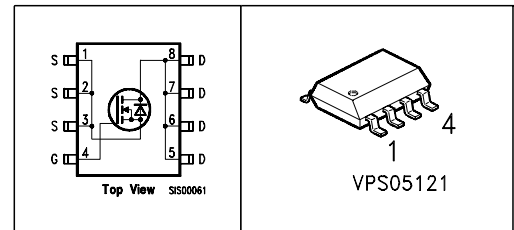


**OptiMOS® Small-Signal-Transistor**
**Feature**

- N-Channel
- Logic Level
- Very low on-resistance  $R_{DS(on)}$
- Excellent Gate Charge x  $R_{DS(on)}$  product (FOM)
- Avalanche rated
- $dv/dt$  rated
- Ideal for fast switching applications

**Product Summary**

|              |     |            |
|--------------|-----|------------|
| $V_{DS}$     | 30  | V          |
| $R_{DS(on)}$ | 7.8 | m $\Omega$ |
| $I_D$        | 13  | A          |



| Type    | Package | Ordering Code | Marking |
|---------|---------|---------------|---------|
| BSO4420 | SO 8    | Q67042-S4027  | 4420    |

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

| Parameter   | Symbol                | Value       | Unit              |
|---|-----------------------|-------------|-------------------|
| Continuous drain current<br>$T_A=25^\circ\text{C}$  | $I_D$                 | 13          | A                 |
| Pulsed drain current<br>$T_A=25^\circ\text{C}$  | $I_{D\text{ puls}}$   | 52          |                   |
| Avalanche energy, single pulse<br>$I_D=13\text{ A}$ , $V_{DD}=25\text{V}$ , $R_{GS}=25\Omega$   | $E_{AS}$              | 230         | mJ                |
| Reverse diode $dv/dt$<br>$I_S=13\text{A}$ , $V_{DS}=24\text{V}$ , $dI/dt=200\text{A}/\mu\text{s}$ , $T_{j\text{max}}=150^\circ\text{C}$ | $dv/dt$               | 6           | kV/ $\mu\text{s}$ |
| Gate source voltage   | $V_{GS}$              | $\pm 20$    | V                 |
| Power dissipation<br>$T_A=25^\circ\text{C}$   | $P_{\text{tot}}$      | 2.5         | W                 |
| Operating and storage temperature   | $T_j, T_{\text{stg}}$ | -55... +150 | $^\circ\text{C}$  |
| IEC climatic category; DIN IEC 68-1   |                       | 55/150/56   |                   |

**Thermal Characteristics**

| Parameter   | Symbol     | Values |      |      | Unit |
|---|------------|--------|------|------|------|
|   |            | min.   | typ. | max. |      |
| <b>Characteristics</b>  |            |        |      |      |      |
| Thermal resistance, junction - soldering point  | $R_{thJS}$ | -      | -    | 30   | K/W  |
| SMD version, device on PCB:   | $R_{thJA}$ | -      | -    | 110  |      |
| @ min. footprint; $t \leq 10$ sec.<br>@ 6 cm <sup>2</sup> cooling area <sup>1)</sup> ; $t \leq 10$ sec. |            | -      | -    | 50   |      |

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

| Parameter  | Symbol        | Values |            |          | Unit      |
|--|---------------|--------|------------|----------|-----------|
|  |               | min.   | typ.       | max.     |           |
| <b>Static Characteristics</b>  |               |        |            |          |           |
| Drain-source breakdown voltage<br>$V_{GS}=0V, I_D=1mA$   | $V_{(BR)DSS}$ | 30     | -          | -        | V         |
| Gate threshold voltage, $V_{GS} = V_{DS}$<br>$I_D=80\mu A$   | $V_{GS(th)}$  | 1.2    | 1.6        | 2        |           |
| Zero gate voltage drain current<br>$V_{DS}=30V, V_{GS}=0V, T_j=25^\circ\text{C}$<br>$V_{DS}=30V, V_{GS}=0V, T_j=125^\circ\text{C}$ | $I_{DSS}$     | -      | 0.01<br>10 | 1<br>100 | $\mu A$   |
| Gate-source leakage current<br>$V_{GS}=20V, V_{DS}=0V$   | $I_{GSS}$     | -      | 1          | 100      |           |
| Drain-source on-state resistance<br>$V_{GS}=4.5V, I_D=11A$   | $R_{DS(on)}$  | -      | 9.3        | 10.9     | $m\Omega$ |
| Drain-source on-state resistance<br>$V_{GS}=10V, I_D=13A$  | $R_{DS(on)}$  | -      | 6.7        | 7.8      |           |

<sup>1</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, at  $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

| Parameter                      | Symbol       | Conditions  | Values |      |      | Unit     |
|--------------------------------|--------------|---|--------|------|------|----------|
|                                |              |   | min.   | typ. | max. |          |
| <b>Dynamic Characteristics</b> |              |   |        |      |      |          |
| Transconductance               | $g_{fs}$     | $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ ,<br>$I_D = 11.6\text{A}$             | 13.7   | 27.4 | -    | S        |
| Input capacitance              | $C_{iss}$    | $V_{GS} = 0, V_{DS} = 25\text{V}$ ,<br>$f = 1\text{MHz}$                            | -      | 1770 | 2213 | pF       |
| Output capacitance             | $C_{oss}$    |   | -      | 740  | 925  |          |
| Reverse transfer capacitance   | $C_{rss}$    |   | -      | 165  | 206  |          |
| Gate resistance                | $R_G$        |   | -      | 1.3  | -    | $\Omega$ |
| Turn-on delay time             | $t_{d(on)}$  | $V_{DD} = 15\text{V}, V_{GS} = 10\text{V}$ ,<br>$I_D = 11\text{A}, R_G = 2.2\Omega$ | -      | 9    | 13.5 | ns       |
| Rise time                      | $t_r$        |   | -      | 44   | 66   |          |
| Turn-off delay time            | $t_{d(off)}$ |   | -      | 10   | 15   |          |
| Fall time                      | $t_f$        |   | -      | 32   | 48   |          |

**Gate Charge Characteristics**

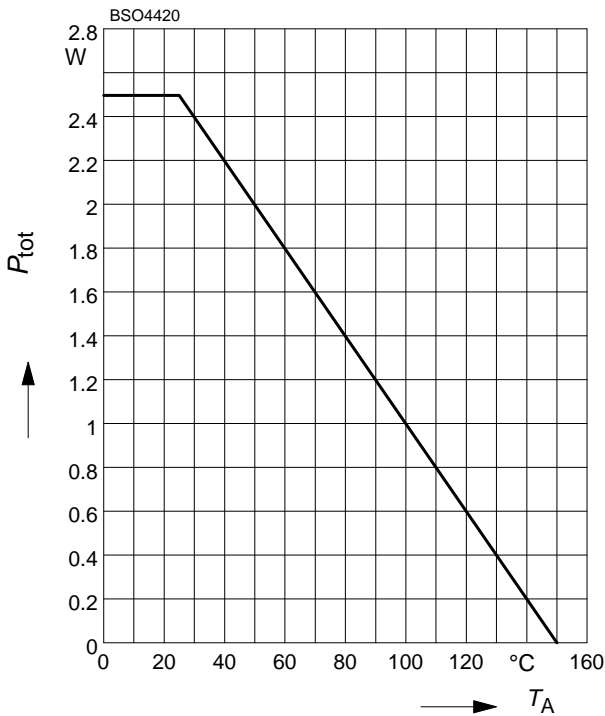
|                       |                 |   |   |      |      |    |
|-----------------------|-----------------|---|---|------|------|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD} = 15\text{V}, I_D = 13\text{A}$   | - | 4.9  | 6.1  | nC |
| Gate to drain charge  | $Q_{gd}$        |   | - | 12.8 | 16   |    |
| Gate charge total     | $Q_g$           | $V_{DD} = 15\text{V}, I_D = 13\text{A}$ ,<br>$V_{GS} = 0 \text{ to } 5\text{V}$ | - | 27   | 33.7 |    |
| Output charge         | $Q_{oss}$       | $V_{DS} = 15\text{V}, I_D = 13\text{A}$ ,<br>$V_{GS} = 0$                       | - | 25   | -    |    |
| Gate plateau voltage  | $V_{(plateau)}$ | $V_{DD} = 15\text{V}, I_D = 13\text{A}$   | - | 2.7  | -    | V  |

**Reverse Diode**

|  |          |  |   |      |      |    |
|--|----------|--|---|------|------|----|
| Inverse diode continuous forward current | $I_S$    | $T_A = 25\text{ }^\circ\text{C}$                                       | - | -    | 3.6  | A  |
| Inverse diode direct current, pulsed     | $I_{SM}$ |  | - | -    | 52   |    |
| Inverse diode forward voltage            | $V_{SD}$ | $V_{GS} = 0,  I_S  =  I_F $  | - | 0.85 | 1.13 | V  |
| Reverse recovery time                    | $t_{rr}$ | $V_R = 15\text{V}, I_F = I_S$ ,<br>$di_F/dt = 100\text{A}/\mu\text{s}$ | - | 32   | 48   | ns |
| Reverse recovery charge                  | $Q_{rr}$ |  | - | 43.6 | 70   | nC |

**1 Power dissipation**

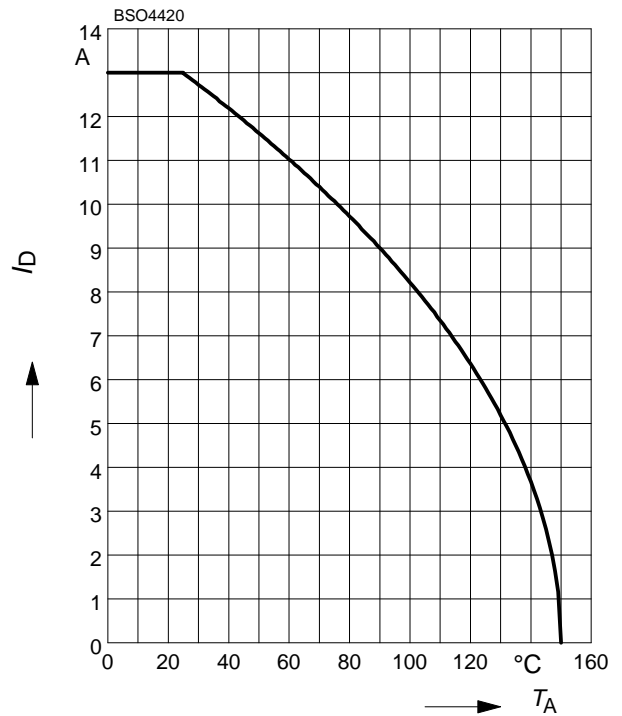
$P_{tot} = f(T_A)$



**2 Drain current**

$I_D = f(T_A)$

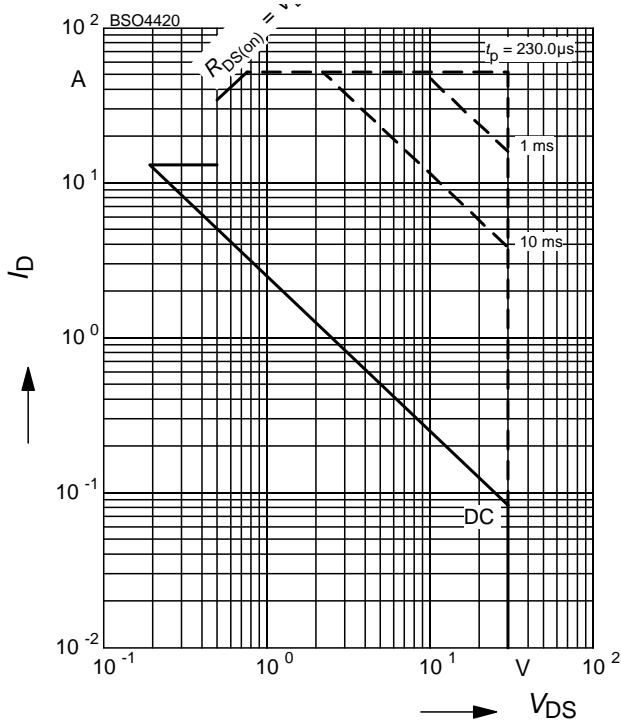
parameter:  $V_{GS} \geq 10\text{ V}$



**3 Safe operating area**

$I_D = f(V_{DS})$

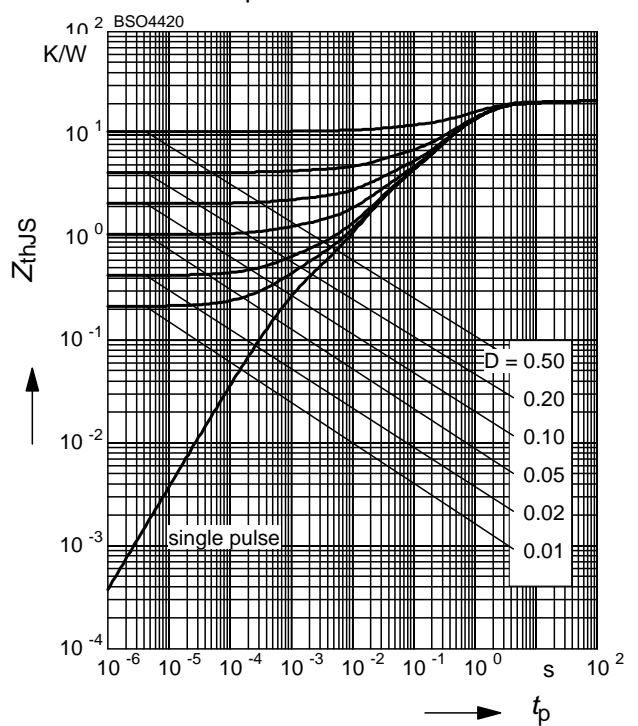
parameter:  $D = 0, T_A = 25\text{ °C}$



**4 Transient thermal impedance**

$Z_{thJS} = f(t_p)$

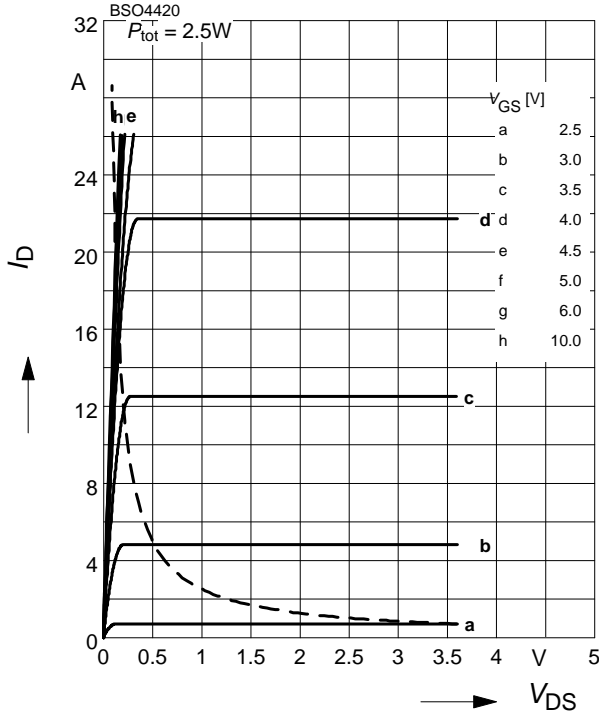
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

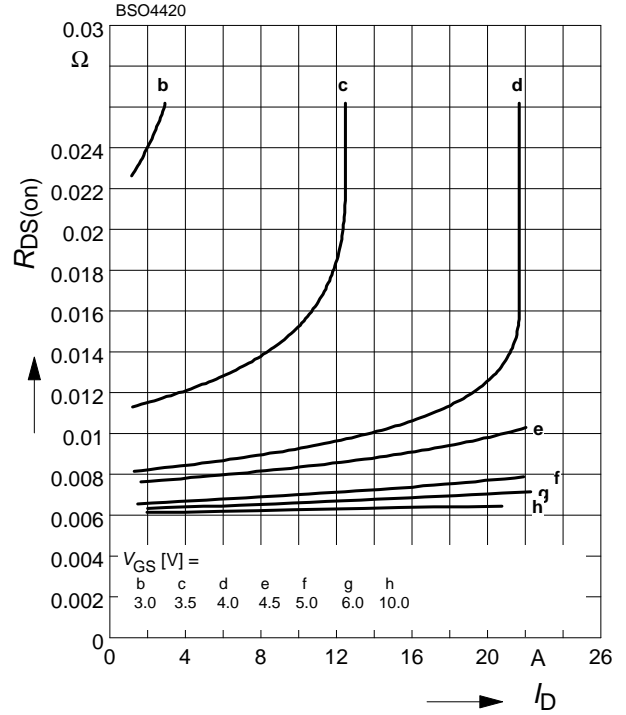
parameter:  $t_p = 80 \mu\text{s}$



**6 Typ. drain-source on resistance**

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

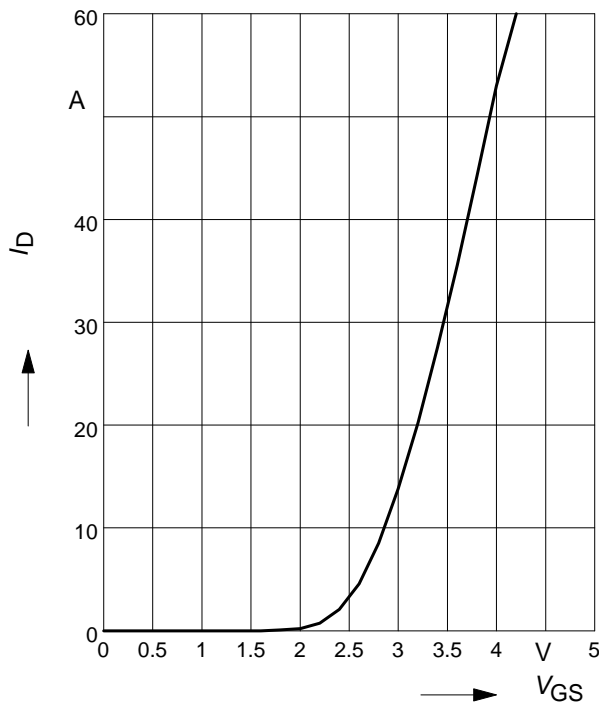
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

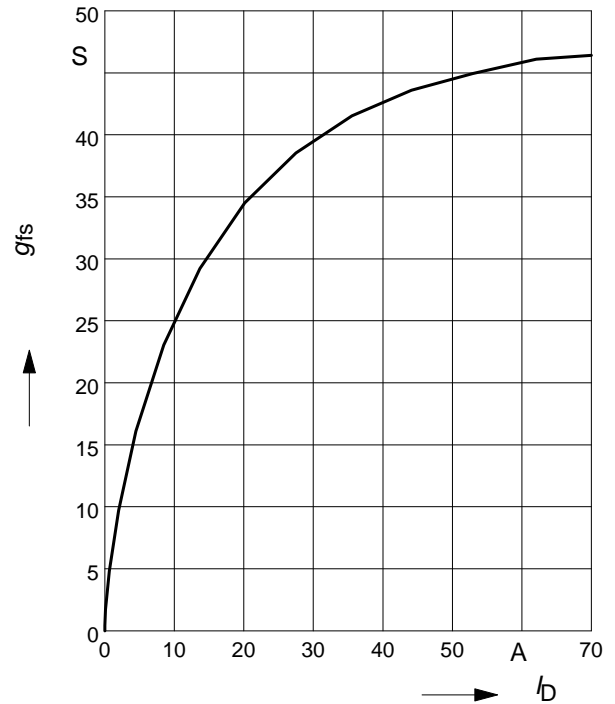
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

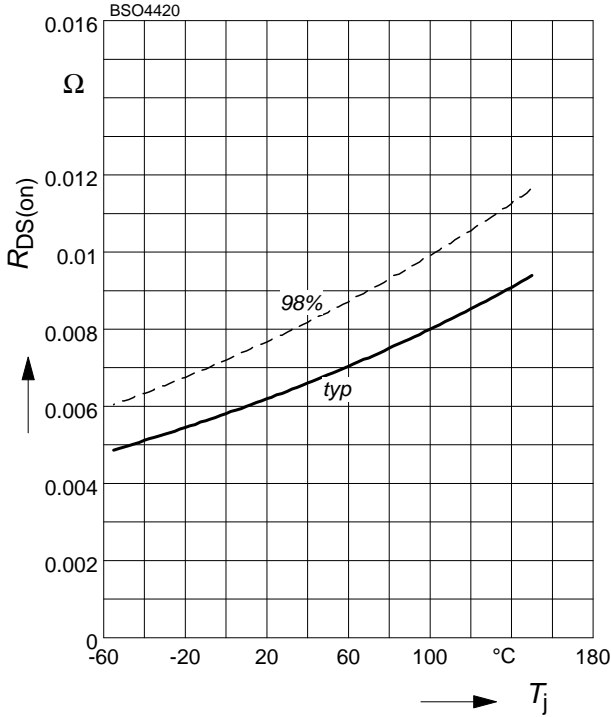
parameter:  $g_{fs}$



**9 Drain-source on-state resistance**

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

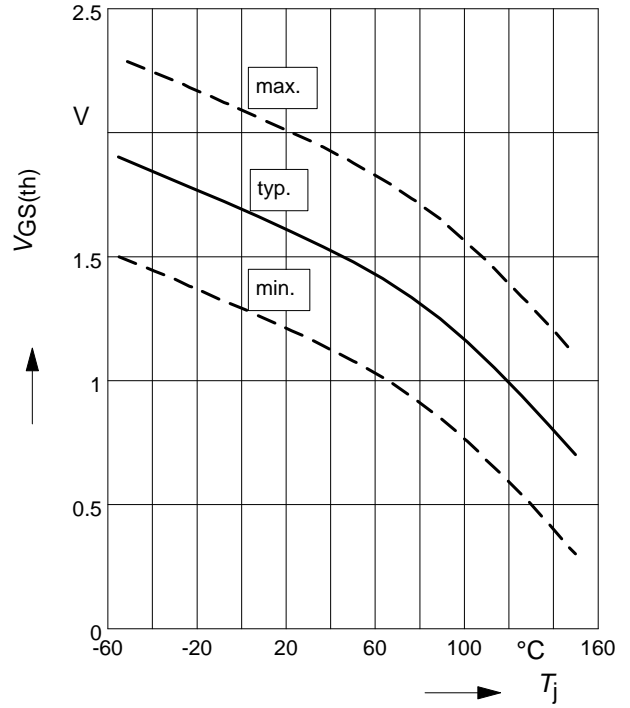
parameter :  $I_D = 13 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

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

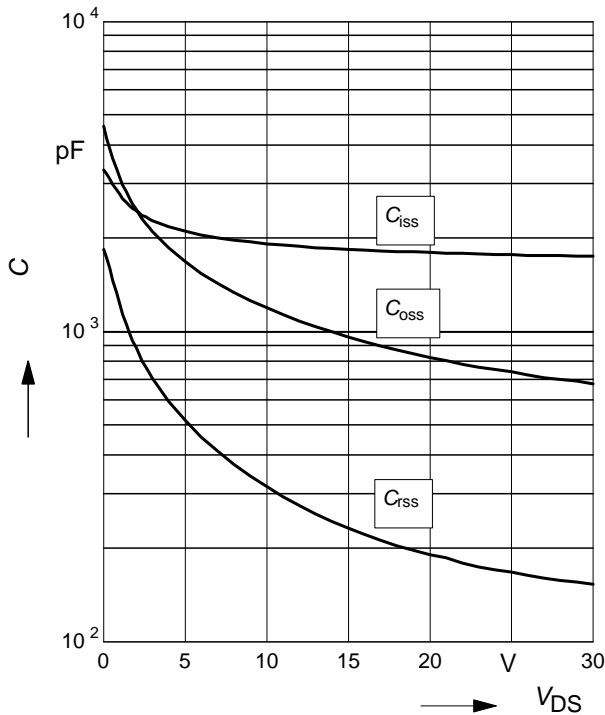
parameter:  $V_{GS} = V_{DS}$



**11 Typ. capacitances**

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

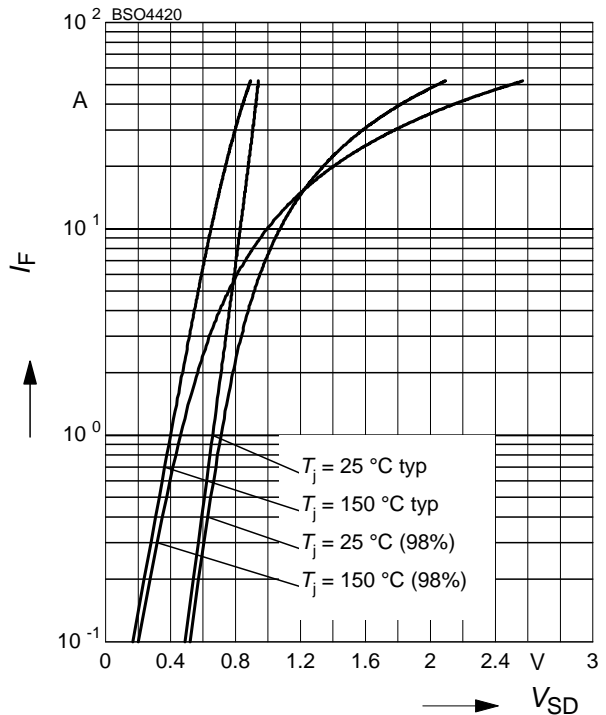
parameter:  $V_{GS}=0\text{V}$ ,  $f=1 \text{ MHz}$



**12 Forward character. of reverse diode**

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

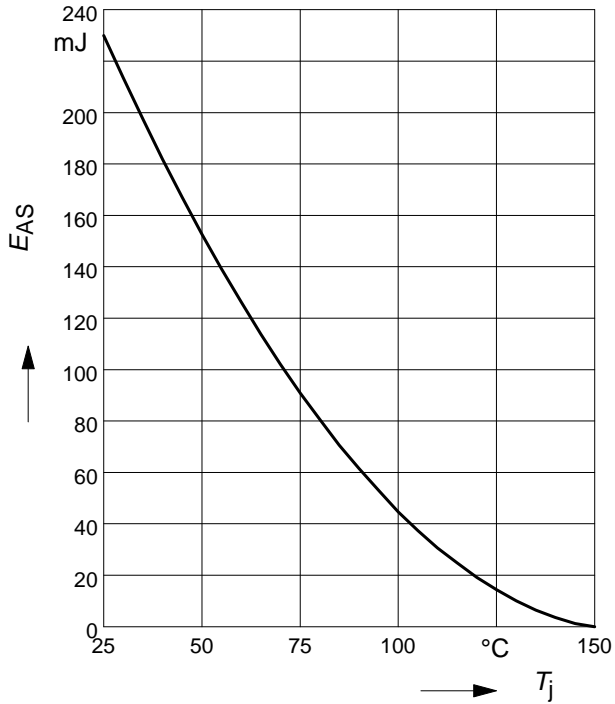
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



**13 Typ. avalanche energy**

$$E_{AS} = f(T_j)$$

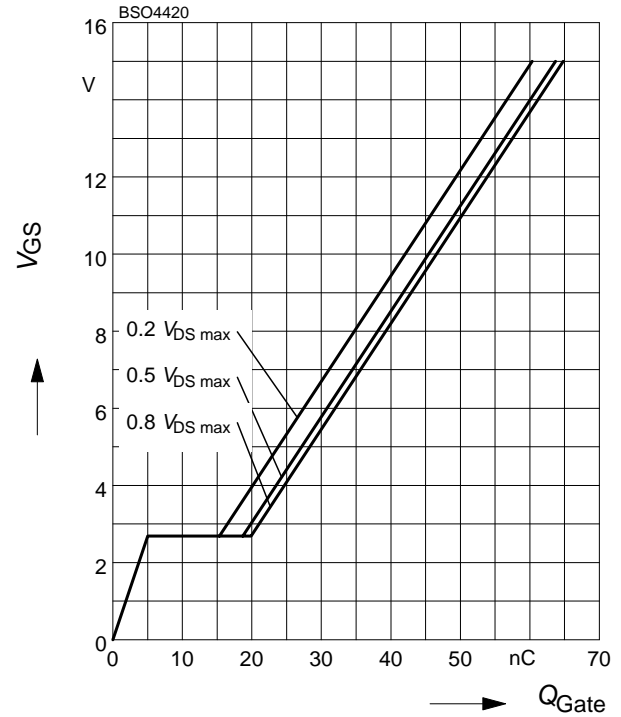
par.:  $I_D = 13\text{ A}$  ,  $V_{DD} = 25\text{ V}$ ,  $R_{GS} = 25\ \Omega$



**14 Typ. gate charge**

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

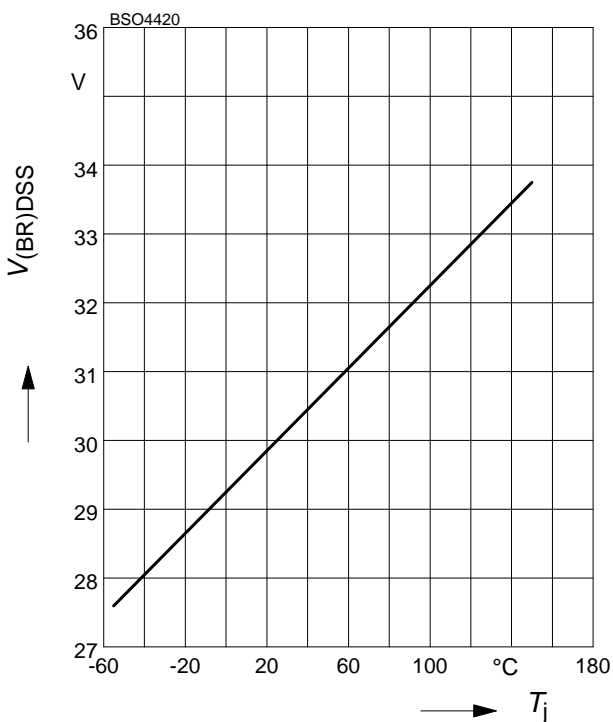
parameter:  $I_D = 13\text{ A}$  pulsed



**15 Drain-source breakdown voltage**

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

parameter:  $I_D = 10\text{ mA}$



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