

1. General description

WSJM65R170B is a high voltage N-channel MOSFET in TO263 package, which utilizes the advanced super-junction technology to provide superior FOM $R_{DS(on)} * Q_g$ among silicon based MOSFETs. It is particularly suitable for applications require extreme high efficiency and power density.



2. Features and benefits

- Superior FOM $R_{DS(on)} * Q_g$
- Extremely low switching loss
- 100% avalanche tested

3. Applications

- high efficiency power supplies

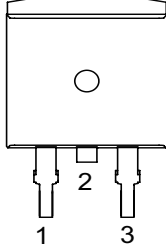
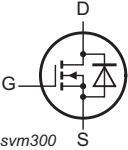
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Notes | Values | | | Unit |
|--------------------------------|----------------------------------|--|-------|------------|-----|-----|------|
| Absolute maximum rating | | | | | | | |
| V_{DS} | drain-source voltage | | | 650 | | | V |
| V_{GS} | gate-source voltage | | | ±30 | | | V |
| I_D | continuous drain current | $T_{mb} = 25\text{ °C}$ | | 23 | | | A |
| P_{tot} | power dissipation | $T_{mb} = 25\text{ °C}$ | | 240 | | | W |
| T_j | junction temperature | | | -55 to 150 | | | °C |
| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
| Static characteristics | | | | | | | |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10\text{ V}, I_D = 11\text{ A}$ | | - | 156 | 170 | mΩ |
| Dynamic characteristics | | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D = 11\text{ A}; V_{DS} = 400\text{ V}; V_{GS} = 10\text{ V}$ | | - | 38 | - | nC |
| E_{OSS} | coss stored energy | $V_{GS} = 0\text{ V}; V_{DS} = 0\text{ to }400\text{ V}$ | | - | 5.1 | - | μJ |

5. 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 | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|-------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| WSJM65R170B | TO263 | WSJM65R170BJ | Reel | 800 | TO263d | 17-Mar-2023 |

7. Marking

Table 4. Marking codes

| Type number | Marking codes |
|-------------|-----------------|
| WSJM65R170B | WSJM 65R170B |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Notes | Values | Unit |
|---------------------|--|---|-------|------------|------------------|
| V_{DS} | drain-source voltage | | | 650 | V |
| V_{GS} | gate-source voltage | | | ± 30 | V |
| I_D | continuous drain current | $T_{mb} = 25\text{ }^\circ\text{C}$ | | 23 | A |
| | | $T_{mb} = 100\text{ }^\circ\text{C}$ | | 14 | A |
| I_{DM} | pulsed drain current | $T_{mb} = 25\text{ }^\circ\text{C}$ | | 72 | A |
| P_{tot} | power dissipation | $T_{mb} = 25\text{ }^\circ\text{C}$ | | 240 | W |
| E_{AS} | single pulse drain-to-source avalanche | $I_{AS} = 6.9\text{ A}$; $R_{GS} = 25\text{ }\Omega$; $V_{DD} = 50\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$ | | 238 | mJ |
| E_{AR} | repetitive avalanche energy | $I_{AS} = 6.9\text{ A}$; $R_{GS} = 25\text{ }\Omega$; $V_{DD} = 50\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$ | | 1.67 | mJ |
| I_{AS} | avalanche current, single pulse | | | 6.9 | A |
| dv/dt | MOSFET dv/dt ruggedness | | | 50 | V/ns |
| dv/dt | reverse diode dv/dt | | | 15 | V/ns |
| dI _r /dt | maximum diode commutation speed | | | 500 | A/ μs |
| T_{stg} | storage temperature | | | -55 to 150 | $^\circ\text{C}$ |
| T_j | junction temperature | | | -55 to 150 | $^\circ\text{C}$ |

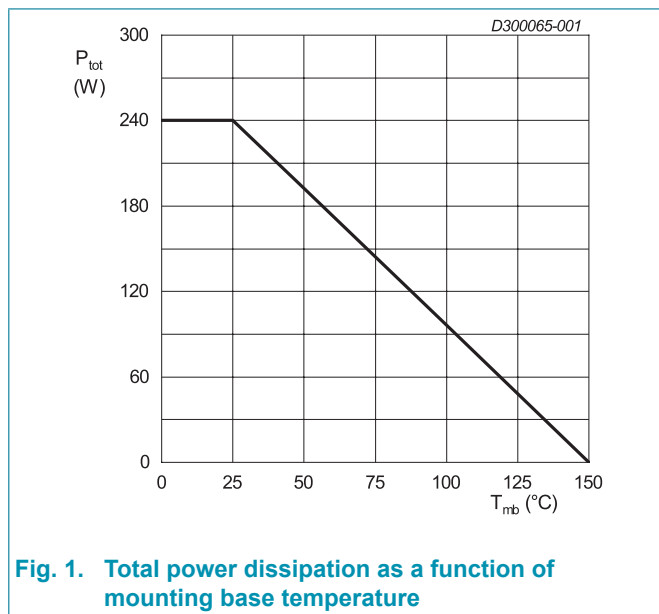


Fig. 1. Total power dissipation as a function of mounting base temperature

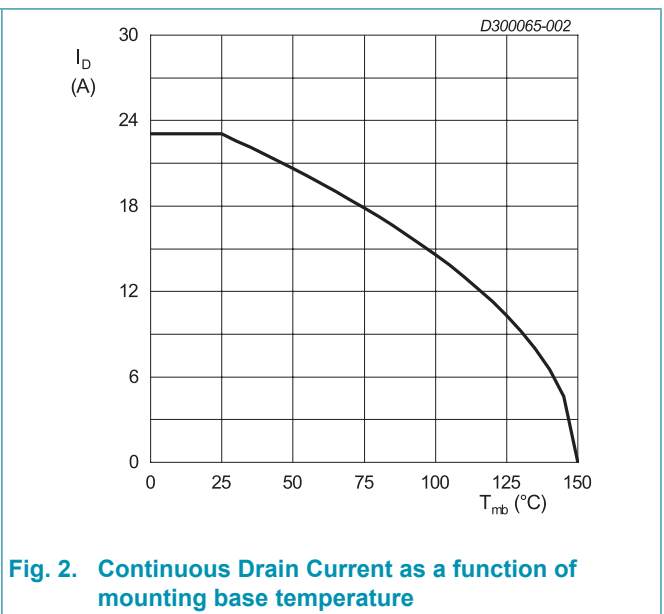


Fig. 2. Continuous Drain Current as a function of mounting base temperature

9. Thermal & Mechanical characteristics

Table 6. Thermal & Mechanical characteristics

| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
|----------------|---|-------------|-------|-----|------|------|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | | | - | 0.45 | 0.52 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | - | 60 | - | K/W |

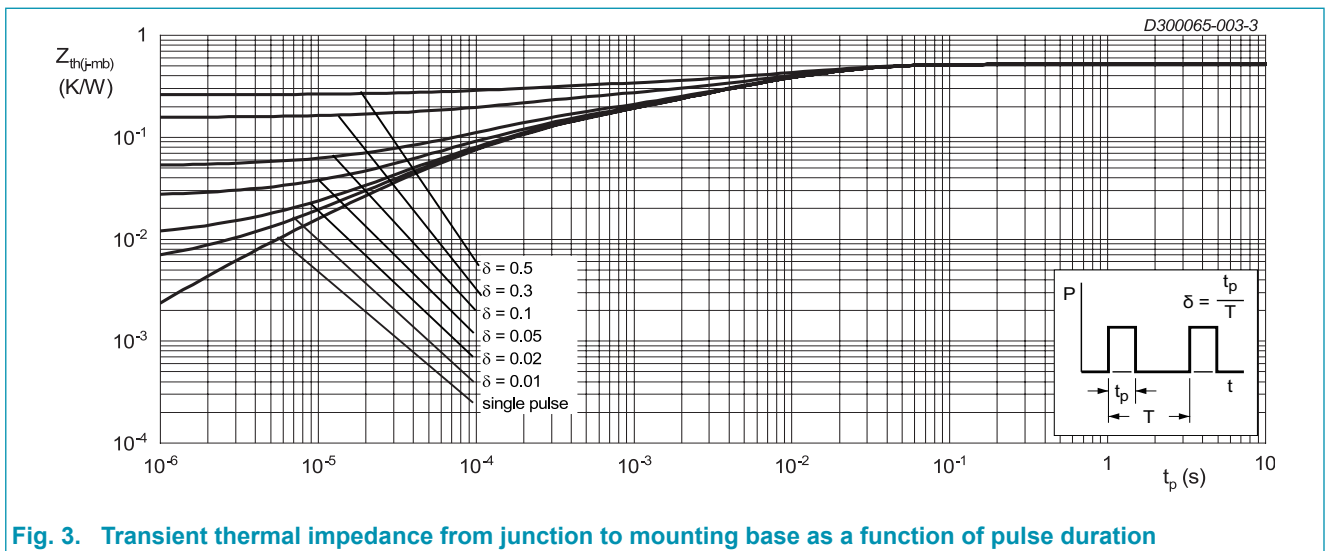


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics
 $T_j = 25\text{ }^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
|--------------------------------|--|--|-------|-----|------|-----------|---------------|
| Static characteristics | | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $I_D = 250\text{ }\mu\text{A}; V_{GS} = 0\text{ V}$ | | 650 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $I_D = 250\text{ }\mu\text{A}; V_{DS} = V_{GS}$ | | 2.5 | - | 4.5 | V |
| I_{DSS} | drain leakage current | $V_{DS} = 650\text{ V}; V_{GS} = 0\text{ V}$ | | - | - | 1 | μA |
| | | $V_{DS} = 650\text{ V}; V_{GS} = 0\text{ V}; T_j = 125\text{ }^\circ\text{C}$ | | - | - | 10 | μA |
| I_{GSS} | gate leakage current | $V_{GS} = \pm 30\text{ V}; V_{DS} = 0\text{ V}$ | | - | - | ± 100 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = 10\text{ V}; I_D = 11\text{ A}$ | | - | 156 | 170 | m Ω |
| R_G | gate resistance | $f = 1\text{ MHz}$ | | - | 12 | - | Ω |
| Dynamic characteristics | | | | | | | |
| $Q_{G(tot)}$ | total gate charge | $I_D = 11\text{ A}; V_{DS} = 400\text{ V}; V_{GS} = 10\text{ V}$ | | - | 38 | - | nC |
| Q_{GS} | gate-source charge | | | - | 8.7 | - | nC |
| Q_{GD} | gate-drain charge | | | - | 14 | - | nC |
| C_{iss} | input capacitance | $V_{DS} = 400\text{ V}; V_{GS} = 0\text{ V}; f = 1\text{ MHz}$ | | - | 1751 | - | pF |
| C_{oss} | output capacitance | | | - | 41 | - | pF |
| C_{rss} | reverse transfer capacitance | | | - | 2.3 | - | pF |
| $C_{o(er)}$ | effective output capacitance, energy related | $V_{GS} = 0\text{ V}; V_{DS} = 0\text{ to }400\text{ V}$ | | - | 64 | - | pF |
| $C_{o(tr)}$ | effective output capacitance, time related | | | - | 370 | - | pF |
| $t_{d(on)}$ | turn-on delay time | $V_{DS} = 400\text{ V}; V_{GS} = 10\text{ V}; R_G = 2\text{ }\Omega;$ $I_D = 11\text{ A}$ | | - | 21 | - | ns |
| t_r | rise time | | | - | 21 | - | ns |
| $t_{d(off)}$ | turn-off delay time | | | - | 72 | - | ns |
| t_f | fall time | | | - | 11 | - | ns |
| Source-drain diode | | | | | | | |
| V_{SD} | source-drain voltage | $V_{GS} = 0\text{ V}; I_S = 11\text{ A}$ | | - | 0.8 | 1.1 | V |
| I_S | body-diode continuous current | $T_{mb} = 25\text{ }^\circ\text{C}$ | | - | - | 23 | A |
| t_{rr} | reverse recovery time | $V_R = 400\text{ V}; I_F = 11\text{ A}; dI_F/dt = 100\text{ A}/\mu\text{s}$ | | - | 285 | - | ns |
| Q_{rr} | reverse recovered charge | | | - | 3.8 | - | μC |
| I_{rrm} | reverse recovery current | | | - | 26 | - | A |

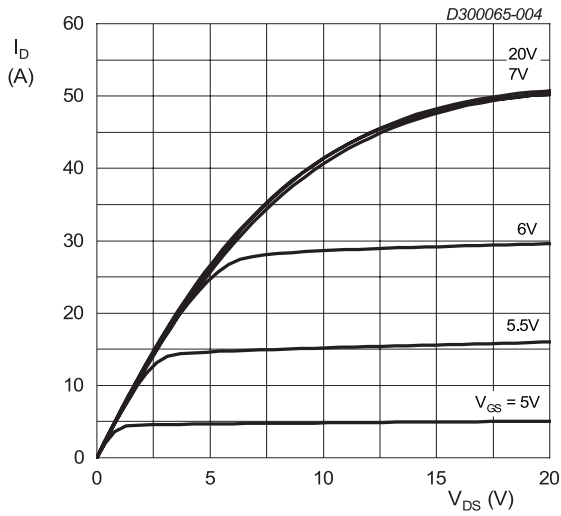


Fig. 4. Drain current as a function of drain-source voltage; typical values

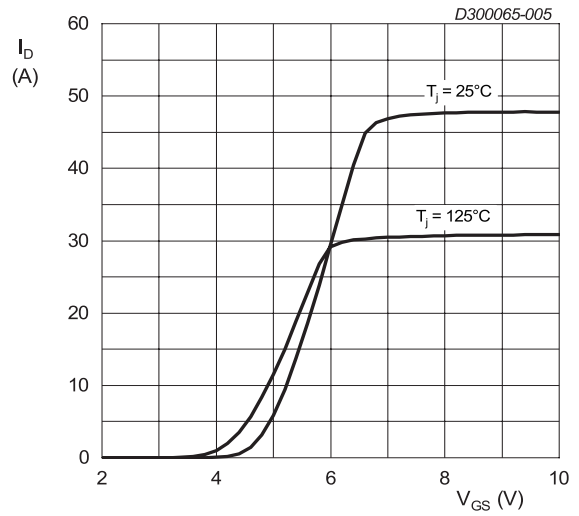


Fig. 5. Drain current as a function of gate-source voltage; typical values
 $V_{DS} = 20\text{ V}$

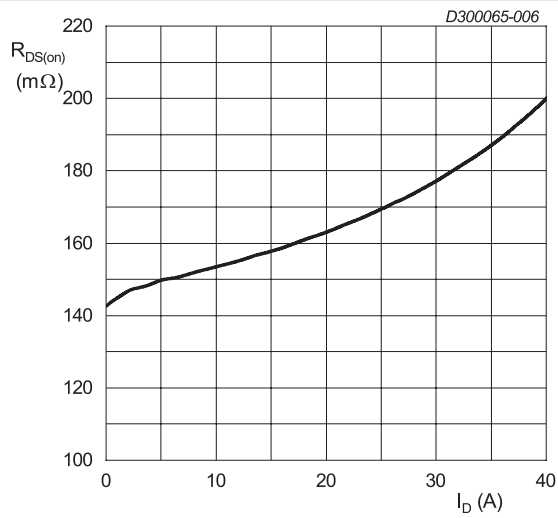


Fig. 6. Drain-source on-state resistance as a function of drain current; typical values
 $V_{GS} = 10\text{ V}$

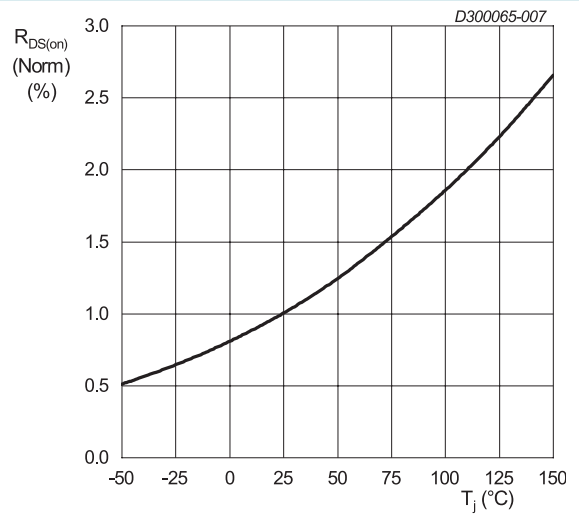
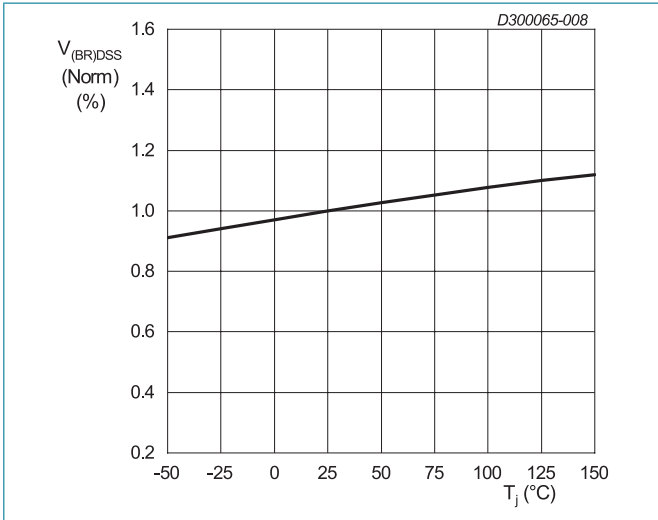
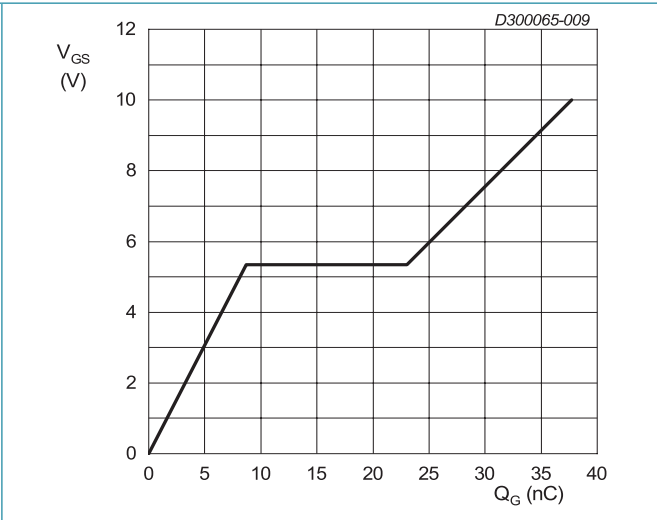


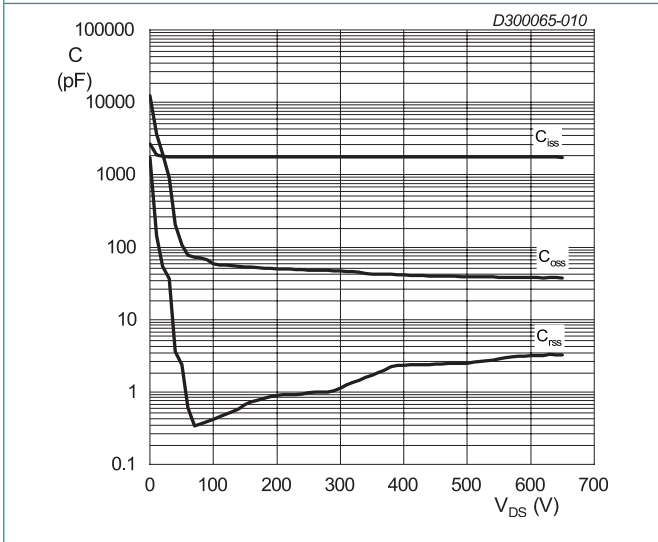
Fig. 7. Normalized drain-source on-state resistance as a function of junction temperature
 $V_{GS} = 10\text{ V}; I_D = 11\text{ A}$



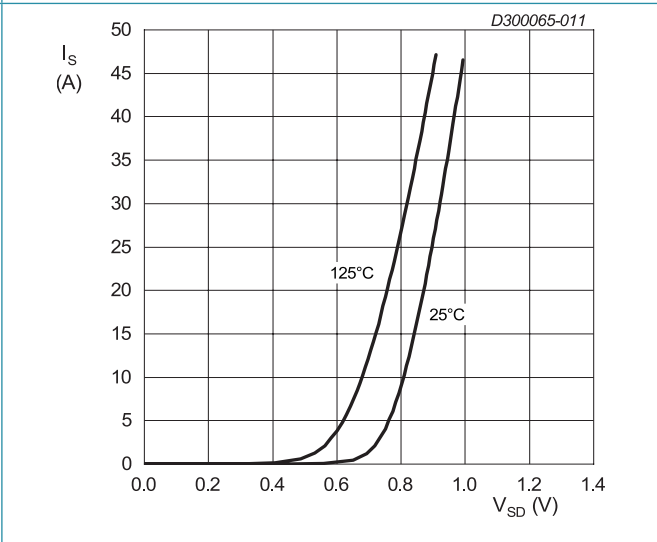
$I_D = 250 \mu A$
Fig. 8. Normalized drain-source breakdown voltage as a function of junction temperature



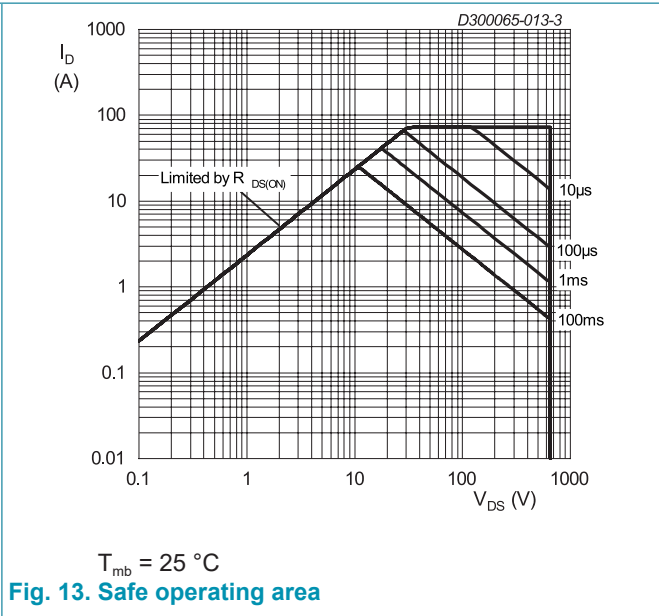
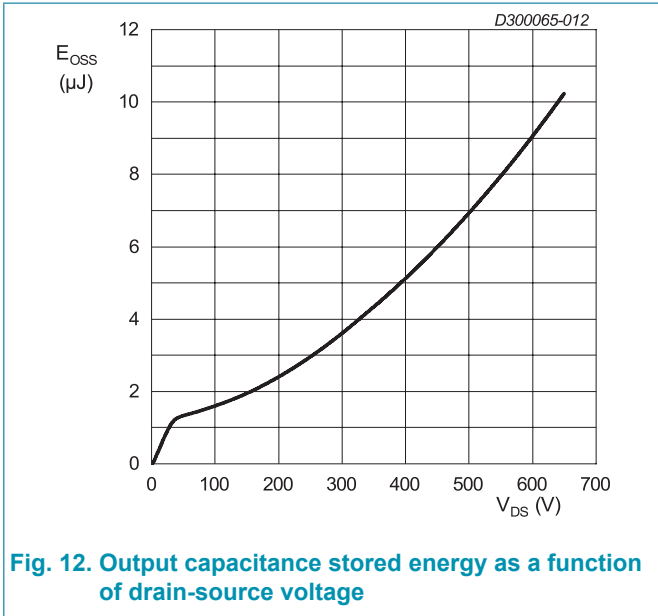
$I_D = 11 A; V_{DS} = 400 V$
Fig. 9. Gate-source voltage as a function of gate charge; typical values



$V_{GS} = 0 V; f = 1 MHz$
Fig. 10. Capacitances as a function of drain-source voltage; typical values



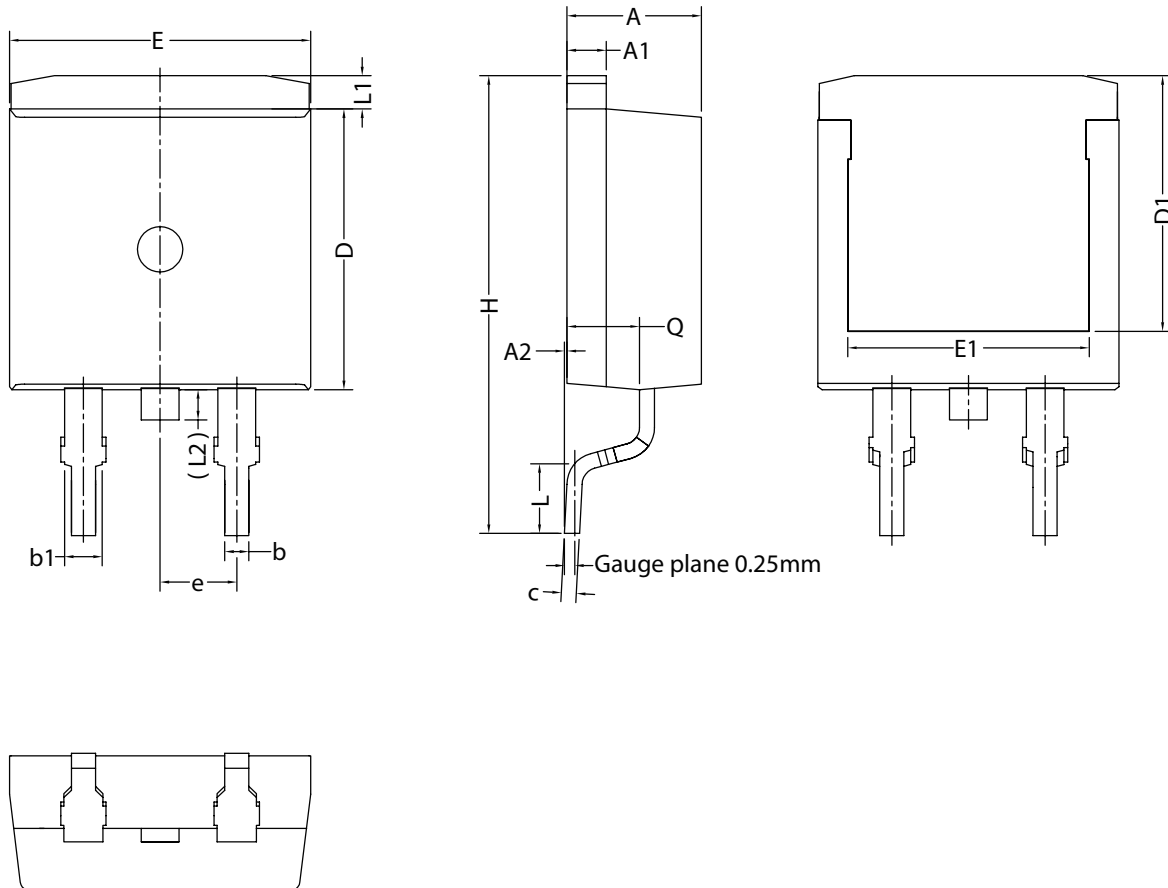
$V_{GS} = 0 V$
Fig. 11. Source current as a function of source-drain voltage; typical values



11. Package outline

Plastic single-ended surface-mounted package (D2PAK);

TO263



Note:
All dimensions do not include mold flash or protrusion.

| Unit | | A | A1 | A2 | b | b1 | c | D | D1 | e | E | E1 | H | L | L1 | L2 | Q |
|------|-----|------|------|------|------|------|------|------|------|---------------|-------|------|-------|------|------|------|------|
| MM | min | 4.30 | 1.27 | 0.00 | 0.75 | 1.20 | 0.45 | 9.00 | 7.65 | 2.54 (BSC) | 9.85 | 7.80 | 14.84 | 1.90 | 0.90 | -- | 2.20 |
| | max | 4.60 | 1.37 | 0.25 | 0.90 | 1.36 | 0.60 | 9.45 | 8.05 | | 10.10 | 8.20 | 15.64 | 2.60 | 1.35 | 1.50 | 2.40 |

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