

AUTOMOTIVE PRODUCT AEC-Q100G Qualification Test Plan

Objective: MC Qualification for the PowerSBC LIN device			
Freescale PN: PowerSBCLIN Part Name: MC33908LAE/ MC33907LAE/MC33908NAE/ MC33907NAE Qual Vehicle PN: PC33908LAE Qual Vehicle Name: PowerSBCLIN	Customer Name(s): Open Market PN(s):	Test Program ID: Test Program Rev:	Report Type: Results Revision #: 6 Date: 17th November 2014
Technology: SMOS8MV (Also Product A&B-See Generic data) Package Description: LQFP-EP 7X7 48 LD copper wire LQFP64 EP 10X10 copper wire (Product A) & LQFP48EP 7X7 copper wire (Product B)	Mask set#: N97M Revision #: 1	CAB #: 14080401M FSL Qual Quartz 227098 Tracking #:	Rel. Engr. Approval Signature: Date: Carmen Ortigosa 17th November 2014
Fab site: FSL-CHD Fab Assembly site: FSL-TJN FM Final Test site: FSL-TJN FM Rel Test site: FSL-RAL-TLS Same Fab/ Assembly /Test/ Rel test site for Product A and B.	Design Engr: Eric Rolland Product Engr: Isabelle Garçon Packaging Engr: Catherine Pronga Reliability Engr: Carmen Ortigosa	<u>Target Dates</u> Test Start: 06/27/2014 Test Finish: 10/01/2014 PPAP target date: 28/01/2014	CAB Approval 14080401M Signature: Pierre Soufflet Date: 18th November 2014
Die Size (in mm) 3.806x3.856 W x L Product A: 3.95x4.105 Product B: 3.55x3.61X0	Part Operating -40C to 125C Temp. Range: Grade 1 AEC Grade:	Freescale Contact: Carmen Ortigosa Phone Number: +330561191258	Customer Approval Signature: Date: Standard No approval required

Generic Data: PowerSBC20; Product A:Airbag product. Product B:Breaking product .

This qualification plan covers the new product introduction for the PowerSBC LIN product: Die is in SMOS8 technology The package is the LQFP-EP 7X7 48 LD type with copper wires. The PowerSBC LIN is a derivative product of the PowerSBC 20 (MC33907AE/R2,MC33908AE/R2) qualified on December 2013. Product reliability stress tests are aligned with AECQ100-RevG requirements, MSL3/260°C. We have benefited from the Product A (MCZ33789AE), qual vehicle for TJN-FM LQFP package 1.3 mils wires CHD SMOS8MV, and Product B for package qualification data. Therefore only 1 lot of PowerSBC LIN has been run on all the package related stresses. We have benefited from the PowerSBC 20 qualification data. Therefore no PTC neither ELFR has been run.

Die manufacturing is at FSL-CHD-FAB (SMOS8)
 Assembly and test are at FSL-TJN-FM.

PRE-STRESS REQUIREMENTS/OPTIONS

Stress	JEDEC22 Reference	Test Conditions	End Point Requirements	Minimum Sample Size per lot	# of Lots of PC3390 8LAE	Total Units including spares (Note 1)	Results			Comments (Generic Data, Qualification achievements)
							Lot A TH79495 (lot id) CTNY1417A	Lot B TH79687(lot id) CTNR1419B	LotC TH80177(lot id) CTNV1422A	
PC	A113 J-STD-020	Preconditioning (PC) MSL 3 at 260°C, +5/-0°C CSAM: Note 2	TEST at RH CSAM			All surface mount devices prior to THB/HAST, AC/UHST, TC, PC+PTC, or as required per individual stress Test Conditions.				PC is performed and results reported as part of the individual stress tests.

GROUP A - ACCELERATED ENVIRONMENTAL STRESS TESTS

HAST	A110	Highly Accelerated Stress Test (HAST): PC before HAST if required. HAST = 110°C/85%RH for 264hrs. Bias: 18V Timed RO of 48hrs. MAX	TEST @ RH;	77	1	77	0/77	0/231 Product A (3 qual lots). 0/77 PowerSBC20 (1 qual lot).	-One lot of PowerSBC20, Pass 4. Previous silicon design version but gold wire package. -For copper introduction: Three lots of Product A (qual vehicle for TJN-FM LQFP package copper 1.3 mils wires CHD SMOS8MV). Bias: 35V.
UHST	A118	Unbiased HAST (UHST): PC before UHST if required. UHST = 110°C/85%RH for 264 hrs. Timed RO of 48hrs. MAX	TEST @ R;	77	1	77	0/77	0/231 Product A (3 qual lots).	Three lots of Product A (qual vehicle for TJN-FM LQFP package 1.3 mils wires CHD SMOS8MV)
TC	A104 AEC Q100-Appendix 3	Temperature Cycle (TC): PC before TC if required. TC = -50°C to 150°C for 1000 cycles. Extended read-point up to 2000 cycles. WBP after qual readpoint on 5 devices from each lot; 2 bonds per corner and one mid-bond per side on each device. Record which pins were used. CSAM : 11 units on one lot on the following flow CSAM-> PC -> CSAM -> TC -> CSAM .	TEST @ H WBP => 3 grams CSAM	77	1	77	0/77 1000 cyc: 0/77 2000 cyc: 0/77	0/231 Product B (3 qual lots)	Three lots of ProductB . Same BOM and similar die size. Three lots perform TC . PASS PowerSBC Lin Results: PASS extended read-point up to 2000 cycles.

Stress	JEDEC22 Reference	Test Conditions	End Point Requirements	Minimum Sample Size per lot	# of Lots of PC3390 8LAE	Total Units including spares (Note 1)	Results			Comments (Generic Data, Qualification achievements)
							Lot A TH79495 (lot id) CTNY1417A	Lot B TH79687 (lot id) CTNR1419B	LotC TH80177 (lot id) CTNV1422A	
PTC	A105	Power Temperature Cycle (PTC): PTC = -40°C to 125°C for 500 & 1000 cycles; Bias: 5V, 6.7V, 14V and 15V	TEST @ RH	45	0	45	1000cyc: 0/45 PowerSBC20 Pass 4.0			1 lot Power SBC 20 Pass 4.0 Previous silicon design version but gold wire package.
HTSL	A103	High Temperature Storage Life (HTSL): HTSL = 150°C for 1008 hrs Timed RO = 96hrs. MAX	TEST @ RH	45	1	45	0/45			
TEST GROUP B - ACCELERATED LIFETIME SIMULATION TESTS										
HTOL	A108	High Temperature Operating Life (HTOL): HTOL = 125°C for 1008 hrs. Read point at 168h, 500h, 1000h, 1250h, 2000h Extended read point up to 1250 hours on three lots. Extended read point up to 2000 hours on two lots. Bias: 18 V Timed RO of 96hrs. MAX	TEST @ RHC; Drift Analysis Note 3	77	3	231	0/77	0/77	0/77	Pass extended read point Up to 1250 hours. (3 lots). Up to 2000 hours (2 lots)
ELFR	AEC Q100-008	Early Life Failure Rate (ELFR): ELFR = 125°C for 48 hrs; Bias: 18V Timed RO of 48 hrs MAX	TEST @ RH	800	0	0	PowerSBC 20 Pass 4.0 0/2400 3 qual lots			3 lots PowerSBC20 Pass 4 Previous silicon design version but gold wire package.
TEST GROUP C - PACKAGE ASSEMBLY INTEGRITY TESTS										
WBS	AEC Q100-001	Wire Bond shear (WBS)	Cpk = or > 1.67	30 bonds from minimum 5 units	1	5	Cpk>1.67			Performed by Assembly Site during qual lot builds
WBP	MilStd883-2011	Wire Bond Pull (WBP): Cond. C or D	Cpk = or > 1.67	30 bonds from minimum 5 units	1	5	Cpk>1.67			Performed by Assembly Site during qual lot builds
SD	B102	Solderability (SD): 8hr.(1 hr. for Au-plated leads) Steam age prior to test.	>95% lead coverage of critical areas	15	1	15	0/15 Pass			
PD	B100	Physical Dimensions(PD): PD per FSL 98A drawing	Cpk = or > 1.67	10	1	10	Cpk>1.67			Performed by Assembly Site during qual lot builds
TEST GROUP D - DIE FABRICATION RELIABILITY TESTS (For new technologies, the data, test method, calculations and internal criteria for EM, TDDb, HCI, NBTI, and SM are available to the customer upon request.)										
TEST GROUP E - ELECTRICAL VERIFICATION TESTS										
TEST	Freescale 48A	Pre- and Post Functional / Parametrics (TEST): Test software shall meet requirements of AEC-Q100-007. Testing performed to the limits of device specification in temperature and limit value.	0 Fails	All	All	All				TEST results is shown for each individual stress test in the qual results report generated upon qual completion.
HBM	AEC-Q100-002	ElectroStatic Discharge/ Human Body Model Classification (HBM): Test @ 1000/2000/2500 Volts for all pins except for -VSUP1, VSUP2, VSUP3, VSENSE, IO_0:1, IO_4:5, FS0B, DEBUG, VAUX at 3KV; 4KV; 4.5KV -CANH, CANL, LIN at 5KV; 6KV; 6.5KV See AEC-Q100-002 for classification levels.	TEST @ RH -2KV min all pins except. -4KV VSUP1, VSUP2, VSUP3, VSENSE, IO_0:1, IO_4:5, FS0B, DEBUG, VAUX. -6KV CANH, CANL, LIN	3 units per Voltage level	1	27	Pass 2KV on all pins. 0/3 Pass 4KV on VSUP1, VSUP2, VSUP3, VSENSE, IO_0:1, IO_4:5, FS0B, DEBUG, VAUX. 0/3 Pass 6KV on CANH, CANL, LIN 0/3			

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							Lot A TH79495 (lot id) CTNY1417A	Lot B TH79687 (lot id) CTNR1419B	LotC TH80177 (lot id) CTNV1422A	
MM	AEC-Q100-003	ElectroStatic Discharge/ Machine Model Classification (MM): Test @ 50/100/200 Volts See AEC-Q100-003 for classification levels.	TEST @ RH 200V min.	3 units per Voltage level	1	9	Pass 100 V 0/3			For Information Only
CDM	AEC-Q100-011	ElectroStatic Discharge/ Charged Device Model Classification (CDM): Test @ 500/750 all pins Test @1000 Volts only corner pins See AEC-Q100-011 for classification levels. <i>Timed RO of 96hrs MAX.</i>	TEST @ RH Corner pins => 750V; All other pins => 500V	3 units per Voltage level	1	9	Pass 750V on all pins. 0/9			
LU	JESD78 plus AEC-Q100-004	Latch-up (LU): Test per JEDEC JESD78 with the AEC-Q100-004 requirements. Ta= 25°C Vsupply =18V	TEST @ RH	6	1	6	100mA. Pass 0/6			
ED	AEC-Q100-009, Freescale 48A spec	Electrical Distribution (ED)	TEST @ RHC Cpk = or > 1.67	30	3	90	PC33908LAE (See PPAP for results)	PC33908LAE (See PPAP for results)	PC33908LAE (See PPAP for results)	
				30	3	90	PC33907LAE (See PPAP for results)	PC33907LAE (See PPAP for results)	PC33907LAE (See PPAP for results)	
Short Circuit Characterization										
SC	AEC-Q100-012	Short Circuit Characterization (SC) 125°C LCS1 to 1Million cycles. Intermediate read-point at 500K cycles.	TEST @ HOT	10	3	30	0/10 Pass 1,1M Grade A	0/10 Pass 1,1M Grade A	0/10 Pass 1,1M Grade A	Short-circuit on LIN. PASS 1.1M cycles. Grade A.