



# HL7509FNQ

## I<sup>2</sup>C Programmable 5A DVS Buck Converter

### Overview

The HL7509FNQ is a synchronous buck converter optimized to supply low-voltage applications. Its input voltage range is 2.5-5.5V. Its output voltage range is 0.6-1.23V programmed through an I<sup>2</sup>C interface. Its output voltage can be adjusted on the fly to provide dynamic voltage scaling (DVS) function with a programmable slew rate.

The HL7509FNQ maintains good efficiency for a wide range of load. It delivers a maximum 5A RMS load current while spurious load up to 8A can be supported for 10ms duration. It operates at fixed frequency of 2.4MHz, which reduces the value of the external components. A wide range of output capacitors can be used to optimize VOUT excursion during load transients. The inductors from 0.22μH to 1.0μH may be used without affecting loop stability.

At moderate to light load, the pulse frequency modulation (PFM) is used to maintain conversion efficiency with a typical non-switching quiescent current of 70μA. Even with such a low quiescent current, the HL7509FNQ maintains excellent load and line transient responses. At higher loads, the system automatically switches to fixed-frequency pulse width modulation (PWM) operation at for minimum VOUT ripple and optimal load transient response. In shutdown mode, the supply current drops below 1μA and reduces a power consumption. The PFM mode can be disabled if needed through I<sup>2</sup>C registers.

The HL7509FNQ supports VOUT remote sensing. It's feedback signal VOUT can be connected close to the power supply pin of the load for a true point-of-load operation without affecting control loop stability. See Detailed Description section for the maximum allowed

trace resistance and bandwidth requirement. The USB OTG boost function provides a programmable 4.55-5.5V boost output at VIN port from the battery and supports current up to 2.1A.

The HL7509FNQ is AEC Q100 grade 3 certified to operate in automotive environment with ambient temperature ranges from -40°C to +85°C.

The HL7509FNQ is available in a 4mm x 3 mm 14-pin DFN package.

### Features

- Input voltage ranges: 2.5-5.5V
- Programmable output voltage
  - 0.600-1.230V in 10mV steps
- Maximum output current
  - 5A Continuous, 8A peak for 10ms
- VOUT remote sensing capable for point-of-load operation
- 2.4MHz PWM with seamless PWM/PFM switching for light-load efficiency
- Dynamic voltage scaling (DVS) with programmable voltage slew rate
- Class-leading load and line transient
- Quiescent current in PFM tristate: 70μA
- I<sup>2</sup>C Interface with SM, FM, FM+ and HS modes
- Comprehensive protections
  - Output under-voltage lockout (OVLDT)
  - Input over-voltage protection (OVP)
  - Over-current and short-circuit protections
  - Thermal shut-down
- 4mm x 3mm 14-pin DFN package
- AEC-Q100 qualified grade 3, automotive temperature ranges (-40°C to +85°C)

## Applications

- Application Processors
- Graphic Processors
- Memory, Hard Disk, and SSD
- Smartphones
- Tablets
- Handheld Devices
- Automotive Infotainment System

## Typical Application Diagram

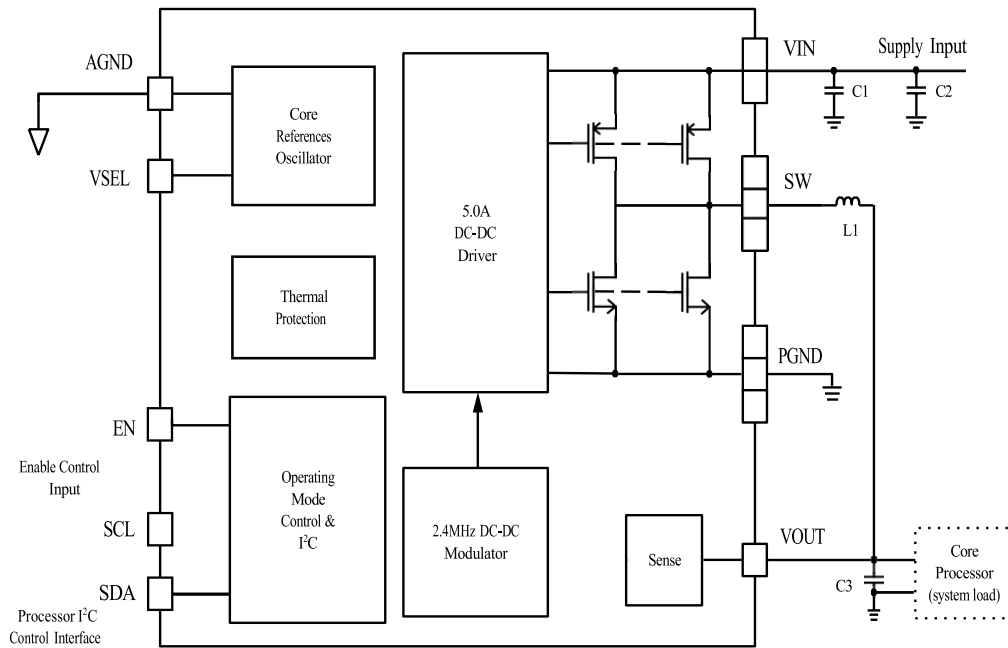


Figure 1. HL7509FNQ Typical Application Diagram

Component	Part Number	Value	Description	Vendor
L1	See Table 2	220 to 470nH	See Table 2	See Table 2
C1 (Optional)	GRM21BR71H473KA01L	47μF	50V, X7R, 0805	Murata
C2	C1608X5R1A475k	4.7μF	*2, 6.3V, X5R, 0603	TDK
C3	C2012X5ROJ476M	47μF	*4, 6.3V, X5R, 0805	TDK

Table 1. Recommended External Components

Manufacturer	Part Number	L	DCR	I <sub>MAXDC</sub> <sup>(1)</sup>	Component Dimensions		
					L	W	H
VISHAY	IHLP2020BZERR22M01	220nH	4.9mΩ	>5A	5.18mm	5.49mm	2mm
VISHAY	IHLP2020BZERR33M01	330nH	7.6mΩ	>5A	5.18mm	5.49mm	2mm
VISHAY	IHLP2020BZERR47M01	470nH	8.9mΩ	>5A	5.18mm	5.49mm	2mm

Table 2. Recommended Inductors

**Notes:** I<sub>MAXDC</sub> is the smaller current to product 40°C temperature rising or 30% effective inductance reduction.

## Ordering Information

Part Number	Default V <sub>OUT</sub> after POR		Default mode after POR		Max output current rms	Max pulse current (10ms)	I2C address	Packing	Packing method
	VSET=0	VSET=1	VSET=0	VSET=1					
HL7509FNQ	0870V	0.910V	FPWM	FPWM	5A	8A	1101000	DFN-14	Tape & Reel

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