

## **FEATURES**

- \* 0.3 INCH (7.62 mm ) DIGIT HEIGHT.
- \* FOUR-DIGIT, RIGHT HAND DECIMAL.
- \* WIDE SUPPLY VOLTAGE OPERATION.
- \* SERIAL DATA INPUT.
- \* CONSTANT CURRENT DRIVERS.
- \* CONTINUOUS BRIGHTNESS CONTROL.
- \* OUTPUT AVAILABLE FOR TWO EXTERNAL LEDS.
- \* WIDE VIEWING ANGLE.
- \* TTL COMPATIBLE.

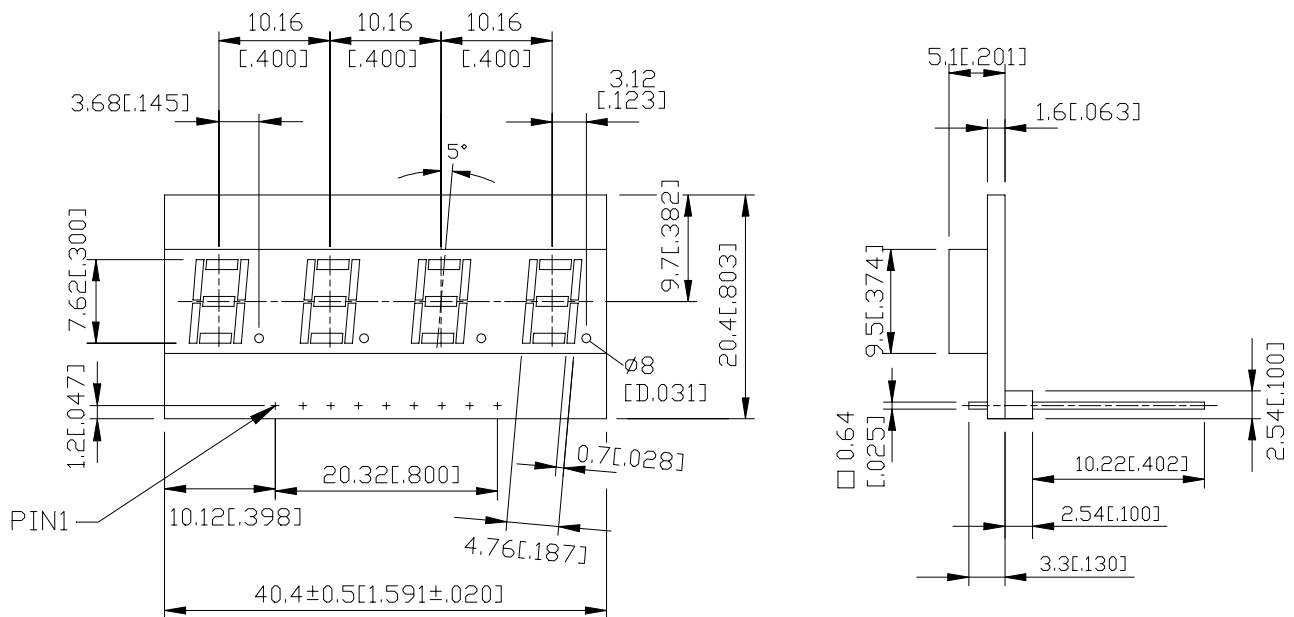
## **DESCRIPTION**

The LTM-8328PKR-04 is a 0.3 inch (7.62mm) digit display. It has a built-in M5450 MOS IC that contains serial data input and 35 bit shift control. The MOS IC produced with N-channel silicon gate technology. This device utilizes bright red LED chips, which are made from GaP on a transparent GaP substrate. Have black face with diffusion tape.

## **DEVICE**

| PART NO        | DESCRIPTION                            |
|----------------|----------------------------------------|
| Bright red     | FOUR DIGIT R.H.D.P,<br>WITH I.C DRIVER |
| LTM-8328PKR-04 |                                        |

## PACKAGE DIMENSIONS

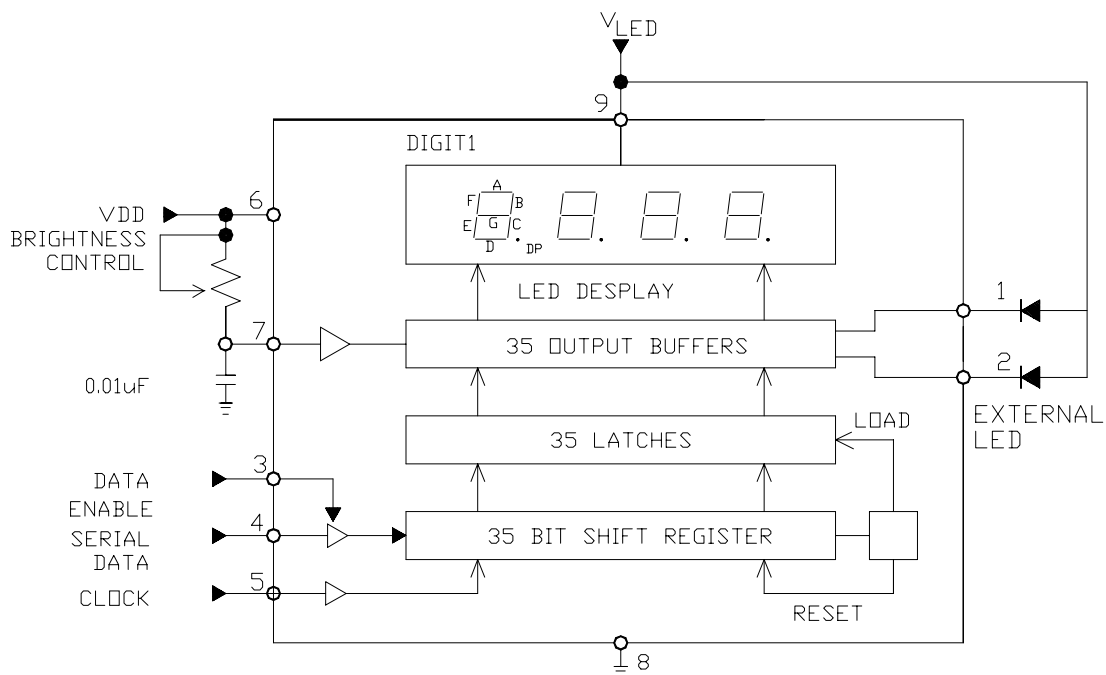


NOTES: All dimensions are in millimeters. Tolerances are  $\pm 0.25\text{mm}$  (0.01") unless otherwise noted.

## PIN CONNECTION

| NO. | CONNECTION  | NO. | CONNECTION       |
|-----|-------------|-----|------------------|
| 1   | EXT LED1    | 6   | V <sub>DD</sub>  |
| 2   | EXT LED2    | 7   | DIMMER           |
| 3   | DATA ENABLE | 8   | GND              |
| 4   | DATA SERIAL | 9   | V <sub>LED</sub> |
| 5   | CLOCK       |     |                  |

## INTERNAL CIRCUIT DIAGRAM



## SERIAL DATA INPUT SEQUENCE

| BIT | DIGIT | SEGMENT | BIT | DIGIT | SEGMENT |
|-----|-------|---------|-----|-------|---------|
| 1   | 1     | A       | 18  | 3     | B       |
| 2   | 1     | B       | 19  | 3     | C       |
| 3   | 1     | C       | 20  | 3     | D       |
| 4   | 1     | D       | 21  | 3     | E       |
| 5   | 1     | E       | 22  | 3     | F       |
| 6   | 1     | F       | 23  | 3     | G       |
| 7   | 1     | G       | 24  | 3     | DP      |
| 8   | 1     | DP      | 25  | 4     | A       |
| 9   | 2     | A       | 26  | 4     | B       |
| 10  | 2     | B       | 27  | 4     | C       |
| 11  | 2     | C       | 28  | 4     | D       |
| 12  | 2     | D       | 29  | 4     | E       |
| 13  | 2     | E       | 30  | 4     | F       |
| 14  | 2     | F       | 31  | 4     | G       |
| 15  | 2     | G       | 32  | 4     | DP      |
| 16  | 2     | DP      | 33  |       | LED1    |
| 17  | 3     | A       | 34  |       | LED2    |

## ABSOLUTE MAXIMUM RATING AT TA=25°C

| PARAMETER                                                                | SYMBOL              | MIN. | MAX. | UNIT |
|--------------------------------------------------------------------------|---------------------|------|------|------|
| Supply Voltage                                                           | V <sub>DD</sub>     | -0.3 | 12   | V    |
| Input Voltage                                                            | V <sub>I</sub>      | -0.3 | 12   | V    |
| Off State Output Voltage                                                 | V <sub>O(off)</sub> |      | 12   | V    |
| LED Supply Voltage                                                       | V <sub>LED</sub>    | 2.8  | 3.5  | V    |
| Power Dissipation of IC                                                  | P <sub>D(IC)</sub>  |      | 335  | mW   |
| Supply Current                                                           | I <sub>DD</sub>     |      | 8.5  | mA   |
| Operating Temperature Range                                              | T <sub>OP</sub>     | -20  | +60  | °C   |
| Storage Temperature Range                                                | T <sub>stg</sub>    | -20  | +60  | °C   |
| Solder Temperature: 1/16 inch Below Seating Plane for 3 Seconds at 260°C |                     |      |      |      |

NOTE: 1. All Voltages are with respect to V<sub>SS</sub>(GND).

2. Power dissipation of IC is given by  $P_D = (V_{LED} - V_F) \cdot (I_F) \cdot (\text{NO. of Segments}) + (8.5\text{mA}) \cdot (V_{DD})$

\* V<sub>F</sub> is LED forward voltage.

## RECOMMENDED OPERATING CONDITION AT TA=25°C

| PARAMETER                | SYMBOL              | MIN.               | TYP. | MAX.            | UNIT | TEST CONDITION                  |
|--------------------------|---------------------|--------------------|------|-----------------|------|---------------------------------|
| Supply Voltage           | V <sub>DD</sub>     | 4.75               |      | 11              | V    |                                 |
| Input Voltage            |                     |                    |      |                 |      |                                 |
| Logical "0" Level        |                     | -0.3               |      | 0.8             | V    | ±10uA Input Bias                |
| Logical "1" Level        | V <sub>I</sub>      | 2.2                |      | V <sub>DD</sub> | V    | 4.75V < V <sub>DD</sub> < 5.25V |
| Logical "1" Level        |                     | V <sub>DD</sub> -2 |      | V <sub>DD</sub> | V    | V <sub>DD</sub> > 5.25V         |
| Brightness Input Current | I <sub>B</sub>      | 0                  |      | 0.75            | mA   |                                 |
| Brightness Input Voltage | V <sub>B</sub>      | 3                  |      | 4.3             | V    | Input Current = 750uA           |
| Off State Voltage        | V <sub>O(off)</sub> |                    |      | 11              | V    |                                 |
| Output Sink Current      |                     |                    |      |                 |      |                                 |
| Segment Off              |                     |                    | 3    | 10              | uA   | I <sub>B</sub> =0uA             |
| Segment On               |                     |                    | 6    |                 | mA   | I <sub>B</sub> =100uA           |
| Input Clock Frequency    | F <sub>CLOCK</sub>  | 0                  |      | 0.5             | MHZ  | I <sub>B</sub> =200uA           |
| Output Matching          | I <sub>O</sub>      |                    |      | ±20             | %    |                                 |

**ELECTRICAL OPTICAL CHARACTERISTICS AT TA=25°C**

| PARAMETER                         | SYMBOL            | MIN. | TYP. | MAX. | UNIT | TEST CONDITION        |
|-----------------------------------|-------------------|------|------|------|------|-----------------------|
| Average Luminous Intensity        | I <sub>v</sub>    | 79   | 155  |      | ucd  | I <sub>B</sub> =0.4mA |
| Peak Emission Wavelength          | λ <sub>p</sub>    |      | 697  |      | nm   | I <sub>B</sub> =0.4mA |
| Spectral Line Half-Width          | Δλ                |      | 90   |      | nm   | I <sub>B</sub> =0.4mA |
| Dominant Wavelength               | λ <sub>d</sub>    |      | 638  |      | nm   | I <sub>F</sub> =20mA  |
| Luminous Intensity Matching Ratio | I <sub>v</sub> -m |      |      | 2:1  |      | I <sub>B</sub> =0.4mA |

**FUNCTIONAL DESCRIPTION**

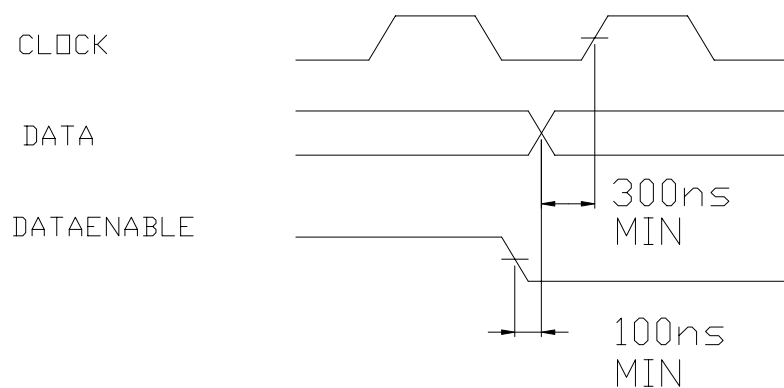
Serial data transfer from the data source to the display driver is accomplished with 2 signals serial data and clock. Using a format of a leading “1” following by the 35 data bits allows data transfer without an additional load signal. The 35 data bits are latched after the 36<sup>th</sup> bit is completed, thus providing non-multiplexed, direct drive to the display. Outputs change only if the serial data bits differ from the previous time.

Brightness of display is determined by control the Output current of LED display. A 1nF capacitor should be connected to brightness control, Pin 7 to prevent possible oscillations. The output current is typically 25 times greater than the current into Pin 7 which is set by an external variable resistor. There is an internal limiting resistor of 400Ω nominal value.

Figure 1 shows the input data format. A start bit of logical “1” proceed the 35 bits of data. At the 36<sup>th</sup> clock, a LOAD signal is generated synchronously with the high state of the clock, which loads the 35 bits of the shift registers into the latches. At the low state of the clock a RESET signal is generated which clears all the shift registers for the next set of data. The shift registers are static master-slave configuration. There is no clear for portion of the first register, thus allowing continuous operation.

There must be a complete set of 36 clocks or the shift registers won't clear. When power is first applied to the chip an internal power ON reset signal is generated which reset all registers and all latched. The ATART bit and first clock return the chip on its normal operation. Bit 1 is the first following the start bit and it will appear on the Figure 2 shows the timing relationship between data clock, and DATA ENABLE. A maximum clock frequency of 0.5 MHz is assumed.

**FIGURE.1 Input Data Format**



**FIGURE.2 Timing Relationship**

