STP110N8F7

N-channel 80 V, 6.4 mΩ typ., 80 A, STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data

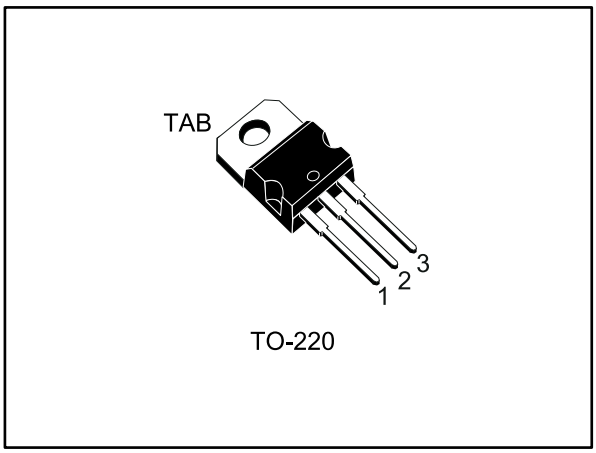
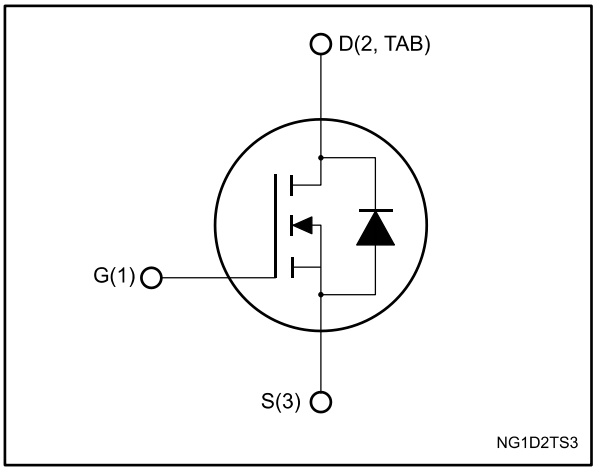


Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)max}$	I_D	P_{TOT}
STP110N8F7	80 V	7.5 mΩ	80 A	170 W

- Among the lowest $R_{DS(on)}$ on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

Table 1: Device summary

Order code	Marking	Package	Packaging
STP110N8F7	110N8F7	TO-220	Tube

Contents

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	80	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current (continuous) at T_C = 25 °C	80 (1)	A
I_D	Drain current (continuous) at T_C = 100 °C	76	A
I_{DM} (2)	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at T_C = 25 °C	170	W
E_{AS} (3)	Single pulse avalanche energy	220	mJ
T_J	Operating junction temperature	-55 to 175	°C
T_{stg}	Storage temperature		°C

Notes:

(1)Limited by package

(2)Pulse width is limited by safe operating area

(3)Starting T_j = 25°C, I_d = 25 A, V_{dd} = 40 V

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	0.88	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max	62.5	°C/W

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	80			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0, V_{DS} = 80 V			1	µA
		V_{GS} = 0, V_{DS} = 80 V, T_C = 125 °C			10	µA
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 µA	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on- resistance	V_{GS} = 10 V, I_D = 40 A		6.4	7.5	mΩ

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{GS} = 0, V_{DS} = 40 V, f = 1 MHz	-	3435	-	pF
C_{oss}	Output capacitance		-	653	-	pF
C_{rss}	Reverse transfer capacitance		-	57	-	pF
Q_g	Total gate charge	V_{DD} = 40 V, I_D = 80 A, V_{GS} = 10 V (see *Figure 14: "Test circuit for gate charge behavior"*)	-	46.8	-	nC
Q_{gs}	Gate-source charge		-	23.4	-	nC
Q_{gd}	Gate-drain charge		-	11.2	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 40 V, I_D = 40 A, R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 13: "Test circuit for resistive load switching times"* and *Figure 18: "Switching time waveform"*)	-	49	-	ns
t_r	Rise time		-	95	-	ns
$t_{d(off)}$	Turn-off delay time		-	60	-	ns
t_f	Fall time		-	32	-	ns

Table 7: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{SD} (1)	Forward on voltage	V_{GS} = 0, I_{SD} = 80 A	-		1.2	V
t_{rr}	Reverse recovery time	I_{SD} = 80 A, di/dt = 100 A/µs V_{DD} = 60 V (see *Figure 15: "Test circuit for inductive load switching and diode recovery times"*)	-	48.6		ns
Q_{rr}	Reverse recovery charge		-	58.6		nC
I_{RRM}	Reverse recovery current		-	2.4		A

Notes:

(1)Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.2 Electrical characteristics (curves)

Figure 2: Safe operating area

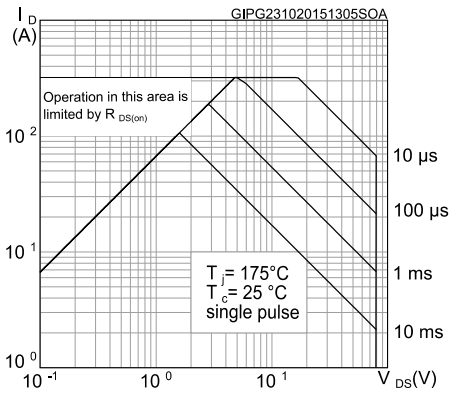


Figure 3: Thermal impedance

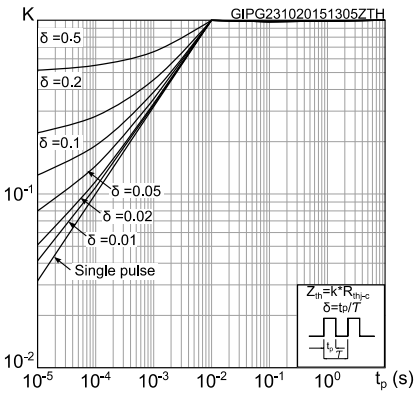


Figure 4: Output characteristics

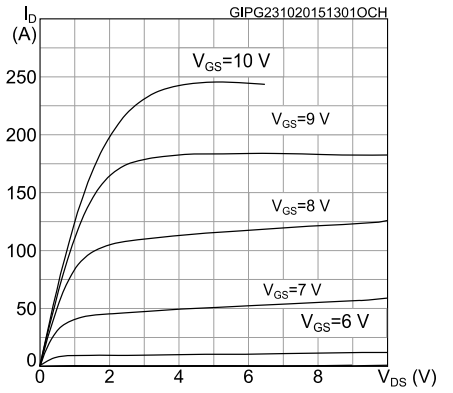


Figure 5: Transfer characteristics

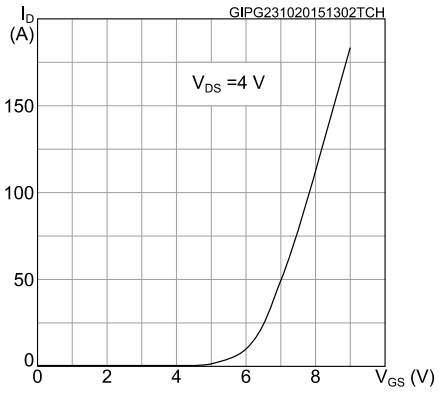


Figure 6: Gate charge vs gate-source voltage

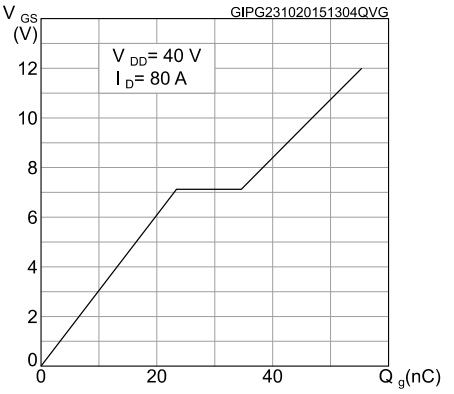


Figure 7: Static drain-source on-resistance

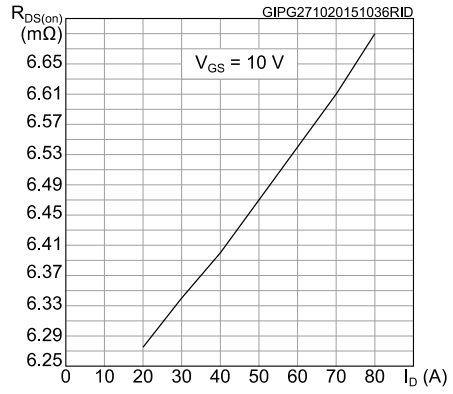


Figure 8: Capacitance variations

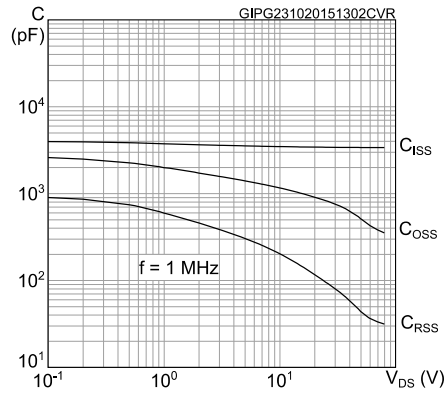


Figure 9: Normalized gate threshold voltage vs temperature

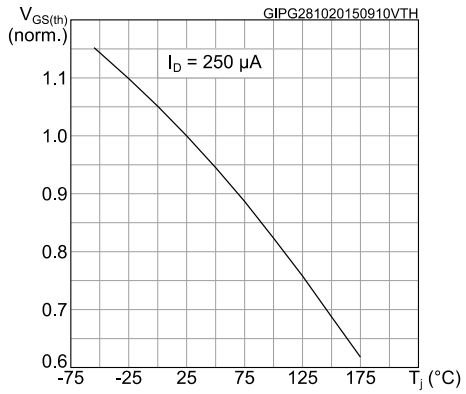


Figure 10: Normalized on-resistance vs temperature

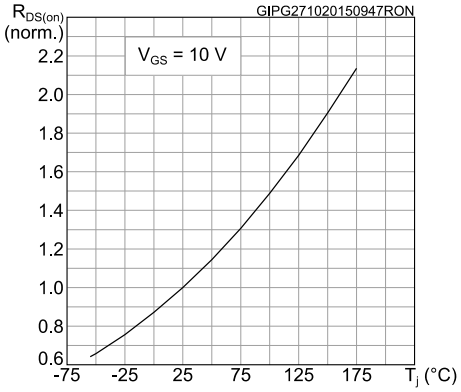


Figure 11: Normalized $V_{(BR)DSS}$ vs temperature

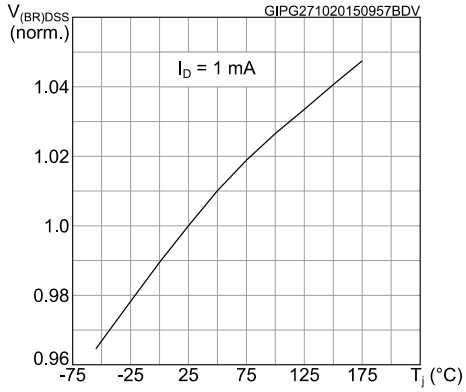
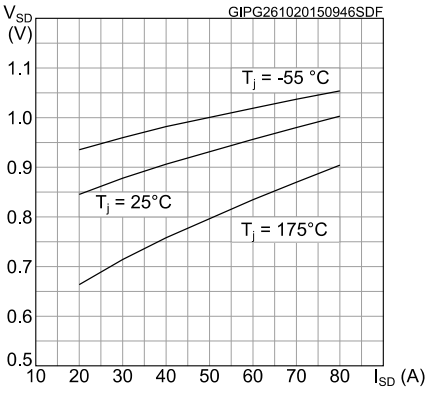


Figure 12: Source-drain diode forward characteristics



3 Test circuits

Figure 13: Test circuit for resistive load switching times

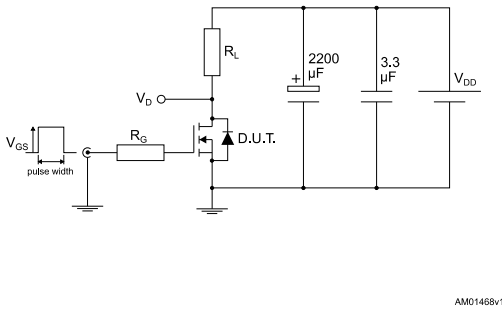


Figure 14: Test circuit for gate charge behavior

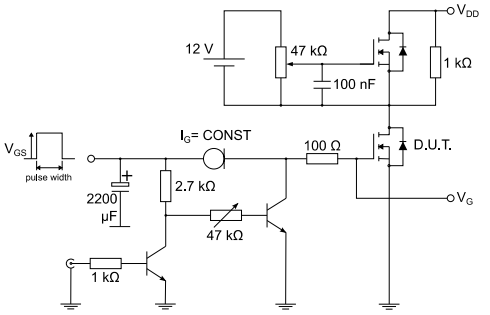


Figure 15: Test circuit for inductive load switching and diode recovery times

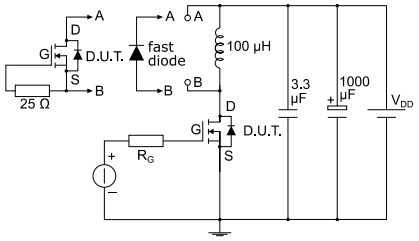


Figure 16: Unclamped inductive load test circuit

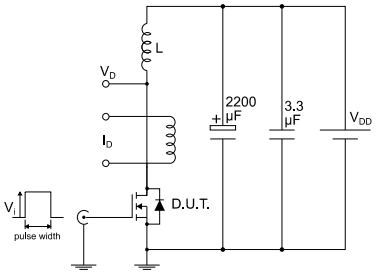


Figure 17: Unclamped inductive waveform

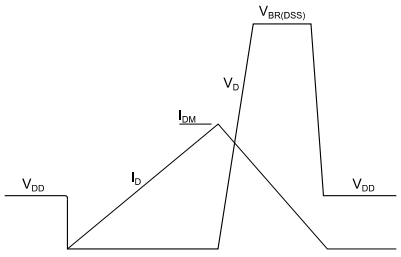
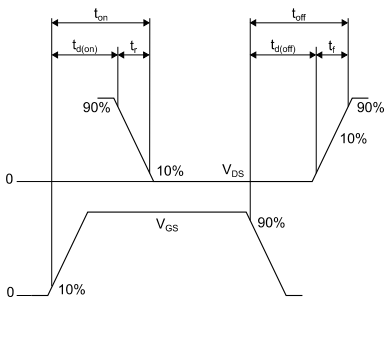


Figure 18: Switching time waveform



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.

4.1 TO-220 package mechanical data

Figure 19: TO-220 type A package outline

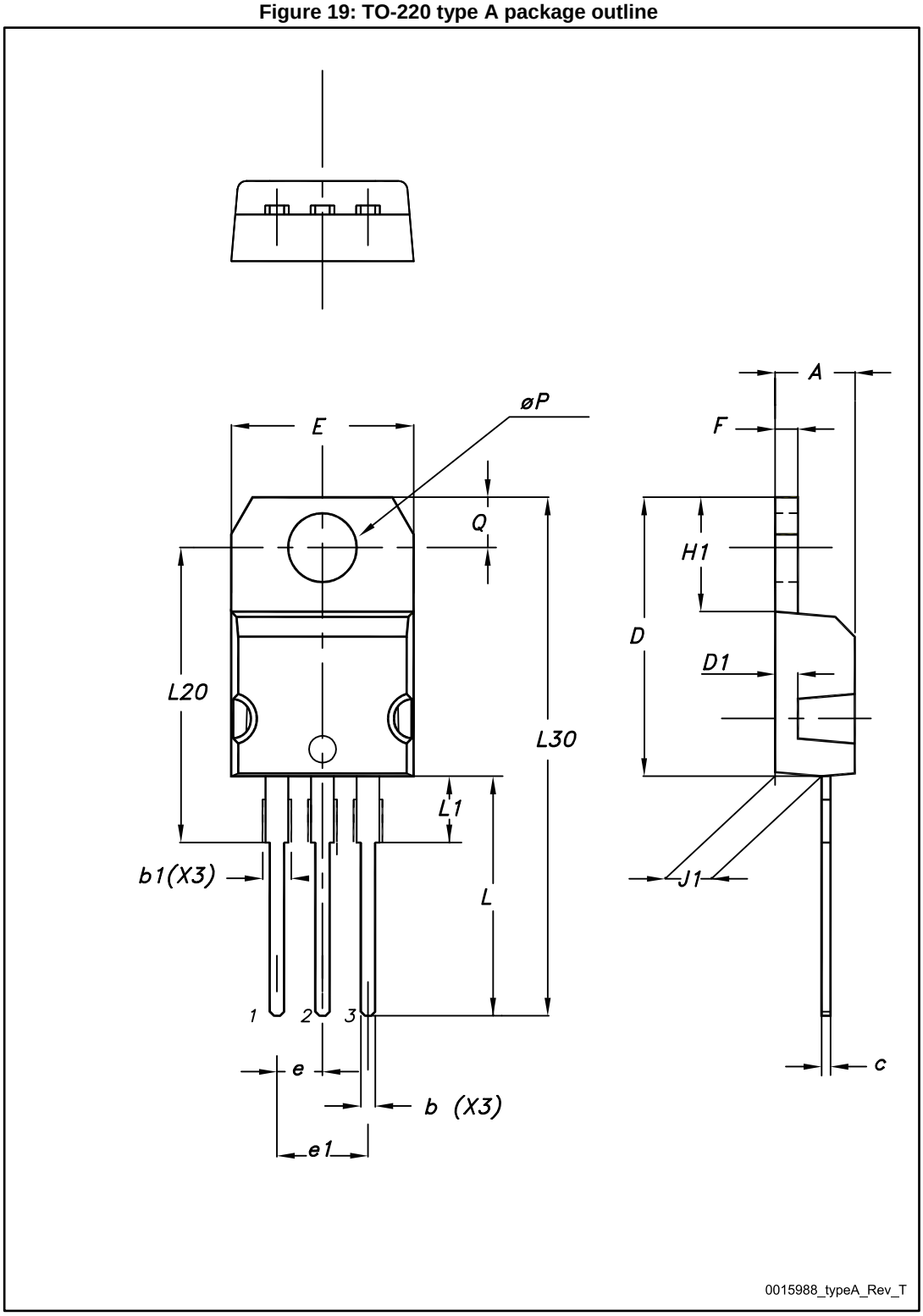


Table 8: TO-220 type A mechanical data

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	
øP	3.75		3.85
Q	2.65		2.95

5 Revision history

Table 9: Document revision history

Date	Revision	Changes
10-Nov-2014	1	Initial release.
04-Nov-2015	2	Datasheet promoted from target to production data. Modified: *Table 2: "Absolute maximum ratings"* , *Table 5: "Dynamic"*, *Table 6: "Switching times"* and *Table 7: "Source drain diode"* Added: *Section 4.1: "Electrical characteristics (curves)"* Minor text changes.

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