# Voltage Regulators for the IBM 6x86 Microprocessor

IBM®

*Application Note*

| Revision Summary: This is the initial release of this Application Note. |
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# Introduction

The IBM 6x86** microprocessor delivers more performance than comparable microprocessors, but as a result, often draws more current and dissipates more power in active mode as well. As a result, some precautions need to be taken to ensure proper operation of the IBM 6x86 microprocessor. In particular, the system designer should be aware of three concerns related to this increased power consumption :

1. Increased demand of current from the voltage regulator,
2. Increased need for decoupling capacitance for the CPU voltage plane,
3. Increased heat from the extra power dissipation.

## Increased demand of current from the voltage regulator.

The IBM 6x86 microprocessor draws more current than some other competing microprocessors and requires a more robust voltage regulator as a result. In general, regulators with a minimum current limit of 7.0 Amps are required to reliably operate the 6x86 processors in the range of 100 - 120 MHz. These guidelines are conservative, in order to ensure that every 6x86 microprocessor will work with every regulator that is appropriate to its class, for every possible hardware and software condition.

Many regulators used in system designs today have an upper current limit of 5.0 A. The tables on the following page give a list of alternative regulators that fit many common physical specifications (3-pin, 5-pin, and VRM) and according to their specifications provide the appropriate current that the IBM 6x86 microprocessor requires. Keep in mind that in some system designs, the voltage plane provided by the regulator supplies power to other components (such as SRAM) as well as the CPU, and the power demand of all these components must be considered when choosing a regulator. These power solutions are currently only applicable to 100 - 120 MHz processors. This is not a complete list. Other vendors may also offer a high-current voltage regulator that fits you particular needs.

## Increased need for decoupling capacitance for the CPU voltage plane.

As the demand for current draw increases, the requirements for decoupling current spikes that the regulator sees become more severe -- see the Faxback document #40215, *Proper Decoupling Solutions for the IBM 6x86 Microprocessor* for suggestions.

## Increased heat from the extra power dissipation.

The increased heat from this power dissipation makes heatsink and fansink selection more crucial -- see the Faxback documents 40209, *Selection of Appropriate Thermal Solution for IBM 6x86 Microprocessors* and 40214 *Heatsink and Fan/Heatsink for IBM 6x86 Microprocessors* for suggestions.

| Vendor | Part Number | Current Limit (Amps) | | Package | Address |
|---|---|---|---|---|---|
| | | Min | Nominal | | |
| Semtech Incorporated [1] | EZ1083 | 7.5 | 9.5 | TO-220-3 | 652 Mitchell Road Newbury Park, CA 91320 (805)-498-2111 |
| | EZ1584 | 7.1 | 8.25 | TO-220-3 | |
| | EZ1087 [2] | 5 | 7.5 | TO-220-5 | |
| | | | | | |
| Micrel Semiconductor[3] | MIC29752BWT | 7.5 | 9.5 | TO-247-5 | 1849 Fortune Drive San Jose,CA 95131 (408)-435-3415 |
| | MIC29712BT | 7.5 | 9.5 | TO-220-5 | |
| | | | | | |
| Linear Technology [4] | LT1584 | 7.1 | 8.25 | TO-220-3 | 1630 McCarty Blvd.Milpitas,CA 95035 (408)-432-1900 |
| | LT1083 | 7.5 | 9.5 | TO-220-3 | |
| | LT1087 | 5 | 7.5 | TO-220-5 | |

[1] Semtech Corp. Linear Regulator Data Book, Copyright 1985

[2] Requires two (2) regulators in parallel to provide 10A current limit

[3] Micrel Semiconductor 1995 Data Book

[4] Linear Technology 1994 Linear Data Book Volume III

**Table 1: Linear Regulator Power Solutions for the IBM 6x86 Microprocessor**

| Vendor | Part Number | Current Limit (A) | | Package | Address |
|---|---|---|---|---|---|
| | | Min | Nominal | | |
| Semtech Incorporated [1] | MP54C-E | 7.5 | 9.5 | Module | 652 Mitchell Road Newbury Park,CA 91320 |
| | | | | | |
| Amp Incorporated [2] | 869947-1 | 7.1 | | Module | (800)522-6752 |

[1] Semtech Corp. Linear Regulator Data Book, Copyright 1985

[2] AMP FAX Document 108-1573 Rev.O - 02Nov95

**Table 2: Voltage Regulator Power Solutions for the IBM 6x86 Microprocessor**

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