**The general steps to setup up MIPI CSI camera solution with CX3 – KBA225748**

**Question: What’re the general steps to setup up MIPI camera solution with CX3?**

**Answer:** This KBA will explain the general steps to setup up MIPI camera soliton with CX3.

CX3 is a MIPI CSI-2 to super speed USB bridge controller. The physical layer of CX3 is D-PHY. Consequently, CX3 could interface with MIPI CSI-2 sensors but not MIPI CSI-3 sensors. Please check the datasheet of CX3 for more information.

1. Open EZ-USB SDK. Click the icon below to open the CX3 configuration tool.

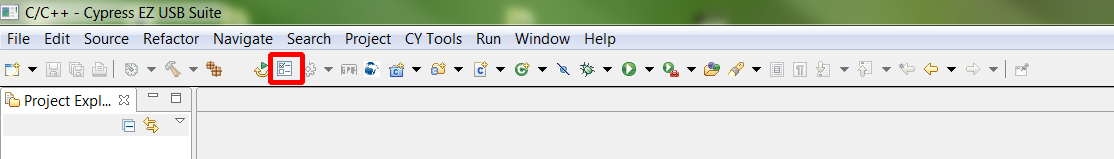


Fig.1 Start a new project

1. Fill up the blanks.

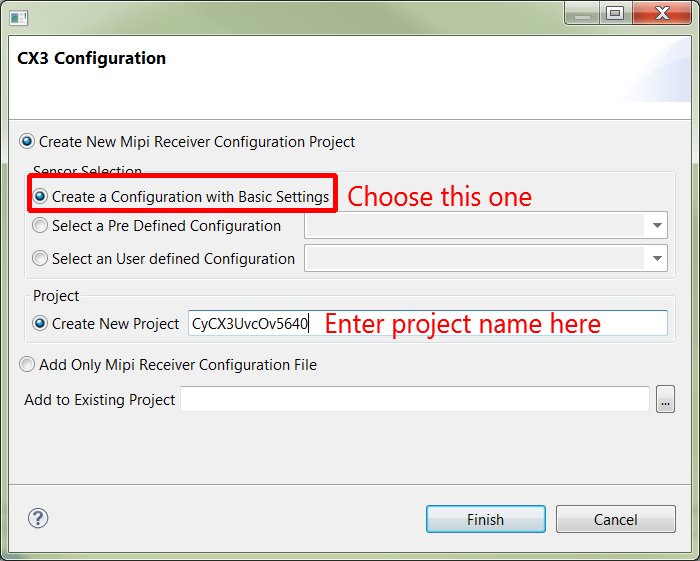


Fig.2 Enter the project name

1. After clicking finish, a new project will appear in the explorer panel with blank MIPI configuration.

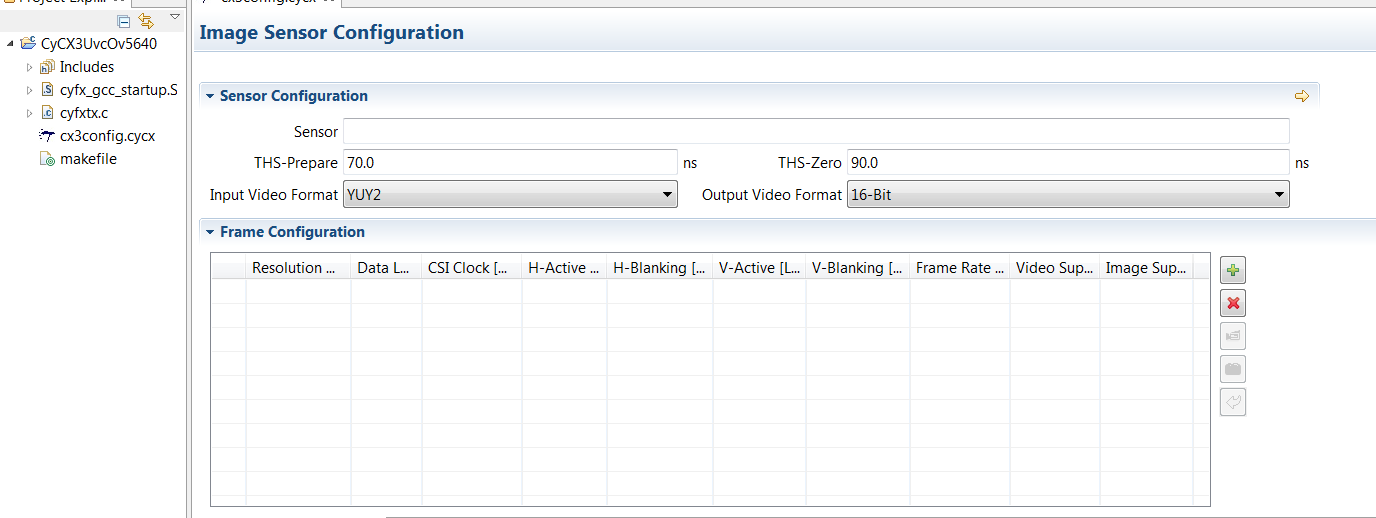


Fig 3. New project

1. Enter the necessary parameters for a new resolution.

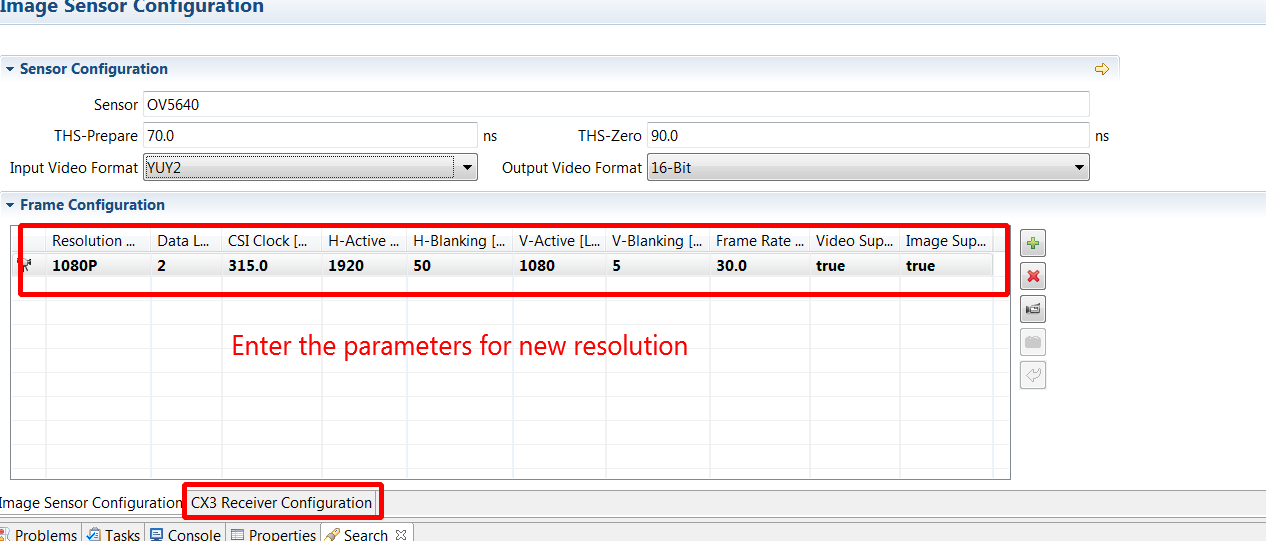


Fig 4. Specify a new resolution

Note: Some explanations to the terminologies above.

* THS-prepare and THS-zero are the values defined in MIPI CSI-2 D-PHY specification. Contact the sensor vendor to get the correct value.
* Input video format: this item is used to identify the data format from image sensor or ISP.
* Output video format: this item is used to choose whether 16-bit or 24-bit parallel data bus is used inside of CX3.

1. Click *CX3 receiver configuration* tab. The tool will lock the values in previous tab so that they are not editable here. If you want to modify them, back to the image sensor configuration page.

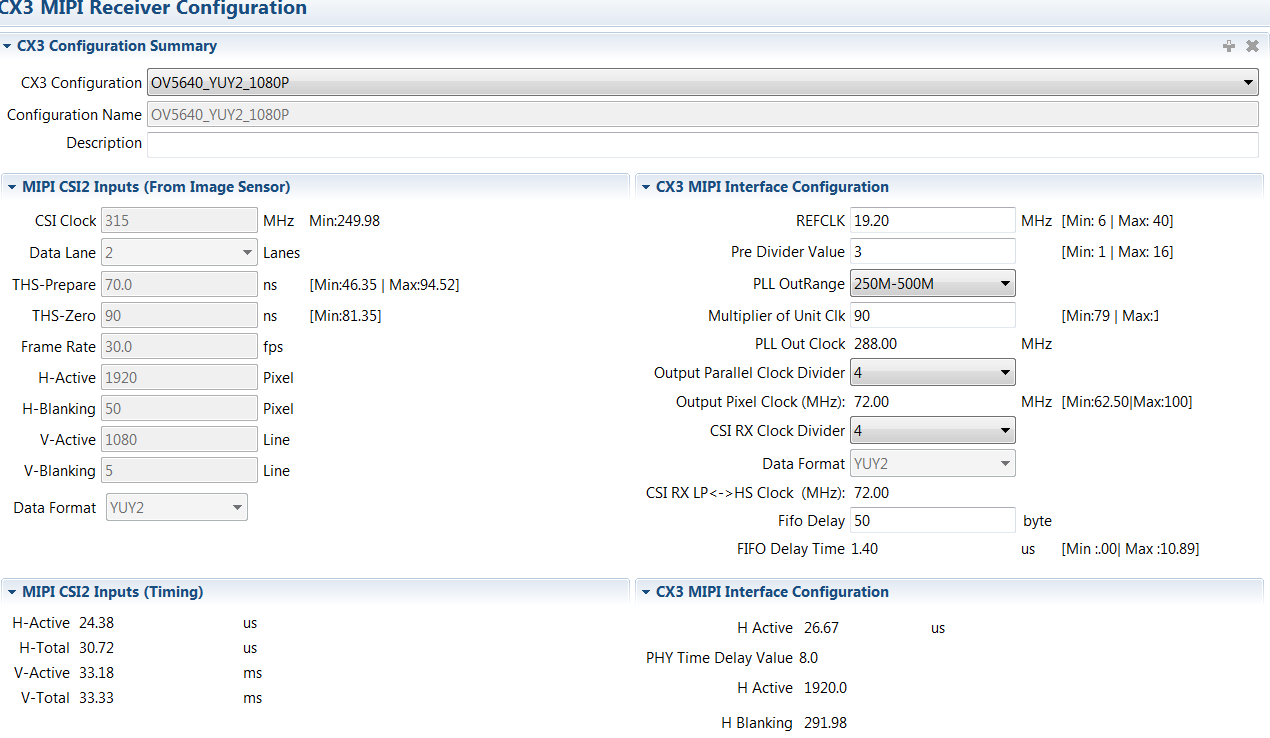


Fig 5. CX3 MIPI Receiver configuration page

1. Configure the MIPI CSI-2 block clocks. These values will be applied to configure the PLL of CX3. For more information, please refer to the section 1.7 of CX3 TRM [here](http://www.cypress.com/documentation/technical-reference-manuals/ez-usb-cx3-technical-reference-manual). It is also available at the install path of EZ-USB FX3 SDK C:\Program Files (x86)\Cypress\EZ-USB FX3 SDK\1.3\doc\firmware. Enter or choose the value according to your application. Make sure that all the values are within the correct range.

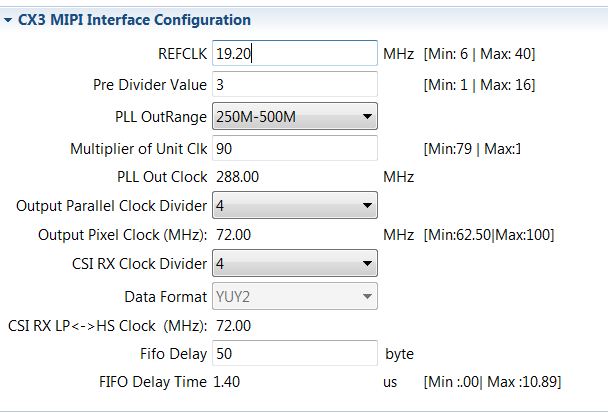


Fig 6. CX3 MIPI CSI-2 block clocks

1. Check and save all the files generated by the configuration tool.

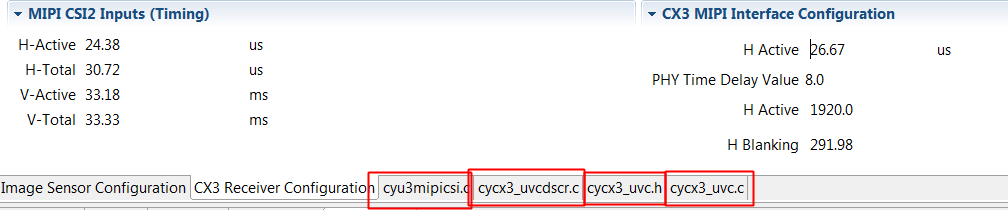




Fig 7. Save all the files

Note:

* Four files will be created here. Cyu3mipicsi.c consists of the structure(s) CyU3PMipicsiCfg\_t which will be used to configure the PLL of CX3 according to the required resolution(s). Cycx3\_uvcdscr.c is the descriptor file which includes all the structures for communication with the host. Cycx3\_uvc.h is the necessary header file. Last but not the least, cycx3\_uvc.c includes the all the codes to enumerate CX3 as an UVC device, initialize CX3 and start/stop video streaming.
* It could be found that cyu3imgasensor.c and cyu3imgagesensor.h are also created and saved in this project. Cyu3imagesensor.c is used to configure, control the image sensor. In this file, some structures are defined without valid value. Customer just need to replace them with actual settings. Generally used APIs such as CyCx3\_ImageSensor\_Sleep, CyCx3\_ImageSensor\_Wakeup, CyCx3\_ImageSensor\_Trigger\_Autofocus are also stated here. Add the corresponding codes into these definitions.

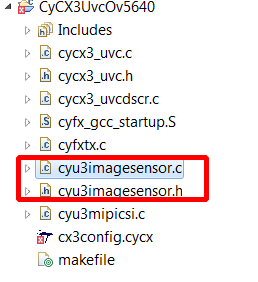


Fig 8. Project explorer view

* The configuration tool helps customer setup a new project template from the very beginning. Customer could modify the project to implement other applications basing on this template. In addition, the tool can be used to check the values when adding a new resolution to the previous project. Be careful to the save icon since it will overwrite the whole file if have written codes to implement other functions.

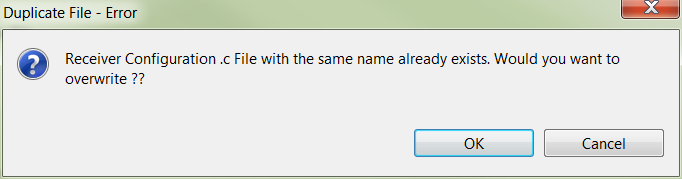


Fig 9. Be careful to overwrite a file

1. Save and build the project. EZ-USB SDK should generate image file. If failed, check the console output message to locate the root cause.

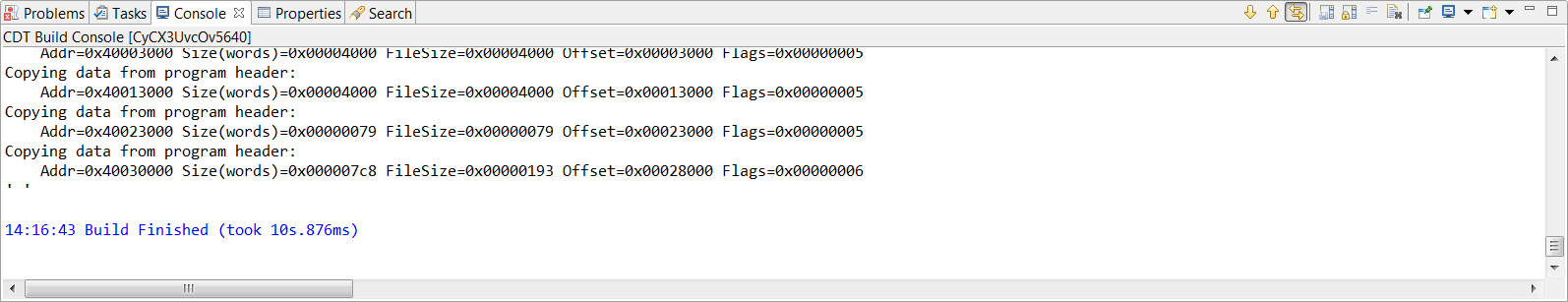


Fig 10. Build the project

**Related Categories:**

**Keywords:** [CX3 MIPI CSI-2]

**Product Family:** [SS\_USB, HSLS\_USB]

**Related Tags:** [Select the Tags by clicking the checkbox associated to the Tags]

Clocks & Buffers Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Adapter | Algorithm | Bitmap | Buffer | Bypass | CLKMAKER |
| CML | CY3670 | CY3672 | CY3675 | CY36800 | Cascade |
| Charge Pump | Clock Tree | Clocks | Clocks and Buffers | ComLink | Crystal Oscillators |
| CyClock | CyClockWizard | CyberClocks | CyberClocks Online | Cycle to Cycle | DCXO |
| Delay | Deterministic Jitter | Differential | Divider | Duty Cycle | EMI |
| Enhanced Performance | Ent | Entrant | FNOM | Factory | Failsafe |
| Fanout | FastEdge | Feedback | Field | Flexo | Frequency |
| Frequency Margining | Function Select | Generators | Ground Bounce | HPB | HSTL |
| Hershey Kiss | I2C | IBIS Model | Impedance | Input | InstaClock |
| Inverted | Jed | Jedec | Jitter | LVCMOS | LVDS |
| LVPECL | Layout | Lexmark Profile | Loop Bandwidth | MoBL | Modulation Rate |
| Multiplier | NZDB | Non-Volatile Memory | OTP | Offset | Oscillator |
| Output | Overvoltage | PCI Express | PLL | PPM | PREMIS |
| Period | Phase | Phase Noise | Power Supply Noise | Program | Programmable |
| Propagation | Pullability | RMS | Rambus | Random Jitter | Reference |
| Rise Fall Time | RoboClock | Schematic | Serial | Signal Integrity | Skew |
| Socket | Specialty Clocks | Spread % | Spread Aware | Spread Profile | Spread Spectrum |
| Synthesizer | TCXO | TIE | Termination | Thermal | Translator |
| Undervoltage | UniClock | Unit Interval | VCO | VCXO | Volatile Memory |
| Voltage Droop | XCG | XDR | XO | Xtal | ZDB |
| Zepto |  |  |  |  |  |

Lighting & Power Control Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Board Layout | Boost Regulator | Buck Regulator | CY3261 | CY3267 | CY3268 |
| CY3269 | Color Mixing | Current Sense | DALI | DMX | FN Pins |
| HB LEDs | Hysteretic Controller | MOSFETs | MPPT | Modulators | PrISM |
| Programming | SSDM | Schematics | Switching Regulators | Trip | Voltage Regulator |

Wireless/RF Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2.4 GHz | 8DR | Antenna | Audio | AgileHID | Bridge |
| CY3271 | CY3630 | CY4636 | CY4672 | CYFI | CYFISNP |
| CYRF6936 | CYRF7936 | Channel | DDR | DSSS | GFSK |
| HID | HUB | IRQ | Interference Avoidance | Keyboard | Link Budget |
| Mouse | Node | PMU | PN Code | PRoC | PRoC-CS |
| PRoC-EMB | PRoC-TT | PRoC-USB | PRoC-UI | Power Amplifier | Preamble |
| Pseudo Noise code | RF | RSSI | Range | Remote | SCD |
| SDR | SOP | SPIM | Star-Network Protocol | Streaming | Trackpad |
| Wireless | Wireless USB | Wireless USB LP | Wireless USB LS | Wireless USB LR | Wireless USB NL |
| Wireless Capacitive Touch |  |  |  |  |  |

Memory Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Address Bus | Async | Automotive | Autostore | BHE / BLE | BUSY |
| Battery Backup | Burst | Bus Contention | Clock | DDR | Data Bus |
| Data Integrity | Data Retention | Datasheet | Dual Port | Echo Clocks | FIFO |
| FPGA | Flags | Flowthrough | Fullflex | FRAM | HOLD |
| HD-FIFO | HSB | I2C | INT | Impedance Matching | Interface |
| Interleaving | JTAG | Junction Temperature | Low Power | MSL | Migration Path |
| MoBL | Models | NoBL | ODT | Obsolete | PCB |
| PLL / DLL | Packaging | Parallel | Parity | Part Decoder | Part Difference |
| Password Protection | Pin Configuration | Pipeline | Power Consumption | Power On State | Processor |
| QDR | Qualification Reports | Quality | RECALL | RTC | Race Condition |
| Read | SER | SPCM | SPI | SRAM | Serial |
| Signal Integrity | Sync | Technology | Termination | Timing | Vcap |
| Vddq | Voltage Levels | Vref | Width / Depth Expansion | Write | nvSRAM |
| uPower |  |  |  |  |  |

 Interface Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 10B/8B Decoder | 3 Level Inputs | ALDEC | ATM | Altera | BIST |
| BSDL | Biasing | CDR | CML | CPLD | CY3900i |
| CY3950i | CYUSBISRPC | Cable | Cable Driver | Channel Bonding | Clock Multiplier |
| Clocking Modes | Coaxial Cable | Copper Cable | Coupling | Crystal | Current |
| DVB | Data Character | Data rate | Delta39K | Deserialize | Deserializer |
| Dual Channel | EPLD | EPROM | ESCON | Elasticity Buffer | Equalizer |
| Error | Evaluation Board | FPGA | Fiber Optics | Flash370i | Framer |
| Framing Character | Framing Mode | Gigabit Ethernet | Hex | High Speed Serial Links | Hotlink |
| HotlinkI | HotlinkII | IP | Isr | Jtag | LFI |
| LVTTL | Logic Level | Loop Back | Macrocell | Max340 | Model |
| Non-Volatile | OC-1 | OC-2 | OC-3 | Operating System | PAL |
| PECL | PLD | PLL | Parallel Input | Parallel Output | Parity |
| Phase Align Buffer | PoF | Point To Multi Point | Point To Point | Power Supply | Programming |
| Quad Channel | Quantum38K | Receiver | Recovered Clock | Redundant Outputs | Reference Clock |
| Report File | Reprogrammable | SMA | SMPTE | SMPTE-259M | SMPTE-292M |
| SONET | SPICE | SPLD | STAPL | SVF | Serial Input |
| Serial Output | Serializer | Simulator | Size | Special Character | Specification |
| TTL | Temperature | Third Party Tool | Transceiver | Transmitter | USBISRPC Cable |
| Ultra37K | User Guide | VHDL | Verilog | Voltage | Warp |
| Word Sync Sequence |  |  |  |  |  |

[PSoC](javascript:toggle1353();) 1 Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ADC | ADCINC | Analog | Analog Bus | API | Assembly Language |
| Boot.asm | Bootloader | BSDL Files | Build Errors | Calibration | Capsense |
| Clock | Clock Synchronization | Cloning | Column Clock | Communication | Comparator |
| Compiler | Counter | CPU Speed | Crystal | CT Block | DAC |
| Debugging | Decimator | Delta Sigma ADC | Development Kit | Digital | Dynamic Reconfiguration |
| ECO | EEPROM | Errata | Filter | Flash | Flash Security |
| Global Resources | GPIO | Hex File | I2C | I2C-USB Bridge | ICE Cube |
| Installation | Internet Explorer | Interrupt | ISR | ISSP | Large Memory Model |
| LCD | License | MAC | MiniProg1 | MiniProg3 | Mux |
| Mux Bus | OCD | Offset | Pod | Port and Pins | Power Management |
| Production Programmer | PWM | RAM | RTC | SAR | SC Block |
| SMP | SPI | System Level Design | Timer | UART | USB |
| USBUART | Watchdog | Amplifier UM | Analog Reference | Analog UM | Build Tools |
| Communication UM | CRC UM | CYFI | Device Programming | Digital UM | DTMF |
| Fan Controller UM | Firmware UM | FMEA | Port Expander | PSoC Power System Architecture | Voltage Sequencer UM |

[PSoC](javascript:toggle1353();) 3/4/5 Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Component Tags** |  |  |  |  |  |
| Analog Hardware Mux | Analog Mux | Boost Converter | Bootloader / Bootloadable | CAN | CapSense\_CSD |
| Character LCD | Clock | Comparator | Control / Status Register | Counter | CRC |
| DAC | Debouncer | Delta Sigma ADC | DFB | DFB Assembler | Die Temperature |
| Digital Comparator | Digital Multiplexer | DMA | EEPROM | emFile SPI Mode | EMIF |
| EzI2C Slave | Fan Controller | Filter | Frequency Divider | Glitch Filter | Global Signal Reference |
| Graphic LCD | I2C /I 2S | iAP | Interrupt | LIN | Logic Gates |
| Lookup Table | Manual Routing | MDIO | Mixer | Opamp | PGA |
| Ports and Pins | Power Monitor | PRS | PWM | Quadrature Decoder | Resistive Touch |
| RTC | RTD Calculator | Sample / Track and Hold | SAR ADC | SAR Sequencer | Segment LCD |
| SGPIO | Shift Register | Sleep Timer | SM / PMBus | SPDIF | SPI |
| Sync | Thermistor Calculator | Thermocouple Calculator | TIA | Timer | TMP05 Interface |
| TrimMargin | UART | UDBClkEn | USBFS | USBMIDI | USBUART (CDC Interface) |
| Voltage Fault Detector | Voltage Sequencer | Vref | WaveDAC |  |  |
| **General Tags** |  |  |  |  |  |
| Analog Bus | Analog Global Bus | Analog Mux Bus | API | Application Specific | Assembly Language |
| Bootloader Host | Boundary Scan / BSDL | Bridge Control Panel | Build Settings | Clock | Compiler - GCC |
| Compiler - KEIL | Compiler - MDK | Compiler - RVDS | Cortex-M0 | Cortex-M3 | Creator Registration |
| Custom Component Interconnect | Datapath Configuration Tool | Debugging | DMA Wizard | DVK | ECO |
| Errata | Error Message | Flash | Hex File | Installation | ISSP / HSSP |
| KEIL Registration | Linux Platform | Low Power Modes | LVD / HVD | MFi | MiniProg3 |
| Optimization | Programmer COM | PSoC Creator | PSoC Programmer | Reset | RTOS |
| Schematic | Silicon | Software Download | STA | Supply Voltage | System Reference Guide |
| Verilog | Watchdog | Windows Platform |  |  |  |
| **Kit Tags** |  |  |  |  |  |
| CAN / LIN EBK | CapSense Expansion EBK | CY8CKIT-001 Kit | CY8CKIT-030 / 050 Kit | CY8CKIT-042 Kit | Digital Audio EBK |
| First Touch Kit | LCD Segment Drive EBK | MFI EBK | Power Supervisor EBK | PSoC 3/4/5 Processor Module | Thermal Management EBK |

Touch Sensing Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ADC | Air gap | Backlighting | Bleeder Resistor | Bootloader | CMOD |
| CSA | CSD | CSD Parameters | CSD2X | CSDADC | CSDAUTO |
| CY3203A | CY3213A | CY3214 | CY3218 | CY3280-20x34 | CY3280-20xx6 |
| CY3280-21x34 | CY8C20x34 | CY8C20xx6 | CY8C21x34 | CY8C21xxx-CapSense Express | CY8C24x94 |
| CY8CMBR2044 | CapSense Express | Circuit Housing | Conductive Objects | Configuration | Diplexing |
| Dynamic Reconfiguration | EEPROM | EMI | ESD | Errors | FR4 |
| Filters | Finger Threshold | Flex PCB | I2C | I2C-USB Bridge | IDAC |
| IMO and Prescaler | ITO | Layout Guidelines | Metal | Noise | Overlay |
| PSoC3 CapSense | Parasitic Capacitance | Pathfinder | Power Consumption | Proximity | SNR |
| SPI | Scanning Techniques | Schematic | Sensors | Shield | Sliders |
| SmartSense | Tuning | UART | Water | Water Proofing |  |

USB Controllers Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 8051 | AN2131 | AT2LP | ATA / ATAPI | ATA Commands | Asynchronous |
| Auto Mode | Bandwidth | Blaster | Bulk Transfer | Bus Power | C# |
| C++ | CAT5 | CF Card | CY3216 | CY3649 | CY3654 |
| CY3655 | CY3660 | CY3662 | CY3664 | CY3674 | CY3681 |
| CY3684 | CY3685 | CY3686 | CY4605 | CY4606 | CY4611B |
| CY4615 | CYUSB | Clock | Compliance | Control Center | Control Transfer |
| Crystal | CyConsole | DLL | Debug | Descriptors | Driver |
| EEPROM | EZ-HOST | EZ-OTG | EZ-USB | Emulation | EnCoreII |
| EnCoreIII | EnCoreV | Encore | Endpoint | Enumeration | Errata |
| FIFO | FX | FX1 | FX2 | FX2LP | Firmware |
| Firmware Debug | Flags | Framework | Full Speed | GPIF | HDD |
| HID | HX2 | HX2LP | Hi-Lo Programmer | High Speed | Host Application |
| Hub | I2C | ICE | IN Transfer | Interrupt Transfer | Interrupts |
| Isochronous Transfer | Keil | Keyboard | Layout | Library | Loader |
| Low Speed | M8A | M8B | Manual Mode | Mass Storage | Memory |
| Mouse | NX2LP | NX2LP-Flex | Nand Flash | Nand Manufacturing Utility | OTP |
| OUT Transfer | Port IO | Register | Renumeration | Report | Reset |
| SFR | SIE | SL811HS | SPI | SX2 | Schematic |
| Schematic Review | Screamer | Script | Self Power | Slave FIFO | Streaming |
| SuiteUSB | Synchronous | TX2 | TX2UL | Tetra Hub | Throughput |
| Timer | UART | UDMA | USBFS | USBUART | USBSerial |
| Vendor Command | Video Class | WHQL | WLK | cyapi | uVision |
| **SuperSpeed** |  |  |  |  |  |
| FX3 | ADMux | ARM926EJ -S | Bootloader | DMA | Eclipse |
| FX3 GPIO | FX3 Power Management | FX3 Power supply | FX3 SDK | GPIF II | HS-OTG |
| JTAG | LPP | MSC | Oscillator | RTOS | SD Card |
| Slavefifo | USB 3.0 | USB Compliance Test | USB Host | UVC |  |
| FX3S | eMMC | SDIO | S-Ports | Bay | Benicia |
| HX3 | ASSP | Battery charging | Bootloader | Cortex-M0 | EEPROM |
| GPIOs | HX3 Power Management | HX3 Power supply | I2C | In-system programming | Oscillator |
| USB 3.0 hub | USB Shared Link™ |  |  |  |  |

Automotive MCU Tags

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Traveo | S6J3110 | S6J3120 | S6J3200 | S6J3300 | S6J3310 |
| S6J3320 | S6J3330 | S6J3340 | S6J3350 | S6J3400 | S6J3500 |
| S6J326C | S6J324C | S6J327C | S6J328C | S6J32DA | S6J32BA |
| S6J3360 | S6J3680 | S6J32G0 |  |  |  |
| FR81S | MB91520 | MB91550 | MB91580 | MB91570 | MB91590 |
| FCR4 | MB9DF120 | MB9EF220 | MB9D560 | F2MC-16FX | MB96300 |
| MB96600 | MB96800 | CAN | CAN FD | LIN | Flexray |
| Ethernet | AUTOSAR | Serial | Timer | Watchdog | A/D Converter |
| SHE | Security | Current | Interrupt | Graphics | Document |
| CPU | Clock | Mode | Reset | Real Time Clock | BootROM |
| Flash Memory | RAM | Backup RAM | MPU | PPU | DMA |
| Multi-Function Serial | UART | CSIO | I2C | Base Timer | QPRC |
| CRC | Port | External Bus | DDR HSSPI | Hyper Bus | Parity |
| PSS | Low Power | SMC | LCDC | Media LB | DAC |
| Audio DAC | I2S | PCMPWM | Sound | APIX | Motor |
| Wave Generator | RDC | MVM | Flash Programmer | Tool |  |

**Knowledge Base Article Type:** [Select the category by clicking the checkbox associated]

|  |  |
| --- | --- |
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| Compiler | ByteCraft |
| Imagecraft |
| Keil |
| HiTech |
| Component Development | Training/Things you should know |
| Component Architecture |
| Component/Project management |
| Datapath |
| Analog components |
| Digital components |
| Component software/tools |
| Component Testing |
| Development Kits | FirstTouch Kit |
| Development Tools |  |
| Device Drivers | Pullability |
| Mass Storage |
| Device Programming | PSoC Programmer |
| Documentation |  |
| Firmware |  |
| General |  |
| Hardware | Digital |
| Specifications |
| Analog |
| Known Problems and Solutions |  |
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| M8 |
| M8C |
| Traveo |
| FCR4 |
| FR |
| F2MC |
| Modules |  |
| Platforms | MacOS X |
| Windows |
| Protocols | HID |
| I2C |
| Quality |  |
| Reference Designs |  |
| Software | PSoC Designer |
| PSoC Creator |
| User Modules | Analog |
| Digital |

Document History

Document Title: **The general steps to setup up MIPI CSI camera solution with CX3.**

Document Number:

| Rev. | ECN No. | Orig. of Change | Description of Change |
| --- | --- | --- | --- |
| \*\* |  | YYCA | Created KBA. |