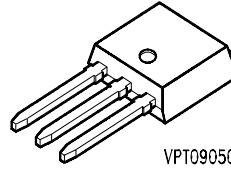
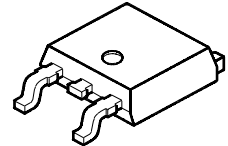


**SIPMOS® Power Transistor**

- N-Channel
- Enhancement mode
- Avalanche rated



VPT09050



VPT09051

Pin 1	Pin 2	Pin 3
G	D	S

Type	$V_{DS}$	$I_D$	$R_{DS(on)}$ @ $V_{GS}$	Package	Ordering Code
SPD02N60	600 V	2 A	$5.5 \Omega$ @ $V_{GS} = 10 V$	P-TO252	Q67040-S4133
SPU02N60				P-TO251	Q67040-S4127-A2

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25 \text{ }^\circ\text{C}$ $T_C = 100 \text{ }^\circ\text{C}$	$I_D$	2 1.3	A
Pulsed drain current $T_C = 25 \text{ }^\circ\text{C}$	$I_{Dpulse}$	8	
Avalanche energy, single pulse $I_D = 2 \text{ A}$ , $V_{DD} = 50 \text{ V}$ , $R_{GS} = 25 \Omega$ , $T_j = 25 \text{ }^\circ\text{C}$	$E_{AS}$	135	mJ
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25 \text{ }^\circ\text{C}$	$P_{tot}$	55	W
Operating temperature	$T_j$	-55 ... +150	°C
Storage temperature	$T_{stg}$	-55 ... +150	
IEC climatic category; DIN IEC 68-1		55/150/56	

## Electrical Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
at $T_j = 25\text{ °C}$ , unless otherwise specified					

## Thermal Characteristics

Thermal resistance, junction - case	$R_{thJC}$	-		2.25	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	-	100	-	
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	50	-	
@ 6 cm <sup>2</sup> cooling area <sup>1)</sup>		-	tdb	-	

## Static Characteristics

Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	600	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 1\text{ mA}$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS} = 600\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ °C}$ $V_{DS} = 600\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ °C}$	$I_{DSS}$	-	0.1	1	μA
		-	-	100	
Gate-source leakage current $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	-	10	100	nA
Drain-Source on-state resistance $V_{GS} = 10\text{ V}$ , $I_D = 1.3\text{ A}$	$R_{DS(on)}$	-	4.2	5.5	Ω

<sup>1)</sup> Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70μm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics					
Parameter at $T_j = 25\text{ °C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 1.3\text{ A}$	$g_{fs}$	1	1.8	-	S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$	-	350	460	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$	-	40	60	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$	-	15	22	
Turn-on delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 1.5\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_{d(on)}$	-	10	15	ns
Rise time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 1.5\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_r$	-	25	40	
Turn-off delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 1.5\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_{d(off)}$	-	35	50	
Fall time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 1.5\text{ A}$ , $R_G = 50\text{ }\Omega$	$t_f$	-	25	35	

## Electrical Characteristics

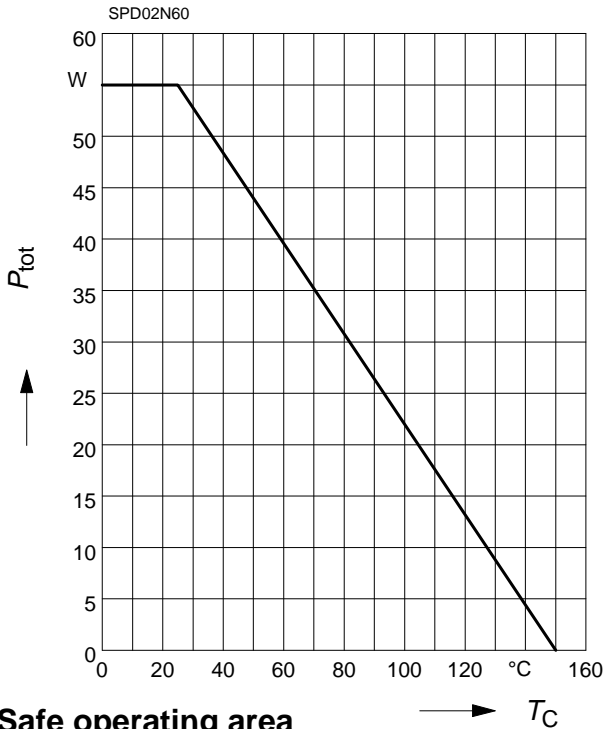
Parameter at $T_j = 25\text{ °C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	

### Reverse Diode

Inverse diode continuous forward current $T_C = 25\text{ °C}$	$I_S$	-	-	2	A
Inverse diode direct current, pulsed $T_C = 25\text{ °C}$	$I_{SM}$	-	-	8	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = 4\text{ A}$	$V_{SD}$	-	0.85	1.4	V
Reverse recovery time $V_R = 100\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	300	450	ns
Reverse recovery charge $V_R = 100\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	2.3	3.45	$\mu\text{C}$

### Power Dissipation

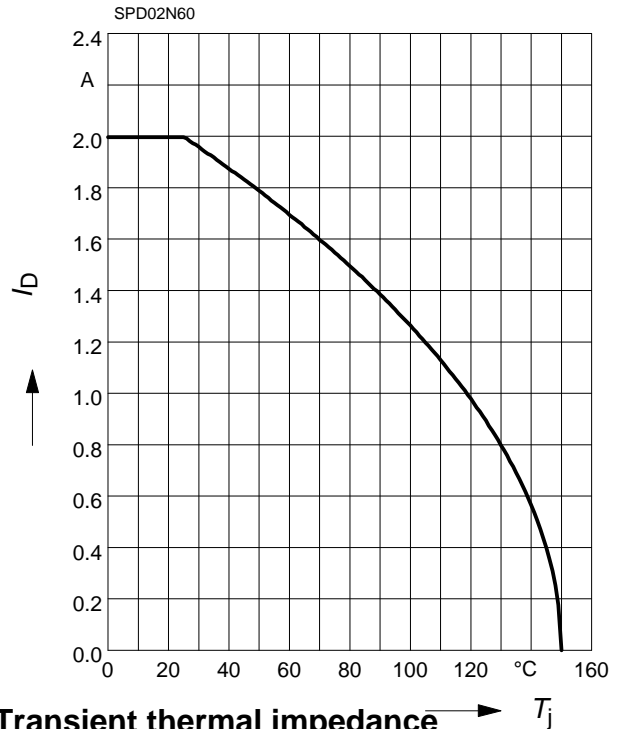
$$P_{\text{tot}} = f(T_C)$$



### Drain current

$$I_D = f(T_C)$$

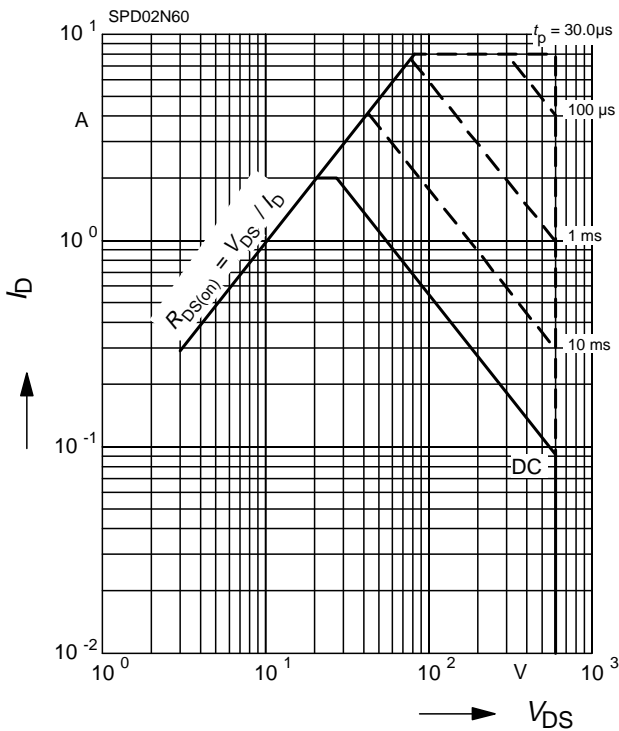
parameter:  $V_{GS} \geq 10 \text{ V}$



### Safe operating area

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

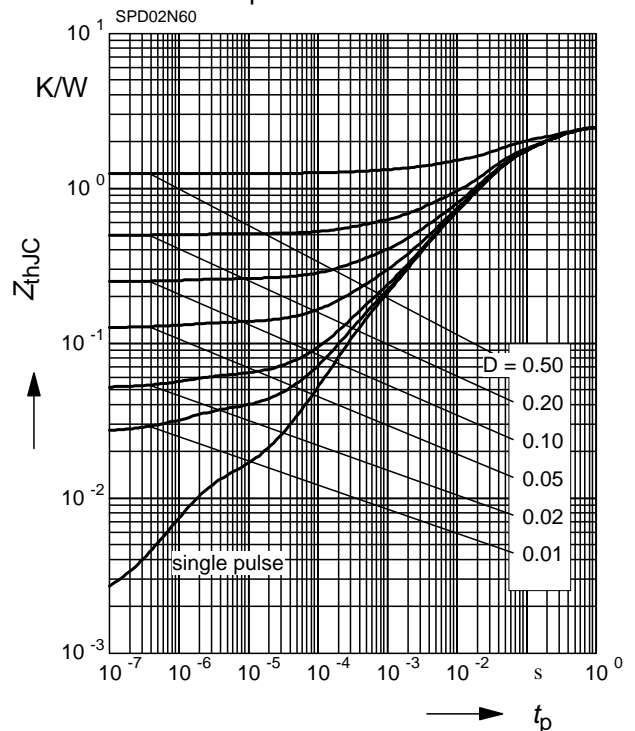
parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$



### Transient thermal impedance

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

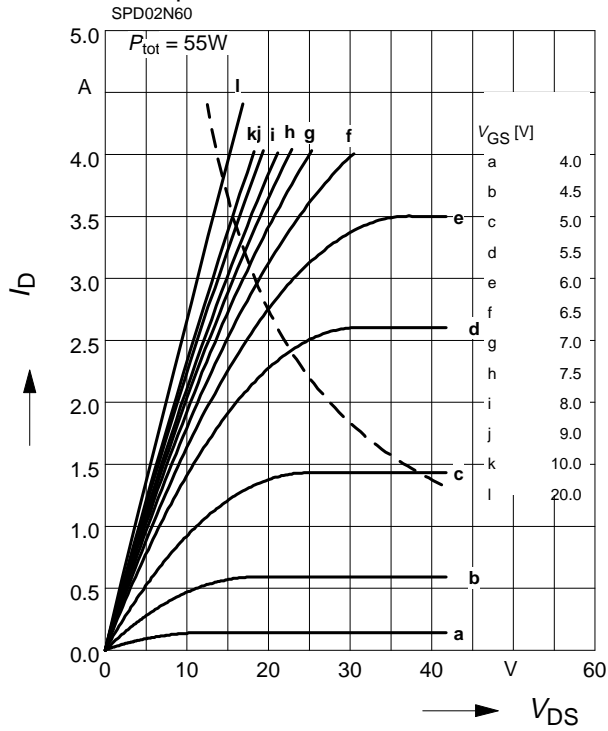
parameter:  $D = t_p/T$



### Typ. output characteristics

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

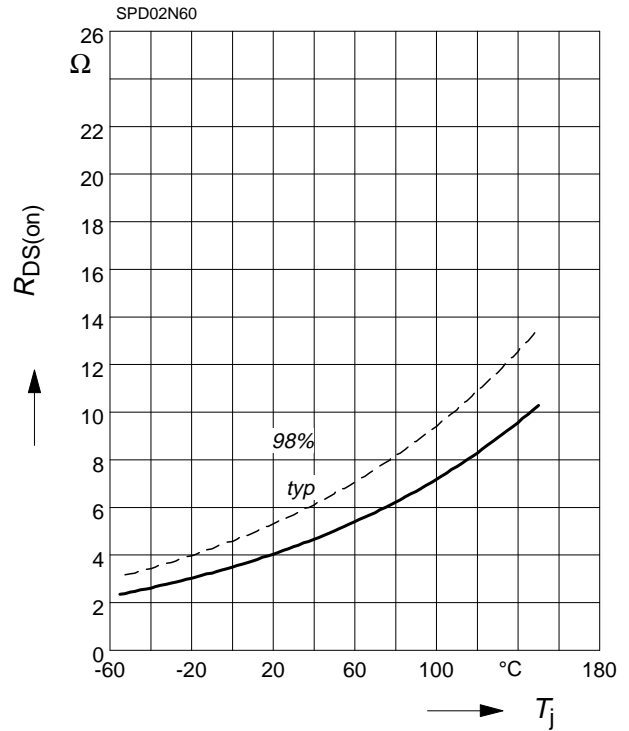
parameter:  $t_p = 80 \mu s$



### Drain-source on-resistance

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

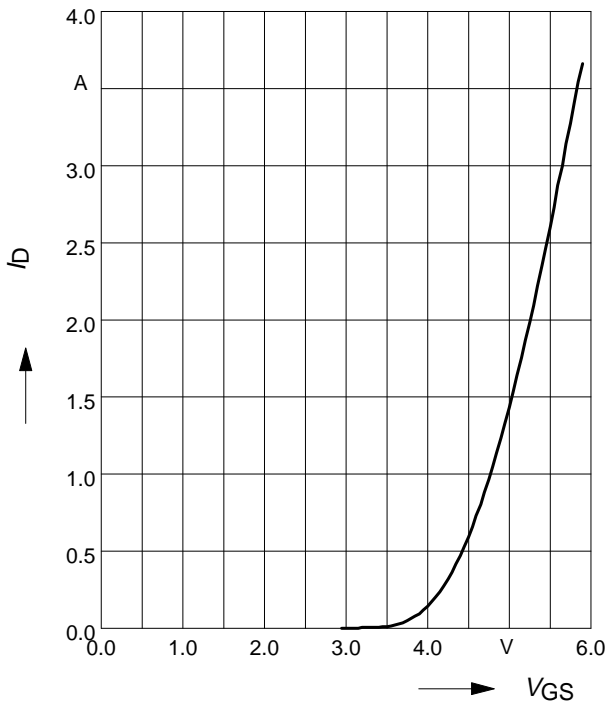
parameter:  $I_D = 1.3 A, V_{GS} = 10 V$



**Typ. transfer characteristics  $I_D = f(V_{GS})$**

parameter:  $t_p = 80 \mu s$

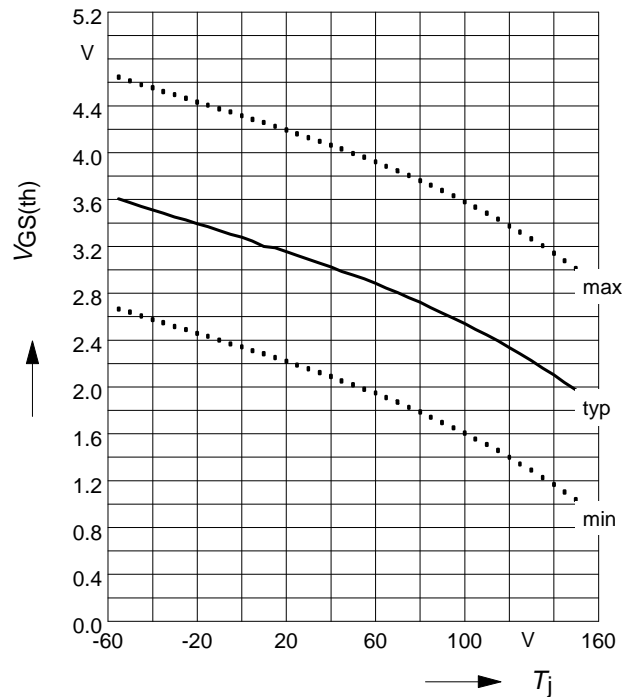
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Gate threshold voltage  $V_{GS(th)} = f(T_j)$**

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

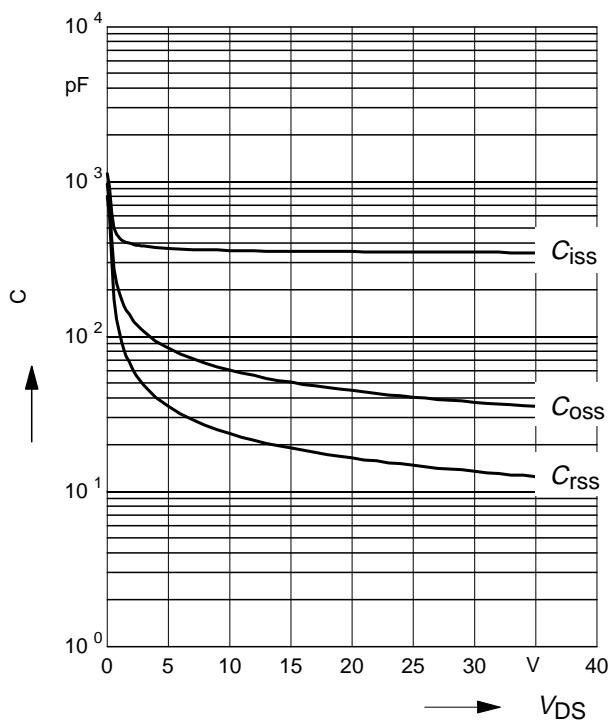
parameter:  $V_{GS} = V_{DS}, I_D = 1 \text{ mA}$



**Typ. capacitances  $C = f(V_{DS})$**

$C = f(V_{DS})$

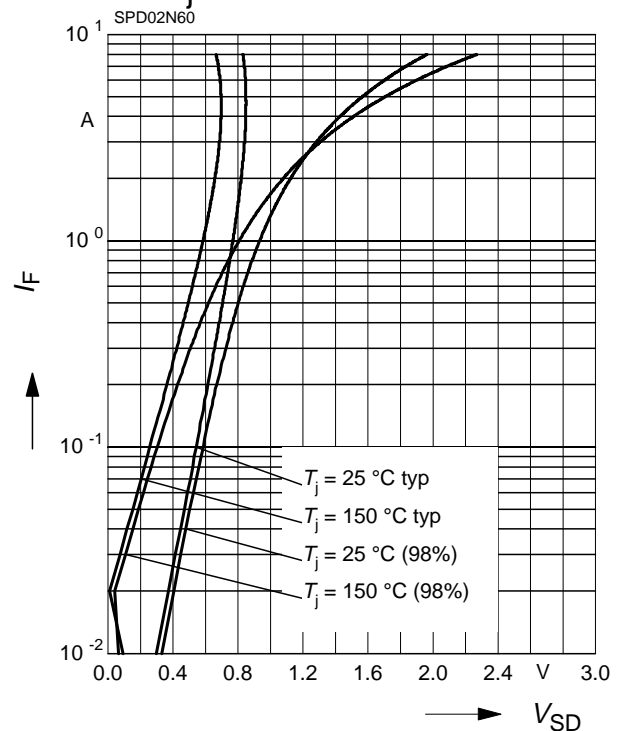
Parameter:  $V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$



**Forward characteristics of reverse diode  $I_F = f(V_{SD})$**

$I_F = f(V_{SD})$

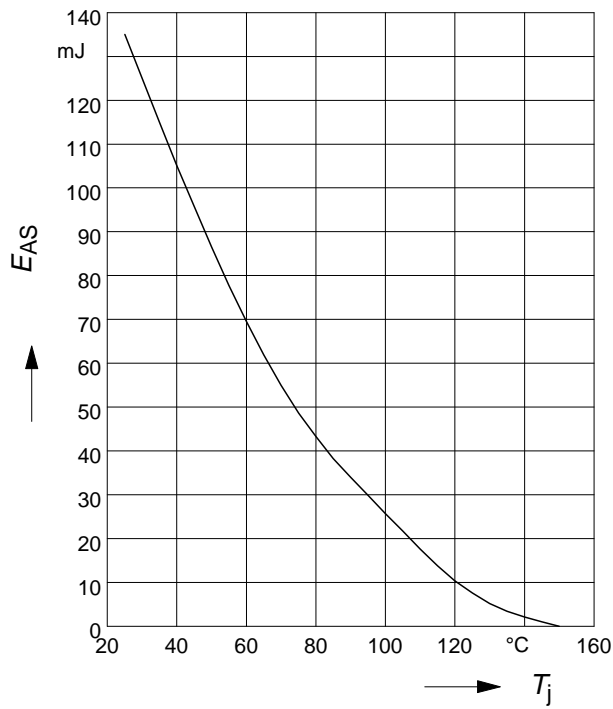
parameter:  $T_j, t_p = 80 \mu s$



**Avalanche Energy  $E_{AS} = f(T_j)$**

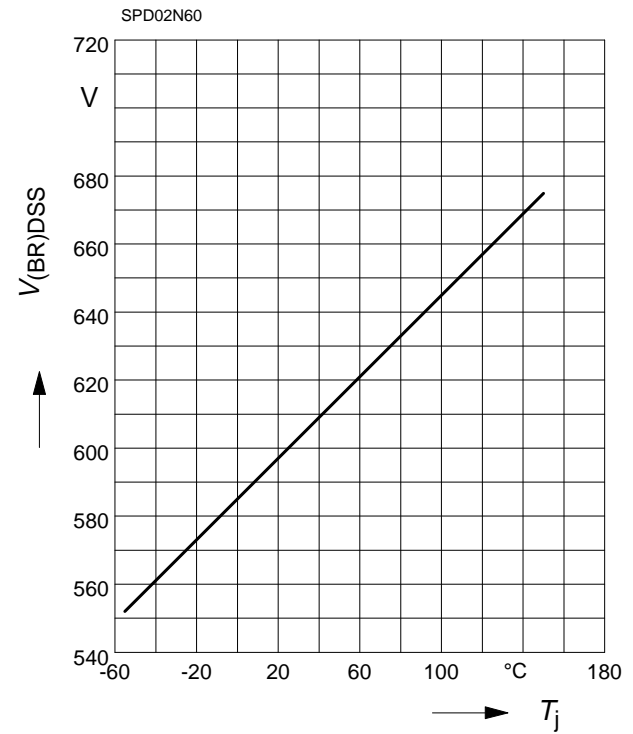
parameter:  $I_D = 2 \text{ A}$ ,  $V_{DD} = 50 \text{ V}$

$R_{GS} = 25 \Omega$



**Drain-source breakdown voltage  $V_{(BR)DSS} = f(T_j)$**

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





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