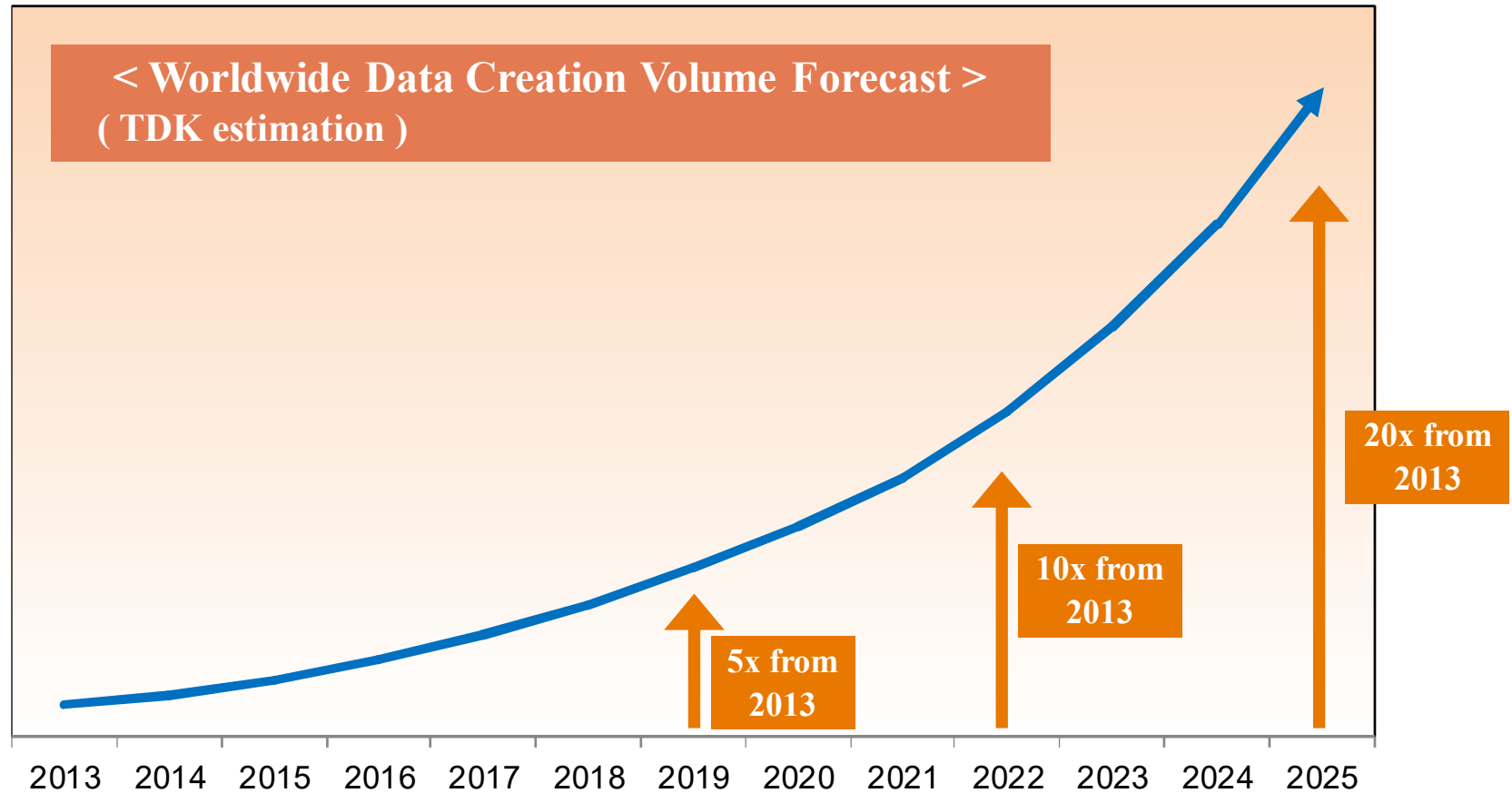


HDD Head Business Strategy

Albert Ong

Corporate Officer

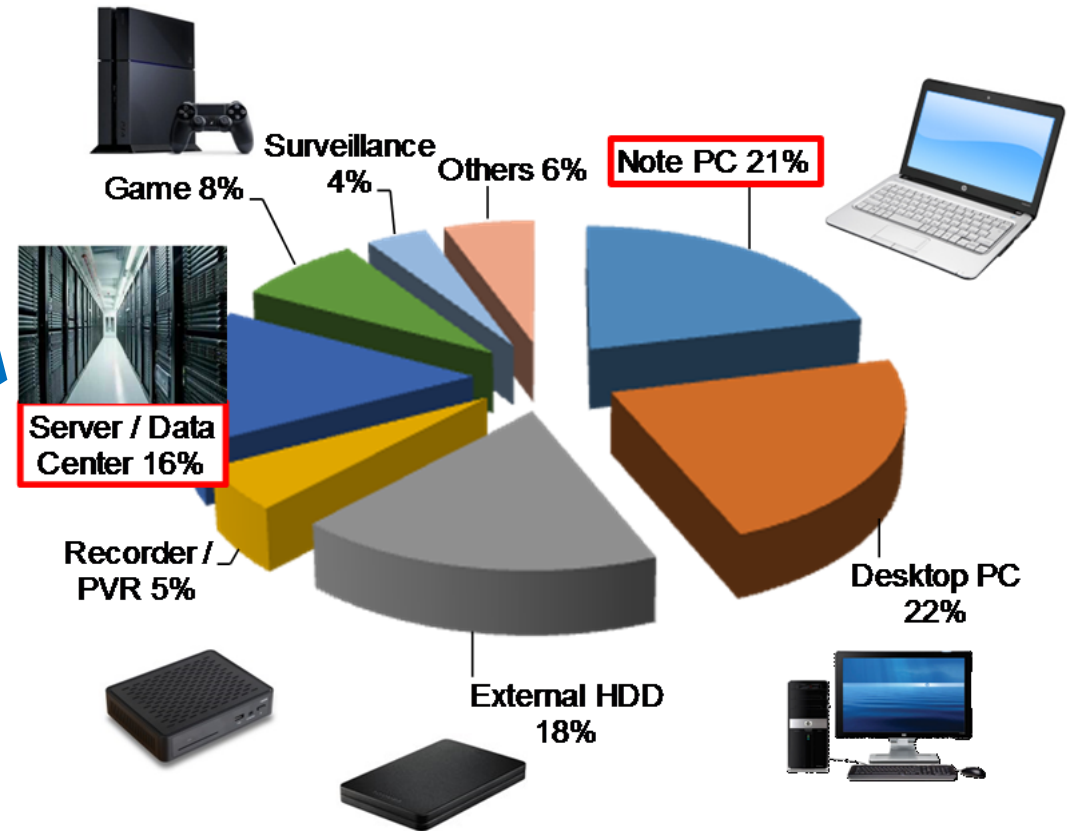
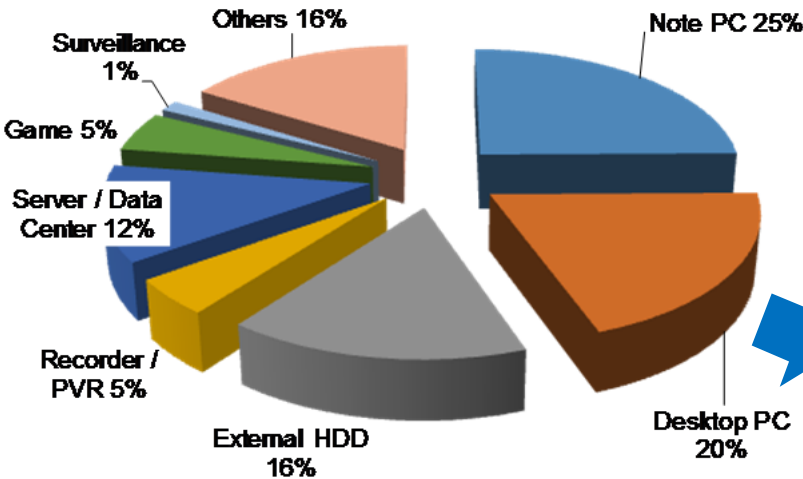
CEO of Magnetic Heads Business Company



- **Worldwide data creation volume will be significantly increasing, due to Cloud computing growth and spread of IoT.**

< CY2014 >

< CY2016 >

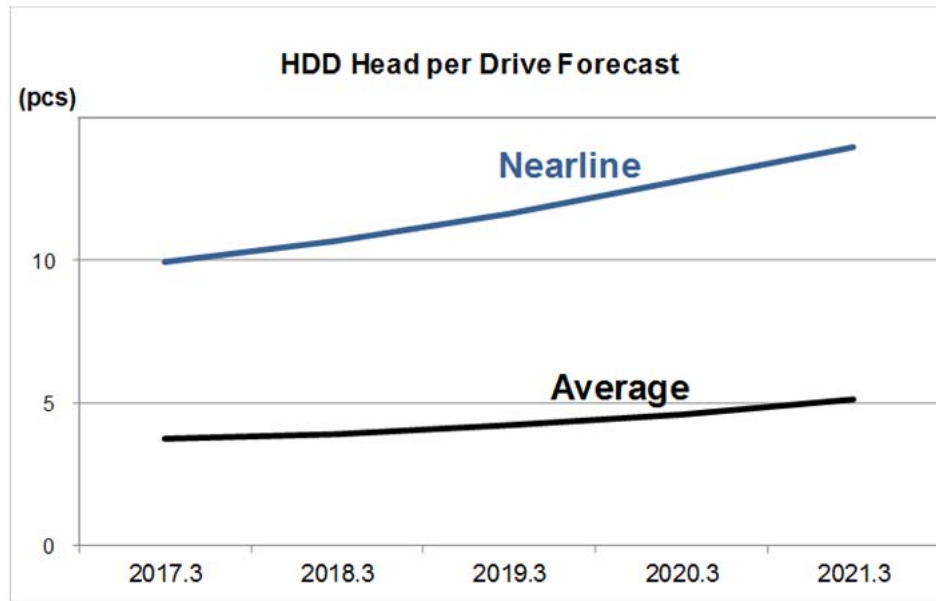


- Declining for Note-PC market
- Increasing Server/Data Center use

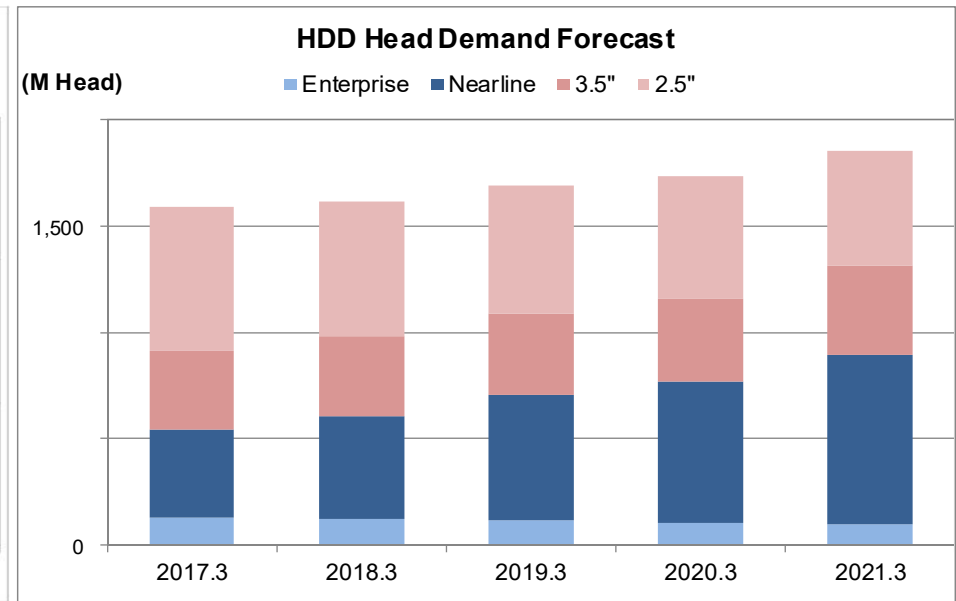
TDK's estimation

□ HDD Head Market Outlook

- 1) HDD shifts to High capacity market. Number of heads per HDD will be increasing. Especially Nearline HDD.
- 2) HDD head market will be steady.



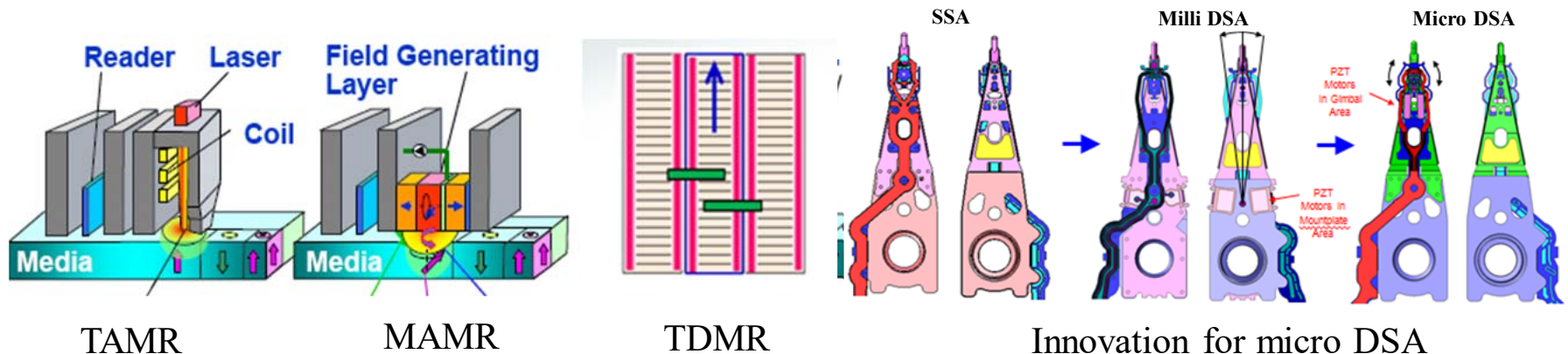
TDK's estimation



TDK's estimation

Changes and technology innovation of HDD industry

- Continuous R&D and improvement activities for HDD/HDD Head.
 - Needs multi disk and multi head technology for high capacity HDD.
 - Thermal assist (TAMR) & Microwave Assisted Head (MAMR)
 - Two dimension Magnetic Recording (TDMR)
 - Micro dual stage actuator (Micro DSA)
- TDK leads on HDD Head technology development and will fully support growing Near-Line / Datacenter.



- **Integrate Hutchinson's HDD suspension operation / technology, and maximize synergy .**

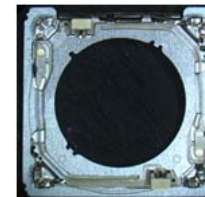
- **Promote vertical integrated HDD suspension business with advanced component technology & process automation.**
- **Improves suspension value chain.**
 - ➔ **Contribute to the HDD industry through Advanced technology.**
- **Leverage Hutchinson's innovative technologies: Additive Metal Deposition, precision components and SMA technology for cameras.**
 - ➔ **Apply HDD Suspension component technologies for micro electronic components in ICT market.**



Multiple layer circuits
by additive deposition



High density, thin micro coil by
additive deposition

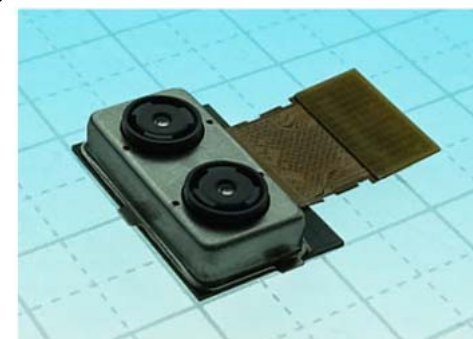
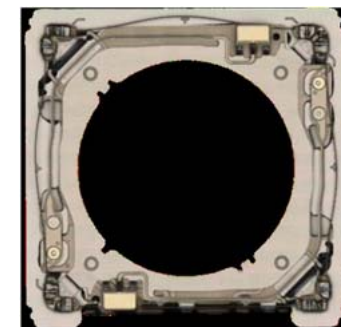
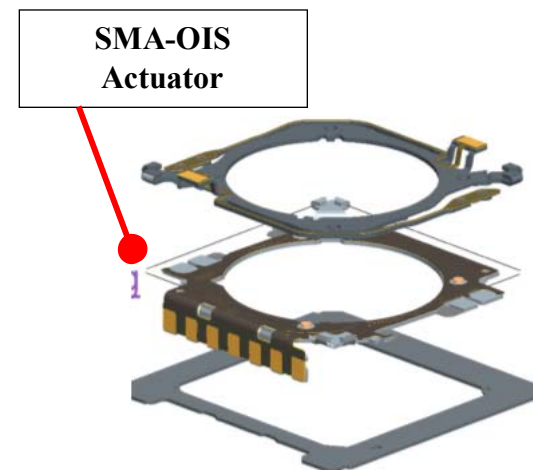


SMA (Shape Memory Alloy)
Optical Image Stabilizer

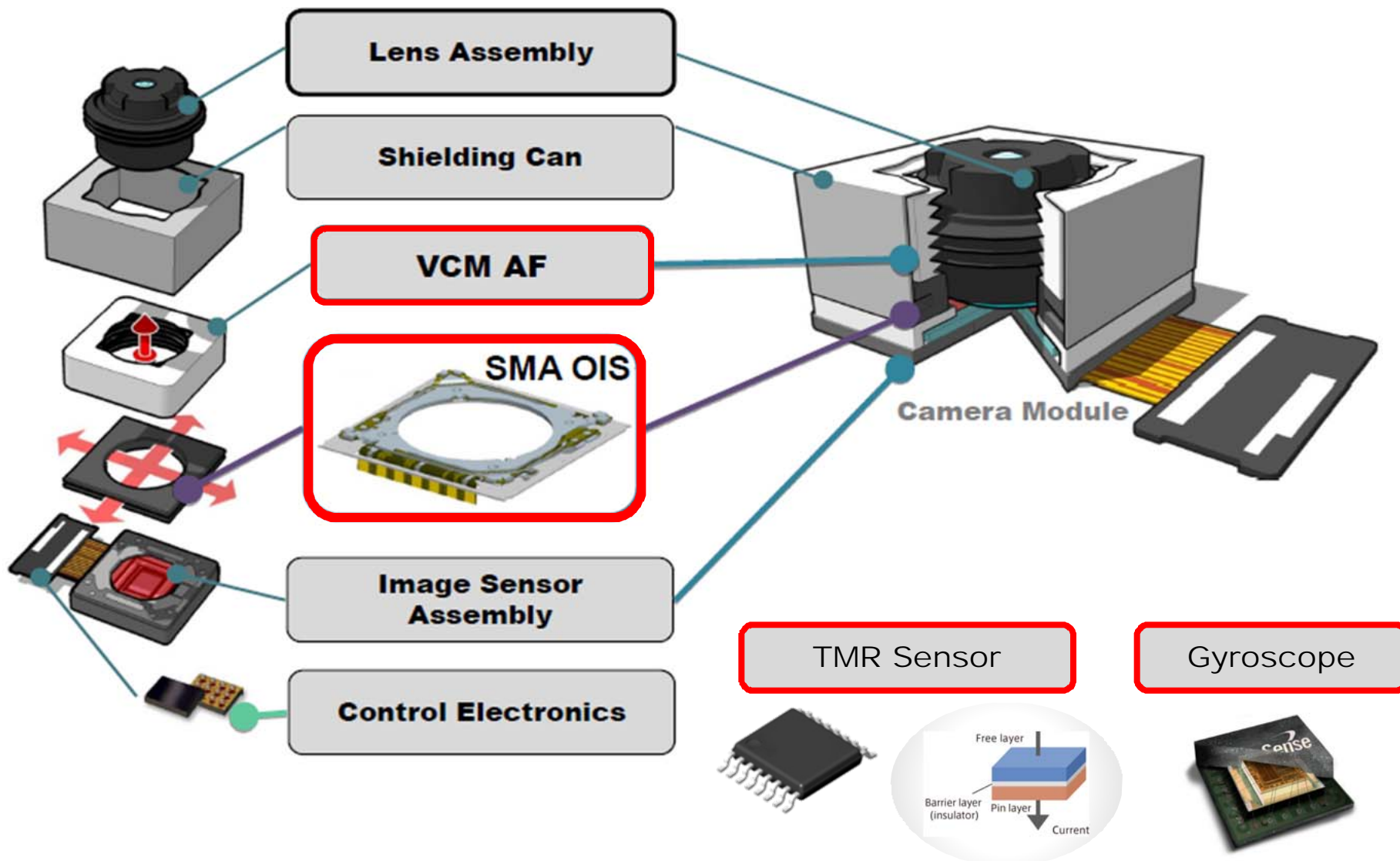


➤ Camera Module Business in ICT Market (Shape Memory Alloy Technology for OIS)

- Easier to implement Automation process.
- Leverages existing HDD suspension process, components and technology
- Enables lower module (AF + OIS) height. (3.0 mm thickness, Other types are 3.2-3.5mm) and Larger lens size for same footprint
- Lower power consumption (2-5x less than VCM), and low heat dissipation
- Inherent position sensing through resistance of SMA wire. Does not need position sensors
- No magnetic influence benefits Dual Camera applications
- Auto Focus applications under development



Camera Module Components Business



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