

**INTEGRATED CIRCUITS**

# DATA SHEET

## **TDA5636; TDA5637** 9 V VHF, hyperband and UHF mixers- oscillators for TV and VCR 3-band tuners

Product specification  
Supersedes data of 1995 Mar 21  
File under Integrated Circuits, IC02

1996 Jun 10

## 9 V VHF, hyperband and UHF mixers-oscillators for TV and VCR 3-band tuners

## TDA5636; TDA5637

### FEATURES

- Balanced mixer with a common emitter input for band A (single input)
- 2-pin oscillator for bands A and B
- Balanced mixer with a common base input for bands B and C (balanced input)
- 4-pin oscillator for band C
- Local oscillator buffer output for external prescaler
- SAW filter preamplifier with a low output impedance to drive a 75  $\Omega$  load
- Band gap voltage stabilizer for oscillator stability
- Electronic band switch
- External IF filter between the mixer output and the IF amplifier input
- Pin to pin compatible with TDA5636B; TDA5637B family (same function with symmetrical IF output).

### APPLICATIONS

- 3-band all-channel TV and VCR tuners
- Any standard.

### GENERAL DESCRIPTION

The TDA5636 and TDA5637 are monolithic integrated circuits that perform the mixer/oscillator functions for bands A, B and C in TV and VCR tuners. These low-power mixer/oscillators require a power supply of 9 V and are available in a very small package.

The devices give the designer the capability to design an economical and physically small 3-band tuner.

They are suitable for European standards, as illustrated in Fig.17, with the following RF bands:

- 48.25 to 168.25 MHz
- 175.25 to 447.25 MHz
- 455.25 to 855.25 MHz.

With an appropriate tuned circuit, they are also suitable for NTSC all-channel tuners (USA and Japan). The tuner development time can be drastically reduced by using these devices.

These circuits belong to the TDA5636B/TDA5637B family which has exactly the same function with an IF amplifier having a symmetrical IF output to drive a SAW filter directly. It is possible to build tuners with either an asymmetrical or a symmetrical IF output with one main tuner lay-out.

## 9 V VHF, hyperband and UHF mixers- oscillators for TV and VCR 3-band tuners

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### QUICK REFERENCE DATA

| SYMBOL   | PARAMETER  | CONDITIONS                | MIN. | TYP. | MAX. | UNIT       |
|----------|--|---------------------------|------|------|------|------------|
| $V_P$    | supply voltage                                       |                           | –    | 9.0  | –    | V          |
| $I_P$    | supply current                                       | band A                    | –    | 45   | –    | mA         |
|          |  | band B                    | –    | 41   | –    | mA         |
|          |  | band C                    | –    | 44   | –    | mA         |
| $f_{RF}$ | frequency range                                      | RF input; band A; note 1  | 45   | –    | 180  | MHz        |
|          |  | RF input; band B; note 1  | 160  | –    | 470  | MHz        |
|          |  | RF input; band C; note 1  | 430  | –    | 860  | MHz        |
| $G_V$    | voltage gain   | band A; $R_L = 75 \Omega$ | –    | 20   | –    | dB         |
|          |  | band B; $R_L = 75 \Omega$ | –    | 31   | –    | dB         |
|          |  | band C; $R_L = 75 \Omega$ | –    | 31   | –    | dB         |
| NF       | noise figure   | band A; $R_L = 75 \Omega$ | –    | 7.5  | –    | dB         |
|          |  | band B; $R_L = 75 \Omega$ | –    | 6    | –    | dB         |
|          |  | band C; $R_L = 75 \Omega$ | –    | 7    | –    | dB         |
| $V_o$    | output voltage to get 1% cross modulation in channel | band A; $R_L = 75 \Omega$ | –    | 110  | –    | dB $\mu$ V |
|          |  | band B; $R_L = 75 \Omega$ | –    | 110  | –    | dB $\mu$ V |
|          |  | band C; $R_L = 75 \Omega$ | –    | 110  | –    | dB $\mu$ V |

#### Note

- The limits are related to the tank circuits used in Fig.17 and the intermediate frequency. Frequency bands may be adjusted by the choice of external components.

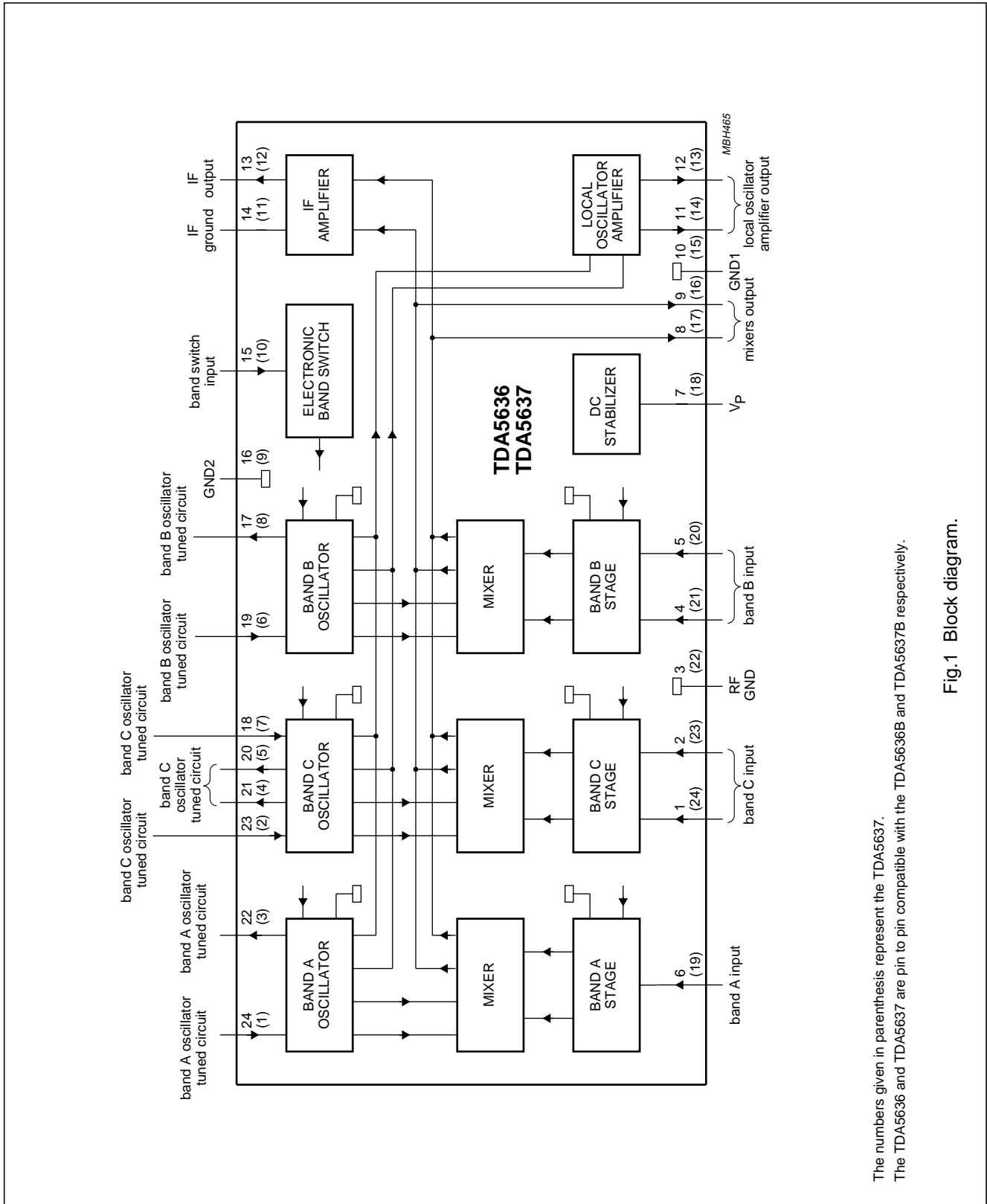
### ORDERING INFORMATION

| TYPE NUMBER | PACKAGE |   |          |
|-------------|---------|---|----------|
|             | NAME    | DESCRIPTION   | VERSION  |
| TDA5636T    | SO24    | plastic small outline package; 24 leads; body width 7.5 mm        | SOT137-1 |
| TDA5636M    | SSOP24  | plastic shrink small outline package; 24 leads; body width 5.3 mm | SOT340-1 |
| TDA5637T    | SO24    | plastic small outline package; 24 leads; body width 7.5 mm        | SOT137-1 |
| TDA5637M    | SSOP24  | plastic shrink small outline package; 24 leads; body width 5.3 mm | SOT340-1 |

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BLOCK DIAGRAM



The numbers given in parenthesis represent the TDA5637. The TDA5636 and TDA5637 are pin to pin compatible with the TDA5636B and TDA5637B respectively.

Fig.1 Block diagram.

## 9 V VHF, hyperband and UHF mixers- oscillators for TV and VCR 3-band tuners

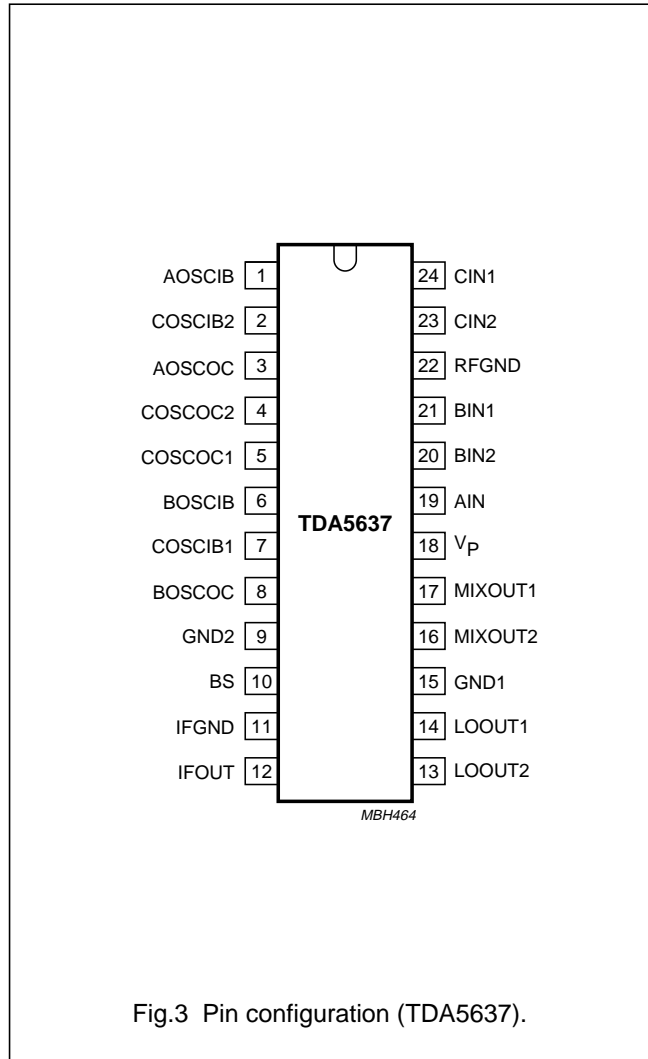
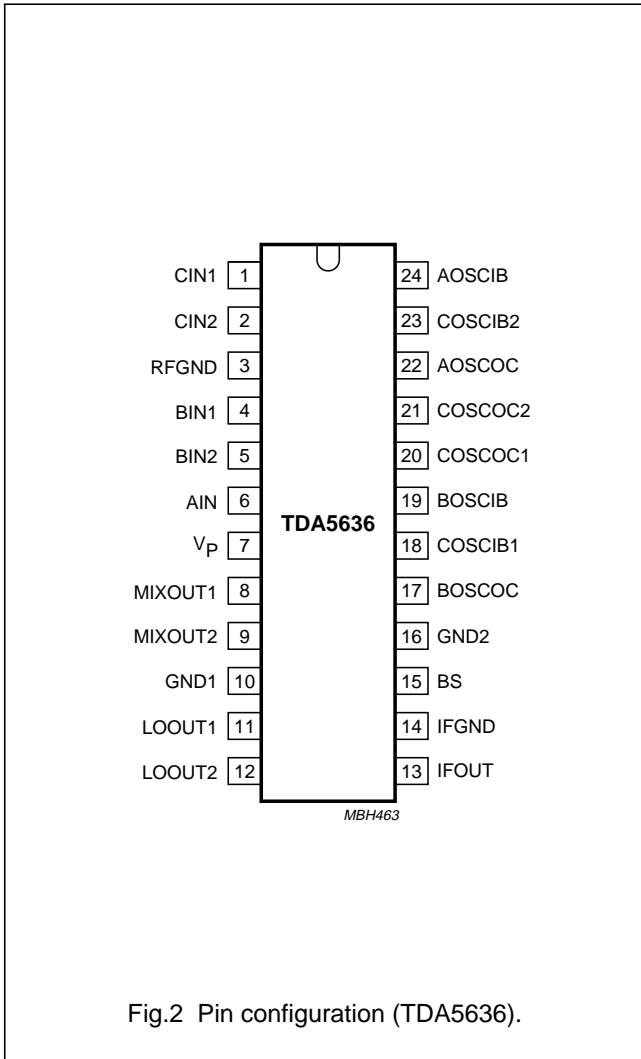
TDA5636; TDA5637

**PINNING**

| SYMBOL         | PIN     |         | DESCRIPTION                          |
|----------------|---------|---------|--------------------------------------|
|                | TDA5636 | TDA5637 |                                      |
| CIN1           | 1       | 24      | band C input 1                       |
| CIN2           | 2       | 23      | band C input 2                       |
| RFGND          | 3       | 22      | ground for RF inputs                 |
| BIN1           | 4       | 21      | band B input 1                       |
| BIN2           | 5       | 20      | band B input 2                       |
| AIN            | 6       | 19      | band A input                         |
| V <sub>P</sub> | 7       | 18      | supply voltage                       |
| MIXOUT1        | 8       | 17      | mixers output 1                      |
| MIXOUT2        | 9       | 16      | mixers output 2                      |
| GND1           | 10      | 15      | ground 1 (0 V)                       |
| LOOUT1         | 11      | 14      | local oscillator amplifier output 1  |
| LOOUT2         | 12      | 13      | local oscillator amplifier output 2  |
| IFOUT          | 13      | 12      | IF amplifier output                  |
| IFGND          | 14      | 11      | IF amplifier ground                  |
| BS             | 15      | 10      | electronic band switch input         |
| GND2           | 16      | 9       | ground 2 (0 V)                       |
| BOSCOC         | 17      | 8       | band B oscillator output collector   |
| COSCIB1        | 18      | 7       | band C oscillator input base 1       |
| BOSCIB         | 19      | 6       | band B oscillator input base         |
| COSCOC1        | 20      | 5       | band C oscillator output collector 1 |
| COSCOC2        | 21      | 4       | band C oscillator output collector 2 |
| AOSCOC         | 22      | 3       | band A oscillator output collector   |
| COSCIB2        | 23      | 2       | band C oscillator input base 2       |
| AOSCIB         | 24      | 1       | band A oscillator input base         |

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### LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL        | PARAMETER                             | MIN. | MAX.  | UNIT |
|---------------|---------------------------------------|------|-------|------|
| $V_P$         | supply voltage                        | -0.3 | +10.5 | V    |
| $V_{SW}$      | switching voltage                     | 0    | 10.5  | V    |
| $I_O$         | output current of each pin to ground  | -    | -10   | mA   |
| $t_{sc(max)}$ | maximum short-circuit time (all pins) | -    | 10    | s    |
| $T_{stg}$     | IC storage temperature                | -55  | +150  | °C   |
| $T_{amb}$     | operating ambient temperature         | -10  | +80   | °C   |
| $T_j$         | junction temperature                  | -    | +150  | °C   |

### THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER   | TYPICAL VALUE | UNIT |
|---------------|---|---------------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient in free air |               |      |
|               | SSOP  | 120           | K/W  |
|               | SO  | 75            | K/W  |

### HANDLING

#### Human Body Model

For TDA5636 GND (10, 16), RFGND (3), IFGND (14) and  $V_P$  (7) are separate.  
For TDA5637 GND (9, 15), RFGND (22), IFGND (11) and  $V_P$  (18) are separate.

All pins withstand 2000 V in accordance with the "UZW-BO/FQ-A302" specification equivalent to the "MIL-STD-883C" category B (2000 V).

#### Machine Model

All pins withstand 200 V in accordance with the "UZW-BO/FQ-B302 (issue date: Nov 6th, 1990)" specification.

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**CHARACTERISTICS** $V_P = 9\text{ V}$ ;  $T_{\text{amb}} = 25\text{ °C}$ ; measured in circuit of Fig.17; unless otherwise specified.

| SYMBOL                                       | PARAMETER                  | CONDITIONS  | MIN. | TYP. | MAX.  | UNIT                   |
|--|----------------------------|---|------|------|-------|------------------------|
| <b>Supply</b>                                |                            |   |      |      |       |                        |
| $V_P$  | supply voltage             |   | 8.1  | 9.0  | 9.9   | V                      |
| $I_P$  | supply current             | band A  | –    | 45   | 50.5  | mA                     |
|  |                            | band B  | –    | 41   | 46    | mA                     |
|  |                            | band C  | –    | 44   | 49    | mA                     |
| $V_{SW}$                                     | switching voltage          | band A  | 0    | –    | 1.1   | V                      |
|  |                            | band B  | 1.6  | –    | 2.4   | V                      |
|  |                            | band C  | 3.0  | –    | $V_P$ | V                      |
| $I_{SW}$                                     | switching current          | band A  | –    | –    | 2     | $\mu\text{A}$          |
|  |                            | band B  | –    | –    | 5     | $\mu\text{A}$          |
|  |                            | band C; $V_{SW(C)} = 5\text{ V}$  | –    | –    | 10    | $\mu\text{A}$          |
| <b>Band A mixer (including IF amplifier)</b> |                            |   |      |      |       |                        |
| $f_{RF}$                                     | frequency range            | note 1  | 45   | –    | 180   | MHz                    |
| $G_V$  | voltage gain               | $R_L = 75\ \Omega$ ; $f_{RF} = 50\text{ MHz}$ ; see Fig.4                                     | 17.5 | 20.0 | 22.5  | dB                     |
|  |                            | $R_L = 75\ \Omega$ ; $f_{RF} = 180\text{ MHz}$ ; see Fig.4                                    | 17.5 | 20.0 | 22.5  | dB                     |
| NF   | noise figure               | $R_L = 75\ \Omega$ ; $f_{RF} = 50\text{ MHz}$ ;<br>see Figs 5 and 6.                          | –    | 7.5  | 9.5   | dB                     |
|  |                            | $R_L = 75\ \Omega$ ; $f_{RF} = 180\text{ MHz}$ ;<br>see Figs 5 and 6.                         | –    | 7.5  | 9.5   | dB                     |
| $V_o$  | output voltage             | 1% cross-modulation in channel;<br>$R_L = 75\ \Omega$ ; $f_{RF} = 50\text{ MHz}$ ; see Fig.7  | 107  | 110  | –     | $\text{dB}\mu\text{V}$ |
|  |                            | 1% cross-modulation in channel;<br>$R_L = 75\ \Omega$ ; $f_{RF} = 180\text{ MHz}$ ; see Fig.7 | 107  | 110  | –     | $\text{dB}\mu\text{V}$ |
| $V_i$  | input voltage              | 10 kHz pulling in channel;<br>$f_{RF} = 180\text{ MHz}$ ; note 6                              | –    | 100  | –     | $\text{dB}\mu\text{V}$ |
| $g_{os}$                                     | optimum source conductance | $f_{RF} = 50\text{ MHz}$  | –    | 0.5  | –     | mS                     |
|  |                            | $f_{RF} = 180\text{ MHz}$   | –    | 1    | –     | mS                     |
| $Y_i$  | input admittance           | see Fig.12  | –    | –    | –     | mS                     |
| $C_i$  | input capacitance          | $f_{RF} = 50\text{ to }180\text{ MHz}$ ; see Fig.12   | –    | 2    | –     | pF                     |
| <b>Band A oscillator</b>                     |                            |   |      |      |       |                        |
| $f_{OSC}$                                    | frequency range            | note 2  | 80   | –    | 216   | MHz                    |
| $f_{\text{shift}}$                           | frequency shift            | $\Delta V_P = 10\%$ ; note 3  | –    | –    | 200   | kHz                    |
| $f_{\text{drift}}$                           | frequency drift            | $\Delta T = 25\text{ °C}$ with no compensation;<br>NP0 capacitors; note 4                     | –    | –    | 600   | kHz                    |
|  |                            | 5 s to 15 min after switching on; note 5  | –    | –    | 200   | kHz                    |



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| SYMBOL                                       | PARAMETER                                 | CONDITIONS  | MIN. | TYP. | MAX. | UNIT       |
|--|---|---|------|------|------|------------|
| <b>Band B mixer (including IF amplifier)</b> |   |   |      |      |      |            |
| $f_{RF}$                                     | frequency range                           | note 1  | 160  | –    | 470  | MHz        |
| $G_V$  | voltage gain                              | $R_L = 75 \Omega$ ; $f_{RF} = 170$ MHz; see Fig.8                                     | 28   | 31   | 34   | dB         |
|  |   | $R_L = 75 \Omega$ ; $f_{RF} = 470$ MHz; see Fig.8                                     | 28   | 31   | 34   | dB         |
| NF   | noise figure<br>(not corrected for image) | $R_L = 75 \Omega$ ; $f_{RF} = 170$ MHz; see Fig.9                                     | –    | 6.0  | 8.0  | dB         |
|  |   | $R_L = 75 \Omega$ ; $f_{RF} = 470$ MHz; see Fig.9                                     | –    | 7.0  | 9.0  | dB         |
| $V_o$  | output voltage                            | 1% cross-modulation in channel;<br>$R_L = 75 \Omega$ ; $f_{RF} = 170$ MHz; see Fig.10 | 107  | 110  | –    | dB $\mu$ V |
|  |   | 1% cross-modulation in channel;<br>$R_L = 75 \Omega$ ; $f_{RF} = 470$ MHz; see Fig.10 | 107  | 110  | –    | dB $\mu$ V |
| $V_i$  | input voltage                             | 10 kHz pulling in channel;<br>$f_{RF} = 470$ MHz; note 6                              | –    | 91   | –    | dB $\mu$ V |
|  | input voltage                             | $N + 5 - 1$ MHz pulling;<br>$f_{RF} = 430$ MHz; see Fig.11                            | –    | 77   | –    | dB $\mu$ V |
| $Z_i$  | input impedance<br>( $R_s + jL_s\omega$ ) | $f_{RF} = 170$ to 470 MHz; see Fig.13   | –    | 30   | –    | $\Omega$   |
|  |   | $f_{RF} = 170$ to 470 MHz; see Fig.13   | –    | 10   | –    | nH         |
| <b>Band B oscillator</b>                     |   |   |      |      |      |            |
| $f_{OSC}$                                    | frequency range                           | note 2  | 200  | –    | 500  | MHz        |
| $f_{shift}$                                  | frequency shift                           | $\Delta V_P = 10\%$ ; note 3  | –    | –    | 400  | kHz        |
| $f_{drift}$                                  | frequency drift                           | $\Delta T = 25$ °C with no compensation;<br>NP0 capacitors; note 4                    | –    | –    | 2    | MHz        |
|  |   | 5 s to 15 min after switching on; note 5  | –    | –    | 300  | kHz        |
| <b>Band C mixer (including IF amplifier)</b> |   |   |      |      |      |            |
| $f_{RF}$                                     | frequency range                           | note 1  | 430  | –    | 860  | MHz        |
| $G_V$  | voltage gain                              | $R_L = 75 \Omega$ ; $f_{RF} = 430$ MHz; see Fig.8                                     | 28   | 31   | 34   | dB         |
|  |   | $R_L = 75 \Omega$ ; $f_{RF} = 860$ MHz; see Fig.8                                     | 28   | 31   | 34   | dB         |
| NF   | noise figure<br>(not corrected for image) | $R_L = 75 \Omega$ ; $f_{RF} = 430$ MHz; see Fig.9                                     | –    | 7.0  | 9.0  | dB         |
|  |   | $R_L = 75 \Omega$ ; $f_{RF} = 860$ MHz; see Fig.9                                     | –    | 8.0  | 10.0 | dB         |
| $V_o$  | output voltage                            | 1% cross-modulation in channel;<br>$R_L = 75 \Omega$ ; $f_{RF} = 430$ MHz; see Fig.10 | 107  | 110  | –    | dB $\mu$ V |
|  |   | 1% cross-modulation in channel;<br>$R_L = 75 \Omega$ ; $f_{RF} = 860$ MHz; see Fig.10 | 107  | 110  | –    | dB $\mu$ V |
| $V_i$  | input voltage                             | 10 kHz pulling in channel;<br>$f_{RF} = 860$ MHz; note 6                              | –    | 93   | –    | dB $\mu$ V |
|  | input voltage                             | $N + 5 - 1$ MHz pulling;<br>$f_{RF} = 820$ MHz; see Fig.11                            | –    | 79   | –    | dB $\mu$ V |
| $Z_i$  | input impedance<br>( $R_s + jL_s\omega$ ) | $f_{RF} = 430$ to 860 MHz; see Fig.14   | –    | 40   | –    | $\Omega$   |
|  |   | $f_{RF} = 430$ to 860 MHz; see Fig.14   | –    | 10   | –    | nH         |

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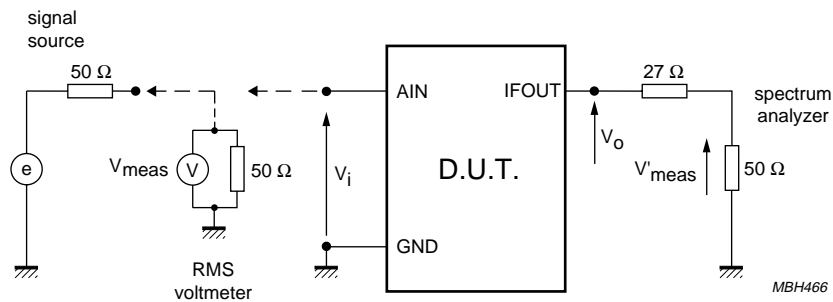
| SYMBOL                   | PARAMETER   | CONDITIONS  | MIN. | TYP.  | MAX. | UNIT                   |
|--------------------------|---|---|------|-------|------|------------------------|
| <b>Band C oscillator</b> |   |   |      |       |      |                        |
| $f_{OSC}$                | frequency range   | note 2  | 470  | –     | 900  | MHz                    |
| $f_{shift}$              | frequency shift   | $\Delta V_P = 10\%$ ; note 3                                    | –    | –     | 500  | kHz                    |
| $f_{drift}$              | frequency drift   | $\Delta T = 25\text{ }^\circ\text{C}$ with compensation; note 4 | –    | –     | 1400 | kHz                    |
|                          |   | 5 s to 15 min after switching on; note 5                        | –    | –     | 400  | kHz                    |
| <b>LO output</b>         |   |   |      |       |      |                        |
| $S_{22}$                 | output reflection coefficient                                 | see Fig.16  | –    | –     | –    |                        |
| $Y_O$                    | output admittance ( $Y_p + j\omega C_p$ )                     | see Fig.16  | –    | 400   | –    | $\Omega$               |
|                          |   | see Fig.16  | –    | 0.7   | –    | pF                     |
| $V_o$                    | output voltage  | $R_L = 50\ \Omega$  | 83   | 91    | 100  | $\text{dB}\mu\text{V}$ |
| SRF                      | spurious signal on LO output with respect to LO output signal | $R_L = 50\ \Omega$ ; note 7                                     | –    | –     | –10  | dBc                    |
| HLO                      | LO signal harmonics with respect to LO signal                 | $R_L = 50\ \Omega$  | –    | –     | –10  | dBc                    |
| <b>IF amplifier</b>      |   |   |      |       |      |                        |
| $S_{22}$                 | output reflection coefficient                                 | magnitude; through 1 nF; see Fig.15                             | –    | –14.5 | –    | dB                     |
|                          |   | phase; through 1 nF; see Fig.15                                 | –    | 5.5   | –    | deg.                   |
| $Z_o$                    | output impedance ( $R_s + j\omega L_s$ )                      | $R_s$ ; through 1 nF  | –    | 73    | –    | $\Omega$               |
|                          |   | $L_s$ ; through 1 nF  | –    | 12    | –    | nH                     |

**Notes**

- The RF frequency range is defined by the oscillator frequency range and the intermediate frequency.
- Limits are related to the tank circuits used in Fig.17; frequency bands may be adjusted by the choice of external components.
- The frequency shift is defined as the change in oscillator frequency when the supply voltage varies from  $V_P = 9$  to 8.1 V or from  $V_P = 9$  to 9.9 V.
- The frequency drift is defined as the change in oscillator frequency when the ambient temperature varies from  $T_{amb} = 25$  to 0  $^\circ\text{C}$  or from  $T_{amb} = 25$  to 50  $^\circ\text{C}$ .
- Switching on drift is defined as the change in oscillator frequency between 5 s and 15 min after switching on.
- The input level causing 10 kHz frequency detuning at the LO output;  $f_{OSC} = f_{RF} + 38.9$  MHz.
- SRF: spurious signal on LO with respect to LO output signal:
  - RF level = 120  $\text{dB}\mu\text{V}$  at  $f_{RF} < 180$  MHz
  - RF level = 107.5  $\text{dB}\mu\text{V}$  at  $f_{RF} = 180$  to 225 MHz
  - RF level = 97  $\text{dB}\mu\text{V}$  at  $f_{RF} = 225$  to 860 MHz.

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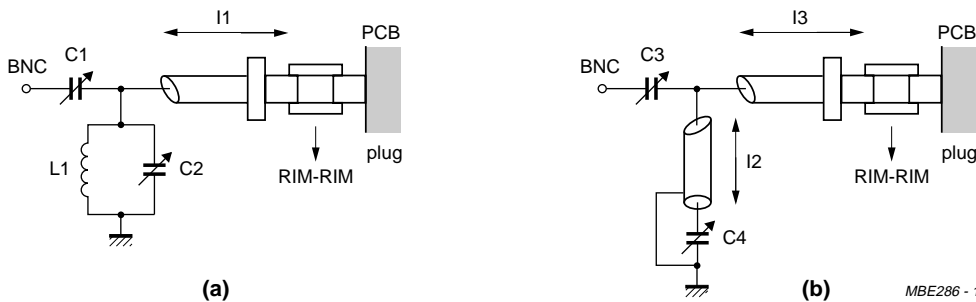


$$Z_i(\text{AIN}) \gg 50 \Omega \Rightarrow V_i = 2 \times V_{\text{meas}}$$

$$V_o = V'_{\text{meas}} \times \left( \frac{50 + 27}{50} \right)$$

$$G_v = 20 \log \frac{V_o}{V_i}$$

Fig.4 Band A gain measurement.



(a) For  $f_{RF} = 50 \text{ MHz}$ :

mixer A frequency response measured = 57 MHz, loss = 0 dB.

image suppression = 16 dB.

C1 = 9 pF.

C2 = 15 pF.

L1 = 7 turns (diameter. = 5.5 mm, wire diameter. = 0.5 mm).

I1 = semi rigid cable (RIM): 5 cm long

(semi rigid cable (RIM); 33 dB/100 m; 50 Ω; 96 pF/m).

(b) For  $f_{RF} = 150 \text{ MHz}$ :

mixer A frequency response measured = 150.3 MHz, loss = 1.3 dB.

image suppression = 13 dB.

C3 = 5 pF.

C4 = 25 pF.

I2 = semi rigid cable (RIM): 30 cm long.

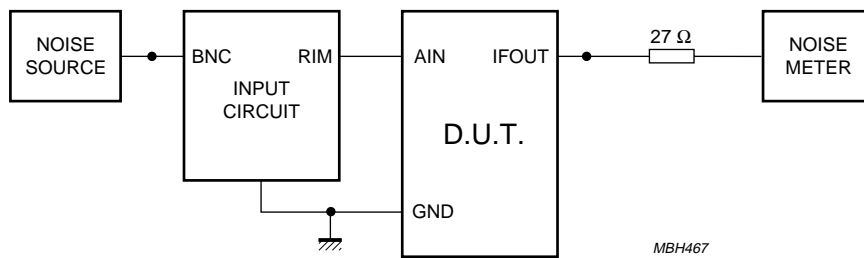
I3 = semi rigid cable (RIM): 5 cm long

(semi rigid cable (RIM); 33 dB/100 m; 50 Ω; 96 pF/m).

Fig.5 Input circuit for optimum noise figure in band A.

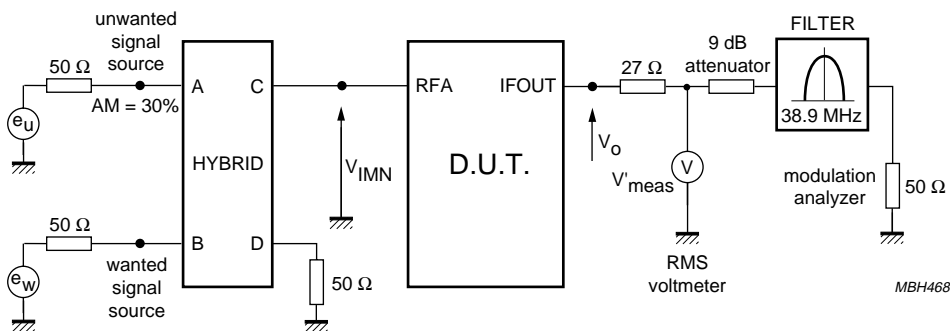
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Input circuit as shown in Fig.5.  
 $NF = NF_{meas} - loss_{(input\ circuit)}\text{ dB.}$

Fig.6 Noise figure measurement in band A.



Wanted output signal at  $f_{RFW}$ ;  $V_{ow} = 100\text{ dB}\mu\text{V.}$

We measure the level of the unwanted signal  $V_{ou}$  causing 0.3 % AM modulation in the wanted output signal;  $V_{ou} = V'_{meas} \times \left(\frac{50 + 27}{50}\right).$

$f_{RFW} = 50\text{ MHz, } f_{RFU} = 55.5\text{ MHz, } f_{OSC} = 88.9\text{ MHz.}$

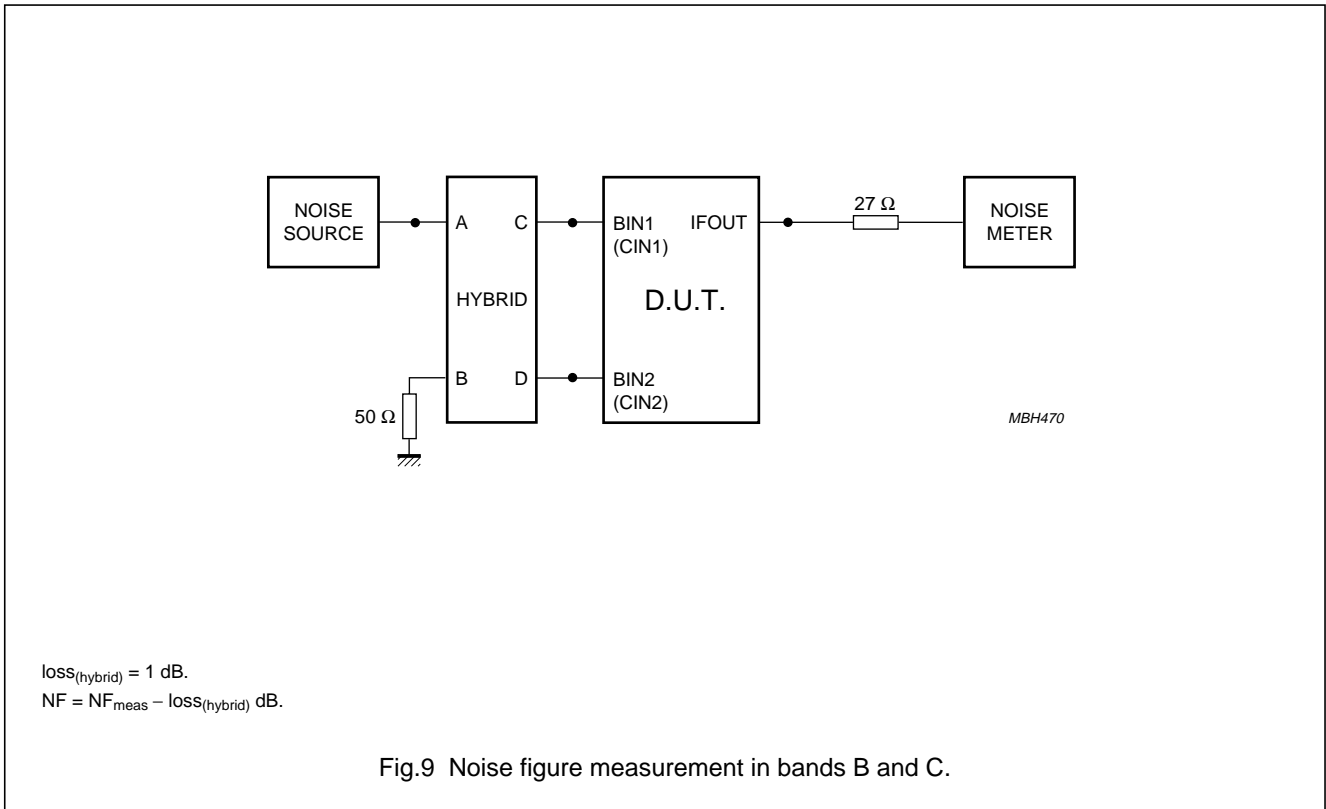
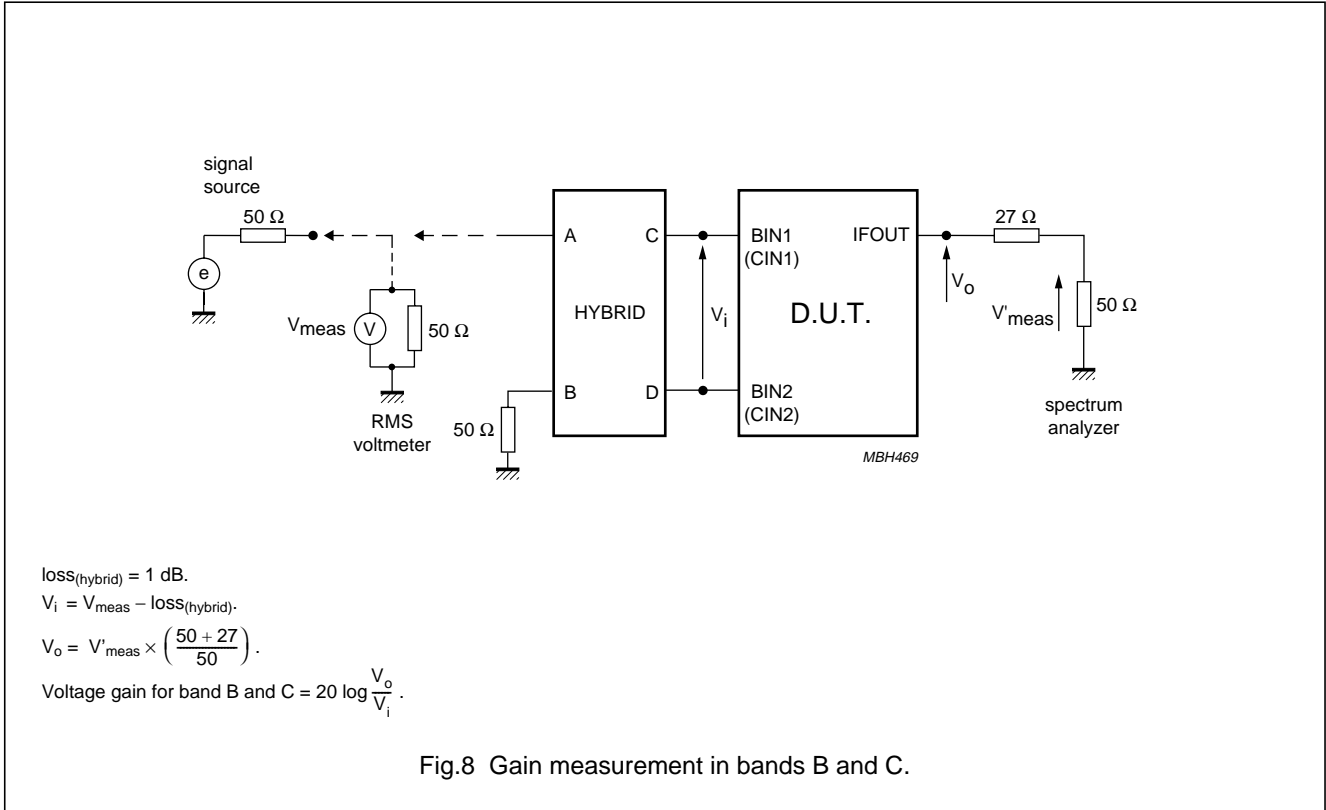
$f_{RFW} = 180\text{ MHz, } f_{RFU} = 185.5\text{ MHz, } f_{OSC} = 218.9\text{ MHz.}$

Filter characteristics:  $f_c = 38.9\text{ MHz, } f_{-3\text{dB}} = 1.2\text{ MHz, } f_{-30\text{dB}} = 2.64\text{ MHz.}$

Fig.7 Cross modulation measurement in band A.

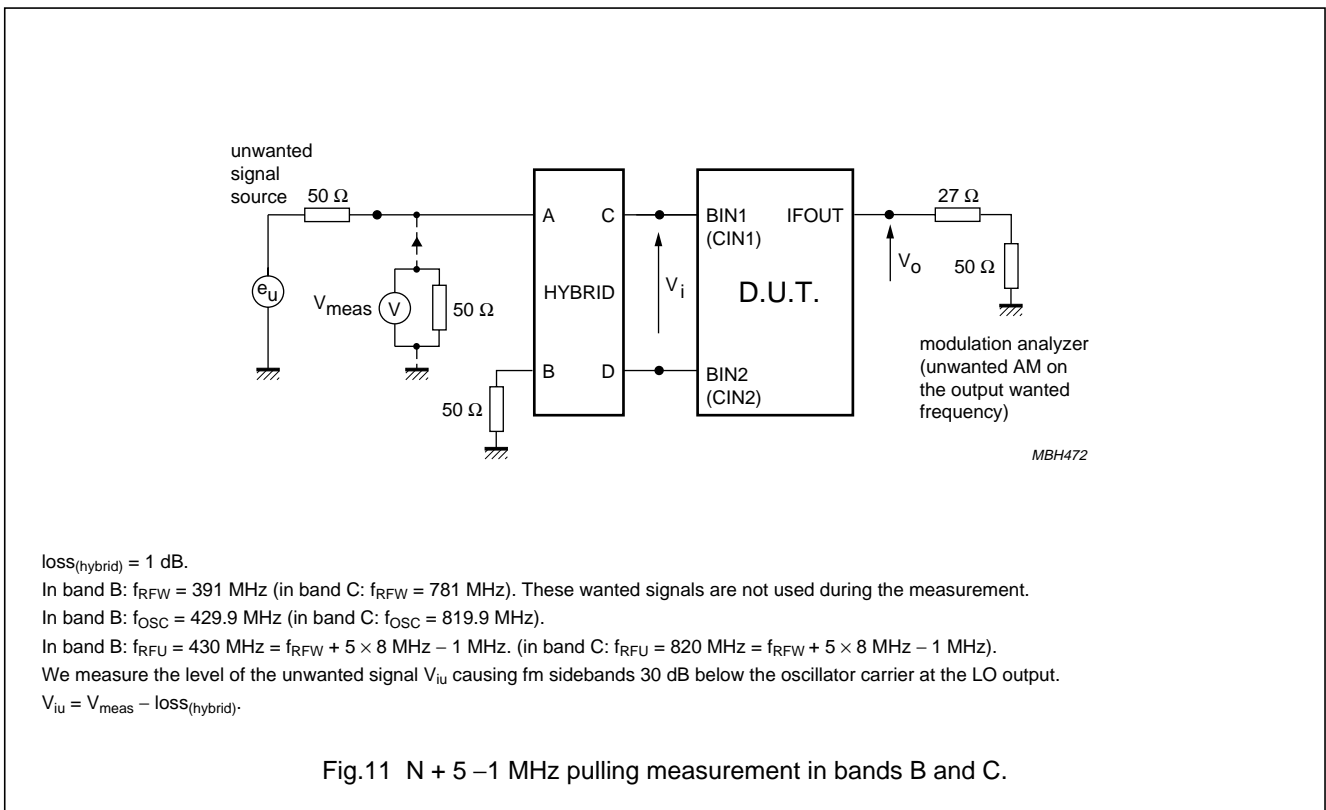
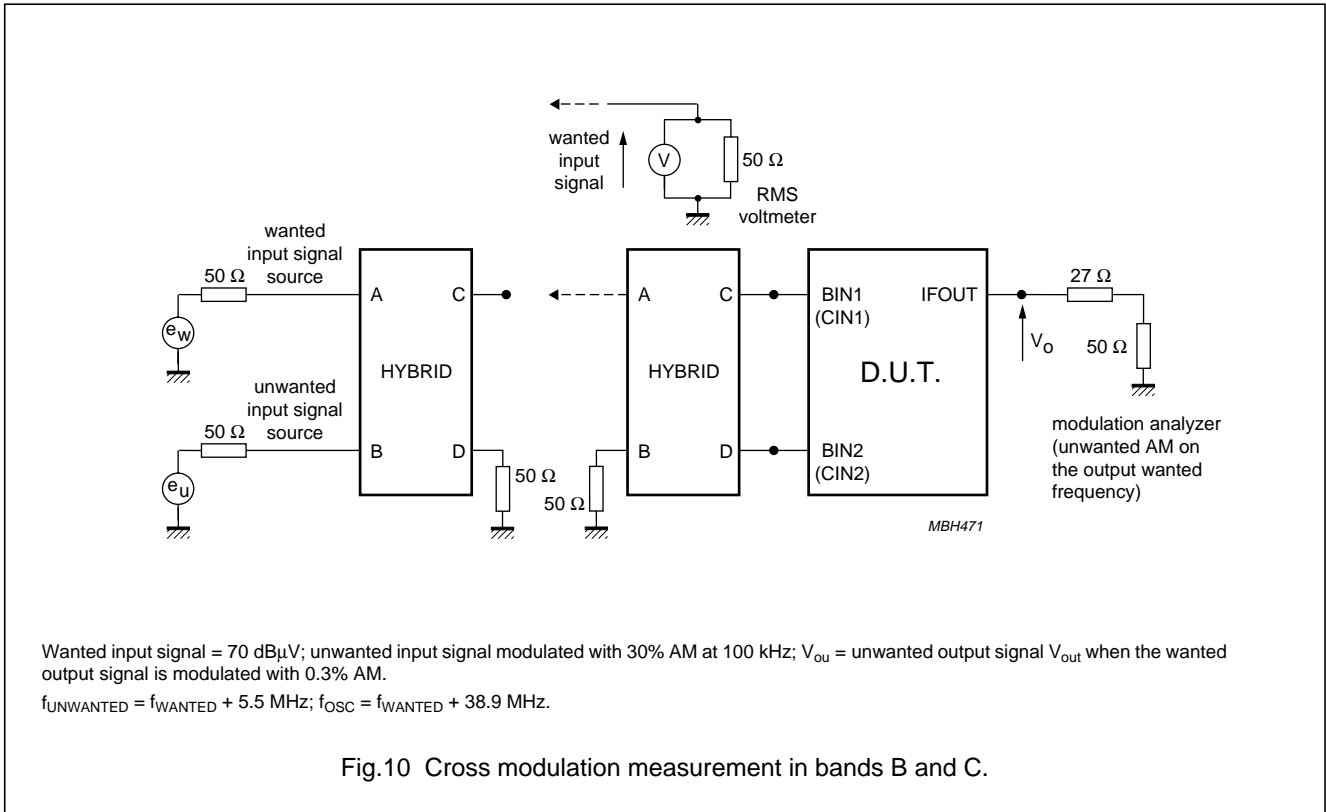
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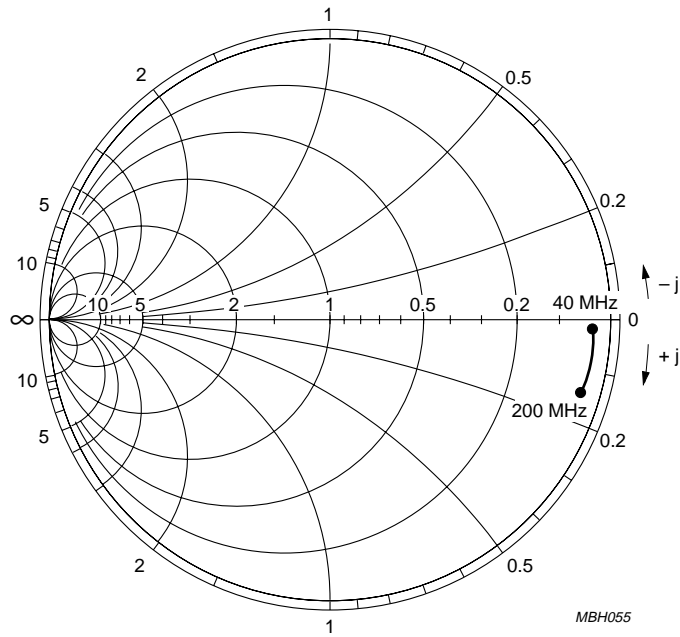


Fig.12 Input admittance ( $S_{11}$ ) of the band A mixer input (40 to 200 MHz);  $Y_o = 20 \text{ mS}$ .

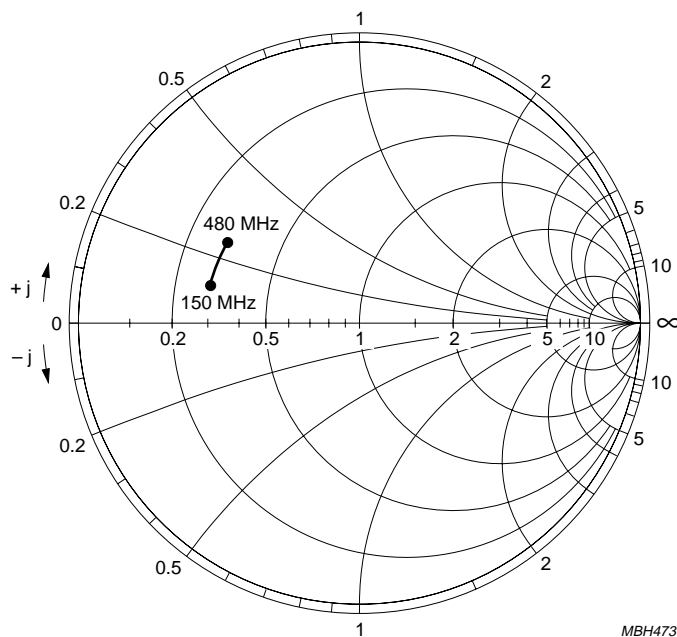


Fig.13 Input impedance ( $S_{11}$ ) of the band B mixer input (150 to 480 MHz);  $Z_o = 100 \Omega$ .

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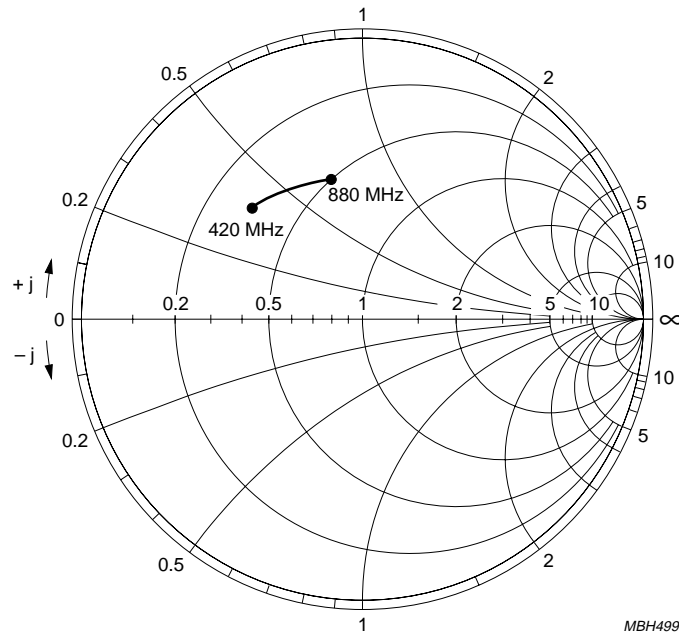


Fig.14 Input impedance ( $S_{11}$ ) of the band C mixer input (420 to 880 MHz);  $Z_0 = 100 \Omega$ .

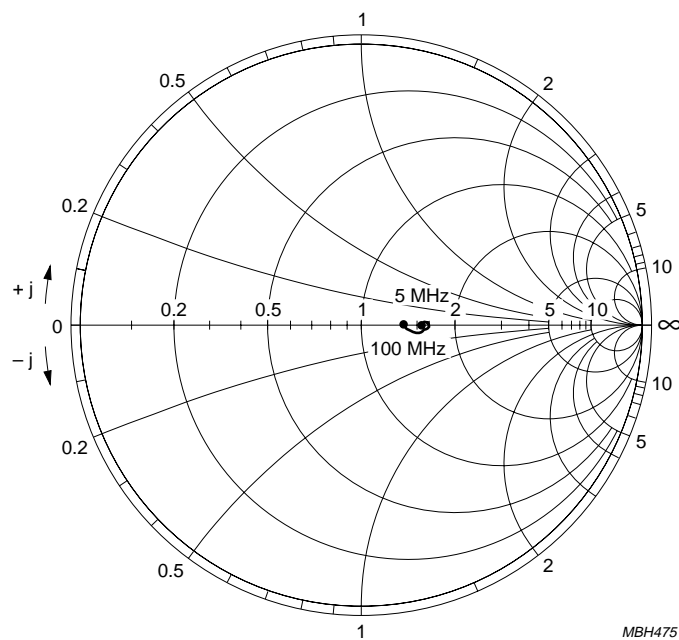


Fig.15 Output impedance ( $S_{22}$ ) of the IF amplifier (20 to 60 MHz);  $Z_0 = 50 \Omega$ .



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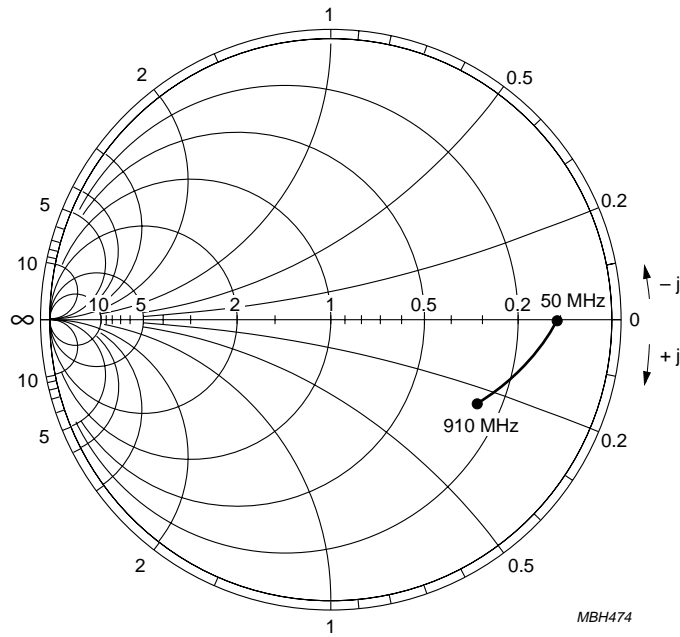
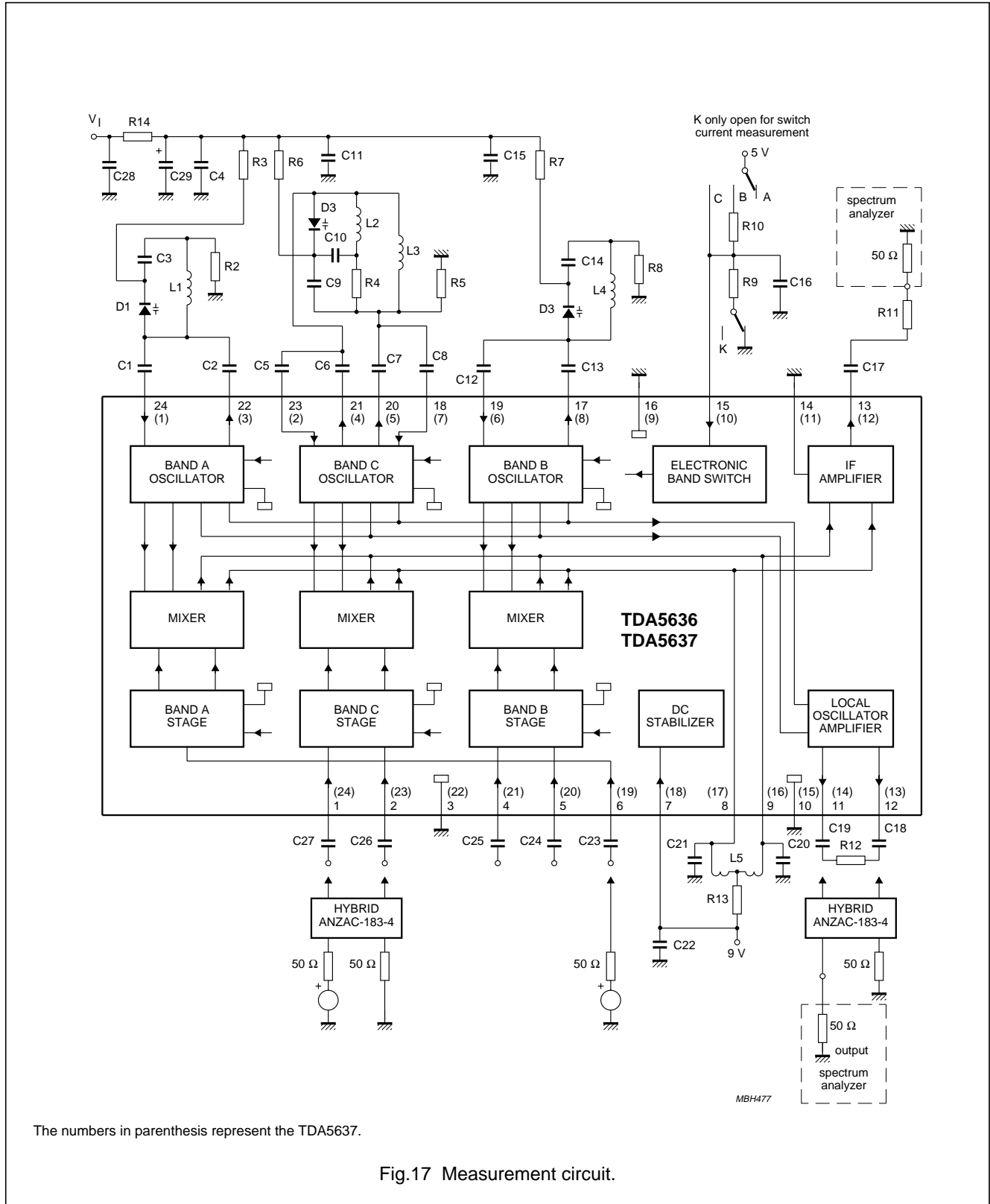


Fig.16 Output admittance ( $S_{22}$ ) of the LO amplifier (50 to 910 MHz);  $Y_o = 20 \text{ mS}$ .

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APPLICATION INFORMATION



# 9 V VHF, hyperband and UHF mixers-oscillators for TV and VCR 3-band tuners

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## Application diagram component values

**Table 1** Capacitors  
(all SMD and NP0 except C5 to C9 and C29)

| NUMBER | VALUE                                   |
|--------|---|
| C1     | 2 pF                                    |
| C2     | 2 pF                                    |
| C3     | 82 pF                                   |
| C4     | 2.2 nF                                  |
| C5     | 1 pF (N750)                             |
| C6     | 1 pF (N750)                             |
| C7     | 1 pF (N750)                             |
| C8     | 1 pF (N750)                             |
| C9     | 6 pF (N470)                             |
| C10    | 100 pF                                  |
| C11    | 2.2 nF                                  |
| C12    | 2 pF                                    |
| C13    | 4 pF                                    |
| C14    | 150 pF                                  |
| C15    | 2.2 nF                                  |
| C16    | 1.2 nF                                  |
| C17    | 1 nF                                    |
| C18    | 1 nF                                    |
| C19    | 1 nF                                    |
| C20    | 12 pF                                   |
| C21    | 12 pF                                   |
| C22    | 22 nF                                   |
| C23    | 1 nF                                    |
| C24    | 1 nF                                    |
| C25    | 1 nF                                    |
| C26    | 1 nF                                    |
| C27    | 1 nF                                    |
| C28    | 2.2 nF                                  |
| C29    | 1 $\mu$ F (40 V electrolytic capacitor) |

**Table 2** Resistors (all SMD)

| NUMBER | VALUE          |
|--------|----------------|
| R2     | 22 $\Omega$    |
| R3     | 47 k $\Omega$  |
| R4     | 2.2 k $\Omega$ |
| R5     | 22 k $\Omega$  |
| R6     | 47 k $\Omega$  |
| R7     | 47 k $\Omega$  |
| R8     | 12 $\Omega$    |
| R9     | 15 k $\Omega$  |
| R10    | 33 k $\Omega$  |
| R11    | 27 $\Omega$    |
| R12    | 100 $\Omega$   |
| R13    | 150 $\Omega$   |
| R14    | 47 k $\Omega$  |

**Table 3** Diodes, coils and transformers

| NUMBER                           | VALUE                           |
|----------------------------------|---------------------------------|
| <b>Diodes</b>                    |                                 |
| D1                               | BB132                           |
| D2                               | BB134                           |
| D3                               | BB146                           |
| <b>Coils<sup>(1)</sup></b>       |                                 |
| L1                               | 8 turns ( $\varnothing$ 3 mm)   |
| L2                               | 2 turns ( $\varnothing$ 2.5 mm) |
| L3                               | 3 turns ( $\varnothing$ 2.5 mm) |
| L4                               | 2 turns ( $\varnothing$ 4 mm)   |
| <b>Transformer<sup>(2)</sup></b> |                                 |
| L5                               | 2 $\times$ 6 turns              |

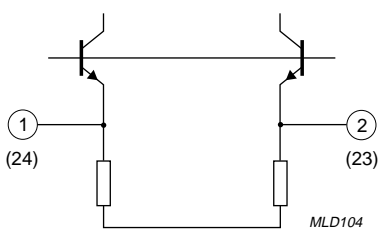
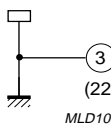
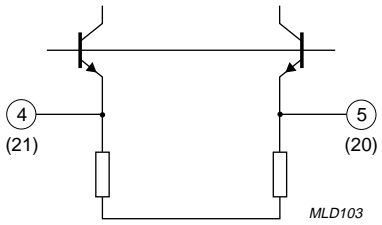
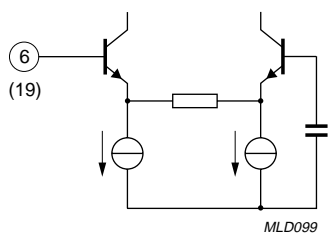

### Notes

- Wire size for L1 to L4 is 0.4 mm.
- Coil type: TOKO 7KN; material: 113 KN, screw core: 03-0093, pot core: 04-0026.

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INTERNAL PIN CONFIGURATION

| SYMBOL         | PIN      |          | DESCRIPTION  | AVERAGE DC VOLTAGE <sup>(1)</sup> IN (V) |        |        |
|----------------|----------|----------|--|--|--------|--------|
|                | TDA5636B | TDA5637B |  | BAND A                                   | BAND B | BAND C |
| CIN1           | 1        | 24       |     | 0  | 0      | 2.2    |
| CIN2           | 2        | 23       |  | 0  | 0      | 2.2    |
| RFGND          | 3        | 22       |    | 0  | 0      | 0      |
| BIN1           | 4        | 21       |   | 0  | 2.2    | 0      |
| BIN2           | 5        | 20       |  | 0  | 2.2    | 0      |
| AIN            | 6        | 19       |   | 2.2                                      | 1.2    | 1.2    |
| V <sub>P</sub> | 7        | 18       | supply voltage   | 9.0                                      | 9.0    | 9.0    |
| MIXOUT1        | 8        | 17       |  | 8.4                                      | 8.4    | 8.4    |
| MIXOUT2        | 9        | 16       |  | 8.4                                      | 8.4    | 8.4    |


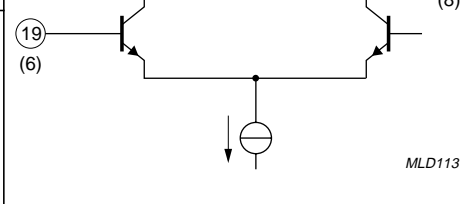
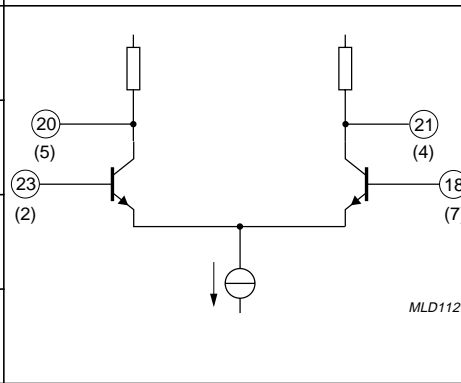

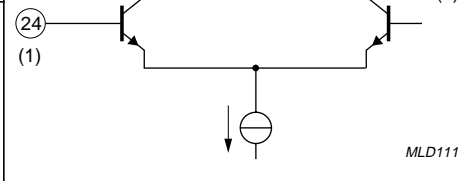
9 V VHF, hyperband and UHF mixers-oscillators for TV and VCR 3-band tuners

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| SYMBOL | PIN      |          | DESCRIPTION | AVERAGE DC VOLTAGE <sup>(1)</sup> IN (V) |             |             |
|--------|----------|----------|-------------|--|-------------|-------------|
|        | TDA5636B | TDA5637B |             | BAND A                                   | BAND B      | BAND C      |
| GND1   | 10       | 15       |             | 0  | 0           | 0           |
| GND2   | 16       | 9        |             | 0  | 0           | 0           |
| LOOUT1 | 11       | 14       |             | 5.6                                      | 5.6         | 5.6         |
| LOOUT2 | 12       | 13       |             | 5.6                                      | 5.6         | 5.6         |
| IFOUT  | 13       | 12       |             | 4.4                                      | 4.4         | 4.4         |
| IFGND  | 14       | 11       |             | 0.0                                      | 0.0         | 0.0         |
| BS     | 15       | 10       |             | $V_{SW(A)}$                              | $V_{SW(B)}$ | $V_{SW(C)}$ |

9 V VHF, hyperband and UHF mixers-oscillators for TV and VCR 3-band tuners

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| SYMBOL  | PIN      |          | DESCRIPTION  | AVERAGE DC VOLTAGE <sup>(1)</sup> IN (V) |        |        |
|---------|----------|----------|--|--|--------|--------|
|         | TDA5636B | TDA5637B |  | BAND A                                   | BAND B | BAND C |
| BOSCOB  | 17       | 8        |    | 5.8                                      | 3.4    | 5.8    |
| BOSCIB  | 19       | 6        |    | 1.2                                      | 2.3    | 1.2    |
| COSCIB1 | 18       | 7        |   | 1.4                                      | 1.4    | 2.3    |
| COSCOC1 | 20       | 5        |  | 5.8                                      | 5.8    | 4.2    |
| COSCOC2 | 21       | 4        |  | 5.8                                      | 5.8    | 4.2    |
| COSCIB2 | 23       | 2        |  | 1.4                                      | 1.4    | 2.3    |
| AOSCOB  | 22       | 3        |  | 3.8                                      | 5.8    | 5.8    |
| AOSCIB  | 24       | 1        |  | 2.1                                      | 1.0    | 1.0    |

**Note**

1. Average DC voltage measured in circuit of Fig.17.

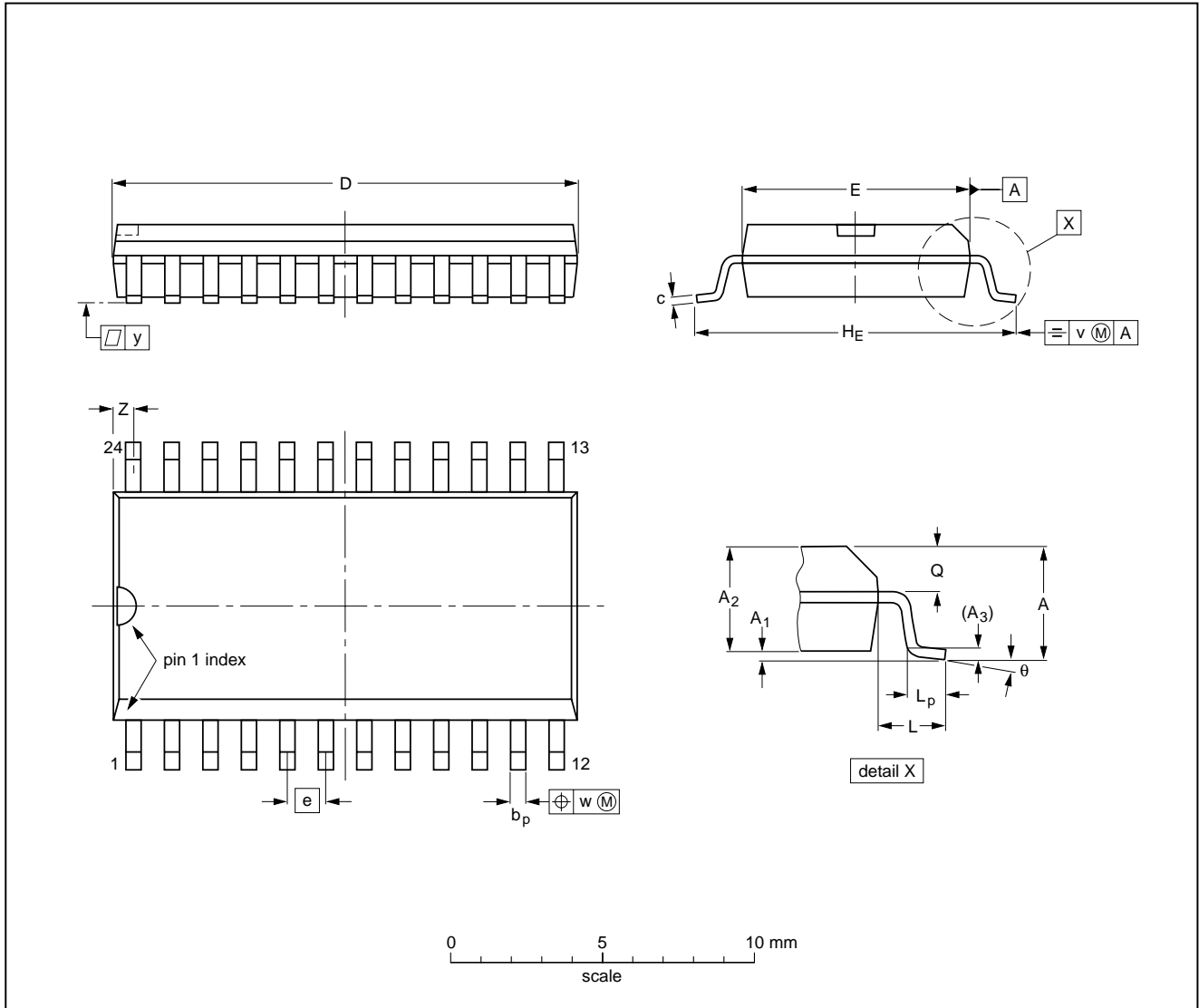
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PACKAGE OUTLINES

SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e     | H <sub>E</sub> | L     | L <sub>p</sub> | Q              | v    | w    | y     | z <sup>(1)</sup> | θ        |
|--------|--------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm     | 2.65   | 0.30<br>0.10   | 2.45<br>2.25   | 0.25           | 0.49<br>0.36   | 0.32<br>0.23   | 15.6<br>15.2     | 7.6<br>7.4       | 1.27  | 10.65<br>10.00 | 1.4   | 1.1<br>0.4     | 1.1<br>1.0     | 0.25 | 0.25 | 0.1   | 0.9<br>0.4       | 8°<br>0° |
| inches | 0.10   | 0.012<br>0.004 | 0.096<br>0.089 | 0.01           | 0.019<br>0.014 | 0.013<br>0.009 | 0.61<br>0.60     | 0.30<br>0.29     | 0.050 | 0.419<br>0.394 | 0.055 | 0.043<br>0.016 | 0.043<br>0.039 | 0.01 | 0.01 | 0.004 | 0.035<br>0.016   |          |

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

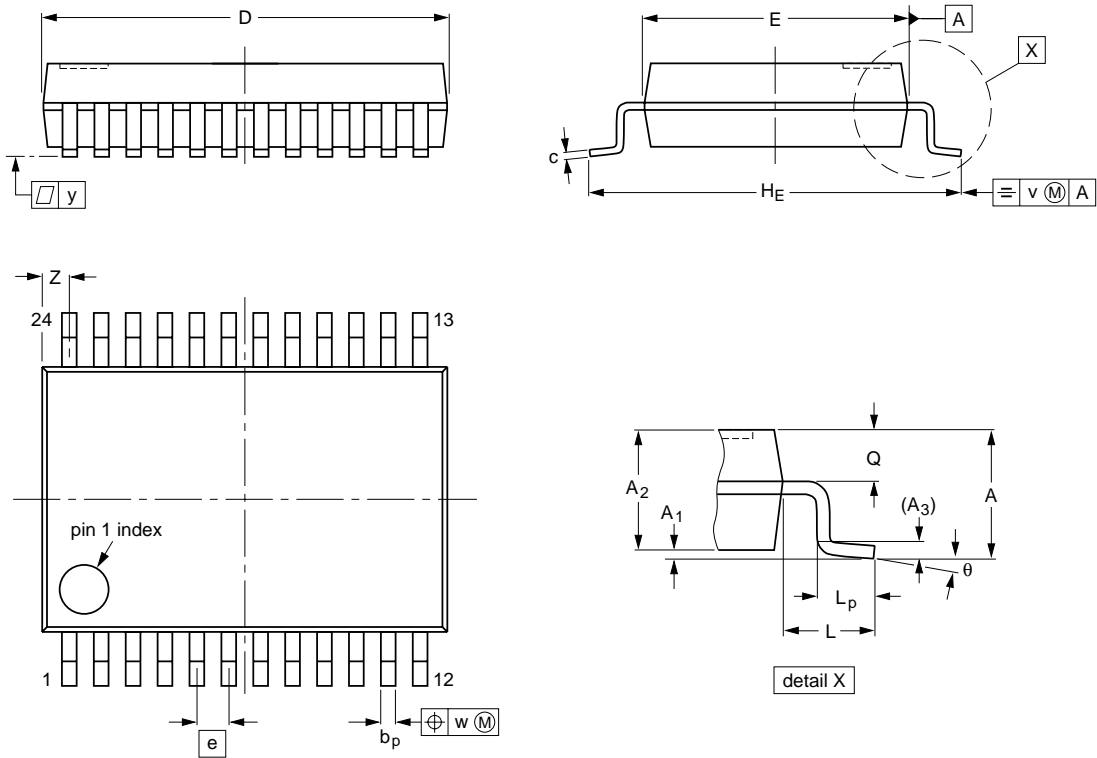
| OUTLINE VERSION | REFERENCES |          |      | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |                     |                      |
| SOT137-1        | 075E05     | MS-013AD |      |                     | 95-01-24<br>97-05-22 |

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SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c            | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | H <sub>E</sub> | L    | L <sub>p</sub> | Q          | v   | w    | y   | z <sup>(1)</sup> | θ        |
|------|--------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|------|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 2.0    | 0.21<br>0.05   | 1.80<br>1.65   | 0.25           | 0.38<br>0.25   | 0.20<br>0.09 | 8.4<br>8.0       | 5.4<br>5.2       | 0.65 | 7.9<br>7.6     | 1.25 | 1.03<br>0.63   | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 0.8<br>0.4       | 8°<br>0° |

Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES |          |      |  | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|----------|------|--|---------------------|----------------------|
|                 | IEC        | JEDEC    | EIAJ |  |                     |                      |
| SOT340-1        |            | MO-150AG |      |  |                     | 93-09-08<br>95-02-04 |



## 9 V VHF, hyperband and UHF mixers-oscillators for TV and VCR 3-band tuners

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### SOLDERING

#### Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our "IC Package Databook" (order code 9398 652 90011).

#### Reflow soldering

Reflow soldering techniques are suitable for all SO and SSOP packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

#### Wave soldering

##### SO

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

##### SSOP

Wave soldering is **not** recommended for SSOP packages. This is because of the likelihood of solder bridging due to closely-spaced leads and the possibility of incomplete solder penetration in multi-lead devices.

**If wave soldering cannot be avoided, the following conditions must be observed:**

- **A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.**
- **The longitudinal axis of the package footprint must be parallel to the solder flow and must incorporate solder thieves at the downstream end.**

**Even with these conditions, only consider wave soldering SSOP packages that have a body width of 4.4 mm, that is SSOP16 (SOT369-1) or SSOP20 (SOT266-1).**

##### METHOD (SO AND SSOP)

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

#### Repairing soldered joints

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

## 9 V VHF, hyperband and UHF mixers- oscillators for TV and VCR 3-band tuners

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### DEFINITIONS

|   |   |
|---|---|
| <b>Data sheet status</b>  |   |
| Objective specification   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification   | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification   | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>  |   |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |   |
| <b>Application information</b>  |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

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These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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