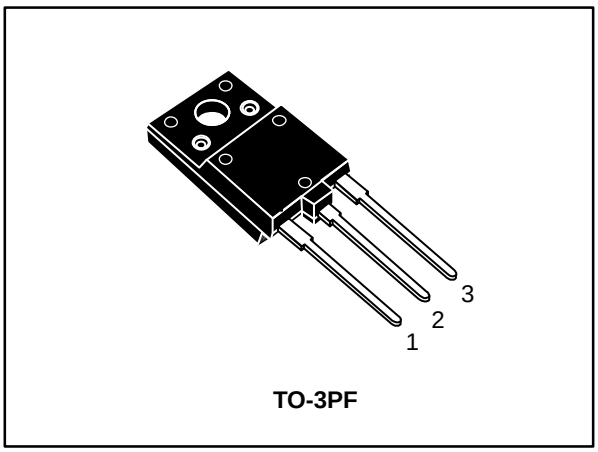
STFW3N170

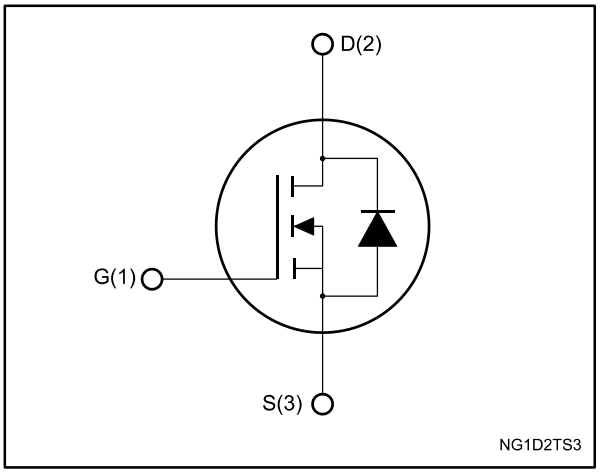
N-channel 1700 V, 7 Ω typ., 2.6 A PowerMESH™ Power MOSFET in a TO-3PF package

Datasheet - production data



TO-3PF

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

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 °C	2.6	A
	Drain current (continuous) at T_{case} = 100 °C	1.6	
I_{DM}	Drain current (pulsed)	10.4	A
P_{TOT}	Total dissipation at T_{case} = 25 °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 s; T_C = 25 °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 °C, I_D = I_{AR}, V_{DD} = 50 V.

Table 3: Thermal data

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

2 Electrical characteristics

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

Table 4: Static

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

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 100 V, f = 1 MHz, V_{GS} = 0 V	-	1100	-	pF
C_{oss}	Output capacitance		-	50	-	
C_{rss}	Reverse transfer capacitance		-	7	-	
R_G	Intrinsic gate resistance	f = 1 MHz, I_D = 0 A	-	3.6	-	Ω
Q_g	Total gate charge	V_{DD} = 1360 V, I_D = 2.6 A, V_{GS} = 10 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
$t_{d(on)}$	Turn-on delay time	V_{DD} = 850 V, I_D = 1.3 A R_G = 4.7 Ω, V_{GS} = 10 V (see *Figure 14: "Switching times test circuit for resistive load"* and *Figure 19: "Switching time waveform"*)	-	25	-	ns
t_r	Rise time		-	9	-	
$t_{d(off)}$	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 °C	-		2.6	A
I_{SDM}	Source-drain current (pulsed)		-		10.4	
V_{SD}(1)	Forward on voltage	V_{GS} = 0 V, I_{SD} = 2.6 A	-		1.5	V
t_{rr}	Reverse recovery time	I_{SD} = 2.6 A, di/dt = 100 A/µs, V_{DD} = 60 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 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"*)	-	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 2: Safe operating area

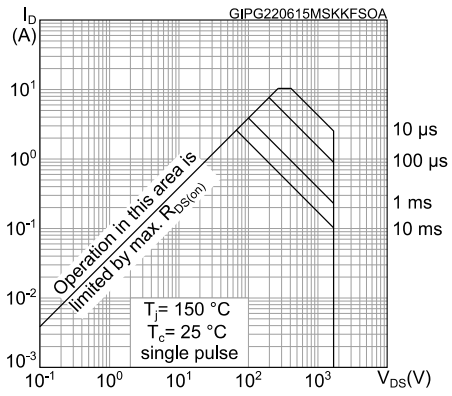


Figure 3: Thermal impedance

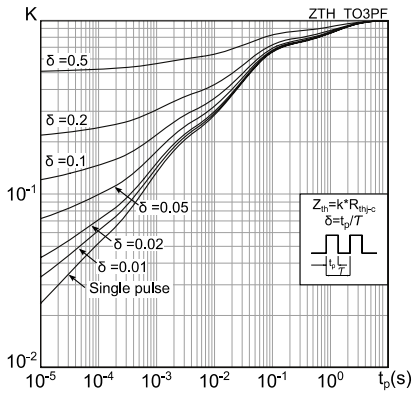


Figure 4: Output characteristics

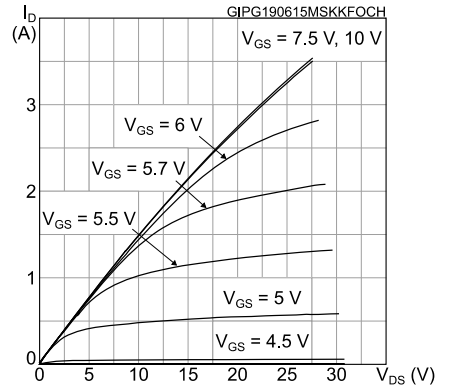


Figure 5: Transfer characteristics

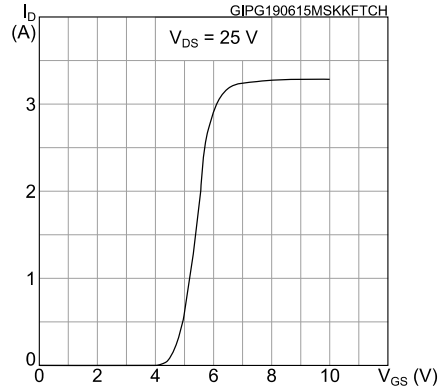


Figure 6: Gate charge vs gate-source voltage

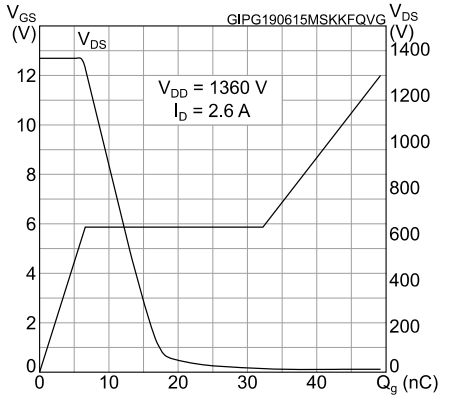


Figure 7: Static drain-source on-resistance

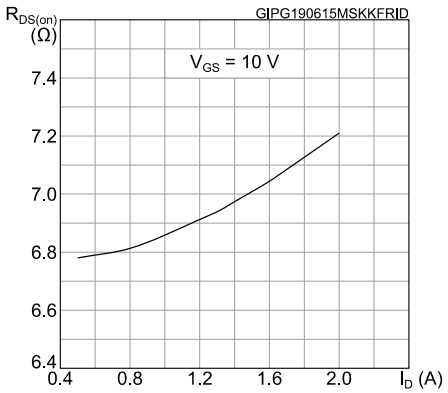


Figure 8: Capacitance variations

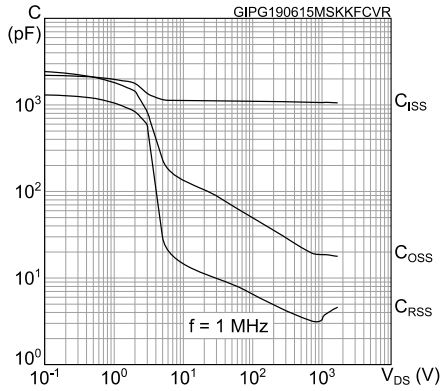


Figure 9: Normalized gate threshold voltage vs temperature

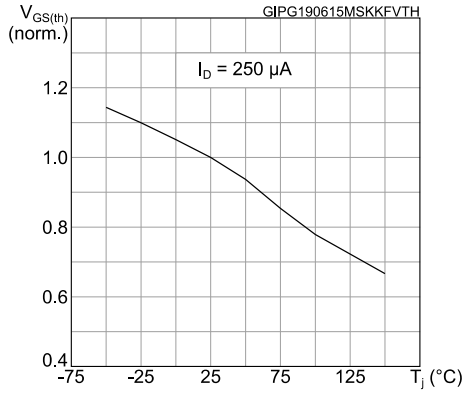


Figure 10: Normalized on-resistance vs temperature

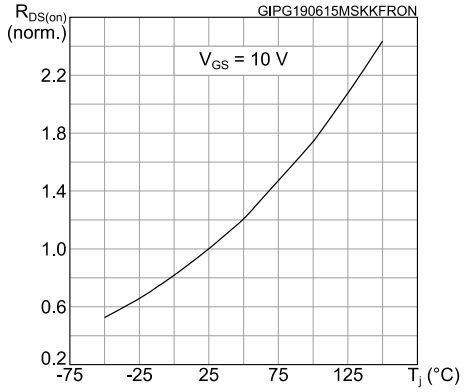


Figure 11: Normalized V(BR)DSS vs temperature

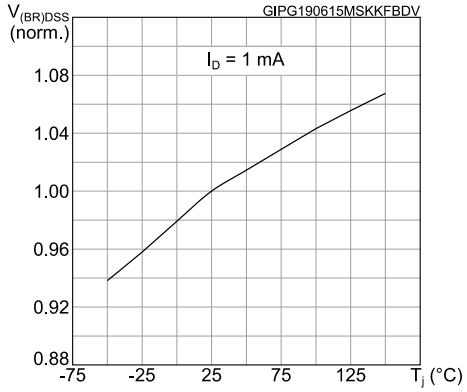


Figure 12: Output capacitance stored energy

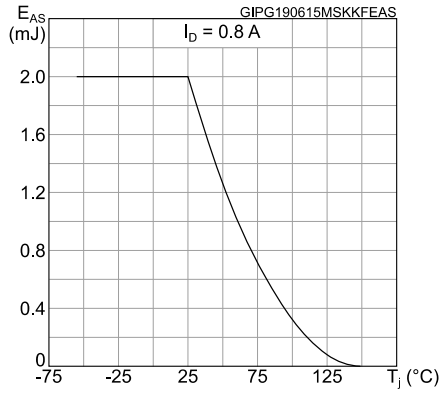
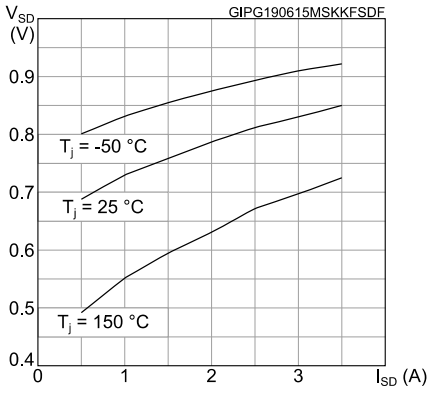


Figure 13: Source- drain diode forward characteristics



3 Test circuits

Figure 14: Switching times test circuit for resistive load

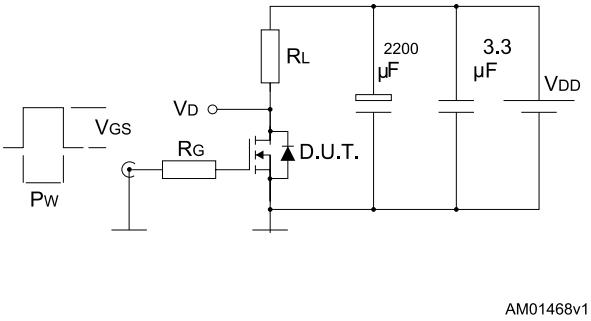


Figure 15: Gate charge test circuit

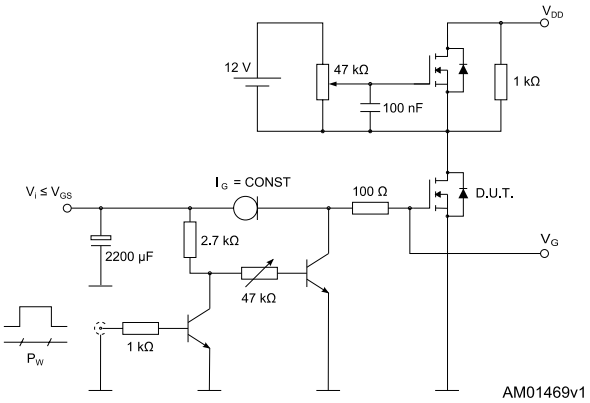


Figure 16: Test circuit for inductive load switching and diode recovery times

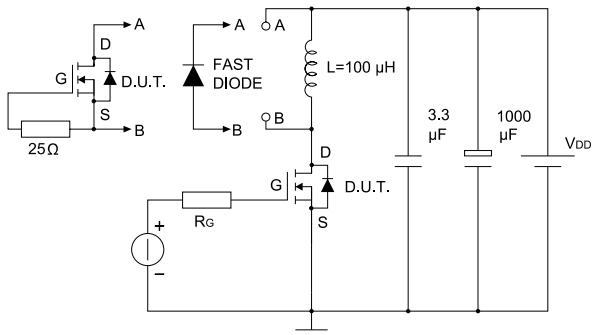


Figure 17: Unclamped inductive load test circuit

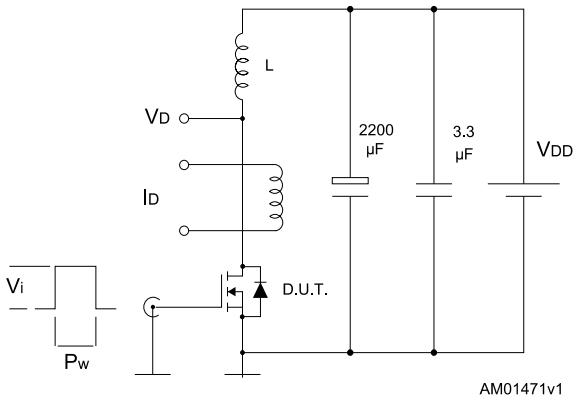


Figure 18: Unclamped inductive waveform

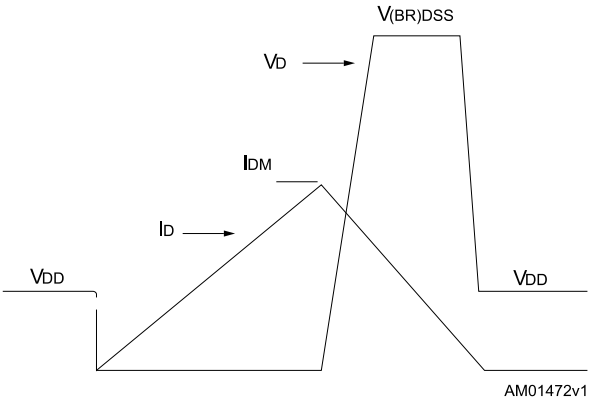
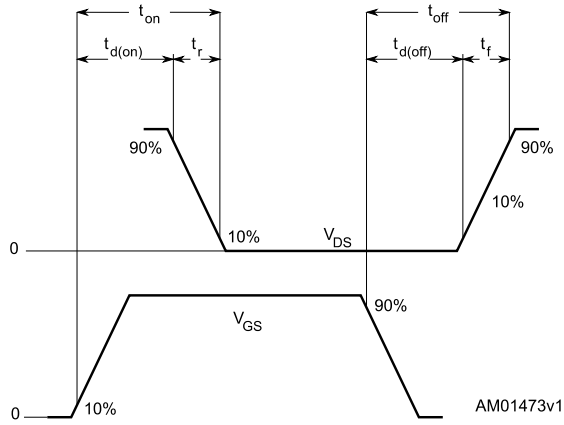


Figure 19: Switching time waveform



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-3PF package information

Figure 20: TO-3PF package outline

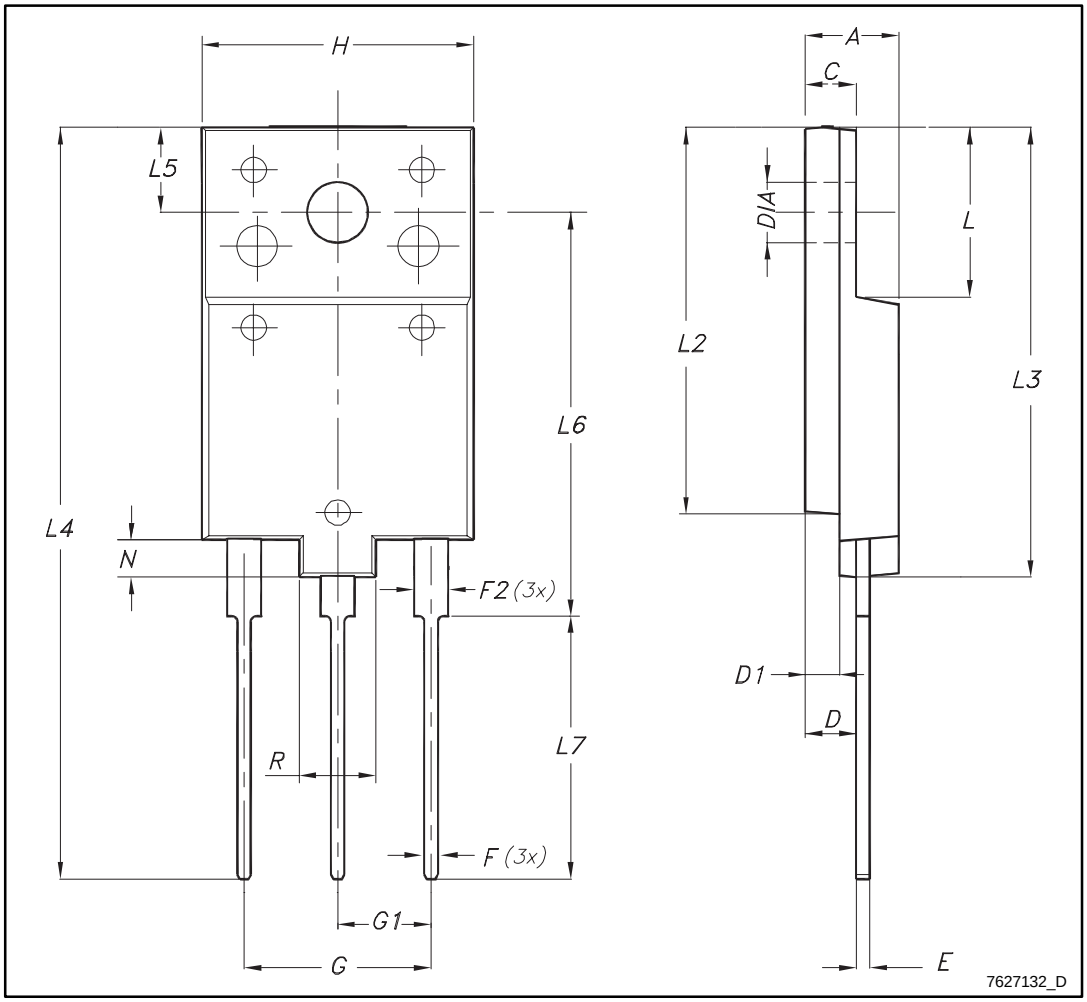


Table 8: TO-3PF mechanical data

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	Text and formatting changes throughout document. Part number STW3N170 has been moved to a separate document. In section Electrical ratings: - updated Table Absolute maximum ratings In section Electrical characteristics: - renamed Table Static (was On/off states) - updated Table Dynamic - updated Table Switching times - updated Table Source-drain diode Added section Electrical characteristics (curves) In section Package information: - updated section name (was Package mechanical data) - updated TO-3PF package information
16-Sep-2015	3	In section *Electrical ratings*: - updated table *Absolute maximum ratings* In section *Electrical characteristics*: - updated table *Dynamic* In section *Electrical characteristics (curves)*: - updated figures *Thermal impedance* and *Output capacitance stored energy*

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