

VHF/UHF Tuner-IC

Description

This tuner IC requires a power supply of 12 V and performs the function of two separate oscillators and mixers, SAW-filter driver and dual state band switch.

Features

- Frequency range from 48 to 860 MHz
- Band A: balanced high impedance mixer input and amplitude controlled oscillator
- Band B: balanced low impedance mixer input and symmetrical oscillator
- SAW filter driver with low impedance output
- Voltage regulator for stable operating characteristics
- ESD protection on all pins except oscillator pins and RF-inputs

Block Diagram

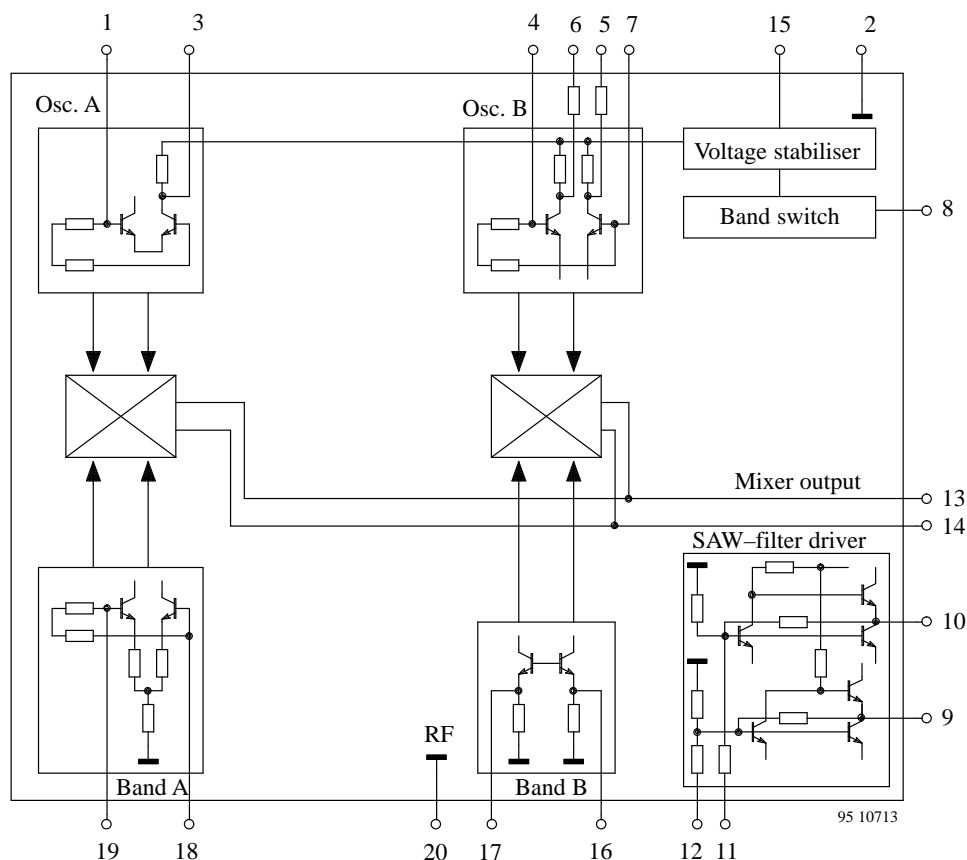
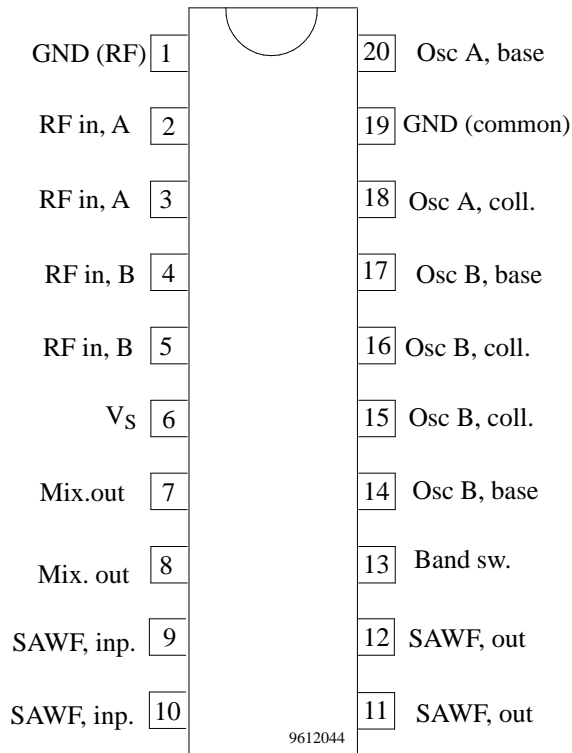


Figure 1.

Ordering Information

| Extended Type Number | Package | Remarks |
|----------------------|----------------------|------------------|
| U2320B-FLG3 | SO20 plastic package | Taped and reeled |

Pin Description



| Pin | Symbol | Function |
|--------|--------------|-------------------------------|
| 1 | Osc A, base | Oscillator band A, base |
| 2 | GND (common) | Ground, common |
| 3 | Osc A, coll. | Oscillator band A, collector |
| 4, 7 | Osc B, base | Oscillator band B, bases |
| 5, 6 | Osc B, coll. | Oscillator band B, collectors |
| 8 | Band sw. | Dual-state band switch |
| 9, 10 | SAWF, out | SAW filter driver outputs |
| 11, 12 | SAWF, inp. | SAW filter driver input |
| 13, 14 | Mix, out | Mixer outputs, open collector |
| 15 | V_S | Supply voltage V_S |
| 16, 17 | RF in, B | RF inputs, band B |
| 18, 19 | RF in, A | RF inputs, band A |
| 20 | GND (RF) | Ground, RF part |

Absolute Maximum Ratings

All voltages are referred to GND, Pin 2

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|---------------------------|------------------------|------------|------|------|------|------|
| Supply voltage | Pin 15 | V_S | | | 13,5 | V |
| RF inputs | Pin 16-19 | | | | 5.0 | V |
| IF outputs | Pin 13-14 | | | | 13.5 | V |
| Dual-state switch voltage | Pin 8 | V_{iDSW} | | | 13.5 | V |
| Junction temperature | | T_j | | | 150 | °C |
| Storage temperature | | T_{stg} | -40 | | 150 | °C |

Operating Range

All voltages are referred to GND, Pin 2

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|---------------------|---------------------------|-----------|------|------|------|------|
| Supply voltage | Pin 13-15 | V_S | 10.8 | 12 | 13.2 | V |
| Ambient temperature | With heat conductive glue | T_{amb} | -25 | | 75 | °C |

Thermal Resistance

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|------------------|---|------------|------|------|------|------|
| Junction ambient | Test conditions page 4 Package soldered to PCB | R_{thJA} | | 90 | | K/W |

Electrical Characteristics

Test conditions (unless otherwise specified): $V_S = 12\text{ V}$, $T_{\text{amb}} = 25^\circ\text{C}$, reference point Pin 2, referred to test circuit page 5.

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|---|---|--------|------|------|------|---------------|
| Supply voltage | Pin 13-15 | V_S | 10.8 | 12.0 | 13.2 | V |
| Supply current | Pin 13-15 | I_S | | 42 | 50 | mA |
| Band switch | | | | | | |
| Voltage band A | Pin 8 | VSWA | 0 | 0 | 1.0 | V |
| Voltage band B | Pin 8 | VSWB | 3.4 | 4.0 | 5.0 | V |
| Switching current | VSW = 5 V Pin 8 | ISW | | | 100 | μA |
| SAW filter driver | | | | | | |
| | $f_i = 36\text{ MHz}$ | | | | | |
| Input impedance | Pin 11, 12 | ZiSAW | | 450 | | Ω |
| Output impedance | Pin 9, 10 | ZoSAW | | 70 | | Ω |
| Voltage gain | 11, 12 \rightarrow 9, 10 | GvSAW | | 19 | | dB |
| Band A (note 1) | | | | | | |
| Input frequency range | Pin18 | f_iA | 48 | | 470 | MHz |
| Input impedance | Figure 4 Pin18 | S11A | | | | |
| Gain (note 4) | I/P to O/P | GA | | 30 | | dB |
| Noise figure DSB (note 2) | $f_iA = 50\text{ MHz}$ I/P to O/P $f_iA = 150\text{ MHz}$ | NF | | 11.5 | | dB |
| | | | | 12 | | dB |
| Input level for (note 3): | Each carrier | | | | | |
| IM3 (Interm. of 3rd order) | $f_iA = 71\text{ MHz}$ I/P | V_iA | | -22 | | dBm |
| IM2 (Interm. of 2nd order) | $f_iA = 71\text{ MHz}$ I/P | V_iA | | -22 | | dBm |
| Band B (note 1) | | | | | | |
| Input frequency range | Pin 16, 17 | f_iB | 470 | | 860 | MHz |
| Input impedance | Figure 4 Pin 16, 17 | S11B | | | | |
| Gain (note 4) | I/P to O/P | GB | | 34 | | dB |
| Noise figure DSB (note 2) | $f_iB = 500\text{ MHz}$ I/P to O/P $f_iB = 800\text{ MHz}$ | NF | | 10.5 | | dB |
| | | | | 11.5 | | dB |
| Input level for IM3 (Interm. of 3rd order, note 3) | Each carrier $f_iB = 600\text{ MHz}$ I/P | V_iB | | -27 | | dBm |

Notes

- 1) The RF input B is symmetrical driven by means of a hybrid for 180° phase shifting, consequently the source impedance is $100\ \Omega$. All other impedance for RF tests is $50\ \Omega$.
- 2) The noise figure (NF) is the value for double-side-band measurement.
- 3) The intermodulation test (2-carrier-method) which is made on IF-centre is in reference to a signal-to-IM ratio of 60 dB.
- 4) Gain is the ratio of the voltage at the primary coil of L5 to the available voltage at the input.

Test and Principle Application Circuit

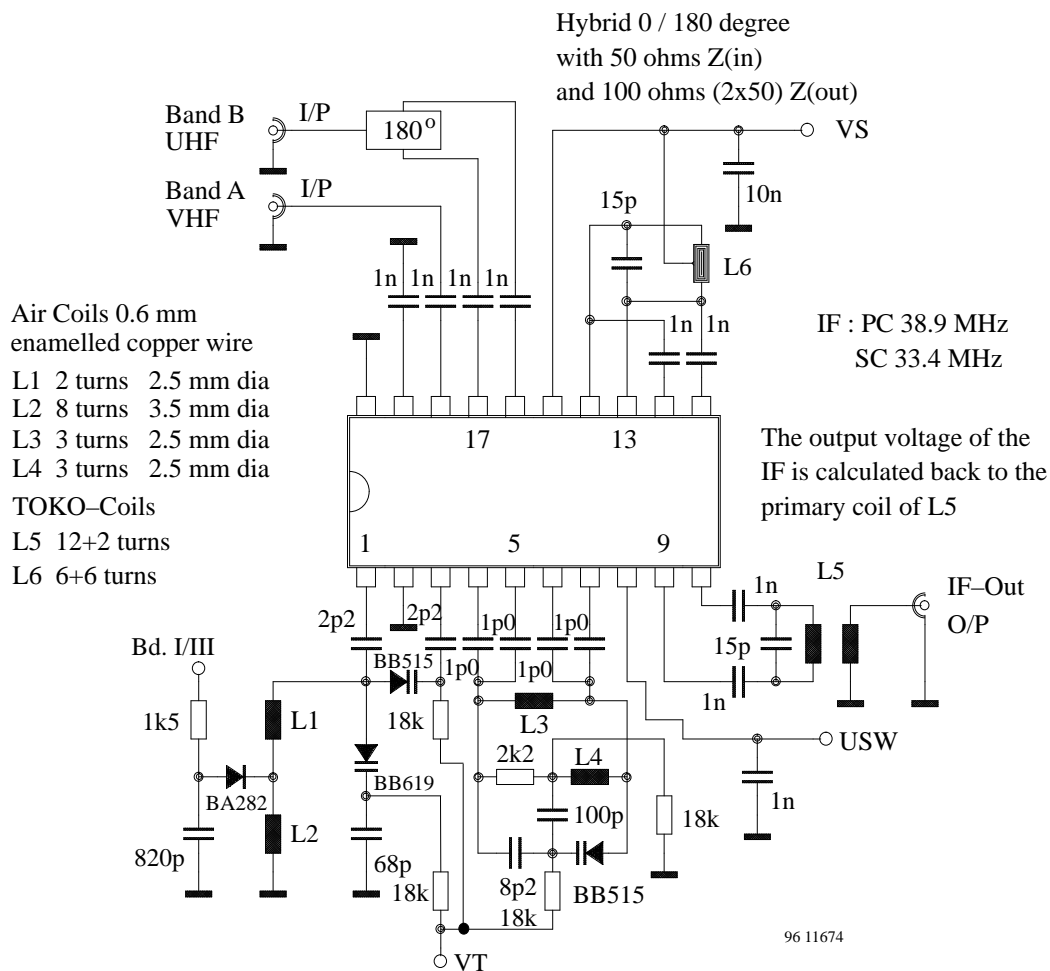


Figure 2. Test and principle application circuit

Note: All component values must be determined application specific. For more detailed information pls. request the application note "Semiconductors for TV-Tuners and The New EasyLink Concept".

PCB for the R_{thJA} -Measurement

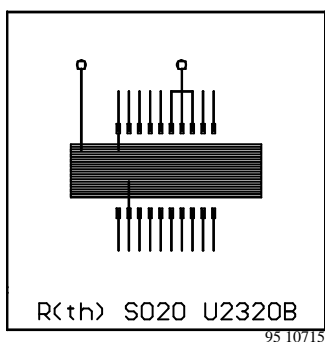


Figure 3. PCB for the R_{thJA} -measurement

35 μ m one-sided Cu-coated PCB,
40 mm x 40 mm x 1.5 mm.

Input Impedance Mixer Band A (S11A) and B (S11B)

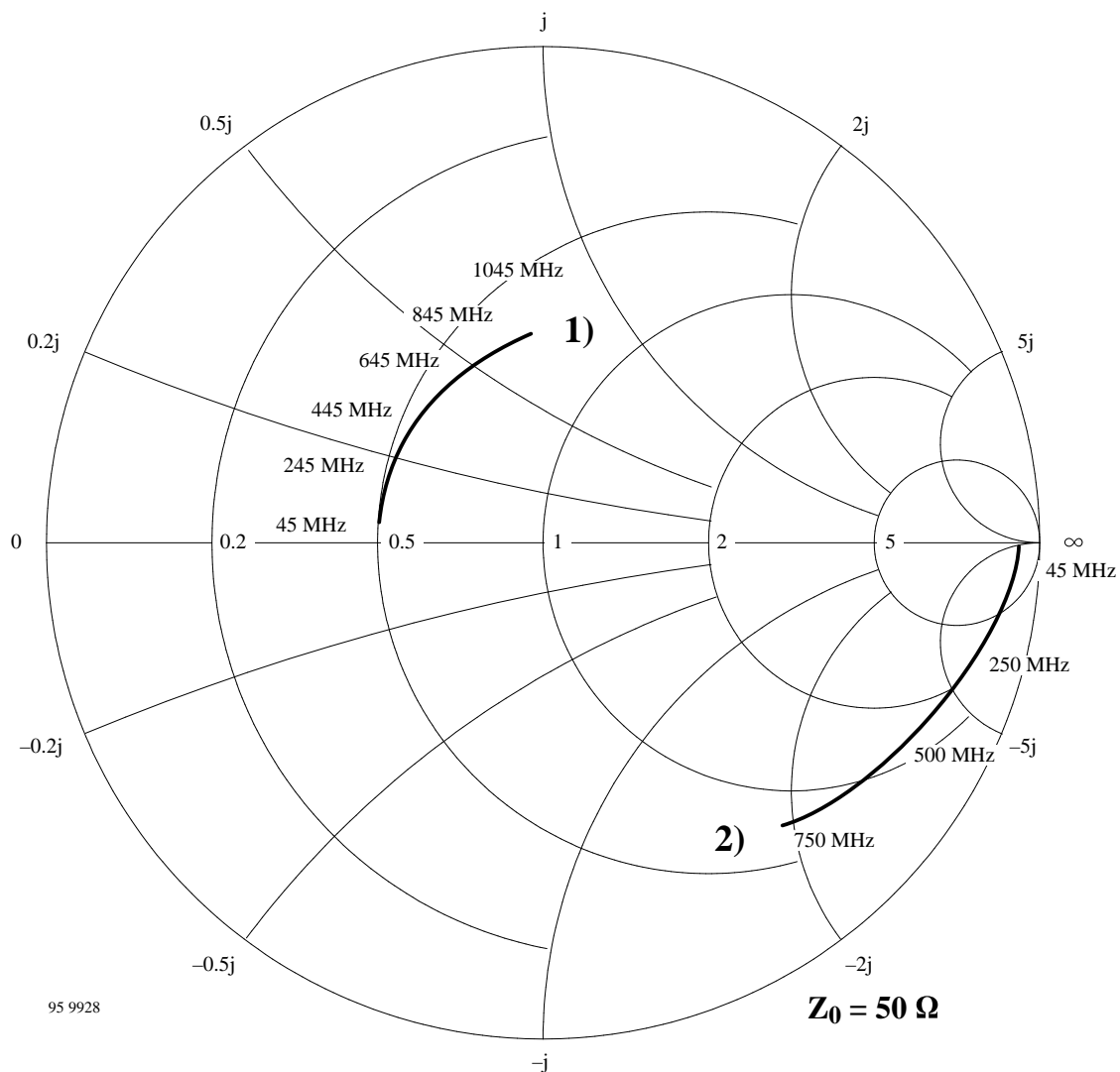
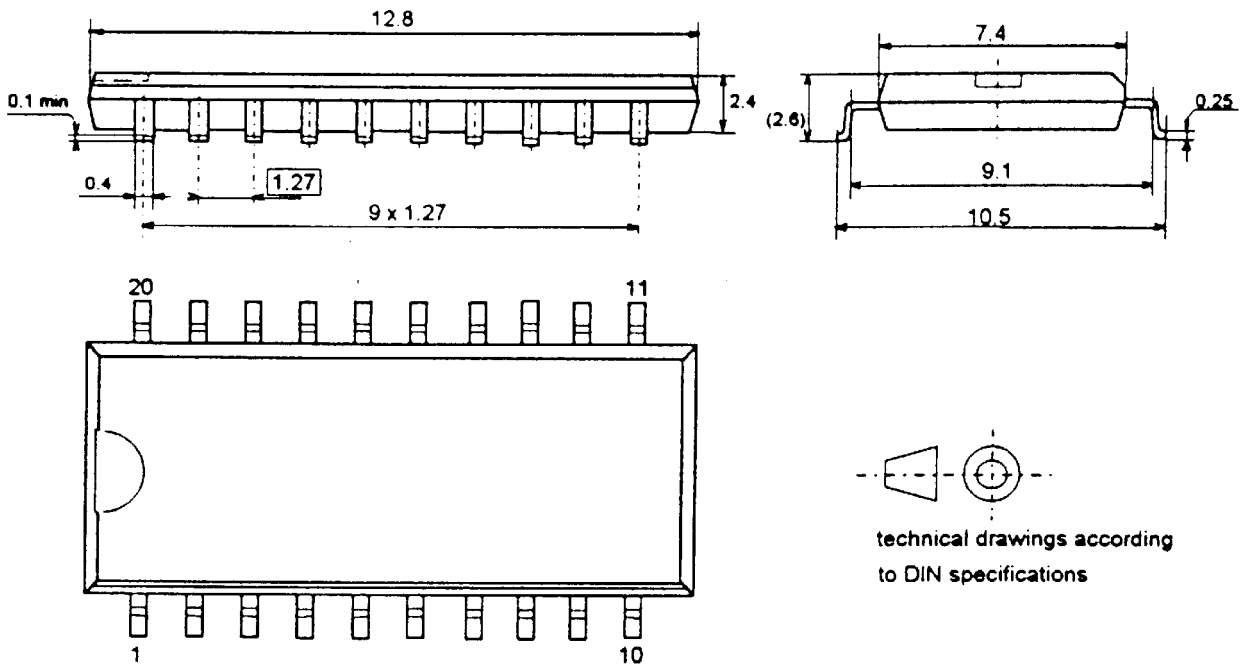


Figure 4. Input impedance mixer band A (S11A), and B (S11B)

- 1) **VHF-Low**
Normalized to 50Ω , measuring range 45 MHz to 750 MHz.
- 2) **VHF-High and UHF**
Normalized to 50Ω , measuring range 45 MHz to 1045 MHz. Both inputs are driven symmetrical. The output impedance of the hybrid is 100Ω , the measured levels are then calculated in reference to 50Ω .

Package Dimensions

Small outline plastic package, 20 pin-SO20
Dimensions in mm



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