**G i g a D e v i c e**
Semiconductor, Inc.

Flash Memory Overview

NOR and NAND Flash Memory are the critical Non-Volatile Memory devices that store a digital device's configuration data. GigaDevice has a large Flash memory product portfolio that is specifically designed to meet the different needs of various electronic applications, in terms of density, performance, reliability and security, while providing small packages and low power consumption.

SPI Flash Memory Interface

Serial Peripheral Interface (SPI) is the most popular bus protocol for accessing the Flash Memory. It requires only 6 signals to communication between the controller and the memory, thus reducing the design complexity and offering reduction in board space, power consumption and total system cost. The small 8-pin package is ideal to meet the compact design requirement of modern electronics.

About Us

GigaDevice, founded in Silicon Valley in 2004, is a leading fabless company engaged in advanced memory technology and IC solutions. The company successfully completed their IPO on the Shanghai Stock Exchange in 2016.

GigaDevice provides a wide range of high performance Flash Memory and 32-bit general purpose MCU products. GigaDevice is among the companies that pioneered SPI NOR Flash Memory and is currently one of the top three suppliers in the world in this market segment with more than 1.8 billion units annual shipment.

Our Flash Memory portfolio offers the following features:

- Density: 512Kb (64KB) ~ 8Gb (1GB)
- Performance: 52MB/s ~ 104MB/s (with Quad SPI), 400MB/s (with Xccela™)
- Reliability: 100,000 P/E Cycles, 20-year Data Retention
- Security: UID, Array Protection, OTP area, RPMC
- Package: WLCSP, USON, WSON, SOP, TFBGA
- Power Consumption: 0.1uA DPD, 1uA Standby, 5mA Active Read,10mA Active Program/Erase

Note: All datasheets are available for download at www.gigadevice.com

GigaDevice SPI NOR Flash delivers high-performance and security features necessary to meet the diverse design requirements of today's applications.

Key Features

Density: 512Kb to 1Gb

Voltage: 1.8V, 2.5V, 3V and 1.65~3.6V

Interface: Single, Dual and Quad SPI mode with DTR can transfer data up to 640Mbit/s; ideal for Fast-boot or code execution (XIP)

Flexible Memory Architecture: sector size - 4K Bytes, block size - 32/64K Bytes

Power Mode: Zero Standby, Zero Deep Power Down and Ultra Low Active Current

Security: OTP area for customer key storage, Unique ID for individual device, advanced security with RPMC

Wide Operating Temperature Range: -40°C - 85°C/105°C/125°C

GigaDevice NAND Flash offers high-capacity storage and performance necessary for multimedia data storage applications in networking, mobile devices, set-top boxes, data cards, TVs and more.

Key Features

Density: 1Gb to 8Gb

Voltage: 1.8V, 3V

Interface: Quad I/O for SPI NAND & x8/x16 I/O for SLC NAND

High-speed clock frequency: 120MHz for SPI and 40MBps for SLC NAND
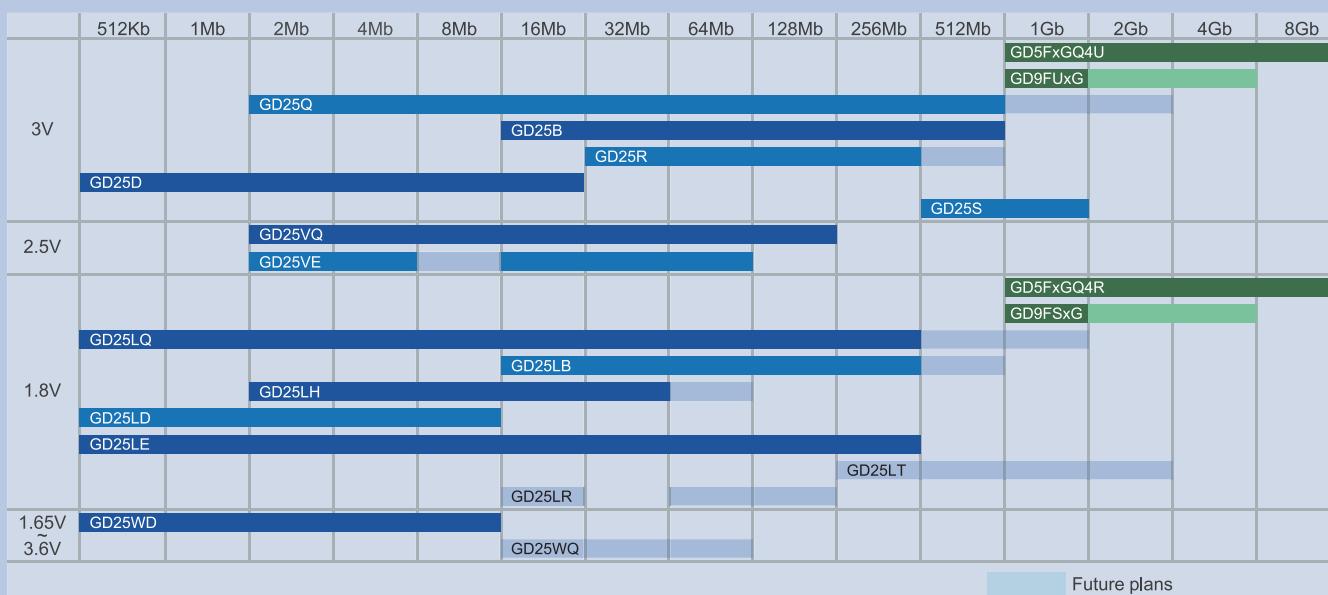
Reliability: All SPI NAND products have an on-chip ECC engine

Enhanced access performance: With 2K- or 4K-Byte cache for fast random read

Open NAND Flash Interface: ONFI1.0 and ONFI3.0 compliant

Package: WSON8 (6mm x 8mm)/TSOP48 (12mm x 20mm)

GigaDevice Flash Memory Portfolio

Voltage	Product	Density Range
3V	GD5FxGQ4U	1Gb – 8Gb
3V	GD9FUxG	1Gb – 4Gb
3V	GD25Q	2Mb – 512Mb
3V	GD25B	16Mb – 512Mb
3V	GD25R	32Mb – 256Mb
3V	GD25D	512Kb – 2Mb
3V	GD25S	512Mb – 1Gb
2.5V	GD25VQ	2Mb – 128Mb
2.5V	GD25VE	2Mb – 64Mb
1.8V	GD5FxGQ4R	1Gb – 8Gb
1.8V	GD9FSxG	1Gb – 4Gb
1.8V	GD25LQ	512Kb – 512Mb
1.8V	GD25LB	16Mb – 512Mb
1.8V	GD25LH	2Mb – 16Mb
1.8V	GD25LD	512Kb – 8Mb
1.8V	GD25LE	512Kb – 512Mb
1.8V	GD25LT	256Mb – 2Gb
1.8V	GD25LR	16Mb – 32Mb
1.65V ~ 3.6V	GD25WD	512Kb – 2Mb
1.65V ~ 3.6V	GD25WQ	16Mb – 32Mb

Future plans

GigaDevice
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GigaDevice
NAND Flash Memory

GigaDevice is one of the top three global suppliers for Serial Flash Memory and is currently dominating the China market with the largest customer base. Our 38nm SLC NAND Flash products have been in production for many years offering customers stability and reliability. This reliability has exceeded customer expectations in applications such as industrial control, base stations, voice storage, network communications, set-top boxes, OTT, smart TVs, printers, wearable devices, and many others. We also allow for easy portability from other vendors with industry-standard packages, PIN definitions, registers and instruction sets.

GigaDevice NAND Product Advantage

- **Reliability:** With billions of units shipped, GigaDevice provides reliable NAND product with our 38nm process, which can meet industrial, as well as automotive demands

- **Comprehensive Product Lines:** GigaDevice has planned expanded capacities and packages to meet various customer needs. Parallel NAND capacity is planned from 1Gb to 64Gb. SPI NAND capacity is planned from 1Gb to 16Gb extending SPI NOR flash capacity with many in pin-compatible packages. Overall, GigaDevice SPI FLASH products from 512Kb to 16Gb can fit in a vast array of embedded applications.

- **Stable Supply:** GigaDevice continues to offer 2D SLC NAND products where many competitors have exited this business. We will continue to provide users with long-term availability by maintaining our strong relationships with fabrication partners to ensure continuity of supply.

- **Application Support:** Strong local presence of R&D and FAE teams to support customers in the regions.

Main features of NAND Flash
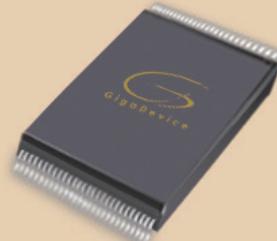
GD5F SPI NAND Product Highlights

- **Density:** 1Gb to 8Gb

- **Voltage:** 3V and 1.8V options

- **Endurance:** up to 100K P/E cycles

- **Data Retention:** 10 years

- **Internal ECC:** 8-bit

- **Bus Width:** x1/x2/x4

- **Temperature Range:**
  Industrial (-40°C to 85°C)

- **Packages** for SPI NAND
  8-pin WSON 6 mm x 8 mm
  8-pin LGA 6 mm x 8 mm
  24-ball FBGA 6mm x 8mm

GD9F Parallel NAND Product Highlights

- **Density:** 1Gb to 8Gb

- **Voltage:** 3V and 1.8V options

- **Endurance:** up to 100K P/E cycles

- **Data Retention:** 10 years

- **ECC Requirements:** 4-bit or 8-bit

- **Bus Width:** x8 or x16 options

- **Temperature Range:**
  up to (-40°C to 105°C)

- **Packages** for ONFI NAND
  48-pin TSOP 12 mm x 20 mm
  63-ball FBGA 9 mm x 11 mm

- **Compatible ONFI1.0 or ONFI3.0**

Low Density NAND products with SLC technology

Product	Voltage	Page Size	Bus Width	Density	Performance Read/Write
GD9FU1G	2.7v ~ 3.6v	2KB+128B	X8/X16	1Gb	26.88MBps/ 3.28MBps
GD9FS1G	1.7v ~ 1.95v	2KB+128B	X8/X16	1Gb	17.48MBps/ 2.96MBps
GD5F1GQ4R	1.7V to 2.0V	2KB+128B	X1/X2/X4	1Gb	17.96MBps/ 2.79MBps
GD5F1GQ4U	2.7V to 3.6V	2KB+128B	X1/X2/X4	1Gb	17.96MBps/ 2.79MBps
GD5F2GQ4R	1.7V to 2.0V	2KB+128B	X1/X2/X4	2Gb	17.96MBps/ 2.79MBps
GD5F2GQ4U	2.7V to 3.6V	2KB+128B	X1/X2/X4	2Gb	17.96MBps/ 2.79MBps

Note: Please contact the GigaDevice sales team for high density NAND products.
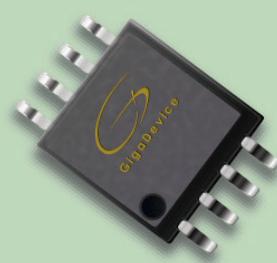
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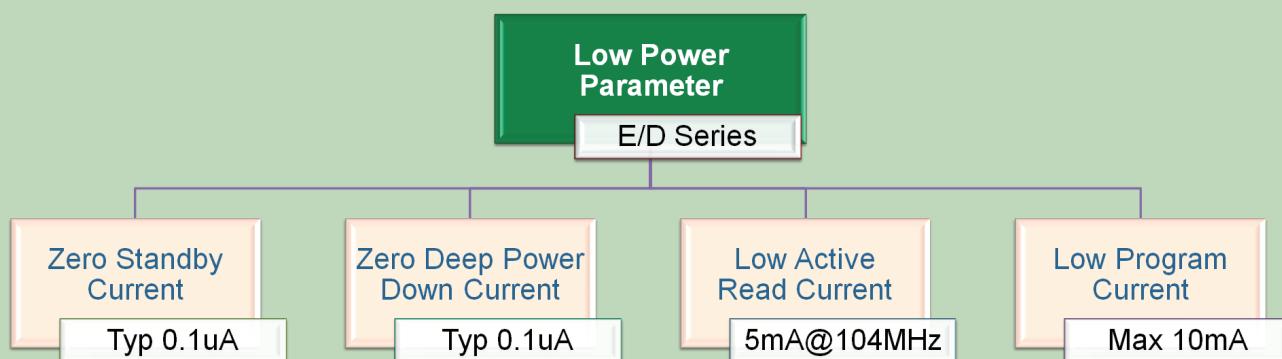
GigaDevice
Low Power NOR
Flash Memory

As consumers pay more and more attention to the battery life of electronic products, applications such as health monitoring, Bluetooth connection, IoT, Wearable and Mobile Internet devices trend toward higher and higher power consumption requirements. In response to these different application requirements, GigaDevice has introduced the GD25*E and GD25*D series low-power consumption SPI NOR Flash Products to extend battery life.

GD25*D series highlights include Zero Standby Current, Low active read, program and erase current. Specifically, GD25WD series is a great product family designed for battery-hungry applications that not only offers low power consumption but also wide voltage range.

GD25*E series is also a low power product with Zero Deep Power Down Current and Low active read current.

```
              ┌─────────────────┐
              │   Low Power     │
              │   Parameter     │
              └─────────────────┘
              │    E/D Series   │
              └─────────────────┘
```

| Zero Standby Current	Zero Deep Power Down Current	Low Active Read Current	Low Program Current
Typ 0.1uA	Typ 0.1uA	5mA@104MHz	Max 10mA

Note: "*" represents different voltages
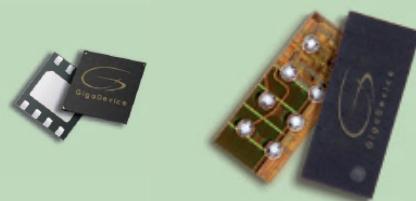
Low Power Series Key Feature

GD25*D

(Include GD25D, GD25LD and GD25WD)

- **GD25D Voltage**: 2.7~3.6v

- **GD25LD Voltage:** 1.65~2.0v

- **GD25WD Voltage:** 1.65~3.6v

- **Density:** 512Kb~8Mb

- **Interface:** Single I/O, Dual Output SPI

- **Power Consumption:**
  Zero Standby Current: 0.1uA
  (no need for DPD)
  Read Current down to 3mA at 40MHz
  Program/Erase current: <10mA

- Support Smallest Molding Package **USON8 1.5*1.5mm**, and KGD wafer

GD25VE

- **Voltage:** 2.1~3.6v

- **Density:** 2Mb~64Mb

- **Interface:** Single, Dual, Quad I/O SPI

- **Power Consumption:**
  Zero Deep Power Down Current: 0.1uA

- Support Small Package and KGD wafer
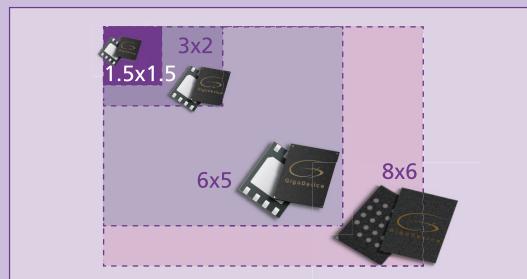
GD25LE

- **Voltage:** 1.65~1.8v

- **Density:** 512Kb~128Mb

- **Interface:** Single, Dual, Quad I/O SPI

- **Power Consumption:**
  Zero Deep Power Down Current
  Read Current down to 5mA at 104MHz

- Support Smallest Package WLCSP and KGD wafer

Low Power Products List

Low Power Series	Product Series	Voltage	Density	Max Frequency (MHz)	Status
GD25*D	GD25DxxC	2.7~3.6V	512Kb~8Mb	100(x1) 80(x2)	MP
	GD25LDxxC	1.65~2.0V	512Kb~8Mb	50(x1) 40(x2)	MP
	GD25WDxxC	1.65~3.6V	512Kb~8Mb	100(x1) 80(x2)	MP
GD25*E	GD25VE	2.1~3.6V	2Mb~64Mb	104(x1,x2,x4)	MP
	GD25LE	1.65~2.0V	512Kb~128Mb	104(x1,x2,x4)	MP

1.5x1.5 / 3x2 / 6x5 / 8x6

Package Type	Thickness	Density
USON 1.5x1.5mm	0.5mm	512Kb ~ 8Mb
USON 3x2mm	0.5mm	512Kb ~ 32Mb
WSON 6x5mm	0.8mm	16Mb ~ 128Mb
WSON 8x6mm	0.8mm	64Mb ~ 4Gb
SOP8 (5x8mm)	2.16mm	512Kb ~ 128Mb
VSOP8 (5x8mm)	1.0mm	512Kb ~ 128Mb
BGA 8x6mm	1.2mm	64Mb ~ 4Gb

3.0V Units:mm

Package	512Kb	1Mb	2Mb	4Mb	8Mb	16Mb	32Mb	64Mb	128Mb	256Mb	512Mb	1Gb	2Gb	4Gb
WSON8 6*8												■		■
LGA8 6*8													■	
SOP8 150mil	■	■	■	■	■									
SOP8 208mil	■	■	■	■	■	■	■	■	■					
SOP16 300mil								■	■	■	■			
VSOP8 208mil						■	■		■					
TSSOP 173mil	■	■	■	■	■									
USON8 1.5*1.5	■	■	■	■	■									
USON8 3*2	■	■	■	■	■	■	■							
USON8 3*3							■							
USON8 3*4			■	■	■	■	■							
USON8 4*4					■	■	■	■						
WSON8 6*5					■	■	■	■	■					
WSON8 8*6								■	■	■	■			
TFBGA 24						■	■	■	■	■	■			
DIP8 300mil	■	■	■	■	■	■	■	■	■					
WLCSP										■				

1.8V Units:mm

Package	512Kb	1Mb	2Mb	4Mb	8Mb	16Mb	32Mb	64Mb	128Mb	256Mb	1Gb	2Gb	4Gb
LGA8 6*8											■	■	
WSON8 6*8													■
SOP8 150mil	■	■	■	■	■								
SOP8 208mil	■	■	■	■	■	■	■	■	■				
SOP16 300mil									■	■			
VSOP8 150mil	■	■	■	■	■								
VSOP8 208mil	■	■	■	■	■	■	■	■	■				
TSSOP8 173mil	■	■	■	■	■	■							
USON8 1.5*1.5	■	■	■	■	■	■							
USON8 3*2	■	■	■	■	■	■							
USON8 3*3	■	■	■	■	■	■	■						
USON8 3*4	■	■	■	■	■	■	■	■					
USON8 4*4	■	■	■	■	■	■	■	■	■				
WSON8 6*5	■	■	■	■	■	■	■	■	■	■			
WSON8 8*6									■	■			
WLCSP					■	■	■	■	■				
LGA8 3*2				■									
LGA8 4*4									■				
DIP8 300mil	■	■	■	■	■	■							

Flash Memory Packages

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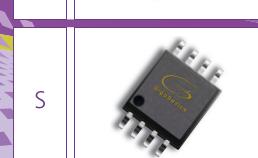
Unit: mm
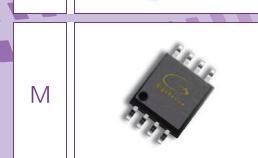
T	SOP8 150mil	
	Length(Normal)	4.90
	Width(Normal)	6.00
	Thickness(Max)	1.75
	Pitch(Normal)	1.27
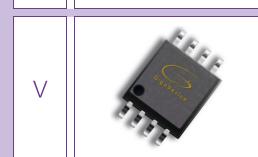
S	SOP8 208mil	
	Length(Normal)	5.23
	Width(Normal)	7.90
	Thickness(Max)	2.16
	Pitch(Normal)	1.27
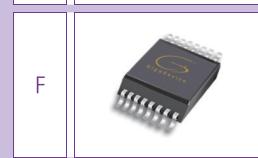
M	VSOP8 150mil	
	Length(Normal)	4.90
	Width(Normal)	6.00
	Thickness(Max)	0.90
	Pitch(Normal)	1.27

V	VSOP8 208mil	
	Length(Normal)	5.28
	Width(Normal)	7.90
	Thickness(Max)	1.00
	Pitch(Normal)	1.27
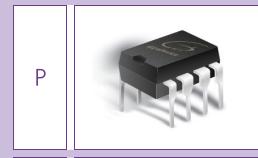
F	SOP16 300mil	
	Length(Normal)	10.30
	Width(Normal)	10.35
	Thickness(Max)	2.75
	Pitch(Normal)	1.27
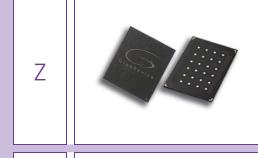
M	TSOP48 12*20mm	
	Length(Normal)	12.00
	Width(Normal)	20.00
	Thickness(Max)	1.20
	Pitch(Normal)	0.50
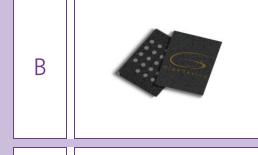
P	DIP8 300mil	
	Length(Normal)	9.32
	Width(Normal)	7.94
	Thickness(Max)	3.50
	Pitch(Normal)	2.54

Z	TFBGA-24ball 6*8mm (6*4ball array)	
	Length(Normal)	6.00
	Width(Normal)	8.00
	Thickness(Max)	1.20
	Pitch(Normal)	1.00
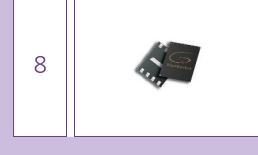
B	TFBGA-24ball 6*8mm (5*5ball array)	
	Length(Normal)	6.00
	Width(Normal)	8.00
	Thickness(Max)	1.20
	Pitch(Normal)	1.00
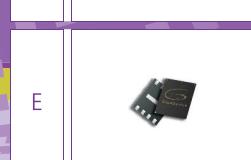
8	LGA8 3*2mm	
	Length(Normal)	3.00
	Width(Normal)	2.00
	Thickness(Max)	0.50
	Pitch(Normal)	0.50

K	USON8 1.5*1.5mm	
	Length(Normal)	1.50
	Width(Normal)	1.50
	Thickness(Max)	0.50
	Pitch(Normal)	0.40
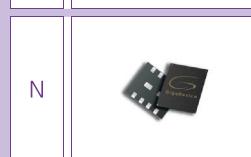
E	USON8 3*2mm (0.45mm)	
	Length(Normal)	3.00
	Width(Normal)	2.00
	Thickness(Max)	0.50
	Pitch(Normal)	0.50
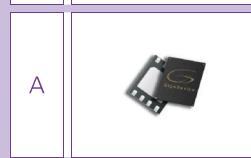
H	USON8 3*3mm	
	Length(Normal)	3.00
	Width(Normal)	3.00
	Thickness(Max)	0.60
	Pitch(Normal)	0.50
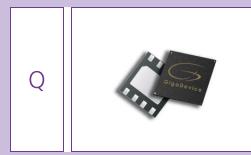
N	USON8 3*4mm	
	Length(Normal)	3.00
	Width(Normal)	4.00
	Thickness(Max)	0.60
	Pitch(Normal)	0.80

A	USON8 4*3mm	
	Length(Normal)	4.00
	Width(Normal)	3.00
	Thickness(Max)	0.60
	Pitch(Normal)	0.80

Q	USON8 4*4mm (0.45mm)	
	Length(Normal)	4.00
	Width(Normal)	4.00
	Thickness(Max)	0.50
	Pitch(Normal)	0.80

W	WSON8 6*5mm	
	Length(Normal)	6.00
	Width(Normal)	5.00
	Thickness(Max)	0.80
	Pitch(Normal)	1.27

Y	WSON8 8*6mm	
	Length(Normal)	8.00
	Width(Normal)	6.00
	Thickness(Max)	0.80
	Pitch(Normal)	1.27

L	WLCSP
	Depends on specific product

Note:
1. The values provided are the normal values for length, width and pitch, as well as the max values for thickness.
2. The pictures are for reference only, always verify your selection with the product data sheet.