FOR ENERGY EFFICIENT INNOVATIONS

THINK ON.

www.onsemi.com

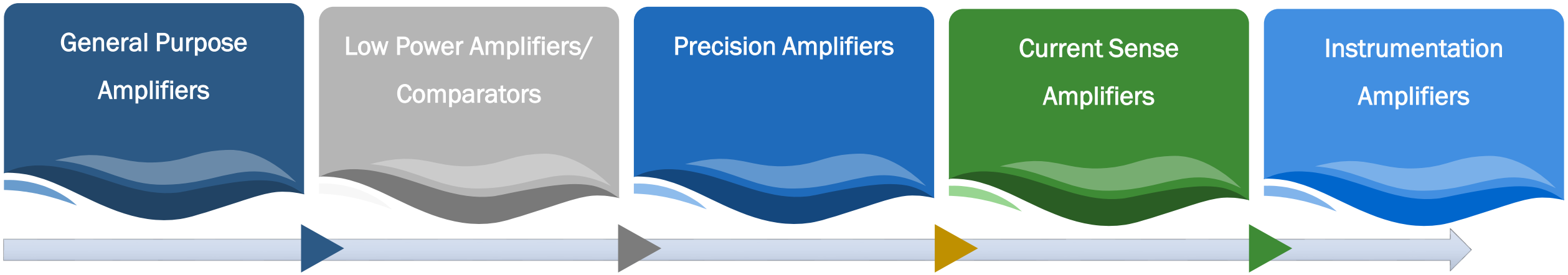
Op Amps, Current Sense Amps and Comparators

September 2020

Public Information

Vision – Amplifiers

Building towards a leadership position in amplifiers by providing low power, high performance solutions for all power supply and sensor signal conditioning needs.



- Smaller packaging
- Dual source capability
- Expanding the high performance offering to provide a complete power and signal conditioning solution

Wireless, Computing & Telecom

- Strong alignment with corporate automotive customers
- Grade-0 automotive qualified product
- No obsolescence on volume products to support long life cycles

Automotive

- Broad field engineering support for customers
- Expanding the low power amplifiers and Zero-Drift Amplifiers for Instrumentation

Industrial

Automotive Applications

Strong and growing portfolio of products that provide low power, high performance solutions for all power supply and sensor signal conditioning needs for Automotive markets.

- General Purpose Amplifiers
- Low Power Amplifiers
- Precision Amplifiers
- Current Sense Amplifiers
- Comparators

Active Safety and Semi-Autonomous Driving

ADAS - Exterior, E-Mirror,
Park Assist
Power Supplies
Electronic Power Steering

Body & Convenience

Climate Control
Instrument Clusters
Power Supplies
Steering Wheel Sensors
Electric-Chromic Mirrors
Seat Positioning, Heating & Cooling
Door/Mirror/Window Control

Powertrain

Engine Control (Gas/ Diesel)
Throttle Control
Ignition Control
Sensor Interface
Power Supplies
Fuel Injection Control
Position Sensing
HEV/PHEV/EV
Electric Pump & Fan Control

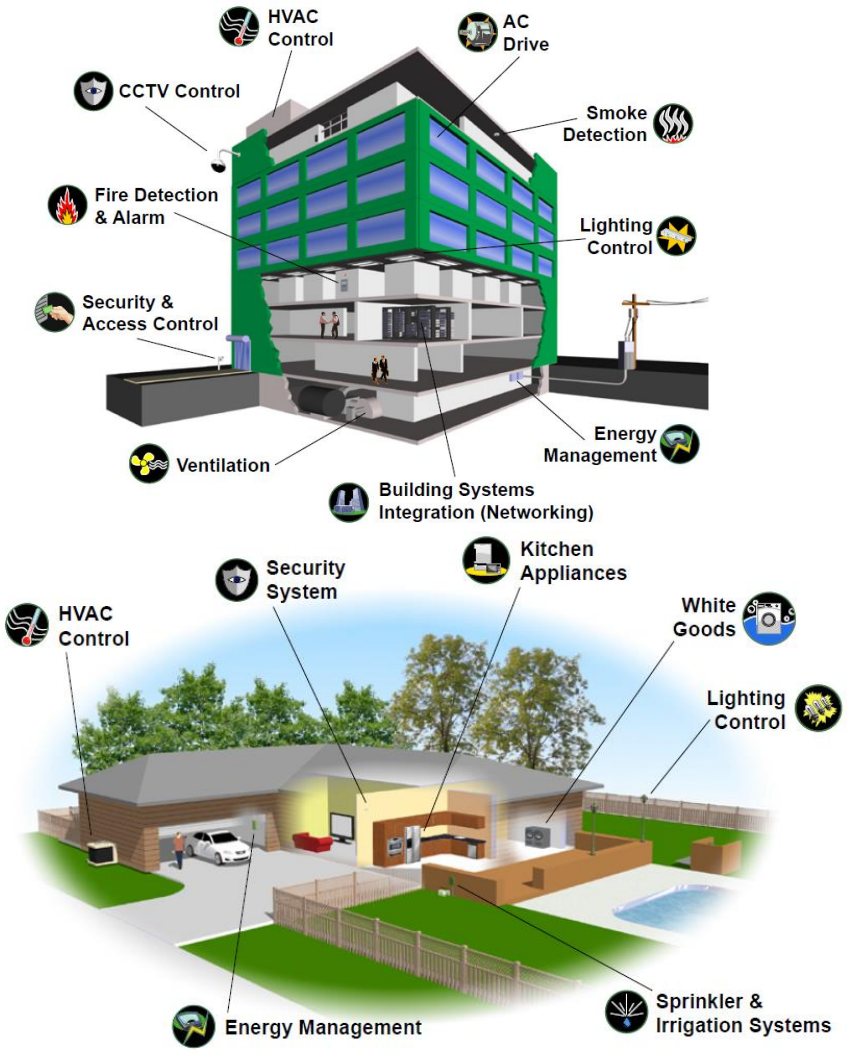
Audio & Infotainment

Navigation Systems
Power Supplies

LED lighting

Interior: Door, Dome, RGB Accent, Puddle
Exterior: CHMSLs, RCLs, Accent
Advanced Front Lighting & Motor Control

Industrial Applications



White Goods

- Washing Machine (Low Side Current Sense)
- Refrigerator (Low Side Current Sense & 12V Motor Driver)
- Dishwasher (Low Side Current Sense & 12V Motor Driver)
- Outside Air Conditioner (Low Side Current Sense)
- Air Purifier (Precision Signal Conditioning)
- Vacuum Cleaner (Low Side Current Sense)
- Water Heater (Various Signal Conditioning)

Building Automation

- Smoke Detector (Various Signal Conditioning)
- Flow Meter (Various Signal Conditioning)
- Thermostat Control (Various Signal Conditioning)
- Smart Meter (Low Side Current Sense)
- LED Lighting

Process Automation & Measurement

- AC Induction Motors (Low Side Current Sense)
- Brush DC Motors (Low Side Current Sense)
- Industrial Weigh Scales (Precision Signal Conditioning)
- Digital Multi-meter (Precision Signal Conditioning)

Medical

- Blood Glucose Meter (Precision Signal Conditioning)
- Blood Pressure Monitor (Precision Signal Conditioning)

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General Purpose Amplifiers

Public Information

Standard Op Amps

Standard Amplifiers

ON Semiconductor Industry Standard Op Amps With the Best Price to Performance Ratio

High Volume Manufacturing

More than 1B Units per Year

General Purpose Comparators

Device	Ch.	Min.V_S (V)	Max.V_S (V)	I_Q (mA)	$t_{RESP\ (H-L)}$ (µs)	Max. V_{OS} (mV)	Output Type	Package(s)
LM2903	2	2	36	0.4	1.5	15	Open Collector	SO-8, MICRO8
LM293	2	2	36	0.4	1.3	9	Open Collector	SO-8, MICRO8
LM393	2	2	36	0.4	1.3	9	Open Collector	SO-8, MICRO8, PDIP-8
LM239/339	4	3	36	0.8	1.3	5		
LM2901	4	3	36	0.8	1.3	7		
TS391, TL331	1	2	36	0.5	0.35	9		
LM211	1	5	30	1.2	0.2	0.7		
LM311	1	5	30	1.2	0.2	0.2		

General Purpose Op-Amps

Device	Ch.	Min.V_S (V)	Max.V_S (V)	I_Q/Ch. (mA)	GBW (MHz)	Max. V_{OS} (mV)	Package(s)
NCV952	2	2.7	26	0.75	3.5	8	TSSOP-8
MC3320x	1,2,4	1.8	12	0.9	2.2	6	SO-8, MICRO8, SO-14, TSSOP-14
LM321	1	3	32	0.75	1	9	SOT-23-5
LM224	4	3	32	1.2	1	5	SO-14, TSSOP-14
LM258	2	3	32	0.75	1	5	SO-8, MICRO-8
LM2902/V	4	3	32	1.2	1	7	SO-14, TSSOP-14
LM2904/V	2	3	32	0.75	1	7	SO-8, MICRO-8
LM324,A	4	3	32	1.2	1	3	SO-14, TSSOP-14
LM358, A	2	3	32	0.75	1	7	SO-8, MICRO-8
NCS7101	1	1.8	10	1.0	1	9	SOT-23-5
LM301A	1	3	18	1.2	1	7.5	SO-8
LM201A	1	3	18	1.2	1	2	SO-8

High Quality Manufacturing

Industry leading ppb rates

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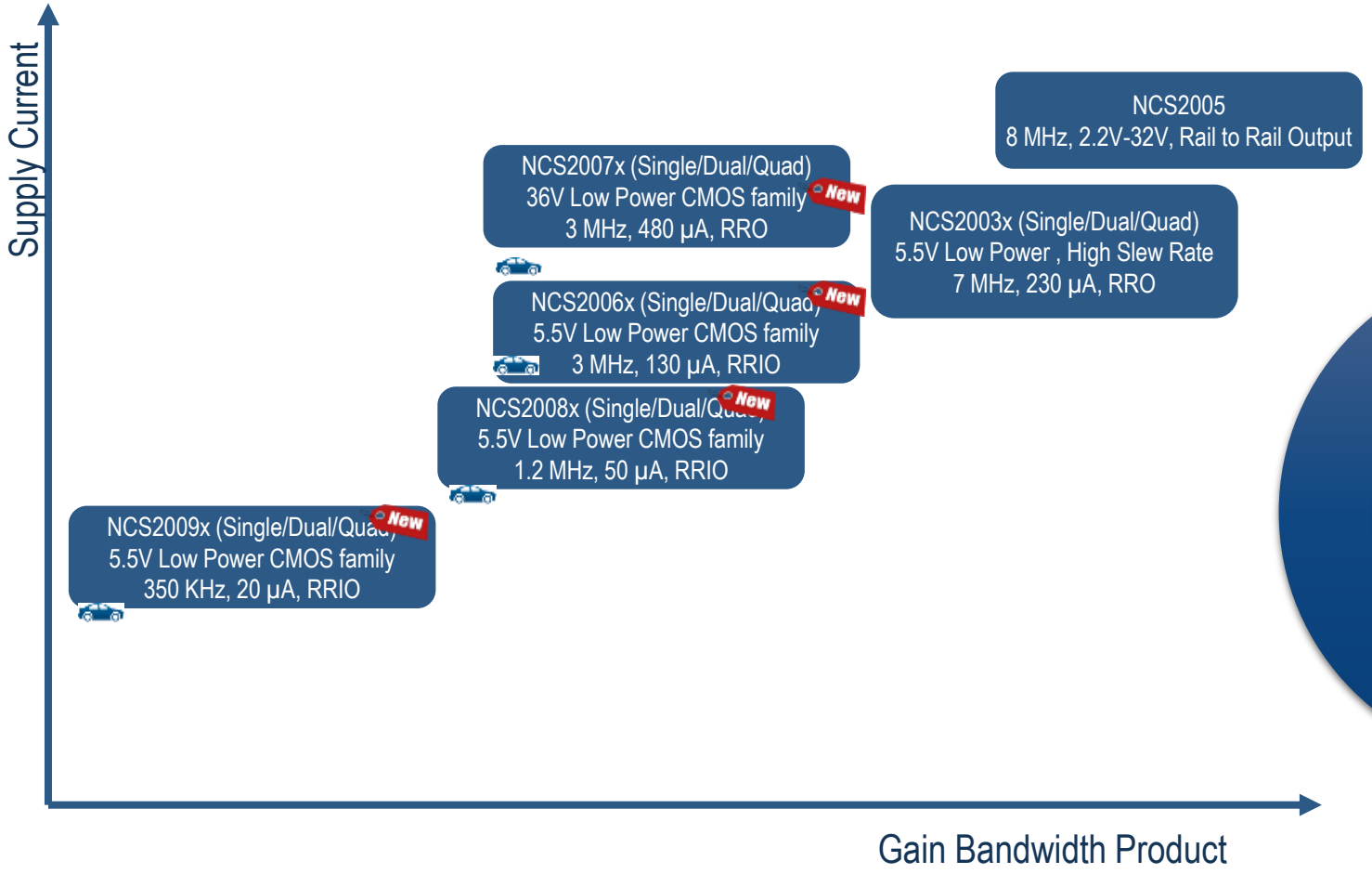
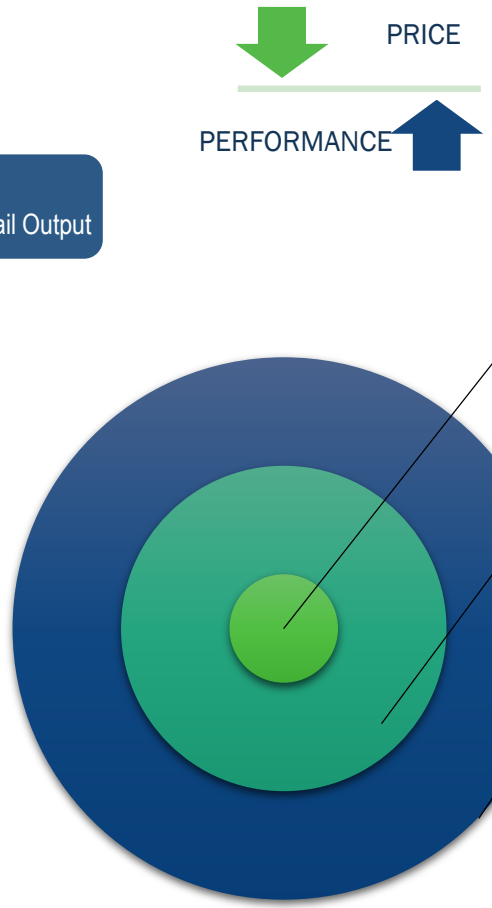
Low Power Amplifier & Comparators

Public Information

Low Power Op Amp (Less than 1mA current consumption)

6 Families of Low Power Amplifiers





Good Price to Performance Balance

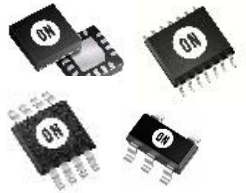
- Migration Path for next generation designs

Performance

- Low Current Consumption
- Low Voltage Options
- Rail to Rail
- Wide offering of GBWP OPA

Space Saving Package

- Single, Dual and Quad
- Small packages (SOT23, SC-70, SOIC 8, SOIC 14)



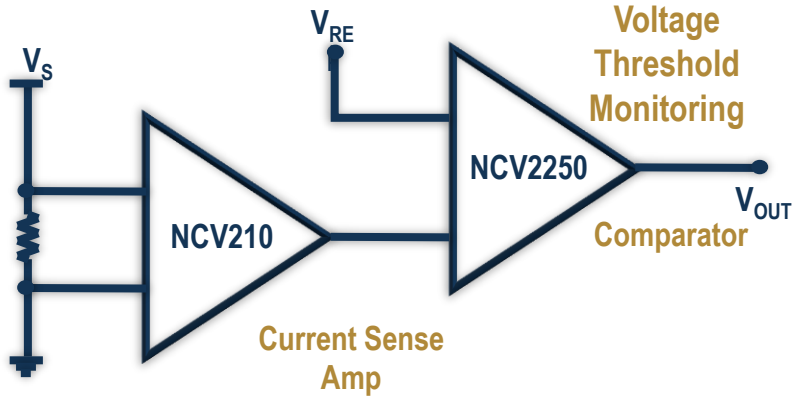
Low Power Products

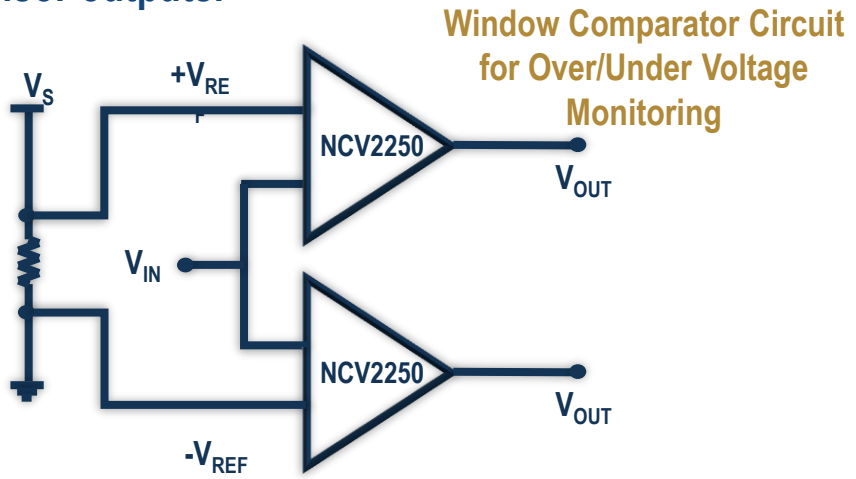
Parameter	NCS(V)20091/2	NCS(V)20081/2	NCS(V)20061/2	NCS(V)20071/2/4
Operating Temperature Range (°C)	-40 to +125	-40 to +125	-40 to +125	-40 to +125
Supply Current (µA)	29	50	140	405
GBWP (MHz)	0.35	1.2	3	3
Offset Voltage (max.)	4mV	3mV	3mV	4mV
Slew rate (V/µs)	0.15	0.5	1.5	2.8
Rail-to-Rail Swing	Input /Output	Input /Output	Input /Output	Out
Operating Voltage Range (V)	1.8 -5.5	1.8 -5.5	1.8 -5.5	2.7 – 36V
Input Bias Current (pA)	1	1	1	5
Packages	Single – SC70, TSOP-5, UDFN6 Dual – Micro8, TSSOP-8, SOIC-8 Quad* – SOIC-14, SOP-14, TSSOP-14 (in Development)			Single: TSOP-5, SOT553-5 Dual: Micro8, SOIC-8, TSSOP-8 Quad: SOIC-14, TSSOP-14
	NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC–Q100 Qualified and PPAP Capable			
Ideal Applications	Filter Circuits, Buffering, Sensor Signal Conditioning, Amplification, Combine with a Precision Amplifier like the NCSx333 to make a two gain stage precision amplification circuit			

www.onsemi.com/opamps

Comparators

ON Semiconductor comparator portfolio provides for solutions with low power consumptions and fast response times. Often times amplifiers are combined with comparators to monitor the supply voltage rails or sensor outputs.





Device	Channels	Vs Min (V)	Vs Max (V)	ICC Typ (mA)	tres Typ (ns)	VOS Max (mV)	Temp Range (C)	Package Type
TL331V	1	2	36	0.5	400	9	-40 to 125	TSOP5
NCV2901	4	3	36	1	1300	7	-40 to 150	SOIC14, TSSOP14
NCV2903	2	2	36	0.7	1500	7	-40 to 125	SOIC8, Micro8
NCV2200	1	0.85	6	0.01	1100	5	-40 to 125	SOT235, SC705
NCV2250/2 New	1	1.8	5.5	0.15	50	6	-40 to 125	SOT235, SC705
NCV2393	2	2.7	16	0.006	1000	14	-40 to 125	SOIC8
NCV331	1	2.7	5	0.06	800	9	-40 to 125	TSOP5

NCS(V)2250/52

Value Proposition

The NCS(V)2250/52 series of low voltage comparators feature fast response time and common mode input voltage range extending beyond the rails. These single channel devices are available with complementary push-pull output in the NCS2250 or with open drain output in the NCS2252. These single channel comparators are available in space saving SOT23-5 and SC70-5 packages. Automotive qualified devices are also available, denoted by the NCV prefix.

Unique Features

- Low Propagation delay: 50ns
- Supply Voltage: 1.8V to 5.5V
- Supply Current: 150 μA Typical at 5 V Supply
- Temperature Range: -40 to +125C

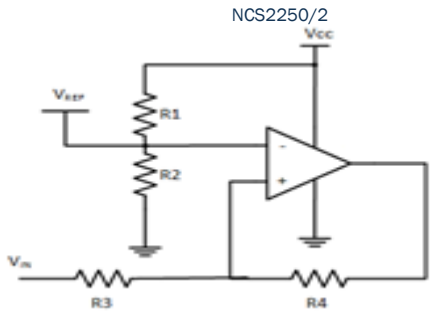
Benefits

- Fast response time and power consumption are generally trade-offs. The NCS2250/52 provides a lower current consumption and is optimized for low voltage operation
- Common-Mode Voltage range extends to 200mV beyond rails providing a wider dynamic range of operation

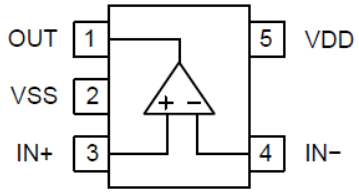
Market & Applications

- Smart Phone, Cell Phones
- Automotive
- Lighting
- Windowed Comparators
- Portable and battery−powered systems
- Power supplies
- Voltage Threshold Detector
- Zero−crossing Detectors
- High−speed Sampling Circuits
- Logic Level Shifting / Translation
- Clock and Data Signal Restoration

Typical Application diagram



Packages/ Pin Outs



Automotive	Output	OPN	Package
No	Push−Pull	NCS2250SQ2T2G	SC−88A (SC70−5)
		NCS2250SN2T1G	TSOP−5 (SOT23−5)
	Open Drain	NCS2252SQ2T2G	SC−88A (SC70−5)
		NCS2252SN2T1G	TSOP−5 (SOT23−5)
Yes	Push−Pull	NCV2250SQ2T2G	SC−88A (SC70−5)
		NCV2250SN2T1G	TSOP−5 (SOT23−5)
	Open Drain	NCV2252SQ2T2G	SC−88A (SC70−5)
		NCV2252SN2T1G	TSOP−5 (SOT23−5)

http://www.onsemi.com/NCV2250

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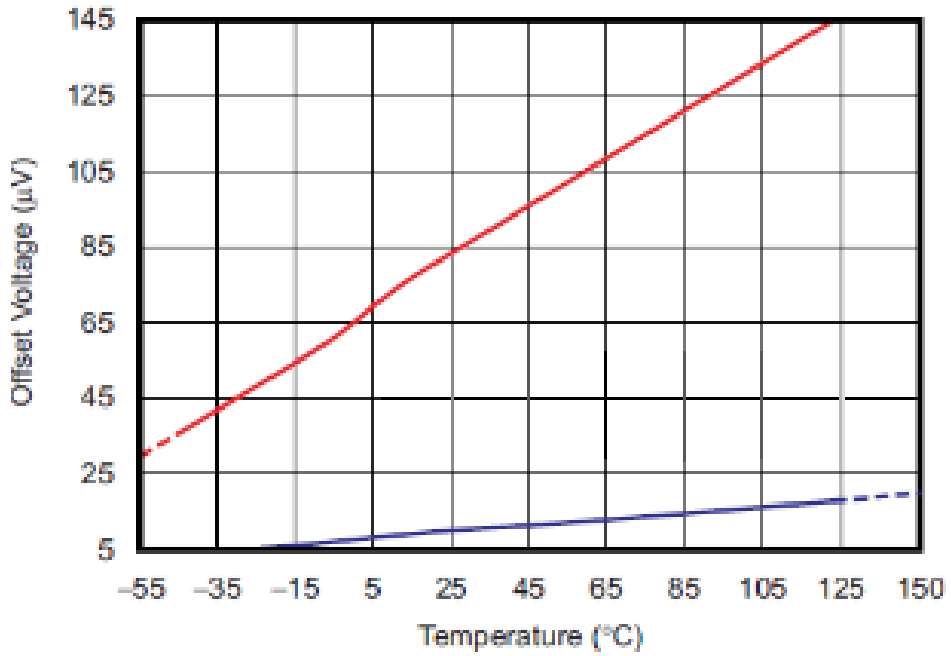
Precision Amplifiers

Precision Architectures – Low Input Offset Voltage

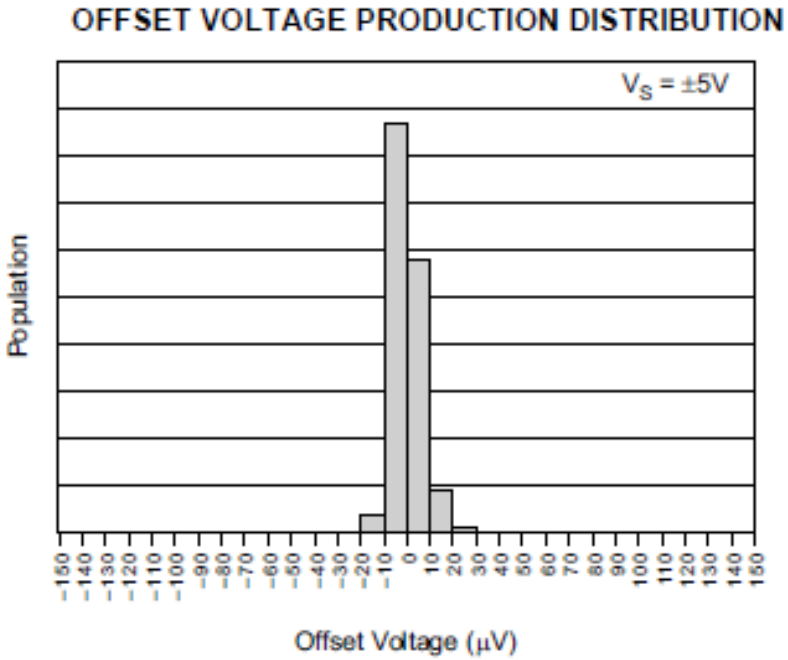
Zero-Drift Architecture

- Internally calibrates the offsets through a feedback loop to provide low error at the output
- Enables offsets as low as 10uV at lower speeds



Voltage Offset E-Trim

- Low Offset voltage through internal memory
- Accommodates for offset induced due to package stress by trimming after package



High Precision Op Amps

Product	#	VS Min (V)	VS Max (V)	Iq Typ (mA)	VOS Max (mV)	GBW Typ (MHz)	SR Typ (V/µs)	ΔVOS/ΔT (µV/C)	Temperature Range (°C)	Package Type
NCS2325	2	1.8	5.5	0.021	0.05	0.27	0.1	14	-40 to 125	Micro8™ SOIC-8
NCS2333	2	1.8	5.5	0.017 0.021	0.03	0.27	0.1	0.04	-40 to 125	Micro8™ SOIC-8 UDFN-8
NCS4325	4	1.8	5.5	0.021	0.05	0.27	0.1	14	-40 to 125	SOIC-14
NCS325	1	1.8	5.5	0.021	0.05	0.35	0.16	14	-40 to 125	SOT-23-5
NCS/V333A	1	1.8	5.5	0.021 0.028	0.01 0.03	0.35	0.1	0.03	-40 to 125	SC-70-5 SOT-23-5
NCS/V4333	4	1.8	5.5	0.021	0.01 0.03	0.35	0.015 0.15	0.095	-40 to 125	SOIC-14
NCS/V2187x	1/ 2/ 4	1.8	5.5	40	45	0.35	0.1	0.4	-40 to 125	TSOP-5, SC705, UDFN8, Micro8, SOIC-14
NCS21911/2	1	4	36	0.475	0.025	2	1.6	0.02	-40 to 125	SOT-23-5, Micro8™ SOIC-8
NCS20166	1	3	5.5	1.2	1.05	10	0.5	5	-40 to 125	SOT-23-5

Available: NCS(V)20166

Value Proposition

- The NCS(V)20166 is a single Op Amp featuring low initial input offset voltage at 10 MHz and operates over a wide supply range from 3V to 5.5V., making them ideal for portable and low power applications. The single channel devices are offered in SOT23-5 (TSOP-5). All versions are specified for operation from -40°C to +125°C.

Unique Features

- Gain Bandwidth: 10 MHz typ.
- Input Offset Voltage: Typ 50 Max 550 µV
- Supply Current/ Channel: 1.25mA (Max)
- Supply Voltage: 3V to 5.5 V
- Rail-to-Rail Input and Output

Benefits

Input offset voltage (Vos) is the error at input of the amplifier. It drifts over both time and temperature, unless calibrated in the op amp.

- The NCS20166 offer a low initial offset voltage which makes a good cost to performance ratio for the applications that need the additional accuracy over the general purpose amplifiers

Wide GBWP amplifiers offer significant advantage for applications where the microcontroller would need faster slewing Op Amp. Typically, when the systems depend on feedback from the sensor, the rest of the signal chain consumes current while waiting on response from the Op Amp.

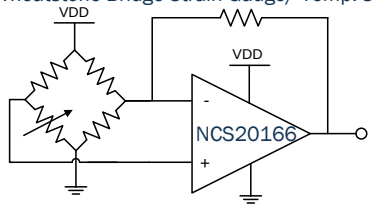
- NCS20166 offers a slew rate of 6V/ µs which contributes to faster signal response, and could translate to saving the overall power consumption for system

Market & Applications

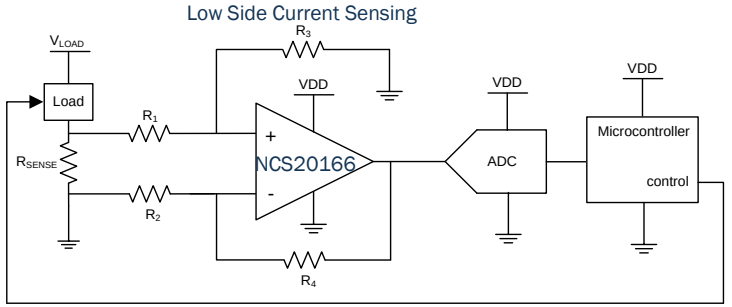
- Industrial Automation
- Medical
- Networking and Telecom
- Sensors
- Power Supplies
- Automotive

Typical Application diagram

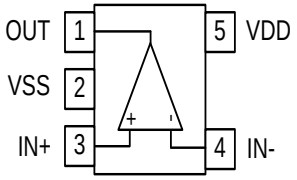
Wheatstone Bridge Strain Gauge/ Temp. Sensing



Low Side Current Sensing



Packages/ Pin Outs



Product	Package
NCS20166	SOT23-5
NCV20166	SOT23-5, AEC

- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable

Available Now: NCS(V)21911/2. In Dev: NCS21914 (Quad)

Value Proposition

The NCS(V)21911 high precision op amp features low input offset voltage and low offset drift over time and temperature. This low quiescent current, low noise amplifier has rail-to-rail output swing within 15 mV of the rails. This device operate over a wide supply range from 4V to 36V. It is single channel device, that is offered in space saving packages. All versions are specified for operation from -40°C to +125°C.

Unique Features

- Gain Bandwidth: 2 MHz typical
- Input Offset Voltage: 40 µV max
- Offset Drift Over Temp: 0.085 µV/°C max
- Unity Gain Stable
- Quiescent Current: 600 µA max
- Supply Voltage: 4 V to 36 V
- Rail-to-Rail Output
- Integrated EMI filters

Benefits

Input offset voltage (Vos) is the error at input of the amplifier. It drifts over both time and temperature, unless calibrated in the op amp.

- The NCS2191x's zero drift architecture calibrates the Vos to provide a low error over time and temperature to address for the application sensitive to the drift

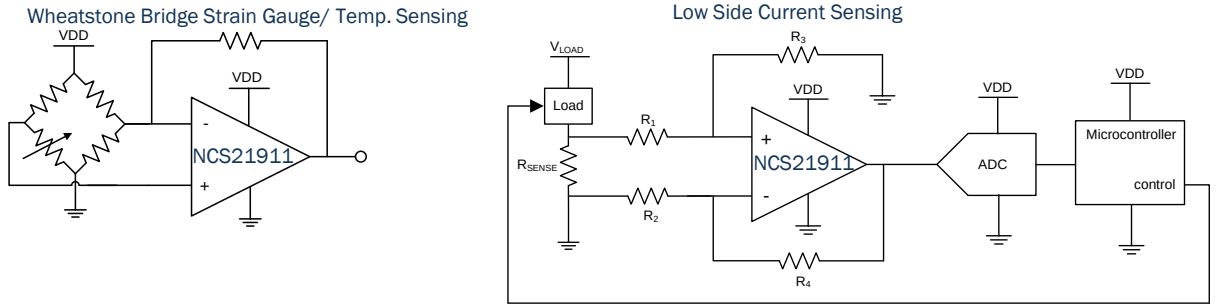
Op amps have varying amounts of EMI susceptibility. Semiconductor junctions can pick up and rectify EMI signals, creating an EMI-induced voltage offset at the output, adding another component to the total error. Input pins are the most sensitive to EMI.

- The NCS2191x integrates low-pass filters to decrease its sensitivity to EMI.

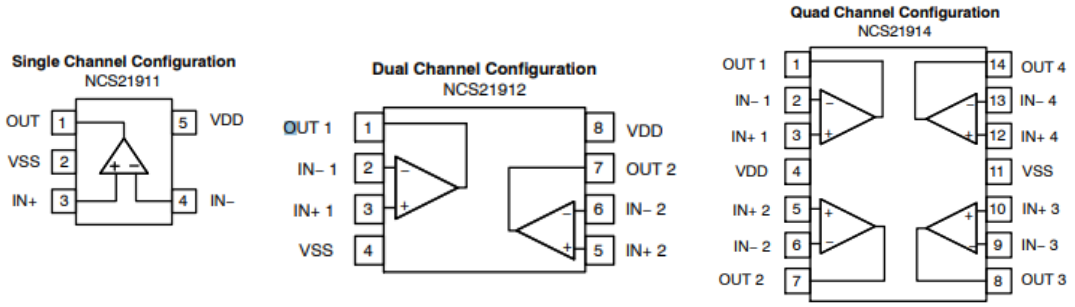
Market & Applications

- Industrial Automation
- Medical
- Networking and Telecom

Typical Application diagram



Packages/ Pin Outs



Availabe: NCS(V)21871/2/4

Value Proposition

This family of single, dual and quad zero-drift amplifier is provides high accuracy performance due to the continuous calibration of the input offset voltage over time and temperature. Their performance and features are comparable, if not better to all the competitors.

Unique Features

- Gain-Bandwidth Product: 270 to 350 kHz
- Low Supply Current/ Channel: 17 µA (typ., at 3.3V)
- Low Offset Voltage: 45 µV max
- Low Offset Drift: 0.4 µV/°C max
- Wide Supply Range: 1.8V to 5.5 V
- Wide Temperature Range: −40°C to +125°C
- AEC- Q100 Qualified (NCV333A) are available

Benefits

- Offset error is inherent to all amplifiers. This error tends to increase with time and temperature. Op amps amplify both the signal and the error. Among the various architectures employed to lower the offset, Zero-Drift is one such, which provides exceptionally low offset and drift, resulting in high accuracy sensor measurements and amplification, especially when the input of the op amp is a small signal.

Market & Applications

- Thermal Management Circuits
- Transducer Applications
- Current Sensing in Motor Control, Lighting etc.
- Power Supplies
- Battery Powered/ Portable Applications
- Electronic Scales, Wheatstone Bridges
- Instrumentation in Medical and Industrial
- Automotive
- Telecom
- Industrial
- Computing
- Medical

Typical Application diagram

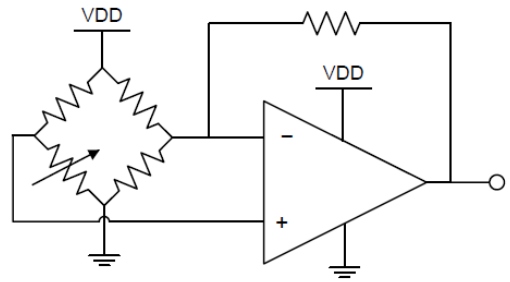


Figure 18. Bridge Circuit Amplification

Packages/ Pin Outs


SOT23−5
SN SUFFIX
CASE 483

SC70−5
SQ SUFFIX
CASE 419A

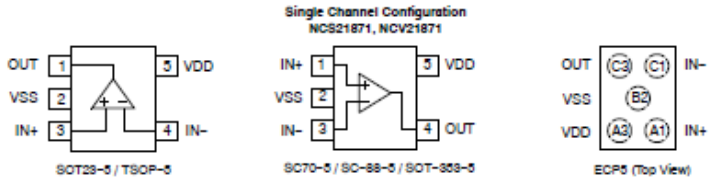

UDFN8
MU SUFFIX
CASE 517AW

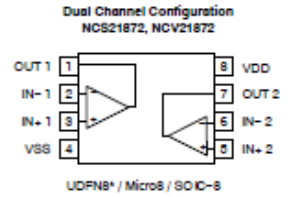

MSOP−8
DM SUFFIX
CASE 846A−02

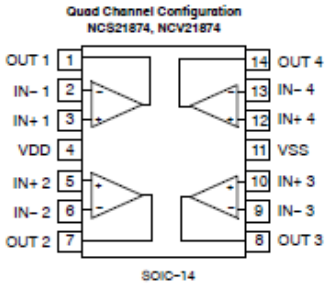

SOIC−8
D SUFFIX
CASE 751


SOIC−14
D SUFFIX
CASE 751A


ECP5
FCT SUFFIX
CASE 971BE







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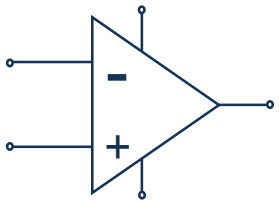
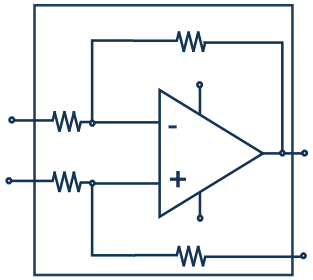
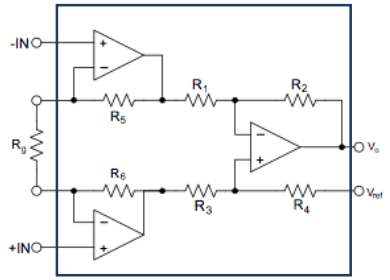
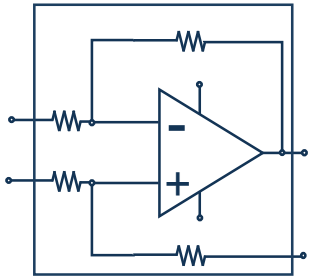
Current Sensing Solutions

Public Information

Current Sensing Amplifiers

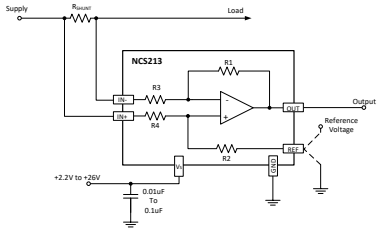
Operational Amplifiers	Difference Amplifiers	Instrumentation Amplifiers	Current Sense Amplifiers
			
Low Side Current Sensing	High/ Low Side Sensing	Low Side Current Sensing	High/ Low Side Current Sensing
$V_{CM} = 0$	$V_{CM} > Vs$	$0 < V_{CM} < Vs$	$V_{CM} > Vs$
- Low Cost - External resistor matching is a big concern	- Limited to gain of 1 - Old Technology - CMV dependent on Vs	- High CMRR - High Performance - CMV dependent on Vs	- Wide Variety of Gain Options - CMV independent of Supply

Current Sense Amplifiers (Integrated Resistors)

Current Sense Amplifiers

Monitoring the current consumption provide critical information that can assist in the safety and diagnostic functions in a system. ON Semiconductors offers current sense amplifiers that integrate external resistors to offer a higher accuracy, smaller solution, in addition to the cost effective stand alone Op Amps.

Current Sensing Amplifier with Int. Gain Setting Resistors



Zero Drift Current Sense Amplifiers (Integrated and Precision performance)

Device	Ch.	Min.V_S (V)	Max.V_S (V)	Input CM Range (V)	BW (KHz)	Max. V_{OS} (µV)	V_{OS} Drift (µV/°C)	Gain Error (%)	CMRR (dB)	Package(s)	Features
NCS(V)21xR[NEW]	1	2.2	26	2.2 to 26	25- 90	as low as 35	0.5	1	105	SC70, UQFN	Low V_{OS} and drift over time and temp.
NCS199AxR*[NEW]	1	2.2	26	2.2 to 26	40-90	150	0.5	1.5	100	SC70, UQFN	Low V_{OS} and drift over time and temp.

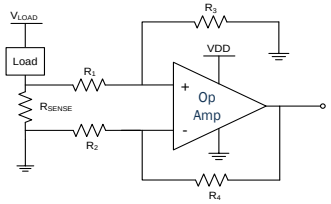
Targeting Direct p2p Replacement of TI's INA210/211/213/214/199 Product

Amplifiers for Low Side Current Sensing (external resistors)

Current Sense Amplifiers

Monitoring the current consumption provide critical information that can assist in the safety and diagnostic functions in a system. ON Semiconductors offers current sense amplifiers that integrate external resistors to offer a higher accuracy, smaller solution, in addition to the cost effective stand alone Op Amps.

Current Sensing with Ext. Gain Setting Resistors



Low Voltage Current Sensing using Zero Drift Op-Amps (High Precision)

Device	Ch.	Min.V_S (V)	Max.V_S (V)	I_Q/Ch (µA)	GBW (KHz)	Max. V_{OS} (µV)	V_{OS} Drift (µV/°C)	CMRR (dB)	e_{p-p} (µVpp)	Package(s)	Features
NCS(V)333A NCS(V)2333/NEW NCS(V)4333NEW	1,2,4	1.8	5.5	21	350	10	0.03	120	1	SOT-23-5, SC70-5, DFN8, MICRO-8, SO-8, SO-14	Low V_{OS}
NCS(V)21911/2/4	1,2*,4*	4	36	475	2000	25	0.02	130	22	SOT-23-5	Higher GBW, Low Vos

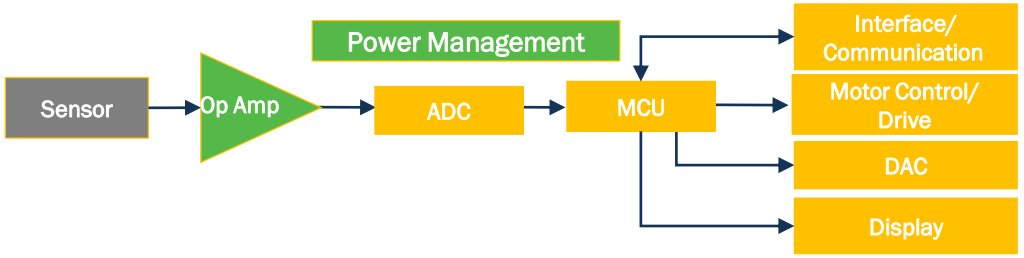
Low Voltage Current Sensing Solutions (Cost Effective)

Device	Ch.	Min.V_S (V)	Max.V_S (V)	I_Q /Ch. (µA)	GBW (MHz)	Max. V_{OS} (mV)	V_{OS} Drift (µV/°C)	I_B (nA)	CMRR (dB)	Rail to Rail	Package(s)	Features
NCS(V)2009x NEW	1,2	1.8	5.5	20	0.35	4	1	0.001	80	I/O	SOT23-5. SC-70-5, UDFN-6, MICRO-8, TSSOP-8, SO-8,	Low I_Q &V_{OS}
NCS(V)2008x NEW	1,2	1.8	5.5	50	1.2	4	1	0.001	80	I/O	SOT23-5. SC-70-5, UDFN-6, MICRO-8, TSSOP-8, SO-8,	Low I_Q &V_{OS}
NCS(V)2006x NEW	1,2	1.8	5.5	140	3	4	1	0.001	80	I/O	SOT23-5. SC-70-5, UDFN-6, MICRO-8, TSSOP-8, SO-8,	Low I_Q &V_{OS}
NCS(V)2003x NEW	1,2,4	1.7	5.5	275	7	5	2	0.001	80	Output	SOT23-5, SOT553, SOT23-5, SOT553, Micro-8, SOIC-8, TSSOP-8,	Fast Slew Rate, Low V_S & I_B
NCS(V)2007xNEW	1,2,4	2.7	36	400	3	4	2	0.005	110	Output	SOT-553, TSOP-5, Micro8, SO-8, TSSOP-8,	Wide V_S range

* NCS21912/4 Samples Available

Expanding the Portfolio with New Op Amps

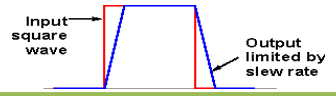
Addressing signal conditioning needs in wide variety of applications



Low Power Op Amps

P/N	Product Description
NCS2005	1.3mA, 8.5MHz, **RRIO**, 6mV Max V_{IO}, **V_S=2.2V – 32V**
NCS2006x	**140µA**, 3MHz, RRIO, 3mV Max V_{IO}, V_S=1.8V – 5.5V
NCS2007x	400µA, 3MHz, RRO, 3mV Max V_{IO}, **V_S=2.7V – 36V**
NCS2008x	**50µA**, 1MHz, RRIO, 3mV Max V_{IO}, V_S=1.8V – 5.5V
NCS2009x	**20µA**, 350KHz, RRIO, 3mV Max V_{IO}, V_S=1.8V – 5.5V
LM7301	600µA, 4MHz, **RRIO**, 6mV Max V_{IO}, **V_S=1.8V – 32V**
NCV952	750µA, 3.5MHz, **RRIO**, 8mV Max V_{IO}, **V_S=2.7V – 26V**

High Slew Rate Op-Amps



P/N	Product Description
NCS2003x	**8.5V/µs SR**, 7MHz, RRO, 20nV/rtHz Noise, V_S=1.8V – 5.5V
NCS20166[NEW]	**6V/µs SR**, 10MHz, RRO, 10nV/rtHz Noise, V_S=3V – 5.5V

Low Power Comparators

P/N	Product Description
NCS3402	18µs tPHL, **0.47µA Icc**, Open Drain, Dual, V_S=2.5V – 16V
TS391	0.35µs tPHL, 0.5mA Icc, Open Drain, Single, **V_S=2V – 36V**
TS393	0.8µs tPHL, **9µA Icc**, Open Drain, Dual, **V_S=2.7V – 16V**
NCS2202A	0.5µs tPHL, **9µA Icc**, Open Drain, Single, RRIO, V_S=0.85V – 6V
NCS2250	**74ns tPHL**, 80µA Icc, Push Pull, Single, RRIO, V_S=1.8V – 5.5V

Precision/Zero Drift Op-Amps

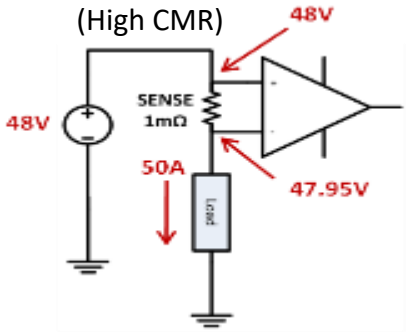
P/N	Product Description
NCS2187x[NEW]	**45µV Max V_{IO}, 0.4µV/°C**, 270-350 kHz, RRIO, V_S=1.8V – 5.5V
NCSx333	**30µV Max V_{IO}, 0.070µV/°C**, 350 kHz, RRIO, V_S=1.8V – 5.5V
NCS21911[NEW]	**25µV Max V_{IO}, 0.085µV/°C**, 2 MHz, RRO, V_S=4.0V – 36V

Current Sense Amplifiers with Wide CMV

P/N	Product Description
NCS21xR[NEW]	**V_{CMR} = -0.3V to 26V**, Gain Error = 1.0%, 140dB CMRR, 35 µV V_{IO}
NCS199AxR[NEW]	**V_{CMR} = -0.3V to 26V**, Gain Error = 1.5%, 120dB CMRR, 150µV V_{IO}

High Side Current Sensing

(High CMR)



Advantages

- Detects load shorts
- No ground path resistance

Disadvantages

- More expensive than low side sensing (primarily due to high voltage process)

New Products released within past 18 months

Thank You