

# Digital servo controller for VCRs

## BU2880 series

The BU2880 series are linear digital-servo controllers that allow construction of a VCR servo system using one IC. The DRUM and CAPSTAN systems have digital filters, and the IC is compatible with VISS / VASS overwriting and wide-aspect operation.

### ●Applications

Video cassette recorders

### ●Features

- 1) All VCR servo functions on a single chip.
- 2) Digital filters in the DRUM and CAPSTAN speed and phase systems.
- 3) Built-in CTL amplifier with serial gain setting.
- 4) VISS / VASS overwriting and INDEX detection functions for wide-aspect operation.
- 5) DRUM  $f_H$  compensation calculation function from speed detect function.
- 6) 6.5H discrimination.
- 7) Compatible with 19 $\mu$ m heads.

### ●Absolute maximum ratings (Ta = 25°C)

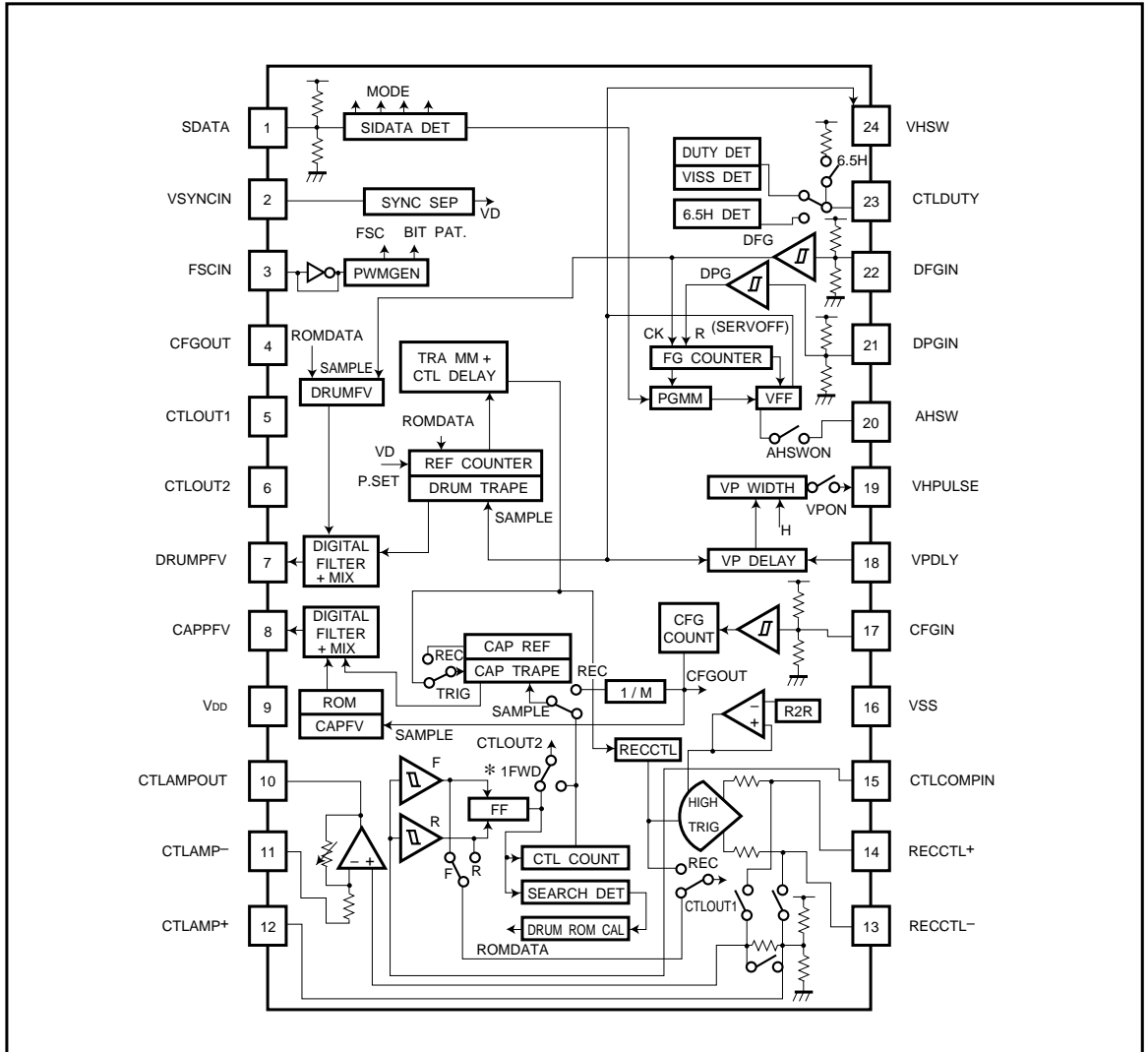
| Parameter             | Symbol    | Limits       | Unit |
|-----------------------|-----------|--------------|------|
| Power supply voltage  | $V_{DD}$  | 7.0          | V    |
| Power dissipation     | $P_d$     | 500*         | mW   |
| Operating temperature | $T_{opr}$ | - 15 ~ + 70  | °C   |
| Storage temperature   | $T_{stg}$ | - 55 ~ + 125 | °C   |

\* Reduced by 5mW for each increase in Ta of 1°C over 25°C.

### ●Recommended operating conditions (Ta = 25°C)

| Parameter            | Symbol   | Min. | Typ. | Max. | Unit |
|----------------------|----------|------|------|------|------|
| Power supply voltage | $V_{DD}$ | 4.5  | 5.0  | 5.5  | V    |

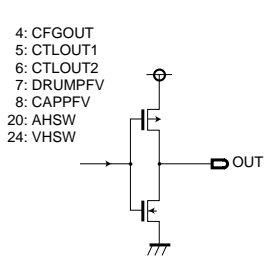
●Block diagram



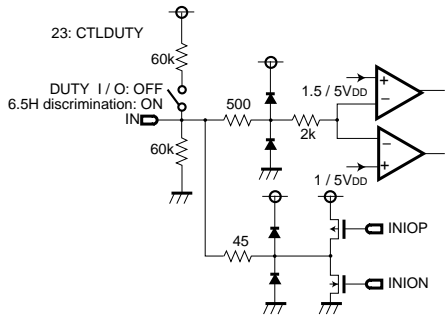
●Pin descriptions

| Pin No. | Pin name        | Function   |
|---------|-----------------|--|
| 1       | SDATA           | Serial data input (tri-state)  |
| 2       | VSYNCIN         | Composite sync input   |
| 3       | FSCIN           | System clock input   |
| 4       | CFGOUT          | CFG divider output   |
| 5       | CTLOUT1         | CTL comparator output  |
| 6       | CTLOUT2         | CTL divider output   |
| 7       | DRUMPFV         | DRUM control output (digital filter output)  |
| 8       | CAPPFV          | CAPSTAN control output (digital filter output)   |
| 9       | V <sub>DD</sub> | Power supply   |
| 10      | CTLAMPOUT       | CTLAMP output  |
| 11      | CTLAMP-         | CTLAMP - input   |
| 12      | CTLAMP+         | CTLAMP + input   |
| 13      | RECCTL-         | Recording CTL - output   |
| 14      | RECCTL+         | Recording CTL + output   |
| 15      | CTLCOMPIN       | CTL comparator input   |
| 16      | VSS             | GND  |
| 17      | CFGIN           | CFG input  |
| 18      | VPDLY           | Quasi-VH pulse delay amount control input  |
| 19      | VHPULSE         | Quasi-VH pulse output  |
| 20      | AHSW            | Head switch audio output   |
| 21      | DPGIN           | DRUM PG input  |
| 22      | DFGIN           | DRUM FG input  |
| 23      | CTLDUTY         | Duty discrimination, VISS discrimination, 6.5H discrimination output / VASS duty control input |
| 24      | VHSW            | HEAD SW video output   |

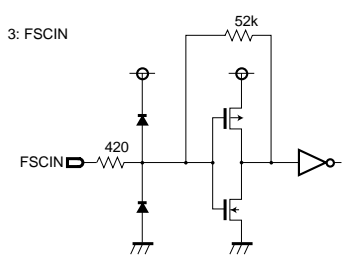
●Input / output circuits



Logic output

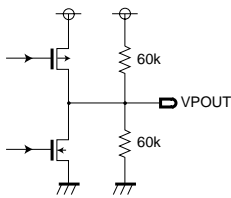


Shared input / output terminal



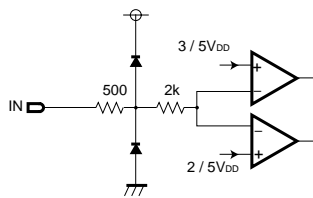
FSC input

19: VHPULSE



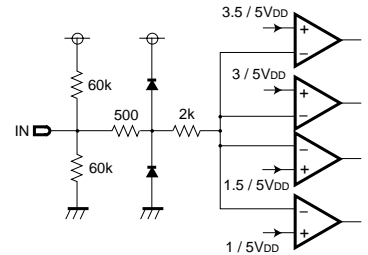
Tri-state output

2: VSYNCIN  
18: VPDLY



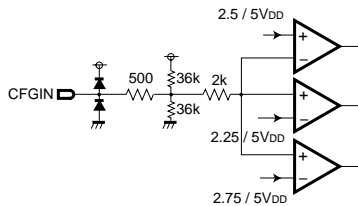
Two-value input

1: SDATA



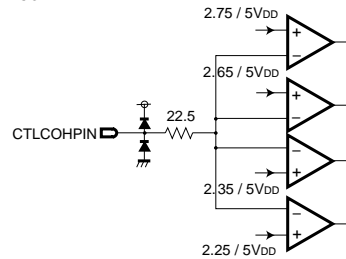
Three-value input

17: CFGIN



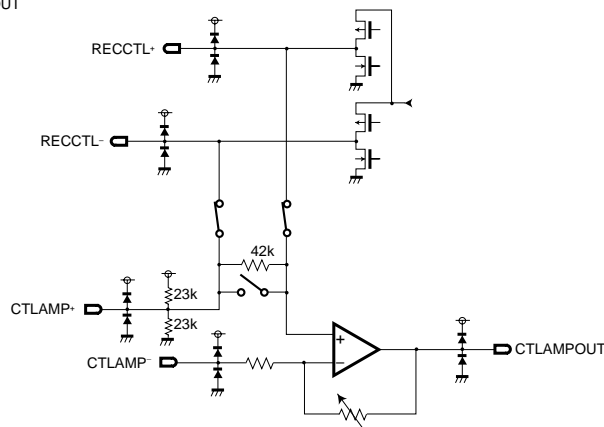
CFG input (zero cross comparator)

15: CTLCOMP IN



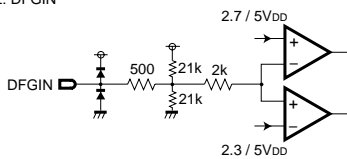
CTL comparator input

10: CTLAMP-OUT  
11: CTLAMP-  
12: CTLAMP+  
13: RECCTL-  
14: RECCTL+



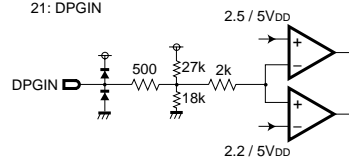
CTLAMP

22: DFGIN



DFG input

21: DPGIN



DPG input

●Electrical characteristics (unless otherwise noted, Ta = 25°C and V<sub>DD</sub> = 5V)

| Parameter                           | Symbol             | Min. | Typ. | Max. | Unit             | Conditions                              |
|-------------------------------------|--------------------|------|------|------|------------------|---|
| Supply current                      | I <sub>DD</sub>    | —    | 27   | 38   | mA               |   |
| Power on reset threshold            | V <sub>PON</sub>   | 1.0  | 1.5  | 2.0  | V                |   |
| Two-value output high level voltage | V <sub>H</sub>     | 4.0  | 4.5  | —    | V                | I <sub>LOAD</sub> = 1.5mA               |
| Two-value output low level voltage  | V <sub>L</sub>     | —    | 0.4  | 1.0  | V                | I <sub>LOAD</sub> = 1.5mA               |
| Two-value input threshold           | V <sub>TH</sub>    | 2.5  | 3.0  | 3.5  | V                | Schmitt level + 0V, - 1.0V              |
| Two-value input current             | I <sub>LIN</sub>   | —    | 0    | 1    | μA               | V <sub>IN</sub> = V <sub>DD</sub> , GND |
| Pullup input current                | I <sub>PU</sub>    | 59   | 83   | 116  | μA               | V <sub>N</sub> = GND                    |
| CFG input current                   | I <sub>CFG</sub>   | 100  | 140  | 196  | μA               | V <sub>N</sub> = V <sub>DD</sub> , GND  |
| Three-value output high voltage     | V <sub>H3</sub>    | 4.0  | 4.5  | —    | V                | I <sub>LOAD</sub> = 1.5mA               |
| Three-value output low voltage      | V <sub>L3</sub>    | —    | 0.4  | 1.0  | V                | I <sub>LOAD</sub> = 1.5mA               |
| Three-value output mid voltage      | V <sub>M3</sub>    | 2.0  | 2.5  | 3.0  | V                |   |
| Three-value input "H" threshold     | V <sub>TINH</sub>  | 3.10 | 3.50 | 4.00 | V                | Schmitt level + 0V, - 0.5V              |
| Three-value input "L" threshold     | V <sub>TINL</sub>  | 1.00 | 1.50 | 1.90 | V                | Schmitt level + 0V, - 0.5V              |
| Three-value input current (±)       | I <sub>TIN</sub>   | 59   | 83   | 116  | μA               | V <sub>IN</sub> = V <sub>DD</sub> , GND |
| FSC operating input level           | V <sub>RCK</sub>   | 0.2  | —    | 4.0  | V <sub>P-P</sub> | AC coupled, duty: 40 to 60%, C = 1000pF |
| FSC input current (±)               | I <sub>FSCIN</sub> | 61   | 85   | 119  | μA               | V <sub>IN</sub> = V <sub>DD</sub> , GND |
| RECCTL output high level voltage    | V <sub>RCTH</sub>  | 4.00 | 4.56 | —    | V                | I <sub>LOAD</sub> = 2.0mA               |
| RECCTL output low level voltage     | V <sub>RCTL</sub>  | —    | 0.16 | 0.60 | V                | I <sub>LOAD</sub> = 2.0mA               |
| 〈CTLAMP〉                            |                    |      |      |      |                  |   |
| Output high level voltage           | V <sub>OH</sub>    | 3.8  | 4.3  | —    | V                | I <sub>LOAD</sub> = 1.0mA               |
| Output low level voltage            | V <sub>OL</sub>    | —    | 0.2  | 0.5  | V                | I <sub>LOAD</sub> = 1.0mA               |
| CTLAMP comparator level             | V <sub>CTLI</sub>  | 200  | 250  | 300  | mV               | With respect to bias                    |
| CTLAMP comparator width             | V <sub>CO</sub>    | 75   | 100  | 125  | mV               | —                                       |
| CTLAMP bias level                   | V <sub>BI</sub>    | 2.4  | 2.5  | 2.6  | V                | —                                       |

○Not designed for radiation resistance.

● Measurement circuit

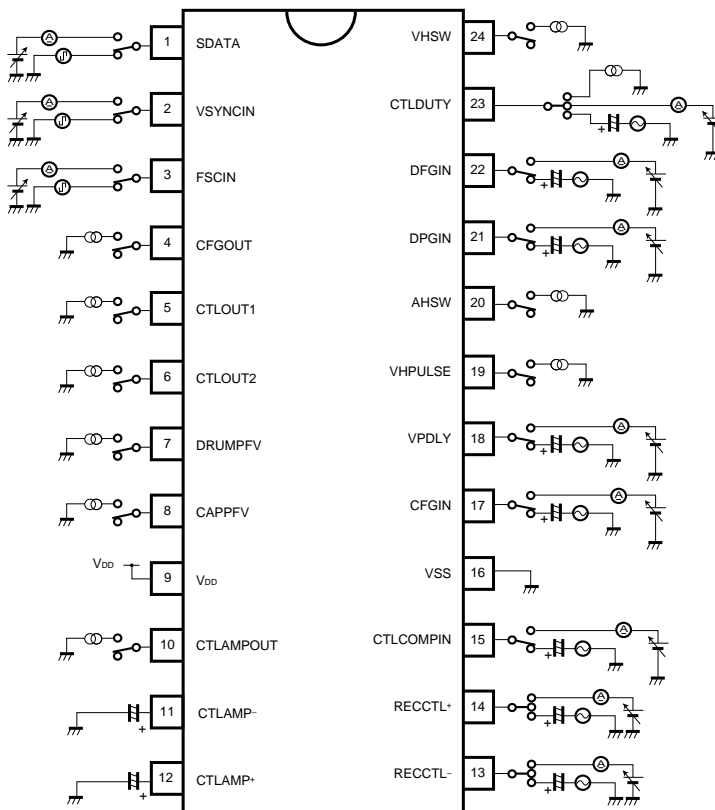


Fig.1

● Electrical characteristic curves

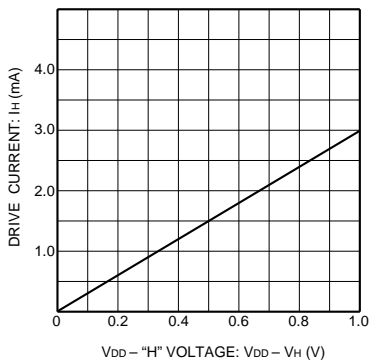


Fig. 2 Two-value output high level voltage vs. drive current characteristics

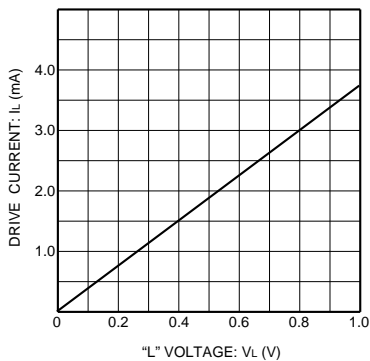


Fig. 3 Two-value output low level voltage vs. drive current characteristics

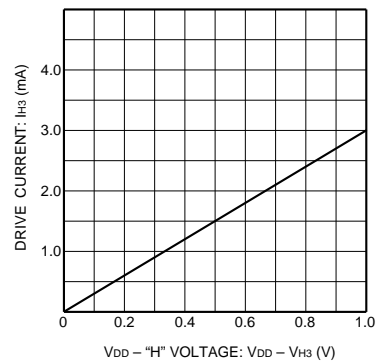


Fig. 4 Three-value output high level voltage vs. drive current characteristics

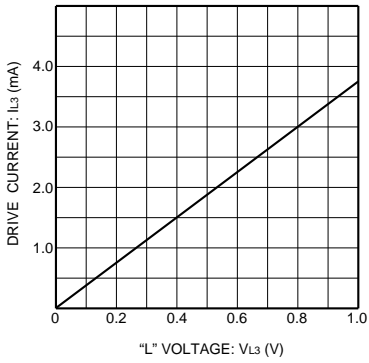


Fig. 5 Three-value output low level voltage vs. drive current characteristics

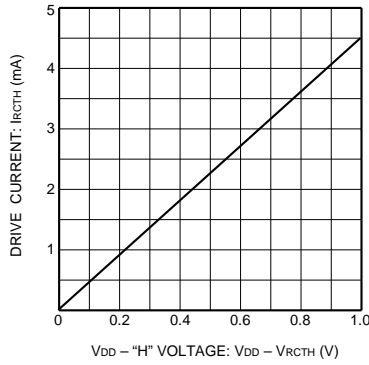


Fig. 6 RECCTL output high level voltage vs. drive current characteristics

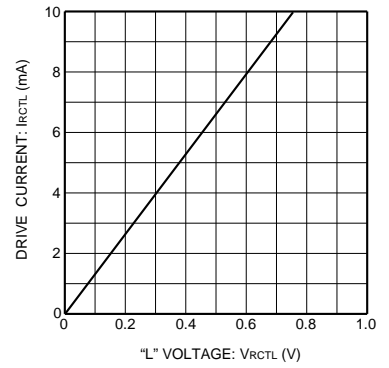


Fig. 7 RECCTL output low level voltage vs. drive current characteristics

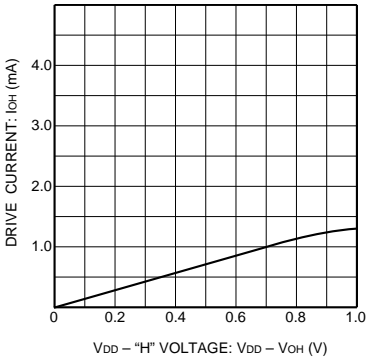


Fig. 8 CTLAMP output high level voltage vs. drive characteristics

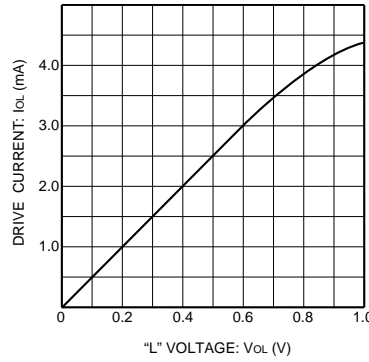


Fig. 9 CTLAMP output low level voltage vs. drive current characteristics

●External dimensions (Units: mm)

