Audio ICs

Band-pass filter for spectrum analyzer
BA3834S / BA3834F

The BA3834S and BA3834F are 7-band, band-pass filter ICs that use microprocessor time division to produce serial output for spectrum analyzer displays. To minimize the number of attached components required and enable compact and reliable designs, all of the capacitors for the filters are on the chip.

●Applications
CD radio cassette players, mini-component stereo systems, car stereos

●Features
1) Seven band-pass filter elements for spectrum analyzer displays.
2) High-speed readout
   (output response time: 5μsec. Typ.).
3) Discharge time constant circuit for each band is on the chip.
4) Differential input amplifier rejects common-mode noise.
5) Single 5V power supply.

●Absolute maximum ratings (Ta = 25°C)

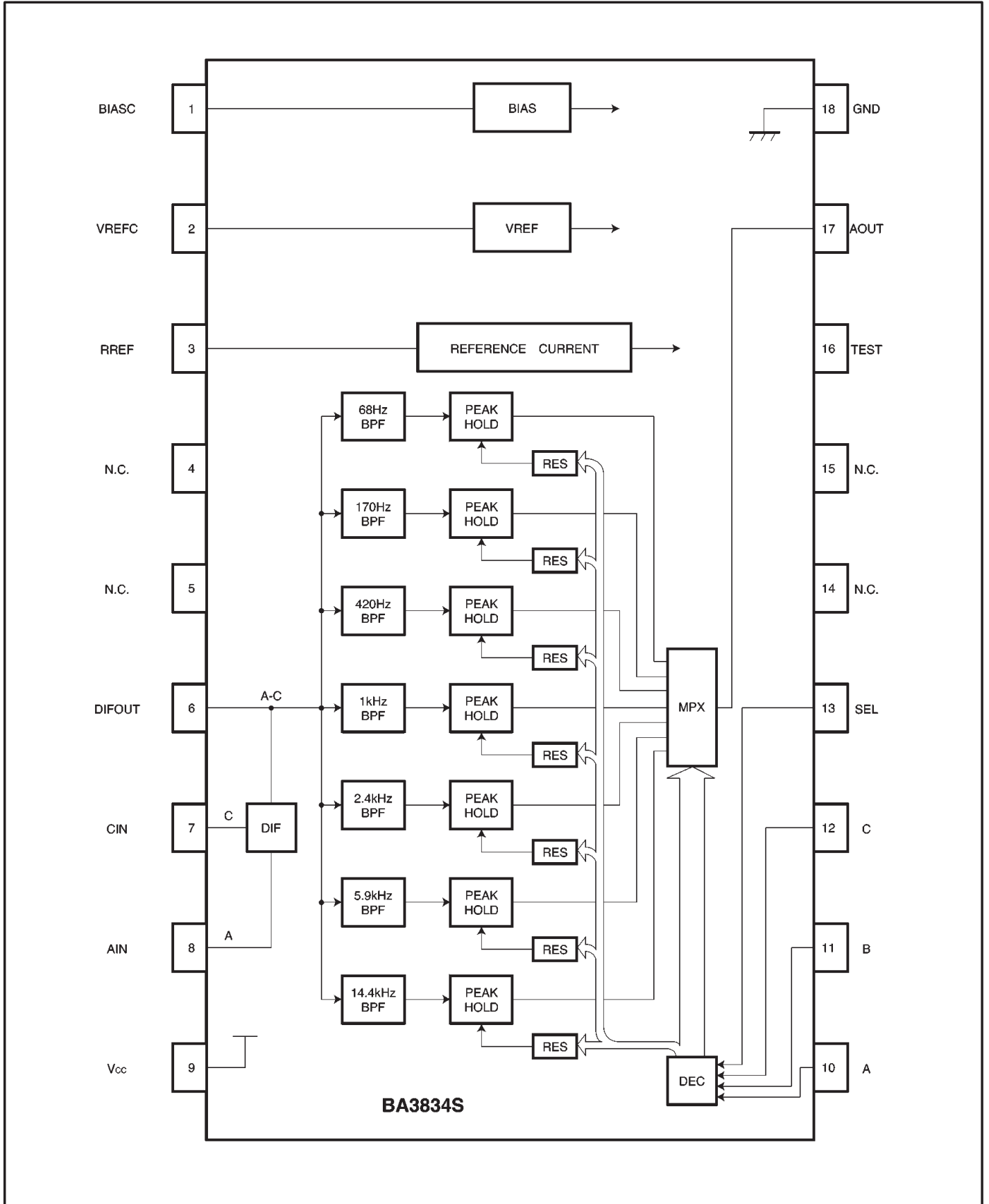| Parameter		Symbol	Limits	Unit
Power supply voltage		V_{CC}	7	V
Power dissipation	BA3834S	Pd	600*1	mV
	BA3834F		450*2	
Operating temperature		Topr	−25～+75	℃
Storage temperature		Tstg	−55～+125	℃

＊1 Reduced by 6mW for each increase in Ta of 1°C over 25°C.
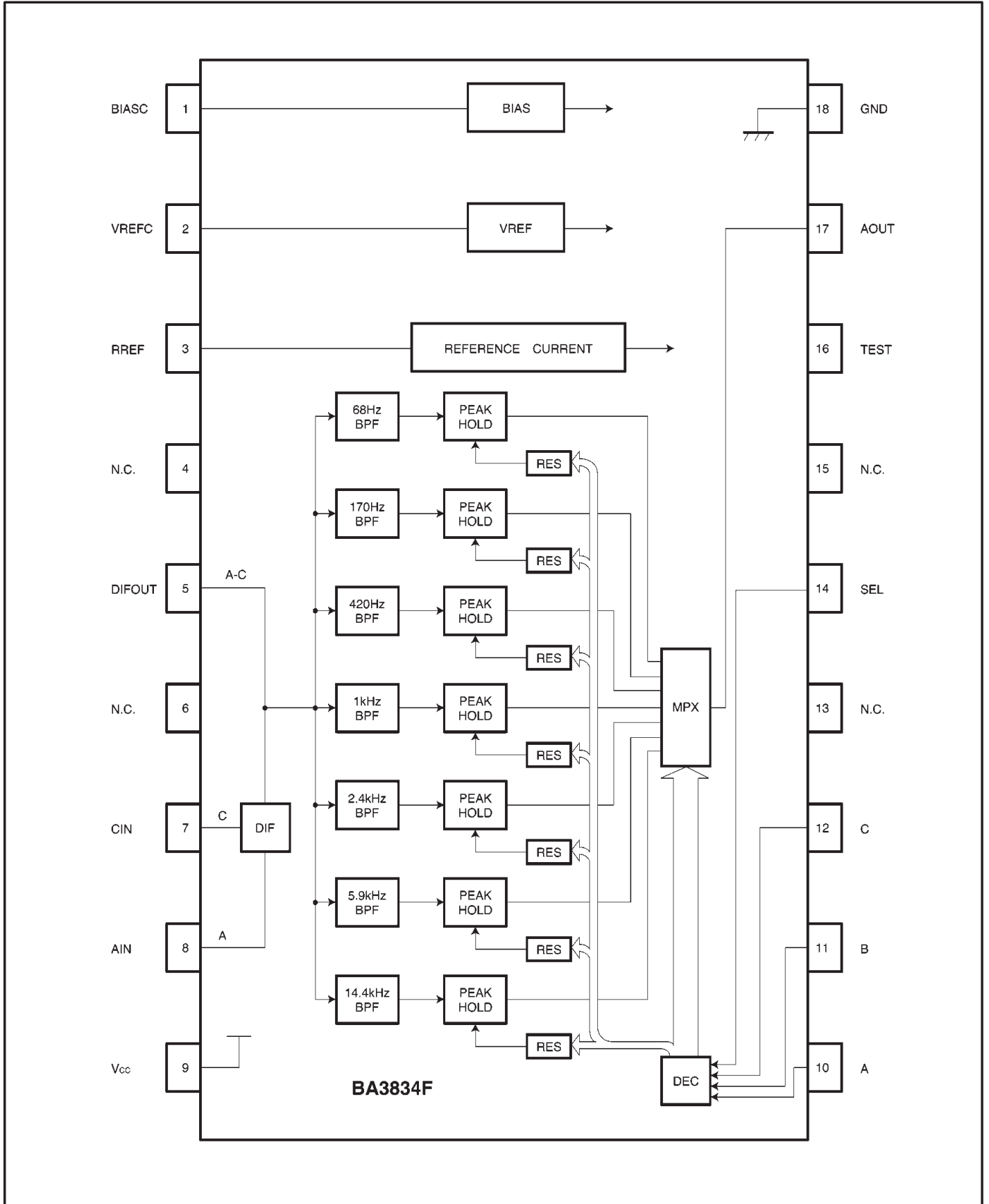＊2 Reduced by 4.5mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	4.5	5.0	6.5	V

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●Block diagram 1 (BA3834S)

●Block diagram 2 (BA3834F)

BA3834F

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 5V, R_L = 10MΩ, V_{AIN} = −30dBV and SEL = 1)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Circuit current	I_{CC}	—	10	15	mA	V_{AIN}=0V, A, B, C, SEL=0
Maximum output level	V_{OM}	4.0	4.8	—	V	V_{AIN}=−14dBV, Measured at each output
Output offset voltage	V_{OS}	—	30	150	mV	V_{AIN}=0V, SEL=0/1, Measured at each output （cycle time:Ts=50ms）
Standard output level 1	V_{O1}	0.65	1.35	1.70	V	f_{IN}=68Hz, A=0, B=0, C=1
Standard output level 2	V_{O2}	0.65	1.35	1.70	V	f_{IN}=170Hz, A=0, B=1, C=0
Standard output level 3	V_{O3}	0.65	1.35	1.70	V	f_{IN}=420Hz, A=0, B=1, C=1
Standard output level 4	V_{O4}	0.65	1.35	1.70	V	f_{IN}=1kHz, A=1, B=0, C=0
Standard output level 5	V_{O5}	0.65	1.35	1.70	V	f_{IN}=2.4kHz, A=1, B=0, C=1
Standard output level 6	V_{O6}	0.65	1.35	1.70	V	f_{IN}=5.9kHz, A=1, B=1, C=0
Standard output level 7	V_{O7}	0.65	1.35	1.70	V	f_{IN}=14.4kHz, A=1, B=1, C=1
Input impedance	R_{IN}	80	100	120	kΩ	f_{IN}=1kHz
Common-mode rejection ratio	CMRR	25	50	—	dB	f_{IN}=1kHz, V_{AIN}=V_{CIN}
Logic input high level	V_{IH}	2.5	5.0	—	V	
Logic input low level	V_{IL}	—	0	0.5	V	Not applicable in the when item 3 of the operation notes applies.
Output response time*1	T_O	—	5	10	μs	
Discharge level	DL	—	3	—	dB	Reset pulse width T_R = 10 μs (Typ.) *2

The measurement circuit is given in Fig. 1.

∗1 The time from the rise of A, B, C or SEL until the rise of AOUT (90% of peak). If the output selection time is less than this, the output value is not guaranteed and the reset pulse is not generated.

∗2 Automatically generated internally based on the output select signal. For the duration that this signal is "H", a resistor is connected to the peak hold capacitor, and the output level drops by -3dB (Typ.) for one pulse.

∗3 The Q of the bandpass filter is 3.5 for f_{O1} to f_{O6}, and 2.5 for f_{O7}.

◎Not designed for radiation resistance.

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●Measurement circuit (BA3834S)

Fig. 1

✳ The DIFOUT and SEL pins are
different for the BA3834F.

●Output select logic table

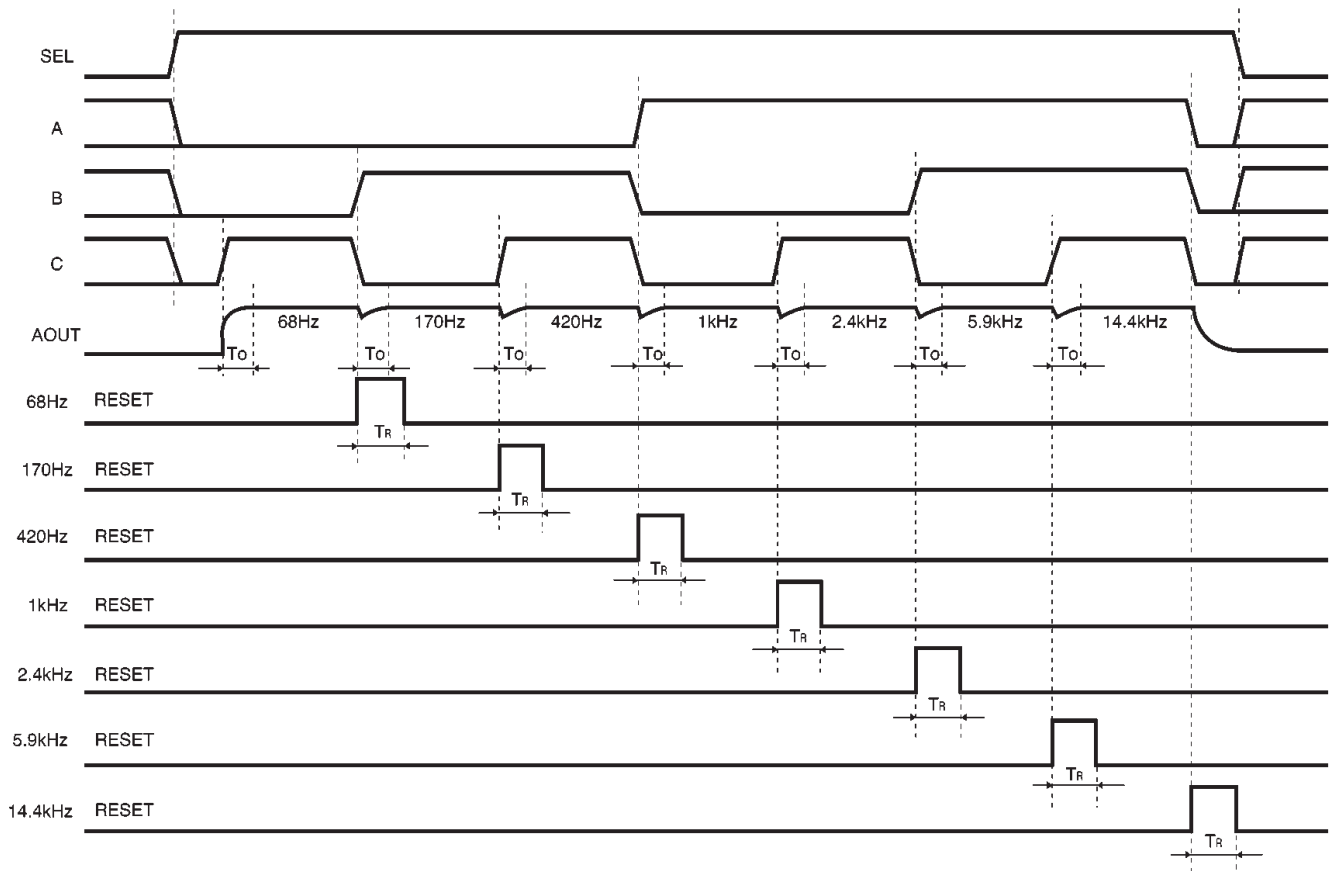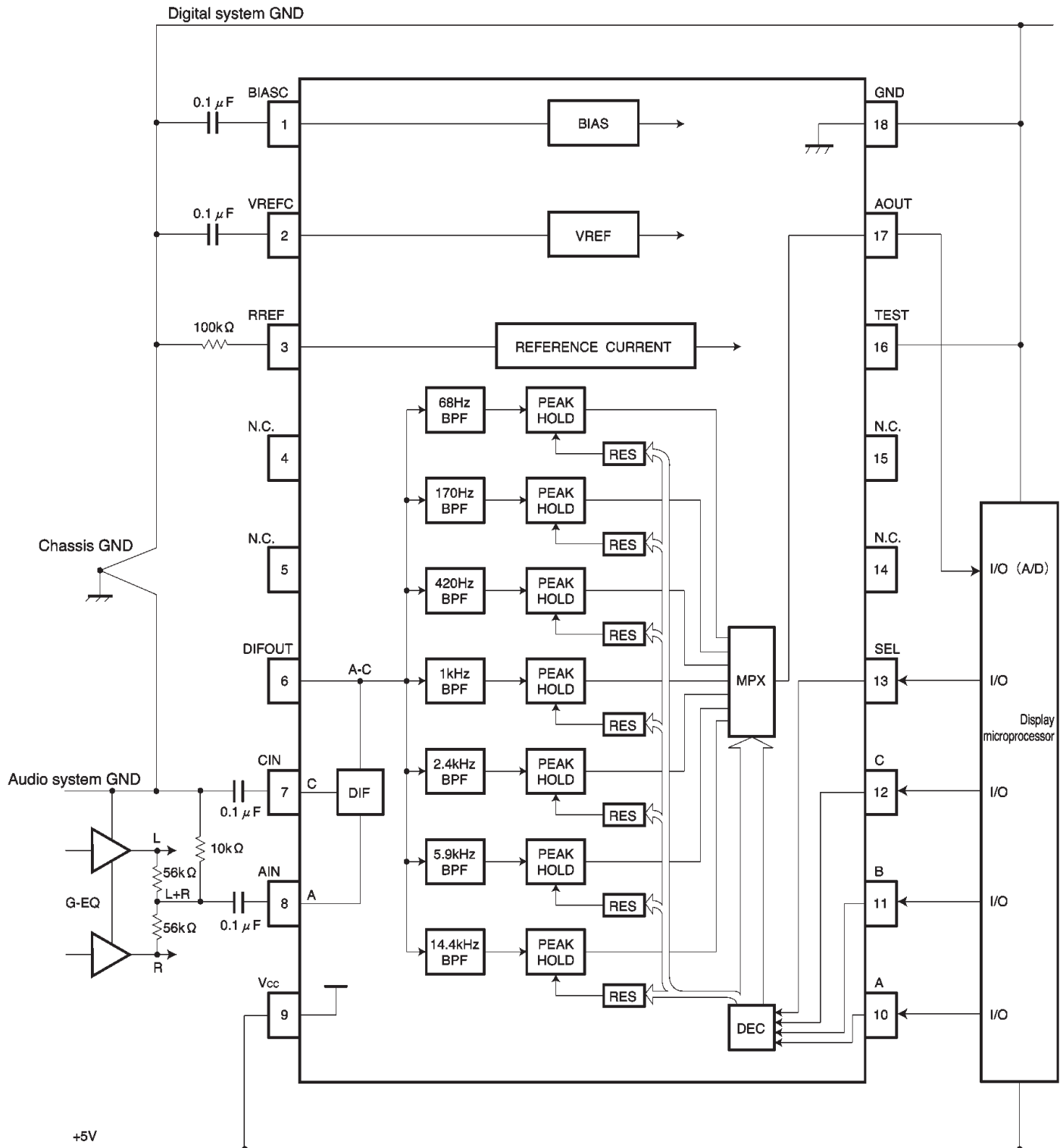| S E L	A	B	C	AOUT
0	×	×	×	GND
1	0	0	0	GND
1	0	0	1	68Hz
1	0	1	0	170Hz
1	0	1	1	420Hz
1	1	0	0	1kHz
1	1	0	1	2.4kHz
1	1	1	0	5.9KHz
1	1	1	1	14.4kHz

×: Don't Care.

●Timing chart

Fig. 2

●Application example (BA3834S)

Fig. 3

＊ The DIFOUT and SEL pins are
different for the BA3834F.

●Operation notes

(1)   Frequency characteristics

The frequency characteristics of this IC are determined by the resistor connected between the R_{REF} terminal and GND. For the specification conditions, the value of this resistor is 100kΩ. If it is necessary to set the frequency characteristics accurately, use a variable resistor (note: all bands will shift together).

(2)   Load characteristics

To convert the bias sense output signal to the GND sense signal, the IC performs a V / I conversion, and then an I / V conversion using a 10kΩ resistor (Typ.) for the output. Therefore, if the load circuit connected to the AOUT pin has a MOS structure there is no problem (eg. microprocessor input port), but if the connected circuit has a low input impedance, it may cause the output level to drop.

(3)   External resistor for the control pin

When using a common port for the output select control and FL drive, you must add a diode and resistor as shown in Fig. 4 to prevent the FL drive "L" voltage from destroying the IC.
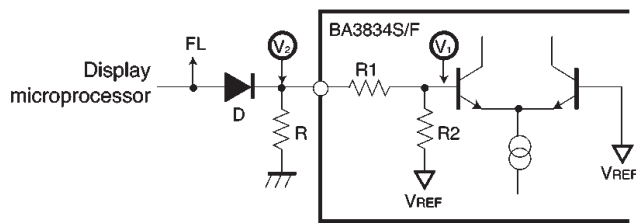

Fig. 4

In this case, the "L" voltage applied to the internal comparator input terminal V_1 is given by:

$$V_1 = \frac{R_1 + R}{R_1 + R_2 + R} \times V_{REF}$$

To maintain a noise margin of at least 2.5V with respect to the comparator threshold level V_{REF}, the representative values for V_{REF}, R_1 and R_2 are 1.5V, 20kΩ, and 10kΩ respectively. This gives:

$$\frac{20k\Omega + R}{20k\Omega + 10k\Omega + R} \times 1.5V + 0.25V < 1.5V$$

And from this, the following condition is obtained:

$$R < 30k\Omega$$

In this case, the "L" level voltage V_2 for the IC will be:

$$V_2 < 0.75V$$

(4)   Recommended operating ranges

Provided that the IC is operated within the recommended operating conditions and the recommended temperature range, the basic circuit functions are guaranteed. Within these ranges, ratings for electrical characteristics for conditions other than those stipulated cannot be guaranteed, but the inherent function of the bandpass filter will be maintained.

(5)   Application example

Provided the recommended circuit constants are used, the application example should function correctly. However, we recommend that you confirm the characteristics of the circuits in actual use and pay due attention to the cautionary notes given below.

If you change the circuit constants, check both the static and transient characteristics of the circuit, and allow sufficient margin to accommodate variations between both ICs and external components. Note, also, that Rohm has not been able to conduct a sufficient study into patent rights.

(6)   Output offset voltage

The relationship between the output offset voltage and the output selection cycle (cycle time) for this IC is shown in Fig.5. The maximum output offset voltage of 150mV that is given in the electrical characteristics table is under the condition that Ts = 200msec. When Ts is greater than 50msec, the graph of the output offset voltage is a straight line at 150mV. When Ts is below 50msec, due to transient characteristics of the peak hold circuit, the graph is a line sloping downwards to the right. In other words, the shorter the cycle, the larger the output offset voltage.

Furthermore, the output offset voltage may shift due to soldering or other temperature stresses from the surroundings. Therefore, when setting the spectral analyzer light level, take into consideration the points given above and make sure that it does not light by mistake during quiescent periods. Use the chart below as a guide for this, and, if necessary, leave even a larger margin.
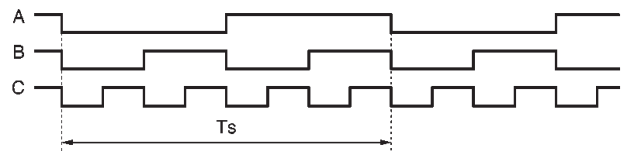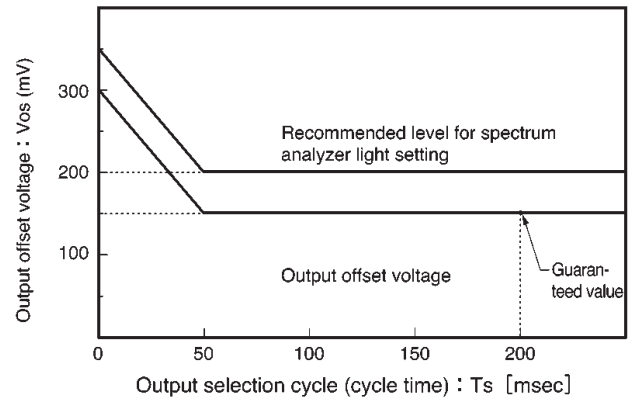

Fig. 5

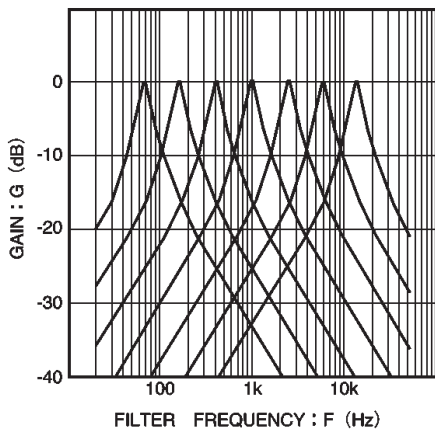●Electrical characteristics curves

Fig. 6 BPF frequency characteristics

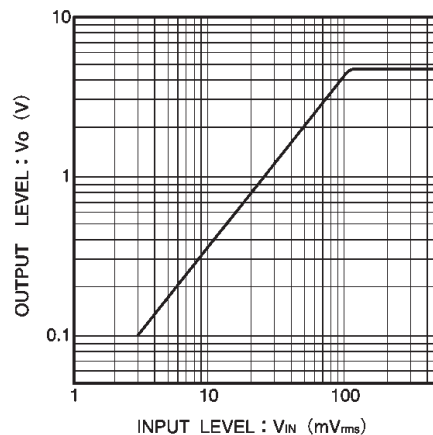

Fig. 7 Input level vs. output level

●External dimensions (Units: mm)

BA3834S

BA3834F

19.4±0.3

18   10

6.5±0.3

1   9

3.95±0.3   0.51Min.

3.4±0.2

1.778   0.5±0.1

7.62

0.3±0.1

0˚ ～15˚

SDIP18

11.2±0.2

18   10

7.8±0.3   5.4±0.2

1   9

1.8±0.1   0.11

1.27   0.4±0.1

0.3Min.

0.15±0.1

0.15

SOP18

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