

OptiMOS®-T2 Power-Transistor



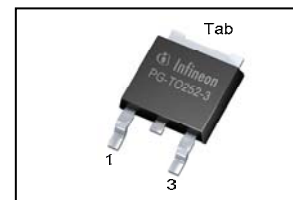
Features

- 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

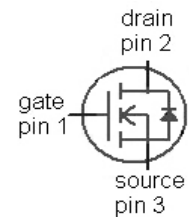
Product Summary

V_{DS}	30	V
$R_{DS(on),max}$	3.3	mΩ
I_D	90	A

PG-TO252-3-11



Type	Package	Marking
IPD90N03S4L-03	PG-TO252-3-11	4N03L03



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current ¹⁾	I_D	$T_C=25\text{ °C}$, $V_{GS}=10\text{ V}$	90	A
		$T_C=100\text{ °C}$, $V_{GS}=10\text{ V}^{2)}$	90	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$	360	
Avalanche energy, single pulse	E_{AS}	$I_D=90\text{ A}$	85	mJ
Avalanche current, single pulse	I_{AS}	$T_C=25\text{ °C}$	90	A
Gate source voltage	V_{GS}	-	±16	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	94	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}		-	-	1.6	K/W
SMD version, device on PCB	R_{thJA}	minimal footprint	-	-	62	
		6 cm ² cooling area ³⁾	-	-	40	

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

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$	30	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$, $I_D=45\text{ }\mu\text{A}$	1.0	1.6	2.2	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ }^{\circ}\text{C}$	-	0.01	1	μA
		$V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ }^{\circ}\text{C}^{2)}$	-	10	1000	
		$V_{DS}=18\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=85\text{ }^{\circ}\text{C}^{2)}$	-	5	60	
Gate-source leakage current	I_{GSS}	$V_{GS}=16\text{ V}$, $V_{DS}=0\text{ V}$	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}$, $I_D=45\text{ A}$	-	3.4	4.4	m Ω
		$V_{GS}=10\text{ V}$, $I_D=90\text{ A}$	-	2.5	3.3	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics²⁾

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$	-	4000	5100	pF
Output capacitance	C_{oss}		-	1000	1300	
Reverse transfer capacitance	C_{rss}		-	53	100	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=10\text{ V},$ $I_D=90\text{ A}, R_G=3.5\ \Omega$	-	9	-	ns
Rise time	t_r		-	6	-	
Turn-off delay time	$t_{d(off)}$		-	37	-	
Fall time	t_f		-	7	-	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=24\text{ V}, I_D=90\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	12	15	nC
Gate to drain charge	Q_{gd}		-	8	16	
Gate charge total	Q_g		-	60	75	
Gate plateau voltage	$V_{plateau}$		-	3.1	-	V

Reverse Diode

Diode continuous forward current ²⁾	I_S	$T_C=25\text{ °C}$	-	-	90	A
Diode pulse current ²⁾	$I_{S,pulse}$		-	-	360	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=90\text{ A},$ $T_j=25\text{ °C}$	0.6	0.9	1.3	V
Reverse recovery time ²⁾	t_{rr}	$V_R=15\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	60	-	ns
Reverse recovery charge ²⁾	Q_{rr}		-	50	-	nC

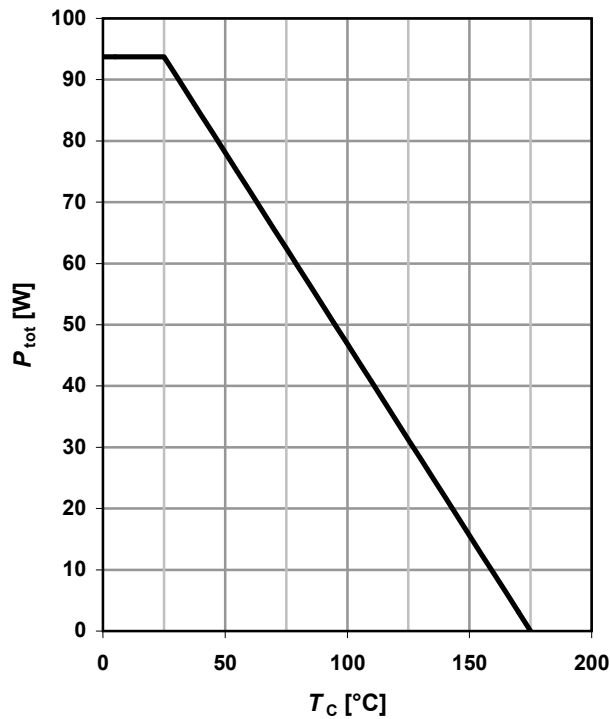
¹⁾ Current is limited by bondwire; with an $R_{thJC} = 1.6\text{K/W}$ the chip is able to carry 129A at 25°C.

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

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.

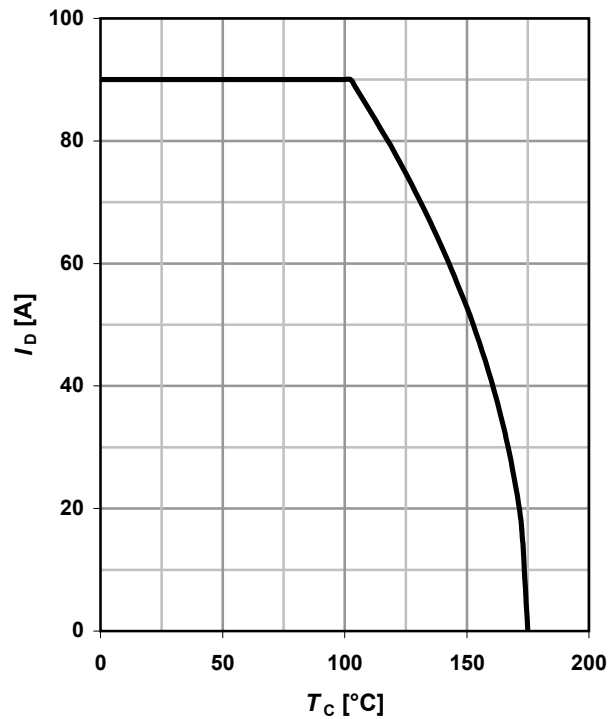
1 Power dissipation

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



2 Drain current

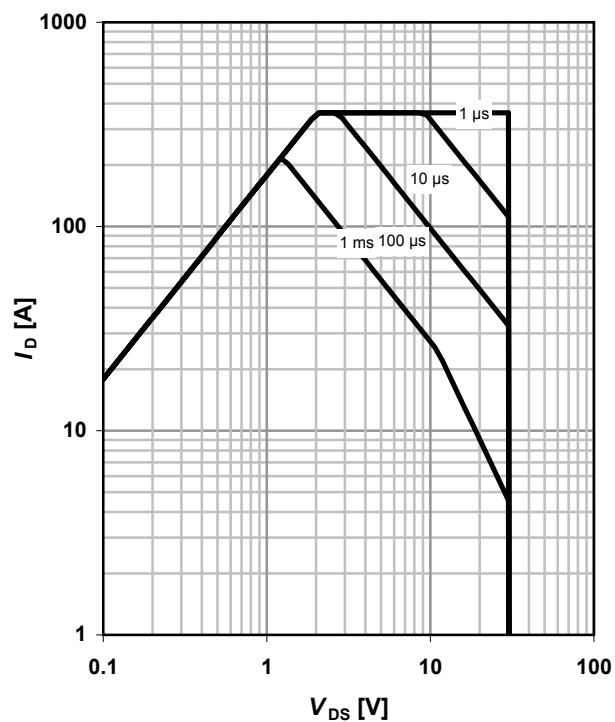
$$I_D = f(T_C); V_{\text{GS}} \geq 6 \text{ V}$$



3 Safe operating area

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

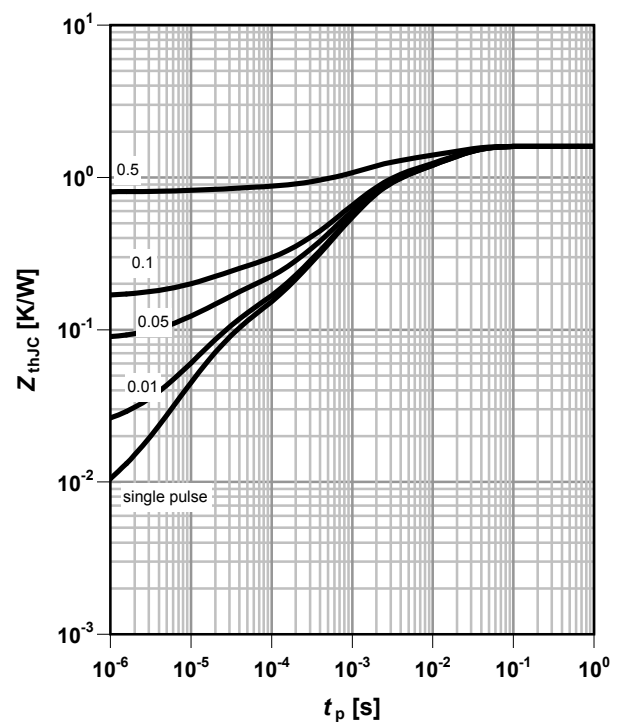
parameter: t_p



4 Max. transient thermal impedance

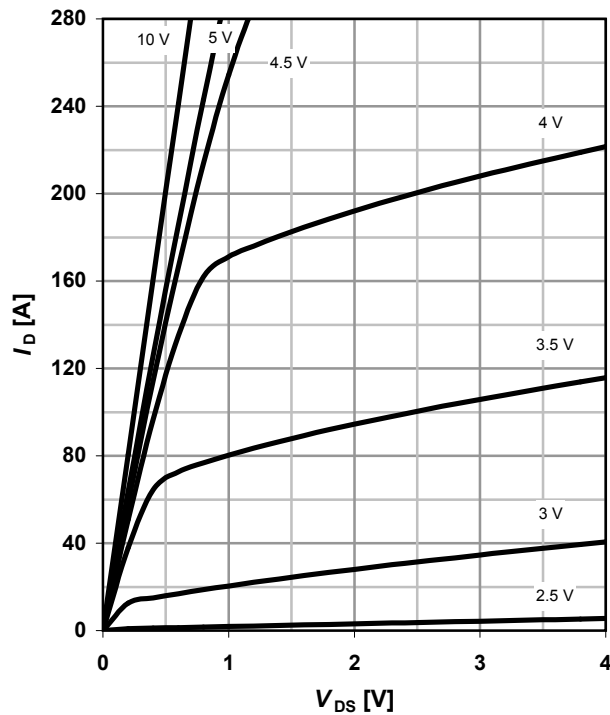
$$Z_{\text{thJC}} = f(t_p)$$

parameter: $D = t_p/T$



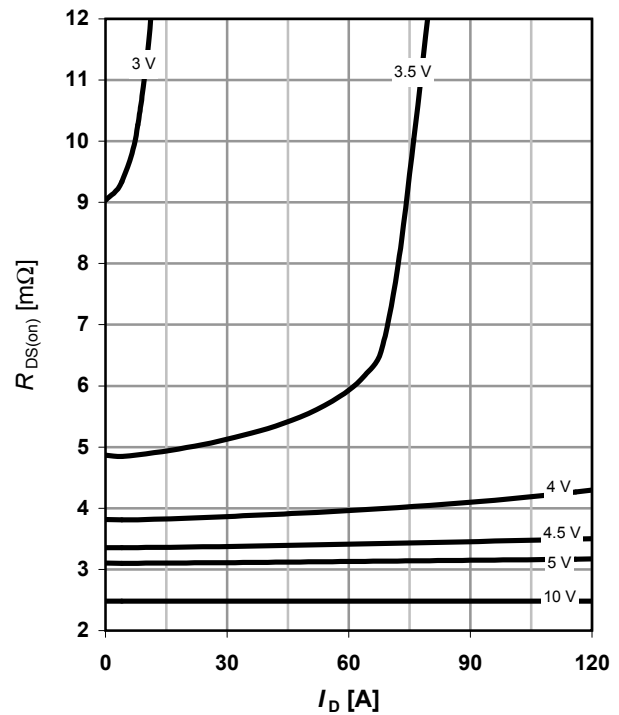
5 Typ. output characteristics

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

parameter: V_{GS}


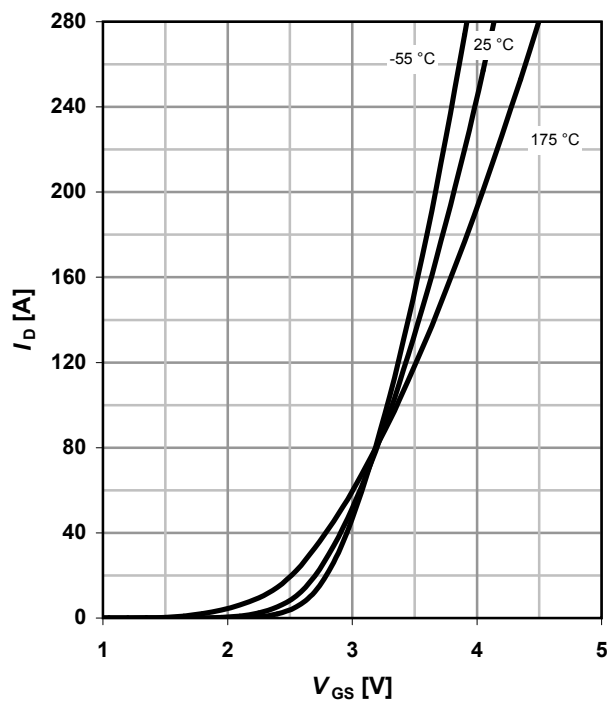
6 Typ. drain-source on-state resistance

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

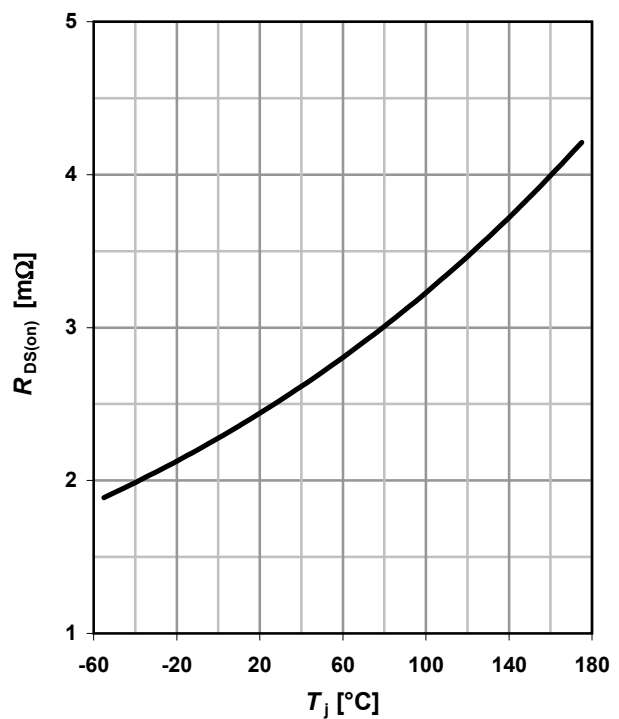
parameter: V_{GS}


7 Typ. transfer characteristics

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

parameter: T_j


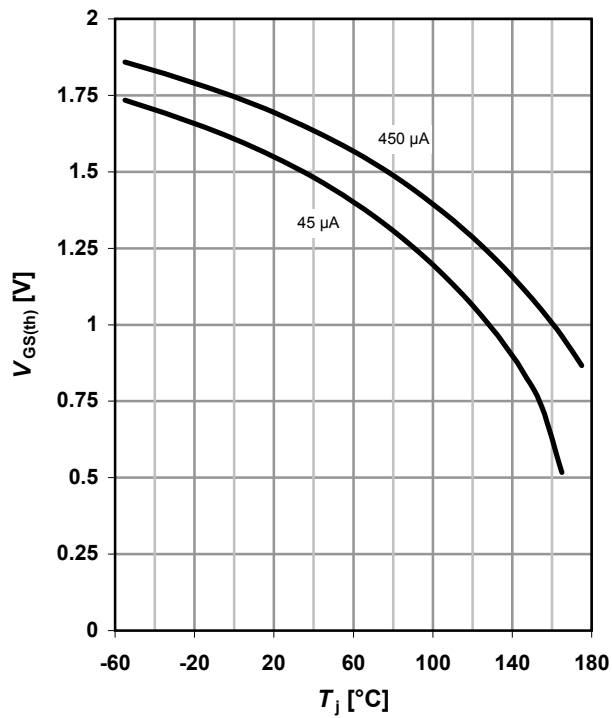
8 Typ. drain-source on-state resistance

 $R_{DS(on)} = f(T_j); I_D = 90\text{ A}; V_{GS} = 10\text{ V}$


9 Typ. gate threshold voltage

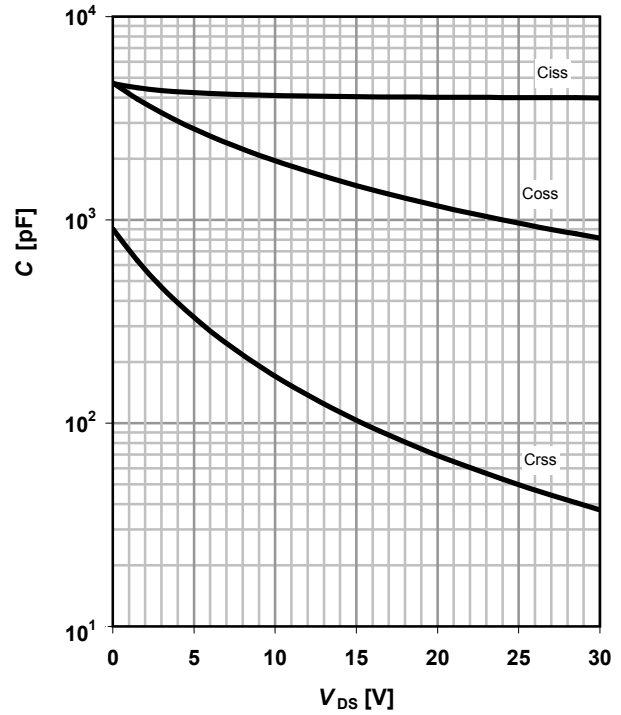
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



10 Typ. capacitances

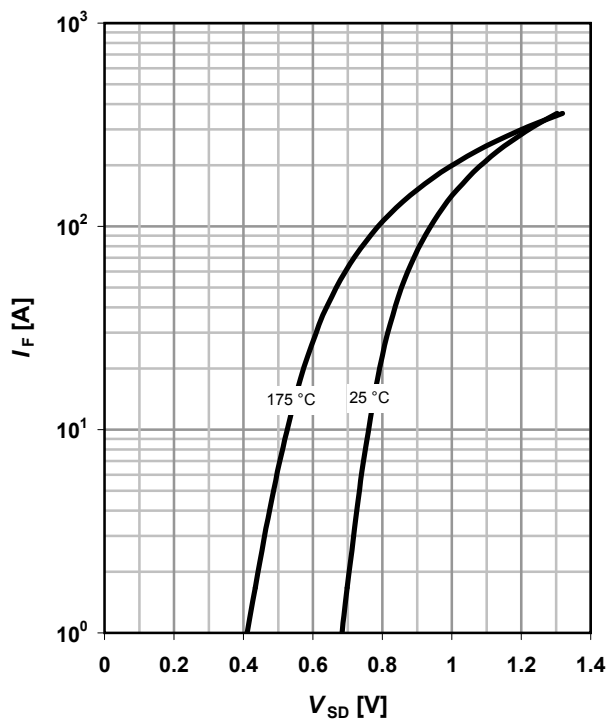
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



11 Typical forward diode characteristics

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

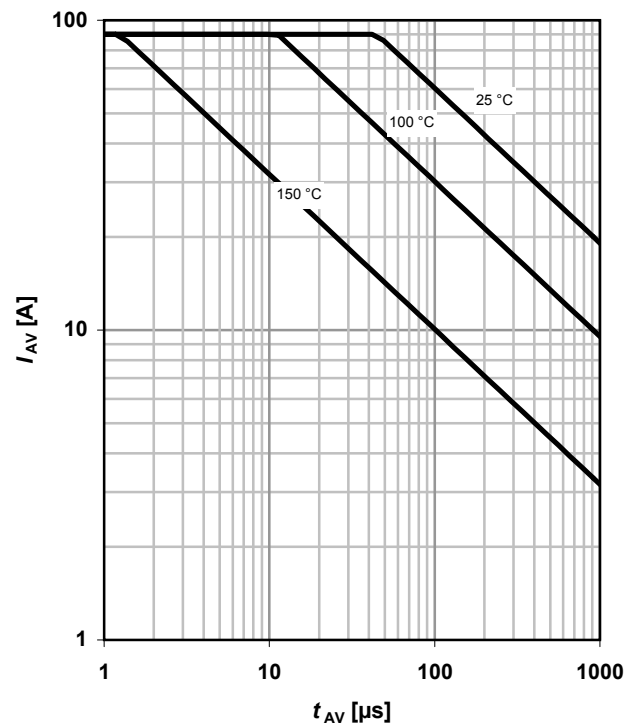
parameter: T_j



12 Typ. avalanche characteristics

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

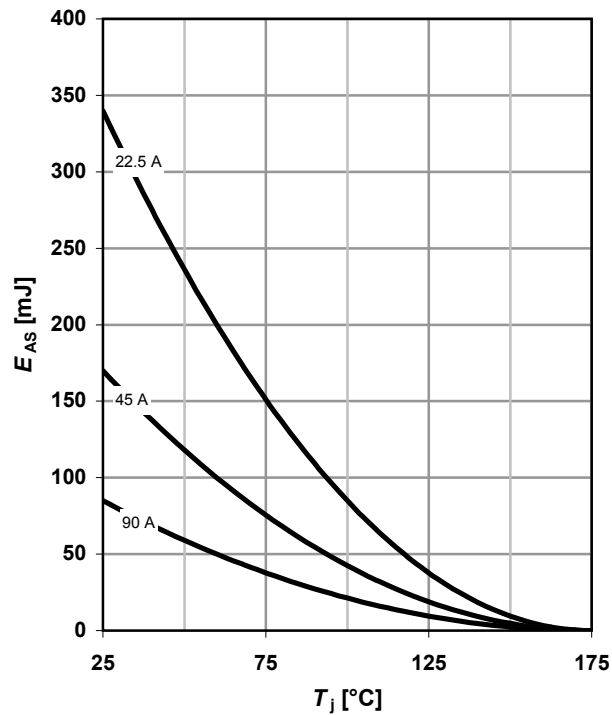
parameter: $T_{j(start)}$



13 Typical avalanche energy

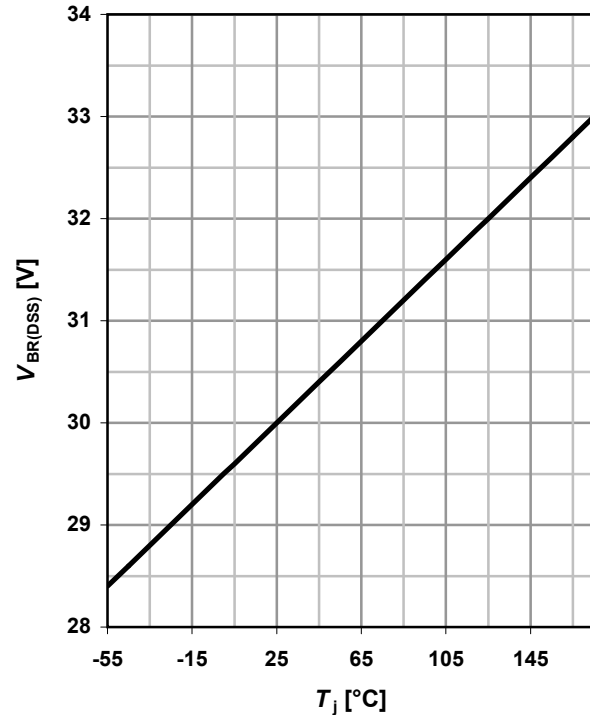
$$E_{AS} = f(T_j)$$

parameter: I_D



14 Typ. drain-source breakdown voltage

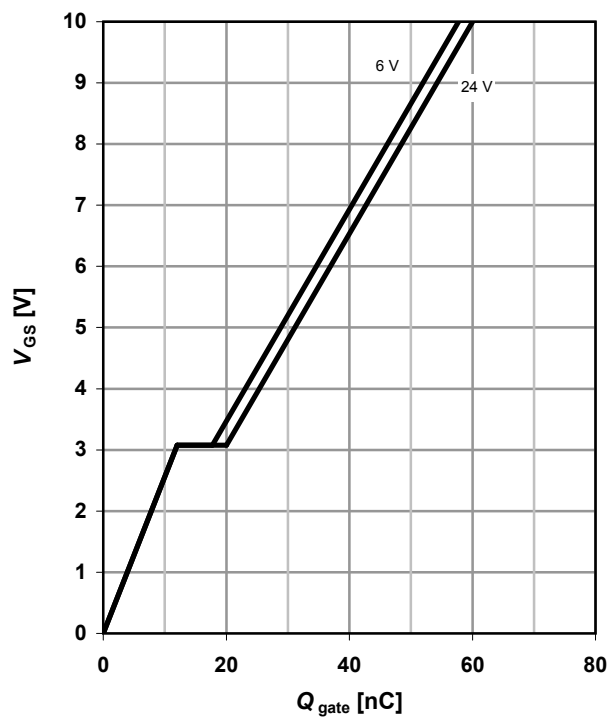
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



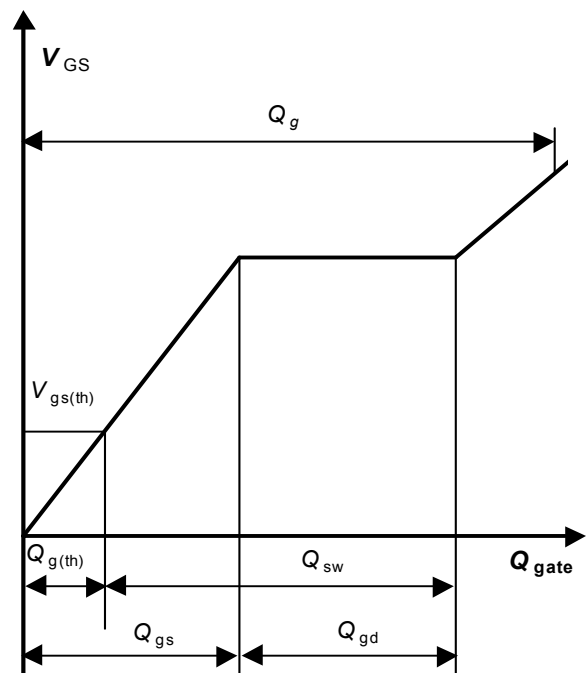
15 Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = 90 \text{ A pulsed}$$

parameter: V_{DD}



16 Gate charge waveforms



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Infineon Technologies AG
81726 Munich, Germany

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If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History

Version	Date	Changes
Rev 2.0	09.03.2007	Final data sheet
Rev 2.1	08.03.2010	Update of RDSon