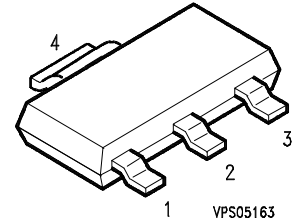


## SIPMOS<sup>®</sup> Power Transistor

- P-Channel
- Enhancement mode
- Avalanche rated
- dv/dt rated



Pin 1	Pin 2/4	Pin 3
G	D	S

Type	V <sub>DS</sub>	I <sub>D</sub>	R <sub>DS(on)</sub>	@ V <sub>GS</sub>	Package	Ordering Code
BSP 170 P	60 V	-1.9 A	0.3 Ω	V <sub>GS</sub> = -10 V	SOT-223	Q67041-S4018
					-	

### Maximum Ratings , at T<sub>j</sub> = 25°C, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current T <sub>A</sub> = 25 °C T <sub>A</sub> = 70 °C	I <sub>D</sub>	-1.9 -1.5	A
Pulsed drain current T <sub>A</sub> = 25 °C	I <sub>D</sub> pulse	-7.6	
Avalanche energy, single pulse I <sub>D</sub> = -1.9 A, V <sub>DD</sub> = -25 V, R <sub>GS</sub> = 25 Ω	E <sub>AS</sub>	70	mJ
Avalanche current, periodic limited by T <sub>jmax</sub>	I <sub>AR</sub>	-1.9	A
Avalanche energy, periodic limited by T <sub>j(max)</sub>	E <sub>AR</sub>	0.18	mJ
Reverse diode dv/dt I <sub>S</sub> = -1.9 A, V <sub>DD</sub> ≤ V <sub>(BR)DSS</sub> , di/dt = 200 A/μs, T <sub>jmax</sub> = 150 °C	dv/dt	6	kV/μs
Gate source voltage	V <sub>GS</sub>	±20	V
Power dissipation T <sub>A</sub> = 25 °C	P <sub>tot</sub>	1.8	W
Operating temperature	T <sub>j</sub>	-55 ... +150	°C
Storage temperature	T <sub>stg</sub>	-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 -soldering point (Pin 4 )	$R_{thJS}$	-	-	tbd	K/W
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{thJA}$	-	tbd	-	
		-	-	70	

### Static Characteristics

Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = -0.25\text{ mA}$	$V_{(BR)DSS}$	60	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = -460\text{ }\mu\text{A}$	$V_{GS(th)}$	-2.1	-3	-4	
Zero gate voltage drain current $V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ °C}$ $V_{DS} = -60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 125\text{ °C}$	$I_{DSS}$	-	-0.1	-1	$\mu\text{A}$
		-	-	-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 $V_{GS} = -10\text{ V}$ , $I_D = -1.9\text{ A}$	$R_{DS(on)}$	-	0.175	0.3	$\Omega$

<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 $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = -1.9\text{ A}$	$g_{fs}$	1	2.5	-	S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$	-	335	420	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$	-	105	135	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = -25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$	-	65	85	
Turn-on delay time $V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -1.9\text{ A}$ , $R_G = 6\text{ }\Omega$	$t_{d(on)}$	-	14	21	ns
Rise time $V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -1.9\text{ A}$ , $R_G = 6\text{ }\Omega$	$t_r$	-	30	45	
Turn-off delay time $V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -1.9\text{ A}$ , $R_G = 6\text{ }\Omega$	$t_{d(off)}$	-	125	190	
Fall time $V_{DD} = -30\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_D = -1.9\text{ A}$ , $R_G = 6\text{ }\Omega$	$t_f$	-	65	100	

## Electrical Characteristics

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

## Dynamic Characteristics

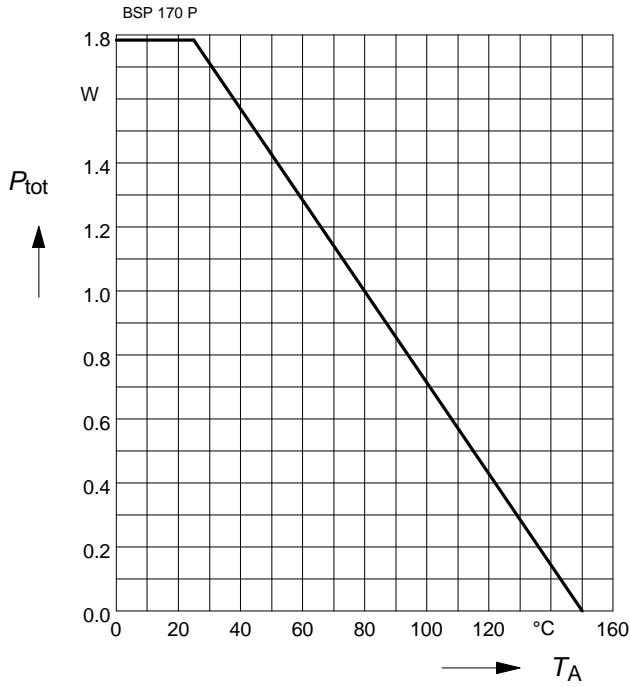
Gate charge at threshold $V_{DD} = -48\text{ V}$ , $I_D \geq -0,1\text{ A}$ , $V_{GS} = 0\text{ to } -1\text{ V}$	$Q_{G(th)}$	-	0.36	0.54	nC
Gate charge at $V_{GS}=7\text{ V}$ $V_{DD} = -24\text{ V}$ , $I_D = -1.9\text{ A}$ , $V_{GS} = 0\text{ to } -7\text{ V}$	$Q_{g(7)}$	-	7.8	11.7	nC
Gate charge total $V_{DD} = -48\text{ V}$ , $I_D = -1.9\text{ A}$ , $V_{GS} = 0\text{ to } -10\text{ V}$	$Q_g$	-	10	15	
Gate plateau voltage $V_{DD} = -48\text{ V}$ , $I_D = -1.9\text{ A}$	$V_{(plateau)}$	-	3.85	-	V

## Reverse Diode

Inverse diode continuous forward current $T_A = 25\text{ °C}$	$I_S$	-	-	-1.9	A
Inverse diode direct current,pulsed $T_A = 25\text{ °C}$	$I_{SM}$	-	-	-7.6	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = -3.8\text{ A}$	$V_{SD}$	-	-0.85	-1.2	V
Reverse recovery time $V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	60	90	ns
Reverse recovery charge $V_R = -30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	100	150	nC

### Power Dissipation

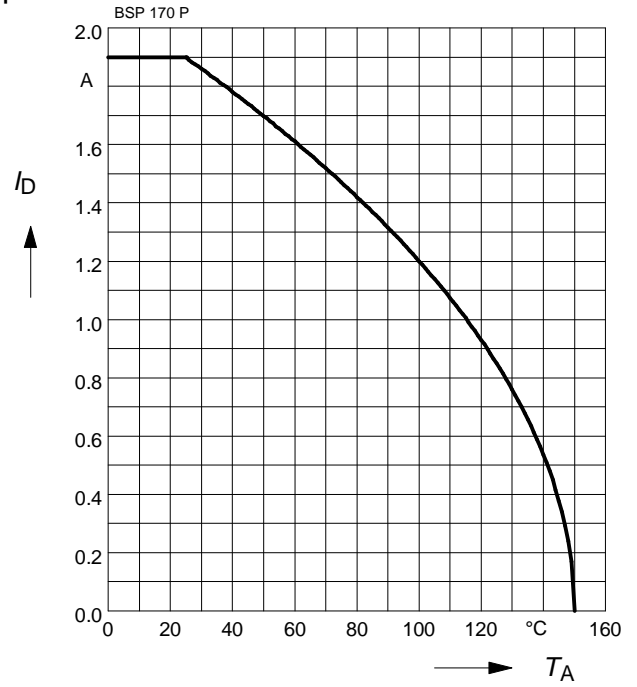
$$P_{\text{tot}} = f(T_A)$$



### Drain current

$$I_D = f(T_A)$$

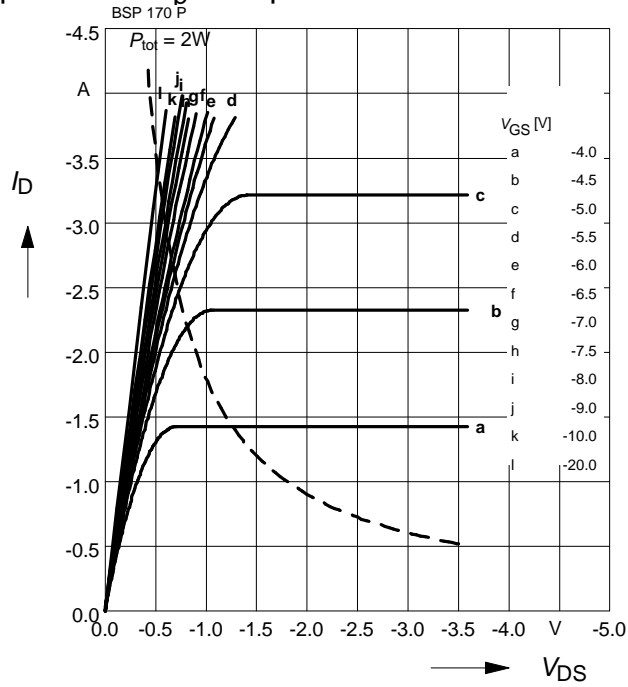
parameter:  $V_{GS} \geq -10V$



### Typ. output characteristics

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

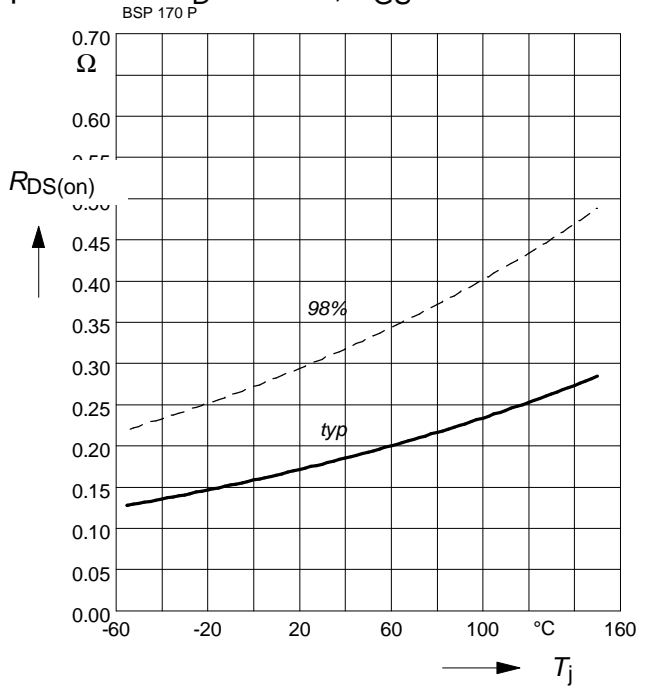
parameter:  $t_D = 80 \mu s$



### Drain-source on-resistance

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

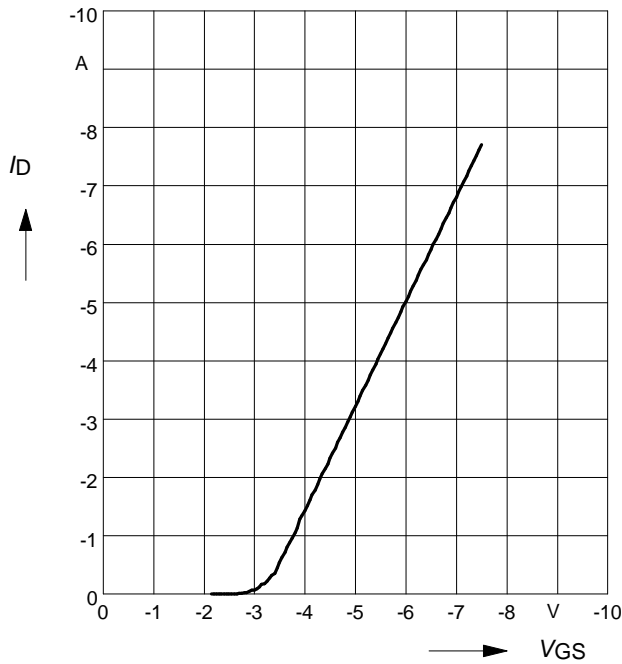
parameter:  $I_D = -1.9 A, V_{GS} = -10 V$



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

parameter:  $t_p = 80 \mu s$

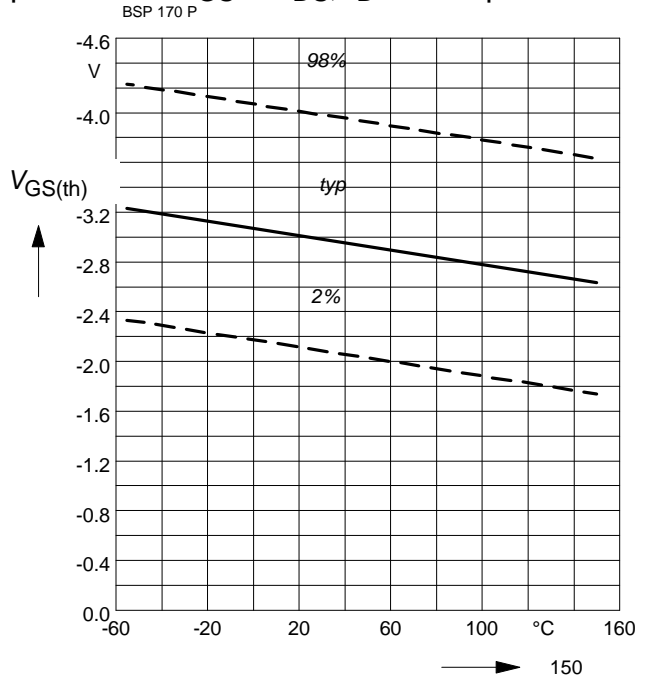
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Gate threshold voltage**

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

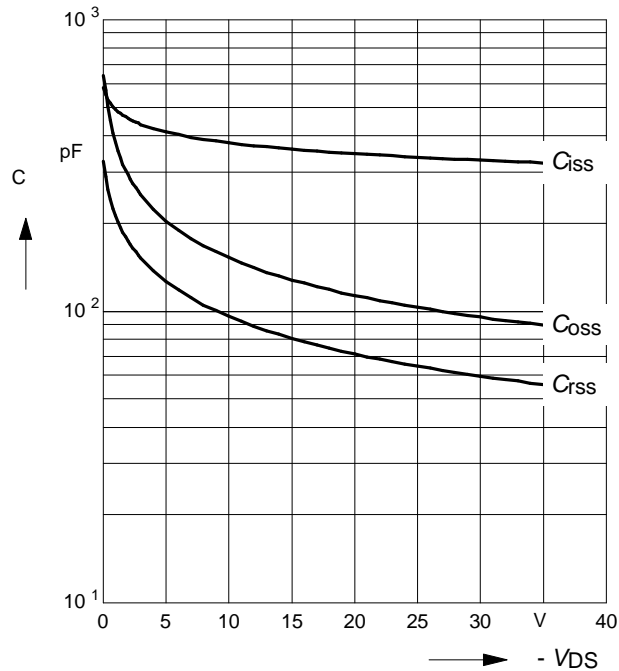
parameter:  $V_{GS} = V_{DS}, I_D = -460 \mu A$



**Typ. capacitances**

$C = f(V_{DS})$

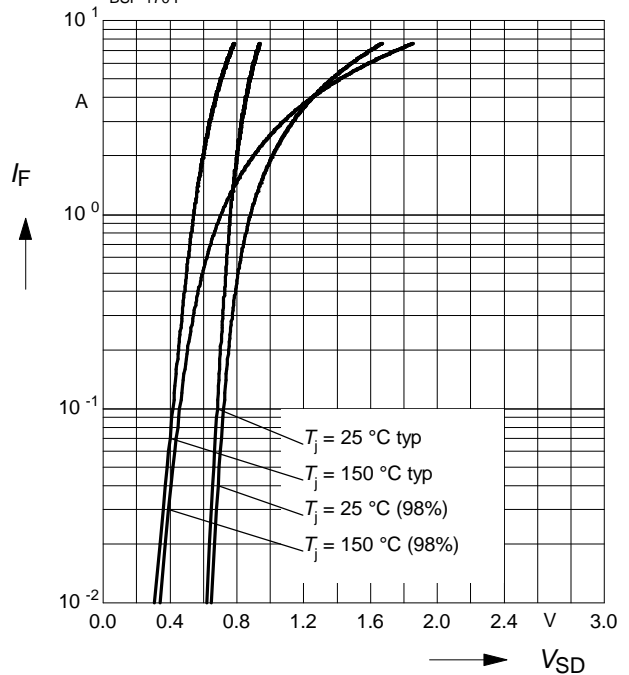
Parameter:  $V_{GS} = 0 V, f = 1 MHz$



**Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

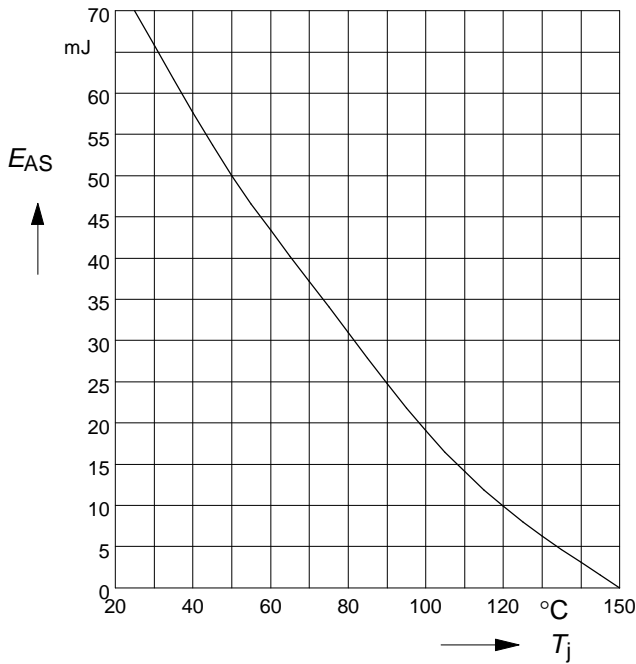
parameter:  $T_j, t_p = 80 \mu s$



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

parameter:  $I_D = -1.9 \text{ A}$ ,  $V_{DD} = -25 \text{ V}$

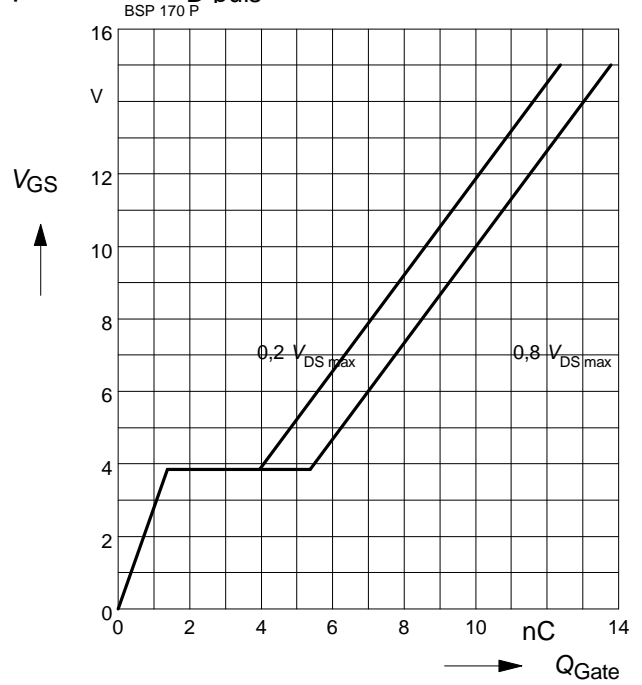
$R_{GS} = 25 \Omega$



### Typ. gate charge $V_{GS} = f(Q_{Gate})$

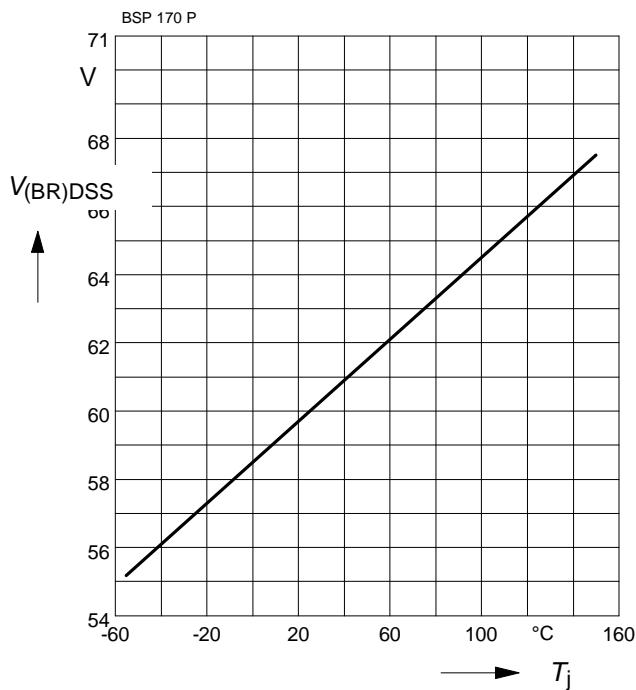
parameter:  $I_{D \text{ puls}} = -1.9 \text{ A}$

parameter:  $I_{D \text{ puls}} = -1.9 \text{ A}$



### 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