

KA22427C

AM/FM 1 CHIP RADIO

INTRODUCTION

KA22427C is a monolithic integrated circuit designed for the portable AM/FM radio or AM/FM clock radios.

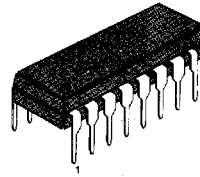
FUNCTIONS

- AM RF & MIX
- AM AGC
- AM/FM DET
- Regulator
- AM Local OSC
- AM/FM IF AMP
- Audio Power AMP
- FM AFC Control

FEATURE

- Portable AM/FM 1-chip radio
- Wide operating supply voltage range: $V_{CC} = 3V \sim 12V$ (Approximately) (Depending on the internal regulator tolerance)
- Recommended operating supply voltage: $V_{CC} = 4.5V \sim 9V$

16-DIP-300A



ORDERING INFORMATION

Device	Package	Operating Temperature
KA22427C	16-DIP-300A	20°C ~+70°C

V_{CC}	4.5V	6.0V	7.5V	9.0V	Line Operated
$R_L = 8\Omega$	O	O	O	X	X
$R_L = 16\Omega$	O	O	O	O	X
$R_L = 45\Omega$	O	O	O	O	O

- On using AC line as an internal shunt regulator mode, it is possible to use low cost application without a transformer (approximately 42mA).
- IF AMP gain is determined by DC voltage appeared at IC Pin 16.
- Power output: $P_o = 0.28W$ (Min.) at THD = 10% ($V_{CC} = 5.5V/8\Omega$).

BLOCK DIAGRAM

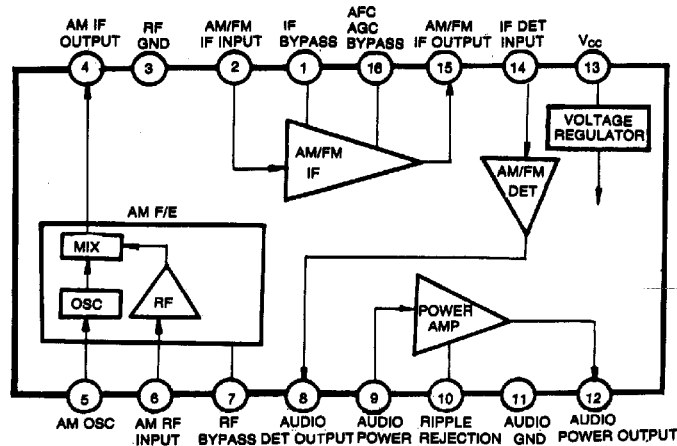


Fig. 1

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Character istic	Symbol	Value	Unit
Supply Voltage	V _{CC}	13	V
Power Dissipation	P _D	600	mW
Supply Current	I _{CC}	44	mA
Thermal Resistance Junction to Ambient	R _{EJA}	100	°C /W
Operating Temperature	T _{OPR}	-20 ~ +70	°C
Storage Temperature	T _{STG}	-55 ~ +150	°C

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V_{CC} = 5.5V, fm = 1KHz, AM: f=1MHz, 30% Mod, FM: f =10.7MHz
 Δf = 22.5KHz, Unless otherwise specified)

Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit
FM	Quiescent Circuit Current	I _{CCQ}	SW: FM, V _{CC} = 3V	7	12	17	mA
			SW: FM, V _{CC} = 9V	10	17	23	
	Pin 16 Terminal Voltage	V _{16(FM)}	SW: FM, V _{CC} = 9V, V _I = 0	2.0	2.4	3.1	V
	-3dB Limiting Sensitivity	V _{I(LIM)}	SW: FM, -3dB V ₁₆ = 2.4V, V _R Min		57		dB
AM	Internal Regulated Vtg.	V _{CC}	SW: AM, I _{CC} = 42mA	12	13.2	14.0	V
	Pin 16 Voltage	V _{16 (AM)}	SW: AM, V _{CC} = 9V, V _I = 0	1.4		1.9	V
	Maximum Sensitivity	S _{MAX}	SW: AM, V _{CC} = 12V V _I = 37dBμ , R _L = 8Ω	1.5	3.0		V
	Signal to Noise Ratio	S/N	V _I = 37.5dBμ , R _L = 8Ω P _O = 50mW	15	20		dB
PWR AMP	Output Power	P _O	f = 1KHz, THD = 10% V _R Min, R _L = 8Ω	0.28			W
	Total Harmonic Distortion	THD	I _{CC} = 42mA, R _L = 45Ω f = 1KHz, V _O = 2V V _R Min		0.5	4.0	%
	Voltage gain	G _V	f = 1kHz, R _L = 8Ω P _O = 50mW		41		dB

TEST CIRCUIT

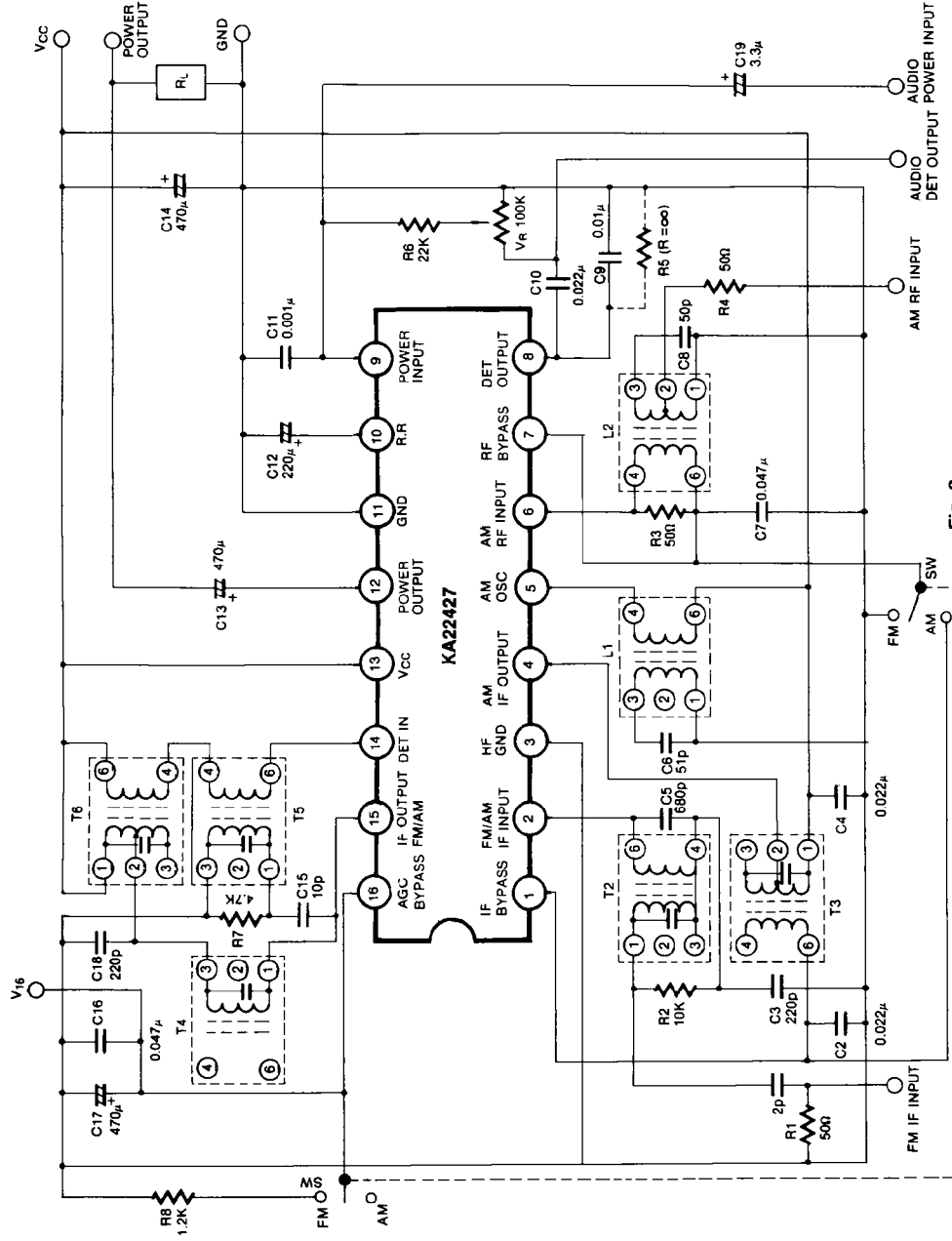


Fig. 2

APPLICATION INFORMATION

- EXTERNAL COMPONENTS

Parts Number	Purpose	Typical	Influence	
			Smaller Than Typ	Greater Than Typ
R5	AM Gain Control	47K Ω (33K \sim ∞)	Low AM Gain	AGC Distortion Increase, High Gain
R7	FM Detector Damper	4.7K Ω	Low Detector Output, Stable IF Gain, Low FM Gain	Sharp IF AMP Curve
R8	FM Gain Adjust	470	Low FM Gain	High Gain, but Noise Increase
C2	IF Bypass	0.022 μ F	Should Not Be Less Than 0.005 μ F	High IF Gain, S/N Ratio Degrade
C4	IF Filter	0.022 μ F	Removal May Cause IF Oscillation	No Influence
C7	AM Bypass	0.047 μ F	Low Gain	Using over 1 μ F Will Cause FM Distortion at Small Signal
C9	Detector Filter	0.01 μ F	Unstable IF AMP Oscillation	Poor FM Frequency Response
C10	Audio Coupling	0.022 μ F	Lower Sensitivity, Poor Low Frequency Response	Bass Boost Affects De-emphasis Curve
C11	Audio Input High-Cut	0.001 μ F	Audio Oscillation	Poor Response
C12	Ripple Filter	220 μ F	Poor Frequency Response & Low Gain	Improve AC Hum
C13	Audio Output Coupling	470 μ F	Poor Low Frequency Response	Can Achieve Optimum Output Power
C14	Power Line Filter	470 μ F	Poor AC Hum	Improve AC Hum
C15	FM Detector Phase-Shift	10pF	Narrow IF Bandwidth	Wide IF Bandwidth
C16	High Freq. (IF) Bypass	0.047 μ F	Removal Will Cause FM Oscillation	No Influence
C17	AN AGC Time Constant and High Frequency (IF) Bypass	0.047 μ F	Not Recommend to Charge	

FUNCTION DESCRIPTION (Pin 16 DC Voltage)

1. IF Gain Grouping Table

(1) Test Condition: $V_{CC} = 9V$ (Pin 13).Pin 8 resistance (AM) = $47K\Omega$ Pin 16 resistance (FM) = $1.2K\Omega$

(2) Grouping Table

V16(AM)	1.4 - 1.7V
V16(FM)	2B
2.4 - 2.85V	

2. IF gain is determined by DC voltage appeared at IC Pin 16.

The DC voltage at Pin 16 to the following values:

AM = 1.4 ~ 1.65V (DC)

FM = 1.9 ~ 2.10V (DC)

AM gain can be adjusted by the loading resistor value of Pin 8 (AM) from $33K\Omega$ to infinity.FM gain can be adjusted by the loading resistor value of Pin 16 (FM) from $3K\Omega$ to 680Ω .

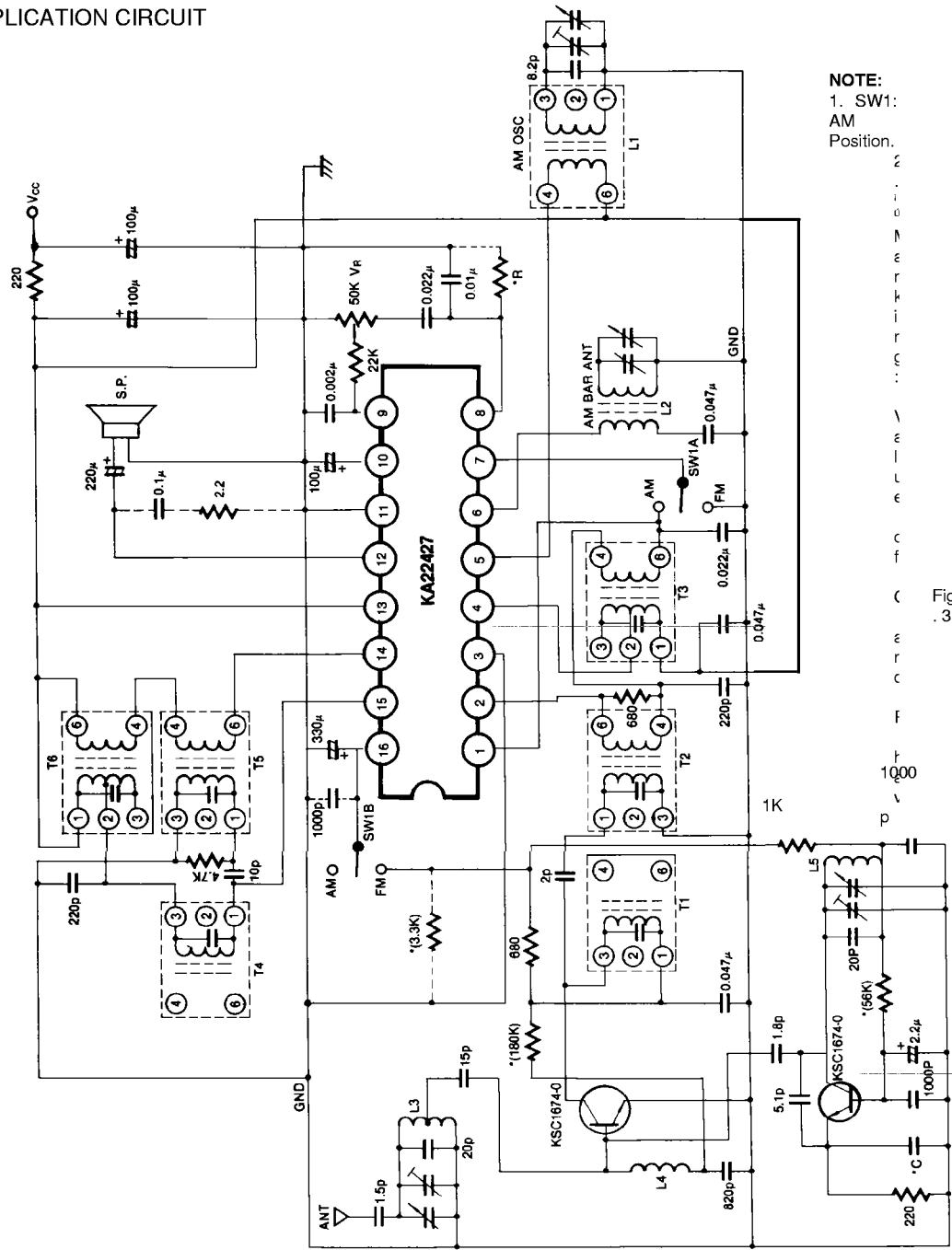
Recommended resistance (Pin 8, Pin 16).

Pin 8 (AM) = $47K\Omega$ Pin 16 (FM) = 470Ω

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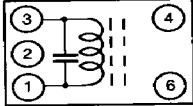
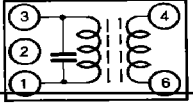
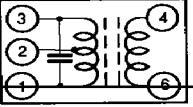
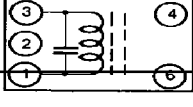
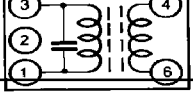
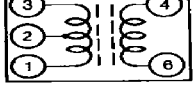
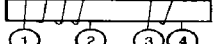
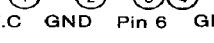
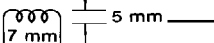
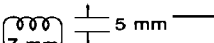
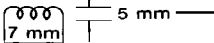
APPLICATION CIRCUIT



NOTE:
1. SW1:
AM
Position.

Fig
.3.

COIL SPECIFICATION 1

Coil No.	f	Q _o	Turns	C _o	Connections
T1	10.7MHz	120	1-3 8T	150pF	
T2	10.7MHz	70min	1-3 4-6 11T 2T	75±5pF	
T3 (T6)	455KHz	80min	1-2 2-3 4-6 91T 55T 6T	180±5pF	
T4	10.7MHz	45min	1-3 11T	82±3pF	
T5	10.7MHz	25min	1-3 4-6 7T 7T	180pF	
L1	AM Local Oscillator	90min	1-3 4-6 86T 7T		
L2	AM ANT	200	1-2 (L = 560 μ _H) 3-4	138T 9T	Core: 10 mm ø × 55 mm 
L3	FM ANT		0.8 mmø UEW TAP	5T 0.5T	V.C GND Pin 6 GND 
L4	Trap		0.32 mmø UEW	10T	
L5	FM Oscillator		0.8 mmø UEW	4T	 

APPLICATION CIRCUIT 2

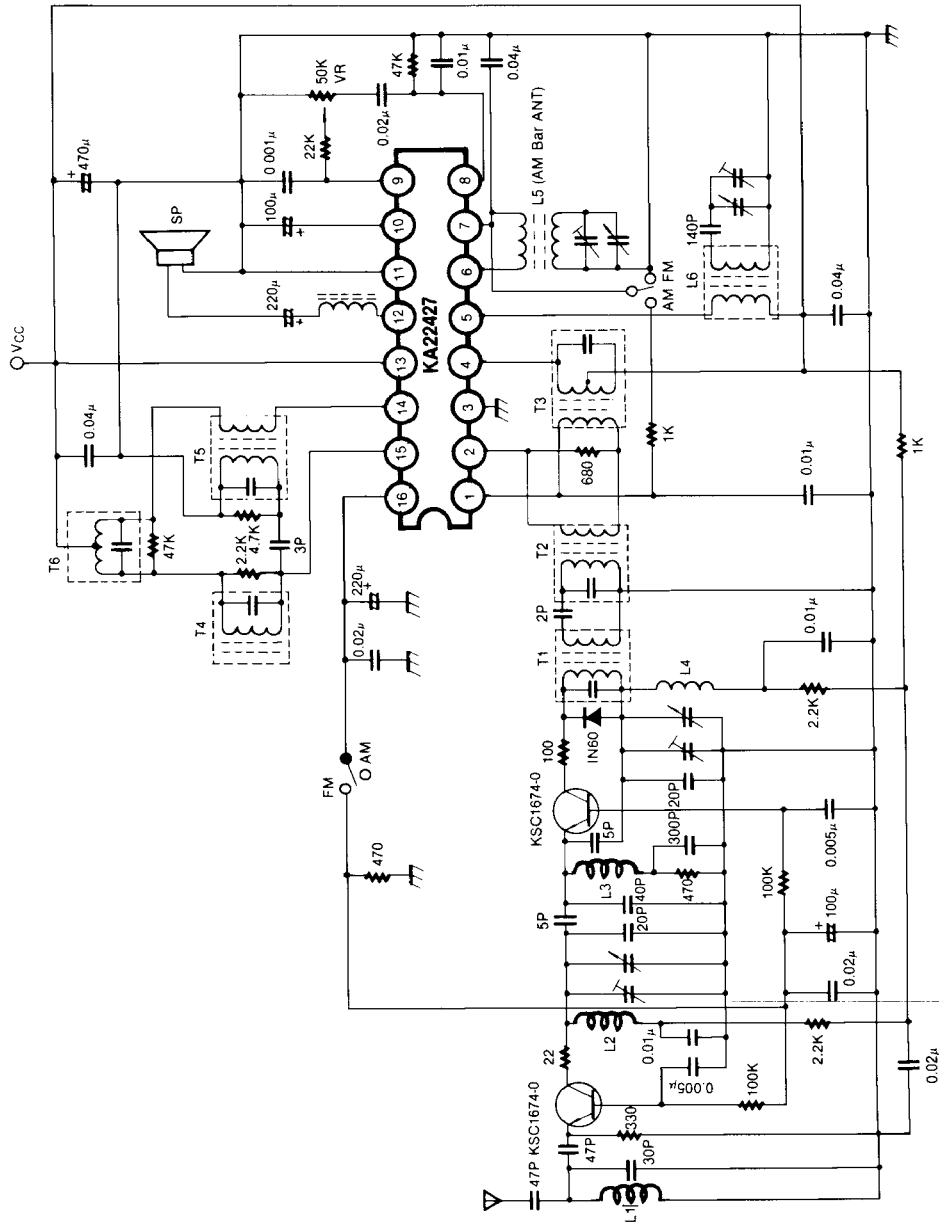
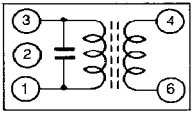
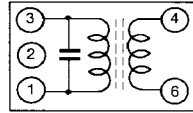
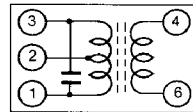
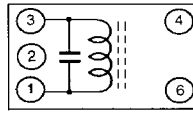
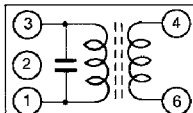
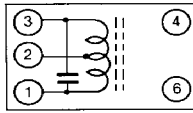


Fig. 4.

COIL SPECIFICATION 2

Coil No.	f	Q ₀	Turns		C.L.	Connections
			1-3	4-6		
T1	10.7MHz	90	1-3 4-6	113	82pF	
T2	10.7MHz	60	1-3 4-6	52	390 pF	
T3	455 KHz	100	1-2 2-3 4-6	127 28 10	180 pF	
T4	10.7 MHz	45(Min)	1-3	11	82 pF	
T5	10.7 MHz	25(Min)	1-3 4-6	77	180 pF	
T6	455 KHz	100	1-2 2-3	50 50	390 pF	
L6	796KHz	100	1-3 4-6	100 10	360μH	