Subject Index

A
Aavid 5801, heat sink, 5.28
Absorption, 10.47-49
AC induction motor control, block diagram, 6.18-19
AC power supply:
  filtering, 10.34-36
  noise filtering, 10.36
Accelerometer, 1.2, 5.1, 5.26, 6.1, 6.19-23
  applications, 6.20
  basic sensor unit, 6.19-20
  DC acceleration measurement, 6.19
  internal signal conditioning, 6.21
  micromachining, 6.20
  tilt measurement, 6.21-22
Active sensor, 1.1-2
Actuator, 1.3-4
AD210:
  isolation amplifier:
    three-port, 3.54-55
      applications, 3.55-56
      circuit, 3.54
      key features, 3.55
AD260:
  digital isolator, 10.55-57
    key specifications, 10.57
    schematic, 10.56
AD261:
  digital isolator, 10.55-57
    key specifications, 10.57
    schematic, 10.56
AD420:
  4-20mA DAC, 9.1-2
  16-bit sigma-delta DAC, 9.2
AD421:
  loop-powered 16-bit DAC, 9.2
  smart sensor, 9.2
AD524, in amp, series-protection FETs, 3.48
AD524C, precision in amp, performance, 3.47
AD549, BiFET op amp, low bias current precision, 5.6
AD588, precision voltage reference, 4.10
AD592:
  current output temperature sensor, 7.21-22
    specifications, 7.22
AD594, in amp, type J thermocouple, 7.9-10
AD595, in amp, type K thermocouple, 7.9-10
AD598, LVTD signal conditioner, 6.3, 6.5
AD598 and AD698 Data Sheet, 6.24
AD620:
  in amp, 2.7, 3.38-39, 3.42, 10.5
    bridge signal conditioning circuit, 4.9-10
    common mode choke, 10.42
    composite, performance summary, 3.40
    equivalent input circuit, overvoltage, 10.61-62
    error analysis, 3.45-46
    filtering, 10.41-42
    schematic, 10.61-62
    three op amp:
      overvoltage protection, 3.36
      schematic, 3.36-37
      single-supply, rail-to-rail input, 3.39
      Superbeta input, 3.36
AD620B:
  bridge amplifier, error budget, table, 3.46
  precision in amp, performance, 3.47
AD621, in amp, pin-programmable, gain, 3.42
AD621B, precision in amp, performance, 3.47
AD622, precision in amp, performance, 3.47
AD623:
  in amp, 2.7, 3.40-41, 3.46
    data sheet, 3.40
    key specifications, 3.41
    single-supply, architecture, 3.41
AD623 and AD627 Instrumentation Amplifier
  Data Sheets, 3.58
AD623B, in amp, single-supply, performance,
  3.47
AD624C:
  in amp, 3.47
  precision in amp, performance, 3.47
AD625C, precision in amp, performance, 3.47
AD626:
  in amp, 3.46
    common mode voltage attenuation, 3.23
AD626B, in amp, single-supply, performance,
  3.47
AD627:
  in amp, 2.7, 3.34
    architecture, 3.35
    data sheet, 3.34
    key specifications, 3.34-35
    rail-to-rail output, 3.34
  two op amp in-amp, 10.64
AD627B:
  in amp:

CMR, 3.34
single-supply, performance, 3.47
AD645:
BiFET op amp, low bias current, 5.6
JFET amplifier, 3.15
AD688, stable voltage reference, 3.9
AD698:
half-bridge LVDT, 6.5-6
LVDT signal conditioner, 6.5-6
AD707:
op amp, bias-current compensated bipolar, 3.6
precision bipolar amplifier, noise, 3.51
precision op amp, 2.16, 10.3
1/f corner frequency, 3.11
CMR, 3.16
input voltage noise, 3.11
offset adjustment, 3.5
PSR, 3.17-18
stability, 3.4
AD743:
BiFET amplifier:
characteristics, 5.29
low noise, 5.28-29
FET-input op amp, 3.11-12, 3.15
JFET input, 5.29-30
photodiode preamplifier, 5.22
AD744:
JFET amplifier, 3.15
photodiode preamplifier, 5.22
AD745:
BiFET amplifier:
characteristics, 5.29-30
low noise, 5.28-29
FET-input op amp, 3.11-12, 3.15
JFET input, 5.29-30
op amp, high input impedance, 5.27-30
photodiode preamplifier, 5.22
AD795:
BiFET op amp:
key specifications, 5.7
low bias current, 5.6-9
buffer amplifier, low input current, 5.30
DIP package, guarding techniques, 5.6, 5.8-9
guarding techniques, virgin Teflon insulation, 5.8, 5.10
photodiode preamplifier, 5.22
preamplifier:
circuit performance summary, 5.18-19
DC offset errors, circuit, 5.11
noise gain plot, 5.14
offset null adjustment, 5.18
voltage and current noise spectral densities, 5.14-15
precision BiFET op amp:
low input current, 5.30-31
pH probe buffer, 5.30-31
AD795K, preamplifier, total output offset error, 5.11
AD820:
op amp, single supply, 8.8-9
photodiode preamplifier, 5.22
precision op amp, single-supply, performance characteristics, 3.27-28
AD822:
in amp, composite, performance summary, 3.40
precision op amp:
JFET-input dual rail-to-rail output, 3.38, 3.40
single-supply, performance characteristics, 3.27-28
AD823, photodiode preamplifier, 5.21-25
AD824, precision op amp, single-supply, performance characteristics, 3.27-28
AD843, photodiode preamplifier, 5.22
AD845, photodiode preamplifier, 5.22
AD974, 16-bit SAR ADC, 8.5
AD77XX family:
sigma-delta ADCs, 7.11, 7.14-15, 8.22
equivalent input circuits, 8.32
AD77XX-Series Data Sheets, 8.38
AD789X family, SAR ADC, single supply, 8.8
AD1879, 18-bit sigma-delta ADC, 8.22
AD7472, 12-bit SAR ADC, 8.5
AD7670, 16-bit SAR ADC, 8.5
AD7705, 16-bit sigma-delta ADC, 8.23
AD7706, 16-bit sigma-delta ADC, 8.23
AD7710, sigma-delta ADC, 8.23
AD7711, sigma-delta ADC, 8.23
AD7712, sigma-delta ADC, 8.23
AD7713, sigma-delta ADC, 8.23
AD7714, sigma-delta ADC, 8.23, 9.2
AD7715, sigma-delta ADC, 9.2
AD7716:
quad sigma-delta ADC, 8.32
functional diagram, 8.33
key specifications, 8.34
AD7722, 16-bit ADC, 10.7
AD7730:
24-bit sigma-delta ADC, 4.12
internal programmable gain amplifier, 4.12
load-cell application, 4.13
sigma-delta ADC, 2.14, 8.23, 10.7
bridge application, schematic, 8.31
calibration options, 8.29-30

characteristics, 8.25
circuit, 8.26
external voltage reference, 8.30
FASTStep mode, 8.28
filter settling time, 8.29
high impedance input buffer, 8.31
internal programmable digital filter, 8.27
frequency response, 8.28
key specifications, 8.26
oversampling frequency, 8.27
AD7730 Data Sheet, 2.19, 4.14
AD7731, sigma-delta ADC, 8.23, 10.7
AD7750:
sigma-delta ADC, 8.34-37
block diagram, 8.35-36
power meter single-phase application, diagram, 8.37
AD7751, Energy Metering IC, 8.36
AD7816:
digital temperature on-chip sensor, 7.32-34
block diagram, 7.33
key specifications, 7.34
AD7817:
digital temperature on-chip sensor, 7.32-34
block diagram, 7.33
key specifications, 7.34
AD7818:
digital temperature on-chip sensor, 7.32-34
block diagram, 7.34
key specifications, 7.34
AD7856, 14-bit SAR ADC, 8.5
AD7857, 14-bit SAR ADC, 8.5
AD7858:
12-bit SAR ADC, 8.5
circuit, 8.8-9
12-bit single-supply ADC, 8.14-15
integrated IC data acquisition system, 8.14-15
key specifications, 8.15
AD7858L:
12-bit single-supply ADC, 8.14-15
integrated IC data acquisition system, 8.14-15
key specifications, 8.15
AD7859:
12-bit SAR ADC, 8.5
circuit, 8.8-9
parallel output device, key specifications, 8.15
AD7859L, parallel output device, key specifications, 8.15
AD7887, 12-bit SAR ADC, 8.5
AD7888, 12-bit SAR ADC, 8.5
AD7890-10:
12-bit ADC, 8.8-9
diagram, 8.9
thin-film input attenuator, 10.63, 10.65
AD7891, 12-bit SAR ADC, 8.5
AD7892, 12-bit SAR ADC, 10.7
AD8531, op amp, rail-to-rail input, 3.23
AD8532, op amp, rail-to-rail input, 3.23
AD8534, op amp, rail-to-rail input, 3.23
AD8551:
chopper-stabilized ADC, 2.16-17
key specifications, 3.52
noise, 3.51
AD8552:
chopper-stabilized ADC, 2.16-17
key specifications, 3.52
noise, 3.51
AD8554:
chopper-stabilized ADC, 2.16-17
key specifications, 3.52
noise, 3.51
AD9814, 14-bit ADC, analog front end solution, 5.37
AD9816:
12-bit ADC:
analog front end solution, 5.37
charge coupled device/contact image sensor processor, 5.37
key specifications, 5.38
AD22103:
ratiometric voltage output sensor, 7.22-23
specifications, 7.23
AD22151:
linear magnetic field sensor, 6.8
circuit, 6.9
AD22151 Data Sheet, 6.24
Adams, R.W., 8.38-39
ADC:
12-bit, two-stage pipelined, 8.6-7
digital output, Faraday shield, 10.14
first-order sigma-delta, diagram, 8.18
high speed architecture, 8.2
high-resolution, output code histogram, 8.23-24
input range within supply voltage, input protection, 10.64
multiple sigma-delta, in simultaneous sampling, 8.33
on-chip temperature sensor, 7.32-34
SAR:
multiplexed, filtering and timing, 8.11-12
multiplexed inputs, 8.10-14
single-pole filter settling, 8.13
single-supply, resolution/conversion time

comparison, 8.5
switched capacitor, 8.8
timing, 8.6
second-order sigma-delta, diagram, 8.20-21
sigma-delta, 8.1-2, 8.16-37
characteristics, 8.16
high resolution, low frequency, 8.23-34
oversampling, 8.22
in power meters, 8.34-37
signal conditioning, 8.1-2, 8.16-37
signal conditioning, 8.1-37
design issues, 8.1
high speed architecture, 8.2
successive approximation, 8.1-9
single-supply, thin film resistor input attenuator, input protection, 10.65
subranging, pipelined, 8.6-7
successive approximation, 8.1-8
basic diagram, 8.3
SAR reset, 8.2
SHA in hold, 8.2
tracking, for resolver-to-digital converter, 6.14
ADG7XX family, switch/multiplex, 8.12
ADG451, switch/multiplex, 8.12
ADG452, switch/multiplex, 8.12
ADG453, switch/multiplex, 8.12
ADG465:
CMOS channel protector, 10.65-67
key specifications, 10.67
ADG466:
CMOS channel protector, 10.65-67
key specifications, 10.67
overvoltage and power supply sequencing, 10.67
ADG467:
CMOS channel protector, 10.65-67
key specifications, 10.67
ADG508F, switch/multiplex, 8.12
ADG509F, switch/multiplex, 8.12
ADG527F, switch/multiplex, 8.12
ADM1021:
microprocessor temperature monitor, 7.35-38
block diagram, 7.37
input signal conditioning circuits, 7.36
key specifications, 7.38
on-chip temperature sensor, 7.37
ADM3311E RS-232 Port Transceiver Data Sheet, 10.77
ADMC300, 16-bit ADC system, 6.18-19
ADMC330, 12-bit ADC system, 6.18-19
ADMC331, 12-bit ADC system, 6.18-19
ADP1148:
synchronous buck regulator, 10.28-31
circuit, 10.29
driving low dropout regulator, 10.31
waveforms, 10.31
filtered output, 10.30
output waveform, 10.30
ADP3310:
low dropout buck regulator, 10.30-31
driven by synchronous buck regulator, 10.31
waveforms, 10.31
ADS290:
integrated resolver-to-digital converter, 6.14
key specifications, 6.15
ADT05, thermostatic switch, 7.29-30
ADT14, quad setpoint controller, 7.32
ADT22, programmable setpoint controller, 7.32
ADT23, programmable setpoint controller, 7.32
ADT45, absolute voltage output temperature
sensor, 7.24-25
ADT50, absolute voltage output temperature
sensor, 7.24-25
ADT70, RTD signal conditioner, 7.14
ADuC810:
MicroConverter:
basic analog I/O functionality, 9.8
on-chip flash memory, 9.9
on-chip microcontroller, 9.9
ADuC812:
MicroConverter:
12-bit successive approximation ADC, 9.11
basic analog I/O functionality, 9.8
functional block diagram, 9.12
on-chip flash memory, 9.9
on-chip microcontroller, 9.9
performance specifications, 9.12-13
ADuC816:
MicroConverter:
basic analog I/O functionality, 9.8
functional block diagram, 9.10
highest resolution product, 9.10
on-chip flash memory, 9.9
on-chip microcontroller, 9.9
performance specifications, 9.11
ADXL202, dual axis accelerometer, 6.22-23
Air discharge, 10.68
Air-gap discharge, 10.73
Aluminum electrolytic capacitor, 10.22-23
AMP01A, precision in amp, performance, 3.47
AMP02, in amp, series-protection FETs, 3.48

AMP02E, precision in amp, performance, 3.47
AMP04E, in amp, single-supply, performance, 3.47
Amplifier:
bipolar versus chopper, input voltage noise, 3.51
chopper stabilized, 3.49-52
critical parameters, signal conditioning, 3.1-58
DC error budget analysis, 3.19
resolution error, 3.19
temperature, 3.19
isolation, 3.52-56
noise model, 5.15-16
offset voltage, error source, 2.16
selection criteria, 3.1-2
types, 3.1
see also In amp; Op amp
Amplifier Applications Guide (1992), 3.57, 10.57, 10.77
Analog front end solution, for signal processing problems, 5.36
Analog ground, 10.12-14
Analog-to-digital converter, *see*: ADC
Andreas, D., 8.38
Aperture jitter, 10.16
ASI, industrial network standard, 9.5
Auto-focus device, 5.2
Average real power, 8.35

B
Baker, Bonnie, 10.20
Bandgap temperature sensor, 7.21
Bar code scanner, 5.2
Barnes, Erik, 5.40
Base-emitter junction breakdown, 10.59
Bell 202 Communications Standard, 9.2
Bias current, error source, 2.16
Blood particle analyzer, 5.2
Bode plot, 5.12-13, 5.16, 5.20
Boltzmann's constant, 3.13, 5.15, 7.19
Bonded strain gage, 4.2
Boser, B., 8.38
Bridge:
AC, drive circuit, diagram, 2.18
AC excitation, offset voltage minimization, 2.17
all-element varying, 2.4, 2.6
six-lead assemblies, 2.13
amplifier, 2.8
considerations, 2.7
constant current:
all-element varying, 2.6
configurations, 2.6
single-element varying, 2.6
sources, 2.5-6
two-element varying, 2.6
constant voltage:
all-element varying, 2.4
linear, 2.4
configurations, 2.4
error, 2.4
single-element varying, 2.4
two-element varying, 2.4
driving, 2.11-18
error minimizing, ratiometric technique, 2.14-15
four-wire sensing, 2.13-14
Kelvin sensing, 2.13-14
linearization methods, 2.5
linearizing, 2.9-11
nonlinearity, 2.5
offset error, sources, 2.16
output, amplifying and linearizing, 2.7-11
output amplifying, by in-amp, 2.7-8
output voltage, linearity error, 2.4
remote:
driving:
Kelvin sensing, 2.15
ratiometric connection, 2.15
single-element varying, three-wire connection, 2.13
resistance, null, 2.3
resistance measurement, 2.3
sensitivity, 2.4
sensor applications, 2.4
single-element varying, 2.4, 2.6
linearizing, 2.9-10
op-amp, null, 2.9
output, amplifying, 2.7-8
two-element varying, 2.4, 2.6
linearizing, 2.10-11
Wheatstone, 2.2-3
wiring resistance, effects, 2.12
Bridge circuit, 1.3, 2.1-19
fundamentals, 2.1
Bridge signal conditioning circuit, 4.9-13
all-element varying, 4.9-10
Brokaw cell, 7.20-21
Brokaw, Paul, 7.39, 9.17, 10.20, 10.58
Bryant, James, 3.1, 7.1, 8.1, 8.16 10.1, 10.7, 10.20,10.58, 10.68
Bryant, James M., 8.16
Buxton, Joe, 2.19, 3.57, 8.1, 10.59

C
Cable:

coaxial, grounding, 10.53-54
"electrical length", 10.51-52
shielded:
grounding, 10.53-54
remote passive sensor, 10.53
shielding, 10.51-54
grounding, 10.52
twisted pair, shielded, ground loops, 10.52
Cage jack, 10.8
CAN-Bus, industrial network standard, 9.5
Capacitor, 10.22
equivalent circuit and pulse response, 10.25
ESR degradation with temperature, 10.24
finite ESR, 10.24
impedance versus frequency, 10.26
low ESL/ESR, 10.32
noise regulation, 10.22
parasitic elements, 10.25
shunt resistance, 10.25
types, 10.22
Card entry filter, 10.28
CAT scanner, 5.2
CCD, *see*: charge coupled device
Ceramic capacitor, 10.9, 10.22, 10.24
advantages, 10.24
multilayer "chip caps", bypassing/filtering, 10.24
Charge coupled device, 5.1
CMOS fabrication, 5.33
image processing, 5.31-38
kT/C noise, 5.33-35
linear arrays, 5.33
output stage, 5.33-34
Charged Device Model, ESD model, 10.73
Charpentier, A., 8.38
Chemical sensor, 5.1
Chestnut, Bill, 9.1, 10.21
Choke, common mode, 10.41
Chop mode, 8.27
Chopper-stabilized amplifier, 3.49-52
architecture, 3.50
circuit, 3.49
input signal, 3.50
low frequency 1/f noise, 3.51
nulling, 3.50
Christie, S.H., developer of Wheatstone bridge, 2.2
Circuit:
bridge, 2.1-19
ESD-susceptible interfaces, design precautions, 10.76
shielding, conductive enclosures, 10.47
signal conditioning, 1.3
Circuit board:
double-sided versus multilayer printed, 10.9-10
ground planes, 10.18
layout guidelines, 10.18-19
multicard, mixed signal systems, 10.10-11
multilayer, 10.10
noise minimization, 10.18
partitioning, 10.18
traces, termination, 10.44
track impedance, calculation, 10.45
CIS, *see*: contact image sensor
Clelland, Ian, 10.37
CMOS channel protector, 10.65-67
application, 10.66-67
circuit, 10.66
key specifications, 10.67
properties, 10.65-66
CMRR:
definition, 3.16
offset error calculation, 3.17
output offset voltage error, 3.16
Coaxial cable, grounding, 10.53-54
Code flicker, 8.25
Cold junction, 7.6
ice point reference, 7.7
temperature sensor, 7.7
Columbia Research Labs 2682 strain sensor, 4.10
Common mode rejection, *see*: CMR
Common mode rejection ratio, *see*: CMRR
Compatibility of Analog Signals for Electronic Industrial Process Instruments, 9.17
Conduction, 10.59
Connelly, J.A., 10.20
Constantan wire, 4.2
Contact discharge, 10.68, 10.73
Contact image sensor, 5.1
applications, 5.35
image processing, 5.31-38
waveforms, 5.36
Control loop, 4-20mA, 9.1-3
Correlated double sampling, to reduce kT/C noise, 5.34-36
Counts, Lew, 2.19, 3.57
Coussens, P.J.M., 6.24
Crosstalk, 8.10
Crystal Oscillators: MF Electronics, 10.20

D

DAC:
3-bit switched capacitor, track (sample) mode, 8.4
4-20mA, 9.2-3

Dark current, photodiode, 5.3
Data acquisition system, on chip, 8.14
Dattorro, J., 8.38
Decimation, 8.16, 8.18
Decoupling:
  circuit points, 10.15
  mixed-signal ICs, 10.12-14
Del Signore, B.P., 8.38
Designing for EMC (Workshop Notes), 10.57
Designing a Watt-Hour Energy Meter Based on the AD7750, 8.39
Device-Net, industrial network standard, 9.5
DIGI-KEY, 10.38
Digital camera, imaging system, generic, 5.32
Digital current, in analog return path, 10.8-9
Digital filtering, 8.16
Digital ground, 10.12-14
Digital-to-analog converter, *see*: DAC
DIP packaging, 5.6, 5.8-9, 10.8
  guarding, PCB layout, 5.9
Doebelin, Ernest O., 4.14
Dostal, J., 2.19, 3.57

E
E-Series LVDT Data Sheet, 6.24
Early effects, 7.19
ECG, isolation amplifiers, 3.52
Eckbauer, F., 8.38
EDN's Designer's Guide to Electromagnetic Compatibility, 10.57
EEG, isolation amplifiers, 3.52
EEPROM, 8.29
Effective input noise, 8.23
Effective number of bits, *see*: ENOB
Effective resolution, 8.17
  definition, 8.24
  ENOB, 8.24
EIAJ ED-4701 Test Method C-111, Electrostatic Discharges, 10.77
Eichhoff Electronics, Inc., 10.38
80C51, microcontroller, 7.28
Electric motor, types, operations, 6.17-18
Electrocardiograph, isolation amplifiers, 3.52
Electroencephalograph, isolation amplifiers, 3.52
Electrolytic capacitor, 10.22
  switching, 10.23
Electromagnetic interference, *see*: EMI
Electrostatic discharge, *see*: ESD
EMC Design Workshop Notes, 10.37
EMC Test & Design, 10.58
EMG, isolation amplifiers, 3.52
EMI:
  maximum radiation through opening, 10.50
  path, 10.21
  receptor, 10.21
  source, 10.21
Energy Metering IC, 8.36
Engelhardt, E., 8.38
ENOB, 8.17-18
  effective resolution, 8.24
Equivalent series resistance, *see*: ESR
ESD, 10.68-76
  catastrophic destruction, from arcing or heating, 10.74
  damage, 10.69
  examples, 10.68
  generation, 10.68
  models and testing, 10.72-76
  protection plan, 10.72
  testing standards, comparison, 10.74
  see also Electrostatic discharge
ESD Association Draft Standard DS5.3 for Electrostatic Discharge (ESD) Sensitivity Testing--Charged Device Model(CDM)--Component Testing, 10.77
ESD Association Standard S5.2 for Electrostatic Discharge (ESD)Sensitivity Testing--Machine Model (MM)--Component Level, 10.77
ESD Prevention Manual, 10.77
ESD-sensitive device:
  assembling with other components, 10.71
  labeling, 10.70
  packaging and handling, 10.69-71
  workbench, 10.69, 10.71
Ethernet, industrial network standard, 9.5

F
Fair-Rite Linear Ferrites Catalog, 10.37
Faraday shield, 10.35
  ADC digital output, 10.14
FASTStep mode, 8.28
Fatigue monitor, bridge signal conditioning circuit, 4.9-10
Ferguson, P. Jr., 8.39
Ferguson, P.F. Jr., 8.38
Ferrite:
  bead, 10.9
    impedance, 10.27
    leaded, 10.27
  characteristics, 10.26
  impedance, calculation;, 10.27-28
  power supply filters, 10.25

surface mount bead, 10.27
Fiber optic receiver, 5.2
Fieldbuses: Look Before You Leap, 9.17
Film capacitor, 10.22-24
limiting frequencies, 10.24
stacked, 10.24
Filter:
analog, quantization noise, 8.20
card entry, 10.28
common and differential mode, 10.41
localized high frequency, for decoupling to
ground plane, 10.33
switching supply:
layout/construction guidelines, 10.33-34
summary, 10.32
Fisher, J., 8.38
Flash control, 5.2
FLASH Memory, 1.4
Flatness, 8.10
Flett, F.P., 6.24
The Flow and Level Handbook, Vol. 29, 4.14
Flow measurement:
bending vane with strain gage, 4.9
pitot tube, 4.7-8
pressure sensors, 4.7-9
venturi effect, 4.7-8
Foundation Fieldbus, industrial network standard, 9.5
Four-wire sensing, 2.13-14
Fraden, Jacob, 4.14
Franco, Sergio, 2.19, 3.57
Fredrickson, Thomas M., 3.57, 5.39
Freeman, Wes, 10.59, 10.68
Frequency shift keying, 9.2
Fu, Dennis, 6.24

G
Ganesan, A., 8.39
Gelbach, Herman, 10.58
Gerber file, 10.19
Goodenough, Frank, 6.25
Graeme, Jerald, 5.40, 10.20
Graham, Martin, 10.20
Grant, Doug, 10.6
Gray code, used in optical encoder, 6.10
Gray, Paul R., 3.57
Ground:
digital noise, 10.13-14
separating analog and digital, 10.11-12
Ground pin:
IC, 10.8
multiple, 10.18-19
Ground plane, 10.7-9
backplane, 10.10
digital, 10.14
islands, 10.9
mandatory on circuit boards, 10.10
separation of analog and digital, 10.12
Ground screen, 10.11-12
Grounding:
circuit, precautions, 10.28-29
circuit points, 10.15
mixed-signal ICs, 10.12-14
mixed-signal systems, 10.7-20

H
Hageman, Steve, 10.37
Hall effect magnetic sensor, 6.1, 6.7-9
diagram, 6.7
as rotation sensor, 6.8
Hall voltage, 6.7
Handbook of Chemistry and Physics, 7.39
Hardware, design techniques, 10.1-77
Harrington, M.B., 6.25
Harris, Steven, 8.39
Harrold, Dave, 9.17
HART:
industrial network standard, 9.4-5
intelligent remote transmitter:
block diagram, 9.3
using AD421 loop-powered 4-20mA DAC, 9.3
HART protocol, 9.2-4
Hauser, Max W., 8.39
Headlight dimmer, 5.2
Heise, B., 8.38
High impedance charge output sensor, 5.26-31
High Speed Design Techniques (1996), 3.57
High-speed digital signal processor, 6.18
High-speed resolver-to-digital converter, 6.18
How to Reliably Protect CMOS Circuits Against Power Supply Overvoltaging, 10.77
HP5082-4204 PIN Photodiode, 5.22-23
Human Body Model, ESD model, 10.73
Humidity monitor, 5.1
Hydrophone, 5.1, 5.26, 5.28
Hysteresis, programmed, 7.31

I
I-O lines, ESD vulnerability, 10.74
IC, mixed-signal, decoupling and grounding, 10.12-14
Ice point junction, 7.6
IEC1000-4-2:
comparison with MIL-STD Human Body

Model, 10.75
waveforms, 10.76
European Community ESD standard, testing, 10.73
IEC1000-4-x, European Community ESD standards, table, 10.74
IEEE 1451.2, sensor interface standard, 9.4-6
Imaging system, light-sensing element, 5.32
iMEMS, Analog Devices' accelerometer, 6.19
Impedance, and noise sources, 3.14
In amp, 3.30-48
as amplifier, in single-element varying bridge, 2.8
bridge amplifier, error budget analysis, 3.45-46
circuit diagram, 3.30
CMR, 3.30, 3.43
composite:
single-supply:
performance summary, 3.40
rail-to-rail output, schematic, 3.39
configurations, 3.31-41
DC error sources, 3.42-44
gain, 3.42
error specifications, 3.42
nonlinearity, 3.42
RTI, summary, 3.44
definition, 3.30
dual-supply, rail-to-rail op amp gain stage, 3.38
external voltage protection circuit, 10.63
input bias currents, offset errors, 3.43
input overvoltage, 3.48
input overvoltage protection, 3.48
internal feedback resistor network, 3.30
noise sources, 3.44-45
gain, 3.45
model, 3.44-45
total output noise calculation, 3.44
offset voltage model, 3.43
performance tables, 3.46-47
precision:
common mode RFI, 10.39
ferrite bead filter, 10.41
filtering, 10.40
against EMI/RFI, 10.42
performance, table, 3.47
PSR, 3.43
RTI CMR, 3.43
single-supply, performance, table, 3.47
three op amp, 3.35-36
circuit, 3.36
CMR, 3.36
internal node voltages, 3.37
single-supply operation, 3.37
restrictions, 3.37
total input offset voltage, 3.43
total output offset error, 3.43
two op amp:
circuit, 3.32
CMR, 3.33
disadvantage, 3.32-33
input protection, 10.64
single supply:
high gain, 3.33-34
low gain, 3.33
zero-volt common mode input voltages, restriction, 3.34
Indirect field-oriented control, 6.18
Inductosyn, 6.1, 6.15-17
components, 6.15
diagram, 6.16
linear position measurement, 6.15
operation similar to resolver, 6.16
rotary, 6.17
Industrial network standard, listing, 9.5
Industrial process control, sensor application, 1.3-4
Input bias current:
models, 3.5-7
offset errors, 3.5-6
precision op amp, PNP or NPN standard bipolar input stage, 3.6
Input offset voltage:
air flow effects, 3.4
change with time, 3.4
control by device selection, 3.4
long-term stability, 3.4
measurement, 3.3-5
mechanical board layout, 3.3
RTI, 3.3
models, 3.5-7
diagram, 3.6
parasitic thermocouple junctions, 3.3
precision amplifier error source, 3.2
temperature effects, 3.4
Input overvoltage, 10.60
Input-referred noise, 8.23
Instantaneous power, 8.34-35
Instantaneous real power, 8.34-36
Instrumentation amplifier, *see*: In amp
Interbus-S, industrial network standard, 9.5
Interference:
impedance, 10.47
sources, 10.47
An Introduction to the Imaging CCD Array,

5.39
Isolated gate bipolar transistor, 6.18
Isolation, as form of shielding, 10.55
Isolation amplifier, 3.52-56
  applications, 3.53-54
  input circuit, 3.53
  linearity, 3.53
  three-port, 3.54

J
Jantzi, S.A., 8.38
Jitter, sampling clock, 10.16
Johnson noise, 3.13, 3.14, 5.15, 8.23
  from feedforward resistor, 5.17
  op amp, 3.11, 3.13, 3.14
Johnson, Howard W., 10.20
Jung, Walt, 3.1, 7.1, 10.1, 10.21, 10.37, 10.39,
  10.58
Jung, Walter G., 3.57

K
Kaufman, M., 2.19, 3.57
Keil, third-party tools for MicroConverter, 9.15
Kelvin connection, RTD, 7.14
Kelvin sensing, 2.13-14
Kerridge, Brian, 10.6
Kester, Walt, 1.1, 2.1, 2.19, 3.1, 4.1, 4.14, 5.1,
  5.39, 6.1, 7.1, 7.39, 8.1, 9.1, 10.1, 10.7,
  10.20, 10.21, 10.39, 10.59, 10.68
Kettle, P., 6.25
King, Grayson, 9.1, 9.4
Kitchin, Charles, 2.19, 3.57, 5.1, 10.39
Koch, R., 8.38
kT/C noise, 8.23
  reduction, by correlated double sampling, 5.34-36

L
Laser printer, 5.2
Law of Intermediate Metals, 7.6
Lee, Wai Laing, 8.38
Lee, W.L., 8.38
Light meter, 5.2
Light-sensing element, 5.32
Linear Design Seminar (1994), 10.77
Linear Design Seminar (1995), 3.57, 8.38
The Linear Variable Differential Transformer,
  by Herman Schaevitz, in 1946, 6.1-2
Linear variable differential transformer, *see*:
  LVDT
Load cell, sensor, all-element varying bridge,
  2.5
Load-cell amplifier, circuit, 4.10-11
Logic:
  circuit separation, 10.45
  families, circuit board termination, 10.44
  high speed, 10.44-46
  slowing, EMI/RFI minimization, 10.47
Lonwork, industrial network standard, 9.5
Lucey, D.J., 6.25
LVDT, 1.2, 6.1-7
  advantages, 6.2
  improved, signal processing output, 6.3-4
  linear distance measurement, applications, 6.1
  measurement ranges, 6.2
  position-to-electrical sensor, 6.2
  precision rectifier, 6.3-4
Lyne, Niall, 6.25, 10.77

M
Machine Model, ESD model, 10.73
MacKenzie, I. Scott, 9.17
Marsh, Dick, 10.37
Matsuya, Y., 8.38-39
Melsa, James L., 3.57, 5.39
Metalink, third-party tools for MicroConverter,
  9.15
Meyer, Robert G., 3.57
MicroConverter:
  12-bit voltage output DAC, 9.7-8
  based on 8052 core, 9.12
  basic analog I/O functionality, 9.8
  characteristics, 9.8
  design support matrix, 9.13
  future developments, 9.15
  product roadmap, 9.16
  QuickStart development kit, 9.14
  smart sensor, 1.6, 9.6-8
    primary functions, 9.7-8
  third-party tools, 9.15
  Web site, 9.14
MicroConverter Technology Backgrounder, 9.17
Microprocessor:
  supply voltage and temperature, critical parameters, 7.35
  temperature monitoring, 7.35-38
Microstrain, 4.2
Migration, 10.59
MIL-STD-883 Method 3015, for ESD sensitivity, 10.72, 10.74
MIL-STD-883 Method 3015, Electrostatic Discharge Sensitivity Classification, 10.77

MIL-STD-883 Method 3015.7:
Human Body Model:
comparison with IEC, 10.75
waveforms, 10.76
Mixed Signal Design Seminar (1991), 8.38
Mixed signal system, grounding, 10.7-20
Mixed-signal grounding, techniques, 10.16
Modulation, 8.10
Modulator:
sigma-delta:
linearized model, 8.19
quantization noise shaping, 8.21
Morrison, Ralph, 10.20, 10.57, 10.58
MOSFET:
Kelvin sensing, 2.17
N-Channel, 2.17
P-Channel, 2.17
Motchenbacher, C.D., 10.20
Motor control current sensing, isolation amplifier, circuit, 3.56
Multiplexed SAR ADC, filtering and timing,
8.11-12
Multiplexer:
analog, diagram, 8.11
key specifications, 8.10
Multiplexing, 8.10
Multipoint ground, diagram, 10.11
Muncy, Neil, 10.58
Murray, Aengus, 6.25
MUX, *see also* Multiplex

N

N-Channel MOSFET switch, 8.10
Nash, Eamon, 3.58
Negative temperature coefficient, *see*: NTC
Network:
industrial, diagram, 9.4
standard, HART, 9.2-4
Nichrome wire, 4.2
Noise:
1/f corner frequency, 3.11
RMS, equation, 3.12
switcher, high frequency, tools, 10.21-22
white, 3.11-12
Noise shaping, 8.19
Noise-free code resolution, definition, 8.24-25
Nonlinearity:
closed loop gain:
calculations, 3.10
op amp, 3.8
definition, 3.42
open loop gain, calculations, 3.10
Null measurement, feedback system, 2.3
Nyquist band, 8.17
Nyquist criterion, 8.18

O

Offset errors, AC excitation, offset voltage minimization, 2.17
Offset referred to input, *see*: RTI
O'Grady, Albert, 9.17
OMEGA Temperature Measurement Handbook,
7.39
On-chip programmable-gain amplifier, *see*: PGA
OP07:
bipolar op amp:
ultra-low offset voltage, 5.5
open-loop gain, 3.21
voltage noise, 3.12
OP27:
bipolar op amp:
bias-current compensated, 5.29-30
low voltage noise, 3.12, 3.14-15
OP42, photodiode preamplifier, 5.22
OP97, super-beta bipolar op amp, bias current
compensation, 5.5
OP113:
precision op amp:
high open-loop gain, 3.21
single-supply, performance characteristics,
3.27-28
OP177:
precision bipolar op amp, 2.18, 10.3
1/f corner frequency, 3.11
bias-current compensated bipolar, 3.6
CMR, 3.16
gain nonlinearity, 3.10
input voltage noise, 3.11
noise, 3.51
offset adjustment, 3.5
PSR, 3.17-18
stability, 3.4
OP177A, op amp, room temperature error budget analysis, 3.19
OP181, precision op amp, single-supply, performance characteristics, 3.27-28
OP184:
precision op amp:
rail-to-rail input, 3.24
single-supply, performance characteristics,
3.27-28
OP191:
precision op amp:
common mode crossover threshold, 3.24
single-supply, performance

characteristics,
3.27-28
OP193, precision op amp, single-supply,
performance characteristics, 3.27-28
OP196, precision op amp, single-supply,
performance characteristics, 3.27-28
OP213:
precision op amp, high open-loop gain,
3.21
two op amp in-amp, 4.11
single-supply, performance
characteristics,
3.27-28, 3.37
OP250, op amp, rail-to-rail input, 3.23
OP279, op amp, common mode crossover
threshold, 3.24
OP281, precision op amp, single-supply,
performance characteristics, 3.27-28
OP282, op amp, P-channel JFET input
pair,
3.23
OP284:
precision op amp:
rail-to-rail input, 3.24
single-supply, performance
characteristics,
3.27-28, 3.37
OP291:
precision op amp:
common mode crossover threshold, 3.24
single-supply, performance
characteristics,
3.27-28, 3.37
OP293, precision op amp, single-supply,
performance characteristics, 3.27-28
OP296, precision op amp, single-supply,
performance characteristics, 3.27-28
OP413:
precision op amp:
high open-loop gain, 3.21
single-supply, performance
characteristics,
3.27-28
OP450, op amp, rail-to-rail input, 3.23
OP481, precision op amp, single-supply,
performance characteristics, 3.27-28
OP482, op amp, P-channel JFET input
pair,
3.23
OP484:
precision op amp:
rail-to-rail input, 3.24
single-supply, performance
characteristics,
3.27-28
OP491:
precision op amp:
common mode crossover threshold, 3.24
single-supply, performance
characteristics,
3.27-28
OP493, precision op amp, single-supply,
performance characteristics, 3.27-28
OP496, precision op amp, single-supply,
performance characteristics, 3.27-28
Op amp:
1/f noise, 3.11
as amplifier, in single-element varying
bridge,
2.8
bias compensated, low voltage noise, 3.14
BiFET:
input stage, circuit, 5.6
specifications, 3.15
bipolar:
bias-current compensated, 3.6
specifications, 3.15
breakdown voltage, 10.59
chopper stabilized, 3.1
no 1/f noise, 3.51
noise reduction, 3.12
CMRR, definition, 3.16
current noise, 3.11
DC open loop gain nonlinearity,
measurement,
3.8-9
decoupling techniques, 3.18
input bias current compensated, diagram,
3.7
input voltage noise, 3.11
JFET, specifications, 3.15
JFET versus bipolar, 5.29-30
source resistance, effects on noise and
offset
voltage, 5.30
low-frequency CMR, 3.31
noise, 3.11-15
Johnson, voltage, 3.13
low frequency, 3.11
model, 3.13
noise model, 5.15-16
non-inverting:
gain variation with temperature, 10.1
resistor temperature coefficient
mismatches,
10.1
noninverting mode, 3.16-17
offset adjustment pins, diagram, 3.5
offset drift with temperature, 3.5
overvoltage:
conduction, 10.59
protection circuit, 10.61
precision:
characteristics, 3.2-18

CMR, 3.16-18
DC open loop gain nonlinearity, 3.7-10
measurement, 3.8-9
input bias current, models, 3.5-7
input offset voltage, 3.2-5
models, 3.5-7
noise, 3.11-15
PSR, 3.16-18
CMR, 3.16
gain nonlinearity, plot, 3.10
gain uncertainty, 3.7-8
key performance specifications, 3.2
noise gain, 3.7
offset null, 3.4
open loop gain, 3.7
PNP or NPN bipolar input stage, input bias
currents, 3.6
PSR, 3.17-18
PSRR, 3.17
frequency dependent, 3.17
ramp generator output, 3.9
frequency, 3.9
resistance, Johnson noise, 3.11
resistor Johnson noise, 5.15
single supply, 3.20-29
advantages, 3.20
design tradeoffs, 3.20
gain accuracy, 3.21
input bias current, CMR, 3.24
input stages, 3.22-25
characteristics, 3.22
N-channel JFET, 3.22-23
offset voltage, 3.25
overvoltage, 3.22
parallel NPN and PNP, 3.21
transient response, 3.25
output stages, 3.25-28
"almost" rail-to-rail, 3.27
asymmetry, 3.25
bipolar processes, 3.25
CMOS FETs, 3.26
complementary common-emitter/common-source, 3.26-27
performance characteristics, summary, 3.27-28
process technologies, 3.28-29
BiMOS or CBCMOS use, 3.29
JFET use, 3.29
summary, 3.28-29
PSR, 3.17
rail-to-rail, 3.20
ground reference, 3.21
input stage:
design, 3.24
long-tailed pairs, 3.23-24
output stages, 3.22
selection criteria, 3.27-28
SNR, 3.22
performance, 3.21
voltage noise increase, 3.21
subtractor, 3.31
temperature, offset drift, 3.5
types, null capability, 3.5
voltage noise, 3.11
white noise, 3.11
Optical encoder:
absolute, expense, 6.10
diagrams, 6.10
disadvantages, 6.9-10
incremental, 6.9-10
position measurement, 6.9-10
use of Gray code, 6.10
Optical rotational encoder, 6.1
Optoelectronics Data Book, 5.39
Optoisolator, 3.53, 10.55
Organic semiconductor electrolytic capacitor,
10.22-23
OS-CON Aluminum Electrolytic Capacitor 93/94 Technical Book, 10.37
OS-CON electrolytic capacitor, 10.22-23
Ott, Henry, 10.20, 10.37, 10.57
Output ripple, 10.32
Oversampling, 8.16-17
ratio, 8.17
Overvoltage:
CMOS channel protector, 10.65-67
protection, 10.59-67
Schottky diode, 10.60-61

P

P-Channel MOSFET switch, 8.10
P-NET, industrial network standard, 9.5
Pallas-Areny, Ramon, 2.19, 4.14, 5.39, 6.24, 7.39
Parasitic thermocouples, error sources, 2.16
Parzefall, F., 8.38
Passive sensor, 1.1-2
Pattavina, Jeffrey S., 10.20
Permanent magnet synchronous motor, 6.18
pH monitor, 5.1
pH probe buffer amplifier, 5.30-31
Phase jitter, 10.16-17
Photodiode 1991 Catalog, 5.39
Photodiode, 1.2
amplifier:
low noise:
circuits, 5.27-28
source impedance balancing, 5.27
applications, 5.2

circuit, leakage paths, 5.7-8
current proportional to illumination, 5.1-2
current-to-voltage converter, 5.4-5
SNR, 5.5
equivalent circuit, 5.1-3
shunt resistance, 5.3
high speed current-to-voltage converter:
compensation, 5.20-25
input capacitance compensation, 5.20
high speed preamplifier:
dark current compensation, circuit, 5.24
design, 5.22-24
dynamic range, 5.22
equivalent noise bandwidth, 5.24
noise analysis, 5.24-25
output noise analysis, equivalent circuit, 5.25
output voltage, 5.23
total RMS noise, 5.25
modes of operation, circuits, 5.3
op amp, current-to-voltage converter, 5.4-5
parasitic leakage, 5.7-8
photoconductive mode, 5.3
photovoltaic mode, 5.3
short circuit current, light intensity, 5.4
preamplifier, 5.1
Bode plot, 5.12-13
circuit noise:
gain versus frequency, 5.12-13
summary, 5.17
circuit performance summary, 5.18-19
circuit tradeoffs, 5.19
closed loop bandwidth, 5.13-14
design, 5.1-19
design, bandwidth, and stability, 5.12-14
Bode plot, 5.12-13
circuit noise gain versus frequency, 5.12-13
FET-input op amp, comparisons, 5.22
input bias current, function of temperature, 5.10-11
input voltage noise, 5.16
Bode plot, 5.16
Johnson noise from feedforward resistor, 5.17
Johnson noise of resistor in non-inverting input, 5.17
noise analysis, 5.14-18
noise gain plot, 5.13-14
noise reduction, via output filtering, 5.18
non-inverting input current noise, 5.17
offset null adjustment, 5.18
offset voltage and drift analysis, 5.10-11
offset voltage errors, summary, 5.10-11
shunt resistance, function of temperature, 5.10-11
signal bandwidth, 5.13-14
reverse bias, 5.3
dark current, 5.3
specifications, 5.4
thermoelectric voltage, source of input offset voltage, 5.12
wideband converter, op amp selection, 5.21-22
zero bias, 5.3
Piezoelectric, 1.2
sensor amplifier, 5.28
Piezoelectric sensor, 5.26
Piezoelectric transducer:
amplifier, lower bias current, 5.28
displacement type, 4.4
output voltage, 4.4-5
Piezoresistance, semiconductor strain gage, 4.4
Pin socket, 10.8
Pitot tube, flow measurement, 4.7-8
Plug and play, 9.5-6
Polyester capacitor, 10.22-23
Position sensor, 5.2
Power:
average real, 8.35
instantaneous, 8.34-35
instantaneous real, 8.34-35
measurement basics, 8.35
Power meter, single-phase application, 8.36-37
Power plane, 10.7-9
Power supply:
AC, filtering, 10.34-36
commercial EMI filter, 10.34-35
EMI generation, 10.34
filter, ferrites, 10.25
localized high frequency, filtering, 10.32-34
noise reduction and filtering, 10.21-38
separate for analog and digital circuits, 10.15
switching, 10.21
analog ready, 10.21
drawbacks, 10.21
filters, 10.21
Power supply rejection, *see*: PSR
Power supply rejection ratio, *see*: PSRR
Practical Analog Design Techniques (1996), 3.57

Practical Design Techniques for Power and Thermal Management, 10.38
Precision load-cell amplifier, 4.11-12
  single-supply, 4.12-13
    circuit, 4.13
Precision Resistor Co., Inc., 5.40
  PT146, 5.30
Pressure sensor:
  resistance, 2.1
  transducers, 4.7
The Pressure, Strain, and Force Handbook, Vol.
  29, 4.14
Product-to-Frequency Converter, 8.34, 8.36
Profibus, industrial network standard, 9.5
Programmable-gain amplifier, *see*: PGA
Proximity detector, 6.1
PT146, Precision Resistor Co., 5.30
Pulse Engineering, Inc., 10.43

Q
Quantization error, 8.17
Quantization noise, 8.17-18
Quantization noise shaping, 8.16

R
Radiofrequency interference, *see*: RFI
Ramp generator, frequency, 3.9
RCD Components, Inc., 10.6
REF195, bridge drive, 4.11
Reflection, 10.47-49
Relative humidity sensor, resistance, 2.1
Rempfer, William C., 10.20
Resistance:
  measurement:
    bridge, 2.2-3
    indirect, 2.2
Resistance temperature device, *see*: RTD
Resistive strain gage, 4.1
Resistor:
  error, high accuracy system, 10.1-6
  Johnson noise, 3.13, 5.15
  model, with thermocouples, 10.2-3
  orientation, error minimization, 10.3-4
  self-heating, gain variation with input level,
    10.2
Resolver, 6.10-15
  brushless, 6.11
  diagram, 6.11
  rotating transformer, 6.11
RFI rectification:
  filtering, 10.39-40
  prevention, 10.39-43
Rich, A., 10.58
RMS noise:
  equation, 3.12
  gaussian distribution, 8.24
Roberge, J.K., 3.57
Roche, P.J., 6.25
Rotary variable differential transformer, 6.1
  LVDT variant, 6.7
RS-232 port, ESD-sensitive, 10.72-73, 10.75
RS-485 port, ESD-sensitive, 10.75
RTD, 1.1-3, 2.1-2
  demodulates AC error signal, 6.13
  diagram, 6.12-13
  four-resistor bridge circuit, 7.13-14
  measurement errors, 7.12-13
  passive temperature sensor, 7.11-15
  platinum, 2.2
    interfaced to high resolution ADC, circuit,
      7.15
  resistance, 2.1
  resistance versus Seebeck coefficient, 7.12
  single-element varying bridge, 2.4-5
  temperature sensor, 7.2, 7.11-15
  tracking, 6.14

S
Sample-and-hold, *see*: SHA
Sampling clock:
  ground planes, 10.17
  grounding and decoupling, 10.15
  jitter, 10.16
    SNR, 10.16
Sauerwald, Mark, 10.20
Scannell, J.R., 6.25
Scanner, imaging system, generic, 5.32
Schaevitz E100 LVTD:
  diagram, 6.2
  key specifications, 6.3
Schaevitz, Herman, 6.24
Schmidt, Ernest D.D., 6.24
Schottky diode, 3.48, 10.12, 10.60-61, 10.63-64
Schultz, Donald G., 3.57, 5.39
Scott-T transformer, in synchro, 6.12
Seebeck coefficient:
  and RTD, 7.12
  temperature variation, 7.3-4
Self-generating sensor, 1.1-2
Semiconductor:
  strain gage, 4.4
    advantages, 4.4
    piezoresistance, 4.4
  temperature sensor, 7.2, 7.19-34
    advantages, 7.19
    basic relationships, 7.19-20
Sensor:

active, 1.1-2
charge coupled device, 5.1
charge output, 5.1
classification, 1.1, 1.3
definition, 1.1
digital interface, standardization, 1.5
electrical character, 1.3
external active circuitry, 1.1
high impedance, 5.1-38
charge amplifier, 5.26
circuits, 5.27-28
charge output, 5.26-31
interfaced with network, 9.4-16
output, 1.2
overview, 1.2
passive, 1.1-2
examples, 1.1
piezoelectric, 5.1
popular, resistances, 2.1
position and motion, 6.1-23
process control system application, 1.3-4
remote resistive bridge, errors, 2.12
resistive elements, 2.1
self-generating, 1.1-2
smart, 9.1-16
temperature, 7.1-38
applications, 7.1
see also Temperature sensor
types, 1.3
uses, 1.1
Setpoint controller, temperature sensor, 7.29-32
Sheingold, Dan, 2.19, 3.57, 4.14, 5.39, 6.24, 7.39, 8.39
Shielded cable, grounding, 10.53-54
Shielding:
absorption, 10.47-49
effectiveness, calculation, 10.50
magnetic fields, loss, 10.48
materials, conductivity and permeability, summary, 10.50
reflection, 10.47-48
review, 10.47-58
Siemens Optoisolator Products, 10.58
Sigma-delta ADC, 24 bits, internal PGA, for bridges, 2.14
Signal conditioning:
amplifiers, 3.1-58
circuit, 1.3
Signal-to-noise ratio, *see*: SNR
Silicon Detector Corporation, 5.39
Silicon Detector Part Number SD-020-12-001, 5.4
Silicon sensor, 1.2
68HC11, microcontroller, 7.28
Slattery, B., 10.57
Smart sensor, 9.1-16
4-20mA loop powered, 9.2
applications, 1.5
basic elements, 1.5
Smart Transducer Interface Module, smart sensor, 9.5-6
Smith, Lewis, 3.57, 5.39
Smoke detector, 5.1
Snelgrove, M., 8.38
SNR versus oversampling ratio, 8.22
SO-8 packaging, 7.27
Sockolov, Steve, 10.6
Sodini, C.G., 8.38
SOIC packaging, 5.6, 5.8-9, 5.19, 8.26
guarding, PCB layout, 5.9
SOT-23-3 packaging, temperature sensors, 7.24-26
Standard, industrial network, listing, 9.5
Star ground, 10.10-11
STIM, smart sensor, 9.5-6
Stout, D., 2.19, 3.57
Strain gage, 1.2, 4.1-9
bonded, 4.2-3
diagram, 4.3
bridge circuit, 4.9-10
comparisons, 4.4
flow devices, 4.1
foil-type, 4.2-3
force measurement, 4.5
fullscale variation, 2.12
gas and liquid pressure measurements, 4.6
load cell, 4.1, 4.5-6
precision amplifier, 4.11
low impedance, 4.5
metal foil, diagram, 4.3
piezoelectric transducers, 4.1
precision, sensor amplifier, 4.10
pressure devices, 4.1
resistance, 2.1
resistive, 4.1
semiconductor, 4.4
unbonded, 4.1-2
Successive approximation register, *see*: SAR
Swanson, E.J., 8.38
Switch, CMOS analog, basic, 8.10
Switching regulator, experiment, 10.28-32
Synchro, 6.10-15
diagram, 6.11
rotating transformer, 6.11
Scott-T transformer, 6.12
three stator coils, 6.11
Synchro and resolver, 6.1
System, definition, 1.1
System Applications Guide (1993), 8.38, 10.43, 10.77

System Applications Guide (1994), 3.57, 10.57

T
Tantalum electrolytic capacitor, 10.22-23
Tantalum Electrolytic Capacitor SPICE Models, 10.38
Tantalum Electrolytic and Ceramic Capacitor Families, 10.37
TEDS, in microcontroller, 9.5
Temperature monitoring, microprocessor, 7.35-38
Temperature sensor, 7.1-38
  applications, 7.1
  bandgap, 7.21
  current and voltage output, 7.21-25
  digital output, 7.26-29
  direct digitization, by ADCs, 7.2
  EMI/RFI effects, 7.25
  nonlinear transfer functions, 7.1
  RTD, 7.2, 7.11-15
  semiconductor, 7.2, 7.19-34
  setpoint controller, 7.29-32
  thermistor, 7.2, 7.16-19
  thermocouple, 7.2-11
  thermostatic switch, 7.29-32
  types, 7.2
Tesla, Nikola, 6.17
Thermal EMF, thermocouple effect, 10.2
Thermistor, 1.2
  amplifier, linearized, 7.19
  definition, 7.16
  fragility, 7.17
  NTC, 7.16
    linearization, 7.18
    resistance characteristics, 7.16
    temperature coefficient, 7.17
  resistance, 2.1
  sensitivity, 7.17
  single-element varying bridge, 2.4-5
  temperature sensor, 7.2, 7.16-19
Thermocouple, 1.2
  basic principles, 7.5-6
  characteristics, 7.2
  cold-junction compensation, 7.2-11
  effect, thermal EMF, 10.2
  error, high accuracy system, 10.1-6
  isothermal block, 7.8
  parasitic, circuit, 10.5
  reference cold junction, 7.3-4
  reference junction, 7.6
  Seebeck coefficient and temperature, 7.3-4
  thermoelectric emf, 7.5
  type J:
    Seebeck coefficient, 7.5
    sensitivity, 7.3-4
  type K, 7.5
    Seebeck coefficient, 7.8
  type S, 7.5
  types, 7.2-3
  voltage generation, 7.6
  voltage-temperature curves, 7.3-4
Thermoelectric emf, thermocouple, 7.5
Thermostatic switch, temperature sensor, 7.29-32
Thermostream-type heater/cooler, amplifier temperature controller, 3.4
TII, in sensor, 9.5
TMP01:
  programmable setpoint controller, 7.31-32
    key features, 7.32
TMP03:
  digital output sensor, 7.26-29
    diagram, 7.27
    output format, 7.27
    thermal monitoring, 7.29
TMP04:
  digital output sensor, 7.26-29
    diagram, 7.27
    high power microprocessor monitoring, 7.29
    output format, 7.27
    thermal monitoring, 7.29
  microcontroller interfacing, 7.28
TMP17:
  current output temperature sensor, 7.21-22
    specifications, 7.22
TMP35:
  absolute voltage output temperature sensor, 7.23
  voltage output sensor, 7.8-9, 7.11
TMP36, absolute voltage output temperature sensor, 7.23
TMP37, absolute voltage output temperature sensor, 7.23
TO-92 packaging, 7.27
TO-99 packaging, 5.6, 5.12
Transducer, 1.2
Transducer Electronic Data Sheet, in microcontroller, 9.5
Transducer Independent Interface, in sensor, 9.5
Transformer, best common-mode power line isolation, 10.35
Transient Voltage Suppresser, 3.48, 10.63
TransZorb, 10.63, 10.75

TransZorbs Available from General Semiconductor, Inc., 10.77
Travis, Bill, 6.24
Triboelectric effect, 10.68
Trietley, Harry L., 4.14, 6.24
TSSOP packaging, 7.27, 8.26
TVS, *see*: Transient Voltage Suppresser
Twilight detector, 5.2
Two op amp in amp, circuit, 3.32
Type 5MC Metallized Polycarbonate Capacitor, 10.37
Type 5250 and 6000-101K chokes, 10.38
Type EXCEL leaded ferrite bead EMI filter, and type EXC L leadless ferrite bead, 10.37
Type HFQ Aluminum Electrolytic Capacitor and Type V Stacked Polyester Film Capacitor, 10.37

U-V
Unbonded strain gage, 4.1-2
wire, 4.2
Universal Serial Bus, industrial network standard, 9.5
USB, industrial network standard, 9.5
Vector AC induction motor control, 6.17-19
Vector control, 6.18
Venturi effect, flow measurement, 4.7-8
VLSI mixed-signal processing, 8.14

W-Z
Webster, John G., 2.19, 4.14, 5.39, 6.24, 7.39
Weigh-scale load cell, resistance, 2.1
Welland, D.R., 8.38
Wheatstone bridge, 2.2-3
circuit, 2.3
Williams, Jim, 7.39
Wong, James, 7.39, 10.6
Wooley, Bruce, 8.38
WorldFIP, industrial network standard, 9.5
Wurcer, Scott, 5.1, 10.6
Wynne, J., 10.57
Zener diode, 10.63

Analog Devices Parts Index

A

AD210, 3.54-56
AD260, 10.55-57
AD261, 10.55-57
AD2S90, 6.14-15
AD420, 9.1-2
AD421, 9.2-3
AD524, 3.48
AD524C, 3.47
AD549, 5.6, 5.8
AD588, 4.10-11
AD592, 7.21-22
AD592CN, 7.21
AD594, 7.9
AD595, 7.9
AD598, 6.3, 6.5
AD620, 2.7, 3.36-40, 3.42, 3.45-46, 3.55-56, 4.9-11, 10.5, 10.41-42, 10.61-62
AD620B, 3.46-47
AD621, 3.42
AD621B, 3.47
AD622, 3.47
AD623, 2.7, 3.40-41, 3.46
AD623B, 3.47
AD624C, 3.42
AD625C, 3.47
AD626, 3.23, 3.46
AD626B, 3.47
AD627, 2.7, 3.34-35, 3.46, 10.64
AD627B, 3.34, 3.47
AD645, 3.15, 5.6
AD688, 3.9
AD698, 6.5-6
AD707, 2.16, 3.4, 3.5, 3.6, 3.11, 3.16-18, 3.51, 10.3
AD743, 3.11, 3.14, 3.15, 5.22, 5.28-29
AD744, 3.15, 5.22
AD745, 3.11, 3.14, 5.22, 5.27-30, 5.28-29
AD795, 5.6-9, 5.22
AD795K, 5.11, 5.18
AD820, 3.27-28, 5.22, 8.8-9
AD822, 3.27-28, 3.38, 3.40
AD823, 5.21-25
AD824, 3.27-28
AD843, 5.22
AD845, 5.22
AD974, 8.5, 8.8
AD976, 8.8
AD977, 8.8
AD77XX family, 7.11, 7.14-15, 8.22, 8.25, 8.31-32
AD789X family, 8.8
AD1555, 8.23
AD1556, 8.23
AD1879, 8.22
AD7472, 8.5
AD7670, 8.5
AD7705, 8.23
AD7706, 8.23
AD7710, 8.23
AD7711, 8.23
AD7712, 8.23
AD7713, 8.23
AD7714, 8.23, 9.2
AD7715, 8.23, 9.2
AD7716, 8.32-34
AD7722, 10.7
AD7730, 2.14-15, 2.17, 4.12-13, 8.23, 8.25-31, 10.7
AD7731, 8.23, 10.7
AD7750, 8.34-37
AD7751, 8.36
AD7816, 7.32-34
AD7817, 7.32-34
AD7818, 7.32-34
AD7856, 8.5
AD7857, 8.5
AD7858, 8.5, 8.14-15
AD7858L, 8.14-15
AD7859, 8.5, 8.15
AD7859L, 8.15
AD7887, 8.5
AD7888, 8.5
AD7890-10, 8.8-9, 10.63, 10.65
AD7891, 8.5
AD7892, 10.7
AD8531, 3.23
AD8532, 3.23
AD8534, 3.23
AD8551, 2.16, 3.51-52
AD8552, 2.16, 3.51-52
AD8554, 2.16, 3.51-52
AD9814, 5.37
AD9816, 5.37-38
AD22103, 7.22-23
AD22151, 6.8-9
ADG7XX family, 8.12
ADG451, 8.12
ADG452, 8.12
ADG453, 8.12
ADG465, 10.65-67
ADG466, 10.65-67

ADG467, 10.65-67
ADG508F, 8.12
ADG509F, 8.12
ADG527F, 8.12
ADMXXX-E, 10.75-76
ADM1021, 7.35-38
ADMC300, 6.18-19
ADMC330, 6.18-19
ADMC331, 6.18-19
ADP1148, 10.28-31
ADP3310, 10.30-31
ADT05, 7.29-30
ADT14, 7.32
ADT22, 7.32
ADT23, 7.32
ADT45, 7.24-25
ADT50, 7.24-25
ADT70, 7.14-15
ADT71, 7.14
ADT701, 7.14
ADuC810, 9.8-9, 9.15-16
ADuC812, 9.8, 9.11-13, 9.15-16
ADuC816, 9.8-11, 9.15-16
ADXL05, 6.23
ADXL150, 6.23
ADXL190, 6.23
ADXL202, 6.22-23
ADXL210, 6.23
ADXL250, 6.23
AMP01A, 3.47
AMP02, 3.48
AMP02E, 3.47
AMP04E, 3.47

M
MicroConverter, 1.4, 1.6, 9.6-8

O
OP07, 3.12, 3.15, 3.21, 5.5
OP27, 3.12, 3.14-15, 5.29-30
OP42, 5.22
OP97, 5.5
OP113, 3.21, 3.27-28
OP177, 2.16, 3.4-6, 3.10-11, 3.16-18, 3.51, 4.9-11, 10.3
OP177A, 3.3, 3.19
OP181, 3.27-28
OP184, 3.24, 3.27-28
OP191, 3.24, 3.27-28
OP193, 3.27-28, 7.9
OP196, 3.27-28
OP213, 3.21, 3.27-28, 3.37, 4.11-12
OP250, 3.23
OP279, 3.24
OP281, 3.27-28
OP282, 3.23
OP284, 3.24, 3.27-28, 3.37
OP291, 3.24, 3.27-28, 3.37
OP293, 3.27-28
OP296, 3.27-28
OP413, 3.21, 3.27-28
OP450, 3.23
OP481, 3.27-28
OP482, 3.23
OP484, 3.24, 3.27-28
OP491, 3.24, 3.27-28
OP493, 3.27-28
OP496, 3.27-28

R
REF195, 4.11-12

T
TMP01, 7.31-32
TMP03, 7.26-29
TMP04, 7.26-29
TMP17, 7.21-22
TMP35, 7.8-9, 7.11, 7.23
TMP36, 7.23
TMP37, 7.23
TMP17F, 7.21