# ALP

# High Current Drivers

## New Product Training

## October, 2001

http://www.analog.com/industry/communications/modems/line_drivers.html

# Target Markets
# High Current Drivers

**xDSL -CPE Modem**
**- CO DSLAM**

**Cable Modem**
**Cable Set-top Box**
**Cable Telephony**

**CD R/W**
**DVD – R/W**

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# ADI's xDSL Component Strategy

## Line Driver Components for xDSL Modems

- **For CPE**
  - **Reduce Cost**
  - **Reduce # of Power Supplies by increasing Output Current**
  - **Maximize Peak Power Drive (Voltage and Current)**
  - **Improve Efficiency**
  - **No Sacrifice of Distortion Performance- Reach**
- For Central Office
  - Increase Efficiency (Reduce Power Dissipation = Density*)
  - No Sacrifice of Distortion Performance- Reach
  - Maintain Peak Power Drive

*Reduce Power Dissipation = Smaller Package = Increased Density = Lower System Cost

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# AD8391 Low Cost, +3V to +12V xDSL Line Driver

- What is it?
  - The AD8391 is a low cost xDSL line driver designed for xDSL CPE modems. The AD8391 has a flexible power supply that supports +3V to +12V designs supporting VoDSL applications. The AD8391 can be used as general low cost CPE line driver or as a special purpose part.

- Features
  - The AD8391 drives minimum 250mA of current while maintaining -95dBc of SFDR at 100kHz on +12V.
  - When using the AD8391 in +3V mode it can drive a minimum of 100mA of current while maintaining -94dBc of SFDR at 100kHz .
  - The AD8391 is available in an 8-pin SOIC and still supports a power down mode.

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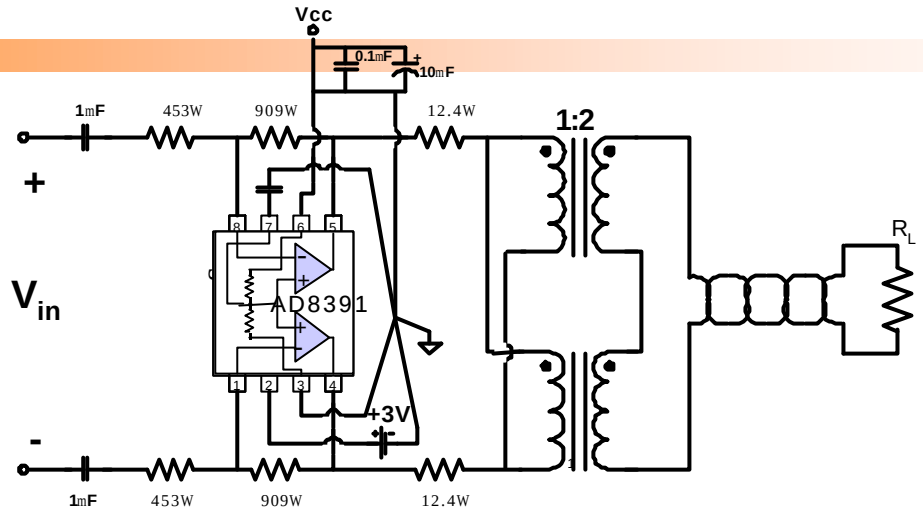
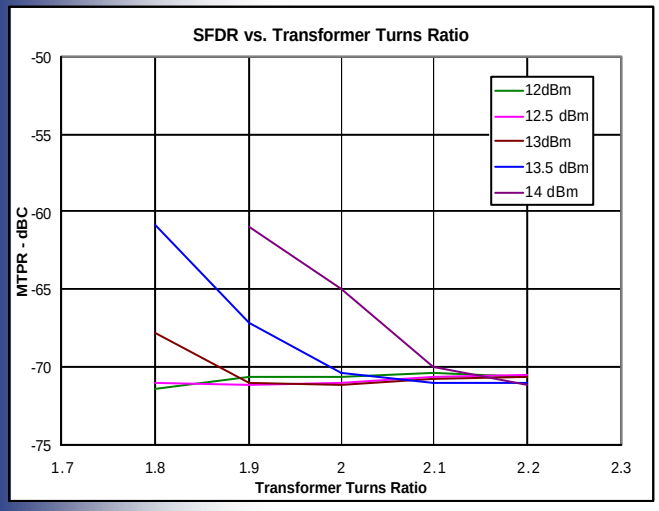
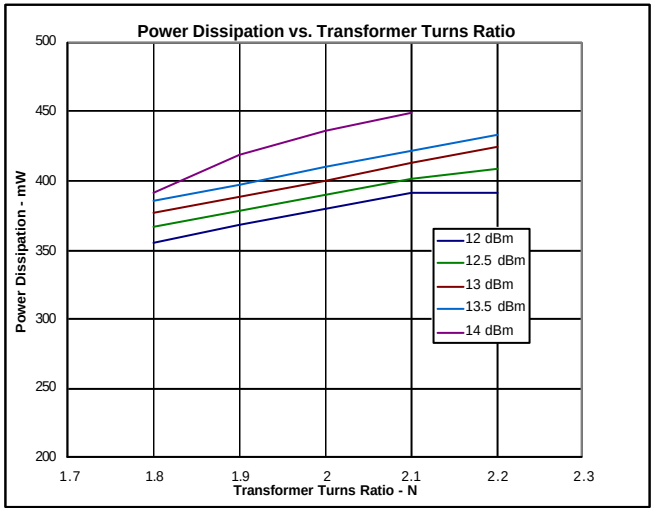
# AD8391 - Twisted Pair Driver




**Increasing the turns ratio of the transformer will allow more power to be delivered to the line while maintaining the the same level of distortion**

**But it also means that more power will be dissipated by the driver!!**

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# AD8391 Twisted Pair Driver

- Packaging:
  - AD8391 8 lead SOIC
- Milestones:
  - AD8391 Samples — Now
  - AD8391 M/P — October 2001

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# AD8393 xDSL CO Line Driver Supply on Peak Amplifier

- What is it?
  - Driver amplifier for xDSL-CO applications. It provides 23.3dBm output power. Very low power dissipation based on proprietary “Supply on Peak” active circuitry enabling the lowest possible port density.

- Features
  - Low power operation
    - 526mW total power dissipation (typical 1:1.1 turns ratio), not including line power, +/- 6V Voltage Supply
  - Shutdown to 1mA
  - Current Feedback Amplifiers
  - High Output Voltage and Current Drive
    - 23.3dBm Differential Drive for a DMT Signal
    - 425mA Peak Output Drive Current, R L = 25 Ω
  - Low Distortion
    - -70dBc @ 1MHz MTPR, $R_L$ = 25 Ω

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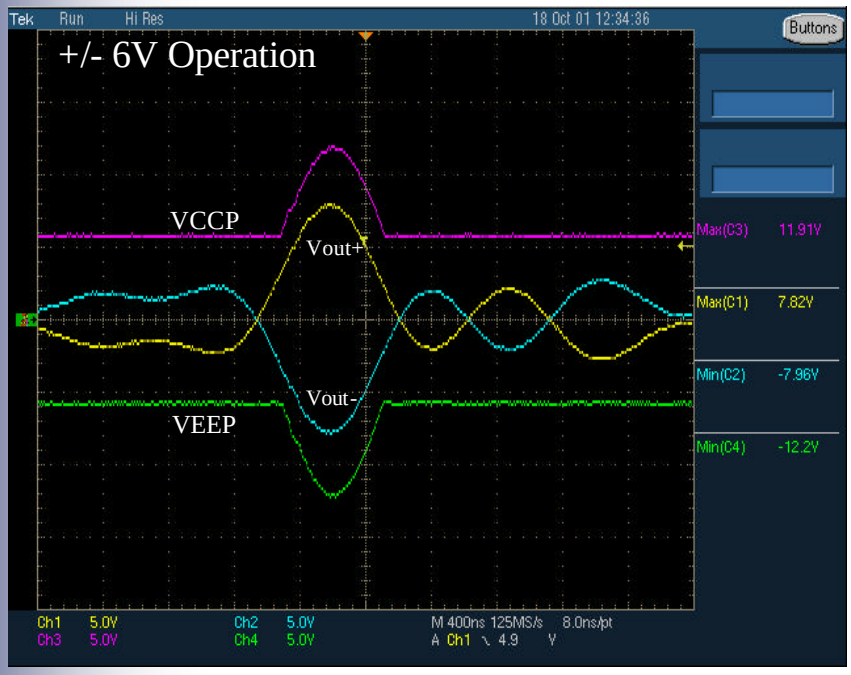
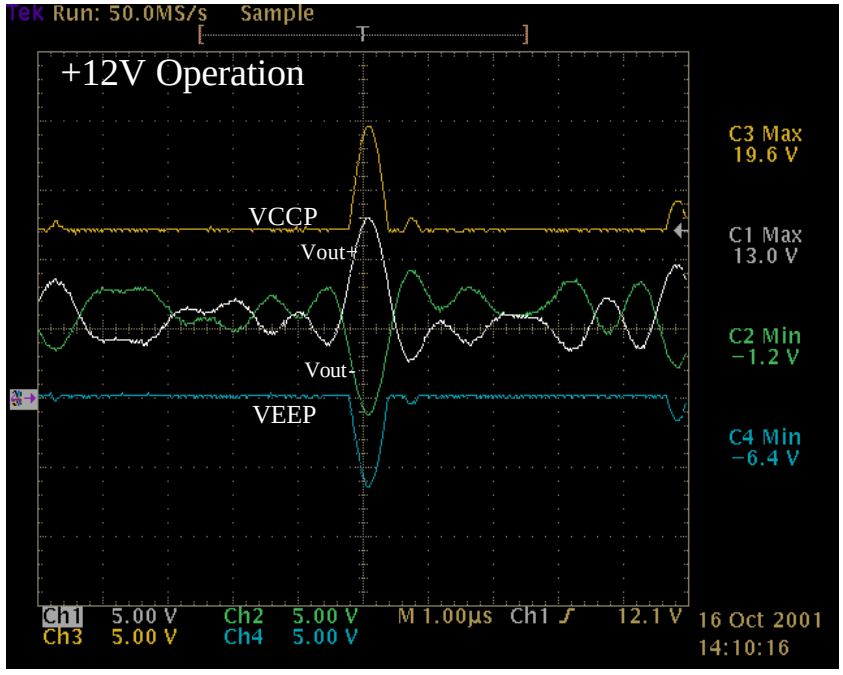
# AD8393 Supply On Peak

- Full Rate ADSL CO Operation on Supplies of +/- 6V or Single +12V
- Proprietary Adaptive Circuitry Temporarily Pumps Up Supply Rails to Handle DMT Peaks
- Innovative architecture allows lowest power dissipation for any CO driver available




- VCCP and VEEP are the positive and negative rails to the amplifier, these sit about 300mV inside the supply rails at approximately +/- 5.7V respectively
- Note the differential output voltage of approx 16Vp-p on +/- 6V supplies

- Operating from a single +12V supply, VCCP is at +11.7V and VEEP is at +0.3V
- During single supply operation even the rail at ground is pumped to accommodate the negative going peak
- The differential outputs can again be seen extending beyond both rails

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# AD8393 xDSL CO Line Driver

- Packaging:
  - 5mm x 5mm CSP
  - 28 lead TSSOP
- Milestones:
  - Samples Now
  - M/P March ’02
- Preview of Follow-on Version:
  - Target <500mW power dissipation.
  - Samples available in March ‘02

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# Cable Drivers

# AD8327/28/29

## Low Cost DOCSIS Drivers

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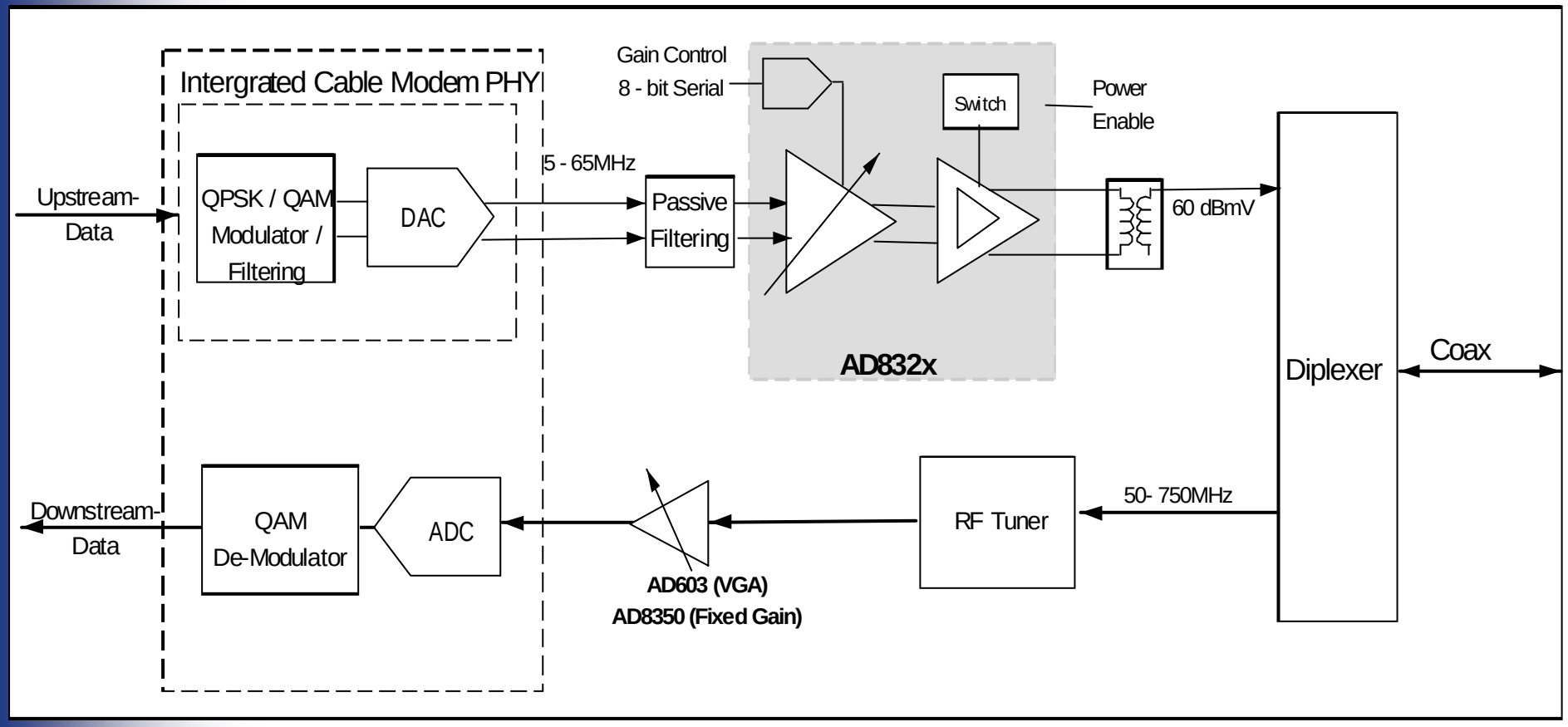
# AD8327/28/29
# +5V CATV Line Drivers

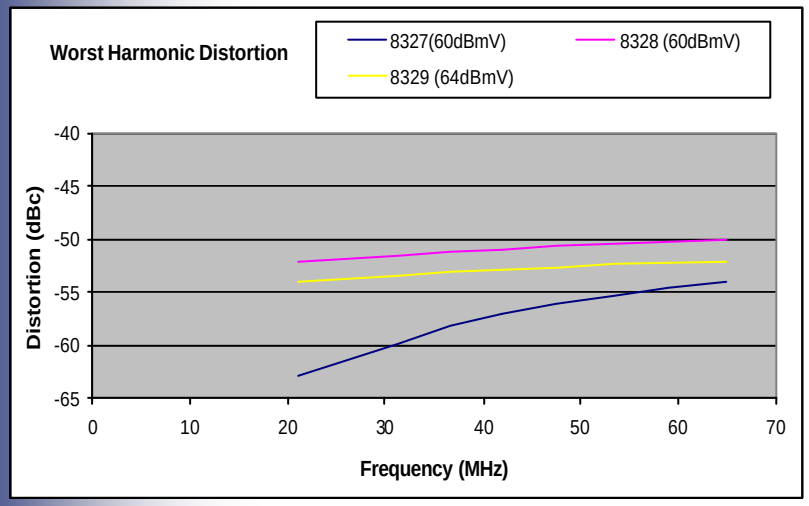


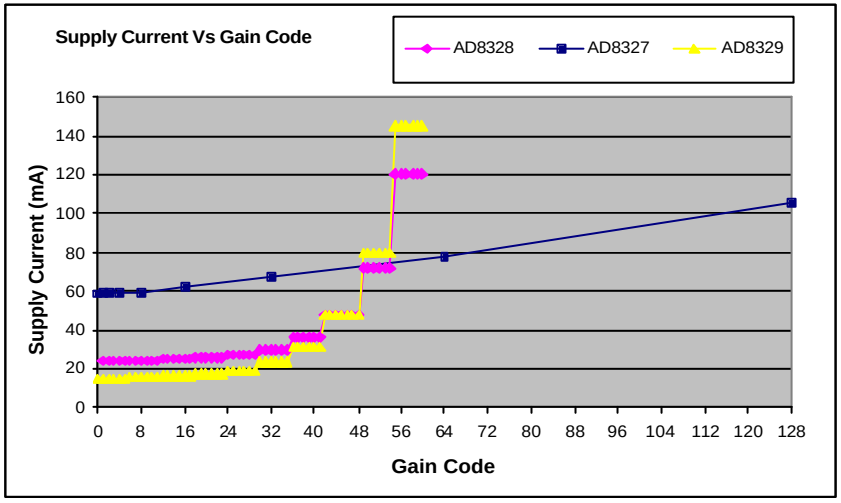
# AD8327/28/29
# +5V CATV Line Drivers

- Key Applications Information
  - Gain Range
    - DOCSIS needs a signal level from 8dBmV-58dBmV so a wide gain range is important because of losses in the signal chain. Minimum gain from DOCSIS specification is 50dB.
    - The AD8328, AD8329 and AD8327 (when combined with fine step attenuator) exceed gain range of DOCSIS specification.
  - Low Distortion
    - Low Distortion allows maximum bit rate through the cable system. Minimum DOCSIS distortion specification is –47dBc.
    - Distortion performance for the AD8328, AD8329 and AD8327 exceed DOCSIS specifications.
  - Low Glitch
    - Low transient (on/off) glitch is important to keep noise in the cable system low. DOCSIS specifies a minimum glitch of 7mVp-p for minimum gain.
    - The AD8328, AD8329 and AD8327 fully meet DOCSIS glitch specification.
  - Cost
    - Low solution cost is important since cable modems are a consumer product.
    - AD8327 eliminates output transformer which lowers solution cost, while the AD8328 and AD8329 have been designed in low cost processes combined with a low cost package.

# Application Information – Cable Line Drivers

| | AD8327 (+5V) | AD8328* (+5V) | AD8329* (+5V) |
|---|---|---|---|
| **Output Level** | +60 dBmV | +60 dBmV | +64 dBmV |
| **Step Size** | 6 dB | 1 dB | 1 dB |
| **Gain Range** | 48 dB | 59 dB | 59 dB |
| **Transmit Disable / Sleep Mode Current** | 13mA / 4mA | 2.6mA / 10µA | 3mA / 10µA |
| **Special Features** | Single Output<br>Ramp Pin to Control Transients | Low Cost LFCSP Available<br>Ramp Pin to Control Transients | Low Cost LFCSP Available<br>Ramp Pin to Control Transients |




- Distortion for all three parts exceeds DOCSIS and EuroDOCSIS specifications by at least 3dB.

- Lower gain codes draw less current This means that the devices only draw the current they need for optimum performance and energy conservation.

*All data for AD8328 and AD8329 is preliminary

# AD8327/28/29
# +5V CATV Line Drivers

- What are they?
  - The **AD8328/29** are differential output CATV line drivers for use in Cable Modems and Set Top Box
- Features
  - For use with all DOCSIS* and EuroDOCSIS Cable Chipsets
  - Wide gain range of 59dB
  - 1 dB step size
  - Low output distortion of 50dBc at 65MHz and 11dBm (AD8328)
  - Low output distortion of 52dBc at 65MHz and 15dBm (AD8329)
  - Small LFCSP package
  - Low Cost

*DOCSIS – Data Over Cable System Interface Standard

- What are they?
  - The **AD8327** is a single-ended output CATV line driver for use in CPE Cable Modems
- Features
  - Single-ended output which eliminates the output transformer in a Cable Modem design.
  - For use with Cable Chipsets with integrated attenuator(Broadcom) for DOCSIS & EuroDOCSIS applications.
  - Wide gain range of 48dB
  - 6dB step size
  - Low output distortion of 54dBc at 65MHz and 11dBm
  - Low solution cost (no transformer needed)

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# AD8327/28/29 Cable Drivers

- Packaging:
  - AD8327 20 lead TSSOP
  - AD8328 20 lead CSP & 20 lead QSOP
  - AD8329 20 lead CSP & 20 lead TSSOP (E-Pad)

- Milestones:

| | |
|---|---|
| – AD8327 Samples | Now |
| – AD8328 Samples | November 2001 |
| – AD8329 Samples | April 2002 |
| – AD8327 M/P | Now |
| – AD8328 M/P | June 2002 |
| – AD8329 M/P | August 2002 |

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# Laser Diode Drivers

http://www.analog.com/industry/communications/modems/line_drivers.html

# Laser Diode Driver Product Preview

**The Laser Diode Driver is a +5V, high current driver optimized for driving a laser diode in CD/RW and DVD-REC drives.**

## FEATURES

- **Current Controlled output current source with 3 input channels**
- **Output current for Channel 2 - 250mA**
- **Output current for Other Channels - 125mA**
- **Total output current to 375mA**
- **Rise time / Fall time of 1 ns**
- **On-chip 100MHz to 400MHz Oscillator**
- **Single 5V power supply (+/-10%)**
- **Low Output Overshoot**
- **Low Power Consumption**
- **Small 4mm x 4mm LFCSP**

## APPLICATIONS

- **CD-RW drives**
- **DVD-RW, DVD+RW, DVD-RAM drives**
- **MO Drives**
- **Laser Diode Current Switching**

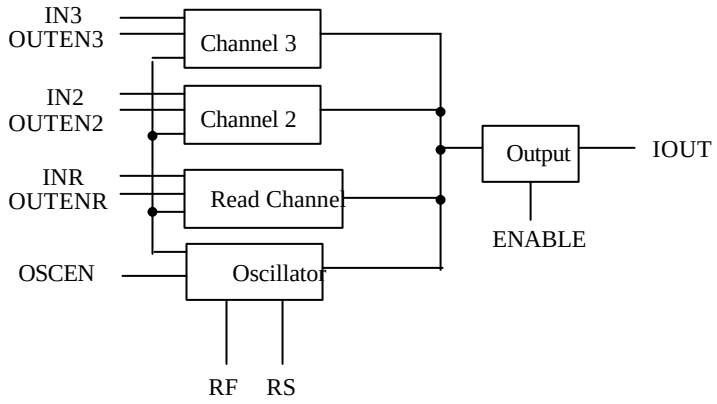


Figure 1. Block diagram of 3-Channel Laser Driver

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# Laser Diode Driver Availability and Pricing

- Packaging:
  - 4mm x 4mm CSP
  - 16 lead QSOP
- Milestones:
  - Samples March 2002
  - M/P July 2002
- More Information:
  - Contact: Marco Baratta
    marco.baratta@analog.com
    781-937-1868

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