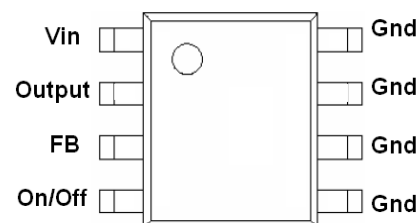


GENERAL DESCRIPTION

The HV96LK series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving 200mA load with excellent line and load regulation. These devices are available in fixed output voltages of 5V, 12V, and an adjustable output version. Available in standard SO-8EP 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.

PIN CONFIGURATION



SO-8EP

PIN ASSIGNMENT

PIN	SO-8EP
1	Vin
2	Output
3	FB
4	On/Off
5 to 8	Gnd

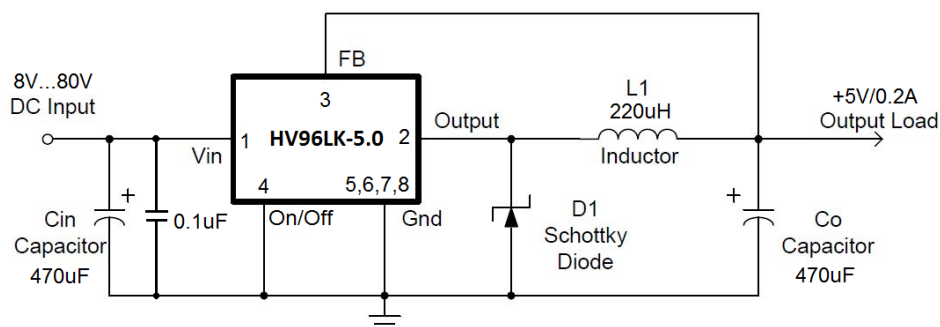
FEATURES

- 5V, 12V, and adjustable output versions
- Adjustable version output voltage range, 1.2V to 48V -4%...+5% max over line and load conditions
- Guaranteed 200mA output load current
- Input voltage range up to 80V
- Requires only 4 external components
- Excellent line and load regulation specifications
- 150 kHz fixed frequency internal oscillator
- Low power standby mode, I_{stb} typically 30 μ A
- Thermal shutdown and current limit protection
- Output short protection by reduction of frequency by 5 times.

APPLICATIONS

- Simple high-efficiency step-down (buck) regulator
- Telecom / Networking Equipment
- Efficient pre-regulator for linear regulators
- On-card switching regulators
- Isolated Bias Supply

TYPICAL APPLICATION (Fixed Output version)



ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit
Maximum Supply Voltage	V_{IN}	83	V
ON/OFF Pin Input Voltage	$V_{ON/OFF}$	-0.3 to 80, but $\leq V_{IN}$	V
FB (Feedback) Pin Voltage	V_{FB}	-0.3 to 25, but $\leq V_{IN}$	V
Output Voltage to GND	V_{OUT}	-1	V
Power Dissipation	P_D	Internally limited	W
Minimum ESD Rating HBM (C=100pF, R=1.5k)	ESD	2.0	kV
Maximum Junction Temperature	$T_{J,max}$	+150	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Ratings	Unit
Junction Temperature Range	T_J	-40 to +125	°C
Supply Voltage	V_{OP}	4.5 to 80	V
I_{LOAD}	I_{LOAD}	≤ 0.2	A

ELECTRICAL CHARACTERISTICS

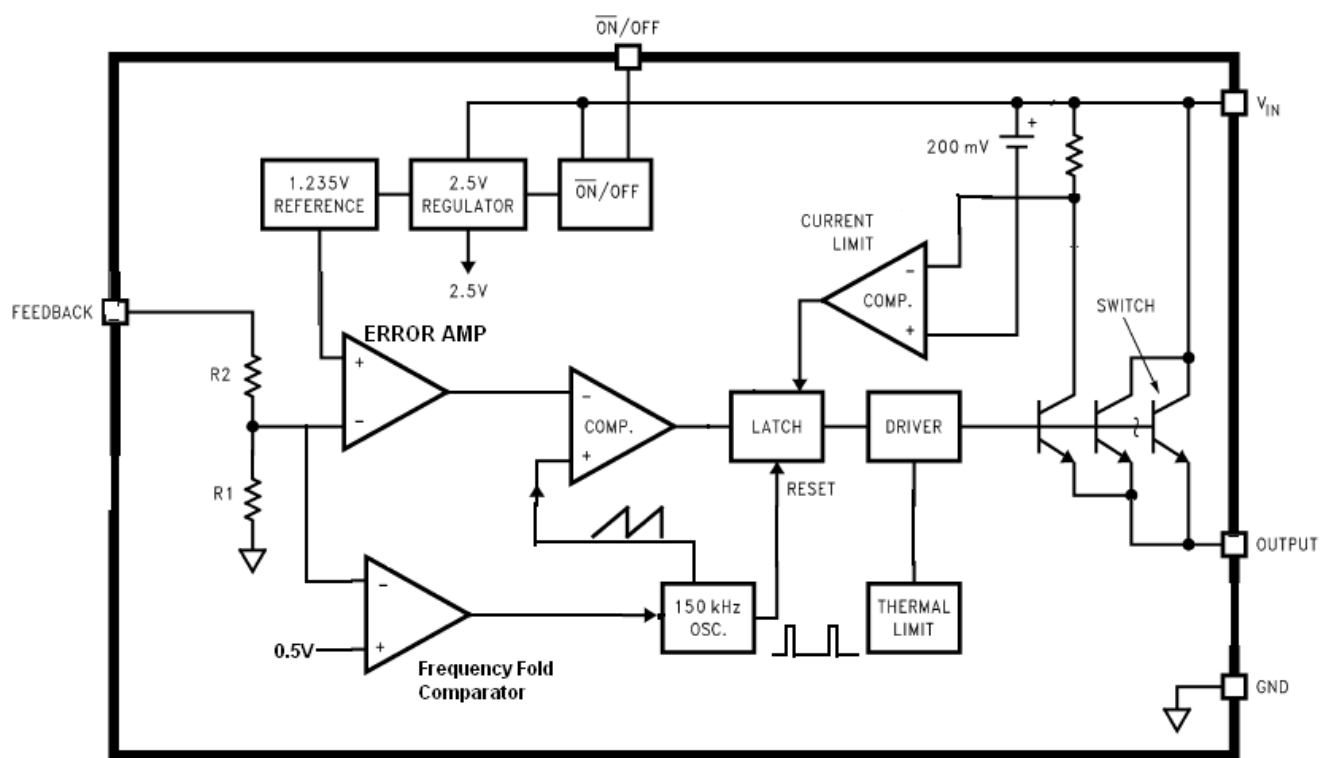
Unless otherwise specified, $V_{IN}=12V$ for the 5V and adjustable versions, $V_{IN}=18V$ for 12V version. $I_{LOAD}=0.2A$.

The * denotes the specifications, which apply over full operating temperature range $T_J = -40$ to $+125^\circ C$.

Parameter	Symbol	Conditions	*	Min	Typ	Max	Unit
SYSTEM PARAMETERS Test Circuit, Figure 1							
Output Voltage HV96LK-5.0	V_{OUT}	$8V \leq V_{IN} \leq 80V, I_{LOAD} = 0.2A$		4.80	5.00	5.25	V
			*	4.75		5.30	
Output Voltage HV96LK-12		$15V \leq V_{IN} \leq 80V, I_{LOAD} = 0.2A$		11.52	12.00	12.60	
			*	11.40		12.72	
Output Voltage HV96LK-adj		$8V \leq V_{IN} \leq 80V, I_{LOAD} = 0.2A$		1.180	1.230	1.293	
			*	1.167		1.305	
Line Regulation	LNR	$8V \leq V_{IN} \leq 80V, I_{LOAD} = 0.2A$			0.5		%
Load Regulation	LDR	$10mA \leq I_{LOAD} \leq 0.2A, V_{IN} = 12V$			0.5		%
DEVICE PARAMETERS							
Quiescent Current	I_Q	$V_{IN}=80V, V_{FB}=12V$ force driver off			5	8	mA
Feedback Bias Current	I_{FB}	$V_{FB}=1.3V$ (Adjustable version only)		-150	-50		nA
			*	-300			
Shutdown Supply Current	I_{STB}	$V_{ON/OFF}=5V, V_{IN}=80V$			30	280	μA
			*			330	
Oscillator Frequency	F_{OSC}			135	150	165	kHz
			*	125		175	
Oscillator Frequency of Short Circuit Protection (SCP)	F_{SCP}	When $V_{OUT}<40\%$ from nominal, $I_{OUT}=CL$			23		kHz
Max. Duty Cycle	$DC_{(Max)}$	$V_{FB}=0V$ force driver on	*	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. $V_{FB}=0V$		0.5	0.67	0.95	A
			*	0.45		1.1	
Saturation Voltage	V_{SAT}	$I_{OUT}=0.2A$. No outside circuit. $V_{FB}=0V$			1.05	1.25	V
			*			1.45	
Output Leakage Current	I_L	$V_{OUT}=0V$. No outside circuit. $V_{FB}=12V$		-300	-50		μA
Output Leakage Current	I_{L1}	$V_{OUT}=-1V$. No outside circuit. $V_{FB}=12V$		-30	-4		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

ON/OFF Input Current	I_L	$V_{ON/OFF}=0.5V$		-1	-0.01	1	μA
Thermal Shutdown Temperature	T_{SD}	Junction Temperature	*		160		$^{\circ}C$

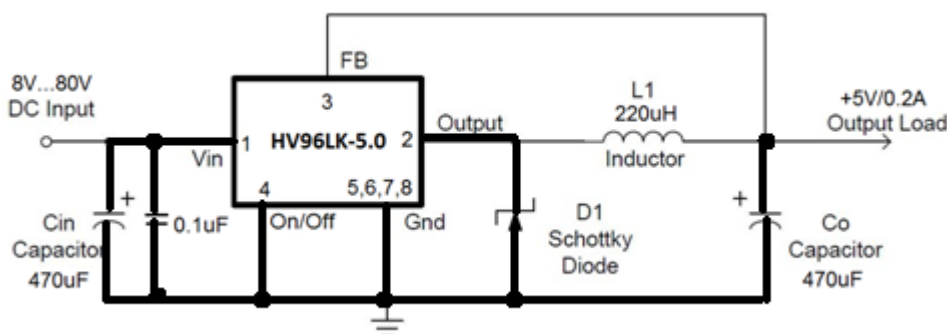
BLOCK DIAGRAM



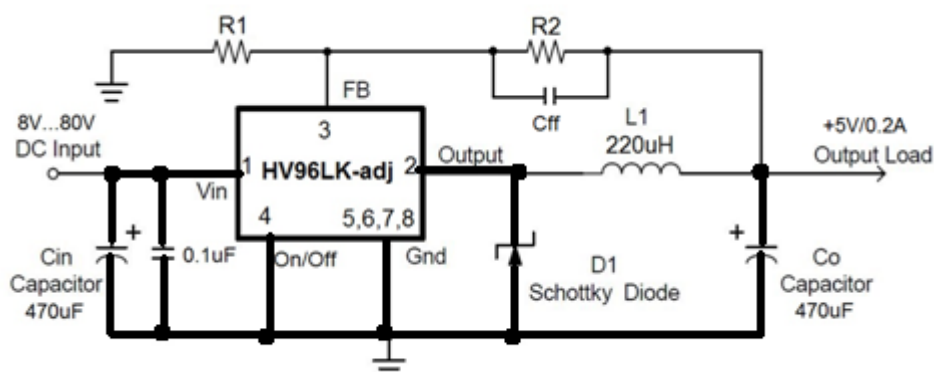
For ADJ Version
R1=open, R2=0

TEST CIRCUIT AND LAYOUT GUIDELINES

Fixed Output Version



Adjustable Version



$R1=2.0k$, $R2=6.12k$

Figure 1. Test Circuit (Fixed Output Version & Adjustable Version)

$V_{OUT} = V_{FB} * (1 + R2/R1)$, where $V_{FB}=1.23V$; $R1$ between $1k$ and $5k$.

For minimal inductance and ground loops, the wires indicated by heavy lines should be wide printed circuit traces and kept as short as possible. Keep the FEEDBACK wiring away from the inductor flux. $C_{ff} \sim 1$ to $10nF$ – as option.

It is necessary to use inductor L1 on current $1.5...2.0A$ and with a resistance inductor $RL < 0.1 \Omega$

RECOMMENDATIONS ON THE CHOICE OF INDUCTOR AND CAPACITOR

Inductor, μH

$V_{\text{IN}} \backslash V_{\text{OUT}}$	8	12	15	20	30	40	60	80
5	33	47	47	68	68	68	100	220
12			68	68	68	100	150	220
24					68	100	150	220
48							150	220

C_{OUT}

V_{OUT}, V	3.3	5	12	24	48
$C_{\text{OUT}}, \mu\text{F}$	680	470	220	100	100

APPLICATION DATA

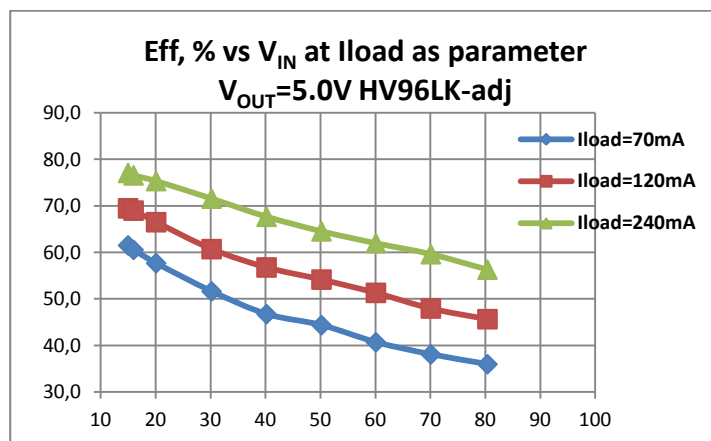
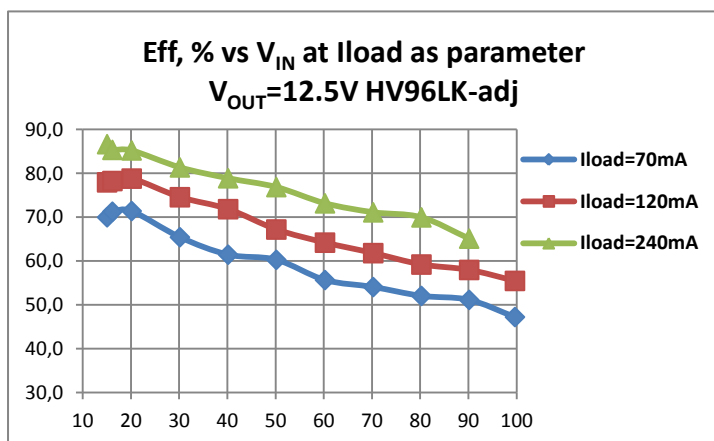
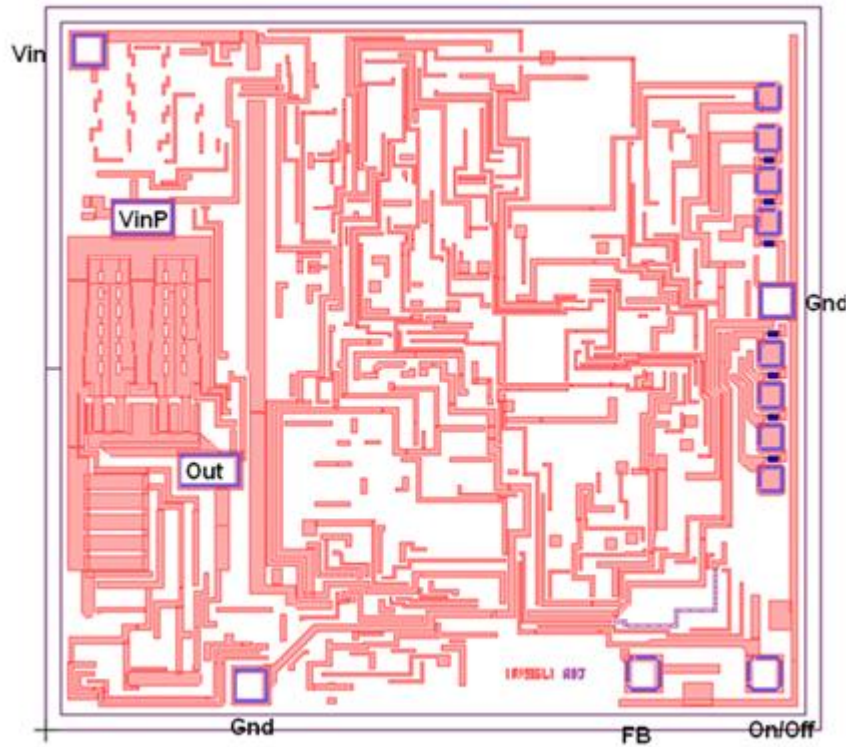


Figure 2. Efficiency vs V_{IN}

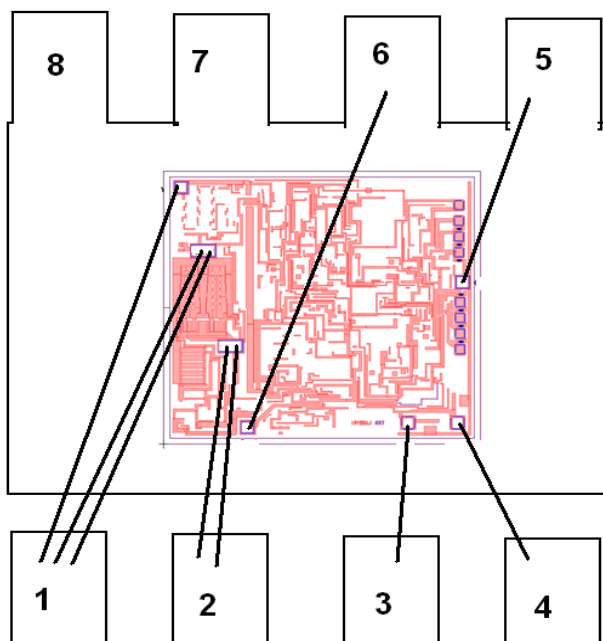
PAD LOCATION AND COORDINATES



Die size (including scribe line): 2.05mm×1.91mm

# Pin (Package)	Pad Name	Pad centers coordinates (μm)		Pad Size (μm×μm)
		X	Y	
1	V _{in}	115	1795	90×90
1	V _{inP}	260	1353	160×90
2	Output	437	687	160×90
3	FB	1582	149	90×90
4	On/Off	1903	149	90×90
5-8	Gnd	545	115	90×90
5-8	Gnd	1933	1032	90×90

BONDING DIAGRAM



SO-8EP Package

ASSEMBLY CHARACTERISTICS

No.	Assembly Characteristics	Value
1	Wafer Size	6 Inch
2	Wafer Thickness before Grinding	675 ±20 µm
3	Scribe Street Width	80 µm
4	Chip Size (including Scribe Line)	2.05×1.91 mm ²
5	Die Attach Material	Substrate is connected to Gnd
6	Quantity of Bond Pad Metal Layers	2
7	Pad Thickness	2.25 µm
8	Composition of Metal Layers	Al+Si(1.0%)+Ti(0.5%)
9	Min. Bond Pad Opening Size	90×90 µm
10	Min. Bond Pad Pitch	313 µm
11	Min. Wire Diameters	1 mil (25.4 µm)
12	Circuit Under Pad Design (CUP)	No

ADDITIONAL INFORMATION

Pb-free products:

- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.

Green products:

- Lead-free (RoHS compliant)
- Halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

The appearance complies with the requirements of the company standards