150KHz 2A Step-Down DC/DC Converter

● Features

- 3.3V, 5V, 12V and Adjustable Output
- Adjustable Version Output Voltage Range 1.23V to 18V ± 4%
- Available in SOP-8 Packages
- Output Load Current 2A
- Input Voltage Range up 22V
- 150KHz ±15%Fixed Frequency
- Low Power Standby Mode
- Thermal Shutdown and Current Limited Protection
- TTL Shutdown Capability

● General Description

The CDT2302 series are monolithic integrated circuits that provide a step-down switching regulator, and capable of driving a 2A load with excellent line and load regulation.

These devices are available in fixed output voltage of 3.3V, 5V, 12V, and adjustable output version. Requiring a minimum number of external components, these regulators are simple to use and include internal frequency compensation and a fixed-frequency oscillator.

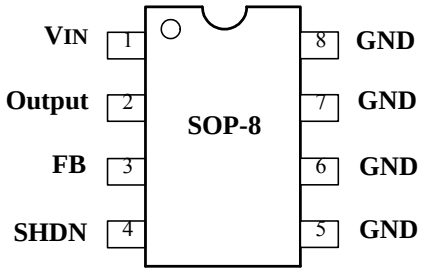
The CDT2302 operates at a switching frequency of 150 KHz thus allowing smaller sized filter components than what would be needed with lower frequency switching regulators. The device features include a guaranteed ±4% tolerance on output voltage under specified input voltage and output load conditions, and ±15% on the oscillator frequency. It does also provide external shutdown, current limited and over temperature shutdown functions for complete protection under fault conditions. The packages are available in a standard SOP-8 package.

● Applications

- On-card switching regulators
- Simple high efficiency step-down (buck)regulator
- Positive to negative converter

● Pin Assignment

Top View



● Ordering Information

CDT2302-X XX

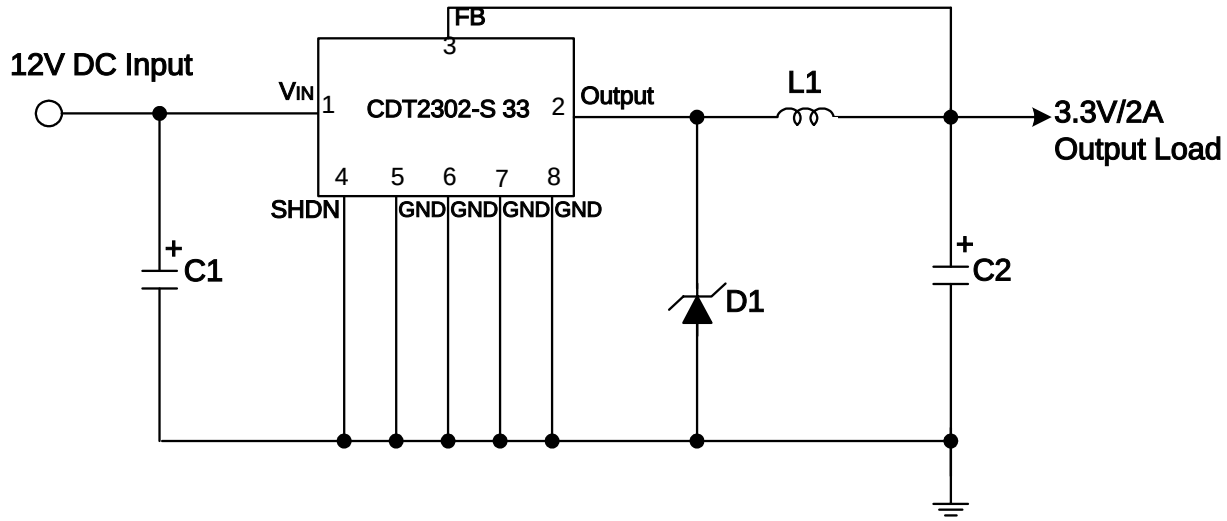
Package Type	Output Voltage
S: SOP-8L	33 : 3.3V 50 : 5.0V 12 : 12V ADJ：Adjustable

● Pin Description

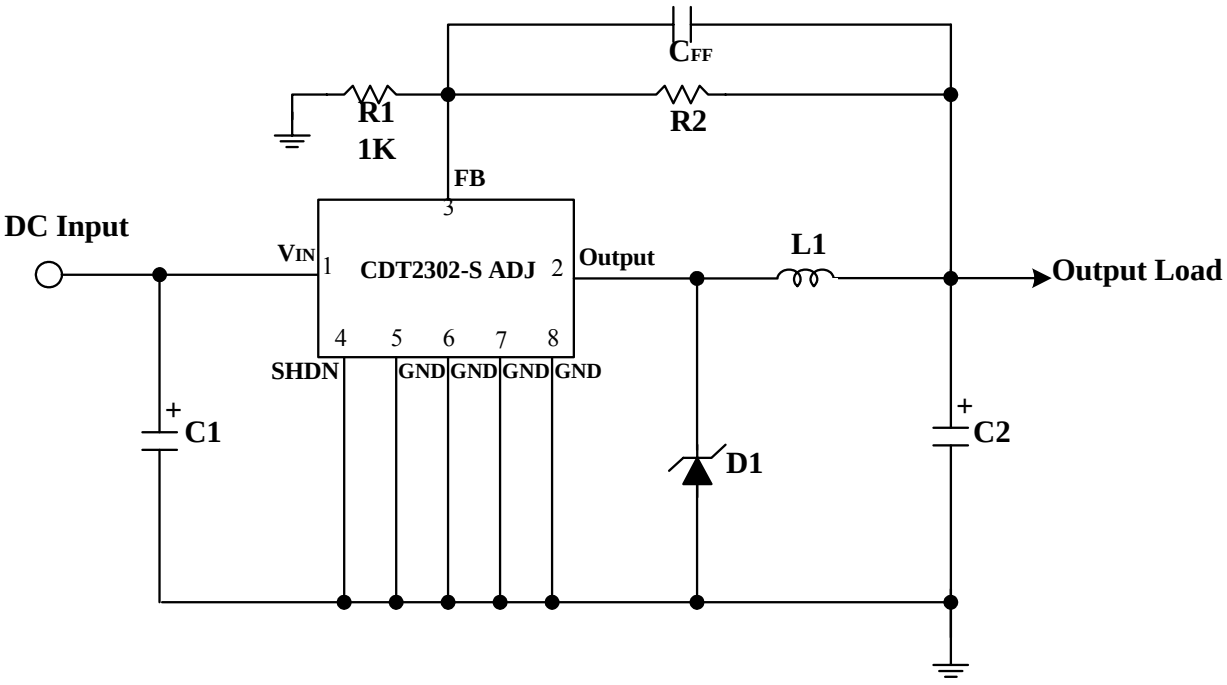
NO.	PIN_NAME	FUNCTION
1	VIN	Supply Voltage Pin
2	Output	Switch Pin. Connect inductor/diode here
3	FB	Feedback Pin.
4	SHDN	Shutdown Control Pin. Active-Low into shutdown mode
5-8	GND	Ground Pin

● Typical Application Circuit

(1). Fixed Type Circuit



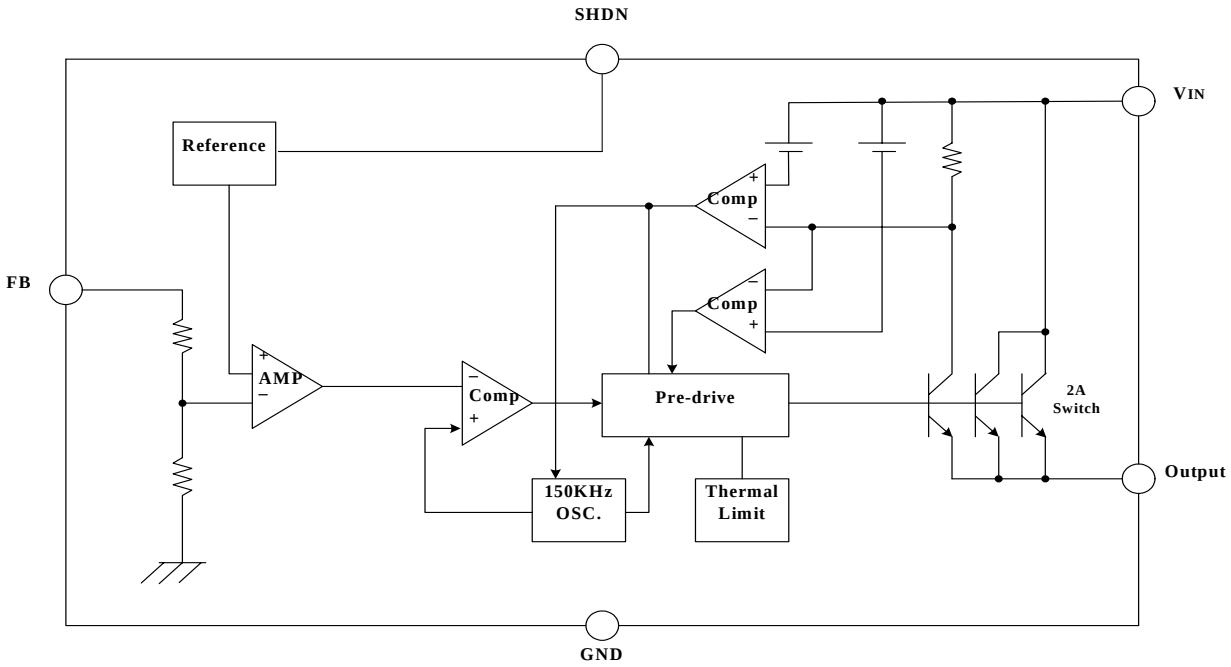
(2). Adjustable Type Circuit



$$Vout = V_{FB} \times (1 + \frac{R2}{R1}), \qquad R2 = R1 \times (\frac{Vout}{V_{FB}} - 1)$$

$$V_{FB} = 1.245V, \qquad C_{FF} = \frac{1}{31 \times 10^3 \times R2}$$

● Block Diagram



● Absolute Maximum Ratings

- Supply Voltage ---------- −0.3V to 22V
- Input Voltage ---------- -0.3V to V_{DD}+0.3V
- Operating Temperature --------- -40℃ to 125℃
- Storage Temperature---------- −50℃ to 125℃

* Note：Stresses above those listed may cause permanent damage to the devices.

● Electrical Characteristic

(Specifications with standard type face are for T_J=25℃, and those with **boldface type** apply over **full Operating Temperature Range**. Unless otherwise specified. V_{IN}=12V for the 3.3V, 5V, Adjustable version and V_{IN}=18V for the 12V Version I_{LOAD}=500mA)

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Unit
I_{FB}	Feedback bias Current	V_{FB} = 1.3V (Adjustable Only)			40	60 100	nA
F_{OSC}	Oscillator Frequency			127 **110**	150	173 **173**	KHz
V_{SAT}	Saturation Voltage	I_{OUT} = 2A, No outside circuit and V_{FB} = 0V force driver on			1.5	1.6 **1.7**	V
DC	Max. Duty Cycle (ON)	V_{FB} = 0V force driver on			100		%
	Min. Duty Cycle (OFF)	V_{FB} = 12V force driver off			0		%
I_{CL}	Current Limit	Peak current, No outside circuit and V_{FB} = 0V force driver on		3.6	4	5.5 **6.5**	A
I_{LEAK}	Output Leakage Current	Output = 0V, No outside circuit and V_{FB} = 12V force driver off				200	μA
		Output = - 0.8V, V_{IN} = 20V			10	30	mA
I_Q	Quiescent Current	V_{FB} = 12V force driver off			5	10	mA
I_{STBY}	Standby Quiescent Current	SHDN Pin = 5V, V_{IN} = 20V			150	250 **300**	μA
V_L	SHDN Pin Logic Input Threshold Voltage	Low (Regulator ON)			1.3	0.6	V
V_H		High (Regulator OFF)		2.0			
I_H	SHDN Pin Logic Input Current	V_{LOGIC} = 2.5V (OFF)			15	25	μA
I_L		V_{LOGIC} = 0.5V (ON)			0.02	5	
Θ_{JC}	Thermal Resistance, Θ_{JC}	SOP-8L	Junction to case		15		℃/W
Θ_{JA}	Thermal Resistance with Copper area of approximately 3 in^2	SOP-8L	Junction to ambient		70		℃/W

• **CDT2302-ADJ**

Symbol	Parameter	Conditions	Typ.	Limit	Unit
VFB	Output Feedback	5V ≤ VIN ≤ 20V, 0.2A ≤ ILOAD ≤ 2A, VOUT programmed for 3V	1.23	1.193/**1.18** 1.267/**1.28**	V VMIN VMAX
η	Efficiency	VIN = 12V, ILOAD = 2A	76		%

• **CDT2302-3.3V**

Symbol	Parameter	Conditions	Typ.	Limit	Unit
Vout	Output Feedback	5.5V ≤ VIN ≤ 20V, 0.2A ≤ ILOAD ≤ 2A,	3.3	3.168/**3.135** 13.432/**3.465**	V VMIN VMAX
η	Efficiency	VIN = 12V, ILOAD = 2A	78		%

• **CDT2302-5.0V**

Symbol	Parameter	Conditions	Typ.	Limit	Unit
Vout	Output Feedback	8V ≤ VIN ≤ 20V, 0.2A ≤ ILOAD ≤ 2A,	5	4.8/**4.75** 5.2/**5.25**	V VMIN VMAX
η	Efficiency	VIN = 12V, ILOAD = 2A	83		%

• **CDT2302-12V**

Symbol	Parameter	Conditions	Typ.	Limit	Unit
Vout	Output Feedback	15V ≤ VIN ≤ 20V, 0.2A ≤ ILOAD ≤ 2A,	12	11.52/**11.4** 12.48/**12.6**	V VMIN VMAX
η	Efficiency	VIN = 16V, ILOAD = 2A	90		%

(Specifications with standard type face for T_J = 25 ℃, and those with boldface type apply over full operating temperature range)

● Operation Description

- **Pin Functions:**

VIN

This is the positive supply for the IC switching regulator. A suitable input bypass capacitor must be present at this pin to minimize voltage transients and to supply the switching currents needed by the regulator.

GND

Circuit ground

Output

Internal switch. The voltage at this pin switches between (+VIN – VSAT) and approximately –0.5V, with a duty cycle of approximately VOUT/VIN. To minimize coupling to sensitive circuitry, the PC board copper area connected to this pin should be kept a minimum.

SHDN

Allows the switching regulator circuit to be shutdown using logic level signals thus dropping the total input supply current to approximately 150μA. Pulling this pin below a threshold voltage of approximately 1.3V turns the regulator on, and pulling this pin above 1.3V (up to a maximum of 18V) shuts the regulator down. If this shutdown feature is not needed, the SHDN pin can be wired to the ground pin or it can be left open, in either case the regulator will be in the ON condition.

FB

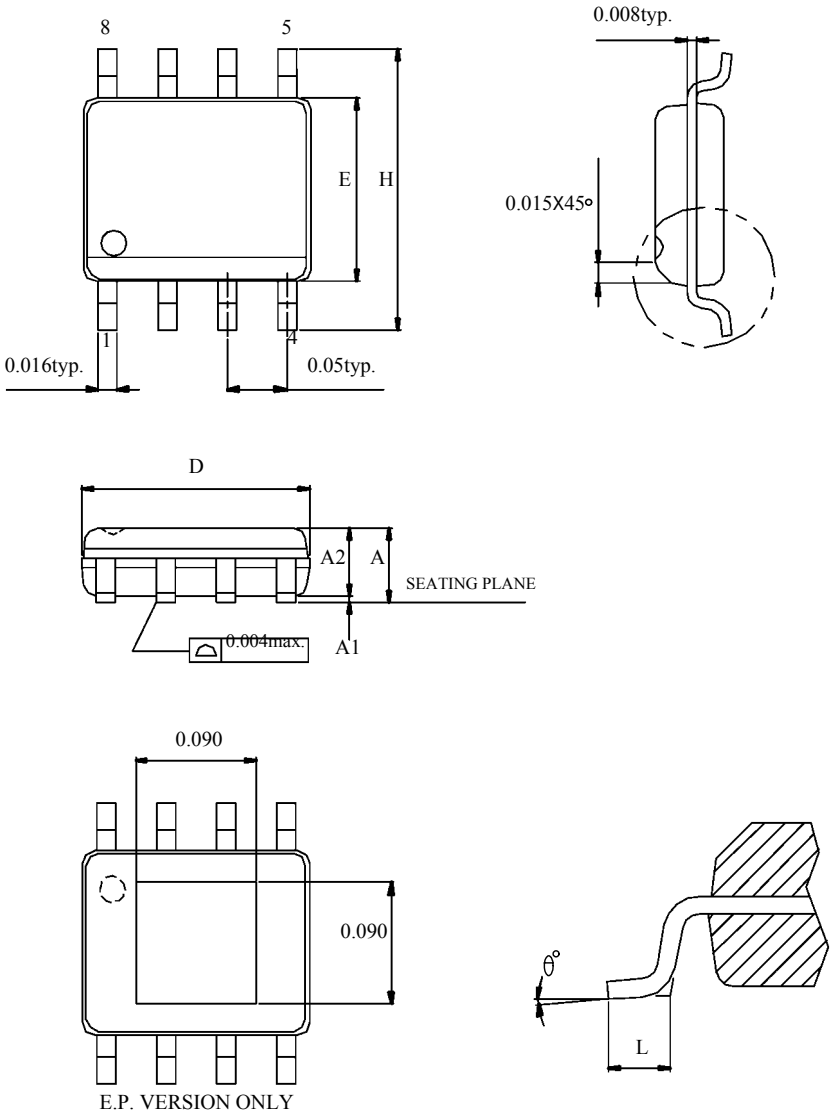
Senses the regulated output voltage to complete the feedback loop.

- **Thermal Considerations:**

The CDT2302 is available in a surface mount SOP-8. The size of the heatsink depends on the input voltage, the output voltage, the load current and the ambient temperature. The CDT2302 junction temperature rises above ambient temperature for a 2A load and different input and output voltage. The data was taken with the CDT2302 operating as a buck switching regulator in an ambient temperature of 25 ℃ (still air). These temperature rise numbers are all approximate and there are many factors that can affect these temperatures. Higher ambient temperature requires more heat sinking.

● Package Information

• 8-pin SOP outline dimensions



Symbols	MIN.	MAX.
A	0.053	0.069
A1	0.004	0.010
A2	—	0.059
D	0.189	0.196
E	0.150	0.157
H	0.228	0.244
L	0.016	0.050
θ°	0	8

UNIT：INCH

NOTES.

1. JEDEC OUTLINE：MS-012 AA / E.P. VERSION：N/A
2. DIMENSIONS “D” DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.15mm (0.006in) PER SIDE.
3. DIMENSIONS “E” DOES NOT INCLUDE INTER-LEAD FLASH, OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.25mm (0.010in) PER SIDE.