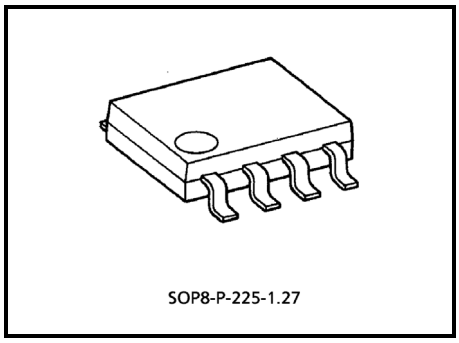
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA7371AFG

FM Front−End (1.5V USE)

The TA7371AFG is an FM front end IC designed for low voltage operation (1.5V), which is suitable for stereo headphone radio or radio cassette.
This IC contains RF amplifier, MIX, local oscillator and varactor diode for AFC.
It simplifies the design of front end circuit.

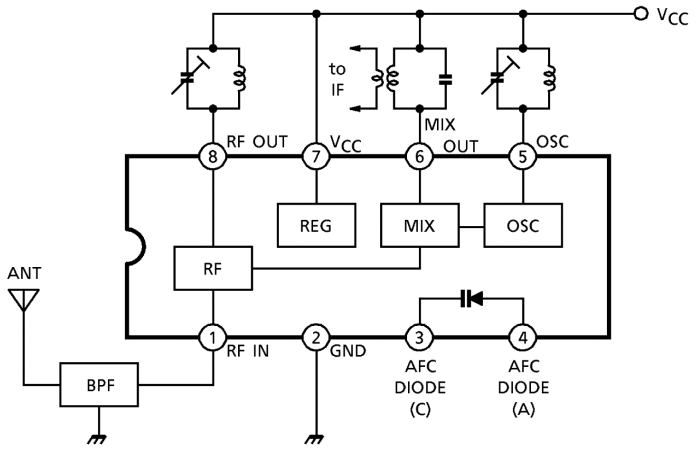


Weight: 0.08g (typ.)

Features

- Clamping diode for mixer output.
- Varactor diode for AFC.
- Local OSC. stop voltage: V_{CC} = 0.85V (typ.)
- Low quiescent current
  I_{CC} = 1.8mA (typ.) (V_{CC} = 1.5V, Ta = 25°C)
- Low noise.
- Very few external parts.
- Operating supply voltage range.: V_{CC} = 0.95~5V (Ta = 25°C)

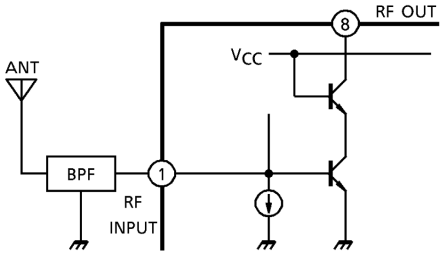
Block Diagram



Explanation Of Inner Circuit And Functions

(1) RF block

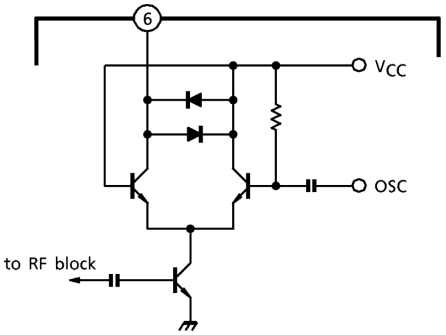
The radio signal is applied to RF INPUT passed through the ANT and BPF.
This RF block is composed of the common emitter amplifier. The output is designed to be the cascade connection, because of high sensitivity characteristic, and excellent spurious radiation. (Fig.1)



(Fig.1)

(2) MIX block

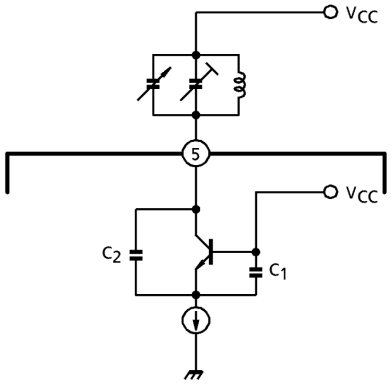
The MIX block is composed of the emitter coupled pair amplifier. (Fig.2)



(Fig.2)

(3) OSC block

OSC block is composed of the colpitts oscillation circuit.
The capacitors C_1 and C_2 are built in this IC.



(Fig.3)

Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Supply voltage	V_{CC}	5	V
Power dissipation	P_D (Note)	240	mW
Operating temperature	T_{opr}	−25~75	°C
Storage temperature	T_{stg}	−55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 2mW / °C.

Electrical Characteristics

(unless otherwise specified, V_{CC} = 1.5V, Ta = 25°C, f = 83MHz, Δf = ±22.5kHz, f_m = 1kHz)

Characteristic	Symbol	Test Cir–cuit	Test Condition	Min.	Typ.	Max.	Unit
Supply current	I_{CC}	2	V_{in} = 0	—	1.8	2.6	mA
Input limiting sensitivity	V_{in} (lim)	2	−3dB limiting point	—	10	16	dBμV EMF
Quiescent sensitivity	Q_S	2	S / N = 30dB	—	12	—	dBμV EMF
Conversion gain	G_C	2	V_{if} = 20mV_{rms}	—	25	—	dB
Local oscillator voltage	V_{osc}	1	f = 60MHz	75	110	150	mV_{rms}
Local oscillator stop voltage	V_{stop}	1	f = 60MHz	—	0.85	0.95	V
AFC diode capacity	C_{AFC}	6	f = 70MHz, V_{AFC} = 3V	—	5.0	—	pF
Pin(1) input impedance	$R_{ip}1$	3	f = 83MHz	—	300	—	Ω
	$C_{ip}1$			—	8.7	—	pF
Pin(6) input impedance	$R_{op}2$	4	f = 10.7MHz	—	100	—	kΩ
	$C_{op}2$			—	3.8	—	pF
Pin(8) input impedance	$R_{op}3$	5	f = 83MHz	—	2.2	—	kΩ
	$C_{op}3$			—	4.8	—	pF

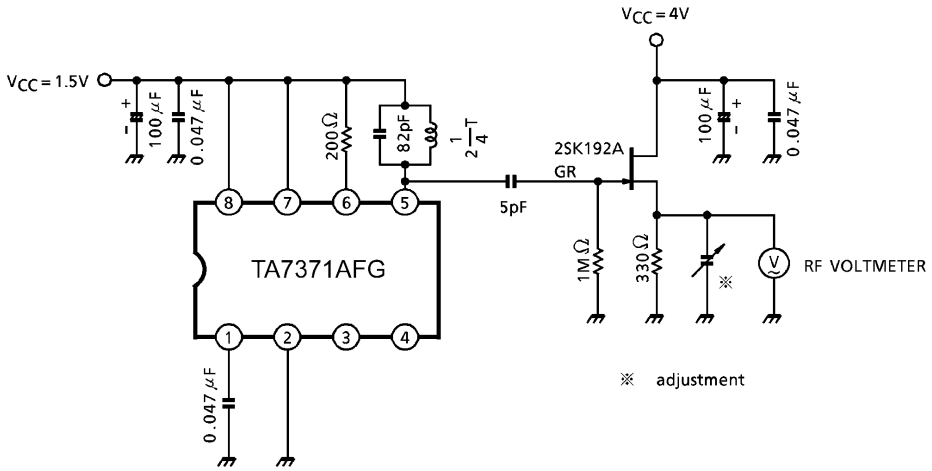
Terminal Voltage

Terminal Voltage at no Signal (V_{CC} = 1.5V, Ta = 25°C)

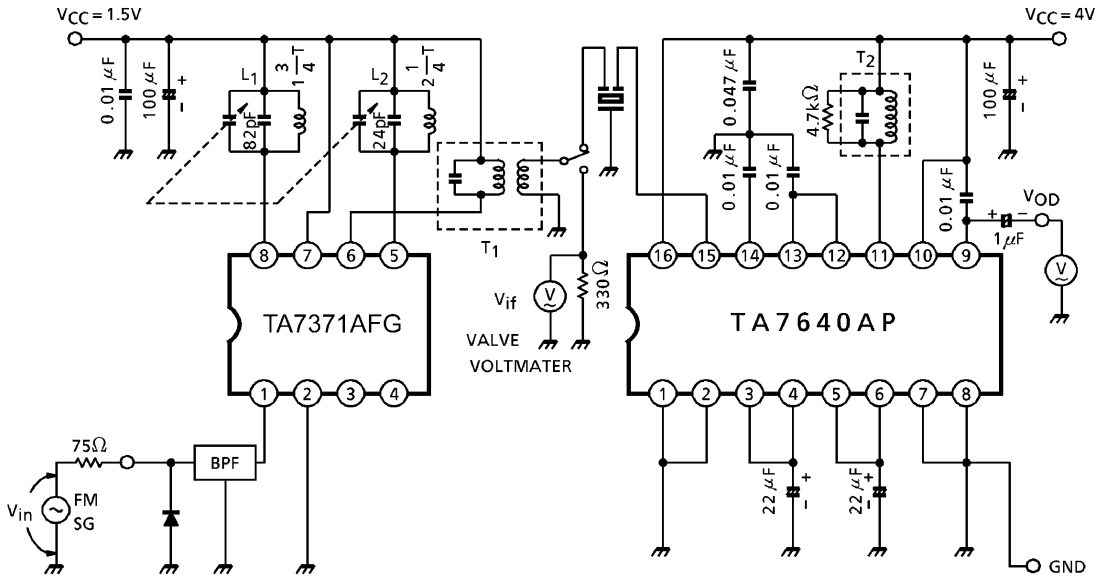
Terminal No.	Terminal Name	Terminal Voltage Typ. (V)
1	RF INPUT	0.7
2	GND	0
3	AFC DIODE (cathode)	—
4	AFC DIODE (anode)	—
5	LOCAL OSC	1.5
6	MIXER OUTPUT	1.5
7	V_{CC}	1.5
8	RF OUTPUT	1.5

Test Circuit 1

V_{osc}, V_{stop} TEST CIRCUIT



Test Circuit 2



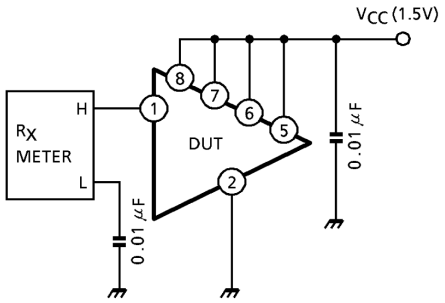
- Conversion gain: G_C (dB) = 20 ℓog $\frac{V_{if}}{V_{in}}$

Input / Output Impedance Test Circuit

Input / output impedance and AFC diode capacity test circuit

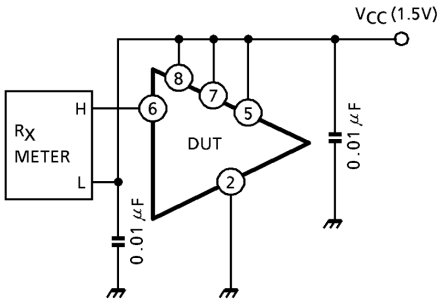
TEST CIRCUIT 3 (R_{ip} 1, C_{ip} 1)

Pin (1) input impedance



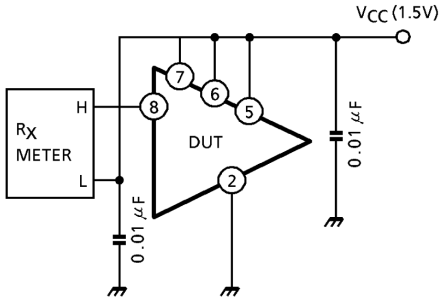
TEST CIRCUIT 4 (R_{op} 2, C_{op} 2)

Pin (6) output impedance



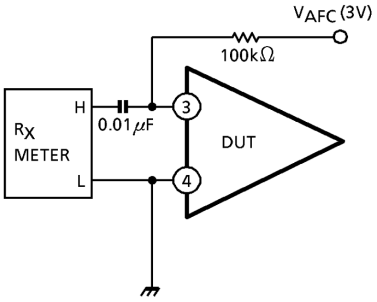
TEST CIRUCIT 5 (R_{op} 3, C_{op} 3)

Pin (8) output impedance



TEST CIRUCIT 6 (C_{AFC})

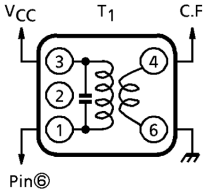
AFC diode

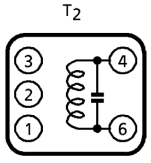


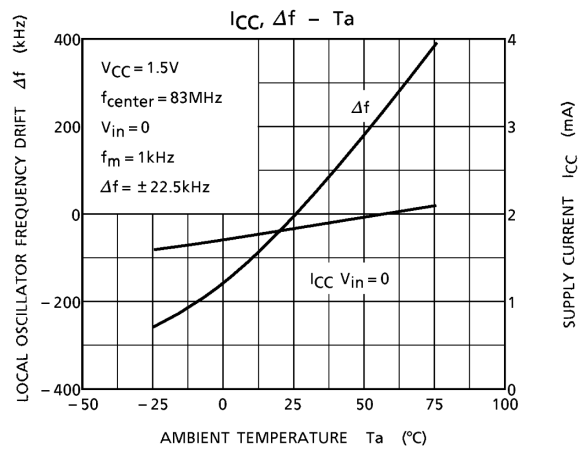
Coil Data For Test Circuit (lower side heterodyne type)

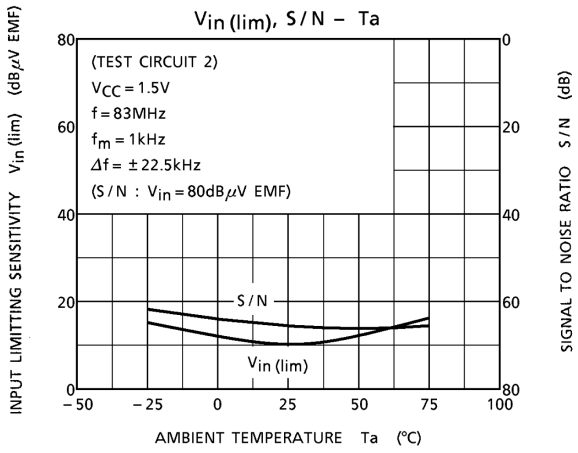
Coil Name	f_o	Q_o	Turn	Capacitance	Comment
L_1 RF	100MHz	85	(1)–(3) $1\frac{3}{4}$T	82pF (external)	Bobbin with ferrite core φ0.5mm UEW
L_2 OSC	100MHz	100	(1)–(3) $2\frac{1}{4}$T	24pF (external)	Bobbin with ferrite core φ0.5mm UEW
T_1 IFT	10.7MHz	115	(1)–(3) 12T (4)–(6) 1T	75pF	SUMIDA ELECTRIC Co. LTD. 0133–309–048
T_2 QUAD	10.7MHz	150	(4)–(6) 14T	47pF	SUMIDA ELECTRIC Co. LTD. 44M–037–933A

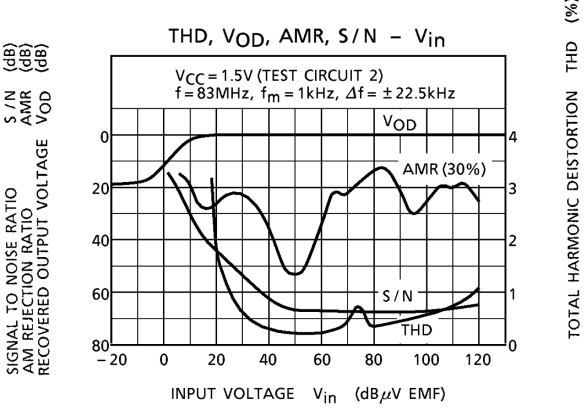
RF BPF SOSHIN ELECTRIC Co. LTD. BPW B6A
IF BPF MURATA ELECTRIC Co. LTD. SFE 10.7 MA5

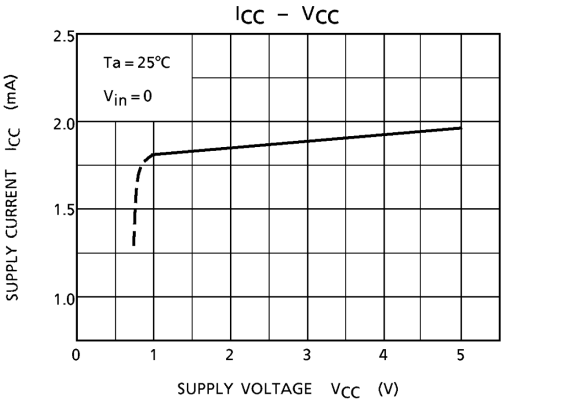


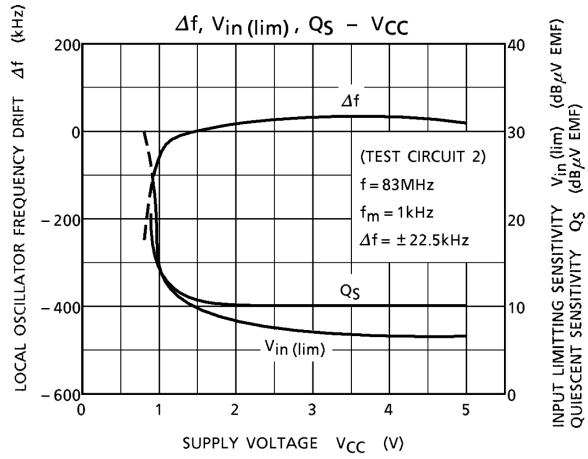


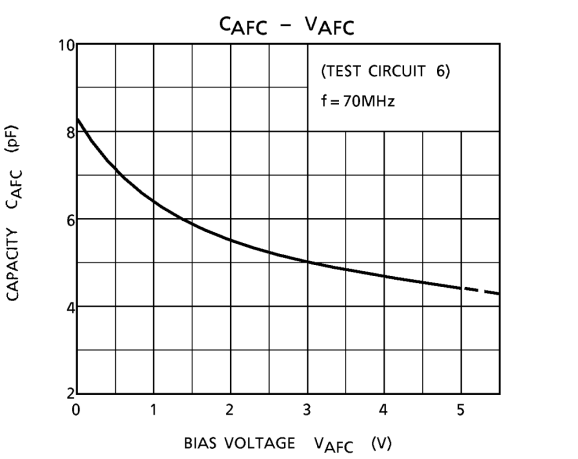

I_{CC}, Δf – Ta
V_{CC} = 1.5V
f_{center} = 83MHz
V_{in} = 0
f_m = 1kHz
Δf = ± 22.5kHz
Δf
I_{CC} V_{in} = 0
LOCAL OSCILLATOR FREQUENCY DRIFT Δf (kHz)
SUPPLY CURRENT I_{CC} (mA)
AMBIENT TEMPERATURE Ta (°C)


V_{in} (lim), S/N – Ta
(TEST CIRCUIT 2)
V_{CC} = 1.5V
f = 83MHz
f_m = 1kHz
Δf = ± 22.5kHz
(S/N : V_{in} = 80dBμV EMF)
S/N
V_{in} (lim)
INPUT LIMITTING SENSITIVITY V_{in} (lim) (dBμV EMF)
SIGNAL TO NOISE RATIO S/N (dB)
AMBIENT TEMPERATURE Ta (°C)


THD, V_{OD}, AMR, S/N – V_{in}
V_{CC} = 1.5V (TEST CIRCUIT 2)
f = 83MHz, f_m = 1kHz, Δf = ± 22.5kHz
V_{OD}
AMR (30%)
S/N
THD
SIGNAL TO NOISE RATIO S/N (dB)
AM REJECTION RATIO AMR (dB)
RECOVERED OUTPUT VOLTAGE V_{OD}
TOTAL HARMONIC DEISTORTION THD (%)
INPUT VOLTAGE V_{in} (dBμV EMF)

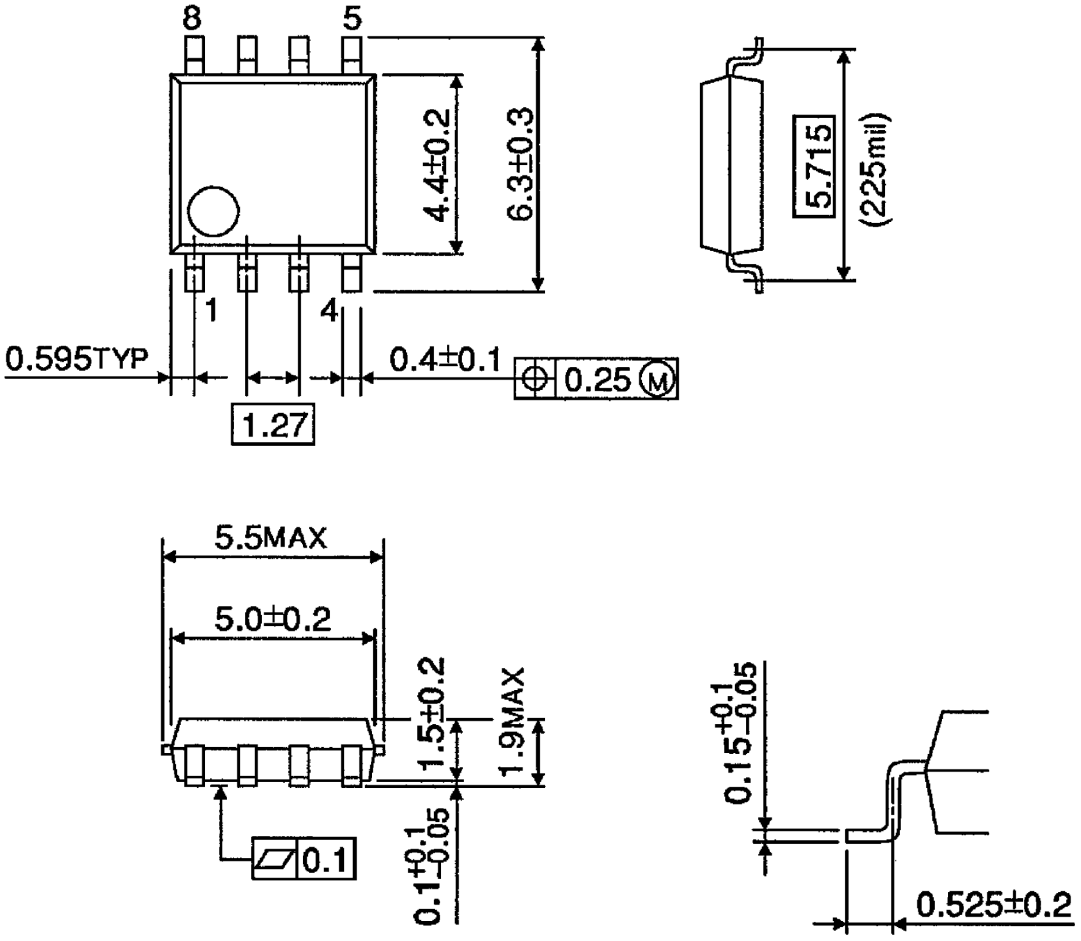

I_{CC} – V_{CC}
Ta = 25°C
V_{in} = 0
SUPPLY CURRENT I_{CC} (mA)
SUPPLY VOLTAGE V_{CC} (V)


Δf, V_{in} (lim), Q_S – V_{CC}
Δf
(TEST CIRCUIT 2)
f = 83MHz
f_m = 1kHz
Δf = ± 22.5kHz
Q_S
V_{in} (lim)
LOCAL OSCILLATOR FREQUENCY DRIFT Δf (kHz)
INPUT LIMITTING SENSITIVITY V_{in} (lim) (dBμV EMF)
QUIESCENT SENSITIVITY Q_S (dBμV EMF)
SUPPLY VOLTAGE V_{CC} (V)


C_{AFC} – V_{AFC}
(TEST CIRCUIT 6)
f = 70MHz
CAPACITY C_{AFC} (pF)
BIAS VOLTAGE V_{AFC} (V)

Package Dimensions

SOP8-P-225-1.27 Unit : mm



Weight: 0.08g (typ.)

About solderability, following conditions were confirmed

- Solderability

  (1) Use of Sn-63Pb solder Bath
  - solder bath temperature = 230°C
  - dipping time = 5 seconds
  - the number of times = once
  - use of R-type flux

  (2) Use of Sn-3.0Ag-0.5Cu solder Bath
  - solder bath temperature = 245°C
  - dipping time = 5 seconds
  - the number of times = once
  - use of R-type flux

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