

Enabling Modular PLC System Designs with Single-Supply Level Translation



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Electronic system designers in various markets are accelerating the use of modular systems designs. Factors such as system scalability and upgrade options are key drivers for developing modular systems. End equipment such as Programmable Logic Controllers (PLCs) and Programmable Automation Controllers (PACs) provide examples of systems that benefit from a modular design. PLC and PAC systems often consist of a main controller chassis into which a variety of plug-in cards (as shown in [Figure 1](#)) are added to achieve specific control functionality required for applications for industrial and factory automation use cases. Modular system design approaches can present system designers with design challenges, such as developing modular components that can adapt to different system environments.

For example, in PLC systems, a control line card must be designed to support different chassis systems that can operate on different voltage ranges. The electrical control and data interfaces of the different modular components must be able to operate when plugged into a common chassis. One way the system designers can make modular design components more adaptable to data interfaces operating at different I/O (Input/Output) voltage levels is to use single-supply voltage level translation devices.

Single-supply voltage level translation supports a wide range of I/O level inputs and can set the output I/O voltage level based on the single input voltage supply level on the translator. Single-supply level translators can be used for both up and down translation of I/O levels. As a result, the translators are flexible for modular system designs where each module or component can interoperate on different I/O voltage levels. For example, a PLC line card can use a processor or controller operating at a lower I/O voltage such as 1.8V, while a different line card can use a processor operating at 2.5V I/O voltage, as shown in [Figure 1](#).

[Figure 1](#) shows how the SN74LV4T125 4-bit single-supply level translator device can be used to design line cards that level shift the control I/O of the line card based on the bus supply of the PLC chassis. When the line cards are plugged into a PLC chassis that has a bus supply voltage of 3.3V, the control I/O of the line card must interoperate with the other line card components that are plugged into the chassis that are operating at 3.3V I/O levels. A line card designed with single-supply translation devices can provide a flexible design for accommodating different bus voltages. This enables the control I/O of the line card to be level shifted based on the bus voltage of the chassis system rather than a fixed voltage that is more common for non-modular systems.

Single supply level translation devices are available in a wide variety of bit counts, I/O configurations, voltage ranges, and ratings that are designed for industrial, automotive, communication, enterprise and personal electronic applications, as listed in [Table 1](#). For more information on single-supply level translation devices that are applicable for a modular design, see [TI's level translation landing page](#) and the [single supply level translation portfolio page](#).

Table 1. Single-Supply Level Translation Device List

Device	Description	Voltage Range
SN74LV1T125	One-bit fixed direction level translator with low enable	5V to 1.8V
SN74LV1T126	One-bit fixed direction level translator with high enable	5V to 1.8V
SN74LV1T34	One-bit fixed direction level translator	5V to 1.8V
SN74LV1T04	One-bit fixed direction inverting level translator	5V to 1.8V
SN74LV4T125	Four-bit fixed-direction level translator	5V to 1.8V
SN74LV6T06	Six-bit inverting open-drain fixed-direction level translator	5V to 1.8V
SN74LV6T07	Six-bit open-drain fixed-direction level translator	5V to 1.8V
SN74LV6T14	Six-bit fixed-direction inverting level translator with Schmitt-trigger inputs	5V to 1.8V
SN74LV6T17	Six-bit fixed-direction level translator with Schmitt-trigger inputs	5V to 1.8V

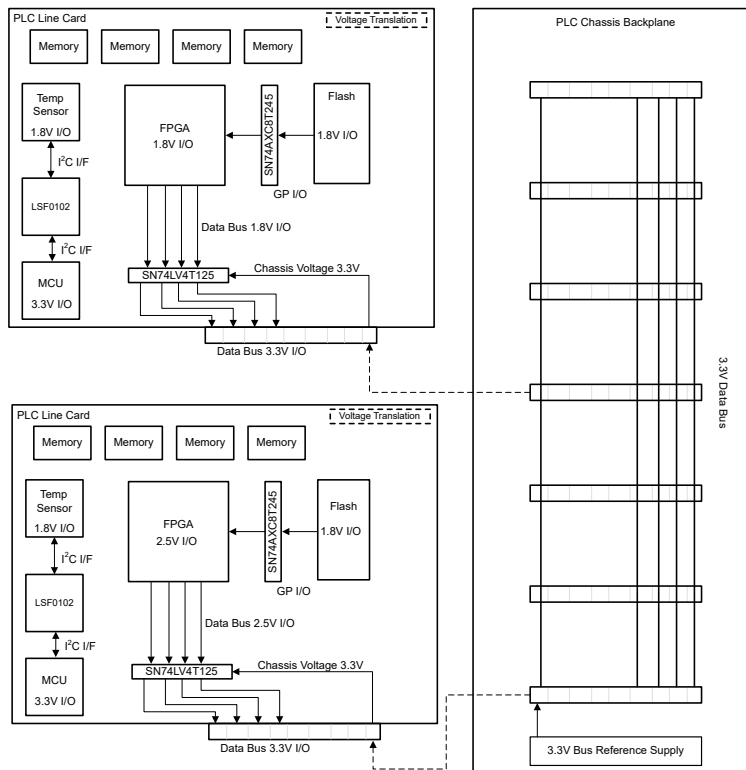


Figure 1. PLC Chassis and PLC Line Cards Use Case

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