SIEMENS

ICs for Consumer Electronics

Multistandard Video-PLL-Demodulator
QPT-IF DF-Mixer
AM-AF Sound Demodulator

TDA 6930 Version 1.0

Data Sheet 02.97

TDA 6930 **Revision History:** **Current Version: 02.97**		
Previous Version:		
Page (in previous Version)	Page (in current Version)	Subjects (major changes since last revision)

Edition 02.97

This edition was realized using the software system FrameMaker®.

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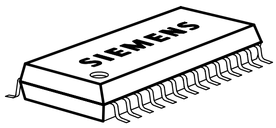
Multistandard Video-PLL-Demodulator TDA 6930
QPT-IF DF-Mixer
AM-AF Sound Demodulator

1 Features

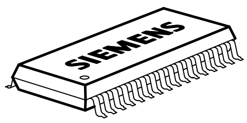
- **FPLL carrier regeneration**
  from sound channel without nyquist slope
  for best sound S/N and pulse response
- **Choice of 2 VIF/SIF switchable inputs**
- **Intercarrier operation possible**
- **Separate AM-AF demodulator channel**
  without external components
- **VCO frequency switchable for L/L‘**
- **Digital tuning AFC**
  separate adjustable for L‘
- **Parallel output of DF/Nicam and AM-AF**
- **L/L‘ peak white detector VIF-AGC**
  with average controlled response,
  scrambling save for Canal +
- **Adjustable tuner AGC**
- **Low operating voltage of 7.5 V**
- **Precise internal bandgap reference**
- **Fully ESD protected**

2 Applications

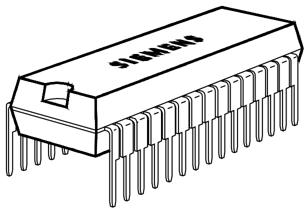
- **Television sets**
- **VTR sets**



P-DSO-28-1



P-DSO-32-1



P-SDIP-30-1

Type	Ordering Code	Package
TDA 6930X	Q67007-A5217 GEG	P-DSO-28-1
TDA 6931X	Q67007-A5229 GEG	P-DSO-32-1
TDA 6930S	Q67000-A5180	P-SDIP-30-1

3 General Description

The TDA 6930 is an integrated circuit for high class multistandard TV vision IF signal, sound IF signal and AM-Audio signal processing.
FM and NICAM sound IF carriers are converted to their intercarrier frequency.
All switching functions are controlled via open collector transistors.
Outputs for threshold controlled tuner AGC, digital tuning AFC, DF and AM-AF for all terrestrial standards are available.

4 Pin Configuration
(top view)

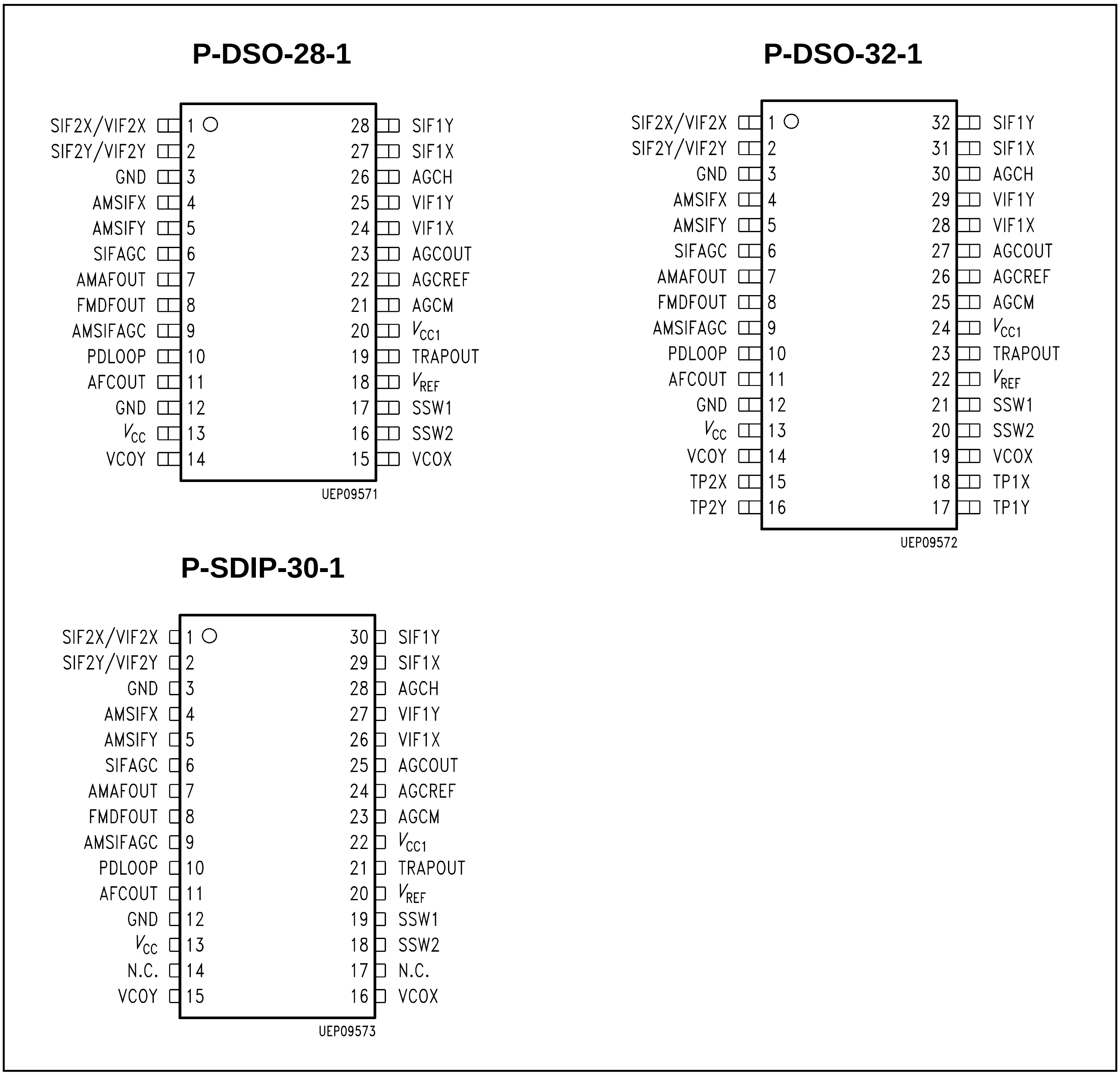


Figure 1

4.1 Pin Definitions and Functions

Table 1

Pin No.			Symbol	Function
P-DSO-28-1	P-DSO-32-1	P-SDIP-30-1		
1	1	1	SIF2X/VIF2X	Sound IF2/Carrier differential input signal Video IF2/Carrier differential input signal
2	2	2	SIF2Y/VIF2Y	
3	3	3	GND	Signal input ground
4	4	4	AMSIFX	AM Sound IF differential input signal
5	5	5	AMSIFY	
6	6	6	SIFAGC	FM Sound IF AGC capacitor
7	7	7	AMAFOUT	AM audio frequency output
8	8	8	FMDFOUT	FM/NICAM differential frequency output
9	9	9	AMSIFAGC	AM Sound IF AGC capacitor
10	10	10	PDLOOP	PLL loop filter
11	11	11	AFCOUT	AFC output
12	12	12	GND	Power supply ground
13	13	13	V_{CC}	Positive power supply voltage
14	14	15	VCOY	VCO reference circuit for $2 \times f_{pc}$
–	15	–	TP2X	Differential low pass capacitor in automatic phase control circuit for video demodulator
–	16	–	TP2Y	
–	17	–	TP1Y	Differential low pass capacitor in automatic phase control circuit for video demodulator
–	18	–	TP1X	
15	19	16	VCOX	VCO reference circuit for $2 \times f_{pc}$
16	20	18	SSW2	Standard switch
17	21	18	SSW1	
18	22	20	V_{REF}	Internal reference voltage capacitor
19	23	21	TRAPOUT	CVBS output signal
20	24	22	V_{CC1}	Analog small signal positive power supply voltage
21	25	23	AGCM	AGC average capacitor
22	26	24	AGCREF	Tuner AGC takeover adjust
23	27	25	AGCOUT	Tuner AGC output
24	28	26	VIF1X	Video IF1/Carrier differential input signal
25	29	27	VIF1Y	
26	30	28	AGCH	Video IF AGC capacitor
27	31	29	SIF1X	Sound IF1/Carrier differential input signal
28	32	30	SIF1Y	

4.2 Functional Block Diagram (P-DSO-32-1)

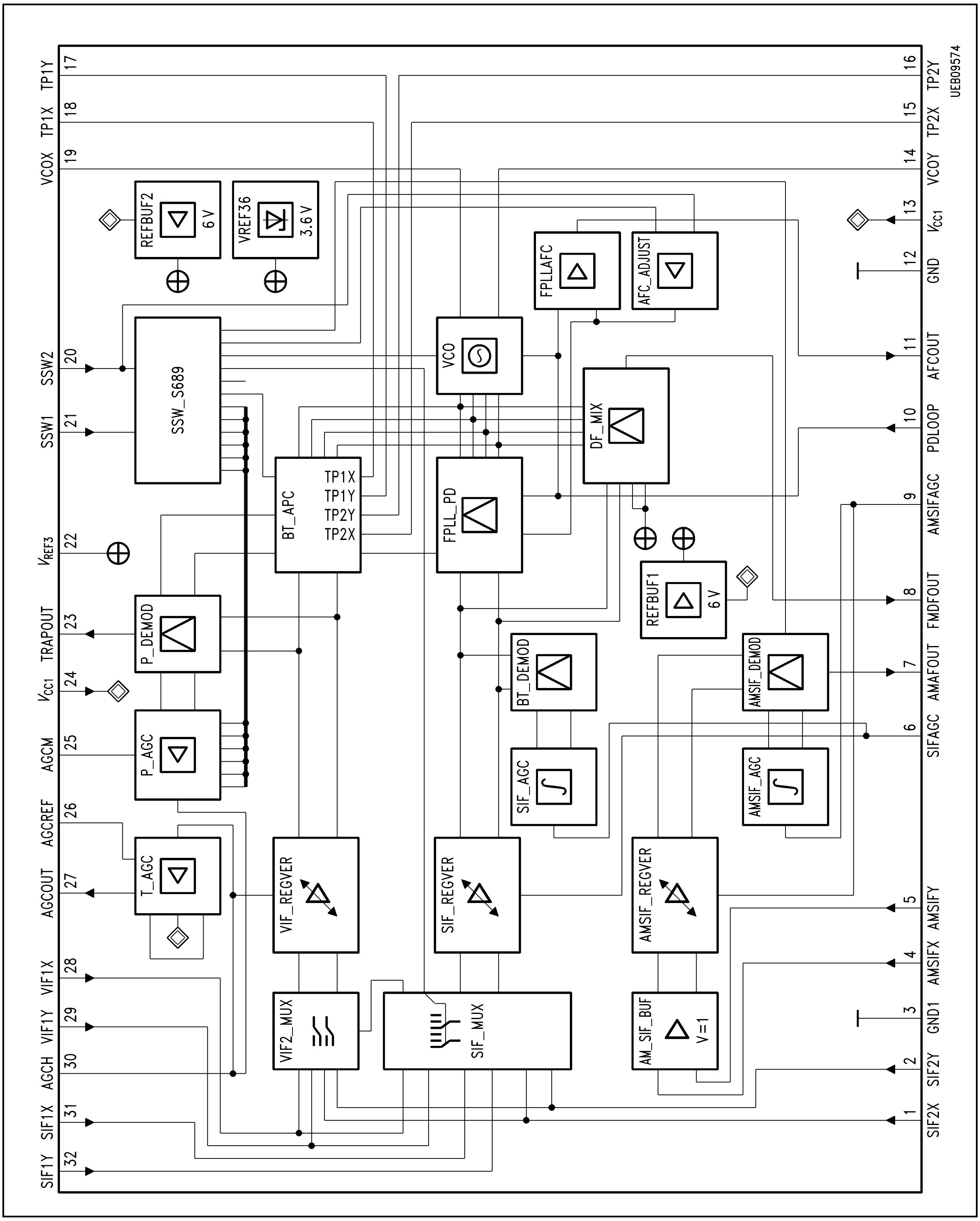


Figure 2
Block Diagram

5 Functional Description (P-DSO-32-1)

Inputs

The input signal is distributed via the IF-MUX to the according amplifier channels.

VIF-Mux

Normally VIF1 is used for video if input (filter with no sound carrier).

A special mode with a secondary VIF input at SIF2 is available. In this case the carrier recovery gets its input signal in any way from SIF1. For more Information see input selection logic-table in the application circuit section.

In the also available Intercarrier mode for low cost application, all signals are transferred together via VIF1 or VIF2 input, depending on input switching logic.

SIF-Mux

SIF1 input is used for DF-sound and carrier recovery (double channel filter).
For L‘ inverted sideband application SIF2 is used instead.

AMSIF input is used for all AM sound norms with switchable input filter.

IF Gain Controlled Amplifiers

The TDA 6930X incorporates a Video-IF demodulation part (VIF), a AM-sound demodulation part (AMSIF) and a Section for PIC-carrier recovery +FM/NICAM SIF conversion (SIF). Each path has its own four-stage capacitively coupled, gain controlled amplifier.

AGCs

Tuner AGC

A delayed tuner AGC voltage is derived from the VIF-AGC via an inverting threshold amplifier (increasing VIF input voltage decreases the AGCOUT voltage). Its take over point with positive control direction is set by means of a external potentiometer.

To avoid regulation oscillation the input has a shared characteristic and the output is clamped to min 0.3 V which prevents for coming into gain control inversion at low regulation voltage levels in several tuner application.

VIF AGCs

The AGC for the video-IF-amplifier (VIF) has a peak detector for both kinds of modulation. An additional mean value detector will increase the control current for positive modulation if the input signal decreases more than ca. 15 dB. In this case a hysteresis keeps the high control current until the mean value increases by ca. 10 dB. This and an extremely large sample time prevents from AGC oscillation with critical signals.

SIF/AMSIF AGCs

The AGC‘s for the AM- sound section and PIC-carrier recovery +FM/NICAM section use envelope detectors with extremely low distortion for the SIF amplifiers.
They have a quick charge circuit which increases the charge current by a factor of 1500 if the mean value of the signal increases by more than 10 dB.
The time constants of the AGCs can be set by the according external capacitor.

FPLL

FPLL Carrier Recovery

High performance in terms of FM sound, digital sound and videotext is obtained by means of a combined path for carrier recovery and FM/NICAM SIF (QPT). The input signal for this section is derived from the QPT SIF I/II input to overcome Nyquist slope distortions in all cases. For L‘-applications the VCO frequency is switched internally, thus no external tank circuit switching is necessary. Adjustment of the tank circuit (only necessary for the AFC) is achieved by aligning the AFC voltage to a certain value except in L‘- mode. In L‘-mode the AFC needs to be adjusted via control voltage at pin SSW2.

APC

For best video demodulation a phase locked clean carrier is needed. Due to differences in the filter and amplifier characteristics of the amplifier channels it is necessary to align the phase of the recovered carrier to the incoming signal of VIF port. The possible phase control margin of the therefore used APC is + 180° to – 180°.

For best performance 2 external low pass capacitors are added at the P-DSO-32 package. In this case the APC is extremely stable at carrier zero time and over modulation. This feature is not available in the less than 32 pin packages.

VCO

The VCO consists of a temperature compensated stacked symmetrical ECL multivibrator and divider by 2. The main tank circuit is aligned to twice of the recovery frequency. All internal signals are of symmetrical ECL type. This is necessary for small amplitudes with high temperature stability and low oscillator radiation.

Video Demodulation + Output

Video IF Demodulation

A real synchronous demodulator receives an inphase carrier via the automatic phase control (APC) from the FPLL. Thus, low differential phase and gain, high intermodulation ratio and good impulse response is achieved without any alignment.

DF-Mixer/FM Sound Conversion

The SIF-Sound/PIC-carrier section gets its input signal from SIF1 except in L‘-NICAM mode, then input SIF2 is active. The SIF- signal is mixed with the 90°-carrier from the FPLL to generate the 2. sound IF at the according output (DF). This output is always active except in Mac standard, there both sound outputs are off.

AM-Audio Sound Demodulation

The AM-sound section uses the envelope detector of the AGC to demodulate the AM sound signal. An optimized special AM-sound demodulator and the envelope detector guarantee an extremely low AF output distortion. In case of L or L‘ standard the AM-AF output is active, in other standards this output is inactive.

According to the standard switches FM/NICAM and/or AM processing is performed.

AFC + Adjust

The AFC consists of a high impedance input comparator who gets its control voltage from the loopfilter/VCO charge pump capacitor. Its OTA output voltage swing and gain can be controlled via the necessary external load resistors.
The adjust is controlled by norm switch inputs and is only active in L‘ mode. The operation is performed by controlling the reference input voltage of the AFC comparator.

Switches

The internal I^2L norm switch decoding logic is buffered by PNP comparator interfaces with hysteresis.

Therefore the input signal voltage margin at SSW1 and SSW2 is 0 to V_{CC}.

Voltage Reference

The reference voltage is performed by a temperature compensated band-gap structure with extremely low noise and high ripple rejection (PSSR). The reference voltage distribution is done by 3 buffer amplifiers with extremely high ripple rejection (PSSR).

6 Electrical Characteristics

6.1 Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	V_{CC}, V_{CC1}	0	10	V
Supply voltage (P-SDIP-30-1 only)	V_{CC}, V_{CC1}	0	12	V
Output current (R_{Lmin} = 500 Ω)	$I_{TRAPOUT}$	0	6	mA
Output current (R_{Lmin} = 2 kΩ)	$I_{uref3!}$	0	3	mA
Output current	I_{AGCOUT}	0	25	mA
Output voltages	$V_{SIFAGC's}$	0	3.6	V
Output voltage	V_{AGCOUT}	0	12	V
Output voltage	V_{AFCOUT}	0	V_{CC}	V
Output voltage	V_{DFOUT}	0	V_{CC}	V
Output voltage	V_{AFOUT}	0	V_{CC}	V
Output voltage	V_{AGCM}	0	3.6 < V_{CC}	V
Output voltage	$V_{TRAPOUT}$	0	V_{CC}	V
Output voltage	$V_{uref3!}$	0	7 < V_{CC}	V
Input voltage	V_{AGCREF}	0	3.6 < V_{CC}	V
Input voltages	$V_{VIF,SIF}$	0	V_{CC}	V
Input voltages	V_{SSW}	0	V_{CC}	V
Input voltages	V_{TP}	0	6 < V_{CC}	V
Input voltages	V_{VCO}	0	4.5 < V_{CC}	V
Input voltage	V_{PDLOOP}	0	6 < V_{CC}	V
ESD-voltage all pins HBM (R = 1.5 kΩ, C = 100 pF)	V_{ESD}	– 4	4	kV
Junction temperature	T_j		150	°C
Storage temperature	T_{stg}	– 40	125	°C
Thermal resistance P-DSO-28-1 (sys-air)	T_{thSA}		76	K/W
Thermal resistance P-DSO-32-1 (sys-air)	T_{thSA}		76	K/W
Thermal resistance P-SDIP-30-1 (sys-air)	T_{thSA}		57	K/W

Note: The maximal ratings may not be exceeded under any circumstances, not even momentary and individual, as permanent damage to the IC will result.
All voltage values are referenced to ground, if not stated otherwise.

6.2 Operating Characteristics

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	V_{CC}, V_{CC1}	7.5	10	V
Supply voltage (P-SDIP-30-1 only)	V_{CC}, V_{CC1}	7.5	12	V
Tuner AGC supply voltage	V_{AGCOUT}	0.6	10	V
IF-input frequency range VIF, SIF, AMSIF	f_{in}	12	60	MHz
IF-input AC-voltages	V	50 µVrms	120 mVrms	
Ambient temperature during operation	T_A	– 10	85	°C

Note: Within the operational range the IC operates as described in the circuit description. The AC/DC characteristic limits are not guaranteed.
All voltage values are referenced to ground, if not stated otherwise.

6.3 DC Characteristics

T_A = 25 °C, V_{CC} = 8.5 V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Power Supply						
Total current consumption	$I_{CC} + I_{CC1}$		90		mA	R_L > 1 MΩ, C_L < 1.5 pF
Reference voltage	$V_{uref3!}$	5.7	6.0	6.3	V	R_L > 1 MΩ, C_L < 1.5 pF
Reference voltage	$I_{uref3!}$			2	mA	
Norm Switches						
H Level	V_{SSW}	2		5	V	
L Level	V_{SSW}	0		1	V	
External load at SSW2 if high	I_{SSW2}			1	%	of resistor divider current

6.3 DC Characteristics (cont'd)

T_A = 25 °C, V_{CC} = 8.5 V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
IF Inputs						
DC level	V_{IF}	3.4	3.6	3.8	V	V_{IF} = 0 Vpp
Mono/Intercarrieractive	I_{SIF1}	100		400	µA	R_{Gnd} < 27 kΩ
2nd. IF input VIF2 active	I_{VIF1}	100		400	µA	R_{Gnd} < 27 kΩ
VCO						
Tank circuit, DC level	V_{VCO}		2.6		V	
Loopfilter voltage	V_{PDloop}	2.3		5	V	dependent on input frequency
Peak - Detector VIF-AGC						
Voltage range	V_{AGCH}	0		3.6	V	dependent on input amplitude
AGC Time Constant B/G Standard						
Charge current	I_{AGCH}		1		mA	V_{AGCH} = 2 V, $V_{TRAPOUT}$ < 1.0 V
Discharge current	I_{AGCH}		12		µA	V_{AGCH} = 2 V, $V_{TRAPOUT}$ > 2.0 V
Charge/discharge ratio	AGCH		83			

6.3 DC Characteristics (cont'd)

T_A = 25 °C, V_{CC} = 8.5 V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
AGC Time Constant With L-Standard or Mac Standard						
Charge current	I_{AGCH}		1		mA	V_{AGCH} = 2 V, $V_{TRAPOUT}$ > 3.0 V
Discharge current	I_{AGCH}		120		nA	V_{AGCH} = 2 V, $V_{TRAPOUT}$ = 2.5 V
Discharge current (under average control)	I_{AGCH}		100		µA	V_{AGCH} = 2 V, $V_{TRAPOUT}$ < 1.0 V
Charge/discharge ratio	AGCH		8300			
Envelope - Detector AGCs						
Voltage range	$V_{SIFAgcs}$	0.2		2.9	V	dependent on input amplitude
Charge/discharge current	$\pm I_{SIFAgcs}$		1.5		µA	$V_{SIFAgcs}$ = 1.5 V
Quick charge	$I_{SIFAgcs}$		1.5		mA	$V_{SIFAgcs}$ = 1.5 V
Video Output						
Output current	$-I_{Trapout}$		0.84		mA	$V_{AGCM} = V_{sync}$ + 0.7 V V_{VIF} = Carrier nomod.
Sync pulse level	$V_{Trapout}$		1.25		V	
White level	$V_{Trapout}$		2.75		V	
AM Output						
DC level (L, L')	$V_{AMAFout}$	3.2	3.6	4.0	V	SC $_{nomod.}$
DC level (AM inactive)	$V_{AMAFout}$	high impedance				

6.3 DC Characteristics (cont'd)

T_A = 25 °C, V_{CC} = 8.5 V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
DF Output						
DC level	$V_{FMDFout}$	2.8	3.4	4.0	V	
Output current	$I_{FMDFout}$		2.5		mA	$V_{FMDFout}$ = DC level + 0.7 V
AFC Output						
Voltage range	V_{AFCout}	1V		V_S – 1 V	V	
Output current	I_{AFCout}		250		µA	$V_{AFC} = V_{CC}/2$
Voltage at centerfrequency	V_{AFCout}		$V_{CC}/2$		V	1:1 V_{CC} divider
Slope	I_{AFCout}		0.7		µA/kHz	
AFC - adjust	V_{SSW2}	3		5	V	switch at SSW2: high impedance
Tuner AGC						
Max. output current max. 1 ms	I_{AGCOUT}	10	18	30	mA	V_{AGCOUT} = 4 V R_{AGCOUT} = 0 Ω
Min. output current	I_{AGCOUT}	0		10	µA	$V_{AGCOUT} = V_{CC1}$ V_{AGCREF} = max.
Output short current	I_{AGCOUT}	150	200	250	µA	V_{AGCOUT} = 0 V $R_{AGCOUT} = \infty$
Min. output voltage	V_{AGCOUT}	0.2	0.3	0.5	V	$R_{AGCOUT} = \infty$

Note: AC/DC characteristics involve the spread of values guaranteed in the specified supply voltage and ambient temperature range.
Typical characteristics are the median of the production.

6.4 AC Characteristics

T_A = 25 °C, V_{CC} = 8.5 V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
IF Inputs						
Control range	$\Delta V_{VIF,SIF}$	54	60		dB	
Min. input voltage	$V_{VIF,SIF}$		120	180	µVrms	$V_{Trapout}$ = – 3 dB
AGC range	ΔV_{AMSIF}	54	60		dB	
Min. input voltage	V_{AMSIF}		120	180	µVrms	$V_{AMAFout}$ = – 3 dB
Video Output, VIF OFW G1962M Sound Shelf – 20 dB						
Signal level	$V_{Trapout}$	1.25	1.5	1.75	Vpp	B/G norm
Video bandwidth	$f_{-1\,dB}$	7	8		MHz	$V_{Trapout}$ = – 1 dB
Differential Gain	DG		4		%	R_L > 1 MΩ, C_L < 1.5 pF
Differential Phase	DP		1.5		deg	R_L > 1 MΩ, C_L < 1.5 pF
Intermodulation f_1 = 4.52 MHz, PC modulated from black to white, f_2 = 5.50 MHz, SC –13 dB to unmodulated PC	@IM		62		dB	f = 980 kHz Levels at Trapout f_1 = – 2.0 dB f_2 = – 13 dB R_L > 1 MΩ, C_L < 1.5 pF
Intermodulation f_1 = 4.4 MHz, – 13.2 dB to PC sync level, – 10 dB to PC modulated from black to white, f_2 = 5.50 MHz, SC – 7 dB to unmodulated PC	@IM		69		dB	f = 1.1 MHz Levels at IF input f_1 = – 13.2 dB to sync f_2 = – 27 dB to PC R_L > 1 MΩ, C_L < 1.5 pF
S/N CCIR Unified WTD S/N CCIR 567 Unweighted		60 55	65 59		dB	V_{IF} = max. black & white
Residual vision carrier	$V_{Trapout}$		500		µVrms	R_L > 1 MΩ, f = 38.9 MHz

6.4 AC Characteristics (cont'd)

T_A = 25 °C, V_{CC} = 8.5 V

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Residual VCO carrier	$V_{Trapout}$		350		μVrms	R_L > 1 MΩ, f = 77.8 MHz

DF Output

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Signal level Input wideband transformer coupled	$V_{FMDFout}$		100		mVrms	SC/PC = – 13 dB $PC_{nomod.}$
Output current	$I_{FMDFout}$		2.5		mA	$V_{FMDFout}$ = DC level + 0.7 V
S/N CCIR WTD			58		dB	PIC = FubK Pattern V_{IF} = max.

AM Output: No Picture Carrier, AM SIF OFW L9453M

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Signal level	$V_{AMAFout}$	700	900	1100	mVrms	m = 80%, 1 kHz
THD total			0.25	0.5	%	m = 30%, 1 kHz
THD total			0.35	1.0	%	m = 80%, 1 kHz
S/N Quasi Peak CCIR WTD			60		dB	m = 80%, 1 kHz $V_{AMAFout}$ = + 3 dB

AM Output: Picture Carrier FubK Modulation, AM SIF OFW L9453M

Parameter	Symbol	min.	typ.	max.	Unit	Test Condition
Signal level	$V_{AMAFout}$	700	900	1100	mVrms	m = 80%, 1 kHz
THD $2 \times f_o$			0.1	0.25	%	m = 30%, 1 kHz
THD total			1.5	2.0	%	m = 30%, 1 kHz
THD $2 \times f_o$			0.2	0.5	%	m = 80%, 1 kHz
THD total			0.7	1.5	%	m = 80%, 1 kHz
S/N Quasi Peak CCIR WTD			45		dB	m = 80%, 1 kHz $V_{AMAFout}$ = + 3 dB

Note: AC/DC characteristics involve the spread of values guaranteed in the specified supply voltage and ambient temperature range.
Typical characteristics are the median of the production.

7 Application Circuits

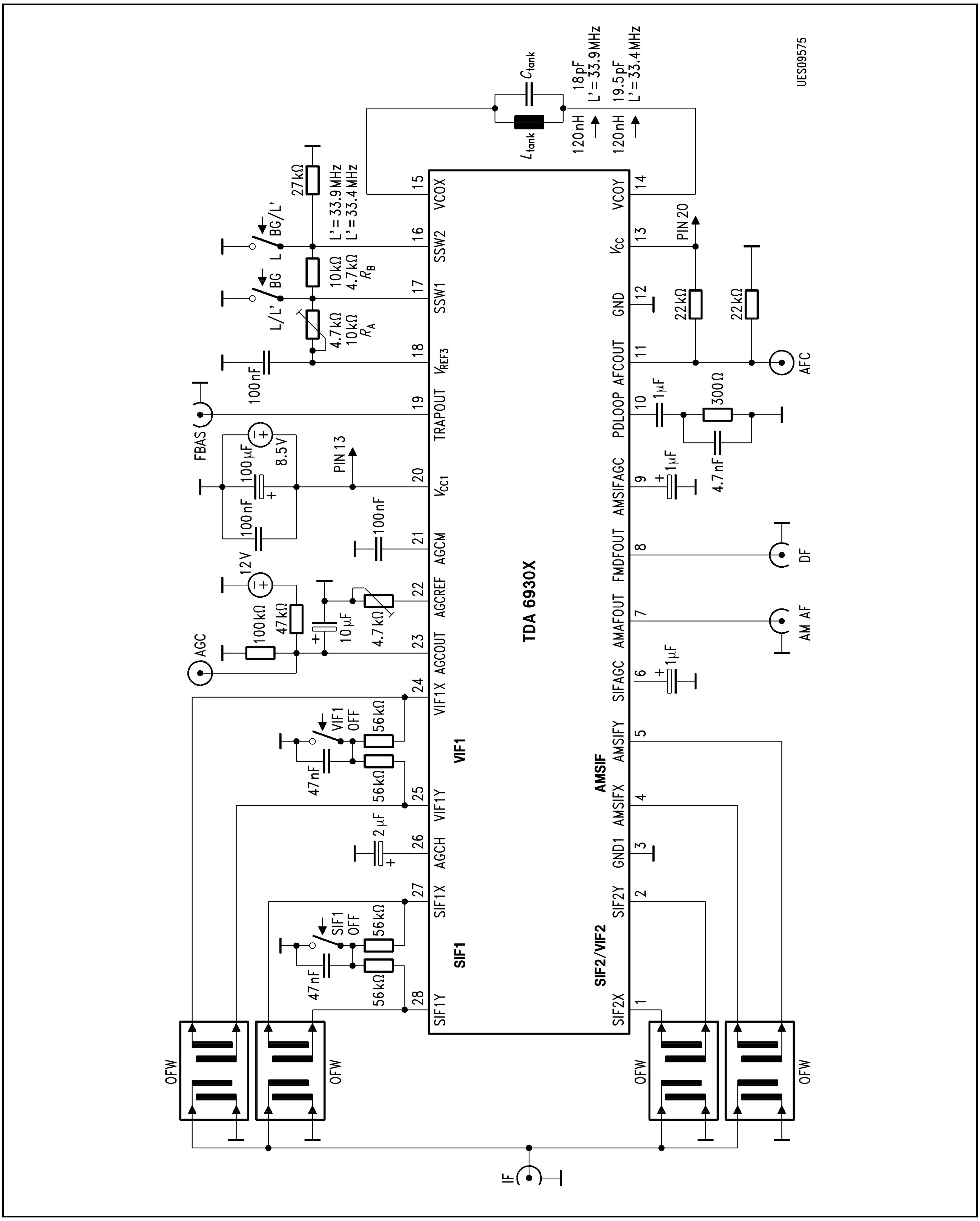


Figure 3
Application Circuit P-DSO-28-1

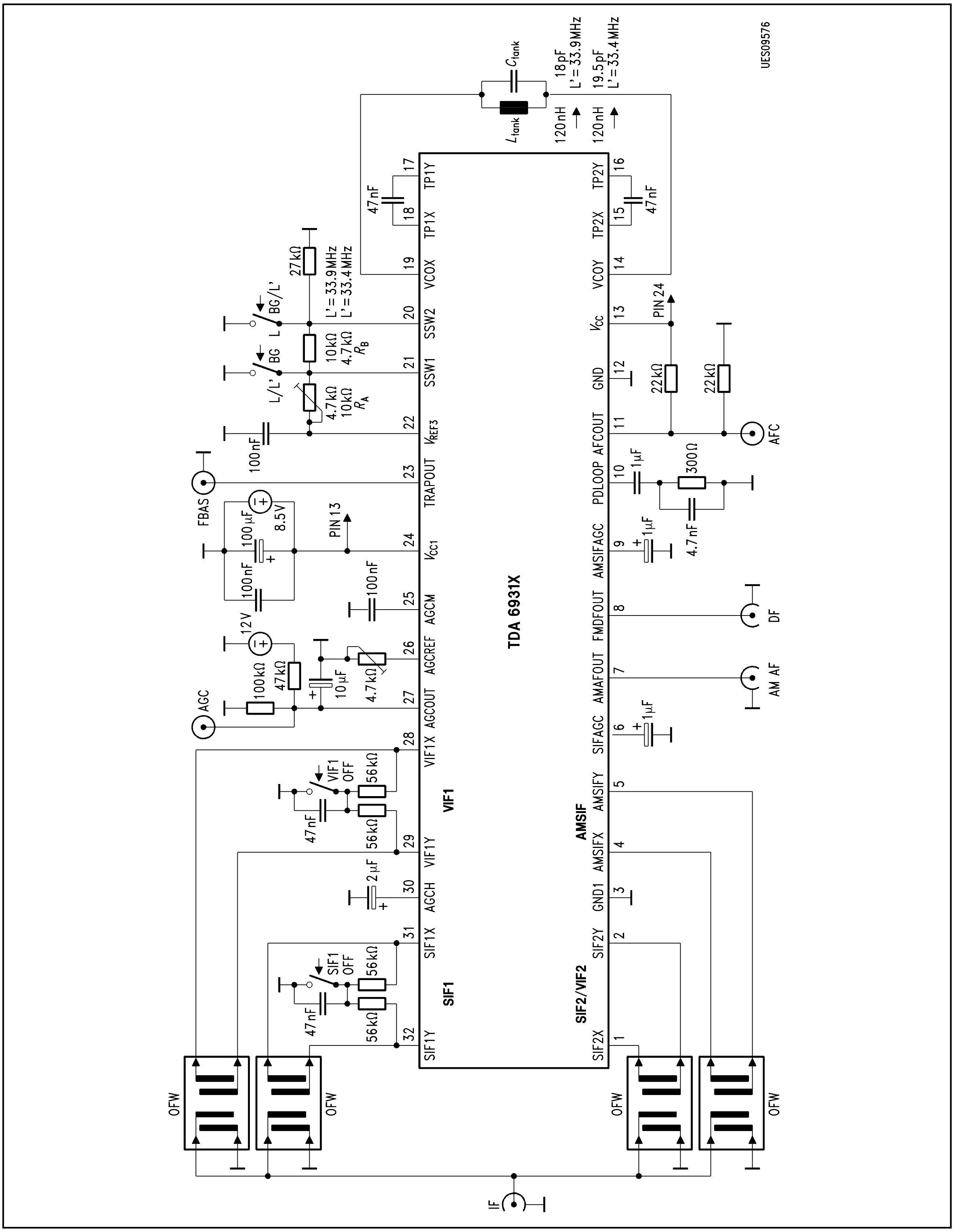


Figure 4
Application Circuit P-DSO-32-1

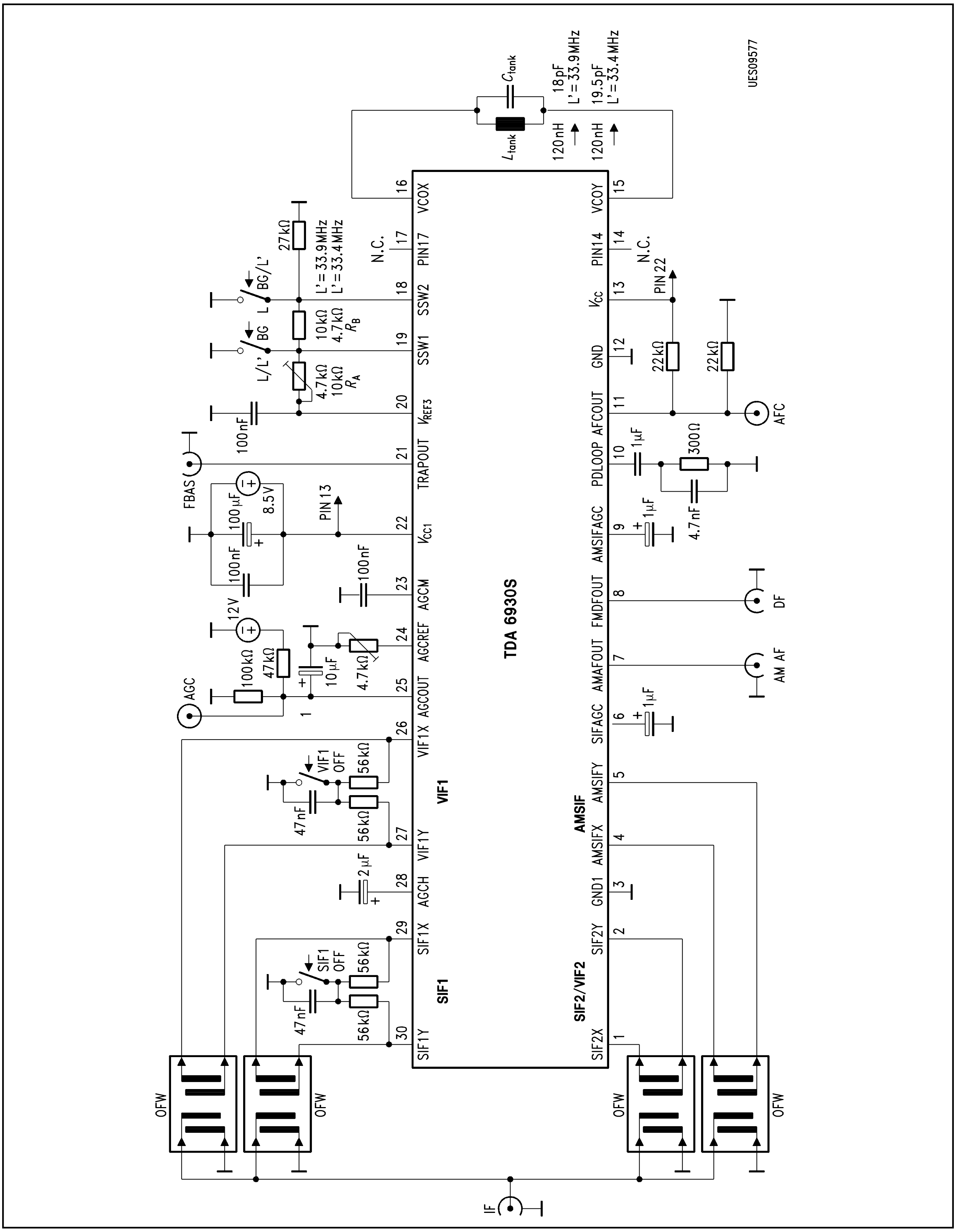


Figure 5
Application Circuit P-SDIP-30-1

Table 2
Input Selection Logic

SIF1	VIF1	SSW1	SSW2	VCO[1] MHz	Selected Inputs[2]		Modu-lation	AGC-type/Ratio	AM AF	AFC Adjust	Norm	
					VIF	SIF						
H	H	H	H	38.9	VIF1	SIF1	neg.	syncpeak/1:83	mute	off		BG
H	H	H	L	38.9	VIF1	SIF1	neg.	syncpeak, average/1:8300	mute	off		(Mac)
H	H	L	H	33.9	VIF1	SIF2	pos.	whitepeak, average/1:8300	on	on		L‘
H	H	L	L	38.9	VIF1	SIF1	pos.	whitepeak, average/1:8300	on	off		L
H	L	H	H	38.9	VIF2	SIF1	neg.	syncpeak/1:83	mute	off		BG
H	L	H	L	38.9	VIF2	SIF1	neg.	syncpeak, average/1:8300	mute	off		(Mac)
H	L	L	H	33.9	VIF2	SIF1	pos.	whitepeak, average/1:8300	on	on		L‘
H	L	L	L	38.9	VIF2	SIF1	pos.	whitepeak, average/1:8300	on	off		L
L	H	H	H	38.9	VIF1	VIF1	neg.	syncpeak/1:83	mute	off	intercarrier	BG
L	H	H	L	38.9	VIF1	VIF1	neg.	syncpeak, average/1:8300	mute	off	intercarrier	(Mac)
L	H	L	H	33.9	VIF1	VIF1	pos.	whitepeak, average/1:8300	on	on	intercarrier	L‘
L	H	L	L	38.9	VIF1	VIF1	pos.	whitepeak, average/1:8300	on	off	intercarrier	L
L	L	H	H	38.9	VIF2	VIF2	neg.	syncpeak/1:83	mute	off	intercarrier	BG
L	L	H	L	38.9	VIF2	VIF2	neg.	syncpeak, average /1:8300	mute	off	intercarrier	(Mac)
L	L	L	H	33.9	VIF2	VIF2	pos.	whitepeak, average/1:8300	on	on	intercarrier	L‘
L	L	L	L	38.9	VIF2	VIF2	pos.	whitepeak, average/1:8300	on	off	intercarrier	L

[1] ..internal VCO: 2 [2] ..VIF = Vision-IF, SIF = Sound-IF + Carrie
S-DIP-30: SIF1 = pin 29, 30; SIF2 = pin 1, 2; VIF1 = pin 26, 27; VIF2 = pin 1, 2; SSW1 = pin 19; SSW2 = pin 18
P-DSO-32: SIF1 = pin 31, 32; SIF2 = pin 1, 2; VIF1 = pin 28, 29; VIF2 = pin 1, 2; SSW1 = pin 21; SSW2 = pin 20

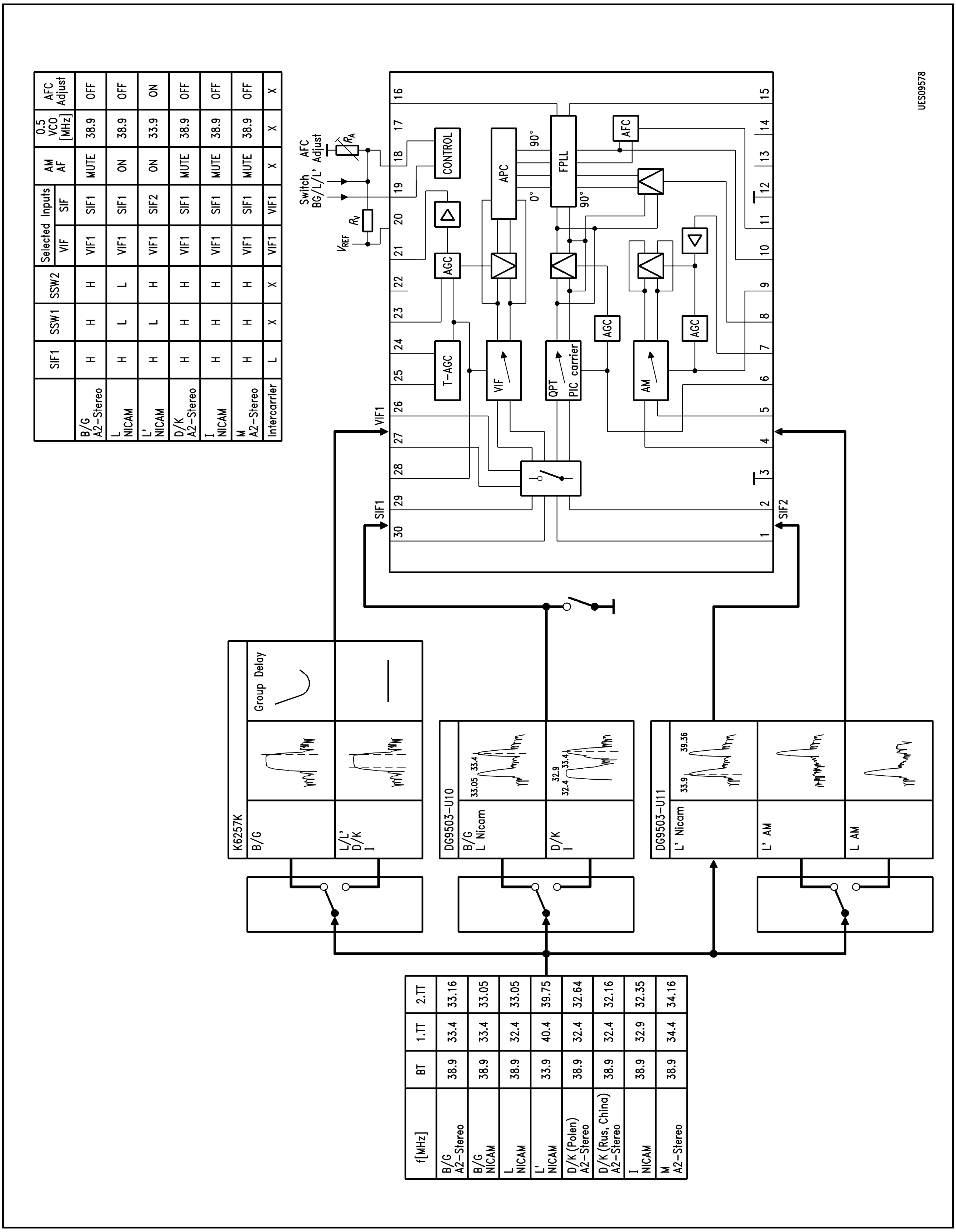
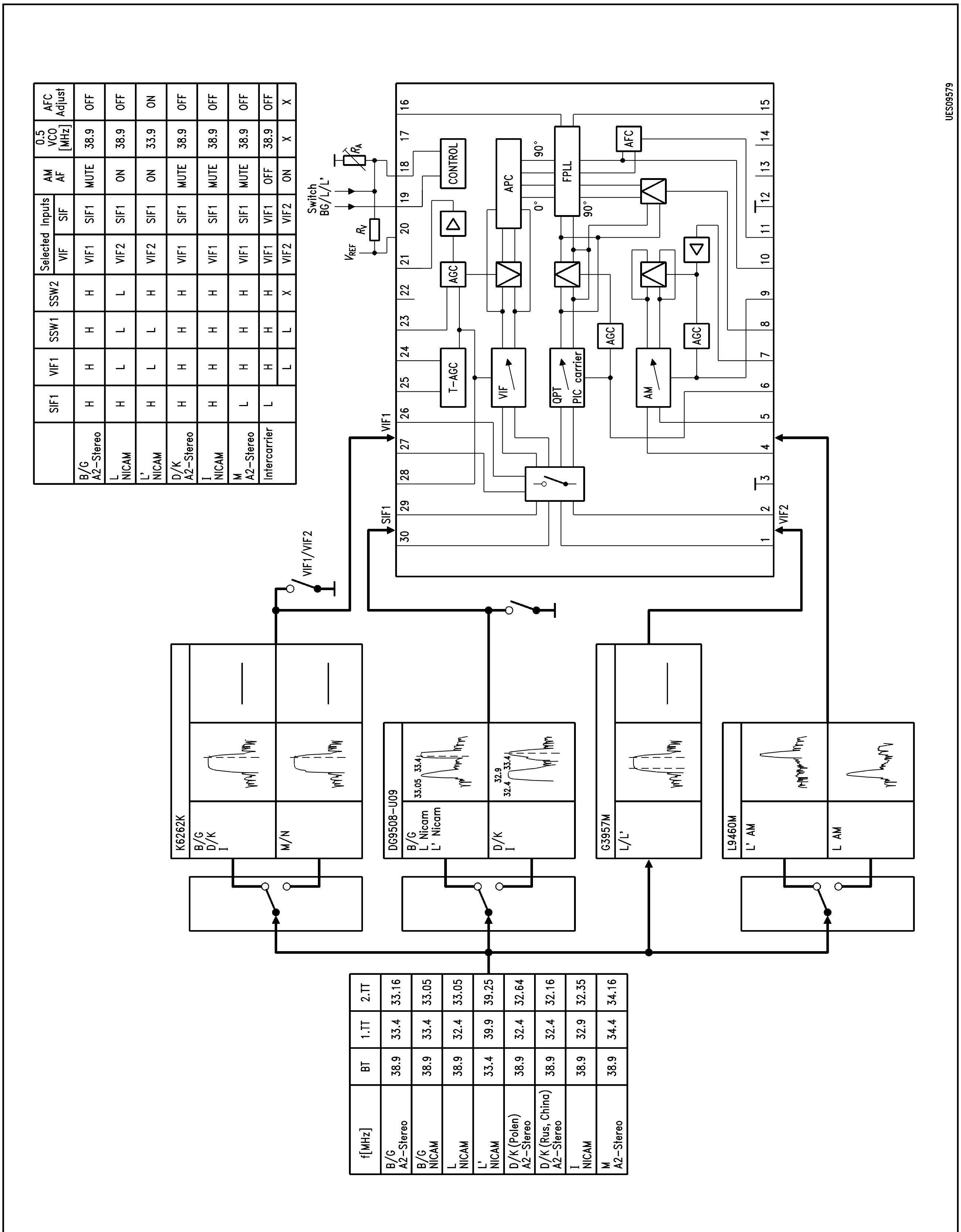


Figure 6
Typical Input-Filter Concept 1



	SIF1	VIF1	SSW1	SSW2	Selected Inputs VIF	Selected Inputs SIF	AM AF	0.5 VCO [MHz]	AFC Adjust
B/G A2-Stereo	H	H	H	H	VIF1	SIF1	MUTE	38.9	OFF
L NICAM	H	L	L	L	VIF2	SIF1	ON	38.9	OFF
L' NICAM	H	L	L	H	VIF2	SIF1	ON	33.9	ON
D/K A2-Stereo	H	H	H	H	VIF1	SIF1	MUTE	38.9	OFF
I NICAM	H	H	H	H	VIF1	SIF1	MUTE	38.9	OFF
M A2-Stereo	L	H	H	H	VIF1	SIF1	MUTE	38.9	OFF
Intercarrier	L	H	H	H	VIF1	VIF1	OFF	38.9	OFF
		L	L	X	VIF2	VIF2	ON	X	X

f[MHz]	BT	1.TT	2.TT
B/G A2-Stereo	38.9	33.4	33.16
B/G NICAM	38.9	33.4	33.05
L NICAM	38.9	32.4	33.05
L' NICAM	33.4	39.9	39.25
D/K (Polen) A2-Stereo	38.9	32.4	32.64
D/K (Rus, China) A2-Stereo	38.9	32.4	32.16
I NICAM	38.9	32.9	32.35
M A2-Stereo	38.9	34.4	34.16

Figure 7
Typical Input-Filter Concept 2

Application Hints

Table 3
AFC Adjust and VCO Tank Circuit Dimension 1st VCO[1] Frequency = 38.9 MHz

2nd VCO Frequency[2]	R_a	R_b	L_c	C_c
33.4 MHz	10 k	4.7 k	120 nH	19.5 pF
33.9 MHz	4.7 k	10 k	120 nH	18 pF

[1] ..internal VCO: 2 frequency for any norm except L‘

[2] ..internal VCO: 2 frequency for L‘

Application Note 1: Adjusting the Tank Circuit

At the desired IF-frequency the AFC-output current has to be zero. Therefore the voltage at that pin will be V_s/2. This is achieved by adjusting 1st the coil, 2nd R_a for L‘ mode. No further alignment e.g. for sound S/N is necessary.

Application Note 2: FPLL, Loopfilter Response

Measuring the frequency response of the loop.

The frequency response of the FPLL can be measured at the loopfilter output pin 10. If a frequency modulated carrier is applied to the Picture carrier input the demodulated signal occurs at pin 10. Within its bandwidth the FPLL can track modulation frequencies, thus this frequencies can be measured there. The frequency response with the recommended loopfilter can be seen in the picture below.

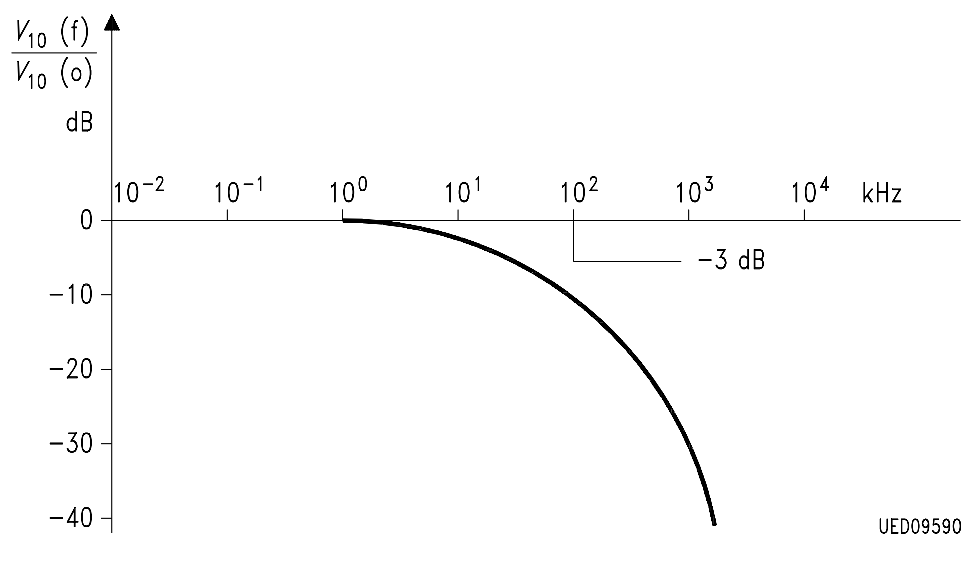


Figure 8

Designing the frequency response:

There should be no overshoot until 20 kHz. The bandwidth has to be high enough to control the distortions generated by the tuner. To reject intercarrier buzz at 250 kHz video modulation the loop filter response at that frequency should be as low as possible.

Application Note 3: Equations

Resonance frequency: $f_n = \frac{1}{2\pi}\sqrt{\frac{K_O\ K_{DI}}{C_{LF}}}$

Damping factor: $\nu = \pi\ f_n\ C_{LF}\ R_{LF}$

Phase detector gain: $K_{OI} = 250\ \frac{\mu A}{rad}$

VCO-gain: $K_O = 2\pi \times 2\ \frac{MHz}{V}$

with tank circuit: 120 nH || 18 pF

Loopfilter capacitor:	C_{LF}	recommended	C_{LF} = 1 µF
Loopfilter resistor:	R_{LF}	recommended	R_{LF} = 120 Ω
A second capacitor in parallel with R_{LF} is recommend to reduce the response at	250 kHz		C_P = 4.7 nF

Values:

With the recommend tank circuit and loopfilter

VCO range:	Δf_{pp} = 4 MHz
Resonance frequency:	f_n = 9 kHz
Damping factor:	ν = 8.5
Loop cut off frequency:	$f_{-3\ dB}$ = 100 kHz

8 Internal Circuits

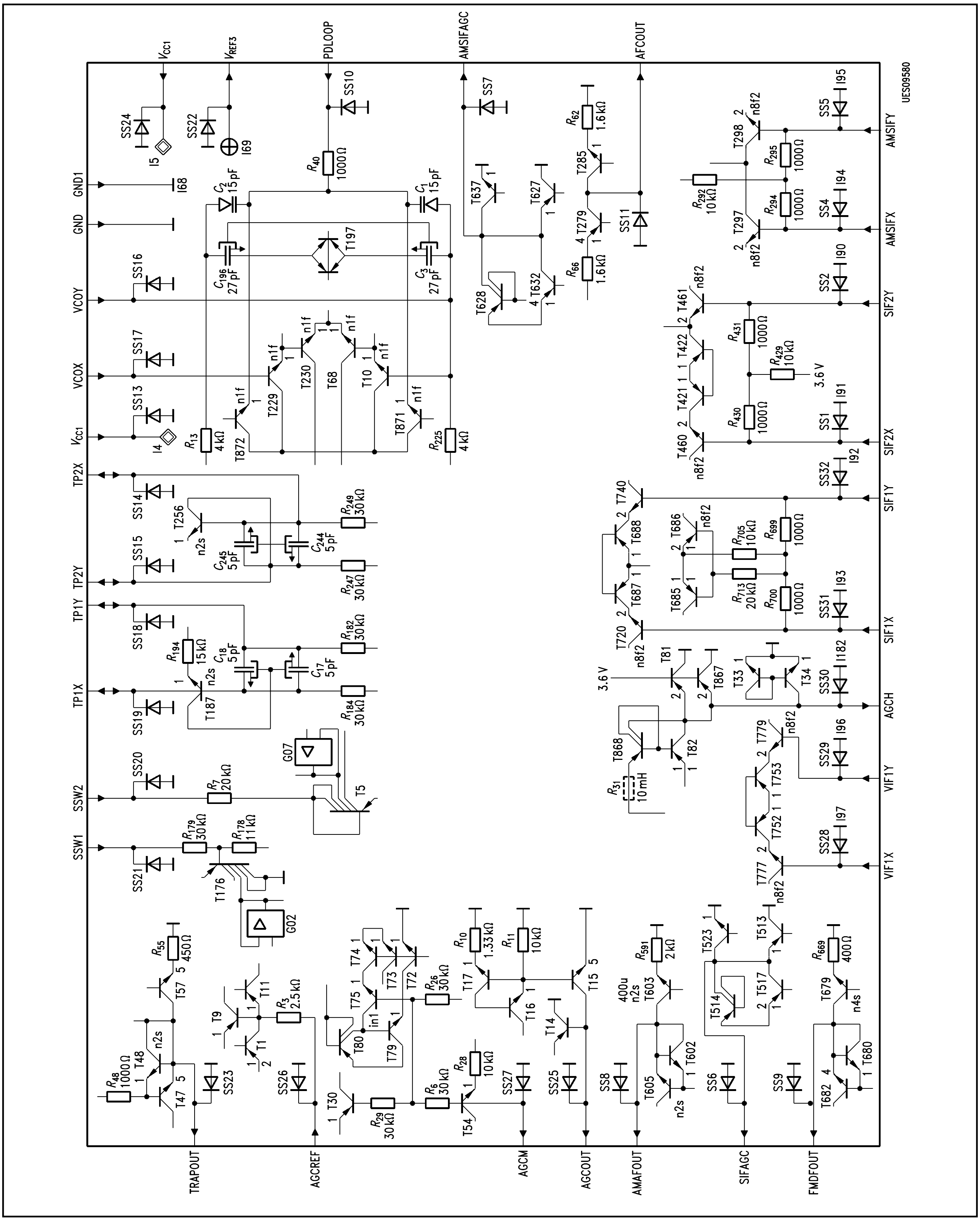


Figure 9

9 Electrical Diagrams

Conditions: V_{CC} = 8.5 V

9.1 Typical VIF AGC Voltage Characteristic

as a function of input signal

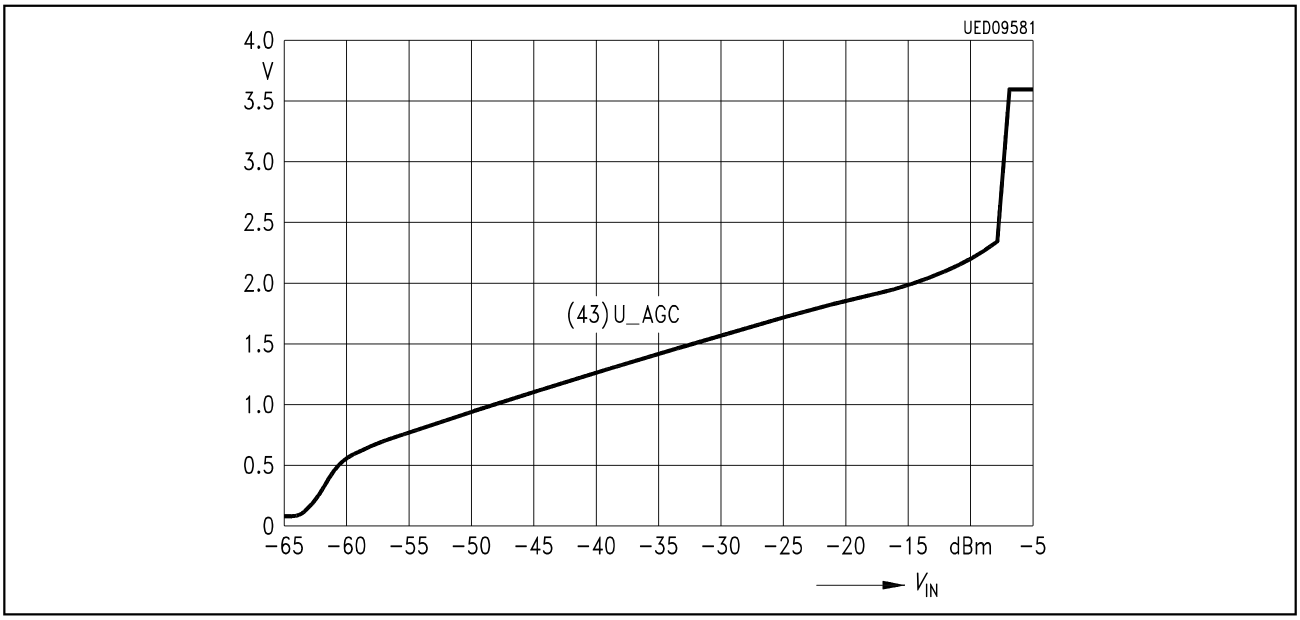


Figure 10

9.2 Typical VIF Intermodulation

as a function of input signal

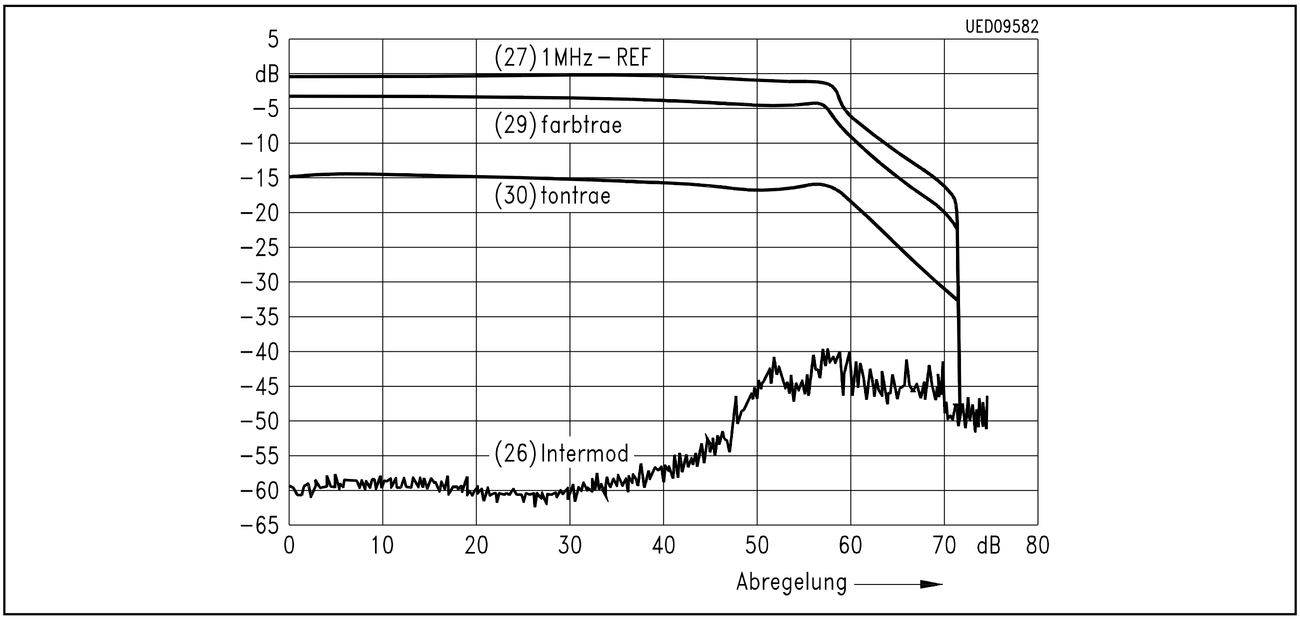


Figure 11

9.3 Typical AM AF S/N

as a function of input signal

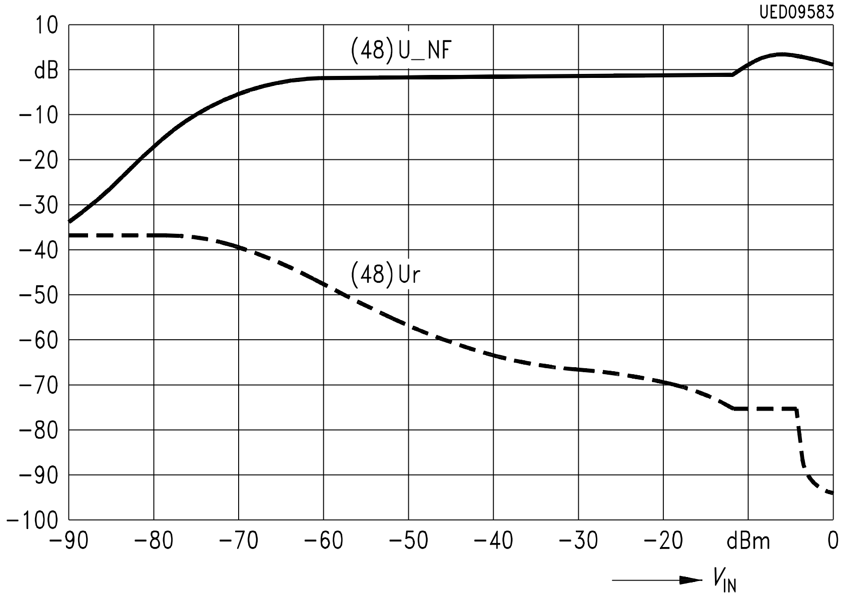


Figure 12

9.4 Typical AM Audio THD

as a function of input signal: m = 80%

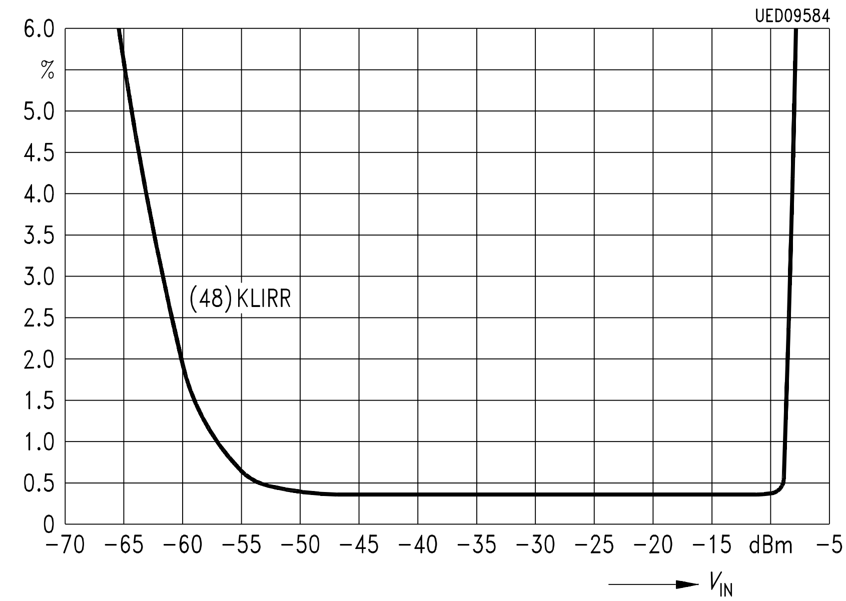


Figure 13

9.5 Typical DC-Current Consumption

as a function of V_{CC}

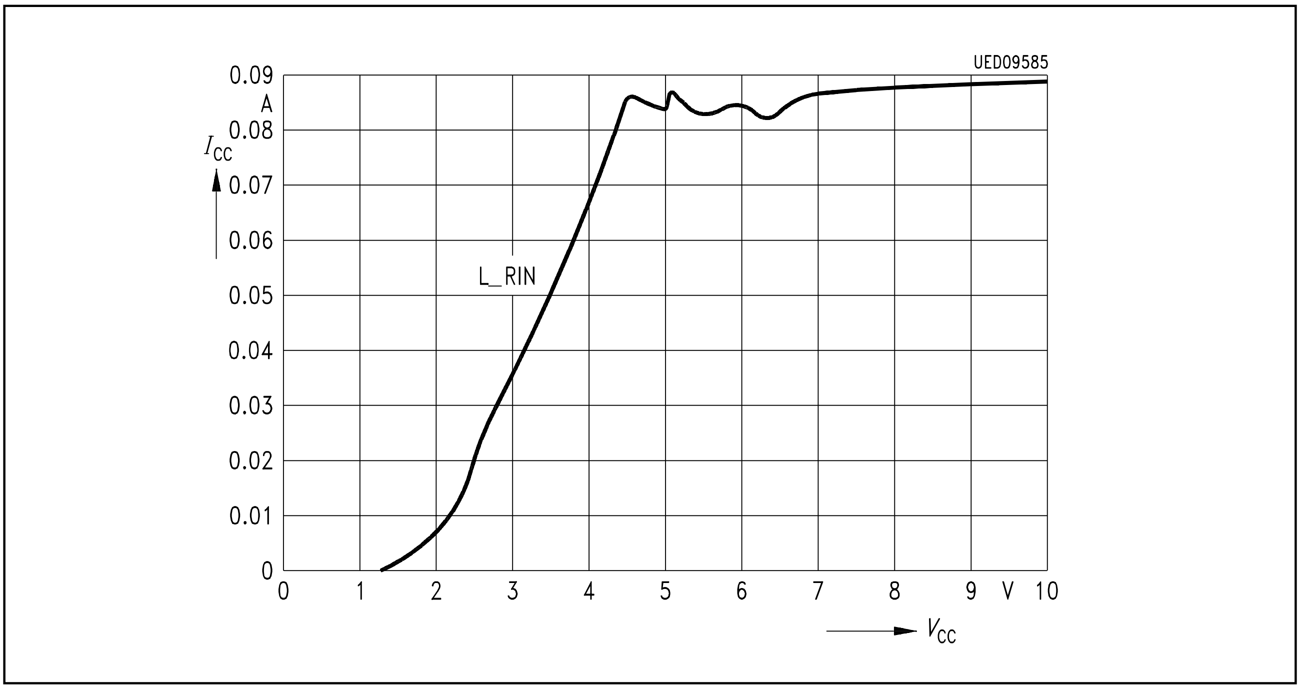


Figure 14

9.6 Typical AF Amplitude

as a function of input signal: m = 80%

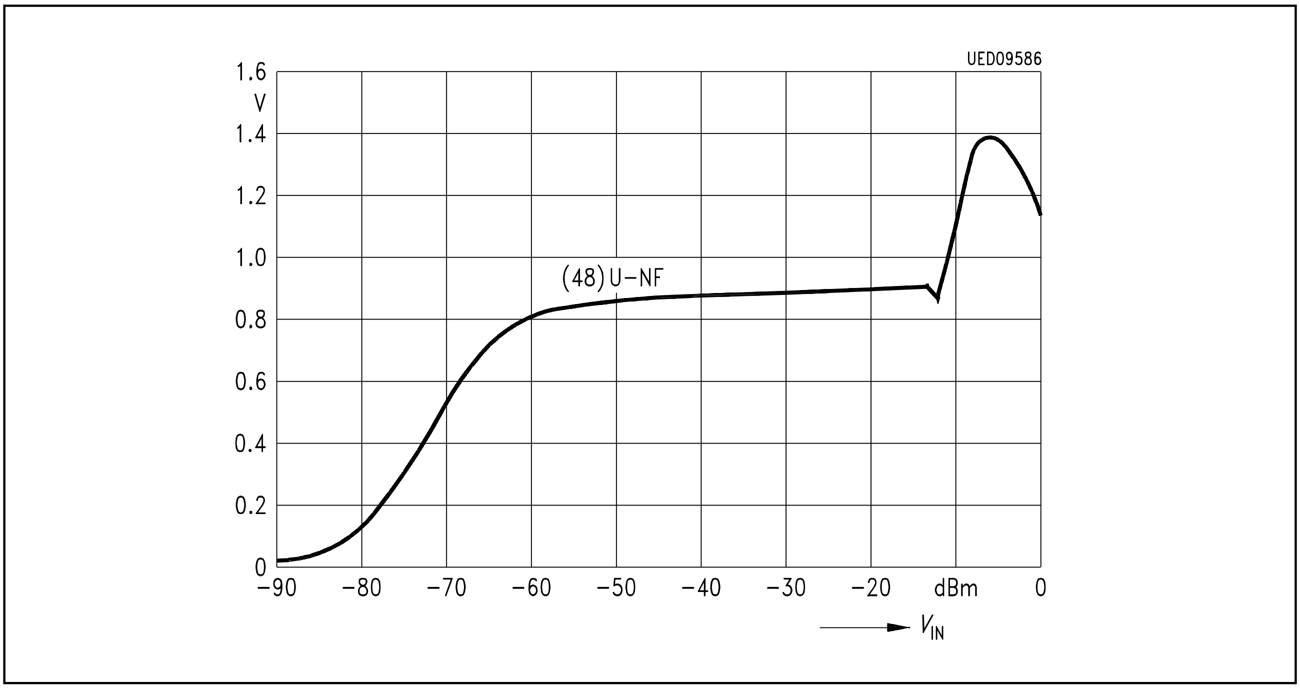
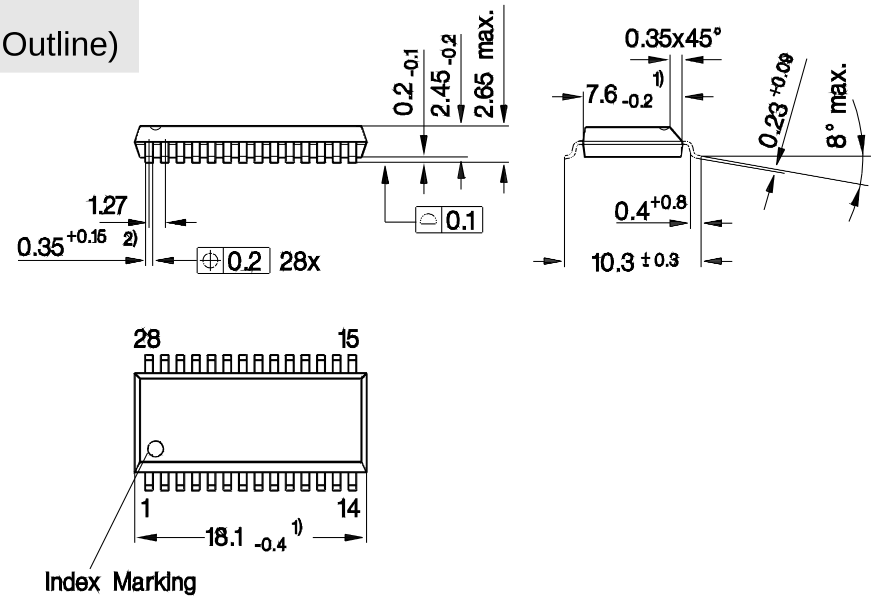


Figure 15

10 Package Outlines

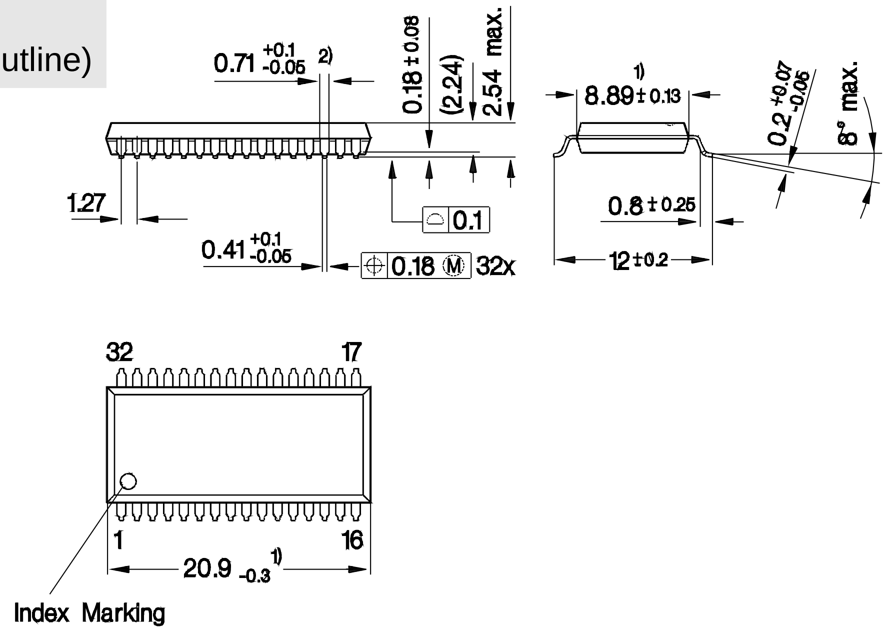
P-DSO-28-1
(Plastic Dual Small Outline)



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

GPS05123

P-DSO-32-1
(Plastic Dual Small Outline)



1) Does not include plastic or metal protrusion of 0.25 max. per side
2) Does not include dambar protrusion of 0.1 max. per side

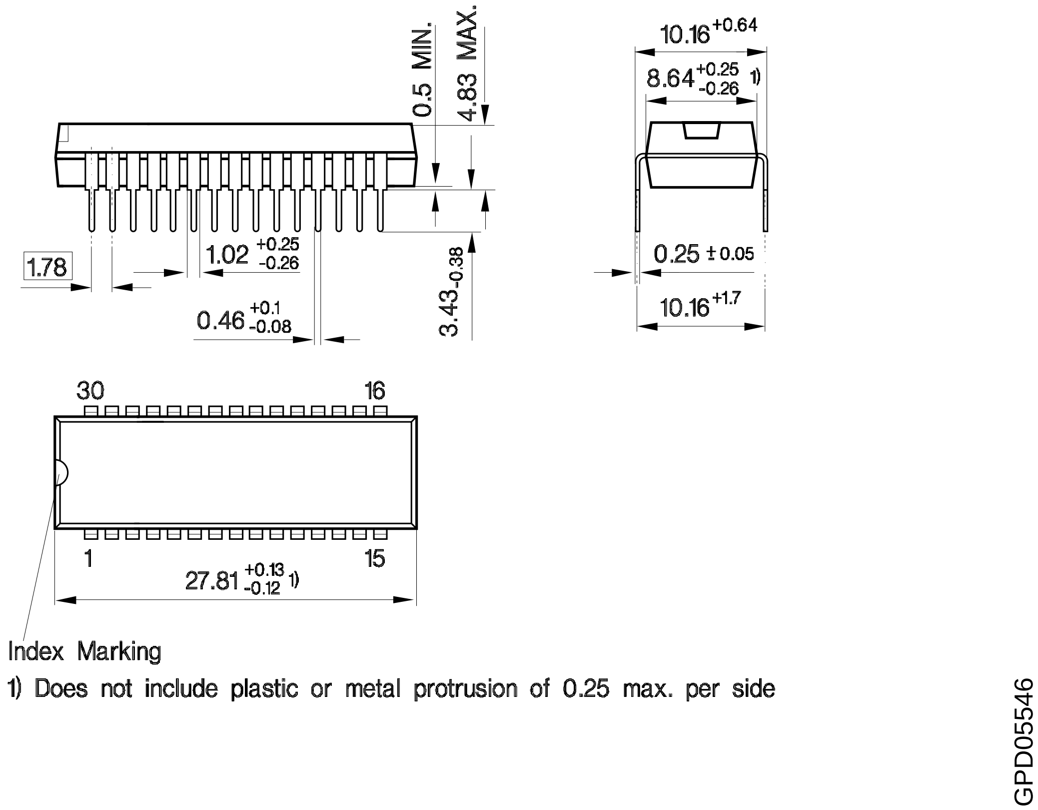
GPS05697

Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book “Package Information”.

SMD = Surface Mounted Device

Dimensions in mm

P-SDIP-30-1
(Shrink Dual Inline 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