

# **LDO Regulators Glossary**

## **Outline**

The Low Drop Out (LDO) regulator operates even when the voltage difference between the input and output is low.

This document explains terminologies such as absolute max. rating, operating range, electric characteristics, and built-in function listed in LDO regulator datasheet.

## Table of Contents

|                                     |   |
|-------------------------------------|---|
| Outline .....                       | 1 |
| Table of Contents.....              | 2 |
| 1. Absolute maximum ratings .....   | 3 |
| 2. Operating range .....            | 4 |
| 3. Electrical characteristics.....  | 5 |
| 4. Built-in Functions.....          | 6 |
| 5. Related Links.....               | 7 |
| 6. RESTRICTIONS ON PRODUCT USE..... | 8 |

### 1. Absolute maximum ratings

| Term                        | Symbol                  | Description   |
|-----------------------------|-------------------------|---|
| Input voltage               | $V_{IN}$                | The maximum rated voltage that can be applied to the $V_{IN}$ terminal without causing permanent damage to an IC or degrading its characteristics or reliability                |
| Bias voltage                | $V_{BAT}$<br>$V_{BIAS}$ | The maximum rated voltage that can be applied to the $V_{BAT}$ or $V_{BIAS}$ terminal without causing permanent damage to an IC or degrading its characteristics or reliability |
| Control voltage             | $V_{CT}$                | The maximum rated voltage that can be applied to the CONTROL terminal without causing permanent damage to an IC or degrading its characteristics or reliability                 |
| Adjustable voltage          | $V_{ADJ}$               | The maximum rated voltage that can be applied to the $V_{BAT}$ or $V_{ADJ}$ terminal without causing permanent damage to an IC or degrading its characteristics or reliability  |
| Output voltage              | $V_{OUT}$               | The maximum rated voltage that can be applied to the $V_{OUT}$ terminal without causing permanent damage to an IC or degrading its characteristics or reliability               |
| Output current              | $I_{OUT}$               | The maximum rated current that can be applied to the output terminal without causing permanent damage to an IC or degrading its characteristics or reliability                  |
| Power dissipation           | $P_D$                   | The maximum power consumption that does not cause permanent damage to an IC over the entire operating range   |
| Operating temperature range | $T_{opr}$               | The ambient temperature range in which an IC functions properly   |
| Storage temperature range   | $T_{stg}$               | The ambient temperature range in which an IC can be stored and transported without voltage application  |

### 2. Operating range

| Term                  | Symbol     | Description   |
|-----------------------|------------|---|
| Input voltage         | $V_{IN}$   | The input voltage range in which the normal operation and electrical characteristics of an IC are guaranteed            |
| Bias voltage          | $V_{BIAS}$ | The bias voltage range in which the normal operation and electrical characteristics of an IC are guaranteed             |
| Control voltage       | $V_{CT}$   | The control voltage range in which the normal operation and electrical characteristics of an IC are guaranteed          |
| Output voltage        | $V_{OUT}$  | The output voltage range in which the normal operation and electrical characteristics of an IC are guaranteed           |
| Output current        | $I_{OUT}$  | The maximum output current at which the normal operation and electrical characteristics of an IC are guaranteed         |
| Input capacitor       | $C_{IN}$   | The minimum input capacitor value at which the normal operation and electrical characteristics of an IC are guaranteed  |
| Bias capacitor        | $C_{BIAS}$ | The minimum bias capacitor value at which the normal operation and electrical characteristics of an IC are guaranteed   |
| Output capacitor      | $C_{OUT}$  | The minimum output capacitor value at which the normal operation and electrical characteristics of an IC are guaranteed |
| Operating temperature | $T_{opr}$  | The operating temperature range in which the normal operation and electrical characteristics of an IC are guaranteed    |

### 3. Electrical characteristics

| Term                           | Symbol   | Description  |
|--------------------------------|--|--|
| Output voltage accuracy        | $V_{OUT}$                                      | The accuracy of output voltage when the output current specified as a test condition is applied  |
| Bias voltage                   | $V_{BAT}$<br>$V_{BIAS}$                        | The bias voltage range in which the proper operation and electrical characteristics of an IC are guaranteed  |
| Input voltage                  | $V_{IN}$                                       | The input voltage range in which the proper operation and electrical characteristics of an IC are guaranteed   |
| Adjustable voltage             | $V_{ADJ}$                                      | The reference voltage of the internal error amplifier  |
| Line regulation                | Reg·line                                       | The variation of the output voltage as a function of input voltage changes over the specified test condition   |
| Load regulation                | Reg·load                                       | The variation of the output voltage as a function of output current changes over the specified test condition  |
| Quiescent current              | $I_B$  | The current that flows to the GND terminal under the specified test conditions   |
| Standby current                | $I_B(OFF)$<br>$I_{BIAS(OFF)}$<br>$I_{IN(OFF)}$ | The current that flows to the GND terminal when an IC is in the standby state by maintaining the control voltage at zero   |
| Minimum dropout voltage        | $V_{IN} - V_{OUT}$<br>$V_{DO}$                 | The drain-source on-voltage of the output MOSFET when the output current specified as a test condition is applied  |
| Temperature coefficient        | $T_{CVO}$                                      | The rate of change of the output voltage over the temperature range specified as a test condition  |
| Output noise voltage           | $V_{NO}$                                       | The noise voltage generated at the output of the specified test circuit  |
| Ripple rejection ratio         | R.R.   | The ratio of output voltage ripple to input voltage ripple applied to the specified test circuit   |
| Control voltage (ON)           | $V_{CT(ON)}$                                   | The CONTROL terminal voltage at which an IC turns on   |
| Control voltage (OFF)          | $V_{CT(OFF)}$                                  | The CONTROL terminal voltage at which an IC is in the standby state  |
| Control pulldown current       | $I_{CT}$                                       | The current that flows through the CONTROL terminal when the control voltage specified as a test condition is applied  |
| Load transient response        | $\Delta V_{OUT}$                               | The variation of the output voltage as a function of output current changes over the specified test condition  |
| Undervoltage lockout           | $V_{UVLO}$                                     | The input voltage at which the undervoltage lockout circuit is tripped to prevent a malfunction in the event of the voltage dropping below the operational value |
| Output discharge on-resistance | $R_{SD}$                                       | The value of the resistor that discharges an output capacitor when the output turns off  |

| Term                            | Symbol                | Description   |
|---------------------------------|-----------------------|---|
| Turn-on delay<br>Turn-off delay | $t_{ON}$<br>$t_{OFF}$ | <p>The time required for the output voltage to rise to its 90% point after the control voltage rises to its 10% point, and the time required for the output voltage to fall to its 10% point after the control voltage falls to its 90% point</p> |

### 4. Built-in Functions

| Term                           | Description  |
|--------------------------------|--|
| Overcurrent protection         | A protection function that limits the output current in the event that it exceeds the programmed value   |
| Foldback                       | A protection function that decreases the output voltage and thereby the output current in the event of an overcurrent condition. This output voltage-vs-output current curve is called the foldback curve.     |
| Thermal shutdown               | A function that protects an IC by turning off its output in the event that the IC temperature exceeds the programmed value   |
| Inrush current reduction       | A function that prevents a false malfunction of the overcurrent protection circuitry and an overshoot of the output voltage by limiting the current that flows to an output capacitor when the output turns on |
| Auto output discharge function | A function that discharges the charge stored in an output capacitor when the CONTROL terminal voltage drops to the Low level, turning off the output   |
| Undervoltage lockout circuit   | A function that maintains an IC in the standby state to prevent a malfunction in the event that the input voltage drops below the specified operating value  |
| Output-voltage soft-start      | A function that prevents a malfunction of the overcurrent protection circuitry and an overshoot of the output voltage by slowly raising the output voltage to slowly charge an output capacitor                |
| Control pulldown connection    | A function that pulls the CONTROL terminal to the Low level to prevent the internal circuitry from entering an undefined state in the event that the CONTROL terminal becomes open                             |

### 5. Related Links

- Product Line Ups (Catalog)
- Product Line Ups (Detail)
- Product Line Ups (Parametric search)
- Stock check & Purchase
- FAQ of Low Dropout Regulator ICs
- Application Notes

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