STW38NB20

N-CHANNEL 200V - 0.052 Ω - 38A TO-247
PowerMESH™ MOSFET

PRELIMINARY DATA

Table 1. General Features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STW38NB20	200 V	< 0.065 Ω	38 A

FEATURES SUMMARY

- TYPICAL $R_{DS(on)}$ = 0.052 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- LOW INTRINSIC CAPACITANCE
- GATE CHARGE MINIMIZED
- REDUCED VOLTAGE SPREAD

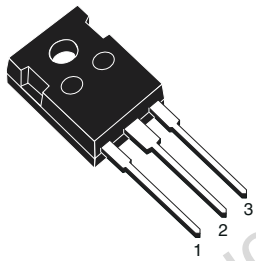
DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest RDS(on) per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

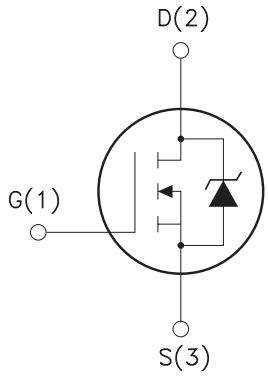
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLY (SMPS)
- DC-AC CONVERTER FOR WELDING EQUIPMENT AND UNINTERRUPTABLE POWER SUPPLY AND MOTOR DRIVE

Figure 1. Package



TO-247

Figure 2. Internal Schematic Diagram



SC06140

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Table 2. Order Codes

Part Number	Marking	Package	Packaging
STW38NB20	W38NB20	TO-247	TUBE

This is preliminary information on a new product now in development or undergoing evaluation. Details are subject to change without notice.

Table 3. Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200	V
V_{GS}	Gate-source Voltage	± 30	V
I_D	Drain Current (cont.) at T_C = 25 °C	38	A
I_D	Drain Current (cont.) at T_C = 100 °C	24	A
I_{DM} (1)	Drain Current (pulsed)	152	A
P_{tot}	Total Dissipation at T_C = 25 °C	180	W
	Derating Factor	1.44	W°/C
dv/dt (2)	Peak Diode Recovery voltage slope	5.5	V/ns
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

Note: 1. Pulse width limited by safe operating area
2. I_{SD} ≤38 A, di/dt ≤ 200 A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ T_{JMAX}

Table 4. Thermal Data

Symbol	Parameter		Value	Unit
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	0.69	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	30	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

Table 5. Avalanche Characteristics

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, δ < 1%)	38	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C; I_D = I_{AR}; V_{DD} = 50 V)	550	mJ

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

Table 6. Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 mA V_{GS} = 0	200			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			1	µA
		V_{DS} = Max RatingTc = 125 °C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 30 V			± 100	nA

Table 7. On (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	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} = 10V; I_D = 19 A		0.052	0.065	Ω

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

Table 8. Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$; I_D = 19 A	10	19		S
C_{iss}	Input Capacitance	V_{DS} = 25 V; f = 1 MHz; V_{GS} = 0		2800	3800	pF
C_{oss}	Output Capacitance			750	1000	pF
C_{rss}	Reverse Transfer Capacitance			100	140	pF

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

Table 9. Switching On

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	V_{DD} = 100 V I_D = 19 A; R_G = 4.7 Ω V_{GS} = 10 V (see test circuit)		35	47	ns
t_r	Rise Time			40	55	ns
Q_g	Total Gate Charge	V_{DD} = 160 V; I_D = 38 A; V_{GS} = 10 V		70	95	nC
Q_{gs}	Gate-Source Charge			22		nC
Q_{gd}	Gate-Drain Charge			35		nC

Table 10. Switching Off

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 160 VI_D = 38 A; R_G = 4.7 Ω; V_{GS} = 10 V		18	24	ns
t_r	Fall Time			22	30	ns
t_c	Cross-over Time			42	57	ns

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Table 11. Source Drain Diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				38	A
I_{SDM} (1)	Source-drain Current (pulsed)				152	A
V_{SD} (2)	Forward On Voltage	I_{SD} = 38 A; V_{GS} = 0			1.5	V
t_{rr}	Reverse Recovery Time	I_{SD} = 38 A; di/dt = 100 A/µs V_{DD} = 50 V; T_j = 150 °C		350		ns
Q_{rr}	Reverse RecoveryCharge			2.3		µC
I_{RRM}	Reverse RecoveryCurrent			13		A

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

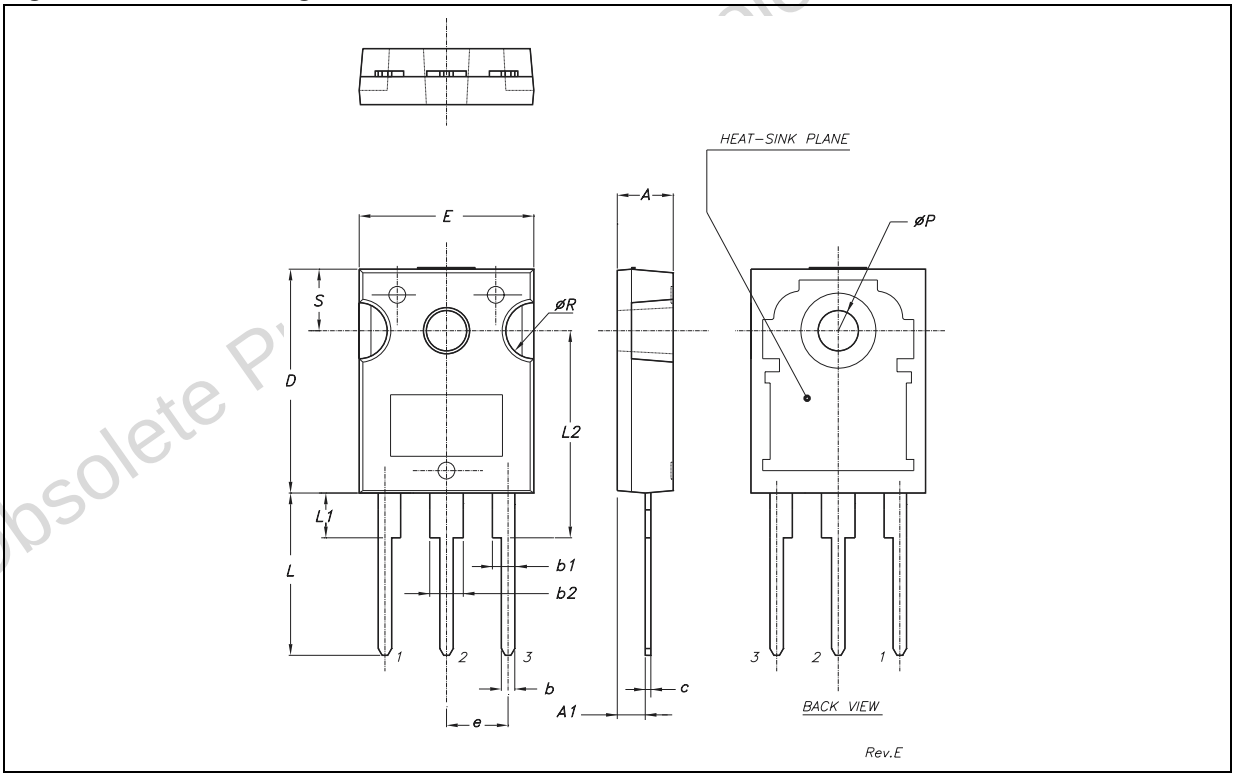
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PACKAGE MECHANICAL

Table 12. TO-247 Mechanical Data

Symbol	millimeters			inches		
	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	

Figure 3. TO-247 Package Dimensions



Note: Drawing is not to scale.

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REVISION HISTORY

Table 13. Revision History

Date	Revision	Description of Changes
January-1998	1	First Issue
14-Apr-2004	2	Stylesheet update. No content change.

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