

Cypress Semiconductor Product Qualification Report

QTP# 003201 VERSION 1.1
May, 2003

VMEbus Product	
CMOS2AN Technology, Hynix fab	
CY7C964A	Bus Interface Logic Circuit

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
003201	Military Qualification for CY7C964A, MSL1	Sep 01
003301	Technology CMOS2AN / Bus Interface Logic Circuit CY7C964A, MSL3	Sep 01

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify Military device CY7C964A in Technology CMOS2AN Hynix fab, Hyundai.Korea	
Marketing Part #:	CY7C964A
Device Description:	5V, Commercial and Industrial and Military, available in 64-pin TQFP, PQFP and CQFP package
Cypress Division:	Cypress Semiconductor Corporation – Data Com Division (DCD)
Overall Die (or Mask) REV:	Rev. B
What ID markings on Die:	7C964B

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: Al-1.0%Si-0.5%Cu Metal 2: Al-1.0%Si-0.5%Cu
Passivation Type and Materials:	Silicon Nitride		
Free Phosphorus contents in top glass layer(%):	3.8%		
Die Coating(s), if used:	N/A		
Number of Transistors:	40,000		
Number of Gates:	10,000		
Generic Process Technology/Design Rule (μ -drawn):	CMOS2AN, 1.2 μ		
Gate Oxide Material/Thickness (MOS):	SiO ₂ 200Å		
Name/Location of Die Fab (prime) Facility:	Hynix Fab, Hyundai Korea		
Die Fab Line ID/Wafer Process ID:	Hynix Fab / CMOS, Single Poly, Double Metal, 1.2 μ		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
64-lead PQFP / TQFP	ASE Taiwan / ASAT HONG KONG
64-lead CQFP	ALPHATEC

Note: Package Qualification details upon request.

HERMETIC PACKAGE/ASSEMBLY DESCRIPTION	
Package Designation:	G68
Package Outline, Type, or Name:	68-lead Ceramic Pin Grid Array (CPGA)
Lead Seal Method / Material:	Clip and Belt Furnace Sealing / Metal Lid with Sn Au Solder Seal
Mold Compound Flammability Rating:	V-O per UL 94
Oxygen Rating Index:	>28%
Lead Frame Material:	Kovar
Lead Finish, Composition / Thickness:	Au over Ni finish, 80um min each
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	QMI
Die Attach Material:	Glass Paste, 2419MA
Die Attach Method:	Silver Glass
Bond Diagram Designation	10-02147
Wire Bond Method:	Ultrasonic wedge bonding
Wire Material/Size:	Al / 1.25mil
Thermal Resistance Theta JA °C/W:	28 °C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-15020
Name/Location of Assembly (prime) facility:	Alphatec Bangkok (ALPHA-X)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Alphatec Bangkok (ALPHA-X)
Fault Coverage:	100%

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure	Dynamic Operating Condition, Vcc = 5.75V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 125°C	P
Military Life test Group C	MIL-STD-883C, Method 1005.4 Dynamic Operating Condition, Vcc = 5.75V, 125°C	P
Long Life Verification	Dynamic Operating Condition, Vcc = 5.75V, 125°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max=5.5V, 125°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C, MSL 1 MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C, MSL 3 Precondition: JESD22 Moisture Sensitivity 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
High Accelerated Saturation Test (HAST)	130°C, 5.5V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	600V MIL-STD-883, Method 3015	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Current Density	Cypress Spec. 22-00029	P
Low Temperature Operating Life	-30°C, 6.5V	P
Acoustic Microscopy, Level 3	Cypress Spec. 25-00104	P
High Temperature Storage	150°C No Bias	P
Age Bond Strength	200°C, 4hrs MIL-STD-883, Method 2011	P
SEM X-Section	MIL-STD-883C, Method 2018.2	P
Dynamic Latch-up	Cypress Spec. 25-00020	P
Static Latch-up Sensitivity	125°C, 10V, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Acceleration Factor ³	Failure Rate ⁴
High Temperature Operating Life Early Failure Rate	1,595	0	N/A	N/A	0 PPM
High Temperature Operating Life Long Term Failure Rate ^{1,2}	940,168 HRs	1	0.7	55	19 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 FIT Rate based on LFR and Long Life Verification, QTP #003301 and Military Life Test QTP #003201.

Reliability Test Data

QTP #: 003201

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Ass Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: MILITARY LIFETEST GROUP C (150C, 5.75V)							
CY7C964A-GM (7C964B)	9115182	610114999	ALPHA-X	184	47	0	
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY7C964A-GM (7C964B)	9115182	610114999	ALPHA-X	COMP	184	0	
STRESS: TC COND. C -65C TO 150C							
CY7C964A-GM (7C964B)	9115182	610114999	ALPHA-X	100	48	0	
CY7C964A-GM (7C964B)	9115182	610114999	ALPHA-X	1000	47	0	

Reliability Test Data

QTP #: 003301

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.75V, Vcc Max)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	96	446	0	
CY7C964A-NC (7C964B)	9106614	610110262/4/437	ASAT-B	96	529	0	
CY7C964A-NC (7C964B)	9115182	340100110/12/14	ASAT-B	96	288	0	
CY7C964A-NC (7C964B)	9106611	610107294/5/6	ASAT-B	96	332	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.75V, Vcc Max)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	168	135	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	500	135	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	1000	135	0	
CY7C964A-NC (7C964B)	9106614	610110262/4/437	ASAT-B	168	134	0	
CY7C964A-NC (7C964B)	9106614	610110262/4/437	ASAT-B	500	133	0	UNKNOWN
CY7C964A-NC (7C964B)	9106614	610110262/4/437	ASAT-B	1000	133	0	
CY7C964A-NC (7C964B)	9115182	340100110/12/14	ASAT-B	168	135	0	
CY7C964A-NC (7C964B)	9115182	340100110/12/14	ASAT-B	500	135	0	
CY7C964A-NC (7C964B)	9115182	340100110/12/14	ASAT-B	1000	135	0	
CY7C964A-NC (7C964B)	9106611	610107294/5/6	ASAT-B	1000	135	0	
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	COMP	9	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	COMP	9	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (700V)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	COMP	9	0	
CY7C964A-NC (7C964B)	9106614	610110262/4/437	ASAT-B	COMP	9	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	COMP	9	0	
CY7C964A-NC (7C964B)	9106611	610107294/5/6	ASAT-B	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING (125C, 12V, +I300mA)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	COMP	3	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	COMP	3	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	COMP	3	0	
STRESS: DYNAMIC LATCH-UP TESTING							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	COMP	3	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 6.5V)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	500	48	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	1000	46	0	

Reliability Test Data

QTP #: 003301

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Ass Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.5V)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	128	47	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	128	46	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	128	47	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HR 30C/60%RH							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	168	45	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	168	48	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	168	48	0	
STRESS: ACOUSTIC							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	COMP	15	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	COMP	15	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	COMP	15	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V, Vcc MAX)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	168	80	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	336	80	0	
STRESS: LONG LIFE VERIFICATION (125C, 5.75V, Vcc MAX)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	1256	134	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	2000	134	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	3000	134	0	
STRESS: HIGH TEMP STORAGE (150C)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	500	48	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	1000	48	0	
STRESS: AGE BOND STRENGTH							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	COMP	15	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	COMP	15	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH (MSL3)							
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	300	48	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	500	48	0	
CY7C964A-NC (7C964B)	9104539	610104147/9/52	ASAT-B	1000	48	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	300	48	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	500	48	0	
CY7C964A-NC (7C964B)	9106614	610110257/8/9	ASAT-B	1000	48	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	300	48	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	500	48	0	
CY7C964A-NC (7C964B)	9115182	340100109/11/13	ASAT-B	1000	48	0	