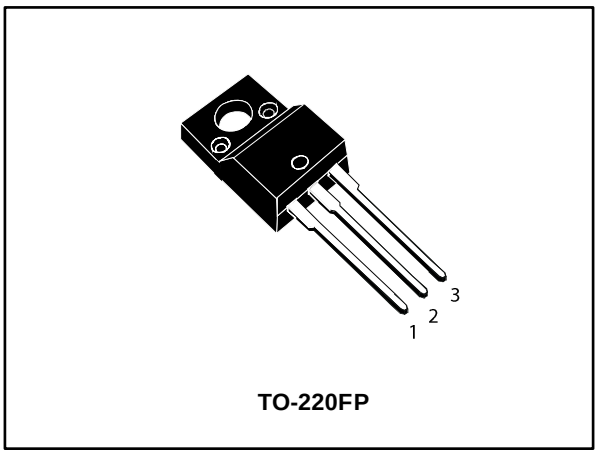
STF16N60M6

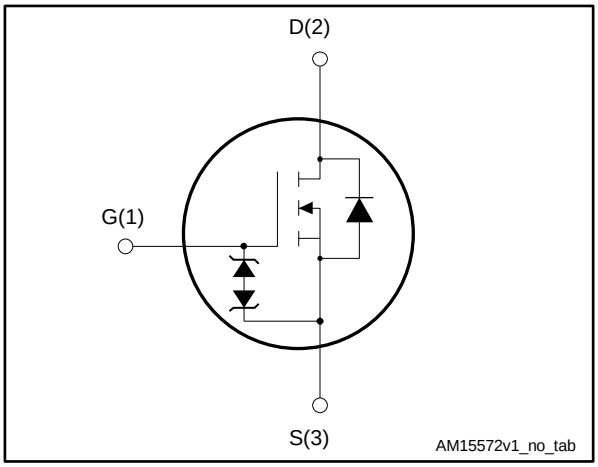
N-channel 600 V, 0.26 Ω typ., 12 A MDmesh™ M6 Power MOSFET in a TO-220FP package

Datasheet - production data



TO-220FP

Figure 1: Internal schematic diagram



Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STF16N60M6	600 V	0.32 Ω	12 A

- Reduced switching losses
- Lower $R_{DS(on)}$ x area vs previous generation
- Low gate input resistance
- 100% avalanche tested
- Zener-protected

Applications

- Switching applications
- LLC converters
- Boost PFC converters

Description

The new MDmesh™ M6 technology incorporates the most recent advancements to the well-known and consolidated MDmesh family of SJ MOSFETs. STMicroelectronics builds on the previous generation of MDmesh devices through its new M6 technology, which combines excellent $R_{DS(on)}$ * area improvement with one of the most effective switching behaviors available, as well as a user-friendly experience for maximum end-application efficiency.

Table 1: Device summary

Order code	Marking	Package	Packing
STF16N60M6	16N60M6	TO-220FP	Tube

This is information on a product in full production.

Contents

1 Electrical ratings 3
2 Electrical characteristics 4
2.1 Electrical characteristics (curves) 6
3 Test circuits 8
4 Package information 9
4.1 TO-220FP package information 10
5 Revision history 12

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{GS}	Gate-source voltage	±25	V
I_D	Drain current (continuous) at T_c = 25 °C	12(1)	A
I_D	Drain current (continuous) at T_c = 100 °C	7.6(1)	A
I_{DM}	Drain current (pulsed)	32(1)(2)	A
P_{TOT}	Total dissipation at T_c = 25 °C	25	W
dv/dt(3)	Peak diode recovery voltage slope	15	V/ns
dv/dt (4)	MOSFET dv/dt ruggedness	50	
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t = 1 s; T_C = 25 °C)	2.5	kV
T_{stg}	Storage temperature range	-55 to 150	°C
T_j	Operating junction temperature range		

Notes:

(1) Limited by maximum junction temperature.

(2)Pulse width limited by safe operating area.

(3)I_{SD} ≤ 12 A, di/dt ≤ 400 A/µs; $V_{DS(peak)}$ < $V_{(BR)DSS}$, V_{DD} = 400 V

(4) V_{DS} ≤ 480 V

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case	5	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient	62.5	

Table 4: Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or not repetitive (pulse width limited by T_{jmax})	2.5	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25 °C, I_D = I_{AR}; V_{DD} = 50 V)	110	mJ

2 Electrical characteristics

(T_C = 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 V, I_D = 1 mA	600			V
I_{DSS}	Zero gate voltage drain current	V_{GS} = 0 V, V_{DS} = 600 V			1	µA
		V_{GS} = 0 V, V_{DS} = 600 V, T_C = 125 °C (1)			100	
I_{GSS}	Gate-body leakage current	V_{DS} = 0 V, V_{GS} = ± 25 V			±5	µA
$V_{GS(th)}$	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	3.25	4	4.75	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 6 A		0.26	0.32	Ω

Notes:

(1)Defined by design, not subject to production test.

Table 6: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{GS} = 100 V, f = 1 MHz, V_{GS} = 0 V	-	575	-	pF
C_{oss}	Output capacitance		-	33	-	
C_{rss}	Reverse transfer capacitance		-	3	-	
$C_{oss\ eq.}$ (1)	Equivalent output capacitance	V_{DS} = 0 to 480 V, V_{GS} = 0 V	-	104	-	pF
R_G	Intrinsic gate resistance	f = 1 MHz open drain	-	5.2	-	Ω
Q_g	Total gate charge	V_{DD} = 480 V, I_D = 12 A, V_{GS} = 0 to 10 V (see *Figure 15: "Test circuit for gate charge behavior"*)	-	16.7	-	nC
Q_{gs}	Gate-source charge		-	3.5	-	
Q_{gd}	Gate-drain charge		-	9.4	-	

Notes:

(1) $C_{oss\ eq.}$ is defined as a constant equivalent capacitance giving the same charging time as C_{oss} when V_{DS} increases from 0 to 80% V_{DSS}.

Table 7: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 300 V, I_D = 6 A R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 14: "Test circuit for resistive load switching times"* and *Figure 19: "Switching time waveform"*)	-	13	-	ns
t_r	Rise time		-	7.6	-	
$t_{d(off)}$	Turn-off delay time		-	19.8	-	
t_f	Fall time		-	6.8	-	

Table 8: Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		12	A
I_{SDM}(1)	Source-drain current (pulsed)		-		32	A
V_{SD}(2)	Forward on voltage	V_{GS} = 0 V, I_{SD} = 12 A	-		1.6	V
t_{rr}	Reverse recovery time	I_{SD} = 12 A, di/dt = 100 A/µs, V_{DD} = 60 V (see *Figure 16: "Test circuit for inductive load switching and diode recovery times"*)	-	210		ns
Q_{rr}	Reverse recovery charge		-	1.7		µC
I_{RRM}	Reverse recovery current		-	13.8		A
t_{rr}	Reverse recovery time	I_{SD} = 12 A, di/dt = 100 A/µs, V_{DD} = 60 V, T_j = 150 °C (see *Figure 16: "Test circuit for inductive load switching and diode recovery times"*)	-	310		ns
Q_{rr}	Reverse recovery charge		-	3.2		µC
I_{RRM}	Reverse recovery current		-	15.4		A

Notes:

(1) Pulse width is limited by safe operating area.

(2) Pulse test: pulse duration = 300 µs, duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

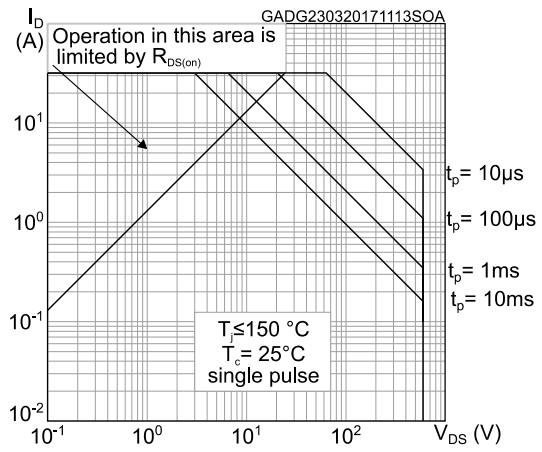


Figure 3: Thermal impedance

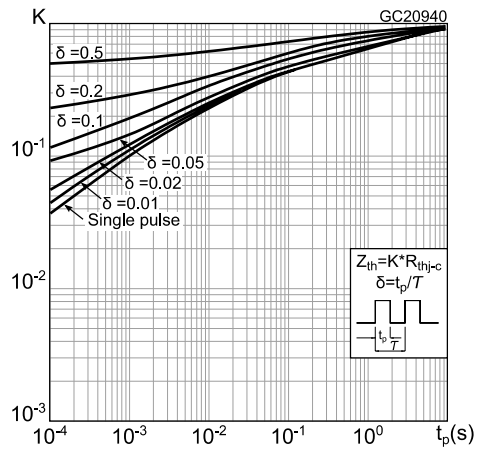


Figure 4: Output characteristics

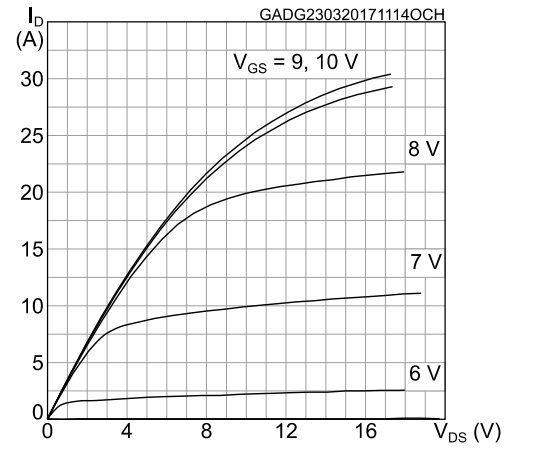


Figure 5: Transfer characteristics

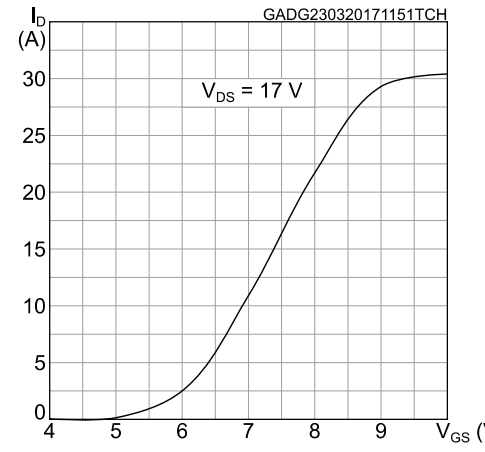


Figure 6: Gate charge vs gate-source voltage

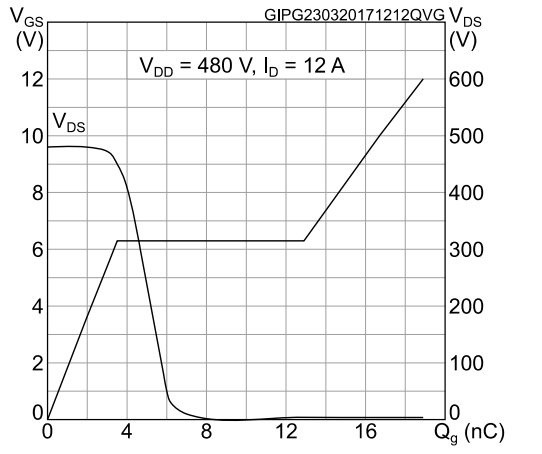


Figure 7: Static drain-source on-resistance

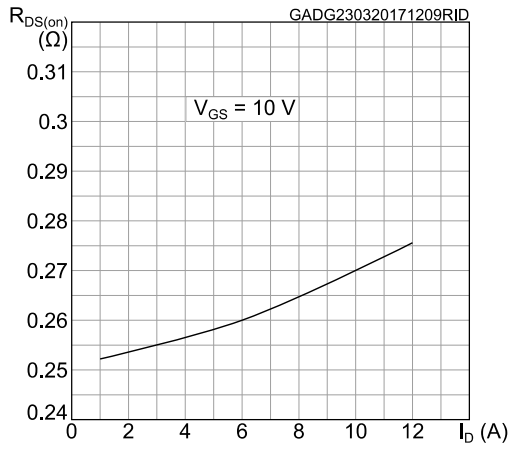


Figure 8: Capacitance variations

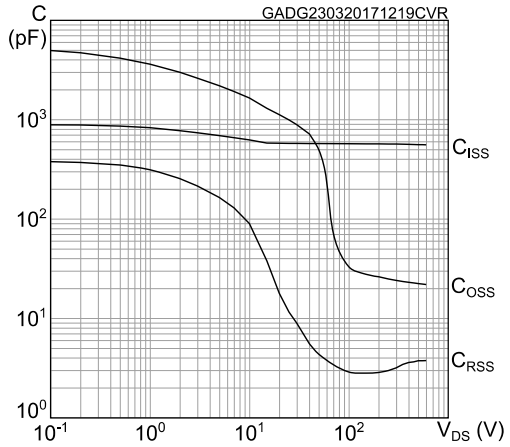


Figure 9: Normalized gate threshold voltage vs temperature

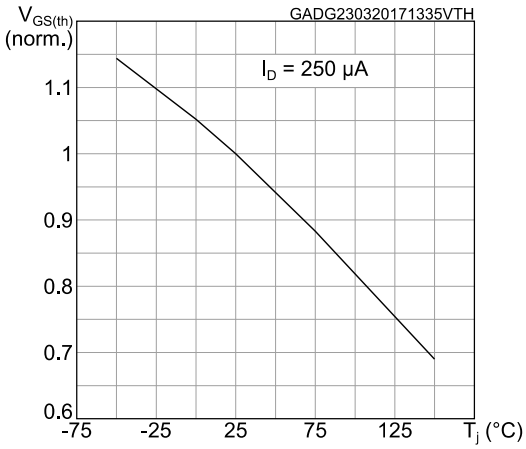


Figure 10: Normalized on-resistance vs temperature

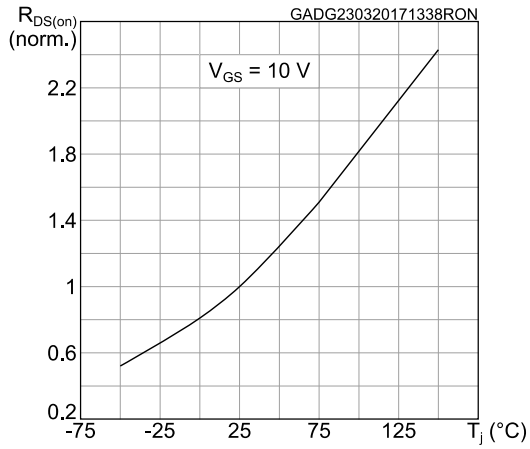


Figure 11: Normalized V(BR)DSS vs temperature

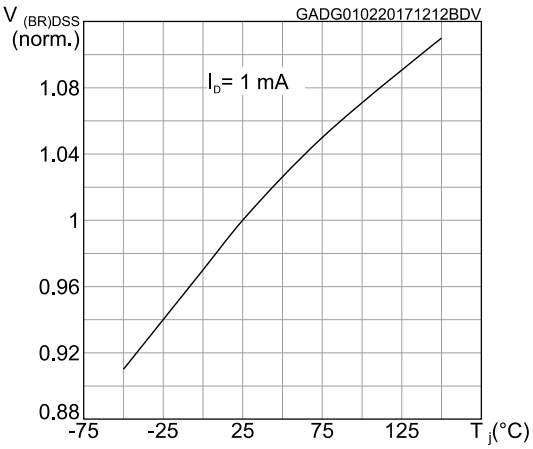


Figure 12: Output capacitance stored energy

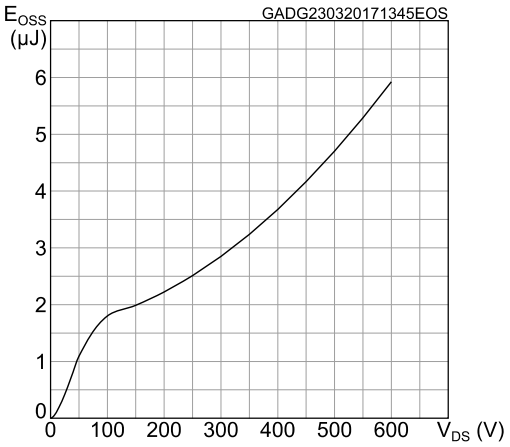
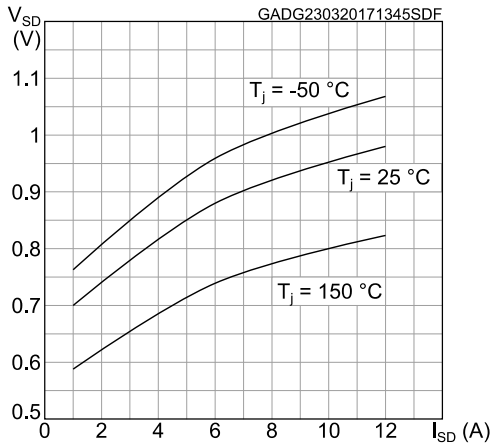


Figure 13: Source-drain diode forward characteristics



3 Test circuits

Figure 14: Test circuit for resistive load switching times

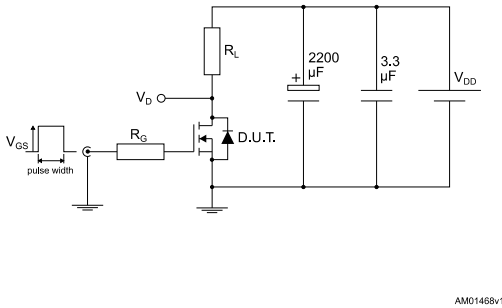


Figure 15: Test circuit for gate charge behavior

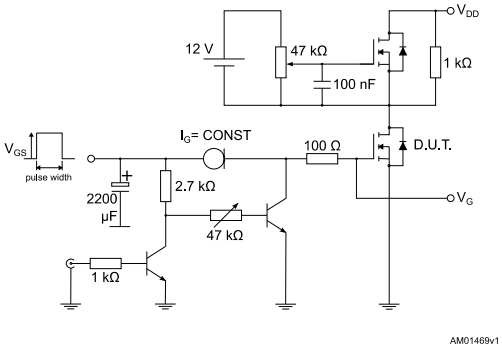


Figure 16: Test circuit for inductive load switching and diode recovery times

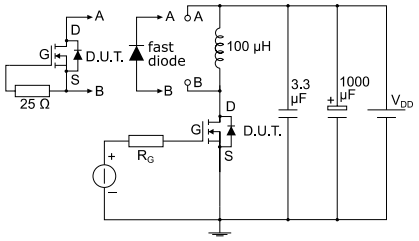


Figure 17: Unclamped inductive load test circuit

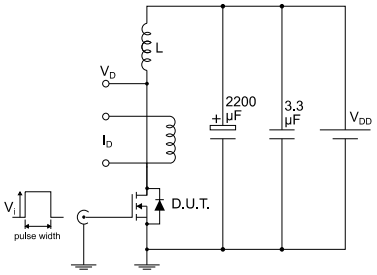


Figure 18: Unclamped inductive waveform

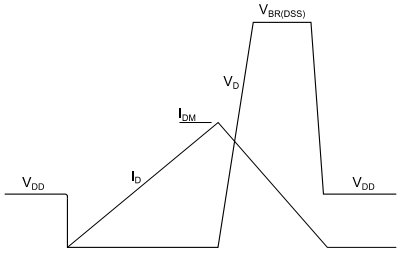
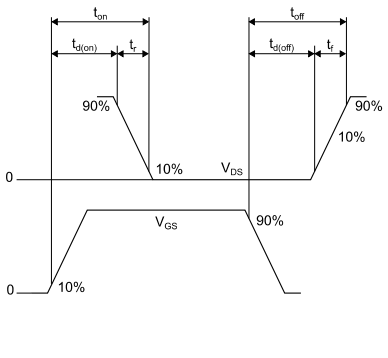


Figure 19: Switching time waveform



4 Package information

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-220FP package information

Figure 20: TO-220FP package outline

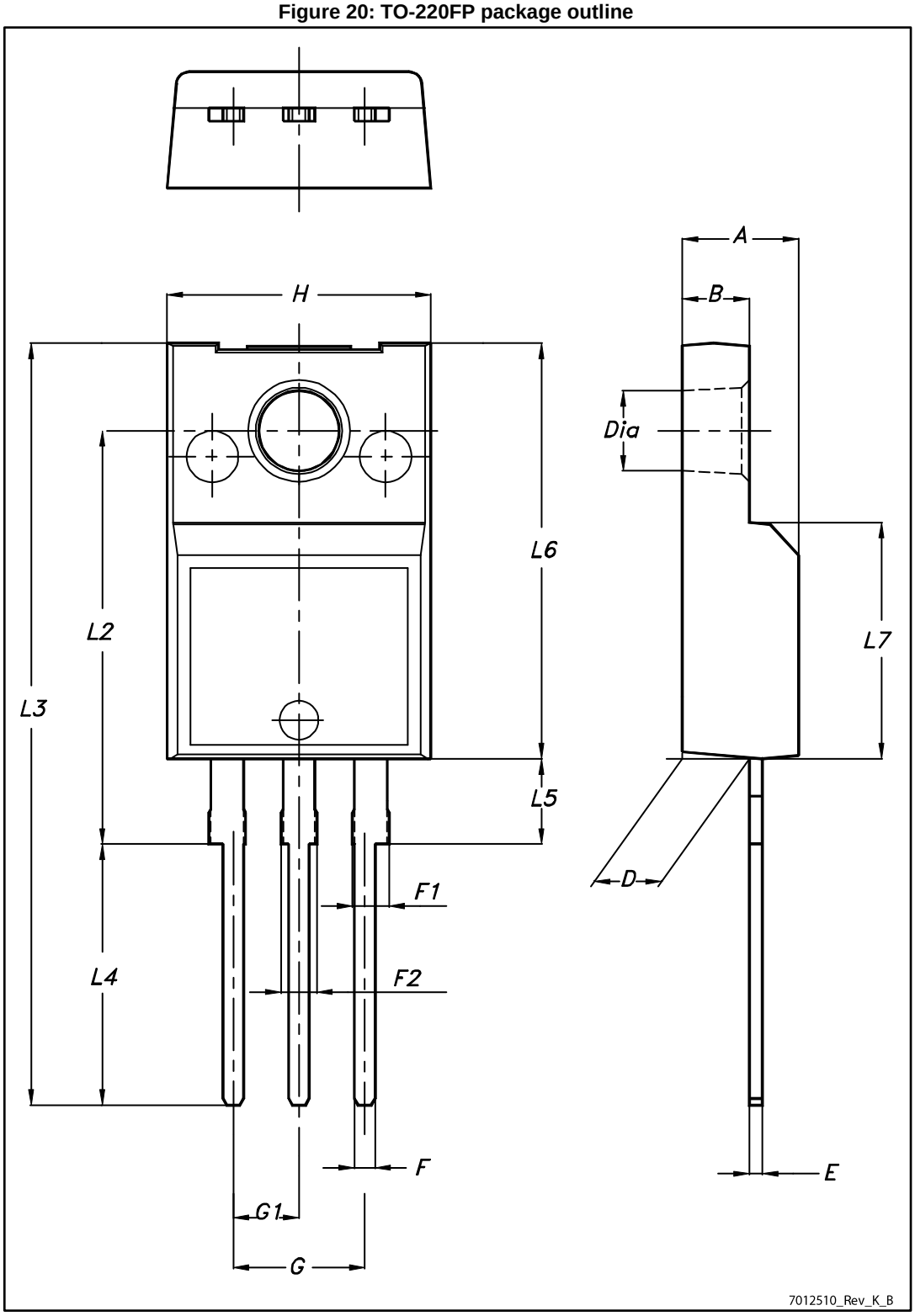


Table 9: TO-220FP package mechanical data

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

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
23-Mar-2017	1	First release.

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

单击下面可查看定价，库存，交付和生命周期等信息

>>STMicro(意法半导体)