RDS/RBDS decoder

BU1920F

The BU1920F is a RDS/RBDS decoder that employs a digital PLL. It has a built-in anti-aliasing filter and an eight-stage BPF (switched-capacitor filter). Linear CMOS circuitry is used for low power consumption.

●Applications

RDS/RBDS compatible FM receivers for Europe and North America, car stereo systems, home stereo systems and FM pagers.

●Features

1) Low power consumption.
2) Two-stage anti-aliasing filter.
3) 57kHz bandpass filter.
4) DSB demodulation (digital PLL).
5) ARI signal discrimination.
6) Quality indication output for demodulated data.

●Absolute maximum ratings (Ta = 25℃)

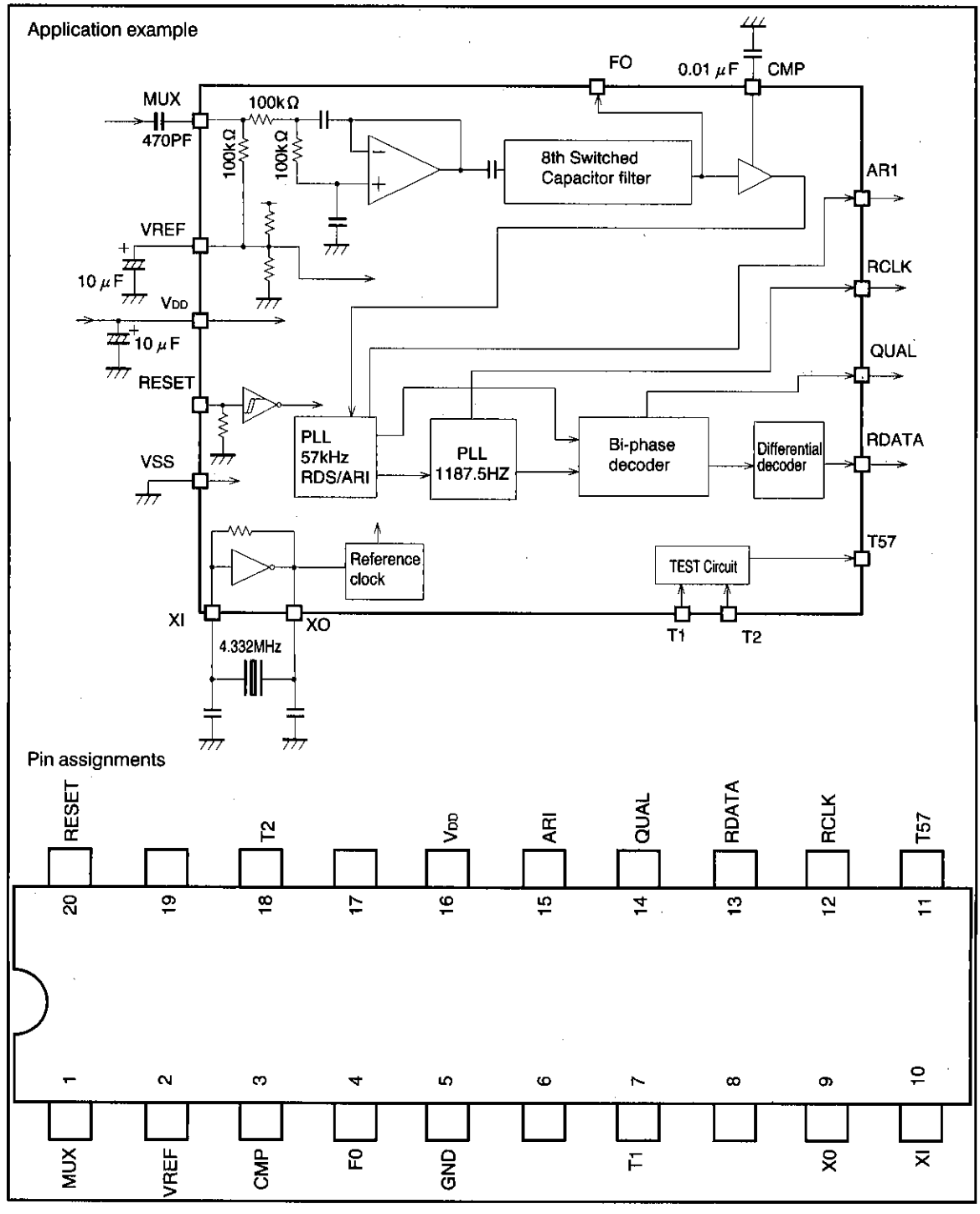
Parameter	Symbol	Limits	Unit
Supply voltage	V_{DD}	−0.3～+7.0	V
Maximum input voltage	V_{MAX}	−0.3～V_{DD}+0.3*1	V
Maximum output current	I_{MAX}	±4.0*2	mA
Power dissipation	P_D	350*3	mW
Operating temperature	T_{opr}	−40～+85	℃
Storage temperature	T_{stg}	−55～+125	℃

*1 All input pins.
*2 All output pins.
*3 Reduced by 3.5mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta = 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V_{DD}	4.5	—	5.5	V

●Block diagram

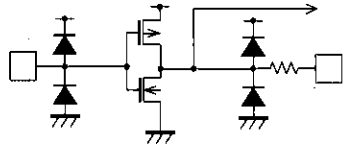


●Pin descriptions

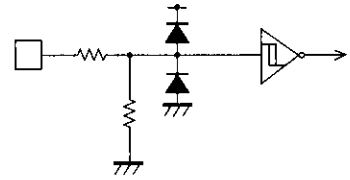
Pin No.	Symbol	Pin name	Function	Input/output type
1	MUX	Input	Composite signal input (refer to the circuit example)	Type F
2	VREF	Reference voltage	1/2 VDD1 (refer to the circuit example)	Type G
3	CMP	Comparator	Refer to the circuit example	Type H
4	FO	Output	Open, for monitoring the filter output	Type I
5	GND			
6	(NC)		Not connected (floating)	
7	T1	Test input	Open or connected to GND	Type B
8	(NC)		Not connected (floating)	
9	XO	Crystal oscillator	Connects to 4.332MHz oscillator (refer to the circuit example)	Type A
10	XI			
11	T57	Test output	Open	Type E
12	RCLK	Demodulator clock	1187.5kHz clock (refer to the timing diagram)	
13	RDATA	Demodulator data	Refer to the timing diagram	
14	QUAL	Demodulator quality	Good data: HI, bad data: LO	
15	ARI	ARI signal discrimination	ARI + RDS: HI, RDS: LO, no signal: unstable	
16	V_{DD}	Power supply	4.5~5.5V	
17	(NC)		Not connected (floating)	
18	T2	Test input	Open or connected to GND	Type E
19	(NC)		Not connected (floating)	
20	RESET	Reset	HI: reset, open/LO: operating	Type C

●Input/output circuit

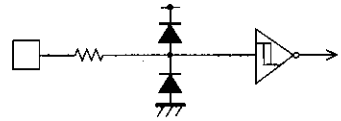
Type A



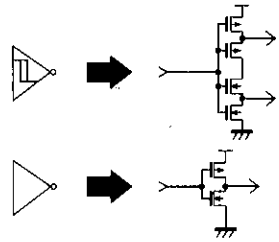
Type B



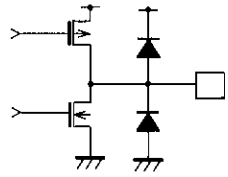
Type C



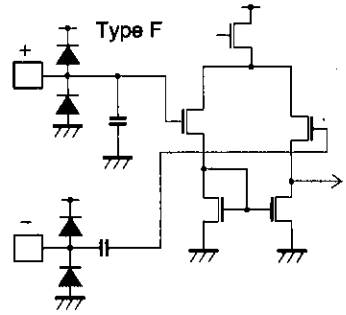
Type D



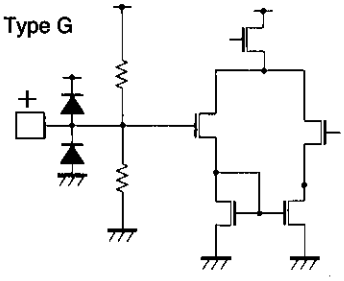
Type E



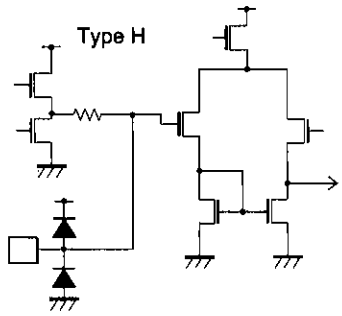
Type F



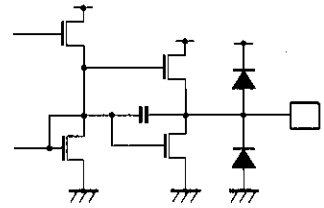
Type G



Type H



Type I



●Electrical characteristics (unless otherwise specified Ta = 25℃, V_{DD} = 5.0V and GND = 0.0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Operating current	I_{DD}	—	4.5	7.0	mA	I_{DD}
Reset current	I_{DD}	—	2.0	4.0	mA	I_{DD}
Reference voltage	VREF	—	$1/2V_{DD1}$	—	V	Pin 2
Input current 1	I_{IN1}	—	—	1.0	μA	MUX $V_{IN}=V_{DD}$
Output current 1	I_{OUT1}	—	—	1.0	μA	MUX $V_{IN}=V_{DD}$
Input current 2	I_{IN2}	—	—	1.0	μA	RESET XI $V_{IN}=V_{DD}$
Output current 2	I_{OUT2}	—	—	1.0	μA	RESET XI $V_{IN}=V_{DD}$
"L" level output voltage 1	V_{OL1}	V_{DD2} −1.0	V_{DD2} −0.3	—	V	RCLK RDATA QUAL ARI I_O=−1.0mA
"H" level output voltage 1	V_{OH1}	—	0.2	1.0	V	RCLK RDATA QUAL ARI I_O=1.0mA
"H" level output voltage	V_{IH}	$0.8V_{DD2}$	—	—		RESET
"L" level output voltage 1	V_{IL}	—	—	$0.2V_{DD2}$	V	RESET

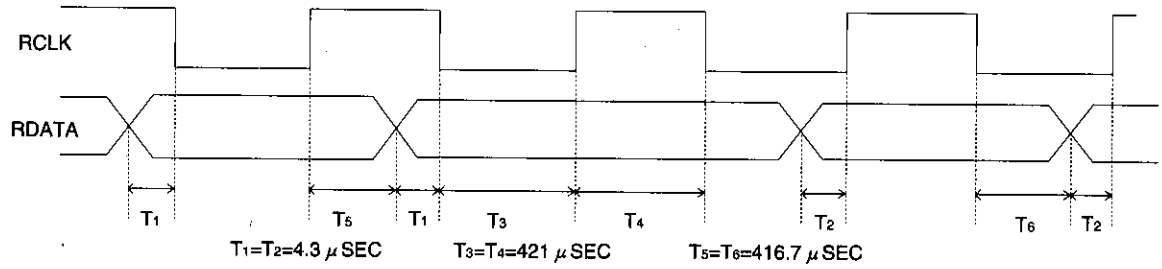
Filter block

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Center frequency	FC	56.5	57.0	57.5	kHz	
Gain	GA	18	20	22	dB	F=57.0kHz
Attenuation 1	ATT1	18	22		dB	57kHz±4kHz
Attenuation 2	ATT2	50	80		dB	38kHz
Attenuation 3	ATT3	35	50		dB	67kHz
S/N ratio	SN	30	40		dB	57kHz V_{IN}=3mVrms
Maximum input level	VMAX1			500	mVrms	

Demodulator block

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
RDS detector sensitivity	SRDS	—	0.5	1.0	mVrms	
RDS maximum input level	MRDS	—	—	300	mVrms	
ARI detector sensitivity	SARI	—	1.5	3.0	mVrms	
ARI maximum input level	MARI	—	—	500	mVrms	
Lockup time (RDS)	TL	—	100	200	ms	
Data rate	DRATE	—	1187.5	—	Hz	
Clock transient vs. data	CT	—	4.3	—	μs	

●Output data timing



The clock (RCLK) frequency is 1187.5Hz. Depending on the state of the internal PLL clock, the data (RDATA) is replaced in synchronous with either the rising or falling edge of the clock. To read the data, you may choose either the rising or falling edge of the clock as the reference. The data is valid for 416.7usec. after the reference clock edge.

QUAL pin operation : Indicates the quality of the demodulated data.

(1) Good data	: HI
(2) Poor data	: LO

ARI pin operation: ARI/RDS discrimination.

(1) ARI	: LO
(2) RDS + ARI	: LO
(3) RDS	: HI
(4) No signal	: unstable

●Electrical characteristics curve

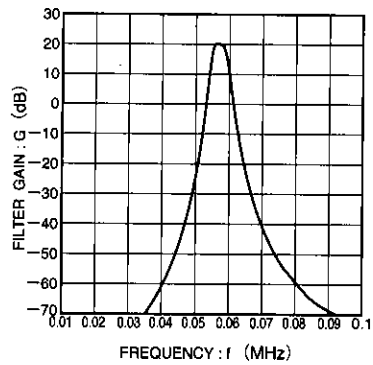
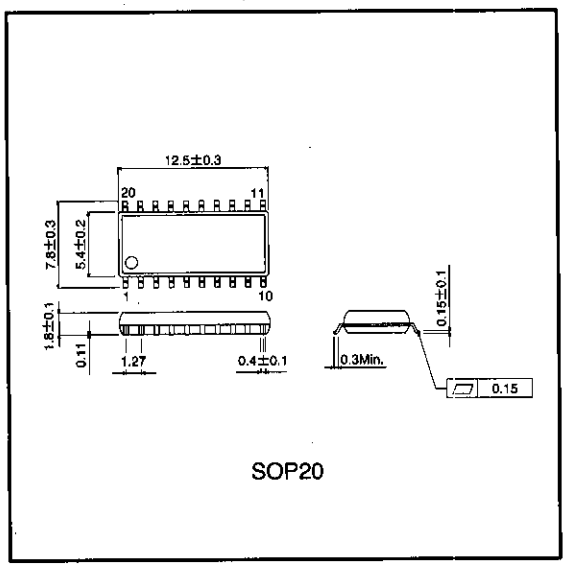


Fig. 1 Bandpass filter characteristics

●External dimensions (Unit: mm)



SOP20

Notes

- The contents described in this catalogue are correct as of March 1997.
- No unauthorized transmission or reproduction of this book, either in whole or in part, is permitted.
- The contents of this book are subject to change without notice. Always verify before use that the contents are the latest specifications. If, by any chance, a defect should arise in the equipment as a result of use without verification of the specifications, ROHM CO., LTD., can bear no responsibility whatsoever.
- Application circuit diagrams and circuit constants contained in this data book are shown as examples of standard use and operation. When designing for mass production, please pay careful attention to peripheral conditions.
- Any and all data, including, but not limited to application circuit diagrams, information, and various data, described in this catalogue 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 device shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes absolutely no liability 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 the 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.
- The products in this manual are manufactured with silicon as the main material.
- The products in this manual are not of radiation resistant design.

The products listed in this catalogue 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 which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers, or other safety devices) please be sure to consult with our sales representatives in advance.

- Notes when exporting
  - It is essential to obtain export permission when exporting any of the above products when it falls under the category of strategic material (or labor) as determined by foreign exchange or foreign trade control laws.
  - Please be sure to consult with our sales representatives to ascertain whether any product is classified as a strategic material.