SIEMENS

SIEMENS AKTIENGESELLSCHAF

SAT-IF-Demodulator

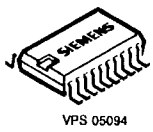
TDA 6142X

Preliminary Data

Bipolar IC

Features

- Good C/N response through high input sensitivity
- Reduced noise bandwidth of prescaler at 480MHz through LC circuit
- Limiting of internal bandwidth of prescaler at 960 MHz
- Improved stability against oscillation through LC circuit
- High frequencies are damped and interference is reduced by LC circuit
- Enhanced AFC circuit with good thermal stability
- Integrated input selector for dual SAW filter



VPS 05094

P-DSO-20

Type	Ordering Code	Package
TDA 6142X	Q6700-A5046	P-DSO-20 (SMD)

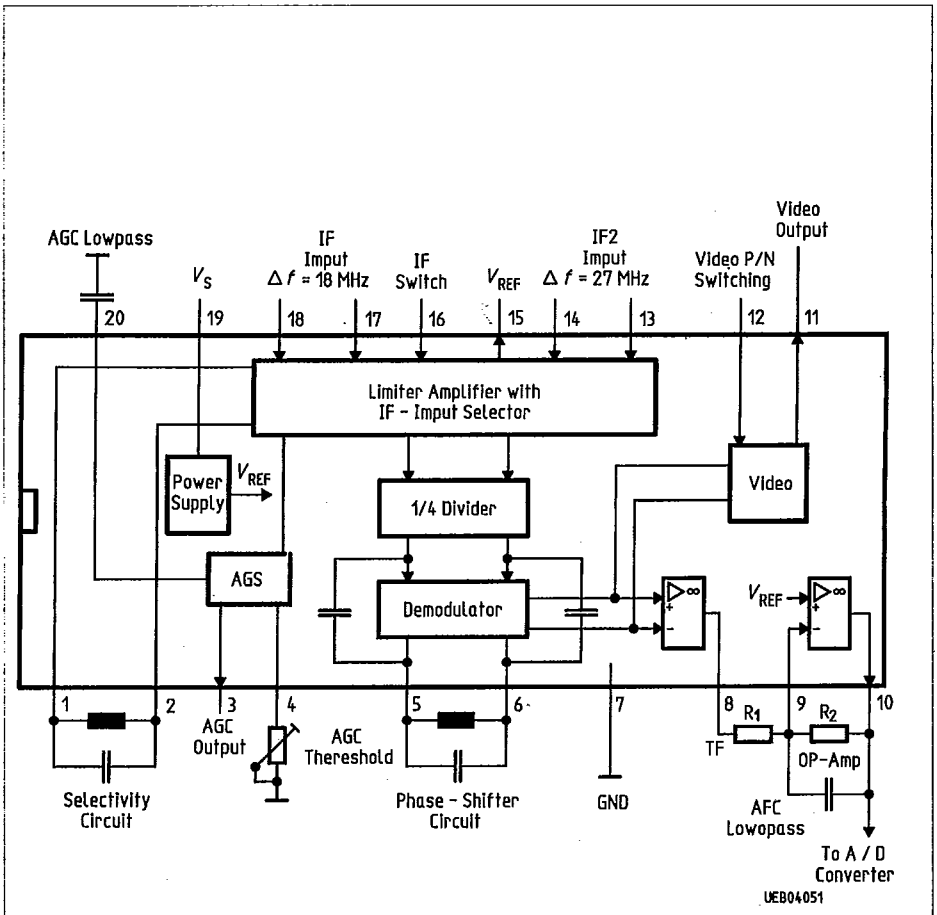
Amplifier and IF demodulator for satellite applications, consisting of: four-stage limiter amplifier with selectivity circuit and selector switch for two IF-inputs, each with a base stage; divider by 4; video amplifier; automatic gain control; AFC-output with adjustable rate of rise; polarity switchover of video signal.

Application

In satellite receiving systems.

Pin Definitions and Functions

Pin No.	Function
1	Connection of parallel-resonant circuit
2	Connection of parallel-resonant circuit
3	AGC-voltage output
4	Setting of AGC threshold
5	Connection of resonant circuit for demodulator
6	Connection of resonant circuit for demodulator
7	Ground
8	AFC-preamplifier output
9	AFC-lowpass filter and feedback point for AFC-sensitivity setting
10	AFC-output to A/D-converter and AFC-lowpass filter
11	Video output
12	Video polarity switching, positive/negative
13	IF-reference input 2
14	IF-input 2, eg $\Delta f = 27$ MHz
15	Reference voltage output
16	IF-input selector for IF-input 1 or 2
17	IF-reference input 1
18	IF-input 1, eg $\Delta f = 18$ MHz
19	Supply voltage 5 V
20	AGC-lowpass filter



Block Diagram

Circuit Description

The frequency-modulated satellite IF-signal is applied by way of a SAW-filter - with two balanced outputs and different bandwidth - to the two low-impedance, balanced inputs of the limiter amplifier. One IF-input at a time can be through-connected by applying an external DC-voltage to the IF-input selector. Unbalanced operation is also possible by appropriate RF blocking of the balanced inputs, but this entails higher noise levels. An external selectivity circuit in the penultimate amplifier stage produces good selectivity in the limiter amplifier and consequently better harmonics suppression.

The output signal from this amplifier is fed to a divider, which divides the frequency by 4. Following this the signal is applied once direct and once with phase shift - produced by an external phase-shifter circuit - to a quadrature demodulator.

The demodulated video signal is amplified and appears at the video output. The polarity of this demodulated video signal can be inverted by applying an external DC-voltage to the polarity-switching input.

Parallel to this, the demodulated video signal is used for automatic frequency control (AFC). Here it is fed via a preamplifier to an inverting operational amplifier with an internal reference voltage. Any frequency offset that is present will show itself in the form of a changing DC voltage, which can be applied to an external A/D-converter. The rate of rise of the AFC and thus the gain of the operational amplifier can be set externally by a resistor network.

The information for the field strength of the frequency-modulated satellite IF-signal appears both as a DC-voltage at the AGC-output and on the AGC-lowpass filter. The AGC-threshold can be varied with a potentiometer. The IF stage of the satellite tuner (TUA 2008X) or an input stage can be controlled in gain by way of the AGC-output.

Absolute Maximum Ratings
T_A = 0 to 70 °C

Parameter	Symbol	Limit Values		Unit	Remarks
		min.	max.		
Supply voltage	V_S	0	6	V	
Selectivity circuit	$V_{1,2}$	0	6	V	
AGC-output voltage	V_3	1	13	V	Open collector
AGC-threshold input	V_4	0.3	2	V	
Resonant-circuit inputs	$V_{5,6}$	– 0.3	3	V	
Video P/N-switching	V_6	– 0.3	6	V	
AFC-amplifier	V_8	0	6	V	
AFC-lowpass filter	V_9	0	5	V	
AFC-output	V_{10}	0	5	V	
Video output	V_{11}	1	5	V	
Video P/N-switching	V_{12}	– 0.3	6	V	
IF-inputs	$V_{13,14,17,18}$	0.3	3	V	
Reference voltage	V_{15}	0.3	5	V	
IF-input selector	V_{16}	0.3	5	V	
AGC-lowpass filter	V_{20}	– 0.3	5	V	
Junction temperature	T_J		150	°C	
Storage temperature	T_{stg}	– 40	125	°C	
Thermal resistance system-air	R_{thSA}		125	K/W	
Surge strength for all pins[1)]	V_{ESD}	– 2000	2000	V	2)

Operating Range

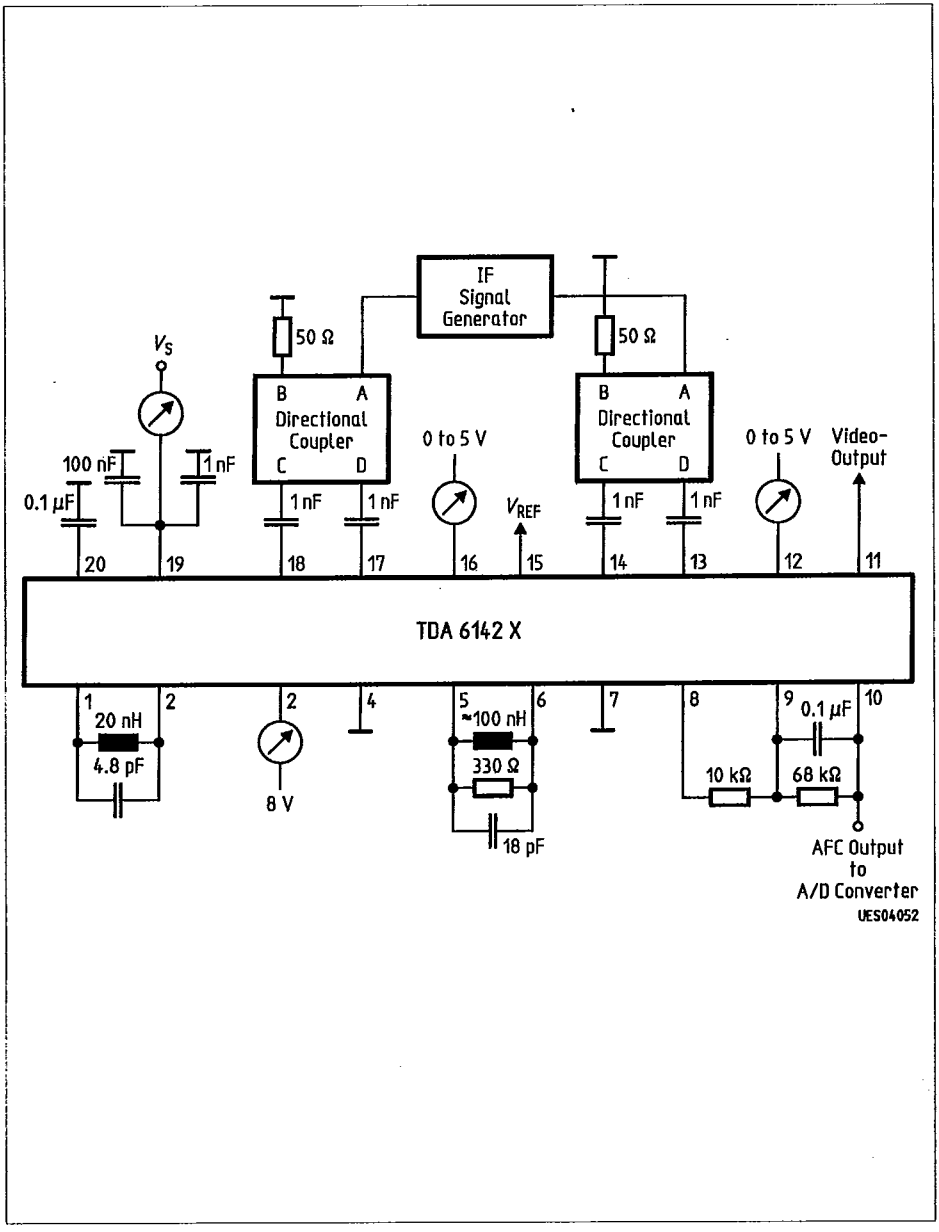
Supply voltage	V_S	4.5	5.5	V
Input frequency range	f_{15}	300	700	MHz
Ambient temperature	T_A	0	70	°C

1) Single discharge of 100-pF capacitor across series resistor of 1.5 kΩ in turn on each pin (MIL-STD)
2) Float pins not required; pin 7 always ground

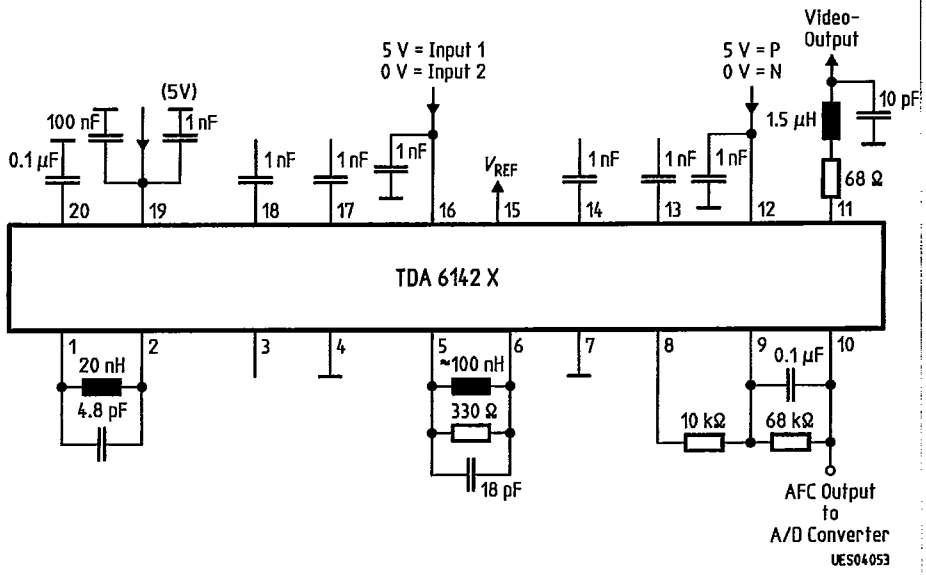
Characteristics

$T_A = 25$ °C; $V_S = 5$ V ± 10 %

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Current drain	I_S	40	50	60	mA	
Input Sensitivity						
IF input	a_{IFin}	– 65		3	dBm	$f_{13, 14 \& 17, 18}$ = 480 MHz
IF-Input Switching						
IF-input 1	V_{16}	3.2		5	V	
IF-input 2	V_{16}	0		2.8	V	
Video Output						
Video voltage (Δf = 13.5 MHz)	V_{11}	400		800	mV	
Distortion factor	THD		< 1		%	
Signal/noise ratio	S/N		70		dB	
Video P/N-Switching						
Positive polarity	V_{12}	3.5			V	
Input current	I_{12H}			50	µA	
Negative polarity	V_{12}			1	V	
Input current	I_{12L}			– 50	µA	
AGC-Current (Open-collector current limited)						
a_{IFin} = + 3 dBm	I_3		500		µA	V_3 = 8 V; $R_{AGC} = 0$
a_{IFin} = – 3 dBm	I_3		10		µA	V_3 = 8 V; $R_{AGC} = 0$
a_{IFin} = – 24 dBm	I_3		500		µA	V_3 = 8 V; $R_{AGC} = \infty$
a_{IFin} = – 30 dBm	I_3		10		µA	V_3 = 8 V; $R_{AGC} = \infty$
AFC-Voltage (Open-collector current limited)						
f_{IFin} = 380 MHz	V_{10}	V_S			V	R_2/R_1 =7
f_{IFin} = 580 MHz	V_{10}	– 0.5		0.5	V	R_2/R_1 = 7



Test Circuit 1



Application Circuit

Diagram 1

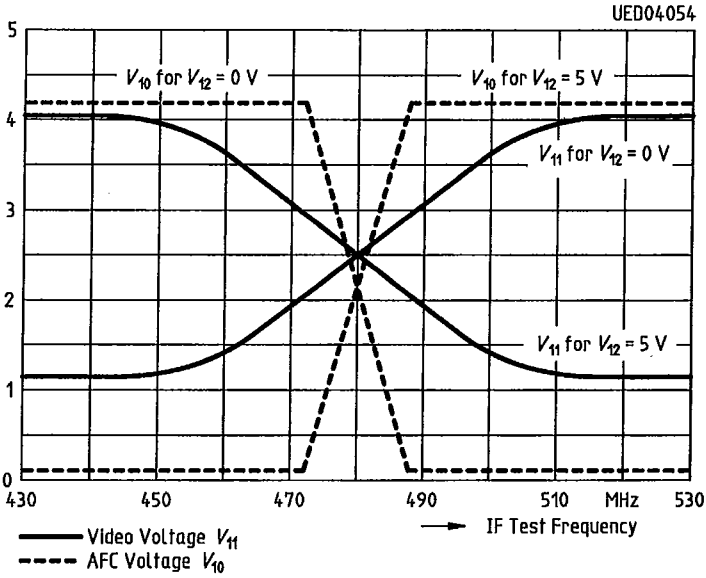


Diagram 2