

## nanotRONIC C-SADE

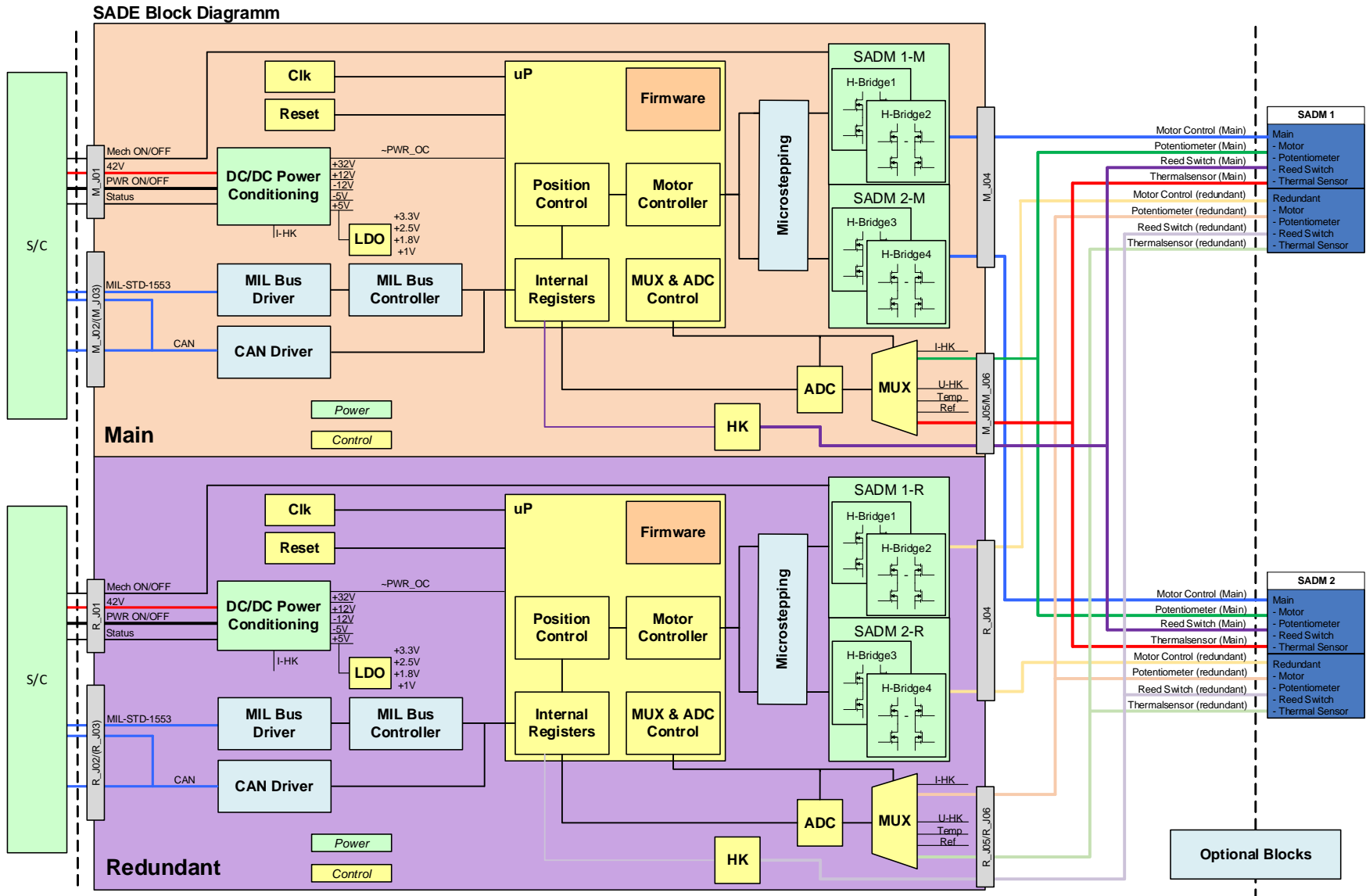
### Solar Array Drive Electronics



The C-SADE is a 2 axis redundant drive electronics to be used with stepping motor-based actuators (mainly SADM), with the following characteristic:

- Independent drive of both actuators
- Bus Interface (MIL-STD-1553B or CAN)
- High reliable
- Full redundancy (cold)
- Single Point Failure Free
- Radiation hardness 100kRAD TID
- Modularity
- Interface Flexibility
- Compact size

## System Overview



## Electrical Interfaces

Unit-Name	Unit-Con	Connector Function	Connector Type	EMC-Code	Magn. Level
SADE-MAIN	M_J01	SADE Power nominal	DAM15P-1AON	1R/2	NMB
SADE-MAIN	M_J02	MIL Interface nominal	DEM9P-1AON	2	NMB
SADE-MAIN	M_J02	CAN Interface nominal in	DEM9S-1AON	2	NMB
SADE-MAIN	M_J03	CAN Interface nominal out	DEM9S-1AON	2	NMB
SADE-MAIN	M_J04	Motor1/Motor2 nominal	DAM15S-1AON	2	NMB
SADE-MAIN	M_J05 <sup>1</sup>	Analog Feedback nominal	DEM15S-1CON	2	NMB
SADE-MAIN	M_J06 <sup>1</sup>	Digital Feedback nominal	DEM9S-1AON	2	NMB
SADE-RED	R_J01	SADE Power redundant	DAM15P-1AON	1R/2	NMB
SADE-RED	R_J02	MIL Interface redundant	DEM9P-1AON	2	NMB
SADE-RED	R_J02	CAN Interface nominal in	DEM9S-1AON	2	NMB
SADE-RED	R_J03	CAN Interface nominal out	DEM9S-1AON	2	NMB
SADE-RED	R_J04	Motor1/Motor2 redundant	DAM15S-1AON	2	NMB
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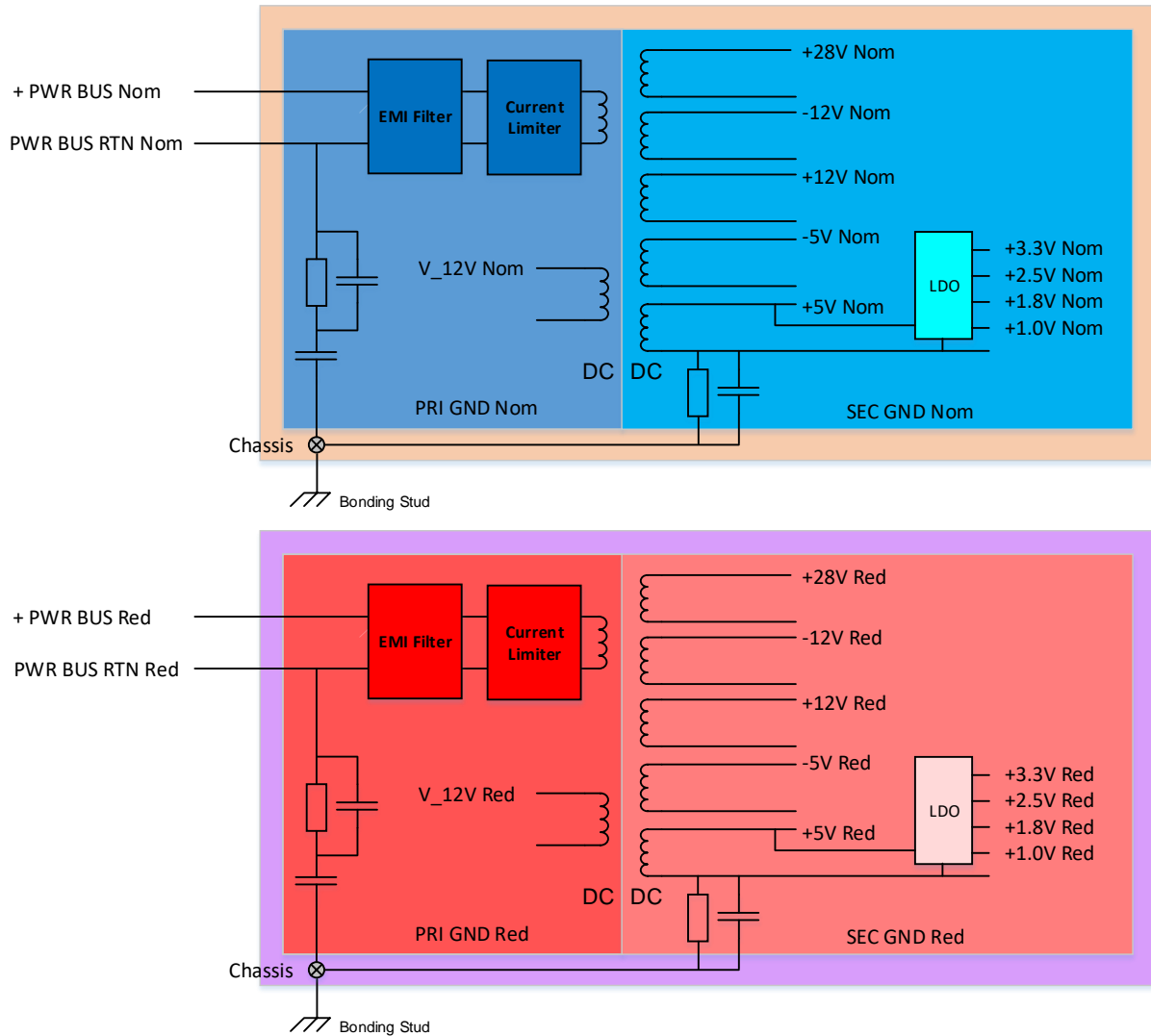
The SADE provides following electrical interfaces for each unit (nominal and redundant):

- System I/F towards S/C:
  - Power bus interface (42V)
  - System ON/OFF signal
  - Mechanism ON/OFF signal
  - MIL bus 1553 B or CAN interface for TM/TC
- I/Fs to the SADM pairs:
  - 2×2 step motor power I/Fs (4 lines each)
  - 2×2 coarse potentiometer (3 lines each)
  - 2×2 temperature sensors (2 lines each)
  - 2×2 position switches (2 lines each)

The electrical interconnection is achieved by means of DSUB and High-Density DSUB connectors.

<sup>1</sup> Version where J05/J06 is merged into one connector only (J05: DAM26S-1CON) is available.

## Grounding Concept



The Power Supply Unit has a primary ground and one single secondary ground for all type circuitries (analog and digital). Between primary and secondary ground there is a galvanic isolation. The primary ground is routed through the EMI filter and is then connected by (47nF+47nF//1M) to chassis and the secondary ground is connected by 5.6M//10nF to chassis. Secondary ground is the star-point for the logic and Chassis is connected to the bonding stud.

<b>Specifications</b>																
<b>Control Interface</b>																
MIL Bus 1553 B CAN	Only one bus interface implemented															
<b>Motor Interface</b>																
Driving Mode	Fullstep Microstep up to 64 $\mu$ steps Several speeds possible Autozero Function Speed ramping optional Position absolute and relative possible															
<b>Mechanical Properties</b>																
Mass	< 4kg															
Dimension	324x 214 x 78 mm															
Housing Thickness	3.0 mm Al															
Interface contacting	Six M5															
Surface coating	Surtec 650 (where electrical connective) Ematal (not electrical connective)															
Thermal Emissivity Ematal	> 0.9															
1. Eigenfrequency	~1'200 Hz															
Vibration loads:	<table border="0"> <tr> <td>Sine:</td> <td>0-20 Hz:</td> <td>11mm</td> </tr> <tr> <td></td> <td>20-60 Hz:</td> <td><math>\pm 20</math> g</td> </tr> <tr> <td></td> <td>60-100 Hz:</td> <td><math>\pm 6</math> g</td> </tr> <tr> <td>Random:</td> <td><math>\perp</math> MP:</td> <td>21.2 grms</td> </tr> <tr> <td></td> <td>// MP:</td> <td>22 grms</td> </tr> </table>	Sine:	0-20 Hz:	11mm		20-60 Hz:	$\pm 20$ g		60-100 Hz:	$\pm 6$ g	Random:	$\perp$ MP:	21.2 grms		// MP:	22 grms
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Shock loads	<table border="0"> <tr> <td>100 – 1'500 Hz:</td> <td>+ 9dB/oct</td> </tr> <tr> <td>1'500 – 10'000 Hz:</td> <td>1'000 g</td> </tr> </table>	100 – 1'500 Hz:	+ 9dB/oct	1'500 – 10'000 Hz:	1'000 g											
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<b>Electrical Properties</b>																
Supply voltage	42 V (34.2 V – 46 V)															
Nominal Current	600 mA															
Max operating Current	800 mA															
Limiting current	1.2 A															
Shutdown time	1.1 s															
Power consumption	14 W (Worst case)															
<b>Temperature</b>																
Non-op.	-20°C; +55°C															
Operating	-20°C; +55°C															

## Specifications

### Radiation on component level

Total Ionizing Dose (TID)	100 kRAD
SEU LETth	$\geq 36 \text{ MeVcm}^2\text{mg}^{-1}$
SEL LETth	$\geq 60 \text{ MeVcm}^2\text{mg}^{-1}$
SET LETth	$\geq 36 \text{ MeVcm}^2\text{mg}^{-1}$

### Additional information

Heritage	> 39.5 years flight heritage 12 units in space, 5 units delivered to customers LEO, MEO
TRL	9
Reliability	0.9975 for 15 years in orbit
Export regulations	EAR99 (de-minimis)
ITAR	No

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## Mechanical Interface (CAN Version)

