LX8610-xx

1A BiCMOS Very Low Dropout Regulators

PRELIMINARY DATA SHEET

DESCRIPTION

The LX8610 family are positive very low dropout regulators. They are designed to provide a power supply for very low headroom applications, such as 3.3V - 2.5V.

BiCMOS technology allows an effective series pass element resistance, $R_{DS(ON)}$ of 250mΩ resulting in a typical dropout voltage of 250mV at 1A.

Low Quiescent Current and Logic-Controlled Shutdown help conserve battery life and increase system efficiency. Typical quiescent current is under 400µA irrespective of load current, while the shutdown current is only 10µA. The device will enter shutdown mode when the ENABLE pin is pulled low.

Thermal and Short-Circuit Current Limiting: the LX8610 limits the current when the output is shorted, so protecting sensitive load circuits. The device will also turn off if the junction temperature exceeds 165°C.

Available in small outline SOT-223 and 8-pin SOIC: adjustable versions use the 8-pin SOIC, and fixed output voltage devices are supplied in the 3-lead SOT-223.

NOTE: For current data & package dimensions, visit our web site: **http://www.linfinity.com.**

KEY FEATURES

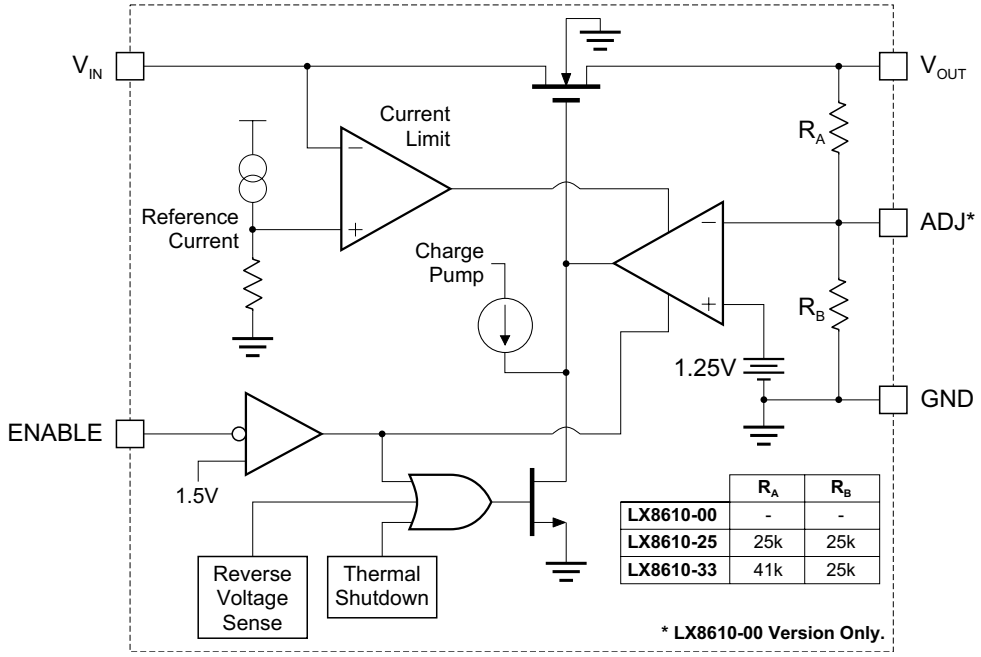
- Dropout Voltage Typically 250mV At 1A And 50mV At 10mA
- Low Quiescent Current, Under 400µA, Irrespective Of Load
- Shutdown Current 10µA
- Adjustable Output Version In 8-Pin SOIC Package
- Fixed Outputs Of 2.5V, 3.3V Available In 3-Pin SOT-223 Package
- Low Reverse Leakage Current
- Short-Circuit And Thermal Shutdown Protection

APPLICATIONS

- 3.3V & 2.5V Supplies For Memory, Microprocessors, Clock Circuits, Etc.
- Portable Equipment

PRODUCT HIGHLIGHT

LX8610-xx Block Diagram



	R_A	R_B
LX8610-00	-	-
LX8610-25	25k	25k
LX8610-33	41k	25k

PACKAGE ORDER INFORMATION

T_A (°C)	Output Voltage	ST Plastic SOT-223 3-pin	DM Plastic SOIC 8-pin
0 to 70	3.3	LX8610-33CST	LX8610-33CDM
	2.5	LX8610-25CST	LX8610-25CDM
	ADJ (00)	—	LX8610-00CDM

Note: All surface-mount packages are available in Tape & Reel, append the letter "T" to part number. (i.e. LX8610-xxCDMT)

Rev. 0.5 1/00

LINFINITY MICROELECTRONICS INC.
11861 WESTERN AVENUE, GARDEN GROVE, CA. 92841, 714-898-8121, FAX: 714-893-2570

ABSOLUTE MAXIMUM RATINGS (Note 1)

Input Voltage (V_{IN}) 6.5V
Enable Pin ..... -0.3V to V_{IN}+0.3V
Operating Junction Temperature
Plastic (ST & DM Packages) ..... 125°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

ST PACKAGE:

THERMAL RESISTANCE-JUNCTION TO TAB, θ_{JT}	15°C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	*150°C/W

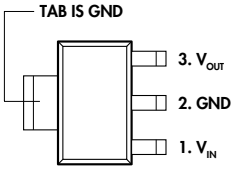
DM PACKAGE:

THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	165°C/W

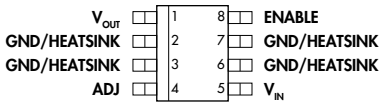
Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
The θ_{JA} numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.

* θ_{JA} can be improved with package soldered to 0.5IN^2 copper area over backside ground plane or internal power plane. θ_{JA} can vary from 20ºC/W to > 40ºC/W depending on mounting technique.

PACKAGE PIN OUTS



ST PACKAGE
(Top View)



DM PACKAGE
(Top View)

FUNCTIONAL PIN DESCRIPTION

Pin Designator	Description
V_{IN}	Positive supply input for the regulator. Bypass to GND with at least 2.2µF of low ESR, ESL capacitance if supply source is further than 1 inch from the device.
V_{OUT}	Output for the regulator. It is recommended to bypass to GND with at least 10µF although this is not required for regulation, rather its needed for transient response. Size your output capacitor to meet the transient loading requirement. If you have a very dynamic load, a larger capacitor will improve the response to these load steps.
GND	Reference ground. The input and output decoupling capacitors should be connected to this pin. In addition the tab on the SOT-223 package and pins 2, 3, 6 and 7 on the SOIC package are also used for heatsinking the device.
ADJ	Feedback pin for the regulator. For the LX8610-00, the output voltage can be set by two external resistors with the following relationship: V_{OUT} = 1.25V * (1+R2/R1) where R1 is the resistor connected between V_{OUT} and ADJ, and R2 is the resistor connected between ADJ and GND pin.
ENABLE	Enable input. This pin has a threshold of about 1.5V, it should be actively pulled high to enable the regulator. This can be accomplished with a resistive pull-up or controlled by a logic gate. When low, it turns off the regulator and puts the device in a low current shutdown state.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Recommended Operating Conditions			Units
		Min.	Typ.	Max.	
Input Voltage	V_{IN}	2.5		5.5	V
Load Current (with adequate heatsinking)		10		1000	mA
Input Capacitor (V_{IN} to GND)		2.2			µF
Output Capacitor (V_{OUT} to GND)		10			µF

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, these specifications apply over the operating ambient temperatures for the LX8610-xxC with $0°C \le T_A \le 70°C$; $V_{IN} = V_{OUT} + 1.5V$; $I_{OUT} = 10mA$; $C_{IN} = 10µF$; $C_{OUT} = 22µF$; $T_J = T_A$. Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.)

LX8610-33 Fixed 3.3V, 1A

Parameter	Symbol	Test Conditions	LX8610-33			Units
			Min.	Typ.	Max.	
Output Voltage	V_{OUT}	$T_J = 25°C$	3.25	3.3	3.35	V
		Over Temperature	3.22		3.38	V
Line Regulation	V_{REG}	$V_{IN} = 3.45V$ to 5.5V		4	8	mV
Load Regulation	I_{REG}	$I_{OUT} = 10mA$ to 1A		5	10	mV
Dropout Voltage ($V_{DO} = V_{IN} - V_{OUT}$)	V_{DO}	$I_{OUT} = 1A$, $V_{OUT} = \Delta V_{OUT}$ - 1%		0.25	0.4	V
		$I_{OUT} = 0.5A$, $V_{OUT} = \Delta V_{OUT}$ - 1%		0.15	0.25	V
		$I_{OUT} = 10mA$, $V_{OUT} = \Delta V_{OUT}$ - 1%		0.05	0.15	V
Current Limit	I_{CL}	$V_{OUT} = V_{OUT}$ - 1%	1.1	1.3	1.8	A
Short Circuit Current	I_{SC}	$V_{OUT} = 0V$	1	1.25	1.7	A
Quiescent Current	I_Q	$I_{OUT} = 10mA$ to 1A		400	600	µA
Reverse Leakage Current		$0V < V_{IN} < V_{OUT}$, $V_{OUT} < 3.4V$ (at V_{OUT})		400	650	µA
		$0V < V_{IN} < V_{OUT}$, $V_{OUT} < 3.4V$ (at V_{IN})	-50	0		mA
Enable Threshold *			0.8	1.5		V
Shutdown Current *				10	25	µA

LX8610-25 Fixed 2.5V, 1A

Parameter	Symbol	Test Conditions	LX8610-25			Units
			Min.	Typ.	Max.	
Output Voltage	V_{OUT}	$T_J = 25°C$	2.46	2.5	2.54	V
		Over Temperature	2.44	2.5	2.56	V
Line Regulation	V_{REG}	$V_{IN} = 3.1V$ to 5.5V, $I_{OUT} = -10mA$		3	6	mV
Load Regulation	I_{REG}	$I_{OUT} = 10mA$ to 1A		5	10	mV
Dropout Voltage ($V_{DO} = V_{IN} - V_{OUT}$)	V_{DO}	$I_{OUT} = 1A$, $V_{OUT} = \Delta V_{OUT}$ - 1%		0.25	0.4	V
		$I_{OUT} = 0.5A$, $V_{OUT} = \Delta V_{OUT}$ - 1%		0.15	0.25	V
		$I_{OUT} = 10mA$, $V_{OUT} = \Delta V_{OUT}$ - 1%		0.05	0.1	V
Current Limit	I_{CL}	$V_{OUT} = V_{OUT}$ - 1%	1.1	1.3	1.8	A
Short Circuit Current	I_{SC}	$V_{OUT} = 0V$	1	1.25	1.7	A
Quiescent Current	I_Q	$I_{OUT} = 10mA$ to 1A		300	600	µA
Reverse Leakage Current		$0V < V_{IN} < V_{OUT}$, $V_{OUT} < 2.6V$ (at V_{OUT})		400	650	µA
		$0V < V_{IN} < V_{OUT}$, $V_{OUT} < 2.6V$ (at V_{IN})	-50	0		mA
Enable Threshold *			0.8	1.5		V
Shutdown Current *				10	25	µA

* Enable Threshold and Shutdown Current apply only to 8-pin SOIC package outline versions.

ELECTRICAL CHARACTERISTICS (Continued)

LX8610-00 Adjustable Output, 1A

Parameter	Symbol	Test Conditions	LX8610-00			Units
			Min.	Typ.	Max.	
Reference Voltage	V_{REF}	T_J = 25°C	1.238	1.25	1.262	V
		Over Temperature	1.225	1.25	1.270	V
Line Regulation	V_{REG}	V_{IN} = V_{OUT}+150mV to 5.5V, I_{OUT} = 10mA		2	4	mV
Load Regulation	I_{REG}	I_{OUT} = 10mA to 1A		7	15	mV
Dropout Voltage (V_{DO} = V_{OUT} - V_{IN})	V_{DO}	I_{OUT} = 1A, V_{IN} > 4V		0.25	0.4	V
		I_{OUT} = 0.5A, V_{IN} > 3V		0.15	0.25	V
		I_{OUT} = 10mA, V_{IN} > 3V		0.05	0.15	V
Current Limit	I_{CL}	V_{OUT} = V_{OUT} - 1%	1.1	1.3	1.8	A
Short Circuit Current	I_{SC}	V_{OUT} = 0V	1	1.25	1.7	A
Quiescent Current	I_Q	I_{OUT} = 10mA to 1A, V_{IN} = 5.5V		400	600	µA
Reverse Leakage Current		0V < V_{IN} < V_{OUT}, V_{OUT} < 5.5V (at V_{OUT})		400	650	µA
		0V < V_{IN} < V_{OUT}, V_{OUT} < 5.5V (at V_{IN})	-50	0		mA
Bias Current at ADJ Pin				100	250	nA
Enable Threshold			0.8	1.5		V
Shutdown Current		Enable < 0.8V		10	25	µA

TYPICAL APPLICATION

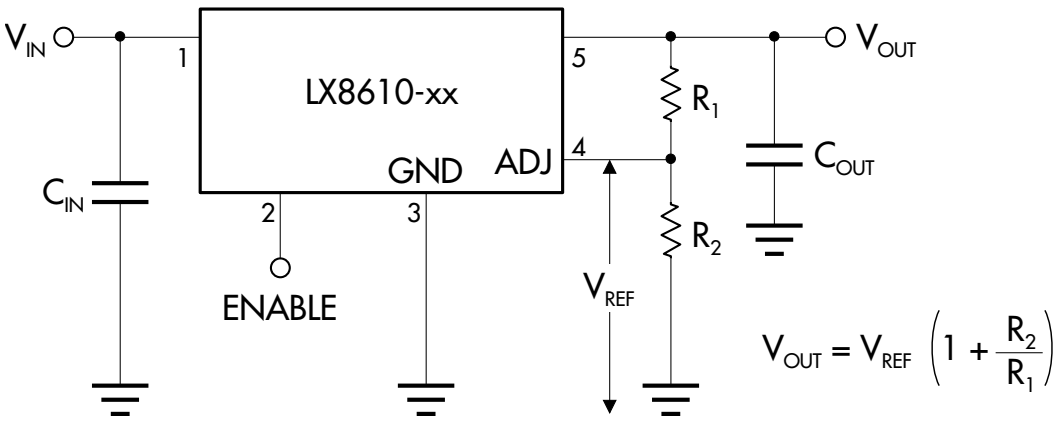


FIGURE 1 — Typical Application

CHARACTERISTIC CURVES

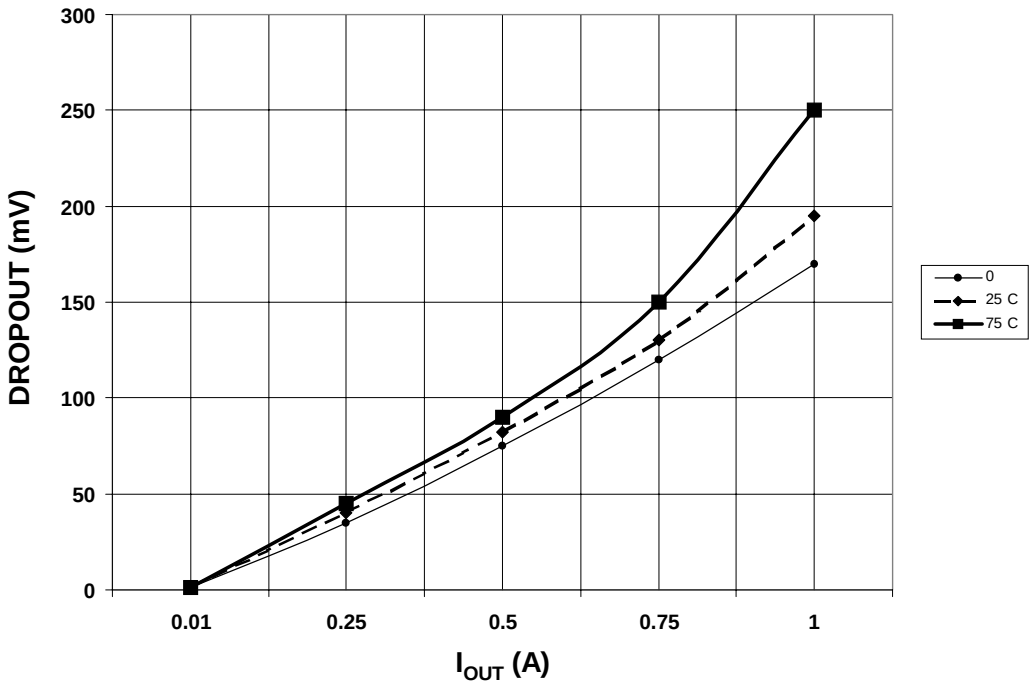


FIGURE 2 — Dropout Voltage vs. Output Current (Typical - LX8610-25CST)