

STB55NF06, STP55NF06, STP55NF06FP

N-channel 60 V, 0.015 Ω 50 A STripFETTM II Power MOSFET in D²PAK, TO-220 and TO-220FP packages

Datasheet — production data

Features

Order code	V _{DSS}	R _{DS(on)} max.	I _D
STB55NF06			50 A
STP55NF06	60 V	< 0.018 Ω	30 A
STP55NF06FP			50 A ⁽¹⁾

- Refer to soa for the max allowable current value on FP-type due to Rth value
- 100% avalanche tested
- Exceptional dv/dt capability

Applications

■ Switching application

Description

These Power MOSFETs have been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the devices 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.

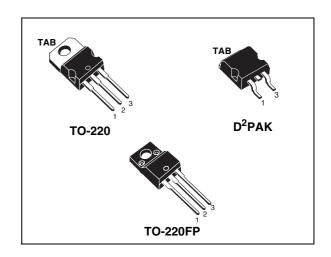


Figure 1. Internal schematic diagram

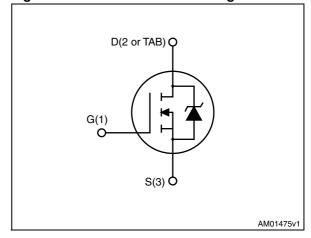


Table 1. Device summary

Order code	Marking	Package	Packaging
STB55NF06	B55NF06	D²PAK	Tape and reel
STP55NF06	P55NF06	TO-220	Tube
STP55NF06FP	P55NF06FP	TO-220	Tube

Contents

1	Electrical ratings	. 3
2	Electrical characteristics	
3	Test circuit	
4	Package mechanical data	10
5	Packaging mechanical data	16
6	Revision history	18

1 Electrical ratings

Table 2. Absolute maximum ratings

		Val	lue	
Symbol	Parameter	TO-220, D ² PAK	TO-220FP	Unit
V_{DS}	Drain-source voltage	6	0	V
V_{GS}	Gate- source voltage	±	20	V
I _D	Drain current (continuous) at T _C = 25 °C	50	50 ⁽¹⁾	Α
I _D	Drain current (continuous) at T _C = 100 °C	35 35 ⁽¹⁾		Α
I _{DM} ⁽²⁾	Drain current (pulsed)	200 200 ⁽¹⁾		Α
P _{tot}	Total dissipation at T _C = 25 °C	110 30		W
	Derating factor	0.73	0.20	W/°C
E _{AS} (3)	Single pulse avalanche energy	34	10	mJ
dv/dt (4)	Peak diode recovery voltage slope	7		V/ns
V _{ISO}	Insulation withstand voltage (DC)	2500		V
T _{stg}	T _{stg} Storage temperature		-55 to 175	
T _j	Max. operating junction temperature	-55 (ט זו ט	°C

- 1. Refer to soa for the max allowable current value on FP-type due to Rth value
- 2. Pulse width limited by safe operating area.
- 3. Starting Tj = 25 °C, V_{DD} = 30 V, I_{D} =25 A
- 4. $I_{SD} \leq$ 50 A, di/dt \leq 400 A/ μ s, $V_{DD} \leq$ V $_{(BR)DSS}$, $Tj \leq$ T $_{JMAX}$

Table 3. Thermal data

Symbol	Parameter		Unit		
Symbol Parameter		D ² PAK	TO-220	TO-220FP	Oille
R _{thj-case}	Thermal resistance junction-case max	1.36		5	°C/W
R _{thj-amb}	Thermal resistance junction-ambient max	62.5			°C/W

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test conditions		Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	$I_D = 250 \ \mu A, \ V_{GS} = 0$	60			٧
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = 60 V V _{DS} = 60 V,@ T _J = 125 °C			1 10	μ Α μ Α
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	V _{GS} = ± 20 V			±100	nA
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2	3	4	٧
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 27.5 A		0.015	0.018	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 25 \text{ V, f} = 1 \text{MHz,}$ $V_{GS} = 0$	-	1300 300 105		pF pF pF
t _{d(on)} t _r t _{d(off)} t _f	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD} = 30 \text{ V}, I_{D} = 27.5 \text{ A}$ $R_{G} = 4.7 \Omega V_{GS} = 10 \text{ V}$ (see <i>Figure 15</i>)	-	20 50 36 15		ns ns ns ns
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 48 \text{ V}, I_{D} = 55 \text{ A},$ $V_{GS} = 10 \text{ V}$ (see <i>Figure 16</i>)	-	44.5 10.5 17.5	60	nC nC nC

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain current Source-drain current (pulsed)		-		50 200	A A
V _{SD} ⁽²⁾	Forward on voltage	I _{SD} = 50 A, V _{GS} = 0	-		1.5	V
t _{rr} Q _{rr} I _{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 50 \text{ A},$ $di/dt = 100 \text{ A/}\mu\text{s},$ $V_{DD} = 30 \text{ V}, T_j = 150 ^{\circ}\text{C}$ (see <i>Figure 17</i>)	-	75 170 4.5		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area for TO-220, Figure 3. Thermal impedance for TO-220, D²PAK

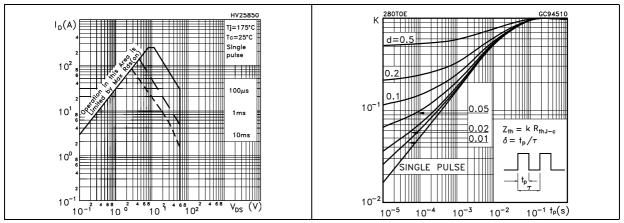


Figure 4. Safe operating area for TO-220FP

Figure 5. Thermal impedance TO-220FP

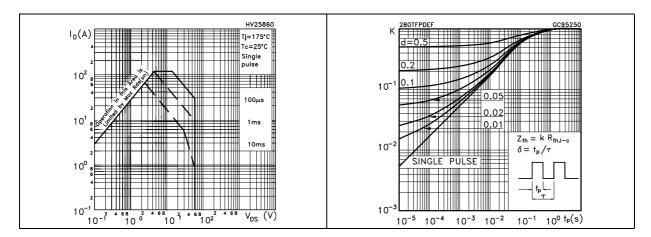
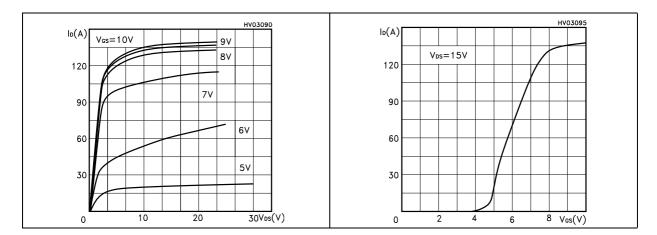


Figure 6. Output characterisics

Figure 7. Transfer characteristics



6/19 Doc ID 7544 Rev 11

Figure 8. Transconductance

Figure 9. Static drain-source on-resistance

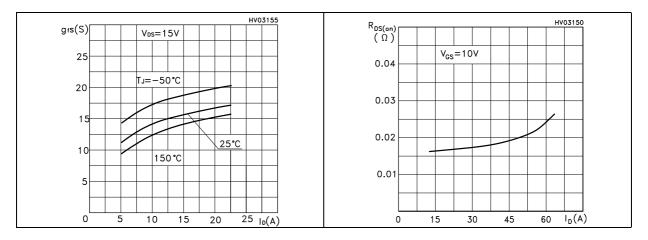


Figure 10. Gate charge vs gate-source voltage Figure 11. Capacitance variations

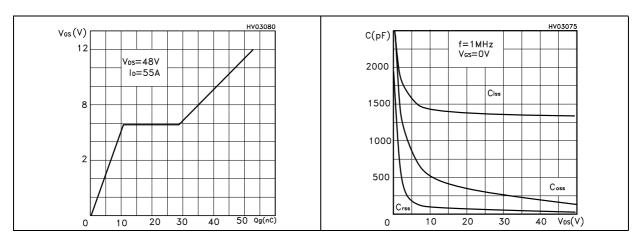


Figure 12. Normalized gate threshold voltage Figure 13. Normalized on-resistance vs vs temperature temperature

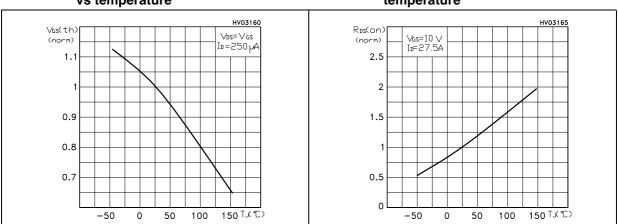
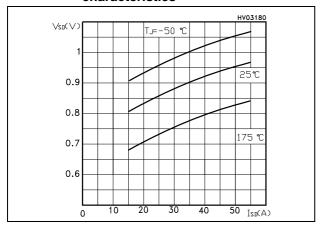


Figure 14. Source-drain diode forward characteristics



8/19 Doc ID 7544 Rev 11

3 Test circuit

Figure 15. Switching times test circuit for resistive load

Figure 16. Gate charge test circuit

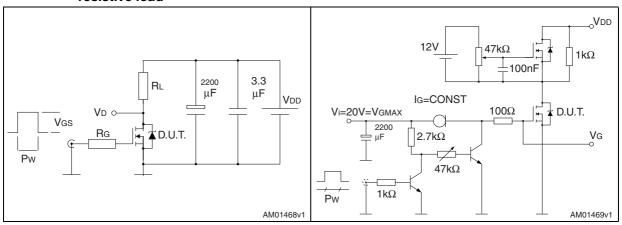


Figure 17. Test circuit for inductive load switching and diode recovery times

Figure 18. Unclamped inductive load test circuit

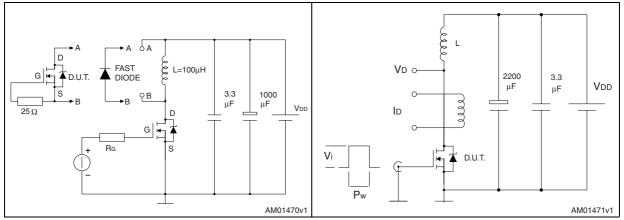
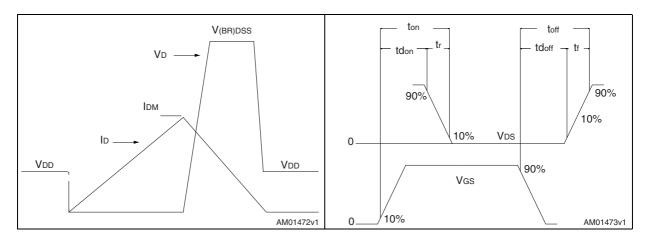


Figure 19. Unclamped inductive waveform

Figure 20. 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 7. D2PAK (TO-263) mechanical data

Dim		mm				
Dim.	Min.	Тур.	Max.			
Α	4.40		4.60			
A1	0.03		0.23			
b	0.70		0.93			
b2	1.14		1.70			
С	0.45		0.60			
c2	1.23		1.36			
D	8.95		9.35			
D1	7.50					
E	10		10.40			
E1	8.50					
е		2.54				
e1	4.88		5.28			
Н	15		15.85			
J1	2.49		2.69			
L	2.29		2.79			
L1	1.27		1.40			
L2	1.30		1.75			
R		0.4				
V2	0°		8°			

SEATING PLANE

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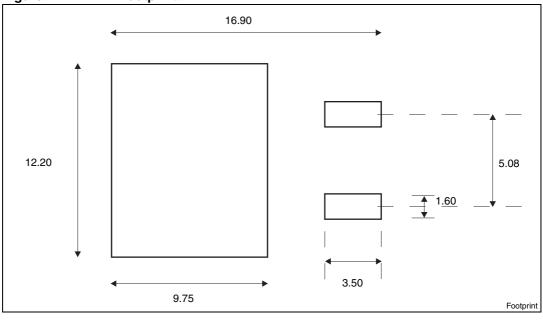
GAUGE PLANE

V2

0079457_T

Figure 21. D²PAK (TO-263) drawing





a. All dimensions are in millimeters

Table 8. TO-220 type A mechanical data

D:		mm	
Dim.	Min.	Тур.	Max.
Α	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
С	0.48		0.70
D	15.25		15.75
D1		1.27	
Е	10		10.40
е	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	
ØP	3.75		3.85
Q	2.65		2.95

D D1 L30 D1 L30

Figure 23. TO-220 type A drawing

Table 9. TO-220FP mechanical data

Dim	mm				
Dim.	Min.	Тур.	Max.		
Α	4.4		4.6		
В	2.5		2.7		
D	2.5		2.75		
Е	0.45		0.7		
F	0.75		1		
F1	1.15		1.70		
F2	1.15		1.70		
G	4.95		5.2		
G1	2.4		2.7		
Н	10		10.4		
L2		16			
L3	28.6		30.6		
L4	9.8		10.6		
L5	2.9		3.6		
L6	15.9		16.4		
L7	9		9.3		
Dia	3		3.2		

-*B*-Dia L6 L2 *L7* L3 F1 **L4** F2 Ε -G1_ 7012510_Rev_K_B

Figure 24. TO-220FP drawing

5 Packaging mechanical data

Table 10. D²PAK (TO-263) tape and reel mechanical data

Таре				Reel	
Dim.	m	m	Dim.	n	nm
Dilli.	Min.	Max.		Min.	Max.
A0	10.5	10.7	Α		330
В0	15.7	15.9	В	1.5	
D	1.5	1.6	С	12.8	13.2
D1	1.59	1.61	D	20.2	
Е	1.65	1.85	G	24.4	26.4
F	11.4	11.6	N	100	
K0	4.8	5.0	Т		30.4
P0	3.9	4.1			
P1	11.9	12.1		Base qty	1000
P2	1.9	2.1		Bulk qty	1000
R	50				
Т	0.25	0.35			
W	23.7	24.3			

Figure 25. Tape

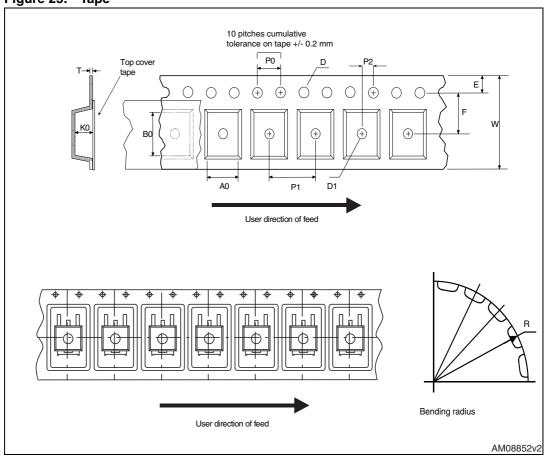
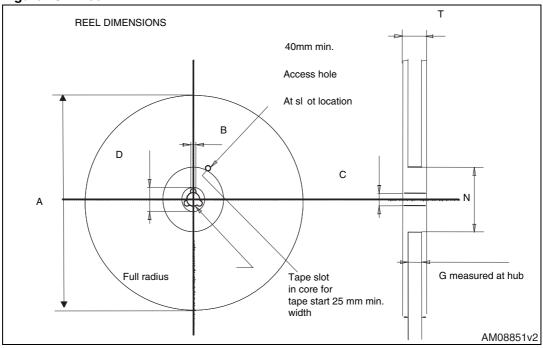


Figure 26. Reel



6 Revision history

Table 11. Document revision history

Date	Revision	Changes
19-Oct-2005	7	Preliminary document
02-Dec-2005	8	New datasheet according to PCN MLD-PMT/05/1115
28-Mar-2006	9	Inserted ecopack indication
26-Jun-2006	10	New template, no content change
25-May-2012	11	Removed part number STB55NF06-1 in I²PAK package Section 4: Package mechanical data and Section 5: Packaging mechanical data have been updated Minor text changes

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