SIEMENS

Dual Sound FM IF Amplifier

TBA 229-2

Bipolar IC

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

Features

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

Type	Ordering Code	Package
TBA 229-2	Q67000-A8037	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

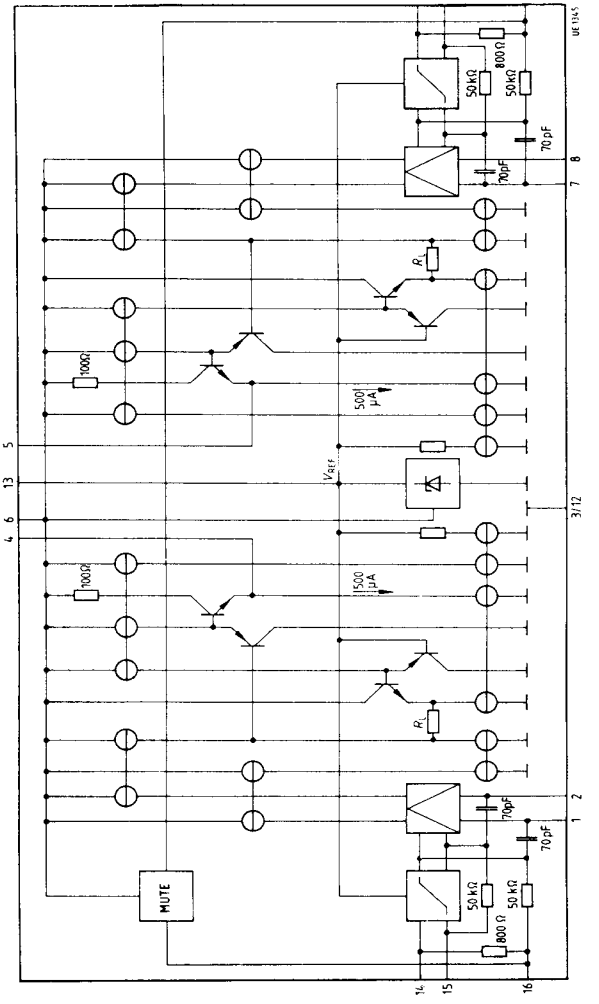
Supply voltage	V_S	10.5	15.75	V
Ambient temperature	T_A	0	70	°C
Fequency	f_I	0.1	12	MHz

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	$C_{IF\,1\text{-}2} = V_{Q\,4}/V_{Q\,5}$ $C_{IF\,1\text{-}2} = V_{Q\,4}/V_{Q\,5}$	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 ΔV_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

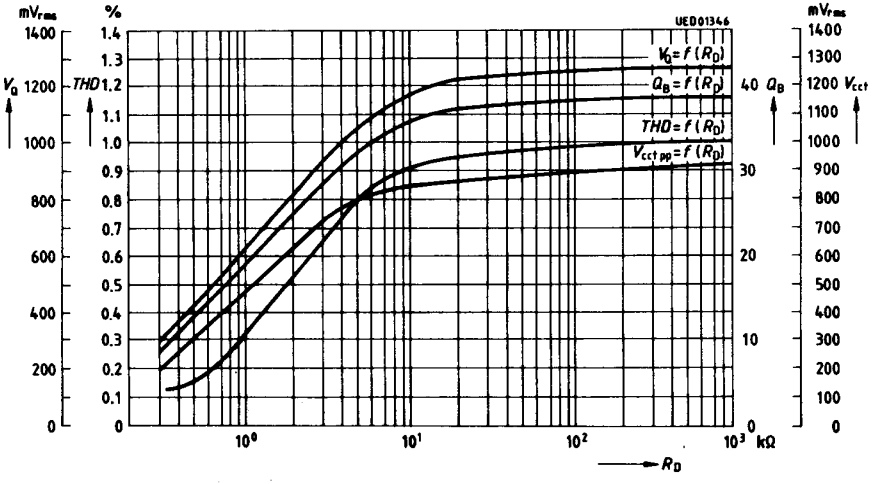


Pin Functions

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!)

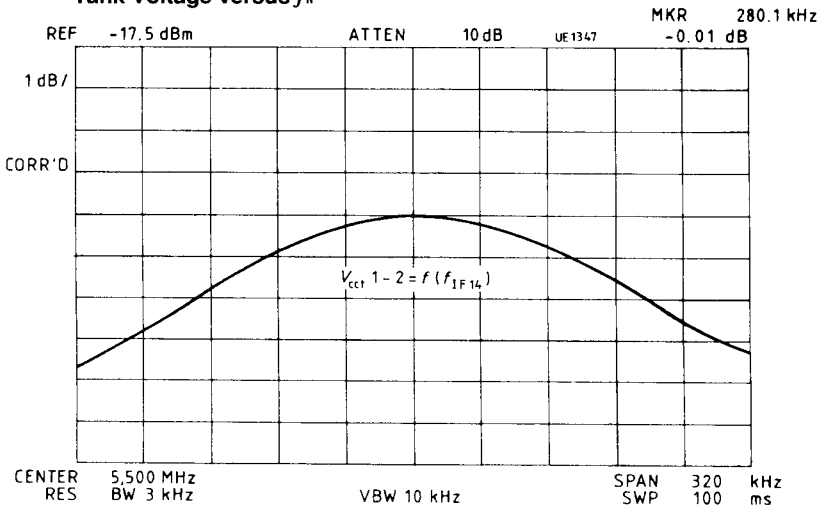
Diagrams

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



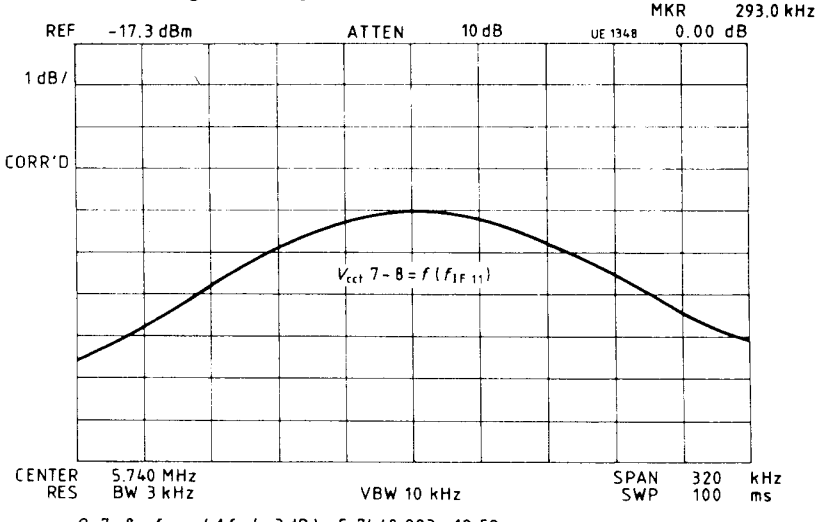
V_Q:	$V_{Q\,4}$ rms; $V_{Q\,5}$ rms
THD:	THD_4; THD_5
Measured at:	$f_{i\,IF}$ = 5.5 MHz; Δf = 30 kHz; f_{mod} = 1 kHz; $V_{i\,IF}$ = 10 mV
V_{cct}:	$V_{1,2} = V_{7,8}$
Measured at:	$f_{i\,IF}$ = 5.5 MHz; Δf = 0 kHz; $V_{i\,IF}$ = 10 mV
Q_B:	Q between connections 1, 2 and 7, 8
Measured at:	$f_{i\,IF}$ = 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}



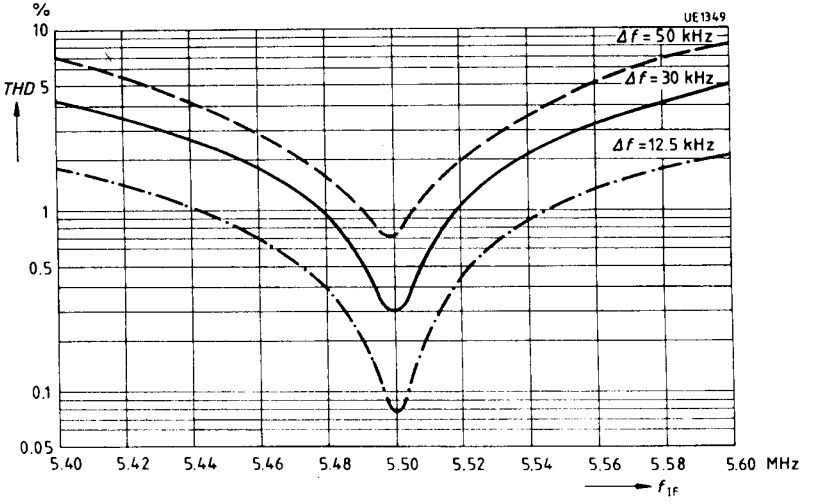
Q_B 1 - 2 = $f_{IF\,14}$ / Δf_{14} (- 3 dB) = 5.5 / 0.28 = 19.64
V_{cct} 1 - 2 max = 450 mV_{pp}

Tank Voltage versus f_{IF}

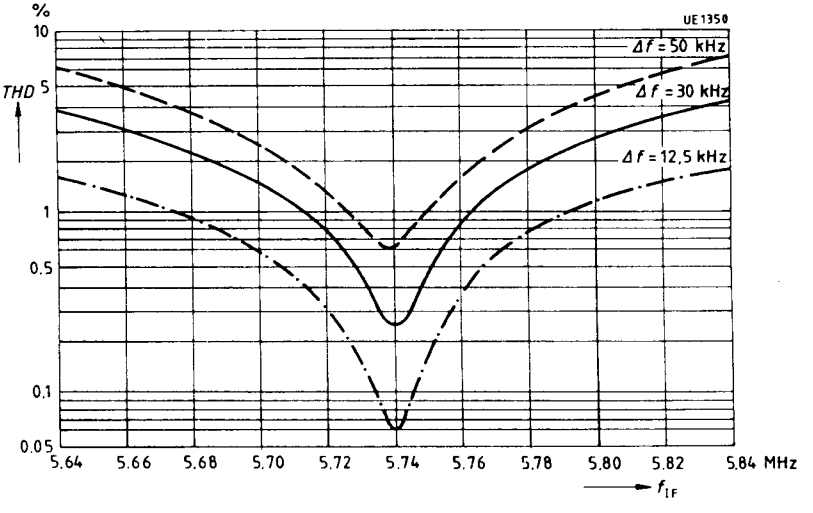


Q_B 7 - 8 = $f_{IF\,11}$ / Δf_{11} (- 3 dB) = 5.74 / 0.293 = 19.59
V_{cct} 7 - 8 max = 450 mV_{pp}

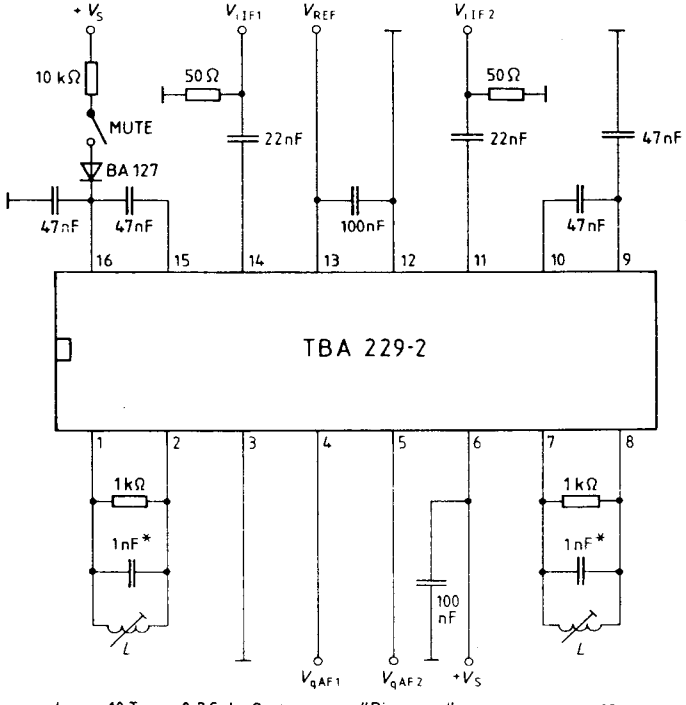
Total Harmonic Distortion versus Detuning (FM Operation)
$THD_4 = f(f_{1IF})$; V_I= 10 mV; V_S = 12 V; f_{mod} = 1 kHz,
Δf = 50 kHz, 30 kHz, 12.5 kHz



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



Test Circuit

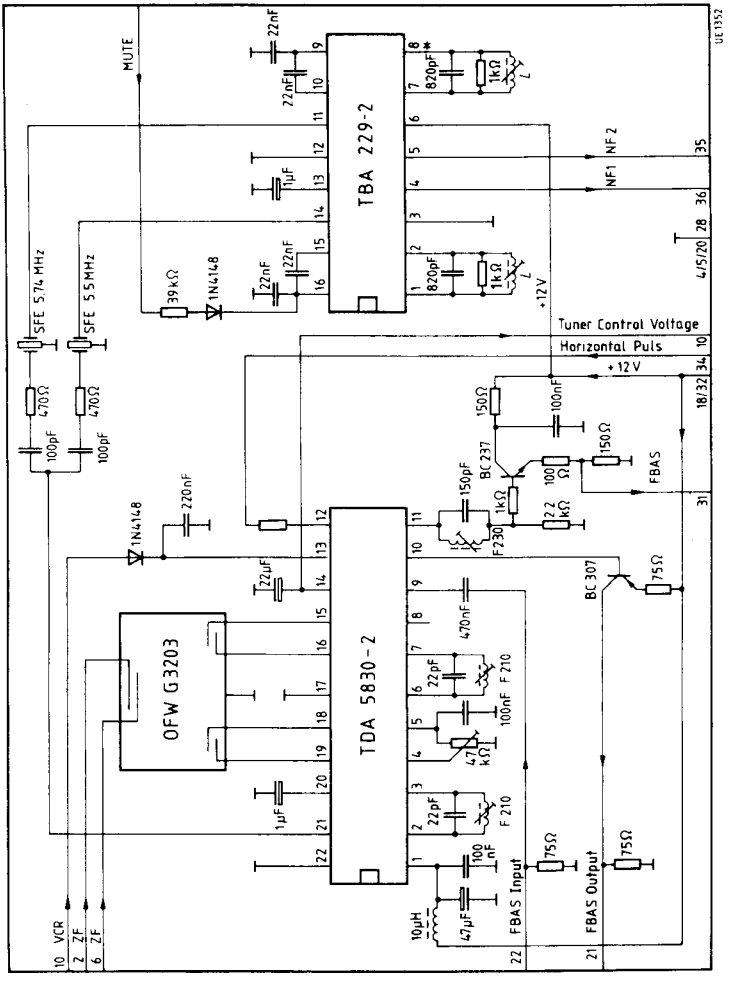


L = 10 Turns 0.2 CuL; Q_B see page "Diagrams"
e.g. Vogt Coil Assembly 517 12 000 00

UE 1351

* STYROFLEX Capacitor

Application Circuit



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