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## Quartzdyne Newsletter

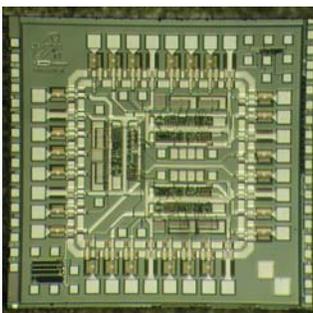
Autumn 2008

- **ASICs Improve Transducer Reliability**
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### ASICs Improve Transducer Reliability

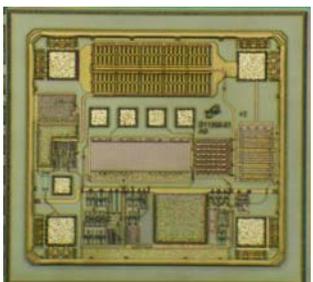
We are rapidly incorporating ASICs (application-specific integrated circuits) into our hybrids. ASIC technology allows us to reduce component count while adding new features that improve reliability and functionality. The oscillator ASIC is already in production. A new Voltage Regulator ASIC goes into production later this year, and a new Frequency Counter ASIC in early 2009. Since that totals three ASICs in our hybrid within six months, the table below indicates the phase-in of the ASICs, followed by an explanation of each ASIC's function and benefits:

Circuit Type	Volts DC	Features	Availability
Frequency	4.5 – 12.6	No ASICs; '0' in 4 <sup>th</sup> position of P/N	Obsolete; place final orders before January 1, 2009
Frequency	3.6 – 5.5	Oscillator ASIC; '1' in 4 <sup>th</sup> position of P/N	Current version
Frequency	2.7 – 5.5	Oscillator & Vreg ASICs; no P/N change	January 2009
Digital	2.7 – 5.5	Oscillator ASIC	Current version
Digital	2.7 – 5.5	Oscillator & Vreg ASICs; no P/N change	January 2009
Digital	2.7 – 5.5	Oscillator, Vreg, & FC ASICs; no P/N change	Q1 2009



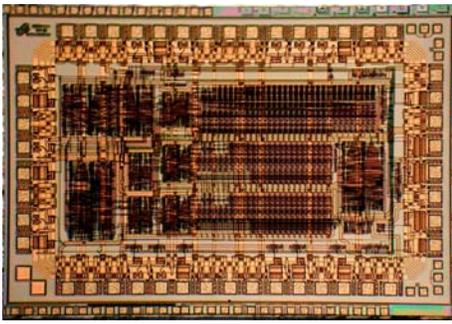
**Oscillator ASIC.** This ASIC drives the pressure, temperature, and reference crystals. It cuts startup time in half, increases crystal reliability, and eliminates almost half of the components inside the hybrid. It is used in all digital-output hybrid transducers, and in all frequency-output transducers where '1' occupies the first numeric digit of the transducer part number, i.e., QHB108, QMB102, SPB112.

NOTE: The oscillator ASIC allows the frequency-output hybrid transducers to run at lower voltage: [3.6 to 5.5 VDC](#). The old, non-ASIC hybrid ([4.5 to 12.6 VDC](#)) is being phased out: after January 1, 2009, we will not accept orders for this old design. We kindly ask for your cooperation by switching to the lower voltage ASIC hybrid.



**Voltage Regulator ASIC.** This ASIC provides a stable voltage to the circuit core, reduces the current draw by 0.2 to 0.5 mA, and further reduces the component count inside the hybrid. It lowers the minimum supply voltage of frequency-output hybrid transducers to 2.7 VDC, making digital- and frequency-output transducers equivalent in supply requirements: 2.7 to 5.5 VDC. It has also been designed to operate above 200°C--the present temperature limit of digital-output transducers.

Qualification of the Vreg ASIC is complete, and the Vreg ASIC will be incorporated into all hybrids by January 2009.



**Frequency Counter ASIC.** This ASIC performs the simultaneous, period-based counting of the pressure and temperature frequencies, and it replaces the Actel 42MX16 FPGA we currently use. It also provides two new options for customers: a 5th byte checksum on the 32-bit pressure and temperature counts (with repeat) and a clock output (1 kHz or 7.2 MHz.) It also operates above 200°C.

This month we manufactured a hybrid module that included all three ASICs. The "Tri-ASIC" hybrid operated from 25 through 275°C, and drew less than half the current of a typical digital-output hybrid at 200°C: 5.5 mA versus 12+ mA. (Please see the [Tri-ASIC current draw](#) over the temperature range.) Moreover, the Tri-ASIC hybrid has fewer than half the components and wirebonds of a non-ASIC hybrid. These are indeed exciting results, and we couldn't be more pleased with the progress we're making with ASIC technology.

Prior to releasing an ASIC into production, we qualify it at three design stages (ASIC, hybrid, transducer.) We manufacture 6-12 hybrids during the latter two qualification stages. Half of the hybrids are qualified in [life-cycle tests](#); the other half are built into transducers for metrology and high-temperature powered testing. In total, we verify that an ASIC exceeds the following standards:

- functional testing from -40 through 250°C (hybrids)
- >1000 hours hybrid survival at 250°C in [life-cycle test](#) (hybrids)
- >1000 hours operation in continuously powered tests at 225°C (transducers)
- quantify metrology effects by calibrating transducers over multiple temperature ranges (transducers)

We invite customers to review the [ASIC qualification process](#) on our website.

### Quartzdyne's New 50,000 ft<sup>2</sup> [4650 m<sup>2</sup>] Facility



Walls are up on our new facility; the exterior shell will be completed and sealed for the winter by November 1st. Interior construction will continue through the winter in preparation for our move-in by May 2009. It is located five miles northwest of our present location (closer to the airport.) The new building has been designed with growth and flexibility in mind, and it will facilitate some LEAN

manufacturing initiatives that we have been unable to do in our current facility. (Those who have visited our facility know that we have run out of space in the three buildings we presently occupy.)

We are keenly aware that moving a company is a significant disruption. We will minimize the disruption by managing inventory and by moving manufacturing, offices, and IT in planned stages. We are also employing outside resources to advise and assist in the relocation process.

### Quartzdyne Electronics (QE): Hybrids Offer a 10X R.O.I.



QE manufactures hybrid circuits (multi-chip modules) that offer longer life, higher temperature operation, reduced circuit size, and rugged packaging for downhole environments. The value proposition for going hybrid is a 10X return on investment: hybrids achieve 100 times the life of a surface-mount circuit at 10 times the price. (See our [circuit test results](#).) In addition, hybrids increase tool up-time and revenue.

Considering a hybrid? Please read our [scope of supply](#) agreement which details responsibilities and project costs.

## Accuracy Outside the Calibrated Temperature Range

Customers periodically ask us how far measurements will remain accurate beyond the calibrated temperature range. Answer: within 15°C of the calibration limits, the accuracy will remain within specification. Reason: the polynomial LMS curvefit characterizes the frequency versus temperature behavior of the quartz crystals with exceptional conformance. We have added a technote on this subject to the [performance menu](#) of our webpage.

## Piecewise Discount Pricing in 2009

We will revise our pricing discount structure on January 1, 2009. The historic price breaks at 10, 20, and 30 pieces will be replaced with a piecewise, continuous quantity discount. In other words, customers will earn a discount at each quantity, 10 through 50 pieces (per P/N, per PO.) The purpose of the piecewise discount is to encourage customers to "right-size" purchase orders: a customer who needs 17 transducers can purchase 17 and get the discount. (In the past, most customers would purchase 20 to reach the next price break.) We hope that customers will use the piecewise discount to order true demand quantity rather than ordering a speculative quantity to reach a price break point.

We are also adding a customer-specific discount to 2009 pricing. This January (2009), we will calculate a "reward discount" for each customer from the total products shipped (in dollars) during 2008. Ranging from 0 to 3%, the reward discount will be applied to all purchases, regardless of order quantity. (We discussed a year-end rebate program with some customers, but we abandoned it since rebates hide the "real" price at the time of ordering.)

Combined together, the piecewise and reward discounts will keep most customers within 1% of current pricing. (Please see graph below.) Our [2009 pricesheet](#) is now available for review; we encourage buyers to review it in preparation for 2009 budgets.

