



STW43NM50N

N-channel 500 V - 0.065 Ω - 37 A - TO-247
second generation MDmesh™ Power MOSFET

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Preliminary Data

Features

Type	V _{DSS} @ T _{Jmax}	R _{DS(on)}	I _D
STW43NM50N	550 V	<0.085 Ω	37 A

- 100% avalanche tested
- Low input capacitance and gate charge
- Low gate input resistance

Application

- Switching applications

Description

This series of devices implements second generation MDmesh™ technology. This revolutionary Power MOSFET associates a new 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.

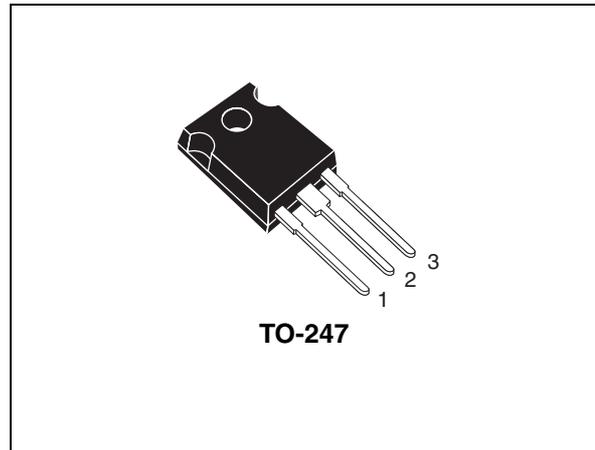


Figure 1. Internal schematic diagram

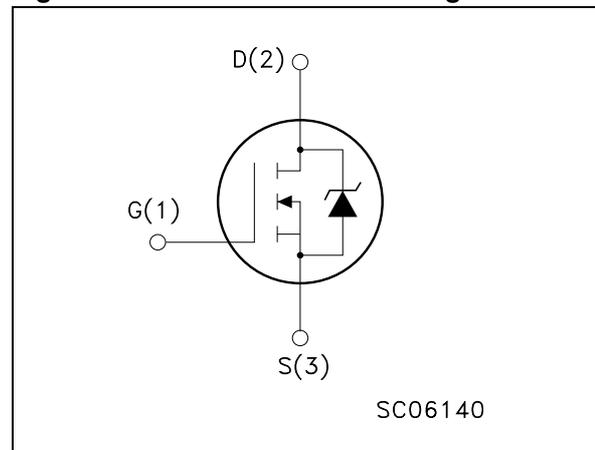


Table 1. Device summary

Order code	Marking	Package	Packaging
STW43NM50N	43NM50N	TO-247	Tube

1 Electrical ratings

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Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	500	V
V_{GS}	Gate- source voltage	± 25	V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$	37	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	23	A
$I_{DM}^{(1)}$	Drain current (pulsed)	148	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	255	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	Tbd	V/ns
T_{stg}	Storage temperature	-55 to 150	$^\circ\text{C}$
T_j	Max. operating junction temperature	150	$^\circ\text{C}$

1. Pulse width limited by safe operating area

2. $I_{SD} \leq 37\text{A}$, $di/dt \leq 400\text{ A}/\mu\text{s}$, $V_{DD} = 80\% V_{(BR)DSS}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.49	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$
T_l	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AS}	Avalanche current, repetitive or not-repetitive (pulse width limited by T_j Max)	Tbd	A
E_{AS}	Single pulse avalanche energy (starting $T_j=25^\circ\text{C}$, $I_D=I_{AS}$, $V_{DD}=50\text{V}$)	Tbd	mJ

2 Electrical characteristics

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($T_{CASE}=25^{\circ}C$ unless otherwise specified)

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 1 \text{ mA}, V_{GS} = 0$	500			V
$dv/dt^{(1)}$	Drain source voltage slope	$V_{DD} = 400 \text{ V}, I_D = 37 \text{ A}, V_{GS} = 10 \text{ V}$	Tbd			V/ns
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}, @125^{\circ}C$			1 100	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 \text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}, I_D = 18.5 \text{ A}$		0.065	0.085	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	$V_{DS} = 15 \text{ V}, I_D = 18.5 \text{ A}$		Tbd		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	$V_{DS} = 50 \text{ V}, f = 1 \text{ MHz}, V_{GS} = 0$		Tbd Tbd Tbd		pF pF pF
$C_{oss \text{ eq.}}^{(2)}$	Equivalent output capacitance	$V_{GS} = 0 \text{ V}, V_{DS} = 0 \text{ V to } 400 \text{ V}$		Tbd		pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 400 \text{ V}, I_D = 37 \text{ A}, V_{GS} = 10 \text{ V},$ <i>(see Figure 3)</i>		Tbd Tbd Tbd		nC nC nC
R_g	Gate input resistance	$f = 1 \text{ MHz}$ Gate DC Bias=0 Test signal level = 20 mV open drain		Tbd		Ω

1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5%

2. $C_{oss \text{ eq.}}$ 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}

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Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 250\text{ V}$, $I_D = 18.5\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (see Figure 2)		Tbd		ns
t_r	Rise time			Tbd		ns
$t_{d(off)}$	Turn-off delay time			Tbd		ns
t_f	Fall time			Tbd		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				37	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				148	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 37\text{ A}$, $V_{GS} = 0$			Tbd	V
t_{rr}	Reverse recovery time	$I_{SD} = 37\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$, $T_j = 25\text{ }^\circ\text{C}$ (see Figure 4)		Tbd		ns
Q_{rr}	Reverse recovery charge			Tbd		μC
I_{RRM}	Reverse recovery current				Tbd	A
t_{rr}	Reverse recovery time	$I_{SD} = 37\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$, $T_j = 150\text{ }^\circ\text{C}$ (see Figure 4)		Tbd		ns
Q_{rr}	Reverse recovery charge				Tbd	μC
I_{RRM}	Reverse recovery current				Tbd	A

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

3 Test circuit

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Figure 2. Switching times test circuit for resistive load

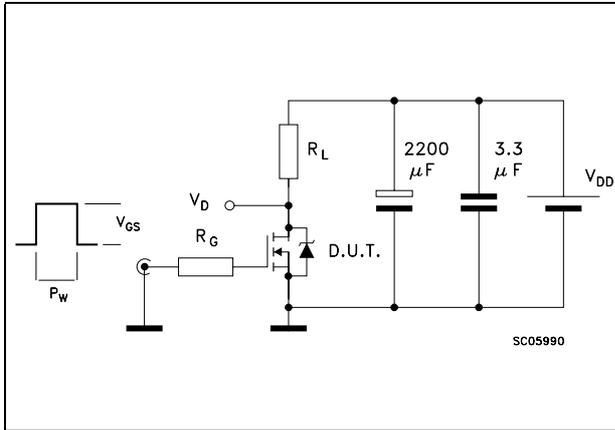


Figure 3. Gate charge test circuit

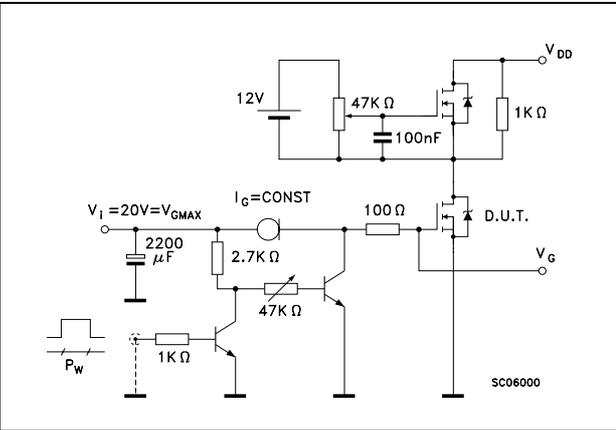


Figure 4. Test circuit for inductive load switching and diode recovery times

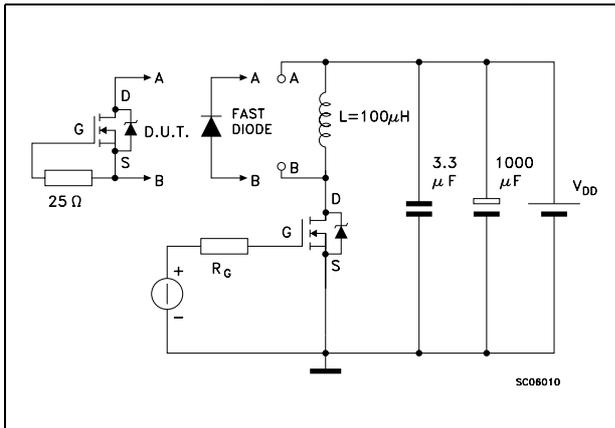


Figure 5. Unclamped Inductive load test circuit

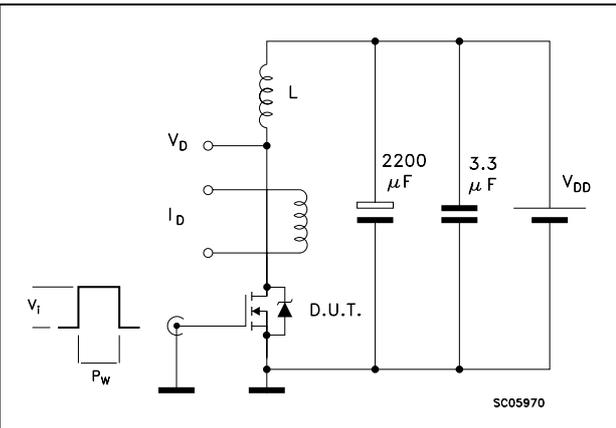


Figure 6. Unclamped inductive waveform

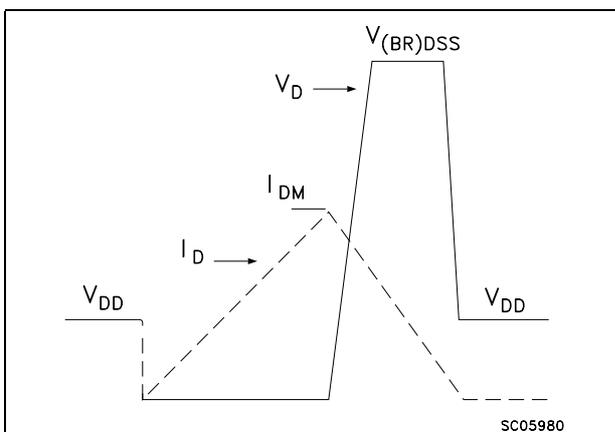
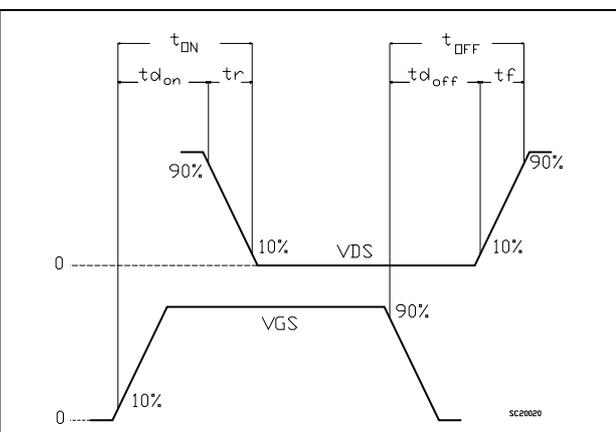


Figure 7. Switching time waveform



4 Package mechanical data

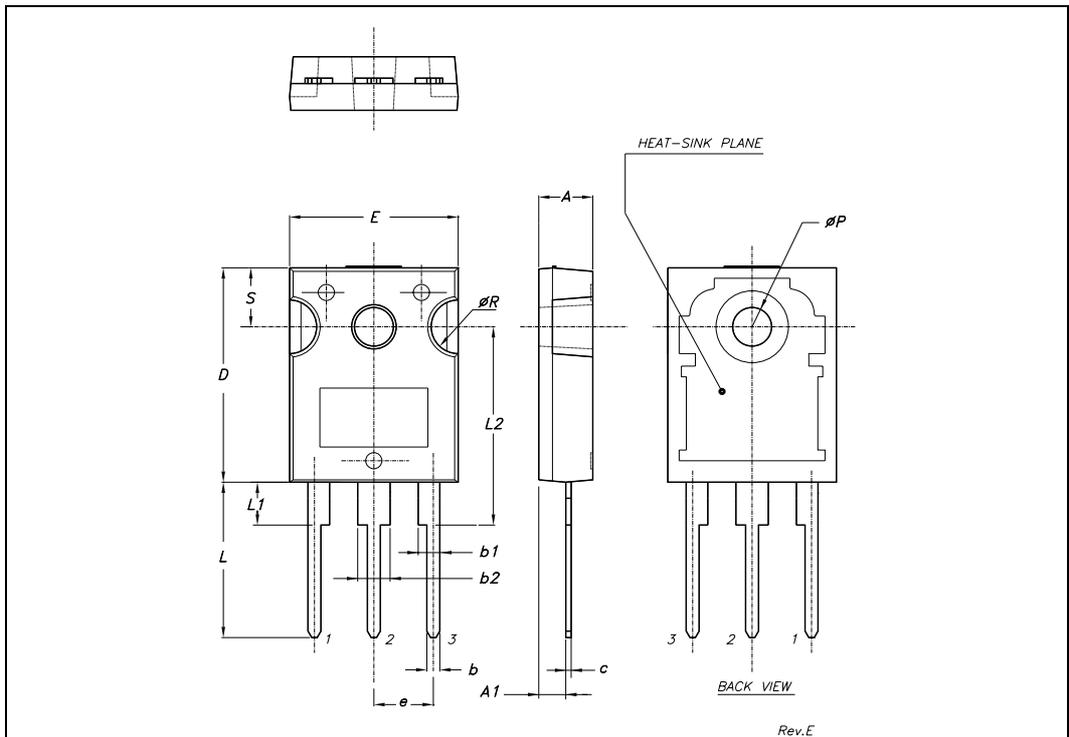
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In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

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TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
øP	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	



5 Revision history

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Table 9. Document revision history

Date	Revision	Changes
15-Nov-2007	1	First release

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