

Cypress Semiconductor Technology Qualification Report

G970001 VERSION 1.0

May, 2001

TSMC 0.35um Technology	
GVT7132D32D	32 x 32
GVT7164D32Z	64 x 32
GVT71128B36Z / GVT71128E36Z	128 x 36
GVT71128G36Z	128 x 36
GVT71256B18Z / GVT71256D18Z	256 x 18
GVT71256E18Y / GVT71256F18Y	256 x 18
GVT71256G18Y	256 x 18

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
G970001	New Technology TSMC 0.35um / 4 Meg, GVT71128E36 and its product family and bonding option	Jan 97

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify New Technology TSMC 0.35um/ 4Meg, GVT71128E36 family and its bonding option	
Marketing Part #:	GVT71128E36
Device Description:	2.5V / 3.3V, Commercial available in 100-pin TQFP package.
Cypress Division:	Cypress Semiconductor Corporation - Memory Product Division (MPD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. Z
What ID markings on Die:	GVT71128E36

Galvantech Part #	Product Information	TSMC Part #
GVT7132D32D	B,C,D: 3.3V E, F, G: 2.5V 128E36 and 128G36 are bonding option 256B18 and 256D18 are bonding option 256E18, 256F18 and 256G18 are bonding option	TM4438
GVT7164D32Z		TM4360
GVT71128B36Z		TM5020
GVT71128E36Z		TM5020
GVT711128G36Z		TM5020
GVT71256B18B		TM5020
GVT71256D18Z		TM5020
GVT71256E18Y		TM5020
GVT71256F18Y		TM5020
GVT71256G18Y		TM5020

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 4,000Å Ti/1,000Å TiN/4,000Å AlCu/250Å TiN Metal 2: 1,500Å Ti/6,000Å AlCu/250Å TiN
Passivation Type and Materials:	2K PE-Oxide + 6.5K PE-Nitride		
Free Phosphorus contents in top glass layer(%):	0		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal, 0.35um		
Gate Oxide Material/Thickness (MOS):	70Å SiO ₂		
Name/Location of Die Fab (prime) Facility:	WaferTech, WA, USA		
Die Fab Line ID/Wafer Process ID:	WaferTech 0.35um 4T SRAM TPDM Technology		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
100-pin TQFP	SPIL/ ASEK

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 Package (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:	Ablestik
Die Attach Material:	Ablestik 8361H
Bond Diagram Designation	GVT71128E36T-0
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0um
Thermal Resistance Theta JA °C/W:	29.9 °C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-78002
Name/Location of Assembly (prime) facility:	SPIL/ASEK

ELECTRICAL TEST / FINISH DESCRIPTION

Test Location:	CHIPMOS
Fault Coverage:	100%

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=3.6V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=3.6V, 150°C	P
Pressure Cooker	121C, 100%RH	P
High Accelerated Saturation Test (HAST)	130°C, ,85%RH	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,000V MIL-STD-883, Method 3015.7	P
Physical Dimension	SS 15/0	P
Solderability	8hrs, 500L, 5D/0	P
Lead Integrity	Condition B2, 75L / 5D	P
Die Shear	SS 18/0	P
Bond Pull Strength	> 5gram, 12/0	P
Ball Shear Strength	> 5gram, 10/0	P
Acoustic Microscope/C-SAM	SS 5/0	P
X-Ray	SS 18/0	P
Latchup Sensitivity	In accordance with JEDEC 17, Cypress Spec. 01-00081, 6.5V	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	1960	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} , Long Term Failure Rate	816,796 DHRs	0	0.7	170	7 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.

3.3V Synchronous SRAM Qualification Data
2Meg, 4Meg
TSMC 0.35 um Triple Poly Double Metal SRAM Process

1. Life Test (Dynamic)

Device	Lot #	Package	Condition		0 hour	184 hour	368 hour	500 hour	Device Hours
GVT7164D32Q-6	C60400-2	100L QFP	150°C	S.S.	1235	1235	1234		454,296
			3.6V	# of reject	0	0 (1*)	0		
GVT71128E36T	C60548	100L TQFP	150°C	S.S.	145	145	145	145	72,500
			3.6V	# of reject	0	0	0	0	
GVT71128E36T	C19940-17	100L TQFP	150°C	S.S.	145	145	145	145	72,500
			3.6V	# of reject	0	0	0	0	
GVT71256E18T	C20905-2	100L TQFP	150°C	S.S.	145	145	145	145	72,500
			3.6V	# of reject	0	0	0	1**	
GVT71256E18T	C22619-3	100L TQFP	150°C	S.S.	145	145	145	145	72,500
			3.6V	# of reject	0	0	0	0	
GVT71256E18T	C22271-1	100L TQFP	150°C	S.S.	145	145	145	145	72,500
			3.6V	# of reject	0	0	0	0	

Total Device Hours= 816,796

**One invalid reject (this unit passed at retesting)

2. ESD

Device	Lot #	Package	Condition	Stress Level	1000V	1500V	2000V
GVT7164D32Q	C60400-2	100L QFP	HBM	S.S.	3	3	3
				# of reject	0	0	0
GVT71128E36T	C19940	100L TQFP	HBM	S.S.			3
				# of reject			0
GVT71128G36T	C22615-2	100L TQFP	HBM	S.S.			3
				# of reject			0
GVT71256B18T	C22620-1	100L TQFP	HBM	S.S.			3
				# of reject			0

A blank entry means the stress was not performed for that level.

3. Latch-up

Device	Lot #	Package	Condition	Forcing	Vcc	Input	I/O
GVT7164D32Q-7	C60092	100L QFP	Room	Voltage	≥6.5V		≥6.5V
				Current		> 700 mA	
GVT71128E36T	C19940	100L TQFP	Room	Voltage	≥6.5V		≥6.5V
				Current		> 700 mA	

4. Temperature Cycle

Device	Lot #	Package	Condition		0 cycle	500 cycle
GVT71128E36T-6	C19940-4	100L TQFP	C	S.S. # of reject	22 0	22 0
GVT7164D32T-6	C19660-24	100L TQFP	C	S.S. # of reject	22 0	22 0
GVT7164D32T-6	C19373-24	100L TQFP	C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19374-1	100L QFP	C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19374-2	100L QFP	C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19673-1	100L QFP	C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19663-3	100L QFP	C	S.S. # of reject	22 0	22 0
GVT7132C32Q-6	C17884-1	100L QFP	C	S.S. # of reject	22 0	22 0
GVT7132D32T-7	C18936-1	100L TQFP	C	S.S. # of reject	22 0	22 0

Test Condition C: -65°C to 150°C, 10 minutes dwelling time between cycles.

5. Highly Accelerated Stress Test (Generic data)

Device	Lot #	Package	Condition		0 hour	100 hour
GVT71128B36	C34068-3	100L TQFP	85%RH 130°C	S.S. # of reject	22 0	22 0
GVT71256B18	C34068-1	100L TQFP	85%RH 130°C	S.S. # of reject	22 0	22 0

7. Pressure Pot

Device	Lot #	Package	Condition		0 hour	288 hour
GVT71128E36T-6	C19940-4	100L TQFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32T-6	C19660-24	100L TQFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32T-6	C19373-24	100L TQFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19374-1	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19374-2	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19673-1	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C19663-3	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C35115-1	100L QFP	100% RH 121°C	S.S. # of reject	21 0	21 0
GVT7164D32Q-6	C34890-1	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C34895-1	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C34234-1	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C34892-1	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C34887-1	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0
GVT7164D32Q-6	C34231-3	100L QFP	100% RH 121°C	S.S. # of reject	22 0	22 0

Mechanical Related Tests (Generic data included)

8. Physical Dimension

Device	Lot #	Package	Test Result	
GVT7164D32T-6	C19660-24	100L TQFP	S.S.	15
			# of reject	0
GVT7164D32T-6	C19373-24	100L TQFP	S.S.	15
			# of reject	0

13. Bond Pull Strength

Device	Lot #	Package	Condition	S.S.	Max (g)	Min(g)	Avg.
GVT71128E36T	C19940	100L TQFP	> 5 gram	12	7.6	6.1	7.06

10. Solderability

Device	Lot #	Package	Condition	Test Result
GVT7164D32T-6	C19660-24	100L TQFP	8 hour steam age	S.S. 500L/5D # of reject 0
GVT7164D32T-6	C19373-24	100L TQFP	8 hour steam age	S.S. 500L/5D # of reject 0

11. Die Shear

Device	Lot #	Package	Condition	S.S.	Max (kg)	Min(kg)	Avg.
GVT7164D32T-6	C19660-24	100L TQFP	> 5 kg	5	19.2	11.4	13.92
GVT7164D32T-6	C19373-24	100L TQFP	> 5 kg	5	19.2	11.4	13.92

12. X-Ray

Device	Lot #	Package	Condition	Test Result
GVT7164D32T-6	C19660-24	100L TQFP	no broken wire or void*	S.S. 18 # of reject 0
GVT7164D32T-6	C19373-24	100L TQFP	no broken wire or void*	S.S. 18 # of reject 0

*Void size has to be bigger than 20 mil

14. Lead Integrity

Device	Lot #	Package	Condition	Test Result
GVT7132C32Q-7	C10842-7	100L QFP	B2	S.S. 75L/5D # of reject 0
GVT7132C32Q-7	C10842-17	100L QFP	B2	S.S. 75L/5D # of reject 0

19. Delamination Detection Test (Scanning Acoustic Microscopy)

Device	Lot #	Package	Test Result
GVT7164D32T-6	C19373-24	100L TQFP	S.S. 5 # of reject 0
GVT7164D32T-6	C19660-24	100L TQFP	S.S. 5 # of reject 0

20. Ball Shear Strength

Device	Lot #	Package	Condition	S.S.	Max (g)	Min(g)	Avg.
GVT71128E36T	C19940	100L TQFP	> 5 gram	10	40.9	38	39.55