TUNER 4707PH5 3X 0456

TARGET - SPECIFICATION ELECTRICAL DATA

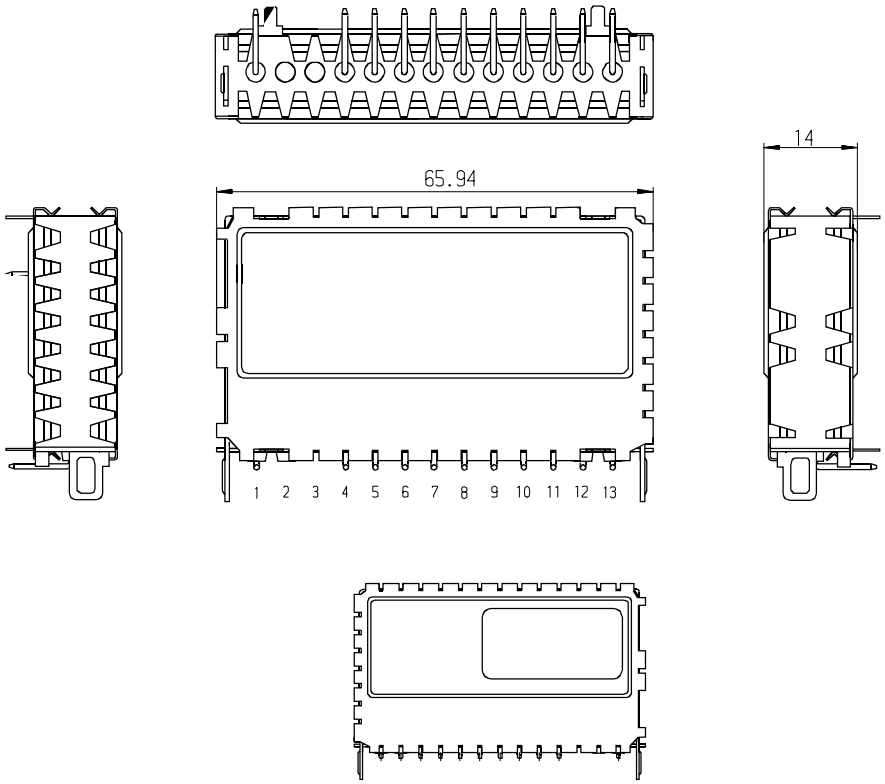
1. Description

The tuner 4707 PH5 is specially designed for subscriber side cable modem and set top box applications. It covers a frequency range from 48 to 862 MHz for the downstream signals. The receiver uses a single conversion approach with the reception frequency range divided into VHF low, VHF high and UHF. Band selection and tuning is done via I²C-bus.

The IF output is able to drive a standard SAW filter directly.

The common antenna input is realized by a pin (75Ω).

A digital AFC-function can also be realized, because the AFC-voltage generated by the IF-Demodulator is fed to a built in analogue/digital converter, available via pin 6 and readable via I²C-bus.



PIN	CONNECTION
1	Antenna input
2	
3	
4	Supply voltage VS1 + 5 V for power supply
5	AGC voltage
6	Switch port P6 output/input for ADC
7	Supply voltage VS2 + 33 V
8	Supply voltage VS1 for tuner + 5 V
9	IIC bus signal SCL
10	IIC bus signal SDA
11	Address selection for IIC bus
12	IF output
13	IF output

2. Mechanical Characteristics

2.1. Dimensions: according drawing 3X 7203

2.2. Weight: appr. 41 g

3. Functional Characteristics

3. 1. Frequency Range

VHF low	48 MHz	...	148 MHz
VHF high	140 MHz	...	471 MHz
UHF	463 MHz	...	862 MHz

Referred to center frequency of 8 MHz bandwidth:

VHF low	52 MHz	...	144 MHz
VHF high	144 MHz	...	467 MHz
UHF	467 MHz	...	858 MHz

3. 2. Tuning Resolution

The standard tuning increment is 62.5 kHz (see table 7.3).

3. 3. Recommended take over frequencies

VHF low / VHF high	141 MHz
UHF	464 MHz

3.4. IF

Center frequency: 36.125 MHz

Oscillator operates above received frequency.

3.5. Input impedance

VHF/UHF common	75 Ω, unbalanced

3.6. AGC

AGC-Voltage for maximum gain:	U_{AGC} = + 4 V ± 0.1 V
AGC-Current:	max. 12 µA
Limiting voltage :	U_{AGC} = + 6 V

3.7. Supply voltage

Supply voltage V_{S1}:	5 V ± 5%, typ. 160 mA, max. 200 mA
Permissible ripple voltage:	max. 20 mVpp, 20 Hz - 100 kHz
Limiting voltage :	V_{S1} = + 6 V
Supply voltage V_{S2}:	33V ± 5%, max. 2 mA
Permissible ripple voltage:	max. 10 mVpp, 20 Hz - 100 kHz
Limiting voltage :	V_{S2} = + 35 V

3.8. 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:	+ 5 V ± 2%
AGC-Voltage:	+ 4 V ± 2%

5. Tuner Data

5.1. Voltage Gain

Voltage gain is measured between antenna input and IF1 and IF2.
For this measurement the input is loaded with 75Ω, the IF output is loaded with a test circuit according test circuit page 5.

	min.	typ.	max.	unit
48 MHz to 862 MHz	40			dB

	min.	typ.	max.	unit
5.2. Noise Figure				
VHF low		8.5	10	dB
VHF high		8.5	10	dB
UHF		8.5	10	dB

5.3. VSWR

48 MHz ... 862 MHz			3	

5.4. AGC-Range

By varying of AGC-voltage from + 4 V to + 0.5 V
following gain reduction must be possible:

VHF low	45			dB
VHF high	40			dB
UHF	35			dB

5.4.1. Influence of AGC

By varying voltage gain between nominal gain and 20 dB gain reduction.

48 MHz ... 860 MHz tilt may increase by 1dB

5.5. IF-Rejection

Measured from channel center frequency to 36.125 MHz.

VHF low	50	70		dB
VHF high	60	80		dB
UHF	60	75		dB

5.6. Image-Rejection

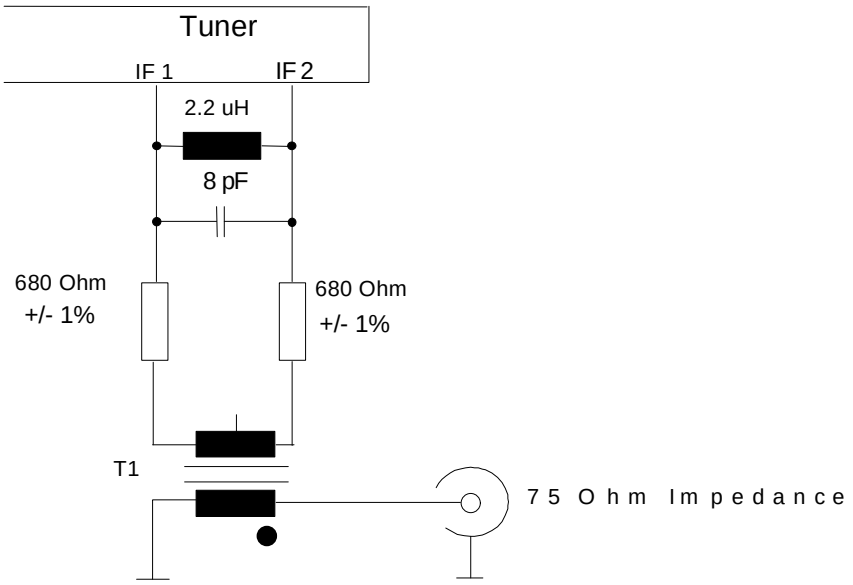
VHF low	60	70		dB
VHF high	55	65		dB
UHF	53	60		dB

5.7. RF Tilt:

Over a 8 MHz bandwidth around center frequency		2	3	dB

Measuring Method

5.8. Test circuit for voltage gain



test circuit attenuation: 22.6 dB

T1 = RF - Transformer

W- Ratio = 1:4
Type: MCL T4-1 or equivalent
Supplier: Industrial Electronics GmbH
Hauptstr. 71-79
65760 Eschborn
Tel.: 06196-48689

		min.	typ.	max.	unit
5.9. Signal level for 1 dB gain compression					
AGC deactivated with AGC = 4 V for max. gain:		70			dBµV
With AGC set for 15 dB gain reduction:		85			dBµV
5.10. Phase noise (charge pump current low)					
measured at 1 kHz distance from carrier	VHF low		- 71	-55	dBc/Hz
	VHF high		- 60	-55	dBc/Hz
	UHF		- 58	-55	dBc/Hz
measured at 10 kHz distance from carrier	VHF low		- 95	-80	dBc/Hz
	VHF high		- 85	-80	dBc/Hz
	UHF		- 85	-80	dBc/Hz
measured at 20 kHz distance from carrier	VHF low		- 102	-90	dBc/Hz
	VHF high		- 92	-85	dBc/Hz
	UHF		- 90	-85	dBc/Hz
measured at 100 kHz distance from carrier	VHF low		- 109	-100	dBc/Hz
	VHF high		- 106	-100	dBc/Hz
	UHF		- 103	-100	dBc/Hz
5.11. Oscillator voltage at aerial terminal and RF output					
	< 88 MHz			no oscillator signal	
	< 862 MHz			10	dBµV
	< 1740 MHz			40	dBµV
5.12. Intermodulation					
Composite triple beat				50	dB
Composite second order beat				50	dB
5.13. Group delay					
Over any 8 MHz bandwidth centered about the tuned frequency the group delay variation as measured between the antenna terminal and the IF output terminal shall not exceed the following limits.					
VHF low			70	100	ns p-p
VHF high			40	100	ns p-p
UHF			30	100	ns p-p
5.14. PLL Settling Time (charge pump current high)**:**				100	ms

6. I²C bus

6.1. 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

6.2. Address selection

MA1	MA0	Address	Voltage at Pin 11
0	0	C0	(0 to 0.1) V_{S1}
0	1	C2	always valid
1	0	C4	(0.4 to 0.6) V_{S1}
1	1	C6	(0.9 to 1) V_{S1}

6.3. 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
SF : Programmable scaling factor

Scaling factor
SF= 16384* 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

6.4. Control bytes

6.4.1. Control byte 1 settings (default)

	MSB							LSB	
Control byte 1	1	1	0	0	1	1	1	0	A

CP = Charge pump current, 1 = fastest tuning, 0 = better phase noise for distance < 10 kHz to the carrier
T0, T1, T2 = Test mode bit
RSA, RSB = Reference divider see 8.2.2
OS = Tuning voltage, 0 = ON

6.4.2. Control byte 2 (Band selection):

Band	Active port	P7	P6	P5	P4	P3	P2	P1	P0
UHF	P0	X	0	X	X	0	0	0	1
VHF high	P2	X	0	X	X	0	1	0	0
VHF low	P1	X	0	X	X	0	0	1	0

X = not used

6.5. 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 P7, P5 and P4
A2, A1, A0: Digital output of 5-level ADC for AFC function.
Value for correct tuning: A2 = 0, A1= 1, A0 = 0

MSB is transmitted first.

6.6. A/D converter levels

Voltage applied on port P6	A2	A1	A0
0.6 VS1 to VS1	1	0	0
0.45 VS1 to 0.6 VS1	0	1	1
0.3 VS1 to 0.45 VS1	0	1	0
0.15 VS1 to 0.3 VS1	0	0	1
0 to 0.15 VS1	0	0	0

7. Safety and Reliability

7.1. ESD protection

The tuner contains components that can be damaged by static discharge.

Observe these precautions:
Ground yourself before handling the tuner.
Do not touch the tuner connector pins without ESD protection.

7.2. High Voltage: The Tuner meets specifications IEC 801.2 level 2

7.3. Humidity: Local oscillator drift

Test conditions:	VHF Low	± 15 kHz
	VHF High	± 45 kHz
	UHF	± 75 kHz

1. 60h @ 55°C and 20% RH
2. 1h @ 23°C and 50% RH
3. 1st measurement
4. 65h @ 40°C and 95% RH
5. 2nd measurement

7.4. Vibration Test

After applying vibration of 1.5 mm amplitude, frequency of 10 - 55 - 10 Hz
(1 min.) each X, Y, Z direction for 2 hrs (total 6 hrs), tuner shall not have any rattling or loosening and shall comply with the followings to its initial value.

Gain variation	<	± 3 dB
Wave variation	<	± 30 %

7.5. Microphony

Test is made with a TV-set.
Resolution: optimal
With max. AF-output of the TV-set the tuner is free of microphone effects,
provided the unit is installed in a professional manner.

7.6. Loose Contact

Test is made with a TV-set.
Test pattern: Color bar
Resolution: optimal
By knocking the TV-set there must be no visible effects,
provided the unit is installed in a professional manner.

7.7. Loose Contact Test of Tuner alone

Test pattern: Color bar
Resolution: 3 MHz

Test: Knocking the edge of the tuner, fastened with ground contact, there must be no interruption effects.

7.8. National Reglementations

The tuner meets the requirements of VDE 9872/7.72 and Amtsblatt DBP 069/1981 (FTZ), EN 55013, EN 55020 (if properly mounted into TV-Set, VCR or Converter).

We reserve the right to make changes to improve technical design without further notice.

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