

## FRONTEND 4049 FM5

## 3x8168; 3x8292

### TARGET SPECIFICATION ELECTRICAL DATA

#### 1. Description:

The frontend 4049 FM5 is specially designed for multimedia applications. It includes TV as well as FM reception possibility. TV reception standard are B/G; I, D/K, L, L'. The frontend includes a hyperband tuner which covers the frequency range from 45 to 865 MHz and an IF-part with SAW-filter, IF-amplifier, video- and sound demodulator. So the AF signal is available at the audio output terminal, the CVBS signal is available at the video output terminal. Also a 2<sup>nd</sup> IF output is provided, which allows external sound demodulation for stereo and NICAM reception. A video buffer is built in which makes a direct connection to 75  $\Omega$  inputs possible. The reception frequency range is divided in VHF low, VHF high and UHF.

VHF low part of the tuner is used for FM reception also. Complete FM signal processing including demodulation and stereo decoding is built in. Baseband signals L (left) and R (right) as well as MPX (Baseband Multiplex signal) are on pins available.

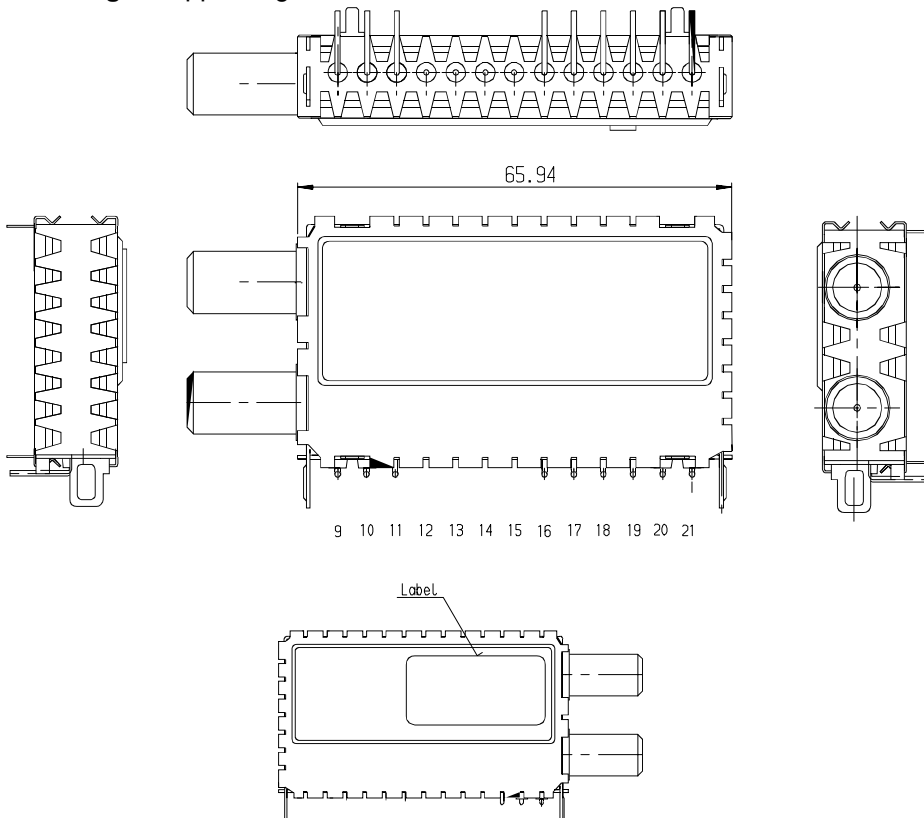
Band, standard selection and tuning are done via I<sup>2</sup>C-bus, completely. Also a digital AFC-function can be realized, because the AFC-voltage generated by the IF-demodulator is fed to an analogue/digital converter which is integrated in the IF demodulator-IC and readable via I<sup>2</sup>C-bus.

A DC/DC converter is built in. Therefore supply voltage is 5V only.

#### 2. Mechanical Characteristics:

2.1. Dimensions: according drawing 3x8168GZ

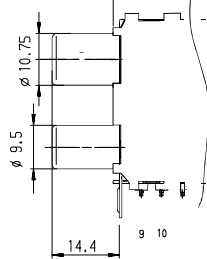
2.2. Weight: appr. 52 g



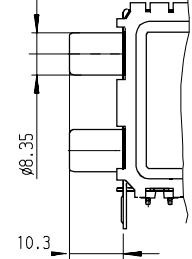
| PIN |  |
|-----|--|
| 9   | I <sup>2</sup> C bus signal SCL            |
| 10  | I <sup>2</sup> C bus signal SDA            |
| 11  | Address selection for I <sup>2</sup> C bus |
| 12  |  |
| 13  |  |
| 14  |  |
| 15  |  |
| 16  | FM sound output R                          |
| 17  | FM sound output L                          |
| 18  | 2nd IF                                     |
| 19  | Video output CVBS                          |
| 20  | Supply voltage V <sub>ST</sub>             |
| 21  | AF sound output / FM MPX                   |

### 2.3. Types

|            |                |               |
|------------|----------------|---------------|
| Tunertype  | 3x8168         | 3x8292        |
| Sockettype | IEC connectors | Phono sockets |



Socketlength 14.4 mm  
Height 28.55/10.25 mm



Socketlength 10.3 mm  
Height 28.55/10.25 mm

### 3. Working Data:

#### 3.1. Reception Standard:

B/G, I, D/K, L, L`

#### 3.2. Frequency Range:

|          |              |                           |
|----------|--------------|---------------------------|
| VHF low  | ch IA ...S6  | 45.75 MHz ... 140.25 MHz  |
| VHF high | ch S7 ...S41 | 147.25 MHz ... 463.25 MHz |
| UHF      | ch 21 ...69  | 471.25 MHz ... 855.25 MHz |
| FM       |              | 87.50 MHz ... 108.10 MHz  |

#### Margin:

|          |           |     |                    |
|----------|-----------|-----|--------------------|
| VHF low  | ch IA ... | S6  | +0.5 MHz/-0.25 MHz |
| VHF high | ch S7...  | S41 | +1 MHz/-6 MHz      |
| UHF      | ch 21 ... | 69  | +3 MHz/-6 MHz      |
| FM       |           |     | +/- 0.5 MHz        |

#### Recommended take over frequencies:

|                    |         |
|--------------------|---------|
| VHF low / VHF high | 141 MHz |
| VHF high/ UHF      | 464 MHz |

Frequency referred to picture carrier.

#### IF:

|                     | B, G  | I      | L     | L`    | D/K   |
|---------------------|-------|--------|-------|-------|-------|
| picture carrier     | 38.9  | 38.9   | 38.9  | 33.90 | 38.9  |
| sound carrier 1     | 33.4  | 32.9   | 32.4  | 40.40 | 32.4  |
| sound carrier 2     | 33.16 |        |       |       |       |
| NICAM sound carrier | 33.05 | 32.348 | 33.05 |       | 33.05 |

all frequencies in MHz

Oscillator operates above received frequency.

### 3.3. Supply voltage:

Supply voltage  $V_{S1}$  5 V +/- 5% max. 230 mA

### 3.4. Input impedance:

VHF/UHF and FM 75  $\Omega$ , unbalanced

### 3.5. Temperature:

Operating temperature: 0 ... 60 °C

Storage temperature: -25 ... 60 °C

( measured in slowly moved air )

## 4. Test conditions:

If not otherwise noticed all data are hold under following conditions:

Measurement tolerance: 10 % or 1 dB

Ambient temperature: 25 °C +/- 3°

Supply voltage:  $V_{S1}$  +/- 5%

## 5. TV Tuner Data:

### 5.1. VSWR:

|          | min. | typ. | max. | unit |
|----------|------|------|------|------|
| VHF low  |      |      | 5.0  |      |
| VHF high |      |      | 5.0  |      |
| UHF      |      |      | 5.0  |      |

Referred to channel center frequency.

### 5.2. AGC-Range:

|          |    |  |  |    |
|----------|----|--|--|----|
| VHF low  | 40 |  |  | dB |
| VHF high | 40 |  |  | dB |
| UHF      | 35 |  |  | dB |
| FM       | 40 |  |  | dB |

### 5.3. IF-Rejection:

|          |    |  |  |    |
|----------|----|--|--|----|
| VHF low  | 50 |  |  | dB |
| VHF high | 60 |  |  | dB |
| UHF      | 60 |  |  | dB |
| FM       | 50 |  |  | dB |

### 5.4. Image-Rejection:

|          |                    |    |  |    |
|----------|--------------------|----|--|----|
| VHF low  |                    | 60 |  | dB |
| VHF high | ch S7 .... ch S20  | 60 |  | dB |
| VHF high | ch S21 .... ch S41 | 55 |  | dB |
| UHF      |                    | 50 |  | dB |
| FM       |                    | 50 |  | dB |

## 6. TV Output parameter:

### 6.1. Video output:

|   | min.   | typ. | max. | unit            |
|---|--|------|------|-----------------|
| Conditions:                                   | Standard B/G; Ant. input level 66 dB $\mu$ V |      |      |                 |
| CVBS - Output level (B/G, D/K, L/L`):         |  | 1    |      | V <sub>pp</sub> |
| (Standard I):                                 |  | 0.9  |      | V <sub>pp</sub> |
| Load impedance                                |  | 75   |      | $\Omega$        |
| Video S/N (unweighted):                       |  |      |      |                 |
| Flat Field                                    |  |      |      |                 |
| VHF   |  | 46   |      | dB              |
| UHF   |  | 47   |      | dB              |
| Video sensitivity (Off Air Channels)          |  | 45   |      | dB $\mu$ V      |
| Video S/N = 30 dB                             |  |      |      |                 |
| Frequency response:                           |  |      |      |                 |
| (sin x)/x Ref.: 0.2 MHz                       |  |      |      |                 |
| 1 MHz   | -1.5   |      | 2    | dB              |
| 2 MHz   | -2   |      | 3    | dB              |
| 3 MHz   | -4   |      | 3    | dB              |
| 4 MHz   | -4   |      | 4    | dB              |
| 4.43 MHz                                      | -5   |      | 3    | dB              |
| 5 MHz   |  | -12  |      | dB              |
| sound carrier rejection                       |  |      |      |                 |
| B/G   | 30   |      |      | dB              |
| I, D/K, L/L`                                  | 26   |      |      | dB              |
| Differential gain modulated 5 step staircase  |  | 3    |      | %pp             |
| Differential phase modulated 5 step staircase |  | 5    |      | $^{\circ}$ pp   |

## 6.2 TV Sound output:

| Pin 21        |    | min. | typ. | max. | unit |
|---------------|----|------|------|------|------|
| Load          | DC | 100  |      |      | kΩ   |
|               | AC | 10   |      |      | kΩ   |
| Output level: | DC |      | 2.3  |      | V    |

### 6.2.1 TV FM sound

Conditions:

Ant.input level 66 dBμV; Video signal: color bar

Audio signal 1kHz, 27 kHz deviation; 50 μs preemphasis

Measurements with 50 μs deemphasis:

|   |  |     |     |     |                   |
|---|--|-----|-----|-----|-------------------|
| AF - level:   |  | 400 | 540 | 680 | mV <sub>rms</sub> |
| THD:  |  |     |     | 0.5 | %                 |
| S/N:  |  |     | 50  |     | dB                |
| Frequency response: 40 Hz ... 15 kHz<br>(6 kHz deviation) |  | -1  |     | 1   | dB                |

### 6.2.2 TV AM sound

input level 66 dBμV, video signal: color bar

audio signal 1kHz AM 54% modulation

|             |  |     |     |     |                   |
|-------------|--|-----|-----|-----|-------------------|
| AF - level: |  | 400 | 500 | 600 | mV <sub>rms</sub> |
| THD:        |  |     |     | 1.0 | %                 |
| S/N:        |  |     | 45  |     | dB                |

## 6.3. 2nd IF output

|  |  |     |     |  |                  |
|--|--|-----|-----|--|------------------|
| AC level of SC <sub>1</sub> 5.5, 6.0, 6.5 MHz:<br>(PC/ sound carrier SC <sub>1</sub> : 7, 10, 13 dB)<br>(sound carrier SC <sub>2</sub> off ) |  |     | 400 |  | mV <sub>pp</sub> |
| AC level of SC <sub>1</sub> 6.5 MHz:<br>(PC/ sound carrier: 10 dB)<br>(L standard, without modulation)                                       |  |     | 400 |  | mV <sub>pp</sub> |
| AC level of SC <sub>2</sub> 5.74, 6.55 MHz:<br>(PC/ sound carrier SC <sub>1</sub> : 10 dB)<br>(PC/ sound carrier SC <sub>2</sub> : 20dB)     |  |     | 125 |  | mV <sub>pp</sub> |
| Load impedance   |  | 0.5 |     |  | kΩ               |

## 7. FM part

### 7.1 FM output

|  | min. | typ. | max.  | unit  |
|--|------|------|-------|-------|
| <b>7.1.1 Frequency range</b>   | 87.5 |      | 108.1 | MHz   |
| <b>7.1.2 Output levels</b>   |      |      |       |       |
| AF = 1 kHz, 75 kHz deviation   |      |      |       |       |
| MPX  |      | 810  |       | mVrms |
|  |      | 2.3  |       | V     |
| Load impedance   |      | 100  |       | kΩ    |
|  |      |      |       |       |
| L, R resp.   |      | 255  |       | mVrms |
|  |      | 1.0  |       | V     |
| Load impedance   |      | 100  |       | kΩ    |
|  |      |      |       |       |
| <b>7.1.3 Frequency response</b>  |      |      |       |       |
| 40 Hz to 15 kHz  | -2   |      | 2     | dB    |
| <b>7.1.4 Usable sensivity</b>  |      |      |       |       |
| 30 dB S/N  |      | 5    |       | dBμV  |
| 50 dB S/N  |      | 15   |       | dBμV  |
| 1 kHz 75 kHz deviation   |      |      |       |       |
| <b>7.1.5 S/N at high input level</b>   |      | 65   |       | dB    |
| Vin = 60 dBμV, Mod. = 1kHz<br>75 kHz deviation<br>measured at MPX output with 50 μs deemphasis |      |      |       |       |
| <b>7.1.6 Distortion at high input level</b>  |      | 0.2  |       | %     |
| 22.5 kHz deviation   |      |      |       |       |
| <b>7.1.7 Stereo channel separation</b>   |      | 30   |       | dB    |
| <b>7.1.8 AM suppression</b>  |      | 60   |       | dB    |
| Vin 60 dBμV 75 kHz dev. AM 30%   |      |      |       |       |
| <b>7.1.9 Image rejection</b>   | 53   | 80   |       | dB    |
| unwanted signal 66.6 MHz above wanted signal   |      |      |       |       |
| <b>7.1.10 IF rejection</b>   | 50   |      |       | dB    |
| referred to 33.3 MHz unwanted signal   |      |      |       |       |

## 8. I<sup>2</sup>C bus

There are two different I<sup>2</sup>C bus used one **I<sup>2</sup>C Tuner** to control tuning and one **I<sup>2</sup>C IF** to control IF demodulation and baseband processing. With port P0 of control byte 2 the slave address of **I<sup>2</sup>C IF** can be controlled.

### 8.1 I<sup>2</sup>C Tuner

#### 8.1.1 Write data format

|                |     |     |     |     |     |     |     |     |   |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|---|
|                | MSB |     |     |     |     |     |     | LSB |   |
| Address byte   | 1   | 1   | 0   | 0   | 0   | MA1 | MA0 | R/W | A |
| Divider byte 1 | 0   | n14 | n13 | n12 | n11 | n10 | n9  | n8  | A |
| Divider byte 2 | n7  | n6  | n5  | n4  | n3  | n2  | n1  | n0  | A |
| Control byte 1 | 1   | CP  | T2  | T1  | T0  | RSA | RSB | OS  | A |
| Control byte 2 | P7  | P6  | P5  | P4  | P3  | P2  | P1  | P0  | A |

A = Acknowledge

R/W = 0 : Write mode

CP = 1 : charge pump current high

T2, T1, T0 = test bits, normal operation: T2 = 0, T1 = 0, T0 = 1

RSA, RSB bits for minimum step size, see 8.1.2

OS = tuning voltage switch, normal operation: OS = 0

#### 8.1.2 Address selection

| MA1 | MA0 | Address | Voltage at Pin 11                      |
|-----|-----|---------|--|
| 0   | 0   | C0      | ( 0 to 0.1 ) * V <sub>S1</sub>         |
| 0   | 1   | C2      | (0.2 to 0.3) * V <sub>S1</sub> or open |
| 1   | 0   | C4      | ( 0.4 to 0.6 ) * V <sub>S1</sub>       |
| 1   | 1   | C6      | ( 0.9 to 1 ) * V <sub>S1</sub>         |

#### 8.1.3 Oscillator frequency and divider byte calculation:

| RSA | RSB | Reference divider | Min. tuning step [kHz] | f <sub>ref</sub> [kHz] |
|-----|-----|-------------------|------------------------|------------------------|
| 1   | 1   | 512               | 62.5                   | 7.8125                 |
| X   | 0   | 640               | 50.0                   | 6.25                   |
| 0   | 1   | 1024              | 31.25                  | 3.90625                |

for FM reception we recommend 50 kHz minimum step size

$$f_{OSC} = f_D + f_{IF}$$

$$f_{IF} = 38.9 \text{ MHz at B/G, D/K, I, L}$$

$$f_{IF} = 33.9 \text{ MHz at L'}$$

$$f_{IF} = 33.3 \text{ MHz at FM}$$

f<sub>OSC</sub> : Local oscillator frequency

f<sub>D</sub> : Desired frequency

$$f_{OSC} = f_{REF} * 8 * SF$$

f<sub>REF</sub> : Crystal reference frequency / 640 = 4 MHz / 640 = 6.25 kHz, ( RSA = X, RSB = 0 )

SF : Programmable scaling factor

#### Scaling factor

$$SF = 16384 * n_{14} + 8192 * n_{13} + 4096 * n_{12} + 2048 * n_{11} + 1024 * n_{10} + 512 * n_9 + 256 * n_8 + 128 * n_7 + 64 * n_6 + 32 * n_5 + 16 * n_4 + 8 * n_3 + 4 * n_2 + 2 * n_1 + n_0$$

### 8.1.4 Control byte 1 settings (default)

|                |     |   |   |   |   |   |   |     |   |
|----------------|-----|---|---|---|---|---|---|-----|---|
|                | MSB |   |   |   |   |   |   | LSB |   |
| Control byte 1 | 1   | 0 | 0 | 0 | 1 | X | 0 | 0   | A |

### 8.1.5 Control byte 2 (Bandselection)

| Band     | Active port | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0  |
|----------|-------------|----|----|----|----|----|----|----|-----|
| VHF low  | P7, P5      | 1  | 0  | 1  | 0  | 0  | 0  | 0  | MAD |
| VHF high | P7,P4       | 1  | 0  | 0  | 1  | 0  | 0  | 0  | MAD |
| UHF      | P5,P4       | 0  | 0  | 1  | 1  | 0  | 0  | 0  | MAD |
| FM       | P7, P5, P2  | 1  | 0  | 1  | 0  | 0  | 1  | MS | MAD |

MAD: Programmable module address **I<sup>2</sup>C IF**

0 = Slave address **I<sup>2</sup>C IF** = 43[hex]

1 = Slave address **I<sup>2</sup>C IF** = 42[hex]

MS: Forced Mono at FM mode:

0 = Stereo Mode with capability of stereo indication

1 = Forced Mono Mode

### 8.1.6 Read data format

|              |     |    |    |    |    |     |     |     |   |
|--------------|-----|----|----|----|----|-----|-----|-----|---|
|              | MSB |    |    |    |    |     |     | LSB |   |
| Address byte | 1   | 1  | 0  | 0  | 0  | MA1 | MA0 | R/W | A |
| Status byte  | POR | FL | I2 | I1 | I0 | A2  | A1  | A0  | A |

R/W : 1 = Read mode

POR: Power on reset flag ( POR =1 at power on)

FL : In lock flag (FL= 1 when PLL is locked)

I2, I1, I0: Digital levels for I/O ports P2, P1 and P0 respect.

In case of FM I1 = 1: Stereo indication

I2, I0 not defined

A2, A1, A0: FM-AFC or FM-AGC or SIF-AGC radio output detection

| A2 | A1 | A0 | SIF-AGC radio output *1) | FM-AGC radio output *2) | FM-AFC radio output *3) |
|----|----|----|--------------------------|-------------------------|-------------------------|
| 1  | 0  | 0  | not defined              | not defined             | -100 kHz                |
| 0  | 1  | 1  | > 20dBμV                 | normal signal           | -35 kHz                 |
| 0  | 1  | 0  | 5dBμV ... 20dBμV         | weak signal             | Correct tuning          |
| 0  | 0  | 1  | <5dBμV                   | very weak signal        | +35 kHz                 |
| 0  | 0  | 0  | not defined              | not defined             | +100 kHz                |

\*1) typical values, peak level detection within a bandwidth of appr. 2MHz

\*2) only valid if FM-carrier exist and SIF-AGC radio output = (A2=0, A1=1, A0=1)

\*3) typical values, only valid if CARRDET = high, see section 8.3.2



## 8.2. I<sup>2</sup>C IF

### 8.2.1. I<sup>2</sup>C-bus sequence write

|       |             |        |     |            |     |      |     |      |
|-------|-------------|--------|-----|------------|-----|------|-----|------|
| Start | Slave addr. | R/W =0 | Ack | subaddress | Ack | data | Ack | Stop |
|-------|-------------|--------|-----|------------|-----|------|-----|------|

|            |  |
|------------|--|
| Start      | start condition.   |
| Slave addr | Slave address (7bit) = 42[hex] or 43[hex] in respect of MAD.             |
| R/W        | Read/Write bit: 0 = write to component; 1 = master reads from component. |
| Subaddress | byte which indicates register of component which the are data for.       |
|            | “switching register”      00[hex]  |
|            | “adjust register”        01[hex]   |
|            | “data register”         02[hex]  |
| Ack        | acknowledge generated by the component                                   |
| Stop       | stop condition   |

If more than one byte of data is transmitted, then auto-increment of subaddress is performed.  
 i.e. transmit 3 bytes starting with data for switch register

| mode                | Slave addr + R/W =0<br>MAD=0 / MAD=1 | Subaddress | switch reg. | adjust reg. | data reg. |
|---------------------|--------------------------------------|------------|-------------|-------------|-----------|
| B/G                 | 86 / 84                              | 00         | D4          | 70          | 09        |
| I                   | 86 / 84                              | 00         | D4          | 70          | 0A        |
| D/K                 | 86 / 84                              | 00         | D4          | 70          | 0B        |
| L                   | 86 / 84                              | 00         | C4          | 10          | 0B        |
| L`                  | 86 / 84                              | 00         | 84          | 10          | 13        |
| FM - AFC            | 86 / 84                              | 00         | DC          | 70          | 1D        |
| FM - AGC            | 86 / 84                              | 00         | DC          | 70          | 9D        |
| SIF - AGC           | 86 / 84                              | 00         | DC          | 70          | 81        |
| FM - AFC<br>stereo  | 86 / 84                              | 00         | DC          | 10          | 1D        |
| FM - AGC<br>stereo  | 86 / 84                              | 00         | DC          | 10          | 9D        |
| SIF – AGC<br>stereo | 86 / 84                              | 00         | DC          | 10          | 81        |

all bytes in [hex]

## 8.2.2 switch register

acc. Chapter 8.2.1 switch register is addressed by subaddress **00** [hex]

switch register

| B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0   |
|----|----|----|----|----|----|----|--|
|    |    |    |    |    |    |    | <b>Video mode</b><br>0   Sound bypass off<br>1   Sound bypass on                       |
|    |    |    |    |    |    |    | <b>Audio mute FM</b><br>0   Inactive<br>1   active                                     |
|    |    |    |    |    |    |    | <b>Carrier mode</b><br>0   intercarrier<br>1   QSS                                     |
|    |    |    |    |    |    |    | <b>Modulation</b><br>0   0   Positive AM TV<br>1   0   Negative TV<br>x   1   FM Radio |
|    |    |    |    |    |    |    | <b>Forced mute audio</b><br>0   off<br>1   on  |
|    |    |    |    |    |    |    | <b>Output port 1 (Audio-SAW switch)</b><br>0   L'<br>1   B/G, D/K, I, L                |
|    |    |    |    |    |    |    | <b>Output port 2 (not used)</b><br>0   Low ohmic active<br>1   High ohmic disabled     |

Recommended settings **switch register**

| mode       | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | = [hex]   |
|------------|----|----|----|----|----|----|----|----|-----------|
| <b>B/G</b> | 1  | 1  | 0  | 1  | 0  | 1  | 0  | 0  | <b>D4</b> |
| <b>I</b>   | 1  | 1  | 0  | 1  | 0  | 1  | 0  | 0  | <b>D4</b> |
| <b>D/K</b> | 1  | 1  | 0  | 1  | 0  | 1  | 0  | 0  | <b>D4</b> |
| <b>L</b>   | 1  | 1  | 0  | 0  | 0  | 1  | 0  | 0  | <b>C4</b> |
| <b>L'</b>  | 1  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | <b>84</b> |
| <b>FM</b>  | 1  | 1  | 0  | 1  | 1  | 1  | 0  | 0  | <b>DC</b> |

### 8.2.3 Adjust register

acc. Chapter 8.2.1 adjust register is addressed by subaddress **01** [hex]

#### Adjust register

| C7 | C6 | C5 | C4                   | C3              | C2 | C1 | C0 |
|----|----|----|----------------------|-----------------|----|----|----|
|    |    |    | AGC adjustment       |                 |    |    |    |
|    |    |    | 1                    | 0               | 0  | 0  | 0  |
|    |    |    | Deemphasis           |                 |    |    |    |
|    |    |    | 0                    | De-emphasis off |    |    |    |
|    |    |    | 1                    | De-emphasis on  |    |    |    |
|    |    |    | Value of de-emphasis |                 |    |    |    |
|    |    |    | 0                    | 75 us           |    |    |    |
|    |    |    | 1                    | 50 us           |    |    |    |

#### Audio gain

|   |       |
|---|-------|
| 0 | 0 dB  |
| 1 | -6 dB |

#### Recommended settings **adjust** register

| mode             | C7 | C6 | C5 | C4 | C3 | C2 | C1 | C0 | = [hex]   |
|------------------|----|----|----|----|----|----|----|----|-----------|
| <b>B/G</b>       | 0  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | <b>70</b> |
| <b>I</b>         | 0  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | <b>70</b> |
| <b>D/K</b>       | 0  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | <b>70</b> |
| <b>L</b>         | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | <b>10</b> |
| <b>L'</b>        | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | <b>10</b> |
| <b>FM</b>        | 0  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | <b>70</b> |
| <b>FM stereo</b> | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | <b>10</b> |

### 8.2.3 data register

acc. Chapter 8.2.1 data register is addressed by subaddress **02** [hex]

data register

| E7 | E6 | E5 | E4 | E3 | E2 | E1                          | E0           |       |                      |
|----|----|----|----|----|----|-----------------------------|--------------|-------|----------------------|
|    |    |    |    |    |    | <b>2<sup>nd</sup> IF</b>    |              |       |                      |
|    |    |    |    |    |    | 0                           | 0            | 4.5   |                      |
|    |    |    |    |    |    | 0                           | 1            | 5.5   |                      |
|    |    |    |    |    |    | 1                           | 0            | 6.0   |                      |
|    |    |    |    |    |    | 1                           | 1            | 6.5   |                      |
|    |    |    |    |    |    | <b>Video IF</b>             |              |       |                      |
|    |    |    |    |    |    | <b>TV Mode: B3=0</b>        |              |       |                      |
|    |    |    |    |    |    | <b>MHz</b>                  |              |       |                      |
|    |    |    |    |    |    | 0                           | 0            | 58.75 |                      |
|    |    |    |    |    |    | 0                           | 0            | 45.75 |                      |
|    |    |    |    |    |    | 0                           | 1            | 38.9  |                      |
|    |    |    |    |    |    | 0                           | 1            | 38.0  |                      |
|    |    |    |    |    |    | 1                           | 0            | 33.9  |                      |
|    |    |    |    |    |    | 1                           | 0            | 33.4  |                      |
|    |    |    |    |    |    | <b>Radio Mode: B3=1</b>     |              |       |                      |
|    |    |    |    |    |    | 0                           | 0            | 44    | SIF-AGC radio output |
|    |    |    |    |    |    | 1                           | 1            | 44    | FM-AGC radio output  |
|    |    |    |    |    |    | <b>VIF, SIF, tuner gain</b> |              |       |                      |
|    |    |    |    |    |    | 0                           | Normal gain  |       |                      |
|    |    |    |    |    |    | 1                           | Minimum gain |       |                      |
|    |    |    |    |    |    | <b>Gating (pos. AM)</b>     |              |       |                      |
|    |    |    |    |    |    | 0                           | 0 %          |       |                      |
|    |    |    |    |    |    | 1                           | 36 %         |       |                      |

#### VIF AGC output – TV Mode: B3=0

|   |                                     |
|---|-------------------------------------|
| 0 | Normal port function (Output port2) |
| 1 | No port function                    |

#### PIN 21 output – Radio Mode: B3=1

|   |   |
|---|---|
| 0 | FM-AFC radio output                         |
| 1 | FM-AGC or SIF-AGC radio output acc. E2...E4 |

#### Recommended settings data register

| mode           | E7 | E6 | E5 | E4 | E3 | E2 | E1 | E0 | = [hex]   |
|----------------|----|----|----|----|----|----|----|----|-----------|
| <b>B/G</b>     | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 1  | <b>09</b> |
| <b>I</b>       | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 0  | <b>0A</b> |
| <b>D/K</b>     | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | <b>0B</b> |
| <b>L</b>       | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | <b>0B</b> |
| <b>L`</b>      | 0  | 0  | 0  | 1  | 0  | 0  | 1  | 1  | <b>13</b> |
| <b>FM-AFC</b>  | 0  | 0  | 0  | 1  | 1  | 1  | 0  | 1  | <b>1D</b> |
| <b>FM-AGC</b>  | 1  | 0  | 0  | 1  | 1  | 1  | 0  | 1  | <b>9D</b> |
| <b>SIF-AGC</b> | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | <b>81</b> |

### 8.3.1. I<sup>2</sup>C-bus sequence read

|       |             |        |     |      |         |      |
|-------|-------------|--------|-----|------|---------|------|
| Start | Slave addr. | R/W =1 | Ack | data | Ack not | Stop |
|-------|-------------|--------|-----|------|---------|------|

Start start condition.  
 Slave addr Slave address = 43[hex].  
 R/W Read/Write bit: 0 = write to component; 1 = master reads from component.  
 Ack acknowledge, generated by the component  
 Ack not acknowledge, generated by the master  
 Stop stop condition

### 8.3.2 Read data format

| Status register                |      |      |                           |      |      |      |                    |
|--------------------------------|------|------|---------------------------|------|------|------|--------------------|
| Bit7                           | Bit6 | Bit5 | Bit4                      | Bit3 | Bit2 | Bit1 | Bit0               |
|                                |      |      |                           |      |      |      | Power on reset     |
|                                |      |      |                           |      |      |      | 0 Normal operation |
|                                |      |      |                           |      |      |      | 1 Power on reset   |
|                                |      |      | AFC value                 |      |      |      |                    |
|                                |      |      | AFC4                      | AFC3 | AFC2 | AFC1 |                    |
| CARRDET – FM carrier detection |      |      |                           |      |      |      |                    |
|                                |      |      | 0 FM carrier not detected |      |      |      |                    |
|                                |      |      | 1 FM carrier detected     |      |      |      |                    |
| VIFLEV - VIF level input       |      |      |                           |      |      |      |                    |
|                                |      |      | 0 VIF low level           |      |      |      |                    |
|                                |      |      | 1 VIF high level          |      |      |      |                    |

#### AFCWIN - AFC window (Note 1)

|   |                                    |
|---|------------------------------------|
| 0 | Tuning out of window (+/- 1.6 MHz) |
| 1 | Tuning in window (+/- 1.6 MHz)     |

Note1. If no IF input is applied, then bit AFCWIN = 1 due to the fact that the VCO is forced to the AFC window border for fast load-in behaviour.

| Automatic Frequency Control $f_{VIF}$ Versus $f_0$ | AFC4 | AFC3 | AFC2 | AFC1 |
|--|------|------|------|------|
| $f_{VIF} \leq f_0 - 187.5$ kHz                     | 0    | 1    | 1    | 1    |
| $f_{VIF} = f_0 - 162.5$ kHz                        | 0    | 1    | 1    | 0    |
| $f_{VIF} = f_0 - 137.5$ kHz                        | 0    | 1    | 0    | 1    |
| $f_{VIF} = f_0 - 112.5$ kHz                        | 0    | 1    | 0    | 0    |
| $f_{VIF} = f_0 - 87.5$ kHz                         | 0    | 0    | 1    | 1    |
| $f_{VIF} = f_0 - 62.5$ kHz                         | 0    | 0    | 1    | 0    |
| $f_{VIF} = f_0 - 37.5$ kHz                         | 0    | 0    | 0    | 1    |
| $f_{VIF} = f_0 - 12.5$ kHz                         | 0    | 0    | 0    | 0    |
| $f_{VIF} = f_0 + 12.5$ kHz                         | 1    | 1    | 1    | 1    |
| $f_{VIF} = f_0 + 37.5$ kHz                         | 1    | 1    | 1    | 0    |
| $f_{VIF} = f_0 + 62.5$ kHz                         | 1    | 1    | 0    | 1    |
| $f_{VIF} = f_0 + 87.5$ kHz                         | 1    | 1    | 0    | 0    |
| $f_{VIF} = f_0 + 112.5$ kHz                        | 1    | 0    | 1    | 1    |
| $f_{VIF} = f_0 + 137.5$ kHz                        | 1    | 0    | 1    | 0    |
| $f_{VIF} = f_0 + 162.5$ kHz                        | 1    | 0    | 0    | 1    |
| $f_{VIF} \geq f_0 + 187.5$ kHz                     | 1    | 0    | 0    | 0    |

## 9. ESD Protection



The frontend contains components that can be damaged by static discharge.  
 Observe these precautions:      Ground yourself before handling the frontend.  
    Do not touch the frontend connector pins without ESD protection.

|           |                  |  |  |  |  |  |
|-----------|------------------|--|--|--|--|--|
| NAME      | J. Kreil         |  |  |  |  |  |
| DATE      | 07.November 2002 |  |  |  |  |  |
| REV.:     | 01               |  |  |  |  |  |
| FÄM.- NO. |                  |  |  |  |  |  |
| DATE      | 07.11.2002       |  |  |  |  |  |
| NAME      | J. Kreil         |  |  |  |  |  |
| SIGNATURE |                  |  |  |  |  |  |