Webinar

Integrated, accurate and affordable isolated voltage sensing

for EV and energy infrastructure applications

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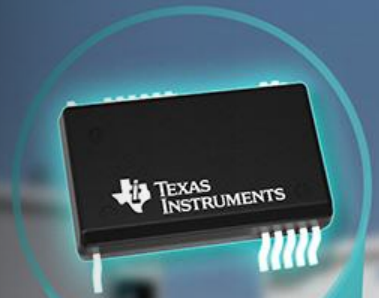


Agenda

- Introduction
- Differential, single-ended, ratiometric output devices
- Integrated high-voltage resistor devices
- AMC03xx use cases
- Isolated voltage sensing selection guide
- Getting started resources

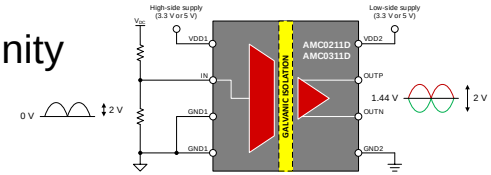
Introduction

Market trend	Growing demand to harvest more renewable energy and push for greater innovation.
Market need	More precise, efficient, size-optimized and cost-effective isolated voltage sensing.
Our solution	New portfolio of isolated voltage sensing amplifiers and modulators designed to improve accuracy at a reduced solution size and cost with integrated resistive divider, fixed-gain single-ended output or ratiometric single-ended output options.

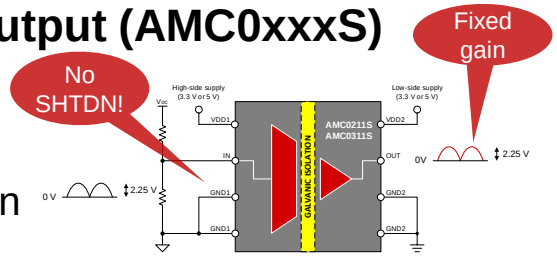
Differential, single-ended, ratiometric output devices

Differential vs. single-ended vs. ratiometric

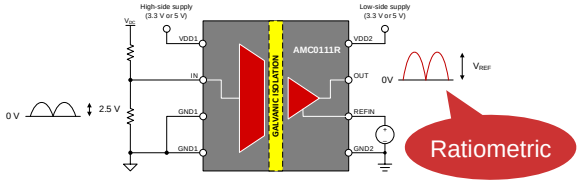
- **Differential output (AM0xxxD)**
  - Dual output
  - Ground noise immunity
  - Highest accuracy
  - Fixed gain



- **Single-ended output (AMC0xxxS)**
  - Single output
  - Smallest size
  - Cheapest option
  - Fixed gain



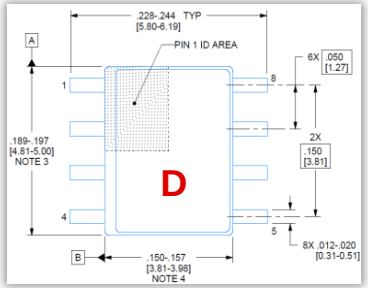
- **Ratiometric output (AMC0xxxR)**
  - Single output
  - Smallest size
  - Cheapest option
  - Variable gain



Levels of isolation

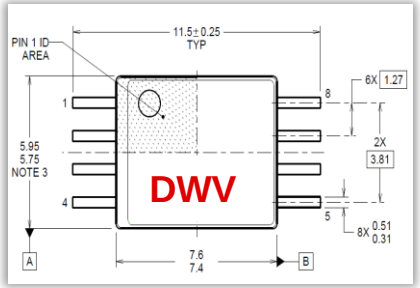
- **Reinforced isolation (AMC03xx)**
  - 8.5 mm creepage and clearance
  - 1500 Vrms working voltage
- **Basic isolation (AMC02xx)**
  - 4 mm creepage and clearance
  - 800 Vrms working voltage
- **Functional isolation (AMC01xx)**
  - 1 mm creepage and clearance
  - 200 Vrms working voltage

Basic



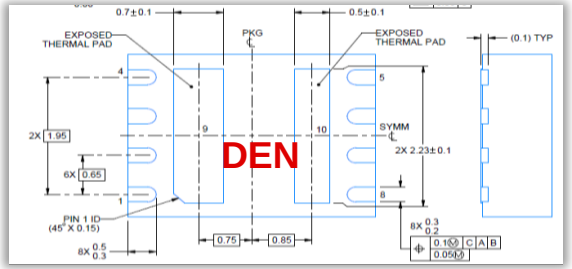
4.9mm x 3.9mm

Reinforced



5.85mm x 7.5mm

Functional



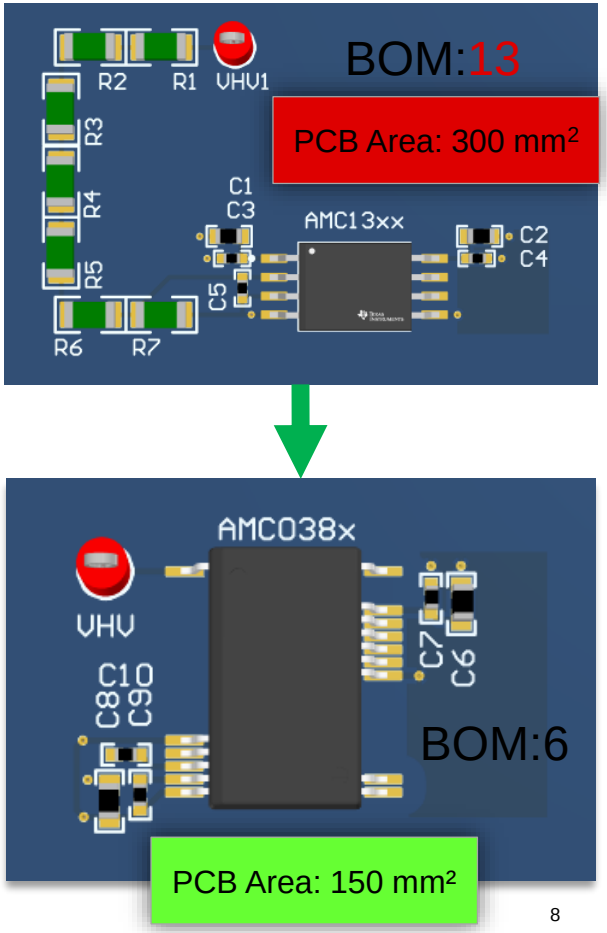
3.5mm x 2.7mm

Integrated high-voltage resistor devices

Integrated high voltage resistor

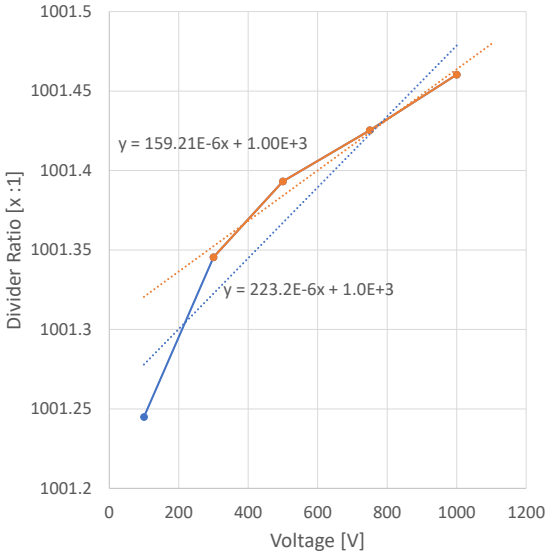
AMC0380D/Rxx, AMC0381Mxx, and AMC0386D/Rxx

- Reduced BOM and board space
- Improved accuracy
  - Gain error is calibrated out at factory
  - Integrated resistive divider has very low temperature drift
  - Better than 1% measurement accuracy achievable w/o calibration
- Lifetime stability
  - Integrated resistor divider has very low life-time drift
  - Insensitive to corrosion, condensation, and pollution
- Device is configurable for 400V, 800V, and 1500V battery systems



HV resistive divider | Voltage & temp coefficients

Voltage coefficient

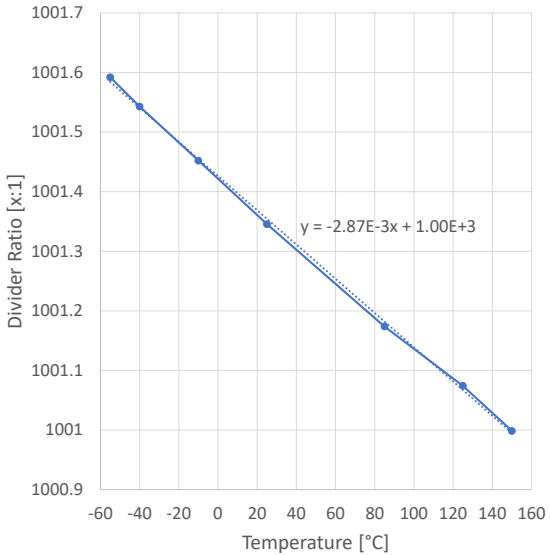


$G = G_{NOM} + E_G$

$E_G = E_{G\ @\ V=0}$ x (1+ VCE_G x ΔV)

VCE_G <0.2ppm/V

Temperature coefficient

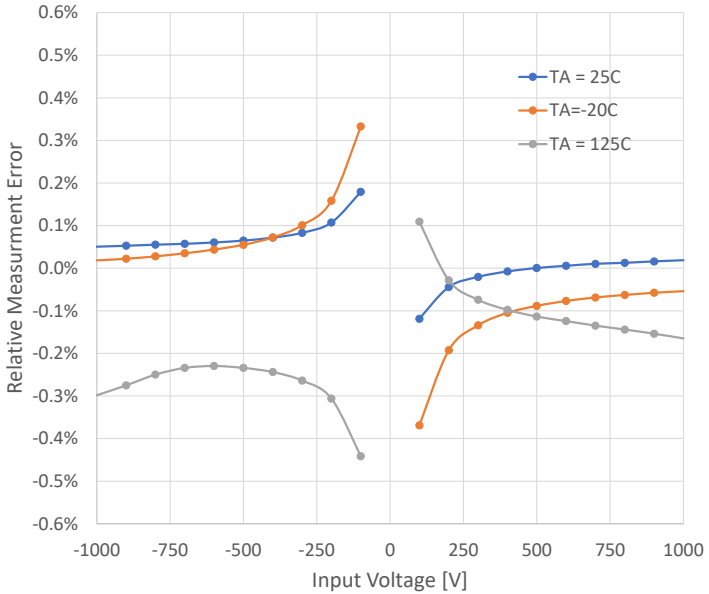


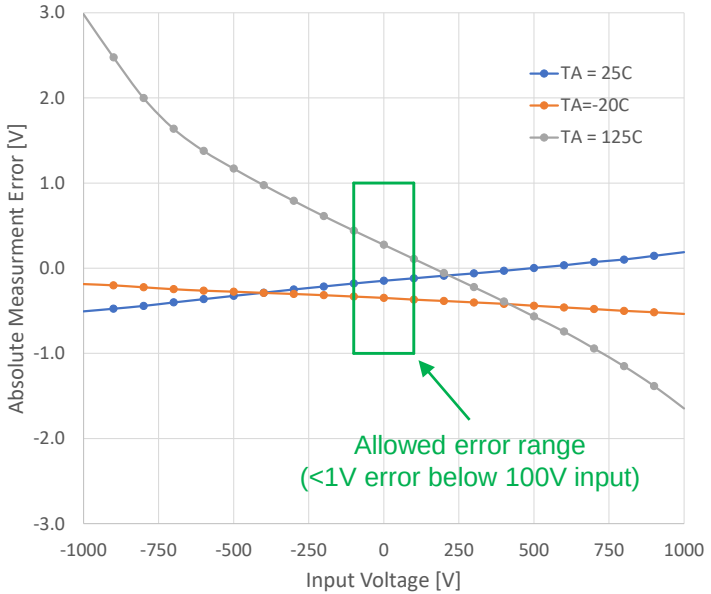
$G = G_{NOM} + E_G$

$E_G = E_{G\ @\ T=25°C}$ x (1+ TCE_G x ΔT)

TCE_G < 3ppm/°C

AMC0386 | Test results (no offset or gain compensation)



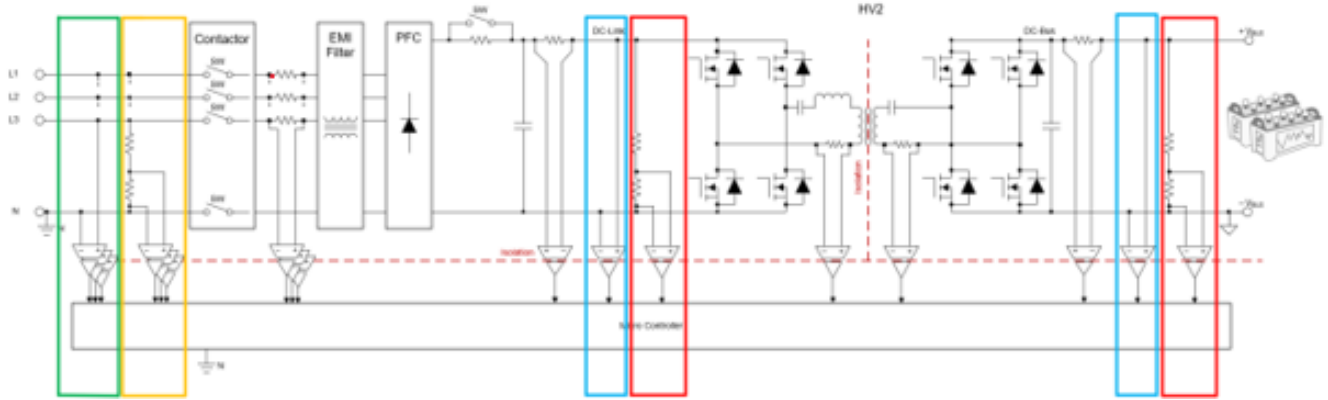


Better than 0.5% accuracy above 100 V
Less than 0.3 V absolute error below 100 V
over temperature, without system-level calibration

AMC03xx use cases

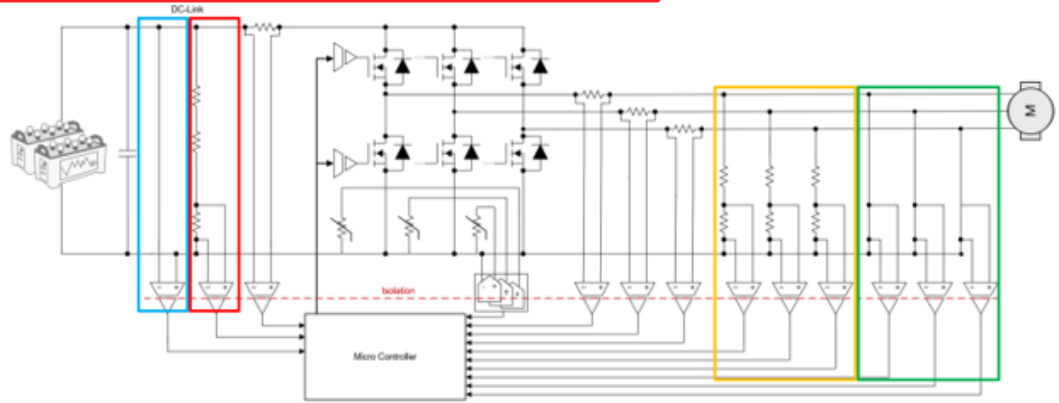
Use case | Power conversion system

- AC voltage sensing
  - AMC0380Dx/Rx-Q1 without external HV resistors
  - AMC0330D/R/S-Q1 with external HV resistors
- DC voltage sensing
  - AMC0381Dx/Rx-Q1 or AMC0386Mxx-Q1 without external HV resistors
  - AMC0311D/R/S-Q1 with external HV resistors



Use case | Motor control system

- AC voltage sensing
  - AMC0380Dx/Rx-Q1 without external HV resistors
  - AMC0330D/R/S-Q1 with external HV resistors
- DC voltage sensing
  - AMC0381Dx/Rx-Q1 or AMC0386Mxx-Q1 without external HV resistors
  - AMC0311D/R/S-Q1 with external HV resistors



Electric vehicle (EV) applications

- Automakers strive to develop EVs that support a longer driving range and provide better operational safety, while maintaining affordability.
- High-accuracy voltage sensing with < 1% error enables more precise battery measurement. AC and DC isolated voltage sensing devices detect functional failures and notify drivers for enhanced safety. Integrating the external components reduces costs and accelerates time to market.

DC voltage-sensing

- Maximize DC voltage measurement
- Enable longer driving ranges with low accuracy error of DC battery voltage

AC voltage-sensing

- Maximize grid use of voltage levels
- Accurately measure single or three-phase AC grid voltages in a compact IC

Energy infrastructure applications

- In a smart energy infrastructure, isolated voltage-sensing solutions with advanced integration can enable cost reduction and increased power density.
- High-accuracy voltage sensing with < 1% error enables more precise power delivery and lower power dissipation. The improved efficiency makes it possible to pass the cost savings on to consumers.

DC voltage-sensing

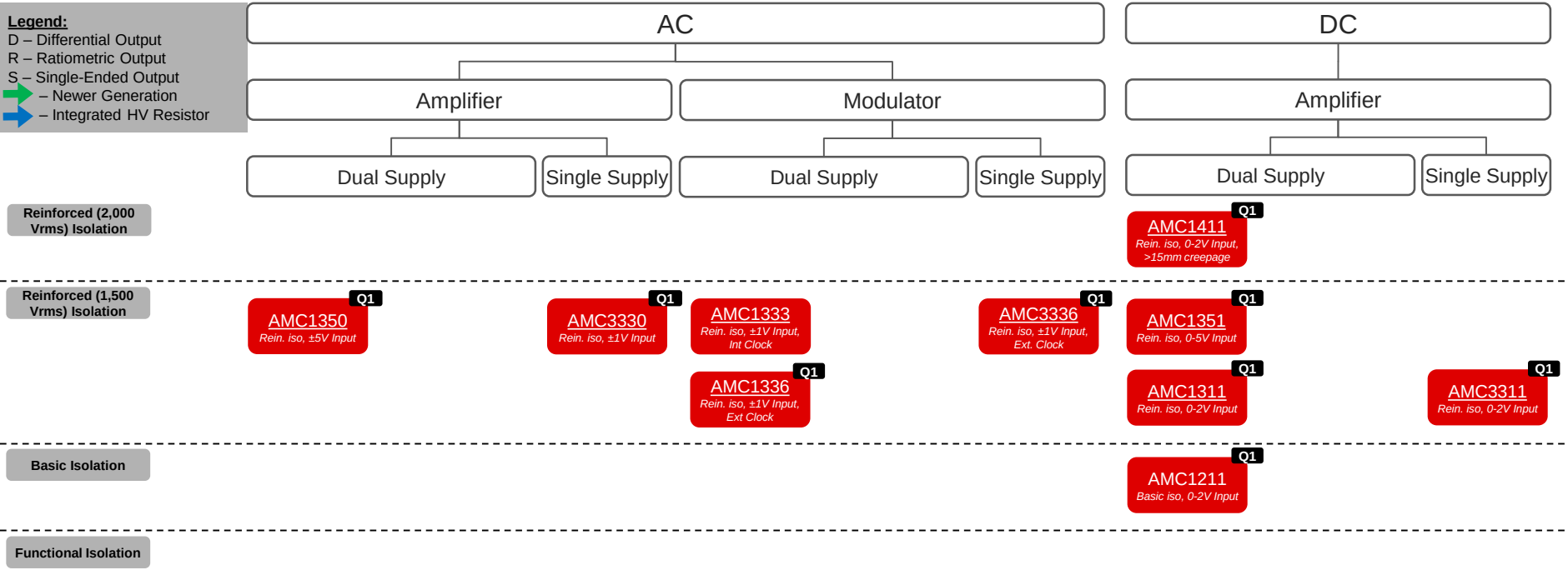
- Facilitate faster charge during constant voltage phase when charging the battery to the final voltage without damage.

AC voltage-sensing

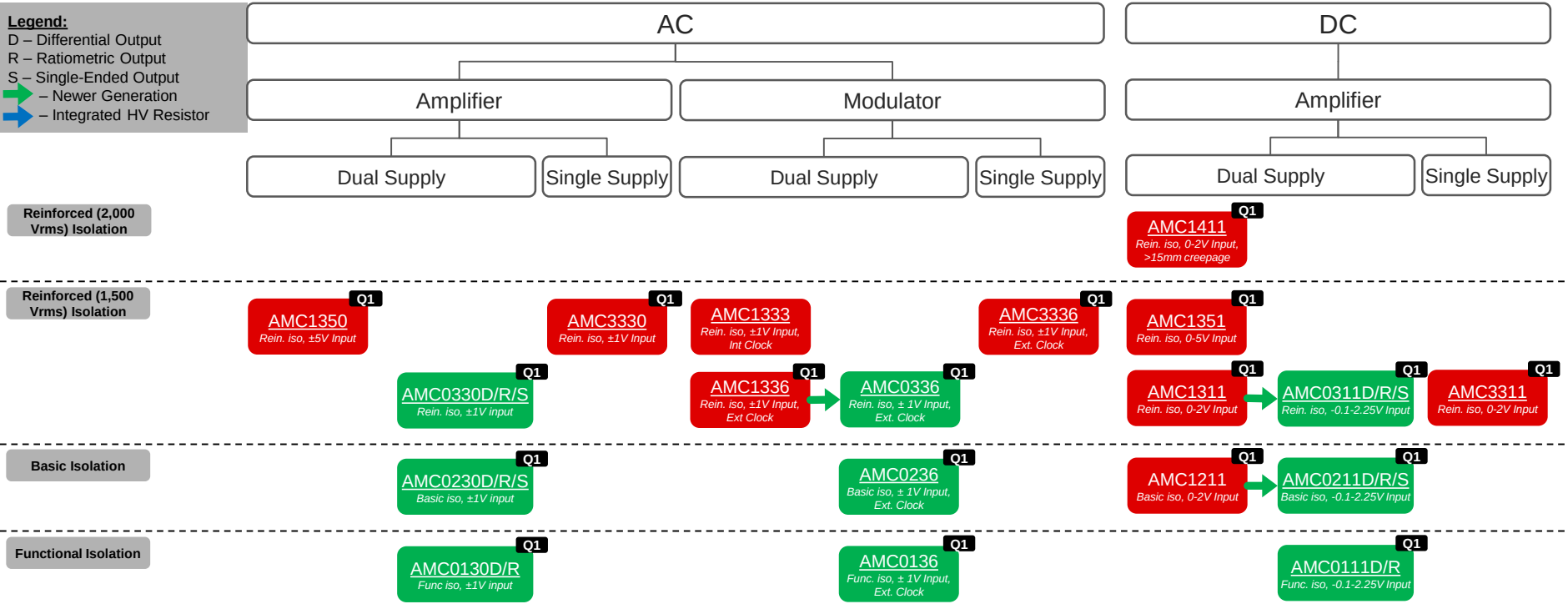
- Enable more precise measurement of the grid voltage to know the phase difference between each voltage to perform power factor correction.

Isolated voltage sensing selection guide

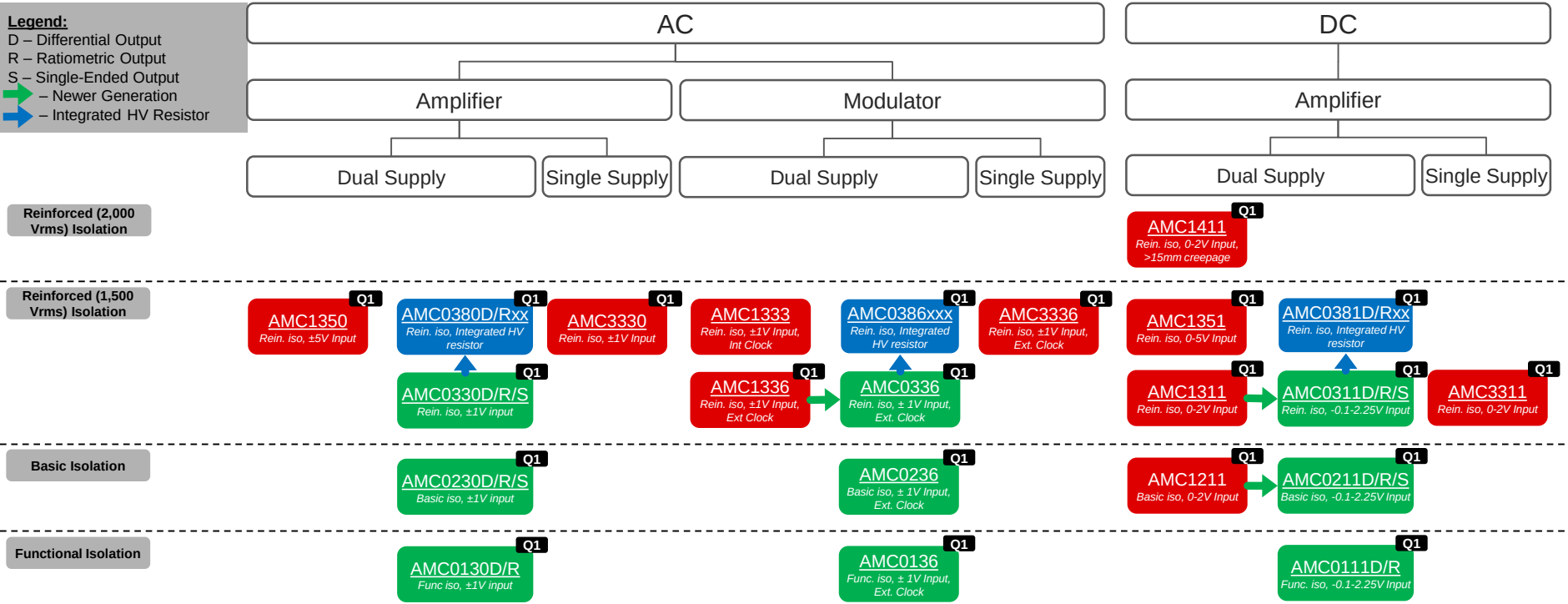
Isolated voltage sensing – selection tree



Isolated voltage sensing – selection tree



Isolated voltage sensing – selection tree



AC voltage sensing

AMC0230D / -Q1 & AMC0330D / -Q1

±1-V Input Basic & Reinforced Isolated Amplifier w/ Differential Output for AC Voltage Sensing

Features

Isolation	Basic & Reinforced
Lin Input Voltage Range	±1V
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Nonlinearity (max)	±0.01%
Output BW (typ)	100 kHz
Working Voltage (V_{IOWM})	800 V_{RMS} (basic) 1.5 kV_{RMS} (reinforced)
Withstand Voltage (V_{ISO})	3 kV_{RMS} (basic) 5 kV_{RMS} (reinforced)
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- AC Voltage Sensing
- Differential Output
- Basic & Reinforced Iso
- High Accuracy
- Layout Compatible to AMC1350
- D and DWV Package Options

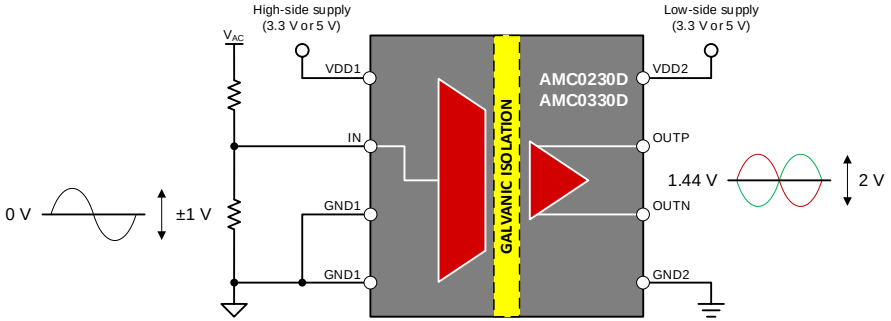
Applications

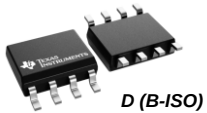
Isolated AC Voltage Sensing in:

- Industrial Motor Drives
- Photovoltaic Inverter
- Uninterruptible Power Supplies
- Power Factor Correction
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **±1-V, high Impedance** Input for **AC Voltage sensing**
- Low offset and gain errors & drift for **highest accuracy**
- Differential analog output for **highest noise immunity**
- Missing VDD1 detection for system-level diagnostics
- **D** (SOIC) and **DWV** (stretched SOIC) Package options
- **Layout compatible with AMC1350/-Q1**





D (B-ISO)

DWV (R-ISO)

AMC0230D / -Q1 & AMC0330D / -Q1

±1-V Input Basic & Reinforced Isolated Amplifier w/ Differential Output for AC Voltage Sensing

Features

Isolation	Basic & Reinforced
Lin Input Voltage Range	±1V
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Nonlinearity (max)	±0.01%
Output BW (typ)	100 kHz
Working Voltage (V_{IOWM})	800 V_{RMS} (basic) 1.5 kV_{RMS} (reinforced)
Withstand Voltage (V_{ISO})	3 kV_{RMS} (basic) 5 kV_{RMS} (reinforced)
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- AC Voltage Sensing
- Differential Output
- Basic & Reinforced Iso
- High Accuracy
- Layout Compatible to AMC1350
- D and DWV Package Options

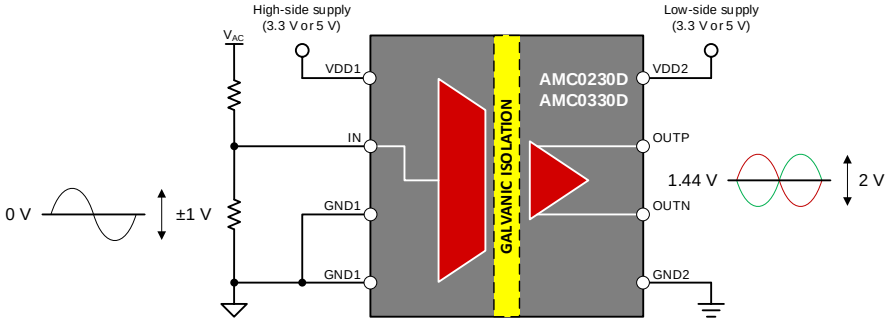
Applications

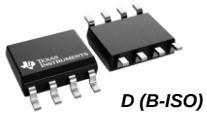
Isolated AC Voltage Sensing in:

- Industrial Motor Drives
- Photovoltaic Inverter
- Uninterruptible Power Supplies
- Power Factor Correction
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **±1-V, high Impedance** Input for **AC Voltage sensing**
- Low offset and gain errors & drift for **highest accuracy**
- Differential analog output for **highest noise immunity**
- Missing VDD1 detection for system-level diagnostics
- **D** (SOIC) and **DWV** (stretched SOIC) Package options
- **Layout compatible with AMC1350/-Q1**





D (B-ISO)

DWV (R-ISO)

AMC0230S / -Q1 & AMC0330S / -Q1

±1V Input Basic & Reinforced Isolated Amplifier w/ Single Ended Output for AC Voltage Sensing

Features

Isolation	Basic & Reinforced
Lin Input Voltage Range	+/- 1V
Input Offset / Drift (max)	±2.5 mV / ±20 µV/°C
Gain Error / Drift (max)	±0.3% / ±40 ppm/°C
Nonlinearity (max)	±0.05%
Output BW (typ)	100 kHz
Working Voltage (V_{IOWM})	800 V_{RMS} (basic) 1.5 kV_{RMS} (reinforced)
Withstand Voltage (V_{ISO})	3 kV_{RMS} (basic) 5 kV_{RMS} (reinforced)
CMTI (min)	100 kV/µs
Temperature Range	–40°C to 125°C

- AC Voltage Sensing
- Basic & Reinforced Iso
- Fixed Gain: 1V/V
- Single-Ended Output
- Narrow and Wide-Body SOIC Package

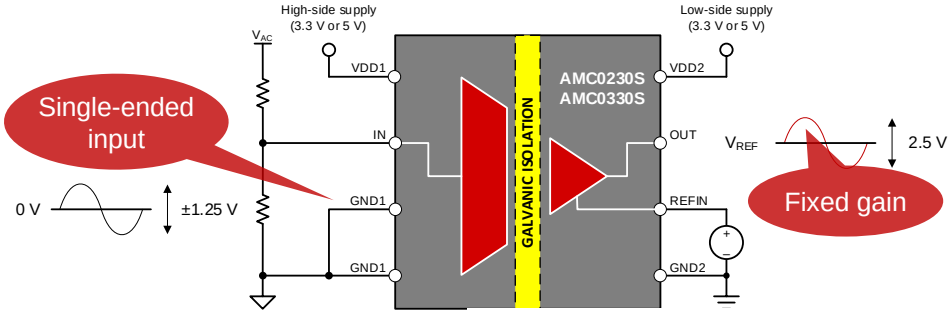
Applications

Isolated DC Voltage Sensing in:

- Industrial Motor Drives
- Photovoltaic Inverter
- Uninterruptible Power Supplies
- Power Factor Correction
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- High Impedance, bipolar Input for **AC Voltage sensing**
- Low offset and gain errors & drift for **highest accuracy**
- Single-ended analog output for **smallest solution size** and **lowest BOM cost**
- **D8** (SOIC) and **DWV8** (stretched SOIC) Package options

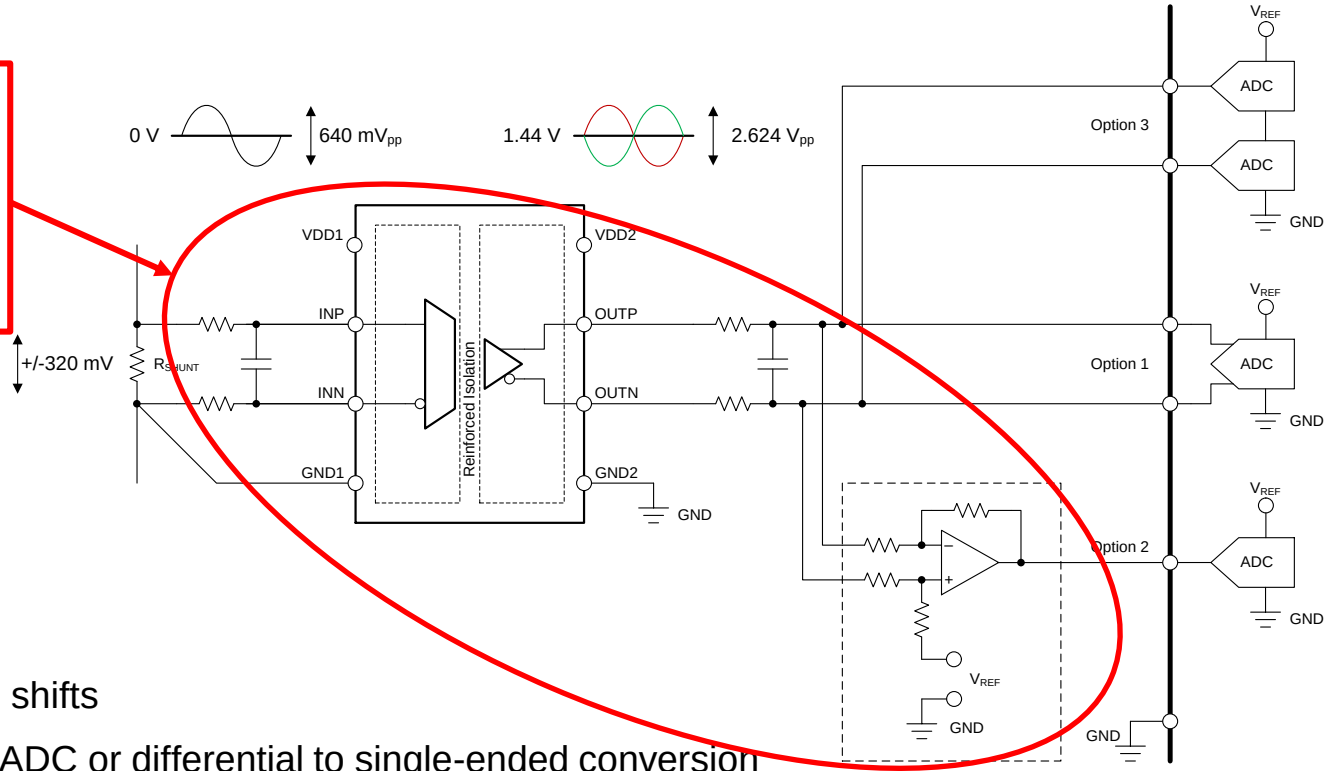


D package: AMC0230S / -Q1

DWV package: AMC0330S / -Q1

Existing solution: Differential analog output

AMC0230S, AMC0330S, AMC230R, and AMC0330R combine differential to single-ended op-amp into our device to reduce customer cost and PCB space



- ▲ Highest accuracy
- ▲ High noise immunity
- ▲ Insensitive to ground shifts
- ▼ Requires differential ADC or differential to single-ended conversion

AMC0230R / -Q1 & AMC0330R / -Q1

±1-V Input Basic & Reinforced Isolated Amplifier w/ Single-Ended Output for AC Voltage Sensing

Features

Isolation	Basic & Reinforced
Lin Input Voltage Range	±1V
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Nonlinearity (max)	±0.01%
Output BW (typ)	100 kHz
Working Voltage (V_{IOWM})	800 V_{RMS} (basic) 1.5 kV_{RMS} (reinforced)
Withstand Voltage (V_{ISO})	3 kV_{RMS} (basic) 5 kV_{RMS} (reinforced)
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- AC Voltage Sensing
- Differential Output
- Basic & Reinforced Iso
- High Accuracy
- Layout Compatible to AMC1350
- D and DWV Package Options

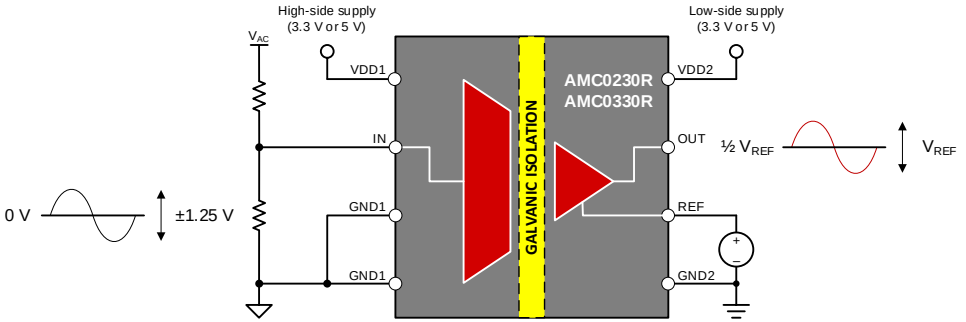
Applications

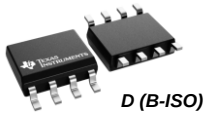
Isolated AC Voltage Sensing in:

- Industrial Motor Drives
- Photovoltaic Inverter
- Uninterruptible Power Supplies
- Power Factor Correction
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **±1-V, high Impedance** Input for **AC Voltage sensing**
- Low offset and gain errors & drift for **highest accuracy**
- Single-ended analog output for **smallest solution size** and **lowest BOM cost**
- **D** (SOIC) and **DWV** (stretched SOIC) Package options





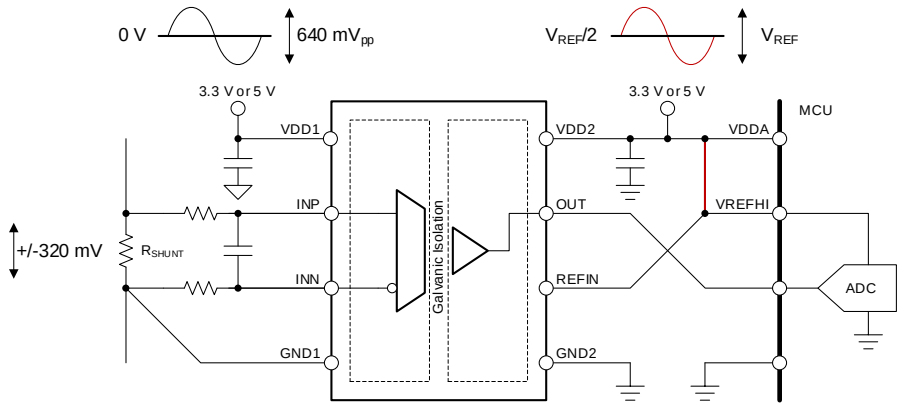
D (B-ISO)

DWV (R-ISO)

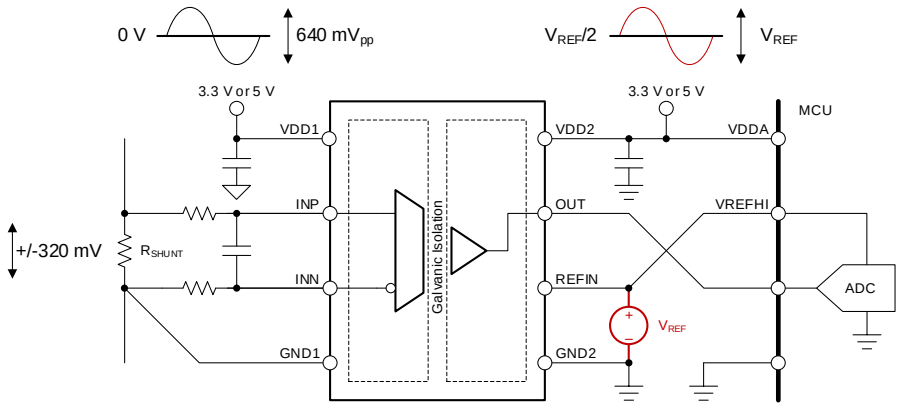
Ratiometric single-ended output

- Output Of Amplifier: $V_{OUT} = (V_{INP}-V_{INN}) / 320\ mV \times (V_{REF} / 2) + (V_{REF} / 2)$
- Supported V_{REF} range : 2.7..5.5 V
- Input voltage range: ±250 mV (linear), ±320 mV (clipping),

Low-cost: V_{REF} derived from supply



Low Noise: V_{REF} supplied by external reference



AMC0380Dxx / -Q1

AC Input, Isolated Amplifier w/ Integrated Resistive Divider and Differential Output

Features

Isolation	Reinforced
Linear Input Range	±1000 / ±400V_{PK}
Input Impedance (typ)	12.5M / 8MΩ
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Working Voltage	1.5 kV_{RMS}
Isolation Transient Overvoltage	7 kV_{PEAK}
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- **Reinforced Isolation**
- **690 / 230V_{RMS} AC Voltage Sensing**
- **Integrated Resistive Divider**
- **High Accuracy**
- **Differential Output**

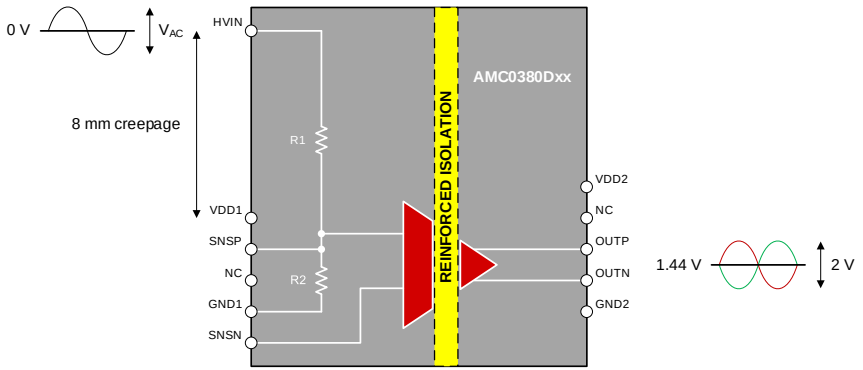
Applications

Isolated AC Voltage Sensing in:

- Photovoltaic Inverter
- Uninterruptible Power Supplies
- DC Charging Stations
- Industrial Motor Drives
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **690V_{RMS}, 280V_{RMS}** direct **AC** voltage sensing without external resistive divider
- Supports **AC and DC** voltage sensing
- Integrated resistive divider reduces PCB area and simplifies design
- **Low offset and gain drift** enable high-accuracy measurements
- **Differential analog output** provides highest **noise immunity**



AMC0380D / -Q1 | Device selection table

Orderable	Grade	R1	R2	Divider Ratio	Linear Input Range	Clipping Voltage
AMC0380D04DFXR	Industrial	8MΩ	20kΩ	401 : 1	±400V_{PK}	±500V_{PK}
AMC0380D04QDFXRQ1	Automotive					
AMC0380D06DFXR	Industrial	10MΩ	16.6kΩ	601 : 1	±600V_{PK}	±750V_{PK}
AMC0380D06QDFXRQ1	Automotive					
AMC0380D10DFXR	Industrial	12.5MΩ	12.5kΩ	1001 : 1	±1000V_{PK}	±1250V_{PK}
AMC0380D10QDFXRQ1	Automotive					
AMC0380D16DFXR	Industrial	33MΩ	21kΩ	1601 : 1	±1600V_{PK}	±2000V_{PK}
AMC0380D16QDFXRQ1	Automotive					

AMC0380Rxx / -Q1

AC Input, Isolated Amplifier w/ Integrated Resistive Divider and Ratiometric, Single-Ended Output

Features

Isolation	Reinforced
Linear Input Range	±1000 / ±400V_{PK}
Input Impedance (typ)	12.5M / 8MΩ
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Working Voltage	1.5 kV_{RMS}
Isolation Transient Overvoltage	7 kV_{PEAK}
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- **Reinforced Isolation**
- **690 / 230V_{RMS} AC Voltage Sensing**
- **Integrated Resistive Divider**
- **High Accuracy**
- **SE Output**

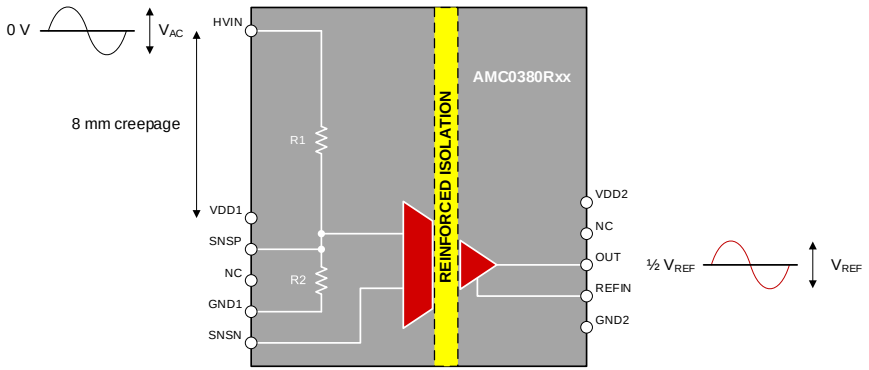
Applications

Isolated AC Voltage Sensing in:

- Photovoltaic Inverter
- Uninterruptible Power Supplies
- DC Charging Stations
- Industrial Motor Drives
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **690V_{RMS}, 280V_{RMS}** direct **AC** voltage sensing without external resistive divider
- Supports **AC and DC** voltage sensing
- Integrated resistive divider reduces PCB area and simplifies design
- **Low offset and gain drift** enable high-accuracy measurements
- **SE Ratiometric output** provides lowest BOM cost



AMC0380R / -Q1 | Device selection table

Orderable	Grade	R1	R2	Divider Ratio	Linear Input Range	Clipping Voltage
AMC0380R04DFXR	Industrial	8MΩ	20kΩ	401 : 1	±400V_{PK}	±500V_{PK}
AMC0380R04QDFXRQ1	Automotive					
AMC0380R06DFXR	Industrial	10MΩ	16.6kΩ	601 : 1	±600V_{PK}	±750V_{PK}
AMC0380R06QDFXRQ1	Automotive					
AMC0380R10DFXR	Industrial	12.5MΩ	12.5kΩ	1001 : 1	±1000V_{PK}	±1250V_{PK}
AMC0380R10QDFXRQ1	Automotive					
AMC0380R16DFXR	Industrial	33MΩ	21kΩ	1601 : 1	±1600V_{PK}	±2000V_{PK}
AMC0380R16QDFXRQ1	Automotive					

AMC0386Mxx / -Q1

AC Input, Isolated Modulator w/ Integrated Resistive Divider and External Clock

Features

Isolation	Reinforced
Linear Input Range	±1k / ±600 / ±400V_{PK}
Input Impedance (typ)	12.5M / 10M / 8MΩ
Input Offset / Drift (max)	±0.5 mV / ±4 µV/°C
Gain Error / Drift (max)	±0.25% / ±40 ppm/°C
Working Voltage	1.5 kV_{RMS}
Isolation Transient Overvoltage	7 kV_{PEAK}
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

Reinforced Isolation

690 / 400 / 230V_{RMS} AC Voltage Sensing

Integrated Resistive Divider

High Accuracy

10 MHz ext. clock

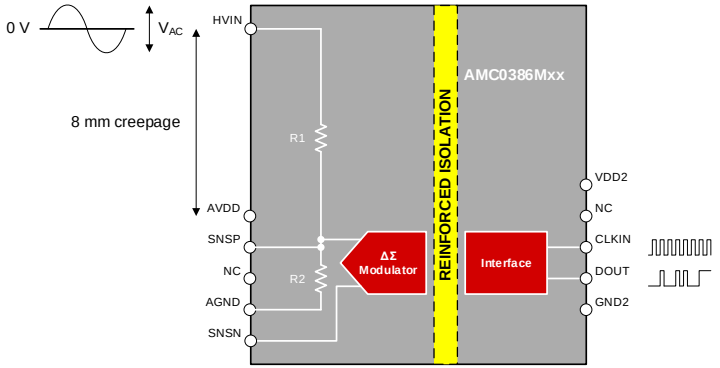
Applications

Isolated AC or DC Voltage Sensing in:

- Photovoltaic Inverter
- Uninterruptible Power Supplies
- DC Charging Stations
- Industrial Motor Drives
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **690V_{RMS}, 400V_{RMS}, 230V_{RMS}** direct **AC** voltage sensing without external resistive divider
- Supports **AC and DC** voltage sensing
- Integrated resistive divider reduces PCB area and simplifies design
- **Low offset and gain drift** enable high-accuracy measurements
- **External clock** for simplified system level synchronization



AMC0386M / -Q1 | Device selection table

Orderable	Grade	R1	R2	Divider Ratio	Linear Input Range	Clipping Voltage
AMC0386M04DFXR	Industrial	8MΩ	20kΩ	401 : 1	±400V_{PK}	±500V_{PK}
AMC0386M04QDFXRQ1	Automotive					
AMC0386M06DFXR	Industrial	10MΩ	16.6kΩ	601 : 1	±600V_{PK}	±750V_{PK}
AMC0386M06QDFXRQ1	Automotive					
AMC0386M10DFXR	Industrial	12.5MΩ	12.5kΩ	1001 : 1	±1000V_{PK}	±1250V_{PK}
AMC0386M10QDFXRQ1	Automotive					
AMC0386M16DFXR	Industrial	33MΩ	21kΩ	1601 : 1	±1600V_{PK}	±2000V_{PK}
AMC0386M16QDFXRQ1	Automotive					

DC voltage sensing

AMC0211D / -Q1 & AMC0311D / -Q1

2-V Input Basic & Reinforced Isolated Amplifier w/ Differential Output for DC Voltage Sensing

Features

Isolation	Basic & Reinforced
Lin Input Voltage Range	-0.1 to 2.25V
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Nonlinearity (max)	±0.01%
Output BW (typ)	100 kHz
Working Voltage (V_{IOWM})	800 V_{RMS} (basic) 1.5 kV_{RMS} (reinforced)
Withstand Voltage (V_{ISO})	3 kV_{RMS} (basic) 5 kV_{RMS} (reinforced)
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- DC Voltage Sensing
- Differential Output
- Basic & Reinforced Iso
- High Accuracy
- Pin Compatible to AMC1211 & AMC1311
- D and DWV Package Options

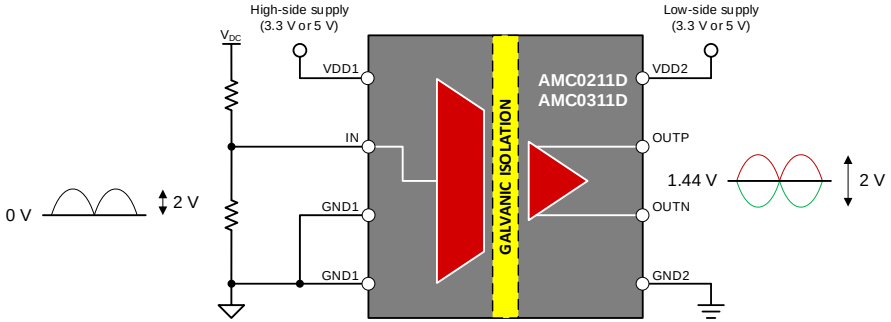
Applications

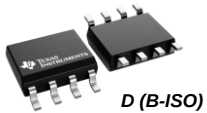
Isolated DC Voltage Sensing in:

- Industrial Motor Drives
- Photovoltaic Inverter
- Uninterruptible Power Supplies
- Power Factor Correction
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **2-V, high Impedance**, unipolar Input for **DC Voltage sensing**
- Low offset and gain errors & drift for **highest accuracy**
- Differential analog output for **highest noise immunity**
- Missing VDD1 detection for system-level diagnostics
- **D** (SOIC) and **DWV** (stretched SOIC) Package options
- **Pin compatible** to **AMC1211/Q1 & AMC1311/-Q1**





D (B-ISO)

DWV (R-ISO)

AMC0211S / -Q1 & AMC0311S / -Q1

2V Input Basic & Reinforced Isolated Amplifier w/ Single Ended Output for DC Voltage Sensing

Features

Isolation	Basic & Reinforced
Lin Input Voltage Range	0 to 2.25V
Nominal Gain	1 V/V
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Output BW (typ)	100 kHz
Working Voltage (V_{IOWM})	800 V_{RMS} (basic) 1.5 kV_{RMS} (reinforced)
Withstand Voltage (V_{ISO})	3 kV_{RMS} (basic) 5 kV_{RMS} (reinforced)
CMTI (min)	100 kV/µs
Temperature Range	–40°C to 125°C

- DC Voltage Sensing
- Basic & Reinforced Iso
- Fixed Gain: 1V/V
- Single-Ended Output
- Narrow and Wide-Body SOIC Package

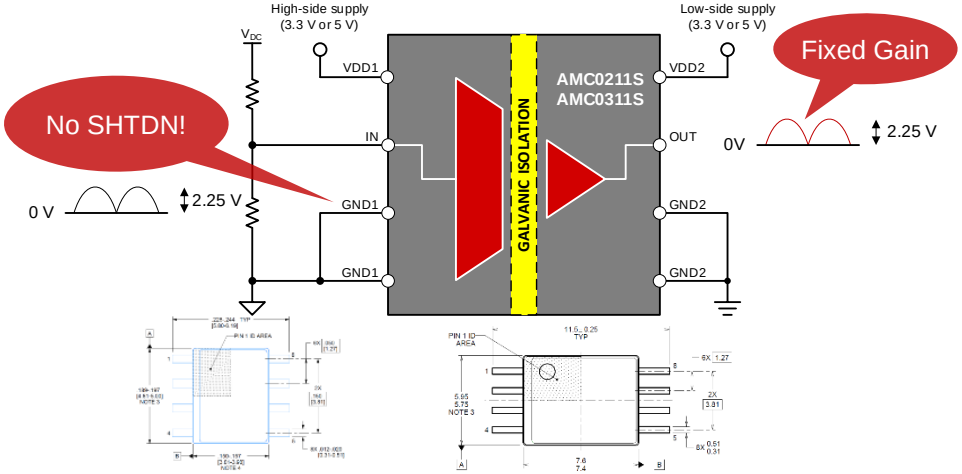
Applications

Isolated DC Voltage Sensing in:

- Industrial Motor Drives
- Photovoltaic Inverter
- Uninterruptible Power Supplies
- Power Factor Correction
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

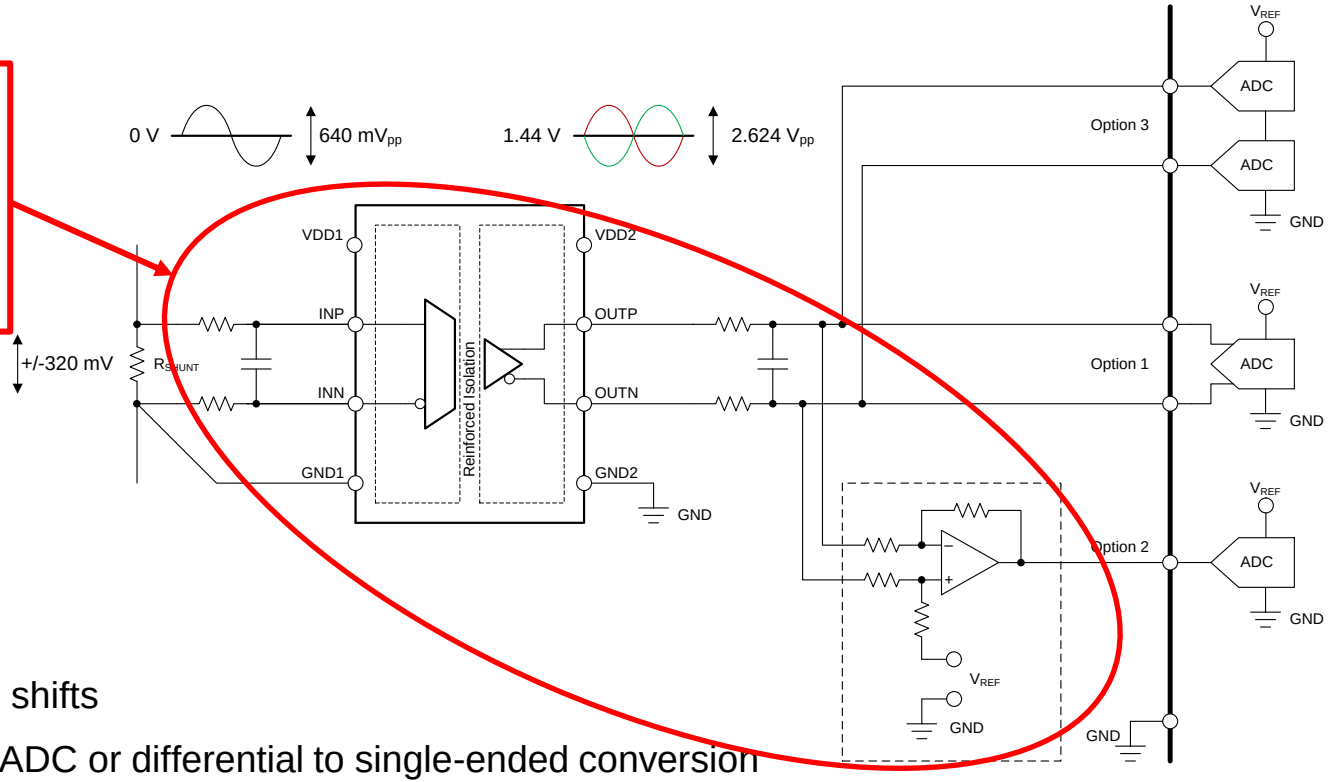
- Low offset and gain errors & drift for **highest accuracy**
- Single-ended analog output for **smallest solution size** and **lowest BOM cost**
- **D8** (SOIC) and **DWV8** (stretched SOIC) Package options



D package: AMC0211S / -Q1 *DWV package: AMC0311S / -Q1*

Existing solution: Differential analog output

AMC0211S, AMC0311S, AMC211R, and AMC0311R combine differential to single-ended op-amp into our device to reduce customer cost and PCB space



- ▲ Highest accuracy
- ▲ High noise immunity
- ▲ Insensitive to ground shifts
- ▼ Requires differential ADC or differential to single-ended conversion

AMC0211R / -Q1 & AMC0311R / -Q1

2-V Input Basic & Reinforced Isolated Amplifier w/ Single Ended Output for DC Voltage Sensing

Features

Isolation	Basic & Reinforced
Lin Input Voltage Range	-0.1 to 2.25V
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Nonlinearity (max)	±0.01%
Output BW (typ)	100 kHz
Working Voltage (V_{IOWM})	800 V_{RMS} (basic) 1.5 kV_{RMS} (reinforced)
Withstand Voltage (V_{ISO})	3 kV_{RMS} (basic) 5 kV_{RMS} (reinforced)
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- DC Voltage Sensing
- Basic & Reinforced Iso
- High Accuracy
- Single-Ended Output
- Supports 2.7 V to 5.5 V Reference Voltages
- Narrow and Wide-Body SOIC Package

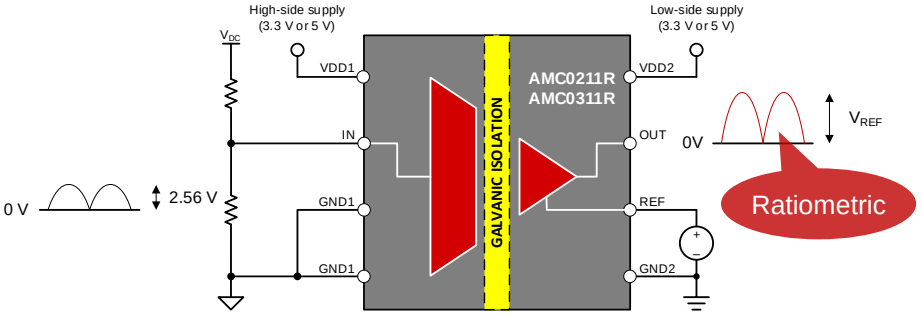
Applications

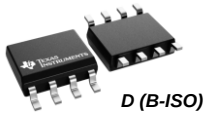
Isolated DC Voltage Sensing in:

- Industrial Motor Drives
- Photovoltaic Inverter
- Uninterruptible Power Supplies
- Power Factor Correction
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- High Impedance, unipolar Input for **DC Voltage sensing**
- Low offset and gain errors & drift for **highest accuracy**
- Single-ended analog output for **smallest solution size** and **lowest BOM cost**
- **D8** (SOIC) and **DWV8** (stretched SOIC) Package options





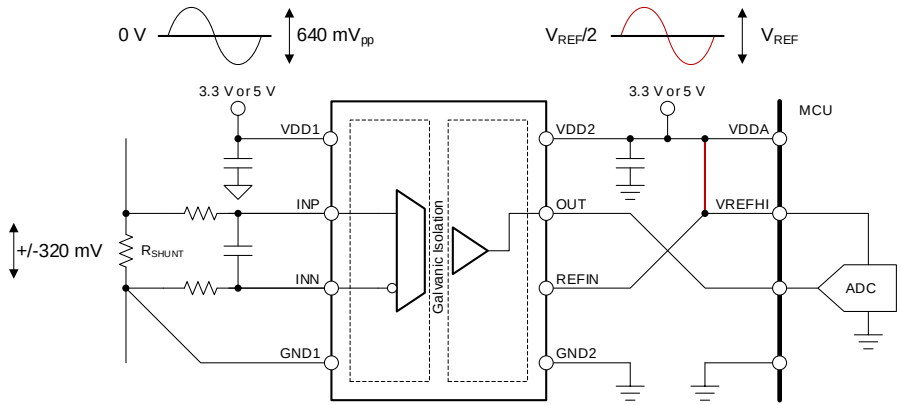
D (B-ISO)

DWV (R-ISO)

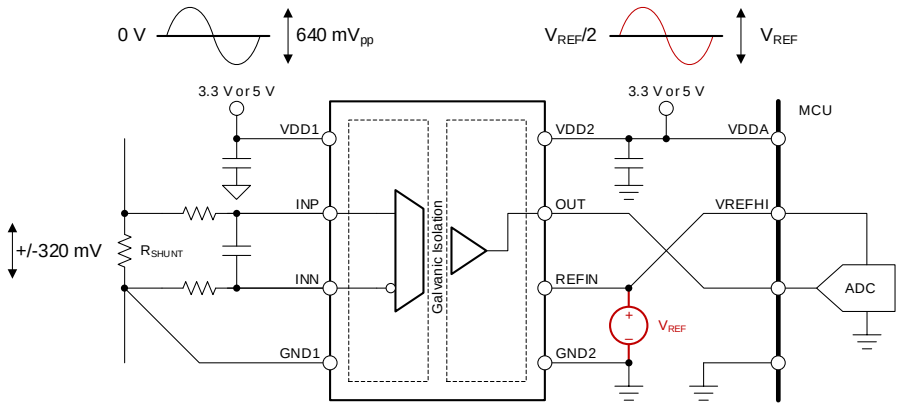
Ratiometric single-ended output

- Output Of Amplifier: $V_{OUT} = (V_{INP}-V_{INN}) / 320\ mV \times (V_{REF} / 2) + (V_{REF} / 2)$
- Supported V_{REF} range : 2.7..5.5 V
- Input voltage range: ±250 mV (linear), ±320 mV (clipping),

Low-cost: V_{REF} derived from supply



Low Noise: V_{REF} supplied by external reference



AMC0381Dxx / -Q1

DC Input, Isolated Amplifier w/ Integrated Resistive Divider and Differential Output

Features

Isolation	Reinforced
Linear Input Range	1600 / 1000 / 400V
Input Impedance (typ)	33M / 12.5M / 10MΩ
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Working Voltage	1.5 kV_{RMS}
Isolation Transient Overvoltage	7 kV_{PEAK}
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- **Reinforced Isolation**
- **1600V / 1000V / 600V DC Voltage Sensing**
- **Integrated Resistive Divider**
- **High Accuracy**
- **Differential Output**

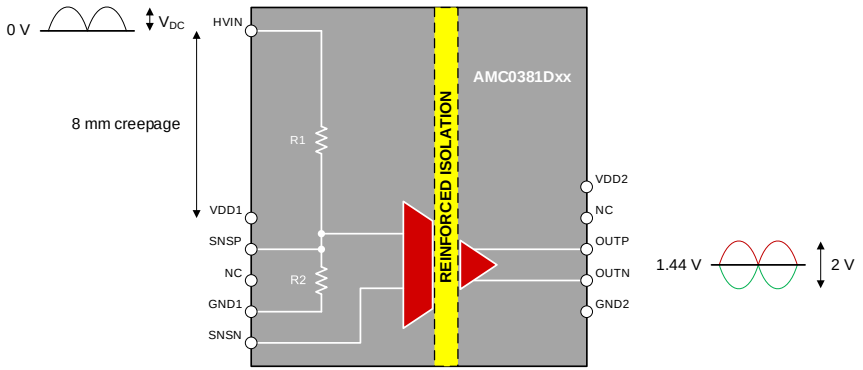
Applications

Isolated DC Voltage Sensing in:

- Photovoltaic Inverter
- Uninterruptible Power Supplies
- DC Charging Stations
- Industrial Motor Drives
- Energy Storage Systems
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **1600V / 1000V / 600V** direct **DC** voltage sensing without external resistive divider
- Integrated resistive divider reduces PCB area and simplifies design
- **Low offset and gain drift** enable high-accuracy measurements
- **Differential analog output** provides highest **noise immunity**



AMC0381Rxx / -Q1

DC Input, Isolated Amplifier w/ Integrated Resistive Divider and Ratiometric, Single-Ended Output

Features

Isolation	Reinforced
Linear Input Range	1600 / 1000 / 400V
Input Impedance (typ)	33M / 12.5M / 10MΩ
Input Offset / Drift (max)	±1.5 mV / ±10 µV/°C
Gain Error / Drift (max)	±0.2% / ±40 ppm/°C
Working Voltage	1.5 kV_{RMS}
Isolation Transient Overvoltage	7 kV_{PEAK}
CMTI (min)	150 V/ns
Temperature Range	–40°C to 125°C

- **Reinforced Isolation**
- **1600V / 1000V / 600V DC Voltage Sensing**
- **Integrated Resistive Divider**
- **High Accuracy**
- **SE Output**

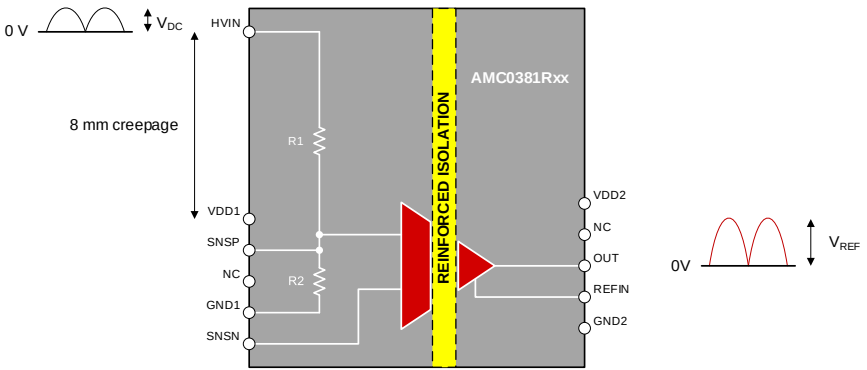
Applications

Isolated DC Voltage Sensing in:

- Photovoltaic Inverter
- Uninterruptible Power Supplies
- DC Charging Stations
- Industrial Motor Drives
- Energy Storage Systems
- On-Board Chargers (OBC)
- DC/DC Converters
- Traction Inverters

Benefits

- **1600V / 1000V / 600V** direct **DC** voltage sensing without external resistive divider
- Integrated resistive divider reduces PCB area and simplifies design
- **Low offset and gain drift** enable high-accuracy measurements
- **SE Ratiometric output** provides lowest BOM cost



AMC0381R / -Q1 | Device selection table

Orderable	Grade	R1	R2	Divider Ratio	Linear Input Range	Clipping Voltage
AMC0381R04DFXR	Industrial	8MΩ	20kΩ	401 : 1	$400V_{PK}$	$500V_{PK}$
AMC0381R04QDFXRQ1	Automotive					
AMC0381R06DFXR	Industrial	10MΩ	16.6kΩ	601 : 1	$600V_{PK}$	$750V_{PK}$
AMC0381R06QDFXRQ1	Automotive					
AMC0381R10DFXR	Industrial	12.5MΩ	12.5kΩ	1001 : 1	$1000V_{PK}$	$1250V_{PK}$
AMC0381R10QDFXRQ1	Automotive					
AMC0381R16DFXR	Industrial	33MΩ	21kΩ	1601 : 1	$1600V_{PK}$	$2000V_{PK}$
AMC0381R16QDFXRQ1	Automotive					

Getting started with isolated voltage sensing

You can learn more about these devices by leveraging the following:

Content type	Content title	Link to content or more details
White paper	Maximizing power conversion and motor control efficiency with isolated voltage sensing	https://www.ti.com/lit/pdf/slyy240
Video	Charging ahead: How voltage sensing innovation is improving driving range and charge times for EVs	https://www.ti.com/video/6364408970112
AMC038x application brief	Increased accuracy and performance with integrated high voltage resistor isolated amplifiers and modulators	https://www.ti.com/lit/an/sbaa646/sbaa646.pdf
AMC0xxxD/S/R application brief	Isolated amplifiers with differential, single-ended fixed gain and ratiometric outputs for voltage sensing applications	https://www.ti.com/lit/an/sbaa645/sbaa645.pdf
Product Folders	AMC038x product folders	https://www.ti.com/product/AMC0381D-Q1 https://www.ti.com/product/AMC0380D-Q1 https://www.ti.com/product/AMC0386-Q1
	AMC0xxxD/S/R product folders	https://www.ti.com/product/AMC0330R-Q1 https://www.ti.com/product/AMC0330S-Q1 https://www.ti.com/product/AMC0311S-Q1 https://www.ti.com/product/AMC0311R-Q1 https://www.ti.com/product/AMC0311D-Q1

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