DATA SHEET

TDA5636B; TDA5637B
9 V VHF hyperband and UHF mixer/oscillator for TV and VCR 3-band tuners

Product specification
Supersedes data of 1995 August 01
File under Integrated Circuits, IC02

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Philips Semiconductors

PHILIPS

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 the SAW filter directly
- 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 TDA5636; TDA5637 family (same function with asymmetrical IF output).

APPLICATIONS

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

GENERAL DESCRIPTION

The TDA5636B and TDA5637B 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 TDA5636/TDA5737 family which has exactly the same function with an IF amplifier having an asymmetrical IF output to drive a 75 Ω load. It is possible to build tuners with either an asymmetrical or a symmetrical IF output with one main tuner lay-out.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	supply voltage		–	9.0	–	V
I_P	supply current	band A	–	43	–	mA
		band B	–	39	–	mA
		band C	–	42	–	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	–	25	–	dB
		band B	–	36	–	dB
		band C	–	36	–	dB
NF	noise figure	band A	–	7.5	–	dB
		band B	–	6	–	dB
		band C	–	7	–	dB
V_o	output voltage to get 1% cross modulation in channel	band A	–	121	–	dBμV
		band B	–	120	–	dBμV
		band C	–	119	–	dBμV

Note

1. 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.

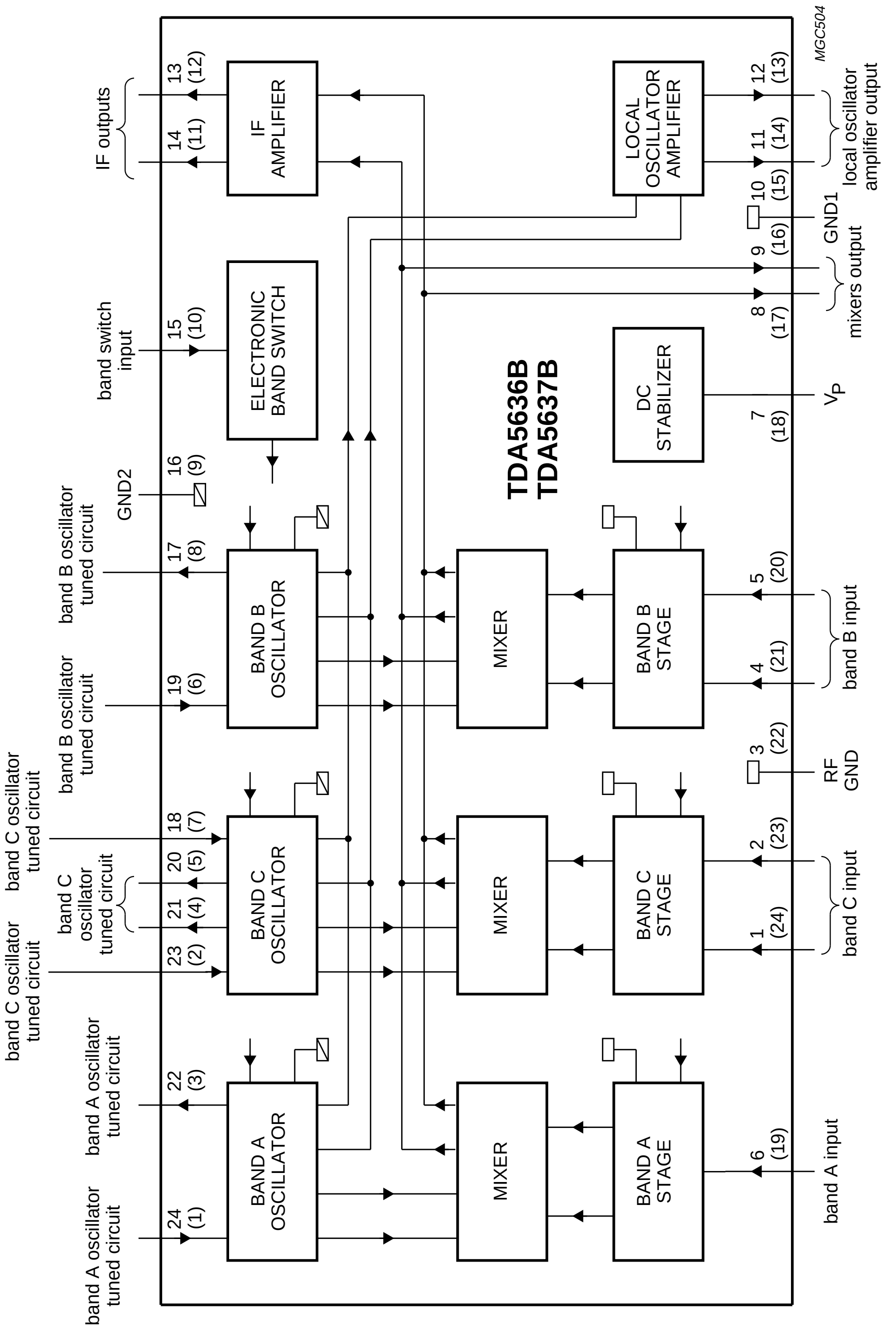
ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA5636BT(1)	SO24	plastic small outline package; 24 leads; body width 7.5 mm	SOT137-1
TDA5636BM	SSOP24	plastic shrink small outline package; 24 leads; body width 5.3 mm	SOT340-1
TDA5637BT	SO24	plastic small outline package; 24 leads; body width 7.5 mm	SOT137-1
TDA5637BM	SSOP24	plastic shrink small outline package; 24 leads; body width 5.3 mm	SOT340-1

Note

1. The TDA5636BT is available on request.

BLOCK DIAGRAM



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

Fig.1 Block diagram.

PINNING

SYMBOL	PIN		DESCRIPTION
	TDA5636B	TDA5637B	
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_P	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
IFOUT1	13	12	IF amplifier output 1
IFOUT2	14	11	IF amplifier output 2
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

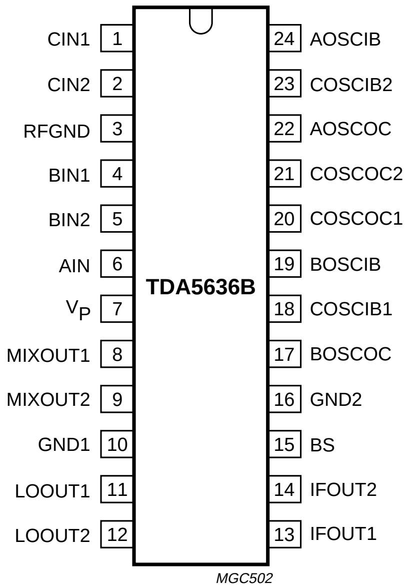


Fig.2 Pin configuration (TDA5636B).

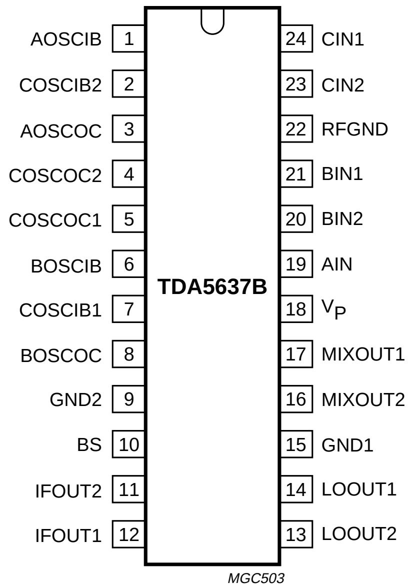


Fig.3 Pin configuration (TDA5637B).

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

HANDLING

Human Body Model:

- For TDA5636B GND (10) (16), RFGND (3), and V_P (7) are separate.
- For TDA5637B GND (9) (15), RFGND (22), and V_P (18) are separate.

All pins withstand 2000 V in accordance with the *“UZW-B0/FQ-A302”* specification equivalent to the *“MIL-STD-883C”* category B (2000 V); R = 1500 Ω; C = 100 pF.

Machine Model:

- For TDA5636B GND (10) (16), RFGND (3), and V_P (7) are separate.
- For TDA5637B GND (9) (15), RFGND (22), and V_P (18) are separate.

All pins withstand 175 V in accordance with the *“UZW-B0/FQ-A302”* specification (date of issue: Nov 6th, 1990); R = 0 Ω; C = 200 pF.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air		
	SSOP24	120	K/W
	SO24	75	K/W

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_P	supply voltage		8.1	9.0	9.9	V
I_P	supply current	band A	–	43	48	mA
		band B	–	39	44	mA
		band C	–	42	47	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	μA
		band B	–	–	5	μA
		band C; $V_{SW(C)}$ = 5 V	–	–	10	μA
Band A mixer (including IF amplifier)						
f_{RF}	RF frequency	note 1	45	–	180	MHz
G_v	voltage gain	f_{RF} = 50 MHz; see Fig.4; note 2	22.5	25.0	27.5	dB
		f_{RF} = 180 MHz; see Fig.4; note 2	22.5	25.0	27.5	dB
NF	noise figure	f_{RF} = 50 MHz; see Figs 5 and 6	–	7.5	9.5	dB
		f_{RF} = 180 MHz; see Figs 5 and 6	–	7.5	9.5	dB
V_o	output voltage	1% cross modulation in channel; f_{RF} = 50 MHz; see Fig.7	118	121	–	dBμV
		1% cross modulation in channel; f_{RF} = 180 MHz; see Fig.7	119	122	–	dBμV
V_i	input voltage	10 kHz pulling in channel; f_{RF} = 180 MHz; note 3	–	104	–	dBμV
g_{os}	optimum source conductance	f_{RF} = 50 MHz	–	0.5	–	mS
		f_{RF} = 180 MHz	–	1	–	mS
Y_i	input admittance	see Fig.12	–	–	–	mS
C_i	input capacitance	f_{RF} = 50 to 180 MHz; see Fig.12	–	2	–	pF
Band A oscillator						
f_{OSC}	oscillator frequency	note 4	80	–	216	MHz
f_{shift}	frequency shift	ΔV_p = 10%; note 5	–	–	200	kHz
f_{drift}	frequency drift	ΔT = 25 °C with no compensation; NP0 capacitors; note 6	–	–	600	kHz
		5 s to 15 min after switch on; note 7	–	–	200	kHz

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Band B mixer (including IF amplifier)						
f_{RF}	RF frequency	note 1	160	–	470	MHz
G_v	voltage gain	f_{RF} = 170 MHz; see Fig.8; note 2	33	36	39	dB
		f_{RF} = 470 MHz; see Fig.8; note 2	33	36	39	dB
NF	noise figure (not corrected for image)	f_{RF} = 170 MHz; see Fig.9	–	6.0	8.0	dB
		f_{RF} = 470 MHz; see Fig.9	–	7.0	9.0	dB
V_o	output voltage	1% cross modulation in channel; f_{RF} = 170 MHz; see Fig.10	118	121	–	dBμV
		1% cross modulation in channel; f_{RF} = 470 MHz; see Fig.10	117	120	–	dBμV
V_i	input voltage	10 kHz pulling in channel; f_{RF} = 470 MHz; note 3	–	91	–	dBμV
	input voltage	N+5–1 MHz pulling; f_{RF} = 430 MHz; see Fig.11	–	77	–	dBμV
Z_i	input impedance ($R_S + jL_S\omega$)	f_{RF} = 170 to 470 MHz; see Fig.13	–	30	–	Ω
		f_{RF} = 170 to 470 MHz; see Fig.13	–	10	–	nH
Band B oscillator						
f_{OSC}	oscillator frequency	note 4	200	–	500	MHz
f_{shift}	frequency shift	ΔV_P = 10%; note 5	–	–	400	kHz
f_{drift}	frequency drift	ΔT = 25 °C with no compensation; NP0 capacitors; note 6	–	–	2	MHz
		5 s to 15 min. after switch on; note 7	–	–	300	kHz
Band C mixer (including IF amplifier)						
f_{RF}	RF frequency	note 1	430	–	860	MHz
G_v	voltage gain	f_{RF} = 430 MHz; see Fig.8; note 2	33	36	39	dB
		f_{RF} = 860 MHz; see Fig.8; note 2	33	36	39	dB
NF	noise figure (not corrected for image)	f_{RF} = 430 MHz; see Fig.9	–	7.0	9.0	dB
		f_{RF} = 860 MHz; see Fig.9	–	8.0	10.0	dB
V_o	output voltage	1% cross modulation in channel; f_{RF} = 430 MHz; see Fig.10	116	119	–	dBμV
		1% cross modulation in channel; f_{RF} = 860 MHz; see Fig.10	116	119	–	dBμV
V_i	input voltage	10 kHz pulling in channel; f_{RF} = 860 MHz; note 3	–	103	–	dBμV
	input voltage	N+5–1 MHz pulling; f_{RF} = 820 MHz; see Fig.11	–	79	–	dBμV
Z_i	input impedance ($R_S + jL_S\omega$)	f_{RF} = 430 to 860 MHz; see Fig.14	–	40	–	Ω
		f_{RF} = 430 to 860 MHz; see Fig.14	–	10	–	nH

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Band C oscillator						
f_{OSC}	oscillator frequency	note 4	470	–	900	MHz
f_{shift}	frequency shift	ΔV_P = 10%; note 5	–	–	500	kHz
f_{drift}	frequency drift	ΔT = 25 °C with compensation; note 6	–	–	1400	kHz
		5 s to 15 min. after switch on; note 7	–	–	400	kHz
LO output						
S_{22}	output reflection coefficient	see Fig.16	–	–	–	
Y_o	output admittance ($Y_P + j\omega C_P$)	see Fig.16	–	400	–	Ω
		see Fig.16	–	1.0	–	pF
V_o	output voltage	R_L = 50 Ω	83	91	100	dBμV
SRF	spurious signal on LO output with respect to LO output signal	R_L = 50 Ω; note 8	–	–	–10	dBc
HLO	LO signal harmonics with respect to LO signal	R_L = 50 Ω	–	–	–10	dBc
IF amplifier characteristics						
S_{22}	output reflection coefficient	magnitude; through 1 nF; see Fig.15	–	–21.3	–	dB
		phase; through 1 nF; see Fig.15	–	49	–	deg
Z_o	output impedance ($R_s + jL_s\omega$)	R_s; through 1 nF	–	110	–	Ω
		L_s; through 1 nF	–	65	–	nH

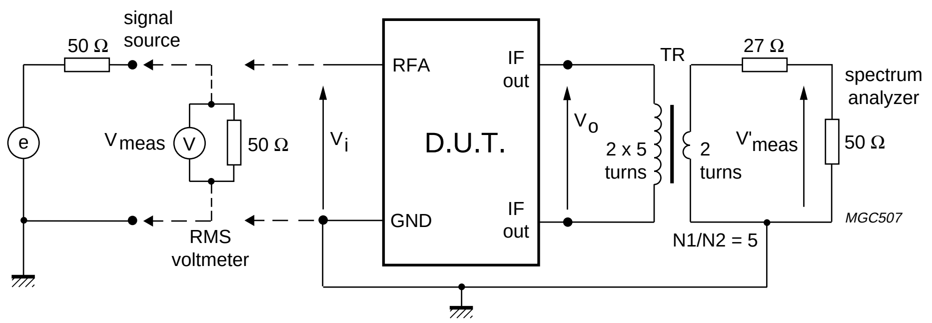
Notes

1. The RF frequency range is defined by the oscillator frequency range and the intermediate frequency.
2. The gain is defined as the transducer gain (measured in Fig.17) plus the voltage transformation ratio of L6 to L7 (10 : 2, 15.4 dB including transformer loss).
3. The input level causing 10 kHz frequency detuning at the LO output; $f_{osc} = f_{RF}$ + 33.4 MHz.
4. Limits are related to the tank circuits used in Fig.17. Frequency bands may be adjusted by the choice of external components.
5. The frequency shift is defined as the change in oscillator frequency when the supply voltage varies from V_P = 9 to 8.1 V and from V_P = 9 to 9.9 V.
6. The frequency drift is defined as the change in oscillator frequency when the ambient temperature varies from T_{amb} = 25 to 0 °C and from T_{amb} = 25 to 50 °C.
7. Switch on drift is defined as the change in oscillator frequency between 5 s and 15 min after switch on.
8. SRF: spurious signal on LO with respect to LO output signal:

   RF level = 120 dBμV at f_{RF} < 180 MHz

   RF level = 107.5 dBμV at f_{RF} = 180 to 225 MHz

   RF level = 97 dBμV at f_{RF} = 225 to 860 MHz.



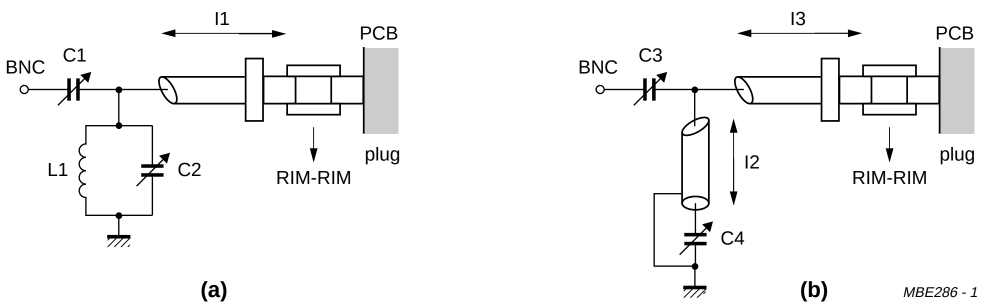
Z_i (AIN) >> 50 Ω ⇒ $V_i = 2 \times V_{meas}$.

$V_i = V_{meas}$ + 6 dB.

$V_o = V'_{meas} \times \left(\frac{50 + 27}{50}\right) +$ 15.4 dB (transformer ratio N1/N2 = 5 and transformer loss).

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

Fig.4 Band A gain measurement.



(a) For f_{RF} = 50 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)

l1 = 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 MHz:

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

image suppression = 13 dB

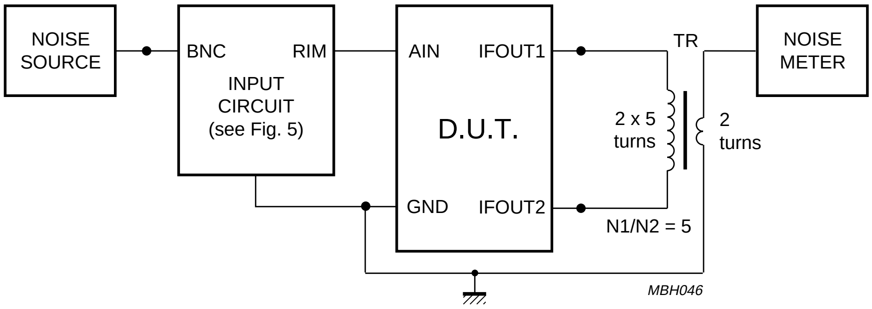
C3 = 5 pF

C4 = 25 pF

l2 = semi rigid cable (RIM): 30 cm long

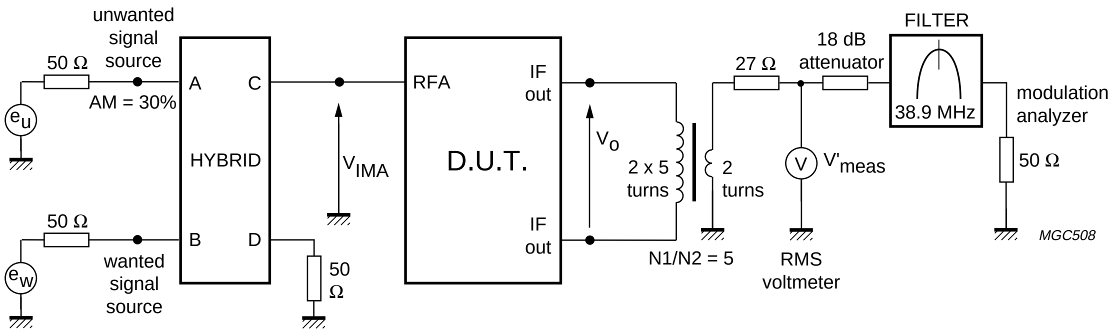
l3 = semi rigid cable (RIM): 5 cm long
(semi rigid cable (RIM); 33 dB/100 m; 50 Ω; 96 pF/m).

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



(1) NF = NF_{meas} – loss (input circuit) dB.

Fig.6 Noise figure measurement in band A.



$V'_{meas} = V_o \times \left(\frac{50 + 27}{50}\right)$ – 15.4 dB (transformer ratio $\frac{N1}{N2}$ = 5 and transformer loss).

Wanted output signal at f_{RFW} = 180 MHz: V_{ow} =104 dBμV.

We measure the level of the unwanted signal V_{ou} causing 0.3% AM modulation in the wanted output signal; f_{RFU} = 185.5 MHz.

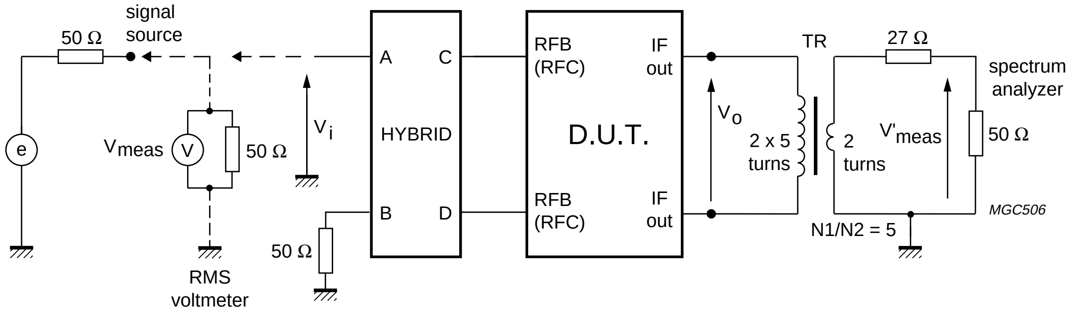
$V_{ou} = V'_{meas} \times \left(\frac{50 + 27}{50}\right)$ + 15.4 dB.

The cross modulation measurements are done at these frequencies:

- f_{RFW} = 50.0 MHz; f_{RFU} = 55.5 MHz; f_{osc} = 88.9 MHz
- f_{RFW} = 180.0 MHz; f_{RFU} = 185.5 MHz; f_{osc} = 218.9 MHz.

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

Fig.7 Cross modulation measurement in band A.

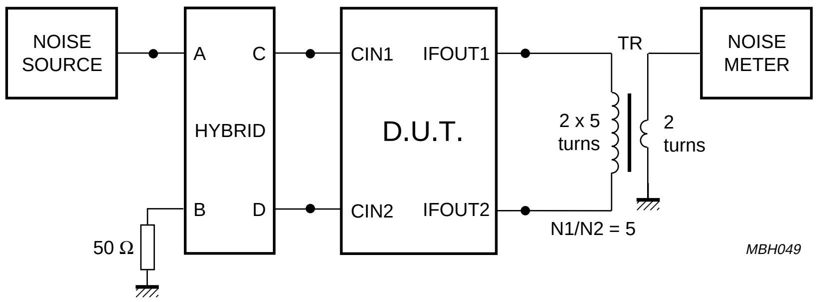


$V_i = V_{meas}$; $V_o = V'_{meas} \times \left(\frac{50 + 27}{50}\right)$ + 15.4 dB (transformer ratio $\frac{N1}{N2}$ and transformer loss).

Voltage gain for band B and C = 20log $\frac{V_o}{V_i}$ + $loss_{(hybrid)}$.

$loss_{(hybrid)}$ = 1 dB.

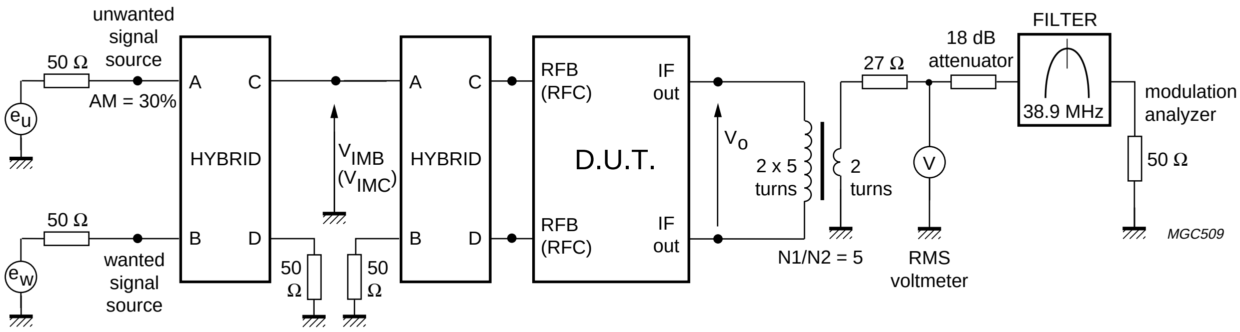
Fig.8 Gain measurement in bands B and C.



Loss of the hybrid: 1 dB.

NF = NF_{meas} – loss of the hybrid.

Fig.9 Noise figure measurement in bands B and C.



$V'_{meas} = V_o \times \left(\frac{50 + 27}{50}\right) - 15.4$ dB (transformer ratio $\frac{N1}{N2}$ = 5 and transformer loss).

Wanted output signal at f_{RFW} : V_{ow} =104 dBμV.

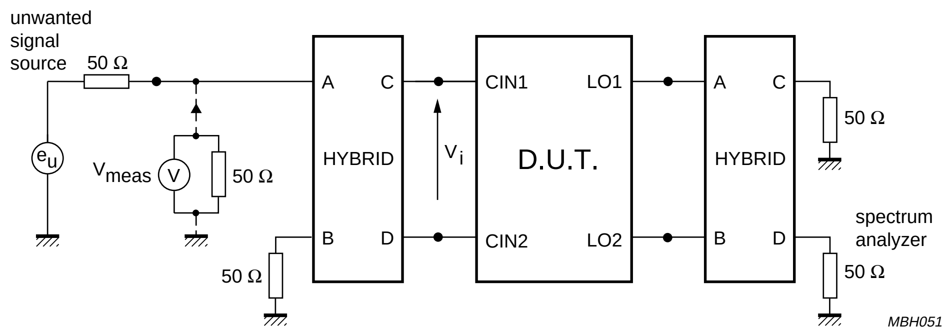
We measure the level of the unwanted signal V_{ou} causing 0.3% AM modulation in the wanted output signal.

$V_{ou} = V'_{meas} \times \left(\frac{50 + 27}{50}\right) + 15.4$ dB.

$f_{RFU} = f_{RFW} + 5.5$ MHz; $f_{osc} = f_{RF} + 38.9$ MHz.

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

Fig.10 Cross modulation measurement in bands B and C.



Loss of the hybrid: 1 dB.

In band B: f_{RFW} = 391 MHz (in band C: f_{RFW} = 781 MHz). These wanted signals are not used during the measurement.

In band B: f_{osc} = 429.9 MHz (in band C: f_{osc} = 819.9 MHz).

In band B: f_{RFU} = 430 MHz = $f_{RFW} + 5 \times 8$ MHz − 1 MHz. (in band C: f_{RFU} = 820 MHz = $f_{RFW} + 5 \times 8$ MHz − 1 MHz).

We measure the level of the unwanted signal V_{iu} causing fm sidebands 30 dB below the oscillator carrier at the LO output.

$V_{iu} = V_{meas}$ − loss of the hybrid.

Fig.11 N+5-1 MHz pulling measurement in bands B and C.

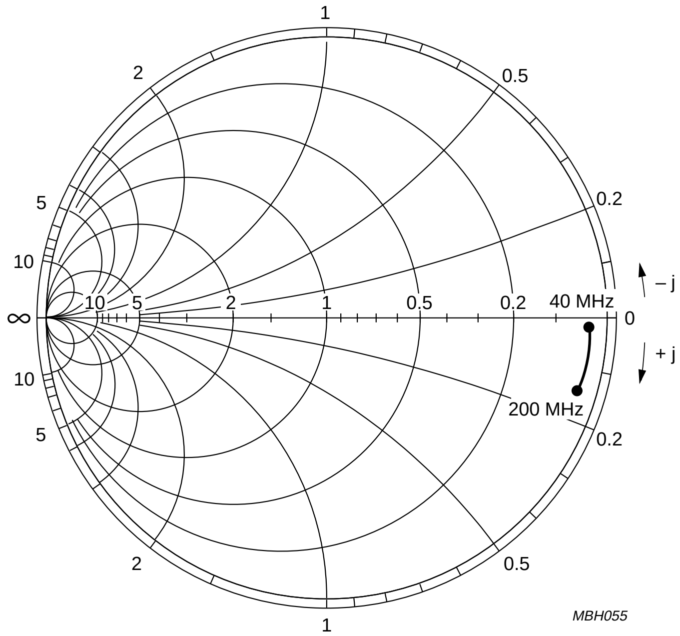


Fig.12 Input admittance (S_{11}) of the band A mixer input (40 to 200 MHz); Y_o = 20 mS.

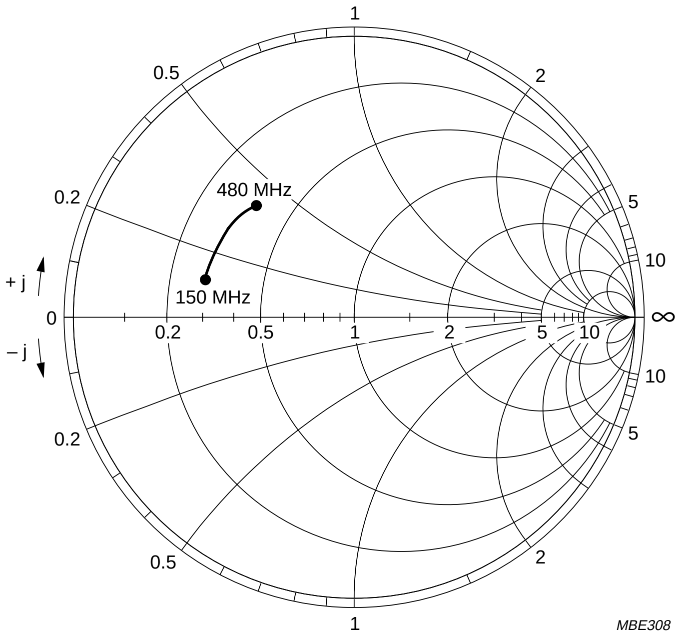


Fig.13 Input impedance (S_{11}) of the band B mixer input (150 to 480 MHz); Z_o = 100 Ω.

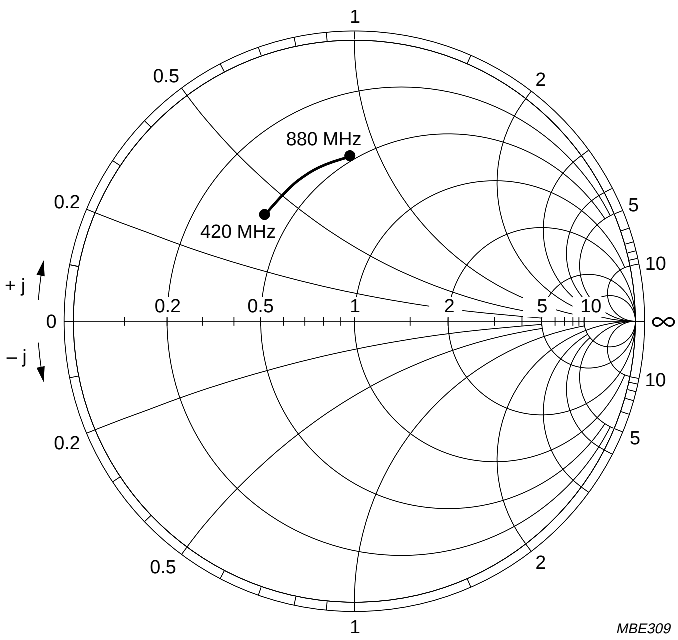


Fig.14 Input impedance (S_{11}) of the band C mixer input (420 to 880 MHz); Z_o = 100 Ω.

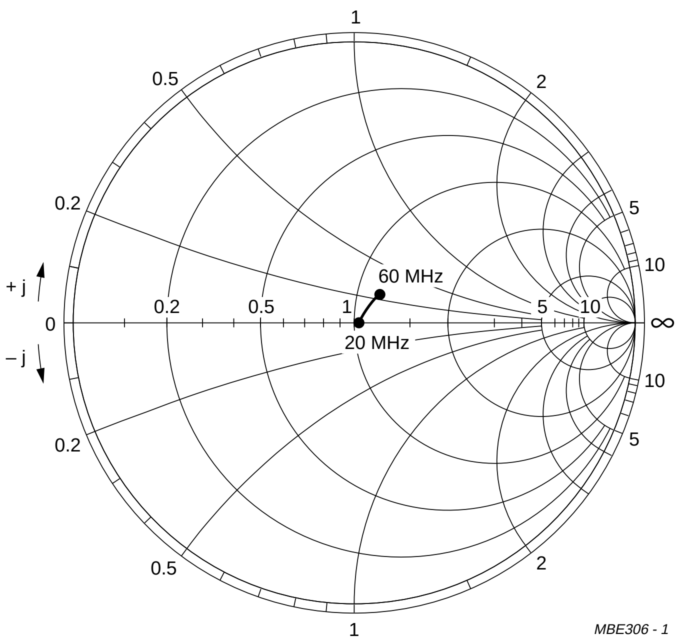


Fig.15 Output impedance (S_{22}) of the IF amplifier (20 to 60 MHz); Z_o = 100 Ω.

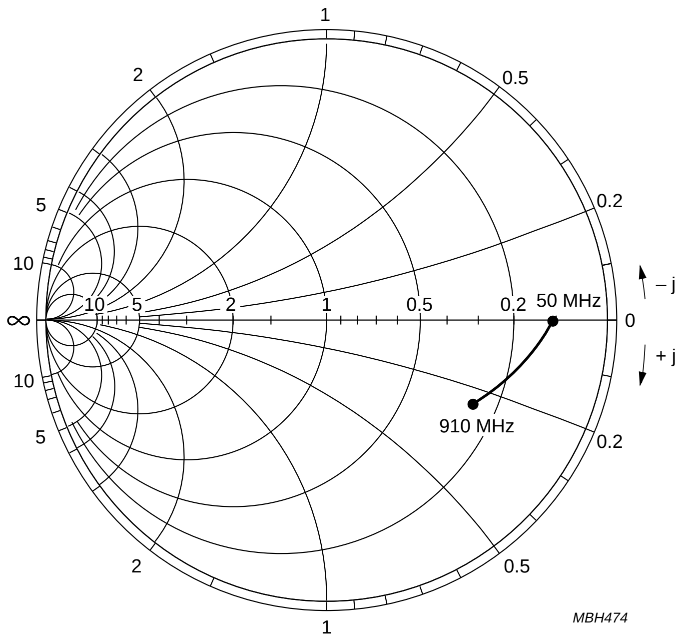
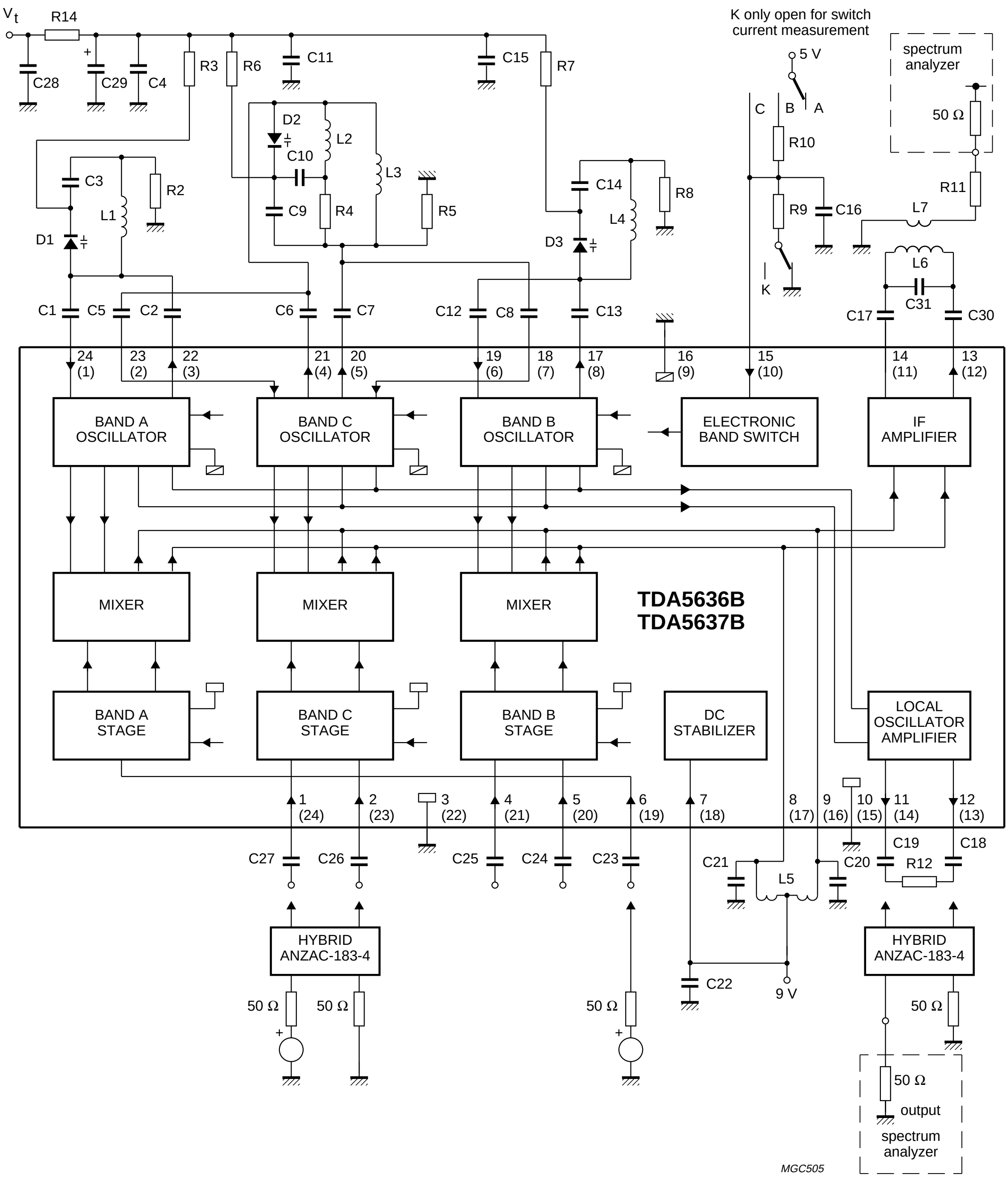


Fig.16 Output admittance (S_{22}) of the LO amplifier (50 to 910 MHz); Y_o = 20 mS.

APPLICATION INFORMATION



The numbers in parenthesis represent the TDA5637B.

Fig.17 Measurement and application circuit.

Application diagram component values (see Fig.17)

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	18 pF
C21	18 pF
C22	1 nF
C23	1 nF
C24	1 nF
C25	1 nF
C26	1 nF
C27	1 nF
C28	2.2 nF
C29	1 µF (electrolytic)
C30	1 nF
C31	18 pF

Table 2 Resistors (all SMD)

NUMBER	VALUE
R2	22 Ω
R3	47 kΩ
R4	2.2 kΩ
R5	22 kΩ
R6	47 kΩ
R7	47 kΩ
R8	12 Ω
R9	15 kΩ
R10	33 kΩ
R11	27 Ω
R12	100 Ω
R14	47 kΩ

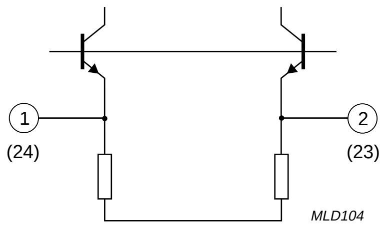
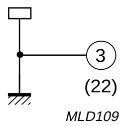
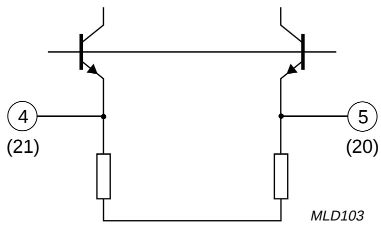
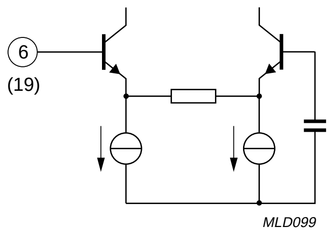
Table 3 Diodes, coils and transformers

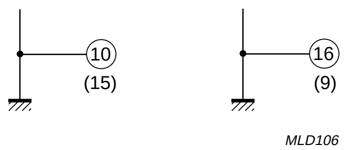
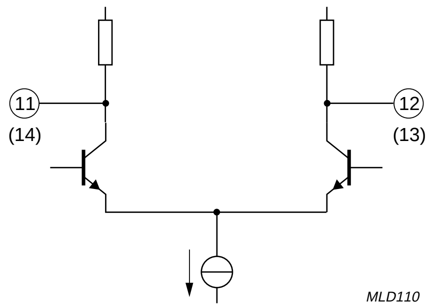
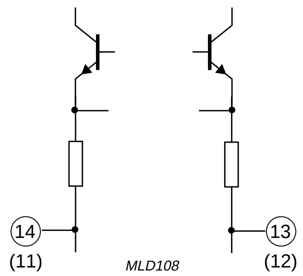
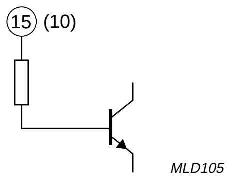
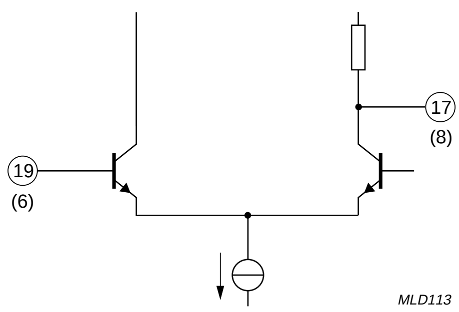
NUMBER	VALUE
Diodes	
D1	BB132
D2	BB134
D3	BB146
Coils(1)	
L1	8 turns (∅ 3 mm)
L2	2 turns (∅ 2.5 mm)
L3	3 turns (∅ 2.5 mm)
L4	2 turns (∅ 4 mm)
Transformers(2)	
L5	2 × 6 turns
L6	2 × 5 turns
L7	2 turns

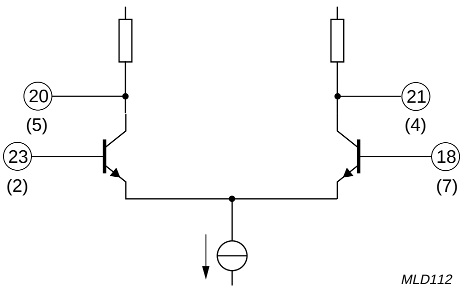
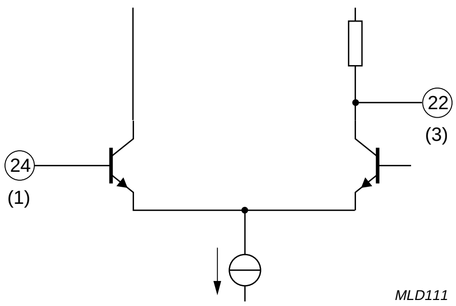
Notes

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

INTERNAL PIN CONFIGURATION

SYMBOL	PIN		DESCRIPTION(1)	AVERAGE DC VOLTAGE(2) 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_P	7	18	supply voltage	9.0	9.0	9.0
MIXOUT1	8	17		9.0	9.0	9.0
MIXOUT2	9	16		9.0	9.0	9.0

SYMBOL	PIN		DESCRIPTION[1]	AVERAGE DC VOLTAGE[2] 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
IFOUT1	13	12		4.4	4.4	4.4
IFOUT2	14	11		4.4	4.4	4.4
BS	15	10		$V_{SW(A)}$	$V_{SW(B)}$	$V_{SW(C)}$
BOSCOC	17	8		5.8	3.4	5.8
BOSCIB	19	6		1.2	2.3	1.2

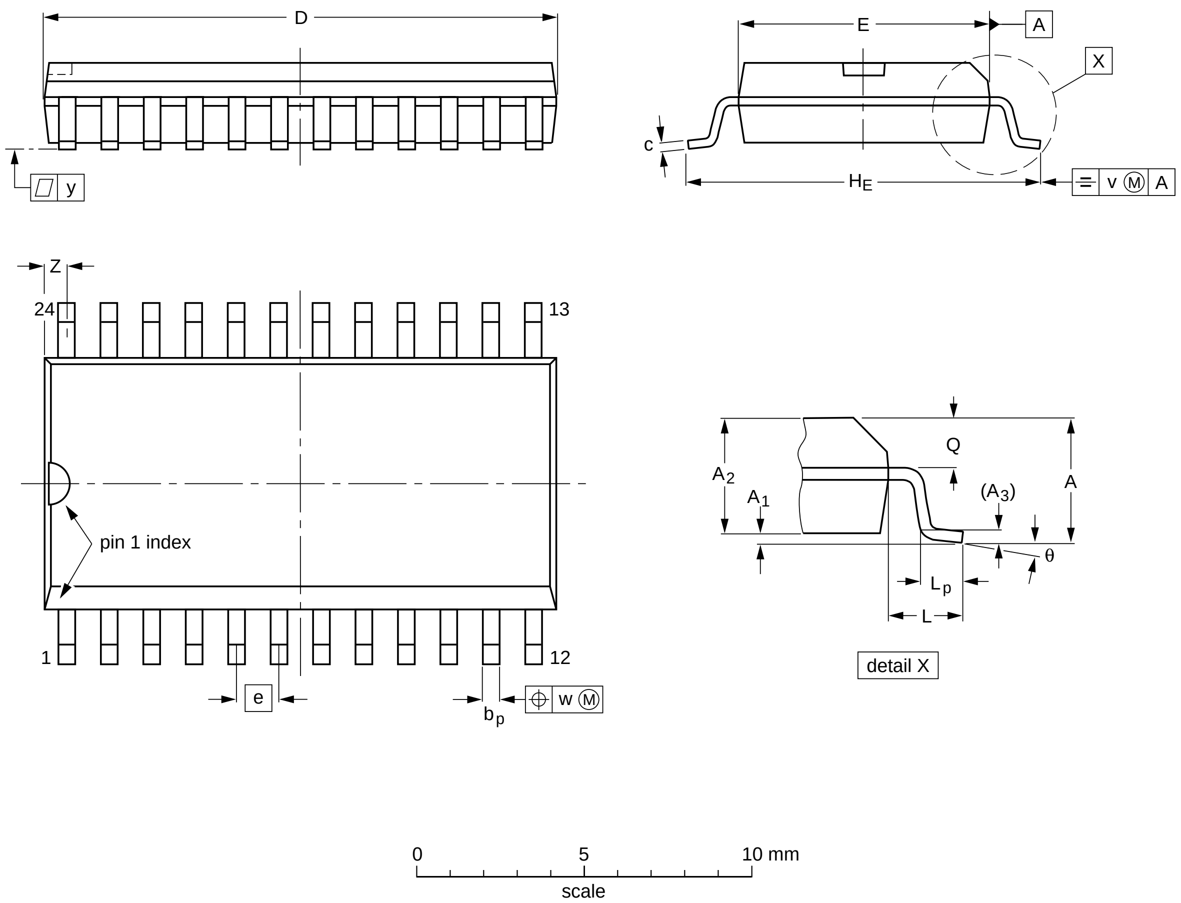
SYMBOL	PIN		DESCRIPTION(1)	AVERAGE DC VOLTAGE(2) IN (V)		
	TDA5636B	TDA5637B		BAND A	BAND B	BAND C
COSCIB1	18	7		1.4	1.4	2.3
COSCOC1	20	5		5.8	5.8	4.2
COSCOC2	21	4		5.8	5.8	4.2
COSCIB2	23	2		1.4	1.4	2.3
AOSCOC	22	3		3.8	5.8	5.8
AOSCIB	24	1		2.1	1.0	1.0

Notes

1. The pin numbers in parenthesis represent the TDA5637B.
2. Average DC voltage measured in circuit of Fig.17.

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)

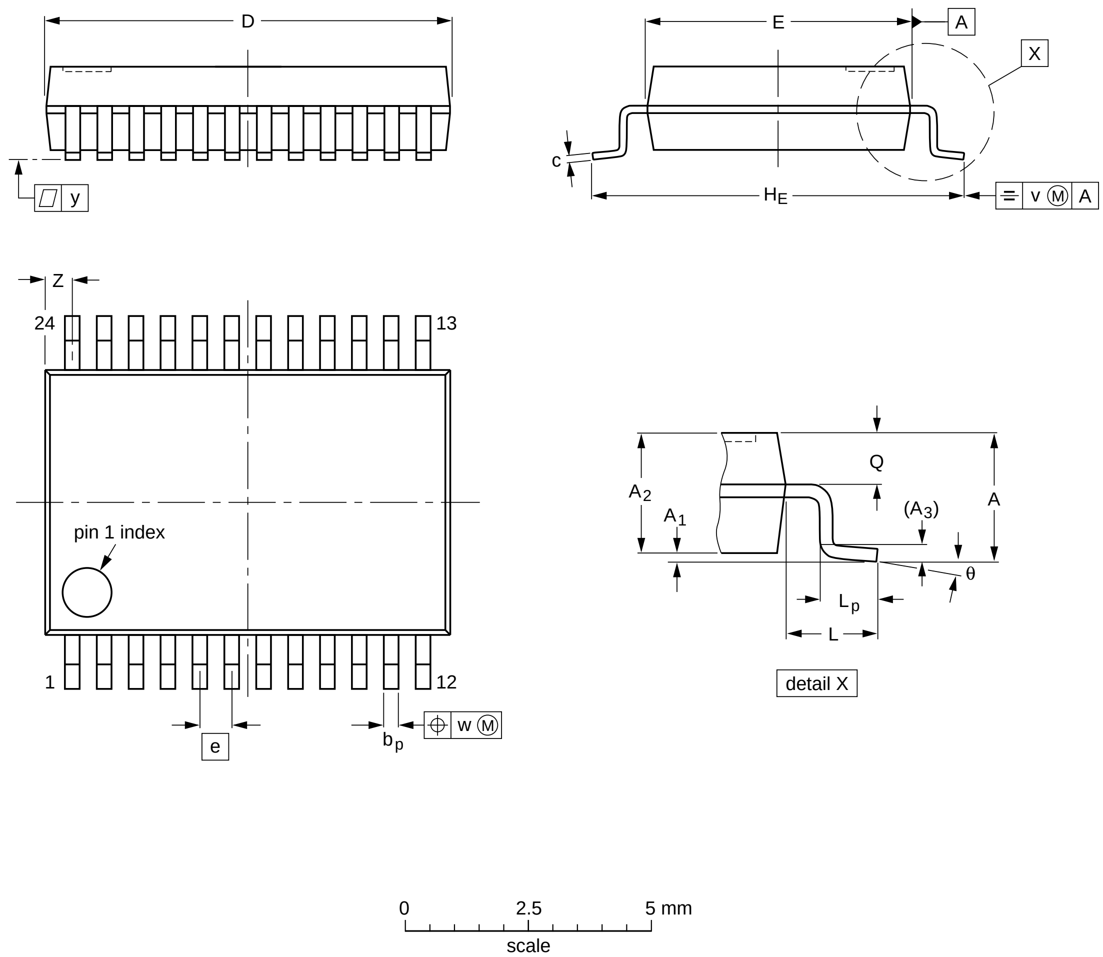
UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	15.6 15.2	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.61 0.60	0.30 0.29	0.050	0.42 0.39	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 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				~~92-11-17~~ 95-01-24

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_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	8.4 8.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.8 0.4	8^o 0^o

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~~ 95-02-04

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.

DEFINITIONS

Data sheet status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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