

FRONTEND 4016FY5

3X 1392

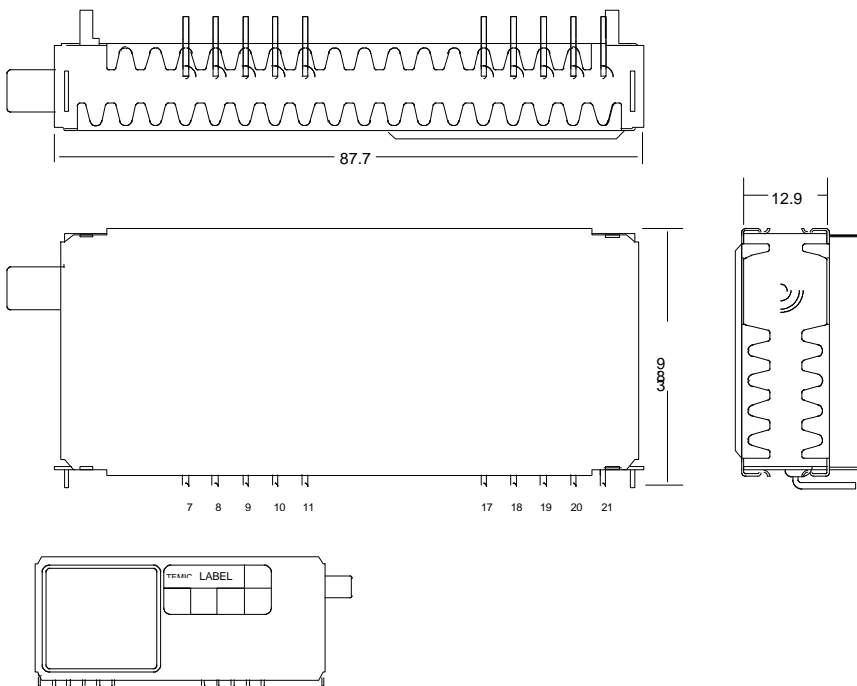
3X1393

TARGET - SPECIFICATION ELECTRICAL DATA

1. Description:

The frontend 4016 FY5 is specially designed for multimedia applications. Reception standard is D/K. The frontend includes a hyperband tuner which covers the frequency range from 48 to 870 MHz and an IF-part with SAW-filter, IF-amplifier, video and sound demodulator. The CVBS signal is via a video buffer available at the video output terminal (suitable for 75 Ω load), the audio signal at the audio output terminal. Also a 2nd IF output is provided, which allows external sound demodulation for stereo and NICAM reception.

The reception frequency range is divided in VHF low, VHF high and UHF. Bandselection and tuning is done via I²C-bus, completely. Also a digital AFC-function can be realized, because the AFC-voltage, generated by the IF-demodulator is fed to an analog/digital converter which is included in the PLL-IC and readable via I²C-bus. A DC/DC converter is built in. Therefore supply voltage is 5 V only



| PIN | |
|-----|--------------------------------|
| 4 | |
| 5 | |
| 6 | |
| 7 | NOT CONNECTED |
| 8 | SUPPLY VOLTAGE VS1 FOR TUNER |
| 9 | IIC BUS SIGNAL SCL |
| 10 | IIC BUS SIGNAL SDA |
| 11 | ADDRESS SELECTION FOR IIC BUS |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | NOT CONNECTED |
| 18 | 2nd IF |
| 19 | VIDEO OUTPUT CVBS |
| 20 | SUPPLY VOLTAGE VS1 FOR IF PART |
| 21 | AF1 SOUND OUTPUT |

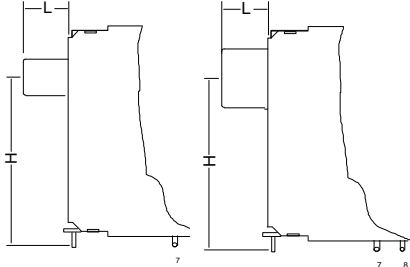
2. Mechanical Characteristics:

2.1. Dimensions:

2.2. Weight: ca. 51 g

according drawing 3X 9500 GZ

2.3. Types



| | | |
|--------------|------------|---------|
| Tunertyp | 3X 1392 | 3X 1393 |
| Sockettyp | MINI PHONO | IEC |
| Socketlength | 8.5 mm | 14.0 mm |
| Height | 29.1 mm | 29.1 mm |

3. Working Data:

3.1. Reception Standard:

D/K

3.2. Frequency Range:

| | | |
|----------|---------------------|---------------------------|
| VHF low | ch Z 1 ... ch Z 6 | 49.75 MHz ... 168.25 MHz |
| VHF high | ch R VI ... ch Z 36 | 175.25 MHz ... 448.25 MHz |
| UHF | ch Z 37 ... ch 57 | 456.25 MHz ... 863.25 MHz |

Margin:

| | |
|----------|-----------------|
| VHF low | +2 MHz / -1 MHz |
| VHF high | +7 MHz / -6 MHz |
| UHF | +3 MHz / -2 MHz |

Recommended take over frequencies:

| | |
|--------------------|---------|
| VHF low / VHF high | 169 MHz |
| VHF high / UHF | 454 MHz |

Frequency referred to picture carrier.

IF:

| | |
|------------------|-----------|
| picture carrier: | 38.90 MHz |
| sound carrier 1: | 32.40 MHz |

Oscillator operates above received frequency.

3.3. Supply voltage:

Supply voltage V_{S1} 5 V +/- 5% max. 190 mA

3.4. Input impedance:

VHF/UHF common 75 Ω , unbalanced

3.5. Temperature:

Operating temperature: 0 ...60 °C
 Storage temperature: -25 ...60 °C

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 voltages: V_{S1} , +/- 5%

5. Tuner Data:

5.1. Voltage Gain:

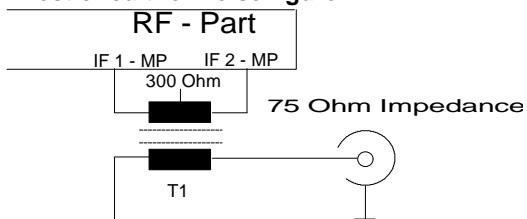
Voltage gain is measured between antenna input and IF1-Mp and IF2-Mp.
 For this measurement the input is loaded with 75 Ω , the output is loaded with a test circuit according diagram.

| | min. | typ. | max. | unit |
|----------------|------|------|------|------|
| ch 1 ... ch 57 | 38 | | 52 | dB |

5.2. Noise Figure:

| | | |
|----------|-----|----|
| VHF low | 9.0 | dB |
| VHF high | 9.0 | dB |
| UHF | 9.0 | dB |

. Test circuit for noise figure:



5.3. VSWR:

| | min. | typ. | max . | unit |
|----------|------|------|-------|------|
| VHF low | | | 4.0 | |
| VHF high | | | 4.0 | |
| UHF | | | 4.0 | |

Referred to channel center frequency.

5.4. AGC-Range:

| | | | | |
|----------|----|--|--|----|
| VHF low | 45 | | | dB |
| VHF high | 40 | | | dB |
| UHF | 35 | | | dB |

5.5. IF-Rejection:

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

5.6. Image-Rejection:

| | | | | |
|--------------------|----|--|--|----|
| ch Z 1 ... ch Z 17 | 65 | | | dB |
| ch Z 18 ... ch 36 | 53 | | | dB |
| ch Z 31 ... ch 57 | 50 | | | dB |

6. Output parameter:

6.1. Video output:

Output signal type: CVBS

| Conditions: | min. | typ. | max. | unit |
|--|------|------|------|----------|
| Ant. input level 66 dB μ V 12.5% residual carrier | | | | |
| CVBS - Output level: | | 1 | | V (p-p) |
| Load impedance | | 75 | | Ω |
| Video S/N (unweighted): | | | | |
| Quiet line | | | | |
| VHF | 43 | | | dB |
| UHF (70dB μ V input level) | 43 | | | dB |
| Frequency response: | | | | |
| Input signal: (sin x)/x Ref.: 0.2 MHz | | | | |
| 1 MHz | -1.5 | | 1.0 | dB |
| 2 MHz | -2.0 | | 2.0 | dB |
| 3 MHz | -2.5 | | 2.5 | dB |
| 4 MHz | -4.0 | | 2.0 | dB |
| 4.43 MHz | -7.0 | | 3.0 | dB |

| | | | | |
|----------------------------|--|--|---|------------------|
| Differential gain | | | 6 | % (p-p) |
| Modulated 5 step staircase | | | | |
| Differential phase | | | 5 | $^{\circ}$ (p-p) |
| Modulated 5 step staircase | | | | |

6.2. Sound output:

| Conditions: | | min. | typ. | max. | unit |
|---|----------|------|------------|------|--------------|
| Ant. input level: 66 dB μ V Video signal: color bar PC / SC : 10dB AF1: 1kHz, 27 kHz deviation, 50 μ s preemphasis | | | | | |
| Output level AF1: | AC DC | | 1.2 2.0 | | V (p-p) V |
| Load impedance: | | 1.5 | | | k Ω |

Measurements with 50µs deemphasis:

| | | | | |
|--|-----|-----|-----|-------|
| AF1 - level : | 260 | 350 | 460 | V rms |
| THD : | | | 0.5 | % |
| S/N (CCIR weighted) : | 41 | | | dB |
| Frequency response: (6 kHz deviation) | | | | |
| 40 Hz ... 15 kHz | -1 | | 1 | dB |

6.3. 2nd IF output

| | | | |
|----------------------|-----|----|----------|
| AC level of 6.5 MHz: | | 80 | mV (p-p) |
| Load impedance | 0.5 | | kΩ |

Note: Short circuit at pin 18,19 or 21 can damage internal circuits.

7. I²C bus

7.1 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 | 0 | 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 = Bits for test normal operation: T2 = 0, T1 = 0, T0 = 1

RSA, RSB : select minimum step size, see chapter 7.1.2

7.1 Address selection

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

7.1.2 Oscillator frequency and divider byte calculation:

| RSA | RSB | Reference divider | Min. tuning step [kHz] | f _{ref} [kHz] |
|-----|-----|-------------------|------------------------|------------------------|
| 1 | 1 | 512 | 62.5 | 7.8125 |
| X | 0 | 640 | 50.0 | 6.25 |
| 0 | 1 | 1024 | 31.25 | 3.90625 |

$$f_{osc} = f_{ref} * 8 * SF$$

f_{osc} : Local oscillator frequency

f_{ref} : Crystal reference frequency / 512 = 4 MHz / 512 = 7.8125 kHz (RSA = 1, RSB = 1)

SF : Programmable scaling factor

Scaling factor

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

Bandselection by control byte 2:

| Band | active ports | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 |
|---------------------|--------------|----|----|----|----|----|----|----|----|
| VHF _{low} | P7, P5 | 1 | 0 | 1 | 0 | 0 | X | X | X |
| VHF _{high} | P7, P4 | 1 | 0 | 0 | 1 | 0 | X | X | X |
| UHF | P5, P4 | 0 | 0 | 1 | 1 | 0 | X | X | X |

Read data format

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

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

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

I2, I1, I0: not used

A2, A1, A0: Internally used for AFC function

Value for correct tuning: A2 = 0, A1= 1, A0 = 0

| | | | | | | | | | |
|-----------|-----------|--|--|--|--|--|--|--|--|
| NAME | F. Heigl | | | | | | | | |
| DATE | 14.6.1998 | | | | | | | | |
| REV.: | M1 | | | | | | | | |
| FAM.- NO. | | | | | | | | | |
| DATE | | | | | | | | | |
| NAME | | | | | | | | | |
| SIGNATURE | | | | | | | | | |