

**SIPMOS® Power-Transistor**
**Feature**

- P-channel
- Enhancement mode
- Logic Level
- 175°C operating temperature
- Avalanche rated
- dv/dt rated
- Pb-free lead plating; RoHS compliant

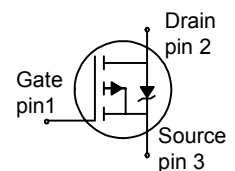
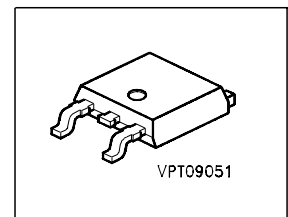


Type	Package	Lead free
SPD09P06PL	PG-TO252-3	Yes

**Product Summary**

$V_{DS}$	-60	V
$R_{DS(on)}$	0.25	$\Omega$
$I_D$	-9.7	A

PG-TO252-3


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

Parameter	Symbol	Value	Unit
Continuous drain current	$I_D$		A
$T_C=25\text{ }^\circ\text{C}$		-9.7	
$T_C=100\text{ }^\circ\text{C}$		-6.8	
Pulsed drain current	$I_D \text{ puls}$	-38.8	
$T_C=25\text{ }^\circ\text{C}$			
Avalanche energy, single pulse	$E_{AS}$	70	mJ
$I_D=-9.7\text{ A}$ , $V_{DD}=-25\text{ V}$ , $R_{GS}=25\text{ }\Omega$			
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	4.2	
Reverse diode dv/dt	dv/dt	6	kV/ $\mu\text{s}$
$I_S=-9.7\text{ A}$ , $V_{DS}=-48$ , $di/dt=200\text{ A}/\mu\text{s}$ , $T_{jmax}=175\text{ }^\circ\text{C}$			
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation	$P_{tot}$	42	W
$T_C=25\text{ }^\circ\text{C}$			
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/175/56	

**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	-	3.6	K/W
Thermal resistance, junction - ambient, leaded	$R_{thJA}$	-	-	100	
SMD version, device on PCB:	$R_{thJA}$				
@ min. footprint		-	-	75	
@ 6 cm <sup>2</sup> cooling area <sup>1)</sup>		-	-	50	

**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 $V_{GS}=0V, I_D=-250\mu A$	$V_{(BR)DSS}$	-60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D=-250\mu A$	$V_{GS(th)}$	-1	-1.5	-2	
Zero gate voltage drain current $V_{DS}=-60V, V_{GS}=0V, T_j=25^\circ\text{C}$ $V_{DS}=-60V, V_{GS}=0V, T_j=150^\circ\text{C}$	$I_{DSS}$	-	-0.1	-1	$\mu A$
		-	-10	-100	
Gate-source leakage current $V_{GS}=-20V, V_{DS}=0V$	$I_{GSS}$	-	-10	-100	nA
Drain-source on-state resistance $V_{GS}=-4.5V, I_D=-5.4A$	$R_{DS(on)}$	-	0.3	0.4	$\Omega$
Drain-source on-state resistance $V_{GS}=-10V, I_D=-6.8A$	$R_{DS(on)}$	-	0.2	0.25	

<sup>1)</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu m$  thick) copper area for drain connection. PCB is vertical without blown air.

**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	$g_{fs}$	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = -5.4$	1.8	3.5	-	S
Input capacitance	$C_{iss}$	$V_{GS} = 0V$ , $V_{DS} = -25V$ , $f = 1MHz$	-	360	450	pF
Output capacitance	$C_{oss}$		-	103	130	
Reverse transfer capacitance	$C_{rss}$		-	40	50	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = -30V$ , $V_{GS} = -4.5V$ , $I_D = -5.4$ , $R_G = 6\Omega$	-	11	17	ns
Rise time	$t_r$	$V_{DD} = -30V$ , $V_{GS} = -4.5V$ , $I_D = -5.4A$ , $R_G = 6\Omega$	-	168	252	
Turn-off delay time	$t_{d(off)}$		-	49	74	
Fall time	$t_f$		-	89	134	

**Gate Charge Characteristics**

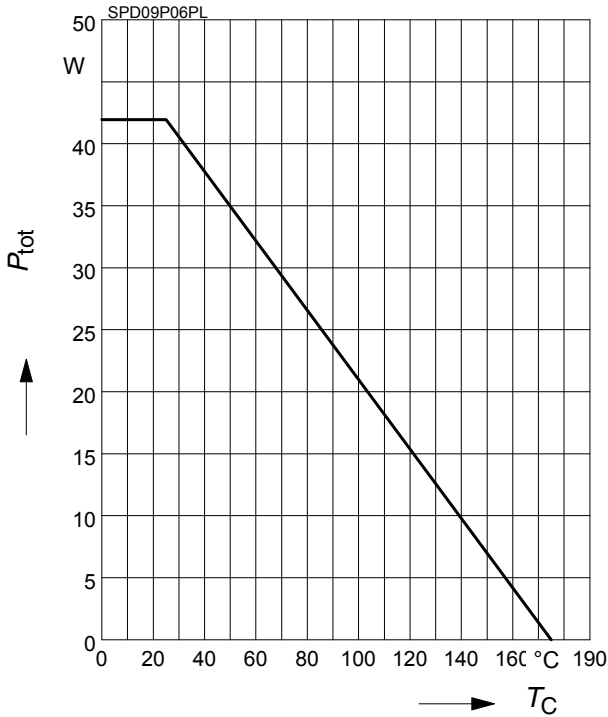
Gate to source charge	$Q_{gs}$	$V_{DD} = -48V$ , $I_D = -9.7A$	-	1.3	2	nC
Gate to drain charge	$Q_{gd}$		-	5.1	7.5	
Gate charge total	$Q_g$	$V_{DD} = -48V$ , $I_D = -9.7A$ , $V_{GS} = 0$ to $-10V$	-	14	21	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = -48V$ , $I_D = -9.7A$	-	-4.1	-	V

**Reverse Diode**

Inverse diode continuous forward current	$I_S$	$T_C = 25^\circ\text{C}$	-	-	-9.7	A
Inverse diode direct current, pulsed	$I_{SM}$		-	-	-38.8	
Inverse diode forward voltage	$V_{SD}$	$V_{GS} = 0V$ , $I_F = -9.7A$	-	-1.1	-1.4	V
Reverse recovery time	$t_{rr}$	$V_R = -30V$ , $I_F = I_S$	-	52	76	ns
Reverse recovery charge	$Q_{rr}$	$di_F/dt = 100A/\mu s$	-	64	96	

### 1 Power dissipation

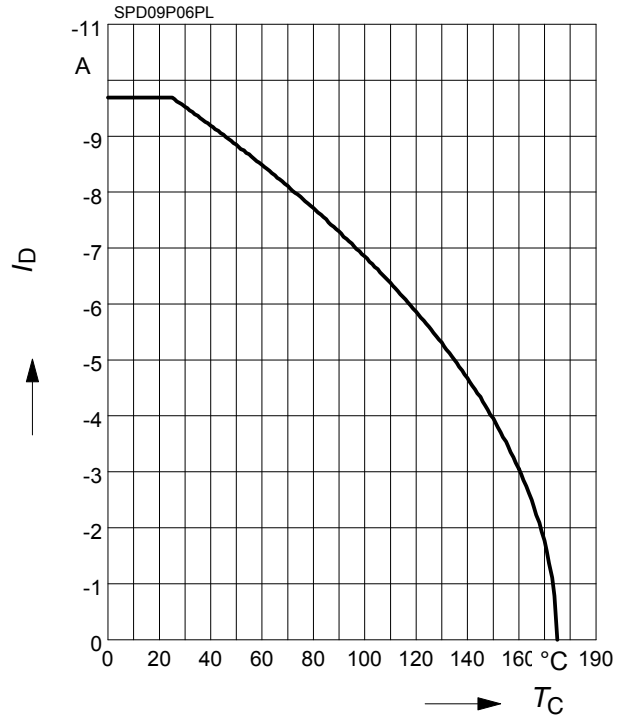
$$P_{\text{tot}} = f(T_C)$$



### 2 Drain current

$$I_D = f(T_C)$$

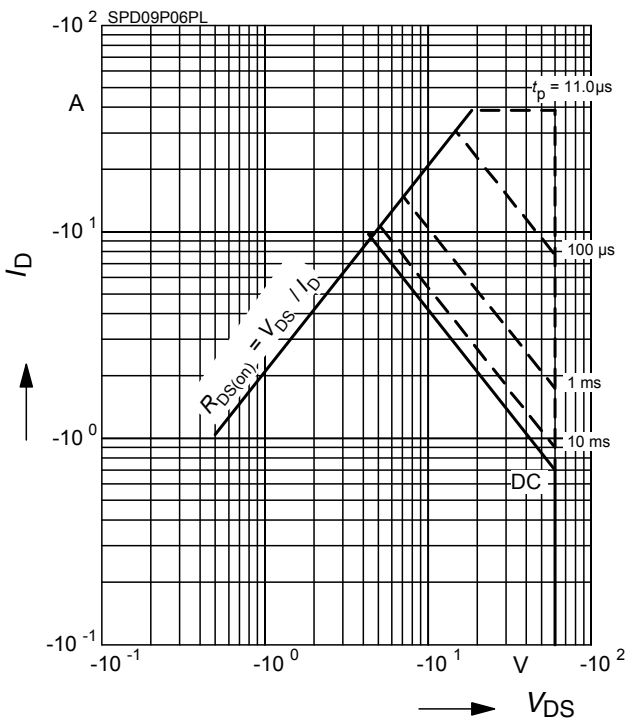
parameter:  $V_{GS} \geq 10 \text{ V}$



### 3 Safe operating area

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

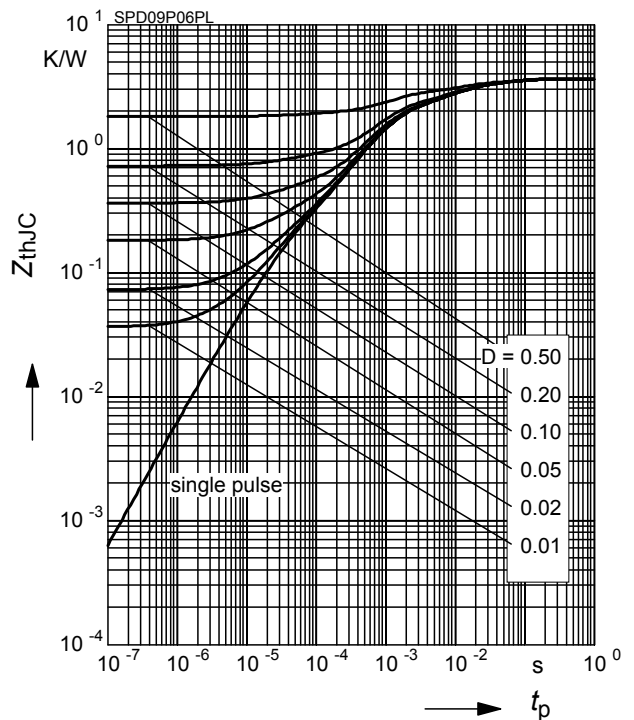
parameter:  $D = 0$ ,  $T_C = 25 \text{ °C}$



### 4 Transient thermal impedance

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

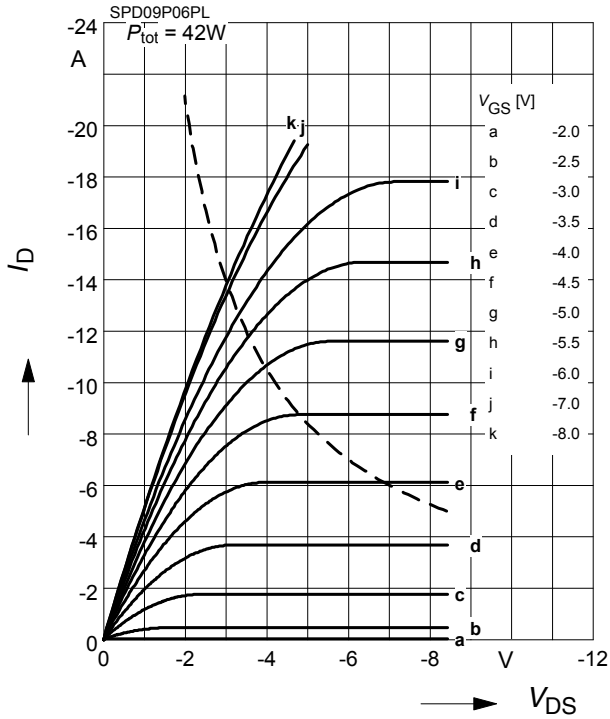
parameter:  $D = t_p/T$



**5 Typ. output characteristic**

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

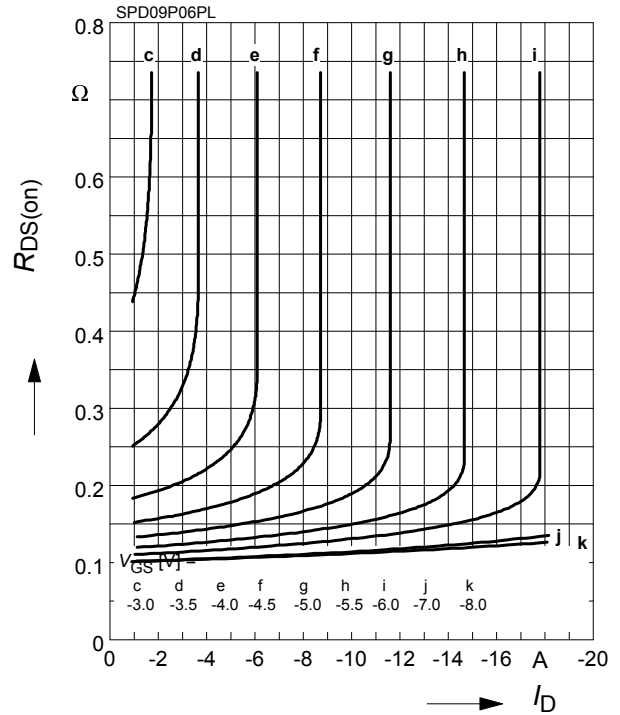
parameter:  $t_p = 80 \mu\text{s}$



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

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

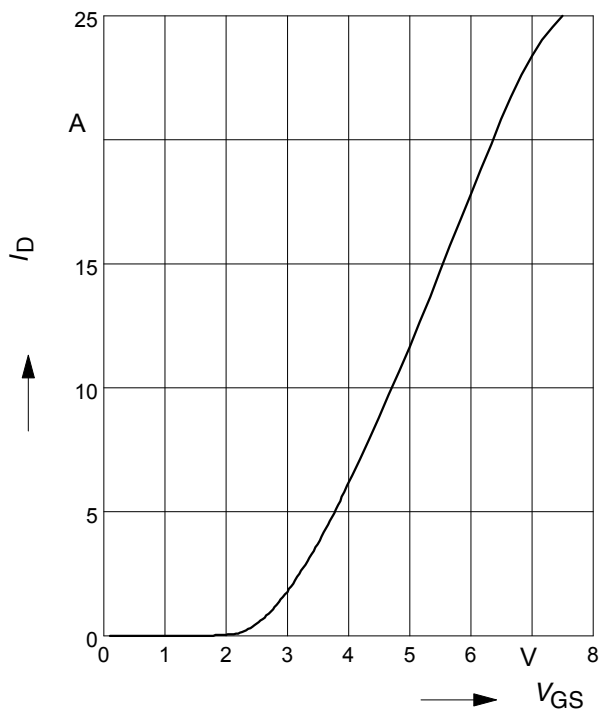
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

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

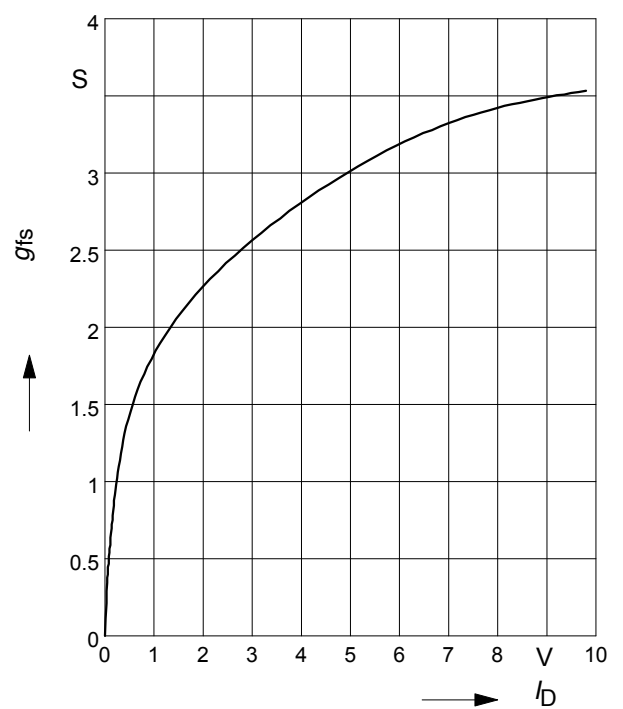
parameter:  $t_p = 80 \mu\text{s}$



**8 Typ. forward transconductance**

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

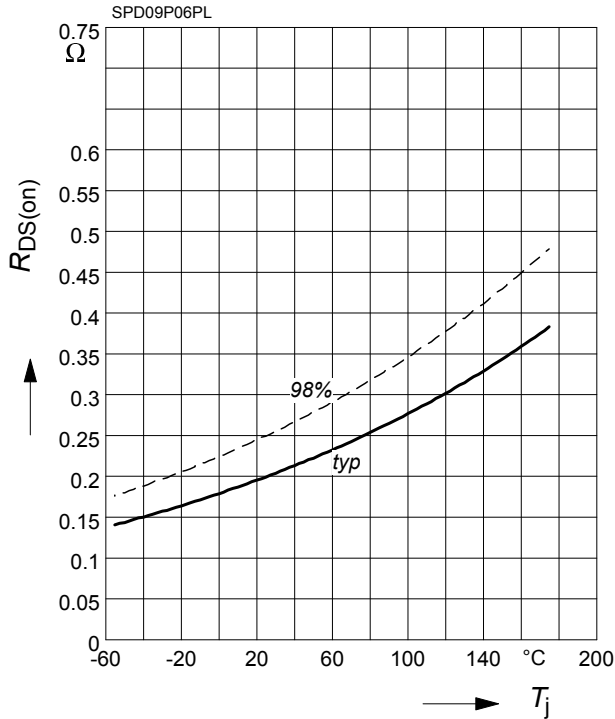
parameter:  $g_{fs}$



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

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

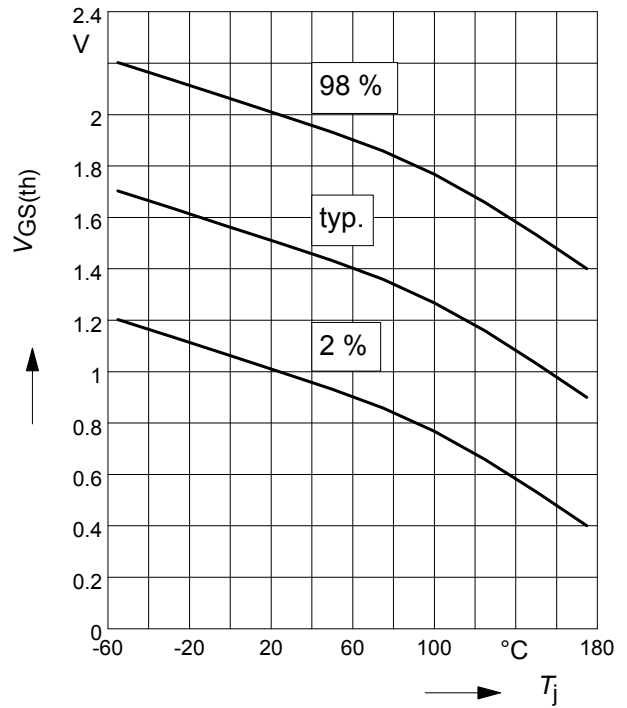
parameter :  $I_D = -6.8 \text{ A}$ ,  $V_{GS} = -10 \text{ V}$



**10 Gate threshold voltage**

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

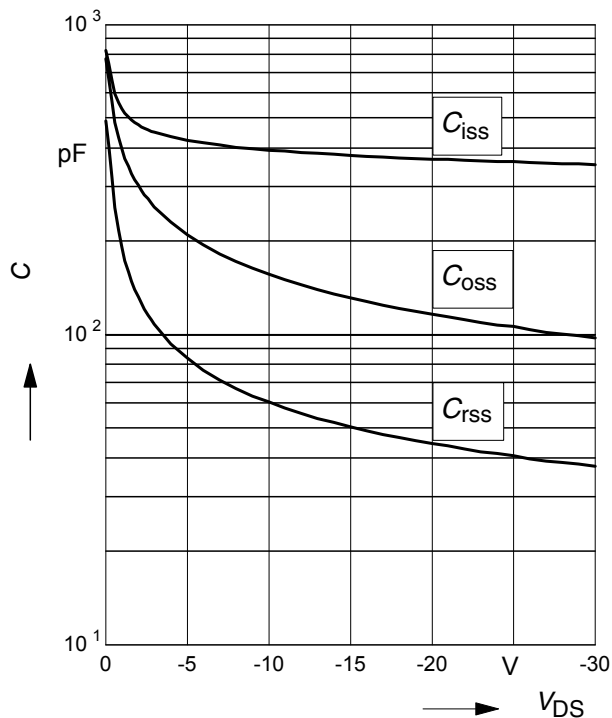
parameter:  $V_{GS} = V_{DS}$ ,  $I_D = -250 \mu\text{A}$



**11 Typ. capacitances**

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

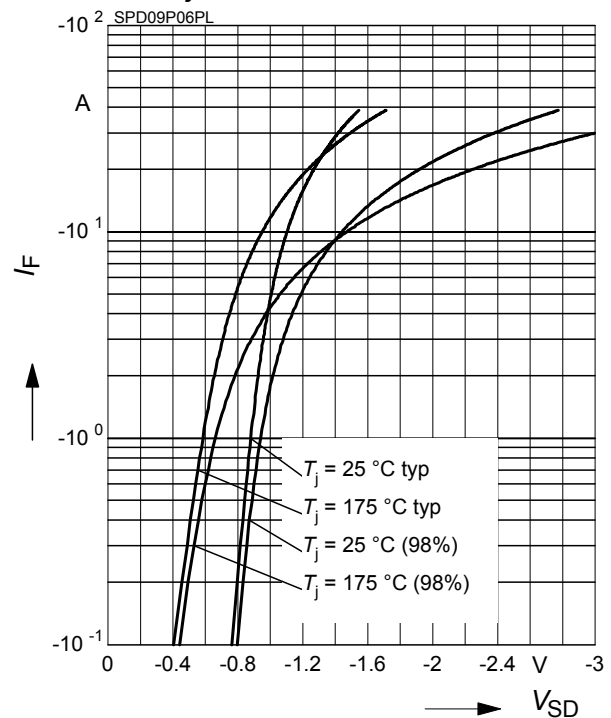
parameter:  $V_{GS}=0\text{V}$ ,  $f=1 \text{ MHz}$



**12 Forward character. of reverse diode**

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

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





**SPD09P06PL**



