SIEMENS

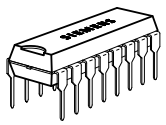
Dual Sound FM IF Amplifier

TBA 229-5

Bipolar IC

Features

- High AM suppression over a very wide input voltage range
- High sensitivity
- Very high symmetry



P-DIP-16

The component contains two separate limiter amplifiers with FM demodulators and separate AF outputs.

Type	Ordering Code	Package
TBA 229-5	Q67000-A5133	P-DIP-16

Circuit Description

The component contains two separate FM sound IF sections for television stereo applications or for multistandard receivers. Each FM section consists of an eight-stage symmetrical limiter amplifier followed by a coincidence demodulator and an AF pre-amplifier with a low-ohmic output. The component features considerably improved AM suppression characteristics with small input signals, as well as a very low frequency deviation between $THD_{\min}$ and $AM_{\min}$.

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Supply voltage	V_S	0	16	V
Reference current	I_{REF}	0	2	mA
IF input voltage	$V_{I\,IF\,rms}$	0	600	mV
DC voltages	$V_{9, 10, 11}$ $V_{14, 15, 16}$	0 0	V_{REF} V_{REF}	V V
DC currents	$I_{1, 2, 4, 5, 7, 8}$	0	2	mA
Junction temperature	T_j		150	°C
Storage temperature range	T_{stg}	– 40	125	°C
Thermal resistance (system-air)	$R_{th\,SA}$		80	K/W

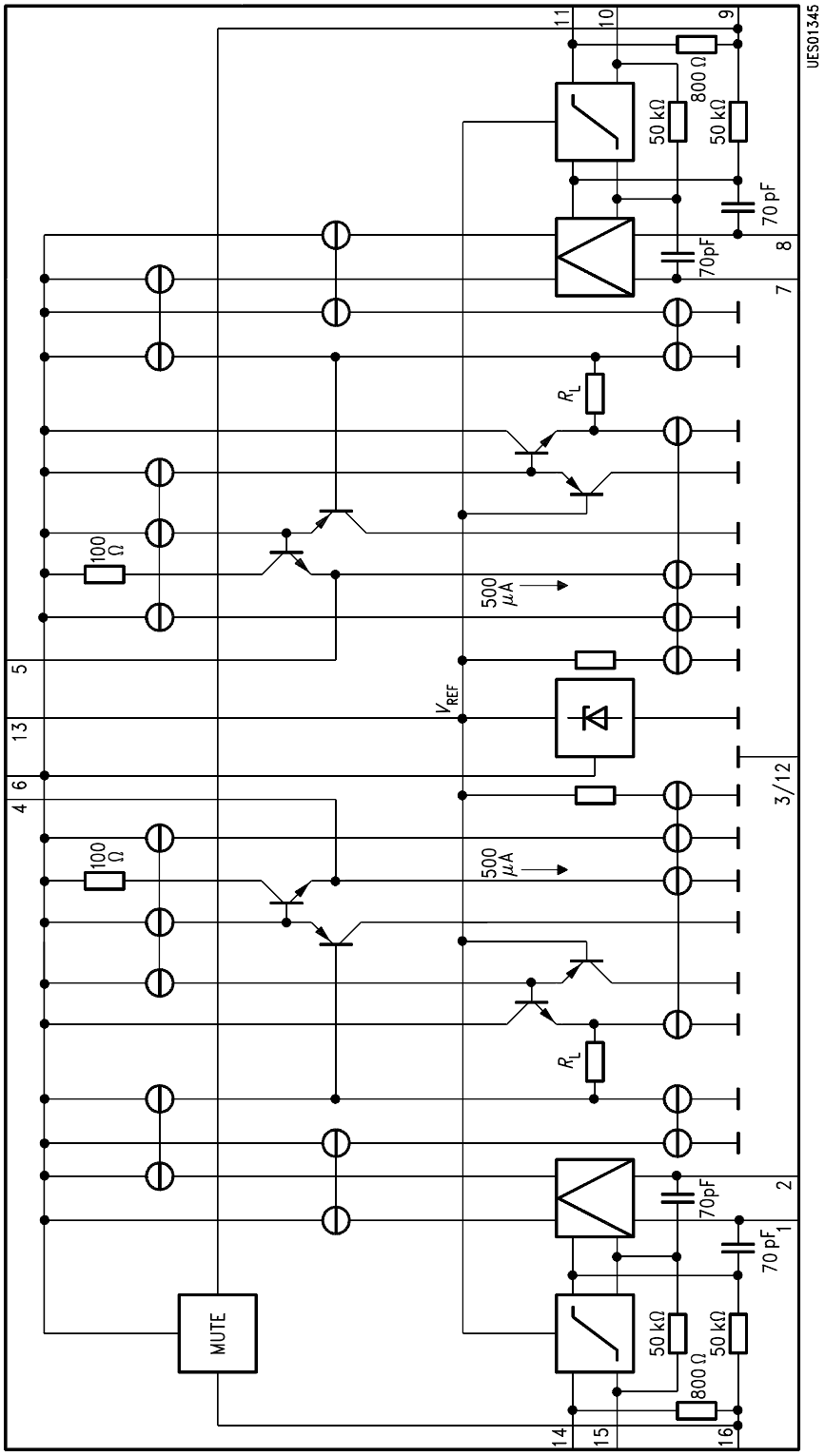
Operating Range

Supply voltage	V_S	10.5	15.75	V
Ambient temperature	T_A	0	70	°C
Frequency	f_I	0.1	12	MHz

Characteristics

V_S = 12 V; T_A = 25 °C; $V_{I\ IF\ 14\ rms}$ = 10 mV; $f_{I\ IF\ 11,\ 14}$ = 5.5 MHz; f_{mod} = 1 kHz; Δf = ± 30 kHz (if not stated otherwise)

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Current consumption	I_S	25	35	42	mA	
Input voltage for limiter threshold	$V_{I\ 11\ rms}$ $V_{I\ 14\ rms}$		50 50	100 100	µV µV	 $V_{Q\ 4,\ 5}$ = – 3 dB
Output voltage	$V_{Q\ 4\ rms}$ $V_{Q\ 5\ rms}$	510 510	600 600	700 700	mV mV	
DC voltage portion	$V_{Q\ 4}$ = $V_{Q\ 5}$ =	4.8 4.8	6 6	6.2 6.2	V V	 Δf = 0; THD = THD min
Total harmonic distortion	THD_4, THD_5		0.4	0.8	%	THD = THD min
AM suppression $V_{i\ rms}$ =1 mV; m = 30%	$\alpha_{AM\ 4}$ $\alpha_{AM\ 5}$	55 55	60 60		dB dB	 $V_{I\ rms}$=1 mV; m = 30%
Cross-talk rejection	$C_{IF\ 1-2}$ = $V_{Q\ 4}$/ $V_{Q\ 5}$ $C_{IF\ 1-2}$ = $V_{Q\ 4}$/ $V_{Q\ 5}$	60 60			dB dB	$f_{I\ IF\ 11}$ = 5.5 MHz; Δf_{11} = 0 kHz; $V_{I\ 11\ rms}$ = 4 mV; $V_{I\ 14\ rms}$ =10 mV $f_{I\ IF\ 11}$ = 5.74 MHz; Δf_{14} = 0 kHz $V_{I\ 11\ rms}$ = 4 mV; $V_{I\ 14\ rms}$ =10 mV
Reference voltage	V_{13} =	5.4	6	6.6	V	
Switching voltage muting ON (AF off) OFF	V_{16} V_{16}	8 0		V_S 3	V V	
Design-Related Values						
Input resistance	$R_{I\ 1,\ 2}$ $R_{I\ 7,\ 8}$	20 20			kΩ kΩ	
Output resistance	$R_{Q\ 4,\ 5}$			100	Ω	
Input impedance	$Z_{I11,\ 14}$		800		Ω	
IF residual voltage	$V_{Q\ 4,\ 5\ (IF)}$		15		mV	
Hum suppression	$\alpha_{Q\ hum}$		32		dB	f_S = 100 Hz $\Delta V_{S\ rms}$ = 500 mV; $V_S/V_{Q\ 4}$; $V_S/V_{Q\ 5}$
Frequency deviation AM min – THD min	Δf_{IF}		±10		kHz	



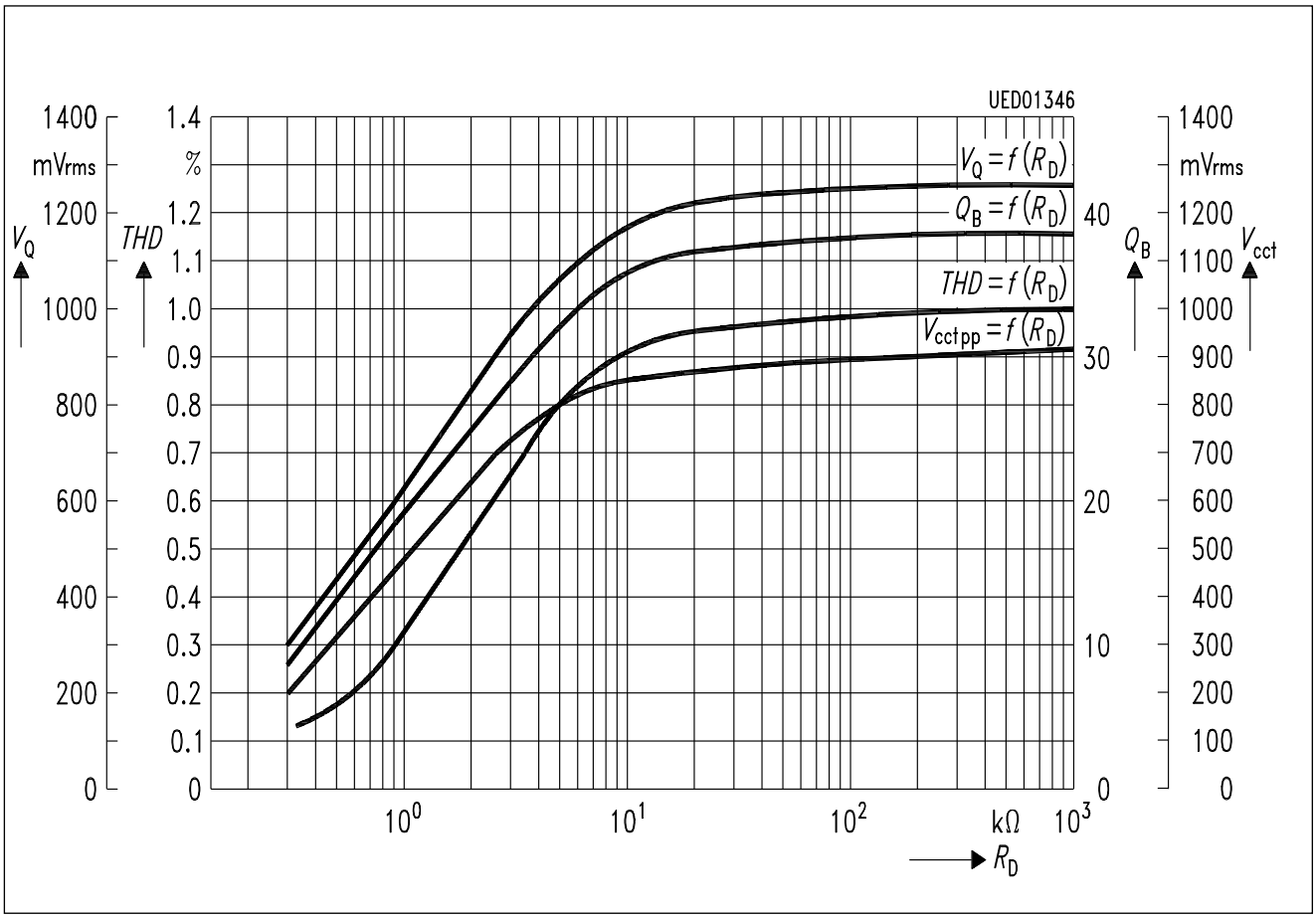
Block Diagram

Pin Functions

Pin No.	Function
1, 2	Demodulator tank circuit connection IF 1 (high impedance input – slope of S-curve can be determined by external resistor between pins 1 and 2)
3	GND
4	AF output IF 1 (emitter follower)
5	AF output IF 2 (emitter follower)
6	Supply voltage
7, 8	Demodulator tank circuit connection IF 2 (high impedance input – slope of S-curve can be determined by external resistor between pins 1 and 2)
9	Operating point feedback of limiter amplifier and low end IF 2 (RF decoupling of IF amplifiers with appropriate capacitors is required!
10	Operating point feedback of limiter amplifier IF 2 (RF decoupling of IF amplifiers with appropriate capacitors is required!)
11	IF 2 input (input of limiter amplifier IF 2; internal resistor between pins 9 and 11 is typ. 800 Ω)
12	GND
13	Internal reference voltage (typ. 6 V)
14	IF 1 input (input of limiter amplifier IF 2; internal resistor between pins 14 and 15 is typ. 800 Ω)
15	Operating feedback of limiter amplifier IF 1 (RF decoupling of IF amplifiers with appropriate capacitors is required!)
16	Operating point feedback of limiter amplifier and low end IF 1 (RF decoupling of IF amplifiers with appropriate capacitors is required!)

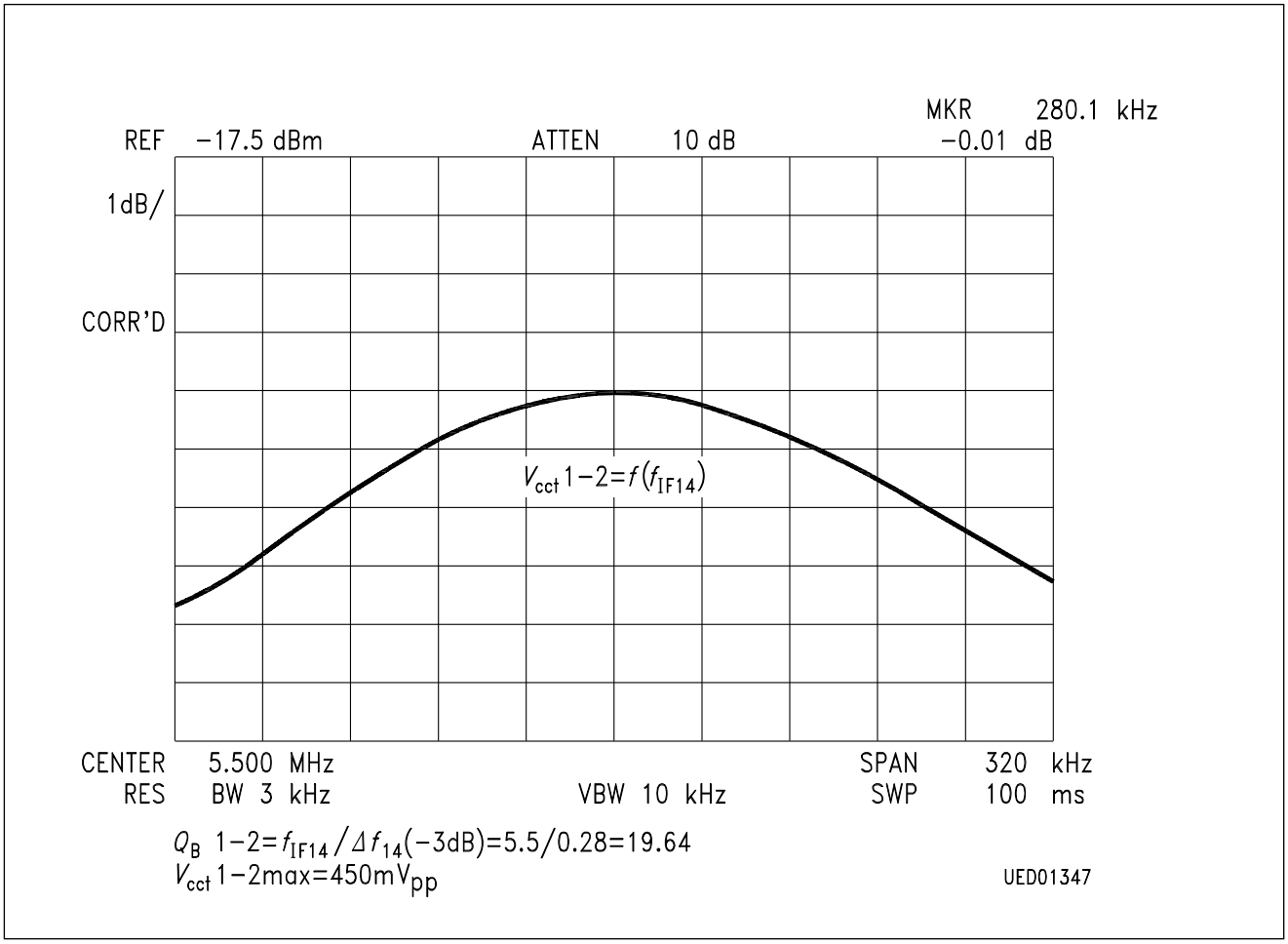
Diagrams

AF Output Voltage, Total Harmonic Distortion, Circuit Voltage versus Circuit Q_B

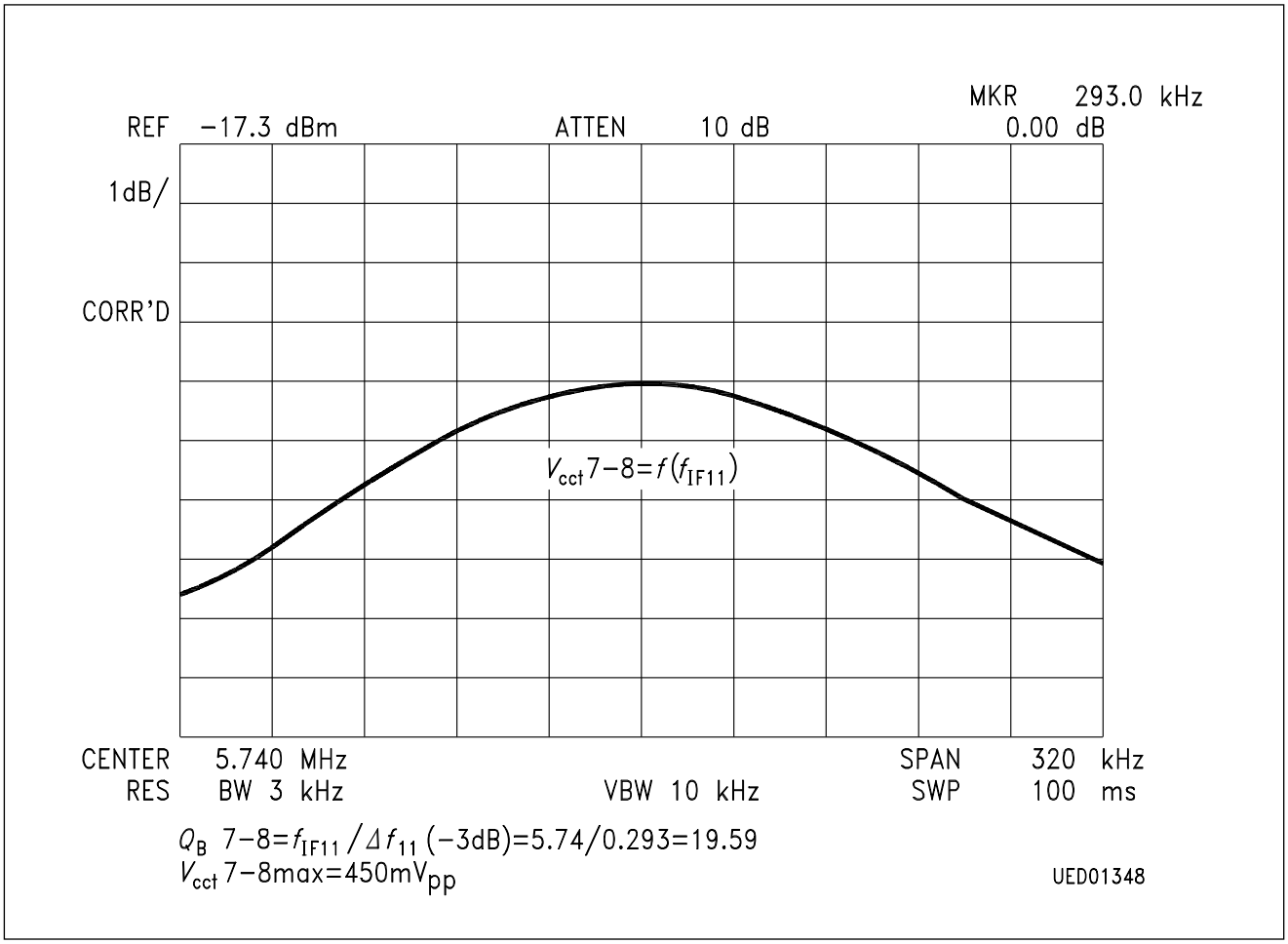


V_Q:	$V_{Q\,4}$ rms; $V_{Q\,5}$ rms
THD:	THD_4; THD_5
Measured at:	$f_{I\,IF}$ = 5.5 MHz; Δf = 30 kHz; f_{mod} = 1 kHz; $V_{I\,IF}$ = 10 mV
V_{cct}:	$V_{1,2} = V_{7,8}$
Measured at:	$f_{I\,IF}$ = 5.5 MHz; Δf = 0 kHz; $V_{I\,IF}$ = 10 mV
Q_B:	Q between connections 1, 2 and 7, 8
Measured at:	$f_{I\,IF}$ = 5.5 MHz/$\Delta f_{I\,IF}$ for 3 dB bandwidth, Δf = 0 kHz; $V_{I\,IF}$ = 10 mV
Circuit:	L = 10 turns 0.25 CuL; Vogt Coil Assembly 517 12 000 00 without cap C = 1 nF STYROFLEX Capacitor

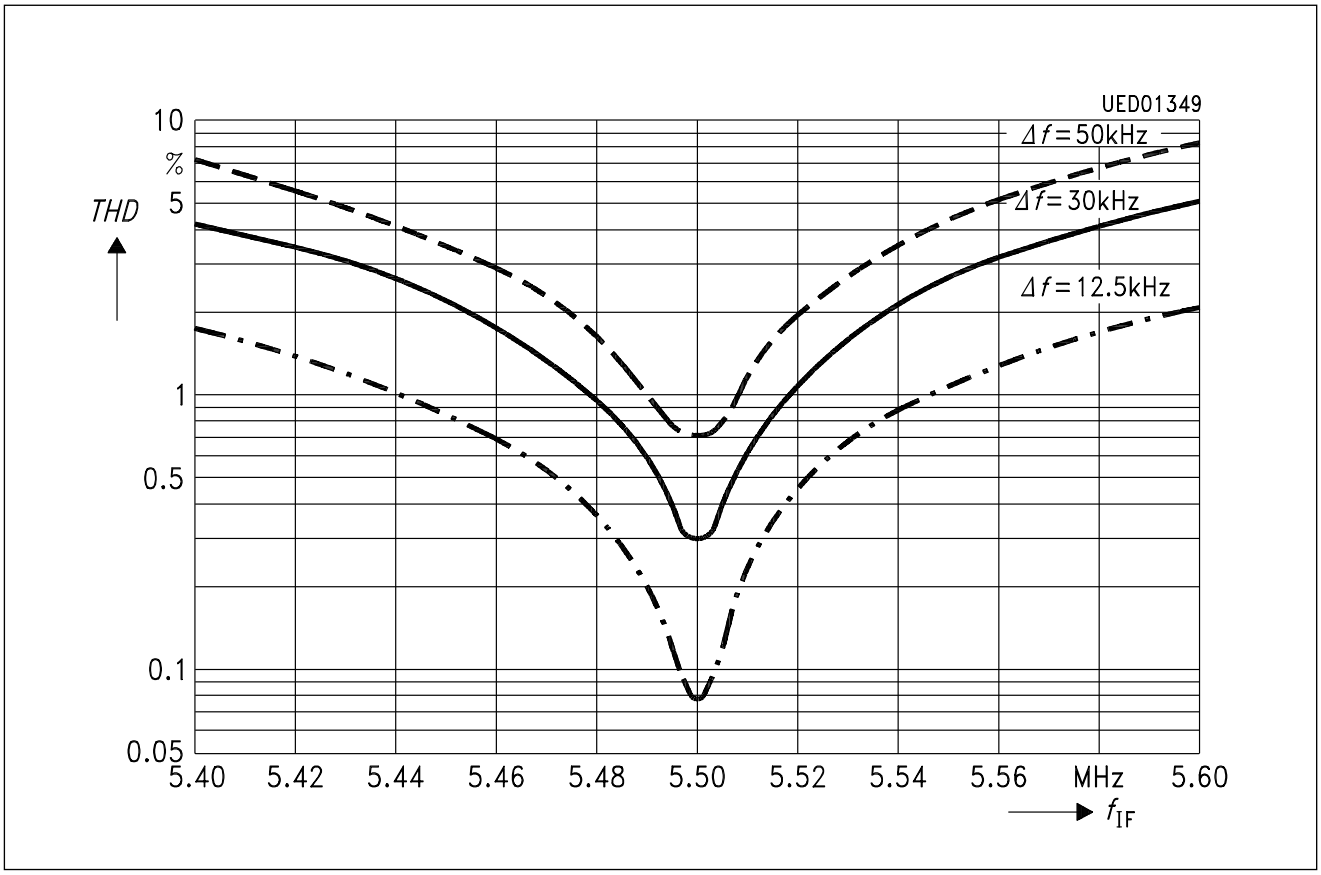
Tank Voltage versus f_{IF}



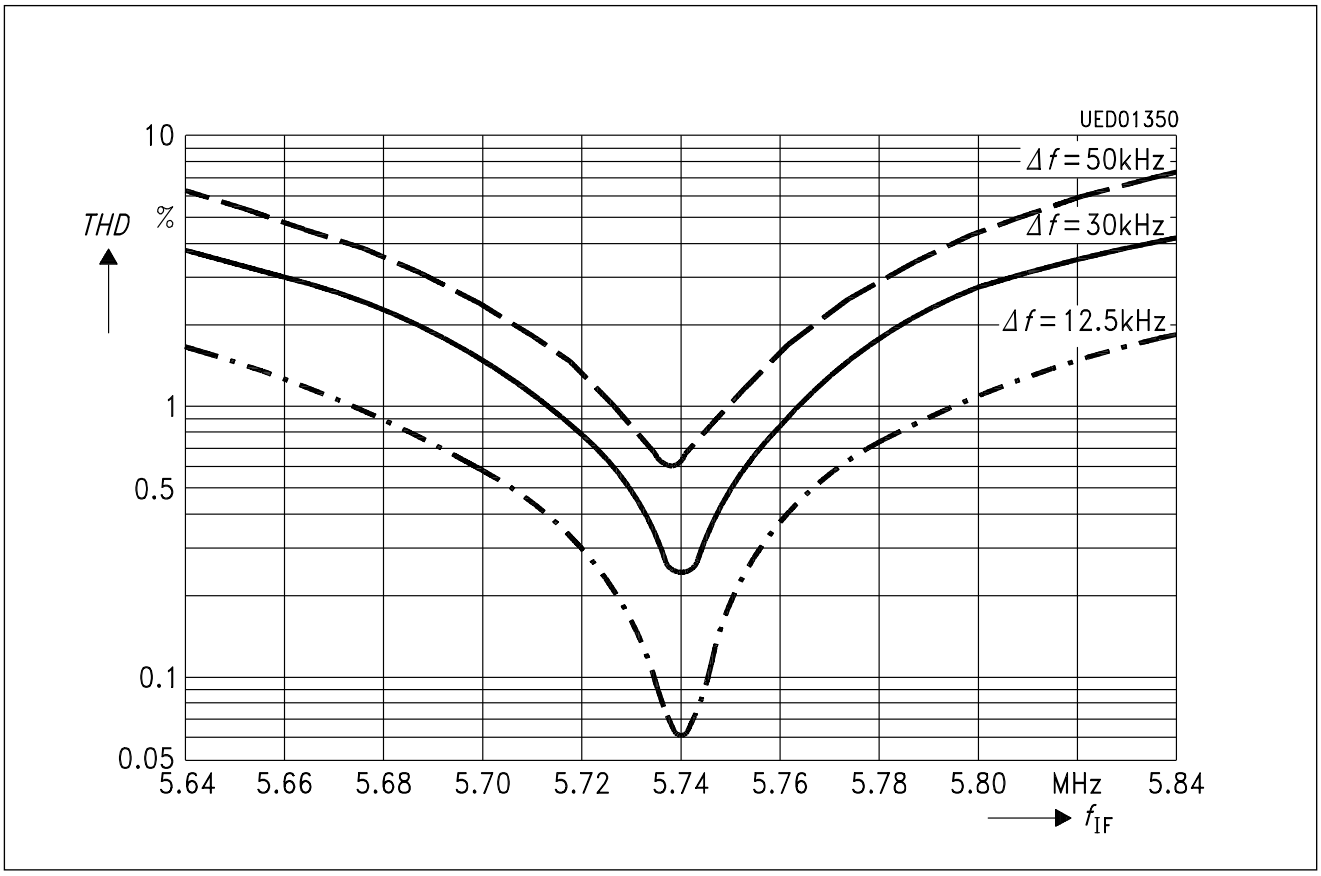
Tank Voltage versus f_{IF}

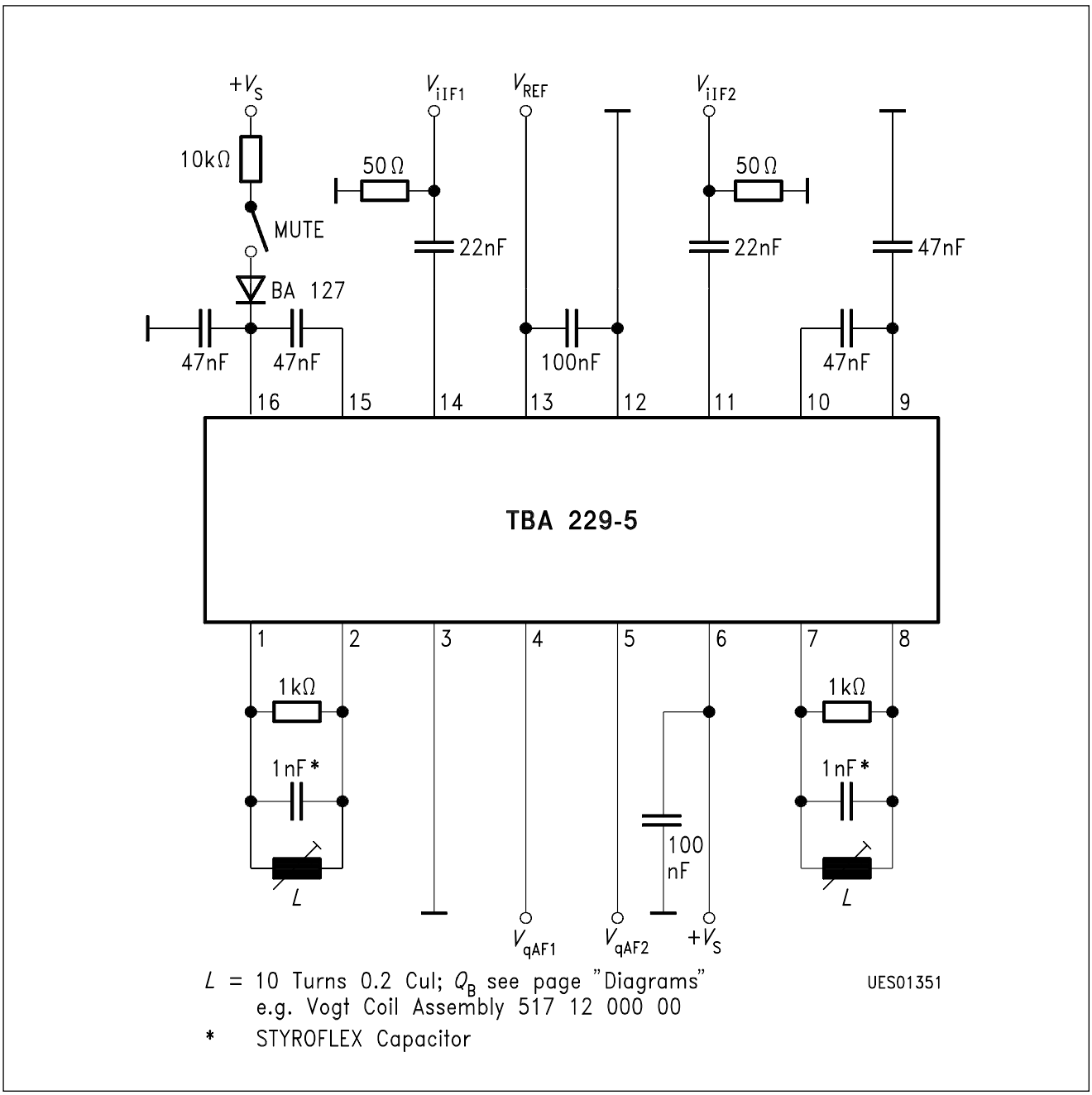


Total Harmonic Distortion versus Detuning (FM Operation)
$THD_4 = f(f_{IF})$; V_I = 10 mV; V_S = 12 V; f_{mod} = 1 kHz,
Δf = 50 kHz, 30 kHz, 12.5 kHz

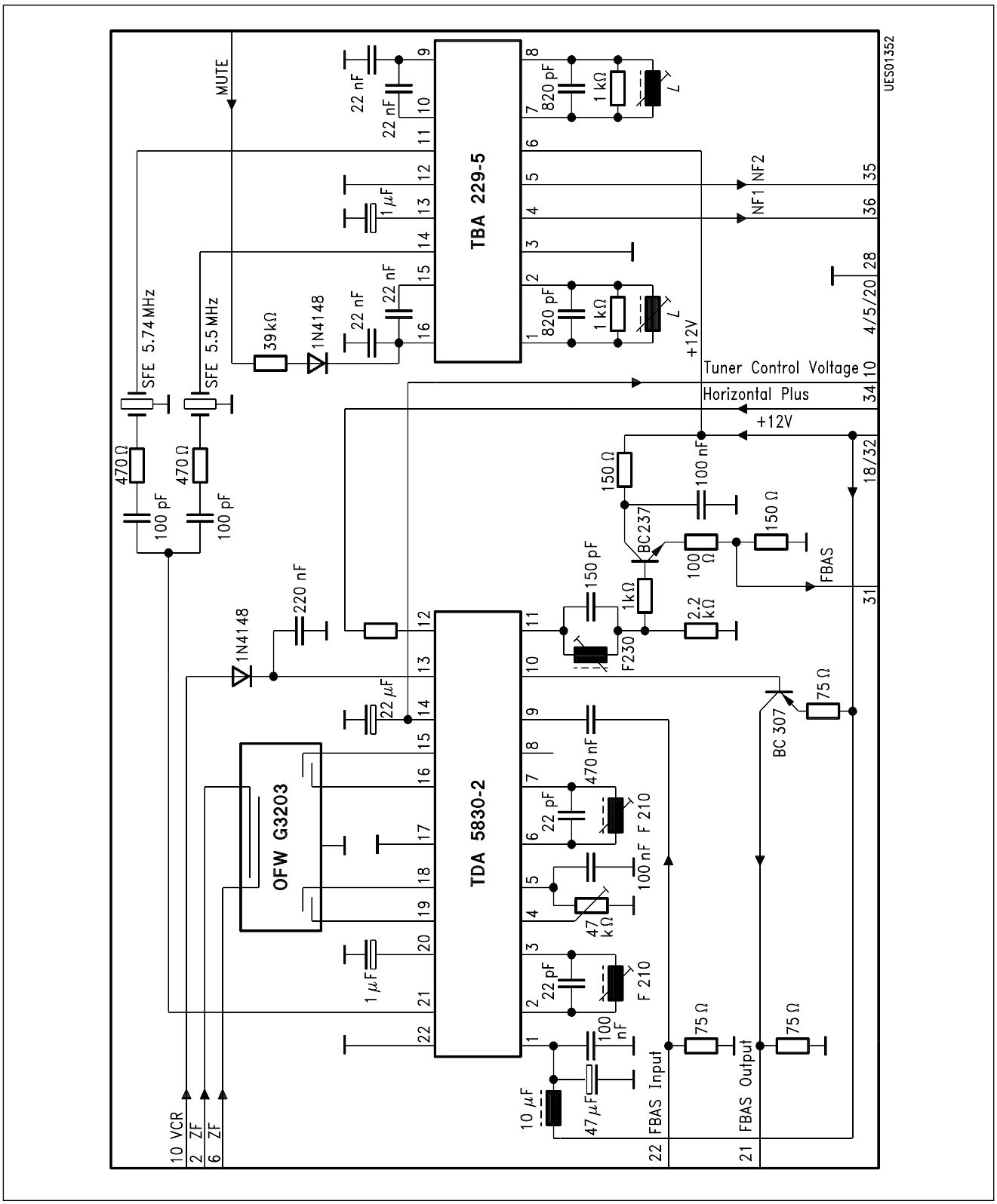


Total Harmonic Distortion versus Detuning (FM Operation)
compensated for minimum total harmonic distortion at f_{IF} = 5.5 MHz;
$THD = f(f_{IF})$; V_I = 10 mV; V_S = 12 V; f_{mod} = 1 kHz,
Δf = 50 kHz; 30 kHz; 12.5 kHz





Test Circuit



Application Circuit

L = 10 turns 0.2 CuL; Q_B approx. 25
e.g. Vogt Coil Assembly 517 12 000 00