

# GEM318 Guardian Enclosure Management Controller

## Data Sheet

### Features

- Integrated backplane controller for *SCSI Accessed Fault-Tolerant Enclosures* (SAF-TE) applications
- Low voltage differential (LVD) SCSI interface
- Ultra2 and Ultra3 SCSI compatible
- Supports up to eight drives
- Eight LED control pins provided
- Global failure input
- Global alarm output
- Automatic *hot swap* detection
- Automatic fault notification
- Integrated master/slave I<sup>2</sup>C interface
- Supports up to two LM75 temperature sensors
- Packaging: 80-pin thin quad flat pack (TQFP)
- Programmable options:
  - Number of slots in enclosure
  - SCSI ID of each drive slot; or enable GEM318 to read SCSI IDs from a user-programmable device
  - Number of temperature sensors
  - Temperature threshold value
  - Enable/disable SCSI  $\overline{\text{RESET}}$  after a new drive is inserted
  - Define conditions that trigger an automatic global alarm
  - Inquiry data (vendor ID, enclosure ID, product ID)

The GEM318 also provides an I<sup>2</sup>C interface that operates in master and slave modes. As an I<sup>2</sup>C master, the GEM318 reads I<sup>2</sup>C based devices such as the National LM75 temperature sensor and the Phillips PCF8575. As an I<sup>2</sup>C slave, the GEM318 can be accessed by the host, allowing baseboard management controllers or service processors to read the enclosure status data from the GEM318.

The GEM318 block diagram is illustrated in figure 1.

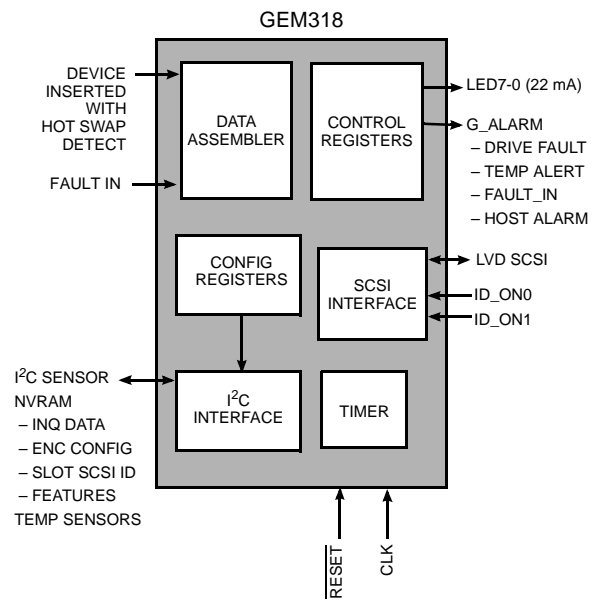


Figure 1. GEM318 Block Diagram

### Product Description

The GEM318 is a low-cost, self-contained storage backplane controller. It is a true single-chip solution – no additional components are required. Its small footprint and low implementation cost make it ideal for entry-level storage subsystem and server applications. It is implemented as a standard LVD SCSI target device and supports the SAF-TE specification. The GEM318 reports enclosure configuration and status, detects and reports when a drive has been swapped, and controls visual indicators and alarms.

## Application

Figure 2 illustrates the GEM318 in one type of application.

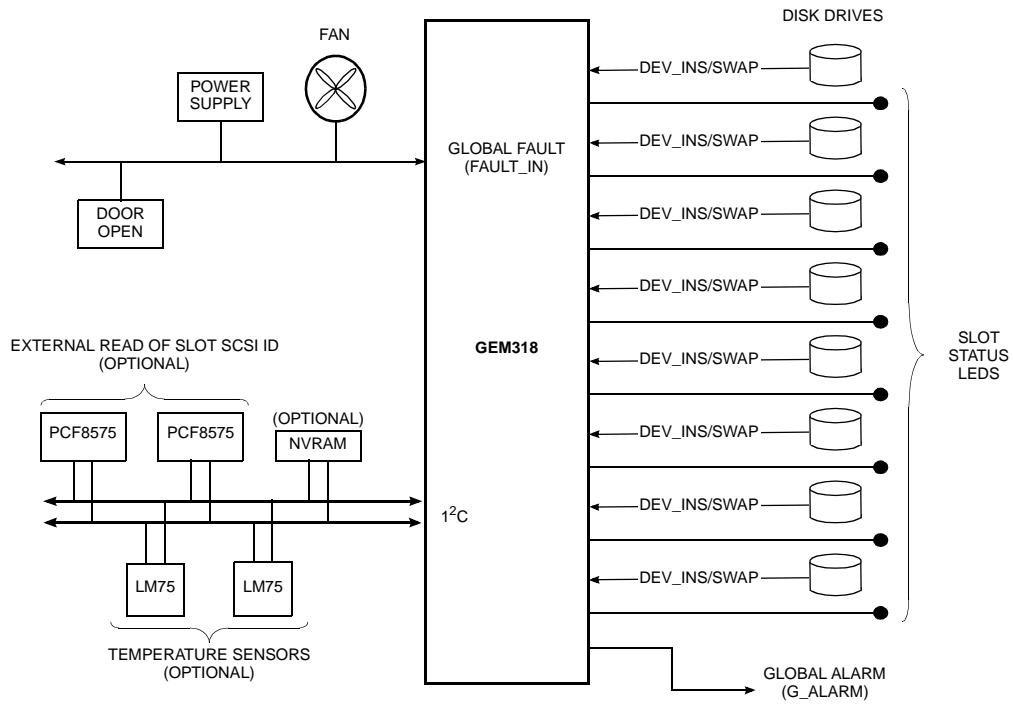


Figure 2. GEM318 Application

## Interfaces

The GEM318 interfaces include a backplane management interface, an LVD SCSI interface, and an integrated master/slave I<sup>2</sup>C interface (see figure 3).

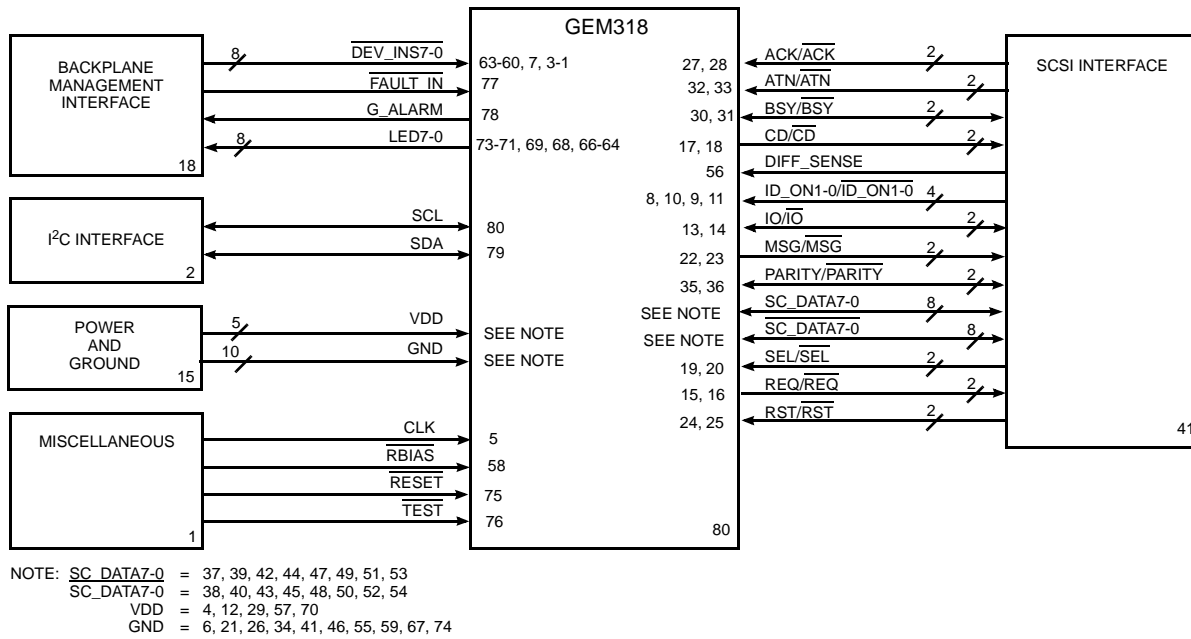


Figure 3. GEM318 Functional Signal Grouping

## Hardware Functional Description

### Input Pins

The GEM318 provides the following input pins.

- Eight device inserted pins ( $\overline{\text{DEV\_IN7-0}}$ ) with *hot swap* detect support
- One fault input ( $\overline{\text{FAULT\_IN}}$ ). This pin is host definable and programmable for general fault conditions such as drive fault, fan fault, power supply fault, and door open.

### Output Pins

The GEM318 provides the following output pins.

- Eight LED control pins (LED7-0)
- One global alarm (G\_ALARM), driven by the ( $\overline{\text{FAULT\_IN}}$ ) input and/or the SAF-TE Send Global command. Additionally, a user configurable output bit may be set by temperature out-of-range detected (if enabled) and/or drive failure (if enabled).

### SCSI Bus

The GEM318 SCSI bus provides support for the following.

- LVD and single-ended SCSI operation
- Differential sense input that automatically selects the bus operating mode
- Eight-bit asynchronous data transfers, as defined by the SAF-TE specification
- Wide SCSI addressing. The SCSI ID of the GEM318 device is determined by connecting one of the two ID\_ON pins to the desired SCSI address signals on the SCSI bus.
- SCSI reset assertion after device swap. The GEM318 can be programmed to assert the SCSI reset ( $\overline{\text{RST}}$ ) signal after a drive has been swapped. This feature allows a redundant array of independent disks (RAID) controller to automatically initiate a data rebuild operation.

### I<sup>2</sup>C Bus Interface

The GEM318 contains a two-wire, I<sup>2</sup>C-compliant serial bus with the following features.

- Master and slave modes supported
- The SCSI ID of each slot can be read by the GEM318 from an external Phillips PCF8575 device (two are needed for eight slots)
- Support for an external NVRAM device that can contain the following:
  - Vendor-defined inquiry data
  - Slot SCSI ID. This data is returned to the host as part of the data. For implementations that do not use NVRAM or PCF8575 devices, the GEM318 automatically assigns the slot number.

- Certain operating parameters of the GEM318 may be programmed, for example, the number of temperature sensors, enabling an external SCSI read operation, and enabling a global fault.
- Support for up to two LM75 or equivalent temperature sensors. The temperature threshold value is programmable.
- I<sup>2</sup>C slave interface support:
  - Backplane status can be read from the GEM318 through the I<sup>2</sup>C interface
  - Two I<sup>2</sup>C slave addresses are provided

### Reset Input

While the reset input ( $\overline{\text{RESET}}$ ) is asserted, the GEM318 does the following:

- Tristates all output pins. This feature is useful when multiple GEM318-equipped SCSI backplanes are *daisy chained* and one or more of the GEM318 controllers must be disabled.
- If the  $\overline{\text{TEST}}$  pin is driven low while  $\overline{\text{RESET}}$  is asserted, the LED7-0 outputs are asserted. This feature is useful as a production LED test mode.

### Non-Volatile Memory Device

An optional 24C01A type NVRAM device can be connected through the I<sup>2</sup>C bus. If installed, the default inquiry data is replaced with the data programmed into the NVRAM. The NVRAM also stores user programmable slot SCSI ID values.

## Software Functional Description

### SCSI Command Set

The following SCSI commands are supported:

- Inquiry
- Read Buffer
- Write Buffer
- Test Unit Ready
- Request Sense
- Send Diagnostic

### SAF-TE Command Set

The following SAF-TE commands are supported:

- Read Enclosure Configuration
- Read Enclosure Status
- Read Device Slot Status
- Write Device Slot Status
- Perform Slot Operation
- Send Global Flags
- Read Global Flags

### Enclosure Configuration

The GEM318 provides the host with the following enclosure configuration information:

- Device slots supported (eight maximum)
- Temperature sensors supported (two maximum)

### Control Functions

The following control functions are provided:

- LED on/off/flashing pattern (see table 1)
- Global alarm on/off

### Status Data

The following status information is reported:

- Devices installed
- Hot swap status
- Slot SCSI ID (vendor programmable if NVRAM or a PCF8575 is implemented or automatically assigned by the GEM318)
- Slots with unconfigured drives inserted (drives installed but not configured by host. Default power-on state is *unconfigured*)
- Enclosure temperature value

- Temperature out of range alert
- Drive status (good/fault status programmed by the host using the Write Device Slot Status command)
- Global failure bit status

### Visual Indicators

The GEM318 controls status indicator lights for up to eight device slots. Table 1 describes the states that are displayed. The identify LED can be flashed with or without a drive inserted in the slot; consequently, it indicates which slot is housing the faulty device and shows the user in which slot to install a replacement drive.

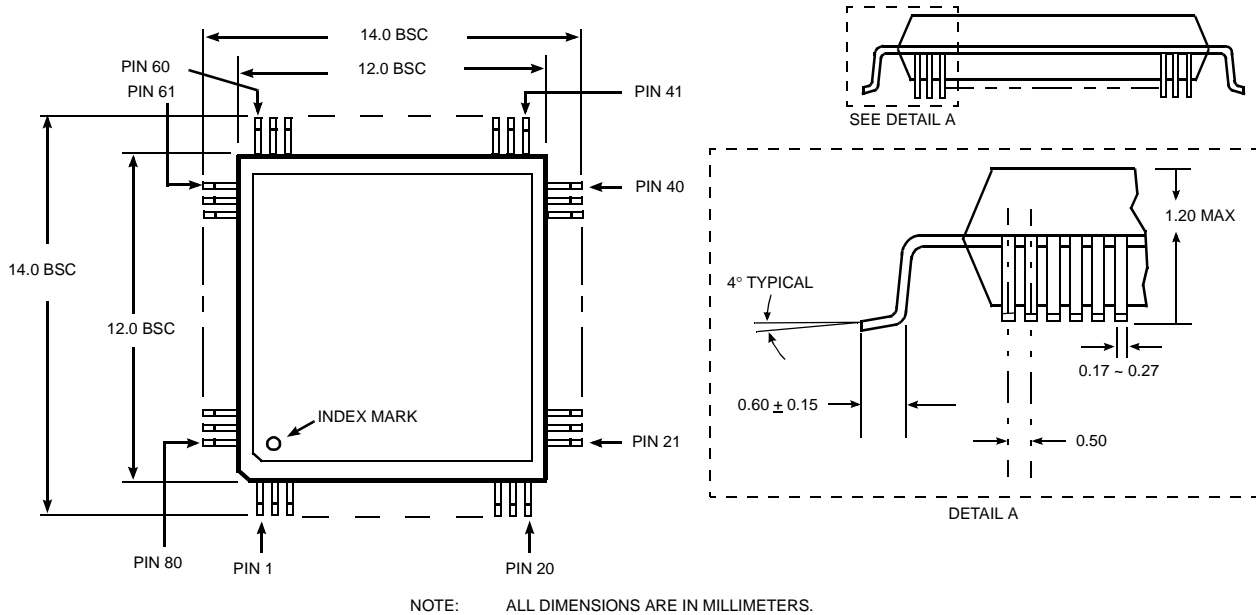
**NOTE:** Issuing a SCSI Reset or Bus Device Reset message does not change the state of the indicator lights.

**Table 1. Visual Indicator State**

Device Status	Indicator Light
No Error	Off
Faulty or rebuild stopped	Steady on
Rebuild	Slow blink (~1/sec)
Identify	Fast blink (~3/sec)

### Packaging

The GEM318 is available in an 80-pin TQFP. Mechanical dimensions are illustrated in figure 4.



**Figure 4. GEM318 Mechanical Drawings**

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