

HN9261/A

PFM Step-up DC/DC Converter

Product Description

The HN9261 series are PFM Step-up DC/DC ICs (pulse voltage regulators) with output voltages 1.5; 2.5; 3.3; 5.0V. The ICs of pulse voltage regulators are purposed for use in power supply sources of consumer & industrial electronic devices with battery-power sourcing. The application of this ICs permit to keep constant output voltage of power supply source even in the case of low charge level of the battery.

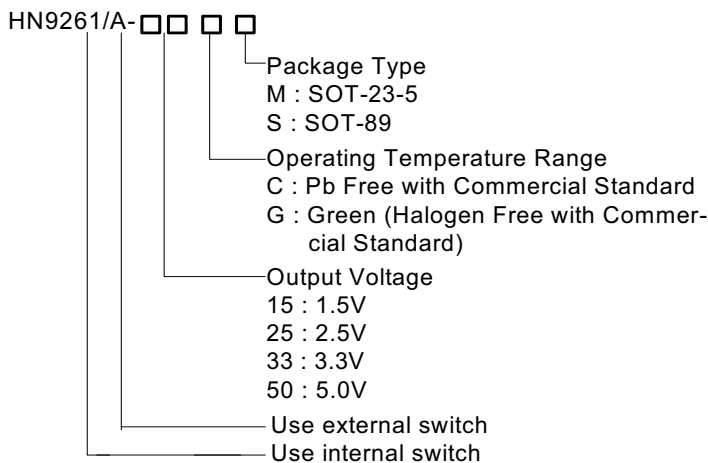
The HN9261 consists of an oscillator, a PFM control circuit, a driver transistor (LX switch), a reference voltage unit, an error amplifier, resistors for voltage detection, and a LX switch protection circuit. A low ripple and high efficiency step-up DC/DC converter can be constructed of this HN9261 with only three external components.

The HN9261A provides with a drive pin (EXT) for an external transistor, so that a power transistor can be externally applied. Therefore, the HN9261A IC is recommended for applications where large currents are required. EN pin enables circuit to set the standby supply current at a maximum of 0.5 μ A.

Features

- Minimal Number of External Components (Only an inductor, a diode, and a capacitor)
- Ultra Low Input Current (5 μ A at Switch Off State)
- High Output Voltage Accuracy \pm 2%
- Low Ripple and Low Noise
- Low Start-up Voltage, 0.85V at 1mA
- 75% Efficiency with Low Cost Inductor
- Low Temperature-Drift +50 ppm/ $^{\circ}$ C

Ordering Information



Pin Description

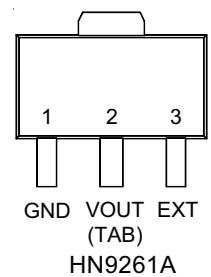
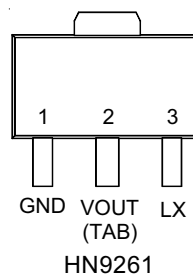
Pin Number	Pin Name	Pin Function	
SOT-89	SOT-25		
1	CE	Chip Enable Input (Active High)	
2	VOUT	Output Voltage	
	3	NC	No Connected
1	4	GND	Ground (Common)
3	5	LX	Switching Pin
3	5	EXT	External Control

Applications

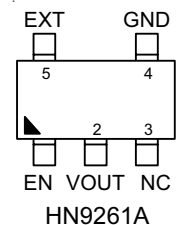
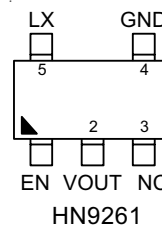
- Power source for battery powered systems
- Power source for cameras, VCRs, PDAs, pagers, electronic data banks, and hand-held communications equipment
- Portable consumer equipment instrumentation
- Power source for applications, which require higher voltage than that of batteries used in the appliances

Pin Configurations

(TOP VIEW)



SOT-89



SOT-23-5

Typical Application Circuit

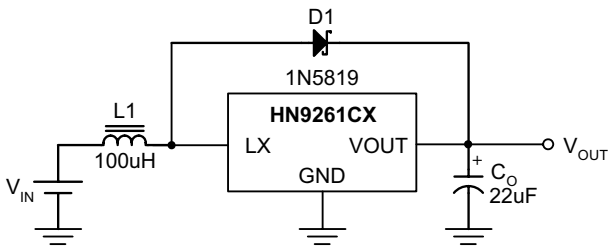


Figure 1

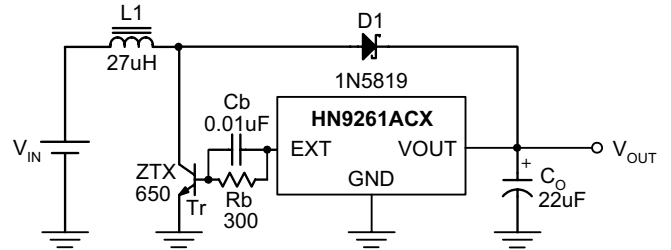


Figure 2

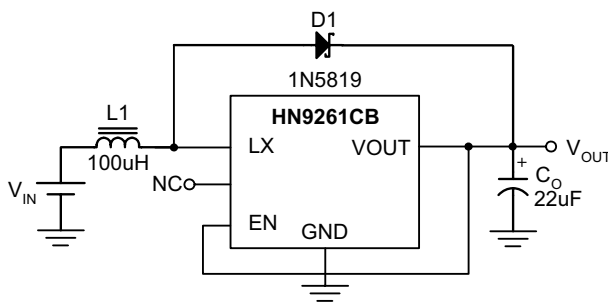


Figure 3

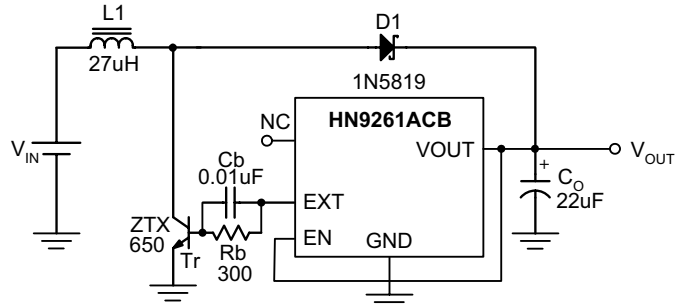


Figure 4

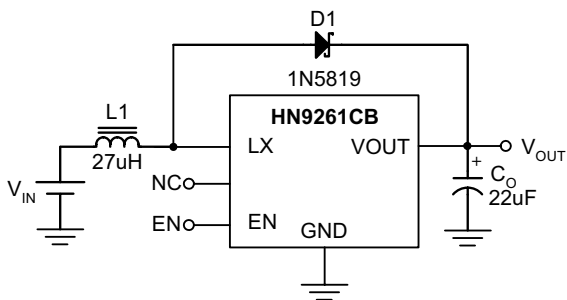
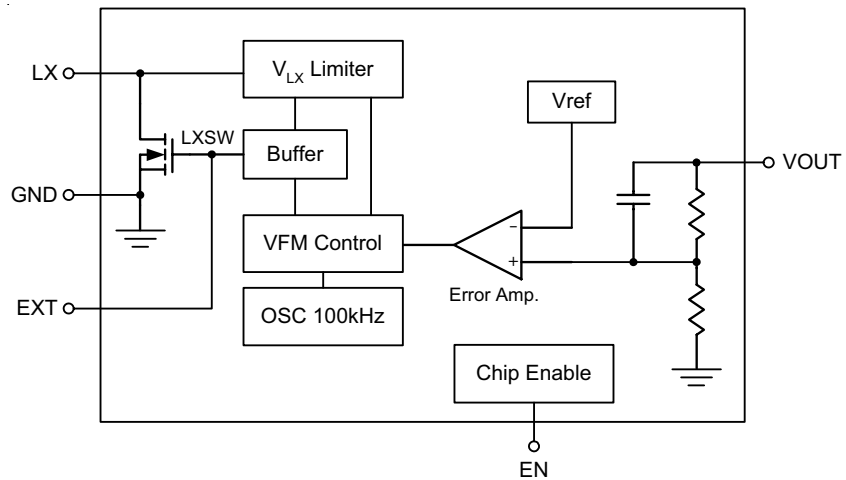


Figure 5

Function Block Diagram



Notes:

- (1) LX Pin..... only for 9261-□□CX and 9261-□□CB
- (2) EXT Pin.... only for 9261A-□□CX and 9261A-□□CB
- (3) EN Pin..... only for 9261-□□CB and 9261A-□□CB

Absolute Maximum Ratings

- Output Voltage ----- 8V
- LX Pin Voltage ----- 8V
- EXT Pin Voltage ----- -0.3 to $V_{OUT} + 0.3V$
- EN Pin Voltage ----- -0.3 to $V_{OUT} + 0.3V$
- LX Pin Output Current ----- 250mA
- EXT Pin Current ----- ±50mA
- Power Dissipation, P_D @ $T_A=25^\circ C$
 - SOT-89 ----- 0.5W
 - SOT-23 ----- 0.25W
- Package Thermal Resistance
 - SOT-89, θ_{JC} ----- $100^\circ C/W$
 - SOT-89, θ_{JA} ----- $300^\circ C/W$
 - SOT-23, θ_{JA} ----- $250^\circ C/W$
- Operation Temperature Range ----- -20 to $+85^\circ C$
- Storage Temperature Range ----- $165^\circ C$
- Lead Temperature Range (Soldering, 10sec.) ----- $260^\circ C$

Electrical Characteristics ($T_A = 25^\circ\text{C}$, For HN9261 application without external input transistor)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage Accuracy		ΔV_{OUT}		-2		+2	%
Input Voltage		V_{IN}				7,0	V
Start-up Voltage		V_{ST}	$I_{OUT} = 1\text{mA}; V_{IN}: 0 \rightarrow 2\text{V}$		0.85	1,0	V
Hold-on Voltage		V_{HO}	$I_{OUT} = 1\text{mA}; V_{IN}: 2 \rightarrow 0\text{V}$	0,7			V
Input Current 1	HN9261-15 ⁽¹⁾	I_{IN1}	To be measured at V_{IN} at no load		15	18	μA
	HN9261-25 ⁽²⁾						
	HN9261-33 ⁽²⁾						
	HN9261-50 ⁽³⁾						
Input Current 2	HN9261-15 ⁽¹⁾	I_{IN2}	To be measured at V_{OUT} in switch off condition		5	8	μA
	HN9261-25 ⁽²⁾						
	HN9261-33 ⁽²⁾						
	HN9261-50 ⁽³⁾						
LX Switching Current	HN9261-15	$I_{SWITCHING}$	$V_{LX} = 0.4\text{V}$		60		mA
	HN9261-25						
	HN9261-33						
	HN9261-50						
LX Leakage Current		$I_{LEAKAGE}$	$V_{LX} = 6\text{V}$			0.5	μA
EN High level voltage		V_{EN-H}	$V_{IN} = V_{OUT} \times 0.9$	$0.4 \times V_{OUT}$			V
EN Low level voltage		V_{EN-L}	$V_{IN} = V_{OUT} \times 0.9$			0.2	V
EN High Level Input Current		I_{EN-H}	EN = VOUT	-		0.5	μA
EN Low Level Input Current		I_{EN-L}	EN = 0 V	-0.5			μA
Maximum Oscillator Frequency		F_{MAX}		80	120	160	KHz
Oscillator Duty Cycle		D_{OSC}	On (V_{LX} "L" Side)	65	75	85	%
Efficiency	HN9261-15 ⁽¹⁾	η			75		%
	HN9261-25 ⁽²⁾						
	HN9261-33 ⁽²⁾						
	HN9261-50 ⁽³⁾						
V_{LX} Voltage Limit		V_{LX}	LX switch on	0.65	0.8	1.0	V

Note:

(1) Unless otherwise provided, $V_{IN}=1.4\text{V}$, $I_{OUT}=10\text{mA}$, and External Circuit of Typical Application(2) Unless otherwise provided, $V_{IN}=1.8\text{V}$, $I_{OUT}=10\text{mA}$, and External Circuit of Typical Application(3) Unless otherwise provided, $V_{IN}=3.0\text{V}$, $I_{OUT}=10\text{mA}$, and External Circuit of Typical Application

Electrical Characteristics ($T_A = 25^\circ\text{C}$, For HN9261A application with external input transistor)

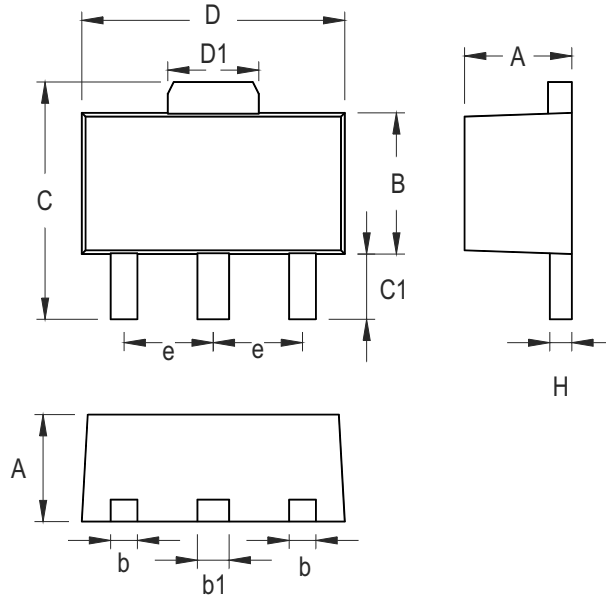
Parameter		Symbol	Test Conditions	Min	Typ	Max	Units
Output Voltage Accuracy		ΔV_{OUT}		-2		+2	%
Input Voltage		V_{IN}				7,0	V
Start-up Voltage		V_{ST}	$I_{OUT} = 1\text{mA}; V_{IN}: 0 \rightarrow 2\text{V}$		0.85	1,0	V
Input Current 1	HN9261A-15 ⁽¹⁾	I_{IN1}	To be measured at V_{IN} at no load		30	50	μA
	HN9261A-25 ⁽²⁾						
	HN9261A-33 ⁽²⁾						
	HN9261A-50 ⁽³⁾						
Input Current 2		I_{IN2}	To be measured at V_{OUT} in switch off condition		6	10	μA
EXT "H" Ouput Current	HN9261A-15	I_{EXT-H}	$V_{EXT} = V_{OUT} - 0.4\text{V}$				mA
	HN9261A-25						
	HN9261A-33						
	HN9261A-50						
EXT "L" Ouput Current	HN9261A-15	I_{EXT-L}	$V_{EXT} = 0.4\text{V}$				mA
	HN9261A-25						
	HN9261A-33						
	HN9261A-50						
EN High level voltage		V_{EN-H}	$V_{IN} = V_{OUT} \times 0.9$	$0.4 \times V_{OUT}$			V
EN Low level voltage		V_{EN-L}	$V_{IN} = V_{OUT} \times 0.9$			0.2	V
EN High Level Input Current		I_{EN-H}	$EN = V_{OUT}$	-		0.5	μA
EN Low Level Input Current		I_{EN-L}	$EN = 0\text{V}$	-0.5			μA
Maximum Oscillator Frequency		F_{MAX}		80	120	160	KHz
Oscillator Duty Cycle		D_{OSC}	On (V_{LX} "L") Side	65	75	85	%
Efficiency	HN9261A-15 ⁽¹⁾	η			75		%
	HN9261A-25 ⁽²⁾						
	HN9261A-33 ⁽²⁾						
	HN9261A-50 ⁽³⁾						
V_{LX} Voltage Limit		V_{LX}	LX switch on	0.65	0.8	1.0	V

Note:

- (1) Unless otherwise provided, $V_{IN}=1.4\text{V}$, $I_{OUT}=10\text{mA}$, and External Circuit of Typical Application
- (2) Unless otherwise provided, $V_{IN}=1.8\text{V}$, $I_{OUT}=10\text{mA}$, and External Circuit of Typical Application
- (3) Unless otherwise provided, $V_{IN}=3.0\text{V}$, $I_{OUT}=10\text{mA}$, and External Circuit of Typical Application

Outline Dimension

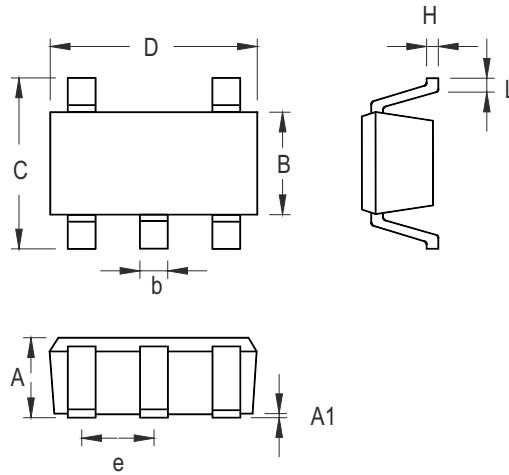
SOT-89-3 Surface Mount



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.397	1.600	0.055	0.063
b	0.356	0.483	0.014	0.019
B	2.388	2.591	0.094	0.102
b1	0.406	0.533	0.016	0.021
C	3.937	4.242	0.155	0.167
C1	0.787	1.194	0.031	0.047
D	4.394	4.597	0.173	0.181
D1	1.397	1.753	0.055	0.069
e	1.448	1.549	0.057	0.061
H	0.356	0.432	0.014	0.017

Outline Dimension

SOT-23-5 Surface Mount



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.889	1.295	0.035	0.051
A1	0.000	0.152	0.000	0.006
B	1.397	1.803	0.055	0.071
b	0.356	0.559	0.014	0.022
C	2.591	2.997	0.102	0.118
D	2.692	3.099	0.106	0.122
e	0.838	1.041	0.033	0.041
H	0.080	0.254	0.003	0.010
L	0.300	0.610	0.012	0.024