FEATURES

* 0.56-INCH (14.22-mm) DIGIT HEIGHT.
* WIDE SUPPLY VOLTAGE OPERATION.
* SERIAL DATA INPUT.
* CONSTANT CURRENT DRIVERS.
* CONTINUOUS BRIGHTNESS CONTROL.
* SOLID STATE RELIABILITY-LONG OPERATION LIFE.
* WIDE VIEWING ANGLE.
* TTL COMPATIBLE.

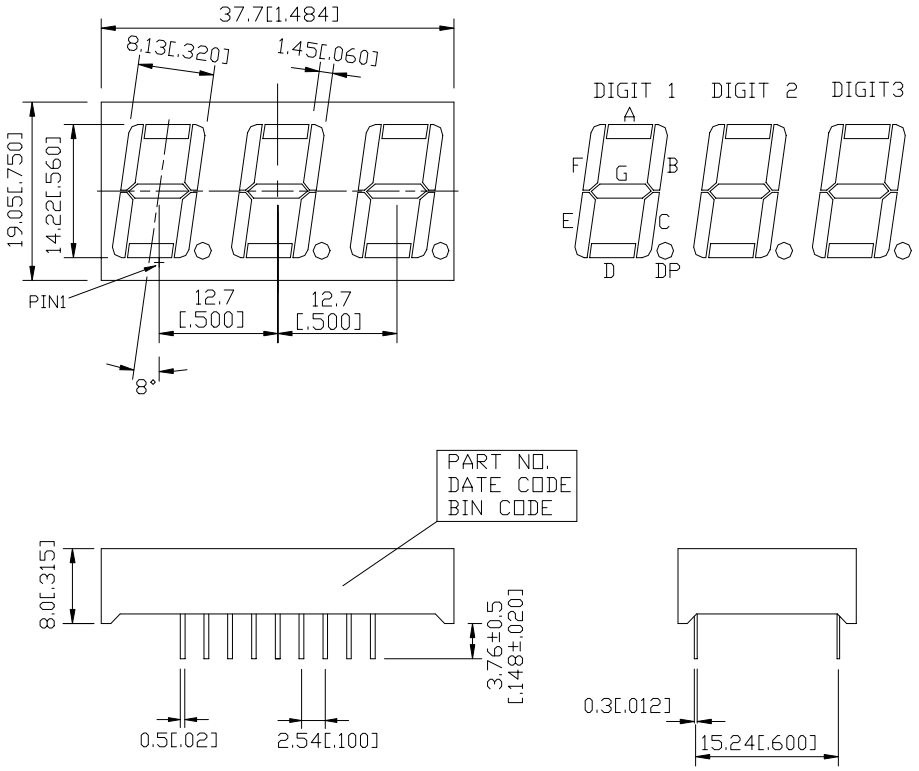
DESCRIPTION

The LTM-8522HR is a 0.56-inch (14.22-mm) numeric display modules, and a built-in M5450 MOS integrated circuits. The integrated circuit contains serial data input, 35 bits shift register. 34 LED driver output and a brightness control. This device utilizes high efficiency red LED chips, which are made from GaAsP on a transparent GaP substrate, and has a red face and red segments. The MOS integrated circuits are produced with N-channel silicon gate technology.

DEVICE

PART NO.	DESCRIPTION
Hi-Eff. Red	3 Digit
LTM-8522HR	Rt. Hand Decimal

PACKAGE DIMENSIONS



NOTES: All dimensions are in millimeters. Tolerances are ± 0.25-mm (0.01“) unless otherwise noted.

PIN CONNECTION

No.	CONNECTION
1	VSS
2	VLED
3	VLED
4	BIT 25 OUTPUT
5	BIT 26 OUTPUT
6	BIT 27 OUTPUT
7	BIT 28 OUTPUT
8	BIT 29 OUTPUT
9	BIT 30 OUTPUT
10	BIT 31 OUTPUT
11	BIT 32 OUTPUT
12	BIT 33 OUTPUT
13	BIT 34 OUTPUT
14	DATA ENABLE
15	DATA INPUT
16	CLOCK INPUT
17	VDD
18	BRT. CONTROL

ABSOLUTE MAXIMUM RATING AT T_A=25°C

PARAMETER	Symbol	Min.	Max.	UNIT
Supply Voltage *1	VDD	-0.3	12	V
Input Voltage	VI	-0.3	12	V
Off State Output Voltage	VO(off)		12	V
LED Supply Voltage	VLED	2.8	3.5	V
Power Dissipation of IC *2	PD(IC)		335	mW
Supply Current	IDD		8.5	mA
Operating Temperature Range	Top	-20	+60	^{0}C
Storage Temperature Range	Tstg	-20	+60	^{0}C
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260^{0}C				

RECOMMENDED OPERATING CONDITION AT T_A=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Supply Voltage	VDD	4.75		11	V	
Input Voltage						
Logical "0" Level		-0.3		0.8	V	±10μA Input Bias
Logical "1" Level	VI	2.2		VDD	V	4.75V < VDD < 5.25V
Logical "1" Level		VDD -2		VDD	V	VDD > 5.25V
Brightness Input Current	IB	0		0.75	mA	
Brightness Input Voltage	VB	3		4.3	V	Input Current=750 μA
Off State Voltage	VO(off)			11	V	
Output Sink Current						
Segment Off				10	μA	IB=0 μA
Segment On			3		mA	IB=100 μA
			6		mA	IB=200 μA
Input Clock Frequency	FCLOCK	0		0.5	MHZ	
Output Matching	IO			±20	%	

Note: Luminous intensity is measured with a light sensor and filter combination that approximates the CIE (Commision Internationale De L'Eclairage) eye-response curve.

ELECTRICAL/OPTICAL CHARACTERISTICS AT Ta=25℃

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	Iv	800	2400		μcd	IB=0.4mA
Peak Emission Wavelength	λp		635		nm	IB=0.4mA
Spectral Line Half-Width	Δλ		40		nm	IB=0.4mA
Dominant Wavelength	λd		623		nm	IF=20mA
Luminous Intensity Matching Ratio	Iv-m			2:1		IB=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" followed by the 35 data bits allow data transfer without an additional load signal. The 35 data bits are latched after the 36th 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 400 Ω nominal value.

Figure 1 shows the input data format. A start bit of logical "1" proceed the 35 bits of data. At the 36th 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 master 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, a reset signal is generated which reset all registers and all latches. The START 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 segment A of the digit 1. A logical "1" at the input will turn on the appropriate LED. Figure 2 shows the timing relationship between data, clock, and DATA ENABLE. A max. clock frequency of 0.5 MHz is assumed.

FIGURE 1. INTERNAL BLOCK DIAGRAM

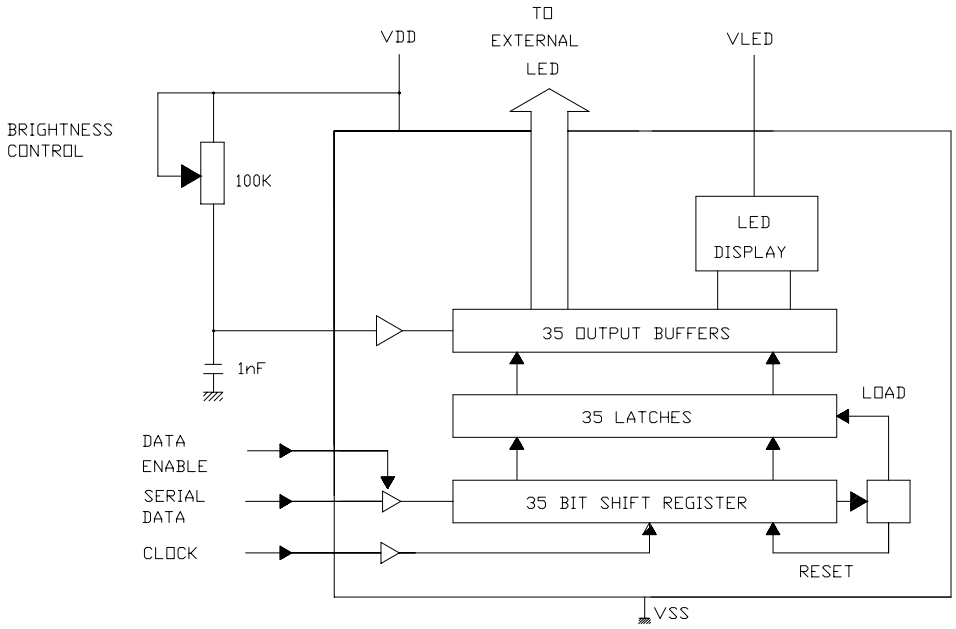


FIGURE 2. INPUT DATA FORMAT

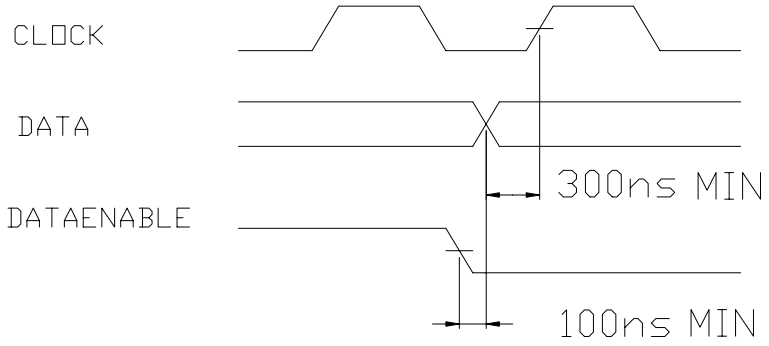


FIGURE 3. TIMING RELATIONSHIP

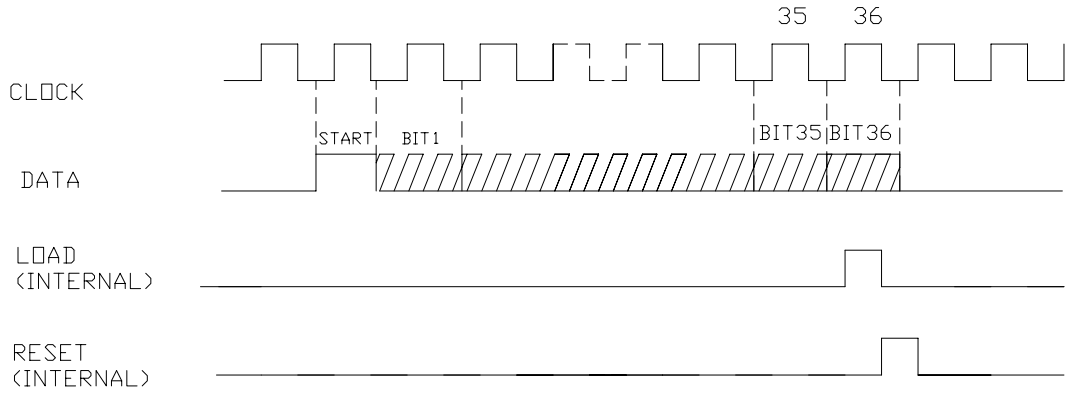


TABLE 1 SERIAL DATA INPUT SEQUENCE

BIT	LTM-8522	
	DIGIT	SEGMENT
1	1	A
2	1	B
3	1	C
4	1	D
5	1	E
6	1	F
7	1	G
8	1	D.P.
9	2	A
10	2	B
11	2	C
12	2	D
13	2	E
14	2	F
15	2	G
16	2	D.P.
17	3	A
18	3	B
19	3	C
20	3	D
21	3	E
22	3	F
23	3	G
24	3	D.P.
25		PIN 4
26		PIN 5
27		PIN 6
28		PIN 7
29		PIN 8
30		PIN 9
31		PIN 10
32		PIN 11
33		PIN 12
34		PIN 13

TYPICAL APPLICATION