

BUK7215-55A

N-channel TrenchMOS standard level FET Rev. 02 — 27 January 2011

Product data sheet

Product profile 1.

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

- AEC Q101 compliant
- Low conduction losses due to low on-state resistance
- 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 | Тур | Max | Unit |
|-------------------|----------------------------------|---|-----|-----|-----|-----|------|
| V_{DS} | drain-source voltage | $T_j \ge 25 \text{ °C}; T_j \le 175 \text{ °C}$ | | - | - | 55 | V |
| I _D | drain current | V _{GS} = 10 V; T _{mb} = 25 °C; see <u>Figure 3</u> ; see <u>Figure 1</u> | [1] | - | - | 62 | Α |
| P _{tot} | total power dissipation | T _{mb} = 25 °C; see <u>Figure 2</u> | | - | - | 115 | W |
| Static chara | Static characteristics | | | | | | |
| R _{DSon} | drain-source on-state resistance | $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure 11}}{\text{Figure 12}};$ see Figure 12 | | - | 13 | 15 | mΩ |



Table 1. Quick reference data ...continued

| Symbol | Parameter | Conditions | Min | Тур | Max | Unit |
|----------------------|--|--|-----|-----|-----|------|
| Avalanche | Ruggedness | | | | | |
| E _{DS(AL)S} | non-repetitive drain-source avalanche energy | $I_D = 62 \text{ A; } V_{sup} \le 55 \text{ V;}$ $R_{GS} = 50 \Omega; V_{GS} = 10 \text{ V;}$ $T_{j(init)} = 25 \text{ °C; unclamped}$ | - | - | 211 | mJ |
| Dynamic cl | Dynamic characteristics | | | | | |
| Q_{GD} | gate-drain charge | $V_{GS} = 10 \text{ V; } I_D = 25 \text{ A;}$ $V_{DS} = 44 \text{ V; } T_j = 25 \text{ °C;}$ see <u>Figure 13</u> | - | 19 | - | nC |

^[1] Current is limited by power dissipation chip rating.

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|---------------------------------|-------------|--------------------|----------------|
| 1 | G | gate | | |
| 2 | D | drain | mb | D |
| 3 | S | source | | |
| mb | D mounting base; connected to d | | 1 3 | mbb076 S |
| | | | SOT428 (DPAK) | |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BUK7215-55A | 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).

| | | 3 , (| | | | |
|----------------------|--|--|-----|-----|-----|------|
| Symbol | Parameter | Conditions | | Min | Max | Unit |
| V_{DS} | drain-source voltage | T _j ≥ 25 °C; T _j ≤ 175 °C | | - | 55 | V |
| V_{DGR} | drain-gate voltage | $R_{GS} = 20 \text{ k}\Omega$ | | - | 55 | V |
| V_{GS} | gate-source voltage | | | -20 | 20 | V |
| I _D | drain current | $T_{mb} = 100 ^{\circ}\text{C}; V_{GS} = 10 \text{V}; \text{see} \frac{\text{Figure 1}}{}$ | [1] | - | 44 | Α |
| | | T_{mb} = 25 °C; V_{GS} = 10 V; see <u>Figure 3</u> ; | [1] | - | 62 | Α |
| | | see <u>Figure 1</u> | [2] | - | 55 | Α |
| I _{DM} | peak drain current | T_{mb} = 25 °C; pulsed; $t_p \le 10 \mu s$; see Figure 3 | | - | 248 | Α |
| P _{tot} | total power dissipation | T _{mb} = 25 °C; see <u>Figure 2</u> | | - | 115 | W |
| T _{stg} | storage temperature | | | -55 | 175 | °C |
| Tj | junction temperature | | | -55 | 175 | °C |
| Source-drai | n diode | | | | | |
| Is | source current | T _{mb} = 25 °C | [1] | - | 62 | Α |
| | | | [2] | - | 55 | Α |
| I _{SM} | peak source current | pulsed; $t_p \le 10 \ \mu s$; $T_{mb} = 25 \ ^{\circ}C$ | | - | 248 | Α |
| Avalanche F | Ruggedness | | | | | |
| E _{DS(AL)S} | non-repetitive drain-source avalanche energy | I_D = 62 A; V_{sup} ≤ 55 V; R_{GS} = 50 Ω; V_{GS} = 10 V; $T_{j(init)}$ = 25 °C; unclamped | | - | 211 | mJ |
| | · · · · · · · · · · · · · · · · · · · | | | | | |

- [1] Current is limited by power dissipation chip rating.
- [2] Continuous current is limited by bond wires.

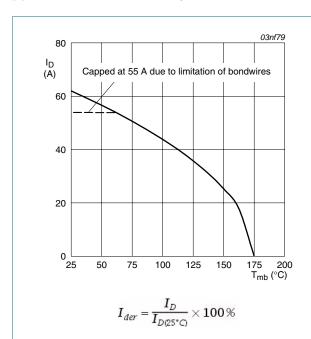
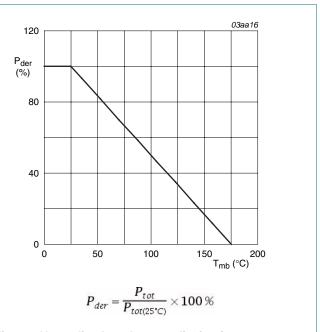


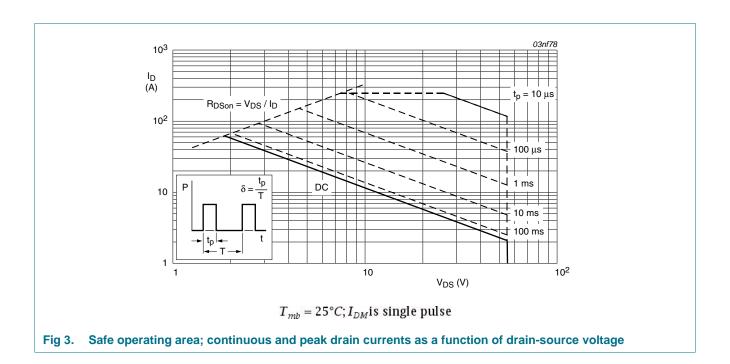
Fig 1. Continuous drain current as a function of mounting base temperature



ig 2. Normalized total power dissipation as a function of mounting base temperature

BUK7215-55A

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5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Тур | Max | Unit |
|----------------------|---|--|-----|------|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | see <u>Figure 4</u> | - | - | 1.3 | K/W |
| R _{th(j-a)} | thermal resistance from junction to ambient | minimum footprint; FR4 printed circuit board | - | 71.4 | - | K/W |

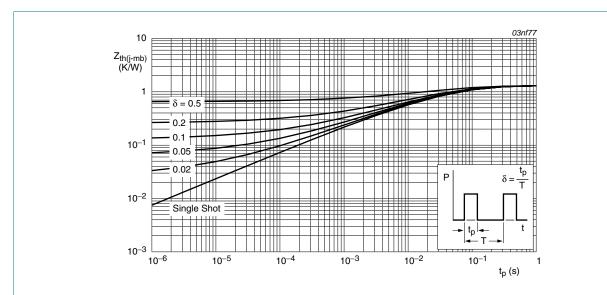


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

6. Characteristics

Table 6. Characteristics

| Table 6. | Characteristics | | | | | |
|--|----------------------------------|--|-----|------|------|------|
| Symbol | Parameter | Conditions | Min | Тур | Max | Unit |
| Static cha | racteristics | | | | | |
| V _{(BR)DSS} | drain-source breakdown | $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$ | 55 | - | - | V |
| | voltage | $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ °C}$ | 50 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 25$ °C; see Figure 10 | 2 | 3 | 4 | V |
| | | $I_D = 1$ mA; $V_{DS} = V_{GS}$; $T_j = 175$ °C; see Figure 10 | 1 | - | - | V |
| | | $I_D = 1 \text{ mA}$; $V_{DS} = V_{GS}$; $T_j = -55 \text{ °C}$; see Figure 10 | - | - | 4.4 | V |
| I _{DSS} c | drain leakage current | $V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ °C}$ | - | - | 500 | μΑ |
| | | $V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ °C}$ | - | 0.05 | 10 | μΑ |
| I _{GSS} | gate leakage current | $V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ °C}$ | - | 2 | 100 | nΑ |
| | | V _{GS} = -20 V; V _{DS} = 0 V; T _j = 25 °C | - | 2 | 100 | nΑ |
| R _{DSon} drain-source on- resistance | drain-source on-state resistance | V_{GS} = 10 V; I_D = 25 A; T_j = 175 °C; see <u>Figure 11</u> ; see <u>Figure 12</u> | - | - | 30 | mΩ |
| | | $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ °C};$ see Figure 11; see Figure 12 | - | 13 | 15 | mΩ |
| Dynamic (| characteristics | | | | | |
| Q _{G(tot)} | total gate charge | $I_D = 25 \text{ A}; V_{DS} = 44 \text{ V}; V_{GS} = 10 \text{ V};$ $T_j = 25 \text{ °C}; \text{ see } \frac{\text{Figure } 13}{\text{Figure } 13}$ | - | 50 | - | nC |
| Q_{GS} | gate-source charge | | - | 9 | - | nC |
| Q_{GD} | gate-drain charge | | - | 19 | - | nC |
| C _{iss} | input capacitance | $V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$ | - | 1580 | 2107 | pF |
| C _{oss} | output capacitance | T _j = 25 °C; see <u>Figure 14</u> | - | 370 | 446 | рF |
| C _{rss} | reverse transfer capacitance | | - | 220 | 300 | pF |
| t _{d(on)} | turn-on delay time | V_{DS} = 30 V; R_L = 1.2 Ω ; V_{GS} = 10 V; | - | 26 | - | ns |
| t _r | rise time | $R_{G(ext)} = 10 \Omega; T_j = 25 ^{\circ}C$ | - | 99 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | - | 73 | - | ns |
| t _f | fall time | | - | 65 | - | ns |
| L _D | internal drain inductance | measured from drain to centre of die ; $T_j = 25 ^{\circ}\text{C}$ | - | 2.5 | - | nΗ |
| L _S | internal source inductance | measured from source to source bond pad ; $T_j = 25 ^{\circ}\text{C}$ | - | 7.5 | - | nΗ |
| Source-dr | rain diode | | | | | |
| V_{SD} | source-drain voltage | $I_S = 25 \text{ A}$; $V_{GS} = 0 \text{ V}$; $T_j = 25 \text{ °C}$; see <u>Figure 15</u> | - | 0.85 | 1.2 | V |
| t _{rr} | reverse recovery time | $I_S = 25 \text{ A}$; $dI_S/dt = -100 \text{ A/}\mu\text{s}$; | - | 48 | - | ns |
| Qr | recovered charge | $V_{GS} = -10 \text{ V}; V_{DS} = 30 \text{ V}; T_j = 25 \text{ °C}$ | - | 106 | - | nC |

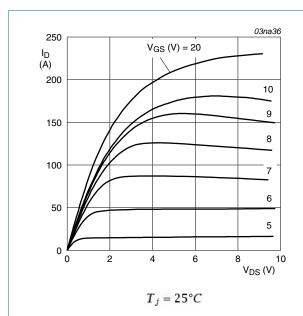


Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values

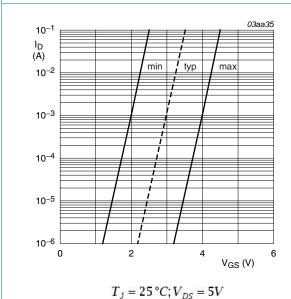


Fig 7. Sub-threshold drain current as a function of gate-source voltage

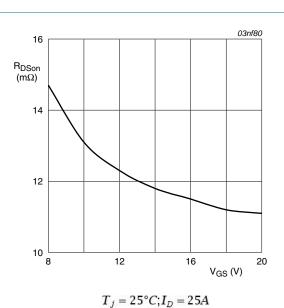


Fig 6. Drain-source on-state resistance as a function of gate-source voltage; typical values

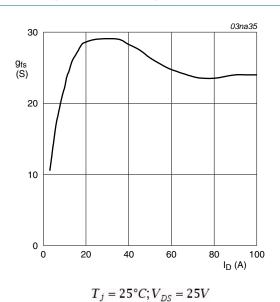


Fig 8. Forward transconductance as a function of drain current; typical values

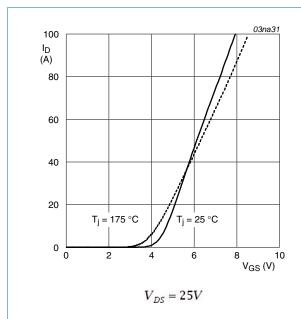


Fig 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

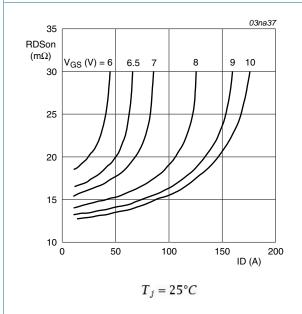


Fig 11. Drain-source on-state resistance as a function of drain current; typical values

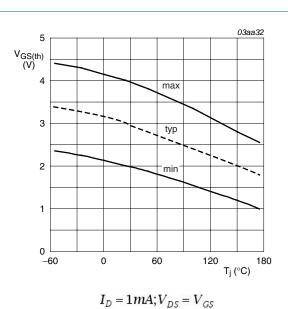


Fig 10. Gate-source threshold voltage as a function of junction temperature

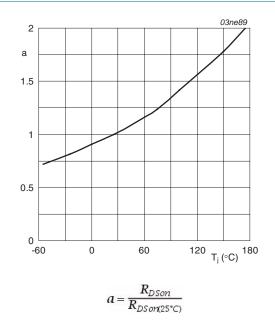


Fig 12. Normalized drain-source on-state resistance factor as a function of junction temperature

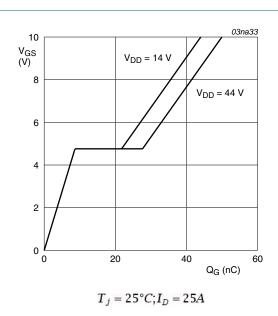
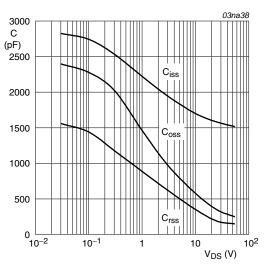
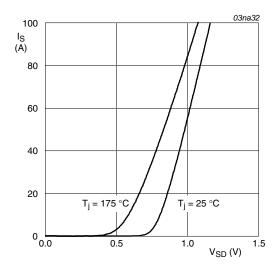


Fig 13. Gate-source voltage as a function of turn-on gate charge; typical values



 $V_{GS} = 0V; f = 1MHz$

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



 $V_{GS} = 0V$

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

7. Package outline

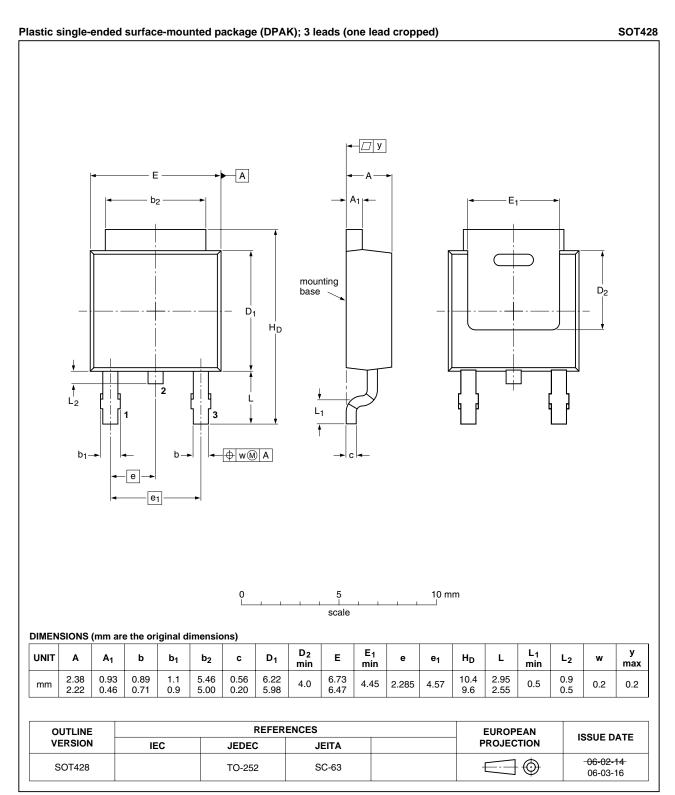


Fig 16. Package outline SOT428 (DPAK)

8. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes | | |
|-----------------|------------------------------------|--|--------------------|-----------------|--|--|
| BUK7215-55A v.2 | 20110127 | Product data sheet | - | BUK7215_55A v.1 | | |
| Modifications: | | The format of this data sheet has been redesigned to comply with the new identity guideline of NXP Semiconductors. | | | | |
| | Legal texts ha | ve been adapted to the new | company name where | appropriate. | | |
| BUK7215_55A v.1 | 20010816 | Product data | - | - | | |

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9.1 Data sheet status

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|--------------------------------|-------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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| Product [short] data sheet | Production | This document contains the product specification. |

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