



BUK9215-55A

N-channel TrenchMOS logic level FET

7 April 2014

Product data sheet

1. General description

Logic 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.

2. Features and benefits

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

3. Applications

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

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 | $V_{GS} = 5\text{ V}; T_{mb} = 25\text{ °C};$ Fig. 2 ; Fig. 3 | [1] | - | 62 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C};$ Fig. 1 | - | - | 115 | W |
| Static characteristics | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C}$ | - | 11 | 13.6 | mΩ |
| | | $V_{GS} = 4.5\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C}$ | - | - | 16.6 | mΩ |
| | | $V_{GS} = 5\text{ V}; I_D = 25\text{ A}; T_j = 25\text{ °C};$ Fig. 11 ; Fig. 12 | - | 13 | 15 | mΩ |
| Dynamic characteristics | | | | | | |
| Q_{GD} | gate-drain charge | $V_{GS} = 5\text{ V}; I_D = 25\text{ A}; V_{DS} = 44\text{ V};$ $T_j = 25\text{ °C};$ Fig. 9 | - | 20 | - | nC |



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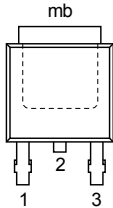
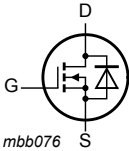


| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------------|--|---|-----|-----|-----|------|
| Avalanche ruggedness | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 62\text{ A}$; $V_{sup} \leq 55\text{ V}$; $R_{GS} = 50\ \Omega$; $V_{GS} = 5\text{ V}$; $T_{j(init)} = 25\text{ }^\circ\text{C}$; unclamped | - | - | 211 | mJ |

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

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-----------------------------------|---|--|
| 1 | G | gate |  <p style="text-align: center;">DPAK (SOT428)</p> |  <p style="text-align: center;"><i>mbb076</i></p> |
| 2 | D | drain | | |
| 3 | S | source | | |
| mb | D | mounting base; connected to drain | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BUK9215-55A | DPAK | plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) | SOT428 |

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------------------------|--|---|-----|-----|-----|------|
| V_{DS} | drain-source voltage | $T_j \geq 25\text{ °C}; T_j \leq 175\text{ °C}$ | | - | 55 | V |
| V_{DGR} | drain-gate voltage | $R_{GS} = 20\text{ k}\Omega$ | | - | 55 | V |
| V_{GS} | gate-source voltage | | | -15 | 15 | V |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C};$ Fig. 1 | | - | 115 | W |
| I_D | drain current | $T_{mb} = 25\text{ °C}; V_{GS} = 5\text{ V};$ Fig. 2 ; Fig. 3 | [1] | - | 62 | A |
| | | | [2] | - | 55 | A |
| | | $T_{mb} = 100\text{ °C}; V_{GS} = 5\text{ V};$ Fig. 2 | [1] | - | 44 | A |
| I_{DM} | peak drain current | $T_{mb} = 25\text{ °C};$ pulsed; $t_p \leq 10\text{ }\mu\text{s};$ Fig. 3 | | - | 248 | A |
| T_{stg} | storage temperature | | | -55 | 175 | °C |
| T_j | junction temperature | | | -55 | 175 | °C |
| Source-drain diode | | | | | | |
| I_S | source current | $T_{mb} = 25\text{ °C}$ | [2] | - | 55 | A |
| | | | [1] | - | 62 | A |
| I_{SM} | peak source current | pulsed; $t_p \leq 10\text{ }\mu\text{s}; T_{mb} = 25\text{ °C}$ | | - | 248 | A |
| Avalanche ruggedness | | | | | | |
| $E_{DS(AL)S}$ | non-repetitive drain-source avalanche energy | $I_D = 62\text{ A}; V_{sup} \leq 55\text{ V}; R_{GS} = 50\text{ }\Omega;$ $V_{GS} = 5\text{ V}; T_{j(init)} = 25\text{ °C};$ unclamped | | - | 211 | mJ |

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

[2] Continuous current is limited by bond wires.

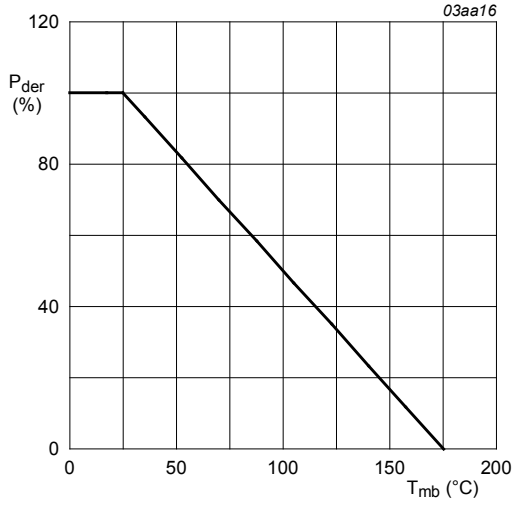


Fig. 1. Normalized total power dissipation as a function of mounting base temperature

$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

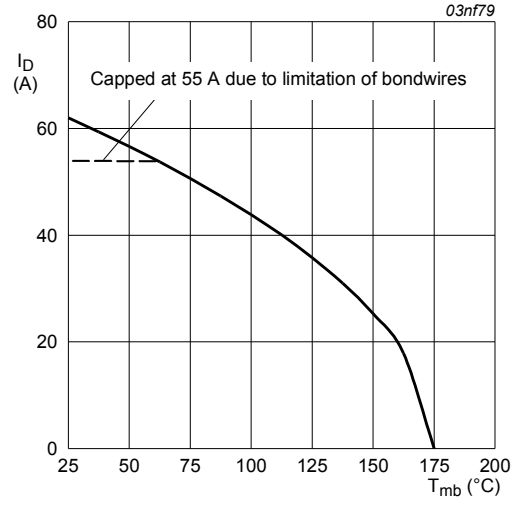


Fig. 2. Continuous drain current as a function of mounting base temperature

$$I_{der} = \frac{I_D}{I_{D(25^{\circ}C)}} \times 100\%$$

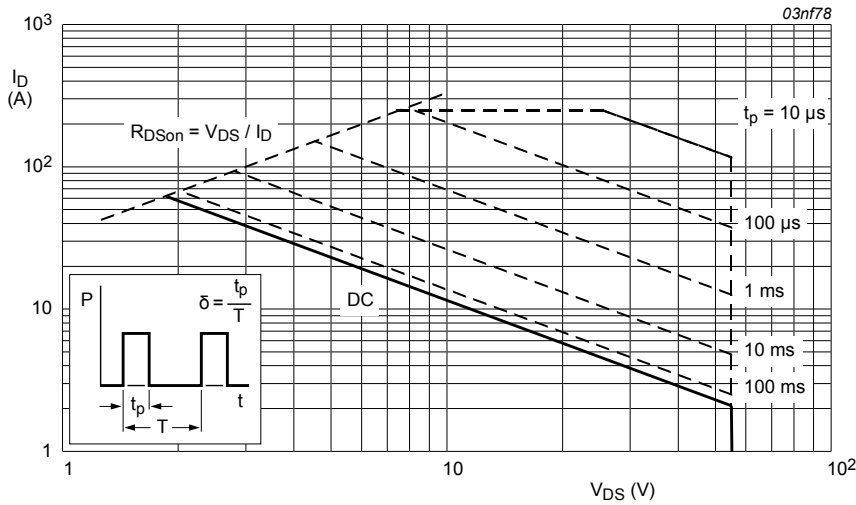


Fig. 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

$T_{mb} = 25^{\circ}C; I_{DM}$ is single pulse

8. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|------------------------|-----|------|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 4 | - | - | 1.3 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | | - | 71.4 | - | K/W |

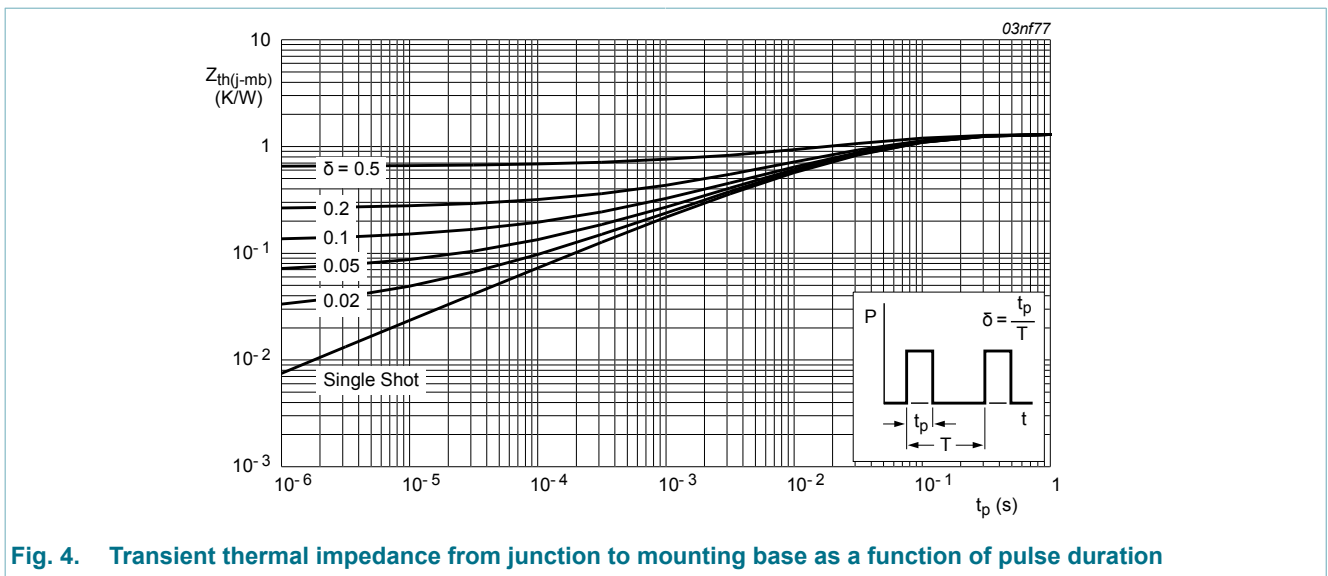


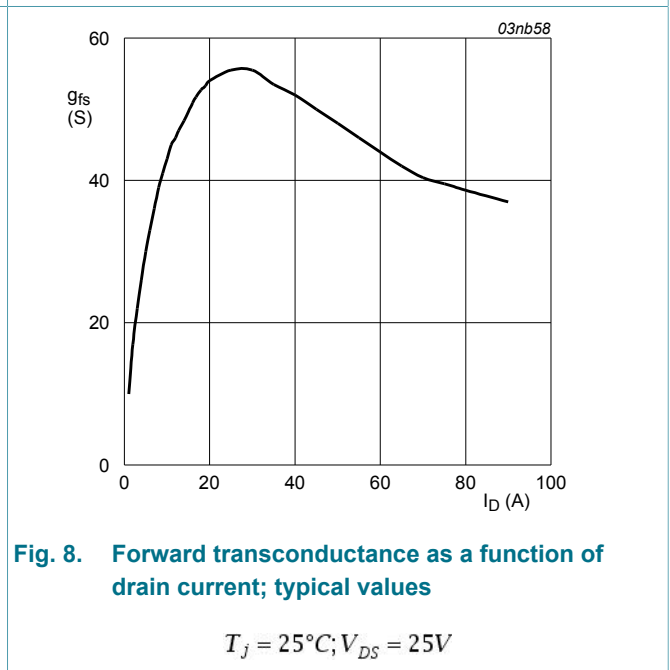
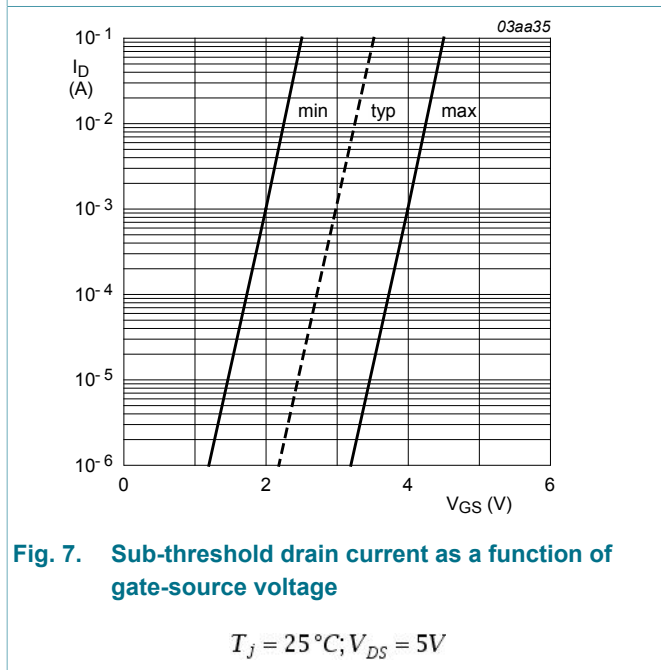
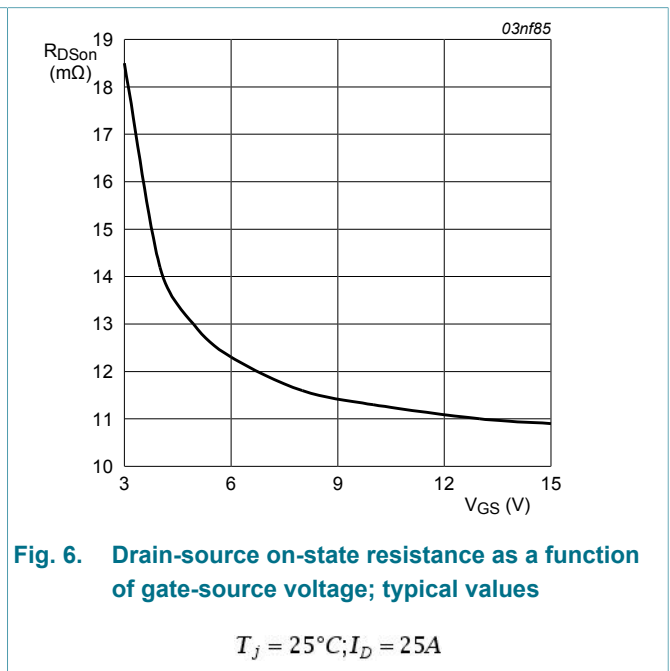
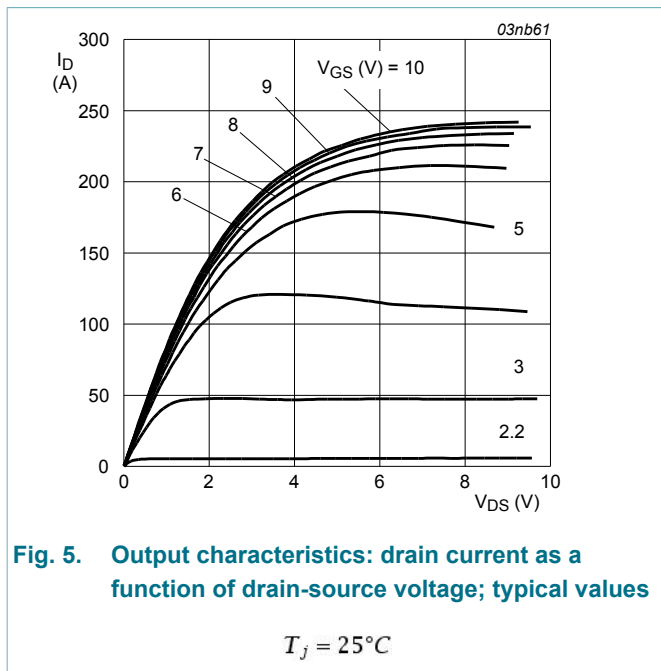
Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|---|------|------|---------------|
| Static characteristics | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | 55 | - | - | V |
| | | $I_D = 0.25 \text{ mA}; V_{GS} = 0 \text{ V}; T_j = -55 \text{ }^\circ\text{C}$ | 50 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = -55 \text{ }^\circ\text{C};$ Fig. 10 | - | - | 2.3 | V |
| | | $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 175 \text{ }^\circ\text{C};$ Fig. 10 | 0.5 | - | - | V |
| | | $I_D = 1 \text{ mA}; V_{DS} = V_{GS}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 10 | 1 | 1.5 | 2 | V |
| I_{DSS} | drain leakage current | $V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 0.05 | 10 | μA |
| | | $V_{DS} = 55 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 175 \text{ }^\circ\text{C}$ | - | - | 500 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = 10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 2 | 100 | nA |
| | | $V_{GS} = -10 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 2 | 100 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ | - | 11 | 13.6 | m Ω |
| | | $V_{GS} = 4.5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$ | - | - | 16.6 | m Ω |
| | | $V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 175 \text{ }^\circ\text{C};$ Fig. 11; Fig. 12 | - | - | 30 | m Ω |
| | | $V_{GS} = 5 \text{ V}; I_D = 25 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ Fig. 11; Fig. 12 | - | 13 | 15 | m Ω |
| Dynamic characteristics | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D = 25 \text{ A}; V_{DS} = 44 \text{ V}; V_{GS} = 5 \text{ V};$ $T_j = 25 \text{ }^\circ\text{C};$ Fig. 9 | - | 48 | - | nC |
| Q_{GS} | gate-source charge | | - | 6 | - | nC |
| Q_{GD} | gate-drain charge | | - | 20 | - | nC |
| C_{iss} | input capacitance | $V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz};$ $T_j = 25 \text{ }^\circ\text{C};$ Fig. 13 | - | 2190 | 2916 | pF |
| C_{oss} | output capacitance | | - | 380 | 450 | pF |
| C_{rss} | reverse transfer capacitance | | - | 250 | 344 | pF |
| $t_{d(on)}$ | turn-on delay time | | $V_{DS} = 30 \text{ V}; R_L = 1.2 \text{ } \Omega; V_{GS} = 5 \text{ V};$ $R_{G(ext)} = 10 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$ | - | 19 | - |
| t_r | rise time | - | | 161 | - | ns |
| $t_{d(off)}$ | turn-off delay time | - | | 138 | - | ns |
| t_f | fall time | - | | 165 | - | ns |
| L_D | internal drain inductance | measured from drain to centre of die | - | 2.5 | - | nH |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------------------|----------------------------|--|-----|------|-----|------|
| L_S | internal source inductance | measured from source lead to source bond pad | - | 7.5 | - | nH |
| Source-drain diode | | | | | | |
| V_{SD} | source-drain voltage | $I_S = 20\text{ A}$; $V_{GS} = 0\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 14 | - | 0.85 | 1.2 | V |
| t_{rr} | reverse recovery time | $I_S = 20\text{ A}$; $di_S/dt = -100\text{ A}/\mu\text{s}$; | - | 51 | - | ns |
| Q_r | recovered charge | $V_{GS} = -10\text{ V}$; $V_{DS} = 30\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$ | - | 102 | - | nC |



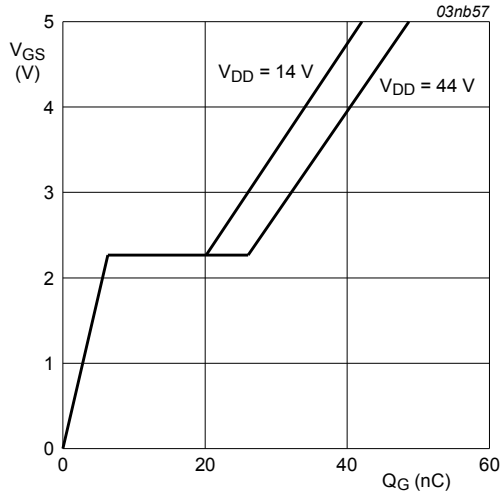


Fig. 9. Gate-source voltage as a function of turn-on gate charge; typical values

$$T_j = 25^\circ\text{C}; I_D = 25\text{A}$$

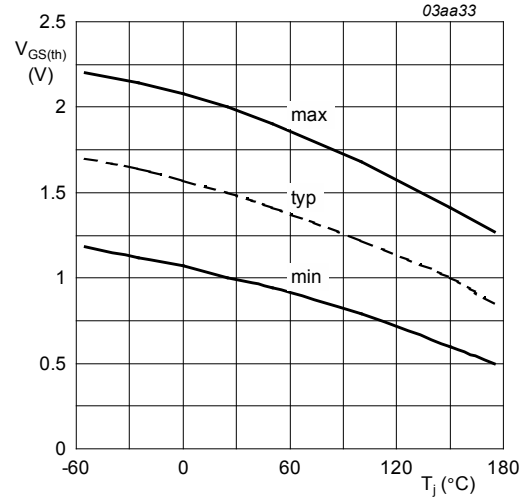


Fig. 10. Gate-source threshold voltage as a function of junction temperature

$$I_D = 1\text{mA}; V_{DS} = V_{GS}$$

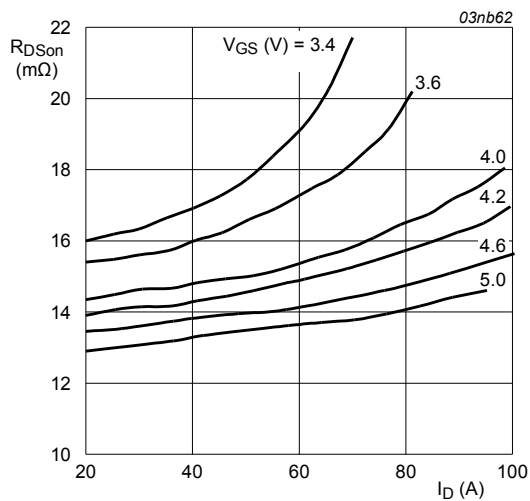


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

$$T_j = 25^\circ\text{C}$$

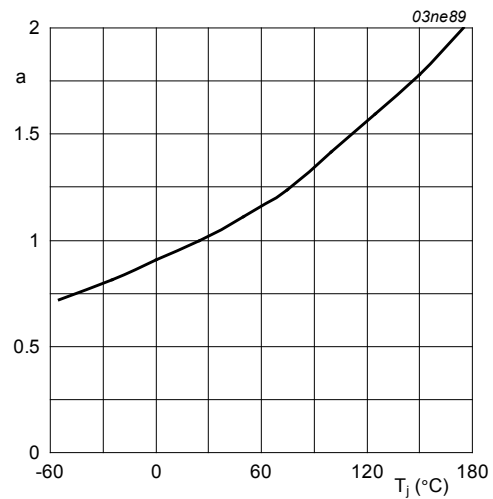


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

$$a = \frac{R_{DSon}}{R_{DSon}(25^\circ\text{C})}$$

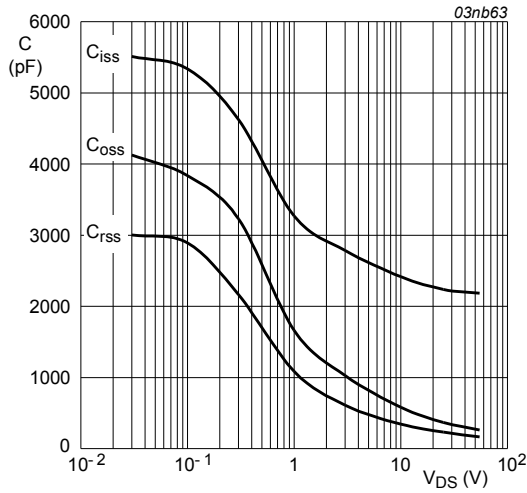


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

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

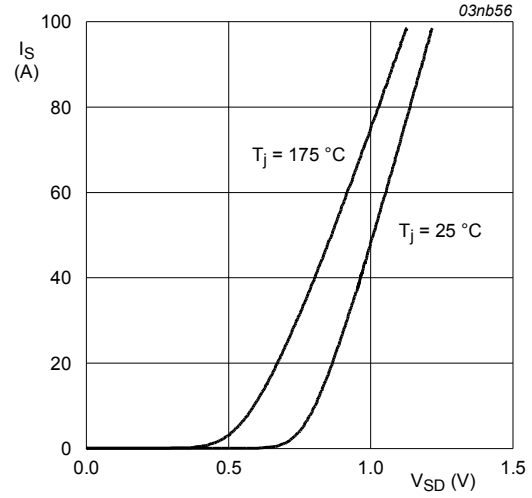


Fig. 14. Reverse diode current; typical value

$$V_{GS} = 0V$$

10. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) SOT428

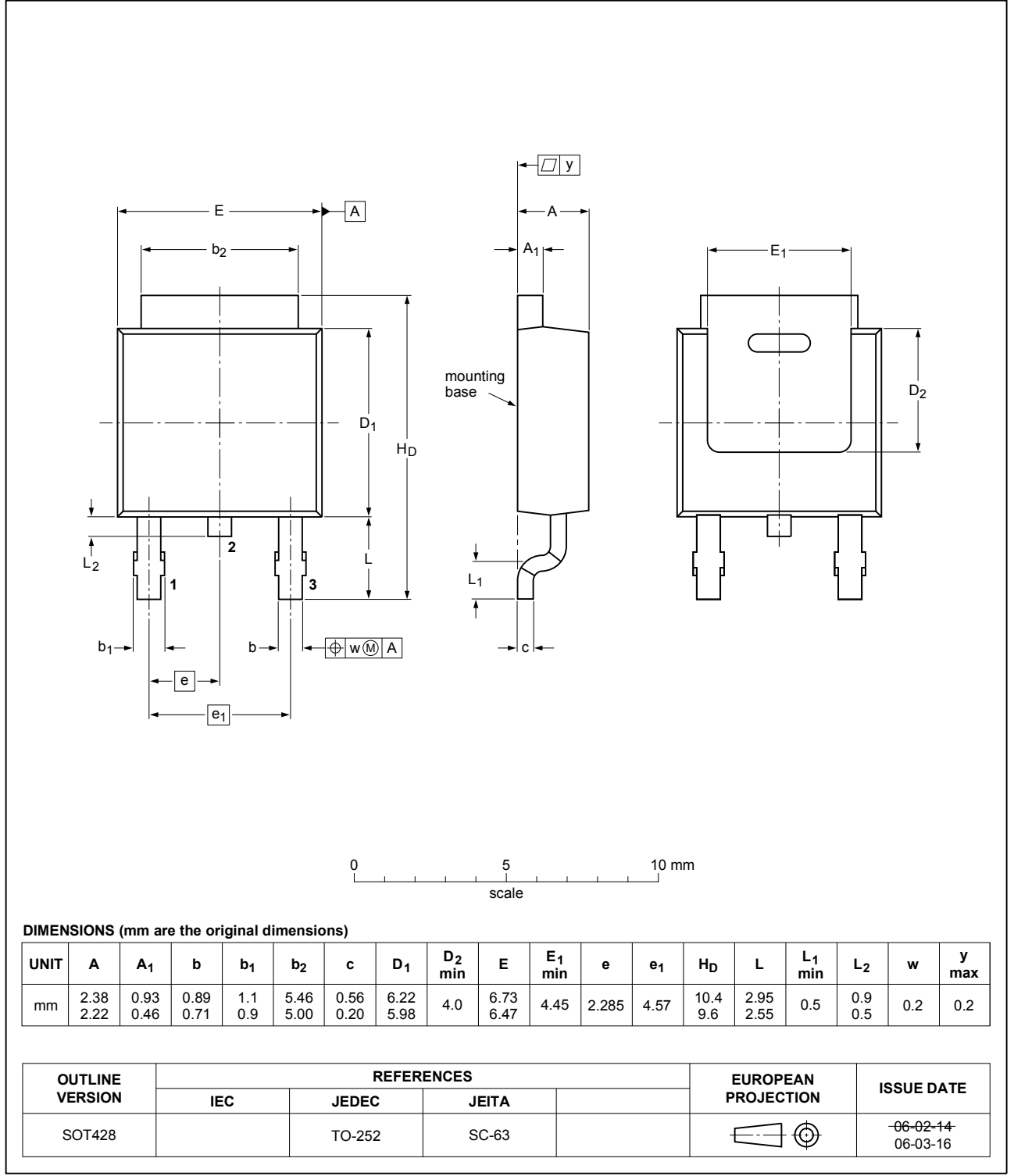


Fig. 15. Package outline DPAK (SOT428)

11. Legal information

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|--------------------------------|--------------------|---|
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