SCREEN RESOLUTIONS

General

1. In digital display screens, resolution is the number of pixels (individual points of colour) contained on a display screen, expressed in terms of the number of pixels on the horizontal axis and the number on the vertical axis. The sharpness of the image on a display depends on the resolution and the size of the monitor. The same pixel resolution will be sharper on a smaller monitor and gradually lose sharpness on larger monitors because the same number of pixels are being spread out over a larger number of inches.

2. A given display screen display system will have a maximum resolution that depends on its physical ability to focus light (in which case the physical dot size - the dot pitch - matches the pixel size) and usually several lesser resolutions. For example, a display system that supports a maximum resolution of 1280 by 1024 pixels may also support 1024 by 768, 800 by 600, and 640 by 480 resolutions. Note that on a given size monitor, the maximum resolution may offer a sharper image but be spread across a space too small to read well.

3. Display resolution is not measured in dots per inch as it usually is with printers. However, the resolution and the physical monitor size together do let you determine the pixels per inch. Typically, PC monitors have somewhere between 50 and 100 pixels per inch. For example, a 15-inch VGA monitor has a resolution of 640 pixels along a 12-inch horizontal line or about 53 pixels per inch. A smaller VGA display would have more pixels per inch.

Terms and concepts

4. Few common terms used in screen resolutions are:-

(a) Screen size: Actual physical size, measured as the screen's diagonal. For simplicity, all actual screen sizes into four generalized sizes: small, normal, large, and extra-large.

(b) Screen density: The quantity of pixels within a physical area of the screen; usually referred to as dpi (dots per inch). For example, a "low" density screen has fewer pixels within a given physical area, compared to a "normal" or "high" density screen. For simplicity, all actual screen densities into six generalized densities: low, medium, high, extra-high, extra-extra-high, and extra-extra-extra-high.

(c) Orientation: The orientation of the screen from the user's point of view. This is either landscape or portrait, meaning that the screen's aspect ratio is either wide or tall, respectively.

(d) Resolution: The total number of physical pixels on a screen. When adding support for multiple screens, applications do not work directly with resolution; applications should be concerned only with screen size and density, as specified by the generalized size and density groups.

(e) Density-independent pixel (dp): A virtual pixel unit that you should use when defining UI (user Interface)layout, to express layout dimensions or position in a density-independent way.

Liquid Crystal Diode (LCD) Monitors

4. An LCD monitor is one with a fluorescent panel and cold cathode technology. This type of monitor is an improvement over the older cathode ray tube (CRT) monitors, which used a vacuum tube to emit electrons onto the fluorescent panel. LCD offers improvements with almost half the power usage, a mercury-free environment, and low electromagnetic interference (EMI). Also of importance to consumers are the weight reduction and the much slimmer design of about 1/2-inch thick. Liquid crystal diode (LCD) technology is a form of lighting used in computer monitors, laptops, and televisions, along with various other forms of home and outdoor lighting.

Light-Emitting Diode (LED) Monitors

5. Light-emitting diode (LED) computer monitors do not use cold-cathode technology and fluorescent technology. Instead, light diodes illuminate the screen in one of two different ways, or a combination of both. White LED lights are clustered around the rim of the screen and diffuse evenly, called edge lighting. LED lights are also spaced evenly behind the screen, and they are either not controlled or are controlled with a "local dimming" option. If you are looking for an LED monitor, look for this local dimming on/off option.

LED Advantages

6. The advantage of LED backlighting is an even better energy savings, the best on the market, in fact. LED also offers better colour quality, clarity, and faster refresh rates. The local-dimming option found in some models allows fine tuning of colour, especially in the black-and-white ranges. When the black-and-white range is clearer, it provides a better contrasts to the true colours, and therefore a more dynamic and realistic image. LED monitors offer even thinner construction than LCD monitors because of the LED lights around the edge of the panel.

Mobile Screen Resolutions

7. There are lot of display types used in mobile phones. They can be either color or monochrome. Monochrome displays on the other hand can be alphanumeric or graphic. Alphanumeric displays can show only symbols with a constant size, while graphic displays can show fonts of different sizes and animations.

8. The color displays usually are CSTN, TFT, TFD or OLED with a predominant use of TFT displays in current mobile lineups. There are also two types of touch screen displays - capacitive and resistive, which are both based on TFT technology.

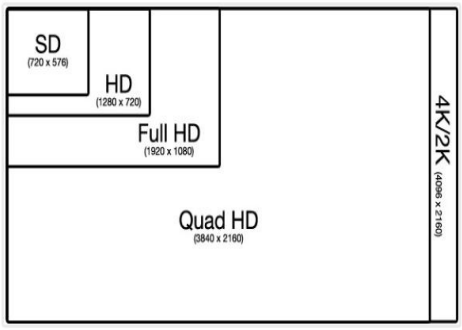
(a) Capacitive: Touchscreens work by sensing the electrical properties of the human body, while RESISTIVE ones operate by sensing direct pressure applied by the user.

(b) Resistive: This type of screens can be activated by pressing not only with human skin but also with a stylus and thus allow handwriting recognition input.

9. Other important displays are:

(a) TFT (Thin Film Transistor): TFT is one of the best Liquid Cristal display technologies in terms of image quality and response time. However, it also consumes more power and is more expensive.TFT, like TFD, is an active-matrix technology. This means a transistor is located next to each pixel, allowing it to be turned on and off individually. This ensures faster response time and greater contrast.

(b) AMOLED display (Active-matrix organic light-emitting diode): AMOLED is an emerging display technology used in portable devices like mobile phones. Active-matrix OLED displays provide the same performance as their passive-matrix OLED counterparts, but they consume significantly less power. This advantage makes active-matrix OLEDs well suited for portable electronics where battery power consumption is critical.



Four resolutions compared: standard definition, full high definition, Quad HD and 4K/2K.
(Credit: Derek Fung/CNET)

10. Common Smartphone Screens: The terms often used to describe smartphone screens:

(a) Retina Display: Apple's proprietary name for its LCD screen, which serves up a 1,136x640 pixel resolution.

(b) HD Super AMOLED: Samsung's name for its high-definition smartphone displays, which use the OLED screen technology.

(c) 1080p: The highest common high-definition screen resolution, measuring 1,920 pixels by 1,080 pixels. Also called "full HD."

(d) 720p: The lower high-definition designation, 1,280 by 720 pixels.

(e) Supersensitive or ultrasensitive: A new technology that lets you operate a touch screen with your fingernail or glove.

(f) PureMotion HD+: Nokia's name for its display with 1,280x768-pixel resolution and various properties.

(g) ClearBlack: Nokia's name for an antiglare filter applied to the screen.

(h) Super LCD: A product name that also describes an LCD screen made in a certain way.

(j) IPS: A type of LCD screen technology known for producing clearer image quality and wider viewing angles, among other traits. It's used in many smartphones.

11. Gorilla Glass: There's also the touch-sensitive panel; various films and filters that might reduce glare, for instance; and the cover glass, which is often bonded to the touch layer. Gorilla Glass is one designer brand of cover glass. Few examples of famous smartphones resolution is given in chart below:

The Digital Disciple's Smartphone Screen Resolution Chart

Device	PPI	Pix H Pixels	Pix W Pixels	Megapixels	Display H Inches	Display W Inches	Front H Inches	Front W Inches	Display Area Sq. Inches	Front Area Sq. Inches	Display %	Aspect Ratio
Apple												
iPhone 6 Plus	401	1,920	1,080	2.07	4.79	2.69	6.22	3.06	12.90	19.03	67.75%	16:9
iPhone 6	326	1,334	750	1.00	4.09	2.30	5.44	2.64	9.41	14.36	65.55%	16:9
iPhone 5 & 5s	326	1,136	640	0.73	3.48	1.96	4.87	2.31	6.84	11.25	60.81%	16:9
iPhone 4 & 4s	326	960	640	0.61	2.94	1.96	4.54	2.31	5.78	10.49	55.12%	3:2
Blackberry												
Z10	356	1,280	768	0.98	3.60	2.16	5.12	2.58	7.76	13.21	58.72%	
HTC												
HTC One (M8)	441	1,920	1,080	2.07	4.35	2.45	5.76	2.78	10.66	16.01	66.59%	16:9
HTC One (M7)	468	1,920	1,080	2.07	4.10	2.31	5.41	2.69	9.47	14.55	65.06%	16:9
HTC One Max	373	1,920	1,080	2.07	5.15	2.90	6.48	3.25	14.90	21.06	70.77%	16:9
HTC One Mini	341	1,280	720	0.92	3.75	2.11	5.20	2.49	7.93	12.95	61.21%	16:9
HTC Desire	252	800	480	0.38	3.17	1.90	4.69	2.36	6.05	11.07	54.63%	5:3
Droid DNA	441	1,920	1,080	2.07	4.35	2.45	5.55	2.78	10.66	15.43	69.11%	16:9
Windows Phone 8X	342	1,280	720	0.92	3.74	2.11	5.21	2.61	7.88	13.60	57.94%	16:9
HTC EVO 4G LTE	312	1,280	720	0.92	4.10	2.31	5.31	2.71	9.47	14.39	65.79%	16:9
Droid Incredible 4G LTE	275	960	540	0.52	3.49	1.96	4.82	2.40	6.85	11.57	59.26%	16:9
HTC One SV LTE	217	800	480	0.38	3.69	2.21	5.04	2.63	8.15	13.26	61.52%	5:3
HTC 8XT	217	800	480	0.38	3.69	2.21	5.20	2.60	8.15	13.52	60.32%	5:3
HTC One X	312	1,280	720	0.92	4.10	2.31	5.31	2.75	9.47	14.60	64.83%	16:9
LG												
LG G2	423	1,920	1,280	2.46	4.54	3.03	5.45	2.79	13.74	15.21	90.33%	16:9
LG G2 Mini	234	960	540	0.52	4.10	2.31	5.10	2.60	9.47	13.26	71.40%	16:9
Lucid 3	234	960	540	0.52	4.10	2.31	5.18	2.60	9.47	13.47	70.30%	16:9
Motorola												
Moto X	316	1,280	720	0.92	4.05	2.28	5.09	2.57	9.23	13.08	70.55%	16:9
Moto G	329	1,280	720	0.92	3.89	2.19	5.11	2.59	8.51	13.23	64.33%	16:9
Droid Maxx	294	1,280	720	0.92	4.35	2.45	5.41	2.80	10.66	15.15	70.39%	16:9
Droid Ultra	294	1,280	720	0.92	4.35	2.45	5.41	2.80	10.66	15.15	70.39%	16:9
Droid Mini	342	1,280	720	0.92	3.74	2.11	4.77	2.41	7.88	11.50	68.54%	16:9
Droid Razr M	256	960	540	0.52	3.75	2.11	4.82	2.40	7.91	11.57	68.38%	16:9
Motorola Photon 4G	256	960	540	0.52	3.75	2.11	5.00	2.63	7.91	13.15	60.15%	16:9
Droid Razr Maxx	256	960	540	0.52	3.75	2.11	5.15	2.71	7.91	13.96	56.68%	16:9
Droid Razr Maxx HD	312	1,280	720	0.92	4.10	2.31	5.19	2.67	9.47	13.86	68.32%	16:9
OnePlus												
One	401	1,920	1,080	2.07	4.79	2.69	6.02	2.99	12.90	18.00	71.64%	16:9
Samsung												
Galaxy S5	432	1,920	1,080	2.07	4.44	2.50	5.59	2.85	11.11	15.93	69.74%	16:9
Galaxy Note 3	386	1,920	1,080	2.07	4.97	2.80	5.95	3.12	13.92	18.56	74.97%	16:9
Galaxy S4	441	1,920	1,080	2.07	4.35	2.45	5.38	2.75	10.66	14.80	72.07%	16:9
Galaxy S4 Mini	256	960	540	0.52	3.75	2.11	4.91	2.41	7.91	11.83	66.85%	16:9
Galaxy S III	306	1,280	720	0.92	4.18	2.35	5.38	2.78	9.84	14.96	65.81%	16:9
Galaxy Note II	265	1,280	720	0.92	4.83	2.72	5.94	3.17	13.12	18.83	69.70%	16:9
Galaxy S III Mini	233	800	480	0.38	3.43	2.06	4.78	2.48	7.07	11.85	59.67%	5:3
Galaxy Mega 6.3	233	1,280	720	0.92	5.49	3.09	6.60	3.46	16.98	22.84	74.34%	16:9
Galaxy S4 Zoom	256	960	540	0.52	3.75	2.11	4.94	2.50	7.91	12.35	64.05%	16:9
Ativ S Neo	308	1,280	720	0.92	4.16	2.34	5.33	2.72	9.71	14.50	67.01%	16:9
Galaxy Stellar	233	800	480	0.38	3.43	2.06	4.80	2.51	7.07	12.05	58.71%	5:3
ATIV Odyssey	233	800	480	0.38	3.43	2.06	4.82	2.51	7.07	12.10	58.47%	5:3
Galaxy Discover	165	480	320	0.15	2.91	1.94	4.44	2.42	5.64	10.74	52.51%	4:3
Galaxy Admire 4G	148	480	320	0.15	3.24	2.16	4.52	2.26	7.01	10.22	68.65%	4:3

Notes:

Special thanks to Phone Arena for their comprehensive phone specs that were used to prepare this chart.
Check them out at www.phonearena.com.

Fig. 2 : Smart Phones Resolution Chart

Conclusion

12. LED monitors and LCD monitors have objective and measurable specifications. Those measures affect your subjective viewing experience. If you are just a regular computer user without advanced imaging needs, you probably will not notice the difference between the two. However, you will notice it in your budget. Naturally, if you have a clunky CRT monitor on your desk, definitely upgrade to either the LCD or LED monitor, as they both offer thin profiles, and are lightweight and energy efficient.

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Overview of Screens Support

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and in the API, a summary of the screen configurations that the system supports, and an overview of the API and underlying screen-compatibility features.

Terms and concepts

Screen size: Actual physical size, measured as the screen's diagonal.For simplicity, all actual screen sizes into four generalized sizes: small, normal, large, and extra-large.

Screen density: The quantity of pixels within a physical area of the screen; usually referred to as dpi (dots per inch). For example, a "low" density screen has fewer pixels within a given physical area, compared to a "normal" or "high" density screen. For simplicity, all actual screen densities into six generalized densities: low, medium, high, extra-high, extra-extra-high, and extra-extra-extra-high.

Orientation: The orientation of the screen from the user's point of view. This is either landscape or portrait, meaning that the screen's aspect ratio is either wide or tall, respectively.

Resolution: The total number of physical pixels on a screen. When adding support for multiple screens, applications do not work directly with resolution; applications should be concerned only with screen size and density, as specified by the generalized size and density groups.

Density-independent pixel (dp): A virtual pixel unit that you should use when defining UI (user Interface)layout, to express layout dimensions or position in a density-independent way.The density-independent pixel is equivalent to one physical pixel on a 160 dpi screen, which is the baseline density assumed by the system for a "medium" density screen.

Range of screens supported

Starting with Android 1.6 (API Level 4), Android provides support for multiple screen sizes and densities, reflecting the many different screen configurations that a device may have. You can use features of the Android system to optimize your application's user interface for each screen configuration and ensure that your application not only renders properly, but provides the best user experience possible on each screen.

To simplify the way that you design your user interfaces for multiple screens, Android divides the range of actual screen sizes and densities into:

- A set of four generalized **sizes**: *small*, *normal*, *large*, and *xlarge*

  > **Note:** Beginning with Android 3.2 (API level 13), these size groups are deprecated in favor of a new technique for managing screen sizes based on the available screen width. If you're developing for Android 3.2 and greater, see Declaring Tablet Layouts for Android 3.2 for more information.

- A set of six generalized **densities**:

- *ldpi* (low) ~120dpi
- *mdpi* (medium) ~160dpi
- *hdpi* (high) ~240dpi
- *xhdpi* (extra-high) ~320dpi
- *xxhdpi* (extra-extra-high) ~480dpi
- *xxxhdpi* (extra-extra-extra-high) ~640dpi

The generalized sizes and densities are arranged around a baseline configuration that is a *normal* size and *mdpi* (medium) density. This baseline is based upon the screen configuration for the first Android-powered device, the T-Mobile G1, which has an HVGA screen (until Android 1.6, this was the only screen configuration that Android supported).

Each generalized size and density spans a range of actual screen sizes and densities. For example, two devices that both report a screen size of *normal* might have actual screen sizes and aspect ratios that are slightly different when measured by hand. Similarly, two devices that report a screen density of *hdpi* might have real pixel densities that are slightly different. Android makes these differences abstract to applications, so you can provide UI designed for the generalized sizes and densities and let the system handle any final adjustments as necessary. Figure 1 illustrates how different sizes and densities are roughly categorized into the different size and density groups.

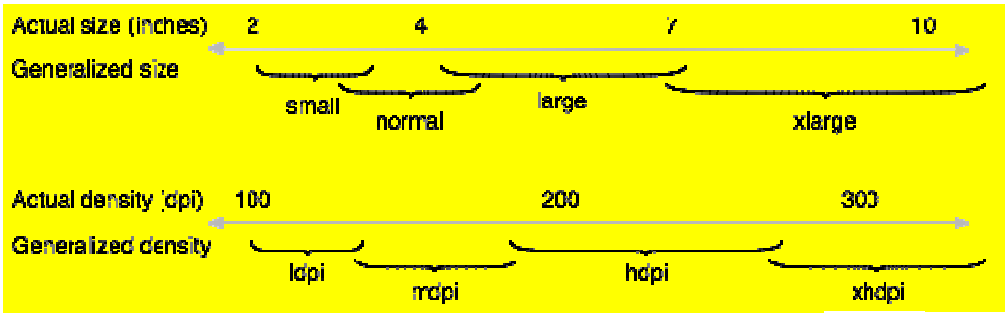

Figure 1. Illustration of how Android roughly maps actual sizes and densities to generalized sizes and densities (figures are not exact).

There are lot of display types used in mobile phones. They can be either color or monochrome. Monochrome displays on the other hand can be alphanumeric or graphic. Alphanumeric displays can show only symbols with a constant size, while graphic displays can show fonts of different sizes and animations.

The color displays usually are CSTN, TFT, TFD or OLED with a predominant use of TFT displays in current mobile lineups. There are also two types of touchscreen displays - capacitive and resistive, which are both based on TFT technology.

CAPACITIVE touchscreens work by sensing the electrical properties of the human body, while RESISTIVE ones operate by sensing direct pressure applied by the user.

The RESISTIVE type can be activated by pressing not only with human skin but also with a stylus and thus allow handwriting recognition input.

Related terms:

CSTN (Color Super Twisted Nematic) STN is a type of LCD display technology. STN is black and white while CSTN is the color version. (C)STN displays are used on lower end devices.

Typically an STN display has worse image quality and response times than a TFT LCD, but is cheaper and more energy efficient.

- TFT (Thin Film Transistor) TFT is one of the best Liquid Cristal Display technologies in terms of image quality and response time. However, it also consumes more power and is more expensive.

  TFT, like TFD, is an active-matrix technology. This means a transistor is located next to each pixel, allowing it to be turned on and off individually. This ensures faster response time and greater contrast.

- TFD (Thin Film Diode) TFD is a kind of Liquid crystal display (LCD) technology. It is an active-matrix technology which means that a diode is situated next to each pixel making it possible for the pixels to be turned on and off individually. This allows a quicker response time and more contrast than passive-matrix technologies.

  TFD takes the excellent picture quality and the fast response of TFT displays and combines them with the low power consumption and cost of the STN ones.

- OLED (Organic Light-Emitting Diode) A display technology that consists of small dots of organic polymer which emit light when charged with electricity.

  OLED displays have several advantages over the LCDs. They are thinner, lighter, brighter, need less power, have better viewing angles, contrast and response time for video and animation. OLEDs are also cheaper and easier to manufacture.

  On the other hand, LCDs offer better legibility in bright ambient light.

- AMOLED display (Active-matrix organic light-emitting diode) AMOLED is an emerging display technology used in portable devices like mobile phones. Active-matrix OLED displays provide the same performance as their passive-matrix OLED counterparts, but they consume significantly less power.

  This advantage makes active-matrix OLEDs well suited for portable electronics where battery power consumption is critical.

- Capacitive TouchscreenCapacitive touch sensors are used either as buttons or on touchscreens. They work by sensing the electrical properties of the human body instead of pressure and generally they don't work with a stylus so they don't allow handwriting recognition. However, capacitive touchscreens feel more sensitive than their resistive counterparts.

  Capacitive touch screens are also considered more durable than resistive touch screens.

- Resistive touchscreenResistive touchscreens operate by sensing direct pressure applied by the user. It can be activated by pressing it not only with a finger but also with a stylus (unlike the competing capacitive technology).

  A resistive touch screen consists of a touch layer placed on top of a standard display. The touch layer normally includes two transparent electrical layers separated by a small gap.

  Pressing the display's surface causes the two separate layers to come into contact, which creates an electrical connection that can be sensed and located.

The smartphone industry tosses around a whole bucket of names and numbers to describe the viewing experience on your smartphone screen: ClearBlack, 1080p, Retina, AMOLED, supersensitive. And the list goes on.

Some designations are marketing monikers cooked up to give one company an edge; others are more scientific. That isn't to say that flashy names like Apple's Retina Display are worthless and empty. Sometimes the trademarked name masks a unique process too technical to quickly explain.

To make things simpler, here are some common terms you might see attached to smartphone screens, and some factors that actually go into making your screen a standout, like the physical screen materials, LCD versus OLED, brightness, color accuracy, and pixel resolution. Got all that? Good. Now let's dive in.

Common smartphone screens
The terms often used to describe smartphone screens aren't always so clear.

- **Retina Display**: Apple's proprietary name for its LCD screen, which serves up a 1,136x640 pixel resolution.
- **HD Super AMOLED**: Samsung's name for its high-definition smartphone displays, which use the OLED screen technology.
- **1080p**: The highest common high-definition screen resolution, measuring 1,920 pixels by 1,080 pixels. Also called "full HD."
- **720p**: The lower high-definition designation, 1,280 by 720 pixels.
- **Supersensitive or ultrasensitive**: A new technology that lets you operate a touch screen **with your fingernail or glove.**
- **PureMotion HD+**: Nokia's name for its display with 1,280x768-pixel resolution and various properties.
- **ClearBlack**: Nokia's name for an antiglare filter applied to the screen.
- **Super LCD**: A product name that also describes an LCD screen made in a certain way.
- **IPS**: A type of LCD screen technology known for producing clearer image quality and wider viewing angles, among other traits. It's used in many smartphones.

There's also the touch-sensitive panel; various films and filters that might reduce glare, for instance; and the cover glass, which is often bonded to the touch layer. **Gorilla Glass** is one designer brand of cover glass.

Pixel density
Generally speaking, though, the more pixels you have per inch (ppi), the better your picture. So smaller screens should look crisper than larger screens when both have the same pixel density.

That said, Apple claims that the human eye can't really distinguish more than 326 pixels per inch. Screens with 1080p HD resolutions typically hover in the 5-inch range, delivering pixel densities in the high 300s to 400s.

	HTC One	Samsung Galaxy S4	iPhone 5
Screen size	4.7 in.	5 in.	4 in.
Resolution	1,920x1,080	1,920x1,080	1,136 x 640
Pixel density	468ppi	441ppi	326ppi

While pixel density is an important factor in the smoothness of the overall picture, it's just one facet of many. And when it comes to comparing smartphone pixel density with that of a tablet, you don't necessarily need the same high density

Brightness and color
It's as true with smartphones as it is with HDTVs: people's eyes are often drawn to the brightest and punchiest of the pack, blue blues and green greens that are rich and saturated, but just not true to life.

Oversaturated color gets tiring, and just looks cheap or fake when you're viewing something so familiar that your eye knows it's being fooled -- a video or photo of something you just know isn't that candied.

Some OLED devices do contain settings to dial down the juice, but you'll have to go hunting in the sub-menus to find more realistic tones.