



Factory Scorpius Char Test Plan for J5xx

Module: Scorpius

Station: Scorpius Char (DEV40)

Build: P1

Release Date: 17 April 2020

This Document Covers the Following Products: J5xx

Revision: P1_V1.5

[<rdar://problem/56766302> J5xx Scorpius Factory ERS](rdar://problem/56766302)

[<rdar://problem/60027625> J3xx&J5xx Scorpius ERS - Foxconn](rdar://problem/60027625)

[Note: Anything in brackets is expected to be updated / deleted for the official document]



Table of Contents

1. Revision	3
2. Purpose	4
3. Scope.....	4
4. References	4
5. Glossary & Definitions.....	4
6. Critical and Frequently Used Commands	5
6.1. Quiesce Test Mode	5
6.2. Nominal Mode.....	5
7. Overview	6
7.1. Summary of Test Coverage.....	6
7.2. Fixture Coupling specs	6
8. Test Coverage @ Scorpius Char Station.....	7
8.1. Load Tx FW & Read Version	7
8.2. Rx FW Version.....	7
8.3. Initial MTP Sector Check Before Tests.	8
8.4. Low Power Ping (LPP)	10
8.5. Digital Ping Level Tests	11
8.6. Power, Efficiency & Ping Pong Tests	12
8.7. Final MTP Sector Check After Tests.	17
A. Appendix - B332 Dev Board UART Baud rate-----	19
B. Feature DRI Comments for Changes to this Document -----	20



1. Revision

Build Type	Version	Date	Notes	Author
Please refer to last section of this document for Details/Comments on change to this document				
P0	1.0	8 January 2020	Initial release for J5xx P0 Build. Based on J307 P1. Limits need to be updated.	Bhushan Koli
	1.1	21 January 2020	General updates on limits and smokey commands	Bhushan Koli/Alberto M/Nan Liu/ Frank B
P1	1.2	19 February 2020	Reverted back to original smokey commands	Bhushan Koli
	1.3	21 February 2020	Updated Minimum Vboost requirement from 6V to 6.1V	Bhushan Koli/Mikhal
	1.3	21 February 2020	Updated Minimum Vboost requirement from 6V to 6.1V	Bhushan Koli/Rex H/Nan Liu
	1.4	3 April 2020	Updated power flow test procedure to include VCC main and Vbatt measurements Updated LPP limits Added Dotara Temperature measurement Updated command and response format of LPP and VCTx respectively Updated procedure to disable LFOD during Vsense & Isense measurement	Bhushan Koli/Rex H/Nan Liu/ Frank
	1.5	17 April 2020	Updated LPP, Power Transfer & Digital ping limits Updated formulas in Power Transfer section for VSYS_ANA & VSYS_1P8	Bhushan Koli/Nan Liu/Frank



2. Purpose

This document describes the FATP Scorpius Char test plan for the J5xx inductive charging Tx module for P0.

3. Scope

The scope of this document is the Scorpius only module of the J5xx products. It covers FATP tests of the following high level features:

Test	Scorpius Test
LPP ping and delta calculation	✓
Power Flow & Efficiency	✓
Comms - PingPong	✓

4. References

<[rdar://problem/47434171](#)> J4xx Scorpius factory ERS
<[rdar://problem/48910417](#)> Dotara Data-sheet
<[rdar://problem/48964978](#)> Dotara Block initializations
<[rdar://problem/49391712](#)> J5xx FW specifications
<[rdar://problem/54853341](#)> Radar for Scorpius Factory FW releases
J5xx Schematic

5. Glossary & Definitions

Acronym	Term	Description
AMPL	Amplitude	-
ASK	Amplitude shift keying	-
Ballast	Ballast Load	Internal load within Aculeus/Iktara that maintains a constant current load.
CAL	Calibrated	These are after calibration values.
COMM's	Communications	Referring to ASK and FSK communications
CPLG	Coupling	-
CTX	-	Series resonant capacitance.
DC	Duty Cycle	-
DSBL	Disable	-
ENBL	Enable	-
FOD	Foreign Object Detection	Detection mechanism for metallic objects near the inductive power link
FREQ	Frequency	-
FSK	Frequency shift keying	-
FXST	Fixture Setup	-
Kmax	-	Maximum Coupling Coefficient
Kmin	-	Minimum Coupling Coefficient
LPP	Low Power Ping	Object/Rx detection system
MPE	Maximum Permissible Exposure	Protection scheme to limit the maximum leakage H-field when Scorpius is charging
Rx	Receiver	Wireless Power Receiver. Also referred to as PRx
SCRP	Scorpius	Reference for searching Scorpius Module related Data in Insight.
Tx	Transmitter	Wireless Power Transmitter. Also referred to as PTx(J5xx MLB)
VCTX	-	Voltage across Tx coil
VBoost	-	Voltage across Boost output
VRect	-	Voltage across Rx Rectifier



6. Critical and Frequently Used Commands

6.1. Quiesce Test Mode

After programming the Tx defaults to NominalMode (LPP > Digital Ping > Power negotiation > Closed loop). The following command needs to be sent to the Tx to enable QuiesceMode whereby certain test commands are then enabled.

A power cycle will mean the unit needs to be re-programmed as the firmware application is run from SRAM.

This is the test mode whereby additional commands for test/validation are active. This command will disable everything except the MCU i.e. Boost, Bridge, LPP switch will be disabled.

Resets into the quiesce mode with the bridge disabled.

```
smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"
```

Note: This command i.e. Quiesce Mode needs to be set once at beginning of testing i.e. from [Section 8.1. Load FW](#) or unless unit is reset or power cycled or Nominal Mode has been set. **If the unit is power cycled you will need to load fw again. Nominal Mode**

6.2. Nominal Mode

This is the normal runtime mode. Here, a subset of commands used for test/validation are deactivated.

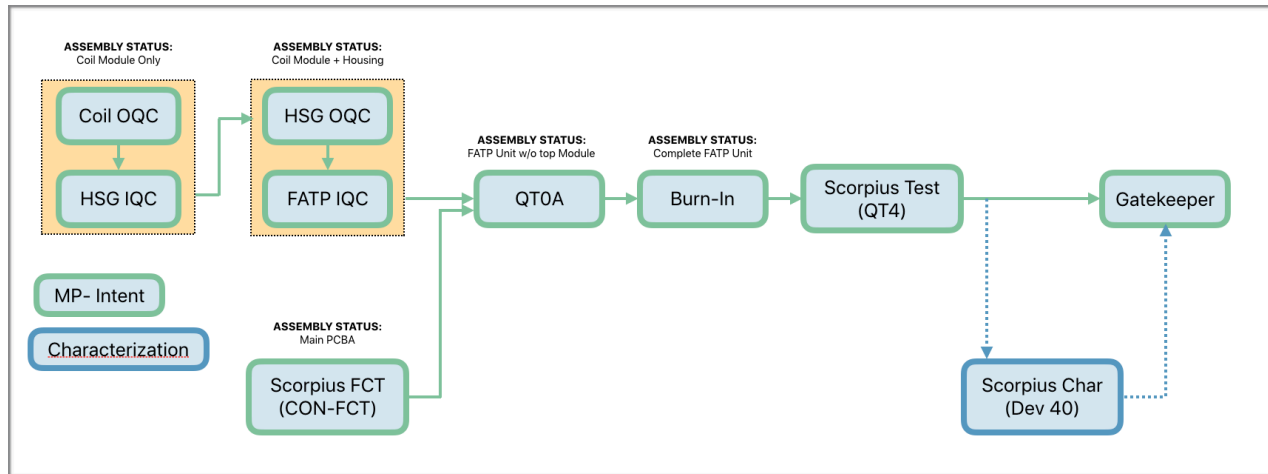
```
smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x00}"
```

Resets into the nominal mode where it will start the LPP-> Digital Ping-> Power Negotiation-> Closed loop sequence.



7. Overview

The block diagram below shows the overall end-end test coverage for the inductive Scorpius module. This document covers Scorpius Char Station.



7.1. Summary of Test Coverage

	Kmax	Knom	Kmin
LPP	no load	no load	no load
Digital Ping	0.1C	n/a	0.1C
Open Loop + Ping Pong	0.1C, 3C, 10C	0.1C, 3C, 10C	0.1C, 3C, 10C

7.2. Fixture Coupling specs

Throughout this document various tests will have different limits depending on the offset position i.e. coupling. Ensure close attention is paid to the tables shown for the different coupling positions, loads and limits.

All = all possible positions (MaxK, NomK, MinK)

Physical parameter / InSight Keys Recorded	Position (mm)	K Spec	Measured Results (averaged after 5 readings)
KMax	0, 0.83, 0	0.535 - 0.610	Limits to be used need to be same as IQC_coupling station. FYI only. To be updated.
KNom	D1.1, 0.88, L1.1	-	
KMin	D1.5, 0.93, L1.5	0.440 - 0.530	



8. Test Coverage @ Scorpius Char Station

8.1. Load Tx FW & Read Version

Description:- Load Tx FW. Dotara has no NVRAM and therefore will lose all the memory/setting after power cycling or load fw. Dotara will need to load the fw after each power cycling.

Failure Mode(s) Captured:TBD

Test Setup and Procedure:

Step	Description	Interface	Command / Notes
Note: This command i.e. Quiesce Mode needs to be set once at beginning of testing i.e. from Section 8.1. Load FW or unless unit is reset or power cycled or Nominal Mode has been set. If the unit is power cycled you will need to load fw again.			
A	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 Note:- Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.
B	Tell Tx to enter Quiesce Mode	TX HID	Note: Need to send the below command after every 2nd time of the above command within 3sec or with minimum or no delay as possible of above command. You cannot enter Quiesce mode without exiting the standalone mode. smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"
1	Set Vin 3.6V. Or Preparation to pull high: PMU_TO_DOTARA_EN_EXT	Fixture	pmugpio --pin 14 --output 1 --pushpull
2	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 Note:- Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.
3	Load Tx FW	Tx HID	Note: Need to send this command every time within 3sec of above command. You cannot enter Load FW without exiting the standalone mode. Path for FW might change. smokey ScorpiusHid --run --test "FwLoad" --args "PathToFwLoad='nandfs:\\AppleInternal\\Diags\\Scorpius\\J517J522\\ScorpiusTx-dotara.bin'"
4	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 Note:- Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.
5	Tell Tx to enter Quiesce Mode	TX HID	Note: Need to send the below command after every 2nd time of the above command within 3sec or with minimum or no delay as possible of above command. You cannot enter Quiesce mode without exiting the standalone mode. smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"
6	Read Status (Version)	Tx HID	smokey ScorpiusHid --run --test "Get" --args "ReportID=0xBB"

Command to read Tx FW version:

smokey ScorpiusHid --run --test "Get" --args "ReportID=0xBB"

Example:-This reads back 4 bytes: 0x01 0x00 0x13 0x05

Main FW Type (byte1&2): 0x0001

Main FW Version (byte3&4): 0x0513

Test Parameter	Insight Keys Recorded	Notes
Tx Fw Version	SCRP_Tx_Version	

8.2. Rx FW Version

Ginger SN: diags get mlbsn

Eload SN: diags get eloadsn

Versions: get versions

——> application: 2.6.19, this line is the Ginger FW version

B332 Dev Board Command to read Rx FW version:

i2c lock charger

i2c rawwrite charger 0x10 0x00 0x02 0x00 0x00 0x00

i2c rawread charger 04

i2c unlock charger

Read 4 byte packet: x x x x

Last 3 bytes will determine Rx version:



8.3. Initial MTP Sector Check Before Tests.

Description: Make sure FW is in a good state at the Before of the test. [TBD]

Failure Mode(s) Captured: TBD

Test Setup and Procedure: Refer below

Dotara MTP Sector 126		32 Bit	
	0	Signature (0x01)	
	1	Version	
	2	Ltx_nH	
	3	Frequency_Hz	
	4	RAC_mOhm	QAC_q7
	5	Rsys_MTP	Poffset
	6	m_q17	b
	7	Rsys_main	P
	8	Device_Type	
	9	Ctx_pF	
	10	Arcas_Vrect_Target_adj	Callisto_Vrect_Target_adj
....	RESERVED[20]....		
31	Checksum (Word31)		

FATP Station (QT0A) (Read and Write)		32 Bit	
	0	Signature (0x01)	
	1	Version	
	2	Ctx_pF	
	3	Ctx_pF	
	4	L_sense_Gain_Tx	L_sense_Offset_Tx
	5	L_sense_Gain_Rx	L_sense_Offset_Rx
	6	Scorp_VBoost_GCAL	Scorp_VBoost_OCAL
	7	Scorp_VSNS_GCAL	Scorp_VSNS_OCAL
	8	Scorp_ISNS_GCAL	Scorp_ISNS_OCAL
	9	Scorp_VCTX_GCAL	Scorp_VCTX_OCAL
	10	Device_Type	
11	Board SN (byte 1-4)		
12	Board SN (byte 5-8)		
13	Board SN (byte 9-12)		
14	Board SN (byte 13-16)		
15	Board SN (byte 17)		
16	Scorp_VSYS_ANA_m	Scorp_VSYS_ANA_c	
17	Scorp_VSYS_IP8_b		
....	RESERVED[13]....		
31	Checksum (Word31)		

Dotara MTP Sector 129		32 Bit (only 16 Bit utilized)	
	0	Reserved	
	1	Reserved	
	2	Reserved	
	3	Reserved	
	4	Reserved	
	5	Reserved for trimming data	
	6	Reserved	
	7	Reserved	
	8	Reserved	
	9	LOT_NUMBER (31:0)	Bits<31:0>
	10	EWS1FL	Bit <31>
10	Unused	Bits <30:28>	
10	Y_COORD	Bits <27:20>	
10	Unused	Bits <19:17>	
10	X_COORD	Bits <16:9>	
10	Wafer ID	Bits<8:4>	
10	LOT_NUMBER (35:32)	Bits <3:0>	
11	ST_PARTNUMBER <25:0>	Bits <31:6>	
11	SILICON_VERSION (LSB is bit 51)	Bits <5:4>	
11	TESTING_PLANT (LSB is bit 31)	Bits <3:2>	
11	CSPFL	Bit <1>	
11	EWS2FL	Bit <0>	
12	Not used	Bits<31:22>	
12	ST_PARTNUMBER <47:26>	Bits <21:0>	
13	Not Used		
14	Not Used		
15	Device trimmed indication		

Dotara MTP Sector 127		32 Bit	
	0	Signature (0x01)	
	1	Version	
	2	Ctx_pF	
	3	Ctx_pF	
	4	L_sense_Gain_Tx	L_sense_Offset_Tx
	5	L_sense_Gain_Rx	L_sense_Offset_Rx
	6	Scorp_VBoost_GCAL	Scorp_VBoost_OCAL
	7	Scorp_VSNS_GCAL	Scorp_VSNS_OCAL
	8	Scorp_ISNS_GCAL	Scorp_ISNS_OCAL
	9	Scorp_VCTX_GCAL	Scorp_VCTX_OCAL
	10	Device_Type	
11	Board SN (byte 1-4)		
12	Board SN (byte 5-8)		
13	Board SN (byte 9-12)		
14	Board SN (byte 13-16)		
15	Board SN (byte 17)		
16	Scorp_VSYS_ANA_m	Scorp_VSYS_ANA_c	
17	Scorp_VSYS_IP8_b		
....	RESERVED[13]....		
31	Checksum (Word31)		

SFCT Station (Read and Write)		32 Bit	
	0	Signature (0x01)	
	1	Version	
	2	Ctx_pF	
	3	Ctx_pF	
	4	L_sense_Gain_Tx	L_sense_Offset_Tx
	5	L_sense_Gain_Rx	L_sense_Offset_Rx
	6	Scorp_VBoost_GCAL	Scorp_VBoost_OCAL
	7	Scorp_VSNS_GCAL	Scorp_VSNS_OCAL
	8	Scorp_ISNS_GCAL	Scorp_ISNS_OCAL
	9	Scorp_VCTX_GCAL	Scorp_VCTX_OCAL
	10	Device_Type	
11	Board SN (byte 1-4)		
12	Board SN (byte 5-8)		
13	Board SN (byte 9-12)		
14	Board SN (byte 13-16)		
15	Board SN (byte 17)		
16	Scorp_VSYS_ANA_m	Scorp_VSYS_ANA_c	
17	Scorp_VSYS_IP8_b		
....	RESERVED[13]....		
31	Checksum (Word31)		

SFCT Station (Read Only)		32 Bit (only 16 Bit utilized)	
	0	Reserved	
	1	Reserved	
	2	Reserved	
	3	Reserved	
	4	Reserved	
	5	Reserved for trimming data	
	6	Reserved	
	7	Reserved	
	8	Reserved	
	9	LOT_NUMBER (31:0)	Bits<31:0>
	10	EWS1FL	Bit <31>
10	Unused	Bits <30:28>	
10	Y_COORD	Bits <27:20>	
10	Unused	Bits <19:17>	
10	X_COORD	Bits <16:9>	
10	Wafer ID	Bits<8:4>	
10	LOT_NUMBER (35:32)	Bits <3:0>	
11	ST_PARTNUMBER <25:0>	Bits <31:6>	
11	SILICON_VERSION (LSB is bit 51)	Bits <5:4>	
11	TESTING_PLANT (LSB is bit 31)	Bits <3:2>	
11	CSPFL	Bit <1>	
11	EWS2FL	Bit <0>	
12	Not used	Bits<31:22>	
12	ST_PARTNUMBER <47:26>	Bits <21:0>	
13	Not Used		
14	Not Used		
15	Device trimmed indication		

Figure 1 : MTP Word Locations



6	Location to store Calibrated values of Inductance (Ltx_nH) & frequency_Hz into MTP and also Signature and version.	Test Overlay	Sector 126 :- Word 0(Signature = 0x01); Word 1(Version = 0x02); Word 2(Ltx_nH); Word 3(frequency_Hz)
---	--	--------------	--

Acceptance:

Test Parameter	Insight Keys Recorded	Comments/Notes	
Sector 127			
Check Sum - Sector 127 (Word 31)	SCRP_Check Sum_127_MTP_BEFORE	Will need this Values to be compared against MTP Check after test Section 8.7.	
Version (Word 1)	SCRP_Version_127_MTP_BEFORE		
Signature (Word 0)	SCRP_Signature_127_MTP_BEFORE		
Tx HWID_MTP (Word 10):- J51x - 0x05170000 J52x - 0x05200000	SCRP_TX_HWID_127_MTP_BEFORE		
CTx MTP (Word 2)	SCRP_CTx_127_MTP_BEFORE		
VBoost_Control MTP (Word 6)	SCRP_VBoost_127_MTP_BEFORE		
Vsense MTP (Word 7)	SCRP_VSense_127_MTP_BEFORE		
Isense MTP (Word 8)	SCRP_Isense_127_MTP_BEFORE		
LFOD MTP (Word 9)	SCRP_LFOD_127_MTP_BEFORE		
VSYS_ANA (Word 16)	SCRP_VSYS_ANA_127_MTP_BEFORE		
VSYS_1P8 (Word 17)	SCRP_VSYS_1P8_127_MTP_BEFORE	Will need this Values to be compared against MTP Check after test Section 8.7.	
MLB Serial No. (Word 11 to Word 15 - Bits<1:17>)	SCRP_MLB_SN_127_MTP_BEFORE		
Sector 126			
Check Sum - Sector 126 (Word 31)	SCRP_Check Sum_126_MTP_BEFORE		Will need this Values to be compared against MTP Check after test Section 8.7.
Version (Word 1)	SCRP_Version_126_MTP_BEFORE		
Signature (Word 0)	SCRP_Signature_126_MTP_BEFORE		
LPP Inductance_MTP (Word 2)	SCRP_LPP_L_126_MTP_BEFORE		
LPP Frequency_MTP (Word 3)	SCRP_LPP_FREQ_126_MTP_BEFORE		



8.4. Low Power Ping (LPP)

Description: Check the frequency and inductance for LPP at free air vs nominal position coupling.

Failure Mode(s) Captured: Poorly assembled / manufactured coils

Test Setup and Procedure:

Step	Description	Interface	Command / Notes
1	Connect coils at nominal position	Fixture	
2	Send 1.4uS LPP pulse	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x05, ReportPayload={0x00; 0x46}" Note: 0x46 gives 70 * 20ns = 1.4uS is the duration of the pulse.
3	Delay 15mS before proceeding	Fixture	
4	Read output parameters of F and L and raw ADC data	Tx HID	<u>To read Frequency, Inductance and Raw ADC data:</u> smokey ScorpiusHid --run --test "Get" --args "ReportID=0x05" Response: (Received LSB First, Length should be 23bytes) Byte0: ReportId (should equal 0x05) Byte1: Error code (0x00-> no error) Byte2: Sub-cmd (should be 0x00) bytes3-6: Floating point value of frequency Bytes7-10: Floating point value of inductance Bytes19-22: Buffer address of raw ADC data Bytes23-26: Number of raw ADC data elements (of size uint16_t)
5	Collect raw ADC samples and upload to Insight	Tx HID & Fixture	Collect Pointer to raw LPP data by sending the following command from bytes19-22 in the above response. Use the above info to read the raw data and upload to insight. Use the command Below to read the raw ADC buffered data smokey ScorpiusHid --run --test "Mem16" --args "Address=<address>, Length=<number of bytes to read>" smokey ScorpiusHid --run --test "Mem16" --args "Address=<buffer address>, Length=220" The LPP data is 660 bytes. Therefore 3 loops of above should finished reading all the LPP data
6	Repeat steps 2 - 5 x 100 times	Fixture & Tx HID	Save all of the data as a single log file for each unit and upload to InSight.
7	Calculate Free Air Δ Tx Frequency & Δ Tx Inductance <small>Averaged over 100 repeats vs MTP sector Value</small>	Tx HID & Fixture	Δ Tx Frequency = SCRP_LPP_FREQ_MTP_BEFORE (From Section 8.3) - Kxx_LPP_Frequency_100_avg Δ Tx Inductance = Kxx_LPP_Inductance_100_avg - SCRP_LPP_L_MTP_BEFORE (From Section 8.3)
8	Record parameters as per the table below	Fixture	Apply limits accordingly
9	Repeat steps 2 - 8 at all coupling position	Fixture & Tx HID	Coupling Position :- KMax, KNom & KMin

Acceptance:

Physical Parameter	InSight Keys Recorded	LL	UL	Unit	Comments/Notes
LPP Frequency	KMax_LPP_Frequency	62	71.5	kHz	Updated based on J5xx FEA MSS table
	KNom_LPP_Frequency	63	72.8		
	KMin_LPP_Frequency	64	77.2		
	KMax_LPP_Frequency_avg	62	71.5		
	KNom_LPP_Frequency_avg	63	72.8		
	KMin_LPP_Frequency_avg	64	77.2		
LPP Inductance	KMax_LPP_Inductance	22.3	28	μH	
	KNom_LPP_Inductance	21.5	27		
	KMin_LPP_Inductance	19.1	26		
	KMax_LPP_Inductance_avg	22.3	28		
	KNom_LPP_Inductance_avg	21.5	27		
	KMin_LPP_Inductance_avg	19.1	26		
Δ Tx Frequency	KMax_LPP_Frequency_FA_delta	5.0	22.3	kHz	
	KNom_LPP_Frequency_FA_delta	5.0	20.8		
	KMin_LPP_Frequency_FA_delta	5.0	17.3		
Δ Tx Inductance	KMax_LPP_Inductance_FA_delta	3.74	11.2	μH	
	KNom_LPP_Inductance_FA_delta	2.92	10.2		
	KMin_LPP_Inductance_FA_delta	2.13	7.4		
LPP Frequency STD	Kxxx_LPP_Frequency_STDEV	-	0.4	-	
LPP Inductance STD	Kxxx_LPP_Inductance_STDEV	-	0.4	-	
LPP_repeatability		100	100	-	



8.5. Digital Ping Level Tests

Description: This test required ginger/B332 dev board, both Tx and Rx coil. Test digital ping level (6Vboost and 100deg bridge phase) at 0.1C charge rate at various positions and Vrect and Ping Pong Tests. Ping Pong test is performed to check In-band comms by sending a train of bits as ASK (ginger board/B332 Dev Board).

Failure Mode(s) Captured:

1. Vrect: - Ginger/[B332-TBD] reach UVP or OVP at the digital ping level
2. Ping Pong :-Test Dotara's Internal ASK/FSK Communication.

Test Setup and Procedure:

Order of load ramping as follows:

- Set VBOOST to **6.1V**
- Adjust bridge phase from **100 degrees**
- Set loading to 40mA ballast (No Eload i.e. turn Eload off/Set Eload to 0A)

Description		Interface	Command
Set coupling position		Fixture	Loads @ all Couplings
Step	Description	Interface	Command
Digital Ping Testing			
For DP @ 0.1C			
1	Set boost to meet the load conditions. Note: Minimum Vboost is 6100mV, Don't set Vboost < 6100mV.	TX Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x03, ReportPayload={0xD4; 0x17; 0x88; 0x13}" Payload: —> Byte0-1: Boost voltage (eg. 0x17D4 = 6100mV)
2	Set the Bridge phase 110deg	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x04, ReportPayload={0x1C; 0xF3; 0x01; 0x00; 0xF8; 0x2A; 0x50; 0x46}" Eg 0x2AF8: 11000cdeg = 110deg phase
3	Command for following variables: Rx:- Vrect	Tx HID/Rx I2C	Vrect:- seorpius-get-vrect{B332}/ ikt adc (Ginger)
4	Tell Rx to go into static mode	Rx I2C	Write I2C packet: (39) c0 ae 80 80 1e 09 02 01 AE Ginger command: set mode none Ginger command: set mode rx Ginger command: ikt write 0xF0000B80 0xAE010209 Read one byte: Should be 0x60 B332 DevBoard: i2c rawwrite charger 0x0f 0x00 0x2E 0x09 0x01 0x01 //set Aculeus to static closed loop mode
5	Choose Comm1	Rx I2C	Write I2C packet: (39) c0 ae 80 80 1e 01 00 05 AD Ginger command: ikt write 0x0F0000B80 0xAD050001 B332 DevBoard : i2c rawwrite charger 0x0F 0x00 0x2d 0x01 0x00 0x05 //Select Comm cap1 - For IpadTx
6	Tell Tx to initiate ping pong with the Rx i.e. 10 packets, 100ms packet delay	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x02, ReportPayload={0x0A; 0x00; 0x64; 0x00}" Payload:----> byte0-1: Number of packets to send: 10 byte2-3: Delay between packets: 100ms
7	Wait 3 second for RX to send packets before reading buffer	Fixture	Wait 3 second
8	Read back data that was captured from the Tx.	Tx HID	smokey ScorpiusHid --run --test "Get" --args "ReportID=0x02" Response: byte0: ID (PingPongID = 0x02) byte1: Status (eg. 0x00 = complete) [0 = Complete; 1 = In-Progress] byte2-3: Pings Sent (eg. 0x000A = 10 pings sent) byte4-5: Pongs Received (eg. 0x000A = 10 pongs received) byte6: Last error (e.g. 0x00 = no errors) Note:-If byte1:Status is in process then repeat the step
9	Repeat step 2 to 8 At Kmax & Kmin		

Acceptance criteria:

Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
Vrect_FXST @ DP	Kmax_SCRP_Vrect@DPxxC	7000	8000	mV	
	Kmin_SCRP_Vrect@DPxxC	5800	6800	mV	
Number of Pings Sent @ DP	Kxxx_Pings_Sent@DP	10	10	-	
Number of Pongs Received @ DP	Kxxx_Pongs_Recieved@DP	10	10	-	



8.6. Power, Efficiency & Ping Pong Tests

Description: This test required Ginger/B332-dev board, both Tx and Rx coil. Transferring power at various loads / charge rates (0.1C, 3C, 10C) at various positions and measuring power and efficiency and Ping Pong Tests. Ping Pong test is performed to check In-band comms by sending a train of bits as ASK (Ginger board/B332-Dev Board).

Failure Mode(s) Captured:

1. Power & efficiency:-Unit is not able to transfer required power at different load conditions at required efficiency
2. Ping Pong :-Test Dotara's Internal ASK/FSK Communication.

Test Setup and Procedure:

Order of load ramping as follows:

- Adjust bridge phase from 0 - 180 degrees to reach target Vrect at desired load.
- If target Vrect still cannot be achieved with a phase shift of 180 degrees?
- Start increasing VBoost.
- VBoost should only be adjusted when phase = 180 degrees.
- To reach the desired Vrect start ramping the boost voltage.
- To reach the 10C load step the load with 50mA to avoid OVP.

Charge Rate	0.1C @ 6.5V Vrect	3C @ 8V Vrect	10C @ 14V Vrect
Loading	40mA ballast No Eload i.e. turn Eload off/Set Eload to 0A	~0.9W Set Eload to ~112.5mA	3W Set Eload to ~214mA

Description	Interface	Command
Set load and coupling position	Fixture	Repeat all below tests for the following Load conditions 0.1C; 3C; 10C

Step	Description	Interface	Command
Power & Efficiency Testing			
A	PPVCC_MAIN(VSYS_ANA) Record this as x1	Tx HID	PPVCC_MAIN(VSYS_ANA): smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x06; 0x00; 0x8C}" note: the last part "0x8C" donates the number of samples with a multiplier of 32x. i.e 0x8C = 140 x 32 = 4480 samples -----> Fixture wait 2 sec <----- smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" Response--> byte0: [u8] ID (GetAdclD = 0x31) byte1-4: [u32] Floating point value read from ADC (eg 0xYYYYYYYY) (Convert this value to mV from V) byte5: [u8] Error Code (eg. 0x00 - no error) byte6: [u8] Reserved (eg. 0x00) byte7-8: [u16] ADC raw value (eg. 0xXXXX) byte9-12: [u32] Channel_Id that was read (eg. 0x00000007 = VSYS_1P8)
B	Calculate PPVCC_MAIN(VSYS_ANA) actual VSYS_ANA_Actual = y1	Overlay	$y_1 = (m \cdot x_1 / 10000) + (c / 1000)$ --> Where m = slope & c = offset --> from Word16 = VSYS_ANA_Offset_MTP <<16 VSYS_ANA_Slope_MTP Note : Convert m & c values into decimal before calculating y1
C	Record value of VSYS_1P8 Record this as x1	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x07; 0x00; 0x8C}" note: the last part "0x8C" donates the number of samples with a multiplier of 32x. i.e 0x8C = 140 x 32 = 4480 samples -----> Fixture wait 2 sec <----- smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" Response--> byte0: [u8] ID (GetAdclD = 0x31) byte1-4: [u32] Floating point value read from ADC (eg 0xYYYYYYYY) (Convert this value to mV from V) byte5: [u8] Error Code (eg. 0x00 - no error) byte6: [u8] Reserved (eg. 0x00) byte7-8: [u16] ADC raw value (eg. 0xXXXX) byte9-12: [u32] Channel_Id that was read (eg. 0x00000007 = VSYS_1P8)
D	Calculate VSYS_1P8 actual VSYS_1P8_Actual = y1	Overlay	$y_1 = x_1 + (b / 1000)$ Where b = offset --> from Word17 = value from step 14 above in Hex Note : Convert b value into decimal before calculating y1
E	Command for following variables: Tx:- Vbatt, lbatt	Tx (Diags & HID)	pmuadc --read all Vbatt:- potomac vbat : xxxx.xxxx mV; lbatt:- ibat_out: xxxx.xxx mA Example ---> 00024088:2240013A] :-) pmuadc --read all vddout: 4199.9389 mV vbat: 3036.0195 mV brick_id: 3.6630 mV brick_id_usb_d+: 0mV brick_id_usb_d-: 0mV brick_jd2: 3.6630 mV ibuck9: 0.0000 mA ibuck11: 0.0000 mA ibuck14: 0.0000 mA ibat_out: 23858.3638 mA BIST buck0: 775.0915 mV BIST buck1: 7.5091 mV potomac vsys_lo : 4214.2857 mV potomac ich_1a : 0.2442 mA potomac tbat : -2.0451 C potomac vbat : 4225.2747 mV potomac ich_6a : 1.4652 mA
F	Difference between VSYS-ANA & Vbatt	Fixture	$V_{Flex_Drop} = V_{batt} - V_{SYS_ANA_actual}$
For 0.1C & 3C			
1	Repeat Step A to F	Tx Diags & Fixture	@Standby i.e. before 0.1C testing



Description		Interface	Command
2	Set boost to meet the load conditions. Note: Minimum Vboost is 6100mV, Don't set Vboost < 6100mV.	TX Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x03, ReportPayload={0xD4; 0x17; 0x88; 0x13}" Payload: —> Byte0-1: Boost voltage (eg. 0x17D4 = 6100mV)
3	Set the Bridge phase to meet the load condition (Set Bridge phase to 0-180)	Tx Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x04, ReportPayload={0x1C; 0xF3; 0x01; 0x00; 0x50; 0x46; 0x50; 0x46}" Eg 0x4650: 18000cdeg = 180deg phase
4	Command for following variables: Vsense, Isense, LFOD (VCTx) <div>Note : Disable LFOD before taking Vsense & Isense Reading and Enable LFOD back before taking LFOD(VCTx) reading.</div>	TX Diags	<div>Disable LFOD before reading Isense: smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x36; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}" Check status of LFOD smokey ScorpiusHid --run --test "Set" --args "ReportID=0x40, ReportPayload={0x98; 0x34; 0x00; 0x40}" ————> Fixture wait 2 sec <———— smokey ScorpiusHid --run --test "Get" --args "ReportID=0x40" Response —> bits 7 & bit 8 = 0 if Disabled, 1 if enabled Note: Here, a "set" report command is first sent followed by a "get" report to return the requested data. VSense: smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x00; 0x00; 0x0F}" ————> Fixture wait 2 sec <———— smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" Response —> bytes1-4 = Floating point value from ADC —> VSense_kmxx_MCU Isense: smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x12; 0x00; 0x0F}" ————> Fixture wait 2 sec <———— smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31" Response —> bytes1-4 = Floating point value from ADC —> Isense_kmxx_MCU Enabled LFOD after Isense reading: smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x35; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}"</div> <div>Wait 1 sec after setting back LFOD before doing next test. LFOD(VCTx): smokey ScorpiusHid --run --test "Set" --args "ReportID=0x0B, ReportPayload={0x18; 0x03}" ————> Fixture wait 2 sec <———— smokey ScorpiusHid --run --test "Get" --args "ReportID=0x0B" Response—> byte0 = report byte16-17 = [u16] Read averaged ictx peak value in mA (based on factory calibrated byte18-19 = [u16] Accumulated ADC raw averaged sampling value Note: Upload this raw data into Insight.</div>
5	Measure Dotara (U6200) Temp at all Load conditions	Tx HID	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x08; 0x00; 0x8C}" <-- Trigger reading of Temp1 (channel 8) smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x09; 0x00; 0x8C}" <--Trigger reading of Temp2 (channel 9) smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31"
6	Repeat Step A to F	Tx Diags & Fixture	During 0.1C & 3C loading
For 10C			
7	Set the Full phase to meet the load condition (Set Bridge phase to 180)	Tx Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x04, ReportPayload={0x1C; 0xF3; 0x01; 0x00; 0x50; 0x46; 0x50; 0x46}" Eg 0x4650: 18000cdeg = 180deg phase
8	Set boost to meet the load conditions. Note: Minimum Vboost is 6100mV, Don't set Vboost < 6100mV.	TX Diags	smokey ScorpiusHid --run --test "Set" --args "ReportID=0x03, ReportPayload={0xD4; 0x17; 0x88; 0x13}" Payload: —> Byte0-1: Boost voltage (eg. 0x17D4 = 6100mV)
9	Repeat Step A to F	Tx Diags & Fixture	During 10C loading



Description		Interface	Command
10	<p>Command for following variables: Vsense, Isense, LFOD (VCTx)</p> <p>Note : Disable LFOD before taking Vsense & Isense Reading and Enable LFOD back before taking LFOD(VCTx) reading.</p>	TX Diags	<p>Disable LFOD before reading Isense:</p> <p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x36; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}"</p> <p>Check status of LFOD</p> <p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x40, ReportPayload={0x98; 0x34; 0x00; 0x40}"</p> <p>————> Fixture wait 2 sec <————</p> <p>smokey ScorpiusHid --run --test "Get" --args "ReportID=0x40"</p> <p>Response —> bits 7 & bit 8 = 0 if Disabled, 1 if enabled</p> <p>Note: Here, a "set" report command is first sent followed by a "get" report to return the requested data.</p> <p>VSense:</p> <p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x00; 0x00; 0x0F}"</p> <p>————> Fixture wait 2 sec <————</p> <p>smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31"</p> <p>Response —> bytes1-4 = Floating point value from ADC —> VSense_kmxx_MCU</p> <p>Isense:</p> <p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x12; 0x00; 0x0F}"</p> <p>————> Fixture wait 2 sec <————</p> <p>smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31"</p> <p>Response —> bytes1-4 = Floating point value from ADC —> Isense_kmxx_MCU</p> <p>Enabled LFOD after Isense reading:</p> <p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x41, ReportPayload={0x98; 0x35; 0x00; 0x40; 0x80; 0x01; 0x00; 0x00}"</p> <hr/> <p>Wait 1 sec after setting back LFOD before doing next test.</p> <p>LFOD(VCTx):</p> <p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x0B, ReportPayload={0x18; 0x03}"</p> <p>————> Fixture wait 2 sec <————</p> <p>smokey ScorpiusHid --run --test "Get" --args "ReportID=0x0B"</p> <p>Response—></p> <p>byte0 = report</p> <p>byte16-17 = [u16] Read averaged ictx peak value in mA (based on factory calibrated</p> <p>byte18-19 = [u16] Accumulated ADC raw averaged sampling value</p> <p>Note: Upload this raw data into Insight.</p>
11	Measure Dotara (U6200) Temp at all Load conditions	Tx HID	<p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x08; 0x00; 0x8C}"</p> <p><-- Trigger reading of Temp1 (channel 8)</p> <p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x31, ReportPayload={0x09; 0x00; 0x8C}"</p> <p><--Trigger reading of Temp2 (channel 9)</p> <p>smokey ScorpiusHid --run --test "Get" --args "ReportID=0x31"</p>
Ping Pong Testing			
12	Tell Rx to go into static mode	Rx I2C	<p>Write I2C packet: (39) c0 ae 80 80 1e 09 02 01 AE</p> <p>Ginger command: set mode none</p> <p>Ginger command: set mode rx</p> <p>Ginger command: ikt write 0xF0000B80 0xAE010209</p> <p>Read one byte: Should be 0x60</p>
13	Choose Comm1	Rx I2C	<p>Write I2C packet: (39) c0 ae 80 80 1e 01 00 05 AD</p> <p>Ginger command: ikt write 0x0xF0000B80 0xAD050001</p>
14	Tell Tx to initiate ping pong with the Rx i.e. 10 packets, 100ms packet delay	Tx Diags	<p>smokey ScorpiusHid --run --test "Set" --args "ReportID=0x02, ReportPayload={0x0A; 0x00; 0x64; 0x00}"</p> <p>Payload:————></p> <p>byte0-1: Number of packets to send: 10</p> <p>byte2-3: Delay between packets: 100ms</p>
15	Wait 1 second for RX to send packets before reading buffer	Fixture	Wait 1 second
16	Read back data that was captured from the Tx.	Tx Diags	<p>smokey ScorpiusHid --run --test "Get" --args "ReportID=0x02"</p> <p>Response:</p> <p>byte0: ID(PingPongID = 0x02)</p> <p>byte1: Status(eg. 0x00 = complete) [0 = Complete; 1 = In-Progress]</p> <p>byte2: Last error(e.g. 0x00 = no errors)</p> <p>byte3-4: Pings Sent(eg. 0x000A = 10 pings sent)</p> <p>byte5-6: Pongs Received(eg. 0x000A = 10 pongs received)</p> <p>Note:- If byte1:Status is in process then repeat the step</p>
17	Repeat step 1 to 16 with All loading and coupling positions		

Acceptance criteria:

Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
Load 0.1C					
PPVCC_MAIN@ 0.1C (VSYS_ANA_ACTUAL)	KMax_PPVCC_MAIN@0.1C	TBD	TBD	mV	
	KNom_PPVCC_MAIN@0.1C	TBD	TBD		
	KMin_PPVCC_MAIN@0.1C	TBD	TBD		
Vbatt@ 0.1C	KMax_Vbatt@0.1C	TBD	TBD	mV	
	KNom_Vbatt@0.1C	TBD	TBD		
	KMin_Vbatt@0.1C	TBD	TBD		
	KMax_VSYS_1P8@0.1C	1650	1950		



Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
VSYS_1P8 @ 0.1C	KNom_VSYS_1P8@0.1C	1650	1950	mV	
	KMin_VSYS_1P8@0.1C	1650	1950		
VFlex_Drop@0.1C	KMax_VFlex_Drop@0.1C	TBD	TBD	mA	
	KNom_VFlex_Drop@0.1C	TBD	TBD		
	KMin_VFlex_Drop@0.1C	TBD	TBD		
Ibatt @ 0.1C	KMax_Ibatt@0.1C	TBD	TBD	mA	
	KNom_Ibatt@0.1C	TBD	TBD		
	KMin_Ibatt@0.1C	TBD	TBD		
Vsense @ 0.1C	KMax_Vsense@0.1C	6000	7000	mV	Refer to J4xx, but updated min Vboost = 6.1V
	KNom_Vsense@0.1C				
	KMin_Vsense@0.1C	6000	7000		
Isense @ 0.1C	KMax_Isense@0.1C	50	120	mA	
	KNom_Isense@0.1C				
	KMin_Isense@0.1C	70	160		
Vctx_IPeak @ 0.1C	KMax_VCtx_IctxPeakFactory@0.1C	280	550	mA	
	KNom_VCtx_IctxPeakFactory@0.1C				
	KMin_VCtx_IctxPeakFactory@0.1C	400	650		
Vrect_FXST @ 0.1C	KMax_Vrect_FXST@0.1C	6300	6700	mV	Fixture Cmd: Vrect Target = 6.5V ±2% Use Filtered Vrect Value from 'Ikt Adc' command
	KNom_Vrect_FXST@0.1C	6300	6700		
	KMin_Vrect_FXST@0.1C	6300	6700		
Irect_FXST @ 0.1C	KMax_Irect_FXST@0.1C	40	45	mA	Iktara ballast load = 40mA. No fixture load required.
	KNom_Irect_FXST@0.1C				
	KMin_Irect_FXST@0.1C				
Rx_Loading_Power @ 0.1C	KMax_Rx_Loading_Power@0.1C	252	301.5	mW	Vrect * Irect
	KNom_Rx_Loading_Power@0.1C	252	301.5		
	KMin_Rx_Loading_Power@0.1C	252	301.5		
Efficiency @ 0.1C	KMax_Efficiency@0.1C	19.00	65.00	%	Refer to J4xx
	KNom_Efficiency@0.1C				
	KMin_Efficiency@0.1C	10.00	55.00		
Number of Pings Sent @ 0.1C	Kxxx_Pings_Sent@0.1C	10	10	-	
Number of Pongs Received @ 0.1C	Kxxx_Pongs_Recieved@0.1C	10	10	-	
Dotara Surface Temperature @ 0.1C	Kxxx_Temp1_MCU@0.1C Kxxx_Temp2_MCU@0.1C	20	61	°C	Based on J307 P1 data
Load 3C					
PPVCC_MAIN@ 3C (VSYS_ANA_ACTUAL)	KMax_PPVCC_MAIN@3C	TBD	TBD	mV	
	KNom_PPVCC_MAIN@3C	TBD	TBD		
	KMin_PPVCC_MAIN@3C	TBD	TBD		
Vbatt@ 3C	KMax_Vbatt@3C	TBD	TBD	mV	
	KNom_Vbatt@3C	TBD	TBD		
	KMin_Vbatt@3C	TBD	TBD		
VSYS_1P8 @ 3C	KMax_VSYS_1P8@3C	1650	1950	mV	
	KNom_VSYS_1P8@3C	1650	1950		
	KMin_VSYS_1P8@3C	1650	1950		
VFlex_Drop@3C	KMax_VFlex_Drop@3C	TBD	TBD	mA	
	KNom_VFlex_Drop@3C	TBD	TBD		
	KMin_VFlex_Drop@3C	TBD	TBD		



Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
Ibatt @ 3C	KMax_Ibatt@3C	TBD	TBD	mA	
	KNom_Ibatt@3C	TBD	TBD		
	KMin_Ibatt@3C	TBD	TBD		
Vsense @ 3C	KMax_Vsense@3C	6000	7600	mV	Refer to J4xx, but updated min Vboost = 6.1V
	KNom_Vsense@3C				
	KMin_Vsense@3C	6000	8.5		
Isense @ 3C	KMax_Isense@3C	200	570	mA	
	KNom_Isense@3C				
	KMin_Isense@3C	220	600		
Vctx_IPeak_ @ 3C	KMax_VCtx_IctxPeakFactory@3C	360	600	mA	
	KNom_VCtx_IctxPeakFactory@3C				
	KMin_VCtx_IctxPeakFactory@3C	400	830		
Vrect_FXST @ 3C	KMax_Vrect_FXST@3C	7800	8300	mV	Fixture Cmd: Vrect Target = 8V ±2%
	KNom_Vrect_FXST@3C	7800	8300		
	KMin_Vrect_FXST@3C	7800	8300		
Irect_FXST @ 3C	KMax_Irect_FXST@3C	110	125	mA	Fixture Cmd: Irect Target = 113mA +iktara load (~0 to 15mA)
	KNom_Irect_FXST@3C	110	125		
	KMin_Irect_FXST@3C	110	125		
Rx_Loading_Power @ 3C	KMax_Rx_Loading_Power@3C	858	1037.5	mW	Vrect * Irect
	KNom_Rx_Loading_Power@3C	858	1037.5		
	KMin_Rx_Loading_Power@3C	858	1037.5		
Efficiency @ 3C	KMax_Efficiency@3C	57.00	70.00	%	Refer to J4xx
	KNom_Efficiency@3C				
	KMin_Efficiency@3C	46.00	63.00	%	
Number of Packets Sent @ 3C	Kxxx_Packets_Sent@3C	10	10	-	
Number of Packets Received @ 3C	Kxxx_Packets_Rcieved@3C	10	10	-	
Dotara Surface Temperature @ 3C	Kxxx_Temp1_MCU@3C Kxxx_Temp2_MCU@3C	20	61	°C	Based on J307 P1 data
Load 10C					
PPVCC_MAIN@ 10C (VSYS_ANA_ACTUAL)	KMax_PPVCC_MAIN@ 10C	TBD	TBD	mV	
	KNom_PPVCC_MAIN@ 10C	TBD	TBD		
	KMin_PPVCC_MAIN@ 10C	TBD	TBD		
Vbatt@ 10C	KMax_Vbatt@ 10C	TBD	TBD	mV	
	KNom_Vbatt@ 10C	TBD	TBD		
	KMin_Vbatt@ 10C	TBD	TBD		
VSYS_1P8 @ 10C	KMax_VSYS_1P8@10C	1650	1950	mV	
	KNom_VSYS_1P8@10C	1650	1950		
	KMin_VSYS_1P8@10C	1650	1950		
VFlex_Drop@ 10C	KMax_VFlex_Drop@10C	TBD	TBD	mA	
	KNom_VFlex_Drop@10C	TBD	TBD		
	KMin_VFlex_Drop@10C	TBD	TBD		
Ibatt @ 10C	KMax_Ibatt@ 10C	TBD	TBD	mA	
	KNom_Ibatt@ 10C	TBD	TBD		
	KMin_Ibatt@ 10C	TBD	TBD		
Vsense @ 10C	KMax_Vsense@10C	9000	12900	mV	
	KNom_Vsense@10C				



Test Parameter	Insight Keys Recorded	LL	UL	Units	Comments/Notes
	KMin_Vsense@10C	9300	15000		
Isense @ 10C	KMax_Isense@10C	380	640	mA	
	KNom_Isense@10C				
	KMin_Isense@10C	360	700		
Vctx_IPeak_ @ 10C	KMax_VCtx_IctxPeakFactory@10C	700	1100	mA	
	KNom_VCtx_IctxPeakFactory@10C				
	KMin_VCtx_IctxPeakFactory@10C	1000	1400		
Vrect_FXST @ 10C	KMax_Vrect_FXST@10C	13500	14500	mV	Fixture Cmd: Vrect Target = 14v
	KNom_Vrect_FXST@10C	13500	14500		
	KMin_Vrect_FXST@10C	13500	14500		
Irect_FXST @ 10C	KMax_Irect_FXST@10C	215	225	mA	Fixture Cmd: Irect Target = 214mA
	KNom_Irect_FXST@10C	215	225		
	KMin_Irect_FXST@10C	215	225		
Rx_Loading_Power @ 10C	KMax_Rx_Loading_Power@10C	2902.50	3262.50	mW	Vrect * Irect
	KNom_Rx_Loading_Power@10C	2902.50	3262.50		
	KMin_Rx_Loading_Power@10C	2902.50	3262.50		
Efficiency @ 10C	KMax_Efficiency@10C	53.00	69.00	%	Refer to J4xx
	KNom_Efficiency@10C				
	KMin_Efficiency@10C	47.00	62.00		
Number of Packets Sent @ 10C	Kxxx_Packets_Sent@10C	10	10	-	
Number of Packets Received @ 10C	Kxxx_Packets_Rcieved@10C	10	10	-	
Dotara Surface Temperature @ 10C	Kxxx_Temp1_MCU@10C Kxxx_Temp2_MCU@10C	20	61	°C	Based on J307 P1 data

8.7. Final MTP Sector Check After Tests.

Description: Make sure FW is in a good state at the end of the test. [TBD]

Failure Mode(s) Captured: TBD

Test Setup and Procedure: Refer below

Step	Description	Interface	Command / Notes
1	Pull Low test pin TP93EF i.e. " AOP_TO_DOTARA_RESET_L " to reset Scorpius	Tx Diags	pmugpio --pin 18 --output 0 --pushpull
	Wait 500ms	Fixture	
	Pull High test pin TP93EF i.e. " AOP_TO_DOTARA_RESET_L "	Tx Diags	pmugpio --pin 18 --output 1 --pushpull
2	Wait 1s	Fixture	
3	Preparation	Tx Diags	pmugpio --pin 14 --output 1 --pushpull
4	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.
5	Load Tx FW	Tx HID	Note: Need to send this command every time within 3sec of above command. You cannot enter Load FW without exiting the standalone mode. Path for FW might change. smokey ScorpiusHid --run --test "FwLoad" --args "PathToFwLoad='nandfs:\\AppleInternal\\Diags\\Scorpius\\J517J522\\ScorpiusTx-dotara.bin'"
6	Wait 1s	Fixture	Scorpius FW will take less than 1 second to boot
7	Tell Tx to get out of standalone mode.	TX HID (Diags)	i2c -w 6 0x39 6 Note:-Send this command 2x times with 1s delay. There may be I2C error reported with this command, but can be ignored.
8	Tell Tx to enter Quiesce Mode	TX HID	Note: Need to send the below command after every 2nd time of the above command within 3sec or with minimum or no delay as possible of above command. You cannot enter Quiesce mode without exiting the standalone mode. smokey ScorpiusHid --run --test "Set" --args "ReportID=0x09, ReportPayload={0x01}"



Step	Description	Interface	Command / Notes
9	Read MTP Sector 127	Tx HID	smokey ScorpiusHid --run --test "Print_Sector" --args "MTP_sector=127" Example:--Overlay will read Words that are printed:-- <div> <div>Word 0 : 0x00000001</div> <div>Word 1 : 0x00000002</div> <div>Word 2 : 0x00030570</div> <div>Word 3 : 0x00023F00</div> <div>Word 4 : 0x00000000</div> <div>Word 5 : 0x00000000</div> <div>Word 6 : 0x0A0A0A0A</div> <div>Word 7 : 0x0B0B0B0B</div> <div>Word 8 : 0x0C0C0C0C</div> <div>Word 9 : 0x00000000</div> <div>Word 10 : 0x05170000</div> <div>Word 11 : 0x00000000</div> <div>Word 12 : 0x00000000</div> <div>Word 13 : 0x00000000</div> <div>Word 14 : 0x00000000</div> <div>Word 15 : 0x00000000</div> <div>Word 16 : 0x00000000</div> <div>Word 17 : 0x00000000</div> <div>Word 18 : 0x00000000</div> <div>Word 19 : 0x00000000</div> <div>Word 20 : 0x00000000</div> <div>Word 21 : 0x00000000</div> <div>Word 22 : 0x00000000</div> <div>Word 23 : 0x00000000</div> <div>Word 24 : 0x00000000</div> <div>Word 25 : 0x00000000</div> <div>Word 26 : 0x00000000</div> <div>Word 27 : 0x00000000</div> <div>Word 28 : 0x00000000</div> <div>Word 29 : 0x00000000</div> <div>Word 30 : 0x00000000</div> <div>Word 31 : 0xF29D9024</div> </div>
10	Read MTP Sector 126	Tx HID	smokey ScorpiusHid --run --test "Print_Sector" --args "MTP_sector=126" Example:--Overlay will read Words that are printed:-- <div> <div>Word 0 : 0x00000001</div> <div>Word 1 : 0x00000002</div> <div>Word 2 : 0x0E0E0E0E</div> <div>Word 3 : 0x0F0F0F0F</div> <div>Word 4 : 0x00000000</div> <div>Word 5 : 0x00000000</div> <div>Word 6 : 0x00000000</div> <div>Word 7 : 0x00000000</div> <div>Word 8 : 0x00000000</div> <div>Word 9 : 0x00000000</div> <div>Word 10 : 0x00000000</div> <div>Word 11 : 0x00000000</div> <div>Word 12 : 0x00000000</div> <div>Word 13 : 0x00000000</div> <div>Word 14 : 0x00000000</div> <div>Word 15 : 0x00000000</div> <div>Word 16 : 0x00000000</div> <div>Word 17 : 0x00000000</div> <div>Word 18 : 0x00000000</div> <div>Word 19 : 0x00000000</div> <div>Word 20 : 0x00000000</div> <div>Word 21 : 0x00000000</div> <div>Word 22 : 0x00000000</div> <div>Word 23 : 0x00000000</div> <div>Word 24 : 0x00000000</div> <div>Word 25 : 0x00000000</div> <div>Word 26 : 0x00000000</div> <div>Word 27 : 0x00000000</div> <div>Word 28 : 0x00000000</div> <div>Word 29 : 0x00000000</div> <div>Word 30 : 0x00000000</div> <div>Word 31 : 0xDD9E0E1</div> </div>
11	Pull Low test pin TP93EF i.e. "AOP_TO_DOTARA_RESET_L" to reset Scorpius	Tx Diags	pmugpio --pin 18 --output 0 --pushpull
	Wait 500ms	Fixture	
	Pull High test pin TP93EF i.e. "AOP_TO_DOTARA_RESET_L "	Tx Diags	pmugpio --pin 18 --output 1 --pushpull

Acceptance:

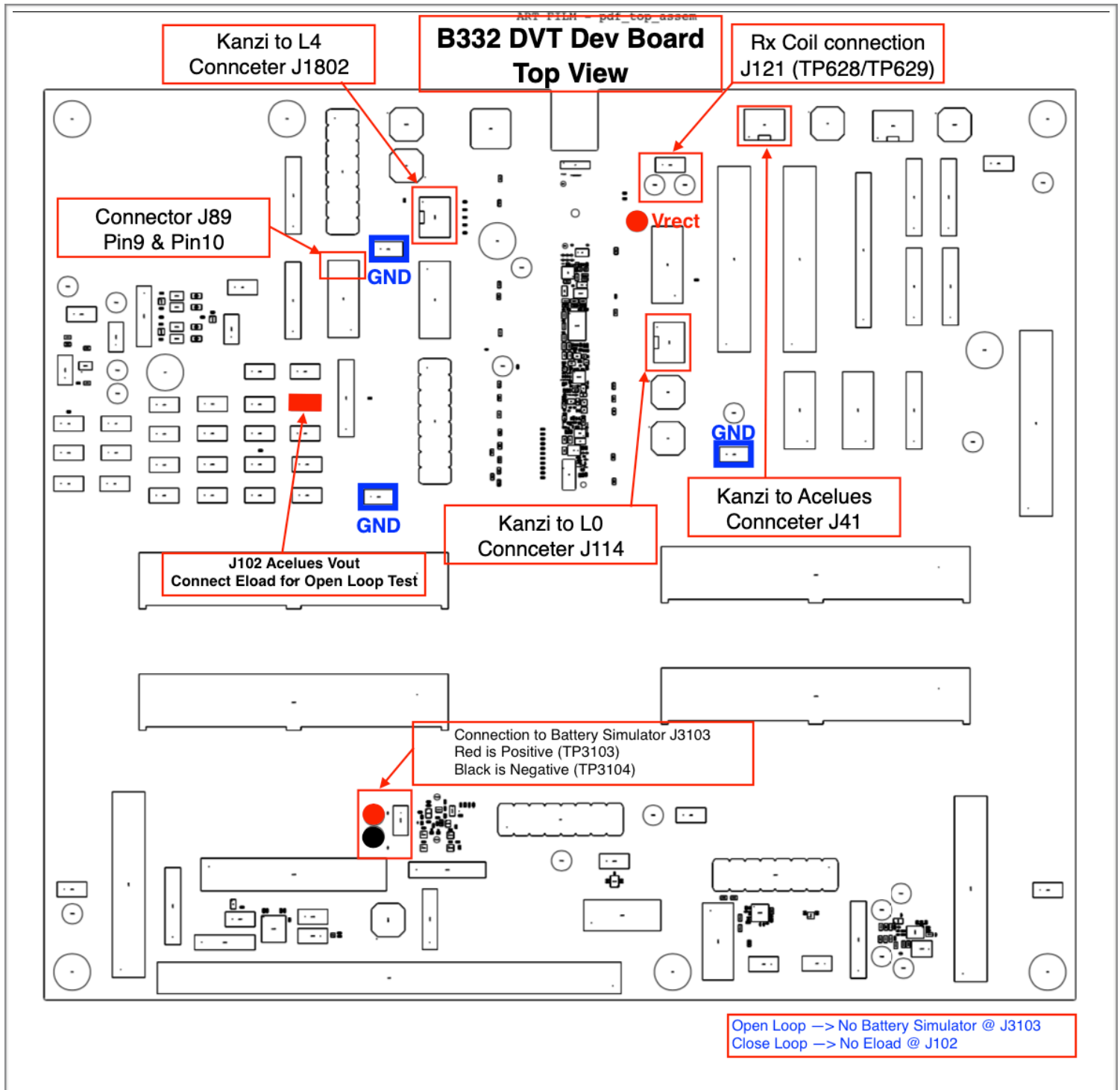
Test Parameter	Insight Keys Recorded	Comments/Notes
Sector 127		
Check Sum - Sector 127 (Word 31)	SCRP_Check Sum_127_MTP_AFTER	Pass if this values match with MTP check before test i.e. Section 8.3
Version (Word 1)	SCRP_Version_127_MTP_AFTER	
Signature (Word 0)	SCRP_Signature_127_MTP_AFTER	
Tx HWID_MTP (Word 10):- J51x - 0x05170000 J52x - 0x05200000	SCRP_TX_HWID_127_MTP_AFTER	
CTx MTP (Word 2)	SCRP_CTx_127_MTP_AFTER	
VBoost_Control MTP (Word 6)	SCRP_VBoost_127_MTP_AFTER	
Vsense MTP (Word 7)	SCRP_VSense_127_MTP_AFTER	
Isense MTP (Word 8)	SCRP_Isense_127_MTP_AFTER	
LFOD MTP (Word 9)	SCRP_LFOD_127_MTP_AFTER	
VSYS_ANA (Word 16)	SCRP_VSYS_ANA_127_MTP_AFTER	
VSYS_1P8 (Word 17)	SCRP_VSYS_1P8_127_MTP_AFTER	
MLB Serial No. (Word 11 to Word 15 – Bits<1:17>)	SCRP_MLB_SN_127_MTP_AFTER	
Sector 126		
Check Sum - Sector 126 (Word 31)	SCRP_Check Sum_126_MTP_BEFORE	Pass if this values match with MTP check before test i.e. Section 8.3
Version (Word 1)	SCRP_Version_126_MTP_BEFORE	
Signature (Word 0)	SCRP_Signature_126_MTP_BEFORE	
LPP Inductance_MTP (Word 2)	SCRP_LPP_L_126_MTP_BEFORE	
LPP Frequency_MTP (Word 3)	SCRP_LPP_FREQ_126_MTP_BEFORE	



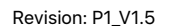
A. Appendix - B332 Dev Board UART Baud rate

The B332 Dev Board is used to send commands to I2C of Aculeus using UART cable. Follow the steps below to open the B332 Dev Board UART.

1. Connect UART (1MByte baudrate, 1.8V) to J89 (Pin9 & Pin 10)
2. Open Terminal
3. `nanocom -w 0 -c 1000000,n,8,1`
4. Select your Connected UART option.



Note:-Testing with Ginger Rx board is a backup incase factory is not able to get B332 open loop test up and running on time.

[illegible]