

2 Mbit / 4 Mbit (x8) Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

FEATURES:

- **Organized as 256K x8 / 512K x8**
- **Single Voltage Read and Write Operations**
 - 4.5-5.5V for GLS29SF020/040
 - 2.7-3.6V for GLS29VF020/040
- **Superior Reliability**
 - Endurance: 100,000 Cycles (typical)
 - Greater than 100 years Data Retention
- **Low Power Consumption:**
 - Active Current: 10 mA (typical)
 - Standby Current:
 - 30 μ A (typical) for GLS29SF020/040
 - 1 μ A (typical) for GLS29VF020/040
- **Sector-Erase Capability**
 - Uniform 128 Byte sectors
- **Fast Read Access Time:**
 - 55 ns for GLS29SF020/040
 - 70 ns for GLS29VF020/040
- **Latched Address and Data**
- **Fast Erase and Byte-Program:**
 - Sector-Erase Time: 18 ms (typical)
 - Chip-Erase Time: 70 ms (typical)
 - Byte-Program Time: 14 μ s (typical)
 - Chip Rewrite Time:
 - 4 seconds (typical) for GLS29SF/VF020
 - 8 seconds (typical) for GLS29SF/VF040
- **Automatic Write Timing**
 - Internal V_{PP} Generation
- **End-of-Write Detection**
 - Toggle Bit
 - Data# Polling
- **TTL I/O Compatibility for GLS29SF020/040**
- **CMOS I/O Compatibility for GLS29VF020/040**
- **JEDEC Standard**
 - Flash EEPROM Pinouts and command sets
- **Packages Available**
 - 32-lead PLCC
 - 32-lead TSOP (8mm x 14mm)
- **All non-Pb (lead-free) devices are RoHS compliant**

PRODUCT DESCRIPTION

The GLS29SF020/040 and GLS29VF020/040 are 256K x8 / 512K x8 CMOS Small-Sector Flash (SSF) manufactured with high-performance SuperFlash technology. The split-gate cell design and thick-oxide tunneling injector attain better reliability and manufacturability compared with alternate approaches. The GLS29SF020/040 devices write (Program or Erase) with a 4.5-5.5V power supply. The GLS29VF020/040 devices write (Program or Erase) with a 2.7-3.6V power supply. These devices conform to JEDEC standard pin assignments for x8 memories.

Featuring high performance Byte-Program, the GLS29SF020/040 and GLS29VF020/040 devices provide a maximum Byte-Program time of 20 μ sec. To protect against inadvertent write, they have on-chip hardware and Software Data Protection schemes. Designed, manufactured, and tested for a wide spectrum of applications, these devices are offered with a guaranteed endurance of at least 10,000 cycles. Data retention is rated at greater than 100 years.

The GLS29SF020/040 and GLS29VF020/040 devices are suited for applications that require convenient and economical updating of program, configuration, or data memory. For all system applications, they significantly improve performance and reliability, while lowering power consumption. They inherently use less energy during Erase and Program than alternative flash technologies. The total energy consumed is a function of the applied voltage, current, and time of application. Since for any given voltage range, the SuperFlash technology uses less current to program and has a shorter erase time, the total energy consumed during any Erase or Program operation is less than alternative flash technologies. They also improve flexibility while lowering the cost for program, data, and configuration storage applications.

The SuperFlash technology provides fixed Erase and Program times independent of the number of Erase/Program cycles that have occurred. Therefore, the system software or hardware does not have to be modified or de-rated as is necessary with alternative flash technologies, whose Erase and Program times increase with accumulated Erase/Program cycles.

Data Sheet

To meet high density, surface mount requirements, the GLS29SF020/040 and GLS29VF020/040 devices are offered in 32-lead PLCC and 32-lead TSOP packages. The pin assignments are shown in Figures 2 and 3.

Device Operation

Commands are used to initiate the memory operation functions of the device. Commands are written to the device using standard microprocessor write sequences. A command is written by asserting WE# low while keeping CE# low. The address bus is latched on the falling edge of WE# or CE#, whichever occurs last. The data bus is latched on the rising edge of WE# or CE#, whichever occurs first.

Read

The Read operation of the GLS29SF020/040 and GLS29VF020/040 devices are controlled by CE# and OE#, both have to be low for the system to obtain data from the outputs. CE# is used for device selection. When CE# is high, the chip is deselected and only standby power is consumed. OE# is the output control and is used to gate data from the output pins. The data bus is in high impedance state when either CE# or OE# is high. Refer to the Read cycle timing diagram in Figure 4 for further details.

Byte-Program Operation

The GLS29SF020/040 and GLS29VF020/040 devices are programmed on a byte-by-byte basis. Before programming, the sector where the byte exists must be fully erased. The Program operation is accomplished in three steps. The first step is the three-byte load sequence for Software Data Protection. The second step is to load byte address and byte data. During the Byte-Program operation, the addresses are latched on the falling edge of either CE# or WE#, whichever occurs last. The data is latched on the rising edge of either CE# or WE#, whichever occurs first. The third step is the internal Program operation which is initiated after the rising edge of the fourth WE# or CE#, whichever occurs first. The Program operation, once initiated, will be completed, within 20 μ s. See Figures 5 and 6 for WE# and CE# controlled Program operation timing diagrams and Figure 16 for flowcharts. During the Program operation, the only valid reads are Data# Polling and Toggle Bit. During the internal Program operation, the host is free to perform additional tasks. Any commands written during the internal Program operation will be ignored.

Sector-Erase Operation

The Sector-Erase operation allows the system to erase the device on a sector-by-sector basis. The GLS29SF020/040 and GLS29VF020/040 offer Sector-Erase mode. The sector architecture is based on uniform sector size of 128 Bytes. The Sector-Erase operation is initiated by executing a six-byte command sequence with Sector-Erase command (20H) and sector address (SA) in the last bus cycle. The sector address is latched on the falling edge of the sixth WE# pulse, while the command (20H) is latched on the rising edge of the sixth WE# pulse. The internal Erase operation begins after the sixth WE# pulse. The End-of-Erase operation can be determined using either Data# Polling or Toggle Bit methods. For timing waveforms, see Figure 9. Any commands issued during the Sector-Erase operation are ignored.

Chip-Erase Operation

The GLS29SF020/040 and GLS29VF020/040 devices provide a Chip-Erase operation, which allows the user to erase the entire memory array to the “1s” state. This is useful when the entire device must be quickly erased.

The Chip-Erase operation is initiated by executing a six-byte Software Data Protection command sequence with Chip-Erase command (10H) with address 555H in the last byte sequence. The internal Erase operation begins with the rising edge of the sixth WE# or CE#, whichever occurs first. During the internal Erase operation, the only valid read is Toggle Bit or Data# Polling. See Table 4 for the command sequence, Figure 10 for the timing diagram, and Figure 19 for the flowchart. Any commands written during the Chip-Erase operation will be ignored.

Write Operation Status Detection

The GLS29SF020/040 and GLS29VF020/040 devices provide two software means to detect the completion of a Write (Program or Erase) cycle, in order to optimize the system Write cycle time. The software detection includes two status bits: Data# Polling (DQ₇) and Toggle Bit (DQ₆). The End-of-Write detection mode is enabled after the rising edge of WE# which initiates the internal Program or Erase operation.

The actual completion of the nonvolatile write is asynchronous with the system; therefore, either a Data# Polling or Toggle Bit read may be simultaneous with the completion of the Write cycle. If this occurs, the system may possibly get an erroneous result, i.e., valid data may appear to conflict with either DQ₇ or DQ₆. In order to pre-

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

vent spurious rejection, if an erroneous result occurs, the software routine should include a loop to read the accessed location an additional two (2) times. If both reads are valid, then the device has completed the Write cycle, otherwise the rejection is valid.

Data# Polling (DQ₇)

When the GLS29SF020/040 and GLS29VF020/040 devices are in the internal Program operation, any attempt to read DQ₇ will produce the complement of the true data. Once the Program operation is completed, DQ₇ will produce true data. Note that even though DQ₇ may have valid data immediately following the completion of an internal Write operation, the remaining data outputs may still be invalid: valid data on the entire data bus will appear in subsequent successive Read cycles after an interval of 1 μ s. During internal Erase operation, any attempt to read DQ₇ will produce a '0'. Once the internal Erase operation is completed, DQ₇ will produce a '1'. The Data# Polling is valid after the rising edge of fourth WE# (or CE#) pulse for Program operation. For Sector- or Chip-Erase, the Data# Polling is valid after the rising edge of sixth WE# (or CE#) pulse. See Figure 7 for Data# Polling timing diagram and Figure 17 for a flow-chart.

Toggle Bit (DQ₆)

During the internal Program or Erase operation, any consecutive attempts to read DQ₆ will produce alternating '0's and '1's, i.e., toggling between 0 and 1. When the internal Program or Erase operation is completed, the toggling will stop. The device is then ready for the next operation. The Toggle Bit is valid after the rising edge of fourth WE# (or CE#) pulse for Program operation. For Sector or Chip-Erase, the Toggle Bit is valid after the rising edge of sixth WE# (or CE#) pulse. See Figure 8 for Toggle Bit timing diagram and Figure 17 for a flowchart.

Data Protection

The GLS29SF020/040 and GLS29VF020/040 devices provide both hardware and software features to protect nonvolatile data from inadvertent writes.

Hardware Data Protection

Noise/Glitch Protection: A WE# or CE# pulse of less than 5 ns will not initiate a Write cycle.

V_{DD} Power Up/Down Detection: The Write operation is inhibited when V_{DD} is less than 2.5V for GLS29SF020/040. The Write operation is inhibited when V_{DD} is less than 1.5V for GLS29VF020/040.

Write Inhibit Mode: Forcing OE# low, CE# high, or WE# high will inhibit the Write operation. This prevents inadvertent writes during power-up or power-down.

Software Data Protection (SDP)

The GLS29SF020/040 and GLS29VF020/040 provide the JEDEC approved Software Data Protection scheme for all data alteration operations, i.e., Program and Erase. Any Program operation requires the inclusion of a series of three- byte sequence. The three-byte load sequence is used to initiate the Program operation, providing optimal protection from inadvertent Write operations, e.g., during the system power-up or power-down. Any Erase operation requires the inclusion of a six-byte load sequence. These devices are shipped with the Software Data Protection permanently enabled. The specific software command codes are shown in Table 4. During SDP command sequence, invalid commands will abort the device to read mode, within T_{RC}.

Product Identification

The Product Identification mode identifies the devices as GLS29SF020, GLS29SF040 and GLS29VF020, GLS29VF040 and manufacturer as Greenliant. This mode may be accessed by software operations. Users may use the Software Product Identification operation to identify the part (i.e., using the device ID) when using multiple manufacturers in the same socket. For details, see Table 4 for

Data Sheet

software operation, Figure 11 for the Software ID Entry and Read timing diagram, and Figure 18 for the Software ID Entry command sequence flowchart.

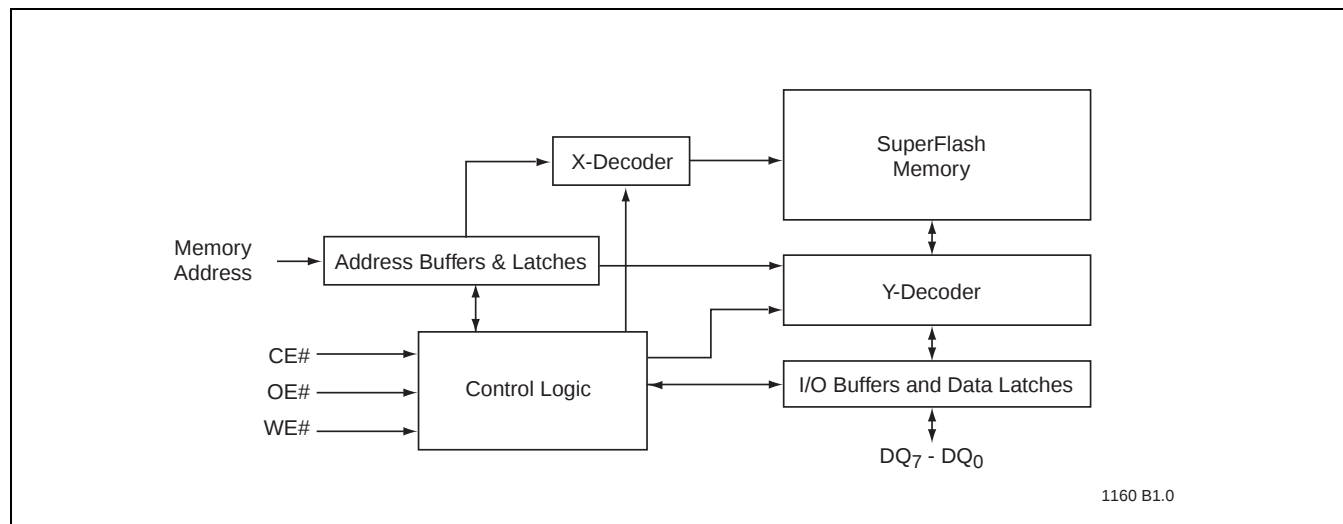
TABLE 1: Product Identification

	Address	Data
Manufacturer's ID	0000H	BFH
Device ID		
GLS29SF020	0001H	24H
GLS29VF020	0001H	25H
GLS29SF040	0001H	13H
GLS29VF040	0001H	14H

T1.3 1160

Product Identification Mode Exit/Reset

In order to return to the standard Read mode, the Software Product Identification mode must be exited. Exit is accomplished by issuing the Software ID Exit command sequence, which returns the device to the Read operation. Please note that the Software ID Exit command is ignored during an internal Program or Erase operation. See Table 4 for software command codes, Figure 12 for timing waveform, and Figure 18 for a flowchart.



1160 B1.0

FIGURE 1: Functional Block Diagram

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

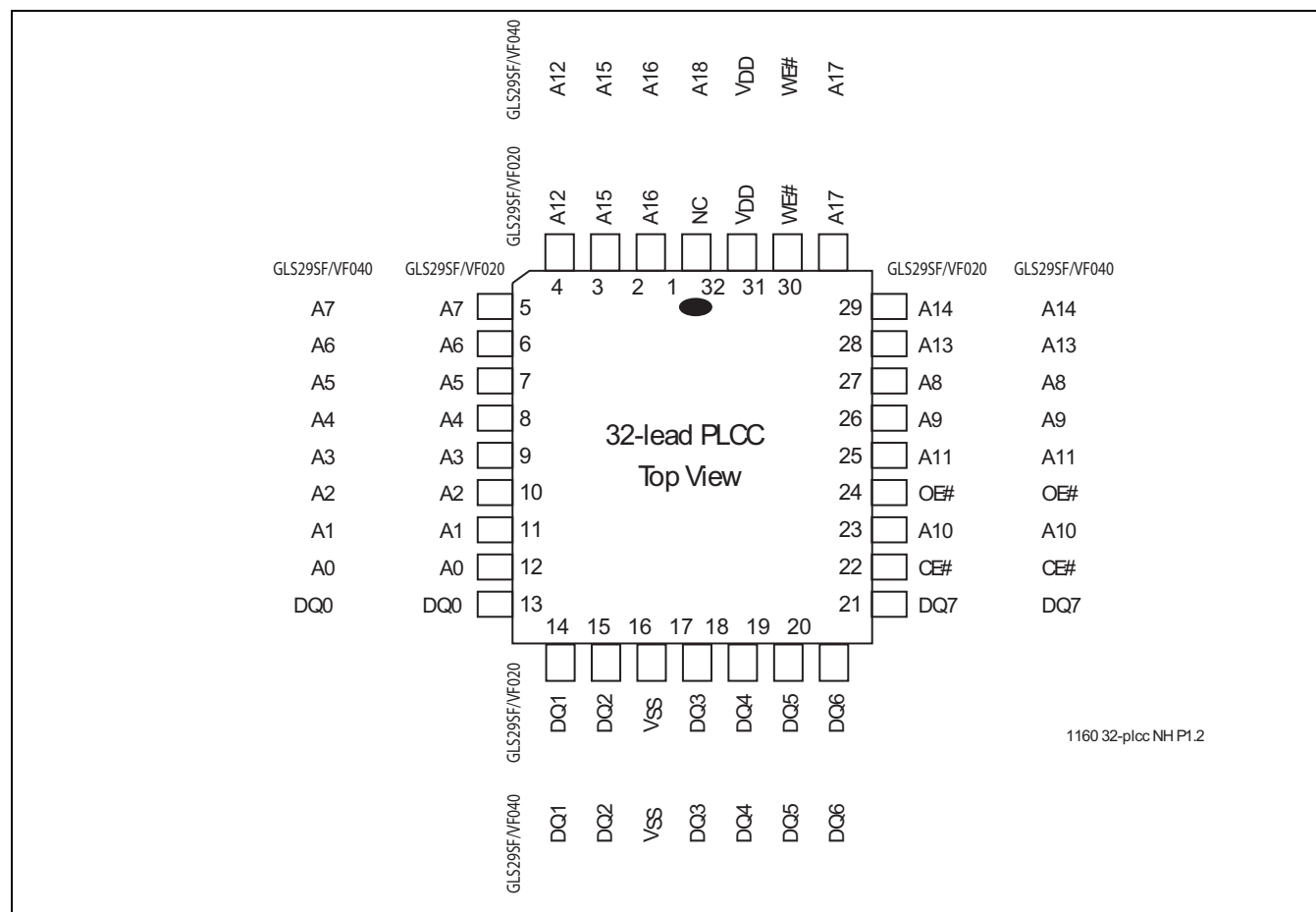


FIGURE 2: Pin Assignments for 32-lead PLCC

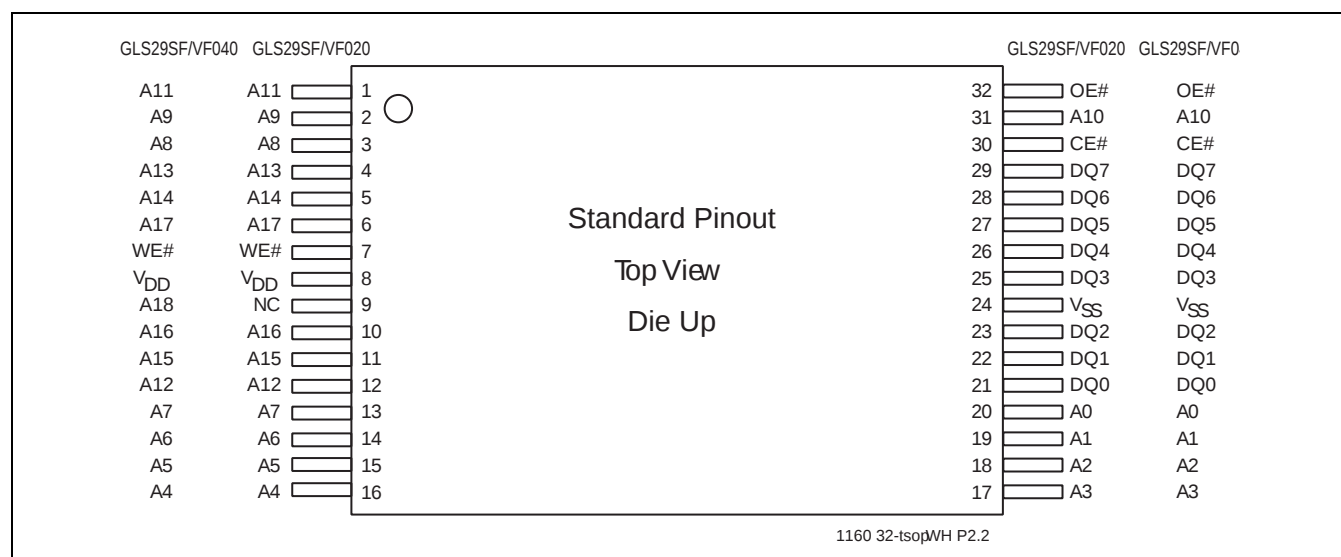


FIGURE 3: Pin Assignments for 32-lead TSOP (8mm x 14mm)

Data Sheet

TABLE 2: Pin Description

Symbol	Pin Name	Functions
$A_{MS}^1-A_0$	Address Inputs	To provide memory addresses. During Sector-Erase $A_{MS}-A_8$ address lines will select the sector.
DQ_7-DQ_0	Data Input/output	To output data during Read cycles and receive input data during Write cycles. Data is internally latched during a Write cycle. The outputs are in tri-state when $OE\#$ or $CE\#$ is high.
$CE\#$	Chip Enable	To activate the device when $CE\#$ is low.
$OE\#$	Output Enable	To gate the data output buffers.
$WE\#$	Write Enable	To control the Write operations.
V_{DD}	Power Supply	To provide power supply voltage: 4.5-5.5V for GLS29SF020/040 2.7-3.6V for GLS29VF020/040
V_{SS}	Ground	
NC	No Connection	Pin not connected internally

T2.5 1160

1. A_{MS} = Most significant address

 $A_{MS} = A_{17}$ for GLS29SF/VF020 and A_{18} for GLS29SF/VF040

TABLE 3: Operation Modes Selection

Mode	$CE\#$	$OE\#$	$WE\#$	DQ	Address
Read	V_{IL}	V_{IL}	V_{IH}	D_{OUT}	A_{IN}
Program	V_{IL}	V_{IH}	V_{IL}	D_{IN}	A_{IN}
Erase	V_{IL}	V_{IH}	V_{IL}	X^1	Sector address, XXH for Chip-Erase
Standby	V_{IH}	X	X	High Z	X
Write Inhibit	X	V_{IL}	X	High Z/ D_{OUT}	X
	X	X	V_{IH}	High Z/ D_{OUT}	X
Product Identification					
Software Mode	V_{IL}	V_{IL}	V_{IH}		See Table 4

T3.4 1160

1. X can be V_{IL} or V_{IH} , but no other value.

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

TABLE 4: Software Command Sequence

Command Sequence	1st Bus Write Cycle		2nd Bus Write Cycle		3rd Bus Write Cycle		4th Bus Write Cycle		5th Bus Write Cycle		6th Bus Write Cycle	
	Addr ¹	Data	Addr ¹	Data	Addr ¹	Data	Addr ¹	Data	Addr ¹	Data	Addr ¹	Data
Byte-Program	555H	AAH	2AAH	55H	555H	A0H	BA ²	Data				
Sector-Erase	555H	AAH	2AAH	55H	555H	80H	555H	AAH	2AAH	55H	SA _X ³	20H
Chip-Erase	555H	AAH	2AAH	55H	555H	80H	555H	AAH	2AAH	55H	555H	10H
Software ID Entry ^{4,5}	555H	AAH	2AAH	55H	555H	90H						
Software ID Exit ⁶	XXH	F0H										
Software ID Exit ⁶	555H	AAH	2AAH	55H	555H	F0H						

T4.7 1160

- Address format A₁₄-A₀ (Hex),
Addresses A₁₅-A_{MS} can be V_{IL} or V_{IH}, but no other value, for the Command sequence for GLS29SF/VF020/040.
A_{MS} = Most significant address
A_{MS} = A₁₇ for GLS29SF/VF020 and A₁₈ for GLS29SF/VF040.
- BA = Program Byte address
- SA_X for Sector-Erase; uses A_{MS}-A₇ address lines for GLS29SF/VF020/040
- The device does not remain in Software Product ID mode if powered down.
- With A_{MS}-A₁ = 0; Greenliant Manufacturer's ID = BFH, is read with A₀ = 0,
GLS29SF020 Device ID = 24H, is read with A₀ = 1
GLS29VF020 Device ID = 25H, is read with A₀ = 1
GLS29SF040 Device ID = 13H, is read with A₀ = 1
GLS29VF040 Device ID = 14H, is read with A₀ = 1
- Both Software ID Exit operations are equivalent

Data Sheet

Absolute Maximum Stress Ratings (Applied conditions greater than those listed under “Absolute Maximum Stress Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these conditions or conditions greater than those defined in the operational sections of this data sheet is not implied. Exposure to absolute maximum stress rating conditions may affect device reliability.)

Temperature Under Bias	-55°C to +125°C
Storage Temperature	-65°C to +150°C
D. C. Voltage on Any Pin to Ground Potential	-0.5V to $V_{DD}+0.5V$
Transient Voltage (<20 ns) on Any Pin to Ground Potential	-2.0V to $V_{DD}+2.0V$
Voltage on A ₉ Pin to Ground Potential	-0.5V to 13.2V
Package Power Dissipation Capability ($T_A = 25^\circ\text{C}$)	1.0W
Through Hole Lead Soldering Temperature (10 Seconds)	300°C
Surface Mount Solder Reflow Temperature ¹	260°C for 10 seconds
Output Short Circuit Current ²	50 mA

1. Excluding certain with-Pb 32-PLCC units, all packages are 260°C capable in both non-Pb and with-Pb solder versions.

Certain with-Pb 32-PLCC package types are capable of 240°C for 10 seconds; please consult the factory for the latest information.

2. Outputs shorted for no more than one second. No more than one output shorted at a time.

Operating Range for GLS29SF020/040

Range	Ambient Temp	V_{DD}
Commercial	0°C to +70°C	4.5-5.5V
Industrial	-40°C to +85°C	4.5-5.5V

Operating Range for GLS29VF020/040

Range	Ambient Temp	V_{DD}
Commercial	0°C to +70°C	2.7-3.6V
Industrial	-40°C to +85°C	2.7-3.6V

AC Conditions of Test

Input Rise/Fall Time	5 ns
Output Load	$C_L = 30 \text{ pF}$ for 55 ns
Output Load	$C_L = 100 \text{ pF}$ for 70 ns
See Figures 13, 14, and 15	

TABLE 5: DC Operating Characteristics $V_{DD} = 4.5\text{-}5.5\text{V}$ for GLS29SF020/040

Symbol	Parameter	Limits			Test Conditions
		Min	Max	Units	
I_{DD}	Power Supply Current				Address input= V_{IL}/V_{IH} , at $f=1/T_{RC}$ Min $V_{DD}=V_{DD} \text{ Max}$
	Read		25	mA	$CE\#=OE\#=V_{IL}$, $WE\#=V_{IH}$, all I/Os open
	Write		30	mA	$CE\#=WE\#=V_{IL}$, $OE\#=V_{IH}$
I_{SB1}	Standby V_{DD} Current (TTL input)		3	mA	$CE\#=V_{IH}$, $V_{DD}=V_{DD} \text{ Max}$
I_{SB2}	Standby V_{DD} Current (CMOS input)		100	μA	$CE\#=V_{IHC}$, $V_{DD}=V_{DD} \text{ Max}$
I_{LI}	Input Leakage Current		1	μA	$V_{IN}=\text{GND to } V_{DD}$, $V_{DD}=V_{DD} \text{ Max}$
I_{LO}	Output Leakage Current		10	μA	$V_{OUT}=\text{GND to } V_{DD}$, $V_{DD}=V_{DD} \text{ Max}$
V_{IL}	Input Low Voltage		0.8	V	$V_{DD}=V_{DD} \text{ Min}$
V_{IH}	Input High Voltage	2.0		V	$V_{DD}=V_{DD} \text{ Max}$
V_{IHC}	Input High Voltage (CMOS)	$V_{DD}-0.3$		V	$V_{DD}=V_{DD} \text{ Max}$
V_{OL}	Output Low Voltage		0.4	V	$I_{OL}=2.1 \mu\text{A}$, $V_{DD}=V_{DD} \text{ Min}$
V_{OH}	Output High Voltage	2.4		V	$I_{OH}=-400 \mu\text{A}$, $V_{DD}=V_{DD} \text{ Min}$

T5.7 1160

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

Data Sheet

TABLE 6: DC Operating Characteristics $V_{DD} = 2.7\text{-}3.6\text{V}$ for GLS29VF020/040

Symbol	Parameter	Limits			Test Conditions
		Min	Max	Units	
I_{DD}	Power Supply Current				Address input= V_{IL}/V_{IH} , at $f=1/T_{RC}$ Min $V_{DD}=V_{DD}$ Max
	Read		25	mA	$CE\#=OE\#=V_{IL}$, $WE\#=V_{IH}$, all I/Os open
	Write		30	mA	$CE\#=WE\#=V_{IL}$, $OE\#=V_{IH}$
I_{SB}	Standby V_{DD} Current		30	μA	$CE\#=V_{IHC}$, $V_{DD}=V_{DD}$ Max
I_{LI}	Input Leakage Current		1	μA	$V_{IN}=\text{GND}$ to V_{DD} , $V_{DD}=V_{DD}$ Max
I_{LO}	Output Leakage Current		10	μA	$V_{OUT}=\text{GND}$ to V_{DD} , $V_{DD}=V_{DD}$ Max
V_{IL}	Input Low Voltage		0.8	V	$V_{DD}=V_{DD}$ Min
V_{IH}	Input High Voltage	$0.7V_{DD}$		V	$V_{DD}=V_{DD}$ Max
V_{IHC}	Input High Voltage (CMOS)	$V_{DD}-0.3$		V	$V_{DD}=V_{DD}$ Max
V_{OL}	Output Low Voltage		0.2	V	$I_{OL}=100\text{ }\mu\text{A}$, $V_{DD}=V_{DD}$ Min
V_{OH}	Output High Voltage	$V_{DD}-0.2$		V	$I_{OH}=-100\text{ }\mu\text{A}$, $V_{DD}=V_{DD}$ Min

T6.9 1160

TABLE 7: Recommended System Power-up Timings

Symbol	Parameter	Minimum	Units
$T_{PU-READ}^1$	Power-up to Read Operation	100	μs
$T_{PU-WRITE}^1$	Power-up to Program/Erase Operation	100	μs

T7.1 1160

1. This parameter is measured only for initial qualification and after a design or process change that could affect this parameter.

TABLE 8: Capacitance ($T_A = 25^\circ\text{C}$, $f=1\text{ MHz}$, other pins open)

Parameter	Description	Test Condition	Maximum
$C_{I/O}^1$	I/O Pin Capacitance	$V_{I/O} = 0\text{V}$	12 pF
C_{IN}^1	Input Capacitance	$V_{IN} = 0\text{V}$	6 pF

T8.1 1160

1. This parameter is measured only for initial qualification and after a design or process change that could affect this parameter.

TABLE 9: Reliability Characteristics

Symbol	Parameter	Minimum Specification	Units	Test Method
N_{END}^1	Endurance	10,000	Cycles	JEDEC Standard A117
T_{DR}^1	Data Retention	100	Years	JEDEC Standard A103
I_{LTH}^1	Latch Up	$100 + I_{DD}$	mA	JEDEC Standard 78

T9.2 1160

1. This parameter is measured only for initial qualification and after a design or process change that could affect this parameter.

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

AC CHARACTERISTICS

TABLE 10: Read Cycle Timing Parameters

$V_{DD} = 4.5-5.5V$ for GLS29SF020/040 and $2.7-3.6V$ for GLS29VF020/040

Symbol	Parameter	GLS29SF020/040-55		GLS29VF020/040-70		Units
		Min	Max	Min	Max	
T_{RC}	Read Cycle Time	55		70		ns
T_{CE}	Chip Enable Access Time		55		70	ns
T_{AA}	Address Access Time		55		70	ns
T_{OE}	Output Enable Access Time		30		35	ns
T_{CLZ}^1	CE# Low to Active Output	0		0		ns
T_{OLZ}^1	OE# Low to Active Output	0		0		ns
T_{CHZ}^1	CE# High to High-Z Output		20		25	ns
T_{OHZ}^1	OE# High to High-Z Output		20		25	ns
T_{OH}^1	Output Hold from Address Change	0		0		ns

T10.10 1160

1. This parameter is measured only for initial qualification and after a design or process change that could affect this parameter.

TABLE 11: Program/Erase Cycle Timing Parameters

$V_{DD} = 4.5-5.5V$ for GLS29SF020/040 and $2.7-3.6V$ for GLS29VF020/040

Symbol	Parameter	Min	Max	Units
T_{BP}	Byte-Program Time		20	μs
T_{AS}	Address Setup Time	0		ns
T_{AH}	Address Hold Time	30		ns
T_{CS}	WE# and CE# Setup Time	0		ns
T_{CH}	WE# and CE# Hold Time	0		ns
T_{OES}	OE# High Setup Time	0		ns
T_{OEH}	OE# High Hold Time	10		ns
T_{CP}	CE# Pulse Width	40		ns
T_{WP}	WE# Pulse Width	40		ns
T_{WPH}^1	WE# Pulse Width High	30		ns
T_{CPH}^1	CE# Pulse Width High	30		ns
T_{DS}	Data Setup Time	40		ns
T_{DH}^1	Data Hold Time	0		ns
T_{IDA}^1	Software ID Access and Exit Time		150	ns
T_{SE}	Sector-Erase		25	ms
T_{SCE}	Chip-Erase		100	ms

T11.9 1160

1. This parameter is measured only for initial qualification and after a design or process change that could affect this parameter.

Data Sheet

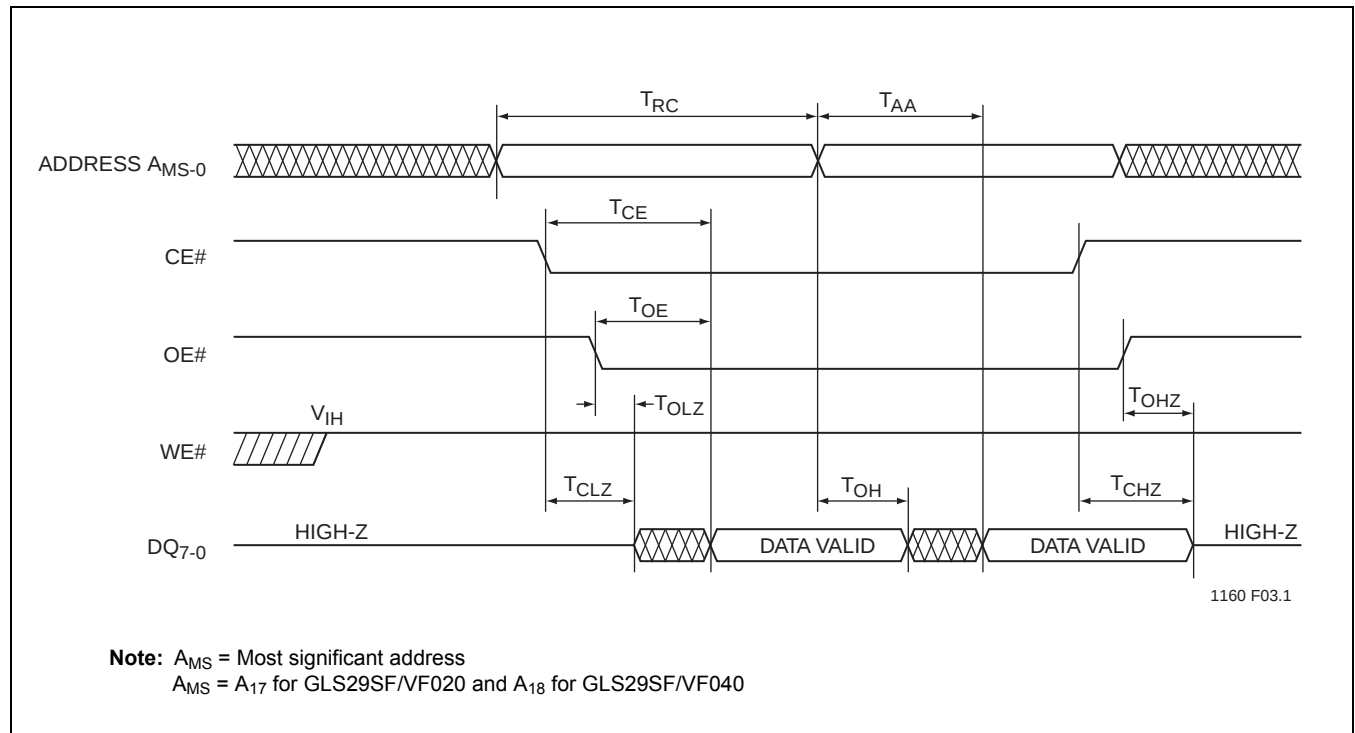


FIGURE 4: Read Cycle Timing Diagram

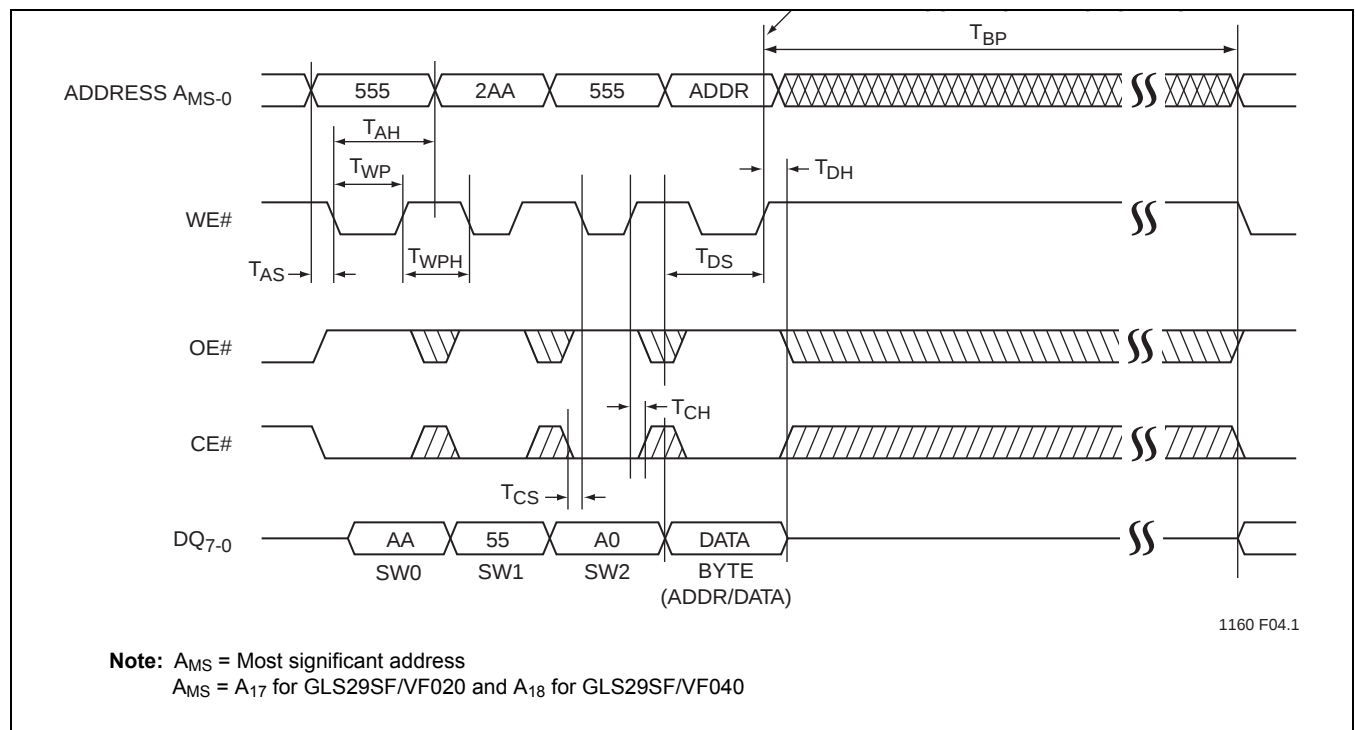


FIGURE 5: WE# Controlled Program Cycle Timing Diagram

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

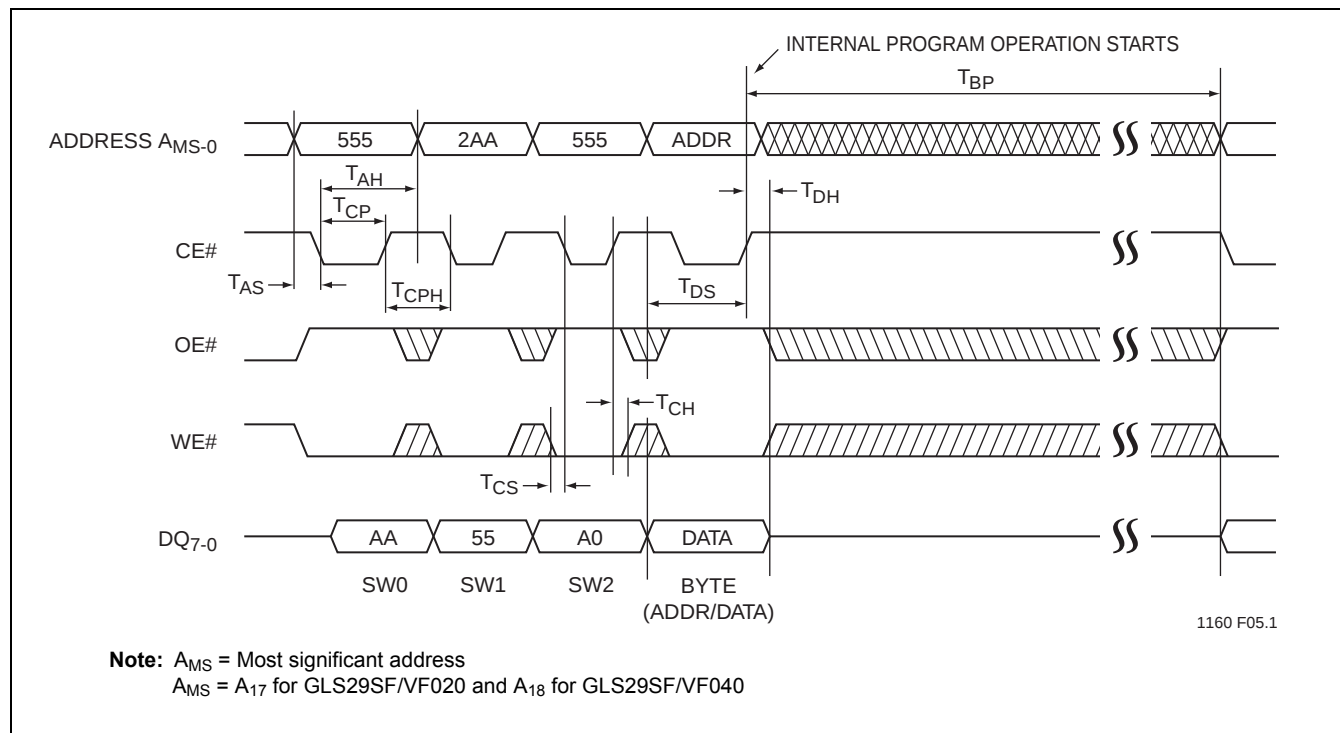


FIGURE 6: CE# Controlled Program Cycle Timing Diagram

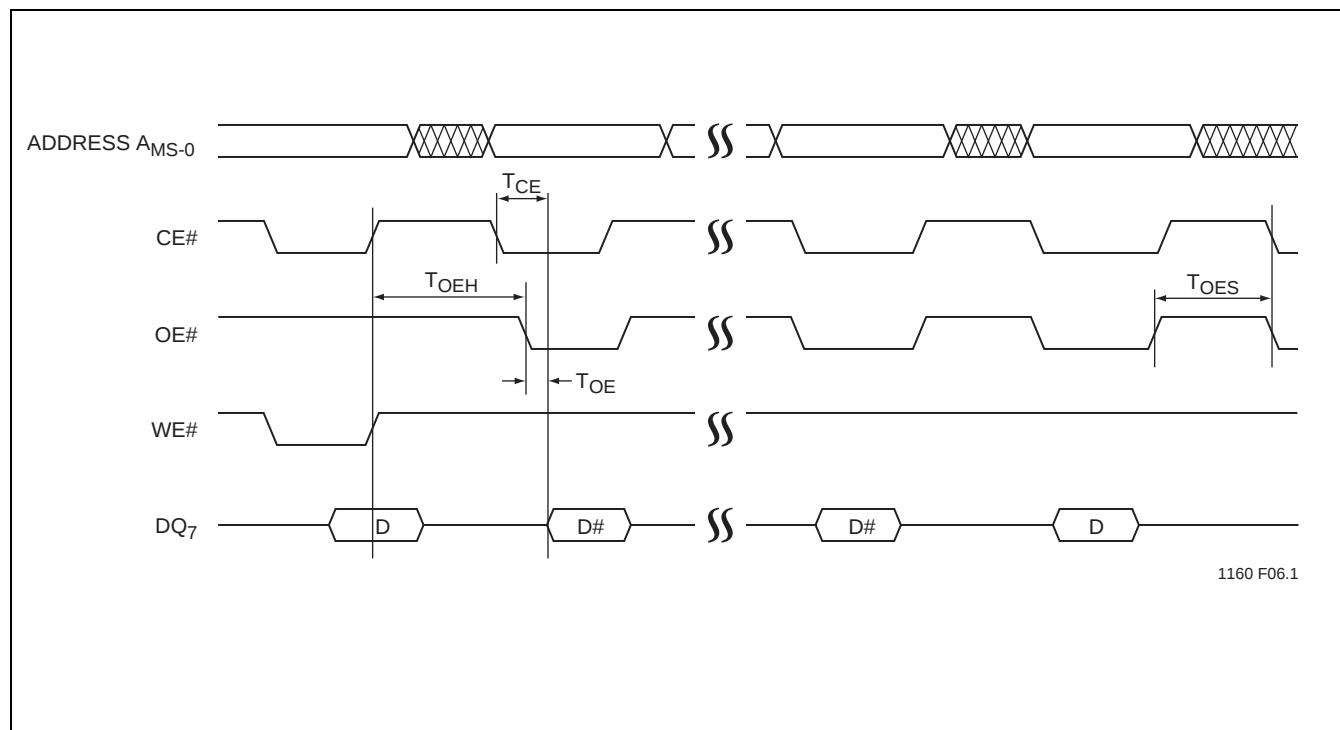


FIGURE 7: Data# Polling Timing Diagram

Data Sheet

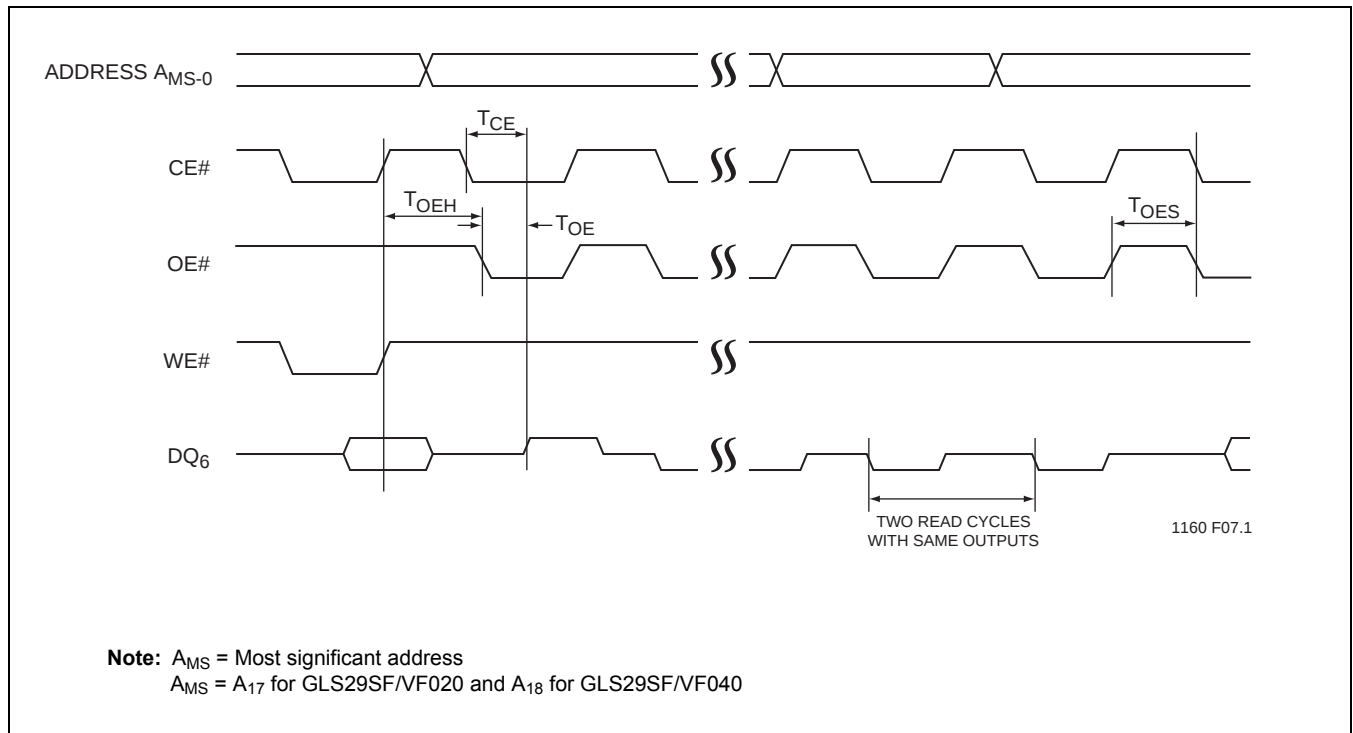


FIGURE 8: Toggle Bit Timing Diagram

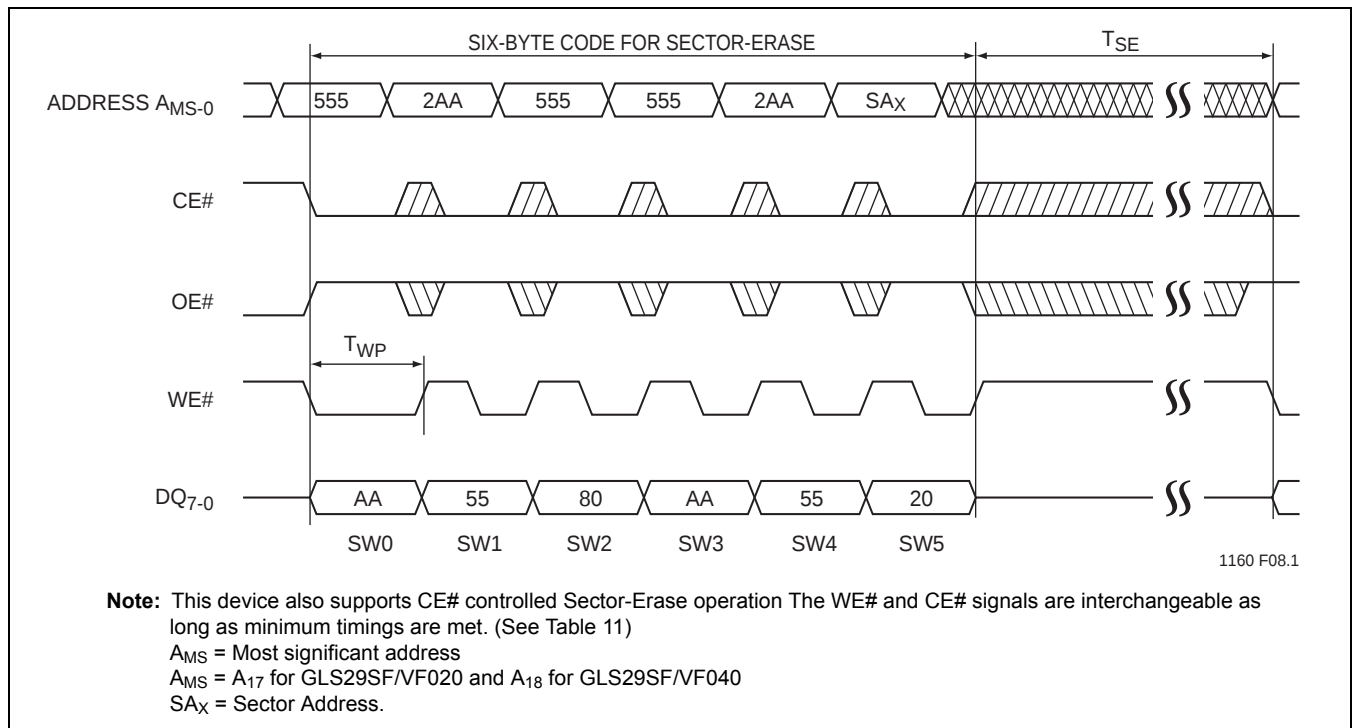


FIGURE 9: WE# Controlled Sector-Erase Timing Diagram

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

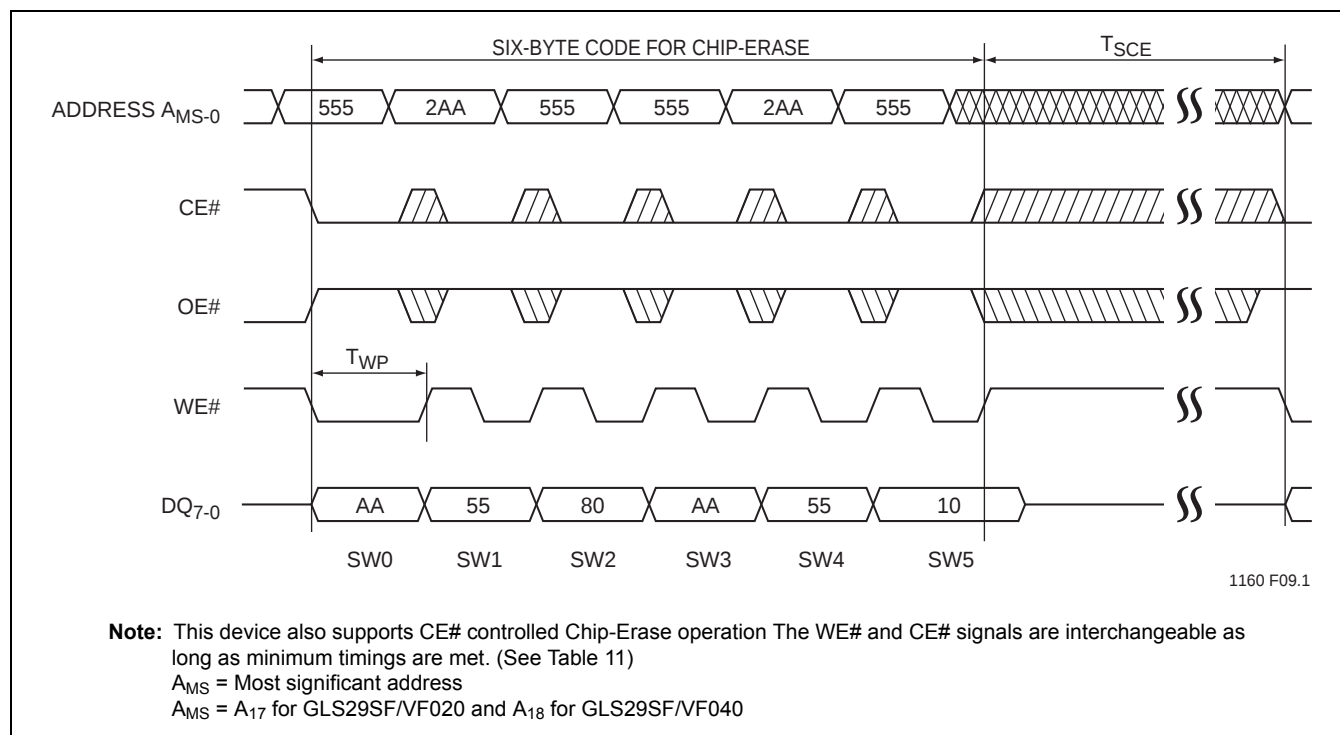


FIGURE 10: WE# Controlled Chip-Erase Timing Diagram

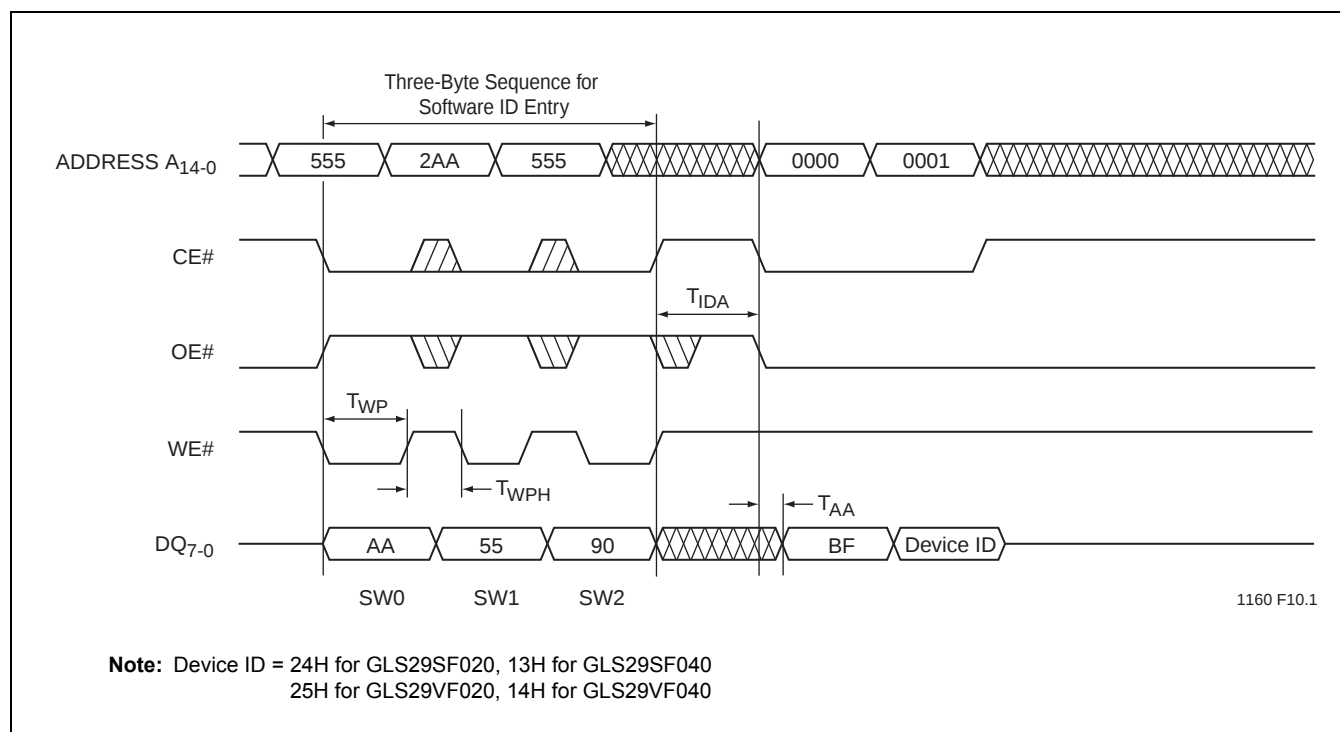


FIGURE 11: Software ID Entry and Read

Data Sheet

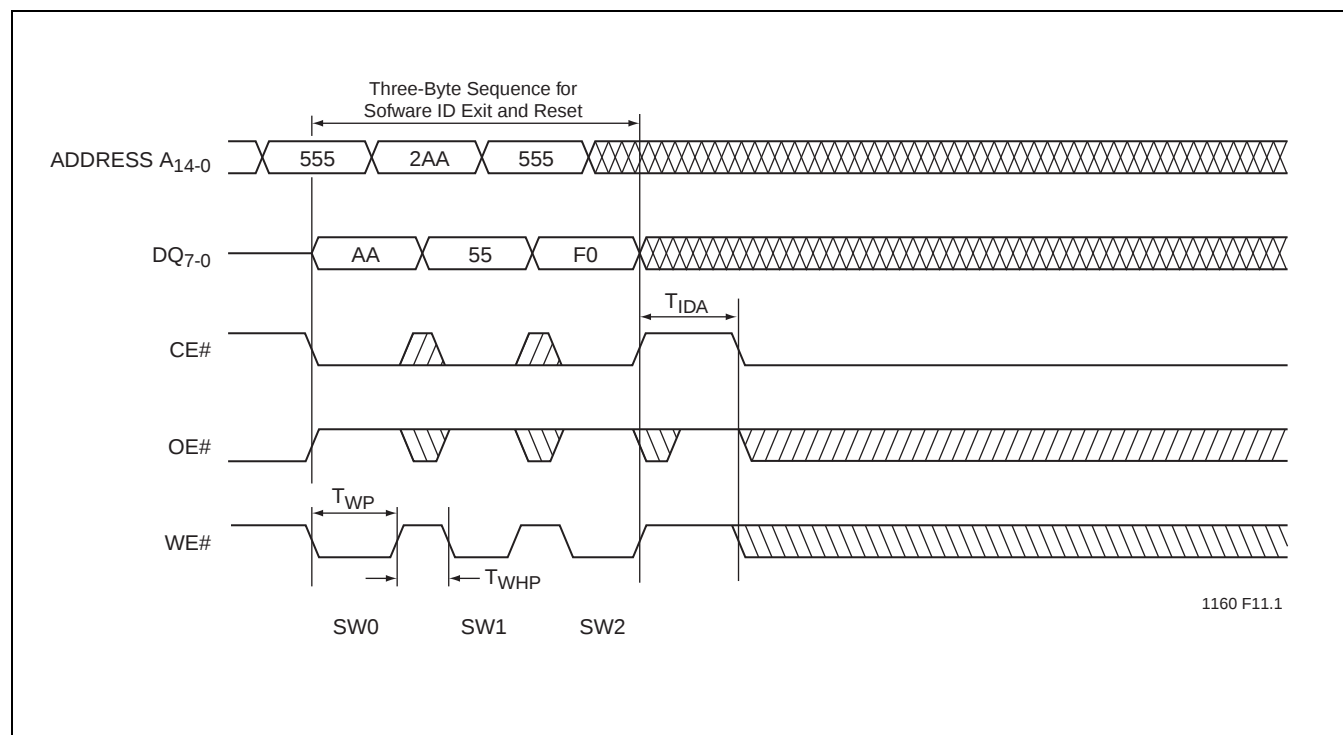


FIGURE 12: Software ID Exit and Reset

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet



AC test inputs are driven at V_{IHT} (3.0V) for a logic "1" and V_{ILT} (0V) for a logic "0". Measurement reference points for inputs and outputs are V_{IT} ($1.5 V_{DD}$) and V_{OT} ($1.5 V_{DD}$). Input rise and fall times (10% $\leftrightarrow$ 90%) are <10 ns.

Note: V_{IT} - V_{INPUT} Test
 V_{OT} - V_{OUTPUT} Test
 V_{IHT} - V_{INPUT} HIGH Test
 V_{ILT} - V_{INPUT} LOW Test

FIGURE 13: AC Input/Output Reference Waveforms for GLS29SF020/040



AC test inputs are driven at V_{IHT} ($0.9 V_{DD}$) for a logic "1" and V_{ILT} ($0.1 V_{DD}$) for a logic "0". Measurement reference points for inputs and outputs are V_{IT} ($0.5 V_{DD}$) and V_{OT} ($0.5 V_{DD}$). Input rise and fall times (10% $\leftrightarrow$ 90%) are <5 ns.

Note: V_{IT} - V_{INPUT} Test
 V_{OT} - V_{OUTPUT} Test
 V_{IHT} - V_{INPUT} HIGH Test
 V_{ILT} - V_{INPUT} LOW Test

FIGURE 14: AC Input/Output Reference Waveforms for GLS29VF020/040

Data Sheet

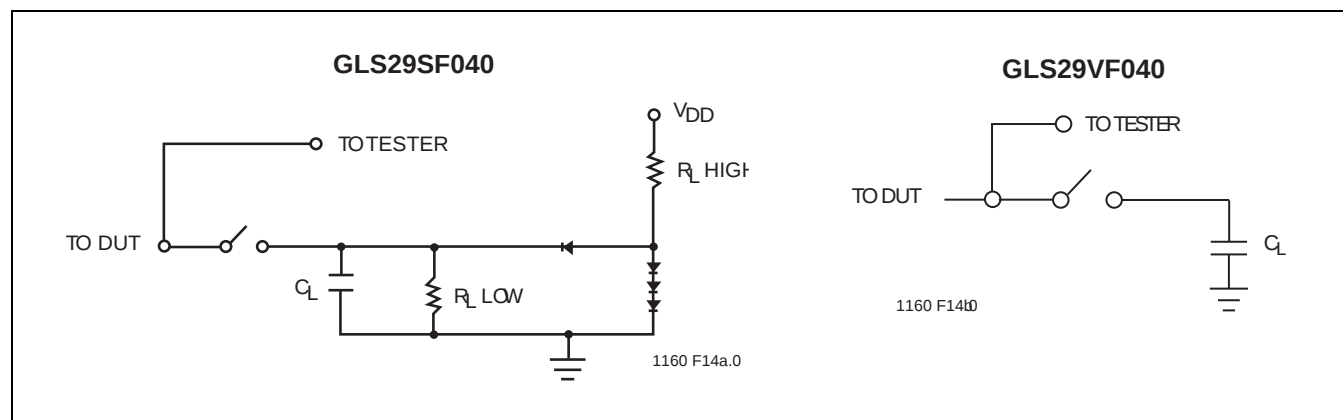


FIGURE 15: Test Load Examples

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

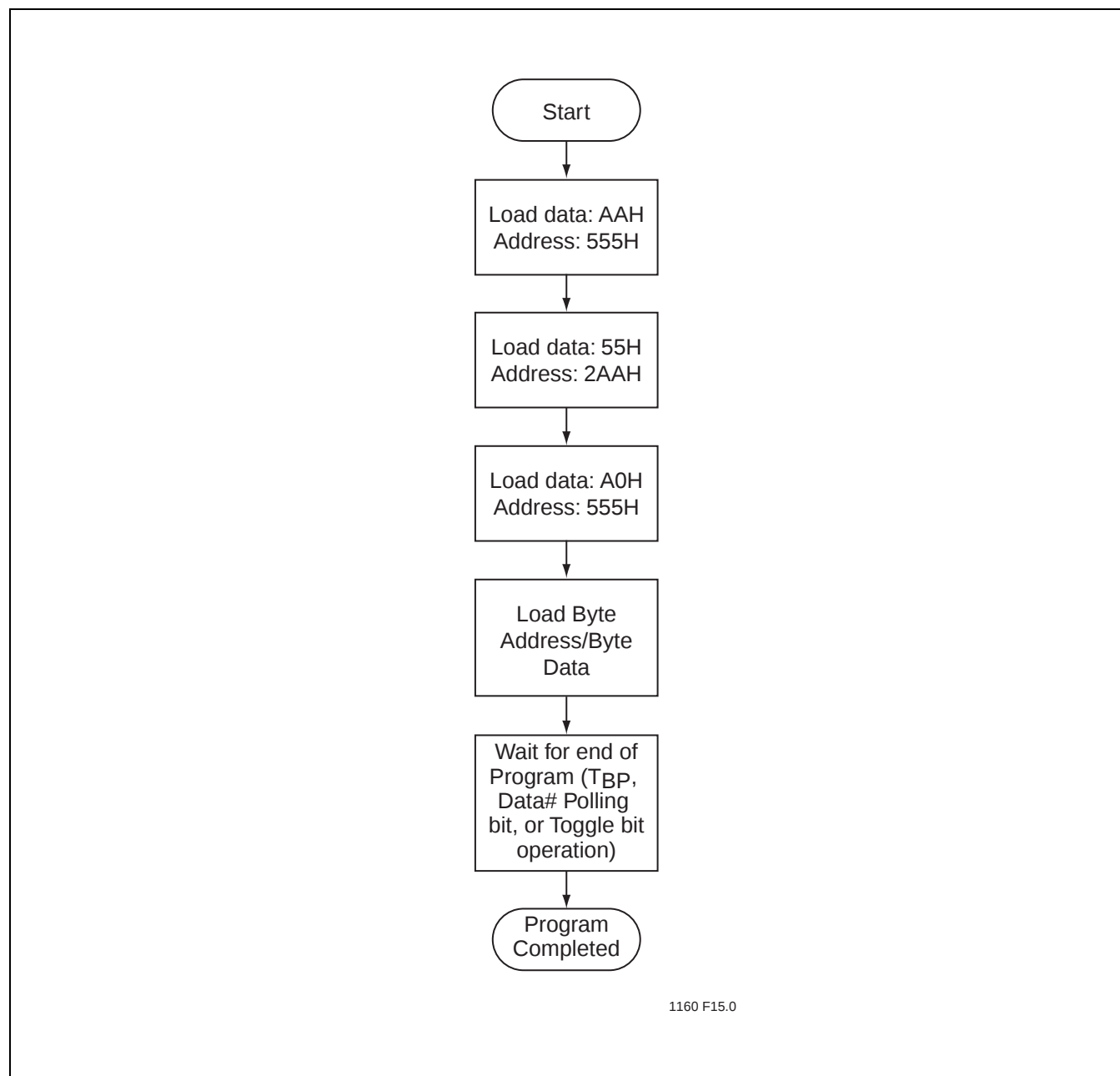


FIGURE 16: Byte-Program Algorithm

Data Sheet

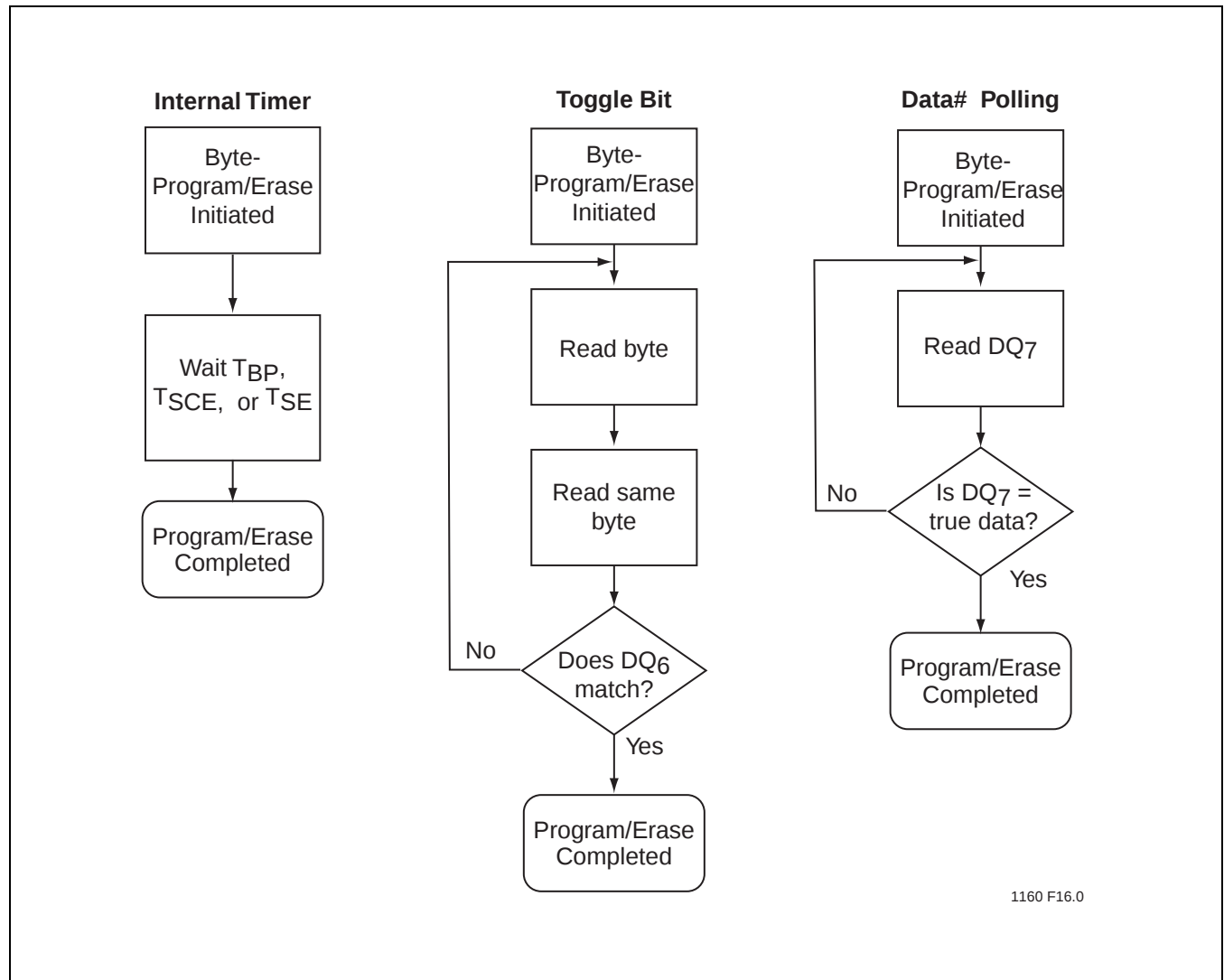


FIGURE 17: Wait Options

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

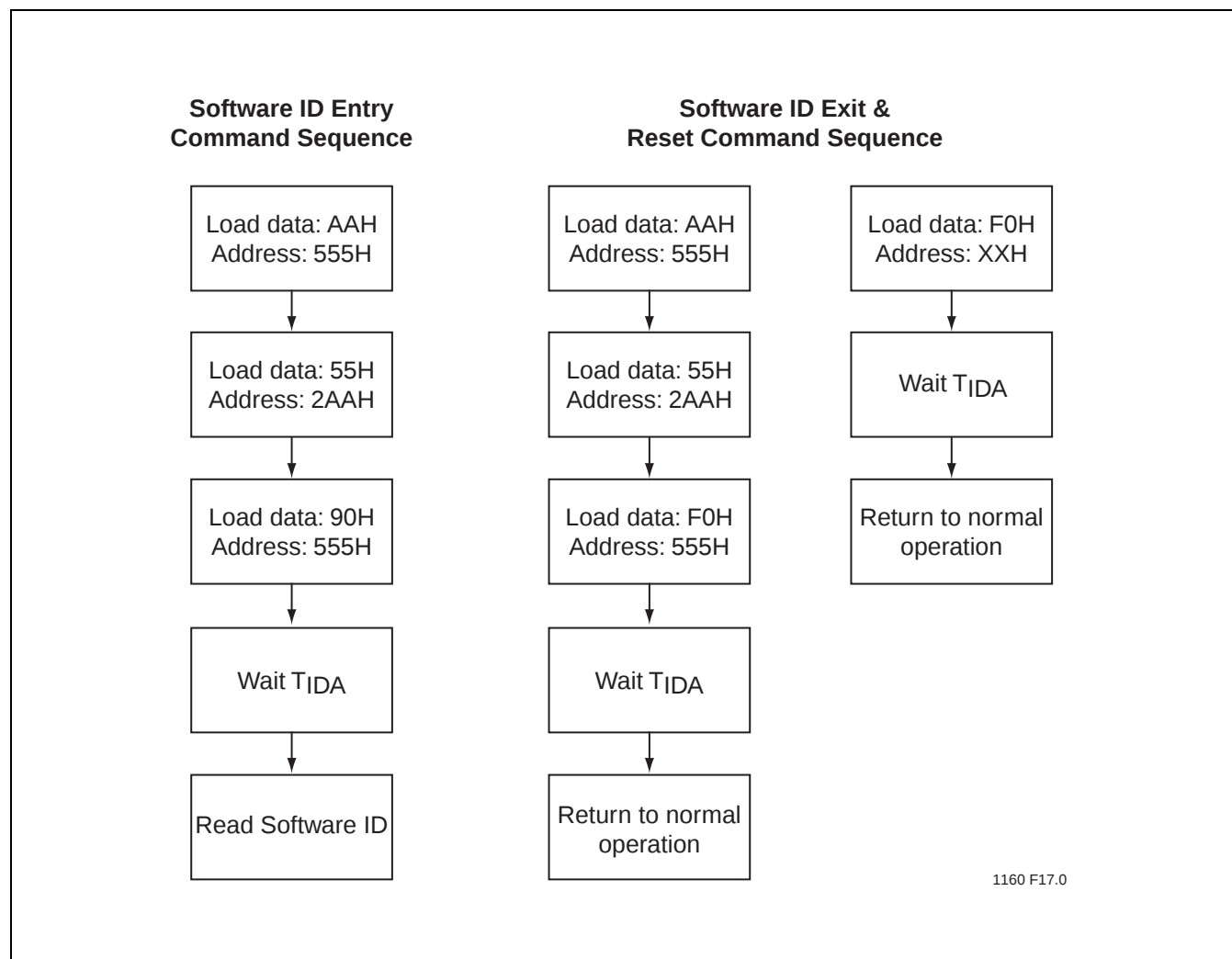


FIGURE 18: Software ID Command Flowcharts

Data Sheet

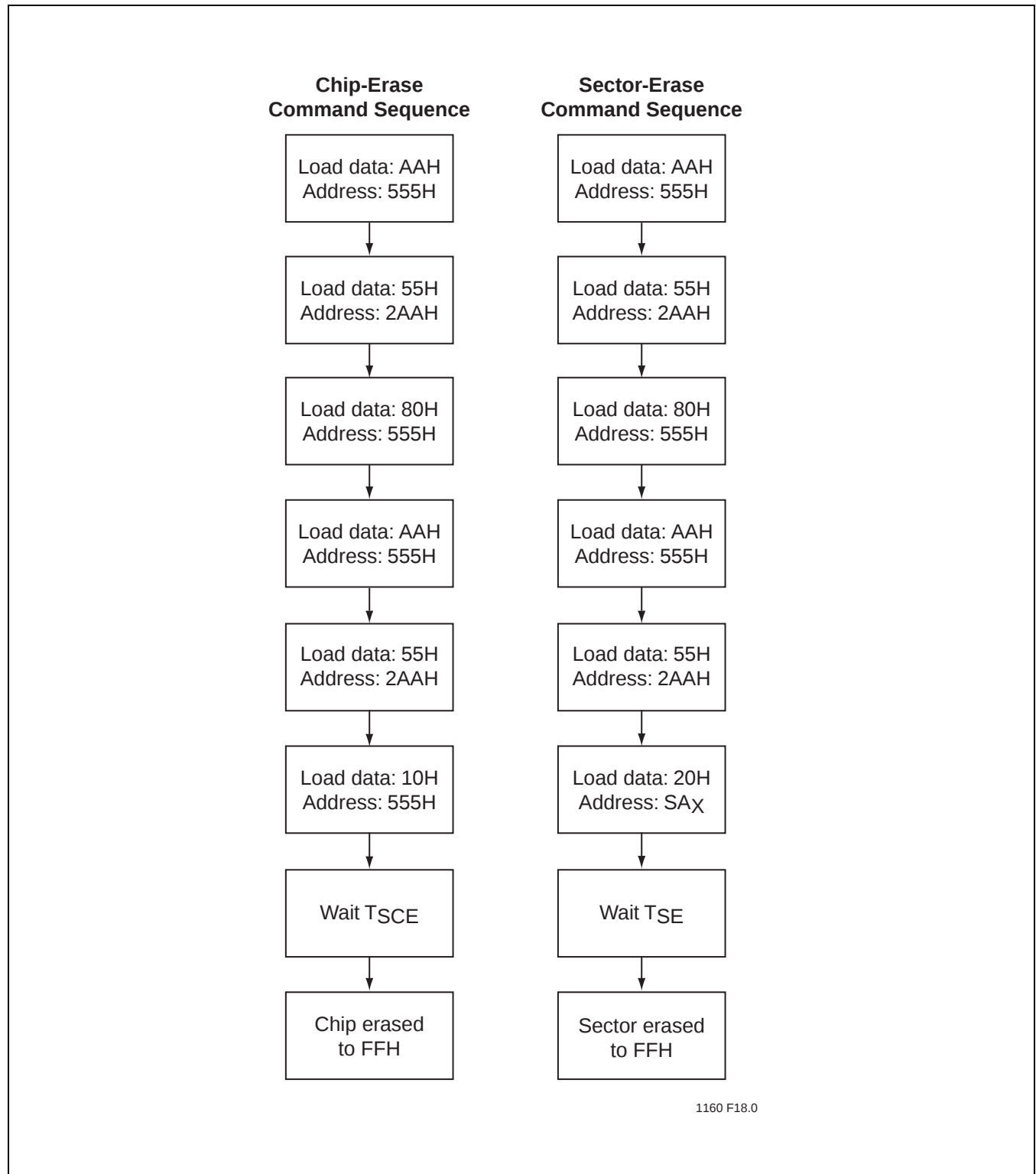


FIGURE 19: Erase Command Sequence

2 Mbit / 4 Mbit Small-Sector Flash

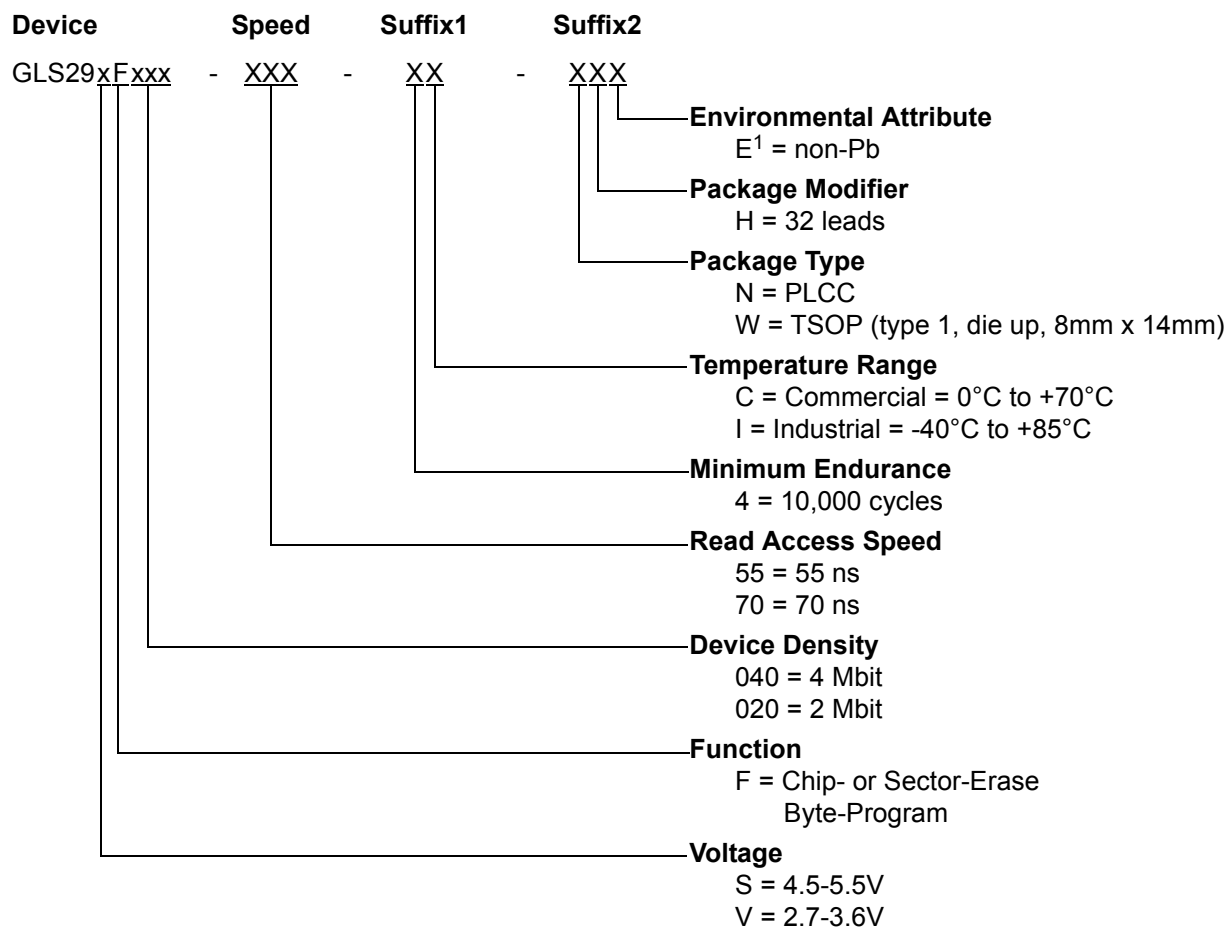
GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

PRODUCT ORDERING INFORMATION



1. Environmental suffix "E" denotes non-Pb solder.
Greenliant non-Pb solder devices are "RoHS Compliant".

Data Sheet

Valid combinations for GLS29SF020

GLS29SF020-55-4C-NHE GLS29SF020-55-4C-WHE

GLS29SF020-55-4I-NHE GLS29SF020-55-4I-WHE

Valid combinations for GLS29VF020

GLS29VF020-70-4C-NHE GLS29VF020-70-4C-WHE

GLS29VF020-70-4I-NHE GLS29VF020-70-4I-WHE

Valid combinations for GLS29SF040

GLS29SF040-55-4C-NH GLS29SF040-55-4C-WH

GLS29SF040-55-4C-NHE GLS29SF040-55-4C-WHE

GLS29SF040-55-4I-NH GLS29SF040-55-4I-WH

GLS29SF040-55-4I-NHE GLS29SF040-55-4I-WHE

Valid combinations for GLS29VF040

GLS29VF040-70-4C-NH GLS29VF040-70-4C-WH

GLS29VF040-70-4C-NHE GLS29VF040-70-4C-WHE

GLS29VF040-70-4I-NH GLS29VF040-70-4I-WH

GLS29VF040-70-4I-NHE GLS29VF040-70-4I-WHE

Note: Valid combinations are those products in mass production or will be in mass production. Consult your Greenliant sales representative to confirm availability of valid combinations and to determine availability of new combinations.

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

PACKAGING DIAGRAMS

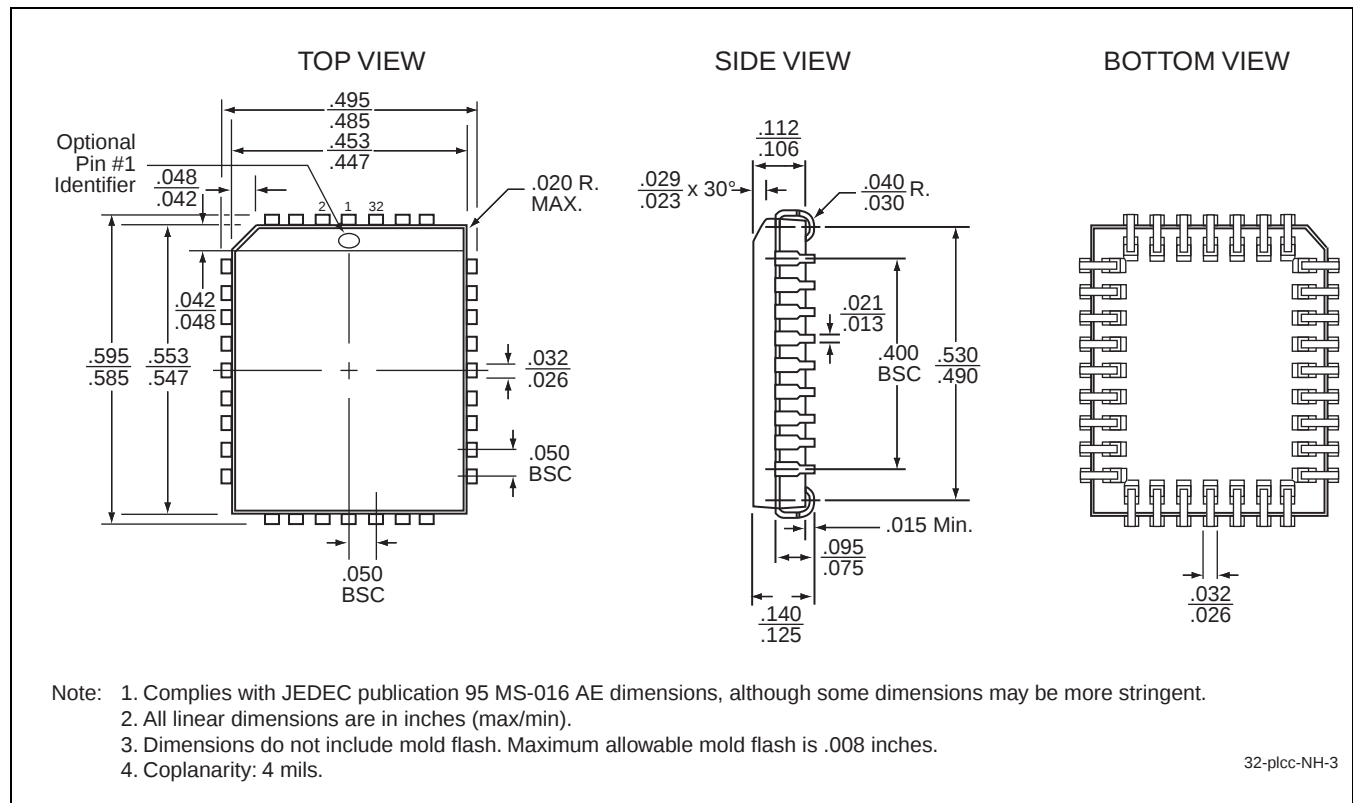


FIGURE 20: 32-lead Plastic Lead Chip Carrier (PLCC)
Greenliant Package Code: NH

© 2010 Greenliant Systems, Ltd. All rights reserved.

Greenliant, the Greenliant logo and NANDrive are trademarks of Greenliant Systems, Ltd.

SSF is a trademark and SuperFlash is a registered trademark of Silicon Storage Technology, Inc., a wholly owned subsidiary of Microchip Technology Inc.

Data Sheet

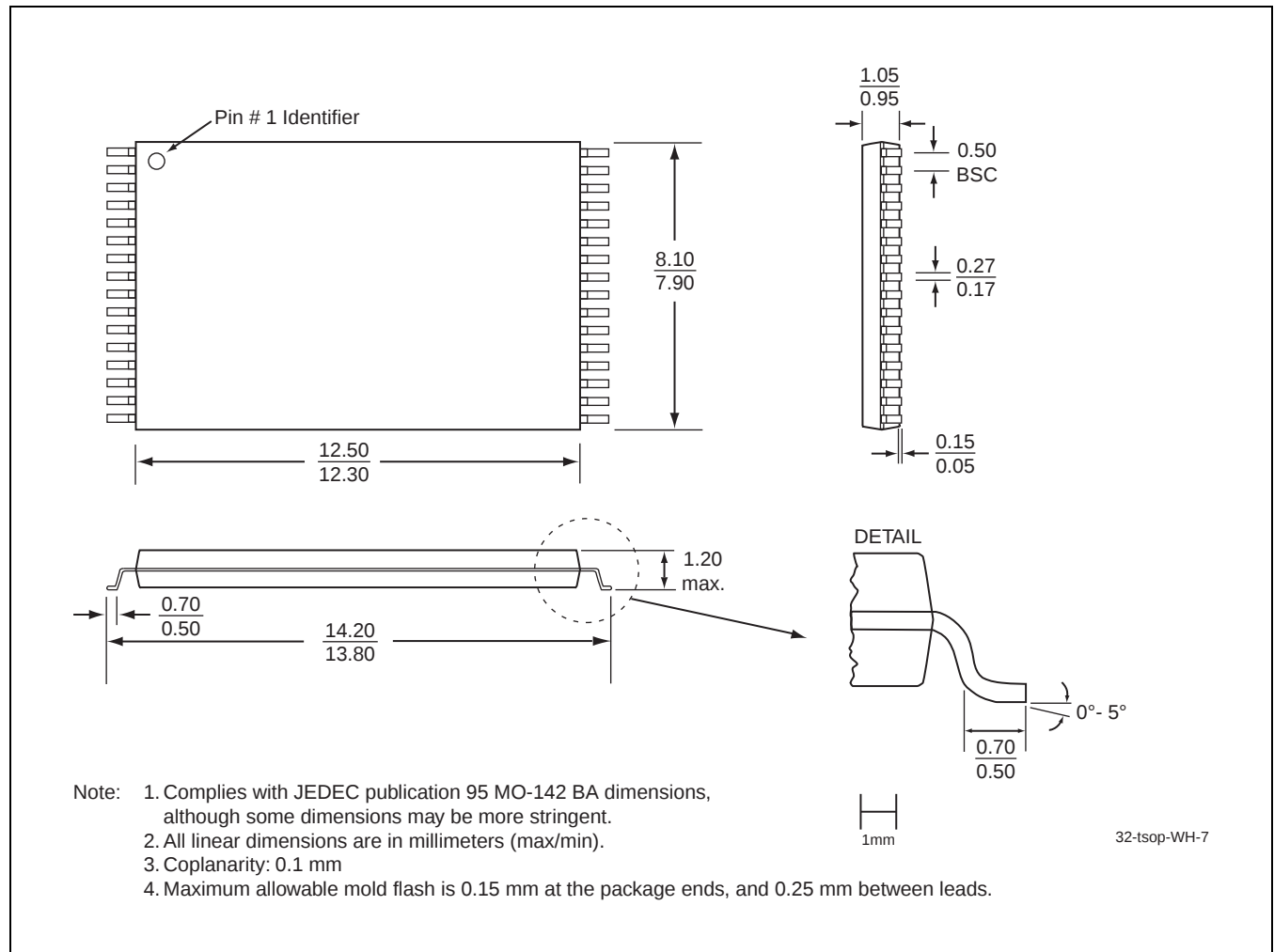


FIGURE 21: 32-lead Thin Small Outline Package (TSOP) 8mm x 14mm
Greenliant Package Code: WH

2 Mbit / 4 Mbit Small-Sector Flash

GLS29SF020 / GLS29SF040

GLS29VF020 / GLS29VF040



Data Sheet

TABLE 12: Revision History

Number	Description	Date
05	• 2002 Data Book	May 2002
06	• Removed 512 Kbit, 1 Mbit, and 2 Mbit parts • Commercial temperature and 70 ns parts removed • PH package is no longer offered • Part number changes - see page 24 for additional information • Changes to Tables 5 and 6 on page 8 and page 10: – Clarified Test Conditions for Power Supply Current and Read parameters – Clarified I_{DD} Write to be Program and Erase – Corrected I_{DD} Program and Erase from 20 mA to 30 mA – Corrected I_{DD} Read from 20 mA to 25 mA • Clarified measurement reference points V _{IT} and V _{OT} to be 1.5V instead of 1.5V _{DD} • Corrected the V _{OL} test condition I _{OL} to be 2.1 mA instead of 2.1 μ A in Table 5 on page 8	Mar 2003
07	• Corrected the Test Conditions for the Read Parameter in Table 5 on page 8	Apr 2003
08	• Added Commercial temperatures for all packages (See page 24 for details)	Aug 2003
09	• 2004 Data Book • Changed status to “Data Sheet”	Dec 2003
10	• Added 70 ns technical data and MPNs for SST29VF040 only	Feb 2004
11	• Added RoHS compliance information on page 1 and in the “Product Ordering Information” on page 23 • Reinstated 512 Kbit, 1 Mbit, and 2 Mbit devices and MPNs (excluding the PDIP package) • Removed 55 ns technical data and MPNs for SST29VF040 • Added non-Pb MPNs for all devices • Clarified the solder temperature profile under “Absolute Maximum Stress Ratings” on page 8	Mar 2005
12	• Removed all entries related to SST29SF/VF512 and SST29SF/VF010 • Removed leaded parts for 020 products.	Nov 2005
13	• Changed I _{DD} Read from 20mA to 25mA, and Changed I _{DD} Write from 20mA to 30mA in Table 5 on page 8 and Table 6 on page 10	Oct 2006
14	• Changed I _{SB} from 15 to 30 μ A in Table 6 on page 10.	Oct 2008
15	• Transferred from SST to Greenliant	May 2010

© 2010 Greenliant Systems, Ltd. All rights reserved.

Greenliant, the Greenliant logo and NANDrive are trademarks of Greenliant Systems, Ltd.

All trademarks and registered trademarks are the property of their respective owners.

These specifications are subject to change without notice.

SSF is a trademark and SuperFlash is a registered trademark of Silicon Storage Technology, Inc., a wholly owned subsidiary of Microchip Technology Inc.