STN3P6F6

P-channel -60 V, 0.13 Ω typ., -3 A STripFET™ F6 Power MOSFET in a SOT-223 package

Datasheet - production data

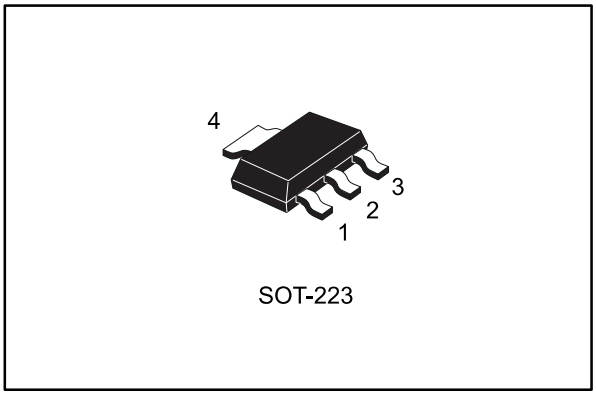
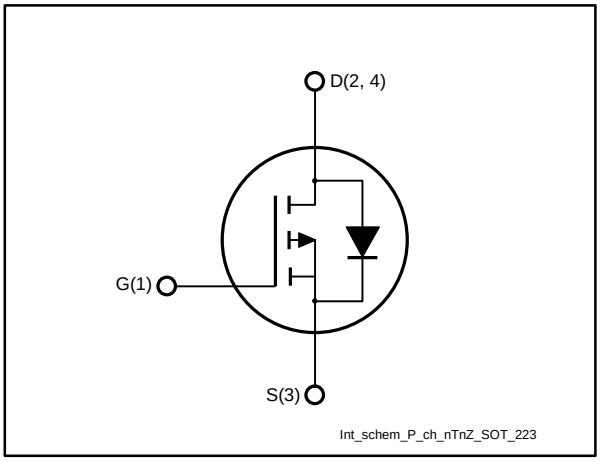


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STN3P6F6	-60 V	0.16 Ω	-3 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.

Table 1: Device summary

Order code	Marking	Package	Packing
STN3P6F6	3P6F6	SOT-223	Tape and reel

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	-60	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at T_{pcb} = 25 °C	-3	A
I_D	Drain current (continuous) at T_{pcb}= 100 °C	-2	A
I_{DM}	Drain current (pulsed)	-12	A
P_{TOT} (1)	Total dissipation at T_{pcb} = 25 °C	2.6	W
T_j	Operating junction temperature range	- 55 to 175	°C
T_{stg}	Storage temperature range		°C

Notes:

(1)Pulse width is limited by safe operating area

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-pcb	57	°C/W

Notes:

(1)When mounted on FR-4 board of 1 inch², 2 Oz Cu, t<10 s

2 Electrical characteristics

(T_C= 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(V_{GS} = 0)	I_D = -250 µA	-60			V
I_{DSS}	Zero gate voltage Drain current (V_{GS}= 0)	V_{DS} = -60 V			-1	µA
		V_{DS} = -60 V, T_C= 125 °C(1)			-10	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	-2		-4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = -10 V, I_D = -1.5 A		0.13	0.16	Ω

Notes:

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

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = -48 V, f = 1 MHz, V_{GS} = 0	-	340	-	pF
C_{oss}	Output capacitance		-	40	-	pF
C_{rss}	Reverse transfer capacitance		-	20	-	pF
Q_g	Total gate charge	V_{DD} = -48 V, I_D = -3 A, V_{GS} = -10 V (see *Figure 14: "Gate charge test circuit"*)	-	6.4	-	nC
Q_{gs}	Gate-source charge		-	1.7	-	nC
Q_{gd}	Gate-drain charge		-	1.7	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = -48 V, I_D = -1.5 A , R_G = 4.7 Ω, V_{GS} = -10 V (see *Figure 13: "Switching times test circuit for resistive load"*)	-	6.4	-	ns
t_r	Rise time		-	5.3	-	ns
$t_{d(off)}$	Turn-off delay time		-	14	-	ns
t_f	Fall time		-	3.7	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		-3	A
I_{SDM} (1)	Source-drain current (pulsed)		-		-12	A
V_{SD} (2)	Forward on voltage	I_{SD} = -3 A, V_{GS} = 0	-		-1.1	V
t_{rr}	Reverse recovery time	I_{SD} = -5 A, di/dt = 100 A/µs, V_{DD} = -16 V, T_j = 150 °C (see *Figure 15: "Test circuit for inductive load switching and diode recovery times"*)	-	20		ns
Q_{rr}	Reverse recovery charge		-	17.8		nC
I_{RRM}	Reverse recovery current		-	-1.8		A

Notes:

(1)Pulse width limited by safe operating area.

(2)Pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

For the P-channel Power MOSFET, current polarity of voltages and current have to be reversed .

Figure 2: Safe operating area

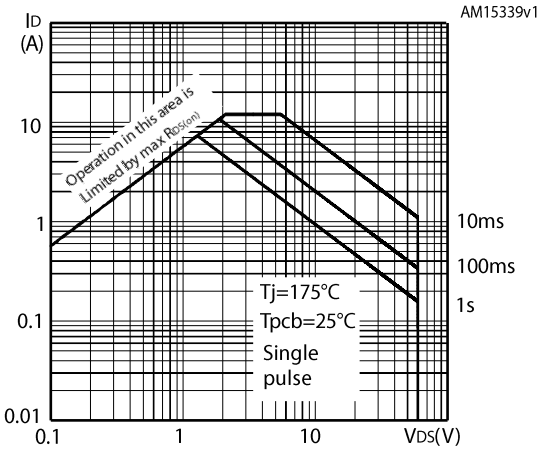


Figure 3: Thermal impedance

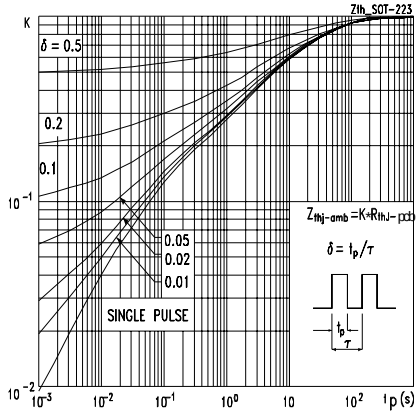


Figure 4: Output characteristics

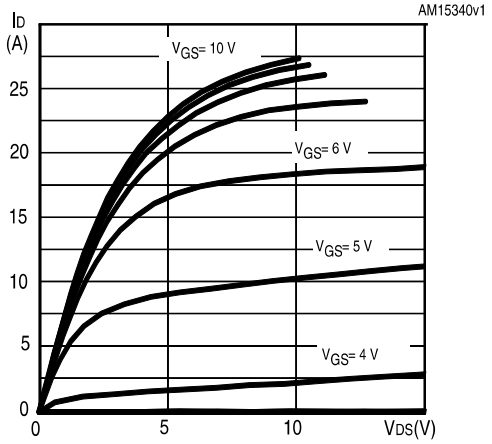


Figure 5: Transfer characteristics

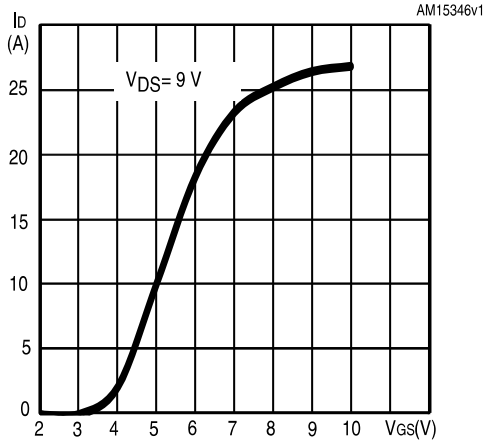


Figure 6: Gate charge vs gate-source voltage

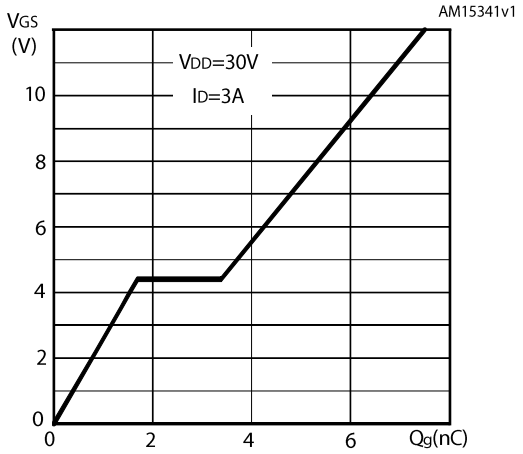


Figure 7: Static drain-source on-resistance

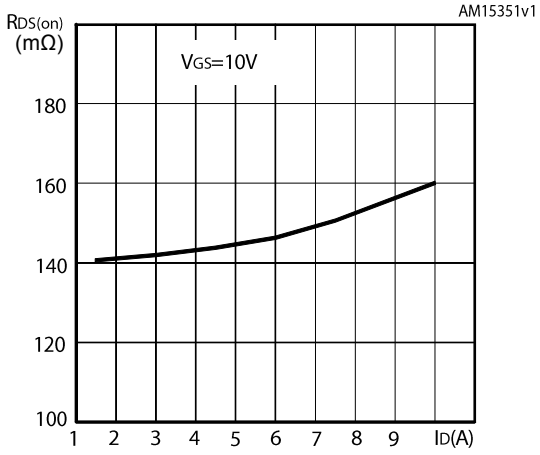


Figure 8: Capacitance variations

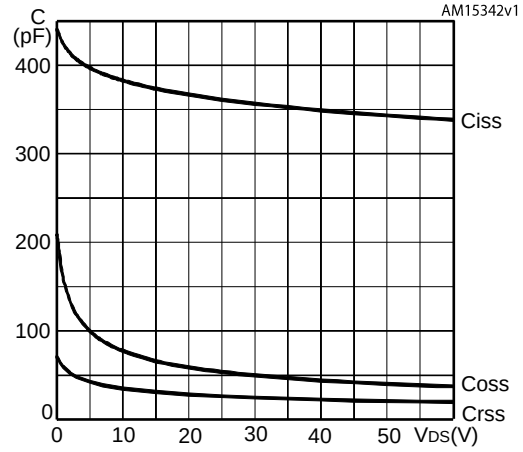


Figure 9: Normalized V(BR)DSS vs. temperature

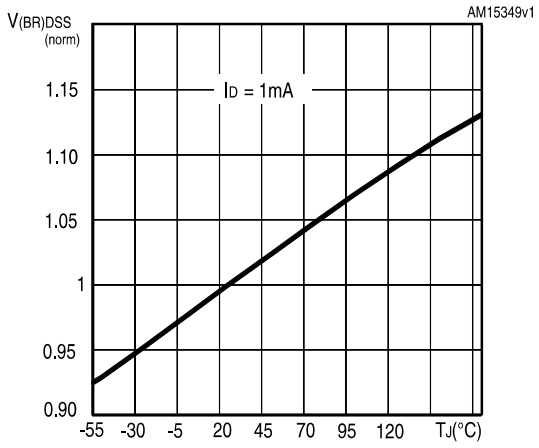


Figure 10: Normalized gate threshold voltage vs temperature

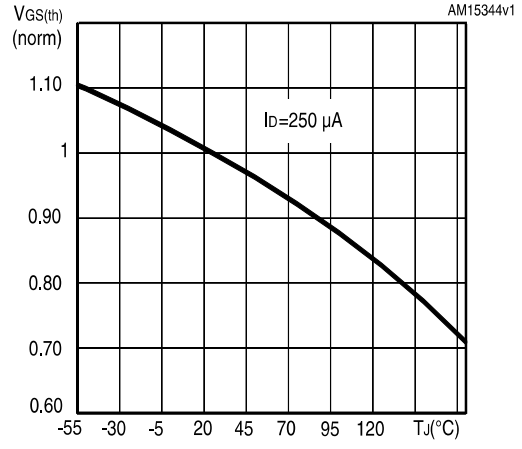


Figure 11: Normalized on-resistance vs. temperature

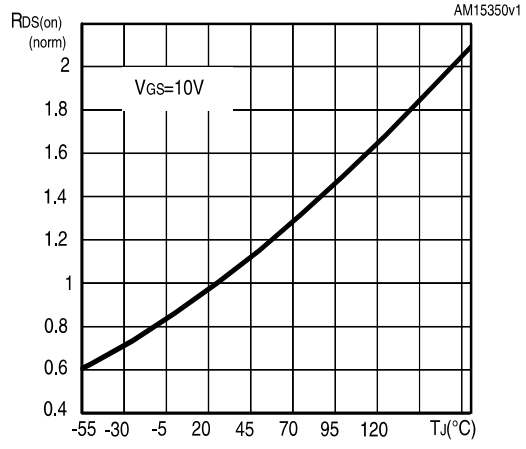
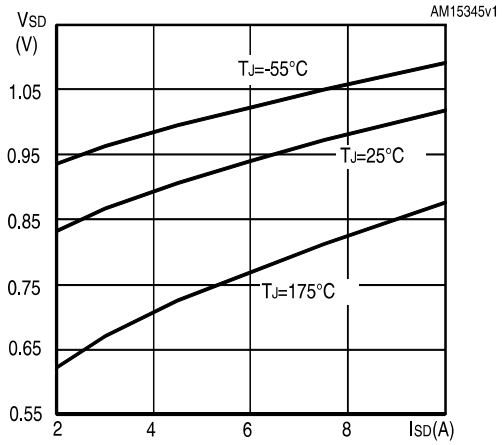


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Switching times test circuit for resistive load

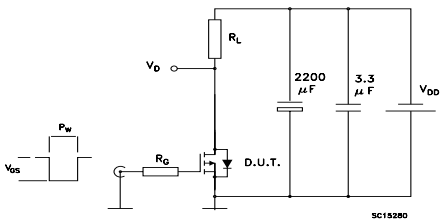


Figure 14: Gate charge test circuit

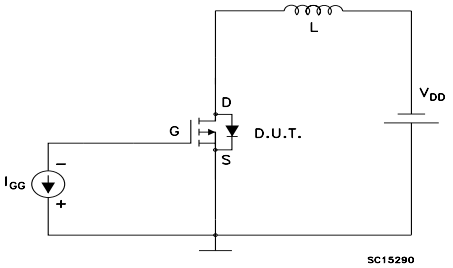
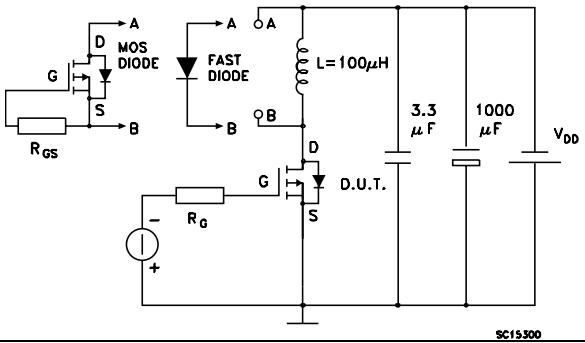


Figure 15: Test circuit for inductive load switching and diode recovery times



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.

Figure 16: SOT-223 package outline

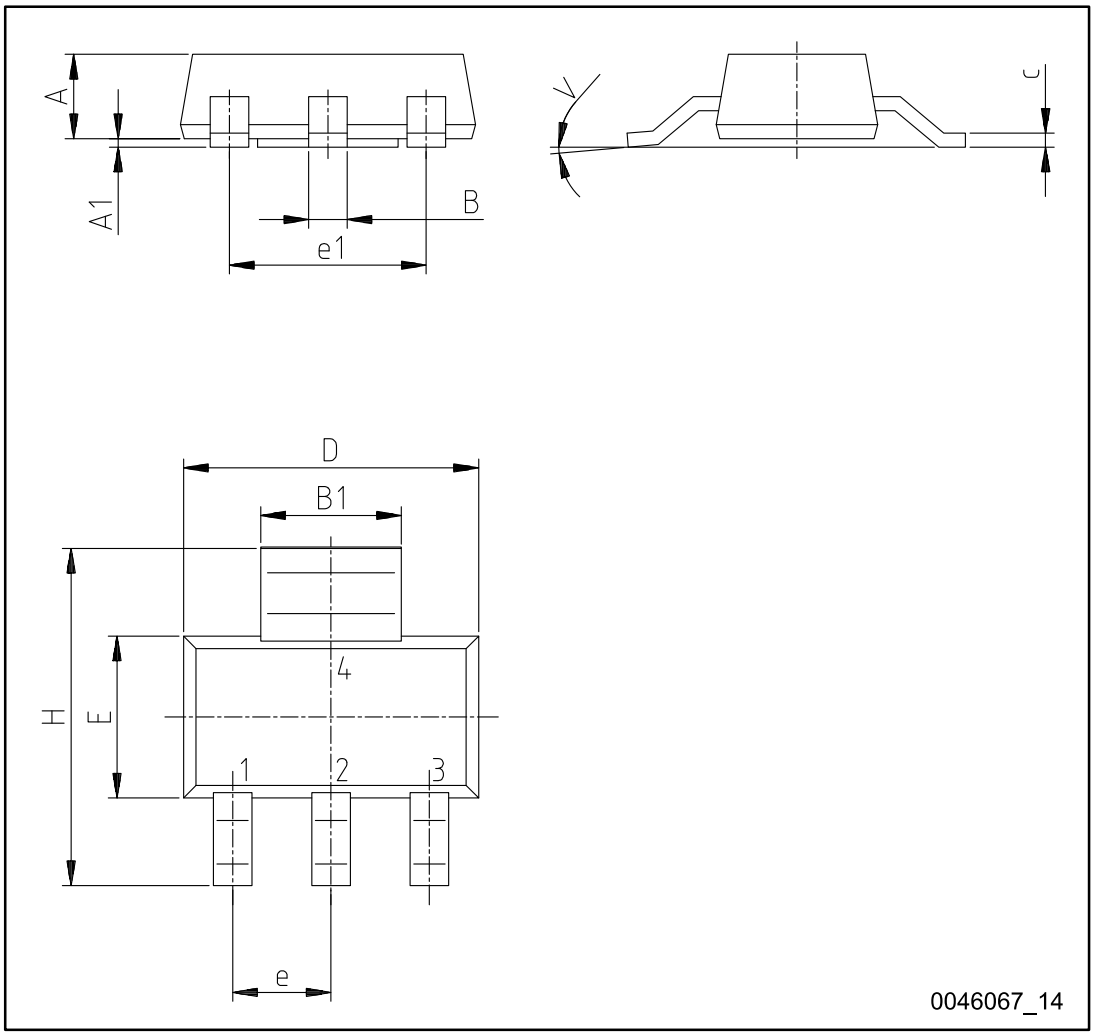
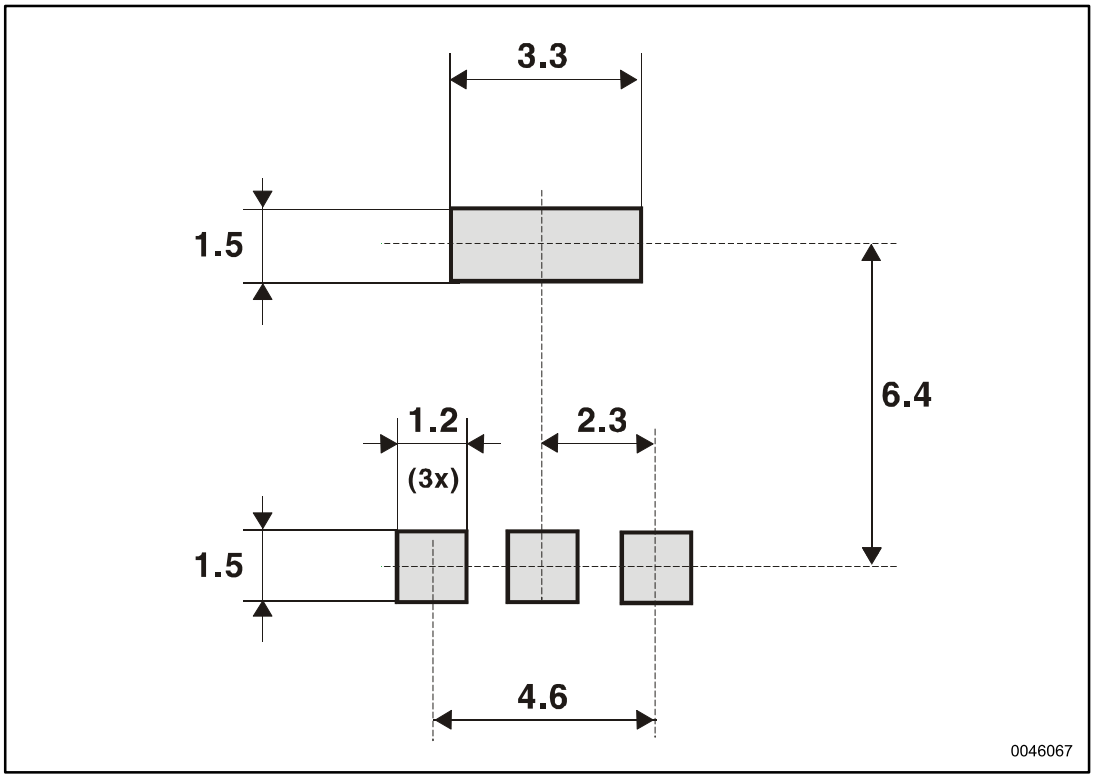


Table 8: SOT-223 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.8
A1	0.02		0.1
B	0.6	0.7	0.85
B1	2.9	3	3.15
c	0.24	0.26	0.35
D	6.3	6.5	6.7
e		2.3	
e1		4.6	
E	3.3	3.5	3.7
H	6.7	7.0	7.3
V			10º

Figure 17: SOT-223 recommended footprint (dimensions are in mm)



5 Revision history

Table 9: Document revision history

Date	Revision	Changes
31-Oct-2012	1	First release.
09-Nov-2012	2	Modified: note 1 in Table 3
16-Jan-2013	3	Document status promoted from preliminary data to production data
14-Mar-2013	4	Modified: Figure 1, 3, Ciss, Coss, Crss typical values in Table 5
07-Oct-2016	5	Updated title, features and description in cover page. Updated silhouette and *Figure 1: "Internal schematic diagram"*. Updated *Figure 16: "SOT-223 package outline"*. Minor text changes.

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