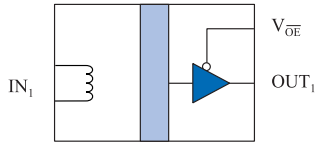
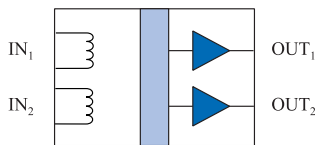


Ultrahigh CMTI Isolated MOSFET Drivers

Functional Diagrams



IL610CMTI



IL611CMTI

Features

- 200 kV/μs guaranteed CMTI; 300 kV/μs with deglitch
- Extended 3 V to 6.6 V power supply range
- Switching frequencies up to 50 Mhz
- Flexible inputs with wide input voltage range
- Input current as low as 5 mA
- No input-side power supply needed
- No reverse input protection needed
- Failsafe output (high output for zero coil current)
- No carrier or clock for low EMI emissions and susceptibility
- Extremely high EMI and magnetic immunity
- 2.5 kV isolation
- 44000 year barrier life
- VDE V 0884-11 / IEC 60747-17 certified; UL 1577 recognized
- -40°C to 85°C temperature range
- Single and dual-channel configurations
- 8-pin MSOP and SOIC packages

Applications

- H-bridges
- Floating supply applications
- Noisy environments

Description

The IL600-Series isolators are passive input digital signal isolators with CMOS outputs. The IL6xxCMTI version is optimized for driving MOSFETs either directly or with an external gate driver.

Resistors set the input current, and five milliamps guarantees switching. The inputs can be configured as non-inverting or inverting.

CMTI-grade isolators are 100% tested to ensure each part has at least 200 kV/μs minimum Common-Mode Transient Immunity. Simple external deglitch circuitry can extend the CMTI to an extraordinary 350 kV/μs typical.

The parts also have an extended supply range of up to 6.6 volts for compatibility to directly drive a range of power MOSFETs or gate driver ICs.

The devices are manufactured with NVE's patented* IsoLoop® spintronic Giant Magnetoresistive (GMR) technology for small size, high speed, and low power.

A unique ceramic/polymer composite barrier provides excellent isolation and virtually unlimited barrier life.

IsoLoop is a registered trademark of NVE Corporation.
*U.S. Patent number 5,831,426; 6,300,617 and others.

REV. D

Absolute Maximum Ratings⁽¹⁾

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Storage Temperature	T_S	-55 ⁽²⁾		150	°C	
Ambient Operating Temperature	T_A	-40 ⁽³⁾		85	°C	
Supply Voltage	V_{DD}	-0.5		7	V	
DC Input Current	I_{IN}	-25		25	mA	
AC Input Current (Single-Ended Input)	I_{IN}	-35		35	mA	
AC Input Current (Differential Input)	I_{IN}	-75		75	mA	
Output Voltage	V_O	-0.5		$V_{DD}+1.5$	V	
Maximum Output Current	I_O	-10		10	mA	
ESD			2		kV	HBM

Note 1: Operating at absolute maximum ratings will not damage the device. Parametric performance is not guaranteed at absolute maximum ratings.

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Ambient Operating Temperature	T_A	-40 ⁽³⁾		85	°C	
Supply Voltage	V_{DD}	3		6	V	
Input Signal Rise and Fall Times	t_{IR}, t_{IF}			1	μs	
Common Mode Input Voltage	V_{CM}			1000	V_{RMS}	

Insulation Specifications

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Creepage Distance (external)						
MSOP8		3.01			mm	
SOIC8		4.03			mm	
Total Barrier Thickness (internal)		0.012	0.013		mm	
Leakage Current			0.2		μA	240 V_{RMS} , 60 Hz
Barrier Resistance	R_{IO}		$>10^{14}$			500 V
Barrier Capacitance	C_{IO}		7		Ω pF	f = 1 MHz
Comparative Tracking Index	CTI	≥175			V	Per IEC 60112
High Voltage Endurance (Maximum Barrier Voltage for Indefinite Life)	AC DC	V_{IO}	1000		V_{RMS} V_{DC}	At maximum operating temperature
Barrier Life			44000		Years	100°C, 1000 V_{RMS} , 60% CL activation energy

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Junction–Ambient Thermal Resistance	θ_{JA}		184 134		°C/W	Soldered to double-sided board;
Junction–Case (Top) Thermal Resistance	θ_{JT}		15 10		°C/W	free air
Power Dissipation	P_D			500 675	mW	

Safety and Approvals

VDE V 0884-11 / IEC 60747-17 (Basic Isolation; VDE File Number 5016933-4880-0001)

- Isolation voltage (V_{ISO}): 2500 V_{RMS}
- Transient overvoltage (V_{IOTM}): 4000 V_{PK}
- Surge rating: 4000 V_{PK}
- Each part tested at 1590 V_{PK} for 1 second, 5 pC partial discharge limit.
- Samples tested at 4000 V_{PK} for 60 sec.; then 1358 V_{PK} for 10 sec. with 5 pC partial discharge limit.
- Working Voltage (V_{IORM} ; pollution degree 2):
MSOP8 (-1 part number suffix): 399 V_{RMS}
SOIC8 (-3 part number suffix): 1000 V_{RMS}

Safety-Limiting Values	Symbol	Value	Units
Safety rating ambient temperature	T_S	180	$^{\circ}C$
Safety rating power (180 $^{\circ}C$)	P_S	270	mW
Supply current safety rating (total of supplies)	I_S	54	mA

UL 1577 (Component Recognition Program File Number E207481)

- 2500 V rating.
- Each part tested at 3000 V_{RMS} (4240 V_{PK}) for 1 second; each lot sample tested at 2500 V_{RMS} (3530 V_{PK}) for 1 minute.

Soldering Profile

Per JEDEC J-STD-020C; MSL 1

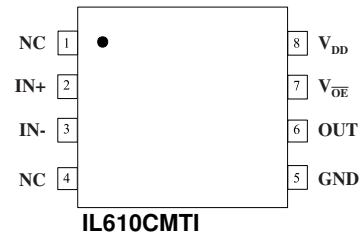
Electrostatic Discharge Sensitivity

This product has been tested for electrostatic sensitivity to the limits stated in the specifications. However, NVE recommends that all integrated circuits be handled with appropriate care to avoid damage. Damage caused by inappropriate handling or storage could range from performance degradation to complete failure.

Pin Connections

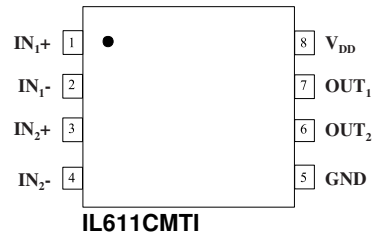
IL610CMTI

1	NC	No internal connection
2	IN+	Coil connection
3	IN-	Coil connection
4	NC	No internal connection
5	GND	Ground return for V_{DD}
6	OUT	Data out
7	V_{OE}	Output enable. Internally held low with 100 k Ω
8	V_{DD}	Supply Voltage



IL611CMTI

1	IN ₁ +	Channel 1 coil connection
2	IN ₁ -	Channel 1 coil connection
3	IN ₂ +	Channel 2 coil connection
4	IN ₂ -	Channel 2 coil connection
5	GND	Ground return for V_{DD}
6	OUT ₂	Data out, channel 2
7	OUT ₁	Data out, channel 1
8	V_{DD}	Supply Voltage



Operating Specifications

Coil Specifications ($V_{DD} = 3\text{ V} - 6.6\text{ V}$; $T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$ unless otherwise stated)						
Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Coil Input Resistance	R_{COIL}	47	85	112	Ω	$T = 25^{\circ}\text{C}$
		31	85	128	Ω	$T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$
Coil Resistance Temperature Coefficient	$TC R_{COIL}$		0.2	0.25	$\Omega/^{\circ}\text{C}$	
Coil Inductance	L_{COIL}		9		nH	

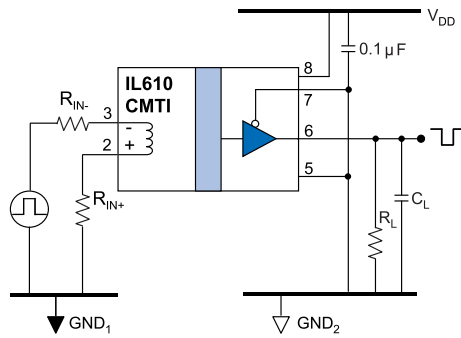


Figure 1. Test circuit.

5 V Specifications

5 V Electrical Specifications ($V_{DD} = 4.5\text{ V} - 6.6\text{ V}$; $T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$ unless otherwise stated)						
Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Quiescent Supply Current						
IL610CMTI	I_{DD}		2	3	mA	$V_{DD} = 5\text{ V}$, $I_{IN} = 0$
IL611CMTI			4	6		
Input Threshold	I_{INH-DC}	0.5	3		mA	
Input Threshold Hysteresis	$I_{INH} - I_{INL}$	0.25	1		mA	$V_{DD} = 5\text{ V}$
		0.25	0.5			$V_{DD} = 6\text{ V}$
Failsafe Input Current ⁽¹⁾	$I_{FS-HIGH}$	-25		0.5	mA	
	I_{FS-LOW}	5		25	mA	
High Output Voltage	V_{OH}	4.9	4.999		V	$V_{DD} = 5\text{ V}$, $I_O = 20\text{ }\mu\text{A}$
		4.0	4.8		V	$V_{DD} = 5\text{ V}$, $I_O = 4\text{ mA}$
Low Output Voltage	V_{OL}		0.0007	0.1	V	$V_{DD} = 5\text{ V}$, $I_O = -20\text{ }\mu\text{A}$
			0.12	0.8	V	$V_{DD} = 5\text{ V}$, $I_O = -4\text{ mA}$
Output Stage High-Side Drain-to-Source Resistance	R_{DS-P}		40		Ω	$V_{DD} = 5\text{ V}$
			38		Ω	$V_{DD} = 6\text{ V}$
Output Stage Low-Side Drain-to-Source Resistance	R_{DS-N}		30		Ω	$V_{DD} = 5\text{ V}$
			28		Ω	$V_{DD} = 6\text{ V}$
Output Short-Circuit Current	$ I_{SC} $	40	55	70	mA	$V_{DD} = 5\text{ V}$
		45	65	80		$V_{DD} = 6\text{ V}$

5 V Switching Specifications ($V_{DD} = 4.5\text{ V} - 6.6\text{ V}$; $T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$ unless otherwise stated)						
Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Minimum Pulse Width ⁽¹⁾	PW	10			ns	Digital Drive: $R_L = 1\text{ K}\Omega$; $C_L = 15\text{ pF}$; $t_{IR} = t_{IF} = 3\text{ ns}$
Propagation Delay Input to Output (High-to-Low)	t_{PHL}		8	15	ns	
Propagation Delay Input to Output (Low to High)	t_{PLH}		8	15	ns	
Average Propagation Delay Drift	t_{PLH}		10		ps/ $^{\circ}\text{C}$	
Pulse Width Distortion $ t_{PHL} - t_{PLH} $ ⁽²⁾	PWD		3	5	ns	
Pulse Jitter	t_j			100	ps	
Propagation Delay Skew ⁽³⁾	t_{PSK}	-2		2	ns	
Output Rise Time (10–90%)	t_R		2	4	ns	
Output Fall Time (10–90%)	t_F		2	4	ns	
Minimum Pulse Width ⁽¹⁾	PW	75			ns	
Propagation Delay Input to Output (High-to-Low)	t_{PHL}		50	70	ns	Driving high-power MOSFET; $R_L = 1\text{ M}\Omega$; $C_L = 1000\text{ pF}$; $t_{IR} = t_{IF} = 3\text{ ns}$
Propagation Delay Input to Output (Low to High)	t_{PLH}		60	90		
Pulse Width Distortion $ t_{PHL} - t_{PLH} $ ⁽²⁾	PWD		30	50		
Output Rise Time (10–90%)	t_R		130	160		
Output Fall Time (10–90%)	t_F		110	140		

5 V Common Mode Transient Immunity Specifications ($V_{DD} = 4.5\text{ V} - 6.6\text{ V}$; $T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$ unless otherwise stated)						
IL610CMTI (single channel)						
5 mA drive	$ ICM_H , ICM_L $		165		kV/ μs	$I_{COIL} = 0 / +5\text{ mA}$
10 mA drive ⁽²⁾		200 ⁽²⁾	240			$I_{COIL} = 0 / +10\text{ mA}$
With external deglitching		300	350			10 ns output deglitch
IL611CMTI (two channel)						
5 mA drive	$ ICM_H , ICM_L $		145		kV/ μs	$I_{COIL} = 0 / +5\text{ mA}$
10 mA drive ⁽²⁾		200 ⁽²⁾	210			$I_{COIL} = 0 / +10\text{ mA}$
With external deglitching		300	350			10 ns output deglitch

3.3 V Specifications

3.3 V Electrical Specifications ($V_{DD} = 3\text{ V} - 3.6\text{ V}$; $T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$ unless otherwise stated)						
Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Quiescent Supply Current						
IL610	I_{DD}		1.3	2	mA	$V_{DD} = 3.3\text{ V}$, $I_{IN} = 0$
IL611	I_{DD}		2.6	4		
Input Threshold	I_{INH-DC}	0.3	1		mA	Single-ended Unipolar Bipolar Differential
	I_{INL-DC}		4	8 5		
Input Threshold Hysteresis	$I_{INH} - I_{INL}$	0.25	3		mA	
Failsafe Input Current ⁽¹⁾	$I_{FS-HIGH}$	-25		0.3	mA	
High Output Voltage	V_{OH}	3.2	3.3		V	$V_{DD} = 3.3\text{ V}$, $I_O = 20\ \mu\text{A}$
		3.0	3.28		V	$V_{DD} = 3.3\text{ V}$, $I_O = 4\text{ mA}$
Low Output Voltage	V_{OL}		0.0005	0.1	V	$V_{DD} = 3.3\text{ V}$, $I_O = -20\ \mu\text{A}$
			0.15	0.8	V	$V_{DD} = 3.3\text{ V}$, $I_O = -4\text{ mA}$
Output Stage High-Side Drain-to-Source Resistance	R_{DS-P}		55		Ω	
Output Stage Low-Side Drain-to-Source Resistance	R_{DS-N}		38		Ω	
Output Short-Circuit Current	$ I_{SC} $	15	25	40	mA	

3.3 V Switching Specifications ($V_{DD} = 3\text{ V} - 3.6\text{ V}$; $T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$ unless otherwise stated)							
Minimum Pulse Width ⁽¹⁾	PW	10			ns	Digital Drive: Test Circuit 2; $R_L = 1\text{ K}\Omega$; $C_L = 15\text{ pF}$; $t_{IR} = t_{IF} = 3\text{ ns}$	
Propagation Delay Input to Output (High to Low)	t_{PHL}		12	18	ns		
Propagation Delay Input to Output (Low to High)	t_{PLH}		12	18	ns		
Average Propagation Delay Drift	t_{PLH}		10		ps/ $^{\circ}\text{C}$		
Pulse Width Distortion $ t_{PHL} - t_{PLH} $ ⁽²⁾	PWD		3	5	ns		
Propagation Delay Skew ⁽³⁾	t_{PSK}	-2		2	ns		
Output Rise Time (10–90%)	t_R		3	5	ns		
Output Fall Time (10–90%)	t_F		3	5	ns		
Minimum Pulse Width ⁽¹⁾	PW	100			ns		MOSFET drive: Test Circuit 2; $R_L = 1\text{ M}\Omega$; $C_L = 1000\text{ pF}$; $t_{IR} = t_{IF} = 3\text{ ns}$
Propagation Delay Input to Output (High-to-Low)	t_{PHL}		75	100	ns		
Propagation Delay Input to Output (Low to High)	t_{PLH}		90	130			
Pulse Width Distortion $ t_{PHL} - t_{PLH} $ ⁽²⁾	PWD		45	75			
Output Rise Time (10–90%)	t_R		200	240			
Output Fall Time (10–90%)	t_F		165	200			

3.3 V Common Mode Transient Immunity Specifications ($V_{DD} = 3\text{ V} - 3.6\text{ V}$; $T = -40^{\circ}\text{C} - 85^{\circ}\text{C}$ unless otherwise stated)						
IL610CMTI (single channel)						
5 mA drive	$ ICM_H , ICM_L $		125		kV/ μs	$I_{COIL} = 0/ +5\text{ mA}$
10 mA drive			175			$I_{COIL} = 0/ +10\text{ mA}$
With external deglitching			300			10 ns output deglitch
IL611CMTI (two channel)						
5 mA drive	$ ICM_H , ICM_L $		110		kV/ μs	$I_{COIL} = 0/ +5\text{ mA}$
10 mA drive			155			$I_{COIL} = 0/ +10\text{ mA}$
With external deglitching			300			10 ns output deglitch

Notes:

- Failsafe Operation is defined as the guaranteed output state which will be achieved if the DC input current falls between the input levels specified. Note if Failsafe to Logic Low is required, the DC current supplied to the coil must be at least 8 mA using 3.3 V supplies versus 5 mA for 4.5 V or higher supplies.
- Minimum Pulse Width is the shortest pulse width at which the specified PWD is guaranteed.
- PWD is defined as $|t_{PHL} - t_{PLH}|$.
- t_{PSK} is equal to the magnitude of the worst case difference in t_{PHL} and/or t_{PLH} that will be seen between units at 25°C.
- 100% tested.

Typical Performance Graphs

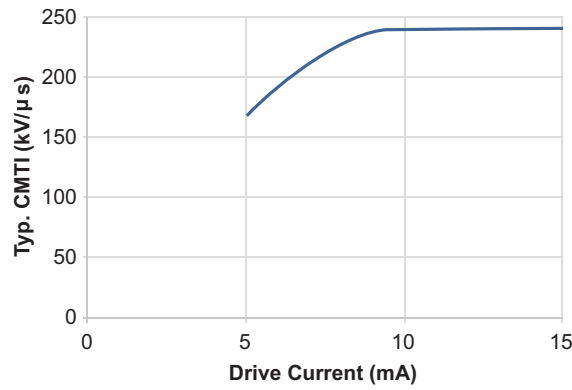


Figure 2. Typical CMTI vs. drive current ($V_{DD} = 5\text{ V}$).

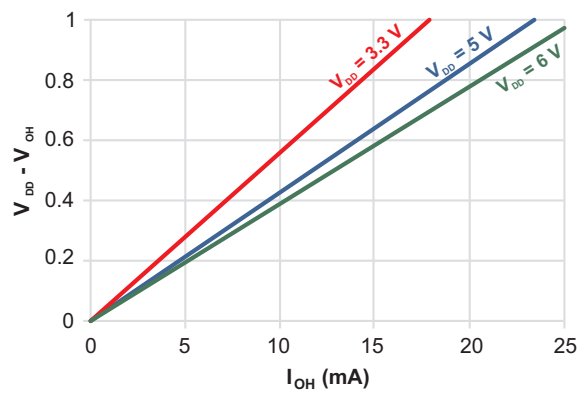


Figure 3. Typical high output voltage vs. load.

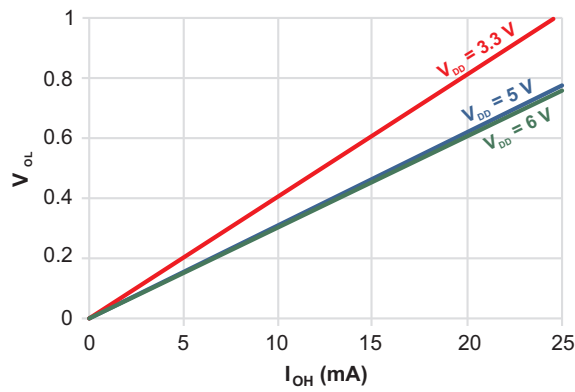


Figure 4. Typical low output voltage vs. load

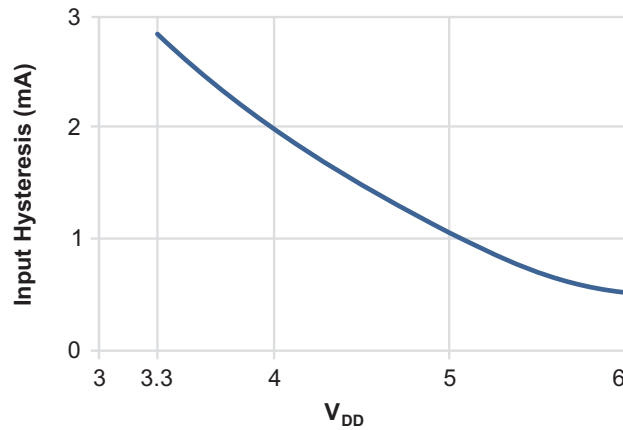


Figure 5. Typical input threshold current hysteresis.

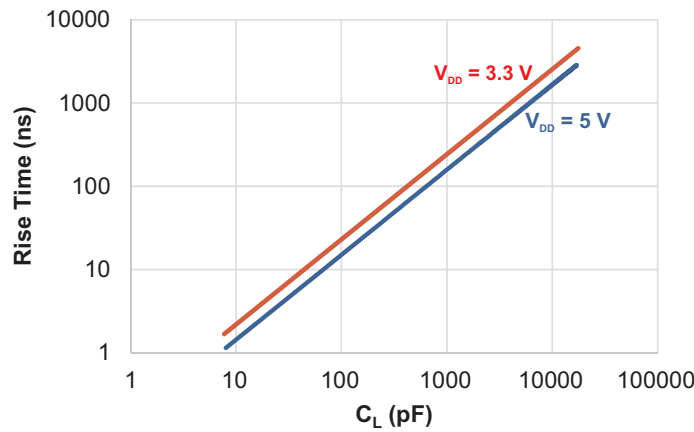


Figure 6. Typical output rise time vs. load capacitance

Applications Information

Overview

Figure 7 shows a block diagram of the IL61xCMTI. The coil, GMR, and support integrated circuitry are integrated on a single chip:

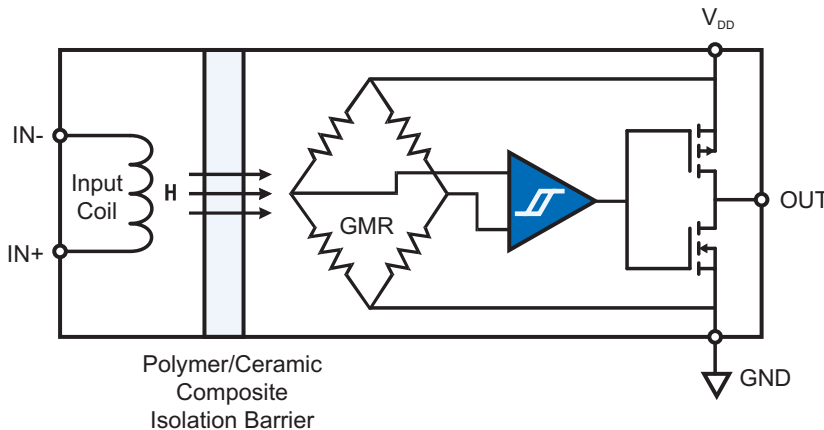


Figure 7. IL61xCMTI block diagram (each channel).

GMR Wheatstone Bridge

The heart of the Isolator is a Wheatstone bridge constructed of GMR resistor elements. The current in the coil driven from the input side of the isolator creates a magnetic field that switches the GMR in the bridge. Thus the signal is transmitted by magnetic field.

Schmitt Trigger and Output Stage

The change in the bridge is detected by a Schmitt trigger comparator. This drives a push-pull MOSFET output stage.

Input Coil

IL600-Series Isolators are current mode devices. Changes in current flow into the input coil result in logic state changes at the output. Input-stage hysteresis improves noise immunity. Output logic high is the zero input current state:

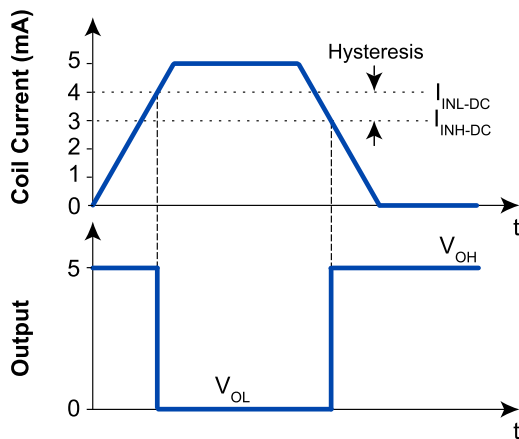


Figure 7. Typical IL600-Series transfer function.

Coil Polarity

The device switches to low if current flows from (In-) to (In+). *Note that the designations “In-“ and “In+” refer to logic levels, not current flow.* Positive values of current mean current flow into the In- input.

Input Resistor Selection

Resistors set the coil input current:

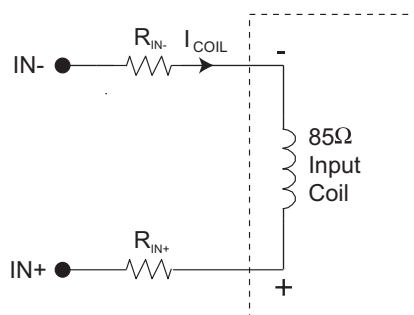


Figure 8. Input resistors.

There is no limit to input voltages because there are no semiconductor input structures.

The resistors can should be divided between the two inputs. The two resistors can be the same if necessary, although because of some inherent structural asymmetry, an R_{IN-} resistor approximately 50% larger than R_{IN+} is optimal for CMTI.

The worst-case drive current is calculated from the worst-case input voltage divided by the total series resistance plus the worst-case coil resistance. Note that coil resistance increases with temperature. Driver output impedance should also be considered if it is significant.

The following table summarizes typical input resistor values:

V_{COIL}	5 mA min. drive current		10 mA typical drive current	
	R_{IN-}	R_{IN+}	R_{IN-}	R_{IN+}
3.3 V	300 Ω	200 Ω	200 Ω	140 Ω
5 V	500 Ω	330 Ω	250 Ω	165 Ω

Table 1. Typical input resistor values.

The values for 5 mA drive are designed to provide a minimum of 5 mA drive current so the isolator is guaranteed to switch. The values for 10 mA drive are designed to provide 10 mA typical drive current to maximize CMTI.

The worst-case logic low threshold current is 8 mA, which is for single-ended operation with a 3 V supply. With differential drive the logic low threshold current is 5 mA for the range of supplies.

Maximum Coil Current

Absolute Maximum unipolar coil current is 25 mA, while bipolar mode allows up to ± 75 mA. The difference in specifications is due to the risk of electromigration of coil metals under constant current flow. Long-term unipolar DC current flow above 25 mA can cause erosion of the coil metal. In differential mode, erosion takes place in both directions as each current cycle reverses and has no net effect up to the absolute maximum current.

An advantage over optocouplers and other high-speed couplers in differential mode is that no reverse bias protection for the input structure is required for a differential signal.

Drive Configurations

IL600-Series Isolators can be configured in inverting (Figure 9) non-inverting (Figure 10) or bipolar (Figure 11) configurations.

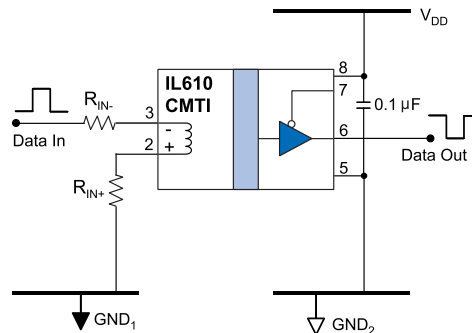


Figure 9. Inverting drive configuration.

This configuration is similar to standard logic. The output is high when the coil current is less than 0.5 mA, and low when the current is more than 5 mA.

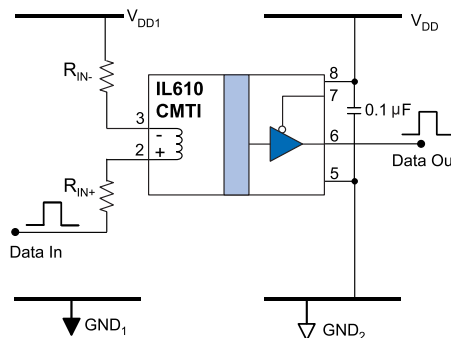


Figure 10. Non-inverting drive configuration.

When a logic high is applied to the input, the current through the coil is zero. When the input is a logic low (0 V), at least 5 mA flows through the coil from the In- side to the In+ side.

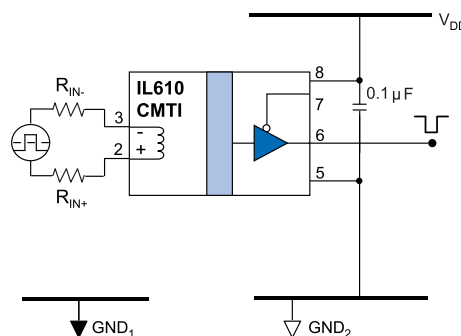


Figure 11. Bipolar drive configuration.

The differential coil current is negative for a high output and positive for a low output. Bipolar drive increases the absolute maximum coil current, minimizes the required input current with a 3.3-volt supply, and maximizes immunity to external magnetic fields. No reverse bias protection for the input structure is required for a bipolar signal.



IL6xxCMTI Isolators

Maximizing CMTI

10 mA coil current

CMTI increases with coil current, up to approximately 10 mA. More than 10 mA does not significantly improve CMTI.

Output Deglitching

Deglitching significantly increases CMTI. Some MOSFET drivers have built-in deglitching, or a simple deglitch circuit is shown in Figure 12.

Power Supply Decoupling

A 0.1 μ F ceramic capacitor is recommended to decouple the output-side power supply (V_{DD2}). The capacitor should be as close as possible to the V_{DD} pin.

Maintaining Creepage

Standard pad libraries often extend under the package, compromising creepage and clearance. Similarly, ground planes, if used, should be spaced to avoid compromising clearance. Package drawings and recommended pad layouts are included in this datasheet.

Electromagnetic Compatibility and Magnetic Field Immunity

IL600-Series isolators are ideal for harsh industrial environments with low emitted fields and very high external magnetic field immunity. Because IL600-Series Isolators are completely static, they have the lowest emitted noise of any non-optical isolators.

Internal shielding and inherent common-mode field immunity

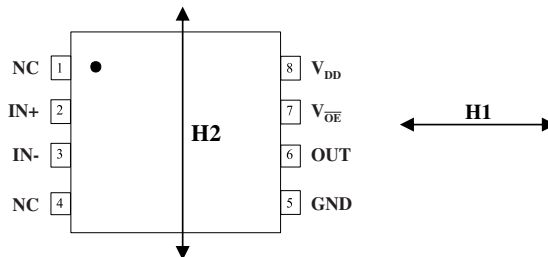
IsoLoop Isolators operate by imposing a magnetic field on a GMR sensor, which translates the change in field into a change in logic state. A magnetic shield and a Wheatstone Bridge configuration provide superb immunity to external magnetic fields.

Inherent AC magnetic field immunity

Unlike inductive or capacitive which transmit and detect high-frequency carriers, IsoLoop Isolators do not rely on AC signals, and are inherently insensitive to AC magnetic fields. It is harder to disrupt an isolated AC signal with an external magnetic field than a DC signal. This enhances the IL6xxCMTI magnetic immunity in switch-mode power control applications. Immunity to external magnetic fields can be enhanced by (1) optimal orientation of the device with respect to the field direction and (2) the use of bipolar inputs.

1. Orientation of the device with respect to the field direction

An applied field in the “H1” direction is the worst case for magnetic immunity. In this case the external field is in the same direction as the applied internal field. In one direction it will tend to help switching; in the other it will hinder switching. This can cause unpredictable operation. An applied field in direction “H2” has considerably less effect and results in higher magnetic immunity.



2. Bipolar input

Regardless of orientation, a bipolar input improves magnetic immunity. This is because the logic high state is driven by an applied field instead of zero field, as is the case with single-ended operation. The higher the coil current, the higher the internal field, and the higher the immunity to external fields.

Method	Approximate Immunity	Immunity Description
Field applied in H1 direction	± 20 Gauss	A DC current of 16 A flowing in a conductor 1 cm from the device could cause disturbance.
Field applied in H2 direction	± 70 Gauss	A DC current of 56 A flowing in a conductor 1 cm from the device could cause disturbance.
Field applied in any direction but with a bipolar input	± 250 Gauss	A DC current of 200 A flowing in a conductor 1 cm from the device could cause disturbance.

Illustrative Applications

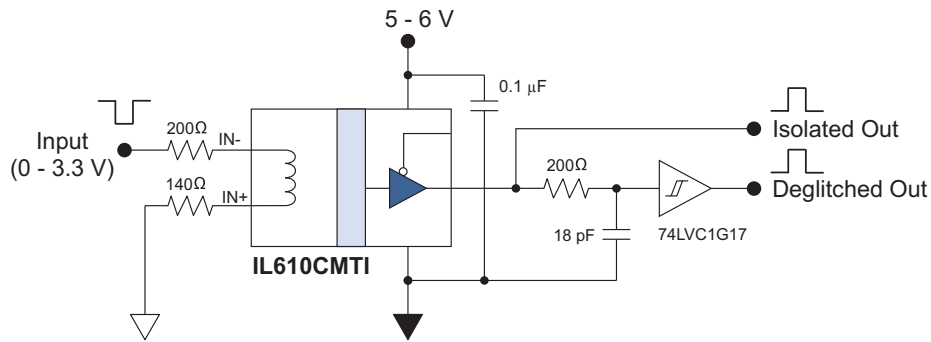


Figure 12. A simple deglitch circuit.

Deglitching provides a minimum of 300 kV/μs transient immunity. In this circuit, the RC delay filters out pulses less than approximately 10 ns, and an inexpensive Schmitt-trigger provides a digital output.

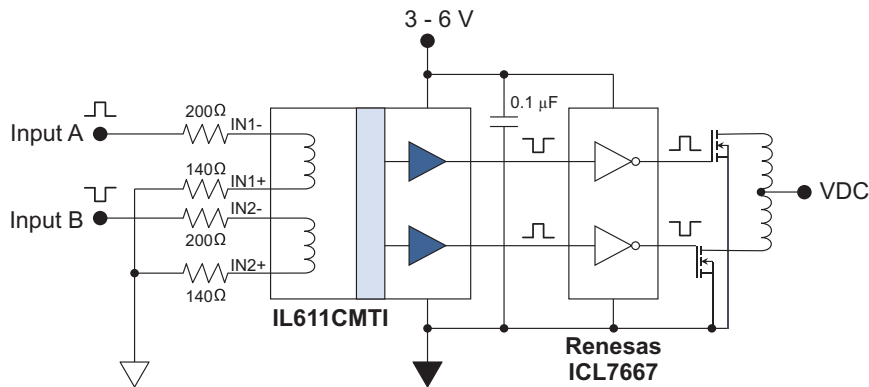


Figure 13. Isolated gate-driver interface.

The isolators can drive general-purpose gate drivers for applications requiring high speed or high gate capacitance MOSFETs. A Renesas ICL7667 dual high-speed monolithic driver is used in the circuit above to drive the primary of an isolated DC-DC converter transformer. The resistor values shown are typical for a 3.3-volt supply.

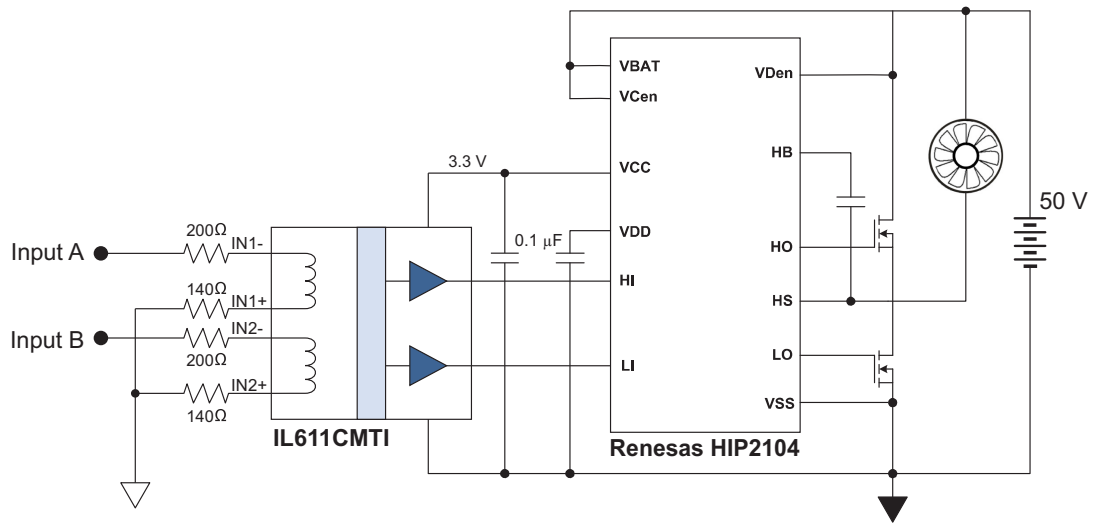


Figure 14. Isolated half-bridge motor drive.

The isolators can be used in conjunction with a half-bridge driver to create an isolated driver for motors or power-drive circuits. The HIP2104 IC provides fast drive of high gate-capacitance MOSFETs and powers the bridge side of the isolator. The resistor values shown are typical for a 3.3 volt input.

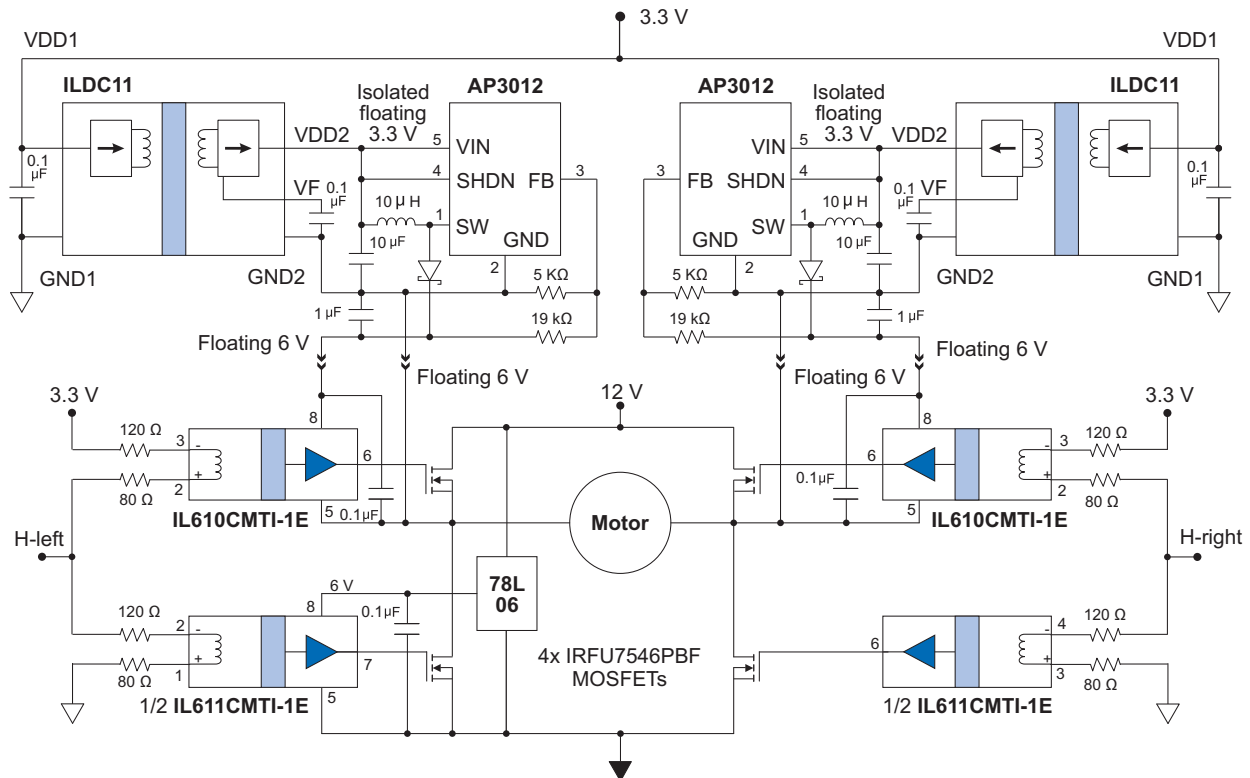


Figure 15. Isolated H-Bridge Driver.

Four channels of isolation in three IL6xxCMTI isolators allow referencing the high-side gate signals to the floating MOSFET source pins, plus they level-shift low-voltage controller inputs to six volts to drive MOSFET gates. These isolators have low-impedance outputs to directly drive MOSFETs, so separate MOSFET drivers are not required.

The ILDC11 ultraminiature DC-DC convertor isolates and floats the high-side gate power, and commodity regulators boost the output to the six volts needed to drive the MOSFET gates.

The isolator inputs on each side of the H-bridge are connected in series, which ensures two MOSFETs on the same side cannot be ON at the same time.

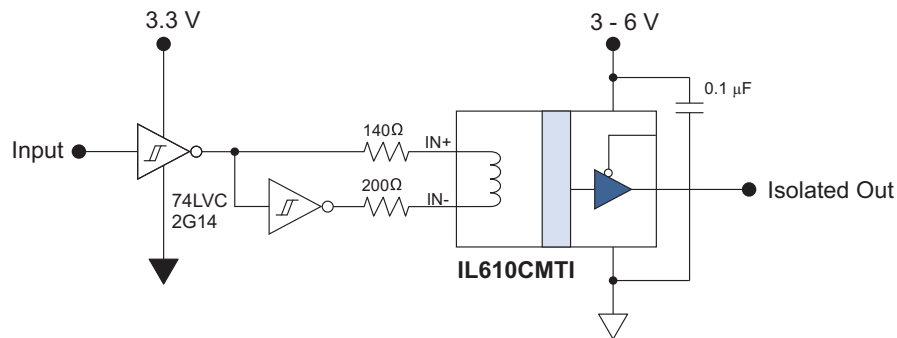


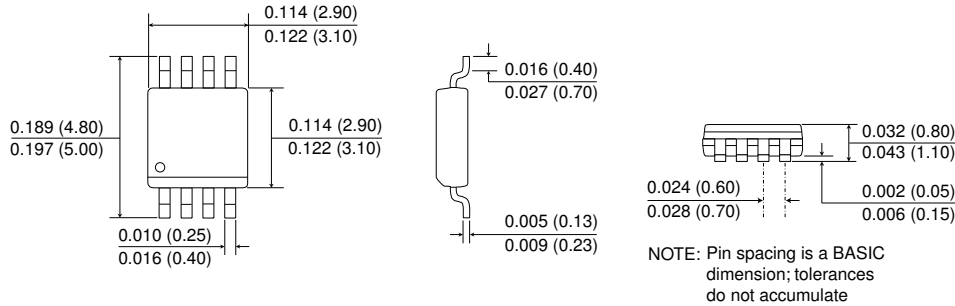
Figure 16. Bipolar driver.

A simple ± 10 mA bipolar differential coil driver using an inexpensive dual Schmitt trigger. Bipolar drive increases the absolute maximum coil current, minimizes the required input current with a 3.3-volt supply, and maximizes immunity to external magnetic fields.

Package Drawings

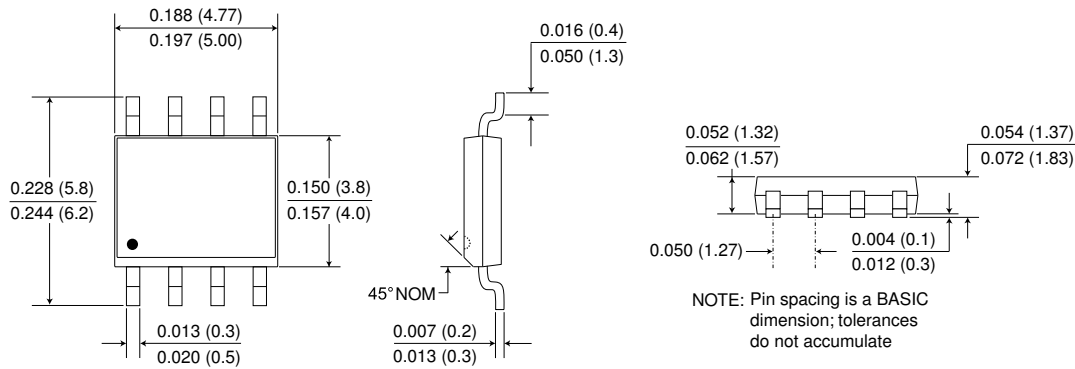
8-pin MSOP (-1 suffix)

Dimensions in inches (mm); scale = approx. 5X



8-pin SOIC Package (-3 suffix)

Dimensions in inches (mm); scale = approx. 5X



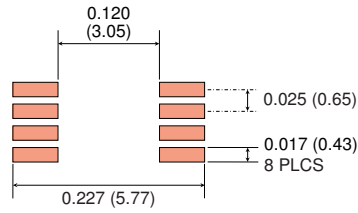


IL6xxCMTI Isolators

Recommended Pad Layouts

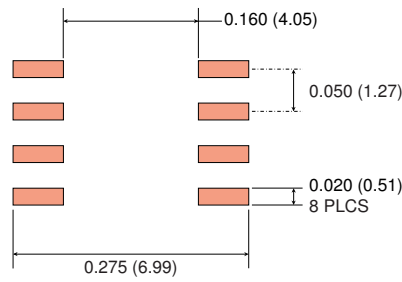
8-pin MSOP Pad Layout

Dimensions in inches (mm); scale = approx. 5X



8-pin SOIC Pad Layout

Dimensions in inches (mm); scale = approx. 5X

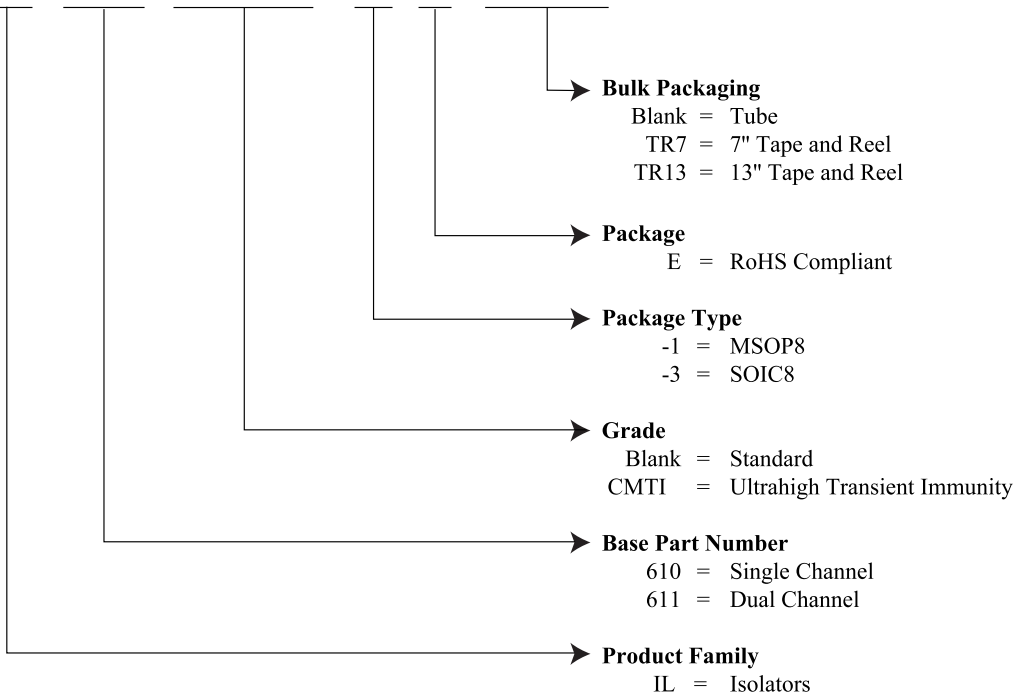




IL6xxCMTI Isolators

Ordering Information and Valid Part Numbers

IL 6xx CMTI - 1 E TR13



Available Parts:

Part Number	Channels	Package
IL610CMTI-1E	1	MSOP8
IL610CMTI-3E	1	SOIC8
IL611CMTI-1E	2	MSOP8



Revision History

ISB-DS-001-IL6xxCMTI-RevD Sept. 2020	Change <ul style="list-style-type: none"> • More detailed Figure 15 (isolated H-bridge driver).
ISB-DS-001-IL6xxCMTI-RevC March 2020	Change <ul style="list-style-type: none"> • Dropped IL6xxCMTI-3 part type.
ISB-DS-001-IL6xxCMTI-RevB February 2020	Changes <ul style="list-style-type: none"> • Increased SOIC Working Voltage to 1000 V_{RMS} (p. 3). • Added drain-source resistance and more detailed output voltage specs. • Separated 3.3 V and 5 V CMTI specification tables and separated one- and two-channel models. • Added detailed block diagram. • Dropped boost capacitor recommendation because it degrades CMTI. • Added several performance graphs. • Recommended two coil resistors and imbalanced resistors. • VDE and UL approval.
ISB-DS-001-IL6xxCMTI-RevA November 22, 2019	Changes <ul style="list-style-type: none"> • Added thermal characteristics (p. 2). • Increased supply voltage range from 6 V to 6.6 V. • Additional application circuits. • Initial release.
ISB-DS-001-IL6xxCMTI-PRELIM2 November 1, 2019	Changes <ul style="list-style-type: none"> • Updated CMTI specs. • Additional application circuits.
ISB-DS-001-IL6xxCMTI-PRELIM September 2019	Change <ul style="list-style-type: none"> • Preliminary release.



IL6xxCMTI Isolators

Datasheet Limitations

The information and data provided in datasheets shall define the specification of the product as agreed between NVE and its customer, unless NVE and customer have explicitly agreed otherwise in writing. All specifications are based on NVE test protocols. In no event however, shall an agreement be valid in which the NVE product is deemed to offer functions and qualities beyond those described in the datasheet.

Limited Warranty and Liability

Information in this document is believed to be accurate and reliable. However, NVE does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

In no event shall NVE be liable for any indirect, incidental, punitive, special or consequential damages (including, without limitation, lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Right to Make Changes

NVE reserves the right to make changes to information published in this document including, without limitation, specifications and product descriptions at any time and without notice. This document supersedes and replaces all information supplied prior to its publication.

Use in Life-Critical or Safety-Critical Applications

Unless NVE and a customer explicitly agree otherwise in writing, NVE products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical devices or equipment. NVE accepts no liability for inclusion or use of NVE products in such applications and such inclusion or use is at the customer's own risk. Should the customer use NVE products for such application whether authorized by NVE or not, the customer shall indemnify and hold NVE harmless against all claims and damages.

Applications

Applications described in this datasheet are illustrative only. NVE makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NVE products, and NVE accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NVE product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customers. Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NVE does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customers. The customer is responsible for all necessary testing for the customer's applications and products using NVE products in order to avoid a default of the applications and the products or of the application or use by customer's third party customers. NVE accepts no liability in this respect.

Limiting Values

Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the recommended operating conditions of the datasheet is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and Conditions of Sale

In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NVE hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NVE products by customer.

No Offer to Sell or License

Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export Control

This document as well as the items described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

Automotive Qualified Products

Unless the datasheet expressly states that a specific NVE product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NVE accepts no liability for inclusion or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NVE's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NVE's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NVE for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NVE's standard warranty and NVE's product specifications.



IL6xxCMTI Isolators

An ISO 9001 Certified Company

NVE Corporation
11409 Valley View Road
Eden Prairie, MN 55344-3617 USA
Telephone: (952) 829-9217

www.nve.com
e-mail: iso-info@nve.com

©NVE Corporation
All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

ISB-DS-001-IL6xxCMTI

Sept. 2020

We are here for you. Addresses and Contacts.

Headquarter Switzerland:

Angst+Pfister Sensors and Power AG
Thurgauerstrasse 66
CH-8050 Zurich
Phone +41 44 877 35 00
sensorsandpower@angst-pfister.com

Office Germany:

Angst+Pfister Sensors and Power Deutschland GmbH
Edisonstraße 16
D-85716 Unterschleißheim
Phone +49 89 374 288 87 00
sensorsandpower.de@angst-pfister.com

Scan here and get an overview of personal contacts!



sensorsandpower.angst-pfister.com
