

# HVC 4222F, HVC 4422F

Feb/2021



## Micronas Embedded Motor Drivers for Direct Control of Stepper, BLDC, and BDC Motors in High-Temperature Environments

The Micronas embedded motor driver family has expanded to allow operation up to 150 °C ambient temperature. The HVC 4222F offers 32k flash memory while the HVC 4422F has 64k flash memory for more complex software implementations. They target applications in automotive drive trains, and thermal management systems in electric and hybrid vehicles. Samples are available today; mass production will start in Q3 of 2021.

These new high-temperature devices are part of TDK-Micronas' expanding automotive-grade, HVC 4xyzF motor-controller family for LIN-bus connected actuators. The HVC 4xyzF family integrates an Arm® M3 based microcontroller with six independent 500 mA half-bridge drivers and a wide range of additional functions for driving small stepper, brushed (BDC) and brushless (BLDC) motors in applications with power requirements up to 1 A peak current.

Various motor control features allow complex algorithms such as Space Vector Modulation (SVM), sensor-less commutation with back electro-magnetic force (BEMF), as well as stepper algorithms with current limiting and stall detection.

Eleven general-purpose input output pins (GPIO) in combination with a 1 μs 12 bit analog-to-digital (A/D) converter and digital

function blocks such as PWM generators, timers, capture-compare units, and an SPI interface enable integration of additional functions as well as TDK-Micronas' large portfolio of Hall switches or 2D/3D sensors for more precise motor control.

All devices come in a thermally efficient 6 mm × 6 mm QFN40 package.

### HVC Variants

	Flash	SRAM	MPU	T <sub>Amax</sub>
HVC 4222F	32k	2k	NO	150 °C
HVC 4223F	32k	2k	NO	125 °C
HVC 4420F	64k	4k	YES	125 °C
HVC 4422F	64k	4k	YES	150 °C

- Arm® Cortex®-M3 CPU
- Comparators
- References: Starpoint D/A Converter
- Integrated Bridges including Diagnosis
- LIN-UART+LIN-PHY
- Temperature Sensors with Overtemperature Detection/Shutdown
- Peripherals: PWM, Timer, CAPCOM, LIN UART, SPI...
- ADC High-Precision A/D Converter
- High-Side Power-Switch
- Main- and Aux-Oscillator
- Flash Memory and NVRAM
- Automotive Voltage Regulator

Functional Safety Support, ISO-Pulses, AEC-Q100, LIN 2.x conform, EMC conformity according to worldwide OEM Specifications, ESD (8 kV @ LIN Port), -40 °C ≤ T<sub>A</sub> ≤ +150 °C

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## Main Features

- ◆ Supply voltage range from 8 V to 18 V (transient from 4.5 to 40 V)
- ◆ 6 × 500 mA (max) half-bridge drivers
- ◆ 5 V, 40 mA supply for peripherals
- ◆ 32-bit Arm® Cortex®-M3 CPU core
- ◆ 20 MHz system oscillator, 35 kHz watch-dog oscillator and for periodic wake-up from IDLE
- ◆ 32k or 64k flash memory versions with 2k or 4k SRAM
- ◆ 12 bit, 1 μs ADC for internal and external measurements
- ◆ 2 × 8 bit current DAC for motor current limiting from 2 mA to 500 mA
- ◆ 12 bit PWM generators with center- and edge alignment and ADC triggering
- ◆ 16 bit timers for input and output PWM signal handling
- ◆ 11 GPIOs for application interface
- ◆ LIN Transceiver for auto-addressing using the bus shunt method
- ◆ Small thermally efficient QFN40 package

## Evaluation Boards (see Fig. 1)

- ◆ HVC 4223F Application Board, 88 mm × 90 mm
- ◆ Clamshell socket for PQFN40 package
- ◆ Driving brushed DC, brushless DC and stepper motors using the integrated half-bridges
- ◆ Prepared for commutation via Hall-sensor feedback or BEMF sensing
- ◆ Standard 20-pin (0.1") debug interface header
- ◆ LIN-bus header with auto-addressing support

## Software Development

- ◆ Keil MDK 5 μVision IDE and ULINK debug probes
- ◆ Various Application Notes available (BLDC- and Stepper-Motor Control, LIN, Bootloader, ...)

## Demo Boards (see Fig. 2)

- ◆ HVC 4xyzF Small Demo Board SDB-I, 40 mm diameter
- ◆ Configurable by solder jumpers, to drive either brushed DC, brushless DC or stepper motors using the integrated half-bridges of the HVC 4xyzF
- ◆ Prepared for commutation via Hall-sensor feedback or BEMF sensing
- ◆ 10-pin (0.05") Cortex Debug Connector
- ◆ LIN-bus interface with auto addressing support

For further information see <https://www.micronas.tdk.com/en/products/embedded-motor-controllers-smart-actuators>

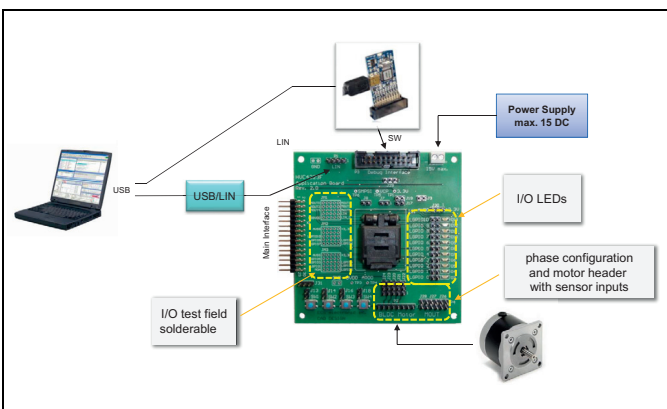


Fig. 1: HVC 4223F Application Board

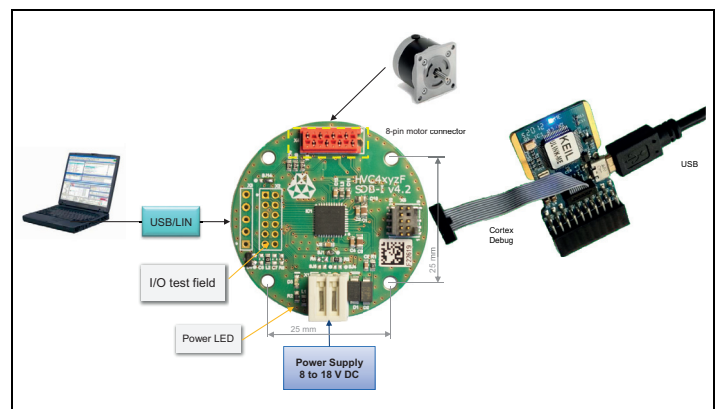


Fig. 2: HVC 4xyzF Small Demo Board SDB-I

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