

How Are IO-Link Solutions Enabling Smarter Factories?



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Introduction

IO-Link is a standardized digital communication protocol offering connectivity between sensors, actuators and control systems. Since its first introduction in 2006, IO link's bidirectional and backward standard input/output (SIO) communication compatibility has enabled the exchange of real-time data efficiently thus leading it to be a widely adopted protocol in the factory automation industry. [Figure 1](#) showcases some of the applications such as [proximity switch](#), [stand-alone remote IO](#), and [robot position sensor](#) where IO technology is utilized for communication.

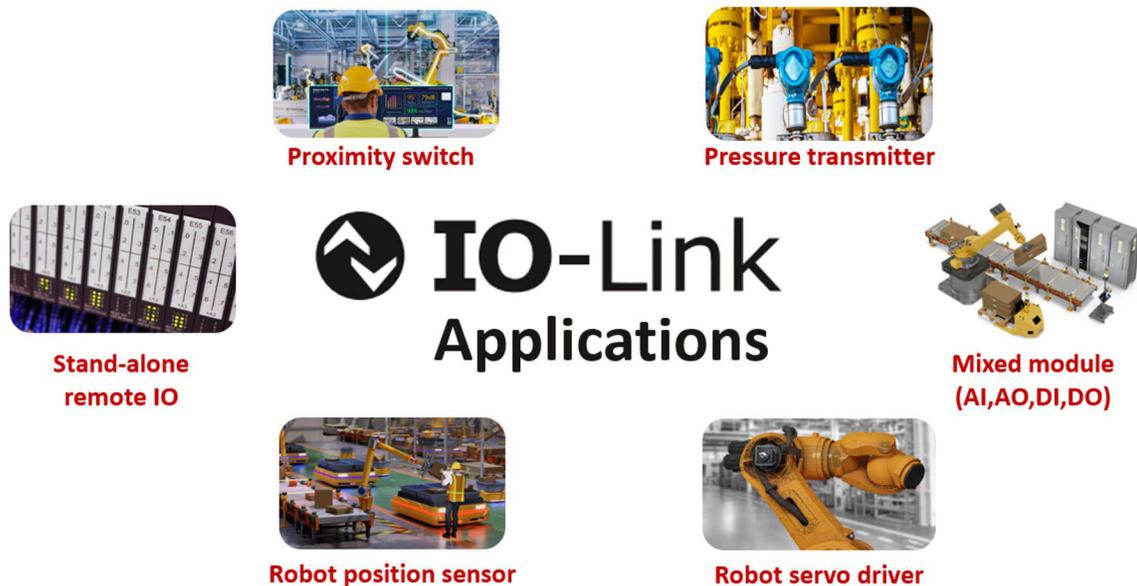


Figure 1. IO Link Applications

Texas Instruments has taken part in providing these IO link devices since 2011 and now offers newer solutions such as [TIOL112](#) and [TIOS102](#) seen in [Figure 2](#), which include features such as:

- Footprint compatibility between TI devices to interface with either IO-Link or SIO sensors
- Low residual voltage of 0.5V (typical) at 200mA for lower power dissipation
- Availability in smaller QFN package to fit in space-constrained sensors
- Providing simple and flexible IO link implementation for modern factory automation designs

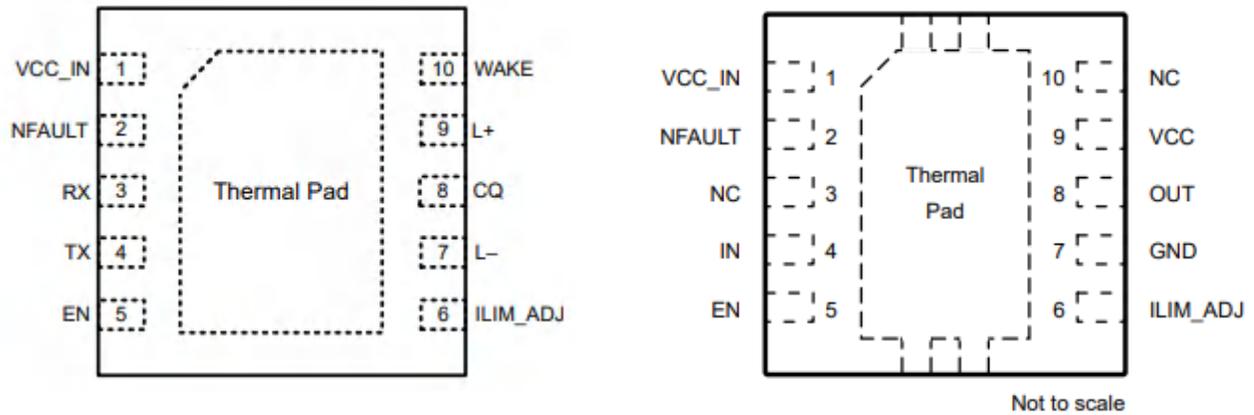


Figure 2. TIOL112 and TIOS102

However, as industrial factory automation systems get more complex the need for advanced integration, robustness, and real-time monitoring is key to enable “smarter” factories. The TIOL221 was designed with these factors in mind.

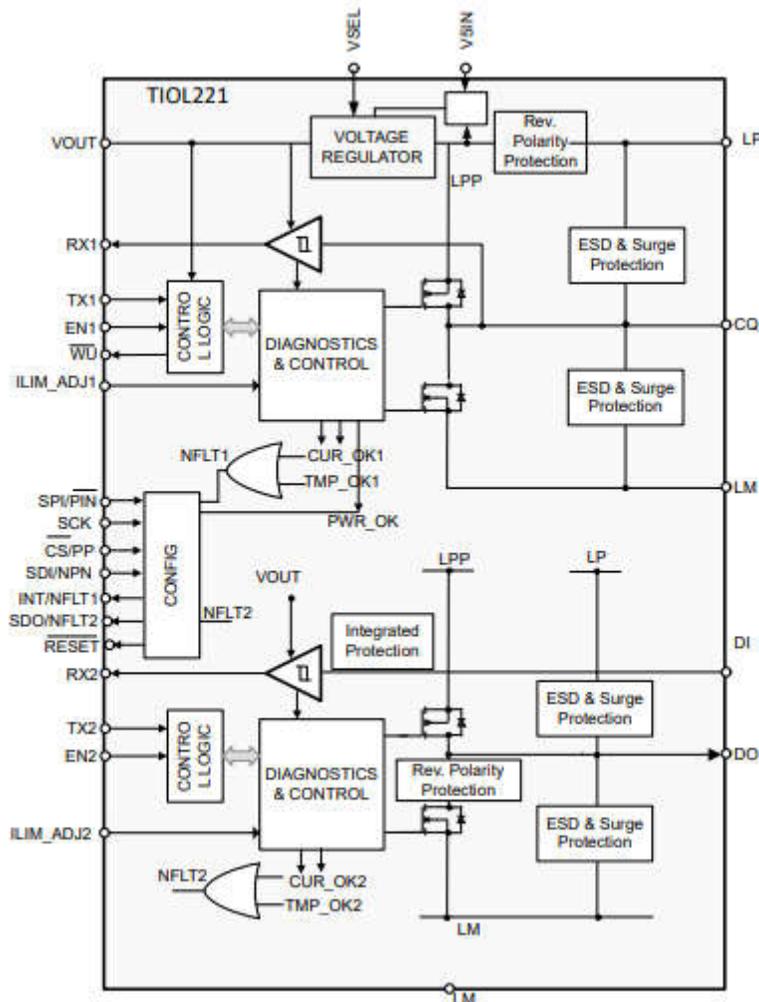


Figure 3. TIOL221 Block Diagram

As seen in [Figure 3](#), this IO link device acts as an IO Link physical layer. Offering two channels, a communication channel (CQ) and an auxiliary digital input/output (DO/DI) channel that provides an additional channel to send and receive data for monitoring, configuration, diagnostics or any another function. The TIOL221 also offers a Serial Peripheral Interface (SPI) pin that provides the capability for the microcontroller to read separate diagnostic and status information. All these features provide faster real-time monitoring of the factory floor.

[Table 1](#) lists additional parameters found in the TIOL221 that provide a wide range of benefits. These parameters help streamline integration and robustness in factory automation systems.

Table 1. TIOL221 Parameters and Benefits

Benefits	TIOL221
Flexibility to communicate with variety of power systems	Input supply voltage: 7V to 36V
Power external system level components	Integrated low dropout regulator (LDO): 3.3V or 5V regulated power and up to 20mA current
Optimize power efficiency through lower power dissipation	Low driver on resistance ($R_{DS(ON)}$): 2.5Ω typical
Increase robustness for harsh industrial environment	IEC protection w/o external components: ±4 kV IEC 61000-4-4 electric fast transient ±1.2 kV/500 Ω IEC 61000-4-5 surge
Improve monitoring and long-term health of sensors/actuators	Fault reporting functions: Overcurrent, overvoltage, and overtemperature
Reduce manufacturing cost and maximize board space with small footprint	Package options: VQFN (4mm x 4mm), DSBGA (2.7mm x 2.7mm)

Conclusion

Furthermore, Texas Instruments offers a wide IO link portfolio that can meet not just current factory automation needs but also provide innovative solutions such as the TIOL221 for future-looking factory automation designs.

Additional Resources

- Texas Instrument: [IO-link and digital output switches](#)
- Evaluate these solutions today using the [TIOL112](#) and [TIOL221](#) evaluation modules

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