

V12/24

Intrinsically Safe Isolators

Introduction

A number of NVE isolators have been certified under stringent ATEX and IECEx requirements for use as isolating components between intrinsically safe circuits (IS-to-IS) in explosive atmospheres. When used within recommended entity parameters they will not become an ignition point when subjected to short circuits or if connected circuitry fails.



ATEX and IECEx

ATEX Equipment Directive is a European certification, while IECEx is accepted in many other countries, including the U.S., China, and Japan. The technical requirements are similar for both certifications. NVE has both ATEX and IECEx certifications so the isolators can meet intrinsic safety requirements almost anywhere in the world.

Intrinsically Safe “Zones”

An intrinsically safe (IS) zone is where dust or gas can create hazardous conditions. Components in an IS zone cannot provide a source of ignition. Energy to components in IS zones must be limited, and IS-zone power supplies must be in the Safety Extra Low Voltage (SELV) range of 24 to 60 volts. Unlike other isolation components, NVE isolators can operate over the full SELV range.

Better Thermal Characteristics

Intrinsically safe components must dissipate the maximum power the system can provide them without overheating. This requires rugged components, and fortunately NVE’s unique spintronic isolators are inherently rugged.

NVE Isolators have better thermal characteristics than other isolators so they can dissipate more power without creating unsafe package temperatures. The isolators are based on spintronics rather than semiconductors. Spintronics uses nanoscale metal films which have good thermal characteristics. Leadframe areas have been maximized to enhance heat radiation. Finally, because their revolutionary design does not require die to be electrically insulated from the leadframe, die attach adhesives with high electrical and thermal conductivity are used.

A Better Barrier

A unique polymer/ceramic composite barrier gives NVE isolators a remarkable 40,000-year barrier life and best-in-class 10^{14} ohms barrier resistance. V-Series versions feature the industry’s highest isolation 6 kV_{RMS}. The better barrier means exceptional reliability in harsh environments and easier agency compliance.

Entity Parameters

IS-certified components are tested to safety or “entity” parameters. Parts must withstand the stresses of these parameters without burning, sparking, or exceeding the maximum component surface temperature.

Entity parameters and temperature ratings are summarized in Table 1. NVE isolators have a best-in-class Maximum Voltage (U_i) of 60 volts, providing flexibility to use higher voltages without compromising safety:

Entity Parameter	Symbol	Package	
		SOIC-8	0.3" SOIC-16
Maximum voltage that can be connected to device	U_i	60 V	
Maximum current that can be connected to device	I_i	300 mA	
Maximum power that can be connected to device	P_i	0.675 W	1.3 W
Maximum Temperature Coefficient at 85 °C	θ_{J-A}	88.5 °C/W	
Maximum internal capacitance of the device	L_i	0	
Maximum internal inductance of the device	C_i	4 pF	
Maximum ambient temperature			
IL7xxVE	T_{A-MAX}	N/A	125 °C
All other parts		85 °C	
Maximum component surface temperature		200 °C	

Table 1. NVE Isolator Intrinsically Safe “entity parameters” and temperature ratings.

Schedule of Limitations

- Parts must be installed in a suitable enclosure.
- Maximum Temperature Coefficient at 85 °C: 88.5 °C/W

Three Intrinsically-Safe Isolator Lines

IS models in three NVE isolator lines support a variety of industrial applications including PROFIBUS and RS-485, SPI, and various parallel interfaces:

IL7xxVE-Series isolated datacouplers are Intrinsically Safe and rated at a best-in-class 6 kV_{RMS} Reinforced Isolation and 1.2 kV_{RMS} Working Voltage under the stringent IEC60747-17:2020 standard.

IL0xx-Series isolators are low power and Intrinsically Safe, reducing energy usage in hazardous areas or allowing more channels for a given power budget.

The **IL3685VE** isolated RS-485 transceiver is fully compliant with PROFIBUS and RS-485 standards and designed for harsh environments. In addition to being Intrinsically Safe, it has a 15 kV bus ESD rating, thermal shutdown protection, and is hot-plug capable. It is also rated at best-in-class 6 kV_{RMS} Reinforced Isolation and 1.2 kV_{RMS} Working Voltage.

Intrinsically-safe isolator models are summarized in Table 2:

Part Type	Channel Configuration	Package	Features
IL711VE	2/0	0.3" SOIC-16	6 kV _{RMS} Reinforced Isolation; 1.2 kV _{RMS} Working Voltage; 125 °C
IL721VE	1/1		
IL715VE	4/0		
IL716VE	2/2		
IL717VE	3/1		
IL011-3E	2/0	SOIC-8	Low Power
IL012-3E	1/1	0.3" SOIC	
IL015E	4/0		
IL016E	2/2		
IL017E	3/1		
IL3685VE	RS-485 / PROFIBUS		6 kV _{RMS} Reinforced Isolation; 1.2 kV _{RMS} Working Voltage; 15 kV bus ESD

Table 2. Intrinsically-safe isolators.

Conclusion

NVE isolators have been certified as Intrinsically Safe for use in hazardous conditions. Their superior thermal characteristics allow these isolators to dissipate a more power with less heating, avoiding ignition in an IS zone. Their better barrier means durability in harsh environments and easier agency compliance. NVE isolators are certified for up to 60 volts, providing flexibility to use higher voltages without compromising safety. Three intrinsically-safe isolator lines and a variety of channel configurations are available, covering a range of industrial applications.

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