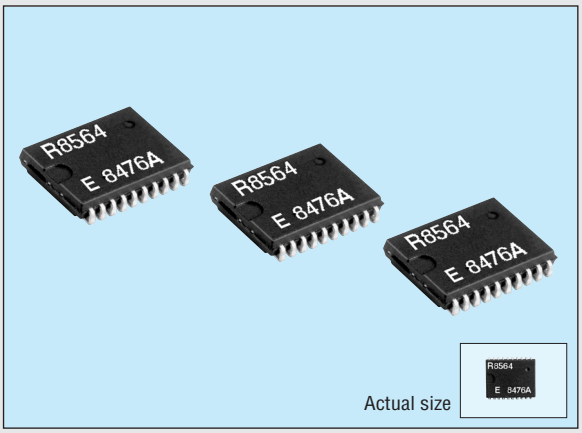
I²C-BUS INTERFACE REAL TIME CLOCK MODULE

RTC-8564JE

- Built-in crystal unit allows adjustment-free efficient operation.
- Compliant with I²C 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 275 nA/3.0 V. (Typ.)



Specifications (characteristics)

Absolute Max. rating

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage	V_{DD}	Between V_{DD} and GND	-0.5	+6.5	V
	I_{DD}	V_{DD} pin	-50	50	mA
Input voltage	Vi	Input pin	GND-0.5	V_{DD}+0.5	V
Output voltage	Vo	$\overline{INT}$ pins			
DC Input current	Ii	—	-10	10	mA
DC Output current	Io				
Storage temperature Range	T_{STG}	As single part	-55	+125	˚C

Operating range

Item	Symbol	Condition	Min.	Max.	Unit
Supply voltage range	V_{DD}	I²C-BUS access at 400 kHz	1.8	5.5	V
Clock voltage range		—	V_{LOW}		
Operating temperature range	T_{OPR}		-40	+85	˚C

Frequency characteristics

Item	Symbol	Condition	Max.	Unit
Frequency precision	Δf/fo	Ta=+25 ˚C, V_{DD}=3.0 V	5±23	× 10⁻⁶
Frequency temperature characteristics	T_{op}	Ta=+25˚C, -10 to +70 ˚C,V_{DD}=3.0 V	+10 -120	
Frequency voltage characteristics	fv	Ta=+25 ˚C, V_{DD}=1.2 V to 5.5 V	±2	× 10⁻⁶/V
Oscillation start-up time	t_{STA}	Ta=+25 ˚C, V_{DD}=1.8 V	3	s
Aging	fa	Ta=+25 ˚C, V_{DD}=3.0 V	±5	× 10⁻⁶/year

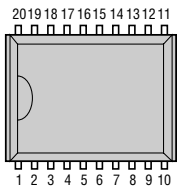
DC characteristics

(V_{DD}=1.8 to 5.5 V, Ta=-40 to +85˚C)

Item	Pin	Symbol	Condition	Min.	Typ.	Max.	Unit
Power current (during access)	—	I_{DD0}	f_{SCL}=400 kHz	—	—	800	μA
			f_{SCL}=100 kHz			200	
Power current (not during access)		I_{DD}	f_{SCL}=0 Hz, V_{DD}=5.0 V		0.33	0.80	
			f_{SCL}=0 Hz, V_{DD}=3.0 V		0.275	0.70	
			f_{SCL}=0 Hz, V_{DD}=2.0 V		0.25	0.65	
		I_{DD32k}	f_{SCL}=0 Hz, V_{DD}=5.0 V		2.5	3.4	
			f_{SCL}=0 Hz, V_{DD}=3.0 V		1.5	2.2	
			f_{SCL}=0 Hz, V_{DD}=2.0 V		1.1	1.6	
"L" input voltage		V_{IL}	—	GND -0.5	—	0.3×V_{DD}	V
"H" input voltage		V_{IH}		0.7×V_{DD}		V_{DD}+0.5	
"L" output voltage	SDA	I_{OL}(SDA)	V_{OL}=0.4 V, V_{DD}=5 V	-3	—	—	mA
"L" output current	$\overline{INT}$	I_{OL}($\overline{INT}$)		-1			
	CLKOUT	I_{OL}(CLKOUT)					
"H" output current		I_{OH}(CLKOUT)		—		1	
Leakage current	—	I_{LO}	V_O=V_{DD} or GND	-1		1	μA
Low voltage detection		V_{LOW}	Ta=-40 ˚C to +85 ˚C	—	0.9	1.1	V
			Ta=-20 ˚C to +70 ˚C		0.9	1.0	

The I²C-Bus is a trademark of Philips Electronics N.V.

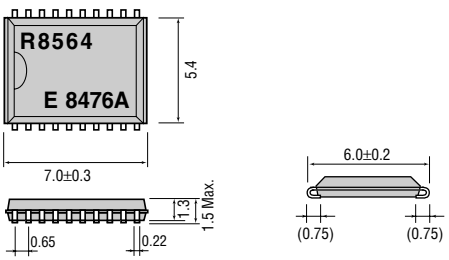
Terminal connection



No.	Pin terminal
1	N.C
2	N.C
3	CLKOE
4	V_{DD}
5	CLKOUT
6	SCL
7	SDA
8	(GND)
9	GND
10	$\overline{INT}$
11	N.C
12	N.C
13	N.C
14	N.C
15	N.C
16	N.C
17	N.C
18	N.C
19	N.C
20	N.C

External dimensions

(Unit: mm)



Register table

Address	Register symbol	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
0	Control 1	TEST	0	STOP	0	TEST	0	0	0
1	Control 2	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

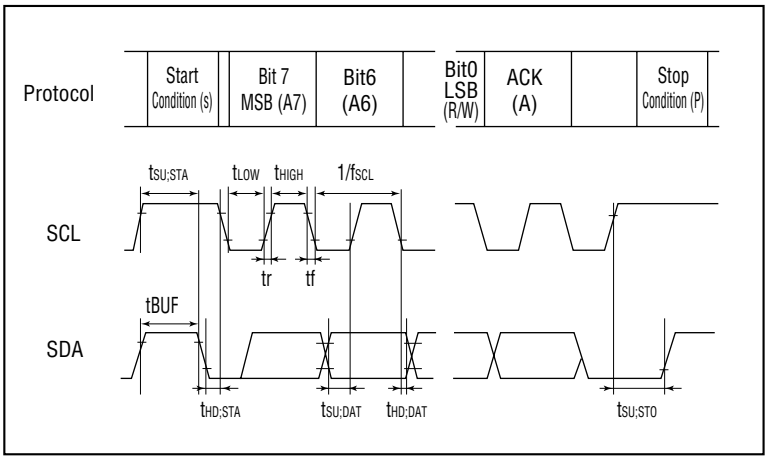
0 : Always set this bit to“0”.

Switching characteristics

(V_{DD}=1.8 to 5.5 V, Ta=-40 °C to +85 °C)

Item	Symbol	Min.	Max.	Unit
SCL clock frequency	f_{SCL}	—	400	kHz
Tolerance spike time on bus	t_{SW}		50	ns
Start condition set-up time	$t_{SU;STA}$	0.6	—	μs
Start condition Hold time	$t_{HD;STA}$			
SCL “L” time	t_{LOW}	1.3		
SCL “H” time	t_{HIGH}	0.6		
SCL and SDA rise time	t_r	—	0.3	
SCL and SDA fall time	t_f			
Date set-up time	$t_{SU;DAT}$	100	—	ns
Date hold time	$t_{HD;DAT}$	0		
Stop condition set-up time	$t_{SU;STO}$	4.0		μs

Timing chart



Block diagram