

# AN5757S

## CRT horizontal deflection voltage control IC

### ■ Overview

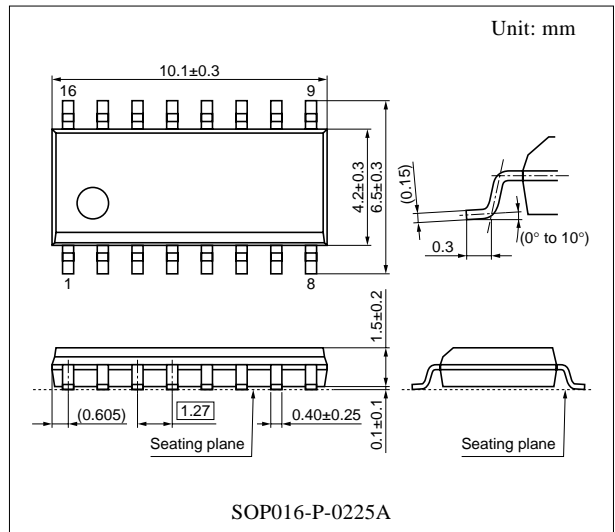
The AN5757S is an IC for PWM-system CRT horizontal deflection voltage control. It can be used for horizontal frequency from 20 kHz to 140 kHz and applicable from a popular type monitor to high precision monitor. Its SO-16-pin package enables the users to design the sets simple and efficient.

### ■ Features

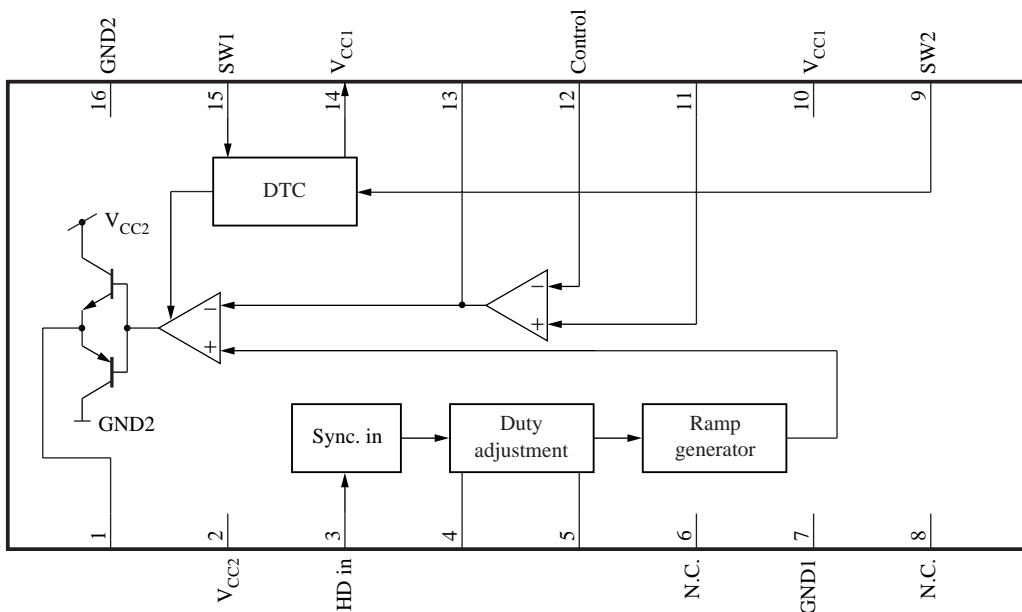
- PWM output
- Built-in thermal protection circuit (cut off both upper and lower push-pull output transistor)
- Soft start function
- Built-in error amp.

### ■ Applications

- CRT monitors



### ■ Block Diagram



## ■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	PWM output	9	On/off SW input2 (SW2)
2	Power supply for output ( $V_{CC2}$ )	10	Power supply ( $V_{CC1}$ )
3	Horizontal synchronous input (HD in)	11	IN+
4	Duty adjustment (capacitor)	12	IN-
5	Duty adjustment (resistor)	13	NF
6	N.C.	14	Capacitor for DTC
7	GND1	15	On/off SW input1 (SW1)
8	N.C.	16	GND2

## ■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	$V_{CC1}$	13.2	V
	$V_{CC2}$	13.2	
Supply current	$I_{CC1}$	6.3	mA
	$I_{CC2}$	15.0	
Output current	$I_1$	$\pm 150$	mA
Power dissipation *2	$P_D$	198	mW
Operating ambient temperature *1	$T_{opr}$	-20 to +70	$^{\circ}\text{C}$
Storage temperature *1	$T_{stg}$	-55 to +125	$^{\circ}\text{C}$

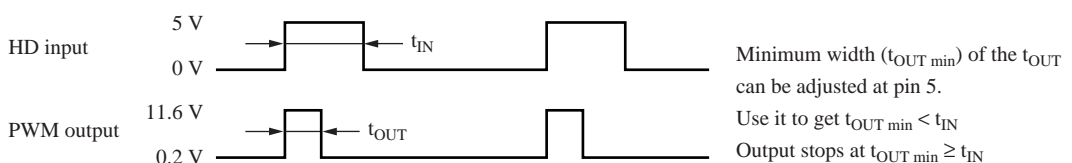
Note) \*1: Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for  $T_a = 25^{\circ}\text{C}$ .

\*2: The power dissipation shown is for the IC package in free air at  $T_a = 70^{\circ}\text{C}$ .

## ■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	$V_{CC1}, V_{CC2}$	11.0 to 13.0	V
HD input	$V_3$	0 to $V_{10}$	V
SW1 input	$V_{115}$	0 to $V_{10}$	V
SW2 input	$V_{19}$	0 to $V_{10}$	V
Max. duty adjustment voltage	$V_5$	0 to 6	V
Error amp. positive input	$V_{11}$	0 to 6	V
Error amp. negative input	$V_{12}$	0 to 6	V
Max. output current of PWM output	$I_{1(max)}$	-150 to +150	mA

Note) '+' denotes current flowing into the IC, and '-' denotes current flowing out of the IC.



**■ Electrical Characteristics at  $T_a = 25^\circ\text{C}$** 

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Power supply current	$I_{CC1}$	$V_{CC} = 12\text{ V}$ , $V_{9,15} = 5\text{ V}$ , $V_3 = 5\text{ V}$ , $V_{11} = 0\text{ V}$	2.0	4.0	6.0	mA
Power supply current for output	$I_{CC2}$	$V_{CC} = 12\text{ V}$ , $V_{9,15} = 5\text{ V}$ , $V_3 = 5\text{ V}$ , $V_{11} = 0\text{ V}$	6.0	10.0	14.0	mA
<b>Duty</b>						
Pin voltage of duty adjustment resistor pin	$V_{5-7}$	$V_{CC} = 12\text{ V}$ , $V_3 = 0\text{ V}$	2.0	3.0	4.0	V
Pin current (for discharge) of duty adjustment capacitor pin	$I_{4D}$	$V_{CC} = 12\text{ V}$ , $V_3 = 0\text{ V}$ , $V_4 = 1\text{ V}$	3.0	—	—	mA
Pin current (for charge) of duty adjustment capacitor pin	$I_{4C}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $V_4 = 1\text{ V}$	-60	-45	-30	$\mu\text{A}$
High-level of duty adjustment capacitor pin	$V_{4-7H}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$	3.2	3.7	4.2	V
Low-level of duty adjustment capacitor pin	$V_{4-7L}$	$V_{CC} = 12\text{ V}$ , $V_3 = 0\text{ V}$	0	—	0.15	V
<b>DTC</b>						
SW2 pin current H	$I_{9H}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $V_9 = 12\text{ V}$	200	300	400	$\mu\text{A}$
SW2 pin current M	$I_{9M}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $V_9 = 5\text{ V}$	45	70	95	$\mu\text{A}$
SW2 pin current L	$I_{9L}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $V_9 = 0\text{ V}$	-5	—	0	$\mu\text{A}$
SW1 pin current H	$I_{15H}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $V_{15} = 12\text{ V}$	200	300	400	$\mu\text{A}$
SW1 pin current M	$I_{15M}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $V_{15} = 5\text{ V}$	45	70	95	$\mu\text{A}$
SW1 pin current L	$I_{15L}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $V_{15} = 0\text{ V}$	-5	—	0	$\mu\text{A}$
Pin current (discharge) of DTC capacitor pin	$I_{14D}$	$V_{CC} = 12\text{ V}$ , $V_{14} = 5\text{ V}$ , $V_{9,15} = 12\text{ V}$	60	90	120	$\mu\text{A}$
Pin current (charge) of DTC capacitor pin	$I_{14C}$	$V_{CC} = 12\text{ V}$ , $V_{14} = 10\text{ V}$ , $V_{9,15} = 0\text{ V}$	-15	-8	-1	mA
High-level of DTC capacitor pin	$V_{14-7H}$	$V_{CC} = 12\text{ V}$ , $V_{9,15} = 0\text{ V}$	11.5	—	—	V
Low-level of DTC capacitor pin	$V_{14-7L}$	$V_{CC} = 12\text{ V}$ , $V_{9,15} = 12\text{ V}$	0	—	0.15	V

### ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>PWM output</b>						
High-level of PWM output pin (no load)	$V_{1-16H1}$	$V_{CC} = 12\text{ V}$ , $V_3 = 0\text{ V}$ , pin 1: Open	11.0	—	—	V
Low-level of PWM output pin (no load)	$V_{1-16L1}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , pin 1: Open	0	—	1.0	V
High-level of PWM output pin (with load)	$V_{1-16H2}$	$V_{CC} = 12\text{ V}$ , $V_3 = 0\text{ V}$ , $I_1 = -150\text{ mA}$	8.0	10.0	11.5	V
Low-level of PWM output pin (with load)	$V_{1-16L2}$	$V_{CC} = 12\text{ V}$ , $V_3 = 5\text{ V}$ , $I_1 = +150\text{ mA}$	0.5	1.5	2.5	V

#### • Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
HD input frequency	$f_3$	$V_{CC} = 12\text{ V}$ , $V_{9,15} = 12\text{ V}$ , $V_{11} = 0\text{ V}$	20	—	140	kHz
HD input threshold value	$V_{3TH}$	$V_{CC} = 12\text{ V}$ , $V_{9,15} = 12\text{ V}$ , $V_{11} = 0\text{ V}$	0.6	1	1.4	V
Open gain of error amp.	A	$V_{CC} = 12\text{ V}$	—	80	—	dB
Current capability of PWM output pin	$I_1$	$V_{CC} = 12\text{ V}$	-150	—	+150	mA
Operation start voltage	$V_{10-7N}$	$V_{11} = 0\text{ V}$ , $V_3 = 5\text{ V}$	8.1	8.5	8.9	V
Operation stop voltage	$V_{10-7F}$	$V_{11} = 0\text{ V}$ , $V_3 = 5\text{ V}$	6.1	6.5	6.9	V
SW1 threshold value	$V_{S15}$	$V_{CC} = 12\text{ V}$ , $V_{11} = 0\text{ V}$ , $V_3 = 5\text{ V}$	1.1	1.5	1.9	V
SW2 threshold value	$V_{S9}$	$V_{CC} = 12\text{ V}$ , $V_{11} = 0\text{ V}$ , $V_3 = 5\text{ V}$	1.1	1.5	1.9	V

### ■ Terminal Equivalent Circuits

Pin No.	Equivalent circuit	Description	Waveform
1		PWM output: Pin for output	
2		Power supply for output: Power supply for PWM output Apply DC 12 V.	DC 12 V

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Waveform
3		<p>Horizontal synchronizing signal input: Input pin of horizontal synchronizing signal Detection level is 1 V.</p>	
4		<p>For duty adjustment (capacitor): Duty can be adjusted by attaching a capacitor between the pin and GND. If capacitance is raised, duty becomes small.</p>	
5		<p>Duty adjustment (resistor): Duty can be adjusted by attaching a resistor between the pin and GND. If resistance is lowered, duty becomes large.</p>	<p>DC 0.5 V to 5.0 V variable</p>
6	—	N.C.: Pin for N.C.	—
7		GND1: Pin for GND	0 V
8	—	N.C.: Pin for N.C.	—
9		<p>Switch input2 for on/off: On/off switch pin for PWM output On at 2 V or more and off at 0 V. (Threshold level: 1.5 V)</p>	<p>Pin 9      Pin 1 0 V      → High (11 V) 2 V or more → Low (1 V)</p>
10		<p>Power supply: Power supply pin Apply DC 12 V.</p>	DC 12 V

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	Waveform
11		IN+: Input pin for + side input pin for error amp.	—
12		IN-: Input pin for - side input pin for error amp.	
13		NF: Output pin for error amp.	—
14		Capacitor for DTC: Capacitor pin to determine a soft start time If capacitance is raised, time becomes long.	—
15		Switch input1 for on/off: On/off switch pin for PWM output. On at 2 V or more and off at 0 V. (Threshold level: 1.5 V)	Pin 15      Pin 1 0 V            → High (11 V) 2 V or more → Low (1 V)
16		GND2 Pin for GND.	0 V

## ■ Usage Notes

### • Allowable mode of short-circuit between pins

Short circuit allowable pins are marked with ● symbol.

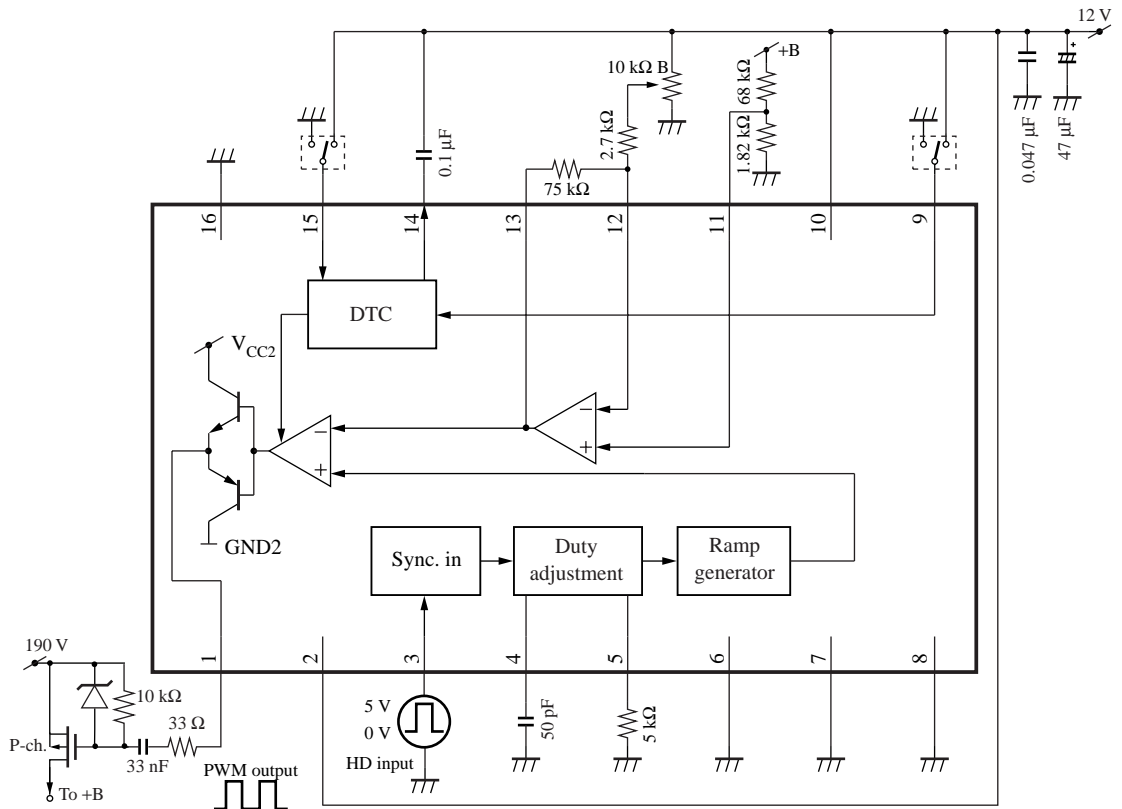
It has been confirmed that a typical IC sample does not break down even if pins are short-circuited for one second.

It has been confirmed that a typical IC sample does not emitting smoke and fire even if pins are short-circuited for ten seconds. This is not inspected for all ICs.

The mark × shows that a breakdown may be caused if the pins are short-circuited. Full care must be taken on using the IC.

1																
2	●															
3	●	●														
4	●	●	●													
5	●	●	●	●												
6	●	●	●	●	●											
7	●	×	●	●	●	●										
8	●	●	●	●	●	●	●									
9	●	●	●	●	●	●	●	●								
10	●	●	●	●	●	●	×	●	●							
11	●	●	●	●	●	●	●	●	●	●						
12	●	●	●	●	●	●	●	●	●	●	●					
13	●	●	●	●	●	●	●	●	●	●	●	●				
14	●	●	●	●	●	●	●	●	●	●	●	●	●			
15	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
16	●	×	●	●	●	●	●	●	●	×	●	●	●	●	●	
Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

■ Application Circuit Example



Note) When both of the pin 4 and the pin 5 are open, minimum pulse width of PWM output is 2.0 μs.