

IZ1229M

10-DIGITS CALCULATOR

The IZ1229M is a single chip CMOS LSI with 10-digit arithmetic operation, single memory, extraction-of-square-root, percentage calculation, auto power off and punctuation and touch tone function, designed for FEM LCD operation with a 1.5V power supply.

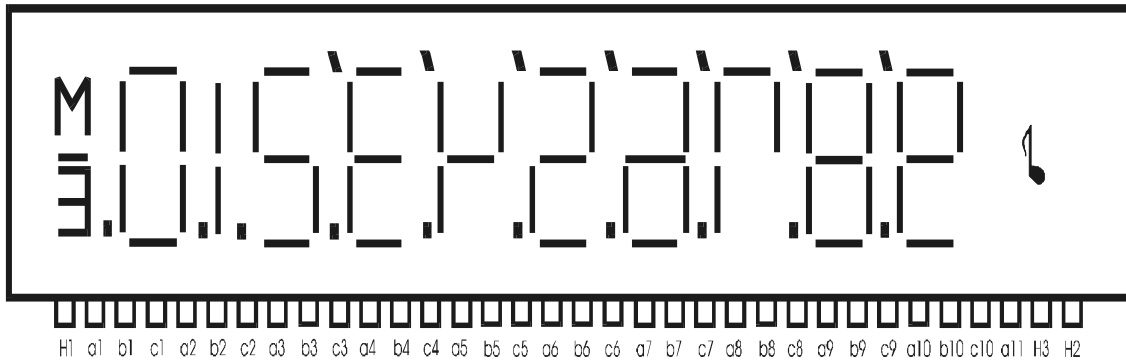
FUNCTIONS

- Four standard functions (+, -, x, ÷)
- 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
- Touch tone function

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



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ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

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	$^\circ\text{C}$
Storage Temperature	T_{stg}	- 55 ~ + 125	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{CC} = 1.5\text{V}$, 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}	$V_{IN} = 0\text{V}$	1.5	2.5	3	
Input Current 2 (pins K4 ÷ K6)	I_{IH2}	$V_{IN} = V_{CC}$; APODISB = 0V			1	μA
	I_{IL2}	$V_{IN} = 0\text{V}$; FDISB = 0V	3	5.5	7.5	
Output Voltage (pins a1÷a11, b1÷b10, 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 Frequency	F_d	$V_{CC} = 1.3\text{V}$, Display is on	55	75		Hz
Touch Tone Output Drive Current	I_{OH}	$V_{OH} = 1.0\text{V}$, APODISB = 0V, FDISB = 0V	1.3	2		mA
	I_{OL}	$V_{OL} = 0.5\text{V}$, APODISB = 0V, FDISB = 1.5V	1.3	2		
Supply Current	I_{OFF}	Display is off			1	μA
	I_{DIS}	$V_{CC} = 1.3\text{V}$, 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
- ♪ : touch tone indicator

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

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

Key bounce protection

Front edge

Minimum 3 words

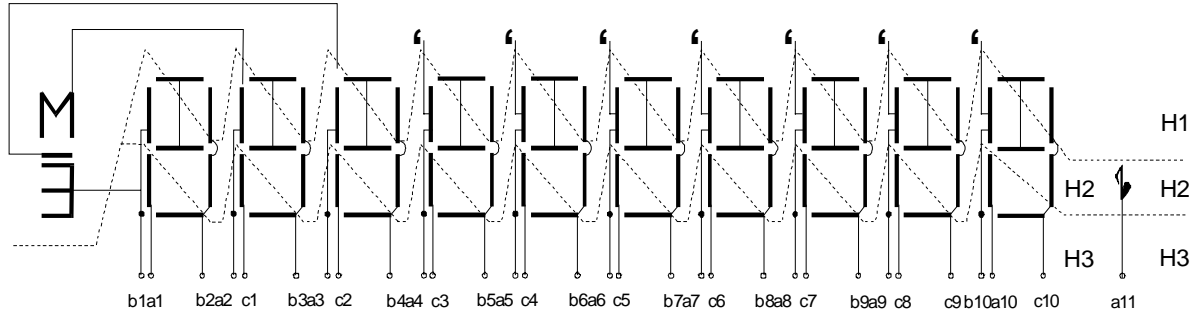
Trailing edge

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 IZ1229M

TOUCH TONE (🎵) KEY

- When power is ON, the touch tone function is enable and the beep sound with $f=2\text{KHz}$ is generated output during 125ms and 🎵 sign is displayed on LCD.
- Selection of touch tone function is toggled by touch tone key.

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.

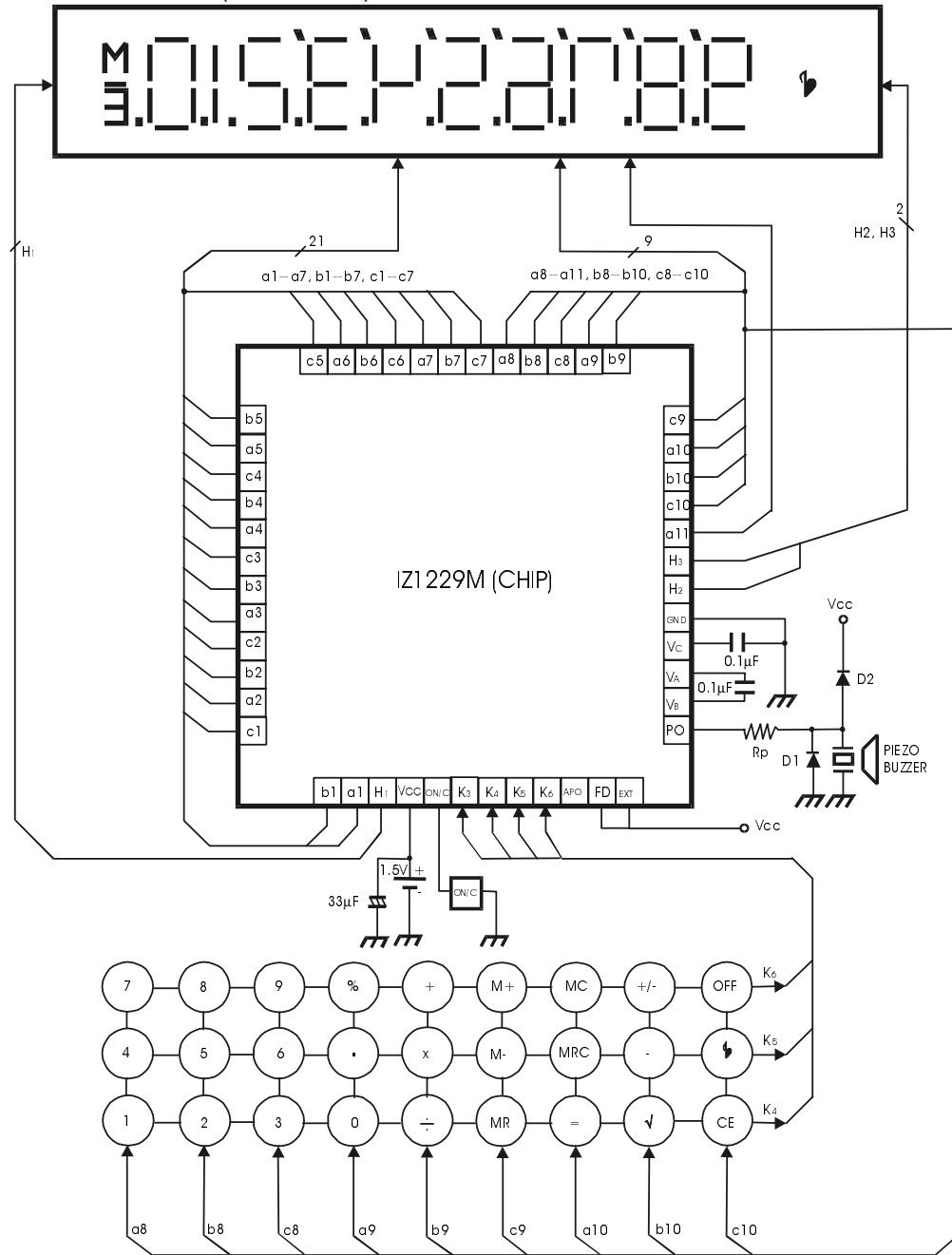
MARK-UP AND MARK-DOWN CALCULATION

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

Note: AM: AMOUNT

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APPLICATION CIRCUIT (mirror LCD)



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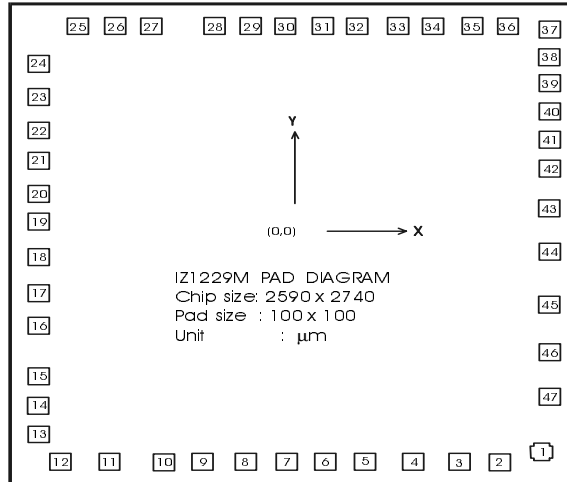
NOTE1:

AUTO POWER OFF CONDITION

D1, D2: Protection Diode
 Rp : Protection Resistor (0.5
 ~1.5KΩ)

APODISB	V _{CC}	GND
APO STATE	ENABLE	DISABLE

PAD DIAGRAM



PAD LOCATION

Pad No.	Pad Name	Description	X	Y	Pad No.	Pad Name	Description	X	Y
1	PO	Piezo Output	1124	-1181	25	c5	Display output	-981	1244
2	EXT	External Clock	939	-1236	26	a6	Display output	-816	1244
3	FDIS	F _{OSC} Disable	759	-1236	27	b6	Display output	-646	1244
4	APOD	APO Disable	541	-1236	28	c6	Display output	-361	1244
5	K6	Key input	329	-1236	29	a7	Display output	-196	1244
6	K5	Key input	149	-1236	30	b7	Display output	-36	1244
7	K4	Key input	-31	-1236	31	c7	Display output	134	1244
8	ON/C	Key Input	-211	-1236	32	a8	Display output	294	1244
9	V _{CC}	Power Supply	-411	-1236	33	b8	Display output	474	1244
10	H1	COM1	-591	-1236	34	c8	Display output	639	1244
11	a1	Display output	-841	-1236	35	a9	Display output	819	1244
12	b1	Display output	-1061	-1236	36	b9	Display output	984	1244
13	c1	Display output	-1161	-1076	37	c9	Display output	1149	1224
14	a2	Display output	-1161	-916	38	a10	Display output	1169	1074
15	b2	Display output	-1161	-746	39	b10	Display output	1169	919
16	c2	Display output	-1161	-461	40	c10	Display output	1169	759
17	a3	Display output	-1161	-276	41	a11	Display output	1169	594
18	b3	Display output	-1161	-66	42	H3	COM3	1169	434
19	c3	Display output	-1161	134	43	H2	COM2	1169	209
20	a4	Display output	-1161	294	44	GND	Ground	1169	-36
21	b4	Display output	-1161	484	45	V _C	Capacitor terminal	1169	-306
22	c4	Display output	-1161	654	46	V _A	Capacitor terminal	1169	-611
23	a5	Display output	-1161	844	47	V _B	Capacitor terminal	1169	-866
24	b5	Display output	-1161	1034					

APO: Output Power OFF