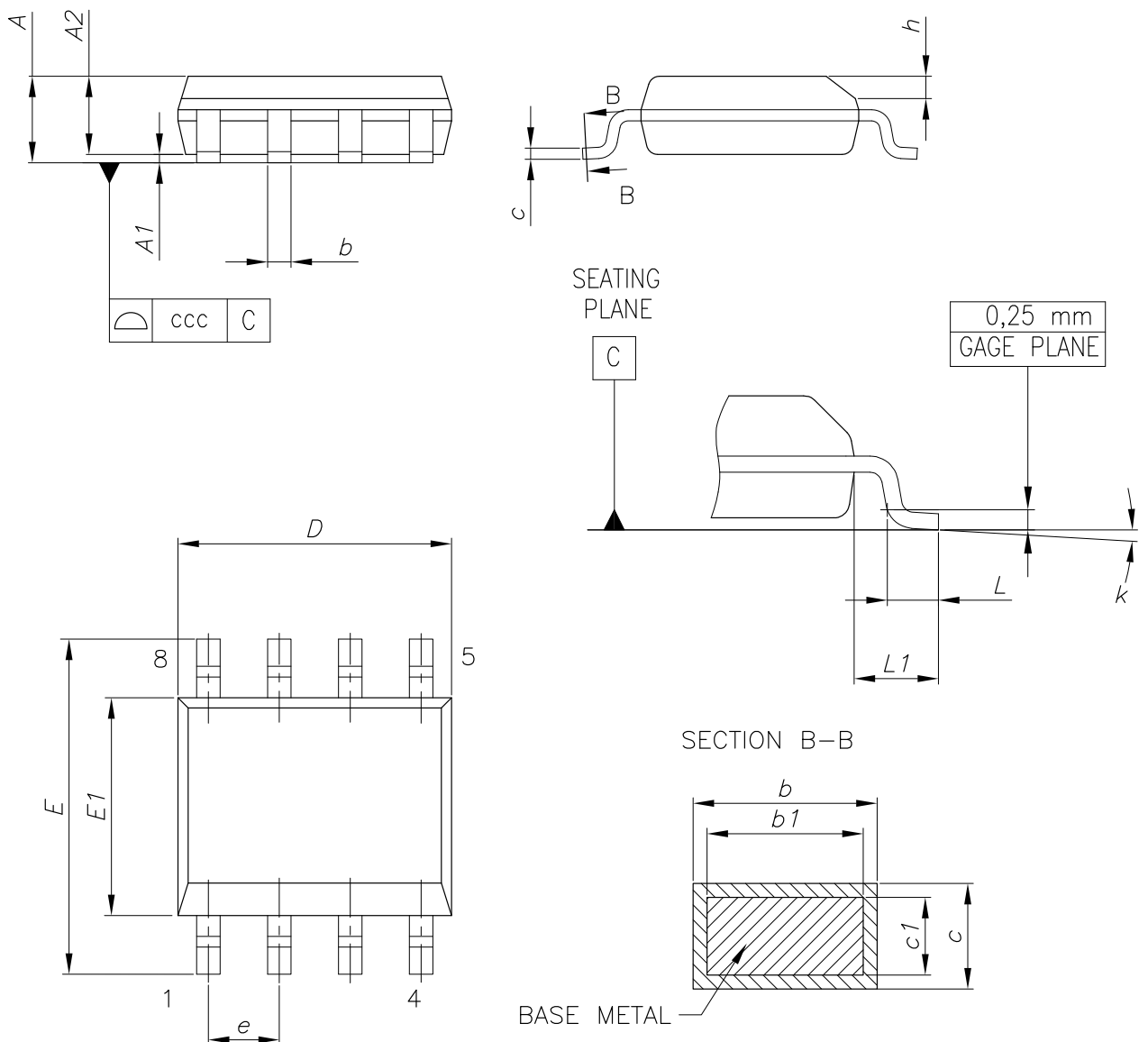
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4 Package information

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 18. SO-8 package outline

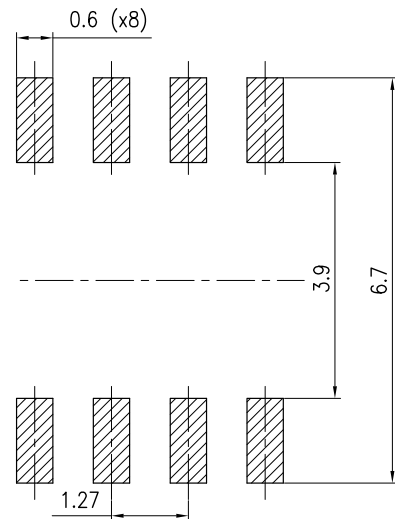


0016023_So-807_fig2_Rev10

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 19. SO-8 recommended footprint (dimensions are in mm)



0016023_So-807_footprint_Rev10

4.2 SO-8 packing information

Figure 20. SO-8 tape and reel dimensions

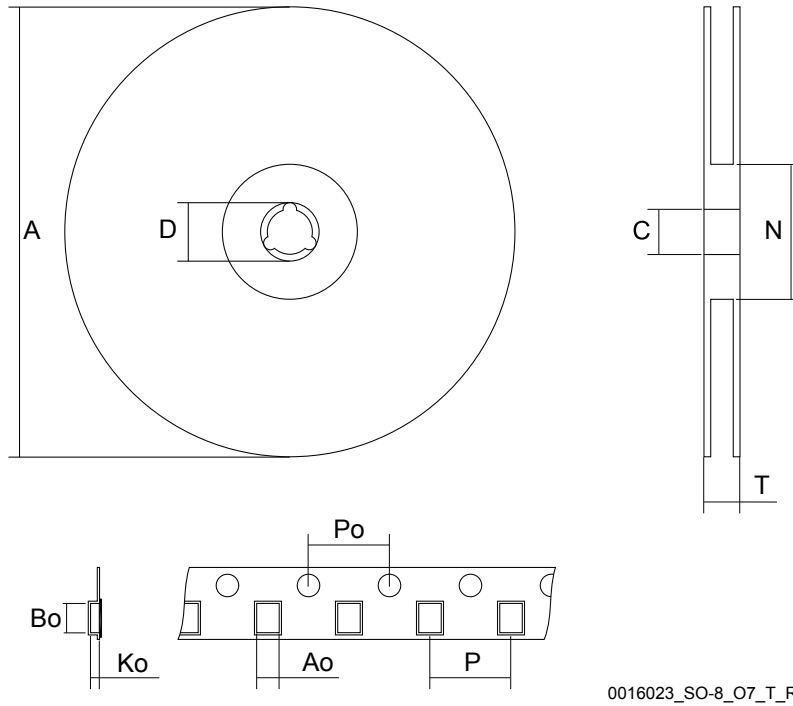


Figure 21. Tape orientation

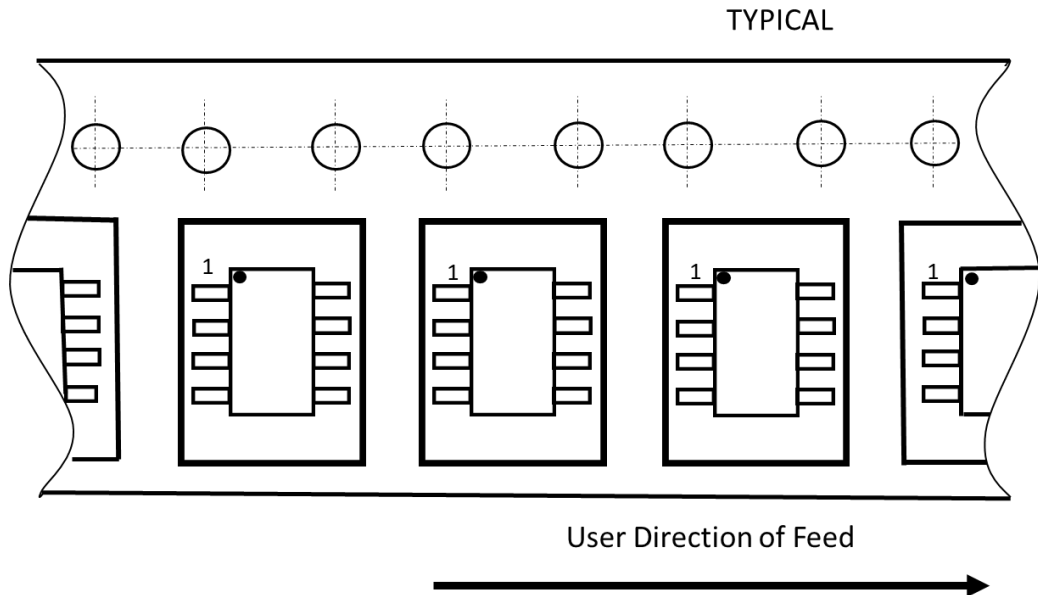


Table 8. SO-8 tape and reel mechanical data

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
20-Jan-2014	1	First revision.
09-Sep-2014	2	<p>Changed the title.</p> <p>Updated <i>Section "Features" and Section "Description"</i>.</p> <p>Updated <i>Table 4: "On/off states", Table 5: "Dynamic", Table 6: "Switching times", Table 7: "Source-drain diode"</i>.</p> <p>Added <i>Section 3: "Electrical characteristics (curves)"</i>.</p>
16-Dec-2014	3	<p>Document status promoted from preliminary data to production data.</p> <p>Minor text changes.</p>
09-Dec-2020	4	<p>Updated title and features in cover page.</p> <p>Updated <i>Section 1 Electrical ratings and Section 2 Electrical characteristics</i>.</p> <p>Minor text changes.</p>
21-Jan-2021	5	<p>Updated Internal schematic.</p> <p>Minor text changes.</p>

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