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

TDA 4200-3

Bipolar IC

Type	Ordering code	Package
TDA 4200-3	Q67000-A2456	DIP 18

The TDA 4200-3 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. The TDA 4200-3 is especially suitable for application in car radios and home receivers which require a search tuning stop pulse.

Features

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

Circuit description

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

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

When applying the integrated circuit in combined AM/FM configurations, the AM-AF signal is injected into pin 3 and forwarded via the muting stage to output pin 5. The muting stage will be connected to $V_{S\,AM}$ via switch S, which simultaneously cancels the mute function.

Maximum ratings

MUTE input	V_2	V_S	V
AF input	V_3	V_S	V
Muting depth	V_4	V_S	V
AF output	V_5	V_S	V
Search tuning stop signal output	I_6	5	mA
AFC output	V_7	V_S	V
Reference voltage	I_8	5	mA
Phase shifter	V_9	V_S	V
Phase shifter	V_{10}	V_S	V
Inverted field strength	I_{11}	5	mA
Field strength	I_{12}	5	mA
AF/IF switch-over	V_B	V_S	V
Supply voltage	V_S	16	V
Limiter threshold	V_{15}	V_8	V
Operating point feedback	V_{16}	V_8	V
Operating point feedback	V_{17}	V_8	V
IF input	V_{18}	V_8	V
Junction temperature	T_j	125	°C
Storage temperature range	T_{stg}	−40 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 circuitry	f	5 to 15	MHz
AF ($V_{q\,AF} = -1$ dB)	f_{AF}	0.02 to 150 kHz	
Ambient temperature	T_A	−25 to 85	°C

Characteristics

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

		Test conditions	min	typ	max	
Current consumption	I_{14}			27	33	mA
Field strength output voltage	V_{12}	$V_{i\,rms} = 50$ mV	2.7		3.7	V
	V_{12}	$V_{i\,rms} = 0$ V		0	0.1	V
Voltage at inverted field strength output	V_{11}	$V_{i\,rms} = 5$ mV	0.1	0.7	1.3	V
	V_{11}	$V_{i\,rms} = 0$ V	3.0	3.8	4.5	V
AF output voltage	$V_{q\,5\,rms}$		270	380	520	mV
Total harmonic distortion factor during FM IF mode	THD	pin 13 open; $I_{AFC} = 0$		0.7	1.5	%
Input voltage for limiter threshold	$V_{i\,IF\,rms}$	$V_{q\,5} - 3$ dB		15	30	µA
AM suppression	α_{AM}	$m = 30\%$	60			dB
Signal-to-noise ratio	$\alpha_{S/N}$		70			dB
Current deviation of AFC output	ΔI_7	$f = f_i \pm 50$ kHz		± 110		µA
AFC offset	ΔI_{Off}	$V_i = 20$ µV..10 mV			± 15	kHz
Search tuning stop window	Δf_{ST}	$R_{7-9} = 22$ kΩ		± 18		kHz
Search tuning stop threshold	$V_{i\,ST}$	$V_6 = V_{S/2}$			70	µV
Stabilized voltage	V_8		3.6	4.1	4.6	V
Adjustable range of limiter threshold via pin 15	$V_{i\,IF}$	$V_{15} = 0$; $V_{15} = V_{REF}$		44		dB
AF MUTE	α_{AF}	$V_2 = 0$; $R_{4-1} = \infty$	3	7	11	dB
	α_{AF}	$V_2 = 0$; $R_{4-1} = 0$	31	39	47	dB
Voltage for AF MUTE OFF	V_2		0.75	0.5		V
AF output voltage	$V_{q\,5\,rms}$	$V_{i\,3\,rms} = 200$ mV; $V_{13} = 0$	250	320	400	mV
Total harmonic distortion factor	THD	$V_{i\,3\,rms} = 500$ mV; $V_{13} = 0$			1	%
Search tuning stop "Low"	V_6				1.3	V
Search tuning stop "High"	V_6		7			V

Additional data with respect to application

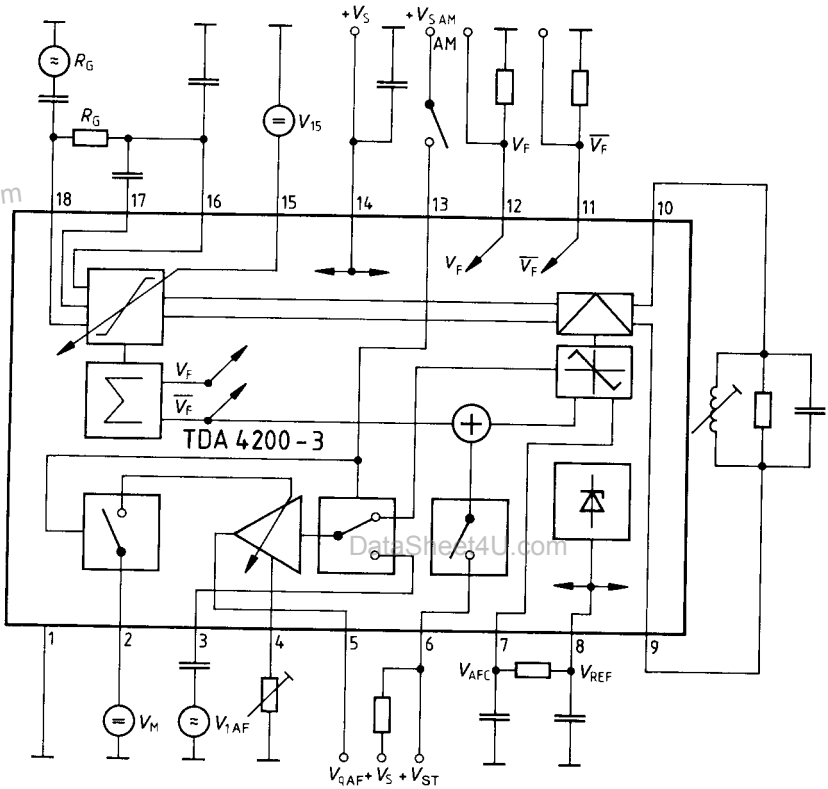
(data does not apply to series measurement)

DC voltage AF output	$V_{q\,5}$	2.8	3.8	4.9	V
Internal dc current of emitter follower output	I_5	0.75	1		mA
Input resistance demodulator circuit	R_{9-10}	27	35		kΩ
Input resistance	$R_{i\,3}$	75	100	125	kΩ

Pin description

Pin	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 for (usually derived from field strength output voltage) 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	AF input for external AF signal, which passes through the output stage during active AF switchover and is present at AF output (pin 5).
4	Muting depth adjustment: By connecting a resistor to ground the requested muting depth can be set. Maximal attenuation of AF output voltage with $R = 0$ (approx. 39 dB), minimal attenuation with $R = \infty$ (approx. 7 dB).
5	AF output for demodulated FM IF or AF injected at pin 3
6	Search tuning stop 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.
7	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.
8	Reference voltage: Should be RF decoupled to pin 1. The AFC resistor and the potentiometer for the limiter threshold are referenced to V_{REF}.
9/10	Demodulator tank circuit: Driven via two integrated capacitors (approx. 40 pF ± 25%). The circuit voltage should be approx. 200 mV_{pp}.
11	Inverted field strength output: Supplies a dc voltage inversely proportional to the input level.
12	Field strength output: Supplies a dc voltage proportional to the input level, which quickly adjusts to changes in the input voltage
13	AF switch-over: Present at pin 13 $V_{S\,AM}$ ($\leq V_{S\,FM}$). Externally injected AF at pin 3 is switched to AF output.
14	Supply voltage: To be RF decoupled to pin 1.
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 decoupled to pin 17 and latter to ground (pin 1).
18	IF input: Frequency modulated IF voltage is injected at pin 18.

Block diagram



Measurement circuit