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.

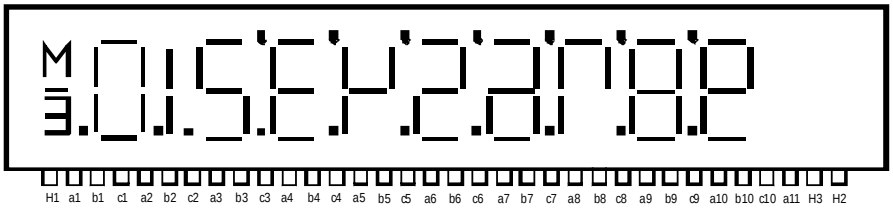
FUNCTIONS

- 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 ($T_a = 25^oC$)

Characteristic	Symbol	Value	Unit
Terminal Voltage	V_{CC}	- 0.3 ~ + 2.1	V
	V_{IN}	- 0.3 ~ V_{CC} + 0.3	V
Operating Temperature	T_a	0 ~ + 50	^oC
Storage Temperature	T_{stg}	- 55 ~ + 125	^oC

ELECTRICAL CHARACTERISTICS ($T_a = 25^oC$, $V_{CC} = 1.5V$, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	V_{OP}		1.1	1.5	1.8	V
Input Voltage (pins FDISB, EXT)	V_{IH}		V_{CC} - 0.4			V
	V_{IL}				0.4	
Input Current 1 (pins FDISB, EXT)	I_{IH1}	$V_{IN} = V_{CC}$			1	µA
	I_{IL1}	$V_{IN} = 0V$	1.5	2.5	3	
Input Current 2	I_{IH2}	$V_{IN} = V_{CC}$; APODISB = 0V			1	µA

INTEGRAL

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
(pins K4 ÷ K6)	I_{IL2}	V_{IN} = 0V; FDISB = 0V	3	5.5	7.5	
Output Voltage	V_{OA}	Without load	2.80	2.95		
(pins a1÷a11, b1÷b10,	V_{OB}	Without load	1.30	1.50	1.70	V
c1÷c10, H1÷H3)	V_{OC}	Without load		0	0.20	
Display Frequency	F_d	V_{CC} = 1.3V, Display is on	55	75		Hz
Supply Current	I_{OFF}	Display is off			1	µA
	I_{DIS}	V_{CC} = 1.3V, Ddisplay 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.

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

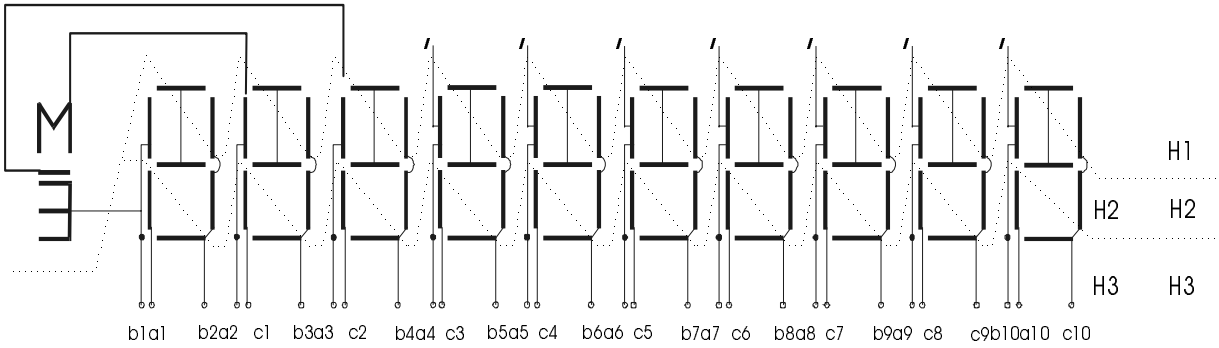
Trailing edge

Minimum 16 words

1 word is 3.3ms when display frequency is F_d = 100Hz.

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

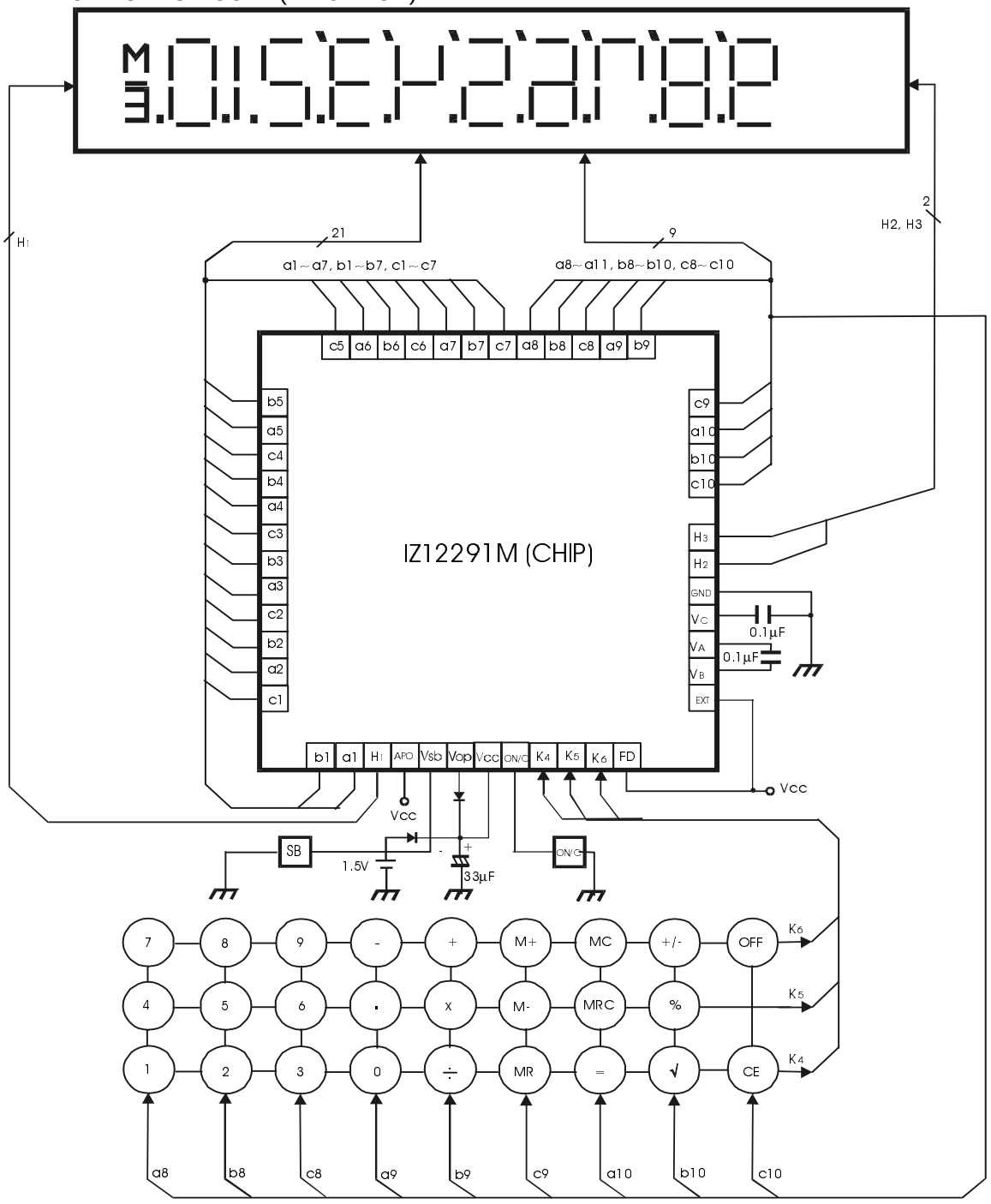
- CE key can edit the last operand or operator.

MARK-UP AND MARK-DOWN CALCULATION

ENTRY		DISPLAY	
A	A	A	A
+/-	×	A	A
B	B	B	B
%	%	A ± AM/100	AM/100
	+ OR -		AM/100
	=		A + AM/100 OR A – AM/100

Note: AM: AMOUNT

APPLICATION CIRCUIT (mirror LCD)



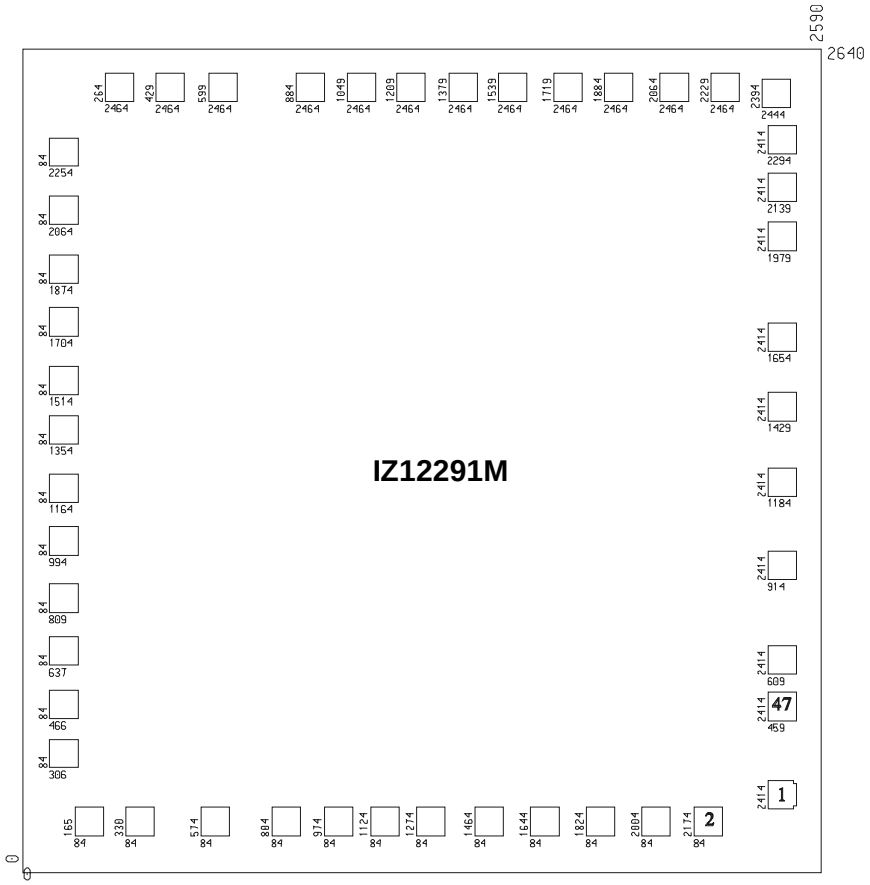
NOTE1:

SB: Solar Battery

AUTO POWER OFF CONDITION

APODISB	V_{CC}	GND
APO STATE	ENABLE	DISABLE

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_{OSC} 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_{CC}	Power Supply	23	c4	Display output	39	a10	Display output
8	V_{OP}	Solar battery	24	a5	Display output	40	b10	Display output
9	V_{SB}	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_C	Capacitor terminal
14	c1	Display output	30	a7	Display output	46	V_A	Capacitor terminal
15	a2	Display output	31	b7	Display output	47	V_B	Capacitor terminal
16	b2	Display output	32	c7	Display output			

APO: Output Power OFF