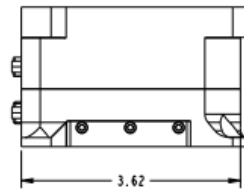# Solar Array Drive Electronics (SADE) – Processor Based Controller
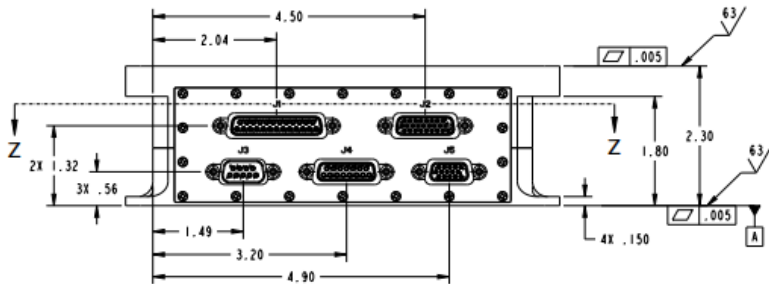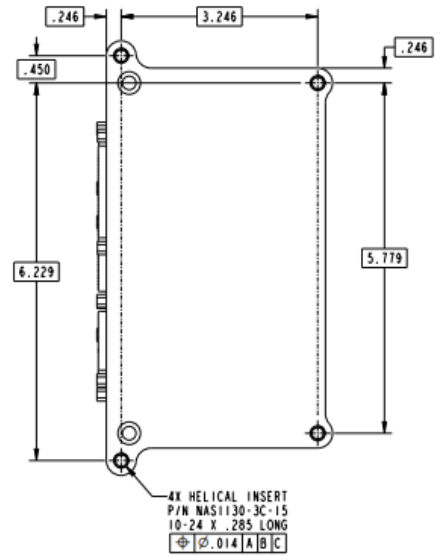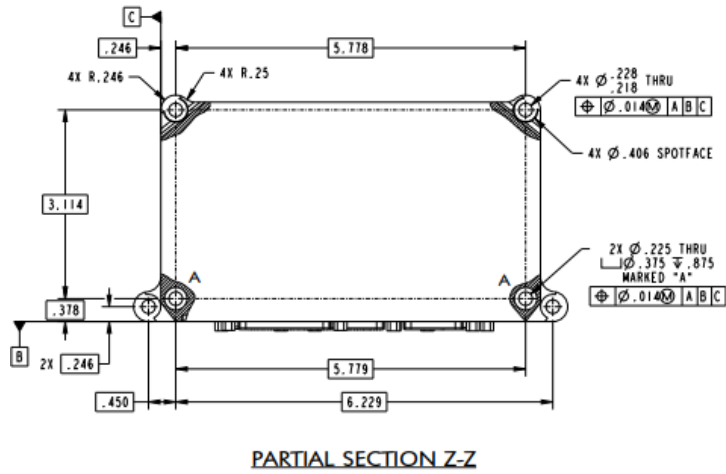

Heritage Architecture with several configurational options

FRONTGRADE
ADVANCED PRODUCT BRIEF

Solar Array Drive Electronics

RT-SADE – Processor Controller

Version #:2.0

3/24/2025

Features	
Dimension	See Mechanical ICD
Mass	< 1kg
Operating Voltage	22 – 38 VDC
Motor Drive	1 Channel / Two or Three Phase stepper motor (Option)
Interfaces	Isolated/Discrete STEP/DIRECTION/ENABLE inputs
	Isolated RS-422 Asynchronous serial (UART)
Controller	ARM M7 Processor incl. 1.5x RDM
Topology	Stackable Chassis
Qualification	NASA PEM IST-002 Level 3
Options	
	Full-step or Micro-stepping
Qualifications	Level 2 or Level 1

J1 – CMD / TELEMETRY, CONTROL DISCRETES
STANDARD D25 PIN FEMALE
P/N SND25S5R800G

PIN	NAME	FUNCTION
1	CHASSIS	CHASSIS GROUND
2	SPARE-RX_P	RS422 SPARE RX (+)
3	SEC_CMD-TELEM-RX_N	RS422 SECONDARY RX (-)
4	PRI_CMD-TELEM-RX_P	RS422 PRIMARY RX (+)
5	SEC_CMD-TELEM-TX_P	RS422 SECONDARY TX (+)
6	SPARE-TX_N	RS422 SPARE TX (-)
7	PRI_CMD-TELEM-TX_N	RS422 PRIMARY TX (-)
8	CHASSIS	CHASSIS GROUND
9	MOTOR_STEP_SELECT_1	MOTOR STEP SELECT 1 CONTROL DISCRETE
10	CHASSIS	CHASSIS GROUND
11	MOTOR_DIR	MOTOR DIRECTION CONTROL DISCRETE
12	MOTOR_ENABLE	MOTOR ENABLE CONTROL DISCRETE
13	CHASSIS	CHASSIS GROUND
14	SPARE-RX_N	RS422 SPARE RX N
15	SEC_CMD-TELEM-RX_P	RS422 SECONDARY RX (+)
16	PRI_CMD-TELEM-RX_N	RS422 PRIMARY RX (-)
17	SEC_CMD-TELEM-TX_N	RS422 SECONDARY TX (-)
18	SPARE-TX_P	RS422 SPARE TX (+)
19	PRI_CMD-TELEM-TX_P	RS422 PRIMARY TX (+)
20	CHASSIS	CHASSIS GROUND
21	MOTOR_STEP_SELECT_2	MOTOR STEP SELECT 2 CONTROL DISCRETE
22	MOTOR_STEP_SELECT_0	MOTOR STEP SELECT 0 CONTROL DISCRETE
23	CHASSIS	CHASSIS GROUND
24	MOTOR_STEP	MOTOR STEP CONTROL DISCRETE
25	CHASSIS	CHASSIS GROUND

J2 – PROGRAMMING / DEBUG / TEST
HIGH DENSITY D-SUB 26 PIN FEMALE
P/N SDD26S4R800G
NOT USED FOR FLIGHT (CAPPED)

PIN	NAME	FUNCTION
1	TMS/SWDIO	SERIAL WIRE DEBUG
2	\WATCHDOG-DISABLE	GROUND PIN TO DISABLE WDT FUNCTION OF POR IC
3	DEBUG/TERMINAL INTERFACE TX-	RS422 SERIAL TERMINAL COMMAND LINE INTERFACE TX (-)
4	DEBUG/TERMINAL INTERFACE RX-	RS422 SERIAL TERMINAL COMMAND LINE INTERFACE RX (-)
5	+5V	5V SUPPLY OUTPUT
6	DEBUG ANALOG OUT 2	UNCOMMITTED ANALOG OUTPUT FOR DEBUG/TEST US
7	DEBUG ANALOG IN 2	UNCOMMITTED ANALOG INPUT FOR DEBUG/TEST USE
8	DEBUG ANALOG IN 1	UNCOMMITTED ANALOG INPUT FOR DEBUG/TEST USE
9	ANALOG GROUND	RETURN FOR ANALOG I/O
10	+3.3V	3.3V SUPPLY OUTPUT
11	TDO/SWO	SERIAL WIRE DEBUG
12	DEBUG/ TERMINAL INTERFACE TX+	RS422 SERIAL TERMINAL COMMAND LINE INTERFACE TX (+)
13	DEBUG/ TERMINAL INTERFACE RX+	RS422 SERIAL TERMINAL COMMAND LINE INTERFACE RX (+)
14	CHASSIS GROUND	CHASSIS GROUND
15	DISCRETE DEBUG/ TEST I/O LVCMOS	LVCMOS
16	DISCRETE DEBUG/ TEST I/O LVCMOS	LVCMOS
17	GROUND	RETURN FOR ALL LVCMOS I/O
18	ANALOG GROUND	RETURN FOR ANALOG I/O
19	TCK/SWCLK	SERIAL WIRE DEBUG
20	\RESET	PROCESSOR RESET
21	CHASSIS GROUND	REFERENCE FOR RS-422 I/O
22	GROUND	RETURN FOR ALL LVCMOS I/O
23	GROUND	RETURN FOR ALL LVCMOS I/O
24	ADC BIAS	ADC 1.5V BIAS (CENTER SPAN)
25	ADC REF	ADC 3.0V REFERENCE (FULL SCALE)
26	DEBUG ANALOG OUT 1	UNCOMMITTED ANALOG OUTPUT FOR DEBUG/TEST USE

J3 – POWER
STANDARD-D 9 PIN MALE
P/N SND9M5R800G

PIN	NAME	FUNCTION
1	PWR +	PRIMARY POWER INPUT (+)
2	PWR +	PRIMARY POWER INPUT (+)
3	CHASSIS	CHASSIS GROUND
4	PWR -	PRIMARY POWER INPUT (-)
5	PWR -	PRIMARY POWER INPUT (-)
6	CHASSIS	CHASSIS GROUND
7	CHASSIS	CHASSIS GROUND
8	CHASSIS	CHASSIS GROUND
9	CHASSIS	CHASSIS GROUND

J4 – TELEMETRY
STANDARD-D 15 PIN FEMALE
P/N SND15S5R800G

PIN	NAME	FUNCTION
1	2PHB-_N	2 PHASE B (-)
2	3PHC/2PHB+_P	3 PHASE C / 2 PHASE B (+)
3	CHASSIS	CHASSIS GROUND
4	TEMP 1 -	TEMP SENSOR 1 SENSE
5	TEMP 2 -	TEMP SENSOR 2 SENSE
6	POT RED WIPER	POTENTIOMETER REDUNDANT WIPER
7	POT PRI RTN	POTENTIOMETER PRIMARY RETURN
8	POT PRI EXC	POTENTIOMETER PRIMARY EXCITATION
9	3PHA/2PHA+_P	3 PHASE A / 2 PHASE A (+)
10	3PHB/2PHA-_N	3 PHASE B / 2 PHASE A (-)
11	TEMP 1 +	TEMP 1 EXCITATION
12	TEMP 2 +	TEMP 2 EXCITATION
13	POT RED RTN	POTENTIOMETER REDUNDANT RETURN
14	POT RED EXC	POTENTIOMETER REDUNDANT EXCITATION
15	POT PRI WIPER	POTENTIOMETER PRIMARY WIPER

J5 – TELEMETRY PASSTHROUGH
HIGH DENSITY D-SUB 15 PIN FEMALE
P/N SDD15S4R800G

PIN	NAME	FUNCTION
1	POT_PRI_WIPER_OUT	POTENTIOMETER PRIMARY WIPER
2	CHASSIS	CHASSIS GROUND
3	POT_RED_WIPER_OUT	POTENTIOMETER REDUNDANT WIPER
4	CHASSIS	CHASSIS GROUND
5	CHASSIS	CHASSIS GROUND
6	POT_PRI_EXC_OUT	POTENTIOMETER PRIMARY EXCITATION
7	POT_PRI_RTN_OUT	POTENTIOMETER PRIMARY RETURN
8	POT_RED_EXC_OUT	POTENTIOMETER REDUNDANT EXCITATION
9	POT_RED_RTN_OUT	POTENTIOMETER REDUNDANT RETURN
10	AGND	ANALOG GROUND
11	TEMP 1 +	TEMP SENSOR 1 (+)
12	TEMP 1 -	TEMP SENSOR 1 (-)
13	AGND	ANALOG GROUND
14	TEMP 2 +	TEMP SENSOR 2 (+)
15	TEMP 2 -	TEMP SENSOR 2 (-)