

IZ1229

10-DIGITS CALCULATOR

The IZ1229 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.

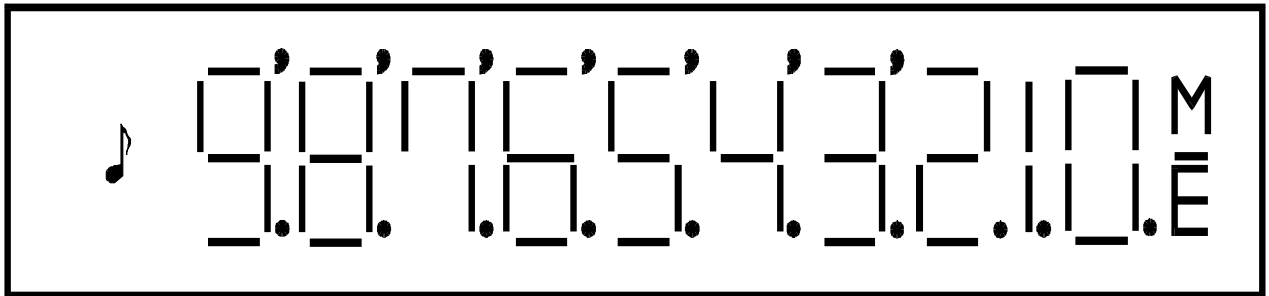
FUNCTIONS

- Four standard functions (+, -, ×, ÷)
- 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
Direct type

LCD CONNECTION



H2 H3 a11 c10 b10 a10 c9 b9 a9 c8 b8 a8 c7 b7 a7 c6 b6 a6 c5 b5 a5 c4 b4 a4 c3 b3 a3 c2 b2 a2 c1 b1 a1 H1

ABSOLUTE MAXIMUM RATINGS (T_a = 25°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	°C
Storage Temperature	T _{stg}	- 55 ~ + 125	°C

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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
- ,
- ⌂ : 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

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

Key bounce protection

Front edge

Minimum 3 words

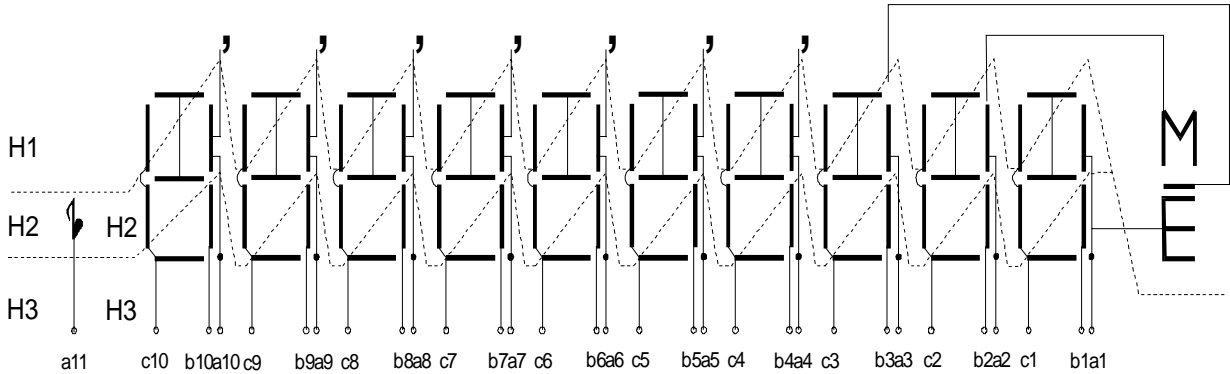
Trailing edge

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.



Direct LCD with IZ1229

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.

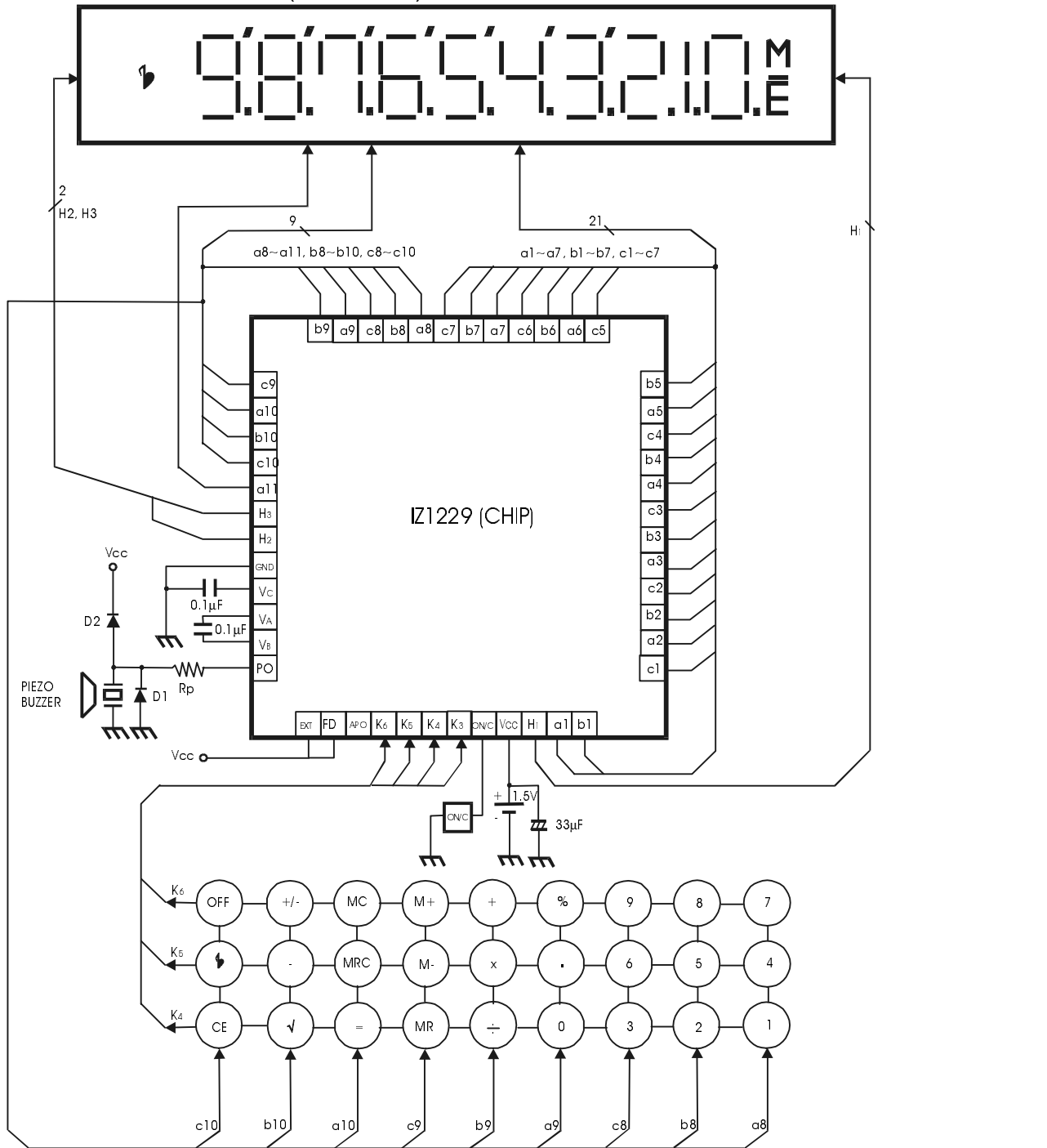
MARK-UP AND MARK-DOWN CALCULATION

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 (direct LCD)



NOTE1:

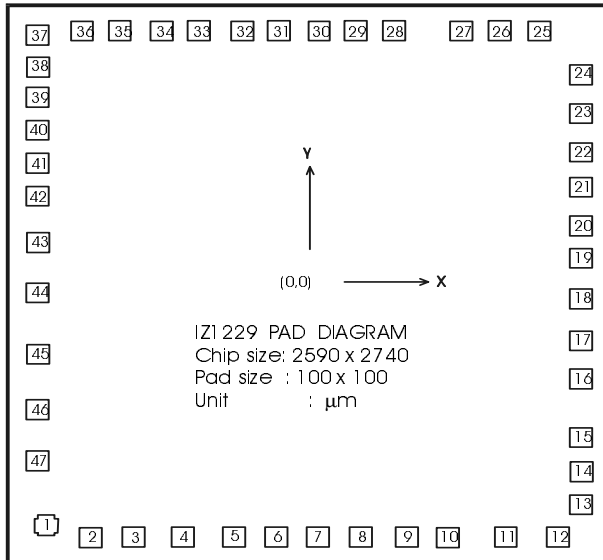
AUTO POWER OFF CONDITION

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

APODISB	V_{CC}	GND
APO STATE	ENABLE	DISABLE

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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