Index
Index

A

AC, see Alternating current
AC circuit 63
AC power 235
AC signal 64
Acceptor atom 85
Acceptor impurity 85
Active power 245
AC - to - DC conversion 110
Alternating current 3, 11, 64
Aluminum 83, 85
Amplifier circuit 176
Amplitude 64, 65
Analog multiplier 188
AND gate 213
Apparent power 245, 247
Arsenic 84
Associative law 219
Atomic number 81
Average power 237
Average value 65, 265
Attractive force 3

B

Barrier potential 94
Base 126
Bias current 138
Biasing the 136
Binary quantity 209
Binary value 209
Binding energy 78
**Fundamentals of Electrical and Electronic Design**

<table>
<thead>
<tr>
<th>Term</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>BJT see Bipolar junction transistor</td>
<td>126</td>
</tr>
<tr>
<td>Bipolar junction transistor</td>
<td>126</td>
</tr>
<tr>
<td>Bipolar junction transistor circuit</td>
<td>132</td>
</tr>
<tr>
<td>Boolean algebra</td>
<td>216, 218</td>
</tr>
<tr>
<td>Boron</td>
<td>83, 85, 89</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Term</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacitance</td>
<td>4, 22</td>
</tr>
<tr>
<td>Capacitive load</td>
<td>247</td>
</tr>
<tr>
<td>Capacitive reactance</td>
<td>70</td>
</tr>
<tr>
<td>Capacitor</td>
<td>67</td>
</tr>
<tr>
<td>Capacitors in parallel</td>
<td>4</td>
</tr>
<tr>
<td>Capacitors in series</td>
<td>4</td>
</tr>
<tr>
<td>Circuit analysis</td>
<td>48</td>
</tr>
<tr>
<td>Clampers</td>
<td>121</td>
</tr>
<tr>
<td>Clippers</td>
<td>116</td>
</tr>
<tr>
<td>Clipper network</td>
<td>117</td>
</tr>
<tr>
<td>Collector</td>
<td>126</td>
</tr>
<tr>
<td>Column - III material</td>
<td>83, 86</td>
</tr>
<tr>
<td>Column - IV material</td>
<td>83</td>
</tr>
<tr>
<td>Column - V material</td>
<td>83, 86</td>
</tr>
<tr>
<td>Common emitter configuration</td>
<td>131</td>
</tr>
<tr>
<td>Commutative law</td>
<td>218</td>
</tr>
<tr>
<td>Compound gate</td>
<td>213</td>
</tr>
<tr>
<td>Conductance</td>
<td>3, 5</td>
</tr>
<tr>
<td>Conduction band</td>
<td>82</td>
</tr>
<tr>
<td>Conductor</td>
<td>77</td>
</tr>
<tr>
<td>Constant current source</td>
<td>183</td>
</tr>
<tr>
<td>Constantan</td>
<td>6</td>
</tr>
<tr>
<td>Construction of transistor</td>
<td>126</td>
</tr>
<tr>
<td>Coulomb</td>
<td>2</td>
</tr>
<tr>
<td>Coulomb's law</td>
<td>2</td>
</tr>
<tr>
<td>Covalent bond</td>
<td>81</td>
</tr>
<tr>
<td>Index</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Crystal</td>
<td>78</td>
</tr>
<tr>
<td>Current – to – voltage converter</td>
<td>182</td>
</tr>
<tr>
<td>Current divider</td>
<td>4, 20</td>
</tr>
<tr>
<td>Current source</td>
<td>4, 9, 12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeMorgan theorem</td>
</tr>
<tr>
<td>Diamond</td>
</tr>
<tr>
<td>Difference operational amplifier</td>
</tr>
<tr>
<td>Differentiator</td>
</tr>
<tr>
<td>Diffuse sensing</td>
</tr>
<tr>
<td>Digital circuit</td>
</tr>
<tr>
<td>Diode</td>
</tr>
<tr>
<td>DC, see Direct current</td>
</tr>
<tr>
<td>Direct current</td>
</tr>
<tr>
<td>Distributive law</td>
</tr>
<tr>
<td>Donor atom</td>
</tr>
<tr>
<td>Donor impurity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective value</td>
</tr>
<tr>
<td>Effective value of current</td>
</tr>
<tr>
<td>Electric value of voltage</td>
</tr>
<tr>
<td>Electric charge</td>
</tr>
<tr>
<td>Electric current</td>
</tr>
<tr>
<td>Electrical power</td>
</tr>
<tr>
<td>Electromotive force</td>
</tr>
<tr>
<td>Electrical potential and potential difference</td>
</tr>
<tr>
<td>Electron</td>
</tr>
<tr>
<td>Electron – hole pair</td>
</tr>
<tr>
<td>Electrostatic force</td>
</tr>
</tbody>
</table>
### Fundamentals of Electrical and Electronic Design

- **emf**, see Electromotive force
- Emitter 126
- Energy 4, 82
- Equilibrium situation 80
- Equivalence of the voltage and current generators 4
- Exclusive NOR gate 215
- Exclusive OR gate 215
- External resistance 31
- Extrinsic semiconductor 84, 85

### F

- Farad 22, 68
- Five – variable map 224
- Flow sensors 275, 276
- Force transducers 275, 276
- Forward bias 93, 99
- Four – variable map 221
- Frequency 64, 65
- Full – wave rectification 106, 113
- Full – wave rectifier 102, 272

### G

- Gallium 83
- Germanium 78, 80
- Gravitational force 2, 3
- Grouping cells 222

### H

- Half – wave rectification 106
Index

Half-wave rectifier  101, 116, 272
Hall effect transducers  274
Heat  82
Henry  72
Hertz, Heinrich  64
Hole  79

Ideal current amplifier  191
Ideal current source  10
Ideal voltage amplifier  189
Impurity  85
Indium  83
Inductance  4, 21
Induction transducers  273
Inductive circuit  74
Inductive load  247
Inductive reactance  74
Inductor  21
Inductors in parallel  4
Inductors in series  4
Input resistance  30, 31
Instantaneous current  75
Instantaneous voltage  75
Insulator  77, 81
Integrator  184
Internal resistance  3, 7
Intrinsic semiconductor  78, 79
Inverting operational amplifier  177
Ionized atom  84, 86
<table>
<thead>
<tr>
<th>Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joule</td>
<td>6, 7</td>
</tr>
<tr>
<td>K – map</td>
<td>see Karnaugh map</td>
</tr>
<tr>
<td>Karnaugh map</td>
<td>220</td>
</tr>
<tr>
<td>KCL, see</td>
<td>Kirchhoff’s current law</td>
</tr>
<tr>
<td>Kirchhoff’s</td>
<td>current law 34</td>
</tr>
<tr>
<td>Kirchhoff’s</td>
<td>voltage law 35</td>
</tr>
<tr>
<td>KVL, see</td>
<td>Kirchhoff’s voltage law</td>
</tr>
<tr>
<td>Lagging phase</td>
<td>75</td>
</tr>
<tr>
<td>Lead</td>
<td>84</td>
</tr>
<tr>
<td>Leading phase</td>
<td>75</td>
</tr>
<tr>
<td>LED, see</td>
<td>Light emitting diode</td>
</tr>
<tr>
<td>LED display</td>
<td>233</td>
</tr>
<tr>
<td>Level sensors</td>
<td>275, 277</td>
</tr>
<tr>
<td>Light emitting diode</td>
<td>104</td>
</tr>
<tr>
<td>Like charges</td>
<td>2</td>
</tr>
<tr>
<td>Limit switches</td>
<td>275</td>
</tr>
<tr>
<td>Load line</td>
<td>134</td>
</tr>
<tr>
<td>Logarithmic operational amplifier</td>
<td>186</td>
</tr>
<tr>
<td>Logic circuit</td>
<td>209</td>
</tr>
<tr>
<td>Logic gate</td>
<td>212</td>
</tr>
<tr>
<td>Magnetic transducers</td>
<td>273</td>
</tr>
<tr>
<td>Majority carriers</td>
<td>85</td>
</tr>
<tr>
<td>Term</td>
<td>Page(s)</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Manganese</td>
<td>6</td>
</tr>
<tr>
<td>Mesh analysis</td>
<td>48, 54</td>
</tr>
<tr>
<td>Mesh analysis method</td>
<td>52, 59</td>
</tr>
<tr>
<td>Minority carriers</td>
<td>85</td>
</tr>
<tr>
<td>Mutual inductance</td>
<td>23</td>
</tr>
<tr>
<td>n-region</td>
<td>87</td>
</tr>
<tr>
<td>n-type semiconductor</td>
<td>88, 90, 127</td>
</tr>
<tr>
<td>NAND gate</td>
<td>214</td>
</tr>
<tr>
<td>Negative charge 1</td>
<td></td>
</tr>
<tr>
<td>Negative half-cycle</td>
<td>101</td>
</tr>
<tr>
<td>Nodal Analysis</td>
<td>48</td>
</tr>
<tr>
<td>Nodal Analysis method</td>
<td>48, 59</td>
</tr>
<tr>
<td>Non-inverting operational amplifier</td>
<td>178</td>
</tr>
<tr>
<td>NOR gate</td>
<td>214</td>
</tr>
<tr>
<td>Norton equivalent circuit</td>
<td>36</td>
</tr>
<tr>
<td>Norton theorem</td>
<td>43</td>
</tr>
<tr>
<td>NOT gate</td>
<td>212</td>
</tr>
<tr>
<td>npn transistor</td>
<td>126</td>
</tr>
<tr>
<td>OHM's law</td>
<td>51</td>
</tr>
<tr>
<td>op-amp see Operational amplifier</td>
<td></td>
</tr>
<tr>
<td>Operation of npn transistor</td>
<td>128</td>
</tr>
<tr>
<td>Operation of pnp transistor</td>
<td>128</td>
</tr>
<tr>
<td>Operation point</td>
<td>133</td>
</tr>
<tr>
<td>Operational amplifier</td>
<td>173</td>
</tr>
<tr>
<td>Opposed sensing</td>
<td>271</td>
</tr>
<tr>
<td>Optical sensors</td>
<td>271</td>
</tr>
<tr>
<td>Optoisolators</td>
<td>273</td>
</tr>
<tr>
<td>Term</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>p - region</td>
<td>87</td>
</tr>
<tr>
<td>p - type semiconductor</td>
<td>88, 90, 127</td>
</tr>
<tr>
<td>p-n junction</td>
<td>91, 93, 95</td>
</tr>
<tr>
<td>pnp transistor</td>
<td>126</td>
</tr>
<tr>
<td>Parallel connection of n capacitors</td>
<td>28</td>
</tr>
<tr>
<td>Parallel connection of n inductors</td>
<td>24</td>
</tr>
<tr>
<td>Parallel connection of n resistors</td>
<td>4, 16</td>
</tr>
<tr>
<td>Parallel connection of resistors</td>
<td>17</td>
</tr>
<tr>
<td>Periodic function</td>
<td>65</td>
</tr>
<tr>
<td>Permittivity</td>
<td>68, 69</td>
</tr>
<tr>
<td>Permittivity of the air</td>
<td>69</td>
</tr>
<tr>
<td>Phase</td>
<td>64, 65</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>84, 89</td>
</tr>
<tr>
<td>Photo conductive cells</td>
<td>269</td>
</tr>
<tr>
<td>Photo diode</td>
<td>104, 270</td>
</tr>
<tr>
<td>Photo transistors</td>
<td>271</td>
</tr>
<tr>
<td>Photovoltaic transducers</td>
<td>269</td>
</tr>
<tr>
<td>pnp transistor</td>
<td>126</td>
</tr>
<tr>
<td>Positive charge</td>
<td>1</td>
</tr>
<tr>
<td>Positive half - cycle</td>
<td>107</td>
</tr>
<tr>
<td>Potential difference</td>
<td>14, 15, 16</td>
</tr>
<tr>
<td>Potentiometers</td>
<td>275, 276</td>
</tr>
<tr>
<td>Power</td>
<td>4, 235</td>
</tr>
<tr>
<td>Power factor</td>
<td>244</td>
</tr>
<tr>
<td>Power factor correction</td>
<td>248</td>
</tr>
<tr>
<td>Power supply</td>
<td>171</td>
</tr>
<tr>
<td>Power triangle</td>
<td>247</td>
</tr>
<tr>
<td>Practical current amplifier</td>
<td>193, 194</td>
</tr>
<tr>
<td>Practical voltage amplifier</td>
<td>193</td>
</tr>
<tr>
<td>Purely capacitive circuit</td>
<td>67</td>
</tr>
</tbody>
</table>
### Index

<table>
<thead>
<tr>
<th>Term</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purely capacitive load</td>
<td>242</td>
</tr>
<tr>
<td>Purely inductive circuit</td>
<td>72</td>
</tr>
<tr>
<td>Purely inductive load</td>
<td>240</td>
</tr>
<tr>
<td>Purely resistive load</td>
<td>237</td>
</tr>
</tbody>
</table>

Quiescent point 133

<table>
<thead>
<tr>
<th>Term</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>RC circuit</td>
<td>252</td>
</tr>
<tr>
<td>Reactance in capacitive circuit</td>
<td>70</td>
</tr>
<tr>
<td>Reactance in inductive circuit</td>
<td>74</td>
</tr>
<tr>
<td>Reactive power</td>
<td>245</td>
</tr>
<tr>
<td>Rectifier circuit</td>
<td>101</td>
</tr>
<tr>
<td>Rectifier diode</td>
<td>103</td>
</tr>
<tr>
<td>Relative permittivity</td>
<td>69</td>
</tr>
<tr>
<td>Repulsive force</td>
<td>3</td>
</tr>
<tr>
<td>Resistance</td>
<td>3, 5, 7</td>
</tr>
<tr>
<td>Resistance Temperature Detectors (RTD)</td>
<td>267</td>
</tr>
<tr>
<td>Resistors in parallel</td>
<td>4</td>
</tr>
<tr>
<td>Resistors in series</td>
<td>4, 13, 16</td>
</tr>
<tr>
<td>Retro-reflective sensing</td>
<td>271</td>
</tr>
<tr>
<td>Reverse bias</td>
<td>93, 95, 99</td>
</tr>
<tr>
<td>Reverse breakdown</td>
<td>96</td>
</tr>
<tr>
<td>RL circuit</td>
<td>261</td>
</tr>
<tr>
<td>RMS value</td>
<td>65, 274</td>
</tr>
<tr>
<td>Root mean square value</td>
<td>65</td>
</tr>
<tr>
<td>Term</td>
<td>Page</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Self inductance</td>
<td>21</td>
</tr>
<tr>
<td>Semiconductor</td>
<td>77</td>
</tr>
<tr>
<td>Semiconductor</td>
<td>77</td>
</tr>
<tr>
<td>Sensors</td>
<td>265</td>
</tr>
<tr>
<td>Series connection of inductors</td>
<td>22</td>
</tr>
<tr>
<td>Series connection of (n) resistors</td>
<td>4</td>
</tr>
<tr>
<td>Series connection of resistors</td>
<td>15</td>
</tr>
<tr>
<td>SI unit</td>
<td>2, 4</td>
</tr>
<tr>
<td>Silicon</td>
<td>78</td>
</tr>
<tr>
<td>Silicon atom</td>
<td>81, 89</td>
</tr>
<tr>
<td>Silicon crystal</td>
<td>81</td>
</tr>
<tr>
<td>Sinusoidal voltage</td>
<td>75</td>
</tr>
<tr>
<td>Sinusoidal wave form</td>
<td>118</td>
</tr>
<tr>
<td>Solid state temperature sensors</td>
<td>268</td>
</tr>
<tr>
<td>Source conversion</td>
<td>3, 12</td>
</tr>
<tr>
<td>Structure of silicon atom</td>
<td>81</td>
</tr>
<tr>
<td>Summing operational amplifier</td>
<td>180</td>
</tr>
<tr>
<td>Super position</td>
<td>58</td>
</tr>
<tr>
<td>Switching diode</td>
<td>103</td>
</tr>
<tr>
<td>Symbol for diode</td>
<td>98</td>
</tr>
<tr>
<td>Symbol for transistor</td>
<td>127</td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>6, 267</td>
</tr>
<tr>
<td>Temperature display system</td>
<td>206</td>
</tr>
<tr>
<td>Terminal voltage</td>
<td>3, 7, 31</td>
</tr>
<tr>
<td>Thermistors</td>
<td>266</td>
</tr>
<tr>
<td>Thermocouples</td>
<td>268</td>
</tr>
<tr>
<td>Thevenin’s equivalent circuit</td>
<td>36</td>
</tr>
<tr>
<td>Thevenin’s theorem</td>
<td>37</td>
</tr>
<tr>
<td>Three variable map</td>
<td>221</td>
</tr>
<tr>
<td>Term</td>
<td>Page(s)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Time constant</td>
<td>121, 255, 262</td>
</tr>
<tr>
<td>Transducers</td>
<td>265</td>
</tr>
<tr>
<td>Transistor</td>
<td>77, 126</td>
</tr>
<tr>
<td>Trigonometry identity</td>
<td>73</td>
</tr>
<tr>
<td>Tunnel diode</td>
<td>105</td>
</tr>
<tr>
<td>Two - variable map</td>
<td>220</td>
</tr>
<tr>
<td>Ultrasonic sensors</td>
<td>277</td>
</tr>
<tr>
<td>Unlike charges</td>
<td>2</td>
</tr>
<tr>
<td>Valence band</td>
<td>81, 82</td>
</tr>
<tr>
<td>Variation reluctance transducers</td>
<td>274</td>
</tr>
<tr>
<td>Volt ampere characteristics of diode</td>
<td>96</td>
</tr>
<tr>
<td>Voltage divider</td>
<td>4, 18</td>
</tr>
<tr>
<td>Voltage follower</td>
<td>179</td>
</tr>
<tr>
<td>Voltage source</td>
<td>3, 7, 11, 31</td>
</tr>
<tr>
<td>Voltmeter</td>
<td>206</td>
</tr>
<tr>
<td>Waveform</td>
<td>64, 265</td>
</tr>
</tbody>
</table>

Index
Zener diode 96, 105, 171