

## AUTOMOTIVE PRODUCT AEC-Q100G Qualification Test Plan

**Objective: Merlot PQFN\_CHG\_Cu Wire Qualification**

Qual Vehicle PN: <b>MC33926PNB</b> Qual Vehicle Name: <b>Merlot PQFN</b>	Customer Name(s): <b>Various</b> PN(s):	Test Program ID: <b>VARIOUS</b> Test Program Rev:	Report Type: <b>QUAL PLAN</b> Revision #: <b>28Oct13</b> Date:
Technology: <b>SMOS8MV</b> Package Description: <b>PQFN 8x8</b>	Mask set#: <b>N36K</b> Revision #:	Rel. Circuits Doc. #: CAB #: FSL Qual Quartz Tracking #:	Rel. Engr. Approval Signature: <b>Tian Meng</b> Date: <b>28Oct13</b>
Fab site: <b>CHD-Fab</b> Assembly site: <b>FSL-TJN-FM</b> Final Test site: <b>FSL-TJN-FM</b> Rel Test site:	Product Engr: <b>Ge Y.C</b> Packaging Engr: Reliability Engr: <b>Tian Meng</b>	Target Dates: <b>NA</b> Test Start: Test Finish: PPAP target date:	CAB Approval Signature: <b>Paige Somero</b> Date: <b>10Jul14</b>
Die Size (in mm) <b>2.429x2.41</b> W x L x T	Part Operating <b>-40 to 125</b> Temp. Range: AEC Grade:	Freescale Contact: <b>Bai Yun</b> Phone Number: <b>+86-85684704</b>	Customer Approval Signature: Date:

### PRE-STRESS REQUIREMENTS/OPTIONS

Stress	JEDEC22 Reference	Test Conditions	End Point Requirements	Minimum Sample Size per lot	# of Lots	Total Units including spares	Results					Comments (Generic Data: Note 2)
							Lot A nominal	Lot B nominal	Lot C nominal	Lot D HH	Lot E LL	
<b>PC</b>	A113 J-STD-020	<b>Preconditioning (PC)</b> MSL 3 at 250°C, +5/-0°C CSAM: Note 3 <b>Freescale/Jedec Reflow will be used for qualification</b>	TEST at RH (add C if PC before HTOL); 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

<b>HAST</b>	A110	<b>Highly Accelerated Stress Test (HAST):</b> PC before HAST if required. HAST = 110°C/85%RH for 264 hrs,528hrs FIO. Bias: 5V; 16V <i>Timed RO of 48hrs. MAX</i>	TEST @ RH; CSAM	77	3	240			264hrs: 0/85 528hrs: 0/80	264hrs: 0/85 528hrs: 0/80	264hrs: 0/85 528hrs: 0/80	When biased humidity is required either HAST or THB can be performed. <b>HAST is the preferred biased humidity test.</b>
<b>UHST</b>	A118	<b>Unbiased HAST (UHST):</b> PC before UHST if required. UHST = 110°C/85%RH for 264 hrs,528hrs FIO. <i>Timed RO of 48hrs. MAX</i>	TEST @ R; CSAM	77	3	240	264hrs: 0/85 528hrs: 0/80	264hrs: 0/85 528hrs: 0/80	264hrs: 0/85 528hrs: 0/80			<b>When unbiased humidity testing is required, UHST is the preferred unbiased humidity test. The AC option is NOT recommended.</b>
<b>TC</b>	A104 AEC Q100-Appendix 3	<b>Temperature Cycle (TC):</b> PC before TC if required. TC = -50°C to 150°C for 1000 cycles,2000cycles FIO 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.	TEST @ H WBP => 3 grams CSAM	77	5	400	1K: 0/100 2K: 0/90	1K: 0/100 2K: 0/90	1K: 0/100 2K: 0/90	1K: 0/100 2K: 0/90	1K: 0/100 2K: 0/90	If WP is to be performed at interim readpoints, add additional samples so that the minimum sample size is maintained for the final readpoint.
<b>PC + PTC</b>	A105	<b>Preconditioning plus Power Temperature Cycle (PC+PTC):</b> PTC = -40°C to 125°C for 1000 cycles;Bias: 5V, 5V, 12V	TEST @ RH	22	1	25	0/25					
<b>PTC</b>	A105	<b>Power Temperature Cycle (PTC):</b> PTC = -40°C to 125°C for 1000 cycles;Bias: 5V, 5V, 12V	TEST @ RH	23	1	26	0/26					
<b>HTSL</b>	A103	<b>High Temperature Storage Life (HTSL):</b> HTSL = 150°C for 1008hrs,2016hrs FIO <i>Timed RO = 96hrs. MAX</i>	TEST @ RH	45	1	48					1008hrs: 0/53 2016Hrs: 0/53	

TEST GROUP B - ACCELERATED LIFETIME SIMULATION TESTS												
HTOL	A108	<b>High Temperature Operating Life (HTOL):</b> HTOL = 125°C for 1008hrs,2016hrs FIO Bias: 5V, 16V Timed RO of 96hrs. MAX	TEST @ RHC;	77	1	80	1008hrs: 0/90 2016Hrs: 0/85					<i>For HTOL drift analysis requirements, see Notes 5 &amp; 6.</i> 1 lot HTOL for Merlot PQFN
ELFR	AEC Q100-008	<b>Early Life Failure Rate ELFR):</b> ELFR = 125°C for 48 hrs; Timed RO of 48 hrs MAX	TEST @ RH	800	1	803	0/803					1 lot ELFR for Merlot PQFN
TEST GROUP C - PACKAGE ASSEMBLY INTEGRITY TESTS												
<b>Full Assy. CZ + Cu WB Cz</b>	FSL Internal Requirement	Full assembly process CZ Data collection per FSL CZ template (for Cu WB) for 3 tech cert lots with nominal Cu WB process. Perform Wire Bond CZ specifically for Copper Wire for 1 HH and 1 LLTech Cert lots.			5					PASS	PASS	Merlot PQFN Assy CZ data
<b>WBS</b>	AEC Q100-001	<b>Wire Bond shear (WBS)</b>	Cpk = or > 1.67	30 bonds from minimum 5 units	5	25	PASS	PASS	PASS	PASS	PASS	Performed by Assembly Site during qual lot builds - PE to include this requirement in the qual lot build ERF.
<b>WBP</b>	MilStd883-2011	<b>Wire Bond Pull (WBP):</b> Cond. C or D	Cpk = or > 1.67	30 bonds from minimum 5 units	5	25	PASS	PASS	PASS	PASS	PASS	Performed by Assembly Site during qual lot builds - PE to include this requirement in the qual lot build ERF
TEST GROUP D - DIE FABRICATION RELIABILITY TESTS												
TEST GROUP E - ELECTRICAL VERIFICATION TESTS												
<b>TEST</b>	Freescale 48A	<b>Pre- and Post Functional / Parametrics (TEST):</b> 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. FSL SQA release required for qual test program.
<b>ED</b>	AEC-Q100-009, Freescale 48A spec	<b>Electrical Distribution (ED)</b>	TEST @ RHC Cpk = or > 1.67	30	3	90	See justification report	See justification report	See justification report			Merlot PQFN