

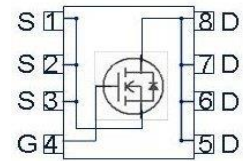
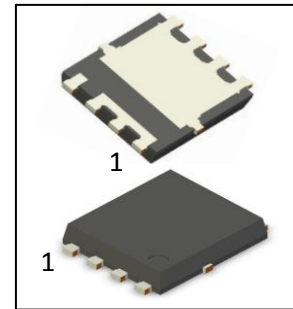
**OptiMOS™ -5 Power-Transistor**

**Product Summary**

|                  |     |            |
|------------------|-----|------------|
| $V_{DS}$         | 40  | V          |
| $R_{DS(on),max}$ | 2.8 | m $\Omega$ |
| $I_D$            | 100 | A          |

**Features**

- OptiMOS™ - power MOSFET for automotive applications
- N-channel - Enhancement mode - Normal Level
- AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green Product (RoHS compliant)
- 100% Avalanche tested

**PG-TDSON-8-34**


| Type            | Package       | Marking |
|-----------------|---------------|---------|
| IPC100N04S5-2R8 | PG-TDSON-8-34 | 5N042R8 |

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

| Parameter                                     | Symbol         | Conditions                                     | Value        | Unit |
|---|----------------|--|--------------|------|
| Continuous drain current <sup>1)</sup>        | $I_D$          | $T_C=25\text{ °C}$ , $V_{GS}=10\text{V}$       | 100          | A    |
|   |                | $T_C=100\text{ °C}$ , $V_{GS}=10\text{V}^{2)}$ | 85           |      |
| Pulsed drain current <sup>2)</sup>            | $I_{D,pulse}$  | $T_C=25\text{ °C}$                             | 400          |      |
| Avalanche energy, single pulse <sup>2)</sup>  | $E_{AS}$       | $I_D=50\text{A}$                               | 66           | mJ   |
| Avalanche current, single pulse <sup>4)</sup> | $I_{AS}$       | -  | 100          | A    |
| Gate source voltage                           | $V_{GS}$       | -  | $\pm 20$     | V    |
| Power dissipation                             | $P_{tot}$      | $T_C=25\text{ °C}$                             | 75           | W    |
| Operating and storage temperature             | $T_j, T_{stg}$ | -  | -55 ... +175 | °C   |

| Parameter                                   | Symbol     | Conditions                                   | Values |      |      | Unit |
|---|------------|--|--------|------|------|------|
|   |            |  | min.   | typ. | max. |      |
| <b>Thermal characteristics<sup>2)</sup></b> |            |  |        |      |      |      |
| Thermal resistance, junction - case         | $R_{thJC}$ | -  | -      | -    | 2    | K/W  |
| Thermal resistance, junction - ambient      | $R_{thJA}$ | 6 cm <sup>2</sup> cooling area <sup>3)</sup> | -      | -    | 50   |      |

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

**Static characteristics**

|                                  |               |   |     |     |     |               |
|----------------------------------|---------------|---|-----|-----|-----|---------------|
| Drain-source breakdown voltage   | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=1\text{mA}$                         | 40  | -   | -   | V             |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=30\mu\text{A}$                  | 2.2 | 2.8 | 3.4 |               |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS}=40V, V_{GS}=0V, T_j=25^\circ\text{C}$       | -   | -   | 1   | $\mu\text{A}$ |
|                                  |               | $V_{DS}=40V, V_{GS}=0V, T_j=125^\circ\text{C}^{2)}$ | -   | -   | 100 |               |
| Gate-source leakage current      | $I_{GSS}$     | $V_{GS}=20V, V_{DS}=0V$                             | -   | -   | 100 | nA            |
| Drain-source on-state resistance | $R_{DS(on)}$  | $V_{GS}=7V, I_D=50\text{A}$                         | -   | 2.8 | 3.4 | m $\Omega$    |
|                                  |               | $V_{GS}=10V, I_D=50\text{A}$                        | -   | 2.3 | 2.8 |               |

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

**Dynamic characteristics<sup>2)</sup>**

|                              |              |  |   |      |      |    |
|------------------------------|--------------|--|---|------|------|----|
| Input capacitance            | $C_{iss}$    | $V_{GS}=0V, V_{DS}=25V,$<br>$f=1MHz$                         | - | 2000 | 2600 | pF |
| Output capacitance           | $C_{oss}$    |  | - | 550  | 730  |    |
| Reverse transfer capacitance | $C_{rss}$    |  | - | 30   | 45   |    |
| Turn-on delay time           | $t_{d(on)}$  | $V_{DD}=20V, V_{GS}=10V,$<br>$I_D=100A, R_{G,ext}=3.5\Omega$ | - | 6    | -    | ns |
| Rise time                    | $t_r$        |  | - | 3    | -    |    |
| Turn-off delay time          | $t_{d(off)}$ |  | - | 11   | -    |    |
| Fall time                    | $t_f$        |  | - | 6    | -    |    |

**Gate Charge Characteristics<sup>2)</sup>**

|                       |               |   |   |     |      |    |
|-----------------------|---------------|---|---|-----|------|----|
| Gate to source charge | $Q_{gs}$      | $V_{DD}=32V, I_D=100A,$<br>$V_{GS}=0 \text{ to } 10V$ | - | 9   | 12   | nC |
| Gate to drain charge  | $Q_{gd}$      |   | - | 7.6 | 11.4 |    |
| Gate charge total     | $Q_g$         |   | - | 34  | 45   |    |
| Gate plateau voltage  | $V_{plateau}$ |   | - | 4.8 | -    | V  |

**Reverse Diode**

|  |               |   |   |     |     |    |
|--|---------------|---|---|-----|-----|----|
| Diode continuous forward current <sup>2)</sup> | $I_S$         | $T_C=25^\circ C$                            | - | -   | 100 | A  |
| Diode pulse current <sup>2)</sup>              | $I_{S,pulse}$ |   | - | -   | 400 |    |
| Diode forward voltage                          | $V_{SD}$      | $V_{GS}=0V, I_F=50A,$<br>$T_j=25^\circ C$   | - | 0.8 | 1.1 | V  |
| Reverse recovery time <sup>2)</sup>            | $t_{rr}$      | $V_R=20V, I_F=50A,$<br>$di_F/dt=100A/\mu s$ | - | 45  | -   | ns |
| Reverse recovery charge <sup>2)</sup>          | $Q_{rr}$      |   | - | 35  | -   | nC |

<sup>1)</sup> Current is limited by package; with an  $R_{thJC} = 2 \text{ K/W}$  the chip is able to carry 120A at 25°C.

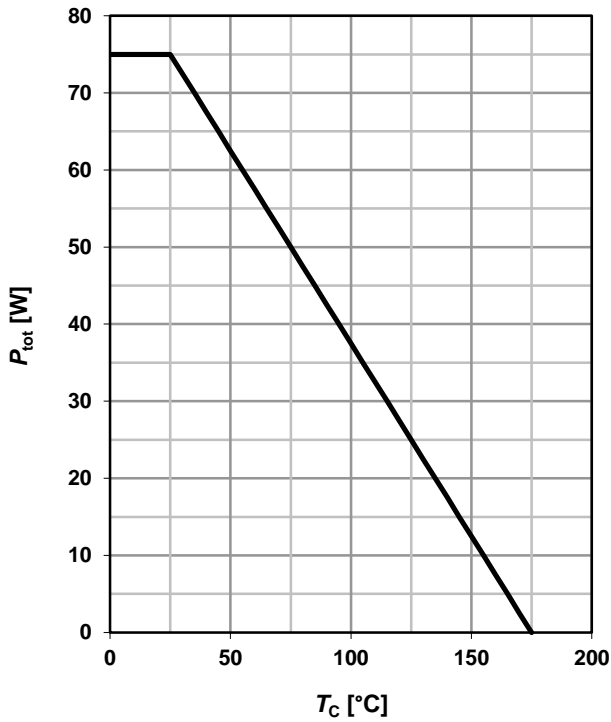
<sup>2)</sup> The parameter is not subject to production test- verified by design/characterization.

<sup>3)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

<sup>4)</sup> The device is tested in production with an avalanche current of 85 A.

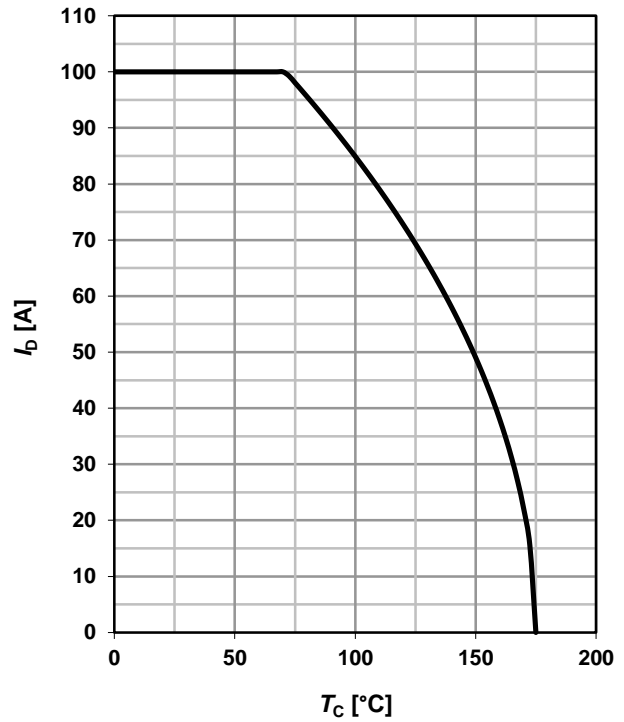
**1 Power dissipation**

$P_{tot} = f(T_C); V_{GS} = 10\text{ V}$



**2 Drain current**

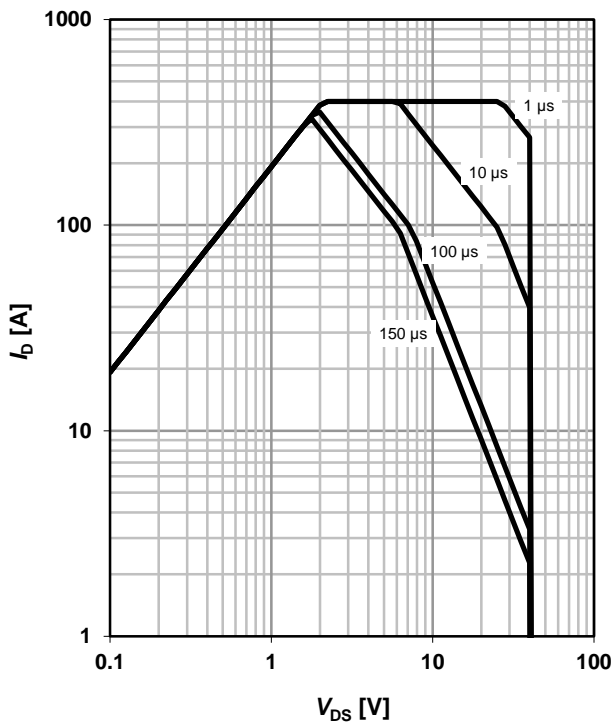
$I_D = f(T_C); V_{GS} = 10\text{ V}$



**3 Safe operating area**

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

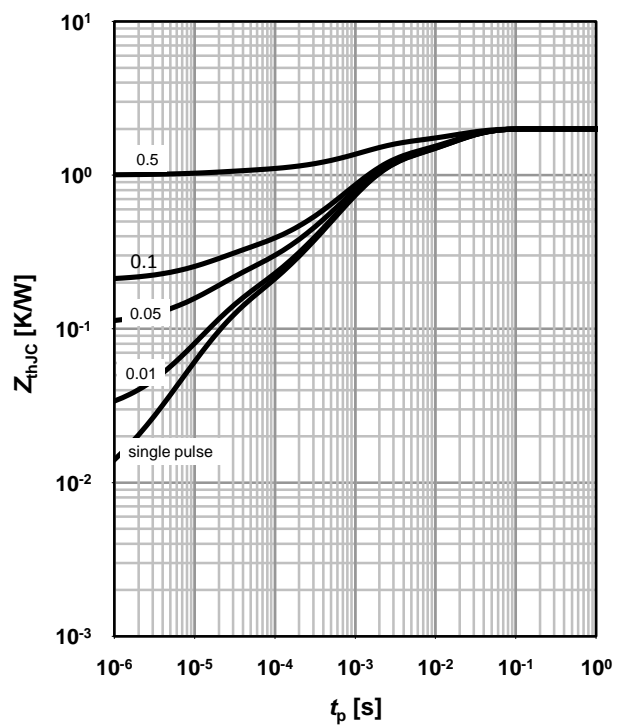
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

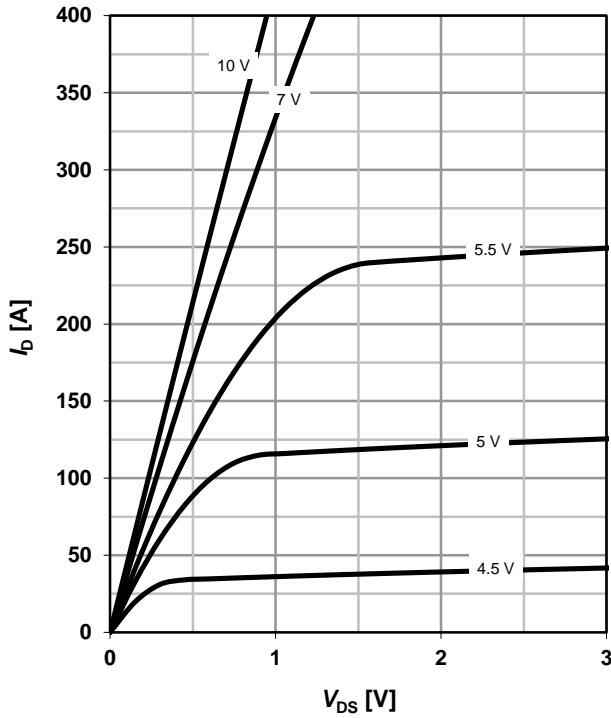
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

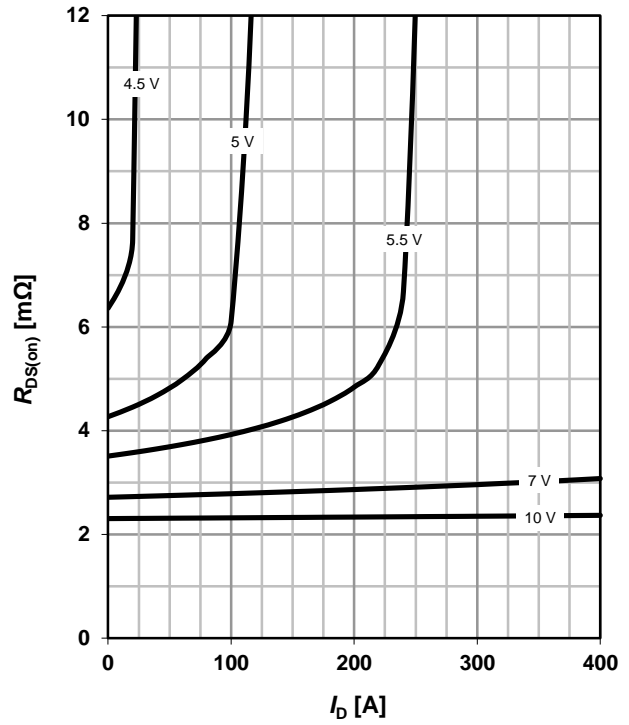
parameter:  $V_{GS}$



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

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

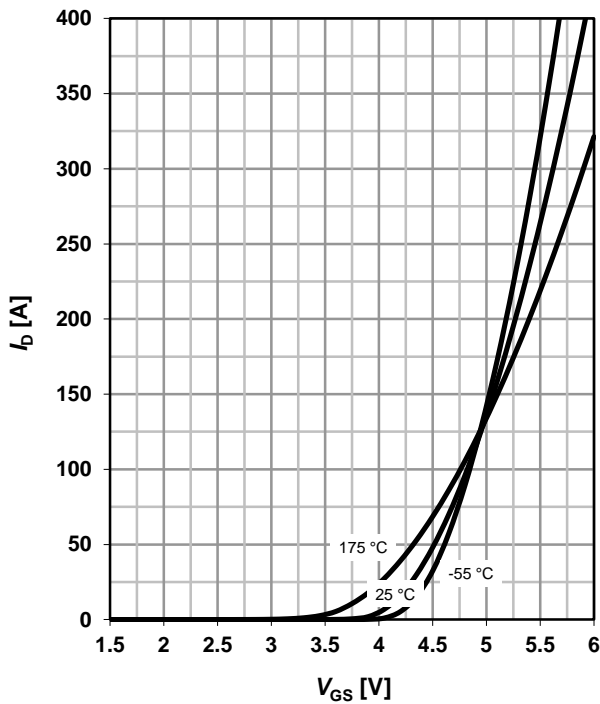
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

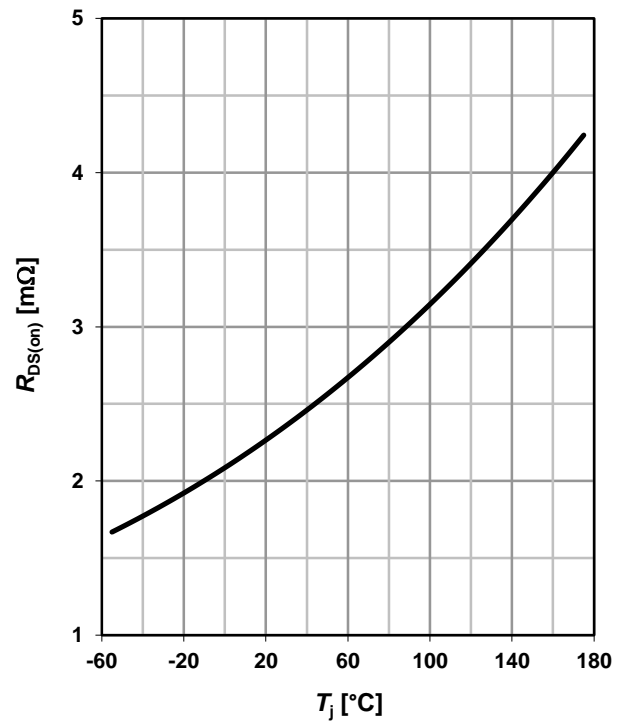
$I_D = f(V_{GS}); V_{DS} = 6\text{ V}$

parameter:  $T_j$



**8 Typ. drain-source on-state resistance**

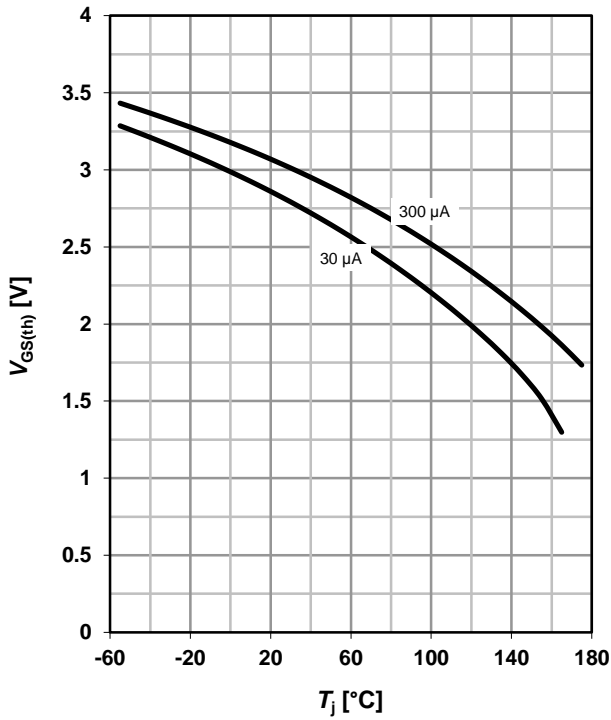
$R_{DS(on)} = f(T_j); I_D = 50\text{ A}; V_{GS} = 10\text{ V}$



**9 Typ. gate threshold voltage**

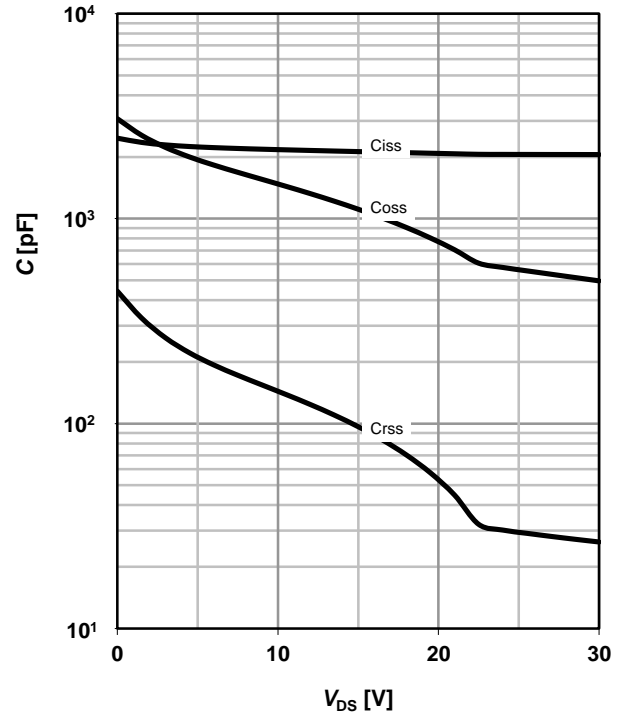
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**10 Typ. capacitances**

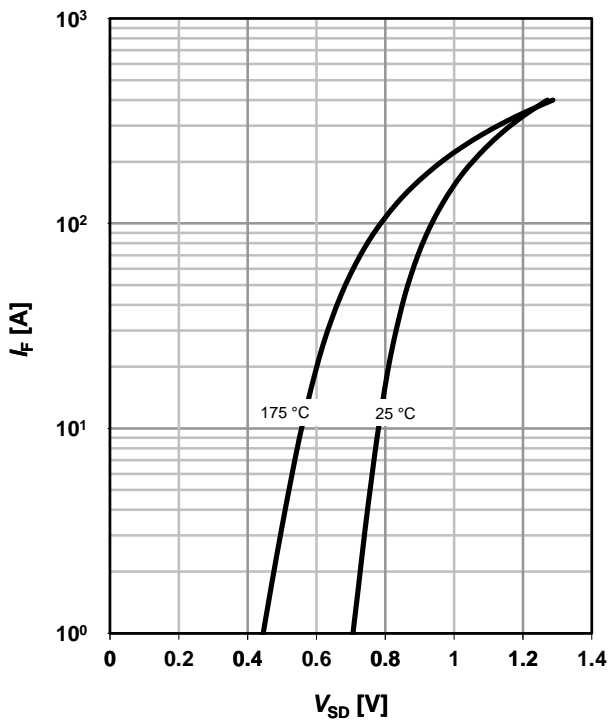
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**11 Typical forward diode characteristics**

$I_F = f(V_{SD})$

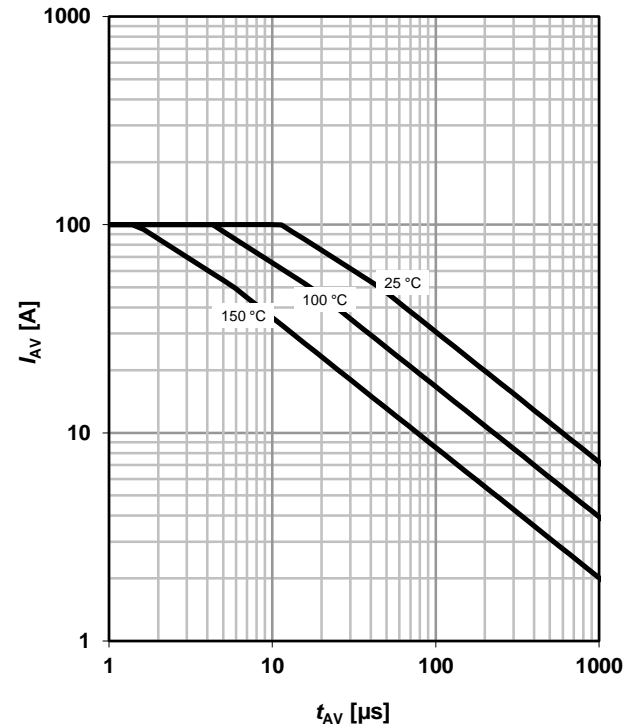
parameter:  $T_j$



**12 Avalanche characteristics**

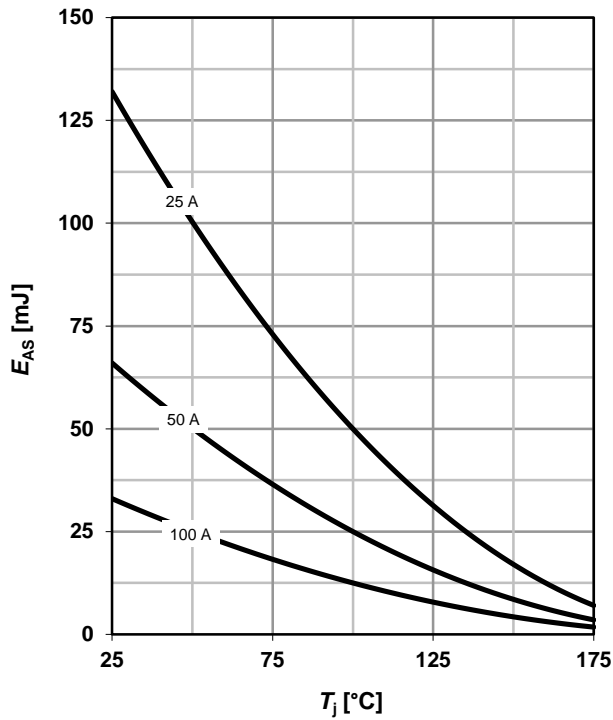
$I_{AS} = f(t_{AV})$

parameter:  $T_{j(start)}$



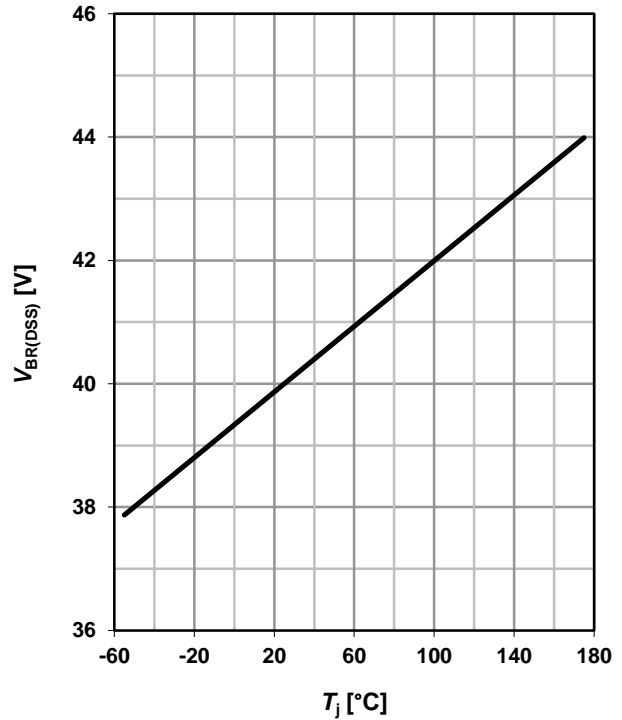
**13 Avalanche energy**

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



**14 Drain-source breakdown voltage**

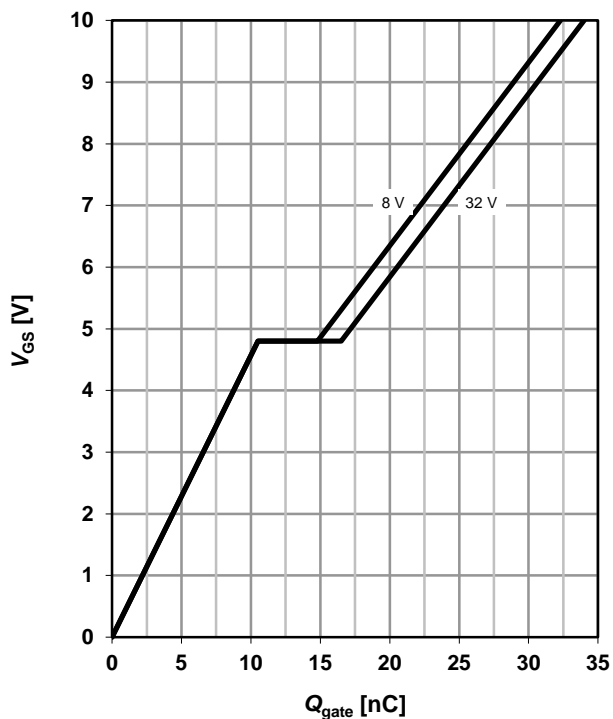
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



**15 Typ. gate charge**

$$V_{GS} = f(Q_{gate}); I_D = 100 \text{ A pulsed}$$

parameter:  $V_{DD}$



**16 Gate charge waveforms**



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## Revision History

| Version      | Date       | Changes          |
|--------------|------------|------------------|
| Revision 1.0 | 06.12.2016 | Final Data Sheet |

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