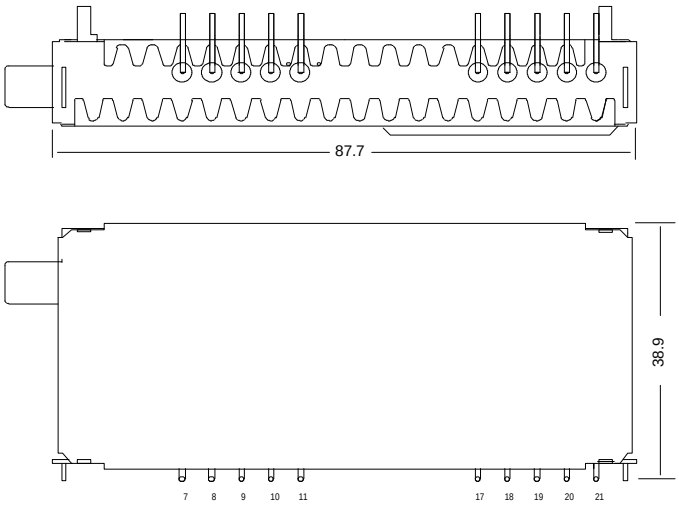
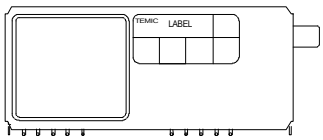
FRONTEND 4006FH5 3X 9500
3X 9501

TARGET - SPECIFICATION ELECTRICAL DATA

1. Description:

The frontend 4006 FH5 is specially designed for multimedia applications. Reception standard is Pal B/G. The frontend includes a hyperband tuner which covers the frequency range from 48 to 860 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 (L+R) 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.





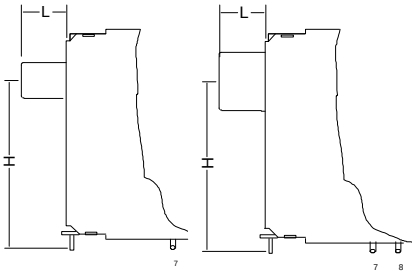
PIN	
4	
5	
6	
7	NOT CONNECTED
8	SUPPLY VOLTAGE VS1 FOR TUNER 5V
9	IIC BUS SIGNAL SCL
10	IIC BUS SIGNAL SDA
11	ADDRESS SELECTION FOR IIC BUS
12	
13	
14	
15	
16	
17	NOT CONNECTED
18	2nd IF
19	VIDEO OUTPUT CVBS
20	SUPPLY VOLTAGE VS1 FOR IF PART 5V
21	AF1 SOUND OUTPUT

2. Mechanical Characteristics:

2.1. Dimensions: according drawing 3X 9500GZ

2.2. Weight: ca. 51 g

2.3. Types



Tunertyp	3X 9500	3X 9501
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: Pal B/G

3. 2. Frequency Range:

VHF low	ch E2 ... ch S10	48.25 MHz ... 168.25 MHz
VHF high	ch E5 ... ch S 39	175.25 MHz ... 447.25 MHz
UHF	ch S 40 ... ch E 69	455.25 MHz ... 855.25 MHz

Margin:

VHF low	ch E2 ... S10	+1 MHz / -1 MHz
VHF high	ch E5 ... S39	+7 MHz / -6 MHz
UHF	ch S40... E69	+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:	33.40 MHz
sound carrier 2:	33.16 MHz
NICAM sound carrier:	33.05 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 75Ω, the output is loaded with a test circuit according diagram.

	min.	typ.	max.	unit
ch 02 ... ch 69	40		52	dB

5.2. Noise Figure:

VHF low	6.0	9.0	dB
VHF high	5.5	9.0	dB
UHF	6.0	9.0	dB

5.3. VSWR:

VHF low	4.0
VHF high	4.0
UHF	4.0

Referred to channel center frequency.

5.4. AGC-Range:

	min.	typ.	max.	unit

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

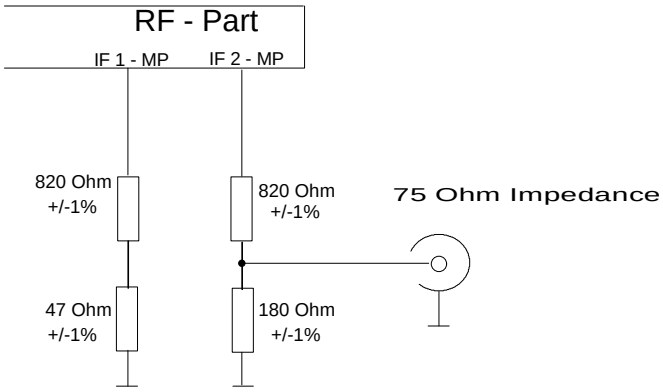
5.6. Image-Rejection:

ch E2 ... ch S10	65	dB
ch E5 ... ch S20	65	dB
ch S21... ch S39	60	dB
ch S40 ... ch E69	53	dB

5.7. RF Tilt:

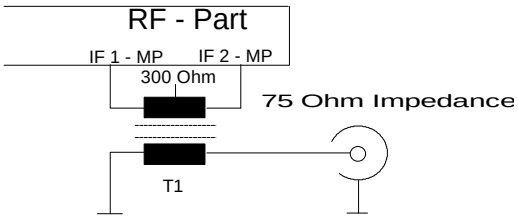
The amplitude difference between top of frequency response curve and any frequency between picture and sound carrier will not exceed 4 dB at nominal gain.

5.8. Test circuit for voltage gain:



test circuit attenuation: 31.2 dB

5.9. Test circuit for noise figure:



6. Output parameter:

6.1. Video output:

Output signal type: CVBS

Conditions: Ant. input level 66 dBµV 10% residual carrier	Testsignal	min.	typ.	max.	unit
CVBS - Output level:			1		V (p-p)
Load impedance			75		Ω
Video S/N (unweighted):					
VHF	Black burst	43			dB
UHF (70dBµV input level)	43			dB	
Frequency response: Ref.: 0.2 MHz	(sin x)/x				
1 MHz		-1.0		1.5	dB
2 MHz		-1.5		2.0	dB
3 MHz		-2.0		2.5	dB
4 MHz		-3.0		2.5	dB
4.43 MHz		-6.0		1.0	dB
5 MHz			-12		dB
Differential gain	Modulated 5 step staircase				5 % (p-p)
Differential phase	Modulated 5 step staircase			5	° (p-p)

6.2. Sound output:

Conditions:		Testsignal	min.	typ.	max.	unit
Ant.input level: 66 dBµV Video signal: color bar PC / SC1 : 13dB PC / SC2 : 20dB		AF1: 1kHz, 27 kHz deviation, 50µs preemphasis AF2: no modulation				
Output level AF1:	AC			1.8		V (p-p)
	DC			2.0		V
Load impedance:			1.5			kΩ
Measurements with 50µs deemphasis:						
AF1 - level :			270	320	370	V rms
THD :					0.4	%
S/N (CCIR weighted) :			44			dB
Frequency response: (6 kHz deviation) 40 Hz ... 15 kHz			-1		1	dB

6.3. 2nd IF output

AC level of 5.5 MHz:			190		mV (p-p)
5.74 MHz:			100		mV (p-p)
5.85 MHz: (PC / NICAM-Carrier : 20dB)			90		mV (p-p)
Load impedance		0.5			kΩ

Note: Short circuit at pin 18 or pin 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, RSA = setting minimum stepsize, see chapter 7.1.2

7.1.1 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

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

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= 16348* n14 + 8192 * n13 * 4096 * n12 + 2048 * n11 + 1024 * n10 + 512 * n9 + 256* n8 + 128 * n7 + 64 * n6 + 32 * n5 + 16 * n4 + 8 * n3 + 4 * n2 + 2 * n1 + n0

Bandselection by control byte 2:

Band	active ports	P7	P6	P5	P4	P3	P2	P1	P0
VHFlow	P7, P5	1	0	1	0	0	X	X	X
VHFhigh	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

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