

# Intersil High Speed Op Amps

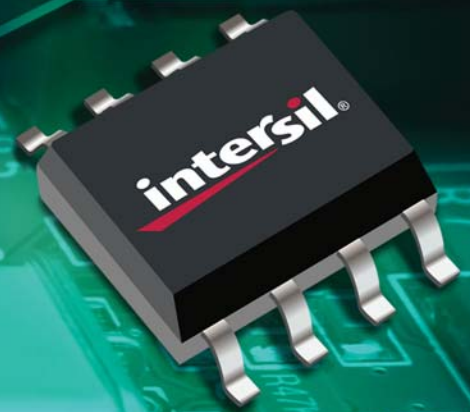
2010



## Best in Class Performance-to-Power Ratio

### Inside:

- Rail-to-Rail Voltage Feedback Amplifiers
- Current Feedback Amplifiers
- Slew Rate Enhanced Voltage Feedback Amplifiers
- High Voltage Voltage Feedback Amplifiers
- Differential Line Drivers/Receivers
- Fixed Gain Op Amps



**intersil**®

# High Speed Op Amps

## Rail-to-Rail VFs (Pg 3)

Single Channel

**EL8100**

- 200MHz, 200V/μs, EN

**EL8101**

- 200MHz, 200V/μs

**EL8102**

- 500MHz, 600V/μs, EN

**EL8103**

- 500MHz, 600V/μs

Dual Channel

**EL8200**

- 200MHz, 200V/μs, EN

**EL8201**

- 200MHz, 200V/μs

**EL8202**

- 500MHz, 600V/μs, EN

**EL8203**

- 500MHz, 600V/μs

Triple Channel

**EL8300**

- 200MHz, 200V/μs, EN

**EL8302**

- 500MHz, 600V/μs, EN

Quad Channel

**EL8401**

- 200MHz, 200V/μs

**EL8403**

- 500MHz, 600V/μs

## Current Feedback Amplifiers (Pg 4)

Single Channel

**EL5160**

- 200MHz, 1,700V/μs, EN

**EL5161**

- 200MHz, 1,700V/μs

**EL5162**

- 500MHz, 4,000V/μs, EN

**EL5163**

- 500MHz, 4,000V/μs

**EL5164**

- 600MHz, 4,700V/μs, EN

**EL5165**

- 600MHz, 4,700V/μs

**EL5166**

- 1400MHz, 6,000V/μs, EN

**EL5167**

- 1400MHz, 6,000V/μs

Dual Channel

**EL5260**

- 200MHz, 2,000V/μs, EN

**EL5261**

- 200MHz, 2,000V/μs

**EL5262**

- 500MHz, 2,500V/μs, EN

**EL5263**

- 500MHz, 2,500V/μs

Triple Channel

**EL5360**

- 200MHz, 1,700V/μs, EN

**EL5362**

- 500MHz, 2,500V/μs, EN

**EL5364**

- 600MHz, 4,200V/μs, EN

Quad Channel

**EL5462**

- 500MHz, 4,000V/μs

## Slew Rate Enhanced VFs (Pg 5)

Single Channel

**EL5100**

- 200MHz, 2,200V/μs, EN

**EL5101**

- 200MHz, 2,200V/μs

**EL5102**

- 400MHz, 3,500V/μs, EN

**EL5103**

- 400MHz, 3,500V/μs

**EL5104**

- 700MHz, 4,000V/μs, EN

**EL5105**

- 700MHz, 4,000V/μs

Dual Channel

**EL5202**

- 400MHz, 3,500V/μs, EN

**EL5203**

- 400MHz, 3,500V/μs

**EL5204**

- 700MHz, 4,000V/μs, EN

**EL5100**

- 700MHz, 4,000V/μs, EN

Triple Channel

**EL5300**

- 200MHz, 2,200V/μs, EN

**EL5302**

- 400MHz, 3,500V/μs, EN

**EL5304**

- 700MHz, 4,000V/μs, EN

## High Voltage VFs (Pg 6)

Single Channel

**ISL55001**

- 220MHz, 300V/μs
- ±2.5V to ±15V

Dual Channel

**ISL55002**

- 220MHz, 300V/μs
- ±2.5V to ±15V

Quad Channel

**ISL55004**

- 220MHz, 300V/μs
- ±2.5V to ±8V

## Differential Line Drivers/Receivers (Pg 7)

Differential Line Drivers

Single Channel

**EL5170**

- 100MHz, 1,100V/μs
- 2 (Fixed), EN

**EL5171**

- 250MHz, 800V/μs

**EL5173**

- 400MHz, 900V/μs
- 2 (Fixed), EN

**EL5174**

- 550MHz, 1,100V/μs, EN

**EL5178**

- 700MHz, 1,000V/μs

Triple Channel

**EL5370**

- 100MHz, 1,200V/μs
- 2 (Fixed), EN

**EL5371**

- 250MHz, 700V/μs, EN

**EL5373**

- 450MHz, 1,100V/μs
- 2 (Fixed), EN

**EL5374**

- 550MHz, 850V/μs, EN

**EL5378**

- 700MHz, 1,000V/μs, EN

Differential Line Receivers

Single Channel

**EL5172**

- 250MHz, 800V/μs, EN

**EL5175**

- 550MHz, 900V/μs, EN

Triple Channel

**EL5372**

- 250MHz, 800V/μs, EN

**EL5375**

- 550MHz, 900V/μs, EN

## Fixed Gain Op Amps (Pg 8)

Single Channel

**EL5106**

- 1.5mA supply current
- 350MHz, 4,500V/μs, ±1.2 (Fixed), EN

**EL5108**

- 3.5mA supply current
- 450MHz, 4,500V/μs, ±1.2 (Fixed), EN

Triple Channel

**EL5306**

- 1.5mA/ch supply current
- 350MHz, 4,500V/μs, ±1.2 (Fixed), EN

**EL5308**

- 3.5mA/ch supply current
- 450MHz, 4,500V/μs, ±1.2 (Fixed), EN

# Rail-to-Rail Voltage Feedback Amplifiers

For driving and buffering today's high speed ADC and DAC applications, utilize the world's fastest rail-to-rail Voltage Feedback Amplifiers (VFAs) – EL8x0x, which offer unmatched harmonic distortion performance at the lowest quiescent power.



## EL8102

### Key Features

- ◆ **Wide 3dB bandwidth: 500MHz ( $A_V = +1$ )**
  - Suitable for various high speed systems
- ◆ **Single supply: +3V to +5.5V with shutdown**
  - Suitable for portable/handheld products
- ◆ **Rail-to-Rail outputs: +50mV to +4.9V ( $V_S = +5V$ )**
  - Suitable for buffering DAC outputs
- ◆ **Low power consumption: 5.6mA per channel ( $V_S = +5V$ )**
  - Fast shutdown (25ns) to 30 $\mu$ A supply current
- ◆ **Fast slew rate: 600V/ $\mu$ s**
  - Suitable for various distribution applications
- ◆ **Very low distortion: -87dBc (HD3)**
  - Suitable for driving high speed ADCs

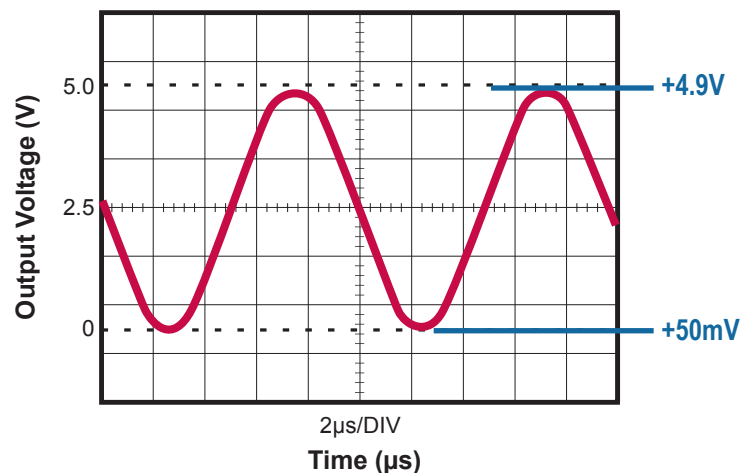
### Applications

- ◆ Portable communications equipment
- ◆ ADC drivers
- ◆ DAC buffers

## Industry's Fastest Rail-to-Rail VFAs

Using only 5.6mA on a single +5V supply, EL8102 offers greater than 600V/ $\mu$ s slew rate and 200MHz gain bandwidth product.

### Rail-to-Rail Outputs



## Rail-to-Rail Voltage Feedback Amplifiers (Single Supply)

Part Number	# of Channels	$V_S$ Min (V)	$V_S$ Max (V)	SSBW @ $A_V$ Min (MHz)	$A_V$ Min (V/V)	Slew Rate (V/ $\mu$ s)	2nd Harmonic (dBc)	3rd Harmonic (dBc)	Total Harmonic Distortion (dBc)	$I_{CC}$ Max/Ch (mA)	$V_N$ (nV/ $\sqrt{Hz}$ )	$V_{OS}$ Max (mV)	$I_O$ Min (mA)	R-R In	R-R Out	Enable
EL8100	1	3	5.5	200	1	200	-62	-65	-60	2.4	10	6	65	$-V_S$	Y	Y
EL8101	1	3	5.5	200	1	200	-62	-65	-60	2.4	10	6	65	$-V_S$	Y	N
EL8102	1	3	5.5	500	1	600	-74	-87	-74	6	12	8	65	$-V_S$	Y	Y
EL8103	1	3	5.5	500	1	600	-74	-87	-74	6	12	8	65	$-V_S$	Y	N
EL8200	2	3	5.5	200	1	200	-62	-65	-60	2.4	10	6	65	$-V_S$	Y	Y
EL8201	2	3	5.5	200	1	200	-62	-65	-60	2.4	10	6	65	$-V_S$	Y	N
EL8202	2	3	5.5	500	1	600	-74	-87	-74	6.2	12	8	65	$-V_S$	Y	Y
EL8203	2	3	5.5	500	1	600	-74	-87	-74	6.2	12	8	65	$-V_S$	Y	N
EL8300	3	3	5.5	200	1	200	-62	-65	-60	2.6	10	5	65	$-V_S$	Y	Y
EL8302	3	3	5.5	500	1	600	-74	-87	-74	6.2	12	7	65	$-V_S$	Y	Y
EL8401	4	3	5.5	200	1	200	-62	-65	-60	2.4	10	6	65	$-V_S$	Y	N
EL8403	4	3	5.5	500	1	600	-74	-87	-74	6.2	12	8	65	$-V_S$	Y	N

# Current Feedback Amplifiers

For today's high speed video and communications applications, take advantage of Intersil's ultra-fast Current Feedback Amplifiers (CFAs) – EL5x6x, which offer best-in-class speed, power, and noise performance.

## EL5166

### Key Features

- ♦ **Ultra-wide 3dB bandwidth: 1.4GHz** ( $A_V = +1$ )
  - Suitable for driving high speed ADCs
- ♦ **Low power consumption: 8.5mA** ( $V_S = \pm 5V$ )
  - Provides the best bandwidth-to-power ratio in the industry
- ♦ **Ultra-fast slew rate: 6,000V/ $\mu$ s**
  - Allows near-perfect reproduction of pulses (no distortion)
- ♦ **Power saving fast enable/disable**
  - Suitable for shutting down the amplifier to preserve power (13 $\mu$ A)
- ♦ **Low input voltage noise: 1.5nV/ $\sqrt$ Hz**
  - Suitable for noise-sensitive applications

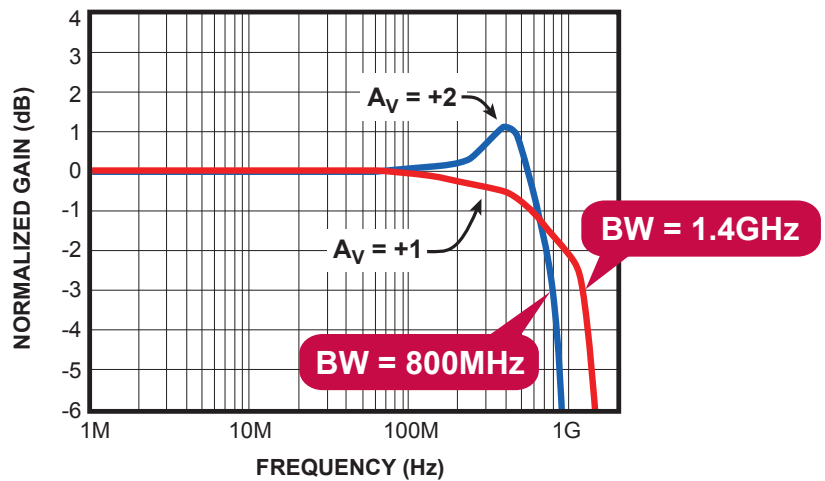
### Key Applications

- ♦ Professional video
- ♦ RF and IF gain stages
- ♦ Communication equipment
- ♦ Instrumentation
- ♦ ADC drivers
- ♦ Data acquisition systems

## Industry's Best Bandwidth-to-Power Ratio

Using only 8.5mA on  $\pm 5V$  supplies, EL5166 offers more than 6,000V/ $\mu$ s slew rate and greater than 800MHz bandwidth at a gain of +2V/V.

### Ultra-Wide 3dB Bandwidth



## Current Feedback Amplifiers

Part Number	# of Channels	$V_S$ Min (V)	$V_S$ Max (V)	SSBW @ $A_V$ Min (MHz)	$A_V$ Min (V/V)	Slew Rate (V/ $\mu$ s)	2nd Harmonic (dBc)	3rd Harmonic (dBc)	Total Harmonic Distortion (dBc)	$I_{CC}$ Max/Ch (mA)	$V_N$ (nV/ $\sqrt$ Hz)	$V_{OS}$ Max (mV)	$I_O$ Min (mA)	R-R In	R-R Out	Enable
EL5160	1	5	10	200	1	1700	-74	-50	-50	0.85	4	5	40	N	N	Y
EL5161	1	5	10	200	1	1700	-74	-50	-50	0.85	4	5	40	N	N	N
EL5162	1	5	12	500	1	4000	-74	-50	-50	2	3	5	60	N	N	Y
EL5163	1	5	12	500	1	4000	-74	-50	-50	2	3	5	60	N	N	Y
EL5164	1	5	12	600	1	4700	-81	-74	-73	4.2	2.1	5	100	N	N	Y
EL5165	1	5	12	600	1	4700	-81	-74	-73	4.2	2.1	5	100	N	N	N
EL5166	1	5	12	1400	1	6000	-70	-78	-69	9.3	1.7	5	110	N	N	Y
EL5167	1	5	12	1400	1	6000	-70	-78	-69	9.3	1.7	5	110	N	N	Y
EL5260	2	5	10	500	1	1300	-74	-50	-50	0.85	4	5	40	N	N	Y
EL5261	2	5	10	500	1	1300	-74	-50	-50	0.85	4	5	40	N	N	N
EL5262	2	5	12	500	1	2500	-74	-50	-50	2	3	5	60	N	N	Y
EL5263	2	5	12	500	1	2500	-74	-50	-50	2	3	5	60	N	N	Y
EL5360	3	5	10	500	1	1700	-81	-74	-50	0.92	4	5	40	N	N	Y
EL5362	3	5	12	500	1	2500	-81	-74	-50	2	3	5	60	N	N	Y
EL5364	3	5	12	600	1	4200	-81	-74	-73	4.2	2.1	5	100	N	N	Y
EL5462	4	5	12	500	1	4000	-81	-74	-73	1.7	3	5	60	N	N	N

# Slew Rate Enhanced Voltage Feedback Amplifiers



Suited for a wide range of high speed applications including video and communications, the EL5x0x enhanced slew rate Voltage Feedback Amplifiers (VFAs) allow designers to use an easy voltage feedback architecture without sacrificing the high speed benefits of a CFA.

## EL5104

### Key Features

- ♦ **Wide 3dB bandwidth: 700MHz** ( $A_V = +1$ )
  - Suitable for various high speed systems
- ♦ **Ultra-fast slew rate: 4,000V/ $\mu$ s**
  - Allows near-perfect reproduction of pulses (no distortion)
- ♦ **Ultra-fast 0.1% settling time: 7ns** (5V step)
  - Suitable for DC coupled applications
- ♦ **Very low distortion: -85dBc (HD3)**
  - Suitable for driving high speed ADCs
- ♦ **High output drive: 160mA**
  - Suitable for driving capacitive loads

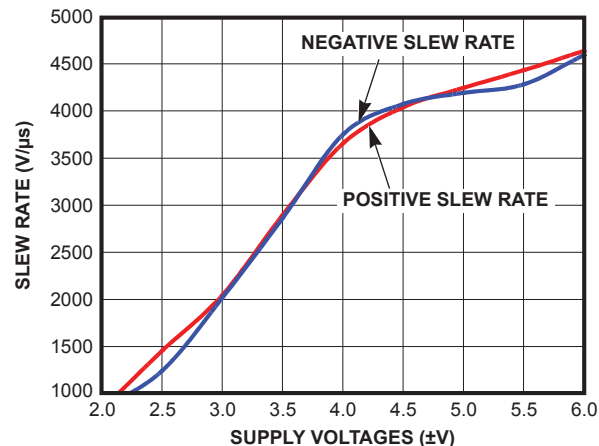
### Key Applications

- ♦ Video line drivers
- ♦ Communications equipment
- ♦ Broadcast equipment
- ♦ Data acquisition systems
- ♦ ADC drivers

## Highest Slew Rate in Unity Gain Stable VFA

Offering more than 4,000V/ $\mu$ s slew rate on 9.5mA and greater than 250MHz gain bandwidth product, EL5104 is a viable alternative to a CFA where a voltage feedback solution is preferred.

### Ultra-Fast Slew Rate

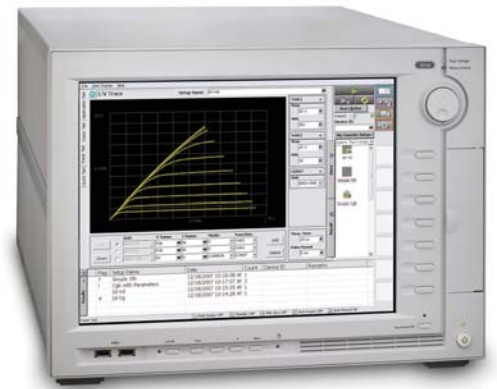


## Slew Rate Enhanced Voltage Feedback Amplifiers

Part Number	# of Channels	V <sub>S</sub> Min (V)	V <sub>S</sub> Max (V)	SSBW @ A <sub>V</sub> Min (MHz)	A <sub>V</sub> Min (V/V)	Slew Rate (V/ $\mu$ s)	2nd Harmonic (dBc)	3rd Harmonic (dBc)	Total Harmonic Distortion (dBc)	I <sub>CC</sub> Max/Ch (mA)	V <sub>N</sub> (nV/ $\sqrt$ Hz)	V <sub>OS</sub> Max (mV)	I <sub>O</sub> Min (mA)	R-R In	R-R Out	Enable
EL5100	1	3.3	12	200	1	2200	-76	-75	-72	2.9	10	4	60	N	N	Y
EL5101	1	3.3	12	200	1	2200	-76	-75	-72	2.9	10	4	60	N	N	N
EL5102	1	5	10	400	1	2200	-76	-75	-72	5.8	12	5	80	N	N	Y
EL5103	1	5	10	400	1	2220	-76	-75	-72	5.8	12	5	80	N	N	N
EL5104	1	4	13.2	700	1	3000	-80	-85	-79	11	10	10	90	N	N	Y
EL5105	1	4	13.2	700	1	3000	-80	-85	-79	11	10	10	90	N	N	N
EL5202	2	5	10	400	1	2200	-76	-75	-72	5.8	12	5	80	N	N	Y
EL5203	2	5	10	400	1	2200	-76	-75	-72	5.8	12	5	80	N	N	N
EL5204	2	4	13.2	700	1	3000	-80	-85	-79	11	10	10	90	N	N	Y
EL5205	2	4	13.2	700	1	3000	-80	-85	-79	11	10	10	90	N	N	N
EL5300	3	3.3	12	200	1	2200	-76	-75	-72	2.9	10	4	60	N	N	Y
EL5302	3	5	10	400	1	2200	-76	-75	-72	5.8	12	8	80	N	N	Y
EL5304	3	4	13.2	700	1	3000	-80	-85	-79	11	10	18	90	N	N	Y

# High Voltage Voltage Feedback Amplifiers

For those uncompromising high voltage industrial applications, exploit Intersil's high speed, ultra wide supply voltage range Voltage Feedback Amplifiers (VFAs) – ISL55001/2/4.



## ISL55001

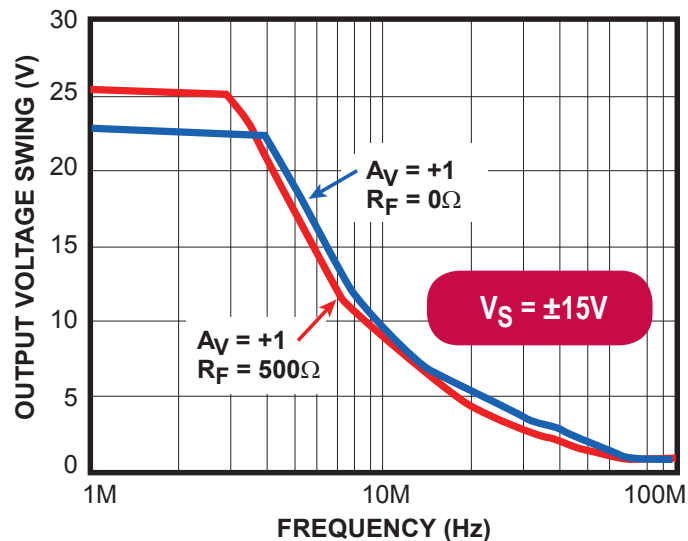
### Key Features

- ♦ **Wide 3dB bandwidth: 220MHz** ( $A_V = +1$ )
  - Suitable for various high speed systems
- ♦ **Wide supply range:  $\pm 2.5V$  to  $\pm 15V$**  (dual),  $+5V$  to  $+30V$  (single)
  - Suitable for industrial systems with wide supply and high dynamic range requirements
  - Allows for very wide output voltage swings (higher dynamic range)
  - Wide common mode range for fast signals sitting on high DC
- ♦ **Low power consumption: 9.3mA** ( $V_S = \pm 15V$ )
  - Suitable for low power dissipation
- ♦ **Fast slew rate: 300V/ $\mu$ s**
  - Suitable for many pulse amplifier applications
- ♦ **High output drive: 140mA**
  - Suitable for driving capacitive loads

## Highest Output Voltage Swing at the Lowest Power

Offering 70MHz gain bandwidth product with 280V/ $\mu$ s slew rate on only 8.3mA supply current, ISL55001 can handle moderately fast signals on a high input common mode range.

### Very High Voltage Swing



### Applications

- ♦ High voltage industrial
- ♦ High dynamic range data acquisition
- ♦ Pulse amplification

## High Voltage Voltage Feedback Amplifiers

Part Number	# of Channels	$V_S$ Min (V)	$V_S$ Max (V)	SSBW @ $A_V$ Min (MHz)	$A_V$ Min (V/V)	Slew Rate (V/ $\mu$ s)	2nd Harmonic (dBc)	3rd Harmonic (dBc)	Total Harmonic Distortion (dBc)	$I_{CC}$ Max/Ch (mA)	$V_N$ (nV/ $\sqrt$ Hz)	$V_{OS}$ Max (mV)	$I_O$ Min (mA)	R-R In	R-R Out	Enable
EL2125	1	5	30	220	10	225	-73	-96	-73	12	0.95	3	60	$-V_S$	N	N
EL2126	1	5	30	135	10	150	-72	-73	-69	6	1.4	3	70	$-V_S$	N	N
ISL55001	1	4.5	30	220	1	280	-72	-80	-71	9.25	12	3	60	N	N	N
ISL55002	2	4.5	30	200	1	300	-72	-80	-71	9.25	12	5	40	N	N	N
ISL55004	4	4.5	30	200	1	300	-72	-80	-71	9.25	12	5	40	N	N	N

# Differential Line Drivers/Receivers

For driving and receiving video and other high speed data over twisted-pair lines or any other noisy cabling environment, utilize Intersil's family of differential amplifiers, EL5x7x, which offers best-in-class bandwidth, noise rejection, and power consumption.

## EL5375/8

### Key Features

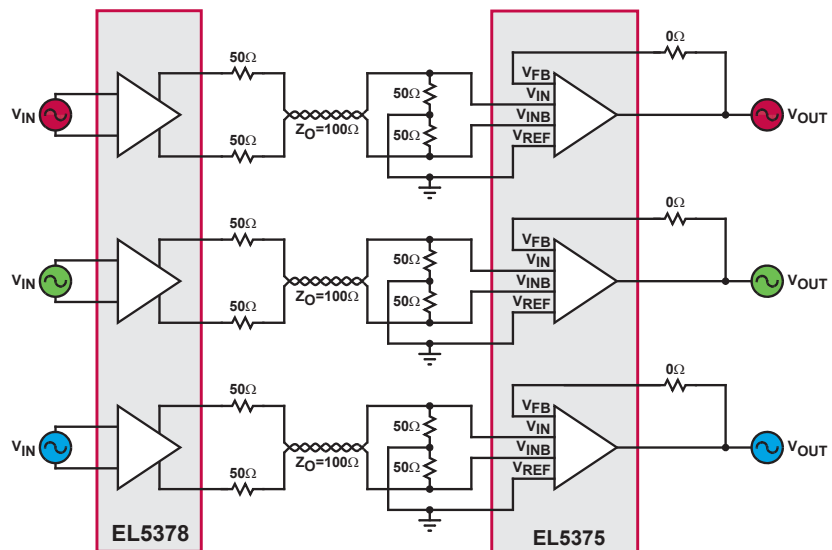
- ♦ **Wide 3dB bandwidth:** EL5378: 700MHz ( $A_V = +2$ ), EL5375: 550MHz ( $A_V = +1$ )
  - Suitable for driving and receiving high speed data
- ♦ **Very low power consumption:** EL5378: 12.5mA, EL5375: 11mA per channel ( $V_S = +5V$ )
  - Suitable for low power dissipation
- ♦ **Very low distortion:**  $< -75\text{dBc}$  (HD3)
  - Suitable for driving/receiving data over noisy cabling environment
- ♦ **Triple-channel Line Driver/Receiver**
  - Reduces design time and saves considerable PCB real-estate

### Applications

- ♦ Twisted-pair lines drivers/receivers
- ♦ KVM Networking
- ♦ Differential-to-single ended amplification
- ♦ VGA over twisted-pair

## Triple Line Driver/Receiver Pair offers Best-in-Class Noise Immunity

On  $\pm 5V$  supplies and less than 12.5mA supply current per channel, EL5375/8 offer a low power solution for triple channel line driver/receiver pairs and still achieve better than  $-75\text{dBc}$  third order distortion.



## Differential Line Drivers

Part Number	# of Channels	$V_S$ Min (V)	$V_S$ Max (V)	SSBW @ $A_V$ Min (MHz)	$A_V$ Min (V/V)	Slew Rate (V/ $\mu$ s)	2nd Harmonic (dBc)	3rd Harmonic (dBc)	Total Harmonic Distortion (dBc)	$I_{CC}$ Max/Ch (mA)	$V_N$ (nV/ $\sqrt{\text{Hz}}$ )	$V_{OS}$ Max (mV)	$I_O$ Min (mA)	R-R In	R-R Out	Enable
EL5170	1	4.75	11	100	2	1100	-65	-43	-43	8.4	28	25	50	$-V_S$	N	Y
EL5171	1	4.75	11	250	1	800	-94	-77	-77	8.2	26	25	70	$-V_S$	N	N
EL5173	1	4.75	11	450	2	900	-84	-62	-62	14	25	30	45	$-V_S$	N	Y
EL5174	1	4.75	11	550	1	1100	-95	-88	-87	14	21	25	50	N	N	N
EL5177	1	4.75	11	550	1	1100	-95	-88	-87	14	21	25	50	N	N	Y
EL5178	1	4.75	11	700	2	850	-83	-88	-82	14	18	30	50	N	N	N
EL5370	3	4.75	11	100	2	1100	-65	-43	-43	8.4	28	25	70	$-V_S$	N	Y
EL5371	3	4.75	11	250	1	800	-94	-77	-77	8.2	26	25	50	$-V_S$	N	Y
EL5373	3	4.75	11	450	2	1100	-84	-62	-62	14	25	30	40	$-V_S$	N	Y
EL5374	3	4.75	11	550	1	850	-95	-88	-87	14	21	25	50	N	N	Y
EL5378	3	4.75	11	700	2	1000	-83	-88	-82	14	18	30	50	N	N	Y

## Differential Line Receivers

Part Number	# of Channels	$V_S$ Min (V)	$V_S$ Max (V)	SSBW @ $A_V$ Min (MHz)	$A_V$ Min (V/V)	Slew Rate (V/ $\mu$ s)	2nd Harmonic (dBc)	3rd Harmonic (dBc)	Total Harmonic Distortion (dBc)	$I_{CC}$ Max/Ch (mA)	$V_N$ (nV/ $\sqrt{\text{Hz}}$ )	$V_{OS}$ Max (mV)	$I_O$ Min (mA)	R-R In	R-R Out	Enable
EL5172	1	4.75	11	250	1	800	-59	-60	-56	7	26	25	60	$-V_S$	No	Y
EL5175	1	4.75	11	550	1	900	-65	-78	-65	11	21	40	40	No	No	Y
EL5372	3	4.75	11	250	1	700	-59	-60	-56	7	26	25	60	$-V_S$	No	Y
EL5375	3	4.75	11	550	1	900	-65	-78	-65	11	21	30	40	No	No	Y

# Fixed Gain Op Amps

For reliable gain accuracy in driving video loads, exploit the world's fastest and lowest power family of fixed gain op amps, EL5x06/8, which embeds highly accurate gain-setting resistors that simplify the system design process considerably.



## EL5308

### Key Features

- ♦ **Wide 3dB bandwidth: 450MHz** ( $A_V = +2$ )
  - Suitable for various high speed systems
- ♦ **Very low power consumption: 3.5mA per channel** ( $V_S = \pm 5V$ )
  - Shutdown feature to 9 $\mu$ A/channel
- ♦ **Fast slew rate: 4,500V/ $\mu$ s**
  - Allows near-perfect reproduction of pulses (no distortion)
- ♦ **Fixed gain:  $A_V = -1, +1, +2$** 
  - Reduces design time and saves considerable PCB real-estate
- ♦ **High gain accuracy: 0.7%** ( $G = +2V/V$ )
  - No external elements or trims required

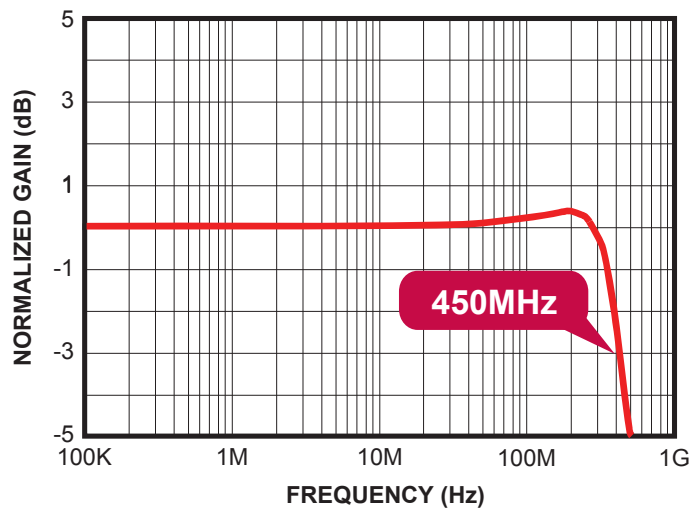
### Applications

- ♦ RGB video line drivers
- ♦ Professional video routing
- ♦ LCD projectors

## Triple Channel Video Line Driver Offers Best Bandwidth-to-Power Ratio

On  $\pm 5V$  supplies, EL5308's 10.5mA total supply current is only 115mW for three channels of 450MHz line driving.

### Wide 3dB Bandwidth at $A_V = +2$



## Fixed Gain Amplifiers

Part Number	# of Channels	$V_S$ Min (V)	$V_S$ Max (V)	SSBW @ $A_V$ Min (MHz)	$A_V$ Min (V/V)	Slew Rate (V/ $\mu$ s)	2nd Harmonic (dBc)	3rd Harmonic (dBc)	Total Harmonic Distortion (dBc)	$I_{CC}$ Max/Ch (mA)	$V_N$ (nV/ $\sqrt{Hz}$ )	$V_{OS}$ Max (mV)	$I_O$ Min (mA)	R-R In	R-R Out	Enable
EL5106	1	5	12	350	1	4500	-70	-54	-54	1.82	2.8	10	60	N	N	Y
EL5108	1	5	12	450	1	4500	-70	-68	-66	4.35	2	8	100	N	N	Y
EL5306	3	5	12	350	1	4500	-70	-54	-54	1.82	2.8	10	60	N	N	Y
EL5308	3	5	12	450	1	4500	-70	-68	-66	4.35	2	8	100	N	N	Y



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