

MIXED SIGNAL PROCESSING DESIGN SEMINAR

INTRODUCTION TO MIXED SIGNAL PROCESSING OF
REAL-WORLD SIGNALS AND SIGNAL CONDITIONING

1

LINEAR AND NON-LINEAR ANALOG SIGNAL PROCESSING

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FUNDAMENTALS OF SAMPLED DATA SYSTEMS

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ANALOG DEVICES MIXED SIGNAL PROCESSING DESIGN SEMINAR

SECTION I

INTRODUCTION TO MIXED SIGNAL PROCESSING OF REAL-WORLD SIGNALS AND SIGNAL CONDITIONING

ORIGINS OF REAL-WORLD SIGNALS AND THEIR UNITS OF MEASUREMENTS

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GENERATION OF REAL-WORLD SIGNALS

**METHODS AND TECHNOLOGIES AVAILABLE FOR PROCESSING REAL-WORLD
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ADC STATIC TRANSFER CHARACTERISTICS

DAC STATIC TRANSFER CHARACTERISTICS

ADC DYNAMIC PERFORMANCE:

SIGNAL TO NOISE RATIO AND EFFECTIVE BITS, PEAK SPURIOUS, PEAK HARMONIC

CONTENT, SPURIOUS FREE DYNAMIC RANGE, TOTAL HARMONIC DISTORTION, FULL POWER BANDWIDTH, FULL-LINEAR BANDWIDTH, INTERMODULATION DISTORTION (IMD), AC LINEARITY PLOTS USING HISTOGRAMS, APERTURE DELAY TIME (OR EFFECTIVE APERTURE DELAY TIME), APERTURE JITTER, TRANSIENT RESPONSE OR SETTLING TIME, OVERVOLTAGE RECOVERY

DAC DYNAMIC PERFORMANCE:

SETTLING TIME, GLITCH IMPULSE AREA, HARMONIC DISTORTION, DEGLITCHING DACs USING SHAs, $\sin(X)/X$ FREQUENCY ROLLOFF EFFECT

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FAST FOURIER TRANSFORMS:

FFT HARDWARE IMPLEMENTATION, FFT DESIGN CONSIDERATIONS, SPECTRAL LEAKAGE AND WINDOWING, DATA SCALING AND BLOCK FLOATING POINT

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DSP PROCESSOR REQUIREMENTS:

FAST ARITHMETIC, ZERO OVERHEAD LOOPING, EXTENDED DYNAMIC RANGE, DUAL OPERAND FETCH, CIRCULAR BUFFERS

ADSP-2101 MICROCOMPUTER GENERAL DESCRIPTION

ADSP-2101 ARCHITECTURE OVERVIEW:

ARITHMETIC LOGIC UNIT (ALU), MULTIPLIER/ACCUMULATOR (MAC),
SHIFTER, DATA ADDRESS GENERATORS (DAGS), PROGRAM SEQUENCER,
SERIAL PORTS, SYSTEM INTERFACE

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CAPACITANCE:

STRAY CAPACITANCE, FARADAY SHIELDS, NOISE, PARASITIC EFFECTS IN CAPACITORS, CAPACITOR LEAKAGE, SERIES/LOSS RESISTANCE, INDUCTANCE OF CAPACITORS, DIELECTRIC ABSORPTION

INDUCTANCE:

STRAY INDUCTANCE, MUTUAL INDUCTANCE, RINGING, PARASITIC EFFECTS IN INDUCTORS, QUALITY FACTOR (Q)

GROUNDING AND SIGNAL ROUTING:

SIGNAL RETURN CURRENTS, GROUND NOISE AND GROUND LOOPS, STAR (MECCA) GROUNDS, SEPARATE ANALOG AND DIGITAL GROUNDS, GROUND PLANES, TRANSMISSION LINES, SYSTEM GROUNDS, SIGNAL ROUTING

POWER SUPPLIES:

POWER SUPPLY NOISE, SWITCHING-MODE POWER SUPPLIES

ELECTROMAGNETIC INTERFERENCE:

RADIO FREQUENCY INTERFERENCE, PHOTOELECTRIC EFFECTS

LOGIC:

FAN-OUT, TIMING VARIATIONS, SAMPLING CLOCK NOISE, LOGIC NOISE

PROBLEM AREAS:

LIMITATIONS OF SPICE MODELLING, SOCKETS, PROTOTYPING HIGH PERFORMANCE ANALOG CIRCUITRY

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