

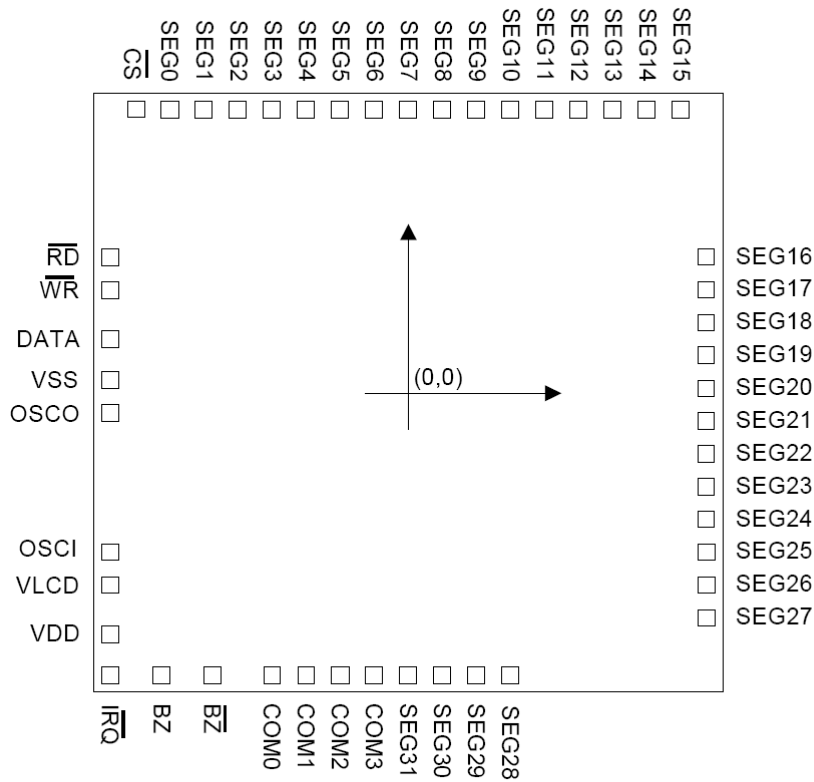
GA1621General Description

The GA1621 is a 128 dots (32x4), memory mapping, and multi-function LCD driver. The S/W con-figuration feature of the GA1621 makes it suitable for multiple LCD applications including LCD modules and display subsystems. Only three or four lines are required for the interface between the host controller and the GA1621. The GA1621 contains a power down command to reduce power consumption.

GA1621Features

- Operating voltage: 2.4V~5.2V
- Built-in 256kHz RC oscillator
- 8 kinds of time base/WDT clock sources
- 32x4 LCD driver
- 3-wire serial interface
- Internal LCD driving frequency source
- Software configuration feature
- Data mode and command mode instructions
- R/W address auto increment
- Three data accessing modes
- Power down command reduces power Consumption

GA1621Pad Assignment



IC SIZE:2.20mm X 2.15mm

The ic substrate should be connecte to VDD in PCB layout artwork

GA1621 Pad Coordinates

| NO | NAME | X (um) | Y (um) | NO | NAME | X (um) | Y (um) |
|----|-------|--------|--------|----|-------|--------|--------|
| 1 | CS- | --926 | 924 | 25 | SEG23 | 935 | --429 |
| 2 | RD- | --926 | 270 | 26 | SEG22 | 935 | --317 |
| 3 | WR- | --926 | 112 | 27 | SEG21 | 935 | --205 |
| 4 | DATA | --926 | --31 | 28 | SEG20 | 935 | -93 |
| 5 | VSS | --926 | --179 | 29 | SEG19 | 935 | 19 |
| 6 | OSCO | --926 | --358 | 30 | SEG18 | 935 | 131 |
| 7 | OSCI | --926 | --522 | 31 | SEG17 | 935 | 243 |
| 8 | VLCD | --926 | --640 | 32 | SEG16 | 935 | 355 |
| 9 | VDD | --926 | --800 | 33 | SEG15 | 864 | 924 |
| 10 | IRQ- | --916 | --929 | 34 | SEG14 | 752 | 924 |
| 11 | BZ | --745 | --929 | 35 | SEG13 | 640 | 924 |
| 12 | BZ- | ---570 | --929 | 36 | SEG12 | 528 | 924 |
| 13 | COM0 | --414 | --929 | 37 | SEG11 | 416 | 924 |
| 14 | COM1 | --302 | --929 | 38 | SEG10 | 304 | 924 |
| 15 | COM2 | --190 | --929 | 39 | SEG9 | 192 | 924 |
| 16 | COM3 | --78 | --929 | 40 | SEG8 | 80 | 924 |
| 17 | SEG31 | 34 | --929 | 41 | SEG7 | --30 | 924 |
| 18 | SEG30 | 146 | --929 | 42 | SEG6 | --142 | 924 |
| 19 | SEG29 | 258 | --929 | 43 | SEG5 | --255 | 924 |
| 20 | SEG28 | 370 | --929 | 44 | SEG4 | --367 | 924 |
| 21 | SEG27 | 935 | --877 | 45 | SEG3 | --478 | 924 |
| 22 | SEG26 | 935 | --765 | 46 | SEG2 | --590 | 924 |
| 23 | SEG25 | 935 | --653 | 47 | SEG1 | --702 | 924 |
| 24 | SEG24 | 935 | --541 | 48 | SEG0 | --814 | 924 |

GA1621 Pad Descriptions

| Pad No. | Pad Name | I/O | Description |
|---------|-----------|-----|--|
| 1 | CS- | I | Chip selection input with pull-high resistor. When the CS- is logic high, the data and command read from or written to the GA1621 are disabled. The serial interface circuit is also reset. But if CS- is at logic low level and is input to the CS- pad, the data and command transmission between the host controller and the GA1621 are all enabled. |
| 2 | RD- | I | READ clock input with pull-high resistor. Data in the RAM of the GA1621 are clocked out on the falling edge of the RD- signal. The clocked out data will appear on the DATA line. The host controller can use the next rising edge to latch the clocked out data. |
| 3 | WR- | I | WRITE clock input with pull-high resistor. Data on the DATA line are latched into the GA1621 on the rising edge of the WR-signal. |
| 4 | DATA | I/O | Serial data input/output with pull-high resistor |
| 5 | GND | -- | Negative power supply, ground |
| 6 | OSCO | O | The OSCI and OSCO pads are connected to a 32.768kHz crystal in order to generate a system clock. If the system clock comes from an external clock source, the external clock source should be connected to the OSCI pad. But if and on-chip RC oscillator is selected instead, the OSCI and OSCO pads can be left open. |
| 7 | OSCI | I | |
| 8 | VLCD | I | VLCD I LCD power input |
| 9 | VDD | -- | Positive power supply |
| 10 | IRQ | O | Time base or WDT overflow flag, NMOS open drain output |
| 11,12 | BZ,BZ- | O | 2kHz or 4kHz tone frequency output pair |
| 13~116 | COM0~COM3 | O | LCD common outputs |
| 48~17 | SEG0 ~ 31 | O | LCD segment outputs |

GA1621 Absolute Maximum Ratings

Supply Voltage ----- -0.3V ~ 5.5V

Storage Temperature ----- -50 °C ~ 125 °C

Input Voltage ----- VSS - 0.3V ~ VDD + 0.3V

Operating Temperature ----- -25 °C ~ 75 °C

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GA1621 D.C. Characteristics

| Parameter | Sym | Min | Typ | Max | Units | Test Conditions | |
|----------------------------|------------------|------|------|------|-------|-----------------|------------------------|
| | | | | | | V _{DD} | Conditions |
| Operating Voltage | V _{DD} | 3.0 | -- | 5.0 | V | -- | |
| Stand by Current | I _{DD} | -- | 0.1 | 5.0 | uA | 3V | No load |
| | | -- | 0.3 | 10.0 | | 5V | Power down mode |
| Operating Current | I _{OP} | -- | 150 | 300 | mA | 3V | No load/LCD ON |
| | | -- | 300 | 600 | | 5V | On-chip RC oscillator |
| Operating Current | I _{OP} | -- | 60 | 120 | mA | 3V | No load/LCD ON |
| | | -- | 120 | 240 | | 5V | Crystal oscillator |
| Operating Current | I _{OP} | -- | 100 | 200 | mA | 3V | No load/LCD ON |
| | | -- | 200 | 400 | | 5V | External clock source |
| Input Low Voltage | V _{IL} | 0 | -- | 0.6 | V | 3V | DATA, WR-, CS-, RD- |
| | | 0 | -- | 1.0 | | 5V | |
| Input High Voltage | V _{IH} | 2.4 | -- | 3.0 | V | 3V | DATA, WR-, CS-, RD- |
| | | 4.0 | -- | 5.0 | | 5V | |
| DATA, BZ, BZ-, IRQ- | I _{OL1} | 0.5 | 1.2 | -- | mA | 3V | V _{OL} =0.3V |
| | | 1.3 | 2.6 | -- | | 5V | V _{OL} =0.5V |
| DATA, BZ, BZ- | I _{OH1} | -0.4 | -0.8 | -- | mA | 3V | V _{OH} =2.7V |
| | | -0.9 | -1.8 | -- | | 5V | V _{OH} =4.5 V |
| LCD Common Sink Current | I _{OL2} | 80 | 150 | -- | uA | 3V | V _{OL} =0.3V |
| | | 150 | 250 | -- | | 5V | V _{OL} =0.5V |
| LCD Common Source Current | I _{OH2} | -80 | -120 | -- | uA | 3V | V _{OH} =2.7V |
| | | -120 | -200 | -- | | 5V | V _{OH} =4.5 V |
| LCD Segment Sink Current | I _{OL3} | 60 | 120 | -- | uA | 3V | V _{OL} =0.3V |
| | | 120 | 200 | -- | | 5V | V _{OL} =0.5V |
| LCD Segment Source Current | I _{OH3} | -40 | -70 | -- | uA | 3V | V _{OH} =2.7V |
| | | -70 | -100 | -- | | 5V | V _{OH} =4.5 V |
| Pull High Resistor | R _{PH} | 40 | 80 | 150 | KΩ | 3V | DATA, WR-, CS- |
| | | 30 | 60 | 100 | | 5V | |

GA1621 A.C. Characteristics

| Parameter | Sym | Min | Typ | Max | Units | Test Conditions | |
|--|---------------------------------|------|-------------------------|-----|-------|-----------------|-----------------------|
| | | | | | | V _{DD} | Conditions |
| System Clock | f _{SYS1} | -- | 256 | -- | KHz | 3V | On Chip RC Oscillator |
| | | -- | 256 | -- | | 5V | |
| System Clock | f _{SYS2} | | 32.768 | | KHz | 3V | Crystal Oscillator |
| | | | 32.768 | | | 5V | |
| System Clock | f _{SYS3} | | 256 | | KHz | 3V | External clock source |
| | | | 256 | | | 5V | |
| LCD Clock | f _{LCD} | -- | F _{SYS1} /1024 | -- | Hz | -- | On-chip RC oscillator |
| | | -- | F _{SYS2} /128 | -- | | | Crystal Oscillator |
| | | -- | F _{SYS3} /1024 | -- | | | External clock source |
| LCD Common Period | t _{COM} | -- | n/f _{LCD} | -- | S | | n: Number of COM |
| Serial Date Clock (WR- Pin) | f _{CLK1} | -- | -- | 150 | KHz | 3V | Duty cycle 50% |
| | | -- | -- | 300 | | 5V | |
| Serial Date Clock (RD- Pin) | f _{CLK2} | -- | -- | 75 | KHz | 3V | Duty cycle 50% |
| | | -- | -- | 150 | | 5V | |
| Tone Frequency | f _{TONE} | -- | 2.0 or 4.0 | -- | KHz | -- | On-chip RC oscillator |
| Serial Interface Reset Pulse Width (Figure 3) | t _{CS} | -- | 250 | -- | ns | 3V | CS- |
| | | -- | | -- | | 5V | |
| WR-, RD- Input Pulse Width (Figure 1) | t _{CLK} | 3.34 | -- | -- | us | 3V | Write mode |
| | | 6.67 | -- | -- | | 5V | Read mode |
| | | 1.67 | -- | -- | | 3V | Write mode |
| | | 3.34 | -- | -- | | 5V | Read mode |
| Rise/Full Time Serial Data Clock Width (Figure 1) | t _r , t _f | -- | 120 | -- | ns | 3V | |
| | | -- | | -- | | 5V | |
| Setup Time for Data to WR-, RD- Clock Width (Figure 1) | t _{su} | -- | 120 | -- | ns | 3V | |
| | | -- | | -- | | 5V | |
| Hold Time for Data to WR-, RD- Clock Width (Figure 1) | t _h | -- | 120 | -- | ns | 3V | |
| | | -- | | -- | | 5V | |
| Setup Time for Data to CS- Clock Width (Figure 1) | t _{su1} | -- | 100 | -- | ns | 3V | |
| | | -- | | -- | | 5V | |
| Hold Time for Data to CS- Clock Width (Figure 1) | t _{h1} | -- | 100 | -- | ns | 3V | |
| | | -- | | -- | | 5V | |

GA1621 Commanded Formant

The GA1621 can be configured by the S/W setting. There are two mode commands to configure the GA1621 resources and to transfer the LCD display data. The configuration mode of the GA1621 is called command mode, and its command mode ID is **1 0 0**. The command mode consists of a system configuration command, a system frequency selection command, a LCD configuration command, a tone frequency selection command, a timer/WDT setting command, and an operating command. The data mode,

The mode command should be issued before the data or command is transferred. If successive commands have been issued, the command mode ID, namely **1 0 0**, can be omitted. While the system is operating in the non-successive command or the non-successive address data mode, the CS- pin should be set to “1” and the previous operation mode will be reset also. Once the CS- pin returns to “0” a new operation mode ID should be issued first.

on the other hand, includes READ, WRITE, and READ-MODIFY-WRITE operations. The following are the data

mode
IDs
and the
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| Operation | Mode | ID |
|-------------------|---------|-----|
| READ | Data | 110 |
| WRITE | Data | 101 |
| READ-MODIFY-WRITE | Data | 101 |
| COMMAND | Command | 100 |

and mode ID: