TELEFUNKEN electronic
Creative Technologies

# BF 966

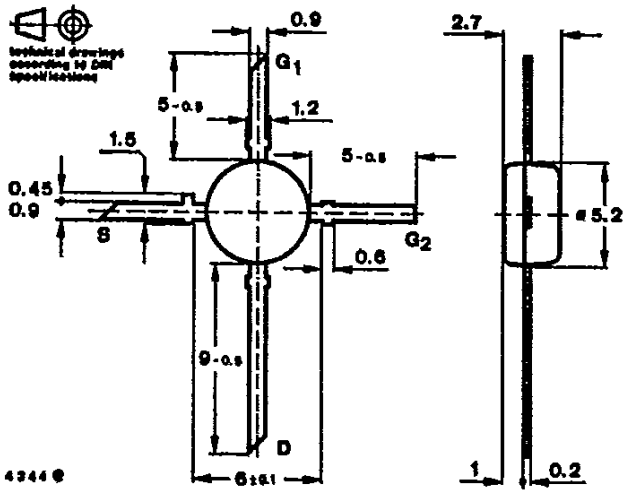
## N-Channel Dual Gate MOS-Fieldeffect Tetrode · Depletion Mode

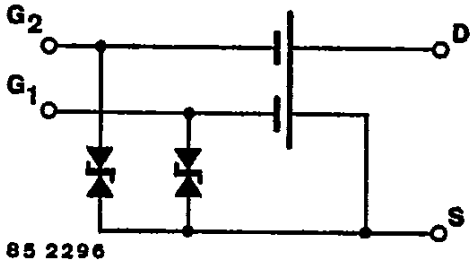
**Applications:** Input- and Mixerstages especially for UHF-tuners

**Features:**

- Integrated Gate protection diodes
- High cross modulation performance
- Low noise figure
- High AGC-range
- Low feedback capacitance
- Low input capacitance

**Dimensions in mm**




Case
50 B 4 DIN 41 867
JEDEC TO 50
Weight max. 0.1 g

**Absolute maximum ratings**

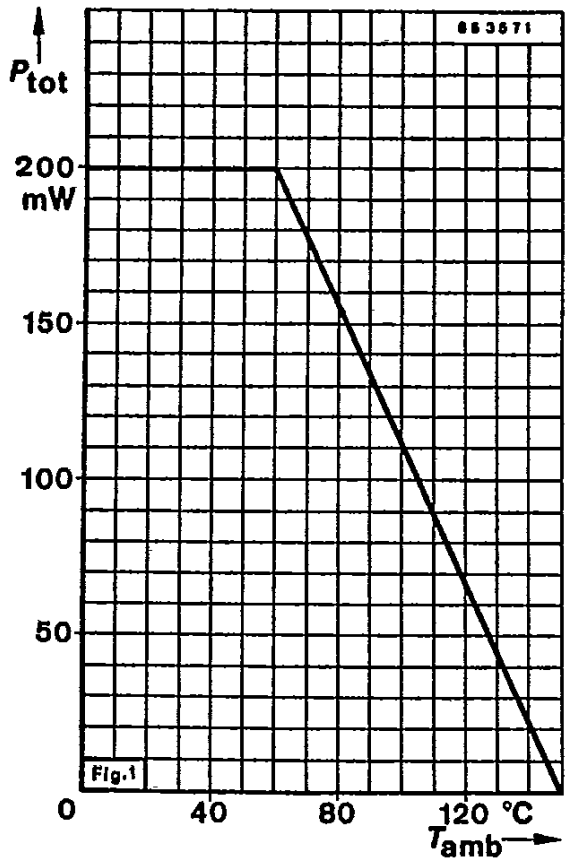
| | | | |
|---|---|---|---|
| Drain Source Voltage | $V_{DS}$ | 20 | V |
| Drain current | $I_D$ | 30 | mA |
| Gate 1/Gate 2-Source peak current | $\pm I_{G1/2SM}$ | 10 | mA |
| Total power dissipation $T_{amb} = 60$ °C | $P_{tot}$ | 200 | mW |
| Channel temperature | $T_C$ | 150 | °C |
| Storage temperature range | $T_{stg}$ | −55 ... +150 | °C |

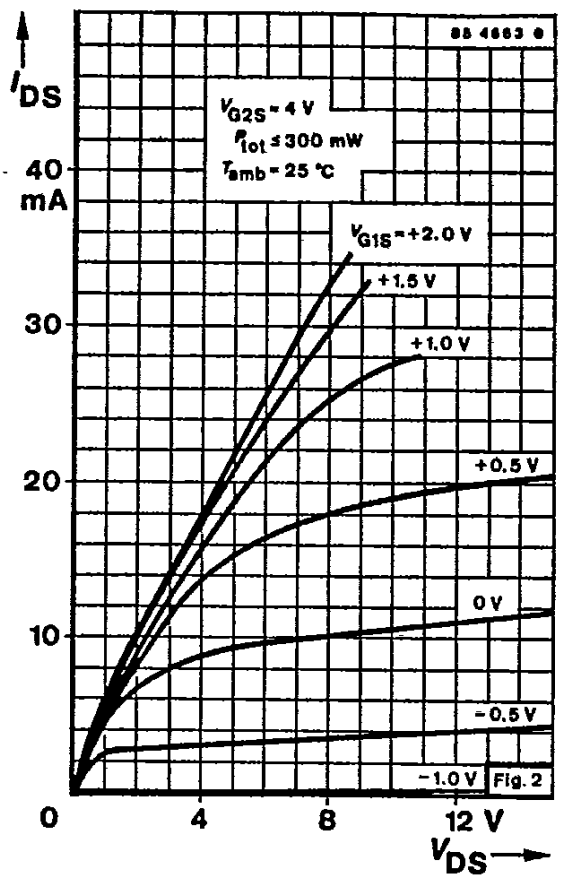
**Thermal resistance**

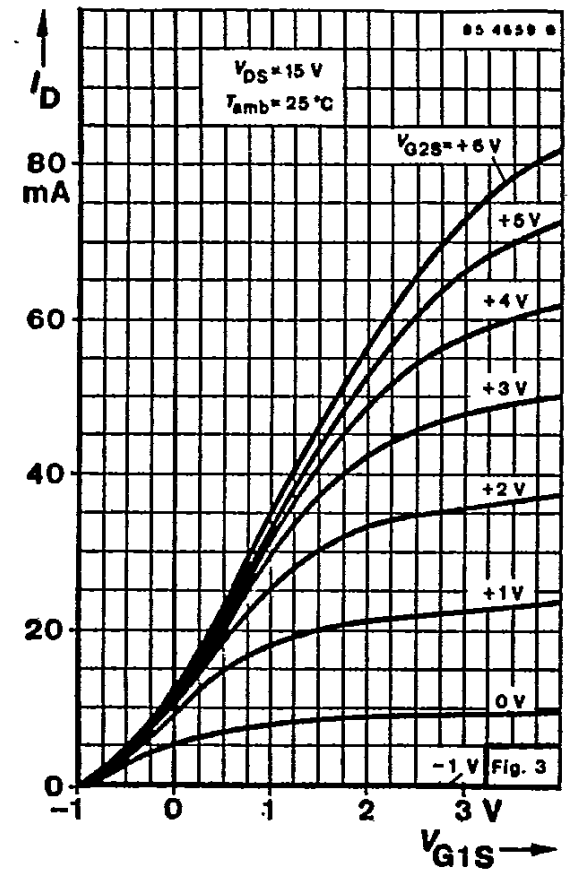
| | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| Channel ambient mounted on pc-board one side Cu 35 µm thickness 40 x 25 x 1.5 mm³ | $R_{thCA}$ | | | 450 | K/W |

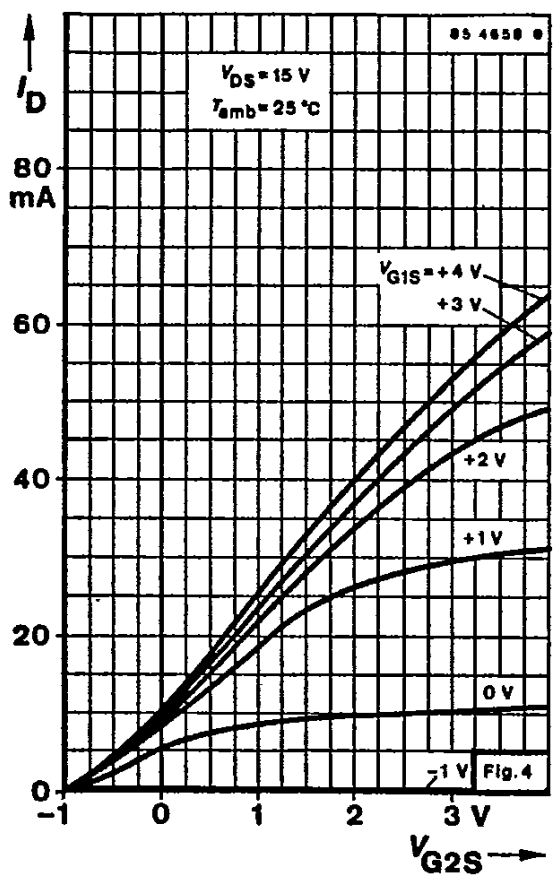
# BF 966

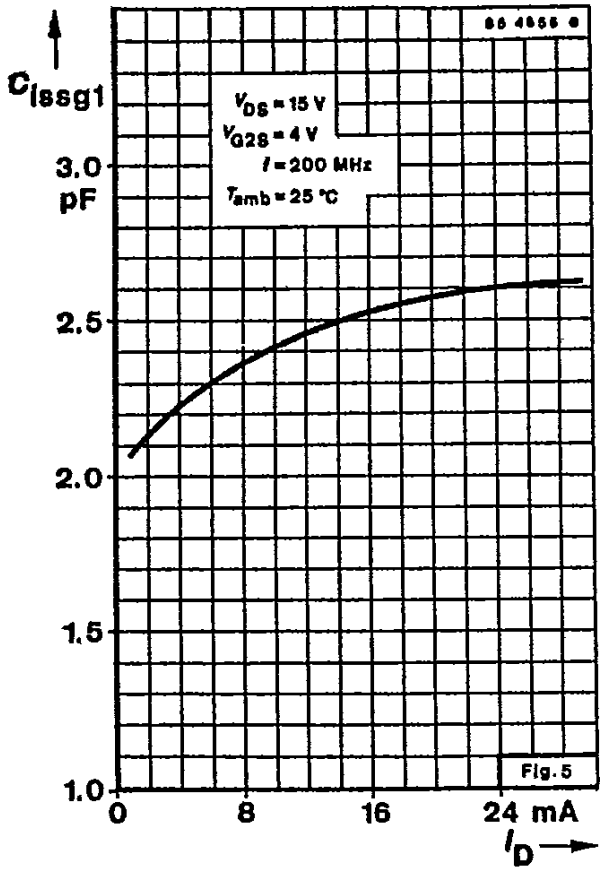
| DC characteristics | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $T_{amb} = 25$ °C, unless otherwise specified | | | | | |
| Drain-source breakdown voltage<br>$I_D = 10$ µA, $-V_{G1S} = -V_{G2S} = 4$ V | $V_{(BR)DS}$ | 20 | | | V |
| Gate 1-Source breakdown voltage<br>$\pm I_{G1S} = 10$ mA, $V_{G2S} = V_{DS} = 0$ | $\pm V_{(BR)G1SS}$ | 6 | | 20 | V |
| Gate 2-Source breakdown voltage<br>$\pm I_{G2S} = 10$ mA, $V_{G1S} = V_{DS} = 0$ | $\pm V_{(BR)G2SS}$ | 6 | | 20 | V |
| Gate 1-Source cutt-off current<br>$\pm V_{G1S} = 5$ V, $V_{G2S} = V_{DS} = 0$ | $I_{G1SS}$ | | | 50 | nA |
| Gate 2-Source cut-off current<br>$\pm V_{G2S} = 5$ V, $V_{G1S} = V_{DS} = 0$ | $I_{G2SS}$ | | | 50 | nA |
| Drain current<br>$V_{DS} = 15$ V, $V_{G1S} = 0$, $V_{G2S} = 4$ V | $I_{DSS}$ | 2 | | 20 | mA |
| Gate 1-Source cutt-off voltage<br>$V_{DS} = 15$ V, $V_{G2S} = 4$ V, $I_D = 20$ µA | $-V_{G1S(OFF)}$ | | | 2.5 | V |
| Gate 2-Source cutt-off voltage<br>$V_{DS} = 15$ V, $V_{G1S} = 0$ V, $I_D = 20$ µA | $-V_{G2S(OFF)}$ | | | 2.0 | V |
| **AC characteristics** | | | | | |
| $V_{DS} = 15$ V, $I_D = 10$ mA, $V_{G2S} = 4$ V, $f = 1$ MHz,<br>$T_{amb} = 25$ °C, unless otherwise specified | | | | | |
| Forward transadmitance | $\|y_{21}\|$ | 15 | 17 | | mS |
| Gate 1-Input capacitance | $C_{iSSg1}$ | | 2.2 | 2.6 | pF |
| Gate 2-Input capacitance<br>$V_{G1S} = 0$, $V_{G2S} = 4$ V | $C_{iSSg2}$ | | 1.1 | | pF |
| Feedback capacitance | $C_{rSS}$ [1] | | 25 | 35 | fF |
| Output capacitance | $C_{oSS}$ | | 0.8 | 1.2 | pF |
| Power gain<br>$V_{DS} = 15$ V, $I_D = 10$ mA, $V_{G2S} = 4$ V,<br>$g_G = 2$ mS, $g_L = 0.5$ mS, $f = 200$ MHz<br>$g_G = 3.3$ mS, $g_L = 1$ mS, $f = 800$ MHz | <br><br>$G_{ps}$<br>$G_{ps}$ | | <br><br>25<br>18 | | <br><br>dB<br>dB |
| Noise figure<br>$V_{DS} = 15$ V, $I_D = 10$ mA, $V_{G2S} = 4$ V, $g_G = 2$ mS,<br>$f = 200$ MHz<br>$f = 800$ MHz | <br><br>$F$<br>$F$ | | <br><br>1.0<br>1.8 | | <br><br>dB<br>dB |

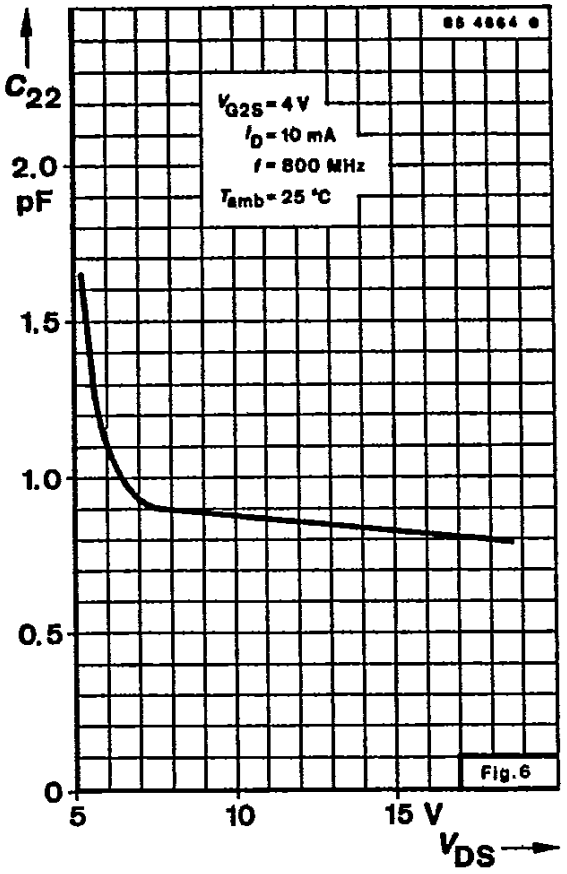

85 3671
$P_{tot}$
200 mW
150
100
50
0
40
80
120 °C
$T_{amb}$
Fig.1

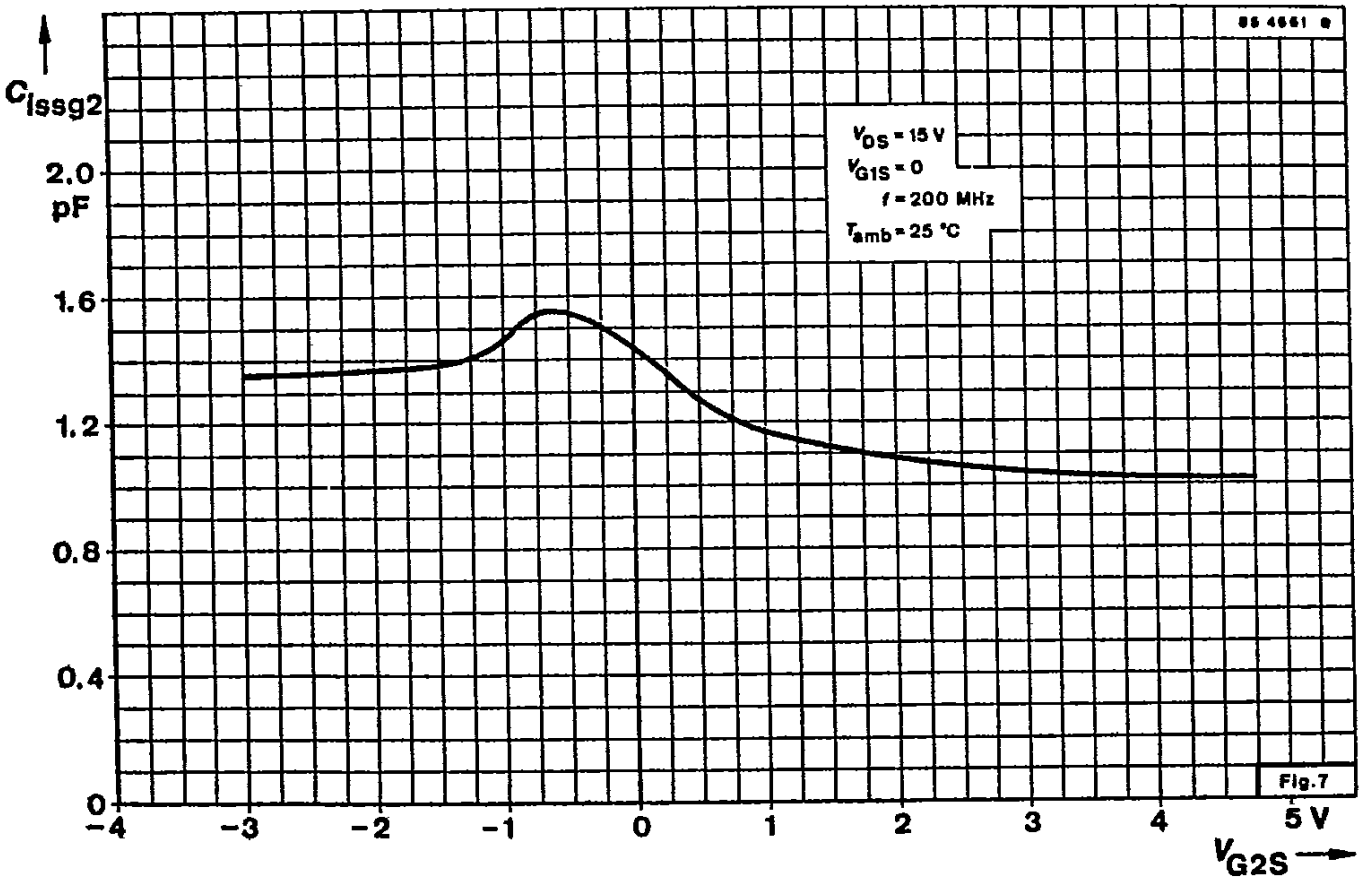

85 4663 e
$I_{DS}$
40 mA
30
20
10
0
4
8
12 V
$V_{DS}$
$V_{G2S}$ = 4 V
$P_{tot}$ ≤ 300 mW
$T_{amb}$ = 25 °C
$V_{G1S}$ = +2.0 V
+1.5 V
+1.0 V
+0.5 V
0 V
−0.5 V
−1.0 V
Fig. 2

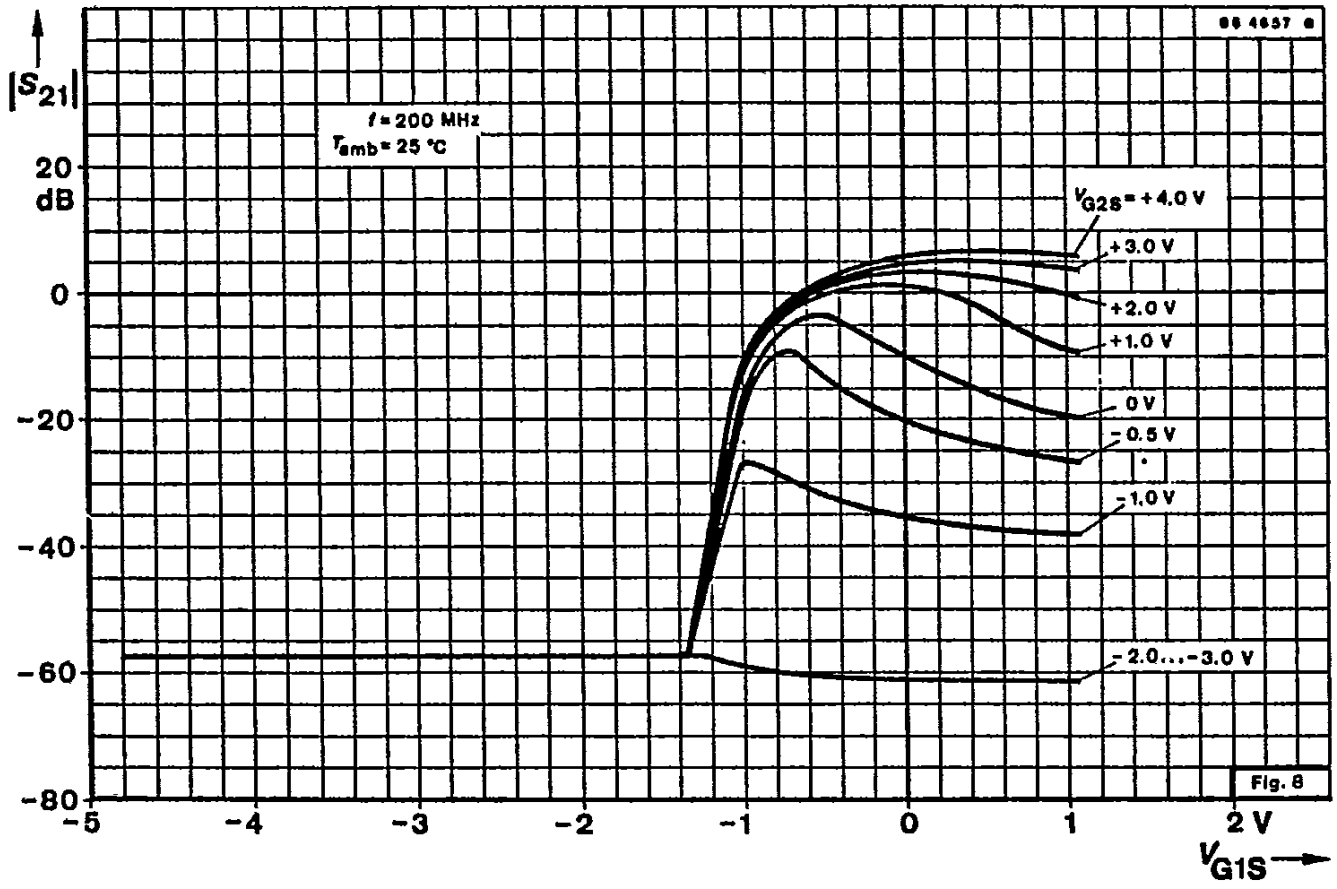

85 4659 e
$I_D$
80 mA
60
40
20
0
−1
0
1
2
3 V
$V_{G1S}$
$V_{DS}$ = 15 V
$T_{amb}$ = 25 °C
$V_{G2S}$ = +6 V
+5 V
+4 V
+3 V
+2 V
+1 V
0 V
−1 V
Fig. 3

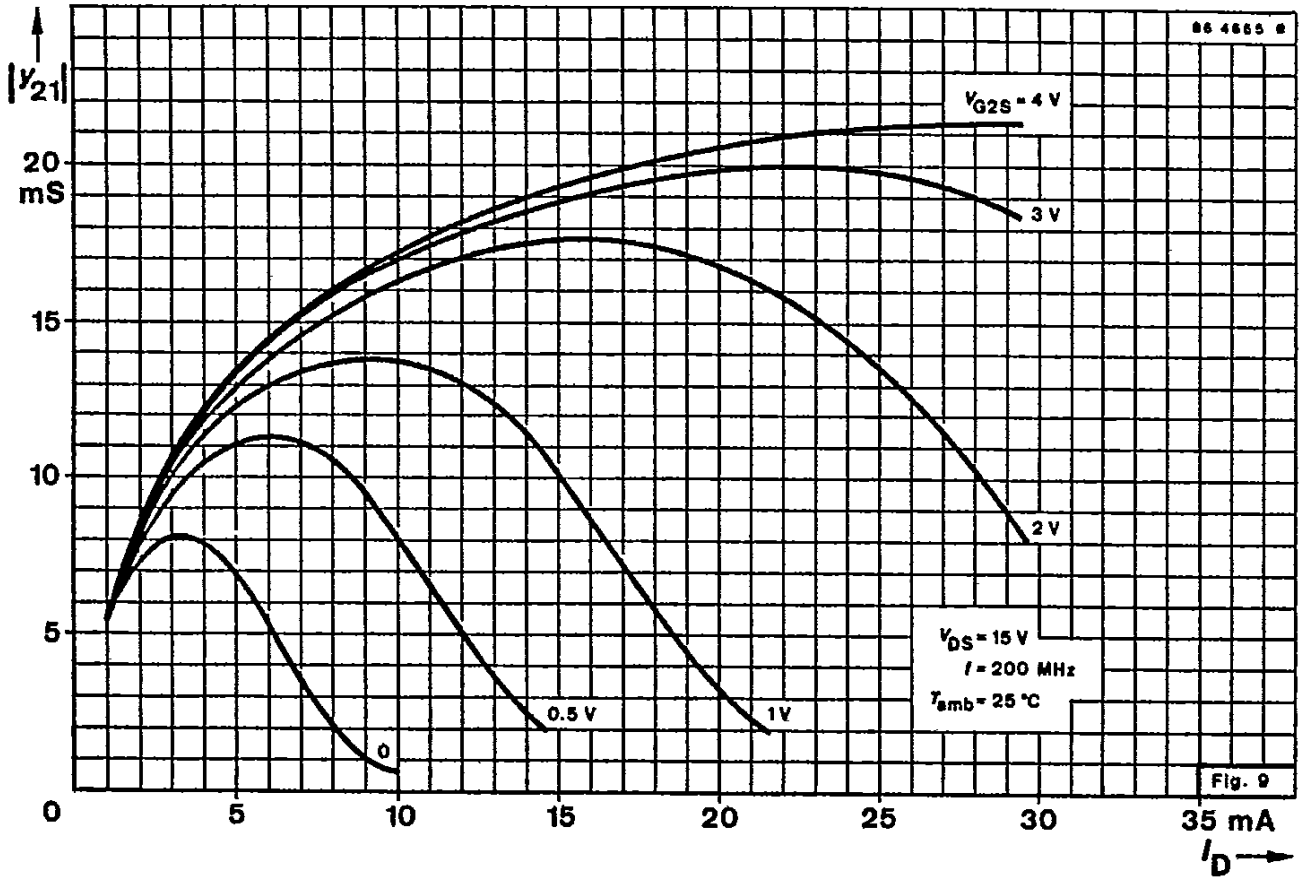

85 4658 e
$I_D$
80 mA
60
40
20
0
−1
0
1
2
3 V
$V_{G2S}$
$V_{DS}$ = 15 V
$T_{amb}$ = 25 °C
$V_{G1S}$ = +4 V
+3 V
+2 V
+1 V
0 V
−1 V
Fig. 4

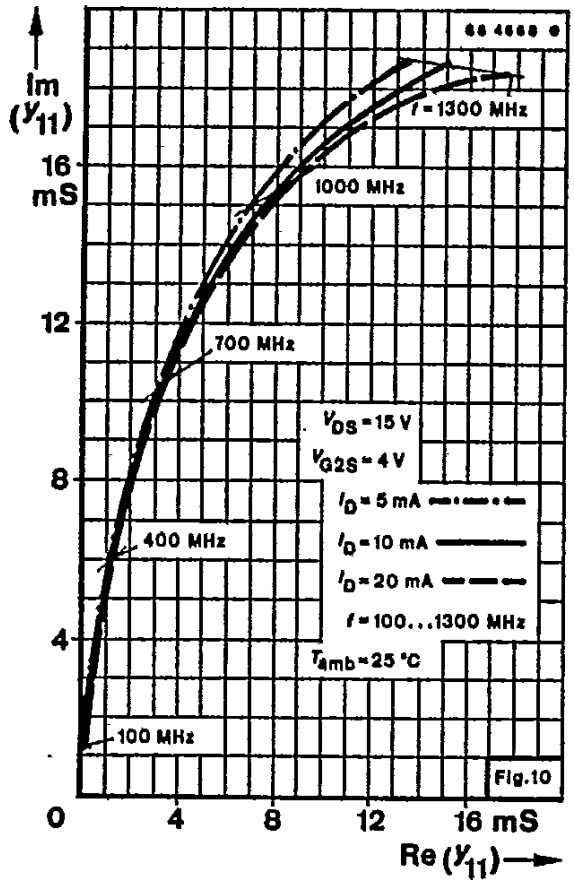

$C_{issg1}$
3.0 pF
2.5
2.0
1.5
1.0
0
8
16
24 mA
$I_D$
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$f$ = 200 MHz
$T_{amb}$ = 25 °C
Fig. 5

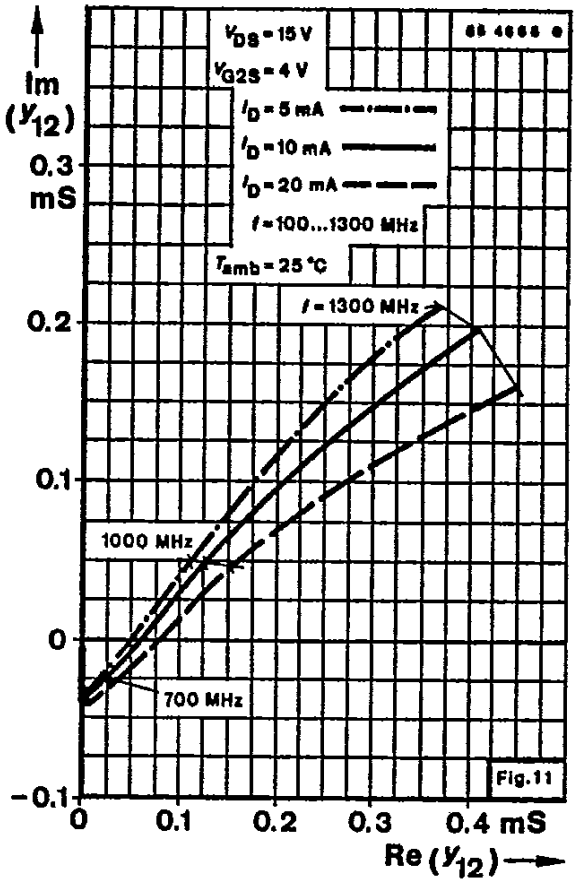

$C_{22}$
2.0 pF
1.5
1.0
0.5
0
5
10
15 V
$V_{DS}$
$V_{G2S}$ = 4 V
$I_D$ = 10 mA
$f$ = 800 MHz
$T_{amb}$ = 25 °C
Fig. 6

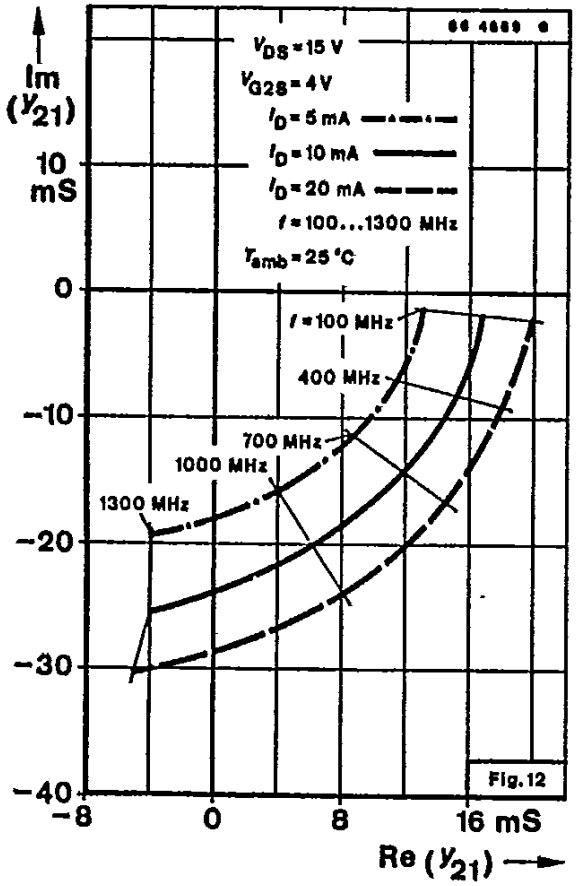

$C_{issg2}$
2.0 pF
1.6
1.2
0.8
0.4
0
−4
−3
−2
−1
0
1
2
3
4
5 V
$V_{G2S}$
$V_{DS}$ = 15 V
$V_{G1S}$ = 0
$f$ = 200 MHz
$T_{amb}$ = 25 °C
Fig. 7

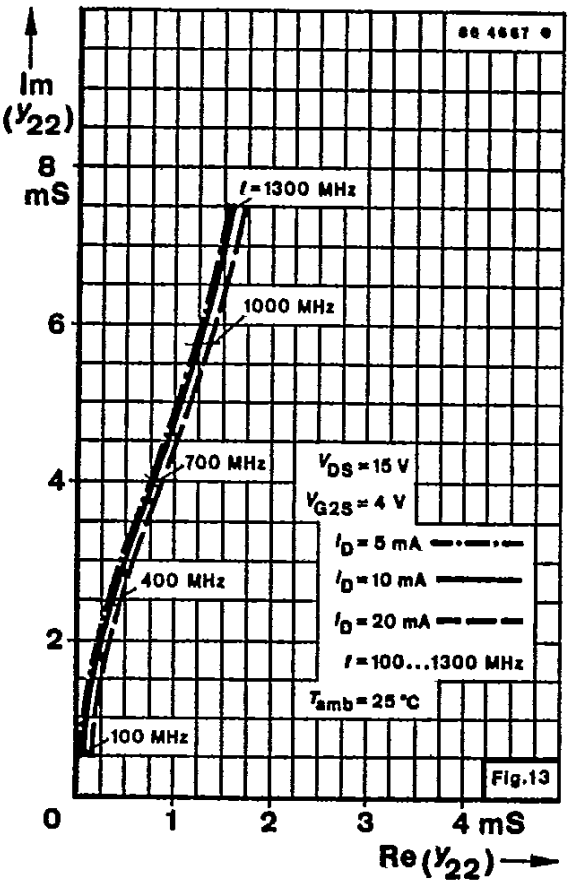

86 4657 e
$|S_{21}|$
$f$ = 200 MHz
$T_{amb}$ = 25 °C
20 dB
0
-20
-40
-60
-80
$V_{G2S}$ = +4.0 V
+3.0 V
+2.0 V
+1.0 V
0 V
- 0.5 V
-1.0 V
- 2.0...-3.0 V
-5
-4
-3
-2
-1
0
1
2 V
$V_{G1S}$
Fig. 8

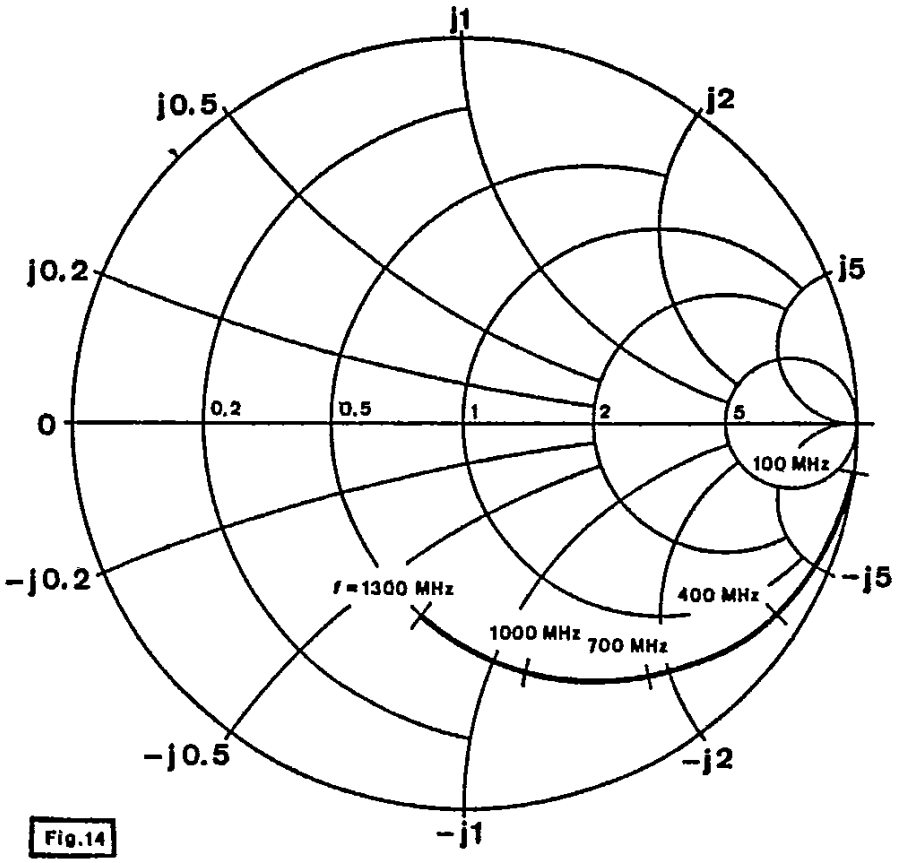

86 4655 e
$|y_{21}|$
20 mS
15
10
5
0
$V_{G2S}$ = 4 V
3 V
2 V
1 V
0.5 V
0
$V_{DS}$ = 15 V
$f$ = 200 MHz
$T_{amb}$ = 25 °C
5
10
15
20
25
30
35 mA
$I_D$
Fig. 9


Im ($y_{11}$)
16 mS
12
8
4
0
4
8
12
16 mS
Re ($y_{11}$)
f = 1300 MHz
1000 MHz
700 MHz
400 MHz
100 MHz
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$I_D$ = 5 mA
$I_D$ = 10 mA
$I_D$ = 20 mA
f = 100...1300 MHz
$T_{amb}$ = 25 °C
Fig.10


Im ($y_{12}$)
0.3 mS
0.2
0.1
0
−0.1
0
0.1
0.2
0.3
0.4 mS
Re ($y_{12}$)
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$I_D$ = 5 mA
$I_D$ = 10 mA
$I_D$ = 20 mA
f = 100...1300 MHz
$T_{amb}$ = 25 °C
f = 1300 MHz
1000 MHz
700 MHz
Fig.11


Im ($y_{21}$)
10 mS
0
−10
−20
−30
−40
−8
0
8
16 mS
Re ($y_{21}$)
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$I_D$ = 5 mA
$I_D$ = 10 mA
$I_D$ = 20 mA
f = 100...1300 MHz
$T_{amb}$ = 25 °C
f = 100 MHz
400 MHz
700 MHz
1000 MHz
1300 MHz
Fig.12

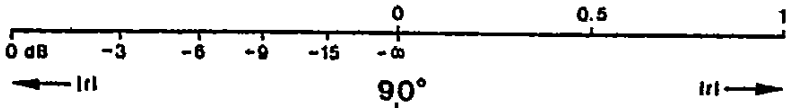

Im ($y_{22}$)
8 mS
6
4
2
0
1
2
3
4 mS
Re ($y_{22}$)
f = 1300 MHz
1000 MHz
700 MHz
400 MHz
100 MHz
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$I_D$ = 5 mA
$I_D$ = 10 mA
$I_D$ = 20 mA
f = 100...1300 MHz
$T_{amb}$ = 25 °C
Fig.13

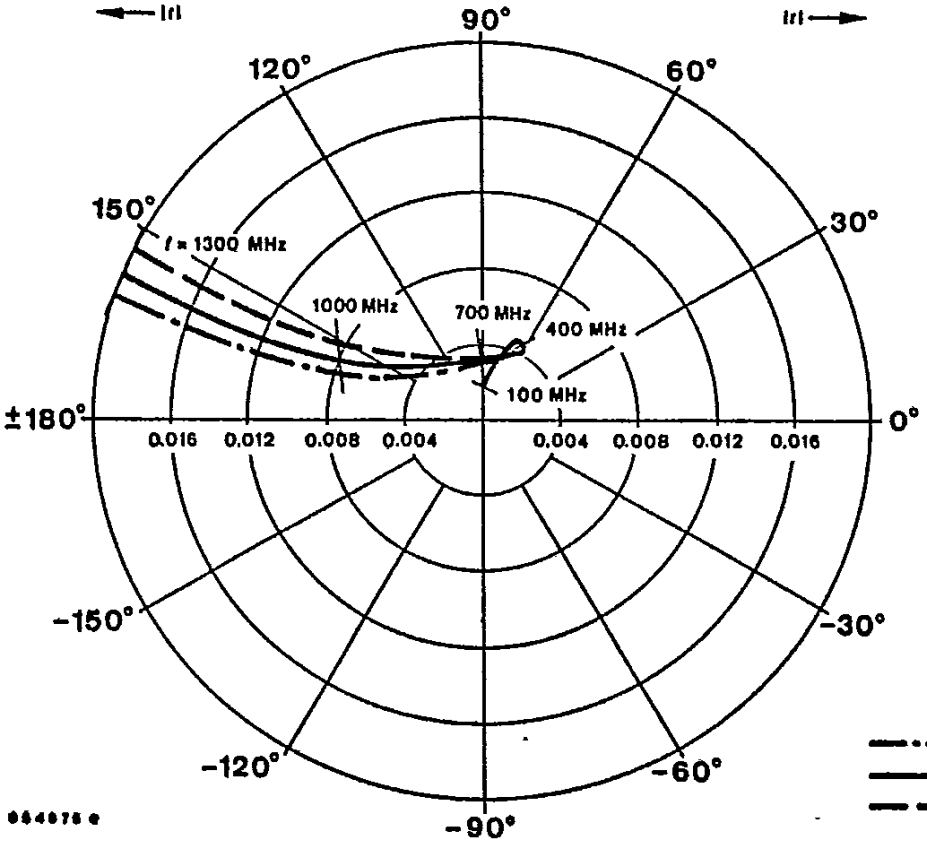



$S_{11}$

$I_D$ = 10 mA
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$z_o$ = 50 Ω
$f$ = 100 ... 1300 MHz
$T_{amb}$ = 25 °C

Fig.14




$S_{12}$

$z_o$ = 50 Ω
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$I_D$ = 5 mA
$I_D$ = 10 mA
$I_D$ = 20 mA
$f$ = 100 ... 1300 MHz
$T_{amb}$ = 25 °C

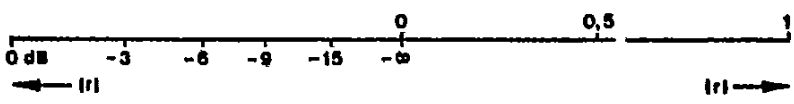
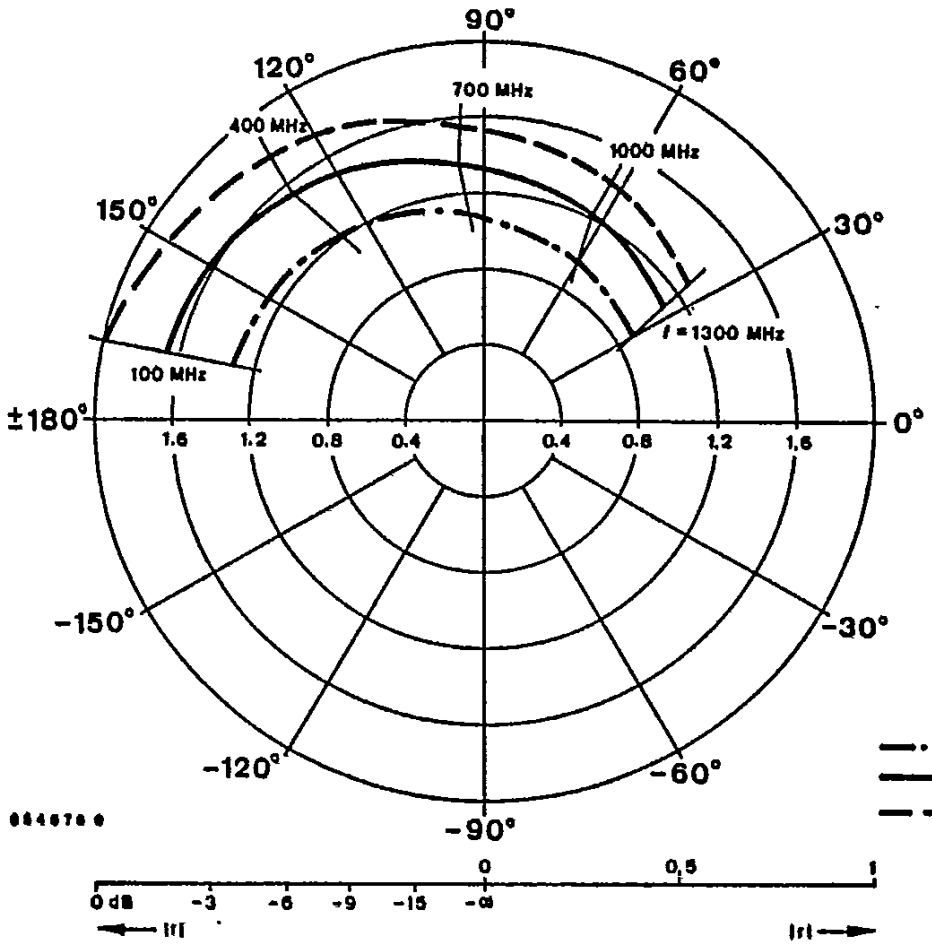


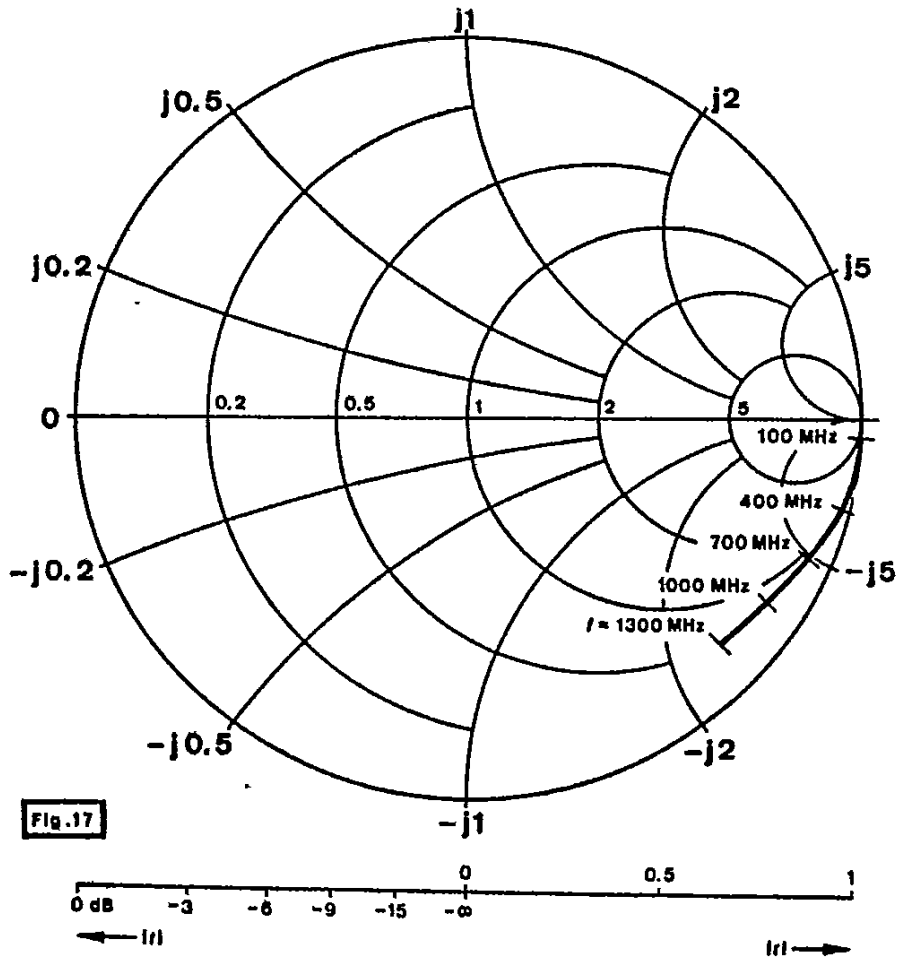

Fig.15




$S_{21}$

$z_o$ = 50 Ω
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$I_D$ = 5 mA
$I_D$ = 10 mA
$I_D$ = 20 mA
$f$ = 100 ... 1300 MHz
$T_{amb}$ = 25 °C

Fig.16




$S_{22}$

$I_D$ = 10 mA
$V_{DS}$ = 15 V
$V_{G2S}$ = 4 V
$z_o$ = 50 Ω
$f$ = 100 ... 1300 MHz
$T_{amb}$ = 25 °C

Fig.17

# 7. Taping and Reeling

## 7.1. Taping of TO-92 Transistors

Standard reeling: Taped on reel, reeled together with a paper film.

7.1.1. Order Numbers
Add the taping-code to the order number.

**Example:**

BC 238 C DU 06 Z

- BC 238 C — Order-No. of Type
- DU — Code for TO-92 Transistors
- 06 — Orientation of transistor on tape [1]
- Z — Additional marking for specials [2]

[1] 06 = View on flat side of transistor, view on gummed tape
05 = View on round side of transistor, view on gummed tape

[2] Additional marking "0": taping without paper film
Additional marking "Z": Zigzag folded tape in special box. Marking for orientation of transistor not necessary, because box can be opened on top or bottom

Example for order No.: BC 237 C DU Z

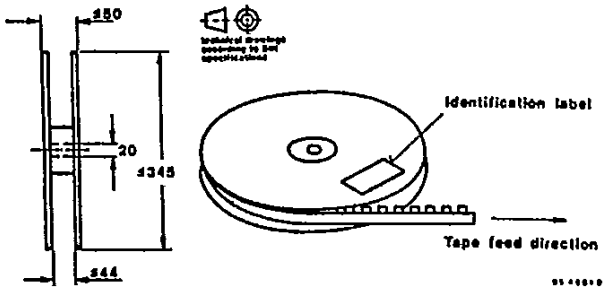



Fig. 7.1. Dimensions of reel in mm

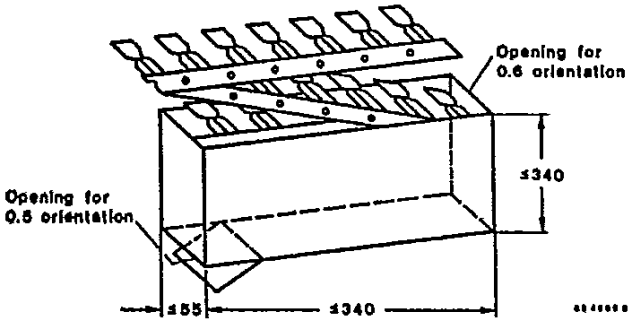



Fig. 7.2. Dimension of box for Zigzag folding in mm

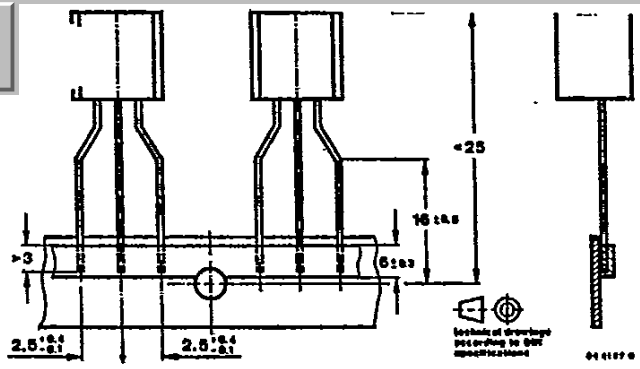



Fig. 7.3 Dimensions of tape in mm

7.1.2 Quantity of devices
1 000 devices per reel
2 000 devices per folded tape in special box.

## 7.2. Taped transistors in SOT 23 and SOT 143 case

7.2.1. Designation

a) Standard taping
Designation is attached with code GS 08 in case of standard taping. Example for normal version transistors as standard taped: BF 569-GS 08.

Example for R-version transistors as standard taped: BF 569 R-GS 08.

In case of standard taping, the transistor orientation on the tape is shown in Fig. 7.4 and Fig. 7.5.

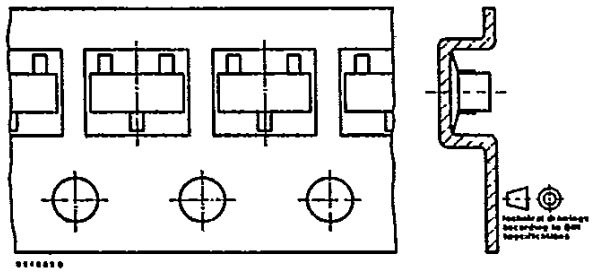


Fig. 7.4 Standard taped SOT 23

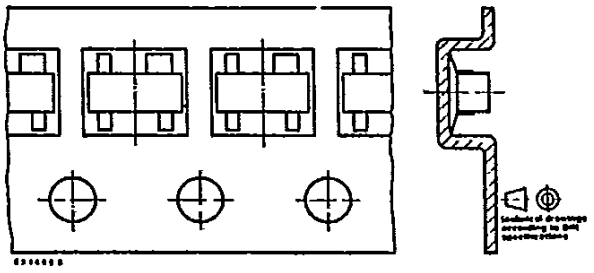


Fig. 7.5. Standard taped SOT 143

b) Reverse taping
Designation is attached with code GS 07 in case of reverse taping. Example for normal version transistors as reverse taped: BF 569-GS 07.

Example for R-version transistors as reverse taping: BF 569 R-GS 07.

In case of reverse taping, the transistor orientation on the tape is shown in Fig. 7.6.

Regarding MOS-FET and MES-FET devices, reverse taping is at present not available.

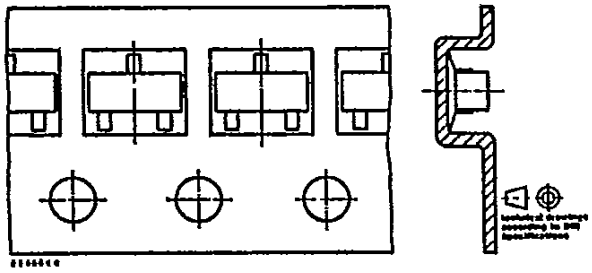


Fig. 7.6 Reverse taped SOT 23

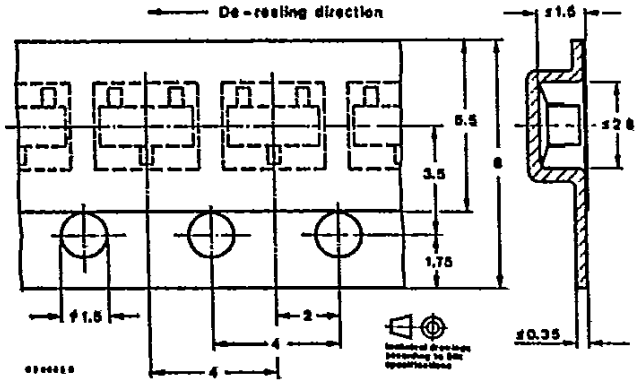



Fig. 7.7 Dimensions of tape in mm

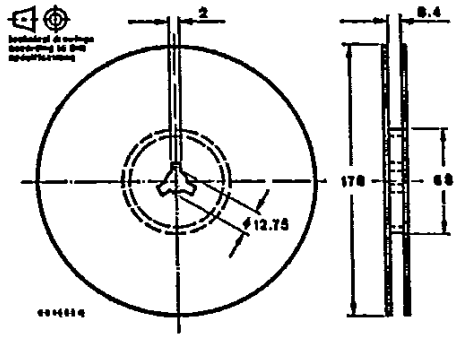



Fig. 7.8 Dimensions of reel in mm

7.2.2 Quantity of devices

3000 devices per reel