

Cypress Semiconductor Product Qualification Report

QTP# 060302 VERSION 1.0
February 2006

USB2 Device Family P26 Technology, Fab2 - Magnachip	
CY7C63413C CY7C63513C CY7C63613C	Low-Speed High I/O, 1.5-Mbps USB Controller

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
99443	P26 Transfer from CTI to Magnachip, Technology Qual	Apr 00
054604	Verify Qualification of P26 Technology at Magnachip	Feb 06
060302	MM1 change to USB2 base die at Magnachip	Jan 06

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify MM1 Change to USB2 base die at Magnachip	
Marketing Part #:	CY7C63413C, CY7C63513C, CY7C63613C
Device Description:	Low-Speed High I/O, 1.5-Mbps USB Controller
Cypress Division:	Cypress Semiconductor Corporation –Consumer and Computation Division (CCD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. C
What ID markings on Die:	7C6341A

TECHNOLOGY/FAB PROCESS DESCRIPTION - P26			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 1500Å TiW / 4000Å Al / 750Å TiW Metal 2: 1500Å TiW / 8000Å Al / 750Å TiW
Passivation Type and Materials:	Oxynitride		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal/0.65μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ , 165Å		
Name/Location of Die Fab (prime) Facility:	Magnachip/Cheong-Ju-Korea		
Die Fab Line ID/Wafer Process ID:	Fab2/P26		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
24-Lead SOIC	CML-R
40-Pin PDIP	INDNS-O
48-Lead SSOP	CML-R

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	SP48
Package Outline, Type, or Name:	48-Lead Shrunken Small Outline Package
Mold Compound Name/Manufacturer:	Nitto MP8500
Mold Compound Flammability Rating:	V-0
Oxygen Rating Index:	N/A
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	NiPdAu
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	100% Saw
Die Attach Supplier:	QMI
Die Attach Material:	509
Die Attach Method:	Epoxy Cure
Bond Diagram Designation:	10-05962
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 1.0 mil
Thermal Resistance Theta JA °C/W:	81.6°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20048
Name/Location of Assembly (prime) facility:	Cypress Philippines (CML-R)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-R
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 = 5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max = 5.75V, 150°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max = 5.75V, 150°C	P
Long Life Verification	Dynamic Operating Condition, Vcc Max = 5.75V, 150°C	P
Low Temperature Operating Life	-30C, 6.5V, 8MHZ	P
High Accelerated Saturation Test (HAST)	130°C, 5.5V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 220°C+0, -5°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 220°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 220°C+0, -5°C	P
Aged Bond Strength	MIL-STD-883, Method 2011	P
Bond Pull	Cypress Spec. 12-00292	P
Data Retention (Hermetic)	250C, non-biased	P
Data Retention (Plastic)	150C/165C, non-biased	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JESD22, Method A114-B	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Acoustic Microscopy	Cypress Spec. 25-00104	P
Dynamic Latch-up	125C, 8.5V	P
Static Latch-up	125C, ± 200mA/± 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 ⁴	Failure Rate
High Temperature Operating Life Early Failure Rate	4,197 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	446,980 DHRs	0	0.7	170	12 FITs

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.

Reliability Test Data

QTP #: 99443

<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, MSL1							
CY7C64113-PVC	2948678	619938213	CSPI-R	COMP	15	0	
CY7C64113-PVC	2001294	610002661	CSPI-R	COMP	15	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	COMP	15	0	
STRESS: BOND PULL							
CY7C65113-SC	2948678	519919718	INDNS-O	COMP	5	0	
STRESS: DATA RETENTION, HERMETIC, 250C							
CY7C66113-PVC	2001294	610002660	CSPI-R	96	78	0	
CY7C66113-PVC	2001294	610002660	CSPI-R	168	78	0	
CY7C64013-*DC	2004702		USA-C	96	78	0	
CY7C64013-*DC	2004702		USA-C	168	78	0	
CY7C64013-*DC	2004741		USA-C	96	78	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY7C64113-PVC	2948678	619938213	CSPI-R	500	82	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	1000	82	0	
CY7C64113-PVC	2001294	610002661	CSPI-R	500	82	0	
CY7C64113-PVC	2001294	610002661	CSPI-R	1000	82	0	
STRESS: DATA RETENTION, PLASTIC, 165C							
CY7C64113-PVC	2004702	610004994	CSPI-R	168	83	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	552	83	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V, Vcc Max)							
CY7C65113-SC	2001294	510000813	INDNS-O	48	351	0	
CY7C65113-SC	2004702	510001508	INDNS-O	48	378	0	
CY7C65113-SC	2948678	519919718	INDNS-O	48	348	0	
STRESS: LONG LIFE VERIFICATION, 150C, 5.75V							
CY7C65113-SC	2948678	519919718	INDNS-O	1000	120	0	
CY7C65113-SC	2948678	519919718	INDNS-O	2000	120	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 6.5V, 8MHZ)							
CY7C64113-PVC	2948678	619938213	CSPI-R	500	48	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	1000	47	0	

Reliability Test Data

QTP #: 99443

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V, Vcc Max)

CY7C65113-SC	2001294	510000813	INDNS-O	80	351	0	
CY7C65113-SC	2001294	510000813	INDNS-O	500	120	0	
CY7C65113-SC	2004702	510001508	INDNS-O	80	120	0	
CY7C65113-SC	2004702	510001508	INDNS-O	500	120	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	80	120	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	500	120	0	
CY7C65113-SC	2948678	519919718	INDNS-O	80	120	0	
CY7C65113-SC	2948678	519919718	INDNS-O	500	120	0	

STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.75V), PRE COND 168 HRS 85C/85%RH, MSL1

CY7C66113-PVC	2001294	610002660	CSPI-R	128	50	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	128	45	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	128	50	0	

STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 168 HRS 85C/85%RH, MSL1

CY7C65113-SC	2001294	510000813	INDNS-O	168	50	0	
CY7C64113-PVC	2001294	610002661	CSPI-R	168	50	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	168	49	0	
CY7C66113-PVC	2948678	619938214	CSPI-R	168	50	0	

STRESS: ESD-CHARGE DEVICE MODEL (1,000V)

CY7C66113-PVC	2001294	610002660	CSPI-R	COMP	3	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	COMP	3	0	
CY7C65013-PVC	2948678	619938212	CSPI-R	COMP	3	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	COMP	3	0	
CY7C66113-PVC	2948678	619938214	CSPI-R	COMP	3	0	

STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)

CY7C66113-PVC	2001294	610002660	CSPI-R	COMP	3	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	COMP	3	0	
CY7C65013-PVC	2948678	619938212	CSPI-R	COMP	3	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	COMP	3	0	
CY7C66113-PVC	2948678	619938214	CSPI-R	COMP	4	0	

Reliability Test Data

QTP #: 99443

<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: STATIC LATCH-UP TESTING (125C, 10V, +/-300mA)							
CY7C64113-PVC	2948678	619938213	CSPI-R	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH, MSL1							
CY7C65113-SC	2001294	510000813	INDNS-O	300	49	0	
CY7C65113-SC	2001294	510000813	INDNS-O	500	49	0	
CY7C64113-PVC	2001294	610002661	CSPI-R	300	49	0	
CY7C64113-PVC	2001294	610002661	CSPI-R	500	49	0	
CY7C64113-PVC	2001294	610002661	CSPI-R	1000	48	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	300	48	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	500	48	0	
CY7C64113-PVC	2004702	610004994	CSPI-R	1000	48	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	300	50	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	500	50	0	
CY7C64113-PVC	2948678	619938213	CSPI-R	1000	48	0	

Note: PV is an index of Cypress Module Package.

Reliability Test Data

QTP #: 054604

<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							
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	COMP	15	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	COMP	10	0	
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	COMP	10	0	
STRESS: DATA RETENTION, 150C, no bias							
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	500	80	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	1000	80	0	
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	500	80	0	
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	1000	80	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	500	80	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	1000	80	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	COMP	9	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	COMP	9	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	COMP	9	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	COMP	9	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	COMP	9	1	Contact Damage
STRESS: DYNAMIC LATCH-UP, 8.5V							
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	COMP	3	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	COMP	3	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	COMP	3	0	

Reliability Test Data

QTP #: 054604

<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: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.75V), PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	128	50	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	128	49	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.75V)							
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	128	48	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V), Vcc Max)							
CY7C65113C (7C651131GU)	2544369	610552933	CML-R	48	816	0	
CY7C65113C (7C651131GU)	2544348	610552934	CML-R	48	1006	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	48	1224	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	48	1151	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V), Vcc Max)							
CY7C65113C (7C651131GU)	2544369	610552933	CML-R	80	130	0	
CY7C65113C (7C651131GU)	2544369	610552933	CML-R	500	130	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	80	130	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	500	130	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	80	117	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	500	117	0	
STRESS: HIGH TEMPERATURE STEADY STATE LIFE- (150C, 5.75V, Vcc Max)							
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	80	80	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	168	80	0	
STRESS: HIGH TEMPERATURE STORAGE, 150C, no bias							
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	500	50	0	
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	1000	50	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C64013C (7C640131GU)	2535026	610539904	CML-R	168	50	0	
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	168	50	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	168	50	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	288	50	0	

Reliability Test Data

QTP #: 054604

<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 COND. C -65C TO 150C							
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	300	50	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	500	50	0	
CY7C63413C (7C634131CU)	2544313	510505323	INDNS-O	1000	50	0	
STRESS: LOW TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, -30C, 6.5V, Vcc							
CY7C65113C (7C651131GU)	2543258	610550662	CML-R	500	51	0	

Reliability Test Data

QTP #: 060302

<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)							
CY7C634131C (7C634131C)	2552707	610603263	CML-R	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY7C634131C (7C634131C)	2552707	610603263	CML-R	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY7C634131C (7C634131C)	2552707	610603263	CML-R	COMP	3	0	