Power Electronics Technology Trend
Tiny & Efficient Power Solutions for Handheld Products

- USB Power Manager: LTC4410
- Boost Converter: LTC3440/1
- Step-Down DC/DC Converter: LTC3406
- Battery Charger: LTC4058
- Low Noise Boost Converter: LTC3460
- White LED Driver: LT3465/A
- Inductorless Boost Converter: LTC3200-5
1, 2, 3, or 4-Cell Designs

MAX1800

MAX1802

MAX1801 SLAVE CONTROLLER

MAX1802 STEP-DOWN MASTER

MAX1800 STEP-UP MASTER

DIMENSIONS INCLUDES LEADS

EXAMPLE OF A COMPLETE DIGITAL CAMERA POWER SUPPLY (CAN ALSO BE USED IN PDAS)

INPUT
0.7V TO 5.5V

- 18V
- 12V
- 7.5V
- 15V
- 7V
- 1.8V
- 3.3V

EIGHT OUTPUTS

5V

LENS COVER

ADD UP TO FIVE SLAVE CONTROLLERS

ZOOM MOTOR DRIVE

CCFL MODULE

CCD BIAS

LCD BIAS

LOGIC

DRIVE

5V
Figure 3: Comparison of alkaline and lithium battery discharge curves.

- 2x Alkaline @ 22μA
- Lithium @ 2μA

[Graph showing the comparison between alkaline and lithium batteries]
C. THREE GENERAL TECHNOLOGIES
1. Linear Regulators
Employed where weight and heat flow are not crucial because design is fast and cost low. Efficiency is only 50 %

2. Pulsewidth modulated (PWM) converters
Employed in portable equipment or where high power flows demands the highest efficiency power conversion of about 95 %

3. RESONANT SWITCHED CONVERTERS
Utilized to achieve small size supplies and still avoid the electronic noise generated by PWM converters.

<table>
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We choose between the three approaches based upon the criterion for the system such as the four below:

1. Power levels in and out and required operating efficiency to minimize heat generation
% Efficiency = P(out) / P(in)

2. Size and weight limits as well as heat flow limits
Resistive voltage divider

Dissipative realization

\[ P_{in} = 1000\,W \]
\[ V = 100\,V \]
\[ P_{loss} = 500\,W \]
\[ R = 5\,\Omega \]
\[ V_{out} = 50\,V \]
\[ I = 10\,A \]
High efficiency is essential.

Efficiency is a good measure of converter performance. It is then feasible to operate within a converter. High efficiency leads to low power loss.

\[
\left(1 - \frac{u}{l}\right) = \frac{u - u_0}{u_0} = \frac{u_0 - p}{p} \\
\frac{u_0}{p_0} = u
\]
Efficiency = 89%

Low Vdc 100 A

Power supply

or

Vac

Power supply

Vac 100V

Efficiency = 80%

Power supply

16V

94%

92%

92%

Low Vdc

Power supply
A goal of current converter technology is to construct converters of small size and weight, which process substantial power at high efficiency.
Realities includes more

Ideal switch consumes zero power

In either event:

\[ p(t) = v(t) i(t) = 0 \]

Switch open:

\[ i(t) = 0 \]

Switch closed:

\[ v(t) = 0 \]

Power loss in an ideal switch

\[ v(t) \]

\[ + \]

\[ i(t) \]