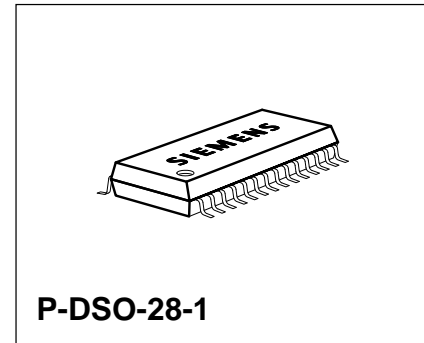


### 1 Overview

#### 1.1 Features

- High flexibility with an external preamplifier stage
- Sym. or asym. mixer input
- 2-pin oscillator for the 1. LO
- 1. LO with LC tank circuit
- 1. LO at 100 MHz range
- Low narrow band noise
- Divider for 1. LO by 10 for the 100 kHz ... 2 MHz range and by 8 for the 2 MHz ... 6 MHz range
- Integrated AGC generation
- Strictly symmetrical RF path
- Decoupled counter output
- 2. LO with quartz or external source
- Output for gain controlled 2. IF
- Switchable AGC time constant



Type	Ordering Code	Package
TDA 4360X	Q67000-A5181	P-DSO-28-1

#### 1.2 Application

The TDA 4360X is an integrated dual conversion AM receiver for use in car radios.

The input signal passes a linear mixer for conversion into the 1. IF (~ 10 MHz). Via an external bandpass filter (CER filter, quartz filter) the 1. IF is converted in a second linear mixer to the 2. IF (~ 460 kHz).

After an external narrowband selectivity (CER filter) the 2. IF passes an automatic gain controlled (AGC) amplifier and is then demodulated to the AF. The AGC time constant can be switched with a ratio of 20.

For counter controlled search tuning stop (STS) the frequencies of the 1. LO and the 2. IF are available.

1.3 Pin Configuration  
(top view)

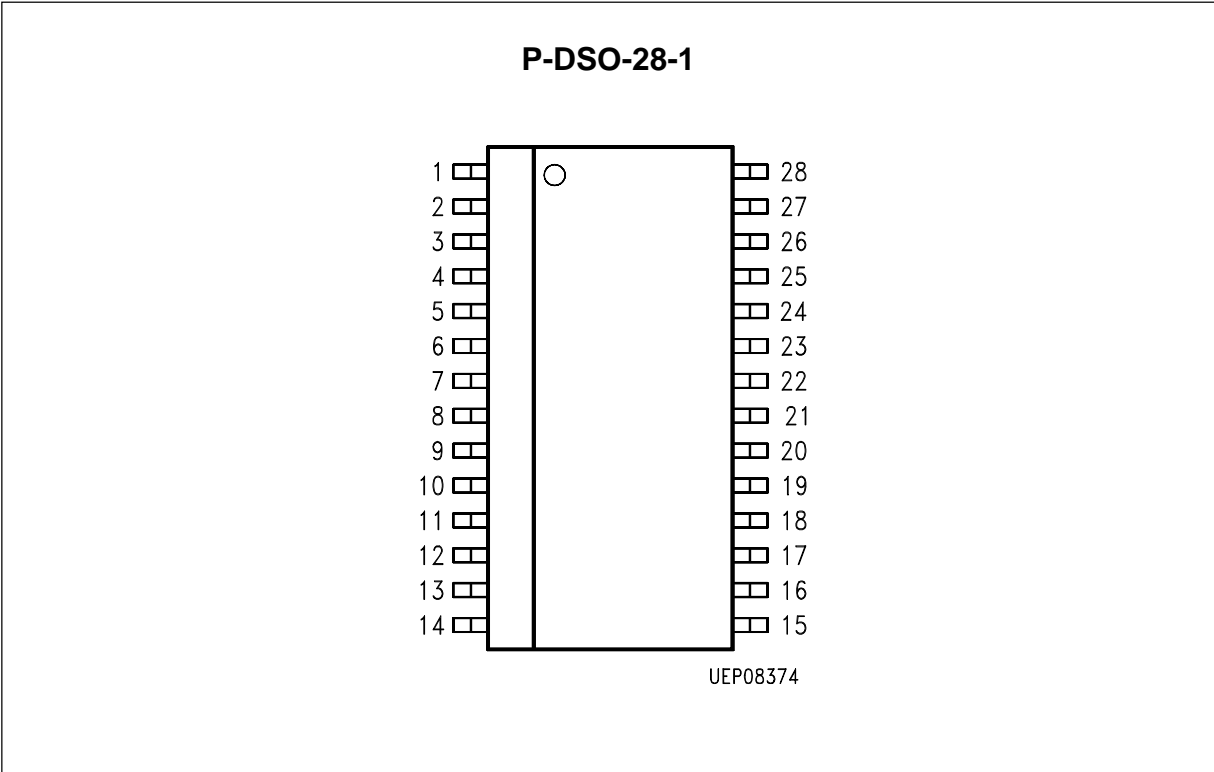


Figure 1

#### 1.4 Pin Definitions and Functions

Pin No.	Function
1, 2	Sym. Input for the AM signal in the frequency range of 100 kHz (SW) to 6.2 MHz (49m-Band) sym. application is recommended, asym. application is possible
3	DC voltage alters the threshold voltage of the prestage AGC circuit.
4	GROUND: All DC values are referred to this pin
5	Buffered output for the by n divided (n = 8 or 10) oscillator frequency
6	Output for the internal reference voltage. This pin is to be blocked with a ceramic capacitor to ground.
7, 8	The ext. LC circuit between pin 7 and pin 8 determines the oscillator frequency.
9	Supply voltage. This point is to be blocked to ground for AF and for RF signals.
10	Buffered output for the oscillator frequency
11	Input for the frequency divider. Low voltage to pin 11 divides the oscillator frequency by 8, high voltage or open input divides by 10.
12	Blocking capacitor for the IF AGC circuit to suppress AF frequencies
13	Input to select the fast or slow AGC time constant
14	Buffered AF output
15	Buffered output for the limited lower IF frequency. This signal is necessary for an IF Counter Tuning System.
16	Buffered output for the AGC controlled lower IF signal. This pin is connected to the AM stereo decoder.
17, 18, 19	Input pins for the DC coupled AGC amplifier
20	Open collector output of mixer for the lower IF (~ 450 MHz). A DC connection to the tank circuit to $V_{ref}$ is recommended.
21, 22	Sym. mixer 2 input for the upper IF (~ 10.7 MHz). Asym. operation is possible. The input signal is converted to the lower IF corresponding the equation $f_{LIF} = f_{UIF} - f_{2,LO}$ .
23, 24	Input for the 2. local oscillator (LO). The pins can be connected via a quartz or the oscillator is to be forced with an ext. signal.
25	Blocking capacitor for the prestage AGC
26	A capacitor to ground determines the AGC time constant. The DC potential at this pin can be used for controlling the FET in the ext. prestage.
27, 28	Sym. collector output of the mixer 1. The external tank circuit is tuned to the upper IF.

1.5 Functional Block Diagram

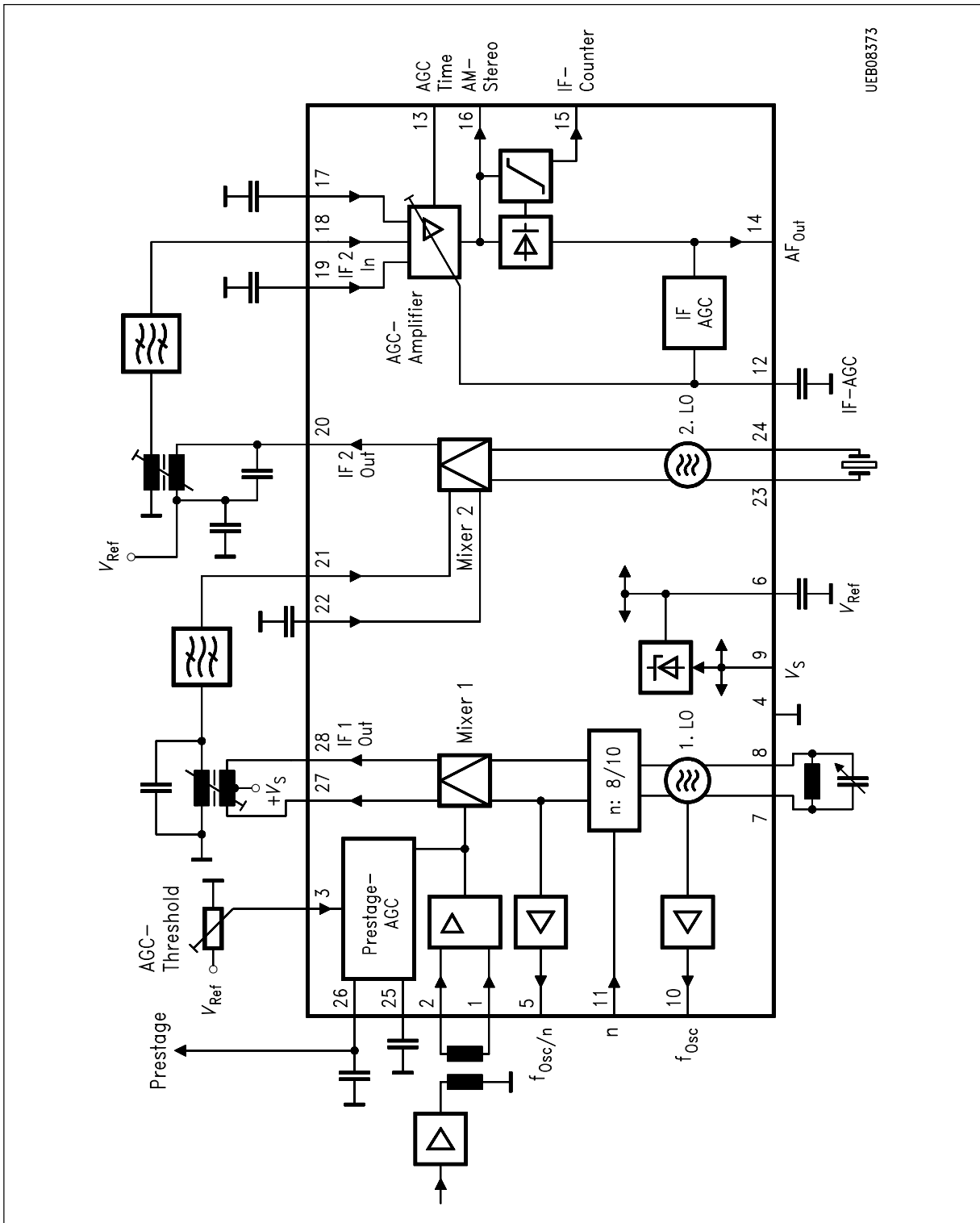


Figure 2  
Block Diagram

## 2 Circuit Description

The integrated circuit includes an 2-pin oscillator (1. LO) with sym. input, buffered output and a double balanced mixer with sym. input. These stages convert the AM input signal to a 1. IF which is much higher (~ 10 MHz) than the input frequencies. The 1. LO operates as a LC varactor oscillator in the same 100 MHz range like the FM tuner oscillator (e.g. TUA 4310X). So the same peripheral elements can be used.

Depending on the signal strength the prestage AGC controls MOSFET prestage amplifiers.

The 1. IF passes an external selectivity and is then converted in a sym. double balanced mixer to the 2. IF.

The 2. LO operates as a quartz controlled oscillator or as an amplifier for an external signal.

The 2. IF signal passes an automatic gain controlled (AGC) IF amplifier and is then demodulated to the AF in a quasi-synchronous demodulator. The AGC time constant can be switched with a ratio of 20.

For fine tuning the decoupled 2. IF frequency is available.

The TDA 4360X is prepared to work with a PLL in the 100 MHz range. When applied with a standard AM-PLL the oscillator frequency divided by 8 or 10 has to be used. In this case a higher phase noise is to be expected.

**3 Electrical Characteristics**

**3.1 Absolute Maximum Ratings**

$T_A = -40\text{ °C to }85\text{ °C}$

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
ESD	$V_{ESD}$	- 4	+ 4	kV	HBM
Supply voltage	$V_S$	0	13.2	V	
Mixer 1 output	$V_{27}, V_{28}$	0	13.2	V	
Mixer 2 output	$V_{20}$	0	13.2	V	
Mixer 2 input	$V_{21}, V_{22}$	0	13.2 V	V	1.5 kΩ, 100 pF
AGC threshold	$V_3$	0	5	V	
Mixer 1 input	$V_{1, 2}$	0	5	V	
$f_{OSC/n}$	$V_5$	0	13	V	
$f_{OSC}$	$V_{10}$	0	13	V	
Divide by n	$V_{11}$	0	5	V	
$V_{Ref}$	$V_6$	0	5	V	
$I_{Ref}$	$I_{6, 0}$	0	3	mA	
2. LO	$V_{23}, V_{24}$	0	5	V	
AGC amplifier input	$V_{17 \dots 19}$	0	5	V	
IF counter	$V_{15}$	0	13.2	V	
AM stereo output	$V_{16}$	0	13.2	V	
AF output	$V_{14}$	0	13.2	V	
IF AGC	$V_{12}$	0	13.2	V	

*Note: Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.*

**3.2 Operating Range**

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	$V_S$	7.5	13.2	V
Ambient temperature	$T_A$	- 40	+ 85	°C

*Note: In the operating range the functions given in the circuit description are fulfilled.*

**3.3 AC/DC Characteristics**

$V_S = 10\text{ V}$ ,  $T_A = + 25\text{ °C}$ ,  $f_{IF1} = 10.7\text{ MHz}$ ,  $f_{IF2} = 456\text{ kHz}$ ,  $f_i = 1\text{ MHz}$

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Current consumption	$I_S$		55		mA		

**Mixer 1**

Intercept point 3. order			110		dB $\mu$ V	$V_i \geq 100\text{ mVrms}$	
Mixer gain			5		dB	$V_{in} = 10\text{ mV}$ , 1.8 k $\Omega$ load	
Max. input voltage	$V_i$			600	mVpp		
Noise figure (10 MHz)	$F$			10	dB		

**1. LO**

Frequency range	$f_{1.LO}$	100		140	MHz		
Counter output	$V_C$		100		mVpp		

**3.3 AC/DC Characteristics (cont'd)**

$V_S = 10\text{ V}$ ,  $T_A = +25\text{ °C}$ ,  $f_{IF1} = 10.7\text{ MHz}$ ,  $f_{IF2} = 456\text{ kHz}$ ,  $f_i = 1\text{ MHz}$

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Divided counter output			100		mVpp		
Divide by 8				0.7	V		
Divide by 10		2.4			V		
Output impedance	$R_C$		330		$\Omega$		

**Mixer 2**

Mixer gain			3		dB	$V_{in} = 10\text{ mV}$ , $1.5\text{ k}\Omega$ load	
Noise figure	F			10	dB		

**2. LO**

Frequency range	$f_{2,LO}$	15			MHz		
External force voltage		30			mVrms		

**Prestage AGC Output**

AGC voltage	$V_{AGC1}$	5.8		7.2	V	$V_{DC} = 2\text{ V}$ ; $V_i = 100\text{ mVrms}$	
AGC voltage	$V_{AGC1}$	0		0.5	V	$V_{DC} = 4\text{ V}$ ; $V_i = 100\text{ mVrms}$	

**AGC Amplifier**

AGC range			66		dB		1
AGC voltage	$V_{AGC2}$	2.0		4.8	V	$V_{18} = 0/100\text{ mVrms}$	1
Reg. output voltage	$V_{IF}$		30		mVrms		1
Input sensitivity	$V_{-3dB}$		50		$\mu\text{Vrms}$		1



**3.3 AC/DC Characteristics (cont'd)**

$V_S = 10\text{ V}$ ,  $T_A = +25\text{ °C}$ ,  $f_{IF1} = 10.7\text{ MHz}$ ,  $f_{IF2} = 456\text{ kHz}$ ,  $f_i = 1\text{ MHz}$

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
AGC current	$I_{AGC}$		- 500		$\mu\text{A}$	$V_{18} = 10\text{ mVrms}$ , $V_{13} \geq 2.4\text{ V}$	1
AGC current	$I_{AGC}$		- 25		$\mu\text{A}$	$V_{18} = 10\text{ mVrms}$ , $V_{13} \leq 0.7\text{ V}$	1

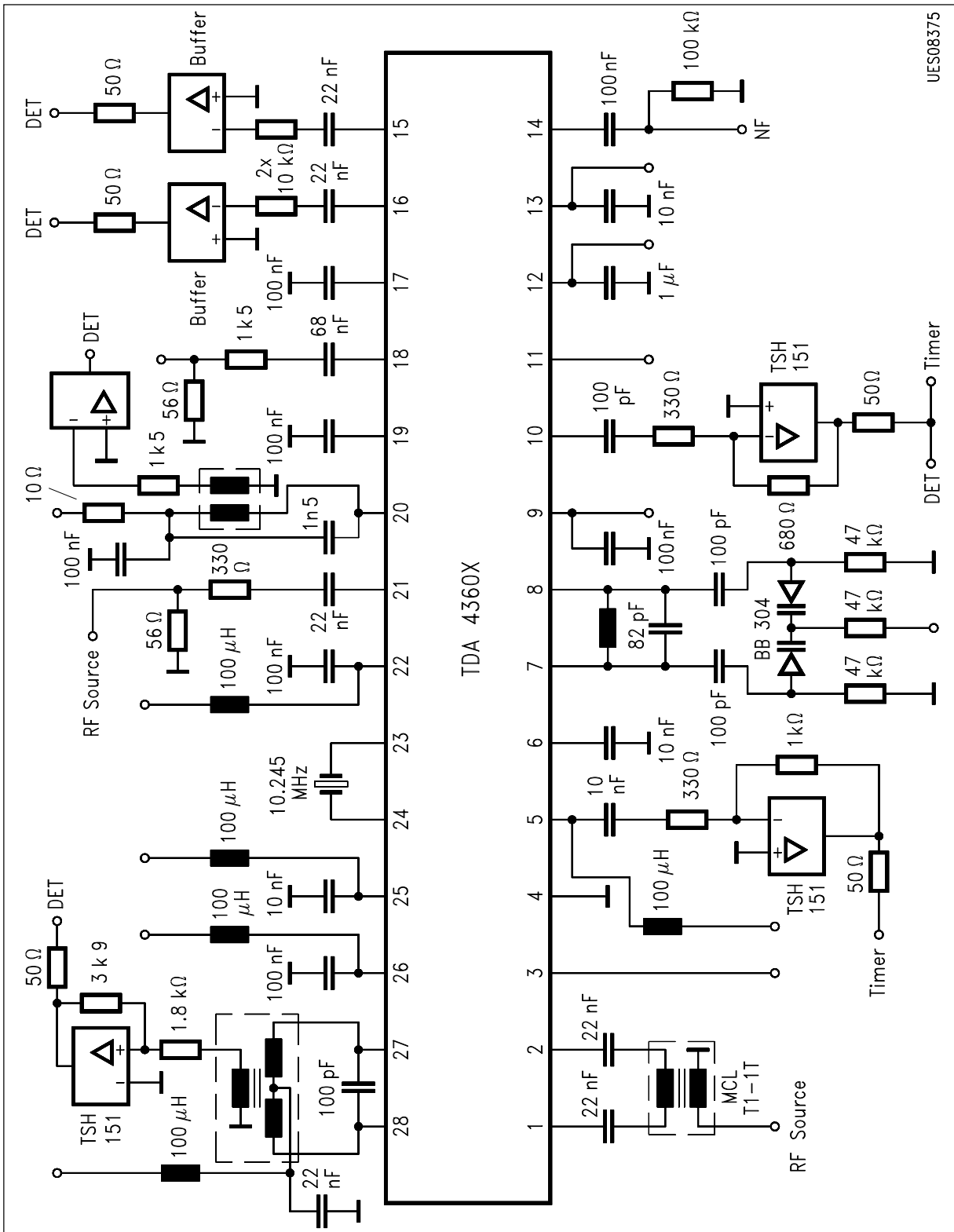
**Demodulator**

AF output voltage	$V_{\text{Audio}}$		180		mVrms	$V_i = 10\text{ mV}$ , $m = 0.3$	1
AF output voltage	$V_{\text{Audio}}$		480		mVrms	$V_i = 10\text{ mV}$ , $m = 0.8$	1
Total harm. distortion	k		1		%	$V_i = 10\text{ mV}$ , $m = 0.8$	1
Input voltage for $S + N/N = 6\text{ dB}$	$V_i$		10		$\mu\text{Vrms}$	$m = 0.3$	1
Input voltage for $S + N/N = 26\text{ dB}$	$V_i$		60		$\mu\text{Vrms}$	$m = 0.3$	1
$S + N/N$			60		dB	$V_i = 10\text{ mV}$ , $m = 0.8$	1
AF linearity	$\Delta V_{\text{Audio}}$			3	dB	100 $\mu\text{V}/100\text{ mV}$	1

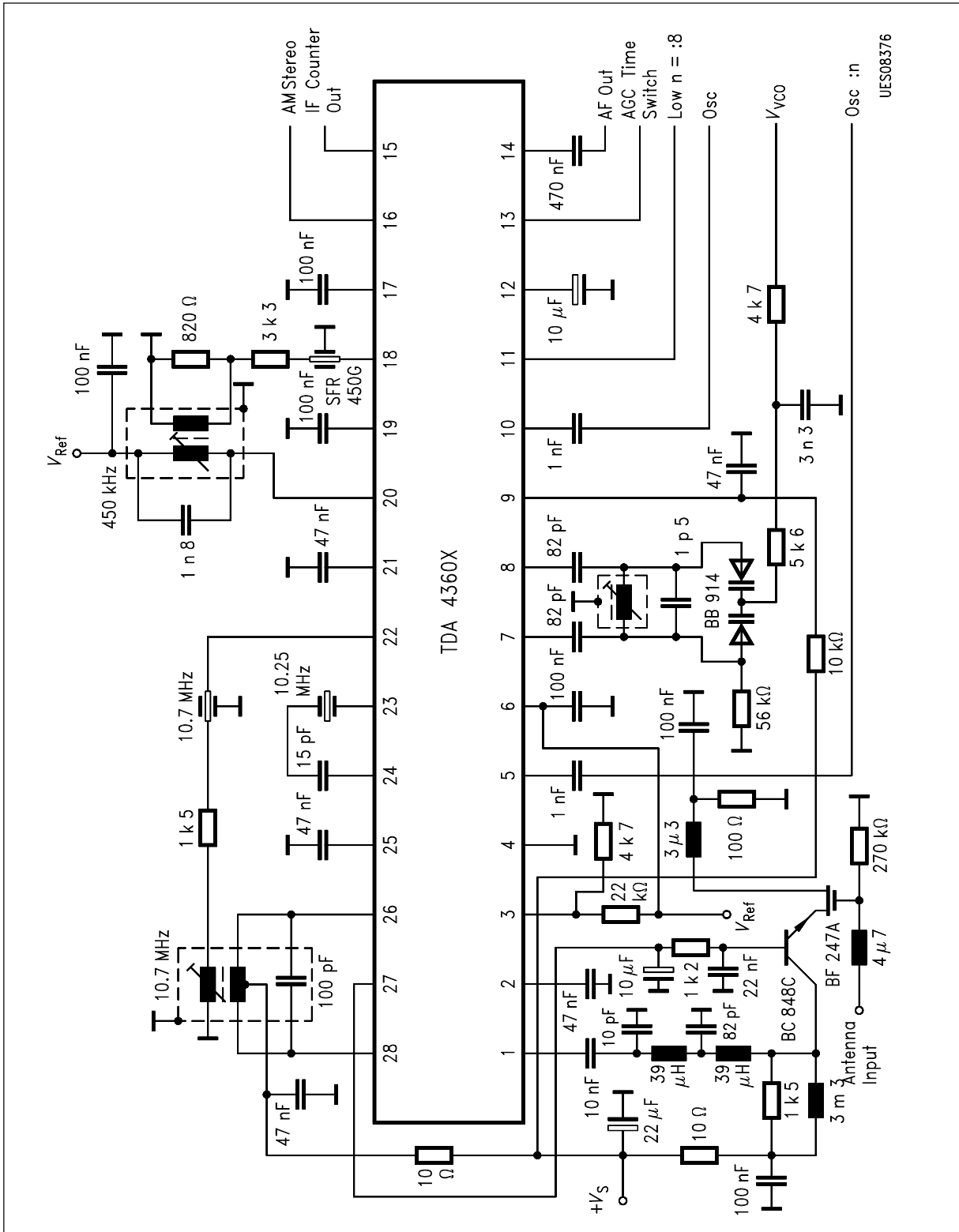
**IF Counter**

IF counter output voltage	$V_C$		100		mVrms		1
---------------------------	-------	--	-----	--	-------	--	---

*Note: The listed characteristics are ensured over the operating range of the integrated circuit. Typical characteristics specify mean values expected over the production spread. If not otherwise specified, typical characteristics apply at  $T_A = 25\text{ °C}$  and the given supply voltage.*



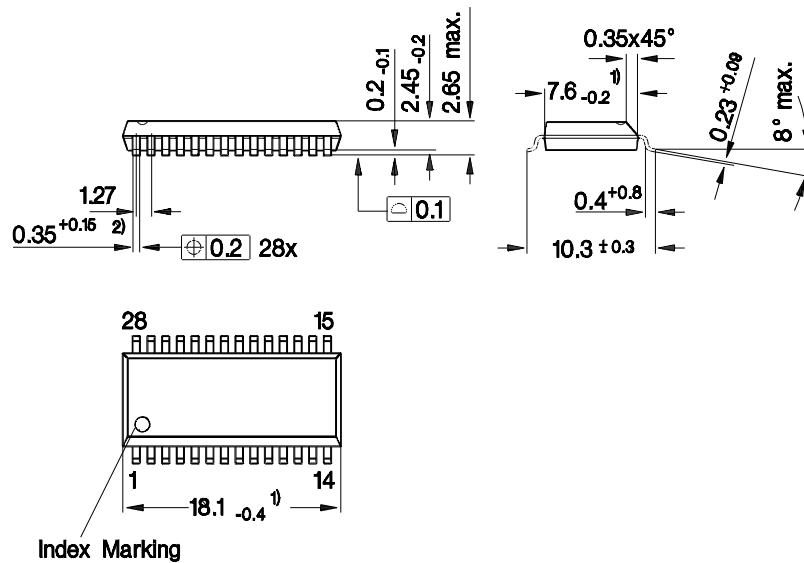
**Figure 3**  
**Test Circuit**



**Figure 4**  
Application Circuit

4 Package Outlines

**P-DSO-28-1**  
(Plastic Dual Small Outline Package)



- 1) Does not include plastic or metal protrusion of 0.15 max. per side
- 2) Does not include dambar protrusion

GPS05123

**Sorts of Packing**

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

SMD = Surface Mounted Device

Dimensions in mm