



# BUK6Y10-30P

30 V, P-channel Trench MOSFET

17 April 2020

Product data sheet

## 1. General description

P-channel enhancement mode MOSFET in an LFPAK56 (Power SO8) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

This product has been designed and qualified to AEC-Q101 standard for use in high-performance automotive applications such as reverse battery protection.

## 2. Features and benefits

- High thermal power dissipation capability
- Suitable for thermally demanding environments due to 175 °C rating
- Trench MOSFET technology
- AEC-Q101 qualified

## 3. Applications

- Reverse battery protection
- Power management
- High-side load switch
- Motor drive

## 4. Quick reference data

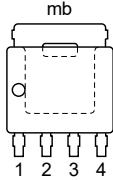
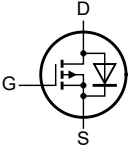
Table 1. Quick reference data

| Symbol                        | Parameter                        | Conditions  | Min | Typ | Max | Unit |
|-------------------------------|----------------------------------|---|-----|-----|-----|------|
| $V_{DS}$                      | drain-source voltage             | $T_j = 25\text{ °C}$  | -   | -   | -30 | V    |
| $V_{GS}$                      | gate-source voltage              | [1]   | -20 | -   | 20  | V    |
| $I_D$                         | drain current                    | $V_{GS} = -10\text{ V}; T_{mb} = 25\text{ °C}$                    | -   | -   | -80 | A    |
| $P_{tot}$                     | total power dissipation          | $T_{mb} = 25\text{ °C}$   | -   | -   | 110 | W    |
| <b>Static characteristics</b> |                                  |   |     |     |     |      |
| $R_{DSon}$                    | drain-source on-state resistance | $V_{GS} = -10\text{ V}; I_D = -13.5\text{ A}; T_j = 25\text{ °C}$ | -   | 8   | 10  | mΩ   |

[1]  $V_{GS} = -20\text{ V}/+5\text{ V}$  according AEC-Q101 at  $T_j = 175\text{ °C}$ ;  $V_{GS} = -20\text{ V}/+20\text{ V}$  according AEC-Q101 at  $T_j = 150\text{ °C}$

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                       | Simplified outline   | Graphic symbol   |
|-----|--------|-----------------------------------|--|--|
| 1   | S      | source                            |  <p>LFPAK56; Power-SO8 (SOT669)</p> |  <p>017aaa094</p> |
| 2   | S      | source                            |  |  |
| 3   | S      | source                            |  |  |
| 4   | G      | gate                              |  |  |
| mb  | D      | mounting base; connected to drain |  |  |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package            |  |         |
|-------------|--------------------|--|---------|
|             | Name               | Description  | Version |
| BUK6Y10-30P | LFPAK56; Power-SO8 | plastic, single-ended surface-mounted package; 4 terminals | SOT669  |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BUK6Y10-30P | 6Y1030P      |

## 8. Limiting values

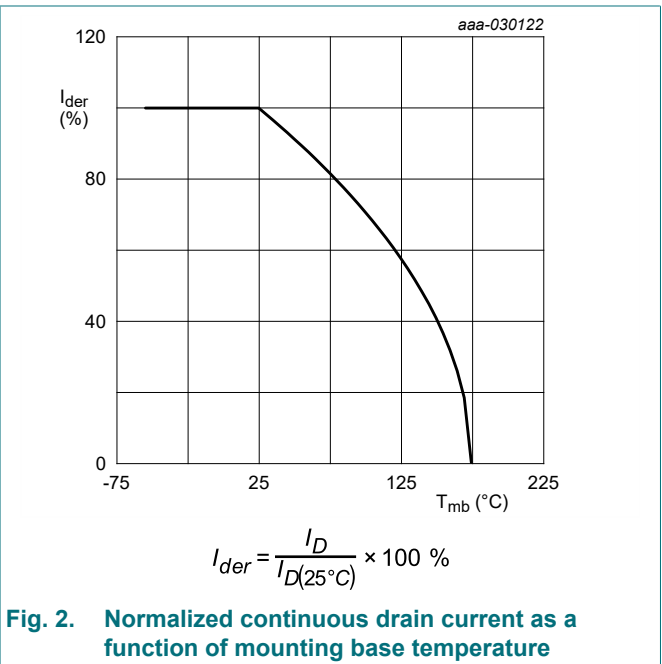
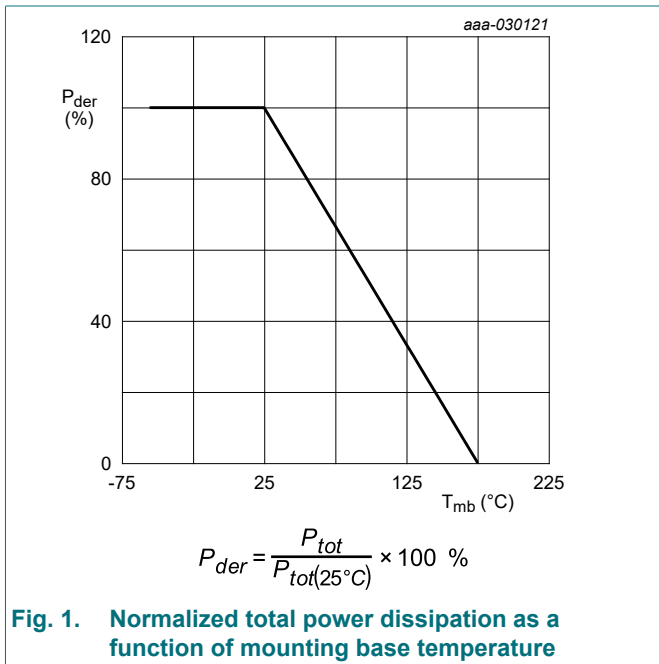
**Table 5. Limiting values**

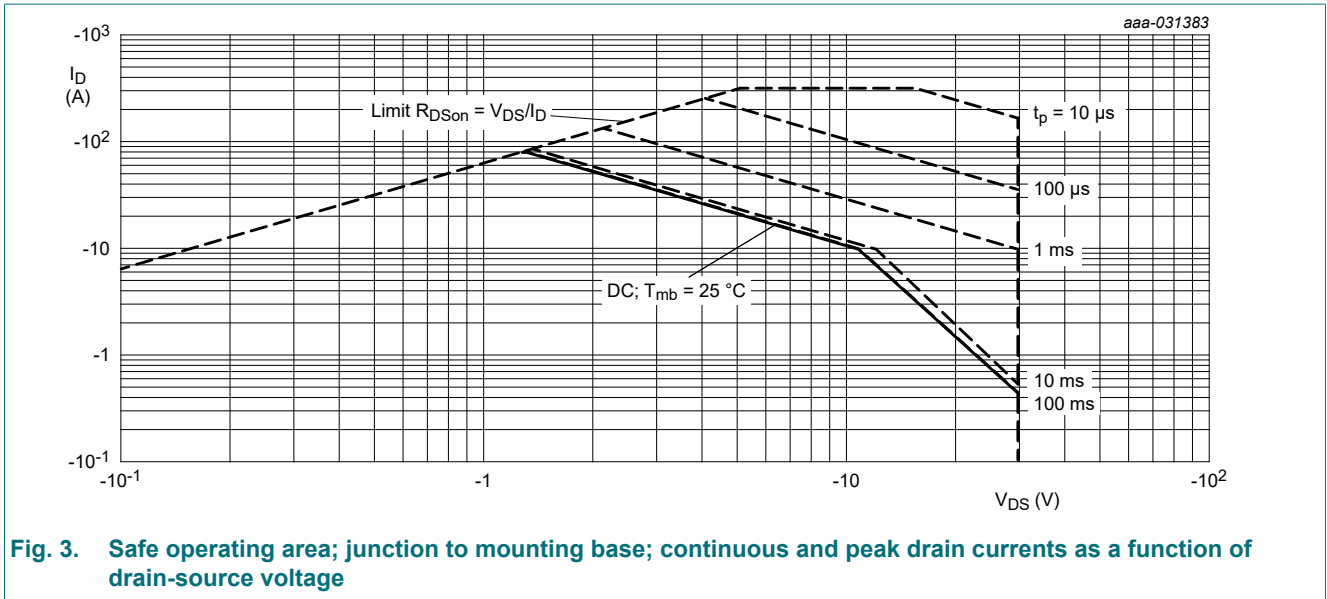
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol                      | Parameter                                    | Conditions   | Min | Max  | Unit |
|-----------------------------|--|--|-----|------|------|
| V <sub>DS</sub>             | drain-source voltage                         | T <sub>j</sub> = 25 °C   | -   | -30  | V    |
| V <sub>GS</sub>             | gate-source voltage                          | [1]  | -20 | 20   | V    |
| I <sub>D</sub>              | drain current                                | V <sub>GS</sub> = -10 V; T <sub>mb</sub> = 25 °C                                       | -   | -80  | A    |
|                             |  | V <sub>GS</sub> = -10 V; T <sub>mb</sub> = 100 °C                                      | -   | -57  | A    |
| I <sub>DM</sub>             | peak drain current                           | single pulse; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C                          | -   | -320 | A    |
| P <sub>tot</sub>            | total power dissipation                      | T <sub>mb</sub> = 25 °C  | -   | 110  | W    |
| T <sub>j</sub>              | junction temperature                         |  | -55 | 175  | °C   |
| T <sub>amb</sub>            | ambient temperature                          |  | -55 | 175  | °C   |
| T <sub>stg</sub>            | storage temperature                          |  | -65 | 175  | °C   |
| <b>Source-drain diode</b>   |  |  |     |      |      |
| I <sub>S</sub>              | source current                               | T <sub>mb</sub> = 25 °C  | -   | -80  | A    |
| I <sub>SM</sub>             | peak source current                          | single pulse; t <sub>p</sub> ≤ 10 μs; T <sub>mb</sub> = 25 °C                          | -   | -320 | A    |
| <b>ESD maximum rating</b>   |  |  |     |      |      |
| V <sub>ESD</sub>            | electrostatic discharge voltage              | HBM  | [2] | 800  | V    |
| <b>Avalanche ruggedness</b> |  |  |     |      |      |
| E <sub>DS(AL)S</sub>        | non-repetitive drain-source avalanche energy | T <sub>j(initial)</sub> = 25 °C; I <sub>D</sub> = -5.3 A; DUT in avalanche (unclamped) | -   | 80   | mJ   |

[1] V<sub>GS</sub> = -20 V/+5 V according AEC-Q101 at T<sub>j</sub> = 175 °C; V<sub>GS</sub> = -20 V/+20 V according AEC-Q101 at T<sub>j</sub> = 150 °C

[2] Measured between all pins.





## 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 |            | -   | 1.1 | 1.4 | K/W  |

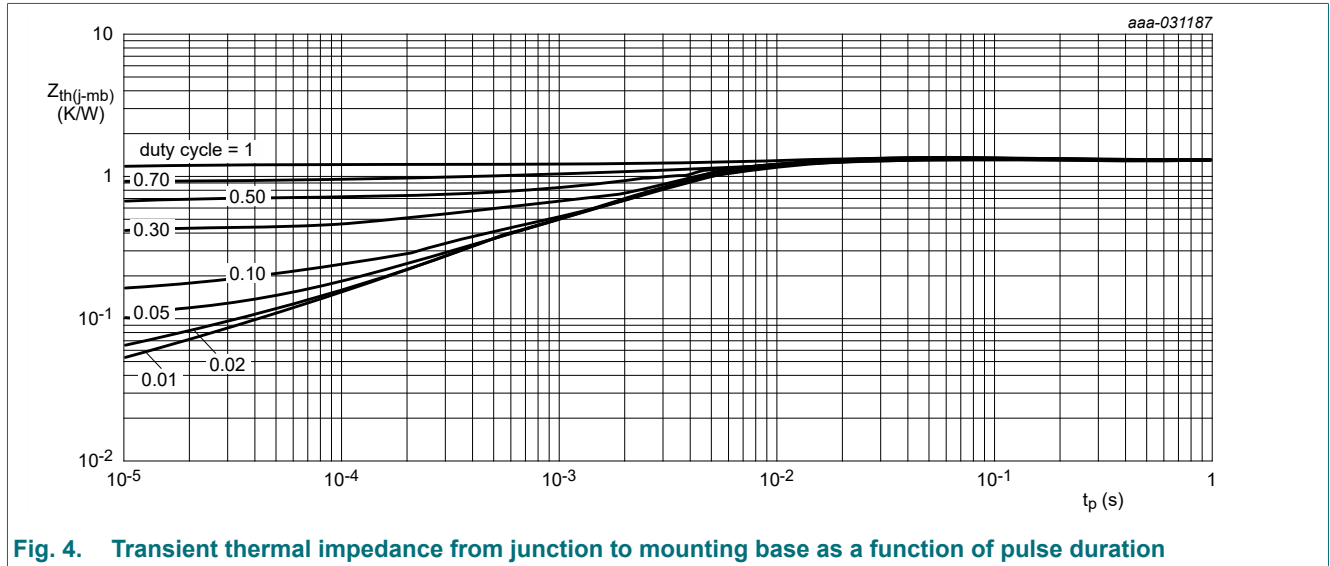


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                        | Conditions  | Min  | Typ  | Max  | Unit          |
|--------------------------------|----------------------------------|---|------|------|------|---------------|
| <b>Static characteristics</b>  |                                  |   |      |      |      |               |
| $V_{(BR)DSS}$                  | drain-source breakdown voltage   | $I_D = -250 \mu\text{A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$   | -30  | -    | -    | V             |
| $V_{GSth}$                     | gate-source threshold voltage    | $I_D = -250 \mu\text{A}; V_{DS}=V_{GS}; T_j = 25 \text{ }^\circ\text{C}$  | -1.5 | -2   | -3   | V             |
| $I_{DSS}$                      | drain leakage current            | $V_{DS} = -30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$   | -    | -    | -1   | $\mu\text{A}$ |
|                                |                                  | $V_{DS} = -30 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ\text{C}$  | -    | -    | -10  | $\mu\text{A}$ |
| $I_{GSS}$                      | gate leakage current             | $V_{GS} = -20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$   | -    | -    | -100 | nA            |
|                                |                                  | $V_{GS} = 20 \text{ V}; V_{DS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -    | -    | 100  | nA            |
| $R_{DSon}$                     | drain-source on-state resistance | $V_{GS} = -10 \text{ V}; I_D = -13.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$  | -    | 8    | 10   | m $\Omega$    |
|                                |                                  | $V_{GS} = -10 \text{ V}; I_D = -13.5 \text{ A}; T_j = 175 \text{ }^\circ\text{C}$   | -    | 13   | 16   | m $\Omega$    |
|                                |                                  | $V_{GS} = -4.5 \text{ V}; I_D = -8.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$  | -    | 19   | 25   | m $\Omega$    |
| $g_{fs}$                       | forward transconductance         | $V_{DS} = -5 \text{ V}; I_D = -13.5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$   | -    | 31   | -    | S             |
| $R_G$                          | gate resistance                  | $f = 1 \text{ MHz}$   | -    | 8.8  | -    | $\Omega$      |
| <b>Dynamic characteristics</b> |                                  |   |      |      |      |               |
| $Q_{G(tot)}$                   | total gate charge                | $V_{DS} = -15 \text{ V}; I_D = -12 \text{ A}; V_{GS} = -10 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$                                      | -    | 42.5 | 64   | nC            |
| $Q_{GS}$                       | gate-source charge               |   | -    | 8.4  | -    | nC            |
| $Q_{GD}$                       | gate-drain charge                |   | -    | 9.3  | -    | nC            |
| $C_{iss}$                      | input capacitance                | $V_{DS} = -15 \text{ V}; f = 1 \text{ MHz}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -    | 2360 | -    | pF            |
| $C_{oss}$                      | output capacitance               |   | -    | 470  | -    | pF            |
| $C_{rss}$                      | reverse transfer capacitance     |   | -    | 270  | -    | pF            |
| $t_{d(on)}$                    | turn-on delay time               | $V_{DS} = -15 \text{ V}; I_D = -13.5 \text{ A}; V_{GS} = -10 \text{ V}; R_{G(ext)} = 6 \text{ } \Omega; T_j = 25 \text{ }^\circ\text{C}$    | -    | 10   | -    | ns            |
| $t_r$                          | rise time                        |   | -    | 38   | -    | ns            |
| $t_{d(off)}$                   | turn-off delay time              |   | -    | 80   | -    | ns            |
| $t_f$                          | fall time                        |   | -    | 580  | -    | ns            |
| <b>Source-drain diode</b>      |                                  |   |      |      |      |               |
| $V_{SD}$                       | source-drain voltage             | $I_S = -80 \text{ A}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -    | -0.7 | -1.2 | V             |
| $t_{rr}$                       | reverse recovery time            | $I_S = -80 \text{ A}; di_S/dt = 100 \text{ A}/\mu\text{s}; V_{GS} = -10 \text{ V}; V_{DS} = -15 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | -    | 24   | -    | ns            |
| $Q_r$                          | recovered charge                 |   | -    | 17   | -    | nC            |

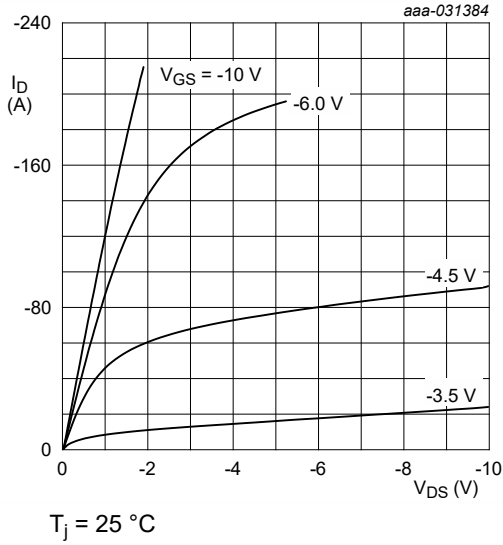


Fig. 5. Output characteristics: drain current as a function of drain-source voltage; typical values

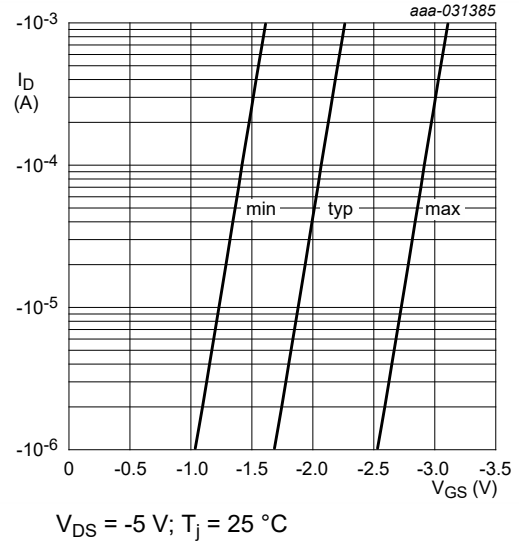


Fig. 6. Sub-threshold drain current as a function of gate-source voltage

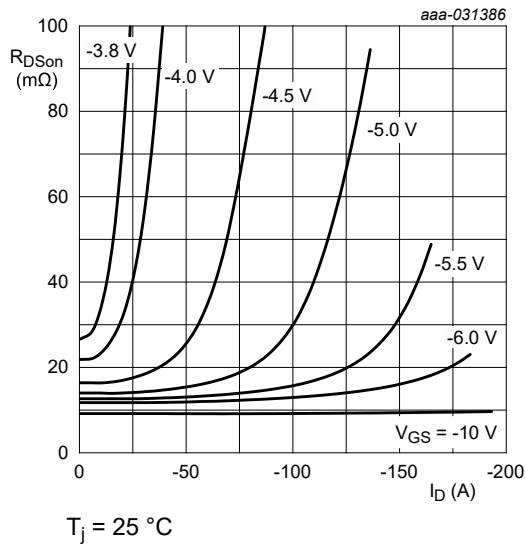


Fig. 7. Drain-source on-state resistance as a function of drain current; typical values

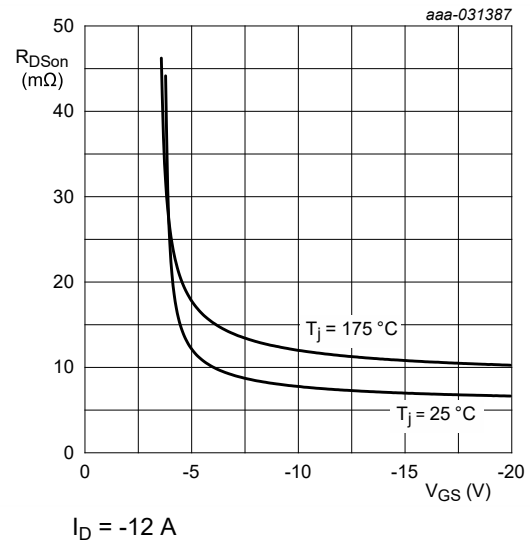


Fig. 8. Drain-source on-state resistance as a function of gate-source voltage; typical values

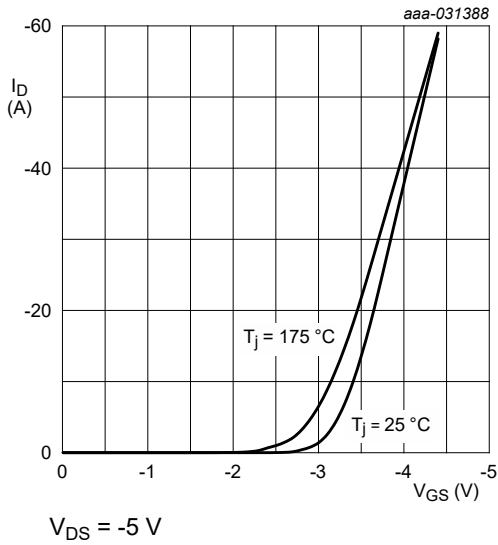


Fig. 9. Transfer characteristics: drain current as a function of gate-source voltage; typical values

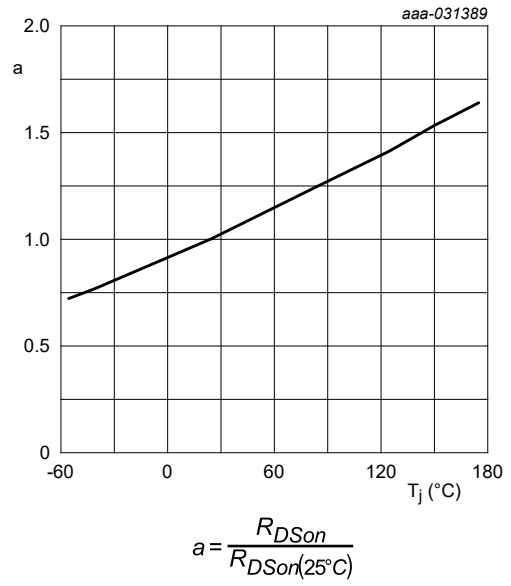


Fig. 10. Normalized drain-source on-state resistance as a function of junction temperature; typical values

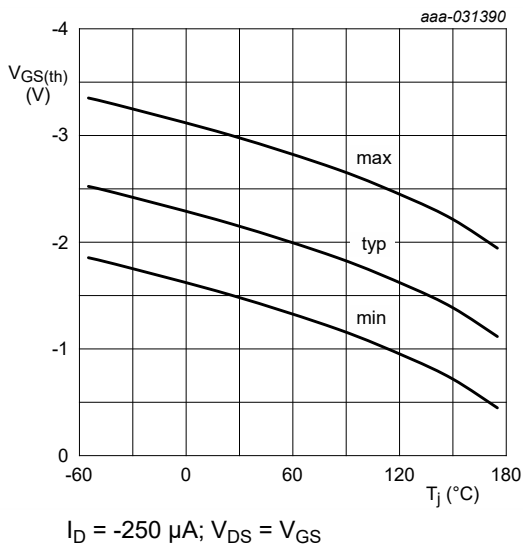


Fig. 11. Gate-source threshold voltage as a function of junction temperature

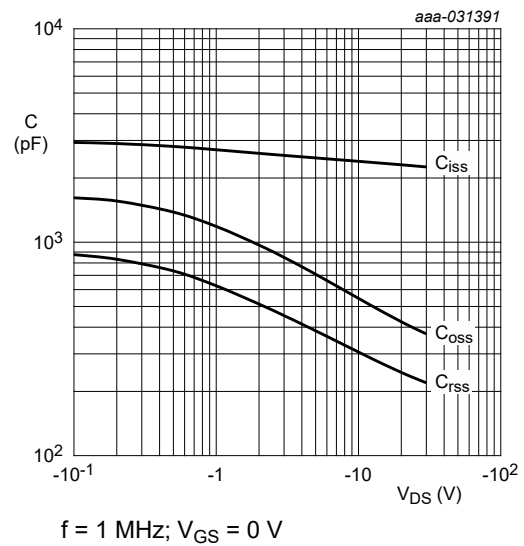
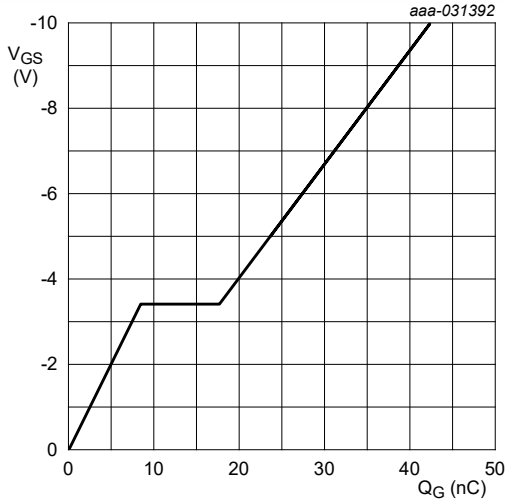


Fig. 12. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values





$V_{DS} = -15\text{ V}; I_D = -12\text{ A}; T_j = 25\text{ }^\circ\text{C}$

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

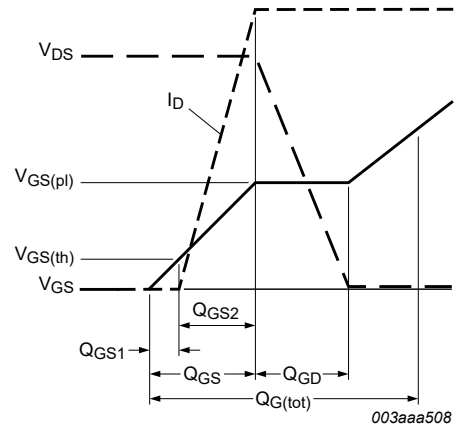
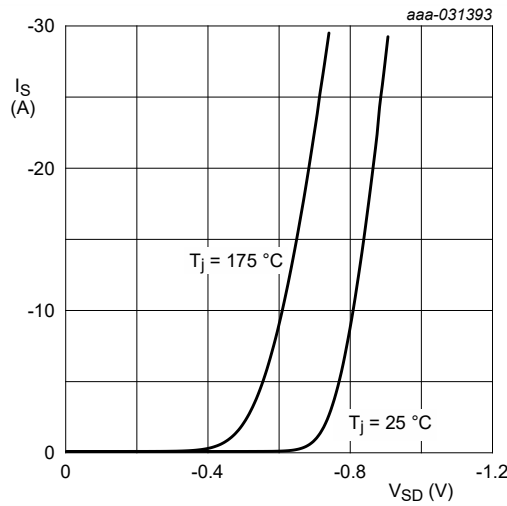


Fig. 14. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$

Fig. 15. Source current as a function of source-drain voltage; typical values

## 11. Test information

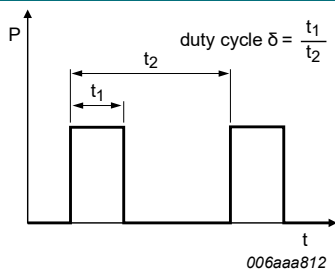


Fig. 16. Duty cycle definition

### Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

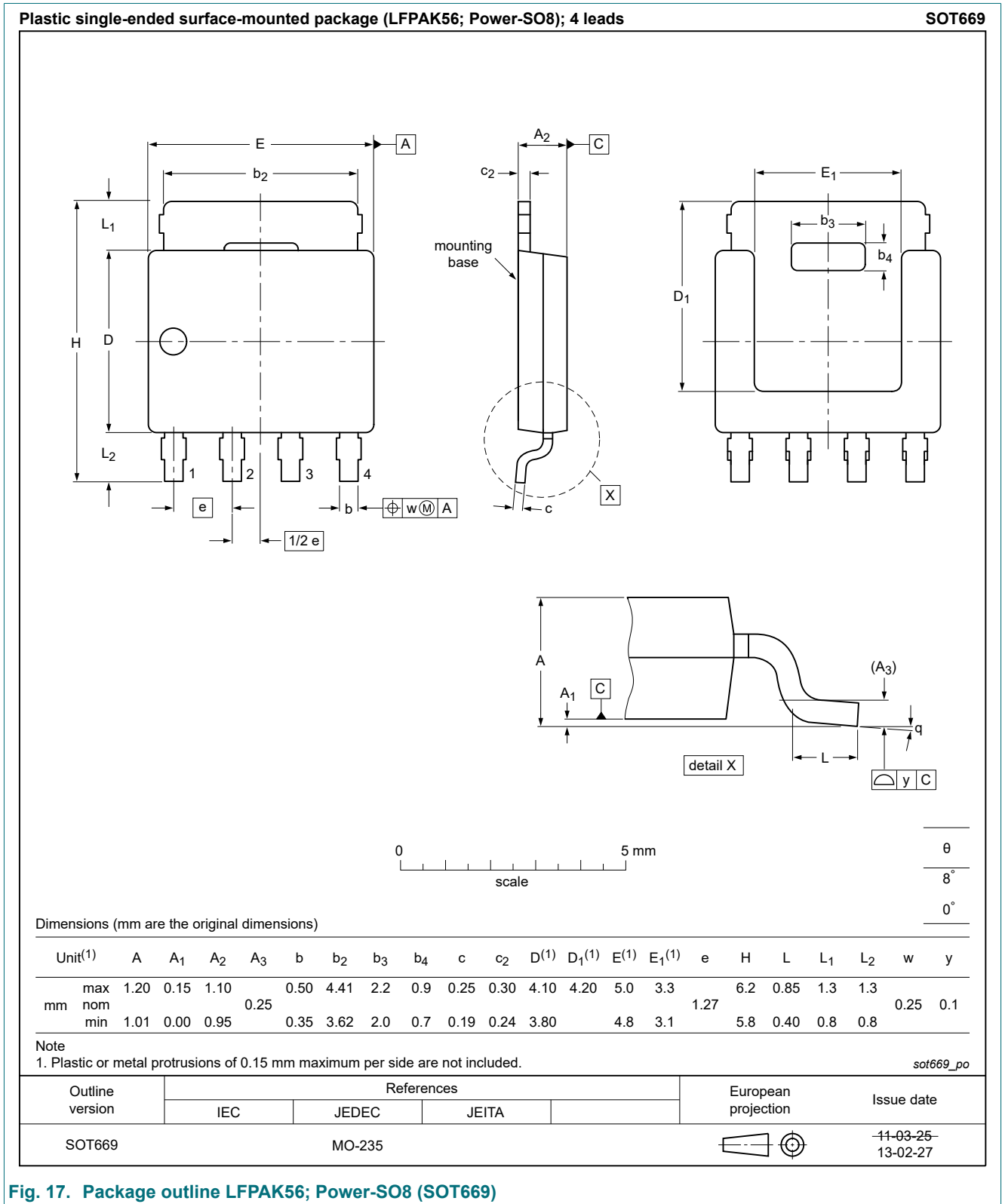


Fig. 17. Package outline LFAK56; Power-SO8 (SOT669)

## 13. Revision history

Table 8. Revision history

| Data sheet ID   | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| BUK6Y10-30P v.1 | 20200417     | Product data sheet | -             | -          |

## 14. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | 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.                                     |

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 17 April 2020

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