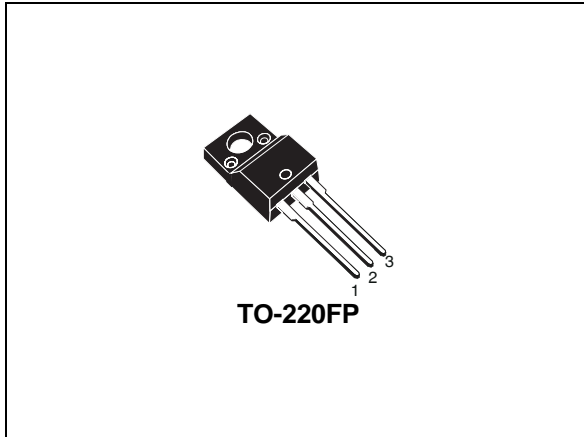


## N-channel 100 V, 0.0145 $\Omega$ typ., 30 A, STripFET™ VII DeepGATE™ Power MOSFET in a TO-220FP package

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

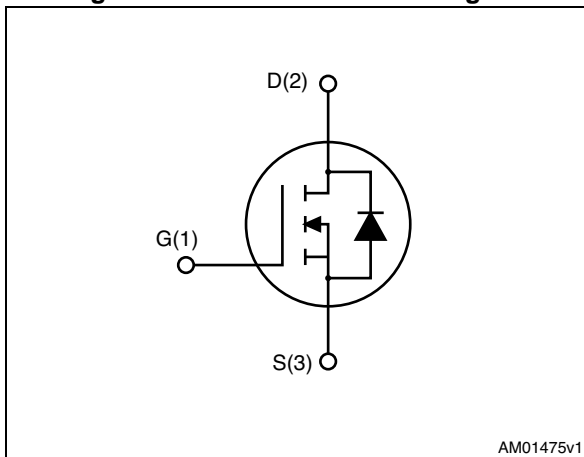


Table 1. Device summary

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
$C_{rss}$	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

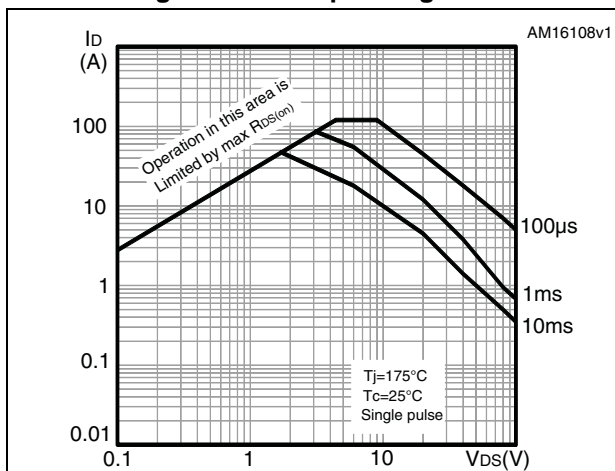


Figure 3. Thermal impedance

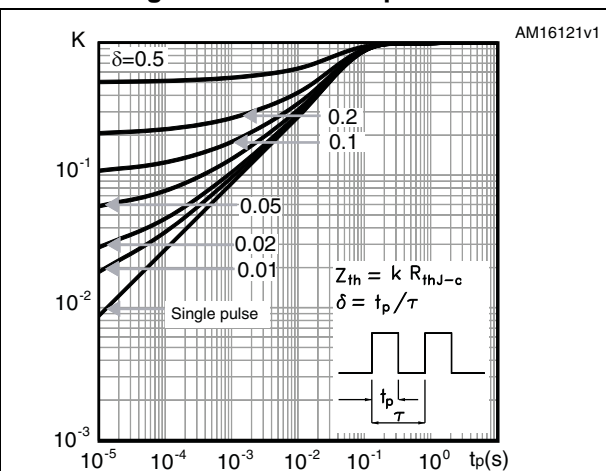


Figure 4. Output characteristics

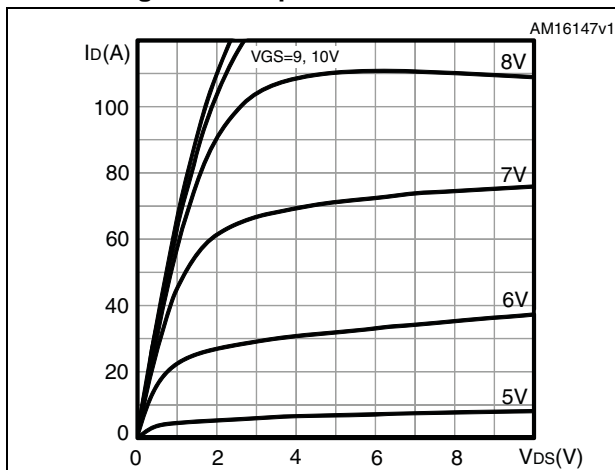


Figure 5. Transfer characteristics

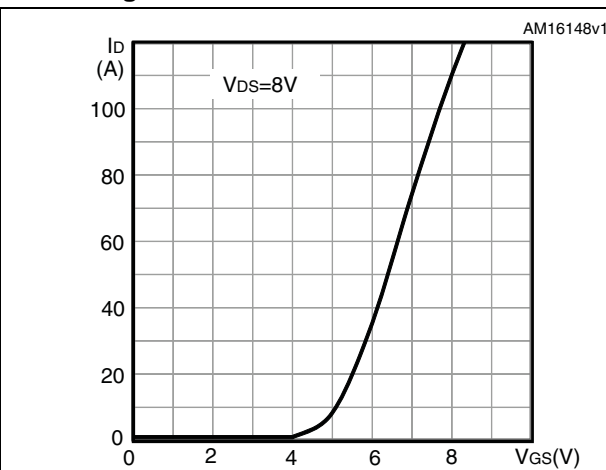


Figure 6. Gate charge vs gate-source voltage

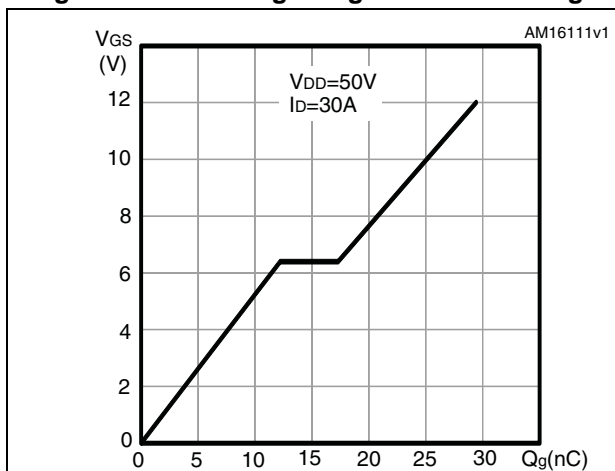


Figure 7. Static drain-source on-resistance

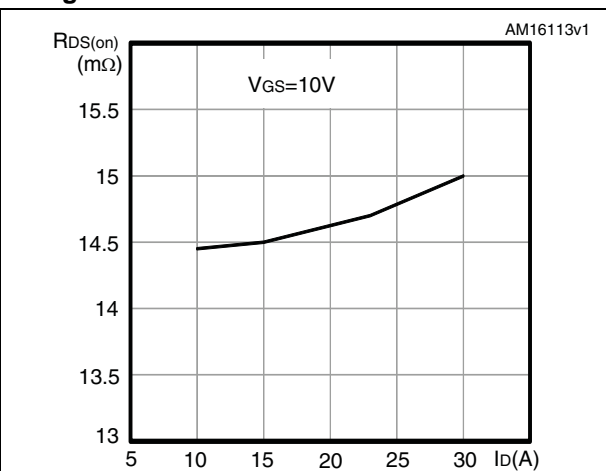


Figure 8. Capacitance variations

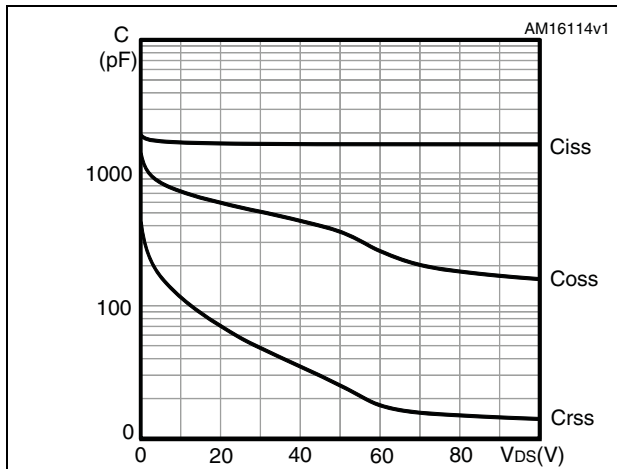


Figure 9. Normalized gate threshold voltage vs temperature

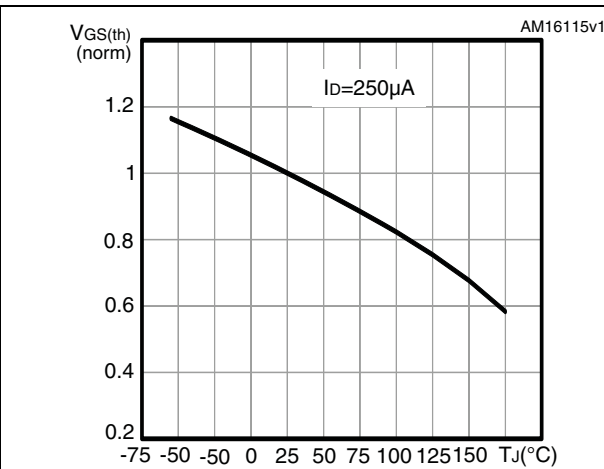


Figure 10. Normalized on-resistance vs temperature

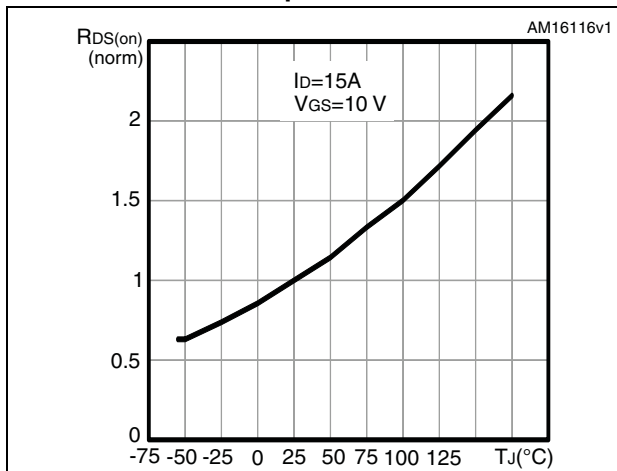


Figure 11. Normalized V(BR)DS vs temperature

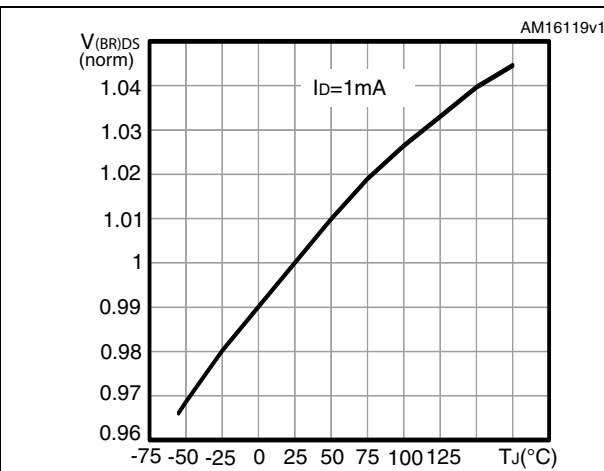
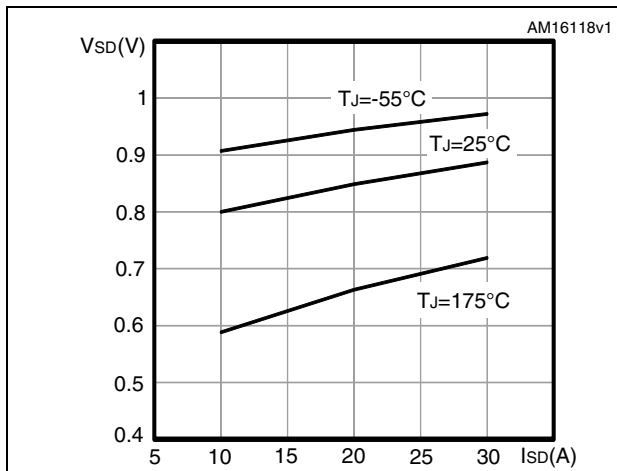


Figure 12. Source-drain diode forward characteristics



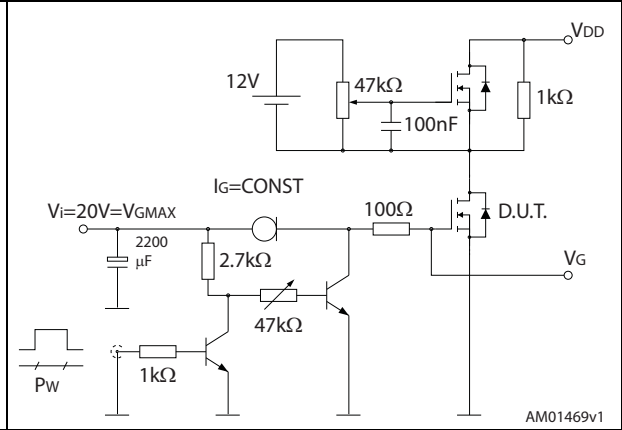
### 3 Test circuits

Figure 13. Switching times test circuit for resistive load



AM01468v1

Figure 14. Gate charge test circuit



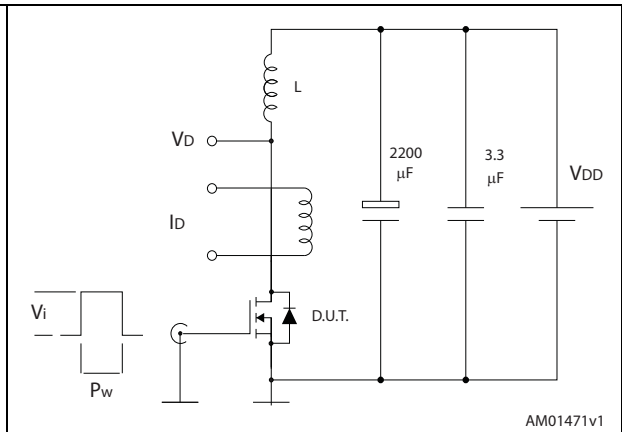
AM01469v1

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



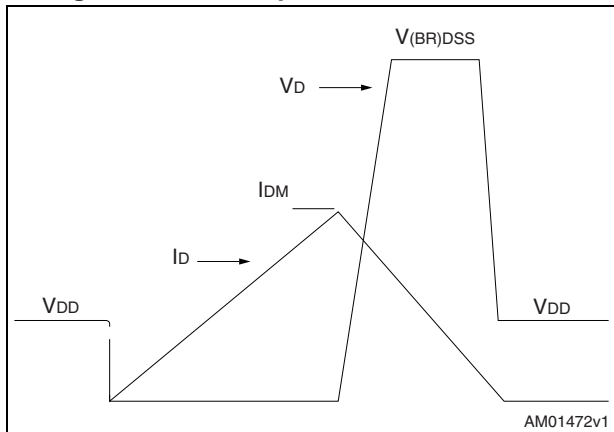
AM01470v1

Figure 16. Unclamped inductive load test circuit



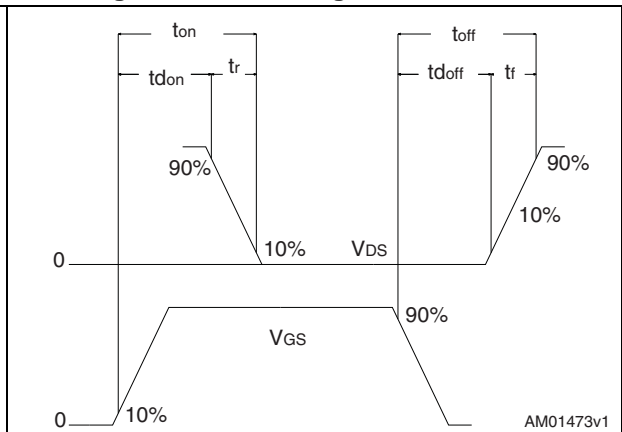
AM01471v1

Figure 17. Unclamped inductive waveform



AM01472v1

Figure 18. Switching time waveform



AM01473v1



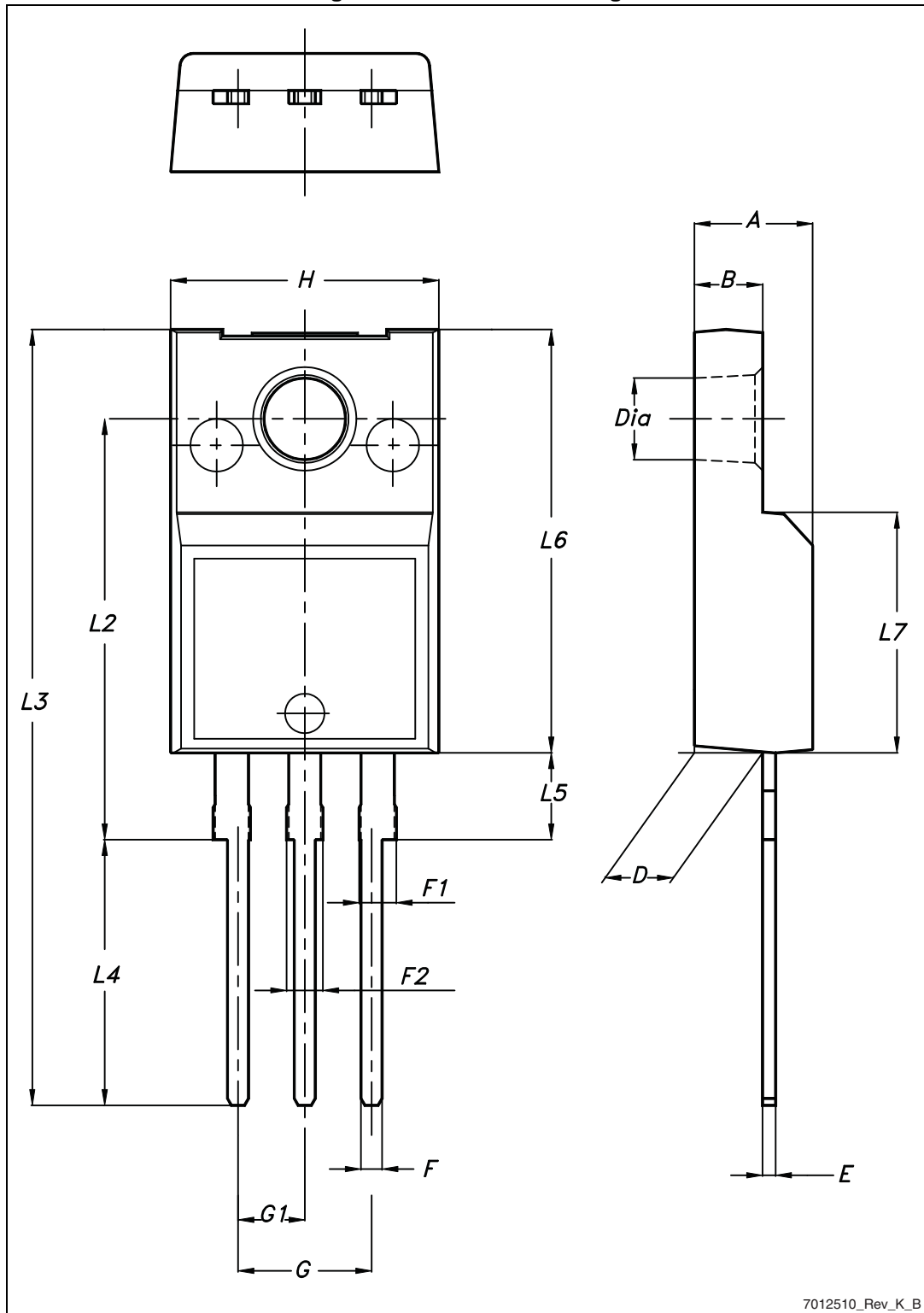
## 4 Package mechanical data

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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