Hyperband television tuner TUN14404

FEATURES

* VHF/Hyperband/UHF tuner
* Systems CCIR: B/G, H, L/L'
* Off-air channels, S-cable channels and Hyperband
* Digitally controlled (PLL) tuning via I^2C-bus
* Compact size
* Comply to "CENELEC EN55020" and "EN55013"

DESCRIPTION

TUN14404 belongs to the family of tuner, which are designed to meet a wide range of applications. It is a combined VHF / Hyperband / UHF tuner suitable for CCIR systems B/G, H, L/L'. The IF output can drive a SAW filter directly and has capability to drive asymmetrical load of 75 Ω.

The tuners comply with the requirements of radiation, signal handling capability and immunity conforming with:

* CISPR 13 (1990) including amendment 1 (1992) and amendment 2 (1993)
* European standards CENELEC EN55013, EN 55020

ORDERING INFORMATION

TYPE	SYSTEM	DESCRIPTION
TUN14404	CCIR	asymmetrical IF output; IEC connector (14.5 mm)

May 2001

INTERMEDIATE FREQUENCIES

SIGNALS	FREQUENCY (MHz)		
	SYSTEMS B/G, H	SYSTEM L	SYSTEM L'
Picture carrier	38.90	38.90	33.40
Colour	34.47	34.47	37.83
Sound	33.40	32.40	39.90

Note

1. The oscillator frequency is above the input signal frequency.

CHANNEL COVERAGE

TYPE	BAND	OFF-AIR CHANNELS		CABLE CHANNELS	
		CHANNELS	FREQUENCY RANGE (MHz)	CHANNELS	FREQUENCY RANGE (MHz)
TUN14404	Low band	E2 to C	48.25 to 83.25[1]	S01 to S1	105.25 to 168.25
	Mid band	E5 to E12	175.25 to 224.25	S11 to S3	217.25 to 447.25
	High band	E21 to E69	471.25 to 855.25[2]	S40 and S41	455.25 to 463.25

Notes

1. Enough margin is available to tune down to 45.25 MHz.

2. Enough margin is available to tune up to 863.25 MHz.

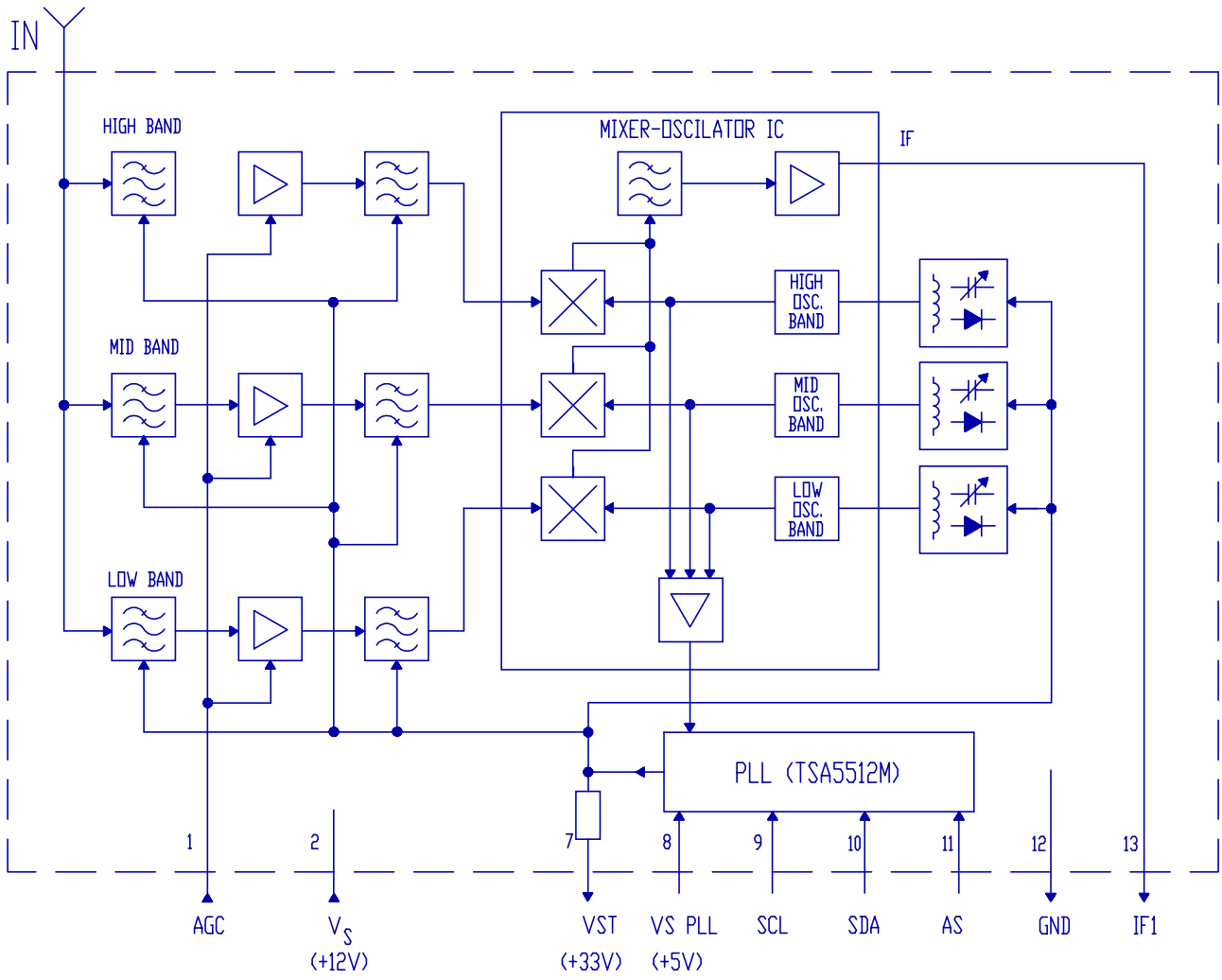

Fig.1 Electrical block diagram

PINNING

SYMBOL	PIN	DESCRIPTION
AGC	1	gain control voltage
V_S	2	supply voltage +12 V
V_{ST}	7	Tuning voltage +33 V
V_{SPLL}	8	PLL supply voltage +5 V
SCL	9	I^2C bus-serial clock
SDA	10	I^2C-bus serial data
AS	11	I^2C-bus address select
GND	12	Ground
IF1	13	Asymmetrical IF output
GND	MT1, MT2	mounting tags (ground)
	IN	aerial input connector IEC (14.5 mm or 32.2 mm)

LIMITING VALUES

Environmental conditions

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Non-operational conditions					
T_{amb}	ambient temperature		-40	+60	^0C
RH	relative humidity		85	%	
Operational conditions					
$\mathbf{T}_{amb}$	ambient temperature		-10	+60	^0C
RH	relative humidity		93	%	

Limiting values under operational conditions

The tuner can be guaranteed to function properly under the following conditions.

SYMBOL	PARAMETER	PIN	MIN.	TYP.	MAX.	UNIT
V_S I_S	supply voltage supply current	2	10.8	12	13.2 85	V mA
V_{ST} I_{ST}	tuning supply voltage tuning supply current	7	30	33	35 1.7	V mA
V_{SPLL} I_{SPLL}	PLL supply voltage PLL supply current	8	4.75	5	5.5 55	V mA
V_{AGC} ΔV_{AGC} I_{AGC}	AGC input voltage AGC input voltage range AGC input current	1	 0.85	9.2	13.2 9.7 30	V V µA
V_{AS} V_{SCL} V_{SDA} I_{SDA}	address select input voltage serial clock input voltage serial data input voltage serial data input current	11 9 10	 3.0 3.0 1		5.5 5.5 5.5 5	V V V mA

ELECTRICAL DATA

Conditional data

Unless otherwise specified, all electrical values for Chapter “Electrical data” apply at the following conditions and the electrical performance is related both to systems B/G, H, L and L’.
A proper function is guaranteed within the specified operational conditions but a certain deterioration of performance parameters may occur at the limits of operational conditions.

SYMBOL	PARAMETER	VALUE	UNIT
T_{amb}	ambient temperature	25 +/- 5	^{0}C
RH	relative humidity	60 +/- 15	%
V_S	supply voltage	12 +/- 0.25	V
V_{SPLL}	PLL supply voltage	5 +/- 0.125	V
V_{AGC}	AGC input voltage	9.2 +/- 0.25	V
V_{ST}	tuning supply voltage	33 +/- 0.5	V
t_{pr}	pre-heating time (+12 V at pin 2)	10	minute
$Z_{S(AE)}$	aerial source impedance (unbalanced)	75	Ω

Aerial input characteristics

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
WSWR	reflection coefficient	referred to 75 Ω impedance		4	
V_{ant}	antenna connection disturbance voltage	< 1.75 GHz; comply to "EN55013 section 3.3"		46	dBμV

General characteristics

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
f_b	frequency range, low band mid band high band		 48.25 175.25 455.25	 168.25 447.25 855.25	 MHz MHz MHz
G_V	voltage gain: all channels gain taper	 referred to 75 Ω impedance	 38	 7	 dB dB
F	noise: low band mid band high band			 9 10 11	 dB dB dB
ΔV_{AGC}	AGC input voltage range: low and mid band high band		 45 35		 dB dB
α_i	image rejection: low band mid band high band		 70 60 53		 dB dB dB
α_{IF}	IF rejection (picture) low and mid band high band		 60 70		
Δf	oscillator characteristics Oscillator tuning resolution lock-in time			 note 1 150	 kHz msec

Note 1. Resolution 31.25 kHz, 50.00 kHz or 62.5 kHz (see Table "Ratio select bits").

Visibility test

The tuners meet the requirements of the European norm "EN55020", when measured in an adequate television receiver.

Radiation

The tuners meet the requirements of the European norm "EN55013" and "CISPR13" (1990), when measured in an adequate television receiver.

APPLICATION INFORMATION

WRITE mode

	MSB							LSB	A[1]
Address byte	1	1	0	0	0	MA1	MA0	0	A
Program divider byte 1	0	0	n13	n12	n11	n10	n9	n8	A
Program divider byte 2	n7	n6	n5	n4	n3	n2	n1	n0	A
Control information byte 1	1	CP	0	0	1	1	1	0	A
Control information byte 2	P7	P6	P5	P4	0	P2	P1	P0	A

Notes

1. A = Acknowledge

Address selection

MA1	MA0	Voltage at pin 11
0	0	GND to $0.1XV_{PLL}$
0	1	don't care
1	0	$0.4XV_{PLL}$ to $0.6XV_{PLL}$
1	1	$0.9XV_{PLL}$ to $2.7XV_{PLL}$

Programmable divider settings (bytes 1 and 2)

Divider ratio:

N = R x { fRF,pc + fIF,pc },

R = 16 with reference divider = 512
R = 20 with reference divider = 640
R = 32 with reference divider = 1024

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

Control byte 1

CP can be set to either 0 (low current) or 1 (high current).

Charge pump settings:

CP = 1, for fast tuning
CP = 0, for moderate speed tuning with slightly better residual oscillator FM.

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Ratio select bits

RSA	RSB	REFERENCE DIVIDER	STEP SIZE (kHz)
X	0	640	50.00
0	1	1024	31.25
1	1	512	62.50

Band switching (Control byte 2)

Band	Active port	P0	P1	P2	P3	P4	P5	P6	P7
Low band	P4	X	X	X	0	0	1	1	0
Mid band	P5 X	X	X	0	1	0	1	0	
High band	P6	X	X	X	0	1	1	0	0

READ mode

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

Notes 1. A = Acknowledge.
2. POR = Power On Reset flag (POR=1 at power on).
3. FL = In-lock flag (FL=1 at loop is phase-locked).

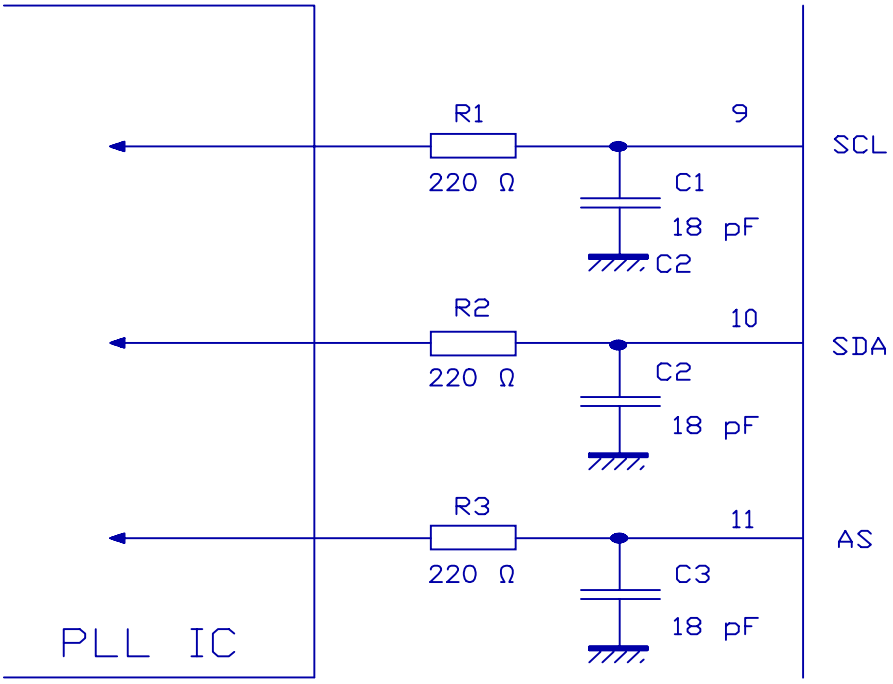

Fig.2 I²C-bus load.

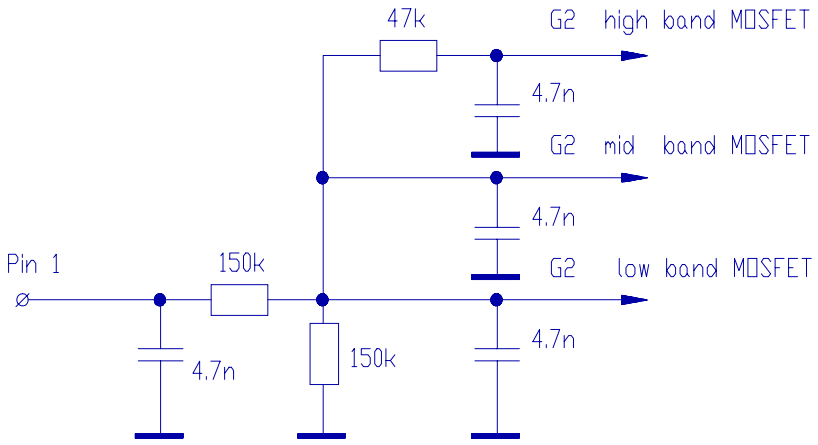

Fig.3 Internal AGC circuit.

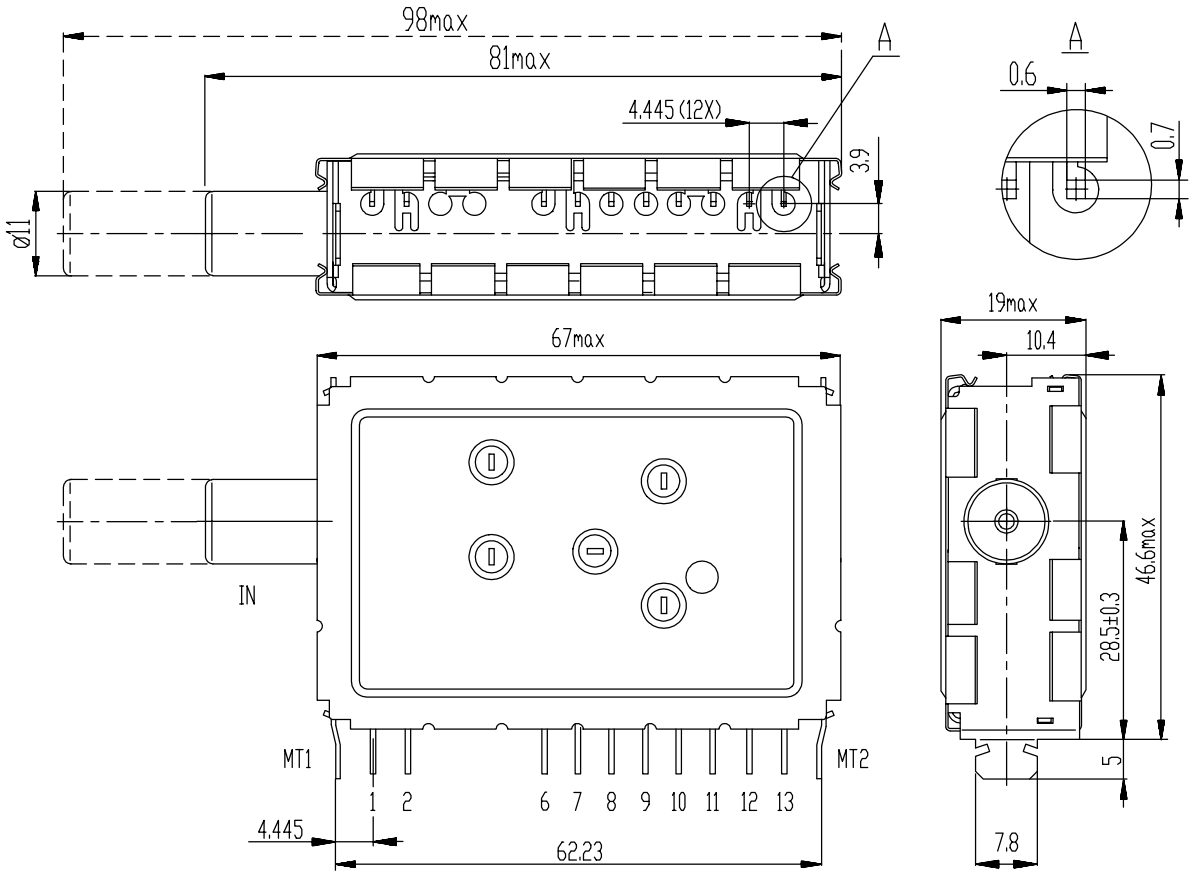

Fig.4 Mechanical outline

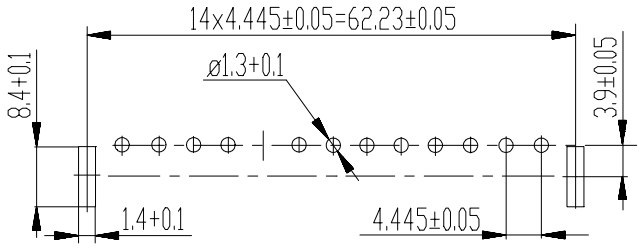

Fig.5 Punching pattern seen from solder side

Aerial connections

Standard IEC socket female 75 Ω.

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