



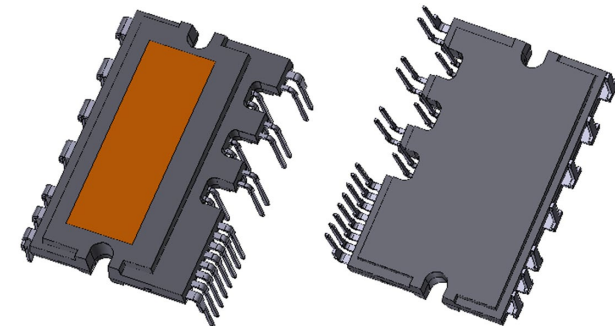
Working Together for a Greener Society

Future of Power Electronics and the Earth



## 3-phase Motor Drivers for Automotive

# SAM470Mx0AF1 Series



## Overview

The SAM470Mx0AF1 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 automotive high-voltage auxiliary systems.

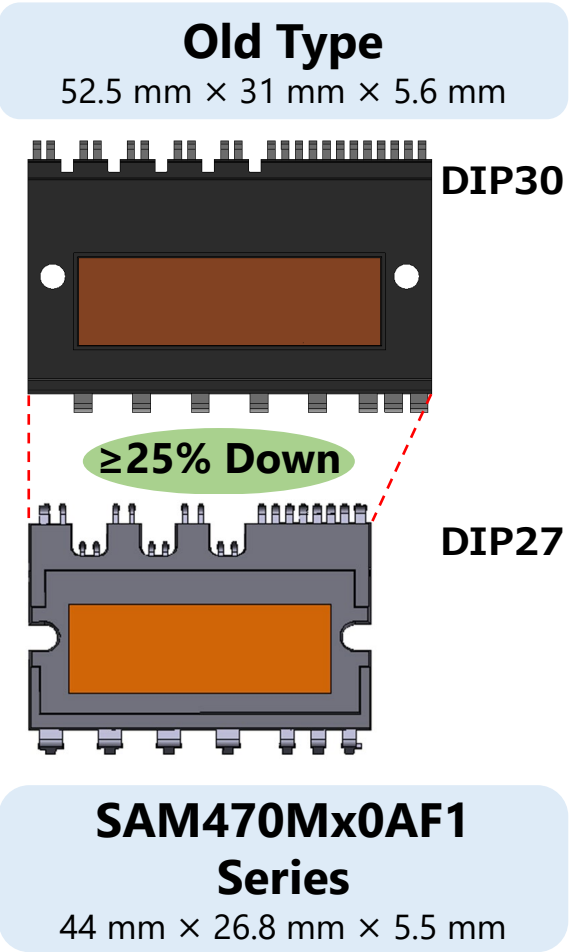
## Main Features

- **≥25% 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!**

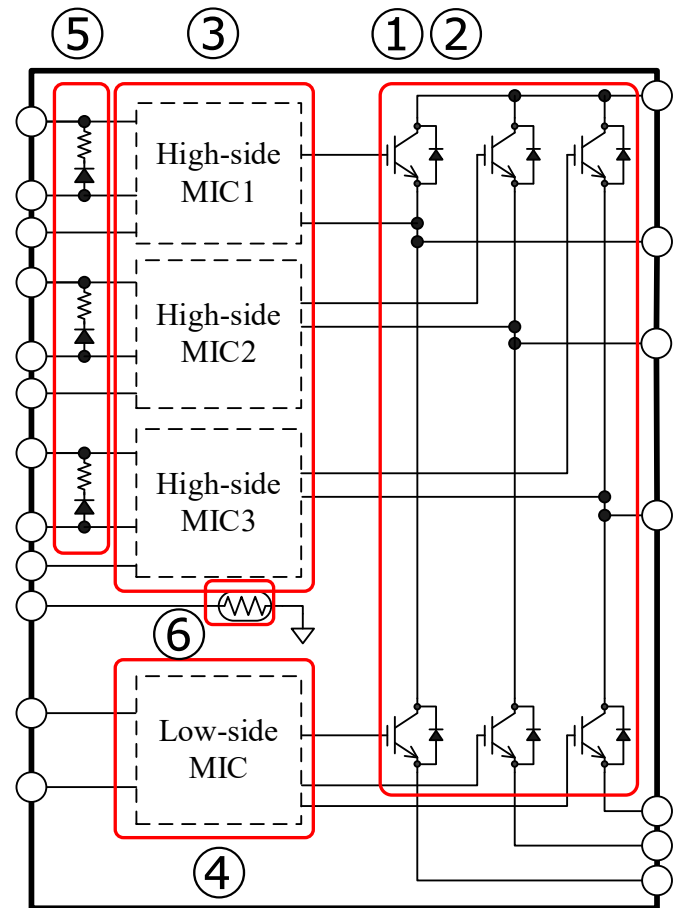
# 02. $\geq 25\%$ Reduction in Package Size

With a direct bonding copper (DBC) structure, the SAM470Mx0AF1 series comes in a package size  $\geq 25\%$  smaller than our old ICs, but still ensures conventional functions and performances.



## 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

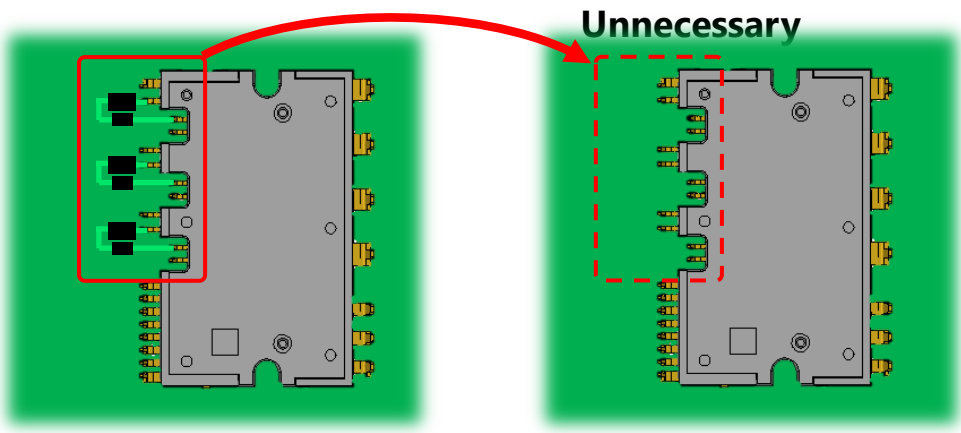


# 02. $\geq 25\%$ Reduction in Package Size

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

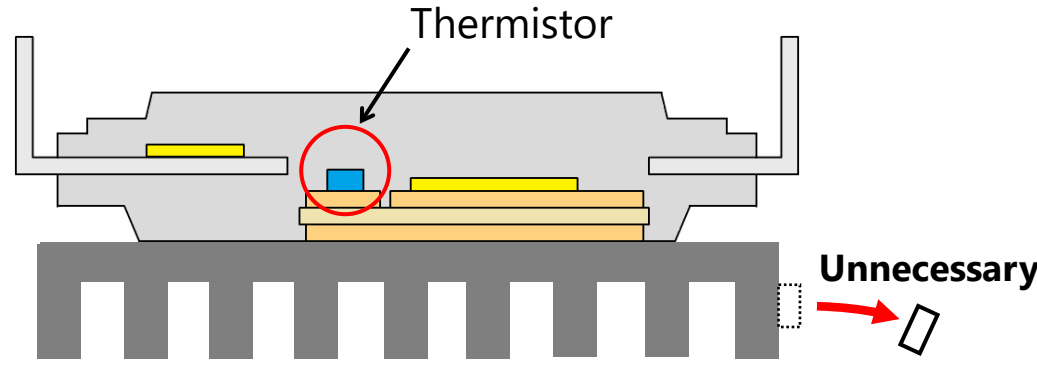
**No need to add external bootstrap diodes + current-limiting resistors**

< Schematic View >



**No need to add an external temperature-sensing thermistor**

< Schematic View >



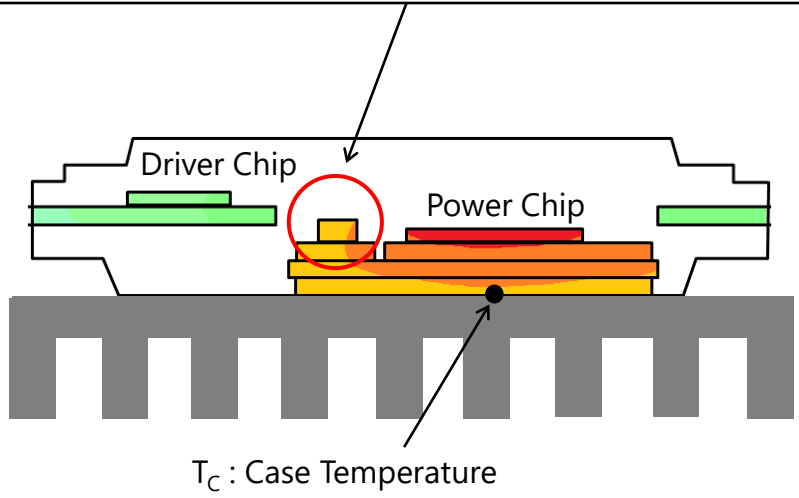
- **Smaller-sized applications**
- **Larger mountable area on a PCB**
- **Less reliability risk from parts mounting**
- **Lower costs in materials and processing**

# 03. 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.

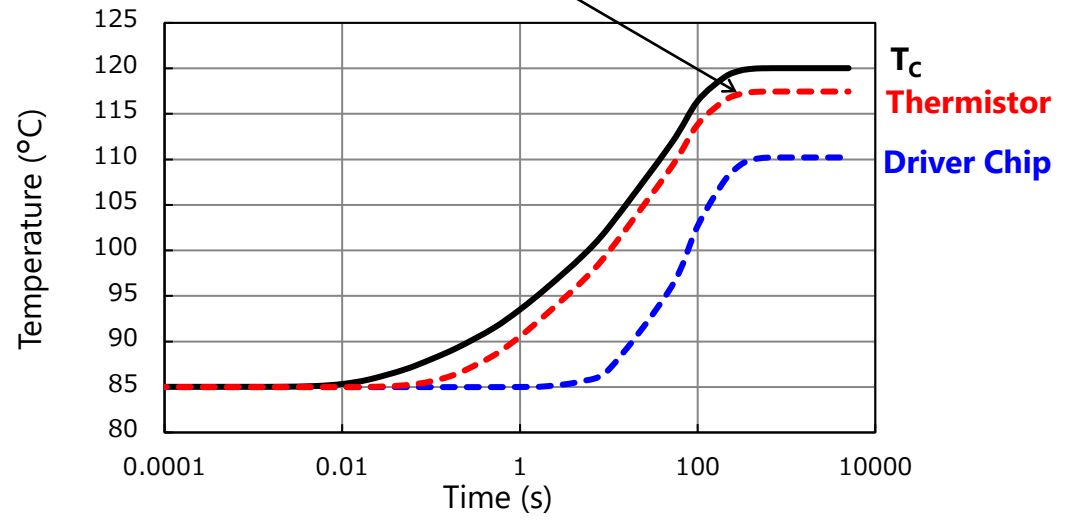
## Thermistor Mounting Position (Schematic View)

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



## Temperature Comparison

Thermistor temperature is detectable as a near-T<sub>c</sub> value.

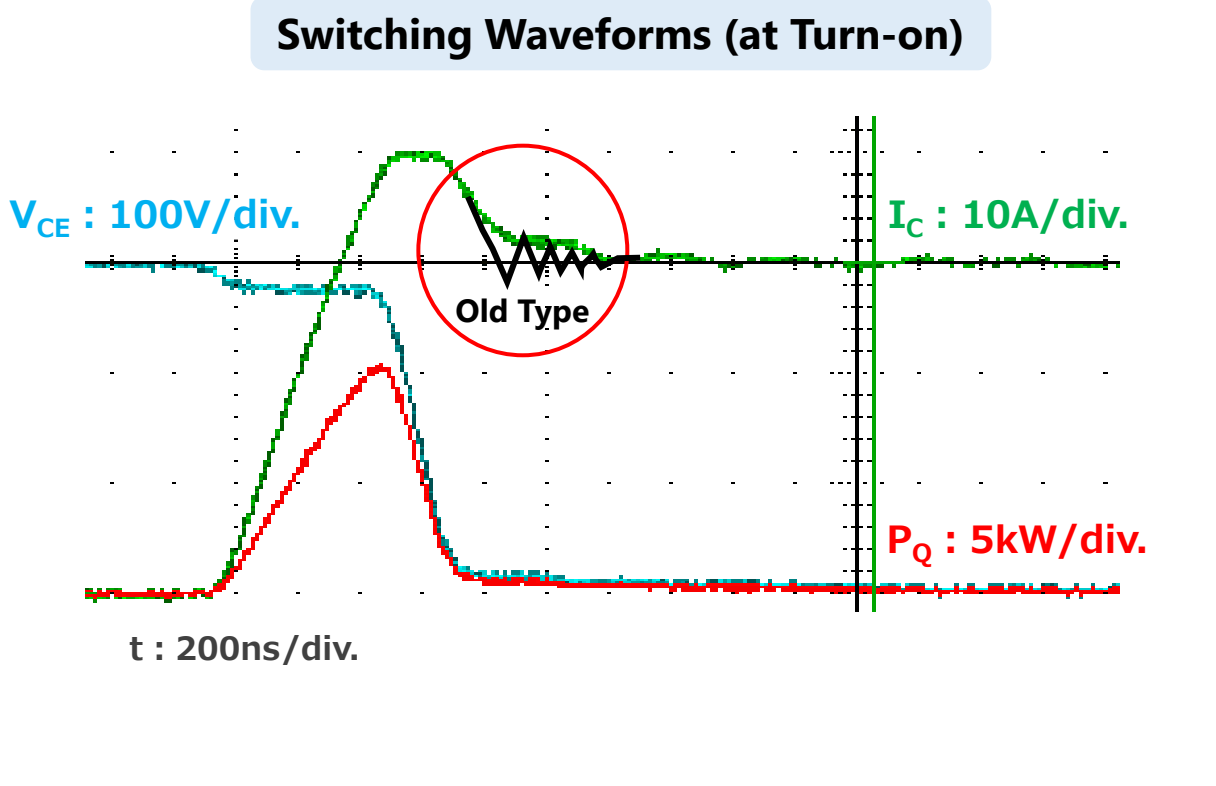


- More accurate temperature sensing
- Higher followability to rapid temperature changes

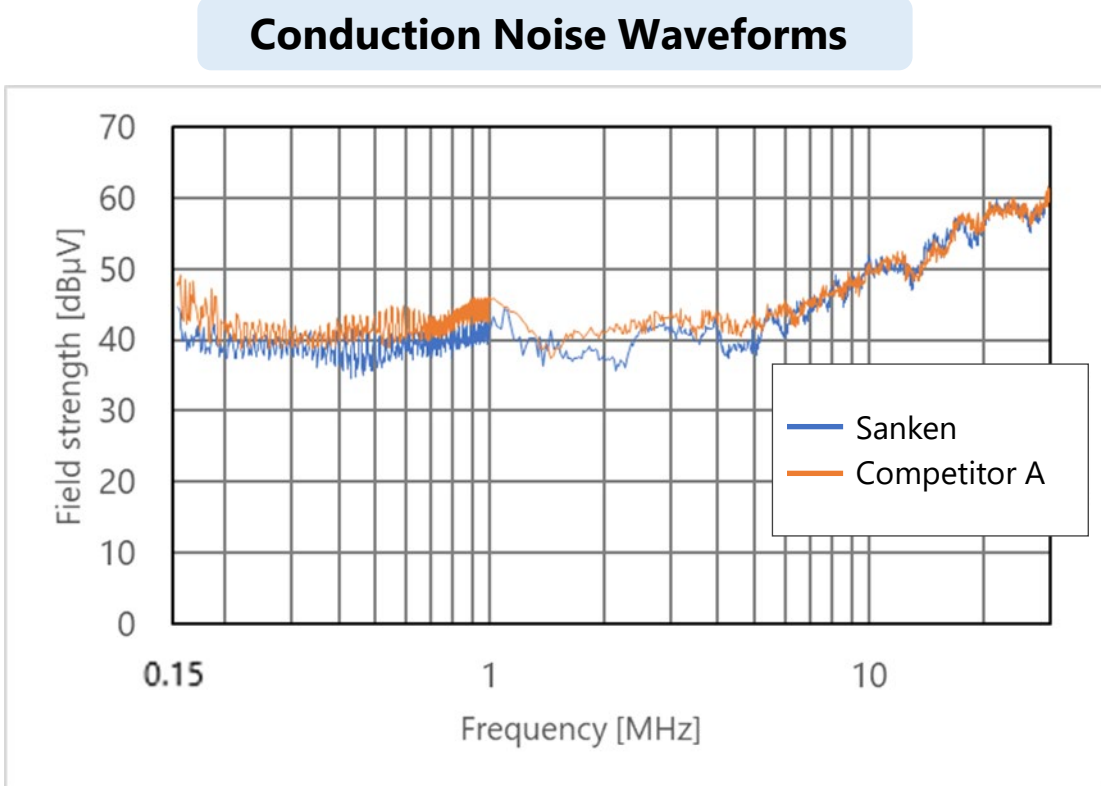
**Your application will have more quality with this precise T<sub>c</sub> sensing.**

# 04. 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 conduction noise as well as competitors.



**Suppressed noise at turn-on**



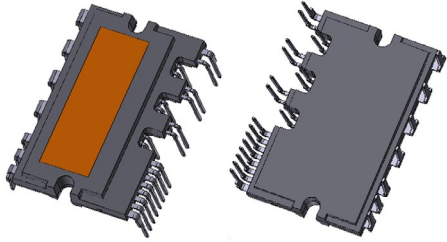
**Reduced conduction noise**

# 05. SAM470Mx0AF1 Series Selection Guide

Here's a selection guide to the SAM470Mx0AF1 series. This series offers many functions besides what we have introduced.

### ■ Package

DIP27 (LF4550)



### ■ Applications

For driving 3-phase motor of the following high voltage auxiliary equipment system such as electrified vehicles (xEV):

- Electric Compressor
- Electric Oil Pump

### ■ Selection Guide

Part Number	$V_{CES}$	$I_C$	$V_{CE(SAT)}$ (Typ.)
SAM470M30AF1	700 V	30 A	1.55 V
SAM470M50AF1 *	700 V	50 A	1.70 V

\* Under development

### ■ Features

- AQG-324 Qualified
- Pb-free (RoHS Compliant)
- Isolation Voltage: 2500 V (for 1 min)
- Direct Bonding Copper (DBC) Structure with Excellent Heat Dissipation
- Built-in Thermistor
- Built-in Bootstrap Diodes
- CMOS-compatible Input (3.3 V or 5 V)
- Fault Signal Output at Protection Activation
- 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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