

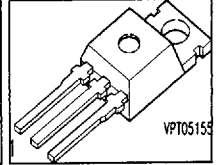
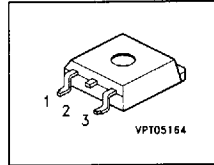
## SIPMOS® Power Transistor

### Features

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

### Product Summary

Drain source voltage	$V_{DS}$	55	V
Drain-Source on-state resistance	$R_{DS(on)}$	0.008	$\Omega$
Continuous drain current	$I_D$	80	A



Type	Package	Ordering Code	Packaging
BUZ111S	P-TO220-3-1	Q67040-S4003-A2	Tube
BUZ111S E3045A	P-TO263-3-2	Q67040-S4003-A6	Tape and Reel
BUZ111S E3045	P-TO263-3-2	Q67040-S4003-A5	Tube

Pin 1	Pin 2	Pin 3
G	D	S

### Maximum Ratings, at $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25\text{ °C}$ , 1) $T_C = 100\text{ °C}$	$I_D$	80 80	A
Pulsed drain current $T_C = 25\text{ °C}$	$I_{Dpulse}$	320	
Avalanche energy, single pulse $I_D = 80\text{ A}$ , $V_{DD} = 25\text{ V}$ , $R_{GS} = 25\text{ }\Omega$	$E_{AS}$	700	mJ
Avalanche energy, periodic limited by $T_{jmax}$	$E_{AR}$	30	
Reverse diode $dv/dt$ $I_S = 80\text{ A}$ , $V_{DS} = 40\text{ V}$ , $di/dt = 200\text{ A}/\mu\text{s}$ , $T_{jmax} = 175\text{ °C}$	$dv/dt$	6	kV/ $\mu\text{s}$
Gate source voltage	$V_{GS}$	$\pm 20$	V
Power dissipation $T_C = 25\text{ °C}$	$P_{tot}$	300	W
Operating and storage temperature	$T_j, T_{stg}$	-55... +175	°C
IEC climatic category; DIN IEC 68-1		55/175/56	

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**Thermal Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	-	0.5	K/W
Thermal resistance, junction - ambient, leded	$R_{thJA}$	-	-	62	
SMD version, device on PCB: @ min. footprint @ 6 cm <sup>2</sup> cooling area <sup>2</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.	

**Static Characteristics**

Drain- source breakdown voltage $V_{GS} = 0\text{ V}$ , $I_D = 0.25\text{ mA}$	$V_{(BR)DSS}$	55	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 240\text{ }\mu\text{A}$	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current $V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 25\text{ }^\circ\text{C}$ $V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$	$I_{DSS}$	-	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 $V_{GS} = 10\text{ V}$ , $I_D = 80\text{ A}$	$R_{DS(on)}$	-	0.0065	0.008	$\Omega$

<sup>1</sup> current limited by bond wire

<sup>2</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.

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**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 $V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$ , $I_D = 80\text{ A}$	$g_{fs}$	30	73	-	S
Input capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{iss}$	-	3600	4500	pF
Output capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{oss}$	-	1100	1375	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$	$C_{rss}$	-	550	690	
Turn-on delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 80\text{ A}$ , $R_G = 2.4\ \Omega$	$t_{d(on)}$	-	25	37	ns
Rise time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 80\text{ A}$ , $R_G = 2.4\ \Omega$	$t_r$	-	30	45	
Turn-off delay time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 80\text{ A}$ , $R_G = 2.4\ \Omega$	$t_{d(off)}$	-	65	95	
Fall time $V_{DD} = 30\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 80\text{ A}$ , $R_G = 2.4\ \Omega$	$t_f$	-	40	60	

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**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 $V_{DD} = 40\text{ V}$ , $I_D = 80\text{ A}$	$Q_{gs}$	-	18	27	nC
Gate to drain charge $V_{DD} = 40\text{ V}$ , $I_D = 80\text{ A}$	$Q_{gd}$	-	61	91.5	
Gate charge total $V_{DD} = 40\text{ V}$ , $I_D = 80\text{ A}$ , $V_{GS} = 0\text{ to }10\text{ V}$	$Q_g$	-	125	185	
Gate plateau voltage $V_{DD} = 40\text{ V}$ , $I_D = 80\text{ A}$	$V_{(\text{plateau})}$	-	5.45	-	V

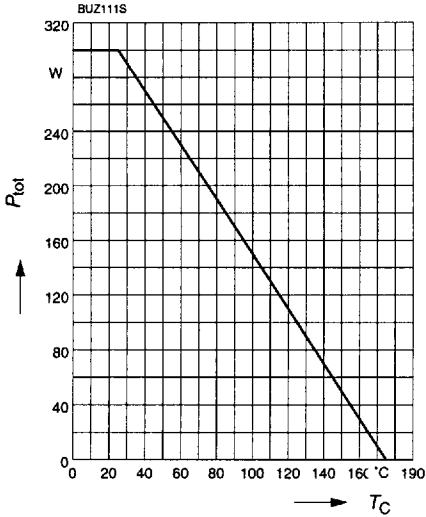
**Reverse Diode**

Inverse diode continuous forward current $T_C = 25\text{ }^\circ\text{C}$	$I_S$	-	-	80	A
Inverse diode direct current, pulsed $T_C = 25\text{ }^\circ\text{C}$	$I_{SM}$	-	-	320	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$ , $I_F = 160\text{ A}$	$V_{SD}$	-	1.25	1.8	V
Reverse recovery time $V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$t_{rr}$	-	105	160	ns
Reverse recovery charge $V_R = 30\text{ V}$ , $I_F = I_S$ , $di_F/dt = 100\text{ A}/\mu\text{s}$	$Q_{rr}$	-	0.29	0.45	$\mu\text{C}$

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**Power Dissipation**

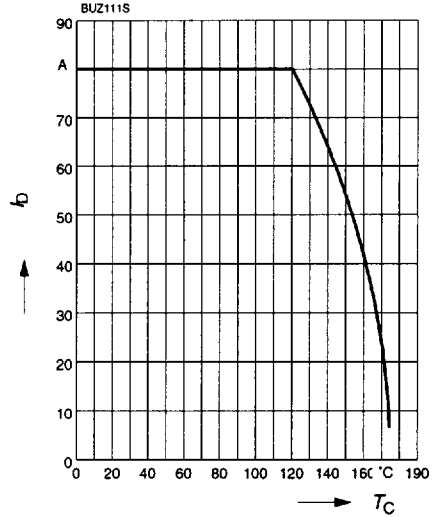
$P_{tot} = f(T_C)$



**Drain current**

$I_D = f(T_C)$

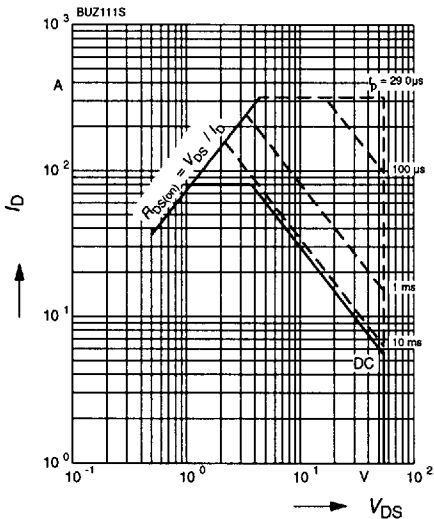
parameter:  $V_{GS} \geq 10 V$



**Safe operating area**

$I_D = f(V_{DS})$

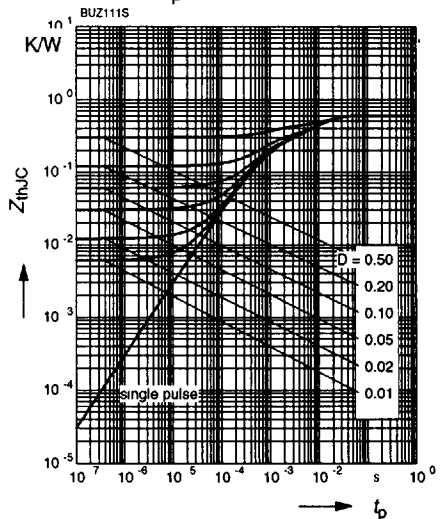
parameter:  $D = 0, T_C = 25^{\circ}C$



**Transient thermal impedance**

$Z_{thJC} = f(t_p)$

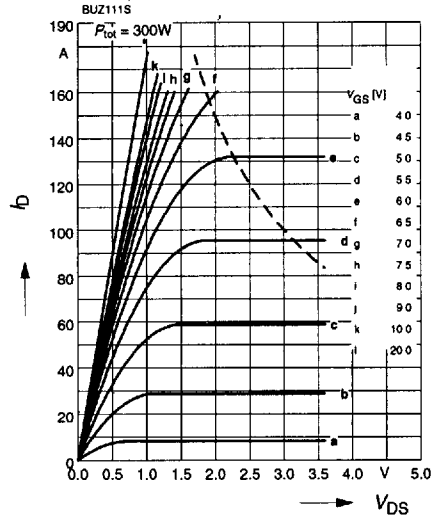
parameter:  $D = t_p/T$



**Typ. output characteristics**

$I_D = f(V_{DS})$

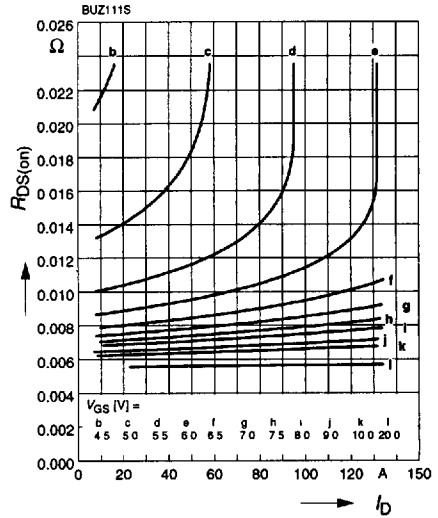
parameter:  $t_p = 80 \mu s$



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

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

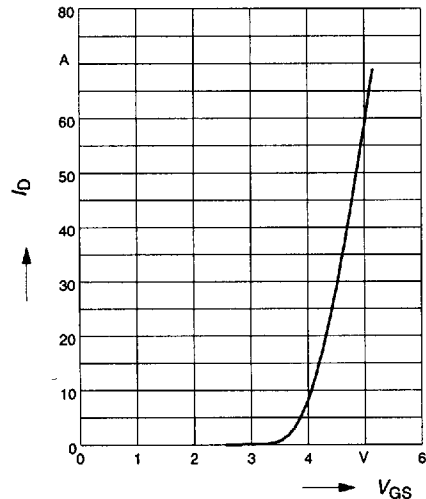
parameter:  $V_{GS}$



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

parameter:  $t_p = 80 \mu s$

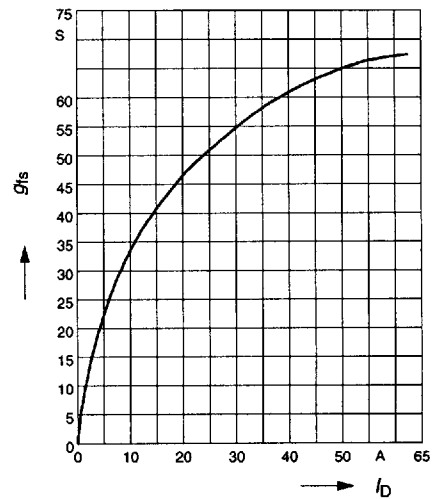
$V_{DS} \geq 2 \times I_D \times R_{DS(on) \max}$



**Typ. forward transconductance**

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

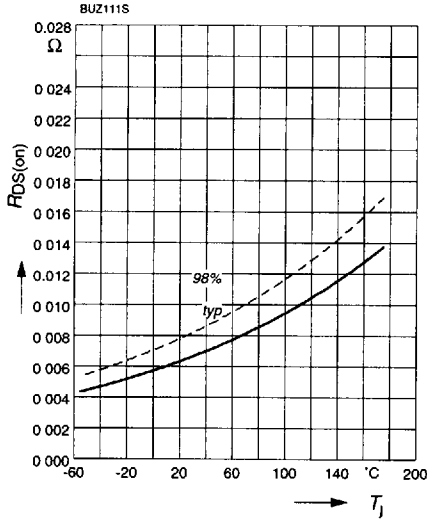
parameter:  $g_{fs}$



**Drain-source on-resistance**

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

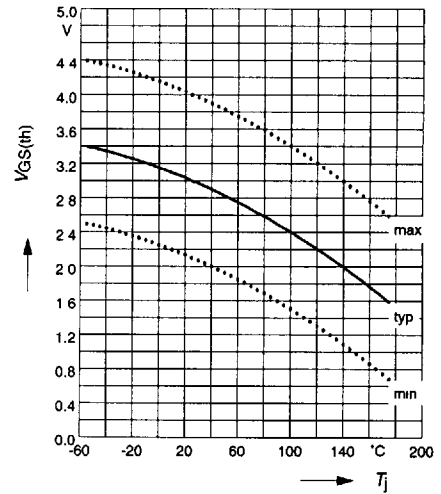
parameter :  $I_D = 80 \text{ A}$ ,  $V_{GS} = 10 \text{ V}$



**Gate threshold voltage**

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

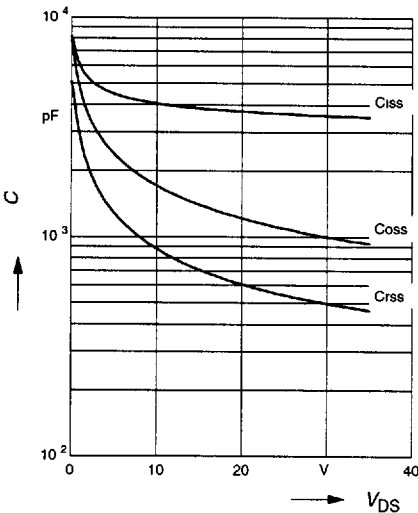
parameter :  $V_{GS} = V_{DS}$ ,  $I_D = 240 \mu\text{A}$



**Typ. capacitances**

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

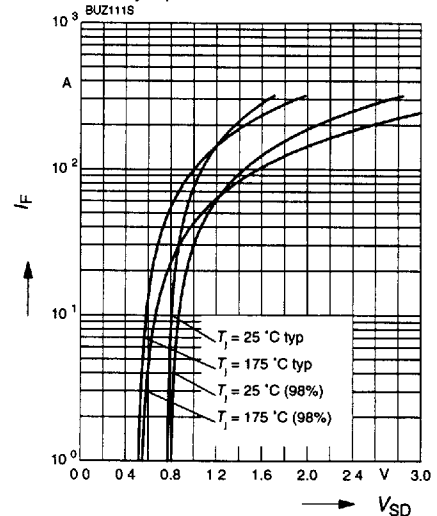
parameter:  $V_{GS} = 0 \text{ V}$ ,  $f = 1 \text{ MHz}$



**Forward characteristics of reverse diode**

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

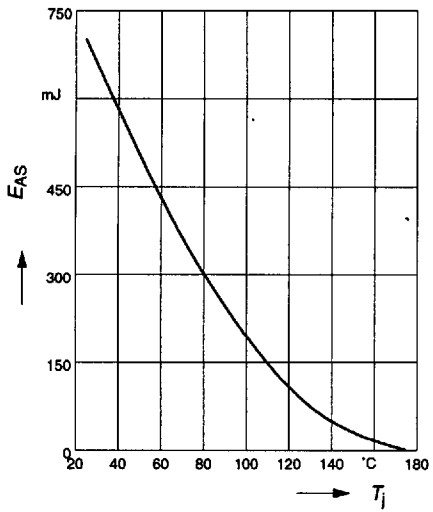
parameter:  $T_j$ ,  $t_p = 80 \mu\text{s}$



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

parameter:  $I_D = 80\text{ A}$ ,  $V_{DD} = 25\text{ V}$

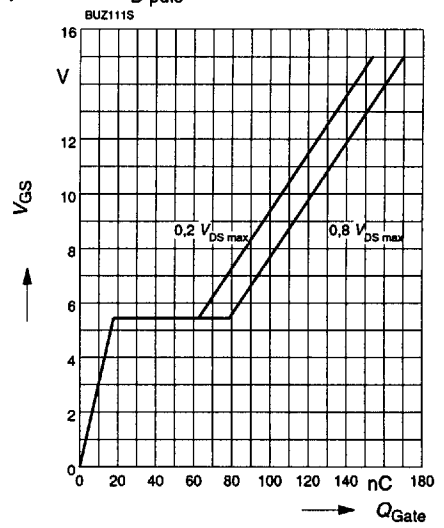
$R_{GS} = 25\ \Omega$



**Typ. gate charge**

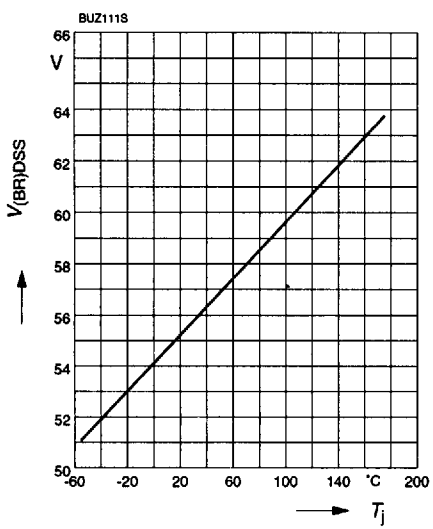
$V_{GS} = f(Q_{Gate})$

parameter:  $I_D\text{ puls} = 80\text{ A}$



**Drain-source breakdown voltage**

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



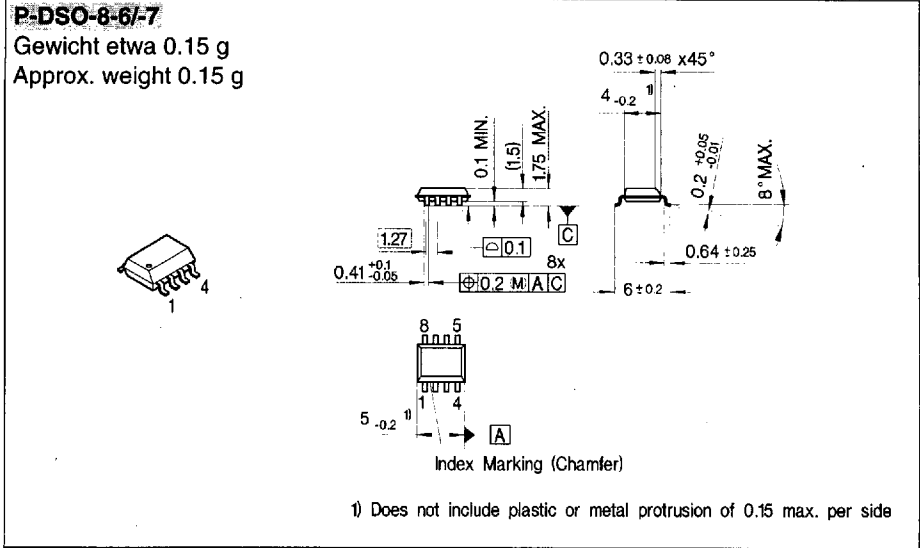


**Gehäusemaßbilder**

(Maße in mm, wenn nicht anders angegeben)

**Package Outlines**

(Dimensions in mm, unless otherwise specified)



**Bild 16**

**Figure 16**

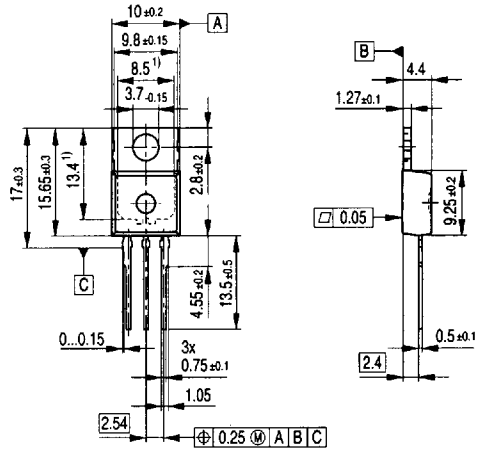
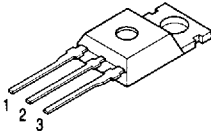
**P-TO218-AA (P-TO218-2-1)**

Gewicht etwa 4.9 g  
Approx. weight 4.9 g

**Bild 17**

**Figure 17**

**P-TO220-3-1**  
Gewicht etwa 1.8 g  
Approx. weight 1.8 g



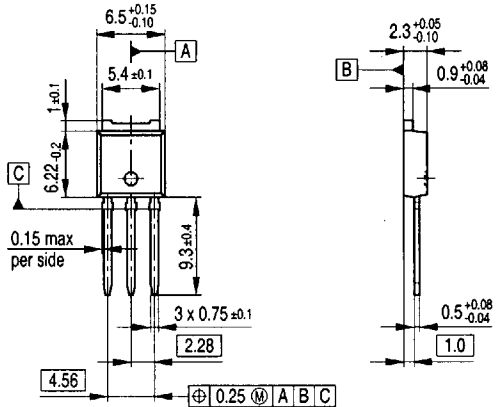
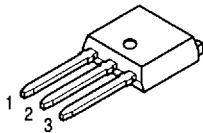
<sup>1)</sup> Typical  
All metal surfaces tin plated, except area of cut.

GPT05155

Bild 18

Figure 18

**P-TO251-3-1**  
Gewicht etwa 2.0 g  
Approx. weight 2.0 g



All metal surfaces tin plated, except area of cut.

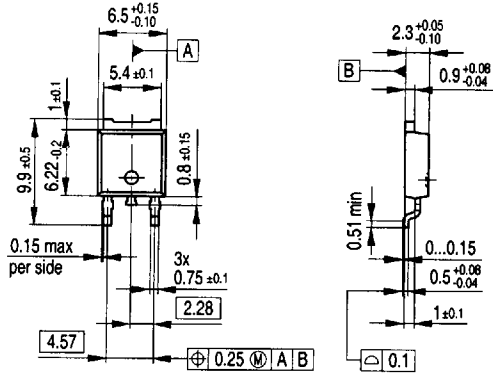
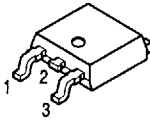
GPT09060

Bild 19

Figure 19

**P-TO252-3-1**

Gewicht etwa 0.38 g  
Approx. weight 0.38 g



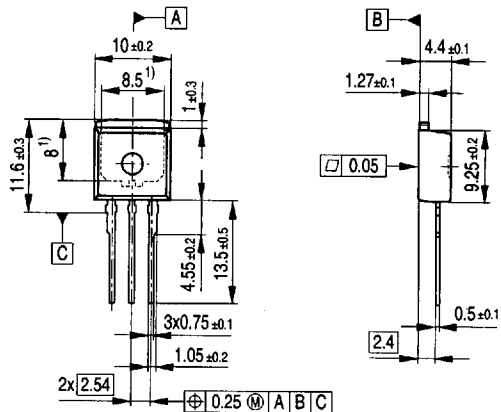
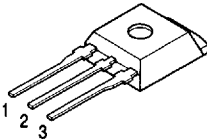
All metal surfaces tin plated, except area of cut.

GPT09051

Bild 20

Figure 20

**P-TO262-3-1/l<sup>2</sup>PAK**



1) Typical

Metal surface min. X = 7.25, Y = 7.35

All metal surfaces tin plated, except area of cut.

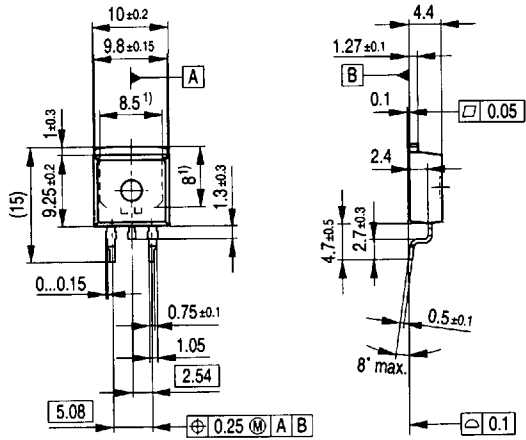
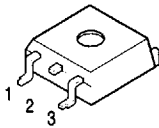
GPT09244

Bild 21

Figure 21

**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.

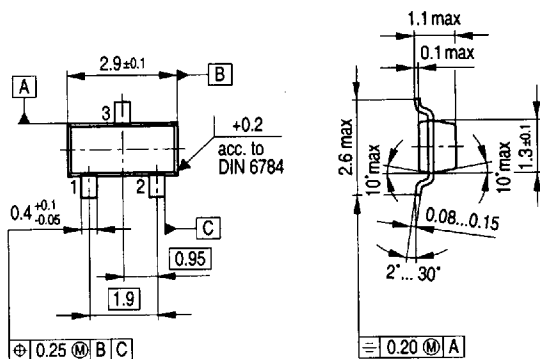
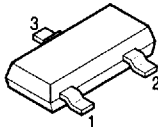
GPT09085

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

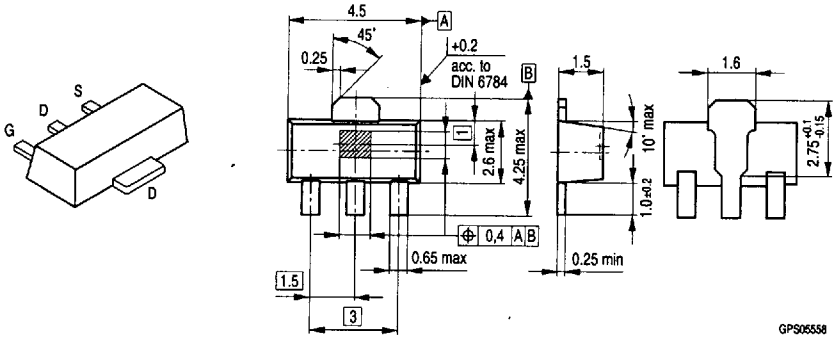


Bild 24

Figure 24

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

Gewicht etwa 0.15 g  
Approx. weight 0.15 g

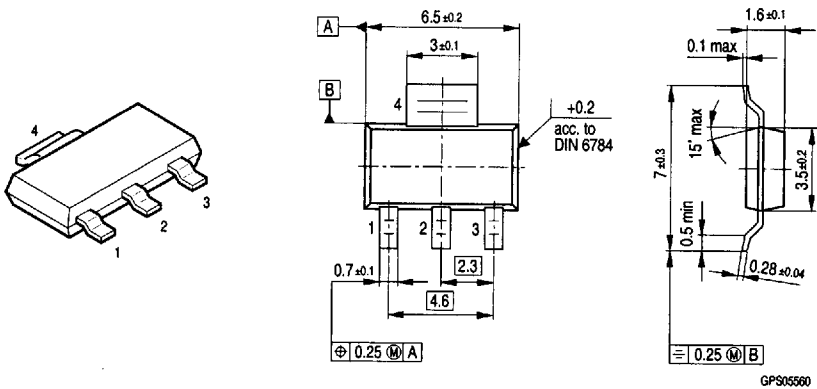
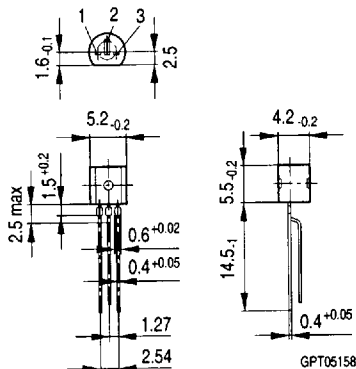
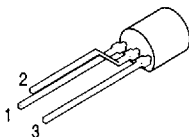


Bild 25

Figure 25

**TO-92**

Gewicht etwa 0.23 g  
Approx. weight 0.23 g



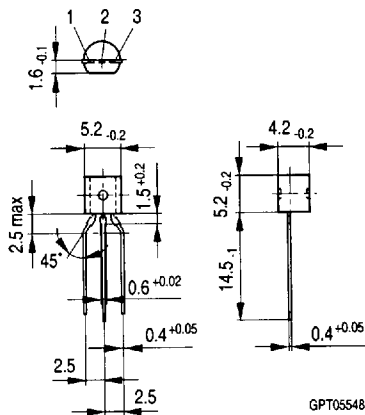
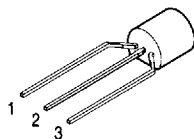
GPT05158

**Bild 26**

**Figure 26**

**TO-92-E6288**

Gewicht etwa 0.23 g  
Approx. weight 0.23 g



GPT05548

**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**