

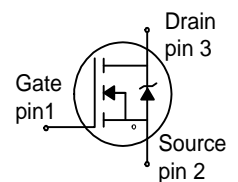
OptiMOS^â Buck converter series
Feature

- N-Channel
- Enhancement mode
- Logic Level
- Avalanche rated ¹⁾
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21


Product Summary

| | | |
|--------------|------|------------|
| V_{DS} | 55 | V |
| $R_{DS(on)}$ | 650 | m Ω |
| I_D | 0.54 | A |

PG-SOT 23



| Type | Package | Tape and Reel | Marking |
|-----------|-----------|----------------------|---------|
| BSS670S2L | PG-SOT 23 | H6327: 3000 pcs/reel | BSs |

Maximum Ratings, at $T_j = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Value | Unit |
|---|---------------------|--------------|------------------|
| Continuous drain current $T_A=25\text{ }^\circ\text{C}$ $T_A=70\text{ }^\circ\text{C}$ | I_D | 0.54 0.43 | A |
| Pulsed drain current $T_A=25\text{ }^\circ\text{C}$ | $I_{D\text{ puls}}$ | 2.2 | |
| Avalanche energy, single pulse $I_D = 0.54\text{ A}$, $R_G = 25\text{ }\Omega$ ¹⁾ | E_{AS} | 8.1 | mJ |
| Gate source voltage | V_{GS} | ± 20 | V |
| Power dissipation $T_A=25\text{ }^\circ\text{C}$ | P_{tot} | 0.36 | W |
| Operating and storage temperature | T_j, T_{stg} | -55... +150 | $^\circ\text{C}$ |
| IEC climatic category; DIN IEC 68-1 | | 55/150/56 | |
| ESD Class JESD22-A114-HBM | | Class 0 | |

¹⁾ Valid from devices with date code 0604 onwards

Thermal Characteristics

| Parameter | Symbol | Values | | | Unit |
|---|------------|--------|------|------------|------|
| | | min. | typ. | max. | |
| Characteristics | | | | | |
| Thermal resistance, junction - soldering point (Pin 3) | R_{thJS} | - | - | 290 | K/W |
| SMD version, device on PCB: @ min. footprint @ 6 cm ² cooling area ²⁾ | R_{thJA} | - | - | 350 300 | |

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

| Parameter | Symbol | Values | | | Unit |
|--|---------------|--------|-----------|-----------|---------------|
| | | min. | typ. | max. | |
| Static Characteristics | | | | | |
| Drain-source breakdown voltage $V_{GS}=0, I_D=1\text{mA}$ | $V_{(BR)DSS}$ | 55 | - | - | V |
| Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=2.7\mu\text{A}$ | $V_{GS(th)}$ | 1.2 | 1.6 | 2 | |
| Zero gate voltage drain current $V_{DS}=55\text{V}, V_{GS}=0, T_j=25\text{°C}$ $V_{DS}=55\text{V}, V_{GS}=0, T_j=150\text{°C}$ | I_{DSS} | - | 0.01 1 | 0.1 10 | μA |
| Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0\text{V}$ | I_{GSS} | - | 1 | 100 | |
| Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=270\text{mA}$ | $R_{DS(on)}$ | - | 430 | 825 | m Ω |
| Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=270\text{mA}$ | $R_{DS(on)}$ | - | 346 | 650 | |

²⁾ Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics

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

Dynamic Characteristics

| | | | | | | |
|------------------------------|--------------|---|-----|-----|----|----|
| Transconductance | g_{fs} | $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 0.54A$ | 0.6 | 1.2 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0, V_{DS} = 25V,$ $f = 1MHz$ | - | 56 | 75 | pF |
| Output capacitance | C_{oss} | | - | 13 | 18 | |
| Reverse transfer capacitance | C_{rss} | | - | 7 | 10 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD} = 30V, V_{GS} = 4.5V,$ $I_D = 0.54A,$ $R_G = 130\Omega$ | - | 9 | 14 | ns |
| Rise time | t_r | | - | 25 | 37 | |
| Turn-off delay time | $t_{d(off)}$ | | - | 21 | 31 | |
| Fall time | t_f | | - | 24 | 32 | |

Gate Charge Characteristics

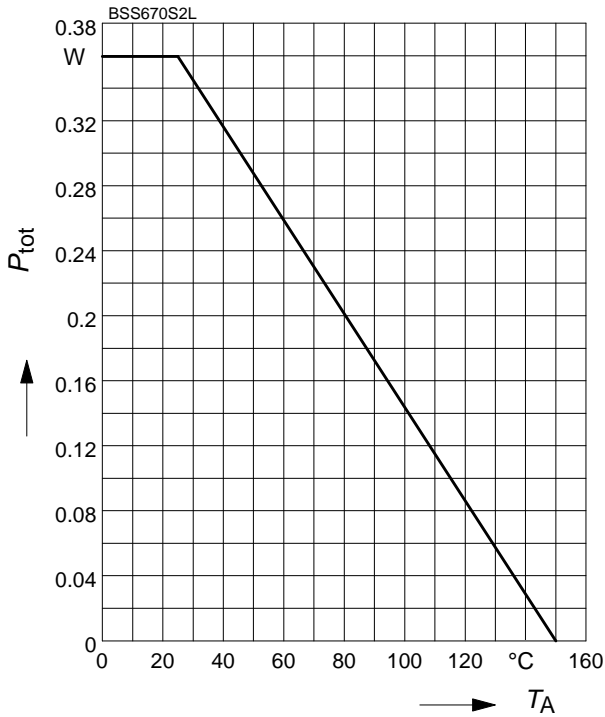
| | | | | | | |
|-----------------------|-----------------|--|---|------|------|----|
| Gate to source charge | Q_{gs} | $V_{DD} = 40V, I_D = 0.54A$ | - | 0.19 | 0.25 | nC |
| Gate to drain charge | Q_{gd} | | - | 0.57 | 0.86 | |
| Gate charge total | Q_g | $V_{DD} = 40V, I_D = 0.54A,$ $V_{GS} = 0 \text{ to } 10V$ | - | 1.7 | 2.26 | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD} = 40V, I_D = 0.54A$ | - | 3.1 | - | V |

Reverse Diode

| | | | | | | |
|--|----------|---|---|-----|------|----|
| Inverse diode continuous forward current | I_S | $T_A = 25^\circ C$ | - | - | 0.38 | A |
| Inv. diode direct current, pulsed | I_{SM} | | - | - | 2.2 | |
| Inverse diode forward voltage | V_{SD} | $V_{GS} = 0, I_F = 0.54A$ | - | 0.8 | 1.1 | V |
| Reverse recovery time | t_{rr} | $V_R = 30V, I_F = I_S,$ $dI_F/dt = 100A/\mu s$ | - | 51 | 64 | ns |
| Reverse recovery charge | Q_{rr} | | - | 22 | 28 | |

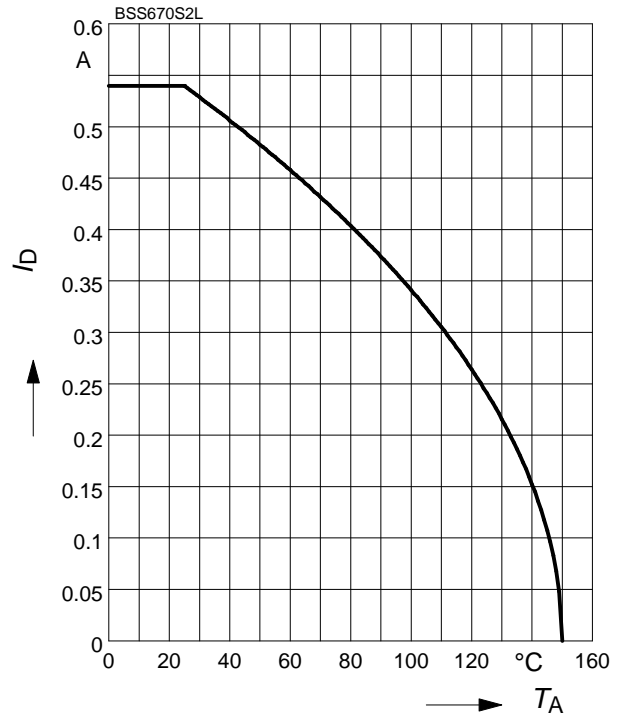
1 Power dissipation

$P_{tot} = f(T_A)$



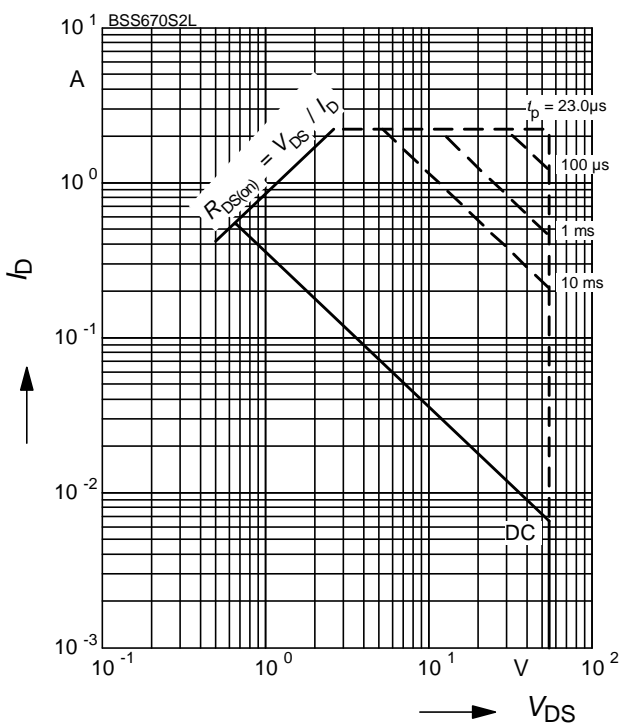
2 Drain current

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



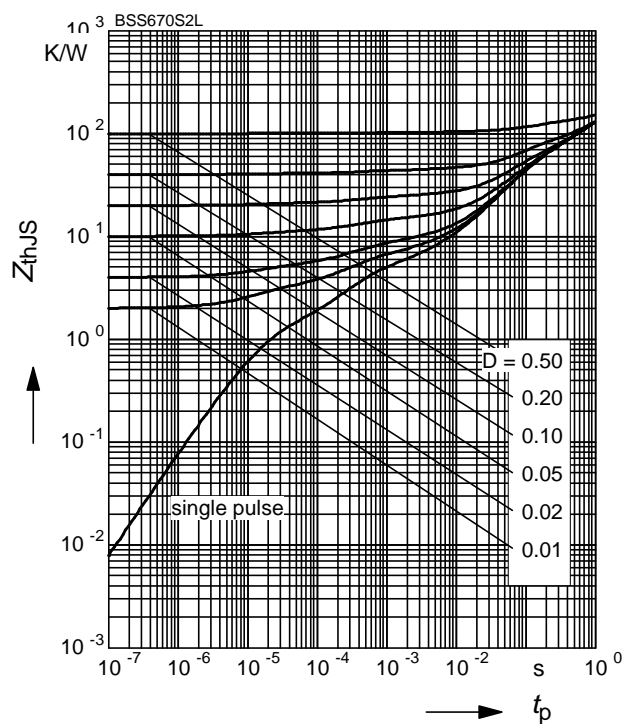
3 Safe operating area

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



4 Transient thermal impedance

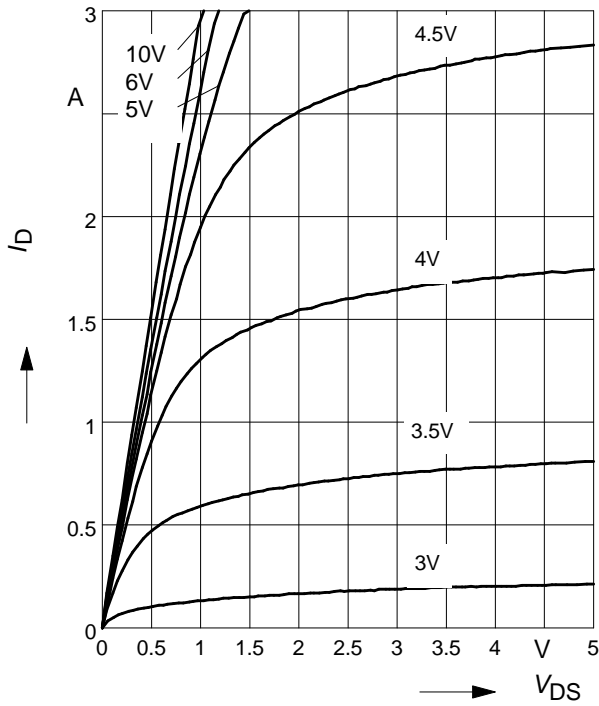
$Z_{thJS} = f(t_p)$
parameter: $D = t_p/T$



5 Typ. output characteristic

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

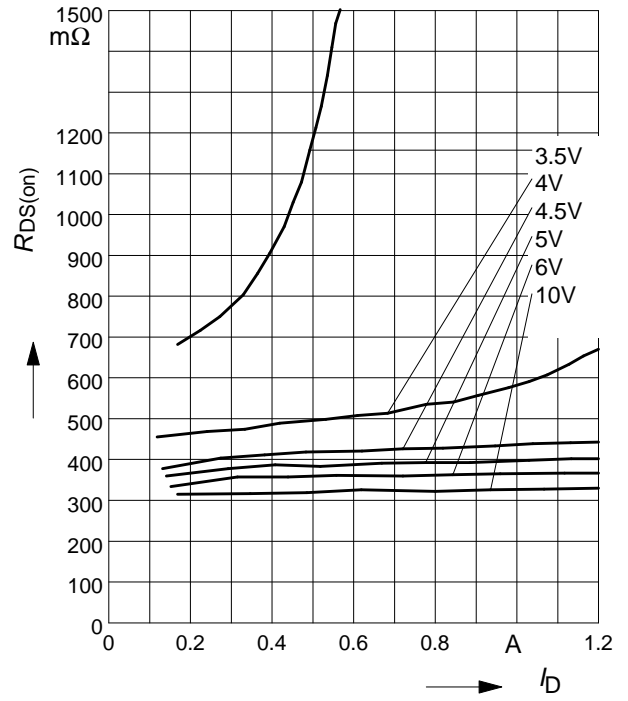
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

$R_{DS(on)} = f(I_D)$

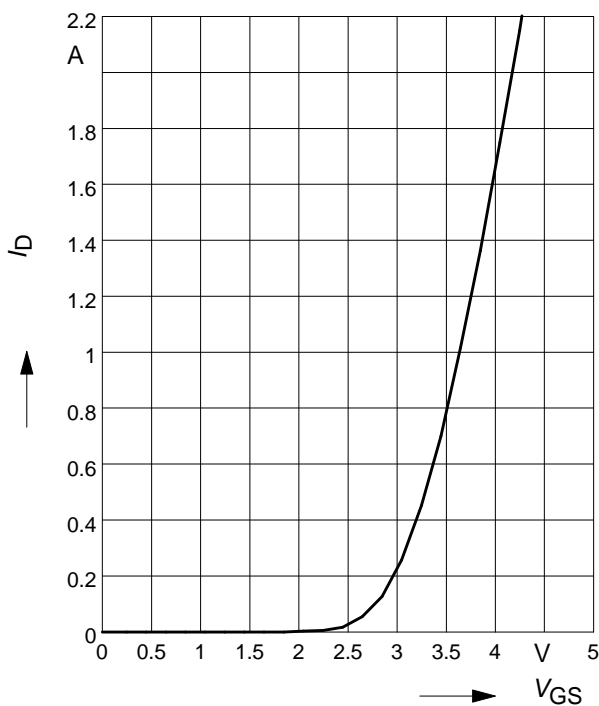
parameter: V_{GS}



7 Typ. transfer characteristics

$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

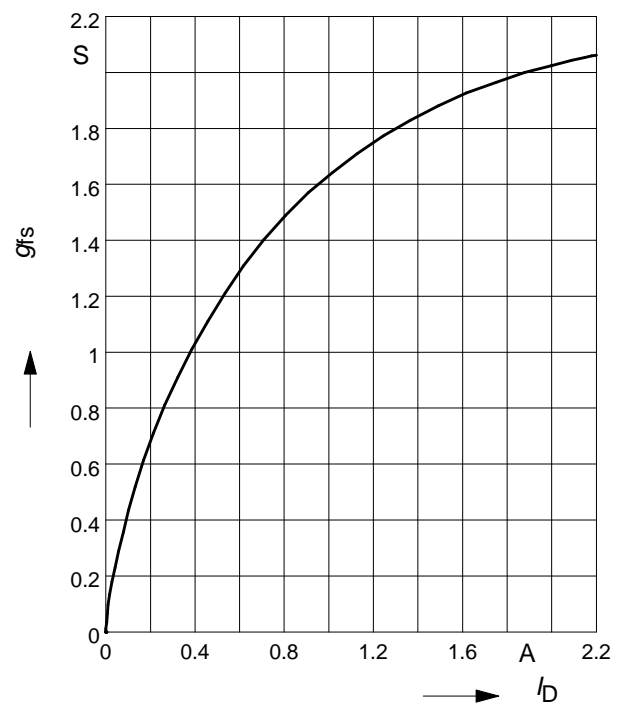
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

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

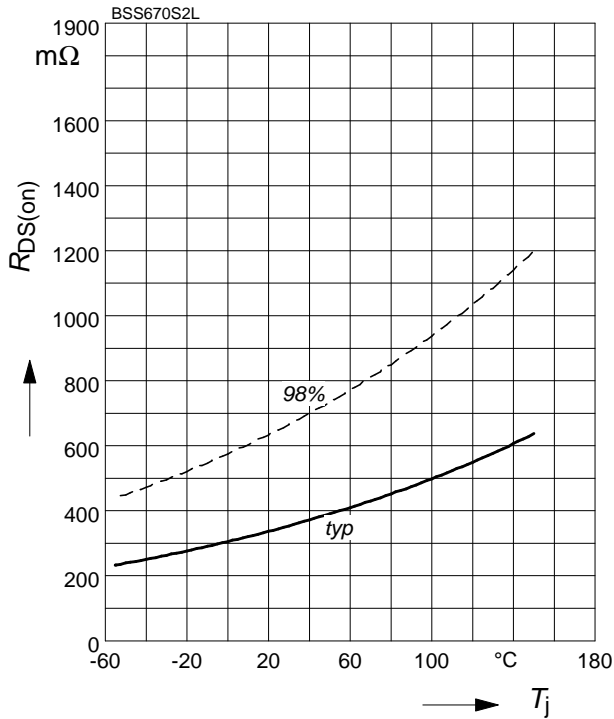
parameter: g_{fs}



9 Drain-source on-state resistance

$R_{DS(on)} = f(T_j)$

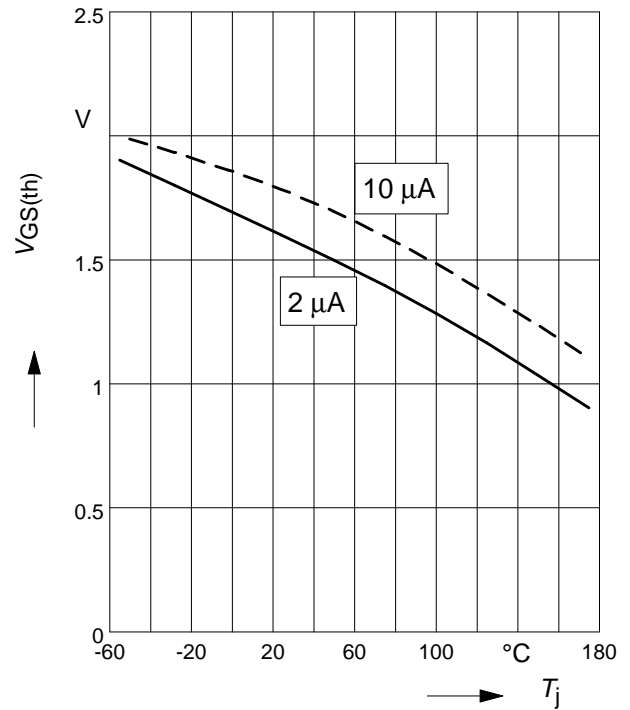
parameter : $I_D = 270 \text{ mA}$, $V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

$V_{GS(th)} = f(T_j)$

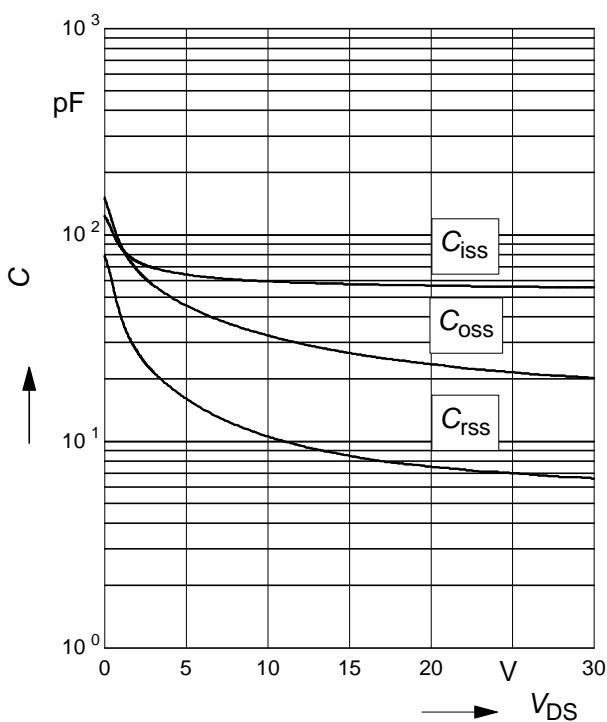
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

$C = f(V_{DS})$

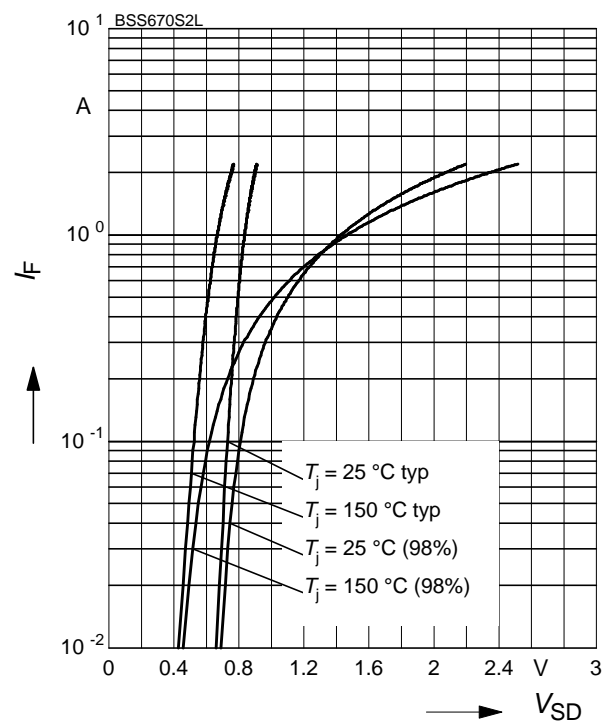
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$



12 Forward character. of reverse diode

$I_F = f(V_{SD})$

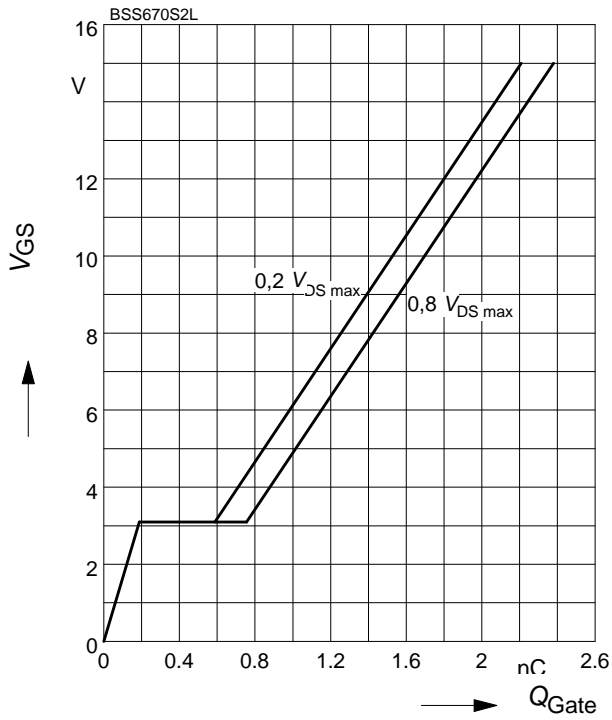
parameter: T_j , $t_p = 80 \mu\text{s}$



13 Typ. gate charge

$V_{GS} = f(Q_{Gate})$

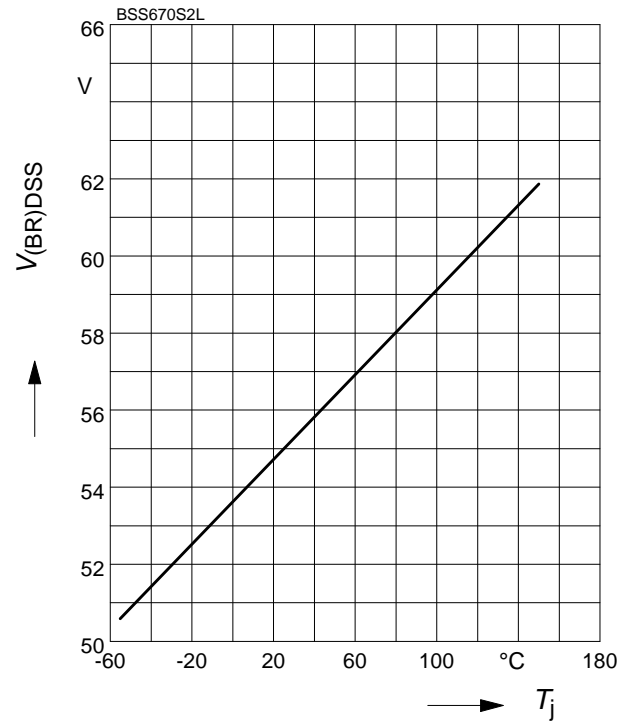
parameter: $I_D = 0.54$ A pulsed



14 Drain-source breakdown voltage

$V_{(BR)DSS} = f(T_j)$

parameter: $I_D = 10$ mA



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81726 Munich, Germany
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