System Reference series for Automotive application

ROHM Power Supply Design for SemiDrive X9M/X9E SoC

This document explains the system reference of a power solution for the SemiDrive X9M/X9E SoC (system-on-chip) power rails using the BD96801Q12-C, BD9SA01F80-C, and BD33IC0VEFJ-C. This power solution is supposed an input voltage of 5 V(+/-5%). BD96801Q12-C has two 4.0A buck converters and two 2.0A buck converters and three 0.3A LDOs. BD9SA01F80-C is 12.0A single buck converter. BD33IC0VEFJ-C is 1.0A single LDO. The BD96801Q12-C has four buck converters configured to work as dual 2-phase converters. BD96801Q12-C and BD9SA01F80-C have OTP(One time programmable) that are written the output voltage settings, ON/OFF sequences and etc. required for SemiDrive X9M/X9E. The ON/OFF sequence required for the SemiDrive X9M is realized with only one line of EN signal from the main system. The OTP is programable in Rohm's production line, so no adjustment is required by customer. Moreover, BD96801Q12-C and BD9SA01F80-C has BIST(Build-in self test) function and can contribute the functional safety. This power solution is an example how SemiDrive X9M/X9E required rails can be powered with Rohm Power products. Reference design with Rohm power solution and SemiDrive X9M/X9E SoC, all needed peripherals, memory, and connections was designed and built to confirm the functionality and performance of the power solution.

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1. Design Parameters

Table 1. shows the power rails, load requirements, and ON/OFF sequence.

Table 1. Design Parameters

Voltage(V)	Current(mA)	Power Source	Rail Name	Sequence (Power ON) (Note)	Sequence (Power OFF)
1.8V	10	External Single LDO	VDDIO_RTC	-	-
0.8V	5	External Single LDO	VDD_RTC	-	-
0.8V	600	BD96801Q12-C Buck1	VDD_SAFETY_0P8	0ms	6.0ms
1.8V	300	BD96801Q12-C LDO5	VDD_SAFETY_1P8	1.0ms	5.0ms
3.3V	100	BD96801Q12-C LDO6	VDD_SAFETY_3P3	1.0ms	5.0ms
3.3V	550	BD33IC0VEFJ	VDD_AP_3P3	3.0ms	3.0ms
1.8V	1250	BD96801Q12-C Buck3	VDD_AP_1P8	3.0ms	3.0ms
1.1V	750	BD96801Q12-C Buck2	VDDQ_DRAM_1P1	4.0ms	2.0ms
0.85V(M) / 0.8V(E)	3500(M) / 3000(E)	BD96801Q12-C Buck4	VDD_CPU	2.0ms	4.0ms
0.8V	4500(M) / 4000(E)	BD9SA01F80-C	VDD_AP_0P8	1.0ms	5.0ms
0.8V	1700(M) / 1450(E)		VDD_AP_PHY		
0.8V	3500(M) / 2500(E)		VDD_GPU		
1.8V	300	BD96801Q12-C LDO7	EXT_1P8 (Optional)	1.0ms	5.0ms

(Note) (M) = SemiDrive X9M SoC, (E) = SemiDrive X9E SoC

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