# HHW e MMC Specification

**e MMC5.1**

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***Product List***

# Revision History

| | | |
|---|---|---|
| *Rev 1.0* | *2021/07/22* | *Released* |
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# 1. Description

## 3. Features

- 6XSSRUW -('(& H&RP&OLDQW
- 6XSSRUW 9 V9XSSRUW
- 6XSSRUW ZLUH EXV &/. '&7> 'DQQ6DUUGZEHUH UHVHW 567B
- 8S WR0+] FORFN VSHHG
- 6XSSRUW 6LQJOH 'DWD 5DWH6DPHQG 'XDO 'DWD
- 6XSSRUW GLIIHUHQW %XVZLGWK ELW ELW
- 6XSSRUW 2ULJLQDO %RRWRGHV $OWHUQDWLYH %RRW
- 6XSSRUW 'DWD 5HPRYDQGUQLWH]H
- 6XSSRUW 5HSOD\ 3URWHFNG5HP%RU\
- 6XSSRUW 0XOWLSOH 3DUWLWLRQV ZLWK HQKDQFHG DWWULEX
- 6XSSRUW /RFN 8QORFWDWQLWH
- 6XSSRUW 'DWD 3URWHFDWQHU 3RZHU
- 6XSSRUW 3RZHU 6DYLQJ 6OHHS
- 6XSSRUW +LJK9ULRUXSW +3,
- 6XSSRUW %DFNJURXQGQG
- 6XSSRUWHPPDQGV
- 6XSSRUW 6DPSOLQJ7XQLQJ
- 6XSSRUW '\QDPLF 3RZHU 0DQDJHPDQG VOHHS
- 6XSSRUW &RPPDQGQG
- 6XSSRUW 6HFXULWLRQ

- 3DFNDJH

7\S

- 2SHUDWLQJ 9ROWDJH UDQJH
  - 9a 9 W\SL9FDO
  - 9a 9 W\SLFDO 9 9a9 9 W\SLFDO

- 7HPSHUDWXUH
  - 2SHUDWL/Qa /
  - 6WRUDJH a /

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# 4. Functional Block Diagram

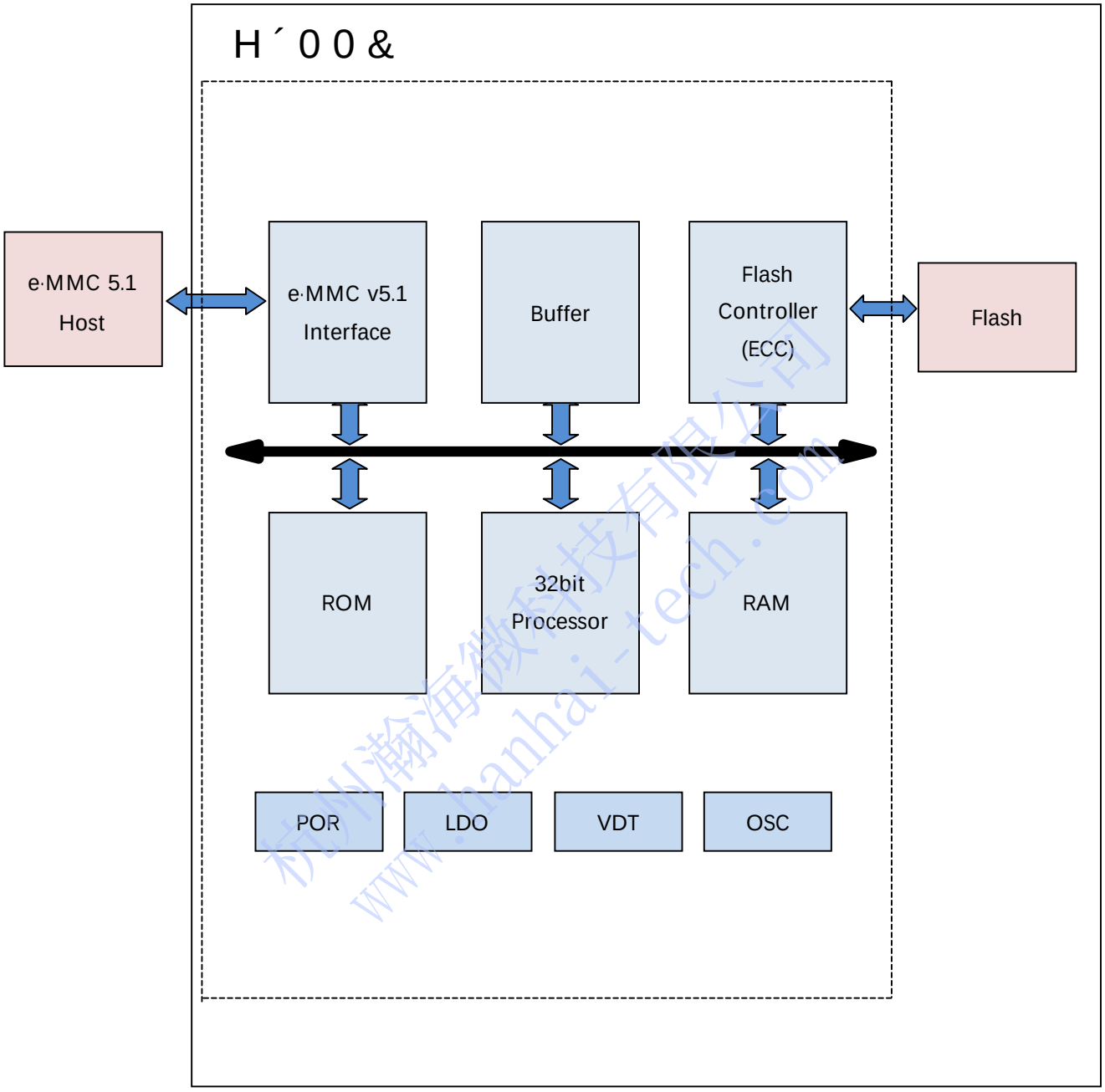



**Figure 1 -** HÂ00& %ORFN 'LDJUDP

# HÂ00& 'HYLFH DQG System

## 5.1 HÂ00& 6\VWHP Overview

7KH H´00& VSHFLILFDWLRQ GHVFULEHV WKH EHKDYLRU RI WKH LQWHUIDFH DQG W
HG (&& $6 SDUW RI WKLV VSHFLILFDWLRQ WKH H[LVWHQFH RI D K
(&& DQG D PHPRU\ VWRUDJH DUUD\ DUH LPSOLHG EXW WKH RSHUDWLO

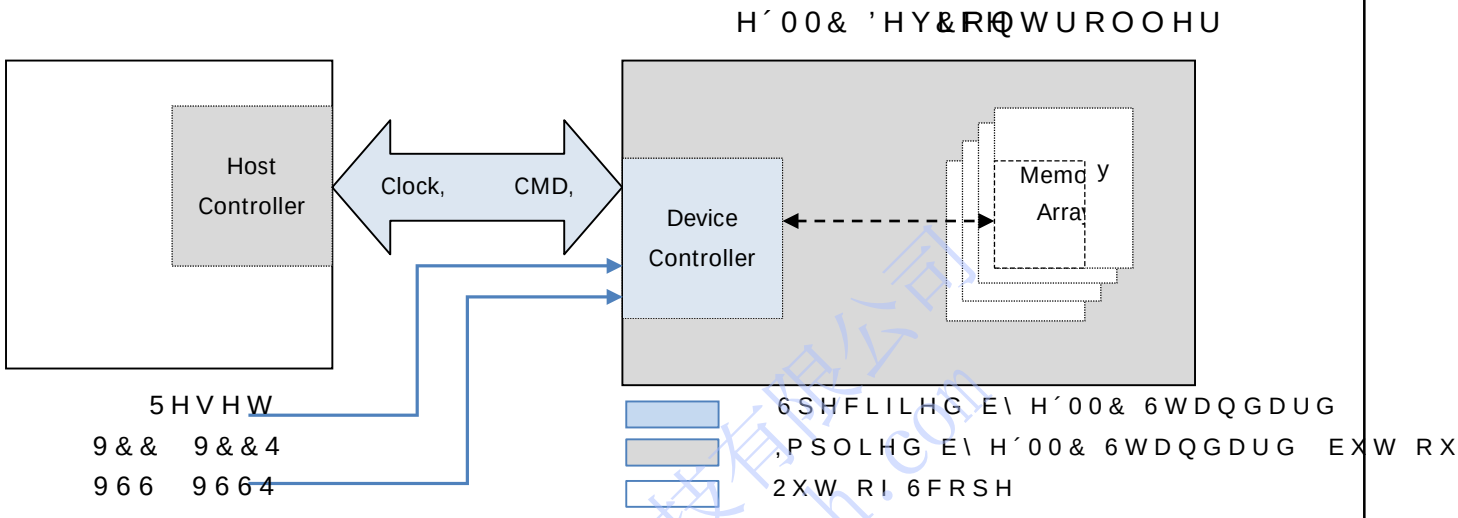



**Figure 2 -** HÂ00& 6\VWHP 2YHUYLHZ

## 5.2 HÂ00& 'HYLFH Overview

7KH H´00& EXV KDV WKH IROORZLQJ FRPPXQLFDWLRQ DQG SRZHU OLQ

- &/. &ORFN input
- '6 'DWD VWUREH XVHG IRU GDWD RXWSXW LQ +6
- &0' &RPPDQG LV D ELGLUHFWLRQDO VLJQDO 7KH KRVW DQG H´
  DQG GXVWKXOO
- '$7 a'$7 'DWD OLQHV DUH ELGLUHFWLRQDO VLJQDOV XVHG WR W DQG H
- 567BQ +DUGZDUH UHVHW input
- 9&& 9&& LV WKH SRZHU VXSSO\ IRU FRUH DQG IODVK
- 9&&4 9&&4 LV WKH SRZHU VXSSO\ IRU LQSXW EXIIHU IRU KRVW
- 966 9664 *URXQGV

| Name | Type | Description |
|---|---|---|
| &/. | , | &ORFN |
| ’6 | 2 33 | ’DWD 6WUREH |
| ’$7 | , 2 33 | |
| ’$7 | , 2 33 | |
| ’$7 | , 2 33 | |
| ’$7 | , 2 33 | |
| ’$7 | , 2 33 | |
| ’$7 | , 2 33 | |
| ’$7 | , 2 33 | |
| ’$7 | , 2 33 | |
| | , 2 33 2’ | &RPPDQG 5HVSRQVH |
| 567BQ | , | +DUGZDUH UHVHW |
| | 6 | 6XSSO\ YROWDJH IRU &RUH |
| | 6 | 6XSSO\ YROWDJH IRU , 2 |
| 966 | 6 | 6XSSO\ YROWDJH JURXQG IRU &RUH |
| 9664 | 6 | 6XSSO\ YROWDJH JURXQG IRU , |
| , LQSXW 2 RXWSXW O3 32 ’ SXW RXW 1& 1RW FRQQHFWHG 6 SRZHU VXSS | | |

**Table 1 -** HÂ00 Interface

| Name | Width (bytes) | Description | Implementation |
|---|---|---|---|
| &,’ | | ’HYLFH ,GHQWLILFDWLRQ QXPEHU DQ LQGLYLGXDO QXP ,GHQWLILFDWLRQ | 0DQGDWRU\ |
| 5&$ | | 5HODWLYH ’HYLFH $GGUHVV LV WKH GHYLFH V\VWHP DG ’\QDPLFDOO\ DVVLJQHG E\ WKH KRVW GXULQJ LQLWLDO | 0DQGDWRU\ |
| ’65 | | ’ULYHU VWDJH 5HVLVWHU WR FRQILJXUH WKH ’HYLFH¶V | 2SWLRQDO |
| &6’ | | ’HYLFH 6SHFLILF ’DWD LQIRUPDWLRQ DERXW WKH ’HYLF &RQGLWLRQV | 0DQGDWRU\ |
| 2&5 | | 2SHUDWLRQ &RQGLWLRQV 5HVLVWHU 8VHG E\ D VSHFLDO FRPPDQG WR LGHQWLI\ WKH YROWDJH W\SH RI WKH ’HYLF | 0DQGDWRU\ |
| (;7B&6’ | | ([WHQGHG ’HYLFH 6SHFLILF ’DWD &RQWDLQV LQIRUPDW WKH ’HYLFH FDSDELOLWLHV DQG VHOHFWDEOH RSWLRQV ,QWURGXFHG LQ VWDQGDUG Y | 0DQGDWRU\ |

**Table 2 -** HÂ00 registers

# H Â 0 0 &  ) H D W X U H  2 Y H U Y L H Z

## *6.1 Boot*

H´00& VXSSRUWV%-(6 ’ERRW RSHUDWLRQ PRGH ERWK PDQGDWRU\ DV
VXSSRUWHG

## *6.2 Sleep* &0'

$ ’HYLFH PD\ EH VZLWFKHG EHWZHHQ D 6OHHS VWDWH DQG D 6WD
6OHHS 6WDWH WKH SRZHU FRQVXPSWLRQ RI WKH PHPRU\ GHYL
RQO\ FRPPDQG5G(V(7 &0’ DUJXPHQW ;) ) ) I +:
UHVHW6/DQG$:.( &0’ $OO WKH RWKHU FRPPDQGV DUH GLVFDUGHG E\ WK
7KH 9FF SRZHU VXSSO\ PD\ EH VZLWFKHG RII LQ 6OHHS VWDWH LV W
XPSWLRQ VDYLQJ

)RU GGLWLRQDO LQIRUPDWLRQ $SHDVH UHIHU -(6’

| 'HYLFH 6WDW | 2SHUDWLRQ PF | %XV PRGH |
|---|---|---|
| ,QDFWLYH 6WDWH | ,QDFWLYH PRGH | 2SHQUDLQ |
| 3UHGOH 6WDWH | %RRW PRGH | |
| 3UHBRRW 6WDWH | | |
| ,GOH 6WDWH | | |
| ,GHQWLILFDWLRQ 6'WDWH | ,GHQWLILFDWLRQ PRGH | |
| 6WDQGE\6WDWH | | |
| 6OHHS 6WDWH | | 3XVKXOO |
| 7UDQVIHU 6WDWH | | |
| %XIVHW 6WDWH | | |
| 6HQGLQJ'DWD 6WDWH | 'DWD WUDQVIHU PRGH | |
| 5HFHLYLQJ'DWD 6WDWH | | |
| 3URJUDPPLQJ 6WDWH | | |
| 'LVFRQQHFW 6WDWH | | |
| %RRW 6WDWH | %RRW PRGH | |
| ,54 6WDWH | ,QWHUUXSW PRGH | 2SHQUDLQ |

**Table 3 -** %XV PRGH¶V RYHUYLHZ

## *6.4 Reliable Write*

H´00& VXSSRUWV % UHOLDEOH ZULWH DV GHILQHG LQ H´00& V

5HOLDEOH ZULWH[ULWH WR VHOHFWHG ZKLFK WKH ROG GDWD SRLQWHG WR

XQFKDQJHG GDWD ORJLFDGGUHVVHV QHZ FHVSUXRJUDPPHG

WR HQVXUH WKDW WKH WDUJHW DGGUHVV XSGDWHG EORFNV DUH

ZULWWHQ ZDLW YDOLGDWHG VXGGHQ ORVV FXUUHQJRJUDPPLQJ

## *6.5 Secure Erase*

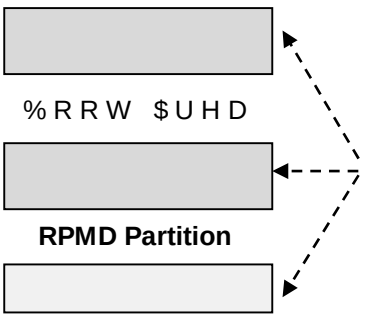
,Q DGGLWLRQ WR WKH VWDQGDUG (UDVH FRP6HFXUH WKHRP´PDQGVXSS

6HFXUH FRPPDQGG IIHUURP EDVLF FRPPDQG UHTXLUHVHYDFHG

WR ZDLW XQWLO WKH RSHUDWLRQ LV FRPSOHWH EHIRUH PRYLQJ

)RU DGGLWLRQDO LQIRUPDWLRQ$SSOHDVH UHIHU -(6'

V H F X U H H U D V H F R P P D Q G U H T X L U H V G H Y L F H W R S H U I R U P D V H F X U H
D Q G F R S \ L W H P V L G H Q W L I L H G I R U H U D V H L Q W K R V H H U D V H J U R X S V
$ S X U J H o o )# Àp Q B Q ia Q‘u ´!ðmca dt PUpH z r h



## 6.9 High priority interrupt + 3 ,

0DQ RSHUDW LQJ HPEHGGHG XQFK UHTXHVW HXGVH, Q HHGV
IHWSFKJHV PLGRO H RSHUDWLRQTXHLVEWGHODXHQGWLFRPSOHWLRQ
ZULWH FRPPDQG ZKLFK LQ WKH ZRUVW FDVH VFHQDULR FDQ WD
7KH KLJK SULRULW\ LQWHUUXSW %+3$ HQVDEOHVQHZLQH-QG' ODWH
VXVSHQGLQJ D ORZHU SULRULW\ RSHUDWLRQ EHIRUH LW LV DFWX
ODWHQF\ LQ W\SLFDO FRQGLWLRQ WR PVHF

)RU DGGLWLRQDO LQIRUPDWL%RQ$SSOHDVH UHIHU -(6'

## 6.10 Background Operations

'HYLFHV KDYH YDULRXV PDLQWHQDQFH RSHUDWLRQVVXFKDWDVWXKDU
FROOHFWLRQG ,QRUGHUUHGXFHWHQGXUDQFHOLIHWLQJFULWLFDOQV EHWWHU
H[HFXWH PDLQWHQDQFH RSHUDWLRQV ZKHQ WKH GHYLFH LV QRW V

2SHUDWLRQV DUH WKHQ VHSDUDWHG LQWR VXZRKWDVSHUVHDGRURHUZRXQG
DQG EDFNJURXQGRSHUDWLRQVWKDW WKH GHYLFH FDQ H[HFXWH Z

)RU DGGLWLRQDO LQIRUPDWL%RQ$SSOHDVH UHIHU -(6'

## 6.11 H/W Reset

+DUGZDUHPD\EHXVHG GHYLFHRHYLQJFDUG 3UHGOH DQGLVDEOLQ
RQ SHULRG ZULWH SURWHFW RQ EORRFXULWKDSWUZDVHWHWEHDYRU
DVVHUWHG

)RU DGGLWLRQDO LQIRUPDWL%RQ$SSOHDVH UHIHU -(6'

## 6.12 Packed &RPPDQGV

5HDGQG FRPPDQGVEHSDFNHGURXSHVRPPDQHLVWDKHHDGZULWHWUDQVIHU
WKH GDWD IRU DOO FRPPDQGV LQ WKH JURXSYHLQKRQEHWUDQVIHU

# *7. Product Specifications*

## *7-1 Power* &RQVXPSWLRQ

| 3RZHU &RQVXPSWLRQ | | 8QLWV |
|---|---|---|
| 6WDQGE\ 9&&4 9&& RQ | | X$ |
| 6OHHS 9&&4 RQ 9&& RII | | X$ |
| +6 5HDG 9&& | | P$ |
| +6 5HDG 9&&4 | | P$ |
| +6 :ULWH 9&& | | P$ |
| +6 :ULWH 9&&4 | | P$ |

**Table 4 -**

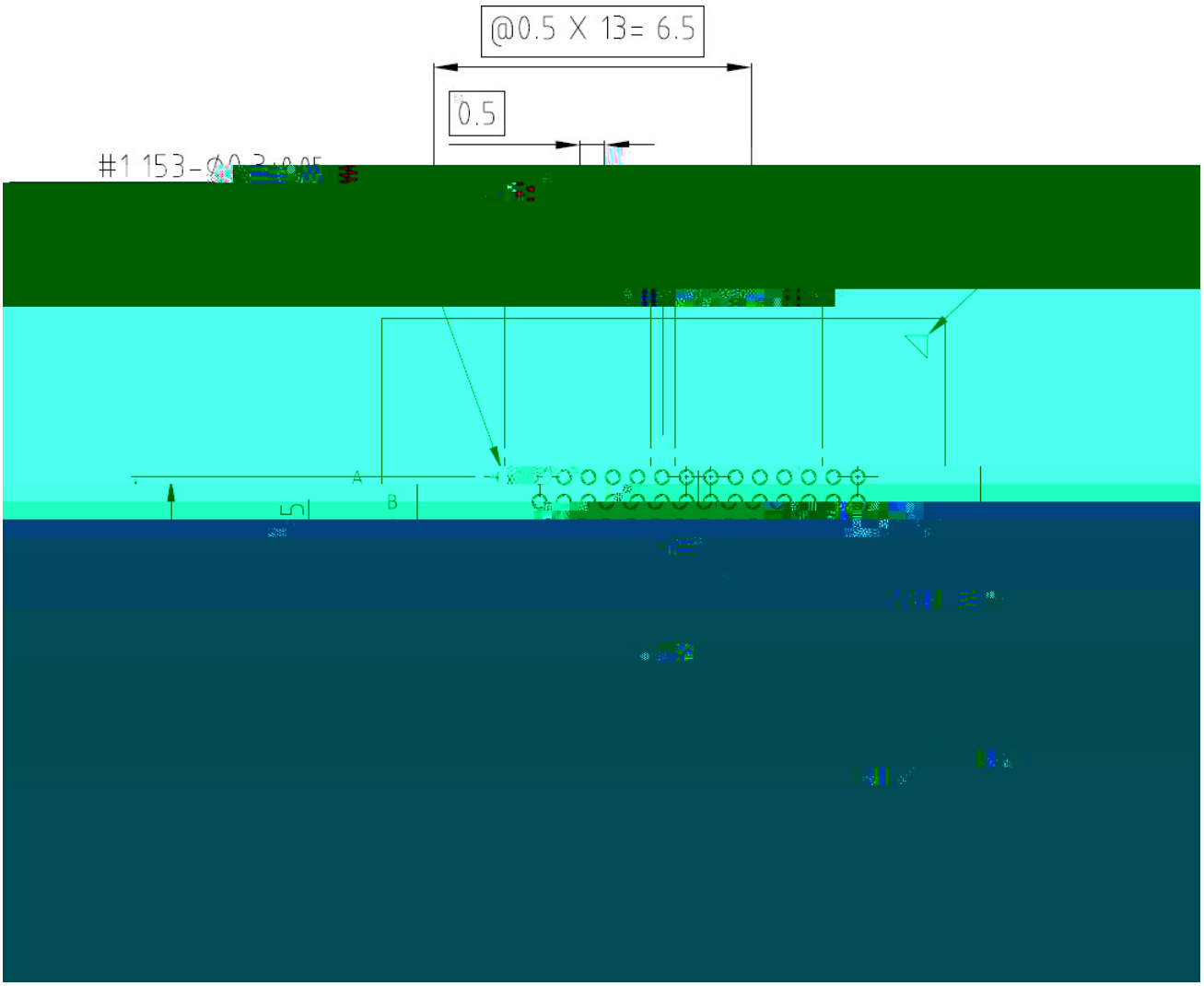



**Figure 5 –** [ [ PP %RWWRP VLGH 9LHZ

*8-2*

(UDVH JURXS VL]H PX(GWL(SBC5H08/7 5 > @ )K

| Name | Field | Cell type | CSD Slice | EXT_ CSD Value | Remark |
|---|---|---|---|---|---|
| &0' 4XHXLQJ 'HSWK | &K0'4B'(37+ | 5 | > @ | | |
| 5HVHUYHG | | | > @ | | |
| 1XPEHU RI ): VHFWRUV FRUUHFWO\ SURJUDPPHG | 180%(5B2)B):B 6(&725256B&255( 1XP%HU2*5$00 | 5 | > | @ | |
| 9HQGRU SURSULHWDU\ | 9(1'25B35235( 7$5<B+($7+B5( 3257 | 5 | > | @ | |
| 'HYLFH OLIH WLPH W\SH % | +(9,&(B/,)(B7,0( B(67B7<3B% | 5 | > @ | | |
| 'HYLFH OLIH WLPH W\SH $ | +(9,&(B/,)(B7,0( B(67B7<3B$ | 5 | > @ | | |
| 3UH (2/ LQIRUPDWLRQ | 5(6(5 9('B2/B,1)2 | 5 | > @ | | |
| 2SWLPDO UHDG VL]H | 237,0$/B5($'B6, =( | 5 | > @ | K | |
| 2SWLPDO ZULWH VL]H | 237,0$/B:5,7(B6 ,=( | 5 | > @ | K | |
| 2SWLPDO WULP XQLW VL]H | 237,0$/B75,0B81 ,7B6,=( | 5 | > @ | K | |
| 'HYLFH YHUVLRQ | '(9,&(B9(56,21 | 5 | > | @ | |
| )LUPZDUH YHUVLRQ | )50:$5(B9(56, 21 | 5 | > | @ | |
| 3RZHU FODVV IRU ''5 DW 9&& 9 | 3:5B0&+/B''5B B | 5 | > @ | | |
| | &$&+(B6,=( | 5 | > | @ | |
| *HQHULF &0' WLPHRXW | *(1(5 &B&0' B7, | 5 | > @ | | 1RW GHILQHG |

| Name | Field | Cell type | CSD Slice | EXT_ CSD Value | Remark |
|---|---|---|---|---|---|
| | | | | | |

| Name | Field | Cell type | CSD Slice | EXT_CSD Value | Remark |
|---|---|---|---|---|---|
| 8VHU DUHD ZULWH SURWHFWLRQ UHJLVWHU | 86(5B:3 | 5 : 5 : &B3 5: (B3 | > @ | | |
| 5HVHUYHG | 5(6(59(' | | > @ | | |
| ): FRQILJXUDWLRQ | QB&21),* | 5 : | > @ | | ): XSGDWHV HQDEOHG |
| 530% 6L]H | 530%B6,=(B08/7 | 5 | > @ | | 530% VL]H .% |
| UHOLDEOH :ULWH UHJLVWHU | :5B5(/B6(7 | 5 : | > @ | | |
| :ULWH UHOLDELOLW\ SDUDPHWHU UHJLVWHU | :5B5(/B3$5$0 | 5 | > @ | | (QKDQFHG GHILQLWLRQ RI UHOLD $OO :5B5(/B6(/ UHJLV :HU DUH |
| 6WDUW 6DQLWL]H | 6 1,7 (B6 7 ; ( B3 | | > @ | | |
| 0DQXDOO\ VWDUW EDFNJURXQG RSHUDWLRQV | % 236B(1 | : ( B3 | > @ | | |
| (QDEOH EDFNJURXQG RSHUDWLRQV KDQGVKDNH | % 236B(1 | 5 : | > @ | | |
| + : UHVHW IXQFWLRQ | 1R7B QB)81&7,21 | 1 : | > @ | | |
| +3, PDQDJHPHQW | +3,B0*07 | 5 : (B3 | > @ | | |
| 3DUWLWLRQLQJ 6XSSRUW | 3$57 7 21,1*B68 3257 | 5 | > @ | K | &DQ KDYH H[WHQGHG SDUWLWLRQ &DQ KDYH HQKDQFHG IHDWXUHV 'HYLFH VXSSRUWV HQKDQFHG |
| 0D[ (QKDQFHG $UHD 6L]H | 0$;B(1+B6,=(B0 8/7 | 5 | > | @ | *% K |
| 3DUWLWLRQV DWWULEXWH | 3$57 7 216B$775 8%87( | 5 : | > @ | | %LW> @ 5HVHUYHG %LW> @ 6HW (QKDQFHG DWWULE 3XUSRVH SDUWLWLRQ %LW> @ 6HW (QKDQFHG DWWULE 3XUSRVH SDUWLWLRQ %LW> @ 6HW (QKDQFHG DWWULE 3XUSRVH SDUWLWLRQ %LW> @ 6HW (QKDQFHG DWWULE 3XUSRVH SDUWLWLRQ |
| 3DUWLWLRQLQJ 6HWWLQJ | 3$57 721B6(77,1 *B &203/(7(' | 5 : | > @ | | |

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