Cypress Semiconductor Automotive Product Qualification Report

QTP# 164005 VERSION *A
February 2019

Automotive 8-MBIT Asynchronous SRAM Family ULL65nm (LL65UP-250DR) Technology, UMC Fab12A	
CY62157H	**MoBL AUTOMOTIVE, 8-MBIT (512K WORDS X 16 BIT) STATIC RAM WITH ERROR-CORRECTING CODE**

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

Qual Report	Description of Qualification Purpose	Date Comp
133601	Qualification of Automotive 16-MBIT Asynchronous SRAM Family, ULL65nm (LL65UP-250DR) Technology, UMC Fab12A	Jun 15
164005	Qualification of Automotive 8-MBITAsynchronous SRAM Family, ULL65nm (LL65UP-250DR) Technology, UMC Fab12A	Mar 17

PRODUCT DESCRIPTION (for qualification)	
Qualification of Automotive 8-MBITAsynchronous SRAM Family, ULL65nm (LL65UP-250DR) Technology, UMC Fab12A	
Marketing Part #:	CY62157H
Device Description:	Automotive, 8-MBIT (512K WORDS X 16 BIT) Static RAM with ERROR Correcting Code
Cypress Division:	Cypress Semiconductor Corporation – Memory Products Division (MPD)

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	Proprietary	Metal Composition:	Proprietary
Passivation Type and Materials:		Proprietary	
Generic Process Technology/Design Rule :		Proprietary	
Gate Oxide Material/Thickness (MOS):		Proprietary	
Name/Location of Die Fab (prime) Facility:		UMC / Taiwan	
Die Fab Line ID/Wafer Process ID:		Fab12A L65LL	

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE	QTP NUMBER
48-Lead VFBGA (6x8x1.0mm)	CML-Philippines (RA)	143606
48-Lead VFBGA (6x8x1.0mm)	ASEK-Taiwan (G)	143605

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BZ48A
Package Outline, Type, or Name:	48L VFBGA 6x8x1.0mm
Mold Compound Name/Manufacturer:	GR9810 / Henkel
Mold Compound Flammability Rating:	V0 UL94
Mold Compound Alpha Emission Rate:	0.002 CPH/cm2
Oxygen Rating Index: >28%	54 (Typical) / 28 (Min. value)
Lead Frame Designation:	N/A
Lead Frame Material:	N/A
Substrate Material:	BT / KIT
Lead Finish, Composition / Thickness:	SAC-105
Die Backside Preparation Method/Metallization:	Backgrind to 7mils
Die Separation Method:	100% Saw
Die Attach Supplier:	Henkel
Die Attach Material:	QMI-506
Bond Diagram Designation	001-91668
Wire Bond Method:	Thermosonic
Wire Material/Size:	CuPd / 0.8mil
Thermal Resistance Theta JA °C/W:	32 degC /W
Package Cross Section Yes/No:	Y
Name/Location of Assembly (prime) facility:	CML-Philippines (RA)
MSL LEVEL	3
REFLOW PROFILE	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Chipmos-Taiwan (GO), CML-Philippines (RA

Note: Please contact a Cypress Representative for other packages availability.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BZ48A
Package Outline, Type, or Name:	48L VFBGA (6x8x1.0mm)
Mold Compound Name/Manufacturer:	KE-G2250 / Kyocera
Mold Compound Flammability Rating:	V0 UL94
Mold Compound Alpha Emission Rate:	</=0.1
Oxygen Rating Index: >28%	>28%
Lead Frame Designation:	N/A
Lead Frame Material:	N/A
Substrate Material:	BT
Lead Finish, Composition / Thickness:	SAC105 (SnAgCu)
Die Backside Preparation Method/Metallization:	Backgrind to 7mils
Die Separation Method:	100% Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	Ablestik 2100A
Bond Diagram Designation	001-85194
Wire Bond Method:	Thermosonic
Wire Material/Size:	CuPd / 0.8mil
Thermal Resistance Theta JA °C/W:	32 degC/W
Package Cross Section Yes/No:	Y
Assembly Process Flow:	49-41001
Name/Location of Assembly (prime) facility:	ASEK-Taiwan (G)
MSL LEVEL	3
REFLOW PROFILE	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Chipmos Taiwan (GO)

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	AEC-Q100-008 and JESD22-A108, 125°C Dynamic Operating Condition, Vcc Max = 1.44V	P
High Temperature Operating Life Latent Failure Rate	JESD22-A108, 1250°C Dynamic Operating Condition, Vcc Max = 1.44V	P
High Accelerated Saturation Test (HAST)	JESD22-A110, 130C, 3.65V, 85%RH Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Temperature Cycle	JESD22-A104, -65°C to 150°C Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	JESD22-A102, 121C, 100%RH, 15 Psig Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	AEC-Q100-002 500V/1000V/1500V/2000V/4000V/6000V	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	AEC-Q100-011 250V/500V/750V (corner pins)	P
Electrostatic Discharge Machine Model (ESD-MM)	200V, JESD22-A115-A	P
Wire Ball Shear	AEC-Q100-001	P
Wire Bond Pull	Mil-Std 883, Method 2011	P
Electrical Distribution	AEC-Q100-009	P
Soft Error (Alpha Particle)	JESD89	P
Final Visual	JESD22-B101B	P
Physical Dimensions	JESD22-B100/108	P
Solderability	JESD22-B102	P
Post Temperature Cycle Wire Bond Pull	Mil-Std 883, Method 2011	P
High Temperature Storage Life Test	JESD22-A103, 150 C	P
Dye Penetrant Test	Criteria: No Package Crack	P
Static Latch-up	AEC-Q100-004, +/140mA, 125C	P
Constructional Analysis	Criteria: Meet external and internal characteristics of Cypress package	P
Acoustic	J-STD-020 Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260C+0, -5C	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	12,009 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	729,000 Device Hours	0	0.7	170	23 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 #: 133601

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	22	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	22	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	22	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	COMP	22	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	COMP	22	0	
STRESS: BALL SHEAR							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	100	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	100	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	100	0	
STRESS: BOND PULL							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	100	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	100	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	100	0	
STRESS: CONSTRUCTIONAL ANALYSIS							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	5	0	
STRESS: DYE PENETRANT TEST							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	15	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	15	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	15	0	

Reliability Test Data

QTP #: 133601

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 1.44V, Vcc Max							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	96	275	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	96	264	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	96	107	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	96	560	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	96	556	0	
CY7C1061G30 (7AP171061AO)	9313001	611508409	ASE-G	96	271	0	
CY7C1061G30 (7AP171061AO)	9313001	611511127	ASE-G	96	361	0	
CY62167G30 (7CC1721673AO)	9423005	611500929	CML-RA	96	927	0	
CY62167G30 (7CC1721673AO)	9438003	611506601	CML-RA	96	3609	0	
CY62167G30 (7CC1721673AO)	9423006	611440524	CML-RA	96	1600	0	
CY7C1061G30 (7AP1710612AO)	9423006	611422550	ASE-G	96	761	0	
CY7C1061G30 (7CC171061AO)	9324001	611342911	ASE-G	96	1627	0	
CY7C1061G30 (7AP1710612AO)	9341020	611422551	ASE-G	96	1091	0	
STRESS: ELECTRICAL DISTRIBUTION							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	30	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	30	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	30	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	250	3	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	500	3	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	750	3	0	
CY62167G30 (7AP172167AO)	9438001	611503292	ASE-G	250	3	0	
CY62167G30 (7AP172167AO)	9438001	611503292	ASE-G	500	3	0	
CY62167G30 (7AP172167AO)	9438001	611503292	ASE-G	750	3	0	

Reliability Test Data

QTP #: 133601

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY MODEL							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	500	3	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	1000	3	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	1500	3	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	2000	3	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	4000	3	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	6000	3	0	
CY62167G30 (7AP172167AO)	9438001	611503292	ASE-G	500	3	0	
CY62167G30 (7AP172167AO)	9438001	611503292	ASE-G	1000	3	0	
CY62167G30 (7AP172167AO)	9438001	611503292	ASE-G	2000	3	0	
STRESS: ESD-MACHINE MODEL							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	200	5	0	
STRESS: FINAL VISUAL INSPECTION							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	986	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	749	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	748	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 3.65V, 85%RH, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	96	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	192	79	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	96	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	192	79	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	96	74	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	128	74	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	96	77	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	128	77	0	

Reliability Test Data

QTP #: 133601

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMPERATURE STORAGE							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	1000	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	2000	80	0	
STRESS: LEAD INTEGRITY							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	5	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 1.44V, Vcc Max							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	1000	84	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	1000	84	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	1000	84	0	
CY7C1069G30 (7AP171069AO)	9313001	611404705	CML-RA	1000	80	0	
CY7C1069G30 (7AP171069AO)	9313001	611404699	CML-RA	1000	77	0	
CY7C1069G30 (7AP171069AO)	9313001	611404743	CML-RA	1000	80	0	
CY7C1061G30 (7AP1710612AO)	9324001	611404528	ASE-G	1000	80	0	
CY7C1061G30 (7AP1710612AO)	9324001	611404529	ASE-G	1000	80	0	
CY7C1061G30 (7AP1710612AO)	9324001	611404527	ASE-G	1000	80	0	
STRESS: PRESSURE COOKER TEST							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	96	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	168	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	192	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	96	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	168	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	192	78	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	96	79	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	168	79	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	192	78	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	96	77	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	168	77	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	96	77	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	168	77	0	

Reliability Test Data

QTP #: 133601

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: PHYSICAL DIMENSION							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	30	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	30	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	30	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	COMP	30	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	COMP	30	0	
STRESS: POST TEMPERATURE CYCLE WIRE BOND PULL							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	500	5	0	
STRESS: PRE/POST LFR CRITICAL PARAMETER							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	30+2	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	30+2	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	30+2	0	
STRESS: STATIC LATCH-UP (+/-140mA 85C)							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	6	0	
CY62167G30 (7AP172167AO)	9438001	611503292	ASE-G	COMP	6	0	
STRESS: STATIC LATCH-UP (+/-180mA 85C)							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	2	0	
STRESS: STATIC LATCH-UP (+/-140mA 125C)							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	2	0	
STRESS: SER – ALPHA PARTICLE SEL, 25C/85C/120C, 1.65V/3.3V/5.5V							
7C1710614GE	0	0	UMC	COMP	3	0	
STRESS: SER – NEUTRON SEL, 85C/125C, 5.25V							
7C17165A	0	0	UMC	COMP	3	0	
STRESS: SOLDERABILITY							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	COMP	15	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	COMP	15	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	COMP	15	0	

Reliability Test Data

QTP #: 133601

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH							
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	500	80	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	1000	75	0	
CY7C1061G30 (7AP171061AO)	9308001	611340601	ASE-G	2000	75	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	500	79	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	1000	79	0	
CY7C1061G30 (7AP171061AO)	9308001	611336557	ASE-G	2000	79	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	500	79	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	1000	79	0	
CY7C1061G30 (7AP171061AO)	9313001	611336551	ASE-G	2000	79	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	500	77	0	
CY7C1061G30 (7AP171061AO)	9313001	611422547	ASE-G	1000	77	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	500	77	0	
CY7C1061G30 (7AP171061AO)	9313001	611422548	ASE-G	1000	77	0	

Reliability Test Data

QTP #: 164005

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL							
CY62157H30 (7AP172157AO)	9517001	611632507	ASE-G	250	3	0	
CY62157H30 (7AP172157AO)	9517001	611632507	ASE-G	500	3	0	
CY62157H30 (7AP172157AO)	9517001	611632507	ASE-G	750	3	0	
STRESS: ESD-HUMAN BODY MODEL							
CY62157H30 (7AP172157AO)	9517001	611632507	ASE-G	500	3	0	
CY62157H30 (7AP172157AO)	9517001	611632507	ASE-G	1000	3	0	
CY62157H30 (7AP172157AO)	9517001	611632507	ASE-G	2000	3	0	
STRESS: STATIC LATCH-UP (+/-100mA, 125C)							
CY62157H30 (7AP172157AO)	9517001	611632507	ASE-G	COMP	6	0	

Document History Page

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Rev.	ECN No.	Orig. of Change	Description of Change
**	5691815	HSTO	Initial spec release
*A	6481340	HSTO	Deleted obsolete spec Update TECHNOLOGY/FAB PROCESS DESCRIPTION table