

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



### Product Summary

$V_{DS}$	30	V
$R_{DS(on),max}$ (SMD version)	14.6	m $\Omega$
$I_D$	22	A

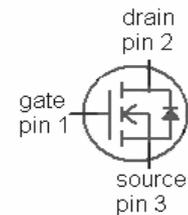
### Features

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

PG-TO263-3-2      PG-TO262-3-1      PG-TO220-3-1



Type	Package	Marking
IPB22N03S4L-15	PG-TO263-3-2	4N03L15
IPI22N03S4L-15	PG-TO262-3-1	4N03L15
IPP22N03S4L-15	PG-TO220-3-1	4N03L15



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current <sup>1)</sup>	$I_D$	$T_C=25^\circ\text{C}$ , $V_{GS}=10\text{ V}$	22	A
		$T_C=100^\circ\text{C}$ , $V_{GS}=10\text{ V}^{2)}$	22	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25^\circ\text{C}$	88	
Avalanche energy, single pulse	$E_{AS}$	$I_D=22\text{ A}$	20	mJ
Avalanche current, single pulse	$I_{AS}$	$T_C=25^\circ\text{C}$	22	A
Gate source voltage	$V_{GS}$		$\pm 16$	V
Power dissipation	$P_{tot}$	$T_C=25^\circ\text{C}$	31	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>2)</sup></b>						
Thermal resistance, junction - case	$R_{thJC}$		-	-	4.9	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  $T_j=25\text{ }^\circ\text{C}$ , 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	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=10\text{ }\mu\text{A}$	1.0	1.5	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	$\mu\text{A}$
		$V_{DS}=30\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}^{2)}$	-	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	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}, I_D=11\text{ A}$	-	17.5	19.8	m $\Omega$
		$V_{GS}=4.5\text{ V}, I_D=11\text{ A},$ SMD version	-	17.2	19.5	
		$V_{GS}=10\text{ V}, I_D=22\text{ A}$	-	12.7	14.9	
		$V_{GS}=10\text{ V}, I_D=22\text{ A},$ SMD version	-	12.4	14.6	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

### Dynamic characteristics<sup>2)</sup>

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V}, f=1\text{ MHz}$	-	750	980	pF
Output capacitance	$C_{oss}$		-	190	250	
Reverse transfer capacitance	$C_{rss}$		-	10	20	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=10\text{ V}, I_D=22\text{ A}, R_G=3.5\ \Omega$	-	3	-	ns
Rise time	$t_r$		-	2	-	
Turn-off delay time	$t_{d(off)}$		-	12	-	
Fall time	$t_f$		-	2	-	

### Gate Charge Characteristics<sup>2)</sup>

Gate to source charge	$Q_{gs}$	$V_{DD}=24\text{ V}, I_D=22\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	2.2	3	nC
Gate to drain charge	$Q_{gd}$		-	1.4	3	
Gate charge total	$Q_g$		-	11	14	
Gate plateau voltage	$V_{plateau}$		-	3.4	-	V

### Reverse Diode

Diode continuous forward current <sup>2)</sup>	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	22	A
Diode pulse current <sup>2)</sup>	$I_{S,pulse}$		-	-	88	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=22\text{ A}, T_j=25\text{ }^\circ\text{C}$	0.6	0.95	1.3	V
Reverse recovery time <sup>2)</sup>	$t_{rr}$	$V_R=15\text{ V}, I_F=I_S, di_F/dt=100\text{ A}/\mu\text{s}$	-	12	-	ns
Reverse recovery charge <sup>2)</sup>	$Q_{rr}$		-	10	-	

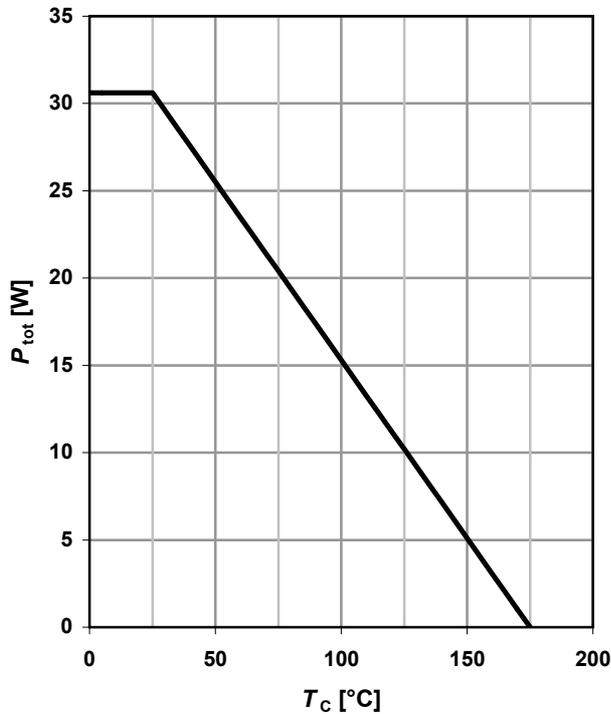
<sup>1)</sup> Current is limited by bondwire; with an  $R_{thJC} = 4.9\text{K/W}$  the chip is able to carry 36A at 25°C. For detailed information see Application Note ANPS071E at [www.infineon.com/optimos](http://www.infineon.com/optimos)

<sup>2)</sup> Defined by design. Not subject to production test.

<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.

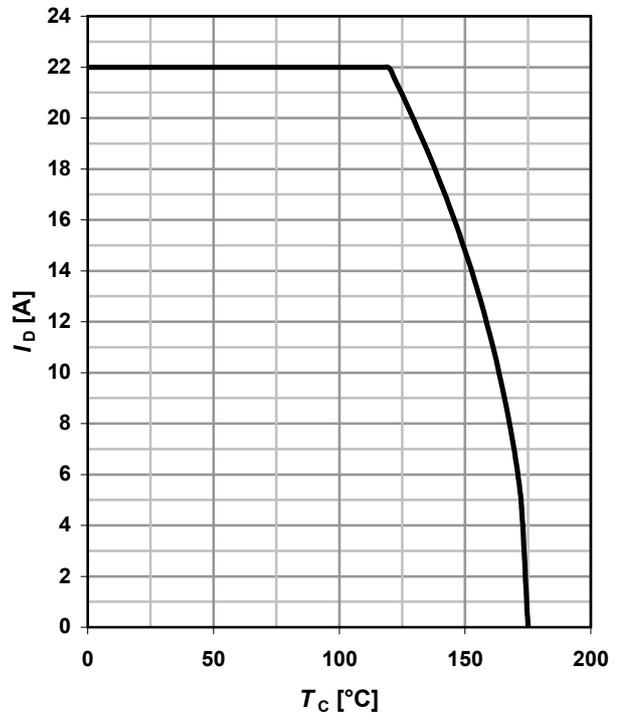
**1 Power dissipation**

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



**2 Drain current**

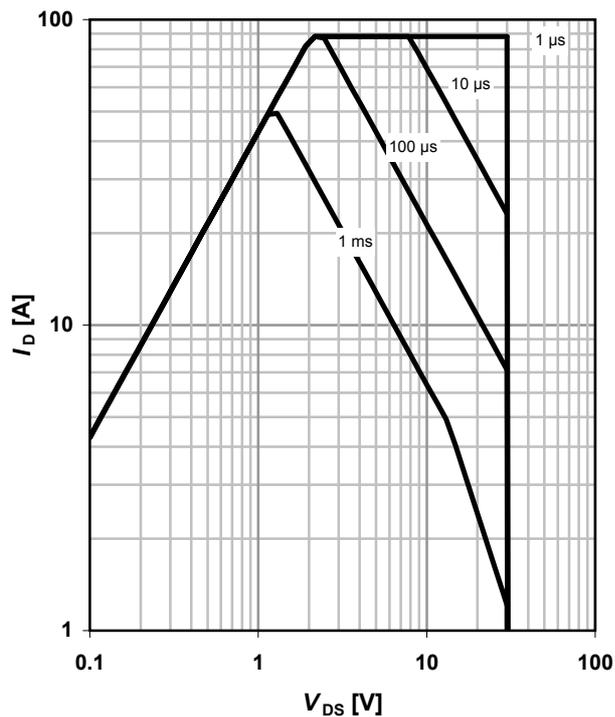
$I_D = f(T_C); V_{GS} \geq 6 V; SMD$



**3 Safe operating area**

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

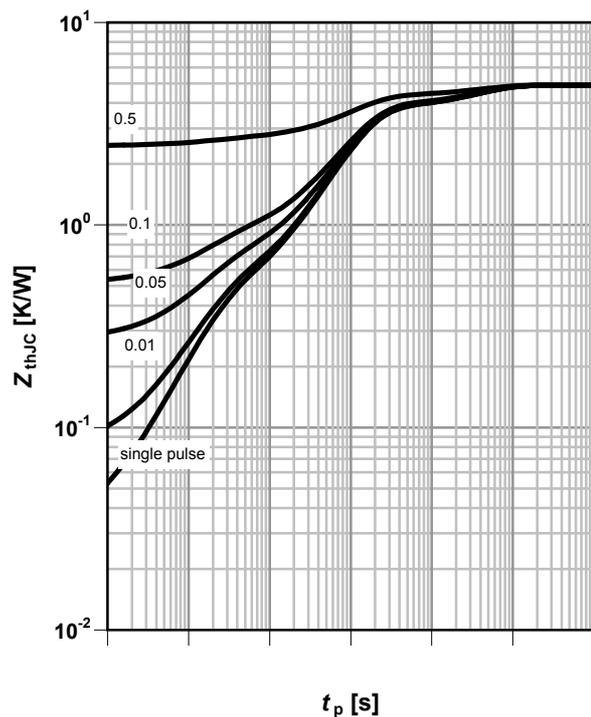
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC} = f(t_p)$

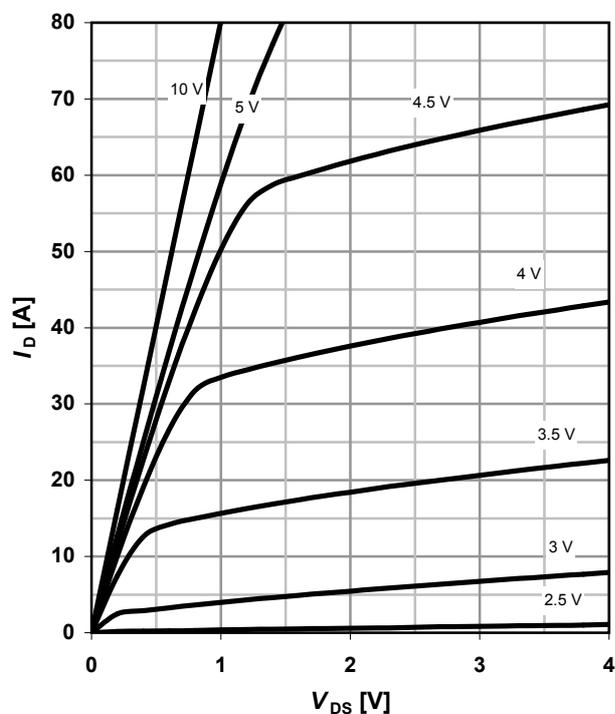
parameter:  $D = t_p/T$



**5 Typ. output characteristics**

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

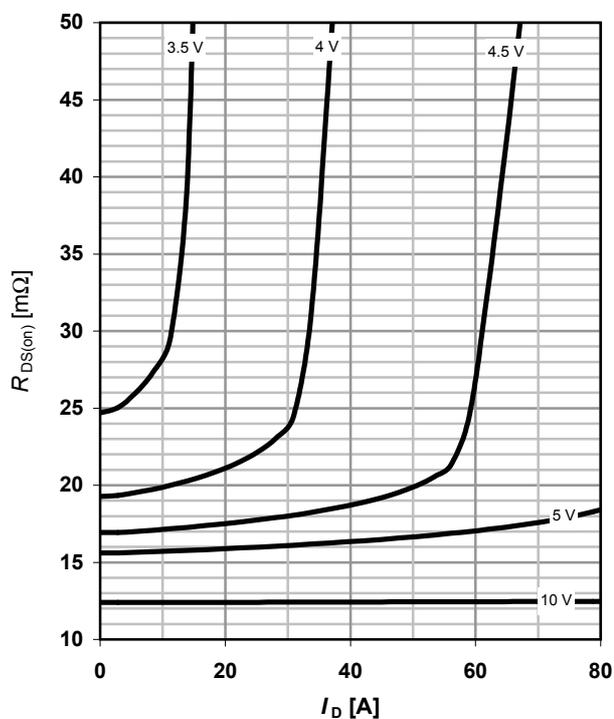
parameter:  $V_{GS}$



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

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

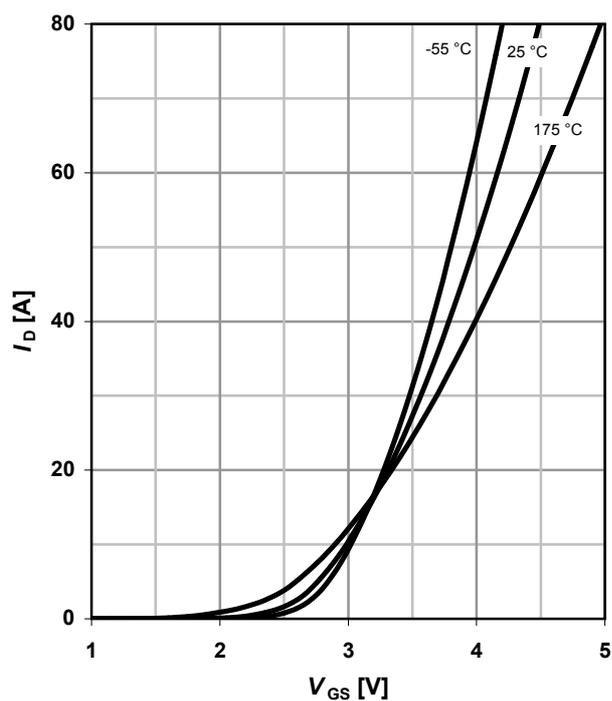
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

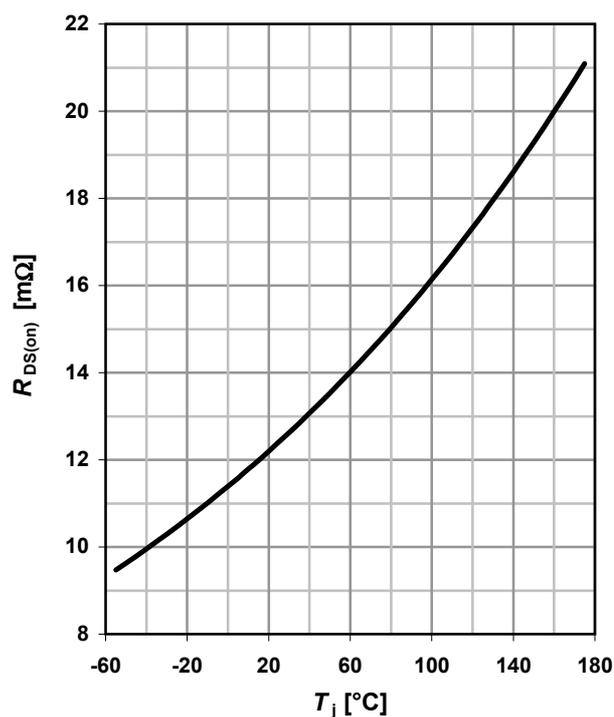
$I_D = f(V_{GS}); V_{DS} = 6\text{ V}$

parameter:  $T_j$



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

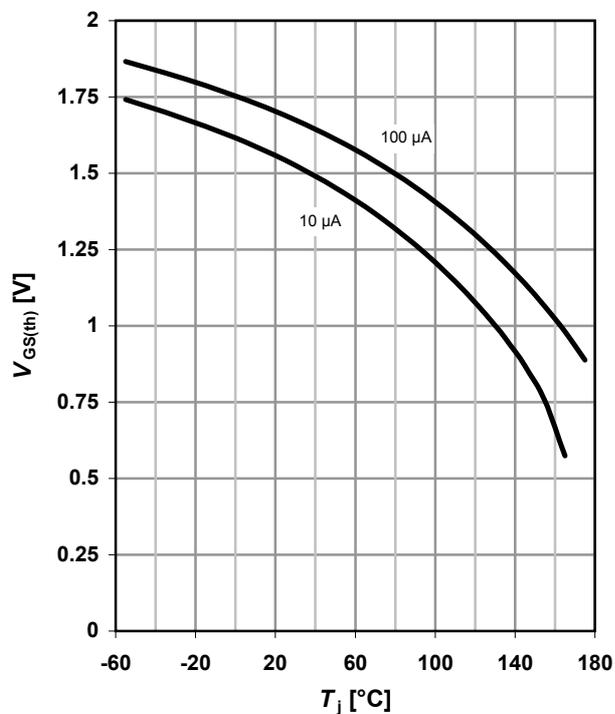
$R_{DS(on)} = f(T_j); I_D = 22\text{ A}; V_{GS} = 10\text{ V}, \text{SMD}$



**9 Typ. gate threshold voltage**

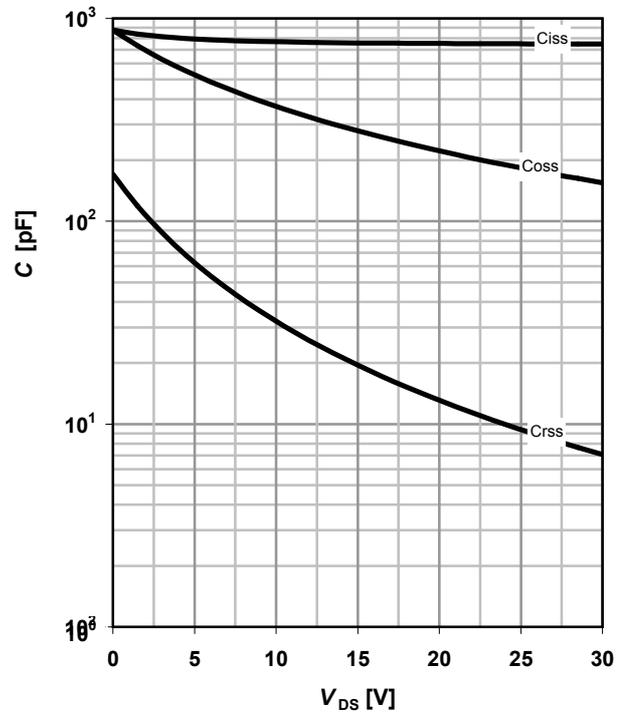
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**10 Typ. capacitances**

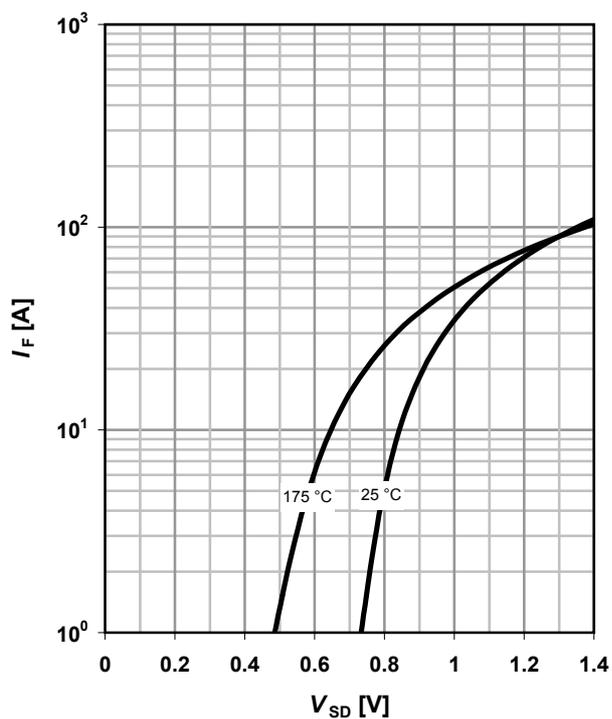
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**11 Typical forward diode characteristics**

$I_F = f(V_{SD})$

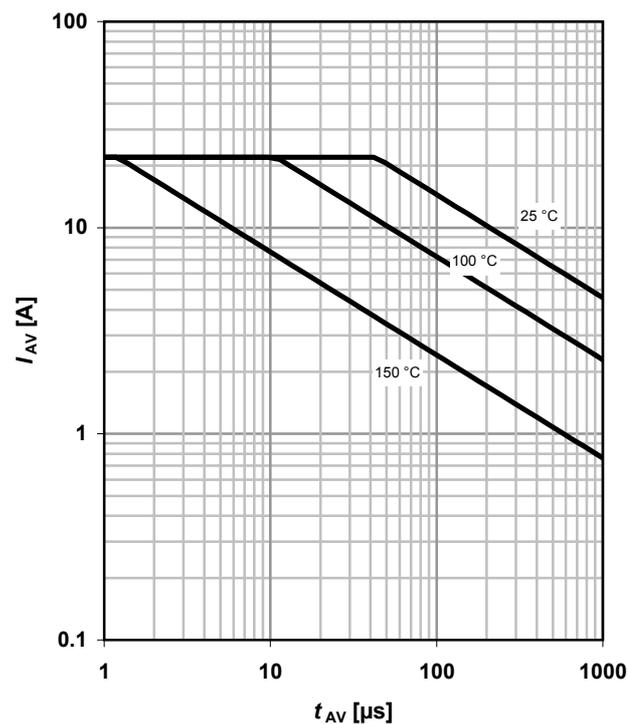
parameter:  $T_j$



**12 Typ. avalanche characteristics**

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

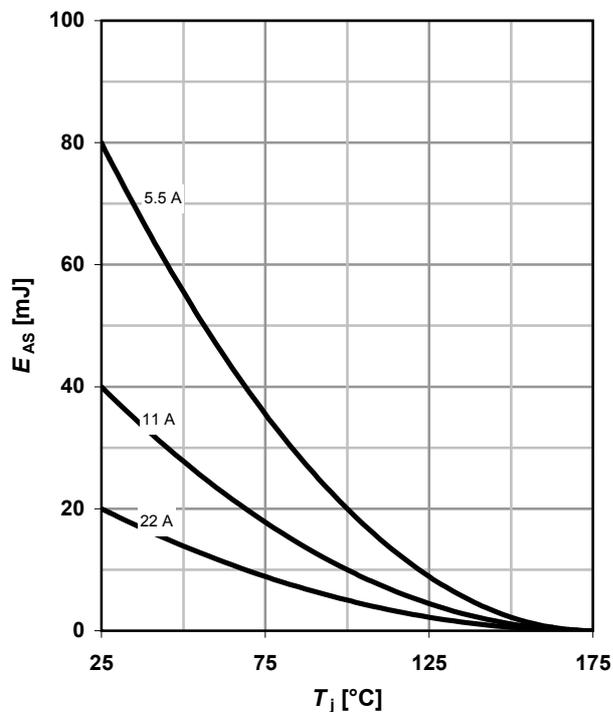
parameter:  $T_{j(start)}$



### 13 Typical avalanche energy

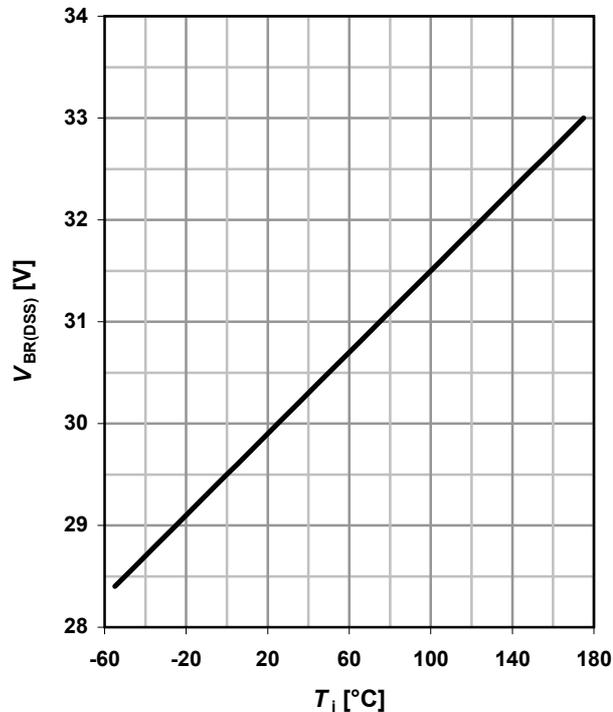
$$E_{AS} = f(T_j)$$

parameter:  $I_D$



### 14 Typ. drain-source breakdown voltage

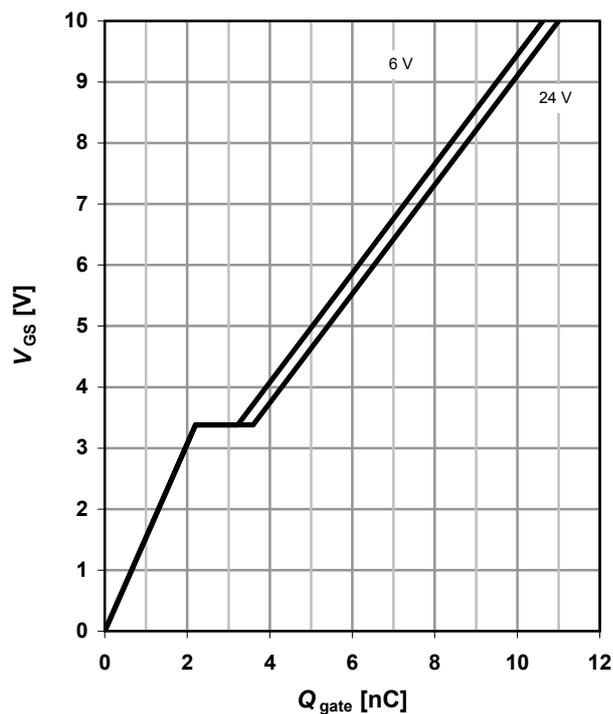
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



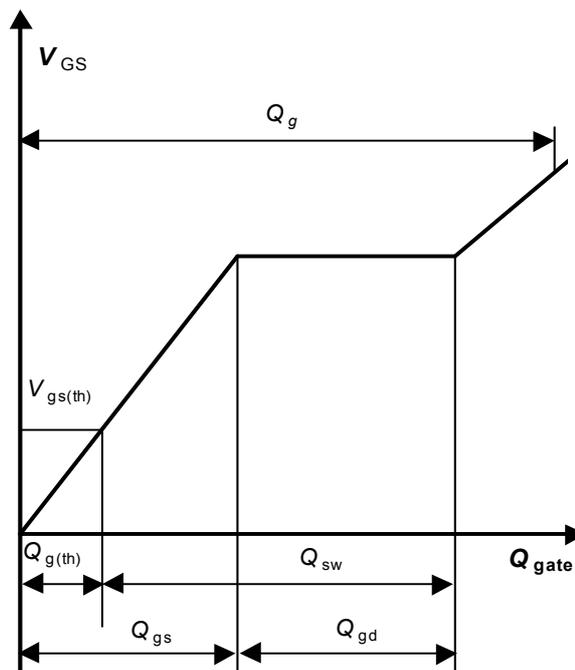
### 15 Typ. gate charge

$$V_{GS} = f(Q_{gate}); I_D = 22 \text{ A pulsed}$$

parameter:  $V_{DD}$



### 16 Gate charge waveforms



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