ELECTRIC VARIABLE VALVE TIMING CONTROL [SKYACTIV-G 2.0, SKYACTIV-G 2.5]

id0140g2318100

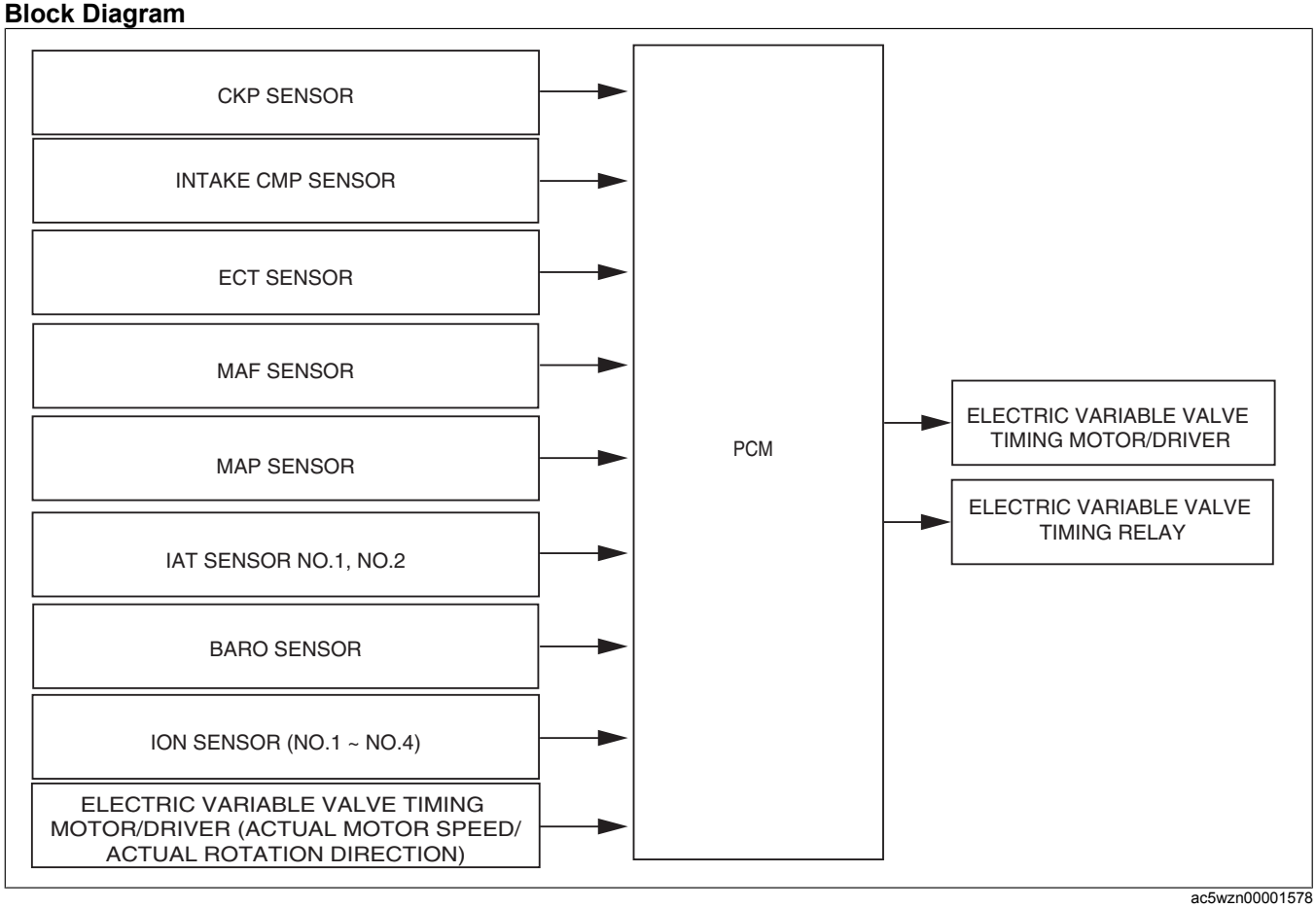
Caution

- **Vehicle specifications differ depending on the vehicle identification number (VIN).**
  - **— Type A VIN:**
    JM0 KE**** 100001−**
    JM6 KE**** 100001−**
    JM7 KE**** 100001−**
    JM8 KE**** 100001−**
    JMZ KE**** 100001−**
    KE10 100001−**
  - **— Type B VIN:**
    JM0 KE**** 200001−**
    JM6 KE**** 200001−**
    JM8 KE**** 200001−**
    JMZ KE**** 200001−**
    KE10 200001−**

Outline

- The PCM determines the optimum intake valve timing according to the engine operation conditions, and sends the motor drive signals to the electric variable valve timing driver. With the adoption of the electric drive system, variable intake valve timing can be controlled without any influence from the engine conditions, thus the fuel economy has been improved and pumping loss has been decreased.
- Based on the coordination with the hydraulic variable valve timing control and by increasing the amount of overlap during high engine loads, nitrogen oxide (NOx) occurring largely at high temperatures is reduced by re-circulating exhaust gas into the combustion chamber which reduces combustion temperature.

Block Diagram



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Operation

Intake valve timing determination

- The PCM determines the optimum target intake valve timing according to the engine operation conditions, and controls the output duty ratio to the electric variable valve timing driver so that the actual intake valve timing approaches close to the target intake valve timing.

Target valve timing

- The target intake valve timing is determined according to the engine speed, charging efficiency, and engine coolant temperature.

Actual valve timing

- The actual intake valve timing is calculated by adding a correction, which is based on the electric variable valve timing actuator signal value, to the value calculated by subtracting the cam maximum retard learning value from the standard intake valve timing.
- The standard intake valve timing is calculated based on the signals from the crankshaft position and camshaft position sensors.

Cam maximum retard learning value

- The cam maximum retard learning value is determined by the maximum retard indication output from the PCM and the standard intake valve timing when the standard intake valve timing is stabilized.

Output duty ratio determination

- The PCM divides the electric variable valve timing motor drive range modes according to the engine operation conditions, and determines the output duty ratio to the electric variable valve timing actuator in each mode.

Mode name	Control description	Control conditions
Feedback mode	• Continuously monitors the intake valve timing if it matches the target intake valve timing determined according to the engine operation condition, and controls the output duty ratio based on the result.	• Except for energization cut mode and phase holding mode
Energization cut mode	• If there is any malfunction in the electric variable valve timing driver, the intake valve timing is held at the maximum retard position to stabilize the engine speed.	• Electric variable valve timing driver malfunction
Phase holding mode	• To improve the startability, the phase of the electric variable valve timing actuator is held at the intermediate position after the engine is stopped.	**Type A VIN:** • After the engine is stopped (within a specified time) **Type B VIN:** • After the engine is stopped (Depending on the engine coolant temperature, operates after a certain period has elapsed from when the engine was stopped to suppress heating of the electrical variable valve timing motor.)