

GENERAL DESCRIPTION

The LM2596HVS series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving a 3A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3V, 5V, 12V, and an adjustable output version. Available in a standard 5-lead TO-220 package and a 5-lead TO-263 surface mount package. External shutdown is included, featuring typically 30 μ A standby current. The output switch includes cycle-by-cycle current limiting, as well as thermal shutdown, and protection from output short for full protection under fault conditions.

Features

- 3.3V, 5V, 12V and Adjustable output versions
- Adjustable version output voltage range, 1.23V to 57V
- $\pm 4\%$ max over line and load condition
- Available in TO-263
- Guaranteed 3A output load current
- Input voltage range up to 60V
- Requires only 4 external components
- Excellent line and load regulation specifications
- 150kHz fixed frequency internal oscillator
- Low power standby mode, I_{STB} typically 30 μ A
- High efficiency
- Thermal shutdown and current limit protection
- Output short protection by reduction of frequency by 3 times

Applications


- Simple high-efficiency step-down (buck) regulator
- Efficient pre-regulator for linear regulators
- On-card switching regulators

TYPICAL APPLICATION


OUTPUT VOLTAGE	PART NO.	PACKAGE	PACKING
3.3V	LM2596HVS-3.3	TO-263-5L(D ² PAK)	800pcs / 13" Reel
5.0V	LM2596HVS-5.0	TO-263-5L(D ² PAK)	800pcs / 13" Reel
12V	LM2596HVS-12	TO-263-5L(D ² PAK)	800pcs / 13" Reel
ADJ	LM2596HVS-ADJ	TO-263-5L(D ² PAK)	800pcs / 13" Reel

Marking:


LM2596HVS-3.3

	TECH PUBLIC
LM2596HVS	
-3.3	P+


LM2596HVS-5.0

	TECH PUBLIC
LM2596HVS	
-5.0	P+

LM2596HVS-12

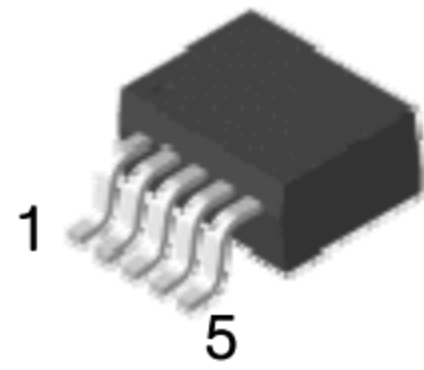
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LM2596HVS	
-12	P+

LM2596HVS-ADJ

	TECH PUBLIC
LM2596HVS	
-ADJ	P+

PIN CONFIGURATION

TO-263-5L (D²PAK)



Pin Definition:

1. Input
2. SW Output
3. Ground
4. Feedback
5. Enable

ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{IN}	-	63	V
ON/OFF Pin Input Voltage	$V_{ON/OFF}$	-0.3	60 (or V_{IN})	V
FB pin voltage	V_{FB}	-0.3	25 (or V_{IN})	V
Output voltage to GND	V_{OUT}	-1		V
Storage Temperature Range	T_{STG}	-65	150	°C
Maximum Junction Temperature Range	$T_{J,MAX}$	-	150	°C

Operating Ratings

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT
Supply Voltage	V_{IN}	4.5	60	V
Load Current	I_{LOAD}	-	3.0	A
Temperature Range	T_J	-40	125	

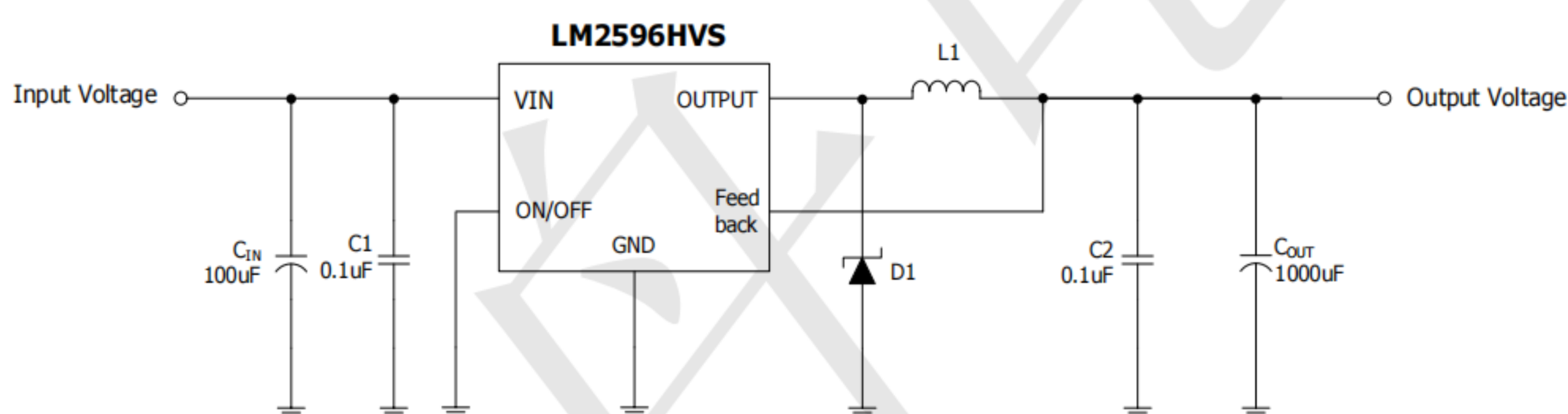
Electrical Characteristics (T_A=25 C unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION (Note 2)	MIN.	TYP.	MAX.	UNIT
SYSTEM PARAMETERS (Note 3)						
Feedback Voltage	V _{FB}	LM2596HVS-ADJ 8V ≤ V _{IN} ≤ 60V, 0.2A ≤ I _{LOAD} ≤ 3A	1.193	1.230	1.273	V
			1.180		1.285	
Output Voltage	V _O	LM2596HVS-3.3 5.5V ≤ V _{IN} ≤ 60V, 0.2A ≤ I _{LOAD} ≤ 3A	3.185	3.30	3.432	V
			3.152		3.465	
		LM2596HVS-5.0 8V ≤ V _{IN} ≤ 60V, 0.2A ≤ I _{LOAD} ≤ 3A	4.825	5.00	5.20	V
			4.775		5.25	
LM2596HVS-12 15V ≤ V _{IN} ≤ 60V, 0.2A ≤ I _{LOAD} ≤ 3A	11.58	12.00	12.48	V		
	11.46		12.60			
Line Regulation	Line Reg	8 ≤ V _{IN} ≤ 60V, I _{LOAD} = 0.2A		0.3		%
Load Regulation	Load Reg	10mA ≤ I _{LOAD} ≤ 3A, V _{IN} = 12V		0.3		%
Efficiency	η	LM2596HVS-ADJ V _{IN} = 12V, I _{LOAD} = 3A, V _{OUT} = 5V		79		%
		LM2596HVS-3.3 V _{IN} = 12V, I _{LOAD} = 3A		77		%
		LM2596HVS-5.0 V _{IN} = 12V, I _{LOAD} = 3A		79		%
		LM2596HVS-12 V _{IN} = 15V, I _{LOAD} = 3A		83		%
DEVICE PARAMETERS						
Quiescent Current	I _Q	V _{FB} = 12V force driver off (Note 6)		5	8	mA
Feedback Bias Current	I _{FB}	V _{FB} = 1.3V (Adjustable version only)	-250	-70		nA
			-450			
Shutdown Supply Current	I _{STB}	V _{ON/OFF} = 5V, V _{IN} = 60V		30	220	uA
					280	
Oscillator Frequency	F _{OSC}	(Note 8)	133	150	168	KHz
			120		180	
Oscillator Frequency of short Circuit Protect	F _{SCP}	When V _{OUT} < 40% from nominal, I _{OUT} = CL (Note 8)		50		KHz
Max. duty Cycle	DC _(MAX.)	V _{FB} = 0V force driver on (Note 5)	100			%
Min. duty Cycle	DC _(MIN.)	V _{FB} = 12V force driver off (V _{FB} = 15V, For 12V Version)			0	

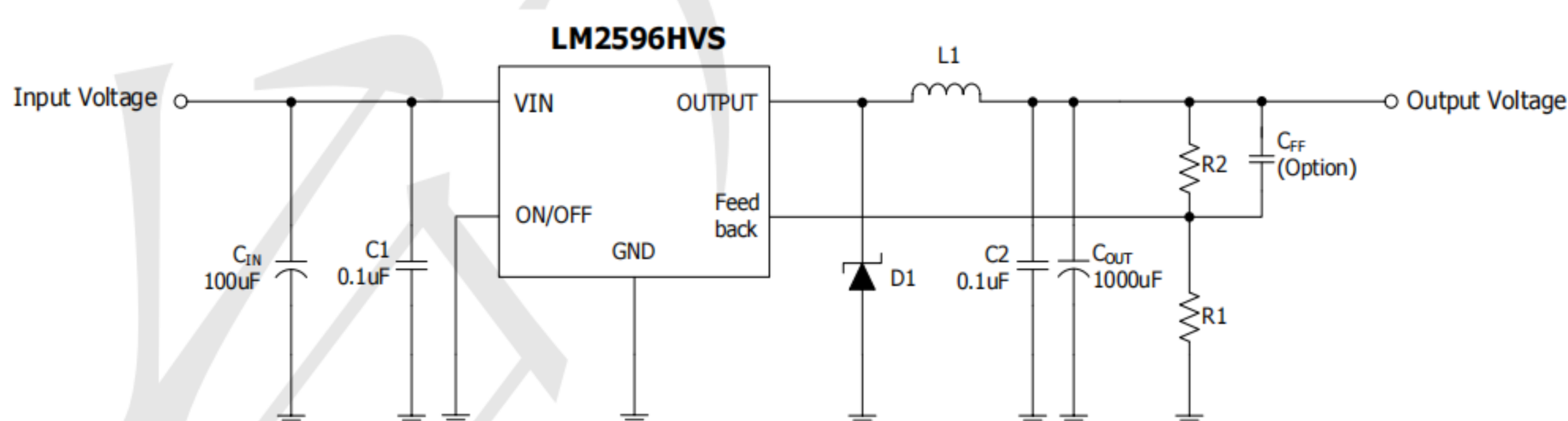
Current Limit	CL	Peak Current. No outside circuit. $V_{FB}=0V$ (Note 4, 8)	4.1	5.3	6.7	A
			3.8		7.0	
Saturation Voltage	V_{SAT}	$I_{OUT}=3A$. No outside circuit. $V_{FB}=0V$ (Note 4)		1.35	1.50	V
					1.70	
Output Leakage Current	I_L	$V_{OUT}=0V$. No outside circuit. $V_{FB}=12V$ (Note 6, 7)	-300	-50		μA
Output Leakage Current	I_{L1}	$V_{OUT}=-1V$. No outside circuit. $V_{FB}=12V$ (Note 6, 7)	-30	-3		mA
ON/OFF Input Threshold	V_{TH}		0.6	1.3	2.0	V
ON/OFF Input Current	I_H	$V_{ON/OFF}=2.5V$	-5	-0.1	5	μA
	I_L	$V_{ON/OFF}=0.5V$	-1	-0.01	1	μA
Thermal Shutdown Temperature	T_{SD}	T_J		160		

TYPICAL APPLICATION

- Fixed Output Voltage Version



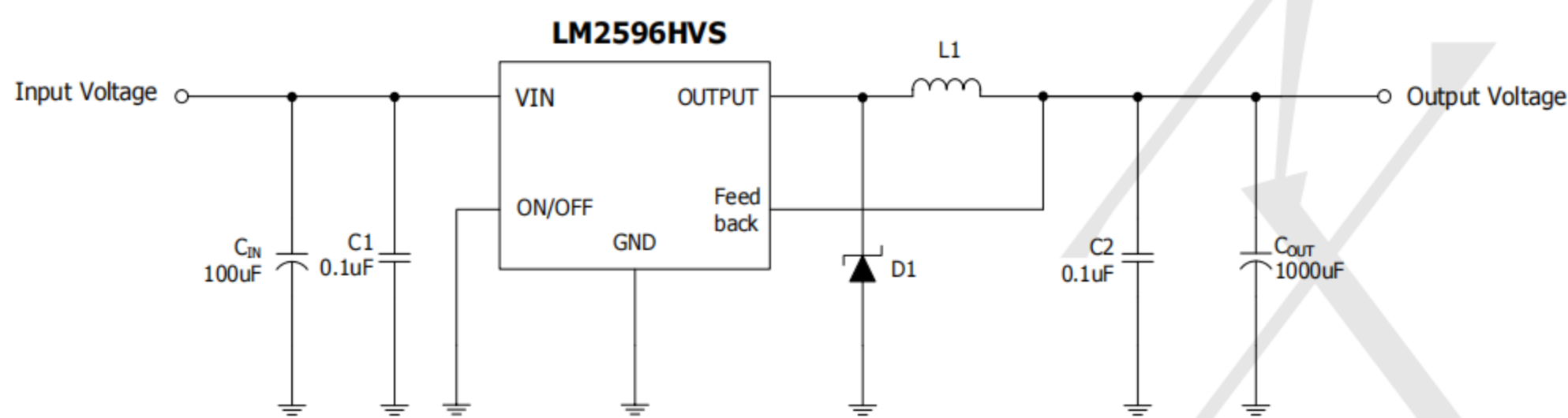
- Adjustable Output Voltage Version



APPLICATION INFORMATION

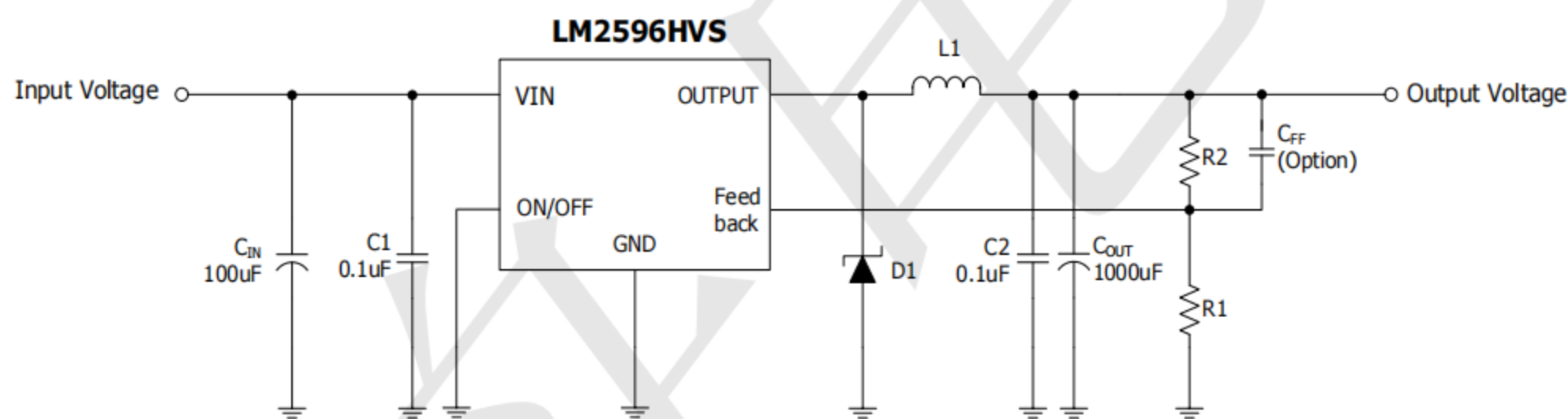
As in any switching regulator, layout is very important. Rapidly switching currents associated with wiring inductance generate voltage transients which can cause problems. For minimal inductance and ground loops, the length of the wires should be kept as short as possible. Single-point grounding or ground plane construction should be used for best results. Keep the feedback wiring away from the inductor flux

- Fixed Output Voltage Version



[Figure 1]

- Adjustable Output Voltage Version



[Figure 2]

$$* V_{OUT} = V_{FB} \left(1 + \frac{R2}{R1} \right)$$

where $V_{FB} = 1.23V$, $R1$ between $1K\Omega$ and $5K\Omega$.

PACKAGE OUTLINE DIMENSIONS (Unit: Millimeters)

TO-263-5L (D²PAK)

