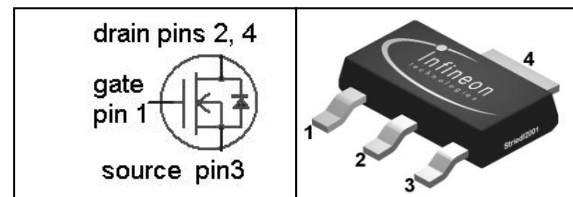


SIPMOS® Small-Signal-Transistor
Features

- N-channel
- Depletion mode
- dv/dt rated
- Available with $V_{GS(th)}$ indicator on reel
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101


Product Summary

| | | |
|------------------|------|----------|
| V_{DS} | 600 | V |
| $R_{DS(on),max}$ | 60 | Ω |
| $I_{DSS,min}$ | 0.02 | A |

PG-SOT223


| Type | Package | Tape and Reel Information | Marking | Packaging |
|--------|-----------|---|---------|-----------|
| BSP135 | PG-SOT223 | L6327: 1000 pcs/reel | BSP135 | Non dry |
| BSP135 | PG-SOT223 | L6906: 1000 pcs/reel sorted in $V_{GS(th)}$ bands ¹⁾ | BSP135 | Non dry |

Maximum ratings, at $T_j=25\text{ °C}$, unless otherwise specified

| Parameter | Symbol | Conditions | Value | Unit |
|-------------------------------------|-------------------|---|-----------------|--------------------|
| Continuous drain current | I_D | $T_A=25\text{ °C}$ | 0.12 | A |
| | | $T_A=70\text{ °C}$ | 0.10 | |
| Pulsed drain current | $I_{D,pulse}$ | $T_A=25\text{ °C}$ | 0.48 | |
| Reverse diode dv/dt | dv/dt | $I_D=0.12\text{ A}$, $V_{DS}=20\text{ V}$, $di/dt=200\text{ A}/\mu\text{s}$, $T_{j,max}=150\text{ °C}$ | 6 | kV/ μs |
| Gate source voltage | V_{GS} | | ± 20 | V |
| ESD Class (JESD22-A114-HBM) | | | 1A(>250V,<500V) | |
| Power dissipation | P_{tot} | $T_A=25\text{ °C}$ | 1.8 | W |
| Operating and storage temperature | T_j , T_{stg} | | -55 ... 150 | $^{\circ}\text{C}$ |
| IEC climatic category; DIN IEC 68-1 | | | 55/150/56 | |

¹⁾ see table on next page and diagram 11

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Thermal characteristics

| | | | | | | |
|--|------------|--|---|---|-----|-----|
| Thermal resistance, junction - soldering point (pin 4) | R_{thJS} | | - | - | 25 | K/W |
| SMD version, device on PCB | R_{thJA} | minimal footprint | - | - | 115 | |
| | | 6 cm ² cooling area ²⁾ | - | - | 70 | |

Electrical characteristics, at $T_j=25\text{ °C}$, unless otherwise specified

Static characteristics

| | | | | | | |
|----------------------------------|---------------|--|------|------|-----|---------------|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}=-3\text{ V}, I_D=250\text{ }\mu\text{A}$ | 600 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}=3\text{ V}, I_D=94\text{ }\mu\text{A}$ | -2.1 | -1.4 | -1 | |
| Drain-source cutoff current | $I_{D(off)}$ | $V_{DS}=600\text{ V}, V_{GS}=-3\text{ V}, T_j=25\text{ °C}$ | - | - | 0.1 | μA |
| | | $V_{DS}=600\text{ V}, V_{GS}=-3\text{ V}, T_j=125\text{ °C}$ | - | - | 10 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$ | - | - | 100 | nA |
| On-state drain current | I_{DSS} | $V_{GS}=0\text{ V}, V_{DS}=10\text{ V}$ | 20 | - | - | mA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}=0\text{ V}, I_D=0.01\text{ A}$ | - | 30 | 60 | Ω |
| | | $V_{GS}=10\text{ V}, I_D=0.12\text{ A}$ | - | 25 | 45 | |
| Transconductance | g_{fs} | $ V_{DS} >2 I_D R_{DS(on)max}, I_D=0.1\text{ A}$ | 0.08 | 0.16 | - | S |

Threshold voltage $V_{GS(th)}$ sorted in bands³⁾

| | | | | | | |
|---|--------------|--|-------|---|-------|---|
| J | $V_{GS(th)}$ | $V_{DS}=3\text{ V}, I_D=94\text{ }\mu\text{A}$ | -1.2 | - | -1 | V |
| K | | | -1.35 | - | -1.15 | |
| L | | | -1.5 | - | -1.3 | |
| M | | | -1.65 | - | -1.45 | |
| N | | | -1.8 | - | -1.6 | |

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (single layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

³⁾ Each reel contains transistors out of one band whose identifying letter is printed on the reel label. A specific band cannot be ordered separately.

| Parameter | Symbol | Conditions | Values | | | Unit |
|-----------|--------|------------|--------|------|------|------|
| | | | min. | typ. | max. | |

Dynamic characteristics

| | | | | | | |
|------------------------------|--------------|---|---|-----|-----|----|
| Input capacitance | C_{iss} | $V_{GS}=-3\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$ | - | 98 | 146 | pF |
| Output capacitance | C_{oss} | | - | 8.5 | 13 | |
| Reverse transfer capacitance | C_{rss} | | - | 3.4 | 5.1 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=300\text{ V},$ $V_{GS}=-3\dots 5\text{ V},$ $I_D=0.1\text{ A}, R_G=6\ \Omega$ | - | 5.4 | 8.1 | ns |
| Rise time | t_r | | - | 5.6 | 8.4 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 28 | 42 | |
| Fall time | t_f | | - | 182 | 273 | |

Gate Charge Characteristics

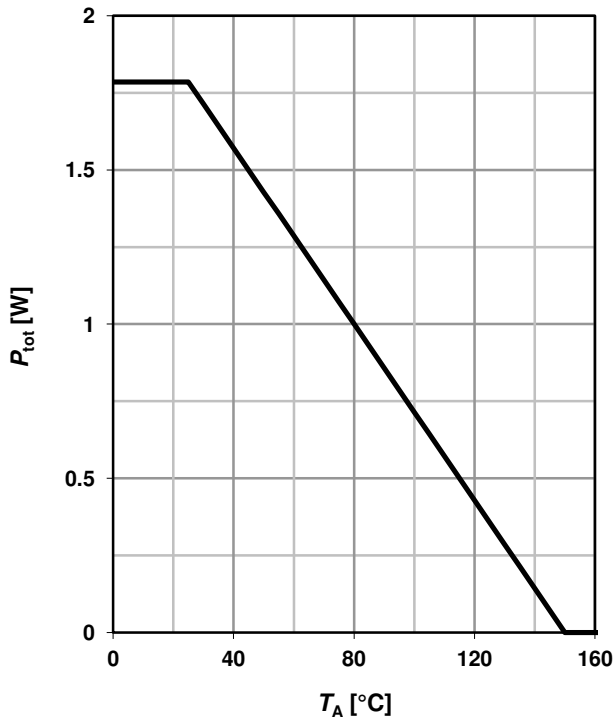
| | | | | | | |
|-----------------------|---------------|--|---|------|------|----|
| Gate to source charge | Q_{gs} | $V_{DD}=400\text{ V}, I_D=0.1\text{ A},$ $V_{GS}=-3\text{ to }5\text{ V}$ | - | 0.24 | 0.36 | nC |
| Gate to drain charge | Q_{gd} | | - | 2.0 | 3.0 | |
| Gate charge total | Q_g | | - | 3.7 | 4.9 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 0.20 | - | V |

Reverse Diode

| | | | | | | |
|----------------------------------|---------------|---|---|------|------|----|
| Diode continuous forward current | I_S | $T_A=25\text{ }^\circ\text{C}$ | - | - | 0.12 | A |
| Diode pulse current | $I_{S,pulse}$ | | - | - | 0.48 | |
| Diode forward voltage | V_{SD} | $V_{GS}=-3\text{ V}, I_F=0.12\text{ A},$ $T_J=25\text{ }^\circ\text{C}$ | - | 0.78 | 1.2 | V |
| Reverse recovery time | t_{rr} | $V_R=300\text{ V}, I_F=0.1\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$ | - | 87 | 130 | ns |
| Reverse recovery charge | Q_{rr} | | - | 70 | 104 | nC |

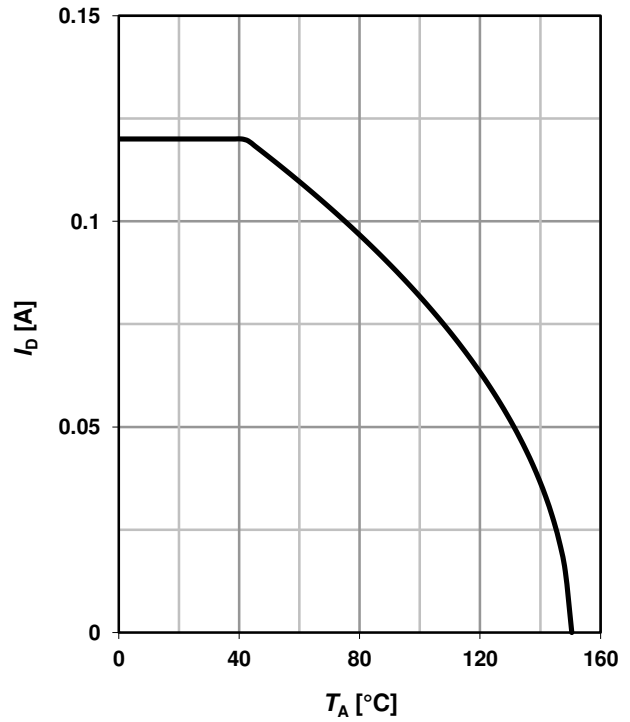
1 Power dissipation

$$P_{tot}=f(T_A)$$



2 Drain current

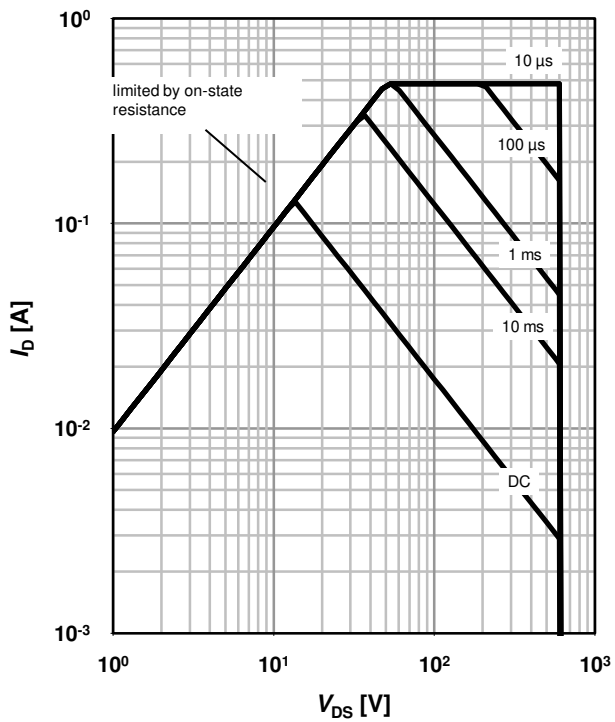
$$I_D=f(T_A); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

$$I_D=f(V_{DS}); T_A=25 \text{ °C}; D=0$$

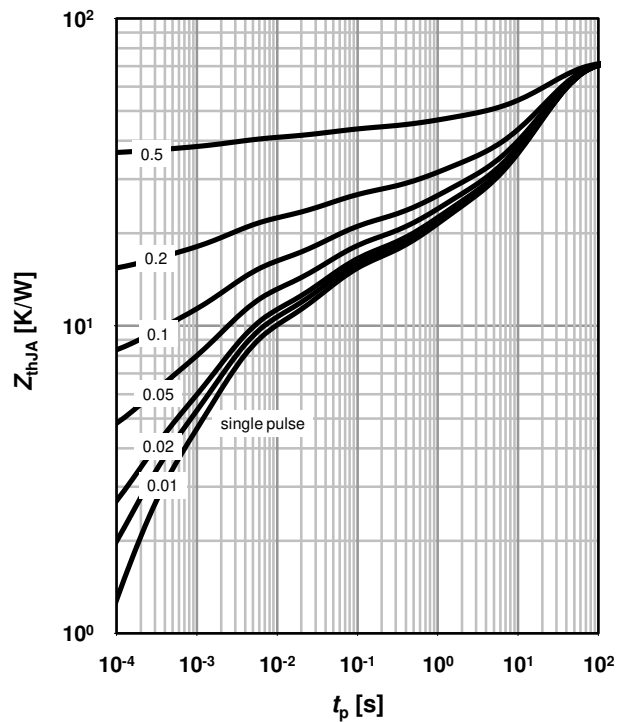
parameter: t_p



4 Max. transient thermal impedance

$$Z_{thJA}=f(t_p)$$

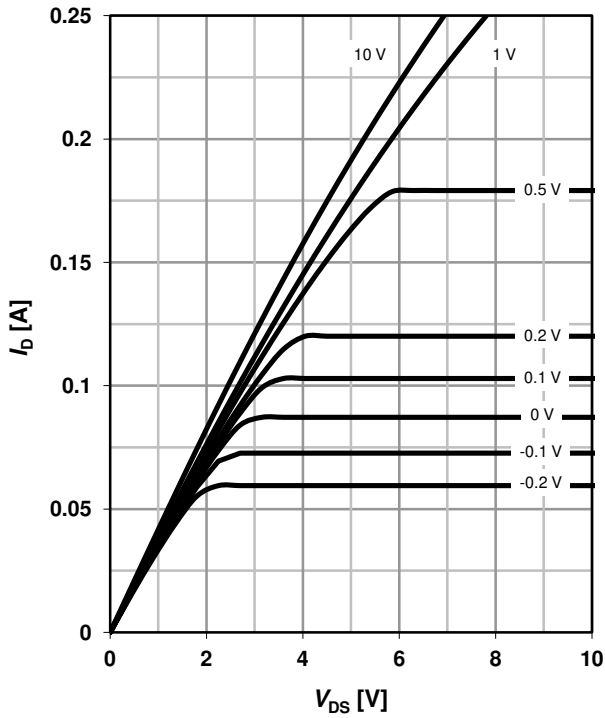
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D = f(V_{DS}); T_j = 25\text{ }^\circ\text{C}$

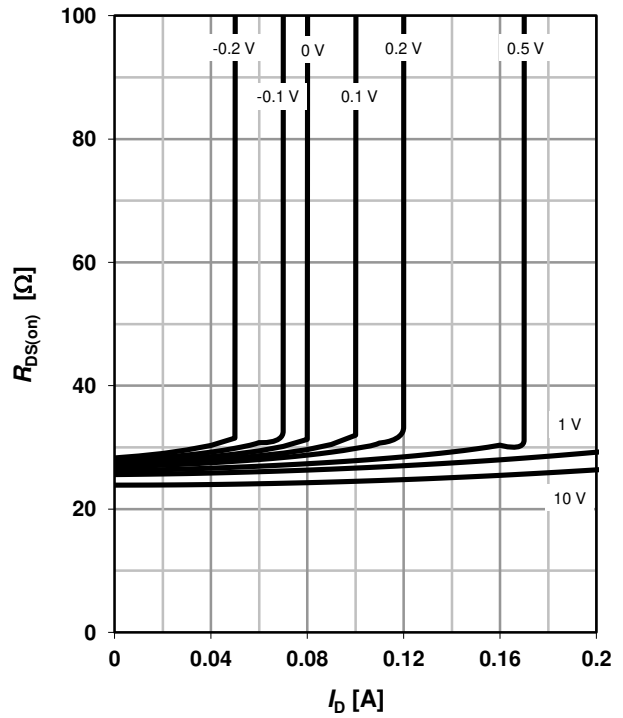
parameter: V_{GS}



6 Typ. drain-source on resistance

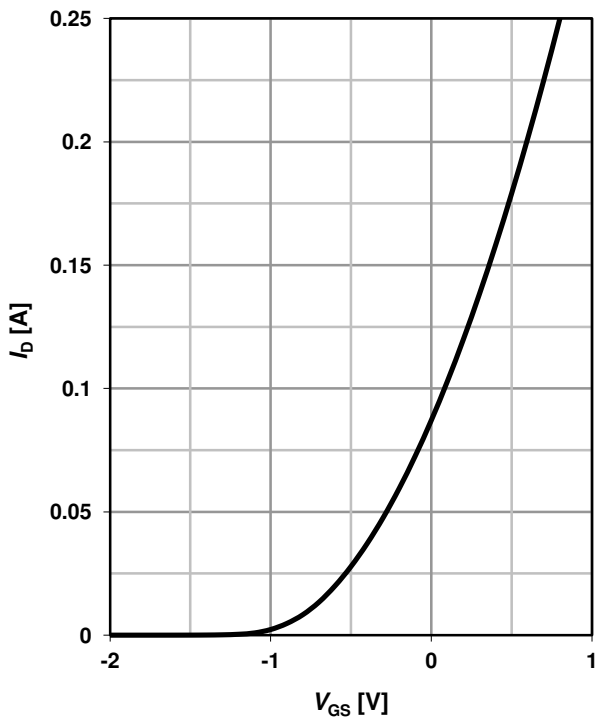
$R_{DS(on)} = f(I_D); T_j = 25\text{ }^\circ\text{C}$

parameter: V_{GS}



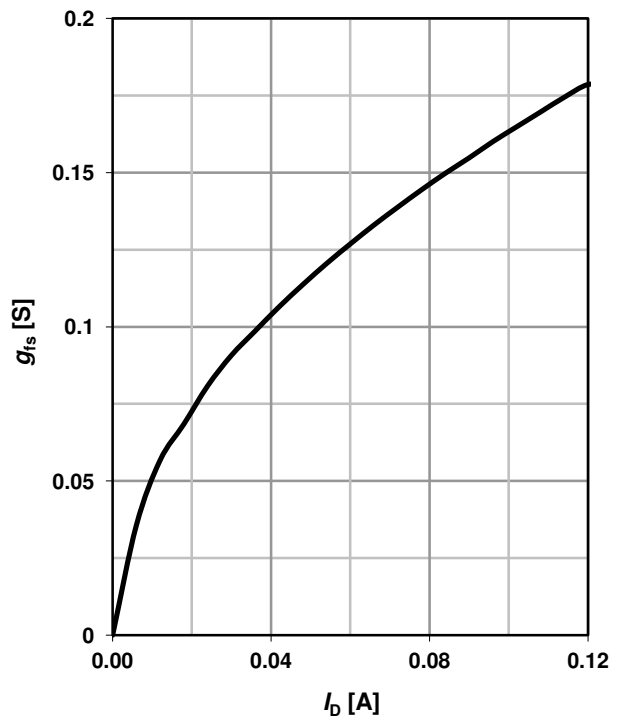
7 Typ. transfer characteristics

$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$



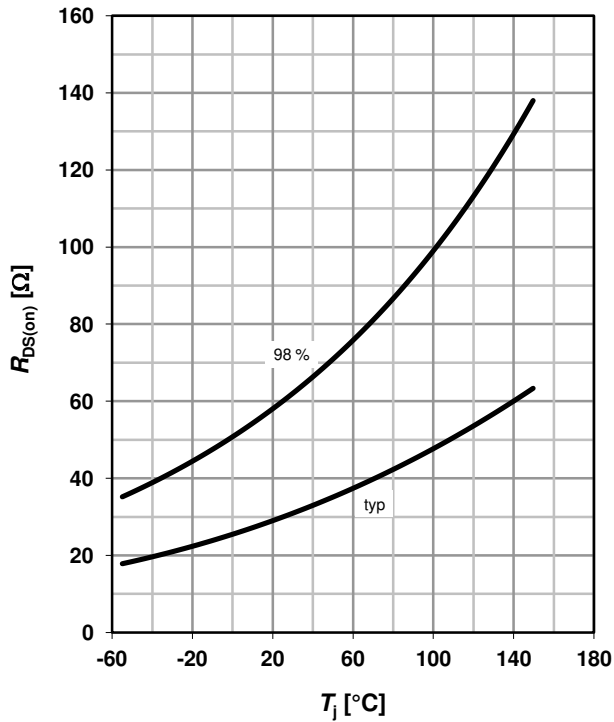
8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25\text{ }^\circ\text{C}$



9 Drain-source on-state resistance

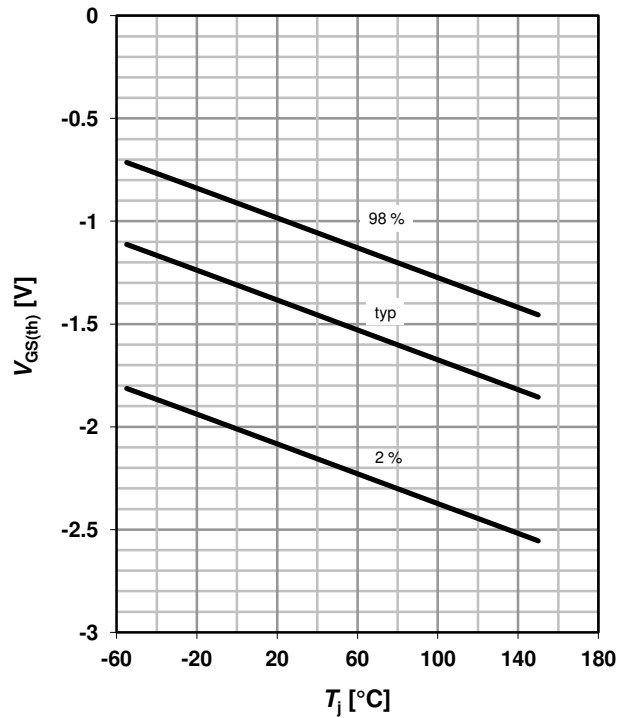
$R_{DS(on)}=f(T_j); I_D=0.01\text{ A}; V_{GS}=0\text{ V}$



10 Typ. gate threshold voltage

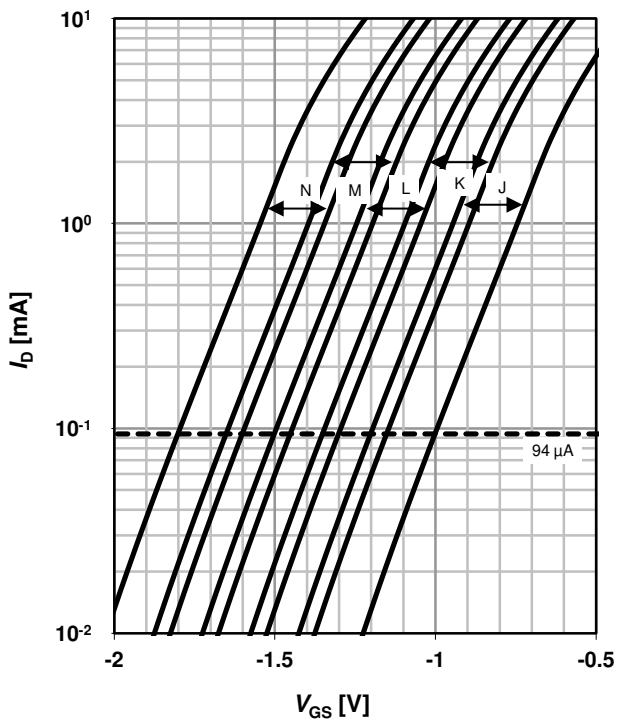
$V_{GS(th)}=f(T_j); V_{DS}=3\text{ V}; I_D=94\text{ }\mu\text{A}$

parameter: I_D



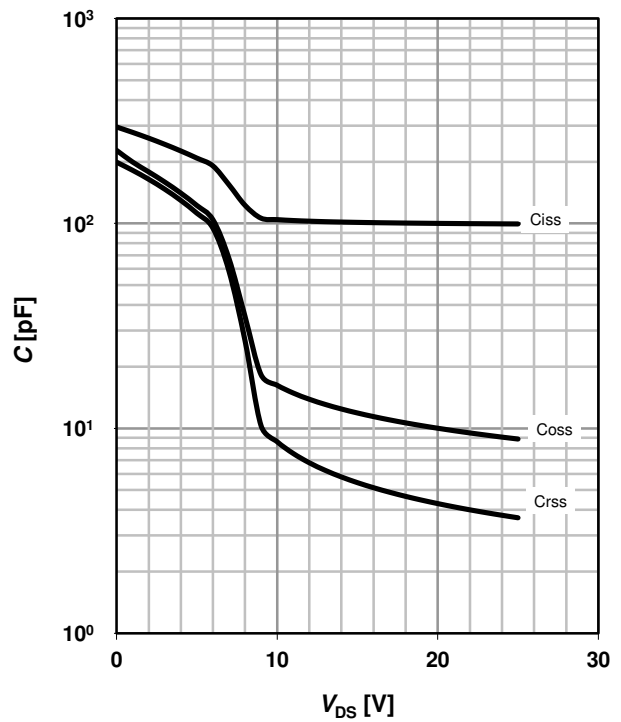
11 Threshold voltage bands

$I_D=f(V_{GS}); V_{DS}=3\text{ V}; T_j=25\text{ }^\circ\text{C}$



12 Typ. capacitances

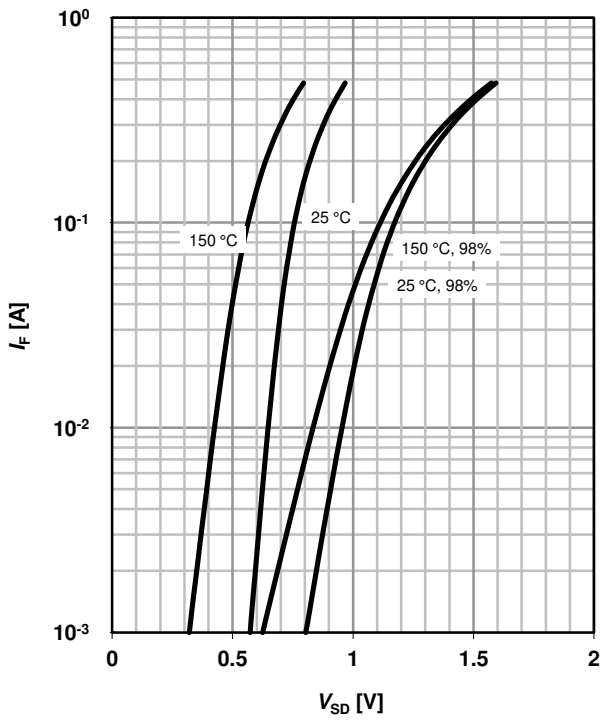
$C=f(V_{DS}); V_{GS}=-3\text{ V}; f=1\text{ MHz}$



13 Forward characteristics of reverse diode

$$I_F = f(V_{SD})$$

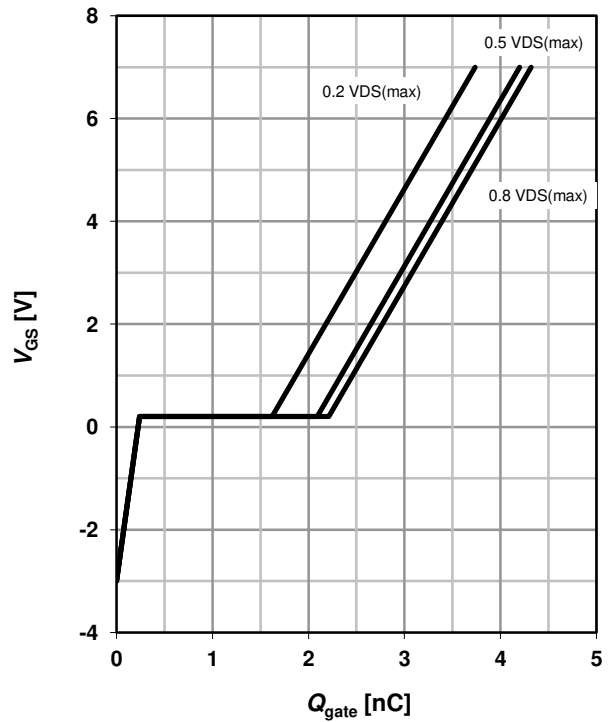
parameter: T_j



15 Typ. gate charge

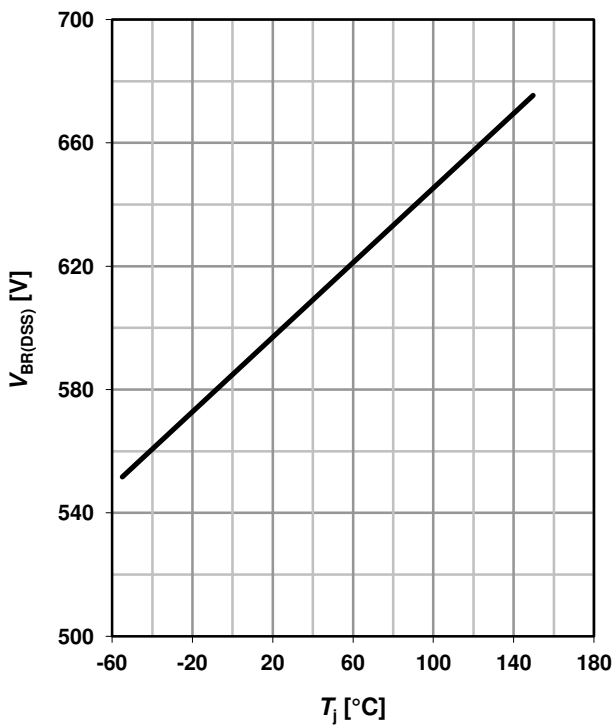
$$V_{GS} = f(Q_{gate}); I_D = 0.1 \text{ A pulsed}$$

parameter: V_{DD}

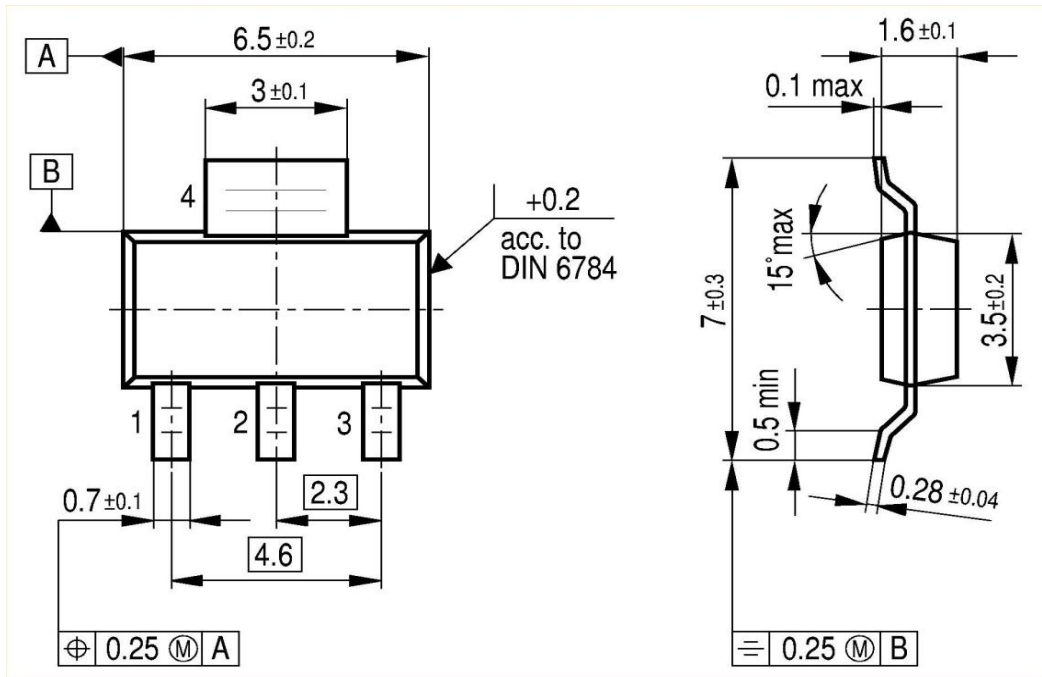


16 Drain-source breakdown voltage

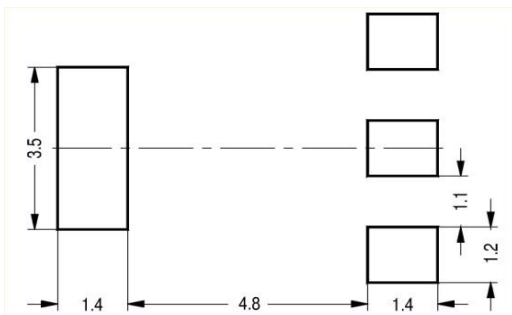
$$V_{BR(DSS)} = f(T_j); I_D = 250 \mu\text{A}$$



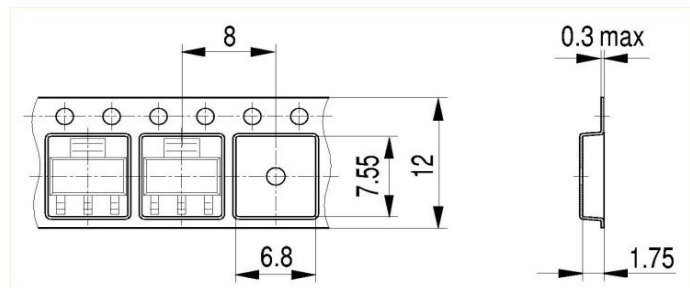
Package Outline:



Footprint:



Packaging:



Dimensions in mm

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