



BUK761R6-40E

N-channel TrenchMOS standard level FET

5 September 2013

Product data sheet

1. General description

Standard level N-channel MOSFET in a SOT404A package using TrenchMOS technology. This product has been designed and qualified to AEC Q101 standard for use in high performance automotive applications.

2. Features and benefits

- AEC Q101 compliant
- Repetitive avalanche rated
- Suitable for thermally demanding environments due to 175 °C rating
- True standard level gate with $V_{GS(th)}$ rating of greater than 1 V at 175 °C

3. Applications

- 12 V Automotive systems
- Electric and electro-hydraulic power steering
- Motors, lamps and solenoid control
- Start-Stop micro-hybrid applications
- Transmission control
- Ultra high performance power switching

4. Quick reference data

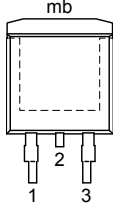
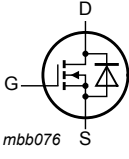
Table 1. Quick reference data

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|--------------------------------|----------------------------------|---|-----|-----|------|------|------|
| V_{DS} | drain-source voltage | $T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$ | | - | - | 40 | V |
| I_D | drain current | $V_{GS} = 10\text{ V}$; $T_{mb} = 25\text{ °C}$; Fig. 1 | [1] | - | - | 120 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$; Fig. 2 | | - | - | 349 | W |
| Static characteristics | | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $T_j = 25\text{ °C}$; Fig. 11 | | - | 1.3 | 1.57 | mΩ |
| Dynamic characteristics | | | | | | | |
| Q_{GD} | gate-drain charge | $V_{GS} = 10\text{ V}$; $I_D = 25\text{ A}$; $V_{DS} = 32\text{ V}$; Fig. 13 ; Fig. 14 | | - | 48.2 | - | nC |

[1] Continuous current is limited by package.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-----------------------------------|--|---|
| 1 | G | gate |  D2PAK (SOT404A) |  mbb076 |
| 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 |
| BUK761R6-40E | D2PAK | plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) | SOT404A |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|--------------|--------------|
| BUK761R6-40E | BUK761R6-40E |

8. Limiting values

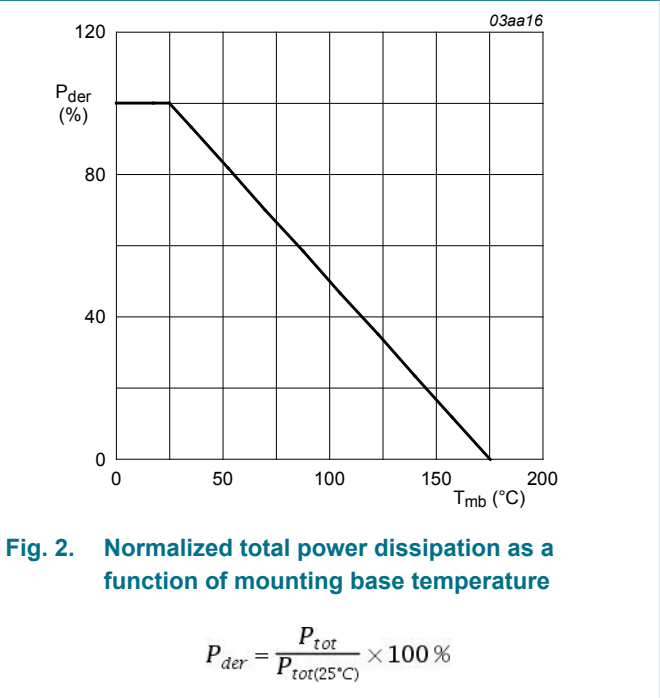
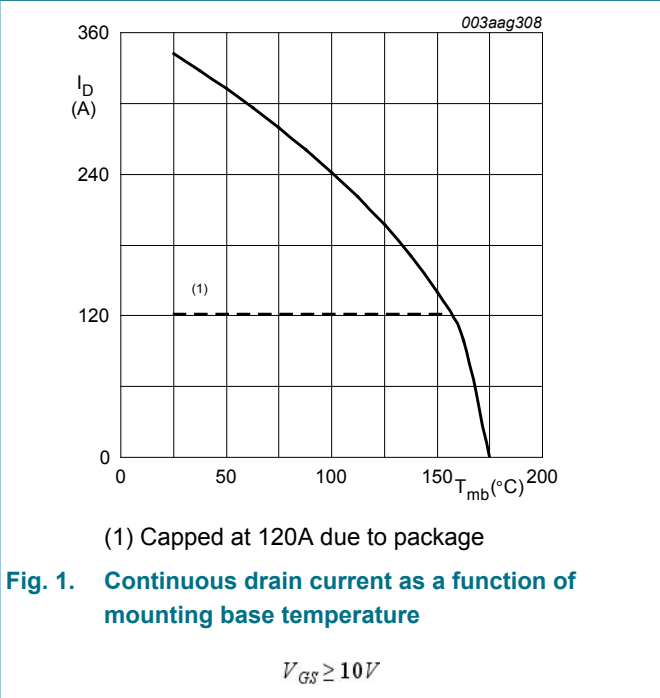
Table 5. Limiting values

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------|-------------------------|---|-----|-----|------|------|
| V_{DS} | drain-source voltage | $T_j \geq 25\text{ °C}$; $T_j \leq 175\text{ °C}$ | | - | 40 | V |
| V_{DGR} | drain-gate voltage | $R_{GS} = 20\text{ k}\Omega$ | | - | 40 | V |
| V_{GS} | gate-source voltage | $T_j \leq 175\text{ °C}$; DC | | -20 | 20 | V |
| I_D | drain current | $T_{mb} = 25\text{ °C}$; $V_{GS} = 10\text{ V}$; Fig. 1 | [1] | - | 120 | A |
| | | $T_{mb} = 100\text{ °C}$; $V_{GS} = 10\text{ V}$; Fig. 1 | [1] | - | 120 | A |
| I_{DM} | peak drain current | $T_{mb} = 25\text{ °C}$; pulsed; $t_p \leq 10\text{ }\mu\text{s}$; Fig. 4 | | - | 1355 | A |
| P_{tot} | total power dissipation | $T_{mb} = 25\text{ °C}$; Fig. 2 | | - | 349 | W |
| T_{stg} | storage temperature | | | -55 | 175 | °C |
| T_j | junction temperature | | | -55 | 175 | °C |

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|----------------------|--|--|--------|-----|------|------|
| Source-drain diode | | | | | | |
| I _S | source current | T _{mb} = 25 °C | [1] | - | 120 | A |
| I _{SM} | peak source current | pulsed; t _p ≤ 10 μs; T _{mb} = 25 °C | | - | 1355 | A |
| Avalanche ruggedness | | | | | | |
| E _{DS(AL)S} | non-repetitive drain-source avalanche energy | I _D = 120 A; V _{sup} ≤ 40 V; R _{GS} = 50 Ω; V _{GS} = 10 V; T _{j(init)} = 25 °C; unclamped; Fig. 3 | [2][3] | - | 1008 | mJ |

- [1] Continuous current is limited by package.
- [2] Single-pulse avalanche rating limited by maximum junction temperature of 175 °C.
- [3] Refer to application note AN10273 for further information.



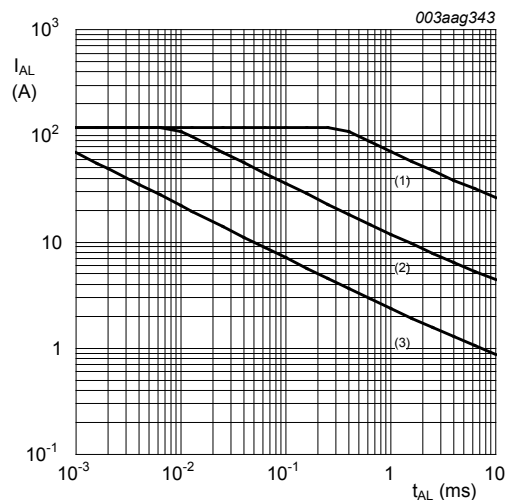


Fig. 3. Single-pulse and repetitive avalanche rating; avalanche current as a function of avalanche time

(1) $T_{j\ (init)} = 25^{\circ}\text{C}$; (2) $T_{j\ (init)} = 150^{\circ}\text{C}$; (3) Repetitive Avalanche

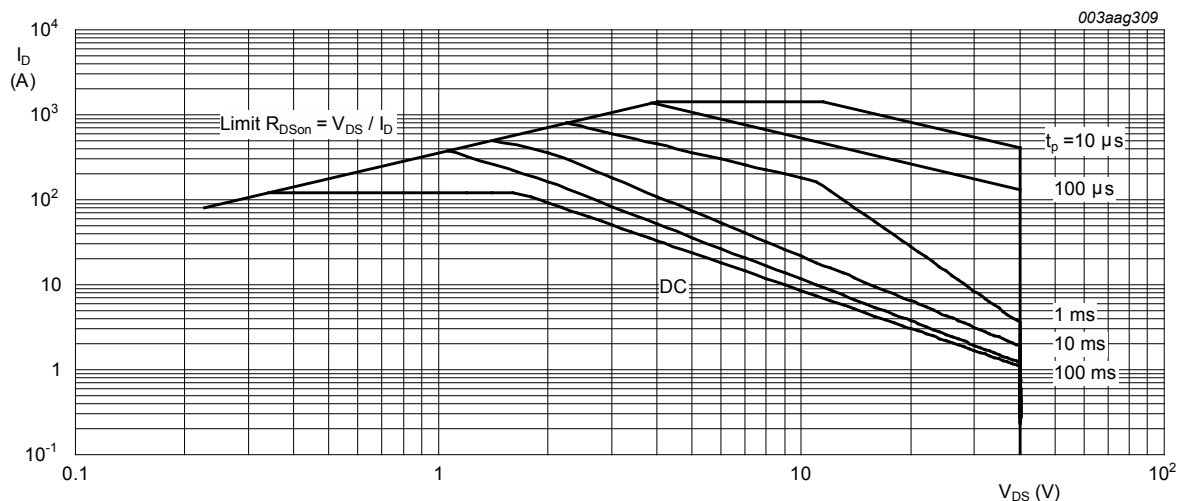


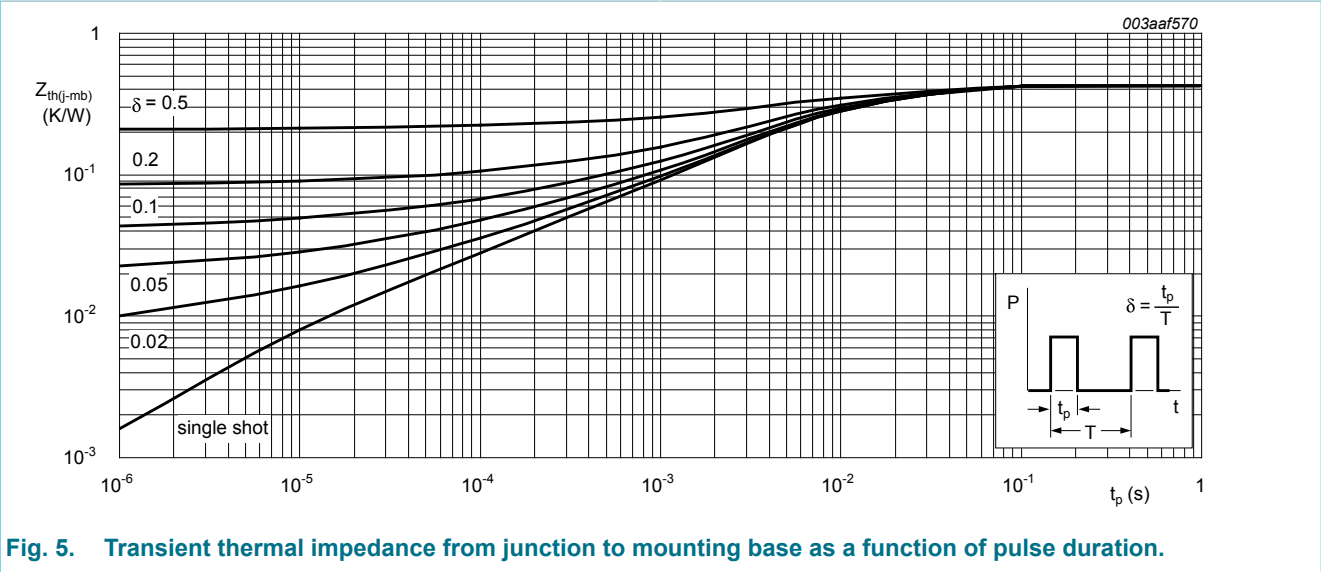
Fig. 4. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

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

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|--|-----|-----|------|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 5 | - | - | 0.43 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | minimum footprint ; mounted on a printed-circuit board | - | 50 | - | K/W |



10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-------------------------|----------------------------------|---|--|-----|------|------|------|
| Static characteristics | | | | | | | |
| V _{(BR)DSS} | drain-source breakdown voltage | I _D = 250 μA; V _{GS} = 0 V; T _J = 25 °C | | 40 | - | - | V |
| | | I _D = 250 μA; V _{GS} = 0 V; T _J = -55 °C | | 36 | - | - | V |
| V _{GS(th)} | gate-source threshold voltage | I _D = 1 mA; V _{DS} = V _{GS} ; T _J = 25 °C; Fig. 9 ; Fig. 10 | | 2.4 | 3 | 4 | V |
| | | I _D = 1 mA; V _{DS} = V _{GS} ; T _J = -55 °C; Fig. 10 | | - | - | 4.5 | V |
| | | I _D = 1 mA; V _{DS} = V _{GS} ; T _J = 175 °C; Fig. 10 | | 1 | - | - | V |
| I _{DSS} | drain leakage current | V _{DS} = 40 V; V _{GS} = 0 V; T _J = 25 °C | | - | 0.25 | 2 | μA |
| | | V _{DS} = 40 V; V _{GS} = 0 V; T _J = 175 °C | | - | - | 500 | μA |
| I _{GSS} | gate leakage current | V _{GS} = 20 V; V _{DS} = 0 V; T _J = 25 °C | | - | 2 | 100 | nA |
| | | V _{GS} = -20 V; V _{DS} = 0 V; T _J = 25 °C | | - | 2 | 100 | nA |
| R _{DSon} | drain-source on-state resistance | V _{GS} = 10 V; I _D = 25 A; T _J = 25 °C; Fig. 11 | | - | 1.3 | 1.57 | mΩ |
| | | V _{GS} = 10 V; I _D = 25 A; T _J = 175 °C; Fig. 12 ; Fig. 11 | | - | - | 3 | mΩ |
| Dynamic characteristics | | | | | | | |
| Q _{G(tot)} | total gate charge | I _D = 25 A; V _{DS} = 32 V; V _{GS} = 10 V; Fig. 13 ; Fig. 14 | | - | 145 | - | nC |
| Q _{GS} | gate-source charge | | | - | 35.7 | - | nC |
| Q _{GD} | gate-drain charge | | | - | 48.2 | - | nC |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---------------------|------------------------------|--|--|-----|------|-------|------|
| C _{iss} | input capacitance | V _{GS} = 0 V; V _{DS} = 25 V; f = 1 MHz; | | - | 8500 | 11340 | pF |
| C _{oss} | output capacitance | T _j = 25 °C; Fig. 15 | | - | 1620 | 1950 | pF |
| C _{rss} | reverse transfer capacitance | | | - | 985 | 1350 | pF |
| t _{d(on)} | turn-on delay time | V _{DS} = 30 V; R _L = 1.2 Ω; V _{GS} = 10 V; R _{G(ext)} = 5 Ω | | - | 42 | - | ns |
| t _r | rise time | | | - | 60 | - | ns |
| t _{d(off)} | turn-off delay time | | | - | 121 | - | ns |
| t _f | fall time | | | - | 83 | - | ns |
| L _D | internal drain inductance | from upper edge of drain mounting base to center of die | | - | 2.5 | - | nH |
| L _S | internal source inductance | from source lead to source bonding pad | | - | 7.5 | - | nH |
| Source-drain diode | | | | | | | |
| V _{SD} | source-drain voltage | I _S = 25 A; V _{GS} = 0 V; T _j = 25 °C; Fig. 16 | | - | 0.77 | 1.2 | V |
| t _{rr} | reverse recovery time | I _S = 20 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; | | - | 56 | - | ns |
| Q _r | recovered charge | V _{DS} = 25 V | | - | 94 | - | nC |

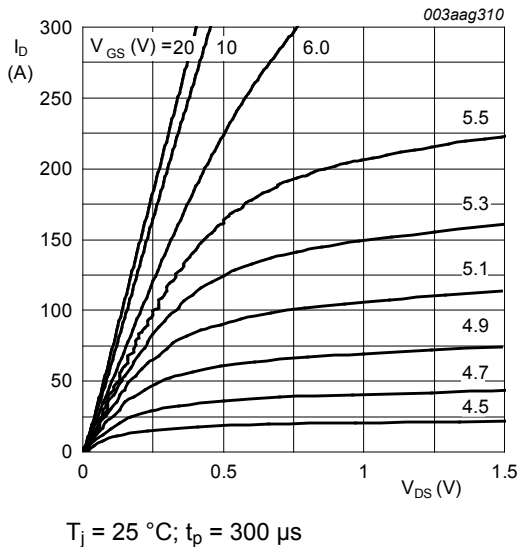


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

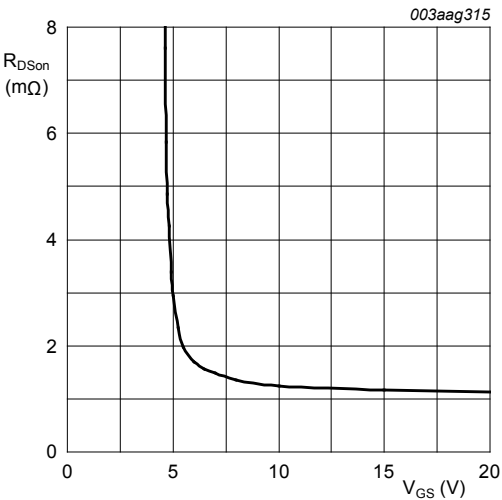


Fig. 7. Drain-source on-state resistance as a function of gate-source voltage; typical values

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

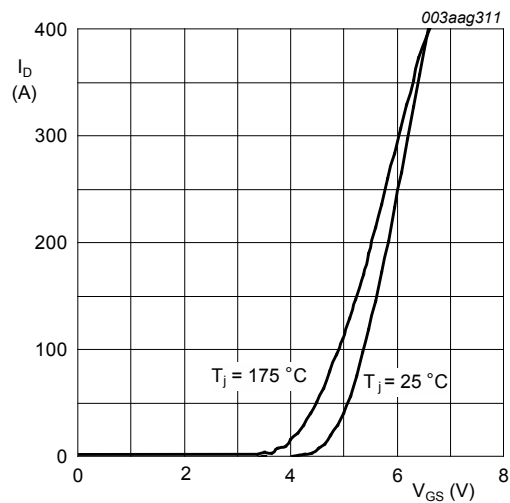


Fig. 8. Transfer characteristics: drain current as a function of gate-source voltage; typical values

$V_{DS} = 12\text{ V}$

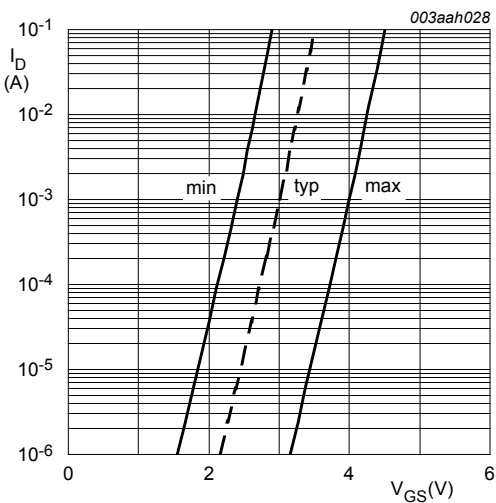


Fig. 9. Sub-threshold drain current as a function of gate-source voltage

$T_j = 25\text{ }^{\circ}\text{C}; V_{DS} = 5\text{ V}$

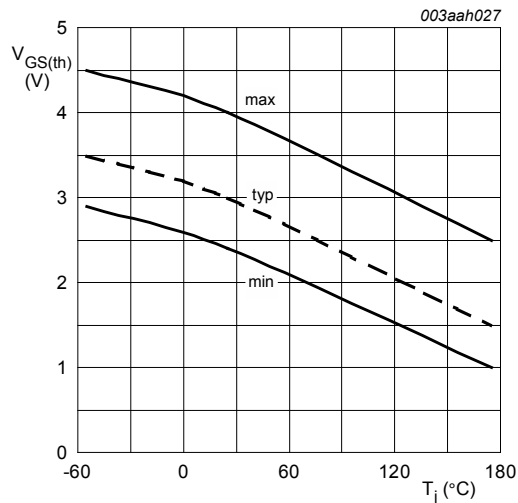


Fig. 10. Gate-source threshold voltage as a function of junction temperature

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

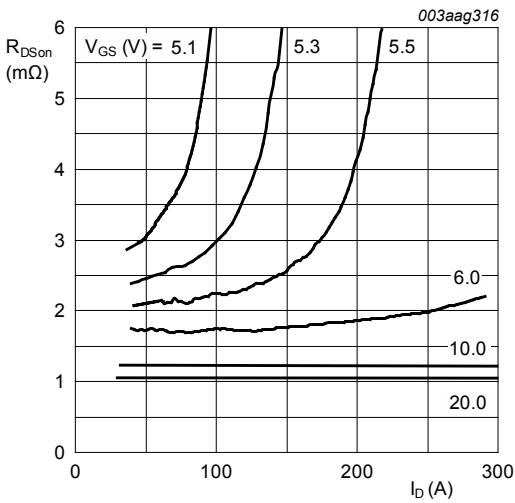


Fig. 11. Drain-source on-state resistance as a function of drain current; typical values

$T_j = 25\text{ }^{\circ}\text{C}; t_p = 300\text{ }\mu\text{s}$

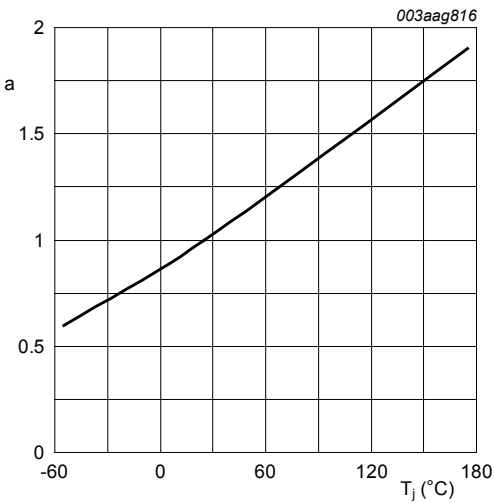


Fig. 12. Normalized drain-source on-state resistance factor as a function of junction temperature

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

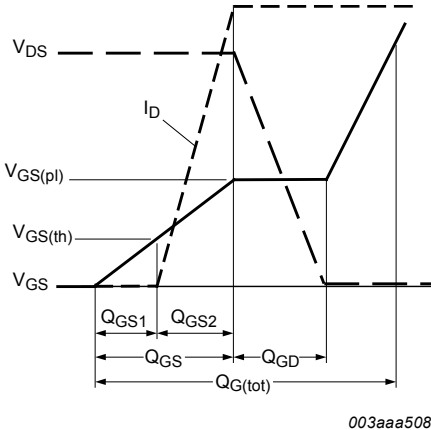


Fig. 13. Gate charge waveform definitions

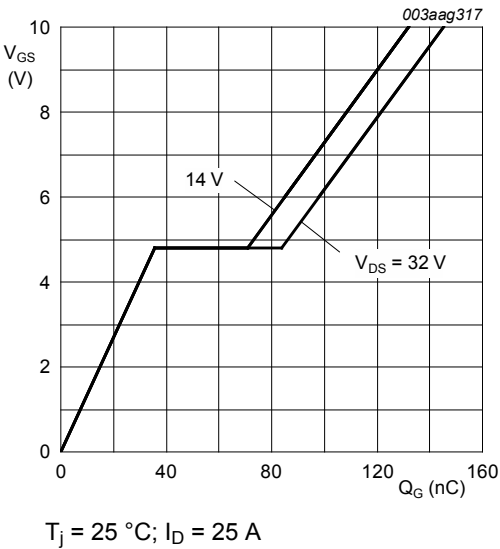


Fig. 14. Gate-source voltage as a function of gate charge; typical values

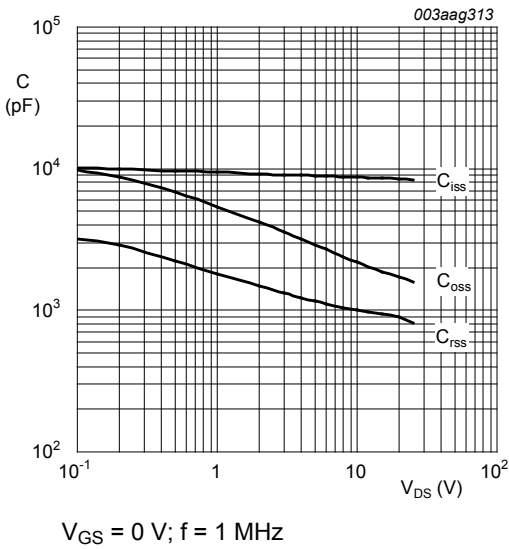
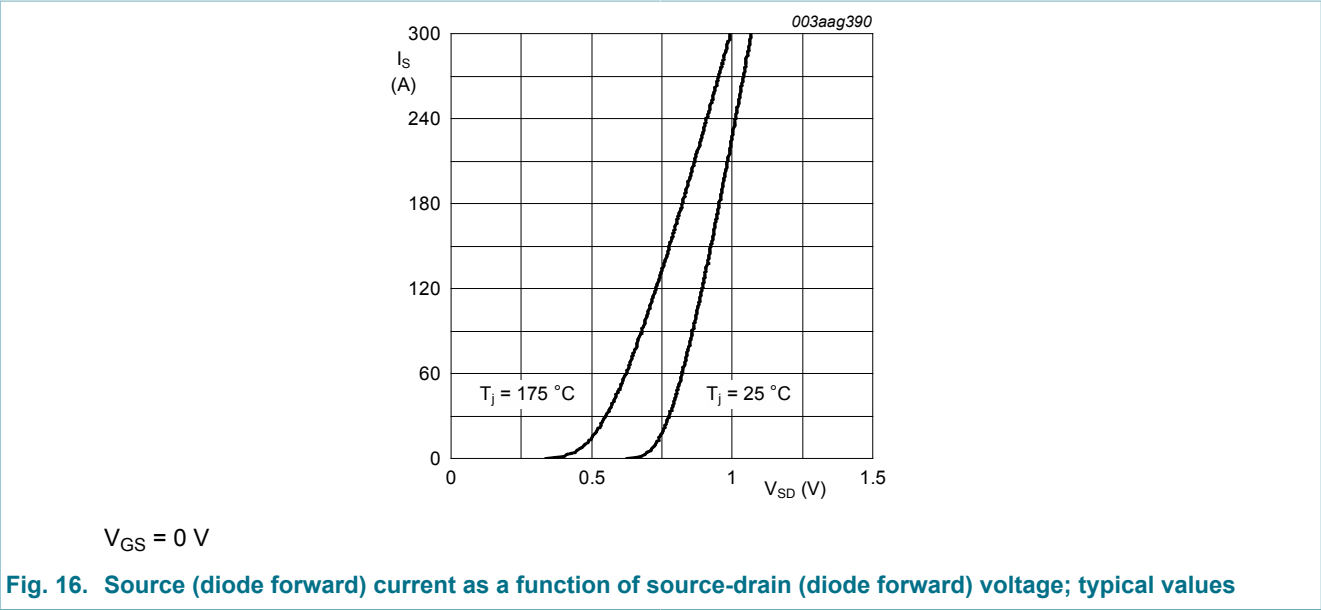


Fig. 15. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values



11. Package outline

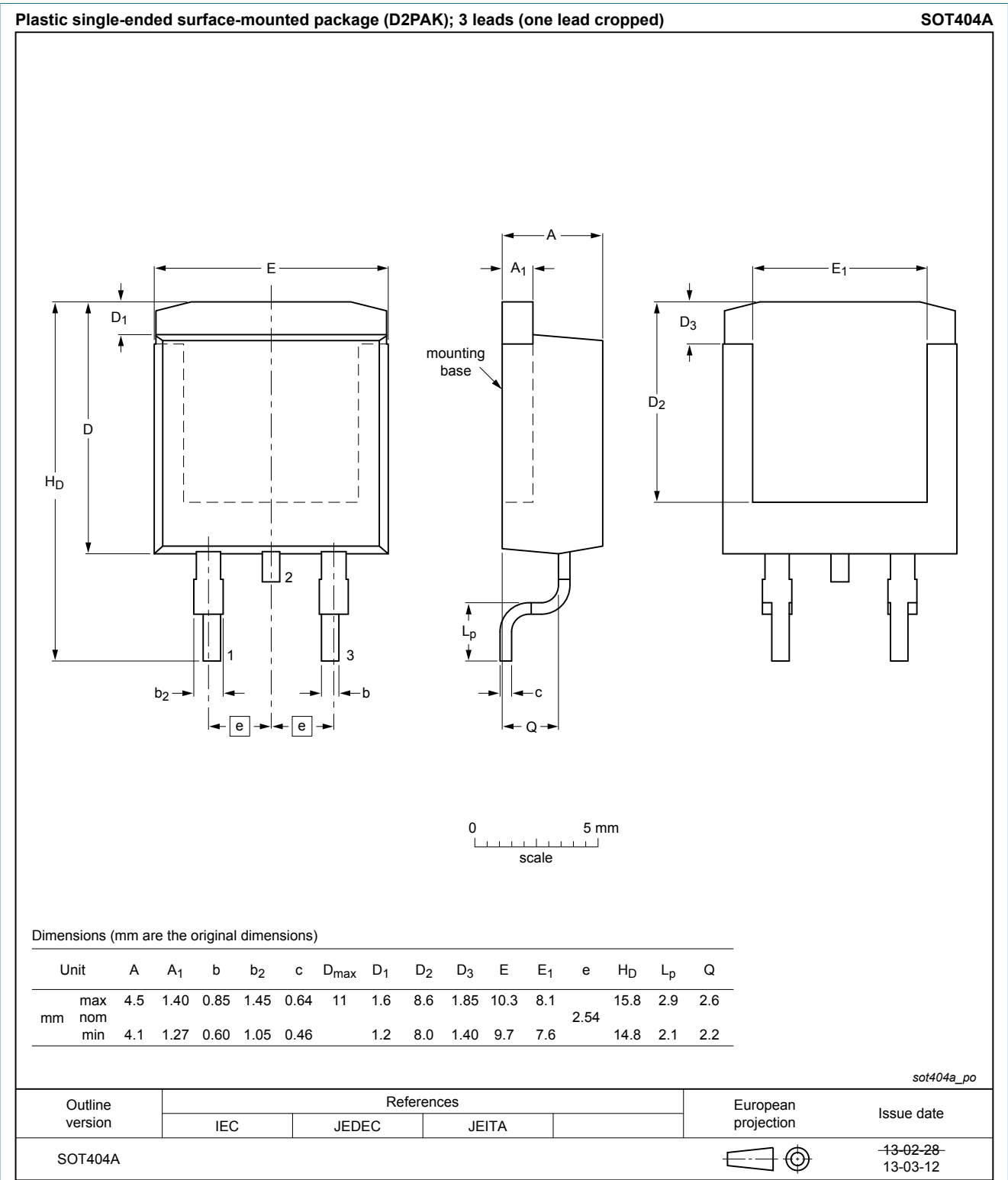


Fig. 17. Package outline D2PAK (SOT404A)

12. Legal information

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| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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