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ECN # 6484841

Cypress Semiconductor
Product Qualification Report

QTP# 162511, 163706, 161604, 174602, 183311, 184507 VERSION *E
February, 2019

Microcontrollers, 90nm Technology (CU100F), SMIC	
CY9A110A Series, CY9A310A Series, CY9A110 Series, CY9A310 Series, CY9B160R Series, CY9B360R Series, CY9B460R Series, CY9B560R Series S6E2H Series	32-Bit Microcontroller
MB91590 Series MB91520 Series	

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date
162511 163706	Qualification of 90nm Techology Product Family at SMIC	November, 2016
161604	Qualification Cu-wire package at J-Devices Usuki	November, 2017
174602	Qualification Cu-wire package at TongFu Microelectronics	January, 2018
183311	Qualification of 90nm Technology S6E2H Series Product at SMIC	November, 2018
184507	Qualification of CY9B160R/360R/460R/560R Series at SMIC	February, 2019

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify 90nm Technology Product Family at SMIC	
Marketing Part #:	MB91F594BSPMC-GSE1
Device Description:	32-Bit general purpose single-chip products with Flash
Cypress Division:	Microcontroller and Connectivity Division

PACKAGE	ASSEMBLY FACILITY SITE
LQFP208	J-Devices – Miyagi

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQR208
Package Outline, Type, or Name:	208-LQFP
Mold Compound Name/Manufacturer:	CEL-9210HFSK / Hitachi
Mold Compound Flammability Rating:	V-0
Lead Frame Material:	Cu Alloy
Lead Finish, Composition / Thickness:	Sn/Bi / 5-15um
Die Backside Preparation Method/Metallization:	Back Grind
Die Separation Method:	Dicing
Die Attach Supplier:	Hitachi
Die Attach Material:	EN4600B
Wire Bond Method:	Ultrasonic & Force
Wire Material/Size:	Au / 23um (0.9mil)
Package Cross Section Yes/No:	Yes
Name/Location of Assembly (prime) facility:	J-Devices Miyagi
MSL LEVEL	3
Reflow Profile	260℃

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	J-Devices – Aizu

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify 90nm Technology Product Family at SMIC	
Marketing Part #:	CY9AF116NPMC-G-MJE1
Device Description:	General purpose single-chip products with Flash
Cypress Division:	Microcontroller and Connectivity Division

PACKAGE	ASSEMBLY FACILITY SITE
LQFP64/80/100	J-Devices – Usuki

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQI100
Package Outline, Type, or Name:	100- Low Profile Quad Flat Package
Mold Compound Name/Manufacturer:	EME-G660B / Sumitomo
Mold Compound Flammability Rating:	V-0
Lead Frame Material:	Cu Alloy
Lead Finish, Composition / Thickness:	Sn/Bi / 5-15um
Die Backside Preparation Method/Metallization:	Back Grind
Die Separation Method:	Dicing
Die Attach Supplier:	Hitachi
Die Attach Material:	EN4600B
Wire Bond Method:	Ultrasonic & Force
Wire Material/Size:	CuPdAu / 20um (0.8mil)
Package Cross Section Yes/No:	Yes
Name/Location of Assembly (prime) facility:	J-Devices Usuki
MSL LEVEL	3
Reflow Profile	260℃

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location	J-Devices Usuki

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose:	Qualify Cu-wire package at J-Devices Usuki site.
Marketing Part #:	MB91F524KHBPMC1-GS-F4E2
Device Description:	General purpose single-chip products with Flash
Cypress Division:	Microcontroller and Connectivity Division

PACKAGE	ASSEMBLY FACILITY SITE
LQFP144	J-Devices – Usuki

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQN144
Package Outline, Type, or Name:	144- Low Profile Quad Flat Package
Mold Compound Name/Manufacturer:	EME-G660B / Sumitomo
Mold Compound Flammability Rating:	V-0
Lead Frame Material:	Cu Alloy
Lead Finish, Composition / Thickness:	Pure-Sn / 7-17um
Die Backside Preparation Method/Metallization:	Back Grind
Die Separation Method:	Dicing
Die Attach Supplier:	Hitachi
Die Attach Material:	EN4600B
Wire Bond Method:	Ultrasonic & Force
Wire Material/Size:	CuPdAu / 20um (0.8mil)
Package Cross Section Yes/No:	Yes
Name/Location of Assembly (prime) facility:	J-Devices Usuki
MSL LEVEL	3
Reflow Profile	260℃

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location	J-Devices Usuki

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify Cu-wire package at TongFu Microelectronics.	
Marketing Part #:	CY9AF316NAPMC-G-MNE2
Device Description:	32-Bit general purpose single-chip products with Flash
Cypress Division:	Microcontroller and Connectivity Division

PACKAGE	ASSEMBLY FACILITY SITE
LQFP100	TongFu Microelectronics

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQI100
Package Outline, Type, or Name:	100- Low Profile Quad Flat Package
Mold Compound Name/Manufacturer:	CEL-8240HF10-CWK / Hitachi
Mold Compound Flammability Rating:	V-0
Lead Frame Material:	Cu Alloy
Lead Finish, Composition / Thickness:	Pure-Sn / 7-17um
Die Backside Preparation Method/Metallization:	Back Grind
Die Separation Method:	Dicing
Die Attach Supplier:	Hitachi
Die Attach Material:	EN4600B
Wire Bond Method:	Ultrasonic & Force
Wire Material/Size:	CuPdAu / 18um (0.7mil)
Package Cross Section Yes/No:	Yes
Name/Location of Assembly (prime) facility:	TongFu Microelectronics
MSL LEVEL	3
Reflow Profile	260℃

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	TongFu Microelectronics

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose:	Qualification of 90nm Technology S6E2H Series Product at SMIC
Marketing Part #:	S6E2HG6G0AGV2000M
Device Description:	General purpose single-chip products with Flash
Cypress Division:	Microcontroller and Connectivity Division

PACKAGE	ASSEMBLY FACILITY SITE
LQFP120	J-Devices – Usuki

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQM120
Package Outline, Type, or Name:	120- Low Profile Quad Flat Package
Mold Compound Name/Manufacturer:	EME-G660B / Sumitomo
Mold Compound Flammability Rating:	V-0
Lead Frame Material:	Cu Alloy
Lead Finish, Composition / Thickness:	Pure-Sn / 7-20um
Die Backside Preparation Method/Metallization:	Back Grind
Die Separation Method:	Dicing
Die Attach Supplier:	Hitachi
Die Attach Material:	EN4600B
Wire Bond Method:	Ultrasonic & Force
Wire Material/Size:	CuPdAu / 20um (0.8mil)
Package Cross Section Yes/No:	Yes
Name/Location of Assembly (prime) facility:	J-Devices Usuki
MSL LEVEL	3
Reflow Profile	260℃

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location	J-Devices Usuki

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose:	Qualification of 90nm Technology CY9B160R/360R/460R/560R Series Product at SMIC
Marketing Part #:	CY9BF568RPMC-G-MNE2
Device Description:	General purpose single-chip products with Flash
Cypress Division:	Microcontroller and Connectivity Division

PACKAGE	ASSEMBLY FACILITY SITE
LQFP120	TongFu Microelectronics

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQM120
Package Outline, Type, or Name:	120- Low Profile Quad Flat Package
Mold Compound Name/Manufacturer:	CEL8240HF10-CWK / Hitachi
Mold Compound Flammability Rating:	V-0
Lead Frame Material:	Cu Alloy
Lead Finish, Composition / Thickness:	Pure-Sn / 7-20um
Die Backside Preparation Method/Metallization:	Back Grind
Die Separation Method:	Dicing
Die Attach Supplier:	Hitachi
Die Attach Material:	EN4600B
Wire Bond Method:	Ultrasonic & Force
Wire Material/Size:	CuPdAu / 18um (0.7mil)
Package Cross Section Yes/No:	Yes
Name/Location of Assembly (prime) facility:	TongFu Microelectronics
MSL LEVEL	3
Reflow Profile	260℃

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location	TongFu Microelectronics

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Max. rating Voltage, 125 degreeC, JESD22-A108	P
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Max. rating Voltage, 125 degreeC, JESD22-A108	P
High Accelerated Saturation Test (HAST)	130 degreeC, 85%RH, Max. Rating Voltage, or 110 degreeC, 85%RH, Max. Rating Voltage, Precondition: JESD22 Moisture Sensitivity Level3 JEDEC STD 22-A110	P
Unbiased High Accelerated Saturation Test (UHST)	130 degreeC, 85%RH, Precondition: JESD22 Moisture Sensitivity Level3 JEDEC STD 22-A118:	P
Temperature Cycle	JESD22-A104, Condition C, -60 to 150 degreeC	P
High Temperature Storage	JESD22-A103: 150 degreeC,	P
Electrostatic Discharge Human Body Model (ESD-HBM)	JEDEC EIA/JESD22-A114-B +/- 2000V	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	JESD22-C101 +/- 500V (+/-750V corner pin)	P
Static Latch up	125 degreeC, 100mA	P
Endurance + Data Retention Bake	JESD22-A117, Cycling temp : 125 degreeC Bake Temperature : 150 degreeC	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal A.F (3)	Failure Rate
High Temperature Operating Life Early Failure Rate	5,000 Devices	0	N/A	N.A	0 PPM (1)
High Temperature Operating Life Latent Failure Rate	48,750,000DHRs	0	0.7	78	19FIT (2)

[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 #: 162511, 163706, 161604, 174602, 183311, 184507

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS : High Temperature Operation Life – Latenf Failure Rate							
MB91F594B	EP3663	1606Z01	Miyagi	1000	77	0	
MB91F594B	EP3657	1611Z01	Miyagi	1000	77	0	
MB91F594B	EP3658	1614Z01	Miyagi	1000	77	0	
MB91F524	-	1502N01	Usuki	1000	78	0	
STRESS : High Temperature Operation Life – Early Failure Rate							
MB91F594B	EP3663	1606Z01	Miyagi	96	1000	0	
MB91F594B	EP3657	1611Z01	Miyagi	96	1000	0	
MB91F594B	EP3658	1614Z01	Miyagi	96	1000	0	
MB91F594B	EP4160	1623Z01	Miyagi	96	1000	0	
MB91F594B	EP4160.2	1623Z02	Miyagi	96	1000	0	
STRESS : High Accelerated Saturation Test							
MB91F594B	EP3663	1606Z01	Miyagi	96	77	0	
MB91F594B	EP3657	1611Z01	Miyagi	96	77	0	
MB91F594B	EP3658	1614Z01	Miyagi	96	77	0	
MB91F524	-	1502N01	Usuki	96	78	0	
CY9AF316	EP4172	1745315	TongFu	264	25	0	
CY9AF316	EP4172	1745316	TongFu	264	25	0	
CY9AF316	EP4172	1745317	TongFu	264	25	0	
S6E2HG6G	EL5653	82744002	Usuki	264	25	0	
CY9BF568R	EP5336	1842D14	TongFu	264	25	0	
STRESS : Unbiased High Accelerated Saturation Test							
MB91F594B	EP3663	1606Z01	Miyagi	96	77	0	
MB91F594B	EP3657	1611Z01	Miyagi	96	77	0	
MB91F594B	EP3658	1614Z01	Miyagi	96	77	0	
MB91F524	-	1502N01	Usuki	96	80	0	
CY9AF116	EP3811	1613N01	Usuki	96	77	0	
CY9AF116	EP3811	1613N02	Usuki	96	77	0	
CY9AF116	EP3811	1613N03	Usuki	96	77	0	
CY9AF316	EP4172	1745315	TongFu	96	77	0	
S6E2HG6G	EL5653	82744002	Usuki	96	77	0	
CY9BF568R	EP5336	1842D14	TongFu	96	77	0	

QTP #: 162511, 163706, 161604, 174602, 183311, 184507

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS ; Temperature Cycle							
MB91F594B	EP3663	1606Z01	Miyagi	500	77	0	
MB91F594B	EP3657	1611Z01	Miyagi	500	77	0	
MB91F594B	EP3658	1614Z01	Miyagi	500	77	0	
MB91F524	-	1502N01	Usuki	500	80	0	
CY9AF116	EP3811	1613N01	Usuki	500	77	0	
CY9AF116	EP3811	1613N02	Usuki	500	77	0	
CY9AF116	EP3811	1613N03	Usuki	500	77	0	
CY9AF316	EP4172	1745315	TongFu	500	77	0	
CY9AF316	EP4172	1745316	TongFu	500	77	0	
CY9AF316	EP4172	1745317	TongFu	500	77	0	
S6E2HG6G	EL5653	82744002	Usuki	500	77	0	
S6E2HG6G	EL5653	82744003	Usuki	500	77	0	
S6E2HG6G	EL5653	82744004	Usuki	500	77	0	
CY9BF568R	EP5336	1842D14	TongFu	500	77	0	
CY9BF568R	EP5336	1842D15	TongFu	500	77	0	
CY9BF568R	EP5336	1842D16	TongFu	500	77	0	
STRESS ; High Temperature Storage							
MB91F594B	EP3663	1606Z01	Miyagi	1000	45	0	
MB91F524	-	1502N01	Usuki	1000	45	0	
CY9AF116	EP3811	1613N01	Usuki	1000	29	0	
CY9AF116	EP3811	1613N02	Usuki	1000	24	0	
CY9AF116	EP3811	1613N03	Usuki	1000	24	0	
CY9AF316	EP4172	1745315	TongFu	1000	45	0	
S6E2HG6G	EL5653	82744002	Usuki	1000	45	0	
CY9BF568R	EP5336	1842D14	TongFu	1000	45	0	
STRESS ; Endurance (100Kcycling) + Data Retention Test							
MB91F594B	EP3663	1606Z01	Miyagi	732	40	0	
MB91F594B	EP3657	1611Z02	Miyagi	732	39	0	
MB91F594B	EP3658	1614Z01	Miyagi	732	40	0	

Reliability Test Data

QTP #: 162511, 163706, 161604, 174602, 183311, 184507

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS ; ESD (HBM)							
MB91F594	EP3514	1551-Z01	Miyagi	COMP	8	0	
CY9AF314	EP3879	1610-N03	Usuki	COMP	9	0	
CY9AF116NA	EP3811	1616-N13	Usuki	COMP	8	0	
CY9AF314M	EP3879	1616-N00	Usuki	COMP	8	0	
CY9AF314L	EP3879	1616-N01	Usuki	COMP	8	0	
CY9AF314L1	EP3879	1616-N02	Usuki	COMP	8	0	
CY9AF316NA	EP3811	1614-311	TongFu	COMP	8	0	
CY9AF316MA	EP3811	1614-311	TongFu	COMP	8	0	
CY9AF314NA	EP3879	1616-311	TongFu	COMP	8	0	
CY9AF314MA	EP3879	1616-311	TongFu	COMP	8	0	
CY9AF314LA	EP3879	1616-311	TongFu	COMP	8	0	
STRESS ; ESD-CDM							
MB91F594	EP3514	1551-Z01	Miyagi	COMP	8	0	
CY9AF314	EP3879	1610-N03	Usuki	COMP	9	0	
CY9AF116NA	EP3811	1616-N13	Usuki	COMP	9	0	
CY9AF314M	EP3879	1616-N00	Usuki	COMP	9	0	
CY9AF314L	EP3879	1616-N01	Usuki	COMP	9	0	
CY9AF314L1	EP3879	1616-N02	Usuki	COMP	9	0	
CY9AF316NA	EP3811	1614-311	TongFu	COMP	9	0	
CY9AF316MA	EP3811	1614-311	TongFu	COMP	9	0	
CY9AF314NA	EP3879	1616-311	TongFu	COMP	9	0	
CY9AF314MA	EP3879	1616-311	TongFu	COMP	9	0	
CY9AF314LA	EP3879	1616-311	TongFu	COMP	9	0	
STRESS ; Latch-up Test							
MB91F594	EP3514	1551-Z01	Miyagi	COMP	3	0	
CY9AF314	EP3879	1610-N03	Usuki	COMP	3	0	
CY9AF116NA	EP3811	1616-N13	Usuki	COMP	3	0	
CY9AF314M	EP3879	1616-N00	Usuki	COMP	3	0	
CY9AF314L	EP3879	1616-N01	Usuki	COMP	3	0	
CY9AF314L1	EP3879	1616-N02	Usuki	COMP	3	0	
CY9AF316NA	EP3811	1614-311	TongFu	COMP	3	0	
CY9AF316MA	EP3811	1614-311	TongFu	COMP	3	0	
CY9AF314NA	EP3879	1616-311	TongFu	COMP	3	0	
CY9AF314MA	EP3879	1616-311	TongFu	COMP	3	0	
CY9AF314LA	EP3879	1616-311	TongFu	COMP	3	0	

Document History Page

Document Title: QTP# 162511 : Microcontrollers, 90nm Technology (CU100F), SMIC
Document Number: 002-16034

Rev.	ECN No.	Orig. of Change	Description of Change
**	5403097	KUMI	Initial Spec. release.
*A	6033854	KUMI	Added Cu-wire package qualificaton result at J-Devices and TongFu Microelectronics.
*B	6188959	KUMI	Updated Qualified MPNs. Corrected qualification used MPN & Package type
*C	6200904	KUMI	Modified Part Number in Cover page.
*D	6387399	KUMI	Add S6E2H Series Qualification Result (QTP#183311) Modify Assy Location from J-Devices to Miyagi or Usuki Change the Document Titile (added CU100F)
*E	6484841	KUMI	Add QTP#184507 result