LINFINITY
A MICROSEMI COMPANY

LX8610-xx

1A BiCMOS Very Low Dropout Regulators

PRELIMINARY DATASHEET

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 & 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 155°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.

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

KEY FEATURES

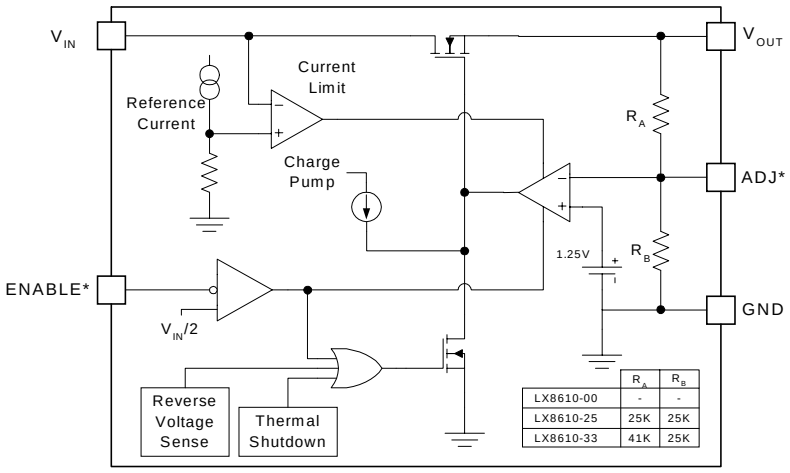
- Dropout Voltage Typically 250mA At 1A And 50mV At 10mA
- Low Quiescent Current, Under 400µA, Irrespective Of Load
- Shutdown Current 10µA
- Adjustable Output Version In 8-pin SOIC Package
- Fixed Outputs Of 2.5V, 3.3V Available In 3-Pin SOT-223 Package
- Low Reverse Leakage Current
- Short-Circuit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

APPLICATIONS/BENEFITS

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

PRODUCT HIGHLIGHT

LX8610-xx Simplified Block Diagram



* Adjustable 8 lead version only

PACKAGE ORDER INFO

T_J (°C)	Output Voltage	ST Plastic SOT-233 3-pin	DM Plastic SOIC 8-pin
0 to 125°C	3.3	LX8610-33CST	LX8610-33CDM
	2.5	LX8610-25CST	LX8610-25CDM
	ADJ (00)	–	LX8610-00CDM

Note: Available in Tape & Reel.
Append the letter "T" to the part number. (i.e. LX8610CDMT)

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ABSOLUTE MAXIMUM RATINGS

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 ..... -65°C to 150°C
Lead Temperature (Soldering, 10 Seconds) ..... 300°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.

THERMAL DATA

ST PLASTIC SOT-223 PACKAGE

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

DM PLASTIC SOIC PACKAGE

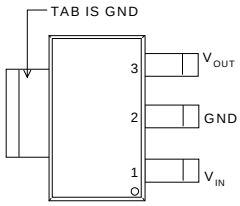
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JLD}	30°C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	90°C/W

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 copper area over backside ground plane or internal power plane. θ_{JA} can vary from 45°C/W > 75°C/W depending on mounting technique. See table below for thermal resistance guidelines.

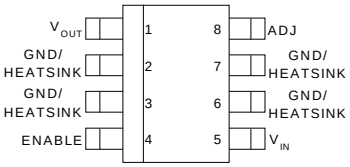
Copper Area (Topside)*	Copper Area (Backside)*	Board Area	Thermal Resistance (θ_{JA})
ST (SOT-223)			
2.0 sq" (1290mm^2)	1.0 sq" (645 mm^2)	2.0 sq" (1290mm^2)	45°C/W
1.0 sq" (645 mm^2)	0.5 sq" (323 mm^2)	1.0 sq" (645 mm^2)	50°C/W
0.5 sq" (323 mm^2)	0.1 sq" (65 mm^2)	0.5 sq" (323 mm^2)	60°C/W
0.25 sq" (161 mm^2)	0.1 sq" (65 mm^2)	0.25 sq" (161 mm^2)	70°C/W
DM (SOIC)			
2.0 sq" (1290mm^2)	1.0 sq" (645 mm^2)	2.0 sq" (1290mm^2)	60°C/W
1.0 sq" (645 mm^2)	0.5 sq" (323 mm^2)	1.0 sq" (645 mm^2)	67°C/W
0.5 sq" (323 mm^2)	0.1 sq" (65 mm^2)	0.5 sq" (323 mm^2)	70°C/W
0.25 sq" (161 mm^2)	0.1 sq" (65 mm^2)	0.25 sq" (161 mm^2)	75°C/W

*Tab of device attached to topside copper, or leads 2,3,5,6 of SOIC package

PACKAGE PIN OUT

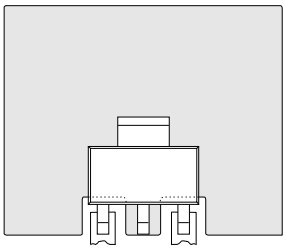


ST PACKAGE
(Top View)

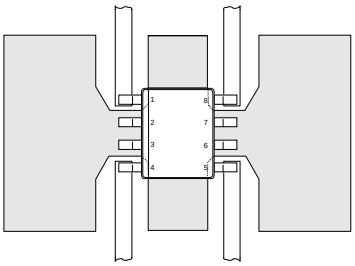


DM PACKAGE
(Top View)

HEAT SINK APPROACH



Possible Heat Sink Approaches using PCB Copper



PACKAGE DATA

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Linfinity Microelectronics Division
11861 Western Avenue, Garden Grove, CA. 92841, 714-898-8121, Fax: 714-893-2570

FUNCTIONAL PIN DESCRIPTION

PIN NAME	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 it is 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 bypass 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 heat sinking 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 + R_A / R_B) where R_A is the resistor connected between V_{OUT} and ADJ, and R_B is the resistor connected between ADJ and GND.
ENALBE	Enable input. This pin has a threshold of about V_{IN} / 2, it should be actively pulled high to enable the regulator. This can be accomplished with a resistive pull-up. When low, it turns off the regulator and puts the device in a low current shutdown state.

TYPICAL APPLICATION

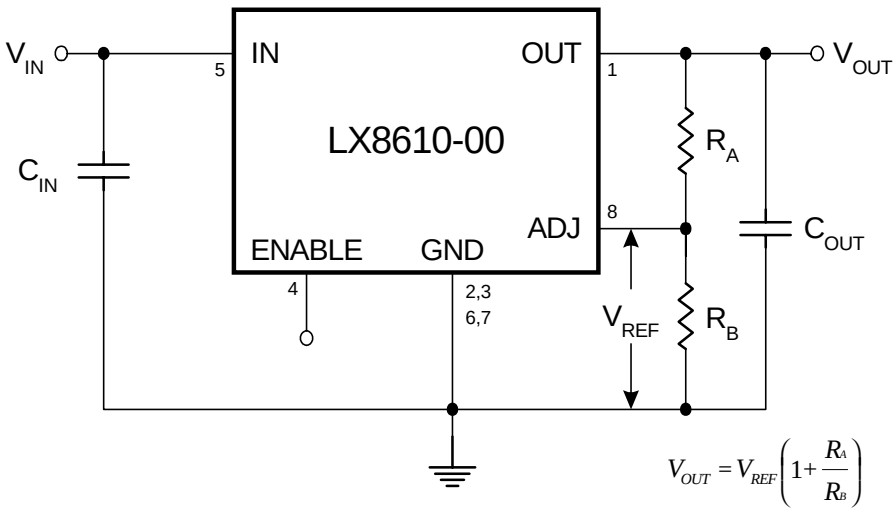

Figure 1 – Typical Application

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RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	LX8610			Units
		Min	Typ	Max	
Input Voltage	V_{IN}	3	5.5		V
Load Current (with adequate heatsinking)		10		1000	mA
Input Capacitor (V_{IN} to GND)		2.2	10		µF
Output Capacitor (V_{OUT} to GND)		10	22*		µF

* 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.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature 0°C ≤ T_A ≤ 125°C except where otherwise noted. Test conditions: $V_{IN} = V_{OUT} + 1.5V$; I_{OUT} = 10mA; C_{IN} = 10µF; C_{OUT} = 22µF; $T_J = T_A$.

Parameter	Symbol	Test Conditions	LX8610-xx			Units
			Min	Typ	Max	
LX8610-33 FIXED 3.3V, 1A						
Output Voltage	V_{OUT}	T_J = 25°C	3.25	3.3	3.35	V
		Over Temperature	3.22		3.38	
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	
		I_{OUT} = 10mA, $V_{OUT} = \Delta V_{OUT}$ – 1%		0.05	0.15	
Short Circuit Current	I_{SC}	V_{OUT} = 0V		1.25	1.7	A
Quiescent Current	I_Q	I_{OUT} = 10mA to 1A		400	600	µA
Reverse Leakage Current	I_{REV}	0V < V_{IN} < V_{OUT}, V_{OUT} <3.4V (at V_{OUT})		400	650	µA
		OV < V_{IN} < V_{OUT}, V_{OUT} <3.4V (at V_{IN})	-50	0		mA
Shutdown Threshold *	V_{SD}		0.8	V_{IN} / 2		V
Shutdown Current *	I_{SD}	ENABLE < 0.8V		10	25	µA
LX8610-25 FIXED 2.5V, 1A						
Output Voltage	V_{OUT}	T_J = 25°C	2.46	2.5	2.54	V
		Over Temperature	2.44	2.5	2.56	
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	.025	
		I_{OUT} = 10mA, $V_{OUT} = \Delta V_{OUT}$ – 1%		0.05	0.1	
Short Circuit Current	I_{SC}	V_{OUT} = 0V		1.25	1.7	A
Quiescent Current	I_Q	I_{OUT} = 10mA to 1A		300	600	µA
Reverse Leakage Current	I_{REV}	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
Shutdown Threshold	V_{SD}		0.8	V_{IN} / 2		V
Shutdown Current	I_{SD}	ENABLE < 0.8V		10	25	µA

ELECTRICAL CHARACTERISTICS (CONT.)

Parameter	Symbol	Test Conditions	LX8610-xx			Units
			Min	Typ	Max	
LX8610-00 ADJUSTABLE OUTPUT, 1A						
Reference Voltage	V_{REF}	T_J = 25°C	1.23	1.22	1.27	V
		Over Temperature	1.22	1.25	1.28	
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
Short Circuit Current	I_{SC}	V_{OUT} = 0V		1.25	1.7	A
Dropout Voltage (V_{DO} = V_{IN}–V_{OUT})	V_{DO}	I_{OUT} = 1A, V_{IN} > 4V		0.25	0.4	V
		I_{OUT} = 0.5A, V_{IN} > 3V		0.15	0.25	
		I_{OUT} = 10mA, V_{IN} > 3V		0.05	0.15	
Quiescent Current	I_Q	I_{OUT} = 10mA to 1A, V_{IN} = 5.5V		400	600	µA
Reverse Leakage Current	I_{REV}	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	I_{BIAS}			100		nA
Shutdown Threshold	V_{SD}		0.8	(V_{IN} / 2)		V
Shutdown Current	I_{SD}	ENABLE < 0.8V		10	25	µA

* Note: Enable threshold and Shutdown Current apply only to 8-Pin SOIC package outline versions

DROPOUT VOLTAGE VS. OUTPUT CURRENT

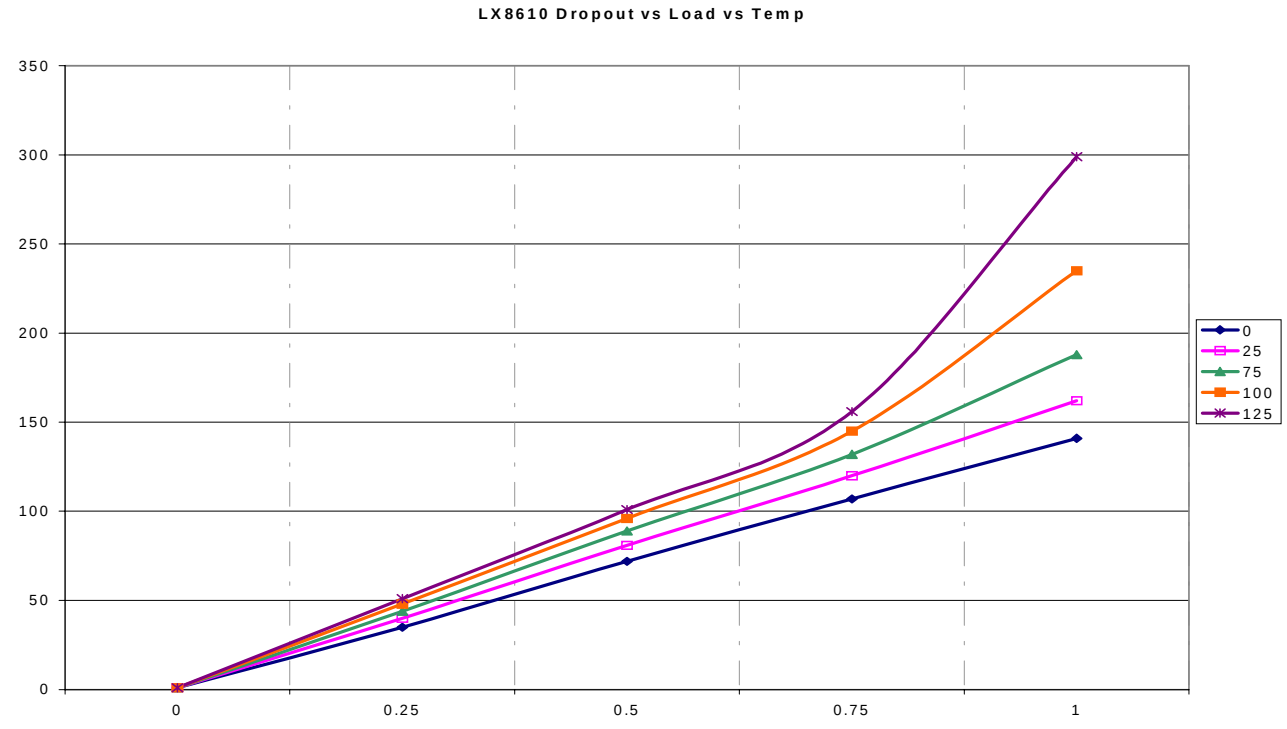
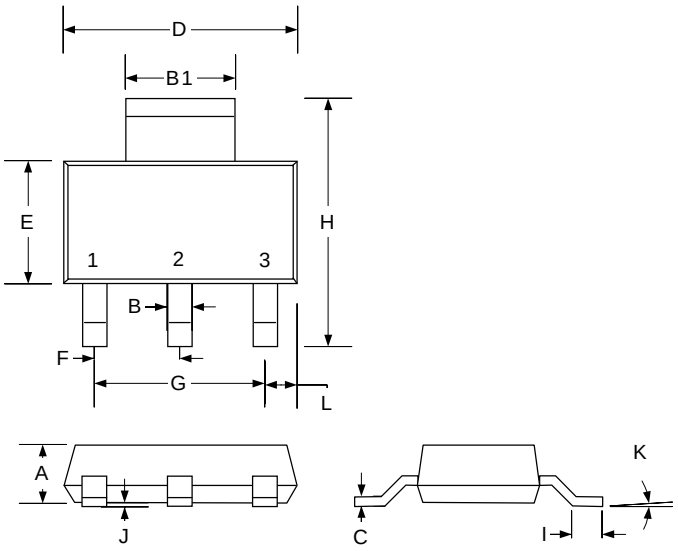


FIGURE 2 – Dropout Voltage Vs. Output Current (Typical – LX8610-25CST)

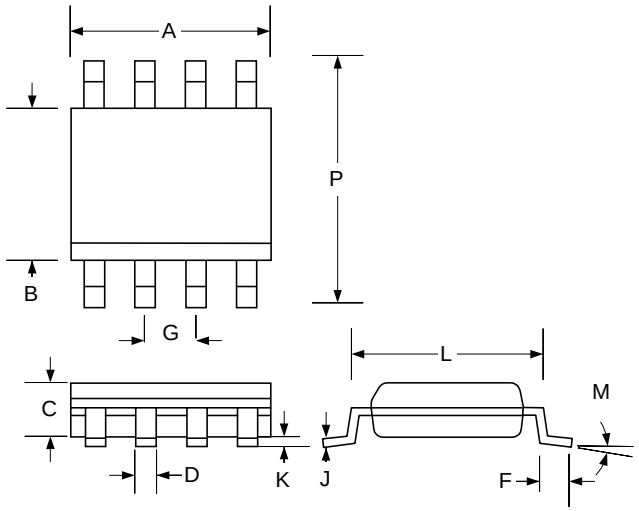
MECHANICAL DIMINSIONS

ST — 3-Pin Plastic SOT-223



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.55	1.80	0.061	0.071
B	0.65	0.85	0.026	0.033
B1	2.95	3.15	0.116	0.124
C	0.25	0.35	0.010	0.014
D	6.30	6.70	0.248	0.264
E	3.30	3.70	0.130	0.146
F	2.30 BSC		0.0905 BSC	
G	4.60 BSC		0.181 BSC	
H	6.71	7.29	0.264	0.287
I	–	0.91	–	0.036
J	0.02	0.10	.0008	.004
K	10° MAX		10° MAX	
L	.084	1.04	0.033	0.041

DM — 8-Pin Plastic SOIC



Dim	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.00	0.190	0.197
B	3.81	3.94	0.150	0.155
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
F	–	0.77	–	0.030
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.007	0.010
K	0.13	0.25	0.005	0.010
L	4.80	5.21	0.189	0.205
M	–	8°	–	8°
P	5.79	6.20	0.228	0.244
*LC	–	0.10	–	0.004

*Lead Coplanarity

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.