1. Introduction

This technical note is intended to provide information about the proper power-on reset of the Kionix **KXTC8**, **KXTC9**, and **KX220** accelerometers.

2. Power-On Reset (POR)

Proper functioning of power-on reset (POR) is dependent on the specific **VDD, VDD_{Low}**, **T_{RISE}**, and **T_{Vdd_Off}** profile of individual applications. It is recommended to minimize **VDD_{LOW}** , **T_{RISE}**, **T_{FALL}**, and maximize **T_{VDD_OFF}**. To assure proper POR in all environmental conditions the application should be evaluated over the range of **VDD_{LOW}**, **T_{VDD_OFF}** and temperature as POR performance can vary depending on these parameters. It is also advised that the Rise or Fall be monotonic. Note that the outputs will not be stable until **VDD** has reached its final value.

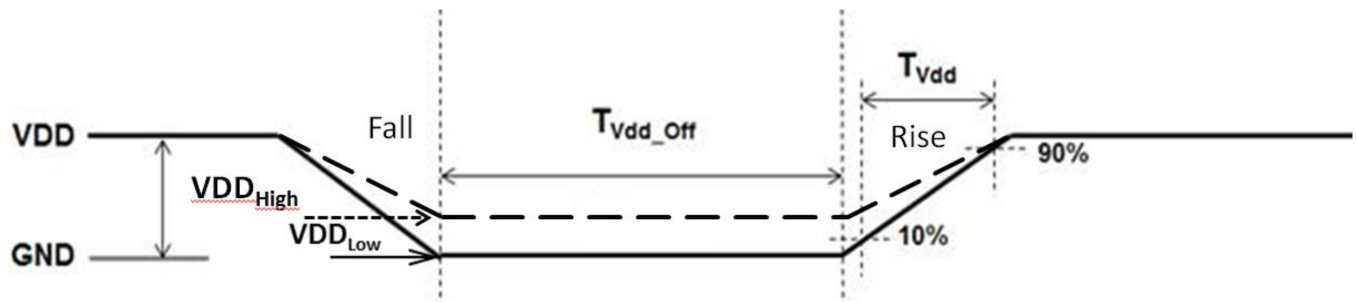

Figure 1. POR Sequence

Specific application testing will likely demonstrate POR performance regions for a proper POR trigger. To assure POR trigger properly executes, setting operational thresholds consistent with Table 1 is suggested.

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3. Example POR Performance Parameters

Parameters	Units	Min	Typical	Max
-40°C				
VDD rise time : T_{Vdd}	ms			5
VDD fall time : T_{Vdd}	ms			5
VDD off time : T_{Vdd_Off}	ms	25		
VDD High voltage : VDD_{High}	mV			250
VDD low voltage : VDD_{Low}	mV	100		
25°C				
VDD rise time : T_{Vdd}	ms			5
VDD fall time : T_{Vdd}	ms			5
VDD off time : T_{Vdd_Off}	ms	10		
VDD High voltage : VDD_{High}	mV			600
VDD low voltage : VDD_{Low}	mV	100		
85°C				
VDD rise time : T_{Vdd}	ms			5
VDD fall time : T_{Vdd}	ms			5
VDD off time : T_{Vdd_Off}	ms	10		
VDD High voltage : VDD_{High}	mV			600
VDD low voltage : VDD_{Low}	mV	100		

Table 1: Example POR Performance Parameters

Notes:
1. VDD must always be monotonic ramp without ambiguous state.
2. T_{Vdd} rise or fall from 10% to 90% of final value needs to be ≤ T_{Vdd} Max.
3. In order to prevent the accelerometer from entering an ambiguous state, VDD needs to be pulled down to GND (≤ VDD_{Low} Min for a duration of time ≥ T_{Vdd_Off} Min)
4. Power will be maintained if VDD does not go below VDD_{High} Max.
5. Between VDD_{High} Max and VDD_{Low} POR may occur.

It is important the user determines the timing (**T_{Vdd_Off}**) and threshold (**VDD_{Low}**) levels by evaluating the performance in the specific system for which the device will be incorporated.

4. Example POR performance chart

Brownout Low Bias (V)	Brownout Low Time (s)										
	0.01	0.02	0.05	0.1	0.2	0.5	1	2	5	10	20
1	1	1	1	1	1	1	1	1	1	1	1
0.9	1	1	1	1	1	1	1	1	1	1	1
0.8	1	1	1	1	1	1	1	1	1	1	1
0.7	1	1	1	1	1	1	1	1	1	1	1
0.6	1	1	1	1	1	1	1	1	1	1	1
0.5	1	1	1	1	1	1	0	0	0	0	0
0.4	1	1	1	1	1	1	0	0	0	0	0
0.3	1	1	1	1	1	1	0	0	0	0	0
0.2	1	1	1	1	1	0	0	0	0	0	0
0.1	1	1	1	1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

1	= No Trigger of POR
0	= POR Triggered

Figure 2. Example POR Performance Chart

As can be seen in the example POR performance chart (Figure 2), the time and voltage to activate POR is variable depending on the voltage and time as indicated by T_{Vdd_Off} max and min and VDD_{High} and VDD_{Low}.

The data provided by Kionix is intended for initial customer design guidance only. Kionix POR testing looks at a finite number of test configurations. Each customer application will have varying input sensor parameters (electrical, mechanical, and environmental) that will be different than the configurations tested by Kionix. Each customer utilizing the sensor will need to properly validate the sensor (including POR function) within their application under their specific use cases to ensure it responds as required.

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