

# Thunderbolt™

## Technical Specifications

### Protocol

- Thunderbolt
  - 700MB/s max PCIe 2.0 x4
  - 750MB/s max DP 1.1a
- Thunderbolt 2
  - 1375MB/s max PCIe 2.0 x4
  - 1500MB/s max DP 1.2

### Bitrate

- Thunderbolt™ – 10Gbps
  - 10Gb/s dedicated to Display; 10Gb/s dedicated to PCIe
- Thunderbolt™ 2 – 20Gbps
  - (2) 10Gb/s bi-directional channels aggregated into a single 20Gb/s bi-directional channel

### Cabling

- Same cable for Thunderbolt and Thunderbolt 2
  - Optical – 100m max distance
  - Copper – 3m max distance

### OS Support

- Mac OS X
- Windows

### Performance Specs

### Compatibility

- 10Gb Thunderbolt technology is forwards compatible with Thunderbolt 2.
- 20Gb Thunderbolt 2 technology is backwards compatible with Thunderbolt.

### Limitations

- Performance will be bottlenecked for every device downstream of a first generation Thunderbolt technology-enabled device in the chain.
- Note: Legacy Thunderbolt technology-enabled devices should be connected at the end of the chain.
- Display traffic takes priority over PCIe traffic.

### 4K Workflow

- Thunderbolt 2 supports 4K output via one Thunderbolt connector.
- Thunderbolt supports 4K output through dual Thunderbolt connectors, each on a dedicated bus.

Thunderbolt™ technology, co-development by Intel and Apple, is a transformational I/O protocol that significantly simplify the end-user experience by concurrently supporting data (PCI Express) and display (DisplayPort) connections over a single cable.

## Thunderbolt Benefits










- Capture and edit multiple uncompressed video streams in real time.
- Edit and view video while simultaneously backing up your content over a single cable connection.
- Backup and restore 1TB of content in less than 5 minutes.
- Daisy chain data and displays to simplify your workflow.

## Thunderbolt 2 Benefits

- Display raw 4K video and backup content at the same time.
- Transfer the total production quantity of a typical 4K TV drama in less than an hour.
- Faster digital content archiving and back up.

## Thunderbolt vs Thunderbolt 2

- Thunderbolt and Thunderbolt 2 are identical at the physical level.
- Thunderbolt 2 enables channel aggregation at the logical level.

Device	Model	Front End Protocol	Back End Protocol	OS Support
	TLNT-1102	(2) Thunderbolt™	(2) 10GbE RJ-45 Copper	Mac OS® X 10.6.8 or later
	TLNS-1101	(2) Thunderbolt™	(1) 10GbE SFP+ LC Optical	Mac OS® X 10.6.8 or later
	TLFC-1082	(2) Thunderbolt™	(2) 8Gb Fibre Channel	Mac OS® X 10.6.8 or later Windows® 7, 8
	TLSH-1068	(2) Thunderbolt™	(2)x4 6Gb SAS/SATA	Mac OS® X 10.6.8 or later Windows® 7, 8
	TSSC-3808	(2) Thunderbolt™	(2)x4 6Gb SAS/SATA RAID	Mac OS® X 10.6.8 or later Windows® 7, 8
	TLFC-2082	(2) Thunderbolt™ 2	(2) 8Gb Fibre Channel	Mac OS® X 10.9 or later Windows® 7, 8
	TLNT-2102	(2) Thunderbolt™ 2	(2) 10GbE RJ-45 Copper	Mac OS® X 10.9 or later
	TLNS-2102	(2) Thunderbolt™ 2	(2) 10GbE SFP+ LC Optical	Mac OS® X 10.9 or later
	TLFC-2162	(2) Thunderbolt™ 2	(2) 16Gb Fibre Channel	Mac OS® X 10.9 or later Windows® 7, 8

