PRODUCT/PROCESS CHANGE NOTIFICATION

PCN CRP/09/4410
Notification Date 03/17/2009

HF4CMOS S Baseline 200A capa DIFFUSION TRANSFER FROM CARROLLTON 6" TO ANG MO KIO 6"

Table 1. Change Implementation Schedule

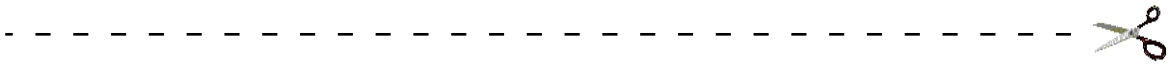
Forecasted implementation date for change	06-Jun-2009
Forecasted availabillity date of samples for customer	17-Mar-2009
Forecasted date for **STMicroelectronics** change Qualification Plan results availability	17-Mar-2009
Estimated date of changed product first shipment	20-Jun-2009

Table 2. Change Identification

Related APCN	3285
Product Identification (Product Family/Commercial Product)	ALL PRODUCTS IN THIS TECHNOLOGY
Type of change	Waferfab location change
Reason for change	FAB CLOSURE AS PER CORPORATE CIL CRP/07/2900
Description of the change	Following Corporate CIL CRP/07/2900 we are transferring the process HF4CMOS S Baseline 200A capa and related products from Carrollton to Ang Mo Kio.
Product Line(s) and/or Part Number(s)	See attached
Description of the Qualification Plan	See attached
Change Product Identification	plant marking identification "V6" for Ang Mo Kio plant
Manufacturing Location(s)	

Table 3. List of Attachments

Customer Part numbers list	
Qualification Plan results	



Customer Acknowledgement of Receipt	**PCN CRP/09/4410**
Please sign and return to STMicroelectronics Sales Office	**Notification Date 03/17/2009**

☐ Qualification Plan Denied	Name:
☐ Qualification Plan Approved	Title:
	Company:
☐ Change Denied	Date:
☐ Change Approved	Signature:

Remark

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DOCUMENT APPROVAL

Name	Function
Buffa, Michel	Corporate Quality Manager
Sibille, Marie-Helene	Corporate Quality Manager
Vitali, Gian Luigi	Corporate Quality Manager
Buiguez, Francois	Process Owner

HF4CMOS S Baseline 200A capa DIFFUSION TRANSFER FROM CARROLLTON 6" TO ANG MO KIO 6" FAB

WHAT:

Progressing along the Restructuring Plan already communicated by Corporate Information Letter (C.I.L.) CRP/07/2900 dated September 25, 2007 and APCN CRP/07/3285 dated December 21, 2007, please be informed that the products currently manufactured in Carrollton 6" Plant (Texas) by using HF4CMOS S (Shrink), Technology, will be moved to our facilities located in Ang Mo Kio 6" Plant (Singapore).

All the products manufactured by ST using HF4CMOS S Technology, even if not expressly included in the above mentioned PIL & APCN, are affected by this change.

WHY:

To optimize ST asset utilization and enhance performance for shareholders and customers.

HOW:

By transferring and re-qualifying the mentioned front-end technology in the receiving plant; this technology has been qualified through a full set of evaluations on the selected test vehicle (TV for technology qualification): T84, EWS, electrical characterization, die and package oriented stress tests; the others products diffused in the same Technology are qualified mainly by similarity (generic data) if assembled in the same package family. In case of different package families, stress test package oriented are carried on a "package test vehicle" (FE/BE compatibility) as listed in the annexed table.

Techno family	Techno sub family	Product	Package	Product Group	QUAL PLAN
HF4CMOS S Baseline 200A capa	**HF4CMOS S Baseline 200A capa**	**A224**	**LQFP**	APG	**TV for technology qualification**
		A184	**SO28**	APG	**TV for FE/BE compatibility**
		A190	**TSSOP**	APG	**TV for FE/BE compatibility**
	HF4CMOS S 545A capa	**n.a.**			

The above test vehicles qualify both Techno sub families: HF4CMOS S Baseline 200A capa and HF4CMOS S 545A capa.

This transfer will not modify the electrical, dimensional and thermal parameters for the affected products, maintaining unchanged current information published on the relevant datasheets.

ST is focused on customer satisfaction in order to ensure a seamless transition in the supply of products from the new site.

WHEN:

The production start and first shipments will be implemented according to our work in progress and material availability. Full traceability is guaranteed by dedicated genealogy and traceability on the part.

We are ready to start shipments from AMK from June 09 onward.

The transfer of all product lines and the ramp up in the new location will be finalized within Q4/2009.

Qualification program and results availability:

Reliability report RR000509CS2039, test vehicle A224 for process evaluation, is provided below.

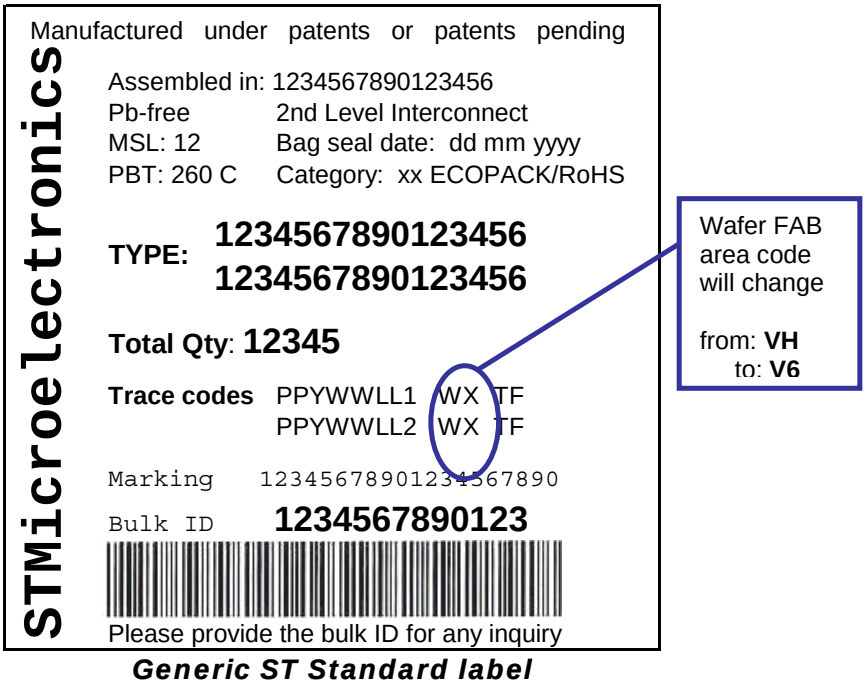
Reliability reports of test vehicle for FE/BE compatibility to be provided in week 17/09.

Product's traceability:

Unless otherwise stated by customer specific requirements, new parts produced in AMK6 have a different traceability code as below:

Diffusion plant	ID	Country of origin
Carrollton (current)	**VH**	Texas
AMK6 (new)	**V6**	Singapore

Shipments from new Wafer FAB location are tracked on ST Standard Label as showed below:



Generic ST Standard label

Samples availability:

Samples are available upon request to our local Sales Offices.

RELIABILITY REPORT

TDA7540N [A224CD6]

LQFP 80 package

Car Audio Processor

Author: F. CERAULO

Approved: R. RODARI

CASTELLETTO, JANUARY 2009

CONTENTS

1. INTRODUCTION

The purpose of this document is to describe the reliability qualification trials and the results carried out on A224CD6 device diffused in HF4CMOS Shrink technology and assembled in LQFP 80 package.

Qualification plan:

HTOL	High Temperature Operating Life Test.
PC	Preconditioning: moisture sensitivity level 3
THB	Thermal Humidity Bias
TC	Thermal Cycles.
AC	Autoclave
HTS	High Temperature Storage
ESD	Electrostatic Discharge.
LU	Latch-up.
WBP	Wire Bond Pull.

2. CONCLUSION

The reliability tests performed on A224CD device diffused in HF4CMOS Shrink and assembled in LQFP 80 package, gave the following results:

HTOL	No failures and no drifts on key parameters have been found after 1000 hours of HTOL test.
PC	No die delamination has been observed after preconditioning sequence (JL3).
THB	No failures have been found after 1000H of thermal humidity bias
TC	No failures have been found after preconditioning plus 1000 thermal cycles.
AC	No failures have been found after preconditioning plus 96h autoclave
HTS	No failures have been found after 1000H of high temperature storage
ESD	HBM ±1.5kV was applied without failures. MM ±125V was applied without failures. CDM* ±250V was applied without failures. ** CORNER PINS ±750V*
LU	Injection and Overvoltage models were applied and no failures have been detected.
WBP	All measurements within specs limit

3. DEVICE DESCRIPTION

The TDA7540N is a high performance tuner circuit for AM/FM car radio. It contains mixer, IF amplifier, demodulator for AM and FM, Stereodecoder, quality detection, ISS filter and PLL synthesizer with IF counter on a single chip. Use of BICMOS technology allows the implementation of several tuning functions and a minimum of external components.

FEATURES

FM-part

☐ RF AGC generation by RF and IF detection
☐ I/Q mixer for 1st FM IF 10.7MHz with image rejection
☐ Mixer for 2nd IF 450kHz
☐ Internal 450 KHz bandpass filter with bandwidth control by ISS
☐ Fully integrated FM-demodulator with spike cancellation

AM-part

☐ Wide and narrow AGC generation
☐ Mixer for 1st IF 10.7MHz, AM up conversion
☐ Mixer for 2nd IF 450 kHz AM down conversion
☐ Integrated AM-demodulator
☐ AM IF- and audio noise blanking

Stereodecoder

☐ PLL with adjustment free, fully integrated VCO
☐ Automatic pilot dependent mono/stereo switching
☐ Programmable ROLL-OFF compensation
☐ High cut and stereo blend-characteristics programmable
☐ Dedicated RDS-mute
☐ Internal noise blanker with several threshold controls

Additional features

☐ VCO for world tuning range
☐ High performance fast PLL for RDS-System
☐ IF counter for FM and AM with search stop signal

☐ Quality detector for level, deviation, adjacent channel and multipath

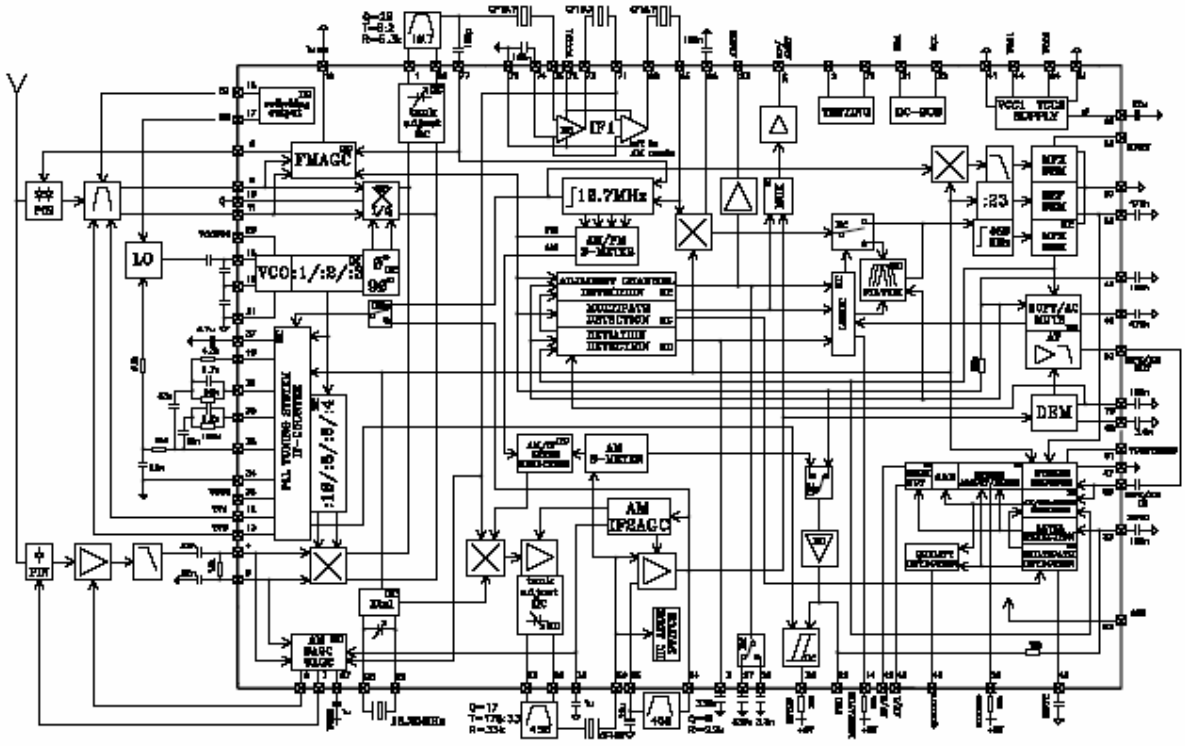
☐ ISS (intelligent selectivity system) for cancellation of adjacent channel and noise influences

☐ Adjacent channel mute

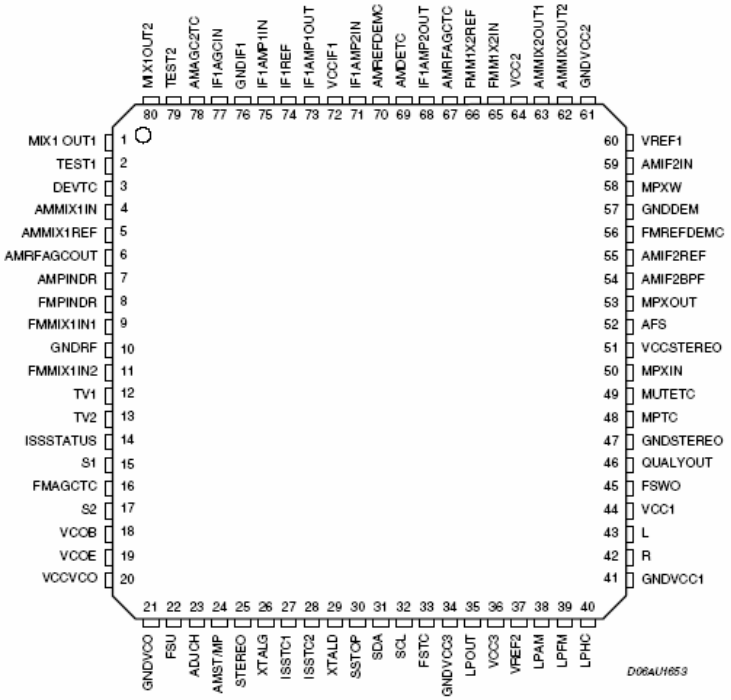
☐ Fully electronic alignment

☐ All functions I2C-Bus controlled

3.1 BLOCK DIAGRAM



3.2 PIN CONNECTION



3.3 PIN LIST

Pin #	Pin name	Function
1	MIX1OUT1	Mixer tank 10.7MHz
2	TEST1	Testing I/O pin
3	DEVTC	Deviation detector time constant
4	AMMIX1IN	AM mixer1 input
5	AMMIX1REF	AM mixer1 reference
6	AMRFAGCOUT	Output AM RF AGC
7	AMPINDR	AM pin diode driver output
8	FMPINDR	FM pin diode driver output
9	FMMIX1IN1	FM mixer1 input1

Pin #	Pin name	Function
10	GNDRF	RF ground
11	FMMIX1IN2	FM mixer1 input2
12	TV1	Tuning voltage preselection1
13	TV2	Tuning voltage preselection2
14	ISSSTATUS	ISS filter status output
15	S1	Free programmable switching output
16	FMAGCTC	FM AGC time constant
17	S2	Free programmable switching output
18	VCOB	VCO input base
19	VCOE	VCO output emitter
20	VCCVCO	VCO supply
21	GNDVCO	VCO ground
22	FSU	Unweighted fieldstrength output
23	ADJCH	Ident. adjacent channel output
24	AMST/MP	AM stereo output / ident. multipath output
25	STEREO	Stereo information indication output
26	XTALG	Xtal oscillator to MOS gate
27	ISSTC1	Time constant1 ISS filter switch
28	ISSTC2	Time constant2 ISS filter switch
29	XTALD	Xtal oscillator to MOS drain
30	SSTOP	Search stop output
31	SDA	I^2C-Bus data
32	SCL	I^2C-Bus clock
33	FSTC	S-meter filtering capacitor
34	GNDVCC3	VCC3 ground
35	LPOUT	Op amp output to PLL loop filters
36	VCC3	Supply tuning voltage
37	VREF2	Voltage reference for PLL op amp
38	LPAM	Op amp input to PLL loop filters AM
39	LPFM	Op amp input to PLL loop filters FM
40	LPHC	High current PLL loop filter input
41	GNDVCC1	Digital ground
42	R	Stereodecoder output right
43	L	Stereodecoder output left
44	VCC1	Digital supply
45	FSWO	Weighted fieldstrength output with programmable DC offset
46	Qualyout	Stereodecoder quality output

Pin #	Pin name	Function
47	GNDSTEREO	Strereodecoder ground
48	MPTC	Multipath time constant
49	MUTETC	Weak signal mute time constant
50	MPXIN	Stereodecoder Input
51	VCCSTEREO	Stereodecoder supply
52	AFS	Alternative frequency search drive
53	MPX/AFAM	MPX output / AM AF output
54	AMIF2BPF	AM IF2 bandpass filter
55	AMIF2REF	Reference voltage AM IF2 amplifier
56	FMREFDEMC	FM demodulator reference
57	GNDDEM	Ground FM demodulator
58	MPXW	MPX Output without ISS filtering
59	AMIF2IN	Input AM IF2
60	VREF1	Reference 5V
61	GNDVCC2	Analog ground
62	AMMIX2OUT2	AM Tank 450kHz
63	AMMIX2OUT1	AM Tank 450kHz
64	VCC2	Analog supply
65	FMMIX2IN	FM IF1 mixer2 input
66	FMMIX2REF	FM IF1 mixer2 reference
67	AMRFAGCTC	AM RF AGC time constant
68	IF1AMP2OUT	IF1 amplifier2 output
69	AMDETC	AM detector capacitor
70	AMREFDEMC	AM demodulator reference
71	IF1AMP2IN	IF1 amplifier2 input
72	VCCIF1	IF1 supply
73	IF1AMP1OUT	IF1 amplifier1 output
74	IF1REF	IF1 amplifier reference
75	IF1AMP1IN	IF1 amplifier1 input
76	GNDIF1	IF1 ground
77	IF1AGCIN	IF1 AGC input
78	AMAGC2TC	AM AGC2 time constant
79	TEST2	Testing I/O pin
80	MIX1OUT2	Mixer tank 10.7MHz

4. CONSTRUCTION NOTE

Device name: TDA7540N

Internal name: A224CD6

Function: car audio processor

DIE DATA

Diffusion process: HF4CMOS Shrink

Die sizes: 5.120 x 4.170 mm^2

Passivation: PSG + NITRIDE

Back finishing: LAPPED SILICON

Metallization: A224CD6:

1) Ti / AlSiCu / TiN 0.62 µm
2) Ti / AlSiCu / TiN 0.72 µm
3) Ti / AlSiCu / TiN 0.85 µm

PACKAGE DATA

Package line: LQFP 80 14x14x1.4 1

Wires: WIRE Au D1 BL10-14g EL.2-7% 2000mt

Resin: RESIN SUMITOMO EME-G700L D14mm W3.7 g

Die Attach: GLUE QMI9507-1A1 10cc/41g Sy

Frame material: FRAME LQFP 80L 14x14mm 7.2x7.2 Fpad SpAg

TRACEABILITY

Design center: GRASBRUH

Diffusion plant: AMK 6”

Traceability: B51S*A224CD6

Diffusion Lot: 681640H (1^Lot) / 681640F (2^Lot) / 6822NH4 (4^Lot) 6823NHK (5^Lot) / 6827XF8 (6^Lot) / 998381NS01

Assembly plant: ST KIRKOP – MALTA

Testing site: ST AGRATE – ITALY

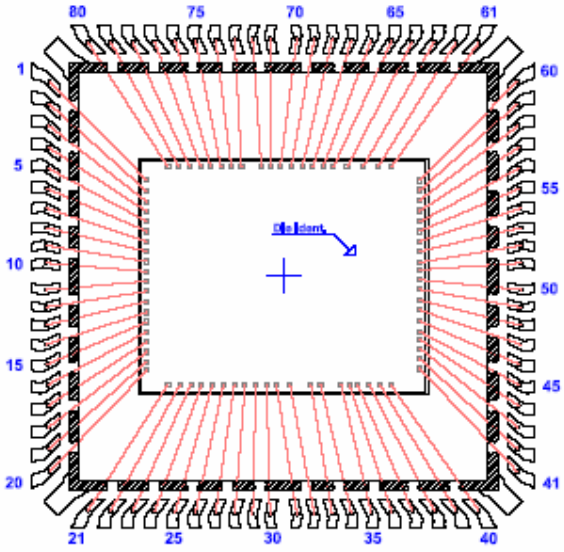
4.1 BONDING DIAGRAM

BONDING DIAGRAM FOR LINE : **A124C** PACKAGE : **1S**

FRAME PAD : 0,283 x 0,283 Inch / 7,200 x 7,200 mm

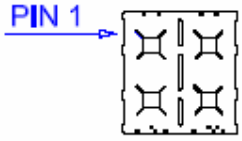
SCALE 1mm

TOTAL NUMBER OF WIRES : 80

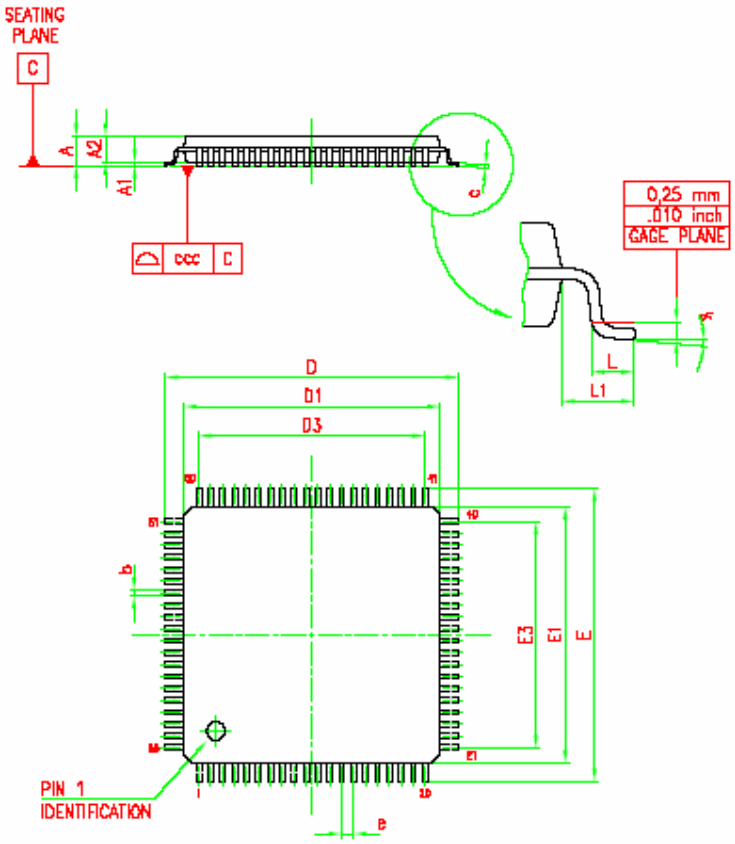


LQFP 80L MATRIX (BODY 14x14x1.4)

BLANK BOND. DIAG. REF. : 5FT72932 (Ag Ring)
5FT55119 (Ag Spot)



4.2 MECHANICAL DATA



TITLE: LQFP 80L BODY 14x14x1.4 FOOT PRINT 1.0

PACKAGE CODE: 1S

JEDEC/EIAJ REFERENCE NUMBER: JEDEC MS-026-BEC

	DIMENSIONS						
	DATABOOK (mm)			DRAWING (mm)			
REF.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	NOTES
A			1.60	1.425	1.50	1.575	
A1	0.05		0.15	0.065	0.10	0.135	
A2	1.35	1.40	1.45	1.38	1.40	1.44	(1)
b	0.22	0.32	0.38	0.275	0.30	0.325	
c	0.09		0.20			0.165	
D	15.80	16.00	16.20	15.90	16.00	16.10	
D1	13.80	14.00	14.20	13.975	14.00	14.025	
D3		12.35		12.30	12.35	12.40	
E	15.80	16.00	16.20	15.90	16.00	16.10	
E1	13.80	14.00	14.20	13.975	14.00	14.025	
E3		12.35		12.30	12.35	12.40	
e		0.65		0.60	0.65	0.70	
L	0.45	0.60	0.75	0.45	0.60	0.75	
L1		1.00		0.988	1.00	1.063	
k	0	3.5	7	0	3.5	7	DEGREES
ccc			0.10			0.05	

NOTES:

(1) – LQFP stands for Low profile Quad Flat Package.
Low Profile: Body thickness (A2=1.40mm)

(3) – Exact shape of each corner is optional.

5. RELIABILITY TESTS DESCRIPTION

The tests performed for the reliability evaluation are described in the following sections.

5.1 DIE ORIENTED TESTS

HIGH TEMPERATURE OPERATING LIFE TEST

This test is performed to simulate and accelerate application conditions. This stress test is related to the investigation of different failure modes including electromigration, thermomigration, wire bonds degradation and oxide faults.

ESD CHARACTERIZATION

To evaluate adequate pin protections to electrostatic discharge.
Human Body Model, Machine Model and Charged Device Model have been performed.

LATCH-UP

To evaluate adequate strength to high current and high voltage condition caused by parasitic devices.

5.2 PACKAGE ORIENTED TESTS

PRECONDITIONING SEQUENCE

The device is submitted to a typical temperature profile used for surface mounting, after a controlled moisture absorption. This test simulates the shipment, storage and soldering phases for a SMT product.

THERMAL HUMIDITY BIAS

To investigate failure mechanisms activated in the die-package environment by electrical field and wet conditions. Typical failure mechanisms are electro-chemical corrosion and surface effects related to the moulding compound.

THERMAL CYCLE

To investigate failure modes related to the thermo-mechanical stress induced by the different thermal expansion of the materials interacting in the die-package system. Typical failure modes are linked to metal displacement, dielectric cracking, molding compound delamination, wire-bonds failure, die-attach layer degradation.

AUTOCLAVE

To investigate corrosion phenomena affecting die or package materials, related to chemical contamination and package hermeticity.

HIGH TEMPERATURE BAKE

To investigate the failure mechanisms activated by high temperature, typically wire-bonds solder joint ageing, data retention faults, metal stress-voiding.

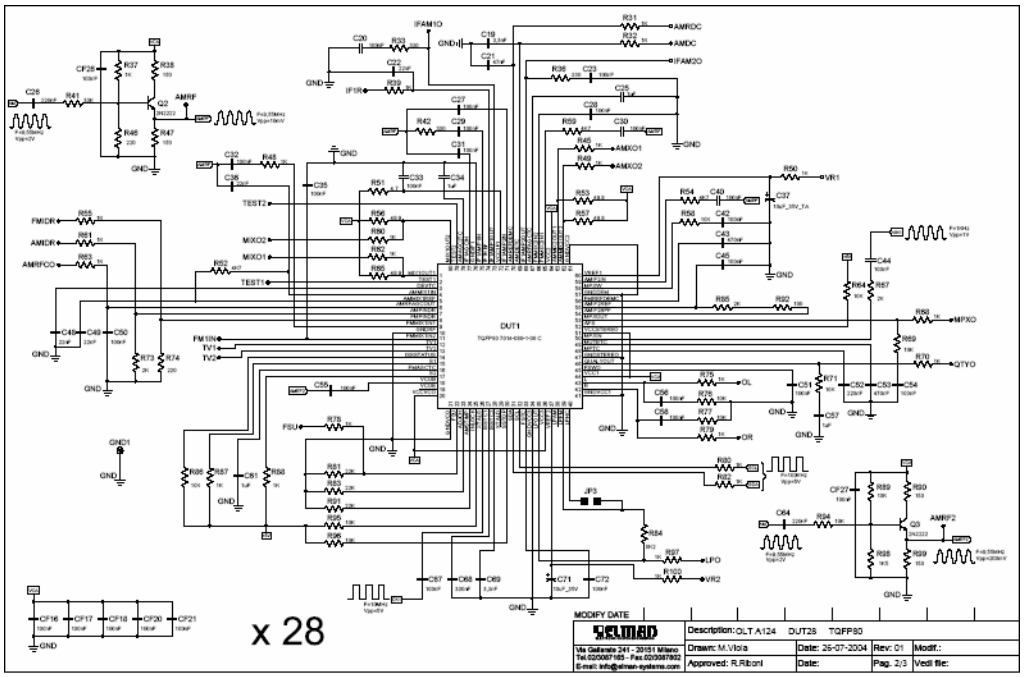
6. RELIABILITY TEST RESULTS

Test	Conditions	Duration	681640H	681640F	6822NH4	6823NHK	6827XF8	
			1^Results	2^Results	4^Results	5^Results	6^Results	Results
PC (JL3)	Storage: 125C Soak: 30C/RH=60% 3 reflow Tpeak=260C	24 Hrs 192Hrs -	Passed[1]	Passed[1]	Passed[1]	Passed[1]	Passed[1]	-
THB	T_a = 85°C, R.H.=85% V_{BAT} = 9 V ; V_{cc} = 5 V	1000Hrs	-	-	0/77	0/77	0/77	-
HTS	Ta = 150°C	1000Hrs	0/77	-	-	-	-	-
TC	T_a = -50°C / 150°C air to air	1000 Cy	0/77	0/77	0/77	-	-	-
PP	T_a = 121°C, P= 2.08 atm	96 Hrs	0/77	0/77	0/77	-	-	-
HTOL	V_1 = 10 V; V_2 = 5 V ; V_4 = 12 V T_{jav} = 150°C	1000Hrs	-	-	0/77	0/77	0/77	-
ESD	HBM [R=1.5kΩ, C=150pF] MM CDM* **CDM corner pins standard*	±1.0KV ±100V ±250V *±750V*	- - - -	- - - -	0/3 0/3 0/3 0/3	- - - -	- - - -	- - - -
LU	Over voltage Injection current	±100mA 1.5 x V_{op} max.	- -	- -	0/8 0/4	- -	- -	- -
ELFR								3 X 800
WBP	Measure in accordance with M2011		0/10	0/5	0/5			

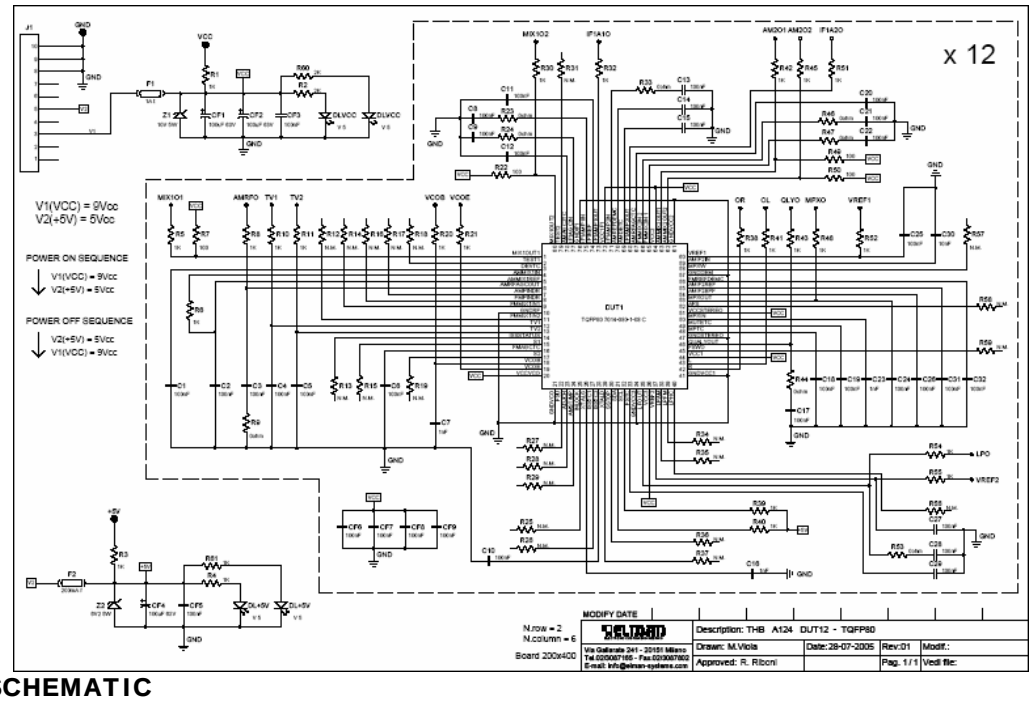
1. SAM inspection has been performed and no die-delamination has been detected before and after preconditioning sequence

7. SCHEMATICS

The HTOL and THB schematics are reported at the end of this document.



OLT SCHEMATIC



THB SCHEMATIC

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