Cardinal Components Inc.
Product Qualification Report

September, 2000

<table>
<tr><th colspan="2">PLL Programmable Clock
L28 Technology, Fab 2</th></tr>
<tr><td>CPP 2000-1 Family
CPP 2000-4 Family
CPP 2000-7 Family</td><td>High Accuracy EPROM Programmable Die for CPP Family Crystal Oscillators</td></tr>
</table>

CARDINAL COMPONENTS INC. TECHNICAL CONTACT FOR QUALIFICATION DATA:

Dave Babcock	Bob Ziegler	Paul Sita
Reliability Director	Staff Reliability Engineer	Product & Test Engineering
973-785-1333	973-785-1333	973-785-1333

PRODUCT QALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date
96388		New Product/Fab3 Qualification		Feb 98
97403		Technology Qualification (Generic)		Apr 98
98314		Fab transfer		Sep 98
98225		Redesign of product		Oct 98

Package used for Qualification

PLASTIC/HERMETIC PACKAGE/ASSEMBLY DESCRIPTION	
Package Designation:	S2032
Package Outline, Type, or Name:	20-lead SOIC
Mold Compound Name/Manufacturer:	Sumitomo
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Designation:	S
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plated 85%Sn, 15%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8361H
Bond Diagram Designation	10-02947
Wire Bond Method:	Thermosonic
Wire Material/Size:	1.0mil
Thermal Resistance Theta JA °C/W:	79.5
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20017M
Name/Location of Assembly (prime) facility:	Cypress Philippines (CSPI-R)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CSPI-R
Fault Coverage:	100%

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

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150C (98225) = 3.65V, 150C (97403)	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150C (98225) = 3.65V, 150C (97403)	P
Read and Record	Dynamic Operating Condition, Vcc = 3.65V, 150C (97403)	P
High Accelerated Saturation Test (HAST)	140°C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 1 (97403) 168 Hrs, 85°C/85%RH	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C (97403) Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85°C/85%RH	P
Electrostatic Discharge Human Body Model (ESD-HBM)	MIL-STD-883, Method 3015.7 (2,200V)	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	Cypress Spec. 25-00020 (500V)	P
High Temperature Storage	165C, no bias	P
Age Bond Pull	MIL-STD-883, Method 2011	P
Cold Life Test	-30C, 6.5V	P
Latchup Sensitivity	In accordance with JEDEC 17. Cypress Spec. 01-00081 (+/- 200mA)	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal[3] A.F	Failure Rate[4]
High Temperature Operating Life Early Failure Rate	1,850 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	173,900 DHRs (97403) 58,000 DHRs (98225)	0 0	0 .7	170	31 FITs 93 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 = 8.62×10^{-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.

[4]EFR based on QTP #97403 (Technology Qualification) and QTP #98225 (Redesign Product)
[4]LFR based on QTP #97403 and QTP #98225.

RELIABILITY TEST DATA

QTP#: 98314

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: ESD-CHARGE DEVICE MODEL (1,000V)							
CY5037ES-SC	CSPI-R	2827384	619809267	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (4,400V)							
CY75037ES-SC	CSPI-R	2827384	619809267	COMP	3	0	

RELIABILITY TEST DATA

QTP#: 98225

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	112	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
STRESS: ESD-CHARGE DEVICE MODEL (1,000V)							
CY5037AES	CSPI-R	2825234	619808136	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY5037AES	CSPI-R	2825234	619808136	COMP	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY5037AES	CSPI-R	2825234	619808136	500	116	0	
STRESS: STATIC LATCH-UP TESTING 125c, 12V (+/-200 mA)							
CY5037AES	CSPI-R	2825234	619808136	DATA	3	0	

RELIABILITY TEST DATA

QTP 97403

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)							
CY2273APVC	CSPI-R	2732995	619708289/319	168	78	0	
CY2273APVC	CSPI-R	2732995	619708289/319	552	78	0	
CY2273APVC	CSPI-R	2735423	619709731	168	78	0	
CY2273APVC	CSPI-R	2735423	619709731	552	78	0	
CY2273APVC	CSPI-R	2734307	619709732	168	78	0	
CY2273APVC	CSPI-R	2734307	619709732	552	78	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.65V)							
CY2273APVC	CSPI-R	2732995	619708289/319	48	180	0	
CY2273APVC	CSPI-R	2735423	619709731	48	340	0	
CY2273APVC	CSPI-R	2734307	619709732	48	330	0	
STRESS: ESD-CHARGE DEVICE MODEL, 2000V							
CY2273APVC	CSPI-R	2732995	619708289/319	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 4000V							
CY2273APVC	CSPI-R	2732995	619708289/319	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 3.63V, 85%RH), PRECOND. 168 HRS 85C/85%RH							
CY2273APVC	CSPI-R	2732995	619708289/319	128	44	0	
CY2273APVC	CSPI-R	2732995	619708289/319	256	44	0	
CY2273APVC	CSPI-R	2734307	619709732	128	45	0	
STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)							
CY2273APVC	CSPI-R	2732995	619708289/319	336	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	500	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	1000	45	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.65V)							
CY2273APVC	CSPI-R	2732995	619708289/319	80	116	0	
CY2273APVC	CSPI-R	2732995	619708289/319	500	116	0	
CY2273APVC	CSPI-R	2735423	619709731	80	120	0	
CY2273APVC	CSPI-R	2735423	619709731	500	116	0	
CY2273APVC	CSPI-R	2734307	619709732	80	116	0	
CY2273APVC	CSPI-R	2734307	619709732	500	115	0	1 EOS
STRESS: COLD LIFE TEST (-30C, 6.5V)							
CY2273APVC	CSPI-R	2732995	619708289/319	500	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	1000	44	0	1 EOS
STRESS: READ & RECORD LIFE TEST (150C, 3.65V)							
CY2273APVC	CSPI-R	2734307	619709732	48	10	0	
CY2273APVC	CSPI-R	2734307	619709732	80	10	0	
CY2273APVC	CSPI-R	2734307	619709732	500	10	0	

RELIABILITY TEST DATA

QTP 97403

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH							
CY2273APVC	CSPI-R	2732995	619708289/319	300	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	1000	45	0	
CY2273APVC	CSPI-R	2735423	619709731	300	48	0	
CY2273APVC	CSPI-R	2735423	619709731	1000	48	0	
CY2273APVC	CSPI-R	2734307	619709732	300	47	0	
CY2273APVC	CSPI-R	2734307	619709732	1000	47	0	