



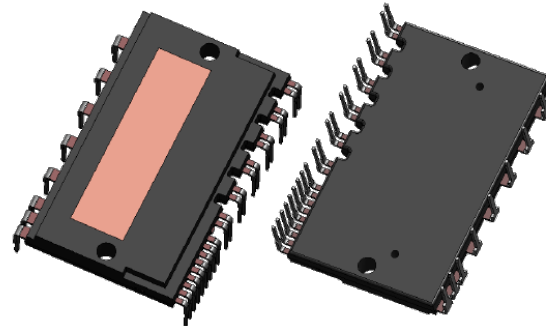
Working Together for a Greener Society

Future of Power Electronics and the Earth

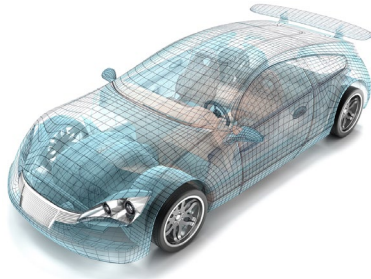


3-phase Motor Drivers for Automotive and Industrial Equipment

SAM2 Series

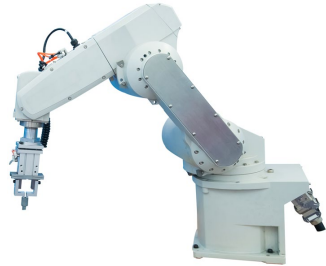


- **Electric Compressor**
- **Electric Oil Pump**



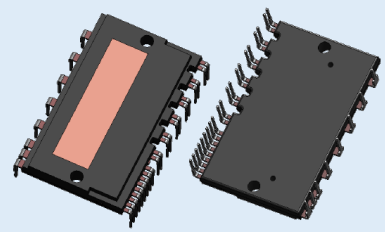
Want a 3-phase motor driver for auxiliary systems used in electrified vehicles (xEV)?

- **Commercial A/C**
- **General Inverter**
- **Servomotor**



Can't find a good 3-phase motor driver for industrial equipment?

If so, our **"SAM2 series"** is exactly what you are looking for!



We would like to share what makes this series special.

Overview

The SAM2 series — 3-phase brushless motor drivers — integrates output transistors, pre-drive circuits, bootstrap diodes with current-limiting resistors, and a temperature-sensing thermistor into one package.

This series will best suit 3-phase motor drivers for industrial equipment, automotive high-voltage auxiliary systems, etc.

Main Features

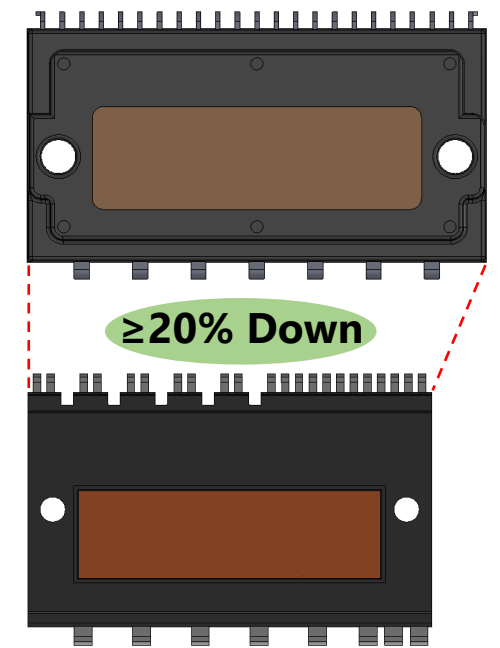
- **≥20% reduction in package size (vs. our old ICs)**
- **Built-in thermistor for precise temperature sensing**
- **Soft recovery diode for switching noise suppression**

Your application can get smaller and more reliable!

03. $\geq 20\%$ Reduction in Package Size

With the DBC (Direct Bonding Copper) structure, the SAM2 series comes in a package size $\geq 20\%$ smaller than our old ICs, but still ensures conventional functions and performances.

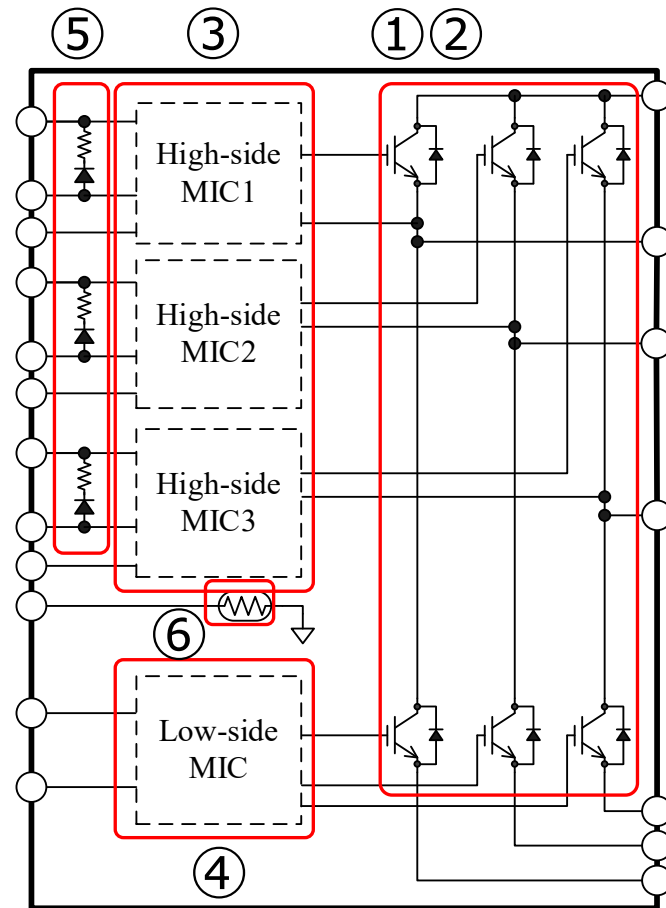
Old Type
60 mm × 31 mm × 6.3 mm



SAM2 Series
52.5 mm × 31 mm × 5.6 mm

All-in-one IPM with multiple components single packaged

- ① Output transistor (IGBT) × 6
- ② Freewheeling diode × 6
- ③ High-side driver IC × 3
- ④ Low-side driver IC × 1
- ⑤ Bootstrap diode with current-limiting resistor × 3
- ⑥ Temp-sensing thermistor × 1

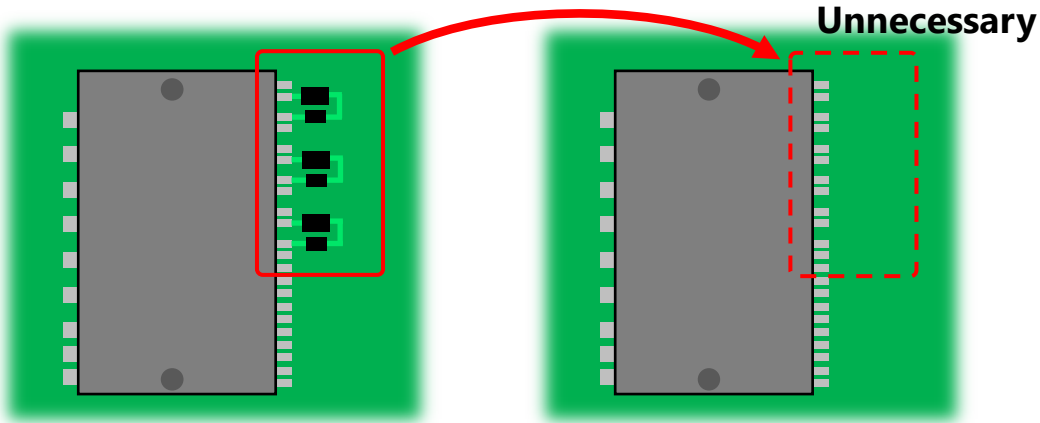


03. $\geq 20\%$ Reduction in Package Size

The single-packaging approach reduces external parts to be mounted.

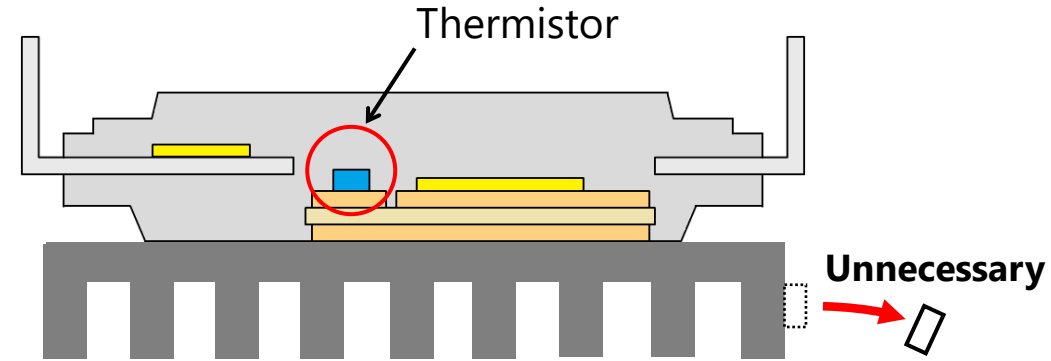
No need to add external bootstrap diodes + current-limiting resistors

< Schematic View >



No need to add an external temperature-sensing thermistor

< Schematic View >



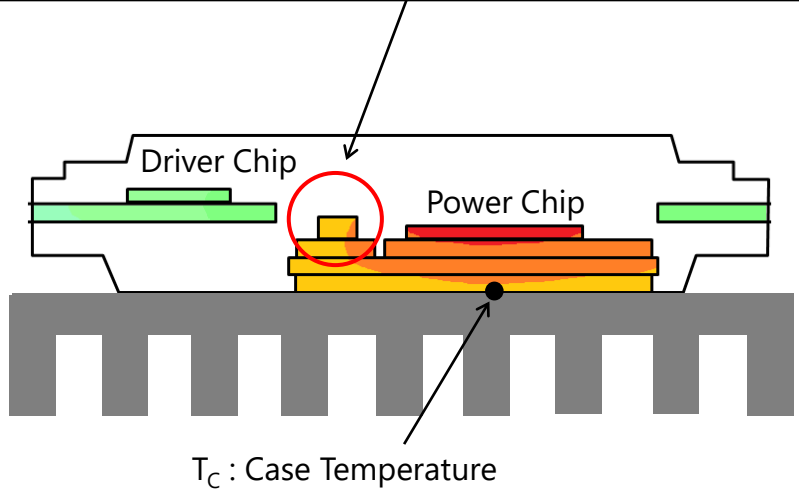
- **Smaller-sized applications**
- **Larger mountable area on a PCB**
- **Less reliability risk from parts mounting**
- **Lower costs in materials and processing**

04. Precise Temperature Sensing

Placing a thermistor on the DBC substrate along with the power chip (IGBTs + freewheeling diodes) resulted in vastly improved temperature-sensing accuracy.

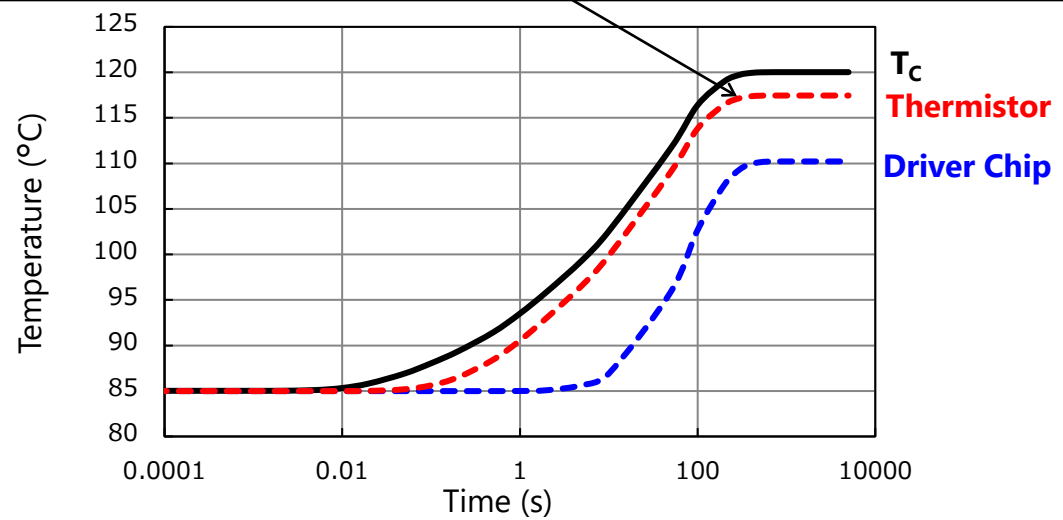
Thermistor Mounting Position (Schematic View)

Thermistor is placed on the DBC substrate, not on the lead frame.



Temperature Comparison

Thermistor temperature is detectable as a near-T_c value.



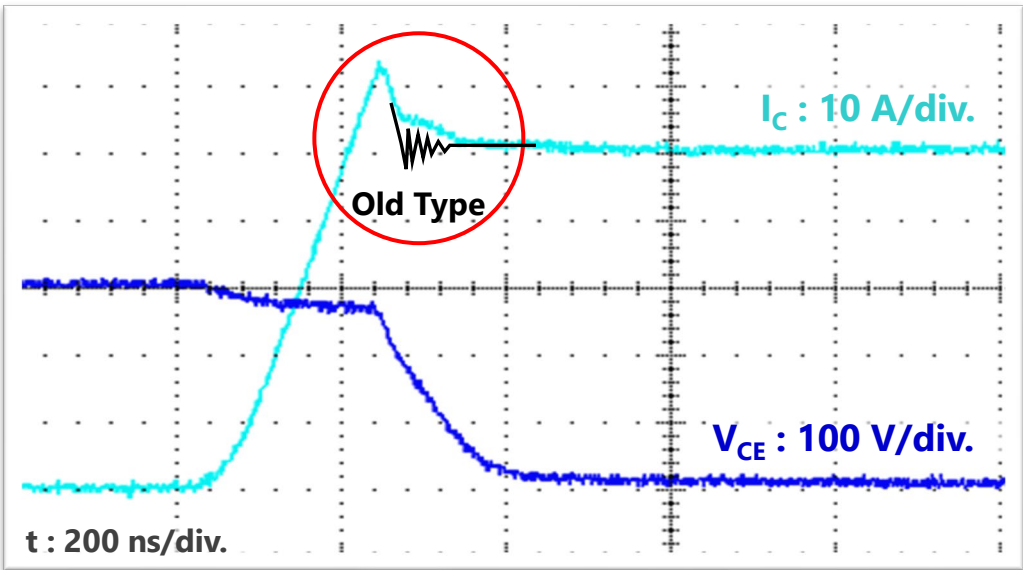
- More accurate temperature sensing
- Higher followability to rapid temperature changes

Your application will have more quality with this precise T_c sensing.

05. Switching Noise Suppression

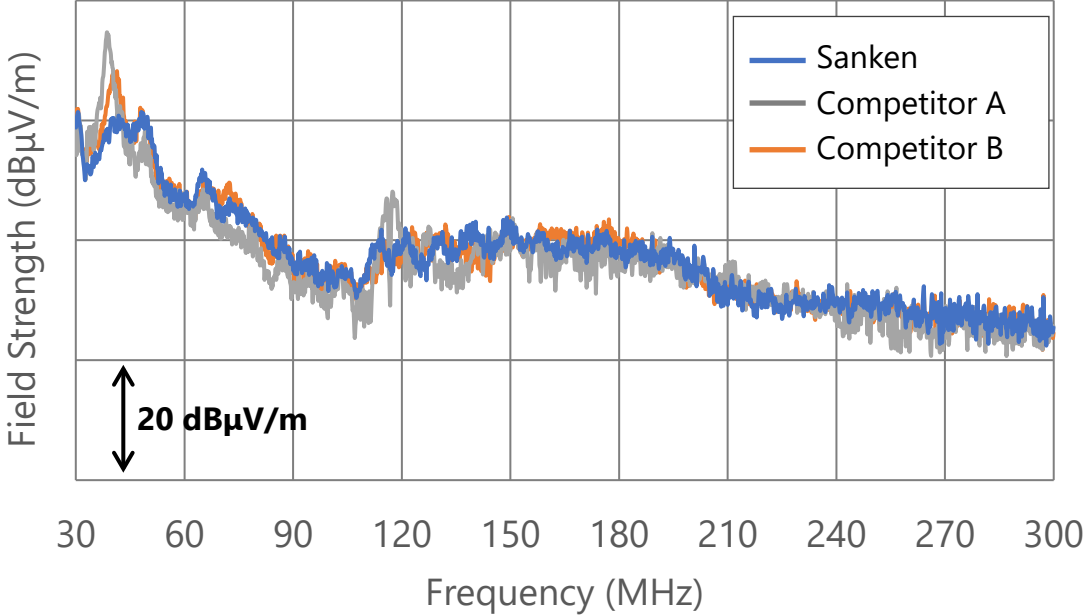
The built-in, self-developed, and excellent-soft-recovery-characteristic freewheeling diodes can greatly suppress the switching noise at turn-on and reduce emission noise as well as competitors.

Switching Waveforms (at Turn-on)



Suppressed noise at turn-on

Emission Noise Waveforms



Reduced emission noise

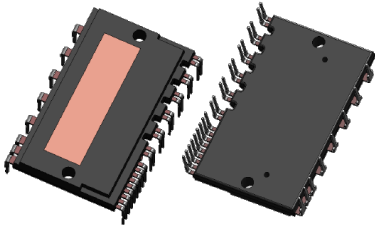
Here's a selection guide to the SAM2 series.
 This series offers many functions besides what we have introduced.

Selection Guide

Part Number	V_{CES}	I_C	$V_{CE(SAT)}$ (Typ.)	Application
SAM265M30AA1	650 V	30 A	1.70 V	Automotive ⁽¹⁾
SAM265M50AS3 ⁽²⁾	650 V	50 A	1.80 V	Automotive ⁽¹⁾
SAM265M50BS3	650 V	50 A	1.70 V	Industrial equip.
SAM212M05BF1	1200 V	5 A	1.30 V	Industrial equip.
SAM212M10BF1	1200 V	10 A	1.60 V	Industrial equip.
SAM212M15BF1 ⁽²⁾	1200 V	15 A	1.70 V	Industrial equip.

⁽¹⁾ Also applicable to industrial equipment

⁽²⁾ Under development (as of Feb. 2024)



Various Functions

- CMOS-compatible Input (3.3 V or 5 V)
- Fault Signal Output at Protection Activation
- Shutdown Signal Input
- Adjustable OCP Hold Time
- Protection Functions
 - Undervoltage Lockout for Power Supply
 - VBx Pin (UVLO_VBx): Auto-restart
 - VCCL Pin (UVLO_VCCL): Auto-restart
 - Overcurrent Protection (OCP): Auto-restart

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