



GENERAL DESCRIPTION

SM16312 is a Vacuum Fluorescent Display (VFD) Controller driven on a 1/8 to 1/16 duty factor. Eleven segment output lines, 6 grid output lines, 5 segment/grid output drive lines, key scan, one display memory, IC control circuit are all incorporated in a single chip. It is pin to pin compatible with uPD16312(NEC). This SM16312 is ideal as a peripheral device of a single chip microcomputer.

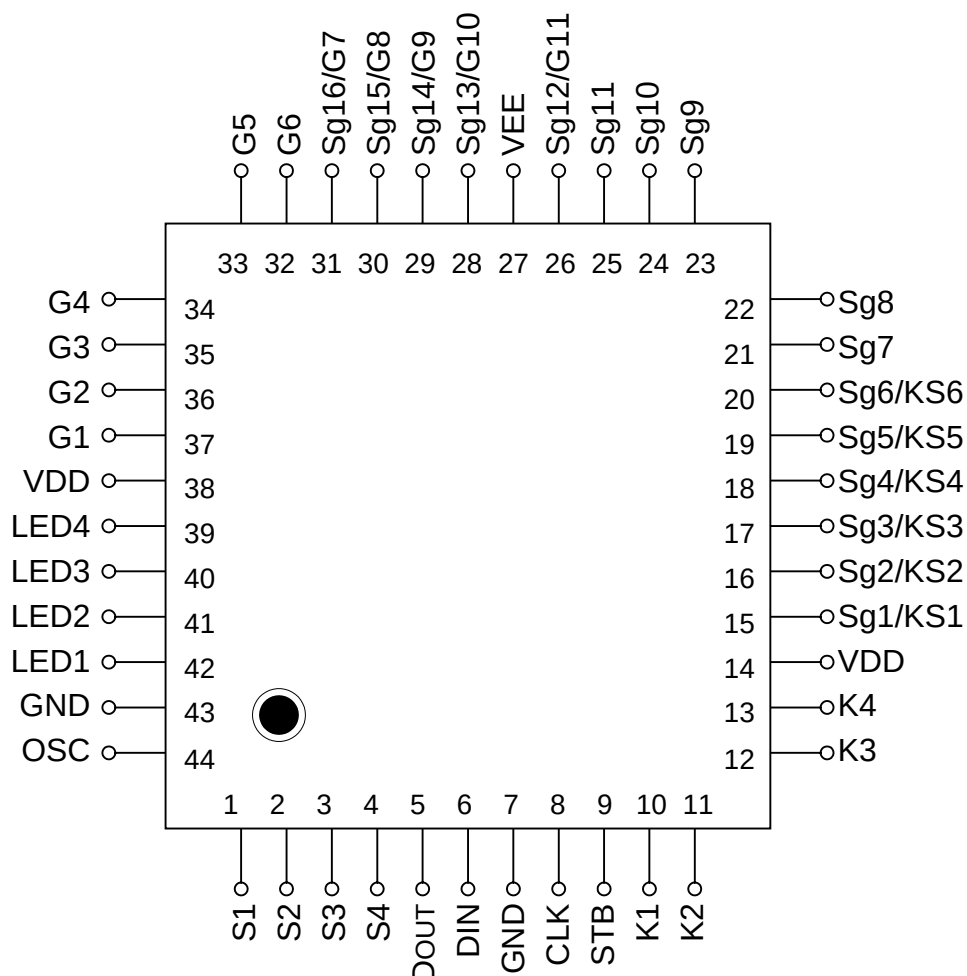
FEATURES

- * Multiple Display Modes
- * High Voltage Output
- * Key Scanning
- * General Purpose Input Ports (4 bit)
- * Dimming Circuitry (8 segment)
- * LED Display Ports(4 outs, 20mA max)
- * No external Resistors Needed for Driver Outputs
- * Serial Interface for controller

APPLICATIONS

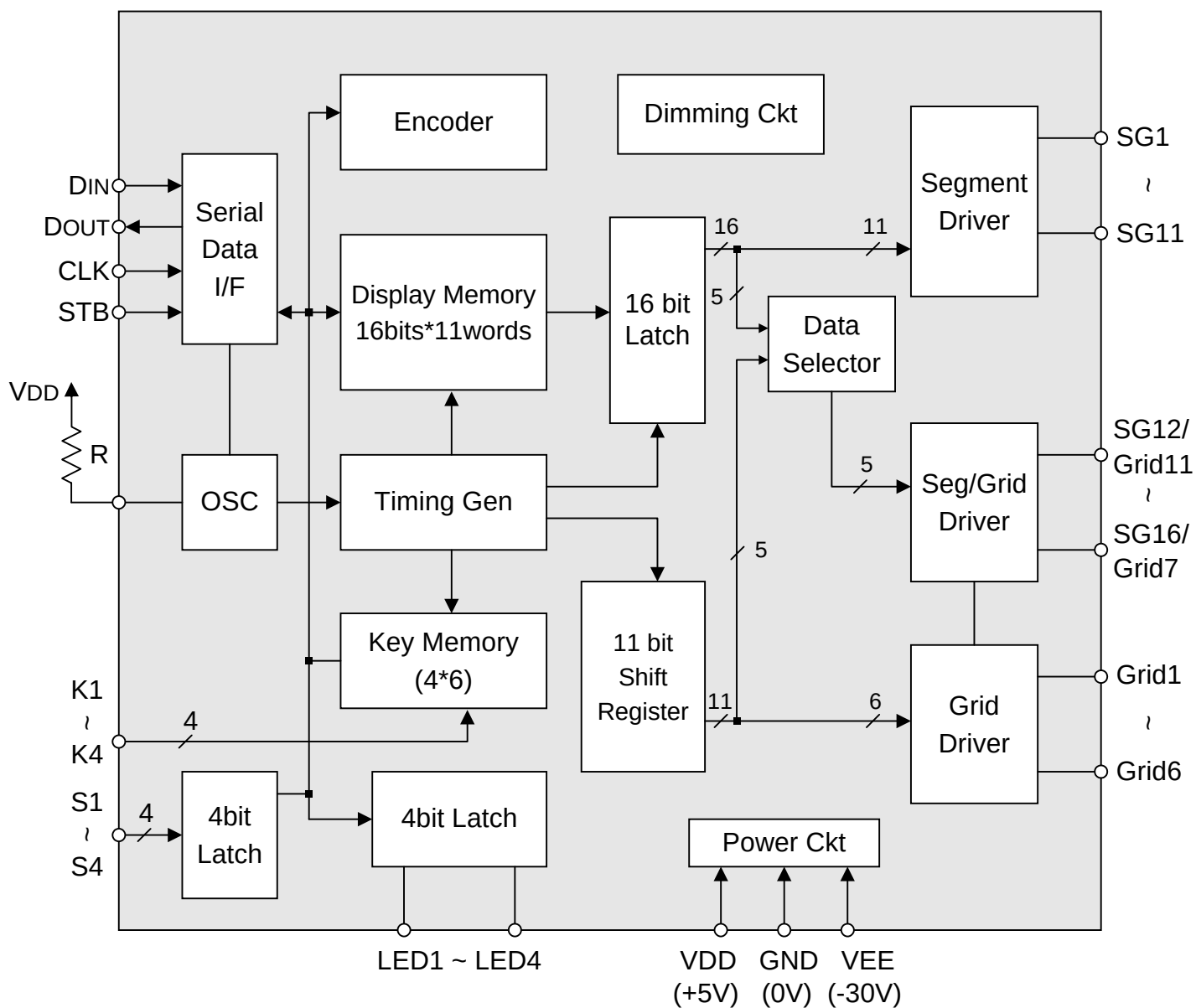
- * Audio System
- * Car Stereo
- * VCD
- * DVD
- * VCR
- * TV

PIN ASSIGNMENT





BLOCK DIAGRAM





PIN DESCRIPTION

Symbol	Pin Name	Pin No.	Function Description
S1 to S4	Switch Input	1 to 4	4 bit general-purpose input port.
Dout	Data Output	5	Outputs serial data at falling edge of shift clock, starting from lower bit.
Din	Data Input	6	Input serial data at rising edge of shift clock, starting from lower bit.
GND	Logic Ground	7, 43	Connect this pin to GND of system.
CLK	Clock Input	8	Reads serial data at rising edge, and outputs data at falling edge.
STB	Strobe	9	While STB is low, Data is valid; while STB is high, CLK is ignored.
K1 to K4	Key data input	10 to 13	Data input to these pins is latched at end of display cycle.
V _{DD}	Logic Power	14, 38	5V±10%.
Sg1/KS1~Sg6/KS6	Segment/Key	15 to 20	Segment output pins (Dual function as key source).
Sg7~Sg11	Segment	21 to 25	Segment output pins
Sg12/G11~Sg16/G7	Segment/Grid	26,28 to 31	These pins are selectable for segment or grid output.
V _{EE}	Pull Down Level	27	V _{DD} -35V max.
G1~G6	Grid	32 to 37	Grid output pins
LED1~LED4	LED Output	39 to 42	CMOS output. +20 mA max.
OSC	Oscillator Pin	44	Connect resistor for determining oscillation frequency to this pin.



ABSOLUTE MAXIMUM RATINGS

(Ta=25°C, GND=0V)

Parameter	Symbol	Rating	Unit
Logic Supply Voltage	VDD	-0.5 to +7	V
Driver Supply Voltage	VEE	VDD+0.5 to VDD-40	V
Logic Input Voltage	VI	-0.5 to VDD+0.5	V
VFD Driver Output Voltage	VO	VEE-0.5 to VDD+0.5	V
LED Driver Output Current	IOLED	+25	mA
VFD Driver Output Current	IOVFD	-40(grid) / -15(segment)	mA

RECOMMENDED OPERATING CONDITIONS

(Ta=-20 to +70°C, GND=0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Logic Supply Voltage	VDD	4.5	5	5.5	V
High-Level Input Voltage	VIH	0.7 VDD	—	VDD	V
Low-Level Input Voltage	VIL	0	—	0.3 VDD	V
Driver Supply Voltage	VEE	0	—	VDD-35	V



DC/AC ELECTRICAL CHARACTERISTIC

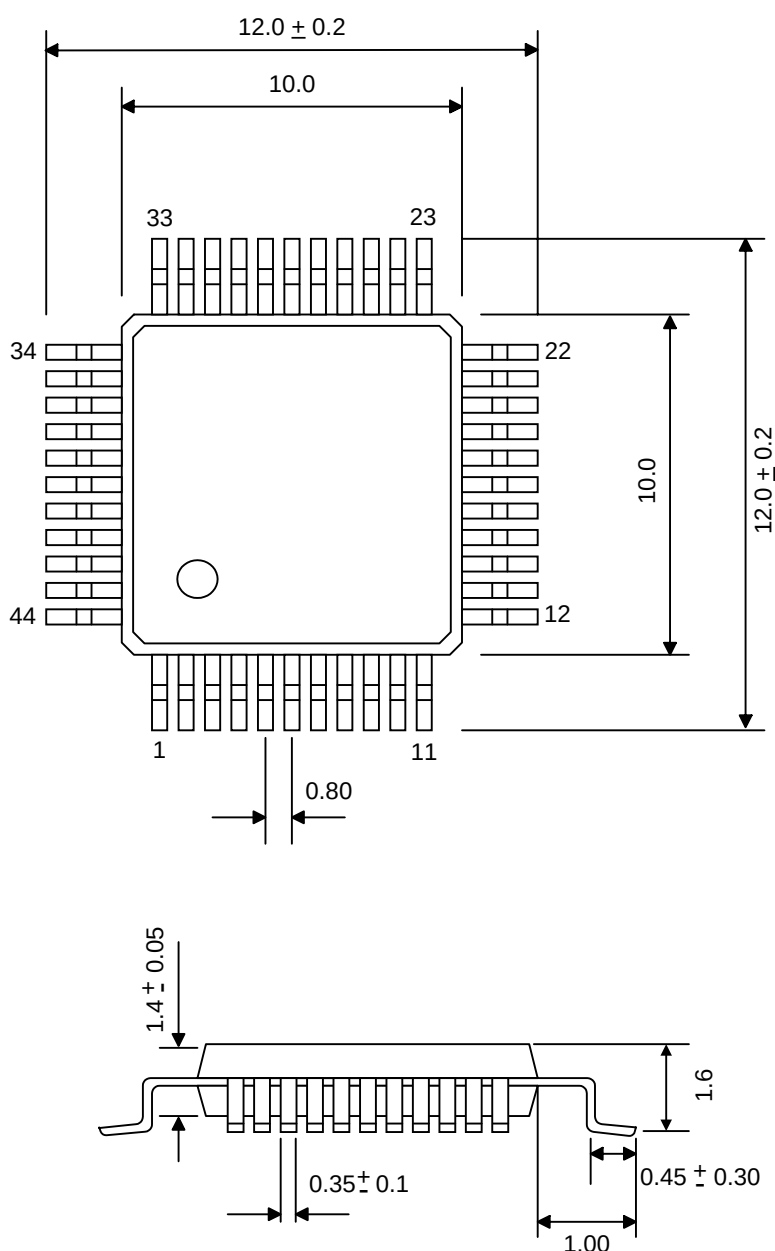
(VDD=5V, GND=0V, VEE=VDD-35V, TA=25°C, unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
High-Level Output Voltage	VOHLED	IOHLED=-1mA LED1 to LED4	0.9VDD	—	—	V
Low-Level Output Voltage	VOLLED	IOLLED=+20mA LED1 TO LED4	—	—	1	V
Low-Level Output Voltage	VOLDout	Dout, IOLDout=4mA	—	—	0.4	V
High-Level Output Current	IOHSg	Vo=VDD-2V Sg1 to Sg11	-3	—	—	mA
High-Level Output Current	VOHGr	Vo=VDD-2V G1 to G6 Sg12/G11 to Sg16/G7	-15	—	—	mA
High-Level Input Voltage	VIH	—	0.7VDD	—	—	V
Low-Level Input Voltage	VIL	—	—	—	0.3VDD	V
Oscillation Frequency	fosc	R=68K Ω	350	350	650	KHz



PACKAGE SPEC.

44 PINS TQFP DIMENSION



Note: Controlling dimensions are in millimeters (MM).



V.1.2, 8/8/01