STP77N6F6

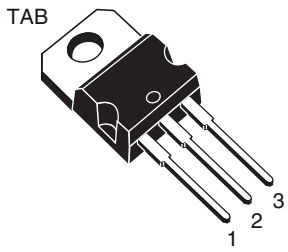
N-channel 60 V, 6.6 mΩ typ., 77 A STripFET™ VI DeepGATE™ Power MOSFET in a TO-220 package

Datasheet — production data

Features

Order code	V_{DS}	$R_{DS(on)}$ max	I_D	P_{TOT}
STP77N6F6	60 V	7.9 mΩ (V_{GS}=10 V)	77 A	80 W

- $R_{DS(on)}$ * Q_g industry benchmark
- Extremely low on-resistance $R_{DS(on)}$
- High avalanche ruggedness
- Low gate drive power losses
- Very low switching gate charge



TO-220

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.

Figure 1. Internal schematic diagram

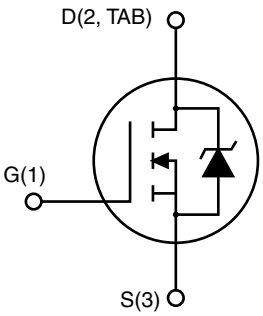


Table 1. Device summary

Order code	Marking	Package	Packaging
STP77N6F6	77N6F6	TO-220	Tube

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	
I_D (1)	Drain current (continuous) at T_c = 25 °C	77	A
I_D (1)	Drain current (continuous) at T_c = 100 °C	55	
I_{DM} (2)	Drain Current (pulsed)	308	
P_{TOT} (1)	Total dissipation at T_c = 25 °C	80	W
$T_{J\ Pstg}$	Operating junction temperature storage temperature	-55 to 175	°C

1. This value is rated according to Rthj-c
2. Pulse width is limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}c}$	Thermal resistance junction-case	1.88	°C/W
$R_{thj\text{-}a}$ (1)	Thermal resistance junction-ambient	62.5	

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

Table 4. Avalache characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by maximum junction temperature)	TBD	A
E_{AS}	Single pulse avalanche energy (T_J = 25 °C, I_D = I_{AR}, V_{DD} = 14 V)	TBD	mJ

2 Electrical characteristics

(T_J= 25 °C unless otherwise specified)

Table 5. 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 V_{DS} = 60 V, T_J=125 °C			10 100	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	V
$V_{GS(th)}$	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 = 33 A		6.6	7.9	Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0	-	5300	-	pF
C_{oss}	Output capacitance			1290		
C_{rss}	Reverse transfer capacitance			217		
Q_g	Total gate charge	V_{DD} = 30 V, I_D = 77 A, V_{GS} = 10 V	-	76	-	nC
Q_{gs}	Gate-source charge			TBD		
Q_{gd}	Gate-drain charge			TBD		
R_g	Intrinsic gate resistance	f = 1 MHz open drain	-	3.6	-	Ω

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD} = 30 V, I_D = 33A R_G = 4.7 Ω V_{GS} = 10 V	-	TBD	-	ns
$t_{d(off)}$ t_f	Turn-off-delay time Fall time		-		-	

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		77	A
I_{SDM} (1)	Source-drain current (pulsed)		-		308	A
V_{SD} (2)	Forward on voltage	I_{SD} = 77 A, V_{GS} = 0	-			V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 77 A, V_{DD} = 80 V di/dt = 100 A/µs, T_j = 150 °C	-	TBD	TBD	ns nC A

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

3 Test circuits

Figure 2. Switching times test circuit for resistive load

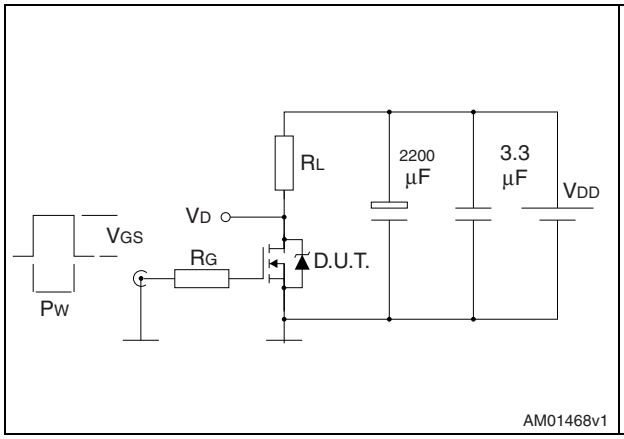


Figure 3. Gate charge test circuit

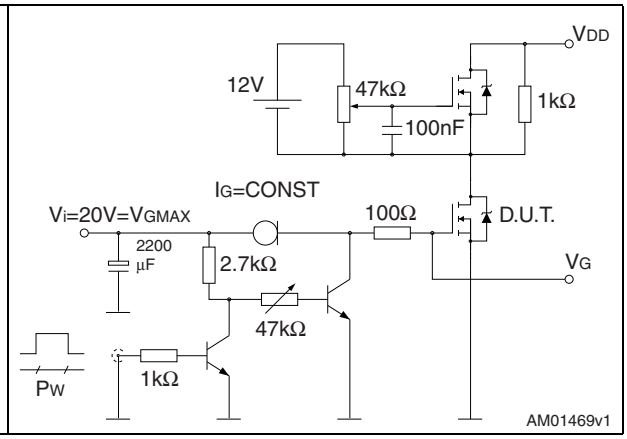


Figure 4. Test circuit for inductive load switching and diode recovery times

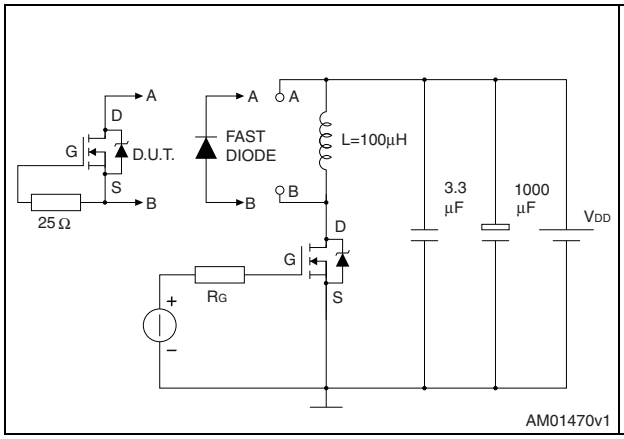


Figure 5. Unclamped inductive load test circuit

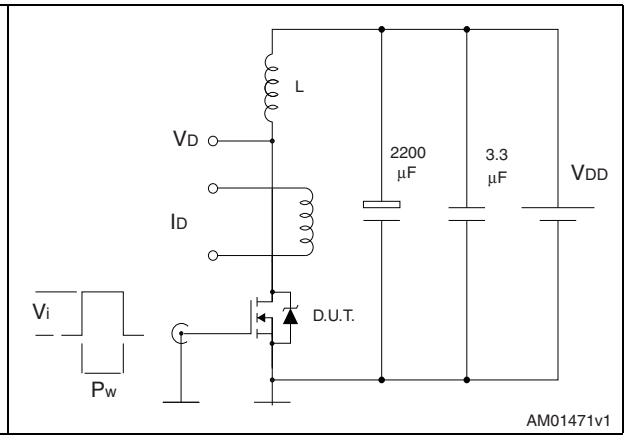


Figure 6. Unclamped inductive waveform

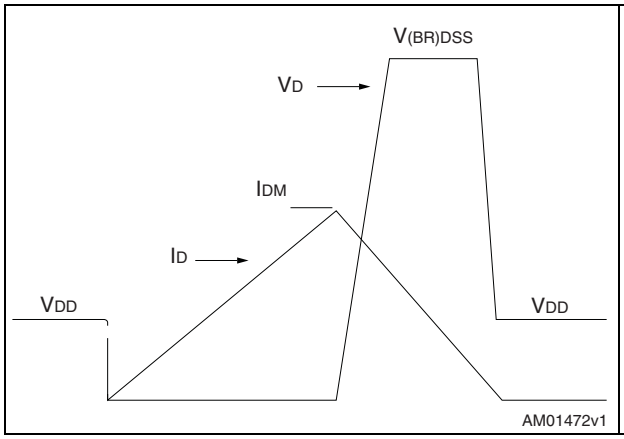
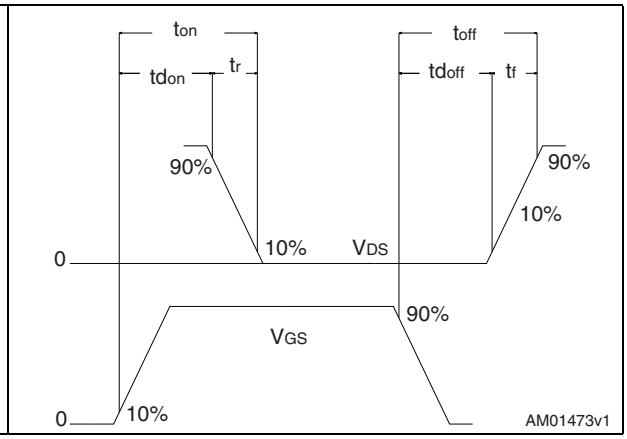


Figure 7. Switching time waveform



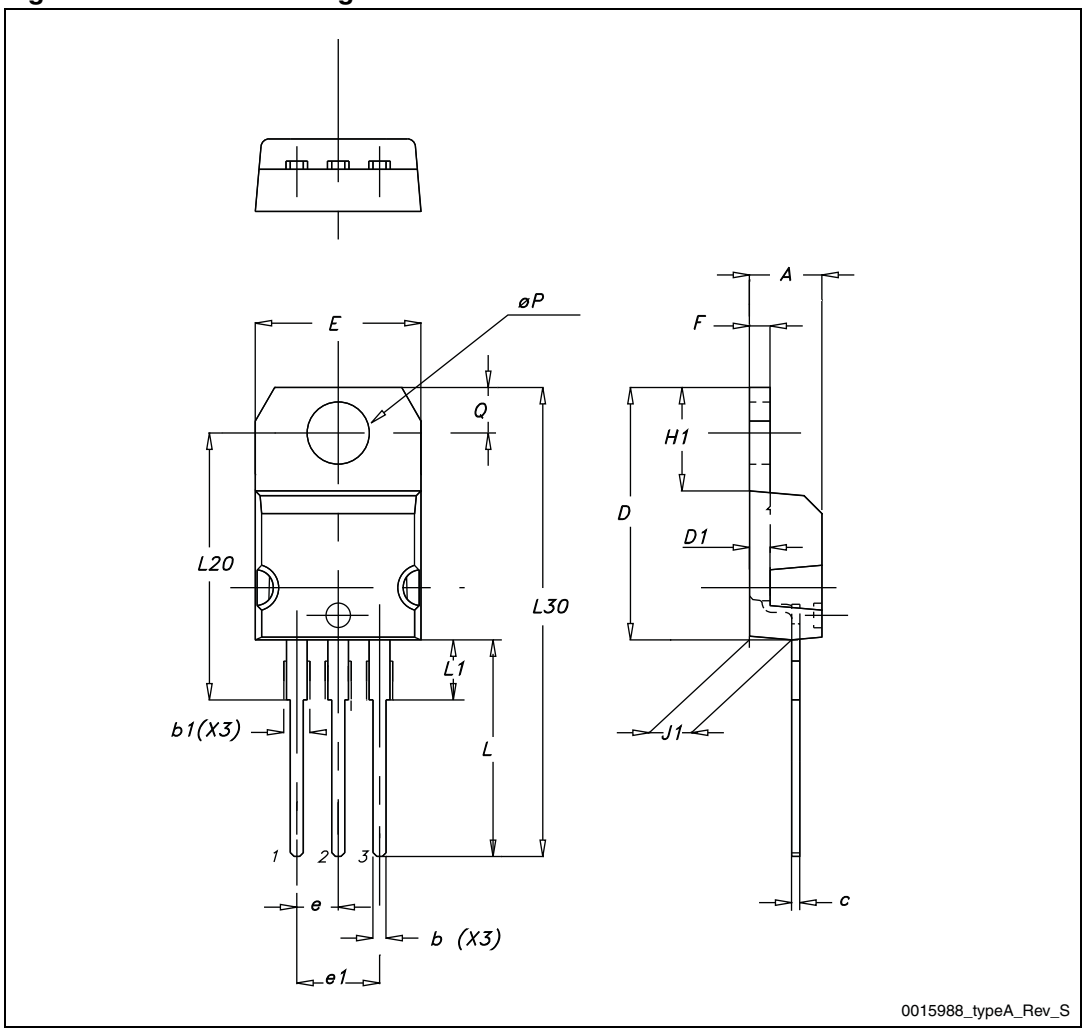
4 Package mechanical data

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 9. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
∅P	3.75		3.85
Q	2.65		2.95

Figure 8. TO-220 drawing



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
12-Dec-2012	1	First release.