Cypress Semiconductor
Product Qualification Report

QTP# 000603 VERSION 2.0
October, 2003

Full Speed USB Microcontrollers **0.5um TLM Technology, Fab HME**	
AN2122TC/ AN2126TC **AN2122SC/ AN2126SC**	**EZ-USB™ Series 2100** **Family**

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
001004	New 0.5um TLM Technology/New CY7C09449PV-AC Product Qualification	Aug 00
000603	New AN2122SC Product and bond options, 0.5um TLM Technology	Oct 00

PRODUCT DESCRIPTION (for qualification)		
Qualification Purpose: To qualify AN2122SC and its product family in qualified 0.5umTLM Technology,.Fab HME		
Marketing Part #:	AN2122SC/AN2126SC, AN2122TC/2126TC	
Device Description:	3.3V, Full Speed Microcontroller, Commercial available in 44-pin / 80-pin PQFP Package.	
Cypress Division:	Cypress Semiconductor Corporation – Interface Product Division (IPD)	
Overall Die (or Mask) REV:		Rev. A
What ID markings on Die:	GVS793K8	

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	3	Metal Composition:	Metal 1: (Ti/TiN)/Ti/Al-1%Si-0.5%Cu/Ti/TiN Metal 2: (Ti/TiN)/Ti/Al-1%Si-0.5%Cu/Ti/TiN Metal 3: (Ti/TiN)/Ti/Al-1%Si-0.5%Cu/TiN
Passivation Type and Materials:		Silicon Nitride	
Free Phosphorus contents in top glass layer (%)		Zero	
Generic Process Technology/Design Rule (μ-drawn):		CMOS / 0.5 micron	
Gate Oxide Material/Thickness (MOS):		SiO2 / 95 A	
Name/Location of Die Fab (prime) Facility:		Hyundai / Cheong Ju, Korea	
Die Fab Line ID/Wafer Process ID:		CF4 / HL50 (Hyundai)	

PACKAGE AVAILABILITY

PACKAGE TYPE	ASSEMBLY SITE FACILITY
44-pin/ 80-pin PQFP	**Hyundai-Korea (HME)**

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Outline, Type, or Name:	44-pin Plastic Quad Flatpack (PQFP)
Mold Compound Name/Manufacturer:	LMC-400V
Mold Compound Flammability Rating:	V-O per UL 94
Oxygen Rating Index:	>28%
Lead Frame Material:	Alloy 42
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:	84-1 LMISR4
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.3um
Thermal Resistance Theta JA °C/W:	33°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	Hyundai-turn-key
Name/Location of Assembly (prime) facility:	Hyundai-Korea (HME)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Hyundai-Korea (HME)
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 =3.8V, 150C Dynamic Operating Condition, Vcc = 3.8V, 135°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc =3.8V, 150C Dynamic Operating Condition, Vcc = 3.8V, 135°C	P
Temperature Cycle	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, 220°C+5, -0°C	P
Pressure Cooker Test	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V, 1,100V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Latchup Sensitivity	125C, 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	Thermal AF[3]	Failure Rate
High Temperature Operating Life Early Failure Rate	858	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2,] Long Term Failure Rate	173,408 DHRs	0	0.7	88-170	45 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.

Reliability Test Data

QTP #: 000603

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE - EARLY FAILURE RATE, 150C, 3.8V, VCC MAX							
AN2122SC-NC	NY0738	*OM26*		48	858	0	
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE-LATENT FAILURE RATE, 150C, 3.8V, Vcc Max							
AN2122SC-NC	NY0738	*OM26*		80	146	0	
AN2122SC-NC	NY0738	*OM26*		500	116	0	
STRESS: ESD-CHARGE DEVICE MODEL, 1000V							
AN2122SC-NC	NY0436	*GL09/16*		COMP	3	0	
STRESS: ESD- HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 1,100V							
AN2122SC-NC	NY0436	*GL09/16*		COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-300mA							
AN2122SC-NC	NY0738	*OM26*		COMP	3	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH), PRE COND 192HRS 30C/60%RH, MSL3							
AN2122SC-NC	NY0436	*GL09/16*		168	50	0	
STRESS: TC CONDITION C, -65C TO 150C, PRE COND. 192 HRS 30C/60% RH, MSL3							
AN2122SC-NC	NY0436	*GL09/16*		300	50	0	
AN2122SC-NC	NY0738	*OM26*		500	48	0	

Reliability Test Data

QTP #: 001004

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE - EARLY FAILURE RATE, 135C, 3.8V, VCC MAX							
CY7C09449PV-AC		*800001208*	SEOL-L	96	140	0	
CY7C09449PV-AC		*800001208/2791*	SEOL-L	96	488	0	
CY7C09449PV-AC		*800002104*	SEOL-L	96	1196	1	**UNKNOWN, NOT VISUAL*
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE-LATENT FAILURE RATE, 135C, 3.8V, Vcc Max							
CY7C09449PV-AC		*800002104*	SEOL-L	168	118	0	
CY7C09449PV-AC		*800002104*	SEOL-L	1000	112	0	
STRESS: ESD-CHARGE DEVICE MODEL, 750V							
CY7C09449PV-AC		*800002104*	SEOL-L	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C09449PV-AC		*800002104*	SEOL-L	COMP	3	0	
STRESS: STATIC LATCH-UP TESTIN,, 125C, 10V, +/-300mA							
CY7C09449PV-AC		*800002104*	SEOL-L	COMP	3	0	
STRESS: PRESSURE COOKER TES, 121C, 100%RH, PRE COND 192HRS 30C/60%RH, MSL3							
CY7C09449PV-AC		*800002104*	SEOL-L	168	47	0	
STRESS: TC CONDITION C, -65C TO 150C, PRE COND. 192 HRS 30C/60% RH, MSL3							
CY7C09449PV-AC		*800002104*	SEOL-L	300	48	0	
CY7C09449PV-AC		*800002104*	SEOL-L	500	47	0	
CY7C09449PV-AC		*800002104*	SEOL-L	1000	45	0	

***A CAR #20001905 was issued to HME**