



EU055 Motor Control for Power Tools

April 2020

Motor Control for Power Tools

■ Overview

This solution is showing a motor control reference design for power tools. The power source (battery or main power supply) is not part of this proposal and is represented here as a simple battery pack.

For this reference design, Renesas choose a high voltage solution (48V), which features the high-performance Arm®-M4 based RA6M3 MCU. It has specific PWM timers for 3-phase motor control and a floating point unit (FPU) to enhance algorithm performance.

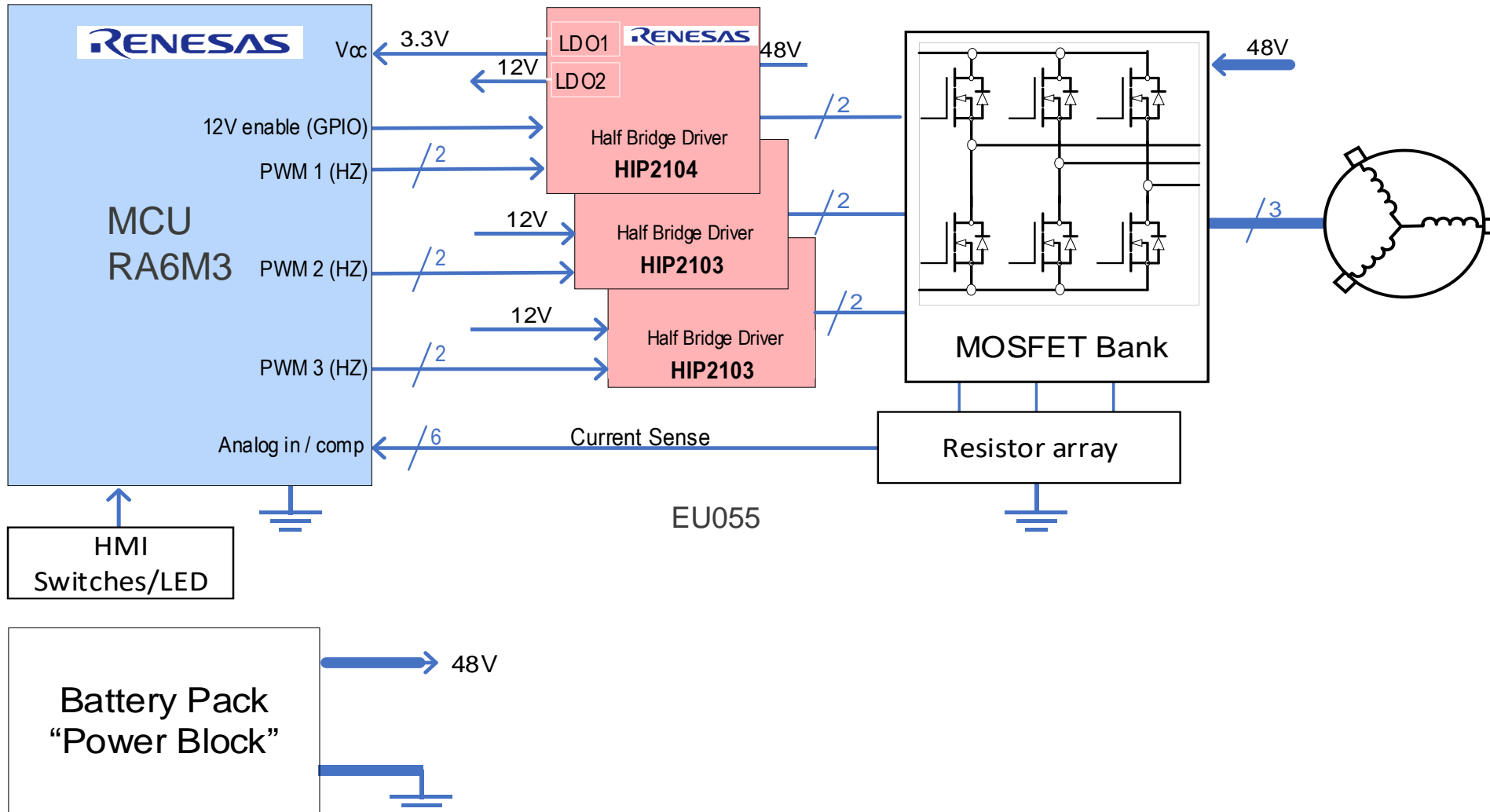
This block diagram shows a setup that includes an embedded power supply for the MCU (3.3V) and MOSFET half-bridge drivers (12V).

■ System Benefits

- High integration MCU with touch/LCD/ADC/DAC features
- Volatile organic compounds (VOC)/temperature sensor
- Light sensor to support filter exchange detection

Motor Control for Power Tools

Using Discrete MOSFET Drivers & Resistor Shunt Feedback



Motor Control for Power Tools

Device Category	P/N	Key Features
MCU	RA6M3	Arm® M4-based 32 bit, wide Vin MCU with built-in FPU for motor control
Power	HIP2103	High voltage drivers for industrial motor control, single phase
	HIP2104	High voltage drivers for industrial motor control, single phase, including LDO

EU055

HIP2103/4 – 60V, 1A/2A, Half-Bridge Driver

High Voltage Drivers for Industrial Motor Control

Flexible Half-Bridge Drivers

- Supports half bridge, full bridge, and 3-phase configurations
- Enables DC and 3-phase BLDC motors

Independent High & Low Inputs

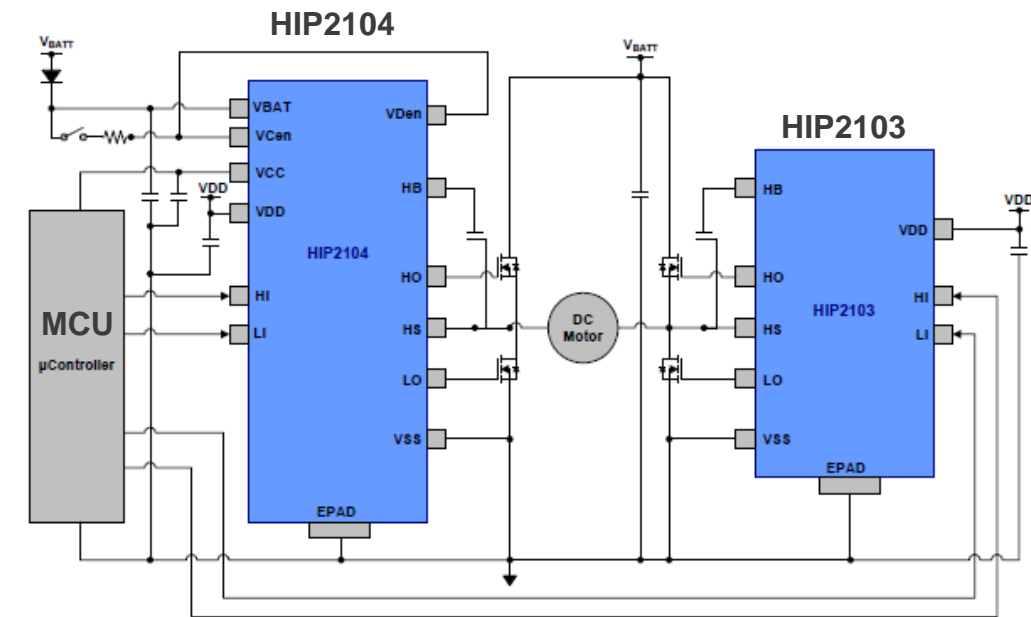
- Reduces connections to MCU and lowers cost
- Supports 3.3V and 5V signals

Sleep Mode

- Low quiescent current (5uA) with unique sleep mode
- Allows direct connection to battery without disconnect switch

Integrated LDO (HIP2104)

- HIP2104 includes integrated 12V & 3.3V LDOs
- Provides bias to external MCU plus HIP2103 & HIP2104 drivers



Typical Application Circuit

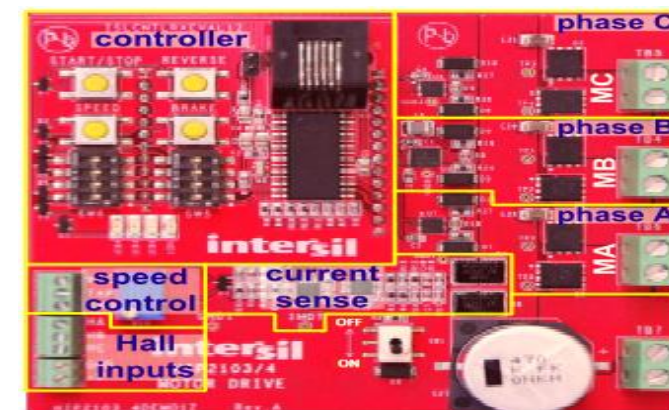


FIGURE 1. HIP2103-4DEMO1Z INPUTS AND OUTPUTS

Part #	UVLO	VCC Reg	VDD Reg	Package
HIP2103FR TAAZ-T	4.0V	N/A	N/A	8L 3x3 TDFN
HIP2104FR TAAZ-T	4.0V	3.3V	12V	12L 4x4 DFN

RA6M3 – Ultra-Low Power 120-MHz Arm® Cortex®-M4 Core

Full Featured for Applications needing HMI/Control/ Security/Graphical and Capacitive Touch

High Performance

- 120MHz Arm® Cortex®-M4 CPU

Highly Integrated Capabilities

- 1MB-2MB Flash Memory and 640kB SRAM
- 128-bit unique ID
- 12-Bit ADC (x2)
- 12-Bit DAC

Communication Interfaces

- USB 2.0 (Full Speed/ High Speed)
- Ethernet Controller with DMA
- SCI x10/SPIx2/IICx3

HMI Interface

- Capacitive Touch Sensing Unit (18ch.)
- Graphics LCD Controller

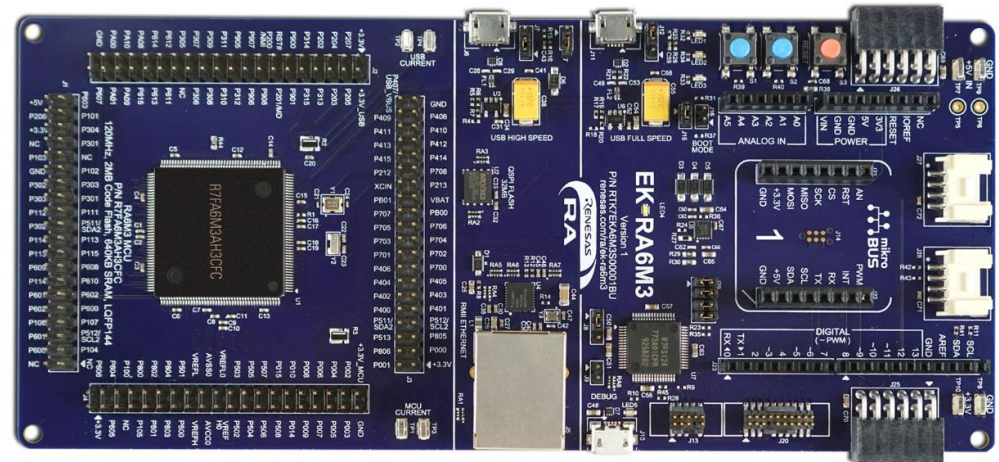
Security and Encryption

- AES128/192/256, 3DES/ARC4, SHA1/SHA224/SHA256/MD5, GHASH, RSA/DSA/ECC
- True Random Number Generator (TRNG)

FLASH / RAM	2MB / 640KB	RA6M3	RA6M3	RA6M3	RA6M3	RA6M3
	1MB / 640KB	RA6M3	RA6M3	RA6M3	RA6M3	RA6M3
Pin Count Package Size Pitch		100pin LQFP 14x14 0.5mm	144pin LQFP 20x20 0.5mm	145pin LGA 7x7 0.5mm	176pin LQFP 24x24 0.5mm	176pin BGA 13x13 0.8mm

Part #	Flash Memory	RAM	Temp	Package
R7FA6M3AH3CFC#AA0	2MB	640KB	40~105°C	176 LQFP
R7FA6M3AF3CFC#AA0	1MB	640KB	40~105°C	176 LQFP

Flash/ RAM/ Package Table



RTK7EKA6M3S00001BU

[Renesas.com](https://www.renesas.com)