Cypress Semiconductor
Technology Qualification Report

011103 VERSION 1.2
April, 2001

WaferTech 0.25um 3P2M Process Technology
WA USA

		Description			
Option #	CYP	GVT Product	Vcc	Arch.	Config.
1	7C1347D	GVT71128D36V	3.3V	PL-1CD	128k x 36
		(TMB057A01A)			
2	7C1348D	GVT71128C36V	3.3V	PL-2CD	128k x 36
		(TMB057A01A)			
3	7C1327D	GVT71256D18V	3.3V	PL-1CD	256k x 18
		(TMB057A02A)			
4	7C1328D	GVT71256C18V	3.3V	PL-2CD	256k x 18
		(TMB057A02A)			
5	7C1359A	GVT71256T18V	3.3V	PL-1CD	256k x 18
		(TMB057A02A)		(TAG)	
6	7C1345D	GVT71128B36V	3.3V	FT	128k x 36
		(TMB057xxxx)			
7	7C1347D	GVT71128G36V	3.3V	PL-1CD	128k x 36
		(TMB057A01A)			
8	na	GVT71128F36V	3.3V	PL-2CD	128k x 36
		(TMB057A01A)			
9	7C1325D	GVT71256B18V	3.3V	FT	128k x 36
		(TMB057xxxx)			
10	7C1345D	GVT71128E36V	3.3V	FT	128k x 36
		(TMB057xxxx)			
11	7C1347C	GVT71128DA36V	3.3V	PL-1CD	128k x 36
		(TMB057C01A)			
12	na	GVT71128CA36V	3.3V	PL-2CD	128k x 36
		(TMB057C01A)			
13	7C1327C	GVT71256DA18V	3.3V	PL-1CD	256k x 18
		(TMB057C02A)			
14	na	GVT71256CA18V	3.3V	PL-2CD	256k x 18
		(TMB057C02A)			

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
011103	WaferTech .25um Technology / 4Meg, GVT71128D36 (CY7C1347D) product and its bond and metal options	Mar 01

PRODUCT DESCRIPTION (for qualification)		
Qualification Purpose: Qualify WaferTech .25um Technology and 4Meg, GVT71128D36 (CY7C1347D) product and its bond and metal options.		
Marketing Part #:	GVT71128D36* (CY7C1347D)	
Device description:	3.3V, Commercial available in 100-pin TQFP and 119-ball BGA package	
Cypress Division:	Cypress Semiconductor Corporation – Synchronous Memory Product Division (SMPD)	
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. D
What ID markings on Die:	GVT71128DA36W	

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 4,000Å AlCu/.700Å TiN Metal 2: 1,000Å TiN/6,000Å AlCu/250Å TiN
Passivation Type and Materials:		1,500Å SiON / 5,000Å SOG/10,000Å PESN	
Free Phosphorus contents in top glass layer(%):		0	
Generic Process Technology/Design Rule (µ-drawn):		CMOS, Double Metal / 0.25um	
Gate Oxide Material/Thickness (MOS):		SiO_2 / 70Å	
Name/Location of Die Fab (prime) Facility:		WaferTech, WA USA	
Die Fab Line ID/Wafer Process ID:		WaferTech 0.25um 3P2M Process Technology	

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
100-pin TQFP	**ASE/SPIL**
119-ball BGA (qualified by extension of 292-ball)	**ASE**

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	A100
Package Outline, Type, or Name:	100-pin, Thin Quad Flat Pack (TQFP)
Mold Compound Name/Manufacturer:	Hitachi 7320
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plate, 85%Sn, 15%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Sumitomo
Die Attach Material:	Sumitomo 1076A
Bond Diagram Designation	10-04091
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0um
Thermal Resistance Theta JA °C/W:	51°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	GVT164-04-000-0053/FC-2800
Name/Location of Assembly (prime) facility:	ASE/SPIL

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	ASE/CHIPMOS
Fault Coverage:	100%

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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 Max=3.8V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 5.5V,85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
High Temperature Steady State life	150°C, 3.63V, Vcc Max	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	200V Cypress Spec. 25-00020	P
Age Bond Strength	MIL-STD-883, Method 883-2011, 200C, 4hrs	P
SEM -X Section	MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy, MSL3	Cypress Spec. 25-00104	P
Low Temperature Operating Life	-30C, 3.3V, 8MHZ	P
Latchup Sensitivity	125°, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	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]	2,991	1	N/A	N/A	334 PPM
High Temperature Operating Life[2,3] Long Term Failure Rate	794,580 DHRs	1	0.7	150	14.9 FIT

[1] A production burn-in of 5 Hrs at 125°C, 4.2V is required for the product
[2] Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.
[3] Chi-squared 60% estimations used to calculate the failure rate.
[4] 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 #: 011103

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V, Vcc Max)							
GVT71128G36* (7C1347D)	W60325	*W60325DA*	SPIL	48	982	1	*BAKE RECOVERED, NON VISUAL*
GVT71256T18* (7C1359A)	*W26921*	*W26921AB*	SPIL	48	1008	0	
GVT71256T18* (7C1359A)	W26998	*W26998AB*	SPIL	48	1000	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)							
GVT71128G36* (7C1347D)	W60325	*W60325DA*	SPIL	80	530	0	
GVT71128G36* (7C1347D)	W60325	*W60325DA*	SPIL	500	530	0	
GVT71256T18* (7C1359A)	*W26921*	*W26921AB*	SPIL	80	529	1	SINGLE BIT FAILURE
GVT71256T18* (7C1359A)	*W26921*	*W26921AB*	SPIL	500	529	0	
GVT71256T18* (7C1359A)	W26998	*W26998AB*	SPIL	80	530	0	
GVT71256T18* (7C1359A)	W26998	*W26998AB*	SPIL	500	530	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V)PRE COND 192 HR 30C/60%RH							
GVT71256D36*(7C1360A)	W90760	*W90760.02*	SPIL	128	48	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192HRS 30C/60%RH							
GVT71256D36*(7C1360A)	W90760	*W90760.02*	SPIL	168	47	0	
STRESS: ESD-CHARGE DEVICE MODEL (200V)							
GVT71128DA36* (7C1347C)	W30857	*W30857AB*	SPIL	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
GVT71128DA36* (7C1347C)	W30857	*W30857AB*	SPIL	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING (125C, +/300mA)							
GVT71256T18* (7C1359A)	W26998	*W26998AB*	SPIL	COMP	3	0	
STRESS: ACOUSTIC-MSL3							
GVT71128G36* (7C1347D)	W60325	*W60325DA*	SPIL	COMP	15	0	
STRESS: AGE BOND STRENGTH TEST							
GVT71256D36*(7C1360A)	W90760	*W90760.02*	SPIL	COMP	15	0	
GVT71256D36*(7C1360A)	W18916	*W18916.02*	SPIL	COMP	15	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V, Vcc MAX)							
GVT71128G36* (7C1347D)	W60325	*W60325DA*	SPIL	80	80	0	
GVT71128G36* (7C1347D)	W60325	*W60325DA*	SPIL	168	80	0	

Reliability Test Data

QTP #: 011103

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC CONDITION C, -65C TO 150C, PRE COND. 192 HRS 30C/60% RH (MSL3)							
GVT71256D36*(7C1360A)	W90760	*W90760.02*	SPIL	300	50	0	
GVT71256D36*(7C1360A)	W90760	*W90760.02*	SPIL	500	50	0	
GVT71256D36*(7C1360A)	W18916	*W18916.02*	SPIL	300	49	0	
GVT71256D36*(7C1360A)	W18916	*W18916.02*	SPIL	500	49	0	
GVT71256D36*(7C1360A)	W18946	*W18946.02*	SPIL	1000	48	0	
GVT71256D36*(7C1360A)	W18746	*W18746.02*	SPIL	300	48	0	
GVT71256D36*(7C1360A)	W18746	*W18746.02*	SPIL	500	47	0	
GVT71256D36*(7C1360A)	W18746	*W18746.02*	SPIL	1000	47	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 3.3V)							
GVT71256D36*(7C1360A)	W18916	*W18916.02*	SPIL	500	48	0	