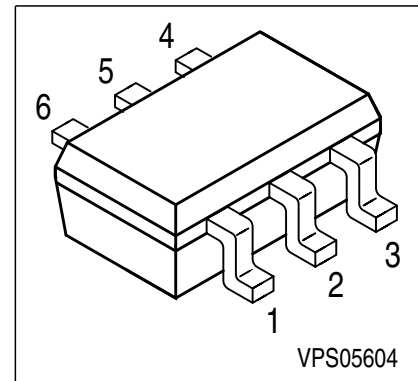
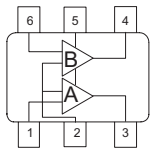


## DUAL N-Channel MOSFET Tetrode

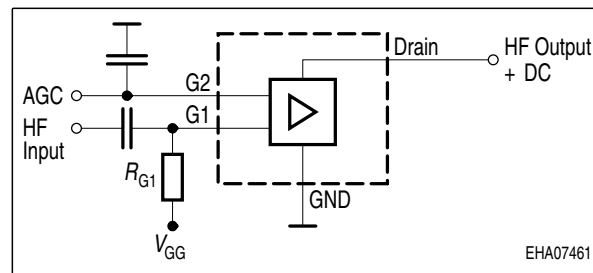
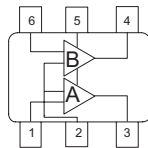
- Two gain controlled input stages for UHF and VHF -tuners e.g. (NTSC, PAL)
- Optimized for UHF (amp. B) and VHF (amp. A)
- Integrated gate protection diodes
- High AGC-range, low noise figure, high gain
- Improved cross modulation at gain reduction



### BG3123



### BG3123R



**ESD:** Electrostatic discharge sensitive device, observe handling precaution!

| Type       | Package | Pin Configuration |      |       |       |      |        | Marking |
|------------|---------|-------------------|------|-------|-------|------|--------|---------|
| BG3123     | SOT363  | 1=G1*             | 2=G2 | 3=D*  | 4=D** | 5=S  | 6=G1** | KOs     |
| BG3123R*** | SOT363  | 1=G1**            | 2=S  | 3=D** | 4=D*  | 5=G2 | 6=G1*  | KRs     |

\* For amp. A; \*\* for amp. B

\*\*\* Target Data

180° rotated tape loading orientation available

## Maximum Ratings

| Parameter                     | Symbol           | Value       | Unit |
|-------------------------------|------------------|-------------|------|
| Drain-source voltage          | $V_{DS}$         | 8           | V    |
| Continuous drain current      | $I_D$            |             | mA   |
| amp. A                        |                  | 25          |      |
| amp. B                        |                  | 20          |      |
| Gate 1/ gate 2-source current | $\pm I_{G1/2SM}$ | 1           |      |
| Gate 1/ gate 2-source voltage | $\pm V_{G1/G2S}$ | 6           | V    |
| Total power dissipation       | $P_{tot}$        | 200         | mW   |
| Storage temperature           | $T_{stg}$        | -55 ... 150 | °C   |
| Channel temperature           | $T_{ch}$         | 150         |      |

**Thermal Resistance**

| Parameter                               | Symbol      | Value      | Unit |
|-----------------------------------------|-------------|------------|------|
| Channel - soldering point <sup>1)</sup> | $R_{thchs}$ | $\leq 150$ | K/W  |

**Electrical Characteristics**

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

**DC Characteristics**

|                                                                                                                                                                      |                 |    |     |    |         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----|-----|----|---------|
| Drain-source breakdown voltage<br>$I_D = 10 \mu A$ , $V_{G1S} = 0 V$ , $V_{G2S} = 0 V$                                                                               | $V_{(BR)DS}$    | 12 | -   | -  | V       |
| Gate1-source breakdown voltage<br>$+I_{G1S} = 10 mA$ , $V_{G2S} = 0 V$ , $V_{DS} = 0 V$                                                                              | $+V_{(BR)G1SS}$ | 6  | -   | 15 |         |
| Gate2-source breakdown voltage<br>$+I_{G2S} = 10 mA$ , $V_{G1S} = 0 V$ , $V_{DS} = 0 V$                                                                              | $+V_{(BR)G2SS}$ | 6  | -   | 15 |         |
| Gate1-source leakage current<br>$V_{G1S} = 6 V$ , $V_{G2S} = 0 V$                                                                                                    | $+I_{G1SS}$     | -  | -   | 50 | $\mu A$ |
| Gate2-source leakage current<br>$V_{G2S} = 8 V$ , $V_{G1S} = 0 V$ , $V_{DS} = 0 V$                                                                                   | $+I_{G2SS}$     | -  | -   | 50 | nA      |
| Drain current<br>$V_{DS} = 5 V$ , $V_{G1S} = 0 V$ , $V_{G2S} = 4.5 V$                                                                                                | $I_{DSS}$       | -  | -   | 10 | $\mu A$ |
| Drain-source current<br>$V_{DS} = 5 V$ , $V_{G2S} = 4 V$ , $R_{G1} = 60 k\Omega$ ,<br>amp. A<br>$V_{DS} = 5 V$ , $V_{G2S} = 4 V$ , $R_{G1} = 50 k\Omega$ ,<br>amp. B | $I_{DSX}$       | -  | 14  | -  | mA      |
|                                                                                                                                                                      |                 | -  | 14  | -  |         |
| Gate1-source pinch-off voltage<br>$V_{DS} = 5 V$ , $V_{G2S} = 4 V$ , $I_D = 20 \mu A$                                                                                | $V_{G1S(p)}$    | -  | 0.7 | -  | V       |
| Gate2-source pinch-off voltage<br>$V_{DS} = 5 V$ , $I_D = 20 \mu A$                                                                                                  | $V_{G2S(p)}$    | -  | 0.6 | -  |         |

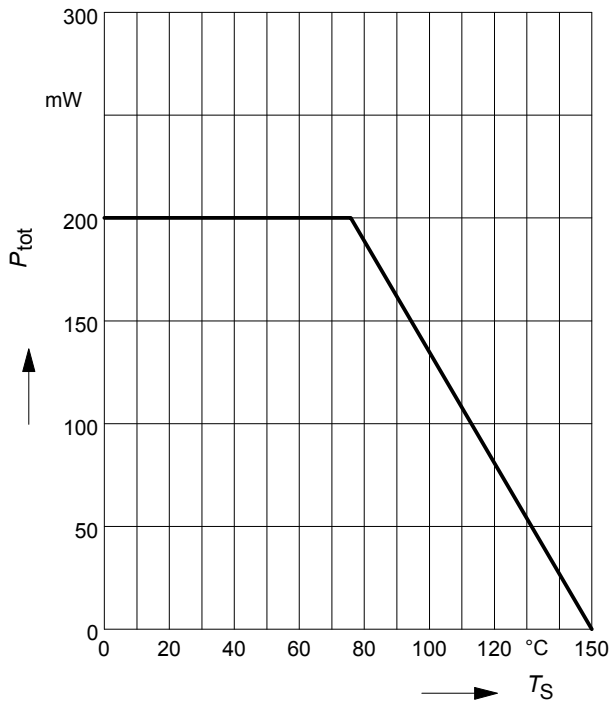
<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

**Electrical Characteristics**

| Parameter                                                                                                                                                                                                        | Symbol       | Values                         |                                    |                            | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------|------------------------------------|----------------------------|------|
|                                                                                                                                                                                                                  |              | min.                           | typ.                               | max.                       |      |
| <b>AC Characteristics</b> $V_{DS} = 5V$ , $V_{G2S} = 4V$ , ( $I_D = 14\text{ mA}$ ) (verified by random sampling)                                                                                                |              |                                |                                    |                            |      |
| Forward transconductance<br>amp. A<br>amp. B                                                                                                                                                                     | $g_{fs}$     | -<br>-                         | 30<br>25                           | -<br>-                     | mS   |
| Gate1 input capacitance<br>$f = 10\text{ MHz}$ , amp. A<br>$f = 10\text{ MHz}$ , amp. B                                                                                                                          | $C_{g1ss}$   | -<br>-                         | 1.9<br>1.5                         | -<br>-                     | pF   |
| Output capacitance<br>$f = 10\text{ MHz}$ , amp. A<br>$f = 10\text{ MHz}$ , amp. B                                                                                                                               | $C_{dss}$    | -<br>-                         | 1.3<br>1.1                         | -<br>-                     |      |
| Power gain<br>$f = 800\text{ MHz}$ , amp. A<br>$f = 800\text{ MHz}$ , amp. B<br>$f = 45\text{ MHz}$ , amp. A<br>$f = 45\text{ MHz}$ , amp. B                                                                     | $G_p$        | -<br>-<br>-<br>-               | 25<br>24<br>32<br>30               | -<br>-<br>-<br>-           |      |
| Noise figure<br>$f = 800\text{ MHz}$ , amp. A<br>$f = 800\text{ MHz}$ , amp. B<br>$f = 45\text{ MHz}$ , amp. A<br>$f = 45\text{ MHz}$ , amp. B                                                                   | $F$          | -<br>-<br>-<br>-               | 1.8<br>1.8<br>1.4<br>1.6           | -<br>-<br>-<br>-           | dB   |
| Gain control range<br>$V_{G2S} = 4 \dots 0\text{ V}$ , $f = 800\text{ MHz}$                                                                                                                                      | $\Delta G_p$ | 45                             | -                                  | -                          |      |
| Cross-modulation $k=1\%$ , $f_w=50\text{MHz}$ , $f_{unw}=60\text{MHz}$<br>amp.A , AGC = 0 dB<br>amp. B, AGC = 0 dB<br>amp. A , AGC = 10 dB<br>amp. B , AGC = 10 dB<br>amp. A, AGC = 40 dB<br>amp. B, AGC = 40 dB | $X_{mod}$    | 90<br>90<br>-<br>-<br>98<br>98 | 96<br>97<br>91<br>94<br>103<br>104 | -<br>-<br>-<br>-<br>-<br>- | -    |

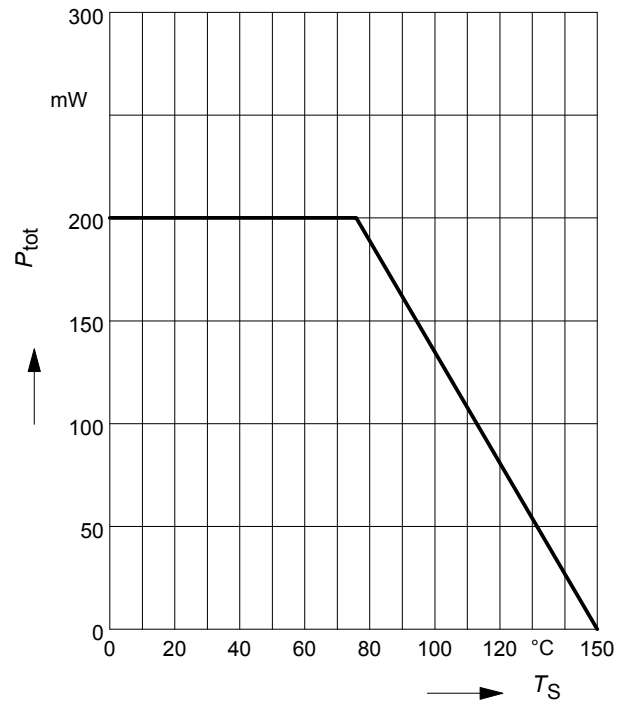
**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

amp. A



**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

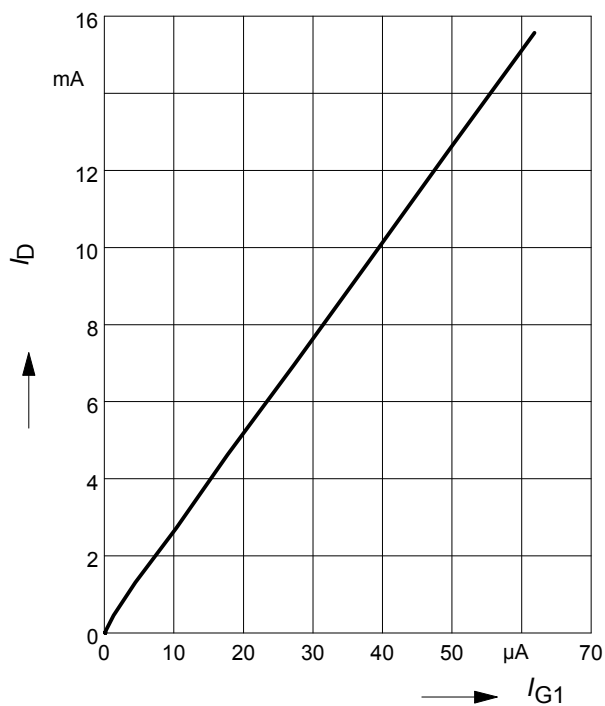
amp. B



**Drain current  $I_D = f(I_{G1})$**

$V_{G2S} = 4V$

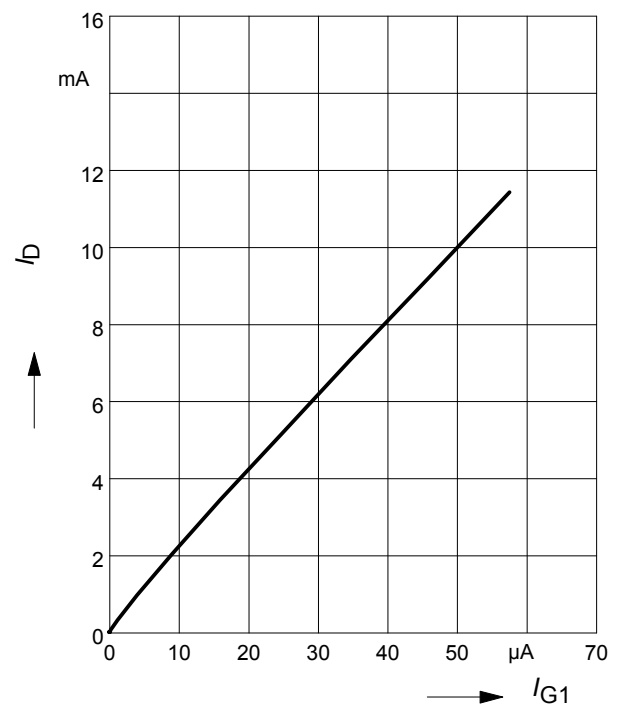
amp. A



**Drain current  $I_D = f(I_{G1})$**

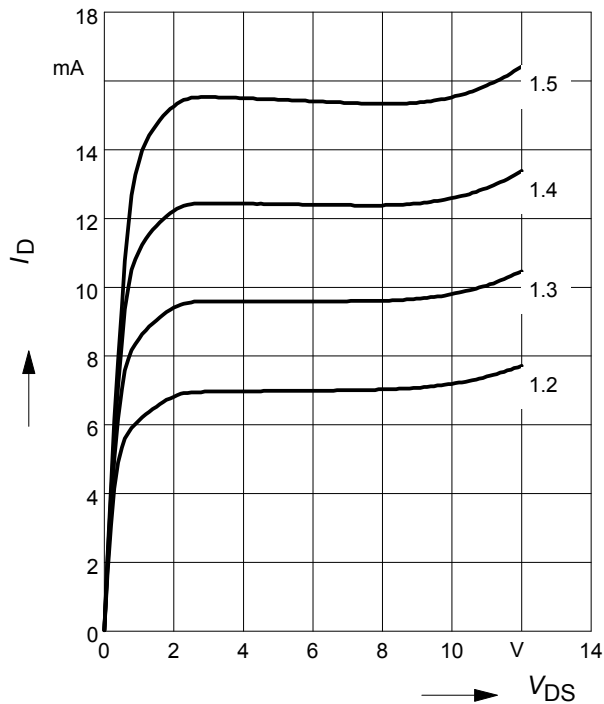
$V_{G2S} = 4V$

amp. B

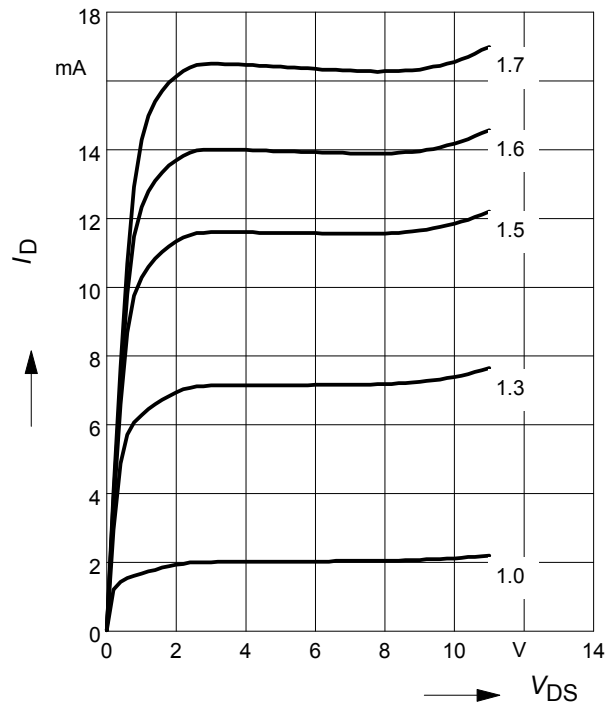


**Output characteristics  $I_D = f(V_{DS})$** 

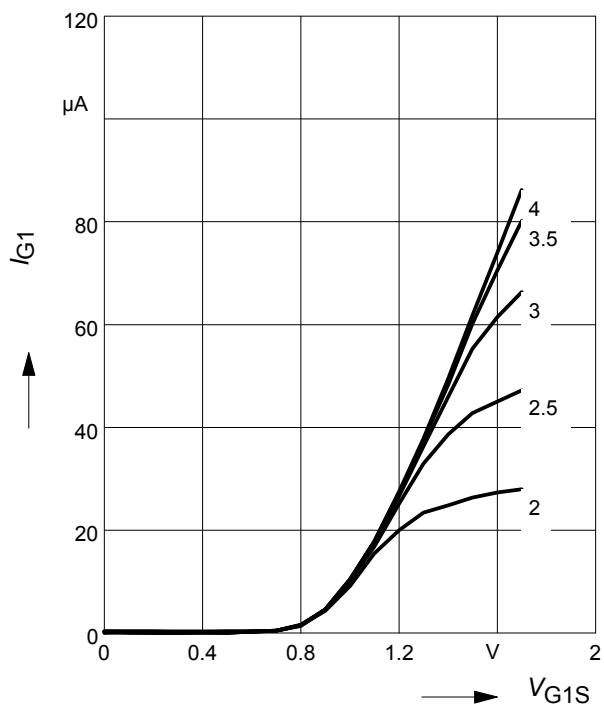
$V_{G2S} = 4V$ ,  $V_{G1S} = \text{Parameter in V}$   
amp. A


**Output characteristics  $I_D = f(V_{DS})$** 

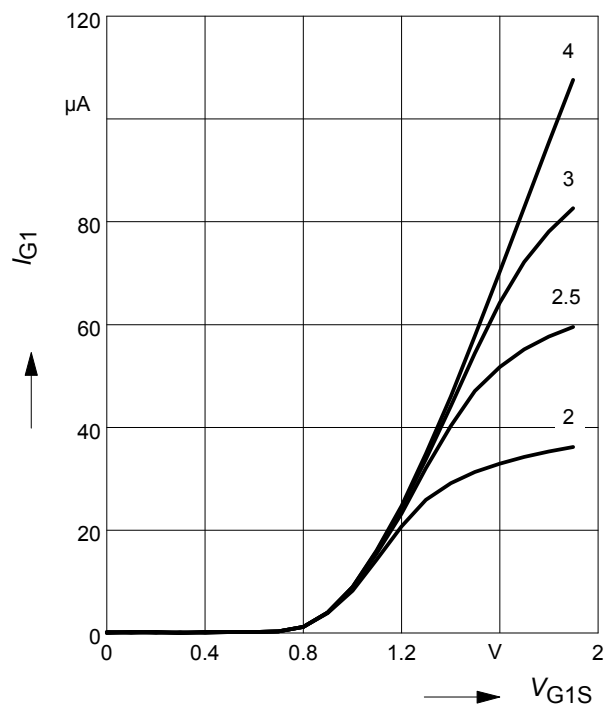
$V_{G2S} = 4V$ ,  $V_{G1S} = \text{Parameter in V}$   
amp. B


**Gate 1 current  $I_{G1} = f(V_{G1S})$** 

$V_{DS} = 5V$ ,  $V_{G2S} = \text{Parameter in V}$   
amp. A

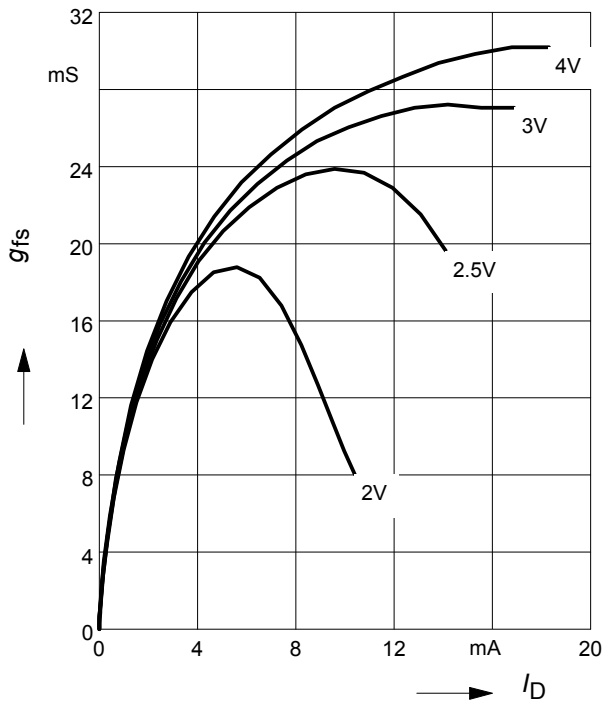

**Gate 1 current  $I_{G1} = f(V_{G1S})$** 

$V_{DS} = 5V$ ,  $V_{G2S} = \text{Parameter in V}$   
amp. B

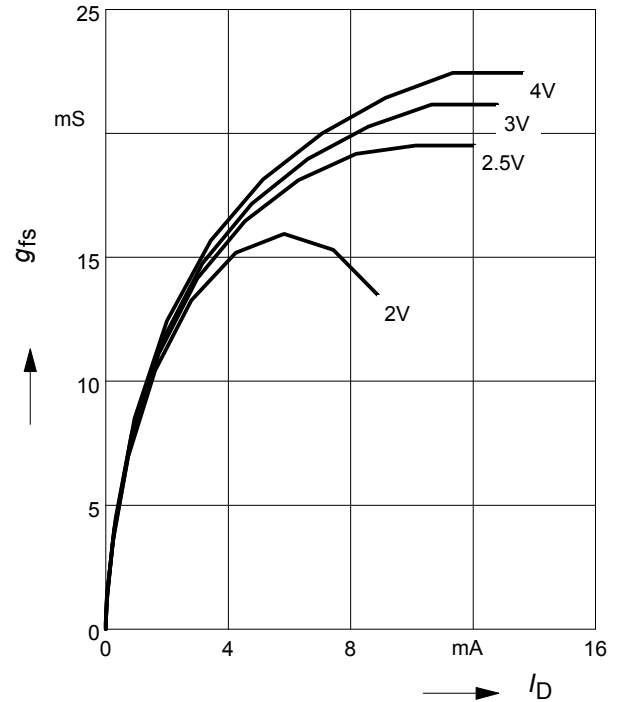


**Gate 1 forward transconductance**

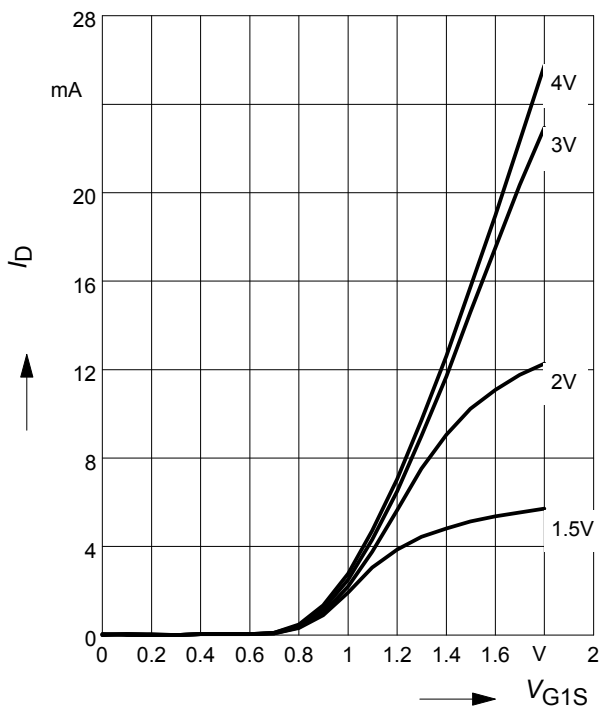
$g_{fs} = f(I_D)$ ,  $V_{DS} = 5V$ ,  $V_{G2S} = \text{Parameter}$   
amp. A


**Gate 1 forward transconductance**

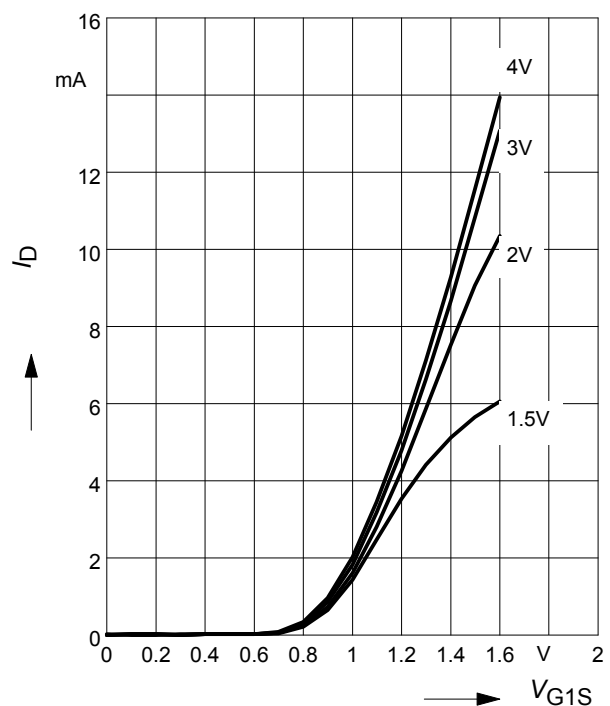
$g_{fs} = f(I_D)$ ,  $V_{DS} = 5V$ ,  $V_{G2S} = \text{Parameter}$   
amp. B


**Drain current  $I_D = f(V_{G1S})$** 

$V_{DS} = 5V$ ,  $V_{G2S} = \text{Parameter}$   
amp. A


**Drain current  $I_D = f(V_{G1S})$** 

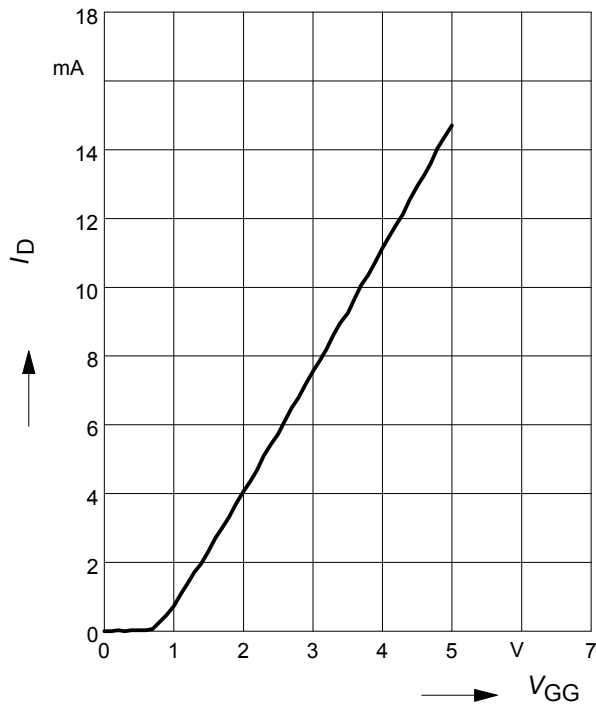
$V_{DS} = 5V$ ,  $V_{G2S} = \text{Parameter}$   
amp. B



**Drain current  $I_D = f(V_{GG})$  amp. A**

$V_{DS} = 5V$ ,  $V_{G2S} = 4V$ ,  $R_{G1} = 60k\Omega$

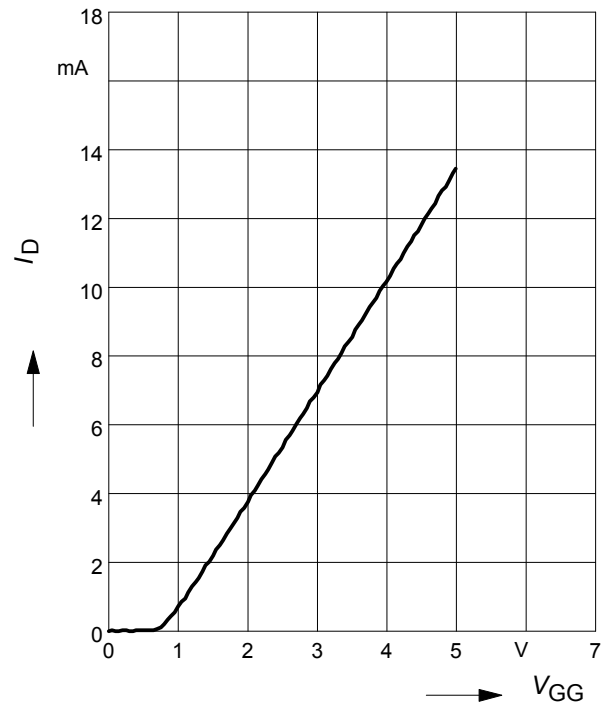
(connected to  $V_{GG}$ ,  $V_{GG}$ =gate1 supply voltage)



**Drain current  $I_D = f(V_{GG})$  amp. B**

$V_{DS} = 5V$ ,  $V_{G2S} = 4V$ ,  $R_{G1} = 50k\Omega$

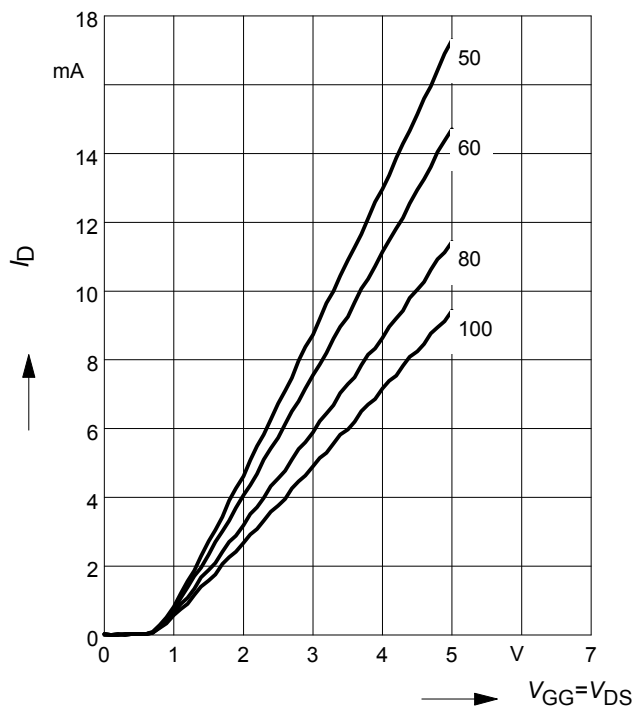
(connected to  $V_{GG}$ ,  $V_{GG}$ =gate1 supply voltage)



**Drain current  $I_D = f(V_{GG})$**

$V_{G2S} = 4V$ ,  $R_{G1} = \text{Parameter in } k\Omega$

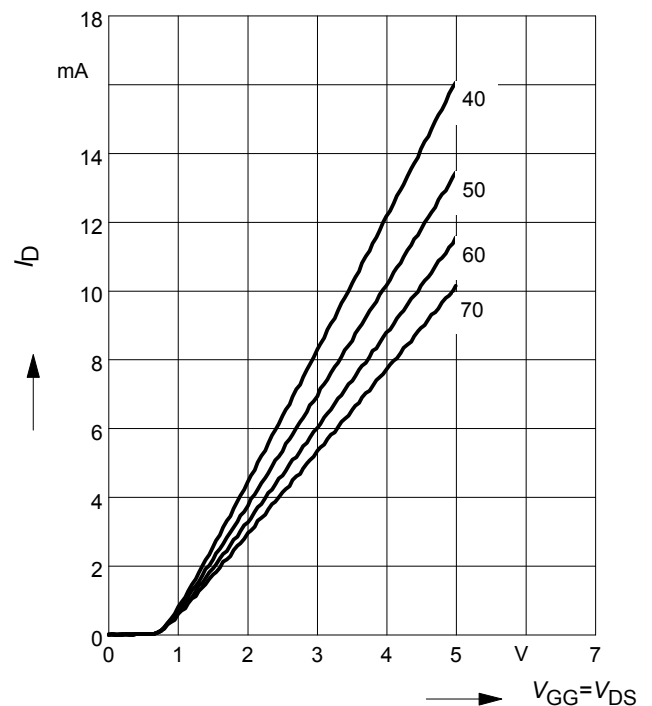
amp. A



**Drain current  $I_D = f(V_{GG})$**

$V_{G2S} = 4V$ ,  $R_{G1} = \text{Parameter in } k\Omega$

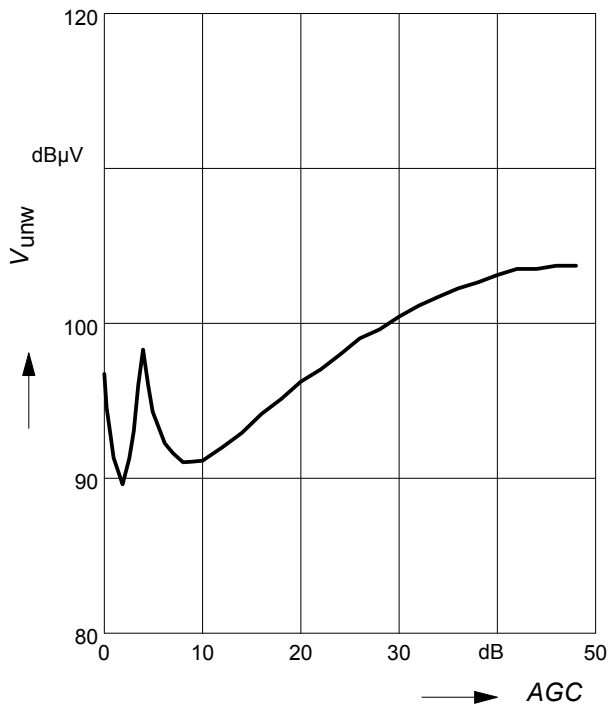
amp. B



**Crossmodulation**  $V_{unw} = (AGC)$

$$V_{DS} = 5 \text{ V}, R_{g1} = 68 \text{ k}\Omega$$

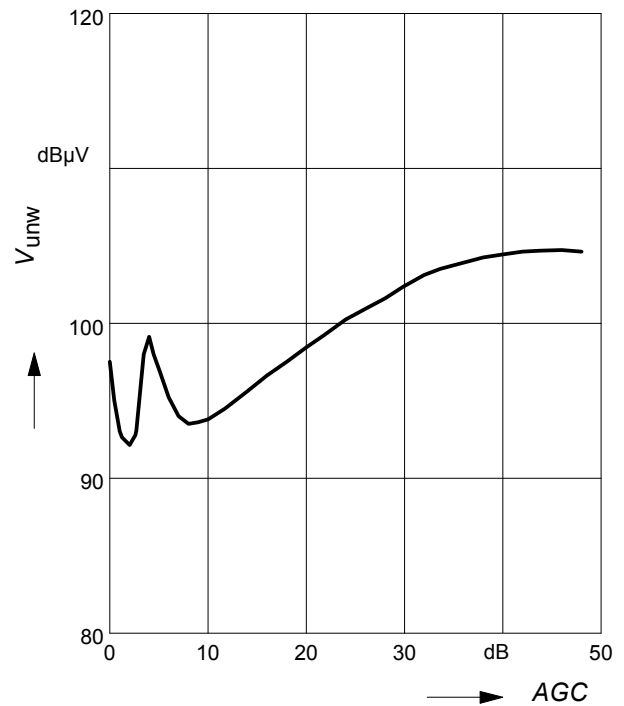
amp.A



**Crossmodulation**  $V_{unw} = (AGC)$

$$V_{DS} = 5 \text{ V}, R_{g1} = 56 \text{ k}\Omega$$

amp.B



### Cosmodulation test circuit

