Contents in Detail

Acknowledgments 9
Introduction 10

1 Passive Components 13
32 kHz Quartz Crystal 14
Carbon Film Resistor 16
High-Stability Film Resistor 18
Wirewound Power Resistor 19
Thick-Film Resistor Array 20
Surface-Mount Chip Resistor 22
Thin-Film Resistor Array 23
Wirewound Potentiometer 24
Trimmer Potentiometer 26
15-Turn Trimmer Potentiometer 28
10-Turn Potentiometer 30
Ceramic Disc Capacitor 32
Glass Capacitor 34
Multilayer Ceramic Capacitor 36
Aluminum Electrolytic Capacitor 37
Film Capacitor 38
Dipped Tantalum Capacitor 40
Polymer Tantalum Chip Capacitor 42
Polymer Aluminum Chip Capacitor 43
Axial Inductor 44
Surface-Mount Inductor 46
Sintered Ferrite Inductor 47
Ferrite Bead 48
Three-Terminal Filter Capacitor 49
Toroidal Transformer 50
Power Supply Transformer 52
Low-Power Cartridge Fuses 54
Axial Lead Fuse 56
Liquid Power Fuse 57
Compact Power Fuse 58
Thermal Fuse 60
1N4002 Diode 64
Glass-Encapsulated Diodes 66
Rectifier Bridge 68
2N2222 Transistor 70
2N3904 Transistor 72
LM309K Voltage Regulator 74
Dual In-Line Package (DIP) ICs 76
ATmega328 Microcontroller 78
Small Outline Integrated Circuit 80
Thin Quad Flat Pack 82
Ball Grid Array 84
Microprocessor SoC 86
Through-Hole Red LED 88
Surface-Mount LED 90
Red Green Bicolor LED 91
White LED 92
Laser Diode 94
Optocoupler 96
Optical Tilt Sensor 97
Optical Encoders 98
Ambient Light Sensor 100
CMOS Image Sensor 102
3 Electromechanics

Toggle Switch 105
Slide Switch 106
Pushbutton Switch 108
DIP Switch 109
Tactile Switch 110
Microswitch 112
Electromagnetic Relay 114
Thermal Switch 116
Brushed DC Motor 118
Stepper Motor 120
Magnetic Buzzer 122
Speaker 124
Smartphone Camera 128
    Inside the Camera Module 130
Rotary Voice Coil Motor 132
Optical Drive Focusing Motors 133
Electret Microphone 134

4 Cables and Connectors

Solid and Stranded Wire 137
AC Power Cable 138
IDC Ribbon Cable 140
Modular Telephone Cable 141
DIP Sockets 142
Barrel Plug and Jack 144
Quarter-Inch Audio Plug and Jack 146
3.5 mm Audio Connector 148
LMR-195 Coaxial Cable 150
Laptop Power Cable 151
RG-6 Coaxial Cable 152
Cable TV RG-59 153
F Connector 154
BNC Plug and Jack 156
SMA Connector 158
DE-9 Connector 160
Category 6 Ethernet Cable 162
SATA Cable 163
HDMI Cable 164
VGA Cable 166
Basic USB Cable 168
    USB Jack 170
SuperSpeed USB Cable 172

5 Retro Tech

Neon Lamp 175
Nixie Tube 176
    Inside the Nixie Tube 180
12AX7 Vacuum Tube 182
Vacuum Fluorescent Display Tube 184
    Inside the CRT 188
Cathode Ray Tube 186
    Mercury Tilt Switch 190
Vintage Wirewound Resistors 191
Carbon Composition Resistor 192
Cornell-Dubilier 9LS Capacitor 194
Dipped Silver Mica Capacitor 196
Axial Multilayer Ceramic Capacitor 197
IF Transformer 198
Incandescent Light Bulb 200
Camera Flashbulb 202
Photoresistor 204
Point Contact Diode 206
Germanium Diode 207
µA702 Integrated Circuit 208
Windowed EPROM 210
Core Memory 212
IBM SLT Module 214
Analog Panel Meter 216
Magnetic Tape Head 218
Thin-Film Hard Drive Head 220
GMR Hard Drive Head 222

6 Composite Devices 225
LED Filament Light Bulb 226
Single-Side Printed Circuit Board 228
Two-Layer Printed Circuit Board 230
Multilayer Circuit Boards 232
Flex and Rigid-Flex Circuit Boards 234
Elastomeric Connector 236
MicroSD Card 238
Glob-Top Packaging 240
EMV Credit Card Chip 241
NFC Key Card 242
Smartphone Logic Board 244
Inside the Logic Board 246

Ethernet Transformer 248
DC-DC Converter 249
Seven-Segment LED Display 250
Thick-Film LED Numeric Display 252
5×7 LED Dot Matrix Display 254
Vintage LED Bubble Display 256
Alphanumeric LED Display 258
Temperature-Compensated Clock 260
Crystal Oscillator 262
Avalanche Photodiode Module 264
3656HG Isolation Amplifier 266
Inside the Isolation Amplifier 268

Afterword 271
Cutting and Polishing 272
Cleaning 274
Potting 275
Mounting 276
Photographic Equipment 278
Retouching 280
About Macro Photography 281
Focus Stacking 282
Glossary 285
Index 291