

PowerMOS transistor Fast recovery diode FET

BUK655-500B

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic envelope.
FREDFET with fast recovery reverse diode, particularly suitable for motor control applications, eg. in full bridge configurations for which faster recovery characteristics simplify design for inductive loads.

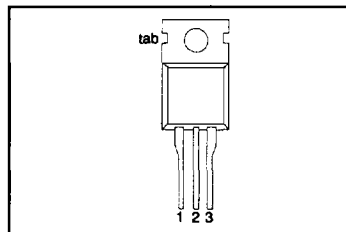
QUICK REFERENCE DATA

| SYMBOL | PARAMETER | MAX. | UNIT |
|--------------|----------------------------------|------|----------|
| V_{DS} | Drain-source voltage | 500 | V |
| I_D | Drain current (DC) | 5.3 | A |
| P_{tot} | Total power dissipation | 100 | W |
| $R_{DS(ON)}$ | Drain-source on-state resistance | 1.5 | Ω |
| t_{rr} | Diode reverse recovery time | 250 | ns |

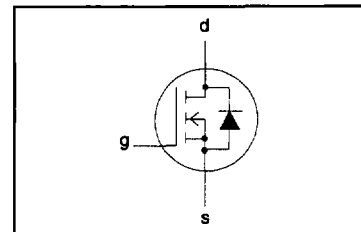
PINNING - TO220AB

| 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 | - | - | 500 | V |
| V_{DGR} | Drain-gate voltage | $R_{GS} = 20 \text{ k}\Omega$ | - | 500 | V |
| $\pm V_{GS}$ | Gate-source voltage | - | - | 30 | V |
| I_D | Drain current (DC) | $T_{mb} = 25 \text{ }^\circ\text{C}$ | - | 5.3 | A |
| I_D | Drain current (DC) | $T_{mb} = 100 \text{ }^\circ\text{C}$ | - | 3.3 | A |
| I_{DM} | Drain current (pulse peak value) | $T_{mb} = 25 \text{ }^\circ\text{C}$ | - | 21 | A |
| P_{tot} | Total power dissipation | $T_{mb} = 25 \text{ }^\circ\text{C}$ | - | 100 | W |
| T_{sig} | Storage temperature | - | -55 | 150 | $^\circ\text{C}$ |
| T_j | Junction Temperature | - | - | 150 | $^\circ\text{C}$ |

THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|--|------------|------|------|------|------|
| $R_{th j-mb}$ | Thermal resistance junction to mounting base | | - | - | 1.25 | K/W |
| $R_{th j-a}$ | Thermal resistance junction to ambient | | - | 60 | - | K/W |

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STATIC CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|----------------------------------|---|------|------|------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}; I_D = 0.25\text{ mA}$ | 500 | - | - | V |
| $V_{GS(TO)}$ | 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 | $V_{DS} = 500\text{ V}; V_{GS} = 0\text{ V}; T_j = 25\text{ }^{\circ}\text{C}$ | - | 2 | 20 | μA |
| I_{DSS} | Zero gate voltage drain current | $V_{DS} = 500\text{ V}; V_{GS} = 0\text{ V}; T_j = 125\text{ }^{\circ}\text{C}$ | - | 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 | $V_{GS} = 10\text{ V}; I_D = 2.5\text{ A}$ | - | 1.4 | 1.5 | Ω |

DYNAMIC CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------|----------------------------|--|------|------|------|------|
| g_{fs} | Forward transconductance | $V_{DS} = 25\text{ V}; I_D = 2.5\text{ A}$ | 2.3 | 3.1 | - | S |
| C_{iss} | Input capacitance | $V_{GS} = 0\text{ V}; V_{DS} = 25\text{ V}; f = 1\text{ MHz}$ | - | 750 | 1000 | pF |
| C_{oss} | Output capacitance | | - | 90 | 140 | pF |
| C_{rss} | Feedback capacitance | | - | 40 | 70 | pF |
| $t_{d\ on}$ | Turn-on delay time | $V_{DD} = 30\text{ V}; I_D = 2.6\text{ A};$ | - | 10 | 45 | ns |
| t_r | Turn-on rise time | $V_{GS} = 10\text{ V}; R_{GS} = 50\text{ }\Omega;$ | - | 45 | 60 | ns |
| $t_{d\ off}$ | Turn-off delay time | $R_{gen} = 50\text{ }\Omega$ | - | 100 | 140 | ns |
| t_f | Turn-off fall time | | - | 40 | 65 | ns |
| L_d | Internal drain inductance | Measured from contact screw on tab to centre of die | - | 3.5 | - | nH |
| L_d | Internal drain inductance | Measured from drain lead 6 mm from package to centre of die | - | 4.5 | - | nH |
| L_s | Internal source inductance | Measured from source lead 6 mm from package to source bond pad | - | 7.5 | - | nH |

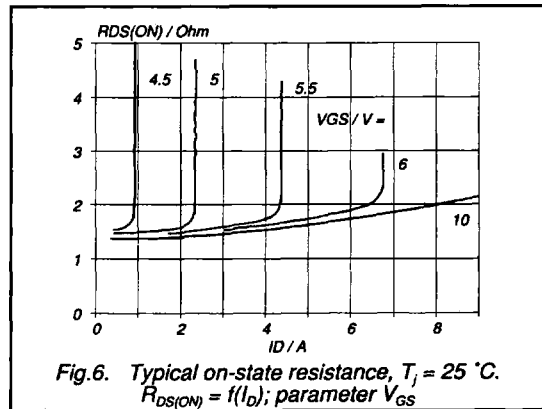
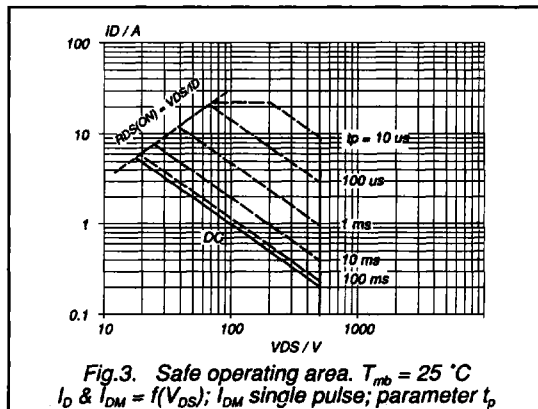
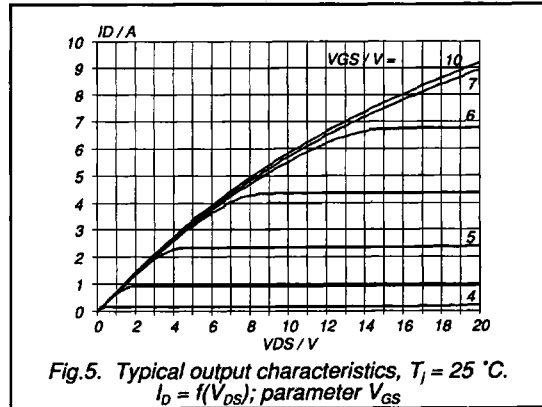
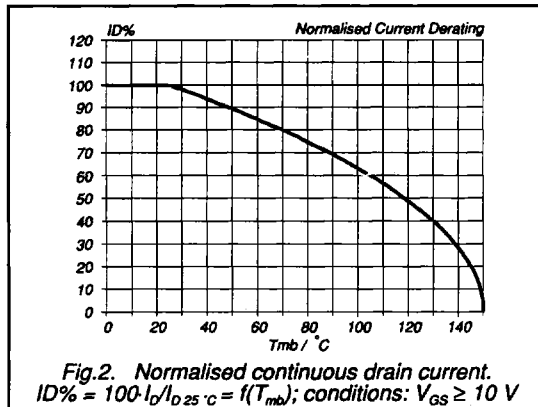
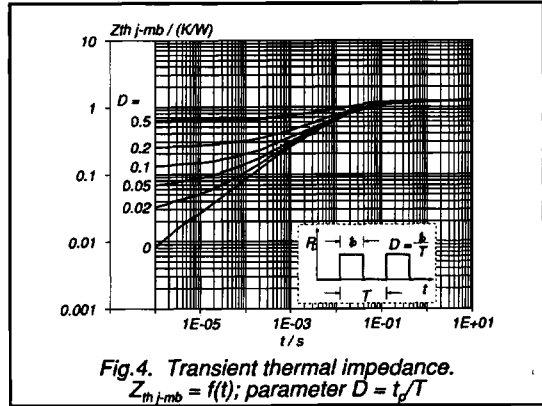
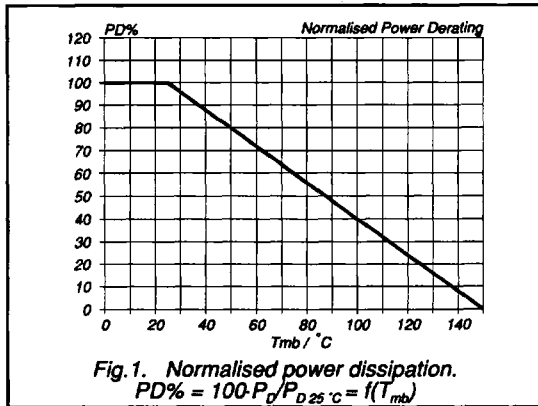
REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------|----------------------------------|--|------|------|------|---------------|
| I_{DR} | Continuous reverse drain current | - | - | - | 5.7 | A |
| I_{DRM} | Pulsed reverse drain current | - | - | - | 23 | A |
| V_{SD} | Diode forward voltage | $I_F = 5.7\text{ A}; V_{GS} = 0\text{ V}$ | - | 1.1 | 1.5 | V |
| t_{rr} | Reverse recovery time | $I_F = 5.7\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$ | - | 180 | 250 | ns |
| | | $-di_F/dt = 100\text{ A}/\mu\text{s}; T_j = 125\text{ }^{\circ}\text{C}$ | - | 220 | 300 | ns |
| Q_{rr} | Reverse recovery charge | $T_j = 25\text{ }^{\circ}\text{C}$ | - | 0.65 | 1.2 | μC |
| | | $T_j = 125\text{ }^{\circ}\text{C}$ | - | 2.6 | 5.0 | μC |
| I_{rrm} | Reverse recovery current | $V_{GS} = 0\text{ V}; V_R = 100\text{ V}$ | - | 15 | - | A |
| | | $T_j = 125\text{ }^{\circ}\text{C}$ | - | - | - | A |

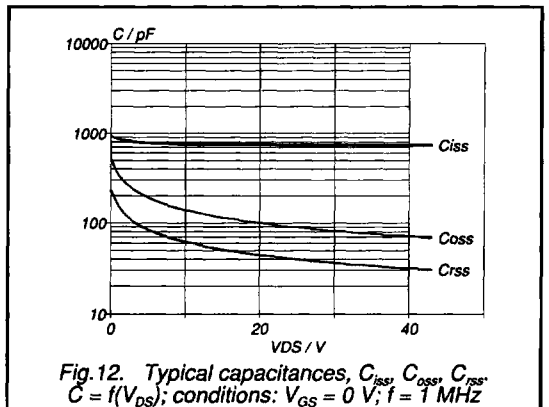
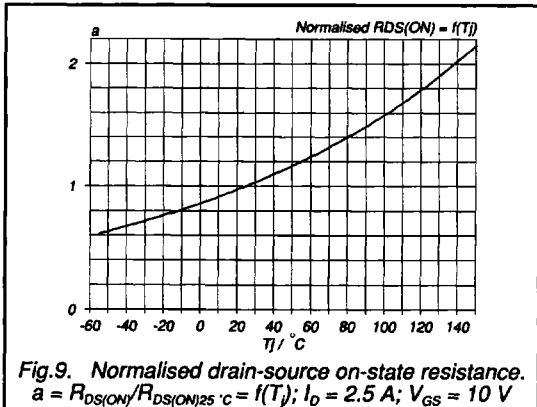
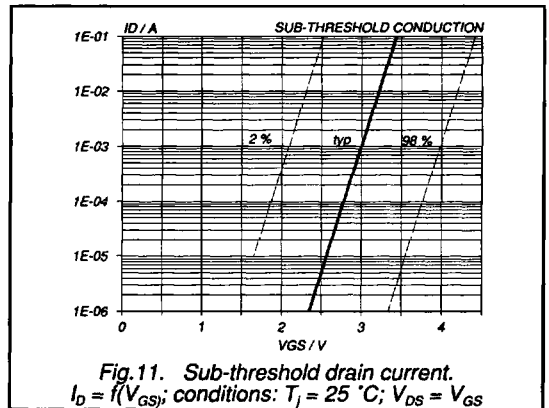
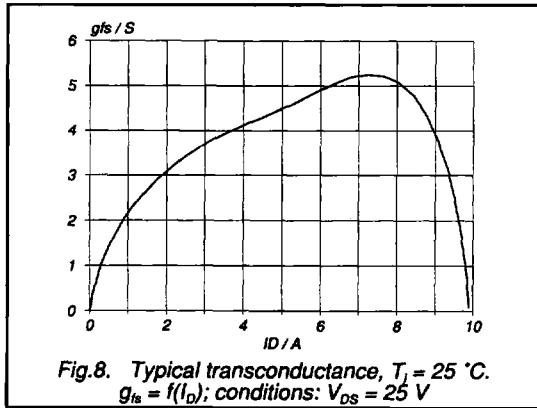
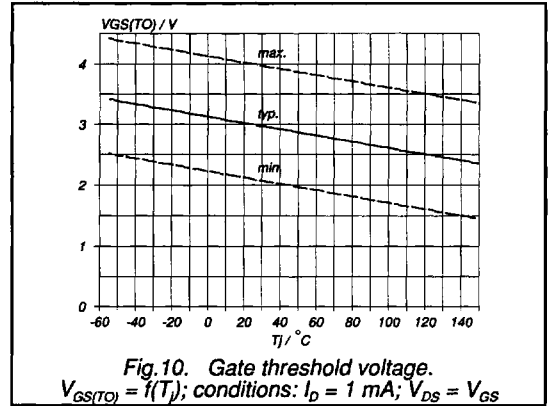
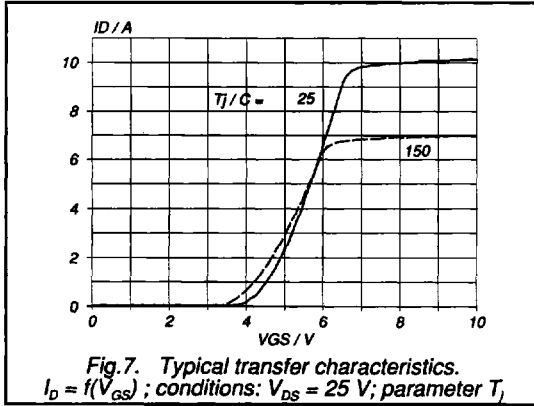
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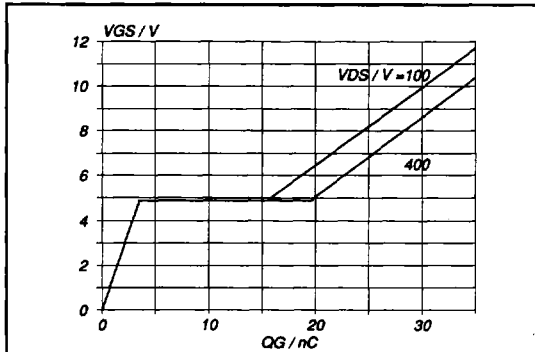


Fig. 13. Typical turn-on gate-charge characteristics.
 $V_{GS} = f(Q_G)$; conditions: $I_D = 5.7 \text{ A}$; parameter V_{DS}

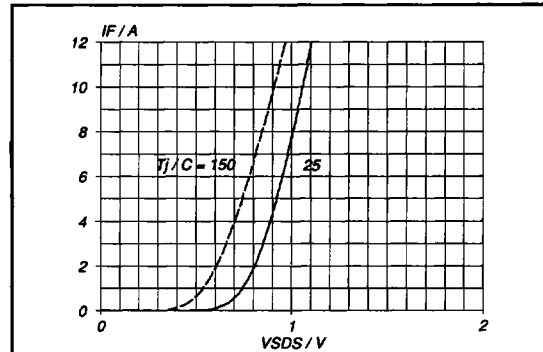


Fig. 14. Typical reverse diode current.
 $I_F = f(V_{SDS})$; conditions: $V_{GS} = 0 \text{ V}$; parameter T_J