

# HL7594

## I<sup>2</sup>C Programmable 3A DVS Buck Converter

### Overview

The HL7594 is a synchronous buck converter optimized to supply different sub systems of portable applications. Its input voltage range is 2.5-5.5V. Its output voltage range is 0.600V to 1.394V in 6.25mV steps, 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 HL7594 can deliver up to 86% efficiency 3A output current and maintain over 80% efficiency at 10mA or higher light load currents. It operates at fixed frequency of 2.4MHz, which reduces the value and size of the external components. A wide range of output capacitors can be used to optimize output load transient performances. The inductors from 0.33 $\mu$ H to 1.0 $\mu$ H may be used without affecting loop stability.

At moderate to light loads, the pulse frequency modulation (PFM) is used to maintain conversion efficiency with a typical non-switching quiescent current of 48 $\mu$ A. Even with such a low quiescent current, the HL7594 maintains excellent load and line transient responses. At higher loads, the system automatically switches to fixed-frequency pulse width modulation (PWM) operation at 2.4MHz for minimum VOUT ripple and optimal load transient response. In shutdown mode, the supply current drops below 1 $\mu$ A and reduces a power consumption. The PFM mode can be disabled if needed through I<sup>2</sup>C registers.

The HL7594 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.

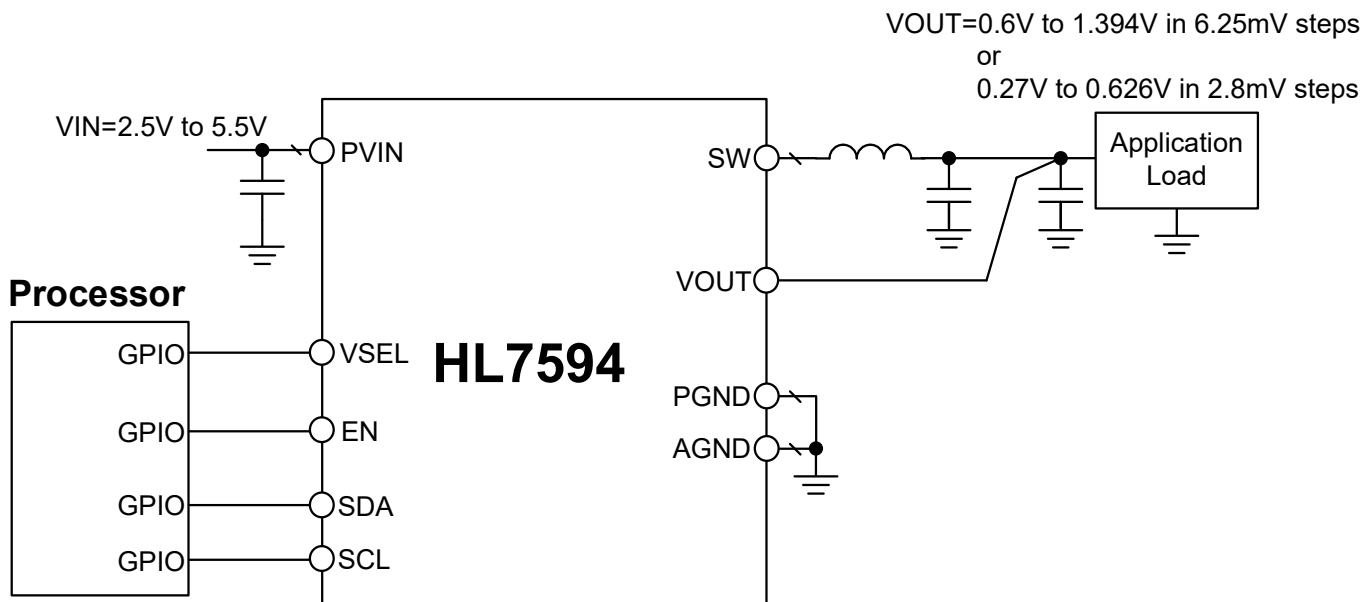
### Features

- Input voltage operation ranges: 2.5-5.5V
- Programmable output voltage:
  - 0.600V to 1.394V in 6.25 mV steps
  - 0.27V to 0.6272V in 2.8125mV steps
- Maximum output current: 3A
- Fixed 2.4MHz switching frequency
- Seamless PWM/PFM mode switching for high efficiency at light-load
- Dynamic Voltage Scaling (DVS) with Programmable Voltage Slew Rate
- Excellent load and line transients
- Quiescent current in PFM mode: 48 $\mu$ A
- I<sup>2</sup>C interface with SM, FM, FM+, and HS modes
- Comprehensive protections
  - Input under-voltage lockout (UVLO)
  - Input over-voltage protection (OVP)
  - Over-current and short-circuit protections
  - Thermal shutdown
- 2.01mm x 1.21mm 15-bump WLCSP

### Applications

- Application Processors
- Memory, Hard Disk Drive, and SSD
- Smartphones
- Tablets
- Handheld Devices

## Simplified Application Diagram



## Ordering Information

Part Number	Default V <sub>OUT</sub> after POR (V)		Default mode after POR		EN Delay time (ms)	I <sup>2</sup> C Address (7-bit)	Packing Method
	VSEL=0	VSEL=1	VSEL=0	VSEL=1			
HL7594WL01	1.125	1.125	Auto PFM	Auto PFM	2	1010 111	Tape & Reel
HL7594WL02	0.75	0.75	Auto PFM	Auto PFM	0	1010 001	Tape & Reel
HL7594WL03	0.4022	0.6019	Auto PFM	Auto PFM	3	1010 000	Tape & Reel
HL7594WL04	0.9	0.9	Auto PFM	Auto PFM	0	1010 101	Tape & Reel
HL7594WL05	0.75	0.75	Auto PFM	Auto PFM	2	1010 010	Tape & Reel
HL7594WL06	1.225	1.225	Auto PFM	Auto PFM	0	1010 110	Tape & Reel
HL7594WL07	1.05	1.05	Auto PFM	Auto PFM	0	1010 111	Tape & Reel
HL7594WL08	0.5034	0.6019	Auto PFM	Auto PFM	0	1010 110	Tape & Reel
HL7594WL09	0.4247	0.9188	Auto PFM	Auto PFM	0	1010 001	Tape & Reel
HL7594WL10	0.5203	0.9375	Auto PFM	Auto PFM	0	1010 111	Tape & Reel

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