40 Segment Static LCD Driver

Description

This V6108 is a CMOS integrated circuit that drives LCD. The circuit drives up to 40 LCD segments from a serial clocked input. It has a serial output for cascading to further drives. The serially clocked data is parallel loaded into latches under control of the strobe pin. The latched data determines which segments are ON or OFF. Any segments output can be used to drive a backplane. A blank function is provided to clear the display.

Applications

- Balance and scales
- Automotive displays
- Utility meters
- Large displays
- Pagers
- Portable, battery operated products
- Telephones

Features

- Serial data input / output
- Low dynamic current, 5 µA max.
- Low standby current , 1 µA max.
- Separate input and display voltages
- Wide power supply range : V_{DD} (logic) 2 to 8V, V_{LCD} (display) V_{DD} to 12V
- On-chip latches separate control and display sections
- Drives up to 40 LCD segments in direct drive
- Crossfree cascadable
- Schmitt Trigger on the inputs
- 30 ns (typ.) glitch filter on every input
- High noise immunity
- Segment outputs short circuit protected
- LCD blanking function
- -40 to +85°C temperature range
- On request extended temperature range, -40 to +125°C
- QFP52 and TAB packages

Typical Operating Configuration

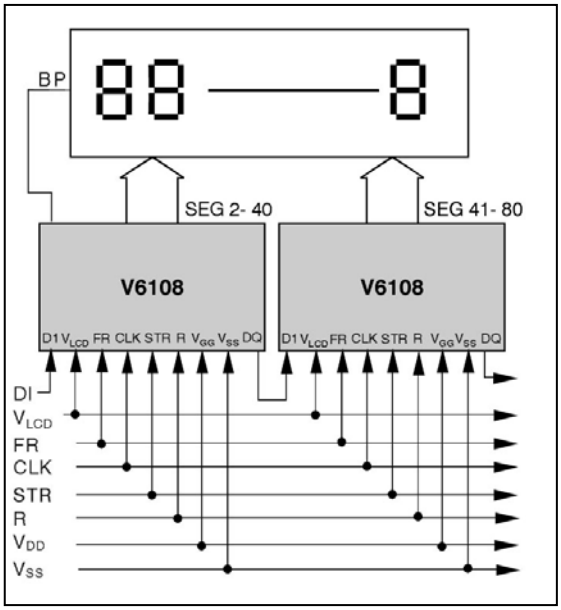

Fig. 1

Pin Assignment

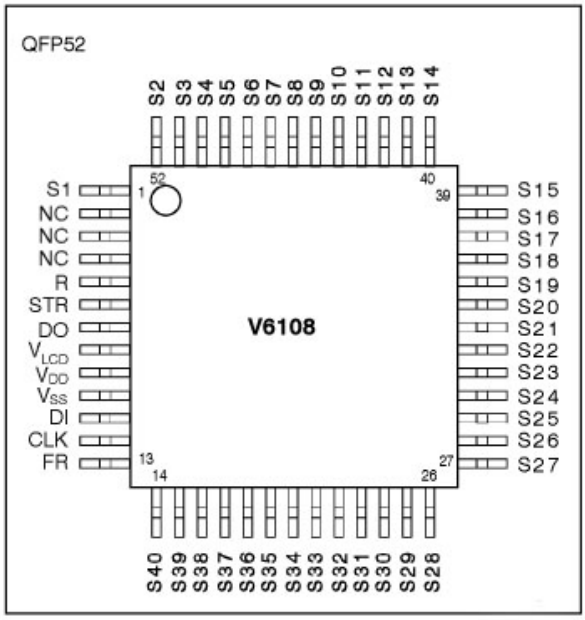

Fig. 2

A COMPANY OF THE SWATCH GROUP

Absolute Maximum Ratings

Parameter	Symbol	Conditions
Logic supply voltage	V_{DD}	-0.3V to +10V
LCD supply voltage (Note1)	V_{LCD}	-0.3V to +14V
Voltage at DI, CLK, STR, FR, R, DO	V_{LOGIC}	-0.3V to V_{DD} + 0.3V
Voltage at S_1 to S_{40}	V_{DISP}	V_{DD} to V_{LCD} + 0.3V
Storage temperature range	T_{STO}	-65 to 150°C
Power dissipation	P_{MAX}	100 mW
Maximum electrostatic discharge to MIL-STD-883C method 3015.7 with ref. to V_{SS}	V_{Smax}	1000V
Max. soldering conditions	T_S	250°C x 10s

Table 1

Note 1 : V_{LCD} has to be higher or equal to V_{DD}

Stresses above these listed maximum ratings may cause permanent damages to the device. Exposure beyond specified operating conditions may affect device reliability or cause malfunction.

Handling Procedures

This device has built-in protection against high static voltages or electric fields; however, anti-static precautions must be taken as for any other CMOS component. Unless otherwise specified, proper operation can only occur when all terminal voltages are kept within the voltage range. Unused inputs must always be tied to a defined logic voltage level.

Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature (Note 1)	T_A	-40	+125	°C
Logic supply voltage	V_{DD}	2.0	8	V
LCD supply voltage	V_{LCD}	V_{DD}	12	V

Table 2

Note 1 : The maximum operating temperature is confirmed by sampling at initial device qualification . In production, all devices are tested at +85°C. On request devices tested at +125°C can be supplied

Electrical Characteristics

Unless otherwise specified: V_{DD}= 5V ± 10%, V_{LCD}= 12V and T_A=-40 to +85°C.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Static supply current	I_{DD}	See note 1		0.1	1	µA
Static supply current	I_{LCD}	See note 1		0.1	1	µA
Dynamic supply current	I_{DD}	See note 1 & 2		55	75	µA
Dynamic supply current	I_{LCD}	See note 1 & 3		0.6	5	µA
All input Signals						
Low level input voltage	V_{IL}				0.8	V
High level input voltage	V_{IH}		3.8	3.5		V
Leakage input current	I_{IL}	$V_{IN}=V_{SS}$ or $V_{IN}=V_{DD}$			1	µA
Data Output DO						
High level output voltage	V_{OH}	I_H=100µA $V_{DD}=V_{LCD}$ =4.5V	V_{DD} -100			mV
Low level output voltage	V_{OL}	I_L=100µA $V_{DD}=V_{LCD}$ =4.5V			V_{SS} +100	mV
Driver Output S1…S40						
High level output voltage	V_{SH}	I_H=20µA $V_{DD}=V_{LCD}$ =4.5V	V_{LCD} -100			mV
Low level output voltage	V_{SL}	I_L=20µA $V_{DD}=V_{LCD}$ =4.5V			V_{SS} +100	mV
Short Circuit Current	I_{SC}	only one output		0.9	2	mA

Table 3

Note 1: Tested with $V_{IL} = V_{SS}$, $V_{IH} = V_{DD}$
Note 2: Tested with f_{CL} = 100kHz, F_{DI} = 50kHz, 50 pF on each segment
Note 3: Tested with f_{FL} = 64Hz, f_{CL} = 0Hz, 50 pF on each segment

Timing Characteristics

Unless otherwise specified: V_{DD}= 5V ± 10%, V_{LCD}= 12V and T_A=-40 to +85°C.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Clock high pulse width	t_{CH}		500			ns
Clock low pulse width	t_{CL}		500			ns
Clock and FR rise time	t_{CR}				500	ns
Clock and FR fall time	t_{CF}				500	ns
Data input setup time	t_{DS}		250			ns
Data input hold time	t_{DH}		0			ns
Data output propagation	t_{PD}	C_{LOAD} = 50pF		600	800	ns
CLK falling to STR rising	t_P		50			ns
STR falling to CLK falling	t_D		250			ns
STR pulse width	t_{STR}		200			ns
FR frequency	f_{FR}			64 Hz (note1)	1 (note2)	mHz
Delay S1 – S40 fall time	t_{SF}			0.5	1	µs
Delay S1 – S40 rise time	t_{SR}			2.9	5	µs

Note 1: Recommended frame frequency
Note 2: Maximum test frequency

Table 4

Timing Waveforms

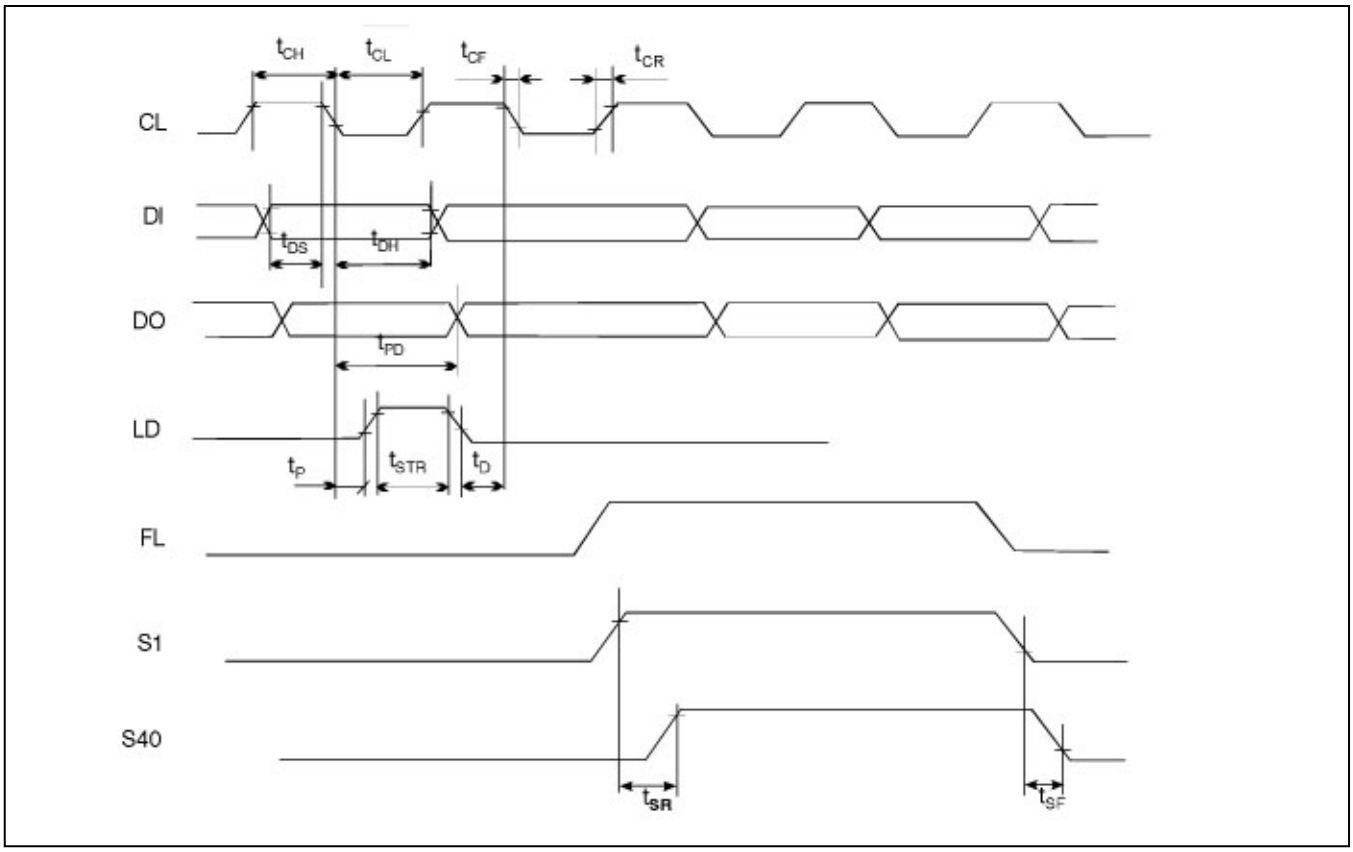

Fig. 3

V_{OL} S1….S40 versus V_{LCD} at -40, +25°C and +85°C.

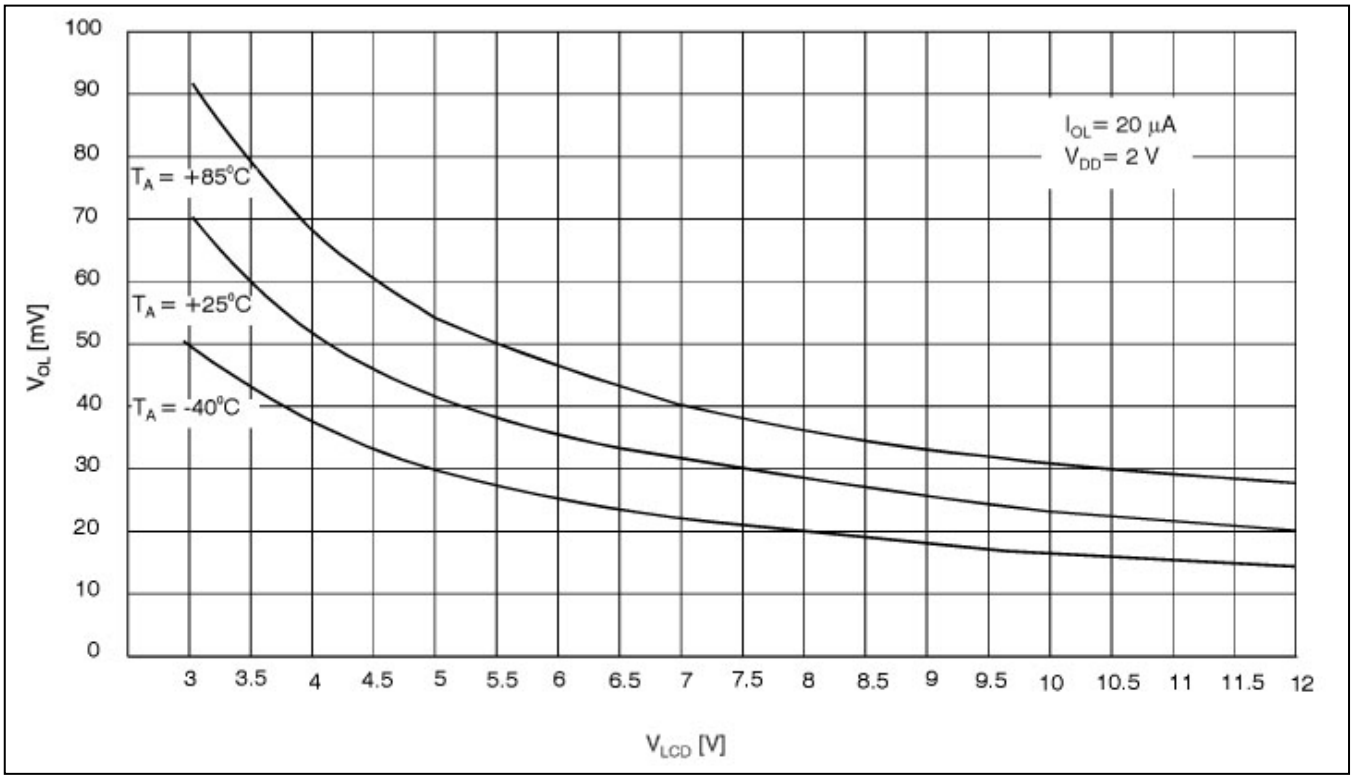

Fig. 4

V_{OH} S1….S40 versus V_{LCD} at -40, +25°C and +85°C.

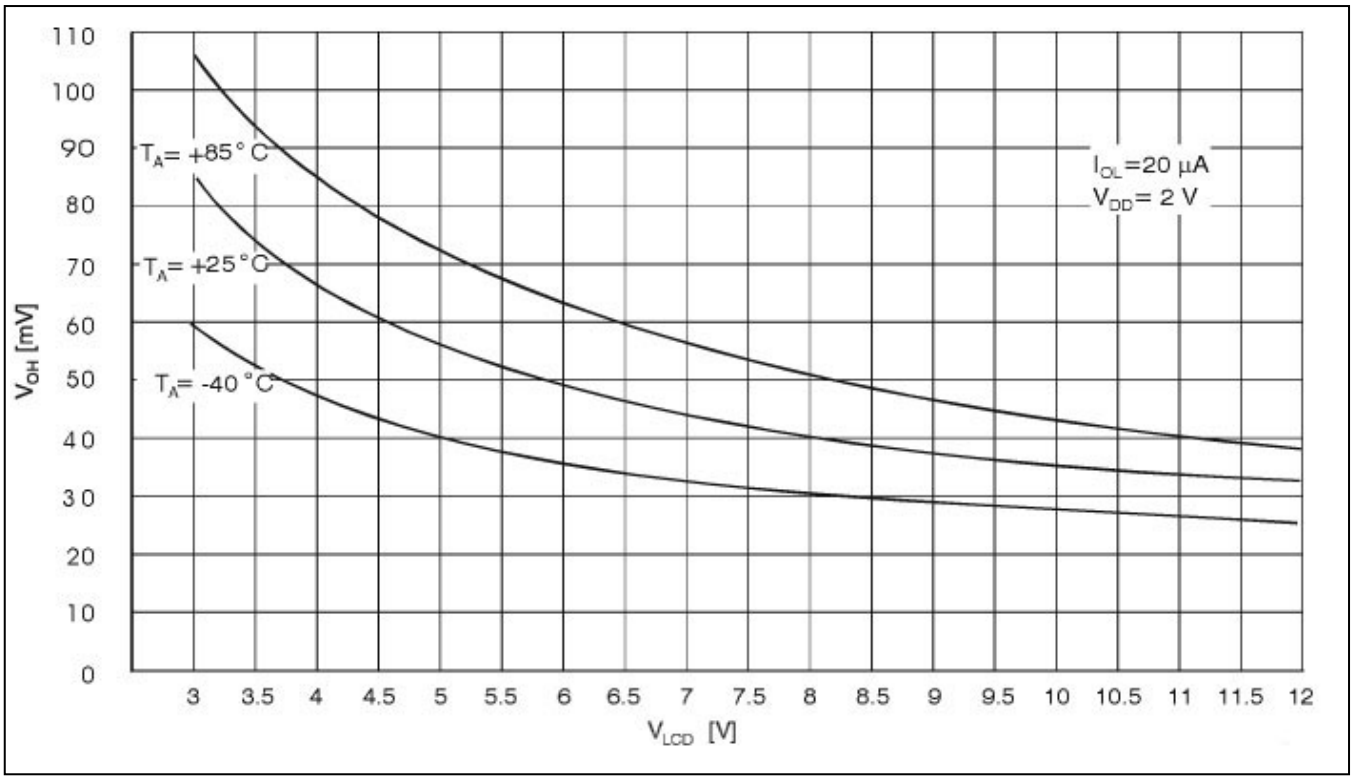

Fig. 5

V_{OL} DO versus V_{DD} at -40, +25°C and +85°C.

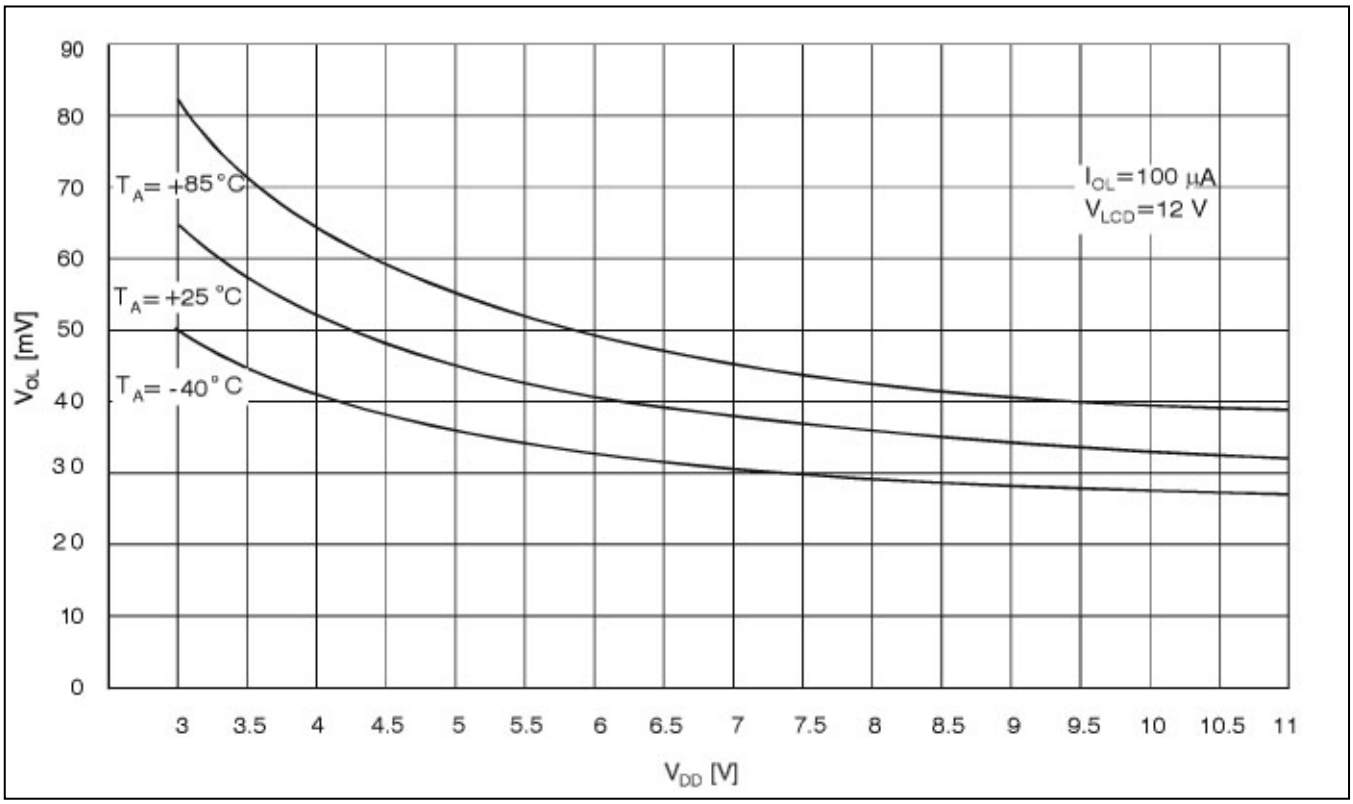

Fig. 6

V_{OH} DO versus V_{DD} at -40, +25°C and +85°C.

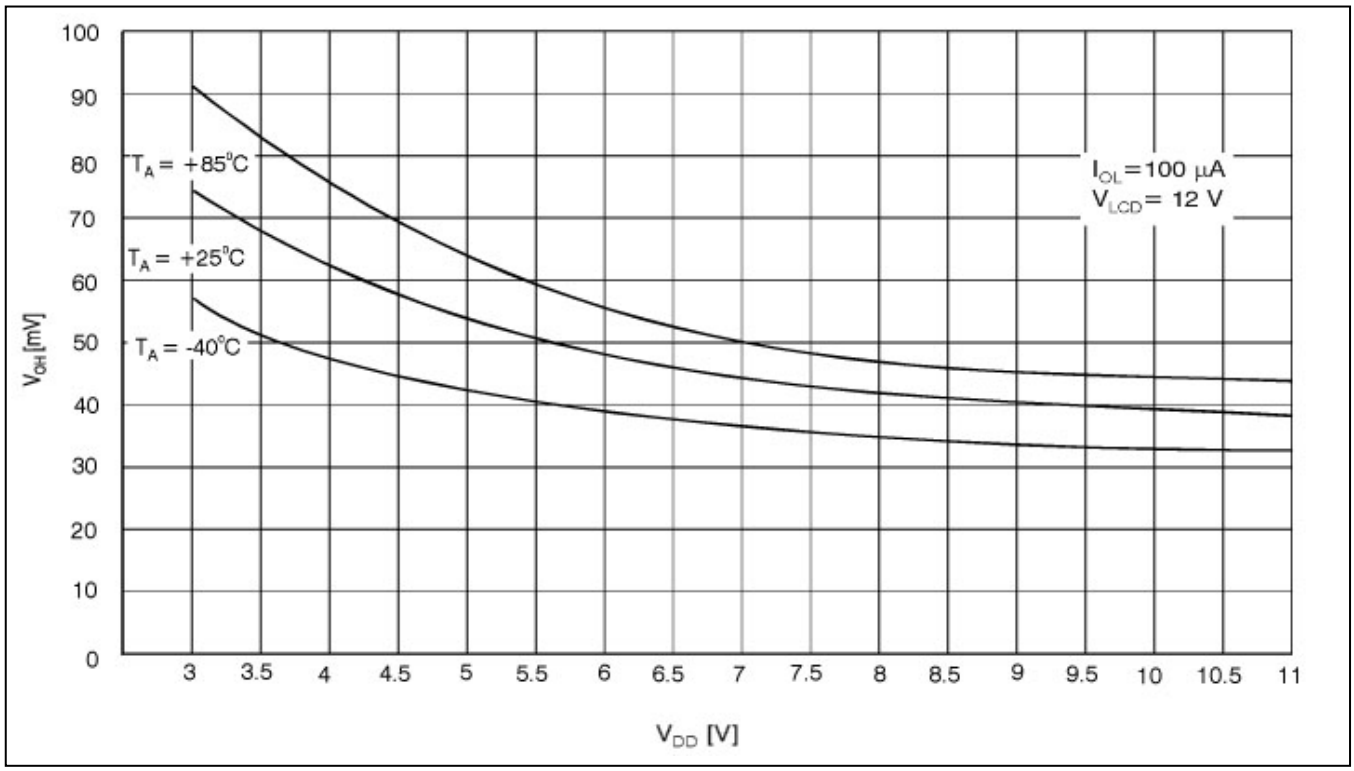

Fig. 7

Block Diagram

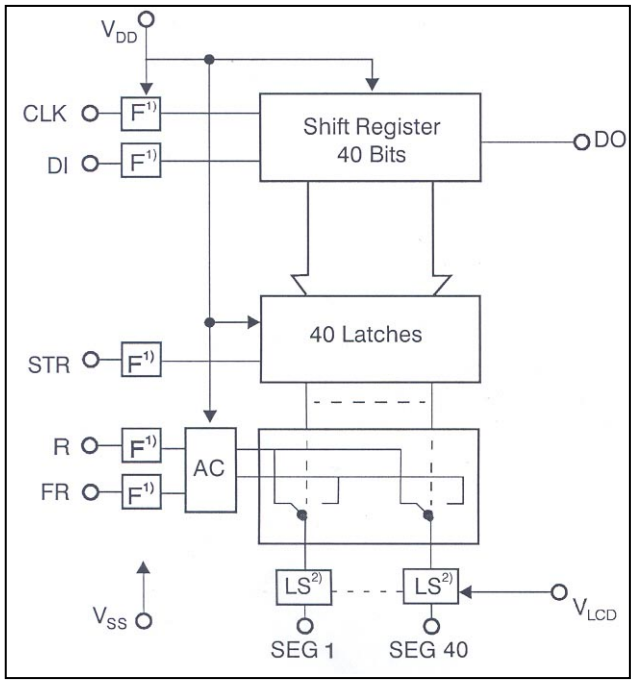

Fig. 8

Note 1: F = Noise Filter
Note 2: LS = Voltage Level Shifter

Pin Assignments

Name	Function
S1….S40	Segment drive outputs
V_{LCD}	Power supply for the LCD
V_{DD}	Power supply for logic
FR	Input for segment frequency control
DI	Serial data input
DO	Serial data output
CLK	Clock input
STR	Strobes the input data into the output latches
R	Display blank control input
V_{SS}	Supply ground

Table 5

Functional Description

Supply voltages V_{LCD}, V_{DD}, V_{SS}

V_{DD} is the positive supply line for the logic and V_{LCD} for the display signals. V_{LCD} has to be equal or higher than V_{DD}. All voltages are specified relative V_{SS}.

Data Input / Output (DI / DO)

The data input pin (DI) accepts serial data from the data source. The data is clocked in a rate determined by the clock input frequency (CLK). A logic "1" on DI corresponds to a visible segment when the backplane is driven by a signal corresponding to logic "0". The data at DO is equal to the data at DI delayed by 40 clock periods. In order to cascade devices the DO of one chip must be connected to DI of the following chip (see Fig.1).

CLK Input

The clock input pin (CLK) is used to clock the DI serial data into the 40-bit shift register. Loading, shifting and outputting of the data occurs at the falling edge of this clock (see Fig.3). When cascading devices , all CLK lines should be tied together.

STR Input

The strobe input pin (STR) is used to latch the input data shifted into the 40-bit shift register. The latched data is held for display. A logic "1" on the STR input transfers the data contained in the shift register cells to the corresponding latches. The latches remain open during the whole time STR remains at logic "1". When cascading devices the STR lines should all be connected.

R Input

When R is active (high), the display is blanked: all segment outputs are tied V_{SS}.. R does not clear the information in the latches.

Segment Driver

The number of segment drivers available on the chip is 40. Each segment driver can be used as backplane-driver. If two or more drivers are connected together, care must be taken to ensure the drivers do not cause circuit malfunction by driving one against the other.

FR Input

This input controls the segment output switching frequency according to Table 6. It must be connected to an external clock signal. When cascading devices, their FR inputs may all be connected to a common signal.

Segment Switching Table

Latched Signal (DI) **0=** V_{IL} **1=** V_{IH}	Signal FR	Segment Voltage **0=** V_{SS} **1=** V_{LCD}
0	0	0
0	1	1
1	0	1
1	1	0

Table 6

Typical Applications

Type V6108 Circuits Driving a 79 Segment Display

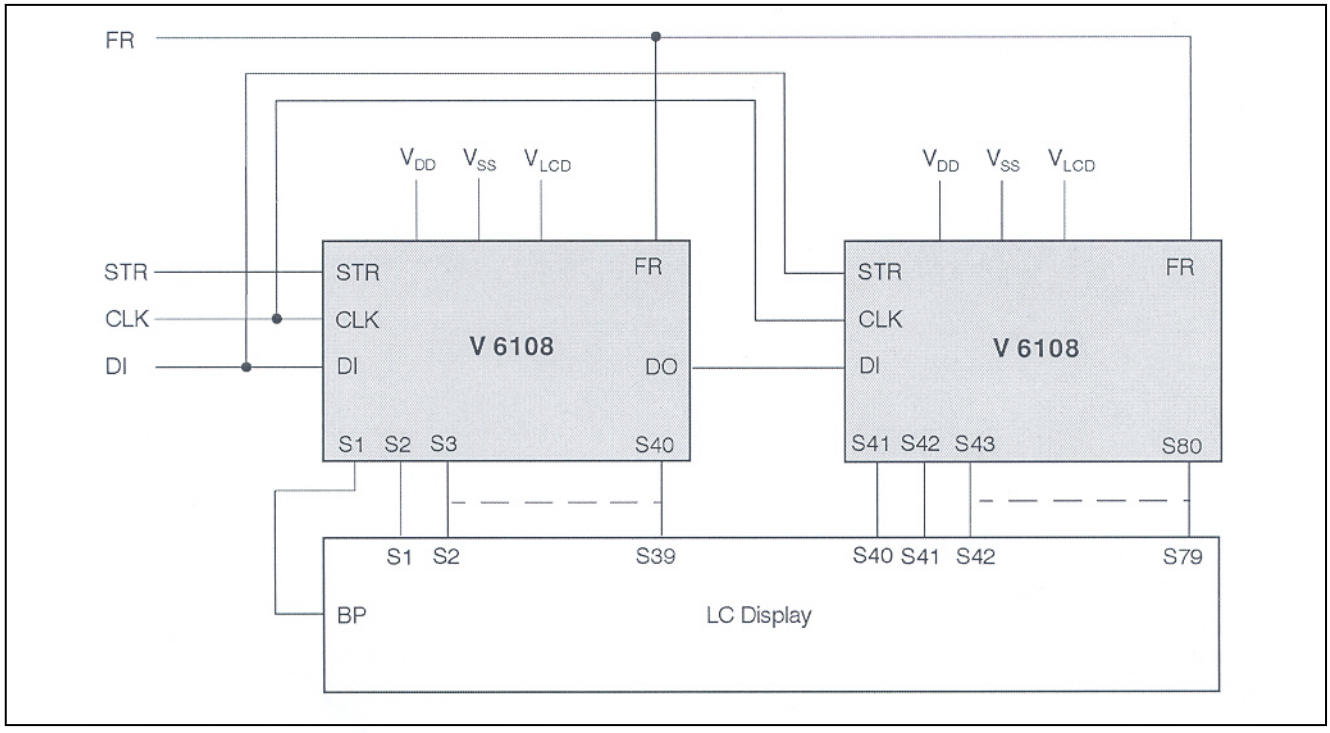

Fig.9

Cascaded V6108 TAB for Direct Drive Application

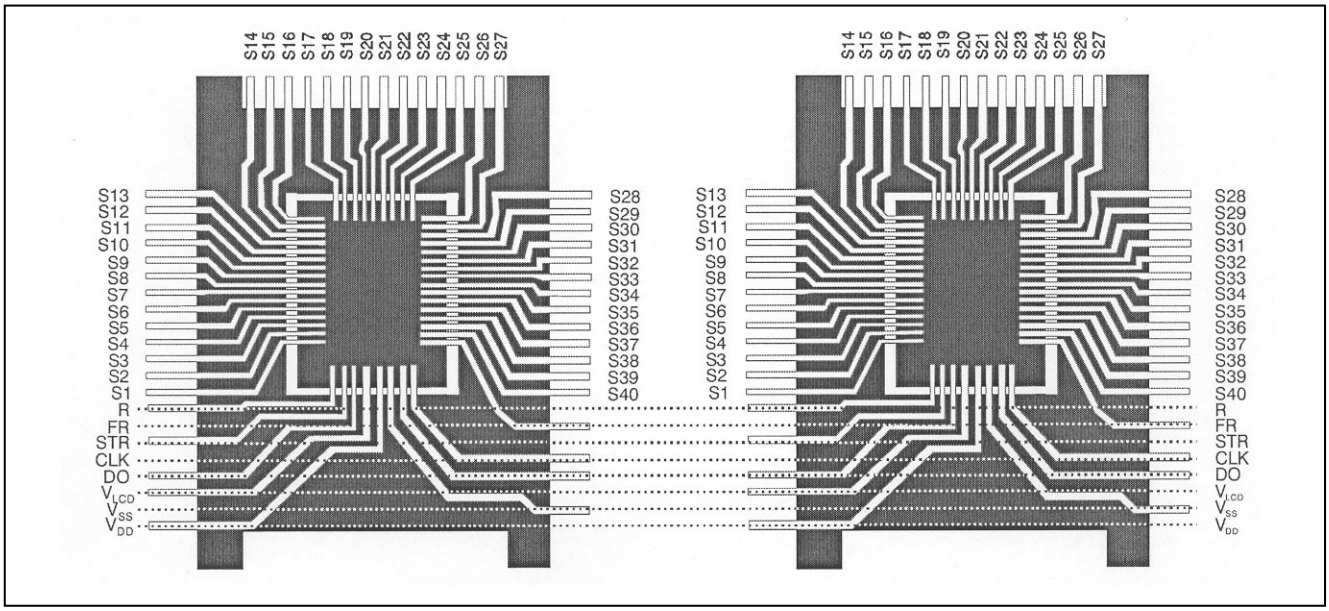

Fig.10

Package and Ordering Information

Dimensions of Chip Form

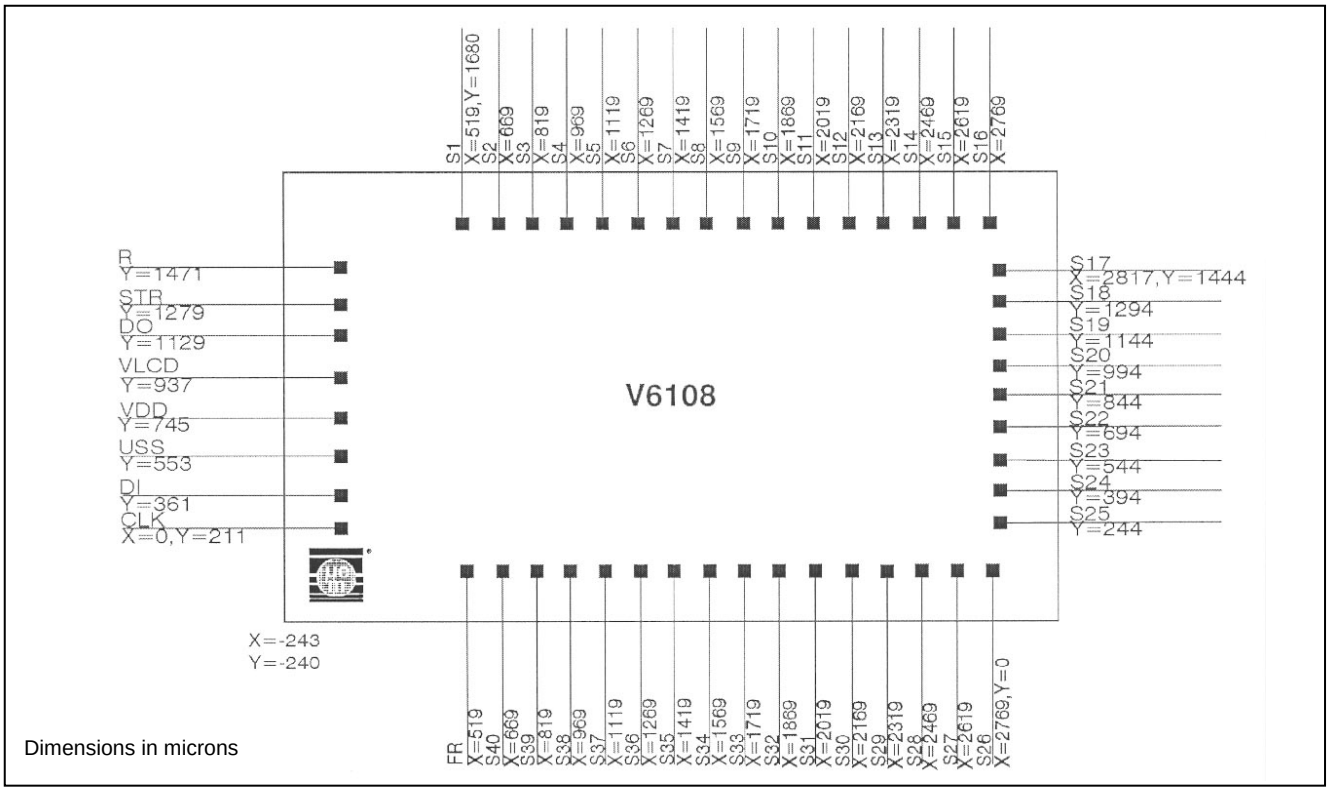

Fig.11

Chip size is X = 3302 by Y= 2159 microns or X = 130 by Y = 85 mils
Note : The origin (0,0) is the lower left coordinate of center pads.
The lower left corner of the chip shows distances to origin.

Side view and recommended Solder Area

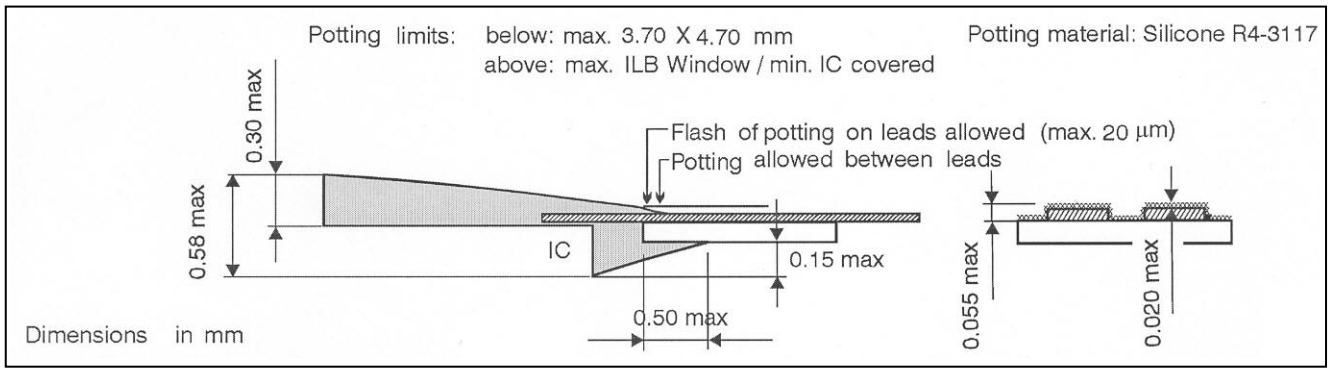

Fig.12

Package and Ordering Information

The V6108 is available in the following packages:

When ordering, please specify the complete part number and package.

QFP52, pin plastic package	V6108 52F
TAB, tape automated bonding	V6108 TAB
Chip form	V6108 Chip *

*on request