

System Management I²C, I3C and SPI Selector Guide

A broad catalog of interface components for all your design needs



I²C Bus: Serial Interface Standard

By replacing complex parallel interfaces with a straightforward yet powerful serial structure, the I²C-bus revolutionized chip-to-chip communications.

Invented by NXP (Philips) more than 30 years ago, the I²C-bus uses a simple two-wire format to carry data one bit at a time. It performs inter-chip addressing, selection, control and data transfer. Speeds are up to 400 kHz (fast mode), 1 MHz (fast mode plus), 3.4 MHz (high-speed mode), or 5 MHz (ultra-fast mode). New 12.5 MHz I3C controllers with backwards compatibility to I²C are starting to hit the market which compete with the higher speeds of the SPI bus.

The I²C-bus shrinks the IC footprint and leads to lower IC costs. Additionally, since far fewer copper traces are needed, it enables a smaller PCB, reduces design complexity and lowers system cost.

I²C-bus devices are available in a wide range of functions. Each target device has its own I²C-bus address, selectable using address pins set high (1) or



Figure 1 - Parallel interface versus I²C Bus interface

low (0). Information is transmitted byte by byte, and each byte is acknowledged by the receiver. There can be multiple devices on the same bus, and more than one IC can act as controller. The controller role is typically played by a microcontroller.





Figure 3 - Write and Read frame format



Figure 4 – I3C vs I²C energy and data rate comparison





Assumptions: 1 All symbols in each mode have equal probability for use. 2 Energy consumption is the energy delivered by pull-up devices to the bus (which includes drivers and resistors)

Overview of MIPI I3C

MIPI I3C (and the publicly available MIPI I3C Basic) provide a scalable, medium-speed, utility and control bus for connecting peripherals to an application processor. Its design incorporates key attributes from both I²C-bus and SPI interfaces to provide a unified, high-performance, low-power interface solution that delivers a flexible upgrade path for I²C-bus and SPI implementers. Originally introduced in 2017, I3C was the culmination of a multi-year development project based on extensive collaboration with the MEMS and Sensors Industry Group and across the broader electronics ecosystem.

As shown in Figure 1, I²C-bus targets (with 50 ns filter) can coexist with I3C controllers operating at 12.5 MHz, enabling the migration of existing I²C-bus designs to the I3C specification. Conversely, I3C targets operating at typical 400 kHz or 1 MHz I²C-bus speeds can coexist with existing I²C-bus controllers.

Just like I²C, I3C is implemented with standard CMOS I/O pins using a two-wire interface, but unlike I²C it supports in-band interrupts enabling target devices to notify controllers of interrupts, a design feature that eliminates the need for a separate general-purpose input/output (GPIO) interrupt for each target, reducing system cost and complexity. Support for dynamic address assignments help minimize pin counts, which is key for accommodating space-constrained form factors.





I3C supports a multi-drop bus that, at 12.5MHz, supports standard data rate (SDR) of 10 Mbps with options for high-data-rate (HDR) modes. The net result is that I3C offers a leap in performance and power efficiency compared with I²C as shown in **Figure 5**.

Additional technical highlights for I3C include multicontroller support, dynamic addressing, commandcode compatibility and a uniform approach for advanced power management features, such as sleep mode. It provides synchronous and asynchronous timestamping to improve the accuracy of applications that fuse signals from various peripherals. It can also batch and transmit data quickly to minimize energy consumption of the host processor.

While the full version of I3C is available only to MIPI Alliance members, MIPI has released a public version called <u>I3C</u> Basic that bundles the most commonly needed I3C features for use by developers and other standards organizations. I3C Basic is available for implementation without MIPI membership and is intended to facilitate a royalty-free licensing environment for all implementers. Figure 3 summarizes key features supported by I3C and I3C Basic.

To support developers, compatibility between different I3C implementations has been confirmed through multiple interoperability workshops, and several supporting MIPI resources are available. These include:

- I3C Host Controller Interface <u>MIPLI3C HCI</u>SM
- I3C HCI Driver for Linux
- I3C Discovery and Configuration Specification <u>DisCo for I3CSM</u>
- I3C Debug and Test Interface <u>MIPI Debug for I3C</u>SM

I3C intellectual property (IP) is available from multiple vendors, including a licence free version for I3C Basic. I3C conformance testing and verification IP test suites are also available from multiple vendors.

More information on I3C and I3C Basic is available via the <u>MIPI Alliance website</u>.

Comparison of Features

Feature	13C v1.0	I3C Basic	13C v1.1	I3C Basic v1.1
12.5 MHz SDR (Controller, Target and Legacy I²C Target Compatibility)	\checkmark	\checkmark	\checkmark	\checkmark
Target can operate as I ² C device on I ² C bus and on I3C bus using HDR modes	\checkmark	\checkmark	\checkmark	\checkmark
Target Reset			\checkmark	\checkmark
Specified 1.2V-3.3V Operation for 50pf C load	~	\checkmark	\checkmark	\checkmark
In-Band Interrupt (w/MDB)	\checkmark	\checkmark	\checkmark	\checkmark
Dynamic Address Assignment	\checkmark	\checkmark	\checkmark	\checkmark
Error Detection and Recovery	\checkmark	\checkmark	\checkmark	\checkmark
Secondary Controller	\checkmark	\checkmark	\checkmark	\checkmark
Hot-Join Mechanism	\checkmark	\checkmark	\checkmark	\checkmark
Common Command Codes (Required/Optional)	\checkmark	~	\checkmark	\checkmark
Specified 1.0V Operation for 100pf C load		\checkmark		\checkmark
Set Static Address as Dynamic Address CCC (SETAASA)		\checkmark	\checkmark	\checkmark
Synchronous Timing Control	\checkmark		\checkmark	
Asynchronous Timing Control (Mode 0)	\checkmark		\checkmark	\checkmark
Asynchronous Timing Control (Mode 1-3)	\checkmark		\checkmark	
HDR-DDR	\checkmark		\checkmark	\checkmark
HDR-TSL/TSP	\checkmark		\checkmark	
HDR-BT (Multi-Lane Bulk Transport)			\checkmark	\checkmark
Grouped Addressing			\checkmark	\checkmark
Device to Device(s) Tunneling			\checkmark	
Multi-Lane for Speed (Dual/ Quad for SDR and HDR-DDR)			~	
Monitoring Device Early Termination			\checkmark	

Figure 6 – Comparison of I3C and I3C basic features

Overview of the SPI bus

SPI is the full duplex synchronous serial interface consisting of four signals: SCLK (serial clock), COTI (controller out, target in), CITO (controller in, target out) and TS (target select). SPI bus operates with a single controller device and one or more target devices. Data rate ranges from 5 to 20 Mbps which is much higher than the I²C-bus rate but like the new I3C-bus.



Figure 7 – SPI interface between controller and one target

Though target devices might operate in one polarity or phase only, clock polarity and phase of the SPI bus could be configured with respect to the data to establish the valid communication link by the controller. CPOL determines the polarity of the clock. When CPOL = 0, clock is low when idle. The leading edge is the rising edge and the trailing edge is the falling edge. When CPOL = 1, clock is high when idle. The leading edge is the failing edge and the trailing edge is the rising edge.

CPHA determines the timing of the data bits relative to the clock pulse. When CPHA = 1, the transmitting side changes data on the leading edge of the clock and the receiving side captures data on the trailing edge of the clock. When CPHA = 0, the transmitting side changes data on the trailing edge of the clock and the receiving side captures data on the leading edge of the clock.



Figure 8 – SPI interface with independent targets

The controller could connect with multiple independent targets in parallel. Each target is controlled with the separate TS signal. When TS = 0, only the corresponding target will response to the controller. Outputs of all others with TS = 1 remain in high impedance.



Figure 9 – SPI interface with daisy chain targets

Alternatively, targets could be connected in a daisy chain configuration to reduce number of the target select signals. The controller output is connected to the first target input. The first target output is connected to the second target input and so on. Then the last target output is connected back to the controller input. Each target is designed to send out during the second group of the clock pulses the exact copy of the data it received during the first group of clock pulses. The controller receives data from the last target first then data from the first target last during the same clock group. It requires two clock groups to complete each operation which would be only one clock group in the parallel configuration



Figure 10 – SPI timing diagram with CPOL and CPHA

NXP I²C, I3C and SPI Product Lines



Figure 11 – NXP's broad portfolio of I2C, I3C and SPI devices

More information: <u>I²C, SPI, I3C Interface Devices</u>. nxp.com

I²C-Bus, I3C-Bus and SPI Product Summary

Bridge and Bus Controllers			
Bridge	+ SC16IS740	I ² C Fm/SPI-to-UART bridge with IrDA	
	SC16IS741A	I ² C Fm/SPI-to-UART bridge with IrDA	
	SC16IS750	I ² C Fm/SPI-to-UART bridge with IrDA and GPIO	
	SC16IS752	I ² C Fm/SPI-to-DUART bridge with IrDA and GPIO	
	SC16IS760	I ² C Fm/SPI-to-UART bridge with IrDA and GPIO	
	SC16IS762	I ² C Fm/SPI-to-DUART bridge with IrDA and GPIO	
	SC18IM704	UART-to-I ² C Fm controller bridge with GPIO (Replacement for SCI18IM700)	
	SC18IS604	SPI-to-I ² C Fm controller bridge with GPIO (Replacement for SC18IS600)	
	SC18IS606	I ² C Fm target-to-SPI controller bridge (Replacement for SC18IS602B)	
Controller	P3H2440	I3C Hub with 2 controller ports and 4 target ports (pre-config) - Coming soon	
	P3H2441	I3C Hub with 2 controller ports and 4 target ports (pre-config) - Coming soon	
	P3H2840	I3C Hub with 2 controller ports and 4 target ports (pre-config) - Coming soon	
	P3H2841	I3C Hub with 2 controller ports and 8 target ports (pre-config) - Coming soon	

Bus Buffers		
Incremental offset	PCA9510A	I²C Fm incremental offset hot-swap bus buffer (no RTA)
	PCA9511A	I ² C Fm incremental offset hot-swap bus buffer
	PCA9512A	I ² C Fm incremental offset VLT hot-swap bus buffer
	PCA9513A	l²C Fm incremental offset hot-swap bus buffer (92 µA CS)
Differential	PCA9614	I ² C Fm+ VLT differential (4-wire) bus buffer
driver with static offset (1 side)	PCA9615	I ² C Fm+ VLT differential (4-wire) hot-swap bus buffer
	PCA9616	I ² C Fm+ 0.8 V LV VLT differential (4-wire) hot- swap bus buffer with INT (2-wire)
No offset	PCA9646	4-channel I ² C Fm+ no offset buffer/switch with RST
Static offset	P82B96	I ² C Fm HV bus buffer
(I side)	PCA9507	I ² C Fm VLT DDC buffer with accelerator
	PCA9508	I ² C Fm VLT hot-swap bus repeater
	PCA9509	I ² C Fm 1.0 V VLV VLT bus buffer with current source
	PCA9517A	I ² C Fm 0.9 V ULV VLT bus repeater
	PCA9600	I ² C Fm+ HV bus buffer
	PCA9601	I ² C Fm+ HV bus buffer with stronger 15 mA local side drive to support multiple Fm+ followers
	PCA9617A	I ² C Fm+ 0.8 V ULV VLT bus repeater
Static offset	PCA9515A	I ² C Fm bus repeater
(All sides)	PCA9516A	I ² C Fm 5-channel hub
	PCA9518A	I²C Fm expandable 5-channel hub

₽ **GPIO Expander** 4-bit PCA9536 4-bit I²C Fm TP GPIO with PU PCA9537 4-bit I²C Fm TP GPIO with INT and RST 8-bit PCF8574 8-bit I²C Fm QB GPIO with INT and PU PCF8574A 8-bit I2C Sm QB GPIO with INT and PU (alternate address) PCA9500 8-bit I²C Fm OB GPIO with PU and 2-K EEPROM 8-bit I²C Fm QB GPIO with INT, PU and 2-K EEPROM PCA9501 8-bit I²C Fm/SPI TP GPIO with INT and RST PCA9502 8-bit I²C Fm TP GPIO with INT PCA9534 + PCA9538 8-bit I²C Fm TP GPIO with INT and RST PCA9538A 8-bit I²C Fm LV TP GPIO with INT and RST PCAL9538A 8-bit I²C Fm LV TP/OD GPIO with INT, RST, latch and PU/PD PCA6408A 8-bit I²C Fm LV VLT TP GPIO with INT and RST 8-bit I²C Fm LV VLT TP/OD GPIO with INT, RST, latch and PCAL6408A PU/ PD PCA9554 8-bit I²C Fm TP GPIO with INT and PU 8-bit I²C Fm TP GPIO with INT and PU (alternate address for PCA9554A PCA9554) PCA9554B 8-bit I2C Fm LV TP GPIO with INT and PU 8-bit I²C Fm LV TP/OD GPIO with INT, latch and PU/PD (PU PCAL9554B default) 8-bit I²C Fm LV TP GPIO with INT and PU (alternate address PCA9554C for PCA9554B) 8-bit I²C Fm LV TP/OD GPIO with INT, latch and PU/PD (PU PCAL9554C default) (alternate address for PCAL9554B) PCA9557 8-bit I²C Fm TP GPIO with RST 8-bit I²C Fm LV VLT TP/OD GPIO with INT, RST, latch and PU/ PCA9574 PD + PCA9704 8-bit SPI 18 V GPI with maskable INT 14-bit SPI LV VLT TP/OD GPIO with INT, RST, latch and PU/PD 14-bit + PCAL9714 16-bit PCF8575 16-bit I²C Fm QB GPIO with INT and PU 16-bit I²C Fm TP GPIO with INT PCA9535 PCA9535C 16-bit I2C Fm OD GPIO with INT 16-bit I2C Fm LV TP GPIO with INT PCA9535A PCAL9535A 16-bit I²C Fm LV TP/OD GPIO with INT, latch and PU/PD + PCA9539 16-bit I²C Fm TP GPIO with INT and RST 16-bit I²C Fm TP GPIO with INT and RST (state machine + PCA9539R only) PCA9539A 16-bit I²C Fm LV TP GPIO with INT and RST PCAL9539A 16-bit I²C Fm LV TP/OD GPIO with INT, RST, latch and PU/PD PCA6416A 16-bit I2C Fm LV VLT TP GPIO with INT and RST 16-bit I²C Fm LV VLT TP/OD GPIO with INT, RST, latch and PCAL6416A PU/PD PCA9555 16-bit I2C Fm TP GPIO with INT and PU 16-bit I²C Fm LV TP GPIO with INT and PU PCA9555A 16-bit I²C Fm LV TP/OD GPIO with INT, latch and PU/PD (PU PCAL9555A default) 16-bit I²C Fm LV VLT TP/OD GPIO with INT, RST, latch and PCA9575 PU/PD PCA9671 16-bit I²C Fm+ QB GPIO with RST and PU PCA9701 16-bit SPI 18 V GPI with INT 22-bit + PCAL9722 22-bit SPI LV VLT TP/OD GPIO with INT, RST, latch and PU/PD 24 bit I²C Fm+ ULV VLT TP/OD GPIO with INT, RST, latch and 24-bit PCAL6524 PU/PD 34 bit I²C Fm+ ULV VLT TP/OD GPIO with INT, RST, latch and 34-bit PCAL6534 PU/PD 40-bit PCA9505 40-bit I2C Em TP GPIO with INT RST OF and PU PCA9506 40-bit I²C Fm TP GPIO with INT, RST and OE PCA9698 40-bit I²C Fm+ TP/OD GPIO with INT, RST, OE and PU

Selector guide \mbox{System} Management $\mbox{I}^2\mbox{C},\mbox{I3C}$ and \mbox{SPI}

LCD Driver	's	
Segment driver	+ PCA8561	I²C Fm or SPI 72-segment low-power LCD driver in HVQFN32 package
	+ PCA/ PCF85162	I ² C Fm 128-segment LCD driver in TSSOP48 package
	+ PCA85262	I ² C Fm 128-segment LCD driver with higher frame frequency in TSSOP48 package
	+ PCA/ PCF8551A/B	I ² C Fm or SPI 144-segment low-power LCD driver with programmable frame frequency in TSSOP48 package
	+ PCA/PCE/ PCF85176	I²C Fm 160-segment LCD driver in TSSOP56 or TQFP64 package
	+ PCA85276	I ² C Fm 160-segment LCD driver with higher frame frequency in TSSOP56 package
	PCF8553	40 × 4 LCD segment driver - ultra low-power LCD segment driver with 4 backplane- and 40 segmentdriver outputs, with either an I ² C- or an SPI-bus interface.
	+ PCA/ PCF85134	I²C Fm 240-segment LCD driver in LQFP80 package
	+ PCA/ PCF8536A/B	I ² C Fm or SPI 320-segment LCD driver with programmable frame frequency and LED backlight PWM control in TSSOP56 package
	+ PCA/ PCF8576D/E	I ² C Fm 160-segment COG LCD driver
	+ PCA8576F	I ² C Fm 160-segment COG LCD driver with higher frame frequency and higher VLCD
	+ PCA/ PCF85133	I ² C Fm 320-segment COG LCD driver with selectable frame frequency
	+ PCA85233	I ² C Fm 320-segment COG LCD driver with higher selectable frame frequency
	+ PCA85232	I ² C Fm 640-segment COG LCD driver with higher programmable frame frequency
Character drivers	PCF2119	I ² C Fm or parallel bus 2 x 16 characters + 160- icon COG LCD driver with charge pump,VLCD temperature compensation

Open Drain Constant Current

Driver (PWM/Ch, 57 mA/ 20 V)	+ PCA9955B	16-channel I ² C Fm+ CC LED driver
	PCA9956B	24-channel I ² C Fm+ CC LED driver
Driver (PWM, 5 V)	PCA9957	24-channel SPI CC LED driver — 32 mA per ch
	+ PCA9958	24-channel SPI CC LED driver — 63 mA per ch
	PCA9959	24-channel SPI CC LED driver — 63 mA per ch — 64 grids

*

Open Drain or Totem Pole Voltage Source

Dimmer (2 PWM, 25 mA/ 5 V)	PCA9531	8-channel I ² C Fm OD LED dimmer with RST
	PCA9532	16-channel I ² C Fm OD LED dimmer with RST
Blinker	PCA9551	8-channel I ² C Fm OD LED blinker with RST
(2 PWM, 25 mA/5 V)	PCA9552	16-channel I ² C Fm OD LED blinker with RST
. ,	PCA9553	4-channel I ² C Fm OD LED blinker
Controller (PWM/Ch, 25 mA/ 5 V)	PCA9632	4-channel I ² C Fm+ low-power TP LED controller
	PCA9633	4-channel I ² C Fm+ TP LED controller with OE
	PCA9634	8-channel I ² C Fm+ TP LED controller with OE
	+ PCA9635	16-channel I ² C Fm+ TP LED controller with OE
	+ PCA9685	16-channel I ² C Fm+ TP LED controller with 12-bit PWMs and OE

Load Switch			
Load	NX3P2902BUK	500 mA / 3.6 V load switch	
Switch	NX3P1108UK	1.5 A / 3.6 V load switch	
	NX5P3363UK	3 A / 5 V source load switch	
	NX20P5090UK	5 A / 20 V sink load switch	
	NX30P6093UK	I ² C-controlled OVP load switch	

Level Translators		
SIM Card Translator	NVT4555	SIM card VLT level translator and LDO
	NVT4557	SIM card VLT level translator for 1.8 V node
	NVT4558	SIM card VLT level translator for 1.2 V and 1.8 V node
SD Card Translator	NVT4857	SD 3.0 - SDR104 auto-direction control memory card level translator and LDO – also support SIM card for combo socket
	NVT4858	SD 3.0 – SDR104 auto-direction control memory card level translator for both 1.2 V and 1.8 V node – also supports SIM card for combo socket
eUSB2 Repeater and Level Shifter	PTN3222	1-port eUSB2 to USB2 redriver functionality
GTL to LVTTL Translators with Direction Pin	GTL2014	4-bit LVTTL to GTL transceiver

Level Translators		
EET	NIVT2002	2-bit 120 Em+ 1/17 10 1/ to 5 5 1/
No Direction Pin	NV12002	
	PCA9306	Dual I2C/SMBus Fm+ VLT I.0 V to 5.5 V
	NVT2008	8-bit I ² C Fm+ VLT 1.0 V to 5.5 V
	NVT2010	10-bit I ² C Fm+ VLT 1.0 V to 5.5 V
FET One Shot No Direction Pin	P3A1604	4-Bit Dual Supply Bidirectional I3C/I²C-Bus, SMBus and SPI Voltage-Level Translator
	P3A9606	Dual I3C 12.5 MHz and I²C/SMBus Fm+ VLT 0.72 V to 1.98 V
	NTS0102	2-bit I²C Fm+ VLT 1.65 V to 3.6 V A side and 2.3 V to 5.5V B side
	P3S0200	Dual bidirectional I3C 12.5 MHz 1:2 and 2:1 switch and voltage level translator 0.72 V to 3.6 V
	NTS0104	4-bit I ² C Fm+ VLT 1.65 V to 3.6 V A side and 2.3 V to 5.5 V B side, AEC Q100 part add "+"
	NTS0302	2-bit improved smart one shot I ² C Fm+ VLT 0.95 V to 3.6 V A side and 1.65 V to 5.5 V B side
	NTS0304E	4-bit improved smart one shot I^2C Fm+ VLT 0.95 V to 3.6 V A side and 1.65 V to 5.5 V B side with IEC 61000-4-2 Class 4, 8 kV contact on B side
	NTS0308E	8-bit improved smart one shot I²C Fm+ VLT 0.95 V to 3.6 V A side and 1.65 V to 5.5V B side with IEC 61000-4-2 Class 4, 8 kV contact on B side
Buffer One Shot No Direction Pinc	NTB0102	2-bit SPI VLT 1.2 V to 3.6 V A side and 1.65 V to 5.5 V B side
	+ NTB0104	4-bit SPI VLT 1.2 V to 3.6 V A side and 1.65 V to 5.5 V B side, AEC Q100 part add "+"
Translators with Direction Pin	GTL2014	4-bit LVTTL to GTL transceiver

High Spe	ed Interface	<u></u> Φ
CC Logic/PD	PTN5150	USB Type-C Rev 1.1 CC-Logic, Pin to control NXP redriver
Phy	PTN5110	USB Type-C Rev 3.0 PD PHY, TCPC Rev 2.0 version 1.0. Laptop/tablet applications
Redrivers	PTN38003A	Multi-protocol USB3.2 and DisplayPort linear redriver
	PTN3944	Multi-channel PCIe 4.0 linear equalizer
DP++ Level Shifter	PTN3360	Enhanced performance HDMI/DVI level shifter with active DDC buffer, supporting 3 Gbi t/s operation
	PTN3361B	HDMI/DVI level shifter with dongle detect support and active DDC buffer
	PTN3365	Enhanced performance HDMI/DVI level shifter with active DDC buffer, supporting 3 Gbit/s operation

Real-time Clocks			
Low-power	PCF2123	SPI lower power RTC with alarm, timer and interrupt	
	PCF85053A	Bootable CPU I ² C Fm RTC with two I ² C controllers, 128 Byte SRAM and alarm function	
	PCF85063	I ² C Fm/Tiny RTC with 30s, 60s interrupt	
	PCF85063A/B	I ² C Fm or SPI/Tiny RTC with alarm and 30s, 60s interrupt	
	PCF85263A	I ² C Fm/Tiny RTC with alarms, time stamp and battery backup +1-byte RAM 0.25 mm pitch WLCSP12 for cellular modem	
	PCF85363A	I ² C Fm/Tiny RTC with alarms, time stamp and battery back-up switch + 64-byte RAM	
	PCF8523	I ² C Fm+ ultra-low-power RTC with loss of main power detection and automatic battery backup	
	PCF8563	I ² C Fm low-power clock/calendar	
	PCF8583	l²C Sm Clock and calendar with 240 x 8-bit RAM and alarm	
	PCF8593	I ² C Sm Low power clock and calendar with alarm	
Automotive high	+ PCA21125	SPI lower power RTC with alarm, timer and interrupt to 125 °C	
temperature	+ PCA85073A	I ² C Fm/Tiny RTC with alarm and 30s, 60s interrupt -40 °C to 105 °C	
	+ PCA8565	l²C Fm high-temperature clock/calendar -40 °C to +125 °C	
	+ PCA2131	I ² C Fm or SPI high accuracy, low voltage 100 mA RTC with embedded crystal, time stamp, tamper pins -40 °C to 105 °C	
Temperature compensated high accuracy with embedded crystal	PCF2131	l²C Fm or SPI high accuracy, low voltage 64 nA RTC time stamp, tamper pins -40 °C to 85 °C	

Improved I²C Fm+ stepper motor controller with TP GPIO with INT and RSTC

i.MX RT5/600 including battery charger

i.MX 8M family with 12 power rails

i.MX 8ULP with 13 power rails

i.MX 93 with 12 power rails

Temp Sensors		
Local	LM75B	I ² C Fm TS local with ± 2 °C accuracy and SMBus timeout
	SE98A	I ² C Fm JEDEC DDR3 TS, no SPD, ±1 °C accuracy and SMBus timeout
	PCT2075	I°C Fm+ TS with ±1 °C accuracy and SMBus timeout Default interrupt trip is + 85 °C
	P3T1085UK	I3C and I ² C TS with ±0.5 °C accuracy and SMBus timeout
	P3T1084UK	±0.4 °C accuracy temperature sensor with I3C/I2C interface in WLCSP6 package
	P3T1755DP	I3C and I ² C TS with ±0.5 °C accuracy and SMBus timeout
	P3T1750DP	±1 °C accuracy temperature sensor with I3C/ I2C interface in TSSOP8 package
	P3T1035x	I3C and I ² C interface with ±0.5C accuracy with 8 address options
	P3T2030x	I3C and I ² C interface with ±2C accuracy with 8 address options
Local and EEPROM	SE97B	l²C Fm JEDEC DDR3 TS local with ±1 °C accuracy, 2K SPD and SMBus timeout
Local and remote	SA56004	I ² C HSmTS, 1.8 V, + 1 °C accuracy and SMBus timeout

Muxes and Switches						
2-channel	+ PCA9540B	2-channel I ² C Fm mux				
	P3S0200GM	2:1 and 1:2 I3C 12.5 MHz mux with select pin				
	PCA9542A	2-channel I ² C Fm mux with INT				
	PCA9543A	2-channel I ² C Fm switch with INT and RST				
2-to-1 demux	PCA9541A/01	2-to-1 I ² C Fm demux with INT and RST (channel 0 default)				
	PCA9541A/03	2-to-1 I ² C Fm demux with INT and RST (no channel default)				
4-channel	PCA9544A	4-channel I ² C Fm mux with INT				
	PCA9545A	4-channel I ² C Fm switch with INT and RST				
	PCA9546A	4-channel I ² C Fm switch with RST				
	PCA9646	4-channel I²C Fm+ no offset buffer/switch with RST				
	PCA9846	4-channel ULV VLT I ² C Fm+ switch with RST				
	PCA9849	4-channel ULV VLT I ² C Fm+ mux with RST				
8-channel	PCA9547	8-channel I ² C Fm mux with RST (channel 0 default)				
	PCA9847	8-channel ULV VLT I ² C Fm+ mux with RST				
	PCA9548A	8-channel I ² C Fm switch with RST				
	PCA9848	8-channel ULV VLT I ² C Fm+ switch with RST				
Arbiter	PCA9641	2 controllers to shared target I ² C Fm+ arbiter with INT and RST (no channels selected at default)				

Legend

1 motor

controller

PCA942X PCA9450

PCA9460

PCA9451

Stepper Motor Controller

PCA9629A

Code	Description	Code	Description	Code	Description
Sm	100 kHz Standard-mode I ² C-bus	ADC	Analog Digital Converter	INT	Interrupt
Fm	400 kHz Fast-mode I ² C-bus	LV	Supply Voltage < 2.3 V	RST	Reset
Fm+	1 MHz Fast-mode Plus I ² C-bus	VLV	Supply Voltage < 1.65 V	OE	Output enable
HSm	3.4 MHz High-speed Mode I ² C-bus	ULV	Supply Voltage < 1.0 V	Latch	Input latch
+	AEC-Q100 Compliance	HV	Outputs >10 V	PU	Pull-up resistors
GPIO	General-purpose I/O Expander	VIT	Voltage Level Translator – 2 Supplies	PU/PD	Pull-up/pull-down resistors
TS	Thermal Sensor			COG	Chip on glass
RTC	Real-time Clock	TP	Totem-pole (push-pull)	SPI	Serial peripheral interface
LCD	Liquid Crystal Display	QB	Quasi-bidirectional	0.01.41	System power management
DAC	Digital Anglog Converter	OD	Open Drain	SPMI	interface
		СС	Constant current	P3A, P3T, P3S	3 indicates I3C Bus capable

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Evaluation Boards

Bridges	OM6270	SC16IS750_760 SPI_I ² C-UART EV	Arduino	PCF85063AT-ARD	Industry Standard RTC	
	OM6273	SC16IS752_762 SPI_I ² C-UART EV	Бойги		Tomp Sopsor	
	SC18IS604-EVB	SPI-to-I ² C Fm controller bridge Eval Board				
	SC18IS606-EVB	I ² C Fm target-to-SPI controller bridge Eval			24-channel LED controller with 64-grid	
		HAPT to 120 Fm controller bridge Fugl Degrad		PCA9959HN-ARD	24-channel LED controller with 64-gha	
	SCI8IM/04-EVB	UARI-to-I ² C Fm controller bridge Eval Board		PCF850631P-ARD	RIC	
LCD display	OM13506	CF8553 LCD Demo		IMX8MMINI-IARD	Interposer Board for i.MX8 EVB	
RTC	OM11059	PCF85063B RTC Eval - SPI		NTS0304EUK-ARD	4cch Voltage Level Translator	
	OM11059A	PCF85063A RTC Eval - 12C		PCAL6534EV-ARD	34-bit GPIO	
	OM13510	PCF85263 RTC Eval		PCAL6524EV-ARD	24-bit GPIO	
	OM13511	PCF8523 RTC Eval		PCF85263ATL-	Full Function RTC	
	OM13512	PCF2123 SPI-bus RTC Eval		PCA9955BTW-	16 ch LED Controllor	
	OM13514	PCF85363 RTC Eval		ARD		
	OM13515	PCF85063A RTC Eval		PCA8561AHN-	LCD Display	
	OM13517	PCA21125 RTC Eval 9 pin		PCAL6408A-ARD	8-bit GPIO	
	OM13519	PCA8565 RTC Eval		PCAL6416AEV-	16-bit GPIO	
Voltage-	OM13317	NVT2008PW VLT Eval		ARD		
Translator	OM13318	NVT2002DP VLT Eval NVT4555UK SIM Card Eval		PCA9617ADP-ARD	I ² C Bus Buffer	
	OM13480			PCA9846PW-ARD	I ² C Low Voltage Switch	
	NVT4858-4557- EVB	NVT4858 SD and NVT4557 SIM Card Eval		PCT2131-ARD	Low Power Temperature Compensated RTC	
	P3A9606JK-EVB	P3A9606JK VLT Eval		ARD	Dual Controller RTC with RAM	
LED driver	OM13269	PCA9632 LED Eval		P3T1085UK-ARD	Temp Sensor - 6 pin 0.5 °C accuracy	
	OM13321	PCA9956B LED Eval Fm_Plus		P3T1755DP-ARD	Temp Sensor - 8 pin 0.5 °C accuracy	
	OM13332	PCA9685 demo board, 16-channel voltage		P3T1035XUK-ARD	Temp Sensor - 4 bump with 0.5C accuracy	
		source with 12-bit PWM demo board I ² C Em+		P3T2030XUK-ARD	Temp Sensor - 4 bump with 2.0C accuracy	
	OM13333	PCA9635 LED Eval		PCAL9722HN-ARD	22-Bit SPI, GPIO Expander Evaluation Board	
	OM13483	PCA9955B LED Eval		PCA9958HN-ARD	24-Channel LED Driver	
	OM13528	PCA9532BS LED Eval		PCF2131-ARD	PCF2131/PCA2131 Evaluation Board	
	OMPCA9957-	PCA9957 IED Eval Socket - MCU		P3A1604UK-ARD	P3A1604UK Evaluation Board	
	LEDEV			P3H2440HN-ARD	P3H2440HN Evaluation Board – Coming soon	
	LEDEV	ACA3323 FED EAGI 20CKGI - WCD		P3H2441HN-ARD	P3H2441HN Evaluation Board – Coming soon	
Temperature Sensors	OM13257	Universal TS DC Fm_Plus		P3H2840HN-ARD	P3H2840HN Evaluation Board – Coming	
Bus Buffers	OM13523	PCA9616PW dl ² C Buffer Eval			P2H2941HN Evaluation Poard - Coming	
GPIO	OM13488	Universal 8-bit GPIO DC — Fm		I SHZO4IAN-ARD	soon	
	OM13489	Universal 16-bit GPIO DC – Fm				
	OM13526	PCAL6524 GPIO Eval				
	OM13529	PCAL6524EV GPIO Eval Fm_Plus				
	OM13541	PCAL6534EV GPIO Eval				

Arduino™ Evaluation Boards

RTCs



PCF85063TP-ARD



PCF85263ATL-ARD



PCF2131-ARD

GPIO Expanders



LED Drivers







PCA9957HN-ARD



P3A1604UK-ARD - coming soon

Bus Controller



P3H2440HN-ARD - Coming soon P3H2441HN-ARD - Coming soon P3H2840HN-ARD - Coming soon P3H2841HN-ARD - Coming soon

Temperature Sensors



PCT2075DP-ARD



P3T2030XUK-ARD





P3T1755DP-ARD

P3T1085UK-ARD

I²C Bus Enablers



PCA9617ADP-ARD



PCA9846PW-ARD

Our I²C-bus website (<u>www.nxp.com/i2c</u>), SPI website (<u>www.nxp.com/SPI</u>) and I3C-bus website (<u>www.nxp.com/i3c</u>) are a valuable resource for device information and training programs. It gives you direct access to a comprehensive handbook, application notes, information about evaluation kits and training materials, links to application and design support and more. The development boards and daughter card make it easy to program new peripherals and are a quick way to learn about the I²C-bus and I3C-bus protocol. Samples and demo boards are available on request; contact a local NXP distributor.

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