

# IZ12291M

## 10-DIGITS CALCULATOR

The IZ12291M is a single chip CMOS LSI with 10-digit arithmetic operation, single memory, extraction-of-square-root, percentage calculation, auto power off and punctuation, designed for FEM LCD operation with a 1.5V power supply.

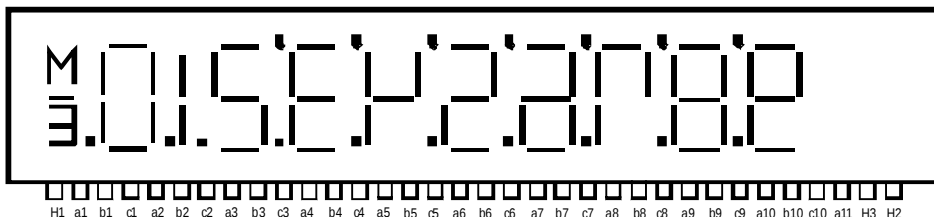
### FUNCTIONS

- Four standard functions (+, -, ×, ÷)
- Square and reciprocal calculations
- Extraction of square root
- Auto constant calculations (constant: multiplicand, divisor, addend and subtrahend)
- Mark-up and mark-down calculations
- Percentage calculations
- Chain multiplication and division
- Power calculations
- Rough estimate calculations
- Punctuation comma and touch tone mark display
- Clear key: ON/C, CE

### FEATURES

- Single chip CMOS construction
- Floating decimal point
- LCD direct drive
- Overflow indication: "E"
- On chip oscillator components
- Auto Power off
- Accumulating memory: M+, M-, MR, MC, MRC
- Bare chip is available
- Mirror type

### LCD CONNECTION



### ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub> = 25°C)

| Characteristic        | Symbol           | Value                         | Unit |
|-----------------------|------------------|-------------------------------|------|
| Terminal Voltage      | V <sub>CC</sub>  | - 0.3 ~ + 2.1                 | V    |
|                       | V <sub>IN</sub>  | - 0.3 ~ V <sub>CC</sub> + 0.3 | V    |
| Operating Temperature | T <sub>a</sub>   | 0 ~ + 50                      | °C   |
| Storage Temperature   | T <sub>stg</sub> | - 55 ~ + 125                  | °C   |

### ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25°C, V<sub>CC</sub> = 1.5V, unless otherwise specified)

| Characteristic                    | Symbol           | Test Condition                                   | Min                   | Typ | Max | Unit |
|-----------------------------------|------------------|--------------------------------------------------|-----------------------|-----|-----|------|
| Operating Voltage                 | V <sub>OP</sub>  |                                                  | 1.1                   | 1.5 | 1.8 | V    |
| Input Voltage (pins FDISB, EXT)   | V <sub>IH</sub>  |                                                  | V <sub>CC</sub> - 0.4 |     |     | V    |
|                                   | V <sub>IL</sub>  |                                                  |                       |     | 0.4 |      |
| Input Current 1 (pins FDISB, EXT) | I <sub>IH1</sub> | V <sub>IN</sub> = V <sub>CC</sub>                |                       |     | 1   | μA   |
|                                   | I <sub>IL1</sub> | V <sub>IN</sub> = 0V                             | 1.5                   | 2.5 | 3   |      |
| Input Current 2                   | I <sub>IH2</sub> | V <sub>IN</sub> = V <sub>CC</sub> ; APODISB = 0V |                       |     | 1   | μA   |

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| Characteristic                                               | Symbol    | Test Condition                  | Min  | Typ  | Max  | Unit    |
|--------------------------------------------------------------|-----------|---------------------------------|------|------|------|---------|
| (pins K4 ÷ K6)                                               | $I_{IL2}$ | $V_{IN} = 0V$ ; $F_{DISB} = 0V$ | 3    | 5.5  | 7.5  |         |
| Output Voltage<br>(pins a1÷a11,<br>b1÷b10,<br>c1÷c10, H1÷H3) | $V_{OA}$  | Without load                    | 2.80 | 2.95 |      | V       |
|                                                              | $V_{OB}$  | Without load                    | 1.30 | 1.50 | 1.70 |         |
|                                                              | $V_{OC}$  | Without load                    |      | 0    | 0.20 |         |
| Display<br>Frequency<br>Supply Current                       | $F_d$     | $V_{CC} = 1.3V$ , Display is on | 55   | 75   |      | Hz      |
|                                                              | $I_{OFF}$ | Display is off                  |      |      | 1    | $\mu A$ |
|                                                              | $I_{DIS}$ | $V_{CC} = 1.3V$ , Display is on |      | 6    | 10   |         |

### FUNCTIONAL DESCRIPTION

#### Decimal point system

Complete floating decimal point system.

#### Integral number

10 digits leading zero suppression. Zero shift.

**Symbols**

- : negative number display
- E : error display
- , : punctuation comma

#### Error detections

##### • System errors occur when:

- 1) The division by zero.
- 2) The extraction of square root of a negative number.
- 3) The integral part of any memory calculation result exceeds 10 digits.

##### • Rough estimate calculation error occur when

The integral part of any calculation – any standard functions, percentage, square root, reciprocal or power calculations result exceeds 10 digits.

#### Error indication

##### • System error

“0” is indicated in the 1-digit position and “E” in the sign-digit position.

##### • Rough estimate calculation error

The high-order 10-digit calculation result is indicated together with “E”.

The decimal point is indicated if the position corresponding to a calculation result of time  $10^{-10}$ , and no zero shift is performed

#### Error release

##### • System error

A system error can be release by the ON/C key.

##### • Rough estimate calculation error

ON/C key can release a rough estimate-calculation error and clear calculation result at once. CE key can release only a rough estimate calculation error (“E” flag).

#### Number entry

Numericals can be entered up to 10 digits. Numerical entries equal to 11 digits or more are ignored.

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## Memory protection

In any error detection, the memory contents present before the error detection are protected.

## Memory indication

If the memory content is not zero, "M" is indicated in the sign-digit position.

## Key bounce protection

### Front edge

Minimum 3 words

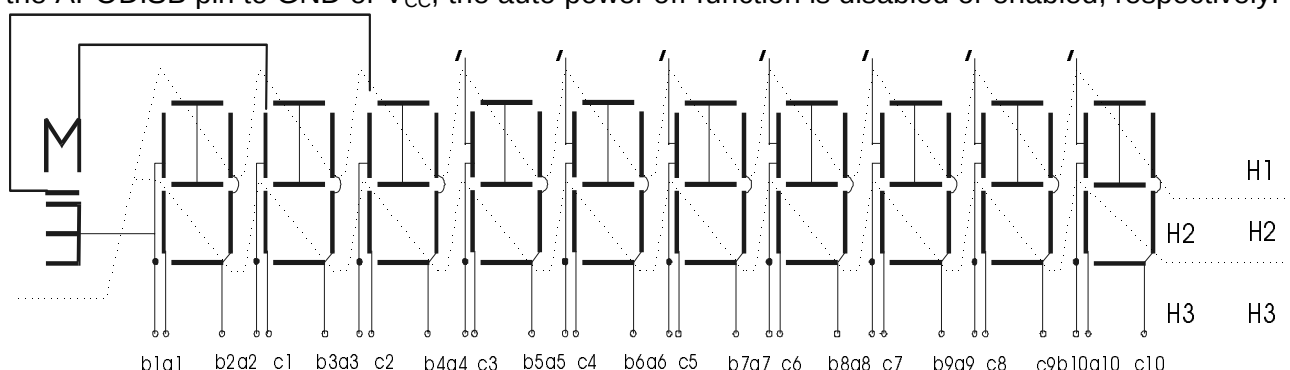
### Trailing edge

Minimum 16 words

1 word is 3.3ms when display frequency is  $F_d = 100\text{Hz}$ .

## Auto power OFF

Power automatically turns off after 7 - 8 minutes pass from the last key pressure. By connecting the APODISB pin to GND or  $V_{CC}$ , the auto power off function is disabled or enabled, respectively.



## Mirror LCD with IZ12291M

## CLEAR KEY DESCRIPTION

### ON/C key

- Power-on function.
- All operations are cleared by the ON/C key (except memory contents).

### CE key

- CE key can edit the last operand or operator.

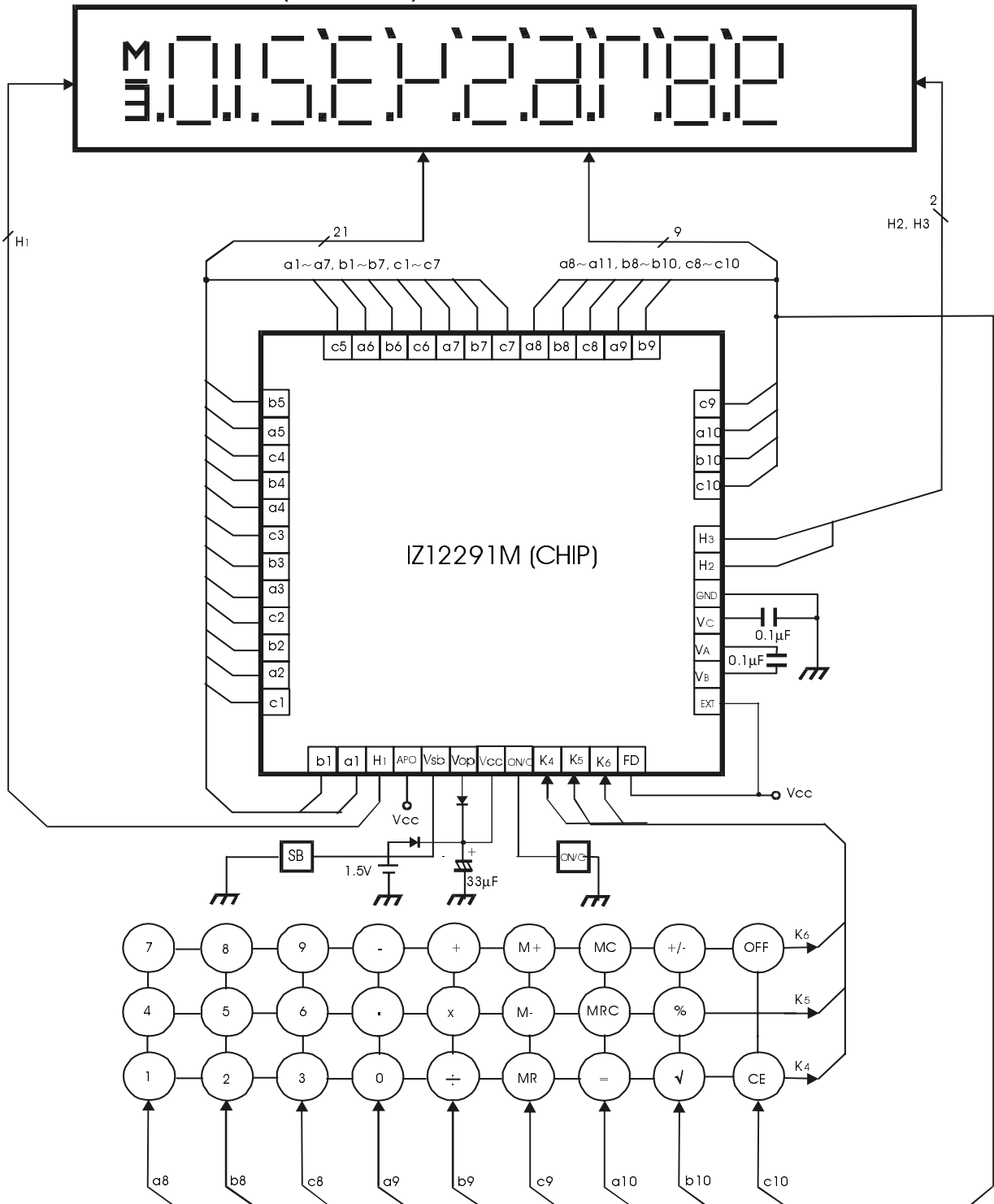
## MARK-UP AND MARK-DOWN CALCULATION

| ENTRY |          | DISPLAY        |                              |
|-------|----------|----------------|------------------------------|
| A     | A        | A              | A                            |
| +/-   | $\times$ | A              | A                            |
| B     | B        | B              | B                            |
| %     | %        | $A \pm AM/100$ | $AM/100$                     |
|       | + OR -   |                | $AM/100$                     |
|       | =        |                | $A + AM/100$ OR $A - AM/100$ |

Note: AM: AMOUNT

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## APPLICATION CIRCUIT (mirror LCD)



NOTE1:

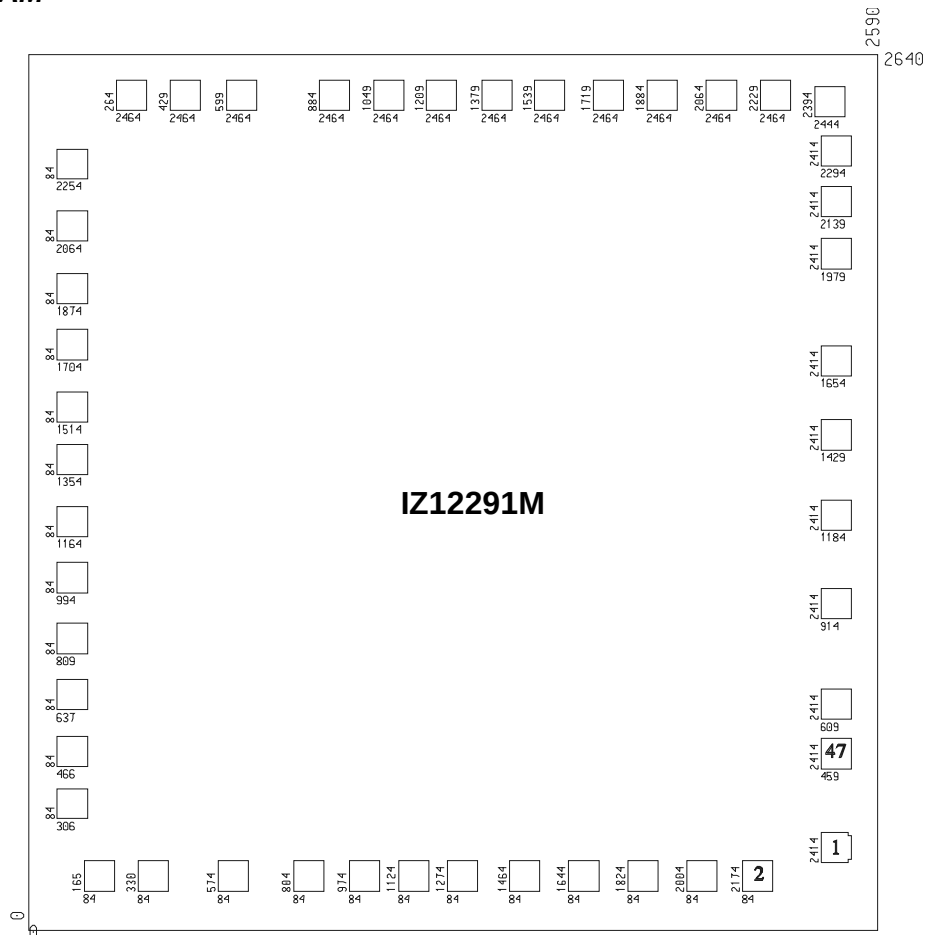
AUTO POWER OFF CONDITION

SB: Solar Battery

|           |                 |         |
|-----------|-----------------|---------|
| APODISB   | V <sub>CC</sub> | GND     |
| APO STATE | ENABLE          | DISABLE |

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## PAD DIAGRAM



## PAD LOCATION

| Pad No. | Pad Name        | Description              | Pad No. | Pad Name | Description    | Pad No. | Pad Name       | Description        |
|---------|-----------------|--------------------------|---------|----------|----------------|---------|----------------|--------------------|
| 1       | EXT             | External Clock           | 17      | c2       | Display output | 33      | a8             | Display output     |
| 2       | FD              | F <sub>OSC</sub> Disable | 18      | a3       | Display output | 34      | b8             | Display output     |
| 3       | K6              | Key input                | 19      | b3       | Display output | 35      | c8             | Display output     |
| 4       | K5              | Key input                | 20      | c3       | Display output | 36      | a9             | Display output     |
| 5       | K4              | Key input                | 21      | a4       | Display output | 37      | b9             | Display output     |
| 6       | ON/C            | Key Input                | 22      | b4       | Display output | 38      | c9             | Display output     |
| 7       | V <sub>CC</sub> | Power Supply             | 23      | c4       | Display output | 39      | a10            | Display output     |
| 8       | V <sub>OP</sub> | Solar battery            | 24      | a5       | Display output | 40      | b10            | Display output     |
| 9       | V <sub>SB</sub> | Option Pin               | 25      | b5       | Display output | 41      | c10            | Display output     |
| 10      | APO             | APO Disable              | 26      | c5       | Display output | 42      | H3             | COM3               |
| 11      | H1              | COM1                     | 27      | a6       | Display output | 43      | H2             | COM2               |
| 12      | a1              | Display output           | 28      | b6       | Display output | 44      | GND            | Ground             |
| 13      | b1              | Display output           | 29      | c6       | Display output | 45      | V <sub>C</sub> | Capacitor terminal |
| 14      | c1              | Display output           | 30      | a7       | Display output | 46      | V <sub>A</sub> | Capacitor terminal |
| 15      | a2              | Display output           | 31      | b7       | Display output | 47      | V <sub>B</sub> | Capacitor terminal |
| 16      | b2              | Display output           | 32      | c7       | Display output |         |                |                    |

APO: Output Power OFF



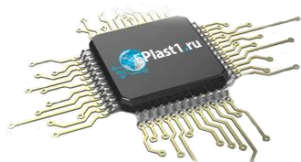
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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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