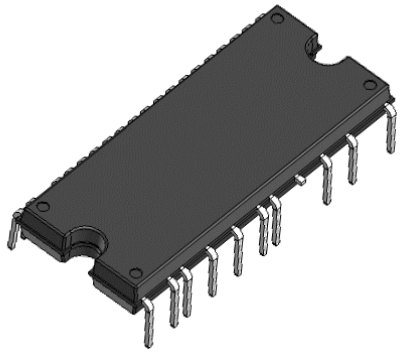
Working Together for a Greener Society

Future of Power Electronics and the Earth

Sine-wave Driving, High Voltage 3-phase Motor Drivers with Built-in Hall Amplifiers

SIM262xM Series



Built-in Control IC (Controller)

No external microcontroller is required for motor control. Supplied in a package, where a controller, a gate driver, the output transistors of three phases, and bootstrap diodes are highly integrated, the product reduces overall application cost.

Support for 8-pole / 10-pole Motors

The IC can output a rotation pulse signal equivalent to an 8-pole motor when a 10-pole BLDC motor is used. This allows 10-pole BLDC motors to be driven with conventional 8-pole BLDC motor systems.

Rotation Direction Switching Without Turning Power Off

Rotation direction (CW/CCW) can be switched without turning off the power when the motor is not rotating.

Various Protection Functions

The IC has various protection functions, including OVP (overvoltage protection), for safe operation even in regions with unstable input voltages.

■ Overview

The SIM262xM series are high voltage 3-phase motor drivers driven by a sinusoidal control, which can support Hall element and Hall IC inputs, thus offering high-efficient yet low-noise motor control. Supplied in a highly heat-dissipating DIP package, where a controller, a gate driver, the output transistors of three phases, and bootstrap diodes are highly integrated, the SIM262xM series requires only a few external components for building a motor driver. This also allows a motor driver to be highly reliable in performance and design-friendly with its compactness. You can select motor rotation directions, FG output pulses, and protections by setting input voltages applied to the ISx pin. The SIM262xM series supports both 8- and 10-pole motors with the function that outputs FG signals equivalent to 8-pole motor rotation signals even when a 10-pole motor is connected. These products can optimally control the inverter systems of low- to medium-capacity motors that require universal input standards.

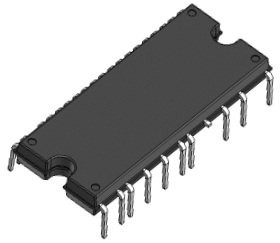
■ Application

For motor drives such as:

- Fan Motor and Pump Motor for Washer and Dryer
- Fan Motor for Air Conditioner
- Fan Motor for Air Purifier and Electric Fan

■ Package

DIP40



■ Selection Guide

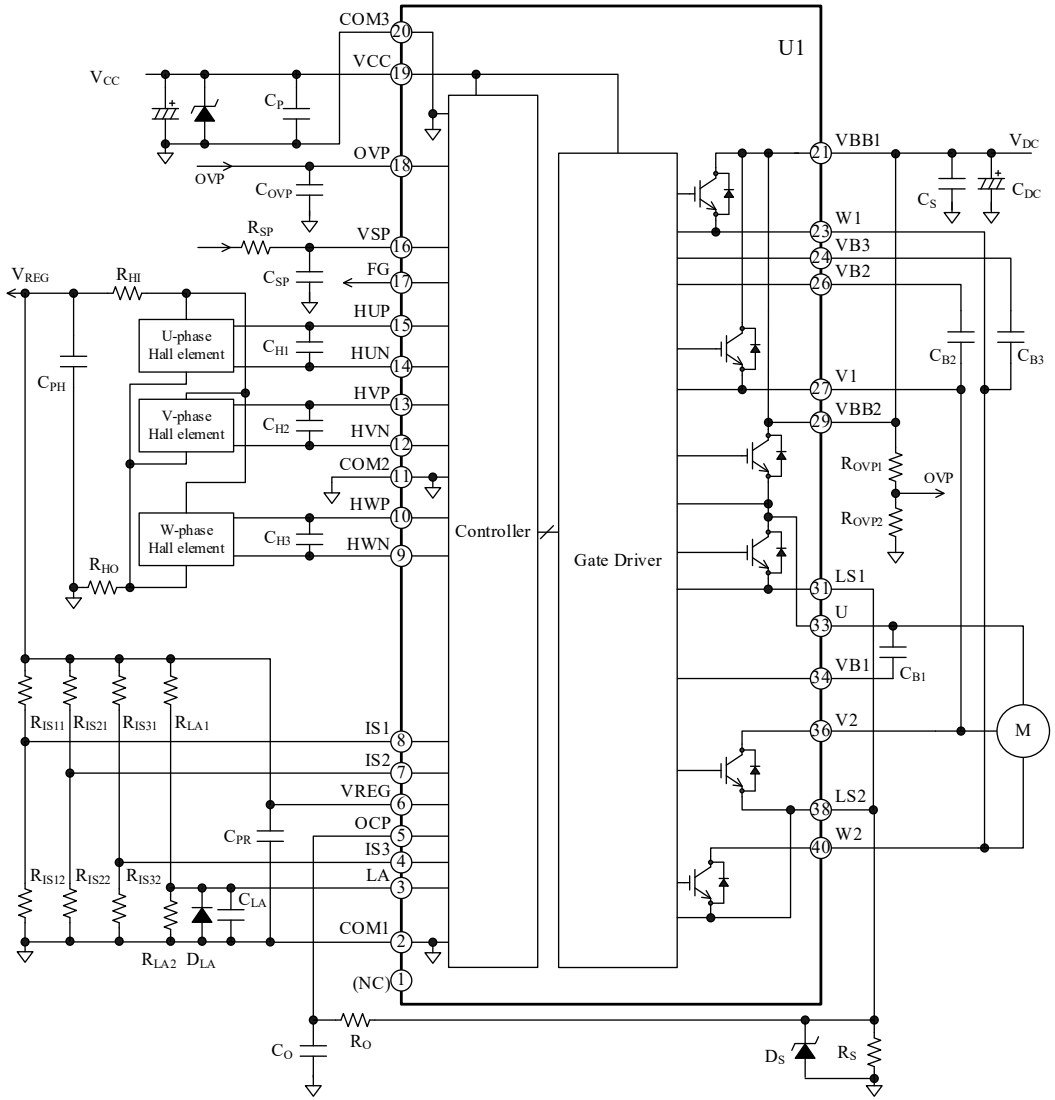
Part Number	Output Transistor	V_{DSS} / V_{CES}	I_D / I_C	$R_{DS(ON)}$ (Max.) / $V_{CE(SAT)}$ (Typ.)
SIM2621M*	Power MOSFET	600 V	2.5 A	2.5 Ω
SIM2622M	IGBT + FRD		5.0 A	1.75 V

* Under development

■ Features

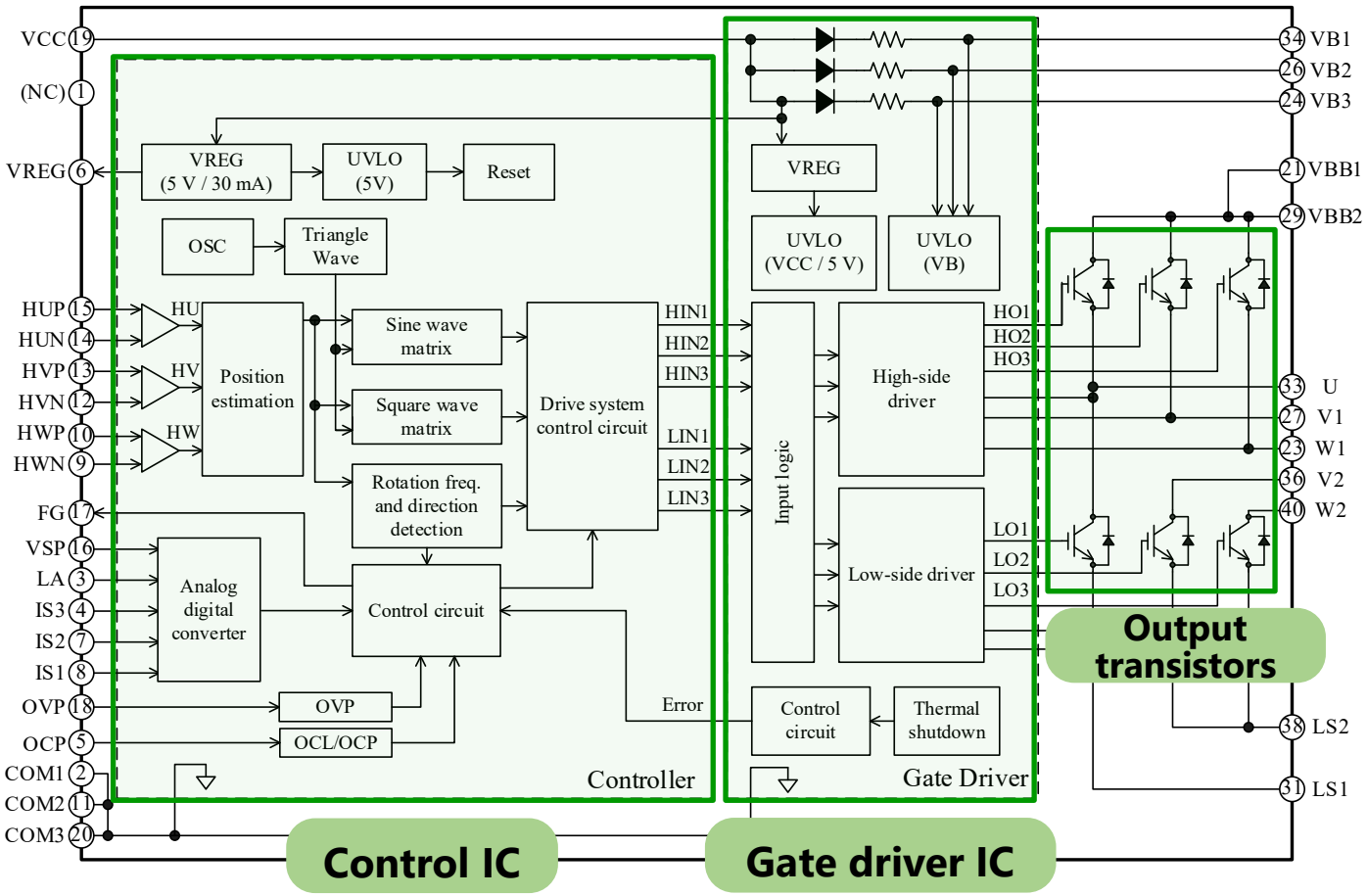
- Pb-free (RoHS Compliant)
- Isolation Voltage: 1500 V (for 1 min) (UL Recognition Pending)
- Low Noise, High Efficiency (Sinusoidal Current Waveform)
- Support for 8-pole/ 10-pole Motors
- Phase Advance Control (Maximum Torque Drive)
- Reduced Number of Parts Achieved by Built-in Bootstrap Diodes
- Hall Element and Hall IC Inputs
- Application-specific Optimal Settings with External Signals:
  - Motor Speed
  - Phase Advance Angle
  - Motor Direction
  - Number of Motor Poles
  - User-settable Motor Lock Detection (Enabled or Disabled)
- 5 V Reference Voltage Output (Used for Driving Hall Elements etc.)
- Various Protection Functions

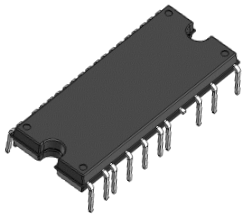
■ Typical Application



A Control IC, a gate driver IC, and output transistors are integrated into a DIP40 package — only by Sanken Electric!*

* As of November 2025, 600 V/ 5.0 A devices





DIP40
(36.0 mm × 14.8 mm ×4.0 mm)

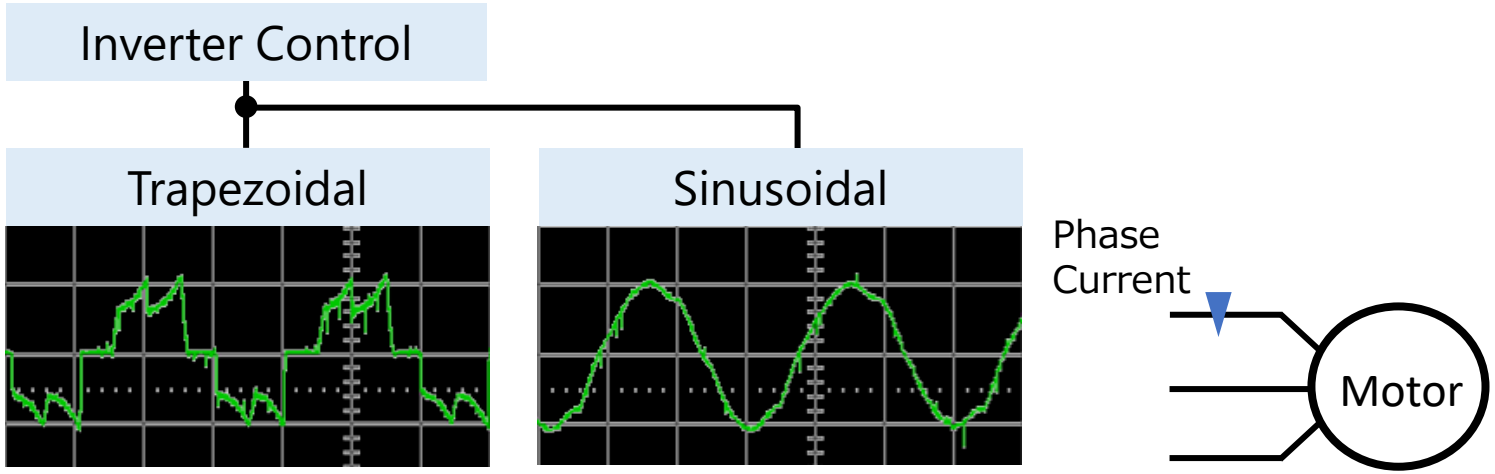
In recent years, as applications such as home appliances have become more advanced, the number of integrated microcontrollers has increased, resulting in larger circuit scales.

The SIM262xM series incorporates a control IC, requiring no external microcontroller for motor control. This leads not only to a smaller motor drive system but also to lower overall application cost.

Features of Sinusoidal Control

The motor driving system includes trapezoidal and sinusoidal controls.

The SIM262xM series uses the sinusoidal control that is excellent in efficiency and quietness.



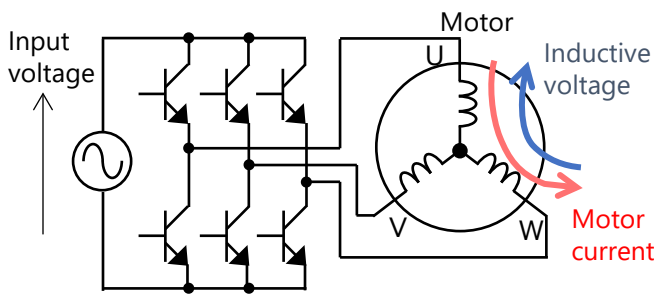
The following table shows the driving controls and motor features.

Sinusoidal control is more efficient and quieter than trapezoidal control.

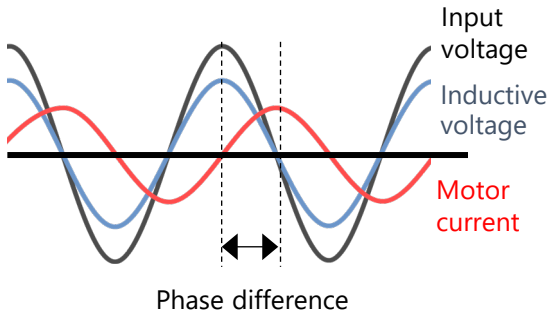
Driving Control	Parameters			
	Motor Efficiency	Switching Efficiency	Quietness	Torque Ripple
Trapezoidal	High	Higher	Quiet	Large
Sinusoidal	Higher	High	Quieter	Small

Phase Advance Function

A phase of the current through the motor normally gets behind a phase of inductive voltage due to winding inductance.
The SIM262xM series has the phase advance function that matches the phases of inductive voltage and motor current.
As a result, the motor can run at a maximum torque.

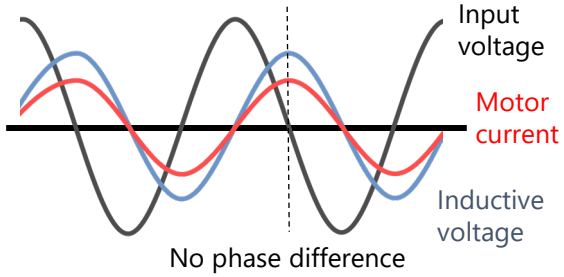


◆Without Phase Advance Control



Phase advance control

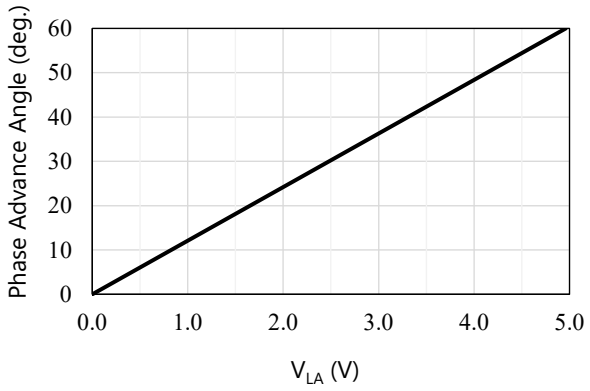
◆With Phase Advance Control



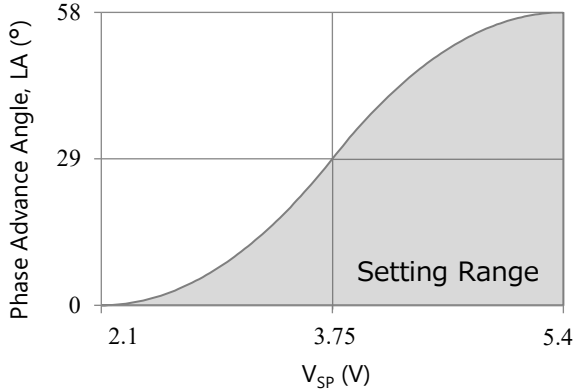
Maximized torque

The SIM262xM series features the phase advance function that includes external advance and internal advance (with linear to cubic function operations). The phase can be optimally adjusted for the motor.

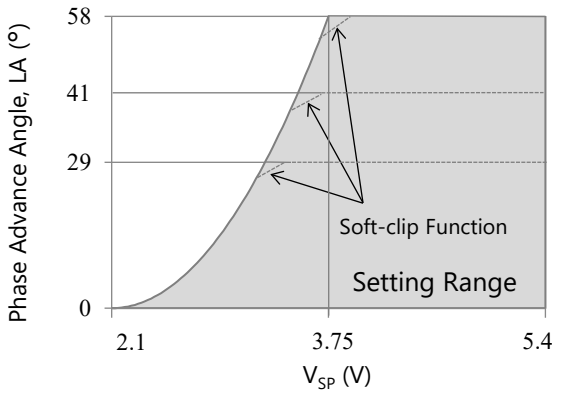
◆External Phase Advance



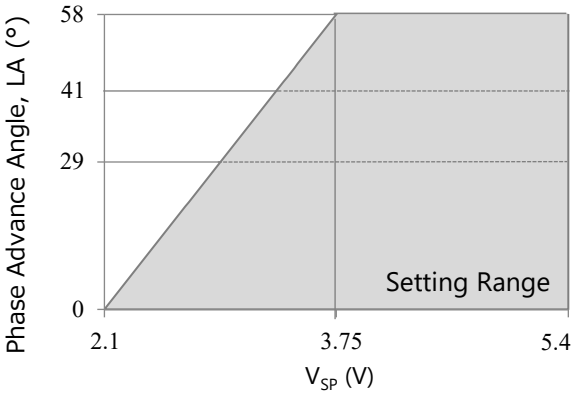
◆Internal Phase Advance
(Cubic Function Characteristics)



◆Internal Phase Advance
(Quadratic Function Characteristics)



◆Internal Phase Advance
(Linear Function Characteristics)



Switching of Speed and Driving Controls

The SIM262xM series switches the motor driving controls according to a frequency.

Based on a motor speed detected by the VSP pin, the IC enters the operation mode determined by the VSP pin voltage. This leads to a stable startup operation.

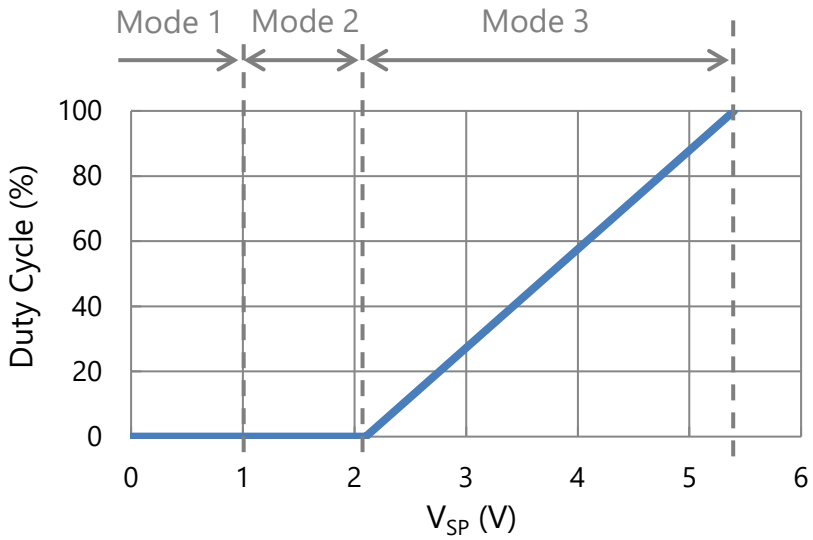
◆ Driving Controls

Frequency	Driving Control
<1 Hz	Trapezoidal
≥1 Hz	Sinusoidal two-phase modulation

◆ Operation Modes (see the right graph)

Mode	VSP Pin Voltage		Operation
	Voltage Range 2.1 V to 5.4 V	Voltage Range 0.5 V to 5.4 V	
1	0 V to 1.0 V	0 V to 0.13 V	Turns off all the switching elements
2	1.0 V to 2.1 V	0.13 V to 0.5 V	Charges the bootstrap capacitors (turns off the low-side switching elements)
3	2.1 V to 5.4 V	0.5 V to 5.4 V	Performs PWM modulation

◆ VSP Pin Voltage vs. Duty Cycle
(Voltage Range: 2.1 V to 5.4 V)



■ Support for 8-pole / 10-pole Motors

The IS1 pin sets the number of motor poles and output pulses and selects which protection recovery mode to enable. This allows the IC to output a rotation pulse signal equivalent to an 8-pole motor when used with a 10-pole BLDC motor. As a result, a 10-pole BLDC motor can be used without changing the existing system for an 8-pole BLDC motor.

IS1 Pin Voltage (Typ.)	Number of FG Output Pulses		Protection Recovery Mode
	Number of Motor Poles	Number of FG Output Pulses per Motor Rotation	
0 to 1/8 V_{REG}	8 poles	3 pulses	Automatic
1/8 V_{REG} to 2/8 V_{REG}	8 poles	3 pulses	Manual
2/8 V_{REG} to 3/8 V_{REG}	10 poles	3 pulses	Automatic
3/8 V_{REG} to 4/8 V_{REG}	10 poles	3 pulses	Manual
4/8 V_{REG} to 5/8 V_{REG}	10 poles	1 pulse	Manual
5/8 V_{REG} to 6/8 V_{REG}	10 poles	1 pulse	Automatic
6/8 V_{REG} to 7/8 V_{REG}	8 poles	1 pulse	Manual
7/8 V_{REG} to 8/8 V_{REG}	8 poles	1 pulse	Automatic

■ Optimal phase advance angle adjustment for motors

The IS2 pin determines the phase advance control.

IS2 Pin Voltage (Typ.)	Phase Advance Function	Setting Range of Phase Advance Angle
0 to 1/8 V_{REG}	External phase advance	0° to 58°
1/8 V_{REG} to 2/8 V_{REG}	Cubic function operation	0° to 58°
2/8 V_{REG} to 3/8 V_{REG}	Quadratic function operation	0° to 29°
3/8 V_{REG} to 4/8 V_{REG}	Quadratic function operation	0° to 41°
4/8 V_{REG} to 5/8 V_{REG}	Quadratic function operation	0° to 58°
5/8 V_{REG} to 6/8 V_{REG}	Linear function operation	0° to 29°
6/8 V_{REG} to 7/8 V_{REG}	Linear function operation	0° to 41°
7/8 V_{REG} to 8/8 V_{REG}	Linear function operation	0° to 58°

■ Rotation direction switching without turning power off

The IS3 pin selects the rotation direction, enables and disables the motor lock protection, and sets the voltage range of output duty cycle control. The IS3 pin can switch the rotation direction without turning off the power when the motor is stopped.

IS3 Pin Voltage (Typ.)	Rotation Direction	Motor Lock Protection*	Voltage Range of Output Duty Cycle Control*
0 to 1/8 V_{REG}	Forward (CW)	Enabled	2.1 V to 5.4 V
1/8 V_{REG} to 2/8 V_{REG}	Forward (CW)	Disabled	2.1 V to 5.4 V
2/8 V_{REG} to 3/8 V_{REG}	Forward (CW)	Enabled	0.5 V to 5.4 V
3/8 V_{REG} to 4/8 V_{REG}	Forward (CW)	Disabled	0.5 V to 5.4 V
4/8 V_{REG} to 5/8 V_{REG}	Reverse (CCW)	Disabled	0.5 V to 5.4 V
5/8 V_{REG} to 6/8 V_{REG}	Reverse (CCW)	Enabled	0.5 V to 5.4 V
6/8 V_{REG} to 7/8 V_{REG}	Reverse (CCW)	Disabled	2.1 V to 5.4 V
7/8 V_{REG} to 8/8 V_{REG}	Reverse (CCW)	Enabled	2.1 V to 5.4 V

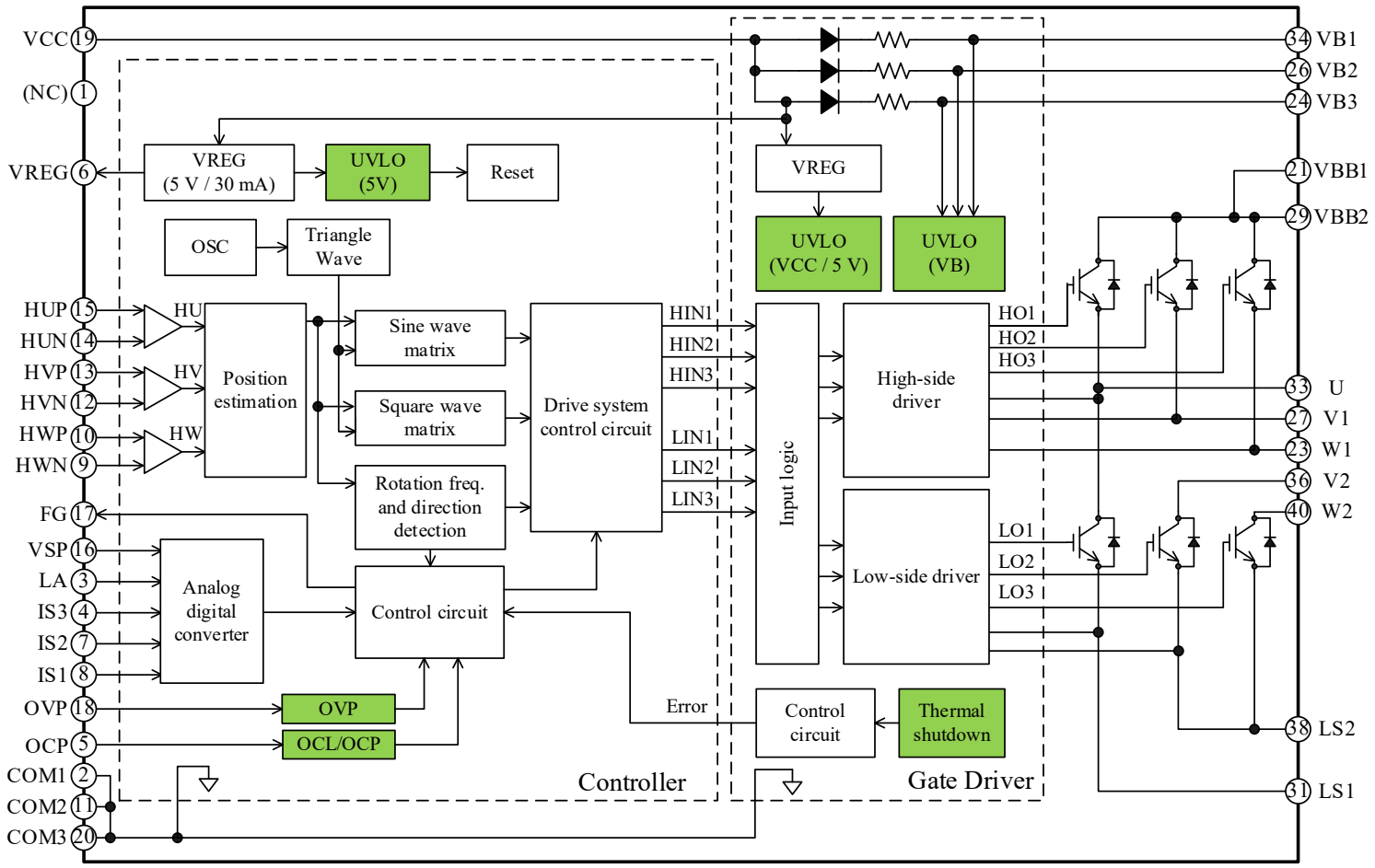
* The power must be turned off before enabling or disabling the motor lock protection or changing the voltage range of output duty cycle control.

Various Protection Functions

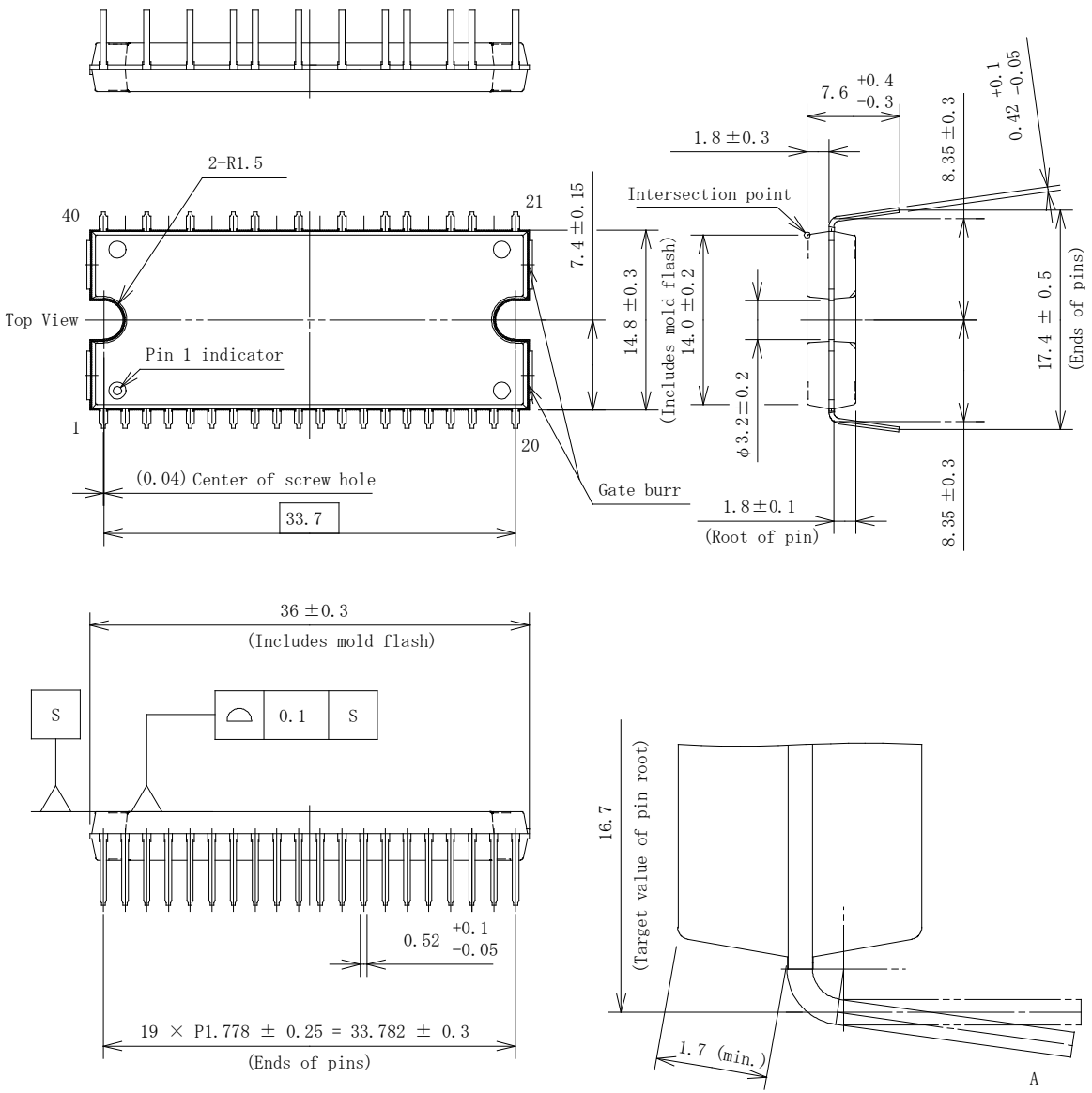
The IC has various protection functions, including OVP (overvoltage protection), for safe operation even in regions with unstable input voltages.

Protection Functions

- VREG Pin Undervoltage Lockout (UVLO_REG)
- Undervoltage Lockout for Power Supplies
  - VBx Pin (UVLO_VB)
  - VCC Pin (UVLO_VCC)
- Overcurrent Limit (OCL)
- Overcurrent Protection (OCP)
- Overvoltage Protection (OVP)
- Thermal Shutdown (TSD)
- Motor Lock Protection (MLP)
- Reverse Rotation Detection
- Hall Signal Abnormality Detection



DIP40



NOTES:

- Dimensions in millimeters
- Pb-free (RoHS compliant)
- "A" represents a pin illustrated for reference only, not the actual state of a bend.
- Maximum gate burr height is 0.3 mm.

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