

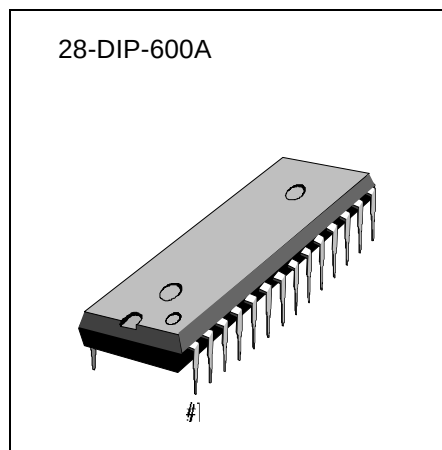
## I<sup>2</sup>C BUS CONTROLLED R/G/B VIDEO AMPLIFIER

The S1D2500A01 is a very high frequency video amplifier system with I<sup>2</sup>C Bus control used in Monitors with high resolution up to 1280 × 1024.

It contains 3 matched R/G/B video Amplifiers with OSD interface and provides flexible interfacing to I<sup>2</sup>C Bus controlled adjustment systems.

### FUNCTIONS

- R/G/B Video Amplifier
- OSD Interface
- I<sup>2</sup>C BUS Control
- Contrast/OSD Contrast
- Brightness Control
- Cut-Off Brightness Control
- R/G/B SUB Contrast/Cut-Off Control
- Blank/Clamp Gate
- Half tone
- Brightness Uniformity



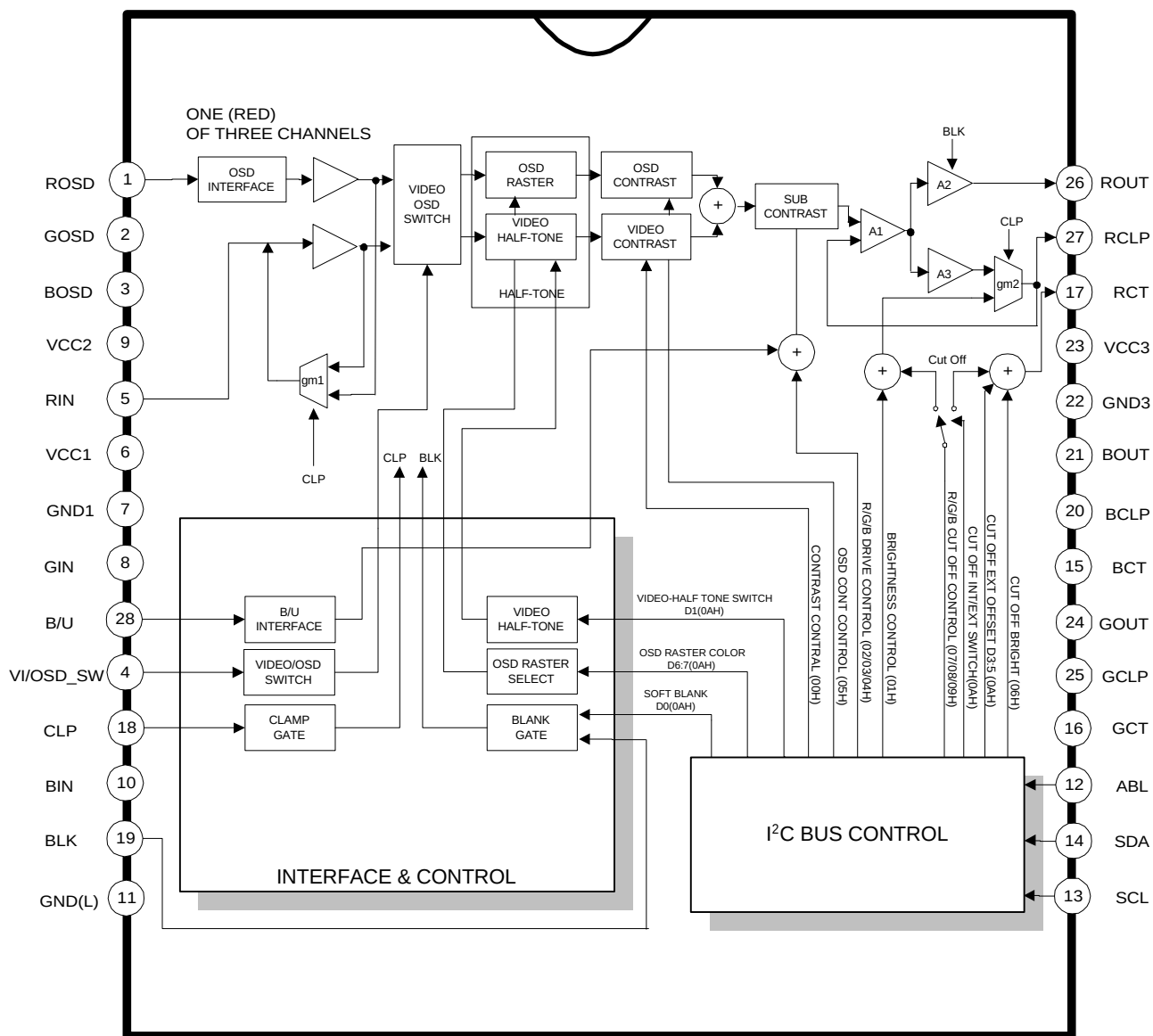
### ORDERING INFORMATION

| Device          | Package     | Operating Temperature |
|-----------------|-------------|-----------------------|
| S1D2500A01-D0B0 | 28-DIP-600A | -20 °C — +75°C        |

### FEATURES

- 3 - Channel R/G/B Video Amplifier, 150MHz @f-3dB
- I<sup>2</sup>C Bus Control Items
  - Contrast Control
  - SUB Contrast Control For Each Channel
  - Brightness Control
  - OSD Contrast Control
  - Cut-off Brightness Control
  - Cut-off Control For Each Channel
  - Switch Registers for SBLK and Video Half Tone and Cut-Off INT/EXT
- SUB Contrast Control Range: -11dB
- Capable of 7.0Vpp Output Swing Range
- Video/OSD High Speed Switch
- Clamp Gate With Anti OSD Sagging
- B/U (Brightness Uniformity) Interface
- Video Input Clamp, BRT Clamp
- Video & OSD Half Tone Function on OSD Picture  
(OSD Raster Selection by HS1, 2: 4 colors)
- OSD Interface, OSD BLK
- ABL
- TTL R/G/B OSD Inputs, 80MHz bandwidth
- Contrast Control Range: -38dB
- OSD Contrast Control Range: -38dB

## BLOCK DIAGRAM



## PIN CONFIGURATION

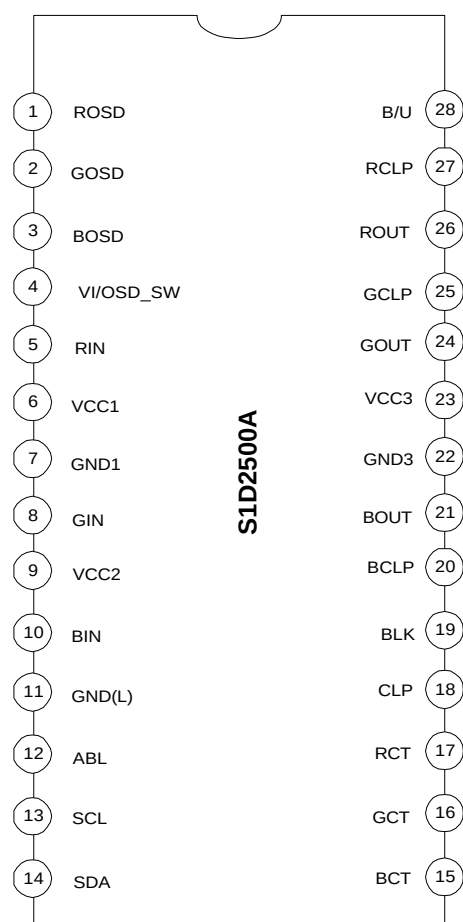


Table 1. Pin Configuration

| Pin No | Symbol           | I/O | Configuration            |
|--------|------------------|-----|--------------------------|
| 1      | ROSD             | I   | Red OSD Input            |
| 2      | GOSD             | I   | Green OSD Input          |
| 3      | BOSD             | I   | Blue OSD Input           |
| 4      | VI/OSD_SW        | I   | Video or OSD Switch      |
| 5      | RIN              | I   | Red Video Input          |
| 6      | V <sub>CC1</sub> | -   | V <sub>CC</sub> (normal) |
| 7      | GND1             | -   | Ground1 (normal)         |
| 8      | GIN              | I   | Green Video Input        |
| 9      | V <sub>CC2</sub> | -   | V <sub>CC</sub> (normal) |

Table 1. Pin Configuration

| Pin No | Symbol           | I/O | Configuration                |
|--------|------------------|-----|------------------------------|
| 10     | BIN              | I   | Blue Video Input             |
| 11     | GND (L)          | -   | Ground2 (logic)              |
| 12     | ABL              | -   | Automatic Beam Limit         |
| 13     | SCL              | I/O | Serial Clock                 |
| 14     | SDA              | I/O | Serial Data                  |
| 15     | BCT              | I   | Blue Cut Off Control         |
| 16     | GCT              | I   | Green Cut Off Control        |
| 17     | RCT              | I   | Red Cut Off Control          |
| 18     | CLP              | I   | Clamp Gate Signal Input      |
| 19     | BLK              | I   | Blank Gate Signal Input      |
| 20     | BCLP             | -   | Blue Clamp Cap               |
| 21     | BOUT             | O   | Blue Video Output            |
| 22     | GND3             | -   | Ground3 (drive part)         |
| 23     | V <sub>CC3</sub> | -   | V <sub>CC</sub> (drive part) |
| 24     | GOUT             | O   | Green Video Output           |
| 25     | GCLP             | -   | Green Clamp Cap              |
| 26     | ROUT             | O   | Red Video Output             |
| 27     | RCLP             | -   | Red Clamp Cap                |
| 28     | B/U              | I   | Brightness Uniformity        |

## PIN DESCRIPTION

Table 2. Pin Description

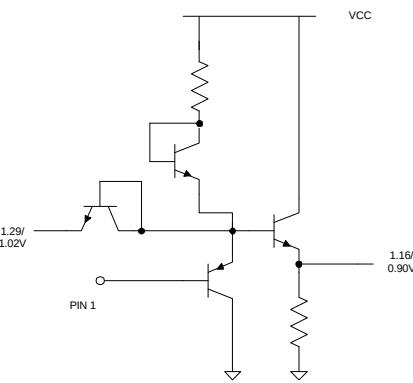
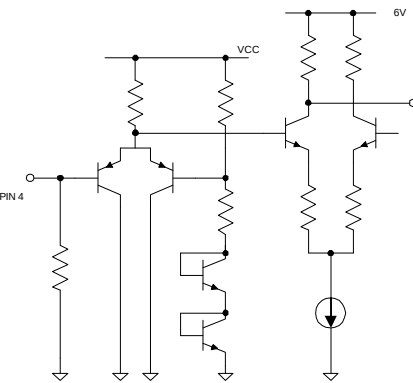
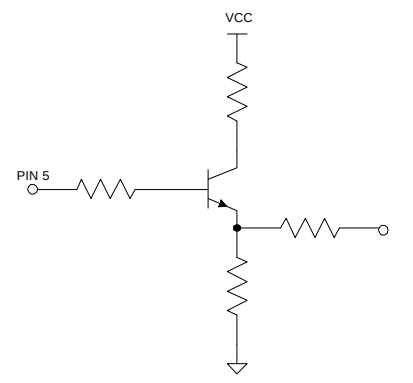
| Pin No       | Pin Name                                                                   | Schematic                                                                            | Description                                                                                      |
|--------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1<br>2<br>3  | Red OSD Input (ROSD)<br>Green OSD Input (GOSD)<br>Blue OSD Input (BOSD)    |    | OSD input signals are in TTL level and will be connected to ground when switching to video input |
| 4            | Video/OSD Switch (VI/OSD_SW)                                               |   | Video/OSD switch signal is TTL level<br>PIN4 = 'high', OSD input<br>PIN4 = 'Low', video input    |
| 5<br>8<br>10 | Red Video Input (RIN)<br>Green Video Input (GIN)<br>Blue Video Input (BIN) |  | MAX input video signal is 0.7 V <sub>pp</sub>                                                    |
| 6<br>9       | V <sub>CC1</sub><br>V <sub>CC2</sub>                                       | -                                                                                    | Supply voltage (except drive part)                                                               |

Table 2. Pin Description (Continued)

| Pin No         | Pin Name                                                       | Schematic | Description                                                                                                                  |
|----------------|----------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------|
| 7              | GND1                                                           | -         | Ground (analogue)                                                                                                            |
| 11             | GND2 (GND (L) )                                                |           | Ground (logic)                                                                                                               |
| 15<br>16<br>17 | Blue Cut-Off (BCT)<br>Green Cut-Off (GCT)<br>Red Cut-Off (RCT) |           | Cut-Off Control Output                                                                                                       |
| 18             | Clamp Gate Input (CLP)                                         |           | <p>Video amp active when clamp gate signal is in low TTL level.</p> <p>Clamp gate Min. pulse width : 0.2us, at fh: 50KHz</p> |
| 19             | Blank Gate Input (BLK)                                         |           | Video amp blanks video signal when blank gate signal is in low TTL level.                                                    |

Table 2. Pin Description (Continued)

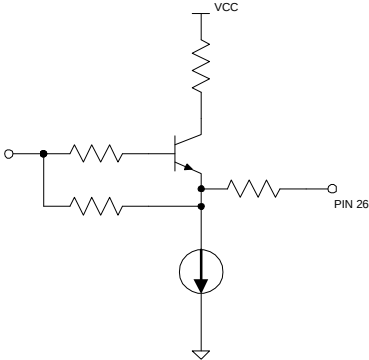
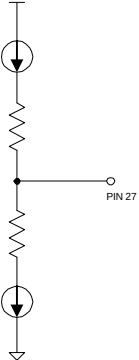
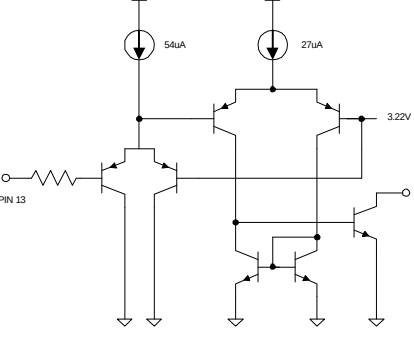
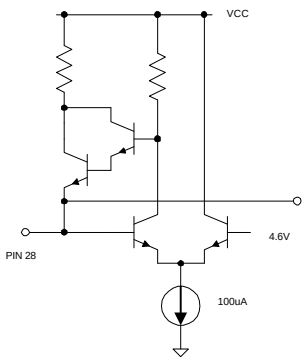
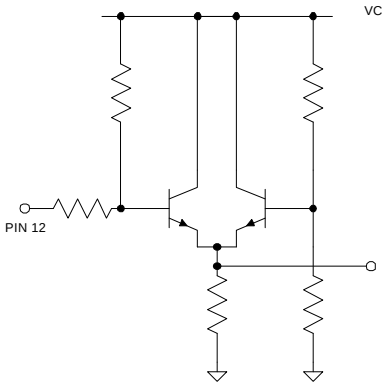
| Pin No         | Pin Name                                                                         | Schematic                                                                            | Description                                                                                                   |
|----------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 26<br>24<br>21 | Red Video Output (ROUT)<br>Green Video Output (GOUT)<br>Blue Video Output (BOUT) |    | Video signal output                                                                                           |
| 20<br>25<br>27 | Blue Clamp Cap (BCLP)<br>Green Clamp Cap (GCLP)<br>Red Clamp Cap (RCLP)          |    | Brightness control activated by charging and discharging of the external cap. (0.1μF) (During low clamp gate) |
| 22             | GND3                                                                             | -                                                                                    | Ground (drive part)                                                                                           |
| 23             | V <sub>CC3</sub>                                                                 | -                                                                                    | Supply voltage (drive part)                                                                                   |
| 13<br>14       | SCL<br>SDA                                                                       |  | Serial clock input port of I <sup>2</sup> C BUS<br>Serial data input port of I <sup>2</sup> C BUS             |

Table 2. Pin Description (Continued)

| Pin No | Pin Name        | Schematic                                                                           | Description                                                    |
|--------|-----------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------|
| 28     | B/U Input (B/U) |    | Parabola input via AC coupling cap                             |
| 12     | ABL Input (ABL) |  | Automatic beam limitation input<br>(Control Range: 0.5 — 4.5V) |



**ABSOLUTE MAXIMUM RATING (TA = 25 °C) <sup>(1)</sup>****Table 3. Absolute Maximum Rating**

| No | Item                                 | Symbol               | Value |      |      | Unit             |
|----|--------------------------------------|----------------------|-------|------|------|------------------|
|    |                                      |                      | Min   | Typ  | Max  |                  |
| 1  | Maximum Supply Voltage               | $V_{CC1/2/3}/V_{DD}$ | -     | -    | 13.2 | V                |
| 2  | Operating Temperature <sup>(2)</sup> | T <sub>opr</sub>     | -20   | -    | 75   | °C               |
| 3  | Storage Temperature                  | T <sub>stg</sub>     | -65   | -    | 150  | °C               |
| 4  | Operating Supply Voltage             | V <sub>ccop</sub>    | 11.4  | 12.0 | 12.6 | V <sup>(3)</sup> |
| 5  | Power Dissipation                    | P <sub>D</sub>       | -     | -    | 2.0  | W                |

**THERMAL & ESD PARAMETER****Table 4. Thermal & ESD Parameter**

| No | Item                                  | Symbol          | Value |     |     | Unit |
|----|---------------------------------------|-----------------|-------|-----|-----|------|
|    |                                       |                 | Min   | Typ | Max |      |
| 1  | Thermal Resistance (Junction-ambient) | θ <sub>ja</sub> | -     | 46  | -   | °C/W |
| 2  | Junction Temperature                  | T <sub>j</sub>  | -     | 150 | -   | °C   |
| 3  | Human Body Mode (C = 100p, R = 1.5k)  | HBM             | 2     | -   | -   | KV   |
| 4  | Machine Model (C = 200p, R = 0)       | MM              | 300   | -   | -   | V    |
| 5  | Charge Device Model                   | CDM             | 800   | -   | -   | V    |

**ELECTRICAL CHARACTERISTICS****DC Electrical Characteristics**

T<sub>a</sub> = 25 °C, V<sub>CC1</sub> = V<sub>CC2</sub> = V<sub>CC3</sub> = 12V; V<sub>4</sub> = 0V; unless otherwise stated

**Table 5. DC Electrical Characteristics**

| Parameter                     | Symbol                         | Min | Typ | Max | Unit |
|-------------------------------|--------------------------------|-----|-----|-----|------|
| Supply Current                | I <sub>CC</sub> <sup>(4)</sup> | 85  | 110 | 135 | mA   |
| Clamp Gate Low Input Voltage  | V <sub>15l</sub>               | 0.8 | 1.5 | 3.0 | V    |
| Clamp Gate High Input Voltage | V <sub>15h</sub>               | 0.8 | 1.5 | 2.0 | V    |

Table 5. DC Electrical Characteristics (Continued)

| Parameter                                 | Symbol                                             | Min   | Typ   | Max   | Unit          |
|-------------------------------------------|----------------------------------------------------|-------|-------|-------|---------------|
| Clamp Gate Low Input Current              | $I_{15l}$                                          | -5.0  | -2.0  | -     | $\mu\text{A}$ |
| Clamp Gate High Input Current             | $I_{15h}$                                          | -     | 0.01  | 1.0   | $\mu\text{A}$ |
| Blank Gate Low Input Voltage              | $V_{16l}$                                          | 0.8   | 1.5   | 3.0   | V             |
| Blank Gate High Input Voltage             | $V_{16h}$                                          | 0.8   | 1.5   | 2.0   | V             |
| Blank Gate Low Input Current              | $I_{16l}$                                          | -5.0  | -2.0  | -     | $\mu\text{A}$ |
| Blank Gate High Input Current             | $I_{16h}$                                          | -     | 0.01  | 1.0   | $\mu\text{A}$ |
| Video Input bias Voltage                  | $V_{\text{bias}}$                                  | 1.6   | 1.9   | 2.2   | V             |
| Output Clamp Cap Charge Current           | $I_{\text{clamp+}}$                                | 0.45  | 0.75  | 1.10  | mA            |
| Output Clamp Cap Discharge Current        | $I_{\text{clamp-}}$                                | -1.10 | -0.75 | -0.45 | mA            |
| Video Output Low Voltage                  | $V_{\text{OL}}$                                    | -     | 100   | 200   | mV            |
| Video Output High Voltage                 | $V_{\text{OH}}$                                    | 6.2   | 7.5   | 9.0   | V             |
| Video Black Level Output Voltage (POR)    | $V_{\text{OBL}}$                                   | 1.9   | 2.2   | 2.5   | V             |
| Video $\Delta$ Black Level Output Voltage | $\Delta V_{\text{OBL}}^{(5)}$                      | -0.3  | -     | 0.3   | V             |
| Video Output Blanked Voltage              | $V_{\text{OB}}$                                    | -     | 0.1   | 0.2   | V             |
| Contrast/Drive Control Input Current      | $I_{\text{osd}}, I_{\text{drive}}, I_{\text{con}}$ | -     | 0.25  | 1     | $\mu\text{A}$ |
| Spot Killer Voltage                       | $V_{\text{spot}}$                                  | 9.2   | 10.4  | 11.2  | V             |

**AC Electrical Characteristics**

T<sub>a</sub> = 25 °C, V<sub>CC1</sub> = V<sub>CC2</sub> = V<sub>CC3</sub> = 12V; V<sub>4</sub> = 0V.

V<sub>in</sub> = 0.56V<sub>pp</sub> Manually adjust Video Output pins 21, 24 and 26 to 4V DC for the AC test <sup>(11)</sup> unless otherwise stated<sup>(12)</sup>

**Table 6. AC Electrical Characteristics**

| Parameter                             | Symbol                              | Min  | Typ  | Max  | Unit |
|---------------------------------------|-------------------------------------|------|------|------|------|
| Video Amplifier Gain                  | AV max                              | 15.5 | 17.5 | 19.5 | dB   |
| Contrast Attenuation 1                | Avc1                                | -4.5 | -6.0 | -7.5 | dB   |
| Contrast Attenuation 2                | Avc2                                | -    | -38  | -35  | dB   |
| Drive Attenuation1                    | Avd1                                | -3   | -4   | -5   | dB   |
| Drive Attenuation 2                   | Avd2                                | -11  | -8   | -5   | dB   |
| Absolute Gain Match                   | A <sub>V</sub> match <sup>(6)</sup> | -1   | -    | 1    | dB   |
| Gain Change between Amplifiers        | A <sub>V</sub> track <sup>(7)</sup> | -1   | -    | 1    | dB   |
| Video Amplifier Distortion            | THD                                 | -    | 1    | 5    | %    |
| Video Amp Bandwidth <sup>(7,8)</sup>  | f (-3dB)                            | 130  | 150  | -    | MHz  |
| Video Output Rise Time <sup>(7)</sup> | tr (Video)                          | -    | 2.3  | 2.8  | ns   |
| Video Output Fall Time <sup>(7)</sup> | tf (Video)                          | -    | 3.2  | 4.0  | ns   |
| Video Amplifier 10kHz Isolation       | Viso_10K <sup>(9)</sup>             | -    | -65  | -45  | dB   |
| Video Amplifier 10MHz Isolation       | Viso_10M <sup>(7,9)</sup>           | -    | -50  | -35  | dB   |
| Blank Output Rise Time <sup>(7)</sup> | tr (Blank)                          | -    | 6    | 15   | ns   |
| Blank Output Fall Time <sup>(7)</sup> | tf (Blank)                          | -    | 10   | 30   | ns   |
| End of Blanking Propagation Delay     | tr-prop (Blank)                     | -    | 23   | 50   | ns   |
| Start of Blanking Propagation Delay   | tf-prop (Blank)                     | -    | 20   | 45   | ns   |

**OSD Electrical Characteristics**

T<sub>a</sub> = 25 °C, V<sub>CC1</sub> = V<sub>CC2</sub> = V<sub>CC3</sub> = 12V; V<sub>19</sub> = 4V; V<sub>12</sub> = V<sub>28</sub> = 0V;

V<sub>1</sub> = V<sub>2</sub> = V<sub>3</sub> = 4V; V<sub>4</sub> = 4V; unless otherwise stated

**Table 7. OSD Electrical Characteristics**

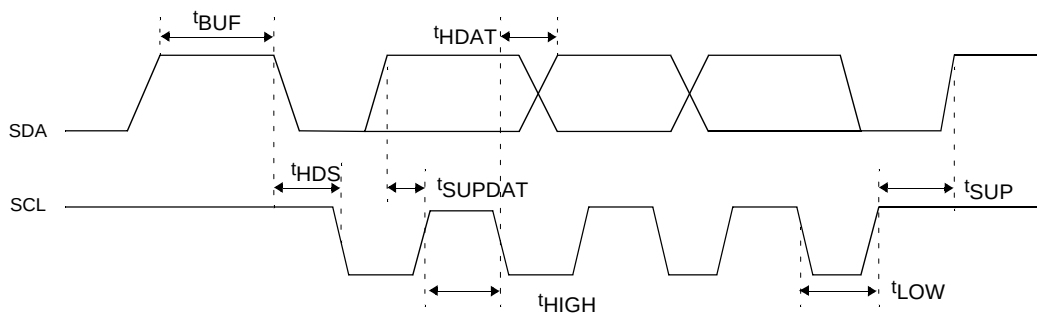
| Parameter                   | Symbol            | Min | Typ | Max | Unit |
|-----------------------------|-------------------|-----|-----|-----|------|
| OSD Input Low Input Voltage | V <sub>OSDI</sub> | 0.4 | 1.3 | 3.0 | V    |

Table 7. OSD Electrical Characteristics (Continued)

| Parameter                               | Symbol             | Min | Typ | Max | Unit     |
|-----------------------------------------|--------------------|-----|-----|-----|----------|
| OSD Input High Input Voltage            | $V_{OSDh}$         | 0.4 | 0.8 | 1.2 | V        |
| OSD Select Low Input Voltage            | $V_{4l}$           | 0.8 | 1.6 | 3.0 | V        |
| OSD Select High Input Voltage           | $V_{4h}$           | 0.8 | 1.6 | 2.0 | V        |
| OSD Select Low Input Current            | $I_{4l}$           | -10 | -5  | -   | $\mu$ A  |
| OSD Select High Input Current           | $I_{4h}$           | 70  | 100 | 130 | $\mu$ A  |
| OSD Output Black Level                  | $V_{BLV-OSD}$      | -   | 0.1 | 0.2 | V        |
| OSD Output Voltage                      | $V_{OSD}$          | 2.6 | 3.6 | 4.6 | $V_{PP}$ |
| OSD Output Vpp Attenuation              | $V_{OSD\_ATT}$     | 30  | 50  | 70  | %        |
| Output Match between Channels           | $V_{OSD}$          | -7  | -   | 7   | %        |
| Video to OSD Switch Time <sup>(7)</sup> | $t_r$ (OSD S)      | -   | 4   | 10  | ns       |
| OSD to Video Switch Time <sup>(7)</sup> | $t_f$ (OSD S)      | -   | 11  | 20  | ns       |
| Video to OSD Propagation Delay          | $t_{r-pr}$ (OSD S) | -   | 11  | 25  | ns       |
| OSD to Video Propagation Delay          | $t_{f-pr}$ (OSD S) | -   | 12  | 25  | ns       |
| OSD Rising Time                         | $t_r$ (OSD)        | -   | 4   | 8   | ns       |
| OSD Falling Time                        | $t_f$ (OSD)        | -   | 5   | 10  | ns       |
| OSD Rising Propagation Delay            | $t_{r-pr}$ (OSD)   | -   | 7   | 15  | ns       |
| OSD Falling Propagation Delay           | $t_{f-pr}$ (OSD)   | -   | 9   | 20  | ns       |
| Video/OSD 10kHz Isolation               | $l_{iso10K}$ (OSD) | -   | -60 | -40 | dB       |
| Video/OSD 10MHz Isolation               | $l_{iso10M}$ (OSD) | -   | -50 | -35 | dB       |

I<sup>2</sup>C BUS Recommended Operating ConditionsTable 8. I<sup>2</sup>C BUS Recommended Operating Conditions

| Parameter                                     | Symbol              | Min  | Typ | Max | Unit |
|-----------------------------------------------|---------------------|------|-----|-----|------|
| Input High Level Voltage                      | V <sub>inH</sub>    | 3.0  | -   | -   | V    |
| Input Low Level Voltage                       | V <sub>inL</sub>    | -    | -   | 1.5 | V    |
| SCL Clock Frequency                           | f <sub>SCL</sub>    | -    | -   | 200 | kHz  |
| Hold Time Before a new transmission can start | t <sub>BUF</sub>    | 1.3  | -   | -   | μs   |
| Hold Time for Start Condition                 | t <sub>HDS</sub>    | 0.6  | -   | -   | μs   |
| Set-up Time for Stop Conditions               | t <sub>SUP</sub>    | 0.6  | -   | -   | μs   |
| The Low Period of SCL                         | t <sub>LOW</sub>    | 1.3  | -   | -   | μs   |
| The High Period of SCL                        | t <sub>HIGH</sub>   | 0.6  | -   | -   | μs   |
| Hold Time Data                                | t <sub>HDATA</sub>  | 0.3  | -   | -   | μs   |
| Set-up Time Data                              | t <sub>SUPDAT</sub> | 0.25 | -   | -   | μs   |
| Rise Time of SCL                              | t <sub>R</sub>      | -    | -   | 1.0 | μs   |
| Fall Time of SCL                              | t <sub>F</sub>      | -    | -   | 3.0 | μs   |

I<sup>2</sup>C BUS Timing Requirement

**NOTES:**

1. Absolute Maximum Rating Indicates the limit beyond which damage to the device may occur.
2. Operating Ratings indicate conditions for which the device is functional but do not guarantee specific performance limits. For guaranteed specifications and test conditions, See the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
3. V<sub>CC</sub> supply pins 6, 9, and 23 must be externally wired together to prevent internal damage during V<sub>CC</sub> power on/off cycles.
4. The supply current specified is the quiescent current for V<sub>CC1</sub>/V<sub>CC2</sub> and V<sub>CC3</sub> with R<sub>L</sub> = ∞ . The supply current for V<sub>CC3</sub> (pin 23) also depends on the output load.
5. Output voltage is dependent on load resistor. Test circuit uses R<sub>L</sub> = 390Ω
6. Measure gain difference between any two amplifiers V<sub>in</sub> = 560mV<sub>pp</sub>.
7. When measuring video amplifier bandwidth or pulse rise and fall times, a double sided full ground plane printed circuit board without socket is recommended. Video amplifier 10MHz isolation test also requires this printed circuit board. The reason for a double sided full ground plane PCB is that large measurement variations occur in single sided PCBs.
8. Adjust input frequency from 10MHz (AV max reference level) to the -3dB frequency (f<sub>-3dB</sub>).
9. Measure output levels of the other two undriven amplifiers relative to the driven amplifier to determine channel separation. Terminate the undriven amplifier inputs to simulate generator loading. Repeat test at f<sub>in</sub> = 10MHz for Iso\_10MHz.
10. A minimum pulse width of 200 ns is guaranteed for a horizontal line of 15kHz. This limit is guaranteed by design. if a lower line rate is used a longer clamp pulse may be required.
11. During the AC test the 4V DC level is the center voltage of the AC output signal. For example. if the output is 4V<sub>pp</sub> the signal will swing between 2V DC and 6V DC.
12. These parameters are not tested on each product which is controlled by an internal qualification procedure.

## FUNCTIONAL DESCRIPTION

### Contrast (OSD Contrast Adjustment) (8-bits)

The contrast adjustment is made by controlling simultaneously the gain of three internal variable gain amplifiers through the I<sup>2</sup>C bus interface.

The contrast adjustment allows you to cover a typical range of 38dB.

### Brightness Adjustment (8-bits)

The brightness adjustment controls to add the same black level (pedestal) to the 3-channel/R/G/B signals after contrast amplifier by I<sup>2</sup>C BUS.

### Cut-Off Brightness Adjustments (8-bits)

The Cut-Off Brightness adjustment is made by simultaneously controlling the external cut-off current.

### Cut-Off (SUB Contrast) Adjustment (8-bits + 3)

These adjustments are used to adjust the white balance, and the gain of each channel is controlled by I<sup>2</sup>C BUS. The SUB contrast adjustment allows you to cover a typical range of 11dB.

### OSD Inputs

The S1D2500A01 includes all the circuitry necessary to mix OSD signals into the R/G/B video signal.

You need 4 pins for this function. (R/G/B OSD, OSD blanking)

### Serial Interface

The 2-wires serial interface is an I<sup>2</sup>C BUS interface.

The slave address of the S1D2500A01 is DC (hexadecimal)

| Bit8 | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1  |
|------|------|------|------|------|------|------|-------|
| 1    | 1    | 0    | 1    | 1    | 1    | 0    | 0 (W) |

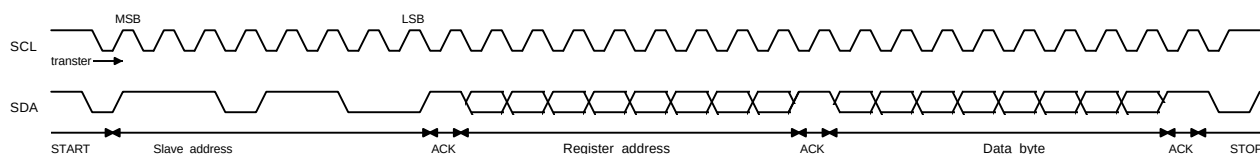
### Data Transfer

All bytes are sent MSB (Most Significant Bit) bit first and the write data transfer is closed by a stop.

The MCU can write data into the S1D2500A01 registers. To do that, after a start, the MCU must send:

- The I<sup>2</sup>C address slave byte with a low level for R/W bit (bit1)
- The byte of the internal register address where the MCU wants to write data (SUB Address)
- The data
- Stop

## I<sup>2</sup>C BUS Write Operation



## Register Description

Register Sub Address (Slave address: DCH)

| Sub Address (Hex) | Register Names                               | DAC bits | Int. value (Hex) |
|-------------------|----------------------------------------------|----------|------------------|
| 00                | Contrast control                             | 8 bits   | 80               |
| 01                | Brightness control (3-ch)                    | 8 bits   | 80               |
| 02                | SUB Contrast control (R)                     | 8 bits   | 80               |
| 03                | SUB Contrast control (G)                     | 8 bits   | 80               |
| 04                | SUB Contrast control (B)                     | 8 bits   | 80               |
| 05                | OSD Contrast control                         | 8 bits   | 80               |
| 06                | Cut-off Brightness control                   | 8 bits   | 80               |
| 07                | Cut-off control (R)                          | 8 bits   | 80               |
| 08                | Cut-off control (G)                          | 8 bits   | 80               |
| 09                | Cut-off control (B)                          | 8 bits   | 80               |
| 0A                | HS2   HS1   CS3   CS2   CS1   CT   HT   SBLK |          | 20               |

HT: Video & OSD Half Tone ctrl switch (1: ON, 0: OFF)

HS2/HS1: OSD Raster Color Switch for Video Half Tone (HT = 1)

| HS2 | HS1 | OSDR | OSDG | OSDB | Half Tone |
|-----|-----|------|------|------|-----------|
| 0   | 0   | 0    | 0    | 0    | Black     |
| 0   | 1   | 0    | 1    | 0    | Green     |
| 1   | 0   | 0    | 0    | 1    | Blue      |
| 1   | 1   | 0    | 1    | 1    | Cyan      |

CT: Cut-off Control INT/EXT (0:INT/1: EXT) select switch (DC/AC mode)

CS1/CS2/CS3/: 80/160/320uA Cut-Off ctrl EXT offset current Switch (CT = 1)

SBLK: Soft Blanking switch (1: ON, 0: OFF)



**Contrast Register (SUB ADRS: 00H) (Vin = 0.56Vpp, bright: 40H, subcont: FFH)**

| Hex           | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | Contrast (Vpp) | Gain (dB) | Int. value (Hex) |
|---------------|----|----|----|----|----|----|----|----|----------------|-----------|------------------|
| 00            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0              | -30.0     |                  |
| 80            | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1.12           | 11.5      | O                |
| FF            | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 4.2            | 17.5      |                  |
| Increment/bit |    |    |    |    |    |    |    |    | 0.0164         |           |                  |

**Brightness Register (3-ch) (SUB ADRS: 01H) (cont: 40H, subcont: FFH)**

| Hex           | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | Brightness (Vpp) | Int. value (Hex) |
|---------------|----|----|----|----|----|----|----|----|------------------|------------------|
| 00            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0                |                  |
| 80            | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 2                | O                |
| FF            | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 4                |                  |
| Increment/bit |    |    |    |    |    |    |    |    | 0.0156           |                  |

**SUB Contrast Register (R/G/B-ch) (SUB ADRS: 02/03/04H)**

(Vin=0.56Vpp, bright: 40H, cont: FFH)

| Hex           | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | SUB Contrast (Vpp) | Gain (dB) | Int. value (Hex) |
|---------------|----|----|----|----|----|----|----|----|--------------------|-----------|------------------|
| 00            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1.33               | 7.5       |                  |
| 80            | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 2.65               | 13.5      | O                |
| FF            | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 4.2                | 17.5      |                  |
| Increment/bit |    |    |    |    |    |    |    |    | 0.0123             |           |                  |

**OSD Contrast Register (SUB ADRS: 05H) (VOSD = TTL, bright: 40H, subcont: FFH)**

| Hex           | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | OSD Contrast (Vpp) | Gain (dB) | Int. value (Hex) |
|---------------|----|----|----|----|----|----|----|----|--------------------|-----------|------------------|
| 00            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0                  | -         |                  |
| 80            | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 3.7                | -         | O                |
| FF            | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 3.5                | -         |                  |
| Increment/bit |    |    |    |    |    |    |    |    | 0.0289             |           |                  |

**Cut-Off Brightness Register (3-ch) (SUB ADRS: 06H)**

| Hex           | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | Cut-Off Brightness (μA) | Int. value (Hex) |
|---------------|----|----|----|----|----|----|----|----|-------------------------|------------------|
| 00            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0                       |                  |
| 80            | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 75                      | 0                |
| FF            | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 150                     |                  |
| Increment/bit |    |    |    |    |    |    |    |    | 0.588                   |                  |

**Cut-Off Register (R/G/B-ch) (SUB ADRS: 07/08/09H)**

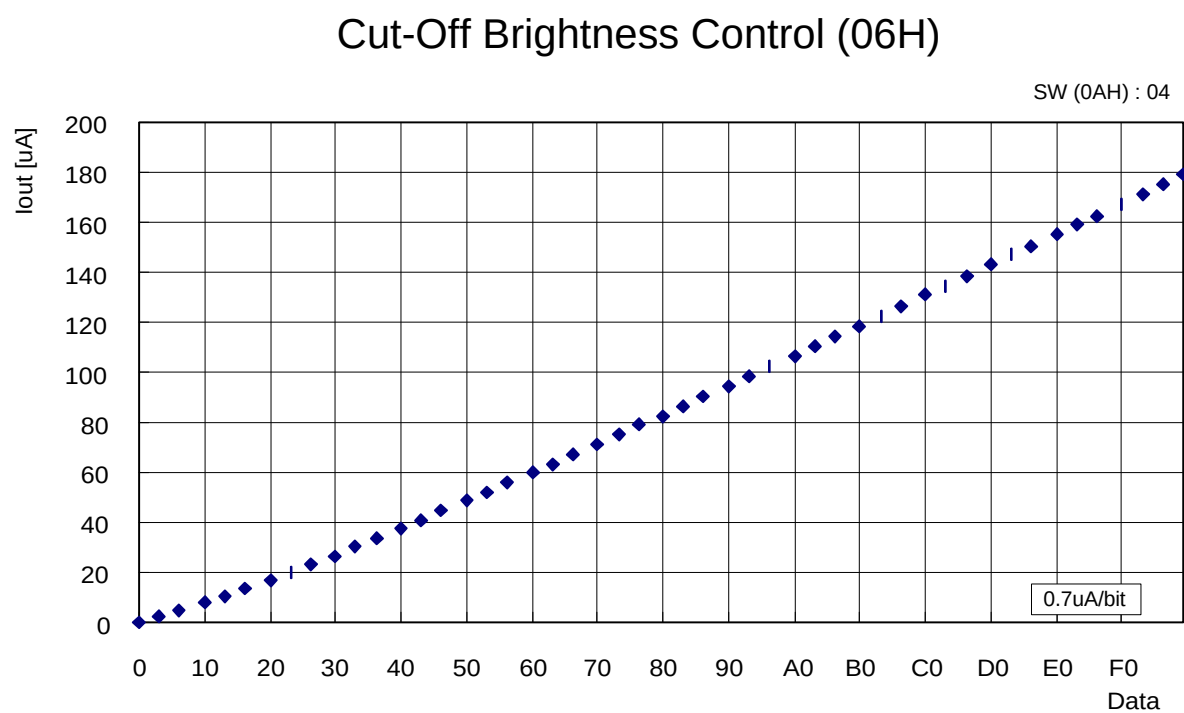
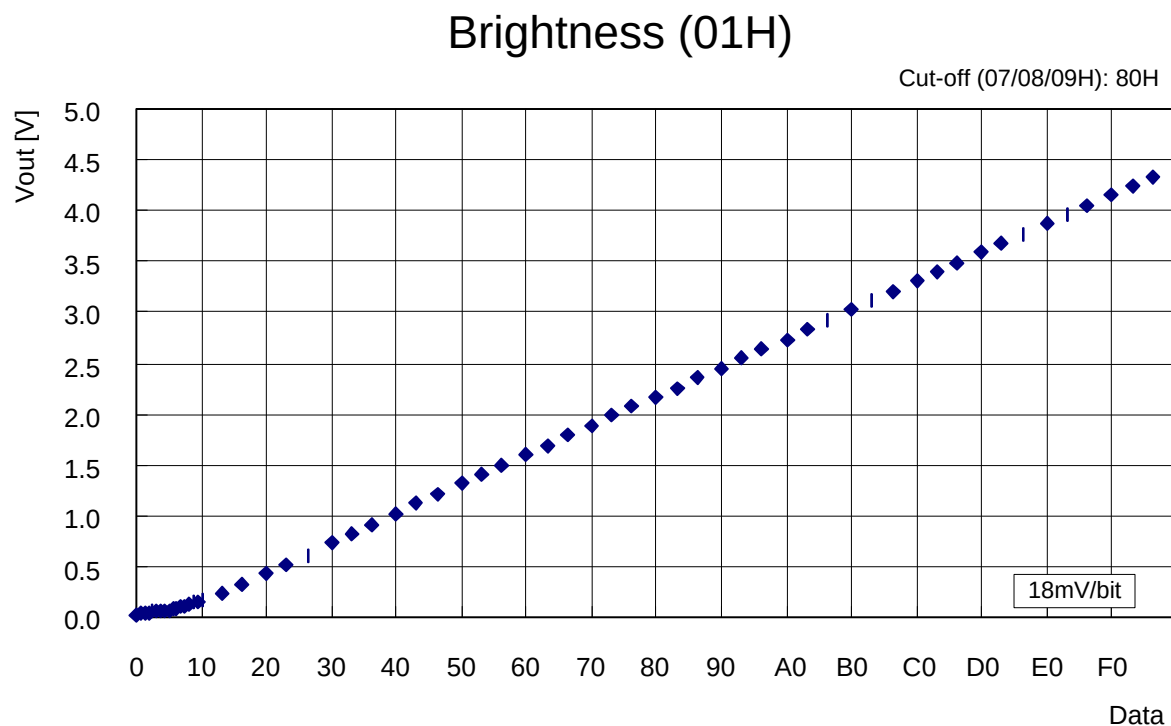
(cont = 80H, subcont: FFH, INT: CT=0, EXT: CT=1)

| Hex           | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | Cut-Off INT (V) | Cut-Off EXT(μA) | Int. value (Hex) |
|---------------|----|----|----|----|----|----|----|----|-----------------|-----------------|------------------|
| 00            | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | -0.5            | 0               |                  |
| 80            | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0               | 250             | 0                |
| FF            | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0.5             | 500             |                  |
| Increment/bit |    |    |    |    |    |    |    |    | 3.9mV           | 1.96            |                  |

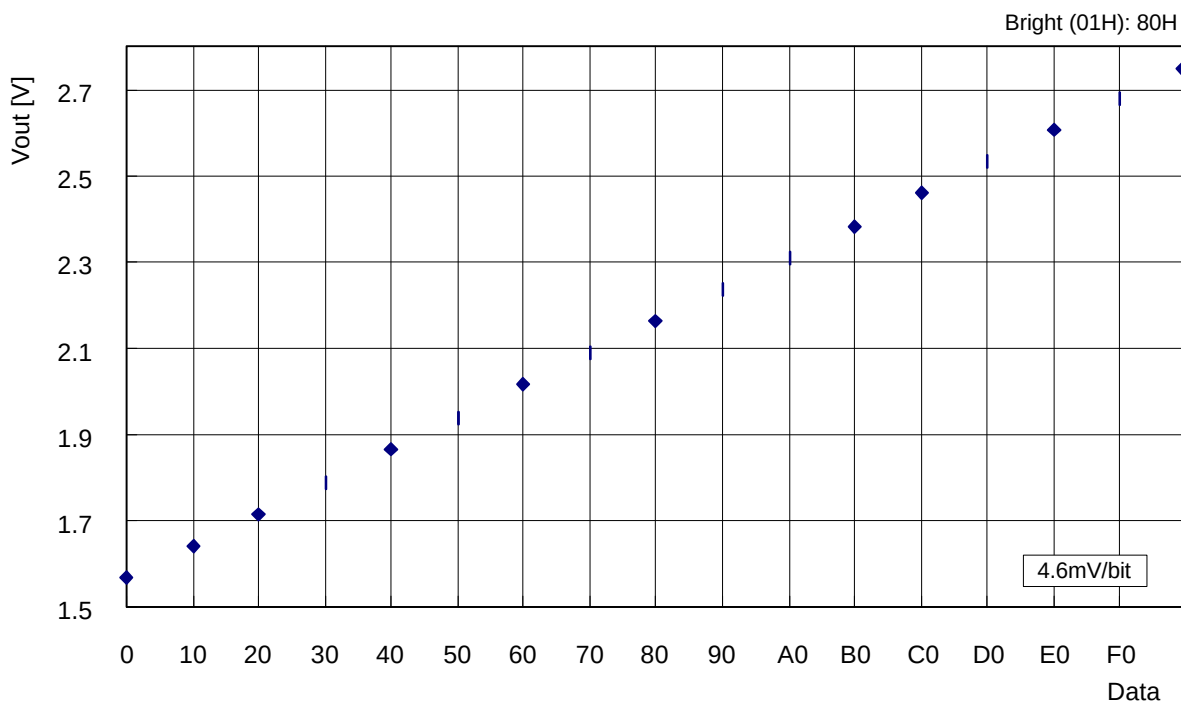




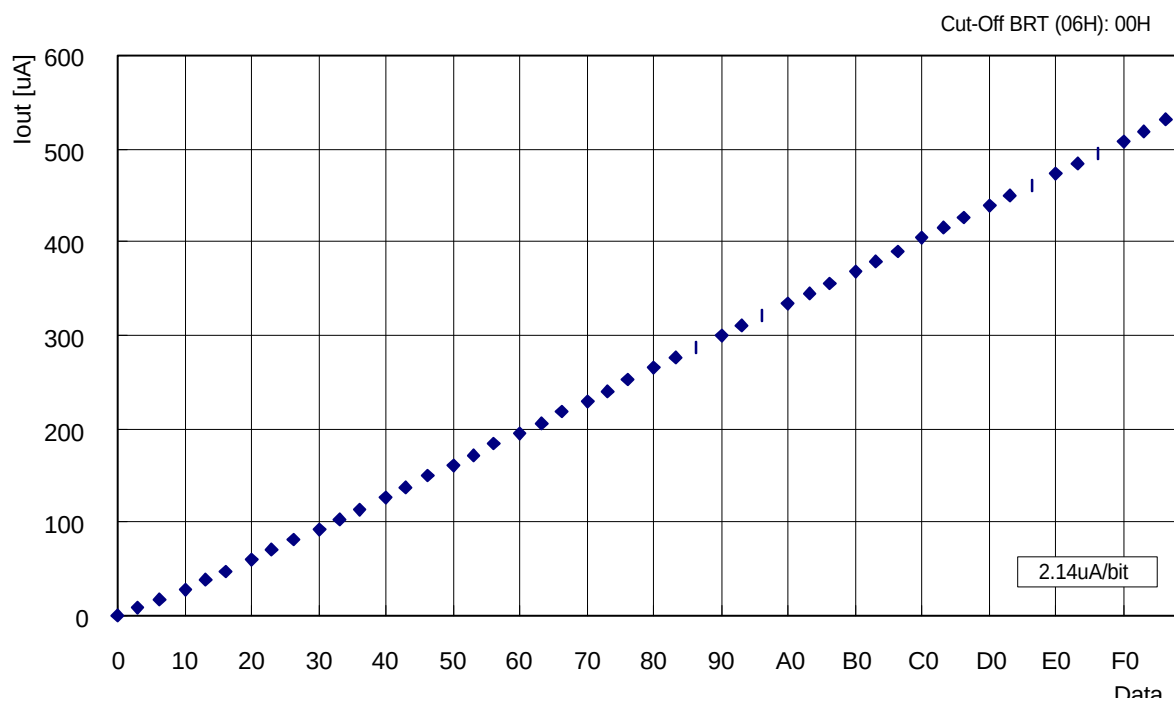
## CHARACTERISTICS CURVE



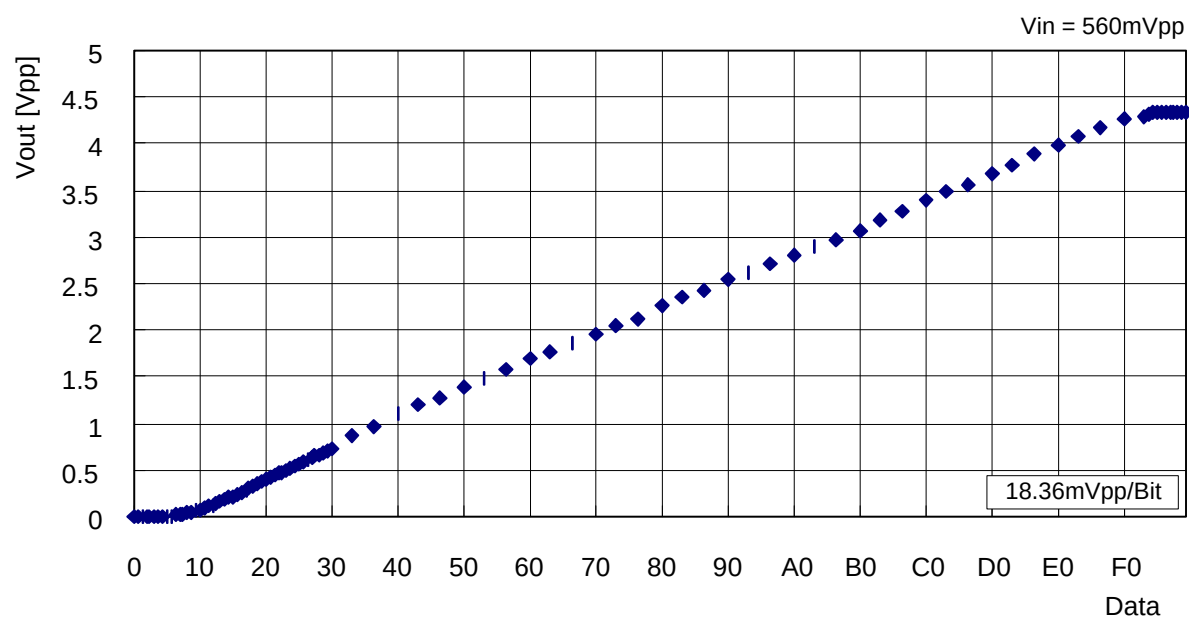
## Int. Cut-Off Control (07/08/09H)



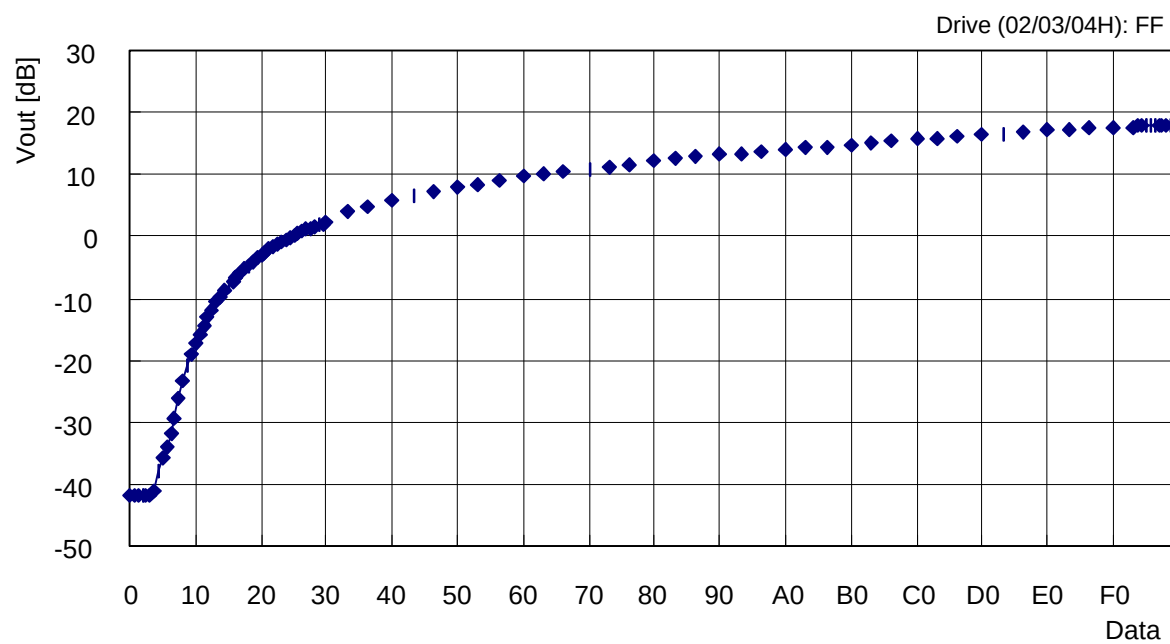
## Ext. Cut-Off Control (07/08/09H)



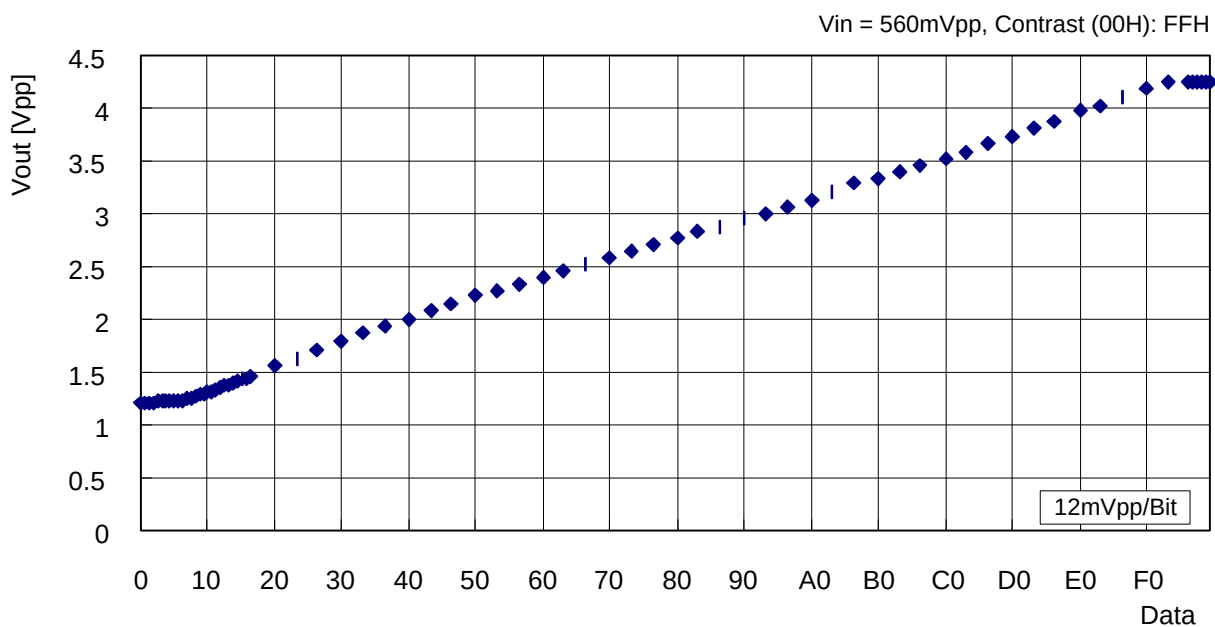
## Contrast Control (00H)



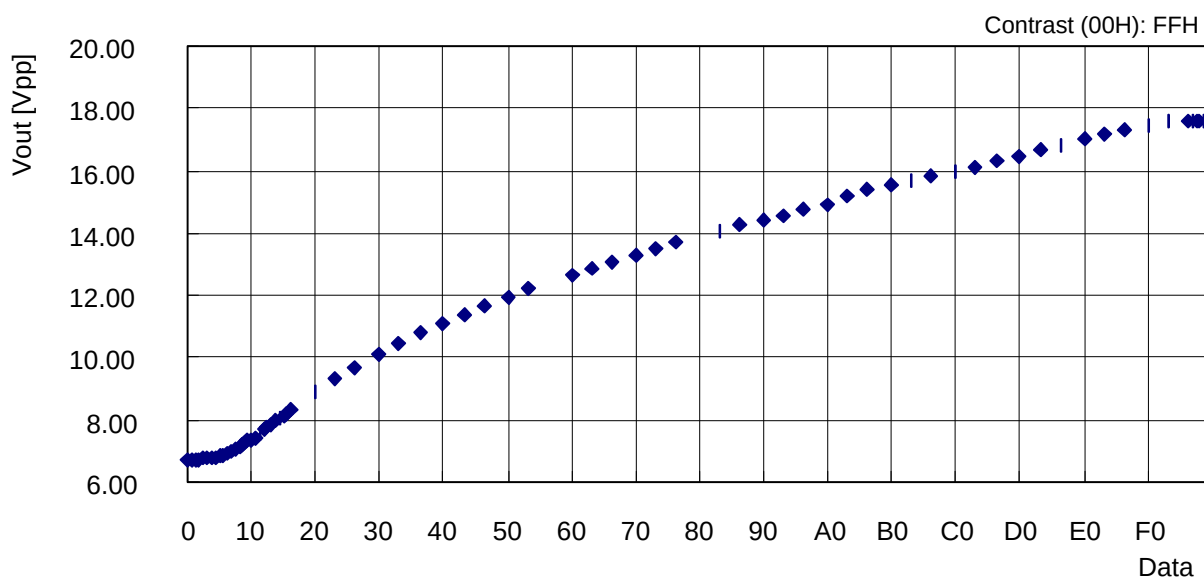
## Contrast Control (00H)



## Drive Control (02/03/04H)

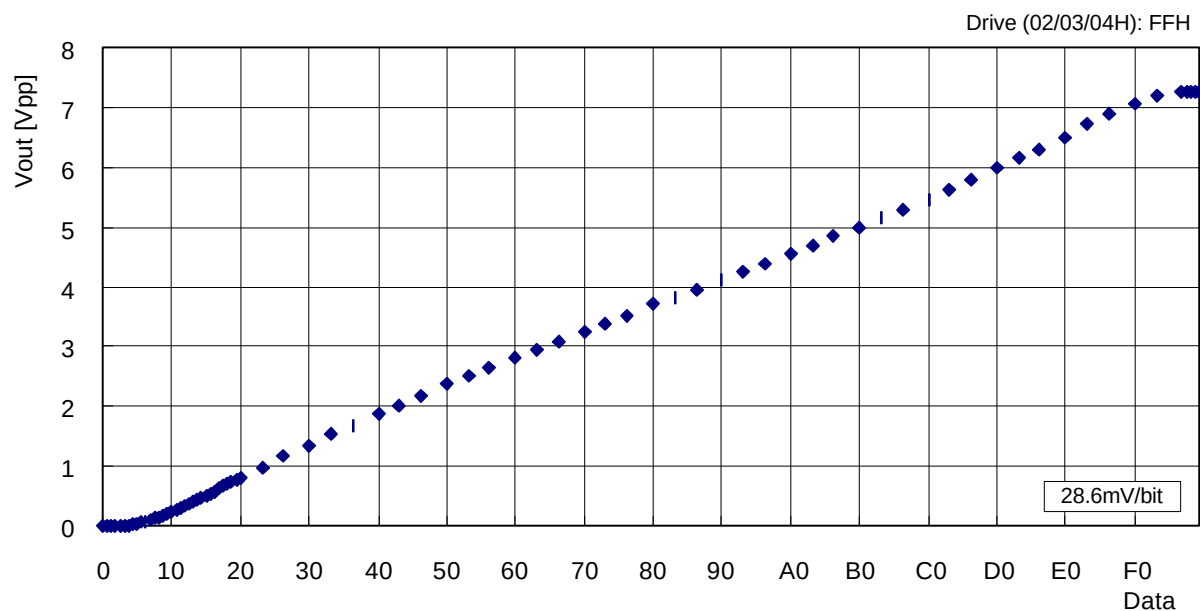


## Drive Control (02/03/04H)

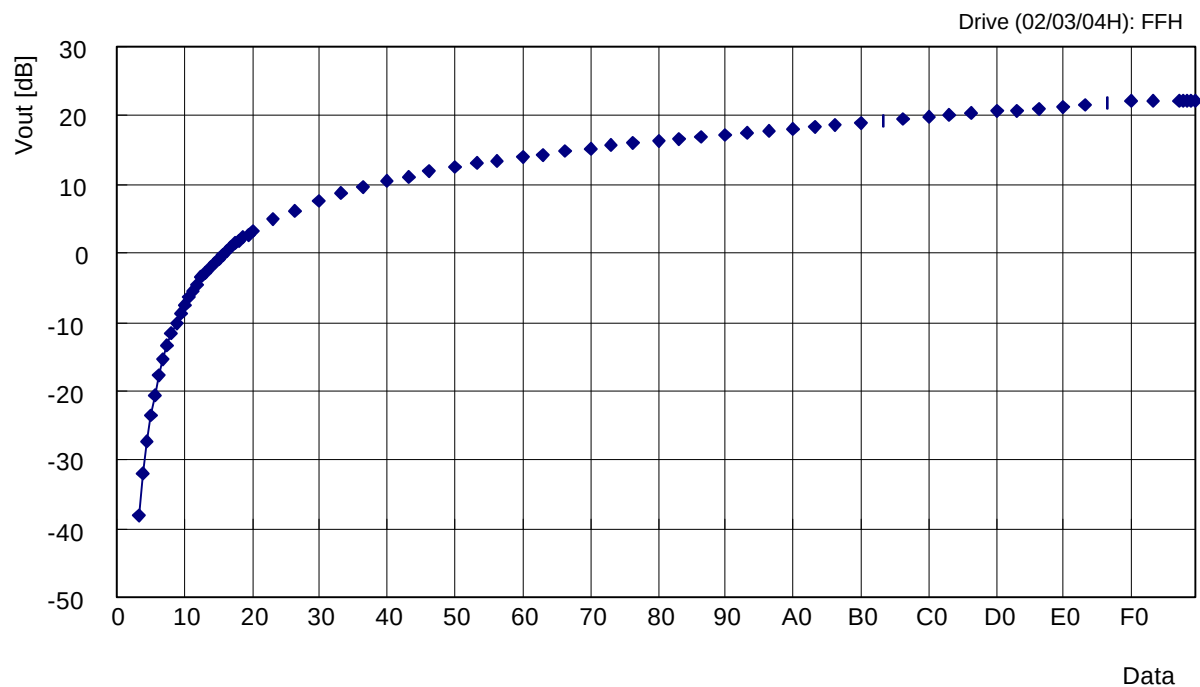




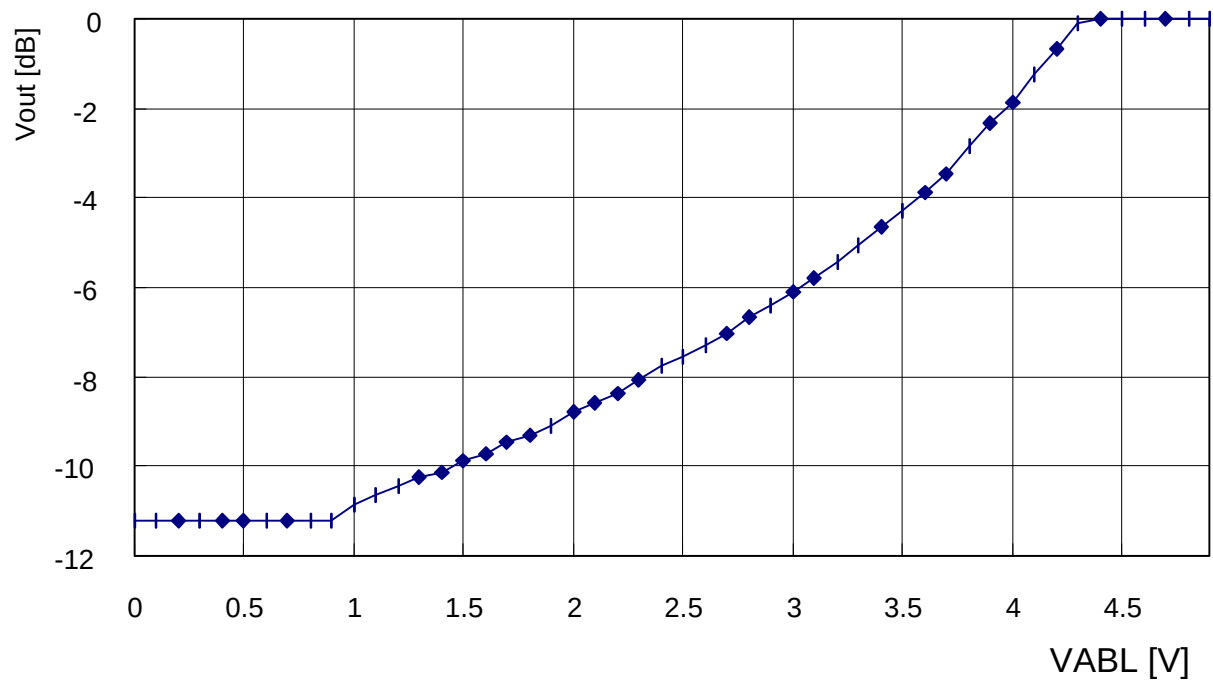
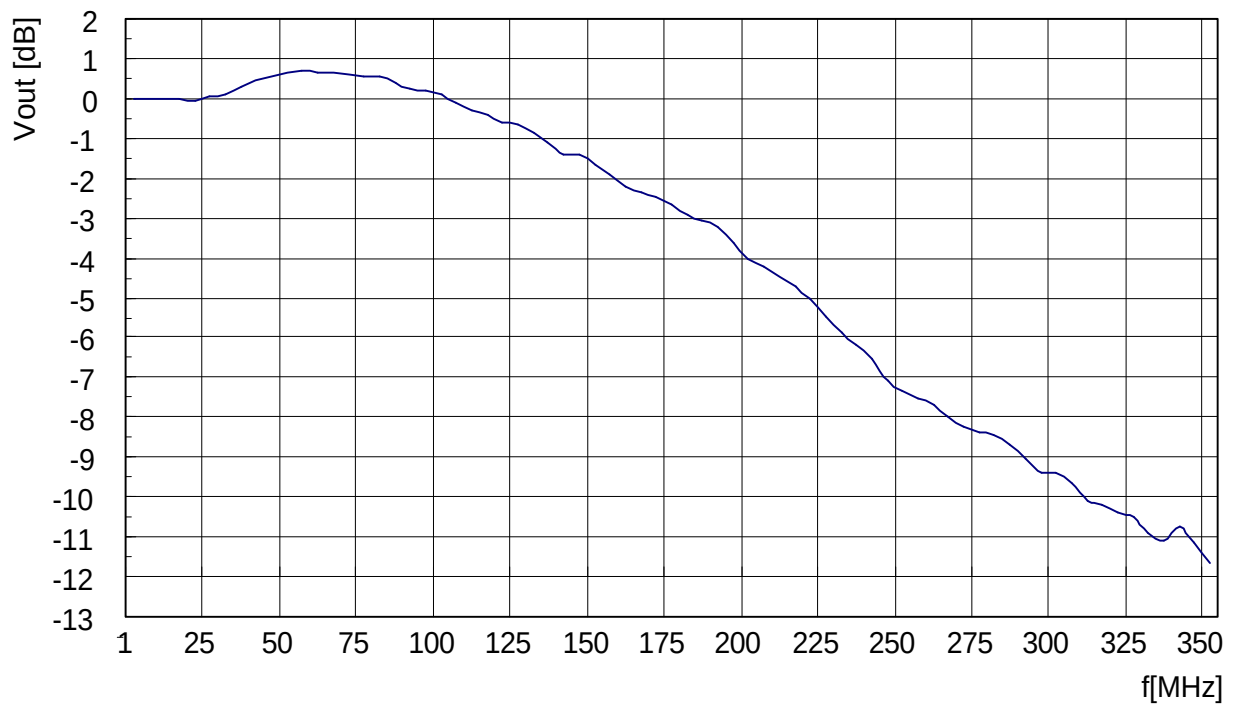
## OSD Contrast Control (05H)



## OSD Contrast Control (05H)



f-3dB (Video Preamp)



## BU Characteristic

