



STN3PF06

P-channel 60 V - 0.20 Ω - 2.5 A - SOT-223
STripFET™ II Power MOSFET

Features

Type	V _{DSS}	R _{DS(on)} max	I _D
STN3PF06	60 V	< 0.22 Ω	2.5 A

- Extremely dv/dt capability
- 100% avalanche tested
- Application oriented characterization

Application

- Switching applications

Description

This Power MOSFET is the latest development of STMicroelectronics unique “single feature size” strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

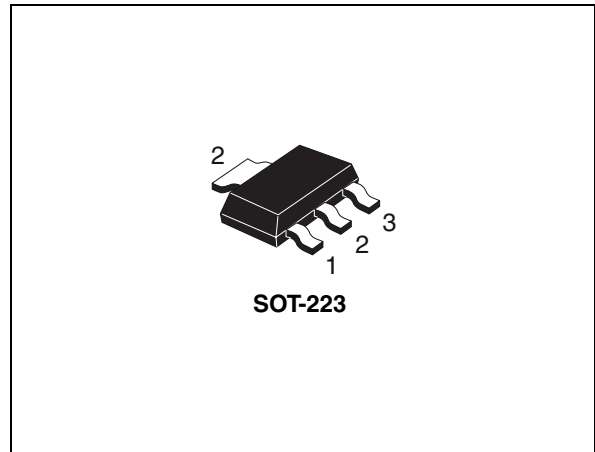


Figure 1. Internal schematic diagram

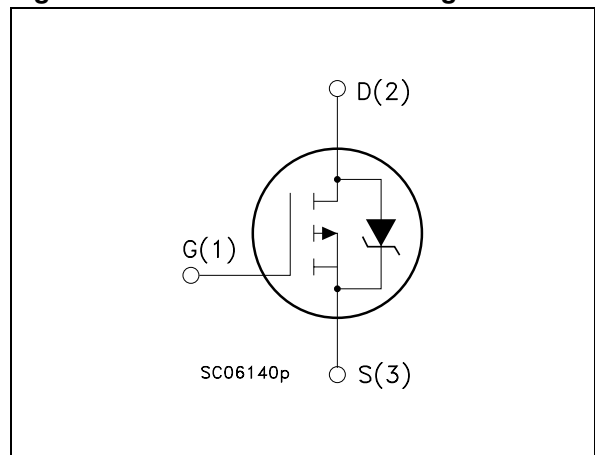


Table 1. Device summary

Order code	Marking	Package	Packaging
STN3PF06	N3PF06	SOT-223	Tape and reel

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	60	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	2.5	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	1.5	A
$I_{DM}^{(1)}$	Drain current (pulsed)	10	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	2.5	W
	Derating factor	0.02	W/ $^{\circ}\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	6	V/ns
T_j T_{stg}	Operating junction temperature Storage temperature	-65 to 150	$^{\circ}\text{C}$

1. Pulse width limited by safe operating area

2. $I_{SD} \leq 3\text{ A}$, $di/dt \leq 200\text{ A}/\mu\text{s}$, $V_{DD} = 80\% V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-pcb}$	Thermal resistance junction-pcb board max	50	$^{\circ}\text{C}/\text{W}$
R_{thj-a}	Thermal resistance junction-ambient max ⁽¹⁾	62.5	$^{\circ}\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose	260	$^{\circ}\text{C}$

1. Surface mounted

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

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0$	60			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}$, $T_C=125\text{ }^{\circ}\text{C}$			1 10	μA μA
$I_{D(on)}$	On state drain current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $V_{GS}=10\text{ V}$	2.5			A
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$, $I_D = 1.5\text{ A}$		0.20	0.22	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, $I_D = 1.25\text{ A}$		1.5		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0$		850 230 75		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$I_D = 12\text{ A}$, $V_{DD} = 48\text{ V}$, $V_{GS} = 10\text{ V}$ (see Figure 14)		16 4 6	21	nC nC nC

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

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	$V_{DD}=30\text{ V}$, $I_D=6\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ (see Figure 13)		20 40		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	$V_{DD}=30\text{ V}$, $I_D=6\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ (see Figure 13)		40 10		ns ns
$t_{r(Voff)}$ t_f t_c	Off-voltage rise time Fall time Cross-over time	$V_{clamp}=48\text{ V}$, $I_D=12\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ (see Figure 13)		10 17 30		ns ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)				2.5 10	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=1.5\text{ A}$, $V_{GS}=0$			1.2	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=12\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$ $V_{DD}=30\text{ V}$, $T_j=150\text{ }^\circ\text{C}$		100 260 5.2		ns μC A

1. Pulse width limited by T_{jmax}

2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

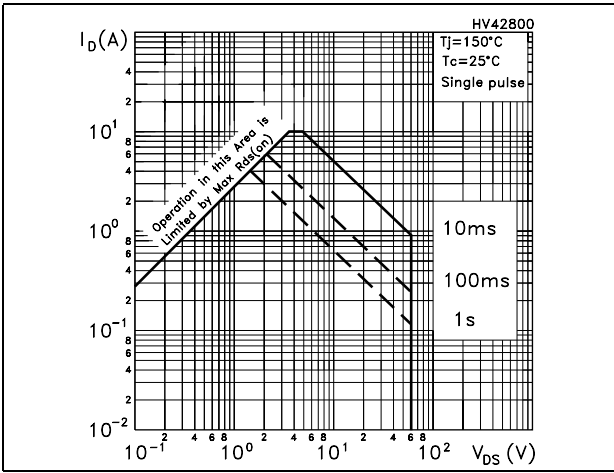


Figure 3. Thermal impedance

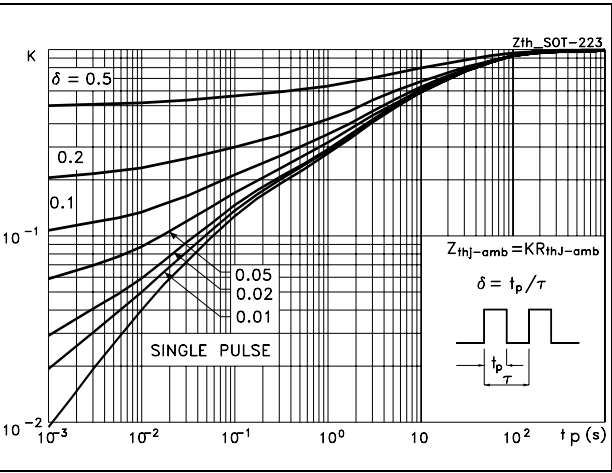


Figure 4. Output characteristics

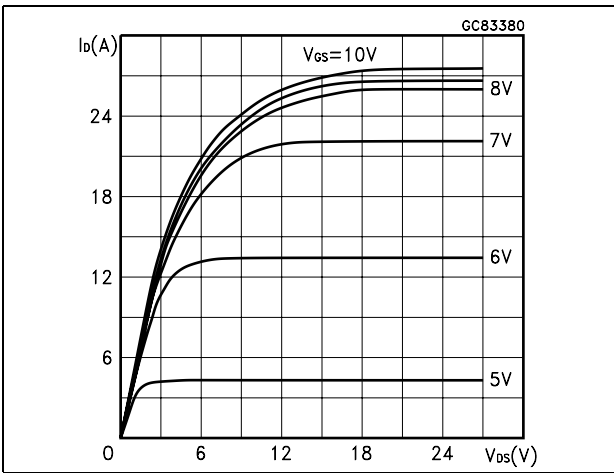


Figure 5. Transfer characteristics

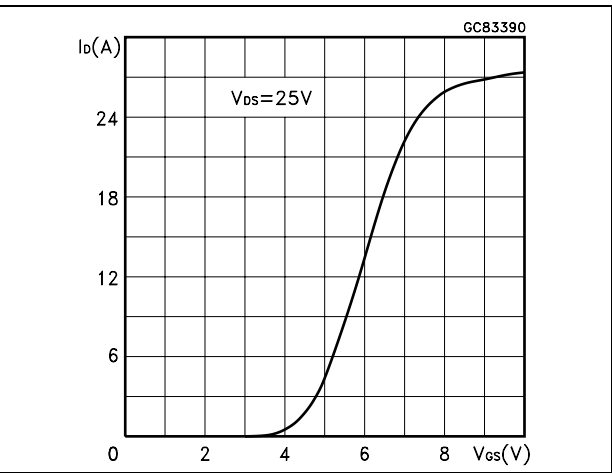


Figure 6. Transconductance

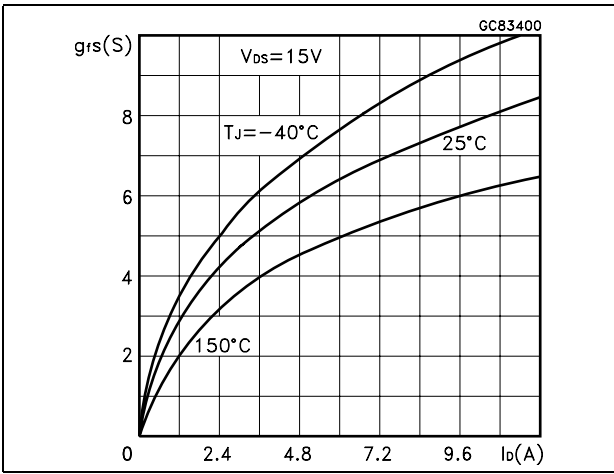


Figure 7. Static drain-source on resistance

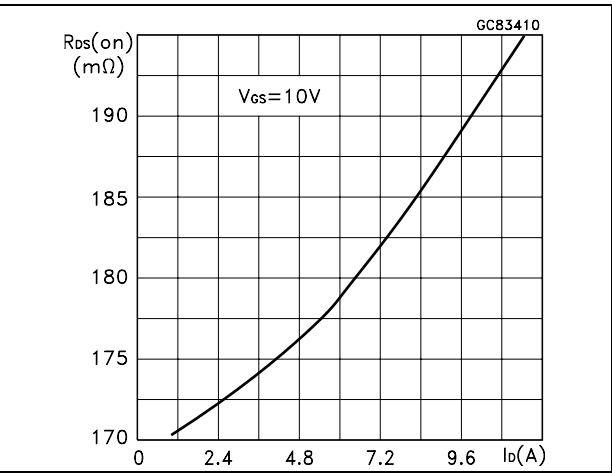


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

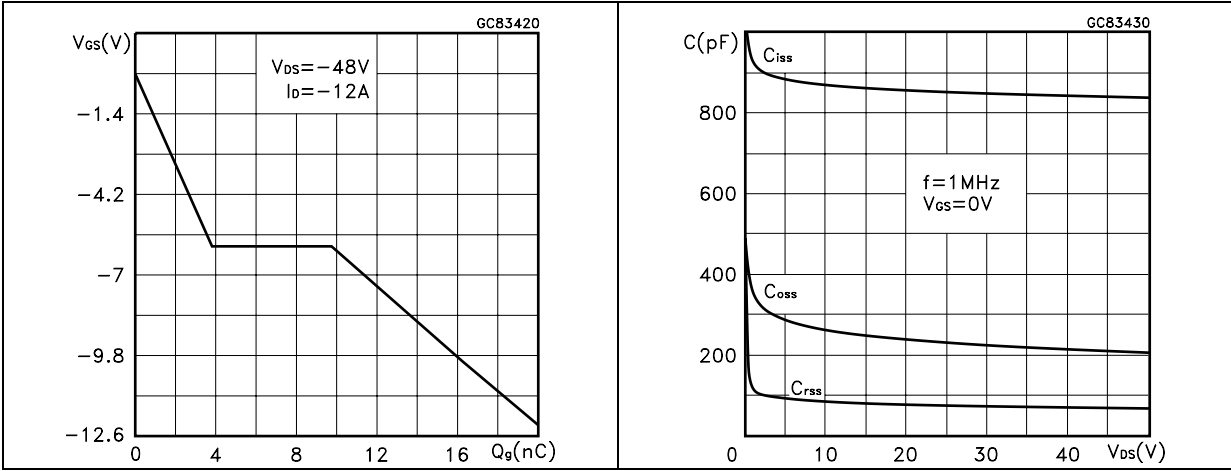


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

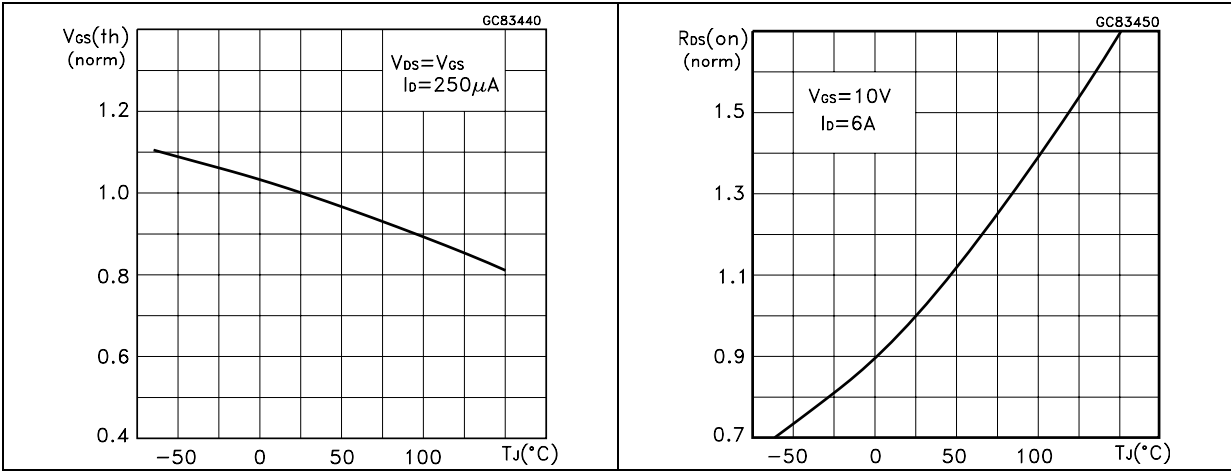
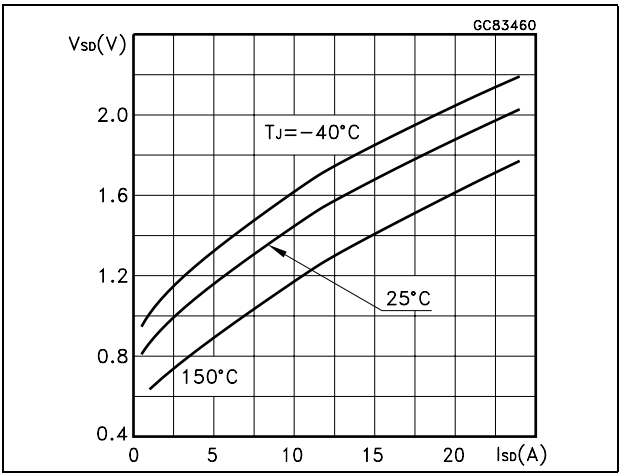


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

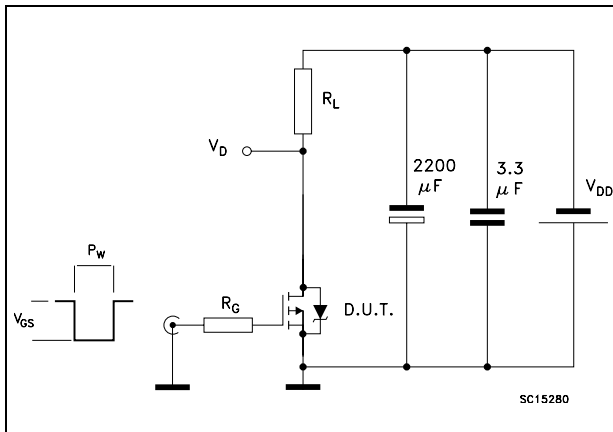


Figure 14. Gate charge test circuit

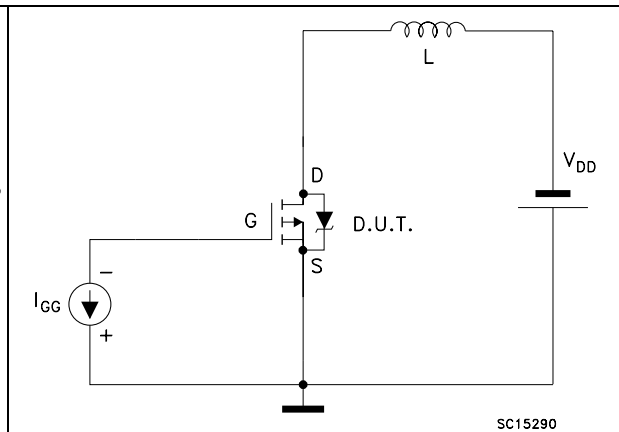
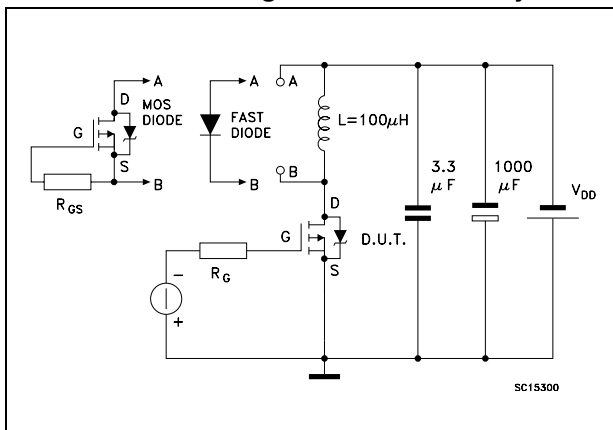


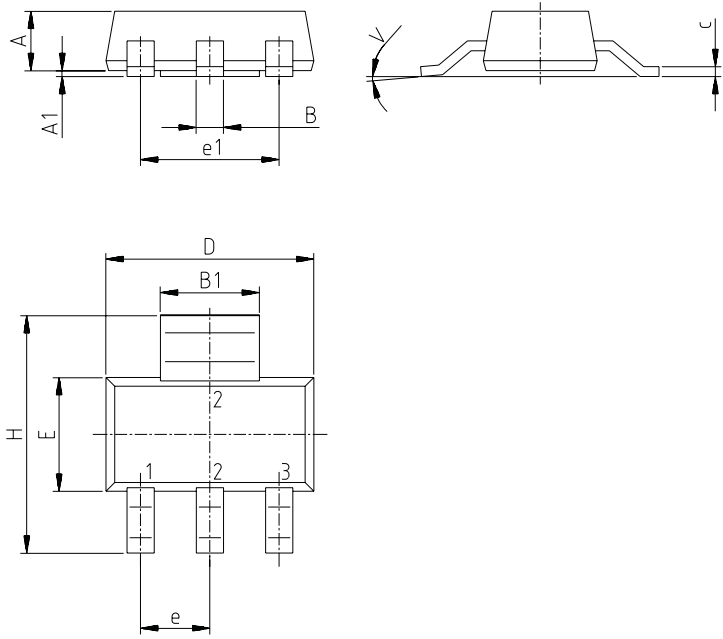
Figure 15. Test circuit for inductive load switching and diode recovery times



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

SOT-223 MECHANICAL DATA						
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.80			0.071
B	0.60	0.70	0.80	0.024	0.027	0.031
B1	2.90	3.00	3.10	0.114	0.118	0.122
c	0.24	0.26	0.32	0.009	0.010	0.013
D	6.30	6.50	6.70	0.248	0.256	0.264
e		2.30			0.090	
e1		4.60			0.181	
E	3.30	3.50	3.70	0.130	0.138	0.146
H	6.70	7.00	7.30	0.264	0.276	0.287
V			10°			10°
A1		0.02				



P008B

5 Revision history

Table 8. Document revision history

Date	Revision	Changes
08-May-2007	3	The document has been reformatted
27-Mar-2008	4	Document status promoted from preliminary data to datasheet.

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