### Features
- Kit library available.
- Advanced CMOS silicon gate technology.
- 2 to 10 Volt power supply.
- Extremely low power consumption.
- High noise immunity.
- TTL compatible inputs and outputs.
- Protection network on all inputs.
- CAD available for quick design.
- Dedicated flip-flops.
- Up to 740 logic gates.
- Up to 55 input/output pads.

### Description
The USI 6000 family of Gate arrays allow the conversion of your analog or analog-digital sub-system into a single IC.

The USI 6000 series Gate Arrays are integrated circuit products that contain matrices of transistor Pairs and dedicated flip-flops designed for high speed digital logic as well as circuit elements optimized for analog circuit applications. These circuit elements include PMOS and NMOS transistors tailored for precision analog performance. MOS capacitors, bipolar NPN common collector transistors. Zener diodes, high valued P-resistors and precision polysilicon resistors. These general purpose chips may be custom engineered through generation of a proprietary metal mask used in conjunction with an inventory of preprocessed wafers.

The USI 6000 family of Gate Arrays is intended to implement systems requiring A/D, D/A and precision analog signal processing and interfacing. A wide range of circuits, including those listed below can be implemented on these arrays.

- Operational amplifiers
- DC to DC converters
- Comparators
- Absolute value detectors.
- Analog multiplexers
- Gain controlled amplifiers.
- Zener and Band gap voltage reference.
- Sample and hold amplifiers.
- A/D and D/A converters.
- Voltage to frequency converters.
- Voltage and crystal controlled oscillators.
- Instrumentation amplifiers.
- Voltage to current converters.
- Current sources, current mirrors.
- Phase locked loops.
- Active RC filters/
- Switched capacitor filters.

KITS AVAILABLE – Most of these circuits are available in kit form. Ask for list of available kits.
ANALOG FUNCTIONS

OPERATIONAL AMPLIFIERS, COMPARATORS

- Operating range: ±1 V to ±5 V.
- Input offset voltage: Typical 3 mV.
- Open loop voltage gain: 80 dB min.
- Unity Gain Bandwidth: 5 MHz internal compensation. 2 MHz external compensation.
- P-P Noise: 50 micro volts.
- Slew Rate: 10 V per microsecond.

- Internal compensation possible
- Operates from single lithium cell.
- N-channel and P-channel input.

ANALOG MULTIPLEXERS

- 100 Ohm ON resistance @ 10 V supply voltage.

ZENER AND BANDGAP REFERENCES

- Zener Voltage: 5.7 volts.
- Bandgap reference: ±25 V ±10%.

A/D AND D/A CONVERTERS

- 12 bit dual slope A/D Converter.
- 5 bit flash A/D converter
- 8 bit D/A converter

OSCILLATORS

- Crystal controlled oscillator
- With feedback resistor and Capacitor on chip.
- R-C Oscillators.

PHASE LOCKED LOOP

- Frequency range: D.C. to 3 MHz.

SWITCHED CAPACITOR FILTERS

- Minimum of 2 sec order Filters (low or bandpass).
- Filters with no external components.
- Bandwidth (Maximum): 50 KHz.

D.C TO D.C. CONVERTERS

- Voltage inverter
- Voltage tripler.

GAIN CONTROLLED AMPLIFIER

- Dynamic range of gain control: 60 dB max.

SAMPLE AND HOLD AMPLIFIERS

- Sample rate with internal capacitors: 0.5 MHz max.

VOLTAGE TO FREQUENCY CONVERTERS

- Frequency range: to 3 MHz max

INSTRUMENTATION AMPLIFIERS

- Low Noise
- Unity Gain Bandwidth: 50 micro volts P-P
- 0.5 MHz max

CURRENT SOURCES CURRENT MIRRORS

- Matching within 3%.

ACTIVE FILTERS

- Bandwidth (Maximum): 50 KHz.

RESISTORS

- P-well resistors (20 elements) 30 KOhms (typical)
- Polysilicon resistors (100 elements) 80 Ohms Typical

CAPACITORS

- Unit capacity (80 elements): 1.5pF

VERTICAL N-P-N TRANSISTORS

- Beta (@ 1mA): 100
The following is a list of the blocks available as various kits, using the USI6000 family of products. These kits may be used to establish a basic set of parameters around which the user’s sub system may be specified. They do not necessarily represent the maximum performance attainable, as they are intended to demonstrate a general capability and allow a potential user an opportunity to evaluate an integrable solution to his requirements.

USI6001 Kit 1. Voltage Splitter for DC-DC converter use.
USI6001 Kit 4. 12 micron N-channel devices with P-well contacts to determine MOS characteristics. 12 micron N-channel current mirror.
USI6001 Kit 5. 24 micron N-channel devices with P-well contacts to determine MOS characteristics. 24 micron N-channel current mirror.
USI6001 Kit 6. Second-order low pass switched capacitor filter.
USI6001 Kit 7. High Speed Comparator.
USI6001 Kit 9. Eight bit monotonic DAC.
USI6001 Kit 10. High impedance N-channel and P-channel devices.
USI6001 Kit 11. High speed differential amplifier with fixed gain.
USI6001 Kit 12. 4 bit flash converter.
USI6001 Kit 13. 12 micron P-channel devices with substrate contact to determine MOS characteristics. 12 micron P-channel current mirror.
USI6001 Kit 14. 24 micron P-channel devices with substrate contact to determine MOS characteristics. 24 micron P-channel current mirror.
USI6001 Kit 15. Voltage Controlled Oscillator (VCO).
USI6001 Kit 16. Triple P-channel Op Amp.
USI6001 Kit 17. Quad P-channel Op Amp.
USI6001 Kit 18. Triple P-channel Op Amp.
USI6001 Kit 19. Quad N-channel Op Amp.
USI6001 Kit 20. Quad comparator.
USI6001 Kit 21. Second-order high-pass switched capacitor filter.
USI6000 ANALOG/DIGITAL PRODUCT MANUAL

NOTE: THIS MANUAL IS SHORTLY BEING PLACED ON THE WEB SITE, HOWEVER BEFORE THAT HAPPENS IT WILL BE SOME TIME, AS IT IS BULKY. IN THE MEANTIME, IT IS AVAILABLE ON DEMAND. IN CASE YOU REQUIRE THE SAME, OR ANY SPECIFIC PART/SECTION, PLEASE SEND US AN EMAIL, AND WE SHALL HAVE IT WITH YOU IN THE SHORTEST POSSIBLE TIME. HOWEVER, FOR YOUR FACILITATION THE INDEX TO THE SAME IS PLACED HERE.

INDEX

Section I  Introduction

The USI6000 family of Analog/Digital Arrays.
Description of USI6000 Family Kit Parts.

Section II  Process Technology

CMOS Technology.
Electrical Parameters.
USI Series Silicon Gate Process
Design Rules.
Radiation Hardening of CMOS.

Section III  Electrical Characteristics

Typical Modeling Parameters.
Transistor Description
D.C. Characteristics for TTL interface.
Gate Delays.
Conduction Factor as a Function of Temperature.
Static Protection.

Section IV  Digital Logic

Logic Description.
Emitter Follower Transistor.
Clock Buffering.

Section V  Digital Cell Layout.

Description of Core Cell.
Layout Aids
Dedicated Latches and Shift Registers
Description of Chip Periphery

Section VI  MOS Analog Implementation

Schematic Diagrams of Representative Analog Structures.
Section VII  
**Analog Design Considerations**
Current Mirrors  
Operational Amplifiers  
Bandgap References.  
Digital to Analog Converters.  
Strobed Comparator.

Section VIII  
**Simulation**
Logic Simulation  
Circuit Simulation  
Switched Capacitor Filter Analyses.  
Switched Capacitor Filter Simulation.  
Spice Parameters.

Section IX  
**Testing**
Analog/Digital Tester.  
High Speed Digital Tester.  
Parametric Tester.

Section X  
**Packaging**
Packages  
Die size Chart and Bonding Diagrams.  
Pin Assignments.

Section XI  
**Cell Library**
Introduction  
List of Library Cells  
Cell Layouts  
Layout Aids.