

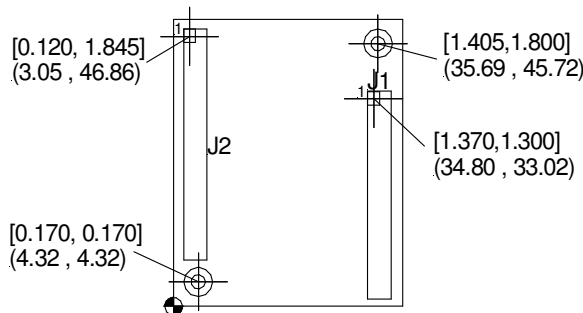
## QVGA Driver Module for VM1

### Product code 5809

The 5809 board aids the inclusion of a QVGA<sup>1</sup> graphics panel and/or a resistive touch screen in VM1 projects. It carries a graphics controller IC (S1D13705) and a touch screen controller IC (TSC2003).

### Mechanical

The diagram gives the exact positions of the connectors and mounting holes, and the exact size of the board.



Size: 40mm x 50mm  
 Mounting holes: 2 off M2.5  
 Connectors: 20 x 2 and 16 x 2, 2mm pitch pins pointing downwards.

Height under board: 6.8mm when using 4.6mm high socket headers.  
 Max component height: 5.6mm  
 Board thickness: 1.6mm

[Coordinates in inches] (Coordinates in mm)

### Compatibility

All types of QVGA LCD display without an on-board controller are catered for in the hardware. However the VM1 software only supports a colour depth of 1 bit-per-pixel (bpp) – i.e. monochrome. The driver software may need to be upgraded to deal with particular displays, but this will normally be done free of charge if suitable target hardware is made available to us.

The 5809 is compatible with resistive touch screens. The *TouchScreen* object drives the TCS2003 providing functions to detect touches or even define 'virtual keypads'.

The TCS2003 has both address inputs tied low giving it an I<sup>2</sup>C Bus address of 144. This address can clash with other I<sup>2</sup>C devices, such as the PCF8591.

The circuit schematic of the module is included at the end of this document.

<sup>1</sup> QVGA – or Quarter VGA – is 320 by 240 pixels resolution.

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## Software Drivers

The two objects that you need to use to drive this board are GraphicsLCD and TouchScreen. Example MAKE statements appear below.

```

;QVGA display on 5809 board.
MAKE g GraphicsLCD (3, 320, 240)
WAIT 50 ;Power sequencing
glcd.On ; --"--

;Touchscreen on 5809 board.
MAKE t Touchscreen(0, 1, 144)

```

The GraphicsLCD MAKE assumes that the 5809 is connected as in the circuit diagrams. See the Object Reference Manual for more details on using these objects.

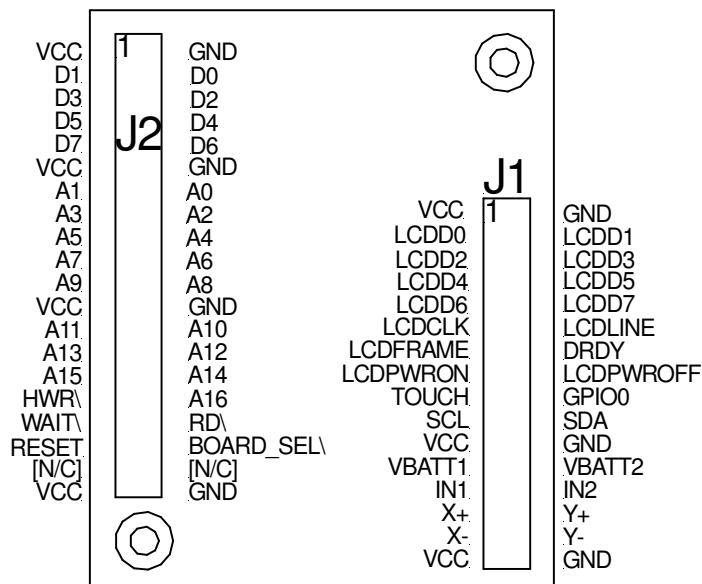
## Connections

The 5809 plugs into an application board<sup>2</sup>, near to, and in the same manner as, the VM1. Tracking on the application board should connect the 5809 to the VM1's data, address and I<sup>2</sup>C buses. See the circuit diagrams for how to connect the 5809 to the VM1.

Note that the hardware specification for connecting modules to the VM1's system bus uses channels 30-37 as extra address lines. Ch 30-33 are used to select more addresses within each module, and Ch 34-37 are used to select between modules. Consequently channels 30-37 are only available for module addressing purposes when any module is connected to a VM1.

The 5809 doesn't have connectors to connect directly to an LCD or a touch screen as there is such a variety of devices on the market, many with different connector styles and pinouts. Instead the connectors to the LCD and touch screen should be sited on the application board, with tracking connecting them to the 5809. See the circuit diagrams for an example of how to do this.

## Pin descriptions



5809, J2	I/O	Comment
D [0 – 7]	I/O	Data bus. From the VM1.
A [0 – 16]	O	Address bus from the VM1.
WAIT\	TS <sup>3</sup>	Bus wait signal – goes to channel 8 on the VM1.
RD\	I	Read strobe from the VM1
HWR\	I	Write strobe from the VM1
RESET\	I	Reset signal from the VM1
BOARD_SEL\	I	Device select for 5809 from the VM1
VCC/GND	P	5 Volt power rail and 0V power rail

5809, J1	I/O	Comment
LCDD [0 – 7]	O	LCD data output. When using a 4-bit panel, use data lines LCDD [4-7] to drive the panel.
LCDCLK	O	LCD pixel clock
LCDLINE	O	LCD line clock
LCDFRAME	O	LCD frame clock
DRDY	--	[Not used currently]
LCDPWRON	O	Hi to power up LCD. Feed this, or the next pin, into the display on/off pin on the LCD.
LCDPWROFF	O	Lo to power up LCD
TOUCH	--	[Not used currently]
SCL	I	I <sup>2</sup> C Bus clock (for touch screen)
SDA	I/O	I <sup>2</sup> C Bus data (for touch screen)
VBATT [1 – 2]	--	[Analogue inputs: not used currently]
IN [1 – 2]	--	[Analogue inputs: not used currently]
X [+ , -]	--	The two ends of the touch screen X driver, + is right.
Y [+ , -]	--	The two ends of the touch screen Y driver, + is top.
GPIO0	O	Modulation output – not always used.
VCC/GND	P	5 Volt power rail and 0V power rail

*Note: if you short out the X+/X- or Y+/Y- signals then you may damage the touchscreen controller.*

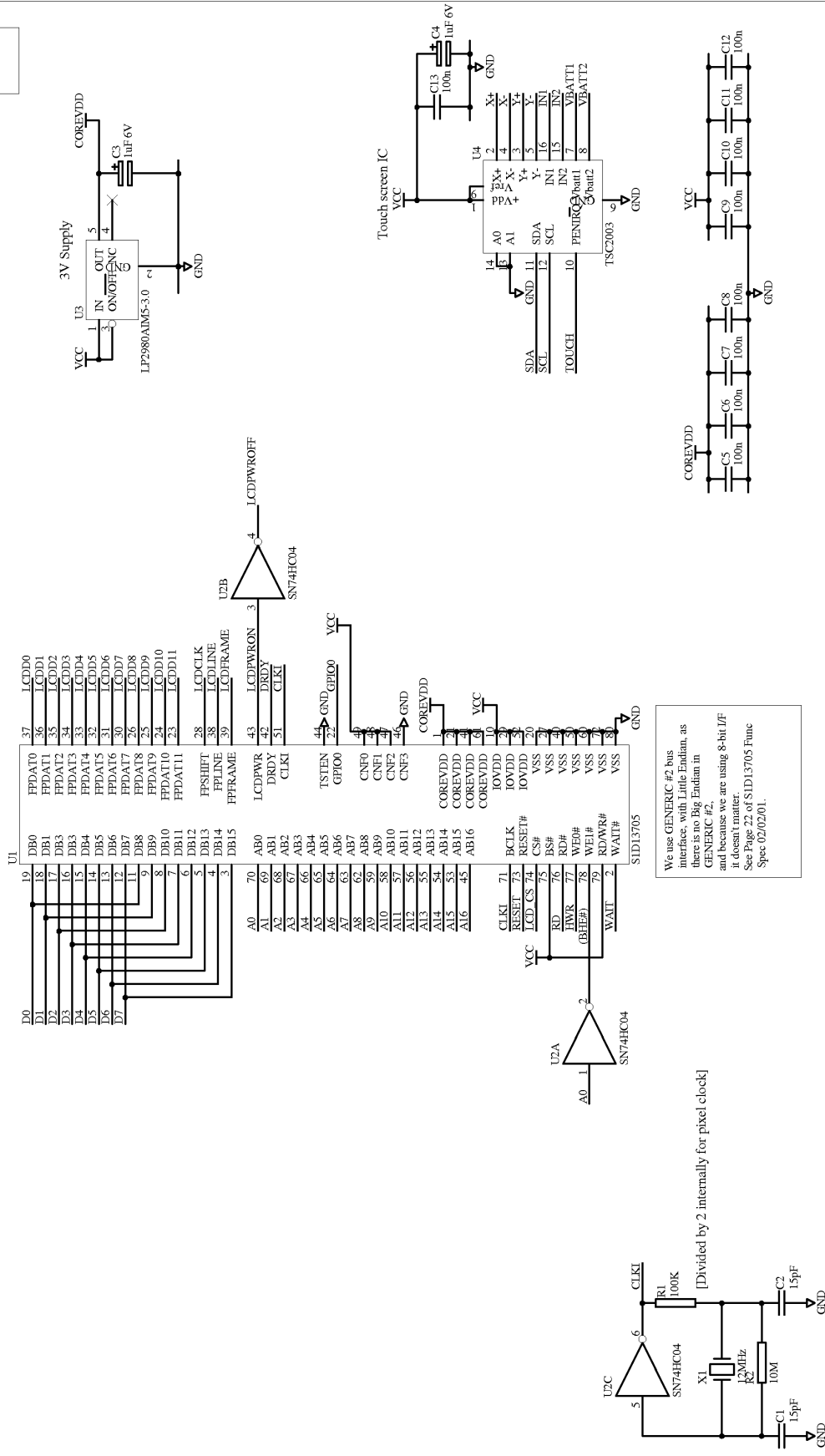
### LCD Drive voltage

Most LCDs require an additional, negative voltage rail (besides 0 and 5 Volts) to drive the display. The same, or a derived, voltage is usually used to set the contrast. Contact us if you need help with designing a circuit to generate this rail.

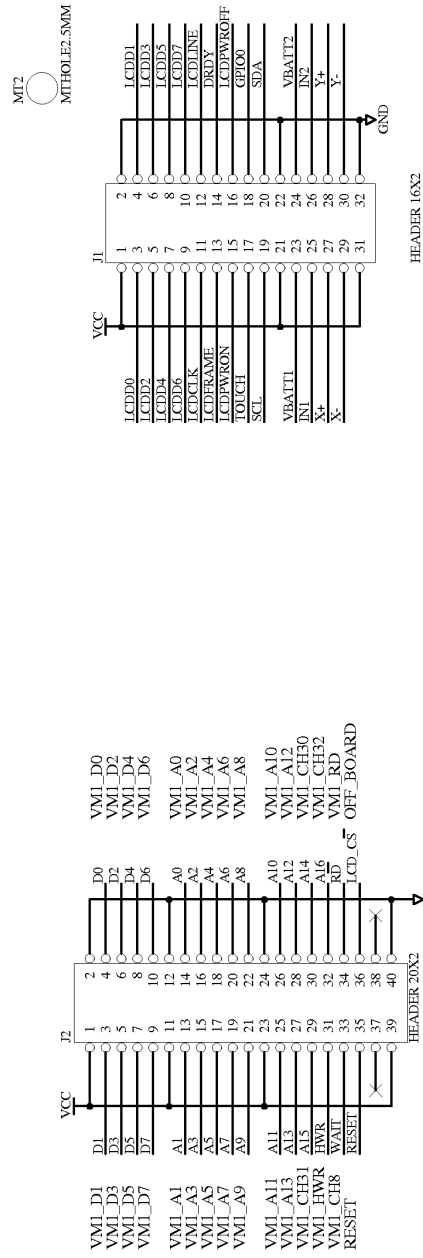
<sup>3</sup> TS: Tri-state. The WAIT output is only active when the board is being accessed.

Signals  
Signals.sch

LCD controller



Micro-Robotics Ltd.  
The Old Millings  
135 Ditton Walk  
Cambridge CB3 8QB  
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Sheet 1 of 2  
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LCD and touch screen general signal connector  
 Note: when using 4-bit panel then use D3-D7.

<b>Connectors</b>	
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