

N-channel 1700 V, 7 Ω typ., 2.6 A PowerMESH™ Power MOSFET in a TO-3PF package

Datasheet - production data

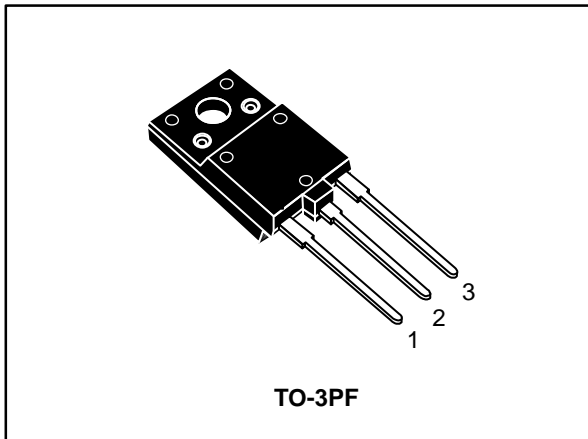
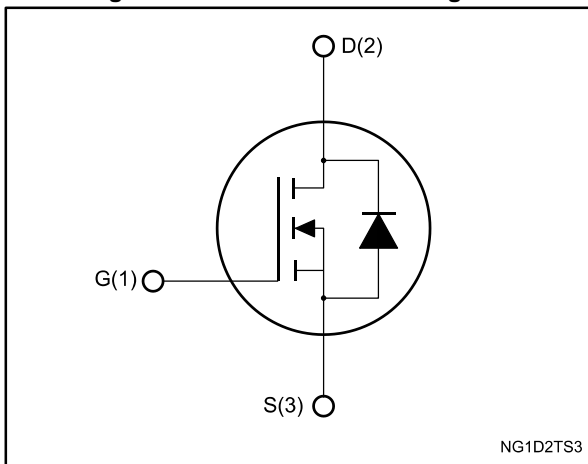


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STFW3N170	1700 V	13 Ω	2.6 A	63 W

- Intrinsic capacitances and Q_g minimized
- TO-3PF for higher creepage between leads
- High speed switching
- 100% avalanche tested

Applications

- Switching applications

Description

This Power MOSFET is designed using the STMicroelectronics consolidated strip-layout-based MESH OVERLAY™ process. The result is a product that matches or improves on the performance of comparable standard parts from other manufacturers.

Table 1: Device summary

Order code	Marking	Package	Packing
STFW3N170	3N170	TO-3PF	Tube

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-3PF package information.....	9
5	Revision history	11

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	1700	V
V_{GS}	Gate-source voltage	± 30	V
$I_D^{(1)}$	Drain current (continuous) at $T_{case} = 25\text{ °C}$	2.6	A
	Drain current (continuous) at $T_{case} = 100\text{ °C}$	1.6	
I_{DM}	Drain current (pulsed)	10.4	A
P_{TOT}	Total dissipation at $T_{case} = 25\text{ °C}$	63	W
I_{AR}	Avalanche current, repetitive or not repetitive	0.8	A
$E_{AS}^{(2)}$	Single pulse avalanche energy	2	mJ
V_{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink ($t = 1\text{ s}$; $T_C = 25\text{ °C}$)	3.5	kV
T_{stg}	Storage temperature	-55 to 150	°C
T_j	Operating junction temperature		

Notes:

(1) Limited by maximum junction temperature.

(2) starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	2	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient	50	

2 Electrical characteristics

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

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 1\text{ mA}$	1700			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 1700\text{ V}$			10	μA
		$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 1700\text{ V}$, $T_{\text{case}} = 125\text{ °C}$			500	
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 30\text{ V}$			± 100	nA
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	3	4	5	V
$R_{\text{DS(on)}}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 1.3\text{ A}$		7	13	Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{\text{DS}} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	1100	-	pF
C_{oss}	Output capacitance		-	50	-	
C_{rss}	Reverse transfer capacitance		-	7	-	
R_{G}	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_{\text{D}} = 0\text{ A}$	-	3.6	-	Ω
Q_{g}	Total gate charge	$V_{\text{DD}} = 1360\text{ V}$, $I_{\text{D}} = 2.6\text{ A}$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 15: "Gate charge test circuit")	-	44	-	nC
Q_{gs}	Gate-source charge		-	7	-	
Q_{gd}	Gate-drain charge		-	25	-	

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d(on)}}$	Turn-on delay time	$V_{\text{DD}} = 850\text{ V}$, $I_{\text{D}} = 1.3\text{ A}$ $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 14: "Switching times test circuit for resistive load" and Figure 19: "Switching time waveform")	-	25	-	ns
t_{r}	Rise time		-	9	-	
$t_{\text{d(off)}}$	Turn-off delay time		-	51	-	
t_{f}	Fall time		-	53	-	

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current	$T_j = 25\text{ °C}$	-		2.6	A
I_{SDM}	Source-drain current (pulsed)		-		10.4	
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0\text{ V}$, $I_{SD} = 2.6\text{ A}$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 2.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$ (see Figure 16 : "Test circuit for inductive load switching and diode recovery times")	-	1.58		μs
Q_{rr}	Reverse recovery charge		-	6		μC
I_{RRM}	Reverse recovery current		-	7.9		A
t_{rr}	Reverse recovery time	$I_{SD} = 2.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 60\text{ V}$, $T_j = 150\text{ °C}$ (see Figure 16 : "Test circuit for inductive load switching and diode recovery times")	-	2.12		μs
Q_{rr}	Reverse recovery charge		-	8.8		μC
I_{RRM}	Reverse recovery current		-	8.3		A

Notes:

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

2.1 Electrical characteristics (curves)

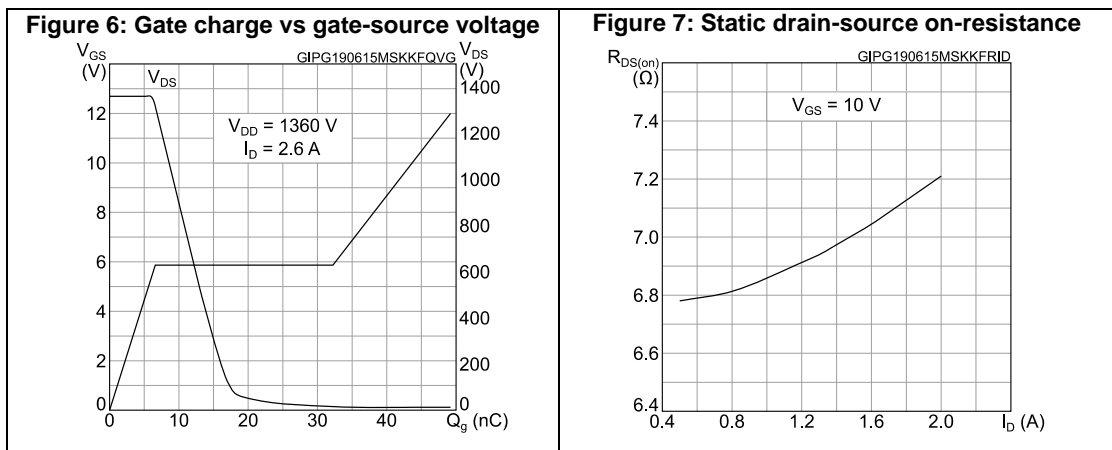
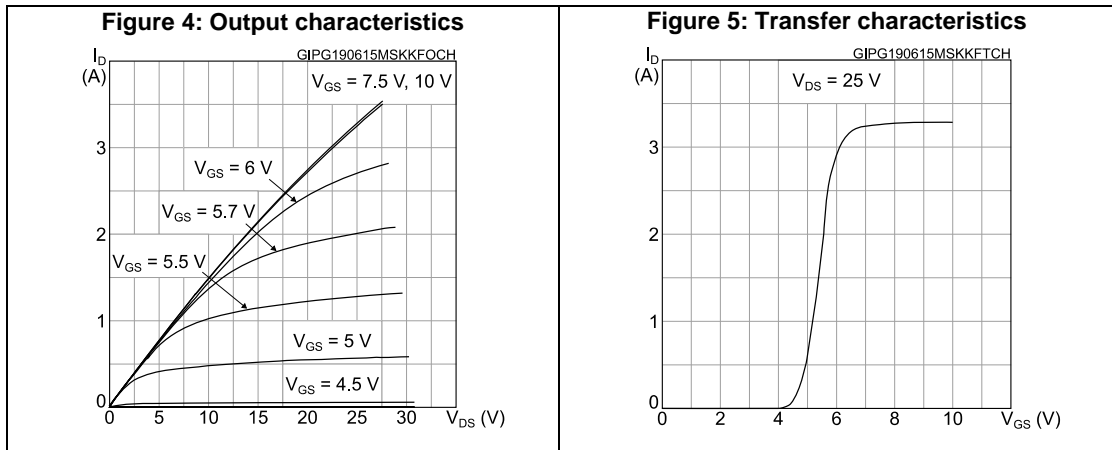
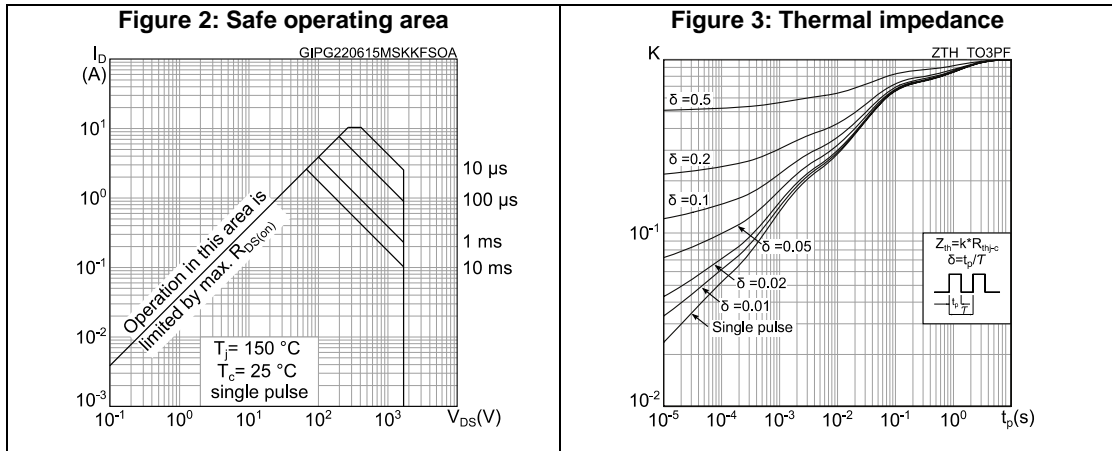


Figure 8: Capacitance variations

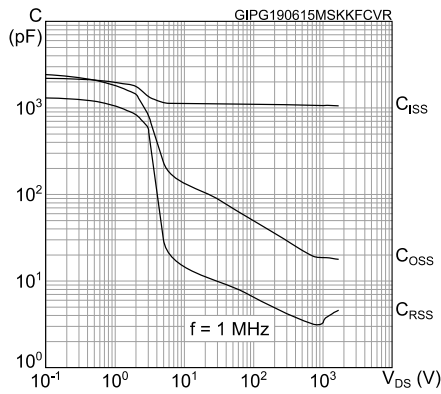


Figure 9: Normalized gate threshold voltage vs temperature

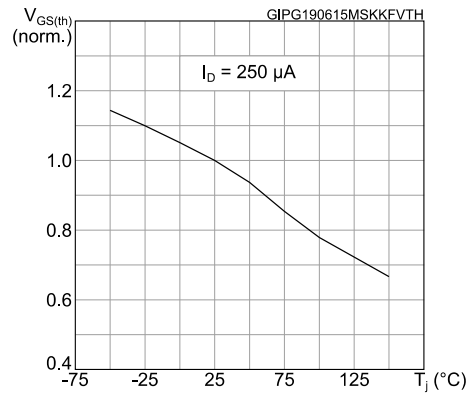


Figure 10: Normalized on-resistance vs temperature

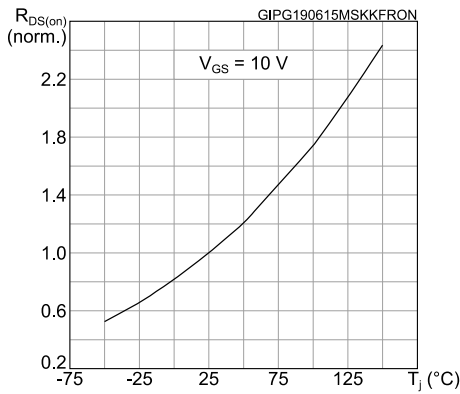


Figure 11: Normalized V(BR)DSS vs temperature

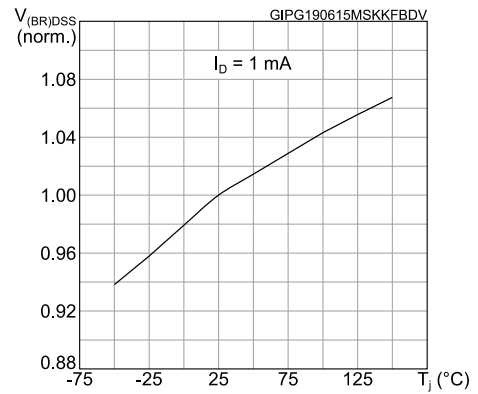


Figure 12: Output capacitance stored energy

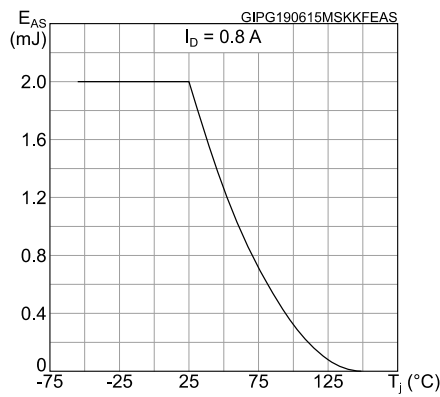
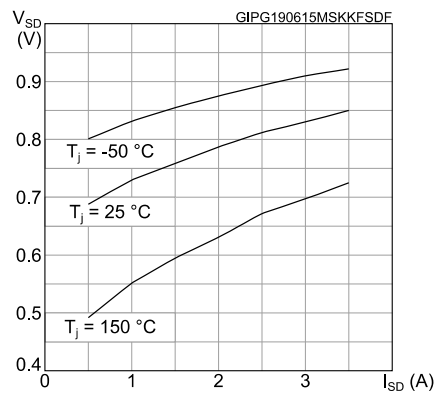
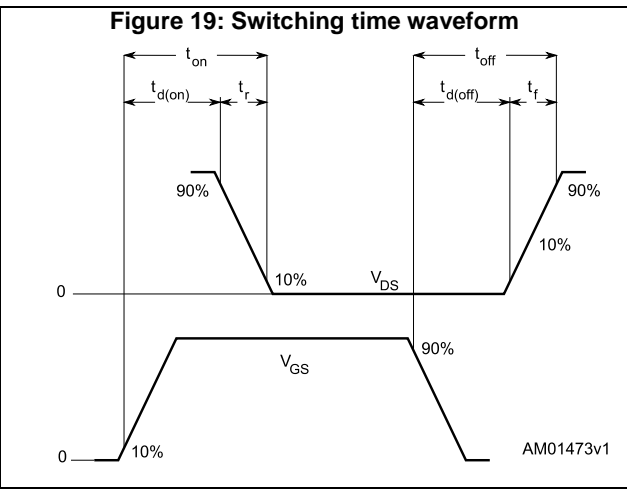
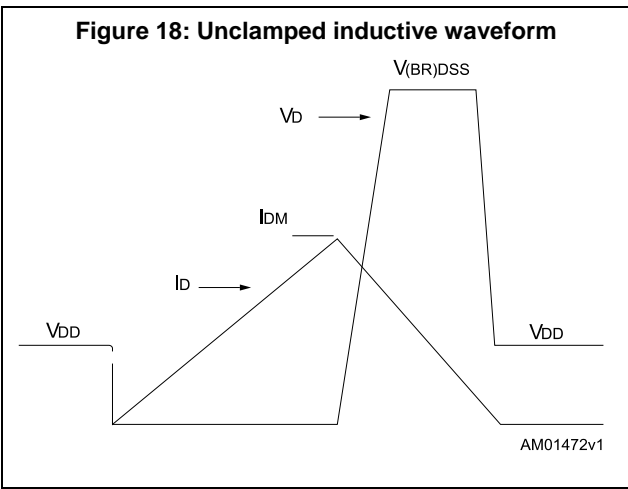
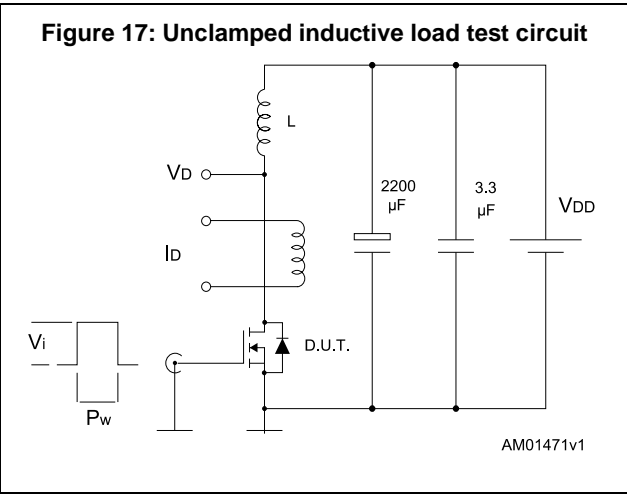
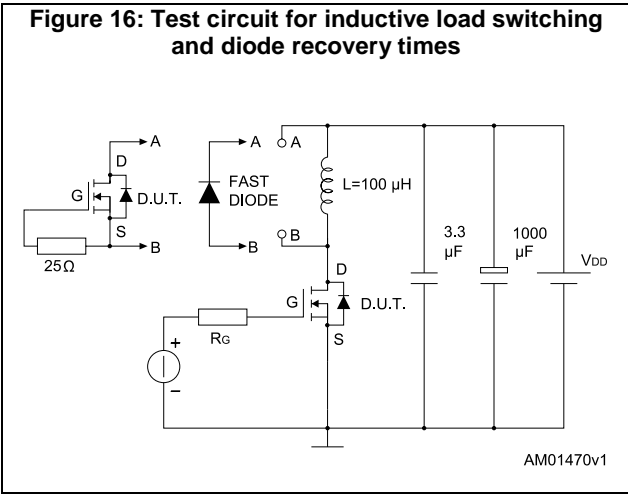
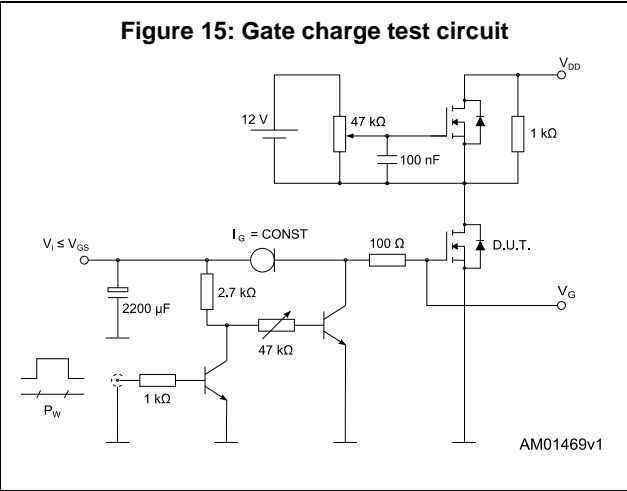
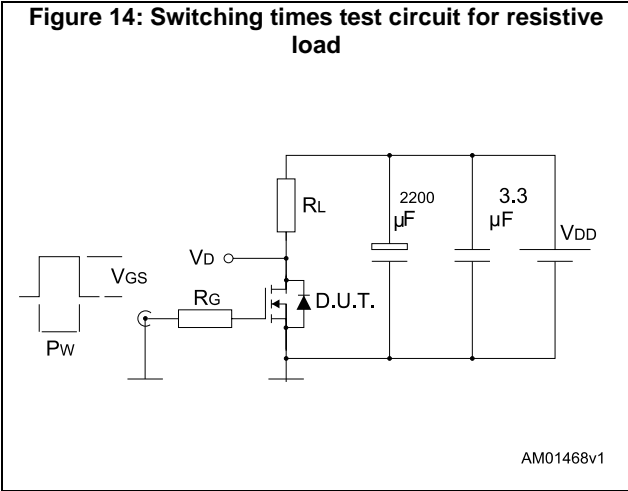


Figure 13: Source-drain diode forward characteristics



3 Test circuits



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-3PF package information

Figure 20: TO-3PF package outline

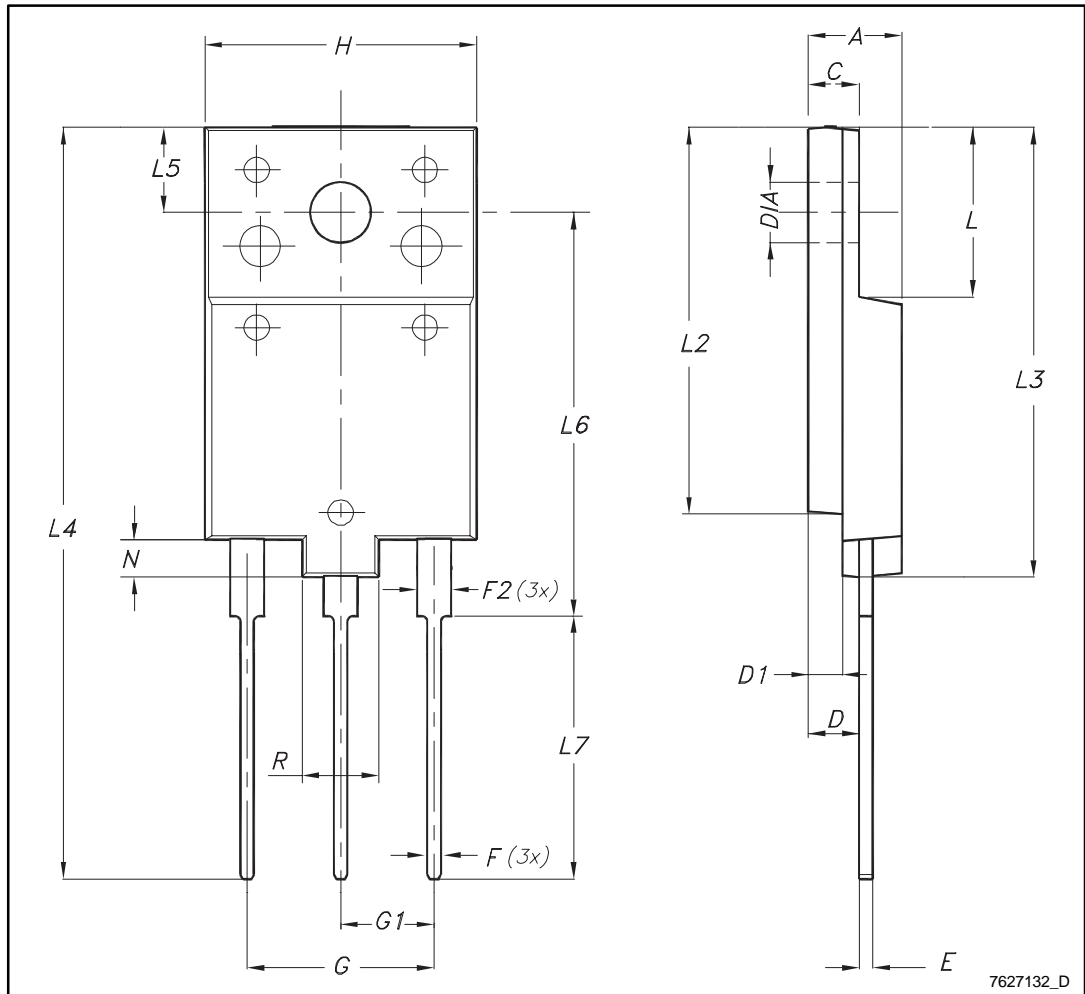


Table 8: TO-3PF mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	5.30		5.70
C	2.80		3.20
D	3.10		3.50
D1	1.80		2.20
E	0.80		1.10
F	0.65		0.95
F2	1.80		2.20
G	10.30		11.50
G1		5.45	
H	15.30		15.70
L	9.80	10	10.20
L2	22.80		23.20
L3	26.30		26.70
L4	43.20		44.40
L5	4.30		4.70
L6	24.30		24.70
L7	14.60		15
N	1.80		2.20
R	3.80		4.20
Dia	3.40		3.80

5 Revision history

Table 9: Document revision history

Date	Revision	Changes
17-Jan-2013	1	First release.
22-Jun-2015	2	<p>Text and formatting changes throughout document. Part number STW3N170 has been moved to a separate document.</p> <p>In section Electrical ratings:</p> <ul style="list-style-type: none"> - updated Table Absolute maximum ratings <p>In section Electrical characteristics:</p> <ul style="list-style-type: none"> - renamed Table Static (was On/off states) - updated Table Dynamic - updated Table Switching times - updated Table Source-drain diode <p>Added section Electrical characteristics (curves)</p> <p>In section Package information:</p> <ul style="list-style-type: none"> - updated section name (was Package mechanical data) - updated TO-3PF package information
16-Sep-2015	3	<p>In section <i>Electrical ratings</i>:</p> <ul style="list-style-type: none"> - updated table <i>Absolute maximum ratings</i> <p>In section <i>Electrical characteristics</i>:</p> <ul style="list-style-type: none"> - updated table <i>Dynamic</i> <p>In section <i>Electrical characteristics (curves)</i>:</p> <ul style="list-style-type: none"> - updated figures <i>Thermal impedance</i> and <i>Output capacitance stored energy</i>

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.

© 2015 STMicroelectronics – All rights reserved