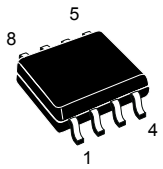
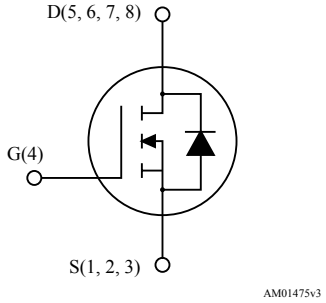
Automotive-grade N-channel 60 V, 21 mΩ typ., 8 A STripFET F6 Power MOSFET in an SO-8 package



SO-8



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D	P_{TOT}
STS8N6LF6AG	60 V	24 mΩ	8 A	3.2 W

- AEC-Q101 qualified
- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss
- Logic level

Applications

- Switching applications

Description

This device is an N-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
STS8N6LF6AG

Product summary	
Order code	STS8N6LF6AG
Marking	8N6LF6
Package	SO-8
Packing	Tape and reel

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	±20	V
I_D (1)	Drain current (continuous) at T_{amb} = 25 °C	8	A
	Drain current (continuous) at T_{amb} = 100 °C	5.8	
I_{DM} (2)	Drain current (pulsed)	32	A
P_{TOT}	Total power dissipation at T_{amb} = 25 °C	3.2	W
T_{stg}	Storage temperature range	-55 to 175	°C
T_J	Operating junction temperature range		°C

1. *When mounted on a 1-inch² FR-4, 2 Oz copper board, t < 10 s.*
2. *Pulse width is limited by safe operating area.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJA} (1)	Thermal resistance, junction-to-ambient	47	°C/W

1. *When mounted on an 1-inch² FR-4, 2 Oz copper board, t < 10 s.*

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AV}	Avalanche current, not repetitive	6	A
E_{AS} (1)	Single pulse avalanche energy	72	mJ

1. *Starting T_J = 25 °C, I_D = I_{AV}, V_{DD} = 43.5 V.*

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	60			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 60 V			1	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		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 4 A		21	24	mΩ
		V_{GS} = 4.5 V, I_D = 4 A		22	26	

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	-	1340	-	pF
C_{oss}	Output capacitance		-	90	-	pF
C_{rss}	Reverse transfer capacitance		-	60	-	pF
Q_g	Total gate charge	V_{DD} = 30 V, I_D = 8 A, V_{GS} = 10 V (see Figure 14. Test circuit for gate charge behavior)	-	27	-	nC
Q_{gs}	Gate-source charge		-	4.6	-	nC
Q_{gd}	Gate-drain charge		-	4.3	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 30 V, I_D = 4 A, R_G = 4.7 Ω, V_{GS} = 10 V (see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	9.6	-	ns
t_r	Rise time		-	20	-	ns
$t_{d(off)}$	Turn-off delay time		-	56	-	ns
t_f	Fall time		-	7	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		8	A
I_{SDM}(1)	Source-drain current (pulsed)		-		32	A
V_{SD}(2)	Forward on voltage	V_{GS} = 0 V, I_{SD} = 8 A	-		1.3	V
t_{rr}	Reverse recovery time	I_{SD} = 8 A, di/dt = 100 A/µs,	-	22.5		ns
Q_{rr}	Reverse recovery charge	V_{DD} = 48 V, T_J = 25 °C	-	22.2		nC
I_{RRM}	Reverse recovery current	(see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	2.0		A

1. *Pulse width is limited by safe operating area.*
2. *Pulse test: pulse duration = 300 µs, duty cycle 1.5%.*

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

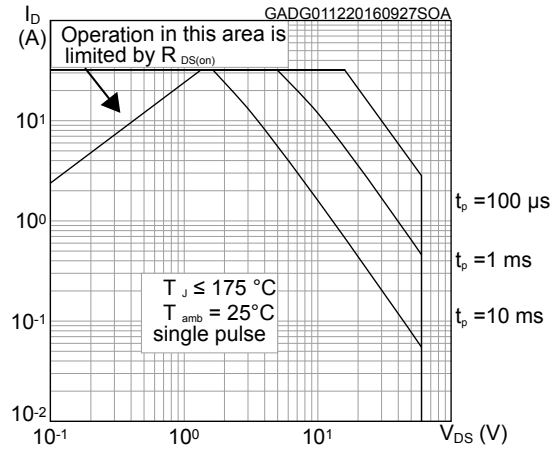


Figure 2. Thermal impedance

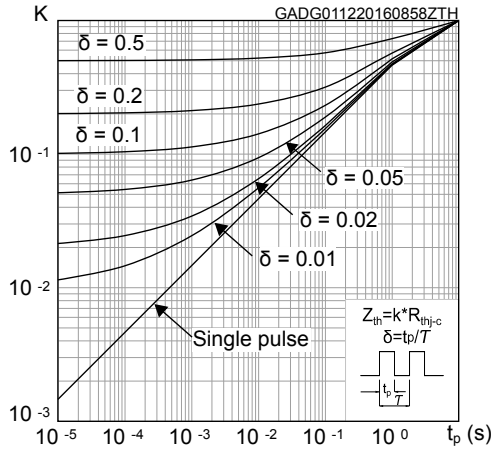


Figure 3. Output characteristics

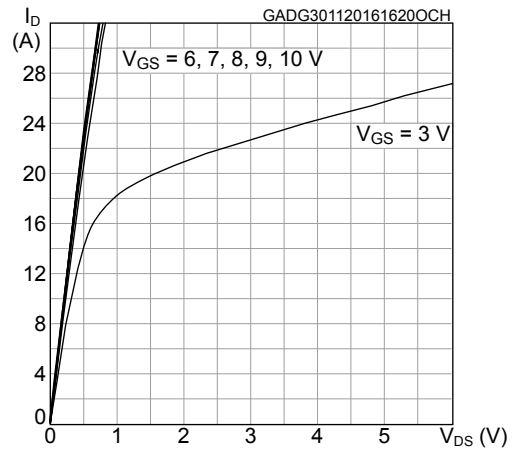


Figure 4. Transfer characteristics

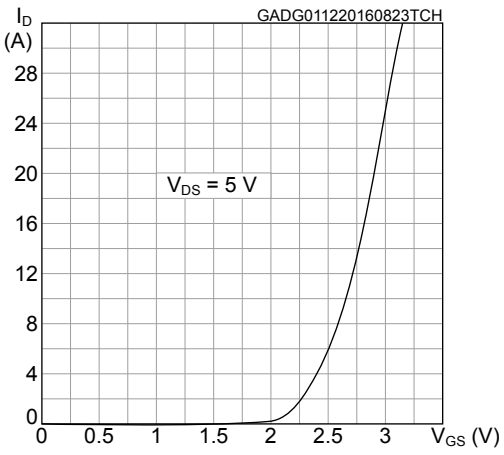


Figure 5. Gate charge vs gate-source voltage

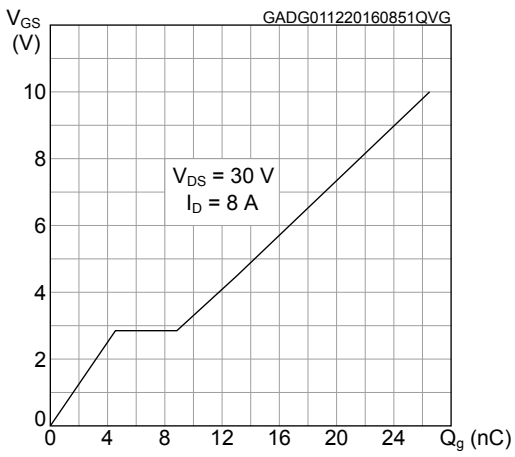


Figure 6. Static drain-source on-resistance

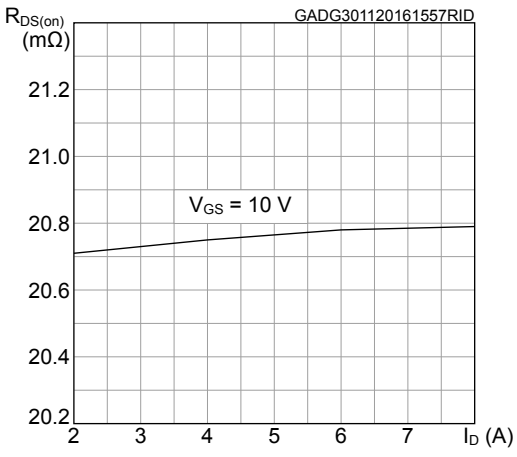


Figure 7. Capacitance variations

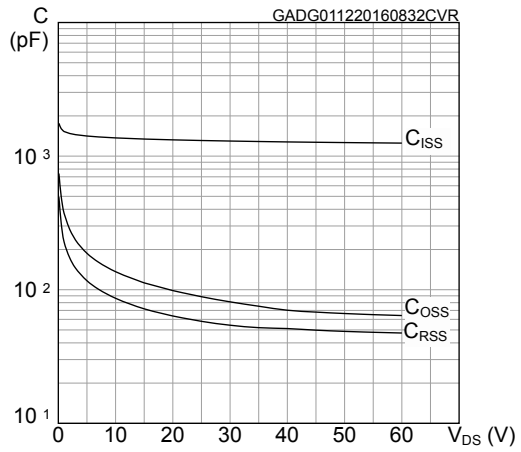


Figure 8. Normalized gate threshold voltage vs temperature

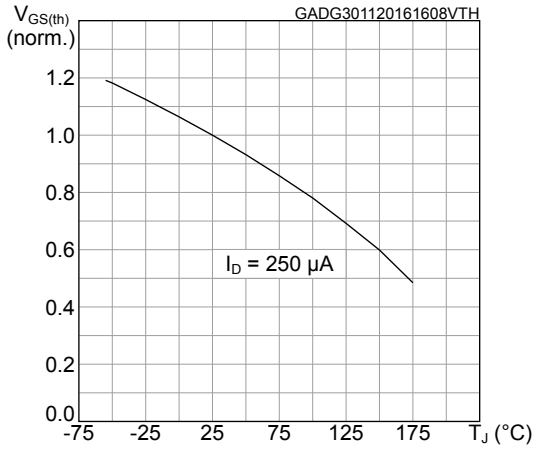


Figure 9. Normalized on-resistance vs temperature

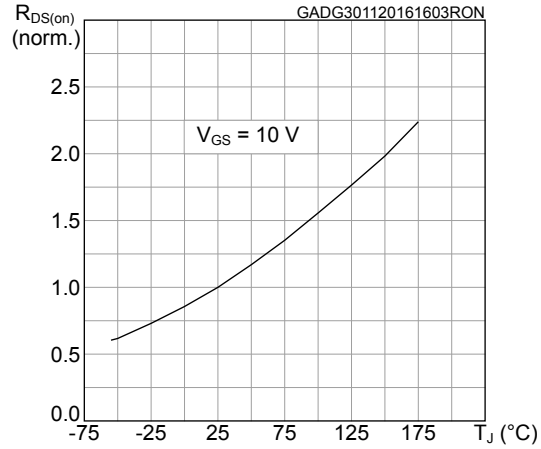


Figure 10. Normalized $V_{(BR)DSS}$ vs temperature

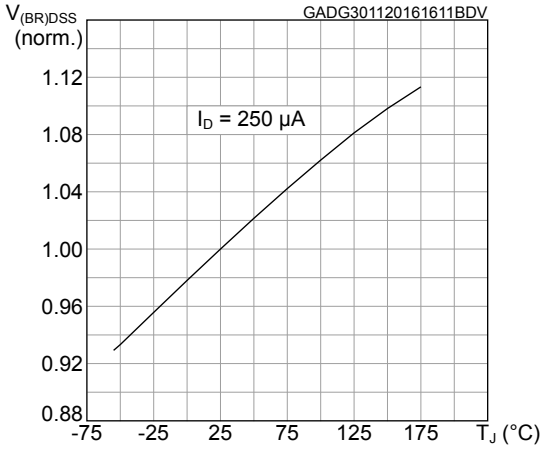
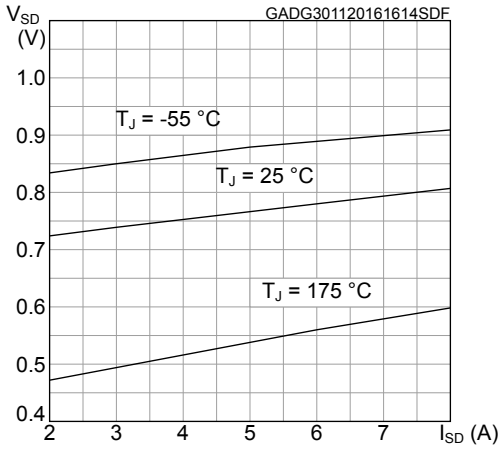


Figure 11. Source-drain diode forward characteristics



3 Test circuits

Figure 12. Test circuit for resistive load switching times

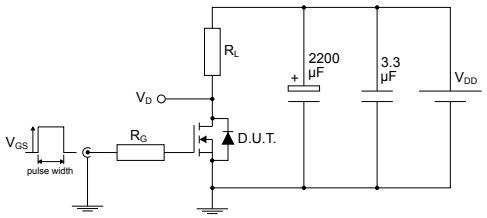


Figure 13. Test circuit for gate charge behavior

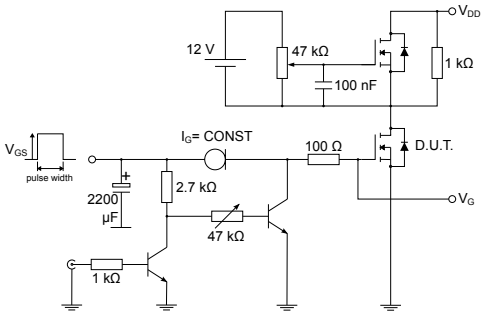


Figure 14. Test circuit for inductive load switching and diode recovery times

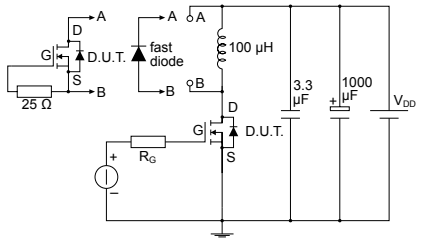


Figure 15. Unclamped inductive load test circuit

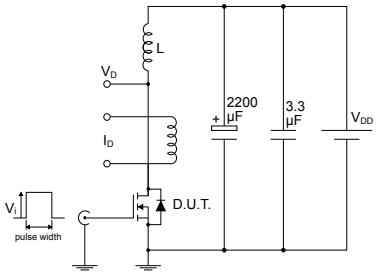


Figure 16. Unclamped inductive waveform

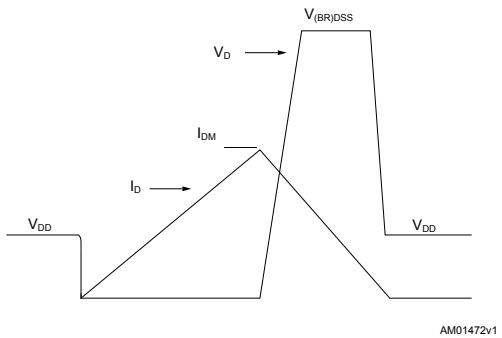
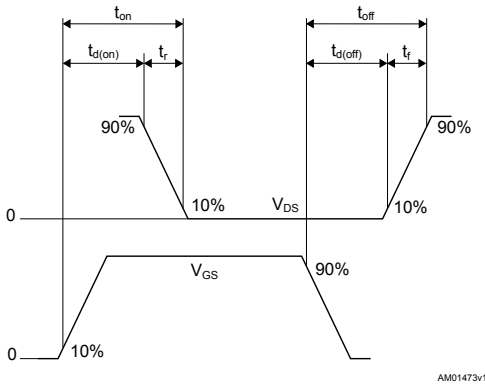


Figure 17. Switching time waveform



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

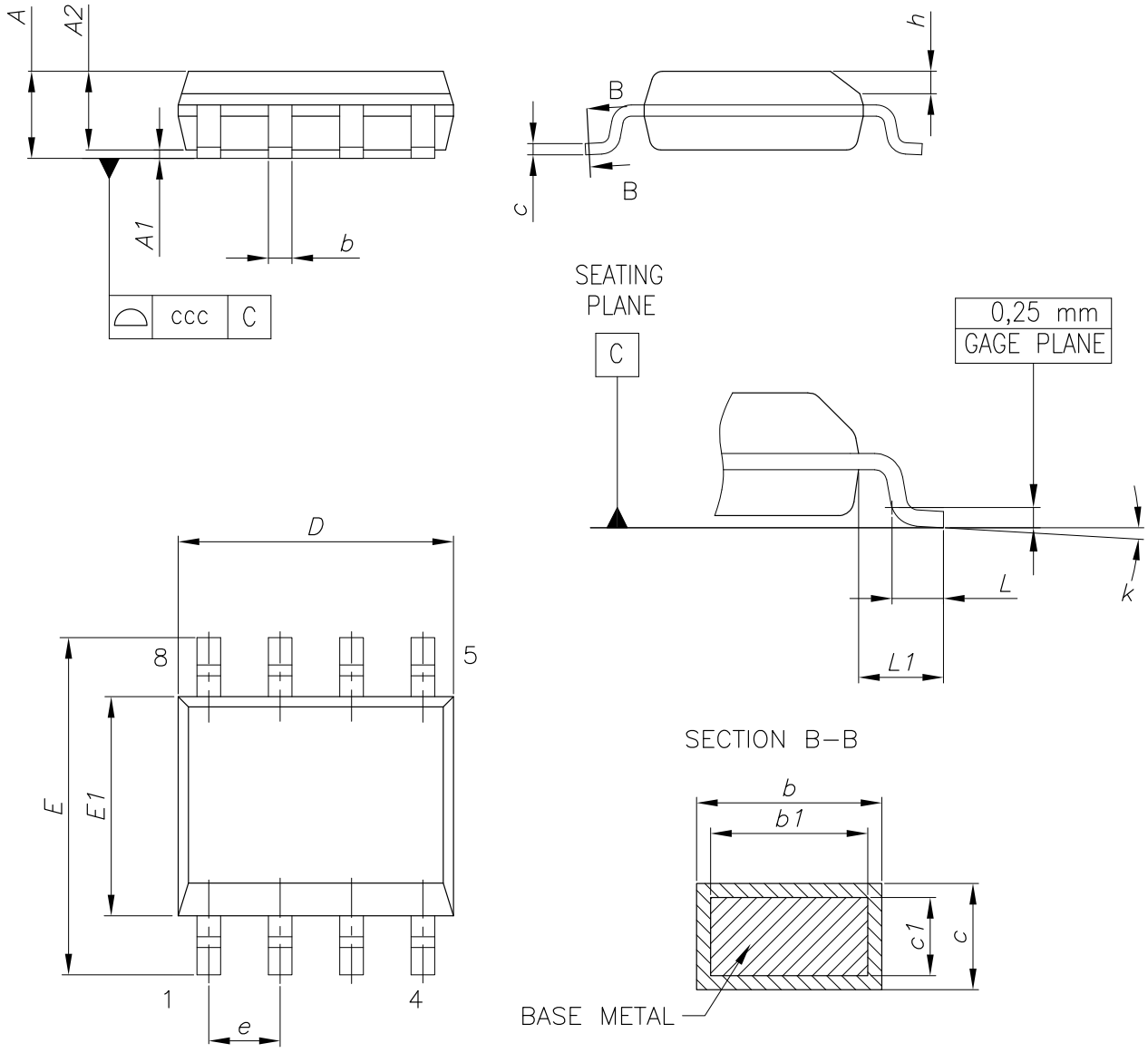


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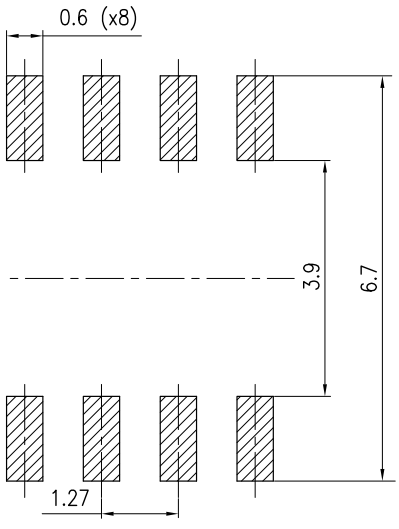
Table 8. **SO-8 mechanical data**

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 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**

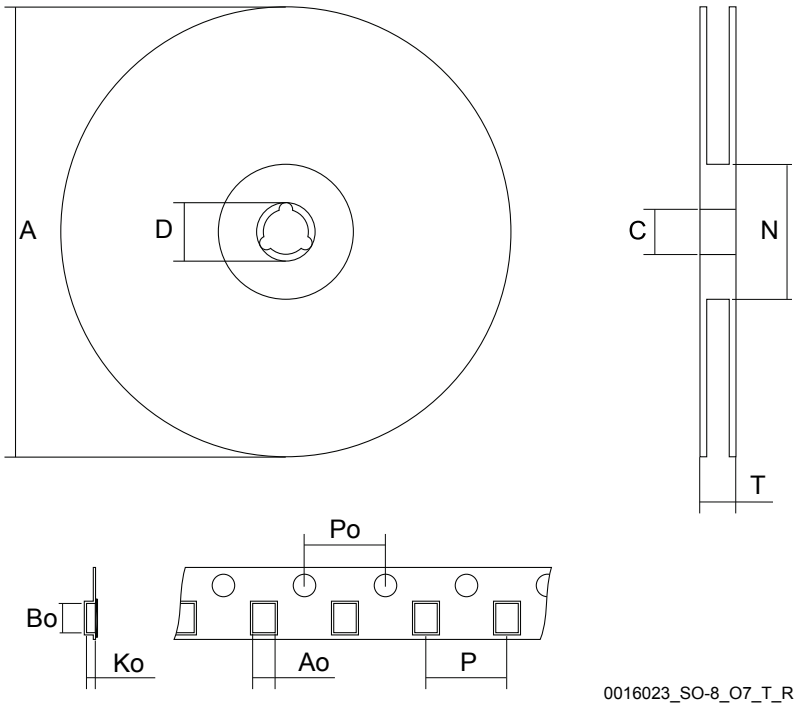


Figure 21. **Tape orientation**

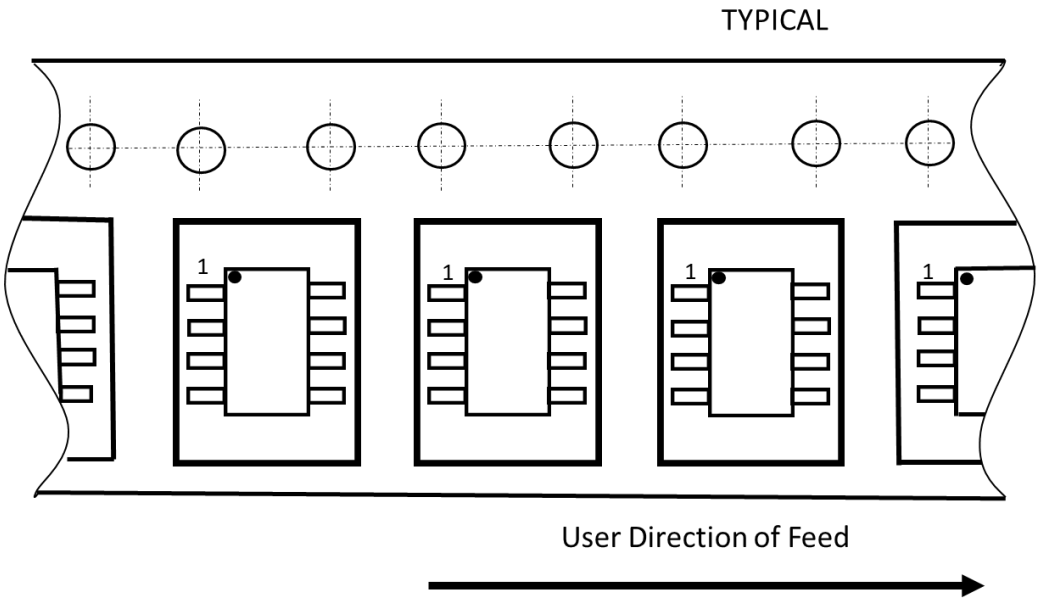


Table 9. **SO-8 tape and reel mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A		-	330
C	12.8		13.2
D	20.2		
N	60		
T			22.4
Ao	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 10. **Document revision history**

Date	Version	Changes
24-Jan-2017	1	First release.
08-Mar-2021	2	Updated Internal schematic. Updated Section 4.2 SO-8 packing information. Minor text changes.
21-Jul-2021	3	Updated Section Internal schematic.

Contents