

OptiMOS™ - 6 Power-Transistor

Product Summary

| | | |
|------------------|-----|------------|
| V_{DS} | 40 | V |
| $R_{DS(on),max}$ | 2.0 | m Ω |
| I_D | 100 | A |

Features

- OptiMOS™ - power MOSFET for automotive applications
- N-channel - Enhancement mode - Logic 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


| Type | Package | Marking |
|------------------|------------|----------|
| IAUC100N04S6L020 | PG-TDSON-8 | 6N04L020 |

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

| Parameter | Symbol | Conditions | Value | Unit |
|--|-------------------|--|--------------|------|
| Continuous drain current ¹⁾ | I_D | $T_C=25\text{ °C}$, $V_{GS}=10\text{V}$ | 100 | A |
| | | $T_C=100\text{ °C}$, $V_{GS}=10\text{V}^{2)}$ | 100 | |
| Pulsed drain current ²⁾ | $I_{D,pulse}$ | $T_C=25\text{ °C}$ | 400 | |
| Avalanche energy, single pulse ²⁾ | E_{AS} | $I_D=20\text{A}$, $R_{G,min}=25\Omega$ | 147 | mJ |
| Avalanche current, single pulse | I_{AS} | $R_{G,min}=25\Omega$ | 20 | A |
| Gate source voltage | V_{GS} | - | ± 16 | 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. | |
| Thermal characteristics²⁾ | | | | | | |
| Thermal resistance, junction - case | R_{thJC} | - | - | - | 2.0 | K/W |
| Thermal resistance, junction - ambient | R_{thJA} | 6 cm ² cooling area ³⁾ | - | - | 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 | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=32\mu\text{A}$ | 1.2 | 1.6 | 2.0 | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS}=40V, V_{GS}=0V, T_j=25^\circ\text{C}$ | - | - | 1 | μA |
| | | $V_{DS}=40V, V_{GS}=0V, T_j=125^\circ\text{C}^{2)}$ | - | - | 10 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=16V, V_{DS}=0V$ | - | - | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}=4.5V, I_D=50A$ | - | 2.26 | 2.70 | m Ω |
| | | $V_{GS}=10V, I_D=50A$ | - | 1.66 | 2.04 | |

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

Dynamic characteristics²⁾

| | | | | | | |
|------------------------------|--------------|--|---|------|------|----|
| Input capacitance | C_{iss} | $V_{GS}=0V, V_{DS}=25V,$ $f=1MHz$ | - | 2111 | 2744 | pF |
| Output capacitance | C_{oss} | | - | 587 | 763 | |
| Reverse transfer capacitance | C_{rss} | | - | 35 | 53 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=20V, V_{GS}=10V,$ $I_D=100A, R_G=3.5\Omega$ | - | 4 | - | ns |
| Rise time | t_r | | - | 2 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 18 | - | |
| Fall time | t_f | | - | 8 | - | |

Gate Charge Characteristics²⁾

| | | | | | | |
|-----------------------|---------------|---|---|-----|------|----|
| Gate to source charge | Q_{gs} | $V_{DD}=32V, I_D=100A,$ $V_{GS}=0 \text{ to } 10V$ | - | 6.6 | 8.7 | nC |
| Gate to drain charge | Q_{gd} | | - | 6.7 | 10.1 | |
| Gate charge total | Q_g | | - | 34 | 46 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 3.1 | - | V |

Reverse Diode

| | | | | | | |
|--|---------------|---|---|-----|-----|----|
| Diode continuous forward current ²⁾ | I_S | $T_C=25^\circ C$ | - | - | 100 | A |
| Diode pulse current ²⁾ | $I_{S,pulse}$ | | - | - | 400 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0V, I_F=50A,$ $T_j=25^\circ C$ | - | 0.8 | 1.1 | V |
| Reverse recovery time ²⁾ | t_{rr} | $V_R=20V, I_F=50A,$ $di_F/dt=100A/\mu s$ | - | 28 | - | ns |
| Reverse recovery charge ²⁾ | Q_{rr} | | - | 15 | - | |

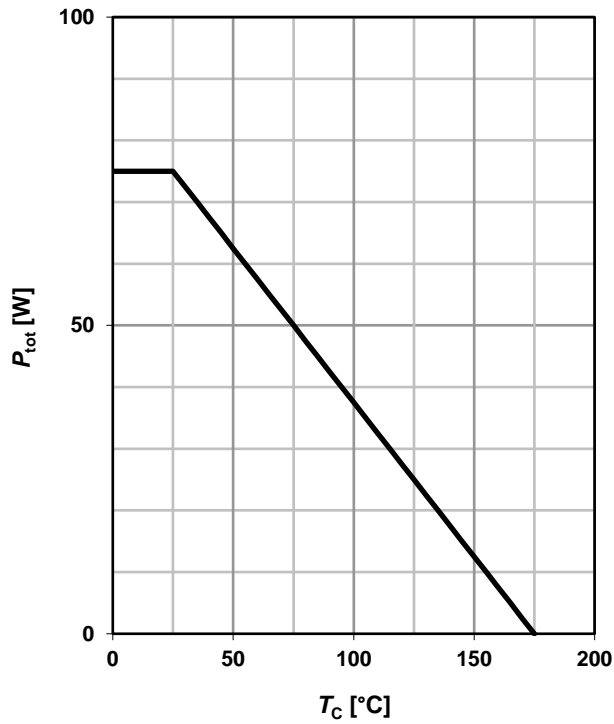
¹⁾ Current is limited by package; with an $R_{thJC} = 2.0 \text{ K/W}$ the chip is able to carry 144 A at 25°C.

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

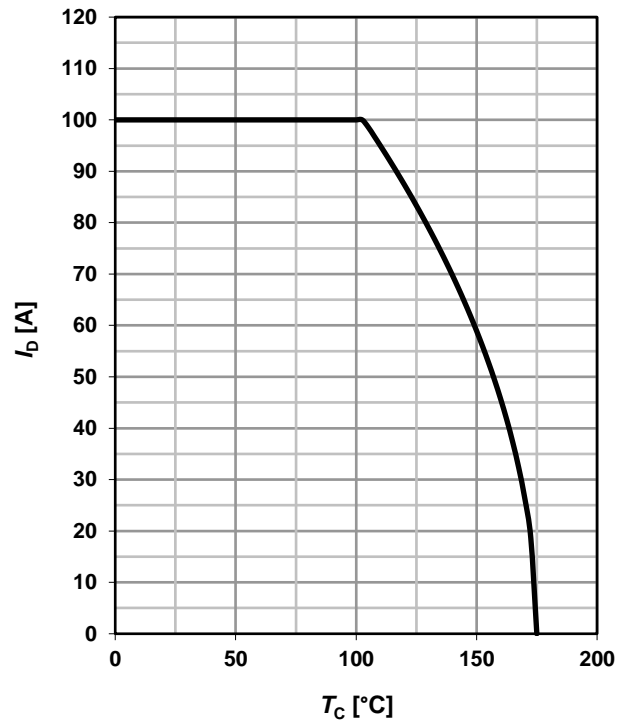
³⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

1 Power dissipation

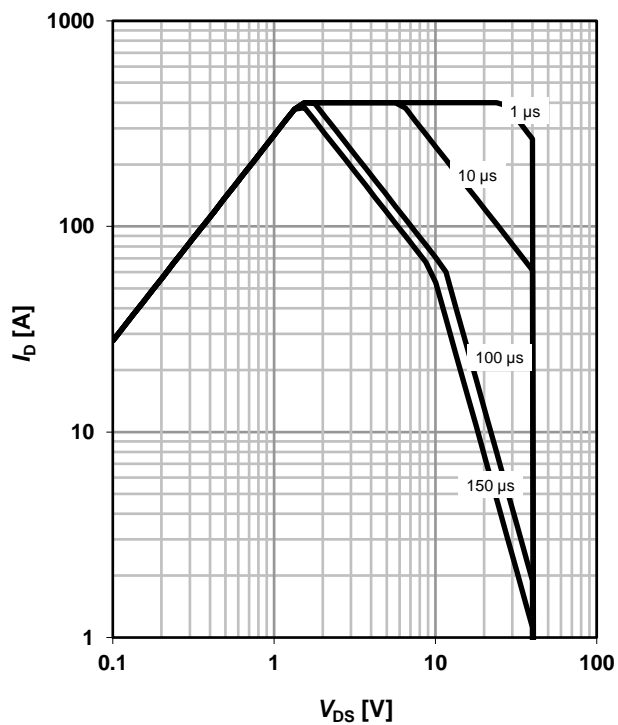
$$P_{\text{tot}} = f(T_C); V_{\text{GS}} = 10 \text{ V}$$


2 Drain current

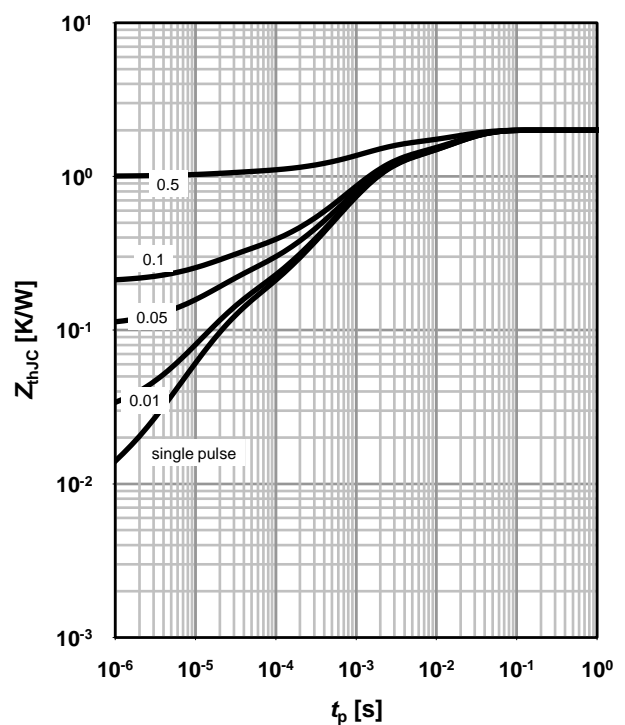
$$I_D = f(T_C); V_{\text{GS}} = 10 \text{ V}$$


3 Safe operating area

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

 parameter: t_p

4 Max. transient thermal impedance

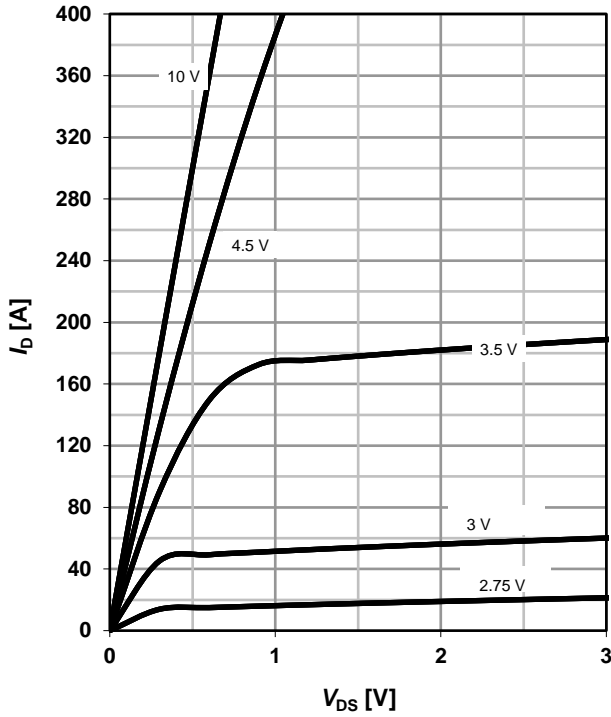
$$Z_{\text{thJC}} = f(t_p)$$

 parameter: $D = t_p/T$


5 Typ. output characteristics

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

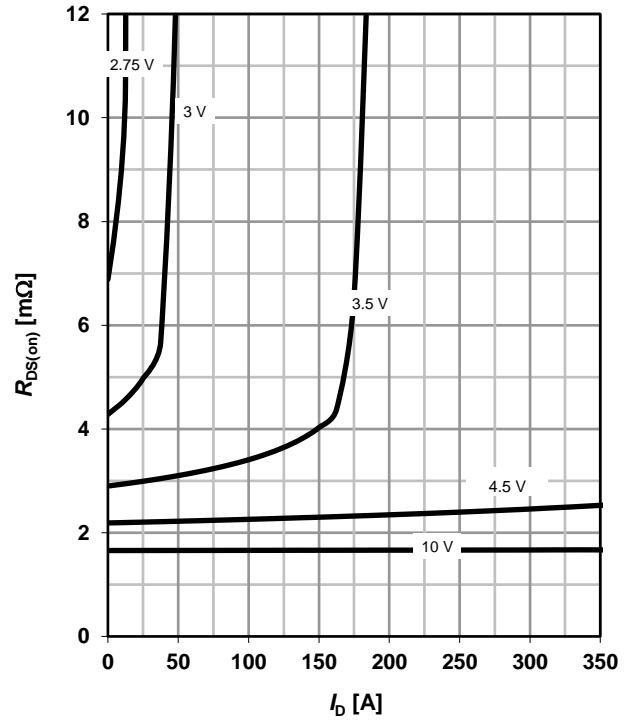
parameter: V_{GS}



6 Typ. drain-source on-state resistance

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

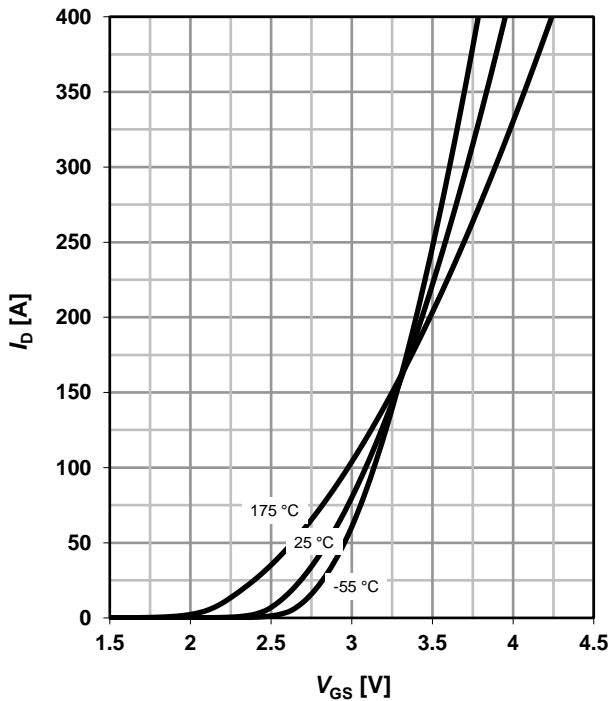
parameter: V_{GS}



7 Typ. transfer characteristics

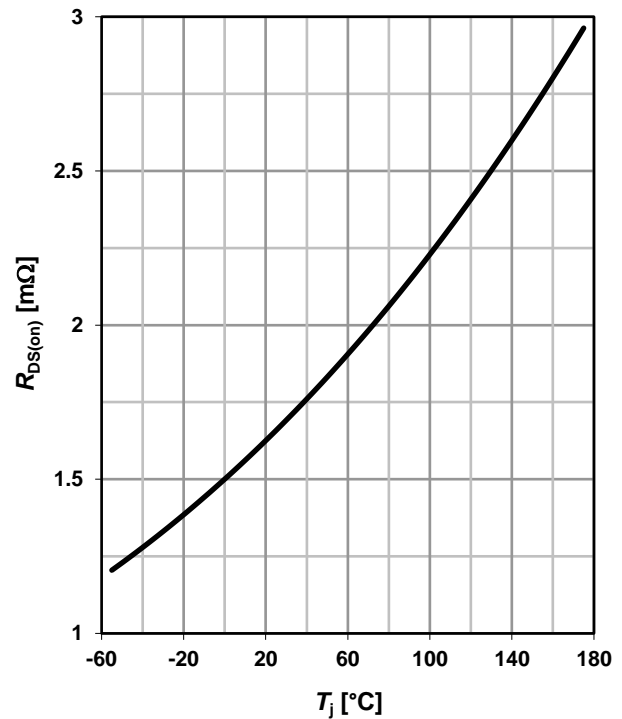
$I_D = f(V_{GS}); V_{DS} = 6\text{ V}$

parameter: T_j



8 Typ. drain-source on-state resistance

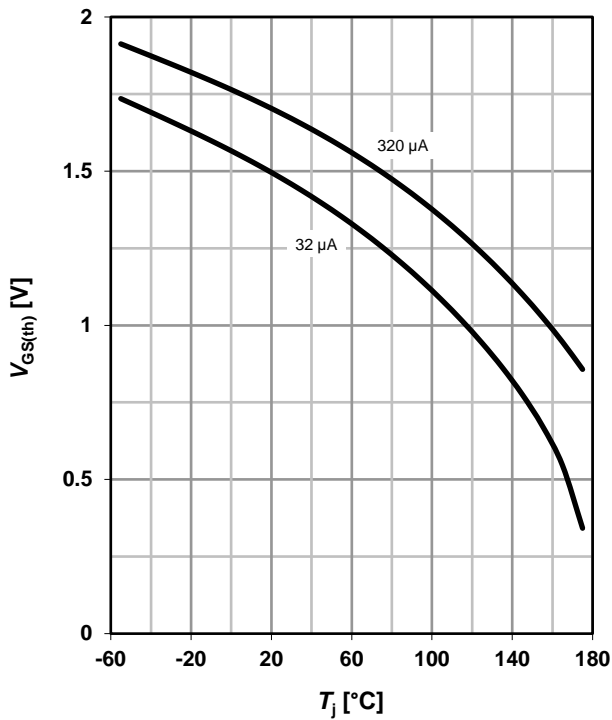
$R_{DS(on)} = f(T_j); I_D = 50\text{ A}; V_{GS} = 10\text{ V}$



9 Typ. gate threshold voltage

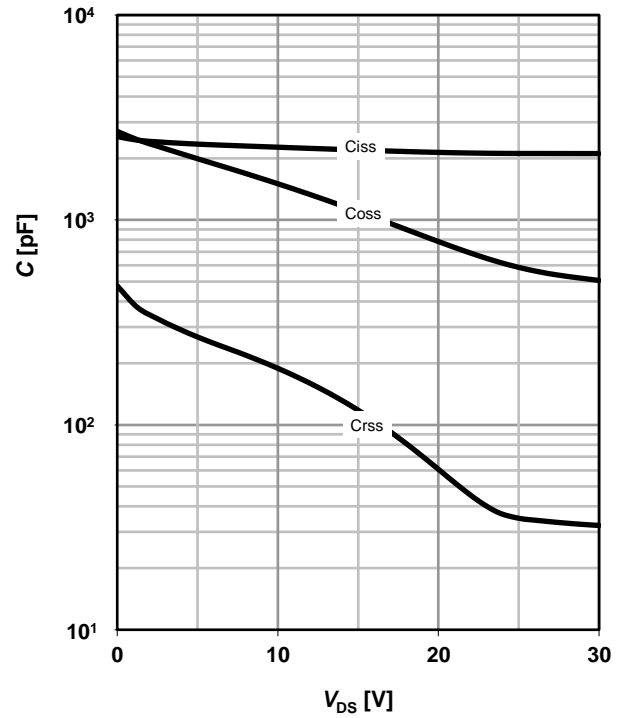
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter: I_D



10 Typ. capacitances

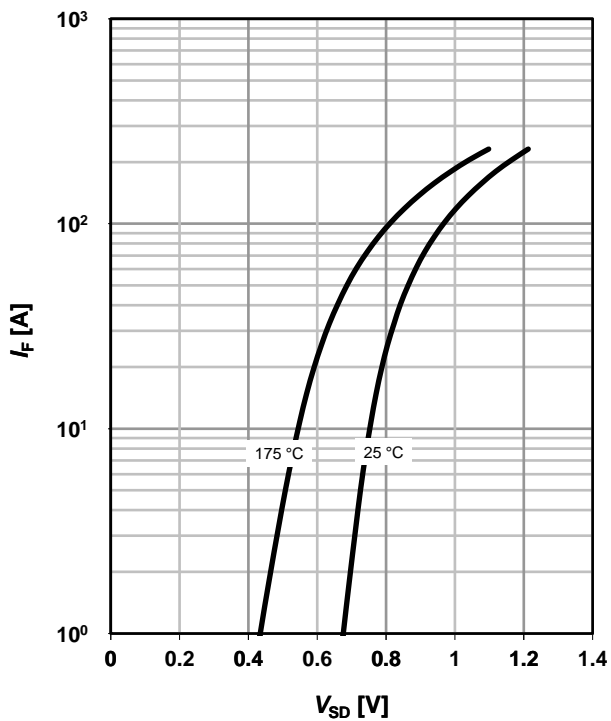
$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$



11 Typical forward diode characteristics

$I_F = f(V_{SD})$

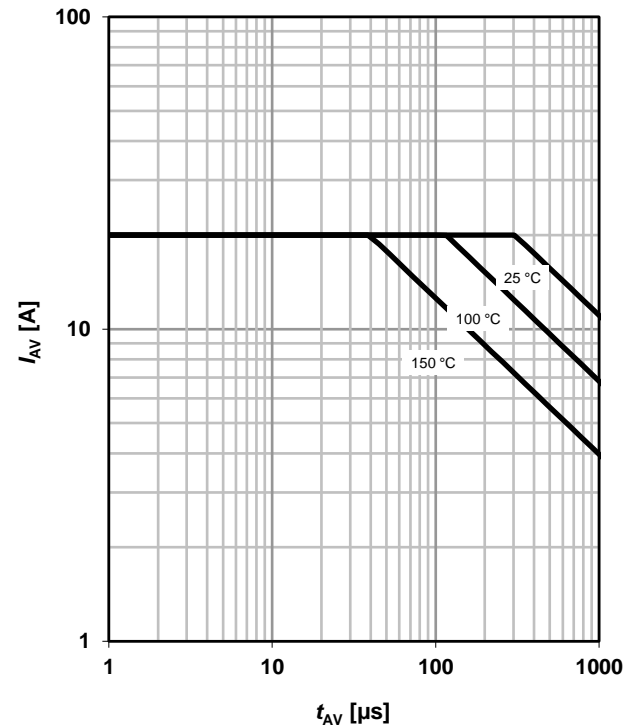
parameter: T_j



12 Avalanche characteristics

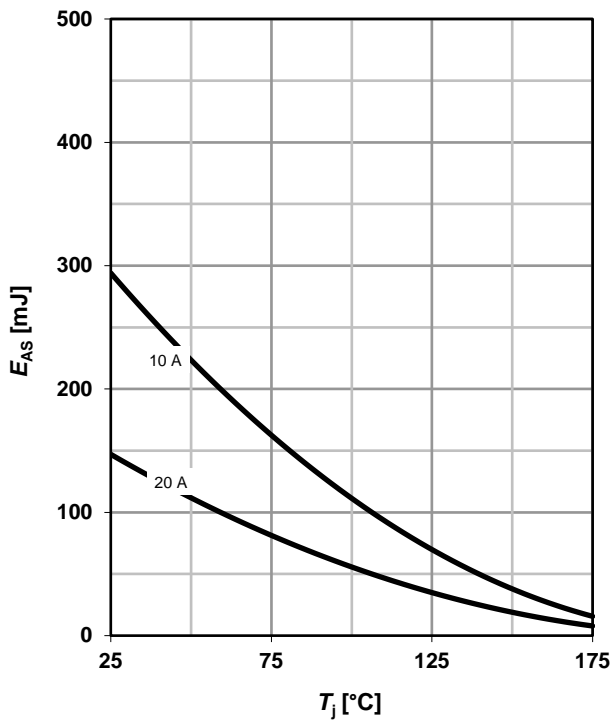
$I_{AS} = f(t_{AV})$

parameter: $T_{j(start)}$

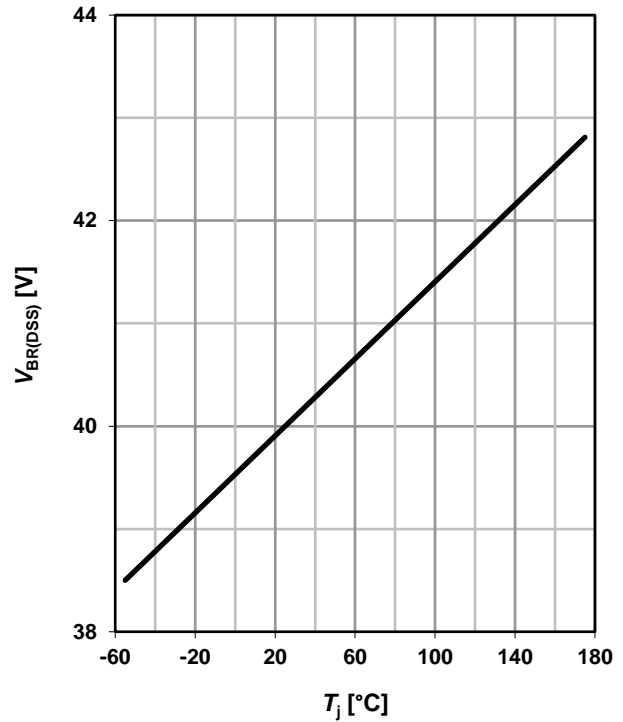


13 Avalanche energy

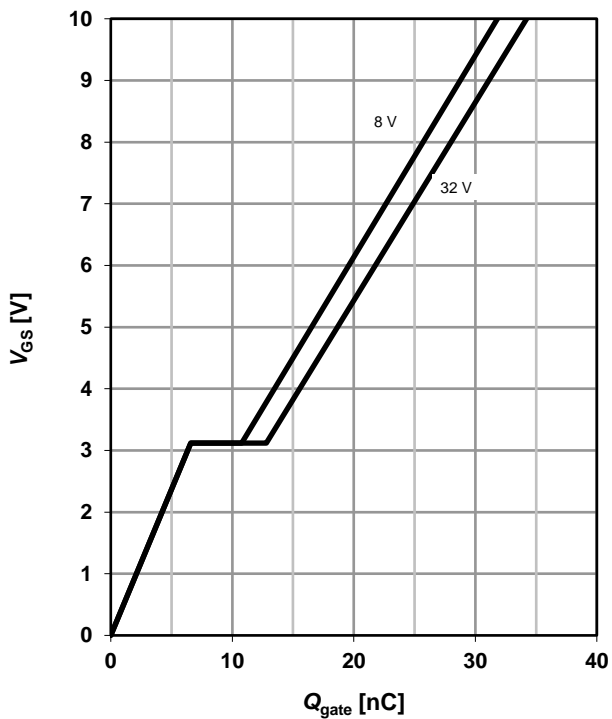
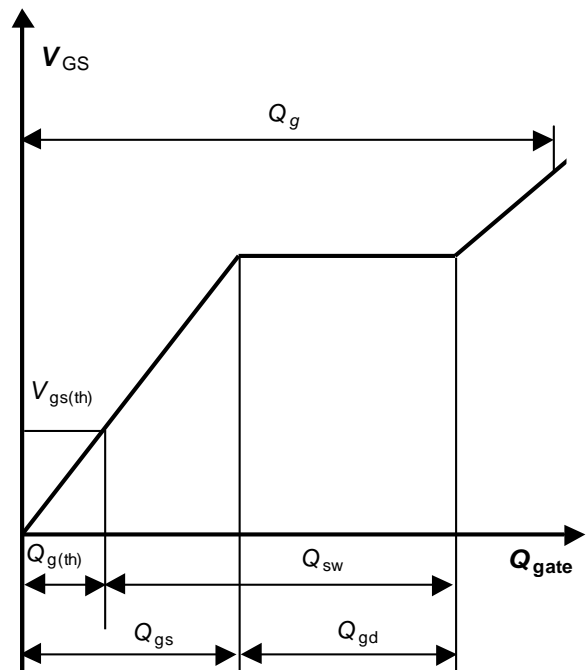
$$E_{AS} = f(T_j)$$


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 |
|---------|------|---------|
| | | |
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| | | |

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