



# 12V Linear Flash EPROM Programming Regulator and 2.5V Precision Reference

## Description

The CS-8109 has a 12V  $\pm 3\%$  linear regulator, a high precision 2.5V reference, and microprocessor compatible control circuitry.

The 2.5V precision trimmed reference serves as an exceptionally stable reference for the least significant bit (LSB) in 8 bit A/D converters in 5V automotive and memory management systems, (1.5mA to 10mA). The reference operates independent of the regulator, remaining on when the regulator is switched off during non programming cycles

The regulator supplies 12V and 50mA (typ) to a FLASH EPROM during the EPROM's programming cycle. The regulator's output is protected against a variety of fault conditions: i.e. overvolt-

age, and short circuit conditions. If the precision reference loses power during the programming cycle, the regulator turns off

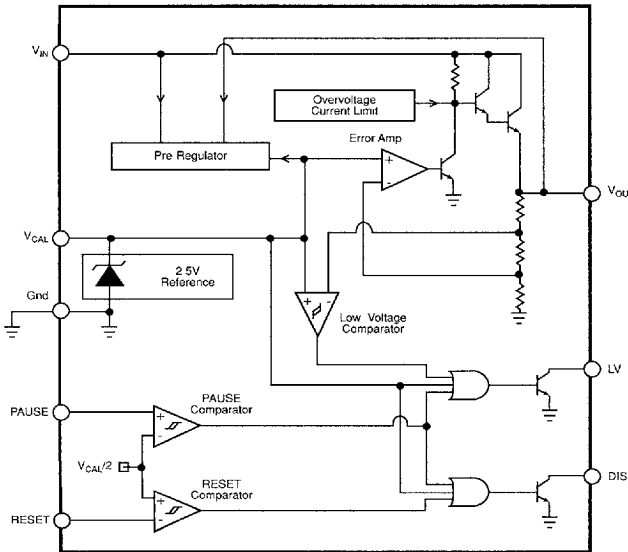
The PAUSE logic input signal enables the regulator control functions Low Voltage (LV) and Disable (DIS). Under normal EPROM programming operations PAUSE is set HIGH. During non-programming times when the  $V_{OUT}$  line is forced on at 12V, the DIS and LV functions are disabled by bringing PAUSE LOW

LV, the low voltage output signal, goes LOW whenever  $V_{OUT}$  falls out of regulation and PAUSE is HIGH. The DIS output is a fast ECL comparator that mirrors the RESET input signal as long as PAUSE is HIGH.

## Features

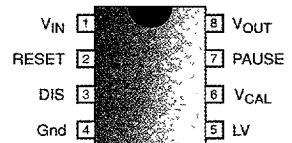
- 12V  $\pm 3\%$  Regulated Output
- 50mA Output Current Capability
- 2.5V  $\pm 0.8\%$  Precision Trimmed A/D Reference
- Microprocessor Compatible Controls
  - RESET
  - Low Voltage Detection
  - DISABLE
  - PAUSE
- Fault Protection
  - 30V Load Dump
  - Short Circuit

## Block Diagram



## Package Options

8 Lead SO



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## Absolute Maximum Ratings

Input Operating Range.....	-0.5 to 25V
Overvoltage Protection.....	.74V
Electrostatic Discharge (Human Body Model).....	4kV
RESET, PAUSE, LV, DIS.....	-0.3 to 7V
Power Dissipation @ 25°C.....	0.7W
Operating Temperature Range.....	-40 to 105°C
Storage Temperature.....	-65 to 150°C
Lead Temperature (Soldering, 10 sec).....	270°C

Electrical Characteristics: -40°C <T<sub>A</sub><+105°C, -40°C <T<sub>J</sub><+150°C, I<sub>OUT</sub> = 0, V<sub>IN</sub>=18V unless otherwise specified

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>■ Regulator</b>					
Output Voltage I <sub>OUT</sub> =0 to 50mA	14.8V≤V <sub>IN</sub> ≤19.0V	11.8	12.2	12.6	V
V <sub>OUT</sub> OFF V <sub>CAL</sub> =0V I <sub>CAL</sub> =0mA	14.8V≤V <sub>IN</sub> ≤19.0V		0.0	1.0	V
Load Regulation I <sub>pp</sub> =0 to 50mA	V <sub>IN</sub> =19.0V		5	50	mV
Line Regulation I <sub>OUT</sub> = 20mA	V <sub>IN</sub> =14.8V to 19.0V		5	50	mV
Dropout Voltage I <sub>OUT</sub> = 50mA	V <sub>IN</sub> =12V		1.6	2.2	V
Supply Ripple Rejection	I <sub>OUT</sub> = 20mA	60	72		dB
Quiescent Current I <sub>OUT</sub> =0 to 50mA	14.8V≤V <sub>IN</sub> ≤19.0V		4.5	10.0	mA
Output Clamp	V <sub>PP</sub> = 12.6V, V <sub>CLMP</sub> = V <sub>OUT</sub> - V <sub>IN</sub>		1.5	6.8	V
Overvoltage Shutdown		28	32	38	V
<b>■ Control Functions</b>					
LV Threshold Low	V <sub>OUT</sub> decreasing from regulation.	11.40	11.70	12.39	V
LV Threshold High	V <sub>OUT</sub> increasing from 6.0V	11.44	11.80	12.59	V
LV Hysteresis		50	100	200	mV
LV Leakage Current	14.8V≤V <sub>IN</sub> ≤19.0V		0	50	μA
LV Output Voltage Low		0.0	0.1	0.4	V
LV Reaction Time			1.0	10.0	μs
DIS Leakage Current	14.8V≤V <sub>IN</sub> ≤19.0V, V <sub>IN</sub> =5.5V		0	100	μA
DIS Output Voltage Low 8.2V≤V <sub>IN</sub> ≤19.0V	RESET=0V;	0.0	0.4	0.8	V
DIS Reaction Time going LOW	14.8V≤V <sub>IN</sub> ≤19.0V, RESET		100	250	ns
RESET Threshold		0.80	1.25	2.00	V
RESET Input Current			0	±10	μA
PAUSE Threshold		0.80	1.25	2.00	V
PAUSE Input Current	0V≤V <sub>IN</sub> ≤19.0V		0	±10	μA

Electrical Characteristics:  $-40^{\circ}\text{C} \leq T_J \leq +105^{\circ}\text{C}$ ,  $V_{\text{IN}}=18\text{V}$ ,  $V_{\text{CC}}=5\text{V}$  unless otherwise specified

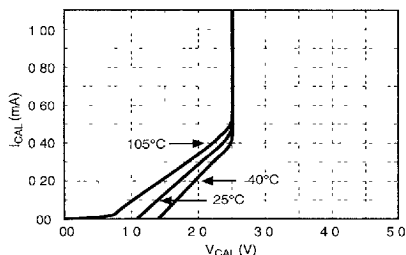
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>■ Precision Reference</b>					
Reverse Breakdown Voltage	$I_{\text{V}_{\text{CAL}}}=2.5\text{mA}$ , $V_{\text{IN}}=\text{OPEN}$ $T_{\text{A}}=25^{\circ}\text{C}$	2.493	2.500	2.507	V
Reverse Breakdown Voltage	$I_{\text{CAL}}=2.5\text{mA}$ ,	2.480	2.500	2.508	V
$\Delta$ Reverse Breakdown Voltage with Current	$1.5\text{mA} \leq I_{\text{CAL}} \leq 10\text{mA}$ $V_{\text{IN}} = \text{OPEN}$		3.0	12.0	mV
Reverse Dynamic Impedance			0.2	1.0	$\Omega$

### Package Pin Description

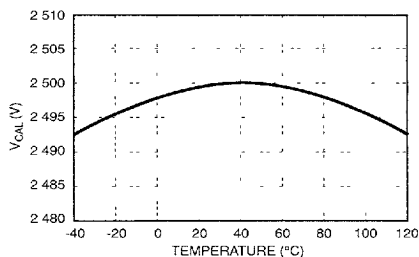
Package Pin #	PIN SYMBOL	FUNCTION
<b>8L SO</b>		
1	$V_{\text{IN}}$	Input for regulator supply.
2	RESET	Input for RESET signal.
3	DIS	Output for Disable (DIS) signal.
4	Gnd	Power ground.
5	LV	Output for Low Voltage (LV) signal.
6	$V_{\text{CAL}}$	2.5V Precision Reference output.
7	PAUSE	Input from PAUSE signal.
8	$V_{\text{OUT}}$	Output from 12V regulator.

### Typical Performance Characteristics

$V_{\text{CAL}}$  vs  $I_{\text{CAL}}$  over Temperature



$V_{\text{CAL}}$  vs Temperature



### Definition of Terms

**Current Limit:** Peak current that can be delivered to the output.

**Dropout voltage:** The input-output voltage differential at which the circuit ceases to regulate against further reduction in input voltage. Measured when the output voltage has dropped 100mV from the nominal value obtained at 14V input, dropout voltage is dependent upon load current and junction temperature

**Input Voltage:** The DC voltage applied to the input terminals with respect to ground

**Leakage Current:** The current flowing in or out of the pin when the function associated with that current is inactive

**Line Regulation:** The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

**Load Regulation:** The change in output voltage for a change in load current at constant chip temperature.

**Overvoltage Protection:** The voltage which causes the IC to turn off its circuitry. By turning off the circuitry large currents which might damage the IC's active areas are prevented

**Quiescent Current:** The part of the positive input current that does not contribute to the positive load current. The regulator ground lead current.

**Reaction Time:** The current flowing in or out of the pin when the function associated with that current is inactive

**Ripple Rejection:** The ratio of the peak-to-peak input ripple voltage to the peak-to-peak output ripple voltage

The CS-8109 has two independent voltage sources, a 2.5V precision reference and a 12V linear regulator. The precision reference is used with 8 bit A/D converters. The 12V regulator is used to program a FLASH EPROM. The regulator and its logic circuitry can be disabled during non programming periods and when the FLASH EPROM is programmed using an external power source; i.e during the manufacture of the module.

#### The Precision Reference

The precision reference is a trimmed 2.5V shunt regulator. The regulator holds its output reference value within  $\pm 3\text{mV}$  over the current range 1.5mA to 10mA. On chip trim links designed as part of a "look ahead" Zener zap scheme, insure that part to part variation in the output reference is kept to 1mV (typ.). The reference operates independent of the 12V regulator.

#### Regulator Control Functions

The 12V regulator has 4 microprocessor compatible control functions. The RESET input signal is logically ANDed with the PAUSE function and the output of the on chip precision reference. As long as the reference is active and PAUSE is high, the DISABLE output will mirror the incoming RESET input signal (See Table 1 and Figure 1).

The LV function is also logically ANDed with the PAUSE and precision reference signals. As long as PAUSE is high and the reference is active, LV will signal each time the output voltage of the 12V regulator moves out of regulation. When it does, LV will go LOW and remain LOW until the output moves back into regulation.

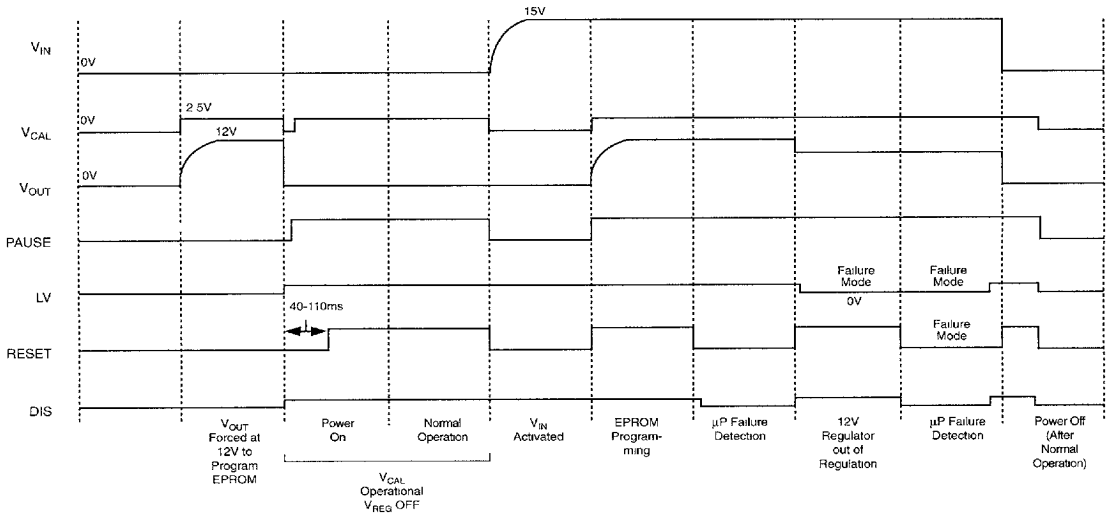
The PAUSE function is used to disable the regulator logic outputs as needed: e.g. a user is programming a FLASH EPROM in a module with an external power source prior to installing the module in a final system. If the DIS is not disabled, the EPROM can not be programmed using the external source (Table 1)

Table 1. Logic Truth Table for  $V_{OUT}$  and  $V_{CAL}$

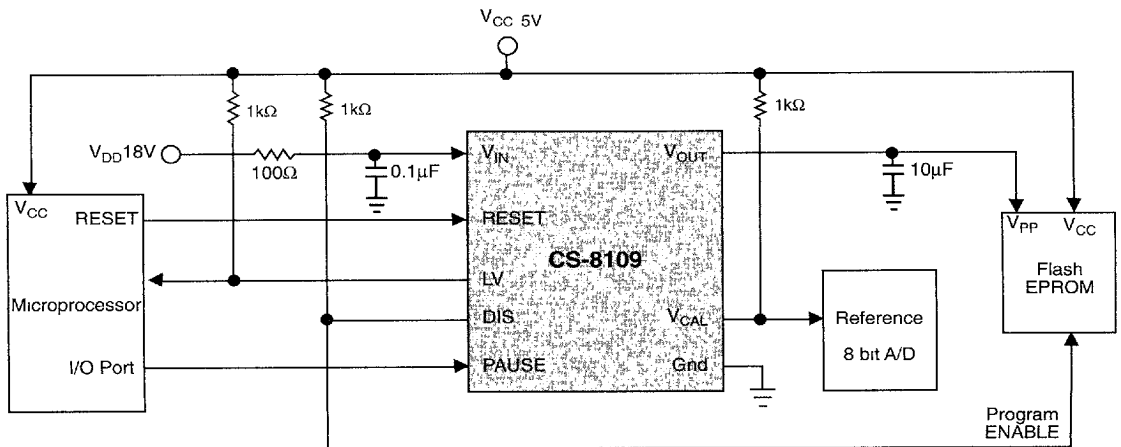
EPROM Operating Condition	INPUTS				OUTPUTS		
	$V_{IN}$ (1=15V 0=0V)	$V_{CAL}$ (1=2.5V 0=0V)	PAUSE (1=5V 0=0V)	RESET (1=5V 0=0V)	$V_{OUT}$ (1=12V 0=<1V)	LV (0=<0.4V)	DIS (0=<0.8V)
Non Programming Cycle	0	0	D	D	0	X	X
	0	1	D	D	0	X	X
	1*	0	D	D	0	X	X
	1*	1	1	0*	1	X	0
	1*	1	1	1	1	X	X
EPROM Programming using 12V Regulator on CS-8109	0	0	D	D	0	X	X
	0	1	D	D	0	X	X
	1	0	D	D	0	X	X
	1	1	1	0*	1	X	0
	1	1	1	1	1	X	X
	1	1	1	0*	<1*	0	0
1	1	1	1	<1*	0	X	
EPROM Programming using External Power Source	0	0	D	D	0	X	X
	0	0	D	D	1	X	X
	0	1	D	D	0	X	X
	0	1	0	D	1	X	X
	>0*	1	0	D	1	X	X
	>0*	1	0	D	<1	X	X

\* - Failure Mode (Unexpected Condition)  
D - Don't Care  
X - Open Collector

Figure 1: Timing Diagram for Regulator Control Functions



Applications Diagram



Package Specification

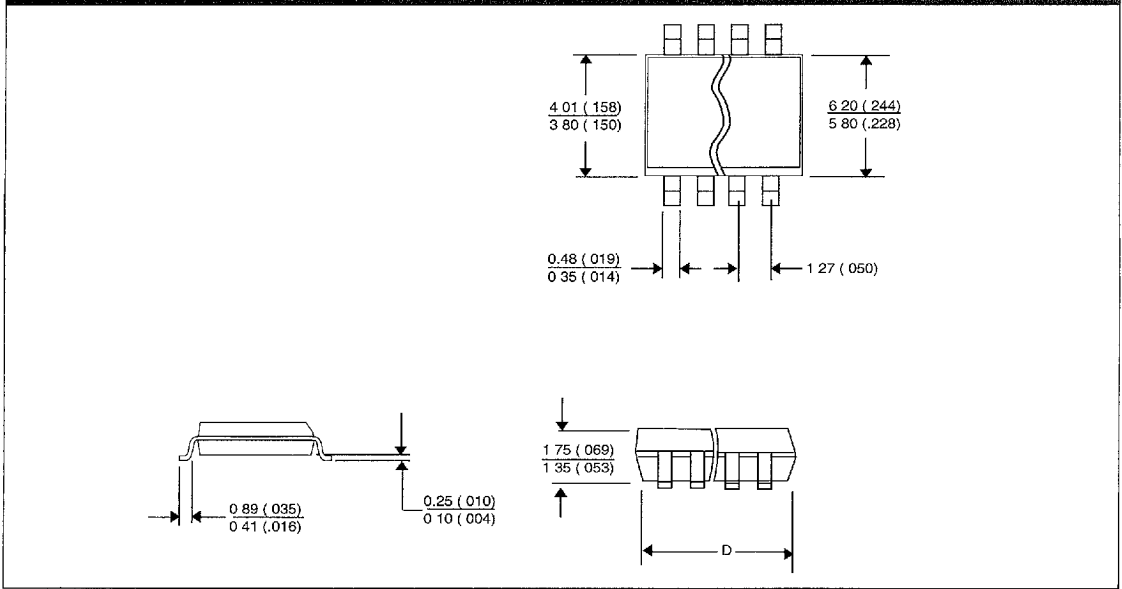
PACKAGE DIMENSIONS IN mm (INCHES)

Lead Count	D			
	Metric		English	
	Max	Min	Max	Min
8L SO	5.00	4.80	.197	.188

PACKAGE THERMAL DATA

Thermal Data		8L SO	
$R\theta_{JC}$	typ	45	$^{\circ}C/W$
$R\theta_{JA}$	typ	140	$^{\circ}C/W$

8 Lead SO Narrow



Ordering Information

Part Number	Description
CS-8109D8	SO Narrow

Preliminary

This product is in the preproduction stages of the design process. The data sheet contains preliminary data. CSC reserves the right to make changes to the specifications without notice. Please contact CSC for the latest available information.

