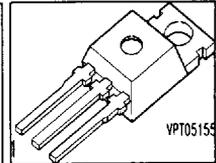
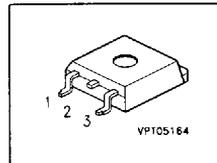


**SIPMOS® Power Transistor**
**Features**

- N channel
- Enhancement mode
- Avalanche rated
- Logic Level
- $dv/dt$  rated
- 175°C operating temperature

**Product Summary**

Drain source voltage	$V_{DS}$	30	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.012	$\Omega$
Continuous drain current	$I_D$	46	A



Type	Package	Ordering Code	Packaging
SPP46N03L	P-TO220-3-1	Q67040-S4147-A2	Tube
SPB46N03L	P-TO263-3-2	Q67040-S4743-A2	Tape and Reel

Pin 1	Pin 2	Pin 3
G	D	S

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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25\text{ }^\circ\text{C}$ , limited by bond wire $T_C = 100\text{ }^\circ\text{C}$	$I_D$	46 44	A
Pulsed drain current $T_C = 25\text{ }^\circ\text{C}$	$I_{Dpulse}$	184	
Avalanche energy, single pulse $I_D = 46\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$	$E_{AS}$	250	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	12	
Reverse diode $dv/dt$ $I_S = 46\text{ A}$ , $V_{DS} = 24\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ , $T_{jmax} = 175\text{ }^\circ\text{C}$	$dv/dt$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25\text{ }^\circ\text{C}$	$P_{tot}$	120	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/175/56	

■ 8235605 0133726 461 ■

**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	-	1.25	KW
Thermal resistance, junction - ambient, leded	$R_{thJA}$	-	-	62	
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{thJA}$	-	-	62 40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 80\text{ }\mu\text{A}$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS} = 30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$ $V_{DS} = 30\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$	$I_{DSS}$	-	0.1	1 100	$\mu\text{A}$
Gate-source leakage current $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$	$I_{GSS}$	-	10	100	
Drain-Source on-state resistance $V_{GS} = 4.5\text{ V}$ , $I_D = 44\text{ A}$ $V_{GS} = 10\text{ V}$ , $I_D = 44\text{ A}$	$R_{DS(on)}$	-	0.014 0.008	0.018 0.012	$\Omega$

<sup>1</sup> Device on 40mm\*40mm\*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.

■ 8235605 0133727 3T8 ■

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Transconductance $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 46\text{ A}$	$g_{fs}$	20	49	-	S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$	-	1640	2100	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$	-	650	820	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$	-	280	350	
Turn-on delay time $V_{DD} = 15\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 46\text{ A}$ , $R_G = 3.6\text{ }\Omega$	$t_{d(on)}$	-	16	24	ns
Rise time $V_{DD} = 15\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 46\text{ A}$ , $R_G = 3.6\text{ }\Omega$	$t_r$	-	30	45	
Turn-off delay time $V_{DD} = 15\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 46\text{ A}$ , $R_G = 3.6\text{ }\Omega$	$t_{d(off)}$	-	20	30	
Fall time $V_{DD} = 15\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 46\text{ A}$ , $R_G = 3.6\text{ }\Omega$	$t_f$	-	25	38	

■ 8235605 0133728 234 ■

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Dynamic Characteristics</b>					
Gate to source charge $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$	$Q_{gs}$	-	6	9	nC
Gate to drain charge $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$	$Q_{gd}$	-	21	31.5	
Gate charge total $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$	$Q_g$	-	54	80	
Gate plateau voltage $V_{DD} = 24\text{ V}$ , $I_D = 46\text{ A}$	$V_{(\text{plateau})}$	-	3.83	-	V

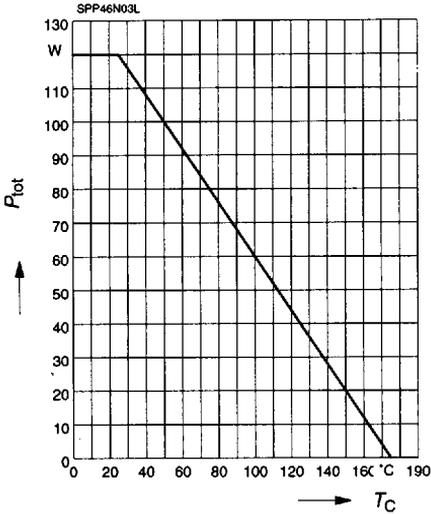
**Reverse Diode**

Inverse diode continuous forward current $T_C = 25\text{ }^\circ\text{C}$	$I_S$	-	-	46	A
Inverse diode direct current, pulsed $T_C = 25\text{ }^\circ\text{C}$	$I_{SM}$	-	-	184	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = 92\text{ A}$	$V_{SD}$	-	1.1	1.7	V
Reverse recovery time $V_R = 15\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	50	75	ns
Reverse recovery charge $V_R = 15\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	0.06	0.09	$\mu\text{C}$

**8235605 0133729 170**

**Power Dissipation**

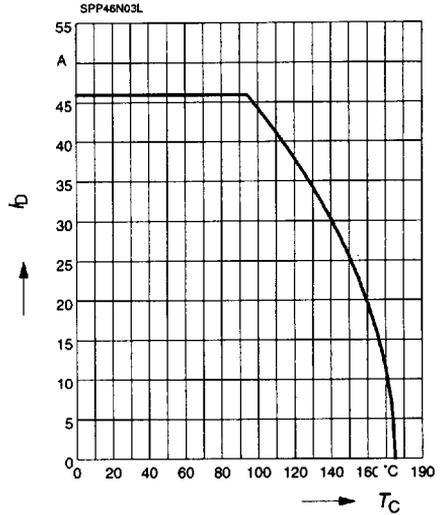
$$P_{tot} = f(T_C)$$



**Drain current**

$$I_D = f(T_C)$$

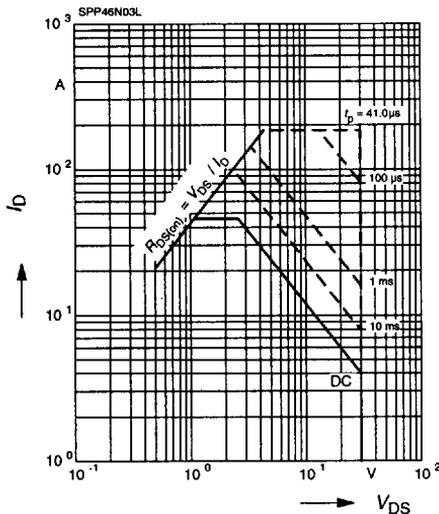
parameter:  $V_{GS} \geq 10 \text{ V}$



**Safe operating area**

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

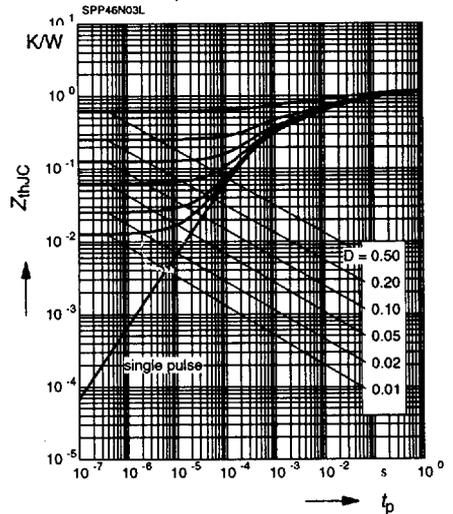
parameter:  $D = 0, T_C = 25 \text{ °C}$



**Transient thermal impedance**

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

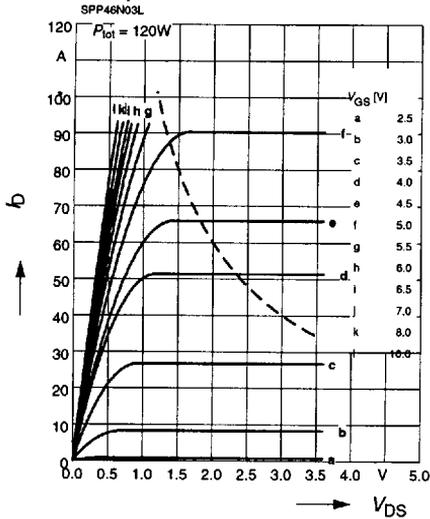
parameter:  $D = t_p / T$



**Typ. output characteristics**

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

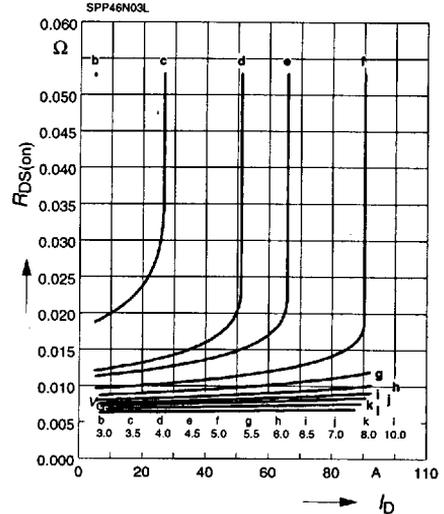
parameter:  $t_p = 80 \mu s$



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

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

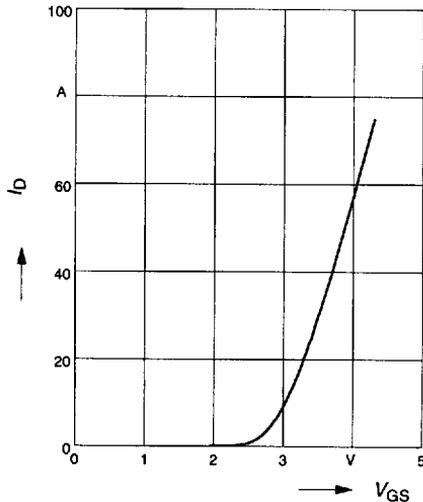
parameter:  $V_{GS}$



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

parameter:  $t_p = 80 \mu s$

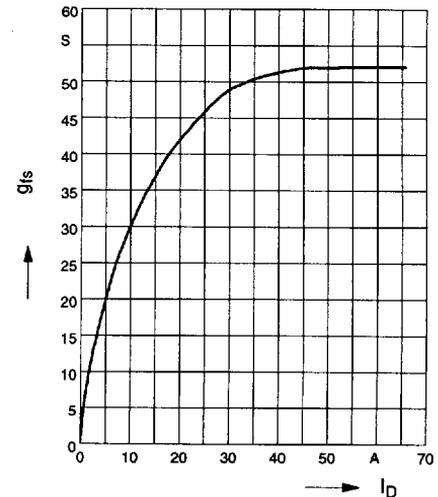
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



**Typ. forward transconductance**

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

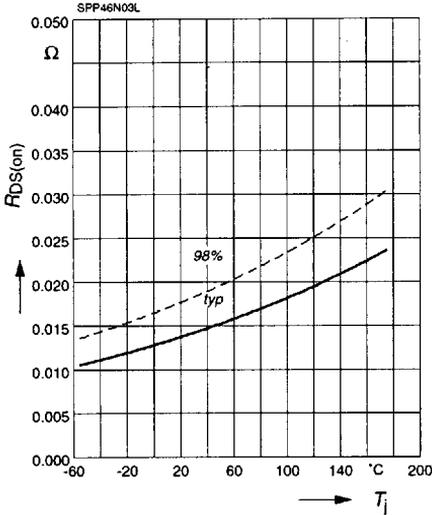
parameter:  $g_{fs}$



**Drain-source on-resistance**

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

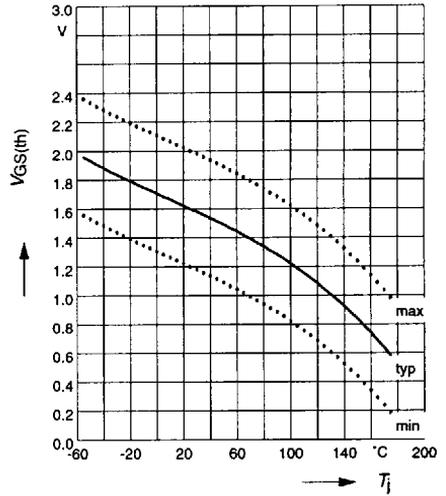
parameter :  $I_D = 44 \text{ A}$ ,  $V_{GS} = 4.5 \text{ V}$



**Gate threshold voltage**

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

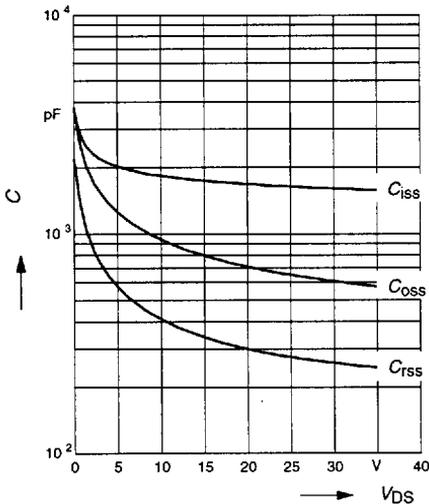
parameter :  $V_{GS} = V_{DS}$ ,  $I_D = 80 \mu\text{A}$



**Typ. capacitances**

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

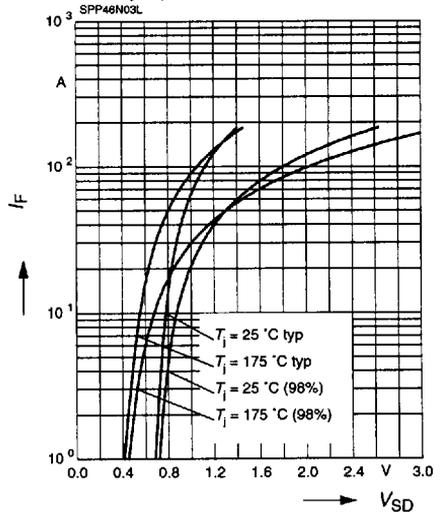
parameter :  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



**Forward characteristics of reverse diode**

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

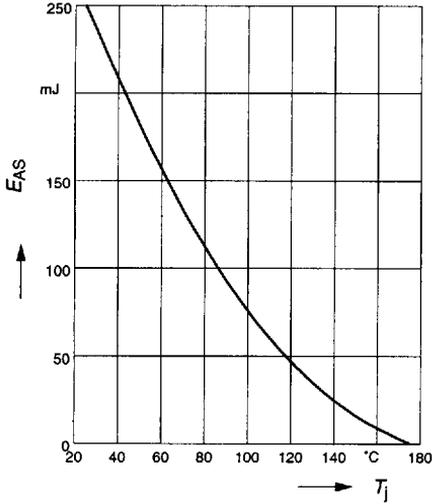
parameter :  $T_j, t_p = 80 \mu\text{s}$



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

parameter:  $I_D = 46 \text{ A}$ ,  $V_{DD} = 25 \text{ V}$

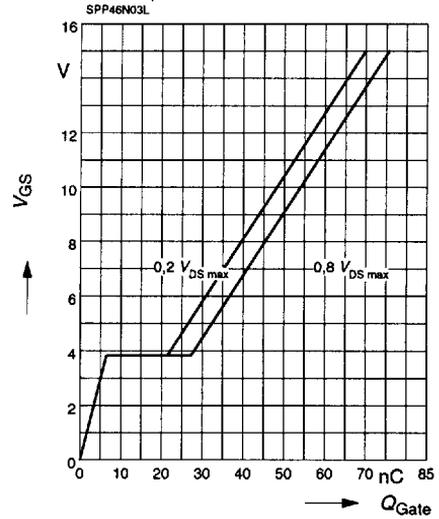
$R_{GS} = 25 \text{ } \Omega$



**Typ. gate charge**

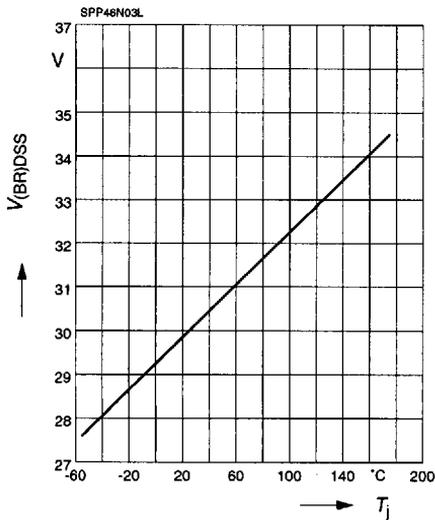
$V_{GS} = f(Q_{Gate})$

parameter:  $I_{D \text{ puls}} = 46 \text{ A}$



**Drain-source breakdown voltage**

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

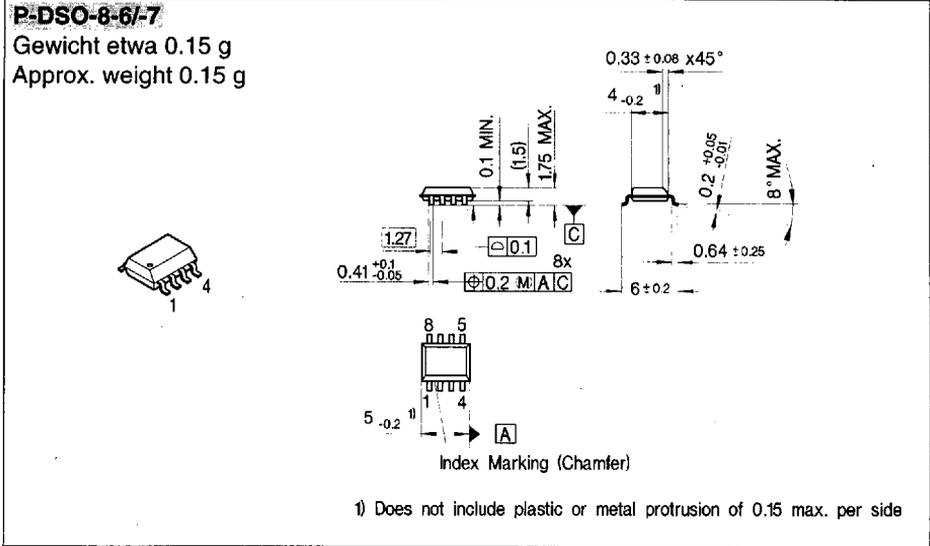


**Gehäusemaßbilder**

(Maße in mm, wenn nicht anders angegeben)

**Package Outlines**

(Dimensions in mm, unless otherwise specified)



**Bild 16**

**Figure 16**

**P-TO218-AA (P-TO218-2-1)**

Gewicht etwa 4.9 g  
Approx. weight 4.9 g

**Bild 17**

**Figure 17**

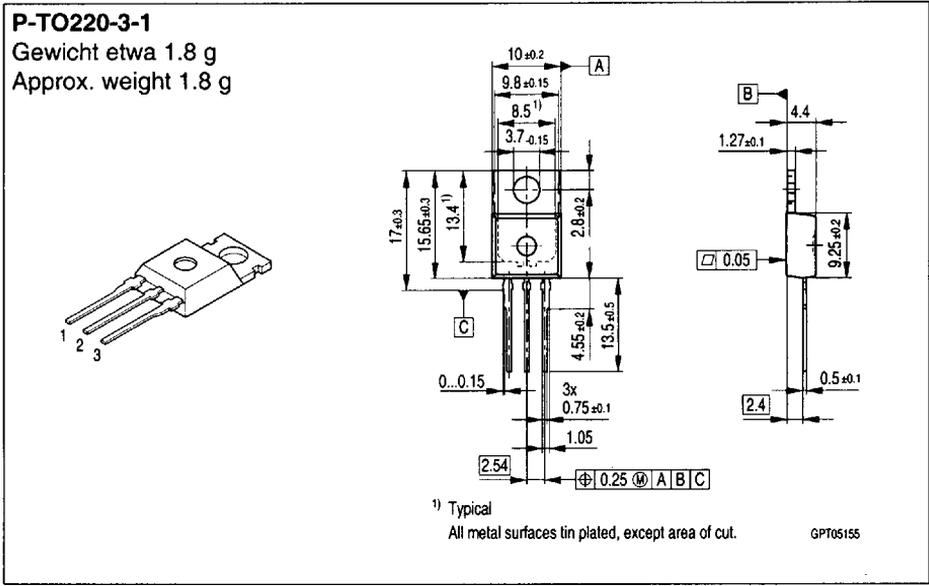


Bild 18

Figure 18

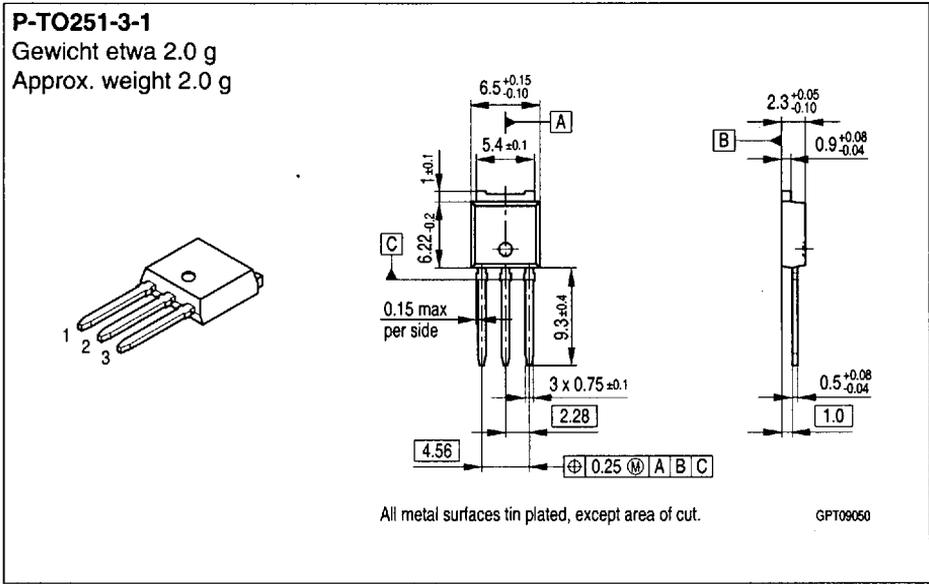


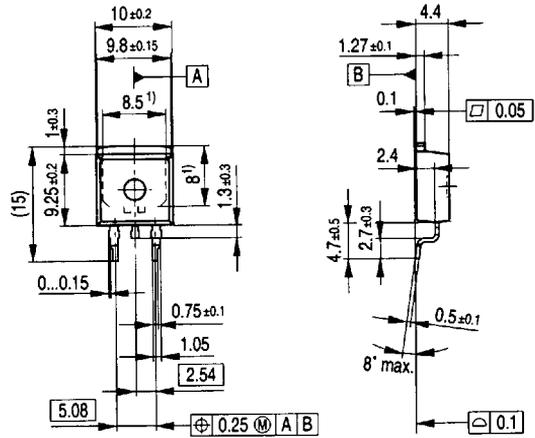
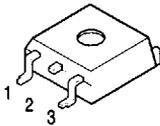
Bild 19

Figure 19



**P-TO263-3-2/D<sup>2</sup>PAK**

Gewicht etwa 1.38 g  
Approx. weight 1.38 g



<sup>1)</sup> Typical

All metal surfaces tin plated, except area of cut.

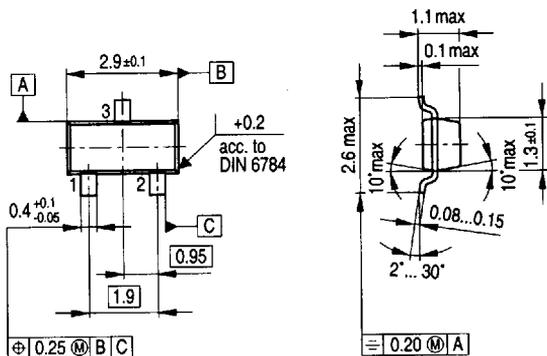
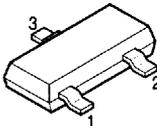
GPT09085

Bild 22

Figure 22

**SOT-23 (P-SOT23-3-1)**

Gewicht etwa 0.01 g  
Approx. weight 0.01 g



GPS05557

Bild 23

Figure 23

**SOT-89**

Gewicht etwa 0.01 g  
Approx. weight 0.01 g

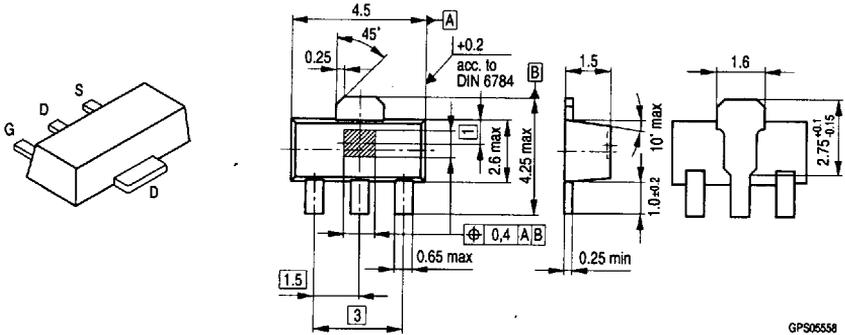


Bild 24

Figure 24

**SOT-223 (P-SOT223-4-1)**

Gewicht etwa 0.15 g  
Approx. weight 0.15 g

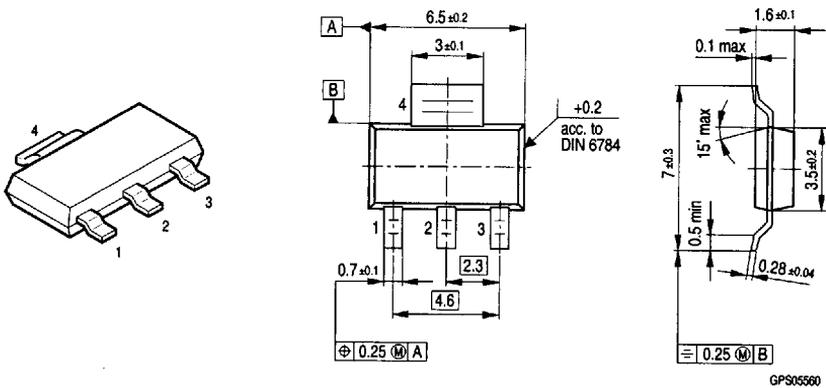
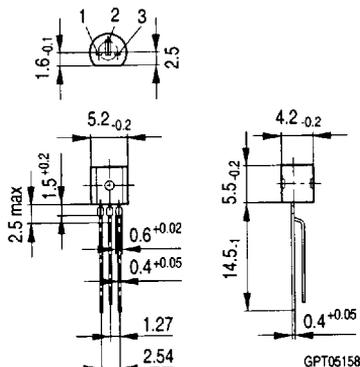
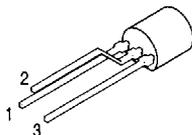


Bild 25

Figure 25

**TO-92**

Gewicht etwa 0.23 g  
Approx. weight 0.23 g

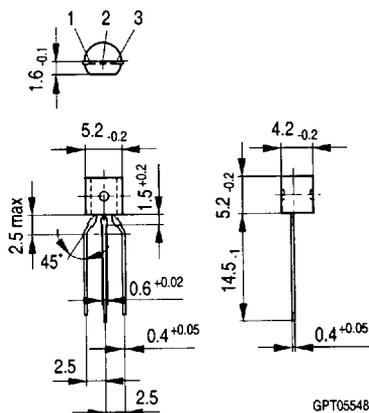
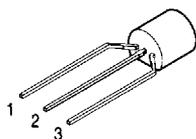


**Bild 26**

**Figure 26**

**TO-92-E6288**

Gewicht etwa 0.23 g  
Approx. weight 0.23 g



**Bild 27**

**Figure 27**

**Sorts of Packing**

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

**SMD = Surface Mounted Device**