

4K Ultra HD TOOLKIT

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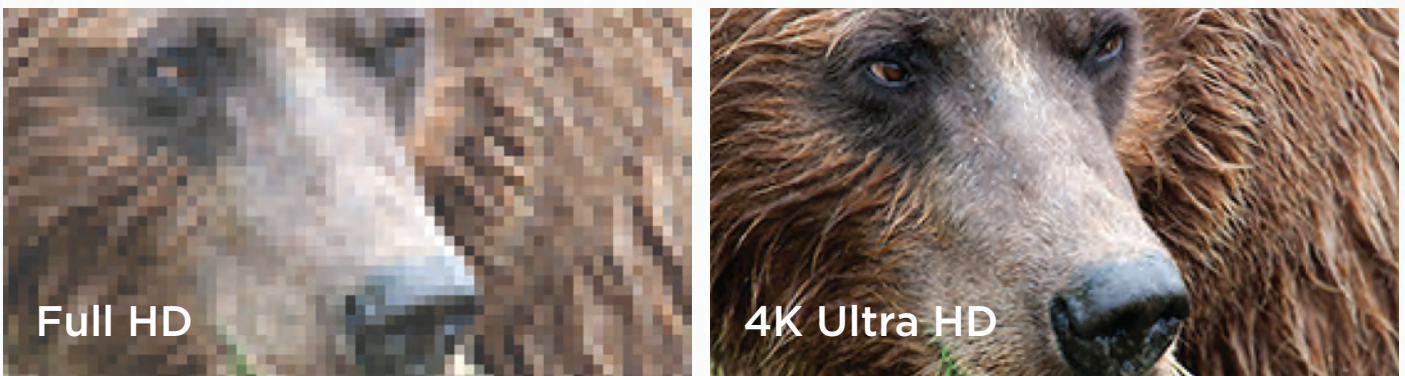
What is 4K Ultra HD video, and how is it different from 4K video?

There are two types of 4K, and in particular, we will be focussing on 4K Ultra HD¹, which is the new video standard for the televisions and monitors that everyone's talking about.

4K Ultra HD = 3840 x 2160p (4x as much detail as Full HD¹)

4K = 4096 x 2160p (This is what you see at your local cinema)

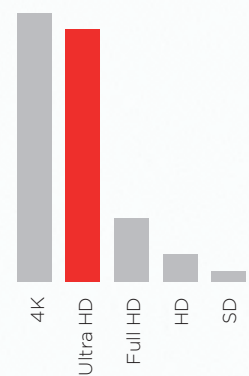
4K Ultra HD captures 8 million pixels as your record, as opposed to 1080p Full HD, which is 2 million pixels...



Why is 4K Ultra HD Better than Full HD?



Total pixels per frame



Resolution	Resolution	Total pixels per frame
4K	4,096 x 2,160	8,847,360 pixels
4K Ultra HD	3,840 x 2,160	8,294,400 pixels
Full HD	1,920 x 1,080	2,073,600 pixels
HD	1,280 x 720	921,600 pixels
SD	720 x 480	345,600 pixels

By using a SanDisk 4K Ultra HD memory card, you're making full use of your host device technology. You invested in the best, now be sure you're capturing full quality content. You can do better than Full HD. 4 times better, to be exact.

Photos © Daisy Gilardini. ¹4K (4096 x 2160), 4K Ultra HD (3840 x 2160), Full HD (1920 x 1080) and HD (1280 x 720) video support may vary based on host device, file attributes and other factors. See: <http://www.sandisk.com/HD>.

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Why should you shoot in 4K Ultra HD?



4K Ultra HD resolution 3,840 x 2,160

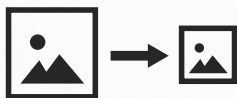
Full HD 1080p resolution 1,920 x 1,080

If you're not shooting and viewing in 4K Ultra HD...
you're not getting the crisp, smooth, textured image that you could be getting

And there are other benefits...



Future proof your content by capturing 4K Ultra HD, so you can enjoy the quality and resolution on your future 4K Ultra HD devices.



4K Ultra HD gives you higher quality files even when you reduce them to 2K for convenient sharing and viewing.

4K Ultra HD (3840 x 2160) and Full HD (1920 x 1080) video support may vary based on host device, file attributes and other factors.
See: <http://www.sandisk.com/HD>.

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Which devices record in 4K Ultra HD?



Smartphones that record 4K Ultra HD¹

- Acer Liquid S2
- Asus PadFone S
- Asus PadFone X
- HTC One M9
- LG G3
- LG G Flex 2
- LG G Pro 2
- Nokia Lumia 1520
- Oppo Find 7
- Oppo Find 7A
- Oppo U3
- Panasonic Lumix CM1
- Pantech Vega Iron 2
- Samsung Galaxy J
- Samsung Galaxy Note 4
- Samsung Galaxy Note 4 Duos
- Samsung Galaxy Note 3
- Samsung Galaxy Note Edge
- Samsung Galaxy S5
- Samsung Galaxy S5 Active
- Samsung Galaxy S5 Duos
- Samsung Galaxy S5 LTE-A
- Samsung Galaxy S5 Plus
- Samsung Galaxy S5 Sport
- Samsung Galaxy Round G910S
- Sony Xperia Z2
- Sony Xperia Z2A
- Sony Xperia Z3
- Sony Xperia Z3 Compact
- Sony Xperia Z3 Dual
- Sony Xperia Z3V
- Vivo Xshot
- ZTE Nubia Z7
- ZTE Nubia Z7 Max
- ZTE Nubia Z7 Mini
- ZTE Star II

And more...

Cameras that record 4K Ultra HD

DSLR and mirrorless cameras

- Canon® EOS 1D-C
- Canon EOS C300 Mark II
- Panasonic Lumix DMC-GH4
- Samsung NX1
- Samsung NX500

Consumer video cameras

- JVC GY-HM200U 4KCAM
- Panasonic HC-VX870
- Panasonic HC-WX970
- Panasonic HC-X1000
- Sony Handycam FDR-AX100
- Sony Handycam FDR-AXP33

Consumer cameras

- Leica D-lux typ 109
- Panasonic Lumix DMC-FZ1000
- Panasonic Lumix DMC-LX100

And more...

Action Cams that record 4K Ultra HD

- AEE S71 Magicam
- GoPro HERO3 Black Edition
- GoPro HERO3+ Black Edition
- GoPro HERO4 Black
- GoPro HERO4 Silver
- Panasonic HX-A500E
- Sony FDR-X1000V


And more...

What memory card do I need for 4K Ultra HD?

A UHS Speed Class 3 (U3)¹ memory card supports a minimum sustained write speed of 30MB/s**, the optimal speed you need to capture 4K Ultra HD²



And SanDisk has a variety of U3-enabled cards to pair with your 4K Ultra HD device...

Memory card	Capacity ³	Video Recording	
SanDisk Extreme PRO® SDHC™ & SDXC™ UHS-I & UHS-II cards	16-512 GB (UHS-I) 16-64 GB (UHS-II)	U3	
SanDisk Extreme® PLUS SDHC & SDXC UHS-I cards	16-64 GB	U3	
SanDisk Extreme SDHC & SDXC UHS-I cards	16-256 GB	U3	
SanDisk Extreme PRO microSDHC™ & microSDXC™ cards	16-64 GB	U3	
SanDisk Extreme PLUS microSDHC & microSDXC cards	16-64 GB	U3	
SanDisk Extreme microSDHC & microSDXC cards	16-64 GB	U3	
SanDisk Extreme PRO CompactFlash® cards	16-256 GB	VPG-65 ⁴	
SanDisk Extreme PRO CFast™ 2.0 cards	64-128 GB	Ready to shoot cinema-quality 4K video (4096x2160p) ²	

** For more information, see https://www.sdcard.org/consumers/speed/speed_class/index.html. ¹UHS Speed Class 3 (30MB/s minimum sustained write speed) designates performance option designed to support real-time video recording with UHS enabled host device. ²4K (4096 x 2160) and 4K Ultra HD (3840 x 2160) video support may vary based on host device, file attributes and other factors. See: <http://www.sandisk.com/HD>. ³1GB = 1,000,000,000 bytes. Actual user storage less. ⁴VPG-65: Video Performance Guarantee enabled to ensure video recording at 65MB/sec minimum sustained write speed. 1MB = 1,000,000 bytes.

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What happens if you use the wrong card?

4K Ultra HD¹ needs a card that can keep up! If you don't have a card that meets the minimum recommended speed to shoot 4K Ultra HD video, you could run into a few issues while recording.

For example...

Dropped frames

If your memory card is struggling to keep up with the flow of 4K Ultra HD data coming in as you record, you could experience dropped frames when you're viewing the video. This might appear as skips or choppy playback.



Photos © Tom Bol

Recording error

Your device could stop recording completely if your memory card isn't 4K Ultra HD ready. If this happens, it might happen right after you start recording, or it could happen minutes in. To be sure you can capture every moment, use a U3-enabled SanDisk memory card, and never worry about missing the action.



Photos © Marcel Lämmerhirt

Added noise

It is possible that 4K Ultra HD video will still be recorded with a memory card that isn't 4K Ultra HD-ready, but will be of inferior quality or with added noise as the camera tries to fill in the missing parts of the image.



Photos © Jonathan & Angela Scott

Above examples are for illustration purposes only. ¹4K Ultra HD (3840 x 2160) video support may vary based on host device, file attributes and other factors. See: <http://www.sandisk.com/HD>.

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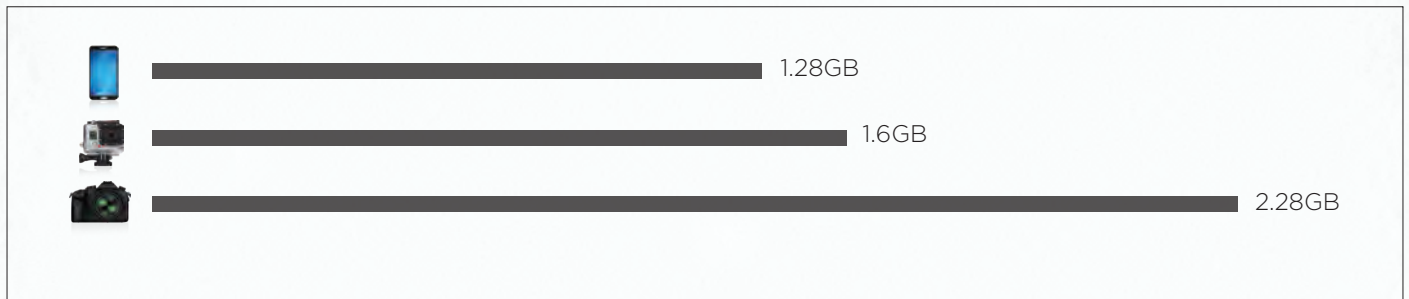
What memory card capacity should I have for 4K Ultra HD?

In some cases, recording 4K Ultra HD¹ requires more than double the storage capacity than the same content recorded in Full HD¹, so a higher capacity card will ensure you can keep shooting without running out of space.



How much capacity does a 4 minute 4K Ultra HD video clip require?

Different devices use different compression technologies for your 4K Ultra HD video, so 4K Ultra HD file sizes will vary from smartphones to cameras and action cameras.



How much video can I record with a smartphone?

Capacity ²	(3840x2160p) in minutes 4K ULTRA HD VIDEO	or	(1920x1080p) in minutes FULL HD
8 GB	26 minutes	or	49 minutes
16 GB	53 minutes	or	100 minutes
32 GB	107 minutes	or	200 minutes
64 GB	215 minutes	or	401 minutes
128 GB	432 minutes	or	804 minutes

²Approximations; Results, 4K Ultra HD (3840 x 2160) and Full HD (1920x1080) video support may vary based on host device, file attributes and other factors. 1GB=1,000,000,000 bytes. Actual user storage less.

How much video can I record with an action camera?

Capacity ²	(3840x2160p) in minutes 4K ULTRA HD VIDEO	or	(1920x1080p) in minutes FULL HD
16 GB	40 minutes	or	99 minutes
32 GB	81 minutes	or	198 minutes
64 GB	162 minutes	or	397 minutes

²Approximations; Results, 4K Ultra HD (3840 x 2160) and Full HD (1920x1080) video support may vary based on host device, file attributes and other factors. 1GB=1,000,000,000 bytes. Actual user storage less.

What memory card capacity should I have for 4K Ultra HD?

How much video can I record with a camera?

Capacity ²	(MP4, MOV 3840x2160p @25fps) in minutes 4K ULTRA HD VIDEO	or	(MP4, MOV 1920x1080p @25fps) in minutes FULL HD
4 GB	7 minutes	or	10 minutes
8 GB	14 minutes	or	20 minutes
16 GB	28 minutes	or	40 minutes
32 GB	56 minutes	or	80 minutes
64 GB	112 minutes	or	160 minutes
128 GB	224 minutes	or	320 minutes
256 GB	448 minutes	or	640 minutes
512 GB	896 minutes	or	1280 minutes

²Approximations; Results, 4K Ultra HD (3840 x 2160) and Full HD (1920x1080) video support may vary based on host device, file attributes and other factors. 1GB=1,000,000,000 bytes. Actual user storage less.

















Not all devices support SDXC™, microSDXC™ or 256GB CompactFlash® memory cards. Contact your device manufacturer for details. ¹4K Ultra HD (3840 x 2160) and Full HD (1920 x 1080) video support may vary based on host device, file attributes and other factors. See: <http://www.sandisk.com/HD>.

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Card recommendations

Host Device	Image	Media Format	Recommended Card		
Smartphones		microSDHC™ microSDXC™	 4K Ultra HD ready Read speed: up to 60MB/s* Class 10, U3 ² Available in 16-64GB ³	 4K Ultra HD ready High performance read speed up to 80MB/s* Class 10, U3 Available in 16-64GB	 4K Ultra HD ready Unparalleled data speeds Advanced photo capture Read speed: up to 95MB/s* Class 10, U3 Available in 16-64GB
Cameras		SDHC™ SDXC™	 4K Ultra HD ready Read speed: up to 80MB/s* Class 10, U3 Available in 16-256GB	 4K Ultra HD ready Faster performance Faster downloads Read speed: up to 80MB/s* Class 10, U3 Available in 16-64GB	 4K Ultra HD ready Ultimate performance Super-fast data transfer Read speed: up to 95MB/s* (UHS-I cards), C10, U3 Available in 16-512GB Read speed: up to 280MB/s* (UHS-II cards), U3 Available in 16-64GB
		CompactFlash®		 4K ¹ ready Read speed: up to 160MB/s* VPG-65 ⁴ Available in 16-256GB	
		CFast™ 2.0		 4K ready For professional cameras Read speed: up to 515MB/s* Available in 64-128GB	
Action Cams		microSDHC microSDXC	 4K Ultra HD ready Read speed: up to 60MB/s* Class 10, U3 Available in 16-64GB	 4K Ultra HD ready High performance speed Read speed: up to 80MB/s* Class 10, U3 Available in 16-64GB	 4K Ultra HD ready Unparalleled data speeds Advanced photo capture up to 95MB/s Class 10, U3 Available in 16-64GB


Not all devices support SDXC, microSDXC or 256GB CompactFlash memory cards. Contact your device manufacturer for details. * SanDisk Extreme PRO® CFast 2.0: Up to 440MB/sec write speed, up to 515MB/sec read speed. SanDisk Extreme PRO CompactFlash: 16-128GB models up to 150 MB/sec write speed, 256GB capacity up to 140MB/sec write speed; up to 160MB/sec read speed. SanDisk Extreme PRO SDHC / SDXC UHS-II: Up to 280MB/sec read speed. Write speed up to 250MB/s. SanDisk Extreme PRO SDHC / SDXC UHS-I and SanDisk Extreme PRO microSDHC / microSDXC: Up to 95MB/sec read speed. Write speed up to 90MB/s. SanDisk Extreme PLUS SDHC / SDXC: Up to 80MB/sec read speed; up to 60MB/sec write speed (16-128GB models); 8GB capacity up to 30MB/sec write speed. SanDisk Extreme SDHC / SDXC: Up to 80MB/sec read speed; up to 60MB/sec write speed (16-256GB models); 8GB capacity up to 30MB/sec write speed. SanDisk Extreme PLUS microSDHC / microSDXC: Up to 80MB/sec read speed, up to 50MB/sec write speed (32 & 64GB models); 16GB capacity up to 80MB/sec read speed, up to 40MB/sec write speed. SanDisk Extreme SDHC / SDXC: Up to 60MB/sec read speed; up to 40MB/sec write speed (16-128GB models); 8GB capacity up to 30MB/sec write speed. SanDisk Extreme microSDHC / microSDXC: Up to 60MB/sec read speed, up to 40MB/sec write speed (32 & 64GB models); 16GB capacity up to 45MB/sec read speed, up to 30MB/sec write speed. Based on internal testing; performance may be lower depending upon host device. 1MB=1,000,000 bytes. ¹ 4K (4096 x 2160), 4K Ultra HD (3840 x 2160) and HD (1280 x 720) video support may vary based on host device, file attributes and other factors. See: <http://www.sandisk.com/HD> ² UHS Speed Class 3 (30MB/s minimum sustained write speed) designates performance option designed to support real-time video recording with UHS enabled host device. ³ 1GB = 1,000,000,000 bytes. Actual user storage less. ⁴ VPG-65: Video Performance Guarantee enabled to ensure video recording at 65MB/sec minimum sustained write speed. 1 MB = 1,000,000 bytes.

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Which SanDisk 4K Ultra HD memory card should you use for your 4K Ultra HD smartphone?



Mobile phone	Recommended Card/Cards
<p>HTC One M9</p> <p>LG</p> <ul style="list-style-type: none"> • G3 • GFlex 2 <p>Samsung</p> <ul style="list-style-type: none"> • Galaxy Note 3 • Galaxy Note 4 • Galaxy Note Edge • Galaxy S5 <p>Sony</p> <ul style="list-style-type: none"> • Xperia Z2 • Xperia Z3 Compact 	

Smartphones that record 4K Ultra HD¹

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> • Acer Liquid S2 • Asus PadFone S • Asus PadFone X • HTC One M9 • LG G3 • LG G Flex 2 • LG G Pro 2 • Nokia Lumia 1520 • Oppo Find 7 • Oppo Find 7A • Oppo U3 • Panasonic Lumix CM1 | <ul style="list-style-type: none"> • Pantech Vega Iron 2 • Samsung Galaxy J • Samsung Galaxy Note 4 • Samsung Galaxy Note 4 Duos • Samsung Galaxy Note 3 • Samsung Galaxy Note Edge • Samsung Galaxy S5 • Samsung Galaxy S5 Active • Samsung Galaxy S5 Duos • Samsung Galaxy S5 LTE-A • Samsung Galaxy S5 Plus • Samsung Galaxy S5 Sport | <ul style="list-style-type: none"> • Samsung Galaxy Round G910S • Sony Xperia Z2 • Sony Xperia Z2A • Sony Xperia Z3 • Sony Xperia Z3 Compact • Sony Xperia Z3 Dual • Sony Xperia Z3V • Vivo Xshot • ZTE Nubia Z7 • ZTE Nubia Z7 Max • ZTE Nubia Z7 Mini • ZTE Star II |
|---|--|---|









And more...

Mountain image © Daisy Gilardini.
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Which SanDisk 4K Ultra HD memory card should you use for your 4K Ultra HD camera?



Camera	Recommended Card/Cards
<ul style="list-style-type: none"> • Canon EOS 1D-C 	
<ul style="list-style-type: none"> • Panasonic Lumix DMC-GH4 • Samsung NX1 • Samsung NX500 	 or  or 
<ul style="list-style-type: none"> • GoPro HERO4 Black • Sony FDR-X1000V • Panasonic HX-A500E • AEE S71 Magicam 	 or  or 
<ul style="list-style-type: none"> • ARRI AMIRA • Canon® EOS C300 Mark II 	

Cameras/Action Cams that record 4K Ultra HD¹

Consumer cameras

- Leica D-lux typ 109
- Panasonic Lumix DMC-FZ1000
- Panasonic Lumix DMC-LX100

Consumer video cameras

- JVC GY-HM200U 4KCAM
- Panasonic HC-VX870
- Panasonic HC-WX970
- Panasonic HC-X1000
- Sony Handycam FDR-AX100
- Sony Handycam FDR-AXP33

And more...

DSLR and mirrorless cameras

- Canon® EOS 1D-C
- Canon EOS C300 Mark II
- Canon XC10
- Panasonic Lumix DMC-GH4
- Samsung NX1
- Samsung NX500

And more...

Action Cams

- AEE S71 Magicam
- GoPro HERO3 Black Edition
- GoPro HERO3+ Black Edition
- GoPro HERO4 Black
- GoPro HERO4 Silver
- Panasonic HX-A500E
- Sony FDR-X1000V

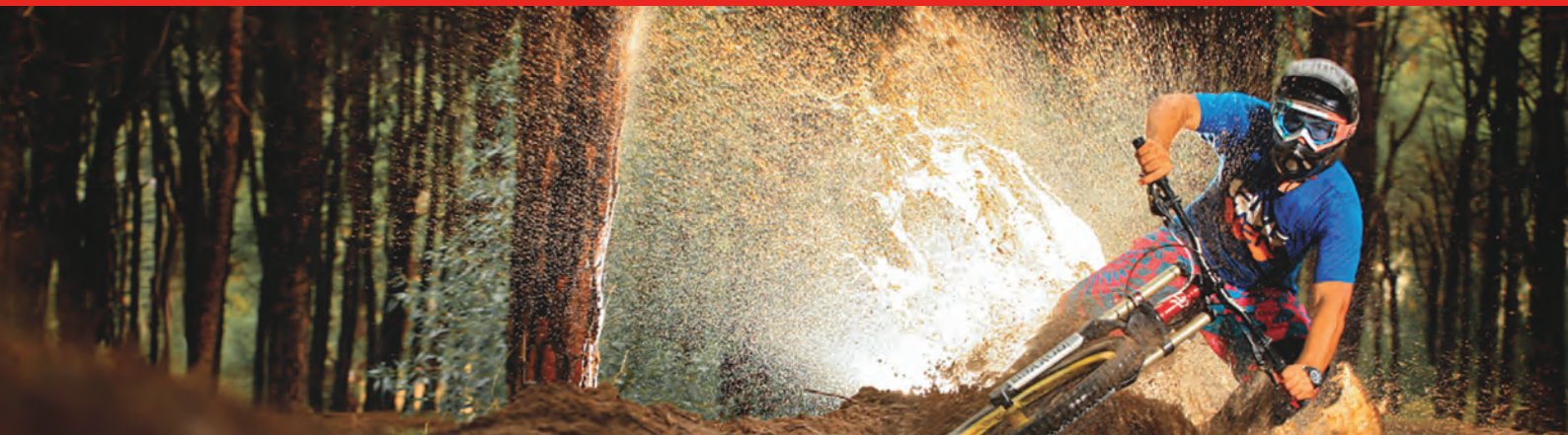
And more...

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Which SanDisk 4K Ultra HD¹ memory card should you use for your GoPro Action Cam?



Model	Image	Media Format	Recommended Card
GoPro HERO4 Black		microSDHC™ microSDXC™ (Class 10, U1 or U3) up to 64GB	or
GoPro HERO4 Silver		microSDHC microSDXC (Class 10, U1 or U3) up to 64GB	or
GoPro HERO3+ Black Edition		microSDHC microSDXC (Class 10) up to 64GB	or
GoPro HERO3 Black Edition		microSDHC microSDXC (Class 10) up to 64GB	or

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