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Cypress Semiconductor Product Qualification Report

QTP# 082405 VERSION*B
March, 2015

EPROM Programmable Clock Family	
S4CAP Technology, GSMC	
CY22392 CY22381	Three-PLL General Purpose FLASH Programmable Clock Generator
CY22393 CY22394 CY22395	Three-PLL Serial- Programmable Flash- Programmable Clock Generator

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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PACKAGE/PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date
060605	Qualify GSMC using PSoC Device Product Family on S4AD-5 Technology	Aug 06
071801	Qualify Programmable Clock Generator 7C80900B Device on S4CAP Technology, Fab5 (GSMC)	Apr 08
082405	CY22393 (7C83900B) S4CAP Fab transfer from CTI to GSMC	Sep 08

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: CY22392 (7C83900B) S4CAP Fab transfer from CTI to GSMC	
Marketing Part #:	CY22392
Device Description:	7C83900B is a 3 PLL, programmable clock, S4CAP Die. CY22392 is 7C83900B die packaged in 16L TSSOP. 7C83900B is the same die as 7C83900A, only Fab'd at GSMC instead of CTI.
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division (MPD)

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6,000A Al 0.5% Cu/1200A TiW Metal 2: 500A Ti/8,000A Al 0.5% Cu/300A TiW
Passivation Type and Thickness:	3,000A TEOS /6,000A Si ₃ N ₄		
Generic Process Technology/Design Rule (μ-drawn):	Single Poly, Double Metal, 0.35 μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 110A		
Name/Location of Die Fab (prime) Facility:	GSMC/Shanghai-China		
Die Fab Line ID/Wafer Process ID:	GSMC / S4CAP		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
8-Lead SOIC	CML-RA, PHIL-M, TAIWAN-T
16-Lead TSSOP	CML-RA, PHIL-M, TAIWAN-T

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION		
Package Designation:	ZZ16, ZZ08	
Package Outline, Type, or Name:	16-Lead Thin Shrunk Small Outline Package (TSSOP)	
Mold Compound Name/Manufacturer:	Hitachi CEL-9200HF	CEL9200CYR
Mold Compound Flammability Rating:	UL94 – V0	
Mold Compound Alpha Emission Rate:	N/A	
Oxygen Rating Index:	None	
Lead Frame Material:	Copper	Copper with NiPdAu Pre-plated
Lead Finish, Composition / Thickness:	Pure Sn	NiPdAu
Die Backside Preparation Method/Metallization:	Backgrind	
Die Separation Method:	100% Saw	
Die Attach Supplier:	Ablestik	Dexter
Die Attach Material:	8340	QMI 509
Die Attach Method:	Epoxy Dispense	
Bond Diagram Designation:	10-05225	001-24359
Wire Bond Method:	Thermosonic	
Wire Material/Size:	Au. 1.0mil	Au 0.9 mil
Thermal Resistance Theta JA °C/W:	117.72	
Package Cross Section Yes/No:	N/A	
Assembly Process Flow:	49-35028	11-20028
Name/Location of Assembly (prime) facility:	OSE-TAIWAN,	CML-RA
MSL Level	3	
Reflow Profile	260C	

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML

Note: Please contact a Cypress Representative for other package availability.

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125°C Dynamic Operating Condition, Vcc Max=3.8V, 150°C Dynamic Operating Condition, Vcc Max=3.3V, 150°C JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125°C Dynamic Operating Condition, Vcc Max=3.8V, 150°C JESD22-A108	P
High Temperature Steady State life	Static Operating Condition, Vcc Max= 5.5V, 125°C JESD22-A108	P
Low Temperature Operating Life	Dynamic Operating Condition, Vcc = 5.5V, -30°C JESD22-A108	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130°C, 85%RH, 5.25V Precondition: JESD22 Moisture Sensitivity Level (168 Hrs, 85°C/85%RH, 260°C Reflow)	P
Temperature Cycle	MIL-STD-883, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level (168 Hrs, 85°C/85%RH, 260°C Reflow)	P
Pressure Cooker	JESD22-A102: 121°C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity Level (168 Hrs, 85°C/85%RH, 260°C Reflow)	P
Acoustic Microscopy	J-STD-020 Precondition: JESD22 Moisture Sensitivity Level (168 Hrs, 85°C/85%RH, 260°C Reflow)	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Data Retention	150°C, non-biased JESD22-A117 and JESD22-A103	P
Dynamic Latch-up	125°C, 8.5V JESD78	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JEDEC EIA/JESD22-A114	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V JESD22-C101	P
Endurance Test	MIL-STD-883, Method 883-1033	P
Static Latch-up	125°C, 5.2V, 6.2V, $\pm 200\text{mA}$ / $\pm 240\text{mA}$ JESD78	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 ¹	1500 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1, 2} Long Term Failure Rate	867, 760 DHRs	0	0.7	170	14 FIT

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 = 8.62x10⁻⁵ eV/Kelvin.

T₁ is the junction temperature of the device under stress and T₂ is the junction temperature of the device at use conditions.



Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	SampRej	Failure Mechanism
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STRESS: ACOUSTIC, MSL1

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	COMP	15	0
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	COMP	15	0
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	COMP	15	0

STRESS: AGE BOND STRENGTH

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	COMP	10	0
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	COMP	10	0
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	COMP	10	0

STRESS: DATA RETENTION, PLASTIC, 150C

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	336	256	0
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	1000	256	0
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	1500	256	0
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	336	256	0
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	1000	256	0
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	336	256	0

STRESS: ENDURANCE

CY8C24494 (8C24494A)	9621713	610632687A	PHIL-M	COMP	47	0
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STRESS: ESD-CHARGE DEVICE MODEL, (500V)

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	COMP	9	0
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	COMP	9	0
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	COMP	9	0
CY8C24494 (8C24494A)	9623715	610635880	PHIL-M	COMP	9	0
CY8C24494 (8C24795A)	9623716	610639349	SEOUL-L	COMP	9	0
CY8C24494 (8C24995A)	9623716	610639350	SEOUL-L	COMP	9	0

STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114, (2,200V)

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	COMP	9	0
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	COMP	9	0
CY8C24494 (8C24494A)	9623715	610635880	PHIL-M	COMP	9	0
CY8C24494 (8C24995A)	9623716	610639350	SEOUL-L	COMP	9	0

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Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	COMP	3	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	COMP	3	0	
CY8C24494 (8C24494A)	9623715	610635880	PHIL-M	COMP	3	0	
CY8C24494 (8C24995A)	9623716	610639350	SEOL-L	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	COMP	3	0	
CY8C24494 (8C24994A)	9621713		C-USA	COMP	3	0	
CY8C24494 (8C24494A)	9623715	610638054	SEOL-L	COMP	3	0	
CY8C24494 (8C24995A)	9623716	610639350	SEOL-L	COMP	3	0	
STRESS: DYNAMIC LATCH-UP (125C, 8.5V)							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	COMP	2	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	96	1005	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	96	1144	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	96	908	1	CAPACITOR DEFECT
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623716	610639767A	PHIL-M	1000	180	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V)							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	168	80	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	336	80	0	
STRESS: LOW TEMPERATURE DYNAMIC OPERATING LIFE, -30C, 5.5V							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	500	45	0	

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.25V), PRE COND 168 HR 85C/85%RH (MSL1)

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	128	49	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	128	49	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	128	49	0	

STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH (MSL1)

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	288	50	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	500	47	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	288	50	0	

STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)

CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	500	50	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	1000	50	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	500	49	0	
CY8C24494 (8C24494A)	9623715	610635580	PHIL-M	1000	49	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9623716	610639767	PHIL-M	500	49	0	



Reliability Test Data

QTP #: 071801

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: DATA RETENTION, PLASTIC, 150C							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	500	80	0	
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	1000	80	0	
CY22050K (7C841400B)	A999278.3	610766457	CML-RA	500	80	0	
CY22050K (7C841400B)	A999278.3	610766457	CML-RA	1000	80	0	
STRESS: ENDURANCE							
CY22050K (7C841400B)	A999278.1			COMP	165	0	
CY22050K (7C841400B)	A999262.1			COMP	165	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114, (2,200V)							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	COMP	8	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V, Vcc Max)							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	48	1520	0	
CY22050K (7C841400B)	A999262.1	610766458	CML-RA	48	500	0	
CY22050K (7C841400B)	A999278.3	610766457	CML-RA	48	500	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	80	1101	0	
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	500	120	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH (MSL1)							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	168	80	0	
STRESS: STATIC LATCH-UP TESTING (125C, 5.4V, +/-200mA)							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	COMP	6	0	



Reliability Test Data

QTP #: 071801

<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>
<i>STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)</i>							
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	500	80	0	
CY22050K (7C841400B)	A999278.1	610754649	CML-RA	1000	80	0	
CY22050K (7C841400B)	A999262.1	610766458	CML-RA	500	80	0	
CY22050K (7C841400B)	A999262.1	610766458	CML-RA	1000	80	0	



Reliability Test Data

QTP #: 082405

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: E-TEST

7C83900B	4830185			COMP	COMPARABLE		
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.3V, Vcc Max)

CY22393K (7C83900B)	4830185	610840128	CML-RA	48	1500	0	
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)

CY22393K (7C83900B)	4830185	610840128	CML-RA	80	116	0	
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STRESS: ESD-CHARGE DEVICE MODEL, (500V)

CY22393K (7C83900B)	4830185	610840128	CML-RA	COMP	9	0	
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CY22393K (7C83900B)	4830185	610840129	CML-RA	COMP	9	0	
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CY22393K (7C83900B)	4830185	610840130	CML-RA	COMP	9	0	
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STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114, (2,200V)

CY22393K (7C83900B)	4830185	610840128	CML-RA	COMP	8	0	
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CY22393K (7C83900B)	4830185	610840129	CML-RA	COMP	8	0	
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CY22393K (7C83900B)	4830185	610840130	CML-RA	COMP	8	0	
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STRESS: STATIC LATCH-UP TESTING, 125C, 5.2V, ± 200 mA

CY22393K (7C83900B)	4830185	610840128	CML-RA	COMP	6	0	
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CY22393K (7C83900B)	4830185	610840129	CML-RA	COMP	6	0	
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CY22393K (7C83900B)	4830185	610840130	CML-RA	COMP	6	0	
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STRESS: STATIC LATCH-UP TESTING, 125C, 6.2V, ± 240 mA

CY22393K (7C83900B)	4830185	610840128	CML-RA	COMP	3	0	
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CY22393K (7C83900B)	4830185	610840129	CML-RA	COMP	3	0	
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CY22393K (7C83900B)	4830185	610840130	CML-RA	COMP	3	0	
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Document History Page

Document Title: QTP#082405: EPROM PROGRAMMABLE CLOCK FAMILY, S4CAP TECHNOLOGY, GSMC
Document Number: 001-59122

Rev.	ECN No.	Orig. of Change	Description of Change
**	2867256	NSR	Initial Spec Release Added Package Information of ZZ16 build in CMR-RA and Added OSET on Name/Location of Assembly (prime) facility. (Ref. Memo HGA-831, 082405 Rev. 1.0)
*A	3906541	NSR	Removed VERSION 1.1 in the title page. Removed Omedata-Indonesia in the assembly site facility as inactive site. Removed reference Cypress specs in the reliability tests performed table and replaced with industry standards.
*B	4674427	JYF	Sunset review: Updated QTP title page and Reliability Tests Performed table (EFR,LFR,HTOL,HTSSL,HAST,PCT,TCT,DRET,Acoustic,Dynamic Latch-up, ESD-HBM) for template alignment; Updated device division from DCD to MPD.

Distribution: WEB

Posting: None