

IZ1238M

8-DIGITS CURRENCY CALCULATOR

The IZ1238M 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 IZ1238M has special keys (C1, C2, SM) for currency exchange calculations and special memory for save currency rate. The result of currency exchange operations rounded to two decimal if it exceeds two decimal.

FUNCTIONS

- Four standard functions (+, -, ×, ÷)
- The result of currency exchange operation is rounded to two decimal
- 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
- Mirror type LCD
- Punctuation comma
- Auto Power off
- Saving special memory contents when auto power off
Currencies C1, C2 indication
- 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

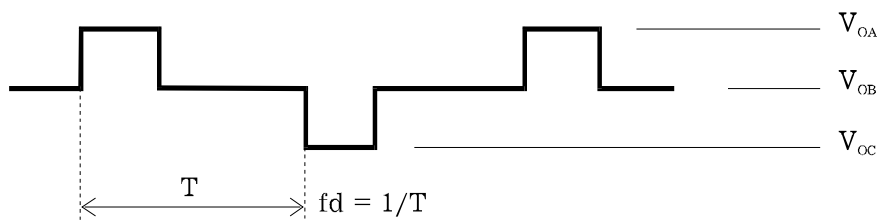
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ELECTRICAL CHARACTERISTICS

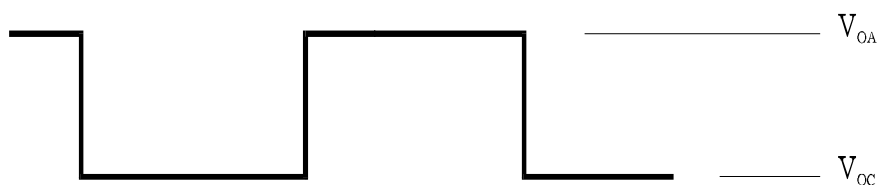
($T_a = 25^\circ\text{C}$, $V_{DD} = 1.5\text{V}$, unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage			1.1	1.5	1.8	V
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	μA
	I_{IL}	$V_{IN} = 0\text{V}$	0.3	1	3	
Output Voltage 1 (P1, P2, A2~A5)	V_{OH}	without load	$V_{DD} - 0.15$			V
	V_{OL}	$I_{OL} = 15\mu\text{A}$			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	$V_{DD} = 1.3\text{V}$ while display is on, $R_f = 560\text{K}$	55	75		Hz
Supply Current	I_{OFF}	display is off			0.1	μA
	I_{DIS}	$V_{DD} = 1.3\text{V}$ while display is on		3.5	5	
	I_{OP}	$V_{DD} = 1.1\text{V}$, 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

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

Error detection

- **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

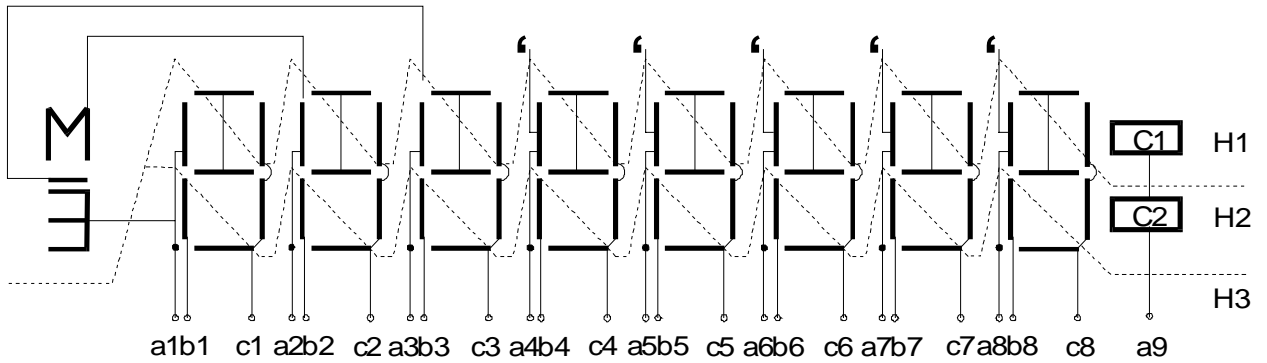
1 word is 3.3ms when display frequency is $f_d = 100\text{Hz}$.

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.

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LCD CONNECTION

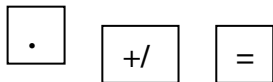


Mirror LCD with IZ1238M

KEY DESCRIPTION



Numerals input keys



Decimal point key, Sign change key, Enter key



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



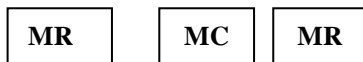
Currency exchange keys

Entered Data multiplied (when press C1) or divided (when press C2) to the currency rate (content of special memory) and result of the operation rounded to two decimal



Set Currency rate C1/C2

(Entered Data set into special memory by this key)



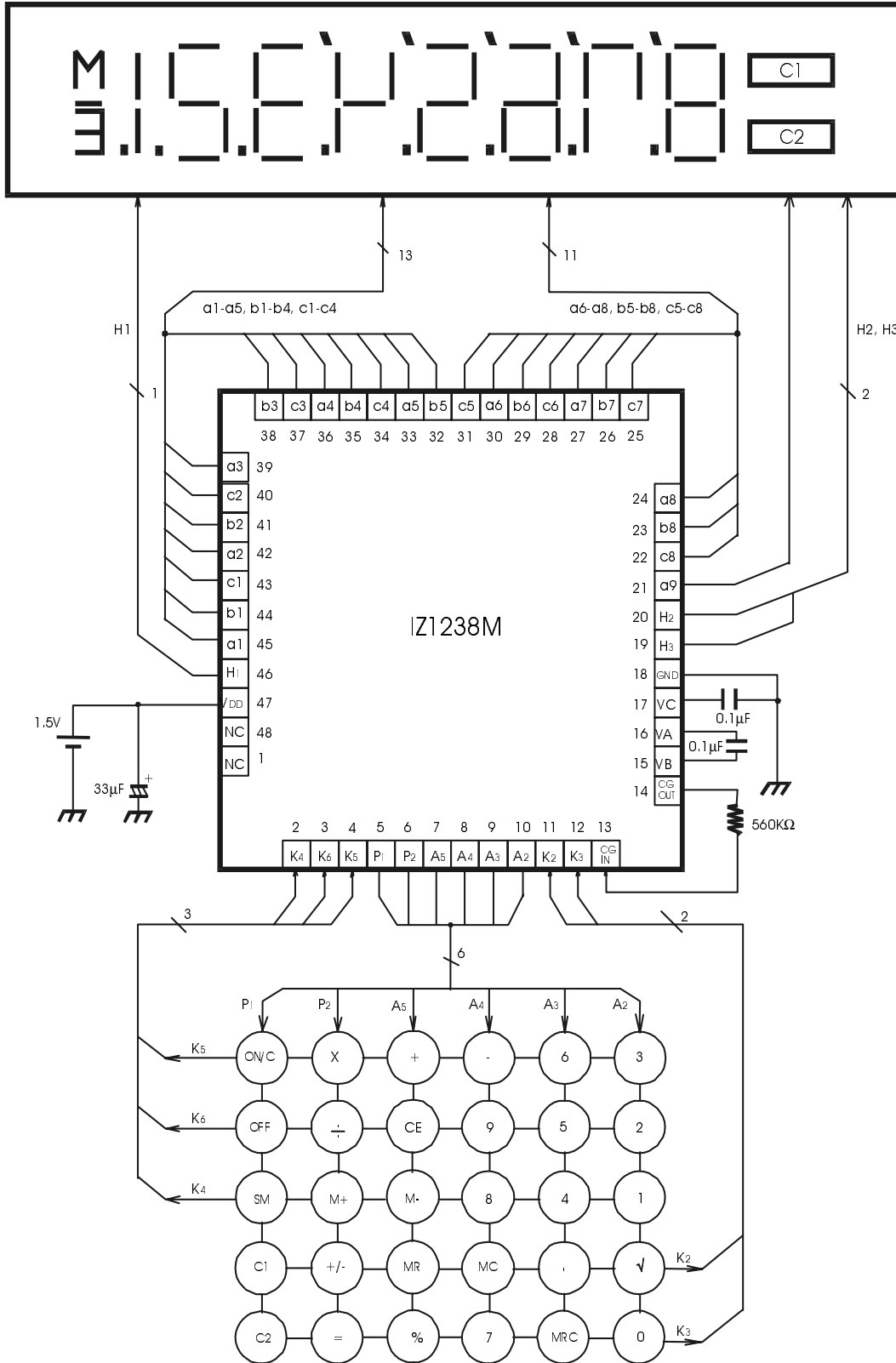
Recall memory, clear memory, recall and clear memory



Off key

APPLICATION CIRCUIT (mirror LCD)

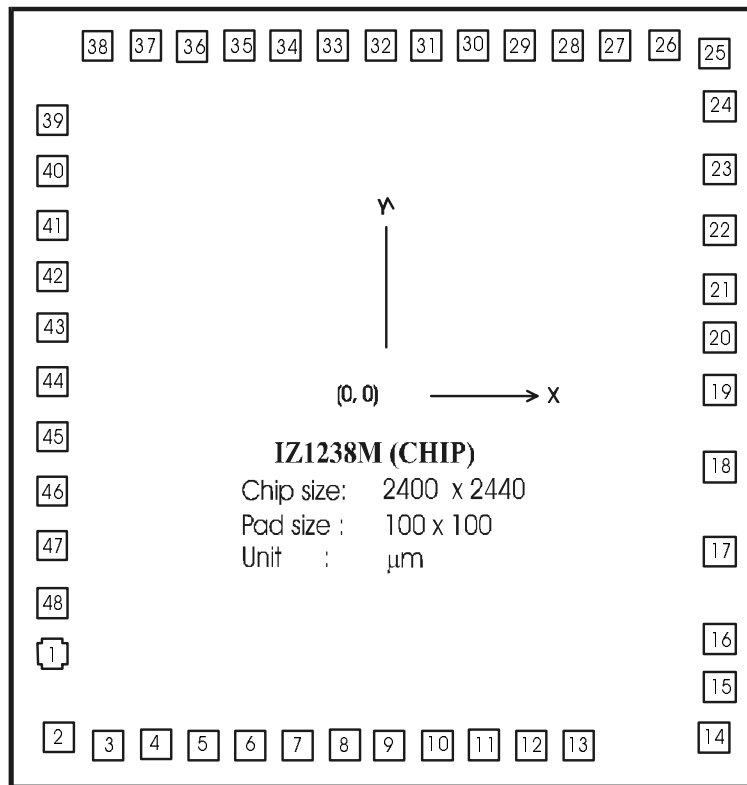
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NOTE1: Chip substrate must be floating or connected to GND

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PAD DIAGRAM



PAD LOCATION

Pad No.	Pad Name	Description	X	Y	Pad No.	Pad Name	Description	X	Y
1	NC	No Connection	-1070	-810	25	c7	Display output	1050	1070
2	K4	Key input	-1050	-1050	26	b7	Display output	885	1090
3	K6	Key input	-885	-1090	27	a7	Display output	735	1090
4	K5	Key input	-735	-1090	28	c6	Display output	585	1090
5	P1	Strobe output	-585	-1090	29	b6	Display output	435	1090
6	P2	Strobe output	-435	-1090	30	a6	Display output	285	1090
7	A5	Strobe output	-285	-1090	31	c5	Display output	135	1090
8	A4	Strobe output	-135	-1090	32	b5	Display output	-15	1090
9	A3	Strobe output	15	-1090	33	a5	Display output	-165	1090
10	A2	Strobe output	165	-1090	34	c4	Display output	-315	1090
11	K2	Key input	315	-1090	35	b4	Display output	-465	1090
12	K3	Key input	465	-1090	36	a4	Display output	-615	1090
13	CG in	Resistor terminal	615	-1090	37	c3	Display output	-765	1090
14	CG out	Resistor terminal	1050	-1070	38	b3	Display output	-915	1090
15	VB	Capacitor terminal	1070	-915	39	a3	Display output	-1070	860
16	VA	Capacitor terminal	1070	-765	40	c2	Display output	-1070	700
17	VC	Capacitor terminal	1070	-485	41	b2	Display output	-1070	530
18	GND	Ground	1070	-225	42	a2	Display output	-1070	370
19	H3	Display output	1070	15	43	c1	Display output	-1070	210
20	H2	Display output	1070	180	44	b1	Display output	-1070	40
21	a9	Display output	1070	330	45	a1	Display output	-1070	-130
22	c8	Display output	1070	515	46	H1	Display output	-1070	-300
23	b8	Display output	1070	705	47	V _{DD}	Power supply	-1070	-470
24	a8	Display output	1070	905	48	NC	No Connection	-1070	-650