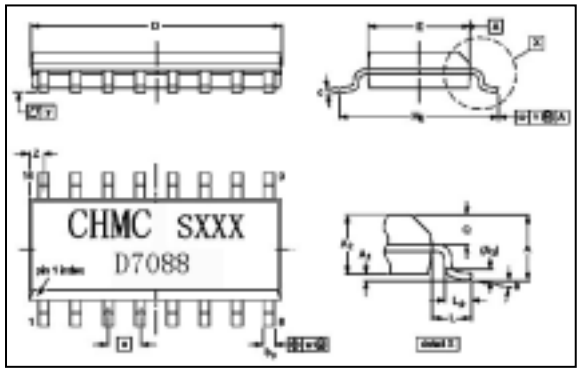
FM receiver circuit for battery supply D7088

GENERAL DESCRIPTION

The D7088 is a bipolar integrated circuit for use in mono portable and pocket radios. It is used when a minimum of peripheral components (of small dimensions and low costs) is important. The circuit contains a frequency-locked-loop (FLL) system with an Intermediate Frequency (IF) of about 70kHz. Selectivity is achieved by active RC-filters. De-tuning related to the IF and too weak input signals is suppressed by the mute circuit.



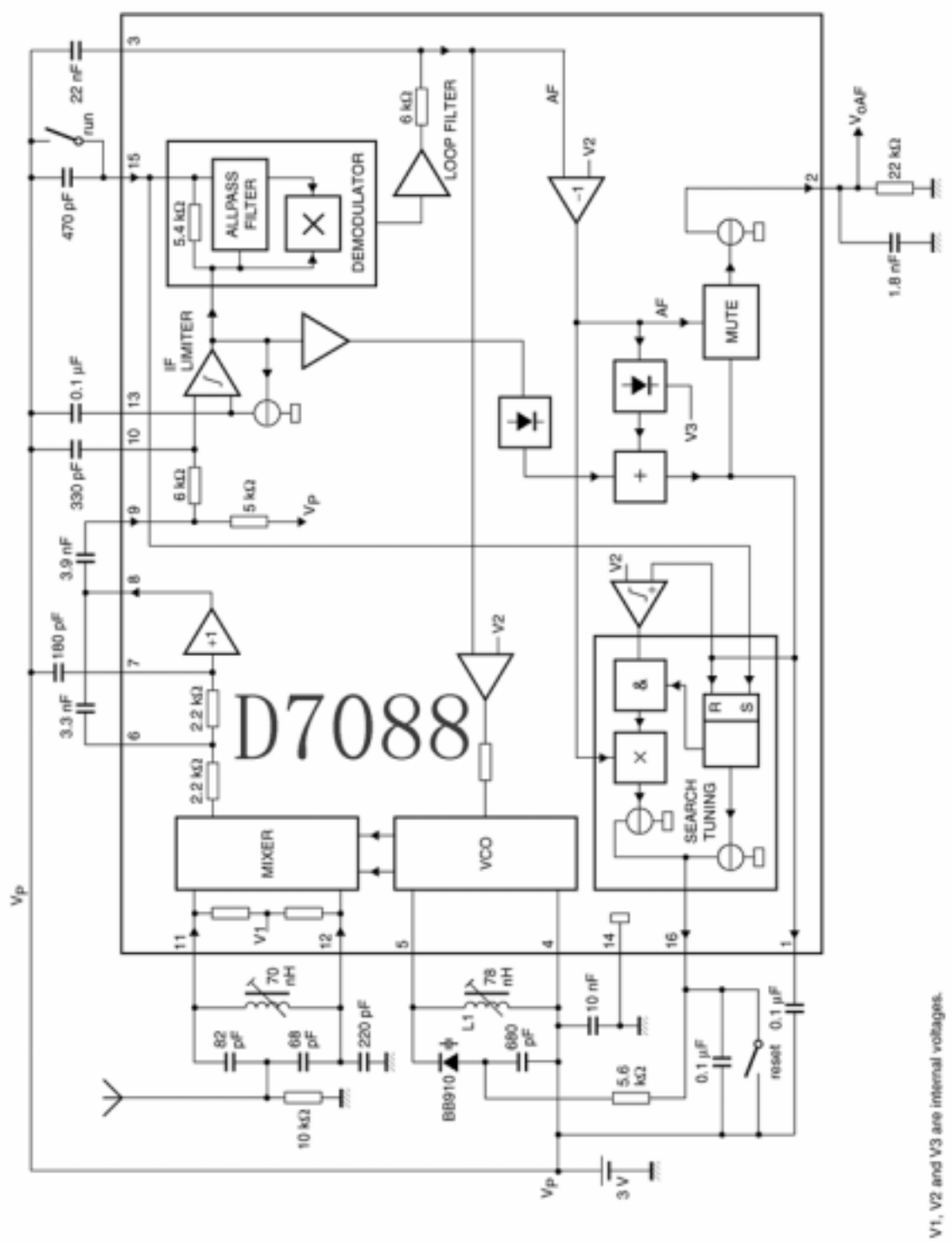
FEATURES

- Equipped with all stages of a mono receiver from antenna to audio output
- Mute circuit
- Search tuning with a single varicap diode
- Mechanical tuning with Integrating AFC
- AM application supported
- Power supply polarity protection
- Power supply voltage down to 1.8V.
- Package: SOP16
- Mechanical tuning; this is possible with or without integrating AFC circuit
- Electrical tuning; this is realized by one directional (band-up) search tuning facility, including RESET to the lower-band limit.

APPLICATIONS

- Mechanical tuning; this is possible with or without integrating AFC circuit.
- Electrical tuning; this is realized by one directional (band-up) search tuning facility, including RESET to the lower-band limit.

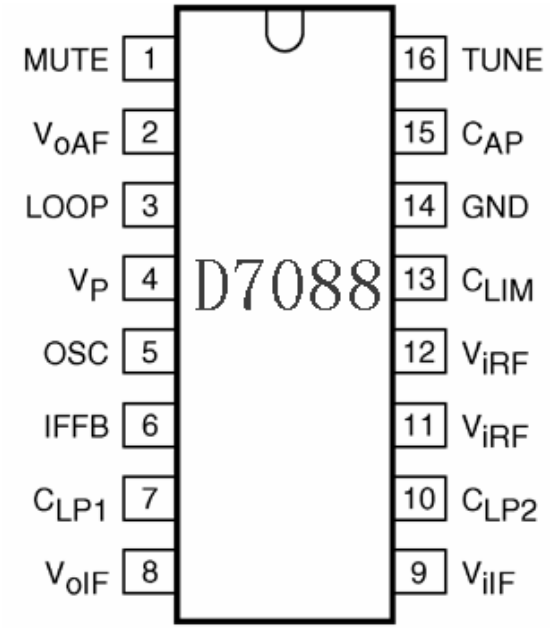
BLOCK DIAGRAM AND APPLICATION CIRCUIT



QUICK REFERENCE DATA

CHARACTERISTIC	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply voltage	Vp		1.8	3	5	V
Supply current	Ip		4.2	5.2	6.6	mA
Radio input frequency	FIRF		0.5	-	110	MHz
RF sensitivity input voltage (RMS value)	Vi(rms)	V_{OAF}=-3dB; V_{OAF}=0dB at Vi=1mV;mute off	-	3	6	μV
Signal handing		Δ f=±75kHz; THD<10%	100	200	-	mV
Audio output signal (RMS value)	Vo(rms)	RL=22kΩ	60	85	120	mV
Operating ambient temperature	Tamb		-10	-	+70	°C

PIN CONNECTION



PINNING

PIN	DESCRIPTION	SYMBOL	PIN	DESCRIPTION	SYMBOL
1	Mute output	MUTE	9	IF input to limiter amplifier	V_{ILF}
2	Audio frequency output signal	V_{OAF}	10	Low-pass capacitor of l limiter amplifier	C_{LP2}
3	AF loop filter	LOOP	11	Radio frequency input	V_{IRF}
4	+3V supply voltage	Vp	12	Radio frequency input	V_{IRF}
5	Oscillator resonant circuit	OSC	13	Limiter offset voltage capacitor	C_{LIM}
6	IF feedback	IFFB	14	Ground (0V)	GND
7	Low-pass capacitor of 1 dB amplifer	C_{LP1}	15	All-pass filter capacitor /input for search tuning	C_{AP}
8	IF output to external coupling capacitor (high-pass)	V_{OIF}	16	Electrical tuning/AFC output	TUNE

LIMITING VALUES

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
Vp	Supply voltage	-	5	V
Tstg	Storage temperature	-55	+150	°C
Tamb	Operating ambient temperature	-10	+70	°C

ELECTRIC CHARACTERISTICS

DC CHARACTERISTICS unless otherwise specified: Vp=3V;Tamb=25°C.

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT
Vp	Supply voltage (pin4)	1.8	3.0	5.0	V
Ip	Supply current (pin4)	4.2	5.2	6.6	mA
V_1	DC voltage on pin 1	2.5	2.55	2.6	V
V_3	DC voltage on pin 3	2.64	2.69	2.74	V
$V_{6,7}$	DC voltage on pin 6 and 7	2.38	2.44	2.5	V
V_8	DC voltage on pin 8	1.6	1.67	1.74	V
$V_{9,10,13}$	DC voltage on pin 9,10 and 13	2.42	2.47	2.52	V
$V_{11,12}$	DC voltage on pin 11 and 12	0.91	0.94	0.98	V
V_{15}	DC voltage on pin 15	2.06	2.12	2.18	V
I_2	AF output current on pin 2	45	60	80	µA
I_5	Oscillator current on pin 5	275	375	500	µA

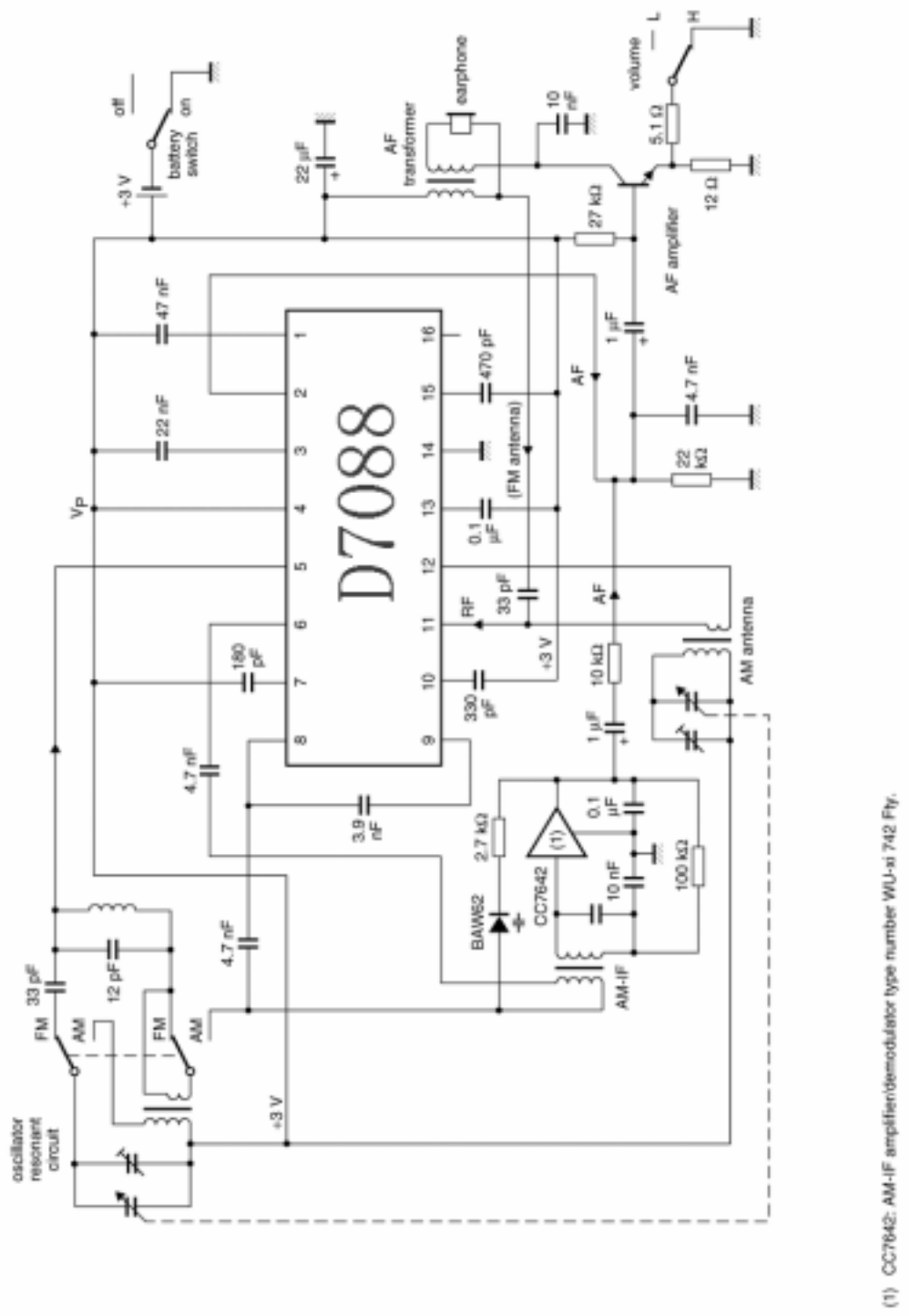
AC CHARACTERISTICS

Unless otherwise specified: Vp=3V;Tamb=25°C;f_{IRF}=96MHz modulated with fmod=1kHz and ±22.5kHz deviation; Vi=400μV (measured as EMF;Rs=75Ω)

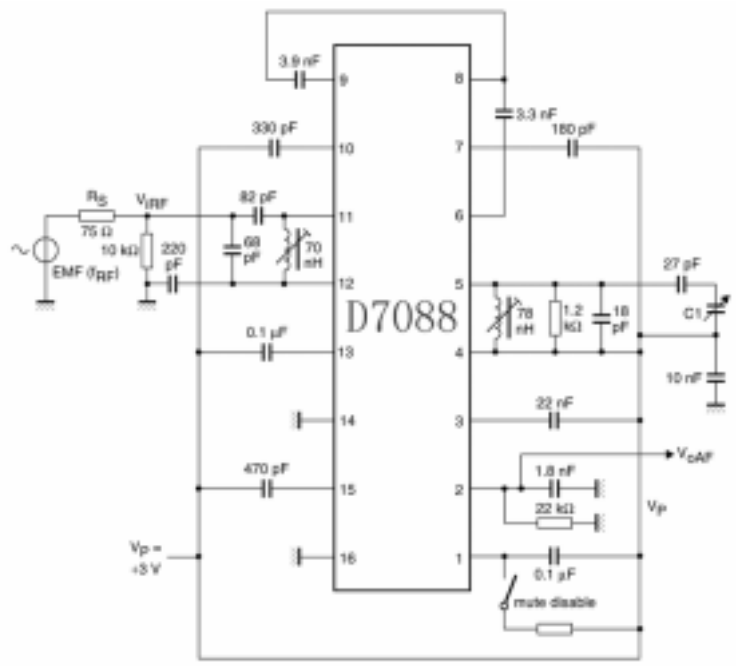
PARAMETER	SYMBOL	CONDITIOND	MIN.	TYP.	MAX.	UNIT
RF sensitivity input voltage (RMS value)	Vi	V_{OAF}=-3dB; V_{OAF}=0dB at Vi=1mV;mute off	-	3	6	μVrms
		V_{OAF}=-3dB; V_{OAF}=0dB at Vi=1mV;mute on	3	6	12	
		(S+N)/N=26dB	-	5	10	
Signal plus noise-to-noise ratio	N+S/N		52	56	-	dB
Total harmonic distortion	THD	Δf=±22.5kHz	-	1.0	1.4	%
		Δf=±75kHz	-	2.4	3.3	
AM suppression	AMR	FM:1kHz; Δf=±75kHz; AM:1kHz,mod=80%	47	52	-	dB
Ripple rejection	R.R	100mV Rms ripple on Vp, f=1kHz	7	10	-	dB
Audio output signal (RMS value)	Vo	R_L=22kΩ	60	85	120	mVrms
Search tuning (with BB910 and C16=0.1μF)						
Minimum output voltage on pin 16	V16	Limiting point	-	Vp-1.85	-	V
Tuning steepness	ΔV/Δt	Voltage at pin 16	95	210	420	mV/s
Oscillator steepness	Δfosc/Δt		1.25	2.83	5.6	MHz/s
AFC steepness	$\Delta I_{AFC}/\Delta V3$	Voltage at pin 3	4.75	9.5	19	μs

TEST AND APPLICATION INFORMATION

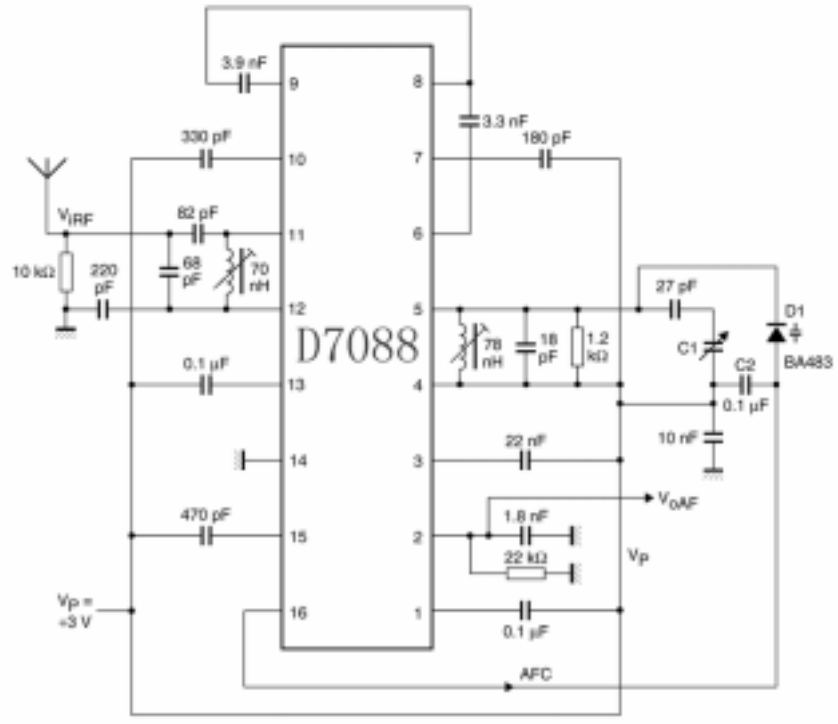
1. AM APPLICATION CIRCUIT



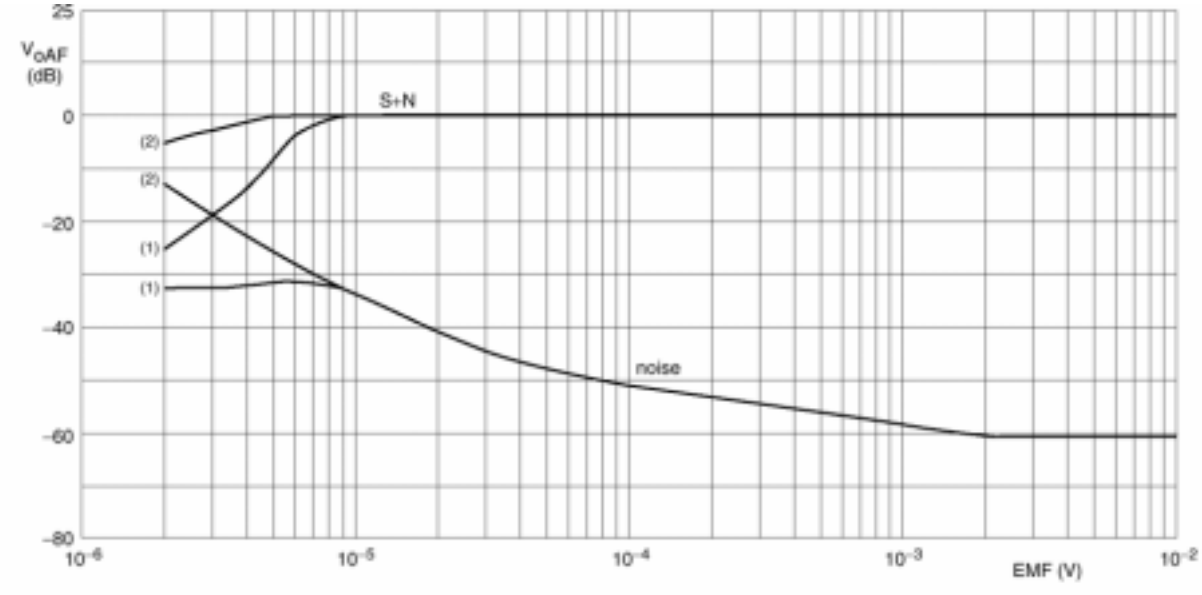
2. TEST CIRCUIT AND APPLICATION FOR MECHANICAL TUNING



3. APPLICATION CIRCUIT WITH AFC FOR MECHANICAL TUNING



CHARACTERISTICS CURVES



(1) Mute on.
(2) Mute off.

Input sensitivity