AN504: SCM5B

Application Note: Interpreting Drift Specifications

I. SCM5B30-XX, SCM5B31-XX, SCM5B40-XX and SCM5B41-XX

Read the drift specifications under the "Stability" heading on the appropriate spec sheet. Determine the overall gain of the module by dividing the output range by the input range.

1. Calculating Offset Drift—Multiply the input offset drift spec by the module gain and add the output offset drift spec.

2. Calculating Gain Drift—Multiply the gain drift spec by the output range of the module. (For worst case analysis, the module is operated at plus or minus full scale output.)

3. Calculating Total Drift—Total Drift = Offset Drift + Gain Drift (For worst case analysis, drift numbers are additive. Therefore, all terms carry the same sign.)

To determine the drift in volts at a given temperature (°C), subtract 25°C (ambient) from the temperature, then multiply by the offset drift, gain drift or total drift calculated above.

EXAMPLE #1: **SCM5B30-03**

Input Offset	=	$\pm 1\mu V/°C$
Output Offset	=	$\pm 20\mu V/°C$
Gain	=	$\pm 25ppm/°C$

Module Gain = [+5V - (-5V)] / [+100mV - (-100mV)] = 50

Offset Drift	=	$(\pm 1\mu V/°C)(50V/V) + (20\mu V/°C)$	=	$\pm 70\mu V/°C$
Gain Drift	=	$(\pm 25ppm/°C)(10V)$	=	$\pm 250\mu V/°C$
Total Drift	=	$\pm 70\mu V/°C + \pm 250uV/°C$	=	$\pm 320\mu V/°C$

Worst case drift at 85°C:

Offset Drift(85°C)	=	$(\pm 70\mu V/°C)(85 - 25°C)$	=	$\pm 4.2mV$
Gain Drift(85°C)	=	$(\pm 250\mu V/°C)(85 - 25°C)$	=	$\pm 15.0mV$
Total Drift(85°C)	=	$(\pm 320\mu V/°C)(85 - 25°C)$	=	$\pm 19.2mV$

II. SCM5B37X and SCM5B47X-XX

Read the drift specifications under the "Stability" heading and the Cold Junction Compensation accuracy from the appropriate spec sheet. Using thermocouple tables to convert the input range to volts, determine the module gain (V/V) by dividing the output range by the input range. Look up the Seebeck Coefficient for the thermocouple type under consideration.

The procedure for calculating drift is the same as in Section I with the exception of adding in the CJC accuracy.

1. Calculating CJC Accuracy—For $T_{ambient}$ = 25°C, multiply the accuracy (± 0.25°C) by the Seebeck Coefficient and the module gain. For 5°C < $T_{ambient}$ < 45°C, multiply the accuracy (± 0.5°C) by the Seebeck Coefficient and the module gain. Add this term to the Offset Drift as calculated in Section I.

EXAMPLE #2: **SCM5B37K**

Input Offset	=	$\pm 1\mu V/°C$
Output Offset	=	$\pm 20\mu V/°C$
Gain	=	$\pm 25ppm/°C$
CJC Accuracy	=	± 0.25°C at 25°C; ± 0.50°C 5°C to 45°C

Type K Thermocouple		
-100°C —>		-3.553mV
+1350°C —>		+54.125mV
Seebeck Coef.		40.44µV/°C

Module Gain = [+5 - 0V]/[54.125 - (-3.553mV)] = 86.69 V/V

Offset Drift	=	$(\pm 1\mu V/°C)(86.69) + (20\mu V/°C) \pm 0.50°C(40.44\mu V/°C)(86.69)$	=	$\pm 106.7\mu V/°C \pm 1.75mV$
Gain Drift	=	$(\pm 25ppm/°C)(5V)$	=	$\pm 125\mu V/°C$
Total Drift	=	$\pm 106.7\mu V/°C \pm 125\mu V/°C \pm 1.75mV$	=	$\pm 231.7\mu V/°C \pm 1.75mV$

III. SCM5B32-XX

The procedure for calculating drift is the same as in Section I with the exception of adding the drift of the supplied input resistor

Add the following term to the Offset Drift:

1. $(\pm 10ppm/°C)(20\Omega)(I_z{}^*)(Gain)$

Add the following term to the Gain Drift:

1. $(\pm 10ppm/°C)(20\Omega)(I_{fs})(Gain)$

* I_z is the input current which results in zero output.