

SIPMOS[®] Small-Signal-Transistor

Feature

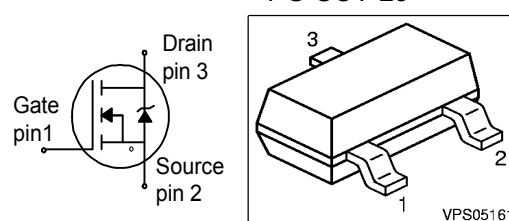
- N-Channel
- Enhancement mode
- Logic Level
- dv/dt rated
- Pb-free lead plating; RoHS compliant
- Qualified according to AEC Q101
- Halogen-free according to IEC61249-2-21



Product Summary

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

PG-SOT-23



VPS05161

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/ μs
$I_S = 0.2\text{A}$, $V_{DS} = 48\text{V}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_{j\text{max}} = 150^\circ\text{C}$			
Gate source voltage	V_{GS}	± 20	V
ESD Class (JESD22-A114-HBM)		0 (<250V)	
Power dissipation	P_{tot}	0.36	W
$T_A = 25^\circ\text{C}$			
Operating and storage temperature	T_j, T_{stg}	-55... +150	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/150/56	

Thermal Characteristics

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

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic Characteristics

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	

Gate Charge Characteristics

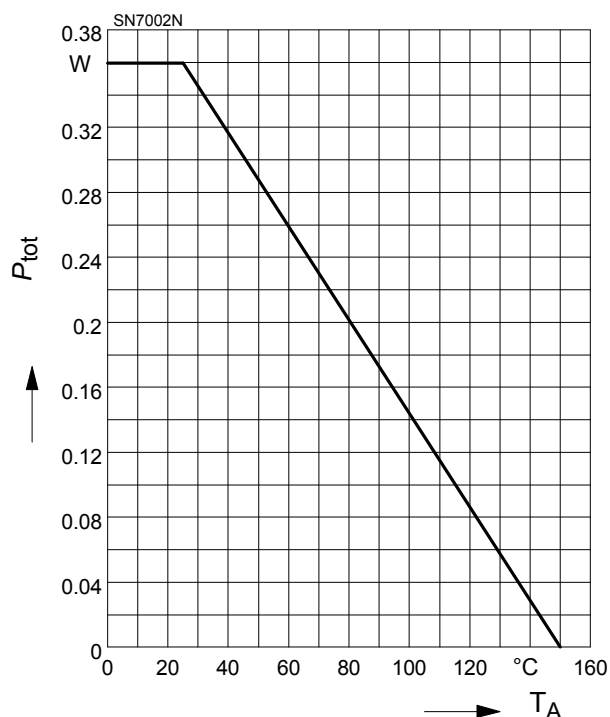
Gate to source charge	Q_{gs}	$V_{DD} = 48\text{V}$, $I_D = 0.5\text{A}$	-	0.14	0.21	nC
Gate to drain charge	Q_{gd}		-	0.42	0.63	
Gate charge total	Q_g	$V_{DD} = 48\text{V}$, $I_D = 0.5\text{A}$, $V_{GS} = 0$ to 10V	-	1	1.5	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 48\text{V}$, $I_D = 0.5\text{A}$	-	4.5	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A = 25^{\circ}\text{C}$	-	-	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

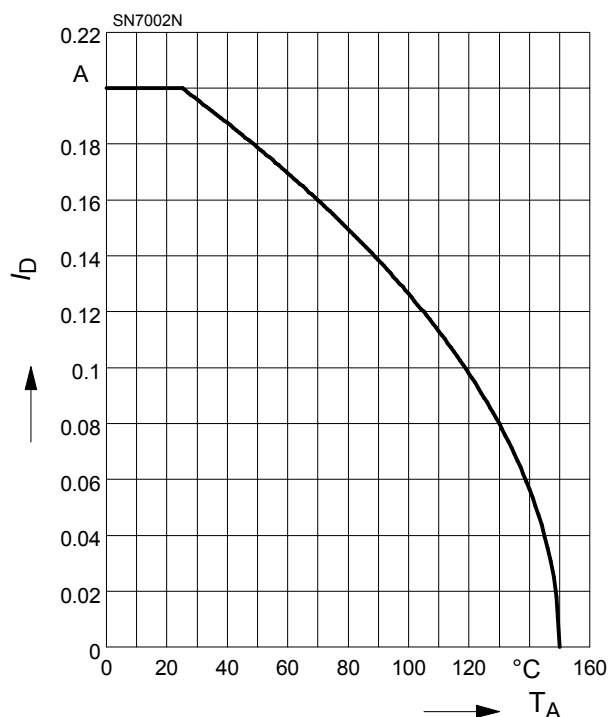
$$P_{\text{tot}} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

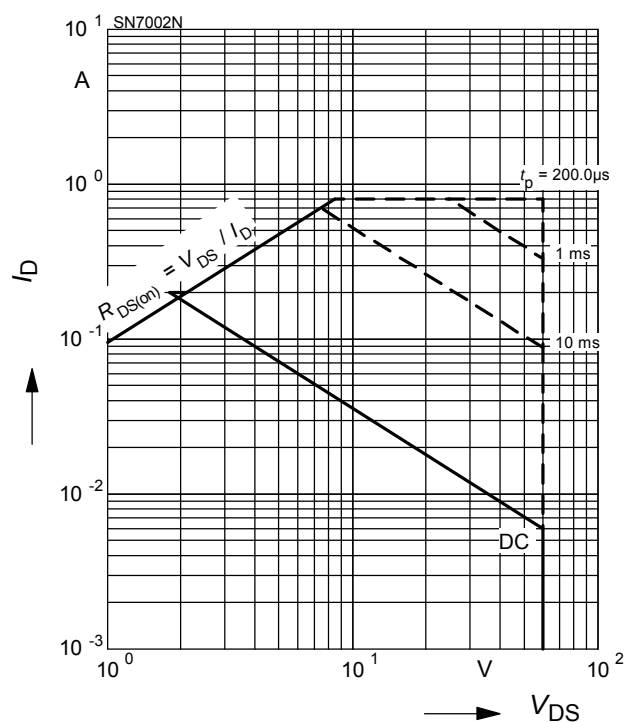
parameter: $V_{GS} \geq 10$ V



3 Safe operating area

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

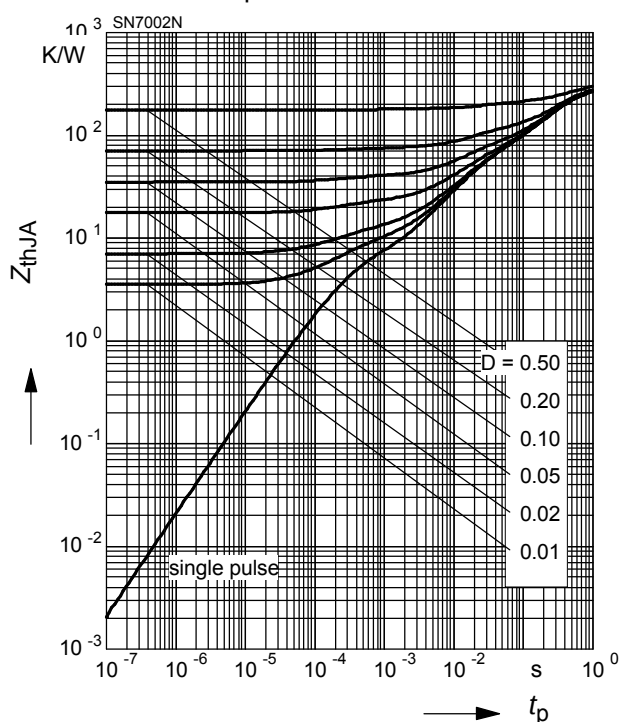
parameter: $D = 0$, $T_A = 25$ °C



4 Transient thermal impedance

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

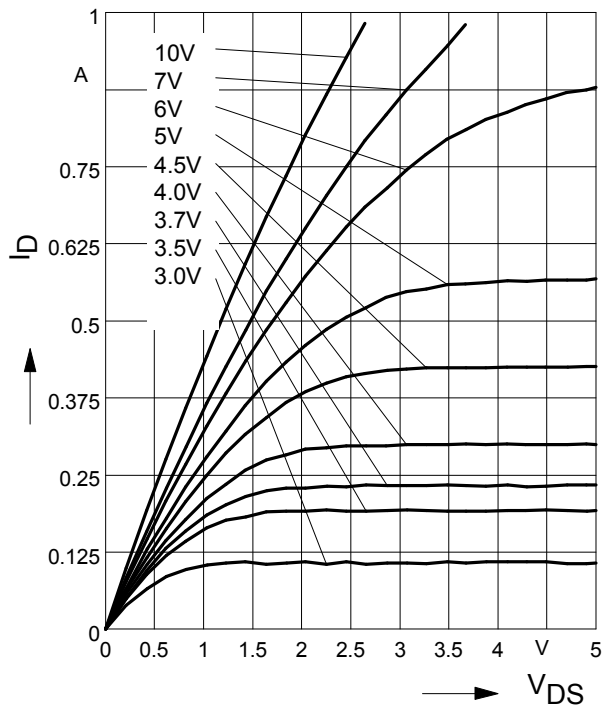
parameter: $D = t_p / T$



5 Typ. output characteristic

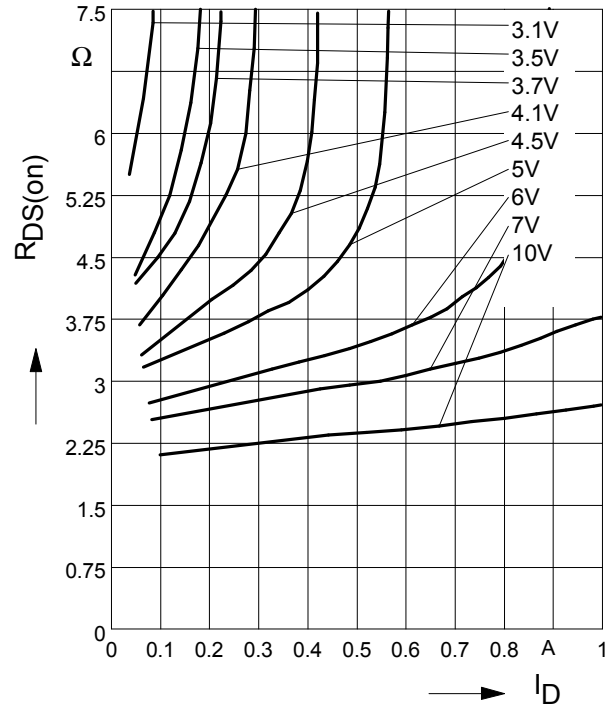
$$I_D = f(V_{DS})$$

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


6 Typ. drain-source on resistance

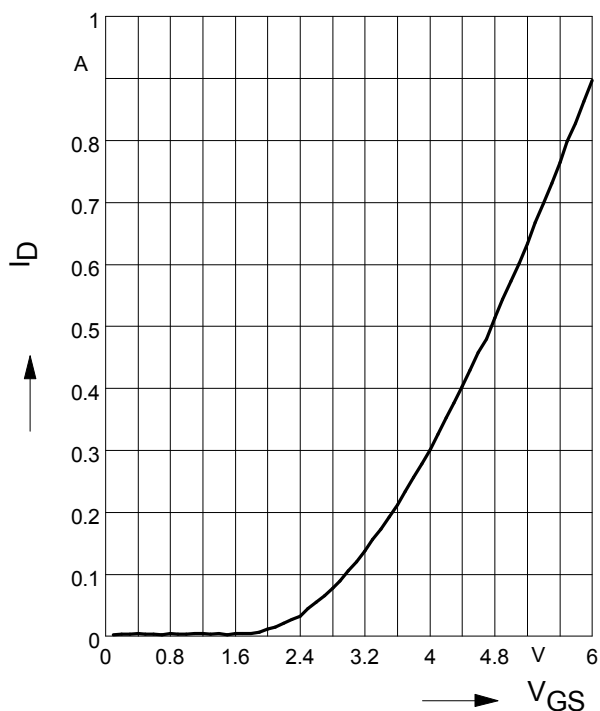
$$R_{DS(on)} = f(I_D)$$

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


7 Typ. transfer characteristics

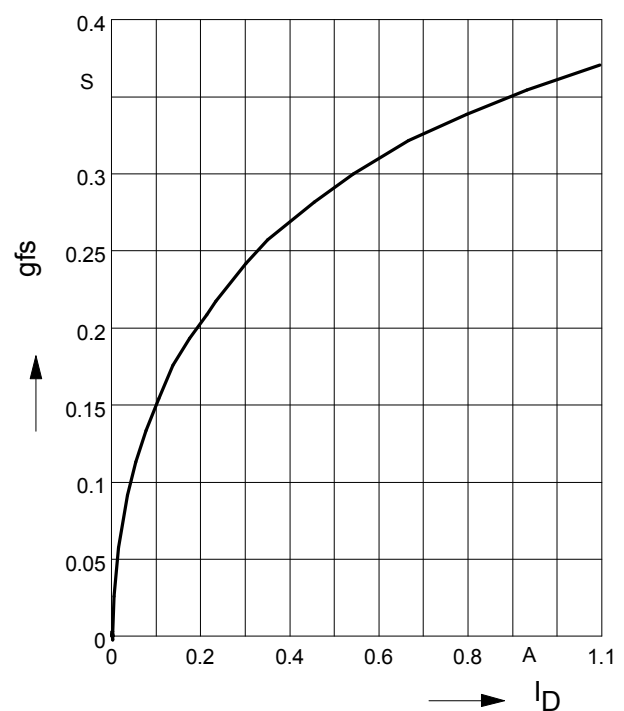
$$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$

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


8 Typ. forward transconductance

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

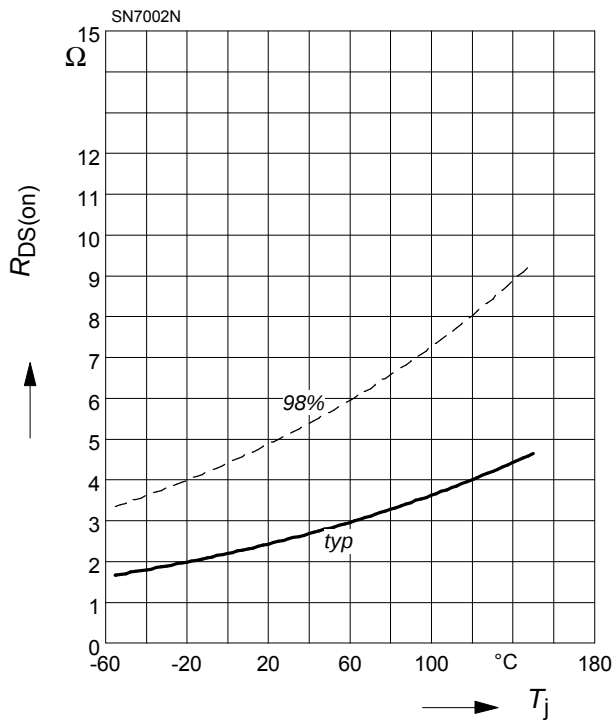
parameter: $T_j = 25\text{ }^{\circ}\text{C}$



9 Drain-source on-state resistance

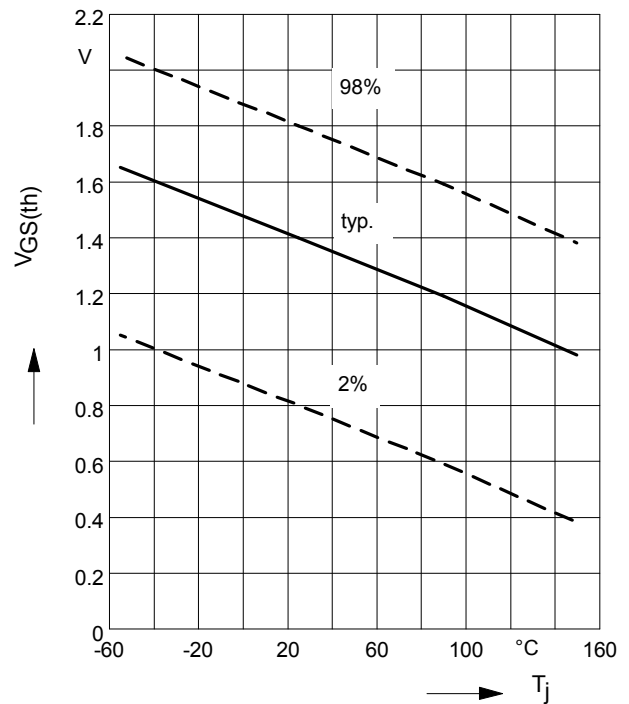
$$R_{DS(on)} = f(T_j)$$

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


10 Typ. gate threshold voltage

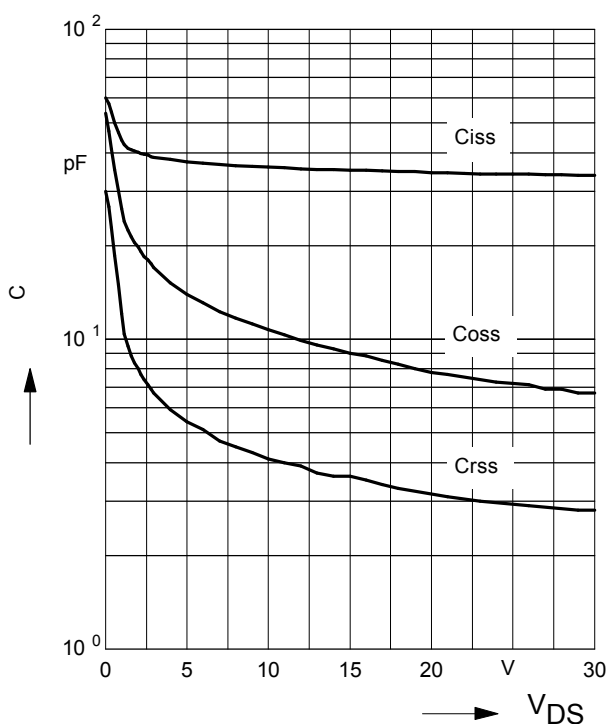
$$V_{GS(th)} = f(T_j)$$

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


11 Typ. capacitances

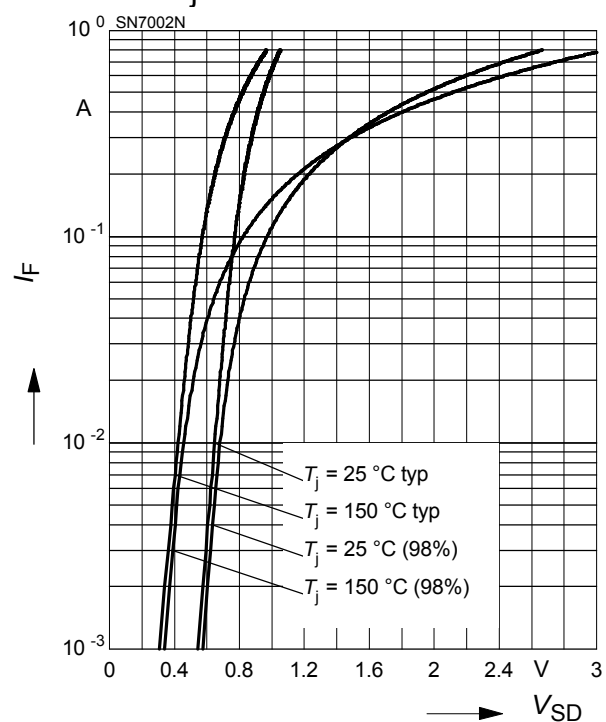
$$C = f(V_{DS})$$

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


12 Forward character. of reverse diode

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

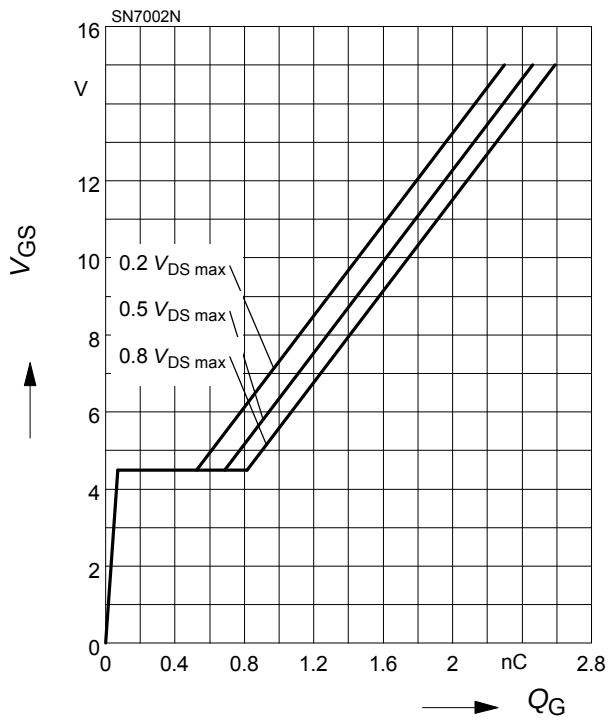
parameter: T_j



13 Typ. gate charge

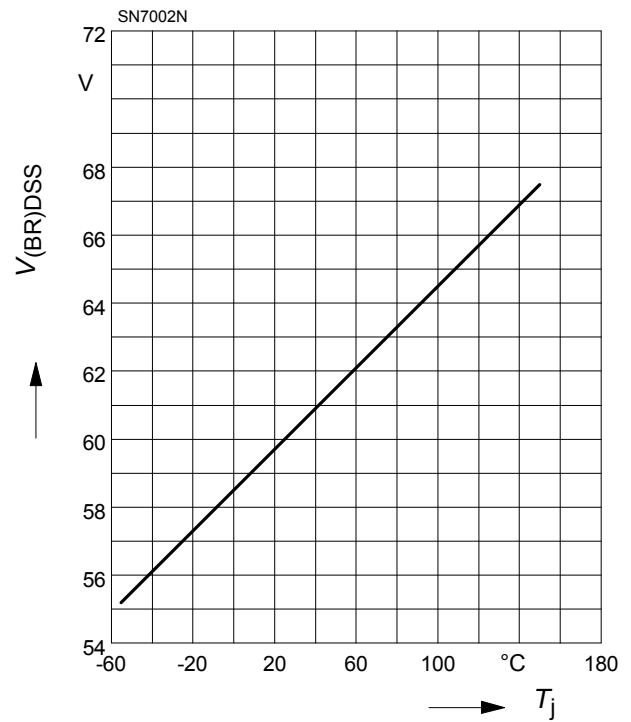
$V_{GS} = f(Q_G)$; parameter: V_{DS} ,

$I_D = 0.2 \text{ A pulsed}$, $T_j = 25^\circ\text{C}$



14 Drain-source breakdown voltage

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



Package Outline:



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