Cardinal Components Inc.
Product Qualification Report

September, 2000

PLL Programmable Clock **L28 Technology, Fab 2**	
CPP 2000-1 Family **CPP 2000-4 Family** **CPP 2000-7 Family**	**High Accuracy EPROM Programmable Die for CPP Family Crystal Oscillators**

CARDINAL COMPONENTS INC. TECHNICAL CONTACT FOR QUALIFICATION DATA:

Dave Babcock
Reliability Director
973-785-1333

Bob Ziegler
Staff Reliability Engineer
973-785-1333

Paul Sita
Product & Test Engineering
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

PRODUCT DESCRIPTION (for qualification)			
Qualification Purpose: Redesign CY2037AWAF/CY5037AWAF in qualified, L28 Technology , Fab 2.			
Marketing Part #:	CPP 2000 Family		
Device Description:	3.3 or 5V, Industrial, available via Die/Wafer sale		
Timing Division:	Cardinal Components Inc. (ICD)		
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. A	
Die Size (stepping):	58.9 mils x 43.5 mils	What ID markings on Die:	7C80380A/7C80381A

TECHNOLOGY/FAB PROCESS DESCRIPTION - L28			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/1,200A TiW/6,000A Al/1,200A TiW Metal 2: 1,500A TiW//10,000A Al/150A Ti
Passivation Type and Materials:	3,000A TEOS + 15,000A Si_2N_4		
Free Phosphorus contents in top glass layer(%):	N/A		
Die Coating(s), if used:	N/A		
Generic Process Technology/Design Rule (µ-drawn):	CMOS, Single Poly, Double Metal /0.65 µm		
Gate Oxide Material/Thickness (MOS):	SiO_2 / 145 A		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab2/L28		

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	