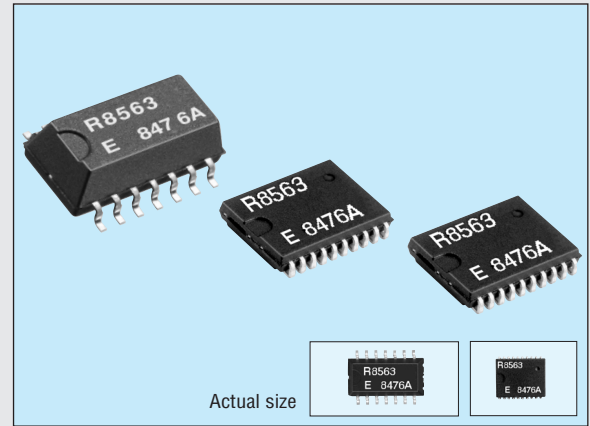


I<sup>2</sup>C-BUS INTERFACE REAL TIME CLOCK MODULE

# RTC-8563SA/JE

- Built-in crystal unit allows adjustment-free efficient operation.
- Compliant with I<sup>2</sup>C high-speed bus specifications. (400 kHz)
- Equipped with alarm, timer, and frequency output (32.768 kHz, 1024 Hz, 32 Hz, 1 Hz) features.
- Inclusion of century bit to enable correct date even after year 2000
- Operating in wide voltage range from 1.8 to 5.5 V, and in wide range of clock voltage from 1.2 to 5.5 V.
- Low power consumption at 250 nA/2.0 V. (Typ.)
- Available in small package (SA:SOP 14-pin) and thin package (JE:VSO J20-pin)



## Specifications (characteristics)

### Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	V <sub>DD</sub>	Between V <sub>DD</sub> and GND	-0.5	+6.5	V
	I <sub>DD</sub>	V <sub>DD</sub> pin	-50	50	mA
Input voltage	V <sub>i</sub>	Input pin	GND-0.5	V <sub>DD</sub> +0.5	V
Output voltage	V <sub>o</sub>	CLKOUT, INT pins			
DC Input current	I <sub>i</sub>	—	-10	10	mA
DC Output current	I <sub>o</sub>	—			
Storage temperature Range	T <sub>STG</sub>	As single part	-55	+125	°C

### Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage range	V <sub>DD</sub>	I <sup>2</sup> C-BUS access at 400 kHz	1.8	5.5	V
Clock voltage range			V <sub>LOW</sub>		
Operating temperature range	T <sub>OPR</sub>	—	-40	+85	°C

### Frequency characteristics

Item	Symbol	Condition	Max.	Unit
Frequency precision	Δf/f <sub>0</sub>	T <sub>a</sub> =+25 °C, V <sub>DD</sub> =3.0 V	5±23	x 10 <sup>-6</sup>
Frequency temperature characteristics	T <sub>OP</sub>	T <sub>a</sub> =+25 °C, -10 to +70 °C, V <sub>DD</sub> =3.0 V	+10 -120	
Frequency voltage characteristics	f <sub>v</sub>	T <sub>a</sub> =+25 °C, V <sub>DD</sub> =1.2 V to 5.5 V	±2	x 10 <sup>-6</sup> /V
Oscillation start-up time	t <sub>STA</sub>	T <sub>a</sub> =+25 °C, V <sub>DD</sub> =1.8 V	3	s
Aging	f <sub>a</sub>	T <sub>a</sub> =+25 °C, V <sub>DD</sub> =3.0 V	±5	x 10 <sup>9</sup> /year

### DC characteristics

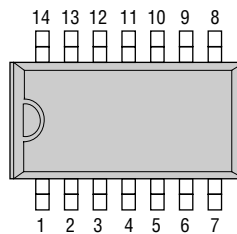
(V<sub>DD</sub>=1.8 to 5.5 V, T<sub>a</sub>=-40 to +85 °C)

Item	Pin	Symbol	Condition	Min.	Typ.	Max.	Unit
Power current (during access)	—	I <sub>DD0</sub>	f <sub>SCL</sub> =400 kHz f <sub>SCL</sub> =100 kHz	—	—	800 200	μA
		I <sub>DD</sub>	f <sub>SCL</sub> =0 Hz, V <sub>DD</sub> =5.0 V f <sub>SCL</sub> =0 Hz, V <sub>DD</sub> =3.0 V f <sub>SCL</sub> =0 Hz, V <sub>DD</sub> =2.0 V			0.35 0.30 0.25	
Power current (not during access)	—	I <sub>DD32k</sub>	f <sub>SCL</sub> =0 Hz, V <sub>DD</sub> =5.0 V f <sub>SCL</sub> =0 Hz, V <sub>DD</sub> =3.0 V f <sub>SCL</sub> =0 Hz, V <sub>DD</sub> =2.0 V	—	—	0.85 0.55 0.45	1.80 1.20 1.00
		I <sub>OL(SDA)</sub>	V <sub>OL</sub> =0.4 V, V <sub>DD</sub> =5 V			-3	—
"L" input voltage	—	V <sub>IL</sub>	—	GND	—	0.3×V <sub>DD</sub>	V
"H" input voltage	—	V <sub>IH</sub>	—	0.7×V <sub>DD</sub>	—	V <sub>DD</sub>	V
"L" output current	SDA	I <sub>OL(SDA)</sub>	V <sub>OL</sub> =0.4 V, V <sub>DD</sub> =5 V	-3	—	—	mA
"L" output current	INT	I <sub>OL(INT)</sub>					
"L" output current	CLKOUT	I <sub>OL(CLKOUT)</sub>	V <sub>OL</sub> =0.4 V, V <sub>DD</sub> =5 V	-1	—	—	mA
Leakage current	—	I <sub>LO</sub>					
Low voltage detection	—	V <sub>LOW</sub>	—	1.0	1.2	V	

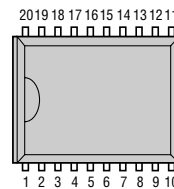
The I<sup>2</sup>C-Bus is a trademark of Philips Electronics N.V.

### Terminal connection

#### RTC-8563SA



#### RTC-8563JE

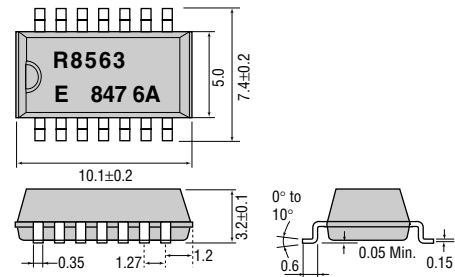


No.	8563SA	8563JE
1	N.C.	N.C.
2	SCL	N.C.
3	SDA	N.C.
4	N.C.	V <sub>DD</sub>
5	GND	CLKOUT
6	N.C.	SCL
7	INT	SDA
8	N.C.	(GND)
9	N.C.	GND
10	N.C.	INT
11	V <sub>DD</sub>	N.C.
12	N.C.	N.C.
13	N.C.	N.C.
14	CLKOUT	N.C.
15		N.C.
16		N.C.
17		N.C.
18		N.C.
19		N.C.
20		N.C.

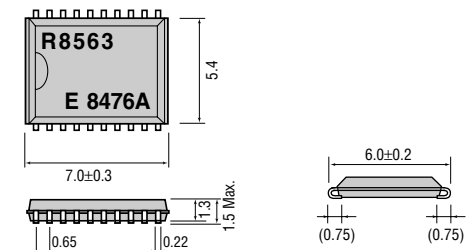
### External dimensions

(Unit: mm)

#### RTC-8563SA (SOP 14-pin)



#### RTC-8563JE (VSOJ 20-pin)



Register table

Address	Register symbol	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
0	Control1	TEST	0	STOP	0	TEST	0	0	0
1	Control2	0	0	0	TI/TP	AF	TF	AIE	TIE
2	Sec	VL	S 40	S 20	S 10	S 8	S 4	S 2	S 1
3	Min	*	Min 40	Min 20	Min 10	Min 8	Min 4	Min 2	Min 1
4	Hour	*	*	Hour 20	Hour 10	Hour 8	Hour 4	Hour 2	Hour 1
5	Day	*	*	Day 20	Day 10	Day 8	Day 4	Day 2	Day 1
6	Week	*	*	*	*	*	W 4	W 2	W 1
7	Month/Century	C	*	*	Month 10	Month 8	Month 4	Month 2	Month 1
8	Year	Year 80	Year 40	Year 20	Year 10	Year 8	Year 4	Year 2	Year 1
9	Minutes Alarm	AE	A-Min 40	A-Min 20	A-Min 10	A-Min 8	A-Min 4	A-Min 2	A-Min 1
A	Hours Alarm	AE	A-Hr 40	A-Hr 20	A-Hr 10	A-Hr 8	A-Hr 4	A-Hr 2	A-Hr 1
B	Day Alarm	AE	*	A-Day 20	A-Day 10	A-Day 8	A-Day 4	A-Day 2	A-Day 1
C	Week Alarm	AE	*	*	*	*	A-W 4	A-W 2	A-W 1
D	CLKOUT frequency	FE	*	*	*	*	*	FD1	FD0
E	Timer control	TE	*	*	*	*	*	TD1	TD0
F	Timer	128	64	32	16	8	4	2	1

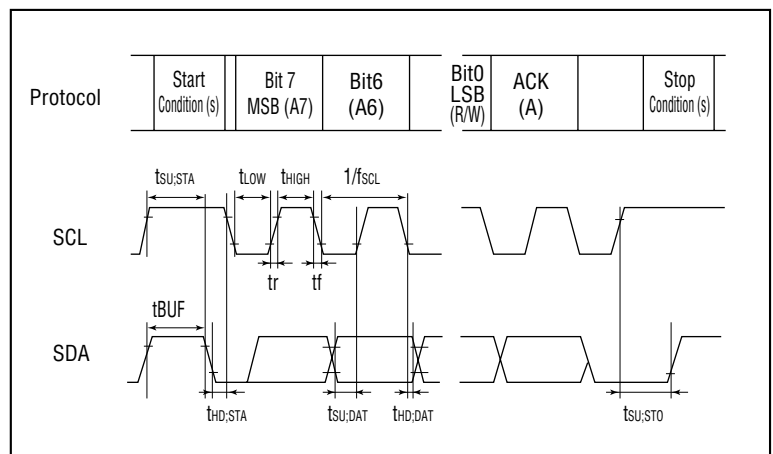
0 : Always set this bit to "0".

Switching characteristics

(VDD=1.8 to 5.5 V, Ta=-40 to +85 °C)

Item	Symbol	Min.	Max.	Unit
SCL clock frequency	f <sub>SCL</sub>	—	400	kHz
Tolerance spike time on bus	t <sub>SW</sub>	—	50	ns
Start condition set-up time	t <sub>SU,STA</sub>	0.6	—	μs
Start condition Hold time	t <sub>HD,STA</sub>			
SCL "L" time	t <sub>LOW</sub>			
SCL "H" time	t <sub>HIGH</sub>	0.6	—	μs
SCL and SDA rise time	t <sub>r</sub>	—	0.3	μs
SCL and SDA fall time	t <sub>f</sub>			
Date set-up time	t <sub>SU,DAT</sub>	100	—	ns
Date hold time	t <sub>HD,DAT</sub>	0	—	μs
Stop condition set-up time	t <sub>SU,STO</sub>	4.0	—	μs

Timing chart



Block diagram

