

DESCRIPTION

The LX8817 is a dual channel positive-voltage linear regulator. This dual regulator has one fixed output coupled with an adjustable output. Each channel features low-dropout and high accuracy.

The LX8817 utilizes dual inputs that can be used as separate sources for the control and power sections. This configuration reduces power dissipation by operating the regulator near dropout ($V_{PWR} - V_{OUT} = V_{DO} = 0.6V @ 2.5A$) while providing sufficient operating headroom for the control logic.

The LX8817 provides designers with an efficient flexible power management solution, minimal printed circuit board area, and shorter design cycles.

Each channel can supply up to 2.5A independently with a regulator design optimized for system efficiency by consuming minimal ground current

and directing quiescent current to the load. The LX8817 features on-chip trimming of the internal voltage reference, enabling precise output voltages, typically $\pm 1\%$ of it's specified value.

Power sequencing logic ensures proper startup regardless of the level of V_{CTRL} or V_{PWR} . The LX8817 outputs remain off while $V_{PWR} < 2.4V$.

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

The LX8817 regulator is stable with a low-value output capacitor, typically $10\mu F$ tantalum or 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.

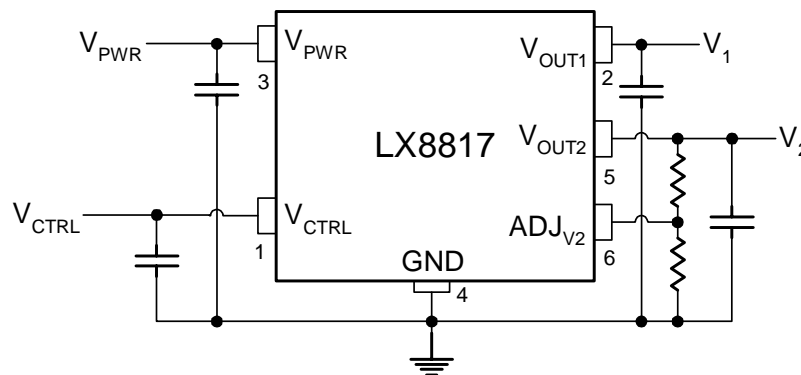
KEY FEATURES

- Two Independent Regulated Outputs
- Accurate Output Voltages
- Max. Dropout of 0.6V at Rated Current
- Independent Thermal and Current Limit Protection
- Low Profile 7 Lead SMT Power Package
- Low Tolerance Line (0.2%) and Load (0.4%) Regulation
- Wide DC Supply Voltage of 3.0V to 10.0V
- Loop Stability Independent of Output Capacitor Type

APPLICATIONS/BENEFITS

- 3.3V to 2.5V/ADJ Linear Regulator
- Low Voltage Logic Supplies
- Active SCSI Terminators
- Battery Charging Circuits
- Instrumentation
- PC Peripherals

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

PRODUCT HIGHLIGHT

PACKAGE ORDER INFO

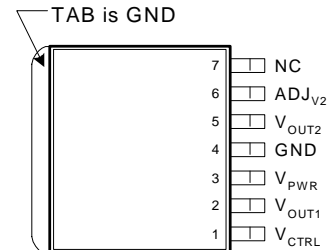
T_A (°C)	OUTPUT V_1	OUTPUT V_2	DF	Plastic S-PAK 7-PIN
0 to 125	2.5V	Adj		LX8817-25CDF

Note: Available in Tape & Reel.
 Append the letter "T" to the part number. (i.e. LX8817-25CDFT)

ABSOLUTE MAXIMUM RATINGS

Input Voltage (V_{CTRL} , V_{PWR})	13.5V
Load Current (Internally Limited)	3.0A
Power Dissipation.....	Internally Limited
Short-Circuit Protection.....	Indefinite
Operating Junction Temperature	150°C
Storage Temperature Range	-65°C to 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 Plastic S-PAK 7-PIN

THERMAL RESISTANCE-JUNCTION TO TAB, θ_{JT}	4.5°C/W
THERMAL RESISTANCE-JUNCTION TO AMBIENT, θ_{JA}	30°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 vary significantly depending on mounting technique. (See Application Notes Section: Thermal considerations)

FUNCTIONAL PIN DESCRIPTION

PIN	NAME	DESCRIPTION
1	V_{CTRL}	Unregulated input voltage supply, provides bias for control circuitry, ($V_{CTRL} - V_{OUT}$) > 1V.
2	V_{OUT1}	Regulator #1 fixed output voltage.
3	V_{PWR}	Unregulated input voltage supply for power section. For proper operation: ($V_{PWR} - V_{OUT}$) > $V_{DROPOUT}$.
4	GND	Common terminal for ground reference, Tab of package is internally connected to this pin.
5	V_{OUT2}	Regulator #2 adjustable output.
6	ADJ_{V2}	Regulator #2 voltage feedback. Sets the output voltage for regulator #2 via an external resistor divider.
7	NC	Not used.

RECOMMENDED MAX OPERATING CONDITION

Parameter	Symbol	LX8817-25			Units
		Min	Typ	Max	
Input Voltage	V_{CTRL}			10	V
	V_{PWR}			7.5	V
Load Current (Internally Limited)	I_1, I_2			3.0	A
Operating Junction Temperature	T_J			125	°C

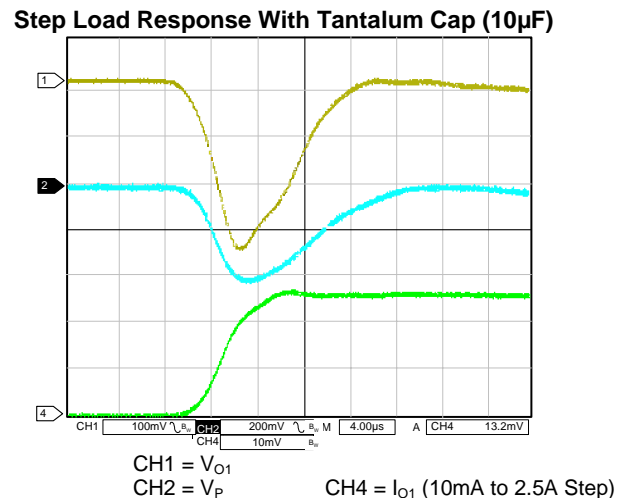
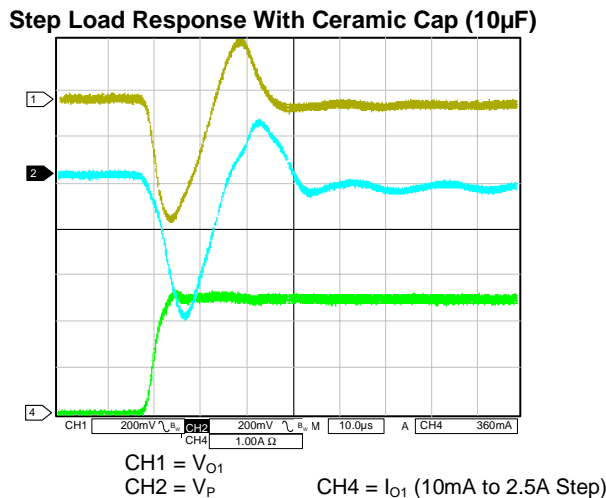
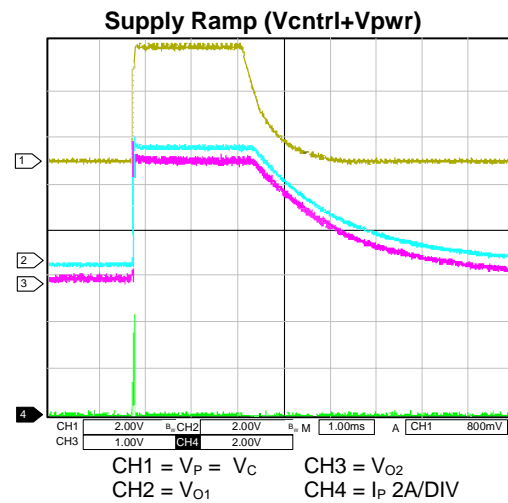
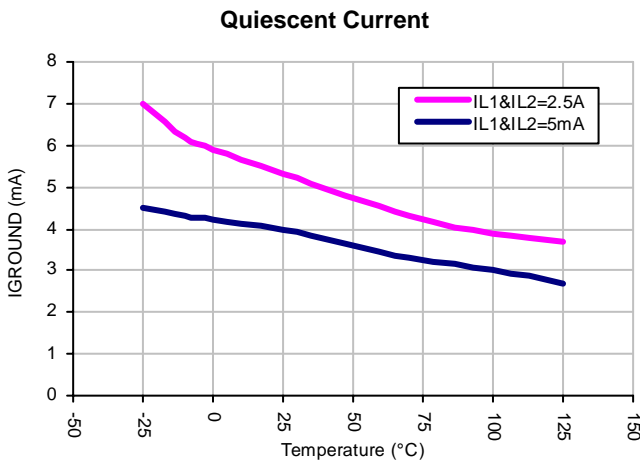
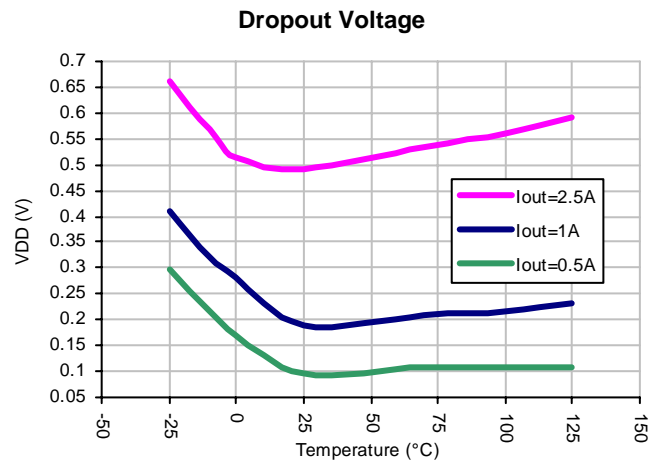
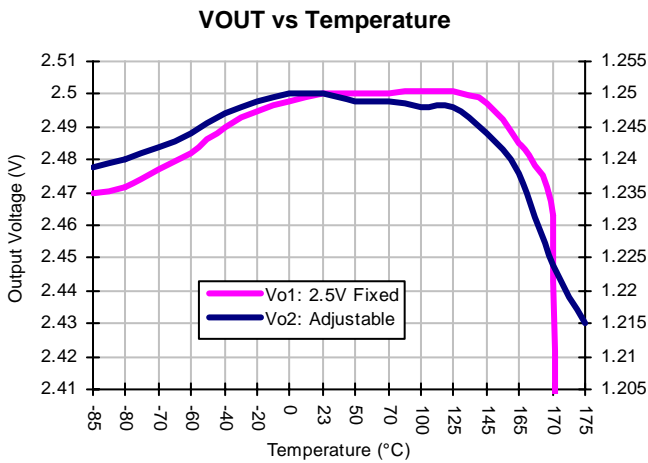
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature $0^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ except where otherwise noted and the following test conditions: $V_{CTRL} = 5\text{V}$, $V_{PWR} = 3.3\text{V}$, $I_{OUT} = 5\text{mA}$, $C_{1,2,3,4} = 10\mu\text{F}$ (Tantalum), and $T_J = T_A$ using low duty cycling methods.

Parameter	Symbol	Test Conditions	LX8817-25			Units
			Min	Typ	Max	
▶ FIXED OUTPUT						
Output Voltage • LX8817-2500	V_1	$5\text{mA} < I_1 < 2.5\text{A}$, $3.75\text{V} < V_{CTRL} < 10\text{V}$ $3.3\text{V} < V_{PWR} < 5.5\text{V}$	2.438	2.500	2.538	V
Line Regulation	$\Delta V_1(V_{IN})$	$3.3\text{V} < V_{CTRL} < 10\text{V}$, $3.3\text{V} < V_{PWR} < 5.5\text{V}$, $I_1 = 5\text{mA}$		1	5	mV
Load Regulation	$\Delta V_1(I_1)$	$5\text{mA} < I_1 < 2.5\text{A}$, $V_{CTRL} = 5\text{V}$, $V_{PWR} = 3.3\text{V}$		1	5	mV
Dropout Voltage (PWR)	$V_{PWR} - V_1$	$I_1 = 2.5\text{A}$, $\Delta V_1 = -2\%$ $I_1 = 2.0\text{A}$, $\Delta V_1 = -2\%$ $I_1 = 1.0\text{A}$, $\Delta V_1 = -2\%$		0.500 0.375 0.225	0.730 0.580 0.390	V
Current Limit	$I_{1(MAX)}$		2.55	3.0		A
Minimum Load Current	I_1	Note 1		0	5	mA
▶ ADJUSTABLE OUTPUT						
Reference Voltage	V_2	$5\text{mA} < I_2 < 2.5\text{A}$, $3.75\text{V} < V_{CTRL} < 10\text{V}$ $3.3\text{V} < V_{PWR} < 5.5\text{V}$	1.231	1.250	1.288	V
Line Regulation	$\Delta V_2(V_{IN})$	$3.3\text{V} < V_{CTRL} < 10\text{V}$, $3.3\text{V} < V_{PWR} < 5.5\text{V}$, $I_2 = 5\text{mA}$		0.05	3	mV
Load Regulation	$\Delta V_2(I_2)$	$5\text{mA} < I_2 < 2.5\text{A}$, $V_{CTRL} = 5\text{V}$, $V_{PWR} = 3.3\text{V}$		10	19	mV
Dropout Voltage	$V_{PWR} - V_2$	$I_2 = 2.5\text{A}$, $\Delta V_2 = -2\%$ $I_2 = 2.0\text{A}$, $\Delta V_2 = -2\%$ $I_2 = 1.0\text{A}$, $\Delta V_2 = -2\%$		0.500 0.375 0.225	0.730 0.580 0.390	V
Current Limit	$I_{2(MAX)}$		2.55	3.0		A
Minimum Load Current	I_2	Note 1		1	5	mA
Adjust Pin Bias Current	I_{ADJ}			1	2	μA
▶ ENTIRE REGULATOR						
Minimum Operating Voltage	V_{PWR}				2.6	V
	$V_{CONTROL}$				3.3	V
Under Voltage Lockout		V_{PWR} Rising, $3.0\text{V} < V_{CTRL} < 10\text{V}$, Both Outputs Off			2.2	V
Quiescent Current	I_Q	$I_1 = I_2 = 5\text{mA}$		3	5	mA
		$I_1 = I_2 = 2.5\text{A}$		6	10	mA
Ripple Rejection	PSRR	$f = 120\text{Hz}$, $T_J = 25^\circ\text{C}$	60	75		dB
RMS Output Noise		$10\text{Hz} < f < 10\text{kHz}$		0.003		$\%V_{OUT}$
Thermal Shutdown	T_{JSD}			160		°C

Note 1: Minimum load current is defined as the amount of output current required to maintain regulation. Typically this current provides the bias to the external resistor divider network used to set the output voltage.

CHARACTERISTIC CURVES



APPLICATION CIRCUIT/BLOCK DIAGRAM

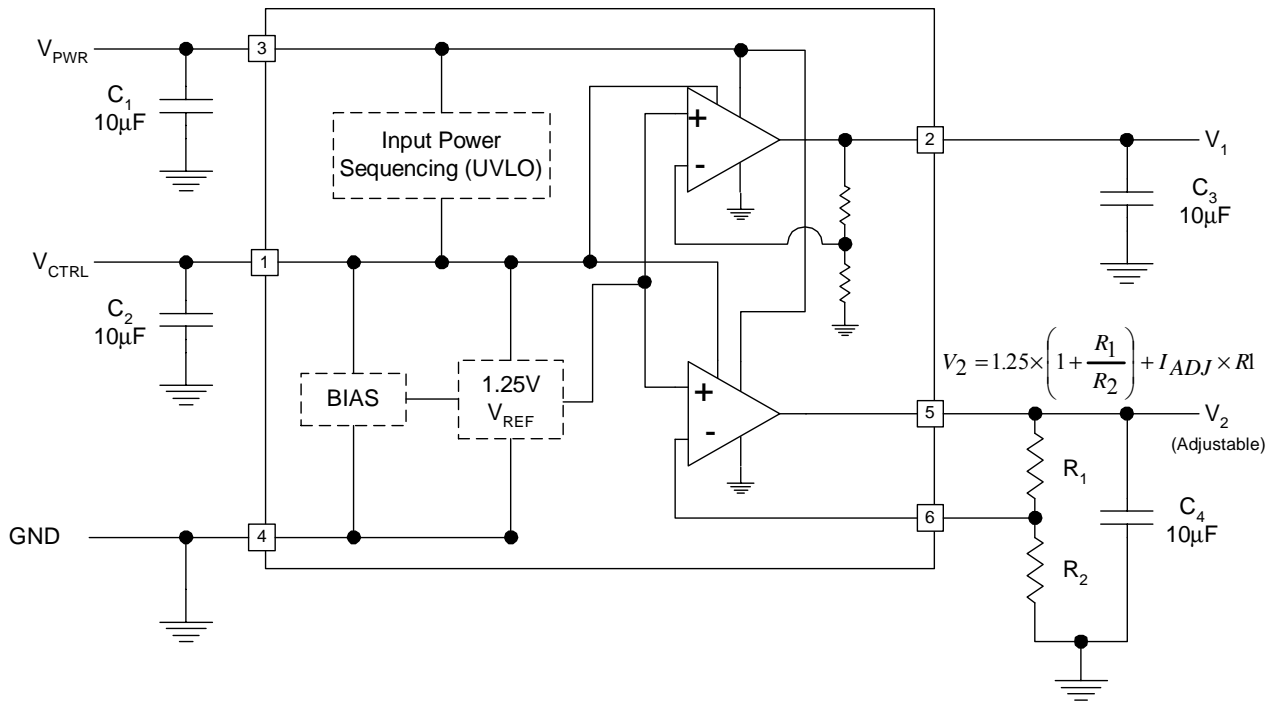


FIGURE – Block Diagram / Application Circuit

APPLICATION INFORMATION

The LX8817 is part of a family of Dual LDO (Low Drop-Out) linear regulators in Linfinity's S-PAK power package which offer maximum power dissipation in a low profile surface mount technology. The family includes combination fixed and adjustable versions. Each channel can supply up to 2.5A independently with a regulator design optimized for system efficiency by consuming minimal ground current and directing quiescent current to the load.

INPUT CAPACITOR

To improve load transient response and noise rejection a input bypass capacitor is of at least 10uF is required. Generally we recommend a 10uF ceramic or tantalum or 22uF electrolytic capacitor.

OUTPUT CAPACITOR

The regulator requires output capacitors connected between each output (V1, V2) to GND to stabilize the internal control loop. Many types of capacitors are available, with different capacitance values tolerances, temperature coefficients and equivalent series resistance. We recommend a minimum of 4.7uF. To ensure good transient response from the power supply system under rapidly changing current load conditions, designers generally use additional output capacitors connected in parallel. Such an arrangement serves to minimize the effects of the parasitic resistance (ESR) and inductance (ESL) that are present in all capacitors. The regulator has been tested stable with capacitor ESR's in the range of 0.05 to 2 ohms. We have found it best to use the same type of capacitor for both input and output bypass.

ADJUSTABLE OUTPUT VOLTAGE

The LX8817x develops a 1.25V reference voltage between the output and the adjust terminal (See Figure 2). By placing a resistor, R1, between these two terminals, a constant current is caused to flow through R1 and down through R2 to set the overall output voltage. Because I_{ADJ} is very small and constant when compared with the current through R1, it represents a small error and can usually be ignored.

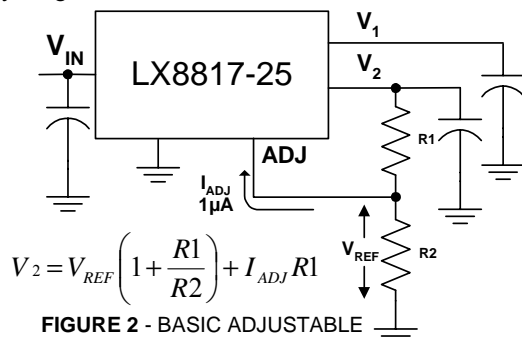


FIGURE 2 - BASIC ADJUSTABLE REGULATOR

MINIMUM LOAD REQUIREMENT

The LX8817 has a minimum load is requirement for proper output regulation. This typical current is specified at 0mA for the fixed output and 1ma for the adjustable output regulators.

TEMPERATURE PROTECTION

The thermal protection shuts the LX8817 down when the junction temperature exceeds 160°C. Each output has independent thermal shutdown capability. Exposure to absolute maximum rated conditions for extended periods may affect device reliability, see Thermal Considerations below.

CURRENT LIMIT PROTECTION

The LX8817 includes over current protection, when the output load current exceeds typically 3A the circuit forces the regulator decrease in output.

THERMAL CONSIDERATIONS

Thermal shutdown protects the integrated circuit from thermal overload caused from a rise in junction temperature during power dissipation. This means of protection is intended for fault protection only and not as a means of current or power limiting during normal application usage. Proper thermal evaluation should be done to ensure that the junction temperature dose not exceed it's maximum rating. Operating at the maximum T_J of 150°C can impact reliability. Due to variation in individual device electrical characteristics and thermal resistance, the built in thermal overload protection may be activated at power levels slightly above or below the rated dissipation. Also peak output power should be considered for each individual output.

Power dissipation for regulator can be calculated using the following equation:

$$P_D = (V_{IN(MAX)} - V_1) \times I_1 + (V_{IN(MAX)} - V_2) \times I_2$$

(Note: power dissipation resulting from quiescent (ground) current is negligible)

For the S-PAK package, thermal resistance, $\theta_{TAB-AMB}$ is 25-45°C/W depending on mounting technique when mounted on a FR4 copper clad PCB. Junction temperature of the integrated circuit can be calculated using:

$$T_{JUNCTION} = T_{JUNCTION-TAB RISE} + T_{TAB-AMBRise} + T_{AMB}$$

$$T_{TAB} = P_{DMAX} \times \theta_{JT}; T_{TAB-AMB} = (P_{DREG1} + P_{DREG2}) \times \theta_{PCB}$$

An example: Given conditions: $T_A = 50^\circ C$, $V_{IN} = 5.0V$, $V_1 = 2.5V$, $I_1 = 210mA$, $V_2 = 3.3V$ $I_2 = 1A$.

Calculated values:

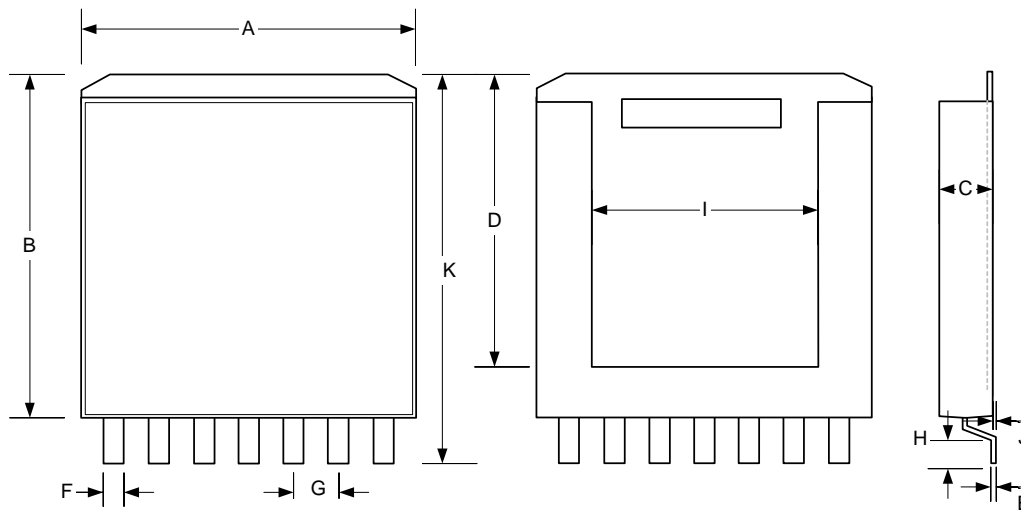
$$T_{J-TABREG1} = (5V - 2.5V) \times 4.5^\circ C/W = (0.525) \times 4.5^\circ C/W = 2.4^\circ C$$

$$T_{J-TABREG2} = (5V - 3.3V) \times (1A) \times 4.5^\circ C/W = (1.7) \times 4.5^\circ C/W = 7.7^\circ C$$

$$T_{TAB-AMBRise} = (0.525W + 1.7W) \times 30^\circ C/W = 66.8^\circ C$$

$$T_{JUNCTION} = 7.7^\circ C + 66.8^\circ C + 50^\circ C = 124.5^\circ C$$

It is important to note that although each output of the regulator will produce up to 2.5A in current, the individual or total power dissipation may limit the useful total current draw. The junction temperature should be calculated for each individual output as well as the combined outputs to insure the maximum junction temperature in not exceeded.

MECHANICAL DIMENSIONS


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	1.27 BSC		0.050 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.

NOTES

PRODUCTION DATA – Information contained in this document is proprietary to Microsemi and is current as of publication date. This document may not be modified in any way without the express written consent of Microsemi. Product processing does not necessarily include testing of all parameters. Microsemi reserves the right to change the configuration and performance of the product and to discontinue product at any time.