636-812 TO 848

B100XXL family

LED displays with integral driver

User Manual Ver 1.0

System Description

The B100M02L and the B100S02L family of LED 7 segment displays provide a fully functional display system that can be easily expanded to suit the user's requirements. Typical applications are for shop floor displays, security systems, public areas, gaming machines or anywhere where a high visibility 7 segment display is required. The B100 series is a dot segment type display with 100 mm high characters and a wide viewing angle.

The displays are based on a high efficiency LED technology with a light output of 200000ucd per segment allowing viewability at 30m.The basic unit in each family is a two digit master display which contains the LED driver and interface circuitry. These are end stackable with a two digit slave board to provide up to 4 digits per unit. A simple serial bus (National MM5450 series) provides access to each of the segments for full versatility. Each digit features a right hand decimal point. The slave unit has two additional outputs that can be used as annunciators.

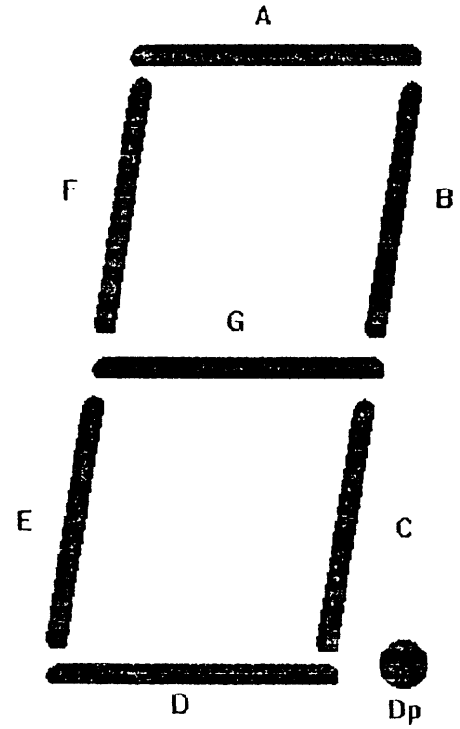
The unit interfaces at CMOS levels to a microcontroller or can be connected to a digit controller board that allows the user to interface to the displays using SPI, I2C or RS232 serial bus protocols. The master unit has a pull down jumper that can permanently enable the communication bus, thereby allowing two wire operation. These devices feature filters allowing the operation across long wiring looms. Faster versions without a filter are also available (designation F) as are parallel loaded version for bus applications.

A master display features a regulated power supply which allows the units to work from an 11.5 to 13.5 (nominally 12) volt DC supply line. The displays are driven by a direct drive system thus minimising spurious radiation and flicker sometimes noticeable with scanned displays. The serial interface consists of a clock, data and enable line allowing more than 1 master to be present on the serial bus. Interfacing to the slave board is done using a 20 way connector that provides drive signals and power. The LED brightness can be altered by adding resistance across on board terminal pins. The slave board is supplied with the necessary master to slave cable.

The B100XXL family of LED displays provide a simple cost effective way of implementing large 2 digit 7 segment characters and offers the ease and flexability of increasing the number of digits by adding a 2 digit end stackable slave unit. On board drivers relieve the system of the overhead of driving a multiplex display whilst the serial bus minimises the i/o requirement. By utilising a digit controller board (BIF-) a display can be driven by RS232 (R), I2C (I) and SPI (S) serial busses allowing a simple connection to be made to a wide variety of host devices. The on-board power regulators allow poorly regulated supplies to be used.

Board dimensions are 100mm by 135mm.Overall depth is 31mm with the depth behind the panel being 19mm. Connections are by 5 pin PCB molex crimp header plug on a 0.1inch pitch. Power consumption is 500mA max with all LEDs on. Operating temperature range is 0 to +50 degrees ambient. A mounting post in each corner allows the use of M3 screws for securing the device.

Segment designation



Bit number	Segment	Digit
1	A	1
2	B	1
3	C	1
4	D	1
5	E	1
6	F	1
7	G	1
8	DP	1
9	A	2
10	B	2
11	C	2
12	D	2
13	E	2
14	F	2
15	G	2
16	DP	2

Bit number	Segment	Digit
17	A	3
18	B	3
19	C	3
20	D	3
21	E	3
22	F	3
23	G	3
24	DP	3
25	A	4
26	B	4
27	C	4
28	D	4
29	E	4
30	F	4
31	G	4
32	DP	4
33	AN1	
34	AN2	

DIGIT 4 DIGIT 3
SLAVE

DIGIT 2 DIGIT 1
MASTER

Functional Description (master unit)

The master control unit contains the driver IC, the regulated power supply and the serial interface filter circuits along with the LED displays mounted on the reverse side. It also has connectors which enable the connection of the serial bus and slave display unit.

Power is applied via the header at +12 volts DC. This is regulated to 8.6 volts by the linear regulator. It is this voltage that is used to drive the current through the series connected LEDs. There are 4 LED's per segment. The decimal point has 1 LED in series with a zener diode. The regulator is mounted on a heatsink which provides sufficient cooling when providing power to a master and slave board with all LED's lit. However care should be exercised if the supply voltage rises above +12v as at full load this could (depending on ambient temperature) cause excessive dissipation and subsequent thermal shutdown of the regulator. The regulator has a series inductor for RF suppression, and supply decoupling on the PCB.

The display driver is the MM5450N. This chip features a "SPI" like serial interface, 34 constant current sinks and a wide supply operating voltage. Each segment on the master display is connected to a current sink. The remaining outputs are pinned out to a 20 way ribbon header for connection to a slave display.The LED display driver is of the non-multiplexed type.

The serial bus consists of a clock, chip enable and data. The chip enable is held low whilst the data is synchronously clocked into the device. A set of pins on the board allow the chip enable to be held permanently low thus reducing the interface to a two wire bus. However noise may cause spurious transitions on the clock or data lines if these are of long length and it is recommended that a chip enable be used if available. Each segment on the LED display is connected to a constant currrent N channel transistor. These outputs are programmed via the resistor R1 to provide around 15 mA of current per segment. The displays are common anode type. Only 32 driver outputs are required by the 7 segment displays. The remaining two are used as annunciators and are pinned via the header to the slave board. The LED brightness can be externally modulated by connecting a external resistance across the brightness header pins. In this way the display can be blanked or dimmed as required. Timing diagrams are shown in figure 1. Segment and digit information for the display is shown in table 1.

To provide high noise immunity and a degree of transient protection when driving the displays from long lines, the board has filter circuits (1st order RC) on the clock, data and chip enable lines. These filters are compatible with the BIF range of driver interface decoder boards. The filters have a time constant of around 10.4 uS which limit the display update rate to around 250 writes per second. Note that this is equivalent to 1000 digits per second as 4 digits are altered on each write.

Header Pin outs - master and slave boards.

Master/slave interconnect header. (20 way IDC ribbon)

PIN#	SIGNAL		PIN#
1	3A	0V	2
3	3B	3C	4
5	3D	3E	6
7	3F	3G	8
9	DP3	4A	10
11	4B	4C	12
13	4D	4E	14
15	4F	4G	16
17	DP4	AN1	18
19	AN2	+8.6	20

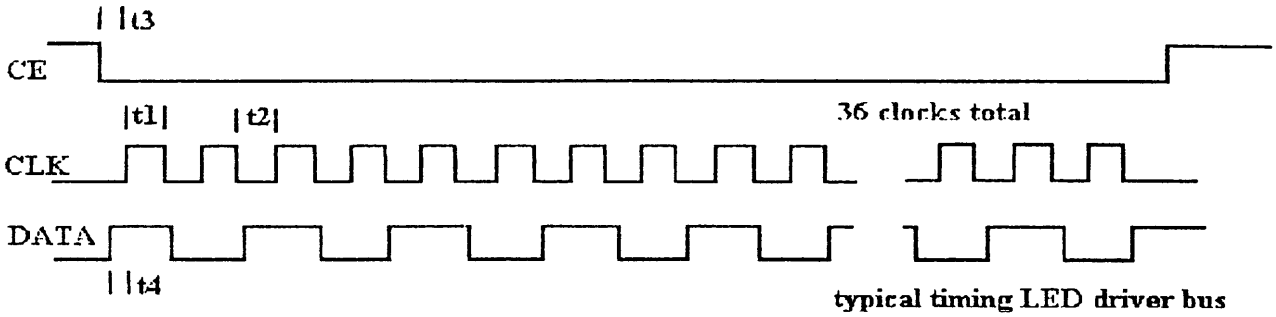
Master / host header

PIN#	SIGNAL
1	Chip enable (active low)
2	Data
3	Clock (positive edge triggered)
4	+12v DC
5	0V

Slave annunciator header

PIN#	SIGNAL
1	AN1
2	AN2
3	+8.6 v
4	0v

LED Driver Bus Timing



typical timing LED driver bus

		Min
Clock high period	t1	50 us
Clock low period	t2	50 us
CE to rclk rising edge	t3	10 us
Data stable before edge	t4	10 us

Note: The first bit of the data is a start bit. It is always a logic 1. It is followed by 32 bits containing the LED segment data, 2 bits of annunciator data and a final clock to latch the data into the driver. Timing information given is with 11 uS filter in circuit.The maximum frequency of the driver is 500 KHz. Please contact the supplier for faster versions.

Slave unit

The slave board contains the segment header, power supply components, annunciator header and reverse mounted LED display. The segment header connects to the master via a short (max 100mm) ribbon cable (supplied with slave board).

The annunciator header allows the connection of two off board annunciator LED's. These are connected to the +8 volt supply on the header (anode to +8v) and the appropriate annunciator AN1 or AN2.
It is recommended that series connected zeners are used to drop the voltage that appears across the driver IC. The value can be calculated as follows.

Vz = 8.6 - (LED forward voltage * number of LED's) - 0.8.

For example a single annunciator LED of 1.8 volts Vf could use a zener of rating as follows:

Vz = 8.6 - (1.8 * 1) - 0.8
Vz = 6 volts.

A 5v6 zener would dissipate (5.6 * 0.02) = .112 watts so a 800mw device is more than adequate.
It is better to select the next lowest zener in voltage rating in order to allow for LED ageing and more important, supply voltage variation.

B100XXL Technical Specification

Parameter	Min	Typ	Max	Units
Supply voltage	11.5	12.0	13.5	VDC *
Supply Current			512	mA **
LED luminosity		60	200	mCd
LED update rate			1000	digits/sec
LED segment current			15	mA
Output matching			-/+ 20	% ***
Annunciator current			20	mA
Serial interface				
Logic 0	0		0.8	Volts
Logic 1	5	6	8.5	Volts
Input current	.		-+10	uA
Filter time constant		11		uS
Operating temperature	0		50	C

*The unit will operate below 11.5 volts but with reduced light output. The LEDs will blank at around 9.5 volts but the data will be retained to below 5 volt.

**All Segments and decimal points illuminated on a four digit display.

*** Calculated as percent variation (imax + imin)/2

Appendix

For further information on these and other displays (including custom designed displays) please contact the supplier at the address below stating the part number, source and the nature of your enquiry. We will be pleased to try to help.

COMTECH LTD
Redgate Road
South Lancs Industrial Estate
Ashton in makerfield
Wigan
Lancs

Tel: 01942 274 731
Fax: 01942 274 732

Alternatively you can Email us on Compuserve UK user ID 101520,2675