



InnoGrit® IG5669/IG5668/IG5666, implemented in advanced 12nm FinFET CMOS process, is an industry-leading **PCIe Gen5 x4, NVMe 2.0** SSD controller supporting capacity size up to 32TB.

#### Stable and Outstanding Performance

- Improve Sequential Read/Write up to 14.7/12 GB/s, and 4KB Random Read/Write up to 3.5M/2.5M IOPs
- Support SLC/MLC/TLC/QLC NAND and XL-FLASH SCM, with either ONFI 5.0 or Toggle 2.0/3.0/4.0/5.0 and maximum data rate of 2666 MT/s
- Support DDR4 and LPDDR4, with maximum DDR rate of 3200 MT/s (DDR4) or 4266 MT/s (LPDDR4)

#### Data Security and Integrity

- Support multiple data encryption and protection schemes including AES, SHA, GHASH, RSA, TCG Opal, SM2/3/4, ECC, CRC, RAID, General-Purpose Cipher Engine, and End-to-End data protection
- Leverage the third generation of proprietary 4K LDPC ECC technology, to largely lower data failure rate and enhance data retention ability

#### Other Advanced Features

- Smart Cache
- ZNS and NVM Open Channel
- Support Conventional SSD mode, Open Channel SSD mode and ZNS
- Thermal throttling protection
- Multi-Namespace: 128 Namespaces
- SR-IOV: Up to 64 Virtual Functions
- Advanced IPMU and multi-level power management
- Various peripheral interfaces: SPI, SMBus/I2C/I3C, UART, JTAG and GPIO
- Support NVMe-MI
- Atomic write
- Embedded DLA to improve data distribution and NAND control

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Website for more information:  
<https://www.innogritcorp.com/>

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## Key Specifications

<b>Full Part Number</b>	IG5669HAA	IG5669FAA	IG5668HAA	IG5668FAA	IG5666FAA
<b>Ball Number</b>	899	899	899	899	675
<b>Package</b>	HFCBGA	FCBGA	HFCBGA	FCBGA	FCBGA
<b>Dimensions (unit: mm)</b>	21 x 21	21 x 21	21 x 21	21 x 21	16 x 16
<b>NAND CH x CE</b>	18CH x 8CE	18CH x 8CE	16CH x 8CE	16CH x 8CE	8CH x 8CE
<b>DDR Data Bus Bit Width</b>	(64+8)/64/(32+8)/32		(64+8)/64/(32+8)/32		(32+8)/32
<b>Typical Application</b>	Enterprise Applications, Data Centers, and Artificial Intelligence				
<b>Max Read/Write Performance</b>	Sequential Read: 14.7 GB/s				
	Sequential Write: 12 GB/s				
	Random Read: 3.5M IOPs				
	Random Write: 2.5M IOPs				
<b>Power Consumption</b>	Peak: 8W				
<b>Random Read Energy Efficiency Ratio</b>	490 KIOPs/W				
<b>Operating Temperature</b>	Commercial grade, 32°F (0°C) ~ 158°F (70°C)				
<b>Reliability</b>	UBER $\leq 10^{-18}$				
	MTBF: 3 million hours				
<b>CPU</b>	Twelve main CPUs for SSD control One CPU for security control				
<b>Interface</b>	PCIe Gen5 x4 interface NAND flash interface DDR interface 1 x UART, 1 x SPI Master, 1 x JTAG 2 x SMBus/I2C Master/Slave + 1 x SMBus/I2C/I3C Master/Slave (I3C only supports Slave mode) 16 GPIOs + 4 SPI pins which can be multiplexed with GPIO function				
<b>Data Security</b>	TCG Opal 2.02 AES-128/256 SHA3-256/384/512 SHA256 GHASH RSA1024/2048/3072/4096 SM2/3/4 published by the State Cryptography Administration of China General-Purpose Cipher Engine, support AES/SM4 with ECB/XTS/CBC/CTR mode				
<b>Data Integrity Protection</b>	Programmable RAID operation End-to-End data protection CRC protection Advanced LDPC ECC engine, with ECC protection for ITIM, DLS, Cache, SRAM and DDR				