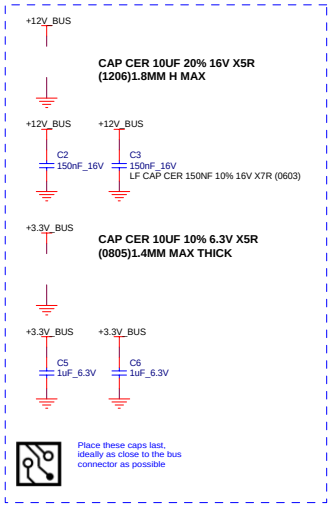
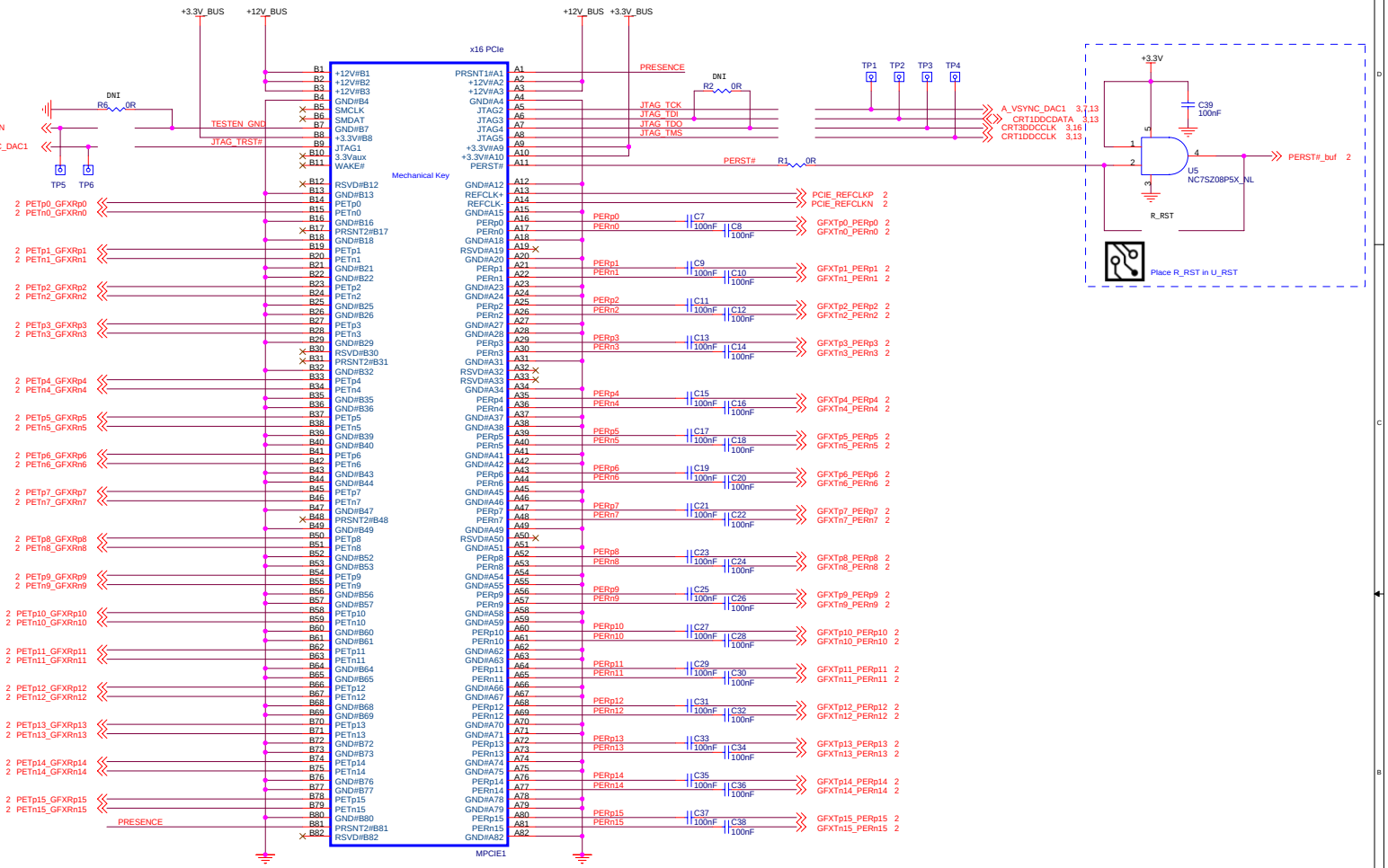
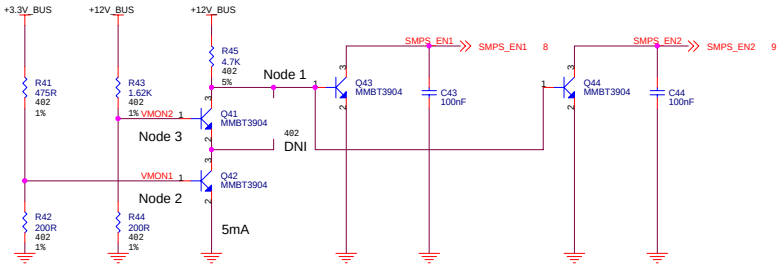
# PCI-EXPRESS EDGE CONNECTOR




## POWER SEQUENCING




Power Sequence Circuit to ensure SMPS_EN is released after +12V_BUS and +3.3V_BUS are both in regulation.
Pull-up may or may not be required on SMPS_EN signal depending on SMPS design.

Node 1 When +12V ramps above min Vbe, SMPS_EN will be helt low

Node 2 When +3.3V gets close to regulation, one of the two conditions of releasing SMPS_EN is active

Target ~ 900mV when +3.3 at min regulation (worse case)

Typical trigger when +3.3V ramps above 2.2V (650mV)

Node 3 When +12V gets close to regulation, one of the two conditions of releasing SMPS_EN is active

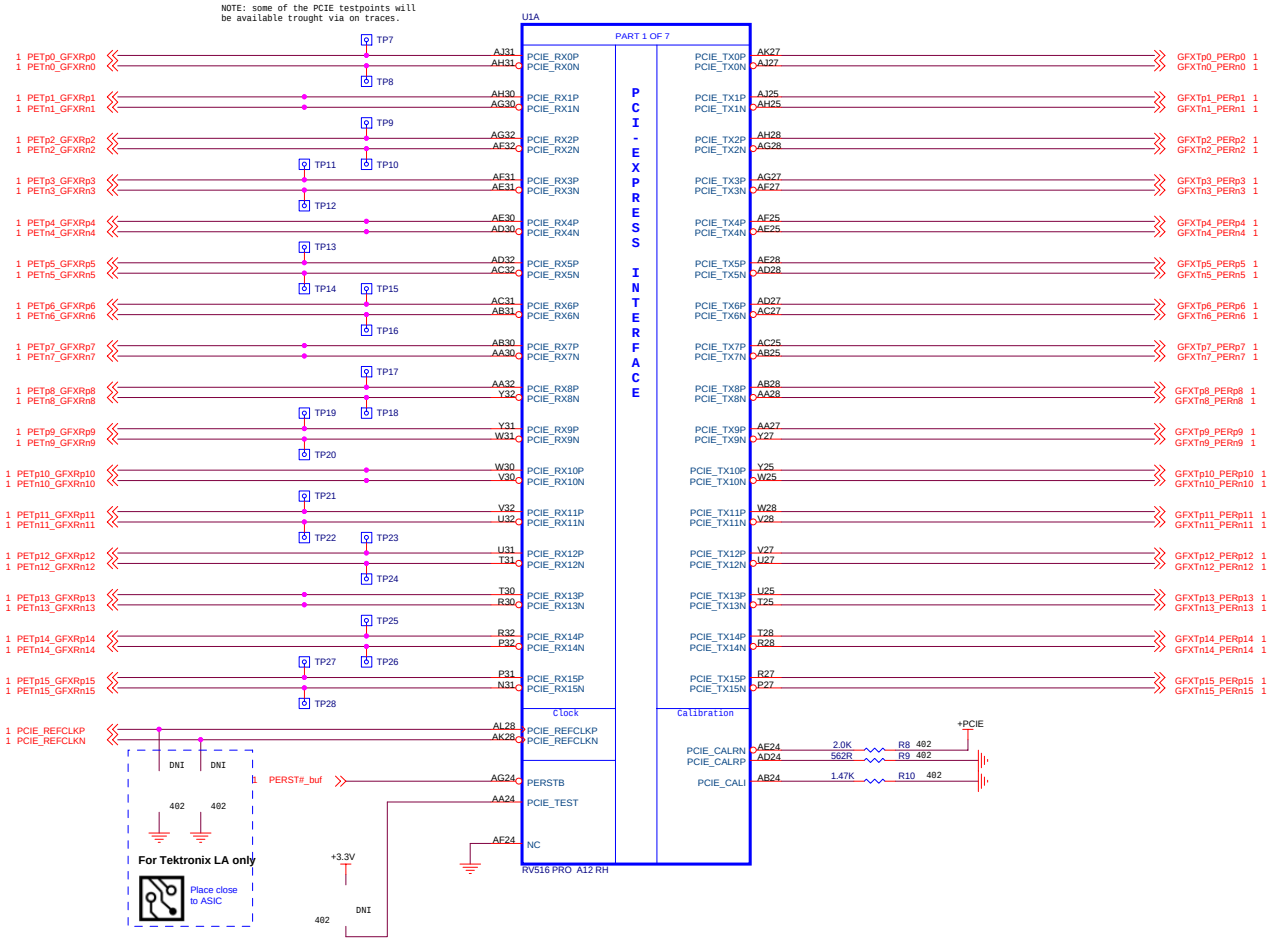
Target ~ 1.25V when +12 at min regulation (worse case)

Typical trigger when +12V ramps above 10V (1.1V)

| SYMBOL LEGEND | |
|---|---|
| DNI | DO NOT INSTALL |
| # | ACTIVE LOW |
| | DIGITAL GROUND |
| | ANALOG GROUND |

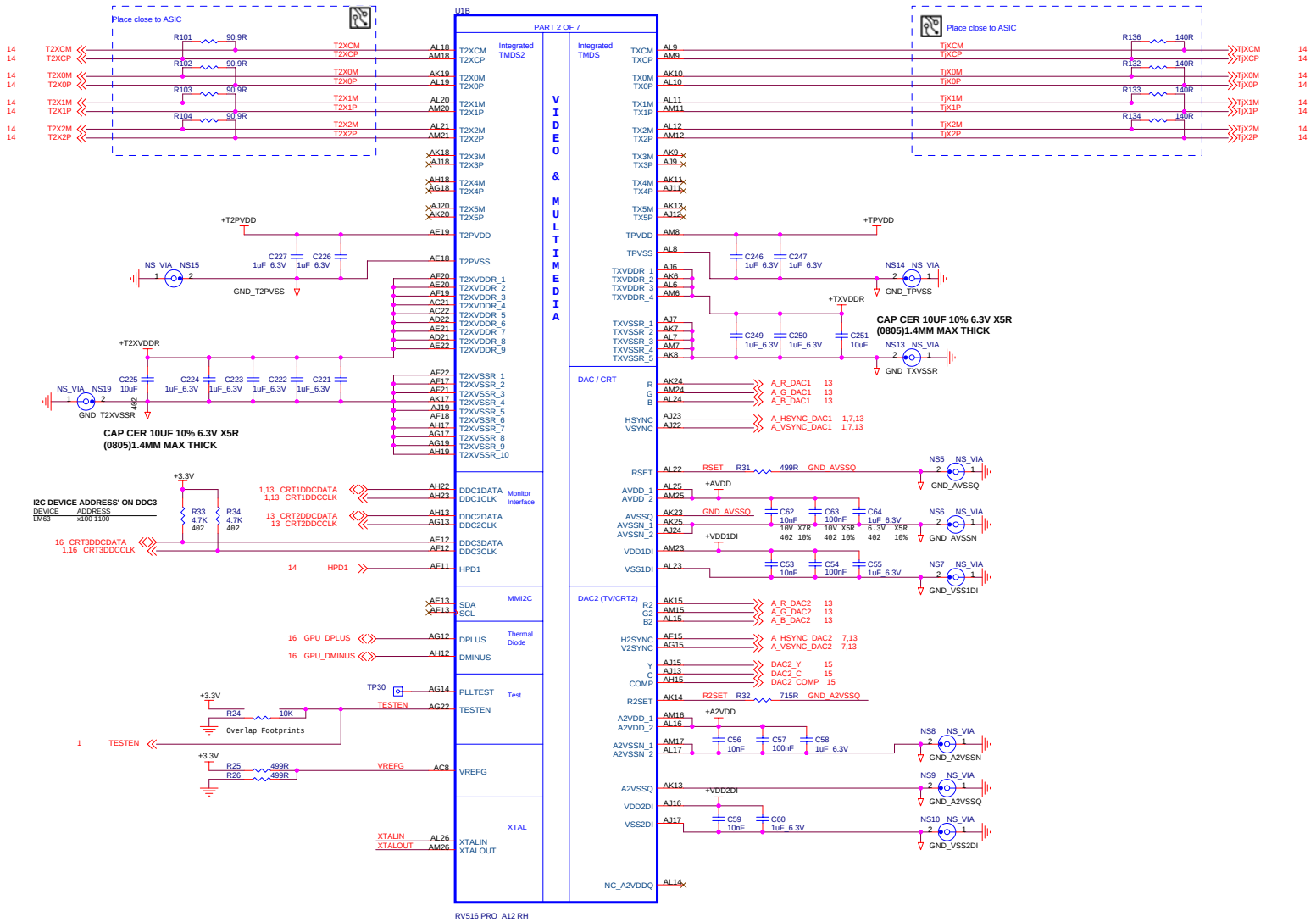

ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

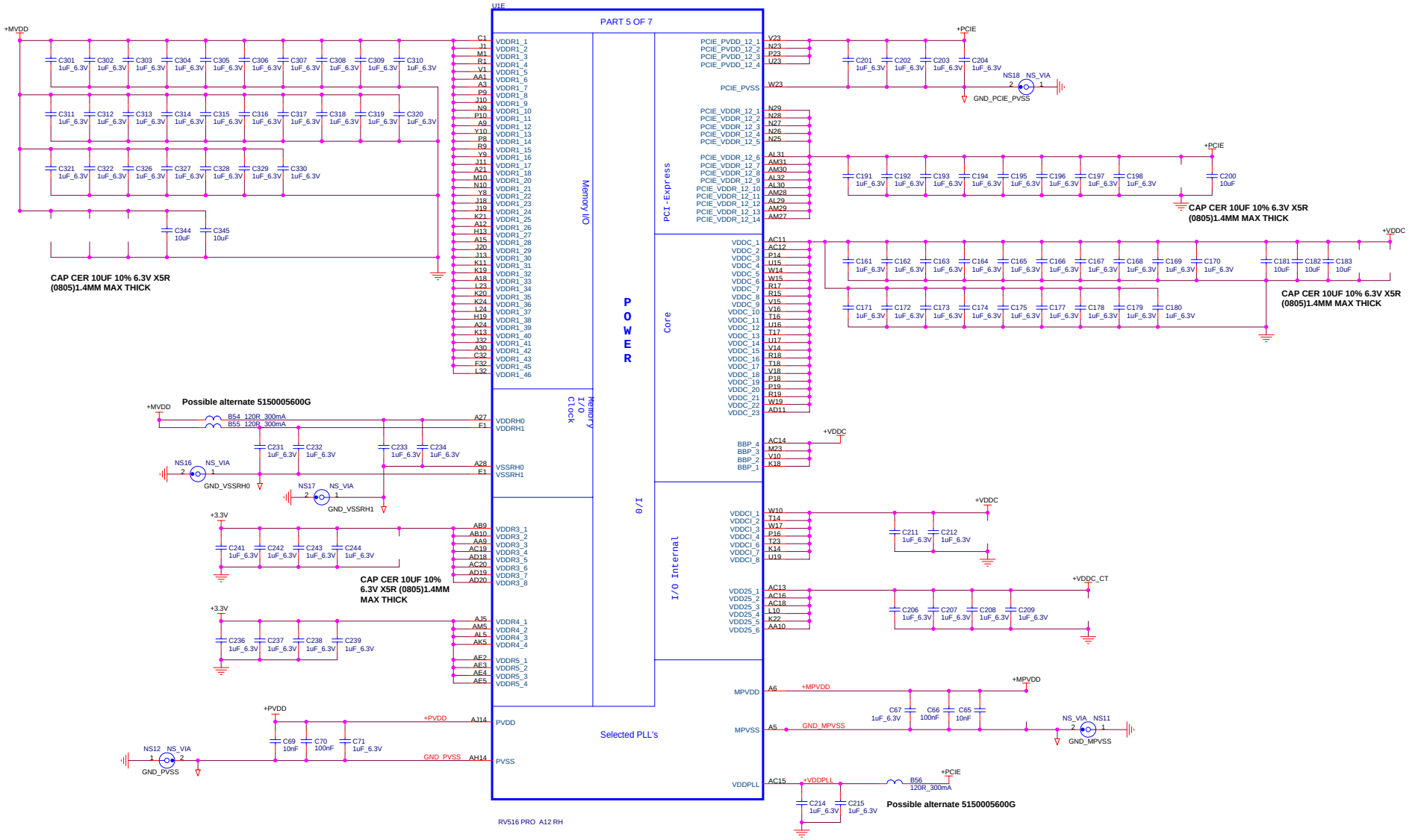

| | | | |
|---|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | | |
| Size C | Document Number 105-A92431-20A | | Rev 3 |
| Date: Wednesday, June 07, 2006 | | Sheet 1 of 19 | |




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size C | Document Number 105-A92431-20A | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 2 of 19 | |

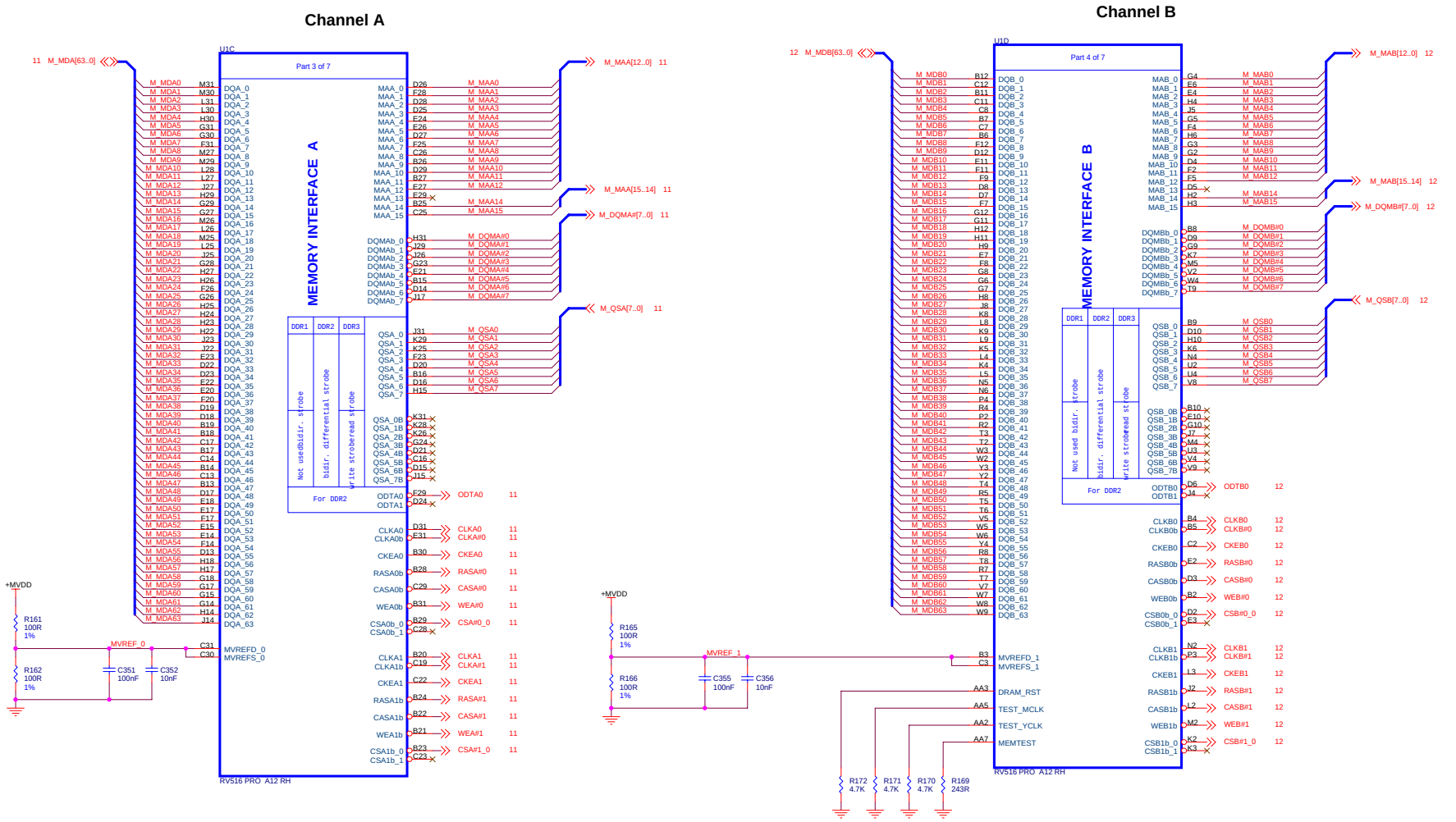

U1B
PART 2 OF 7
VIDEO & MULTIMEDIA
Integrated TMDS2
Integrated TMDS
DAC / CRT
DAC2 (TV/CRT2)
Monitor Interface
MMI2C
Thermal Diode
Test
XTAL
Place close to ASIC
CAP CER 10UF 10% 6.3V X5R (0805)1.4MM MAX THICK
I2C DEVICE ADDRESS' ON DDC3
RV516 PRO A12 RH
ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600
RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP
105-A92431-20A
Wednesday, June 07, 2006




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size C | Document Number 105-A92431-20A | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 4 of 19 | |

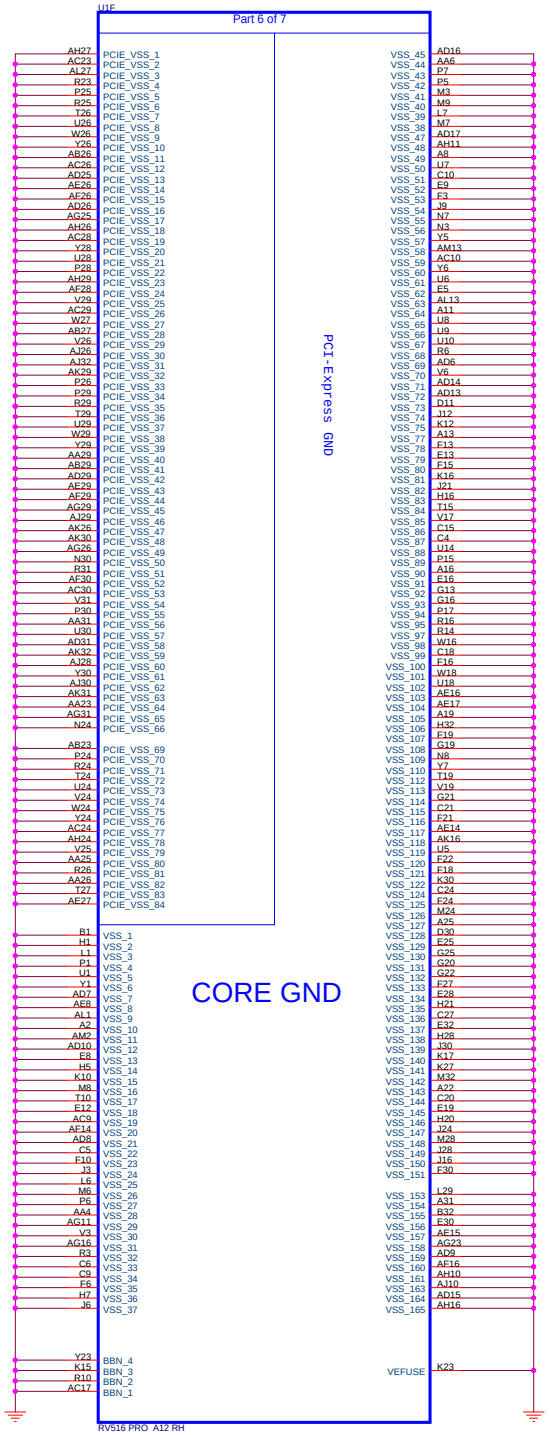
# RV530 MEMORY CHANNELS A and B



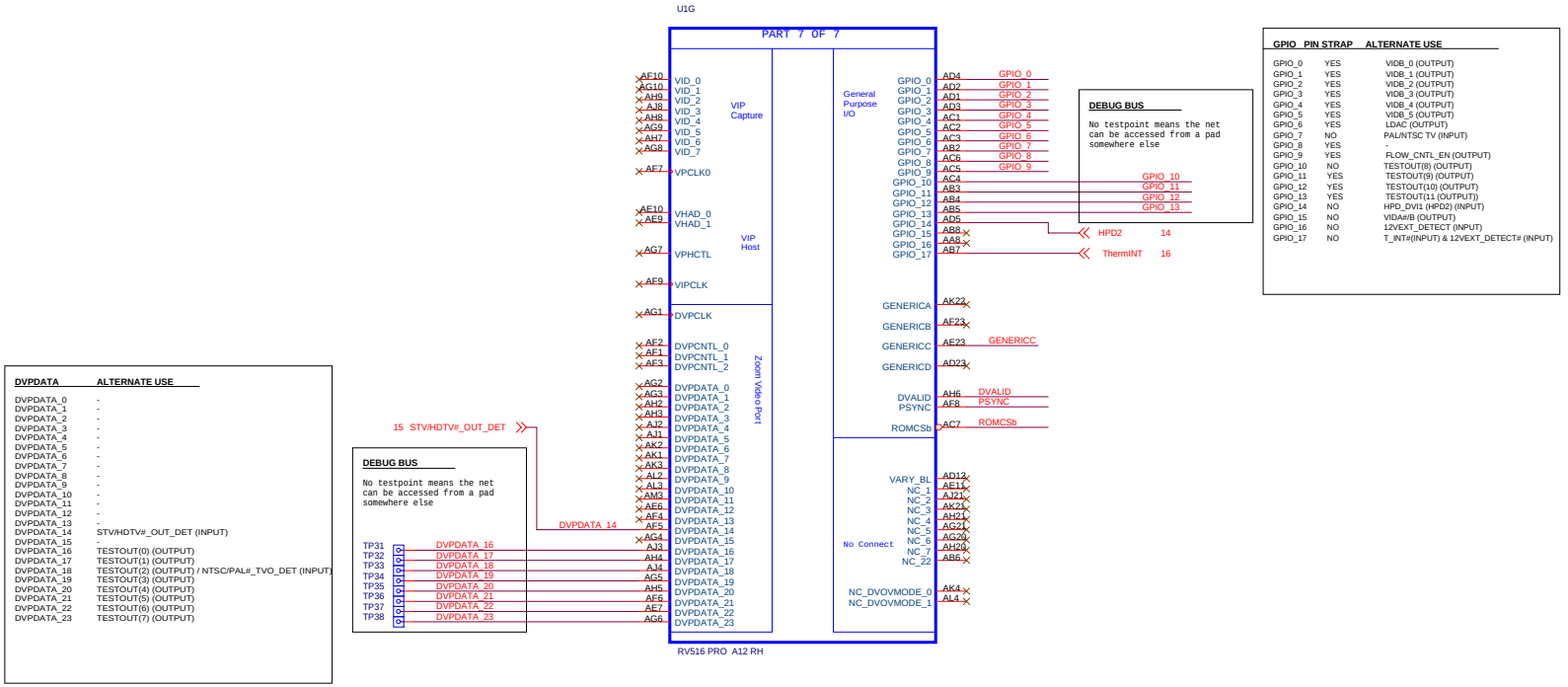


ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600


| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size C | Document Number 105-A92431-20A | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 5 of 19 | |



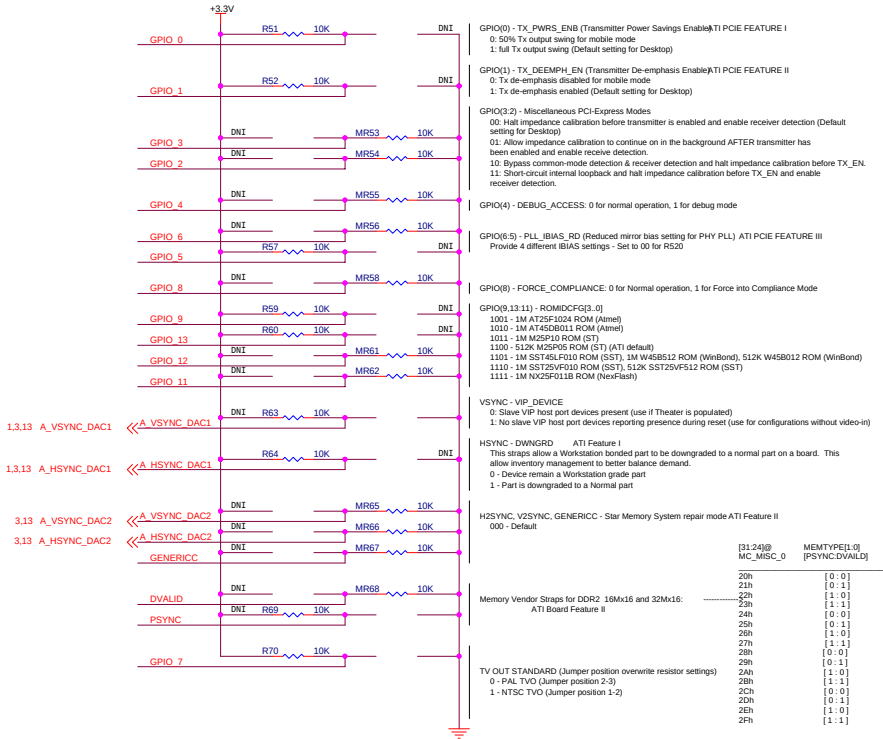

| | |
|---|---|
| ATI Technologies Inc. | |
| 1 Commerce Valley Drive East<br>Markham, Ontario<br>Canada, L3T 7X6<br>(905) 882-2600 | |
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP |
| Size: C | Document Number: 105-A92431-20A |
| Rev: 3 | |
| Date: Wednesday, June 07, 2006 | Sheet 6 of 19 |




| GPIO | PIN STRAP | ALTERNATE USE |
|---|---|---|
| GPIO_0 | YES | VIDB_0 (OUTPUT) |
| GPIO_1 | YES | VIDB_1 (OUTPUT) |
| GPIO_2 | YES | VIDB_2 (OUTPUT) |
| GPIO_3 | YES | VIDB_3 (OUTPUT) |
| GPIO_4 | YES | VIDB_4 (OUTPUT) |
| GPIO_5 | YES | VIDB_5 (OUTPUT) |
| GPIO_6 | YES | LDAC (OUTPUT) |
| GPIO_7 | NO | PAL/NTSC TV (INPUT) |
| GPIO_8 | YES | - |
| GPIO_9 | YES | FLOW_CNTL_EN (OUTPUT) |
| GPIO_10 | NO | TESTOUT(8) (OUTPUT) |
| GPIO_11 | YES | TESTOUT(9) (OUTPUT) |
| GPIO_12 | YES | TESTOUT(10) (OUTPUT) |
| GPIO_13 | YES | TESTOUT(11 (OUTPUT)) |
| GPIO_14 | NO | HPD_DVI1 (HPD2) (INPUT) |
| GPIO_15 | NO | VIDA#/B (OUTPUT) |
| GPIO_16 | NO | 12VEXT_DETECT (INPUT) |
| GPIO_17 | NO | T_INT#(INPUT) & 12VEXT_DETECT# (INPUT) |

| DVPDATA | ALTERNATE USE |
|---|---|
| DVPDATA_0 | - |
| DVPDATA_1 | - |
| DVPDATA_2 | - |
| DVPDATA_3 | - |
| DVPDATA_4 | - |
| DVPDATA_5 | - |
| DVPDATA_6 | - |
| DVPDATA_7 | - |
| DVPDATA_8 | - |
| DVPDATA_9 | - |
| DVPDATA_10 | - |
| DVPDATA_11 | - |
| DVPDATA_12 | - |
| DVPDATA_13 | - |
| DVPDATA_14 | STV/HDTV#_OUT_DET (INPUT) |
| DVPDATA_15 | - |
| DVPDATA_16 | TESTOUT(0) (OUTPUT) |
| DVPDATA_17 | TESTOUT(1) (OUTPUT) |
| DVPDATA_18 | TESTOUT(2) (OUTPUT) / NTSC/PAL#_TVO_DET (INPUT) |
| DVPDATA_19 | TESTOUT(3) (OUTPUT) |
| DVPDATA_20 | TESTOUT(4) (OUTPUT) |
| DVPDATA_21 | TESTOUT(5) (OUTPUT) |
| DVPDATA_22 | TESTOUT(6) (OUTPUT) |
| DVPDATA_23 | TESTOUT(7) (OUTPUT) |

## PIN BASED STRAPS




GPIO(0) - TX_PWRS_ENB (Transmitter Power Savings Enable) ATI PCIE FEATURE I
0: 50% Tx output swing for mobile mode
1: full Tx output swing (Default setting for Desktop)

GPIO(1) - TX_DEEMPH_EN (Transmitter De-emphasis Enable) ATI PCIE FEATURE II
0: Tx de-emphasis disabled for mobile mode
1: Tx de-emphasis enabled (Default setting for Desktop)

GPIO(3:2) - Miscellaneous PCI-Express Modes
00: Halt impedance calibration before transmitter is enabled and enable receiver detection (Default setting for Desktop)
01: Allow impedance calibration to continue on in the background AFTER transmitter has been enabled and enable receive detection.
10: Bypass common-mode detection & receiver detection and halt impedance calibration before TX_EN.
11: Short-circuit internal loopback and halt impedance calibration before TX_EN and enable receiver detection.

GPIO(4) - DEBUG_ACCESS: 0 for normal operation, 1 for debug mode

GPIO(6:5) - PLL_IBIAS_RD (Reduced mirror bias setting for PHY PLL) ATI PCIE FEATURE III
Provide 4 different IBIAS settings - Set to 00 for R520

GPIO(8) - FORCE_COMPLIANCE: 0 for Normal operation, 1 for Force into Compliance Mode

GPIO(9,13:11) - ROMIDCFG[3..0]
1001 - 1M AT25F1024 ROM (Atmel)
1010 - 1M AT45DB011 ROM (Atmel)
1011 - 1M M25P10 ROM (ST)
1100 - 512K M25P05 ROM (ST) (ATI default)
1101 - 1M SST45LF010 ROM (SST), 1M W45B512 ROM (WinBond), 512K W45B012 ROM (WinBond)
1110 - 1M SST25VF010 ROM (SST), 512K SST25VF512 ROM (SST)
1111 - 1M NX25F011B ROM (NexFlash)

VSYNC - VIP_DEVICE
0: Slave VIP host port devices present (use if Theater is populated)
1: No slave VIP host port devices reporting presence during reset (use for configurations without video-in)

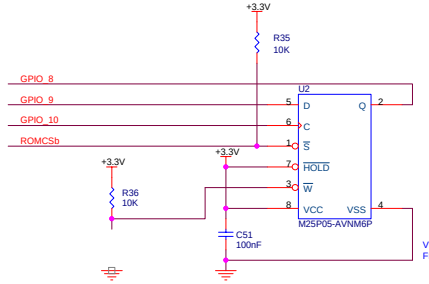
HSYNC - DWNGRD ATI Feature I
This straps allow a Workstation bonded part to be downgraded to a normal part on a board. This allow inventory management to better balance demand.
0 - Device remain a Workstation grade part
1 - Part is downgraded to a Normal part

H2SYNC, V2SYNC, GENERICC - Star Memory System repair mode ATI Feature II
000 - Default

Memory Vendor Straps for DDR2 16Mx16 and 32Mx16: ATI Board Feature II

| [31:24]@ MC_MISC_0 | MEMTYPE[1:0] [PSYNC:DVAILD] | Memory |
|---|---|---|
| 20h | [ 0 : 0 ] | Common and Infineon 16Mx16 2.0V |
| 21h | [ 0 : 1 ] | Samsung 16Mx16 |
| 22h | [ 1 : 0 ] | Infineon 16Mx16 1.8V |
| 23h | [ 1 : 1 ] | Hynix 16Mx16 |
| 24h | [ 0 : 0 ] | Micron 16Mx16 |
| 25h | [ 0 : 1 ] | Elpida 16Mx16 |
| 26h | [ 1 : 0 ] | Reserved |
| 27h | [ 1 : 1 ] | Reserved |
| 28h | [ 0 : 0 ] | Common 32Mx16 |
| 29h | [ 0 : 1 ] | Samsung 32Mx16 |
| 2Ah | [ 1 : 0 ] | Infineon 32Mx16 |
| 2Bh | [ 1 : 1 ] | Hynix 32Mx16 |
| 2Ch | [ 0 : 0 ] | Micron 32Mx16 |
| 2Dh | [ 0 : 1 ] | Elpida 32Mx16 |
| 2Eh | [ 1 : 0 ] | Reserved |
| 2Fh | [ 1 : 1 ] | Reserved |

TV OUT STANDARD (Jumper position overwrite resistor settings)
0 - PAL TVO (Jumper position 2-3)
1 - NTSC TVO (Jumper position 1-2)




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

| | | | |
|---|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | | |
| Size C | Document Number 105-A92431-20A | | Rev 3 |
| Date: Wednesday, June 07, 2006 | | Sheet 7 of 19 | |

## VDDC-PWM1

SIPEX SP6132A p/n 2480054700G

## VDDC-PWM2

INTERSIL ISL6522/ISL6535
RICHTEK RT9232/RT9232A
ANPEC APW7062A
ANPEC APW7062B

## VDDC-PWM3

RICHTEK RT9214
INTERSIL ISL6545

## VDDC-PWM4

ANPEC APW7061A

**This symbol is used for 103 SMPS p/n.**

VDDC1

CAP CER 10UF 20% 16V X5R (1206)1.8MM H MAX

CAP CER 10UF 10% 6.3V X5R (0805)1.4MM MAX THICK

QL

DUAL FOOTPRINT

MULTI FOOTPRINT

0.8V Ref

R4 = (R1 x 0.8V) / (Vout1 - 0.8V)

Place R1 and R4 close to PWM and routed with separate 20mil trace to the ASIC

**Regulator for VDDC (ASIC Core)**

**Vout = 1V ~ 1.3V**

| Part | Vout | R1 | R2 |
|---|---|---|---|
| 0.8V Ref | 1.2V | 1.00K 1% | 2.00K 1% |
| | 1.25V | 1.00K 1% | 1.78K 1% |
| | 1.3V | 1.00K 1% | 1.6K 1% |

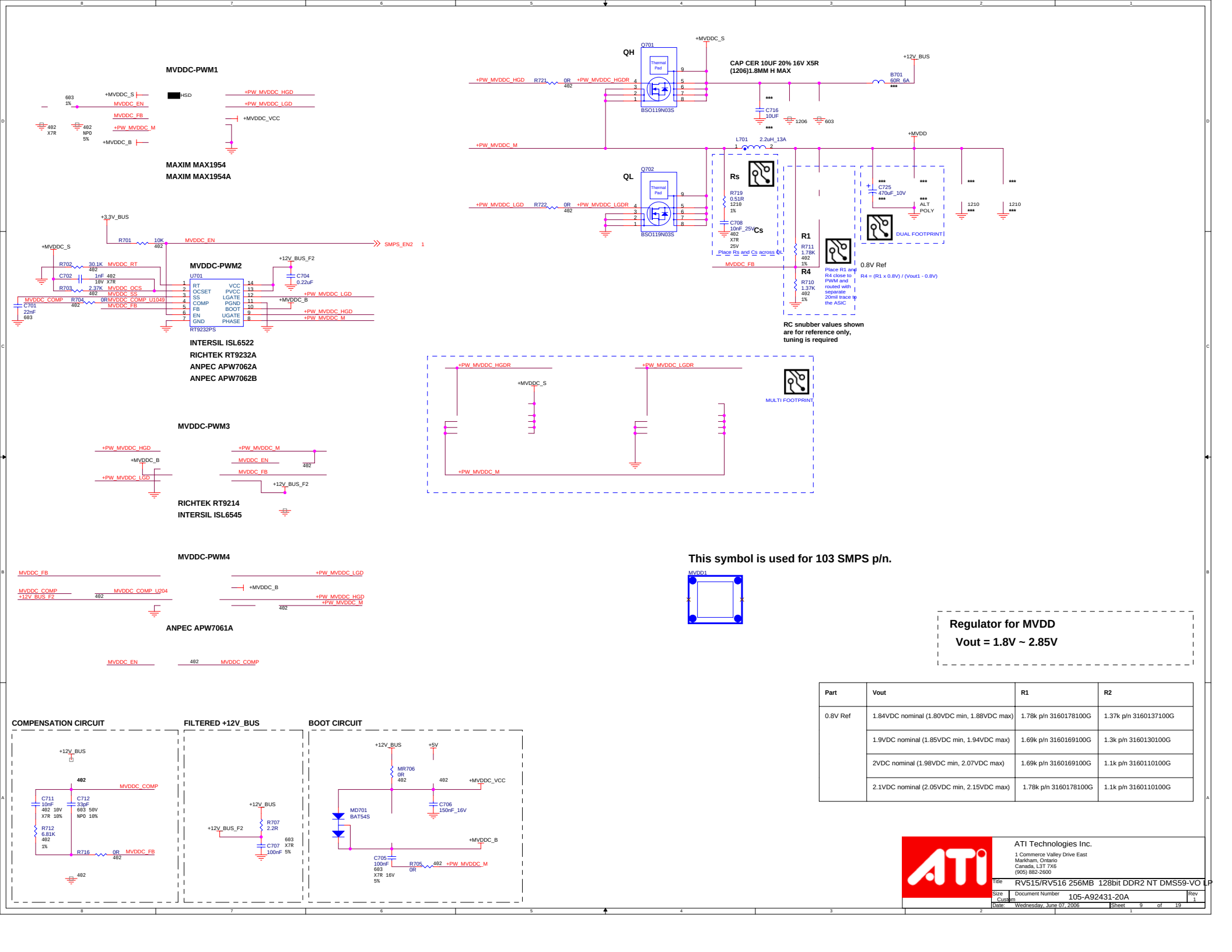
## COMPENSATION CIRCUIT

## FILTERED +12V_BUS

## BOOT CIRCUIT


ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600


| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size: Custom | Document Number: 105-A92431-20A | Rev: 3 |
| Date: Wednesday, June 07, 2006 | Sheet 8 of 19 | |




| Part | Vout | R1 | R2 |
|---|---|---|---|
| 0.8V Ref | 1.84VDC nominal (1.80VDC min, 1.88VDC max) | 1.78k p/n 3160178100G | 1.37k p/n 3160137100G |
| | 1.9VDC nominal (1.85VDC min, 1.94VDC max) | 1.69k p/n 3160169100G | 1.3k p/n 3160130100G |
| | 2VDC nominal (1.98VDC min, 2.07VDC max) | 1.69k p/n 3160169100G | 1.1k p/n 3160110100G |
| | 2.1VDC nominal (2.05VDC min, 2.15VDC max) | 1.78k p/n 3160178100G | 1.1k p/n 3160110100G |


ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600


| | | | |
|---|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | | |
| Size: Custom | Document Number: 105-A92431-20A | | Rev: 1 |
| Date: Wednesday, June 07, 2006 | Sheet 9 of 19 | | |

**Alt regulator for +MPVDD**
**Vout = 1.2V (not tracking to VDDC)**
**Iout = 10mA MAX**

| | Rt1 | Rt2 |
|---|---|---|
| 1.52V | 432R 3240432000<br>3160432000 | 2.15K<br>3160215100 |
| 1.61V | 432R 3240432000 | 1.5K 3230015200<br>1.5K 3160150100 |
| 1.69V | 432R 3240432000 | 1.21K 3240121100 |
| 1.718V | 562R 3240562000 | 1.5K 3230015200<br>1.5K 3160150100 |
| 1.75V | 604R 3160604000 | 1.5K 3230015200<br>1.5K 3160150100 |
| 1.8V | 604R 3160604000 | 1.37K 3160137100 |

**RT9199 p/n 2480054800G (480mR RdsON Max)**
**RT9199A (300mR RdsON Max)**
**RT9173C (250mR RdsON Max)**
**APL5331 p/n 2480054200G (350mR MAX for 2A)**

**Optional regulator for I/O**
**Vout = 2.5V~2.65V**
**Iout = 1A MAX**

**Supported footprint:**
**RT9173C/RT9199A/RT9199**
**APL5331**

~ 2.5V Drop MAX
200mW MAX
1/4 W

270mW MAX for 60mA

Req = 120.7R
Use 845R, 1206, 1/4W

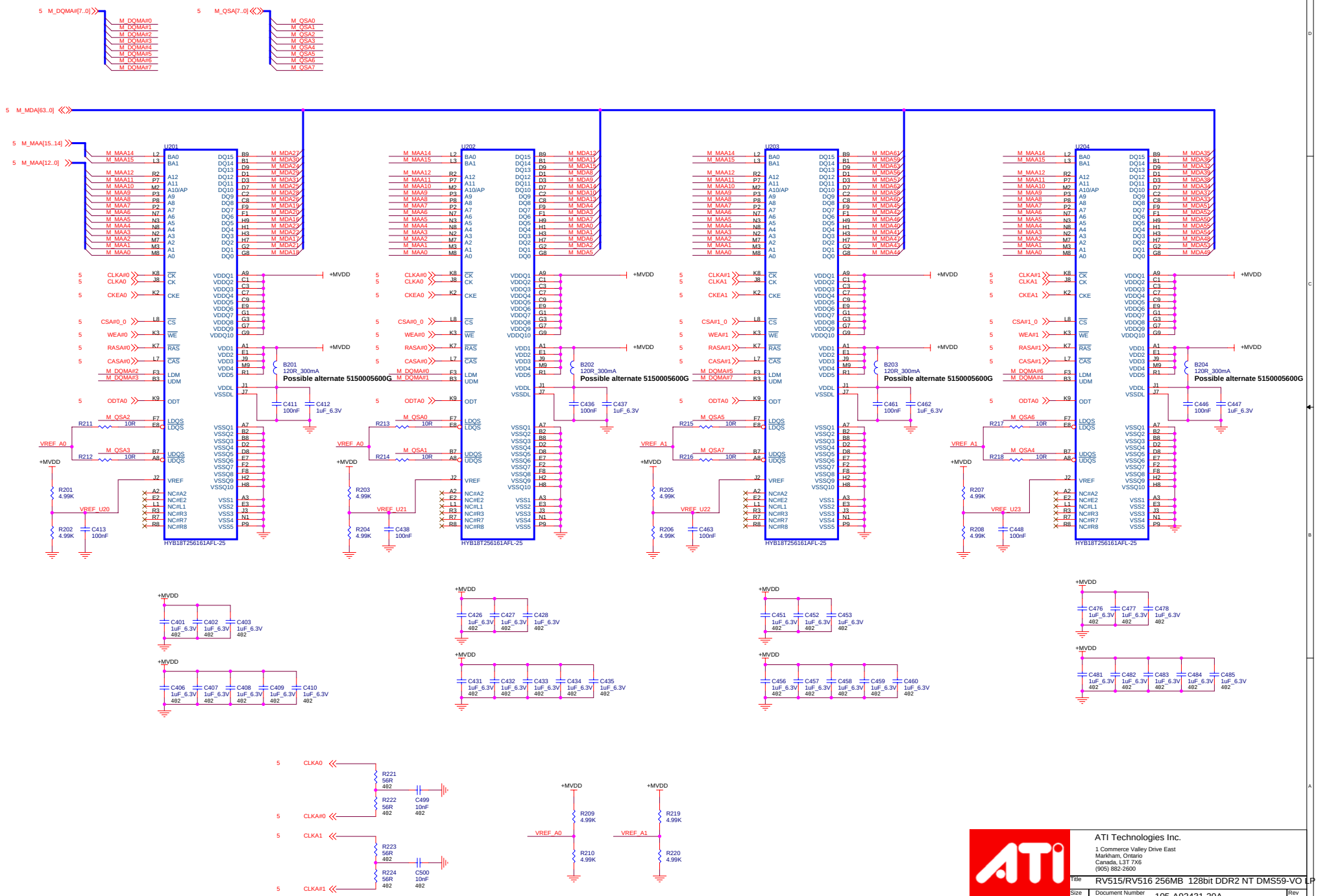
Multi-footprint

Possible alternate 5150005600G

ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

Title: RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP
Size: C | Document Number: 105-A92431-20A | Rev: 3
Date: Wednesday, June 07, 2006 | Sheet 10 of 19

# CHANNEL A: RANK 0 128MB DDR2

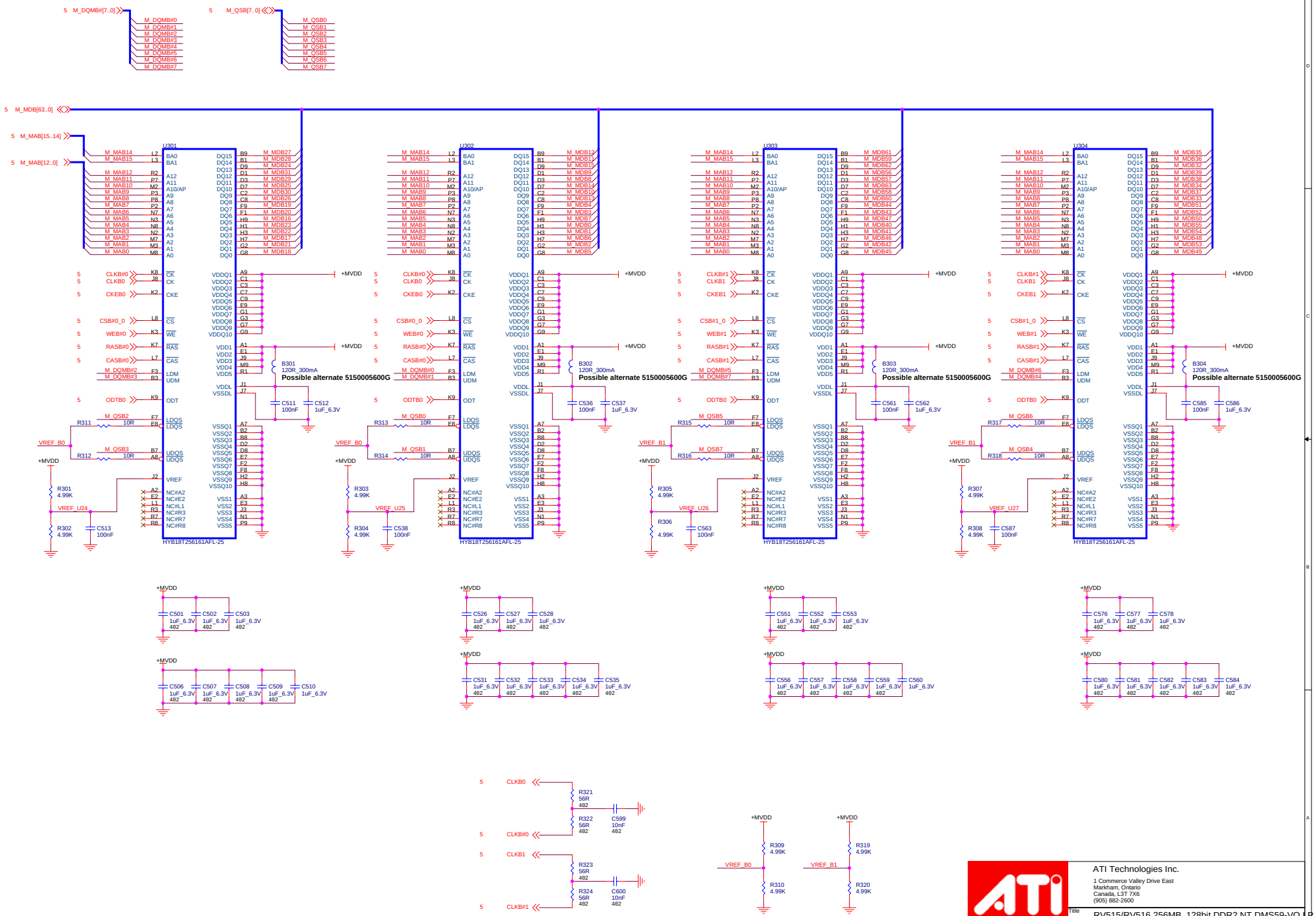




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600


| | | | |
|---|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | | |
| Size C | Document Number 105-A92431-20A | | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 11 of 19 | | |

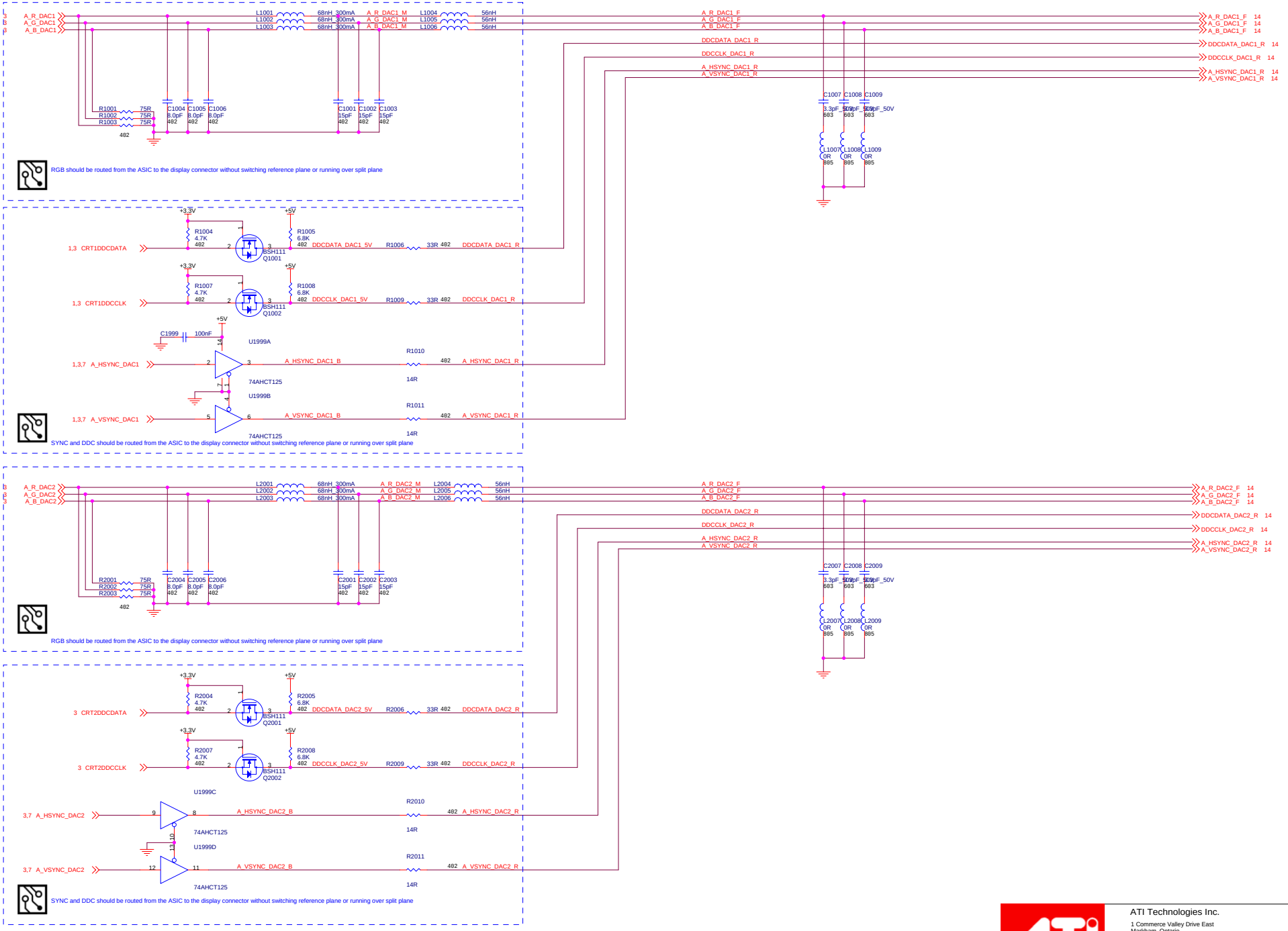
# CHANNEL B: RANK 0 128MB DDR2





ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

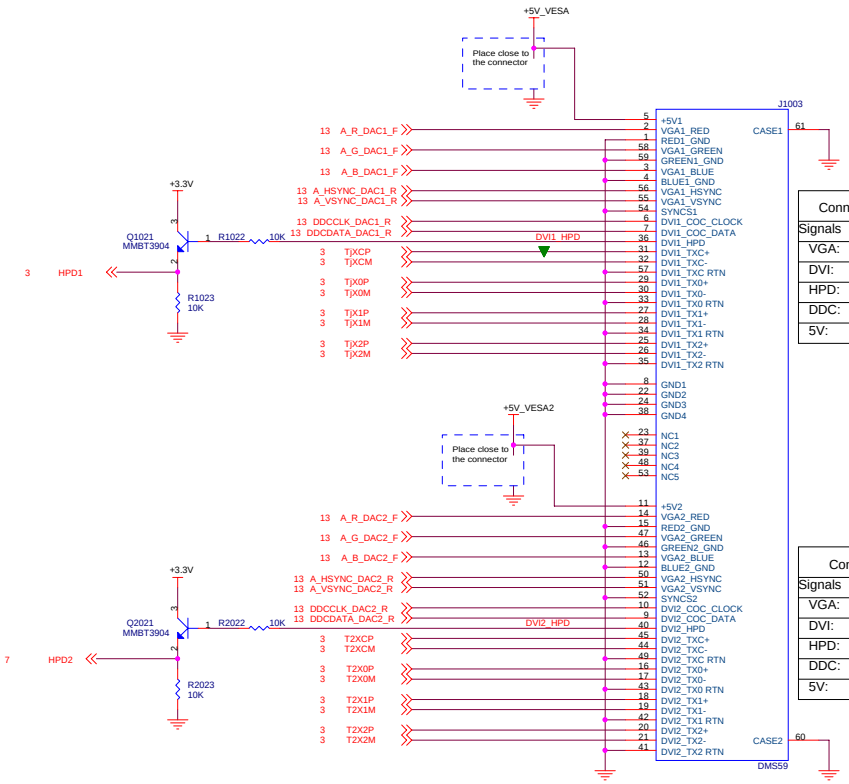

| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size C | Document Number 105-A92431-20A | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 12 of 19 | |




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

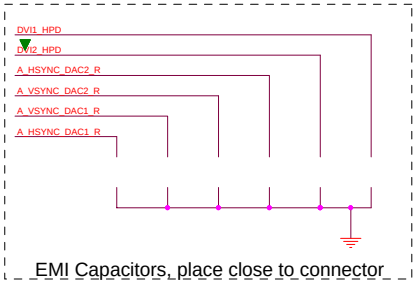
| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size: Custom | Document Number: 105-A92431-20A | Rev: 3 |
| Date: Wednesday, June 07, 2006 | Sheet 13 of 19 | |

# VESA Multi-Display Interface DMS-59 Connector




| Connector 1 | |
|---|---|
| Signals | Mapping |
| VGA: | DAC1 |
| DVI: | Internal TMDS1 |
| HPD: | Internal TMDS HPD |
| DDC: | CRT1 DDC |
| 5V: | +5V_VESA |

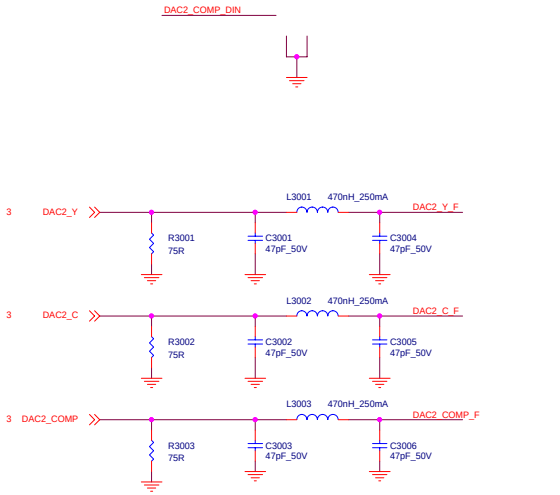
| Connector 2 | |
|---|---|
| Signals | Mapping |
| VGA: | DAC2 (TVDAC) |
| DVI: | Internal TMDS2 (LVTM) |
| HPD: | Internal TMDS2 HPD |
| DDC: | DVI DDC |
| 5V: | +5V_VESA2 |

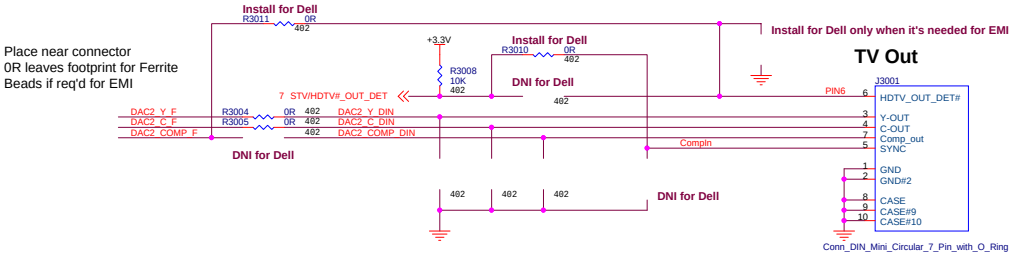




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600


| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size: Custom | Document Number: 105-A92431-20A | Rev: 0 |
| Date: Wednesday, June 07, 2006 | Sheet 14 of 19 | |

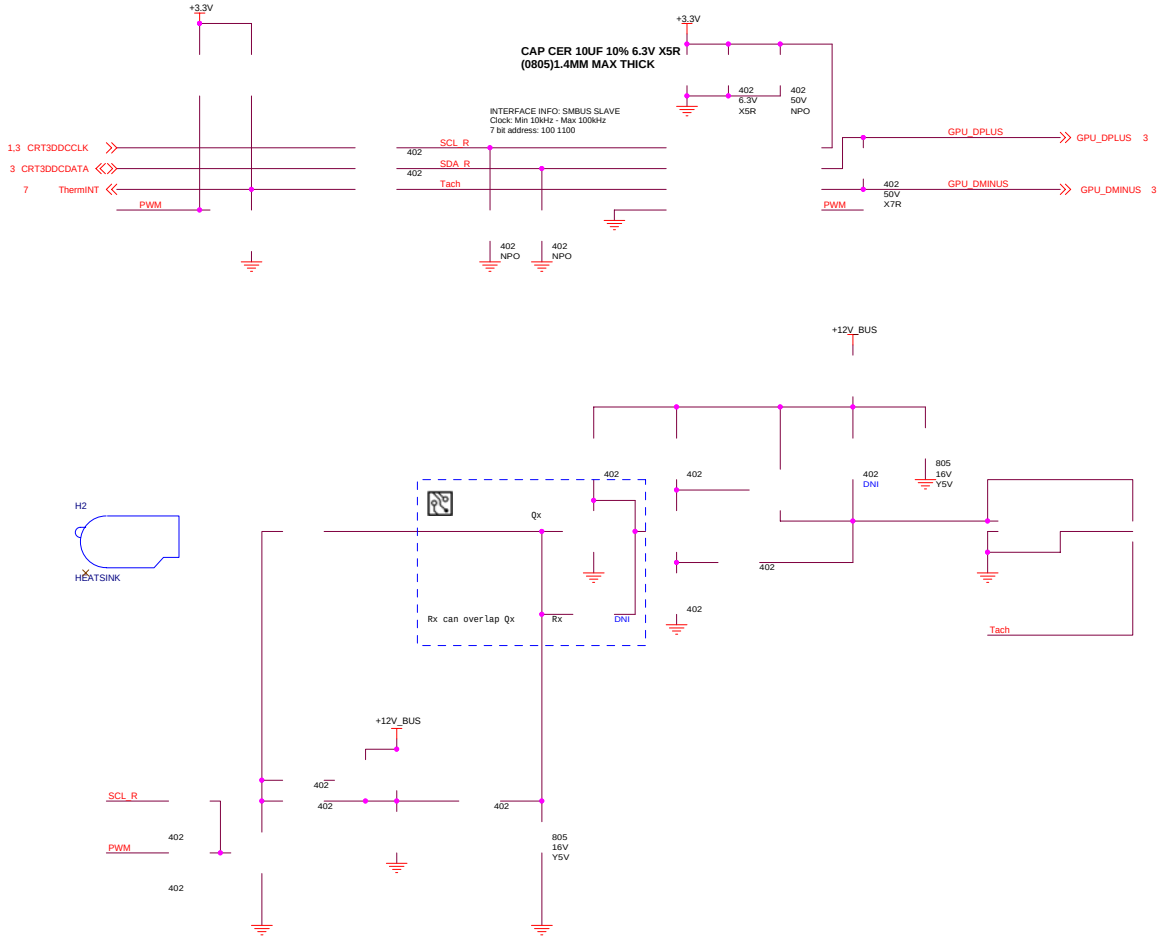



The 7-pin MiniDIN footprint allows one of the two MiniDINs:
- 7-pin Svideo/Composite MiniDIN P/N 6071001500G
- 4-pin Svideo MiniDIN P/N 6070001000G

ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size C | Document Number 105-A92431-20A | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 15 of 19 | |




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size C | Document Number 105-A92431-20A | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 16 of 19 | |

DVI/VGA SCREWS

ASSY-SCREW1
SCREW
JACKPOST, HEX, 3/16 AF, 4-40 X 0.5"
ASSY

ASSY-SCREW2
SCREW
JACKPOST, HEX, 3/16 AF, 4-40 X 0.5"
ASSY

ASSY-SCREW5
SCREW
SCREW

ASSY-SCREW6
SCREW
SCREW

MT1
MT_Hole_0.136_in.
DNI

DNI

PCB1
PCB
109-A92431-20A

## LP brackets

## ATX brackets

BKT4
BRACKET
LP, TOP TAB, DIN, Dual DVI

<Variant Name>

ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size: C | Document Number: 105-A92431-20A | Rev: 3 |
| Date: Wednesday, June 07, 2006 | Sheet 17 of 19 | |

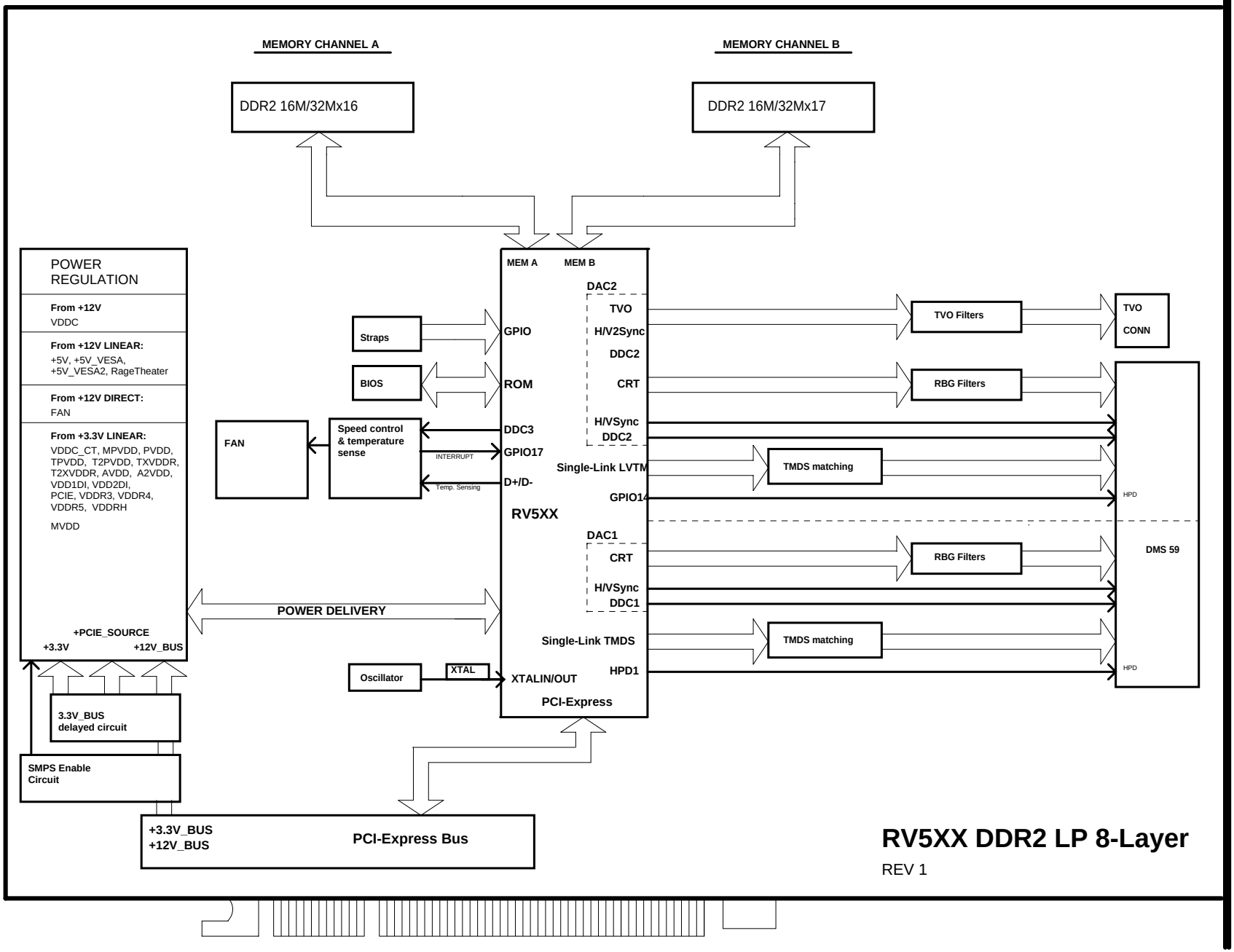
<Variant Name>

| Title | Schematic No. | Date: |
|---|---|---|
| **RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP** | 105-A92431-20A | **Wednesday, June 07, 2006** |

# REVISION HISTORY

Rev 3

| Sch Rev | PCB Rev | Date | REVISION DESCRIPTION |
|---|---|---|---|
| 0 | 00A | 02/21/06 | Initial release , ASIC, Memory & PS from A771 revD |
| 1 | 00 | 04/21/06 | -00 PCB release, No PCB effecting schematic Changes (only ASSY-SCREW6 added for BOM usage), Layout improvements on TMDS reference ground on L3 & Fan trace on bottom layer |
| 2 | 10 | 04/27/06 | -l0 PCB release, No PCB effecting schematic Changes, Few Layout improvements for EMI (increase spacing of power plans from TMDS pairs) |
| 3 | 20A | 05/16/06 | -20A PCB release, Adding ML601 as dual footprint for NL601 in VDDC SMPS , Moving TV DAC Filter far from VDDC regulator , All TVO Filter caps (C3001-6) changed to 402 |




ATI Technologies Inc.
1 Commerce Valley Drive East
Markham, Ontario
Canada, L3T 7X6
(905) 882-2600

| | | |
|---|---|---|
| Title | RV515/RV516 256MB 128bit DDR2 NT DMS59-VO LP | |
| Size C | Document Number 105-A92431-20A | Rev 3 |
| Date: Wednesday, June 07, 2006 | Sheet 19 of 19 | |