Atmel SAM D – Cortex -M0+:

.   sby@rtcs.ru

ARM-

.

.

RISC-   ARM   1991
ARM6.   2000-

ARM7, ARM9   ARM11,   .

Cortex: Cortex-M0, -M3   -M4 (– microcontroller,   –
).
-          – Cortex-M0 –
Cortex
32-   ,
,   8-, 16-   .
Atmel
2013
SAM D20   Cortex-M0+.

( )   (,   -
),
-
Cortex-M0.   Atmel –   .
-
ARM-   -   Cortex-M0,   Atmel
,   -   20-   8-
,   (AVR, 8051)   17-   32-   -
"   " [1].   ARM-   .   ,
,   ,   8-
-          – AVR tiny, Mega   Xmega –   -
8-   -   Cortex-M0.

(Event System),
AVR Xmega.

,

.   —
,
.

,
,

Sleep Walking

,

"   ".
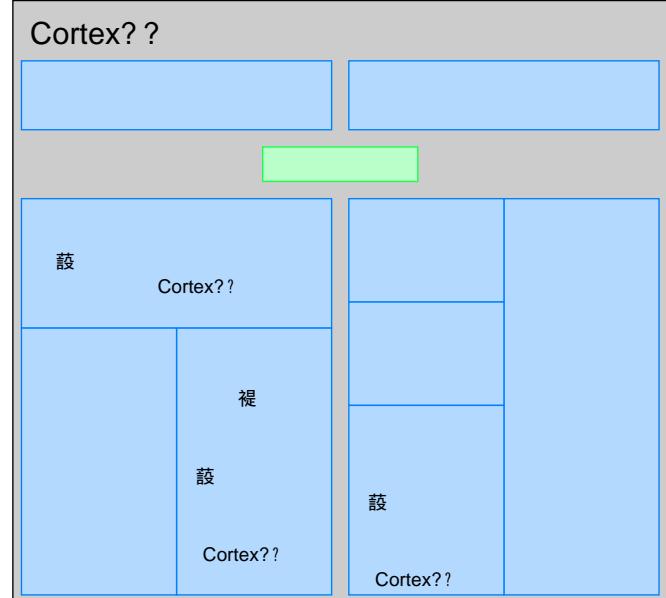
Atmel   ARM-   AVR-
—

SAM D20.
2,14 Coremark/   (CoreMark —
,   Embedded
Microprocessor Benchmark Consortium (EEMBC),
www.coremark.org).
—   120   /
Coremark,
70   /
(,
).   "   "

3,5   .   —
,
,
200   400   /

.

Atmel
ARM — Cortex-M0+ (.1),
(Cortex-M0)

.

SAM D20
(SAM D20E, SAM D20G
SAM D20J)   Cortex-M0
Atmel   2013

.

Cortex??

Cortex??

Cortex??

Cortex??

.1.   -   ARM Cortex-M0+

(. 1).
8-   ,
,
SERCOM (
I²C, USART   SPI),
PTC (Peripheral Touch Controller),

, 12-
350   ./   10-   .
SAM D20
32-, 48-   64-   QFN   TQFP.

,
.

SAM D20   8-
32-

Cortex-M0.

SAM D20

SAM D20.   ,

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.   , "   "

.

100%

,

Atmel –

SERCOM.

SPI, UART/USART I ^{2}C.

SERCOM

. SAMD20

I ^{2}C

400 , UART SPI

24 / .

1. SAM D20

	SAM D20E 32	SAM D20G 48	SAM D20J 64
- ,	16–256	16–256	16–256
,	2–32	2–32	2–32
	8	8	8
SERCOM (I²C, USART, SPI)	4	6	6
/	6	6	8
12- , 350 ./	10	14	20
10- , 350 ./	1	1	1
GPIO	26	38	52
	60	120	256

RTC   RTC

?
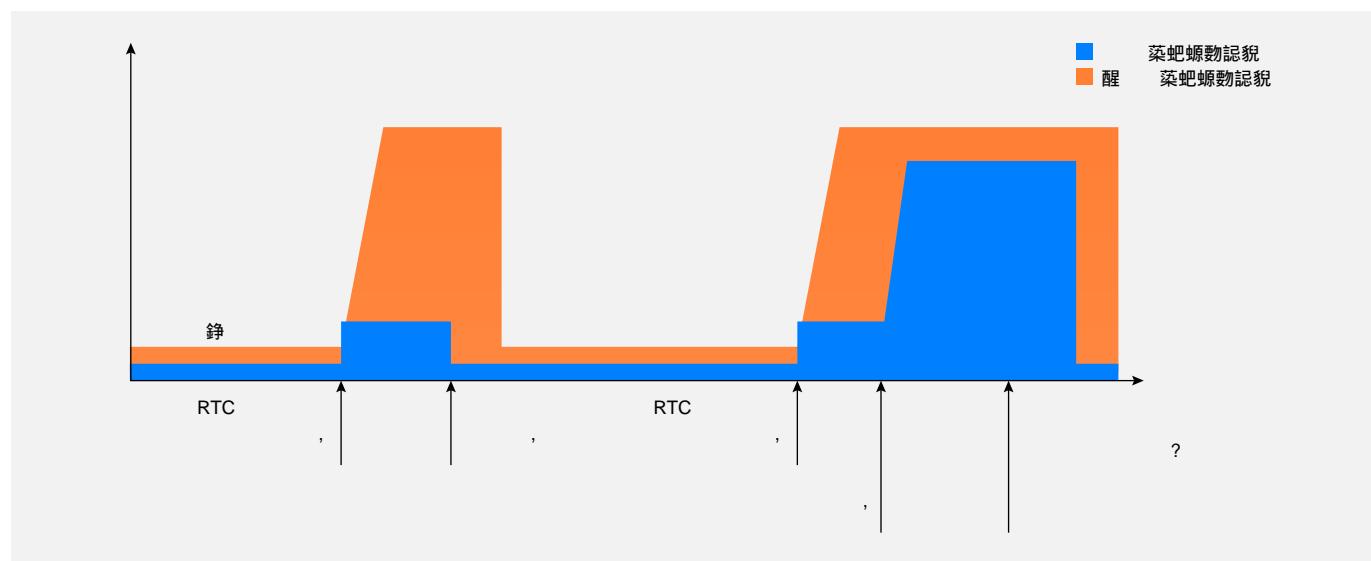
.2.   PTC   SleepWalking

SERCOM

"   ",   .

SleepWalking,
           Atmel.
              ,   –
                    .

      ,   ,
SleepWalking,
      ,   "
        ".
    ,
                   (.2).
"   "

PTC (Peripheral Touch Controller).
         ,   Atmel,
              maxTouch,
      SAM D20
       .
           ,   ,
             ,
        Proximity (
).
     ,   256   .

        , PTC   SAMD20
    (   )
  .

SAM D

                          ,   -
- Atmel   -
-                       Cortex-M0+.
- 2014   :
- SAM D21, SAM D11, SAM D10 [2].
-                  15   35   -
-                   ,   -
           ,   .
-          ,   -
-                   "   "   -
-                      ,   -
           ,   -
-                            -
-                            -
           ,   .

SAM D21, SAM D11   SAM D10
-                       ,   -
           ,   -
-                ,
-                            -
-                  /   .
                 SAM D21   (.2),
-             SAM D20,
-          USB 2.0 Full Speed (Host   Device)   I ^{2}S,
                 (DMA),   -
-         /   ,   -
-                ,
                 SWD
-            .
I ^{2}C   SMBus   PMBus,   -
                          UART

32-

– IrDA.
SAM D21

- Cortex-M0+
.

,

,

- SAM D11 SAM D10 .3.

.

- SAM D –

USB-

RC-

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– ,

,

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- SAM D –

,

USB ,

,

GPIO.

32- Cortex-M0+,

SAM D21 32-,

48- 64- QFN TQFP -

SAM D20,

,

.

SAM D11 SAM D10

SAM D21,

.

SERCOM ,

.

8-

,

2. SAM D21

	SAM D21E 32	SAM D21G 48	SAM D21J 64
- ,	32–256	32–256	32–256
,	4–32	4–32	4–32
	12	12	12
DMA	12	12	12
SERCOM (I²C, USART, SPI)	4	6	6
I²S	2	2	2
USB 2.0 Full Speed (Host/Device)	1	1	1
/	3	3	5
/	3	3	3
12- , 350 ./	10	14	20
10- , 350 ./	1	1	1
GPIO	26	38	54
	48	144	256

Atmel

SAM D

Xplained Pro –
ATSAMD20-XPRO (.3) ATSAMD21-XPRO
SAM D20   SAM D21   .
/   .   ,
, –

micro USB   .
64-

256   ,

.

,

.   Atmel
,

,   /
.
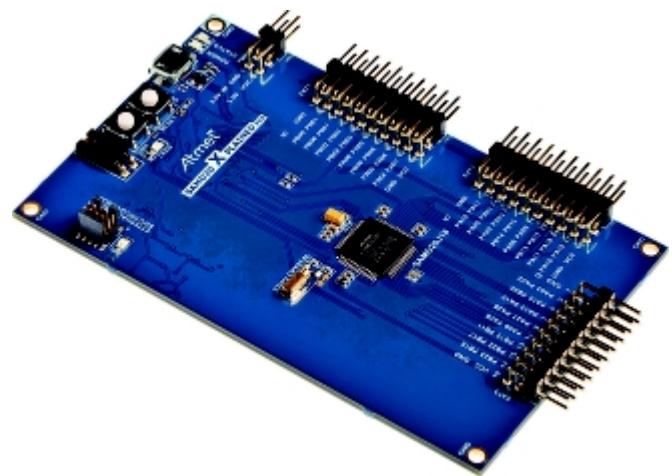
.3.   ATSAMD20-XPRO

Atmel Studio 6

- SAM D   ,   Keil,
- IAR   GCC.   Atmel
- Software Framework (ASF)

3. SAM D11 SAM D10

	SAM D10C SAM D11C 14	SAM D10D SAM D11D 20	SAM D10D SAM D11D 24
- ,	8–16	8–16	8–16
,	4	4	4
	6	6	6
DMA	6	6	6
SERCOM (I²C, USART, SPI)	2	3	3
USB 2.0 Full Speed (Device)	SAM D11	SAM D11	SAM D11
/	2	2	2
/	1	1	1
12- , 350 ./	8	8	10
10- , 350 ./	1	1	1
GPIO	12	18	22
	12	42	72

8- AVR tiny, mega- Xmega-

. ASF Atmel Studio 32- Cortex-M3 -M4,
6 - ,
. , - .
Atmel Studio, SAM D,
Cortex-M0+
GCC, IAR Keil. ,
, , ,
AVR, ,
SAM D -
, AVR. -
STK600 - -
SAM D. ,
ARM Cortex-M0+,
-M3 -M4 (AVR AVR 32)
JTAGICE3. , SAM D -
,
Atmel Studio.   Atmel

8- (AVR) 32- (AVR 32
Cortex-M) – Atmel-ICE.

* * *
, 2014 Atmel -
Cortex-M0+ – SAM D.

1. A.Eieland. Bringing the best of microcontroller innovations to new Cortex-M0+ devices" (-
. ., Rainbow Electronics).
www.atmel.com/Images/45047B_SAM-D-Family-Eieland_Article_021214.pdf.
2. Atmel SAM D Family, , 2014,
.8. www.atmel.com/Images/45037B_SAM%20D%20 Family_E_US_021014_Web.pdf.