



# BUK7237-55A

## N-channel TrenchMOS standard level FET

Rev. 02 — 9 July 2010

Product data sheet

## 1. Product profile

### 1.1 General description

Standard level N-channel enhancement mode Field-Effect Transistor (FET) in a plastic package using TrenchMOS technology. This product has been designed and qualified to the appropriate AEC standard for use in automotive critical applications.

### 1.2 Features and benefits

- Low conduction losses due to low on-state resistance
- Q101 compliant
- Suitable for standard level gate drive sources
- Suitable for thermally demanding environments due to 175 °C rating

### 1.3 Applications

- 12 V and 24 V loads
- Automotive and general purpose power switching
- Motors, lamps and solenoids

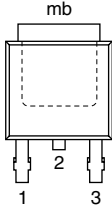
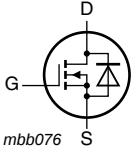
### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol                        | Parameter                                    | Conditions                                                                                                                                    | Min | Typ | Max  | Unit |
|-------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| $V_{DS}$                      | drain-source voltage                         | $T_j \geq 25\text{ °C}$ ; $T_j \leq 175\text{ °C}$                                                                                            | -   | -   | 55   | V    |
| $I_D$                         | drain current                                | $V_{GS} = 10\text{ V}$ ; $T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a>                                | -   | -   | 32.3 | A    |
| $P_{tot}$                     | total power dissipation                      | $T_{mb} = 25\text{ °C}$ ; see <a href="#">Figure 2</a>                                                                                        | -   | -   | 77   | W    |
| <b>Static characteristics</b> |                                              |                                                                                                                                               |     |     |      |      |
| $R_{DS(on)}$                  | drain-source on-state resistance             | $V_{GS} = 10\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 175\text{ °C}$ ; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a>          | -   | -   | 74   | mΩ   |
|                               |                                              | $V_{GS} = 10\text{ V}$ ; $I_D = 25\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 13</a> ; see <a href="#">Figure 12</a>           | -   | 31  | 37   | mΩ   |
| <b>Avalanche ruggedness</b>   |                                              |                                                                                                                                               |     |     |      |      |
| $E_{DS(AL)S}$                 | non-repetitive drain-source avalanche energy | $I_D = 14\text{ A}$ ; $V_{sup} \leq 55\text{ V}$ ; $R_{GS} = 50\text{ Ω}$ ; $V_{GS} = 10\text{ V}$ ; $T_{j(init)} = 25\text{ °C}$ ; unclamped | -   | -   | 49   | mJ   |

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                       | Simplified outline                                                                | Graphic symbol                                                                      |
|-----|--------|-----------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | G      | gate                              |  |  |
| 2   | D      | drain                             |                                                                                   |                                                                                     |
| 3   | S      | source                            |                                                                                   |                                                                                     |
| mb  | D      | mounting base; connected to drain |                                                                                   |                                                                                     |

SOT428 (DPAK)

3. Ordering information

Table 3. Ordering information

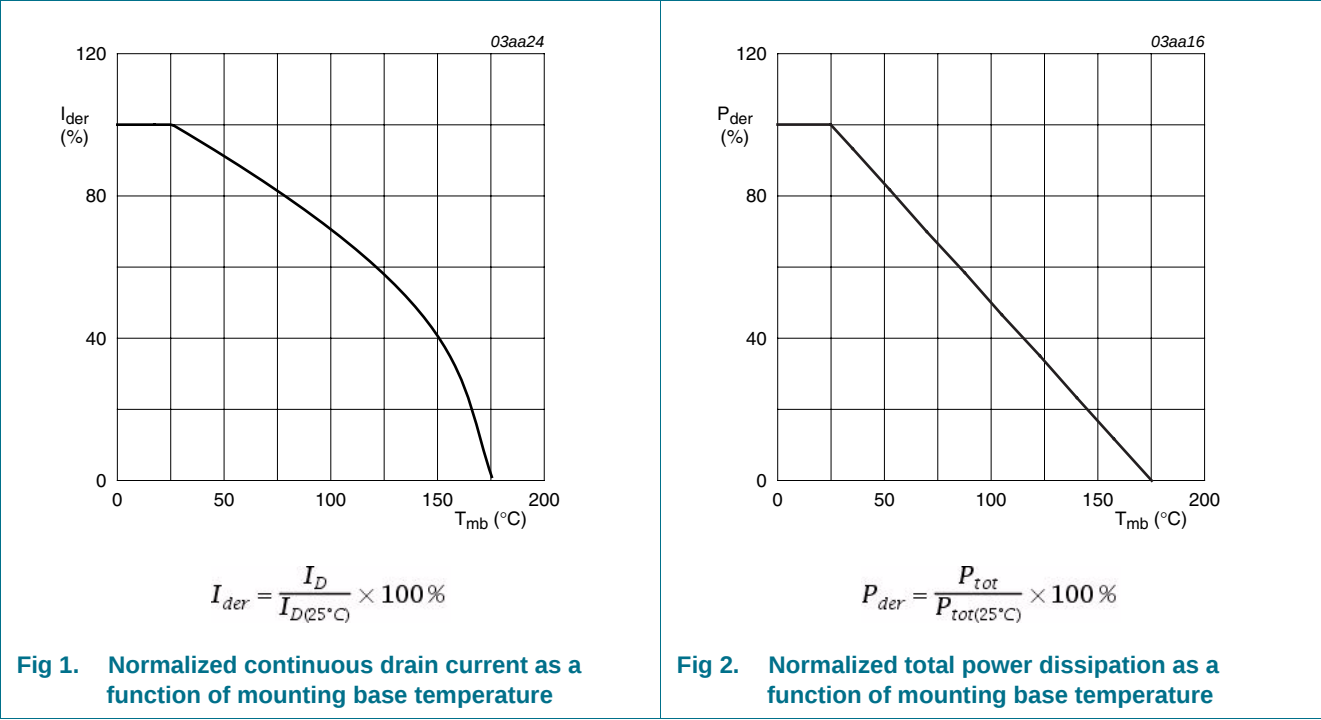
| Type number | Package |                                                                                 | Version |
|-------------|---------|---------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                     |         |
| BUK7237-55A | DPAK    | plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) | SOT428  |

4. Limiting values

Table 4. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol               | Parameter                                    | Conditions                                                                                                                              | Min | Max  | Unit |
|----------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----|------|------|
| V <sub>DS</sub>      | drain-source voltage                         | T <sub>j</sub> ≥ 25 °C; T <sub>j</sub> ≤ 175 °C                                                                                         | -   | 55   | V    |
| V <sub>DGR</sub>     | drain-gate voltage                           | R <sub>GS</sub> = 20 kΩ                                                                                                                 | -   | 55   | V    |
| V <sub>GS</sub>      | gate-source voltage                          |                                                                                                                                         | -20 | 20   | V    |
| I <sub>D</sub>       | drain current                                | T <sub>mb</sub> = 100 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a>                                                          | -   | 22.8 | A    |
|                      |                                              | T <sub>mb</sub> = 25 °C; V <sub>GS</sub> = 10 V; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a>                            | -   | 32.3 | A    |
| I <sub>DM</sub>      | peak drain current                           | T <sub>mb</sub> = 25 °C; t <sub>p</sub> ≤ 10 μs; pulsed; see <a href="#">Figure 3</a>                                                   | [1] | 129  | A    |
| P <sub>tot</sub>     | total power dissipation                      | T <sub>mb</sub> = 25 °C; see <a href="#">Figure 2</a>                                                                                   | -   | 77   | W    |
| T <sub>stg</sub>     | storage temperature                          |                                                                                                                                         | -55 | 175  | °C   |
| T <sub>j</sub>       | junction temperature                         |                                                                                                                                         | -55 | 175  | °C   |
| Source-drain diode   |                                              |                                                                                                                                         |     |      |      |
| I <sub>S</sub>       | source current                               | T <sub>mb</sub> = 25 °C                                                                                                                 | -   | 32.3 | A    |
| I <sub>SM</sub>      | peak source current                          | t <sub>p</sub> ≤ 10 μs; pulsed; T <sub>mb</sub> = 25 °C                                                                                 | -   | 129  | A    |
| Avalanche ruggedness |                                              |                                                                                                                                         |     |      |      |
| E <sub>DS(AL)S</sub> | non-repetitive drain-source avalanche energy | I <sub>D</sub> = 14 A; V <sub>sup</sub> ≤ 55 V; R <sub>GS</sub> = 50 Ω; V <sub>GS</sub> = 10 V; T <sub>j(init)</sub> = 25 °C; unclamped | -   | 49   | mJ   |

[1] Peak drain current is limited by chip, not package.



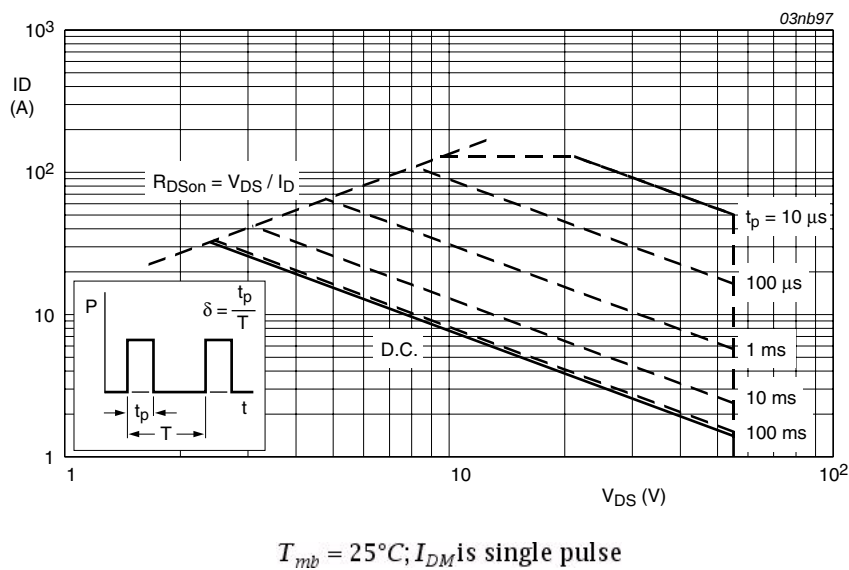


Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol         | Parameter                                         | Conditions                   | Min | Typ  | Max | Unit |
|----------------|---------------------------------------------------|------------------------------|-----|------|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | see <a href="#">Figure 4</a> | -   | -    | 1.9 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | minimum footprint; FR4 board | -   | 71.4 | -   | K/W  |

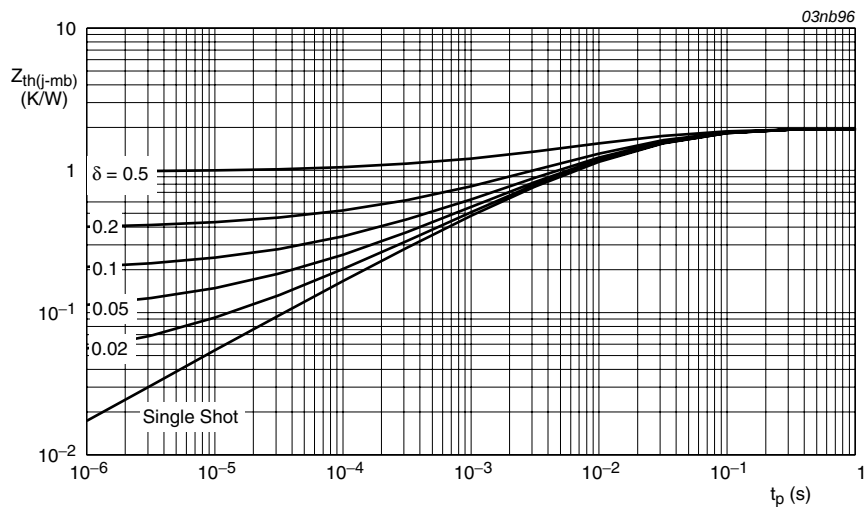


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 6. Characteristics

Table 6. Characteristics

| Symbol                  | Parameter                        | Conditions                                                                                                                            | Min | Typ  | Max | Unit |
|-------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| Static characteristics  |                                  |                                                                                                                                       |     |      |     |      |
| V <sub>(BR)DSS</sub>    | drain-source breakdown voltage   | I <sub>D</sub> = 0.25 mA; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 25 °C                                                               | 55  | -    | -   | V    |
|                         |                                  | I <sub>D</sub> = 0.25 mA; V <sub>GS</sub> = 0 V; T <sub>J</sub> = -55 °C                                                              | 50  | -    | -   | V    |
| V <sub>GS(th)</sub>     | gate-source threshold voltage    | I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>J</sub> = 25 °C; see <a href="#">Figure 11</a>                      | 2   | 3    | 4   | V    |
|                         |                                  | I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>J</sub> = -55 °C; see <a href="#">Figure 11</a>                     | -   | -    | 4.4 | V    |
|                         |                                  | I <sub>D</sub> = 1 mA; V <sub>DS</sub> = V <sub>GS</sub> ; T <sub>J</sub> = 175 °C; see <a href="#">Figure 11</a>                     | 1   | -    | -   | V    |
| I <sub>DSS</sub>        | drain leakage current            | V <sub>DS</sub> = 55 V; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 25 °C                                                                 | -   | 0.05 | 10  | µA   |
|                         |                                  | V <sub>DS</sub> = 55 V; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 175 °C                                                                | -   | -    | 500 | µA   |
| I <sub>GSS</sub>        | gate leakage current             | V <sub>DS</sub> = 0 V; V <sub>GS</sub> = 20 V; T <sub>J</sub> = 25 °C                                                                 | -   | 2    | 100 | nA   |
|                         |                                  | V <sub>DS</sub> = 0 V; V <sub>GS</sub> = -20 V; T <sub>J</sub> = 25 °C                                                                | -   | 2    | 100 | nA   |
| R <sub>DSon</sub>       | drain-source on-state resistance | V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>J</sub> = 175 °C; see <a href="#">Figure 12</a> ; see <a href="#">Figure 13</a> | -   | -    | 74  | mΩ   |
|                         |                                  | V <sub>GS</sub> = 10 V; I <sub>D</sub> = 25 A; T <sub>J</sub> = 25 °C; see <a href="#">Figure 13</a> ; see <a href="#">Figure 12</a>  | -   | 31   | 37  | mΩ   |
| Dynamic characteristics |                                  |                                                                                                                                       |     |      |     |      |
| C <sub>iss</sub>        | input capacitance                | V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 25 V; f = 1 MHz; T <sub>J</sub> = 25 °C; see <a href="#">Figure 14</a>                       | -   | 650  | 872 | pF   |
| C <sub>oss</sub>        | output capacitance               |                                                                                                                                       | -   | 170  | 205 | pF   |
| C <sub>rss</sub>        | reverse transfer capacitance     |                                                                                                                                       | -   | 110  | 153 | pF   |
| t <sub>d(on)</sub>      | turn-on delay time               | V <sub>DS</sub> = 30 V; R <sub>L</sub> = 1.2 Ω; V <sub>GS</sub> = 10 V; R <sub>G(ext)</sub> = 10 Ω; T <sub>J</sub> = 25 °C            | -   | 10   | -   | ns   |
| t <sub>r</sub>          | rise time                        |                                                                                                                                       | -   | 62   | -   | ns   |
| t <sub>d(off)</sub>     | turn-off delay time              |                                                                                                                                       | -   | 24   | -   | ns   |
| t <sub>f</sub>          | fall time                        |                                                                                                                                       | -   | 20   | -   | ns   |
| L <sub>D</sub>          | internal drain inductance        | from drain lead from package to centre of die ; T <sub>J</sub> = 25 °C                                                                | -   | 2.5  | -   | nH   |
| L <sub>S</sub>          | internal source inductance       | from source lead to source bond pad ; T <sub>J</sub> = 25 °C                                                                          | -   | 7.5  | -   | nH   |
| Source-drain diode      |                                  |                                                                                                                                       |     |      |     |      |
| V <sub>SD</sub>         | source-drain voltage             | I <sub>S</sub> = 15 A; V <sub>GS</sub> = 0 V; T <sub>J</sub> = 25 °C; see <a href="#">Figure 15</a>                                   | -   | 0.85 | 1.2 | V    |
| t <sub>rr</sub>         | reverse recovery time            | I <sub>S</sub> = 20 A; dI <sub>S</sub> /dt = -100 A/µs; V <sub>GS</sub> = -10 V; V <sub>DS</sub> = 30 V; T <sub>J</sub> = 25 °C       | -   | 40   | -   | ns   |
| Q <sub>r</sub>          | recovered charge                 |                                                                                                                                       | -   | 80   | -   | nC   |

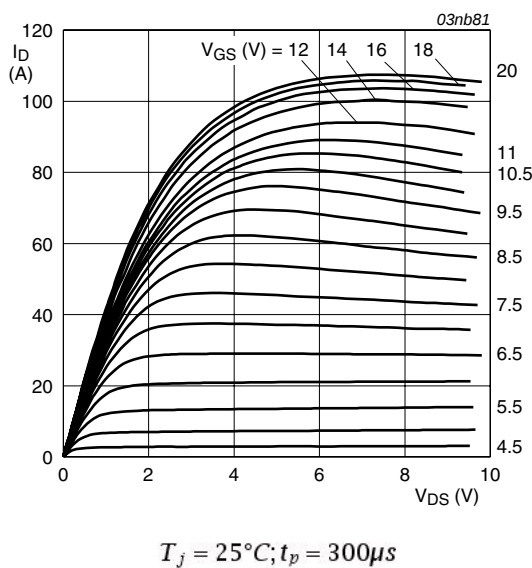


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

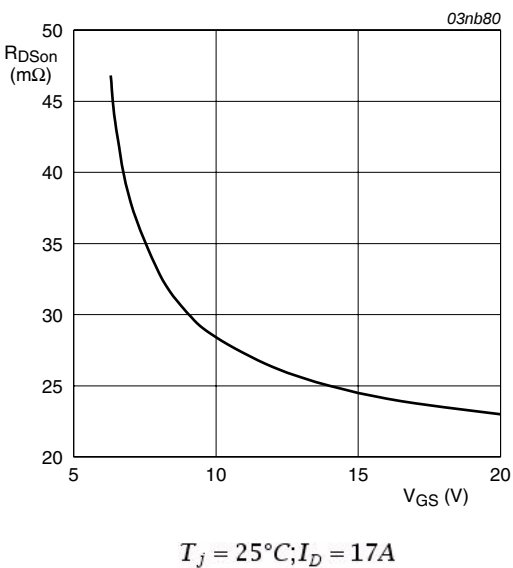


Fig 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

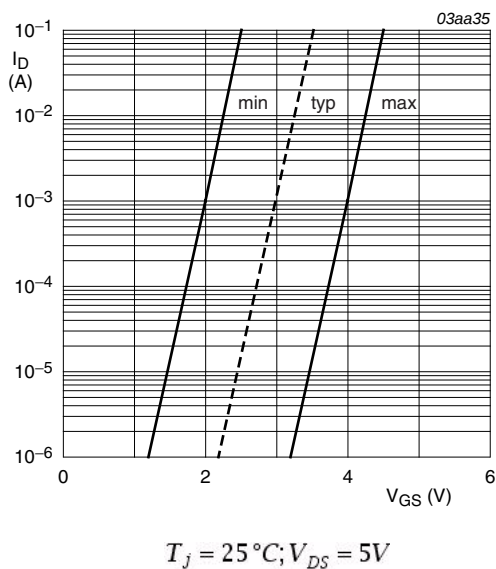


Fig 7. Sub-threshold drain current as a function of gate-source voltage

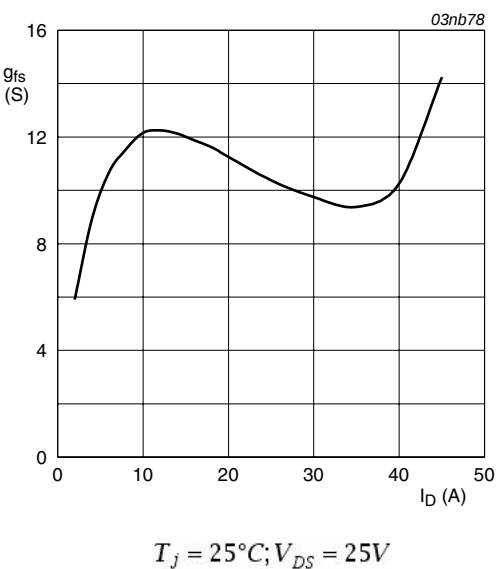


Fig 8. Forward transconductance as a function of drain current; typical values

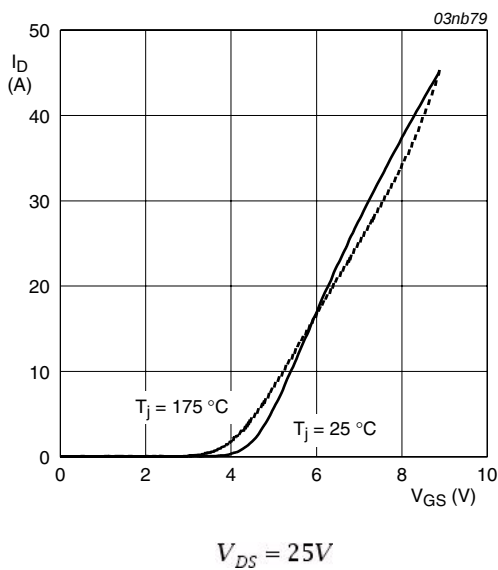


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

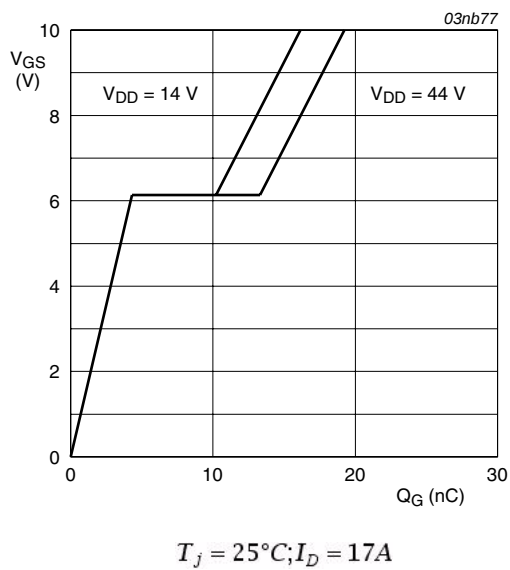


Fig 10. Gate-source voltage as a function of turn-on gate charge; typical values

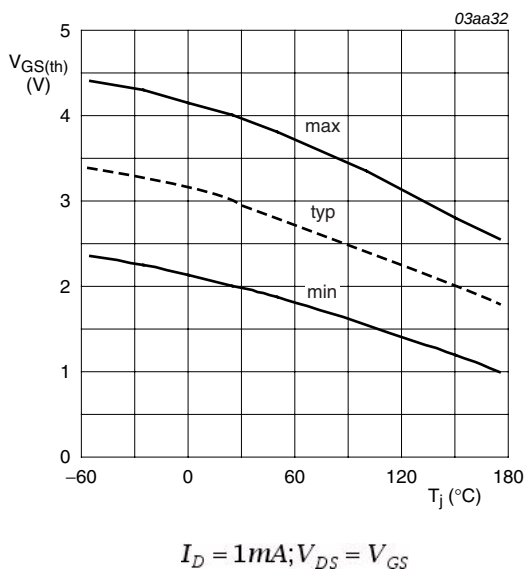


Fig 11. Gate-source threshold voltage as a function of junction temperature

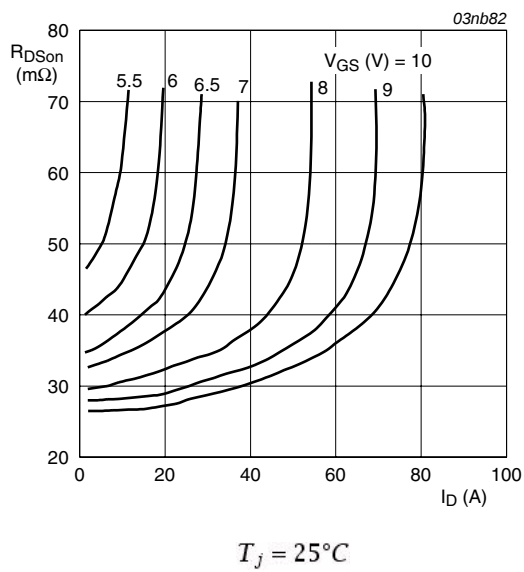


Fig 12. Drain-source on-state resistance as a function of drain current; typical values

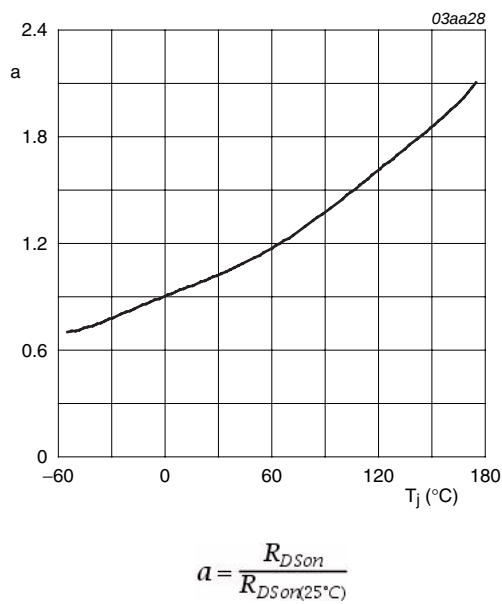


Fig 13. Normalized drain-source on-state resistance factor as a function of junction temperature

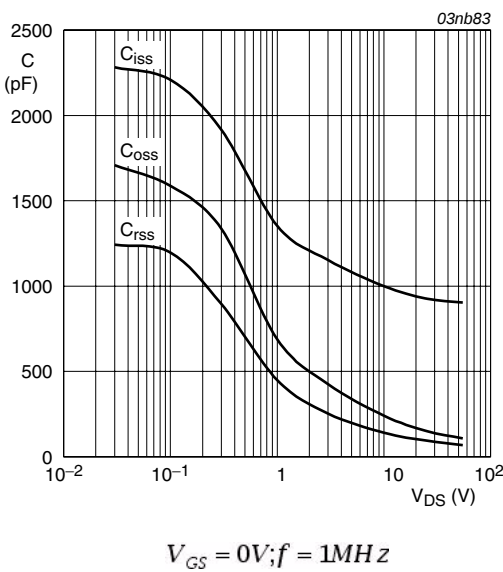


Fig 14. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

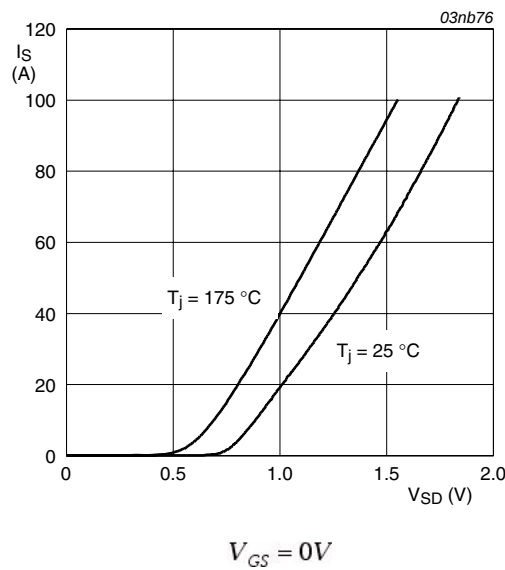


Fig 15. Reverse diode current as a function of reverse diode voltage; typical values

7. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

SOT428

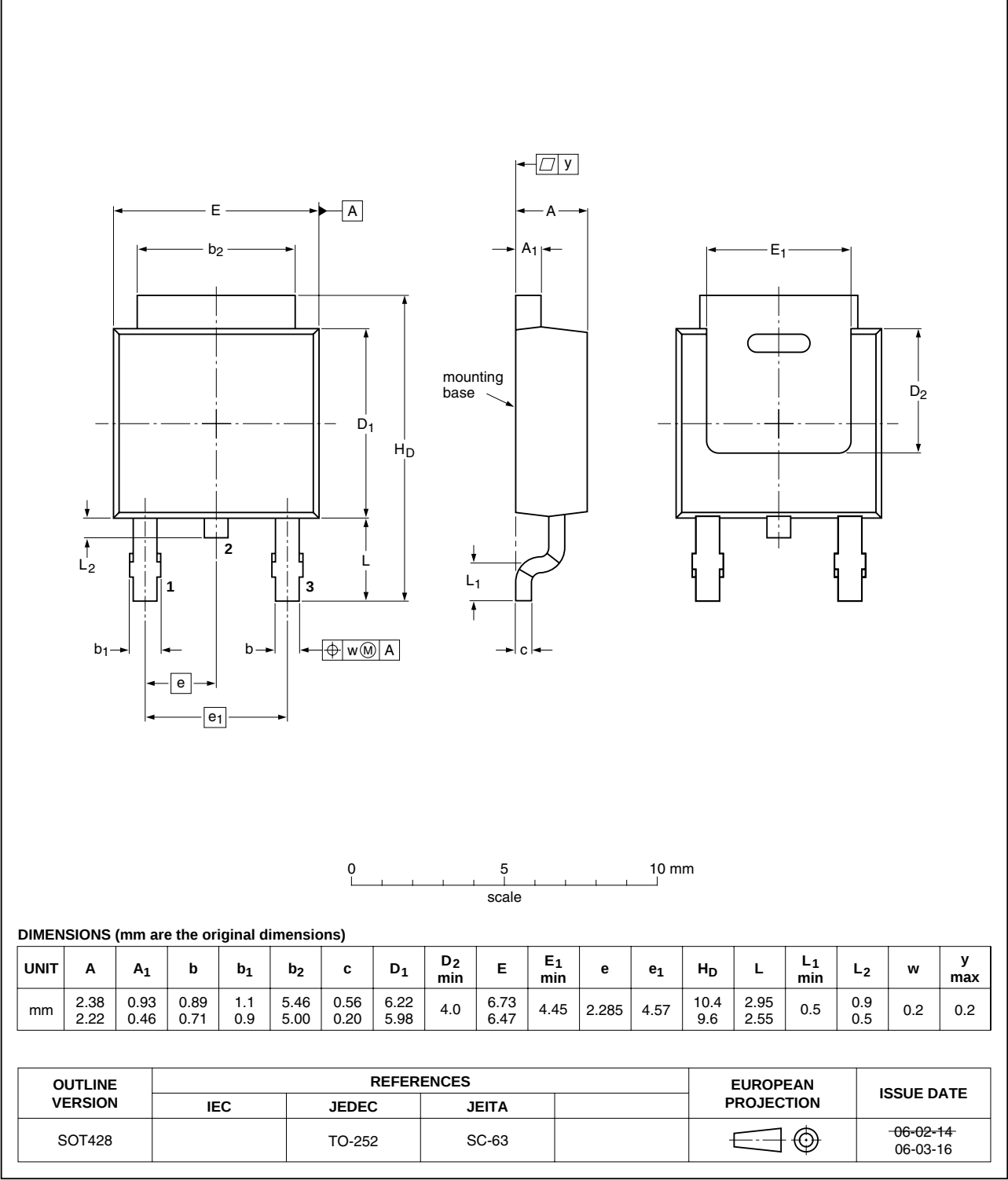


Fig 16. Package outline SOT428 (DPAK)

## 8. Revision history

Table 7. Revision history

| Document ID     | Release date                                                                                                                                                                                                                                         | Data sheet status     | Change notice | Supersedes      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------|
| BUK7237-55A v.2 | 20100709                                                                                                                                                                                                                                             | Product data sheet    | -             | BUK7237-55A v.1 |
| Modifications:  | <ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>Legal texts have been adapted to the new company name where appropriate.</li></ul> |                       |               |                 |
| BUK7237-55A v.1 | 20010129                                                                                                                                                                                                                                             | Product specification | -             | -               |

## 9. Legal information

### 9.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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