TowerJazz and University of California, Irvine Demonstrate an Integrated 94 GHz Millimeter-wave Imaging Transceiver with Record Performance in Silicon

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Breakthrough promises lower cost and broader penetration of the >$100M emerging markets of passive imaging for security and automotive radar

NEWPORT BEACH, and IRVINE Calif., Oct. 18, 2012 /PRNewswire/ -- TowerJazz, the global specialty foundry leader announced today that researchers at the University of California, Irvine's (UCI's) Nanoscale Communication Integrated Circuits (NCIC) Labs have built a W-band (80-100GHz) 2×2 focal-plane array (FPA) integrated system with record NETD (noise equivalent temperature difference) performance for passive millimeter-wave imaging using TowerJazz's advanced SiGe BiCMOS process (SBC18H2). This unprecedented level of integration and performance in a silicon process can reduce cost of millimeter-wave imaging systems, which are initially being deployed in security (cameras and scanning), medical, and automotive radar applications, but with the lower cost that silicon provides, can be applied to future consumer applications.

(Logo: http://photos.prnewswire.com/prnh/20120509/531192)

This imaging receiver (without antenna) achieves a measured average responsivity and noise equivalent power (NEP) of 285MV/W and 8.1fW/Hz1/2 respectively, across the 86-106GHz bandwidth, which results in a calculated NETD of 0.48K with a 30ms integration time. This represents a 1-2 orders of magnitude improvement in NEP vs. other methods and demonstrations to date, a 4-10x improvement in NETD vs. e.g. 65nm CMOS. With antenna, the system NETD increases to 3K with on-chip antenna due to its low antenna efficiency at W-band. This work demonstrates the highest integration level of any silicon-based system in the 94GHz imaging band and the responsivity achieved is orders of magnitude higher than previous work.

Due to performance improvements and lower cost, silicon technologies such as SiGe BiCMOS have been adopted as the primary platform for development of millimeter-wave (MMW) systems for target applications such as short-range high data-rate wireless communication, automotive radar, sensing and imaging. Within the MMW frequency range (30-300GHz), there are propagation windows located near 35, 94, 140, 220GHz, where the atmospheric absorption is relatively low. Because passive millimeter-wave (PMMW) imaging systems are capable of operating with high performance at these frequencies, they are ideal for various applications such as remote sensing, security surveillance (e.g., concealed weapon detection at the airport), non-destructive inspection for biological tissues, and industrial process control. Additionally, the non-invasive nature of passive imaging avoids any public health concerns that are present with potentially harmful active imaging methods, such as x-ray detection used in medical and security applications.

The FPA designed and fabricated using TowerJazz's silicon process incorporates four Dicke-type receivers representing four imaging pixels. Each receiver employs the direct-conversion architecture consisting of an on-chip slot folded dipole antenna, an SPDT switch, a low noise amplifier, a single-balanced mixer, an injection-locked frequency tripler (ILFT), an IF variable gain amplifier, a power detector, an active bandpass filter and a synchronous demodulator. The LO signal is generated by a shared Ka-band PLL and distributed symmetrically to four local ILFTs. The measured LO phase noise is -93dBc/Hz at 1MHz offset from the 96GHz carrier.

"The on-going collaboration with TowerJazz to support NCIC Labs at UCI has led to design and fabrication of 40 RF and high-speed analog ICs, and has led to the completion of several projects such as Terahertz oscillators, distributed amplifiers, and fully integrated radar-on-chip," said Prof. Payam Heydari, Full Professor of Electrical Engineering and Computer Science, University of California, Irvine.

Prof. Heydari will be presenting on the topic of millimeter wave imaging at TowerJazz's 7th annual US Technical Global Symposium (TGS) being held at the Hyatt Regency, Irvine on October 31 – November 1, 2012. For more information on the conference or to register, please visit: http://towerjazz.com/tgs/index.jsp.

"The UCI design cleverly integrates several features needed for millimeter-wave imaging which includes on-chip frequency synthesis and local oscillator distribution. To do this at 94 GHz with low phase noise is very impressive. The UCI work has shown record performance in SiGe BiCMOS as compared to other technologies such as 65nm CMOS, and demonstrates the ability to integrate millimeter-wave transmit and receive functions together," said Dr. David Howard, Executive Director, TowerJazz. "To have such technology available, monolithically, in highly affordable 200mm wafer silicon, should enable a dramatic increase in product usage and implementation, such as in the number of cameras at airports that are used for millimeter-wave imaging."

About Nanoscale Communication Integrated Circuits (NCIC) Labs at UCI
Nanoscale Communication Integrated Circuits (NCIC) Labs is one of the foremost research labs in the area of high frequency integrated circuits. Located at the University of California, Irvine, the NCIC Labs have the infrastructure for the measurement of integrated circuits for frequencies up to 170 GHz. Since its start in 2002, twenty graduate students have graduated from the labs, and eleven Ph.D. student researchers are currently carrying out research.

About TowerJazz
Tower Semiconductor Ltd. (NASDAQ: TSEM, TASE: TSEM), its fully owned U.S. subsidiary Jazz Semiconductor Ltd., and its fully owned Japanese subsidiary Japan, Ltd., operate collectively under the brand name TowerJazz, the global specialty foundry leader. TowerJazz manufactures integrated circuits with geometries ranging from 1.0 to 0.13-micron, offering a broad range of customizable process technologies including: SiGe, BiCMOS, Mixed-Signal and RFCMOS, CMOS Image Sensor, Power Management (BCD), and Non-Volatile Memory (NVM) as well as CMOS and MEMS capabilities. TowerJazz also offers a world-class design enablement platform that complements its sophisticated technology and enables a quick and

accurate design cycle. In addition, TowerJazz provides (TOPS) Technology Optimization Process Services to IDMs as well as fabless companies that need to expand capacity, or progress from an R&D line to a production line. To provide multi-fab sourcing, TowerJazz maintains two manufacturing facilities in Israel, one in the U.S., and one in Japan with additional capacity available in China through manufacturing partnerships. For more information, please visit www.towerjazz.com.

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This press release includes forward-looking statements, which are subject to risks and uncertainties. Actual results may vary from those projected or implied by such forward-looking statements. A complete discussion of risks and uncertainties that may affect the accuracy of forward-looking statements included in this press release or which may otherwise affect TowerJazz's business is included under the heading "Risk Factors" in Tower's most recent filings on Forms 20-F, F-3, F-4 and 6-K, as were filed with the Securities and Exchange Commission (the "SEC") and the Israel Securities Authority and Jazz's most recent filings on Forms 10-K and 10-Q, as were filed with the SEC, respectively. Tower and Jazz do not intend to update, and expressly disclaim any obligation to update, the information contained in this release.

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