

Automotive-grade dual N-channel 60 V, 0.035 Ω typ., 5 A STripFET™ II Power MOSFET in an SO-8 package

Datasheet - production data

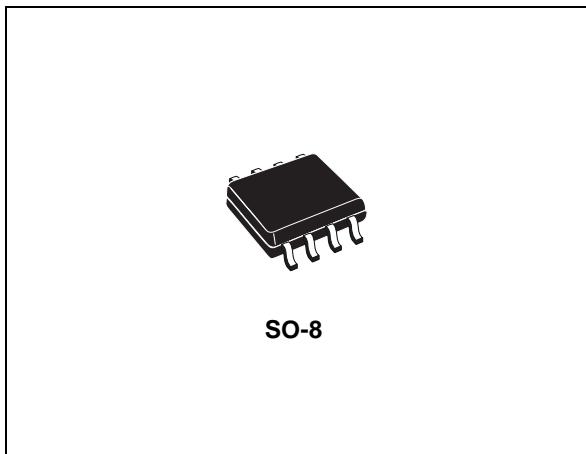
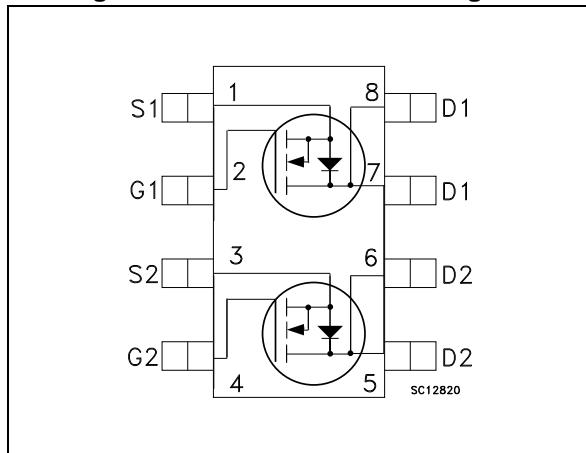


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STS5DNF60L	60 V	0.045 Ω	5 A

- AEC-Q101 qualified
- Low threshold drive



Applications

- Switching applications

Description

This Power MOSFET has been developed using the STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

Table 1. Device summary

Order code	Marking	Package	Packing
STS5DNF60L	5DF60L	SO-8	Tape and reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	6
3	Test circuits	8
4	Package information	9
4.1	SO-8 package information	9
4.2	Packing information	11
5	Revision history	13

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate- source voltage	± 15	V
I_D	Drain current (continuous) at $T_{pcb} = 25^\circ\text{C}$	5	A
I_D	Drain current (continuous) at $T_{pcb} = 100^\circ\text{C}$	3	A
$I_{DM}^{(1)}$	Drain current (pulsed)	16	A
$P_{TOT}^{(2)}$	Total dissipation at $T_{pcb} = 25^\circ\text{C}$	2	W
T_j	Operating junction temperature range	-55 to 150	$^\circ\text{C}$
T_{stg}	Storage temperature range		

1. Pulse width limited by safe operating area

2. $P_{TOT} = 1.6 \text{ W}$ for single operation

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}$	Thermal resistance junction-pcb ⁽¹⁾	62.5	$^\circ\text{C/W}$

1. When mounted on 1 inch² FR-4 board, 2 Oz Cu, $t \leq 10 \text{ s}$, dual operation

2 Electrical characteristics

($T_{CASE} = 25^\circ\text{C}$ unless otherwise specified)

Table 4. On /off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{GS} = 0 \text{ V}, V_{DS} = 60 \text{ V}$			1	μA
		$V_{GS} = 0 \text{ V}, V_{DS} = 60 \text{ V}$ $T_C = 125^\circ\text{C}$ ⁽¹⁾			10	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 15 \text{ V}$			± 100	nA
$V_{GS(\text{th})}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	1	1.7	2.5	V
$R_{DS(\text{on})}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}, I_D = 2 \text{ A}$		0.035	0.045	Ω
		$V_{GS} = 4.5 \text{ V}, I_D = 2 \text{ A}$		0.045	0.055	Ω

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

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward transconductance	$V_{DS} = 25 \text{ V}, I_D = 2 \text{ A}$	-	25	-	S
C_{iss}	Input capacitance	$V_{DS} = 25 \text{ V}, f = 1 \text{ MHz}, V_{GS} = 0 \text{ V}$	-	1030	-	pF
C_{oss}	Output capacitance			140		pF
C_{rss}	Reverse transfer capacitance			40		pF
Q_g	Total gate charge	$V_{DD} = 48 \text{ V}, I_D = 4 \text{ A}, V_{GS} = 4.5 \text{ V}$ (see Figure 13)	-	15	-	nC
Q_{gs}	Gate-source charge			4		nC
Q_{gd}	Gate-drain charge			4		nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{off})}$	Turn-off delay time	$V_{DD} = 30 \text{ V}, I_D = 2.2 \text{ A}, R_G = 4.7 \Omega, V_{GS} = 10 \text{ V}$ (see Figure 12 and Figure 17)		15		ns
t_r	Rise time		-	28	-	ns
$t_{d(\text{off})}$	Turn-off delay time			45		ns
t_f	Fall time			10		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				16	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 4 \text{ A}, V_{GS} = 0 \text{ V}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 4 \text{ A}, \text{di/dt} = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 20 \text{ V}$ (see Figure 14)	-	85		ns
Q_{rr}	Reverse recovery charge			85		nC
I_{RRM}	Reverse recovery current			2		A

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

2.1 Electrical characteristics (curves)

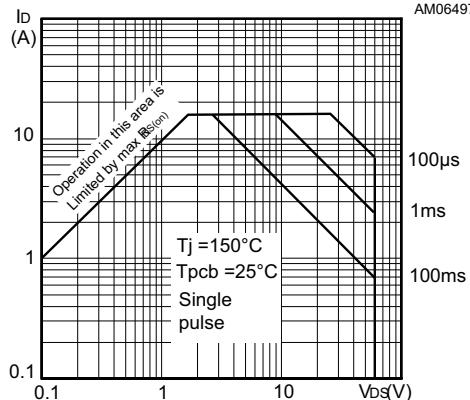
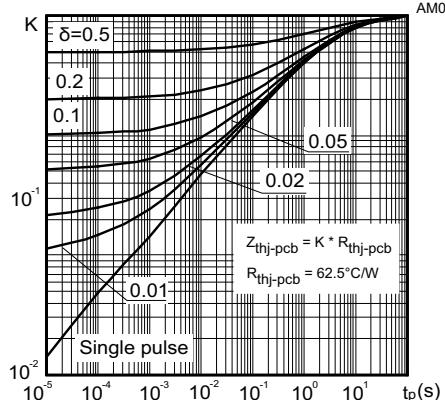
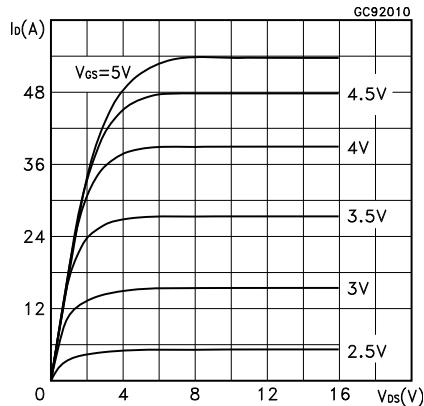
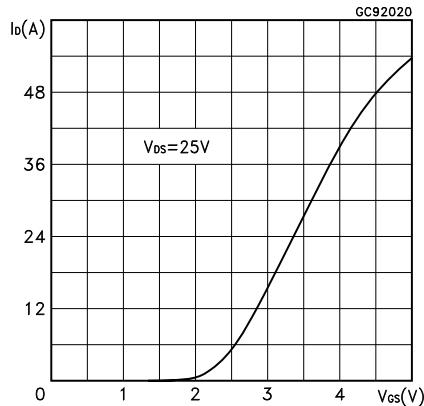
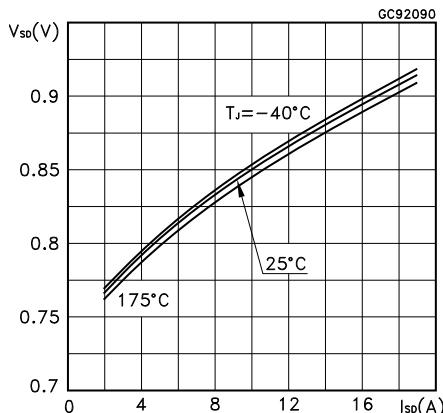
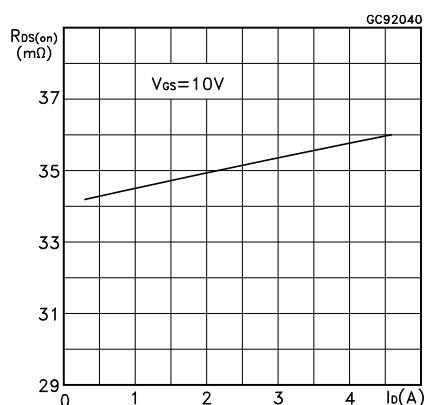
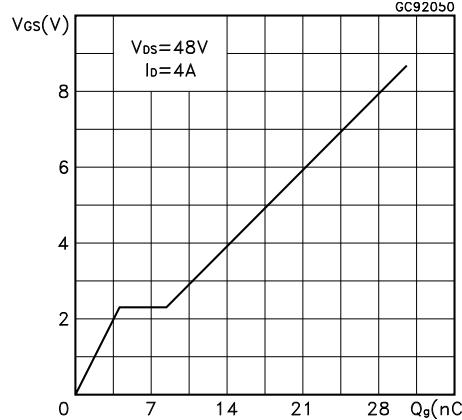
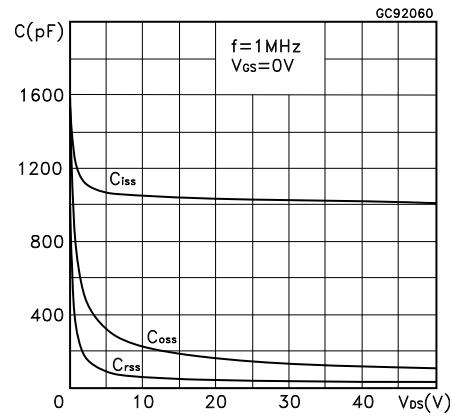
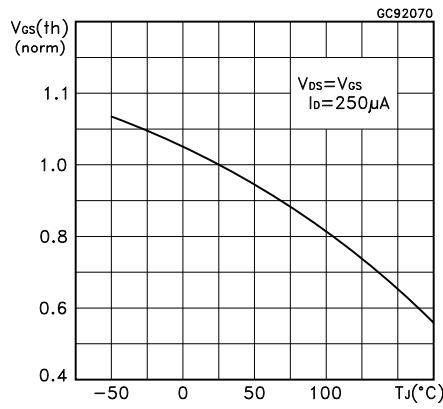
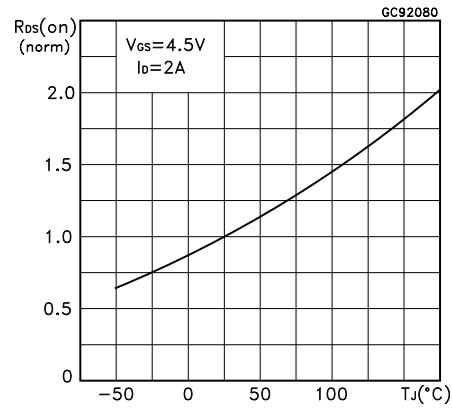
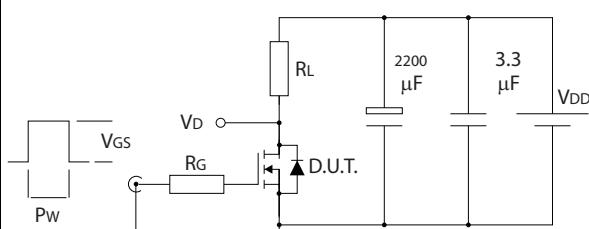
Figure 2. Safe operating area**Figure 3. Thermal impedance****Figure 4. Output characteristics****Figure 5. Transfer characteristics****Figure 6. Source-drain diode forward characteristics****Figure 7. Static drain-source on resistance**

Figure 8. Gate charge vs gate-source voltage**Figure 9. Capacitance variations****Figure 10. Normalized gate threshold voltage vs temperature****Figure 11. Normalized on resistance vs temperature**

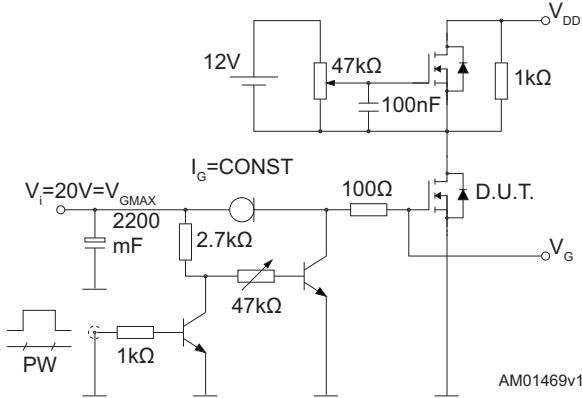
3 Test circuits

Figure 12. Switching times test circuit for resistive load



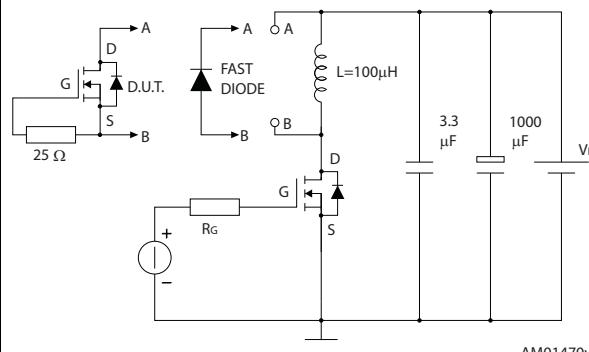
AM01468v1

Figure 13. Gate charge test circuit



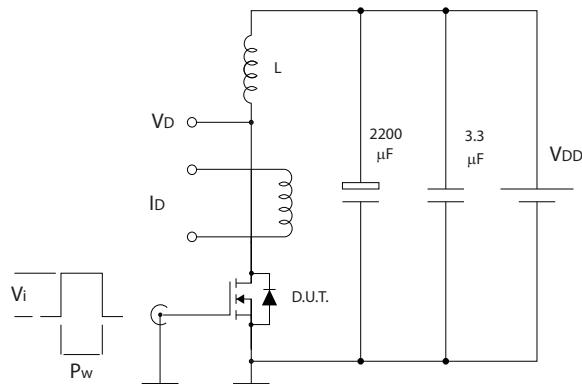
AM01469v1

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



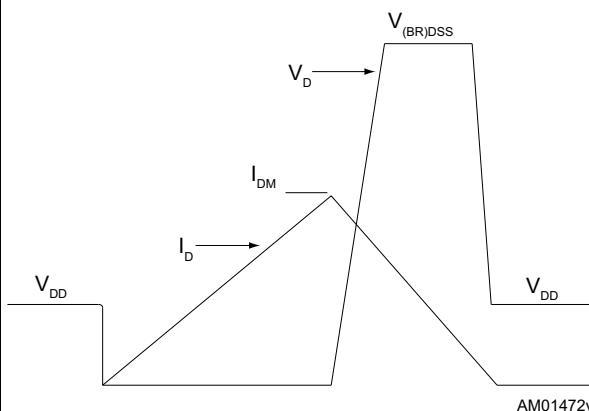
AM01470v1

Figure 15. Unclamped Inductive load test circuit



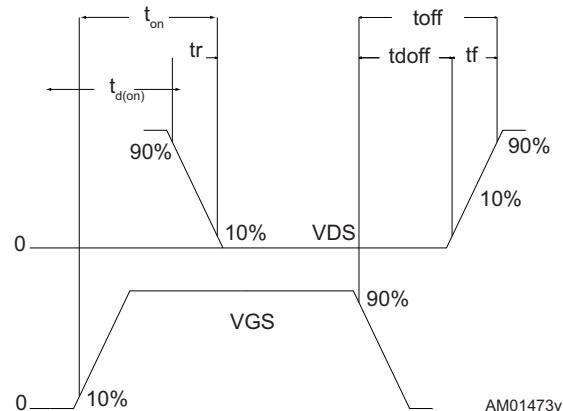
AM01471v1

Figure 16. Unclamped inductive waveform



AM01472v1

Figure 17. Switching time waveform



AM01473v1

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

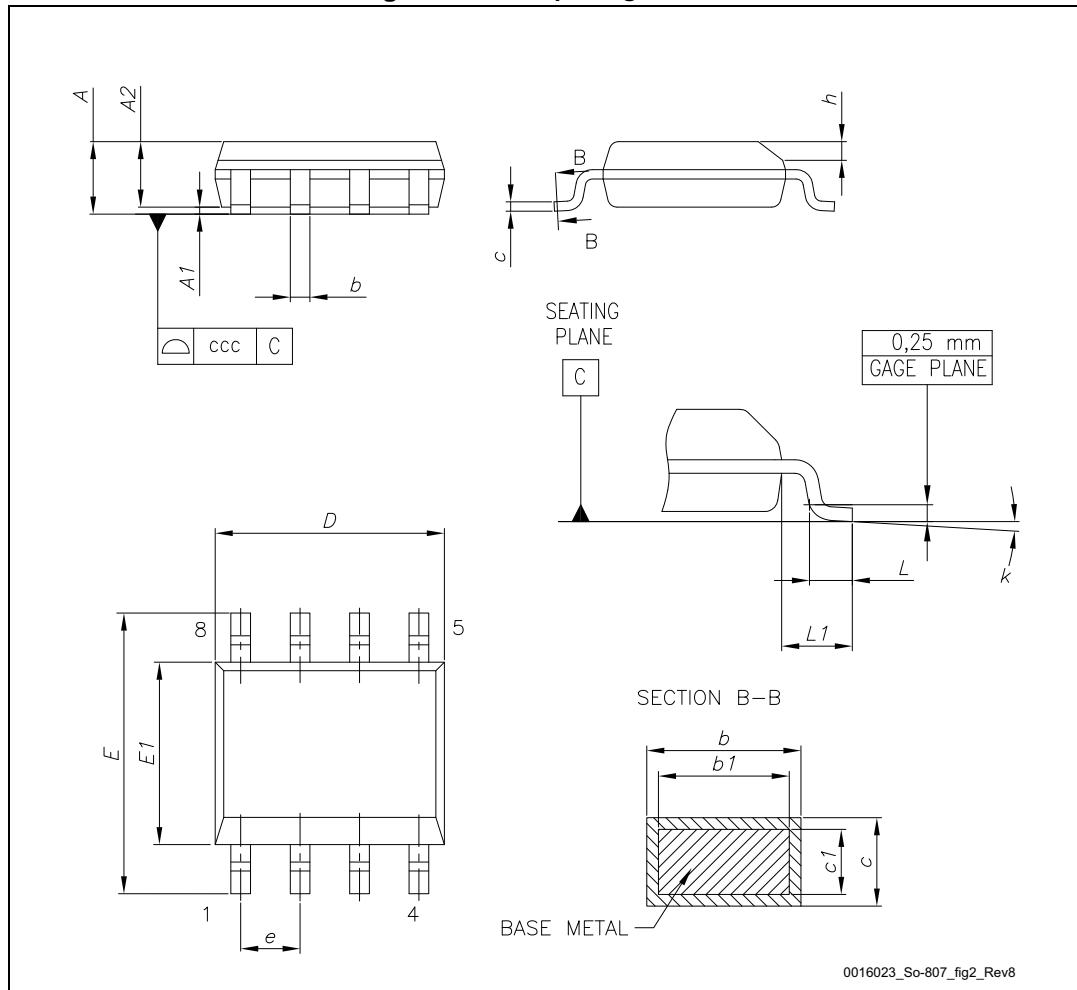
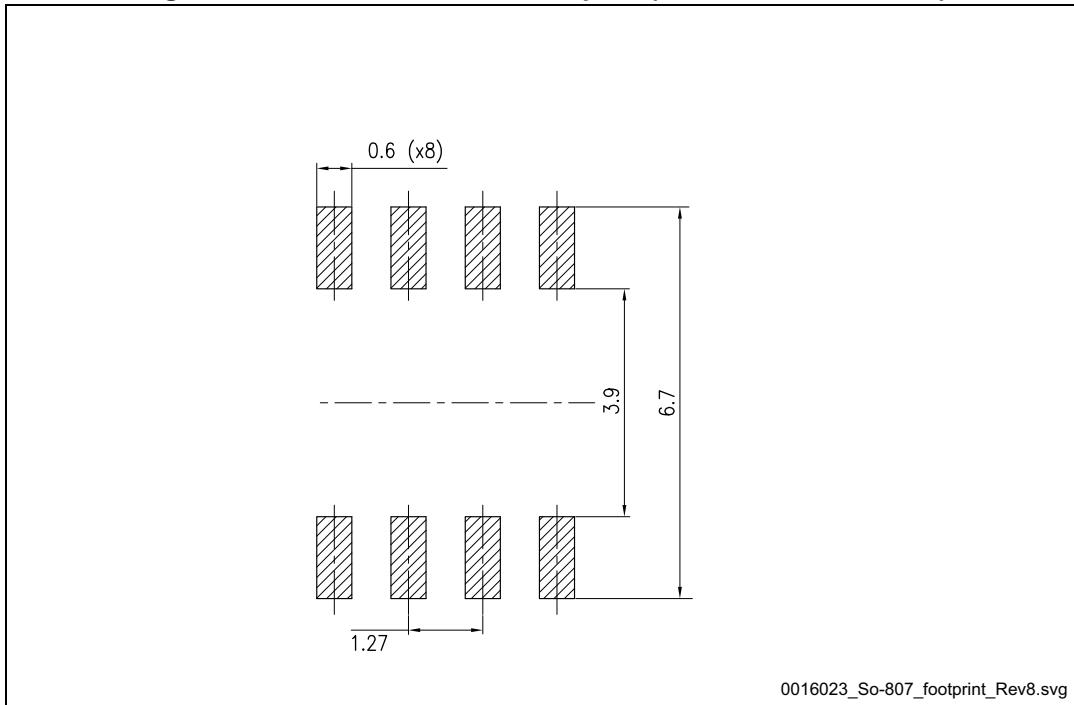


Table 8. SO-8 package mechanical data

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)

4.2 Packing information

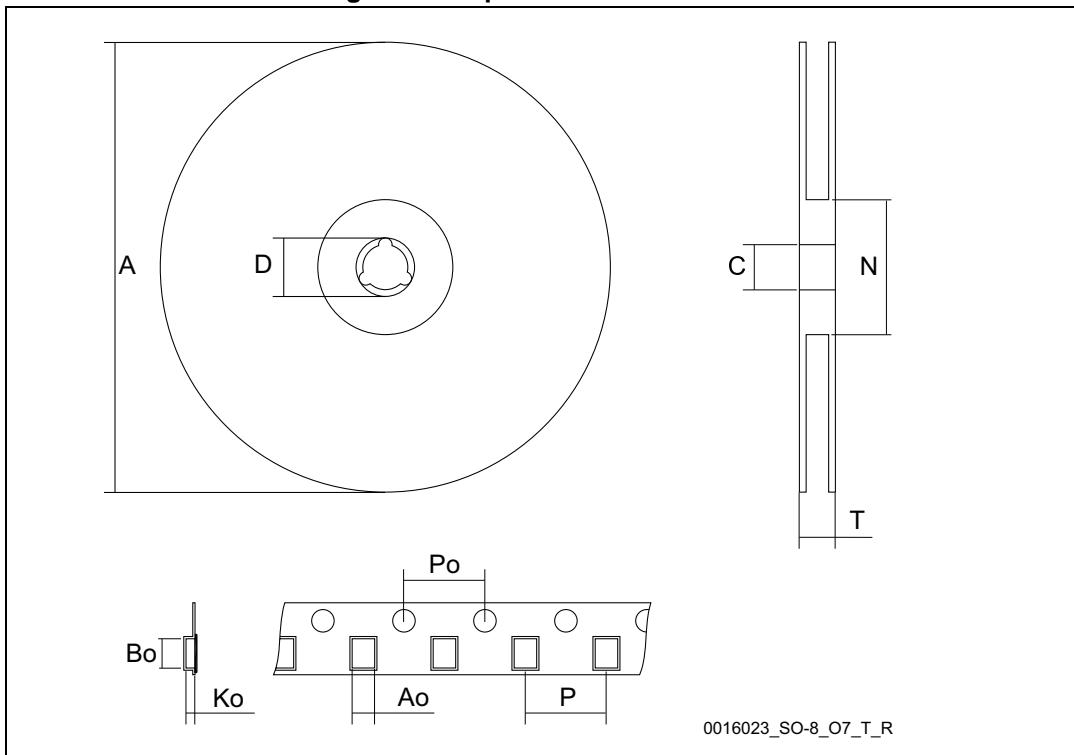
Figure 20. Tape and reel dimension

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. Revision history

Date	Revision	Changes
03-Mar-2008	1	First release
18-Mar-2010	2	<i>Figure 2: Safe operating area and Figure 3: Thermal impedance</i> have been changed.
17-Oct-2016	3	Updated title, features and description in cover page. Added AEC-Q101 qualified in the Features section. Updated Package information and Packing information . Minor text changes.

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2016 STMicroelectronics – All rights reserved



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литер Н,
помещение 100-Н Офис 331