



FM/AM RADIO CIRCUIT CXA1691M

DESCRIPTION

The CXA1691M is a one-chip FM/AM radio IC designed for radio-cassette tape recorders and headphone tape recorders.

FEATURE

- Small number of peripheral components
- Low current consumption ($V_{cc}=3V$)
FM: $I_D=5.3mA$ (Typ.)
AM: $I_D=3.4mA$ (Typ.)
- Built-in FM/AM select switch
- Large output of AF amplifier

FUNCTIONS

FM section

- RF amplifier; Mixer and OSC
(incorporating AFC variable capacitor);
- IF amplifier,
- Quadrature detection;
- Tuning LED driver.

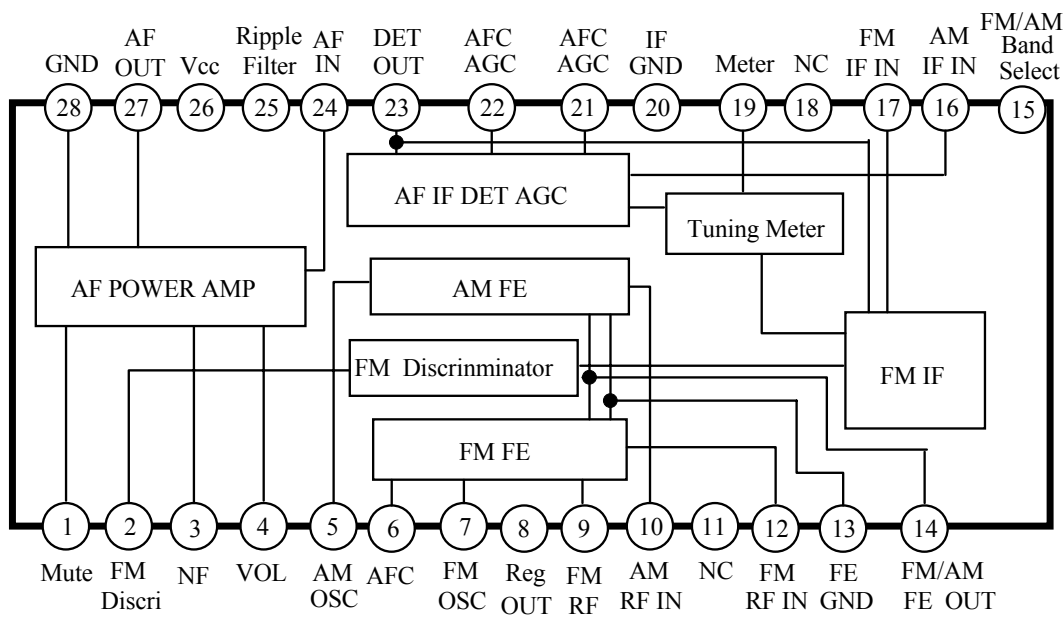
AM section

- RF amplifier, Mixer and OSC (with RF AGC);
- IF amplifier (with IF AGC)
- Detector
- Tuning LED driver

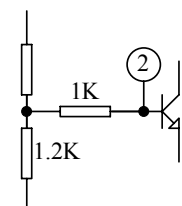
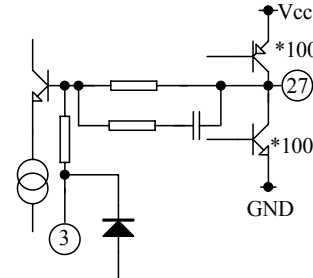
AF section

- Electronic volume control
- FM muting

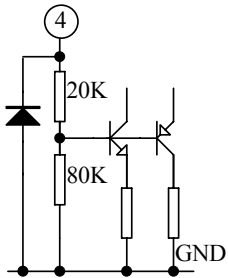
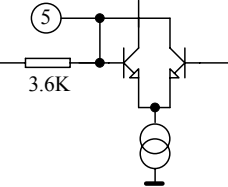
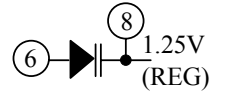
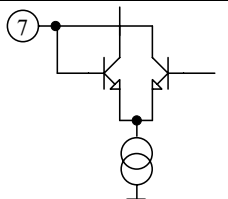
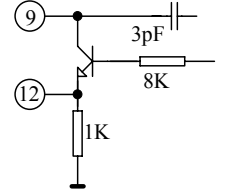
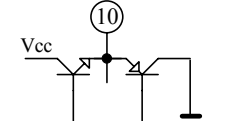
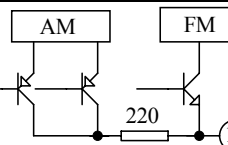
BLOCK DIAGRAM



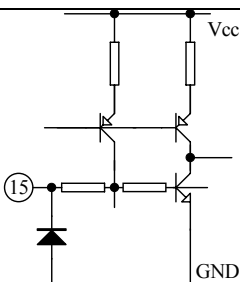
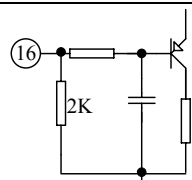
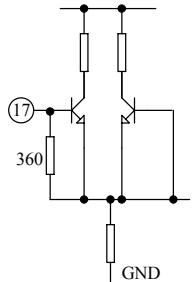
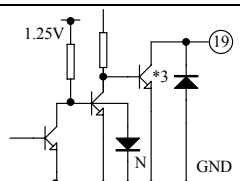
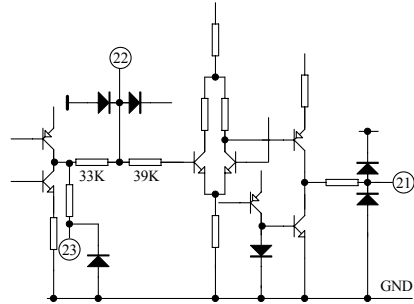
PIN CONFIGURATIONS

Pin	Symbol	Description	Voltage (V)				Equivalent circuit
			Vcc=3V		Vcc=6V		
			FM	AM	FM	AM	
1	MUTE		0	0	0	0	
2	FM DISCRI	Phase-Shift circuit, Connect ceramic discriminator	2.18	2.70	4.88	5.43	
3	NF	Negative feedback pin	1.5	1.5	3.0	3.0	
27	AF OUT	Power amplifier output pin	1.5	1.5	3.0	3.0	

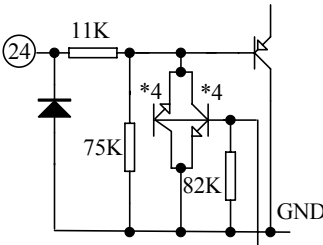
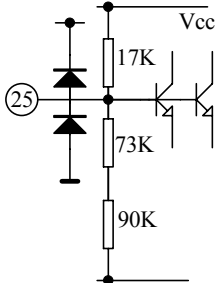
PIN CONFIGURATIONS

Pin	Symbol	Description	Voltage (V)				Equivalent circuit
			Vcc=3V		Vcc=6V		
			FM	AM	FM	AM	
4	VOL CONT	Connect variable resistor for electronic volume control	1.25	1.25	1.25	1.25	
5	AM OSC	AM local oscillation circuit	1.25	1.25	1.25	1.25	
6	AFC	AFC variable capacitor pin	1.25	*	1.25	*	
8	REG OUT	Regulator pin 1.25V(Typ.)	1.25	1.25	1.25	1.25	
7	FM OSC	FM local oscillation circuit	1.25	1.25	1.25	1.25	
9	FM RF	Connect FM RF tuning coil	1.25	1.25	1.25	1.25	
12	FM RF IN	FM RF input pin	0.3	0	0.3	0	
10	AM RF IN	AM RF input	1.25	1.25	1.25	1.25	
11	NC		0	0	0	0	
13	GND(FE GND)		0	0	0	0	
14	FM/AM FE OUT	IF output pin of FM and AM, Connect IF filter	0.36	0.2	0.36	0.2	

PIN CONFIGURATIONS

Pin	Symbol	Description	Voltage (V)				Equivalent circuit
			Vcc=3V		Vcc=6V		
			FM	AM	FM	AM	
15	BAND SELECT	FM and AM bands selection switch pin. During GND it becomes AM and during open it becomes FM	0.84	0	0.88	0	
16	AM IF IN	Input pin of AM IF	0	0	0	0	
17	FM IF IN	Input pin of FM IF	1.3	0	1.3	0	
18	NC		0	0	0	0	
19	METER	Meter drive circuit (For tuning indicator)	1.6	1.6	4.5	4.5	
20	GND		0	0	0	0	
21	AFC/AGC	AFC pin of W band. During AM, it determines time constant of AGC	1.25	1.49	1.25	1.49	
22	AFC/AGC	AFC pin of J band. During AM, it determines time constant of AGC	1.25	1.25	1.25	1.25	
23	DET OUT	Detection output pin	1.25	1.0	1.25	1.0	

PIN CONFIGURATIONS

Pin	Symbol	Description	Voltage (V)				Equivalent circuit
			Vcc=3V		Vcc=6V		
			FM	AM	FM	AM	
24	AF IN	Power amplifier input pin	0	0	0	0	
25	RIPPLE FILTER	Ripple filter	2.71	2.71	5.4	5.4	
26	Vcc	Power supply pin	3.0	3.0	6.0	6.0	
28	GND	Power GND	0	0	0	0	

* Note: The pin voltage of pin 6 during AM, it is the same pin voltage of pin22 during J BAND and is the same pin voltage of pin21 during W BAND.

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	Vcc	14	V
Allowable power dissipation	P _D	700	mW
Operating temperature	T _{opr}	-10~60	°C
Storage Temperature	T _{stg}	-50~125	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value	Unit
Supply voltage	Vcc	2~7.5	V

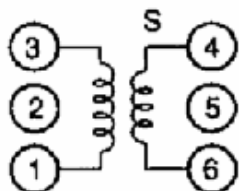
ELECTRICAL CHARACTERISTICS

(Unless otherwise specified: Ta=25°C, Vcc=6V)

Characteristics	Test conditions	Symbol	Min	Typ	Max	Unit
AM circuit current	No signal, AM	I _{Q1}		3.5	10	mA
FM circuit current	No signal, FM	I _{Q2}		7.0	14	mA
FM front end voltage gain	Vin1=40dBμV, 100MHz	G _{V1}	32	39	46	dB
FM detection output level	Vin3=90dBμV, 10.7MHz (1kHz, 22.5kHz,DEV)	V _{D1}	39	77.5	155	mVrms
FM-IF knee level	Vin3=90dBμV 10.7MHz (-3dBpoint) (1kHz, 22.5kHz,DEV)	V _{D2}		24	32	dBμV
FM detection output distortion factor	Vin3=90dBμV, 10.7MHz (1kHz, 75kHz,DEV)	THD ₁		0.3	2.0	%
FM meter current	Vin3=60dBμV, 10.7MHz	I _{B1}	1.8	3.5	7.0	mA
AM front end voltage gain	Vin2=60dBμV, 1660kHz	G _{V2}	15	22	29	dB
AM detection output level	Vin3=85 dBμV, 455kHz (1kHz, MOD=30%)	V _{D3}	39	77.5	155	mVrms
AM-IF voltage gain	Vin3 when 455kHz (1kHz, MOD=30%) Output is -34dBm	G _{V3}	14	20	27	dBμV
AM detection output distortion factor	Vin2=95dBμV, 1660kHz Vcc=7.8V (1kHz, MOD=30%)	THD ₂		0.6	2.0	%
AM meter current	Vin3=85dBμV, 455kHz (1kHz, MOD=30%)	I _{B2}	1.3	3.0	7.0	mA
Audio voltage gain	Vin=60dBμV, 10.7MHz Vin4=-30dBm, 1kHz	G _{V4}	27	31.5	36	dB
Audio distortion factor	Vin4=-20dBm, 1kHz 10.7MHz, Po=50mW, Vin3=60dBμV	THD		0.3	2.5	%
Audio output power	Vcc=6V, THD=10%, R _L =8Ω	P _O	400	500		mW
Muting level	Po=50mW, Vin3=OFF, Vin4=-20dBm, 1kHz	V _{D4}	8	15	22	dB

Coil Data

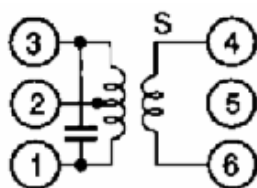
AM OSC

Core diameter $\phi 0.06\text{mm}$ 2UEW

f (kHz)	L(μH) 1 to 3	Qo 1 to 3	Number of windings(t)	
			1 to 3	4 to 6
796	270	125	107	796

Equivalent to L-5K7-H5 R12-1684X. Mitsumi Electric Co.,Ltd. or 7TRS-8441X TOKO Co., Ltd.

AM IFT

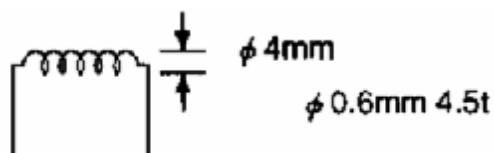
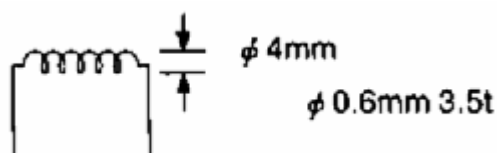
Core diameter $\phi 0.07\text{mm}$ UEW

Co(pF) 1 to 3	Qo 1 to 3	Number of windings (t)		
		1 to 2	2 to 3	4 to 6
180	90	111	35	7

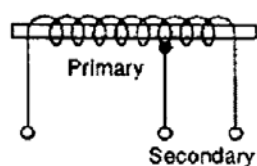
Equivalent to 21K7-H5 R12-8558A. Mitsumi Electric Co.,Ltd. or 7MC-7789N TOKO Co., Ltd.

FM RF

FM OSC



AM bar antenna



f (kHz)	L(μH)	Primary	Secondary
796	650	91t	20t

BPF

PFWE8

(88 to 108MHz)

Soshin Electric Co., Ltd.

CF1

SFU-455B

Murata Mfg. Co., Ltd. Or BFCFL-455 TOKO Co., Ltd.

CF2

SFE10.7MA5

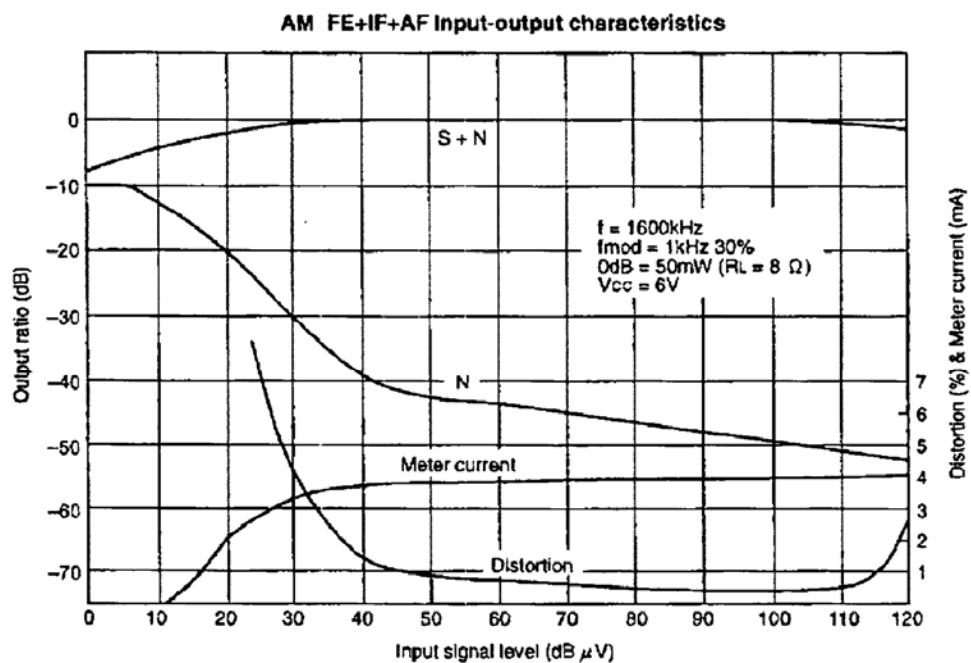
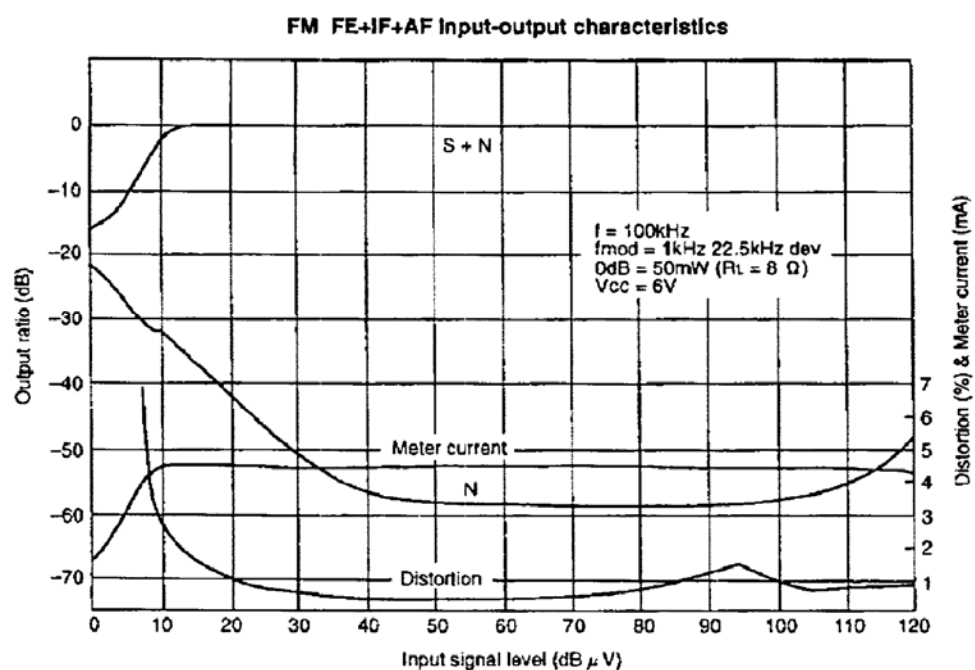
Murata Mfg. Co., Ltd.

CF3

CDA10.7MC1

Murata Mfg. Co., Ltd.

CHARACTERISTICS CURVES



OUTLINE DRAWING

SOP28:

