SK hynix Inc.	Firmware Change Notification			PCN No.	F1611-031-N-00
				Date	2016-11-22
PCN Title	FCN for 1ynm eMMC5.1			**Description of Change**	(I) Change Command Queue handling policy (Aligned with Qualcomm policy) ※ Change Value of Ext_CSD relative to Time Out (GENERIC_CMD6_TIME [248] and SLEEP_NOTIFICATION_TIME [216])
Purpose	Change CMDQ handling policy PRV value: 0xA5 ※ Change Datasheet Value of ext_CSD relative to Time Out				
Customer	ALL				
Device	1ynm eMMC5.1 / eMCP5.1				
Part No.	221Ball eMCP5.1 Product : H9TQ64A8GTCCUR (8+8) H9TQ17AAETACUR (16+12) / H9TQ17ABJTACUR (16+16) H9TQ17ABJTBCUR (16+16) / H9TQ17ADFTACUR (16+24) H9TQ26ABJTACUR (32+16) / H9TQ26ADFTACUR (32+24) H9TQ26ADFTBCUR (32+24) / H9TQ26ACLTMCUR (32+32)			Date Issued : 2016-11-22 Prepared by : Y.E. Cho E-mail : youngeui.cho@sk.com Checked by : K.L. Park EMMC Quality Engneering Project Approved by : VP H.G. Lee Solution Quality Group	
Remark	1ynm based eMCP5.1 - Change CMDQ handling policy PRV 0xA5 - Ext_CSD (CMD6 generic / Sleep Notification)				
Response Due Date	-	**Effective Date**	2016-12-01 Shiping		

FW Change Notice – Summary

SK hynix	Firmware Change Notification	FCN # : F1611-031-N-00 Date : 2016-11-22

1. Customer : All	2. Device : 221Ball eMCP5.1 Product : H9TQ64A8GTCCUR (8+8) H9TQ17AAETACUR (16+12) / H9TQ17ABJTACUR (16+16) H9TQ17ABJTBCUR (16+16) / H9TQ17ADFTACUR (16+24) H9TQ26ABJTACUR (32+16) / H9TQ26ADFTACUR (32+24) H9TQ26ADFTBCUR (32+24) / H9TQ26ACLTMCUR (32+32)
3. Title : Change Value of Ext_CSD / CMDQ handling policy	
4. Purpose	5. Description
• Change CMDQ handling policy • Change Datasheet Value of ext_CSD relative to Time Out *PRV value: 0xA5*	(I) Change Command Queue handling policy (Aligned with Qualcomm policy) ※ Change Datasheet Value of Ext_CSD relative to Time Out (GENERIC_CMD6_TIME[248] and SLEEP_NOTIFICATION_TIME[216])
6. Effective Date : *From 2016. Dec. 1st Shiping*	7. Evaluation Results & Schedule : Appendix (No, Yes) Firmware Evaluation : Pass
Remarks : There is no trade off in customer system.	

Change Description

▪ Firmware Change Note (I)

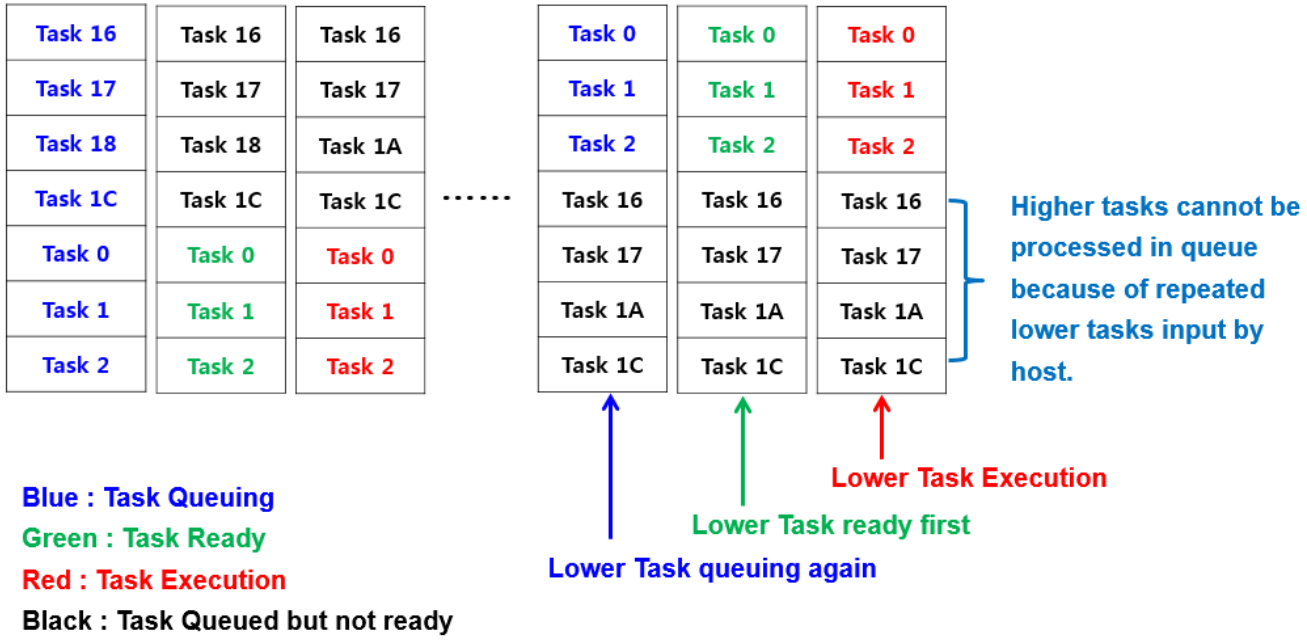
- Change Command Queue handling policy

✓ Root Cause

: **Timeout occurs because command queue handling is not aligned with Qualcomm policy.**

eMMC processes lower number tasks while higher number tasks are waiting in queue

and host sends lower number tasks repeatedly, so higher number tasks cannot be processed within host timeout (120 sec.).

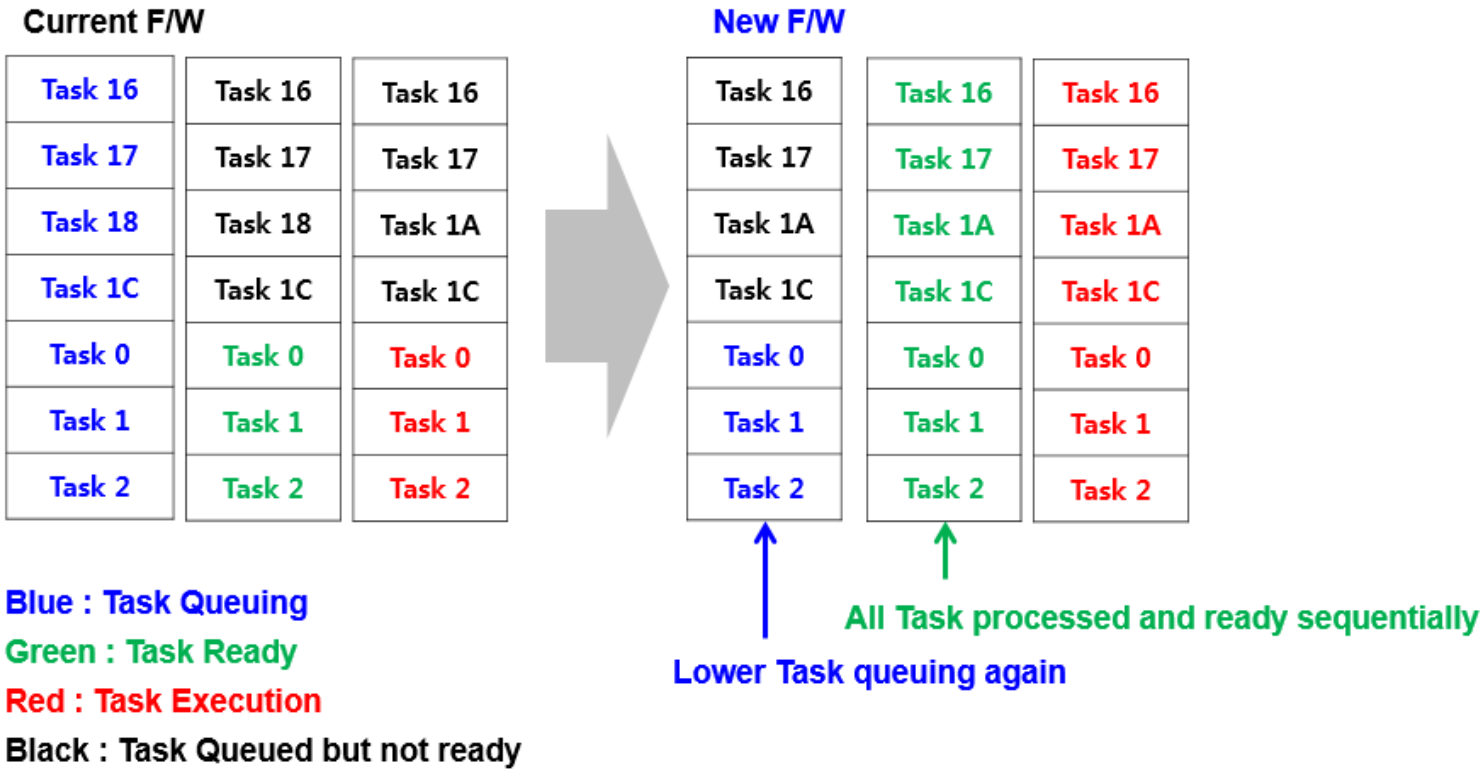


Change Description

✓ Solution

: **SK hynix have a plan to change command queue handling policy** and device will process all task ID sequentially.

Firmware scans tasks in queue and executes all task equally.



✓ Host Behavior when Timeout

: From the QRD scenario based Kernel log and PA log, we noticed Kernel panic does not triggered and host keep running while printing log message over kernel shell.

This means in real consumer situation, this will not trigger device lock-up nor system reset but keep running.

```
adb_log - INFO - <36>[37335.194044] type=1400 audit(38577.136:666): avc: denied { kill } for pid=4013 comm="p
adb_log - INFO - <6>[37344.077155] FG: soc_work_fn: adjust_soc: s 100 r 7226 i 98113 v 4023261 t 427
adb_log - INFO - <6>[37364.117146] FG: soc_work_fn: adjust_soc: s 100 r 7226 i 113066 v 4019904 t 427
adb_log - INFO - <3>[37375.197007] mmc0: request with tag: 22 flags: 0x405c001 timed out
adb_log - INFO - <6>[37375.202078] ==========CMDQ TRACE DUMP==========
adb_log - INFO - <6>[37375.206583] [37375182012] mmc0, mmc_blk_cmdq_issue_rw_rq: cmd tag 1
adb_log - INFO - <6>[37375.212833] [37375182034] mmc0: mmc_blk_cmdq_rw_prep: cmd tag: 1 mrq: 0xffffffc0db4704
adb_log - INFO - <6>[37375.233055] [37375182044] mmc0, mmc_start_cmdq_request: cmd tag: 1 blksz 512 blocks 10
adb_log - INFO - <6>[37375.245037] [37375182185] mmc0, cmdq_request: cmd tag 1, CQTDBR: 0x3fffffff, CQDPT: 0x
adb_log - INFO - <6>[37375.255279] [37375183497] *** mmc0: cmdq intr: 0x00004000
```

```
:18,996 - adb_log - INFO - <3>[37375.197007] mmc0: request with tag: 22 flags: 0x405c001 timed out
:19,003 - adb_log - INFO - <3>[37375.806762] mmc0: request with tag: 23 flags: 0x405c001 timed out
:19,005 - adb_log - INFO - <3>[37377.028283] mmc0: request with tag: 25 flags: 0x405c001 timed out
:19,009 - adb_log - INFO - <3>[37377.639047] mmc0: request with tag: 26 flags: 0x405c001 timed out
:19,016 - adb_log - INFO - <3>[37378.249812] mmc0: request with tag: 27 flags: 0x405c001 timed out
:19,022 - adb_log - INFO - <3>[37378.860575] mmc0: request with tag: 28 flags: 0x405c001 timed out
:19,026 - adb_log - INFO - <3>[37379.471341] mmc0: request with tag: 29 flags: 0x405cc11 timed out
:38,891 - adb_log - INFO - <3>[   39.406297] adm_get_params_v2: get params timed out port_id = 0x0
:42,368 - adb_log - INFO - <3>[   45.482000] adm_get_params_v2: get params timed out port_id = 0x0
```

Appendix

Change Description

- Change Time Out Value on Ext_CSD

Ext_CSD Field	Old	New	Remark (JEDEC Min/Max)
GENERIC_CMD6_TIME [248]	0x05 (50ms)	0x0A (100ms)	10ms / 2.550s
SLEEP_NOTIFICATION_TIME [216]	0x0C (40.96ms)	0x0E (163.8ms)	20μs / 83.88s

Generic CMD6 timeout	GENERIC_CMD6_TIME	[248]	R	0x0A	
Sleep Notification Timeout	SLEEP_NOTIFICATION_TIME	[216]	R	0x0E	

FW Qualification Result

TEST RESULTS

TEST Item		Sample Size (ea)	Fail Rate (%)	REMARKS
Seq. Pre Cycle	Write / Read	231	0	
Group1 Normal function	Random test	231	0	
	Mixed test	231	0	
Group2 Temperature / Partition	Room	231	0	
	Hot	231	0	
	Cold	231	0	
Group3 Aging	Mixed function	231	0	
Group4 SPO Aging	SPO Aging	231	0	
	Random SPO Aging	231	0	
	CMD1 SPO Aging	231	0	
	CMD5-0 & Vcc On/Off	231	0	
Group5 Read Aging	Read disturb	231	0	2K + 2M
Group6 Extension Read Aging	Ext. Read disturb	231	0	
Group7 Workload	Workload	231	0	
Performance	write/read performance	231	0	