Silicore
芯谷科技

D2596DF
150KHz 2A PWM Buck DC/DC Converter

General Description

The D2596DF is a monolithic IC designed for a step-down DC/DC converter, and own the ability of driving a 2A load without additional transistor. It saves board space. The external shutdown function can be controlled by logic level and then come into standby mode. The internal compensation makes feedback control having good line and load regulation without external design. Regarding protected function, thermal shutdown is to prevent over temperature operating from damage, and current limit is against over current operating of the output switch. If current limit function occurs and V_{FB} is down below 0.5V, the switching frequency will be reduced. The D2596DF operates at a switching frequency of 150KHz thus allow smaller sized filter components than what would be needed with lower frequency switching regulators. Other features include a guaranteed ±4% tolerance on output voltage under specified input voltage and output load conditions, and ±15% on the oscillator frequency. The output version included fixed 3.3V, 5V, 12V, and an adjustable type. The chips are available in a standard SOP8 package.

SOP8

Features

- 3.3V, 5V, 12V and Adjustable Output Version
- Output Adjustable Voltage From 1.23V to 37V
- Fixed 150KHz Switching Frequency
- Voltage Mode Non-synchronous PWM Control
- Thermal-Shutdown and Current-Limit Protection
- ON/OFF Shutdown Control Input
- Wide 4.5V to 40V Input Voltage Range
- Output Load Current: 2A
- Low Power Standby Mode
- Built-in Switching Transistor on Chip

Package Information

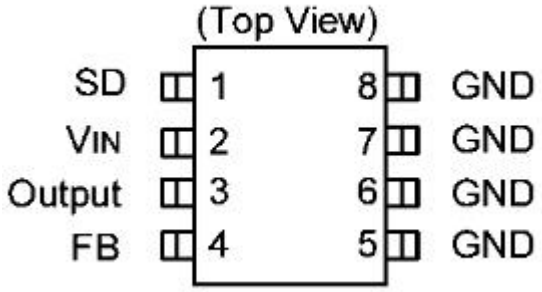
PART NO.	PACKAG DESCRIPTION	PACKAGE MARKING	PACKAGE OPTION
D2596DF-3.3	SOP8	CHMC D2596DF 33 XXX	100/Tube 4000/Reel
D2596DF-5.0	SOP8	CHMC D2596DF 50 XXX	100/Tube 4000/Reel
D2596DF-12	SOP8	CHMC D2596DF 12 XXX	100/Tube 4000/Reel
D2596DF-ADJ	SOP8	CHMC D2596DF ADJ XXX	100/Tube 4000/Reel

CHMC:Trademark D2596DF:Part NO. 33/50/12/ADJ:Voltage XXX:Lot NO.

Application

- Simple High-Efficiency Step-down Regulator
- On-card Switching Regulators
- Positive to Negative Converter

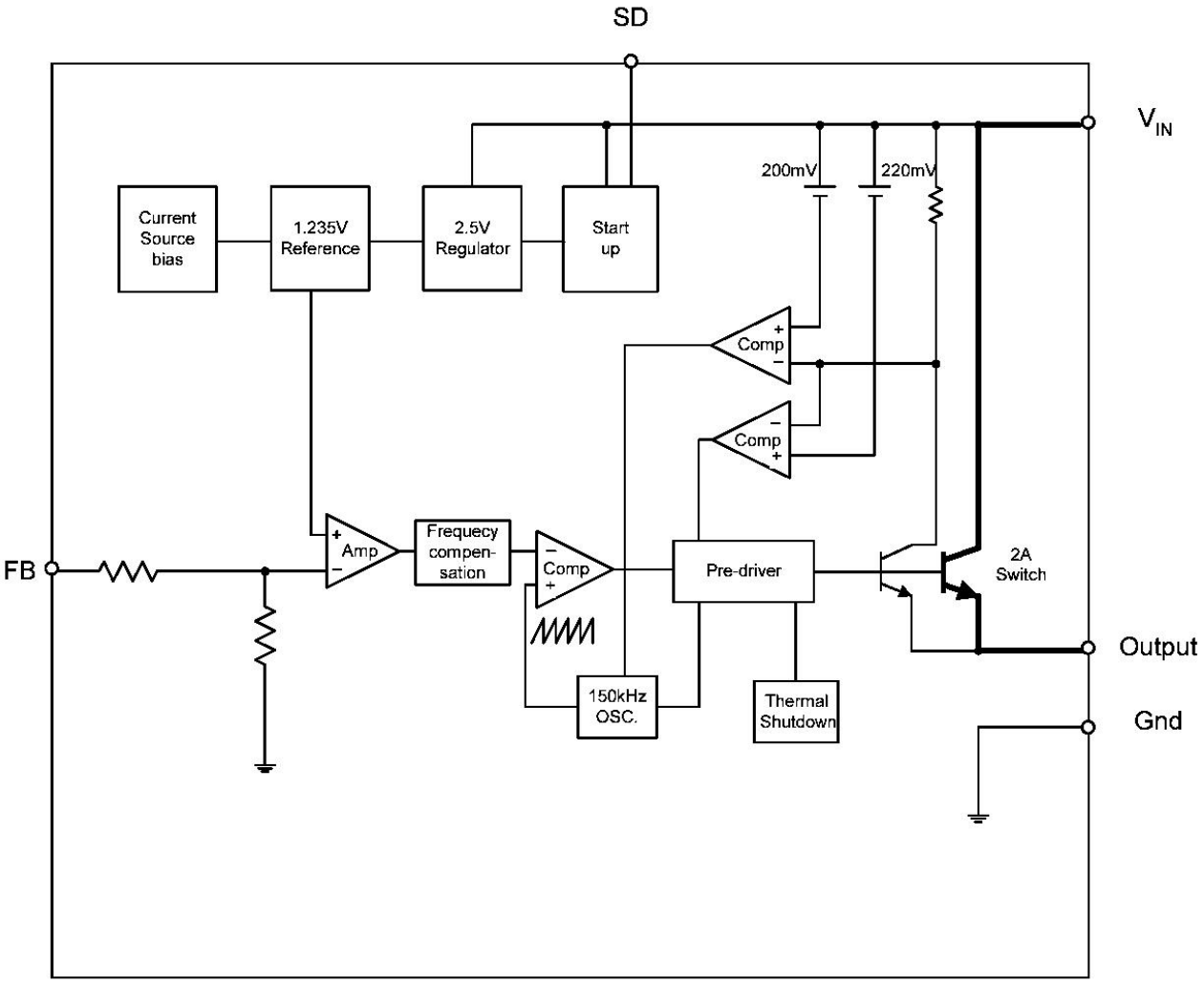
Pin Configuration



Pin Descriptions

Name	Description
SD	ON/OFF Shutdown
V_{IN}	Supply Voltage Input
Output	Power Switching Output
FB	Output Voltage Feedback Control
GND	Ground

Block Diagram



Absolute Maximum Ratings

Characteristics	Symbol	Value	Unit
Supply Voltage	V_{IN}	+42	V
ON/OFF pin input voltage	V_{SD}	-0.3 ~ V_{IN}	V
Feedback pin voltage	V_{FB}	-0.3 ~ V_{IN}	V
Output voltage to ground	V_{OUT}	-1	V
Power dissipation	PD	Internally limited	W
Storage temperature	Tstg	-65 ~ +150	°C
Operating temperature	Topr	-40 ~ +125	°C
Operating voltage	V_{OP}	+4.5 ~ +40	V

Electrical Characteristics

(Refer to the test circuit, V_{IN}=12V for 3.3V, 5V, adjustable version and V_{IN}=24V for the 12V version, I_{LOAD}=0.5A)

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
Feedback Bias Current	I_{FB}	V_{FB}=1.3V (Adjustable version only)		50	100	nA
Oscillator Frequency	Fosc		127	150	173	kHz
Saturation Voltage	V_{SAT}	I_{OUT}=2A, No outside circuit V_{FB}=0V force driver on		1.2	1.5	V
Max. Duty Cycle(ON)	DC	V_{FB}=0V force driver on	93	98		%
Min. Duty Cycle(OFF)		V_{FB}=12V force driver off		0		
Current Limit	I_{CL}	Peak current, No outside circuit V_{FB}=0V force driver on	3.0	4.0		A
Output Leakage Current (Output=0)	I_L	No outside circuit V_{FB}=12V force driver off			2	mA
Output Leakage Current (Output=-1)		V_{IN}=40V		5	20	mA
Quiescent Current	I_Q	V_{FB}=12V force driver off		5	10	mA
Standby Quiescent Current	I_{STBY}	ON/OFF pin=5V V_{IN}=40V		50	200	μA
ON/OFF pin Logic Input Threshold Voltage	V_{IL}	Low(regulator ON)			0.6	V
	V_{IH}	High(regulator OFF)	2.0			
ON/OFF pin Logic Input Current	I_H	V_{LOGIC}=5.0V(OFF)		12	30	μA
ON/OFF pin Input Current	I_L	V_{LOGIC}=0.5V(ON)		0	10	
Thermal Resistance	Θ_{JC}	Junction to case		15		°C/W
Thermal Resistance with Copper Area of Aapproximately 3 in^2	Θ_{JA}	Junction to ambient		70		°C/W

Continue:

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit
D2596DF-3.3						
Output Voltage	V_{OUT}	4.75V≤V_{IN}≤40V 0.2A≤I_{LOAD}≤2A	3.168	3.300	3.432	V
Efficiency	η	V_{IN}=12V, I_{LOAD}=2A		76		%
D2596DF-5.0						
Output Voltage	V_{OUT}	7V<V_{IN}<40V 0.2A≤I_{LOAD}≤2A	4.80	5.00	5.20	V
Efficiency	η	V_{IN}=12V, I_{LOAD}=2A		83		%
D2596DF-12						
Output Voltage	V_{OUT}	15V≤V_{IN}≤40V 0.2A≤I_{LOAD}≤2A	11.52	12.00	12.48	V
Efficiency	η	V_{IN}=25V, I_{LOAD}=2A		90		%
D2596DF-ADJ						
Output Feedback	V_{FB}	4.5V≤V_{IN}≤40V 0.2A≤I_{LOAD}≤2A V_{OUT} programmed for 3V	1.193	1.230	1.267	V
Efficiency	η	V_{IN}=12V, I_{LOAD}=2A		74		%

Function Description

Pin Function $+V_{IN}$

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

Ground

Circuit ground.

Output

Internal switch. The voltage at this pin switches between ($+V_{IN} - V_{SAT}$) and approximately – 0.5V, with a duty cycle of approximately V_{OUT} / V_{IN}. To minimize coupling to sensitive circuitry, the PC board copper area connected to this pin should be minimized.

Feedback

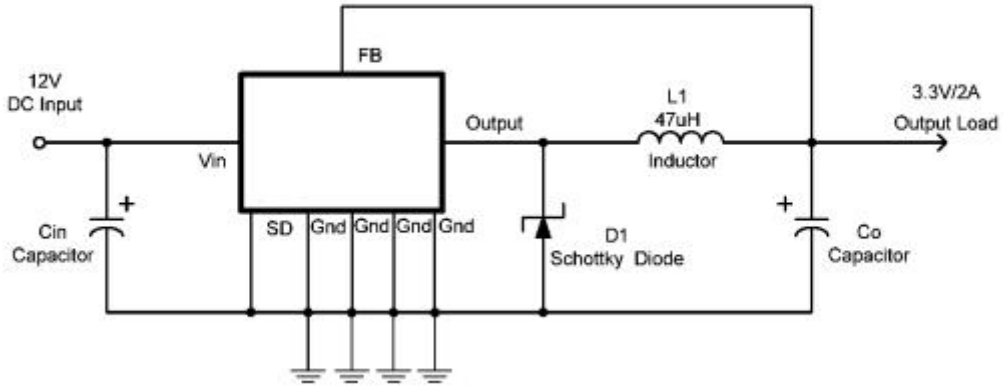
Senses the regulated output voltage to complete the feedback loop.

SD

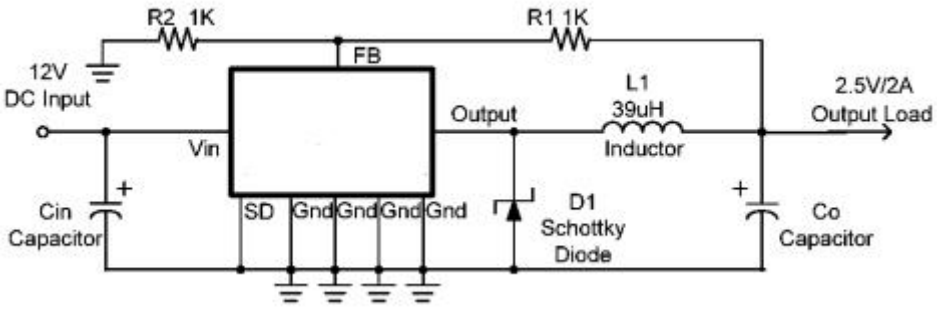
Allows the switching regulator circuit to be shutdown using logic level signals thus dropping the total input supply current to approximately 150uA. Pulling this pin below a threshold voltage of approximately 1.3V turns the regulator on, and pulling this pin above 1.3V (up to a maximum of V_{IN}) shuts the regulator down. If this shutdown feature is not needed, the SD pin can be wired to the ground pin.

Application Circuit

Fixed Type Circuit



Adjustable Type Circuit

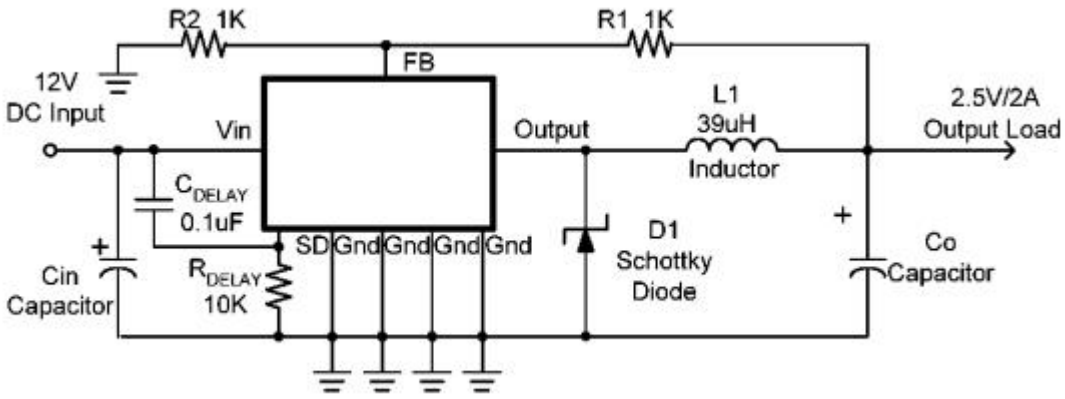


$$Vout = V_{FB} \times (1 + \frac{R1}{R2})$$

V_{FB} = 1.23V

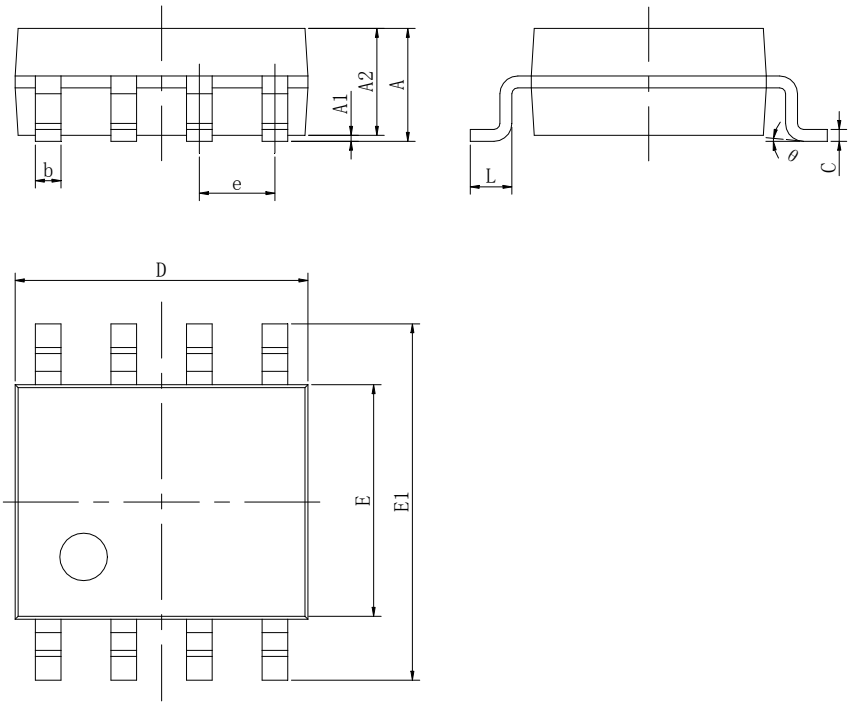
R2 = 1K ~ 3K

Delay Start Circuit



Outline Drawing

SOP8 Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.800	0.053	0.071
A1	0.050	0.250	0.004	0.010
A2	1.250	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.780	5.000	0.185	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Statements

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