

## Sales Sheet

## ASIC, Foundry & COT Solutions

### Highlights

- Toshiba has more than 25 years of experience in ASIC design and has delivered over one-hundred 90 nm designs in volume production over the last two years.
- Toshiba is Japan's largest semiconductor manufacturer and the 3rd largest worldwide.<sup>1</sup>
- Toshiba continues investment in its Electronic Devices business with a multi-billion dollar Capex and R&D investment planned over the next several years.
- Toshiba is a leading patent holder with 1,603 utility patents granted in the United States in 2008. (U.S. Patent Office)

Advanced CMOS technology for ASIC, Foundry and COT businesses includes full service chain management.

### CUSTOMER BENEFITS

Leading-edge CMOS technology through in-house process development

- 65 nm LP in mass production
- 40 nm LP libraries are available
- 32/28 nm under development
- 22 nm in research
- Continuous expansion of System LSI wafer fabrication at multiple locations
- RFCMOS technology, 0.13 $\mu$ m, 90 nm and 65 nm LP

Customized System-on-Chip (SoC) development based on wide Intellectual Property (IP) line up

- In-house analog cell development (mixed-signal IP)
- In-house and 3rd party digital IP
- Processor skills (ARM® and MIPS®)
- Embedded memory (SRAM, eDRAM, eFLASH, OTP)

Local competence and support – U.S. Design Centers

- Highly skilled engineers with many years of chip design experience
- Support of flexible service interfaces from Customer Owned Tooling (COT) to full ASIC
- Development support – EDA/PDK
- Mass production ramp-up (qualification and yield improvement)

Short development Turn-Around-Time (TAT) to meet the market window

- Professional project management during development
- Optimized manufacturing process
- World-class learning curve in Defect Density Reduction for Advanced processes

Flexible platform concept for SoC development

- Re-synthesizable and fully customized UniversalArray™ for high flexibility and low risk

Flexible business models for ASIC, Foundry and COT

- ASIC: one partner for design, implementation, packaging and full service supply chain management.
- COT: Reduce risk by choosing from Toshiba's own IP library with access to Toshiba's reliable infrastructure, mask making and die package solutions.
- Foundry: Selective foundry services (wafer, chip-die, assembly, test).
- A multitude of business models can be realized through Toshiba's open and advanced Integrated Device Manufacturer (IDM) model.

### Toshiba Technology Offerings

Technology Offering			
		65nm LP	40nm LP
Low Voltage Core Device	VDD →	1.2V	1.1V
	HS	Yes	Yes
	LP	Yes	Yes
	LL	Yes (ULL)	Yes (LL)
Core/IO Device	VDD →	1.8V	1.8V
	HS	Yes	Yes
High Voltage IO Device	VDD →	1.8V	1.8V
	LP	—	Yes
	VDD →	2.5V	2.5V
	LP	Yes	Yes
	VDD →	3.3V	3.3V
	AL	Yes	—
SRAM	LP	Yes	Yes
	UDR	Yes	Yes
	UHD	Yes	Yes

AL : Analog Device (Thick Oxide, Low Threshold)  
UDR : Ultra Data Rate  
UHD : Ultra High Density

## TAEC Sales Offices

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## Toshiba Metal Options

Toshiba 65 nm LP and 40 nm LP technology offers flexible metal options that can be optimized to a broad range of applications ranging from digital SOCs to RF. Up to 8 layers of copper are available. A top aluminum layer is also available for routing purposes.

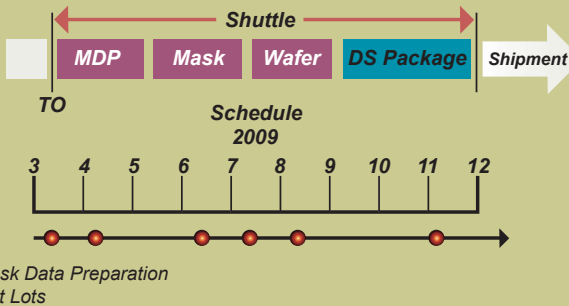
Metal Options		
	65 nm LP	40 nm LP
Top AL Route	1	1
Global Route/RF	UTM/TGM/GLM	GLM/TGM
Semi Global Route	0-2	0-2
Intermediate Route	1-4	1-4
Local Route	1	1

UTM – Ultra Thick Metal  
GLM – Global Layer Metal

TGM – Thin Global Metal

## Toshiba Shuttle Service

The Toshiba Shuttle service incorporates MDP, mask making, wafer and packaging and allows customers to share mask costs. It supports multiple technologies (90 nm, 65 nm LP, 40 nm LP) and operates on a quarterly basis with flexible schedule support. Additional value-added optional services are available such as Testing, PKG assembly, Skew SPL, etc.



<sup>1</sup> Gartner, 2007 WW Semiconductor Revenue Estimate, April, 2008

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