

|               |                           |
|---------------|---------------------------|
| Data sheet    |                           |
| status        | Preliminary specification |
| date of issue | March 1991                |

# BUK438-1000A/B

## PowerMOS transistor

PHILIPS INTERNATIONAL

56E D ■ 7110826 0044551 058 ■ PHIN

### GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.  
The device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and AC/DC converters, and in general purpose switching applications.

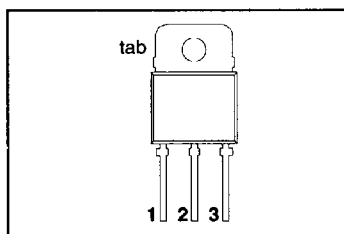
### QUICK REFERENCE DATA

| SYMBOL       | PARAMETER                        | MAX.          | MAX.          | UNIT     |
|--------------|----------------------------------|---------------|---------------|----------|
|              | <b>BUK438</b>                    | <b>-1000A</b> | <b>-1000B</b> |          |
| $V_{DS}$     | Drain-source voltage             | 1000          | 1000          | V        |
| $I_D$        | Drain current (DC)               | 6.5           | 5.7           | A        |
| $P_{tot}$    | Total power dissipation          | 220           | 220           | W        |
| $R_{DS(ON)}$ | Drain-source on-state resistance | 2.0           | 2.6           | $\Omega$ |

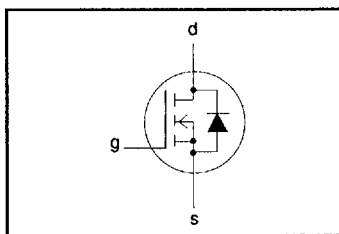
### PINNING - SOT93

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | gate        |
| 2   | drain       |
| 3   | source      |
| tab | drain       |

### PIN CONFIGURATION



### SYMBOL



### LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| SYMBOL       | PARAMETER                        | CONDITIONS                            | MIN. | MAX.                 | UNIT             |
|--------------|----------------------------------|---------------------------------------|------|----------------------|------------------|
| $V_{DS}$     | Drain-source voltage             | -                                     | -    | 1000                 | V                |
| $V_{DGR}$    | Drain-gate voltage               | $R_{GS} = 20 \text{ k}\Omega$         | -    | 1000                 | V                |
| $\pm V_{GS}$ | Gate-source voltage              | -                                     | -    | 30                   | V                |
| $I_D$        | Drain current (DC)               | $T_{mb} = 25 \text{ }^\circ\text{C}$  | -    | <b>-1000A</b><br>6.5 | A                |
| $I_D$        | Drain current (DC)               | $T_{mb} = 100 \text{ }^\circ\text{C}$ | -    | 4.1                  | A                |
| $I_{DM}$     | Drain current (pulse peak value) | $T_{mb} = 25 \text{ }^\circ\text{C}$  | -    | 26                   | A                |
| $P_{tot}$    | Total power dissipation          | $T_{mb} = 25 \text{ }^\circ\text{C}$  | -    | 220                  | W                |
| $T_{stg}$    | Storage temperature              | -                                     | -55  | 150                  | $^\circ\text{C}$ |
| $T_J$        | Junction Temperature             | -                                     | -    | 150                  | $^\circ\text{C}$ |

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## THERMAL RESISTANCES

|                                |                                  |
|--------------------------------|----------------------------------|
| From junction to mounting base | $R_{th\ j-mb} = 0.57\text{ K/W}$ |
| From junction to ambient       | $R_{th\ j-a} = 45\text{ K/W}$    |

## STATIC CHARACTERISTICS

 $T_{mb} = 25\text{ °C}$  unless otherwise specified

| SYMBOL        | PARAMETER                        | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|---------------|----------------------------------|--|------|------|------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage   | $V_{GS} = 0\text{ V}; I_D = 0.25\text{ mA}$                        | 1000 | -    | -    | V             |
| $V_{GS(TH)}$  | Gate threshold voltage           | $V_{DS} = V_{GS}; I_D = 1\text{ mA}$                               | 2.1  | 3.0  | 4.0  | V             |
| $I_{DSS}$     | Zero gate voltage drain current  | $V_{DS} = 1000\text{ V}; V_{GS} = 0\text{ V}; T_J = 25\text{ °C}$  | -    | 5    | 50   | $\mu\text{A}$ |
| $I_{DSS}$     | Zero gate voltage drain current  | $V_{DS} = 1000\text{ V}; V_{GS} = 0\text{ V}; T_J = 125\text{ °C}$ | -    | 0.1  | 1.0  | mA            |
| $I_{GSS}$     | Gate source leakage current      | $V_{GS} = \pm 30\text{ V}; V_{DS} = 0\text{ V}$                    | -    | 10   | 100  | nA            |
| $R_{DS(ON)}$  | Drain-source on-state resistance | $V_{GS} = 10\text{ V}; I_D = 3.5\text{ A}$                         | -    | 1.8  | 2.0  | $\Omega$      |
|               |                                  | <b>BUK438-1000A</b>  | -    | 2.2  | 2.6  | $\Omega$      |
|               |                                  | <b>BUK438-1000B</b>  | -    |      |      |               |

## DYNAMIC CHARACTERISTICS

 $T_{mb} = 25\text{ °C}$  unless otherwise specified

| SYMBOL       | PARAMETER                  | CONDITIONS   | MIN. | TYP. | MAX. | UNIT |
|--------------|----------------------------|--|------|------|------|------|
| $g_{fs}$     | Forward transconductance   | $V_{DS} = 25\text{ V}; I_D = 3.5\text{ A}$                     | 2.5  | 5.0  | -    | S    |
| $C_{iss}$    | Input capacitance          | $V_{GS} = 0\text{ V}; V_{DS} = 25\text{ V}; f = 1\text{ MHz}$  | -    | 3000 | 3500 | pF   |
| $C_{oss}$    | Output capacitance         |  | -    | 300  | 350  | pF   |
| $C_{rss}$    | Feedback capacitance       |  | -    | 150  | 250  | pF   |
| $t_{d\ on}$  | Turn-on delay time         | $V_{DD} = 30\text{ V}; I_D = 2.5\text{ A};$                    | -    | 60   | 90   | ns   |
| $t_r$        | Turn-on rise time          | $V_{GS} = 10\text{ V}; R_{GS} = 50\ \Omega;$                   | -    | 100  | 140  | ns   |
| $t_{d\ off}$ | Turn-off delay time        | $R_{gen} = 50\ \Omega$   | -    | 350  | 430  | ns   |
| $t_f$        | Turn-off fall time         |  | -    | 100  | 140  | ns   |
| $L_d$        | Internal drain inductance  | Measured from contact screw on tab to centre of die            | -    | 5    | -    | nH   |
| $L_d$        | Internal drain inductance  | Measured from drain lead 6 mm from package to centre of die    | -    | 5    | -    | nH   |
| $L_s$        | Internal source inductance | Measured from source lead 6 mm from package to source bond pad | -    | 12.5 | -    | nH   |

## REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

 $T_{mb} = 25\text{ °C}$  unless otherwise specified

| SYMBOL    | PARAMETER                        | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|-----------|----------------------------------|--|------|------|------|---------------|
| $I_{DR}$  | Continuous reverse drain current | -  | -    | -    | 6.5  | A             |
| $I_{DRM}$ | Pulsed reverse drain current     | -  | -    | -    | 26   | A             |
| $V_{SD}$  | Diode forward voltage            | $I_F = 6.5\text{ A}; V_{GS} = 0\text{ V}$                  | -    | 0.9  | 1.3  | V             |
| $t_{rr}$  | Reverse recovery time            | $I_F = 6.5\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s};$ | -    | 1.5  | -    | $\mu\text{s}$ |
| $Q_{rr}$  | Reverse recovery charge          | $V_{GS} = 0\text{ V}; V_R = 100\text{ V}$                  | -    | 20   | -    | $\mu\text{C}$ |

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**AVALANCHE LIMITING VALUE****T-39-15** $T_{mb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

| SYMBOL    | PARAMETER   | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|-----------|---|---|------|------|------|------|
| $W_{DSS}$ | Drain-source non-repetitive unclamped inductive turn-off energy | $I_D = 6.5\text{ A}$ ; $V_{DD} \leq 250\text{ V}$ ;<br>$V_{GS} = 10\text{ V}$ ; $R_{GS} = 50\text{ }\Omega$ | -    | -    | 750  | mJ   |