

OptiMOS[®] Buck converter series

Feature

- N-Channel
- Enhancement mode
- Logic Level

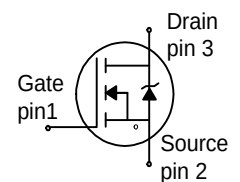
Product Summary

V_{DS}	55	V
$R_{DS(on)}$	650	m Ω
I_D	0.54	A

SOT 23



Type	Package	Ordering Code	Marking
BSS670S2L	SOT 23	Q67042-S4052	BSs


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

Parameter	Symbol	Value	Unit
Continuous drain current $T_A=25^\circ\text{C}$ $T_A=70^\circ\text{C}$	I_D	0.54 0.43	A
Pulsed drain current $T_A=25^\circ\text{C}$	$I_{D \text{ puls}}$	2.2	
Gate source voltage	V_{GS}	± 20	V
Power dissipation $T_A=25^\circ\text{C}$	P_{tot}	0.36	W
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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - soldering point (Pin 3)	R_{thJS}	-	-	290	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	350	
@ 6 cm ² cooling area 1)		-	-	300	

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 $V_{GS}=0, I_D=1\text{mA}$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=2.7\mu\text{A}$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS}=55\text{V}, V_{GS}=0, T_j=25^\circ\text{C}$ $V_{DS}=55\text{V}, V_{GS}=0, T_j=150^\circ\text{C}$	I_{DSS}	- -	0.01 10	1 100	μA
Gate-source leakage current $V_{GS}=20\text{V}, V_{DS}=0\text{V}$	I_{GSS}	-	1	100	
Drain-source on-state resistance $V_{GS}=4.5\text{V}, I_D=270\text{mA}$	$R_{DS(on)}$	-	430	825	$\text{m}\Omega$
Drain-source on-state resistance $V_{GS}=10\text{V}, I_D=270\text{mA}$	$R_{DS(on)}$	-	346	650	

¹⁾Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic Characteristics

Transconductance	g_{fs}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 0.54A$	0.6	1.2	-	S
Input capacitance	C_{iss}	$V_{GS} = 0$, $V_{DS} = 25V$, $f = 1MHz$	-	56	75	pF
Output capacitance	C_{oss}		-	13	18	
Reverse transfer capacitance	C_{rss}		-	7	10	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 30V$, $V_{GS} = 4.5V$, $I_D = 0.54A$, $R_G = 130\Omega$	-	9	14	ns
Rise time	t_r		-	25	37	
Turn-off delay time	$t_{d(off)}$		-	21	31	
Fall time	t_f		-	24	32	

Gate Charge Characteristics

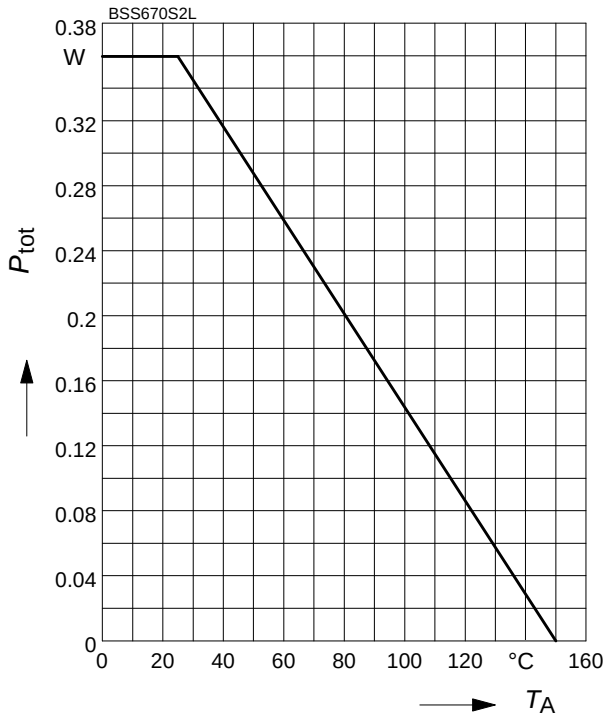
Gate to source charge	Q_{gs}	$V_{DD} = 40V$, $I_D = 0.54A$	-	0.19	0.25	nC
Gate to drain charge	Q_{gd}		-	0.57	0.86	
Gate charge total	Q_g	$V_{DD} = 40V$, $I_D = 0.54A$, $V_{GS} = 0$ to $10V$	-	1.7	2.26	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 40V$, $I_D = 0.54A$	-	3.1	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_A = 25^\circ C$	-	-	0.38	A
Inv. diode direct current, pulsed	I_{SM}		-	-	2.2	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0$, $I_F = 0.54A$	-	0.8	1.1	V
Reverse recovery time	t_{rr}	$V_R = 30V$, $I_F = I_S$, $di_F/dt = 100A/\mu s$	-	51	64	ns
Reverse recovery charge	Q_{rr}		-	22	28	nC

1 Power dissipation

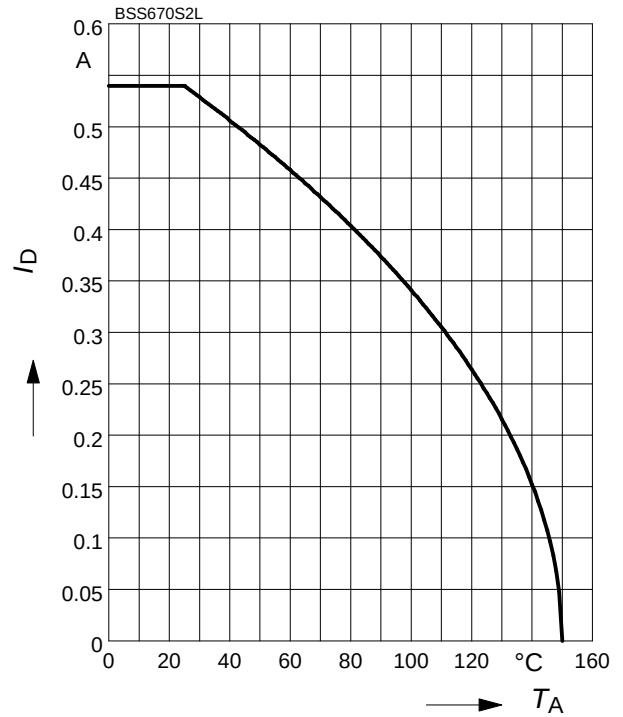
$$P_{\text{tot}} = f(T_A)$$



2 Drain current

$$I_D = f(T_A)$$

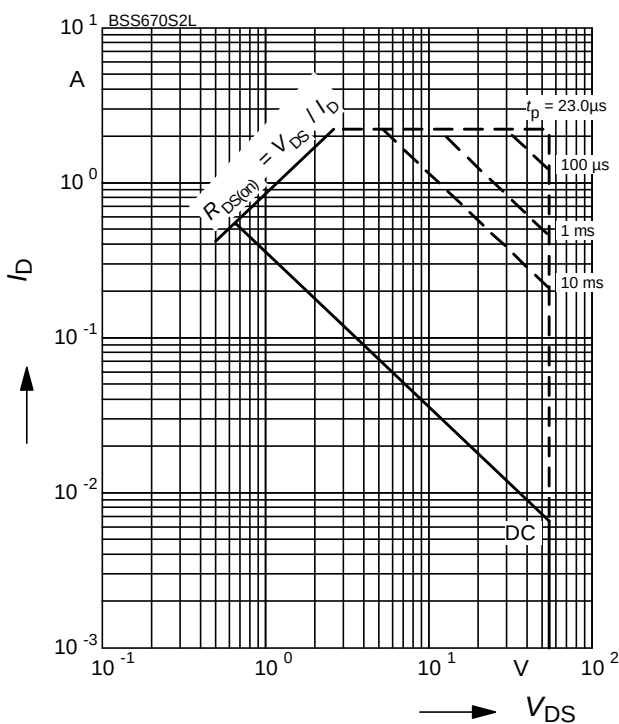
parameter: $V_{GS} \geq 10 \text{ V}$



3 Safe operating area

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

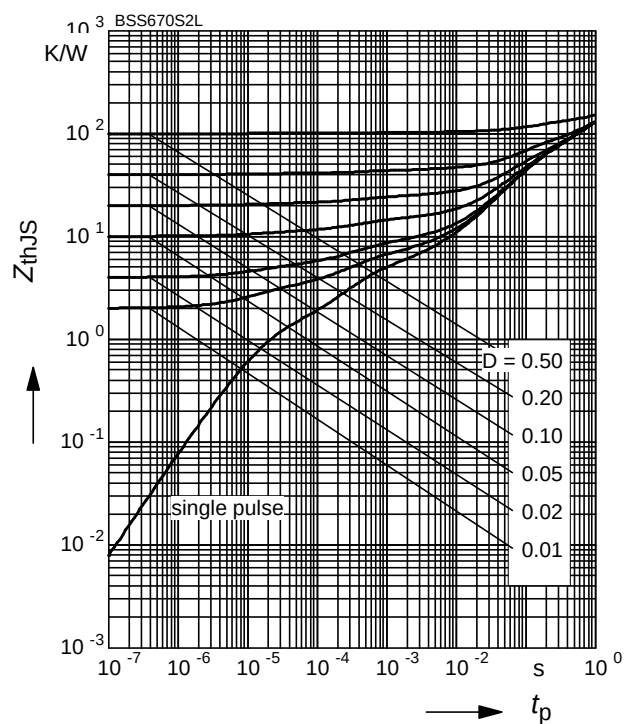
parameter: $D = 0$, $T_A = 25^\circ\text{C}$



4 Transient thermal impedance

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

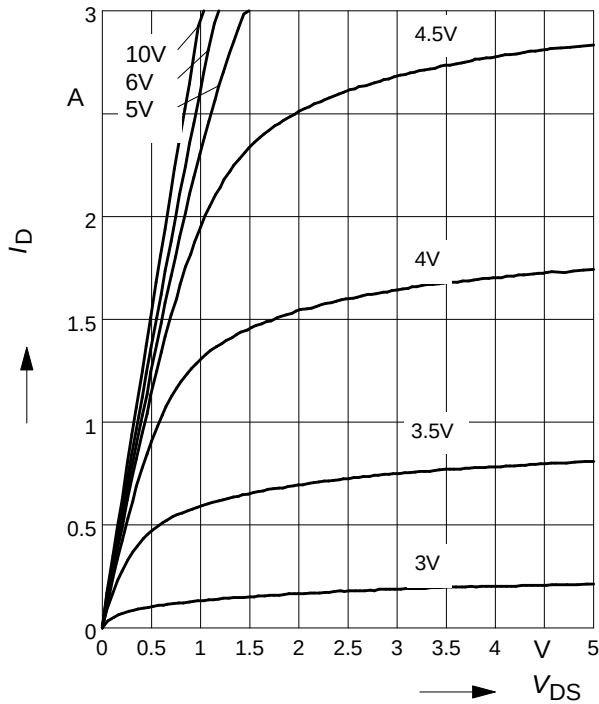
parameter: $D = t_p / T$



5 Typ. output characteristic

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

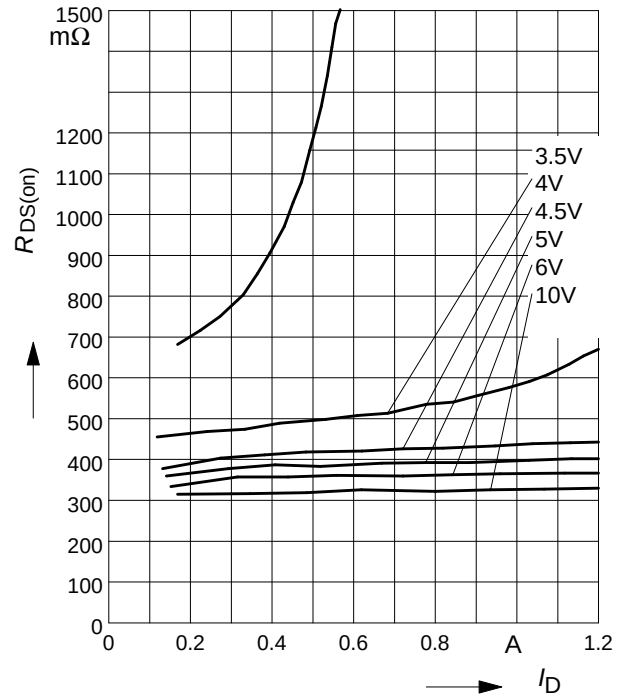
parameter: $t_p = 80\ \mu\text{s}$



6 Typ. drain-source on resistance

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

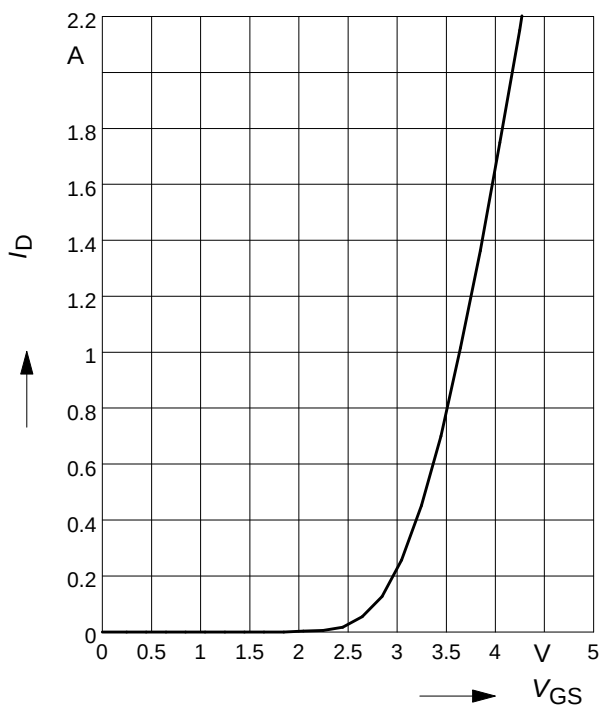
parameter: V_{GS}



7 Typ. transfer characteristics

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

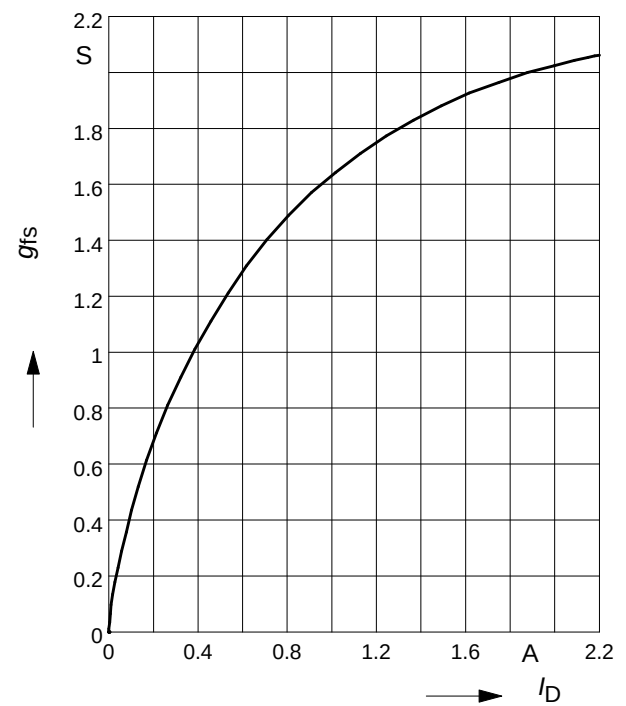
parameter: $t_p = 80\ \mu\text{s}$



8 Typ. forward transconductance

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

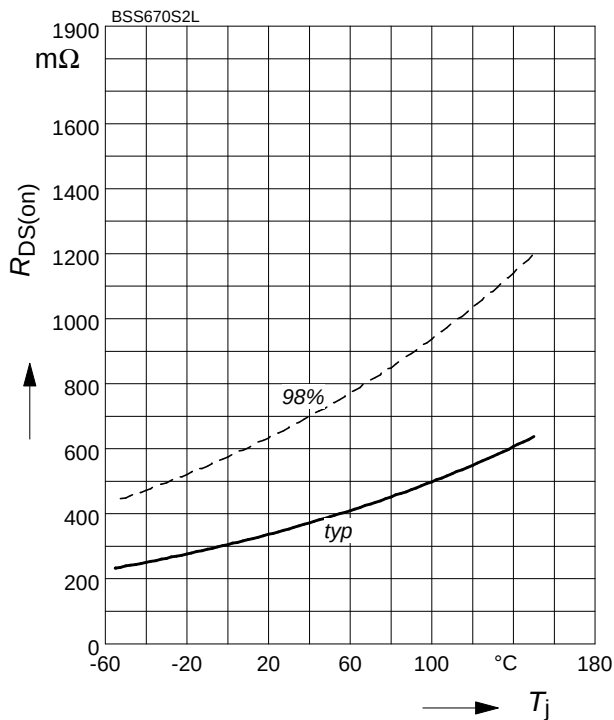
parameter: g_{fs}



9 Drain-source on-state resistance

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

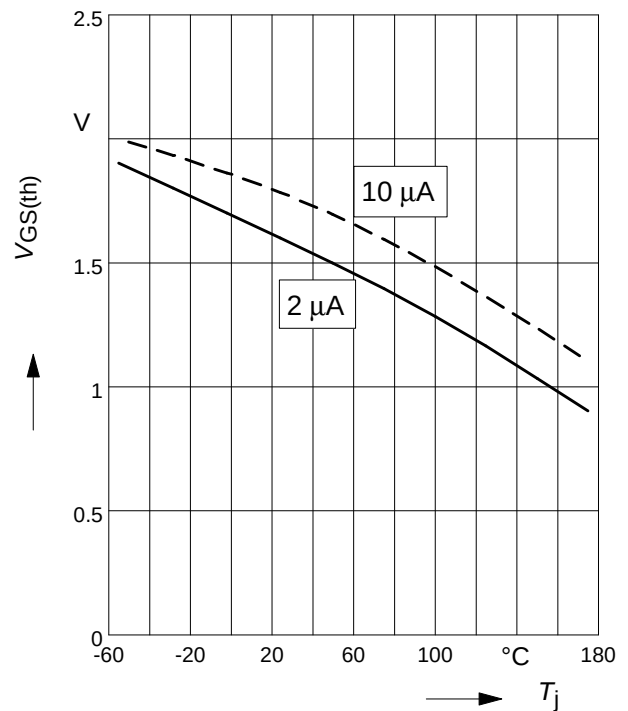
parameter : $I_D = 270 \text{ mA}$, $V_{GS} = 10 \text{ V}$



10 Typ. gate threshold voltage

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

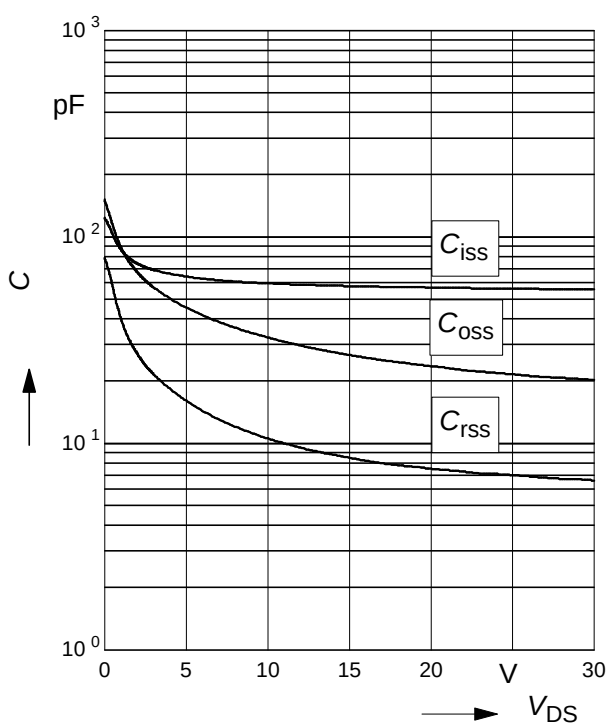
parameter: $V_{GS} = V_{DS}$



11 Typ. capacitances

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

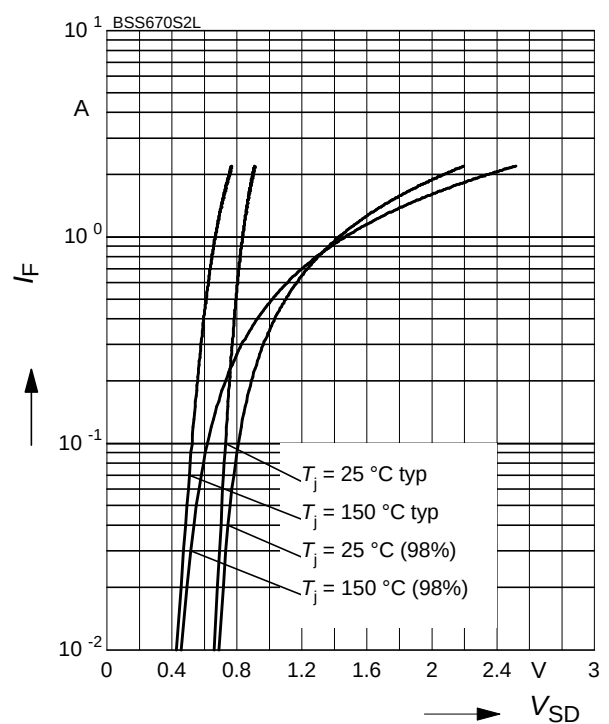
parameter: $V_{GS}=0$, $f=1 \text{ MHz}$



12 Forward character. of reverse diode

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

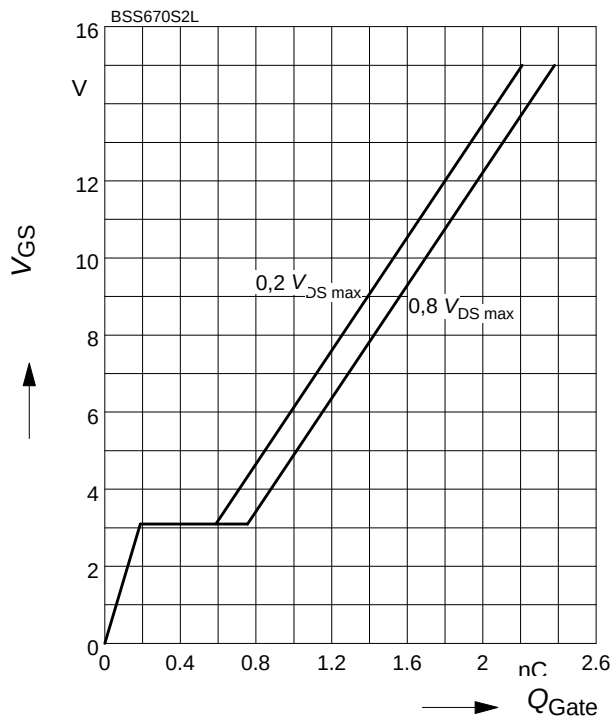
parameter: T_j , $t_p = 80 \mu\text{s}$



13 Typ. gate charge

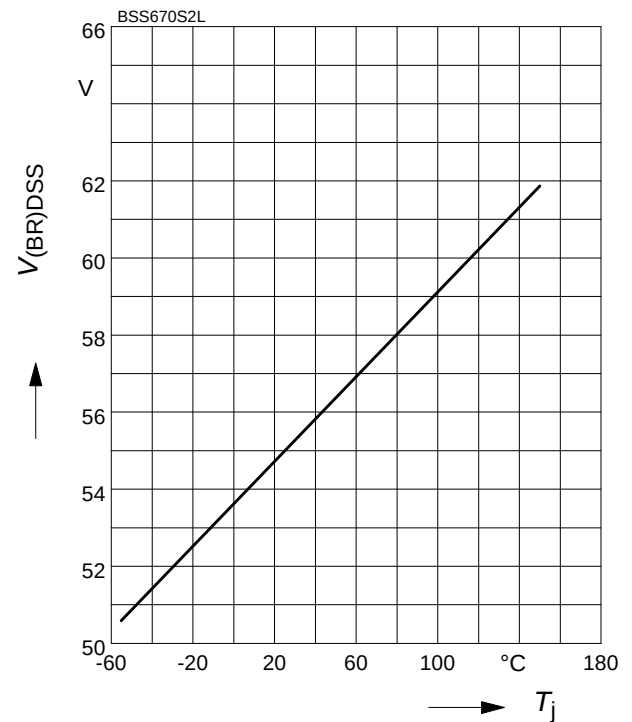
$$V_{GS} = f(Q_{Gate})$$

parameter: $I_D = 0.54$ A pulsed


14 Drain-source breakdown voltage

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

parameter: $I_D = 10$ mA



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