

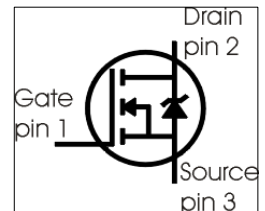
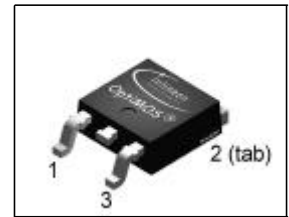
**OptiMOS<sup>®</sup> Buck converter series**
**Feature**

- N-Channel
- Logic Level
- Low On-Resistance  $R_{DS(on)}$
- Excellent Gate Charge x  $R_{DS(on)}$  product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- Avalanche rated
- dv/dt rated
- Ideal for fast switching buck converter

**Product Summary**

|              |     |            |
|--------------|-----|------------|
| $V_{DS}$     | 30  | V          |
| $R_{DS(on)}$ | 5.9 | m $\Omega$ |
| $I_D$        | 50  | A          |

P- TO252 -3-11



| Type      | Package        | Ordering Code | Marking |
|-----------|----------------|---------------|---------|
| IPD06N03L | P- TO252 -3-11 | Q67042-S4109  | 06N03L  |

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

| Parameter                                                                                                                      | Symbol               | Value       | Unit              |
|--------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|-------------------|
| Continuous drain current <sup>1)</sup><br>$T_C=25^\circ\text{C}^1)$                                                            | $I_D$                | 50<br>50    | A                 |
| Pulsed drain current<br>$T_C=25^\circ\text{C}$                                                                                 | $I_{D \text{ puls}}$ | 200         |                   |
| Avalanche energy, single pulse <sup>1)</sup><br>$I_D=20\text{A}$ , $V_{DD}=25\text{V}$ , $R_{GS}=25\Omega$                     | $E_{AS}$             | 250         | mJ                |
| Repetitive avalanche energy, limited by $T_{jmax}^{2)}$                                                                        | $E_{AR}$             | 15          |                   |
| Reverse diode dv/dt<br>$I_S=50\text{A}$ , $V_{DS}=24\text{V}$ , $di/dt=200\text{A}/\mu\text{s}$ , $T_{jmax}=175^\circ\text{C}$ | dv/dt                | 6           | kV/ $\mu\text{s}$ |
| Gate source voltage                                                                                                            | $V_{GS}$             | $\pm 20$    | V                 |
| Power dissipation<br>$T_C=25^\circ\text{C}$                                                                                    | $P_{tot}$            | 150         | W                 |
| Operating and storage temperature                                                                                              | $T_j, T_{stg}$       | -55... +175 | $^\circ\text{C}$  |
| IEC climatic category; DIN IEC 68-1                                                                                            |                      | 55/175/56   |                   |

### Thermal Characteristics

| Parameter                                      | Symbol     | Values |      |      | Unit |
|------------------------------------------------|------------|--------|------|------|------|
|                                                |            | min.   | typ. | max. |      |
| Characteristics                                |            |        |      |      |      |
| Thermal resistance, junction - case            | $R_{thJC}$ | -      | 0.7  | 1    | K/W  |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | -      | -    | 100  |      |
| SMD version, device on PCB:                    | $R_{thJA}$ |        |      |      |      |
| @ min. footprint                               |            | -      | -    | 75   |      |
| @ 6 cm <sup>2</sup> cooling area <sup>3)</sup> |            | -      | -    | 50   |      |

### 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>$V_{GS}=0V, I_D=1mA$                                                                   | $V_{(BR)DSS}$ | 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>$V_{DS}=30V, V_{GS}=0V, T_j=25^{\circ}C$<br>$V_{DS}=30V, V_{GS}=0V, T_j=125^{\circ}C$ | $I_{DSS}$     | -<br>- | 0.01<br>10 | 1<br>100 | $\mu A$ |
| Gate-source leakage current<br>$V_{GS}=20V, V_{DS}=0V$                                                                   | $I_{GSS}$     | -      | 1          | 100      | nA      |
| Drain-source on-state resistance<br>$V_{GS}=4.5V, I_D=30A$                                                               | $R_{DS(on)}$  | -      | 6.8        | 8.7      | mΩ      |
| Drain-source on-state resistance<br>$V_{GS}=10V, I_D=30A$                                                                | $R_{DS(on)}$  | -      | 4.7        | 5.9      |         |

<sup>1</sup>Current limited by bondwire ; with an  $R_{thJC} = 1K/W$  the chip is able to carry  $I_D = 113A$  at  $25^\circ\text{C}$ , for detailed information see app.-note ANPS071E available at [www.infineon.com/optimos](http://www.infineon.com/optimos)

<sup>2</sup>Defined by design. Not subject to production test.

<sup>3</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu m$  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>$I_D = 30A$          | 29 | 58   | -    | S  |
| Input capacitance            | $C_{iss}$    | $V_{GS} = 0V$ , $V_{DS} = 25V$ ,<br>$f = 1MHz$                          | -  | 1900 | 2530 | pF |
| Output capacitance           | $C_{oss}$    |                                                                         | -  | 740  | 990  |    |
| Reverse transfer capacitance | $C_{rss}$    |                                                                         | -  | 180  | 270  |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD} = 15V$ , $V_{GS} = 10V$ ,<br>$I_D = 25A$ ,<br>$R_G = 3.6\Omega$ | -  | 7.3  | 11   | ns |
| Rise time                    | $t_r$        |                                                                         | -  | 19   | 29   |    |
| Turn-off delay time          | $t_{d(off)}$ |                                                                         | -  | 34   | 50   |    |
| Fall time                    | $t_f$        |                                                                         | -  | 20.5 | 30.7 |    |

### Gate Charge Characteristics

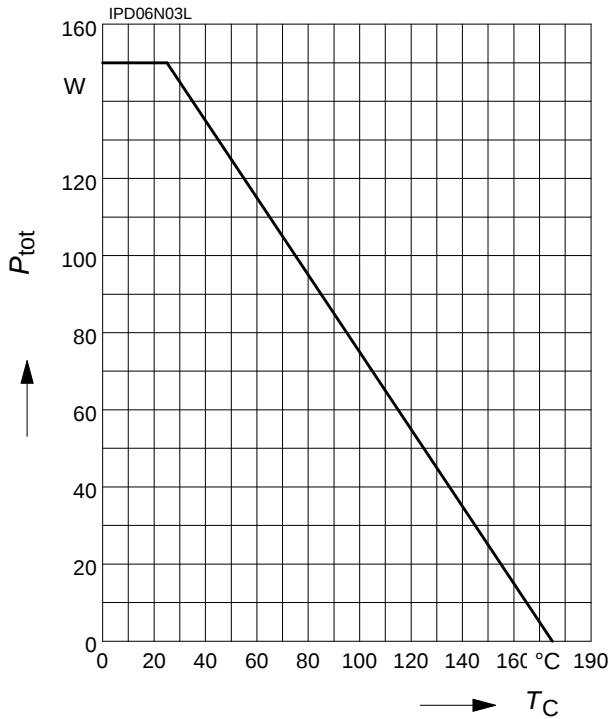
|                       |                 |                                                        |   |      |      |    |
|-----------------------|-----------------|--------------------------------------------------------|---|------|------|----|
| Gate to source charge | $Q_{gs}$        | $V_{DD} = 15V$ , $I_D = 25A$                           | - | 6.3  | 8.4  | nC |
| Gate to drain charge  | $Q_{gd}$        |                                                        | - | 12.3 | 16.4 |    |
| Gate charge total     | $Q_g$           | $V_{DD} = 15V$ , $I_D = 25A$ ,<br>$V_{GS} = 0$ to $5V$ | - | 25.8 | 34.3 |    |
| Output charge         | $Q_{oss}$       | $V_{DS} = 15V$ , $I_D = 25A$ ,<br>$V_{GS} = 0V$        | - | 35.5 | 31.9 | nC |
| Gate plateau voltage  | $V_{(plateau)}$ | $V_{DD} = 15V$ , $I_D = 25A$                           | - | 3.1  | -    | V  |

### Reverse Diode

|                                          |          |                                                       |   |     |     |    |
|------------------------------------------|----------|-------------------------------------------------------|---|-----|-----|----|
| Inverse diode continuous forward current | $I_S$    | $T_C = 25^\circ C$                                    | - | -   | 50  | A  |
| Inv. diode direct current, pulsed        | $I_{SM}$ |                                                       | - | -   | 200 |    |
| Inverse diode forward voltage            | $V_{SD}$ | $V_{GS} = 0V$ , $I_F = 50A$                           | - | 0.9 | 1.2 | V  |
| Reverse recovery time                    | $t_{rr}$ | $V_R = 15V$ , $I_F = I_S$ ,<br>$di_F/dt = 100A/\mu s$ | - | 41  | 51  | ns |
| Reverse recovery charge                  | $Q_{rr}$ |                                                       | - | 46  | 58  | nC |

### 1 Power dissipation

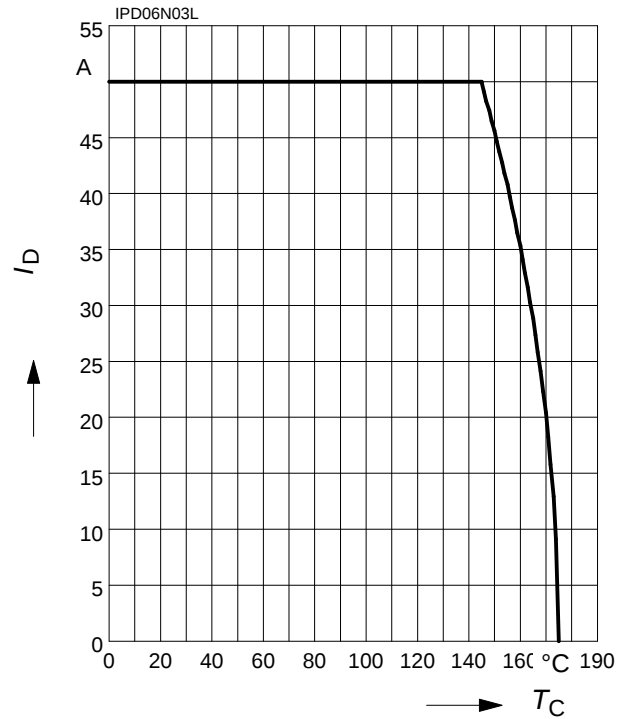
$$P_{\text{tot}} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

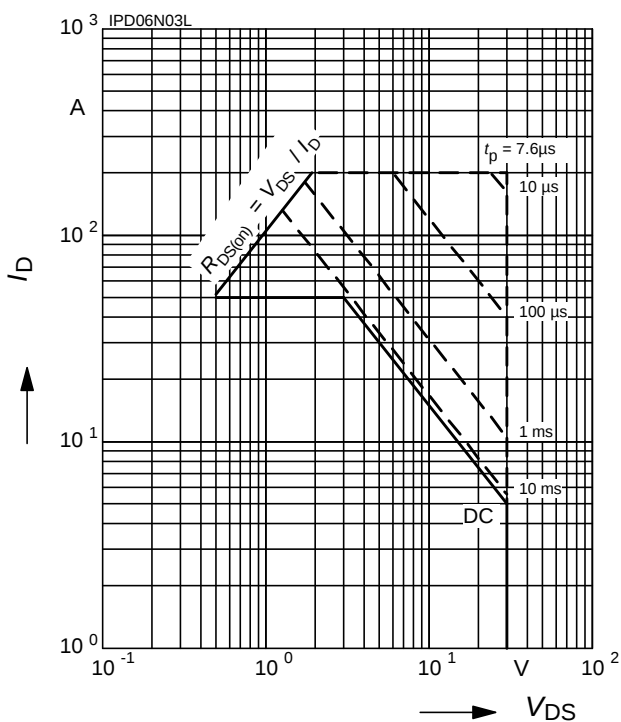
parameter:  $V_{GS} \geq 10$  V



### 3 Safe operating area

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

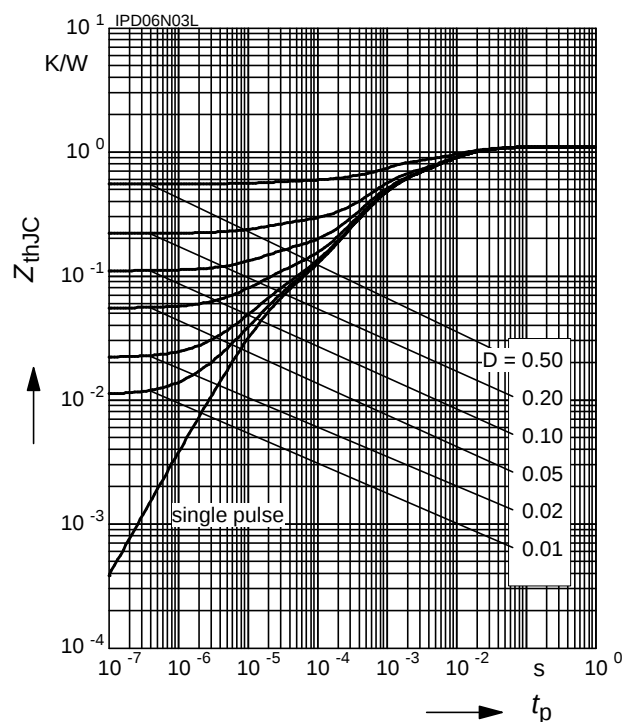
parameter:  $D = 0$ ,  $T_C = 25$  °C



### 4 Max. transient thermal impedance

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

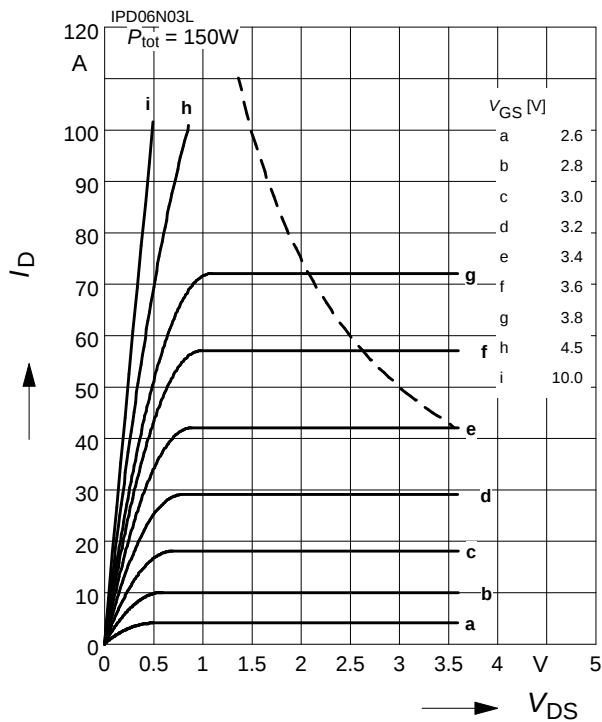
parameter:  $D = t_p / T$



### 5 Typ. output characteristic

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

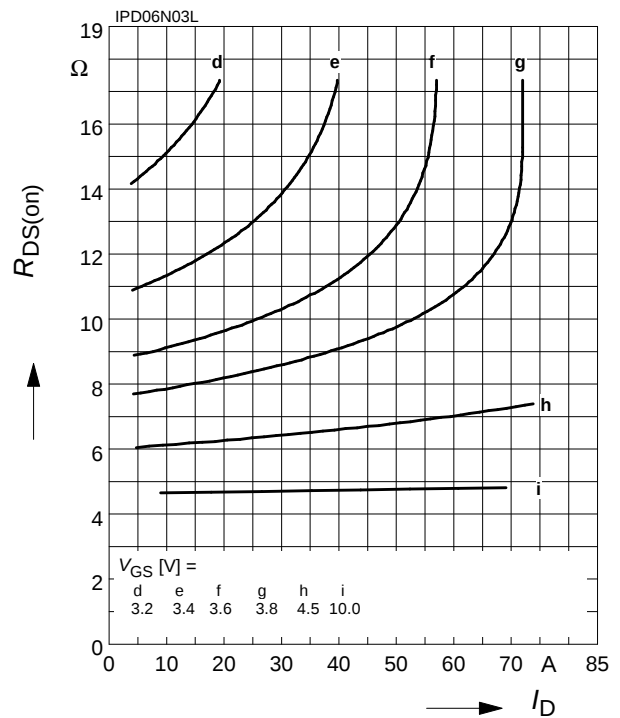
parameter:  $t_p = 80 \mu\text{s}$



### 6 Typ. drain-source on resistance

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

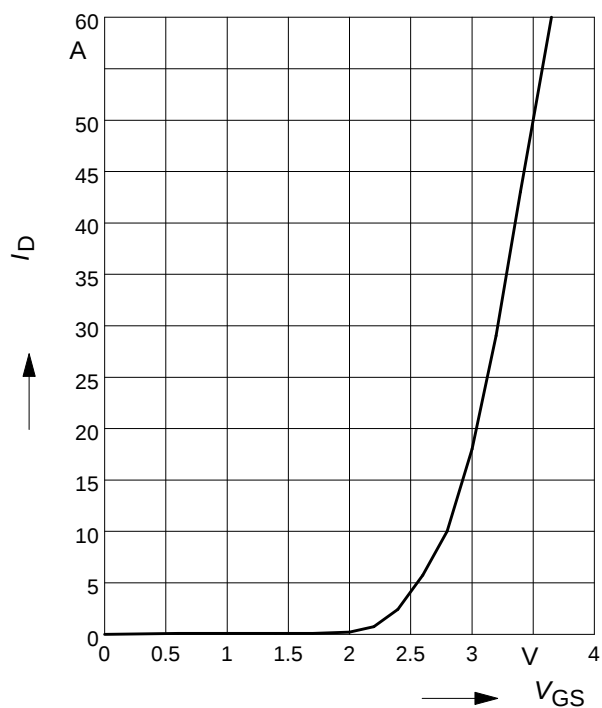
parameter:  $V_{GS}$



### 7 Typ. transfer characteristics

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

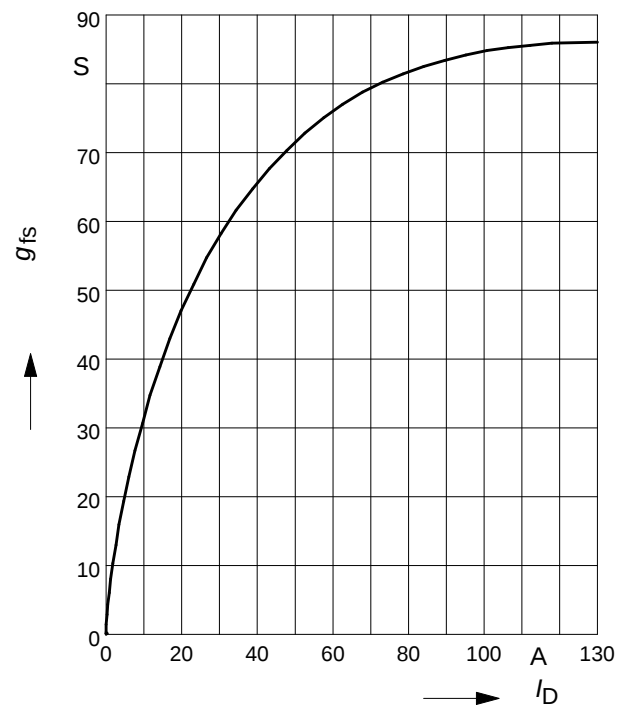
parameter:  $t_p = 80 \mu\text{s}$



### 8 Typ. forward transconductance

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

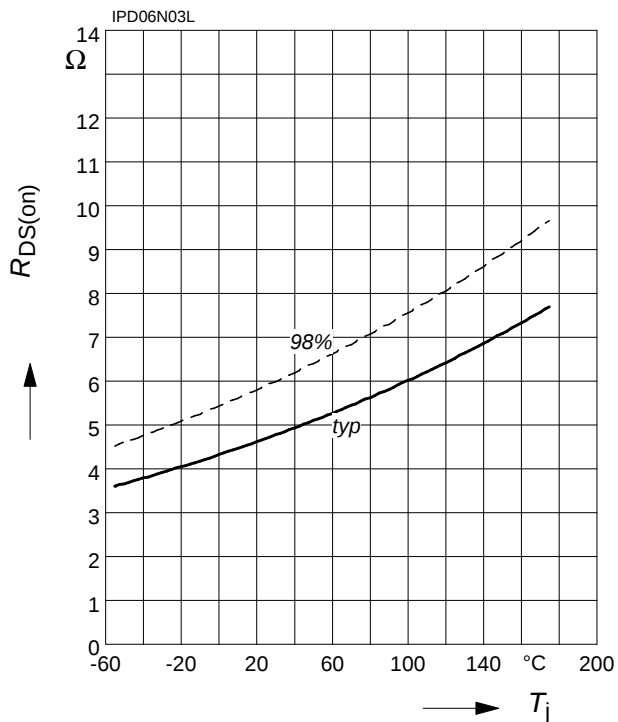
parameter:  $g_{fs}$



### 9 Drain-source on-state resistance

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

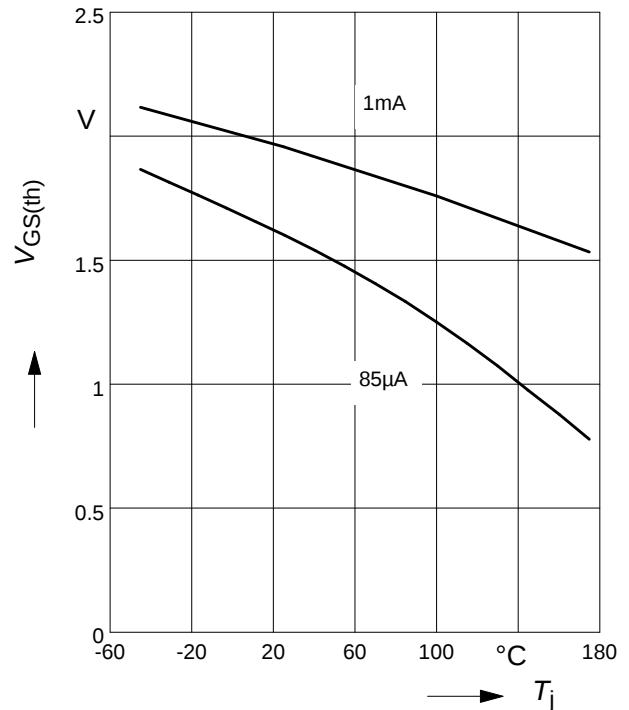
parameter :  $I_D = 30\text{ A}$ ,  $V_{GS} = 10\text{ V}$



### 10 Typ. gate threshold voltage

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

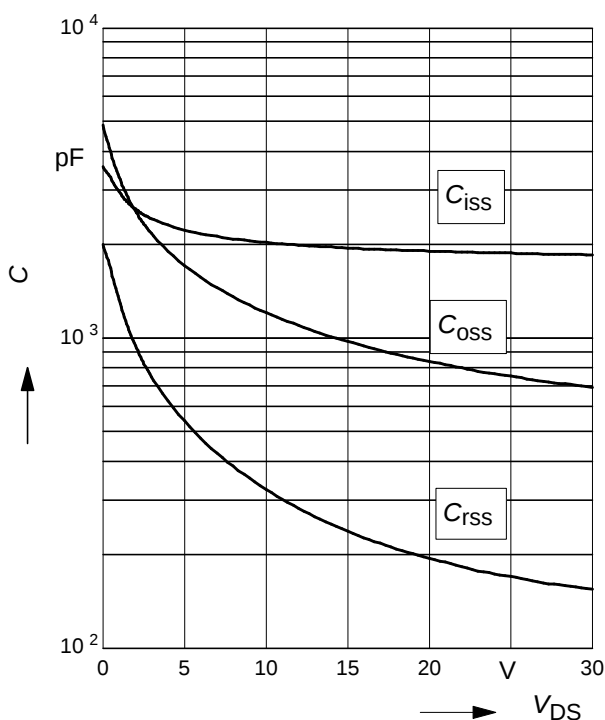
parameter:  $V_{GS} = V_{DS}$



### 11 Typ. capacitances

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

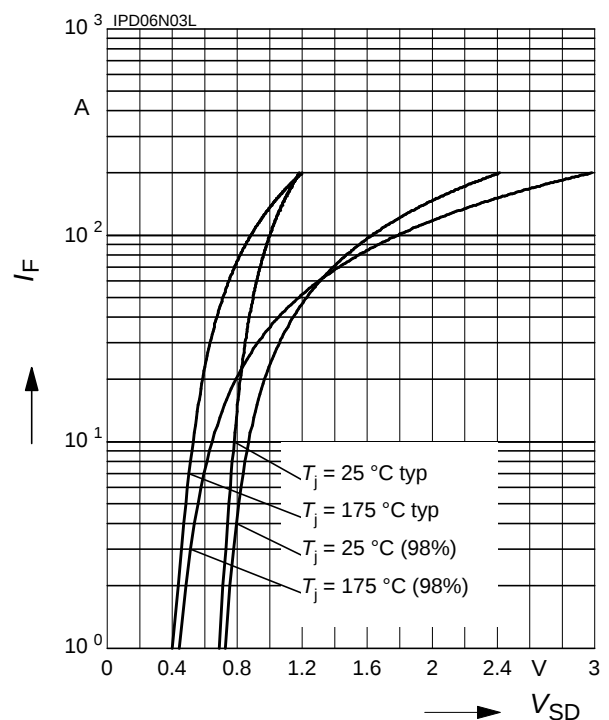
parameter:  $V_{GS} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



### 12 Forward character. of reverse diode

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

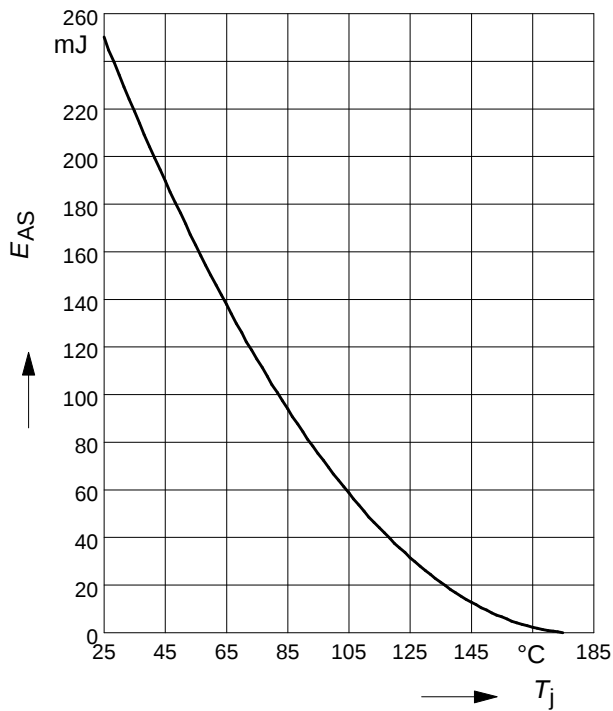
parameter:  $T_j$ ,  $t_p = 80\text{ }\mu\text{s}$



### 13 Typ. avalanche energy

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

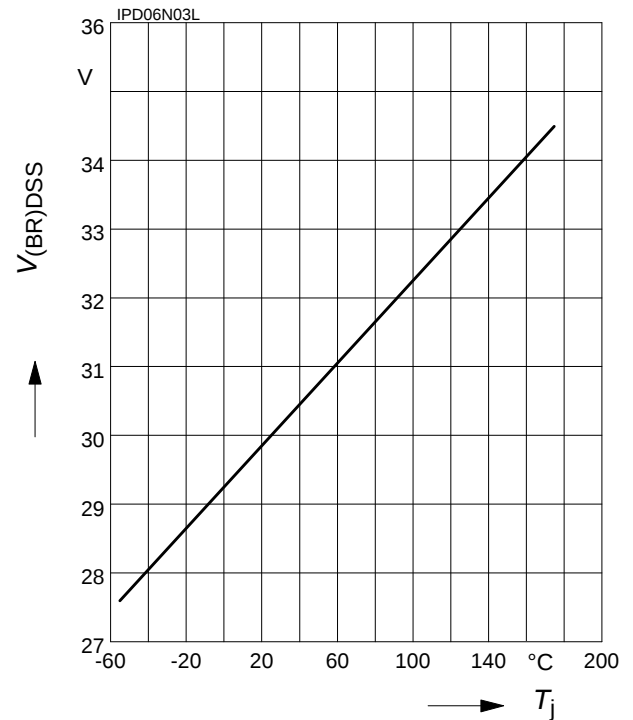
par.:  $I_D = 20\text{ A}$ ,  $V_{DD} = 25\text{ V}$ ,  $R_{GS} = 25\ \Omega$



### 15 Drain-source breakdown voltage

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

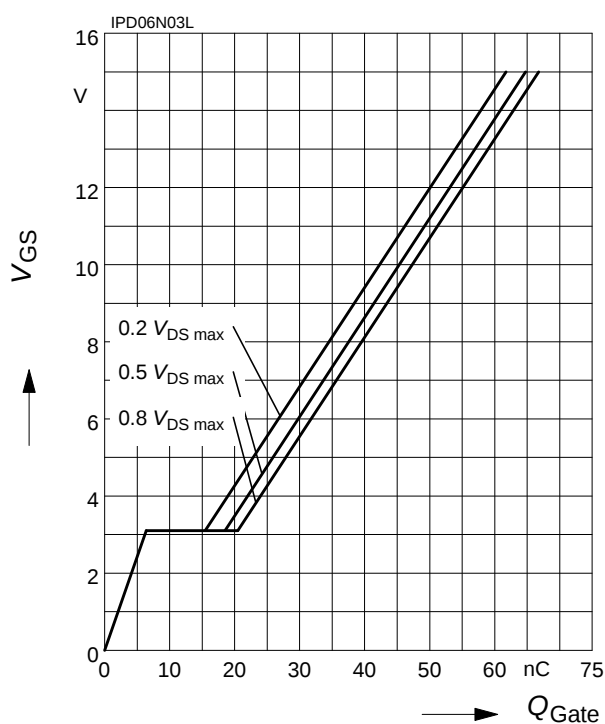
parameter:  $I_D = 10\text{ mA}$



### 14 Typ. gate charge

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

parameter:  $I_D = 25\text{ A pulsed}$



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