

## Peripheral Integrated Circuits

In addition to GMR Sensor products, NVE has begun designing and manufacturing accessory products for our sensors. These products are designed to be used with NVE's sensors, or in some cases as stand-alone parts, to provide higher level signal processing capabilities coupled with the robust performance characteristics that NVE products are known for.

**DB-Series Power Switch ICs** – In many industrial control applications, a digital current output of up to 200 mA is required. NVE's DB-Series parts are designed to meet these requirements. They feature transient protection to meet rigid EMC and ESD standards, thermal shutdown for temperature protection, reverse battery protection, a regulated voltage output, an on-chip LED driver, and short circuit protection of the current drive output transistor. The DB001-00 is designed specifically to work together with NVE's AD9xx-00 short circuit protected GMR switch to create a very small IC combination suitable for use in miniature sensor assemblies. The DB002-02 is designed to take a generic digital input from any source, including inductive and photo sensors, and provide the digital current output.

**DC Series Voltage Regulator ICs** – These ICs are designed for use in high voltage, low current applications. They provide a wide input voltage range, up to 60V, and are available in 3.3V and 5.0V outputs. They feature reverse battery protection and excellent immunity to transients and noise allowing for the reduction or elimination of filtering devices at the PCB level. They are available in the TDFN6 package, which features a small PCB footprint (2.5 mm x 2.5 mm) and an exposed lead frame on the back for heat sinking to the PCB. DC series voltage regulators meet 42V automotive standards.

**DD-Series Signal Processing IC for Analog GT Sensors** – The DD001-12 is designed to be interfaced with an NVE ABL-Series GT Sensor to provide a digital output signal with excellent stability characteristics. It can be located away from the sensor so that the ABL package (MSOP8 or TDFN6) can be placed in a small remote housing, resulting in the absolute minimum size sensor package. The DD001-12 can also be used with other sensing devices which feature a sinusoidal output, to provide the same stable current modulated signal that it provides for NVE's ABL-Series GT Sensors.

## DB001-00 Series Power Switch IC

### Features:

- Designed to Work with AD9xx
- High Current Output
- Short Circuit, Reverse Battery, and Transient Protection
- LED Driver
- Excellent Temperature and Voltage Performance
- Small, Low-Profile Surface Mount Package

### Applications:

- Output Driver for Sensor Assemblies
- Usable with Magnetic, Inductive, and Photo Sensors

### Description:

The DB001-00 signal processing IC is designed to take the digital input signal from NVE's AD9xx GMR Switch and provide a high current switched output corresponding with the sensor input. The part functions as the "front end" of a complete sensor assembly and includes protection against short circuits and high voltage transients from capacitive and inductive loads. The parts also feature thermal shutdown circuitry and reverse battery protection. It provides a regulated output voltage for the sensor and other components in the assembly and an LED driver to indicate an "ON" condition.

Together, the AD9xx GMR Switch and the DB001-00 signal processing IC form the bulk of the signal processing required for pneumatic cylinder position sensing electronics. Using these two ICs, the end user only requires a few capacitors and an LED in order to implement the complete sensor assembly circuit. In addition, both the AD9xx part and the DB001-00 part come in MSOP8 packages, so that the customer can implement the complete design on an extremely small PCB.

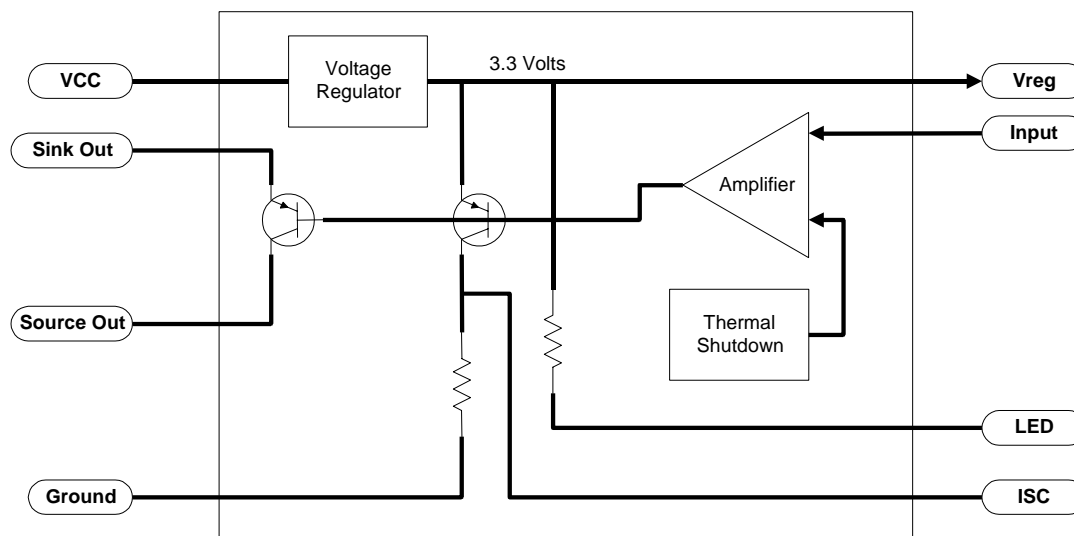
If ultra-miniaturization is desired, the DB001 part can be obtained in die form for COB (Chip On Board) or flip-chip assembly.

### Part Numbers and Configurations:

Part Number	Input	Die Size (mm)	Package	Marking
DB001-00	Current Sinking from AD9xx-00	1.48 x 2.25	MSOP8	FFD
DB001-01	Current Sinking from AD9xx-00	1.48 x 2.25	Raw IC	30284D

**Schematic:**

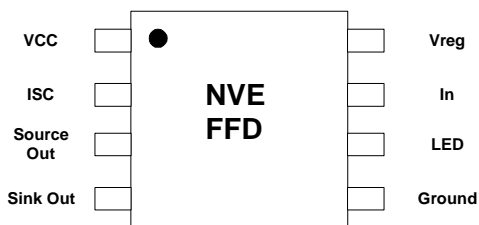
A block representation of the DB001-00 series part is shown below:



**Packages:**

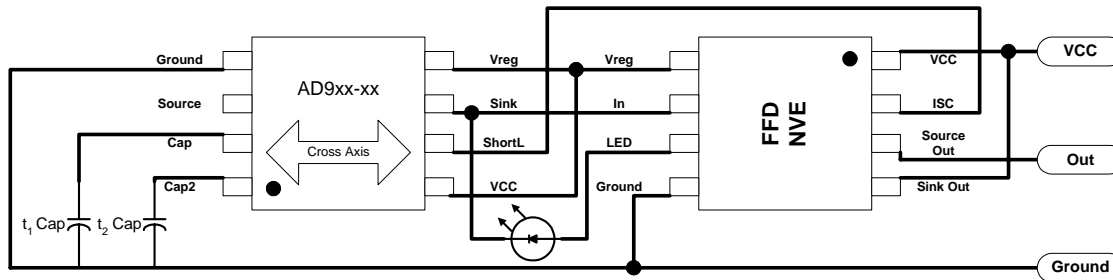
Please see the package drawing section in the Appendix for dimensions of the MSOP8 package.

**Pin Configuration:**



## Application Circuits:

DB001-00 in Current Sourcing Output Configuration:



**Note:** For current-sinking applications, connect “Source Out” to Ground; use “Sink Out” pin as output.

### Electrical characteristics (-40°C to +125°C, unless otherwise noted)

Parameter	Min	Typ	Max	Units
Input Voltage	4.5		30	V
Vreg Voltage	3.0	3.3	3.6	V
Vreg Output Current			10	mA
Switched Output Current			200	mA
Capacitive Load			100	nF
Off State Output Leakage Current			300	μA
Bias Current (output off)		1.0		mA
LED Drive Current		3		mA
Thermal Shutdown Temperature		200		°C
Sinking Input Current Required		100		μA
Output Transistor Saturation Voltage	0.5	1.1	1.5	V
Output Short Circuit Current	0.5	0.84	1.0	A

Absolute maximum ratings*	
Parameter	Limit
Input Voltage	36 V
Reverse Battery Protection	-36 V
Output Current	250 mA
Junction Temperature Range, T <sub>J</sub>	-40°C to +170°C
Storage Temperature Range	-65 °C to +170°C

\*Stresses beyond those listed under “Absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “Electrical characteristics” is not implied.

### Notes:

1. This part has reverse battery protection to -36V
2. Due to package size, MSOP8 package contains 3-letter code to designate part type.

## DB002-02 Series Power Switch IC

### Features:

- Designed to Work with Magnetic, Inductive, or Photo Sensors
- Up to 300 mA Continuous Current Output
- Short Circuit, Reverse Battery, Transient and Thermal Protection
- On-Chip LED Driver
- Excellent Temperature and Voltage Performance
- Available in SOIC8 Package or in Die Form

### Applications:

- Output Driver for Sensor Assemblies
- Usable with Magnetic, Inductive, and Photo Sensors

### Description:

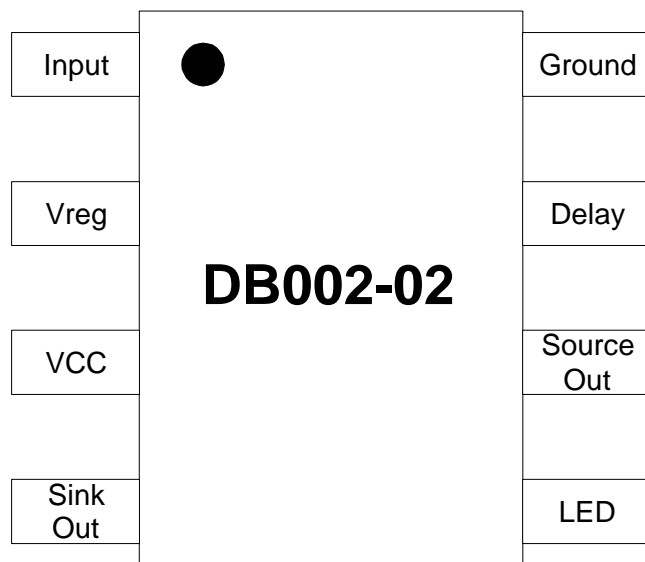
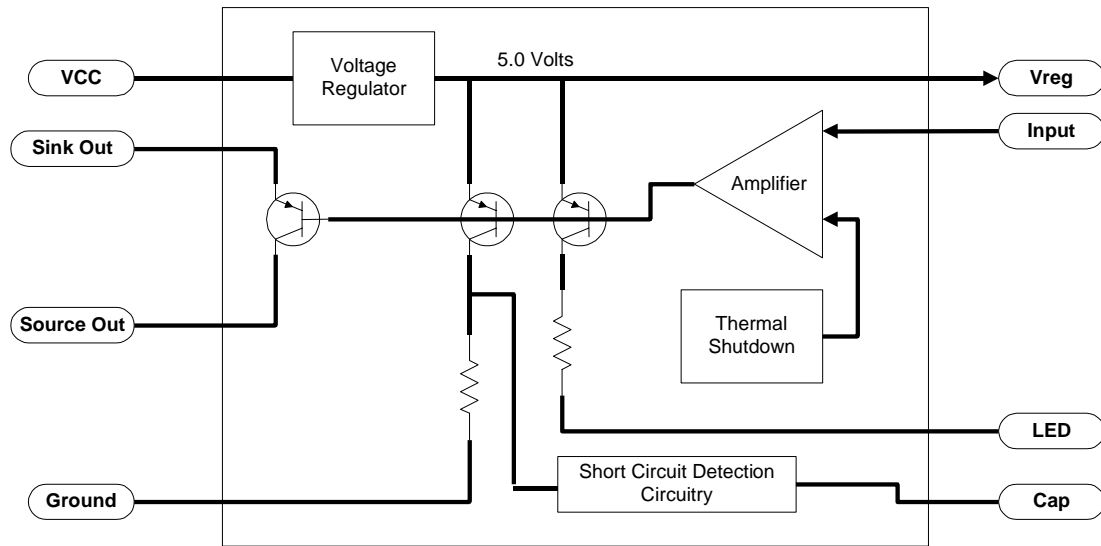
The DB002 series power switch IC is designed to take a digital input from a sensor element and provide a high current switched output corresponding with the sensor input. The part functions as the “front end” of a complete sensor assembly and includes protection against short circuits and high voltage transients from capacitive and inductive loads. The part also features thermal shutdown circuitry and reverse battery protection. It provides a regulated output voltage for the sensor and other components in the assembly and an LED driver to indicate an “ON” condition.

The DB002 is available in the SOIC8 package (p/n DB002-02), as well as in die form (p/n DB002-01). It is designed to work with NVE’s AD1xx GMR Switch products, or any other current sourcing or CMOS/TTL digital output sensor element such as an inductive sensor or a photo sensor.

### Part Numbers and Configurations:

Part Number	Input	Die Size (mm)	Package	Marking
DB002-01	Any Current Sourcing or CMOS/TTL Compatible Digital Output Device	1.89 x 2.85	Die	30304H (Chip ID Number)
DB002-02	Any Current Sourcing or CMOS/TTL Compatible Digital Output Device	1.89 x 2.85	SOIC8	DB002-02

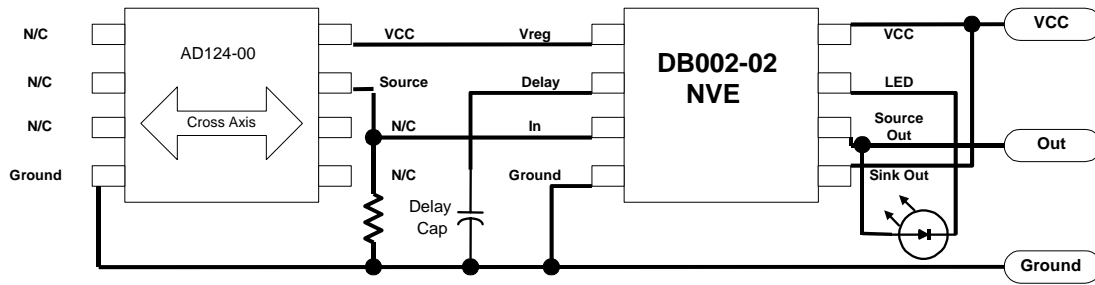
## Functional Block Diagram and Pinout:



### Packages:

Please see the package drawing section in the Appendix for dimensions of the SOIC8 package.

## Example Application Circuit:



## Notes on Operation:

1. A capacitor of at least 1nF value must be placed between the Delay pin and ground on the IC.
2. NVE recommends a bypass capacitor between VCC and Ground, 10nF or larger
3. In noisy environments a capacitor may be used on Vreg if necessary, up to 100nF.

## Electrical characteristics (-40°C to +125°C, unless otherwise noted)

Parameter	Min	Typ	Max	Units
Input Voltage	6.2		30	V
Vreg Voltage	4.5	5.0	5.5	V
Vreg Output Current			10	mA
Switched Output Current			300	mA
Capacitive Load			100	nF
Off State Output Leakage Current			300	μA
Bias Current (output off)		1.4		mA
LED Drive Current		3		mA
Thermal Shutdown Temperature		200		°C
Sourcing Input Current or CMOS/TTL Drive Current Required (DB002-02)		5		μA
Turn-On Voltage at Input Terminal			3.0	V
Turn-Off Voltage at Input Terminal	2.0			V
On/Off Hysteresis		0.25		V
Output Transistor Saturation Voltage	0.5	1.1	1.5	V
Short Circuit Protection Turn-On Current	400		650	mA
Output Short Circuit Current	0.5	0.84	1.0	A

Absolute maximum ratings*	
Parameter	Limit
Input Voltage	36V
Reverse Battery Protection	-36V
Output Current	350mA
Junction Temperature Range, T <sub>j</sub>	-40°C to +170°C
Storage Temperature Range	-65 °C to +170°C

\*Stresses beyond those listed under “Absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Electrical characteristics” is not implied.

## DC-Series Voltage Regulators

### High Voltage, Low Power Voltage Regulators

#### Features:

- Input Voltage to 36VDC (Max Rating 45VDC)
- 5.0V and 3.3V Regulated Output
- Reverse Battery Protection
- Excellent Immunity to Transients and ESD
- High Temperature Operation
- Small, Low-Profile Surface Mount Package

#### Applications:

- Industrial Sensors and Controls
- Automotive Sensors and Controls

#### Description:

The DC series voltage regulator ICs are designed for use in harsh, noisy environments where immunity to large voltage transients and acceptance of high input voltages are required. These regulators protect the sensitive electronic components downstream, while providing a stable regulated supply voltage. They are rated for high temperature operation, up to +170°C. The low-profile small footprint package features an exposed die attach pad, for direct heat sinking to the circuit board.

#### Specifications

##### Electrical characteristics (-40°C to +175°C, unless otherwise noted)

Parameter	Min	Typ	Max	Units
Input Voltage (DC001-10)	4.5		36	Volts
Output Voltage (DC001-10)	3.0	3.3	3.6	Volts
Input Voltage (DC002-10)	6.2		36	Volts
Output Voltage (DC002-10)	4.5	5.0	5.5	Volts
Output Current			20	Milliamps
Bias Current at Zero Output Current			900	Microamps

Absolute maximum ratings*	
Parameter	Limit
Input Voltage	45V
Reverse Battery Voltage	-60V
Output Current	25mA
Junction Temperature Range, T <sub>j</sub>	-40°C to +170°C
Storage Temperature Range	-65 °C to +170°C

\*Stresses beyond those listed under “Absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Electrical characteristics” is not implied.



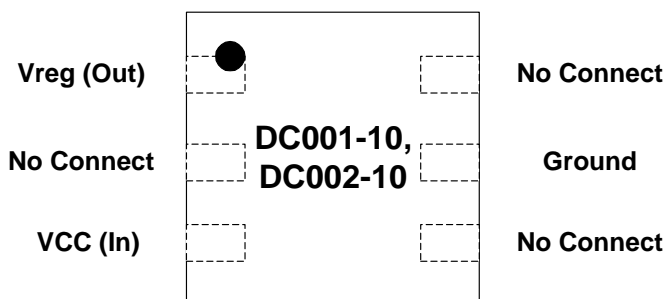
**Notes:**

1. Power dissipation rating for TDFN6 package in free air is 320°C/Watt. Soldering the package to a PCB, including the die attach paddle, improves temperature performance substantially. The input voltage and output current are limited by thermal power dissipation at the package.
2. Due to package size, TDFN6 package has a three-letter code to designate part type.

**Package:**

Please see the package drawing section in the Appendix for dimensions of the TDFN6 package.

**Pin Configuration**



**Note:** The die attach pad is exposed on the back of this package. NVE recommends that it be connected to the ground pin and the PCB for improved temperature performance.

## DD-Series Signal Processing ICs For use with ABL-Series Sensors

### **Features:**

- Converts Analog Sensor to Digital Operation
- Two-Wire Output
- 50% Duty Cycle
- DC (Zero Speed) Operation
- Excellent Temperature and Voltage Performance
- Small, Low-Profile Surface Mount Package

### **Applications:**

- Linear and Angular Speed Sensing
- Linear and Angular Position Sensing
- Direction Detection

### **Description:**

The DD-Series signal processing IC is designed to take an analog, sinusoidal input signal such as that provided by NVE's ABL-Series sensors and convert it to a two wire, current modulated digital output. Inputs as small as 2 mV peak-to-peak can be provided to the IC, along with large signal offsets. The DD001-12 part will provide a 50% duty cycle digital output signal.

The DD001-12 part contains a voltage regulator circuit, programmable amplifier, offset detection and correction circuitry, and an EEPROM for setting gain and current levels. The voltage regulator output (3.3V) is used to power the external sensor element, which should be connected between VREG and VGND. Nominal current levels for the current modulated output are 3 mA and 10 mA. These can be factory programmed to different levels for specific customer requirements.

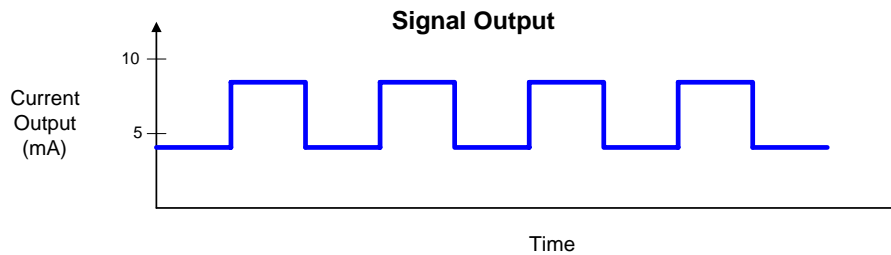
Using the DD-Series signal processing IC allows the user to put the sensor element, which can very small in a remote location, and pipe the signals from the sensor to the DD001-12 for digitizing purposes. In addition, if two phase shifted sensor outputs are available (such as with the ABL014-00, ABL015-00, and ABL015-00sensors), two DD001-12 parts can be used to provide two phase shifted digital signals, for the purpose of detecting the direction of the gear tooth or encoder wheel.

The two-wire output of the DD001-12 can be easily converted to a three-wire current-sinking output with the circuit shown in the GT Sensor applications section.

## Specifications:

Parameter	Min	Typ	Max	Unit
Input Voltage	4.5		36	Volts <sup>1</sup>
Input Voltage Signal	2		200	mV <sup>2</sup>
Input Current			10	μA
Supply Current – Off (Input Voltage=12V)	2.2	3.0	3.8	mA <sup>3</sup>
Supply Current – On (Input Voltage=12V)	7.0	8.0	9.0	mA <sup>3</sup>
Output Duty Cycle	40	50	60	%
Regulated Voltage Output	3.0	3.3	3.6	Volts
Current Supplied by Regulated Voltage Output			10	mA
Operating Temperature Range	-40		+150	°C
Frequency of Operation	0		10k	Hz
ESD		2000		V <sup>4</sup>

Absolute Maximum Ratings	
Parameter	Limit
Supply Voltage	45V
Reverse Battery Voltage	-60V
Output Current	16mA
Junction Temperature Range	-40°C to +170°C
Storage Temperature Range	-65°C to +170°C

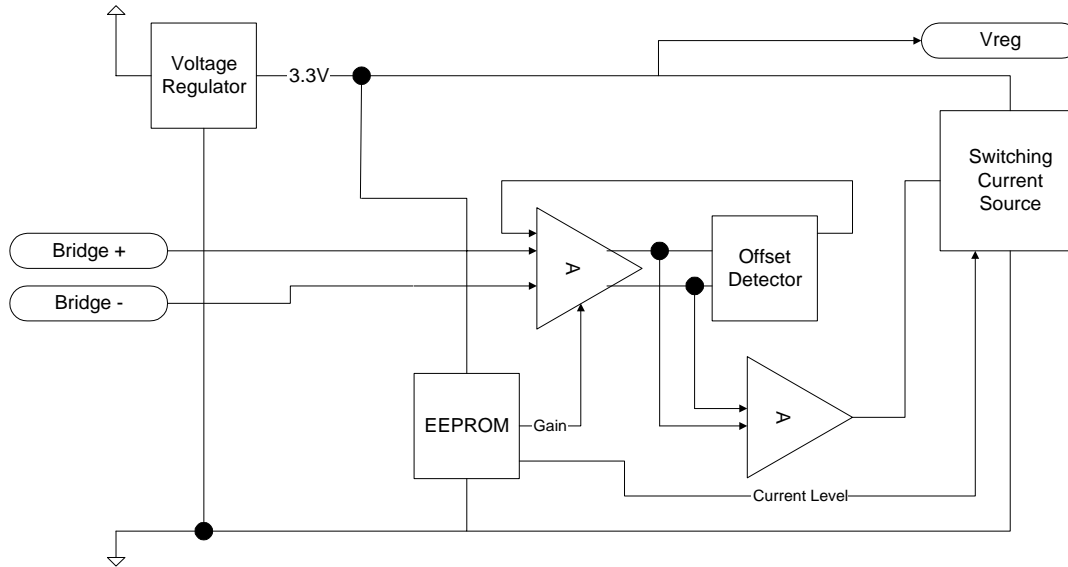


## Notes:

1. The supply voltage must appear across the power and ground terminals of the part. Any additional voltage drop due to the presence of a series resistor is not included in this specification.
2. Input signal range can be adjusted by programming the amplifier gain to a specific value; contact NVE for details.
3. Supply currents can be factory programmed to different levels, for example 3 mA and 6 mA, or 7 mA and 14 mA; contact NVE for details.
4. Pin-to-pin voltage, Human Body Model for ESD.

**Schematic:**

A block representation of the DD-Series parts is shown below:

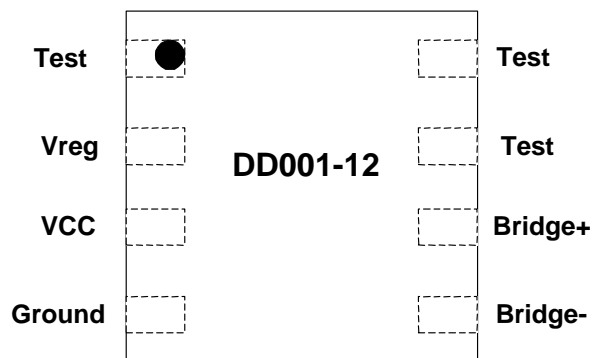


**Packages:**

The DD-Series parts are available in the TDFN SO8 package. Please see the package drawing section in this catalog for dimensions.

**Pin Configuration:**

**TDFN-SO8 Package**



Note: Bridge + and Bridge - should be connected only to the sensor element outputs for ESD and loading reasons. Vreg can supply up to 10 mA at 3.3V (330Ω load). Also, all pins labeled “Test” must be floating, *i.e.*, not connected to each other or any other circuit node.