



SAMSUNG Technical Notification

[Production Transition to Lead-free DRAM]

October, 2004

Rev. 01

Memory Quality Assurance

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Background

To meet industry's requirements, SAMSUNG Electronics has been changing leaded products to lead-free products. This is to notify customers of Samsung's DRAM lead-free products plan and technical information. Table of contents are as below.

Contents

- **Material Information**
- **Whisker Spec. Issue**
- **Module Label**
- **Lead-free Road Map**
- **Reliability Test Condition**
- **IR Reflow**
- **Part Number**

Material Information

		Leaded	Lead-free
Component	Lead Finish	85Sn-15Pb	Sn-Bi (Bi : 1~3%)
	Solder Ball	63Sn-37Pb	Sn-3.0Ag-0.5Cu
Module	Solder Paste	63Sn-37Pb	Sn-3.0Ag-0.5Cu
	Passive Element	90Sn-10Pb	Sn
	Active Element	90Sn-10Pb	Sn @Lead Frame Sn-3.0Ag-0.5Cu @Solder Ball

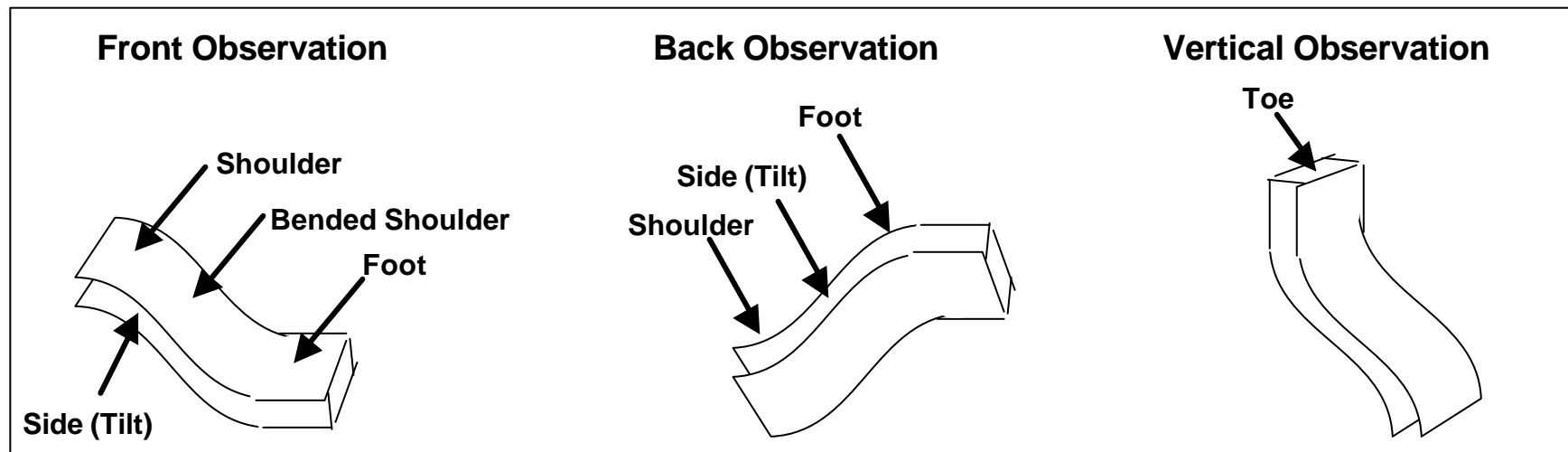
Whisker Spec.

❑ Samsung's Whisker Spec.

[Sample Size: 5 chips for each condition]

Test Item	Conditions	Max. Whisker Length
Temperature Cycles	-55 'C ~ 85 'C, 1000 cycles, 3cyc/1hr	Below 40 um (Pass)
Temperature/Humidity	60 'C/93 %, 4000 hr	Below 40 um (Pass)
Ambient Storage	Room Temp., 6 month	Below 40 um (Pass)

❑ 3 Step Whisker Inspection (SEM Observation)

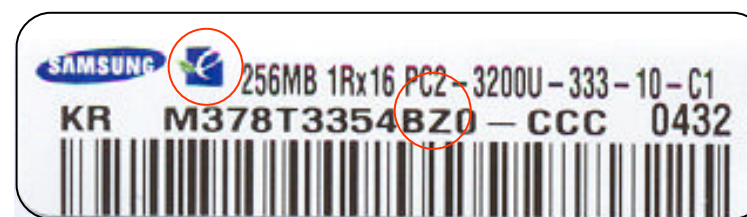


Module Label

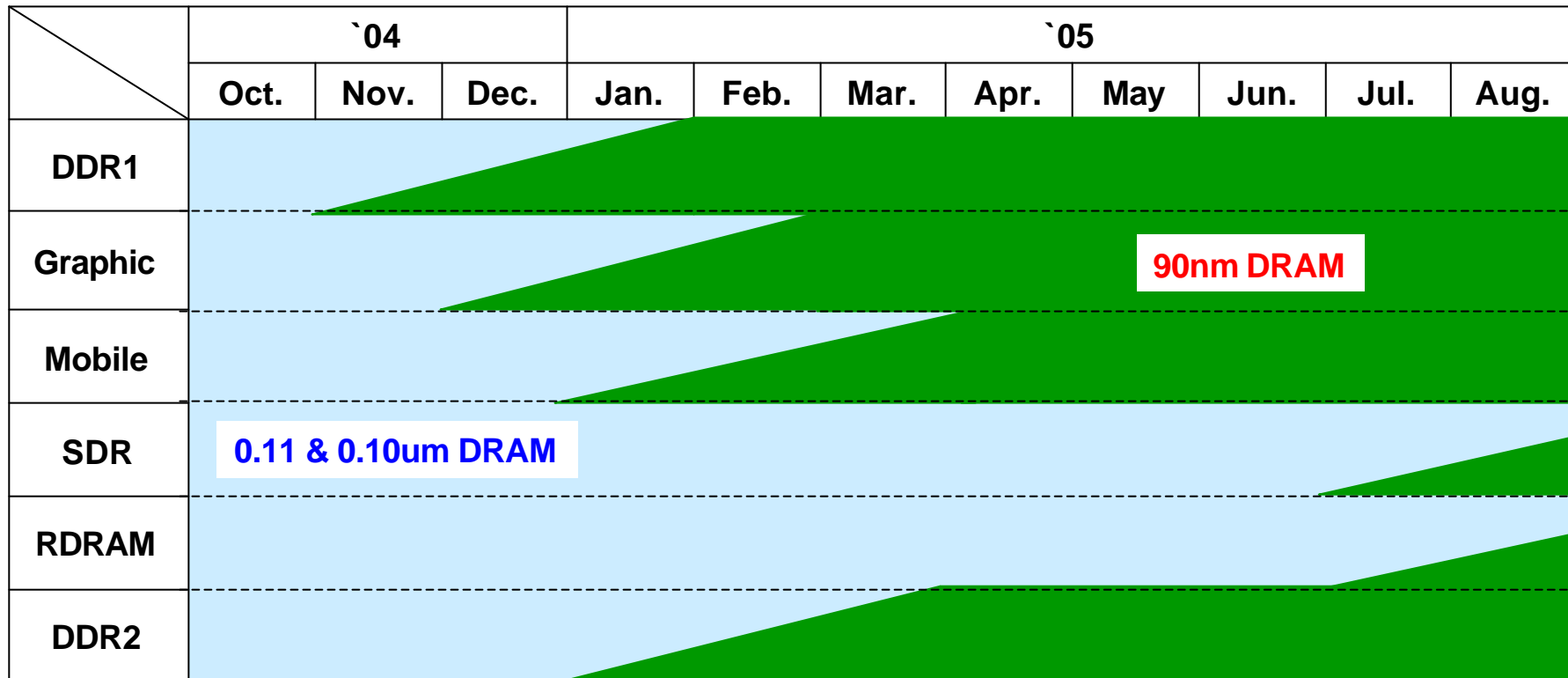
❑ Leaded DDR2 Module (Normal)



❑ Lead-free DDR2 Module (New) - Add SAMUSNG RoHS Compliant Symbol



Technology Transition Road Map by Product

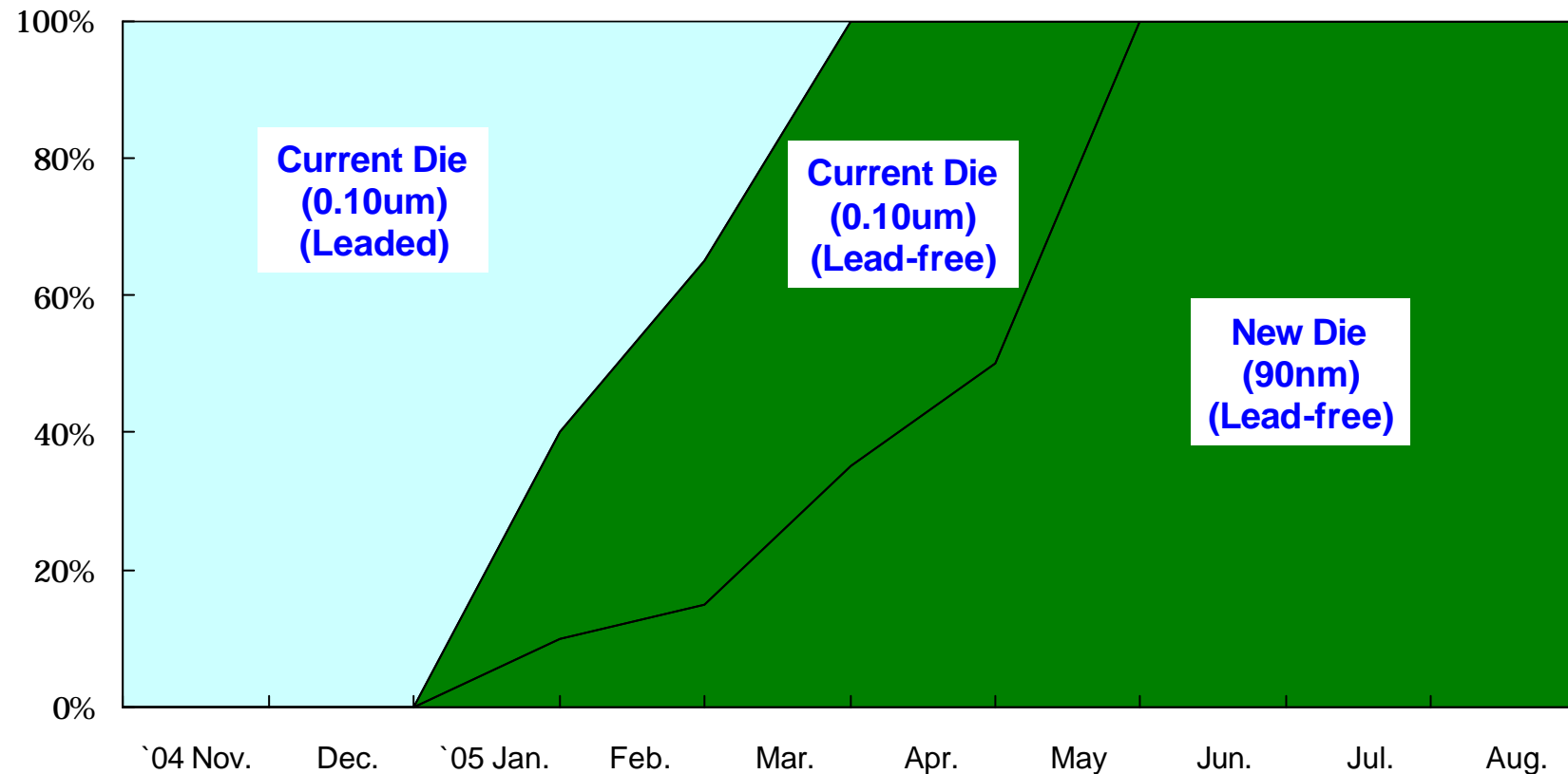


 : New Die (90nm), Only Lead-free Device Available

 : Current Die (0.11um & 0.10um), Leaded Device

- . DDR1/Graphic/SDR/RDRAM : Lead-free device is available upon request.
- . Mobile : Only lead-free device available.
- . **DDR2 : Only lead-free device available from April, `05. (Refer to page 7)**

DDR2 Lead-free Production Transition Plan



The current DDR2 die with leaded will not be available from April, '05

Reliability Test Condition

□ Component Reliability

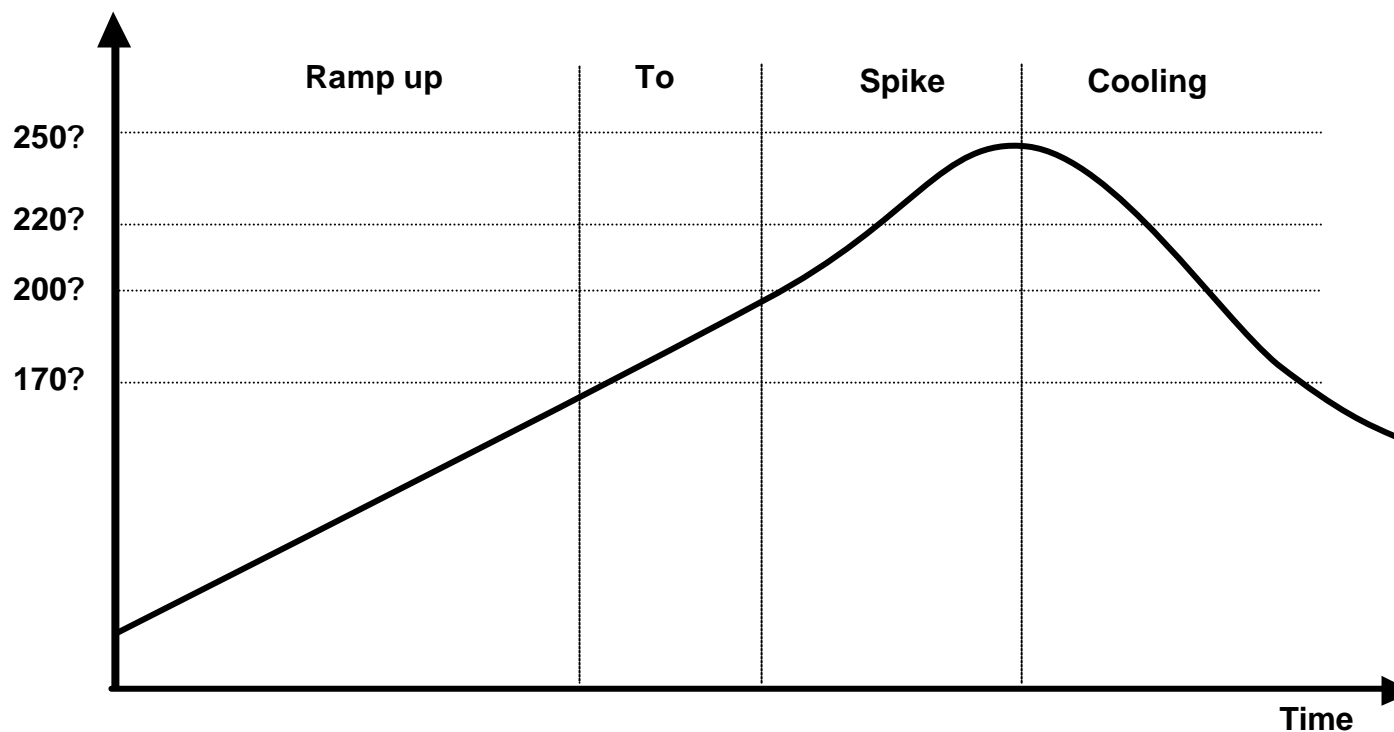
Item	Condition	Read Out Time	# of Lot	Sample Size (per lot / total)
Temp. Humidity Bias	85`C, 85%, Vdd Static Bias	96,168,300,504,1008hr	3	39 / 116
Pressure Cooker	121`C, 100%, 2atm	96,168hr	3	39 / 116
Hot Temp. Storage	150`C	96,168,300,504,1008hr	3	39 / 116
Temp. Cycling	-65~150`C (TSOP) -55~125`C (BGA)	300,600,1000cyc	3	39 / 116
Pre-conditioning	30`C, 60% Soak, IR 3times	192hr	3	116 / 348

□ Module Reliability

Item	Condition	Read Out Time	Sample Size (per module type)
Temp. Cycling	0~125`C	300,600,1000cyc	10

Both 0.10um and 0.11um lead-free device have been internally qualified.

IR Reflow Profile



Ramp -up		To		Reflow	
Range	Slope	Range	Keeping Time	Keeping Time Over 220°C	Peak Temp.
30 ~ 170°C	1~ 2°C	170 ~ 200°C	20~ 50sec	30 ~ 50sec	240 ~ 250°C

Part Number Identification (Component)

DRAM Component Part Numbering Information

Part No.	K	4	*	**	**	*	*	*	-	*	*	**
Refer to Page 12 to Page 19	Memory Component	DRAM	T : DDR2 SDRAM S : SDRAM R : Direct RDRAM N : DDR SGRAM II M : Mobile SDRAM J : GDDR3 SGRAM H : DDR SDRAM D : DDR SGRAM	Density, Refresh	Organization	Bank	Interface, VDD, VDDQ	Generation		Package Type	Temp & Power	Speed

Detail Package type Information on Leaded Product vs Lead-free Product

Product	Package Type	Leaded	Lead-free	Product	Package Type	Leaded	Lead-free
DDR1 SDR	TSOP	T	U	Mobile SDR	54FBGA	R	B
DDR2 SDR	FBGA	G	Z		90FBGA	S	D
Sync DRAM	TSOP	T	U		90FBGA (Smaller)	F	H
Graphic	TSOP	T	L		DDP 54FBGA	Y	P
	TQFP	Q	U		DDP 90FBGA	M	E
Mobile DDR	60FBGA	L	F	RDRAM	FBGA	R, F	T, G

Part Number Identification (Module)

DRAM Module Part Numbering Information

Part No.	M	*	**	*	**	*	*	*	*	*	-	*	**
Refer to Page 12 to Page 19	Memory Module	4 : SODIMM 3 : DIMM	Data bits	Feature, Voltage	Depth	Refresh, # of banks, Interface	Composition component	Component Generation	Package Type	PCB revision and type		Power	Speed

Detail Package type Information on Leaded Product vs Lead-free Product

Product	Package Type	Leaded Product	Lead-free Product
DDR1 SDRAM	TSOP	T	U
	FBGA	G	Z
DDR2 SDRAM	FBGA	G	Z
SDRAM	TSOP	T	U
RDRAM	FBGA	F	G

Part Number - DDR1

Component

	PKG Type	Leaded P/N	Lead-free P/N
Component	TSOP	K4H____38x-TC	K4H____38x-UC
	FBGA	K4H____38x-GC	K4H____38x-ZC

Module

	DIMM Type	PKG	Leaded P/N	Lead-free P/N
Module	R-DIMM	TSOP	M312L____xTS-C	M312L____xUS-C
		FBGA	M312L____xG0-C	M312L____xZ0-C
	U-DIMM	TSOP	M368L____xTN-C	M368L____xUN-C
	SODIMM	TSOP	M470L____xT0-C	M470L____xU0-C

Part Number - DDR2

Component

	PKG Type	Leaded P/N	Lead-free P/N
Component	FBGA	K4TxxxxxQx-GCxx	K4TxxxxxQx-ZCxx

Module

	DIMM Type	PKG	Leaded P/N	Lead-free P/N
Module	R-DIMM	FBGA	M393TxxxxxG0-Cxx	M393TxxxxxZ0-Cxx
	U-DIMM	FBGA	M378TxxxxxG0-Cxx	M378TxxxxxZ0-Cxx
	SODIMM	FBGA	M470TxxxxxG0-Cxx	M470TxxxxxZ0-Cxx

Part Number - SDRAM

Component

	PKG Type	Leaded P/N	Lead-free P/N
Component	TSOP	K4S____32x-TC	K4S____32x-UC

Module

	DIMM Type	PKG	Leaded P/N	Lead-free P/N
Module	R-DIMM	TSOP	M390S____xT1-C	M390S____xU1-C
	U-DIMM	TSOP	M366S____xTS-C	M366S____xUS-C
	SODIMM	TSOP	M464S____xTS-C	M464S____xUS-C

Part Number - Graphic

Component

	PKG Type	Leaded P/N	Lead-free P/N
Component	TSOP	K4D261638I-TC	K4D261638I- LC
		K4D551638F-TC	K4D551638F- LC
		K4D551638H-TC	K4D551638H- LC
	TQFP	K4D263238I-QC	K4D263238I- UC
	FBGA	K4D26323QG-GC	K4D26323QG- VC
		K4D553235F-GC	K4D553235F- VC
		K4D55323QG-GC	K4D55323QG- VC
		K4J55323QF-GC	K4J55323QF- VC
		K4J55323QG-GC	K4J55323QG- VC
		K4J52324QC-GC	K4J52324QC- VC
		K4N56163QF-GC	K4N56163QF- VC
K4N56163QG-GC	K4N56163QG- VC		

Part Number - Mobile (1)

Component

	PKG Type	Leaded P/N	Lead-free P/N
Component (M-SDR)	54FBGA	K4S64163L(3)F - R***	K4S64163L(3)F - B***
		K4M64163PH - R***	K4M64163PH - B***
		K4S64163L(3)H - R***	K4S64163L(3)H - B***
		K4M28163PE - R***	K4M28163PE - B***
		K4M28163PF - R***	K4M28163PF - B***
		K4M28163L(3)F - R***	K4M28163L(3)F - B***
		K4M56163PE - R***	K4M56163PE - B***
		K4S56163PF - R***	K4S56163PF - B***
	54BOC	K4S56163L(3)F - X***	K4S56163L(3)F - Z***
Component (M-DDR)	60FBGA	K4X28163PE - L***	K4X28163PE - F***
		K4X56163PE - L***	K4X56163PE - F***
		K4X56163PF - L***	K4X56163PF - F***

Part Number - Mobile (2)

Component

	PKG Type	Leaded P/N	Lead-free P/N
Component (M-SDR)	90FBGA	K4S64323L(3)F - S***	K4S64323L(3)F - D***
		K4S28323L(3)E - S***	K4S28323L(3)E - D***
	90FBGA (smaller)	K4S64323L(3)H - F***	K4S64323L(3)H - H***
		K4S28323L(3)E - F***	K4S28323L(3)E - H***
		K4S28323L(3)F - F***	K4S28323L(3)F - H***
		K4S56323PF - F ***	K4S56323PF - H***
		K4S56323L(3)F - F***	K4S56323L(3)F - H ***
	DDP 54FBGA	K4M51163L(3)E - Y***	K4M51163L(3)E - P***
		K4M51153L(3)E - Y***	K4M51153L(3)E - P***
		K4M51163PE - Y***	K4M51163PE - P***
		K4S51163PF - Y***	K4S51163PF - P***
		K3S51153PF - Y***	K3S51153PF - P***
		K4S51163L(3)F - Y***	K4S51163L(3)F - P***
		K4S51153L(3)F - Y***	K4S51153L(3)F - P***
	DDP 90FBGA	K4M56323L(3)E - M***	K4M56323L(3)E - E***
		K4M51323L(3)E - M***	K4M51323L(3)E - E***
		K4S51323PF - M***	K4S51323PF - E***
		K4S51323L(3)F - M***	K4S51323L(3)F - E***

PCM031128006-1

Lead-free Plan

GGK - 2004 -October -20

Memory Quality Team

Part Number - RDRAM®

Component

	PKG Type	Leaded P/N	Lead-free P/N
Component	54 FBGA	K4R271669F-RCxx	K4R271669F-TCxx
	84 FBGA	K4R571669E-FCxx	K4R571669E-GCxx
	92 FBGA	K4R881869E-FCxx	K4R881869E-GCxx
		K4R761869A-FCxx	K4R761869A-GCxx

Module

	DIMM Type	PKG	Leaded P/N	Lead-free P/N
Module	X16 RIMM	FBGA	MR16R162xxF0-Cxx	MR16R162xxG0-Cxx
			MR18R162xxF0-Cxx	MR18R162xxG0-Cxx
	X32 RIMM		MD16R162xxF0-Cxx	MD16R162xxG0-Cxx
			MD18R162xxF0-Cxx	MD18R162xxG0-Cxx
	NexMod		MN18R162xxF0-Cxx	MN18R162xxG0-Cxx
			MP18R162xxF0-Cxx	MP18R162xxG0-Cxx
			MN18R3268AF0-Cxx	MN18R3268AG0-Cxx
	SO-RIMM		-	MS18R162xxH0-Cxx