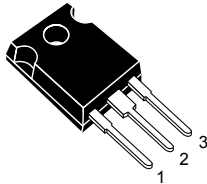
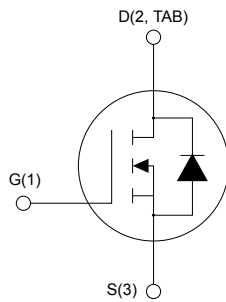


N-channel 1700 V, 7 Ω typ., 2.6 A PowerMESH Power MOSFET in a TO-247 package



TO-247



AM01475v1_noZen



Product status link

[STW3N170](#)

Product summary

Order code	STW3N170
Marking	3N170
Package	TO-247
Packing	Tube

Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STW3N170	1700 V	13 Ω	2.6 A

- 100% avalanche tested
- Intrinsic capacitances and Q_g minimized
- High speed switching

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.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	1700	V
V_{GS}	Gate-source voltage	± 30	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	2.6	A
	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	1.6	
$I_{DM}^{(1)}$	Drain current (pulsed)	10.4	A
P_{TOT}	Total power dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	160	W
T_{stg}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$
T_J	Operating junction temperature range		$^{\circ}\text{C}$

1. Pulse width is limited by safe operating area.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance, junction-to-case	0.78	$^{\circ}\text{C/W}$
R_{thJA}	Thermal resistance, junction-to-ambient	50	$^{\circ}\text{C/W}$

Table 3. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche current, repetitive or non-repetitive (pulse width limited by T_J max.)	0.8	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	2	mJ

2 Electrical characteristics

$T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Table 4. On/off-state

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

1. Specified by design, not tested in production.

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 100\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$	-	1100	-	pF
C_{oss}	Output capacitance		-	50	-	pF
C_{rss}	Reverse transfer capacitance		-	7	-	pF
R_g	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_D = 0\text{ A}$	-	3.6	-	Ω
Q_g	Total gate charge	$V_{DD} = 1360\text{ V}$, $I_D = 2.6\text{ A}$, $V_{GS} = 0\text{ to }10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior)	-	44	-	nC
Q_{gs}	Gate-source charge		-	7	-	nC
Q_{gd}	Gate-drain charge		-	25	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 850\text{ V}$, $I_D = 1.3\text{ A}$,	-	25	-	ns
t_r	Rise time	$R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$	-	9	-	ns
$t_{d(off)}$	Turn-off delay time	(see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)	-	51	-	ns
t_f	Fall time		-	53	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		2.6	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		10.4	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 2.6 \text{ A}$, $V_{GS} = 0 \text{ V}$	-		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 15. Test circuit for inductive load switching and diode recovery times)	-	1.58		ns
Q_{rr}	Reverse recovery charge		-	6		μC
I_{RRM}	Reverse recovery current		-	7.9		A
t_{rr}	Reverse recovery time	$I_{SD} = 2.6 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 60 \text{ V}$, $T_J = 150 \text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	2.12		ns
Q_{rr}	Reverse recovery charge		-	8.8		μC
I_{RRM}	Reverse recovery current		-	8.3		A

1. Pulse width is limited by safe operating area.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

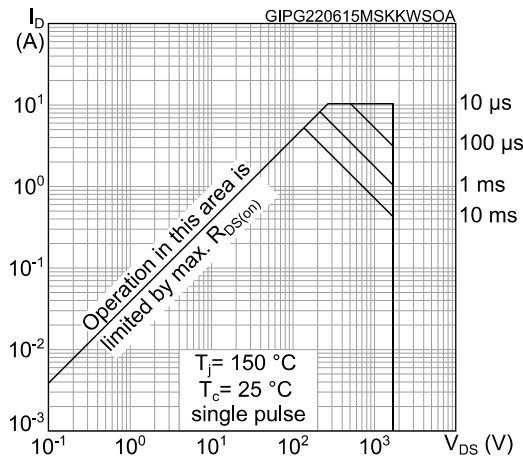


Figure 2. Normalized transient thermal impedance

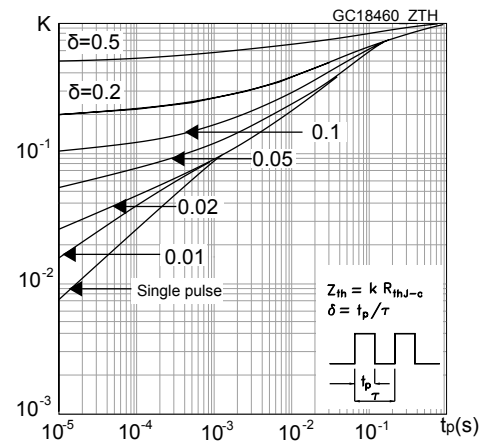


Figure 3. Typical output characteristics

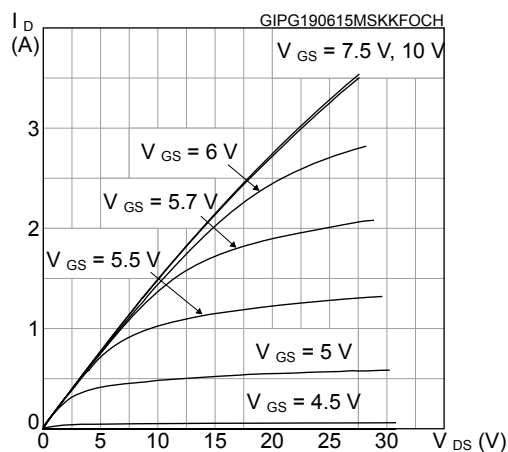


Figure 4. Typical transfer characteristics

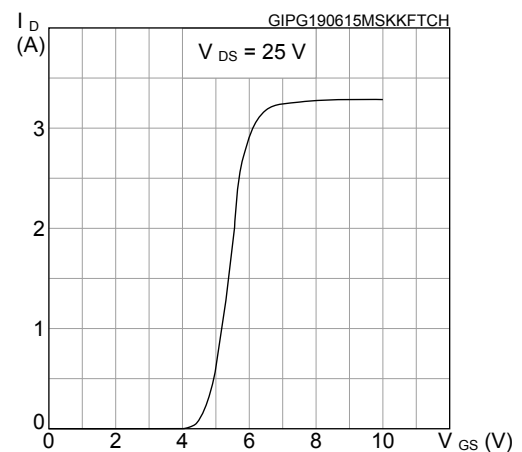


Figure 5. Typical gate charge characteristics

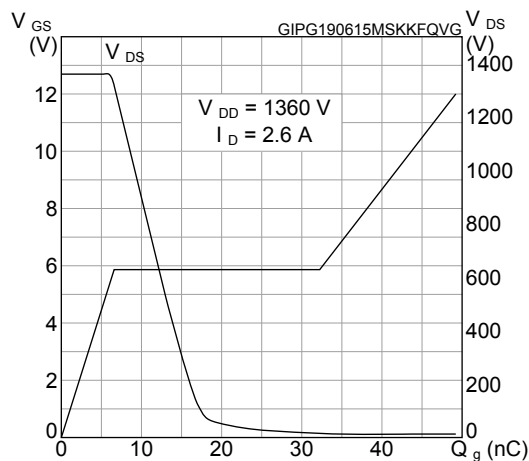


Figure 6. Typical drain-source on-resistance

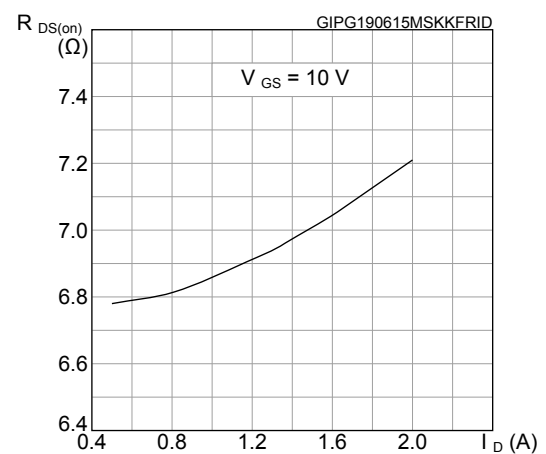


Figure 7. Typical capacitance characteristics

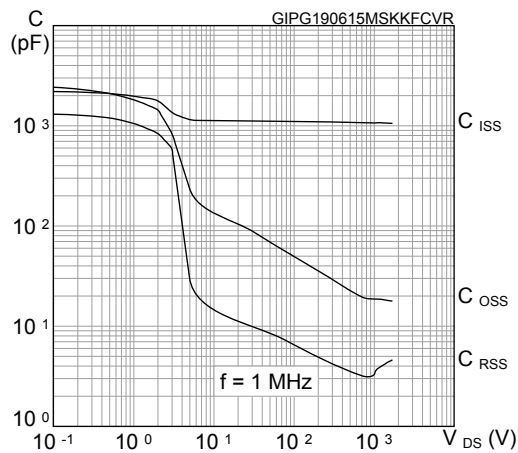


Figure 8. Output capacitance stored energy

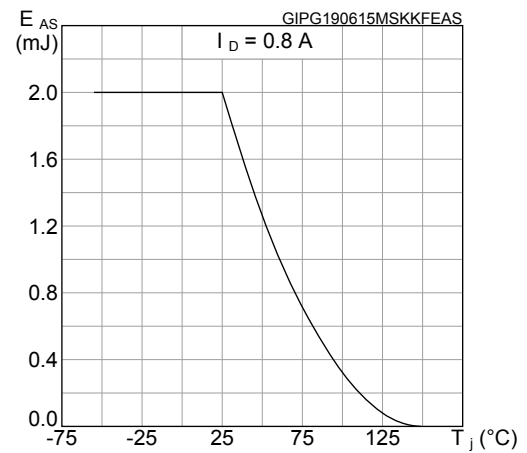


Figure 9. Normalized gate threshold vs temperature

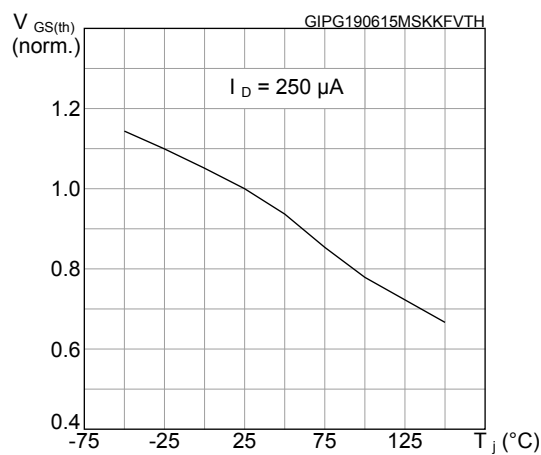


Figure 10. Normalized on-resistance vs temperature

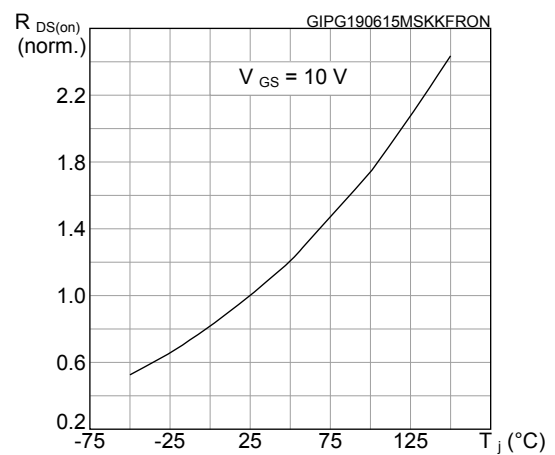


Figure 11. Typical drain-source on-resistance

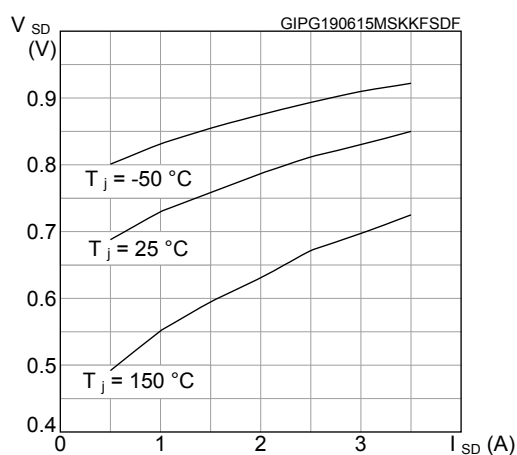
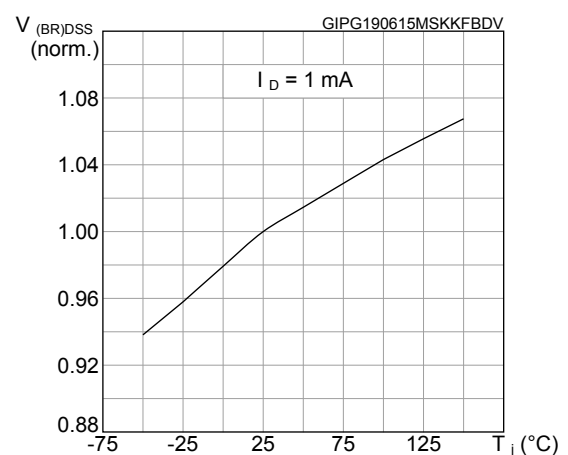


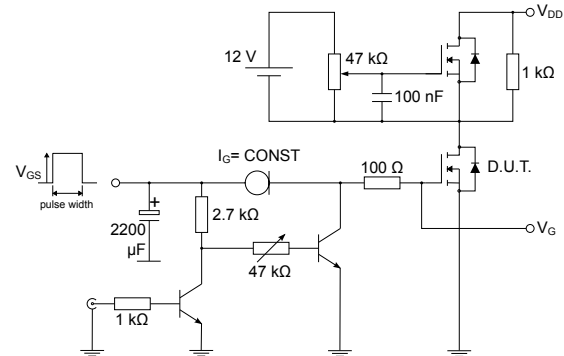
Figure 12. Normalized breakdown voltage vs temperature



3 Test circuits

Figure 13. Test circuit for resistive load switching times


AM01468v1

Figure 14. Test circuit for gate charge behavior


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

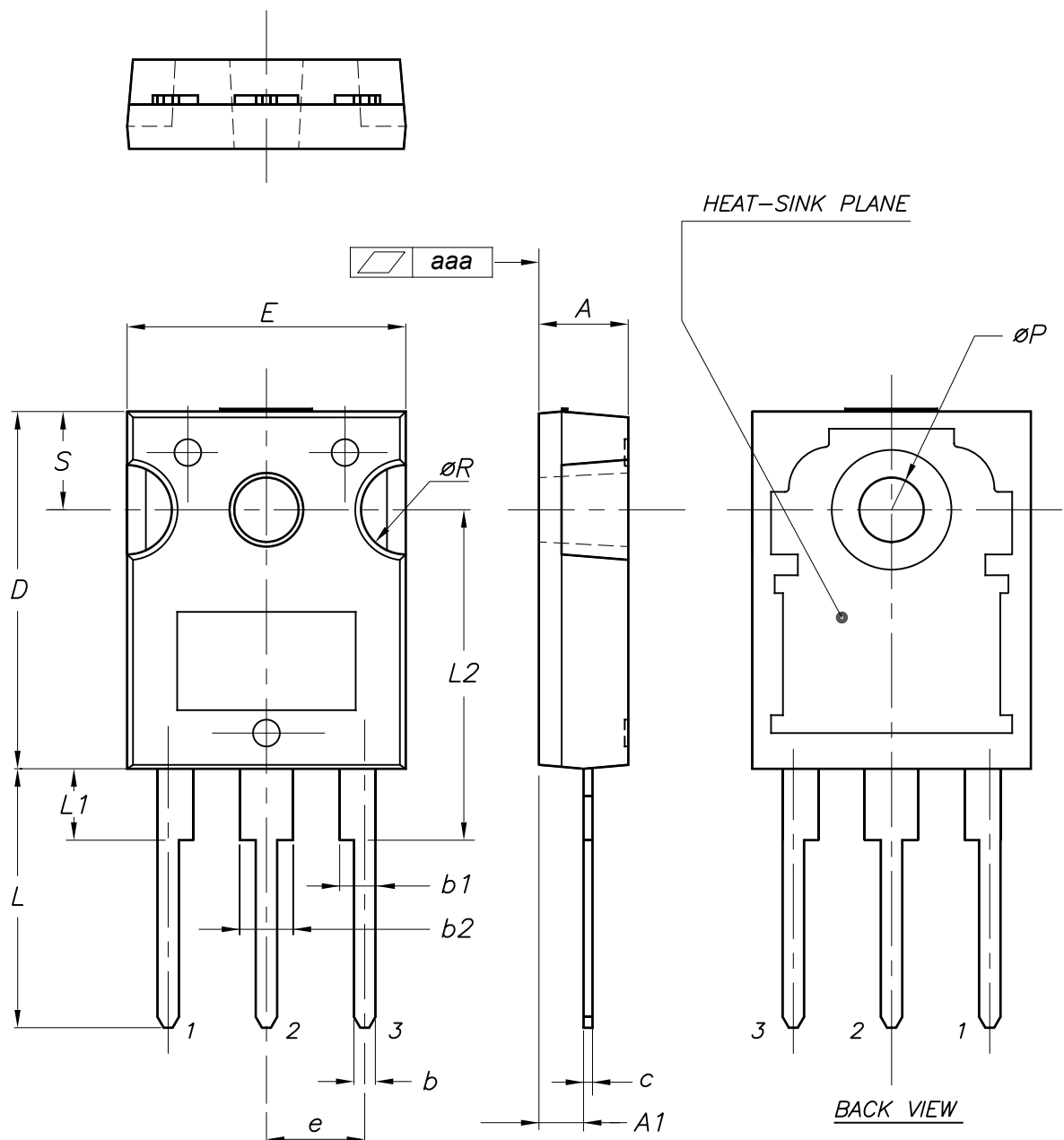

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4 Package information

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-247 package information

Figure 19. TO-247 package outline



0075325_10

Table 8. TO-247 package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
ØP	3.55		3.65
ØR	4.50		5.50
S	5.30	5.50	5.70
aaa		0.04	0.10

Revision history

Table 9. Document revision history

Date	Revision	Changes
14-Sep-2015	1	First release.
22-Apr-2024	2	The part number STWA3N170 has been moved to a separate datasheet and the document has been updated accordingly. Updated Section 4.1: TO-247 package information . Minor text changes.

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