

OptiMOS® -T2 Power-Transistor

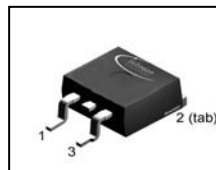
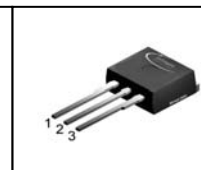
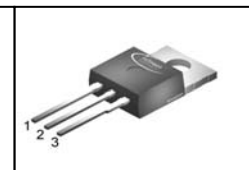


Features

- 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	mΩ
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 $T_J=25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$T_C=25\text{ °C}$, $V_{GS}=10\text{ V}$	77	A
		$T_C=100\text{ °C}$, $V_{GS}=10\text{ V}^{(2)}$	55	
Pulsed drain current ⁽¹⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$	160	
Avalanche energy, single pulse ⁽¹⁾	E_{AS}	$I_D=38.5\text{ A}$	245	mJ
Avalanche current, single pulse	I_{AS}		77	A
Gate source voltage ⁽²⁾	V_{GS}		±20	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	107	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 characteristics¹⁾

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 ² cooling area ³⁾	-	-	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	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}	$V_{GS}=16\text{ V}, V_{DS}=0\text{ V}$	-	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 Ω
		$V_{GS}=10\text{ V}, I_D=39\text{ A},$ SMD version	-	7.4	8.8	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics¹⁾

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 Characteristics¹⁾

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 ¹⁾	I_S	$T_C=25\text{ °C}$	-	-	77	A
Diode pulse current ¹⁾	$I_{S,pulse}$		-	-	160	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=77\text{ A},$ $T_j=25\text{ °C}$		1	1.3	V
Reverse recovery time ¹⁾	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 ¹⁾	Q_{rr}		-	50	-	nC

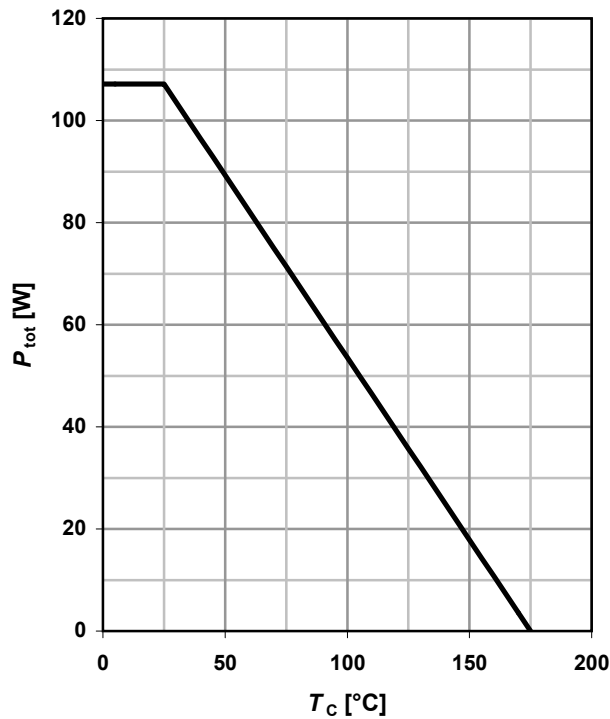
¹⁾ Defined by design. Not subject to production test.

²⁾ Qualified at -5V and +16V

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.

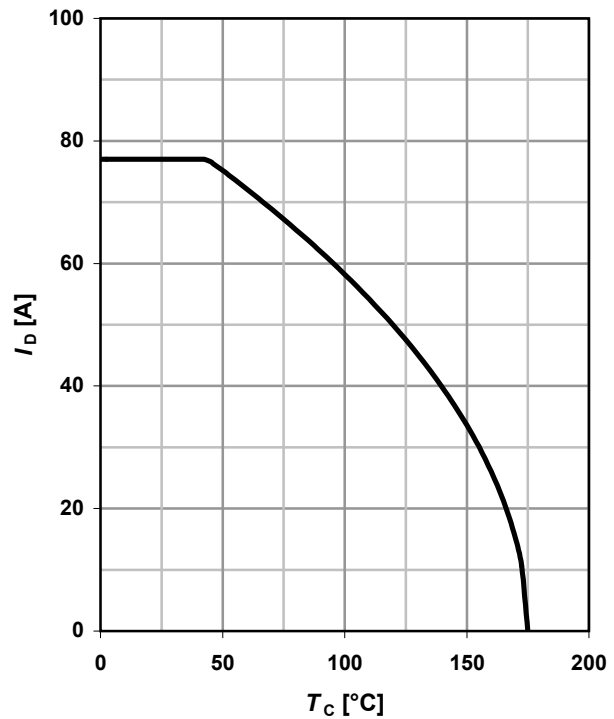
1 Power dissipation

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



2 Drain current

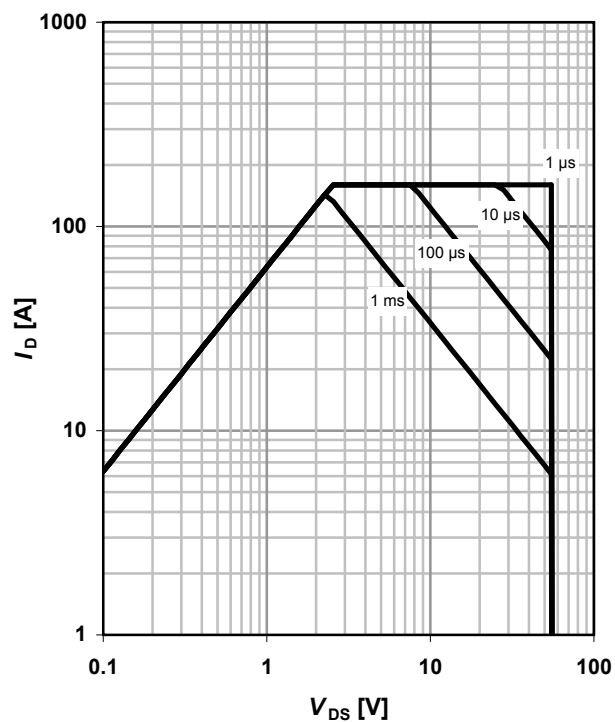
$$I_D = f(T_C); V_{\text{GS}} \geq 4 \text{ V}$$



3 Safe operating area

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

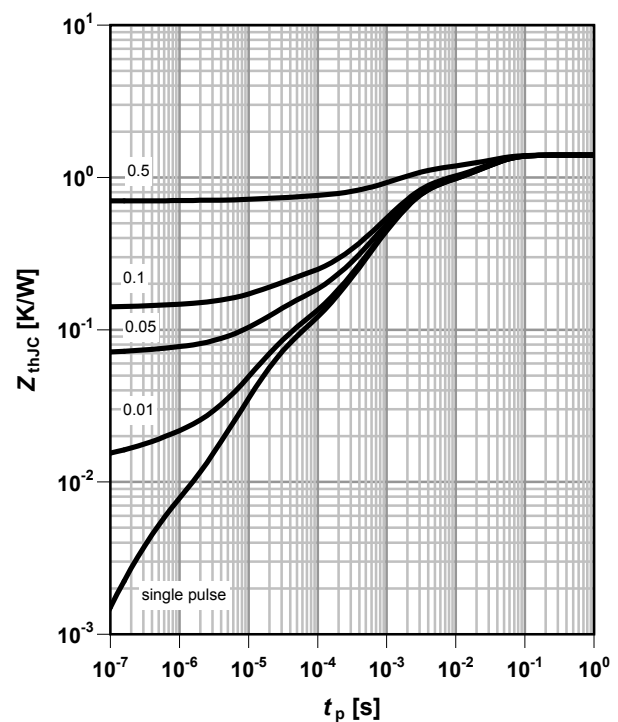
parameter: t_p



4 Max. transient thermal impedance

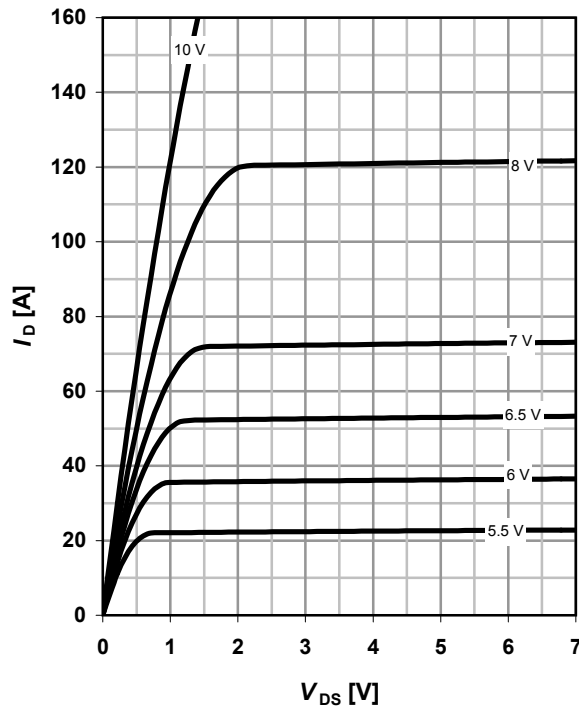
$$Z_{\text{thJC}} = f(t_p)$$

parameter: $D = t_p/T$



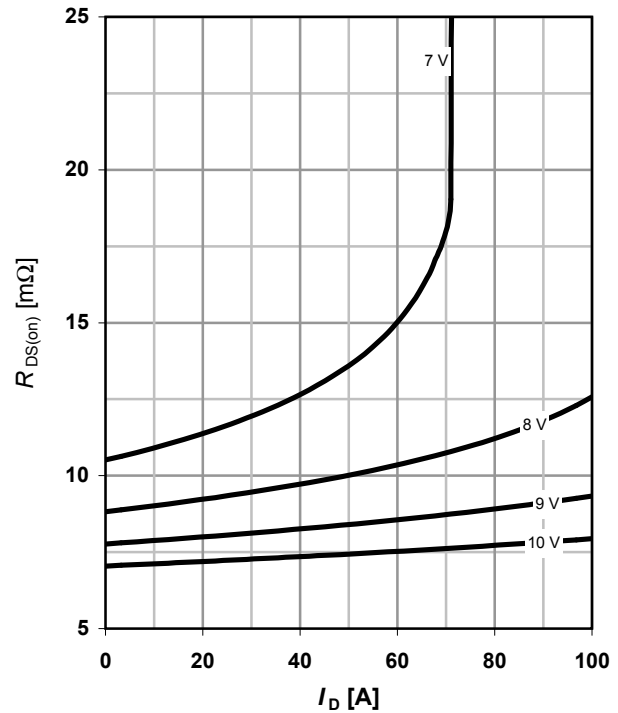
5 Typ. output characteristics

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

parameter: V_{GS}


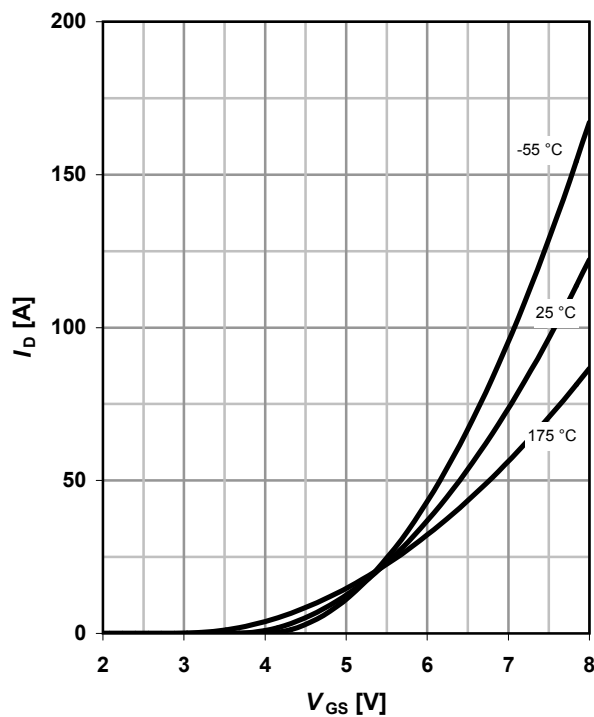
6 Typ. drain-source on-state resistance

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

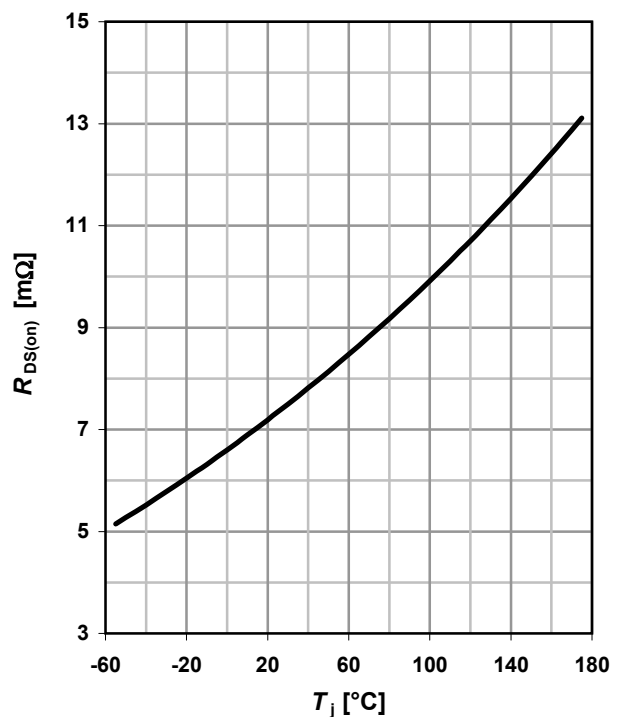
parameter: V_{GS}


7 Typ. transfer characteristics

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

parameter: T_j


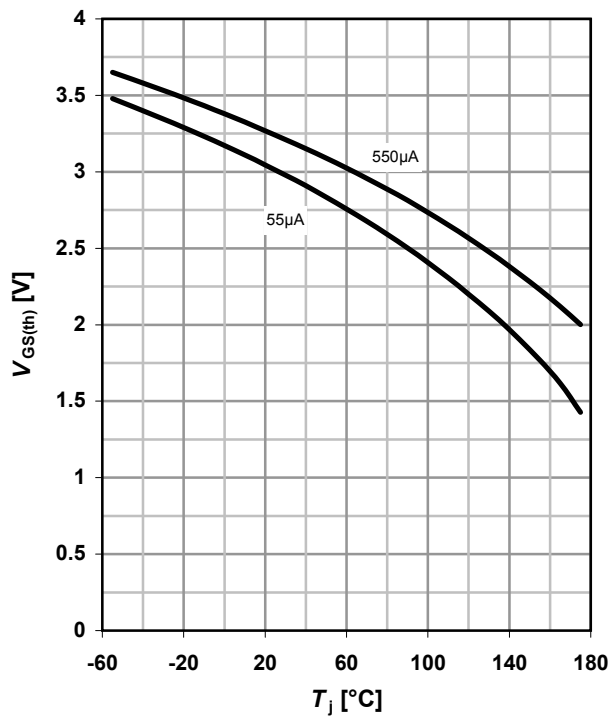
8 Typ. drain-source on-state resistance

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


9 Typ. gate threshold voltage

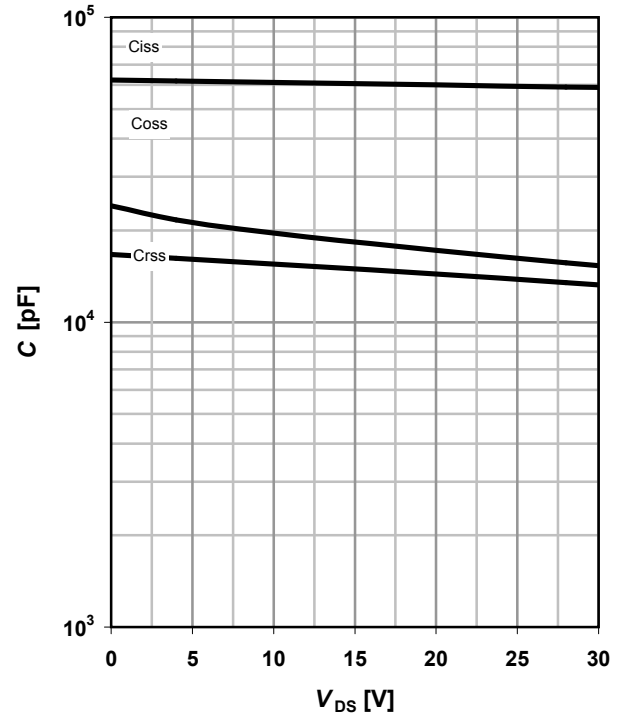
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



10 Typ. capacitances

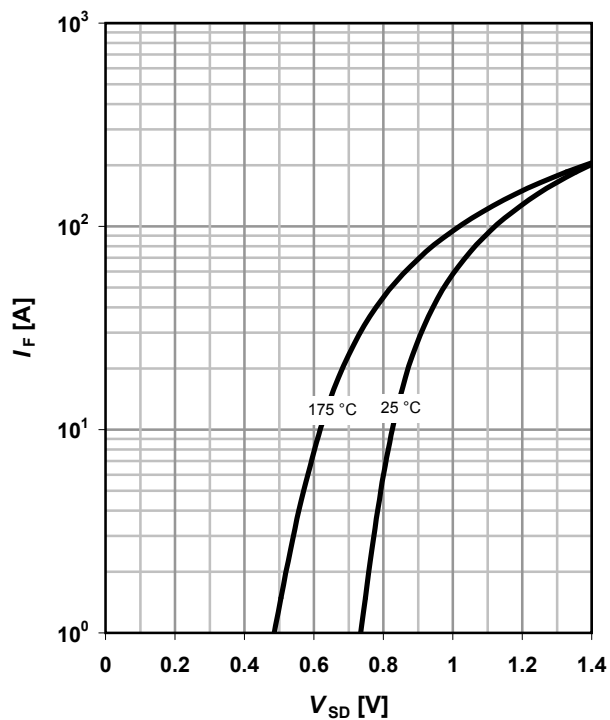
$$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$$



11 Typical forward diode characteristics

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

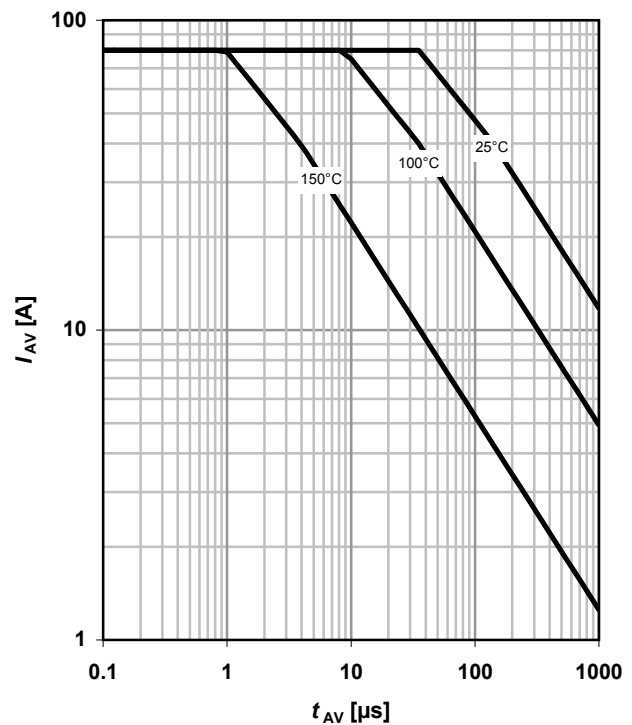
parameter: T_j



12 Typ. avalanche characteristics

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

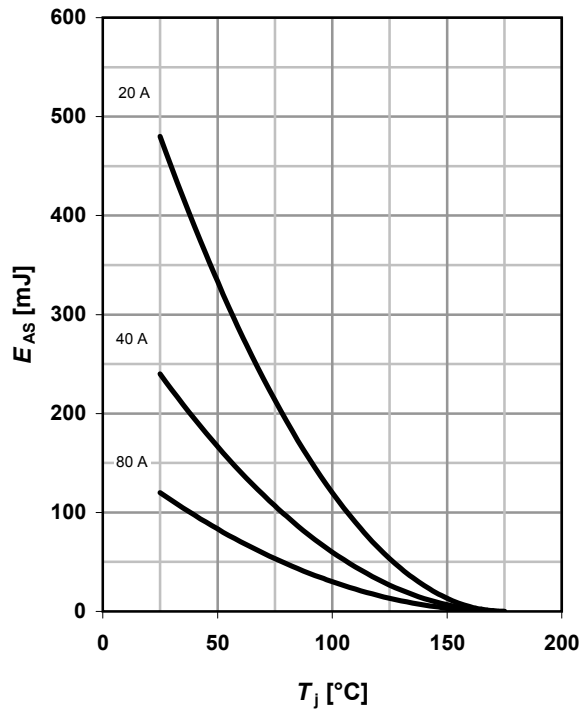
parameter: $T_{j(start)}$



13 Typical avalanche Energy

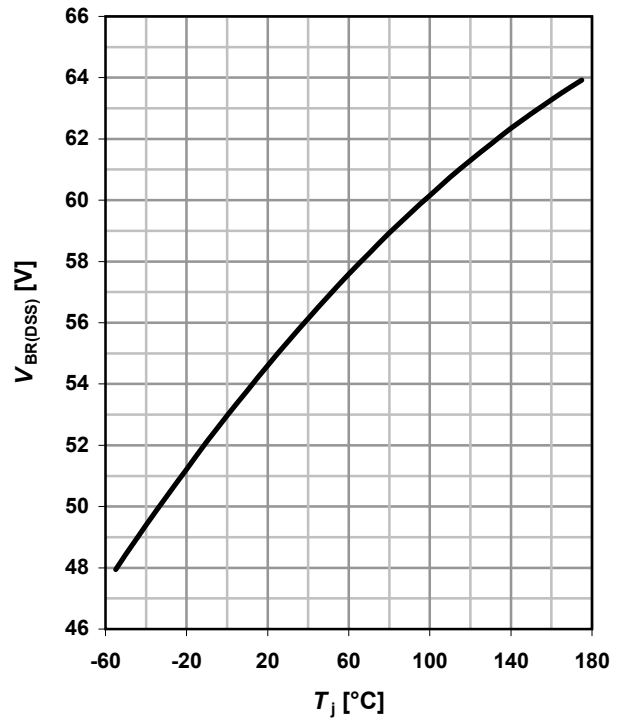
$$E_{AS} = f(T_j)$$

parameter: I_D



14 Drain-source breakdown voltage

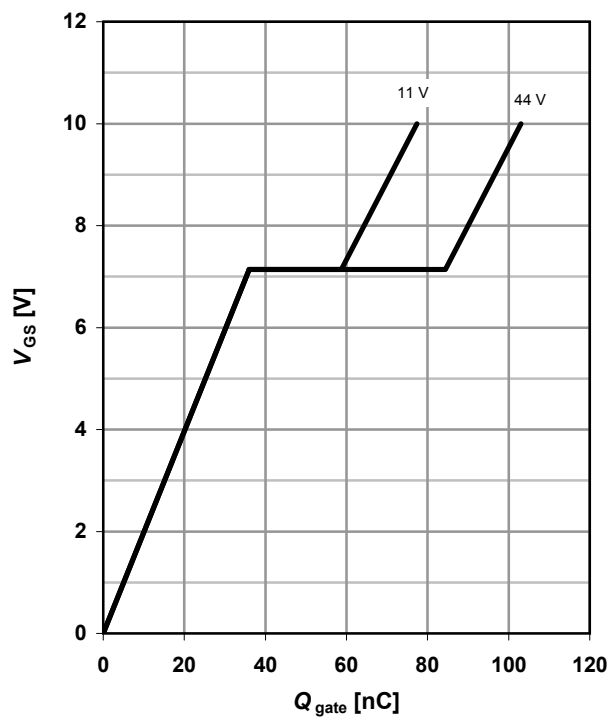
$$V_{BR(DSS)} = f(T_j); I_D = 1\text{ mA}$$



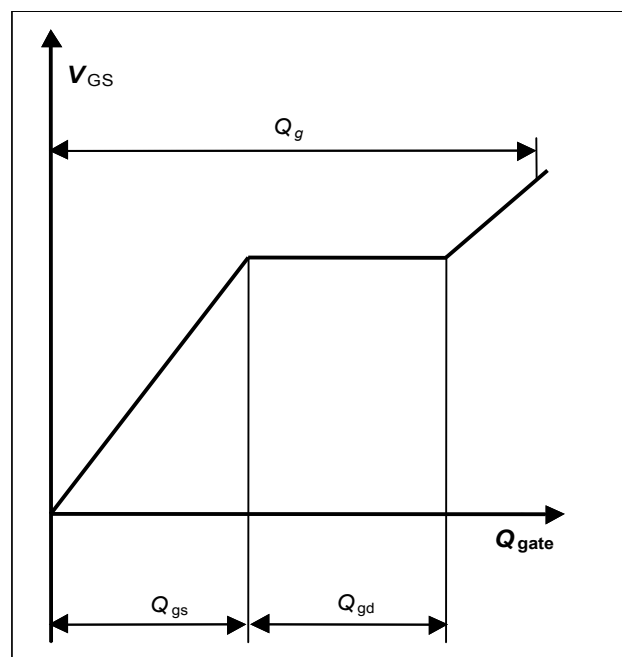
15 Typ. gate charge

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

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