AM-Updown-Conversion TDA 4362

1 Overview

P-MQFP-44-2

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 narrowband 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
- FM-coincidence demodulator

Type	Ordering Code	Package
TDA 4362	on request	P-MQFP-44-2

1.2 Application

The TDA 4362 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 amplifier and is then demodulated to the AF.

For counter controlled search tuning stop (STS) the frequencies of the 1. LO and the 2. IF are available. For NB-FM demodulation a coincidence demodulator is implemented.

1.3 Pin Configuration
(top view)

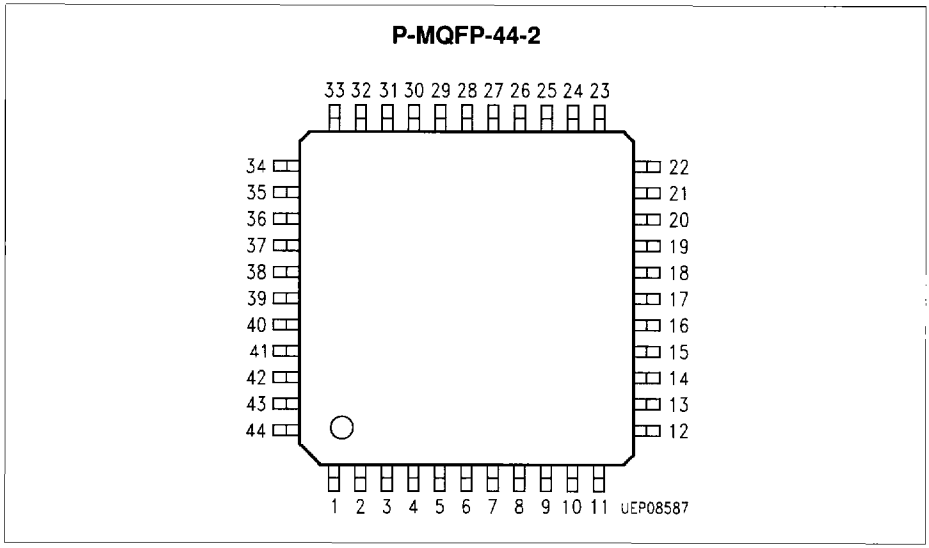


Figure 1

1.4 Pin Definitions and Functions

Pin No.	Function
1	Prestage threshold
2	Mixer 1
3	Mixer 1
4	Ground
5	Mixer 2
6	Mixer 2
7	Reference voltage (HF)
8	Mixer 1/Mixer 2 switch
9	Counter ratio C
10	Counter output direct
11	Counter output divided
12	Oscillator
13	Oscillator

1.4 Pin Definitions and Functions (cont'd)

Pin No.	Function
14	Counter ratio B
15	Counter ratio A
16	LIF1/LIF2 switch
17	Coincidence demodulator
18	Coincidence phaseshifter
19	Coincidence phaseshifter
20	Coincidence demodulator
21	LIF time constant
22	AF output
23	LIF input 1 (blocked to LF GND)
24	LIF input 2 active
25	LIF input 2 (blocked to LF GND)
26	LIF input 1 active
27	Search tuning stop time constant
28	AM output
29	2. LO quartz
30	2. LO quartz
31	Reference voltage (LF)
32	2. Mixer output
33	2. Mixer output
34	Ground (LF)
35	2. Mixer input
36	2. Mixer input
37	Supply voltage
38	Prestage current output
39	1. Mixer output
40	1. Mixer output
41	Search tuning stop output
42	AGC-time constant switch
43	Prestage voltage output
44	Prestage time constant

1.5 Functional Block Diagram

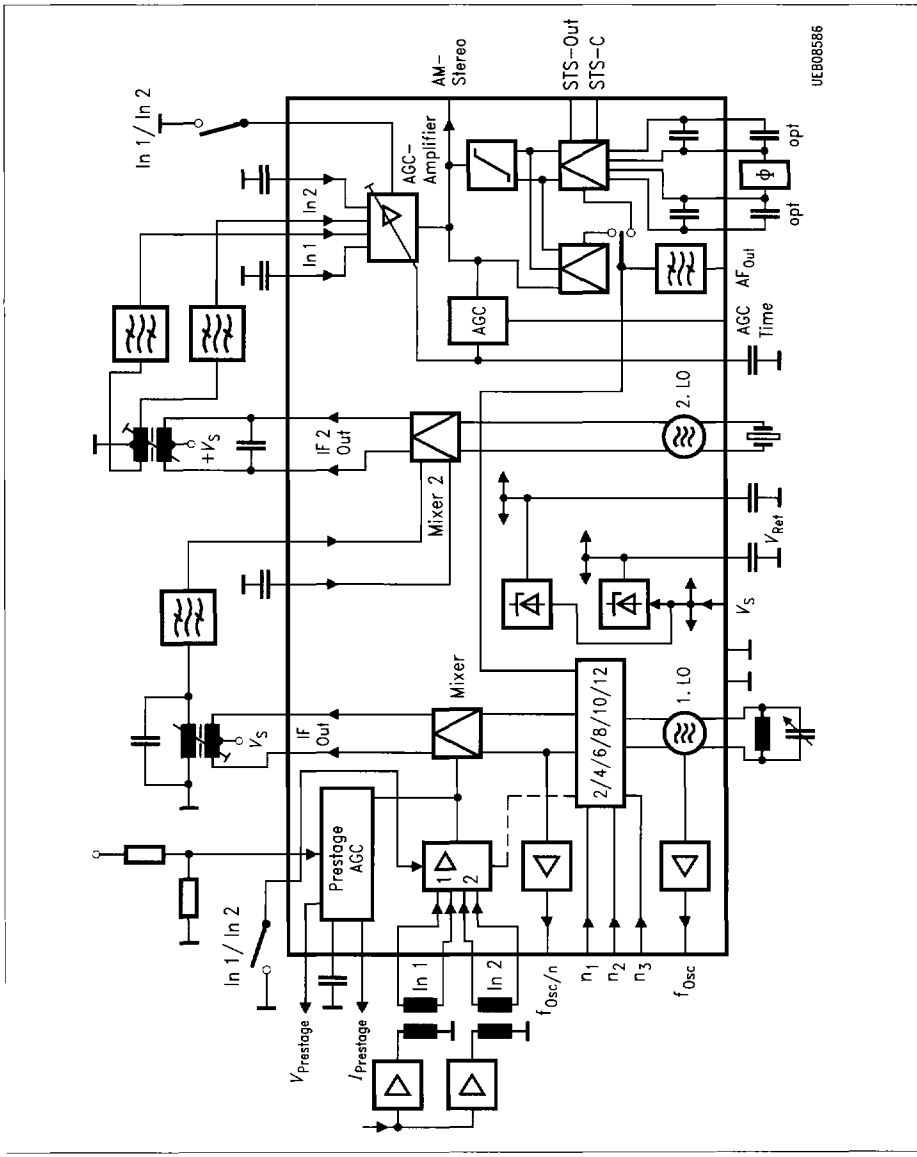


Figure 2
Block Diagram

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 IF amplifier and is then demodulated to the AF in a quasi-synchronous demodulator.

For the demodulation of NB-FM signals an coincidence demodulator is implemented.

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

The TDA 4362 is prepared to work with a PLL in the 100 MHz range. When applied with a standard AM-PLL the oscillator frequency divided by 2, 4, 6, 8, 10 or 12 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 °C to + 85 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	V_{37}	0	13.2	V	
Reference voltage	$V_{7, 31}$	0	5	V	
Reference current	$I_{7, 31}$	0	1	mA	
Prestage threshold	V_1	0	5	V	
Mixer 1 input	$V_{2, 3}$	0	5	V	
Mixer 2 input	$V_{5, 6}$	0	5	V	
Switch for mixer, LIF input	$V_{8, 16}$	0	13.2	V	
Logical divider input	$V_{9, 14, 15}$	0	13.2	V	
Counter output	V_{10}	0	13.2	V	
Divided counter output	V_{11}	0	13.2	V	
1. LO	$V_{12, 13}$	0	5	V	
Coincidence demodulator	$V_{17, 18, 19, 20}$	0	5	V	
Time constant for 2 IF AGC	V_{21}	0	5	V	
Leakage current	I_{21}		1	µA	
AF-output	V_{22}	0	13.2	V	
AGC-timer constant	V_{27}	0	5	V	
AGC 1 input	$V_{23, 26}$	0	5	V	
AGC 2 input	$V_{24, 25, 27}$	0	5	V	
AM-stereo output	V_{28}	0	13.2	V	
2. LO input	$V_{29, 30}$	0	5	V	
2. mixer output	$V_{32, 33}$	0	5	V	
2. mixer input	$V_{35, 36}$	0	5	V	
PIN-diode output	V_{38}	0	5	V	
1. mixer output	$V_{39, 40}$	0	13.2	V	
STS-output	V_{41}	0	13.2	V	
AGC-time	V_{42}	0	13.2	V	

3.1 Absolute Maximum Ratings (cont'd)

T_A = – 40 °C to + 85 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Prestage AGC	V_{43}	0	13.2	V	
Prestage time constant	V_{44}	0	13.2	V	
ESD voltage human body module 100 pF/1500 Ω	V_{ESD}	– 2	2	kV	
Thermal resistance	R_{thst}		65	k/W	

Note: Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.
Pin-numbers are not correct.

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 V, T_A = 25 °C, f_{IF1} = 10.7 MHz, f_{IF2} = 456 kHz, f_i = 1 MHz

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Current consumption	I_S		56		mA		1
Mixer 1							
Intercept point 3. order			120		dBµV	$V_i \geq$ 100 mVrms	Lab
Mixer gain	V		6		dB		1

3.3 AC/DC Characteristics (cont'd)

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

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Max. input voltage	V_i			600	mVpp		1
Noise figure (10 MHz)	F			10	dB		Lab
Mixer 2							
Intercept point 3. order			120		dBµV	$V_i \geq$ 100 mVrms	Lab
Mixer gain	V		6		dB		1
Max. input voltage	V_i			600	mVpp		1
Noise figure (10 MHz)	F			10	dB		Lab
1. LO							
Frequency range	$f_{1.LO}$	60		160	MHz		1
Counter output	V_{10}		250		mVpp		1
Divided counter output	V_{11}		250		mVpp		1
Output impedance	R_C		330		Ω		Lab
Converter							
Mixer gain	V		6		dB		1
Noise figure	F			10	dB		Lab
2. LO							
Frequency range	$f_{2.LO}$	25			MHz		1
External force voltage	V_{29}	30			mVrms		1

3.3 AC/DC Characteristics (cont'd)

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

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Prestage AGC Output							
AGC voltage	V_{AGC1}		7.2		V	V_1 = 2.4 V; V_i = 100 mVrms	1
AGC voltage	V_{AGC1}		0.7		V	V_1 = 4.4 V; V_i = 100 mVrms	1
AGC current	I_{AGC1}		12		mA	V_1 = 2.4 V; V_i = 100 mVrms	1
AGC current	I_{AGC1}		0.1		mA	V_1 = 4.4 V; V_i = 100 mVrms	1
AGC Amplifier							
AGC range			66		dB		1
AGC voltage	V_{21}	2.0		4.8	V	V_{18} = 0/100 mVrms	1
Reg. output voltage	V_{28}		30		mVrms		1
Input sensitivity	$V_{-3\,dB}$		50		µVrms		1
AGC current	I_{21}		500		µA	V_{18} = 10 mVrms, $V_{13} \geq$ 2.4 V	1
AGC current	I_{21}		25		µA	V_{18} = 10 mVrms, $V_{13} \leq$ 0.7 V	1

3.3 AC/DC Characteristics (cont'd)

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

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
AM Demodulator							
AF output voltage	V_{Audio}		180		mVrms	V_i = 10 mV, m = 0.3	1
AF output voltage	V_{Audio}		480		mVrms	V_i = 10 mV, m = 0.8	1
Total harm. distortion	k		1		%	V_i = 10 mV, m = 0.8	1
Input voltage for S + N/N = 6 dB		10			µVrms	V_i m = 0.3	1
Input voltage for S + N/N = 26 dB		60			µVrms	V_i m = 0.3	1
S + N/N			60		dB	V_i = 10 mV, m = 0.8	1
AF linearity	ΔV_{Audio}			3	dB	100 µV/100 mV	1
FM Demodulator $f_{i\,RF}$ = 450 kHz							
FM output voltage	V_{22}		tbd		mVrms	Δf = 2.5 kHz; AGC = slow	1
Limiter threshold	$V_{25,26}$ $V_{23,24}$		30 30		µVrms µVrms	V_{22} – 3 dB; AGC = slow	1 1
S + N/N			tbd		dB	$V_{23,24}$ = 10 mVrms	1
STS Δf_{STS} = 3 kHz, V_i = 10 mVrms R_{STS} = 100 k to V_S							
STS-out	V_{41}		8.5		V	$f_{IF} + \Delta f_{STS}$	1
STS-out	V_{41}			0.2	V	f_{IF}	1
STS-out	V_{41}		8.5		V	$f_{IF} - \Delta f_{STS}$	1

3.3 AC/DC Characteristics (cont'd)

V_S = 10 V, T_A = 25 °C, f_{IF1} = 10.7 MHz, f_{IF2} = 456 kHz, f_I = 1 MHz

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
MODES							
Divider Ratios Ports ABC							
Input voltage "L"	$V_{9, 14, 15}$			1.5	V		1
Input voltage "H"	$V_{9, 14, 15}$	3		V_S	V	s. Appendix A	1
Mixer 1/Mixer 2 SW 1							
Mixer 1 active, mixer 2 passive	V_8	2		V_S	V	s. Appendix A	1
Mixer 2active, mixer 1 passive	V_8			1.4			1
LIF 1/LIF 2 SW 2							
LIF 2 active, LIF 1 passive	V_{16}			1.5	V	s. Appendix A	1
LIF 1active, LIF 2 passive	V_{16}	3		V_S	V		1
Standby							
Standby active	V_{27}		0.7	1	V	Standby	1
Standby current	I_{37}		tbd		mA		1
AGC-Times							
Fast	V_{42}	2		V_S	V		1
Slow	V_{42}	2		0.7	V		1

3.3 AC/DC Characteristics (cont'd)

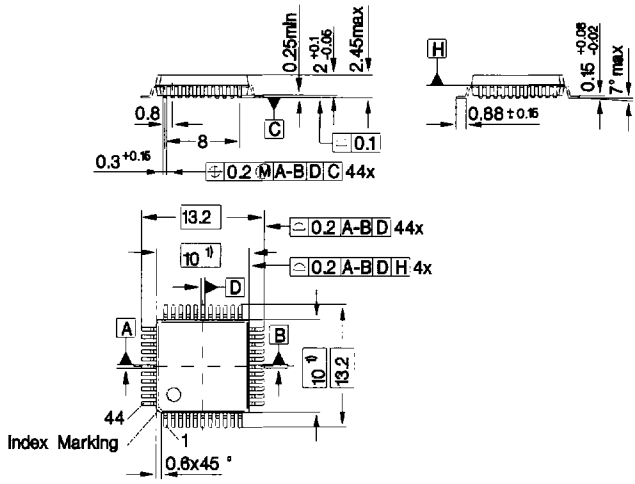
V_S = 10 V, T_A = 25 °C, f_{IF1} = 10.7 MHz, f_{IF2} = 456 kHz, f_i = 1 MHz

Parameter	Symbol	Limit Values			Unit	Test Condition	Test Circuit
		min.	typ.	max.			
Reference Voltage							
Reference voltage AM	V_{31}		4.8		V		1
Reference voltage FM	V_7		4.8		V		1

Note: Stresses above those listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

4 Package Outlines

P-MQFP-44-2
(Plastic Metric Quad Flat Package)



Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".
SMD = Surface Mounted Device

Dimensions in mm

Appendix A

n	1	2	4	6	8	8	10	12
A	0	1	1	0	1	1	0	0
B	0	1	1	1	0	0	1	0
C	0	0	1	1	1	0	0	1

SW 1 = H: Mixer 2 active inputs: AM21 and AM22
SW 1 = L: Mixer 1 active inputs: AM11 and AM12

SW 2 = H: LIF-in 1 (signal) LIF-in 4 (blocked to LF-GND) active
SW 2 = L: LIF-in 3 (signal) LIF-in 2 (blocked to LF-GND) active

SW 2 = H: LIF 1 [LIF-in 1 (signal) LIF-in 1 (signal) LIF-in 4 (blocked to LF-GND)]: active
SW 2 = L: LIF 2 [LIF-in 1 (signal) LIF-in 1 (signal) LIF-in 2 (blocked to LF-GND)]: active

AGCT = L: Normal Mode slow AGC time
AGCT = H: STS Mode fast AGC time

STDBY = L: Standby
STDBY = open: Normal