Technical Guide to Voltage Regulators

Voltage Regulators : The linear regulator is the basic building block of nearly every power supply used in electronics. Every electronic circuit is designed to operate off, of the some supply voltage, which is usually assumed to be constant. A voltage regulator provides this constant DC output voltage & contains circuitry that continuously holds the output voltage at the design value regardless of changes in the load current or input voltage (assuming that the load current & input voltage are within the specified operating range for the part).

IC Voltage Regulators : Integrated circuit voltage regulators are semi conductor devices that output a constant & stable DC voltage at specified level, despite fluctuations in its input voltage or variations in load. Voltage regulator ICs have already become available in so many forms & characteristics that they have virtually eliminated the need to build voltage regulating circuits from discrete components. IC linear voltage regulators can provide positive, negative or both positive & negative polarity. With positive polarity, the output voltage is in phase (positive) with the input voltage. With negative polarity, the output voltage is out of phase (negative) with the input voltage.
Important considerations when selecting a voltage regulator include:

1. The desired output voltage level & its regulation capability
2. The output current capacity
3. The applicable input voltages
4. Conversion efficiency (P_{out}/P_{in})
5. Transient response time.

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A typical linear voltage regulator operates by forcing a fixed voltage at the output through a voltage controlled current source. It has feedback mechanism that continuously adjusts the current source into delivering more current to the load to maintain the output voltage. Thus the capacity of this current source is generally the limiting factor for the maximum load current that the linear regulator can deliver while maintaining the required output level. The amount of time needed for the output to adjust to a change in the input or load is the transient response time of the regulator
The feedback loop used by linear regulators need some form of compensation for stability. In most linear regulator ICs, the required feedback loop compensation is already built into the circuit, thereby requiring no external components for this purpose. However, some regulator ICs, like the low drop out ones, do require that a capacitor be connected between the output & the ground to ensure stability.

Important Defiitions of the Specifications

Line Regulation: The ability of the power supply voltage regulator to maintain its output voltage despite variations in its input voltage

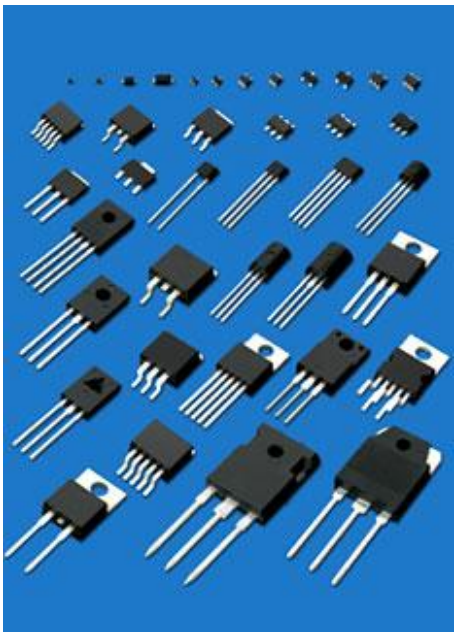
Dropout Voltage (Vdrop): The dropout voltage is the difference between input voltage & the output voltage at which point the regulator starts to fall out of regulation. Below this value, the output voltage will fall as the input voltage is reduced. It depends on the load current & the temperature

Short Circuit Current(Ishort): Current which flows when output is connected with terminal GND, Be not short circuited. This measurement is measured by the pulse so that the power loss is less & the change of the Chip temperature is minimal.

Load Regulation: Load regulation is the ability of the regulator to maintain a constant output voltage as the load current changes. It is pulsed measurement to minimize temperature effects with the input voltage set to Vin=Vo+ 1V

Quiescent Current (Iq): The quiescent current is the current which flows through the ground terminal under no load conditions, (Io = 0 mA)

Ripple Rejection Ratio (RR): Ripple rejection is the ability of the regulator to attenuate the ripple content of the input voltage at the output. It is expressed in dB.



IC voltage regulators are available in a variety of package types. They are used in industrial, automotive, medical electronics, aerospace & military applications, as well as consumer electronics & telecommunications.

Types of Packages

TO 92 : TO-92 is a single in-line, transistor outline (TO) package that is often used for low power devices.TO-92 is suitable for applications I office & communication.

TO 220: TO-220 is a transistor outline (TO) package that is suitable for high power, medium current & fast switching power devices. TO-220 is used I home appliances, office & industrial equipment, & consumer electronics. TO-220 full pack includes a heat sink that does not require extra hardware for electrical isolation.

TO-263: TO-263 is the surface mount version of the TO-220 package. TO-263 is a transistor outline (TO) package with 2,3,5,6 or 7 leads. It is suitable for high power applications due to its low resistance. Typical applications for TO-263 include home appliances & personal computers.

SOT-23: SOT-23 is a rectangular, surface mount, small outline transistor (SOT) package with three or more gull wing leads. SOT-23 features a very small foot print & is optimized for the highest possible current. SOT-23 is commonly used in home appliances, office & industrial equipment, personal computers, printers & communication equipment.

SOT 89: SOT-89 is a plastic, surface mount, small outline transistor (SOT) package with three leads & a collector pad for good heat transfer. Unlike other packages, SOT-89 lead posts are up-sets & not down-set. SOT-89 is designed for medium power & high speed switching applications.