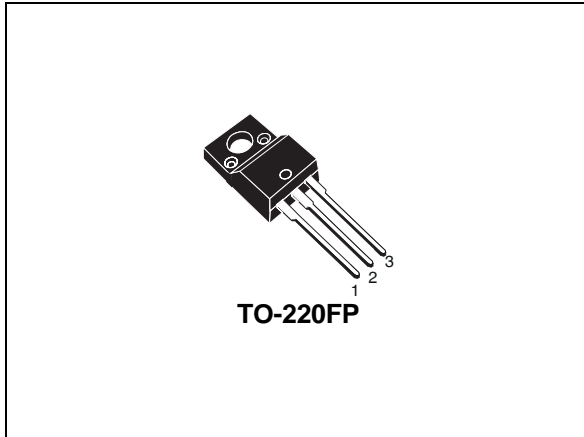


## N-channel 100 V, 0.0145 $\Omega$ typ., 30 A, STripFET™ VII DeepGATE™ Power MOSFET in a TO-220FP package

Datasheet - production data



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max. <sup>(1)</sup>	I <sub>D</sub>	P <sub>TOT</sub>
STF45N10F7	100 V	0.018 $\Omega$	30 A	25 W

1. @ V<sub>GS</sub> = 10 V

- Ultra low on-resistance
- 100% avalanche tested

### Applications

- Switching applications

### Description

This device utilizes the 7<sup>th</sup> generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R<sub>DS(on)</sub> in all packages.

Figure 1. Internal schematic diagram

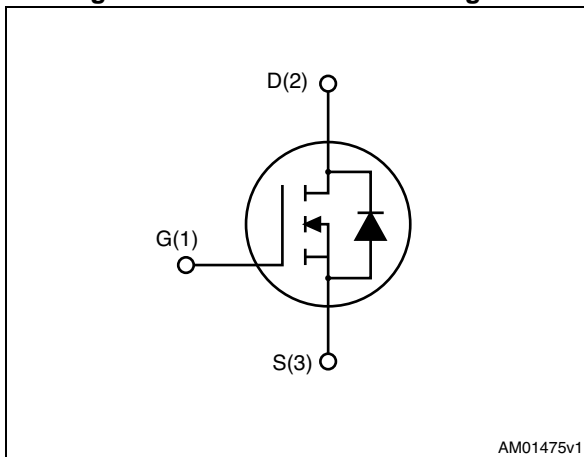


Table 1. Device summary

Order codes	Marking	Package	Packaging
STF45N10F7	45N10F7	TO-220FP	Tube

# Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	100	V
$V_{GS}$	Gate-source voltage	20	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ °C}$	30	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ °C}$	21.4	A
$I_{DM}^{(1)}$	Drain current (pulsed)	120	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ °C}$	25	W
$V_{ISO}$	Insulation withstand voltage (RMS) from all three leads to external heat sink ( $t=1\text{ s}; T_C=25\text{ °C}$ )	2500	V
$T_J$	Operating junction temperature	-55 to 175	°C
$T_{stg}$	Storage temperature		°C

1. Pulse width limited by safe operating area.

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	6	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5	°C/W

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ( $V_{GS} = 0$ )	$I_D = 1\text{ mA}$	100		-	V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 100\text{ V}$			10	$\mu\text{A}$
		$V_{DS} = 100\text{ V}; T_C = 125\text{ °C}$			100	$\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = 20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$		0.0145	0.018	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 50\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$	-	1640	-	pF
$C_{oss}$	Output capacitance		-	360	-	pF
$C_{riss}$	Reverse transfer capacitance		-	25	-	pF
$Q_g$	Total gate charge	$V_{DD} = 50\text{ V}, I_D = 30\text{ A}$	-	25	-	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10\text{ V}$	-	5.1	-	nC
$Q_{gd}$	Gate-drain charge	<a href="#">Figure 14</a>	-	12.2	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\text{ V}, I_D = 15\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ <a href="#">Figure 13</a>	-	15	-	ns
$t_r$	Rise time		-	17	-	ns
$t_{d(off)}$	Turn-off delay time		-	24	-	ns
$t_f$	Fall time		-	8	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		30	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		120	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 30 \text{ A}, V_{GS} = 0$	-		1.1	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 30 \text{ A},$ $di/dt = 100 \text{ A}/\mu\text{s},$ $V_{DD} = 80 \text{ V}, T_j = 150 \text{ }^\circ\text{C}$	-	53		ns
$Q_{rr}$	Reverse recovery charge		-	67		nC
$I_{RRM}$	Reverse recovery current		-	2.5		A

1. Pulse width limited by safe operating area.
2. Pulsed: pulse duration=300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

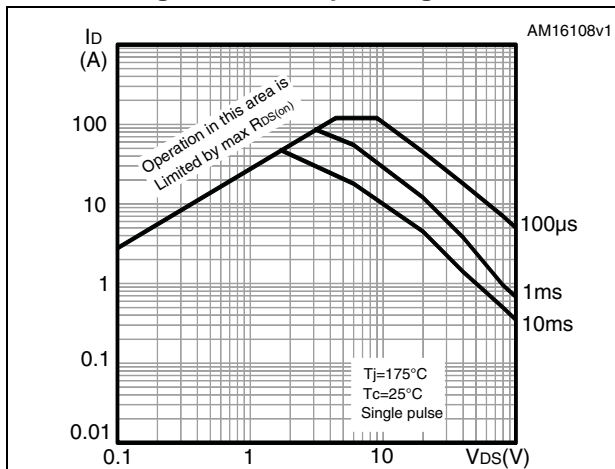


Figure 3. Thermal impedance

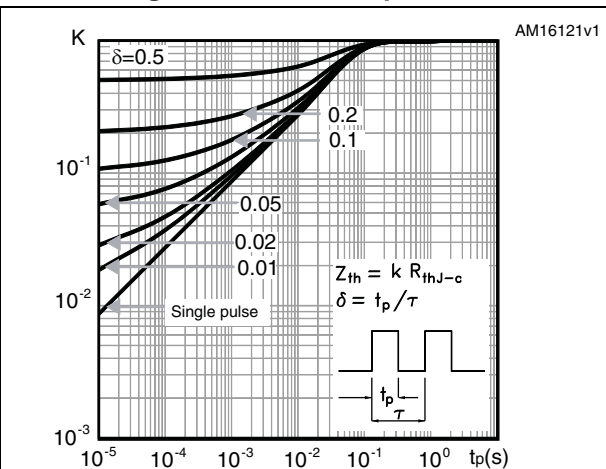


Figure 4. Output characteristics

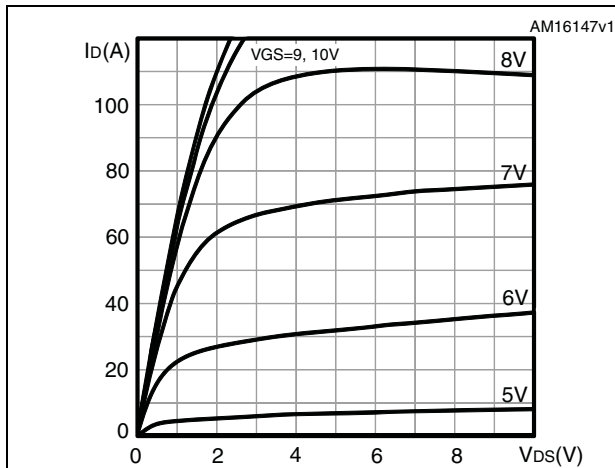


Figure 5. Transfer characteristics

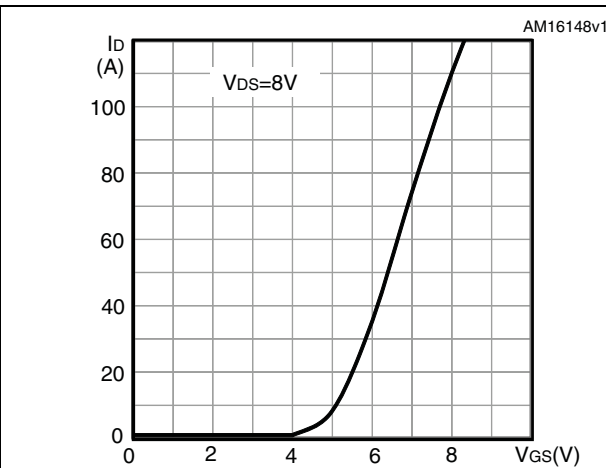


Figure 6. Gate charge vs gate-source voltage

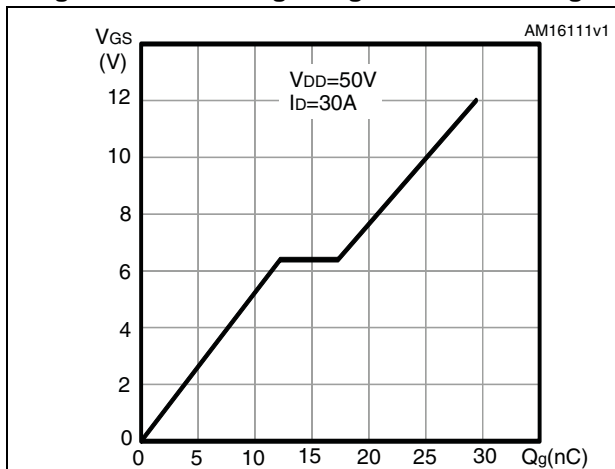


Figure 7. Static drain-source on-resistance

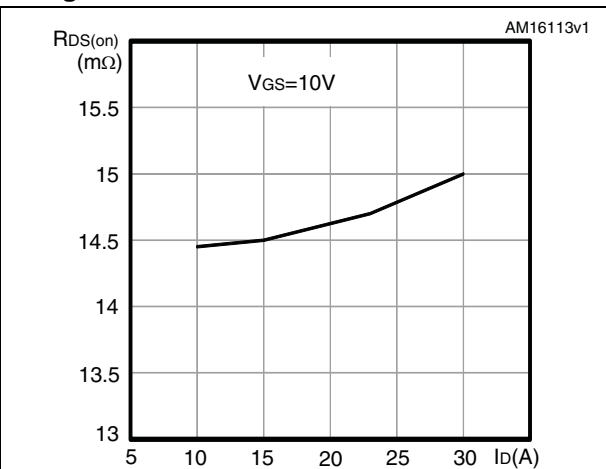


Figure 8. Capacitance variations

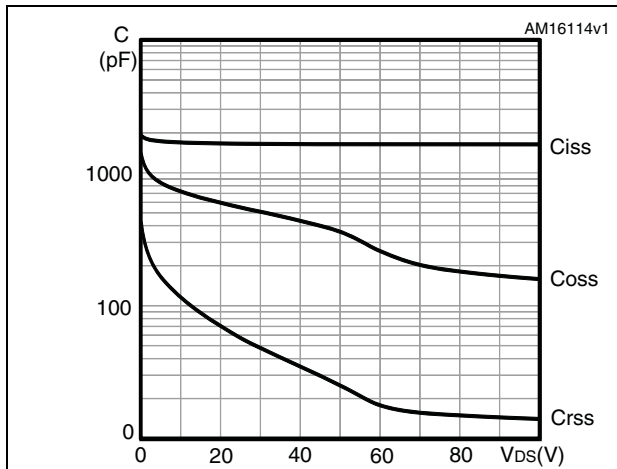


Figure 9. Normalized gate threshold voltage vs temperature

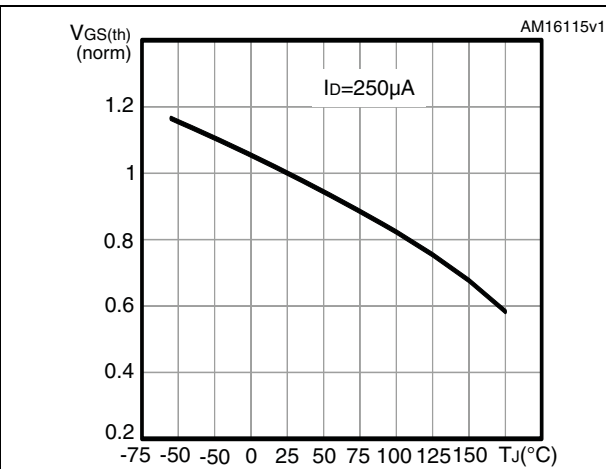


Figure 10. Normalized on-resistance vs temperature

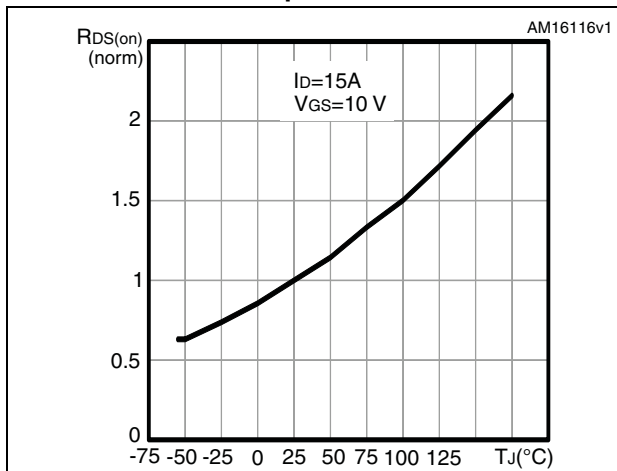


Figure 11. Normalized V(BR)DS vs temperature

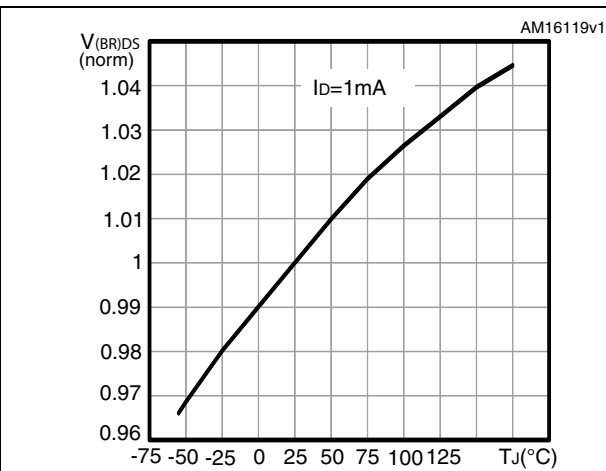
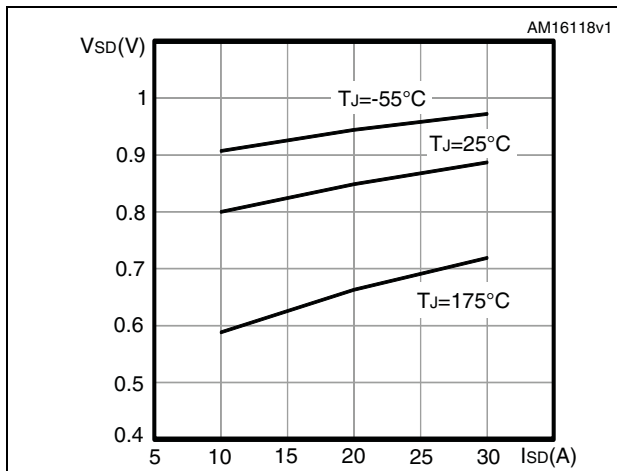


Figure 12. Source-drain diode forward characteristics

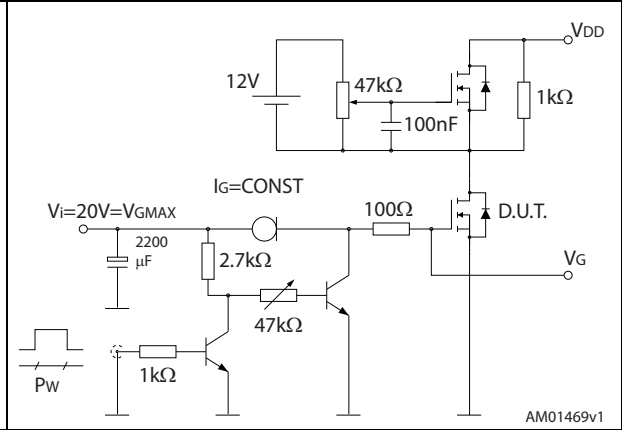


### 3 Test circuits

**Figure 13. Switching times test circuit for resistive load**



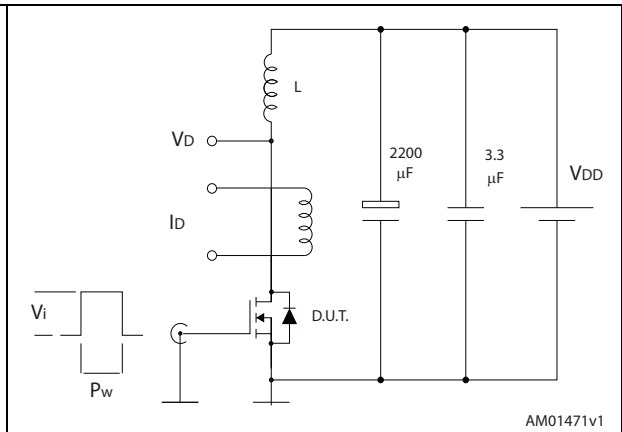
**Figure 14. Gate charge test circuit**



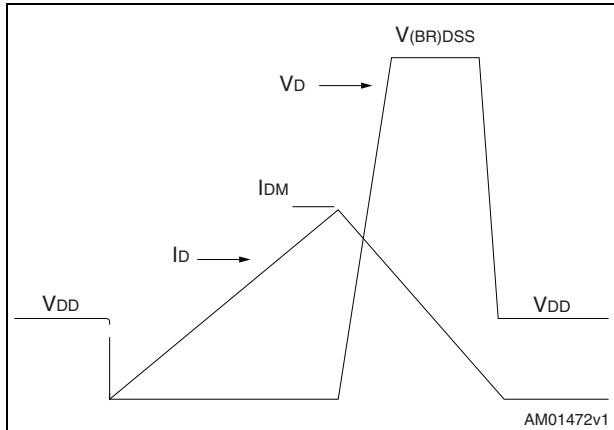
**Figure 15. Test circuit for inductive load switching and diode recovery times**



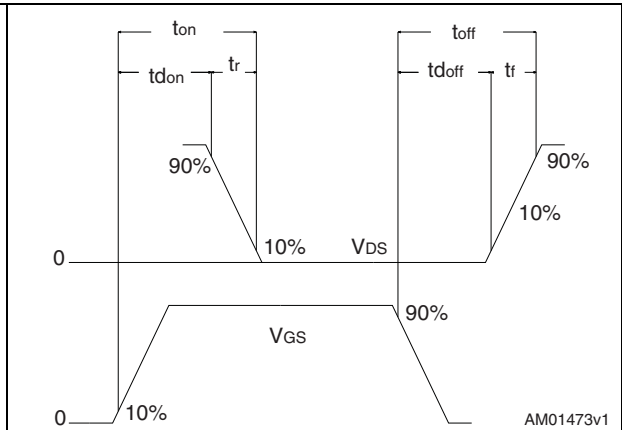
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**





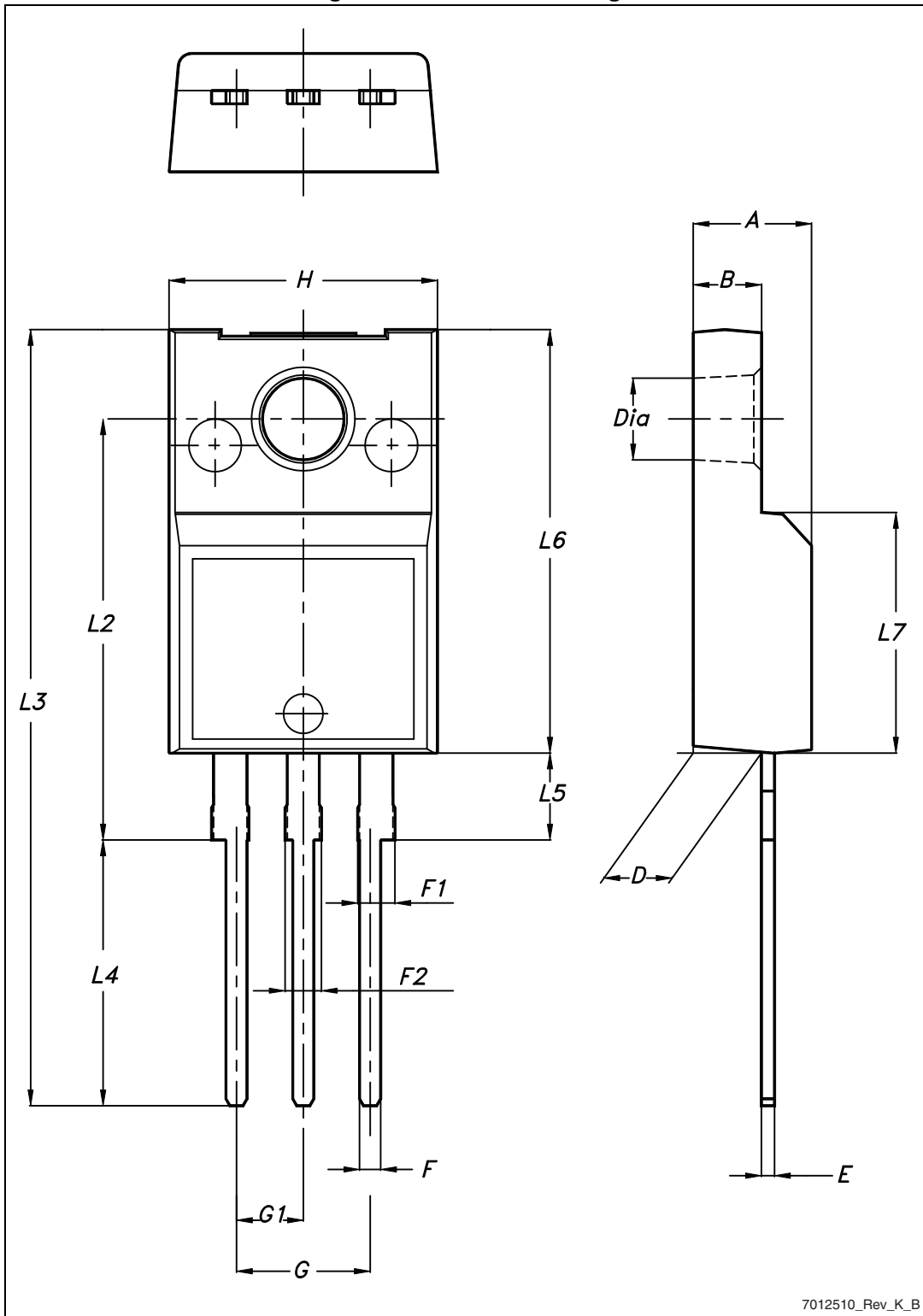
## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Table 8. TO-220FP mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.4		4.6
B	2.5		2.7
D	2.5		2.75
E	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
H	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

Figure 19. TO-220FP drawing



7012510\_Rev\_K\_B

## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
03-Dec-2012	1	First release.
06-Dec-2012	2	Minor text changes The part number STH110N10F7-2 has been moved to a separate datasheet The part number STP110N10F7 has been moved to a separate datasheet
11-Nov-2013	3	Document status promoted from preliminary to production data.

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