

# **DDR2 Application Note**

**Implementation "Dummy Pad" on the module PCB**

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**MEMORY DIVISION**

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- ◇ **Dummy PAD on the module PCB is implementing to improve the over-stress robustness**
- ◇ **Comparing to the normal one, no difference in terms of the electrical characteristics**

- Experienced DRAM package-cracking, which was induced by some over-stress applied to Memory-DIMM mostly during DIMM build into socket in motherboard or some other reasons from rough handling of the DIMMs.

In general, BGA(BOC) based DIMM is more fragile against external mechanical stress than conventional TSOP DIMM, so that more careful handling is required to prevent any damage from over-stress.

- Since it is hard to keep control of DIMM handling, Samsung have decided to highly upgrade the stress-immunity on BGA based DIMM by placing "Dummy-Pads " on the DIMM-PCB at the places where four-corners of package are located. This leads minor modification of PCB pattern but without any alteration of electrical behavior.

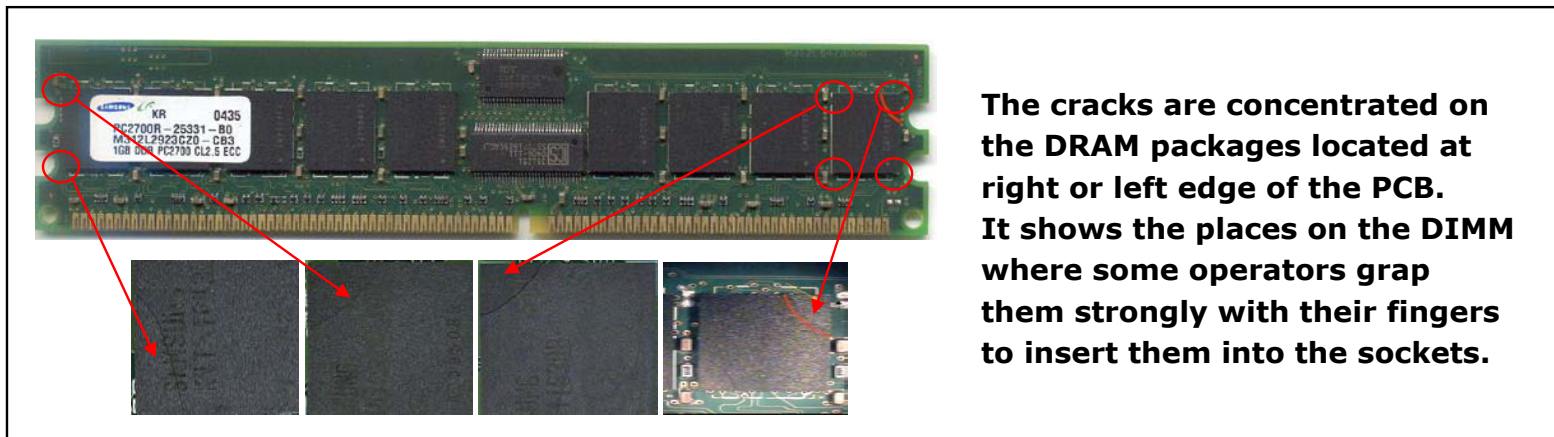
This "Dummy-Pad Solution" will provide our customers much higher confidence in robustness over our Memory DIMMs.

All of the details are described in the next pages.

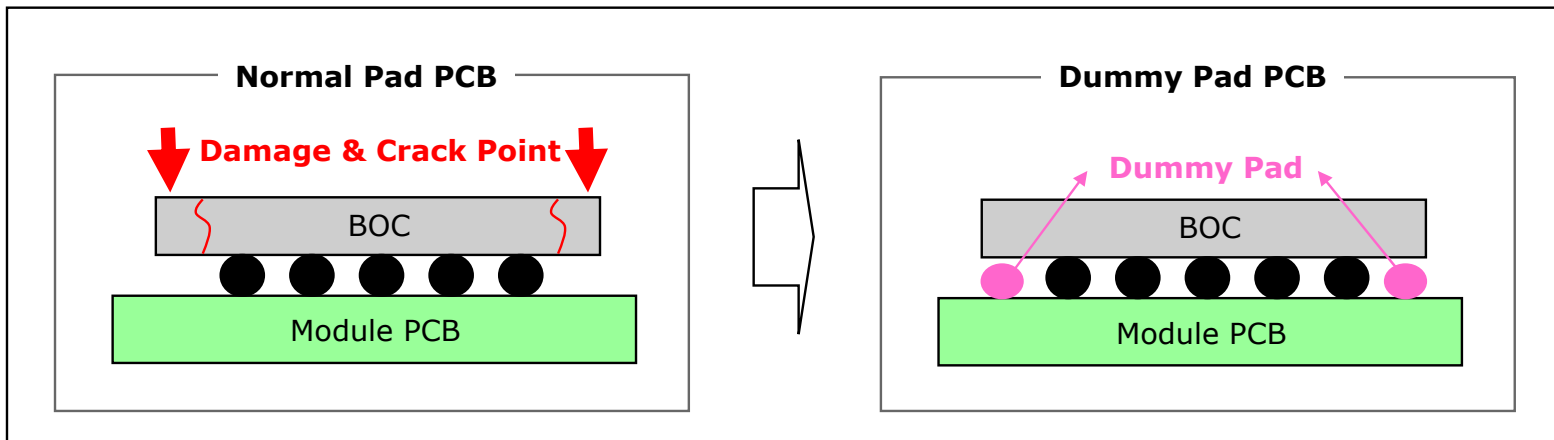
# Symptom and Improvement

Application  
Note

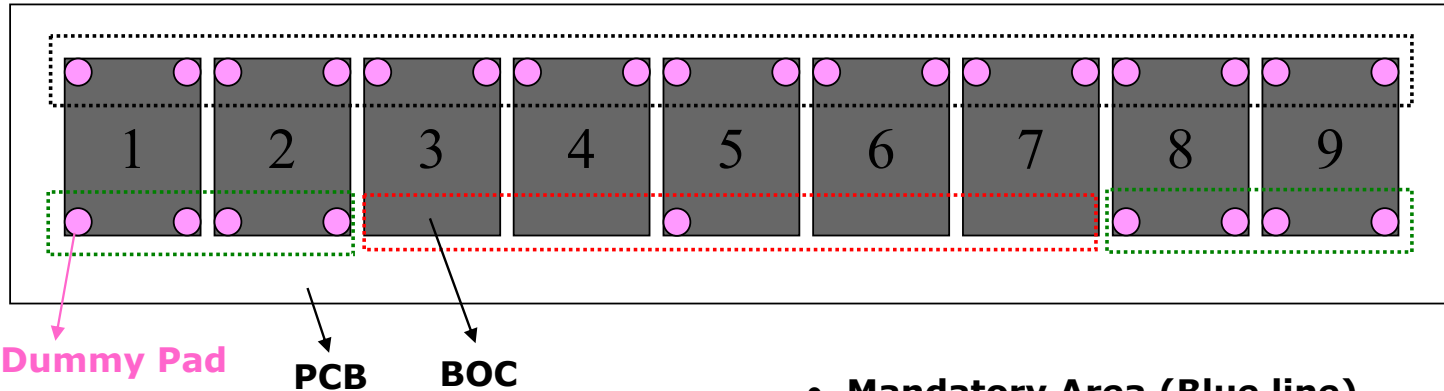
## ➤ Failure Symptom



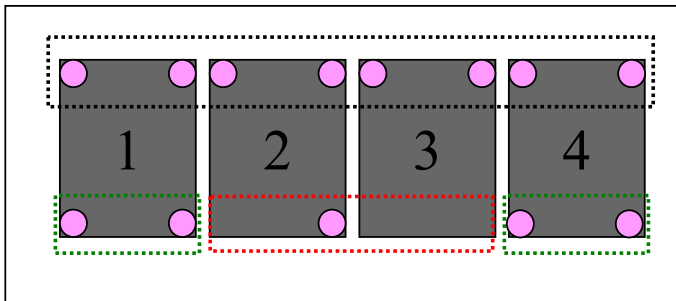
## ➤ How to Improve



## ➤ UDIMM & RDIMM PCB



## ➤ SODIMM PCB

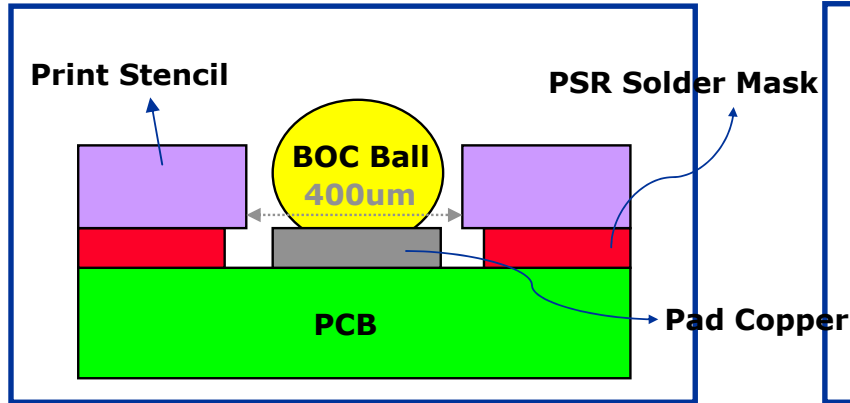


- **Mandatory Area (Blue line)**
  - Dummy pads must be on PCB.
  - No change the layout of signal lines
- **Mandatory Area (Green Line)**
  - Dummy pads must be on PCB
  - Minor change the layout of signal lines
- **Optional Area (Red line)**
  - Dummy pads could be on PCB or not, because of maintaining former design.

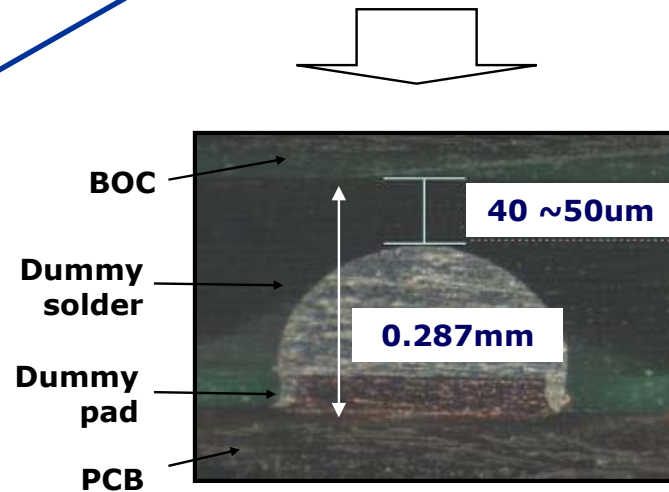
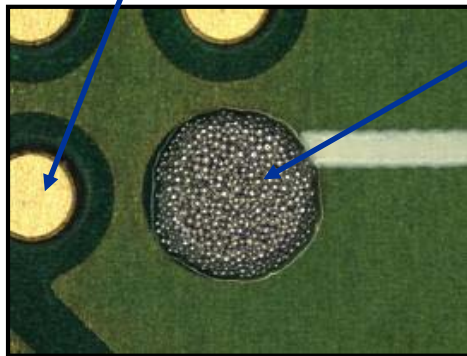
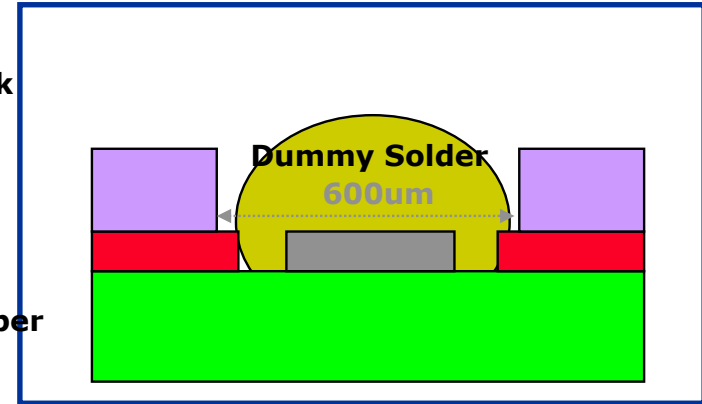
# Revision Overview - Placing Solder Paste on Dummy Pads

Application Note

## Normal Pad

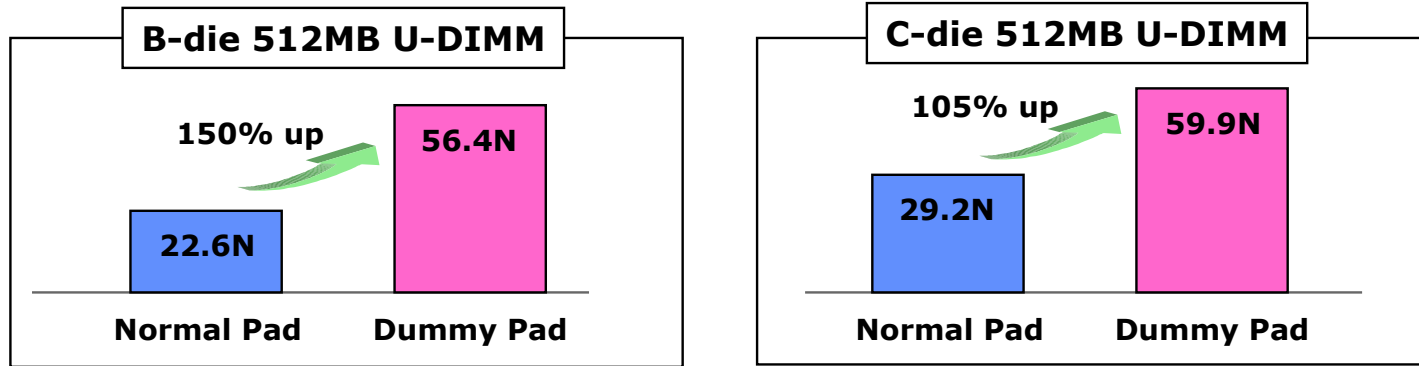


## Dummy Pad



## ➤ Mechanical Stress-Immunity : Tip Breaking Test

New solution shows 2x improvement in Tip-Breaking Test.



※ Force criteria : 1% probability life time of Weibull Distribution of Breaking Load

## ➤ Electrical Performance : Trace-Length Measurement on PCB Pattern

Trace lengths are equivalent between Normal Pad PCB and Dummy Pad PCB so that no difference in electrical performances.

[unit : mm]

Signal Name	DQ11	DQ52	DQ50	DQ55	DQ60	DQ56	DQ63
Normal Pad	22.587	22.751	22.735	22.743	22.765	22.721	22.76
Dummy Pad	22.586	22.751	22.734	22.743	22.765	22.721	22.76

# Identification (Part-Number)

Application  
Note

## ➤ Non Dummy PAD

**M 3 9 3 T 3 2 5 3 F Z(G) 0**



**Identification Digit (Revision Number)**

※ Detailed List (Part number) : See on Page 9~11 - Product P/N List

## ➤ Dummy PAD

**M 3 9 3 T 3 2 5 3 F Z(G) 3**



**Identification Digit (Revision Number)**

※ Detailed List (Part number) : See on Page 9~11 - Product P/N List

- **Dummy PAD is implemented to almost current products except Samsung' proprietary stacked package product. See on page 9~11 for more details.**

# Product P/N List - RDIMM

Application  
Note

	No of Pin	R/C Ver.	Rev. Status	Speed	Part Number (Normal Pad PCB)	Part Number (Dummy Pad PCB)	Parity Support
Registered DIMM	240	R/C A	Rev 0.5	400/533	M393T3253FZ(G)0 M393T6553BZ(G)0	M393T3253FZ(G)3 M393T6553BZ(G)3	No
			Rev 1.0	400/533	M393T6553CZ0	M393T6553CZ3 M393T2863AZ3	
		R/C B	Rev 0.5	400/533	M393T6453FZ(G)0 M393T2953BZ(G)0	M393T6453FZ(G)3 M393T2953BZ(G)3	No
			Rev 1.0	400/533	M393T2953CZ0	M393T2953CZ3 M393T5663AZ3	
		R/C C	Rev 0.5	400/533	M393T6450FZ(G)0 M393T2950BZ(G)0 M393T5660MZ0	M393T6450FZ(G)3 M393T2950BZ(G)3 M393T5660MZ3	No
			Rev 1.0	400/533	M393T2950CZ0	M393T2950CZ3 M393T5660AZ3	
		R/C F	Rev 1.0	400/533/ 667/800	-	M393T6553CZA M393T2863AZA	Yes
		R/C G	Rev 1.0	400/533/ 667/800	-	M393T2953CZA M393T5663AZA	Yes
		R/C H	Rev 1.0	400/533/ 667/800	-	M393T2950CZA M393T5660AZA	Yes
		R/C J	Rev 1.0	400/533/ 667/800	-	M393T5750CZA	Yes
			Rev 1.0	400/533	M393T5750BY(S)0 M393T5750CZ0	M393T5750BY(S)3 M393T5750CZ3	No
		Non Jedec	-	400	M393T5168MZ0	No change	No (x4 2R Stack)
				400/533	M393T5168AZ0	No change	

# Product P/N List - UDIMM

Application  
Note

	No of Pin	R/C Ver.	Rev. Status	Speed	Part Number (Normal Pad PCB)	Part Number (Dummy Pad PCB)	Note
Unbuffered DIMM	240	R/C A	Rev 1.0	400/533	M378T3253FZ(G)0 M378T6553BZ(G)0 M391T3253FZ(G)0 M391T6553BZ(G)0	M378T3253FZ(G)3 M378T6553BZ(G)3 M391T3253FZ(G)3 M391T6553BZ(G)3	
		R/C B	Rev 1.0	400/533	M378T6453FZ(G)0 M378T2953BZ(G)0 M391T6453FZ(G)0 M391T2953BZ(G)0	M378T6453FZ(G)3 M378T2953BZ(G)3 M391T6453FZ(G)3 M391T2953BZ(G)3	
		R/C C	Rev 1.0	400/533	M378T3354BZ(G)0	M378T3354BZ(G)3	
				400/533/ 667/800	M378T3354CZ0	M378T3354CZ3	
		R/C D	Rev 0.3	667	M378T3253FZ(G)0	M378T3253FZ(G)3	
				400/533/ 667/800	M378T6553CZ0	M378T6553CZ3 M378T2863AZ3	
		R/C E	Rev 0.5	667	M378T6453FZ(G)0	M378T6453FZ(G)3	
				400/533/ 667/800	M378T2953CZ0	M378T2953CZ3 M378T5663AZ3	
		R/C F	Rev 0.3	667	M391T3253FZ(G)0	M391T3253FZ(G)3	
				400/533/ 667/800	M391T6553CZ0	M391T6553CZ3 M391T2863AZ3	
		R/C G	Rev 0.3	667	M391T6453FZ(G)0	M391T6453FZ(G)3	
				400/533/ 667/800	M391T2953CZ0	M391T2953CZ3 M391T5663AZ3	

# Product P/N List - SoDIMM

Application  
Note

	No of Pin	R/C Ver.	Rev. Status	Speed	Part Number (Normal Pad PCB)	Part Number (Dummy Pad PCB)	Note
SoDIMM	200	R/C A	Rev 1.0	400/533	<b>M470T6554BZ(G)0</b>	<b>M470T6554BZ(G)3</b>	
				400/533/ 667/800	<b>M470T6554CZ0</b>	<b>M470T6554CZ3</b> <b>M470T2864AZ3</b>	
		R/C C	Rev 1.0	400/533	<b>M470T3354BZ(G)0</b>	<b>M470T3354BZ(G)3</b>	
				400/533/ 667/800	<b>M470T3354CZ0</b>	<b>M470T3354CZ3</b> <b>M470T6464AZ3</b>	
		R/C E	Rev 1.0	400/533	<b>M470T2953BY(S)0</b>	<b>M470T2953BY(S)3</b>	
				400/533/ 667/800	<b>M470T2953CZ0</b>	<b>M470T2953CZ3</b>	
		Non Jedec	-	400/533/ 667	<b>M470T5669AZ0</b>	<b>No change</b>	x8, 2R Stack