# LX8815

## Dual Channel 1A Low Dropout Regulator

**PRELIMINARY**

## DESCRIPTION

The LX8815 is a dual channel positive-voltage linear regulator. This dual regulator has either one fixed output coupled with an adjustable output or two fixed outputs. Each channel features low-dropout and high accuracy.

The LX8815 provides designers with a flexible power management solution, minimal printed circuit board area, and shorter design cycles.

Each channel can supply up to one amp independently with a regulator design optimized for system efficiency by consuming minimal ground current and directing quiescent current to the load.

The LX8815 features on-chip trimming of the internal voltage reference enabling precise output voltages, typically ±1% of it's specified value, while the BiPolar output transistor has a low dropout voltage even at full output current ($V_{DO}$ < 1.1V typ. @ 1A).

Thermal and Short Circuit Current Protection are integrated on-chip and operate independently for each regulator output.

The LX8815 regulator is stable with a low-value output capacitor, typically 3.3µF tantalum or 4.7µF ceramic on the outputs, allowing designers flexibility in external component selection.

Linfinity's S-PAK power package offers maximum power dissipation and ease of assembly using surface mount technology.

**IMPORTANT:** For the most current data, consult *MICROSEMI*'s website: **http://www.microsemi.com**

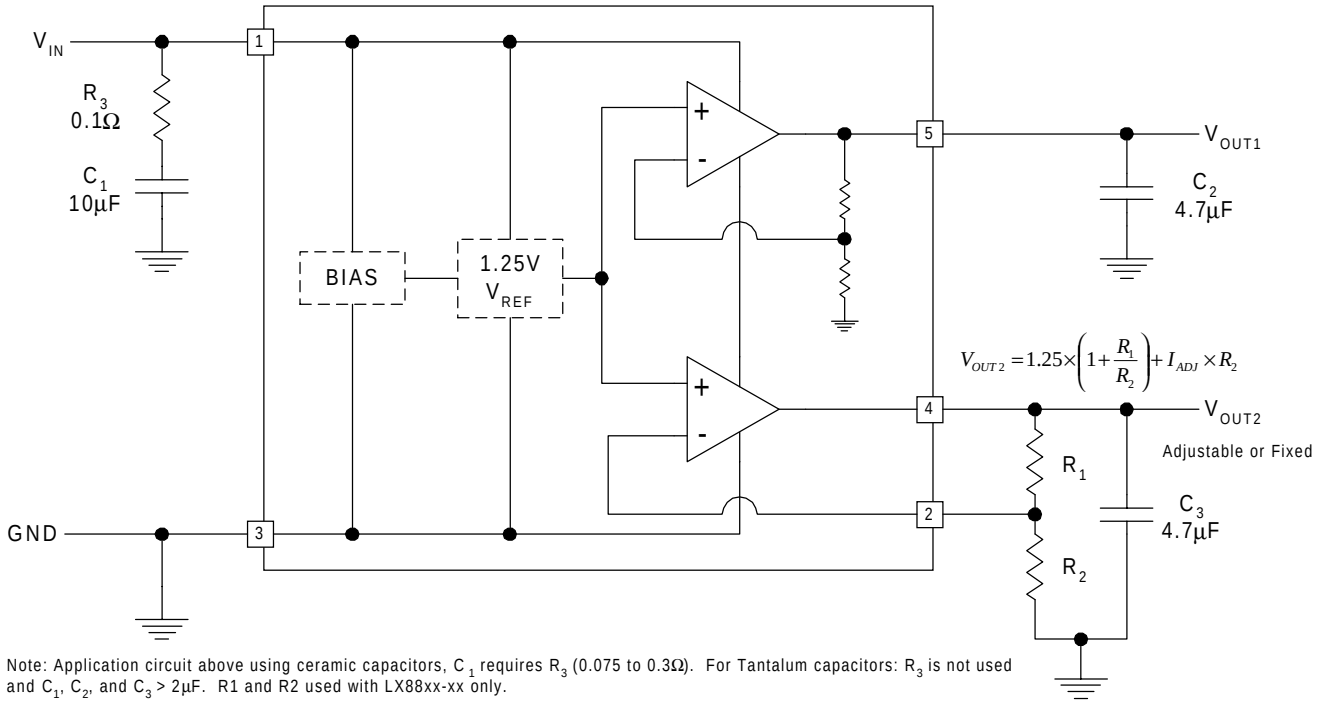
## KEY FEATURES

- Two Independent Regulated Outputs
- Accurate Output Voltages
- Max. Dropout of 1.1V at Rated Current
- Independent Thermal and Current Limit Protection
- Low Profile 5 Lead SMT Power Package
- Low Tolerance Line (0.2%) and Load (0.4%) Regulation
- Wide DC Supply Voltage of 4.0V to 12.0V
- Loop Stability Independent of Output Capacitor Type

## APPLICATIONS/BENEFITS

- 5V to 3.3V Linear Regulator
- Low Voltage Logic Supplies
- Active SCSI Terminators
- Battery Charging Circuits
- Instrumentation
- PC Peripherals

## BLOCK DIAGRAM / APPLICATION CIRCUIT




Note: Application circuit above using ceramic capacitors, $C_1$ requires $R_3$ (0.075 to 0.3Ω). For Tantalum capacitors: $R_3$ is not used and $C_1$, $C_2$, and $C_3$ > 2µF. R1 and R2 used with LX88xx-xx only.

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## PACKAGE ORDER INFO

| $T_J$ (°C) | OUTPUT $V_1$ | OUTPUT $V_2$ | DF Plastic S-PAK 5-PIN |
|---|---|---|---|
| 0 to 125 | 3.3V | 2.5V | LX8815-3325CDF |
| | 3.3V | 1.8V | LX8815-3318CDF |
| | 3.3V | Adj | LX8815-3300CDF |
| | 2.85V | Adj | LX8815-2800CDF |
| | 2.5V | Adj | LX8815-2500CDF |

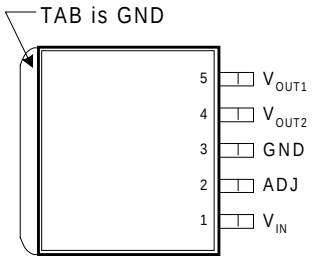
Note: Available in Tape & Reel.
Append the letter "T" to the part number. (i.e. LX8815-3325CDFT)

## ABSOLUTE MAXIMUM RATINGS

Input Voltage ($V_{BAT}$) ..... 13.5V
Load Current (Internally Limited) ..... 1A
Power Dissipation ..... Internally Limited
Short-Circuit Protection ..... Indefinite
Operating Junction Temperature ..... 150°C
Lead Temperature (Soldering 180 seconds) ..... 235°C

Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

## PACKAGE PIN OUT




DF PACKAGE
(Top View)

## THERMAL DATA

**DF** PACKAGE

| | |
|---|---|
| THERMAL RESISTANCE-JUNCTION TO TAB, $\theta_{JT}$ | 4.5°C/W |
| THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$ | 24.5°C/W |

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
The $\theta_{JA}$ numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow. $\theta_{JA}$ can vary from 20°C/W to > 40°C/W depending on mounting technique. (See Application Notes Section: Thermal considerations)

## FUNCTIONAL PIN DESCRIPTION

| PIN NAME | DESCRIPTION |
|---|---|
| $V_{IN}$ | Unregulated input voltage supply. |
| ADJ | Adjust control pin for regulator 2 |
| GND | Common terminal for ground reference |
| $V_{OUT1}$ | Fixed voltage regulator output (Regulator #1) |
| $V_{OUT2}$ | Fixed or adjustable regulator output (Regulator #2) |



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## ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature 0°C ≤ $T_A$ ≤ 125°C except where otherwise noted and the following test conditions: $V_{IN}$ = 5V, $I_{OUT}$ = 10mA, $C_1$ = 4.7µF (Tantalum), $C_2$ = 4.7µF (Tantalum), and $T_J$ = $T_A$ 25°C using low duty cycling methods.

| Parameter | Symbol | Test Conditions | LX8815-xx00 Min | LX8815-xx00 Typ | LX8815-xx00 Max | Units |
|---|---|---|---|---|---|---|
| **FIXED OUTPUT** | | | | | | |
| Output Voltage | | | | | | |
| • LX8815-3300 | $V_1$ | $V_{IN}$ = 5V, $I_{OUT}$ = 5mA, $T_J$ = 25°C | 3.250 | 3.300 | 3.350 | V |
| | | 5mA < $I_1$ < 1A, 4.50V < $V_{IN}$ < 10V | 3.234 | 3.300 | 3.366 | |
| • LX8815-2800 | | $V_{IN}$ = 5V, $I_{OUT}$ = 5mA, $T_J$ = 25°C | 2.807 | 2.850 | 2.893 | |
| | | 5mA < $I_1$ < 1A, 4.50V < $V_{IN}$ < 10V | 2.793 | 2.850 | 2.907 | |
| • LX8815-2500 | | $V_{IN}$ = 5V, $I_{OUT}$ = 5mA, $T_J$ = 25°C | 2.462 | 2.500 | 2.537 | |
| | | 5mA < $I_1$ < 1A, 4.50V < $V_{IN}$ < 10V | 2.450 | 2.500 | 2.550 | |
| Line Regulation | $\Delta V_1(V_{IN})$ | 4.75V < $V_{IN}$ < 10V, $I_{OUT}$ = 5mA | | 0.01 | 0.2 | $\%V_1$ |
| Load Regulation | $\Delta V_1(I_1)$ | 5mA < $I_1$ < 1A, $V_{IN}$ = 4.75V | | 0.01 | 0.4 | $\%V_1$ |
| Dropout Voltage | $\Delta V$ | $I_{LOAD}$ = 1A, $\Delta V_1$ = -2% | | 1.1 | 1.25 | V |
| Current Limit | $I_{OUT\ (MAX)}$ | ($V_{IN}$ – $V_1$) = 5V | 1.0 | 1.4 | | A |
| Minimum Load Current | $I_L$ | Note 1 | | 0 | 2 | mA |
| **ADJUSTABLE OUTPUT** | | | | | | |
| Reference Voltage | $V_{REF}$ | $V_{IN}$ = 5V, $I_{OUT}$ = 10mA, $T_J$ = 25°C | 1.238 | 1.250 | 1.262 | V |
| | | 5mA < $I_1$ < 1A, 4.50V < $V_{IN}$ < 10V | 1.231 | 1.250 | 1.269 | |
| Line Regulation | $\Delta V_{REF}(V_{IN})$ | 4.75V < $V_{IN}$ < 10V, $I_{OUT}$ = 5mA | | 0.01 | 0.2 | $\%V_1$ |
| Load Regulation | $\Delta V_{REF}(I_2)$ | 5mA < $I_1$ < 1A, $V_{IN}$ = 4.75V | | 0.01 | 0.4 | $\%V_1$ |
| Dropout Voltage | $\Delta V$ | $V_{IN}$ > 4.5V, $I_{LOAD}$ = 1A, $\Delta V_1$ = -1% | | 1.1 | 1.3 | V |
| Current Limit | $I_{OUT\ (MAX)}$ | ($V_{IN}$ – $V_1$) = 5V | 1.0 | 1.4 | | A |
| Minimum Load Current | $I_L$ | Note 1 | | 1 | 3 | mA |
| Adjust Pin Bias Current | $I_{ADJ}$ | | | 1 | 5 | µA |
| **ENTIRE REGULATOR** | | | | | | |
| Quiescent Current | $I_Q$ | $V_{IN}$ < 10V, $I_1$ = 5mA, $I_2$ = 5mA | | 1.8 | 5 | mA |
| Ripple Rejection | PSRR | f=120Hz, $V_{IN}$ = 5V | 60 | 75 | | dB |
| RMS Output Noise (% of $V_{OUT}$) | $V_{OUT\ (RMS)}$ | 10Hz < f < 10kHz | | 0.003 | | $\%V_1$ |
| Thermal Shutdown | $T_{JSD}$ | | | 140 | | °C |

Note 1: Minimum load current is defined as the amount of output current required to maintain regulation.






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## ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature 0°C ≤ $T_A$ ≤ 125°C except where otherwise noted and the following test conditions: $V_{IN}$ = 5V, $I_{OUT}$ = 10mA, $C_1$ = 4.7µF (Tantalum), $C_2$ = 4.7µF (Tantalum), and $T_J$ = $T_A$ 25°C using low duty cycling methods.

| Parameter | Symbol | Test Conditions | LX8815-33xx Min | LX8815-33xx Typ | LX8815-33xx Max | Units |
|---|---|---|---|---|---|---|
| **FIXED OUTPUT 1** | | | | | | |
| Output Voltage | $V_1$ | $V_{IN}$ = 5V, $I_{OUT}$ = 5mA, $T_J$ = 25°C<br>5mA < $I_1$ < 1A, 4.50V < $V_{IN}$ < 10V | 3.250<br>3.234 | 3.300<br>3.300 | 3.350<br>3.366 | V |
| Line Regulation | $\Delta V_1(V_{IN})$ | 4.75V < $V_{IN}$ < 10V, $I_{OUT}$ = 5mA | | 0.3 | 5.0 | mV |
| Load Regulation | $\Delta V_1(I_1)$ | 5mA < $I_1$ < 1A, $V_{IN}$ = 4.75V | | 0.8 | 10 | mV |
| Dropout Voltage | $\Delta V$ | $I_{LOAD}$ = 1A, $\Delta V_1$ = -2% | | 1.1 | 1.25 | V |
| Current Limit | $I_{OUT\ (MAX)}$ | ($V_{IN}$ – $V_1$) | 1.0 | 1.4 | | A |
| Minimum Load Current | $I_L$ | Note 1 | | 0 | 2 | mA |
| **FIXED OUTPUT 2** | | | | | | |
| Output Voltage<br>• LX8815-3325<br><br>• LX8815-3318 | $V_1$ | <br>$V_{IN}$ = 5V, $I_{OUT}$ = 5mA, $T_J$ = 25°C<br>5mA < $I_1$ < 1A, 4.50V < $V_{IN}$ < 10V<br>$V_{IN}$ = 5V, $I_{OUT}$ = 5mA, $T_J$ = 25°C<br>5mA < $I_1$ < 1A, 4.50V < $V_{IN}$ < 10V | <br>2.462<br>2.450<br>1.773<br>1.764 | <br>2.50<br>2.50<br>1.80<br>1.80 | <br>2.537<br>2.550<br>1.827<br>1.36 | V |
| Line Regulation | $\Delta V_1(V_{IN})$ | 4.75V < $V_{IN}$ < 10V, $I_{OUT}$ = 5mA | | 0.02 | 0.15 | %mV |
| Load Regulation | $\Delta V_1(I_1)$ | 5mA < $I_1$ < 1A, $V_{IN}$ = 4.75V | | 0.04 | 0.3 | %mV |
| Dropout Voltage | $\Delta V$ | $V_{IN}$ > 4.5V, $I_{LOAD}$ = 1A, $\Delta V_1$ = -1% | | 1.1 | 1.3 | V |
| Current Limit | $I_{OUT\ (MAX)}$ | ($V_{IN}$ – $V_1$) | 1.0 | 1.4 | | A |
| Minimum Load Current | $I_L$ | Note 1 | | 1 | 2 | mA |
| **ENTIRE REGULATOR** | | | | | | |
| Quiescent Current | $I_Q$ | $V_{IN}$ < 10V, $I_1$ = 5mA, $I_2$ = 5mA | | 1.8 | 7 | mA |
| Ripple Rejection | PSRR | f=120Hz, $V_{IN}$ = 5V | 60 | 75 | | dB |
| RMS Output Noise (% of $V_{OUT}$) | $V_{OUT\ (RMS)}$ | 10Hz < f < 10kHz | | 0.003 | | %$V_1$ |
| Thermal Shutdown | $T_{JSD}$ | | | 140 | | °C |

Note 1: Minimum load current is defined as the amount of output current required to maintain regulation.






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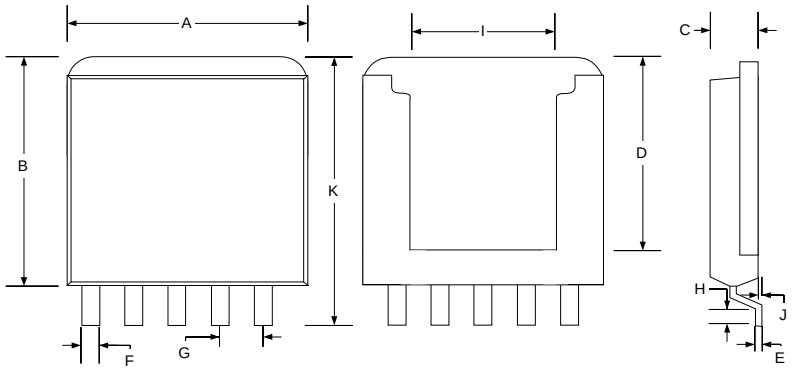
## MECHANICAL DRAWINGS




| Dim | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 9.27 | 9.52 | .365 | .375 |
| B | 8.89 | 9.14 | .350 | .360 |
| C | 1.77 | 2.03 | .070 | .080 |
| D | 7.49 | 7.74 | .295 | .305 |
| E | 0.12 | 0.38 | .005 | .015 |
| F | 0.58 | 0.84 | .023 | .033 |
| G | 1.70 BSC | | 0.067 BSC | |
| H | 0.79 | 1.04 | .031 | .041 |
| I | 4.31 | 6.86 | .170 | .270 |
| J | 0.03 | 0.13 | .001 | .005 |
| K | 10.41 | 10.67 | .410 | .420 |

**Note:**

1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006") on any side. Lead dimension shall not include solder coverage.