STRUCTURE	Silicon Monolithic Integrated Circuit
PRODUCT SERIES	FM stereo transmitter IC for audio systems.
TYPE	**BH1416F**

FEATURES

- It is possible to attempt to improve a timbre because it has the pre-emphasis circuit, limiter circuit and low-pass filter circuit.
- Built-in the pilot-tone system FM stereo modulator circuit.
- The transmission frequency is stable because it has PLL system FM transmitter circuit.
- PLL controls data input in parallel (4bits , 14ch).

○ Absolute Maximum Ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	Conditions
Supply voltage	Vcc	+7.0	V	Pin8, 12
Data input voltage	V_{IN-D}	-0.3 ～ Vcc+0.3	V	Pin15, 16, 17, 18
Phase comparator output voltage	V_{OUT-P}	-0.3 ～ Vcc+0.3	V	Pin7
Power dissipation	Pd	450	mW	(*1)
Storage temperature	Tstg	-55 ～ +125	℃	

(*1) To use at a temperature higher than Ta=25℃, derate 4.5mW per 1℃.

Status of this document
The Japanese version of this document is the formal specification. A customer may use this translation version only for a reference to help reading the formal version. If there are any differences in translation version of this document, formal version takes priority.

Application example
The application circuit is recommended for use. Make sure to confirm the adequacy of the characteristics.
When using the circuit with changes to the external circuit constants, make sure to leave an adequate margin for external components including static and transitional characteristics as well as dispersion of the IC.
Note that ROHM cannot provide adequate confirmation of patents.

The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys.)
Should you intend to use this product with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

ROHM assumes no responsibility for the use of any circuits described herein, conveys no license under any patent or other right, and makes no representations that the circuits are free from patent infringement.

○ Operating Range

Parameter	Symbol	Limits	Unit	Conditions
Operating supply voltage	Vcc	4.0 ~ 6.0	V	Pin 8, 12
Operating temperature	Topr	-40 ~ +85	℃	
Audio input level	V_{IN-A}	~ -10	dBV	Pin 1, 22
Audio input frequency band	f_{IN-A}	20 ~ 15k	Hz	Pin 1, 22
Pre-emphasis time constant set up range	τ PRE	~ 155	μsec	Pin 2, 21
Transmission frequency	f_{TX}	76.8 ~ 78.0 (step 0.2) 88.0 ~ 89.2 (step 0.2)	MHz	Pin 9, 11
Control terminal "H" level input voltage	V_{IH}	0.8Vcc ~ Vcc	V	Pin 15, 16, 17, 18
Control terminal "L" level input voltage	V_{IL}	GND ~ 0.2Vcc	V	Pin 15, 16, 17, 18

○ Electrical Characteristics

Unless otherwise specified Ta=25℃ , V_{CC}=5.0V

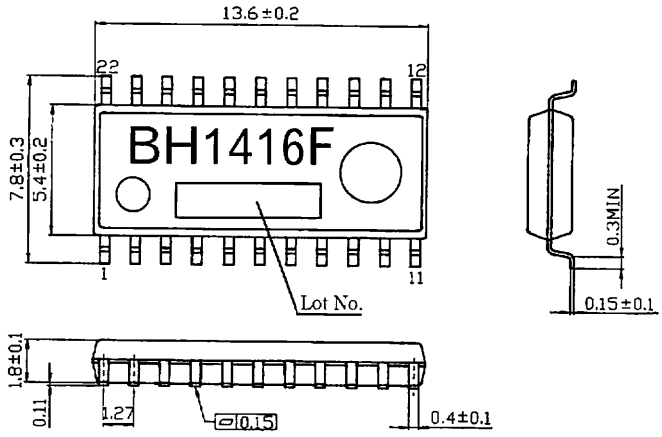
Signal source : f_{IN}=400Hz

Parameter	Symbol	Limits			Unit	Conditions
		Min.	Typ.	Max.		
Quiescent current	I_Q	14	20	28	mA	
Channel separation	Sep	25	40	–	dB	V_{IN}=-20dBV, L→R, R→L
Total harmonic distortion	THD	–	0.1	0.3	%	V_{IN} =-20dBV, L+R
Channel balance	C.B	-2	0	+2	dB	V_{IN} =-20dBV, L+R
Input output gain	G_V	-2	0	+2	dB	V_{IN} =-20dBV, L+R
Pilot modulation rate	M_P	12	15	18	%	V_{IN} =-20dBV, L+R, Pin5
Sub carrier rejection ratio	SCR	–	-30	-20	dB	V_{IN} =-20dBV, L+R
Pre-emphasis time constant	τ PRE	40	50	60	μsec	V_{IN} =-20dBV, L+R
Limiter input level	$V_{IN(LIM)}$	-16	-13	-10	dBV	Output level at 1dB gain compression
LPF cut off frequency	$f_{C(LPF)}$	12	15	18	kHz	V_O=-3dB, Pin2, 21 Open
Transmission output level	V_{TX}	98	101	104	dBμV	f_{TX}=89.2MHz
"H" level input current	I_{IH}	–	–	1.0	μA	Pin 15, 16, 17, 18 V_{IN}=5V
"L" level input current	I_{IL}	-1.0	–	–	μA	Pin 15, 16, 17, 18 V_{IN}=0V
"H" level output voltage	V_{OH}	Vcc-1.0	Vcc-0.15	–	V	Pin 7 I_{OUT}=-1.0mA
"L" level output voltage	V_{OL}	–	0.15	1.0	V	Pin 7 I_{OUT}=1.0mA
"off" level leak current 1	I_{OFF1}	–	–	100	nA	Pin 7 V_{OUT}=5V
"off" level leak current 2	I_{OFF2}	-100	–	–	nA	Pin 7 V_{OUT}=GND

◎ This product is not designed for protection against radioactive rays.

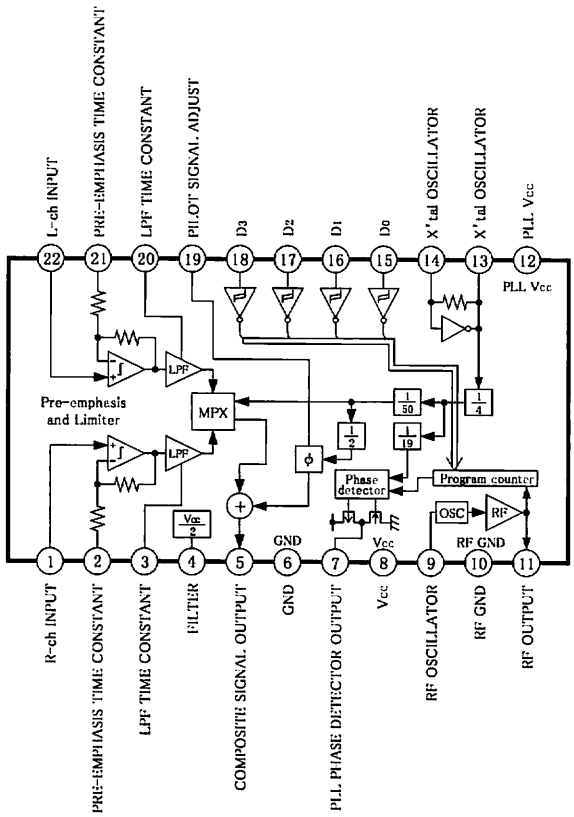
◎ The specification of transmission output level be based on the Radio Law in every country and the area.

○ External Dimension Diagram • Marking Diagram



SOP-22 (Unit : mm)

○ Block Diagram



○ Pin No. • Pin Name

No.	Name	No.	Name
1	R-ch INPUT	12	PLL Vcc
2	PRE-EMPHASIS TIME CONSTANT	13	X'tal OSCILLATOR
3	LPF TIME CONSTANT	14	X'tal OSCILLATOR
4	FILTER	15	D_0
5	COMPOSITE SIGNAL OUTPUT	16	D_1
6	GND	17	D_2
7	PLL PHASE DETECTOR OUTPUT	18	D_3
8	Vcc	19	PILOT SIGNAL ADJUST
9	RF OSCILLATOR	20	LPF TIME CONSTANT
10	RF GND	21	PRE-EMPHASIS TIME CONSTANT
11	RF OUTPUT	22	L-ch INPUT

○ Cautions On Use

(1) Absolute maximum ratings
If applied voltage, operating temperature range, or other absolute maximum ratings are exceeded, the LSI may be damaged. Do not apply voltages or temperatures that exceed the absolute maximum ratings. If you think of a case in which absolute maximum ratings are exceeded, enforce fuses or other physical safety measures and investigate how not to apply the conditions under which absolute maximum ratings are exceeded to the LSI.

(2) GND potential
Make the GND pin voltage such that it is the lowest voltage even when operating below it. Actually confirm that the voltage of each pin does not become a lower voltage than the GND pin, including transient phenomena.

(3) Thermal design
Perform thermal design in which there are adequate margins by taking into account the allowable power dissipation in actual states of use.

(4) Shorts between pins and misinstallation
When mounting the LSI on a board, pay adequate attention to orientation and placement discrepancies of the LSI. If it is misinstalled and the power is turned on, the LSI may be damaged. It also may be damaged if it is shorted by a foreign substance coming between pins of the LSI or between a pin and a power supply or a pin and a GND.

(5) Operation in strong magnetic fields
Adequately evaluate use in a strong magnetic field, since there is a possibility of malfunction.

Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are designed to be used with ordinary electronic equipment or devices (such as audio visual equipment, office-automation equipment, communications devices, electrical appliances and electronic toys).
Should you intend to use these products with equipment or devices which require an extremely high level of reliability and the malfunction of with would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

About Export Control Order in Japan

Products described herein are the objects of controlled goods in Annex 1 (Item 16) of Export Trade Control Order in Japan.
In case of export from Japan, please confirm if it applies to "objective" criteria or an "informed" (by MITI clause) on the basis of "catch all controls for Non-Proliferation of Weapons of Mass Destruction.

Thank you for your accessing to ROHM product informations.

More detail product informations and catalogs are available,

please contact your nearest sales office.

Please contact our sales offices for details ;

U.S.A / San Diego	TEL : +1(858)625-3630	FAX : +1(858)625-3670
Atlanta	TEL : +1(770)754-5972	FAX : +1(770)754-0691
Dallas	TEL : +1(972)312-8818	FAX : +1(972)312-0330
Germany / Dusseldorf	TEL : +49(2154)9210	FAX : +49(2154)921400
United Kingdom / London	TEL : +44(1)908-282-666	FAX : +44(1)908-282-528
France / Paris	TEL : +33(0)1 56 97 30 60	FAX : +33(0) 1 56 97 30 80
China / Hong Kong	TEL : +852(2)740-6262	FAX : +852(2)375-8971
Shanghai	TEL : +86(21)6279-2727	FAX : +86(21)6247-2066
Dilian	TEL : +86(411)8230-8549	FAX : +86(411)8230-8537
Beijing	TEL : +86(10)8525-2483	FAX : +86(10)8525-2489
Taiwan / Taipei	TEL : +866(2)2500-6956	FAX : +866(2)2503-2869
Korea / Seoul	TEL : +82(2)8182-700	FAX : +82(2)8182-715
Singapore	TEL : +65-6332-2322	FAX : +65-6332-5662
Malaysia / Kuala Lumpur	TEL : +60(3)7958-8355	FAX : +60(3)7958-8377
Philippines / Manila	TEL : +63(2)807-6872	FAX : +63(2)809-1422
Thailand / Bangkok	TEL : +66(2)254-4890	FAX : +66(2)256-6334

Japan /
(Internal Sales)

Tokyo 2-1-1, Yaesu, Chuo-ku, Tokyo 104-0082
TEL : +81(3)5203-0321 FAX : +81(3)5203-0300

Yokohama 2-4-8, Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa 222-8575
TEL : +81(45)476-2131 FAX : +81(45)476-2128

Nagoya Dainagayo Building 9F 3-28-12, Meieki, Nakamura-ku, Nagoya,Aichi 450-0002
TEL : +81(52)581-8521 FAX : +81(52)561-2173

Kyoto 579-32 Higashi Shiokouji-cho, Karasuma Nishi-iru, Shiokoujidori, Shimogyo-ku, Kyoto 600-8216
TEL : +81(75)311-2121 FAX : +81(75)314-6559

(Contact address for overseas customers in Japan)

Yokohama TEL : +81(45)476-9270 FAX : +81(045)476-9271

As of 18th. April 2005