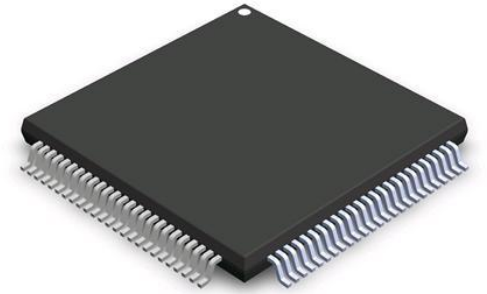
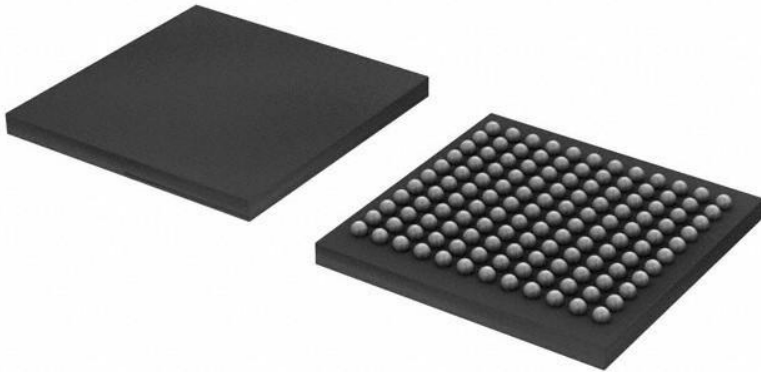


DIP

QFP



BGA



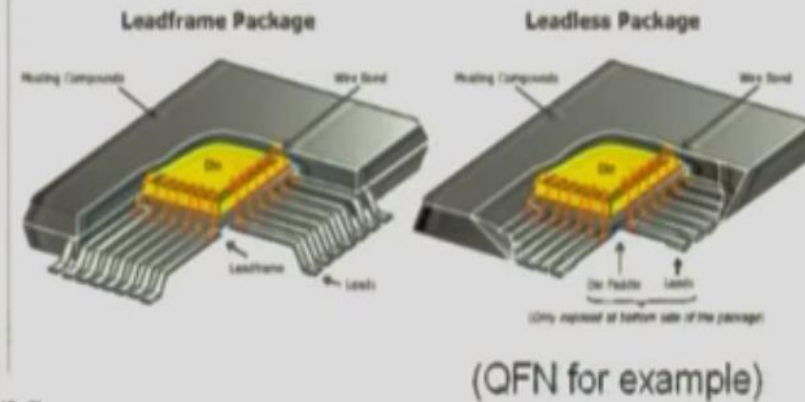
Chip mounting

- **Pin through hole**

- Pins traversing PCB
- Easy manual mounting
- Problem passing signals between pins on PCB (All layers)
- Limited density

- **Surface Mount Devices (SMD)**

- Small footprint on surface of PCB
- Special machines required for mounting
- No blocking of wires on lower PCB layers
- High density



Packages Commonly Used

DIP --- Dual In Line Package

DIL --- Dual In Line Package

PDIP --- Plastic Dual In Line Package

CDIP --- Ceramic Dual In Line Package

CerDIP --- Ceramic Dual In Line Package

MDIP --- Molded Dual In Line Package

FDIP --- Windowed Frit-Seal Dual In Line Package

SDIP --- Shrink Dual In Line Package



SOP --- Small Outline Packages **Packages Commonly Used**

HSOP --- Heat Sink Small Outline Package

SSOP --- Shrink Small Outline Package

HSSOP --- Heat Sink Shrink Small Outline Package

TSOP --- Thin Small Outline Package

TSSOP --- Thin Shrink Small Outline Package

HTSSOP --- Heat Sink Thin Shrink Small Outline Package

VSOP --- Very Small Outline Package

CSOP --- Ceramic Small Outline Package

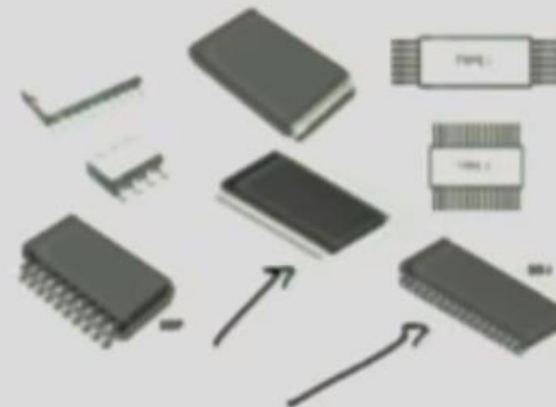
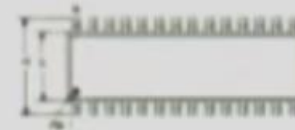
QSOP --- Quarter Size Outline Package

MSOP --- Mini Small Outline Package

SOIC --- Small Outline Integrated Circuit

SSOIC --- Shrink Small Outline Integrated Circuit

SOJ --- Small Outline Integrated Circuit with J- leads



Packages Commonly Used

QFP --- Quad Flat Pack

PQFP --- Plastic Quad Flat Pack

HQFP --- Heat Sink Quad Flat Pack

(PQFP with metal plate)

RQFP --- Plastic Power Quad Flat Pack

(similar to HQFP)

CQFP --- Ceramic Quad Flat Pack

MQFP --- Metal Quad Flat Pack

MQFP --- Metric Quad Flat Pack

BQFP --- Bumped Quad Flat Pack

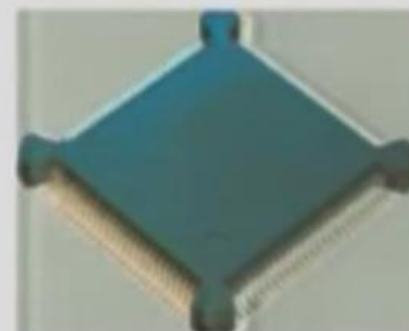
TQFP --- Thin Quad Flat Pack (typ. height 1.40mm)

VQFP --- Very Thin Quad Flat Pack (typ. height 1.00mm)

LQFP --- Low Profile Quad Flat Pack

(0.30/0.40/0.50/0.65mm)

SQFP --- Shrink Quad Flat Pack (similar LQFP)



High I/O Density Packages

- BGA --- Ball Grid Array (typ. 1.50mm / 1.27mm pitch)
- PBGA --- Plastic Ball Grid Array (typ. 1.50mm / 1.27mm pitch)
- CBGA --- Ceramic Ball Grid Array (typ. 1.50mm / 1.27mm pitch)
- MBGA --- Metal Ball Grid Array (typ. 1.50mm / 1.27mm pitch)
- FBGA --- Fine Pitch Ball Grid Array (typ. 1.00mm pitch)
- FTBGA --- Fine Pitch Thin Ball Grid Array (typ. 1.00mm pitch)
- FPBGA --- Fine Pitch Plastic Ball Grid Array (typ. 1.00mm pitch)
- FCBGA --- Fine Pitch Ceramic Ball Grid Array (typ. 1.00mm pitch)
- FMBGA --- Fine Pitch Metal Ball Grid Array (typ. 1.00mm pitch)
- FBGA --- Fine Line Ball Grid Array (typ. 1.00mm pitch)
- UBGA --- Ultra Fine Line Ball Grid Array (typ. 0.80mm pitch)
- SBGA --- Super Ball Grid Array (typ. 0.80mm pitch)
- Flip Chip BGA --- Flip Chip Ball Grid Array (typ. 1.27mm / 1.00mm pitch)
- CSBGA --- Chip Scale Ball Grid Array (typ. 0.80mm / 0.50mm pitch)
- CSP --- Chip Scale Package (typ. 0.80mm / 0.50mm pitch) MicroBGA (μ BGA)

Fine-Pitch BGA Packages



Flip-Chip PBGA Packages



Types of single chip packages

Package Type	Material	Pin Count (Total I/O)	Min. Pitch (mm)
Through-Hole			
Single In Line (SIP)	Plastic	<48	1.27
Dual In Line (DIP)	✓ Plastic (PDIP)	<84	2.54
	✓ Ceramic (CDIP)	<84	2.54
Surface Mount			
Small Outline (SO)	✓ Plastic (SOP/J)	<84	1.27
Leaded Chip Carrier (LCC)	Plastic (PLCC)	<120	1.27
Quad Flat Pack (QFP)	Plastic (PQFP)	<356	0.30
	✓ Ceramic (CQFP)	<356	
Tape Automated Bonding	Plastic (TAB)	<356	0.25
Area Array			
Pin Grid Array (PGA)	Plastic (PPGA)	<750	1.27
	Ceramic (CPGA)	<750	1.27
Ball Grid Array (BGA)	Plastic (PBGA)	<800	1.00
	Plastic (FC-PBGA)	<1700	1.00
	Ceramic (FC-CBGA)	<800	1.00
Column Grid Array (CGA)	Ceramic (FC-CCGA)	<1700	1.00
Chip Scale Package (CSP)	Plastic (CSP, μ BGA)	<356	0.50
	Ceramic (CSP)	<356	0.50