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**EMPCR032**

**10 DIGIT REPLAY  
CALCULATOR**

**Product  
Specification**

**DOC. VERSION 0.3**

**ELAN MICROELECTRONICS CORP.**

September 2002

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### Specification Revision History

Doc. Version	Revision Description	Date
0.1	Initial version	2002/01/22
0.3	<ul style="list-style-type: none"><li>a. Modify VIH &amp; VIL of K3~K14 in page20.</li><li>b. Modify VIH &amp; VIL of RESET in page20.</li><li>c. Add VEE specification in page20.</li><li>d. Modify ROH &amp; ROL (max) of LCD pins in page20.</li><li>e. Modify pull-down resistor of K0~K10 in page21.</li><li>f. Modify pull-up resistor of K0~K7 and RESET in page21.</li><li>g. Modify pull-down resistor of K11~K14 in page21.</li><li>h. Remove 'Preliminary' on form.</li></ul>	2002/09/11

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## 1 General Description

The EMPKR032 is a single-chip LS1 CMOS calculator for 10-digit 1 memory, and up to 32 sets replay memory capacity which is useful for checking calculation process. Besides, the EMPKR032 is an arithmetic four standard types of general function (+, -, x, ÷), TAX function, Euro exchange, percentage calculation functions, leading zero and trailing zero suppression, chain calculations, MU calculation, Auto Power OFF available, 10-digit LCD display. Dual power supply operation, wide operating voltage and lower power consumption make it suitable for 1.5 solar battery operated calculator.

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## 2 Features

- Number of display 10 digits of data, (including punctuation in each digit.)  
1-digit of floating minus sign, memory load, error symbol, 3-digits of commas for thousands, TAX symbol, currency exchange symbol and 3 digits for replay function, "CORRECT", "INS", "DEL", "%", "GT", sing of four general functions (+, -, x, ÷), etc., up to the min 31 symbols in 10 digit with replay function.
- Operation methods By algebraic operation.
- Basic operations Four function, repeat multiplication and division, mixed calculation, square calculation, percentage calculation, percent discount and add-on / discount calculation, memory calculation, add-mode calculation, mark-up / down calculation, Grand total calculation, constant calculation, tax calculation, EURO exchange, square root calculation, check, insert, and correct functions.
- Decimal point method Decimal set lock key controls output format. Fixed decimal  
setting ("0", "1", "2", "3", "4", "6"), full floating decimal, and ADD mode (selectable with a switch).
- Contents of operation
  1. Floating point mode during operation and key entry that specified only Addition and Subtraction.
  2. Specified decimal point mode is valid only for operation results.
  3. Round-off when most significant digits have higher priority or at auto shift of rough estimation.



- Key rollover method Two-key rollover
- Error detect display
  1. Key entry exceeding the number of display digits is invalid, but does not cause an error.
  2. If the integer part of an operation result exceeds the number of display digits, a rough estimate is displayed.
  3. In the overflow condition, all key except "C", "C/CE", "CE", "→" key are inoperative.
- Protection
  1. In the overflow condition, all key except "C", "C/CE", "CE", "→" key are inoperative.
  2. Key chatter protection.
  3. Auto-clear at power on  
Auto-clear functions by connecting a capacitor to the RESET pin.
- Auto power off function
  1. 6 minutes
- Clock source
  1. Oscillator / clock generator internal to chip.
- Others
  1. Keyboard encoding internal to chip.
  2. Wide supply voltage range (1.2 to 1.8V).
  3. Very low power consumption.
  4. Battery / solar power supply.
  5. Symbol blinking available.
  6. Rate will be kept after AC key pressed.



### 3 Pin Descriptions

SYMBOL	I/O	FUNCTION
COM1~3	O	LCD Common signal output.
A1 ~ A3	O	LCD Segment signal output and strobe output for switch status.
A4 ~ A15	O	LCD Segment signal output.
B1 ~ B3	O	LCD Segment signal output and strobe output for switch status.
B4 ~ B15	O	LCD Segment signal output.
C1 ~ C2	O	LCD Segment signal output and strobe output for switch status.
C3 ~ C15	O	LCD Segment signal output.
VDD,VSS	---	Positive and negative power supply pin.
VA,VB	---	Voltage doubler for LCD, connects a capacitor (0.1uF) between both pins.
VEE	---	LCD voltage from voltage doubler, connects a capacitor (0.1uF) to pin VDD.
TS1	I	Test pin input, be opened.
RESET	I	System reset / AC key input. (built-in schmitt trigger for debouncing)
K0 ~ K2	O	Keyboard polling signal output pins.
K3 ~ K7	I/O	Keyboard polling signal output and strobe input pins.
K8 ~ K10	I	Keyboard strobe input pins.
K11~K14	I	Switch status strobe input pins.

### 4 Function Descriptions

#### 4.1 Operation Characteristics

##### 4.1.1 Constant Operation

The EMPCR032 has implied constant mode on +, -, ×, ÷, and % operations. The constant is performed automatically by the "=" key, "%" key, or "%>" key without a constant for addition and division while the first operand is the constant for multiplication.

##### 4.1.2 Number Entry

Numericals can be entered up to 10 digit.

##### 4.1.3 Memory Protection

In any error detection, the memory contents present before the error detection are protected.

##### 4.1.4 Memory Indication

If the memory contents are a number other than zero, "M" is indicated in the sign-digit position.