Applications

- Smart Meters
- In-home appliances
- Smart thermostats

Features

- Integrated PA with 30 dBm output power
- Receive pass through
- Integrated antenna switching
- Single ended 50 Ω Tx & Rx RF interface
- Fast turn-ON / turn-OFF time <1 µsec
- 2.0 V – 4.8 V supply operation
- Sleep mode current <1 µA
- 4 x 4 x 0.9 mm 24 pin QFN
- Pb-free, RoHS compliant and Halogen free

Product Description

The SE2442L is a high performance, integrated RF Front End Module designed for high power ISM band applications operating in the 902 – 928 MHz frequency band.

The SE2442L is designed for ease of use and maximum flexibility, with fully matched 50 Ω input and output, and digital controls compatible with 1.6 – 3.6 V CMOS levels.

The RF blocks operate over a wide supply voltage range from 2.0 to 4.8 V allowing the SE2442L to be used in battery powered applications over a wide spectrum of the battery discharge curve.

Ordering Information

Part No.	Package	Remark
SE2442L-R	24 pin QFN	Tape & Reel
SE2442L-EK1	N/A	Evaluation kit

Functional Block Diagram

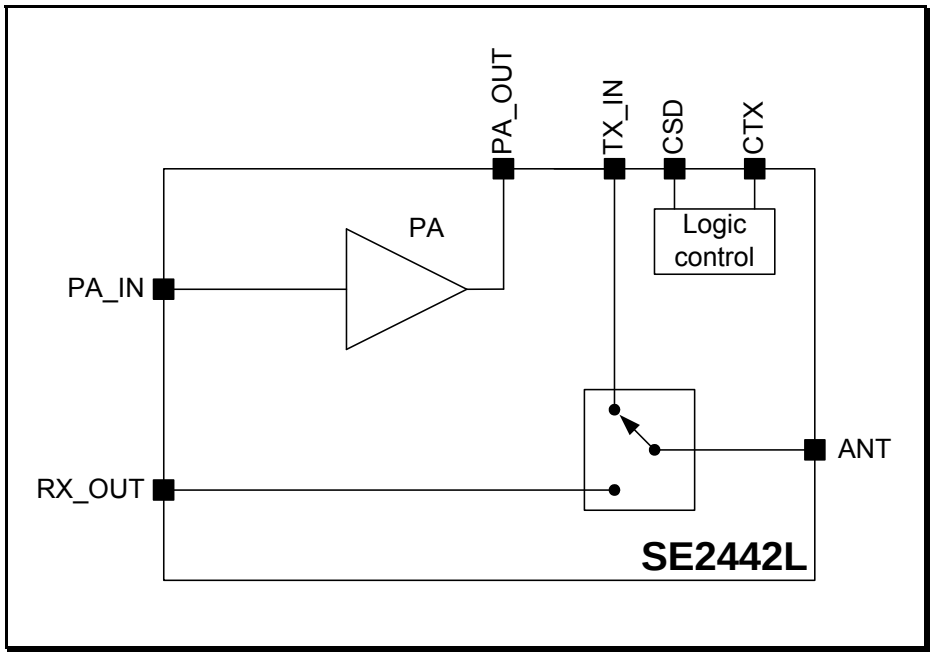

Figure 1: SE2442L Block Diagram

Pin Out Diagram

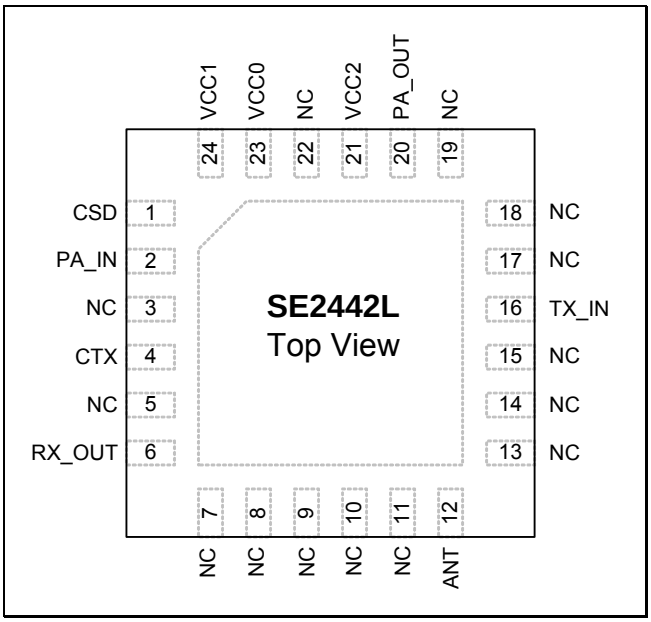

Figure 2: SE2442L Pinout

Pin Out Description

Pin No.	Name	Description
1	CSD	Shutdown control input
2	PA_IN	PA input
3	NC	Not connected internally to the device
4	CTX	Transmit enable control input
5	NC	Not connected internally to the device
6	RX_OUT	Receive signal to transceiver or SoC
7	NC	Not connected internally to the device
8	NC	Not connected internally to the device
9	NC	Not connected internally to the device
10	NC	Not connected internally to the device
11	NC	Not connected internally to the device
12	ANT	Antenna port
13	NC	Not connected internally to the device
14	NC	Not connected internally to the device
15	NC	Not connected internally to the device
16	TX_IN	Tx signal to antenna switch (from OMN)
17	NC	Not connected internally to the device
18	NC	Not connected internally to the device

Pin No.	Name	Description
19	NC	Not connected internally to the device
20	PA_OUT	PA output (to OMN)
21	VCC2	Positive power supply, transmit section
22	NC	Not connected internally to the device
23	VCC0	Positive power supply, receive section
24	VCC1	Positive power supply, transmit section
Paddle	GND	Exposed die paddle; electrical and thermal ground; Connect to PCB ground

Absolute Maximum Ratings

These are stress ratings only. Exposure to stresses beyond these maximum ratings may cause permanent damage to, or affect the reliability of the device. Avoid operating the device outside the recommended operating conditions defined below.

Symbol	Definition	Note	Min.	Max.	Unit
VCC0	Supply Voltage Receive	1	-0.3	5.5	V
VCC1, VCC2	Supply Voltage Transmit – No RF	1	-0.3	5.5	V
	Control pin voltages		-0.3	VCC0	V
T_{OP}	Operating temperature		-40	85	°C
$T_{STORAGE}$	Storage temperature		-40	125	°C
	ESD Voltage all pins (HBM)	1	-	1000	V
Pin_Tx_max	Tx input power at PA_IN port		-	+10	dBm
Pin_Rx_max	Rx input power at ANT port		-	+10	dBm

Note: (1) No damage assuming only one parameter is set at limit at a time with all other parameters set at or below the recommended operating conditions.

Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_A	Ambient temperature	-40	25	85	°C
VCC	Supply voltage on VCC0, VCC1 and VCC2	2.0	3.6	4.8	V

DC Electrical Characteristics

Conditions: VCC = 3.6 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2442L-EK1 evaluation board (de-embedded to device), unless otherwise noted

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_{CC-Tx30}$	Tx Supply Current	Tx mode P_{OUT} = 30 dBm CSD = CTX = HIGH, VCC = 4.8 V	-	420	-	mA
$I_{CC-Tx27}$	Tx Supply Current	Tx mode P_{OUT} = 27 dBm CSD = CTX = HIGH, VCC = 3.6 V	-	280	-	mA
I_{CQ-Tx}	Quiescent Current	No RF CSD = CTX = HIGH	-	50	-	mA
$I_{CC-RxBypass}$	Rx Supply Current	Rx bypass mode CSD = HIGH, CTX = 0 V	-	-	280	uA
I_{CC_OFF}	Sleep Supply Current	No RF, CTX = CSD = 0 V	-	0.05	1	µA

Logic Characteristics

Conditions: T_A = 25 °C, as measured on SiGe Semiconductor's SE2442L-EK1 evaluation board (de-embedded to device), unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{IH}	Logic input high		1.6	-	VCC0	V
V_{IL}	Logic input low		0	-	0.3	V
I_{IH}	Logic input high		-	-	1	µA
I_{IL}	Logic input low		-	-	1	µA

Logic Controls

Conditions: T_A = 25 °C

Mode	Mode description	Note	CSD	CTX
0	All off (sleep mode)	1, 3	0	0
1	Rx bypass mode	1, 2	1	0
3	Tx mode	1, 2	1	1

Note: (1) Logic '0' level compliant to V_{IL} as specified in the "Logic Characteristics" table
(2) Logic '1' level compliant to V_{IH} as specified in the "Logic Characteristics" table
(3) All controls must be at logic '0' in order to achieve the specified sleep current

AC Electrical Characteristics, Transmit

Conditions: VCC = 3.6 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2442L-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 Ω, unless otherwise noted.

Symbol	Parameter	Condition	Note	Min.	Typ.	Max.	Unit
F_{IN}	Frequency Range			902	-	928	MHz
Pout_FEM	Output power at ANT port	VCC = 4.8 V VCC = 4.0 V VCC = 3.6 V VCC = 3.0 V	1, 4	-	31.5 30.0 29.0 27.5		dBm
PAE	PA Power added efficiency	Pout = 28 dBm at PA_OUT port, 915 MHz			64		%
S_{21}	Small Signal Gain	902 – 928 MHz	1	20	-	-	dB
ΔS_{21}	Small Signal Gain Variation	Gain variation across frequency range	1	-	-	1	dBp-p
$S22_{ANT}$	Output Return Loss	Into 50 Ω, ANT port	1	-	-10	-6	dB
HD2	2nd Harmonic	P_{OUT} = 27 dBm	1, 2	-	-	-22	dBc
HD3 – HD10	3rd – 10th Harmonics	P_{OUT} = 27 dBm	1, 2	-	-	-72	dBc
T_{ON}	Turn on time		3	-	-	1	us
T_{OFF}	Turn off time		4	-	-	1	us
STAB	Stability	CW, P_{IN} = +6 dBm 0.1 GHz – 20 GHz Load VSWR = 6:1		All non-harmonically related outputs less than -45 dBm/MHz			
RU	Ruggedness	CW, Pout = 27 dBm into 50 Ω, Load VSWR = 10:1		No permanent damage			

Note: (1) 902 – 928 MHz with specified matching network on the SE2442L-EK1 evaluation board
(2) Continuous wave (CW)
(3) From 50% of CTX edge to 90% of final RF output power
(4) From 50% of CTX edge to 10% of final RF output power

AC Electrical Characteristics, Receive

Conditions: VCC = 3.6 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2442L-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 Ω, unless otherwise noted.

Symbol	Parameter	Condition	Note	Min.	Typ.	Max.	Unit
F_{IN}	Frequency Range		4	902	-	932	MHz
$S11_{ANT}$	Antenna port return loss	Into 50 Ω, ANT port	1, 4	-	-10	-6	dB
T_{ON}	Turn on time		2, 4	-	-	1	us
T_{OFF}	Turn off time		3, 4	-	-	1	us
G_bp	Gain in bypass mode	CTX = logic '0' CSD = logic '1'	4	-	-0.7	-	dB
IP1dB	Input 1-dB compression point in bypass mode	CTX = logic '0' CSD = logic '1'	4	10	-	-	dBm

Note: (1) 902 – 932 MHz
(2) From 50% of CTX edge
(4) From 50% of CTX edge
(5) Receive section can operate with VCC0 = 2.8 V and VCC1 = VCC2 = 0 V

AC Electrical Characteristics, Antenna Function

Conditions: VCC = 3.6 V, T_A = 25 °C, as measured on SiGe Semiconductor's SE2442L-EK1 evaluation board (de-embedded to device), all unused ports terminated with 50 Ω, unless otherwise noted.

Symbol	Parameter	Note	Min.	Typ.	Max.	Unit
Tx_ANT	Insertion loss from TX_IN to ANT	1	-	0.7	-	dB
Rx_ANT	Insertion loss from ANT to RX_OUT	1	-	0.7	-	dB

Note: (1) 902 – 928 MHz

Package Drawing

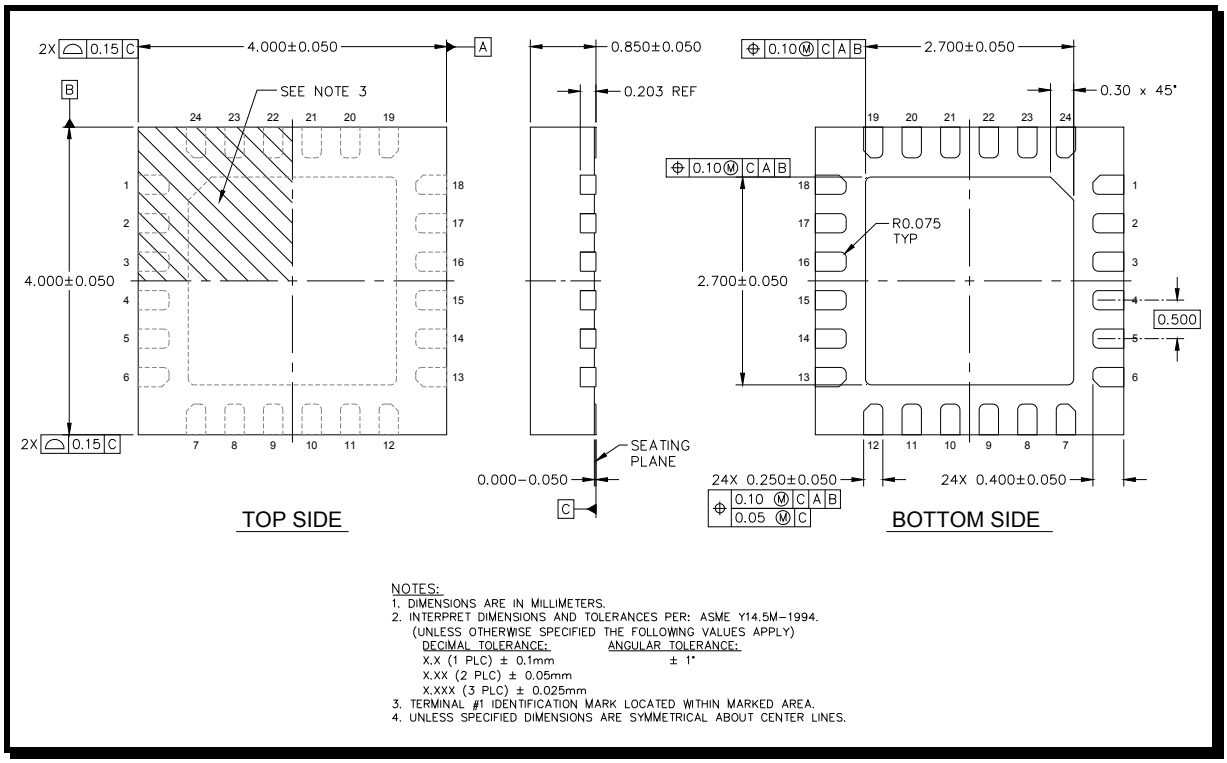

Figure 3: Package Drawing: Topside

Tape and Reel Information

Parameter	Value
Devices Per Reel	3000
Reel Diameter	13 inches
Tape Width	12 millimeters

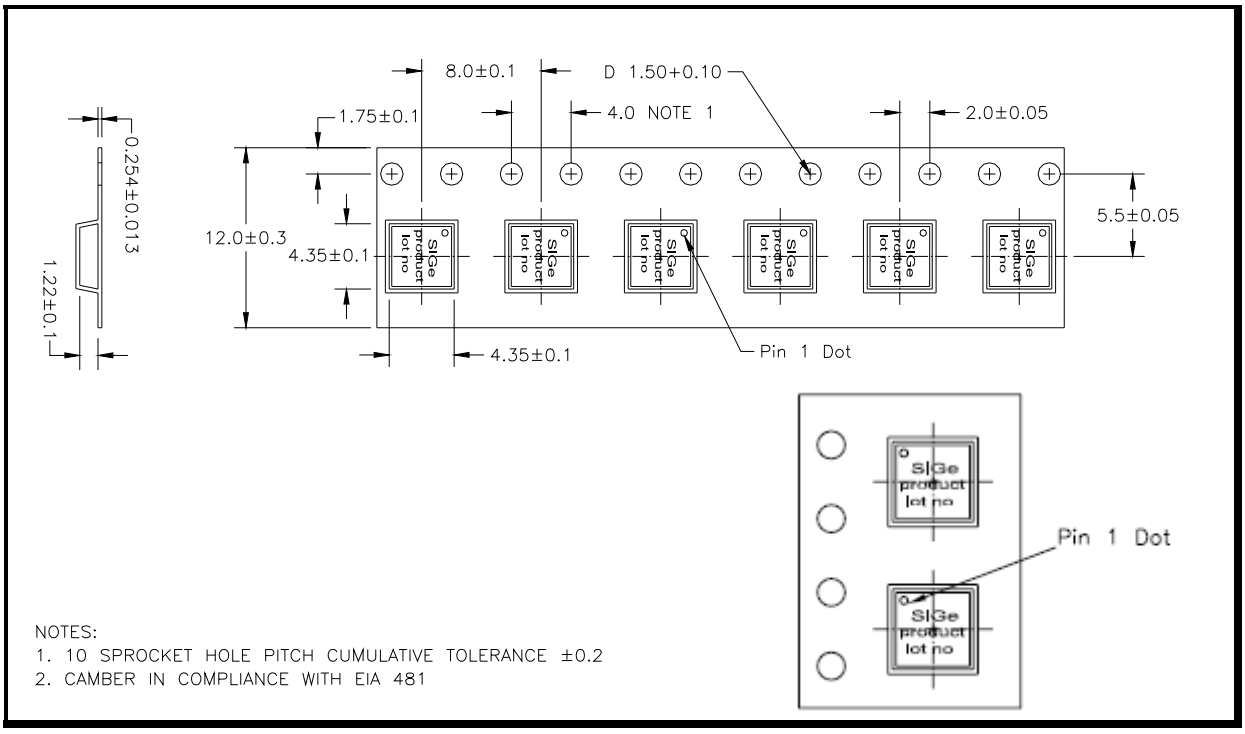

Figure 4: Detailed Tape and Reel Information (All diminensions in Millimeters)

Recommended Reflow Temperature Profile

Profile Feature	SnPb Eutectic Assembly	Lead (Pb) Free Assembly
Average Ramp-up Rate (T_L to T_P)	3°C/s (max)	3°C/s (max)
Preheat		
Temperature Min. (T_{smin})	100°C	150°C
Temperature Max. (T_{smax})	150°C	200°C
Time (Min. to Max) (t_s)	60 - 120s	60 - 80s
Ramp Up		
Tsmax to t_L	-	3°C/s (max)
Time 25°C to Peak Temperature	6 mins. (max)	8 mins. (max)
Reflow		
Temperature (t_L)	183°C	217°C
Time maintained above t_L	60 - 150s	60 - 150s
Peak Temperature (t_p)	240 ±5°C	260 +0/-5°C
Time Within 5°C of Actual Peak Temperature (t_p)	10 - 30s	20 - 40s
Ramp-Down		
Ramp-Down Rate	6°C/s (max)	6°C/s (max)

Reflow Profile (Reference JEDEC J-STD-020)

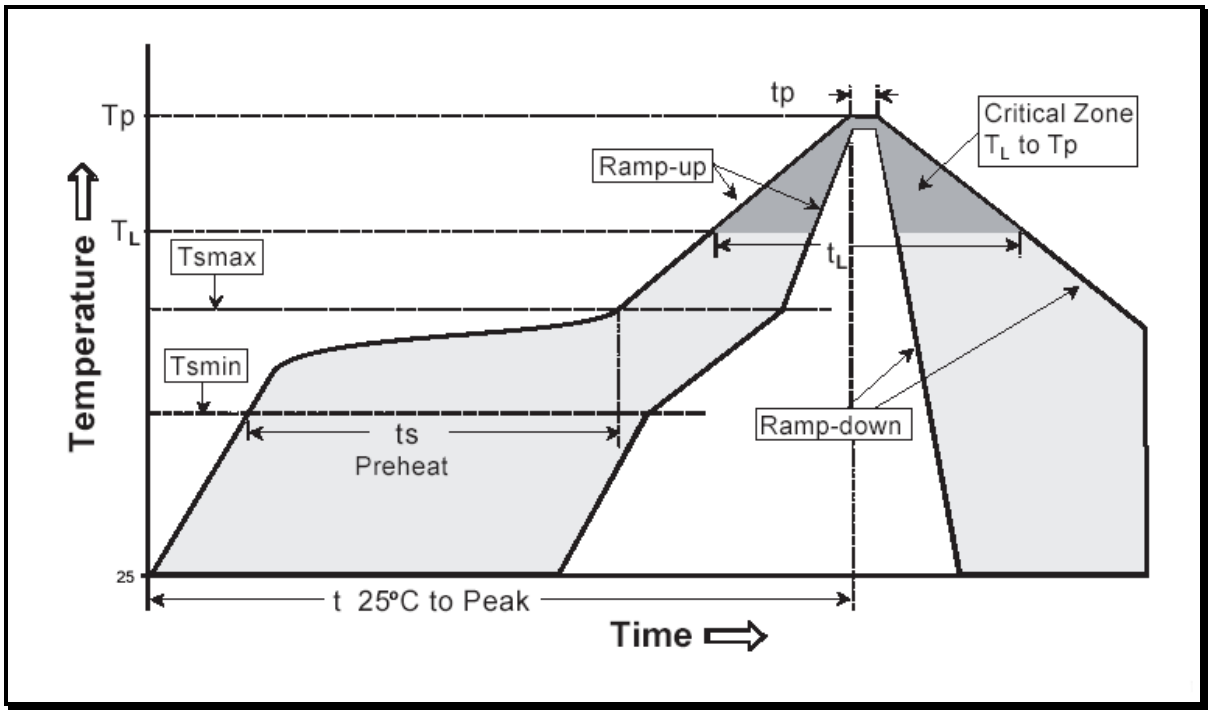

Figure 5: Reflow temperature profile

Branding Information

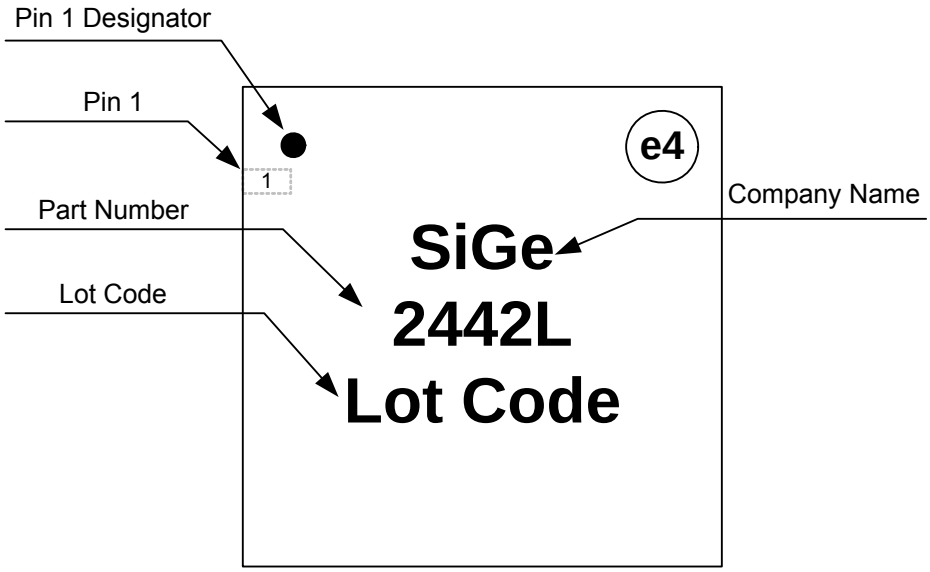

Figure 6: SE2442L Branding

Document Change History

Revision	Date	Notes
1.0	October 6, 2010	Initial release
1.1	October 13, 2010	Updated pinout
1.2	December 09, 2010	Included DC, Tx, Rx performance characteristics

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Product Preview
The datasheet contains information from the product concept specification. SiGe Semiconductor, Inc. reserves the right to change information at any time without notification.

Preliminary Information
The datasheet contains information from the design target specification. SiGe Semiconductor, Inc. reserves the right to change information at any time without notification.

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