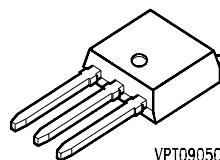
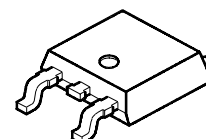


## SIPMOS® Power Transistor

- 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 $T_j = 25$ °C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25$ °C $T_C = 100$ °C	$I_D$	2 1.3	A
Pulsed drain current $T_C = 25$ °C	$I_{Dpulse}$	8	
Avalanche energy, single pulse $I_D = 2$ A, $V_{DD} = 50$ V, $R_{GS} = 25$ $\Omega$ , $T_j = 25$ °C	$E_{AS}$	135	mJ
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25$ °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 at $T_j = 25\text{ °C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	

### Thermal Characteristics

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

### 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	$\mu\text{A}$
Gate-source leakage current $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	-	10	100	
Drain-Source on-state resistance $V_{GS} = 10\text{ V}$ , $I_D = 1.3\text{ A}$	$R_{DS(on)}$	-	4.2	5.5	$\Omega$

<sup>1</sup> Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 $\mu\text{m}$  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.	
<b>Dynamic Characteristics</b>					
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

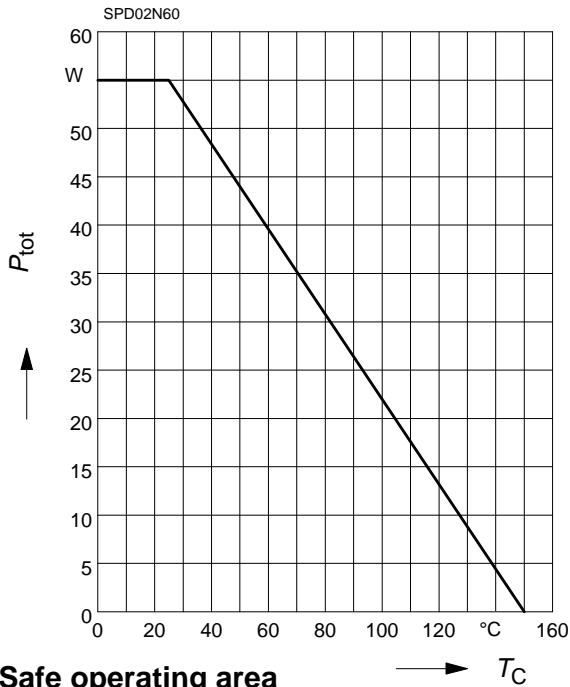
Parameter at $T_j = 25\text{ °C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	

### 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

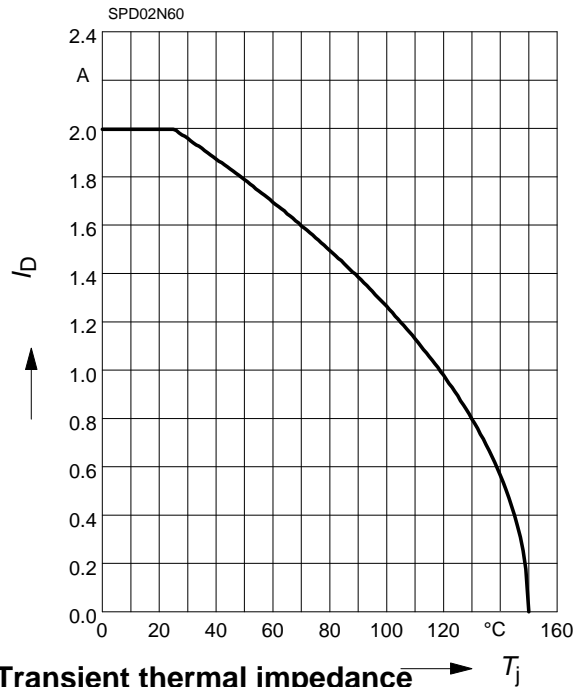
$$P_{\text{tot}} = f(T_C)$$



### Drain current

$$I_D = f(T_C)$$

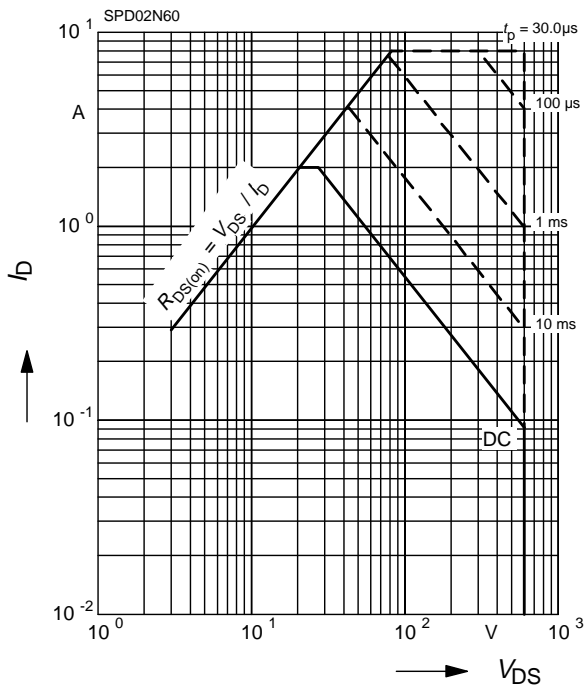
parameter:  $V_{GS} \geq 10 \text{ V}$



### Safe operating area

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

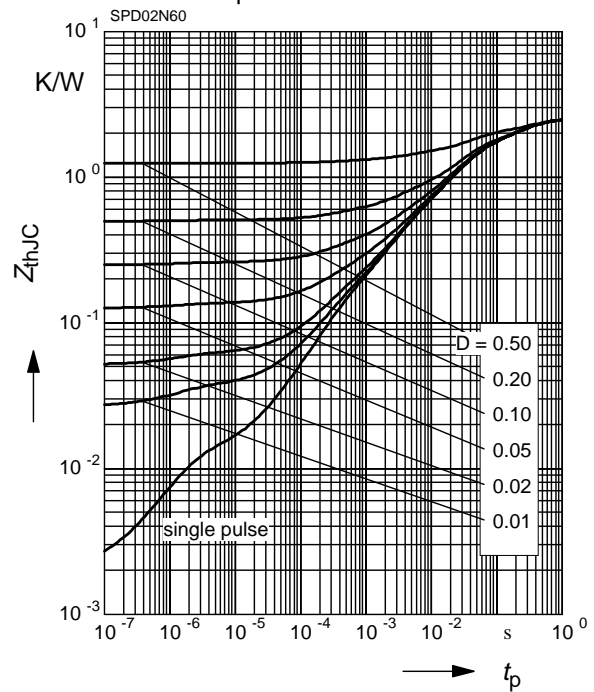
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$



### Transient thermal impedance

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

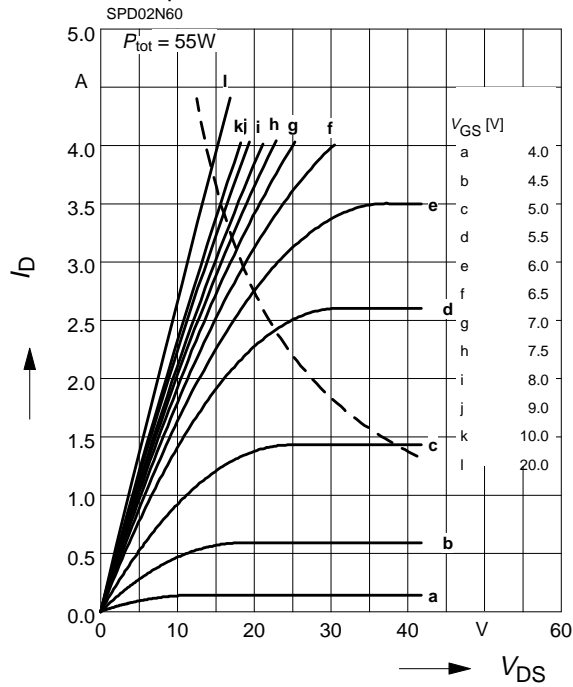
parameter:  $D = t_p/T$



### Typ. output characteristics

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

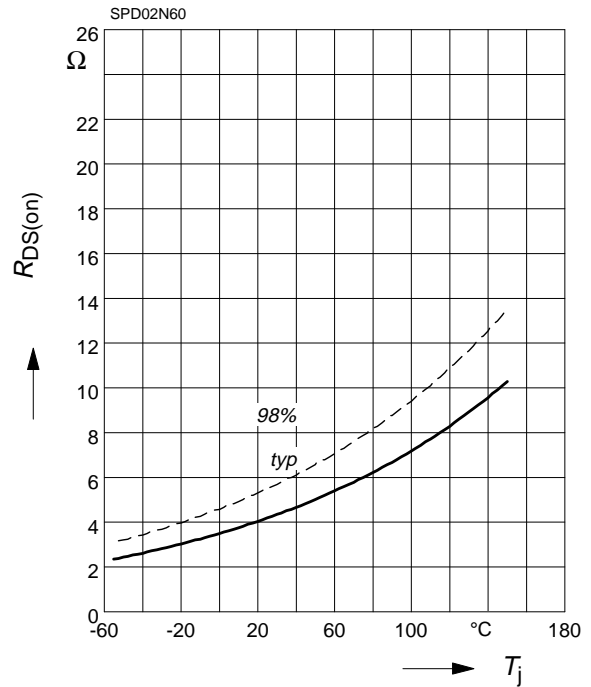
parameter:  $t_p = 80 \mu s$



### Drain-source on-resistance

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

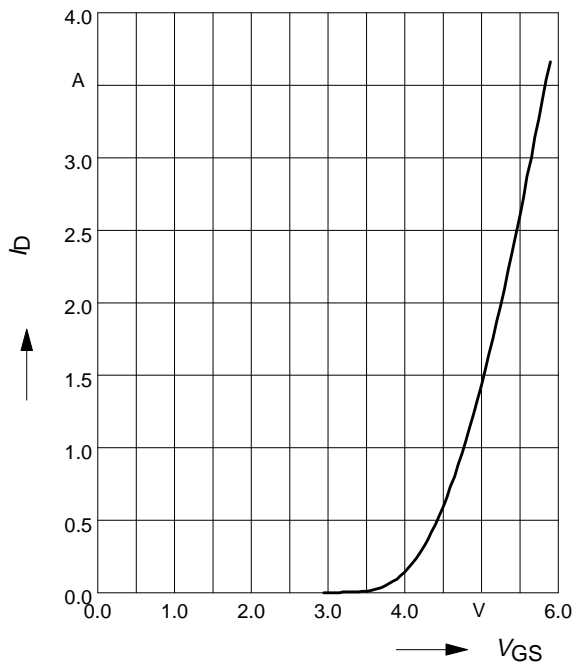
parameter:  $I_D = 1.3 A, V_{GS} = 10 V$



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

parameter:  $t_p = 80 \mu s$

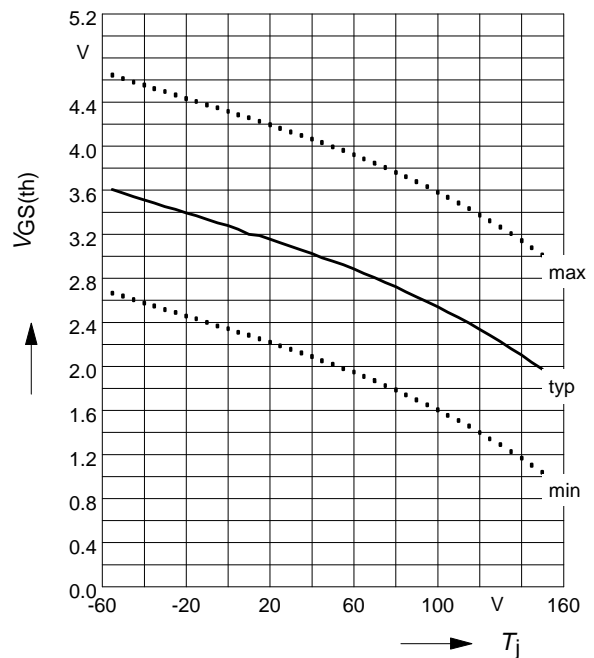
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



### Gate threshold voltage

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

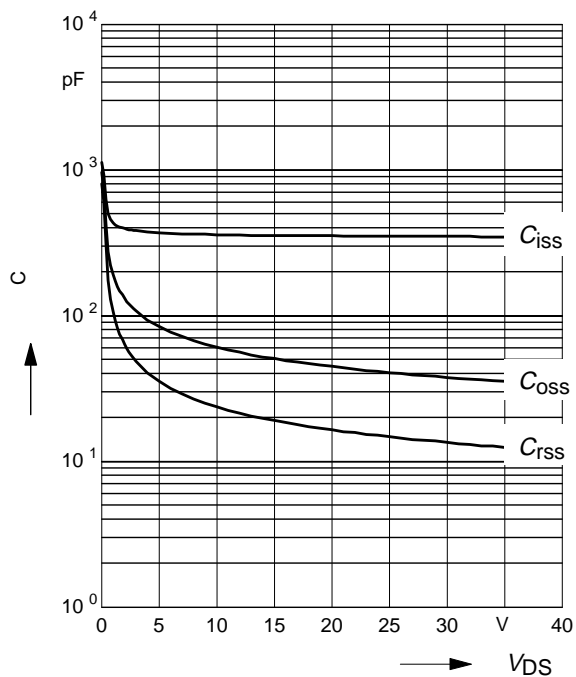
parameter:  $V_{GS} = V_{DS}, I_D = 1 \text{ mA}$



### Typ. capacitances

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

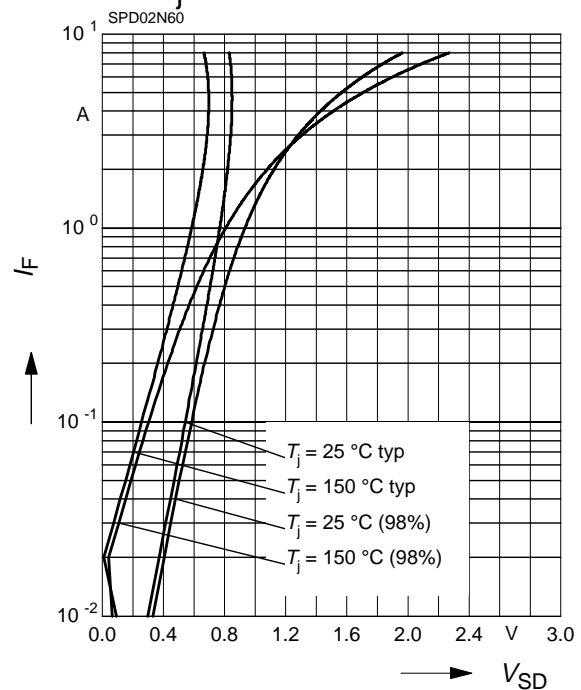
Parameter:  $V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$



### Forward characteristics of reverse diode

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

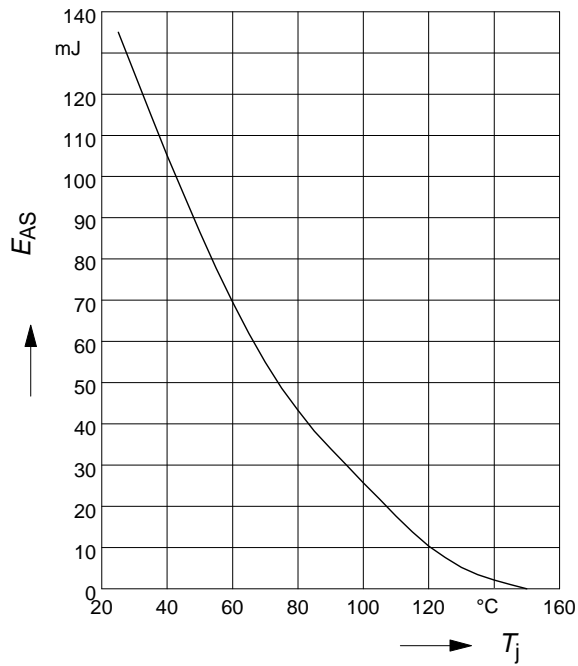
parameter:  $T_j, t_p = 80 \mu s$



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

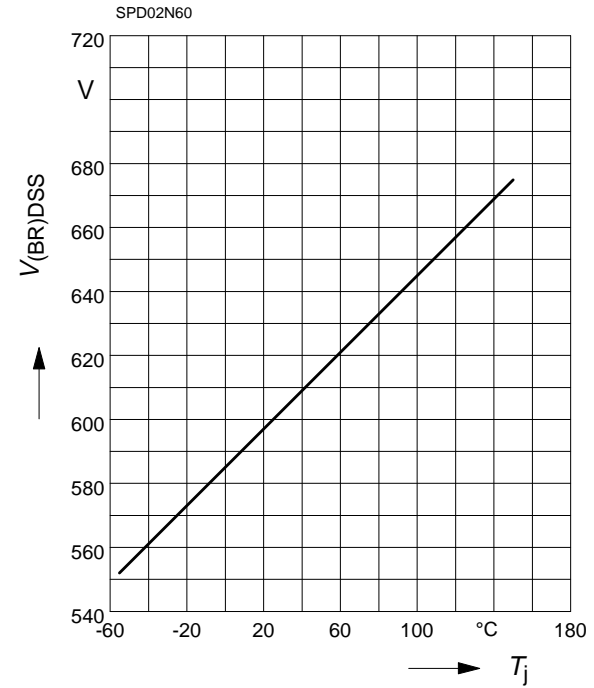
parameter:  $I_D = 2 \text{ A}$ ,  $V_{DD} = 50 \text{ V}$

$R_{GS} = 25 \text{ } \Omega$



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

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





Edition 7.97

Published by Siemens AG,  
Bereich Halbleiter Vertrieb,  
Werbung, Balanstraße 73,  
81541 München

© Siemens AG 1997

All Rights Reserved.

**Attention please!**

As far as patents or other rights of third parties are concerned, liability is only assumed for components, not for applications, processes and circuits implemented within components or assemblies.

The information describes a type of component and shall not be considered as warranted characteristics.

Terms of delivery and rights to change design reserved.

For questions on technology, delivery and prices please contact the Semiconductor Group Offices in Germany or the Siemens Companies and Representatives worldwide (see address list).

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Siemens Office, Semiconductor Group.

Siemens AG is an approved CECC manufacturer.

**Packing**

Please use the recycling operators known to you. We can also help you - get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport.

For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

**Components used in life-support devices or systems must be expressly authorized for such purpose!**

Critical components<sup>1</sup> of the Semiconductor Group of Siemens AG, may only be used in life-support devices or systems<sup>2</sup> with the express written approval of the Semiconductor Group of Siemens AG.

1) A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or effectiveness of that device or system.

2) Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.