



Power Systems Design: Empowering Global Innovation

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Linear's 30 years of Analog Engineering Superiority

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Bob Dobkin Interview



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Linear's HQ in Milpitas, California

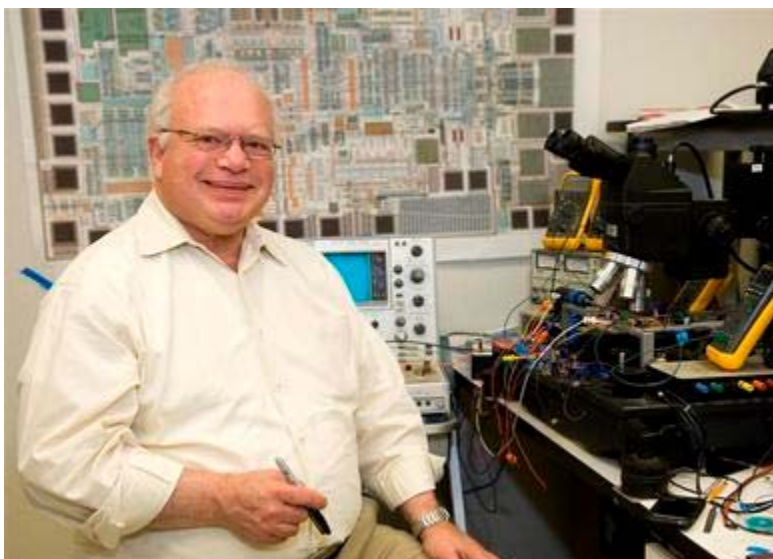
I had the great pleasure to talk with Bob Dobkin, Vice President, Engineering, Chief Technical Officer and Co-Founder of Linear Technology. Founded 30 years ago, the company commemorated three decades of innovation in analog integrated circuits.

At the time of its formation, it was the dawn of the digital revolution. Many questioned the wisdom of founding a company focused purely on analog technology. Over these 30 years, the worldwide analog market has grown from \$2 billion to over \$40 billion today, and Linear has prospered with that growth.

Linear has been at the leading edge of new electronic markets as they have emerged. These include the PC revolution, laptop and tablet computers, industrial control and robotics, network infrastructure, cellular communications, automotive electronics including advanced displays, electronic braking and steering and now the growth of the hybrid/electric automotive segment. Add to these; Power over Ethernet communications systems, advanced satellite communications and sophisticated industrial instrumentation, to name just a few.

Linear's strategy of delivering a diverse and large portfolio of high performance analog building blocks for a broad range of applications to a worldwide customer base has been a proven strategy for 30 years.

Personally, as a visiting editor, I've always found the culture at Linear so different from other companies. There is a genuine engineering focus and a drive to make circuits that serve the company's customers with an emphasis on quality and performance.



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Bob Dobkin, Vice President, Engineering, Chief Technical Officer and Co-Founder of Linear Technology

I asked Bob a few questions for our design engineering communities:

What gave you the inspiration to form an analog company 30 years ago when everyone else was thinking Digital?

Bob was adamant in those days about his commitment to analog technology. He saw the need and was able to predict, as a creative engineer, that this technology needed focus, investment with a commitment from like-minded creative analog engineers and management. At this time the digital boom had clouded many

companies' judgement, which diversified and diluted their focus, and he saw the need for continued, consistent analog commitment and decided he could do it better as a co-founder of the (then) new company; Linear Technology. 'Management in many companies would approve product developments that were not really ready and fit for purpose. Products have to be designed with the customer and demand in mind. We make chips that do what the customer wants in the most efficient way. If there are functions that do not work effectively on the chip, we leave them off.'

How did Linear achieve the huge success that all other companies envy?

In this question, Bob found the answer easily. 'Analog designers are technical and creative, and good engineers in analog are hard to find, so Linear grows them internally. The company has a mentor system where new and aspiring analog designers work with experienced Linear engineers to pick up skills. In addition Linear is widely known to have a great engineering team, and good engineers attract other good engineers, so we end up with a really great engineering group, plus it's an environment where they can fulfill what they want to do, which is to make circuits, and we try to make it easy and a clean work environment for that.'

It can take an engineer from college many years to become a truly creative and productive member of our team. So we put them together with our most experienced and mature engineers in our team as a sort of coach or mentor. This has proven to be a highly successful method of transferring skills and bringing on a newly qualified engineer to become a productive and valuable contributor. It's just like learning a new language; it takes time to take it all in and to become fluent. With a good mentor, this process is accelerated.'

How do you attract, inspire and retain creative engineers to develop highly differentiated analog products?

'Analog engineering is a kind of art form. It takes a long time to learn the craft and our mentoring system has proven to be a fast-track to success. 'The fact that we are a truly analog company with a huge commitment to the industry has attracted the most committed in the engineering community. Word has got out, and engineers are quick to pick up on this. When they are here, they are brought up

to speed in a timescale that could take another company a decade to achieve. Our engineers are treated as entrepreneurs. They play a vital role in product definition. They are passionate about their products and take ownership for the whole process in engineering. At Linear, engineers are an extremely valuable resource for the company which is one of the reasons for Linear's success.'

What's the future for Linear, given the current analog competitive environment?

I asked whether the 30 year strategy that had made Linear a truly driving force in the industry, could stay the same. Bob explained that the company had been successful, and would continue to be successful because the engineer works with the customer, not only to fulfill the customers' needs today, but also to predict the needs for the future, adding value and making the product easy to design in. This works both ways in that Linear can adjust its processes to move with the future needs of the customer.

'This company is completely different to many other organisations where a member of the marketing department would do this; based just on what the customer tells him or her. The engineer has a much better technical insight into what the customer really needs for future trends, and is therefore a major part of the product definition process at Linear. This has the effect of us staying ahead of the pack. We develop products that the customer needs in a timely way and that will have a long, useful and productive life. Our products do what we say they will do. Customers who try to cut corners with cheaper or inferior solutions can suffer the penalty of being late to market due to reworking designs. There is no value in this and significant losses can be made.

Thirty years ago line widths were large and fabs were not as clean as they are today. We have fabs that can deliver extremely small line width, new, more complex processes and new tools to ensure we can support our customers' needs today and well into the future.

We are most comfortable making general purpose products that suit many customers. Some of our products will be in demand for 10 – 20 years. We therefore very rarely obsolete a product.'

Do you have more Bob's in training?

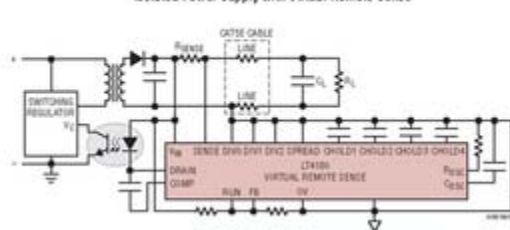
Bob's reply was encouraging. He said that there were several new engineers in his team that are fast becoming the creative and versatile engineers that the company thrives upon. 'It is the lifeblood of the company. Engineers are not just a commodity at Linear Technology.' He stressed that there are many in his group that are even better than he was himself at their age. 'We have some really outstanding people. After my long time in analog design, I can design almost by intuition. This takes a lot of work and practice, just like learning a new language.'

This is praise indeed from a man at the top of the creative analog engineering ladder.

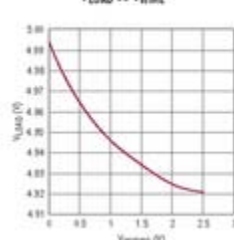
Product Development

TYPICAL APPLICATION

Isolated Power Supply with Virtual Remote Sense



V_{LOAD} VS V_{VMRS}



LT4180 Virtual Remote Sense Controller

This is a field that has always intrigued me personally. When a brilliant engineering idea or concept comes and then enters the production phase, what

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[LT4180 Virtual Remote Sense Controller](#)

happens next? What are the
future plans for the product?

A case in point for me was when Bob presented his concept for a Virtual Remote Sense Controller which became the LT4180 and solves the problem of providing tight load regulation over long, highly resistive cables without requiring an additional pair of remote sense wires.

The concept blew me away when I visited Linear and I was anxious to know where it was going.

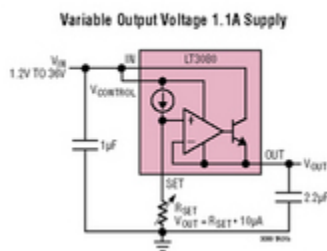
This Virtual Remote Sense™ device continuously interrogates the line impedance and corrects the power supply output voltage via its feedback loop to maintain a steady voltage at the load regardless of current changes.

The LT4180 is a full-featured controller with 5mA optoisolator sink capability, under/overvoltage lockout, vsoft-start and a $\pm 1\%$ internal voltage reference. The Virtual Remote Sense feature set includes user-programmable dither frequency and optional spread spectrum dither.

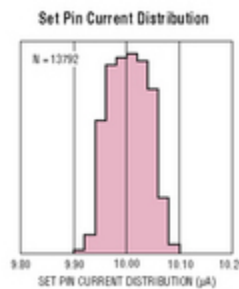
The LT4180 works with any topology and type of isolated or nonisolated power supply, including DC/DC converters and adjustable linear regulators.

I tried to find out what would be the future development of this product which is now becoming well accepted by customers. I asked about further integration of this brilliant concept. Bob would not be drawn on this, but I could feel there was more. Bob wryly and confidently assured me that there was 'more to come soon.'

TYPICAL APPLICATION



[Click on image to enlarge](#)
[LT3080 Adjustable 1.1A Single Resistor Low Dropout Regulator](#)



LT3080 Adjustable 1.1A Single Resistor Low Dropout Regulator

Another product I was interested in following up on was the LT3080. The LT3080 is a 1.1A, single resistor low dropout linear regulator that can be paralleled to increase output current or spread heat in surface mounted boards.

Architected as a precision current source and voltage follower, allows this new regulator to be used in many applications requiring high current, adjustability to zero, and no heat sink. Also the device brings out the collector of the pass transistor to allow low dropout operation — down to 350mV — when used with multiple supplies.

A key feature of the LT3080 is the capability to supply a wide output voltage range. By using a reference current through a single resistor, the output voltage is programmed to any level between zero and 36V. The LT3080 is stable with 2.2μF of capacitance on the output, and the IC uses small ceramic capacitors that do not require additional ESR as is common with other regulators. Internal protection circuitry includes current limiting and thermal limiting. The LT3080 regulator is offered in the 8-lead MSOP (with an exposed pad for better thermal characteristics), a 3mm × 3mm DFN, 5-lead DD-Pak, TO-220 and a simple-to-use 3-lead SOT-223 version.

I asked Bob where this product was going – and whether a switching version would be coming. Bob said, ‘This product has been highly successful and has taken off faster than any product we’ve released. As a 3-terminal device it’s easy to design with. Our customers have really embraced this part. We shall be launching a switching version in a couple of months. These devices will be available in 200mA to 3A versions. One great advantage of the 200mA version is that we have designed it such that absolutely no input and output capacitors will be required.’

From this interview, I strongly detect that there are many more surprises and innovations ‘in the pipe’ at Linear, and judging by the company’s performance over the past 30 years and this thoroughly engaging interview with Bob, I am absolutely certain that we will be seeing many more creative analog engineers delivering innovations such as these in the months and years to come.

www.linear.com



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