



Page 1 of 42

**INTEGRATED CIRCUITS, SILICON MONOLITHIC,
RADIATION-HARDENED 32-BIT ARM® CORTEX®-M7
MICROCONTROLLER**

BASED ON TYPE SAMRH71

ESCC Detail Specification No. 9512/006

Issue 1	March 2021
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DCR No.	CHANGE DESCRIPTION

TABLE OF CONTENTS

1	GENERAL	5
1.1	SCOPE	5
1.2	APPLICABLE DOCUMENTS	5
1.3	TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS	5
1.4	THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS	5
1.4.1	The ESCC Component Number	5
1.4.2	Component Type Variants	5
1.5	MAXIMUM RATINGS AND OPERATING CONDITIONS	6
1.5.1	Maximum Ratings	6
1.5.2	Operating Conditions	6
1.5.3	Notes to Maximum Ratings and Operating Conditions	6
1.6	HANDLING PRECAUTIONS	6
1.7	PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION	7
1.8	FUNCTIONAL DIAGRAM	8
1.9	PIN ASSIGNMENT	9
1.10	INSTRUCTION SET AND TIMING DIAGRAMS	12
1.11	PROTECTION NETWORK	19
2	REQUIREMENTS	20
2.1	GENERAL	20
2.1.1	Deviations from the Generic Specification	20
2.2	MARKING	20
2.3	ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES	20
2.3.1	Room Temperature Electrical Measurements	20
2.3.2	High and Low Temperatures Electrical Measurements	33
2.4	PARAMETER DRIFT VALUES	33
2.5	INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS	34
2.6	POWER BURN-IN CONDITIONS	34
2.7	HIGH TEMPERATURE REVERSE BIAS BURN-IN (STATIC BURN-IN) CONDITIONS	38
2.8	OPERATING LIFE CONDITIONS	38
2.9	TOTAL DOSE IRRADIATION TESTING	39
2.9.1	Bias Conditions and Total Dose Level for Total Dose Radiation Testing	39
2.9.2	Electrical Measurements for Total Dose Radiation Testing	42

1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. [9000](#).
- (b) [MIL-STD-883](#), Test Method Standard for Microcircuits.

1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. [21300](#) shall apply.

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 951200601R

- Detail Specification Reference: 9512006
- Component Type Variant Number: 01 (as required)
- Total Dose Radiation Level Letter: R (as required)

1.4.2 Component Type Variants

The component type variants applicable to this specification are as follows:

Variant Number	Based on Type	Case	Terminal Material and Finish	Weight max g	Total Dose Radiation Level Letter (Notes 2, 3)
01	SAMRH71	CQFP-256	D2 (Note 1)	18	R [100krad(Si)]

NOTES:

1. The terminal material and finish shall be in accordance with the requirements of ESCC Basic Specification No. [23500](#).
2. Total dose radiation level letters are defined in ESCC Basic Specification No. [22900](#). If an alternative radiation test level is specified in the Purchase Order the letter shall be changed accordingly.
3. The Total Dose Radiation Level Letter (R) shall be guaranteed as follows:
 - Test up to 150krad(Si) without non-volatile memory
 - Test up to 15krad(Si) with non-volatile memory (read mode)

1.5 MAXIMUM RATINGS AND OPERATING CONDITIONS

1.5.1 Maximum Ratings

The maximum ratings shall not be exceeded at any time during use or storage. Functional performance for extended periods at the maximum ratings may adversely affect device reliability.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in the Test Methods and Procedures of the applicable ESCC generic specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Supply Voltage	V_{DD} V_{CC}	-0.3 to 2 -0.3 to 4	V	Notes 1, 2
I/O Input Voltage Range	V_{IN}	-0.3 to 2.25	V	Note 2
Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
Storage Temperature Range	T_{stg}	-65 to +150	°C	
Junction Temperature	T_j	+175	°C	
Thermal Resistance, Junction-to-Case	$R_{th(j-c)}$	2.9	°C/W	
Soldering Temperature	T_{sol}	+345	°C	Note 3

1.5.2 Operating Conditions

Device performance beyond the operating conditions specified below is not guaranteed.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Supply Voltage	V_{DD} V_{CC}	1.65 to 1.95 3 to 3.6	V	Notes 1, 2
I/O Input Voltage Range	V_{IN}	-0.3 to 2.25	V	Note 2
Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
Storage Temperature Range	T_{stg}	25 ±5	°C	Note 4

1.5.3 Notes to Maximum Ratings and Operating Conditions

- V_{DD} is for Core. V_{CC} is for I/O.
- With reference to $V_{SS} = 0V$.
- Duration 10 seconds maximum at a distance of not less than 1.6 mm from the device body and the same terminal shall not be re-soldered until 3 minutes have elapsed.
- Storage conditions as follows: 20 to 60% RH, dust free, original packing.

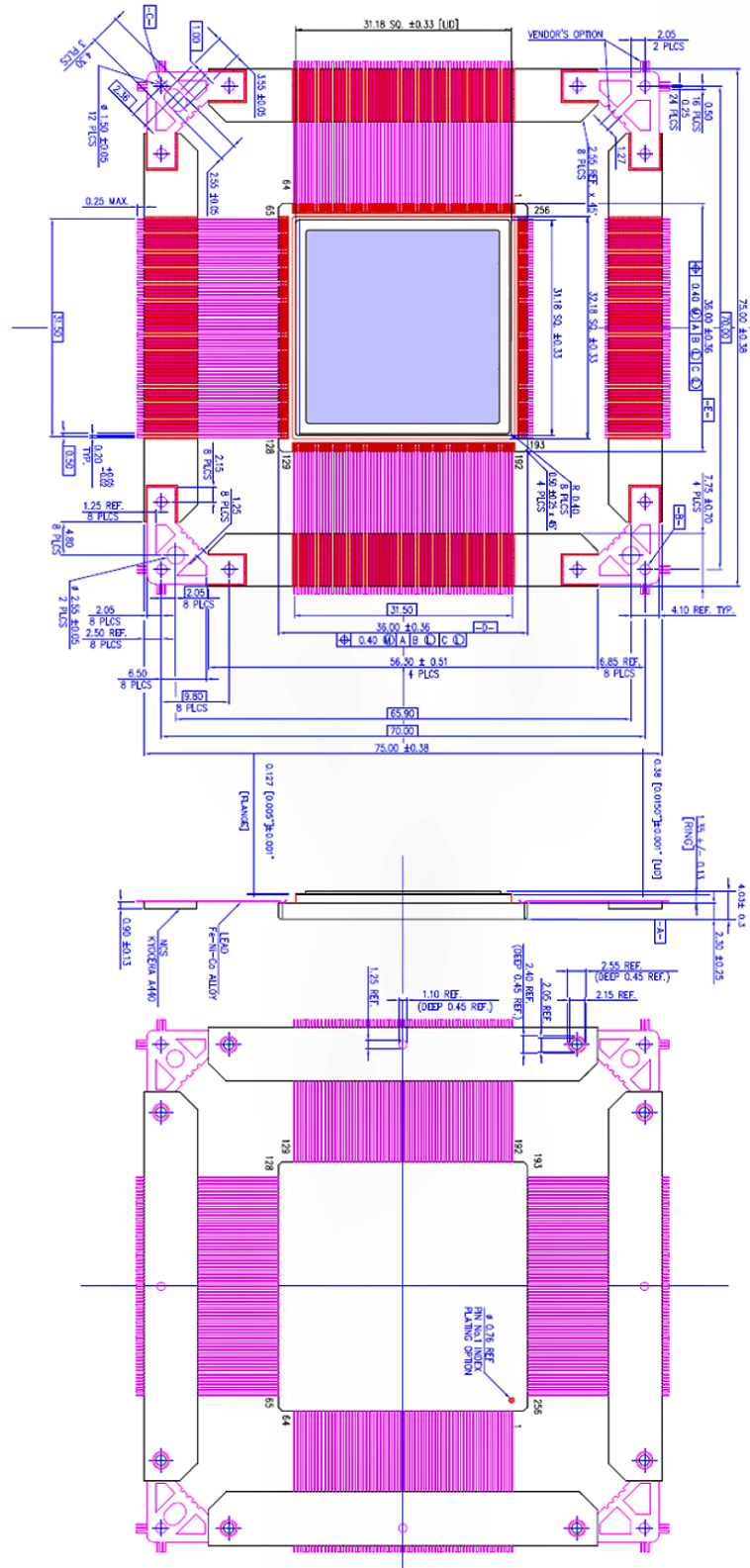
1.6 HANDLING PRECAUTIONS

These devices are susceptible to damage by electrostatic discharge. Therefore, suitable precautions shall be employed for protection during all phases of manufacture, testing, packaging, shipment and any handling.

These components are categorised as Class 1 per ESCC Basic Specification No. 23800 with a Minimum Critical Path Failure Voltage of < 250 Volts.

1.7 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

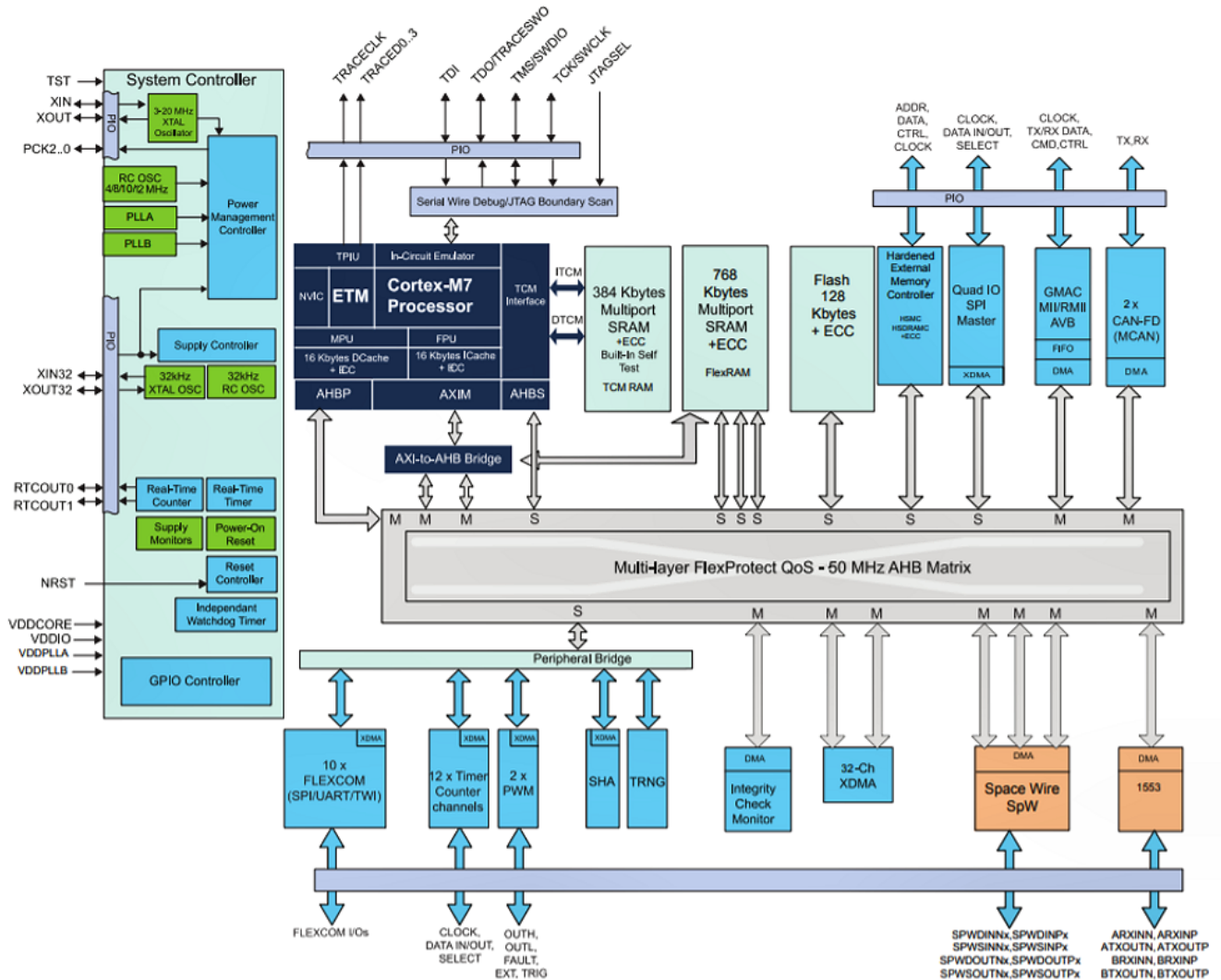
Ceramic Quad Flat Package (CQFP-256) –256 Tied Leads



NOTES:

1. Terminal identification is specified by reference to the index mark.

1.8 FUNCTIONAL DIAGRAM



1.9

PIN ASSIGNMENT

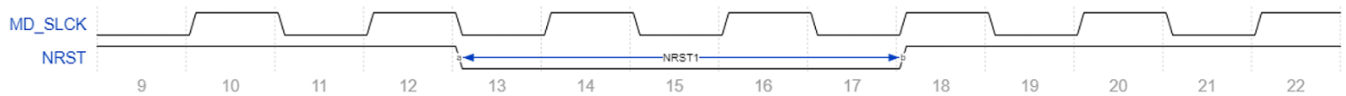
Pin	Signal	On Package Power	State (Pull in Pad)	Pin	Signal	On Package Power	State (Pull in Pad)
1	GNDCORE	GNDCORE	GND	129	GNDCORE	GNDCORE	
2	VDDCORE	VDDCORE	PWR	130	VDDCORE	VDDCORE	
3	PF29	VDDIO	input, pull-up	131	PC26	VDDIO	input, pull-up
4	PF30	VDDIO	input, pull-up	132	PC27	VDDIO	input, pull-up
5	ATXOUTN	VDDIO	output	133	PC28	VDDIO	input, pull-up
6	ATXOUTP	VDDIO	output	134	PC29	VDDIO	input
7	ARXINN	VDDIO	input	135	PC30	VDDIO	input
8	ARXINP	VDDIO	input	136	PC31	VDDIO	input
9	PA0	VDDIO	input, pull-up	137	PE12	VDDIO	input
10	PA1	VDDIO	input, pull-up	138	PE11	VDDIO	input
11	PA2	VDDIO	input, pull-up	139	PE10	VDDIO	input
12	PA3	VDDIO	input, pull-up	140	PE9	VDDIO	input
13	PA4	VDDIO	input, pull-up	141	PE8	VDDIO	input
14	PA5	VDDIO	input, pull-up	142	PE7	VDDIO	input
15	PA6	VDDIO	input, pull-up	143	PE6	VDDIO	input
16	PA7	VDDIO	input, pull-up	144	PE5	VDDIO	input
17	PA8	VDDIO	input, pull-up	145	PE4	VDDIO	input
18	PA9	VDDIO	input, pull-up	146	PE3	VDDIO	input
19	PA10	VDDIO	input, pull-up	147	PE2	VDDIO	input
20	PA11	VDDIO	input, pull-up	148	PE1	VDDIO	input
21	PA12	VDDIO	input, pull-up	149	PE0	VDDIO	input
22	PA13	VDDIO	output	150	PF0	VDDIO	input, pull-up
23	TST	VDDIO	input, pull-down	151	PF1	VDDIO	input, pull-up
24	JTAGSEL	VDDIO	input, pull-down	152	PF2	VDDIO	input, pull-up
25	NMIC_NMI	VDDIO	input, pull-up	153	PF3	VDDIO	input, pull-up
26	PA16	VDDIO	input	154	PF4	VDDIO	input, pull-up
27	PA17	VDDIO	input	155	PF5	VDDIO	input, pull-up
28	NRST	VDDIO	input, pull-up	156	PF6	VDDIO	input, pull-up
29	PA19	VDDIO	input, pull-up	157	PF7	VDDIO	input, pull-up
30	PA20	VDDIO	input, pull-up	158	PF8	VDDIO	input, pull-up
31	PA21	VDDIO	input, pull-up	159	PF9	VDDIO	input, pull-up
32	VDDIO	VDDIO		160	VDDIO	VDDIO	
33	GNDIO	GNDIO		161	GNDIO	GNDIO	
34	PA22	VDDIO	input, pull-up	162	PF10	VDDIO	input, pull-up
35	PA23	VDDIO	input, pull-up	163	PD0	VDDIO	input
36	PA24	VDDIO	input, pull-up	164	PD1	VDDIO	input

Pin	Signal	On Package Power	State (Pull in Pad)	Pin	Signal	On Package Power	State (Pull in Pad)
37	PA25	VDDIO	input, pull-up	165	PD2	VDDIO	input
38	PA26	VDDIO	input, pull-up	166	PD3	VDDIO	input
39	PA27	VDDIO	input, pull-up	167	PD4	VDDIO	input
40	PA28	VDDIO	input, pull-up	168	PD5	VDDIO	input
41	SPWDINP1	VDDIO	input	169	PD6	VDDIO	input
42	SPWDINN1	VDDIO	input	170	PD7	VDDIO	input
43	SPWDOUTP1	VDDIO	output	171	PD8	VDDIO	input
44	SPWDOUTN1	VDDIO	output	172	PD9	VDDIO	input
45	SPWREF1	VDDIO	input	173	PD10	VDDIO	input
46	SPWSOUTP1	VDDIO	output	174	PD11	VDDIO	input
47	SPWSOUTN1	VDDIO	output	175	PD12	VDDIO	input
48	SPWSINP1	VDDIO	input	176	PD13	VDDIO	input
49	SPWSINN1	VDDIO	input	177	PD14	VDDIO	input
50	SPWDINP0	VDDIO	input	178	PD15	VDDIO	input
51	SPWDINN0	VDDIO	input	179	PD16	VDDIO	input
52	SPWDOUTP0	VDDIO	output	180	PD17	VDDIO	input
53	SPWDOUTN0	VDDIO	output	181	PD18	VDDIO	input
54	SPWREF0	VDDIO	input	182	PD19	VDDIO	input
55	SPWSOUTP0	VDDIO	output	183	PD20	VDDIO	input
56	SPWSOUTN0	VDDIO	output	184	PD21	VDDIO	input
57	SPWSINP0	VDDIO	input	185	PD22	VDDIO	input
58	SPWSINN0	VDDIO	input	186	PD23	VDDIO	input
59	PB0	VDDIO	input, pull-up	187	PD24	VDDIO	input
60	PB1	VDDIO	input, pull-up	188	PD25	VDDIO	input
61	PB2	VDDIO	input, pull-up	189	PD26	VDDIO	input
62	PB3	VDDIO	output, pull-up	190	PD27	VDDIO	input
63	VDDCORE	VDDCORE		191	VDDCORE	VDDCORE	
64	GNDCORE	GNDCORE		192	GNDCORE	GNDCORE	
65	GNDCORE	GNDCORE		193	GNDCORE	GNDCORE	
66	VDDCORE	VDDCORE		194	VDDCORE	VDDCORE	
67	PB4	VDDIO	input, pull-up	195	PD28	VDDIO	input
68	PB5	VDDIO	input, pull-up	196	PD29	VDDIO	input
69	PB6	VDDIO	input, pull-up	197	PD30	VDDIO	input
70	PB7	VDDIO	input, pull-up	198	PD31	VDDIO	input
71	PB8	VDDIO	input, pull-up	199	PG0	VDDIO	output
72	PB9	VDDIO	input, pull-up	200	PG1	VDDIO	output
73	PB10	VDDIO	input, pull-up	201	PG2	VDDIO	output

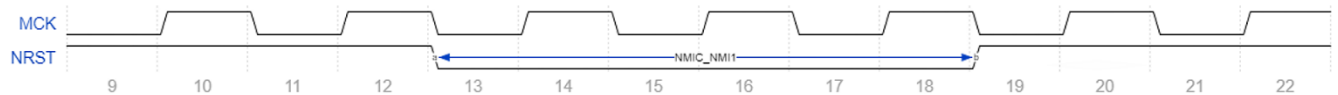
Pin	Signal	On Package Power	State (Pull in Pad)	Pin	Signal	On Package Power	State (Pull in Pad)
74	PB11	VDDIO	input, pull-up	202	PG3	VDDIO	output
75	PB12	VDDIO	input, pull-up	203	PG4	VDDIO	output
76	PB13	VDDIO	input, pull-up	204	PG5	VDDIO	output
77	PB14	VDDIO	input, pull-up	205	PG6	VDDIO	output
78	PB15	VDDIO	input, pull-up	206	PG7	VDDIO	output
79	PB16	VDDIO	output	207	PG8	VDDIO	output
80	XOUT	VDDIO	output	208	PG9	VDDIO	output
81	XIN	VDDIO	input	209	PG10	VDDIO	output
82	VDD18_PLLA	VDDPLLA		210	PG11	VDDIO	output
83	GND_PLLA	GNDPLLA		211	PG12	VDDIO	output
84	GND_PLLB	GNDPLLB		212	PG13	VDDIO	output
85	VDD18_PLLB	VDDPLLB		213	PG14	VDDIO	output
86	PB17	VDDIO	input, pull-up	214	PG15	VDDIO	output
87	PB18	VDDIO	input, pull-up	215	PG16	VDDIO	output
88	PB19	VDDIO	input, pull-up	216	PG17	VDDIO	output
89	PB20	VDDIO	input, pull-up	217	PG18	VDDIO	output
90	PB21	VDDIO	input, pull-up	218	PG19	VDDIO	output
91	PB22	VDDIO	input, pull-up	219	PG20	VDDIO	output
92	PB23	VDDIO	input, pull-up	220	PG21	VDDIO	output
93	PB24	VDDIO	input, pull-up	221	PG22	VDDIO	output
94	PB25	VDDIO	input, pull-up	222	PG23	VDDIO	output
95	PB26	VDDIO	input, pull-up	223	PG24	VDDIO	input
96	VDDIO	VDDIO		224	VDDIO	VDDIO	
97	GNDIO	GNDIO		225	GNDIO	GNDIO	
98	PB27	VDDIO	input, pull-up	226	PG25	VDDIO	input
99	PB28	VDDIO	input, pull-up	227	PG26	VDDIO	input
100	PB29	VDDIO	input, pull-up	228	PG27	VDDIO	input
101	PC0	VDDIO	input, pull-up	229	XOUT32	VDDIO	output
102	PC1	VDDIO	input, pull-up	230	XIN32	VDDIO	input
103	PC2	VDDIO	input, pull-up	231	PG30	VDDIO	input, pull-up
104	PC3	VDDIO	input, pull-up	232	PG31	VDDIO	input, pull-up
105	PC4	VDDIO	input, pull-up	233	PF11	VDDIO	output
106	PC5	VDDIO	input, pull-up	234	PF12	VDDIO	input, pull-up
107	PC6	VDDIO	input, pull-up	235	PF13	VDDIO	input, pull-up
108	PC7	VDDIO	input, pull-up	236	PF14	VDDIO	input, pull-up
109	PC8	VDDIO	input, pull-up	237	PF15	VDDIO	input, pull-up
110	PC9	VDDIO	input, pull-up	238	PF16	VDDIO	input, pull-up

Pin	Signal	On Package Power	State (Pull in Pad)	Pin	Signal	On Package Power	State (Pull in Pad)
111	PC10	VDDIO	input, pull-up	239	PF17	VDDIO	output
112	PC11	VDDIO	input, pull-up	240	PF18	VDDIO	output
113	PC12	VDDIO	input, pull-up	241	PF19	VDDIO	output
114	PC13	VDDIO	input, pull-up	242	PF20	VDDIO	output
115	PC14	VDDIO	input, pull-up	243	PF21	VDDIO	output
116	PC15	VDDIO	input, pull-up	244	PF22	VDDIO	output
117	PC16	VDDIO	input, pull-up	245	PF23	VDDIO	output
118	PC17	VDDIO	input, pull-up	246	PF24	VDDIO	input, pull-up
119	PC18	VDDIO	input, pull-up	247	PF25	VDDIO	output
120	PC19	VDDIO	input, pull-up	248	BTXOUTN	VDDIO	output
121	PC20	VDDIO	input, pull-up	249	BTXOUTP	VDDIO	output
122	PC21	VDDIO	input, pull-up	250	BRXINN	VDDIO	input
123	PC22	VDDIO	input, pull-up	251	BRXINP	VDDIO	input
124	PC23	VDDIO	input, pull-up	252	PF26	VDDIO	input, pull-up
125	PC24	VDDIO	input, pull-up	253	PF27	VDDIO	input, pull-up
126	PC25	VDDIO	input, pull-up	254	PF28	VDDIO	input, pull-up
127	VDDCORE	VDDCORE		255	VDDCORE	VDDCORE	
128	GNDCORE	GNDCORE		256	GNDCORE	GNDCORE	

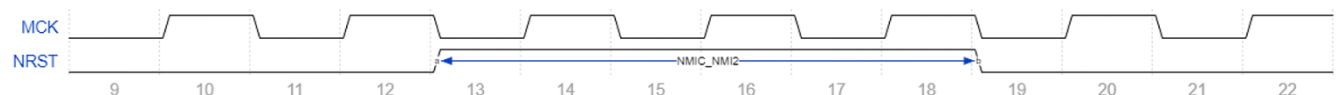
1.10 INSTRUCTION SET AND TIMING DIAGRAMS



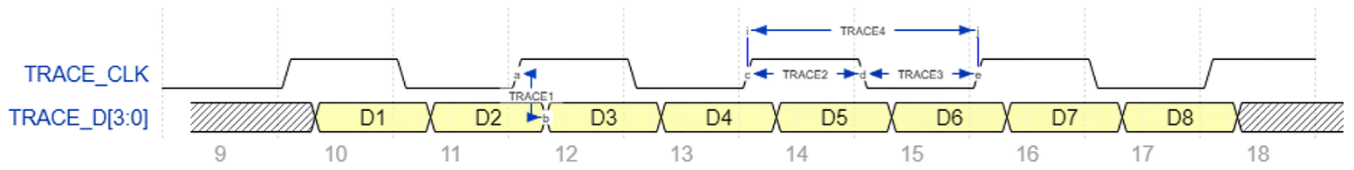
NRST Characteristics



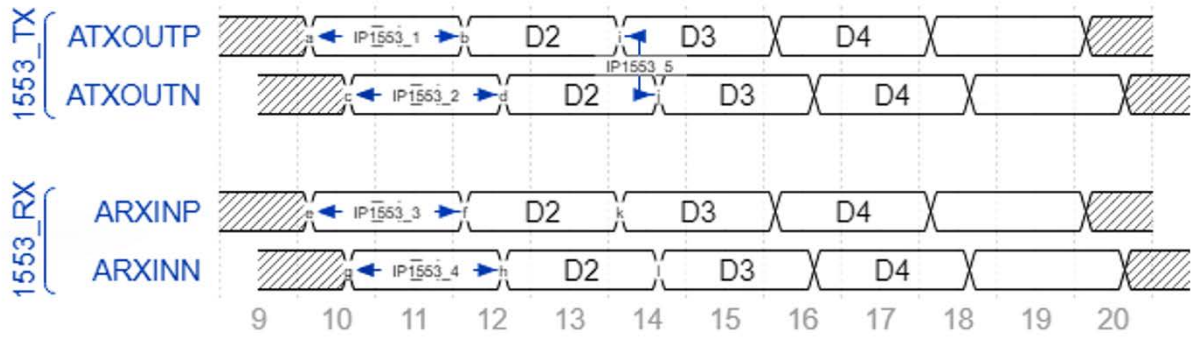
NMIC_NMI Characteristics (Active Level Low)



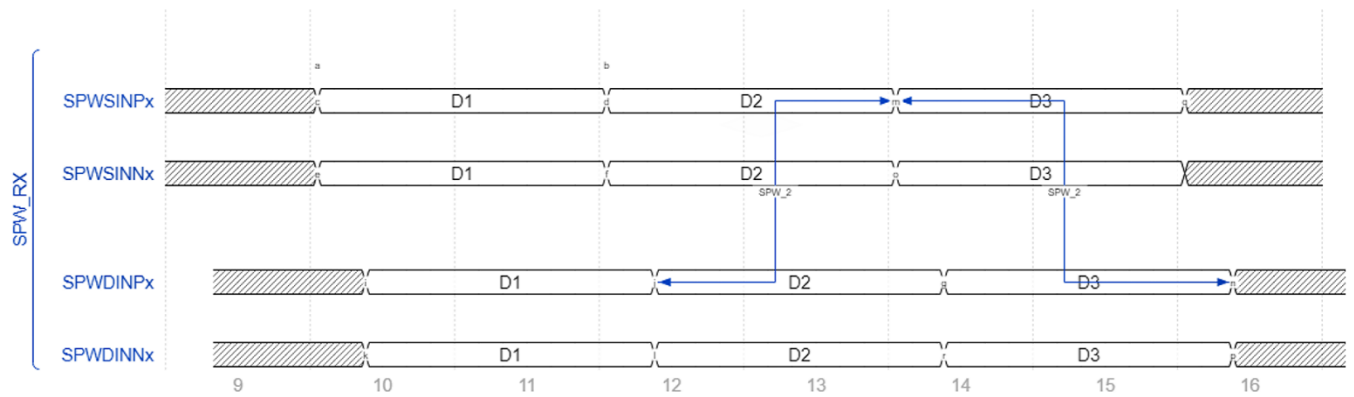
NMIC_NMI Characteristics (Active Level High)



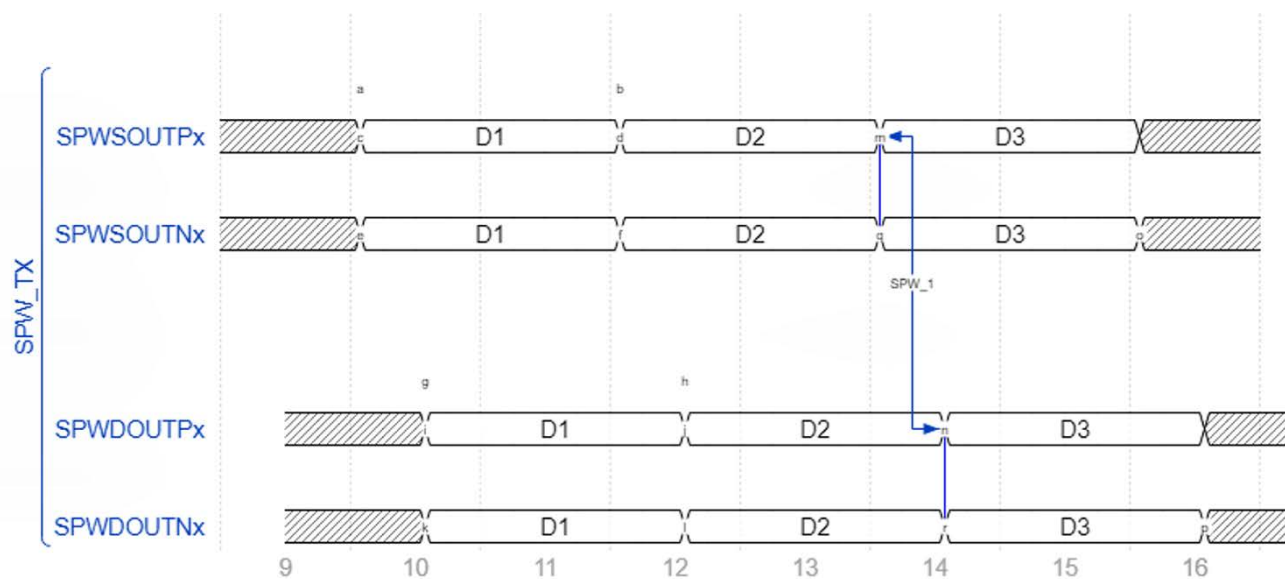
TRACE Characteristics



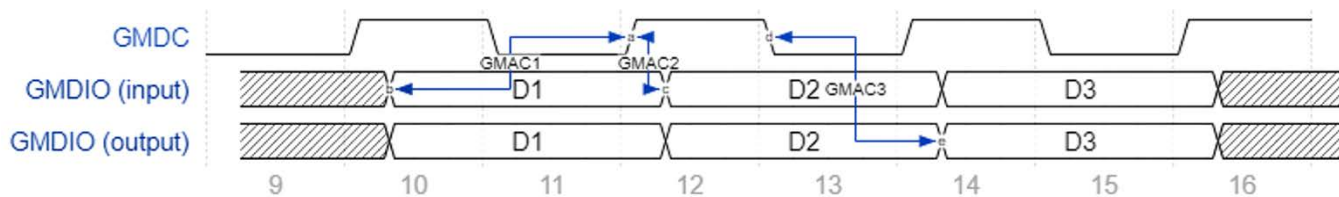
1553 Characteristics



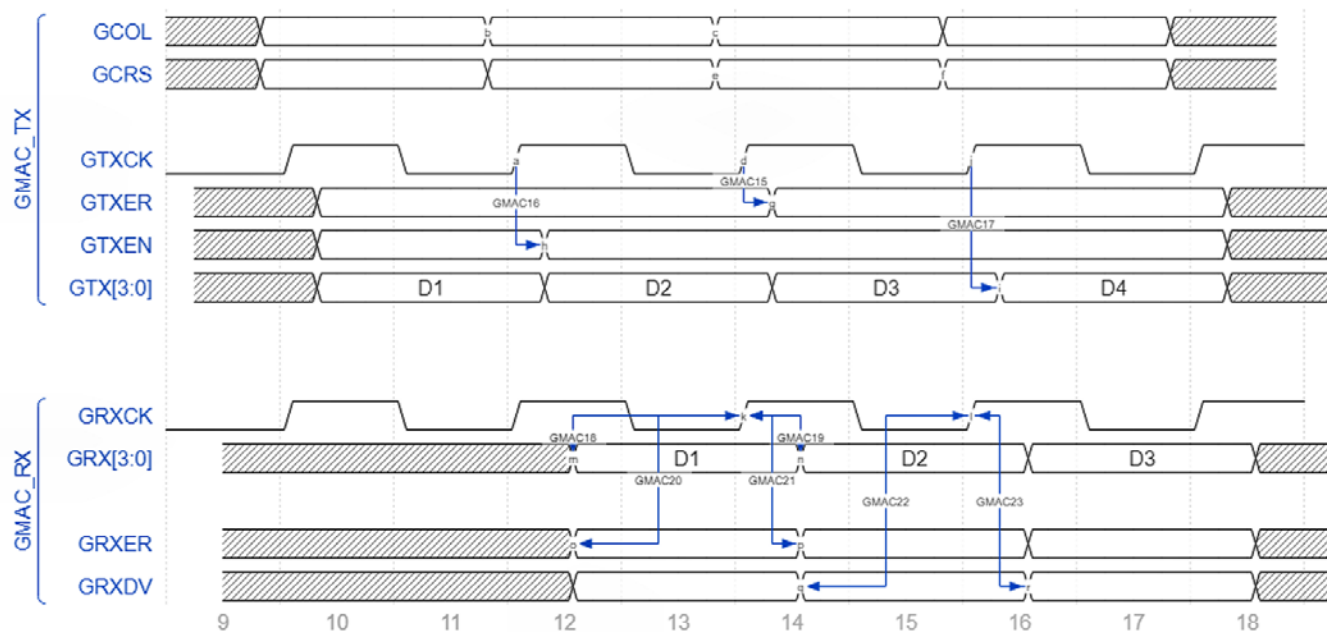
SPW RX Characteristics



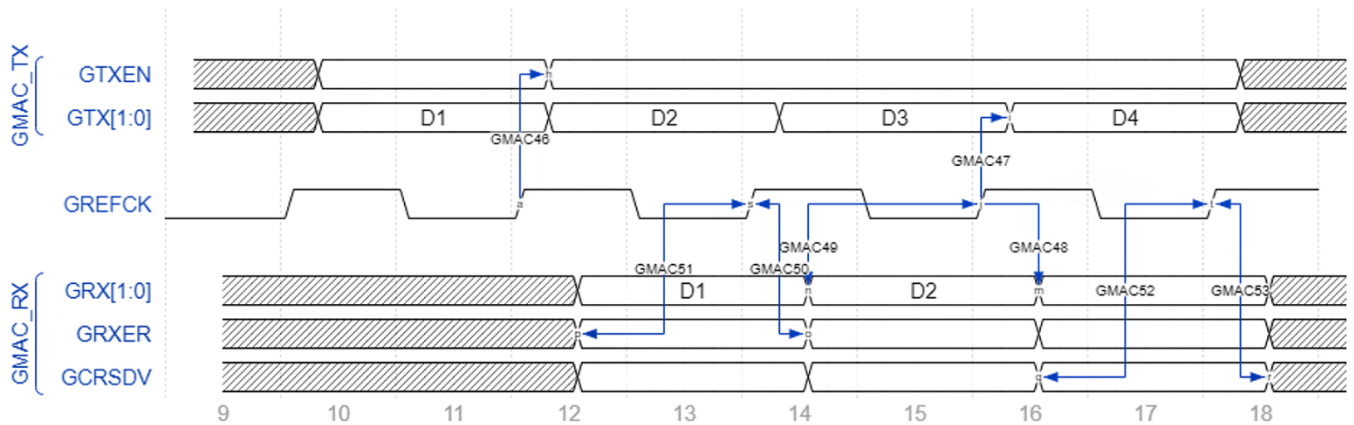
SPW TX Characteristics



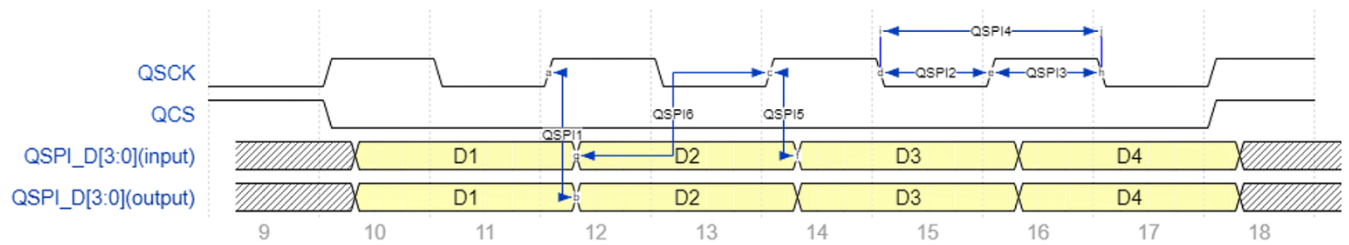
GMAC MDIO/MDC Characteristics



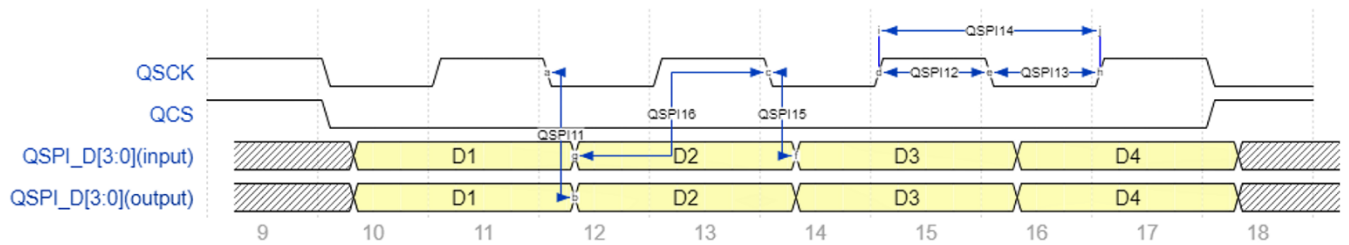
GMAC MII Characteristics



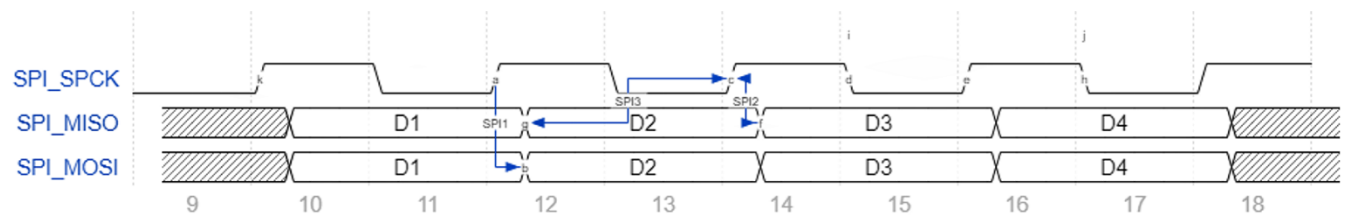
GMAC RMI Characteristics



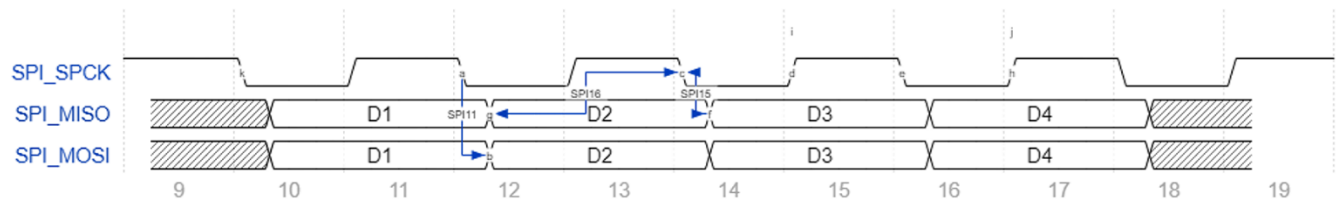
QSPI Master Mode (CPOL=0 and NCPHA=0) or (CPOL=1 and NCPHA=1)



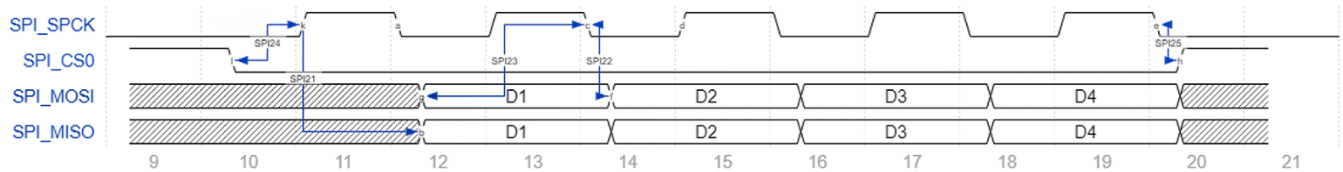
QSPI Master Mode (CPOL=0 and NCPHA=1) or (CPOL=1 and NCPHA=0)



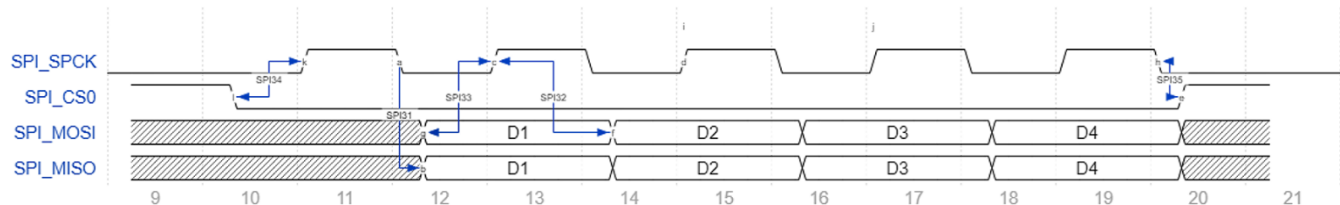
FlexCOM SPI Characteristics Master Mode (CPOL=0 and NCPHA=0) or (CPOL=1 and NCPHA=1)



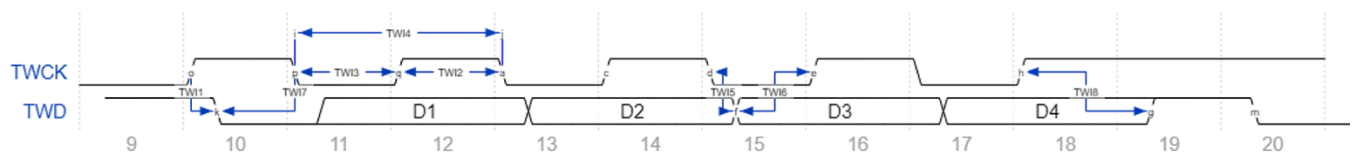
FlexCOM SPI Characteristics Master Mode (CPOL=0 and NCPHA=1) or (CPOL=1 and NCPHA=0)



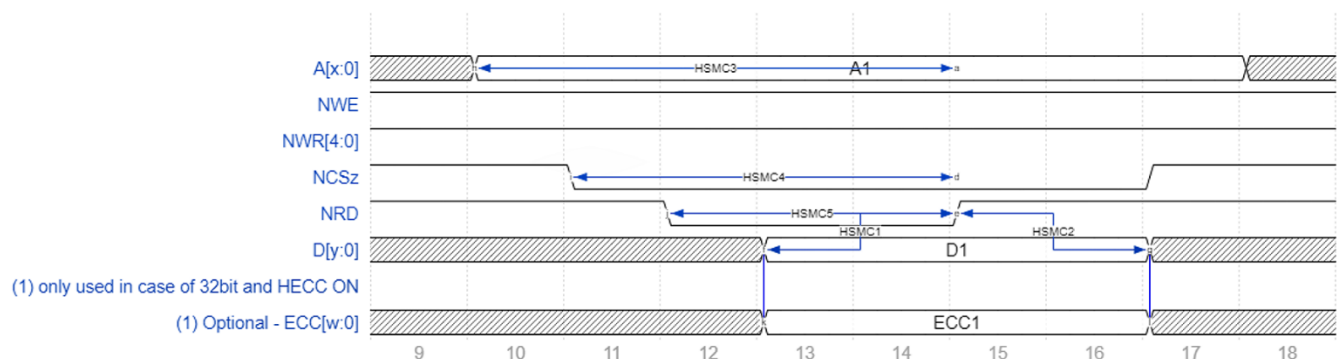
FlexCOM SPI Characteristics Slave Mode (CPOL=0 and NCPHA=0) or (CPOL=1 and NCPHA=1)



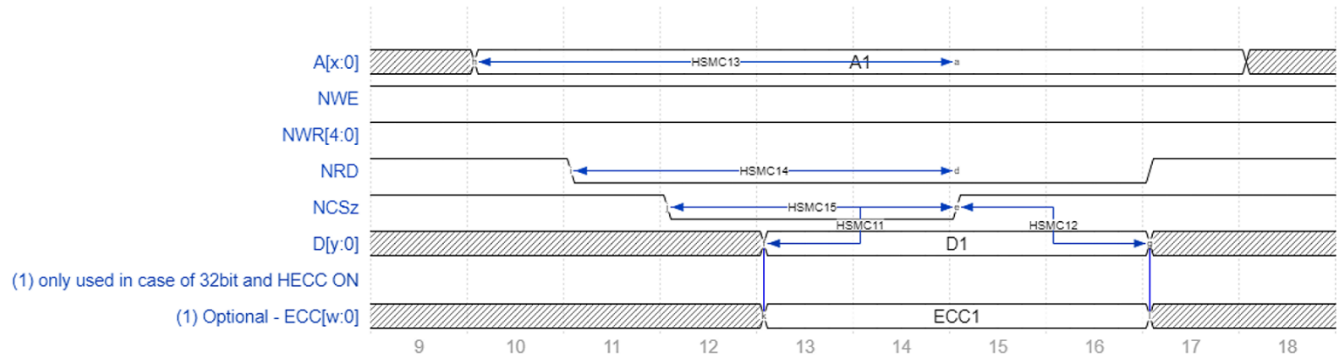
FlexCOM SPI Characteristics Slave Mode (CPOL=0 and NCPHA=1) or (CPOL=1 and NCPHA=0)



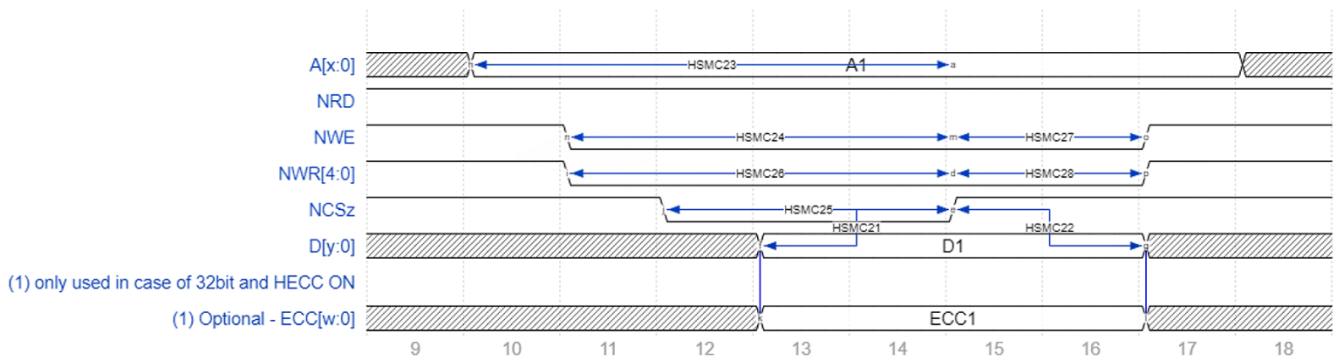
FlexCOM TWI Characteristics



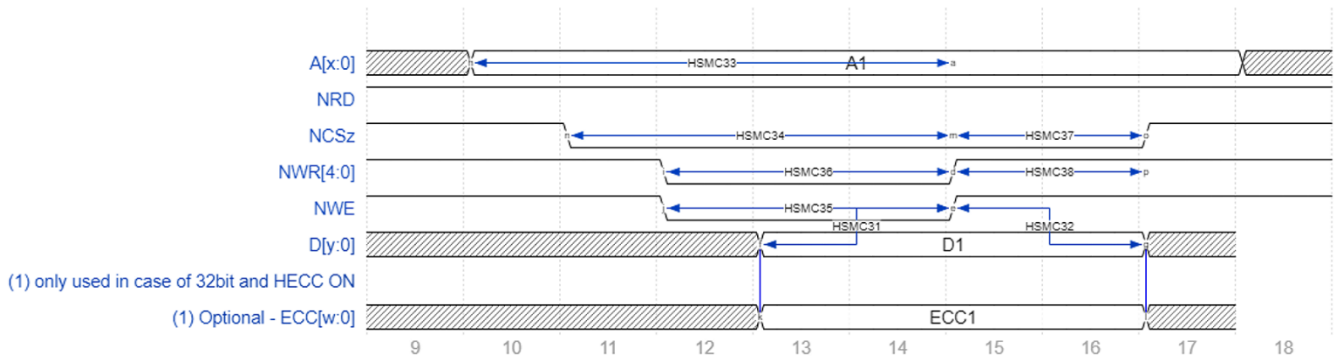
HEMC-HSMC Read Data in NRD Controlled Mode



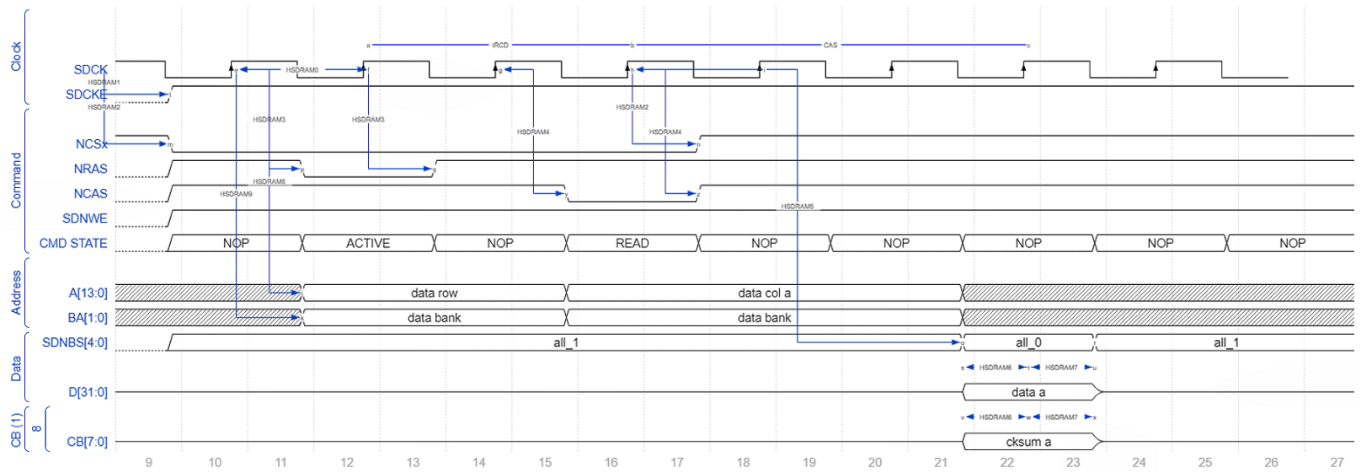
HEMC-HSMC Read Data in NCS Controlled Mode



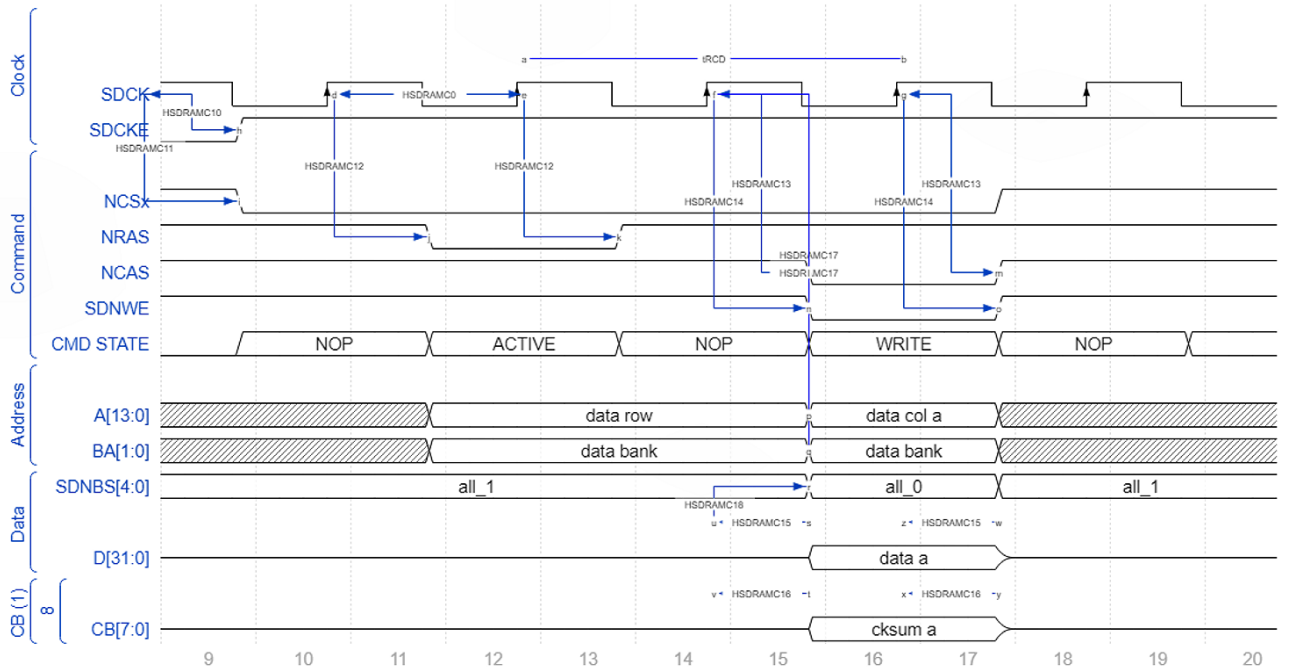
HEMC-HSMC Write Data in NCS Controlled Mode



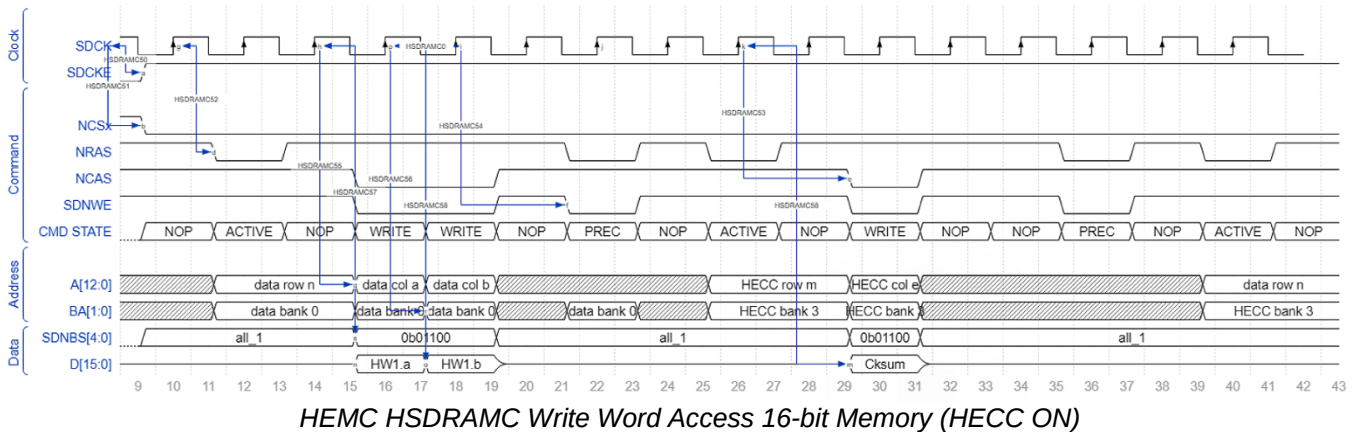
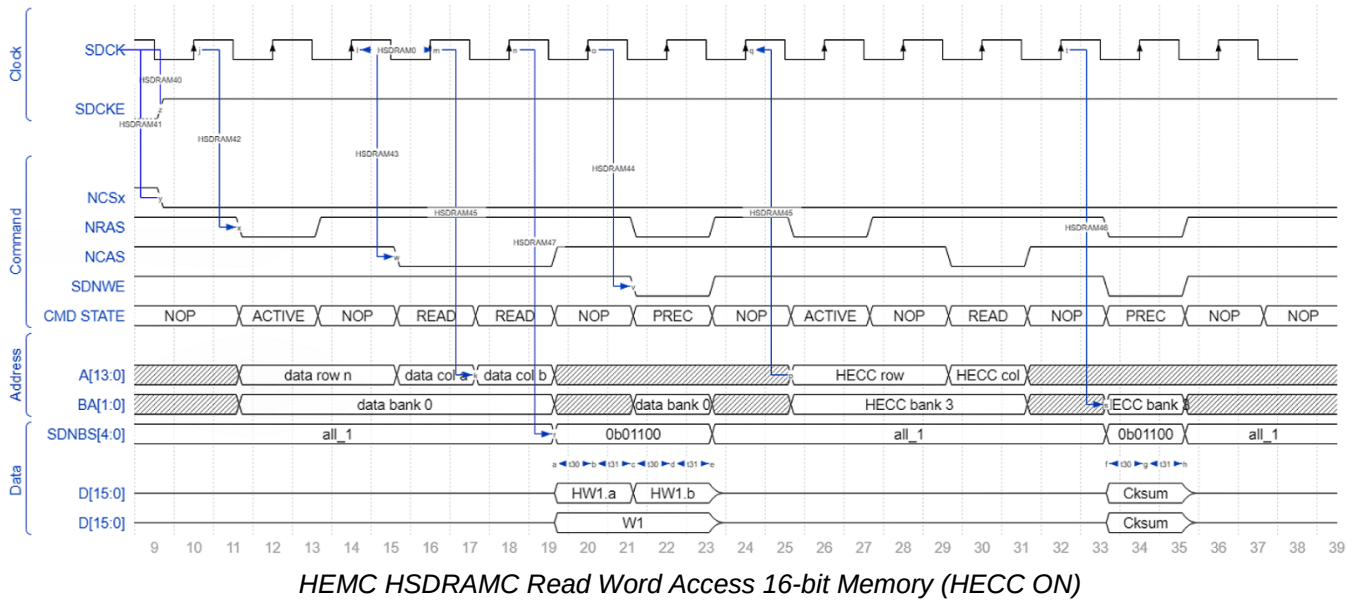
HEMC-HSMC Write Data in NWE Controlled Mode



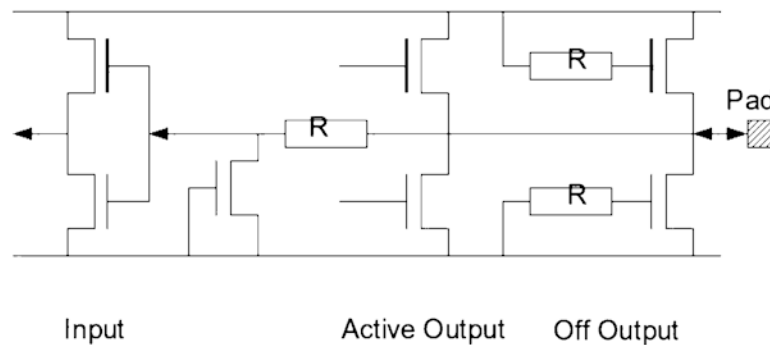
HEMC HSDRAMC Read Word Access 32-bit Memory (HECC ON/OFF)



HEMC HSDRAMC Write Word Access 32-bit Memory (HECC ON/OFF)



1.11 PROTECTION NETWORK



NOTES:

1. The ratio of Active Output to Off Output determines the output strength.
2. Resistors R are approximately 400Ω each.

2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirements and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

None.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and as follows.

The information to be marked on the component shall be:

- (a) Terminal identification (see Para. 1.7).
- (b) The ESCC qualified components symbol (for ESCC qualified component only).
- (c) The ESCC Component Number (see Para. 1.4.1).
- (d) Traceability information.

2.3 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures.

2.3.1 Room Temperature Electrical Measurements

The measurements shall be performed at $T_{case} = +25(+3 -5)^{\circ}C$.

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions $1.65V < V_{DD} < 1.95V$ $3V < V_{CC} < 3.6V$ (Note 1)	Limits		Units
				Min	Max	
Functional Tests (Min.)	-	3014	$V_{DD} = 1.65V$ $V_{CC} = 3V$ $V_{IH} = V_{DD}$ $V_{IL} = V_{SS}$	-	-	-
Functional Tests (Typ.)	-	3014	$V_{DD} = 1.8V$ $V_{CC} = 3.3V$ $V_{IH} = V_{DD}$ $V_{IL} = V_{SS}$	-	-	-
Functional Tests (Max.)	-	3014	$V_{DD} = 1.95V$ $V_{CC} = 3.6V$ $V_{IH} = V_{DD}$ $V_{IL} = V_{SS}$	-	-	-
Low Level Input Voltage	V_{IL}	-	CMOS buffers (Note 2)	-	700	mV

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
High Level Input Voltage	V _{IH}	-	CMOS buffers (Note 2)	2	-	V
Low Level Output Voltage	V _{OL}	3007	CMOS buffers I _{OL} = 2, 4, 8, 16, 24, 32, 40, 48mA	-	400	mV
High Level Output Voltage	V _{OH}	3006	CMOS buffers I _{OH} = -2, -4, -8, -16, -24, -32, -40, -48mA	V _{CC} -0.4	-	V
Low Level Input Current (General case, excepts pads: PA0/1/6/7/12/13/16/17)	I _{OZL}	3009	CMOS buffers V _{IN} = V _{SS}	-1	1	μA
Low Level Input Current (Case of pads: PA0/1/6/7/12/13/16/17)	I _{OZL2}	3009	CMOS buffers V _{IN} = V _{SS}	-3	3	μA
Low Level Input Current with Pull-down	I _{OZLPD}	3009	CMOS buffers V _{IN} = V _{SS}	-3	3	μA
Low Level Input Current with Pull-up	I _{OZLPU}	3009	CMOS buffers V _{IN} = V _{SS}	-480	-160	μA
High Level Input Current (General case, except pads: PA0/1/6/7/12/13/16/17)	I _{OZH}	3010	CMOS buffers V _{IN} = V _{CC} max	-1	1	μA
High Level Input Current (Case of pads: PA0/1/6/7/12/13/16/17)	I _{OZH2}	3010	CMOS buffers V _{IN} = V _{CC} max	-3	3	μA
High Level Input Current with Pull-up	I _{OZHPU}	3010	CMOS buffers V _{IN} = V _{CC} max	-3	3	μA
High Level Input Current with Pull-down	I _{OZHPD}	3010	CMOS buffers V _{IN} = V _{CC} max	237	723	μA
ColdSparing (General case, except pads: PA0/6/12/16)	CS	3010	CMOS buffers V _{IN} = V _{CC} max (Note 3)	-1	1	μA
ColdSparing (Case of pads: PA0/6/12/16)	CS2	3010	CMOS buffers V _{IN} = V _{CC} max (Note 3)	-5	5	μA
LVDS Differential Output Voltage	V _{ODTX}	3006 3007		247	454	mV
LVDS Difference of Magnitude of VOD for opposite binary state	DV _{ODTX}	3006 3007		-	50	mV
LVDS Offset Voltage	V _{OSTX}	3006 3007		1.125	1.375	V
LVDS Difference of Magnitude of VOS for opposite binary state	DV _{OSTX}	3006 3007		-	50	mV

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
Array Stand-by Current	I _{CCSBA}	3005	V _{DD} max Output = 0mA (Note 4)	-	50	mA
Array Operating Current	I _{CCOP}	3005	V _{DD} max V _{CC} max Processor clock = 100MHz System clock = 50MHz	-	1.9	A
Input Pin Capacitance	C _{I33}	3012	CMOS buffers (Note 5)	-	7	pF
Operating Period RC 32kHz	t _{OSC}	3003	(Note 6)	25	41.6	μs
Operating Period after calibration RC 4MHz	t _{ACC4}	3003	(Note 6)	227.3	277.7	ns
Operating Period after calibration RC 8MHz	t _{ACC8}	3003	(Note 6)	113.7	138.9	ns
Operating Period after calibration RC 10MHz	t _{ACC10}	3003	(Note 6)	90.9	111.1	ns
Operating Period after calibration RC 12MHz	t _{ACC12}	3003	(Note 6)	75.8	92.6	ns
Processor TimeCoef (CoreMark with TCM)	t _{MCUCM}	3003	(Notes 6, 20)	-	1	-
Processor TimeCoef (Drhystone with FlexRAM)	t _{MCUDR}	3003	(Notes 6, 20)	-	1	-
NRST Timings						
NRST Reset Low Pulse Width	t _{NRST1}	3003	(Note 5)	10	-	ns
NMIC_NMI Timings						
NMIC_NMI Pulse Width (Active Low)	t _{NMIC_NMI1}	3003	(Notes 5, 11, 12)	If GFEN=1: 2 ^{GFSEL} If GFEN=0: 10	-	GCK ns
NMIC_NMI Pulse Width (Active High)	t _{NMIC_NMI2}	3003	(Notes 5, 11, 12)	If GFEN=1: 2 ^{GFSEL} If GFEN=0: 10	-	GCK ns
TRACE Timings						
Output delay for TRACE_Dx, from TRACE_CLK rising or falling (DDR)	t _{TRACE1}	3003	(Notes 5, 7, 8, 10)	-3.0 +0.48*(Cdata - Cclk) / Drive	1.7 +0.48*(Cdata - Cclk) / Drive	ns
TRACE_CLK High level	t _{TRACE2}	3003	(Notes 5, 13)	1	-	HCLK High level

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
TRACE_CLK Low level	t _{TRACE3}	3003	(Notes 5, 13)	1	-	HCLK Low level
TRACE_CLK Period	t _{TRACE4}	3003	(Notes 5, 13)	2	-	HCLK period
1553 Timings						
1553 Period Data for b. *TXOUTP c. *TXOUTN d. *RXINP *RXINN	t _{IP1553_1} t _{IP1553_2} t _{IP1553_3} t _{IP1553_4}	3003	(Note 5)	1000 (Typical)	-	ns
1553 Delay (*TXOUTP / *TXOUTN)	t _{IP1553_5}	3003	(Note 5)	-	6	ns
SPW Timings						
SPW_TX Data Strobe Output Skew	t _{SPW_1}	3003	(Note 5)	-	1.17	ns
SPW_RX Data Strobe Input Edge Separation	t _{SPW_2}	3003	(Note 5)	2.15	-	ns
GMAC MDIO/MDC Timings						
Setup time for GMDIO, from GMDC rising	t _{GMAC1}	3003	(Notes 5, 7, 10)	24.8 +0.48*(5.6+ Cgmdc) / Drive	-	ns
Hold time for GMDIO, from GMDC rising	t _{GMAC2}	3003	(Note 5)	0	-	ns
Output delay for GMDIO, from GMDC rising	t _{GMAC3}	3003	(Notes 5, 7, 10)	-1.0 +0.48*(Cmdio - Cgmdc) / Drive	7.8 +0.48*(Cmdio - Cgmdc) / Drive	ns
GMAC MII Timings						
Output delay for GTXER, from GTXCK rising	t _{GMAC15}	3003	(Notes 5, 7, 10)	0	21.4 +0.48*(0.56+ Cgtxer) / Drive Value should not exceed 25	ns
Output delay for GTXEN, from GTXCK rising	t _{GMAC16}	3003	(Notes 5, 7, 10)	0	21.4 +0.48*(0.56+ Cgtxen) / Drive Value should not exceed 25	ns
Output delay for GTX[3:0], from GTXCK rising	t _{GMAC17}	3003	(Notes 5, 7, 10)	0	21.4 +0.48*(0.56+ Cgtx) / Drive Value should not exceed 25	ns
Setup time for GRX[3:0], from GRXCK rising	t _{GMAC18}	3003	(Note 5)	1.8	-	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
Hold time for GRX[3:0], from GRXCK rising	t _{GMAC19}	3003	(Note 5)	9.6	-	ns
Setup time for GRXER, from GRXCK rising	t _{GMAC20}	3003	(Note 5)	1.8	-	ns
Hold time for GRXER, from GRXCK rising	t _{GMAC21}	3003	(Note 5)	9.6	-	ns
Setup time for GRXD _V , from GRXCK rising	t _{GMAC22}	3003	(Note 5)	1.8	-	ns
Hold time for GRXD _V , from GRXCK rising	t _{GMAC23}	3003	(Note 5)	9.6	-	ns
GMAC RMII Timings						
Output delay for GT _{XEN} , from GRE _{FCK} rising	t _{GMAC46}	3003	(Notes 5, 7, 10)	2	15.1 +0.48*(0.56+ Cgt _{xen}) / Drive Value should not exceed 16	ns
Output delay for GT _X [1:0], from GRE _{FCK} rising	t _{GMAC47}	3003	(Notes 5, 7, 10)	2	15.1 +0.48*(0.56+ Cgt _x) / Drive Value should not exceed 16	ns
Hold time for GRX[1:0], from GRE _{FCK} rising	t _{GMAC48}	3003	(Note 5)	2	-	ns
Setup time for GRX[1:0], from GRE _{FCK} rising	t _{GMAC49}	3003	(Note 5)	4	-	ns
Hold time for GRXER, from GRE _{FCK} rising	t _{GMAC50}	3003	(Note 5)	2	-	ns
Setup time for GRXER, from GRE _{FCK} rising	t _{GMAC51}	3003	(Note 5)	4	-	ns
Setup time for GCRSD _V , from GRE _{FCK} rising	t _{GMAC52}	3003	(Note 5)	4	-	ns
Hold time for GCRSD _V , from GRE _{FCK} rising	t _{GMAC53}	3003	(Note 5)	2	-	ns
QSPI Master Mode (with CPOL=NCPHA) Timings						
Output delay for QSPI_D[3:0], from Q _{SCK} rising	t _{QSPI1}	3003	(Notes 5, 7, 8, 10)	-0.2 +0.48*(Cdata - Cclk) / Drive	6.5 +0.48*(Cdata - Cclk) / Drive	ns
Q _{SCK} High level	t _{QSPI2}	3003	(Note 5, 14)	0.5	-	MCK
Q _{SCK} Low level	t _{QSPI3}	3003	(Note 5, 14)	0.5	-	MCK
Q _{SCK} Period	t _{QSPI4}	3003	(Note 5, 14)	1	-	MCK
Hold time for QSPI_D[3:0], from Q _{SCK} rising	t _{QSPI5}	3003	(Note 5)	0.2	-	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
Setup time for QSPI_D[3:0], from QSCK rising	t _{QSPI6}	3003	(Note 5)	5.9	-	ns
QSPI Master Mode (with CPOL<>NCPHA) Timings						
Output delay for QSPI_D[3:0], from QSCK falling	t _{QSPI11}	3003	(Notes 5, 7, 8, 10)	-0.8 +0.46*(Cdata - Cclk) / Drive	5.8 +0.46*(Cdata - Cclk) / Drive	ns
QSCK High level	t _{QSPI12}	3003	(Note 5, 14)	0.5	-	MCK
QSCK Low level	t _{QSPI13}	3003	(Note 5, 14)	0.5	-	MCK
QSCK Period	t _{QSPI14}	3003	(Note 5, 14)	1	-	MCK
Hold time for QSPI_D[3:0], from QSCK falling	t _{QSPI15}	3003	(Note 5)	1	-	ns
Setup time for QSPI_D[3:0], from QSCK falling	t _{QSPI16}	3003	(Note 5)	4.8	-	ns
FlexCOM SPI Master Mode (with CPOL=NCPHA) Timings						
Output delay for SPI_MOSI, from SPI_SPCK rising	t _{SPI1}	3003	(Notes 5, 7, 10)	-2.7 +0.48*(Cmosi - Cspck) / Drive	7.6 +0.48*(Cmosi - Cspck) / Drive	ns
Hold time for SPI_MISO, from SPI_SPCK rising	t _{SPI2}	3003	(Note 5)	0	-	ns
Setup time for SPI_MISO, from SPI_SPCK rising	t _{SPI3}	3003	(Notes 5, 7, 10)	26.6 +0.48*(5.6+ Cspck) / Drive	-	ns
FlexCOM SPI Master Mode (with CPOL<>NCPHA) Timings						
Output delay for SPI_MOSI, from SPI_SPCK falling	t _{SPI11}	3003	(Notes 5, 7, 10)	-3.0 +0.48*(Cmosi - Cspck) / Drive	7.2 +0.48*(Cmosi - Cspck) / Drive	ns
Hold time for SPI_MISO, from SPI_SPCK falling	t _{SPI15}	3003	(Note 5)	0	-	ns
Setup time for SPI_MISO, from SPI_SPCK falling	t _{SPI16}	3003	(Notes 5, 7, 10)	26.1 +0.48*(5.6+ Cspck) / Drive	-	ns
FlexCOM SPI Slave Mode (with CPOL=NCPHA) Timings						
Output delay for SPI_MISO, from SPI_SPCK rising	t _{SPI21}	3003	(Notes 5, 7, 10)	7.8 +0.2*(4.1+ Cmiso) / Drive	23.7 +0.48*(5.6+ Cmiso) / Drive	ns
Hold time for SPI_MOSI, from SPI_SPCK falling	t _{SPI22}	3003	(Note 5)	3.7	-	ns
Setup time for SPI_MOSI, from SPI_SPCK falling	t _{SPI23}	3003	(Note 5)	1.8	-	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
Setup time for SPI_CS0, from SPI_SPCK	t _{SPI24}	3003	(Note 5)	4.4	-	ns
Hold time for SPI_CS0, after SPI_SPCK	t _{SPI25}	3003	(Note 5)	3.9	-	ns
FlexCOM SPI Slave Mode (with CPOL<>NCPHA) Timings						
Output delay for SPI_MISO, from SPI_SPCK falling	t _{SPI31}	3003	(Notes 5, 7, 10)	7.5 +0.2*(4.1+ C _{miso}) / Drive	22.7 +0.48*(5.6+ C _{miso}) / Drive	ns
Hold time for SPI_MOSI, from SPI_SPCK rising	t _{SPI32}	3003	(Note 5)	4.9	-	ns
Setup time for SPI_MOSI, from SPI_SPCK rising	t _{SPI33}	3003	(Note 5)	0.7	-	ns
Setup time for SPI_CS0, from SPI_SPCK	t _{SPI34}	3003	(Note 5)	4.4	-	ns
Hold time for SPI_CS0, after SPI_SPCK	t _{SPI35}	3003	(Note 5)	3.9	-	ns
FlexCOM TWI Timings						
Output delay for TWD, from TWCK rising	t _{TWI1}	3003	(Note 5)	t _{TWI2}	-	ns
TWCK Low level	t _{TWI2}	3003	(Notes 5, 14, 15)	[(CLDIV * 2 ^{CKDIV}) +4] * t _{MCK}	-	MCK
TWCK High level	t _{TWI3}	3003	(Notes 5, 14, 15)	[(CHDIV * 2 ^{CKDIV}) +4] * t _{MCK}	-	MCK
TWCK Period	t _{TWI4}	3003	(Notes 5, 14, 15)	[[(CLDIV + CHDIV) * 2 ^{CKDIV}] +8] * t _{MCK}	-	MCK
Hold time for TWD, from TWCK rising	t _{TWI5}	3003	(Notes 5, 14)	0	3*t _{MCK}	ns
Setup time for TWD, from TWCK rising	t _{TWI6}	3003	(Notes 5, 14)	t _{TWI2} - 3*t _{MCK}	-	ns
Output delay for TWD, from TWCK rising	t _{TWI7}	3003	(Note 5)	t _{TWI3}	-	ns
Output delay for TWD, from TWCK rising	t _{TWI8}	3003	(Note 5)	t _{TWI3}	-	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
HEMC HSMC Timings: Read Data in NRD-Controlled Mode						
Setup time for D[y:0] and ECC[w:0], before NRD rising	t _{HSMC1}	3003	(Notes 5, 7, 10)	Hold = 19.0 +0.48*(5.6+ Cnrd) / Drive No Hold = 29.0 +0.48*(5.6+ Cnrd) / Drive	-	ns
Hold time for D[y:0] and ECC[w:0], after NRD rising	t _{HSMC2}	3003	(Note 5)	0	-	ns
A[x:0] valid, before NRD rising	t _{HSMC3}	3003	(Notes 5, 7, 10, 14, 16)	(NRD_SETUP +NRD_PULSE) * t _{MCK} - 12.3 -0.48*(Cnrd- CA[x:0]) / Drive	-	ns
NCSz valid, before NRD rising	t _{HSMC4}	3003	(Notes 5, 7, 10, 14, 16)	(NRD_SETUP +NRD_PULSE -NCS_RD_SETUP) * t _{MCK} - 2.5 -0.48*(Cnrd-Cncs) / Drive	-	ns
NRD Pulse Width	t _{HSMC5}	3003	(Notes 5, 14, 16)	NRD_PULSE * t _{MCK} - 3.0	-	ns
HEMC HSMC Timings: Read Data in NCS-Controlled Mode						
Setup time for D[y:0] and ECC[w:0], before NCSz rising	t _{HSMC11}	3003	(Notes 5, 7, 10)	Hold = 20.0 +0.48*(5.6+Cncs) / Drive No Hold = 30.0 +0.48*(5.6+ Cncs) / Drive	-	ns
Hold time for D[y:0] and ECC[w:0], after NCSz rising	t _{HSMC12}	3003	(Note 5)	0	-	ns
A[x:0] valid, before NCSz rising	t _{HSMC13}	3003	(Notes 5, 7, 10, 14, 16)	(NCS_RD_SETUP +NCS_RD_PULSE) * t _{MCK} - 12.7 -0.48*(Cncs- Caddr) / Drive	-	ns
NRD valid, before NCSz rising	t _{HSMC14}	3003	(Notes 5, 7, 10, 14, 16)	(NCS_RD_SETUP +NCS_RD_PULSE -NRD_SETUP) * t _{MCK} - 0.6 -0.48*(Cncs-Cnrd) / Drive	-	ns
NCSz Pulse Width	t _{HSMC15}	3003	(Notes 5, 14, 16)	NCS_RD_PULSE * t _{MCK} - 4.5	-	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
HEMC HSMC Timings: Write Data in NCS-Controlled Mode						
Setup time for D[y:0] and ECC[w:0], before NCSz rising	t _{HSMC21}	3003	(Notes 5, 7, 10, 14, 17)	NCS_WR_PULSE * t _{MCK} -13.2 -0.48*(Cdata - Cncs) / Drive	-	ns
Hold time for D[y:0] and ECC[w:0], after NCSz rising	t _{HSMC22}	3003	(Notes 5, 7, 10, 14, 17)	NCS_WR_HOLD * t _{MCK} -11.0 -0.45*Cncs / Drive	-	ns
A[x:0] valid, before NCSz rising	t _{HSMC23}	3003	(Notes 5, 7, 10, 14, 17)	(NCS_WR_PULSE +NCS_WR_SETUP) * t _{MCK} -12.7 -0.48*(Cncs - Caddr) / Drive	-	ns
NWE valid, before NCSz rising	t _{HSMC24}	3003	(Notes 5, 7, 10, 14, 17)	(NCS_WR_PULSE +NCS_WR_SETUP -NWE_SETUP) * t _{MCK} -1.6 -0.48*(Cnwe - Cncs) / Drive	-	ns
NCSz Pulse Width	t _{HSMC25}	3003	(Notes 5, 14, 17)	NCS_WR_PULSE * t _{MCK} -4.5	-	ns
NWR[4:0] valid, before NCSz rising	t _{HSMC26}	3003	(Notes 5, 7, 10, 14, 17)	(NCS_WR_PULSE +NCS_WR_SETUP -NWE_SETUP) * t _{MCK} -1.6 -0.48*(Cnwe - Cncs) / Drive	-	ns
NWE valid, after NCSz rising	t _{HSMC27}	3003	(Notes 5, 7, 10, 14, 17)	[NWE_PULSE - (NCS_WR_PULSE +NCS_WR_SETUP -NWE_SETUP)] * t _{MCK} -2.7 -0.48*(Cncs - Cnwe) / Drive	-	ns
NWR[4:0] valid, after NCSz rising	t _{HSMC28}	3003	(Notes 5, 7, 10, 14, 17)	[NWE_PULSE - (NCS_WR_PULSE +NCS_WR_SETUP -NWE_SETUP)] * t _{MCK} -2.7 -0.48*(Cncs - Cnwe) / Drive	-	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
HEMC HSMC Timings: Write Data in NWE-Controlled Mode						
Setup time for D[y:0] and ECC[w:0], before NWE/NWR[4:0] rising	t _{HSMC31}	3003	(Notes 5, 7, 10, 14, 17)	NWE_PULSE * t _{MCK} -13.2 -0.48*(Cdata - Cnwe) / Drive	-	ns
Hold time for D[y:0] and ECC[w:0], after NWE/NWR[4:0] rising	t _{HSMC32}	3003	(Notes 5, 7, 10, 14, 17)	NWE_HOLD * t _{MCK} -7.5 -0.45*Cnwe / Drive	-	ns
A[x:0] valid, before NWE/NWR[4:0] rising	t _{HSMC33}	3003	(Notes 5, 7, 10, 14, 17)	(NWE_PULSE +NWE_SETUP) * t _{MCK} -12.5 -0.48*(Cnwe - Caddr) / Drive	-	ns
NCSz valid, before NWE/NWR[4:0] rising	t _{HSMC34}	3003	(Notes 5, 7, 10, 14, 17)	(NWE_PULSE +NWE_SETUP -NCS_WR_SETUP) * t _{MCK} -2.4 -0.48*(Cncs - Cnwe) / Drive	-	ns
NWE Pulse Width	t _{HSMC35}	3003	(Notes 5, 14, 17)	NWE_PULSE * t _{MCK} -4.8	-	ns
NWR[4:0] Pulse Width	t _{HSMC36}	3003	(Notes 5, 14, 17)	NWE_PULSE * t _{MCK} -4.8	-	ns
NCSz valid, after NWE/NWR[4:0] rising	t _{HSMC37}	3003	(Notes 5, 7, 10, 14, 17)	[NCS_WR_PULSE - (NWE_PULSE +NWE_SETUP -NCS_WR_SETUP)] * t _{MCK} -6.0 -0.48*(Cnwe - Cncs) / Drive	-	ns
HEMC HSDRAMC Timings: Read 32-bit Data (HECC ON/OFF)						
SDCK Period	t _{HSDRAM0}	3003	(Notes 5, 9, 10)	10 and 8.8 +0.9*Csdck / Drive	-	ns
SDCKE output delay, from SDCK rising	t _{HSDRAM1}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NCSx output delay, from SDCK rising	t _{HSDRAM2}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NRAS output delay, from SDCK rising	t _{HSDRAM3}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
NCAS output delay, from SDCK rising	t _{HSDRAM4}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
SDNBS[4:0] output delay, from SDCK rising	t _{HSDRAM5}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
D[31:0] setup time, from SDCK rising	t _{HSDRAM6}	3003	(Note 5)	3.9	-	ns
D[31:0] hold time, from SDCK rising	t _{HSDRAM7}	3003	(Note 5)	0.9	-	ns
A[13:0] output delay, from SDCK rising	t _{HSDRAM8}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
BA[1:0] output delay, from SDCK rising	t _{HSDRAM9}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
HEMC HSDRAMC Timings: Write 32-bit Data (HECC ON/OFF)						
SDCK Period	t _{HSDRAM0}	3003	(Notes 5, 9, 10)	10 and 8.8 +0.9*Csdck / Drive	-	ns
SDCKE output delay, from SDCK rising	t _{HSDRAM10}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NCSx output delay, from SDCK rising	t _{HSDRAM11}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NRAS output delay, from SDCK rising	t _{HSDRAM12}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NCAS output delay, from SDCK rising	t _{HSDRAM13}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
SDNWE output delay, from SDCK rising	t _{HSDRAM14}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
D[31:0] output delay, from SDCK rising	t _{HSDRAM15}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
CB[7:0] output delay, from SDCK rising	t _{HSDRAM16}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
A[13:0] and BA[1:0] output delay, from SDCK rising	t _{HSDRAM17}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
SDNBS[4:0] output delay, from SDCK rising	t _{HSDRAM18}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
HEMC HSDRAMC Timings: Read 16-bit Data (HECC ON)						
SDCK Period	t _{HSDRAM0}	3003	(Notes 5, 9, 10)	10 and 8.8 +0.9*Csdck / Drive	-	ns
SDCKE output delay, from SDCK rising	t _{HSDRAM40}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NCSx output delay, from SDCK rising	t _{HSDRAM41}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NRAS output delay, from SDCK rising	t _{HSDRAM42}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NCAS output delay, from SDCK rising	t _{HSDRAM43}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
SDNWE output delay, from SDCK rising	t _{HSDRAM44}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
A[13:0] output delay, from SDCK rising	t _{HSDRAM45}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
BA[1:0] output delay, from SDCK rising	t _{HSDRAM46}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
SDNBS[4:0] output delay, from SDCK rising	t _{HSDRAM47}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
D[15:0] setup time, from SDCK rising	t ₃₀	3003	(Note 5)	3.9	-	ns
D[15:0] hold time, from SDCK rising	t ₃₁	3003	(Note 5)	0.9	-	ns
HEMC HSDRAMC Timings: Write 16-bit Data (HECC ON)						
SDCK Period	t _{HSDRAM0}	3003	(Notes 5, 9, 10)	10 and 8.8 +0.9*Csdck / Drive	-	ns
SDCKE output delay, from SDCK rising	t _{HSDRAM50}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions 1.65V < V _{DD} < 1.95V 3V < V _{CC} < 3.6V (Note 1)	Limits		Units
				Min	Max	
NCSx output delay, from SDCK rising	t _{HSDRAM51}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NRAS output delay, from SDCK rising	t _{HSDRAM52}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
NCAS output delay, from SDCK rising	t _{HSDRAM53}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
SDNWE output delay, from SDCK rising	t _{HSDRAM54}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
A[12:0] output delay, from SDCK rising	t _{HSDRAM55}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
BA[1:0] output delay, from SDCK rising	t _{HSDRAM56}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
SDNBS[4:0] output delay, from SDCK rising	t _{HSDRAM57}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns
D[15:0] output delay, from SDCK rising	t _{HSDRAM58}	3003	(Notes 5, 7, 9, 10)	1.0 +0.2*(Csdram - Csdck) / Drive	7.6 +0.48*(Csdram - Csdck) / Drive	ns

NOTES:

- Unless otherwise specified, all inputs and outputs shall be tested for each characteristic. Inputs not under test shall be V_{IN} = V_{SS} or V_{CC} and outputs not under test shall be open. V_{SS} = 0V.
- Tested through Functional Tests.
- Pads PA1/7/13/17 are not Cold Sparing-compatible.
- Inputs shall be configured in state corresponding to the Minimum Standby Current.
- Guaranteed, not tested.
- Test conditions: Tester load = 5pF, V_{IL} = 0V, V_{IH} = V_{DD}, Input signals dynamic characteristics: t_r, t_f < 10ns, Threshold voltages: V_{OL} = V_{OH} = V_{DD}/2.
- C_x = Capacitance of the signal "x", referenced in the parameter description.
- C_{clk} = Capacitance of the clock signal of the peripheral referenced.
- C_{sdck} = Capacitance of the clock signal of the HSDRAMC peripheral.
- Drive = PIO drive value of the signal referenced in the parameter description.
- GFEN and GFSEL bit fields are defined in NMIC_SCFGxR registers.
- GCK is Generic Clock for NMIC peripheral.
- HCLK is the Processor Clock.
- MCK is the System Clock.
- CLDIV, CHDIV, CKDIV are bit fields defined in Flex_TWI_CWGR registers.
- NRD_SETUP, NRD_PULSE, NCS_RD_SETUP and NCS_RD_PULSE are bit fields defined in HSMC_SETUPx and HSMC_PULSEx registers.

17. NCS_WR_SETUP, NCS_WR_PULSE, NWE_SETUP and NWE_PULSE are bit fields defined in HSMC_SETUPx and HSMC_PULSEx registers.
18. $NCS_WR_HOLD = NWE_CYCLE - NCS_WR_SETUP - NCS_WR_PULSE$ where NWE_CYCLE, NCS_WR_SETUP and NCS_WR_PULSE are bit fields respectively defined in HSMC_CYCLEx, HSMC_SETUPx and HSMC_PULSEx registers.
19. $NWE_HOLD = NWE_CYCLE - NWE_SETUP - NWE_PULSE$ where NWE_CYCLE, NWE_SETUP and NWE_PULSE are bit fields respectively defined in HSMC_CYCLEx, HSMC_SETUPx and HSMC_PULSEx registers.
20. TimeCoef measures the Max Frequency attainable by the Processor (through the formula: $MaxFreq = 100MHz / TimeCoef$)

2.3.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed at $T_{case} = +125 \pm 3^{\circ}C$ and $T_{case} = -55 \pm 3^{\circ}C$.

The characteristics, test methods, conditions and limits shall be the same as specified in Para. 2.3.1, Room Temperature Electrical Measurements.

2.4 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at $T_{case} = +25(+3 -5)^{\circ}C$.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.3.1, Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits			Units
		Drift Value Δ	Absolute		
			Min	Max	
Low Level Output Voltage	V _{OL}	±100	-	400	mV
High Level Output Voltage	V _{OH}	±0.1	V _{CC} -0.4	-	V
Low Level Input Current <i>(General case, except pads: PA0/1/6/7/12/13/16/17)</i>	I _{OZL}	±0.03	-1	1	µA
High Level Input Current <i>(General case, except pads: PA0/1/6/7/12/13/16/17)</i>	I _{OZH}	±0.03	-1	1	µA
ColdSparing <i>(General case, except pads: PA0/6/12/16)</i>	CS	±0.03	-1	1	µA
Array Stand-by Current	I _{CCSBA}	0.75	-	50	mA
Operating Period RC 32kHz	t _{OSC}	±0.3	25	41.6	µs
Operating Period after calibration RC 4MHz	t _{ACC4}	±0.75	227.3	277.7	ns
Operating Period after calibration RC 8MHz	t _{ACC8}	±0.5	113.7	138.9	ns
Operating Period after calibration RC 10MHz	t _{ACC10}	±0.5	90.9	111.1	ns
Operating Period after calibration RC 12MHz	t _{ACC12}	±0.5	75.8	92.6	ns

2.5 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at $T_{case} = +25(+3 -5)^{\circ}C$.

The characteristics, test methods, conditions and limits shall be the same as specified in Para. 2.3.1, Room Temperature Electrical Measurements.

2.6 POWER BURN-IN CONDITIONS

Prior to submitting the parts to Burn-In or Operating Life, a specific application is loaded in the Flash memory. This application automatically starts after the RESET is released. The correct behaviour of the device can be monitored with an on-board LED.

The specific application will run with internal PLL @75MHz and will exercise the following function blocks:

1. HTOL_FLEXCOM_SPI
FLEXCOM1 as master and FLEXCOM2 as slave / Hardware loop
2. HTOL_FLEXCOM_TWI
FLEXCOM3 as master and FLEXCOM4 as slave / Hardware loop
3. HTOL_SPW
Internal loopback
4. HTOL_CAN
Internal loopback
5. HTOL_PIO
Toggle of IOs
6. HTOL_TC
Start TC0 to TC11, stop in interrupt handler
7. HTOL_FLEXCOMS
USART mode on FLEXCOM0, 5, 6, 7, 8, 9
Putchar and Getchar
8. HTOL_HEMC
Enable ECC, write and read in external memory (not present)
9. HTOL_TRNG
Run TRNG and read random value
10. HTOL_ICM
Check integrity of regions
11. HTOL_XDMAC_PWM
Load PWM duty cycle with DMA
12. HTOL_MEMORY
Code in Flash memory with exec in Flexram.
Read SRAM (768k-16k)
Read Flash (128k)

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+125(+8 -0)	$^{\circ}C$
Core Supply Voltage	V_{DD}	1.95	V
I/O Supply Voltage	V_{CC}	3.6	V

NOTES:

1. Pin connections shall be as follows:

Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To	Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To
1	GNDCORE		direct	GND	129	GNDCORE		direct	GND
2	VDDCORE		direct	VDD	130	VDDCORE		direct	VDD
3	PF29	15	2.2k	VCC	131	PC26		2.2k	VCC
4	PF30	11	bridge 5.6K	VCC-GND	132	PC27		2.2k	VCC
5	ATXOUTN		5.6K	VCC-GND	133	PC28		2.2k	VCC
6	ATXOUTP		5.6K	VCC-GND	134	PC29		2.2k	VCC
7	ARXINN		2.2k	GND	135	PC30		2.2k	VCC
8	ARXINP		2.2k	VCC	136	PC31		2.2k	VCC
9	PA0		2.2k	VCC	137	PE12		2.2k	VCC
10	PA1		2.2k	VCC	138	PE11		2.2k	VCC
11	PA2	4	2.2k	VCC	139	PE10		2.2k	VCC
12	PA3		2.2k	VCC	140	PE9		2.2k	VCC
13	PA4		2.2k	VCC	141	PE8		2.2k	VCC
14	PA5		2.2k	VCC	142	PE7		2.2k	VCC
15	PA6	3	bridge 5.6K	VCC-GND	143	PE6		2.2k	VCC
16	PA7	253	2.2k	VCC	144	PE5		2.2k	VCC
17	PA8	254	2.2k	VCC	145	PE4		2.2k	VCC
18	PA9		2.2k	VCC	146	PE3		2.2k	VCC
19	PA10		2.2k	VCC	147	PE2		2.2k	VCC
20	PA11		2.2k	VCC	148	PE1		2.2k	VCC
21	PA12		2.2k	VCC	149	PE0		2.2k	VCC
22	PA13		5.6K	VCC-GND	150	PF0		2.2k	VCC
23	TST		2.2k	GND	151	PF1		2.2k	VCC
24	JTAGSEL		2.2k	GND	152	PF2		2.2k	VCC
25	NMIC_NMI		2.2k	VCC	153	PF3		2.2k	VCC
26	PA16		2.2k	VCC	154	PF4		2.2k	VCC
27	PA17		2.2k	GND	155	PF5		2.2k	VCC
28	NRST		2.2k	VCC	156	PF6		2.2k	VCC
29	PA19	102	5.6K	VCC	157	PF7		2.2k	VCC
30	PA20	101	5.6K	VCC	158	PF8		2.2k	VCC
31	PA21		2.2k	VCC	159	PF9		2.2k	VCC
32	VDDIO		direct	VCC	160	VDDIO		direct	VCC
33	GNDIO		direct	GND	161	GNDIO		direct	GND
34	PA22		2.2k	VCC	162	PF10		2.2k	VCC

Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To	Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To
35	PA23		2.2k	VCC	163	PD0		2.2k	VCC
36	PA24		2.2k	VCC	164	PD1		2.2k	VCC
37	PA25		2.2k	VCC	165	PD2		2.2k	VCC
38	PA26		2.2k	VCC	166	PD3		2.2k	VCC
39	PA27		2.2k	VCC	167	PD4		2.2k	VCC
40	PA28		2.2k	VCC	168	PD5		2.2k	VCC
41	SPWDINP1	52	2.2k	VCC	169	PD6		2.2k	VCC
42	SPWDINN1	53	2.2k	GND	170	PD7		2.2k	VCC
43	SPWDOUTP1	50	bridge 5.6K	VCC-GND	171	PD8		2.2k	VCC
44	SPWDOUTN1	51	bridge 5.6K	VCC-GND	172	PD9		2.2k	VCC
45	SPWREF1		10k-17.8k	VDD-GND	173	PD10		2.2k	VCC
46	SPWSOUTP1	57	bridge 5.6K	VCC-GND	174	PD11		2.2k	VCC
47	SPWSOUTN1	58	bridge 5.6K	VCC-GND	175	PD12		2.2k	VCC
48	SPWSINP1	55	2.2k	VCC	176	PD13		2.2k	VCC
49	SPWSINN1	56	2.2k	GND	177	PD14		2.2k	VCC
50	SPWDINP0	43	2.2k	VCC	178	PD15		2.2k	VCC
51	SPWDINN0	44	2.2k	GND	179	PD16		2.2k	VCC
52	SPWDOUTP0	41	bridge 5.6K	VCC-GND	180	PD17		2.2k	VCC
53	SPWDOUTN0	42	bridge 5.6K	VCC-GND	181	PD18		2.2k	VCC
54	SPWREF0		10k-17.8k	VDD-GND	182	PD19		2.2k	VCC
55	SPWSOUTP0	48	bridge 5.6K	VCC-GND	183	PD20		2.2k	VCC
56	SPWSOUTN0	49	bridge 5.6K	VCC-GND	184	PD21		2.2k	VCC
57	SPWSINP0	46	2.2k	VCC	185	PD22		2.2k	VCC
58	SPWSINN0	47	2.2k	GND	186	PD23		2.2k	VCC
59	PB0		2.2k	VCC	187	PD24		2.2k	VCC
60	PB1		2.2k	VCC	188	PD25		2.2k	VCC
61	PB2		2.2k	VCC	189	PD26		2.2k	VCC
62	PB3		5.6K	VCC-GND	190	PD27		2.2k	VCC
63	VDDCORE		direct	VDD	191	VDDCORE		direct	VDD
64	GNDCORE		direct	GND	192	GNDCORE		direct	GND
65	GNDCORE		direct	GND	193	GNDCORE		direct	GND
66	VDDCORE		direct	VDD	194	VDDCORE		direct	VDD
67	PB4	70	bridge 5.6K	VCC-GND	195	PD28		2.2k	VCC
68	PB5	69	2.2k	VCC	196	PD29		2.2k	VCC
69	PB6	68	bridge 5.6K	VCC-GND	197	PD30		2.2k	VCC
70	PB7	67	2.2k	VCC	198	PD31		2.2k	VCC

Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To	Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To
71	PB8		2.2k	VCC	199	PG0		5.6K	VCC-GND
72	PB9		2.2k	VCC	200	PG1		5.6K	VCC-GND
73	PB10		2.2k	VCC	201	PG2		5.6K	VCC-GND
74	PB11		2.2k	VCC	202	PG3		5.6K	VCC-GND
75	PB12		2.2k	VCC	203	PG4		5.6K	VCC-GND
76	PB13		2.2k	VCC	204	PG5		5.6K	VCC-GND
77	PB14		2.2k	VCC	205	PG6		5.6K	VCC-GND
78	PB15		2.2k	VCC	206	PG7		5.6K	VCC-GND
79	PB16		5.6K	VCC-GND	207	PG8		5.6K	VCC-GND
80	XOUT		5.6K	VCC-GND	208	PG9		5.6K	VCC-GND
81	XIN		2.2k	GND	209	PG10		5.6K	VCC-GND
82	VDDPLLA		direct	VDD	210	PG11		5.6K	VCC-GND
83	GNDPLLA		direct	GND	211	PG12		5.6K	VCC-GND
84	GNDPLLB		direct	GND	212	PG13		5.6K	VCC-GND
85	VDDPLLB		direct	VDD	213	PG14		5.6K	VCC-GND
86	PB17		2.2k	VCC	214	PG15		5.6K	VCC-GND
87	PB18		2.2k	VCC	215	PG16		5.6K	VCC-GND
88	PB19		2.2k	VCC	216	PG17		5.6K	VCC-GND
89	PB20		2.2k	VCC	217	PG18		5.6K	VCC-GND
90	PB21		2.2k	VCC	218	PG19		5.6K	VCC-GND
91	PB22		2.2k	VCC	219	PG20		5.6K	VCC-GND
92	PB23		2.2k	VCC	220	PG21		5.6K	VCC-GND
93	PB24		2.2k	VCC	221	PG22		5.6K	VCC-GND
94	PB25		2.2k	VCC	222	PG23		5.6K	VCC-GND
95	PB26		2.2k	VCC	223	PG24		5.6K	VCC-GND
96	VDDIO		direct	VCC	224	VDDIO		direct	VCC
97	GNDIO		direct	GND	225	GNDIO		direct	GND
98	PB27		2.2k	VCC	226	PG25		5.6K	VCC-GND
99	PB28		2.2k	VCC	227	PG26		5.6K	VCC-GND
100	PB29		2.2k	VCC	228	PG27		5.6K	VCC-GND
101	PC0	30	5.6K	VCC	229	XOUT32		5.6K	VCC-GND
102	PC1	29	5.6K	VCC	230	XIN32		2.2k	GND
103	PC2		2.2k	VCC	231	PG30		5.6K	VCC-GND
104	PC3		2.2k	VCC	232	PG31		5.6K	VCC-GND
105	PC4		2.2k	VCC	233	PF11		2.2k	VCC
106	PC5		2.2k	VCC	234	PF12		2.2k	VCC

Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To	Pin	Signal	Loopback to Pin#	Serial Resistance	Wired To
107	PC6		2.2k	VCC	235	PF13		2.2k	VCC
108	PC7		2.2k	VCC	236	PF14		2.2k	VCC
109	PC8		2.2k	VCC	237	PF15		2.2k	VCC
110	PC9		2.2k	VCC	238	PF16		2.2k	VCC
111	PC10		2.2k	VCC	239	PF17		2.2k	VCC
112	PC11		2.2k	VCC	240	PF18		2.2k	VCC
113	PC12		2.2k	VCC	241	PF19		2.2k	VCC
114	PC13		2.2k	VCC	242	PF20		2.2k	VCC
115	PC14		2.2k	VCC	243	PF21		2.2k	VCC
116	PC15		2.2k	VCC	244	PF22		2.2k	VCC
117	PC16		2.2k	VCC	245	PF23		2.2k	VCC
118	PC17		2.2k	VCC	246	PF24		2.2k	GND
119	PC18		2.2k	VCC	247	PF25		2.2k	VCC
120	PC19		2.2k	VCC	248	BTXOUTN		5.6K	VCC-GND
121	PC20	122	bridge 5.6K	VCC-GND	249	BTXOUTP		5.6K	VCC-GND
122	PC21	121	2.2k	VCC	250	BRXINN		2.2k	GND
123	PC22		2.2k	VCC	251	BRXINP		2.2k	VCC
124	PC23		2.2k	VCC	252	PF26		2.2k	VCC
125	PC24		2.2k	VCC	253	PF27	16	bridge 5.6K	VCC-GND
126	PC25		2.2k	VCC	254	PF28	17	bridge 5.6K	VCC-GND
127	VDDCORE		direct	VDD	255	VDDCORE		direct	VDD
128	GNDCORE		direct	GND	256	GNDCORE		direct	GND

2.7 HIGH TEMPERATURE REVERSE BIAS BURN-IN (STATIC BURN-IN) CONDITIONS

For the High Temperature Reverse Bias Burn-In, no code needs to be loaded into the Flash. The hardware remains the same as for the Power Burn-In, except for a jumper instead of a 2.2k Ω resistor on pin 28 (NRST).

2.8 OPERATING LIFE CONDITIONS

The conditions shall be as specified in Para. 2.6, Power Burn-in Conditions.

2.9 TOTAL DOSE IRRADIATION TESTING

2.9.1 Bias Conditions and Total Dose Level for Total Dose Radiation Testing

Continuous bias shall be applied during irradiation testing as specified below.

The total dose level applied shall be as specified in Para. 1.4.2 or in the Purchase Order.

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+22±3	°C
Core Supply Voltage	V_{DD}	1.95	V
I/O Supply Voltage	V_{CC}	3.6	V

NOTES:

1. Pin connections shall be as follows, where NC = not connected:

Pin	Signal	Serial Resistance	Wired To	Pin	Signal	Serial Resistance	Wired To
1	GNDCORE	direct	GND	129	GNDCORE	direct	GND
2	VDDCORE	direct	VDD	130	VDDCORE	direct	VDD
3	PF29	100k	VCC	131	PC26	100k	VCC
4	PF30	100k	VCC	132	PC27	100k	VCC
5	ATXOUTN	5.6K	VCC-GND	133	PC28	100k	VCC
6	ATXOUTP	5.6K	VCC-GND	134	PC29	100k	VCC
7	ARXINN	100k	GND	135	PC30	100k	VCC
8	ARXINP	100k	VCC	136	PC31	100k	VCC
9	PA0	100k	VCC	137	PE12	100k	VCC
10	PA1	100k	VCC	138	PE11	100k	VCC
11	PA2	100k	VCC	139	PE10	100k	VCC
12	PA3	100k	VCC	140	PE9	100k	VCC
13	PA4	100k	VCC	141	PE8	100k	VCC
14	PA5	100k	VCC	142	PE7	100k	VCC
15	PA6	100k	VCC	143	PE6	100k	VCC
16	PA7	100k	VCC	144	PE5	100k	VCC
17	PA8	100k	VCC	145	PE4	100k	VCC
18	PA9	100k	VCC	146	PE3	100k	VCC
19	PA10	100k	VCC	147	PE2	100k	VCC
20	PA11	100k	VCC	148	PE1	100k	VCC
21	PA12	100k	VCC	149	PE0	100k	VCC
22	PA13	100k	VCC	150	PF0	100k	VCC
23	TST	100k	GND	151	PF1	100k	VCC
24	JTAGSEL	100k	GND	152	PF2	100k	VCC
25	NMIC_NMI	100k	VCC	153	PF3	100k	VCC
26	PA16	100k	VCC	154	PF4	100k	VCC
27	PA17	100k	VCC	155	PF5	100k	VCC
28	NRST	direct	(*)	156	PF6	100k	VCC

Pin	Signal	Serial Resistance	Wired To	Pin	Signal	Serial Resistance	Wired To
29	PA19	100k	VCC	157	PF7	100k	VCC
30	PA20	100k	VCC	158	PF8	100k	VCC
31	PA21	100k	VCC	159	PF9	100k	VCC
32	VDDIO	direct	VCC	160	VDDIO	direct	VCC
33	GNDIO	direct	GND	161	GNDIO	direct	GND
34	PA22	100k	VCC	162	PF10	100k	VCC
35	PA23	100k	VCC	163	PD0	100k	VCC
36	PA24	100k	VCC	164	PD1	100k	VCC
37	PA25	100k	VCC	165	PD2	100k	VCC
38	PA26	100k	VCC	166	PD3	100k	VCC
39	PA27	100k	VCC	167	PD4	100k	VCC
40	PA28	100k	VCC	168	PD5	100k	VCC
41	SPWDINP1	100k	VCC	169	PD6	100k	VCC
42	SPWDINN1	100k	GND	170	PD7	100k	VCC
43	SPWDOUTP1	5.6K	VCC-GND	171	PD8	100k	VCC
44	SPWDOUTN1	5.6K	VCC-GND	172	PD9	100k	VCC
45	SPWREF1	direct	VDD	173	PD10	100k	VCC
46	SPWSOUTP1	5.6K	VCC-GND	174	PD11	100k	VCC
47	SPWSOUTN1	5.6K	VCC-GND	175	PD12	100k	VCC
48	SPWSINP1	100k	VCC	176	PD13	100k	VCC
49	SPWSINN1	100k	GND	177	PD14	100k	VCC
50	SPWDINP0	100k	VCC	178	PD15	100k	VCC
51	SPWDINN0	100k	GND	179	PD16	100k	VCC
52	SPWDOUTP0	5.6K	VCC-GND	180	PD17	100k	VCC
53	SPWDOUTN0	5.6K	VCC-GND	181	PD18	100k	VCC
54	SPWREF0	direct	VDD	182	PD19	100k	VCC
55	SPWSOUTP0	5.6K	VCC-GND	183	PD20	100k	VCC
56	SPWSOUTN0	5.6K	VCC-GND	184	PD21	100k	VCC
57	SPWSINP0	100k	VCC	185	PD22	100k	VCC
58	SPWSINN0	100k	GND	186	PD23	100k	VCC
59	PB0	100k	VCC	187	PD24	100k	VCC
60	PB1	100k	VCC	188	PD25	100k	VCC
61	PB2	100k	VCC	189	PD26	100k	VCC
62	PB3	5.6K	VCC-GND	190	PD27	100k	VCC
63	VDDCORE	direct	VDD	191	VDDCORE	direct	VDD
64	GNDCORE	direct	GND	192	GNDCORE	direct	GND
65	GNDCORE	direct	GND	193	GNDCORE	direct	GND
66	VDDCORE	direct	VDD	194	VDDCORE	direct	VDD
67	PB4	100k	VCC	195	PD28	100k	VCC
68	PB5	100k	VCC	196	PD29	100k	VCC
69	PB6	100k	VCC	197	PD30	100k	VCC

Pin	Signal	Serial Resistance	Wired To	Pin	Signal	Serial Resistance	Wired To
70	PB7	100k	VCC	198	PD31	100k	VCC
71	PB8	100k	VCC	199	PG0	5.6K	VCC-GND
72	PB9	100k	VCC	200	PG1	5.6K	VCC-GND
73	PB10	100k	VCC	201	PG2	5.6K	VCC-GND
74	PB11	100k	VCC	202	PG3	5.6K	VCC-GND
75	PB12	100k	VCC	203	PG4	5.6K	VCC-GND
76	PB13	100k	VCC	204	PG5	5.6K	VCC-GND
77	PB14	NC	NC	205	PG6	5.6K	VCC-GND
78	PB15	100k	VCC	206	PG7	5.6K	VCC-GND
79	PB16	5.6k	VCC	207	PG8	5.6K	VCC-GND
80	XOUT	5.6K	VCC-GND	208	PG9	5.6K	VCC-GND
81	XIN	100k	GND	209	PG10	5.6K	VCC-GND
82	VDDPLLA	direct	VDD	210	PG11	5.6K	VCC-GND
83	GNDPLLA	direct	GND	211	PG12	5.6K	VCC-GND
84	GNDPLLB	direct	GND	212	PG13	5.6K	VCC-GND
85	VDDPLLB	direct	VDD	213	PG14	5.6K	VCC-GND
86	PB17	100k	VCC	214	PG15	5.6K	VCC-GND
87	PB18	100k	VCC	215	PG16	5.6K	VCC-GND
88	PB19	NC	NC	216	PG17	5.6K	VCC-GND
89	PB20	100k	VCC	217	PG18	5.6K	VCC-GND
90	PB21	100k	VCC	218	PG19	5.6K	VCC-GND
91	PB22	100k	VCC	219	PG20	5.6K	VCC-GND
92	PB23	100k	VCC	220	PG21	5.6K	VCC-GND
93	PB24	100k	VCC	221	PG22	5.6K	VCC-GND
94	PB25	100k	VCC	222	PG23	5.6K	VCC-GND
95	PB26	100k	VCC	223	PG24	100k	GND
96	VDDIO	direct	VCC	224	VDDIO	direct	VCC
97	GNDIO	direct	GND	225	GNDIO	direct	GND
98	PB27	100k	VCC	226	PG25	100k	GND
99	PB28	100k	VCC	227	PG26	100k	GND
100	PB29	100k	VCC	228	PG27	100k	GND
101	PC0	100k	VCC	229	XOUT32	5.6K	VCC-GND
102	PC1	100k	VCC	230	XIN32	100k	GND
103	PC2	100k	VCC	231	PG30	100k	VCC
104	PC3	100k	VCC	232	PG31	100k	VCC
105	PC4	100k	VCC	233	PF11	5.6K	VCC-GND
106	PC5	100k	VCC	234	PF12	100k	VCC
107	PC6	100k	VCC	235	PF13	100k	VCC
108	PC7	100k	VCC	236	PF14	100k	VCC
109	PC8	100k	VCC	237	PF15	100k	VCC
110	PC9	100k	VCC	238	PF16	100k	VCC

Pin	Signal	Serial Resistance	Wired To	Pin	Signal	Serial Resistance	Wired To
111	PC10	100k	VCC	239	PF17	5.6K	VCC-GND
112	PC11	100k	VCC	240	PF18	5.6K	VCC-GND
113	PC12	100k	VCC	241	PF19	5.6K	VCC-GND
114	PC13	100k	VCC	242	PF20	5.6K	VCC-GND
115	PC14	100k	VCC	243	PF21	5.6K	VCC-GND
116	PC15	100k	VCC	244	PF22	5.6K	VCC-GND
117	PC16	100k	VCC	245	PF23	5.6K	VCC-GND
118	PC17	100k	VCC	246	PF24	2.2K	GND
119	PC18	100k	VCC	247	PF25	5.6K	VCC-GND
120	PC19	100k	VCC	248	BTXOUTN	5.6K	VCC-GND
121	PC20	100k	VCC	249	BTXOUTP	5.6K	VCC-GND
122	PC21	100k	VCC	250	BRXINN	100k	GND
123	PC22	100k	VCC	251	BRXINP	100k	VCC
124	PC23	100k	VCC	252	PF26	100k	VCC
125	PC24	100k	VCC	253	PF27	100k	VCC
126	PC25	100k	VCC	254	PF28	100k	VCC
127	VDDCORE	direct	VDD	255	VDDCORE	direct	VDD
128	GNDCORE	direct	GND	256	GNDCORE	direct	GND

*N.B. – to release the RESET, a switch is used on pin 28 (NRST) to connect from GND to V_{CC}.

2.9.2 Electrical Measurements for Total Dose Radiation Testing

Prior to, during and on completion of irradiation testing the devices shall have successfully met the Room Temperature Electrical Measurements specified in Para. 2.3.1.

Unless otherwise stated the measurements shall be performed at T_{case} = +25(+3 -5)°C.

The characteristics, test methods, conditions and limits shall be as per the corresponding test defined in Para. 2.3.1, Room Temperature Electrical Measurements.