STW55NM60ND

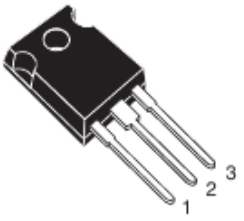
N-channel 600 V, 0.047 Ω typ., 51 A FDmesh™ II Power MOSFET (with fast diode) in a TO-247 package

Datasheet — production data

Features

Type	V_{DSS} (@$T_J$max)	$R_{DS(on)}$ max	I_D
STW55NM60ND	650 V	< 0.060 Ω	51 A

- The worldwide best $R_{DS(on)}$ amongst the fast recovery diode devices in TO-247
- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance
- High dv/dt and avalanche capabilities



TO-247

Application

- Switching applications

Description

This FDmesh™ II Power MOSFET with intrinsic fast-recovery body diode is produced using the second generation of MDmesh™ technology. Utilizing a new strip-layout vertical structure, this revolutionary device features extremely low on-resistance and superior switching performance. It is ideal for bridge topologies and ZVS phase-shift converters.

Figure 1. Internal schematic diagram

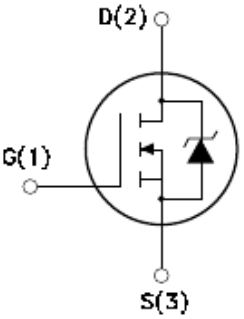


Table 1. Device summary

Order code	Marking	Package	Packaging
STW55NM60ND	55NM60ND	TO-247	Tube

Contents

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	V
I_D	Drain current (continuous) at T_C = 25 °C	51	A
I_D	Drain current (continuous) at T_C = 100 °C	32	A
I_{DM} (1)	Drain current (pulsed)	204	A
P_{TOT}	Total dissipation at T_C = 25 °C	350	W
dv/dt(2)	Peak diode recovery voltage slope	40	V/ns
T_{stg}	Storage temperature	–55 to 150	°C
T_j	Max. operating junction temperature	150	°C

1. Pulse width limited by safe operating area
2. I_{SD} ≤ 51 A, di/dt ≤ 600 A/µs, V_{DD} = 80% $V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}case}$	Thermal resistance junction-case max	0.36	°C/W
$R_{thj\text{-}amb}$	Thermal resistance junction-ambient max	50	°C/W
T_l	Maximum lead temperature for soldering purpose	300	°C

Table 4. Avalanche characteristics

Symbol	Parameter	Max value	Unit
I_{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j max)	15	A
E_{AS}	Single pulse avalanche energy (starting T_j = 25 °C, I_D = I_{AS}, V_{DD} = 50 V)	1600	mJ

2 Electrical characteristics

(T_{CASE}=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	I_D = 1 mA, V_{GS} = 0	600			V
dv/dt (1)	Drain source voltage slope	V_{DD}=480 V, I_D= 51 A, V_{GS} =10 V		30		V/ns
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 600 V V_{DS} = 600 V, T_C= 125 °C			10 100	µA µA
I_{GSS}	Gate-body leakage current (V_{DS} = 0)	V_{GS} = ± 20 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 = 25.5 A		0.047	0.060	Ω

1. Characteristic value at turn off on inductive load.

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15 V, I_D = 25.5 A		45		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 50 V, f = 1 MHz, V_{GS} = 0		5800 300 30		pF pF pF
$C_{oss\ eq.}$ (2)	Equivalent output capacitance	V_{GS} = 0, V_{DS} = 0 to 480 V		900		pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD} = 300 V, I_D = 25.5 A R_G = 4.7 Ω, V_{GS} = 10 V *(see Figure 19),* *(see Figure 14)*		33 68 188 96		ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 480 V, I_D = 51 A, V_{GS} = 10 V, *(see Figure 15)*		190 30 90		nC nC nC
R_g	Gate input resistance	f=1 MHz Gate DC Bias = 0 Test signal level = 20 mV Open drain		2.5		Ω

1. Pulsed: pulse duration= 300 µs, duty cycle 1.5%
2. $C_{oss\ eq.}$ 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. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain current Source-drain current (pulsed)				51 204	A A
V_{SD} (2)	Forward on voltage	I_{SD} = 51 A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 51 A, V_{DD} = 60 V di/dt = 100 A/µs *(see Figure 16)*		200 1.8 18		ns µC A
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 51 A,V_{DD} = 60 V di/dt = 100 A/µs, T_j = 150 °C *(see Figure 16)*		280 3.4 24		ns µC A

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