

**OptiMOS<sup>®</sup> -T2 Power-Transistor**

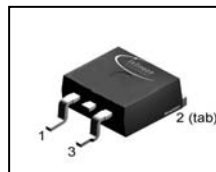
**Features**

- N-channel - Enhancement mode
- Automotive AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green product (RoHS compliant)
- 100% Avalanche tested

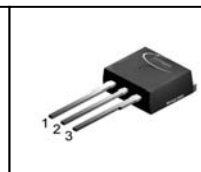
**Product Summary**

$V_{DS}$	55	V
$R_{DS(on),max}$ (SMD version)	8.8	m $\Omega$
$I_D$	77	A

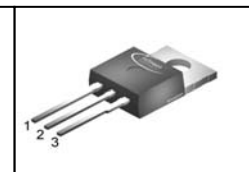
PG-TO263-3-2



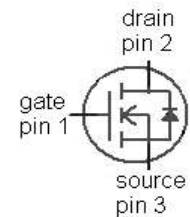
PG-TO262-3-1



PG-TO220-3-1



Type	Package	Marking
IPB77N06S3-09	PG-TO263-3-2	3N0609
IPI77N06S3-09	PG-TO262-3-1	3N0609
IPP77N06S3-09	PG-TO220-3-1	3N0609


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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25\text{ }^\circ\text{C}$ , $V_{GS}=10\text{ V}$	77	A
		$T_C=100\text{ }^\circ\text{C}$ , $V_{GS}=10\text{ V}^{2)}$	55	
Pulsed drain current <sup>1)</sup>	$I_{D,pulse}$	$T_C=25\text{ }^\circ\text{C}$	160	
Avalanche energy, single pulse <sup>1)</sup>	$E_{AS}$	$I_D=38.5\text{ A}$	245	mJ
Avalanche current, single pulse	$I_{AS}$		77	A
Gate source voltage <sup>2)</sup>	$V_{GS}$		$\pm 20$	V
Power dissipation	$P_{tot}$	$T_C=25\text{ }^\circ\text{C}$	107	W
Operating and storage temperature	$T_j, T_{stg}$		-55 ... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1			55/175/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Thermal characteristics<sup>1)</sup></b>						
Thermal resistance, junction - case	$R_{thJC}$		-	-	1.4	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$		-	-	62	
SMD version, device on PCB	$R_{thJA}$	minimal footprint	-	-	62	
		6 cm <sup>2</sup> cooling area <sup>3)</sup>	-	-	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	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=55\text{ }\mu\text{A}$	2.1	3.0	4	
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	$\mu\text{A}$
		$V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}^{2)}$	-	1	100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=16\text{ V}, V_{DS}=0\text{ V}$	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=39\text{ A}$	-	7.7	9.1	m $\Omega$
		$V_{GS}=10\text{ V}, I_D=39\text{ A},$ SMD version	-	7.4	8.8	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics<sup>1)</sup>**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$	-	5335	-	pF
Output capacitance	$C_{oss}$		-	812	-	
Reverse transfer capacitance	$C_{rss}$		-	775	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=27.5\text{ V},$ $V_{GS}=10\text{ V}, I_D=77\text{ A},$ $R_G=10\ \Omega$	-	29	-	ns
Rise time	$t_r$		-	51	-	
Turn-off delay time	$t_{d(off)}$		-	29	-	
Fall time	$t_f$		-	51	-	

**Gate Charge Characteristics<sup>1)</sup>**

Gate to source charge	$Q_{gs}$	$V_{DD}=11\text{ V}, I_D=77\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	41	-	nC
Gate to drain charge	$Q_{gd}$		-	17	-	
Gate charge total	$Q_g$		-	77	103	
Gate plateau voltage	$V_{plateau}$		-	7.1	-	V

**Reverse Diode**

Diode continuous forward current <sup>1)</sup>	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	77	A
Diode pulse current <sup>1)</sup>	$I_{S,pulse}$		-	-	160	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=77\text{ A},$ $T_j=25\text{ }^\circ\text{C}$		1	1.3	V
Reverse recovery time <sup>1)</sup>	$t_{rr}$	$V_R=27.5\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	40	-	ns
Reverse recovery charge <sup>1)</sup>	$Q_{rr}$		-	50	-	nC

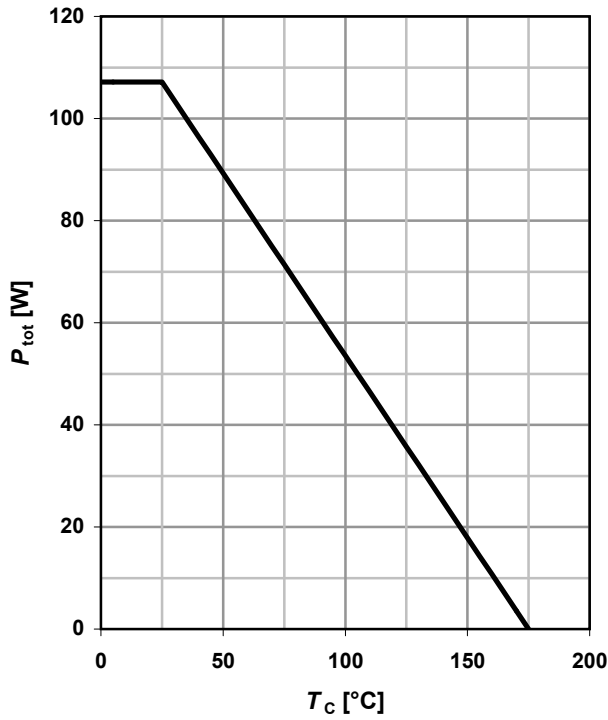
<sup>1)</sup> Defined by design. Not subject to production test.

<sup>2)</sup> Qualified at -5V and +16V

<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.

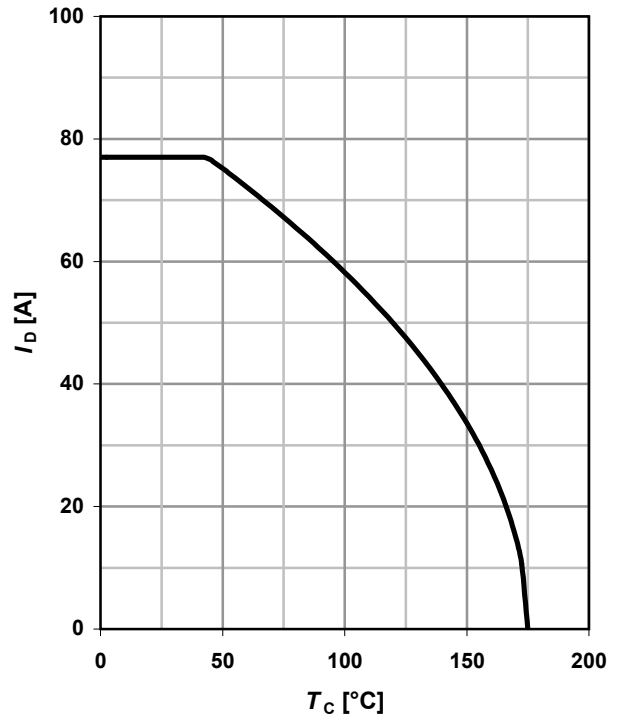
**1 Power dissipation**

$P_{tot} = f(T_C); V_{GS} \geq 4 V$



**2 Drain current**

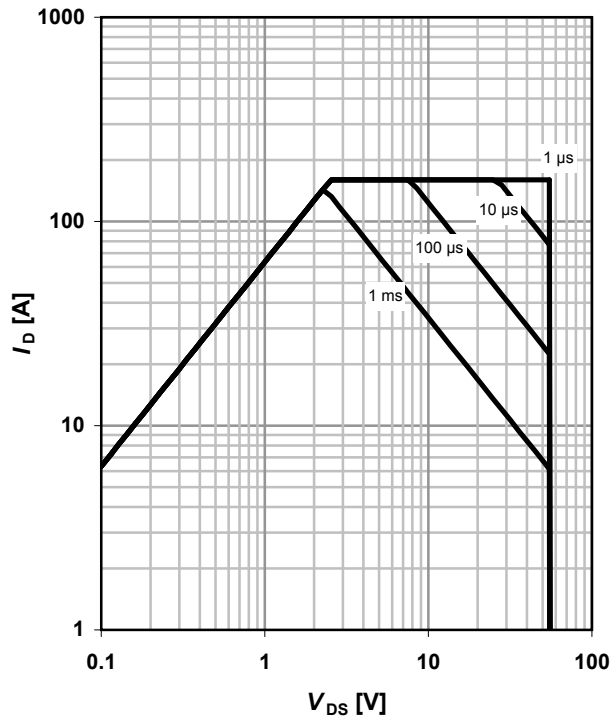
$I_D = f(T_C); V_{GS} \geq 4 V$



**3 Safe operating area**

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

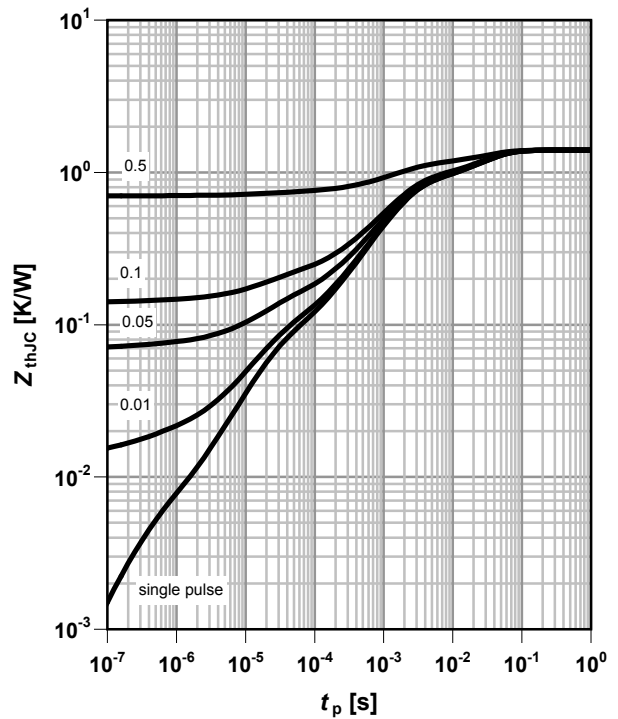
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

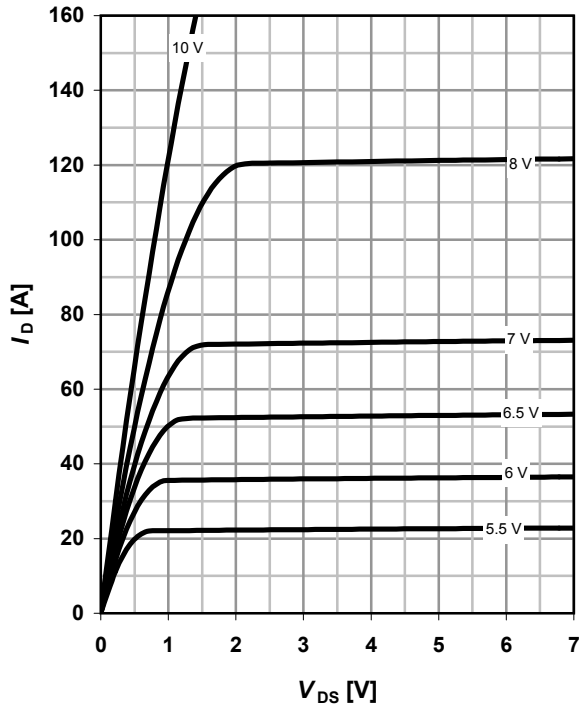
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

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

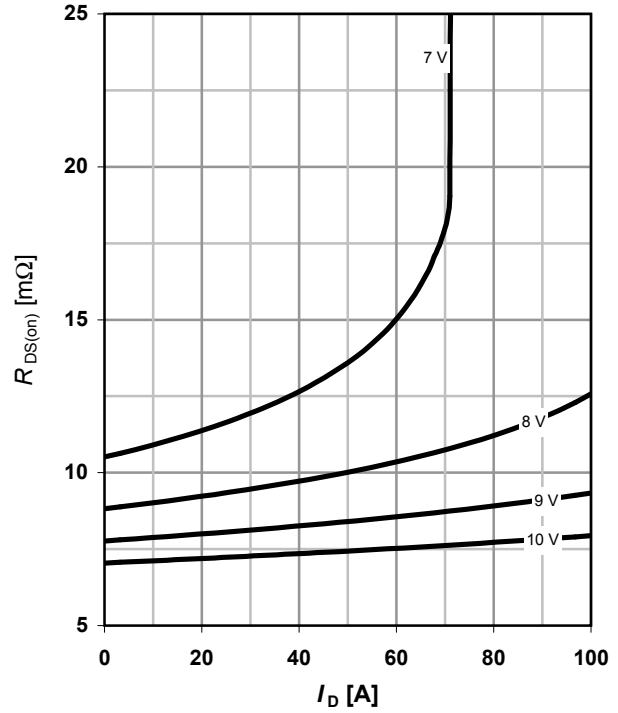
parameter:  $V_{GS}$



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

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

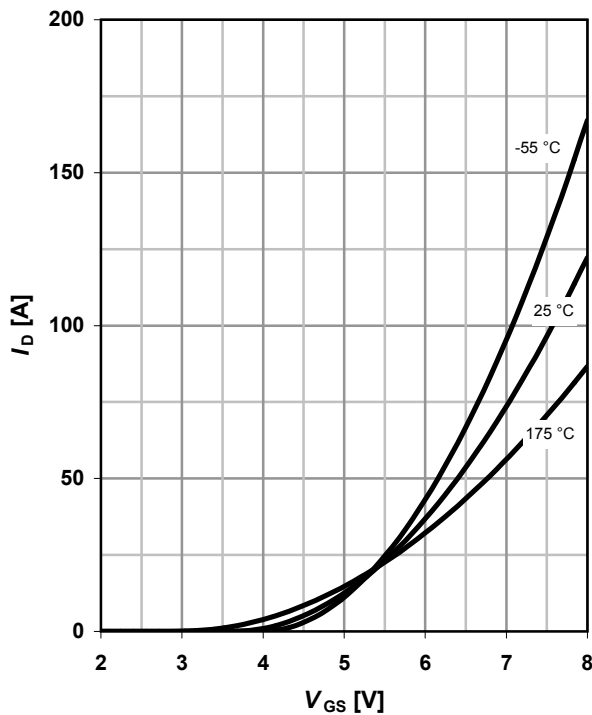
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

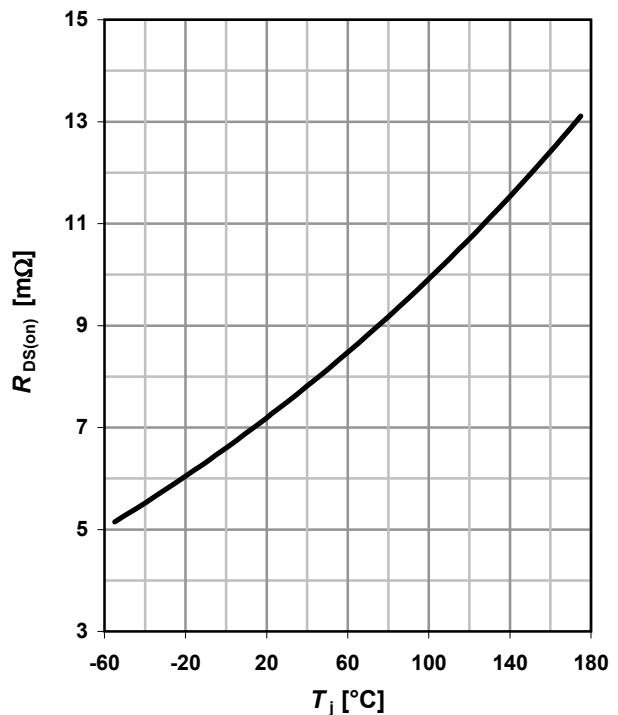
$I_D = f(V_{GS}); V_{DS} = 10\text{ V}$

parameter:  $T_j$



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

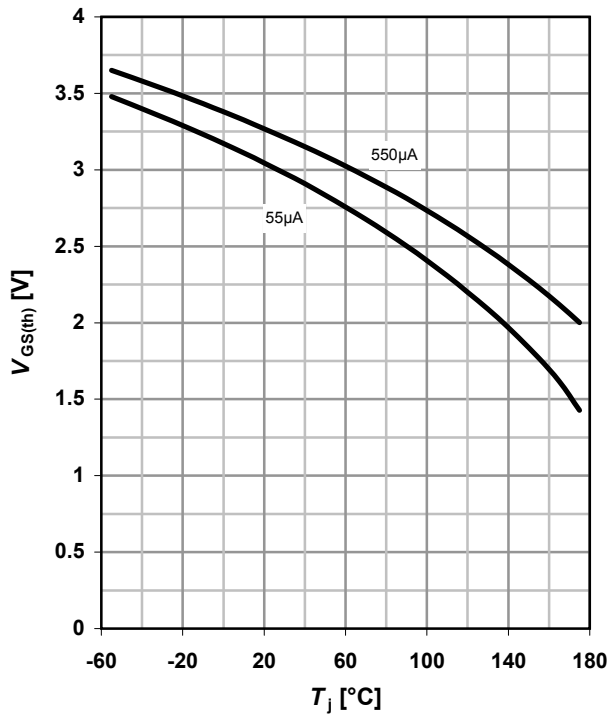
$R_{DS(on)} = f(T_j); I_D = 39\text{ A}; V_{GS} = 10\text{ V}$



**9 Typ. gate threshold voltage**

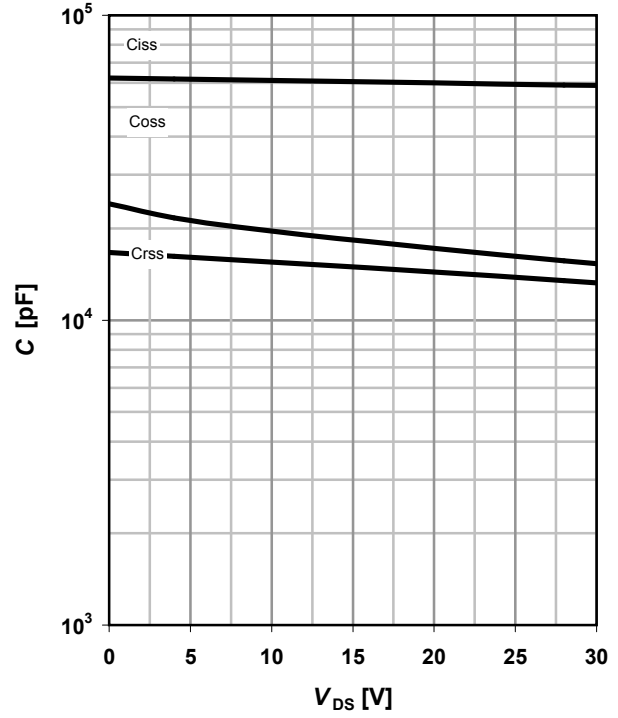
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**10 Typ. capacitances**

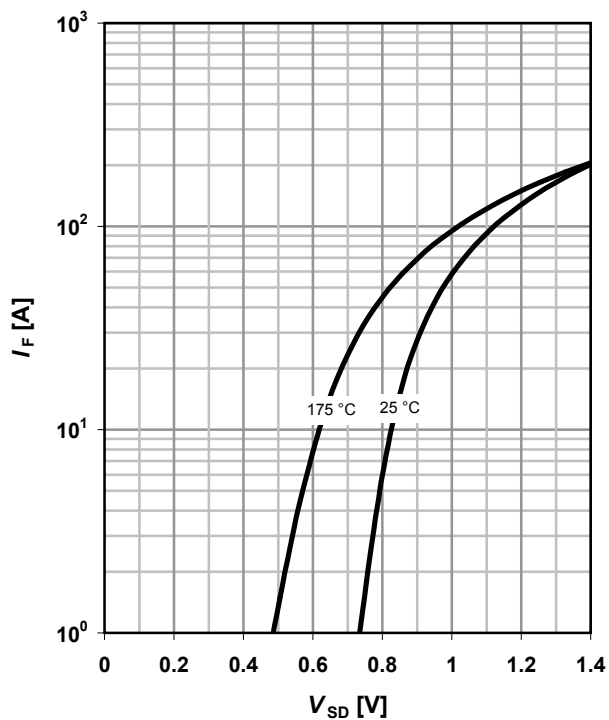
$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$



**11 Typical forward diode characteristics**

$I_F = f(V_{SD})$

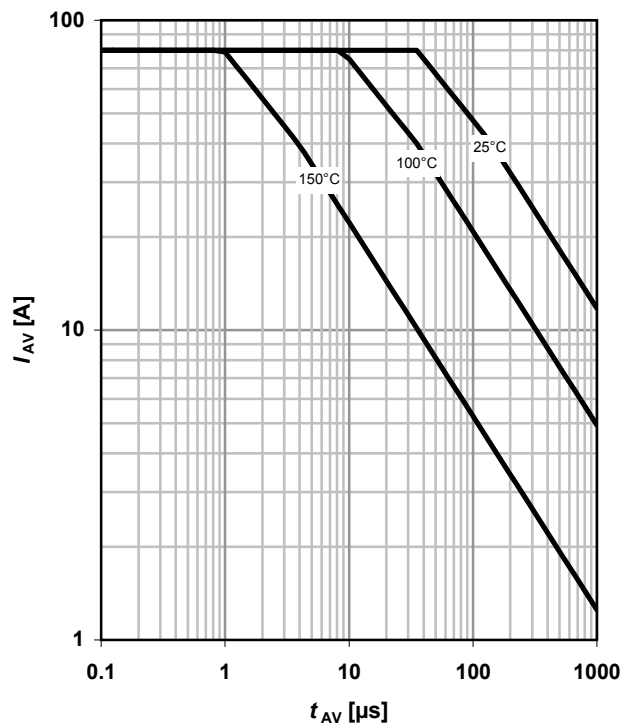
parameter:  $T_j$



**12 Typ. avalanche characteristics**

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

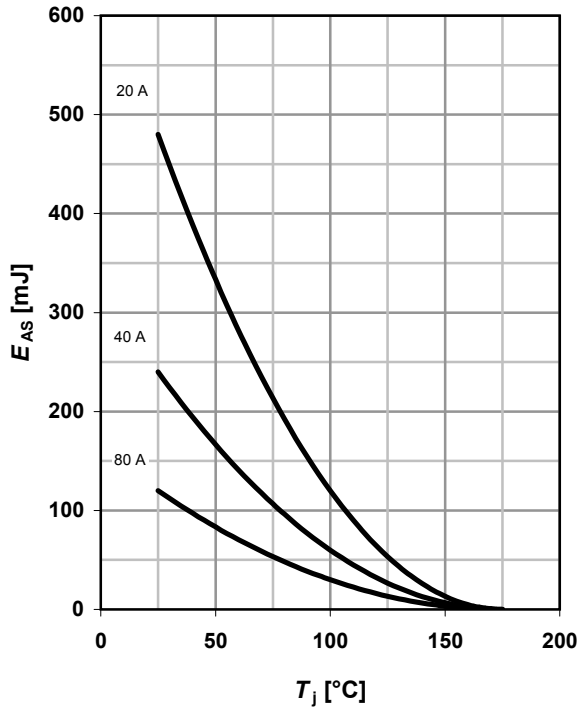
parameter:  $T_{j(start)}$



**13 Typical avalanche Energy**

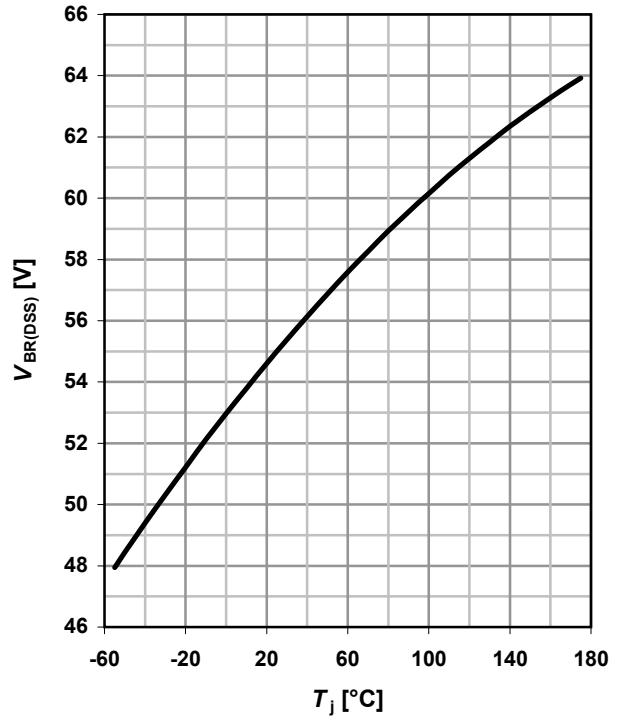
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



**14 Drain-source breakdown voltage**

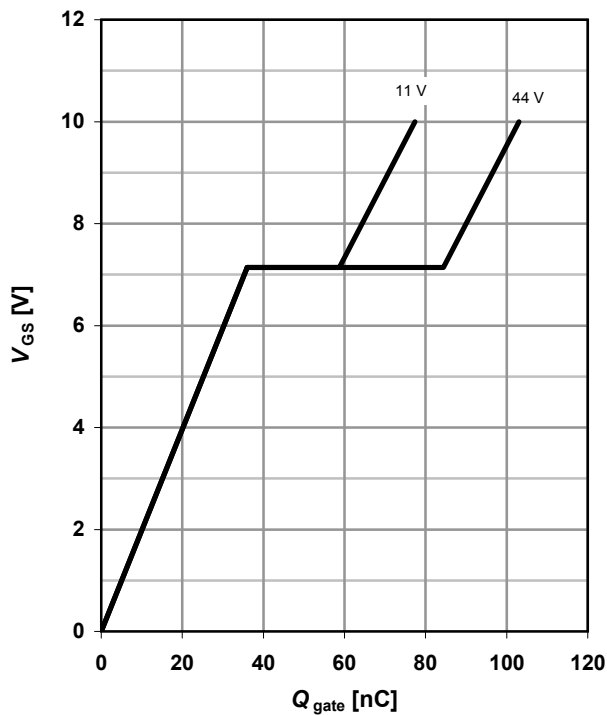
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



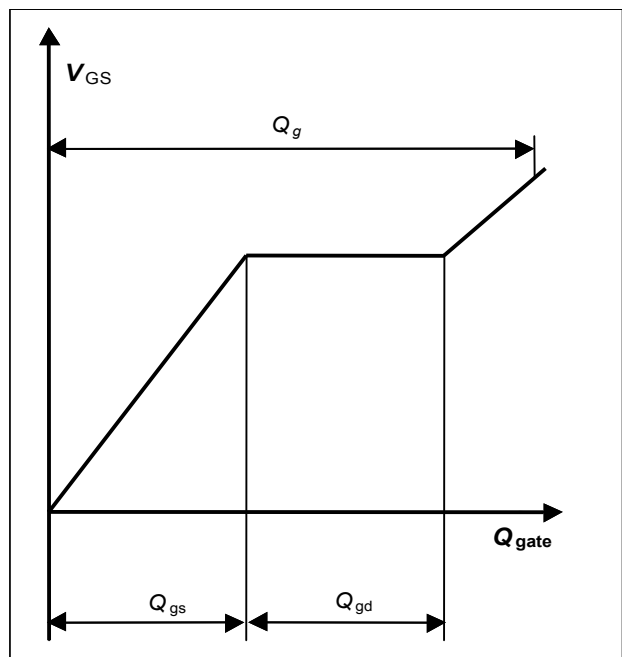
**15 Typ. gate charge**

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

parameter:  $V_{DD}$



**16 Gate charge waveforms**



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Revision History

Version	Date	Changes
Data Sheet 2.1	15.12.2006	Removal of ordering code
Data Sheet 2.1	15.12.2006	Update of Infineon Logo
Data Sheet 2.1	15.12.2006	Implementation of avalanche current single pulse
Data Sheet 2.1	15.12.2006	Removal of ESD class
Data Sheet 2.1	15.12.2006	Update of Infineon address
Data Sheet 2.1	15.12.2006	Removal of foot note 3, avalanche diagrams
Data Sheet 2.1	15.12.2006	Update of trr and Qrr typ
Data Sheet 2.1	15.12.2006	Update of disclaimer
Data Sheet 2.1	15.12.2006	Implementation of RoHS and AEC logo, update of feature list
Data Sheet 1.1	07.11.2007	Update of data sheet layout
Data Sheet 1.1	07.11.2007	Adaptation of Ias
Data Sheet 1.1	07.11.2007	implementation of footnote 2 for Eas specification
Data Sheet 1.1	07.11.2007	removal of Vdg specification from data sheet