

# SIPMOS<sup>®</sup> Small-Signal-Transistor

## Feature

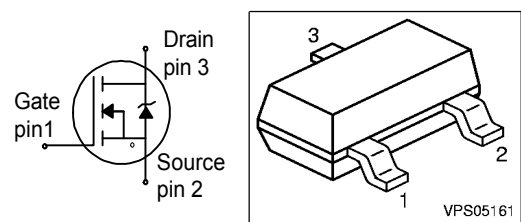
- N-Channel
- Enhancement mode
- Logic Level
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21



## Product Summary

$V_{DS}$	60	V
$R_{DS(on)}$	5	$\Omega$
$I_D$	0.2	A

PG-SOT-23



Type	Package	Pb-free	Tape and Reel Information	Marking
SN7002N	PG-SOT-23	Yes	H6327: 3000 pcs/reel	sSN
SN7002N	PG-SOT-23	Yes	H6433: 10000 pcs/reel	sSN

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

Parameter	Symbol	Value	Unit
Continuous drain current	$I_D$		A
$T_A=25^\circ\text{C}$		0.2	
$T_A=70^\circ\text{C}$		0.16	
Pulsed drain current	$I_{D\text{ puls}}$	0.8	
$T_A=25^\circ\text{C}$			
Reverse diode dv/dt	dv/dt	6	kV/ $\mu\text{s}$
$I_S=0.2\text{A}$ , $V_{DS}=48\text{V}$ , $di/dt=200\text{A}/\mu\text{s}$ , $T_{j\text{max}}=150^\circ\text{C}$			
Gate source voltage	$V_{GS}$	$\pm 20$	V
ESD Class (JESD22-A114-HBM)		0 (<250V)	
Power dissipation	$P_{\text{tot}}$	0.36	W
$T_A=25^\circ\text{C}$			
Operating and storage temperature	$T_j, T_{\text{stg}}$	-55... +150	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/150/56	

**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - ambient at minimal footprint	$R_{thJA}$	-	-	350	K/W

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

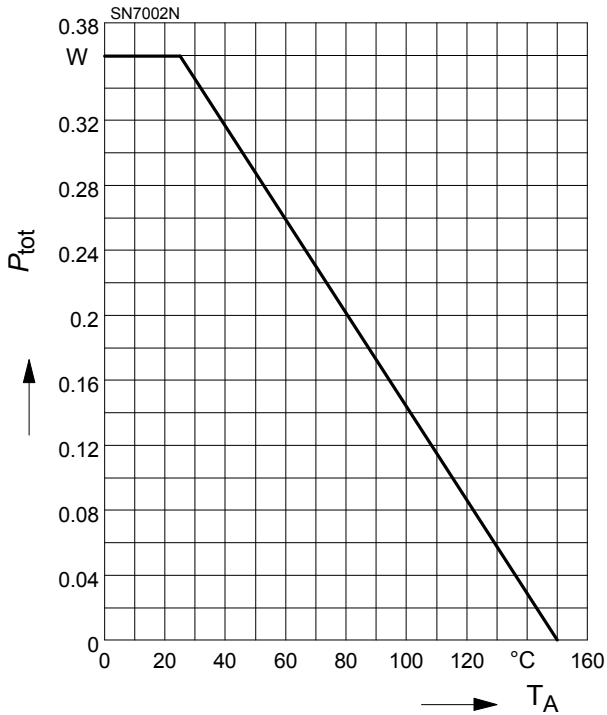
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain-source breakdown voltage $V_{GS}=0, I_D=250\mu\text{A}$	$V_{(BR)DSS}$	60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=26\mu\text{A}$	$V_{GS(th)}$	0.8	1.4	1.8	
Zero gate voltage drain current $V_{DS}=60\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$ $V_{DS}=60\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$	$I_{DSS}$	-	-	0.1 5	$\mu\text{A}$
Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0$	$I_{GSS}$	-	-	10	nA
Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=0.17\text{A}$	$R_{DS(on)}$	-	3.9	7.5	$\Omega$
Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=0.5\text{A}$	$R_{DS(on)}$	-	2.5	5	

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Dynamic Characteristics</b>						
Transconductance	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 0.16\text{A}$	0.09	0.17	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	-	34	45	pF
Output capacitance	$C_{oss}$		-	7.2	9.6	
Reverse transfer capacitance	$C_{rss}$		-	2.8	4.2	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30\text{V}$ , $V_{GS} = 10\text{V}$ , $I_D = 0.5\text{A}$ , $R_G = 6\Omega$	-	2.4	3.6	ns
Rise time	$t_r$		-	3.2	4.8	
Turn-off delay time	$t_{d(off)}$		-	5.3	8	
Fall time	$t_f$		-	3.6	5.4	
<b>Gate Charge Characteristics</b>						
Gate to source charge	$Q_{gs}$	$V_{DD} = 48\text{V}$ , $I_D = 0.5\text{A}$	-	0.14	0.21	nC
Gate to drain charge	$Q_{gd}$		-	0.42	0.63	
Gate charge total	$Q_g$	$V_{DD} = 48\text{V}$ , $I_D = 0.5\text{A}$ , $V_{GS} = 0$ to $10\text{V}$	-	1	1.5	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 48\text{V}$ , $I_D = 0.5\text{A}$	-	4.5	-	V
<b>Reverse Diode</b>						
Inverse diode continuous forward current	$I_S$	$T_A = 25\text{ }^\circ\text{C}$	-	-	0.2	A
Inv. diode direct current, pulsed	$I_{SM}$		-	-	0.8	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0$ , $I_F = I_S$	-	0.83	1.2	V
Reverse recovery time	$t_{rr}$	$V_R = 30\text{V}$ , $I_F = I_S$ , $di_F/dt = 100\text{A}/\mu\text{s}$	-	14.2	21.3	ns
Reverse recovery charge	$Q_{rr}$		-	5.9	8.8	

### 1 Power dissipation

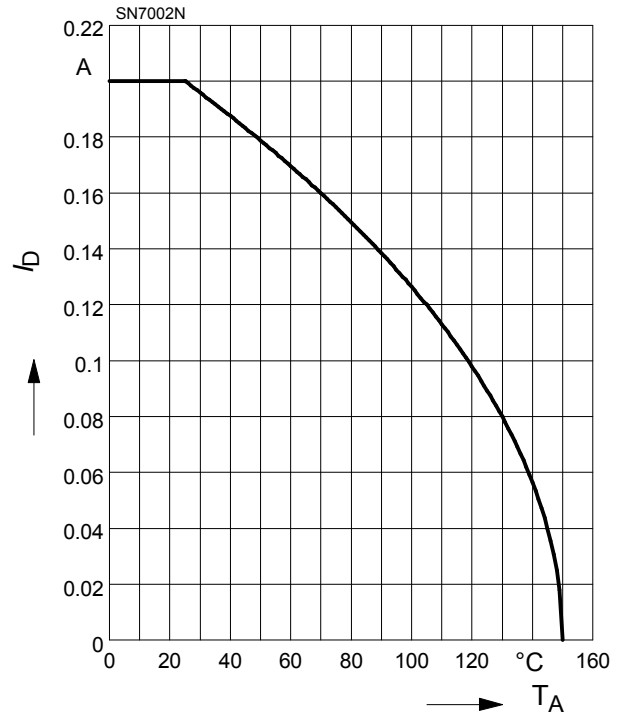
$$P_{tot} = f(T_A)$$



### 2 Drain current

$$I_D = f(T_A)$$

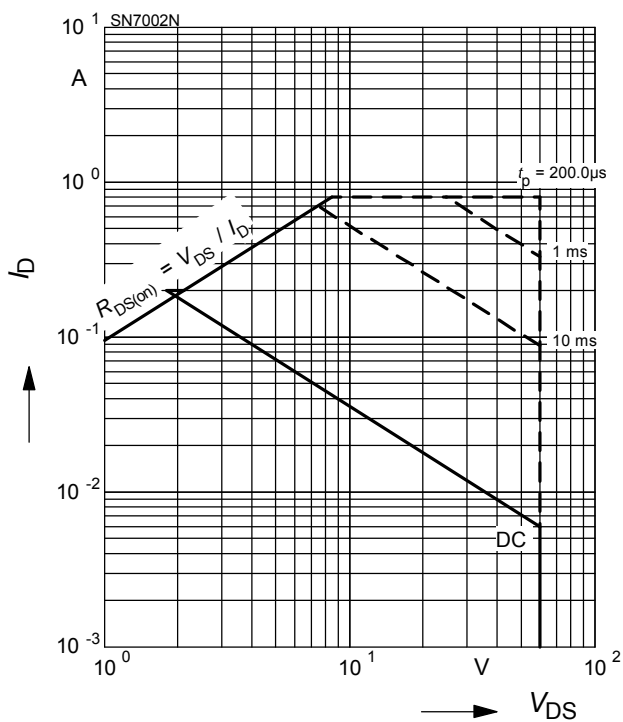
parameter:  $V_{GS} \geq 10\text{ V}$



### 3 Safe operating area

$$I_D = f(V_{DS})$$

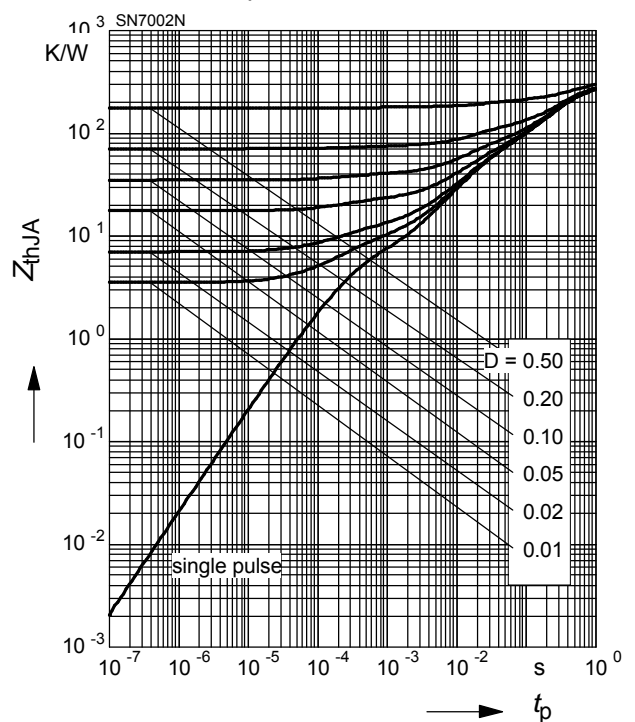
parameter:  $D = 0$ ,  $T_A = 25\text{ °C}$



### 4 Transient thermal impedance

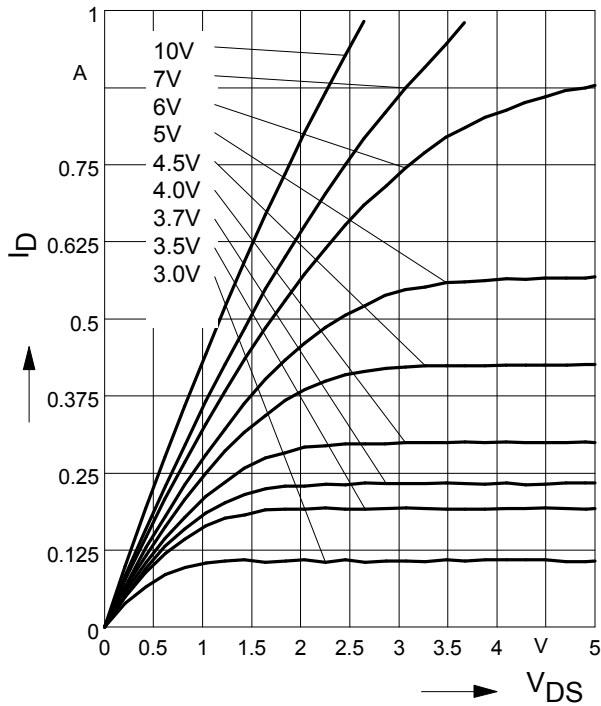
$$Z_{thJA} = f(t_p)$$

parameter:  $D = t_p/T$

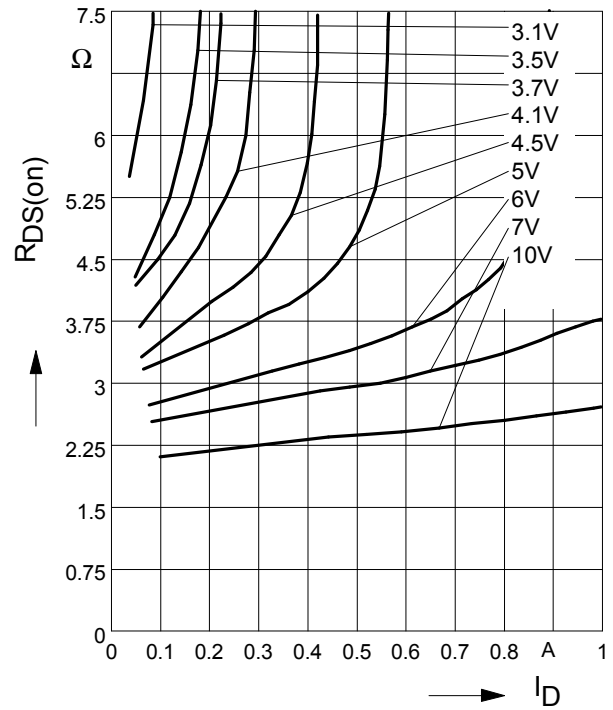


**5 Typ. output characteristic**

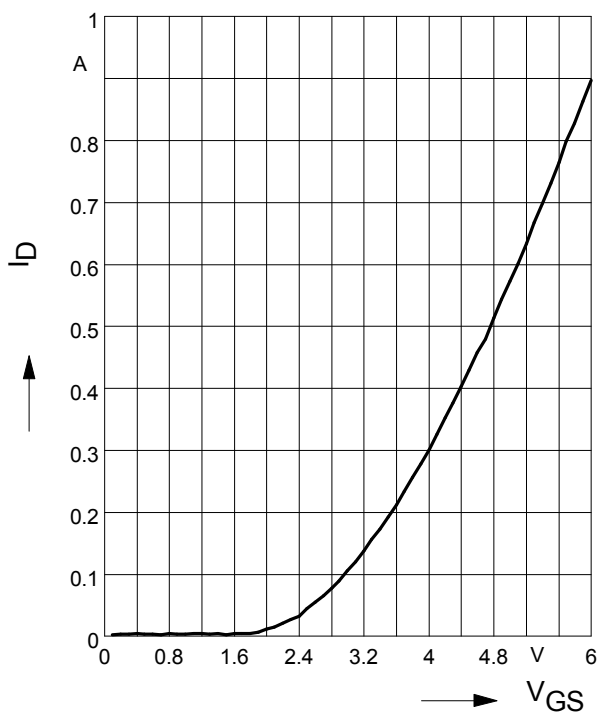
$$I_D = f(V_{DS})$$

 parameter:  $T_j = 25\text{ }^\circ\text{C}$ ,  $V_{GS}$ 

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

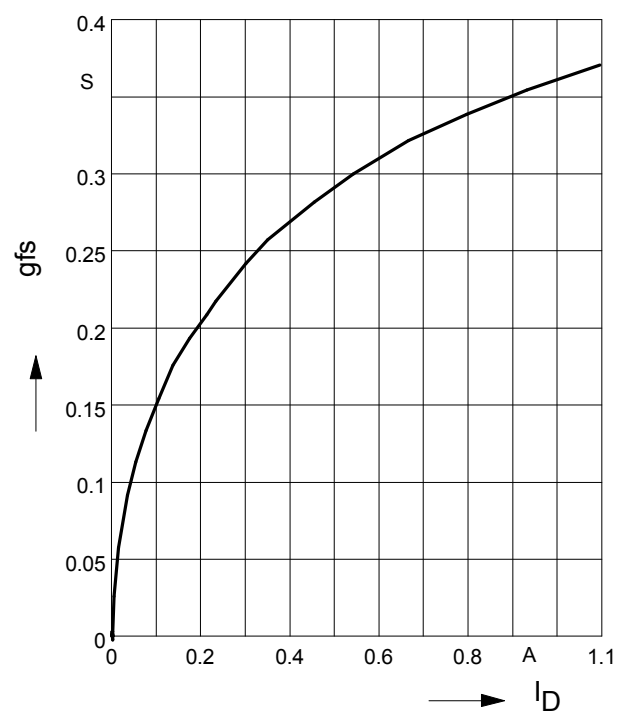
$$R_{DS(on)} = f(I_D)$$

 parameter:  $T_j = 25\text{ }^\circ\text{C}$ ,  $V_{GS}$ 

**7 Typ. transfer characteristics**

$$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

 parameter:  $T_j = 25\text{ }^\circ\text{C}$ 

**8 Typ. forward transconductance**

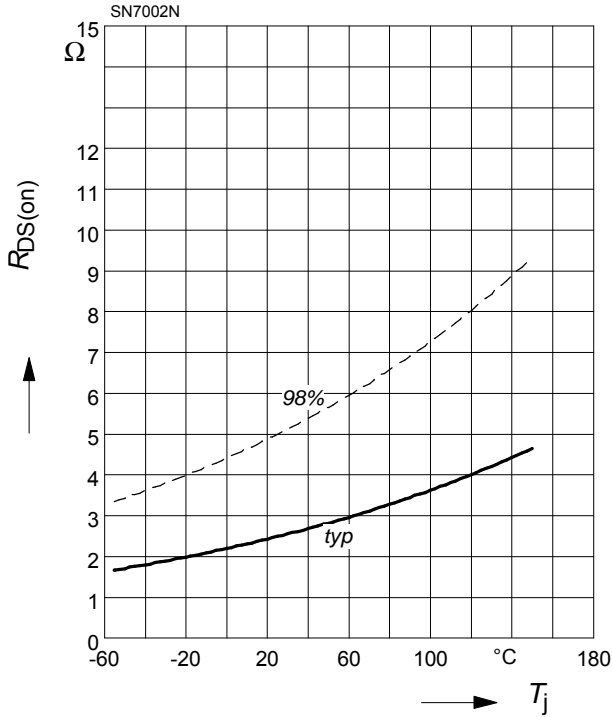
$$g_{fs} = f(I_D)$$

 parameter:  $T_j = 25\text{ }^\circ\text{C}$ 


**9 Drain-source on-state resistance**

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

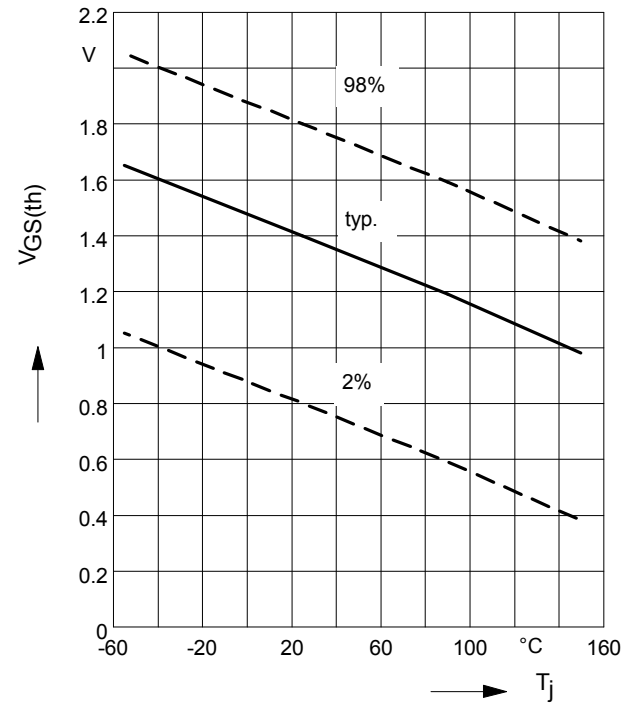
parameter :  $I_D = 0.5 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

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

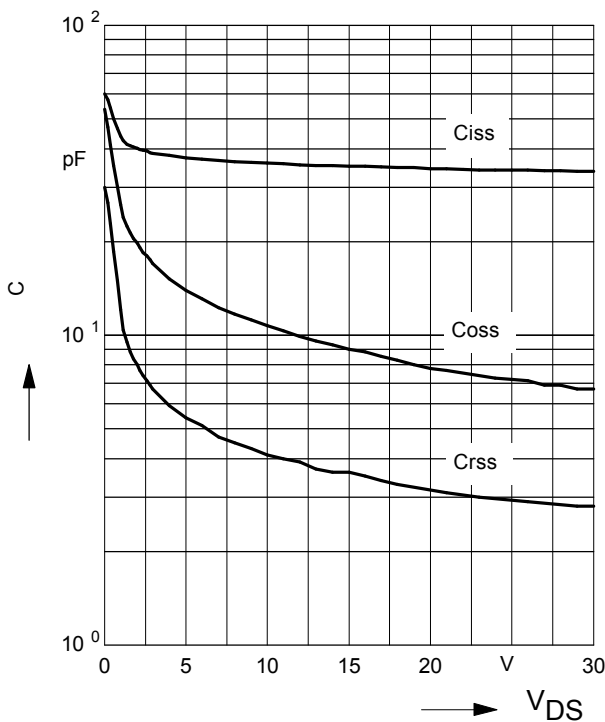
parameter:  $V_{GS} = V_{DS}$ ;  $I_D = 26\mu\text{A}$



**11 Typ. capacitances**

$$C = f(V_{DS})$$

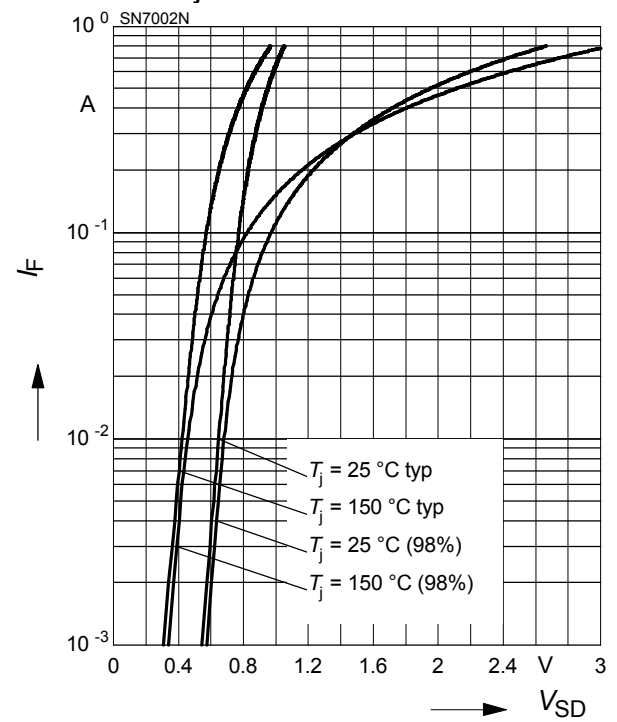
parameter:  $V_{GS}=0$ ,  $f=1 \text{ MHz}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



**12 Forward character. of reverse diode**

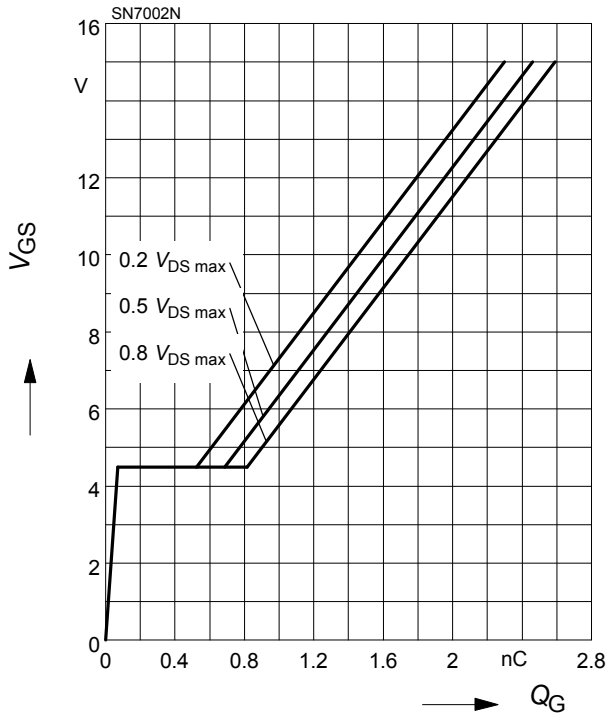
$$I_F = f(V_{SD})$$

parameter:  $T_j$



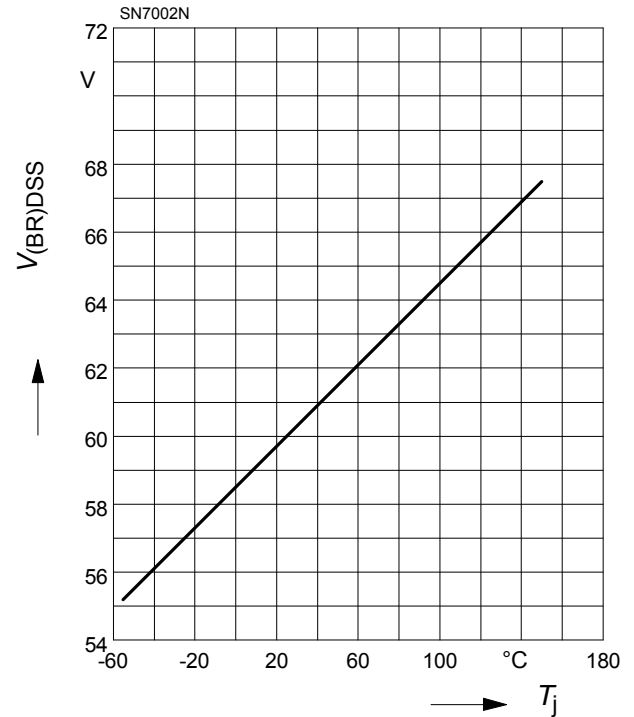
**13 Typ. gate charge**

$V_{GS} = f(Q_G)$ ; parameter:  $V_{DS}$ ,  
 $I_D = 0.2 \text{ A pulsed}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



**14 Drain-source breakdown voltage**

$V_{(BR)DSS} = f(T_j)$







**Published by**  
**Infineon Technologies AG**  
**81726 Munich, Germany**  
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