



Cypress Semiconductor Corporation, 198 Champion Court, San Jose, CA 95134. Tel: (408) 943-2600

PRODUCT CHANGE NOTIFICATION

PCN: PCN181005

Date: March 15, 2018

Subject: Qualification of Fab 25 with the Copper (Cu) BEOL Process and Test 25 as an Additional Sort Site for the PSoC® 4200L Product Family

To: FUTURE ELECTRONICS
FUTURE ELE
pcn.system@futureelectronics.com

Change Type: Major

Description of Change:

Cypress announces the qualification of Fab 25 in Austin, Texas with the Copper (Cu) Backend of Line (BEOL) process and Test 25 as an additional sort site for the PSoC® 4200L product family.

The Aluminum (Al) BEOL process uses Tungsten (W) plugs and Ti/TiN/Al metallization with subtractive patterning to create the metal interconnect layers. The Cu BEOL process converts the underlying metal interconnect layers from W plugs to Cu plugs and from Ti/TiN/Al metallization with subtractive patterning to Cu damascene with Ta/TaN barriers.

These qualifications are part of the flexible manufacturing initiatives which allow Cypress to meet its delivery commitments in dynamic and changing market conditions.

Benefit of Change:

Qualification of alternate manufacturing processes is part of the ongoing flexible manufacturing initiative announced by Cypress. The goal of the flexible manufacturing initiative is to provide the means for Cypress to continue to meet delivery commitments through dynamic, changing market conditions.

Part Numbers Affected: 31

See the attached 'Affected Parts List' file for a list of all part numbers affected by this change. Note that any new parts that are introduced after the publication of this PCN will include all changes outlined in this PCN.

Qualification Status:

The Cu BEOL process and sort site have been qualified through a series of tests documented in Qualification Test Plan reports 172307 and 171610. These qualification reports can be found as attachments to this PCN or by visiting www.cypress.com and typing the QTP number in the keyword search window.

Sample Status:

Qualification samples may not be built ahead of time for all part numbers affected by this change. Please review the attached 'Affected Parts List' file for a list of affected part numbers with their associated sample ordering part numbers. Samples are available now unless there is an indication that the sample ordering part numbers are subject to lead times. If you require qualification samples, please contact your local Cypress sales representative as soon as possible, preferably within 30 days of the date of this PCN, to place any sample orders.

Approximate Implementation Date:

Effective 90 days from the date of this notification or upon customer approval, whichever comes first, all shipments of the affected part numbers in the attached file will be supplied from any of the qualified manufacturing sites. This change will be effective upon customer approval.

Anticipated Impact:

Products manufactured at Cypress Fab 25 with the Cu BEOL process are completely compatible with existing products from form, fit, functional, parametric, and quality performance perspectives.

It is recommended to use PSoC Creator 4.2 version for both AI BEOL and Cu BEOL sample parts to ensure optimized IMO functionality of the chip in USB mode at extreme operating temperatures.

Cypress also recommends that customers take this opportunity to review these changes against current application notes, system design considerations and customer environment conditions to assess impact (if any) to their application.

Method of Identification:

Cypress maintains traceability of product to wafer level, including wafer fabrication location, through the lot number marked on the package.

Response Required:

No response is required.

For additional information regarding this change, contact your local sales representative or contact the PCN Administrator at pcn_adm@cypress.com.

Sincerely,

Cypress PCN Administration

Item	Marketing Part Number	Sample Order Part Number
1	CY8C4246AZI-L423	CY8C4246AZI7-L423 Subject to lead time
2	CY8C4246AZI-L423T	CY8C4246AZI7-L423 Subject to lead time
3	CY8C4246AZI-L433	CY8C4246AZI7-L433 Subject to lead time
4	CY8C4246AZI-L433T	CY8C4246AZI7-L433 Subject to lead time
5	CY8C4246AZI-L435	CY8C4246AZI7-L435 Subject to lead time
6	CY8C4246AZI-L445	CY8C4246AZI7-L445 Subject to lead time
7	CY8C4246LTI-L445	CY8C4246LTI7-L445 Subject to lead time
8	CY8C4247AZI-L423	CY8C4247AZI7-L423 Subject to lead time
9	CY8C4247AZI-L423T	CY8C4247AZI7-L423 Subject to lead time
10	CY8C4247AZI-L433	CY8C4247AZI7-L433
11	CY8C4247AZI-L433T	CY8C4247AZI7-L433
12	CY8C4247AZI-L445	CY8C4247AZI7-L445 Subject to lead time
13	CY8C4247AZI-L475	CY8C4247AZI7-L475 Subject to lead time
14	CY8C4247AZI-L485	CY8C4247AZI7-L485 Subject to lead time
15	CY8C4247BZI-L479	CY8C4247BZI7-L479 Subject to lead time
16	CY8C4247BZI-L479T	CY8C4247BZI7-L479 Subject to lead time
17	CY8C4247BZI-L489	CY8C4247BZI7-L489 Subject to lead time
18	CY8C4247LTI-L445	CY8C4247LTI7-L445 Subject to lead time
19	CY8C4247LTI-L475	CY8C4247LTI7-L475 Subject to lead time
20	CY8C4247LTI-L485	CY8C4247LTI7-L485 Subject to lead time
21	CY8C4248AZI-L475	CY8C4248AZI7-L475
22	CY8C4248AZI-L485	CY8C4248AZI7-L485 Subject to lead time
23	CY8C4248BZI-L469	CY8C4248BZI7-L469
24	CY8C4248BZI-L479	CY8C4248BZI7-L479
25	CY8C4248BZI-L489	CY8C4248BZI7-L489
26	CY8C4248LTI-L475	CY8C4248LTI7-L475
27	CY8C4248LTI-L485	CY8C4248LTI7-L485
28	CYSHM35926P-L068LTI	CYSHM35926P7-L068LTI Subject to lead time
29	CYSHM35926P-L068LTIT	CYSHM35926P7-L068LTI Subject to lead time
30	CG8621AM	CG8621BM Subject to lead time
31	CG8622AM	CG8622BM Subject to lead time

Cypress Semiconductor Product Qualification Report

QTP#172307 VERSION**
November 2017

PSoC® 4200L Device Family S8SPF-10P, Fab25 (Cu BEOL Interconnect)	
CY8C4246 CY8C4247 CY8C4248	Programmable System-On-Chip (PSoC®)

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
reliability@cypress.com or via a CYLINK CRM CASE

Prepared By:
Honesto Sintos
Reliability Engineer

Reviewed By:
Sandhya Chandrashekhar
Reliability Principal Engineer

Approved By:
David Hoffman
Reliability Director

PACKAGE/PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date
151008	Qualification of S8* Technology in Fab25 Using TSG6M Device	Dec 2015
151403	Qualification of PSoC® 4100 and PSoC® 4200 Device, S8PF-10R Technology in Fab25	Dec 2015
151303	Qualification of CapSense® MBR3 Device, S8PF-10R Technology in Fab25	Dec 2015
160401	Qualification of TrueTouch® Fingerprint Device, S8PFHD-10R Technology in Fab25	May 2016
160301	Qualification of TrueTouch® Gen6XL Touchscreen Controller Device, S8SPF-10P Technology in Fab25	Jun 2016
160803	Qualification of PSoC® 4000S Device, S8PFHD-10R Technology in Fab25	Jun 2016
160207	Qualification of PSoC3 Leopard T06, S8P12-10P Technology in Fab25	Jul 2016
160702	Qualification of PSoC® 4200L, S8SPF-10P Technology in Fab25 (AL BEOL Interconnect)	Sep 2016
160701	Qualification of PSoC® 4200L, S8SPF-10P Technology in Fab25 (Cu BEOL Interconnect)	Apr 2017
172307	Qualification of PSoC® 4200L Fix TO Metal Mask Non-Minor Add-On, S8SPF-10P Technology in Fab25. (Cu BEOL Interconnect)	Nov 2017

PRODUCT DESCRIPTION (for qualification)

Qualification Purpose: Qualification of PSoC® 4200L Fix TO Metal Mask Non-Minor Add-On, S8SPF-10P Technology in Fab25. (Cu BEOL Interconnect)

Marketing Part #: CY8C4246 / CY8C4247 / CY8C4248

Device Description: 1.8V, Industrial Programmable System on a Chip

Cypress Division: Cypress Semiconductor Corporation – MCU and Connectivity Division (MCD)

TECHNOLOGY/FAB PROCESS DESCRIPTION

Number of Metal Layers:	Proprietary	Metal Composition:	Proprietary
-------------------------	-------------	--------------------	-------------

Passivation Type and Thickness:	Proprietary
---------------------------------	-------------

Generic Process Technology/Design Rule (μ-drawn):	Proprietary
---	-------------

Gate Oxide Material/Thickness (MOS):	Proprietary
--------------------------------------	-------------

Name/Location of Die Fab (prime) Facility:	Cypress, Fab 25
--	-----------------

Die Fab Line ID/Wafer Process ID:	Fab25 / S8PF-10
-----------------------------------	-----------------

ALTERNATIVE FAB FACILITY SITE

FAB SITE	LOCATION	QTP NUMBER
Skywater	Bloomington, Minnesota	153201
Fab 25	Austin, Texas	160702 (Al BEOL Interconnect)

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	AY64
Package Outline, Type, or Name:	TQFP 64L (14x14x1.4mm)
Mold Compound Name/Manufacturer:	EME-G631 / Sumitomo
Mold Compound Flammability Rating:	V-0 / UL94
Mold Compound Alpha Emission Rate:	N/A
Oxygen Rating Index: >28%	54%
Lead Frame Designation:	FMP
Lead Frame Material:	COPPER
Substrate Material:	N/A
Lead Finish, Composition / Thickness:	Pure Sn
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	100% Saw
Die Attach Supplier:	Hitachi
Die Attach Material:	DAF FH-900
Bond Diagram Designation	001-98722
Wire Bond Method:	Thermosonic
Wire Material/Size:	Copper Palladium (Cu-Pd) / 0.8 mil
Thermal Resistance Theta JA °C/W:	60.50 C/W
Package Cross Section Yes/No:	Yes
Assembly Process Flow:	001-89431M
Name/Location of Assembly (prime) facility:	ASEK-Taiwan
MSL LEVEL	3
REFLOW PROFILE	260C

PACKAGE AVAILABILITY

PACKAGE	WIRE MATERIAL	ASSEMBLY SITE	QTP NUMBER
124-vFBGA	CuPd	ASEK-Taiwan (G)	153304
48-Lead TQFP	CuPd	OSE-Taiwan (T)	153305
64-Lead TQFP	CuPd	CML-Philippines (RA)	133307
64-Lead TQFP	CuPd	ASEK-Taiwan (G)	133306
68-Lead QFN	CuPd	CML-Philippines (RA)	133308
68-Lead QFN	CuPd	ASEK-Taiwan (G)	133309

ELECTRICAL TEST / FINISH DESCRIPTION

Test Location:	ASEK-Taiwan (G), CML-Philippines (RA)
----------------	---------------------------------------

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate (EFR)	Dynamic Operating Condition, 150°C, 2.07V, 48 Hours JESD22-A-108-B	P
High Temperature Operating Life Latent Failure Rate (LFR)	Dynamic Operating Condition, 150°C, 2.07V, 500 Hours JESD22-A-108-B	P
Low Temperature Operating Life	-40°C	P
Endurance	Per datasheet, JESD22-A117	P
Data Retention	JESD22-A117 and JESD22-A103, 150C, 1000 Hours	P
Temperature Cycle	-65°C to 150°C, JESD22-A-104, 500 Cycles / 1000Cycles Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
High Accelerated Saturation Test (HAST)	130C, 5.5V, 85%RH, JESD22-A-110-B, 96 Hours Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	121C/100%RH, JESD22-A102-C, 168 Hours Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2200V, 3300V, JESD22-A114E	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V JESD22-C101C	P
Static Latch-up	± 140mA, 125C/85°C, JESD78	P
Acoustic (M3)	J-STD-020	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF ³	Failure Rate
High Temperature Operating Life Early Failure Rate	2,396 Devices	0	N/A	N/A	0 PPM 1
High Temperature Operating Life Long Term Failure Rate	560,880	0	0.7	170	10 FIT 2

1. EFR devices number is based on QTP#172307 EFR data.

2. LFR device hours are based on QTP#151008, QTP#151403, QTP#151303, QTP#160301, QTP#160207, QTP#160702, QTP#160701 and QTP#172307 LFR data.

¹ Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

² Chi-squared 60% estimations used to calculate the failure rate.

³ Thermal Acceleration Factor is calculated from the Arrhenius equation

$$AF = \exp \left[\frac{E_A}{k} \left[\frac{1}{T_2} - \frac{1}{T_1} \right] \right]$$

where:

E_A = The Activation Energy of the defect mechanism.

K = Boltzmann's constant = 8.62×10^{-5} eV/Kelvin.

T_1 is the junction temperature of the device under stress and T_2 is the junction temperature of the device at use conditions.

Reliability Test Data

QTP #: 151008

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	COMP	15	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	COMP	15	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	COMP	15	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	500	80	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	1000	80	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	500	80	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	1000	80	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	500	80	0	
STRESS: DATA RETENTION, PLASTIC, 175C							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	76	80	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	152	79	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	76	80	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	152	80	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	76	80	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	152	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150, 2.07V, Vcc Max)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	48	1490	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	48	1510	0	
CYTT214032 (8CP206101)	4545249	611537364	CML-RA	48	1547	0	
STRESS: ENDURANCE							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	168	78	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	500	78	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	168	80	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	500	80	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	168	80	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	500	80	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	500	9	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	750	3	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	1000	3	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	1250	3	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	1500	3	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	1750	3	0	

Reliability Test Data

QTP #: 151008

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL							
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	500	9	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	750	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	1000	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	1250	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	1500	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	1750	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	500	9	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	750	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	1000	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	1250	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	1500	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	1750	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	1100	3	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	2200	8	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	3300	3	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	4000	3	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	5000	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	1100	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	2200	8	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	3300	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	4000	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	1100	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	2200	8	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	3300	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	4000	3	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.5V), PRE COND 192 HR 30C/60%RH (MSL3)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	96	30	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	96	30	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.07V, Vcc Max)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	80	116	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	500	116	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	80	120	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	500	120	0	

Reliability Test Data

QTP #: 151008

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: LOW TEMPERATURE OPERATING LIFE, -40C							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	160	40	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	380	40	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	168	75	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	168	78	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	168	80	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	288	80	0	
STRESS: PRE/POST LFR PARAMETER ASSESSMENT							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	COMP	10+2	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	COMP	10+2	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	COMP	10+2	0	
STRESS: STATIC LATCH-UP (85C, 140mA)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	COMP	6	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	COMP	6	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	COMP	6	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	COMP	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	COMP	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	COMP	3	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	COMP	3	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	COMP	3	0	
STRESS: SEM CROSS SECTION							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	COMP	1	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	500	80	0	
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	1000	80	0	
CYTT214032 (8CP206101)	4540145	611534709	CML-RA	500	80	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	500	79	0	
CY8C42452 (8CP44200)	4537464	611531543	CML-RA	1000	79	0	
STRESS: THERMAL JUNCTION MEASUREMENT							
CYTT214032 (8CP206101)	4539372	611534008	CML-RA	COMP	1	0	

Reliability Test Data

QTP #: 151403

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	COMP	15	0		
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	500	80	0		
STRESS: DATA RETENTION, PLASTIC, 175C							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	76	80	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	152	80	0		
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	48	1510	0		
STRESS: ENDURANCE							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	168	80	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	500	80	0		
STRESS: ESD-CHARGE DEVICE MODEL							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	500	9	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	750	3	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	1000	3	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	1250	3	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	1500	3	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	1750	3	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	2000	3	0		
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	1100	3	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	2200	8	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	3300	3	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	4000	3	0		
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	80	120	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	500	120	0		
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	168	80	0		
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	288	80	0		
STRESS: PRE/POST LFR PARAMETER ASSESSMENT							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	COMP	10+2	0		
STRESS: STATIC LATCH-UP (85C, 140mA)							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	COMP	6	0		
STRESS: STATIC LATCH-UP (85C, 200mA)							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	COMP	3	0		
STRESS: STATIC LATCH-UP (125C, 140mA)							
CY8C42452A(8CP44200DB) 4537464	611531543	CML-R	COMP	3	0		

Reliability Test Data

QTP #: 151403

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
--------	-----------	------------	----------	----------	------	-----	-------------------

STRESS: STATIC LATCH-UP (85C, 300mA)

CY8C42452A(8CP44200DB)	4537464	611531543	CML-R	COMP	3	0	
------------------------	---------	-----------	-------	------	---	---	--

STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)

CY8C42452A(8CP44200DB)	4537464	611531543	CML-R	500	79	0	
------------------------	---------	-----------	-------	-----	----	---	--

CY8C42452A(8CP44200DB)	4537464	611531543	CML-R	1000	79	0	
------------------------	---------	-----------	-------	------	----	---	--

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)

CY8C42452A(8CP44200DB)	4537464	611531543	CML-R	48	1469	0	
------------------------	---------	-----------	-------	----	------	---	--

Reliability Test Data

QTP #: 151303

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	COMP	15	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	500	80	0	
STRESS: DATA RETENTION, PLASTIC, 175C							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	76	80	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	152	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8CMBR31552 (8CP44303CB)	4542914	611534693	ASE-G	48	1469	0	
STRESS: ENDURANCE							
CY8CMBR31552 (8CP44303CB)	4542914	611534693	ASE-G	168	80	0	
CY8CMBR31552 (8CP44303CB)	4542914	611534693	ASE-G	500	80	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	500	9	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	750	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	1000	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	1250	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	1500	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	1750	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	1100	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	2200	8	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	3300	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	4000	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	5000	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	6000	3	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	7000	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8CMBR31552(8CP44303CB)	4542914	611534693	ASE-G	80	120	0	
CY8CMBR31552(8CP44303CB)	4542914	611534693	ASE-G	500	120	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	168	80	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	288	79	0	
STRESS: PRE/POST LFR PARAMETER ASSESSMENT							
CY8CMBR31552(8CP44303CB)	4542914	611534693	ASE-G	COMP	10+2	0	

Reliability Test Data

QTP #: 151303

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: STATIC LATCH-UP (85C, 140mA)							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	COMP	6	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	500	80	0	
CY8CMBR3106S2(8CP44304)	4542914	611534639	CML-RA	1000	80	0	

Reliability Test Data

QTP #: 160401

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	COMP	15	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C42452(8CP44200DB)	4537464	611531543	CML-RA	500	80	0	
CY8C42452(8CP44200DB)	4537464	611531543	CML-RA	1000	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	48	1550	0	
STRESS: ENDURANCE							
CY8C42452(8CP44200DB)	4537464	611531543	CML-RA	168	80	0	
CY8C42452(8CP44200DB)	4537464	611531543	CML-RA	1000	80	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	500	9	0	
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	750	3	0	
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	1000	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	1100	3	0	
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	2200	3	0	
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	3300	3	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	168	80	0	
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	168	76	0	
STRESS: STATIC LATCH-UP (125C, 100mA)							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	500	78	0	
CYFPA1 (8CP2F1001BB)	3609025	611610290	CML-R	1000	76	0	

Reliability Test Data

QTP #: 160301

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: DATA RETENTION, PLASTIC, 150C							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	500	80	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	1000	80	0	
STRESS: DATA RETENTION, PLASTIC, 175C							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	76	80	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	152	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	48	2609	1	No Visual Defect found
CYAT816882 (8C206802BB)	3617006	611617664	CML-R	48	1013	0	
STRESS: ENDURANCE							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	500	80	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	1000	80	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	500	9	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	750	3	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	1000	3	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CYTT417012 (8CP206801BB)	3613017	611614958	CML-R	500	9	0	
CYTT417012 (8CP206801BB)	3613017	611614958	CML-R	1000	3	0	
CYTT417012 (8CP206801BB)	3613017	611614958	CML-R	1250	3	0	
CYTT417012 (8CP206801BB)	3613017	611614958	CML-R	1500	3	0	
CYTT417012 (8CP206801BB)	3613017	611614958	CML-R	1750	3	0	
CYTT417012 (8CP206801BB)	3613017	611614958	CML-R	2000	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	1100	3	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	2200	8	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	3300	3	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	4000	3	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	5000	3	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	6000	3	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	7000	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.07V, Vcc Max)							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	500	99	0	
STRESS: PRE/POST LFR PARAMETER ASSESSMENT							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	COMP	10	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	COMP	3	0	

Reliability Test Data

QTP #: 160301

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: STATIC LATCH-UP (85C, 140mA)							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	500	80	0	
CYAT816882 (8C206802BB)	3613017	611611087	CML-R	1000	80	0	

Reliability Test Data

QTP #: 160803

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	48	1596	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	500	9	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	750	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	1000	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	1250	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	1500	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	1100	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	2200	8	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	3300	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	4000	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	5000	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	6000	3	0	
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	7000	3	0	
STRESS: STATIC LATCH-UP (125C, 100Ma)							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, 140Ma)							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 140Ma)							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 200Ma)							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300Ma)							
CY8C4045 (8CP40003BB)	3615013	611612344	OSE-T	COMP	3	0	

Reliability Test Data

QTP #: 160207

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	COMP	15	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	500	90	0	
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	1000	90	0	
STRESS: DATA RETENTION, PLASTIC, 175C							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	76	90	0	
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	152	90	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	48	2303	0	
STRESS: ENDURANCE							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	168	90	0	
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	500	90	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	500	9	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	1100	3	0	
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	2200	8	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.5V), PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	96	30	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.07V, Vcc Max)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	500	125	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	168	78	0	
STRESS: STATIC LATCH-UP (125C, 100mA)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 140mA)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CY8C3866A (8CP38661HB)	3617013	611615839	CML-R	500	80	0	

Reliability Test Data

QTP #: 160702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
--------	-----------	------------	----------	----------	------	-----	-------------------

STRESS: ACOUSTIC, MSL3

CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	COMP	15	0	
CY8C4246 (8CP480001BB)	4542101	611535695	CML-RA	COMP	15	0	

STRESS: DATA RETENTION, PLASTIC, 175C

CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	76	80	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	152	80	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)

CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	48	1521	0	
CY8C4246 (8CP480001BB)	4542101	611535695	CML-RA	48	1532	0	

STRESS: ENDURANCE

CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	168	80	0	
-----------------------	---------	-----------	-------	-----	----	---	--

STRESS: ESD-CHARGE DEVICE MODEL

CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	500	9	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	750	3	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	1000	3	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	1250	3	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	1500	3	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	1750	3	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	2000	3	0	
CY8C4248 (8CP42005CB)	3621015	611619414	ASE-G	500	9	0	
CY8C4248 (8CP42005CB)	3621015	611619414	ASE-G	750	3	0	
CY8C4248 (8CP42005CB)	3621015	611619414	ASE-G	1000	3	0	
CY8C4248 (8CP42005CB)	3621015	611619414	ASE-G	1250	3	0	
CY8C4248 (8CP42005CB)	3621015	611619414	ASE-G	1500	3	0	
CY8C4248 (8CP42005CB)	3621015	611619414	ASE-G	1750	3	0	
CY8C4248 (8CP42005CB)	3621015	611619414	ASE-G	2000	3	0	

STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114

CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	1100	3	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	2200	8	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	3300	3	0	
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	4000	3	0	

STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.5V), PRE COND 192 HR 30C/60%RH (MSL3)

CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	96	30	0	
-----------------------	---------	-----------	-------	----	----	---	--

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.07V, Vcc Max)

CY8C4246 (8CP480001BB)	4542101	611535695	CML-RA	80	80	0	
CY8C4246 (8CP480001BB)	4542101	611535695	CML-RA	500	80	0	

Reliability Test Data

QTP #: 160702

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	168	80	0	
STRESS: STATIC LATCH-UP (125C, 100mA)							
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 140mA)							
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CY8C4248 (8CP42003CB)	3621015	611619413	ASE-G	500	80	0	
CY8C4246 (8CP480001BB)	4542101	611535695	CML-RA	500	80	0	
CY8C4246 (8CP480001BB)	4542101	611535695	CML-RA	1000	80	0	

Reliability Test Data

QTP #: 160701

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	COMP	15	0	
CY8C4248 (8CP42003DB)	3649066	611701516	ASE-G	COMP	15	0	
CY8C4248 (8CP42003DB)	3649067	611701515	ASE-G	COMP	15	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	500	80	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	1000	80	0	
STRESS: DATA RETENTION, PLASTIC, 175C							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	76	80	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	152	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	48	1598	0	
CY8C4248 (8CP42003DB)	3649066	611701516	ASE-G	48	1550	0	
STRESS: ENDURANCE							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	168	88	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	500	88	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	500	9	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	750	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	1000	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	1250	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	1500	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	1750	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	2000	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	1000	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	2200	8	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	3300	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	4000	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	5000	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	6000	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	7000	3	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	8000	3	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.5V), PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	96	25	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	192	25	0	

Reliability Test Data

QTP #: 160701

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	80	80	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	500	80	0	
CY8C4248 (8CP42003DB)	3649066	611701516	ASE-G	500	80	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	96	80	0	
CY8C4248 (8CP42003DB)	3649066	611701516	ASE-G	168	80	0	
STRESS: PRE/POST LFR PARAMETER ASSESSMENT							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	COMP	12	0	
STRESS: STATIC LATCH-UP (125C, 100mA)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 140mA)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	500	80	0	
CY8C4248 (8CP42003CB)	3631019	611627888	ASE-G	1000	80	0	
CY8C4248 (8CP42003DB)	3649066	611701516	ASE-G	500	80	0	
CY8C4248 (8CP42003DB)	3649066	611701516	ASE-G	1000	80	0	
CY8C4248 (8CP42003DB)	3649067	611701515	ASE-G	500	80	0	
CY8C4248 (8CP42003DB)	3649067	611701515	ASE-G	1000	80	0	

Reliability Test Data

QTP #: 172307

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	48	1196	0	
CY8C4248 (8CP42003DB)	3721130	611729092	ASE-G	48	1200	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	500	9	0	
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	1000	3	0	
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	1250	3	0	
CY8C4248 (8CP42005DB)	3726090	611732045	ASE-G	500	9	0	
CY8C4248 (8CP42005DB)	3726090	611732045	ASE-G	1000	3	0	
CY8C4248 (8CP42005DB)	3726090	611732045	ASE-G	1250	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	1100	3	0	
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	2200	8	0	
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	3300	3	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.5V), PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	96	30	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.07V, Vcc Max)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	500	80	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	168	80	0	
STRESS: PRE/POST LFR PARAMETER ASSESSMENT							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	COMP	12	0	
STRESS: STATIC LATCH-UP (125C, 100mA)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	COMP	2	0	
STRESS: STATIC LATCH-UP (85C, 140mA)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	COMP	2	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	COMP	2	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	COMP	80	0	
CY8C4248 (8CP42003DB)	3721130	611724119	ASE-G	COMP	78	0	

Document History Page

Document Title: QTP#172307: PSoC 4200L Device Family S8SPF-10P, Fab25 (Cu BEOL Interconnect)
Document Number: 002-22169

Rev.	ECN No.	Orig. of Change	Description of Change
**	5977929	HSTO	Initial Spec Release

Cypress Semiconductor Sort Site Qualification Report

**QTP# 171610 VERSION *A
September 2017**

Cypress Test 25, Austin, Texas

Sort Site for S8 Technology

MPD / MCD Devices

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
reliability@cypress.com or via a CYLINK CRM CASE

Prepared By:
Honesto Sintos
Reliability Engineer

Reviewed By:
Lorena Zapanta
Reliability Manager

Approved By:
David Hoffman
Reliability Director

PACKAGE/PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date
151907	Cypress Test 25, Austin, Texas Sort Site Qualification for S4 Technology	June 2015
171610	Cypress Test 25, Austin, Texas Sort Site Qualification for S8 Technology	April 2017

QUALIFICATION COVERAGE RANGE

MARKETING PART NUMBER	DEVICE DESCRIPTION
CY8C4013 / CY8C4014 / CY8CMBR3002 / CY8CMBR3102 / CY8CMBR3110	CapSense® MBR3
CY8CMBR31 / CY8C4013 / CY8C4014	PSoC® 4000
CY8C4014	Automotive PSoC® 4000
CY8C4124 / CY8C4125 / CY8C4244 / CY8C4245	PSoC® 4100 & PSoC® 4200
CY8C4124 / CY8C4125 / CY8C4244 / CY8C4245	Automotive PSoC® 4100 & PSoC® 4200
CY8CEBIKE	PSoC® 4100 & PSoC® 4200
CY8C4125 / CY8C4126 / CY8C4127	PSoC® 4100M & PSoC® 4200M M Series
CY8C4245 / CY8C4246 / CY8C4247	PSoC® 4100M & PSoC® 4200M M Series
CY8C4246 / CY8C4247 / CY8C4248	PSoC® 4200L L-Series
CY8C4127 / CY8C4247	PSoC® 4 BLE 128K
CYBL1016 / CYBL10162 / CYBL10163	PRoCTM-BLE 128K
CYBL10461 / CYBL10462 / CYBL10463	PRoCTM-BLE 128K
CYBL10561 / CYBL10562 / CYBL10563	PRoCTM-BLE 128K
CYBL10999	PRoCTM-BLE 128K
CY8C4128 / CY8C4248	PSoC® 4 BLE 256K
CYBL10573	PRoCTM-BLE 256K
CY8C3244 / CY8C3245 / CY8C3246 / CY8C3444	Automotive PSoC® 3
CY8C3445 / CY8C3446 / CY8C3645 / CY8C3646 CY8C3665 / CY8C3666 / CY8C3846 / CY8C3866 /	Automotive PSoC® 3
CY8C3244 / CY8C3245 / CY8C3246 / CY8C3444	PSoC® 3
CY8C3445 / CY8C3446 / CY8C3665 / CY8C3666 / CY8C3846 / CY8C3865 / CY8C3866 / CY8C3MFIDOCK / CY8C3USBAUDIO	PSoC® 3
CY8C5267 / CY8C5268 / CY8C5287 / CY8C5288/ CY8C5467 / CY8C5468 / CY8C5488 / CY8C5666 CY8C5667 / CY8C5668 / CY8C5688 / CY8C5866 / CY8C5867 / CY8C5868 / CY8C5888	PSoC® 5LP
CY8CTMA1036 / CY8CTMA460 / CY8CTMA461/ CY8CTMA768	Automotive True Touch® Gen4 Touchscreen Controller

QUALIFICATION COVERAGE RANGE

MARKETING PART NUMBER	DEVICE DESCRIPTION
CYTMA445A / CYTMA525A / CYTT21100 CYTT21401 / CYTT21402 / CYTT21403	True Touch® Gen6M Touchscreen Controller
CYTT21100 / CYTT21401 / CYTT21402 CYTT21403 / CYTT31401 / CYTT31702 CYTT31802 / CYTT32302	True Touch® Gen6L Touchscreen Controller
CYAT81682 / CYAT81685 / CYAT81688	Automotive True Touch® Gen6XL Touchscreen Controller
CYFPA1I	True Touch® Fingerprint
CYPD1103 / CYPD1104 / CYPD1105 CYPD1120 / CYPD1121 / CYPD1122 CYPD1134	EZ-PDTM CCG1 USB Type-C PD Controller
CYPD2103 / CYPD2104 / CYPD2105 CYPD2119 / CYPD2120 / CYPD2134	EZ-PDTM CCG2 USB Type-C PD Controller
CY7C65210 / CY7C65211 / CY7C65213 CY7C65215 / CY7C65217 / CY7C65221	USB-Serial Bridge Controller
CY14B064 / CY14E064 / CY14MB064 / CY14ME064	64Kb Serial nvSRAM
CY14B256 / CY14E256	256Kb Serial nvSRAM
CY14B512	512Kb Serial nvSRAM
CY14B101 / CY14E101	1Mb Serial nvSRAM
CY14V101	1Mb Quad SPI nvSRAM
CY14B256 / CY14E256 / CY14U256 / CY14V256	256Kb Parallel nvSRAM
CY14101V / CY14B101 / CY14V101	1Mb Parallel nvSRAM
CY14B102NS	2Mb Parallel nvSRAM
CY14104V / CY14B104 / CY14V104	4Mb Parallel nvSRAM
CY14B108 / CYATB108	8Mb Parallel nvSRAM
CY14B116 / CY14V116 / CY14E116	16Mb Parallel nvSRAM
CY27410F / CY27410L	4-PLL Spread-Spectrum Clock Generator

Reliability Test Data

QTP #: 151907

<i>Device</i>	<i>Fab Lot #</i>	<i>Assembly Lot#</i>	<i>Test Loc</i>	<i>Yield</i>
<i>SORT TEST: CORRELATION</i>				
Sort Yield:				
8C24094AC	4446219 w2, w4, w5	N/A	CMI-FAB25	Correlated
8A24094AC	4510997 w5, w6, w7	N/A	CMI-FAB25	Correlated
8A24094AC	4506339 w6, w7, w8	N/A	CMI-FAB25	Correlated
Bin Movement:				
8C24094AC	4446219 w2	N/A	CMI-FAB25	Correlated
8A24094AC	4510997 w5	N/A	CMI-FAB25	Correlated
8A24094AC	4506339 w6	N/A	CMI-FAB25	Correlated
Fishers Exact:				
8C24094AC	4446219 w2, w4, w5	N/A	CMI-FAB25	>0.05
8A24094AC	4510997 w5, w6, w7	N/A	CMI-FAB25	>0.05
8A24094AC	4506339 w6, w7, w8	N/A	CMI-FAB25	>0.05

Reliability Test Data**QTP #: 171610**

Device	Fab Lot #	Assembly Lot#	Test Loc	Yield
---------------	------------------	----------------------	-----------------	--------------

SORT TEST: CORRELATION**Sort Yield:**

8A20680BB	3639013 w21	N/A	FAB25	Correlated
-----------	-------------	-----	-------	------------

Bin Movement:

8A20680BB	3639013 w21	N/A	FAB25	<2%
-----------	-------------	-----	-------	-----

Document History Page

Document Title: QTP#171610: Cypress Test 25, Austin, Texas Sort Site for S8 Technology
Document Number: 002-19700

Rev.	ECN No.	Orig. of Change	Description of Change
**	5747717	HSTO	Initial Spec Release
*A	5874099	GKUS	1. Rearranged the nvSRAM parts as per the density & interface. 2. Included CY14B101 in the 1Mb Serial nvSRAM row which was missed in the last revision.

Cypress Semiconductor Corporation

PSoC® 4200L Characterization Report

Design Engineering Director

John Kizziar

jwk@cypress.com

Product Engineering Director

Bjarni Benjaminsson

byb@cypress.com

Prin Product Engineer

Carlos Awong

cax@cypress.com

Applications Engineer

Meenakshi Sundaram Ravindran

msur@cypress.com

Marketing Engineer

Luke Jiao

ljiao@cypress.com



www.cypress.com

198 Champion Ct.
San Jose, CA 95134 USA

Tel: (408) 943 2600

Fax: (408) 943 4730

Company Confidential

A printed copy of this document is considered uncontrolled. Refer to online copy for latest revision.

1 Table of Contents

1.0 Table of Contents	2
2.0 Introduction	3
2.1 General Description	3
2.2 Datasheet	3
2.3 Reference Documents and Application Notes	3
2.4 Qualification Report	3
2.5 Pin List	4
2.6 Alternative Functions:	7
3.0 Characterization Hardware and Setup	10
3.1 Measurement System and Hardware	10
3.1.1 Temperature Forcing System	10
3.1.2 Power Supply	10
3.1.3 Digital Multimeter	10
3.1.4 Clock Input	10
3.1.5 Oscilloscope	10
3.1.6 Probes	10
3.2 Test Conditions	10
4.0 Characterization Data	11
4.1 Device Level DC Specifications	11
4.2 ILO AC Specifications	11
4.3 GPIO DC Specifications	11
4.4 GPIO AC Specifications	11
4.5 XRES DC Specifications	12
4.6 Opamp Specifications	12
4.7 Comparator DC Specifications	12
4.8 Precise POR(PPOR)	12
4.9 TCPWM Specifications	12
4.10 Voltage Mointor DC Specifications	13
4.11 IMO AC Specifications	13
4.12 SIO Specifications	14
4.13 SAR ADC Specifications	14
Document History Page	15

2 Introduction

2.1 General Description

PSoC® 4 is a scalable and reconfigurable platform architecture for a family of programmable embedded system controllers with an ARM® Cortex®-M0 CPU. It combines programmable and reconfigurable analog and digital blocks with flexible automatic routing. The PSoC 4200-L product family, based on this platform, is a combination of a microcontroller with digital programmable logic, programmable analog, programmable interconnect, secure expansion of memory off-chip, high-performance analog-to-digital conversion, opamps with Comparator mode, and standard communication and timing peripherals. The PSoC 4200-L products will be fully compatible with members of the PSoC 4 platform for new applications and design needs. The programmable analog and digital subsystems allow flexibility and in-field tuning of the design.

2.2 Datasheet

PSoC 4200-L meets all datasheet specifications. The datasheet is available under NDA through your local Cypress sales representative. You can also direct your requests to www.cypress.com

2.3 Reference Documents and Application Notes

Cypress reference documents are available under NDA through your local Cypress sales representative.

001-98126 – *Technical Reference Manual (TRM)* Contains detailed information on communication protocol, modes and registers, power states, and instructions on getting started with supporting tools.

001-81799 – *Programming Reference Manual*. It gives the information necessary to program the nonvolatile memory of the PSoC 4200L devices. It describes the communication protocol required for access by an external requirement, explains the programming algorithm and gives electrical specifications of the physical connection.

2.4 Qualification Report

The PSoC 4200-L is qualified Cu at	BEOL QTP # 172307
The PSoC 4200-L is qualified Al at	BEOL QTP # 160702
The PSoC 4200-L Skywater is qualified Al at	BEOL QTP # 153201.

2.5 Pin List

124-BGA		68-QFN		64-TQFP		48-TQFP		48-TQFP-USB	
Pin	Name	Pin	Name	Pin	Name	Pin	Name	Pin	Name
H13	P0.0	42	P0.0	39	P0.0	28	P0.0	28	P0.0
H12	P0.1	43	P0.1	40	P0.1	29	P0.1	29	P0.1
G13	P0.2	44	P0.2	41	P0.2	30	P0.2	30	P0.2
G12	P0.3	45	P0.3	42	P0.3	31	P0.3	31	P0.3
K10	VSSD								
G11	P0.4	46	P0.4	43	P0.4	32	P0.4	32	P0.4
F13	P0.5	47	P0.5	44	P0.5	33	P0.5	33	P0.5
F12	P0.6	48	P0.6	45	P0.6	34	P0.6	34	P0.6
F11	P0.7	49	P0.7	46	P0.7	35	P0.7	35	P0.7
E13	P8.0								
E12	P8.1								
E11	P8.2								
D13	P8.3								
D12	P8.4								
C13	P8.5								
C12	P8.6								
B12	P8.7								
C11	XRES	50	XRES	47	XRES	36	XRES	36	XRES
A12	VCCD	51	VCCD	48	VCCD	37	VCCD	37	VCCD
D10	VSSD	52	VSSD	49	VSSD	38	VSSD	38	VSSD
B13	VDDD	53	VDDD	50	VDDD	39	VDDD	39	VDDD
A13	VDDD	53	VDDD	50	VDDD	39	VDDD	39	VDDD
A11	P9.0								
B11	P9.1								
A10	P9.2								
B10	P9.3								
C10	P9.4								
A9	P9.5								
B9	P9.6								
C9	P9.7								
						40	VDDA	40	VDDA
C8	P5.0	54	P5.0	51	P5.0				
B8	P5.1	55	P5.1	52	P5.1				
A8	P5.2	56	P5.2	53	P5.2				
A7	P5.3	57	P5.3	54	P5.3				
B7	P5.4	58	P5.4						
C7	P5.5	59	P5.5	55	P5.5				
A6	P5.6								
B6	P5.7								
A2	VDDA	60	VDDA	56	VDDA	40	VDDA	40	VDDA

124-BGA		68-QFN		64-TQFP		48-TQFP		48-TQFP-USB	
B2	VDDA	60	VDDA	56	VDDA	40	VDDA	40	VDDA
C3	VSSA	61	VSSA	57	VSSA	41	VSSA	41	VSSA
C5	P1.0	62	P1.0	58	P1.0	42	P1.0	42	P1.0
B5	P1.1	63	P1.1	59	P1.1	43	P1.1	43	P1.1
A5	P1.2	64	P1.2	60	P1.2	44	P1.2	44	P1.2
A4	P1.3	65	P1.3	61	P1.3	45	P1.3	45	P1.3
B4	P1.4	66	P1.4	62	P1.4	46	P1.4	46	P1.4
C4	P1.5	67	P1.5	63	P1.5	47	P1.5	47	P1.5
A3	P1.6	68	P1.6	64	P1.6	48	P1.6	48	P1.6
B3	P1.7	1	P1.7/VREF	1	P1.7/VREF	1	P1.7/VREF	1	P1.7/VREF
B1	VREF	1	P1.7/VREF	1	P1.7/VREF	1	P1.7/VREF	1	P1.7/VREF
C3	VSSA								
D4	VSSA								
B2	VDDA								
C1	P2.0	2	P2.0	2	P2.0	2	P2.0	2	P2.0
C2	P2.1	3	P2.1	3	P2.1	3	P2.1	3	P2.1
D1	P2.2	4	P2.2	4	P2.2	4	P2.2	4	P2.2
D2	P2.3	5	P2.3	5	P2.3	5	P2.3	5	P2.3
D3	P2.4	6	P2.4	6	P2.4	6	P2.4	6	P2.4
E1	P2.5	7	P2.5	7	P2.5	7	P2.5	7	P2.5
E2	P2.6	8	P2.6	8	P2.6	8	P2.6	8	P2.6
E3	P2.7	9	P2.7	9	P2.7	9	P2.7	9	P2.7
K4	VSSD	10	VSSA	10	VSSA	10	VSSD	10	VSSD
A1	VDDA	11	VDDA	11	VDDA				
F1	P10.0								
F2	P10.1								
F3	P10.2								
G1	P10.3								
G2	P10.4								
G3	P10.5								
H1	P10.6								
H2	P10.7								
K4	VSSD								
J1	P6.0	12	P6.0	12	P6.0				
J2	P6.1	13	P6.1	13	P6.1				
J3	P6.2	14	P6.2	14	P6.2				
K1	P6.3	15	P6.3						
K2	P6.4	16	P6.4/P12.0	15	P6.4/P12.0				
L1	P12.0	16	P6.4/P12.0	15	P6.4/P12.0				
L2	P12.1	17	P6.5/P12.1	16	P6.5/P12.1				
K3	P6.5	17	P6.5/P12.1	16	P6.5/P12.1				
L3	VSSD	18	VSSIO	17	VSSIO	10	VSSD	10	VSSD
N2	P3.0	19	P3.0	18	P3.0	12	P3.0	12	P3.0
M2	P3.1	20	P3.1	19	P3.1	13	P3.1	13	P3.1

124-BGA		68-QFN		64-TQFP		48-TQFP		48-TQFP-USB	
N3	P3.2	21	P3.2	20	P3.2	14	P3.2	14	P3.2
M3	P3.3	22	P3.3	21	P3.3	16	P3.3	16	P3.3
N4	P3.4	23	P3.4	22	P3.4	17	P3.4	17	P3.4
M4	P3.5	24	P3.5	23	P3.5	18	P3.5	18	P3.5
N5	P3.6	25	P3.6	24	P3.6	19	P3.6	19	P3.6
M5	P3.7	26	P3.7	25	P3.7	20	P3.7	20	P3.7
M1	VDDIO	27	VDDIO	26	VDDIO	21	VDDIO	21	VDDIO
N1	VDDIO	27	VDDIO	26	VDDIO	21	VDDIO	21	VDDIO
N6	P11.0								
M6	P11.1								
L6	P11.2								
N7	P11.3								
M7	P11.4								
L7	P11.5								
N8	P11.6								
M8	P11.7								
N12	VDDIO	27	VDDIO	26	VDDIO	21	VDDIO	21	VDDIO
N13	VDDIO	27	VDDIO	26	VDDIO	21	VDDIO	21	VDDIO
L8	P4.0	28	P4.0	27	P4.0	22	P4.0	22	P4.0
N9	P4.1	29	P4.1	28	P4.1	23	P4.1		
M9	P4.2	30	P4.2	29	P4.2	24	P4.2		
N10	P4.3	31	P4.3	30	P4.3	25	P4.3		
M10	P4.4	32	P4.4	31	P4.4				
N11	P4.5	33	P4.5	32	P4.5				
M11	P4.6	34	P4.6	33	P4.6				
M12	P4.7	35	P4.7						
L11	VSSD								
L12	D+/P13.0	36	D+/P13.0	34	D+/P13.0			23	D+/P13.0
L13	D-/P13.1	37	D-/P13.1	35	D-/P13.1			24	D-/P13.1
M13	VBUS/P13.2	38	VBUS/P13.2	36	VBUS/P13.2			25	VBUS/P13.2
L9	P7.0	39	P7.0	37	P7.0	26	P7.0	26	P7.0
L10	P7.1	40	P7.1	38	P7.1	27	P7.1	27	P7.1
K13	P7.2	41	P7.2						
K12	P7.3								
K11	P7.4								
J13	P7.5								
J12	P7.6								
J11	P7.7								

Summary of GPIO pins by package:

124-BGA		68-QFN		64-TQFP		48-TQFP		48-TQFP-USB	
96	IO	57	IO	53	IO	39	IO	36	IO
2	USB	2	USB	2	2	0	USB	2	USB

Port 12 (Port pins 12.0 and 12.1) are SIO pins. Ports 6 (Port pins P6.0..6.5) and 9 (Port pins 9.0...9.7) are Over-Voltage tolerant (GPIO_OVT).

2.6 Alternative Functions:

Each Port pin has multiple functionality programmable via the High-Speed I/O Matrix. The possible HSIO selected alternate functions for the pins are shown below

Port/Pin	Analog	PRGPIO & USB	Alt. Function 1	Alt. Function 2	Alt. Function 3	Alt. Function 4	Alt. Function 5
P0.0	lpcomp.in_p[0]				can[1].can_rx:0	usb.vbus_valid	scb[0].spi_select1:3
P0.1	lpcomp.in_n[0]				can[1].can_tx:0		scb[0].spi_select2:3
P0.2	lpcomp.in_p[1]						scb[0].spi_select3:3
P0.3	lpcomp.in_n[1]						
P0.4	wco_in			scb[1].uart_rx:0		scb[1].i2c_scl:0	scb[1].spi_mosi:0
P0.5	wco_out			scb[1].uart_tx:0		scb[1].i2c_sda:0	scb[1].spi_miso:0
P0.6			srss.ext_clk:0	scb[1].uart_cts:0			scb[1].spi_clk:0
P0.7				scb[1].uart_rts:0	can[1].can_tx_enb_n:0	srss.wakeup	scb[1].spi_select0:0
P8.0				scb[3].uart_rx:0		scb[3].i2c_scl:0	scb[3].spi_mosi:0
P8.1				scb[3].uart_tx:0		scb[3].i2c_sda:0	scb[3].spi_miso:0
P8.2				scb[3].uart_cts:0		lpcomp.comp[0]:0	scb[3].spi_clk:0
P8.3				scb[3].uart_rts:0		lpcomp.comp[1]:0	scb[3].spi_select0:0
P8.4							scb[3].spi_select1:0
P8.5							scb[3].spi_select2:0
P8.6							scb[3].spi_select3:0
P8.7							
P9.0			tcpwm.line[0]:2	scb[0].uart_rx:0		scb[0].i2c_scl:0	scb[0].spi_mosi:0
P9.1			tcpwm.line_co mpl[0]:2	scb[0].uart_tx:0		scb[0].i2c_sda:0	scb[0].spi_miso:0
P9.2			tcpwm.line[1]:2	scb[0].uart_cts:0			scb[0].spi_clk:0
P9.3			tcpwm.line_co mpl[1]:2	scb[0].uart_rts:0			scb[0].spi_select0:0
P9.4			tcpwm.line[2]:2				scb[0].spi_select1:0
P9.5			tcpwm.line_co mpl[2]:2				scb[0].spi_select2:0
P9.6			tcpwm.line[3]:2			scb[3].i2c_scl:3	scb[0].spi_select3:0
P9.7			tcpwm.line_co mpl[3]:2			scb[3].i2c_sda:3	
P5.0	ctb1_pads[0] csd[1].c_mod		tcpwm.line[4]:2	scb[2].uart_rx:0		scb[2].i2c_scl:0	scb[2].spi_mosi:0
P5.1	ctb1_pads[1] csd[1].c_sh_tank		tcpwm.line_co mpl[4]:2	scb[2].uart_tx:0		scb[2].i2c_sda:0	scb[2].spi_miso:0
P5.2	ctb1_pads[2] ctb1_oa0_out_1 0x		tcpwm.line[5]:2	scb[2].uart_cts:0		lpcomp.comp[0]:1	scb[2].spi_clk:0
P5.3	ctb1_pads[3] ctb1_oa1_out_1 0x		tcpwm.line_co mpl[5]:2	scb[2].uart_rts:0		lpcomp.comp[1]:1	scb[2].spi_select0:0
P5.4	ctb1_pads[4]		tcpwm.line[6]:2				scb[2].spi_select1:0
P5.5	ctb1_pads[5]		tcpwm.line_co mpl[6]:2				scb[2].spi_select2:0
P5.6	ctb1_pads[6]		tcpwm.line[7]:2				scb[2].spi_select3:0
P5.7	ctb1_pads[7]		tcpwm.line_co mpl[7]:2				

Port/Pin	Analog	PRGIO & USB	Alt. Function 1	Alt. Function 2	Alt. Function 3	Alt. Function 4	Alt. Function 5
P1.0	ctb0_pads[0]		tcpwm.line[2]:1	scb[0].uart_rx:1		scb[0].i2c_scl:1	scb[0].spi_mosi:1
P1.1	ctb0_pads[1]		tcpwm.line_co mpl[2]:1	scb[0].uart_tx:1		scb[0].i2c_sda:1	scb[0].spi_miso:1
P1.2	ctb0_pads[2] ctb0_oa0_out_1 0x		tcpwm.line[3]:1	scb[0].uart_cts:1			scb[0].spi_clk:1
P1.3	ctb0_pads[3] ctb0_oa1_out_1 0x		tcpwm.line_co mpl[3]:1	scb[0].uart_rts:1			scb[0].spi_select0:1
P1.4	ctb0_pads[4]		tcpwm.line[6]:1				scb[0].spi_select1:1
P1.5	ctb0_pads[5]		tcpwm.line_co mpl[6]:1				scb[0].spi_select2:1
P1.6	ctb0_pads[6]		tcpwm.line[7]:1				scb[0].spi_select3:1
P1.7	ctb0_pads[7], sar_ext_vref		tcpwm.line_co mpl[7]:1				
P2.0	sarmux_pads[0]		tcpwm.line[4]:1	scb[1].uart_rx:1		scb[1].i2c_scl:1	scb[1].spi_mosi:1
P2.1	sarmux_pads[1]		tcpwm.line_co mpl[4]:1	scb[1].uart_tx:1		scb[1].i2c_sda:1	scb[1].spi_miso:1
P2.2	sarmux_pads[2]		tcpwm.line[5]:1	scb[1].uart_cts:1			scb[1].spi_clk:1
P2.3	sarmux_pads[3]		tcpwm.line_co mpl[5]:1	scb[1].uart_rts:1			scb[1].spi_select0:1
P2.4	sarmux_pads[4]		tcpwm.line[0]:1				scb[1].spi_select1:0
P2.5	sarmux_pads[5]		tcpwm.line_co mpl[0]:1				scb[1].spi_select2:0
P2.6	sarmux_pads[6]		tcpwm.line[1]:1				scb[1].spi_select3:0
P2.7	sarmux_pads[7]		tcpwm.line_co mpl[1]:1				
P10.0				scb[2].uart_rx:1		scb[2].i2c_scl:1	scb[2].spi_mosi:1
P10.1				scb[2].uart_tx:1		scb[2].i2c_sda:1	scb[2].spi_miso:1
P10.2				scb[2].uart_cts:1			scb[2].spi_clk:1
P10.3				scb[2].uart_rts:1			scb[2].spi_select0:1
P10.4							scb[2].spi_select1:1
P10.5							scb[2].spi_select2:1
P10.6							scb[2].spi_select3:1
P10.7							
P6.0			tcpwm.line[4]:0	scb[3].uart_rx:1	can[0].can_tx_enb_n:0	scb[3].i2c_scl:1	scb[3].spi_mosi:1
P6.1			tcpwm.line_co mpl[4]:0	scb[3].uart_tx:1	can[0].can_rx:0	scb[3].i2c_sda:1	scb[3].spi_miso:1
P6.2			tcpwm.line[5]:0	scb[3].uart_cts:1	can[0].can_tx:0	scb[2].i2c_scl:3	scb[3].spi_clk:1
P6.3			tcpwm.line_co mpl[5]:0	scb[3].uart_rts:1		scb[2].i2c_sda:3	scb[3].spi_select0:1
P6.4			tcpwm.line[6]:0			scb[0].i2c_scl:3	scb[3].spi_select1:1
P12.0			tcpwm.line[7]:0			scb[1].i2c_scl:3	scb[3].spi_select3:1
P12.1			tcpwm.line_co mpl[7]:0			scb[1].i2c_sda:3	
P6.5			tcpwm.line_co mpl[6]:0			scb[0].i2c_sda:3	scb[3].spi_select2:1
P3.0			tcpwm.line[0]:0	scb[1].uart_rx:2		scb[1].i2c_scl:2	scb[1].spi_mosi:2
P3.1			tcpwm.line_co mpl[0]:0	scb[1].uart_tx:2		scb[1].i2c_sda:2	scb[1].spi_miso:2
P3.2			tcpwm.line[1]:0	scb[1].uart_cts:2		cpuss.swd_data:0	scb[1].spi_clk:2
P3.3			tcpwm.line_co mpl[1]:0	scb[1].uart_rts:2		cpuss.swd_clk:0	scb[1].spi_select0:2

Port/Pin	Analog	PRGIO & USB	Alt. Function 1	Alt. Function 2	Alt. Function 3	Alt. Function 4	Alt. Function 5
P3.4			tcpwm.line[2]:0				scb[1].spi_select1:1
P3.5			tcpwm.line_co mpl[2]:0				scb[1].spi_select2:1
P3.6			tcpwm.line[3]:0				scb[1].spi_select3:1
P3.7			tcpwm.line_co mpl[3]:0				
P11.0		prgio[0].io[0]	tcpwm.line[4]:3	scb[2].uart_rx:2		scb[2].i2c_scl:2	scb[2].spi_mosi:2
P11.1		prgio[0].io[1]	tcpwm.line_co mpl[4]:3	scb[2].uart_tx:2		scb[2].i2c_sda:2	scb[2].spi_miso:2
P11.2		prgio[0].io[2]	tcpwm.line[5]:3	scb[2].uart_cts:2		cpuss.swd_data:1	scb[2].spi_clk:2
P11.3		prgio[0].io[3]	tcpwm.line_co mpl[5]:3	scb[2].uart_rts:2		cpuss.swd_clk:1	scb[2].spi_select0:2
P11.4		prgio[0].io[4]	tcpwm.line[6]:3				scb[2].spi_select1:2
P11.5		prgio[0].io[5]	tcpwm.line_co mpl[6]:3				scb[2].spi_select2:2
P11.6		prgio[0].io[6]	tcpwm.line[7]:3				scb[2].spi_select3:2
P11.7		prgio[0].io[7]	tcpwm.line_co mpl[7]:3				
P4.0				scb[0].uart_rx:2	can[0].can_rx:1	scb[0].i2c_scl:2	scb[0].spi_mosi:2
P4.1				scb[0].uart_tx:2	can[0].can_tx:1	scb[0].i2c_sda:2	scb[0].spi_miso:2
P4.2	csd[0].c_mod			scb[0].uart_cts:2	can[0].can_tx_enb_n:1	lpcomp.comp[0]:2	scb[0].spi_clk:2
P4.3	csd[0].c_sh_tank			scb[0].uart_rts:2		lpcomp.comp[1]:2	scb[0].spi_select0:2
P4.4					can[1].can_tx_enb_n:1		scb[0].spi_select1:2
P4.5					can[1].can_rx:1		scb[0].spi_select2:2
P4.6					can[1].can_tx:1		scb[0].spi_select3:2
P4.7							
P13.0		USBDP					
P13.1		USBDM					
P13.2		VBUS					
P7.0	srss.eco_in		tcpwm.line[0]:3	scb[3].uart_rx:2		scb[3].i2c_scl:2	scb[3].spi_mosi:2
P7.1	srss.eco_out		tcpwm.line_co mpl[0]:3	scb[3].uart_tx:2		scb[3].i2c_sda:2	scb[3].spi_miso:2
P7.2			tcpwm.line[1]:3	scb[3].uart_cts:2			scb[3].spi_clk:2
P7.3			tcpwm.line_co mpl[1]:3	scb[3].uart_rts:2			scb[3].spi_select0:2
P7.4			tcpwm.line[2]:3				scb[3].spi_select1:2
P7.5			tcpwm.line_co mpl[2]:3				scb[3].spi_select2:2
P7.6			tcpwm.line[3]:3				scb[3].spi_select3:2
P7.7			tcpwm.line_co mpl[3]:3				

3 Characterization Hardware and Setup

3.1 Measurement System and Hardware

Temperature Forcing System

Temptronic TPO4310A Precision Temperature Forcing System is used to force ambient/industrial operating temperatures of -40°C, 25°C and 130°C.

Power Supply

Keithley-2400 or NI-PXI-4132 or NI-PXI-4140, 4141 SMU is used to source the operating device power supply voltages as well as to measure currents

Digital Multimeter

Agilent 34410A or NI-PXI-4070 was used to measure voltages at 6.5 digit resolution

Clock Input

Tektronix AFG3102 Arbitrary Function Generator or Stanford Research Systems DS360 was used to provide clock signal

Oscilloscope

The Tektronix DPO7104 Digital Phosphorus Oscilloscope is used to measure all AC parameters on the device including frequency, rise/fall time and duty cycle.

Probes

All AC signals were measured using Tektronix TAP-1500 FET Probe

3.2 Test Conditions

Power Supply	Min	Nominal	Max	Units
VDDA	1.71	3.3	5.5	V
VDDD	1.71	3.3	5.5	V
VDDIO	1.71	3.3	5.5	V
VCCD	1.7	1.8	1.95	V
Temperature	-45	25	130	°C

4 Characterization Data (Reference EROS Rev *F)

4.1 DC Specifications

PARAMETER	DESCRIPTION	Datasheet			FAB 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
Active Mode, -40C to 85C														
IDD16	I2C wakeup, WDT, and Comparators on. Regulator Off. VDD = 1.71 to 1.89, 6 MHz	-	-	2.9	1.93	1.99	2.08	2.06	2.15	2.31	1.58	1.67	1.75	mA
IDD18	I2C wakeup, WDT, and Comparators on. Regulator off, VDD = 1.8 to 5.5, 12 MHz	-	-	4.2	1.21	1.59	2.1	2.94	3.17	3.45	1.78	1.79	1.81	mA
IDD_XR	Supply current while XRES (Active Low) asserted	-	2	5	1.81	1.79	2.21	2.8	-	3.08	0.49	2.72	3.27	mA
IDD_CAN	Block current consumption	-	-	200	3	84.6	177.1	22	97	154.3	17.86	124.71	161.86	uA

4.2 ILO AC Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
FILOTRIM1	32 KHz trimmed frequency	15	32	50	22.68	27.77	39.94	24.3	31.37	36.74	21.45	25.92	30.42	KHz

4.3 GPIO DC Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
VIH	LVTTL input, VDD >= 2.7V	-	-	2	1.23	1.88	1.89	1.18	1.48	1.906	1.17	1.84	1.88	V
VIL	LVTTL input, VDD >= 2.7V	0.8	-	-	1.06	1.06	1.73	0.998	1.299	1.736	1	1.05	1.7	V
VOH	Output Voltage high level	-	-	0.6	0.163	0.243	0.248	0.13	0.17	0.22	0.15	0.2	0.25	V
VOH	Output Voltage high level Unregulated mode	-	-	0.5	0.075	0.101	0.102	0.073	0.091	0.112	0.15	0.2	0.25	V
VOL	Output Voltage low level	-	-	0.6	0.093	0.192	0.312	0.09	0.13	0.23	0.11	0.15	0.25	V
VOL	Output Voltage low level	-	-	0.6	0.125	0.211	0.328	0.09	0.13	0.23	0.08	0.1	0.14	V
VOL	Output Voltage low level	-	-	0.4	0.046	0.095	0.236	0.05	0.07	0.15	0.09	0.12	0.16	V
RPULLUP	Pull-up resistor	3500	5600	8500	4610.72	4962.48	5465.63	4526.38	4963.11	5471.96	4891.1	4981.1	5871.1	Ω
RPULLDOWN	Pull-down resistor	3500	5600	8500	4603.75	5673.85	5379.13	4472.27	4920.1	5410.86	4655.4	5586.1	5873.2	Ω
CIN	Input Capacitance	-	-	7	1.6	1.77	1.9	2.1	-	3.28	1.6	1.77	1.91	pF
VHYSTTL	Input hysteresis LVTTL VDD > 2.7V	0.025	0.04	-	0.17	0.188	0.206	0.118	0.187	0.214	0.16	0.18	2	V
VHYSCMOS	Input hysteresis CMOS	0.05*VDD	-	-	139.64	162.06	177.78	158.4	175.09	194.8	14.15	14.84	17.78	mV

4.4 GPIO AC Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
TRISEF	Rise time in Fast Strong Mode	2	-	12	3.57	6.94	10.64	6.19	7.47	10.01	4.25	9.93	10.85	ns
TFALLF	Fall time in Fast Strong Mode	2	-	12	3.63	5.21	7.58	4.51	5.47	5.74	1.96	6.04	6.67	ns
TRISES	Rise time in Slow Strong Mode	10	-	60	30.01	38.19	45.91	33.56	44.47	45.66	39.19	59.62	62.24	ns
TFALLS	Fall time in Slow Strong Mode	10	-	60	35.49	41.28	53.22	39.62	41.76	52.21	36.05	54.16	56.68	ns
IMOWCO4	Frequency variation with IMO set to 24 MHz	-0.2	-	0.2	0.11	0.0011	0.11	0.057	0.083	0.054	0.03	0.07	0.14	%

4.5 XRES DC Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
RPULLUP	Pull-up resistor Xres	3.5	5.6	8.5	4.78	5.11	5.39	4.67	5.05	5.43	4.89	4.98	5.87	kΩ
CIN	Input Capacitance	-	3	-	1.6	1.77	1.9	2.48	2.58	2.75	1.6	1.77	1.9	pF

4.6 Opamp Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
IDD_HI	power=hi	-	1100	1800	1013.1	1263.3	1673.4	1040.1	1445.5	1528.7	815.52	1211.25	1500.57	uA
IDD_LOW	power=lo	-	150	350	136.2	235.8	333.4	125.06	297.31	327.22	390.15	639.09	806.52	uA
IDD_MED	power=med	-	550	950	503.5	703.2	932.6	522.14	814.03	904.53	101.72	263.72	296.3	uA
GBW_HI	power=hi	6	-	-	17.5	22	35.9	8.22	19.1	29.01	15.13	26.36	32.23	MHz
GBW_MED	power=med	4	-	-	8.7	11.9	30	7.01	12.5	15.02	8.01	10.29	31.4	MHz
VCM	Input common mode voltage	-0.05	-	VDDA-0.2	Covered with Vos and CMRR tests			Covered with Vos and CMRR tests			Covered with Vos and CMRR tests			V
VOS_TR	Offset voltage, trimmed	-1	+/-0.5	1	-0.813	0.303	0.855	-0.435	0.108	0.599	-0.92	0.01	0.66	mV
VOS_TR	Offset voltage, trimmed	-	+/-1	-	-0.248	0.203	0.613	-1.092	-0.069	0.648	-2.37	-0.11	2.15	mV
VOS_TR	Offset voltage, trimmed	-	+/-2	-	-0.634	0.313	0.857	-1.96	0.271	2.81	-3.03	-0.05	3.27	mV
VOS_DR_TR	Offset voltage drift, trimmed	-10	+/-3	10	-0.205	0.265	6.822	-2.37	0.342	8.01	-4.59	-0.24	5.44	uV/C
VOS_DR_TR	Offset voltage drift, trimmed	-	+/-10	-	-0.241	0.074	8.56	-4.15	0.335	9.73	-3.1	-0.05	3.27	uV/C
VOS_DR_TR	Offset voltage drift, trimmed	-	+/-10	-	-0.209	0.162	3.35	-2.78	0.415	9.48	-7.7	7.95	8.43	uV/C
CMRR	DC Common mode rejection ratio VDDD 3.6	60	70	-	63.13	79.6	103.2	73.9	79.3	106.9	52.81	78.83	104.86	dB
SLEW_RATE	Output slew rate	6	-	-	7.23		10.94	8.73		13.5	8.69	11.75	14.81	V/uS

4.7 Comparator DC Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
VOFFSET1	Input offset voltage, Factory trim	-10	-	10	-7.5	-0.214	3.7	-7.53	-0.57	5.94	-7.51	0.55	6.87	mV
VOFFSET2	Input offset voltage, Custom trim	-	-	±4	-2.1	0.206	3.7	-1.4	-0.57	2.35	-3.66	-0.011	3.26	mV
VHYST	Hysteresis when enabled	-	10	35	2.5	11.6	34.7	6.9	14.4	27.8	19.8	24.33	28.86	mV
CMRR	Common mode rejection ratio VDDD>2.7	50	-	-	64.39	79.2	102.9	54.9	-	70.3	73.27	-	131.4	dB
CMRR	Common mode rejection ratio VDDD<2.7	42	-	-	58.2	76.2	99.14	48.2	-	63.2	48.86	-	84.06	dB

4.8 Precise POR (PPOR)

PARAMETER	DESCRIPTION	MIN	TYP	MAX	Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
					Min	TYP	Max	Min	TYP	Max	MIN	AVG	MAX	
VFALLPPOR	BOD trip voltage in Active and Sleep modes	1.64	-	-	1.66	1.67	1.67	1.657	1.665	1.674	1.649	1.659	1.668	V
VFALLDPSLP	BOD trip voltage in Deep Sleep	1.4	-	-	1.42	1.46	1.69	1.424	1.46	1.688	1.437	1.467	1.704	V

4.9 TCPWM Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
ITCPWM1	Block current consumption at 3 MHz	-	-	45	1.32	31.8	45	2.1	29.1	44.3	4.61	38.17	39.91	μA
ITCPWM2	Block current consumption at 12 MHz	-	-	155	1.2	91	161	27.1	106.8	153.2	25.51	146.59	149.92	μA
ITCPWM3	Block current consumption at 48 MHz	-	-	650	1.31	421.5	632.1	5.3	374.9	634.3	71.81	514.66	587.08	μA

4.10 Voltage Monitor DC Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 AI BEOL			SkyWater AI BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
VLVI1	LVI_A/D_SEL[3:0] = 0000b	1706.3	1750	1793.8	1746.15	1753.34	1760.13	1743.13	1754.55	1767.55	1706.3	1750	1793.8	mV
VLVI2	LVI_A/D_SEL[3:0] = 0001b	1755	1800	1845	1796.07	1802.6	1809.97	1790.17	1803.99	1817.57	1755	1800	1845	mV
VLVI3	LVI_A/D_SEL[3:0] = 0010b	1852.5	1900	1947.5	1896.13	1902.75	1909.61	1887.26	1903.35	1917.34	1852.5	1900	1947.5	mV
VLVI4	LVI_A/D_SEL[3:0] = 0011b	1950	2000	2050	1995.68	2004.93	2014.94	1993.14	2004.56	2017.9	1950	2000	2050	mV
VLVI5	LVI_A/D_SEL[3:0] = 0100b	2047.5	2100	2152.5	2095.52	2105.88	2115.04	2089.98	2105.8	2121.32	2047.5	2100	2152.3	mV
VLVI6	LVI_A/D_SEL[3:0] = 0101b	2145	2200	2255	2192.18	2204.58	2216.52	2187.77	2205.36	2221.42	2145	2200	2255	mV
VLVI7	LVI_A/D_SEL[3:0] = 0110b	2242.5	2300	2357.5	2292.98	2305.9	2316.81	2290.1	2307.39	2327.25	2242.5	2300	2357	mV
VLVI8	LVI_A/D_SEL[3:0] = 0111b	2340	2400	2460	2392.52	2404.93	2416.63	2388.76	2406.07	2427.15	2340	2400	2460	mV
VLVI9	LVI_A/D_SEL[3:0] = 1000b	2437.5	2500	2562.5	2492.71	2505.68	2516.64	2487.76	2506.72	2527.16	2437.1	2500	2562.2	mV
VLVI10	LVI_A/D_SEL[3:0] = 1001b	2535	2600	2665	2592.82	2607.7	2622.69	2588.09	2607.87	2624.89	2535	2600	2665	mV
VLVI11	LVI_A/D_SEL[3:0] = 1010b	2632.5	2700	2767.5	2695.67	2708.11	2722.38	2670.14	2707.97	2728.47	2632.5	2700	2767.5	mV
VLVI12	LVI_A/D_SEL[3:0] = 1011b	2730	2800	2870	2795.73	2809.47	2826.61	2784.14	2810.46	2830.7	2730	2800	2870	mV
VLVI13	LVI_A/D_SEL[3:0] = 1100b	2827.5	2900	2972.5	2887	2907.09	2922.17	2878.45	2907.25	2926.98	2827.5	2900	2972.5	mV
VLVI14	LVI_A/D_SEL[3:0] = 1101b	2925	3000	3075	2949.95	2972.1	2992.88	2929.74	2965.46	2994.13	2925	3000	3075	mV
VLVI15	LVI_A/D_SEL[3:0] = 1110b	3120	3200	3280	3139.24	3164.79	3191.51	3126.16	3163.54	3195.75	3120	3200	3280	mV
VLVI16	LVI_A/D_SEL[3:0] = 1111b	4387.5	4500	4612.5	4418.05	4449.33	4485.62	4381.67	4445.25	4493.87	4387.5	4500	4612.1	mV

4.11 IMO AC Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 AI BEOL			SkyWater AI BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
IMO_Screen_32MHz_vNR	Frequency variation	31.04	32	32.96	31.86	32.08	32.32	31.48	32.01	32.41	31.78	32.19	32.6	MHz
IMO_Screen_48MHz_vNR	Frequency variation	46.08	48	49.92	47.76	48.08	48.37	47.2	48.03	48.6	47.58	48.3	49.42	MHz
IMO_Screen_37MHz_vNR	Frequency variation	35.89	37	38.11	36.82	37.06	37.25	36.38	37.03	37.45	36.78	37.2	37.85	MHz
IMO_Screen_30MHz_vNR	Frequency variation	29.1	30	30.9	29.89	30.07	30.29	29.52	30	30.42	29.86	30.2	30.55	MHz
IMO_Screen_39MHz_vNR	Frequency variation	37.83	39	40.17	38.79	39.08	39.29	38.35	39.01	39.48	38.79	39.21	39.75	MHz
IMO_Screen_40MHz_vNR	Frequency variation	38.8	40	41.2	39.85	40.07	40.38	39.31	40.03	40.53	39.8	40.19	40.82	MHz
IMO_Screen_33MHz_vNR	Frequency variation	32.01	33	33.99	32.89	33.08	33.35	32.45	33	33.4	32.82	33.17	33.7	MHz
IMO_Screen_31MHz_vNR	Frequency variation	30.07	31	31.93	30.84	31.07	31.33	30.49	31.01	31.4	30.8	31.19	31.56	MHz
IMO_Screen_38MHz_vNR	Frequency variation	36.86	38	39.14	37.85	38.08	38.35	37.41	38.03	38.53	37.83	38.2	38.72	MHz
IMO_Screen_34MHz_vNR	Frequency variation	32.98	34	35.02	33.84	34.06	34.26	33.53	34.01	34.46	33.83	34.17	34.59	MHz
IMO_Screen_45MHz_vNR	Frequency variation	43.2	45	46.8	44.82	45.1	45.39	44.32	45.06	45.65	44.66	45.31	46.04	MHz
IMO_Screen_35MHz_vNR	Frequency variation	33.95	35	36.05	34.9	35.08	35.28	34.48	35	35.44	33.83	34.17	34.59	MHz
IMO_Screen_47MHz_vNR	Frequency variation	45.12	47	48.88	46.78	47.1	47.37	46.24	47.05	47.69	46.65	47.33	48.3	MHz
IMO_Screen_46MHz_vNR	Frequency variation	44.16	46	47.84	45.81	46.09	46.38	45.29	46.05	46.65	45.52	46.31	47.23	MHz
IMO_Screen_43MHz_vNR	Frequency variation	41.28	43	44.72	42.84	43.09	43.42	42.38	43.04	43.57	42.78	43.31	44.08	MHz
IMO_Screen_36MHz_vNR	Frequency variation	34.92	36	37.08	35.83	36.06	36.34	35.46	36.01	36.47	35.79	36.16	36.61	MHz
IMO_Screen_44MHz_vNR	Frequency variation	42.24	44	45.76	43.84	44.1	44.35	43.33	44.05	44.6	43.69	44.31	45.07	MHz
IMO_Screen_29MHz_vNR	Frequency variation	28.13	29	29.87	28.89	29.06	29.24	28.58	29.01	29.47	28.62	29.05	29.53	MHz
IMO_Screen_42MHz_vNR	Frequency variation	40.32	42	43.68	41.86	42.09	42.36	41.32	42.02	42.55	41.75	42.21	43.04	MHz
IMO_Screen_41MHz_vNR	Frequency variation	39.36	41	42.64	40.84	41.06	41.34	40.4	41.03	41.56	40.79	41.2	42.08	MHz
IMO_Screen_9MHz_vNR	Frequency variation	8.82	9	9.18	8.96	9.01	9.12	8.84	8.99	9.15	8.92	9.01	9.1	MHz
IMO_Screen_12MHz_vNR	Frequency variation	11.76	12	12.24	11.96	12.02	12.12	10.81	11	11.15	11.89	12.01	12.12	MHz
IMO_Screen_28MHz_vNR	Frequency variation	27.44	28	28.56	27.9	28.05	28.23	27.59	28.02	28.41	27.83	28.05	28.34	MHz
IMO_Screen_5MHz_vNR	Frequency variation	4.9	5	5.1	4.98	5.01	5.05	4.95	5	5.07	4.96	4.99	5.03	MHz
IMO_Screen_24MHz_vNR	Frequency variation	23.52	24	24.48	23.9	24.05	24.22	23.65	24.03	24.39	23.88	24.09	24.35	MHz
IMO_Screen_7MHz_vNR	Frequency variation	6.86	7	7.14	6.98	7.01	7.07	6.91	6.99	7.07	6.94	6.98	7.06	MHz
IMO_Screen_27MHz_vNR	Frequency variation	26.46	27	27.54	26.89	27.04	27.26	26.64	27.02	27.43	26.86	27.07	27.42	MHz
IMO_Screen_20MHz_vNR	Frequency variation	19.6	20	20.4	19.93	20.04	20.19	19.73	20.01	20.33	19.8	20.05	20.21	MHz
IMO_Screen_10MHz_vNR	Frequency variation	9.8	10	10.2	9.94	10.01	10.12	9.8	10	10.14	9.89	10.01	10.11	MHz
IMO_Screen_26MHz_vNR	Frequency variation	25.48	26	26.52	25.91	26.05	26.22	25.64	26.02	26.38	25.86	26.07	26.37	MHz
IMO_Screen_3MHz_vNR	Frequency variation	2.94	3	3.06	2.99	3.04	3.05	3.013	3.014	3.015	2.97	2.99	3.03	MHz
IMO_Screen_8MHz_vNR	Frequency variation	7.84	8	8.16	7.96	8.01	8.09	7.86	8	8.12	7.91	8	8.08	MHz
IMO_Screen_18MHz_vNR	Frequency variation	17.64	18	18.36	17.93	18.03	18.2	17.78	18.01	18.25	17.85	18.04	18.19	MHz
IMO_Screen_4MHz_vNR	Frequency variation	3.92	4	4.08	3.99	4	4.03	3.96	4	4.05	3.96	3.99	4.03	MHz
IMO_Screen_22MHz_vNR	Frequency variation	21.56	22	22.44	21.95	22.05	22.21	21.72	22.03	22.33	21.82	22.03	22.32	MHz
IMO_Screen_25MHz_vNR	Frequency variation	24.5	25	25.5	24.92	25.04	25.19	24.65	25.02	25.34	24.86	25.07	25.35	MHz
IMO_Screen_11MHz_vNR	Frequency variation	10.78	11	11.22	10.97	11.03	11.14	10.81	11	11.15	10.9	10.98	11.09	MHz
IMO_Screen_6MHz_vNR	Frequency variation	5.88	6	6.12	5.97	6.01	6.07	5.93	6	6.07	5.99	6.05	6.03	MHz
IMO_Screen_23MHz_vNR	Frequency variation	22.54	23	23.46	22.92	23.05	23.21	22.7	23.03	23.41	22.91	23.08	23.34	MHz
IMO_Screen_15MHz_vNR	Frequency variation	14.7	15	15.3	14.95	15.01	15.12	14.85	15.02	15.24	14.9	15.07	15.14	MHz
IMO_Screen_13MHz_vNR	Frequency variation	12.74	13	13.26	12.95	13.02	13.11	12.83	13	13.15	12.89	13.01	13.15	MHz
IMO_Screen_19MHz_vNR	Frequency variation	18.62	19	19.38	18.92	19.04	19.17	18.75	19.02	19.3	18.8	19.05	19.17	MHz
IMO_Screen_16MHz_vNR	Frequency variation	15.68	16	16.32	15.94	16.03	16.12	15.83	16.02	16.24	15.88	16.07	16.19	MHz
IMO_Screen_21MHz_vNR	Frequency variation	20.58	21	21.42	20.94	21.06	21.21	20.73	21.01	21.33	20.83	21.05	21.26	MHz
IMO_Screen_17MHz_vNR	Frequency variation	16.66	17	17.34	16.95	17.02	17.17	16.8	17.01	17.26	16.9	17.04	17.17	MHz
IMO_Screen_14MHz_vNR	Frequency variation	13.72	14	14.28	13.95	14.02	14.12	13.8	13.99	14.15	13.88	14	14.14	MHz

4.12 SIO Specifications

PARAMETER	DESCRIPTION	Datasheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			UNITS
		MIN	TYP	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	
VIH	Input Voltage high threshold		-	70	55.05	60.6	61.81	43.7	68.16	68.81	55.05	60.6	61.81	%
VIL	Input Voltage low threshold	30	-		40.53	45.69	51.16	36.96	48.09	64.3	35.67	40.4	46.14	%
VOH	Output high voltage in unregulated mode		-	0.4	0.15	0.2	0.25	0.125	0.164	0.224	0.15	0.2	0.25	V
VOL	Output low voltage	-	-	0.8	0.32	0.49	0.68	0.254	0.355	0.67	0.3	0.41	0.61	V
VOL	Output low voltage	-	-	0.4	0.08	0.12	0.17	0.092	0.126	0.231	0.08	0.1	0.14	V
Vinref	Input Voltage Reference	0.48	-	0.52*VDDIO	Functionally Tested			Functionally Tested			Functionally Tested			V
Voutref	Output Voltage Reference (regulated mode)	1	-	VDDIO-1	Functionally Tested			Functionally Tested			Functionally Tested			V
Voutref	Output Voltage Reference (regulated mode)	1	-	VDDIO-0.5	Functionally Tested			Functionally Tested			Functionally Tested			V
RPULLUP	Pull-up resistor	3500	5600	8500	4538.93	4711.79	5623.42	4526.3	4963.1	5471.9	4891	4981	5871	Ω
RPULLDOWN	Pull-down resistor	3500	5600	8500	4503.72	4878.41	5564.4	4472.27	4920.1	5410.86	4655.34	5586.25	5873.66	Ω

4.13 SAR ADC Specifications

Parameter	DESCRIPTION	Data Sheet			Fab 25 Cu BEOL			Fab 25 Al BEOL			SkyWater Al BEOL			Units
		Spec_Min		Spec_Max	Min	Mean	Max	Min	Mean	Max	MIN	AVG	MAX	
A_res	Resolution	-		12	Covered in linearity tests			Covered in linearity tests			Covered in linearity tests			bits
A_gainerr	Gain error	-		±0.1	-0.099	-0.083	-0.062	-0.002	0.062	0.096	-0.002	0.062	0.096	%
A_offset	Input offset voltage	-		2	0.224	0.52	0.952	0.01	0.062	0.096	0.005	0.312	0.664	mV
A_isar	Current consumption	-		1	0.377	0.663	0.873	0.5361	0.5996	0.71486	0.536	0.600	0.715	mA
A_cmrr	Common mode rejection ratio	66		-	104.86	132.67	189.95	73.27	81.43	131.4	73.270	84.790	131.402	dB
A_SNR	Signal-to-noise and Distortion ratio (SNR)	65		-	65.73	67.56	70.02	85.8	98.9	115	68.740	69.783	73.120	dB
A_INL	Integral Non-Linearity. VDD = 1.71 to 5.5, 1 MSPS, VREF=1V to VDD	-1.7		2	-1.135	0.102	1.388	-1.04	-0.67	1.04	-0.980	0.540	0.980	LSB
A_INL	Integral Non-Linearity. VDD = 1.71 to 3.6, 1 MSPS, VREF=1.71V to VDD	-1.5		1.7	-1.135	0.102	1.388	-1.04	-0.67	1.04	-0.850	0.280	0.780	LSB
A_INL	Integral Non-Linearity. VDD = 1.71 to 5.5, 500 KSPS	-1.5		1.7	-1.07	0.102	1.27	-1.04	-0.67	1.04	-0.880	0.470	0.740	LSB
A_DNL	Differential Non-Linearity. VDD = 1.71 to 5.5, 1 MSPS, VREF=1V to VDD	-1		2.2	-0.44	0.487	1.44	-0.82	-0.26	0.93	-0.150	0.020	0.710	LSB
A_DNL	Differential Non-Linearity. VDD = 1.71 to 3.6, 1 MSPS	-1		2	-0.44	0.487	1.44	-0.82	-0.26	0.93	-0.540	0.230	0.740	LSB
A_DNL	Differential Non-Linearity. VDD = 1.71 to 5.5, 500 KSPS	-1		2.2	-0.31	0.505	1.44	-0.82	-0.26	0.93	-0.570	0.240	0.600	LSB
A_thd	Total harmonic distortion	-		-65	68.16	69.8	73.8	67.86	72.91	83.44	67.860	72.910	83.440	dB

Document History Page

Rev.	ECN No.	Orig. of Change	Description of Change
**	6015703	VSD	PSoC 4200L Customer Characterization Report