

**FM/AM Radio**

**Description**

CXA1691BM/BS is a one-chip FM/AM radio IC designed for radio-cassette tape recorders.

**Features**

- Small number of peripheral components.
- Low current consumption ( $V_{CC}=3\text{ V}$ )
  - For FM :  $I_D=5.8\text{ mA}$  (Typ.)
  - For AM :  $I_D=4.7\text{ mA}$  (Typ.)
- Built-in FM/AM select switch.
- Large output of AF amplifier.
  - $V_{CC}=6\text{ V}$ , EIAJ output=500 mW (Typ.) when load impedance  $8\ \Omega$

**Function**

FM section

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

AM section

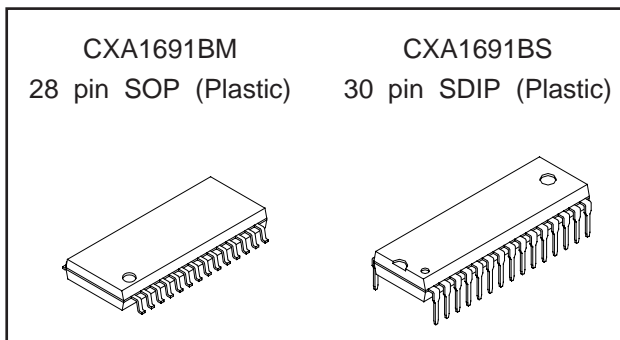
- RF amplifier, Mixer and OSC (with RF AGC)
- IF amplifier (with IF AGC)
- Detector
- Tuning LED driver

AF section

- Electronic volume control
- FM muting

**Structure**

Bipolar monolithic IC



**Absolute Maximum Ratings** ( $T_a=25\text{ }^\circ\text{C}$ )

• Supply voltage	$V_{CC}$	14	V
• Operating temperature	$T_{opr}$	-10 to +60	$^\circ\text{C}$
• Storage temperature	$T_{stg}$	-50 to +125	$^\circ\text{C}$
• Allowable power dissipation	$P_D$	700	mW
			(CXA1691BM)
	$P_D$	1000	mW
			(CXA1691BS)

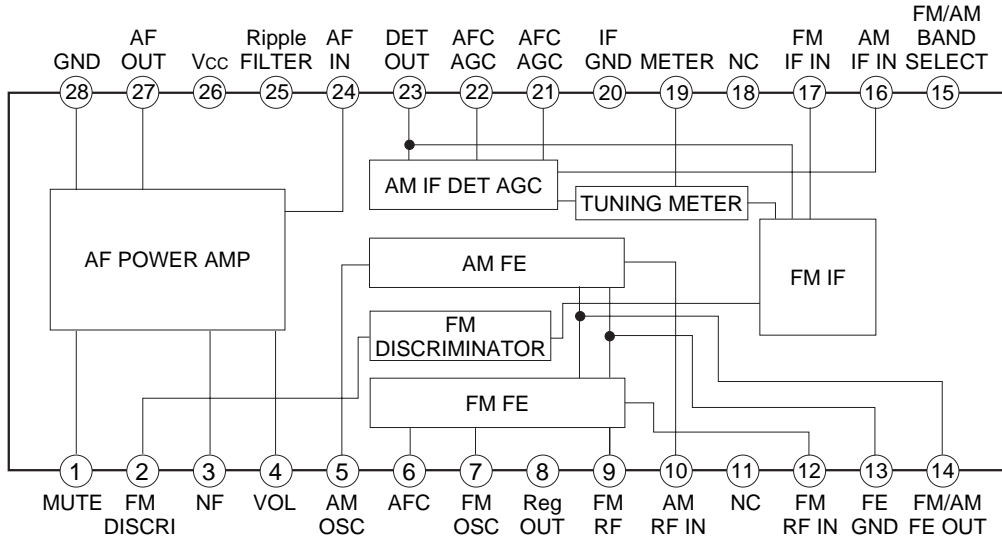
**Recommended Operating Conditions**

Supply voltage	$V_{CC}$	2 to 7.5	V
			(CXA1691BM)
	$V_{CC}$	2 to 8.5	V
			(CXA1691BS)

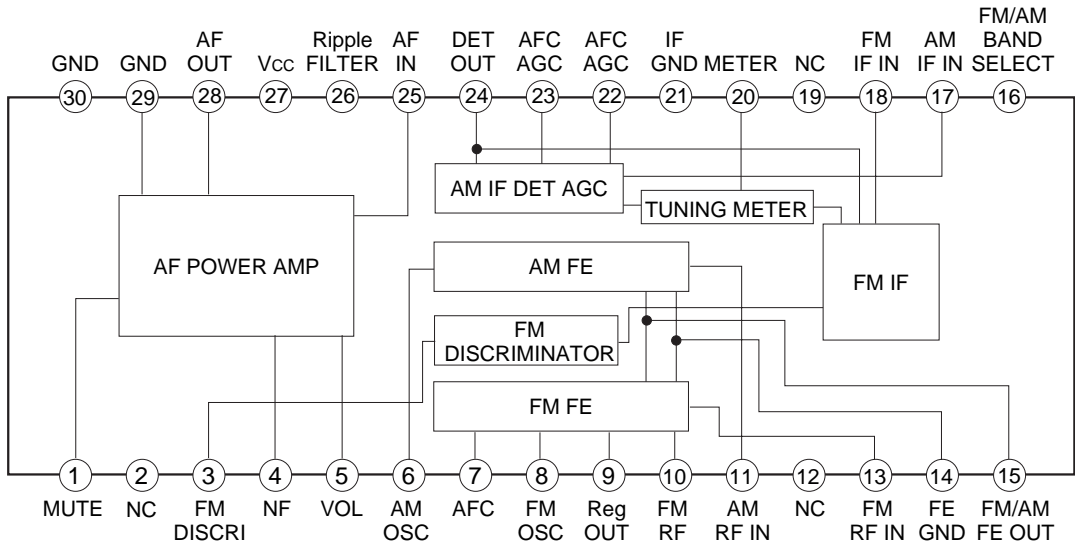
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Block Diagram

CXA1691BM

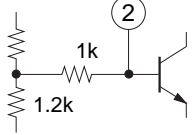
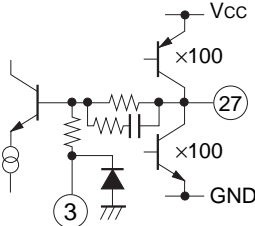
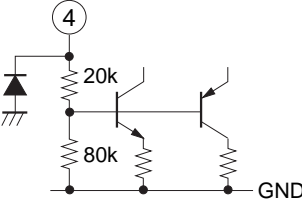
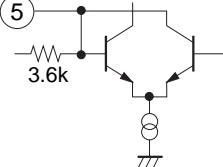
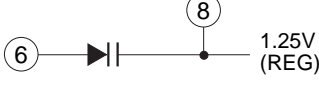
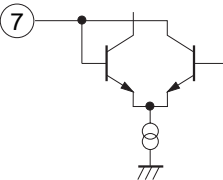


CXA1691BS



Standard Circuit Design Data

(The pin numbers in the parenthesis are for CXA1691BS.)

No.	Symbol	Voltage (V)				Equivalent circuit	Description
		Vcc=3 V		Vcc=6 V			
		FM	AM	FM	AM		
1 (1, 2)	MUTE	0	0	0	0		
2 (3)	FM DISCRI	2.18	2.70	4.88	5.43		Phase-shift circuit Connect ceramic discriminator
3 (4)	NF	1.5	1.5	3.0	3.0		Negative feedback pin
27 (28)	AF OUT	1.5	1.5	3.0	3.0		Power amplifier output pin
4 (5)	VOL CONT	1.25	1.25	1.25	1.25		Connect variable resistor for electronic volume control.
5 (6)	AM OSC	1.25	1.25	1.25	1.25		AM local oscillation circuit
6 (7)	AFC	1.25	*	1.25	*		AFC variable capacitor pin
8 (9)	REG OUT	1.25	1.25	1.25	1.25		Regulator pin 1.25 V (Typ.)
7 (8)	FM OSC	1.25	1.25	1.25	1.25		FM local oscillation circuit

No.	Symbol	Voltage (V)				Equivalent circuit	Description
		Vcc=3 V		Vcc=6 V			
		FM	AM	FM	AM		
9 (10)	FM RF	1.25	1.25	1.25	1.25		Connect FM RF tuning coil
12 (13)	FM RF IN	0.3	0	0.3	0		FM RF input pin
10 (11)	AM RF IN	1.25	1.25	1.25	1.25		AM RF input pin
11 (12)	NC	0	0	0	0		
13 (14)	GND (FE GND)	0	0	0	0		
14 (15)	FM/AM FE OUT	0.36	0.2	0.36	0.2		IF output pin of FM and AM. Connect IF filter.
15 (16)	BAND SELECT	0.84	0	0.88	0		FM and AM bands selection switch pin. During GND it becomes AM and during open it becomes FM.
16 (17)	AM IF IN	0	0	0	0		Input pin of AM IF.
17 (18)	FM IF IN	1.30	0	1.30	0		Input pin of FM IF.
18 (19)	NC	0	0	0	0		

No.	Symbol	Voltage (V)				Equivalent circuit	Description
		V <sub>CC</sub> =3 V		V <sub>CC</sub> =6 V			
		FM	AM	FM	AM		
19 (20)	METER	1.6	1.6	4.5	4.5		Meter drive circuit (For tuning indicator)
20 (21)	GND	0	0	0	0		
21 (22)	AFC/AGC	1.25	1.49	1.25	1.49		AFC pin of W band. During AM, it determines time constant of AGC
22 (23)	AFC/AGC	1.25	1.25	1.25	1.25		AFC pin of J band. During AM, it determines time constant of AGC.
23 (24)	DET OUT	1.25	1.0	1.25	1.0		Detection output pin
24 (25)	AF IN	0	0	0	0		Power amplifier input pin
25 (26)	RIPPLE FILTER	2.71	2.71	5.4	5.4		Ripple filter
26 (27)	V <sub>CC</sub>	3.0	3.0	6.0	6.0		Power supply pin
28 (29, 30)	GND	0	0	0	0		Power GND

\* The pin voltage of pin 6 during AM, it is the same pin voltage of pin 22 (23) during J BAND and is the same pin voltage of pin 21 (22) during W BAND.

(See the Electrical Characteristics Test Circuit, Ta=25 °C, Vcc=6 V)

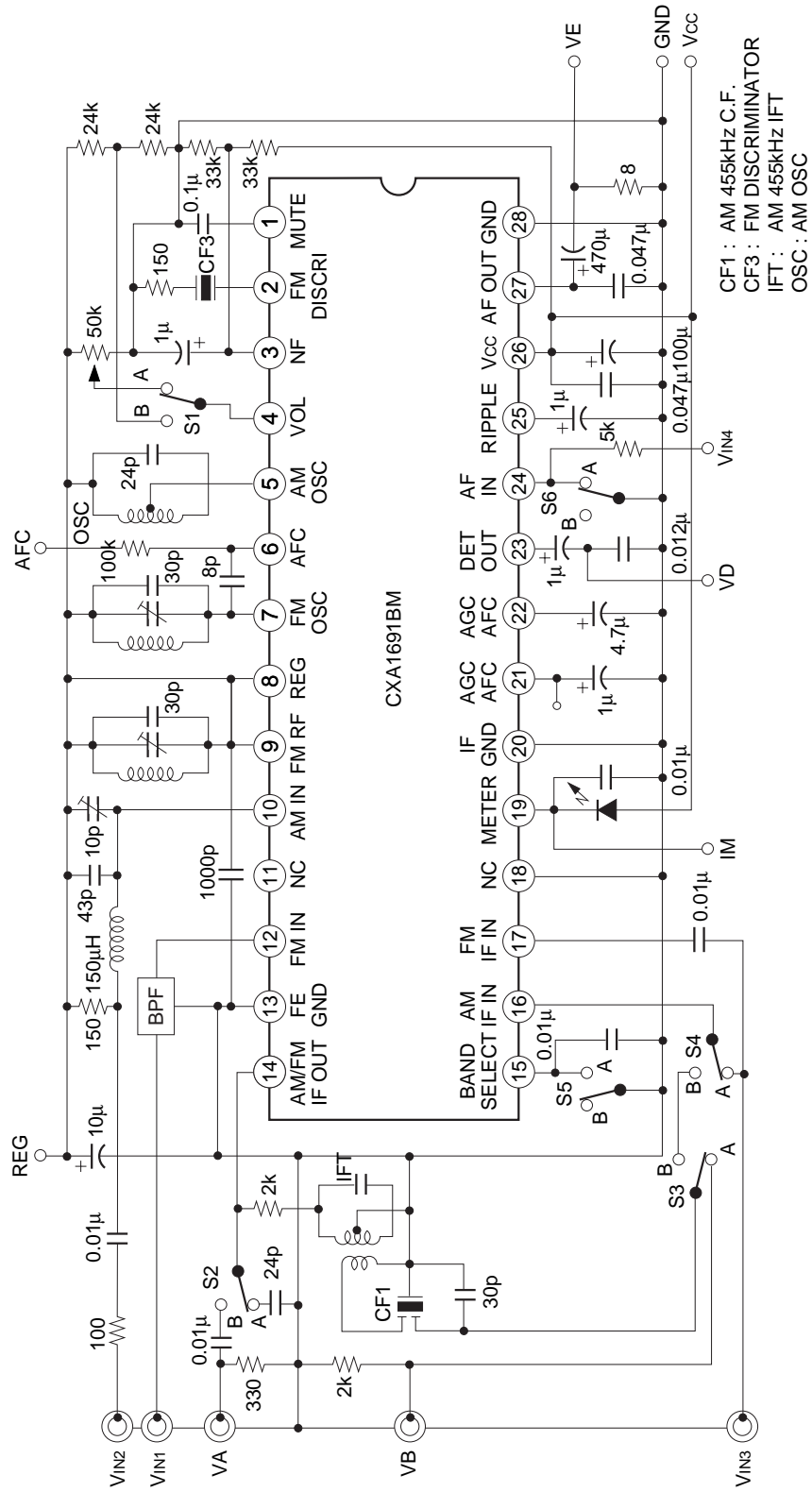
**Electrical Characteristics**

No.	Item	Symbol	SW conditions						Test Point	Conditions	Min.	Typ.	Max.	Unit
			1	2	3	4	5	6						
1	AM circuit current	ID1	A	B	A	A	A	A	IA	No signal, AM	—	4.8	10.0	mA
2	FM circuit current	ID2	A	B	A	A	B	A	IA	No signal, FM	—	7.6	14.0	mA
3	FM front end voltage gain	GV1	A	B	A	A	B	A	VA	V <sub>IN1</sub> =40 dBμV, 100 MHz	32	39	46	dB
4	FM detection output level	VD1	A	—	—	A	B	A	VD	V <sub>IN3</sub> =90 dBμV, 10.7 MHz (1 kHz, 22.5 kHz DEV)	39	77.5	155	mVrms
5	FM IF knee level	VD2	A	—	—	A	B	A	VD	V <sub>IN3</sub> =level at a point 3 dB down from V <sub>IN3</sub> =90 dBμV, 10.7 MHz (1 kHz, 22.5 kHz DEV)	—	24	32	dBμV
6	FM detection output distortion factor	THD1	A	—	—	A	B	A	VD	V <sub>IN3</sub> =90 dBμV, 10.7 MHz (1 kHz, 75 kHz DEV)	—	0.3	2.0	%
7	FM meter current	IB1	A	—	—	A	B	A	IM	V <sub>IN3</sub> =60 dBμV, 10.7 MHz	1.8	3.5	7.0	mA
8	AM front end voltage gain	GV2	A	A	A	A	A	A	VB	V <sub>IN2</sub> =60 dBμV, 1660 kHz	15	22	29	dB
9	AM IF voltage gain	GV3	A	A	—	A	A	A	VD	V <sub>IN3</sub> when 455 kHz (1 kHz, 30 % MOD) output is -34 dBm	14	20	27	dBμV
10	AM detection output level	VD3	A	A	—	A	A	A	VD	V <sub>IN3</sub> =85 dBμV, 455 kHz (1 kHz, 30 % MOD)	39	77.5	155	mVrms
11	AM meter current	IB2	A	A	—	A	A	A	IM	V <sub>IN3</sub> =85 dBμV, 455 kHz (1 kHz, 30 % MOD)	1.3	3.0	7.0	mA
12	AM detection output distortion factor	THD2	A	A	B	A	A	A	VD	V <sub>IN2</sub> =95 dBμV, 1660 kHz (1 kHz, 30 % MOD)	—	0.6	2.0	%
13	Audio voltage gain	GV4	A	—	—	—	—	B	VE	V <sub>IN3</sub> =60 dBμV, 10.7 MHz V <sub>IN4</sub> =-30 dBm, 1 kHz	27	31.5	36	dB
14	Audio distortion factor	THD3	A	—	—	—	—	B	VE	Distortion factor for 50 mW output V <sub>IN3</sub> =60 dBμV, 10.7 MHz V <sub>IN4</sub> =-20 dBm, 1 kHz	—	0.9	2.5	%
15	Muting level	VD4	A	—	—	—	—	B	VE	Muting level for 50 mW output V <sub>IN4</sub> =-20dBm, 1 kHz Attenuation for 60 dBμV input with V <sub>IN3</sub> OFF	8	15	22	dB

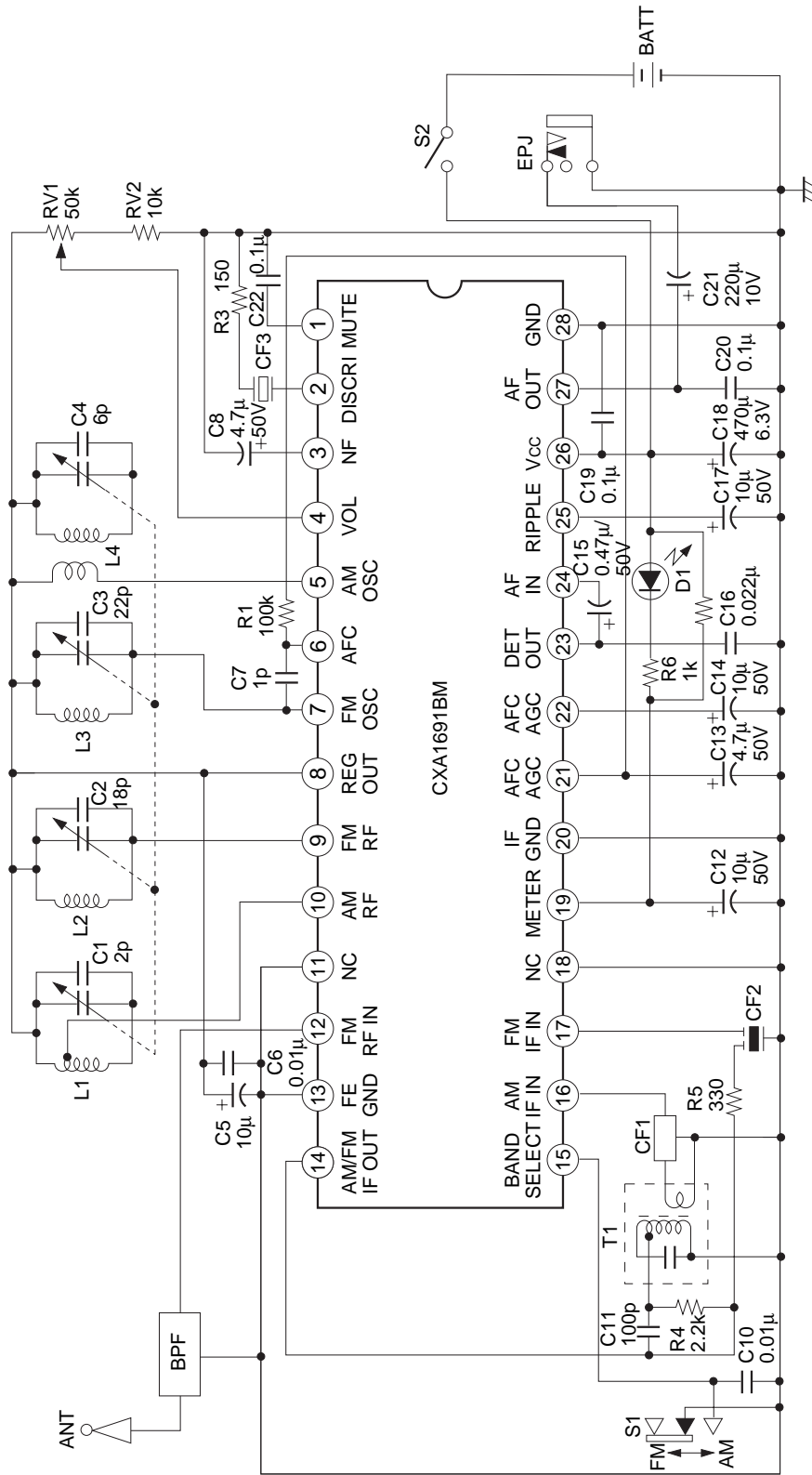
0 dBμV=1 μV



Electrical Characteristics Test Circuit



Application Circuit 1

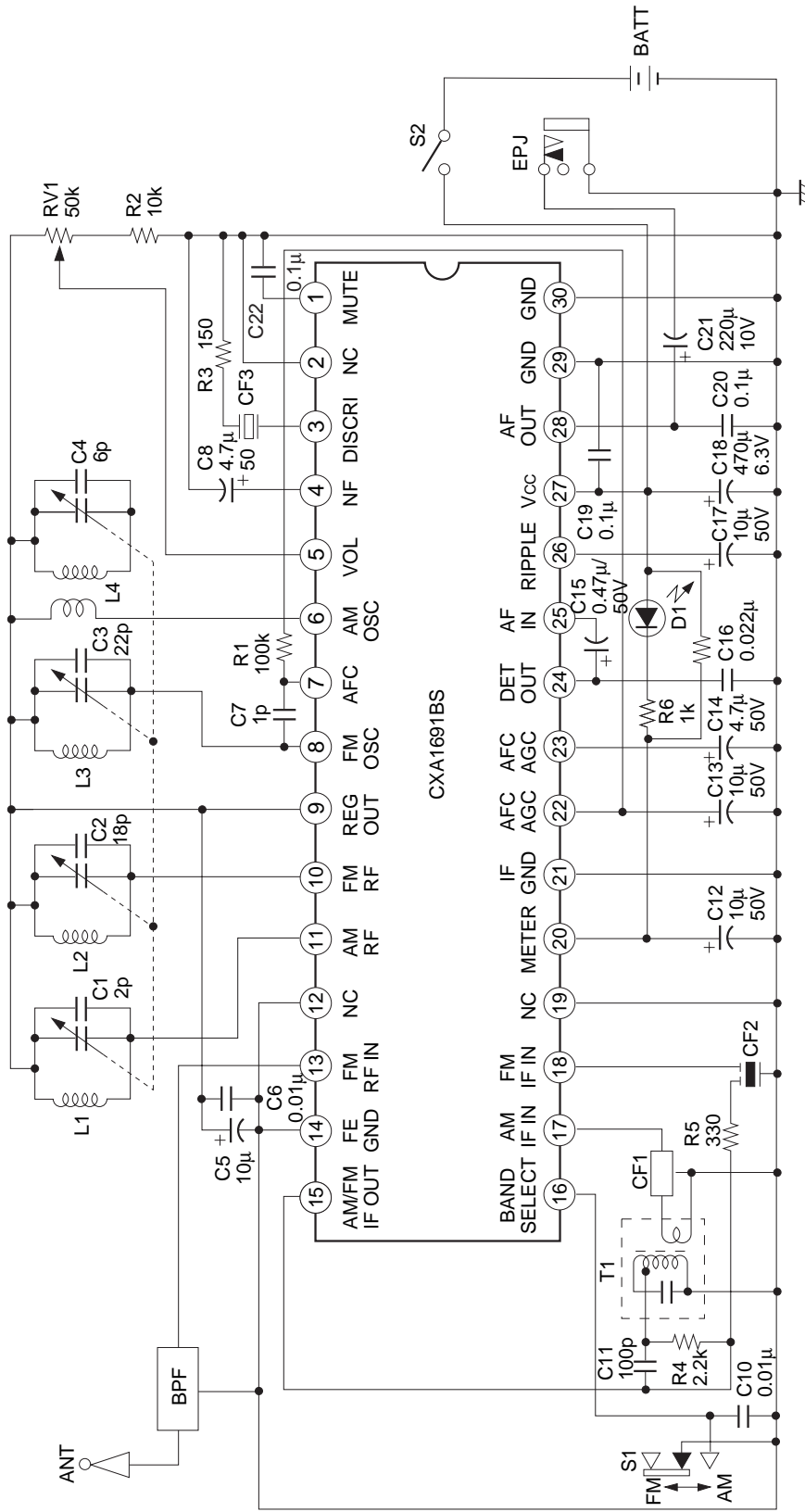


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Application Circuit 2

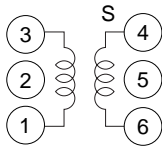


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Coil data

AM OSC

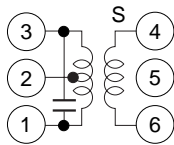


Core diameter  $\phi$  0.06 mm 2UEW

f (kHz)	L ( $\mu$ H)	Qo	Number of windings (t)	
			1 to 3	4 to 6
796	270	125	107	29

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

AM IFT

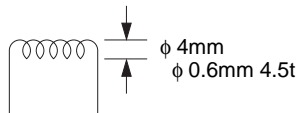


Core diameter  $\phi$  0.07 mm UEW

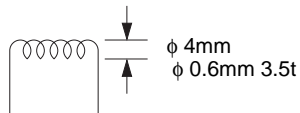
Co (pF)	Qo	Number of windings (t)		
		1 to 2	2 to 3	4 to 6
180	90	111	35	7

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

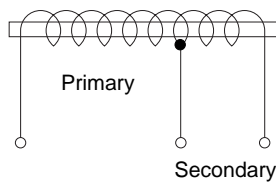
FM RF



FM OSC



AM bar antenna



f (kHz)	L ( $\mu$ H)	Primary	Secondary
796	650	91 t	20 t

BPF      PFW8  
(88 to 108 MHz)      Soshin Electric Co., Ltd.

CF1      SFU-455B      Murata Mfg. Co., Ltd. Or BFCFL-455 TOKO Co., Ltd.

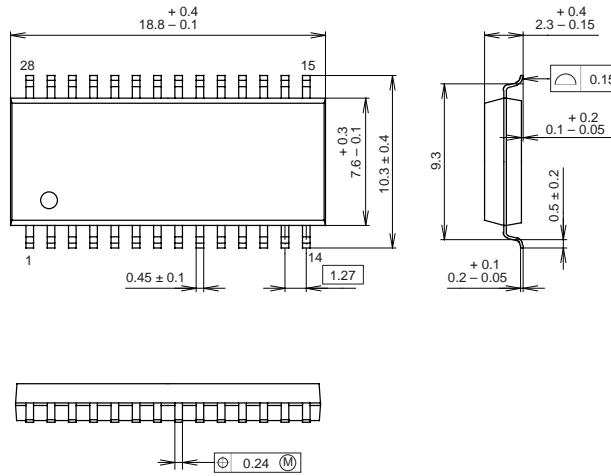
CF2      SFE10.7MA5      Murata Mfg. Co., Ltd.

CF3      CDA10.7MC1      Murata Mfg. Co., Ltd.

Package Outline Unit : mm

CXA1691BM

28PIN SOP (PLASTIC)



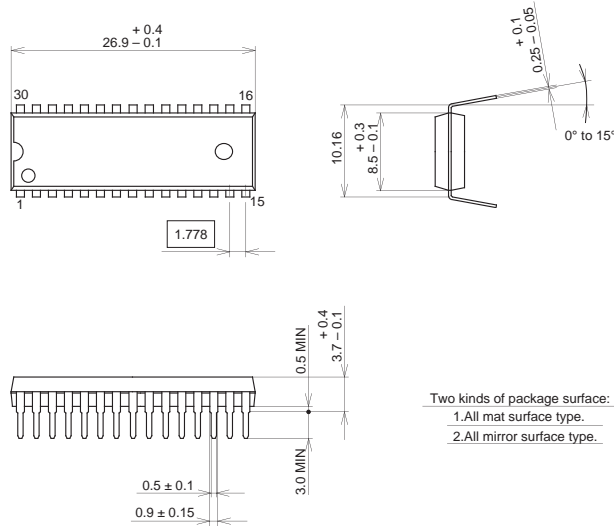
PACKAGE STRUCTURE

SONY CODE	SOP-28P-L04
EIAJ CODE	SOP028-P-0375
JEDEC CODE	

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	42/COPPER ALLOY
PACKAGE MASS	0.7g

CXA1691BS

30PIN SDIP (PLASTIC)



Two kinds of package surface:  
 1.All mat surface type.  
 2.All mirror surface type.

PACKAGE STRUCTURE

SONY CODE	SDIP-30P-01
EIAJ CODE	SDIP030-P-0400
JEDEC CODE	

MOLDING COMPOUND	EPOXY RESIN
LEAD TREATMENT	SOLDER/PALLADIUM PLATING
LEAD MATERIAL	COPPER ALLOY
PACKAGE MASS	1.8g

NOTE : PALLADIUM PLATING  
 This product uses S-PdPPF (Sony Spec.-Palladium Pre-Plated Lead Frame).