# Graphics Standards

Graphics in technical documentation have a primary goal of communicating information to the reader. Graphics standards are intended to make sure that illustrations are consistent and professional.

*When to use graphics*

- Use graphics to illustrate conceptual information covered in the text. Use Visio to create block diagrams, state machine diagrams, and flowcharts.
- Keep graphics simple and to the point. Avoid details that might distract readers from the intended message, or are not discussed in associated text.
- Use white space effectively by grouping objects logically, but avoid clutter. Balance diagram objects and allow enough white space (about 33 percent) to accommodate text translation.
- Use graphics in the introduction topic of cluttered UIs. For example, include an annotated screenshot of the workspace of PSoC Designer in the introduction section or topic to indicate various panels, tools, and windows through callouts.
- Use graphics (illustrations, photographs) to highlight physical access to hardware such as connecting boards, a connector, or a jumper.
- Use sparingly—use only when the absence of a screenshot would force you to add oddly paraphrased text. If the screenshot doesn't require annotation, then the screenshot is not required at all.
- Generally, have a screenshot that shows the initial workspace if it has several panels, windows, pods, etc. Such a tour of the workspace is best contained within an "Introduction to the workspace" section.

*What to avoid*

- Block diagrams or flowcharts with three or fewer elements, or with only a linear flow. A linear flow is best presented in a numbered list.
- Screens or panels where only a one or a few controls are provided, such as a Browse button so that there is no scope of ambiguity on which control to use.
- OS controls such as Browse and Select File or accurately labeled controls, such as "Select file to add".
- Wizards, such as installation wizards. There are only two paths once an install wizard is launched: go with the installation or quit. Neither requires a visual aid or description.
- Photographs of boards or products that have clearly demarcated sections with text and color coding. For example, the silkscreen is most often annotated with component notations, so there is no need to include it in the document.

## General Guidelines

*Color*

Use color sparingly in technical documents. Most technical illustrations can be adequately rendered in black and white.

See Cypress brand guidelines for the approved color palette.

*Text*

- Make it consistent with the size of body text in the document..
- Use parallel constructions. Begin text with all verbs or with all nouns.

- Punctuate complete sentences.
- Use title case in boxes. See **Error! Reference source not found.**.
- Leave 33 percent white space for translations.
- Avoid crossing other graphical elements with arrows.

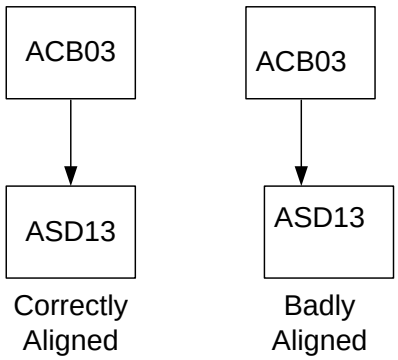
*Arrows*

- Draw all arrows horizontally and vertically. Do not use diagonal arrows in flow charts.
- Whenever possible, place arrows so they exit boxes from the bottom or right sides and they enter boxes from the top or left sides.
- Make arrows touch the boxes – not fall short of or enter them.

*Alignment*

Align and center individual objects and groups of objects relative to each other when appropriate. Avoid gaps or overhangs. Center text horizontally and vertically relative to its associated object, and center downward arrows horizontally as illustrated in Figure 1.

Figure 1. Diagram Example




All figures and figure titles are always centered; figure titles go above a diagram. Even if the figure title is a sentence, use title case in the figure title without a period at the end. See **Error! Reference source not found.**.

Do not indent figures and figure titles to line up with nested lists. The reduced space can make it necessary to size graphics too small to read.

## Flowcharts

Use flowcharts to show a workflow or process.

- Phrase decision box text in the form of a question that is answered with a Yes or a No.
- Embed in the arrow the answer to the decision question or put the answer right next to the arrow.
- Ideally, within a flow diagram, ensure that the yes and no decisions are handled consistently if it is possible to do so. For example, within one flow chart, all no answers go to the right and all yes answers exit the bottom.

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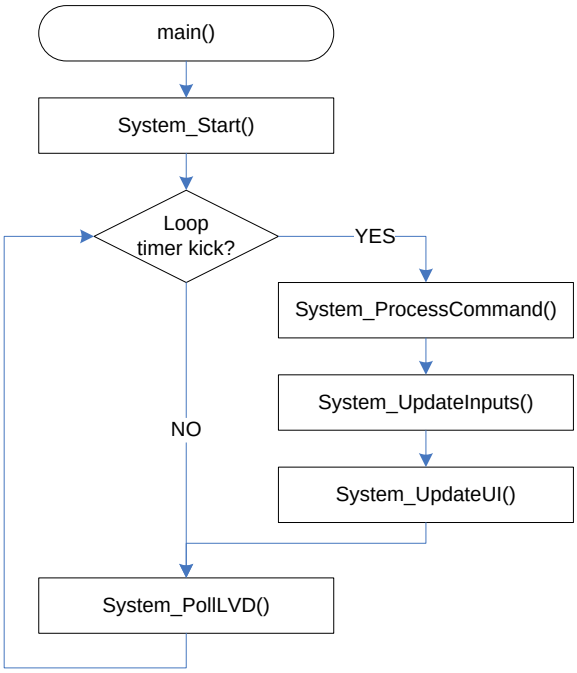
Figure 2. Flowchart Example




## Graphs and Charts

Some data, especially performance data, is best displayed in graphs. For that information to be useful to customers, it needs to be formatted consistently.

In general, graphs are one-half page wide and one-third page high, with allowances for a title with a figure number and a few lines of text. Larger graphs are full-page width. This is consistent with the data presentation of most semiconductor manufacturers. Graphs must drop in directly, without scaling to fit in the final document. Make sure all parts of the graph are legible.

See Excel Settings.

## Photographs

Photographs are used in technical documents for the following reasons:

- Show “how to” do something from the point of view of the customer performing the specified action.
- Show what it looks like or how to find it. A “how to find it” photo may be enhanced with callouts. Consider that a professionally done line drawing is sometimes more effective than a photograph, especially when showing items with little visual contrast.
- Show what is included in a package, kit, or assembly.

Follow these guidelines when using photographs in technical documents:

- Photo is clear and in focus.

- Photo is well lit. Use a professional flash or natural light. If you use a flash, take care to eliminate distracting reflections.
- The subject is on a white or neutral background with no clutter. Items not essential to the photo (e.g., power cords, stray resistors, or the edge of a soda can) should not appear in the photo.
- Where possible, the photo is tightly cropped to show only the item of interest and enough of the surroundings to provide proper context.
- Where possible, items with strong horizontal or vertical lines are shot straight on so that the lines remain parallel to the photo edges.
- Make sure that Cypress owns the right to reproduce any photographs you use.
- Seek files that meet the following minimum requirements:

## Screen Captures (Screenshots)

When using screen captures in a document, use the following guidelines. Also see .

- Make sure text is readable so that viewers understand what they are looking at. All screen shots must be readable. Any exceptions must be justified and approved by the BU.
- Keep the screen captures approximately at the same size or lower than the original size. Text within the screenshot should appear smaller or equal to the text in the body content.
- Keep screenshots at a consistent scale relative to the original resolution. 60% scale for screenshots is readable. If the screenshot is too big and must be smaller scale (50%, even less), care must be taken to keep scale consistent where possible.
- When taking screenshots, omit the title bar which most often shows the software version, and usually has a color theme specific to the version or operating system. This avoids having to update the screenshot if the product version/OS changes.
- Keep the screen capture within the document's text boundaries where possible. This is done by manually cropping and pasting pieces of the screen capture or resizing it.
- When all or part of a screen capture is white and matches the page color where it appears, manually draw a border around the screen capture.
- Depending on the monitor and setup of the computer, screen captures may appear different in color. Try to keep all screen captures for the same document in the same colors and hues.
- Unless the screen capture is part of a larger graphic, it must have a major caption.
- Do not crop in a way that partially shows objects. For example, do not display half of an icon or scroll bar.

## Schematic Diagrams

Schematic diagrams exist in different forms within Cypress documents and serve different purposes. Those in datasheets are normally high level and used for examples, while those in application notes are often design-specific and implement real equipment designs.

A schematic is a visual representation of a circuit. As such, its purpose is to communicate a circuit to someone else. A good schematic does this quickly, clearly, and with a low chance of misunderstanding. If a schematic is likely to mislead or confuse a person reviewing same, it is a bad schematic, regardless of whether it is technically correct.

For code example documents, get the text on the schematic edited by a writer, and then update the screenshot.

Some basic rules for schematics:

- Use component designators

  While component designators are usually automatic in schematic capture programs, schematics-creating tools, such as Visio, do not generate them and they must be added manually. These designators (e.g., R1, C4, Q7, U3) make the circuit easier to describe and discuss. They can also remove clutter from the schematic by placing much of each component's detailed information in a separate bill-of-materials (BOM) table.

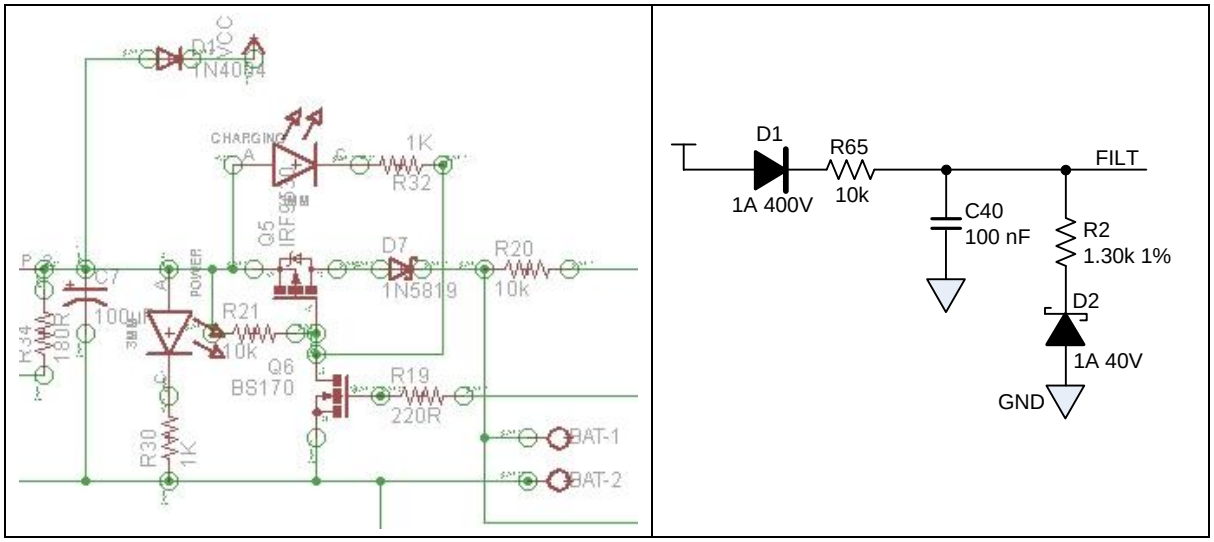
  There are a common set of component designators that should be used unless there is a specific reason not to.

| Designator | Device | Designator | Device | Designator | Device |
|---|---|---|---|---|---|
| C | Capacitor | J | Connector (Jack) | Q | BJT, SCR, SCS |
| D (or CR) | Diode | J | Jumper | R | Resistor |
| D (or VR) | Zener or Breakdown Diode | K | Relay | S | Switch |
| D | LED | L | Inductor | T | Transformer |
| D | TVS diode | M | MOSFET | TP | Test Point |
| F | Fuse | P | Connector (Plug) | U (or IC) | Integrated Circuit |
| J | JFET | PS | Power Supply | X (or Y) | Crystal |

- Clean text placement

  Schematic capture programs place text, values, and parameters based on a generic component definition. When the component gets rotated or flipped, you often get text that is upside down, on top of the component, or interfering with an adjacent component. This is not acceptable in customer-facing documentation (e.g., datasheets and application notes).

  On the left is a clip of a schematic from a standard tool. The associated text elements are all over the place, and unreadable in many places. On the right is a schematic that is clean and readable.

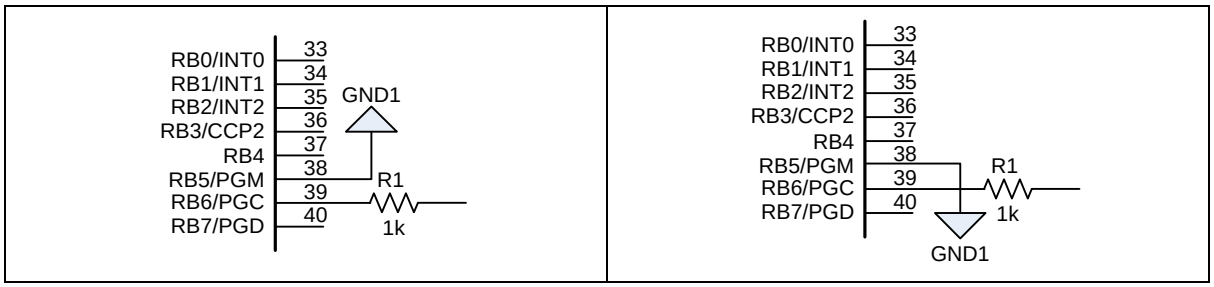



- Schematic layout should flow

The schematic should not be a jumbled mess of signals. Power should flow from top to bottom on a page, with higher (positive) voltages toward the top and lower (ground and negative) toward the bottom. Likewise, signals should flow left to right across the page with inputs on the left and outputs on the right. While this is not possible all the time, this helps to show how the circuit is expected to work.

One exception to this is feedback signals. By design, their signal flow is in the opposite direction (right to left) on the page. These signals should be marked with a left-pointing arrow at some point on the page.

Power connections should also follow the proper direction of flow. The ground connection on the left was drawn going up because resistor R1 was placed too close to the ground symbol. The solution is to move the resistor (as shown on the right) and route the ground correctly.




- Use proper symbols

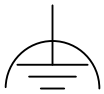
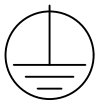
  For a schematic to be understood the same way by all who read it, the symbols used in it must be common across the document and well understood in the industry. Things like diodes, resistors, transistors, and logic gates (e.g., AND, OR, NOR, XOR, NAND, NOT inverter) must follow standard forms that should not be changed.

  One of the bigger issues is exactly which reference for graphic symbols should be followed. IEC has standards 60417-1 and 60617-1, while ANSI and IEEE have standards Y32.2 and 315. There are many places in which these standards are aligned, and others where they are in disagreement.

- Ground symbols

  IEC standard 60417-1 documents five ground symbols, shown in the following table along with their ANSI/IEEE equivalent descriptions. These symbols (within the IEC standard) are also called out by a reference number. These ground symbols are primarily for use at the equipment level, but may also be applied to component-level schematics. The matching ANSI standard documents many of the same symbols but with slightly different descriptions.

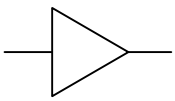
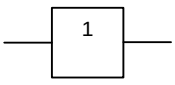
| Symbol/Number | IEC Description | ANSI/IEEE Description |
|---|---|---|
|  5017 | **Earth (ground)** To identify an earth (ground) terminal in cases where neither the symbol 5018 nor 5019 is explicitly required. | **Earth ground** A direct connection to the earth. A direction connection to a vehicle's or an airplane's frame that serves the same function as an earth ground. |

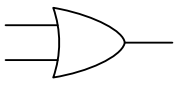
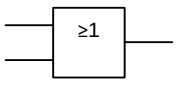
| Symbol/Number | IEC Description | ANSI/IEEE Description |
|---|---|---|
|  5018 | **Noiseless (clean) earth (ground)**<br>To identify a noiseless (clean) earth (ground) terminal, e.g., of a specially designed earthing (grounding) system to avoid causing the equipment to malfunction. | **Noiseless ground**<br>Used to indicate a noiseless earth ground. |
|  5019 | **Protective earth (ground)**<br>To identify any terminal that is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground) electrode. | **Safety ground**<br>Used to indicate a ground connection that serves a safety function against electric shock. |
|  5020 | **Frame or chassis ground**<br>To identify the frame or chassis terminal. | **Chassis ground**<br>A connection to a chassis, or frame, or similar connection of a printed circuit board and may be completely different from earth ground. |
|  5021 | **Equipotentiality**<br>To identify the terminals that, when connected, bring the various parts of an equipment or of a system to the same potential, not necessarily being the earth (ground) potential, e.g., for local bonding. | |
|  | | **Signal Ground / Return**<br>Used to indicate common return connections. |

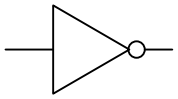
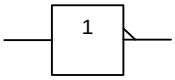
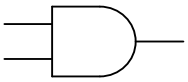
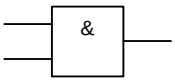
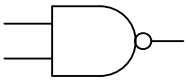
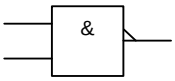
For the bulk of Cypress schematics in datasheets and application notes, the Signal Return is normally the proper symbol. However, when the schematic documents product- or equipment-level connections, some of the other ground symbols may also be appropriate.

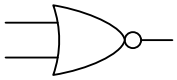
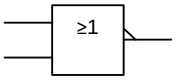
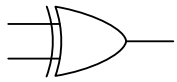
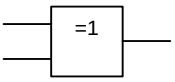
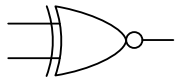
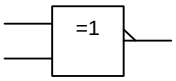
- Logic symbols

  Our industry uses two competing camps for logic symbols: common and IEEE. The common form is what most of us learned in school, while the IEEE form is much more structured and formal. While the IEEE form (documented in IEEE STD 91 and IEEE STD 991) does provide more information to the user on larger (e.g., MSI) logic functions, it does not map well to programmable devices like PSoC where many pins can support logic or analog functions. Here are examples of basic gates in both the common and IEEE formats.

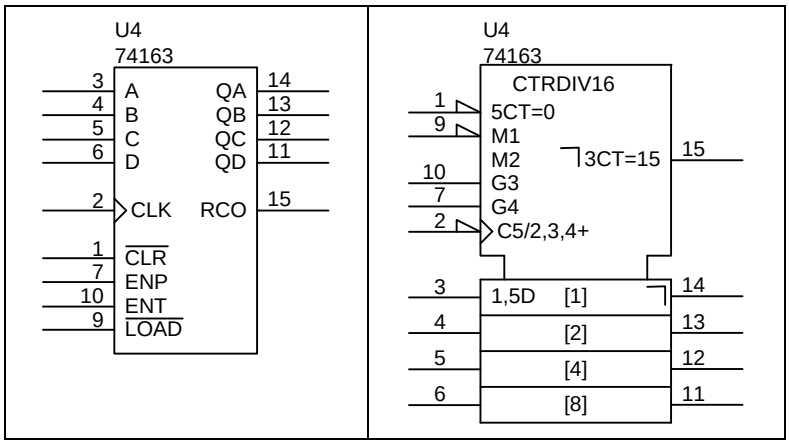
| Gate | Common Form | IEEE Form |
|---|---|---|
| Buffer |  |   |

| Gate | Common Form | IEEE Form |
|---|---|---|
| OR |  |   |

| Gate | Common Form | IEEE Form |
|---|---|---|
| Inverter (NOT) |  |  |
| AND |  |  |
| NAND |  |  |

| Gate | Common Form | IEEE Form |
|---|---|---|
| NOR |  |  |
| XOR |  |  |
| XNOR |  |  |

At the MSI level, IEEE symbols break the component into an upper control portion and a lower datapath portion. A 74163 4-bit loadable counter is shown here in both the common and IEEE forms.




Because of the limited use of the IEEE format (Texas Instruments is one of the few adopters), Cypress diagrams remain with the common format for both basic gates and for more complex devices.

- Text placement

  When schematic elements are created, text associated with each component must be aligned to the component body, and not just randomly placed on the page. As shown in the previous figure for the 74163 counter, text outside the left edge of the component body is right-justified, and text inside the left edge of the component body is left-justified. When signals exit the right side of a component, the opposite occurs, such that text outside the right edge of the component body is left-justified and text inside the right edge of the component body is right-justified.

  When signals enter or exit the top or bottom edges of the component body, the same rules apply, such that interior and exterior text is aligned with the edge of the component body.

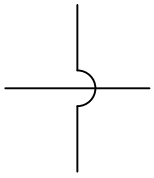
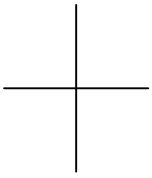
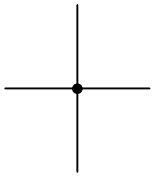
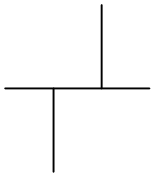
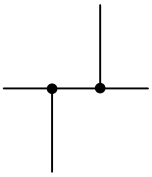
  Horizontal text is always placed to read left-to-right, just like the text in this paragraph. When text is rotated for vertical placement, the text must always read top-to-bottom (just like the spine of a book on a shelf). Regardless of whether the text applies to the signals on the upper or lower edge of the component, vertical text must read top-to-bottom.

- Signal Connections

  One of the primary purposes of a schematic is to document connectivity between components. To reduce complexity, many of these connections are made by net name instead of a drawn wire or signal. When connecting signals by name, the net names must match exactly in spelling and case (e.g., NET1 is not the same as Net1).

  When connecting signals by a drawn line, some older practices are considered archaic and should never

appear in a Cypress document, while others should be avoided to prevent errors in interpretation. These occur mainly on how to show when nets are connected and when they cross over (no connection). The following figures show how these should be implemented in our documents.

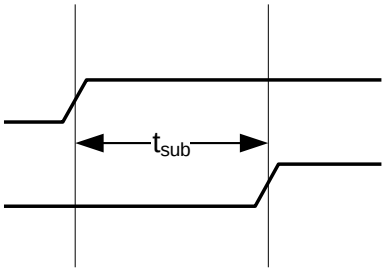
| Type | Not Acceptable | Acceptable | Preferred |
|---|---|---|---|
| Cross-over |  |  | |
| Connection |  |  |  |

*Timing Diagrams*

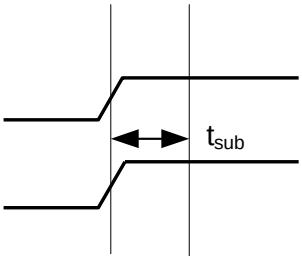
Cypress timing diagrams should conform as closely as possible to the following rules within the limits of the software used to create the diagram.

- Every waveform is labeled with a corresponding signal name or other relevant identifier. Signal names are in all capital letters.
- All timing lines in Visio 2007 are size 5, which is 1.2 pt.
- Vertical solid lines are used to indicate points of reference for timing parameters. Reference lines are Visio 2007 size 1, which is 0.24 pt.
- Logic level transitions are either fast or slow. Fast transitions are shown with lines at a 90° angle from the horizontal portion of the signal. Slow transitions are shown with a diagonal segment at a 60° angle from the horizontal portion of the signal.

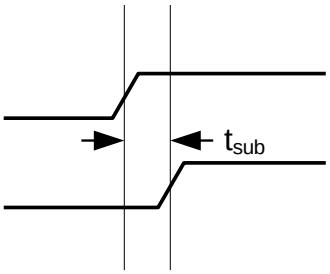
- Signal names are right aligned and do not touch the signal lines.
- The left and right ends of all signal lines are vertically aligned.
- The height of all signals in a diagram is the same and there is uniform space between them. For maximum legibility, use a full signal height space between adjacent signals.
- Place parameter arrows and the label between two points of reference when possible.



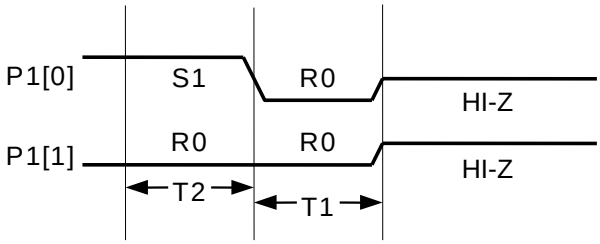
- Place the arrows between the points of reference and the label to the right if there is not enough room for both the arrows and the label between the lines.




- Place the arrows outside the points of reference and the label to the right as a last resort.

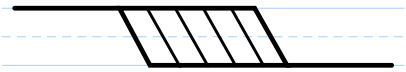
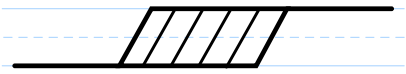



- If a point of reference line is shared, the parameters on either side of the reference are vertically offset from each other for maximum clarity.

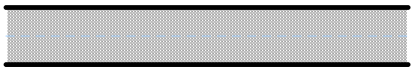
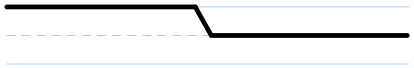



- These notations have special meanings within timing diagrams (blue lines are for reference only).

Table 1. Special Notations in Timing Diagrams

| Notation | Input Waveform | Output Waveform |
|---|---|---|
|  | Must be steady-state high level | Will be steady-state high level |
|  | Must be steady-state low level | Will be steady-state low level |
|  | High- to low-level changes allowed within the interval shown[a] | Will change from high to low level within the interval shown |
|  | Low- to high-level changes allowed within the interval shown[a] | Will change from low to high level within the interval shown |

[a] Cross hatching is thinner than timing lines (Visio line weight 3 in this example) and spaced approximately 0.1 in. apart at the same angle as the logic level transition.

| Notation | Input Waveform | Output Waveform |
|---|---|---|
|  | Do not care[b] | Level unknown or changing |
|  | NA for standard logic inputs; identifies a transition to the MID state for 3-level select inputs | Center line represents high-impedance (HI-Z) state |

[b] Do not care is a cross hatched fill pattern. Visio pattern 04 is used in the example.

# Practical Tips

## Excel Settings

When creating performance graphs for component and device datasheets, use the following settings in Excel:

- Half-page width: 5.2 cells at 64 pixels per cell
- Full-page width: 11 cells at 64 pixels per cell
- Height: 14 cells at 17 pixels per cell
- Text: Scale, axis labels, embedded trace identifiers in 8-pt Arial font
- X axis units in line above X axis title
- Y axis title is rotated 90° counterclockwise, adjacent to Y axis scale
- Axes should be reasonable whole numbers where possible
- Line weight = second narrowest for noisy data (for example, spectrum analyzer)
- Line weight = second heaviest for single-line data, color is discouraged

### *Formatting in Documents*

The graphs are placed in the document in table cells, with the title as a text line in the same cell as the graph (NOT as part of the graph, as this allows the editor to more easily control the figure number). Use a separate default-height empty row of cells between images as a separator. Lines for the table are hidden or set to width of zero thus do not print. For this example, it is easier to control paragraph formatting in Word using tables than it is using columns.

Figure A. Input Noise Voltage versus Frequency

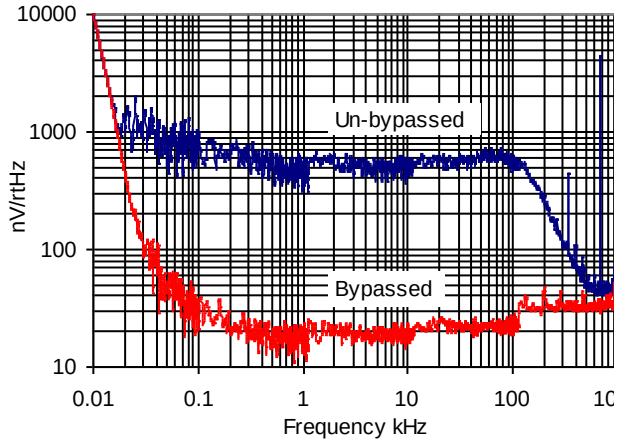



Figure B. Mean Offset Voltage versus Temperature

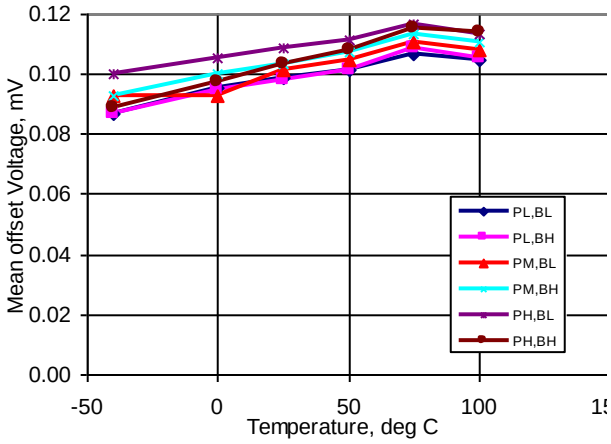
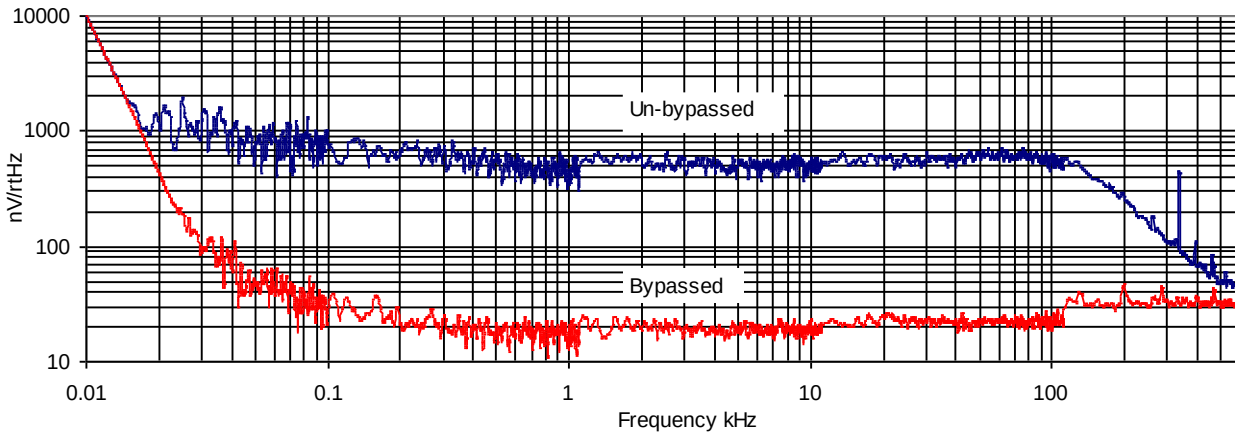



Figure C. Input Noise Voltage versus Frequency




## Visio Settings

When graphics and illustrations are created in Visio, use the "Fit size to contents" option (File > Page Setup > Page Size in Visio 2007; Fit to drawing in Visio 2013 and later) before importing them to your source document.

- Use the following line and arrow weight attributes:
  - Line weight is 0.75 pt in FrameMaker and Word, and #3 in Visio 2007 for all lines and object lines (which outline parts).
  - Arrows are solid black-filled triangles, medium weight (Visio arrow head style 13).

- All timing lines in Visio 2007 are size 5, which is 1.2 pt.
- Vertical solid lines are used to indicate points of reference for timing parameters. Reference lines are Visio 2007 size 1, which is 0.24 pt.

## Screenshots

- Depending on the monitor and setup of the computer, screen captures may appear different in color. Develop all screen captures for your presentation on the same computer and consistently use the same Windows desktop background settings on that computer.