

SIEMENS

FM IF IC with Search Tuning Stop Pulse, Field Strength Indicator, MUTE Setting and Multipath

TDA 4210-3

Bipolar IC

The TDA 4210-3 has been designed as FM IF component with a special demodulator for application in car radios. The sensitivity level of the input amplifier can be adjusted for applications with search tuning mode. In addition, a search tuning stop pulse is generated. Moreover, the included multipath identification circuit activates an interference suppression circuit in case of multipath interference. The TDA 4210-3 is especially suitable for application in car radios and home receivers which require a search tuning stop pulse and include an interference suppression circuit.

Features

- Multipath identification circuit
- 7-stage limiter amplifier
- Product demodulator
- AFC output
- Field strength dependent volume control
- Generation of search tuning stop pulse
- Adjustable limiter threshold
- Adjustable muting depth

Type	Ordering Code	Package
TDA 4210-3	Q67000-A8008	P-DIP-18

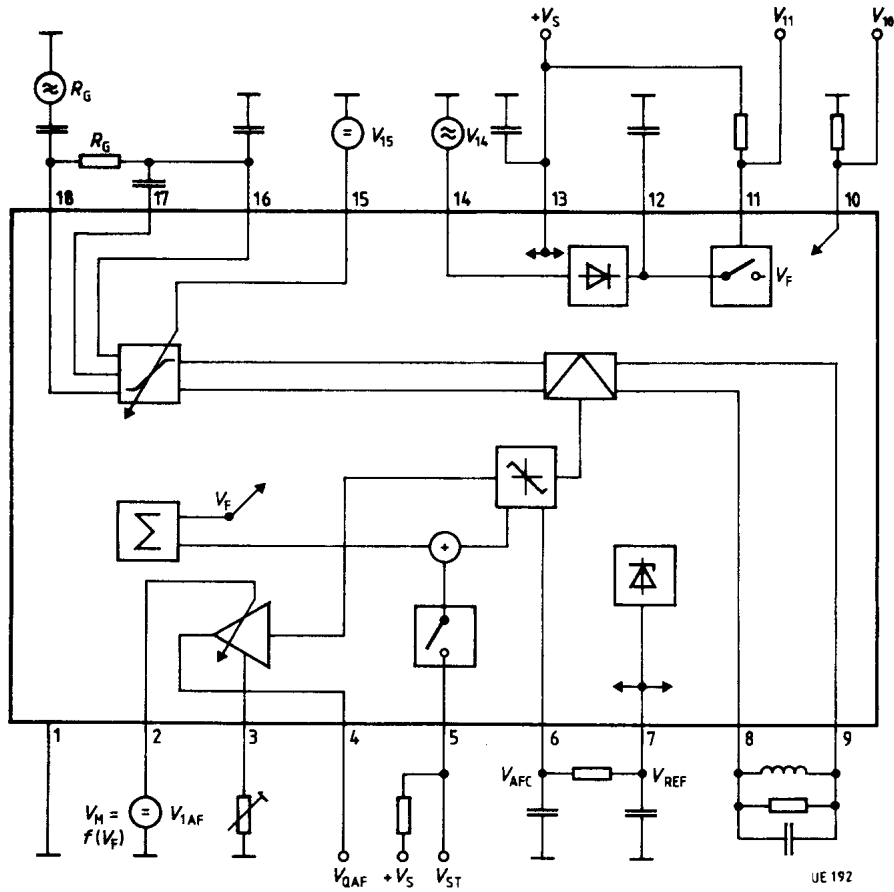
Circuit Description

The integrated circuit includes a 7-stage limiter amplifier with demodulator and non-controlled AF output. The limiter threshold can be raised by approx. 44 dB by means of external circuitry. Within this range the AF output signal can be continuously attenuated by 39 dB typical to eliminate the usually occurring noise products.

To suppress variable interference products, e.g. multipath interference, the TDA 4210-3 includes an identification circuit with an externally adjustable time constant.

Also included are a field strength output, an AFC output, as well as an open collector output. The latter will be activated at zero crossing of the detector S-curve.

Block Diagram



Pin Functions

Pin No.	Function
1	Ground capacitors for operating point feedback, V_S , and V_{REF} decoupling are to be connected directly to pin 1
2	MUTE input (usually derived from field strength output voltage) for DC voltage which attenuates the AF output voltage by the set muting depth (pin 4). Max. attenuation when $V_2 = 0$ V, no attenuation when $V_2 \geq 0.75$ V
3	Muting depth adjustment by connecting a resistor to ground the required muting depth can be set. Maximal attenuation of AF output voltage with $R = 0$ (approx. 46 dB), minimal attenuation with $R = \infty$ (approx. 7 dB)
4	AF output for demodulated FM-IF
5	Search tuning stop (ST) output is connected when the input field strength exceeds the search tuning stop pulse threshold and the input frequency lies within the search tuning stop pulse window.
6	AFC output: push-pull current output, referenced via a resistor connected to a fixed voltage source (e.g. V_{REF}). The voltage generated at the resistor is in proportion to the deviation from the nominal input frequency and can be applied for retuning purposes.
7	Reference voltage should be RF decoupled to pin 1. The AFC resistor and the potentiometer for the limiter threshold are referenced to V_{REF} .
8/9	Demodulator tank circuit driven via two integrated capacitors (approx. 40 pF \pm 25%). The circuit voltage should be approx. 200 mV (peak-to-peak)
10	Field strength output supplies a DC voltage proportional to the input level, which quickly adjusts to changes in the input voltage
11	Identification output designed as an open NPN collector output, which connects an additional time constant in parallel to pin 2 during multipath interference, or activates another circuit to suppress variable interference.
12	Demodulator time constant determines the response and hold time of the identification circuit.
13	Supply voltage to be RF decoupled to pin 1
14	Identification input high impedance input ($R_i \sim 10$ k Ω). This input receives variable interference forwarded on the field strength voltage via a high-pass filter.
15	Input for setting limiter threshold with a potential between V_{REF} and 0 V, the limiter threshold can be varied by approx. 44 dB.
16/17	Operating point feedback to be RF decoupled. For efficient push-push suppression, pin 16 should be blocked against pin 17 and latter to ground (pin 1).
18	IF input: frequency modulated IF voltage is injected at pin 18.

Absolute Maximum Ratings

Parameter	Symbol	Limit Values	Unit
Ground	V_1	0	V
MUTE input	V_2	V_S	V
Muting depth	V_3	V_7	V
AF output	V_4	V_S	V
Search tuning stop signal output	I_5	5	mA
AFC output	V_6	V_S	V
Reference voltage output	I_7	5	mA
Phase shift	V_8	V_S	V
Phase shift	V_9	V_S	V
Field strength	I_{10}	5	mA
Identification output	I_{11}	5	mA
Demodulator time constant	I_{12}	1	mA
Supply voltage	V_S	18	V
Identification input	V_{14}	V_7	V
Limiter threshold	V_{15}	V_7	V
Operating point feedback	$V_{16, 17}$	V_7	V
IF input	V_{18}	V_7	V
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	- 55 to 125	°C

Operating Range

Supply voltage	V_S	7.5 to 15	V
IF section demodulator	f_{IF}	0.4 to 15	MHz
Overall frequency	f	0.4 to 15	MHz
AF ($V_{QAF} = 1$ dB)	f_{AF}	0.02 to 150	kHz
Ambient temperature	T_A	- 25 to 85	°C

Characteristics

$V_S = 8.5 \text{ V}$; $V_{1\text{IF rms}} = 10 \text{ mV}$; $f_{1\text{IF}} = 10.7 \text{ MHz}$; $\Delta f = \pm 75 \text{ kHz}$; $f_{\text{mod}} = 1 \text{ kHz}$; $Q_B \approx 20$; $T_A = 25 \text{ }^\circ\text{C}$;
adjustment when $I_7 = 0$; test circuit 1

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Current consumption	I_{13}		27	33	mA	
Field strength output voltage	V_{10}	3.0	3.8	0	V	$V_{1\text{IF rms}} = 50 \text{ mV}$ $V_{1\text{IF rms}} = 0 \text{ V}$
AF output voltage	$V_{Q4\text{ rms}}$	270	380	520	mV	
Total harmonic distortion during FM IF mode	<i>THD</i>		0.7	1.5	%	$I_{\text{AFC}} = 0$
Input voltage for limiter threshold	$V_{1\text{IF rms}}$		15	30	μV	$V_{Q4-3} \text{ dB}$
AM suppression	a_{AM}	60			dB	$m = 30\%$
Signal-to-noise ratio	$a_{\text{S/N}}$	70			dB	
Current deviation of AFC output	ΔI_7		± 110		μA	$f = f_{1\text{IF}} \pm 50 \text{ kHz}$
AFC offset	Δf_{off}			± 15	kHz	$V_{15} = 20 \mu\text{V} \dots 10 \text{ mV}$
Search tuning stop window	Δf_{ST}		± 18		kHz	$R_{6-7} = 22 \text{ k}\Omega$
Search tuning stop threshold FM	$V_{1\text{ST}}$			70	μV	$V_6 = V_{\text{S}2}$
Search tuning stop threshold AM	$V_{1\text{ST}}$			500	μV	$V_6 = V_{\text{S}2}$
Stabilized voltage	V_7	3.6	4.1	4.6	V	
Adjustable range of limiter threshold via pin 15	$V_{1\text{IF}}$		44		dB	$V_{15} = 0$; $V_{15} = V_{\text{REF}}$
AF MUTE	a_{AF}	3	7	11	dB	$V_2 = 0$; $R_{3-1} = \infty$
	a_{AF}	31	39	47	dB	$V_2 = 0$; $R_{3-1} = 0$
AF MUTE switch-off voltage	V_2		0.5	0.75	V	
MP sensitivity for full drive at pin 1	$V_{114\text{ rms}}$		5		mV	$f = 20 \text{ kHz}$
Charge current pin 12	I_{12}		3		mA	pin 14 to ground
Discharge current pin 12	I_{12}		10		μA	pin 14 open, $V_{12} < 1 \text{ V}$

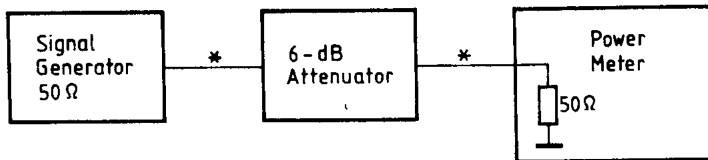
Additional Data with Respect to Application

(data does not apply to series measurement)

DC voltage AF output	V_{Q5}	2.8	3.8	4.8	V	
Internal DC current of emitter follower output	I_4	0.75	1		mA	
Input resistance for demodulator circuit	R_{9-10}	27	35		$\text{k}\Omega$	
Search tuning stop "LOW"	V_6			1.3	V	
Search tuning stop "HIGH"	V_6	7			V	

Measurement Circuit

Calibration of signal generator



Measurement of input sensitivity

