

Definitions

Master: Device which controls the bus

Slave: Device which is addressed by a master

R_{PU} : Pull-up resistance

SDA: Serial Data Line

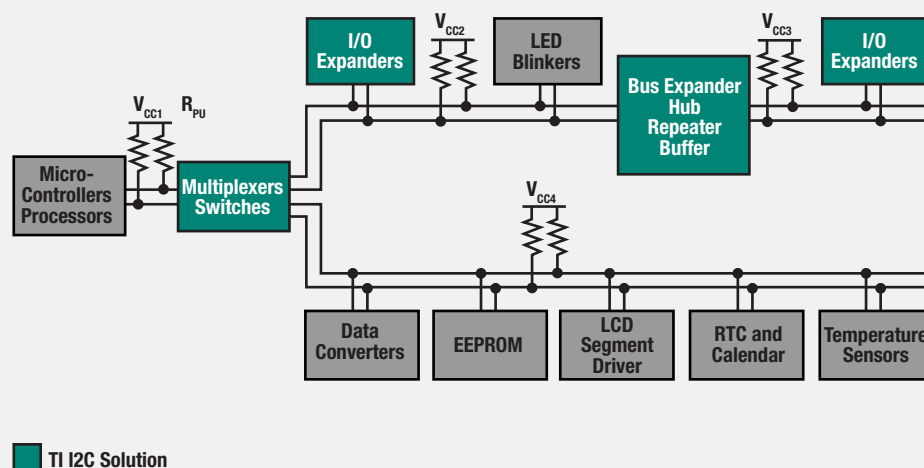
SCL: Serial Clock Line

Transmitter: A device that transmits data onto the I²C Bus

Receiver: A device that receives data from the I²C Bus

Arbitration: Process to determine which master can control the bus when more than one Master exists

Basic Setup



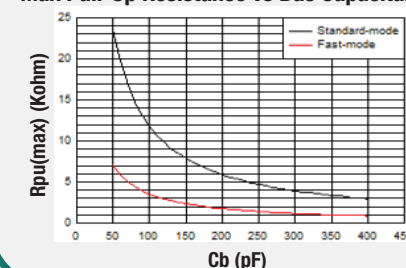
Useful Tips

$$R_{PU(min)} = (V_{CC} - V_{OL}) / I_{OL}$$

$$R_{PU(max)} = tr / (.8473 * Cb_{(SDA/SCL)})$$

Measuring Cb: Good assumption to make it ~15 pF per device added on the bus

Max Pull-Up Resistance vs Bus Capacitance



Extending I²C Buses

Key Concept: Capacitance must be split in order to keep capacitance on a single line below 400 pF.

Devices: [TCA9517](#), [TCA9617B](#), [P82B715](#)

Switching I²C Buses

Key Concept: Useful for addressing multiple **slaves** which might have overlapping I²C addresses, or if you wish to disconnect a part of a bus for a given operation.

Devices: [TCA9543A](#), [TCA9544A](#), [TCA9546A](#), [TCA9545A](#), [TCA9548A](#)

GPIO Expansion with I²C

Key Concept: Useful for providing additional GPIOs by using I²C bus.

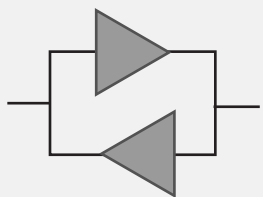
Devices: [TCA9554](#), [TCA9534](#), [TCA9539](#), [TCA6408A](#), [TCA6416A](#)

Symbol	Parameter	Standard Mode Min/Max	Fast Mode Min/Max
V_{IL} (V)	Low-level input voltage	-0.5 / 0.3V _{CC}	-0.5 / 0.3V _{CC}
V_{IH} (V)	High-Level input voltage	0.7V _{CC} / V _{CC(Max)} +.05	0.7V _{CC} / V _{CC(Max)} +.05
V_{OL1} (V)	Low-level output voltage V _{CC} >2V	0 / 0.4	0 / 0.4
V_{OL2} (V)	Low-level output voltage V _{CC} ≤2V	- / -	0 / 0.2V _{DD}
I_{OL} (mA)	Low-level output current V _{OL} = 0.4V	3 / -	3 / -
	Low-level output current V _{OL} = 0.6V	- / -	6 / -
f _{SCL} (kHz)	SCL clock frequency	0 / 100	0 / 400
t _r (ns)	Rise time for SDA/SCL	- / 1000	20 / 300
t _f (ns)	Fall time for SDA/SCL	- / 300	20 x (V _{CC} /5.5V) / 300

Simplify System Management and Control Designs

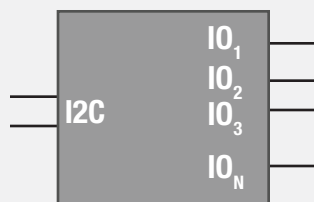
Wide range of I²C & SMBus functions with flexible voltages and channel count options

Repeaters



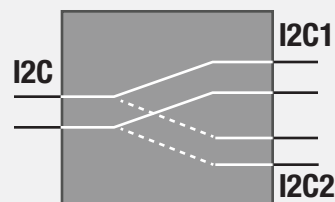
- Static offset buffer
- Hot-swappable buffer
- Bus extender
- Level-shifter

IO expanders



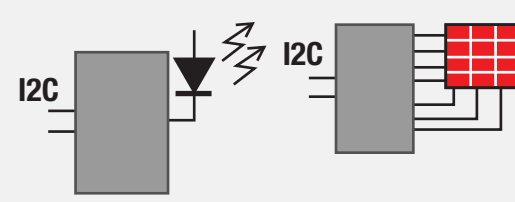
- 4-, 8-, 16-, 24-bit
- Level-shifting expanders
- Open drain, push-pull IOs

Switches



- 1:2, 1:4, 1:8
- Level-shifting switches
- Interrupt switching

Special function



- LED driver
- Keyboard scanner

Key Products

[PCA9306](#)
[TCA9617A](#)
[P82B96](#)

Key Products

[TCA6408A](#)
[TCA6416A](#)
[TCA6424A](#)

Key Products

[TCA9548A](#)
[TCA9546A](#)
[TCA9543A](#)

Key Products

[TCA8418E](#)
[TCA8424](#)
[TCA6507](#)

Target Applications and end equipment:

- | | | | |
|------------|------------------|-------------------|-------------------|
| • Switches | • Base Stations | • Servers | • Remote Controls |
| • Routers | • Control Panels | • Medical Imaging | • HMI |
| • PLC | • Automotive | • Sensing | • Set Top Box |

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