

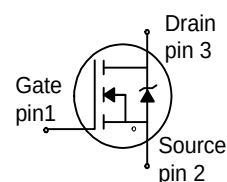
**OptiMOS<sup>®</sup> Buck converter series**
**Feature**

- N-Channel
- Enhancement mode
- Logic Level
- Avalanche rated <sup>1)</sup>
- 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 $\Omega$ |
| $I_D$        | 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<br>$T_A = 25^{\circ}\text{C}$<br>$T_A = 70^{\circ}\text{C}$          | $I_D$               | 0.54<br>0.43 | A                  |
| Pulsed drain current<br>$T_A = 25^{\circ}\text{C}$                                            | $I_{D\text{ puls}}$ | 2.2          |                    |
| Avalanche energy, single pulse $I_D = 0.54\text{ A}$ , $R_G = 25\text{ }\Omega$ <sup>1)</sup> | $E_{AS}$            | 8.1          | mJ                 |
| Gate source voltage                                                                           | $V_{GS}$            | $\pm 20$     | V                  |
| Power dissipation<br>$T_A = 25^{\circ}\text{C}$                                               | $P_{tot}$           | 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<br>JESD22-A114-HBM                                                                  |                     | Class 0      |                    |

<sup>1)</sup> Valid from devices with date code 0604 onwards

**Thermal Characteristics**

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

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

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

<sup>2)</sup> Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  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             | $g_{fs}$     | $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ ,<br>$I_D = 0.54A$           | 0.6 | 1.2 | -  | S  |
| Input capacitance            | $C_{iss}$    | $V_{GS} = 0$ , $V_{DS} = 25V$ ,<br>$f = 1MHz$                              | -   | 56  | 75 | pF |
| Output capacitance           | $C_{oss}$    |                                                                            | -   | 13  | 18 |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                            | -   | 7   | 10 |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD} = 30V$ , $V_{GS} = 4.5V$ ,<br>$I_D = 0.54A$ ,<br>$R_G = 130\Omega$ | -   | 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**

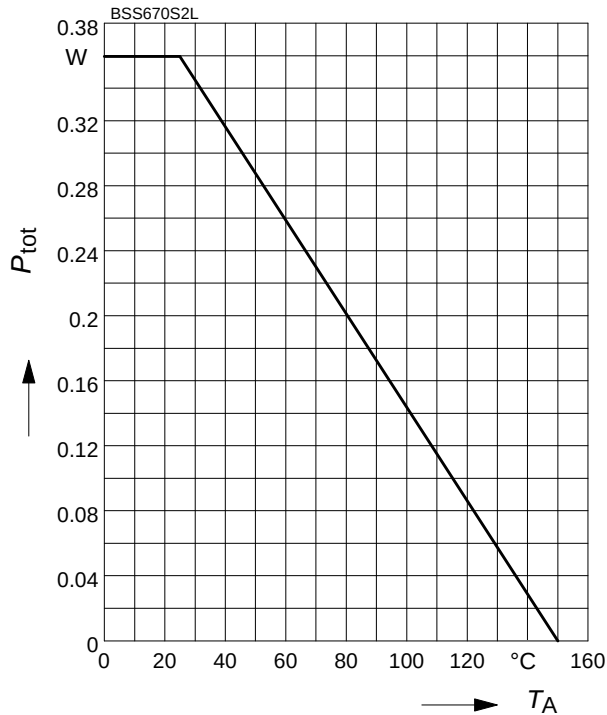
|                       |                 |                                                           |   |      |      |    |
|-----------------------|-----------------|-----------------------------------------------------------|---|------|------|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD} = 40V$ , $I_D = 0.54A$                            | - | 0.19 | 0.25 | nC |
| Gate to drain charge  | $Q_{gd}$        |                                                           | - | 0.57 | 0.86 |    |
| Gate charge total     | $Q_g$           | $V_{DD} = 40V$ , $I_D = 0.54A$ ,<br>$V_{GS} = 0$ 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                    | $t_{rr}$ | $V_R = 30V$ , $I_F = I_S$ ,<br>$di_F/dt = 100A/\mu s$ | - | 51  | 64   | ns |
| Reverse recovery charge                  | $Q_{rr}$ |                                                       | - | 22  | 28   | nC |

### 1 Power dissipation

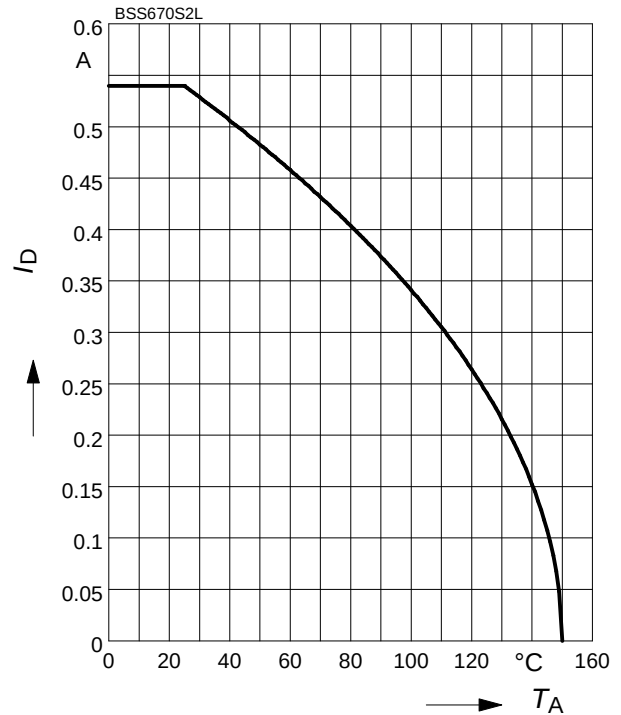
$$P_{\text{tot}} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

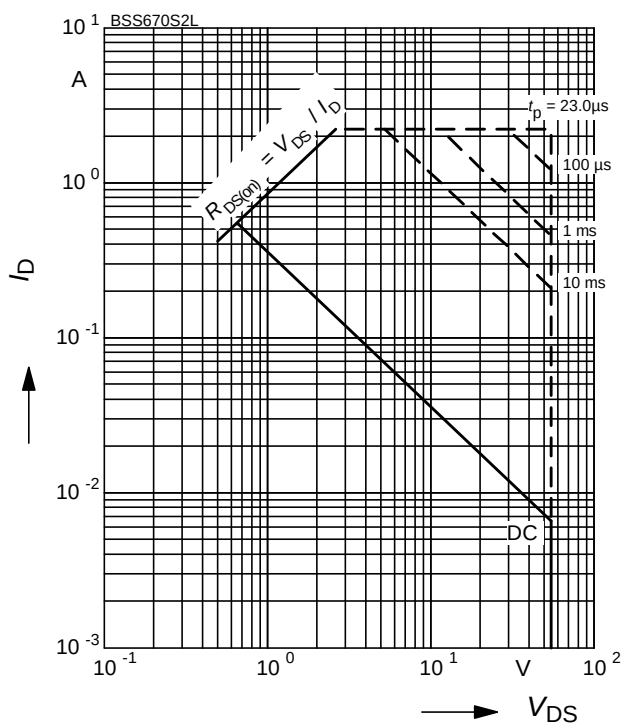
parameter:  $V_{GS} \geq 10$  V



### 3 Safe operating area

$$I_D = f(V_{DS})$$

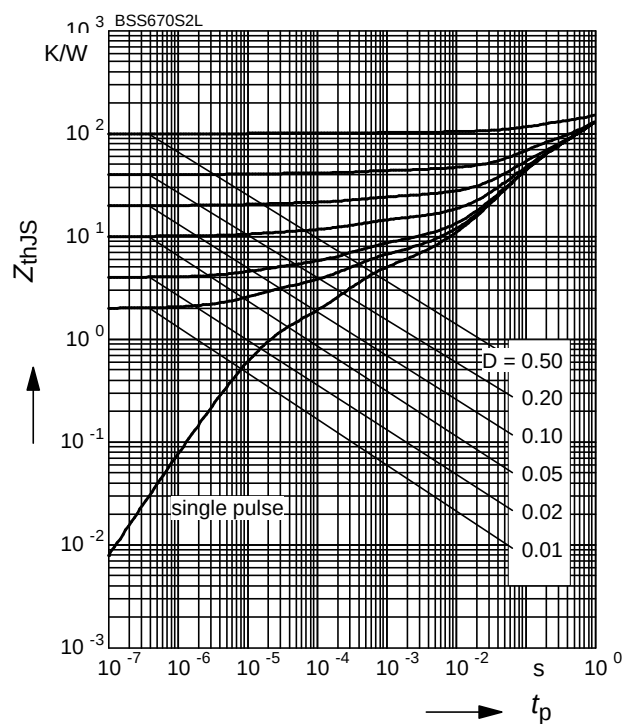
parameter:  $D = 0$ ,  $T_A = 25$  °C



### 4 Transient thermal impedance

$$Z_{\text{thJS}} = f(t_p)$$

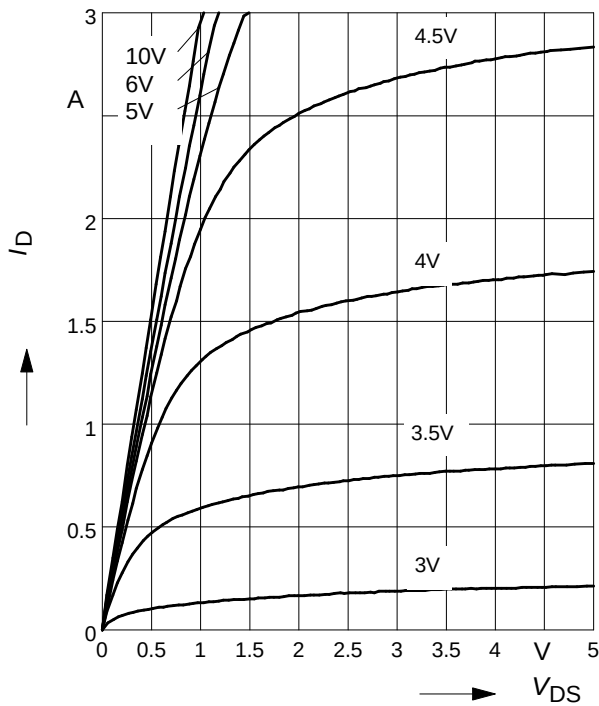
parameter:  $D = t_p / T$



### 5 Typ. output characteristic

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

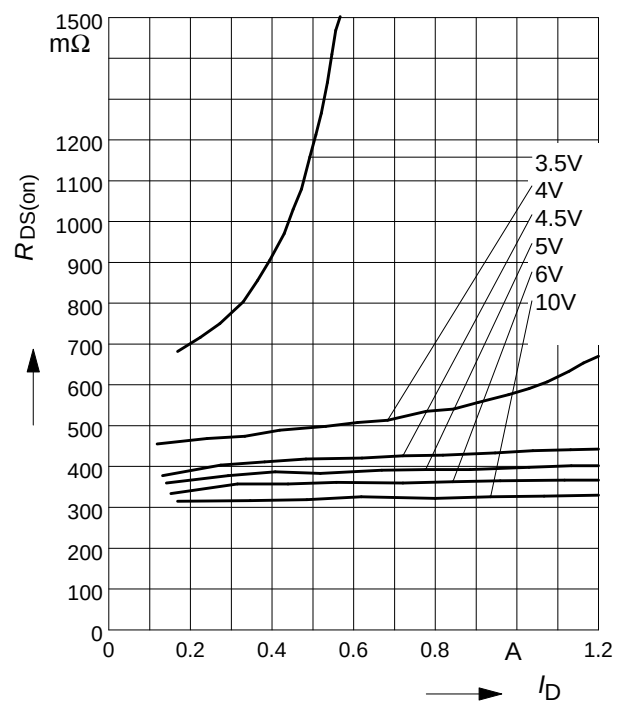
parameter:  $t_p = 80\ \mu\text{s}$



### 6 Typ. drain-source on resistance

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

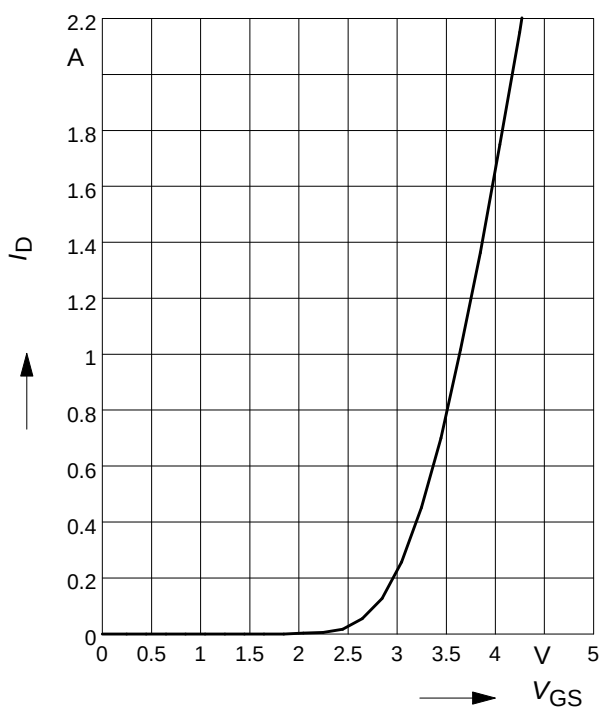
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

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

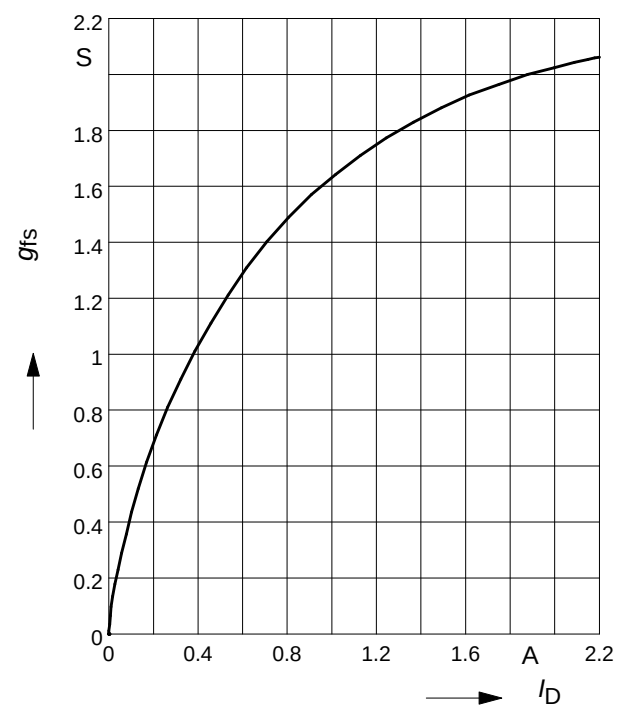
parameter:  $t_p = 80\ \mu\text{s}$



### 8 Typ. forward transconductance

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

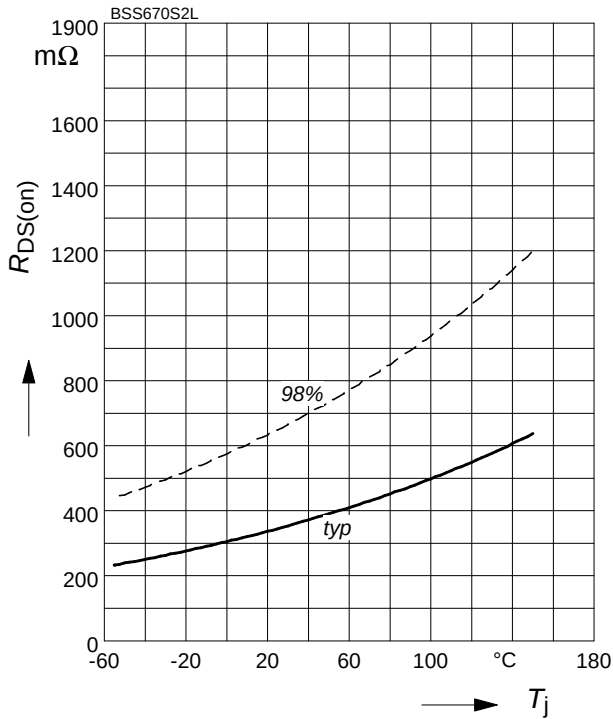
parameter:  $g_{fs}$



### 9 Drain-source on-state resistance

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

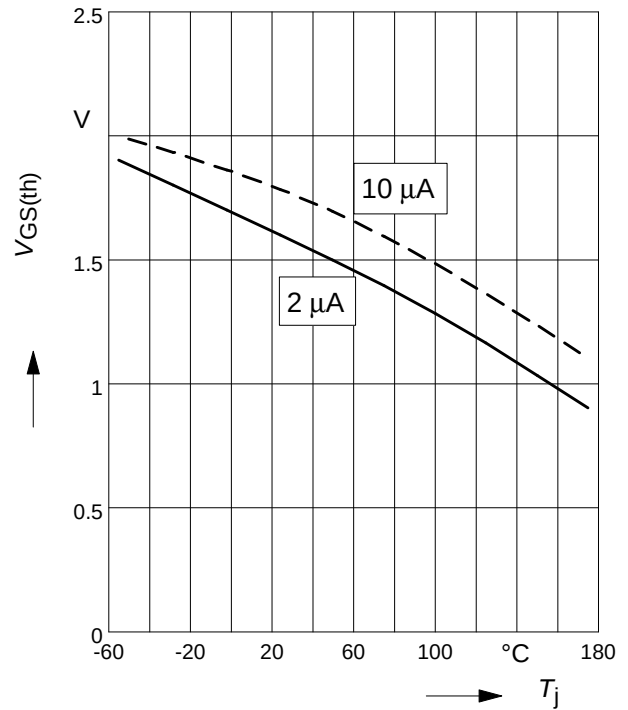
parameter:  $I_D = 270 \text{ mA}$ ,  $V_{GS} = 10 \text{ V}$



### 10 Typ. gate threshold voltage

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

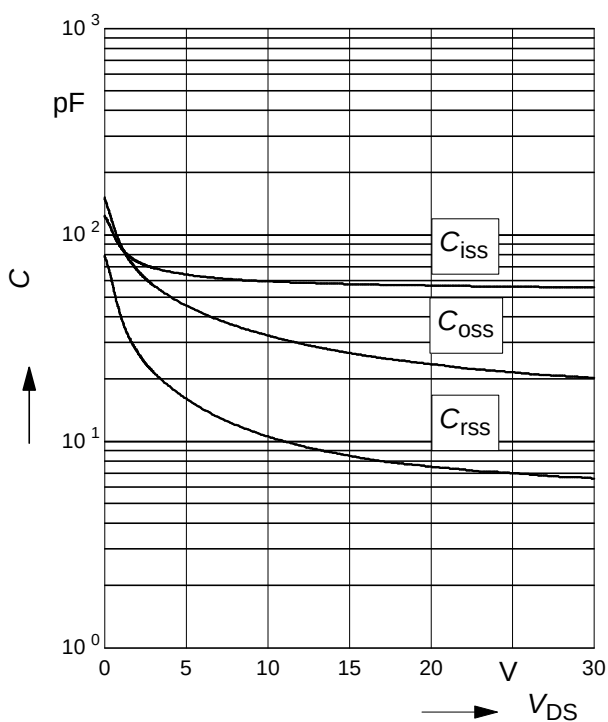
parameter:  $V_{GS} = V_{DS}$



### 11 Typ. capacitances

$$C = f(V_{DS})$$

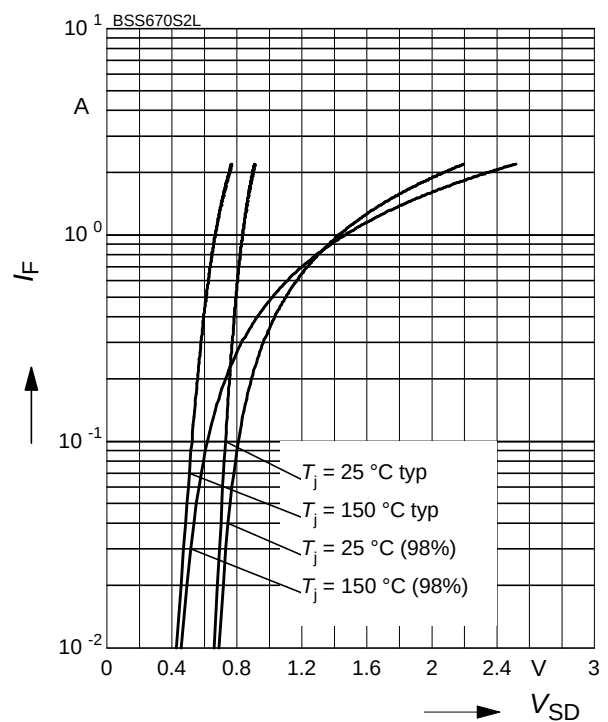
parameter:  $V_{GS}=0$ ,  $f=1 \text{ MHz}$



### 12 Forward character. of reverse diode

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

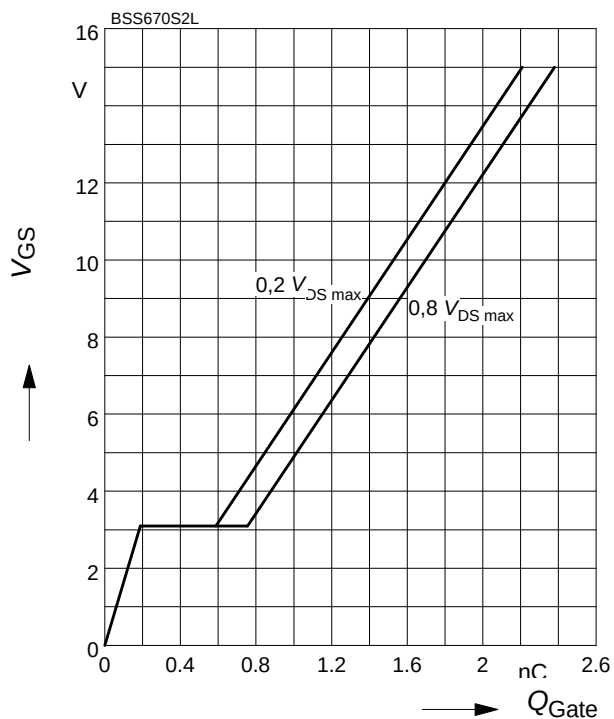
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**13 Typ. gate charge**

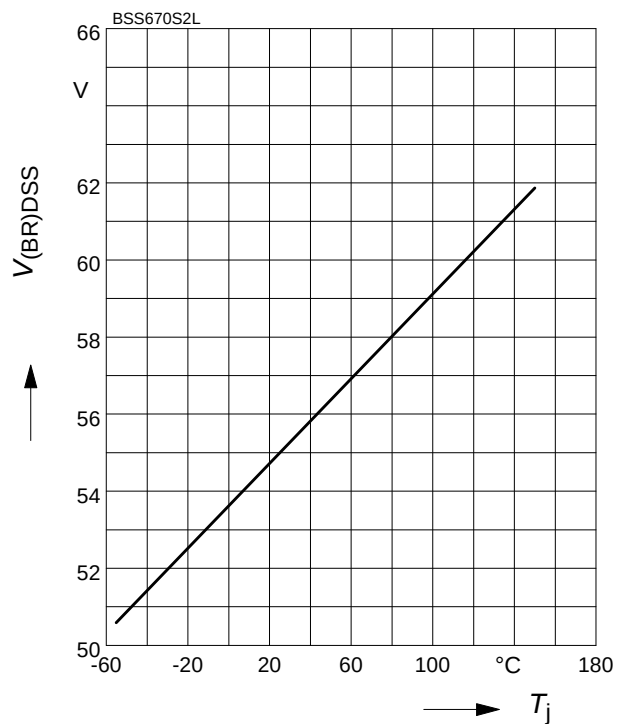
$$V_{GS} = f(Q_{Gate})$$

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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