



Working Together for a Greener Society

Future of Power Electronics and the Earth



High Voltage 3-phase Motor Drivers

SIM1 Series



■ Overview

The SIM1 series are high voltage 3-phase motor drivers in which transistors, pre-drive circuits, and bootstrap circuits (diodes and resistors) are highly integrated. The IC has protection functions, including overcurrent protection for both high-side and low-side. These products can optimally control the inverter systems of low- to medium-capacity motors that require universal input standards.

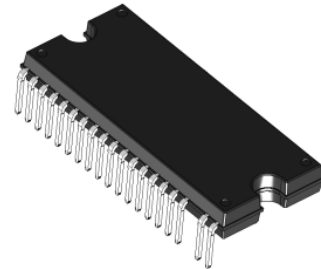
■ Application

For motor drives such as:

- Refrigerator Compressor Motor
- Fan Motor and Pump Motor for Washer and Dryer
- Fan Motor for Air Conditioner
- Fan Motor for Air Purifier

■ Package

DIP40



■ Selection Guide

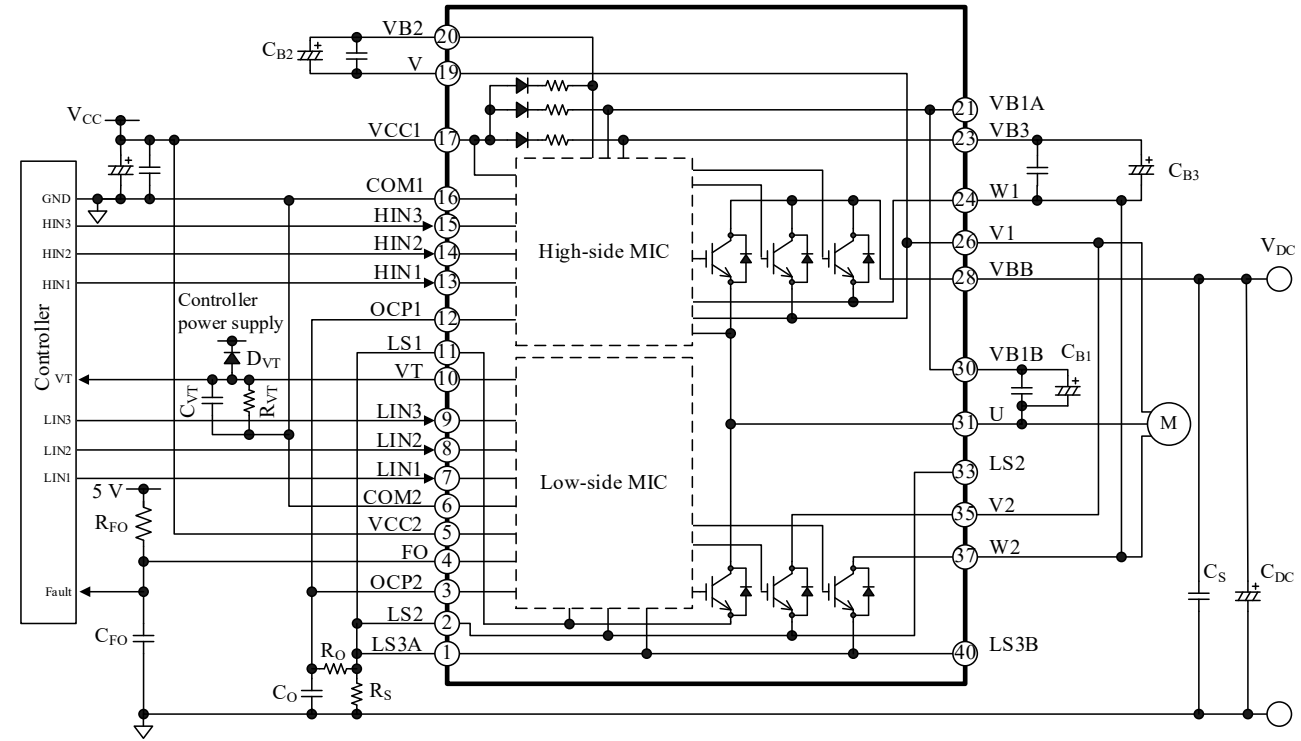
Part Number	Output Transistor	V_{DSS}/V_{CES}	I_D/I_C	$R_{DS(ON)}$ (Max.)/ $V_{CE(SAT)}$ (Typ.)
SIM1-02D2M*	Power MOSFET	600 V	2 A	3.6 Ω
SIM1-03A1M	IGBT+FRD		3 A	1.85 V
SIM1-05A1M	IGBT+FRD		5 A	1.75 V
SIM1-10F1A*	IGBT+FRD		10 A	1.8 V
SIM1-10F1M	IGBT+FRD		10 A	1.65 V

* Under development

■ Features

- Pb-free (RoHS compliant)
- Temperature Sensing Function
- Built-in Bootstrap Diodes with Current Limiting Resistors (60 Ω)
- CMOS-compatible Input (3.3 V or 5 V)
- Fault Signal Output at Protection Activation (FO Pin)
- Protections include:
 - Overcurrent Protection (OCP)
 - High-side (OCP1): Auto-restart
 - Low-side (OCP2): Auto-restart
 - Undervoltage Lockout for Power Supply
 - High-side (UVLO_VB): Auto-restart
 - Low-side (UVLO_VCC): Auto-restart
 - Thermal Shutdown (TSD): Auto-restart

■ Typical Application



■ Overcurrent Protection for High-side and Low-side

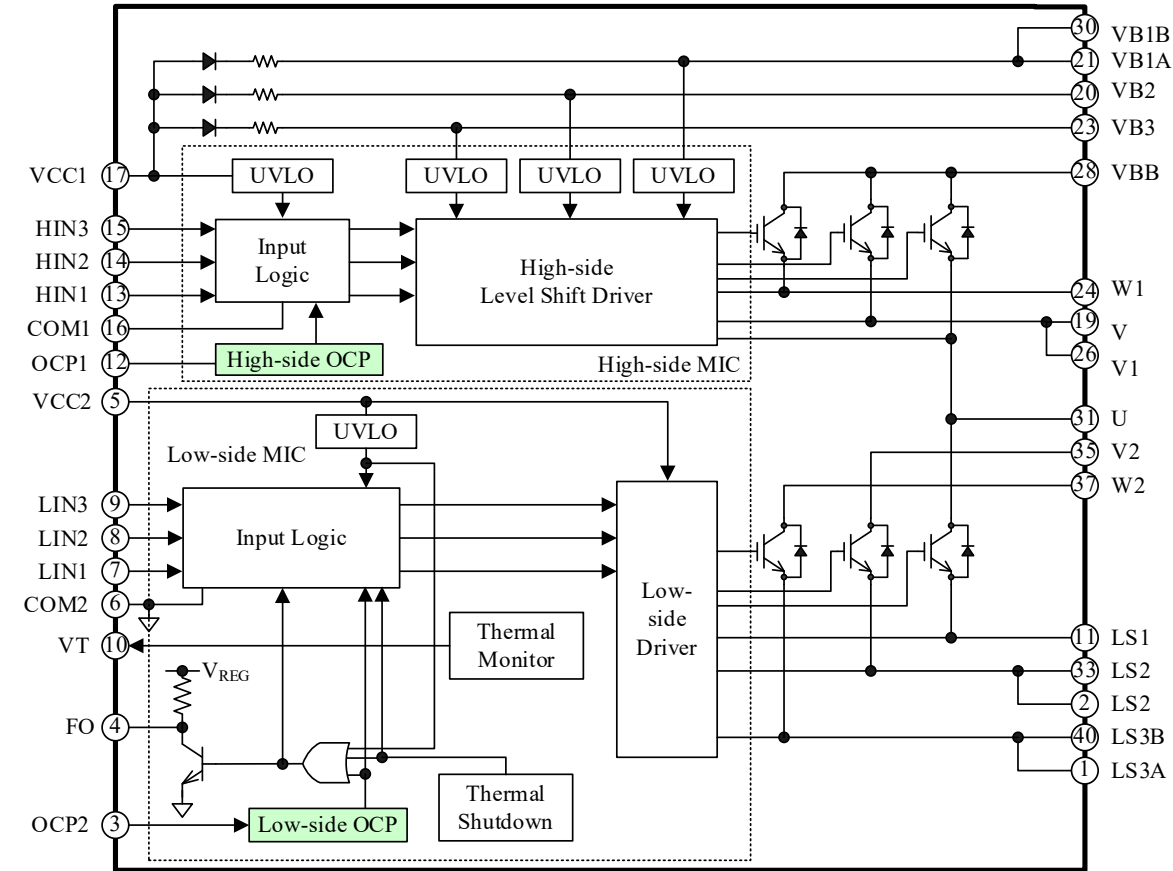
Two types of overcurrent protections are incorporated in the SIM1 series: the high-side overcurrent protection (OCP1) and the low-side overcurrent protection (OCP2).

Even if the high- or low-side output transistors are damaged for any reason and overcurrents flow due to simultaneous turn-on, the OCP on the unaffected side activates and turns off the output transistors. This prevents secondary destruction resulting from simultaneous turn-on after the output transistor failure.

■ Built-in ESD Protection Device

In general, the ESD tolerance between the LS and COM pins depends on the gate-to-emitter breakdown voltage of the low-side output transistor and tends to be lower than that of other pins. The IC incorporates an ESD protection device between the LS and COM pins, improving the ESD tolerance to the same level as other pins.

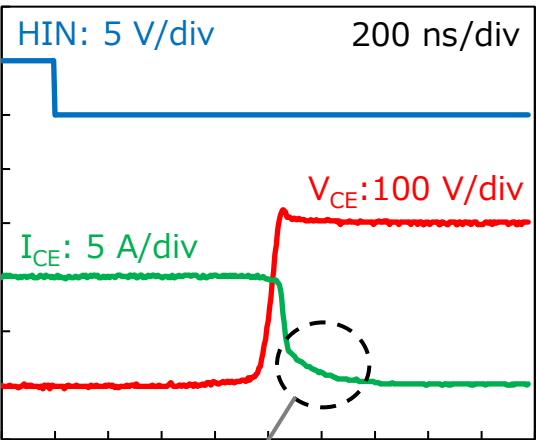
This prevents ESD damage during system assembly.



Switching Loss Suppression

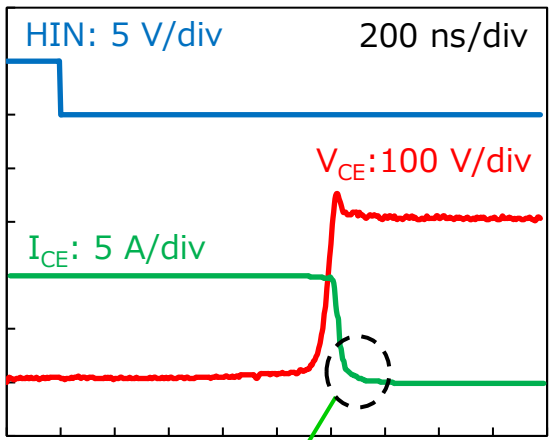
The SIM1-10F1M improves the turn-off characteristics of the output transistors, which greatly reduces switching losses. The IC is expected to enhance efficiency in high-frequency applications, such as washing machine main motor.

Turn-off: Conventional



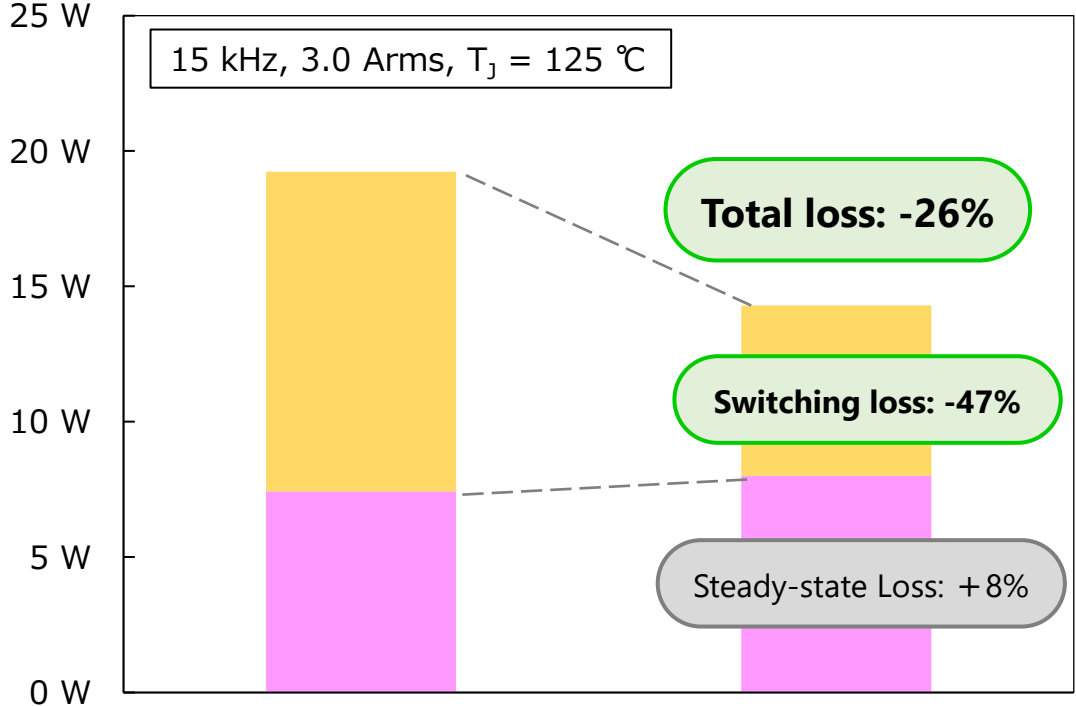
High tail current

Turn-off: SIM1-10F1M



Low tail current

IGBT Total Loss



Conventional SIM1-10F1M

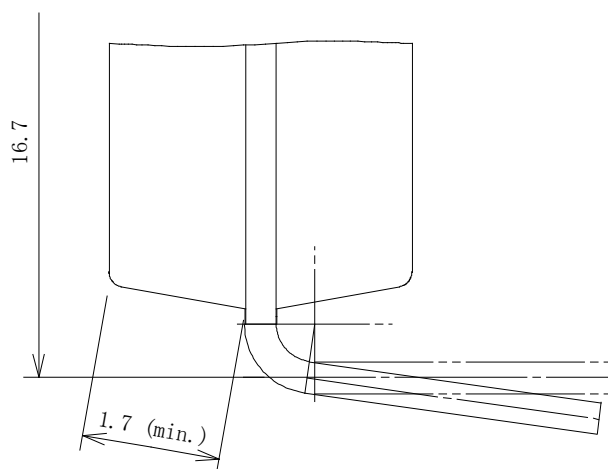
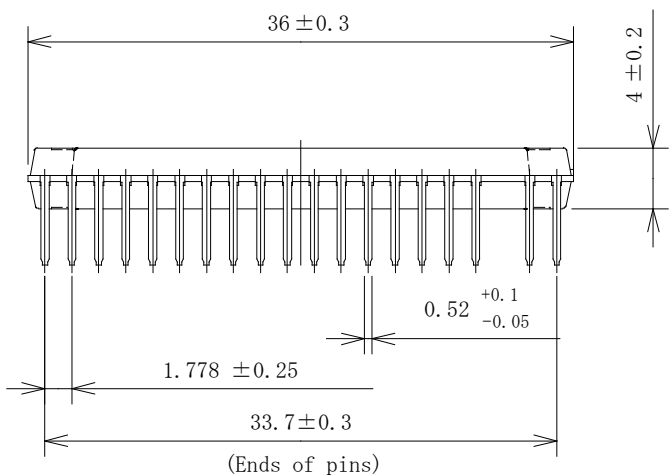
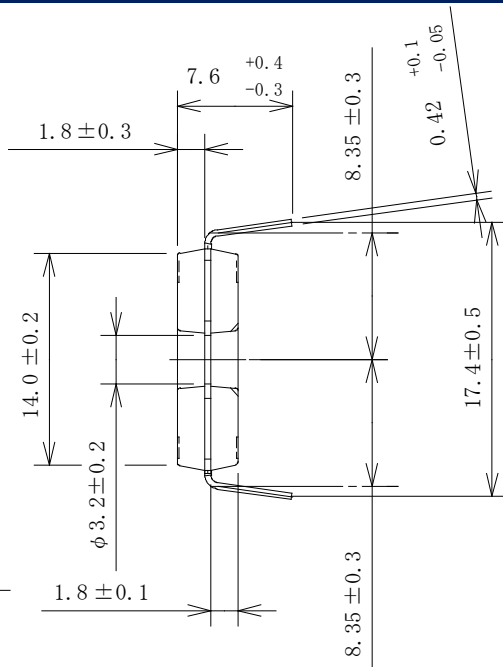
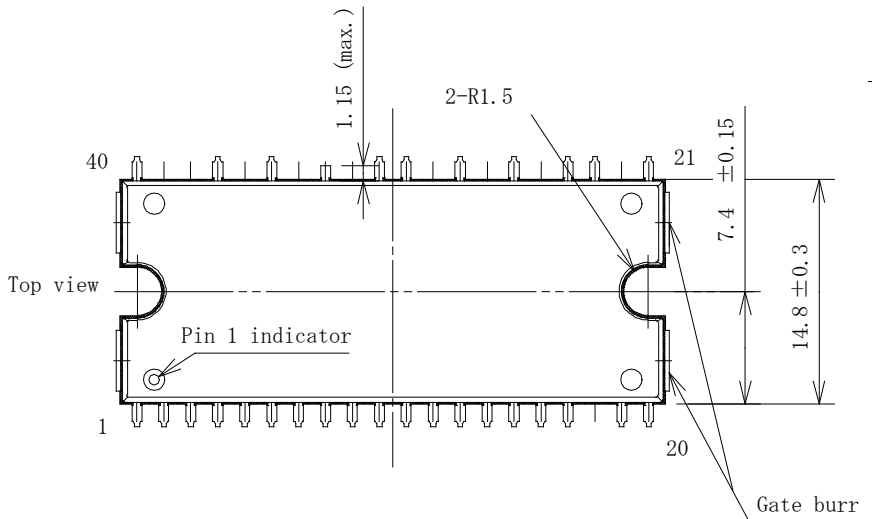
■ Forward Steady-state Loss ■ Switching Loss

Total loss: -26%

Switching loss: -47%

Steady-state Loss: +8%

DIP40



NOTES:

- Dimensions in millimeters
- Pb-free (RoHS compliant)
- The leads illustrated above are for reference only, and may not be actual states of being bent.
- Maximum gate burr height is 0.3 mm.

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