



# STV9306

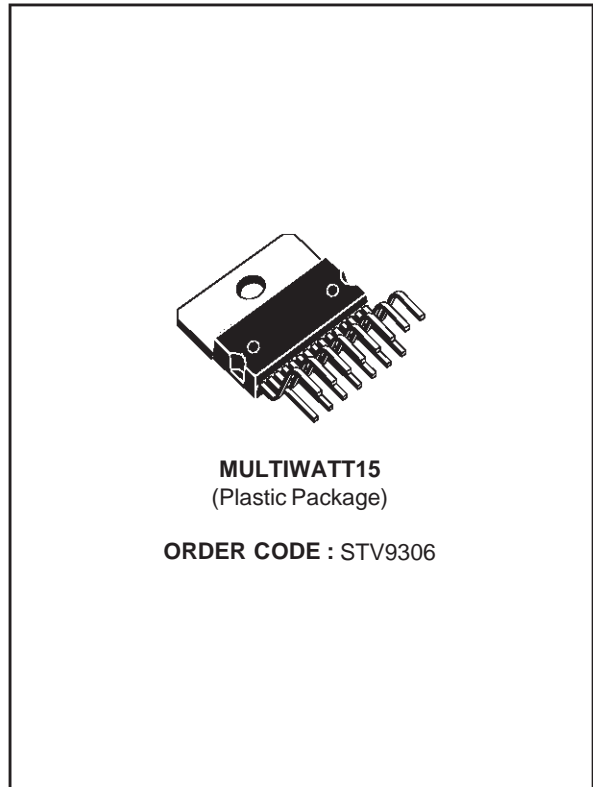
## BUS CONTROLLED VERTICAL DEFLECTION SYSTEM WITH EAST/WEST CORRECTION OUTPUT CIRCUIT

PRELIMINARY DATA

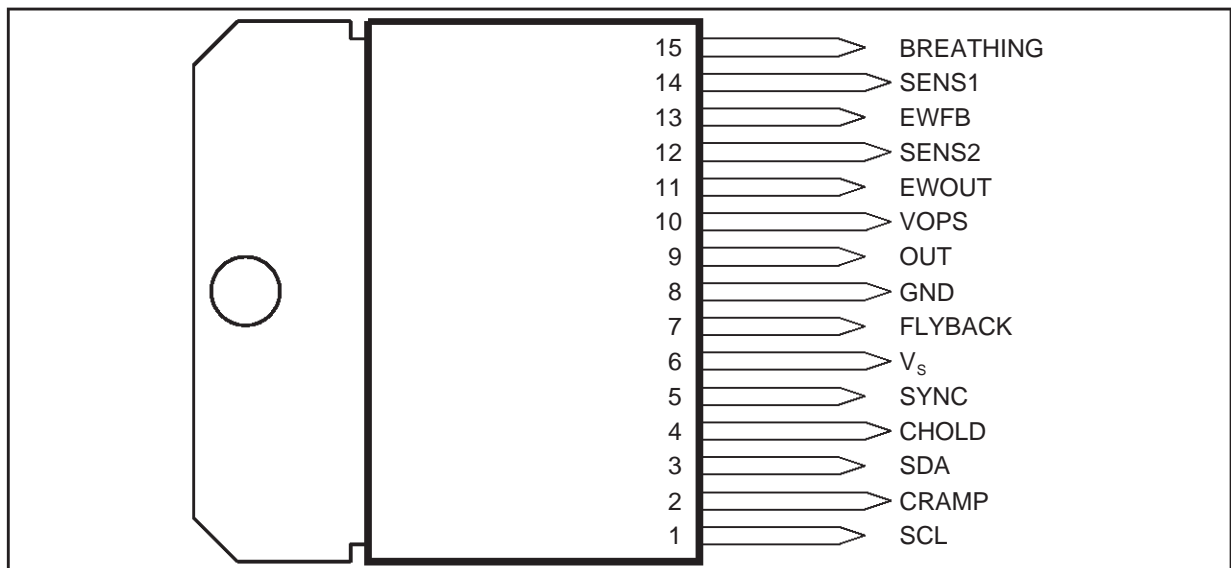
- FULLY I<sup>2</sup>C CONTROLLED
- DMOS POWER HALF-BRIDGE AMPLIFIER
- DC COUPLED OPERATION
- INTERNAL FLYBACK GENERATOR (UP TO 60V)
- SELF ADAPTED SAWTOOTH (50/60Hz)
- 100Hz OPERATION
- VERTICAL LINEARITY, AMPLITUDE AND CENTERING ADJUSTMENTS
- HORIZONTAL WIDTH, PINCUSHION, TRAPEZOID AND CORNER ADJUSTMENTS
- BREATHING CORRECTION
- 4/3, 16/9 CRT APPLICATION
- THERMAL PROTECTION
- LINEAR VERTICAL ZOOM FUNCTION
- E/W CLASS A OUTPUT
- LOW EXTERNAL COMPONENTS

### DESCRIPTION

The STV9306 is a fully I<sup>2</sup>C controlled vertical deflection IC designed for use in 110°, 4/3 or 16/9 CRT applications. It integrates both the vertical deflection and E/W correction circuitries necessary in design of a 110° chassis.



### PIN CONNECTIONS



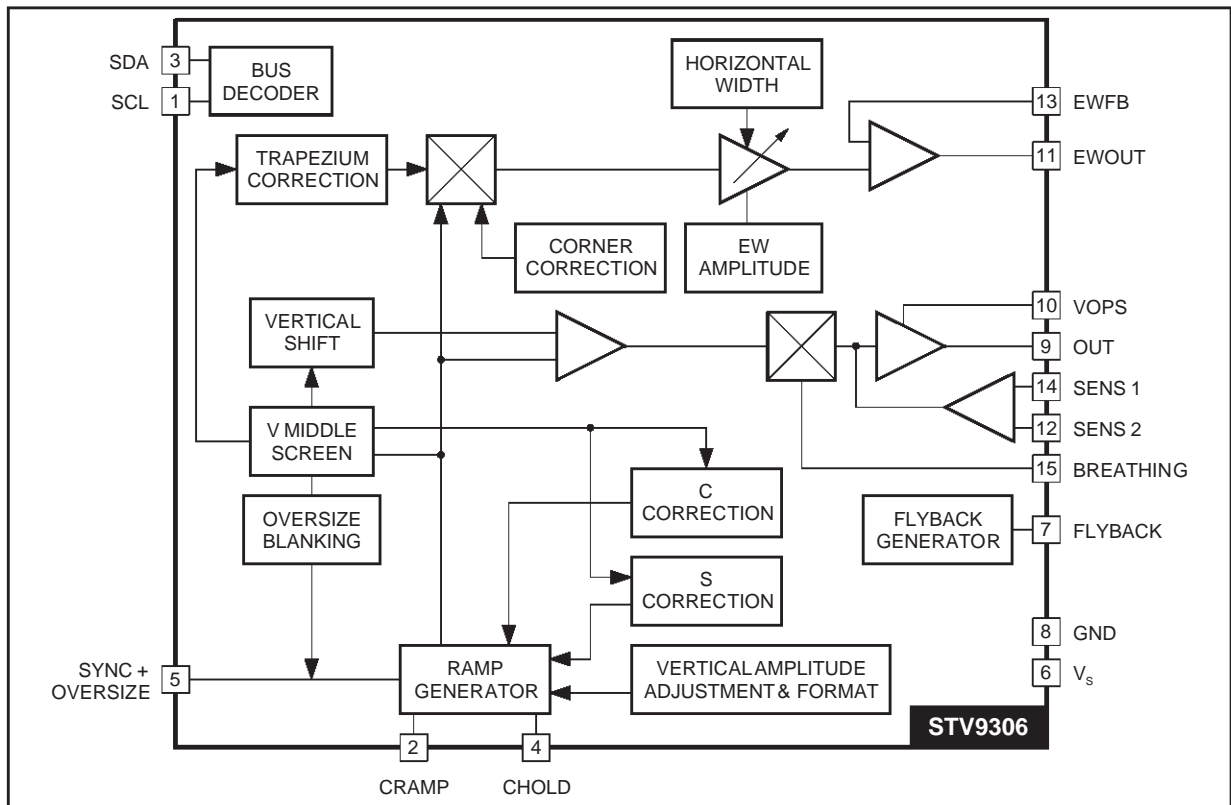
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PIN LIST

Pin	Symbol	Description
1	SCL	I <sup>2</sup> C Bus Clock
2	CRAMP	Ramp Capacitor
3	SDA	I <sup>2</sup> C Bus Data
4	CHOLD	Hold Capacitor
5	SYNC	Sync Input
6	VS	Supply Voltage
7	FLYBACK	Flyback Output
8	GND	Ground
9	OUT	Vertical Output
10	VOPS	Vertical Output Power Supply
11	EWOUT	EW Output
12	SENS2	Vertical Current Sense 2
13	EWFB	EW Feedback
14	SENS1	Vertical Current Sense 1
15	BREATHING	Breathing Input

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BLOCK DIAGRAM



9306-02.EPS

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_S$	Supply Voltage	35	V
$V_{OUT}$	Flyback Peak Voltage	60	V
$V_I$	Input Voltage at Pins 1-3-5-12-13-14-15	-0.3, $V_S$	V
$V_{IS}$	Input Voltage at Pins 2-4	10	V
E/W OUT	East/West Output	60	V
$T_{oper}$	Operating Temperature	-10, +70	°C
$T_{stg}$	Storage Temperature	-55, +150	°C
$T_j$	Junction Temperature	+150	°C

9306-02.TBL

**THERMAL DATA**

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction-case Thermal Resistance	Max. 3	°C/W
$T_t$	Temperature for Thermal Shutdown	Min. 140	°C

9306-03.TBL

**ELECTRICAL CHARACTERISTICS**

V<sub>S</sub> = 24V, R<sub>SENS</sub> = 0.5Ω, Normal mode, T<sub>amb</sub> = 25°C, unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
--------	-----------	-----------------	------	------	------	------

SUPPLY

V <sub>S</sub>	Operating Supply Voltage		16		28	V
I <sub>S</sub>	Supply Current on Pins 6-10	I <sub>O</sub> = 0		40	60	mA

RAMP GENERATOR CONTROL

V <sub>Rlow</sub>	Minimum V <sub>RAMP</sub> Voltage at Pin 2		1.8	2	2.2	V
t <sub>D</sub>	Discharge Time at Pin 2			50		μs
I <sub>SY</sub>	Synchro Input Current at Pin 5	V <sub>SY</sub> = 0	-6	-3		μA
V <sub>THSY</sub>	Synchro Threshold Voltage at Pin 5		2.5	3	3.5	V
I <sub>OB</sub>	Oversize Blank Input Current at Pin 5		70	100		μA

POWER AMPLIFIER

I <sub>IBR</sub>	Breathing Current Input Current at Pin 15	V <sub>BREATH</sub> = 0V	-10	-5		μA
V <sub>BREATH</sub>	Breathing Operating Voltage at Pin 15		0		9	V
V <sub>7H</sub>	Saturation Voltage to supply at Pin 7	I <sub>O</sub> = -1.5A, V <sub>9</sub> > V <sub>S</sub> + 5V		2.5	3.5	V
V <sub>7L</sub>	Saturation Voltage to Ground at Pin 7	I <sub>O</sub> = 100mA		1.5	2.5	V
I <sub>SENS1</sub> I <sub>SENS2</sub>	Bias Input Current at Pin 14 Bias Input Current at Pin 12	V <sub>14</sub> = 0V V <sub>12</sub> = 0V	-20 -20	-10 -10		μA μA
V <sub>9H</sub>	Saturation Voltage to supply at Pin 9 versus Pin 10	I <sub>O</sub> = -1.5A		2.5	3.5	V
V <sub>9L</sub>	Saturation Voltage to Ground at Pin 9	I <sub>O</sub> = 1.5A		1.5	2.5	V
dV <sub>9H</sub> /st dV <sub>9L</sub> /dt				+10 +5		mV/°C mV/°C

VERTICAL OUTPUT (Pin 9)

I <sub>PP</sub>	Vertical Deflection Current (see Figure 1)	V <sub>SAW</sub> = 000000 V <sub>SAW</sub> = 111111		1.8 3		A A
I <sub>DC</sub>	Average Current (vertical shift) at V <sub>SAW</sub> = 111111	V <sub>SH</sub> = 01111 V <sub>SH</sub> = 11111		-0.35 0.35		A A
Z <sub>SLP</sub>	Z <sub>SLP</sub> = $\frac{\text{slope in zoom mode}}{\text{slope in normal mode}}$ (see Figure 2)	V <sub>ZOOM</sub> = 000 V <sub>ZOOM</sub> = 111		106 130		% %
I <sub>SC</sub>	S Correction = I <sub>SC</sub> /I <sub>PP</sub> (see Figure 3)	V <sub>SC</sub> = 0000 V <sub>SC</sub> = 1111		0 6		% %
I <sub>CC</sub>	C Correction = I <sub>CC</sub> /I <sub>PP</sub> (see Figure 4)	V <sub>CC</sub> = 0111 V <sub>CC</sub> = 1111		-3 3		% %
BR	Breathing BR = $\frac{I_{PP} - I_{PPB}}{I_{PP}}$ (see Figure 5)	BR <sub>Min.</sub> V <sub>15</sub> = 9V BR <sub>Max.</sub> V <sub>15</sub> = 1V		0 10		% %

EAST/WEST CORRECTION (V<sub>SAW</sub> = 100000, V<sub>SH</sub> = 10000, V<sub>SC</sub> = 0000, V<sub>CC</sub> = 1000) (see Figure 6)

I <sub>BIAS</sub>	Input Bias Current at Pin 13		-1	-0.5		μA
V <sub>PAR</sub>	Parabola Amplitude (pincushion correction) at Pin 13 (see Figure 7)	EW_AMP = 00000 EW_AMP = 11111		0 5		V V
V <sub>DCEW</sub>	Horizontal Width Adjustment at Pin 13 (see Figure 8)	EW_DC = 00000 EW_DC = 11111 HShrink active		1 6 +6		V V V
Trap	Trapezium Correction at Pin 13 (see Figure 9) Trap = V <sub>PARTUP</sub> /V <sub>PARTLOW</sub>	EW_TRAP = 01111 EW_TRAP = 11111		0.6 1.7		
Shape	Parabola Shape (corner correction) at Pin 13 (see Figure 10) - Shape = V <sub>COR</sub> /V <sub>PAR</sub>	EW_SHAPE = 00000 EW_SHAPE = 11111		0 50		% %
V <sub>11L</sub>	Saturation Voltage	I <sub>OUT</sub> = 500mA			2	V

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Figure 1

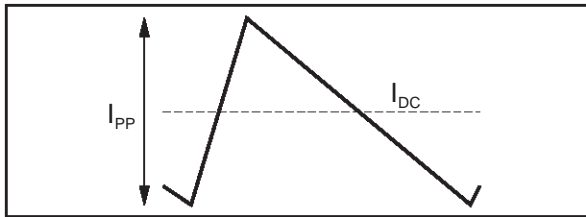


Figure 2

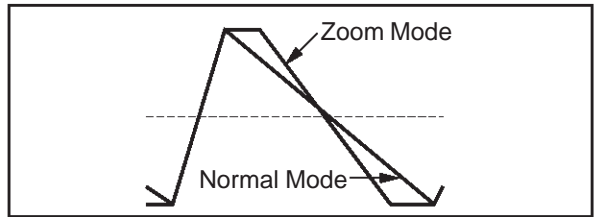


Figure 3

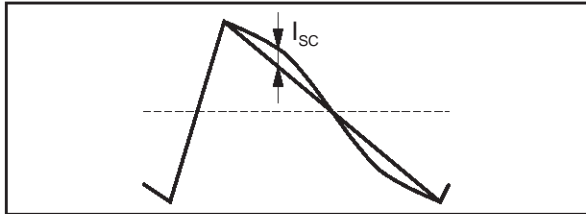


Figure 4

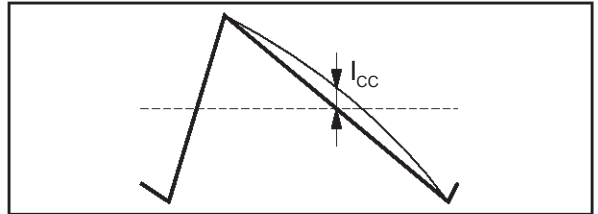


Figure 5

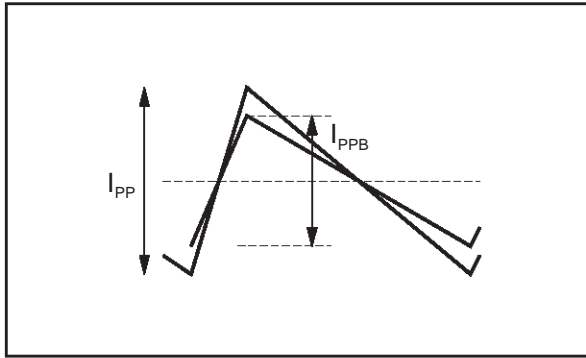


Figure 6

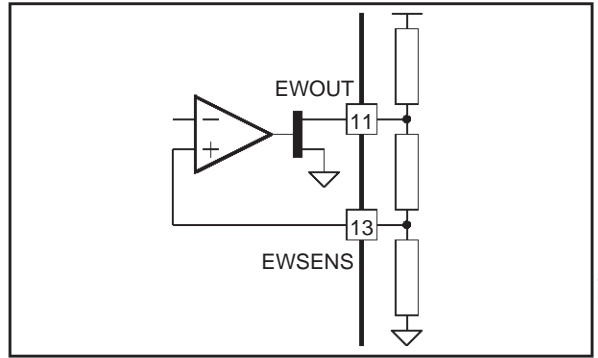


Figure 7

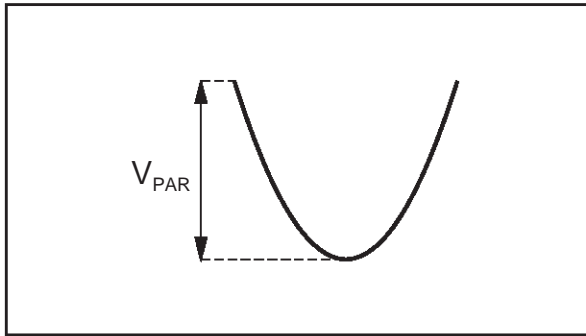


Figure 8

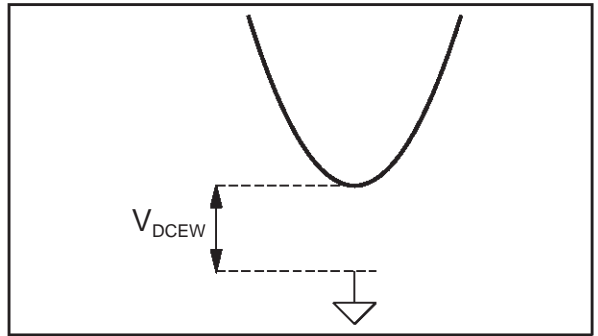


Figure 9

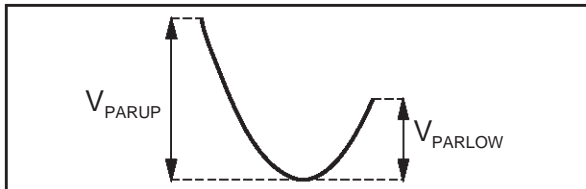
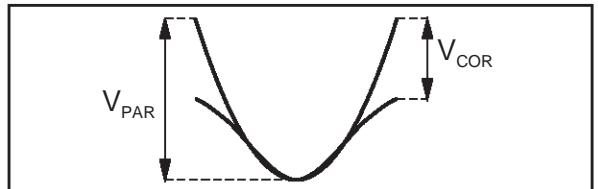


Figure 10



**I<sup>2</sup>C BUS CHARACTERISTICS**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
SCL (Pin 1)						
V <sub>IL</sub>	Low Level Input Voltage		-0.3		+1.5	V
V <sub>IH</sub>	High Level Input Voltage		3.0		5.5	V
I <sub>LI</sub>	Input Leakage Current	V <sub>IN</sub> = 0 to 5V	-10		+10	μA
f <sub>SCL</sub>	Clock Frequency		0		100	kHz
t <sub>R</sub>	Input Rise Time	1.5V to 3V			1000	ns
t <sub>F</sub>	Input Fall Time	1.5V to 3V			300	ns
C <sub>I</sub>	Input Capacitance				10	pF

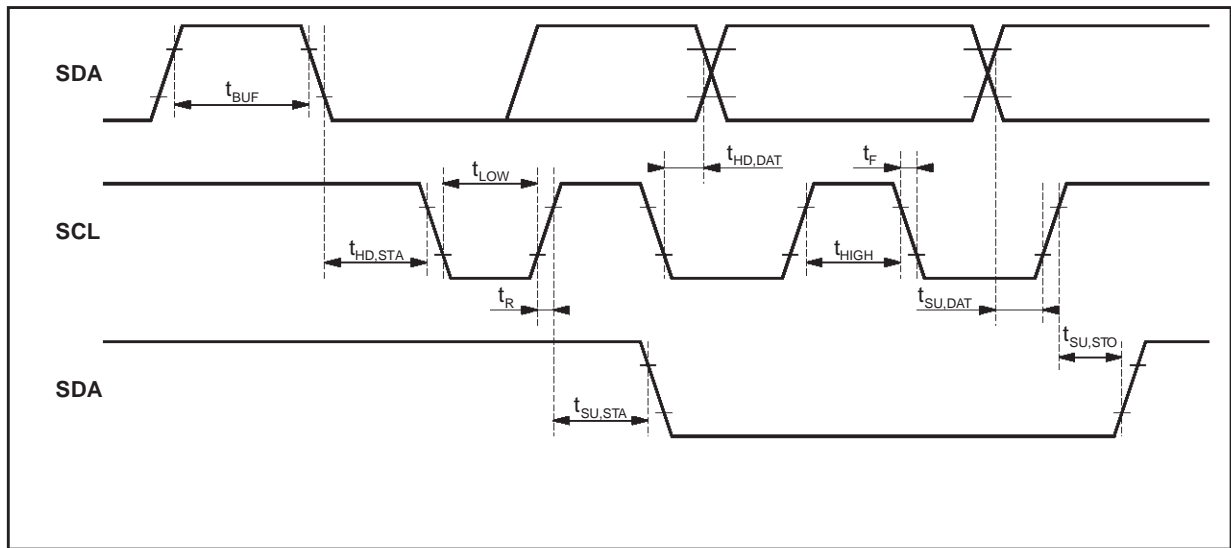
SDA (Pin 3)						
V <sub>IL</sub>	Low Level Input Voltage		-0.3		+1.5	V
V <sub>IH</sub>	High Level Input Voltage		3.0		5.5	V
I <sub>LI</sub>	Input Leakage Current	V <sub>IN</sub> = 0 to 5V	-10		+10	μA
C <sub>I</sub>	Input Capacitance				10	pF
t <sub>R</sub>	Input Rise Time	1.5V to 3V			1000	ns
t <sub>F</sub>	Input Fall Time	1.5V to 3V			300	ns
V <sub>OL</sub>	Low Level Output Voltage	I <sub>OL</sub> = 3mA			0.4	V
t <sub>F</sub>	Output Fall Time	3V to 1.5V			250	ns
C <sub>L</sub>	Load Capacitance				400	pF

**TIMING**

t <sub>LOW</sub>	Clock Low Period		4.7			μs
t <sub>HIGH</sub>	Clock High Period		4.0			μs
t <sub>SU, DAT</sub>	Data Set-up Time		250			ns
t <sub>HD, DAT</sub>	Data Hold Time		0		340	ns
t <sub>SU, STO</sub>	Set-up Time from Clock High to Stop		4.0			μs
t <sub>BUF</sub>	Start Set-up Time following a Stop		4.7			μs
t <sub>HD, STA</sub>	Start Hold Time		4.0			μs
t <sub>SU, STA</sub>	Start Set-up Time following Clock Low-to High Transition		4.7			μs

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**Figure 11 : I<sup>2</sup>C Bus Timing**



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**I<sup>2</sup>C SELECTION**

**1 - Write Mode : Slave Address : 1000 1100 (8C)**

Subaddress								Data											
B7	B6	B5	B4	B3	B2	B1	B0	B7	B6	B5	B4	B3	B2	B1	B0				
0	0	0	X	X	X	X	0	VERTICAL AMPLITUDE										X	1
0	0	1	X	X	X	X	0	SIGN	VERTICAL SHIFT						X	X	1		
0	1	0	X	X	X	X	0	S. CORRECTION					ZOOM MODE						
0	1	1	X	X	X	X	0	SIGN	C. CORRECTION				ZOOM AMPLITUDE						
1	0	0	X	X	X	X	0	HORIZONTAL WIDTH								Hshr	X	1	
1	0	1	X	X	X	X	0	E/W CORRECTION								X	X	1	
1	1	0	X	X	X	X	0	E/W CORNER CORRECTION								ext. T	X	1	
1	1	1	X	X	X	X	0	SIGN	TRAP. CORRECTION						Himp	X	1		

**Data**

B7	B6	B5	B4	B3	B2	B1	B0
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L0 : VERTICAL AMPLITUDE (V\_SAW)

0	0	0	0	0	0	X	1	Min. Amplitude
1	1	1	1	1	1	X	1	Max. Amplitude

L1 : VERTICAL SHIFT (V\_SH)

X	0	0	0	0	X	X	1	Min. Shift Level
X	1	1	1	1	X	X	1	Max. Shift Level
1	X	X	X	X	X	X	1	Positive Shift
0	X	X	X	X	X	X	1	Negative Shift

L2 : S CORRECTION (V\_SC) & ZOOM POSITION

0	0	0	0	X	X	X	1	Min. S Correction
1	1	1	1	X	X	X	1	Max. S Correction
X	X	X	X	0	0	X	1	Normal Mode
X	X	X	X	0	1	X	1	Unzoom
X	X	X	X	1	X	X	1	Zoom
X	X	X	X	X	X	1/0	1	Subtitle(active = 1)

L3 : C CORRECTION (V\_CC) & PROGRESSIVE ZOOM (V\_ZOOM)

1	X	X	X	X	X	X	1	Positive C Correction
0	X	X	X	X	X	X	1	Negative C Correction
X	0	0	0	X	X	X	1	Min. C Correction
X	1	1	1	X	X	X	1	Max. C Correction
X	X	X	X	0	0	0	1	Min. Zoom
X	X	X	X	1	1	1	1	Max. Zoom

L4 : HORIZONTAL WIDTH ADJ (EW\_VDC)

0	0	0	0	0	X	X	1	Hwidth Min. Level
1	1	1	1	1	X	X	1	Hwidth Max. Level
X	X	X	X	X	1/0	X	1	Hwidth Shrink (active = 1)

L5 : PINCUSHION CORRECTION (EW\_AMP)

0	0	0	0	0	X	X	1	Min. Amplitude
1	1	1	1	1	X	X	1	Max. Amplitude

L6 : E/W SHAPE (EW\_SHAPE)

0	0	0	0	0	X	X	1	Min. Shape Correction
1	1	1	1	1	X	X	1	Max. Shape Correction
X	X	X	X	X	1	X	1	E/W Transistor OUT
X	X	X	X	X	0	X	1	E/W Transistor IN

L7 : TRAPEZIUM CORRECTION (EW\_TRAP) & HIGH IMPEDANCE

1	X	X	X	X	X	X	1	Positive Trapezium Correction
0	X	X	X	X	X	X	1	Negative Trapezium Correction
X	0	0	0	0	X	X	1	Min. Level Correction
X	1	1	1	1	X	X	1	Max. Level Correction
X	X	X	X	X	0	X	1	Normal Mode
X	X	X	X	X	1	X	1	High Impedance

**I<sup>2</sup>C SELECTION** (continued)

**2 - Read Mode** : Slave Address : 1000 1101 (8D)

**Data**

B7	B6	B5	B4	B3	B2	B1	B0
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THERMAL SECURITY STATUS

0	X	X	X	X	X	X	1	Normal Temperature
1	X	X	X	X	X	X	1	Thermal Security Active

FLYBACK PULSE DETECTION STATUS

X	0	X	X	X	X	X	1	Flyback Pulse detected
X	1	X	X	X	X	X	1	Lack of Flyback Pulse

SYNC PULSE DETECTION STATUS

X	X	0	X	X	X	X	1	Synchro Pulse Present
X	X	1	X	X	X	X	1	Lack of Synchro Pulse



INPUT/OUTPUT PIN CONFIGURATION

Figure 12

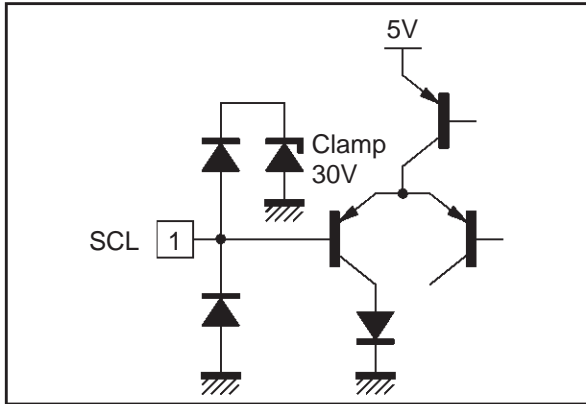


Figure 13

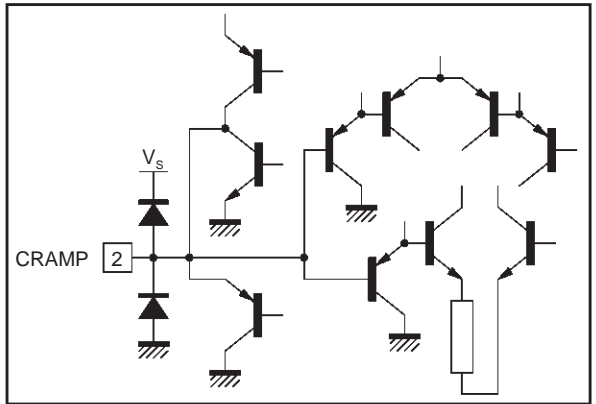


Figure 14

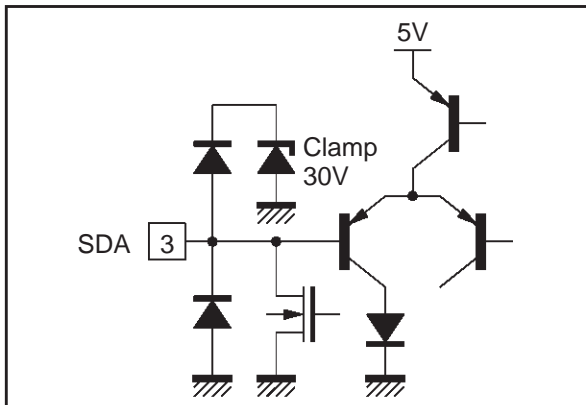


Figure 15

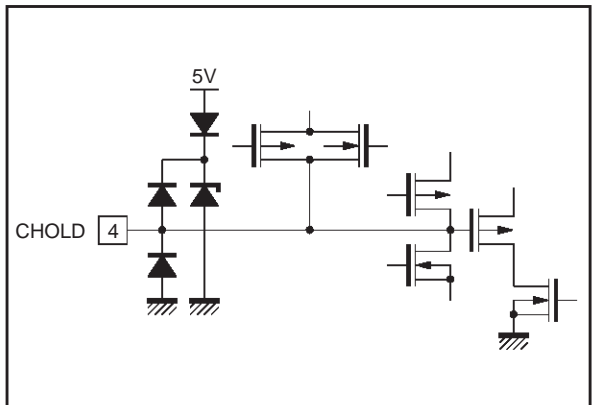


Figure 16

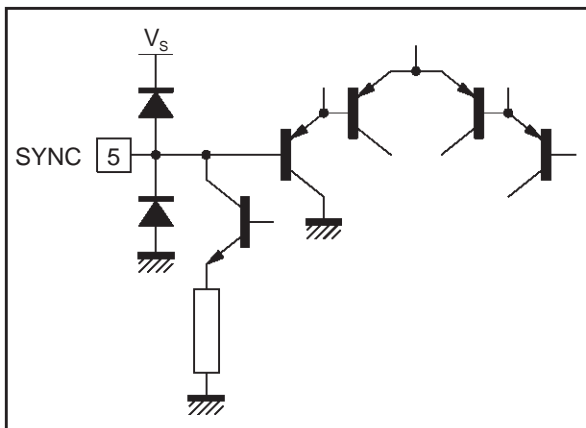
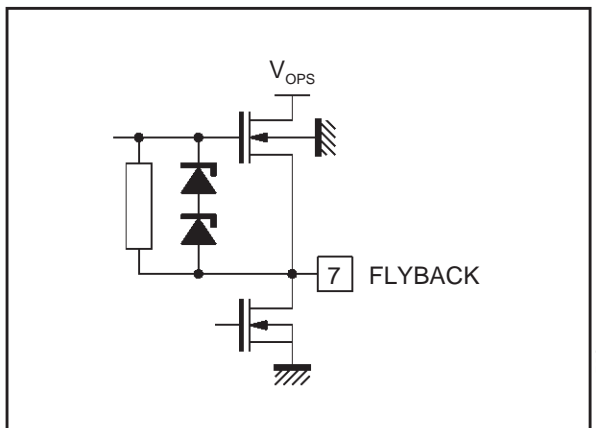
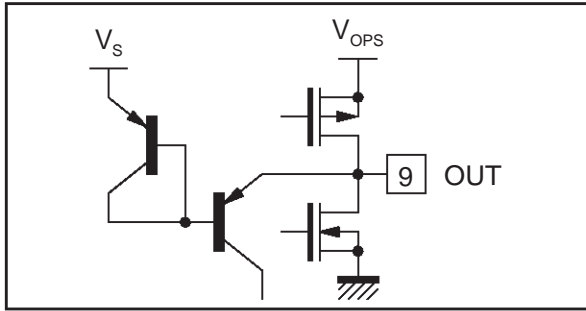


Figure 17



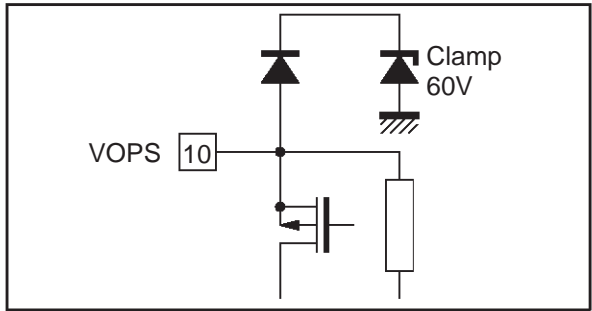
INPUT/OUTPUT PIN CONFIGURATION (continued)

Figure 18



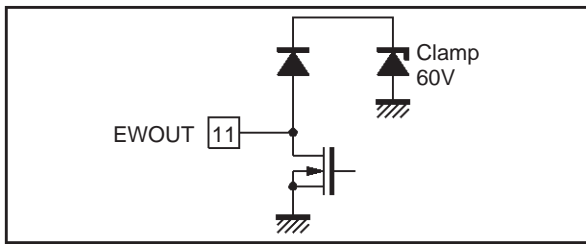
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Figure 19



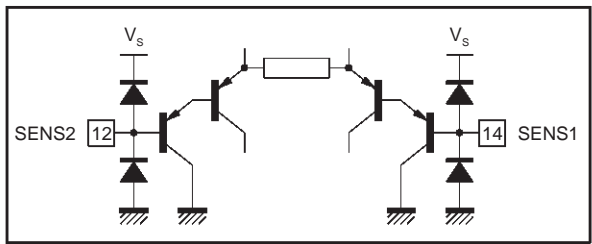
9306-21.EPS

Figure 20



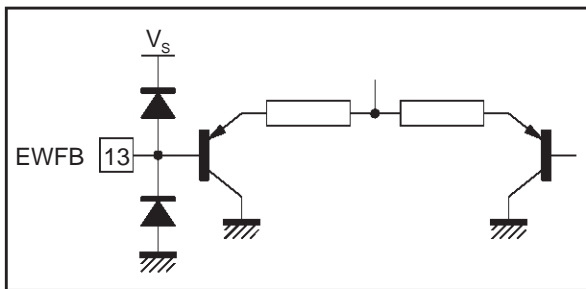
9306-22.EPS

Figure 21



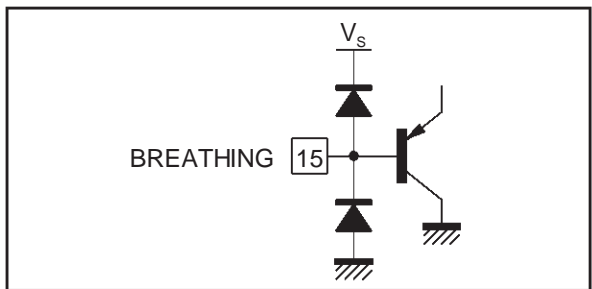
9306-23.EPS

Figure 22



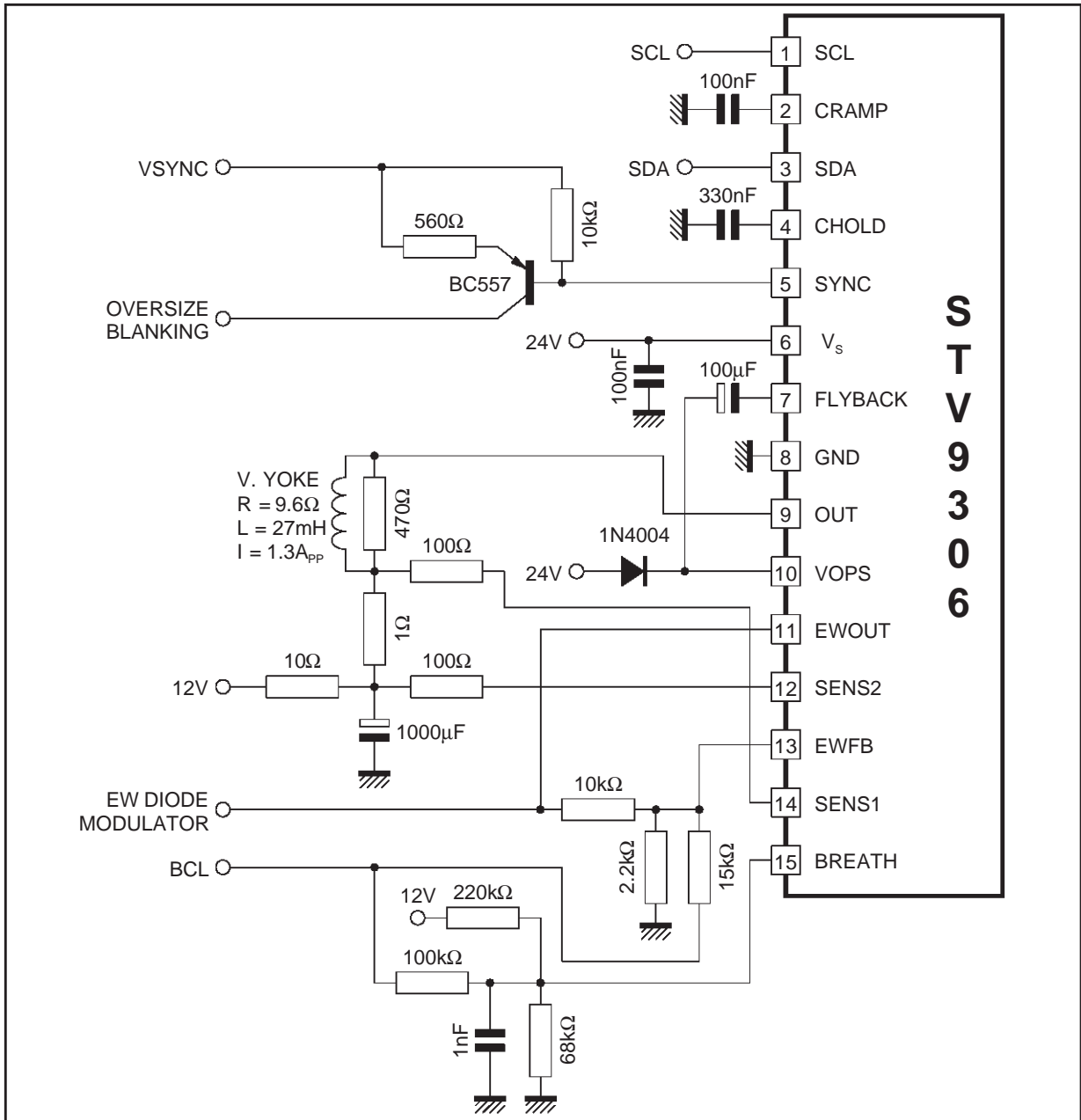
9306-24.EPS

Figure 23



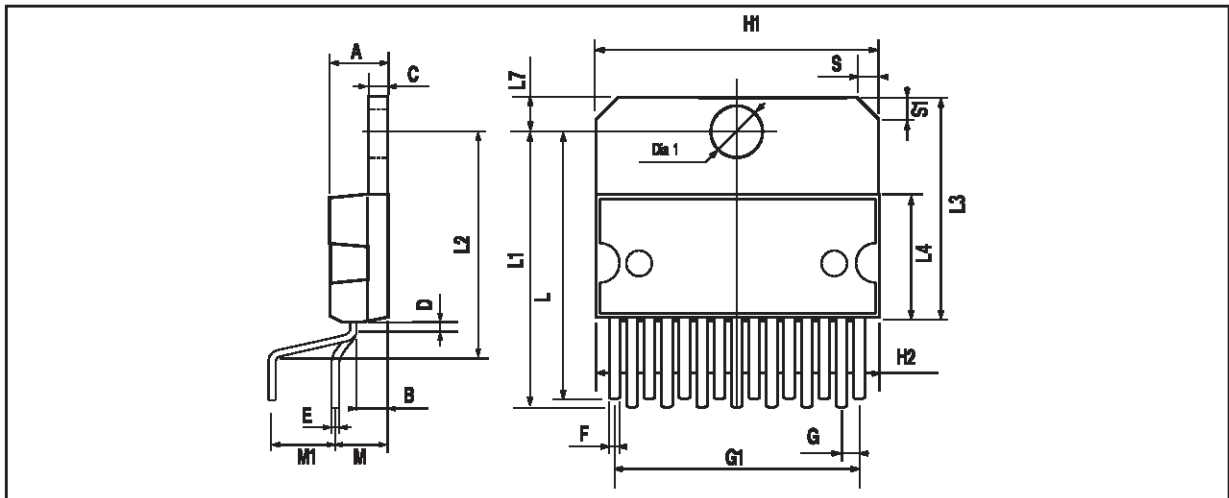
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APPLICATION SCHEMATIC



89306-26.EPS

PACKAGE MECHANICAL DATA : 15 PINS - PLASTIC MULTIWATT



PM-MW15V/EP5

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5			0.197
B			2.65			0.104
C			1.6			0.063
D		1			0.039	
E	0.49		0.55	0.019		0.022
F	0.66		0.75	0.026		0.030
G	1.02	1.27	1.52	0.040	0.050	0.060
G1	17.53	17.78	18.03	0.690	0.700	0.710
H1	19.6			0.772		
H2			20.2			0.795
L	21.9	22.2	22.5	0.862	0.874	0.886
L1	21.7	22.1	22.5	0.854	0.870	0.886
L2	17.65		18.1	0.695		0.713
L3	17.25	17.5	17.75	0.679	0.689	0.699
L4	10.3	10.7	10.9	0.406	0.421	0.429
L7	2.65		2.9	0.104		0.114
M	4.25	4.55	4.85	0.167	0.179	0.191
M1	4.63	5.08	5.53	0.182	0.200	0.218
S	1.9		2.6	0.075		0.102
S1	1.9		2.6	0.075		0.102
Dia. 1	3.65		3.85	0.144		0.152

MW15V/TBL

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