IZ1228/IZ1228M

8-DIGIT CALCULATOR

The IZ1228/IZ1228M are a single chip CMOS LSI with 8-digit arithmetic operation, single memory, extraction-of-square-root,
percentage calculation and auto power off function, designed for FEM LCD operation with a 1.5V power supply. The IZ1228M has
special keys (C1, C2, SM) for currency exchange calculations and special memory for save currency rate.

FUNCTIONS

- Four standard functions (+, -, ×, ÷)
- Auto constant calculations
- Mark-up and mark-down calculations
- Percentage calculations
- Chain multiplication and division
- Power calculations
- Rough estimate calculations
- Clear key: ON/C, CE
- Currency exchange calculations :
  Currency 1 → Currency 2 and
  Currency 2 → Currency 1

FEATURES

- Single chip CMOS construction
- Floating decimal point
- LCD direct drive
- Special memory for currency rates
- Overflow indication: “E”
- On chip oscillator components
- Direct (IZ1228) or Mirror (IZ1228M) LCD
- Punctuation comma
- Auto Power off
- Saving special memory contents when auto power off
- Accumulating memory: M+, M-, MR, MC, MRC
- Bare chip is available

ABSOLUTE MAXIMUM RATINGS (T_a = 25°C)

Characteristic	Symbol	Value	Unit
Terminal Voltage	V_{DD}	- 0.3 ~ + 2.1	V
	V_{IN}	- 0.3 ~ V_{DD} + 0.3	V
Supply Voltage (Battery)	V_{DD}	1.1 ~ 1.8	V
Operating Temperature	T_a	0 ~ + 50	°C
Storage Temperature	T_{stg}	- 55 ~ + 125	°C

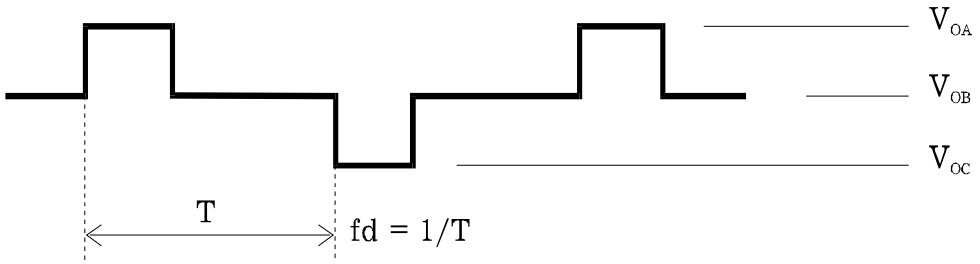
INTEGRAL

ELECTRICAL CHARACTERISTICS

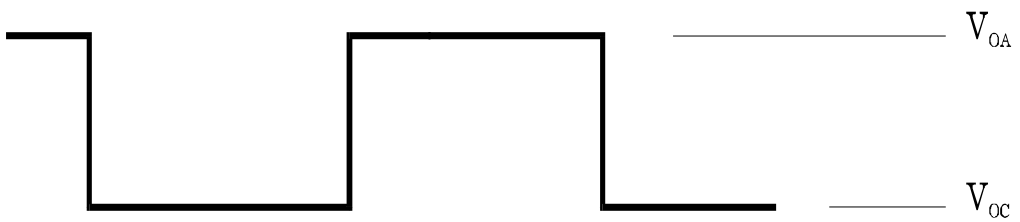
(T_a = 25°C, V_{DD} = 1.5V, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Input Voltage (Pins K2 ~ K6)	V_{IH}		V_{DD} - 0.4			V
	V_{IL}				0.4	
Input Current (Pins K2 ~ K6)	I_{IH}	V_{IN} = V_{DD}			1	uA
	I_{IL}	V_{IN} = 0V	0.3	1	3	
Output Voltage 1 (P1, P2, A2~A5)	V_{OH}	without load	V_{DD} - 0.15			V
	V_{OL}	I_{OL} = 15μA			0.15	
Output Voltage 2 (H1 ~ H3, a1 ~ a9, b1 ~ b8, c1 ~ c8)	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_{DD} = 1.3V while display is on, Rf = 560K	55	75		Hz
Supply Current	I_{OFF}	display is off			1	uA
	I_{DIS}	V_{DD} = 1.3V while display is on		3.5	5	
	I_{OP}	V_{DD} = 1.1V, while operation		5.6		

OUTPUT WAVEFORM 1; Hi (i = 1, 2, 3)



OUTPUT WAVEFORM 2; ai, bi, ci, (i = 1, 2, ... , 8)



FUNCTIONAL DESCRIPTION

Decimal point system

Complete floating decimal point system. 8 digits leading zero suppression. Zero shift.

Symbols : **-** : negative number display
E : error display
, : punctuation comma
M : non-zero memory indicator
C1, C2 : currency exchange operations indicator

Error detections

- **System errors occur when:**
  1) The division by zero.
  2) The extraction of square root of a negative number.

- **Rough estimate calculation error occur when**
  The integral part of the result of any standard functions, percentage, square, reciprocal, or power calculations exceed 8 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 8-digit calculation result is indicated together with "E".
  The decimal point is indicated in the position corresponding to a calculation result of time 10^{-8}, 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**
  A rough estimate calculation error can be released by the ON/C, CE key.

Number entry
Numerical can be entered up to 8 digits. Numerical entries equal to 9 digits or more are ignored.

Memory protection
In any error detection, the special memory content is retained when auto power off.

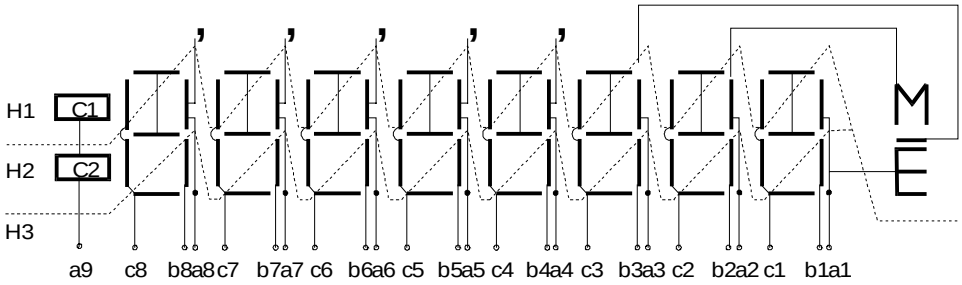
Key bounce protection

Front edge
Down to 1 word and up to about 3 words.

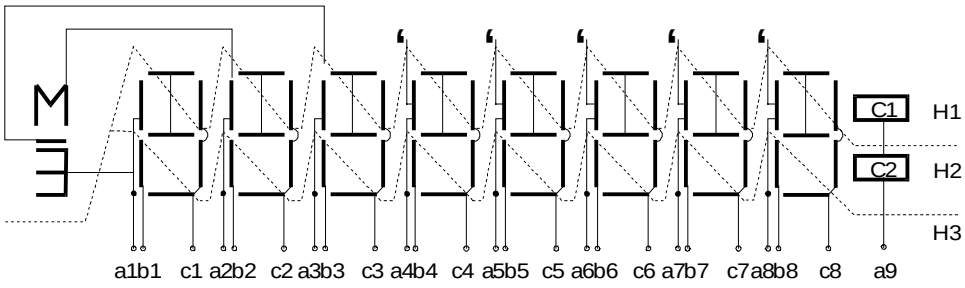
Trailing edge
9 words
1 word is 3.3ms when display frequency is fd = 100Hz.

Auto power OFF
Power automatically turns off after 9 - 11 minutes pass from the last key pressure. The special memory content is saving when power auto off.

LCD CONNECTION



Direct LCD
with IZ1228



Mirror LCD
with IZ1228M

KEY DESCRIPTION

0 ~ **9** **Numerals input keys**

. **+/-** **=** **Decimal point key, Sign change key, Enter key**

ON/ C **CE** **Clear keys**

ON/C: Power ON/All clear (system reset) except special memory contents
CE: Entry clear such as only the entered data is cleared

+ **-** **×** **÷** **Four standard function keys**

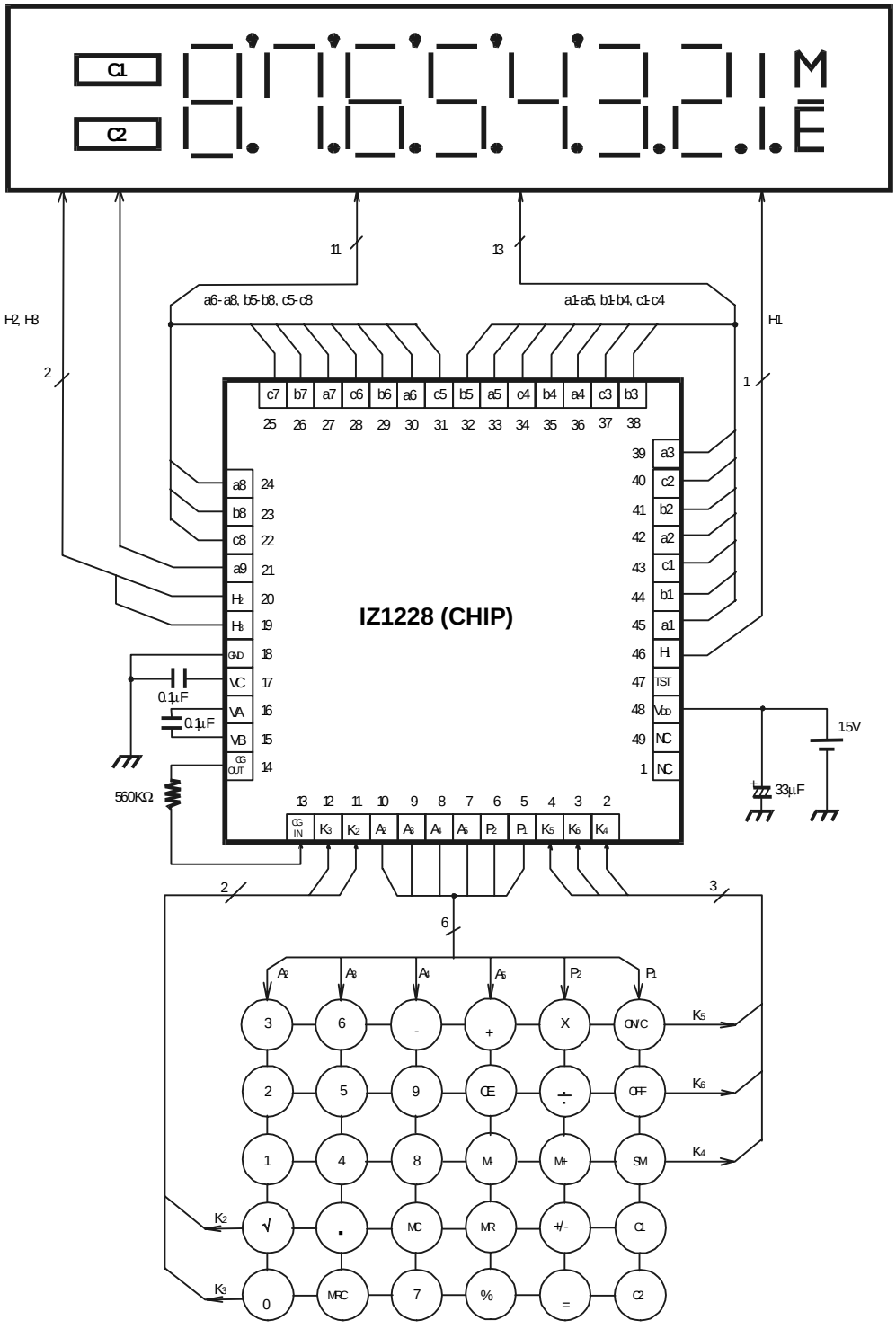
% **√** **Percent key, Extraction of square root key**

C1 **C2** **Currency exchange keys.**
Entered Data multiplied (when press C1) or divided (when press C2) to the currency rate (content of special memory)

INTEGRAL

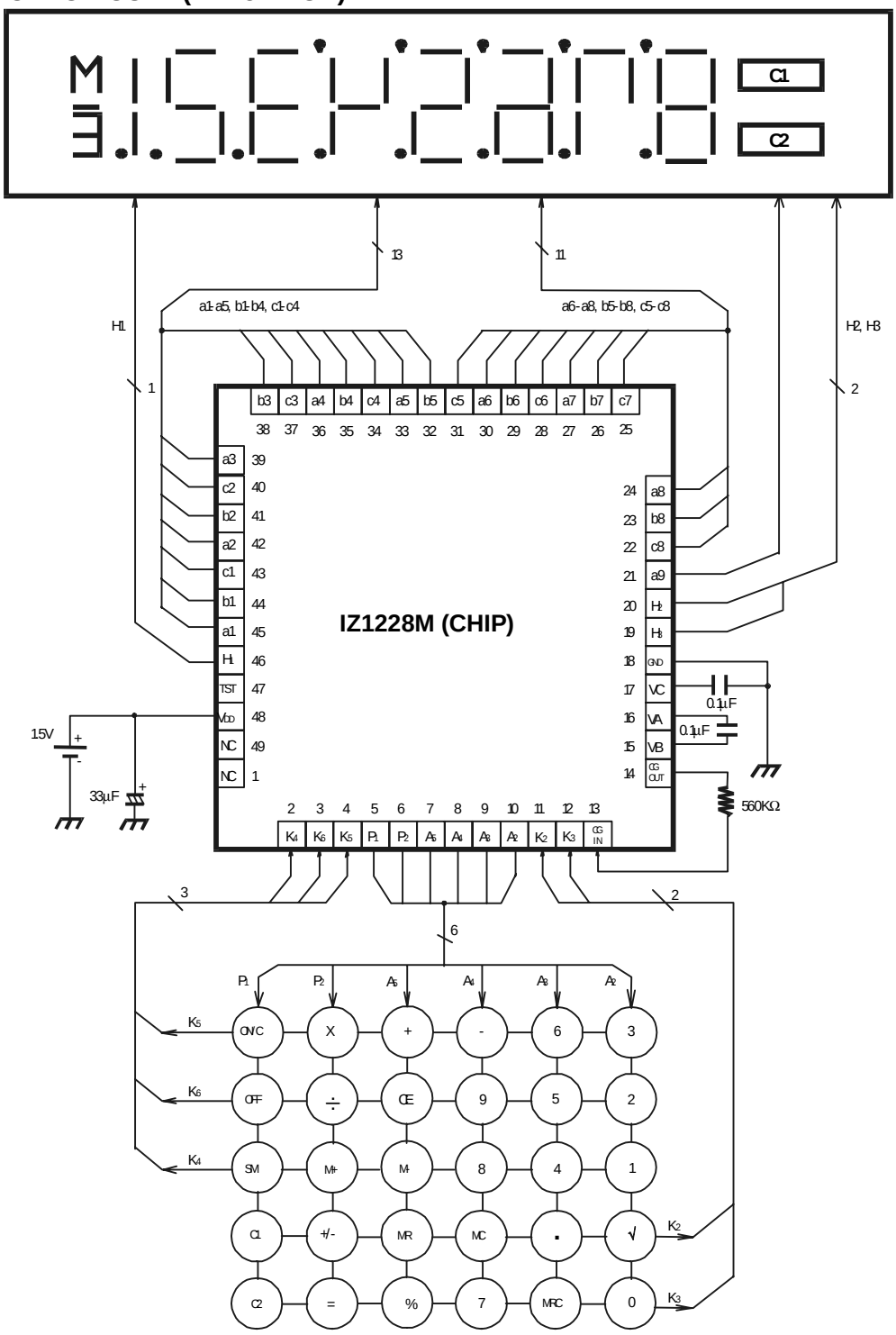
SM	**Set Currency rate C1/C2** (Entered Data set into special memory by this key)
MR **MC** **MRC**	**Recall memory, clear memory, recall and clear memory**
OFF	**Off key**

APPLICATION CIRCUIT (direct LCD)



NOTE1: Chip substrate must be floating or connected to GND

APPLICATION CIRCUIT (mirror LCD)



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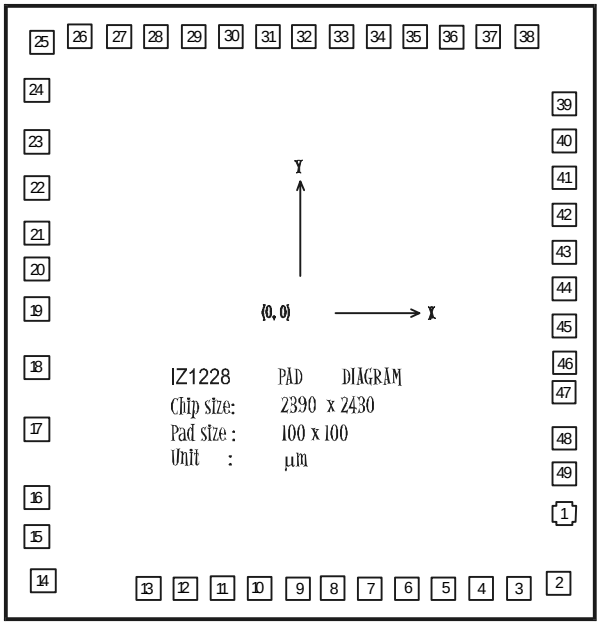
INTEGRAL

PAD DIAGRAM



PAD LOCATION

Pad No.	Pad Name	Description	X	Y	Pad No.	Pad Name	Description	X	Y
1	NC	No Connection	1065	-821	26	b7	Display output	-890	1085
2	K4	Key input	1045	-1065	27	a7	Display output	-740	1085
3	K6	Key input	880	-1085	28	c6	Display output	-590	1085
4	K5	Key input	730	-1085	29	b6	Display output	-440	1085
5	P1	Strobe output	580	-1085	30	a6	Display output	-240	1085
6	P2	Strobe output	430	-1085	31	c5	Display output	-140	1085
7	A5	Strobe output	280	-1085	32	b5	Display output	10	1085
8	A4	Strobe output	130	-1085	33	a5	Display output	160	1085
9	A3	Strobe output	-20	-1085	34	c4	Display output	310	1085
10	A2	Strobe output	-170	-1085	35	b4	Display output	460	1085
11	K2	Key input	-320	-1085	36	a4	Display output	610	1085
12	K3	Key input	-470	-1085	37	c3	Display output	760	1085
13	CG in	Resistor terminal	-620	-1085	38	b3	Display output	910	1085
14	CG out	Resistor terminal	-1035	-1065	39	a3	Display output	1065	849
15	VB	Capacitor terminal	-1065	-913	40	c2	Display output	1065	694
16	VA	Capacitor terminal	-1065	-763	41	b2	Display output	1065	544
17	VC	Capacitor terminal	-1065	-487	42	a2	Display output	1065	394
18	GND	Ground	-1065	-223	43	c1	Display output	1065	244
19	H3	Display output	-1065	17	44	b1	Display output	1065	89
20	H2	Display output	-1065	177	45	a1	Display output	1065	-61
21	a9	Display output	-1065	327	46	H1	Display output	1065	-211
22	c8	Display output	-1065	507	47	TST	Test	1065	-340
23	b8	Display output	-1065	697	48	V_{DD}	Power supply	1065	-521
24	a8	Display output	-1065	902	49	NC	No Connection	1065	-671
25	c7	Display output	-1045	1065					

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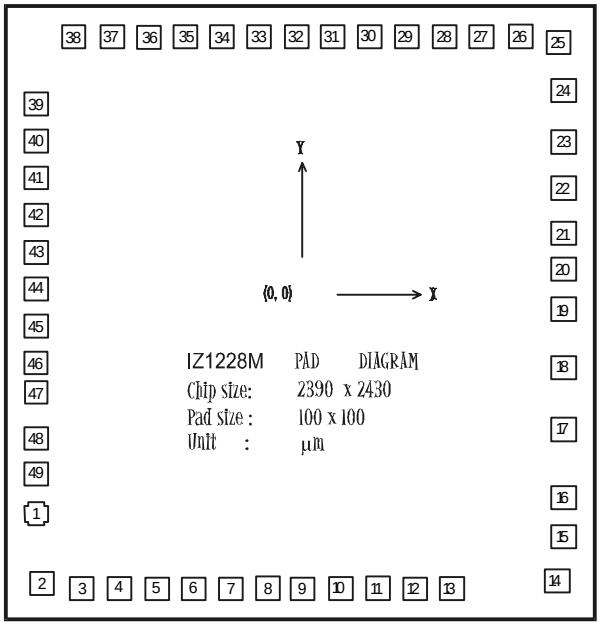

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