

## 4-bit Microcontrollers

### ■ KLCS-47E, 47, 470, 470A Series

#### ■ Features

|                                    | 47E Series                                                                                                                                                                               | 47 Series                                   | 470 Series                                                                                    | 470A Series           |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------|
| Maximum ROM size                   | 4K × 8                                                                                                                                                                                   |                                             | 8K × 8                                                                                        | 16K × 8               |
| Maximum RAM size                   | 256 × 4                                                                                                                                                                                  | 768 × 4                                     | 1024 × 4                                                                                      |                       |
| Minimum instruction execution time | 1.0μs (at 8MHz, V <sub>DD</sub> =2.7V~5.5V)<br>1.3μs (at 8MHz, V <sub>DD</sub> =4.5V~5.5V)<br>1.9μs (at 8MHz, V <sub>DD</sub> =2.7V~5.5V)<br>3.2μs (at 8MHz, V <sub>DD</sub> =2.7V~5.5V) | 1.9μs (at 4.2MHz, V <sub>DD</sub> =4.5V~6V) | 1.3μs (at 6MHz, V <sub>DD</sub> =4.5V~5.5V)<br>244μs (at 32.8MHz, V <sub>DD</sub> =2.7V~5.5V) |                       |
| Number of instructions             | 90                                                                                                                                                                                       |                                             | 92                                                                                            | 105                   |
| Number of interrupts               | 5/6                                                                                                                                                                                      | 6                                           |                                                                                               |                       |
| Packages                           | DIP16~20    SOP16~28<br>SDIP28~42    SSOP30<br>QFP44                                                                                                                                     | SDIP30~42<br>QFP44~80                       | SDIP28~64<br>QFP44~100                                                                        | SDIP42~64<br>QFP44~80 |

#### ■ Basic functions

- Instructions: maximum 105, minimum instruction execution time: 1.0μs
- ROM table look-up instruction
- 5-bit to 8-bit data conversion instruction
- Subroutine nesting: maximum 15 levels
- Interrupt sources: 2 external, 4 internal
- Interval timer
- Serial interface

#### ■ Additional functions

- VFT driver
- LCD driver
- LED driver
- Hold function (low power consumption mode)
- Multi-pin input/output
- D/A conversion (PWM) output
- A/D conversion input
- A/D converter input
- E<sup>2</sup>PROM
- 16-bit high-speed event counter
- On-screen display circuit
- DTMF generator
- DTMF receiver
- Watchdog timer
- Pulse generator
- Remote control pulse detector
- High-speed timer/counter
- Dual clock system
- One-time PROM

## 4-bit Microcontrollers

### KLCS-47E, 47 Series Selection Guide

| ROM<br>(byte) | RAM<br>(nibbles) | Product No      | Driver |     |     | SIO<br>8-bit<br>4-bit | A/D<br>conversion<br>input | Pulse output<br>PPG<br>PWM | Remote control<br>pulse detector | Watchdog<br>timer | High-speed event counter | DTMF generator | OSD<br>Bar display | Dual clock | Hold function | Package  |           | OTP type | Minimum operating voltage<br>(● : 2.7V, ○ : 2.2V) |
|---------------|------------------|-----------------|--------|-----|-----|-----------------------|----------------------------|----------------------------|----------------------------------|-------------------|--------------------------|----------------|--------------------|------------|---------------|----------|-----------|----------|---------------------------------------------------|
|               |                  |                 | LED    | LCD | VFT |                       |                            |                            |                                  |                   |                          |                |                    |            |               | QFP(SOP) | QFP(SSOP) |          |                                                   |
| 1k            | 64               | KMP47C101P/M    | 4      |     |     |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 16       | 16        | ●        | ●                                                 |
|               |                  | KMP47C102P/M    | 4      |     |     |                       |                            |                            |                                  | ●                 |                          |                |                    |            | ●             | 20       | 20        | ●        | ●                                                 |
|               |                  | KMP47C103N/M    | 8      |     |     | 1                     |                            |                            |                                  | ●                 |                          |                |                    |            | ●             | 28       | 28        | ●        | ●                                                 |
|               |                  | † KMP47E187M    |        |     |     |                       |                            |                            |                                  | ●                 |                          |                |                    |            | ●             | 16       |           | ●        | ●                                                 |
|               |                  | † KMP47E186M    |        |     |     |                       |                            |                            |                                  | ●                 |                          |                |                    |            | ●             | 16       |           | ●        | ●                                                 |
| 2k            | 128              | KMP47C201P/M    | 4      |     |     |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 16       | 16        | ●        | ●                                                 |
|               |                  | KMP47C202P/M    | 4      |     |     |                       |                            |                            |                                  | ●                 |                          |                |                    |            | ●             | 20       | 20        | ●        | ●                                                 |
|               |                  | KMP47C203N/M    | 8      |     |     | 1                     |                            |                            |                                  | ●                 |                          |                |                    |            | ●             | 28       | 28        | ●        | ●                                                 |
|               |                  | KMP47C200BN/BF  | 8      |     | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 42       | 44        | ●        | ●                                                 |
|               |                  | * KMP47C206P/M  | 5      |     |     |                       |                            | 1                          | ●                                |                   |                          |                |                    |            | ●             | 20       | 20        | ●        |                                                   |
|               |                  | KMP47C210AN/AF  |        | 20  | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 42       | 44        | ●        |                                                   |
|               |                  | KMP47C212AN     |        | 20  | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 42       |           |          |                                                   |
|               |                  | KMP47C231AN     | 8      |     |     | 1                     | 5                          |                            | ●                                |                   |                          |                |                    |            | ●             | 30       |           |          |                                                   |
|               |                  | KMP47C233AN     | 8      |     |     |                       | 1                          |                            |                                  |                   |                          |                |                    |            | ●             | 42       |           |          |                                                   |
|               |                  | KMP47C241N/M    | 5      |     | 1   | 4                     |                            |                            | ●                                |                   |                          |                |                    |            | ●             | 28       | 28        | ●        | ●                                                 |
|               |                  | KMP47C242BN     | 8      |     |     | 4                     |                            | 1                          | ●                                |                   |                          |                |                    |            | ●             | 30       |           | ●        | ●                                                 |
|               |                  | KMP47C243N/M/DM | 8      |     |     | 1                     | 8                          | 1                          | ●                                |                   |                          |                |                    |            | ●             | 28       | 28        | ●        | ●                                                 |
|               | 192              | KMP47C221ADF    | 24     |     | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             |          |           | ●        |                                                   |
|               |                  | KMP47C222N/F    | 20     |     |     | 1                     | 4                          | 1                          | ●                                |                   |                          |                |                    | ●          | ●             | 42       | 44        | ●        | ●                                                 |
|               |                  | KMP47C400BN/BF  | 8      |     | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 42       | 44        | ●        | ●                                                 |
|               |                  | KMP47C410AN/AF  |        | 20  | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 42       | 44        | ●        |                                                   |
| 4k            | 256              | KMP47C412AN     |        | 20  | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             | 42       |           |          |                                                   |
|               |                  | KMP47C421ADF    | 24     |     | 1   |                       |                            |                            |                                  |                   |                          |                |                    |            | ●             |          | 64        | ●        |                                                   |
|               |                  | KMP47C422N/F    | 20     |     |     | 1                     | 4                          | 1                          | ●                                |                   |                          |                |                    | ●          | ●             | 42       | 44        | ●        | ●                                                 |
|               |                  | KMP47C423ADF    | 24     |     | 1   |                       |                            | 1                          |                                  | 1                 |                          |                |                    |            | ●             |          | 64        |          |                                                   |
|               |                  | KMP47C433AN     | 8      |     |     |                       | 1                          |                            |                                  |                   |                          |                |                    |            | ●             | 42       |           |          |                                                   |
|               |                  | KMP47C440BN/BF  | 8      |     | 1   |                       | 8                          |                            | ●                                |                   |                          |                |                    |            | ●             | 42       | 44        | ●        |                                                   |
|               |                  | KMP47C441AN/AF  |        | 16  | 1   | 4                     |                            |                            | ●                                |                   |                          |                |                    |            | ●             | 42       | 44        | ●        |                                                   |
|               |                  | KMP47C443N/M/DM | 8      |     |     | 1                     | 8                          | 1                          | ●                                |                   |                          |                |                    |            | ●             | 28       | 28        | ●        | ●                                                 |
|               |                  | KMP47C446ADF    | 24     |     | 1   | 4                     |                            |                            | ●                                |                   |                          |                |                    | ●          |               | 64       |           | ●        |                                                   |
|               |                  | * † KMP47E486M  |        |     |     |                       |                            |                            | ●                                |                   |                          |                |                    |            | ●             | 28       |           | ●        | ●                                                 |
|               |                  | * † KMP47E487M  |        |     |     |                       |                            |                            | ●                                |                   |                          |                |                    |            | ●             | 28       |           | ●        | ●                                                 |
|               | 768              | KMP47C407AN/AF  |        |     | 1   |                       |                            | 1                          |                                  |                   | ●                        |                |                    |            | ●             | 42       | 44        | ●        | ●                                                 |
|               |                  | KMP47C451BN     |        |     |     |                       |                            | 1                          |                                  |                   | ●                        |                |                    |            | ●             | 30       |           | ●        | ●                                                 |
|               |                  | KMP47C452BN/BF  |        |     | 1   |                       |                            | 1                          |                                  |                   | ●                        |                |                    |            | ●             | 42       | 44        | ●        | ●                                                 |
|               |                  | KMP47C453AN/AF  |        |     | 1   |                       |                            | 1                          |                                  |                   | ●                        |                |                    |            | ●             | 42       | 44        | ●        | ●                                                 |
|               |                  | KMP47C454AN     |        |     |     |                       |                            | 1                          |                                  |                   | ●                        |                |                    |            | ●             | 30       |           | ●        | ●                                                 |
|               |                  | KMP47C456ADF    | 32     |     | 1   |                       |                            | 1                          | ●                                |                   | ●                        |                |                    | ●          |               | 80       |           | ●        | ●                                                 |

\* : Under development † : USP4, 382, 279 owned by BULL CPU8

## 4-bit Microcontrollers

### KLCS-47E Series

| Product No      | Function                             | ROM (bytes) | RAM (nibbles) | I/O port | Minimum instruction execution time (μs) | Power Supply Voltage (V) | Package             | Built-in One-time PROM product |
|-----------------|--------------------------------------|-------------|---------------|----------|-----------------------------------------|--------------------------|---------------------|--------------------------------|
| KMP47C101P/M    | LED driver                           | 1k          | 64            | 11       | 1.3                                     | 2.2 to 5.5 (note2)       | DIP16 SOP16         | KMP47P201VP                    |
| KMP47C201P/M    |                                      | 2k          | 128           |          |                                         |                          |                     |                                |
| KMP47C102P/M    |                                      | 1k          | 64            | 15       | 1.0                                     | 4.0~5.7                  | DIP20 SOP20         | KMP47P202VP/VM                 |
| KMP47C202P/M    |                                      | 2k          | 128           |          |                                         |                          |                     |                                |
| KMP47C206P/M    |                                      |             |               |          |                                         |                          | DIP20 SOP20         | TMP47P206VP/VM                 |
| KMP47C103N/M    | 8-bit SIO                            | 1k          | 64            | 23       | 1.3                                     | 2.2 to 5.5 (note2)       | SDIP28 SOP28        | KMP47P403VN/VM                 |
| KMP47C203N/M    |                                      |             |               |          |                                         |                          |                     |                                |
| KMP47C241N/M    | A/D converter                        | 2k          | 128           | 21       | 1.0                                     | 2.2 to 5.5 (note 2)      | SDIP28 SOP28 SSOP30 | KMP47P241VN/VM                 |
| KMP47C243N/M/DM |                                      |             |               |          |                                         |                          |                     |                                |
| KMP47C443N/M/DM | A/D converter 8-bit SIO pulse output | 4k          | 256           | 23       | 1.0                                     | 2.2 to 5.5 (note 2)      |                     | KMP47P443VN/VM/VDM             |
| KMP47C222N/F    | LCD driver                           | 2k          | 192           | 22       | 1.0 (244)                               | 2.2 to 5.5               | SDIP42 QFP44        | KMP47P422VN/VF                 |
| KMP47C422N/F    |                                      | 4k          | 256           |          |                                         |                          |                     |                                |
| *† KMP47E186M   | E <sup>2</sup> PROM (16byte), SPI    | 1k          | 64            | 11       | 1.3                                     | 2.0 to 5.5 (note 3)      | SOP16               | KMP47P186M(note 4)             |
| KMP47E187M      | E <sup>2</sup> PROM (16byte), SPI    | 1k          | 64            | 11       | 1.3                                     | 2.0 to 5.5 (note 3)      | SOP16               | KMP47P187M                     |
| *† KMP47E486M   | E <sup>2</sup> PROM                  | 4k          | 256           | 21       | 1.3                                     | 2.7 to 5.5               | SOP28               | KMP47W486M                     |
| *† KMP47E487M   | E <sup>2</sup> PROM                  | 4k          | 256           | 21       | 1.3                                     | 2.7 to 5.5               | SOP28               | KMP47W487M                     |

\* : Under development

† : USP4, 382, 279 owned by BULL CPU8

Note1 : ( ) ; the minimum instruction execution time when low-frequency clock is used.

Note2 : OTP built-in Type is under consideration for high-temperature range/high-quality applications.

Note3 : 2.7 to 5.5V when oscillator is connected, 2.0 to 3.4V during CR oscillation.

Note4 : KMP47P186M (CR oscillation), KMP47P187M (oscillator version)

### KLCS-47 Series

| Product No     | Function                                     |                                                                    | ROM<br>(bytes) | RAM<br>(nibbles) | I/O<br>port | Minimum<br>instruction<br>execution<br>time (μs) | Power<br>Supply<br>Voltage<br>(V) | Package                     | Built-in One-time<br>PROM product |
|----------------|----------------------------------------------|--------------------------------------------------------------------|----------------|------------------|-------------|--------------------------------------------------|-----------------------------------|-----------------------------|-----------------------------------|
| KMP47C200BN/BF | Standard (LED driver)                        |                                                                    | 2k             | 128              | 36          | 1.9                                              | 2.7 to 6.0                        | SDIP42<br>QFP44             | KMP47P400VN/VF                    |
| KMP47C400BN/BF |                                              |                                                                    | 4k             | 256              |             |                                                  |                                   |                             |                                   |
| KMP47C210AN/AF | VFT driver                                   |                                                                    | 2k             | 128              | 36          | 1.9                                              | 4.5 to 6.0                        | SDIP42<br>QFP44             | KMP47P410AN/AF                    |
| KMP47C410AN/AF |                                              |                                                                    | 4k             | 256              |             |                                                  |                                   |                             |                                   |
| KMP47C212AN    |                                              |                                                                    | 2k             | 128              | 35          | SDIP42                                           |                                   | -                           |                                   |
| KMP47C412AN    |                                              |                                                                    | 4k             | 256              |             |                                                  |                                   |                             |                                   |
| KMP47C221ADF   | LCD driver                                   |                                                                    | 2k             | 192              | 28          | 1.9                                              | 4.5 to 6.0                        | QFP64                       | KMP47P421ADF                      |
| KMP47C421ADF   |                                              |                                                                    | 4k             | 256              |             |                                                  |                                   |                             |                                   |
| KMP47C423ADF   |                                              |                                                                    |                |                  |             |                                                  |                                   | High-speed<br>event counter |                                   |
| KMP47C231AN    | D/A conversion<br>(PWM) output<br>LED driver | 4-bit A/D<br>conversion input,<br>remote control<br>pulse detector | 2k             | 128              | 24          | 1.9                                              |                                   | 2.7 to 6.0                  | SDIP30                            |
| KMP47C233AN    |                                              | 3-bit A/D<br>conversion input                                      |                |                  | 36          |                                                  | SDIP42                            |                             |                                   |
| KMP47C433AN    |                                              |                                                                    | 4k             | 256              |             |                                                  |                                   |                             |                                   |
| KMP47C242BN    | A/D converter,<br>watchdog timer             | LED driver                                                         | 2k             | 128              | 23          | 1.9 (244)                                        | 2.7 to 6.0                        |                             | SDIP30                            |
| KMP47C440AN/AF |                                              |                                                                    | VFT driver     | 256              | 34          |                                                  |                                   | 4.5 to 6.0                  | SDIP42<br>QFP44                   |
| KMP47C441AN/AF |                                              | LCD driver                                                         |                |                  |             |                                                  | 24                                |                             | QFP64                             |
| ☆ KMP47C446ADF |                                              |                                                                    |                |                  |             |                                                  |                                   |                             |                                   |
| KMP47C451BN    | DTMF generator                               |                                                                    | 4k             | 768              | 23          | 16.7                                             | 2.2 to 6.0                        | SDIP30                      | KMP47P451VN                       |
| KMP47C452BN/BF |                                              |                                                                    |                |                  | 35          |                                                  |                                   | 8.3                         | SDIP42<br>QFP44                   |
| KMP47C453AN/AF |                                              |                                                                    |                |                  | 23          | 2.1                                              | SDIP30                            | KMP47P453VN/VF              |                                   |
| KMP47C454AN    |                                              |                                                                    |                |                  | 35          |                                                  |                                   | 2.7 to 6.0                  | SDIP42<br>QFP44                   |
| KMP47C407AN/AF |                                              |                                                                    |                |                  | LCD driver  | 34                                               | 8.3 (244)                         | QFP80                       | -                                 |
| KMP47C456ADF   |                                              |                                                                    |                |                  |             |                                                  |                                   |                             |                                   |

Note : ( ) ; the minimum instruction execution time when low-frequency clock is used.

☆ : These package types will be delivered in the short lead length package.

Type suffix P : Plastic dual in-line package (DIP)

M : Plastic small outline package (SOP)

N : Plastic shrink dual in-line package (SDIP)

E : Ceramic shrink dual in-line package (SDIC)

F : Plastic flat package (QFP)

G : Ceramic standard flat package (QFC)

## 4-bit Microcontrollers

### KLCS-470A Series

| Product No    | Function                                                                                                          | ROM (bytes) | RAM (nibbles) | I/O port | Minimum instruction execution time (μs) | Power Supply Voltage (V) | Package      | Built-in One-time PROM product |        |              |
|---------------|-------------------------------------------------------------------------------------------------------------------|-------------|---------------|----------|-----------------------------------------|--------------------------|--------------|--------------------------------|--------|--------------|
| KMP47C623F    | LCD driver (24 to 20×4), High-speed event counter                                                                 | 6k          | 384           | 32 to 28 | 1.3 (244)                               | 4.5 to 6.0               | QFP64        | KMP47P823VF                    |        |              |
| KMP47C823F    |                                                                                                                   | 8k          | 512           |          |                                         |                          |              |                                |        |              |
| KMP47C1220F   | LCD driver (32×4), High-speed timer/counter                                                                       | 12k         | 768           | 36       |                                         |                          | SDIP42       | KMP47P1620VF                   |        |              |
| KMP47C1620F   |                                                                                                                   | 16k         |               |          |                                         |                          |              |                                |        |              |
| KMP47C637N    | On-screen display circuit, D/A conversion (PWM) output, 4-bit A/D conversion input, Remote control pulse detector | 6k          | 384           | 32       |                                         |                          | SDIP42       | KMP47P1637VN                   |        |              |
| KMP47C837N    |                                                                                                                   | 8k          |               |          |                                         |                          |              |                                |        |              |
| KMP47C1237N   |                                                                                                                   | 12k         |               |          |                                         |                          |              |                                |        |              |
| KMP47C1637N   |                                                                                                                   | 16k         | 512           | 41       |                                         |                          |              |                                | SDIP54 | KMP47P1638VN |
| KMP47C1238AN  |                                                                                                                   | 12k         |               |          |                                         |                          |              |                                |        |              |
| KMP47C1638AN  |                                                                                                                   | 16k         |               |          |                                         |                          |              |                                |        |              |
| KMP47C853N/F  | DTMF generator                                                                                                    | 8k          | 1024          | 35       | 8.3 (244)                               | 2.2 to 6.0               | SDIP42 QFP44 | KMP47P853VN/VF                 |        |              |
| KMP47C457N/F  |                                                                                                                   | 4k          | 768           |          | 2.1 (244)                               | 2.7 to 6.0               |              | KMP47P857VN/VF                 |        |              |
| KMP47C857N/F  |                                                                                                                   | 8k          | 1024          |          |                                         |                          |              |                                |        |              |
| KMP47C1260N/F | A/D converter (8bits×8ch), Remote control pulse detector, LED driver                                              | 12k         | 768           | 56       | 1.3 (244)                               | 4.5 to 6.0               | SDIP64 QFP64 | KMP47P1660VN/VF                |        |              |
| KMP47C1660N/F |                                                                                                                   | 16k         |               |          |                                         |                          | SDIP64       | KMP47P1670VN                   |        |              |
| KMP47C1270AN  | 12k                                                                                                               | 53          |               |          |                                         |                          |              |                                |        |              |
| KMP47C1670AN  | 16k                                                                                                               |             |               |          |                                         |                          |              |                                |        |              |

note : ( ) ; the minimum instruction execution time when low-frequency clock is used.

Type N : Plastic shrink dual in-line package (SDIP) E : Ceramic shrink dual in-line package (SDIC)

F : Plastic flat package (QFP)

G : Ceramic standard flat package (QFC)

### KLCS-47E, 47, 470 series (Wide-temperature range/High-quality products)

| Product No     | Function                                                                                                   | ROM (bytes) | RAM (nibbles) | I/O port | Minimum instruction execution time (μs) | Power Supply Voltage (V) | Operating temperature (°C) | Package      | Built-in One-time PROM product (note 2) |
|----------------|------------------------------------------------------------------------------------------------------------|-------------|---------------|----------|-----------------------------------------|--------------------------|----------------------------|--------------|-----------------------------------------|
| * KMP47C101WP  | LED driver                                                                                                 | 1k          | 64            | 11       | 1.3                                     | 2.2 to 5.5 (note 3)      | -40 to 110                 | DIP16        | KMP47P201VP                             |
| * KMP47C201WP  |                                                                                                            | 2k          | 128           |          |                                         |                          | -40 to 110                 | SOP16        |                                         |
| † KMP47E186M   | E <sup>2</sup> PROM (16 bytes), SPI                                                                        | 1k          | 64            |          |                                         | (note 4)                 | -40 to 85                  | SOP16        | KMP47P186M (note 5)                     |
| KMP47E187M     | E <sup>2</sup> PROM (16 bytes), SPI                                                                        | 1k          | 64            |          |                                         | (note 4)                 | -40 to 85                  | SOP16        | KMP47P187M                              |
| KMP47C241IN/TM | A/D converter LED driver                                                                                   | 2k          | 128           | 21       |                                         | 2.7 to 6.0               | -40 to 85                  | SDIP28 SOP28 | KMP47P241VN/VM KMP47P241VN              |
| KMP47C241WM    |                                                                                                            |             |               |          |                                         |                          | -40 to 110                 |              |                                         |
| † KMP47E885IF  | E <sup>2</sup> PROM (64 bytes), PWM, UART A/D converter 16-bit timer/counter Input Capture, Output compare | 8k          | 512           | 36       |                                         | 4.5 to 5.5               | -40 to 85                  | QFP44        | KMP47P885F                              |
| † KMP47E885WF  |                                                                                                            |             |               |          |                                         |                          | -40 to 110                 |              |                                         |

\* : Under development

† : USP4, 382, 279 owned by BULL CP8

Type suffix

P : Plastic dual in-line package (DIP)

M : Plastic small outline package (SOP)

N : Plastic shrink dual in-line package (SDIP)

F : Plastic flat package (QFP)

note 1 : If there is any further information you require when considering I/W version products, please contact our sales representative.

note 2 : OTP built-in type is under consideration for high-temperature range/high-quality applications.

note 3 : During CR oscillation (2.7 to 5.5V when oscillator is connected).

note 4 : 2.7 to 5.5V when oscillator is connected, 2.0 to 3.4V during CR oscillation.

note 5 : KMP47P186M (CR oscillation), KMP47P187M (oscillator version)