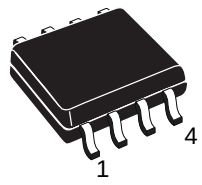
STS6P3LLH6

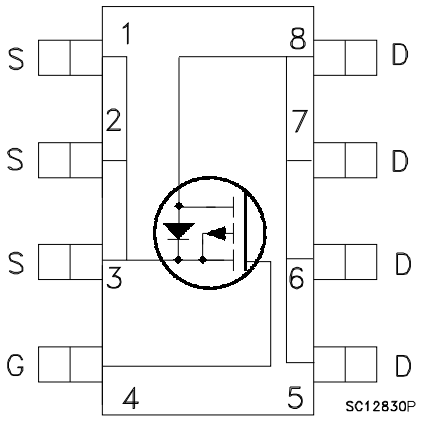
P-channel 30 V, 0.024 Ω typ., 6 A, STripFET™ VI DeepGATE™ Power MOSFET in a SO-8 package

Datasheet - preliminary data



SO-8

Figure 1. Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D
STS6P3LLH6	30 V	0.03 Ω	6 A

- $R_{DS(on)}$* Q_g industry benchmark
- Extremely low on-resistance $R_{DS(on)}$
- High avalanche ruggedness

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest $R_{DS(on)}$ in all packages.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STS6P3LLH6	6K3L	SO-8	Tape and reel

Note: For the P-channel MOSFET actual polarity of voltages and current has to be reversed.

Contents

1 Electrical ratings

Table 2. 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°C	6	A
I_D (1)	Drain current (continuous) at T_{amb} = 100°C	4	A
I_{DM} (2)	Drain current (pulsed)	24	A
P_{TOT} (1)	Total dissipation at T_{amb} = 25°C	2.7	W
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Operating junction temperature	150	°C

1. This value is rated according to $R_{thj\text{-}amb}$
2. 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

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

Note: For the P-channel MOSFET actual polarity of voltages and current has to be reversed.

2 Electrical characteristics

(T_{CASE} = 25 °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 µA	30			V V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 30 V			1	µA
		V_{DS}=30 V, T_C=125 °C				
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	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 A		0.024	0.03	Ω
		V_{GS} = 4.5 V, I_D = 3 A		0.038	0.05	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 24 V, f = 1 MHz, V_{GS} = 0	-	1450	-	pF
C_{oss}	Output capacitance		-	178	-	pF
C_{rss}	Reverse transfer capacitance		-	120	-	pF
Q_g	Total gate charge	V_{DD}=24 V I_D=6 A V_{GS}= 4.5 V	-	12	-	nC
Q_{gs}	Gate-source charge		-	4.4	-	nC
Q_{gd}	Gate-drain charge		-	5	-	nC

Note: For the P-channel MOSFET actual polarity of voltages and current has to be reversed

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 24 V, I_D = 3 A R_G=4.7 Ω, V_{GS} = 10 V *Figure 13*	-	15	-	ns
t_r	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
t_f	Fall time		-	21	-	ns

Note: For the P-channel MOSFET actual polarity of voltages and current has to be reversed

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		6	A
I_{SDM} (1)	Source-drain current (pulsed)		-		24	A
V_{SD} (2)	Forward on voltage	I_{SD} = 3A, V_{GS} = 0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 3 A, di/dt = 100 A/µs V_{DD}=16 V, T_j =150 °C	-	15		ns
Q_{rr}	Reverse recovery charge		-	6.5		nC
I_{RRM}	Reverse recovery current		-	0.9		A

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

Note: For the P-channel MOSFET actual polarity of voltages and current has to be reversed

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

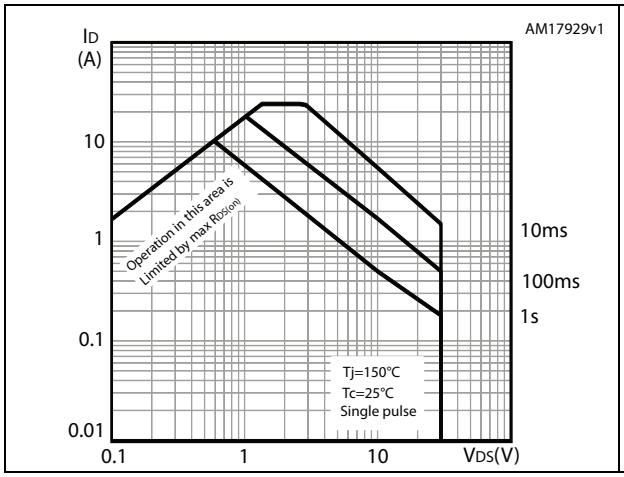


Figure 3. Thermal impedance

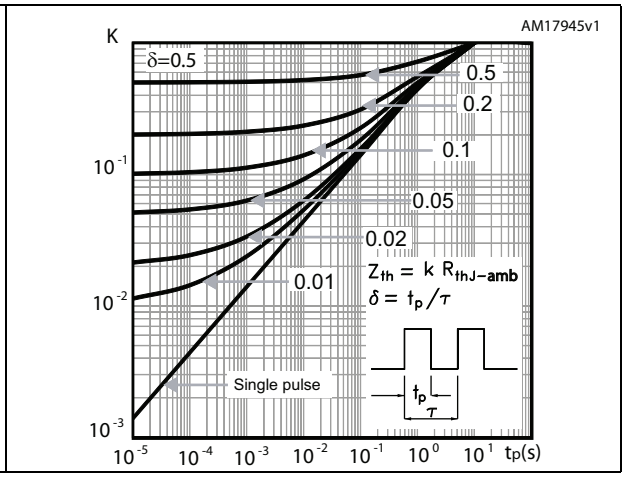


Figure 4. Output characteristics

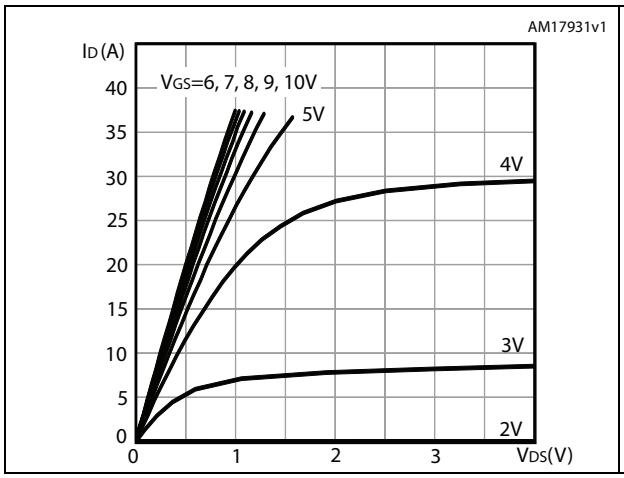


Figure 5. Transfer characteristics

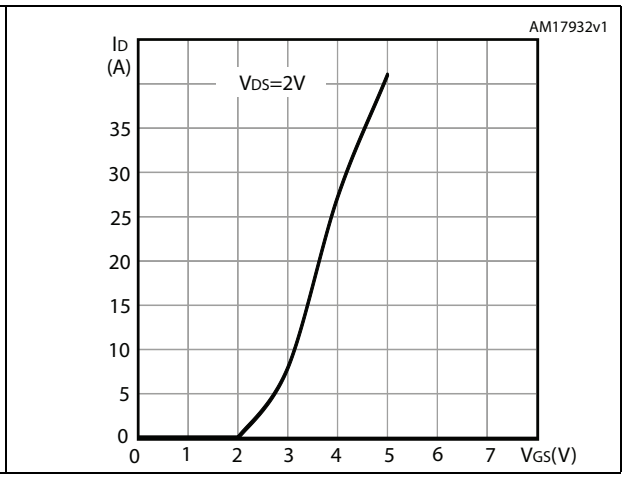


Figure 6. Gate charge vs gate-source voltage

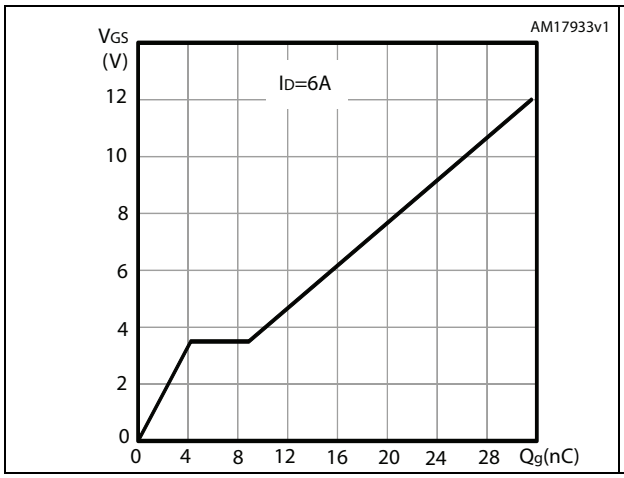


Figure 7. Static drain-source on-resistance

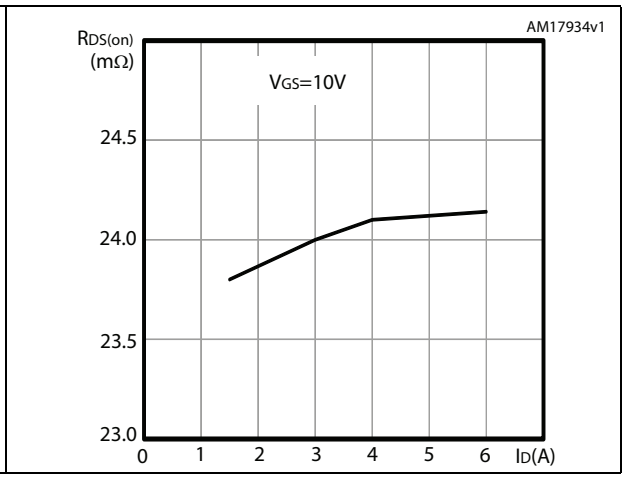


Figure 8. Capacitance variations

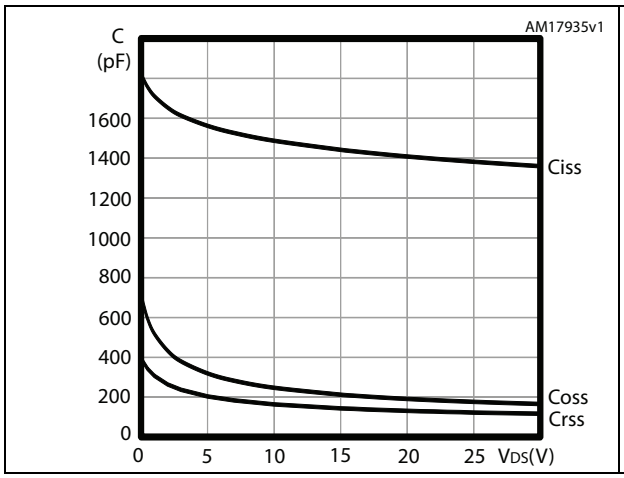


Figure 9. Normalized gate threshold voltage vs temperature

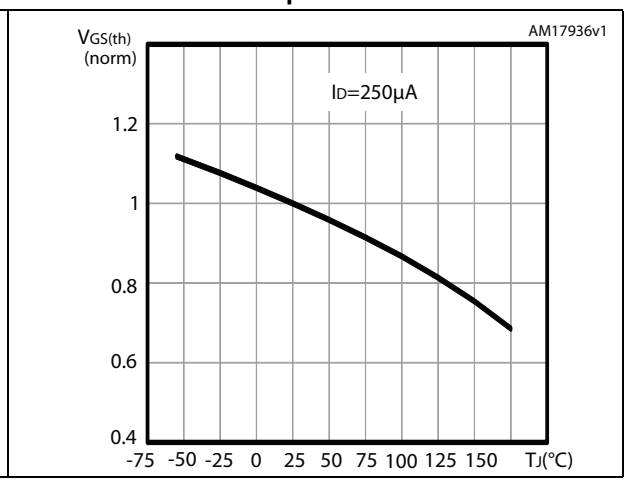


Figure 10. Normalized on-resistance vs temperature

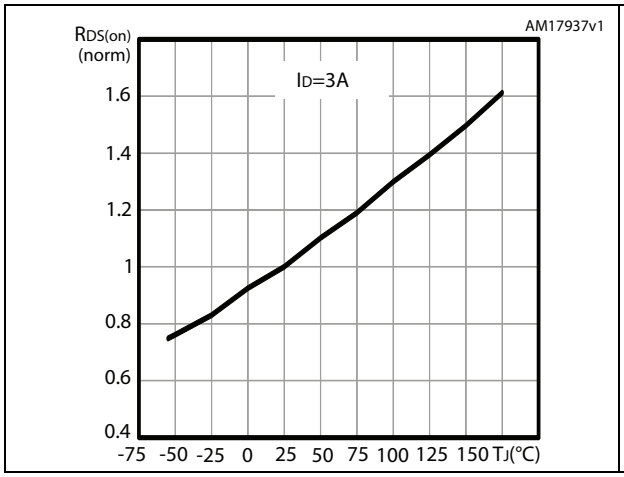


Figure 11. Normalized V_{DS} vs temperature

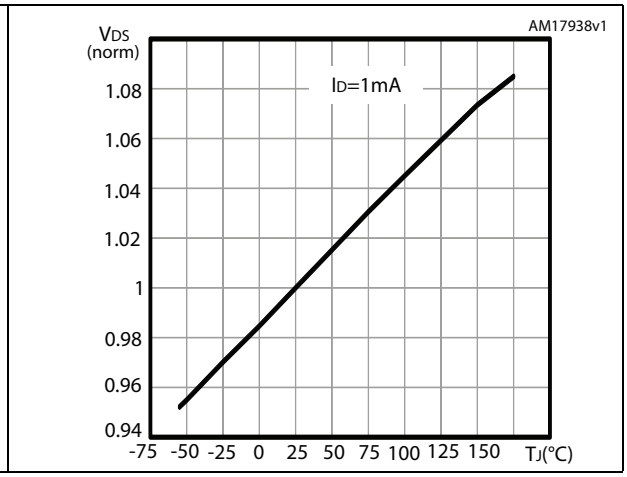
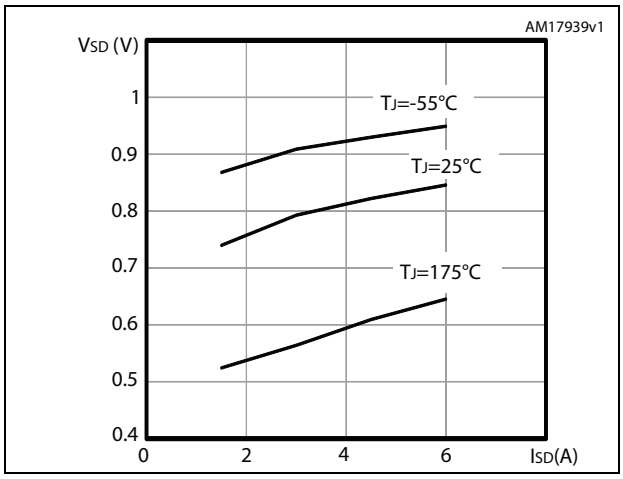


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

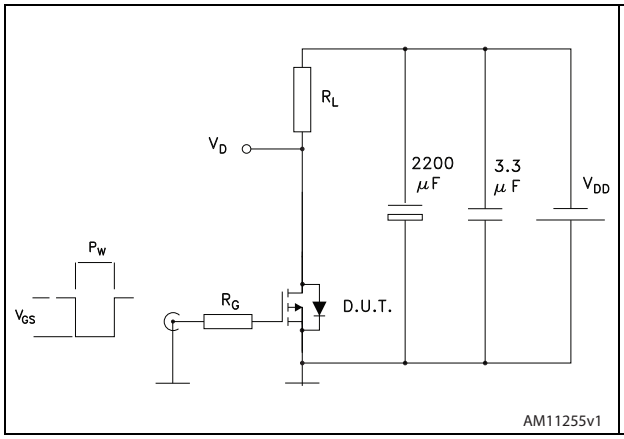


Figure 14. Gate charge test circuit

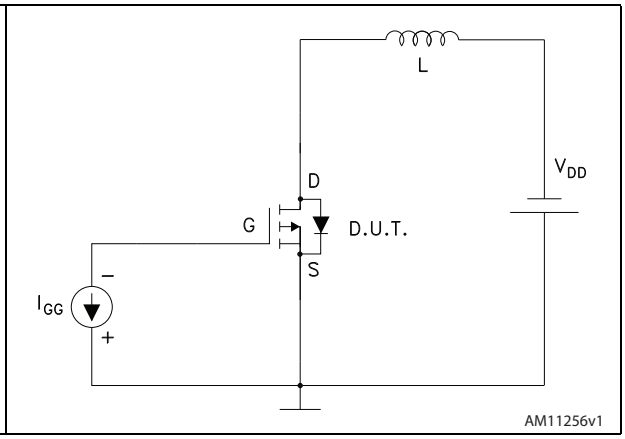
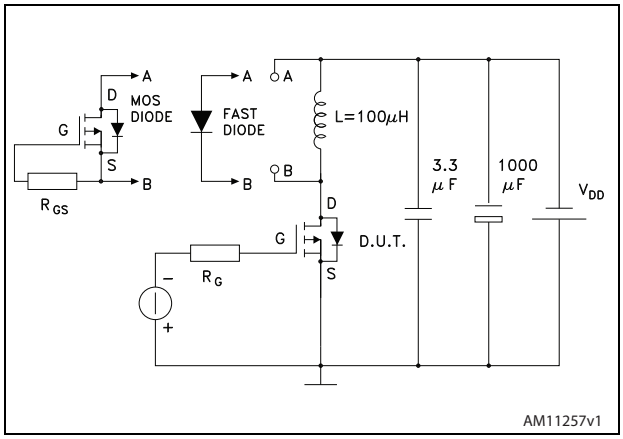


Figure 15. Test circuit for diode recovery behavior



4 Package mechanical data

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.

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 16. SO-8 drawing

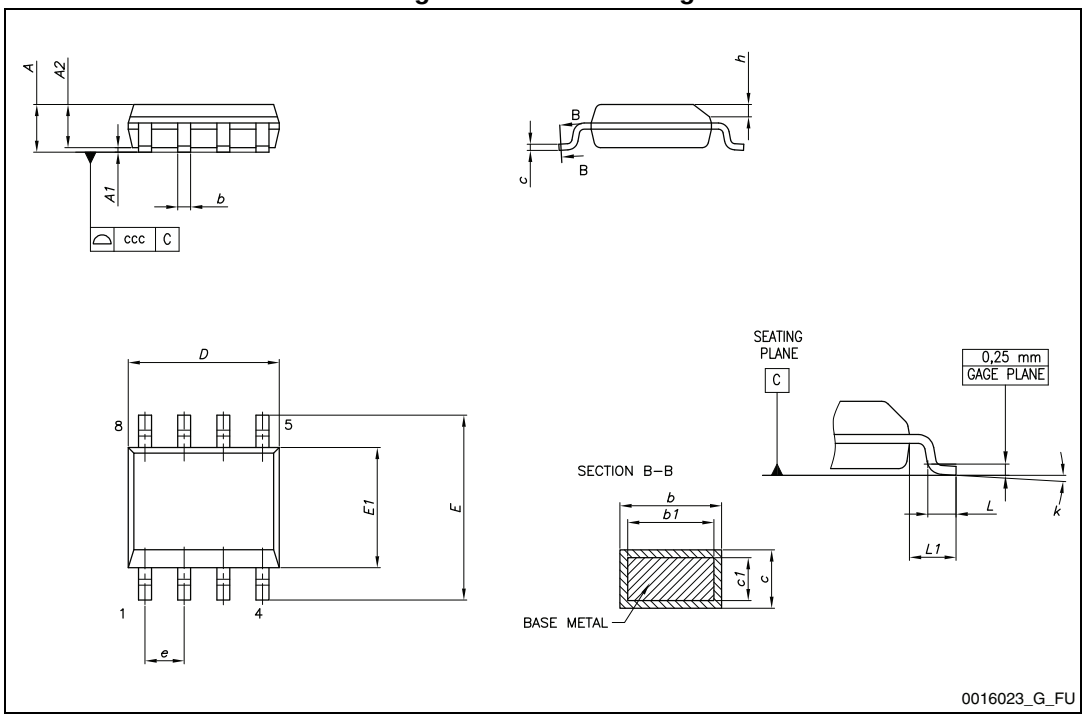
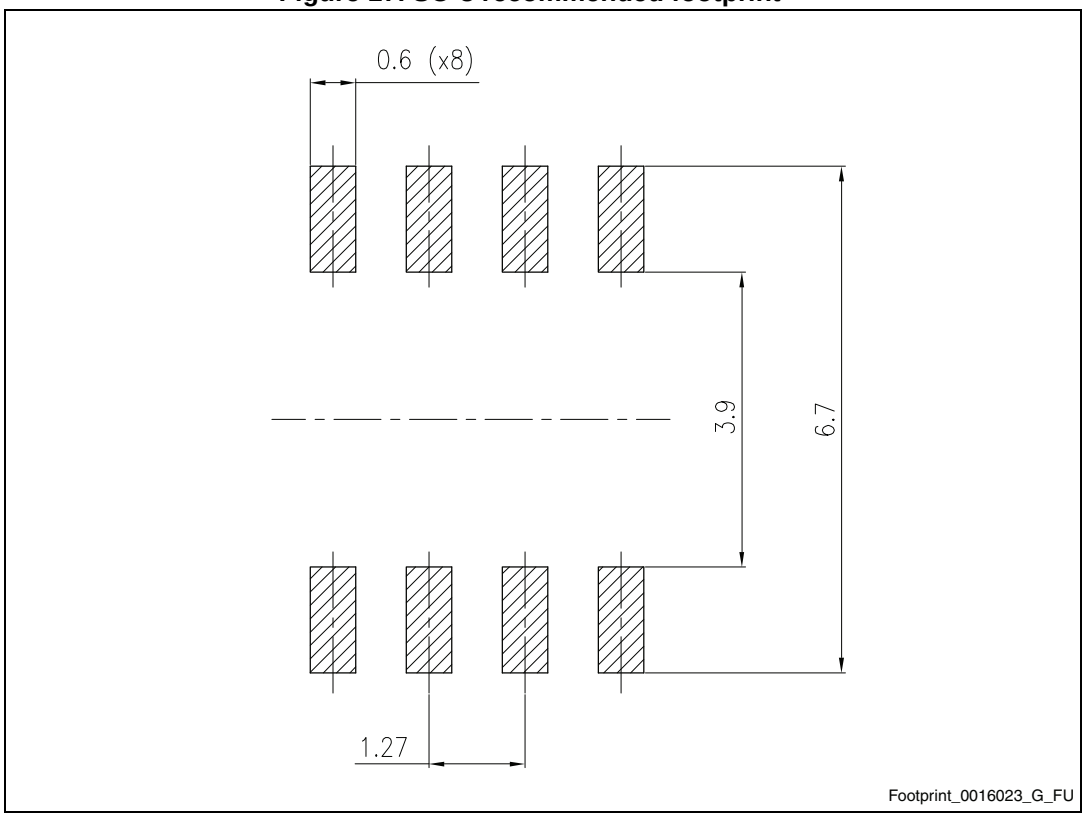


Figure 17. SO-8 recommended footprint(a)



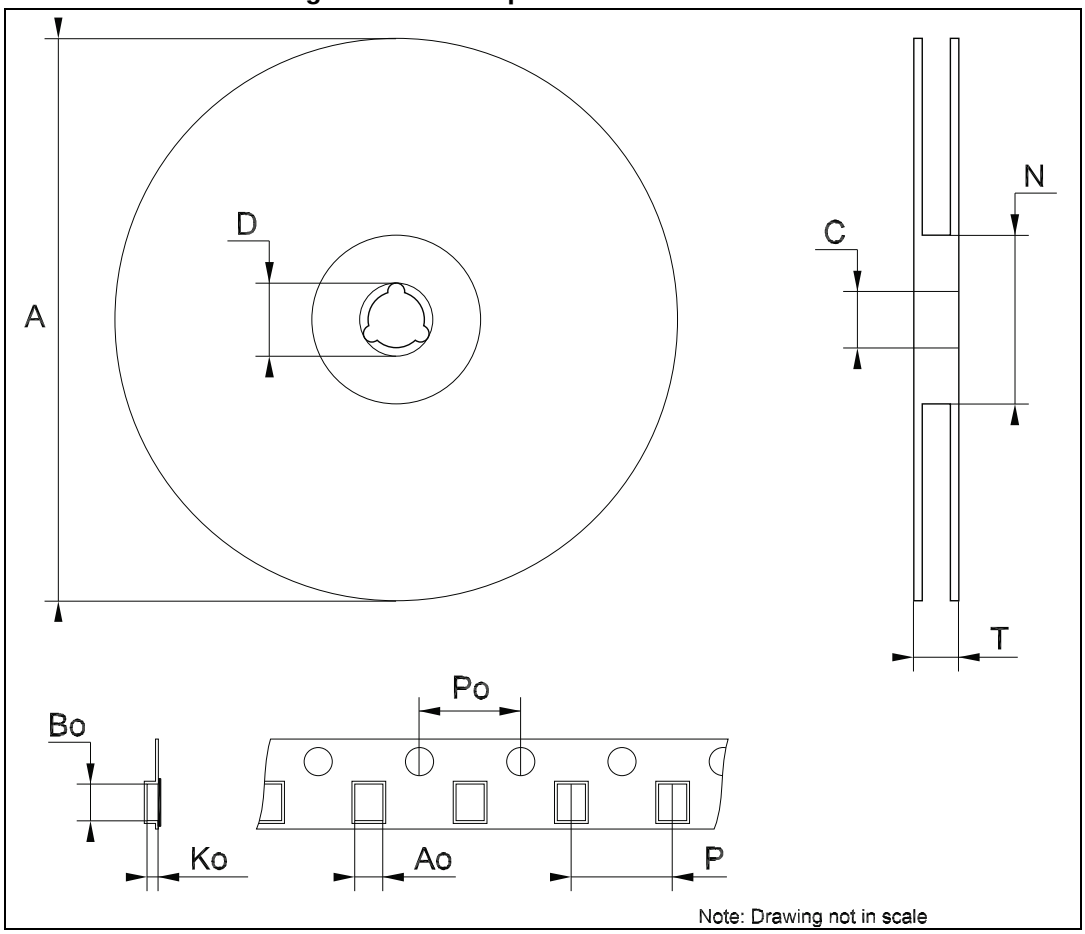
a. All dimensions are in millimeters.

5 Packaging mechanical data

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

Figure 18. SO-8 tape and reel dimensions



6 Revision history

Table 10. Revision history

Date	Revision	Changes
01-Feb-2013	1	First revision.
28-Nov-2013	2	– Modified: $R_{DS(on)}$ value in cover page – Modified: V_{GS} value in *Table 2* – Modified: IGSS test conditions value in *Table 4* – Modified: Q_g typical value in *Table 5* – Added: *Section 2.1: Electrical characteristics (curves)* – Minor text changes

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