

A FIRST CLASS OF DSLR LENS

One of the biggest advantages of owning a DSLR is that you can switch lens. In general, an 18-55mm lens is bundled with an entry-level DSLR. While this lens meets basic photographic needs in most situations, it is a lot of fun to try other lenses to experience and explore the differences and possibilities. For instance, a wide-angle lens can capture more of the scene in a picture, a telephoto lens allows users to zoom in on a distant subject and take a clear picture, and a macro lens can take a close-up picture on very small things. Although there are dozens of choices on market, you need to consider your budget and stay focused on your needs.

I. NOMENCLATURE

A Lens is usually composed of:

- Hood
The hood can minimize stray light by keeping unwanted light out of the lens and protect the lens from rain, snow, and dust.
- Focus ring
Turning the focus ring moves the lens elements inside the lens. The image can be brought into clear focus.
- Zoom ring (only for zoom lenses)
Turning the zoom ring moves the lens elements inside the lens. The desired composition can be framed.
- Distance scale (an optional feature)
The distance scale indicates the approximate distance between the subject and the camera. The minimal value shown in distance scale is the minimum focus distance of the lens. It displays the maximal value “infinity” when shooting distant landscapes.
- Focus mode switch
Use autofocus mode (M/A for Nikon and AF for Canon) unless you prefer to manually focus.
- Anti-shake facility switch (if available)

Anti-shake facility provides optimal image stabilization depending on shooting conditions. Always turn it on (VR for Nikon and IS for Canon).

- Front and rear caps
Both caps protect the lens when not in use.
- Pouch
The soft pouch protects the lens when not in use.

II. DESIGNATIONS

The names of the lenses are a bewildering array of letters and numbers. Although the names don't look user-friendly, they are actually not hard to decipher. We will first give the summary of the acronyms and numbers on the lenses, as shown in Table 1, and then introduce the key specifications one by one.

- Brand
Besides Nikon and Canon, there are three other major Japanese based manufacturers of DSLR lenses: Sigma, Tamron, and Tokina. Those off-brand lenses also perform well and they are more affordable. Nikon's lenses are only designed for Nikon cameras and so are Canon's. However, the third-party companies produce multiple versions of their lenses for each of the most popular camera manufacturers.
- Autofocus
Most of the lenses today have lens-drive motor system that provides the precision control and quiet autofocus operation. Different manufacturers have different names for their motor systems, as shown in Table 2.
- Lens format
There are two types of DSLR in terms of image sensor format: APS-C and full-frame. All the manufacturers have designed lenses optimized for both of the image sensor formats. Since APS-C cameras use a smaller area to form the image than traditional full-frame cameras, the lenses used on APS-C format cameras have a correspondingly narrower field of view, which is called crop factor. As a result, Nikon APS-C cameras have a crop factor of 1.5 and Canon APS-C cameras have a crop factor of 1.6. You need

to multiply the lens focal length by the crop factor to get its equivalent full-frame focal length. Different manufacturers have different names for their lens format, as shown in Table 3.

- Focal length

Focal length is a measure of the distance from the center of lens to the principal foci in millimeters (mm). It defines how much your view will fit in a photo. A higher number means a bigger zoom (i.e., focus will be on a smaller aspect of your view), while a lower number means the lens can be used for wider shots (i.e., the lens will take in a bigger view than you naturally see). As a rough reference, the human eye is said to see about the equivalent of 30-50mm. The lenses could be categorized by the types and the values of focal length, as shown in Table 4.

- Maximum aperture

Aperture is a measure of the size of the lens opening in focal-ratio (f-number). It defines how much light the lens can capture. A larger maximum aperture means the lens could be used in lower-light situations without having to use a flash and is capable of producing a shallower depth of field. The lenses could be categorized by the types and the values of maximum aperture, as shown in Table 5.

- Optical design

All of the manufacturers have a proprietary marking to designate their professional quality lenses. The color of the ring is also probative (i.e., Nikon's gold ring and Canon's red ring). Different manufacturers have their own criteria for determining what constitutes a professional lens, as shown in Table 6.

- Anti-shake facility

The anti-shake facility reduces the camera shake by counter-balancing the natural shake in the photographer's hands. It hence allows for use of slower shutter speeds or lower ISO settings. Most manufacturers put this motor in the lens while some others (e.g., Sony) put this in the camera.

Different manufacturers have different names for their anti-shake facilities, as shown in Table 7.

III. WHICH ONE TO BUY

If you only have the 18-55mm lens, what's the next lens to buy? The short answer is to get a normal prime lens or a telephoto zoom lens. The longer and more considered answer is to think about the type of photographs you currently take. You need to understand how different lenses could improve your current photos and allow you to take ones that you currently can't. You also need to take account of your age, your financial situation, and the possibility to upgrade to a full-frame DSLR in the future.

- Prime vs. zoom lenses

Traditionally, prime lenses have been considered to be optically superior to zoom lenses, because trade-offs have to be made when producing zoom lenses. But some premium zoom lens are better than some entry-level prime lenses.

- Lens set vs. all-in-one lenses

All-in-one lenses cover focal lengths from wide to telephoto. They can be good in situations where you can't or don't want to change lenses. Compromises need to be made when all-in-one lenses are manufactured. Therefore, all-in-one lenses do not have the same image quality of the more dedicated lenses and often have slower and variable maximum apertures.

In the following three tables, we summarize the size in millimeters, weight in grams, price in dollars, and structure in terms of number of glass elements and groups of the premium zoom lenses (shown in Table 8), prime lenses (shown in Table 9), and all-in-one lenses (shown in Table 10) manufactured by Nikon, Canon, Sigma, Tamron, Tokina, and Carl Zeiss.

IV. WHICH ONE TO USE

You have to master two fundamental skills that help you make decision. The two skills are controlling depth of field and finding the best field of view. In addition, the shooting location and time are also considered.

There are three ways to create a shallower depth of field (i.e., a sharp subject and a blur foreground and background).

- Increasing the aperture (i.e., smaller f stop value)
- Increasing the focal length
- Less subject distance

To find the best field of view, remember these two rules.

- Increasing the focal length narrows field of view and captures greater magnification of the subject.
- Decreasing the focal length widens field of view but may distort the subject at the edges.

Below we take a look at a few of the most common types of lens and consider how they can be used.

- Wide-angle lenses
They can take in a wider scene, so typical uses include landscape, architecture, a large group of people and interior photography. Even the distortion characteristics can be used creatively for portrait photography. Also, they can be used for food photography since they often boast close minimum focusing distances.
- Normal lenses
They are versatile lenses which can be used for almost all sorts of photography whether street (at 35mm), documentary, landscape (at 24mm), or portrait (at 85mm).
- Telephoto lenses
In addition to being used to photograph subjects you can't get close to, like sports or wildlife, telephoto lenses can be used for shooting portraits.
- Prime lenses
Prime lenses have better optics, larger maximum apertures, and faster shutter speed. They can be used for portrait photography and interior photography when light is weak.

- All-in-one lenses

They can be used in the situations where it would not be safe to switch lenses or when traveling, if you want to be weighted down by lens sets when on holiday with your family.

V. HOW TO TAKE CARE

Lenses are no doubt the babies of most photographers. To keep the lens surface and coatings away from abrasion, please always install an UV filter, it also can reduce the level of ultraviolet light so that you can get more natural and clear photos. Your lenses can be attacked by molds, especially in the humid seasons in Houston. To keep your lenses at a low level of humidity conditions, you can prepare an electronic dry box or even a sealed airtight box that contains a desiccant. Last but not least, please be gentle with your lenses.

VI. SUMMARY

It is worth remembering that lenses can often last longer than your camera, because they will continue to work on the next generation of cameras, and the one after that, probably. This is why many photographers are willing to spend more on an individual lens than their camera. However, buying new lenses doesn't have to mean spending a fortune. We've seen how relatively inexpensive primes like 35mm f/1.8 or 50 mm f/1.8 can change your photography forever. There are also thousands of second-hand lenses on craigslist or elsewhere, which will work just as well as new ones out there.

Table 1. Summary of acronyms and numbers on the lenses manufactured by Nikon, Canon, Sigma, Tamron, and Tokina.

Brand	Autofocus	Lens format	Focal length	Maximum Aperture	Optical Design	Anti-shake facility
Nikon	AF-S / AF SWM	DX / FX	A range of or a single number between 8mm - 600mm	A single or two numbers between f/ 1.2 - f/5.6	N, ED, IF, Micro	VR
Canon	USM	EF-S / EF			L, Macro	IS
Sigma	HSM	DC / DG			EX, Art, IF, APO, Macro	OS
Tamron	AF USD	Di II / Di			SP, IF, LD, XR, Macro	VC
Tokina		DX / FX			AT-X PRO, IF, SD	VCM

Table 2. Acronyms and full names of autofocus motor system

Brand	Acronym	Full Name
Nikon	AF-S SWM	Auto Focus- Silent Silent Wave Motor
Canon	EF USM	E lectronic F ocus U ltra S onic M otor
Sigma	HSM	H yper S onic M otor
Tamron	AF USD	Auto Focus U ltrasonic S ilent D rive
Tokina		

Table 3. Acronyms and full names (in parentheses) of different lens formats

Brand	Full-frame	APS-C
Nikon	FX (F ull-frame)	DX (D igital)
Canon		-S (S hort-back or S mall)
Sigma	DG (D igital G rade)	DC (D igital C ompact)
Tamron	Di (D igital I ntegrated)	Di II (D igital I ntegrated II)
Tokina	FX (F ull-frame)	DX (D igital)

Table 4. Lenses category in terms of focal length

	Prime	Zoom
Wide-angle	A single value less than 35mm, i.e., 24mm, 28mm, 35mm, etc.	A range of values less than 35mm, i.e., 16-35mm, 17-40mm, etc.
Normal	A single value between 35 and 85mm, i.e., 50mm, 60mm, etc.	A range of values between 35 and 85mm i.e., 24-70mm, 24-85mm, 24-120mm, etc.
Telephoto	A single value greater than 85mm, i.e., 85mm, 105mm, 135mm, 200mm, etc.	A range of values greater than 85mm, i.e., 70-200mm, 200-400mm, etc.

Table 5. Lenses category in terms of maximum aperture

	Prime	Zoom
Fixed Aperture	A single value, i.e., f/1.4, f/1.8, f/2.0, f/2.8, etc.	A single value, i.e., f/2.8 and f/4
Variable Aperture		Typically two values, one for each end of the focal length range, i.e, f/3.5-4.5, f/3.5-5.6, etc.

Table 6. Acronyms and full names of high-end lens

Brand	Acronym	Full Name
Nikon	N	N ano-crystal coating
Canon	L	L uxury series
Sigma	EX, Art	EX cellent, Art
Tamron	SP	S uper P erformance
Tokina	AT-X PRO	A dvanced T echnology- X P ROfessional

Table 7. Acronyms and full names of anti-shake motor system

Brand	Acronym	Full Name
Nikon	VR	V ibration R eduction
Canon	IS	I mage S tabilization
Sigma	OS	O ptical S tabilizer
Tamron	VC	V ibration C ompensation
Tokina	VCM	V ibration C orrection M odule

Table 8. Summary of premium zoom lenses manufactured by Nikon, Canon, Sigma, Tamron, and Tokina, categorized by focal length. The first and second row of each brand lists f/2.8 and f/4 lenses, respectively. Each entry gives the name, filter size in millimeters (if available), weight in grams, price in US dollars on B and H, and the numbers of glass elements and groups.

Brand	Wide-angle	Normal	Telephoto
Nikon	AF-S 14-24mm f/2.8G ED N/A, 969g, \$1997, 11/14	AF-S 24-70mm f/2.8G ED 77mm, 980g, \$1887, 11/15	AF-S 70-200mm f/2.8G ED VR II 77mm, 1540g, \$2397, 16/21
	AF-S 16-35mm f/4G ED VR 77mm, 680g, \$1257, 12/17	AF-S 24-120mm f/4G ED VR 77mm, 670g, \$1297, 13/17	AF-S 70-200mm f/4G ED VR 67mm, 850g, \$1397, 14/20
Canon	EF 16-35mm f/2.8L II USM 82mm, 640g, \$1699, 12/16	EF 24-70mm f/2.8L II USM 82mm, 805g, \$2099, 13/18	EF 70-200mm f/2.8L IS II USM 77mm, 1490g, \$2299, 19/23
	EF 16-35mm f/4L IS USM 77mm, 615g, \$1199, 12/16	EF 24-105mm f/4L IS USM 77mm, 670g, \$1149, 13/18	EF 70-200mm f/4L IS USM 67mm, 760g, \$1299, 15/20
Sigma		24-70mm f/2.8 EX DG HSM 82mm, 790g, \$799, 12/14	APO 70-200mm f/2.8 EX DG OS HSM 77mm, 1430g, \$1199, 17/22
		24-105mm f/4 DG OS HSM 82mm, 885g, \$899, 14/19	
Tamron	Coming soon	SP 24-70mm f/2.8 Di VC USD 82mm, 825g, \$1299, 12/17	SP 70-200mm f/2.8 Di VC USD 77mm, 1470g, \$1499, 17/23
Tokina	AT-X 16-28mm f/2.8 PRO FX N/A, 950g, \$639, 13/15		
	AT-X 17-35mm f/4 PRO FX 82mm, 600g, \$499, 12/13		AT-X 70-200mm f/4 FX VCM-S 67mm, 980g, \$1099, 14/19

Table 9. Summary of prime lenses manufactured by Nikon, Canon, Sigma, and Carl Zeiss, categorized by focal length. The first and second row of each brand lists the first tier and second tier lenses, respectively. Each entry gives the name, filter size in millimeters (if available), weight in grams, price in US dollars on B and H, and the numbers of glass elements and groups.

Brand	24/25mm	28mm	35mm	50/55/58mm	85mm
Nikon	AF-S 24mm f/1.4G ED 77mm, 620g, \$1929, 10/12		AF-S 35mm f/1.4G 67mm, 600g, \$1700, 7/10	AF-S 58mm f/1.4G 72mm, 385g, \$1697, 6/9	AF-S 85mm f/1.4G 77mm, 595g, \$1600, 9/10
	Coming soon	AF-S 28mm f/1.8G 67mm, 330g, \$697, 9/11	AF-S 35mm f/1.8G ED 58mm, 305g, \$597, 8/11	AF-S 50mm f/1.8G 58mm, 185g, \$217, 6/7	AF-S 85mm f/1.8G 67mm, 350g, \$497, 9/9
Canon	EF 24mm f/1.4L II USM 77mm, 650g, \$1649, 10/13		EF 35mm f/1.4L USM 72mm, 580g, \$1479, 9/11	EF 50mm f/1.2L USM 72mm, 545g, \$1549, 6/8	EF 85mm f/1.2L II USM 72mm, 1025g, \$2099, 7/8
		EF 28mm f/1.8 USM 58mm, 310g, \$509, 9/10	EF 35mm f/2 IS USM 67mm, 335g, \$599, 8/10	EF 50mm f/1.8 II 52mm, 130g, \$125, 5/6	EF 85mm f/1.8 USM 58mm, 425g, \$419, 7/9
Sigma			35mm f/1.4 DG HSM Art 67mm, 665g, \$899, 11/13	50mm f/1.4 DG HSM Art 77mm, 815g, \$949, 8/13	Coming soon
	24mm f/1.8 EX DG ASP 77mm, 485g, \$549, 9/10	28mm f/1.8 EX DG ASP 77mm, 480g, \$449, 9/10			
Carl Zeiss				55mm f/1.4 Otus Distagon 77mm, 970g, \$3990, 10/12	85mm f/1.4 Otus Apo Planar 86mm, 1140g, \$4490, 9/11
	25mm f/2 Distagon 67mm, 600g, \$1699, 10/11	28mm f/2 Distagon 58mm, 520g, \$1283, 8/10	35mm f/1.4 Distagon 72mm, 830g, \$1743, 9/11	50mm f/1.4 Planar 58mm, 350g, \$725, 6/7	85mm f/1.4 Planar 72mm, 670g, \$1283, 5/6

Table 10. Summary of all-in-one zoom lenses manufactured by Nikon, Canon, Sigma, and Tamron, categorized by coverage. The first and second row of each brand lists the full-frame and APS-C lenses, respectively. Each entry gives the name, filter size in millimeters (if available), weight in grams, price in US dollars on B and H, and the numbers of glass elements and groups.

Brand	17x	14x	11x
Nikon			AF-S 28-300mm f/3.5-5.6G ED VR 77mm, 800g, \$1047, 14/19
	AF-S DX 18-300mm f/3.5-5.6G ED VR 77mm, 830g, \$997, 14/19		AF-S DX 18-200mm f/3.5-5.6G ED VR II 72mm, 560g, \$597, 12/16
Canon			EF 28-300mm f/3.5-5.6L IS USM 77mm, 1670g, \$2549, 16/22
			EF-S 18-200mm f/3.5-5.6 IS 72mm, 595g, \$700, 12/16
Sigma			
	Coming soon	18-250mm f/3.5-6.3 DC Macro OS HSM 62mm, 470g, \$349, 13/16	18-200mm f/3.5-6.3 II DC OS HSM 62mm, 490g, \$299, 14/18
Tamron			28-300mm f/3.5-6.3 Di VC PZD 67mm, 540g, \$849, 15/19
	16-300mm f/3.5-6.3 Di II VC PZD 67mm, 540g, \$629, 12/16	18-270mm f/3.5-6.3 Di II VC PZD 62mm, 450g, \$449, 13/26	18-200mm f/3.5-6.3 XR Di II 62mm, 398g, \$199, 13/15