
Copper Wire Qualification (PCN 16246)

1. Objective

This report describes the 25um Cu wire electrical distribution data versus baseline 25um Au wire for parts with 0.25um Technology listed in PCN 16246.

Current Wire:

25um Au wire

Proposed New Wire:

25um Cu wire

2. General Information

Product Family: MC9S12C32/MC9S12C128/MC9S08RE16/MC56F8006/MCF51CN128/HC908JW32

Fab site: FSL-ATMC-Fab/TSMCFAB3/FSL-CHD-FAB

Mask set: M34C, M66G, L09S, M21A, M53M, M72P, L78P, L41Y

Package(s): 64&52&44LQFP10x10/48&32LQFP7x7

Assembly Site: Freescale Tianjin, China

3. Method

Two data sets taken from selected key product, 30 units in each set at T0 analysis:

1. 30 units from 25um Cu wire diameter qual lot
2. 30 units from 25um Au wire diameter control lot

Both qualification and control lots are tested to standard production final test flow. Electrical distribution data generated from the selected key parametric tests with Freescale standard criteria CPK > 1.67 and shift ≤ 15%, justification will be provided if otherwise.

4. Data and Summary:

4.1. Electrical Distribution Table:

Selected Key Product: S908DZ60 (64LQFP) M74K

Hot Temperature				Baseline Time 0 Data			Qual Time 0 Data			Lower Spec Limit	Upper Spec Limit	Comment
				(Gold Wire)			(Copper Wire)					
				125C			125C			% Shift	% Shift	
				Parameter Name in Datasheet	Units	Lower Spec Limit	Upper Spec Limit	Avg	Std	Cpk	Avg	
RIDD (fBus = 20 MHz)	mA	na	24	15.12	0.24	12.46	14.83	0.27	11.17	na	3.27%	
RIDD (fBus = 8 MHz)	mA	na	11.4	7.74	0.09	12.97	7.58	0.13	9.90	na	4.15%	
S2IDD	uA	na	70	22.83	2.33	6.74	20.88	1.61	10.16	na	4.13%	
S3IDD	uA	na	90	31.31	3.06	6.39	30.00	2.09	9.56	na	2.23%	
RPU	Komh	20	65	23.71	0.46	2.67	23.84	0.51	2.52	3.37%	-0.30%	
RPD	Komh	20	65	22.96	0.26	3.74	23.26	0.35	3.11	10.18%	-0.72%	
IIn (Vin = VSS)	nA	na	1000	152.81	14.25	19.82	130.05	10.22	28.39	na	2.69%	
IIn (Vin = VDD)	nA	-1000	na	-24.24	3.23	100.72	-21.93	2.64	123.47	0.24%	na	
fdco_t	Mhz	31.36	32.64	31.92	0.03	6.12	31.92	0.03	6.93	-0.09%	0.07%	

Room Temperature				Baseline Time 0 Data			Qual Time 0 Data			Lower Spec Limit	Upper Spec Limit	Comment
				(Gold Wire)			(Copper Wire)					
				Parameter Name in Datasheet	Units	Lower Spec Limit	Upper Spec Limit	25C			25C	
Avg	Std	Cpk	Avg					Std	Cpk	negative drift is toward LSL	positive drift is toward USL	
RIDD (fBus = 20 MHz)	mA	na	24	14.98	0.26	11.58	14.62	0.23	13.77	na	3.91%	
RIDD (fBus = 8 MHz)	mA	na	11.4	7.79	0.08	14.65	7.68	0.12	10.68	na	3.20%	
S2IDD	uA	na	5	1.45	0.05	21.78	1.42	0.04	29.99	na	0.83%	
S3IDD	uA	na	5	1.52	0.07	17.30	1.48	0.04	26.39	na	1.07%	
RPU	Komh	20	65	25.10	0.34	5.03	25.40	0.46	3.94	5.86%	-0.75%	
RPD	Komh	20	65	23.56	0.34	3.53	23.83	0.39	3.26	7.69%	-0.66%	
In (Vin = VSS)	nA	na	1000	10.42	2.84	116.09	11.46	3.23	102.15	na	-0.11%	
In (Vin = VDD)	nA	-1000	na	0.89	3.02	110.38	-0.22	2.66	125.31	-0.11%	na	
fdco_t	Mhz	31.36	32.64	32.19	0.03	5.44	32.19	0.03	5.79	-0.29%	0.53%	

Cold Temperature				Baseline Time 0 Data			Qual Time 0 Data			Lower Spec Limit	Upper Spec Limit	Comment
				(-40C)			(-40C)					
				Parameter Name in Datasheet	Units	Lower Spec Limit	Upper Spec Limit	Avg	Std	Cpk	Avg	
negative drift is toward LSL	positive drift is toward USL											
RIDD (fBus = 20 MHz)	mA	na	24	15.01	0.22	13.62	14.73	0.25	12.35	na	3.18%	
RIDD (fBus = 8 MHz)	mA	na	11.4	7.81	0.13	9.31	7.64	0.16	7.99	na	4.76%	
S2IDD	uA	na	5	1.11	0.04	34.41	1.13	0.05	27.43	na	-0.56%	
S3IDD	uA	na	5	1.10	0.04	30.55	1.13	0.05	28.51	na	-0.75%	
RPU	Komh	20	65	26.20	0.42	4.90	26.40	0.43	5.00	3.27%	-0.52%	
RPD	Komh	20	65	24.70	0.37	4.18	25.03	0.51	3.30	6.91%	-0.81%	
In (Vin = VSS)	nA	na	1000	10.52	2.80	117.61	10.93	3.30	99.94	na	-0.04%	
In (Vin = VDD)	nA	-1000	na	0.51	2.80	119.25	0.74	2.96	112.68	0.02%	na	
fdco_t	Mhz	31.36	32.64	32.07	0.02	8.03	32.07	0.03	7.19	1.10%	-1.36%	

“Shift analysis” refers to analysis of shift of the distribution mean towards the nearest specification limit:

% Shift (USL) = $\frac{\text{Mean}(\text{new}) - \text{Mean}(\text{old})}{\text{Upper Spec Limit} - \text{Mean}(\text{old})}$

% Shift (LSL) = $\frac{\text{Mean}(\text{new}) - \text{Mean}(\text{old})}{\text{Mean}(\text{old}) - \text{Lower Spec Limit}}$

4.2. Summary:

From the above data, it was verified that the requirements and acceptance criteria was achieved.

5. Document History:

Rev	Date	Originator
0	Apr 25th 2014	Nancy Long

Appendix A: Justifications for any Shifts > 15%

Not applicable as no parameter shift > 15%.