



**Genesys Logic, Inc.**

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**GL827L**

**USB 2.0 Single Slot SD/MMC/MS  
Card Reader Controller**

**Datasheet**

**Revision 1.03**

**Oct. 17, 2008**



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## Revision History

| Revision | Date       | Description  |
|----------|------------|--|
| 1.00     | 2007/11/06 | First formal release   |
| 1.01     | 2007/12/14 | 1. Add QFN24 package, p.9, p. 18<br>2. Update absolute maximum rating and DC characteristics, p.14 |
| 1.02     | 2008/07/11 | 1. Remove Ambient Temperature in Table 6.1, p.14<br>2. Update QFN24 package, p.18, p.19            |
| 1.03     | 2008/10/17 | Add QFN24 package (B), p.10,11   |



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### CHAPTER 1 GENERAL DESCRIPTION

The GL827L is USB 2.0 SD/MMC/MS Flash Card Reader single chip. It supports USB 2.0 high-speed transmission to Secure Digital™ (SD), SDHC, Mini SD™, Micro SD™, T-Flash, MultiMediaCard™ (MMC), RS MultiMediaCard™ (RS MMC), MMC Micro, HS-MMC, MMC-Mobile, Memory Stick™ (MS), Memory Stick Duo™ (MS Duo), High Speed Memory Stick™ (HS MS), Memory Stick PRO™ (MS PRO), Memory Stick PRO™ Duo (MS PRO Duo), Memory Stick PRO-HG (MS PRO-HG), Memory Stick ROM, MS PRO Micro (M2) on one chip. As a single chip solution for USB 2.0 flash card reader, the GL827L complies with Universal Serial Bus specification rev. 2.0, USB Storage Class specification ver.1.0, and each flash card interface specification.

The GL827L integrates a high speed 8051 microprocessor and a high efficiency hardware engine for the best data transfer performance between USB and flash card interfaces. Its' pin assignment design fits to card sockets to provide easier PCB layout.

The GL827L is packaged with 28-pin SSOP (150mil) and 24-pin QFN for up to 1 LUN (SD/MMC, MS).

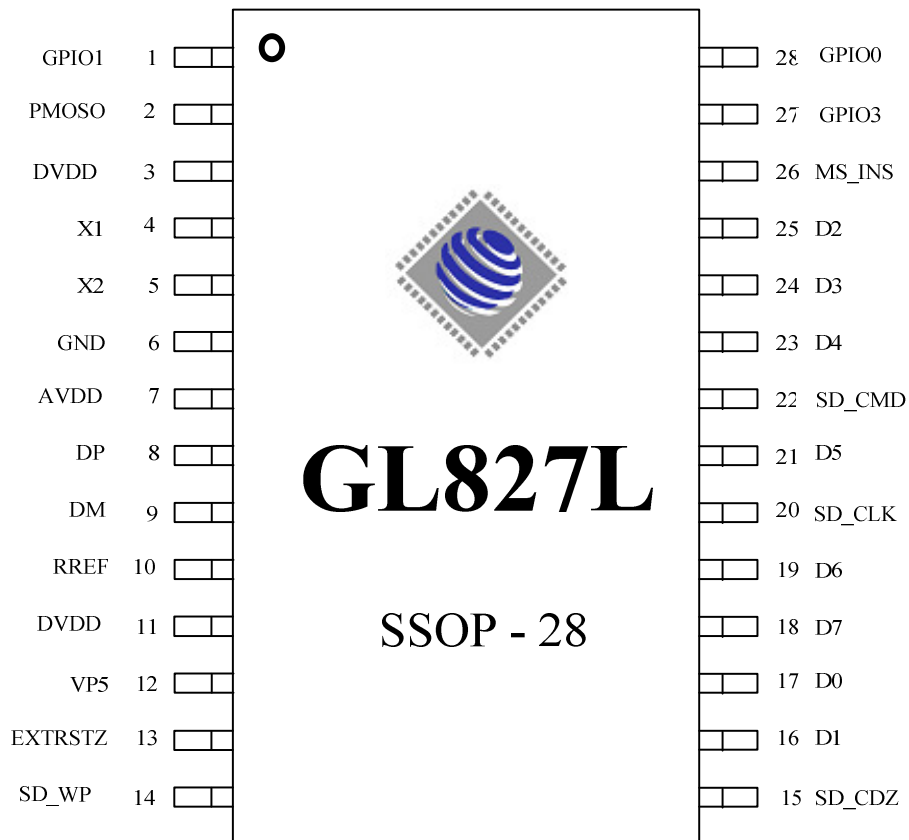


## CHAPTER 2 FEATURES

- USB specification compliance
  - Comply with 480Mbps Universal Serial Bus specification rev. 2.0.
  - Comply with USB Storage Class specification rev. 1.0.
  - Support 1 device address and up to 4 endpoints: Control (0)/ Bulk Read (1)/ Bulk Write (2)/Interrupt (3).
- Integrated USB building blocks
  - USB2.0 transceiver macro (UTM), Serial Interface Engine (SIE), Build-in power-on reset (POR) and low-voltage detector (LVD)
- Embedded 8051 micro-controller
  - Operate @ 60 MHz clock, 12 clocks per instruction cycle
  - Embedded 32K Byte mask ROM and internal 256 byte SRAM
  - Embedded 2K Byte external SRAM
- Secure Digital™ and MultiMediaCard™
  - Supports SD specification v1.0 / v1.1 / v2.0
  - Supports MMC specification v3.X / v4.0 / v4.1 / v4.2.
  - x1 / x4 / x8 data transmission. (For QFN24 up to x4)
  - Automatic CRC7 generation for command and CRC7 verification for response on CMD
  - Support automatic CRC16 generation and verification on DAT0:7
  - In addition to full packet transaction, optional single byte / bit operation on both CMD and DAT line / lines
  - Process data in block or byte
- Memory Stick™/ Memory Stick PRO™ / Memory Stick PRO Duo™ / Memory Stick PRO-HG/ Memory Stick Micro
  - Comply with Memory Stick specification: MS 1.43, MSPRO 1.02, MSPRO-HG 1.01 with 4-bit data bus
  - Support INS signal
  - Support automatic CRC16 generation and verification
- On board 12 MHz Crystal driver circuit or 12 MHz Clock input.
- On-Chip 5V to 3.3V regulator. No external regulator required.
- On-Chip power MOSFETs for supplying flash media card power.
- Available in 28-pin SSOP (150mil) package.
- Available in 24-pin QFN package.

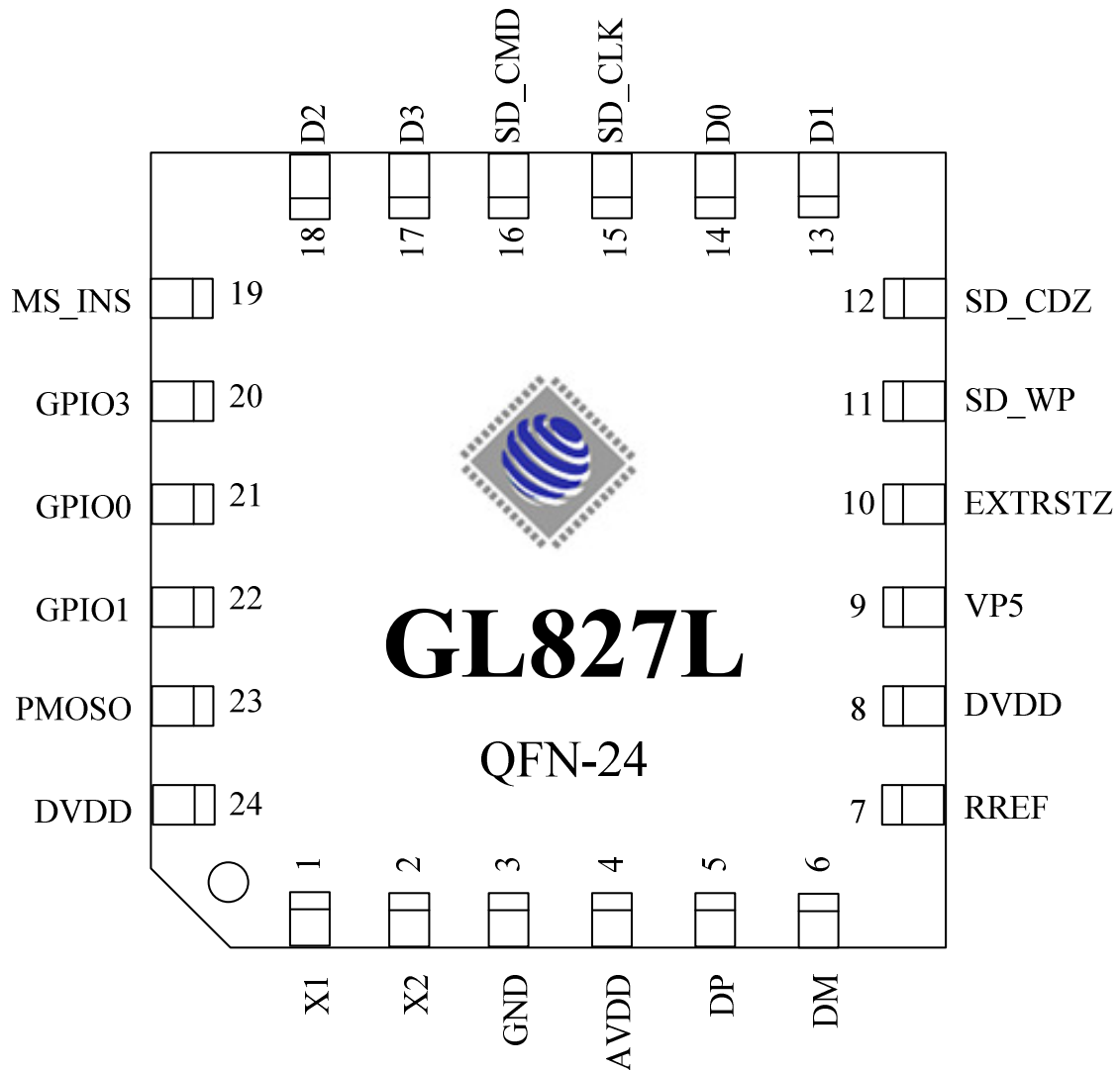
## CHAPTER 3 PIN ASSIGNMENT

### 3.1 Pinout

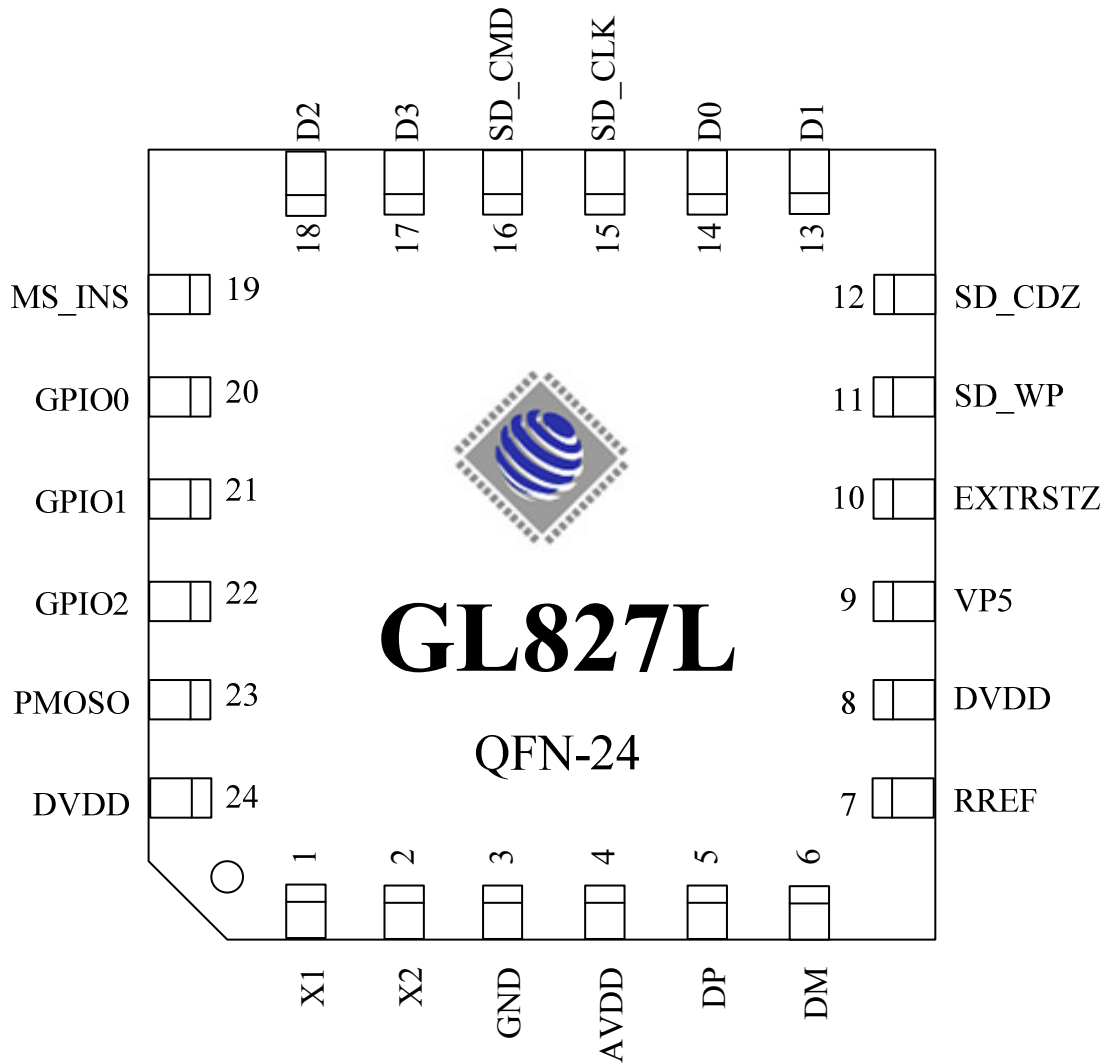


**Figure 3.1 – 28 Pin SSOP Pinout Diagram**





**Figure 3.2 – (A) 24 Pin QFN Pinout Diagram**  
**(No EEPROM, with Power and Access LED support)**



**Figure 3.3 – (B) 24 Pin QFN Pinout Diagram**

**(No Power LED, with EEPROM and Access LED support)**

### 3.2 Pin Descriptions

**Table 3.3 - Pin Descriptions**

| Pin name           | SSOP28       | QFN 24 (A)   | QFN 24 (B)   | Type  | Description  |
|--------------------|--------------|--------------|--------------|-------|--|
| GND                | 6            | 3            | 3            | P     | ground   |
| AVDD               | 7            | 4            | 4            | P     | Analog power 3.3v  |
| DM                 | 9            | 6            | 6            | A     | USB D-   |
| DP                 | 8            | 5            | 5            | A     | USB D+   |
| RREF               | 10           | 7            | 7            | A     | Reference resistor   |
| X1                 | 4            | 1            | 1            | I     | 12MHz XTAL input. It can be connected to external 12MHz clock input. |
| X2                 | 5            | 2            | 2            | B     | 12MHz output.  |
| DVDD               | 3,,11        | 24,,8        | 24,,8        | P     | Digital power 3.3V   |
| VP5                | 12           | 9            | 9            | P     | Regulator 5V Input   |
| PMOSO              | 2            | 23           | 23           | P     | Card power   |
| EXTRSTZ            | 13           | 10           | 10           | I, pu | System reset, active low   |
| MS_INS             | 26           | 19           | 19           | I, pu | Memory Stick insertion detect<br>0: card insert<br>1: no card        |
| SD_CDZ             | 15           | 12           | 12           | I, pu | SD Card detect<br>0: card insert<br>1: no card                       |
| D0~D3              | 17,16,25, 24 | 14,13,18, 17 | 14,13,18, 17 | B     | MS data 0~3<br>SD data 0~3<br>MMC data 0~3                           |
| D4~D7              | 23,21, 19,18 | -            | -            | B     | MMC Data4~7 (Only for SSOP28)  |
| SD_CLK/<br>MS_SCLK | 20           | 15           | 15           | O     | SD/MMC CLK/<br>MemoryStick SCLK                                      |
| SD_WP              | 14           | 11           | 11           | I, pd | SD Write Protect<br>0: write enable<br>1: write protect              |
| SD_CMD/<br>MS_BS   | 22           | 16           | 16           | I, pd | SD/MMC CMD/<br>Memory Stick BS                                       |
| GPIO0              | 28           | 21           | 20           | B     | Access LED   |
| GPIO1              | 1            | 22           | 21           | B     | SSOP28/ QFN24(A) GPIO1: NC<br>QFN24(B) GPIO1: I2C_SCL                |
| GPIO3              | 27           | 20           |              | B     | Power LED  |
| GPIO2              |              |              | 22           | B     | I2C_SDA  |



### Notation:

|             |           |                    |
|-------------|-----------|--------------------|
| <b>Type</b> | <b>A</b>  | Analog             |
|             | <b>B</b>  | Bi-directional     |
|             | <b>I</b>  | Input              |
|             | <b>O</b>  | Output             |
|             | <b>P</b>  | Power / Ground     |
|             | <b>pd</b> | Internal pull down |
|             | <b>pu</b> | Internal pull up   |

## CHAPTER 4 BLOCK DIAGRAM

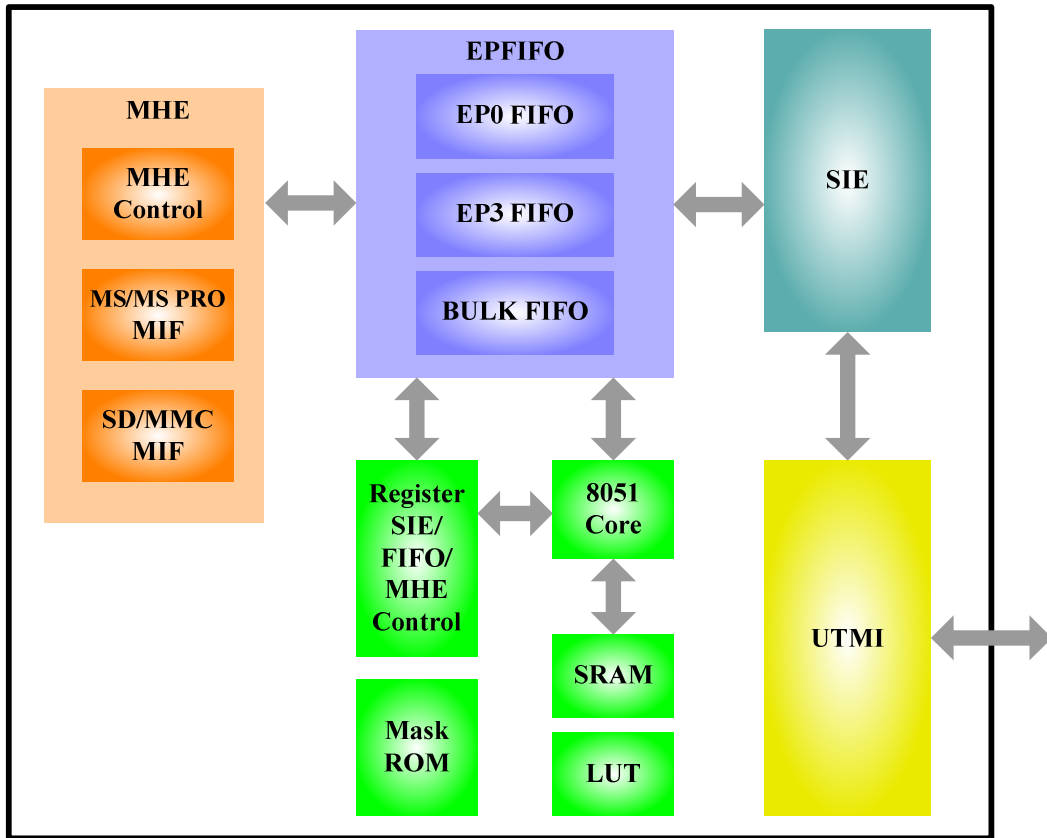


Figure 4.1 - Block Diagram



## CHAPTER 5 FUNCTION DESCRIPTION

### UTM

The USB 2.0 Transceiver Macrocell is the analog circuitry that handles the low level USB protocol and signaling, and shifts the clock domain of the data from the USB 2.0 rate to one that is compatible with the general logic.

### SIE

The Serial Interface Engine, which contains the USB PID and address recognition logic, and other sequencing and state machine logic to handle USB packets and transactions.

### EPFIFO

Endpoint FIFO includes Control FIFO (FIFO0), interrupt FIFO (FIFO3), Bulk In/Out FIFO (BULKFIFO)

- **Control FIFO** FIFO of control endpoint 0.  
It is 64-byte FIFO, and it is used for endpoint 0 data transfer.
- **Interrupt FIFO** 64-byte depth FIFO of endpoint 3 for status interrupt
- **Bulk In/Out FIFO** It can be in the TX mode or RX mode:
  1. It contains ping-pong FIFO (512 bytes each bank) for transmit/receive data continuously.
  2. It can be directly accessed by U<sub>c</sub>
  3. Automatic hardware SmartMedia ECC error correction support

### MHE

It contains 2 MIFs (Media Interface)

- **MIFs**
  1. SD / MMC
  2. MemoryStick/ MemoryStick PRO
- **External reset circuit**  
Non-inverting, Schmitt input with weak pull-up using DVDD power.

## CHAPTER 6 ELECTRICAL CHARACTERISTICS

### 6.1 Absolute Maximum Ratings

**Table 6.1 - Absolute Maximum Ratings**

| Parameter                   | Value            |
|-----------------------------|------------------|
| Storage Temperature         | -65°C to +150 °C |
| DC Input Voltage to Any Pin | -0.5V to +5.8V   |

### 6.2 Operating Conditions

**Table 6.2 - Operating Conditions**

| Parameter  | Value  |
|--|--|
| Ta (Ambient Temperature Under Bias)                | 0°C to 70°C  |
| Supply Voltage                                     | +4.75V to +5.25V   |
| Ground Voltage                                     | 0V   |
| F <sub>OSC</sub> (Oscillator or Crystal Frequency) | 12 MHz ± 0.05%<br>12 MHz ± 0.25% (for USB full-speed only) |

### 6.3 DC Characteristics

**Table 6.3 - DC Characteristics**

| Symbol            | Parameter             | Condition   | Min. | Typ. | Max. | Unit |
|-------------------|-----------------------|---|------|------|------|------|
| V <sub>CC</sub>   | Supply Voltage        |   | 4.75 | -    | 5.25 | V    |
| V <sub>IH</sub>   | Input High Voltage    |   | 2.0  | -    | -    | V    |
| V <sub>IL</sub>   | Input Low Voltage     |   | -    | -    | 0.8  | V    |
| I <sub>I</sub>    | Input Leakage current | 0 < V <sub>IN</sub> < 3.3v  | -10  | -    | 10   | μA   |
| V <sub>OH</sub>   | Output High Voltage   |   | 2.4  | -    | -    | V    |
| V <sub>OL</sub>   | Output Low Voltage    |   | -    | -    | 0.4  | V    |
| I <sub>OH</sub>   | Output Current High   |   | -    | 8    | -    | mA   |
| I <sub>OL</sub>   | Output Current Low    |   |      | 8    | -    | mA   |
| C <sub>IN</sub>   | Input Pin Capacitance |   | -    | 5    | -    | pF   |
| I <sub>SUSP</sub> | Suspend current       | 1.5K external pull-up included                                    | -    | -    | 450  | μA   |
| I <sub>CC</sub>   | Power consumption     | Connect to USB with 8051 operating without Card power consumption | -    | -    | 60   | mA   |

## 6.4 5V to 3.3V Regulator Characteristics

Table 6.4 – Regulator Output Current

| Parameters               | Description                            | Test Conditions       | Typ.. | Units |
|--------------------------|--|-----------------------|-------|-------|
| <b>I<sub>q</sub></b>     | Quiescent current                      | no loading            | 18    | uA    |
| <b>I<sub>o_max</sub></b> | Output driving capability              | V <sub>o</sub> > 2.9V | 400   | mA    |
| <b>V<sub>o_0mA</sub></b> | V <sub>o</sub> voltage without loading |                       | 3.38  | V     |

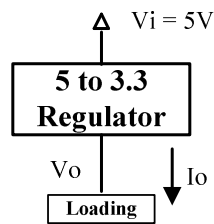


Figure 6.1 - 5V to 3.3V Regulator Architecture

## 6.5 PMOS Characteristics

Table 6.5 - PMOS I-V table

( IO Power=3.3V, Temperature 25 °C)

| Driving Loading (mA) | Vd output voltage(V) |
|----------------------|----------------------|
| 100mA                | 3.12                 |
| 200mA                | 2.94                 |

Note:

1. Driving strength is defined as the PMOS sinking current when V<sub>io</sub>=3.3V

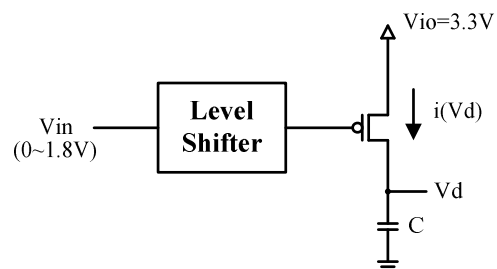


Figure 6.2 - Embedded PMOS Switch Architecture



## 6.6 AC Characteristics

### 6.6.1 UTMI Transceiver

The GL827L is fully compatible with Universal Serial Bus specification rev. 2.0 and USB 2.0 Transceiver MacerCell Interface (UTMI) specification rev. 1.01. Please refer to the specification for more information.

### 6.6.2 Reset Timing

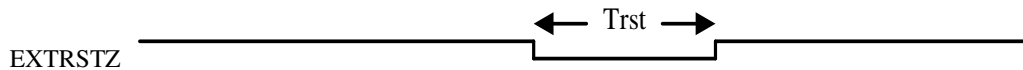


Figure 6.3 - Timing Diagram of Reset width

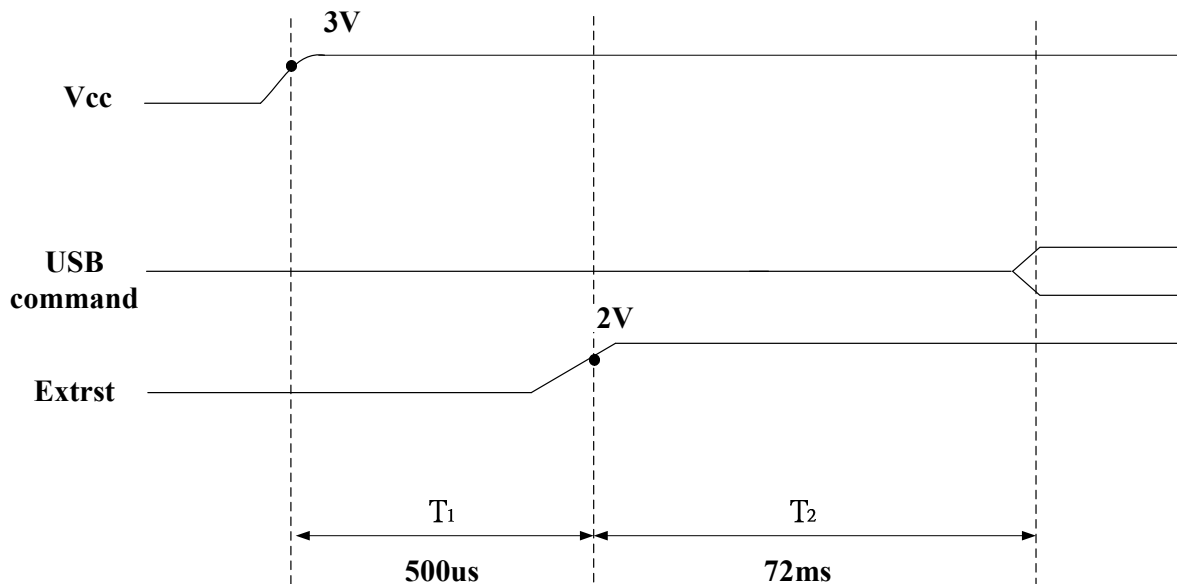
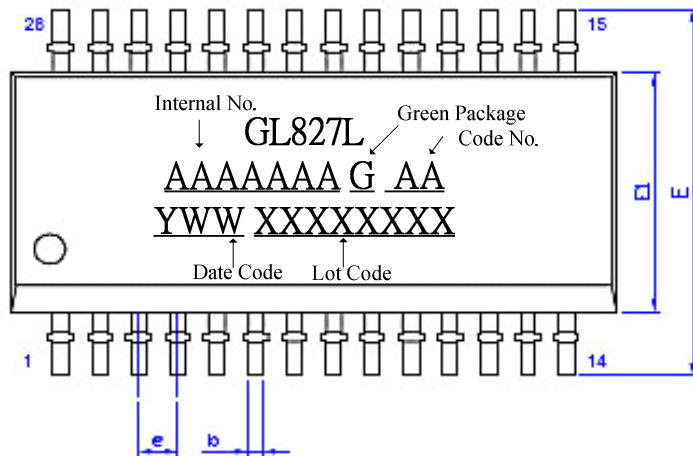


Figure 6.4 - Timing Diagram of Power Good to USB command receive ready

| Parameter | Description                                    | Min | Unit |
|-----------|--|-----|------|
| Trst      | Chip reset sense timing width                  | 2   | us   |
| T1        | External reset valid from power up to high     | 500 | us   |
| T2        | Reset deassertion to respond USB command ready | 72  | ms   |

CHAPTER 7 PACKAGE DIMENSION



| SYMBOL | DIMENSION<br>MM (MIL) |            |             |
|--------|-----------------------|------------|-------------|
|        | MIN.                  | NOM.       | MAX.        |
| A      | 1.35 (53)             | 1.60 (63)  | 1.75 (69)   |
| A1     | 0.10 (4)              | 0.15 (6)   | 0.25 (10)   |
| A2     | 1.25 (49)             | 1.45 (57)  | 1.50 (59)   |
| b      | 0.20 (8)              | 0.25 (10)  | 0.30 (12)   |
| c      | 0.18 (7)              | 0.20 (8)   | 0.25 (10)   |
| D      | 9.80 (386)            | 9.90 (390) | 10.00 (394) |
| E      | 5.80 (228)            | 6.00 (236) | 6.20 (244)  |
| E1     | 3.80 (150)            | 3.90 (154) | 4.00 (157)  |
| e      | 0.635 (25) BSC        |            |             |
| L      | 0.40 (16)             | 0.635 (25) | 1.27 (50)   |
| L1     | 1.00 (39)             | 1.05 (41)  | 1.10 (43)   |
| Y      | ---                   | ---        | 0.10 (4)    |
| θ      | 0°                    |            | 8°          |

NOTE: 1. REFER TO JEDEC MO-137  
2. CONTROLLING DIMENSIONS : MILLIMETER

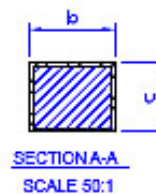
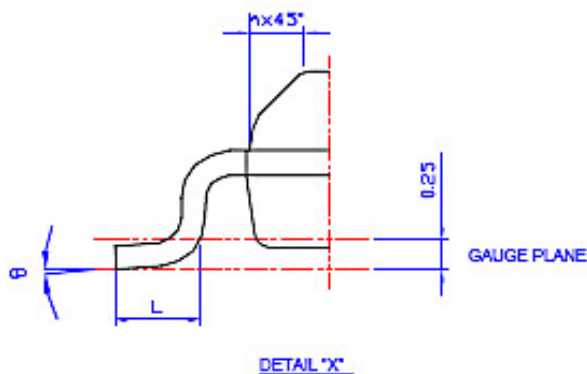
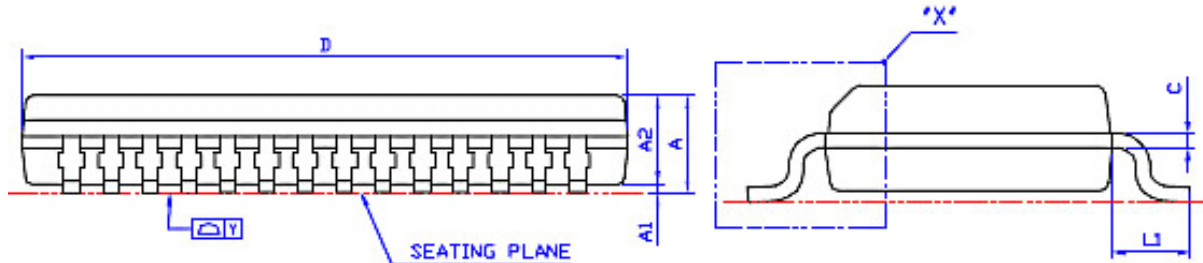
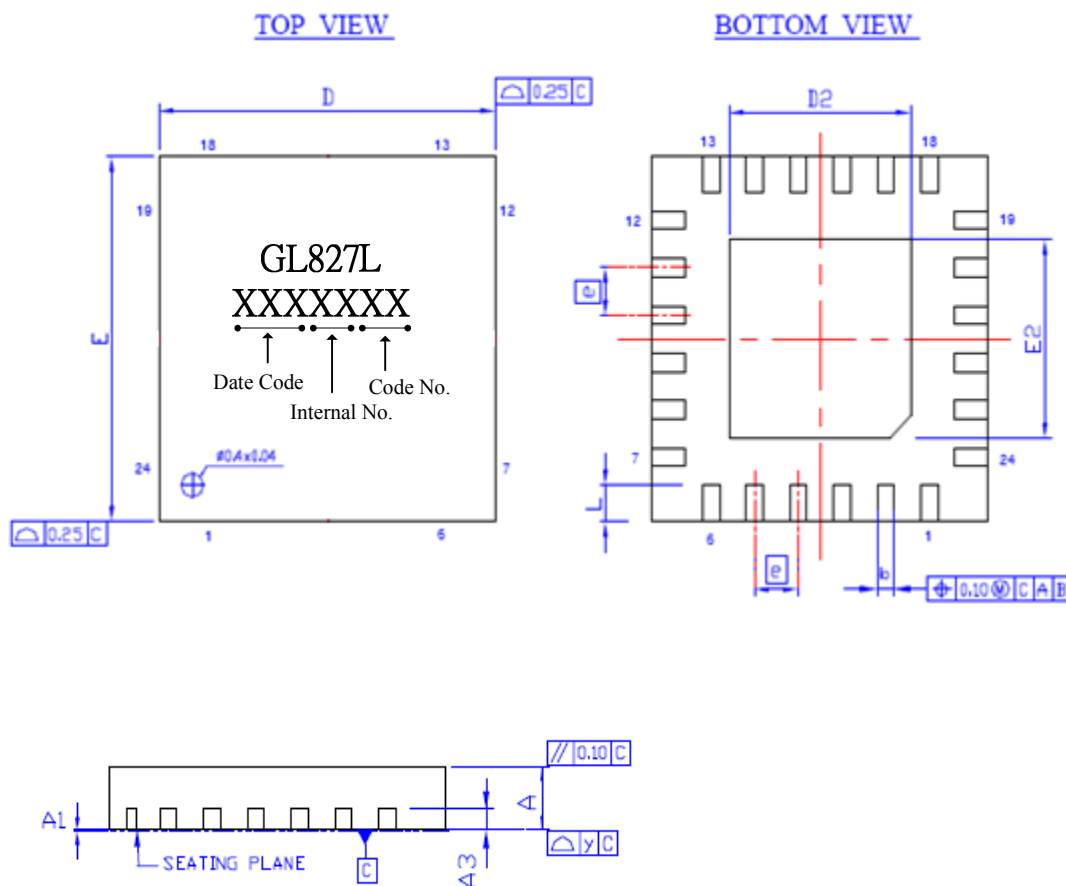


Figure 7.1 - GL827L 28 Pin SSOP Package

| SYMBOL | DIMENSION<br>MM (MIL) |            |            |
|--------|-----------------------|------------|------------|
|        | MIN.                  | NOM.       | MAX.       |
| A      | 0.70 (28)             | 0.75 (30)  | 0.80 (32)  |
| A1     | 0.00 (0)              | 0.02 (0.8) | 0.05 (2)   |
| A3     | 0.20 (8) REF          |            |            |
| b      | 0.18 (7)              | 0.25 (10)  | 0.30 (12)  |
| D      | 3.90 (154)            | 4.00 (158) | 4.10 (161) |
| E      | 3.90 (154)            | 4.00 (158) | 4.10 (161) |
| D2     | 1.90 (75)             | 2.00 (79)  | 2.10 (83)  |
| E2     | 1.90 (75)             | 2.00 (79)  | 2.10 (83)  |
| e      | 0.50 (20) BSC         |            |            |
| L      | 0.30 (12)             | 0.40 (16)  | 0.50 (20)  |
| y      | 0.08 (3)              |            |            |

NOTE: 1. REFER TO JEDEC MO-220  
2. ALL DIMENSIONS IN MILLIMETERS.



**Figure 7.2 - GL827L 24 Pin QFN Package (For 827L-01 and 827L-02 version only)**

| SYMBOL | DIMENSION<br>MM (MIL) |            |            |
|--------|-----------------------|------------|------------|
|        | MIN.                  | NDM.       | MAX.       |
| A      | 0.70 (28)             | 0.75 (30)  | 0.80 (32)  |
| A1     | 0.00 (0)              | 0.02 (0.8) | 0.05 (2)   |
| A3     | 0.20 (8) REF          |            |            |
| b      | 0.18 (7)              | 0.25 (10)  | 0.30 (12)  |
| D      | 3.90 (154)            | 4.00 (158) | 4.10 (161) |
| E      | 3.90 (154)            | 4.00 (158) | 4.10 (161) |
| D2     | 1.90 (75)             | 2.00 (79)  | 2.10 (83)  |
| E2     | 1.90 (75)             | 2.00 (79)  | 2.10 (83)  |
| e      | 0.50 (20) BSC         |            |            |
| L      | 0.30 (12)             | 0.40 (16)  | 0.50 (20)  |
| y      | 0.08 (3)              |            |            |

NOTE: 1. REFER TO JEDEC MO-220  
2. ALL DIMENSIONS IN MILLIMETERS.

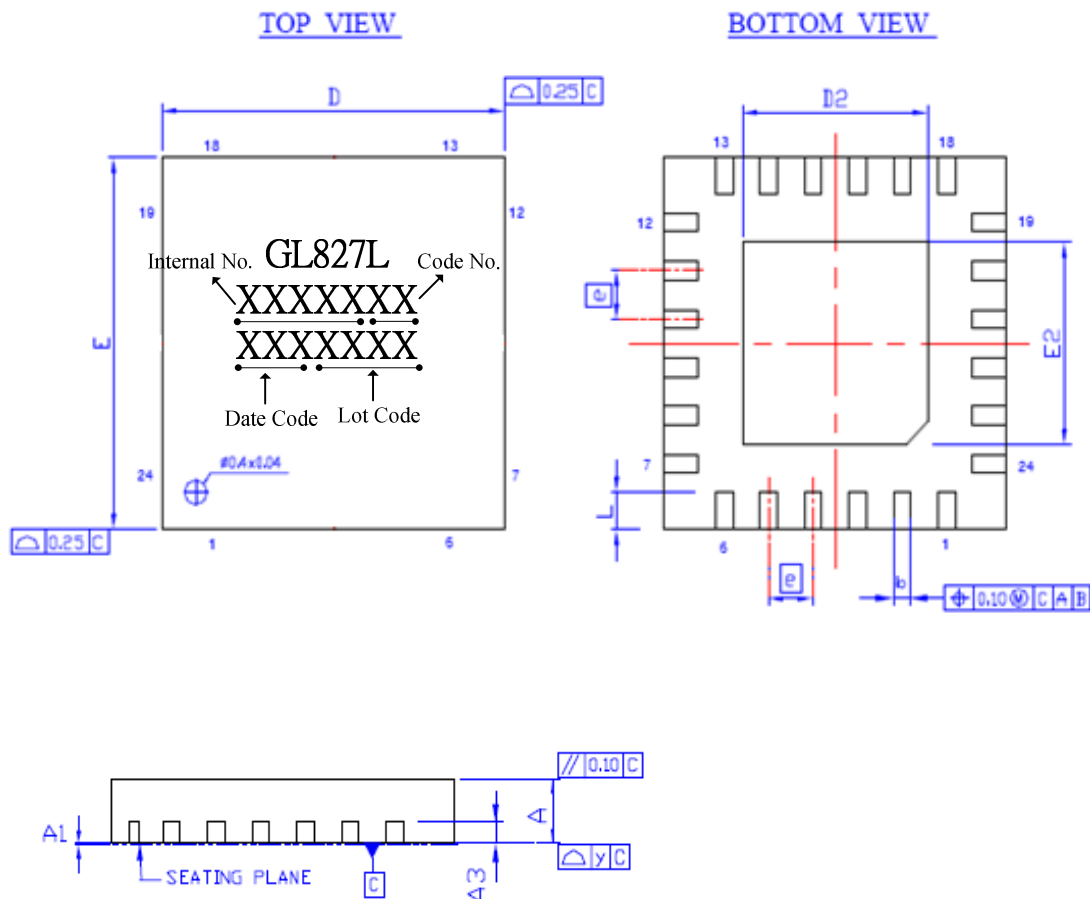


Figure 7.3 - GL827L 24 Pin QFN Package (For 827L-03 and later version)



## CHAPTER 8 ORDERING INFORMATION

**Table 8.1 - Ordering Information**

| Part Number | Package     | Normal/Green  | Version | Status    |
|-------------|-------------|---------------|---------|-----------|
| GL827L -HHG | 28-pin SSOP | Green Package | XX      | Available |
| GL827L -OGG | 24-pin QFN  | Green Package | XX      | Available |