

Cypress Semiconductor Product Qualification Report

**QTP# 013404 VERSION 1.0
February 2003**

**Programmable Serial Interface™
CYP15G04K100V1-MGC / CYP15G04K200V2-MGC
Technology B53D-3, fab 4 / Technology TSMC 0.18um (T018), fab TSMC**

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
002202	B53D-3 Technology transfer from Fab1 to Fab4 using CY7B993V / CY7B994V	Mar 01
99154	New Technology TSMC 0.18um (T018) / New Device, CY39100V* and its package/pin option	Sept 01
013404	New CYP15G04K100VI / CYP15G04K200V2	Apr 02

Cypress products are manufactured using qualified processes. The technology qualification for this product is referenced above and must be considered to get a complete and thorough evaluation of the reliability of the product.

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify New Multi Chip Module CY015G04K100VI / CY015G04K200V2	
Marketing Part #:	CY015G04K100VI// CY015G04K200V2
Device Description:	1.8V, 2.5V and 3.3V commercial available in 456 ball BGA package.
Cypress Division:	Cypress Semiconductor Corporation –Data Com Division (DCD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C3948A 7B9294A 39VF020SST

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW+6,000Å Al/0.5%Cu/300Å TiW Metal 2: 300Å TiW+8,000Å Al/0.5%Cu/300Å TiW
Passivation Type and Materials:	1,000Å TEOS + 9,000Å SiN		
Free Phosphorus contents in top glass layer(%):	0%		
Die Coating(s), if used:	N/A		
Number of Transistors:	15,000		
Number of Gates:	3,750		
Generic Process Technology/Design Rule (□-drawn):	CMOS, Double Metal/0.25 □m		
Gate Oxide Material/Thickness (MOS):	SiO ₂ 55Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor – Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/B53D-3		

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	6	Metal Composition:	Metal 1 - 5 4,000Å Al 0.5%Cu Metal 6: 8,000Å Al 0.5%Cu
Passivation Type and Materials:	17,000Å Oxynitride		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device	24 million		
Number of Gates in Device	100,000		
Generic Process Technology/Design Rule (□-drawn):	Single Poly, 6 layer metal, 0.18um, embedded SRAM		
Gate Oxide Material/Thickness (MOS):	1.8V, SiO ₂ 32Å / 3.3V, SiO ₂ 70Å		
Name/Location of Die Fab (prime) Facility:	TSMC, Hsinchu, Taiwan		
Die Fab Line ID/Wafer Process ID:	TSMC 0.18um, 1P6M Logic with embedded SRAM		

PACKAGE	ASSEMBLY FACILITY SITE
456-ball L2BGA	TAIWN-G

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BG 456
Package Outline, Type, or Name:	456-ball Plastic Ball Grid Array (BG)
Mold Compound Name/Manufacturer:	Plaskon SMT-B-1
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	> 28%
Substrate Material:	BT Resin
Lead Finish, Composition / Thickness:	Solder ball, 63%Sn, 37%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablesitk
Die Attach Material:	8355F
Die Attach Method:	Epoxy
Bond Diagram Designation	10-04502
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold, 1.0mil
Thermal Resistance Theta JA °C/W:	16.97°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	41-41008
Name/Location of Assembly (prime) facility:	ASE Taiwan (TAIWN-G)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress San Jose CA USA
Fault Coverage:	100%

Note: Please contact a Cypress Representative for other packages availability

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure	1) QTP #002202 Dynamic Operating Condition, Vcc = 4.0V, 125° 2) QTP #99154 Dynamic Operating Condition, Vcc = 2.3V, 125°	P
High Temperature Operating Life Latent Failure Rate	1) QTP #002202 Dynamic Operating Condition, Vcc = 4.0V, 125° 2) QTP #99154 Dynamic Operating Condition, Vcc = 2.3V, 125°	P
High Temp Steady State Life Test	1) QTP #002202 Static Operating Condition, Vcc = 3.63V, 125°C	P
High Accelerated Saturation Test (HAST)	1) QTP #002202 130°C, 85%RH, 3.63V MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C	P
Pressure Cooker	1) QTP #013404 Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C 2) QTP #002202 Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C 3) QTP #99154 Precondition: JESD22 Moisture Sensitivity MSL 5* 72 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Temperature Cycle	1) QTP #013404, QTP #002202 Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C 2) QTP #99154 MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 5* 72 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Age Bond Strength	1) QTP #002202 MIL-STD-883C, Method 2011	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #013404, QTP #002202, 2,200V MIL-STD-883, Method 3015	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #013404, QTP #002202, Cypress Spec. 25-00020 500V	P
Bond Pull Test	QTP #002202 1) Cypress Spec. 12-00292	P
High Temperature Storage	1) QTP #002202 150°C, no bias	P
Low Temperature Operating Life	1) QTP #002202 -30°C, 4.3V	P
Physical Dimensions	1) QTP #013404 Cypress Spec. 25-00031	P
Internal Visual	1) QTP #013404 Cypress Spec. 25-00017	P
External Visual	1) QTP #013404 Cypress Spec. 12-00292	P
Current Density	1) QTP #002202 Cypress Spec. 22-00029	P
SEM X-Section	1) QTP #013404 MIL-STD-883C, Method 2018.2	P
Acoustic Microscopy, MSL 3	1) QTP #013404, QTP #002202 Cypress Spec. 25-00104	P
Dynamic Latchup Sensitivity	1) QTP #002202 Cypress Spec. 25-00020	P
Static Latchup Sensitivity	1) QTP #002202, ± 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	1,938	0	N/A	N/A	0
High Temperature Operating Life Long Term Failure Rate ^{1,2}	940,124 HRs	0	0.7	55-170	14 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 Failure Rate and LFR FIT Rate based on QTP #99154, and QTP #002202.

Reliability Test Data

QTP #: 013404

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: ACOUSTIC, MSL3							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	COMP	15	0	
CYP15G04K100VI -MGC (7M92842A)	9120596	610201232	TAIWN-G	COMP	15	0	
CYP15G04K100VI -MGC (7M92842A)	9120596	610201233	TAIWN-G	COMP	15	0	
STRESS: ESD-CDM, 500V							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	COMP	9	0	
STRESS: PHYSICAL DIMENSIONS							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	COMP	5	0	
STRESS: EXTERNAL VISUAL							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	COMP	15	0	
STRESS: INTERNAL VISUAL							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	COMP	15	0	
STRESS: X-RAY							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	COMP	15	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192HRS 30C/60%RH, MSL3							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	168	48	0	
STRESS: TC CONDITION C, -65C TO 150C, PRE COND. 192 HRS 30C/60% RH, MSL3							
CYP15G04K100VI -MGC (7M92842A)	9132991	610137308	TAIWN-G	300	48	0	
CYP15G04K100VI -MGC (7M92842A)	9120596	610201232	TAIWN-G	300	48	0	
CYP15G04K100VI -MGC (7M92842A)	9139528	610203884	TAIWN-G	300	48	0	

Reliability Test Data

QTP #: 99154

<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>
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STRESS: ACOUSTIC-MSL5

CY39100V208 (7C39480A)	9044202	340000405	TAIWN-G COMP	15	0		
CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G COMP	15	0		
CY39100V208 (7C39480A)	9050314	340000428	TAIWN-G COMP	15	0		

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.8V, Vcc Max

CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G 48	79	0		
CY39100V208 (7C39480A)	9050314	340000428	TAIWN-G 48	76	0		
CY39100V208 (7C39480A)	9123746	610120624	TAIWN-G 48	168	0		
CY39100V208 (7C39480A)	9124765	610121047	TAIWN-G 48	164	0		

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V, Vcc Max

CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G 80	79	0		
CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G 500	79	0		
CY39100V208 (7C39480A)	9123746	610120624	TAIWN-G 500	79	0		
CY39100V208 (7C39480A)	9124765	610121047	TAIWN-G 168	79	0		
CY39100V208 (7C39480A)	9124765	610121047	TAIWN-G 500	79	0		

STRESS: ESD-CHARGE DEVICE MODEL, 500V

CY39100V208 (7C39480A)	9044202	340000405	TAIWN-G COMP	9	0		
CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G COMP	9	0		
CY39100V208 (7C39480A)	9050314	340000428	TAIWN-G COMP	9	0		

STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-300mA

CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G COMP	3	0		
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STRESS: AGE BOND STRENGTH

CY39100V208 (7C39480A)	9044202	340000404	TAIWN-G COMP	10	0		
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STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 2.07V, Vcc MAX

CY39100V208 (7C39480A)	9107636	610107389	TAIWN-G 80	77	0		
CY39100V208 (7C39480A)	9107636	610107389	TAIWN-G 168	73	0		

STRESS: LOW TEMPERATURE OPERATING LIFE, -30C, 4.3V

CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G 500	48	0		
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STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 72 HR 30C/60%RH, MSL5

CY39100V208 (7C39480A)	9044202	340000404	TAIWN-G 168	47	0		
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STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 72 HR 30C/60%RH, MSL5

CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G 128	51	0		
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Reliability Test Data

QTP #: 99154

<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: TC COND. C -65C TO 150C, PRECONDITION 72 HRS 30C/60%RH, MSL5							
CY39100V208 (7C39480A)	9044202	340000404	TAIWN-G 300	46	0		
CY39100V208 (7C39480A)	9052411	340100001	TAIWN-G 300	48	0		
CY39100V208 (7C39480A)	9050314	340000428	TAIWN-G 300	48	0		

Reliability Test Data

QTP #: 002202

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: ACOUSTIC, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	15	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	COMP	15	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE - EARLY FAILURE RAT, (125C, 4.0V, >VCC MAX							
CY7B994V-AC	4030964	610042957	TAIWN-G	96	679	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	96	775	0	
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE-LATENT FAILURE RATE, 125C, 4.0, >Vcc Max							
CY7B994V-AC	4030964	610042957	TAIWN-G	168	330	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	1000	328	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	168	330	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	1000	239	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	2000	239	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 125C, 3.63V,>Vcc Max							
CY7B993V-AC	4021265	610036043	TAIWN-G	168	78	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	336	78	0	
STRESS: HIGH TEMP STORGAE, PLASTIC, 150C							
CY7B993V-AC	4021265	610036043	TAIWN-G	500	48	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	1000	48	0	
STRESS: LOW TEMPERATURE OPERATING LIKE, -30C,4.3V							
CY7B993V-AC	4021265	610036043	TAIWN-G	500	47	0	
STRESS: DYNAMIC LATCH-UP TESTING 6.79V							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	3	0	

Reliability Test Data

QTP #: 002202

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING 125C, 10V, +/-300mA							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	3	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	COMP	3	0	
CY7B994V-AC	4030964	610052500	TAIWN-G	COMP	3	0	
STRESS: BOND PULL							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	30	0	
STRESS: AGE BOND STRENGTH							
CY7B994V-AC	4030964	610052500	TAIWN-G	COMP	15	0	
CY7B994V-AC	4030965	610052501	TAIWN-G	COMP	15	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	128	46	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192HRS 30C/60%RH, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	168	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	168	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	168	46	0	

Reliability Test Data

QTP #: 002202

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: TC CONDITION C, -65C TO 150C, PRE COND. 192 HRS 30C/60% RH, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	300	48	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	500	48	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	1000	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	300	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	500	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	1000	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	300	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	500	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	1000	48	0	