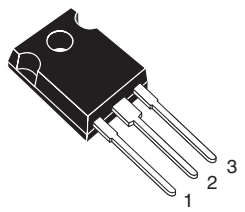
STW19NM60N

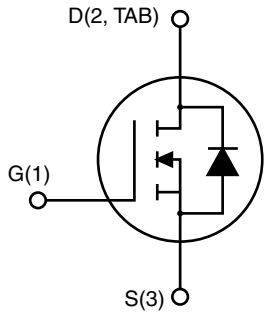
Automotive-grade N-channel 600 V, 0.26 Ω typ., 13 A MDmesh™ II Power MOSFET in a TO-247 package

Datasheet - production data



TO-247

Figure 1. Internal schematic diagram



Features

Order code	V_{DS} (@T_{jmax})	$R_{DS(on)}$ max.	I_D	P_{TOT}
STW19NM60N	650 V	0.285 Ω	13 A	110 W

- Designed for automotive applications and AEC-Q101 qualified
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the second generation of MDmesh™ technology. This revolutionary Power MOSFET associates a vertical structure to the company's strip layout to yield one of the world's lowest on-resistance and gate charge. It is therefore suitable for the most demanding high efficiency converters.

Table 1. Device summary

Order codes	Marking	Package	Packaging
STW19NM60N	19NM60N	TO-247	Tube

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	600	V
V_{GS}	Gate- source voltage	± 25	
I_D	Drain current (continuous) at T_C = 25 °C	13	A
I_D	Drain current (continuous) at T_C = 100 °C	8.2	A
I_{DM} (1)	Drain current (pulsed)	52	A
P_{TOT}	Total dissipation at T_C = 25 °C	110	W
I_{AR}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_J max)	4	A
E_{AS}	Single pulse avalanche energy (starting T_J = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	350	mJ
dv/dt(2)	Peak diode recovery voltage slope	15	V/ns
T_J	Operating junction temperature	-55 to 150	°C
T_{stg}	Storage temperature		°C

1. Pulse width limited by safe operating area.
2. $I_{SD} \leq$ 13 A, di/dt $\leq$ 400 A/µs, $V_{DD} \leq$ 80 % $V_{(BR)DSS}$, $V_{DS(peak)} \leq V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	1.14	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-amb max	50	°C/W

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	I_D = 1 mA, V_{GS}= 0	600			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 600 V			1	µA
		V_{DS} = 600 V, T_J=125 °C			10	µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±25 V			±100	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS}= 10 V, I_D=6.5 A		0.260	0.285	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 50 V, f =1 MHz, V_{GS} = 0	-	1000	-	pF
C_{oss}	Output capacitance		-	60	-	pF
C_{rss}	Reverse transfer capacitance		-	3	-	pF
$C_{oss\ eq.}$ (1)	Output equivalent capacitance	V_{DS} = 0, to 480 V, V_{GS}=0	-	225	-	pF
R_g	Intrinsic resistance	f=1 MHz open drain	-	3.5	-	Ω
Q_g	Total gate charge	V_{DD} = 480 V, I_D = 13 A V_{GS} = 10 V	-	35	-	nC
Q_{gs}	Gate-source charge		-	6	-	nC
Q_{gd}	Gate-drain charge		-	20	-	nC

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_{DS}.

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 300 V, I_D = 6.5 A, R_G = 4.7 Ω, V_{GS} = 10 V	-	12	-	ns
t_r	Rise time		-	15	-	ns
$t_{d(off)}$	Turn-off delay time		-	55	-	ns
t_f	Fall time		-	25	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		13	A
I_{SDM} (1)	Source-drain current (pulsed)		-		52	A
V_{SD}(2)	Forward on voltage	I_{SD} = 13 A, V_{GS}=0	-		1.6	V
t_{rr}	Reverse recovery time	I_{SD} =13 A, di/dt =100 A/µs, V_{DD} = 60 V	-	300		ns
Q_{rr}	Reverse recovery charge		-	4.0		µC
I_{RRM}	Reverse recovery current		-	25		A
t_{rr}	Reverse recovery time	V_{DD} = 60 V di/dt =100 A/µs, I_{SD} = 13 A Tj = 150°C *(see)*	-	360		ns
Q_{rr}	Reverse recovery charge		-	4.5		µC
I_{RRM}	Reverse recovery current		-	25		A

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