

**GCC-2**

**GEMexpress™ II  
LCD Adapter Board**

**August 2019  
Revision C**

**Amulet**

**DATASHEET**

## Introduction

It is a fast, inexpensive production solution for adding a graphic user interface to an embedded product. GEMexpress™ II allows for greater design flexibility and a shorter time to market.

This new hardware approach to GUI integration contains all of Amulet's bill of materials, which is everything needed to drive the user interface. It just needs to be attached to a simple display interface board and the human interface is ready for production.

As it's easy to integrate, Amulet sees it as the "express" lane to production: fast, easy and cost effective.

Compatible with GEMstudio™ for quick and easy GUI design, these production-ready units support GIF, JPEG, PNG, and more graphic formats in 24-bit color, plus 8-bit alpha blending (transparency channel) found in high-end consumer electronic products.

The GCC-2 has 256Mb (32Mx8) of SDR SDRAM for image caching , and 64Mb of serial data flash for code storage.

Amulet's Graphical OS Chip™ handles all the graphics processing and control as well as the communication to a host controller.

## Features

### Adapter Board

- Amulet GEM Graphical OS Chip™ with Royalty-free Graphical Operating System™
- Operating Temperature: -40°C to 85°C
- On-Board Memory - 64 Megabit serial flash for storing GUI pages
- 256Mb SDRAM for image frame buffer
- 24-bit color support
- Small and compact 1.5" x 3.0", fits within the outline of a 3.5" TFTs

### Touch Panel

- Integrated 4-wire or 5-wire touchpanel decoder

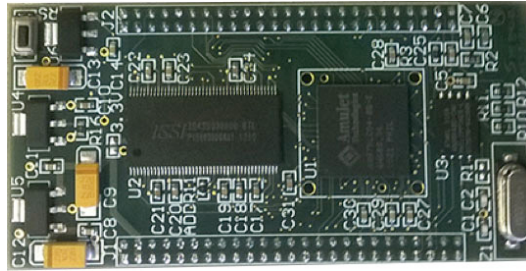
## Communication Interfaces

- 1x UART-TTL
- 1x SPI with 2 Chip Selects
- 1x TWI
- 2x PWM
- USB 2.0 Device Interface

## Power

- 5V DC





J1

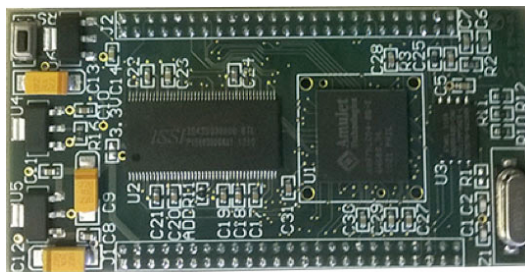
|   |   |   |   |    |      |    |    |    |    |
|---|---|---|---|----|------|----|----|----|----|
| 2 | 4 | 6 | 8 | 10 | •••• | 44 | 46 | 48 | 50 |
| 1 | 3 | 5 | 7 | 9  |      | 43 | 45 | 47 | 49 |

| 50 Pin I/O - J1   |           |            |    |           |                                |
|---|-----------|------------|----|-----------|--------------------------------|
| Description   | Signal    | Pin Number |    | Signal    | Description                    |
| 5V @ 500mA  | 5V        | 1          | 2  | 5V        |                                |
| 3V @ 500mA Output   | 3V        | 3          | 4  | 3V        |                                |
| Ground  | GND       | 5          | 6  | GND       | Ground                         |
| No Connect  | N/C       | 7          | 8  | N/C       | No Connect                     |
| No Connect  | N/C       | 9          | 10 | N/C       | No Connect                     |
| No Connect  | N/C       | 11         | 12 | N/C       | No Connect                     |
| Serial Data   | TWI SDA   | 13         | 14 | TWI SCLK  | Serial Clock                   |
| Ground  | GND       | 15         | 16 | GND       | Ground                         |
| Asynchronous Serial-Data Output                           | COMMU TXD | 17         | 18 | COMMU RXD | Asynchronous Serial-Data Input |
| Ground  | GND       | 19         | 20 | PWM2      | Programmable Clock 2           |
| Ground  | GND       | 21         | 22 | PWM1      | Programmable Clock 1           |
| Power Up Mode (1=Program, 0=Run) <sup>1</sup>             | PMODE     | 23         | 24 | PWM0      | Programmable Clock 0           |
| Touchpanel Calibrate (0=Normal, 1=Calibrate) <sup>1</sup> | TPC       | 25         | 26 | GND       | Ground                         |
| 100K Programmable Pull-up                                 | GPIO4     | 27         | 28 | GPIO12    |                                |
|   | GPIO3     | 29         | 30 | GPIO15    |                                |
|   | GPIO14    | 31         | 32 | GPIO2     |                                |
| Ground  | GND       | 33         | 34 | PROGU RXD | Asynchronous Serial-Data Input |
| Asynchronous Serial-Data Output                           | PROGU TXD | 35         | 36 | GND       | Ground                         |
| Monitor for host detection                                | VBUS      | 37         | 38 | DDP       | USB Data +                     |
| Ground  | GND       | 39         | 40 | DDM       | USB Data -                     |
| Ground  | GND       | 41         | 42 | SPI CS3   | SPI Chip Select 3              |
| SPI Chip Select 2   | SPI CS2   | 43         | 44 | SPI CS1   | SPI Chip Select 1              |
| SPI Clock   | SCLK      | 45         | 46 | MOSI      | SPI Data Out                   |
| SPI Data In   | MISO      | 47         | 48 | GND       | Ground                         |
| No Connect  | N/C       | 49         | 50 | /RESET    | Active Low                     |

Note 1: Internally Pulled Up.

J2

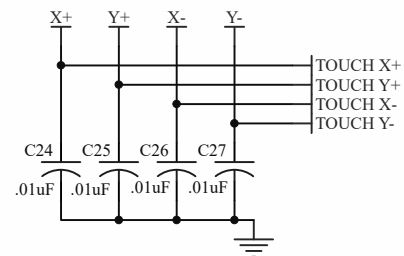
|   |   |   |   |    |     |    |    |    |    |
|---|---|---|---|----|-----|----|----|----|----|
| 2 | 4 | 6 | 8 | 10 | ... | 44 | 46 | 48 | 50 |
| 1 | 3 | 5 | 7 | 9  |     | 43 | 45 | 47 | 49 |



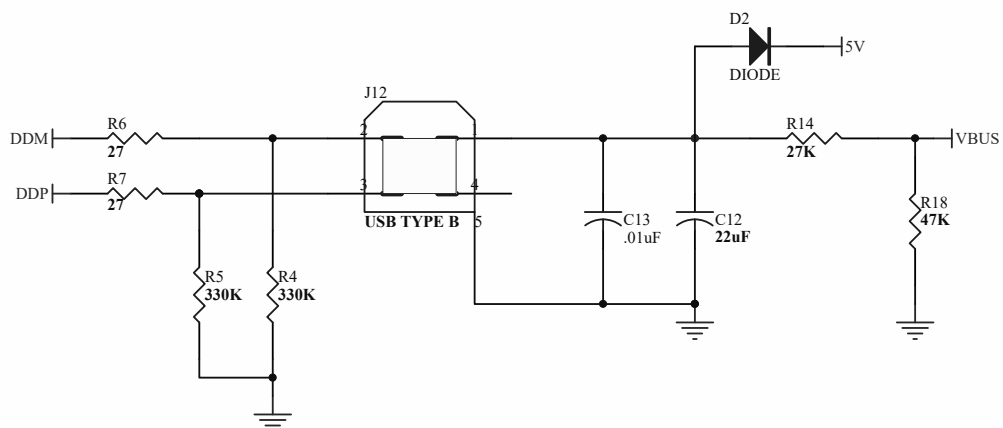
| 50 Pin I/O - J2                         |          |            |    |          |                      |
|---|----------|------------|----|----------|----------------------|
| Description                             | Signal   | Pin Number |    | Signal   | Description          |
| Ground                                  | GND      | 1          | 2  | R0       | LCD Pixel Data Red   |
| LCD Pixel Data Red                      | R1       | 3          | 4  | R2       | LCD Pixel Data Red   |
| LCD Pixel Data Red                      | R3       | 5          | 6  | R4       | LCD Pixel Data Red   |
| LCD Pixel Data Red                      | R5       | 7          | 8  | R6       | LCD Pixel Data Red   |
| LCD Pixel Data Red                      | R7       | 9          | 10 | GND      | Ground               |
| LCD Pixel Data Green                    | G0       | 11         | 12 | G1       | LCD Pixel Data Green |
| LCD Pixel Data Green                    | G2       | 13         | 14 | G3       | LCD Pixel Data Green |
| LCD Pixel Data Green                    | G4       | 15         | 16 | G5       | LCD Pixel Data Green |
| LCD Pixel Data Green                    | G6       | 17         | 18 | G7       | LCD Pixel Data Green |
| Ground                                  | GND      | 19         | 20 | B0       | LCD Pixel Data Blue  |
| LCD Pixel Data Blue                     | B1       | 21         | 22 | B2       | LCD Pixel Data Blue  |
| LCD Pixel Data Blue                     | B3       | 23         | 24 | B4       | LCD Pixel Data Blue  |
| LCD Pixel Data Blue                     | B5       | 25         | 26 | B6       | LCD Pixel Data Blue  |
| LCD Pixel Data Blue                     | B7       | 27         | 28 | GND      | Ground               |
| Display Control Signal<br>(1=ON, 0=OFF) | DISP     | 29         | 30 | OE       | Output Enable        |
| TFT LCD First frame<br>synchronization  | VSYNC    | 31         | 32 | HSYNC    |                      |
| LCD Crystal Polarization<br>Clock       | PC       | 33         | 34 | GND      | Ground               |
| Analog to Digital 6                     | A2D6     | 35         | 36 | A2D5     | Analog to Digital 5  |
| Analog to Digital 4                     | A2D4     | 37         | 38 | Touch X+ | Touchpanel X+        |
| Touchpanel Y+                           | Touch Y+ | 39         | 40 | Touch X- | Touchpanel X-        |
| Touchpanel Y-                           | Touch Y- | 41         | 42 | GND      | Ground               |
| SPI Chip Select 3                       | SPI CS3  | 43         | 44 | SPI CS2  | SPI Chip Select 2    |
| SPI Chip Select 1                       | SPI CS1  | 45         | 46 | SCLK     | SPI Clock            |
| SPI Data Out                            | MOSI     | 47         | 48 | MISO     | SPI Data In          |
| Ground                                  | GND      | 49         | 50 | GND      | Ground               |

## Reference Circuits

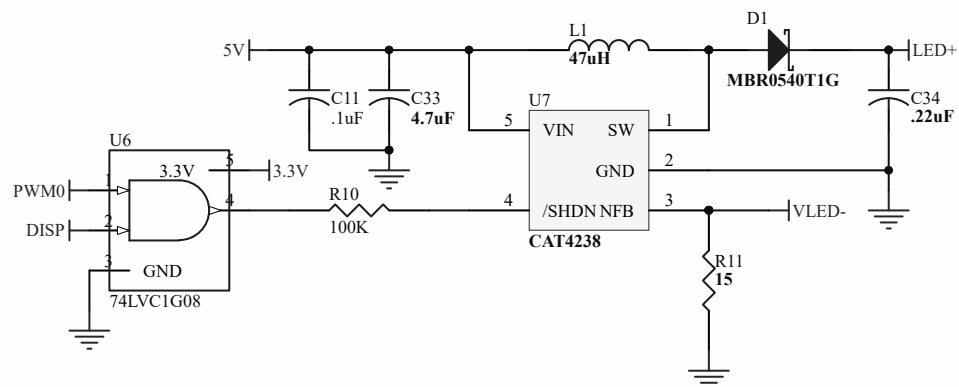
### Touchpanel Filter



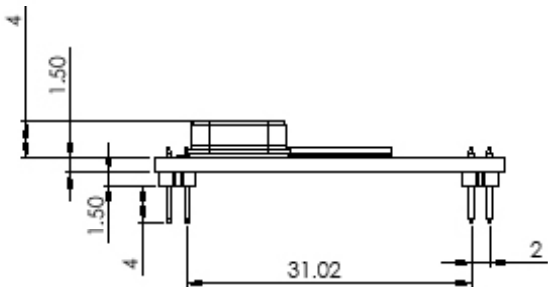
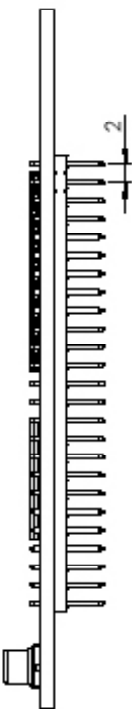
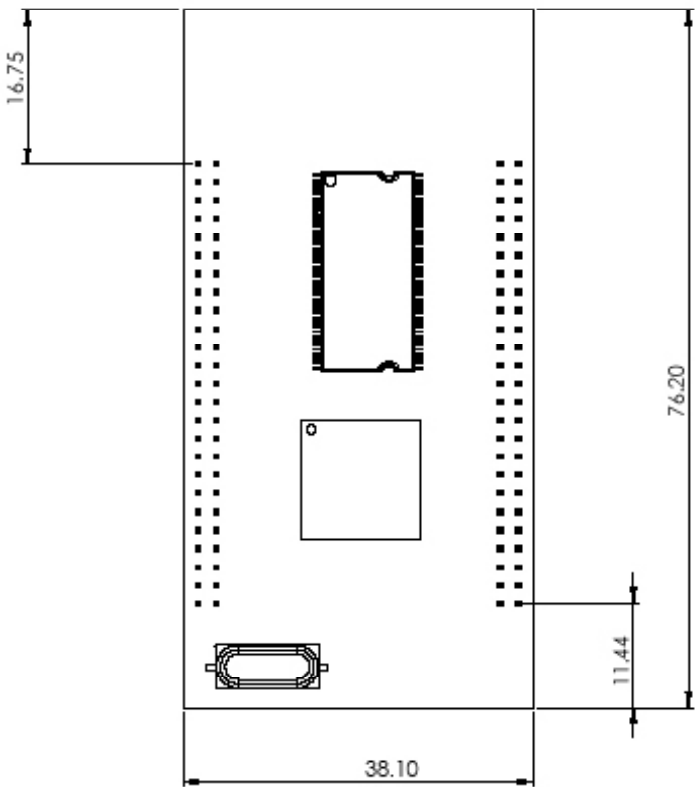
### USB Interface



### Backlight Circuit



Mechanical Specification



## Recommended Operating Conditions

| Parameter      | Conditions                      | Min | Typ | Max | Units |
|----------------|---------------------------------|-----|-----|-----|-------|
| Supply Voltage | Stable external supply required | 4.5 | 5   | 5.5 | Vdc   |

## DC Characeristics

| Parameter   | Min                 |
|---|---------------------|
| V core Supply Current   | 22mA @1.2V          |
| V input Low Level   | -0.3 to 0.8V        |
| V input High Level  | 2V to (Vcc + 0.3V ) |
| Pull Up Resistors   | 70K to 175KOhms     |
| IO Output Current   | 8mA                 |
| Static Current Excluding Power on Reset V core = 1.2V   | 600uA               |
| Static Current Logic cells consumption, including Power on Reset<br>and all input drivers V core = 1.2V | 30uA                |

## Environmental Specification

| Parameter      | Min | Typ | Max | Units |
|----------------|-----|-----|-----|-------|
| Storage Temp   | -30 |     | 80  | °C    |
| Operating Temp | -20 |     | 70  | °C    |

## Revision History

| Date            | Revision | Notes  |
|-----------------|----------|--|
| 13 July 2015    | A        | Publication                                    |
| 12 October 2015 | B        | Format change. Environment Specification added |
| 19 August 2019  | C        | Logo change.                                   |
|                 |          |  |
|                 |          |  |



## Contact Us:

## You have Embedded GUI Questions. We have Answers.

Amulet Technologies Headquarters  
1475 S. Bascom Ave., Suite 111  
Campbell, CA 95008  
USA  
Phone: (408) 374-4956  
Fax: (408) 374-4941  
Email: [info@amulettechnologies.com](mailto:info@amulettechnologies.com)

Sales and Customer Support:  
Phone: (888) 374-8688  
Sales Email: [sales@amulettechnologies.com](mailto:sales@amulettechnologies.com)  
Support Email: [support@amulettechnologies.com](mailto:support@amulettechnologies.com)

Developer Support: [devSupport@amulettechnologies.com](mailto:devSupport@amulettechnologies.com)

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