



LTM-8647A SERIES

0.54" 2-CHARACTER 14-SEGMENT
ALPHANUMERIC DISPLAY WITH MOS I.C. DRIVER

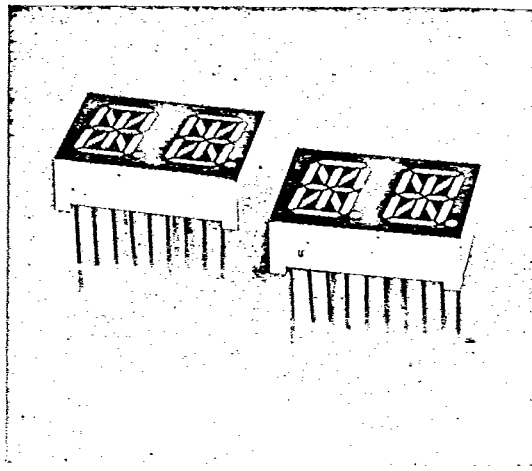
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FEATURES

- 0.54 INCH (13.8mm) DIGIT HEIGHT, 14-SEGMENT CHARACTER.
- WIDE SUPPLY VOLTAGE OPERATION.
- SERIES DATA INPUT.
- CONSTANT CURRENT DRIVERS.
- CONTINUOUS BRIGHTNESS CONTROL.
- SOLID STATE RELIABILITY, LONG OPERATION LIFE.
- WIDE VIEWING ANGLE.
- CHOICE OF FIVE BRIGHT COLORS-RED/BRIGHT RED/GREEN/ORANGE/HIGH EFFICIENCY RED.
- TTL COMPATIBLE.

DESCRIPTION

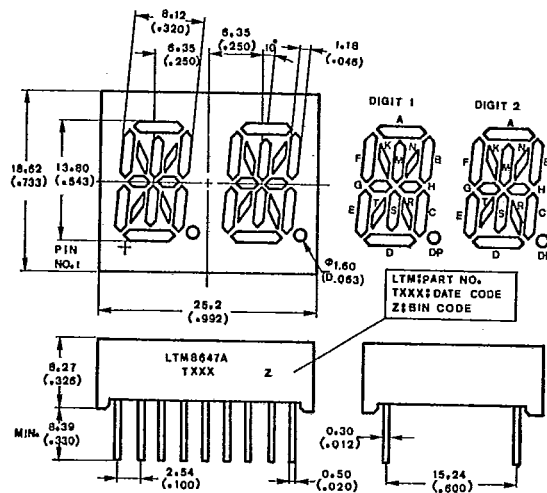
The LTM-8647A series are dual character 14-segment alphanumeric display modules, having a built-in M5450 MOS integrated circuits. The integrated circuit contains series data input, 35 bit shift registers, 34 LED driver outputs and a brightness control. The red devices utilized LED chips which are made from GaAsP on a GaAs substrate. The bright red and green devices utilized LED chips which are made from GaP on a transparent GaP substrate. The orange and high efficiency red devices utilized LED chips which are made from GaAsP on a transparent GaP substrate. The MOS integrated circuits produced with N-channel silicon gate technology. Red and bright red displays have black face and red segment color. Green and orange displays have gray face and white segment color. High efficiency red displays have red face and red segment color.



DEVICES

PART NO. LTM-					DESCRIPTION
RED	BRIGHT RED	GREEN	ORANGE	HI.-EFF. RED	
8647AR	8647AP	8647AG	8647AE	8647AHR	Dual Character, with I.C. Driver

PACKAGE DIMENSIONS



PROGRAMMABLE DISPLAY & LED
DISPLAYS WITH DRIVER IC ROUTING

NOTE: All dimensions are in $\frac{\text{millimeters}}{\text{(inches)}}$ tolerance are:

1. Lead length (from seating plane): minimum value $\frac{+1.00}{-0.000} \text{ mm}$
 $\left(\frac{+0.040''}{-0.000''} \right)$
2. $\frac{\pm 0.25 \text{ mm}}{(0.010'')}$ unless otherwise noted.

PACKAGE PIN CONNECTION

PIN NO.	CONNECTION	PIN NO.	CONNECTION
1	Bit 32 Output	10	No. Pin
2	Bit 33 Output	11	No. Pin
3	Bit 34 Output	12	No. Pin
4	Data Input	13	Vss* 1
5	Clock Input	14	Vss* 1
6	Data Enable	15	No. Pin
7	VDD	16	No. Pin
8	VLED	17	Bit 31 Output
9	Brt Control	18	No. Pin

NOTE: Pin 13 & 14 are internally connected.

ABSOLUTE MAXIMUM RATING AT $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	MIN.	MAX.	UNITS
Supply Voltage *1	V_{DD}	-0.3	15	V
Input Voltage	V_I	-0.3	15	V
Off State Output Voltage	V_o (off)		15	V
LED Supply Voltage	V_{LED}	2.8	3.5	V
Power Dissipation of IC *2	P_D (IC)		350	mW
Supply Current	I_{DD}		7	mA
operating Temperature Range	T_{op}	-20	+60	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-20	+60	$^\circ\text{C}$
Solder Temperature 1/16 inch Below Seating Plane for 3 Seconds at 260°C				

NOTES: 1. All voltages are with respect to V_{SS} (GND)2. Power dissipation of IC is given by $P_D = (V_{LED} - V_F) \cdot (I_F) \cdot (\text{No. of Segments}) + (7\text{mA}) \cdot V_{DD}$ * V_F is LED forward voltage.RECOMMENDED OPERATING CONDITION AT $T_A = 25^\circ\text{C}$

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Supply Voltage	V_{DD}	4.75		13.2	V	
Input Voltage						
Logical "0" Level		-0.3		0.8	V	$\pm 10\mu\text{A}$ Input Bias $4.75\text{V} < V < 5.25\text{V}$ $V_{DD} > 5.25\text{V}$
Logical "1" Level	V_I	2.2		V_{DD}	V	
Logical "1" Level		$V_{DD}-2$		V_{DD}	V	
Brightness Input Current	I_B	0	0.75	mA		
Brightness Input Voltage	V_B	3		4.3	V	Input Current = $750\mu\text{A}$
Off State Voltage	V_o (off)			13.2	V	
Output Sink Current						
Segment Off				10	μA	$I_B = 0\mu\text{A}$ $I_B = 100\mu\text{A}$ $I_B = 200\mu\text{A}$
Segment On			3		mA	
			6		mA	
Input Clock Frequency	F_{clock}	0		0.5	MHZ	
Output Matching	I_o			± 20	%	

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ELECTRICAL/OPTICAL CHARACTERISTICS AT T_A = 25°C

LTM-8647AR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I _v	200	400		μcd	I _B = 0.4 mA
Peak Emission Wavelength	λ _p		655		nm	I _B = 0.4 mA
Spectral Line Half-Width	Δλ		24		nm	I _B = 0.4 mA
Luminous Intensity Matching Ratio	I _{v-m}			2.1		I _B = 0.4 mA

PROGRAMMABLE DISPLAY
DRIVERS WITH DRIVER IC OPTION

LTM-8647AP

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I _v	300	650		μcd	I _B = 0.4 mA
Peak Emission Wavelength	λ _p		697		nm	I _B = 0.4 mA
Spectral Line Half-Width	Δλ		90		nm	I _B = 0.4 mA
Luminous Intensity Matching Ratio	I _{v-m}			2.1		I _B = 0.4 mA

LTM-8647AG

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I _v	600	1800		μcd	I _B = 0.4 mA
Peak Emission Wavelength	λ _p		565		nm	I _B = 0.4 mA
Spectral Line Half-Width	Δλ		30		nm	I _B = 0.4 mA
Luminous Intensity Matching Ratio	I _{v-m}			2.1		I _B = 0.4 mA

LTM-8647AE

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I _v	600	1800		μcd	I _B = 0.4 mA
Peak Emission Wavelength	λ _p		630		nm	I _B = 0.4 mA
Spectral Line Half-Width	Δλ		40		nm	I _B = 0.4 mA
Luminous Intensity Matching Ratio	I _{v-m}			2.1		I _B = 0.4 mA

LTM-8647AHR

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Average Luminous Intensity	I_v	600	1800		μcd	$I_B = 0.4 \text{ mA}$
Peak Emission Wavelength	λ_p		635		nm	$I_B = 0.4 \text{ mA}$
Spectral Line Half-Width	$\Delta\lambda$		40		nm	$I_B = 0.4 \text{ mA}$
Luminous Intensity Matching Ratio	$I_v\text{-m}$			2.1		$I_B = 0.4 \text{ mA}$

FUNCTIONAL DESCRIPTION

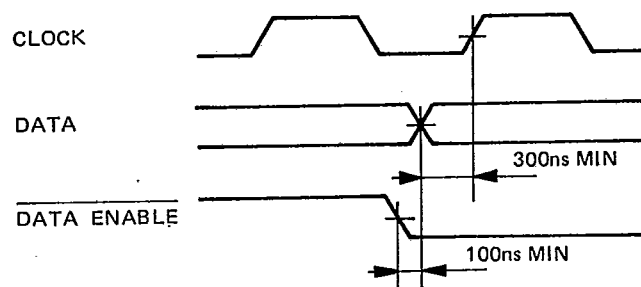
Serial data transfer from the data source to the display driver is accomplished with 2 signals serial data and clock. Using a format of a leading "1" followed by the 35 data bits allows data transfer without an additional load signal. The 35 data bits are latched after the 36th bit is complete, thus providing nonmultiplexed, 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 9 to prevent possible oscillations. The output current is typically 25 times greater than the current into Pin 9 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" precede the 35 bits of data. At the 36th

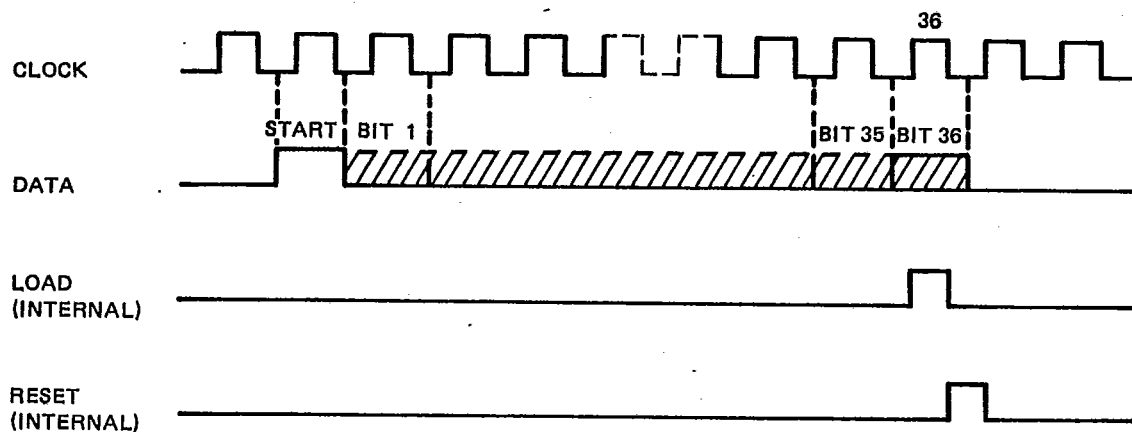
clock, a LOAD signal is generated synchronously with the high state of the clock, which loads the 35 bits of the shift registers into the latches. At the low state of the clock a RESET signal is generated which clears all the shift registers for the next set of data. The shift registers are static master-slave 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 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/Input data format. FIG. 1 Input data format.

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PROGRAMMABLE DISPLAY & LED
DISPLAYS WITH OR WITHOUT

FIG. 2 Timing relationship

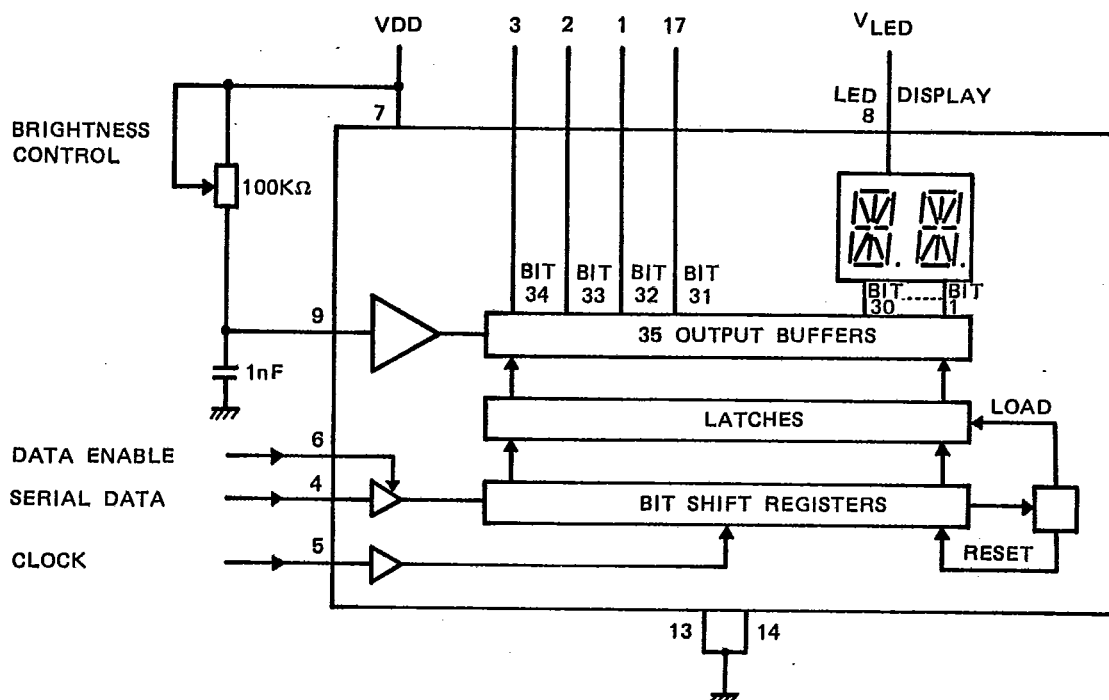


FIG. 3 Internal Block Diagram

TABLE I SERIAL DATA INPUT SEQUENCE

BIT	DIGIT	SEGMENT	BIT	DIGIT	SEGMENT
1	2	A	18	1	D
2	2	B	19	1	E
3	2	C	20	1	F
4	2	D	21	1	G
5	2	E	22	1	H
6	2	F	23	1	K
7	2	G	24	1	M
8	2	H	25	1	N
9	2	K	26	1	R
10	2	M	27	1	S
11	2	N	28	1	T
12	2	R	29	1	DP
13	2	S	30	2	DP
14	2	T	31		PIN 17
15	1	A	32		PIN 1
16	1	B	33		PIN 2
17	1	C	34		PIN 3

PACKAGING

T-90-20

Reel Packaging (Axial Lead Units)

DEVICE TYPE	COMPONENT SPACE (MM) "A"	TAPE SPACE (MM) "B"	REEL DIA (MM) "D"	QUANTITY (EA)		CARTON	
				REEL	CARTON	SIZE (MM)	WEIGHT (KG)
DO-41 DO-41L	5±0.5	52.4±1.5	326~336	5000	20K	355 x 355 x 355	10.5
DO-201AD	10±0.5	52.4±1.5	326~336	1200	4.8K	355 x 355 x 355	9.0
P6(Aleg)	10±0.5	52.4±1.5	326~336	700	2.8K	355 x 355 x 355	8.8

The C dimension of Fig. 3 is between 3.17mm and 635mm greater than the length of the component involved.

FIG. 1

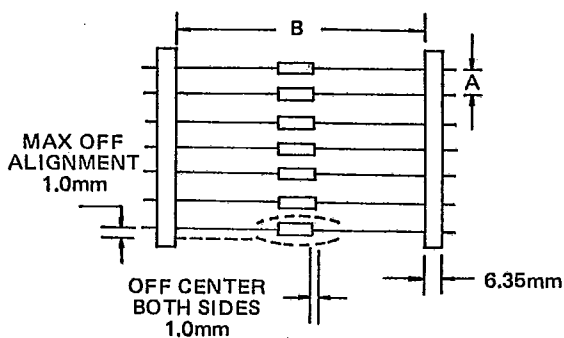


FIG. 2

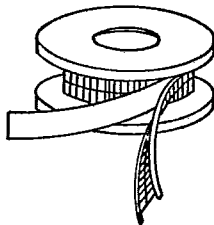
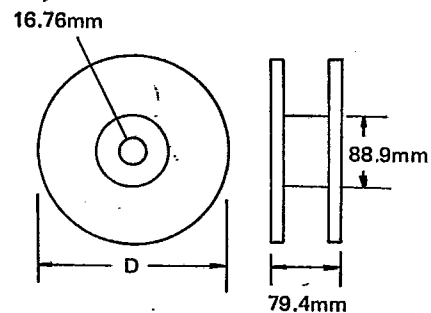


FIG. 3

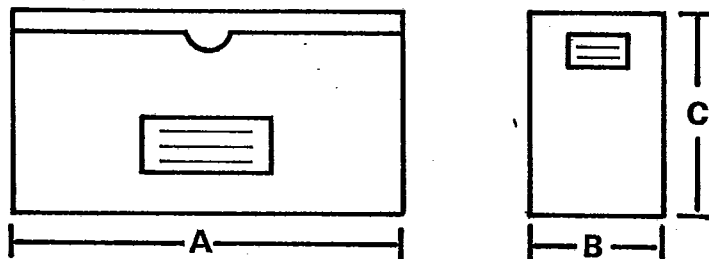


Bulk Packaging (Axial Lead Devices and Bridge Rectifiers)

DEVICE TYPE	PACKAGING SIZE (MM)		QUANTITY (EA)		APPROX GROSS WEIGHT (KG)	
	BOX	CARTON	BOX	CARTON	BOX	CARTON
DO-41 DO-41L	196 x 84 x 20	450 x 210 x 250	1000	50K	0.38	20
DO-201AD	305 x 93 x 59	355 x 355 x 355	1000	20K	1.35	28
P6(Aleg)	305 x 93 x 59	355 x 355 x 355	500	10K	1.2	24.5
PBM	357 x 125 x 60	530 x 360 x 340	1000	20K	1.5	32.3
PBDF	495 x 155 x 145	500 x 325 x 305	5000	20K	5.1	21.5
PBP	357 x 125 x 60	530 x 360 x 340	500	10K	1.5	31.5
PBL	375 x 220 x 155	470 x 385 x 455	1000	5K	5.7	30.5
PBPC-6	357 x 125 x 60	560 x 360 x 340	250	5K	1.1	22
PBPC-8	357 x 125 x 60	560 x 360 x 340	250	5K	1.7	35
KBPC	375 x 220 x 365	470 x 390 x 385	500	1K	15.1	31.5
KBPC-W	375 x 220 x 365	470 x 390 x 385	500	1K	14.5	30.0

AMMO BOX PACKAGING

BOX SIZE



Unit:m. m.

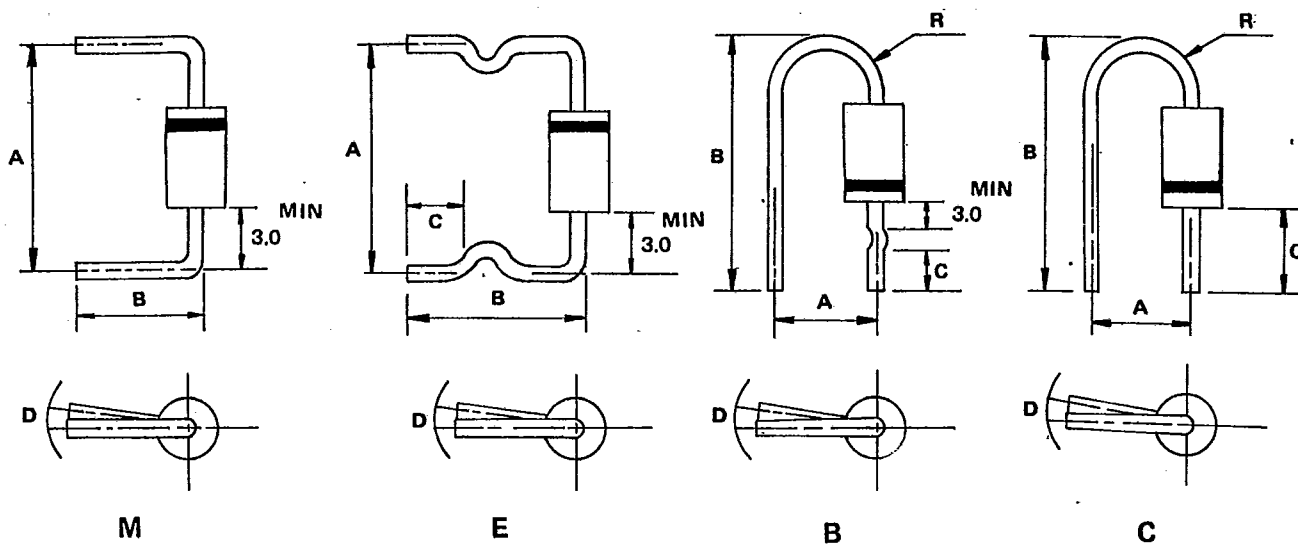
Packaging	Products Outline	Dimension *A*	Dimension *B*	Dimension *C*	Q'ty per BOX
26MM Horizontal Ammo Pack	DO-41 DO-41L(0.6mm Lead)	255	50	95	3K
					3K
52MM Horizontal Ammo Pack	DO-41and DO-41L DO 201AD	250	75	92	3K
					0.8K

CARTON SIZE

Unit:m. m.

Packaging	Products Outline	length	Width	High	Q'ty Per Carton
26MM Horizontal Ammo Pack	DO-41 DO-41L(0.6mm Lead)	330	310	268	42K
					48K
52MM Horizontal Ammo Pack	DO-41and DO-41L DO 201AD	355	355	340	12K
					12K

PREFORMED LEAD DRAWING



Case type	Preformed type	A (mm)		B (mm)		C (mm)		D (mm)		R (mm)	
		range	tolerance	range	tolerance	range	tolerance	range	tolerance	range	tolerance
D041	M	9.0-20.0	1.0	8.0-22.0	±0.5	—	—	1.5	max	—	—
	E	11.0-20.0	±1.0	11.0-16.0	±1.0	4.0-5.0	±0.5	1.5	max	—	—
	B	7.5	±0.5	19.0-22.0	±0.5	7.5	±0.5	1.5	max	2.5-4.0	Typ
	C	4.5	±0.8	18.0-19.0	±0.5	9.0	±0.5	1.5	max	2.5-4.0	Typ
D0201AD	M	15.0-20.0	±1.0	8.0-22.0	±1.0	—	—	2.0	max	—	—
	E	15.0-20.0	±1.0	10.0-22.0	±1.0	3.0-15.0	±0.5	2.0	max	—	—
P6(Aleg)	M	15.0-20.0	±1.0	8.0-22.0	±1.0	—	—	2.0	max	—	—