Hysteretic Current-Mode Controller

Description

The CS-322/4 is designed for operating switching voltage regulators using hysteretic current-mode control. The difference between the CS-322 and the CS–324 is in the Start/Stop Voltages. The CS-322 is intended for off-line applications while the CS-324 is intended for battery input or DC to DC converters

This IC allows the user to select the current hysteresis level required with a minimum of 10% of full load. A differential current sense amplifier (CSA) permits accurate inductor current measurements. The error amplifier (EA) has its non-inverting input connected to the ICs internal reference voltage. Trimming of the bandgap reference is done at the inverting input of the Error Amplifier to achieve a ± 1% tolerance. The output stage provides 1A peak current capability.

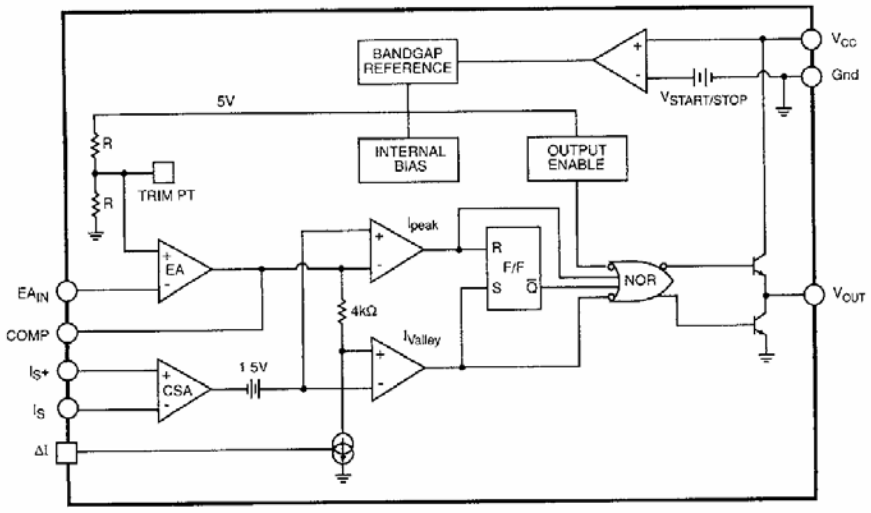
Features

- Provides Hysteretic Current-Mode Control.
- Inherent Short Circuit Protection for the Power Supply.
- High Current Totem Pole Output.
- Eliminates Right-Half Plane Zero in Continuous Conduction Flyback and Boost Converter topologies.
- Feedforward Load Regulation

Absolute Maximum Ratings

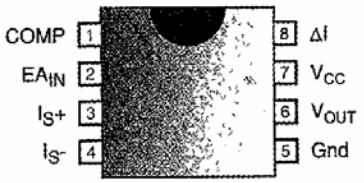
Supply voltage 20V
Output current ..... ±1A (peak)
..... ±200mA (steady state)
Operating Temperature
Industrial ..... -25° to +85°C
Commercial ..... 0° to 70°C

Block Diagram



Package Options

8 Lead PDIP & SO



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Electrical Characteristics: $-25 \le T_A \le 85°C$ for the CS322/4 I, $0 \le T_A \le 70°C$ for the CS322/4 C. V_{CC}=20V, Voltage on ΔI pin = 0.5V, Unless otherwise stated.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
■ Output Section					
Output Low Level	I_{SINK}=20mA		0.25	0.40	V
	I_{SIN}K=200mA		1.5	2.2	V
Output High Level	I_{SINK}=20mA	18.0	18.5		V
	I_{SINK}=200mA	17.5	18.0		V
Rise Time	T_J=25°C, C=1nF (Note 1)		30	60	ns
Fall Time	TJ=25°C, C=1nF (Note 1)		30	60	ns
Output Resistance	7V<V_{CC}<V_{ULVO} (Stop Threshold)		50	65	kΩ
■ Undervoltage Lockout Section					
Start-Up Current			0.8	1.5	mA
Operating Supply Current			14	20	mA
Start Threshold					
CS-322		13.5	14.5	15.5	V
CS-324		8.5	9.0	9.5	V
Stop Threshold					
CS-322		9.5	10.5	11.5	V
CS-324		7.4	7.8	8.2	V
■ Error Amplifier Section					
Input Bias Current	EA_{IN} = 2.5V		-0.3	-1.0	µA
A_{Vol}	1<V_{COMP}<3.5V	65	90		dB
Unity Gain Bandwidth	(Note 1)	1	2		MHz
V_{OUT} HI		3.8	4.0		V
V_{OUT} LO			0.7	1.1	V
Reference Input Voltage	COMP=EA_{IN}	2.45	2.50	2.55	V
■ Current Sense Amplifier					
Gain	V_{Sense^+} =1.4V, V_{Sense^-}=1V	4.35	5.00	5.65	V/V
Maximum Differential Input Signal	V_{Sense^+} = V_{Sense^-} =1V		0.50		V
Internal Offset Voltage			1.5		V
PSRR			70		dB
Input Bias Current			-40	-65	µA
Com-Mode Voltage Range		-0.25		V_{CC}-5.00	V
CMRR			60		dB
■ Hysteresis Level					
Hysteresis Level	$V_{\Delta I}$=0.25V (Note 2)		50		mV
Hysteresis Voltage Dynamic Range					
$V_{\Delta I}$ HI			5		V
$V_{\Delta I}$ LO			0		V

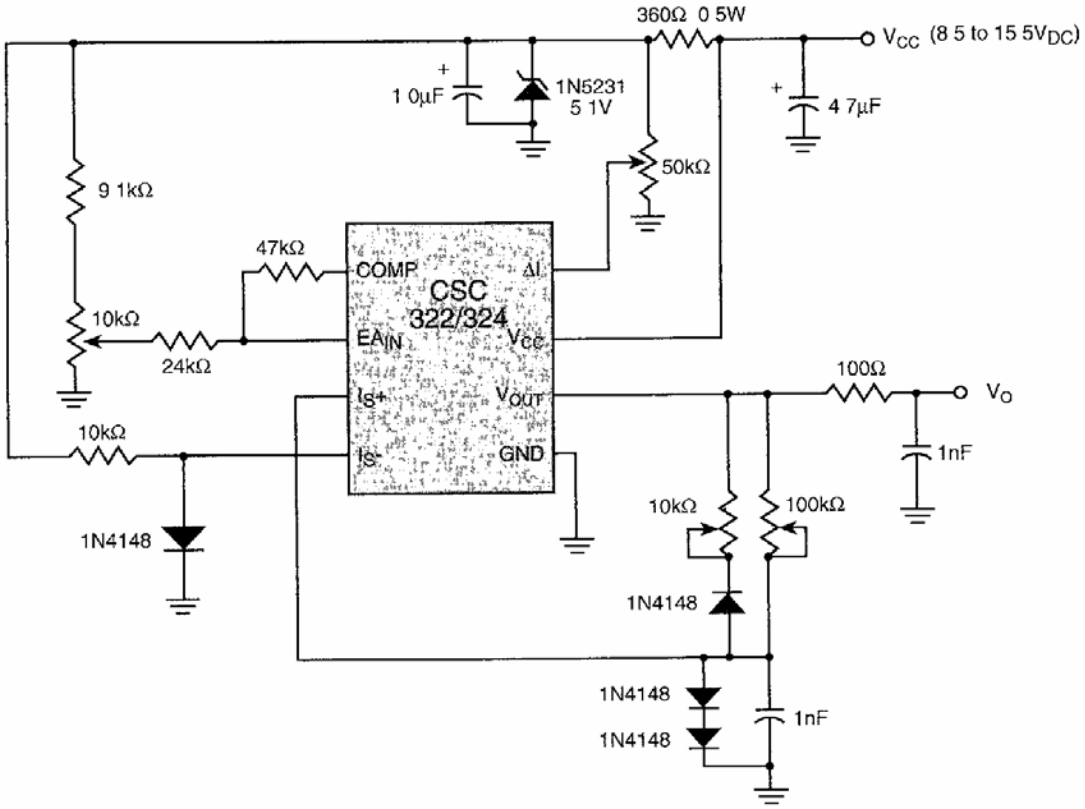
Note: 1. Although guaranteed, these parameters are not 100% tested in production.

2. $V_{\Delta Sense}$ = $0.2V_{\Delta I}$ measured across I_S+ and I_S− .

Package Pin Description

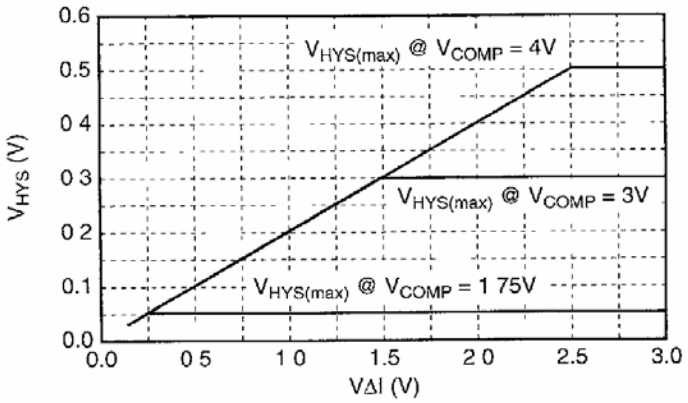
PACKAGE PIN #	PIN SYMBOL	FUNCTION
8L PDIP & 8L SO		
1	COMP	Output of Error Amplifier.
2	EA_{IN}	Inverting input of Error Amplifier.
3	I_S+	Non-inverting input of Current Sense Amplifier.
4	I_S-	Inverting input of Current Sense Amplifier.
5	Gnd	Ground.
6	V_{OUT}	Output driver.
7	V_{CC}	Positive power supply input
8	ΔI	Input voltage that determines the width of the Hysteretic Band.

Test Circuit



V_{HYS} vs $V_{\Delta I}$

$$\left(V_{HYS} = \frac{(V_{COMP} - 1.5V)}{\text{CSA Gain}} \right)$$



Package Specification

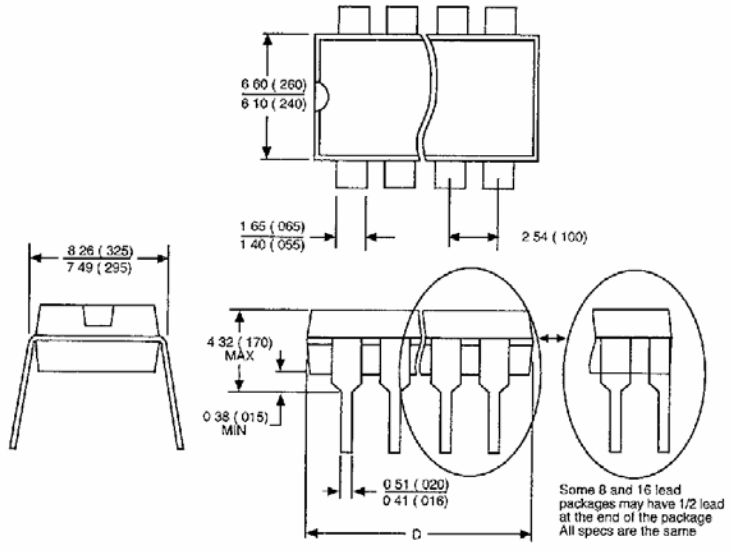
PACKAGE DIMENSIONS IN mm (INCHES)

	D			
Lead Count	**Metric**		**English**	
	Max	Min	Max	Min
8L PDIP	9.40	9.14	.370	.360
8L SO	5.00	4.80	.197	.188

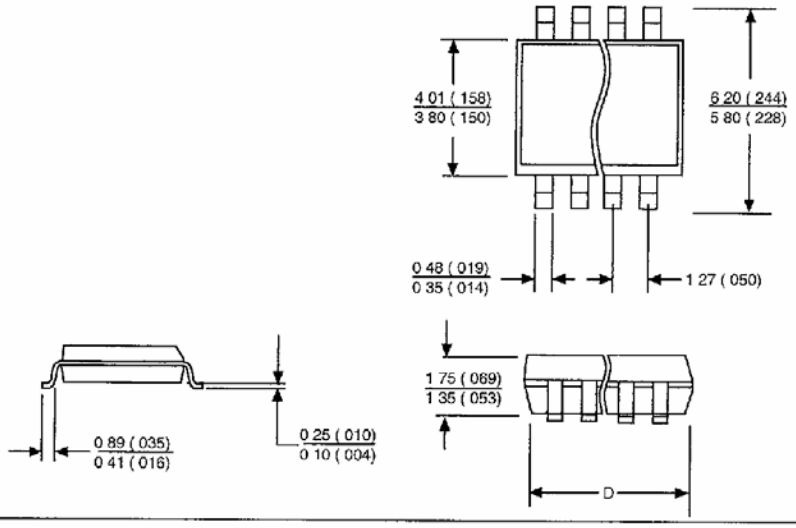
PACKAGE THERMAL DATA

Thermal Data		**8 L PDIP**	**8L SO**	
$R\Theta_{JC}$	typ	52	45	°C/W
$R\Theta_{JA}$	typ	100	165	°C/W

PDIP: 300 mil Wide



SO Narrow: 150 mil Wide



Ordering Information

Part Number	0°C to 70°C	-25°C to 85°C	Description
CS-322CN8	•		8L PDIP
CS-322CD8	•		8L SO
CS-324CN8	•		8L PDIP
CS-324CD8	•		8L SO
CS-322IN8		•	8L PDIP
CS-324IN8		•	8L PDIP