LINFINITY MICROELECTRONICS

THE INFINITE POWER OF INNOVATION

# LX8020-xx/8020A-xx

## ULTRA LOW DROP OUT REGULATOR (ULDO™)

**PRELIMINARY DATA SHEET**

## DESCRIPTION

The LX8020-xx/8020A-xx series of Ultra-Low Drop Out (ULDO™) Voltage Regulators is the latest advance in highly efficient power supply products for battery operated systems. Using the LX8020-xx/8020A-xx in your equipment design provides a significant advantage in operating efficiency, resulting in longer system operating life. See the System Up-Time Figure featured below. A newly-patented design technique coupled with Linfinity BiCMOS wafer process technology not only delivers efficiency but space savings, too! Unlike most LDO's that require bulky compensation capacitors, the LX8020-xx/8020A-xx series is very stable over no-load to full-load conditions using 0603 surface-mount Z5U 0.1µF output/input capacitors. See the Application Notes at the end of this document for assistance in selecting the best capacitor for your application.

The patented CMOS pass element design technique delivers a lot more than high efficiency. A key advantage to this technique is constant quiescent operating current over the full-load range of the device. Unlike bipolar equivalents, which require increasing base drive with increasing loads, the LX8020-xx/8020A-xx is totally independent. Plus, the LX8020-xx/8020A-xx does not exhibit the unwieldy high-current demands of a bipolar device entering the drop out region (saturation phenomena). For example, for a given pass element (typ. a pnp transistor) load, there is a larger than normal amount of stored charge in the base region. This results in a larger base current contribution to the load. In addition, since the base-collector junction is now forward biased, there is a new base current contribution due to injection of carriers from the base to the collector. The combination of these two events results in a base current which is substantially larger during drop-out, resulting in increased device operating current. This term is commonly referred to as *forced beta*. Additionally, as load demands increase, the forced beta condition worsens. The event occurs at the time when your system least wants or needs increasing current demands, at the end of battery life.

Another unique feature of the LX8020-xx/8020A-xx delivers is superb Line and Load regulation from DC out to extraordinarily high frequencies. This is very important for systems which have continuously varying load and line conditions. The clear advantage of excellent AC response is the overall reduction in output capacitor size and value. Using the LX8020-xx/8020A-xx family of ULDO's in size, weight and power sensitive applications enhances your applications performance beyond yesterday's bipolar solutions.

Other advantages the LX8020-xx/8020A-xx offers include current limiting, thermal protection and reverse battery (no battery) protection. The LX8020-xx/8020A-xx Family is offered in a variety of output voltage and packaging options.

## KEY FEATURES

- INDUSTRY'S LOWEST DROP OUT VOLTAGE (SEE SPECIFIC DEVICE SPEC)
- QUIESCENT OPERATING CURRENT CONSTANT OVER LOAD RANGE (SEE SPECIFIC DEVICE SPEC)
- MINIMAL OUTPUT CAPACITANCE NECESSARY FOR STABLE OPERATION (0.1µF)
- HIGH LEVELS OF LOAD AND LINE REGULATION MAINTAINED OVER WIDE FREQUENCY RANGE
- SHORT CIRCUIT PROTECTION
- REVERSE BATTERY PROTECTION WITH NO BATTERY FEATURE
- FIXED AND ADJUSTABLE OUTPUT VOLTAGES AVAILABLE

## APPLICATIONS

- PORTABLE PHONES
- PORTABLE PAGERS
- NOTEBOOK COMPUTER POWER SUPPLIES
- BATTERY CHARGERS

AVAILABLE OPTIONS PER PART #

| Part # | Output Voltage |
|---|---|
| LX8020-28 | 2.85V |
| LX8020-30 | 3V |
| LX8020-33 | 3.3V |
| LX8020-48 | 4.8V |
| LX8020-50 | 5V |
| LX8020-00 | Adjustable |

## PACKAGE ORDER INFORMATION

| $T_A$ (°C) | Initial Tolerance | LP Plastic T0-92 3-pin | DM Plastic SOIC 8-pin |
|---|---|---|---|
| 0 to 70 | 2% | LX8020-xxCLP | LX8020-xxCDM |
| | 1% | LX8020A-xxCLP | LX8020A-xxCDM |
| -40 to 85 | 2% | LX8020-xxILP | LX8020-xxIDM |
| | 1% | LX8020A-xxILP | LX8020A-xxIDM |

Note: All surface-mount packages are available in Tape & Reel.
Append the letter "T" to part number. (i.e. LX8020-xxDMT)
"xx" refers to output voltage, please see table above.

8253880 0003748 T82

FOR FURTHER INFORMATION CALL (714) 898-8121



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## ABSOLUTE MAXIMUM RATINGS (Note 1)

| | |
|---|---|
| Supply Voltage | 10V |
| Operating Junction Temperature | |
| Plastic (LP, DM Package) | 150°C |
| Storage Temperature Range | -65°C to 150°C |
| Lead Temperature (Soldering, 10 seconds) | 300°C |

Note 1. Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

## THERMAL DATA

**LP PACKAGE:**

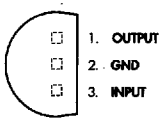
| | |
|---|---|
| THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$ | 156 C/W |

**DM PACKAGE:**

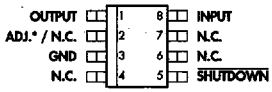
| | |
|---|---|
| THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$ | 165 C/W |

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.

## PACKAGE PIN OUTS




**LP PACKAGE**
(Top View)




**DM PACKAGE**
(Top View)
* Pin for Adjustable version *only*.

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## PRELIMINARY DATA SHEET

### RECOMMENDED OPERATING CONDITIONS (Note 1)

| Parameter | Symbol | Recommended Operating Conditions Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Range | $V_{IN}$, $V_{MIN}$ to $V_{MAX}$ | | | 10 | V |
| Output Current Range | $I_{OUT}$ | | | 200 | mA |
| Short Circuit Range | $I_{SC}$ | | 500 | | mA |
| Input Capacitor Range | $C_{IN}$ | 0.1 | | 10 | µF |
| Output Capacitor Range | $C_{OUT}$ | 0.1 | | 10 | µF |
| Junction Temp Range | °C | | 125 | | °C |
| Reverse Voltage | $V_{REV}$ | | | -10 | V |

### ELECTRICAL CHARACTERISTICS

(Conditions are T = 25°C; $I_{OUT}$ = 10mA; $V_{DIFF}$ = $V_{IN}$-$V_{OUT}$ = 1V; $C_{IN}$ = 0.4µF; $C_{OUT}$ = 0.4µF; and $V_{ENABLE}$ = $V_{IN}$; unless noted.)

| Parameter | | Symbol | Test Conditions | LX8020-xx / 8020A-xx Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Output Voltage | LX8020-xx | $V_{OUT}$ | $T_A$ = 25°C, No Load | -2 | | +2 | % |
| | LX8020A-xx | | $T_A$ = 25°C, No Load | -1 | | +1 | % |
| Output Voltage TC | | | T = 0 to 70°C | | 100 | | ppm/°C |
| Line Regulation | 100Hz | | $I_{OUT}$ = 50mA, $\Delta V_{IN}$ = 200mVpp | | 70 | | db |
| | 1KHz | | $I_{OUT}$ = 50mA, $\Delta V_{IN}$ = 200mVpp | | 65 | | db |
| | 10KHz | | $I_{OUT}$ = 50mA, $\Delta V_{IN}$ = 200mVpp | | 50 | | db |
| | 100KHz | | $I_{OUT}$ = 50mA, $\Delta V_{IN}$ = 200mVpp | | 30 | | db |
| Load Regulation | | | $\Delta I_{OUT}$ = 1mA to 200mA | | 0.5 | | % |
| Dropout Voltage | | $V_{DO}$ | $I_{OUT}$ = 200mA | | 200 | | mV |
| | | | $I_{OUT}$ = 50mA | | 50 | | mV |
| Operating or Ground Current | LX8020-50 /A-50 | | | | 300 | | µA |
| | LX8020-48 /A-48 | | | | 300 | | µA |
| | LX8020-33 /A-33 | | | | 300 | | µA |
| | LX8020-30 /A-30 | | | | 210 | | µA |
| | LX8020-28 /A-28 | | | | 210 | | µA |
| | LX8020-00 /A-00 | | | | 210 | | µA |
| Ground Current Regulation Over Input | | | $\Delta V_{DIFF}$ = 1V to 5V | | 40 | | µA |
| Ground Current Regulation Over Load | | | $\Delta I_{OUT}$ = 1mA to 200mA | | 20 | | µA |
| Enable Threshold | | | | 1.2 | | 1.8 | V |
| Off-mode Input Leakage Current | | | $V_{ENABLE}$ = 0V, $V_{IN}$ = 10V | | 1 | | µA |
| Reverse Output Leakage Current | $V_{IN}$ pin = Open | | $V_{ENABLE}$ = 0V, $V_{OUT}$ = Output Voltage | | 1 | | µA |
| | $V_{IN}$ pin = Ground | | $V_{ENABLE}$ = 0V, $V_{OUT}$ = Output Voltage | | 100 | | µA |
| Output Noise | | en | $T_A$ = 25°C | | TBD | | nV/√Hz |

# LX8020-xx/8020A-xx

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## GRAPH / CURVE INDEX

### Characteristic Curves