

# External Library

## 1.0

## Features

- The library provides documentation for external components

## General Description

The Off-Chip library in the Component Catalog provides a way for you to mix external and internal components on the same schematic. This makes it possible to improve documentation and better understand the internal schematic and entire design. The components in this library cover the most common components that are most likely to be placed on the periphery of a PSoC device. These components consist of resistors, capacitors, transistors, inductors, switches, and others. The library is not intended to supply every possible part, but should support a wide range of designs. You can easily create your own part or parts library if your design includes a custom or unique component.

This library consists of the following individual components. The table lists the components and the Component Catalog display name for each component defined by this document. Additional components may be added in future releases.

Component Name	Component Catalog Display Name
Battery	Off-Chip/Power/Battery
BridgeRect	Off-Chip/Diodes/Bridge Rectifier
Capacitor	Off-Chip/Passive/Capacitor
Connector20	Off-Chip/Electro-Mechanical/Connector (1-20 pins)
Crystal	Off-Chip/Passive/Crystal
Diode	Off-Chip/Diodes/Diode
ExtBuffer	Off-Chip/Active/Buffer
ExtComp	Off-Chip/Active/Comparator
ExtInverter	Off-Chip/Active/Inverter
ExtOpAmp	Off-Chip/Active/OpAmp

Component Name	Component Catalog Display Name
Fuse	Off-Chip/Passive/Fuse
GND	Off-Chip/Power/Ground
Inductor	Off-Chip/Passive/Inductor
ISource	Off-Chip/Active/Current Source
JFET_N	Off-Chip/Transistors/N-Channel JFET
JFET_P	Off-Chip/Transistors/P-Channel JFET
LED	Off-Chip/Diodes/LED
Microphone	Off-Chip/Sensors/Microphone
Motor	Off-Chip/Electro-Mechanical/Motor (DC)
Motor3PH	Off-Chip/Electro-Mechanical/Motor (3 Phase)
NFET_En	Off-Chip/Transistors/N-Channel FET (Enhancement Mode)
NFET	Off-Chip/Transistors/N-Channel FET (Depletion Mode)
NPN	Off-Chip/Transistors/NPN Transistor
PFET_En	Off-Chip/Transistors/P-Channel MOSFET (Enhancement Mode)
PFET	Off-Chip/Transistors/P-Channel FET (Depletion Mode)
PhotoDiode	Off-Chip/Diodes/Photo Diode
PhotoResistor	Off-Chip/Sensors/Photo Resistor
ProtoTrans	Off-Chip/Transistors/Photo Transistor
PNP	Off-Chip/Transistors/PNP Transistor
Potentiometer	Off-Chip/Passive/Potentiometer
Power	Off-Chip/Power/Power
Relay	Off-Chip/Electro-Mechanical/Relay

Component Name	Component Catalog Display Name
Resistor	Off-Chip/Passive/Resistor
Schottky	Off-Chip/Diodes/Schottky Diode
SCR	Off-Chip/Diodes/SCR
Speaker	Off-Chip/Electro-Mechanical/Speaker
StrainGauge	Off-Chip/Sensors/Strain Gauge
SwitchDT	Off-Chip/Electro-Mechanical/Switch (SPDT - DPDT)
SwitchSPST	Off-Chip/Electro-Mechanical/Switch (SPST)
TestPoint	Off-Chip/Electro-Mechanical/TestPoint
Thermistor	Off-Chip/Sensors/Thermistor
Thermocouple	Off-Chip/Sensors/Thermocouple
Transformer	Off-Chip/Passive/Transformer
Triac	Off-Chip/Diodes/Triac
Varactor	Off-Chip/Diodes/Varactor Diode
VREG	Off-Chip/Active/Voltage Regulator
VSource	Off-Chip/Active/Voltage Source
Zener	Off-Chip/Diodes/Zener Diode

The following diagrams show an overview of each component and its placement in the library menu.

**Figure 1. External Component Library Components**



**Figure 2. Placement in the Component Catalog**

## Common Component Parameters

Almost all external components have the following common parameters. If an external component has unique parameters, the descriptions are provided in the specific Component Parameters section.

Basic Built-in	
Parameter	Value
Include_In_Netlist	true
Instance_Name_Visible	true
SPICE_Model	D

### Include\_In\_Netlist

This parameter is reserved for future use when the SPICE template is supported.

### Instance\_Name\_Visible

This parameter indicates whether the instance name is visible. If this parameter is set to **true** (default), the instance name is visible.

### SPICE\_Model

This parameter is reserved for future use when the SPICE template is supported.

## Battery

### Symbol Shape



### Terminals

The terminals of the Battery component are:

- Pos – Positive battery terminal
- Neg – Negative battery terminal

## Component Parameters

### Voltage

The **Voltage** parameter is displayed on the schematic next to the component. It will also be used for the SPICE template when that template is supported. Default **Voltage** value is **6V**.

---

## Bridge Rectifier

### Symbol Shape



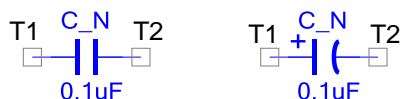
### Terminals

The terminals of the Bridge Rectifier component are:

- P – Positive output of the rectifier terminal
  - N – Negative output of the rectifier terminal
  - AC1 – AC input terminal
  - AC2 – AC input terminal
- 

## Capacitor

### Symbol Shape



## Terminals

The terminals of the Capacitor component are:

- T1 – Capacitor terminal (positive if polarized)
- T2 – Capacitor terminal (negative if polarized)

## Component Parameters

### Capacitance

This parameter sets the capacitance of the capacitor. Default capacitance value is **0.1uF**.

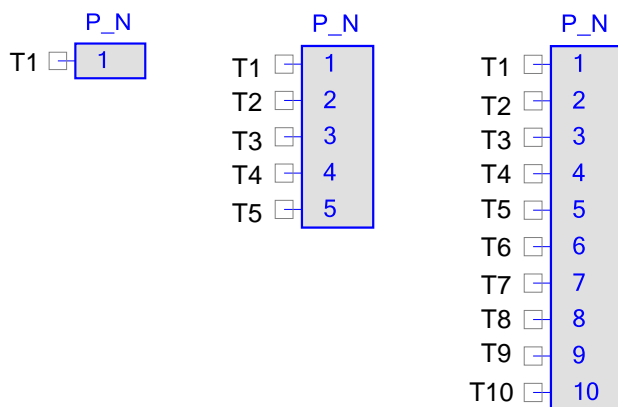
### Capacitor\_Type

This parameter sets the type of the capacitor: **Polarized** or **Non-Polarized**. The default capacitor type is **Non-Polarized**.

---

## Connector20

### Symbol Shape



## Terminals

The terminals of the Connector20 component are:

- T1 to T20 – Connector pins, up to 20 terminals



## Component Parameters

### Pin\_Count

This parameter sets the number of available pins in the connector. This count can vary from 1 to 20. The default pin count is **5**.

---

## Crystal

### Symbol Shape



### Terminals

The terminals of the Crystal component are:

- T1 – Crystal terminal 1
- T2 – Crystal terminal 2

## Component Parameters

### Value

This parameter sets the frequency of the crystal. Default frequency is **10MHz**.

---

## Diode

### Symbol Shape



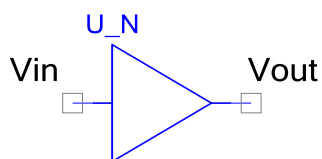
## Terminals

The terminals of the Diode component are:

- A – Anode terminal
  - K – Cathode terminal
- 

## ExtBuffer

### Symbol Shape



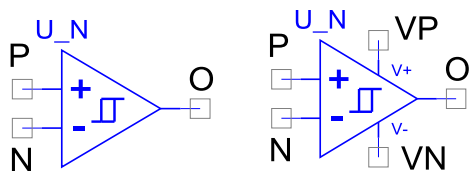
## Terminals

The terminals of the Diode component are:

- Vin – Input terminal
  - Vout – Output terminal
- 

## ExtComp

### Symbol Shape



## Terminals

The terminals of the Comparator component are:

- P – Non-Inverting input terminal

- N – Inverting input terminal
- O – Comparator output terminal
- VP (Label V+) – Positive supply terminal
- VN (Label V-) – Negative supply terminal

## Component Parameters

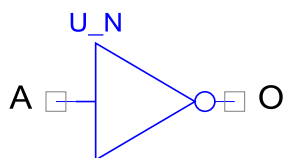
### Show\_Power\_Pins

This parameter is used to show power pins in the comparator. Setting this parameter to **true** shows the power pins. The default is **false**.

---

## ExtInverter

### Symbol Shape



### Terminals

The terminals of the Diode component are:

- A – Input terminal
  - O – Output terminal
-

## ExtOpAmp

### Symbol Shape



### Terminals

The terminals of the Opamp component are:

- P – Noninverting input terminal
- N – Inverting input terminal
- O – Opamp output terminal
- VP (Label V+) – Positive supply terminal
- VN (Label V-) – Negative supply terminal

### Component Parameters

#### Show\_Power\_Pins

This parameter is used to show power pins in the opamp. Setting this parameter to **true** shows the power pins. The default is **false**.

## Fuse

### Symbol Shape



## Terminals

The terminals of the Fuse component are:

- T1 – Fuse terminal 1
  - T2 – Fuse terminal 2
- 

## GND

### Symbol Shape



## Terminals

The terminals of the Ground component are:

- T1 – Ground node connection terminal

## Component Parameters

### Supply\_Name

This parameter sets the ground name of the supply used. Default supply name is **Vss**.

### Symbol\_Type

This parameter sets the symbol type of the ground used: Signal Ground, Chassis Ground, or Earth Ground. Default symbol type is **Signal Ground**.

---

## Inductor

### Symbol Shape



## Terminals

The terminals of the Inductor component are:

- T1 – Inductor terminal 1
- T2 – Inductor terminal 2

## Component Parameters

### Inductance

This parameter sets the inductance of the inductor used. The default is **10uH**.

### Inductor Core

This parameter sets the type of the inductor core used: Iron Core or Air Core. The default is **Iron Core**.

---

## Isource

### Symbol Shape



## Terminals

The terminals of the Current Source component are:

- P – Positive terminal
- N – Negative terminal

## Component Parameters

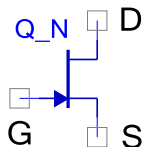
### Current

This parameter is used to set the current output of the current source. Default current value is **DC 10m**.

---

## JFET\_N

### Symbol Shape



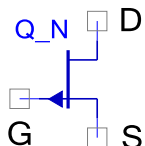
### Terminals

The terminals of the Diode component are:

- D – Drain terminal
  - S – Source terminal
  - G – Gate terminal
- 

## JFET\_P

### Symbol Shape



### Terminals

The terminals of the Diode component are:

- D – Drain terminal
  - S – Source terminal
  - G – Gate terminal
-

# LED

## Symbol Shape



## Terminals

The terminals of the LED component are:

- A – Anode terminal
  - K – Cathode terminal
- 

# Microphone

## Symbol Shape



## Terminals

The terminals of the Microphone component are:

- T1 – Terminal 1
- T2 – Terminal 2

## Component Parameters

### Value

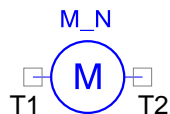
This parameter sets the resistance of the microphone in ohms. The default value is **10K**.

---



# Motor

## Symbol Shape



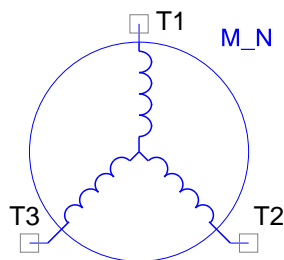
## Terminals

The terminals of the Motor component are:

- T1 – Terminal 1
  - T2 – Terminal 2
- 

# Motor3PH

## Symbol Shape



## Terminals

The terminals of the Motor3PH component are:

- T1 – Terminal 1
  - T2 – Terminal 2
  - T3 – Terminal 3
-

## NFET\_En

### Symbol Shape



### Terminals

This section describes the various terminals of the NFET\_En component.

- D – Drain terminal
  - S – Source terminal
  - G – Gate terminal
- 

## NFET

### Symbol Shape



### Terminals

The terminals of the NFET (Depletion Mode) component are:

- D – Drain terminal
  - S – Source terminal
  - G – Gate terminal
-

# NPN Transistor

## Symbol Shape



## Terminals

The terminals of the NPN Transistor component are:

- E – Emitter terminal
- B – Base terminal
- C – Collector terminal

## Component Parameters

### Model

This parameter sets the model number of the transistor being used: 2N2222, 2N3904, FZT849, ZTX849, ZTX1048A, 2N4124, 2N3391A, 2N5089, 2N5210, 2N2219A, 2N4401, 2N5550, 2N2369, 2N5769, 2N3055. Default is **2N3391A**.

---

# PFET\_En

## Symbol Shape



## Terminals

The terminals of the PFET\_En component are:

- D – Drain terminal

- S – Source terminal
  - G – Gate terminal
- 

## PFET

### Symbol Shape



### Terminals

The terminals of the PFET (Depletion Mode) component are:

- D – Drain terminal
  - S – Source terminal
  - G – Gate terminal
- 

## Photo Diode

### Symbol Shape



### Terminals

The terminals of the Photo Diode component are:

- A – Anode terminal
- K – Cathode terminal

## Component Parameters

### Current

This parameter sets the maximum current that can be passed through the diode. The default value is **1mA**.

---

## Photo Resistor

### Symbol Shape



### Terminals

The terminals of the Photo Diode component are:

- T1 – Terminal 1
- T2 – Terminal 2

## Component Parameters

### Value

Sets the resistance. The default value is **10K**.

---

## Photo Transistor

### Symbol Shape



## Terminals

The terminals of the Photo Transistor component are:

- E – Emitter terminal
- C – Collector terminal

## Component Parameters

### Current

This parameter sets the maximum current that can be passed through the photo transistor. The default value is **10mA**.

---

## PNP Transistor

### Symbol Shape



## Terminals

The terminals of the PNP Transistor component are:

- E – Emitter terminal
- B – Base terminal
- C – Collector terminal

## Component Parameters

This parameter sets the model number of the transistor being used: AN2907, 2N3906, 2N4126, 2N5087, 2N2905, 2N4403, 2N5401, 2N5771. Default is **AN2907**.

---

# Potentiometer

## Symbol Shape



## Terminals

The terminals of the Potentiometer component are:

- T1 – Terminal 1(CW)
- T2 – Terminal 2(CW)
- W – Wiper terminal

## Component Parameters

### Value

This parameter sets the resistance of the potentiometer in ohms. The default is **10K**.

### Wiper\_Position

This parameter sets the position of the wiper in potentiometer in range 0 to 100. The default is **50**.

---

# Power

## Symbol Shape



## Terminals

The terminals of the Power component are:

- T1 – Power node connection terminal

## Component Parameters

### Supply\_Name

This parameter sets the name of the power supply used. The default is **Vdd**.

---

## Relay

### Symbol Shape



## Terminals

The terminals of the Relay component are:

- T1 – Coil Terminal 1
- T2 – Coil Terminal 2
- C1 – Common terminal for pole 1
- NO1 – Normally open terminal for pole 1
- NC1 – Normally closed terminal for pole 1
- C2 – Common terminal for pole 2
- NO2 – Normally open terminal for pole 2
- NC2 – Normally closed terminal for pole 2



## Component Parameters

### Coil\_Resistance

This parameter sets the resistance of the coil in relay. Default resistance value is **50 ohms**.

### Relay\_Type

This parameter sets the type of the relay used: SPDT or DPDT. Default relay type is **DPDT**.

---

## Resistor

### Symbol Shape



### Terminals

The terminals of the Resistor component are:

- T1 – Terminal 1
- T2 – Terminal 2

## Component Parameters

### Value

This parameter sets the resistance of the resistor used in ohms. Default resistance value is **10K**.

---

## Schottky Diode

### Symbol Shape



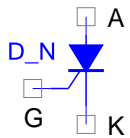
## Terminals

The terminals of the Schottky Diode component are:

- A – Anode terminal
  - K – Cathode terminal
- 

## SCR

### Symbol Shape



## Terminals

The terminals of the SCR component are:

- A – Anode terminal
  - K – Cathode terminal
  - G – Gate terminal
- 

## Speaker

### Symbol Shape



## Terminals

The terminals of the Speaker component are:

- T1 – Terminal 1
- T2 – Terminal 2

## Component Parameters

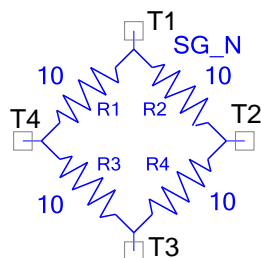
### Coil\_Resistance

This parameter sets the coil resistance of the speaker in ohms. The default is **8**.

---

## Strain Gauge

### Symbol Shape



## Terminals

The terminals of the StrainGauge component are:

- T1 – Top terminal
- T2 – Right terminal
- T3 – Bottom terminal
- T4 – Left terminal

## Component Parameters

### Resistance\_R1

This parameter sets the resistance R1 in StrainGauge. Default value is **10**.



**Resistance\_R2**

This parameter sets the resistance R2 in StrainGauge. Default value is **10**.

**Resistance\_R3**

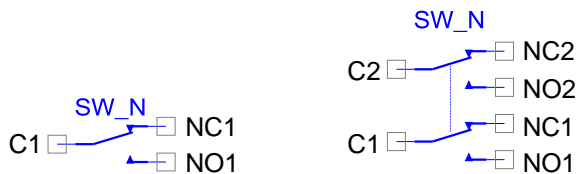
This parameter sets the resistance R3 in StrainGauge. Default value is **10**.

**Resistance\_R4**

This parameter sets the resistance R4 in StrainGauge. Default value is **10**.

## SwitchDT

### Symbol Shape



### Terminals

The terminals of the SwitchDT component are:

- C1 – Common terminal for pole 1
- NO1 – Normally open terminal for pole 1
- NC1 – Normally closed terminal for pole 1
- C2 – Common terminal for pole 2
- NO2 – Normally open terminal for pole 2
- NC2 – Normally closed terminal for pole 2

### Component Parameters

**Switch\_Type**

This parameter sets the type of switch used, **DPDT** or **SPDT**. The default is **DPDT**.

# SwitchSPST

## Symbol Shape



## Terminals

The terminals of the SwitchSPST component are:

- T1 – Switch terminal 1
  - T2 – Switch terminal 2
- 

# Test Point

## Symbol Shape



## Terminals

The terminals of the Test Point component are:

- T1 – Net node connection terminal

## Component Parameters

### Net\_Name

This parameter sets the net name of the test point used. The default name is **TP**.

---

# Thermistor

## Symbol Shape



## Terminals

The terminals of the Thermistor component are:

- T1 – Terminal 1
- T2 – Terminal 2

## Component Parameters

### Value

This parameter sets the resistance of the thermistor. The default is **25K**.

---

# Thermocouple

## Symbol Shape



## Terminals

The terminals of the Thermocouple component are:

- P – Positive terminal
- N – Negative terminal

## Component Parameters

### Voltage

This parameter sets the voltage of the thermocouple. Default voltage is **10mV**.

---

## Transformer

### Symbol Shape



### Terminals

The terminals of the Transformer component are:

- P1 – Primary winding terminal 1
- P2 – Primary winding terminal 2
- PCT – Primary winding center tap
- S1 – Secondary winding terminal 1
- S2 – Secondary winding terminal 2
- SCT – Secondary winding center tap

## Component Parameters

### Center\_Tap

This parameter sets whether a center tap is present in the transformer. If this parameter is set to **false** (default), a center tap is absent.

### Core\_Type

This parameter sets the type of the core used in the transformer, **Iron Core** or **Air Core**. **Iron Core** is the default setting.



### Primary Inductance

This parameter sets the inductance of the primary coil in the transformer. Default is **10uH**.

### Secondary inductance

This parameter sets the inductance of the secondary coil in the transformer. Default is **10uH**.

---

## Triac

### Symbol Shape



### Terminals

The terminals of the Triac component are:

- T1 – Terminal 1
  - T2 – Terminal 2
  - G – Gate terminal
- 

## Varactor

### Symbol Shape



### Terminals

The terminals of the Varactor component are:

- A – Anode terminal



- K – Cathode terminal
- 

## VREG

### Symbol Shape



### Terminals

The terminals of the Voltage Regulator component are:

- VIN – Input Voltage terminal
- VOUT – Output Voltage terminal
- REF – Reference terminal

### Component Parameters

#### Voltage

This parameter sets the regulated output voltage of the Voltage Regulator. Default value is **3.3V**.

---

## VSource

### Symbol Shape



## Terminals

The terminals of the Voltage Source component are:

- P – Positive terminal
- N – Negative terminal

## Component Parameters

### Voltage

This parameter sets the output voltage of the voltage source. Default is **DC 5V**.

Voltage source is not specific to AC or DC. You can specify Voltage source type using Voltage parameter. You can set value of Voltage parameter e.g. to "3V DC" or "3Vpp AC 1kHz" to specify AC or DC source.

---

## Zener

### Symbol Shape



## Terminals

The terminals of the Zener Diode component are:

- A – Anode terminal
- K – Cathode terminal

## Component Parameters

### Voltage

This parameter sets the voltage of the Zener used in the circuit. Default Zener voltage value is **4.7V**.

---

## Component Changes

Version	Change
Rev. *D	Minor datasheet edits.
Rev. *C	Minor datasheet edits.
Rev. *B	The word “Annotation” was changed to “External” and “Off-Chip” to reflect that these components do not implement actual functionality but do document the design on the context of the target board. The version of these components was not changed. Likewise, the library file name was not changed to maintain compatibility with previous versions of PSoC Creator.
	Added External Inverter, External Buffer, Photo Resistor, N-Channel and P-Channel JFETs components.
	Added list of available components with Component Catalog display name for each component.
	Added overview diagrams for each component and its placement in the Component Catalog.
	Moved Common Component Parameters to one section.

© Cypress Semiconductor Corporation, 2011-2017. This document is the property of Cypress Semiconductor Corporation and its subsidiaries, including Spansion LLC (“Cypress”). This document, including any software or firmware included or referenced in this document (“Software”), is owned by Cypress under the intellectual property laws and treaties of the United States and other countries worldwide. Cypress reserves all rights under such laws and treaties and does not, except as specifically stated in this paragraph, grant any license under its patents, copyrights, trademarks, or other intellectual property rights. If the Software is not accompanied by a license agreement and you do not otherwise have a written agreement with Cypress governing the use of the Software, then Cypress hereby grants you a personal, non-exclusive, nontransferable license (without the right to sublicense) (1) under its copyright rights in the Software (a) for Software provided in source code form, to modify and reproduce the Software solely for use with Cypress hardware products, only internally within your organization, and (b) to distribute the Software in binary code form externally to end users (either directly or indirectly through resellers and distributors), solely for use on Cypress hardware product units, and (2) under those claims of Cypress’s patents that are infringed by the Software (as provided by Cypress, unmodified) to make, use, distribute, and import the Software solely for use with Cypress hardware products. Any other use, reproduction, modification, translation, or compilation of the Software is prohibited.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CYPRESS MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS DOCUMENT OR ANY SOFTWARE OR ACCOMPANYING HARDWARE, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. To the extent permitted by applicable law, Cypress reserves the right to make changes to this document without further notice. Cypress does not assume any liability arising out of the application or use of any product or circuit described in this document. Any information provided in this document, including any sample design information or programming code, is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Cypress products are not designed, intended, or authorized for use as critical components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or system could cause personal injury, death, or property damage (“Unintended Uses”). A critical component is any component of a device or system whose failure to perform can be reasonably expected to cause the failure of the device or system, or to affect its safety or effectiveness. Cypress is not liable, in whole or in part, and you shall and hereby do release Cypress from any claim, damage, or other liability arising from or related to all Unintended Uses of Cypress products. You shall indemnify and hold Cypress harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of Cypress products.

Cypress, the Cypress logo, Spansion, the Spansion logo, and combinations thereof, WICED, PSoC, CapSense, EZ-USB, F-RAM, and Traveo are trademarks or registered trademarks of Cypress in the United States and other countries. For a more complete list of Cypress trademarks, visit [cypress.com](http://cypress.com). Other names and brands may be claimed as property of their respective owners.

