

### Description

The 0.3 $\mu$ m drawn TC220/223 ASIC technology provides the optimum density and performance needed for System-Level Integration (SLI) IC designs.

### Product Features

- 2.1M usable gates
- 90ps loaded NAND gate delay for high-performance systems
- Extensive core and cell libraries for SLI implementation
- 3 ranges of macrocells for speed/power optimization
- Technology libraries compatible with TC200 series ASIC family for ease of migration

- Accurate delay modeling ensures system predictability
- Commercial EDA sign-off for flexibility
- True mixed 3.3/5V I/O operation with TC223
- A wide range of packaging options available, including BGA, TAB-BGA, heatspreader plastic, QFP, TAB-QFP, and others to suit all applications

### Applications

The TC220 has been targeted at low-power and SLI ASIC designs. Typical applications include LAN, access, set-top boxes, printers, mass storage, and graphics chipsets. The TC223 enables designers to incorporate a 3V core and a true 5V I/O interface.

### TC220C Standard Cell Product Summary

Part Number	Usable Gates		Maximum I/O Pads		
	DLM	TLM	Wirebond Pads	TCP-TBGA	PQFP{TAB} TBGA
TC220C040/540	59,000	98,000	104	148	200
TC220C060/560	83,000	137,000	128	184	248
TC220C080/580	113,000	186,000	144	212	288
TC220C100/600	137,000	225,000	160	236	316
TC220C120/620	167,000	273,000	176	260	348
TC220C140/640	200,000	327,000	192	284	380
TC220C160/660	224,000	360,000	208	312	420
TC220C180/680	260,000	418,000	224	336	452
TC220C200/700	299,000	481,000	240	360	484
TC220C220/720	341,000	547,000	256	384	516
TC220C240/740	385,000	618,000	272	408	548
TC220C260/760	432,000	694,000	288	432	-
TC220C280/780	481,000	773,000	304	456	-
TC220C300/800	534,000	857,000	320	480	-
TC220C320/820	589,000	945,000	336	504	-
TC220C340/840	635,000	1,024,000	360	540	-
TC220C360/860	723,000	1,166,000	384	576	-
TC220C380/880	817,000	1,317,000	408	612	-
TC220C400/900	916,000	1,477,000	432	648	-
TC220C420/920	1,288,000	2,100,000	512	768	-

NOTE: DLM = Double-Layer Metal, TLM = Triple-Layer Metal

## System-Level IC Cores and Cells

Toshiba's SLI ASIC TC220/223 family is supported by cores and cells such as Analog PLL, 10/100 Ethernet, ATM, RISC, PCI, USB, 1394, LVDS, etc. In addition, Toshiba has established partnerships with IP providers so the broadest offering of IP can be accessed for a design.

## Optimized Macrocell Performance

The TC220 family has three ranges of macrocells for speed/power optimization.

	Cell Type*		
	Normal	High-Speed	Ultra-Speed
Delay	225ps	140ps	90ps
Power	1.42W/MHz	1.86 $\mu$ W/MHz	2.73 $\mu$ W/MHz

\* 2-input NAND, fanout = 2 plus typical interconnect load, nominal operating conditions

## High-Performance I/O

The TC220/223 is supported by a range of high-performance I/O options, including PCI, high-performance GTL, 3V failsafe, and low undershoot buffers.

## Accurate Models

The TC220/223 incorporates Toshiba's accurate delay model which includes effect of via resistance and interwire capacitance, as well as the following features:

- Pin-to-pin timing
- State-dependent delay
- Table Look-up delay
- Input slew
- Non-linear equation

## Commercial EDA Tool Sign-off

The TC220/223 is supported by Toshiba's open EDA strategy based on sign-off on multiple commercial EDA tools. Support includes Static Timing Sign-off (STSO) and Toshiba's Timing-Driven Flow (TDF™) that can reduce SLI design iterations an order of magnitude and achieve timing convergence.

Toshiba has a range of Design for Test (DFT) support, including SCAN, Partial SCAN, BIST, and Boundary SCAN.

## Technology Resource Centers

Toshiba SLI ASIC Technology Resource Centers are located throughout the U.S. to provide technical support before, during, and after the design of a Toshiba ASIC. This includes support dealing with EDA environments and design kits, Toshiba design methodologies, ASIC technologies, and design implementation.

In addition, Toshiba's North America Semiconductor Engineering Development Center based in San Jose, CA is staffed with system, technology, and EDA design experts who work with customers on advanced System IC applications.

## High-Quality, High-Volume Manufacturing

Toshiba's ASIC manufacturing plants are among the largest and most advanced in the world. They are all certified to ISO9000. Rigorous quality control coupled with a sophisticated batch tracking system allows Toshiba to meet the needs of fast-ramping, high-volume markets.

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