FRONTEND 4039 FR5 3X 7246

TARGET SPECIFICATION ELECTRICAL DATA (PRELIMINARY)

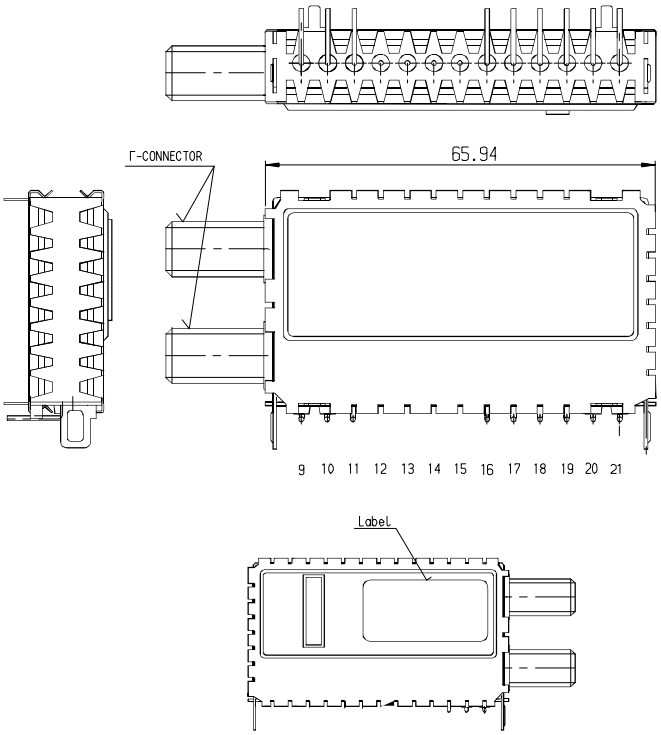
1. Description:

The frontend 4039 FR5 is specially designed for multimedia applications. It includes TV as well as FM reception possibility. TV reception standard is NTSC M/N. The frontend includes a hyperband tuner which covers the frequency range from 54 to 805 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. A video buffer is built in which makes a direct connection to 75 Ω inputs possible. The reception frequency range is divided in VHF low, VHF high and UHF.
VHFlow part of the tuner is used for FM reception also. Complete FM signal processing including demodulation and stereo decoding is bulit in. Baseband signals L (left) and R (right) as well as MPX (Baseband Multiplex sginal) are on pins abvailable.
Bandselection and tuning are 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 analogue/digital converter which is built in PLL-IC and readable via I²C-bus.
A DC/DC converter is built in. Therefore supply voltage is 5V only

2. Mechanical Characteristics:

2.1. Dimensions: according drawing

2.2. Weight: appr. 52 g



PIN	
9	IIC BUS SIGNAL SCL
10	IIC BUS SIGNAL SDA
11	ADRESS SELECTION FOR IIC 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 VS1 FOR IF PART
21	AF SOUND OUTPUT / FM MPX

2.3. Types

Tunertype	3X 7246
Sockettype	F-CONNECTOR
Socketlength	18.0 mm
Height	28.55/10.25 mm

3. Working Data:

3.1. Reception Standard: M/N

3. 2. Frequency Range:

VHF low	ch 02 ...G	55.25 MHz ... 157.25 MHz
VHF high	ch H ...W+26	163.25 MHz ... 451.25 MHz
UHF	ch W+27 ...69	457.25 MHz ... 801.25 MHz
FM		75.9 MHz 108.1 MHz

Margin:

VHF low	ch 02 ... G	+1MHz/-3MHz
VHF high	ch H ... W+26	+1MHz/-5MHz
UHF	ch W+27 ... 69	+3MHz/-6MHz
FM		+/- 0.5 MHz

Recommened take over frequencies:

VHF low / VHF high	158MHz
VHF high/ UHF	453MHz

Frequency referred to picture carrier.

IF:

TV reception	picture carrier:	45.75 MHz
	sound carrier:	41.25 MHz
FM reception:		10.7 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 Ω, 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			4.0	
VHF high			4.0	
UHF			4.0	

Referred to channel center frequency.

5.2. AGC-Range:

VHF low	45			dB
VHF high	40			dB
UHF	35			dB
FM	45			dB

5.3. IF-Rejection:

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

5.4. Image-Rejection:

VHF low		60		dB
VHF high	ch H .... ch 13	60		dB
VHF high	ch J .... ch W+26	50		dB
UHF		50		dB
FM		53		dB

6. TV Output parameter:

6.1. Video output:		min.	typ.	max.	unit
Conditions:	Ant. input level 66 dBµV 12.5% residual carrier				
CVBS - Output level:			1		Vpp
Load impedance			75		Ω
Video S/N (unweighted): Flat Field (0 IRE)					
VHF		46			dB
UHF		45			dB
Video sensitivity Video S/N = 30 dB				45	dBµV
Frequency response: (sin x)/x Ref.: 0.2 MHz					
1 MHz		-1.5		1.5	dB
2 MHz		-2		2	dB
3 MHz		-4		2	dB
3.58 MHz		-8		1	dB
video sound carrier rejection		40			dB
Differential gain	NTC 7 Composite			5	%pp
Differential phase	NTC 7 Composite			5	°pp
K - factor 2T	NTC 7 Composite			2.5	%

6.2. TV Sound output:		min.	typ.	max.	unit
Conditions: Ant.input level 66 dBµV; Video signal: color bar Audio signal 1kHz, 25 kHz deviation; 75µs preemphasis					
Output level:	DC		1.8		V
Measurements with 75µs deemphasis:					
AF - level :			300	410	500
Vrms					
THD+N:				0.5	%
S/N:			49		dB
Frequency response: (6 kHz deviation)					
40 Hz ... 15 kHz		-1		1	dB

6.3. 2nd IF output

AC level of 4.5 MHz:	50	120		mVpp
Load impedance	0.5			kΩ

7. FM part

FM reception is switched on by activate VHFlow and additionally port 2, see 8.1.4

		min.	typ.	max.	unit
71 Frequency range		75.9		108.1	MHz
7.2 Output levels					
AF = 1 kHz, 75 kHz deviation					
MPX	AC		810		mVrms
	DC		2.3		V
Load impedance			100		kΩ
L, R resp.	AC		195		mVrms
	DC		1.0		V
Load impedance			100		kΩ
7.3 Frequency response					
40 Hz to 15 kHz		-2		2	dB
7.4 Usable sensivity					
30 dB S/N			10		dBµV
50 dB S/N			25		dBµV
1 kHz 75 kHz deviation					
7.5 S/N at high input level			67		dB
Vin = 60 dBµV, Mod. = 1kHz					
75 kHz deviation					
measured at MPX output with 75 µs deemphais					
7.6 Distortion at high input level			0.5		%
22.5 kHz deviation					
7.7 Distortion at 12 dBµV			5		%
7.8 Channel selectivity					
400 kHz		55			dB
200 kHz		12			dB
		min.	typ.	max.	unit

7.9 Stereo channel separation		30	dB
7.10 AM suppression	40		dB
7.11 Image rejection unwanted signal 21.4 MHz above wanted signal	53		dB
7.12 IF rejection referred to 10.7 MHz unwanted signal	60		dB

8. I²C bus

8.1. 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

8.1.1 Address selection

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

8.1.2 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

for FM recption we recommend 50 kHz minimum step size

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

8.1.3. Control byte 1 settings (default)

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

8.1.4 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	0
VHF high	P7,P4	1	0	0	1	0	0	0	0
UHF	P5,P4	0	0	1	1	0	0	0	0
FM	P7, P5, P2	1	0	1	0	Mute	1	0	AFC/RIF function note 1

note 1:

P0 = 0 RFinput signal strength could be read via I²C bus

P0 = 1 AFC status is available via I²C bus

8.2.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 respectively
A2, A1, A0: Internally used for AFC function
Value for correct tuning: A2 = 0, A1= 1, A0 = 0

8.3 I²C bus FM reception

8.3.1 Switch to FM recption

Control byte 2 (Bandselection**)**

FM	P7, P5, P2	1	0	1	0	Mute	1	0	AFC/RIF

8.3.2 Tuning

see chapter 8.1.2 and appendix part FM reception
in order to calc. local oscillator frequency add to IF (10.7 MHz)
$f_{OSC} = f_{recep} + 10.7$ MHz

NAME	F. Heigl					
DATE	18. June 1998					
REV.:	M6					
FÄM.- NO.						
DATE						
NAME						
SIGNATURE						