

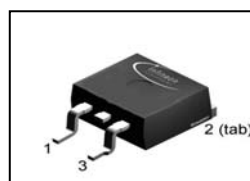
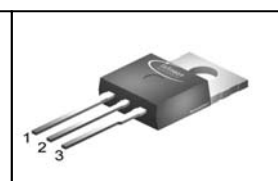
OptiMOS[®] Power-Transistor

Features

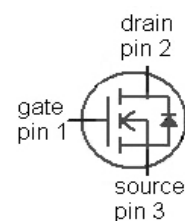
- N-channel - Enhancement mode
- Automotive AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- **Green package (lead free)**
- Ultra low R_{ds(on)}
- 100% Avalanche tested

Product Summary

| | | |
|--------------------------------|------|----|
| V_{DS} | 55 | V |
| $R_{DS(on),max}$ (SMD version) | 11.7 | mΩ |
| I_D | 77 | A |

PG-TO263-3-2

PG-TO220-3-1


| Type | Package | Ordering Code | Marking |
|---------------|--------------|---------------|---------|
| IPB77N06S2-12 | PG-TO263-3-2 | SP0002-18173 | 2N0612 |
| IPP77N06S2-12 | PG-TO220-3-1 | SP0002-18172 | 2N0612 |



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

| Parameter | Symbol | Conditions | Value | Unit |
|--|-------------------|--|--------------|------|
| Continuous drain current ¹⁾ | I_D | $T_C=25\text{ °C}$, $V_{GS}=10\text{ V}$ | 77 | A |
| | | $T_C=100\text{ °C}$, $V_{GS}=10\text{ V}^{2)}$ | 56 | |
| Pulsed drain current ²⁾ | $I_{D,pulse}$ | $T_C=25\text{ °C}$ | 308 | |
| Avalanche energy, single pulse ²⁾ | E_{AS} | $I_D=77\text{ A}$ | 280 | mJ |
| Gate source voltage ⁴⁾ | V_{GS} | | ±20 | V |
| Power dissipation | P_{tot} | $T_C=25\text{ °C}$ | 158 | W |
| Operating and storage temperature | T_j , T_{stg} | | -55 ... +175 | °C |
| IEC climatic category; DIN IEC 68-1 | | | 55/175/56 | |

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

Thermal characteristics²⁾

| | | | | | | |
|--|------------|--|---|---|------|-----|
| Thermal resistance, junction - case | R_{thJC} | | - | - | 0.95 | K/W |
| Thermal resistance, junction - ambient, leaded | R_{thJA} | | - | - | 62 | |
| SMD version, device on PCB | R_{thJA} | minimal footprint | - | - | 62 | |
| | | 6 cm ² cooling area ⁵⁾ | - | - | 40 | |

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

Static characteristics

| | | | | | | |
|----------------------------------|---------------|---|-----|------|------|---------------|
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}=0\text{ V}, I_D=1\text{ mA}$ | 55 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=93\text{ }\mu\text{A}$ | 2.1 | 3.0 | 4.0 | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$ | - | 0.01 | 1 | μA |
| | | $V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}^{2)}$ | - | 1 | 100 | |
| Gate-source leakage current | I_{GSS} | $V_{GS}=20\text{ V}, V_{DS}=0\text{ V}$ | - | 1 | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}=10\text{ V}, I_D=38\text{ A},$ | - | 9.8 | 12.0 | m Ω |
| | | $V_{GS}=10\text{ V}, I_D=38\text{ A},$ SMD version | - | 9.5 | 11.7 | |

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

Dynamic characteristics²⁾

| | | | | | | |
|------------------------------|--------------|---|---|------|---|----|
| Input capacitance | C_{iss} | $V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$ | - | 1770 | - | pF |
| Output capacitance | C_{oss} | | - | 460 | - | |
| Reverse transfer capacitance | C_{rss} | | - | 120 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$ $I_D=77\text{ A}, R_G=6.2\ \Omega$ | - | 14 | - | ns |
| Rise time | t_r | | - | 27 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 34 | - | |
| Fall time | t_f | | - | 26 | - | |

Gate Charge Characteristics²⁾

| | | | | | | |
|-----------------------|---------------|--|---|-----|----|----|
| Gate to source charge | Q_{gs} | $V_{DD}=44\text{ V}, I_D=77\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$ | - | 9 | 12 | nC |
| Gate to drain charge | Q_{gd} | | - | 18 | 28 | |
| Gate charge total | Q_g | | - | 45 | 60 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 5.6 | - | V |

Reverse Diode

| | | | | | | |
|--|---------------|---|---|-----|-----|----|
| Diode continuous forward current ²⁾ | I_S | $T_C=25\text{ °C}$ | - | - | 77 | A |
| Diode pulse current ²⁾ | $I_{S,pulse}$ | | - | - | 308 | |
| Diode forward voltage | V_{SD} | $V_{GS}=0\text{ V}, I_F=77\text{ A},$ $T_J=25\text{ °C}$ | - | 0.9 | 1.3 | V |
| Reverse recovery time ²⁾ | t_{rr} | $V_R=30\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$ | - | 45 | 60 | ns |
| Reverse recovery charge ²⁾ | Q_{rr} | | - | 64 | 80 | |

¹⁾ Current is limited by die area; with an $R_{thJC} = 0.95\text{ K/W}$ the chip is able to carry 77 A at 25°C. For detailed information see Application Note ANPS071E at www.infineon.com/optimos

²⁾ Defined by design. Not subject to production test.

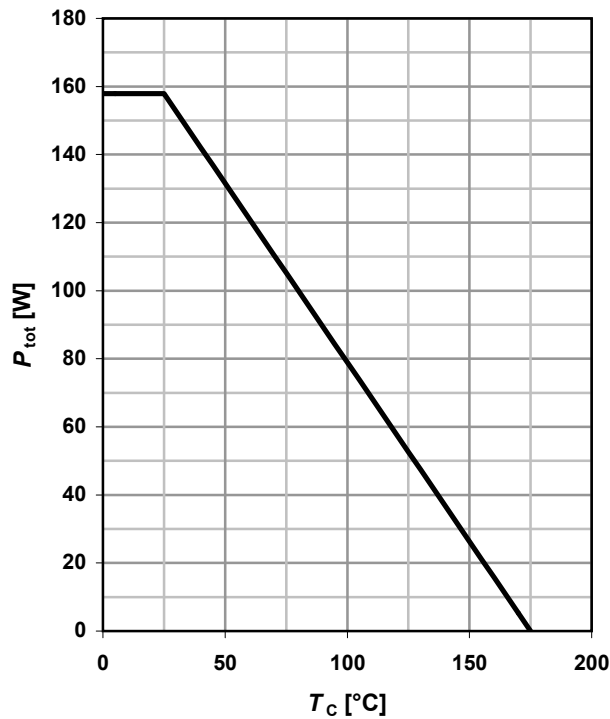
³⁾ See diagram 13.

⁴⁾ Qualified at -20V and +20V.

⁵⁾ 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.

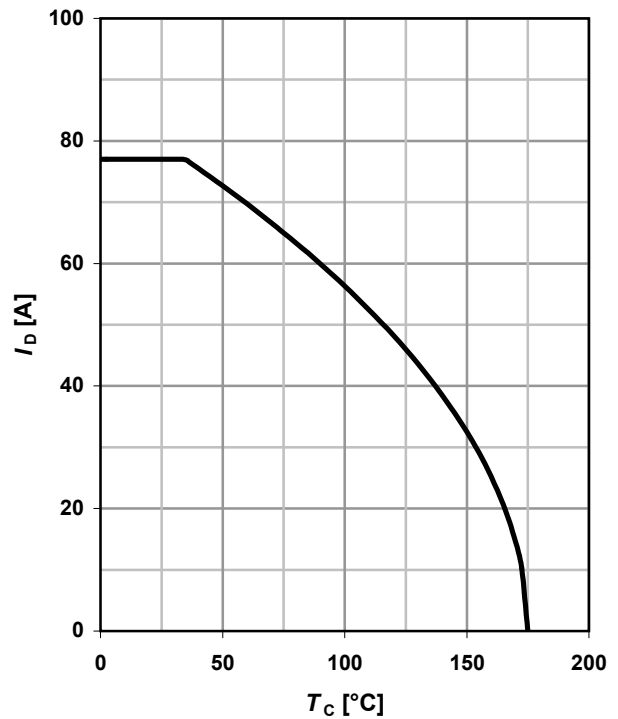
1 Power dissipation

$$P_{\text{tot}} = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



2 Drain current

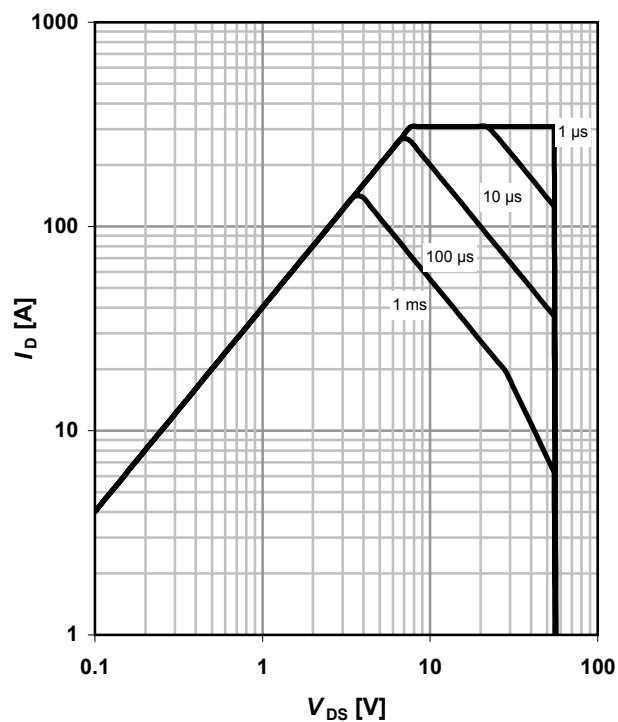
$$I_D = f(T_C); V_{\text{GS}} \geq 10 \text{ V}$$



3 Safe operating area

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

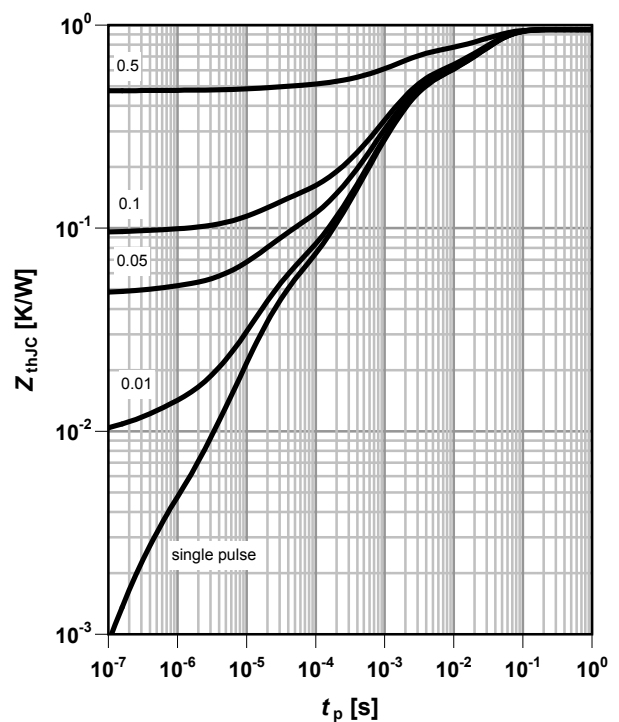
parameter: t_p



4 Max. transient thermal impedance

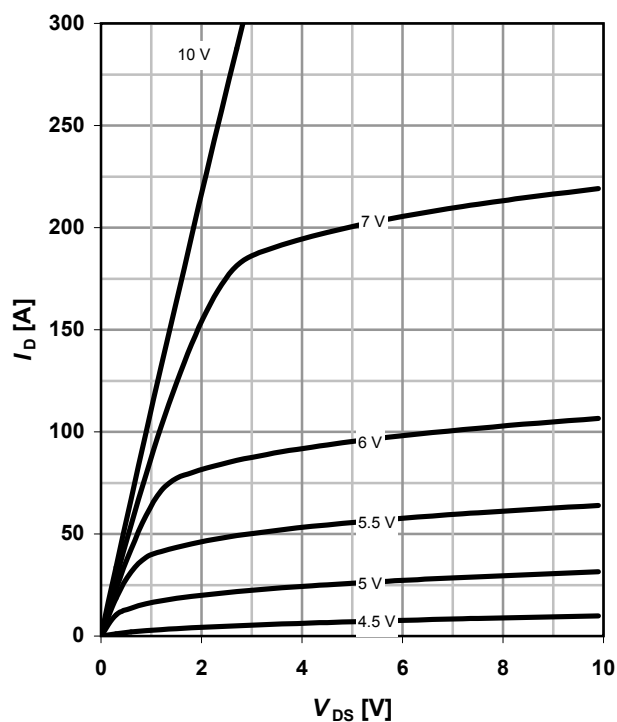
$$Z_{\text{thJC}} = f(t_p)$$

parameter: $D = t_p/T$



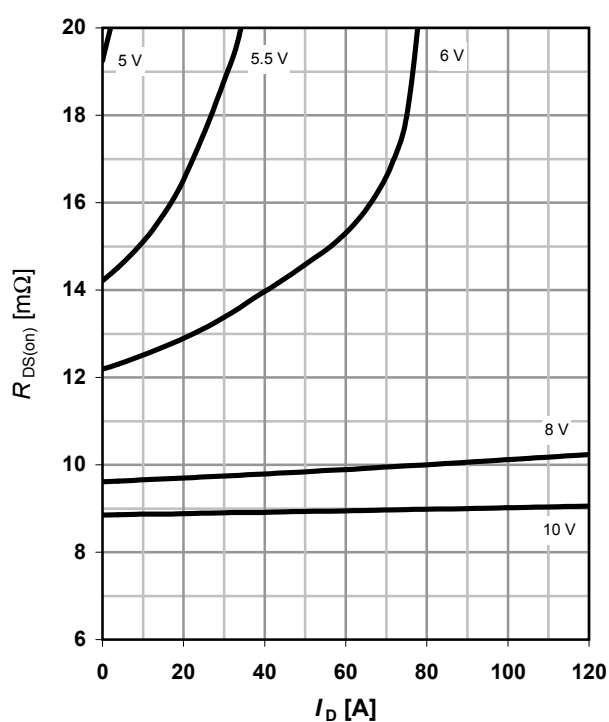
5 Typ. output characteristics

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

parameter: V_{GS}


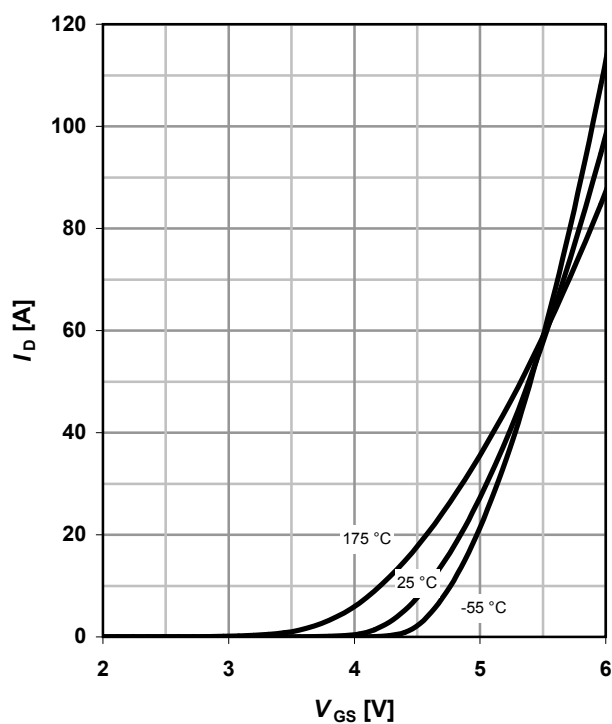
6 Typ. drain-source on-state resistance

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

parameter: V_{GS}


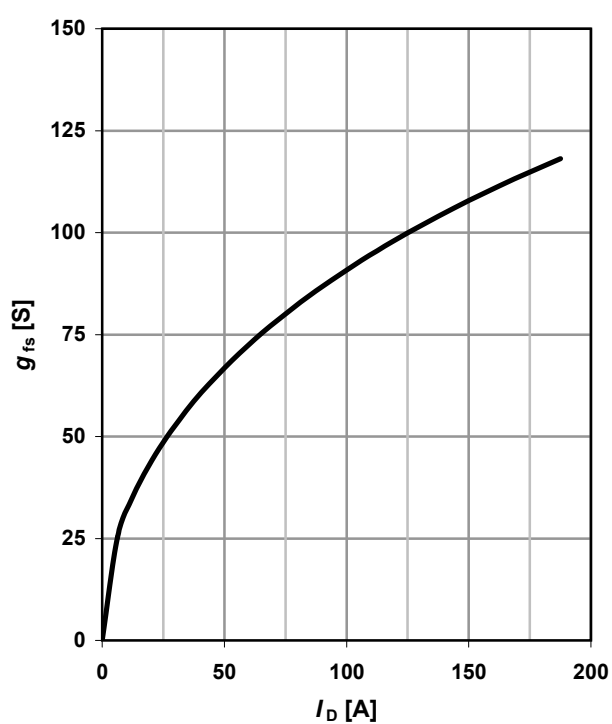
7 Typ. transfer characteristics

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

parameter: T_j


8 Typ. Forward transconductance

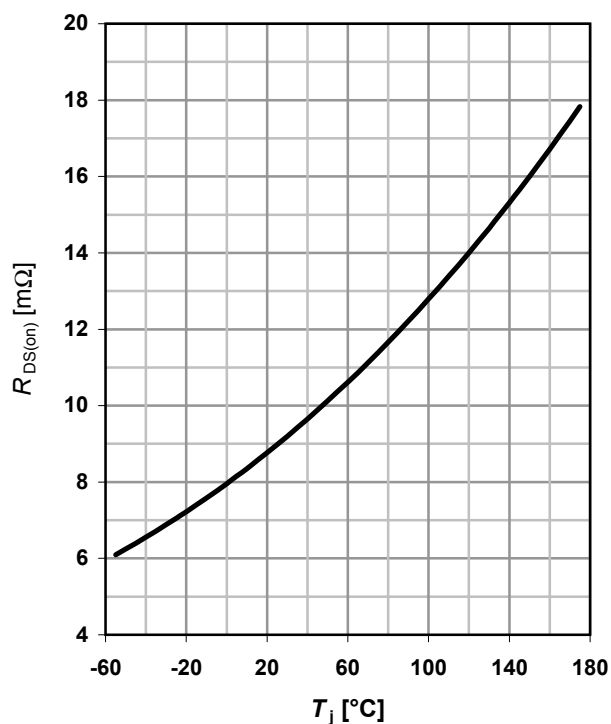
 $g_{fs} = f(I_D); T_j = 25^\circ\text{C}$

parameter: g_{fs}


9 Typ. Drain-source on-state resistance

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

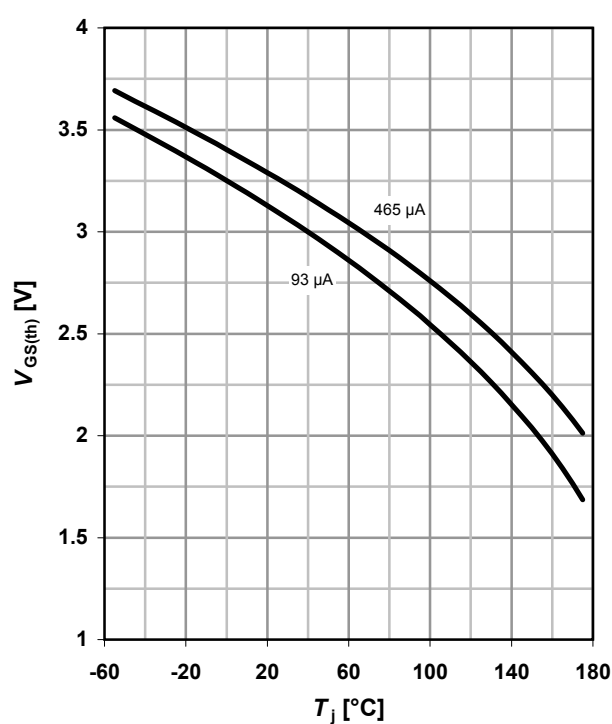
parameter: $I_D = 80 \text{ A}$; $V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

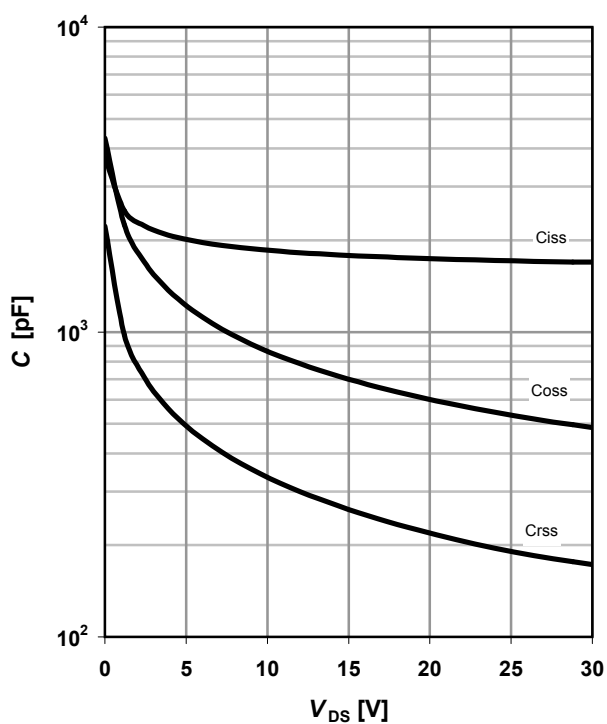
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



11 Typ. capacitances

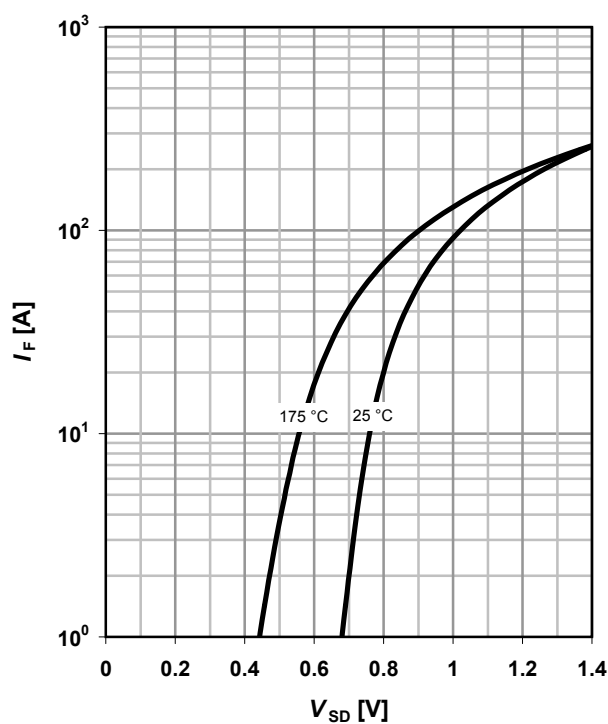
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



12 Typical forward diode characteristics

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

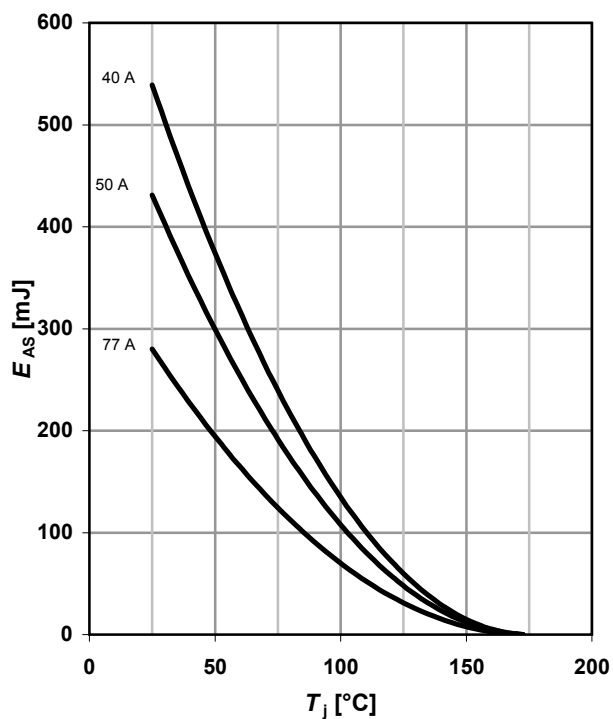
parameter: T_j



13 Typical avalanche energy

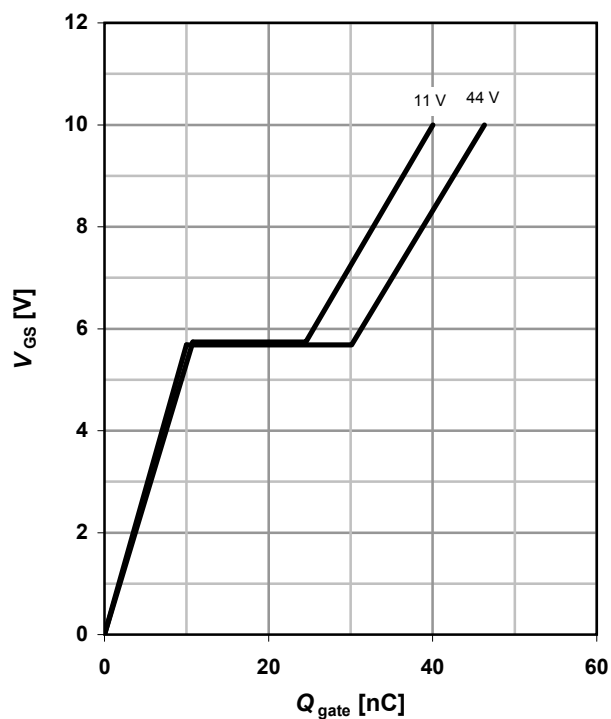
$$E_{AS} = f(T_j)$$

parameter: I_D



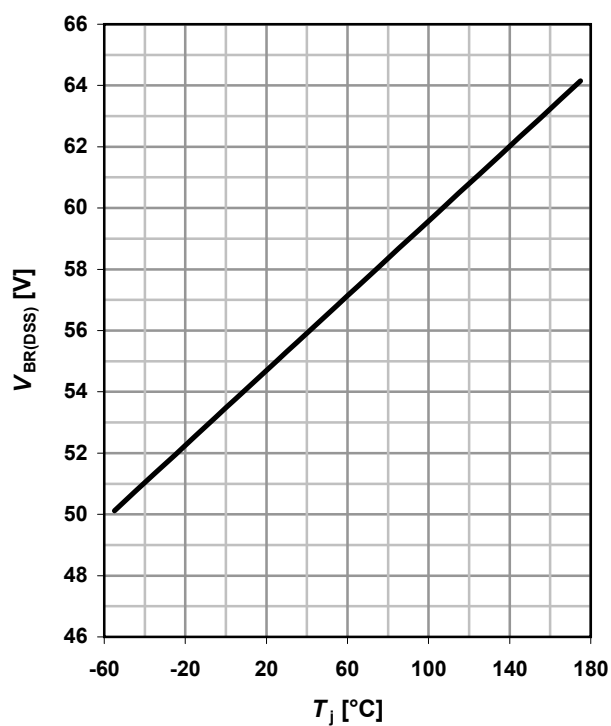
14 Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = 80$$
 A pulsed

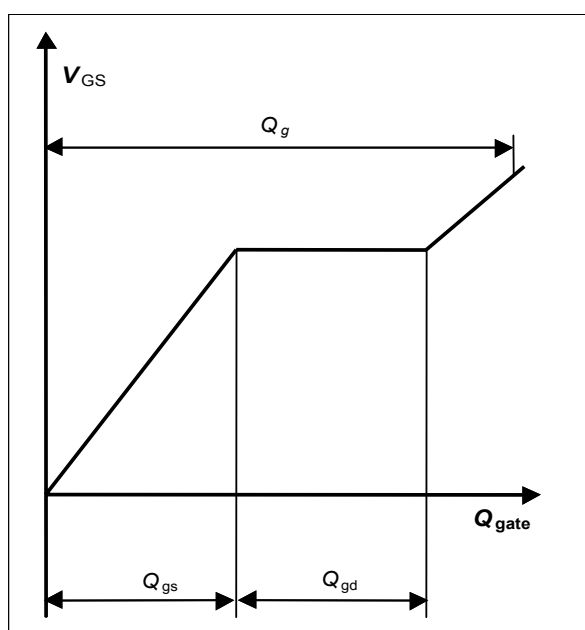


15 Typ. drain-source breakdown voltage

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



16 Gate charge waveforms



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