

**GENERAL DESCRIPTION**

The N5111 is a LCD feedback and protection controller, specifically designed for controlling the multiple lamp application of inverter, it allow to receive 8 different phase input signals from the inverter, and outputs 2 feedback signals to the current and voltage feedback control of the PWM controller. All of input signals can be DC or AC voltage form and are independently comparing with the internal reference voltage, if one of the input signals is always kept lower than the internal reference voltage, outputs the control signal DT and  $\overline{DT}$  for latch off the inverter.

It provides a delay function for delaying DT and  $\overline{DT}$  outputs by external capacitor, preventing error while the inverter is operating in the burst mode dimming condition.

**FEATURES**

- Allows to receive 8 different phase input signals
- Input signals are allowed for DC or AC voltage form
- Provides a current feedback and a voltage feedback control output
- DT and  $\overline{DT}$  outputs for offering opposite control signal
- Allows for using multiple sets of the LCD protection controller in LCD\_TV application
- Low cost solution
- SOP-16 and DIP-16 Package

**APPLICATIONS**

- LCD monitors
- LCD TVs

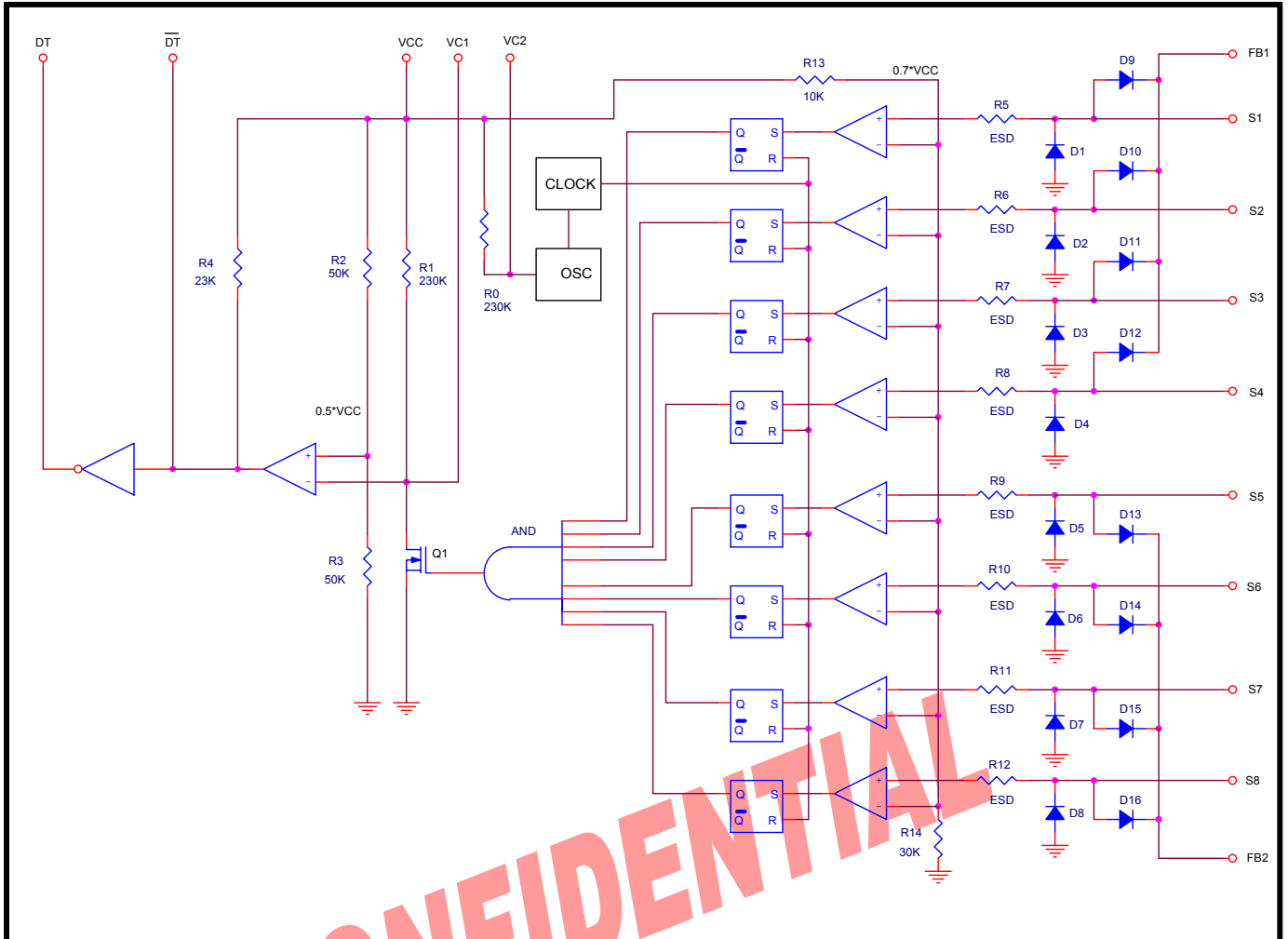
**DEVICE SELECTION GUIDE**

<b>DIP-16</b> N5111P	<b>SOP-16</b> N5111V
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**ABSOLUTE MAXIMUM RATINGS**

SYMBOL	PARAMETER	LIMITS	UNITS
VCC	Power Supply Voltage	6.5	V
S1~S8	Voltage for input signals	16	V
ICLAMP	Max. current of input clamp diodes D1~D8	50	mA
IFB1,2	Max. output current of FB1,FB2	10	mA
P <sub>D</sub>	Power Dissipation at Ta =50 , SOP/DIP	725	mW
T <sub>j</sub>	Operating Junction Temperature	- 20 ~ 125	
TSTG	Storage Temperature	- 65 ~ 150	
TLEAD	Lead Temperature (Soldering) 10S	300	

**BLOCK DIAGRAM**



**THERMAL DATA**

PARAMETER	SYMBOL	SOP- 16	DIP-16	UNIT
Thermal Resistance Junction to Ambient	$\theta_{ja}$	53	45	/W
Thermal Resistance Junction to Case	$\theta_{jc}$	23	15	/W

**ELECTRICAL SPECIFICATIONS** ( - 20 Tc 85 , unless otherwise specified )

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>INPUT SECTION</b>						
Reference Voltage For Input comparator	VREF(IN)		0.7*VCC -5%	0.7*VCC	0.7*VCC +5%	V
Reference Voltage For VC1	VREF(DLY)		0.5*VCC -5%	0.5*VCC	0.5*VCC +5%	V
Charging Resistance For VC1, VC2	R0, R1		196	230	264	K
<b>OUTPUT SECTION</b>						
High Output Voltage For DT and DT	VOH	No load	Vcc-0.075			V
Low Output Voltage For DT and DT	VOL	No load			0.05	V
Pull_High Resistance For DT	R4		19.5	23	26.5	K
Output Source Current For DT	IDT(SO)				1	mA
<b>POWER SUPPLY SECTION</b>						
Recommend Supply Voltage	VCC		4.5	5.0	5.5	V
Supply Current	Icc			0.7		mA

**OPERATION DESCRIPTION**

**Current and voltage sensing input**

N5111 provides 8 input comparators and 8 flip-flops for detecting 8 signal inputs that implements to sense each current and voltage of lamps. All of the inputs are compared with an internal reference voltage (0.7\*VCC), if one of the peak value of input signal is under the internal reference voltage, then the flip-flop will latch the error and charging the delay control pin, after the peak value of all input signals are over the internal reference voltage again, the delay control pin will be discharged. N5111 provides can detect different phase input signals that friendly implement several types of input signal combination, such as all of inputs for current or voltage or half for each.

**Delay control function**

N5111 provides a delay control function to prevent fault signal when operating in the burst mode condition. The protection delay time is calculated by:

$$\text{The protection delay time} = 0.69 \times R1 \times C1$$

R1 is internal resistor of the controller, the resistance is about 230K .

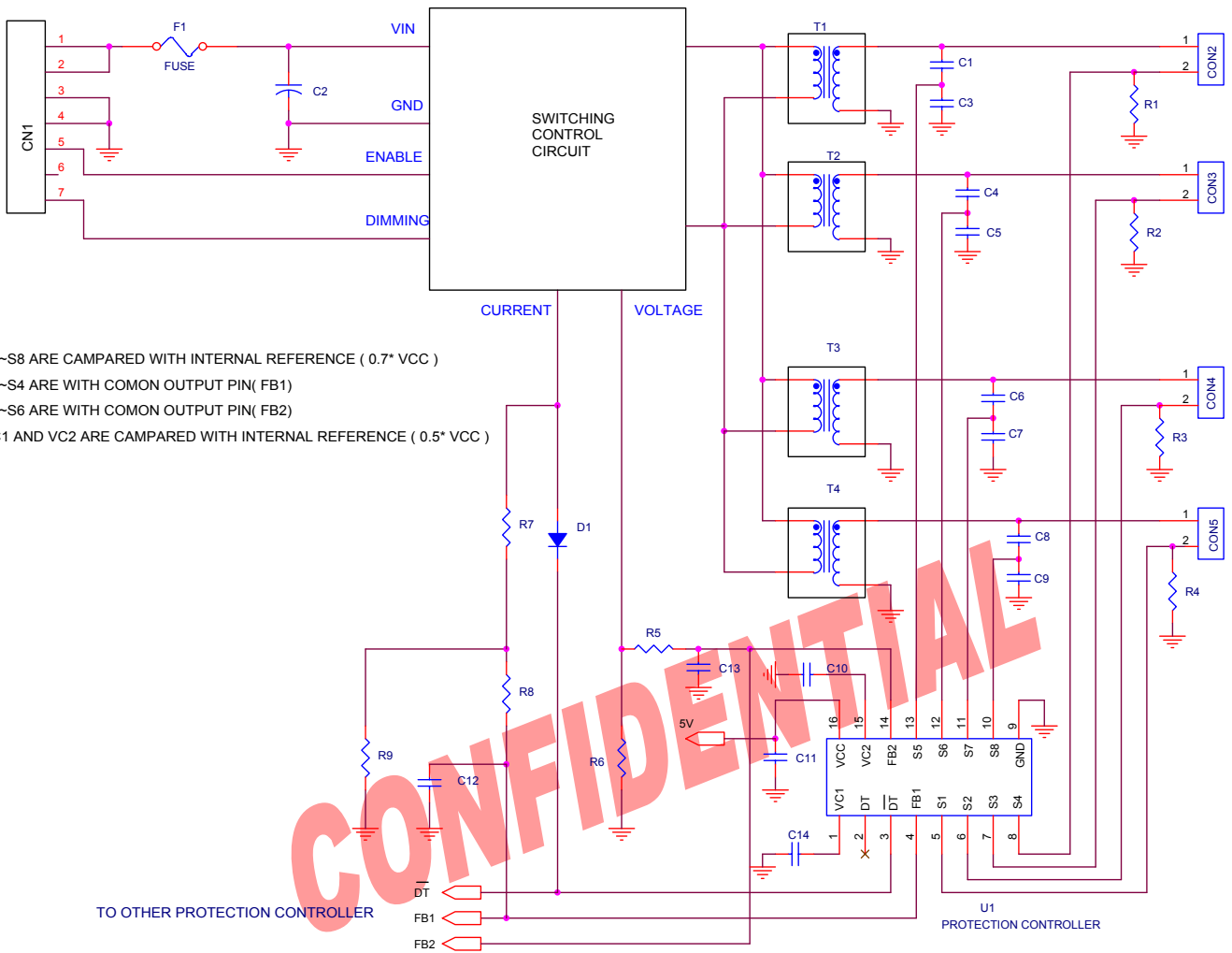
**Reset clock setting**

N5111 provides an oscillation circuit to generate a reset clock signal, the reset clock timing must be set over half of the switching PWM timing, the capacitance of C2 is recommended 330pF for the application and limited to under 1000pF, then detail timing can be calculated by:

$$\text{The reset clock timing} = 0.33 \times R0 \times C2$$

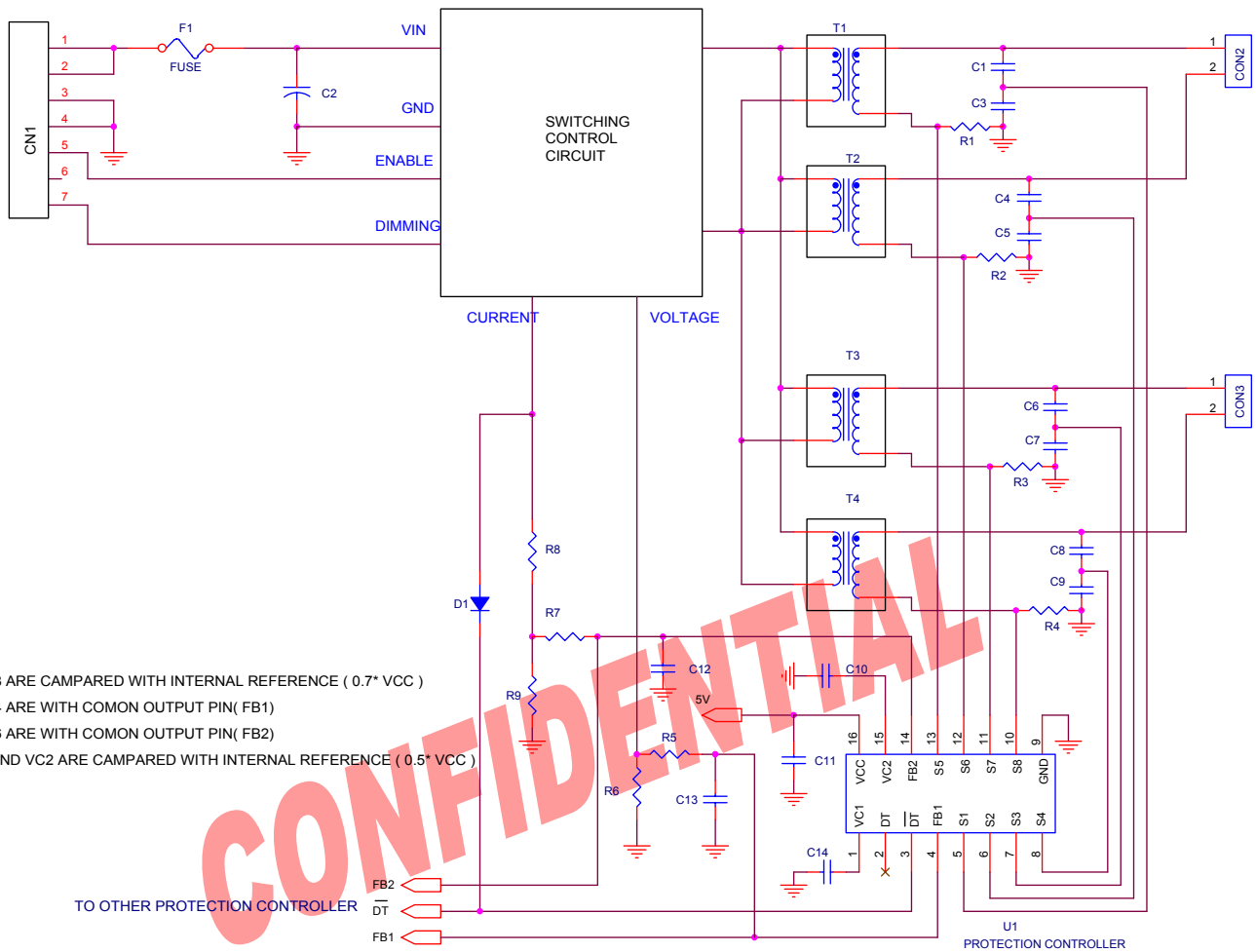
R0 is internal resistor of the controller, the resistance is about 230K .

**TYPICAL APPLICATION 1  
OUTPUT CONNECTORS WITH RETURN PIN**



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**TYPICAL APPLICATION 2:  
OUTPUT CONNECTORS WITHOUT RETURN PIN**

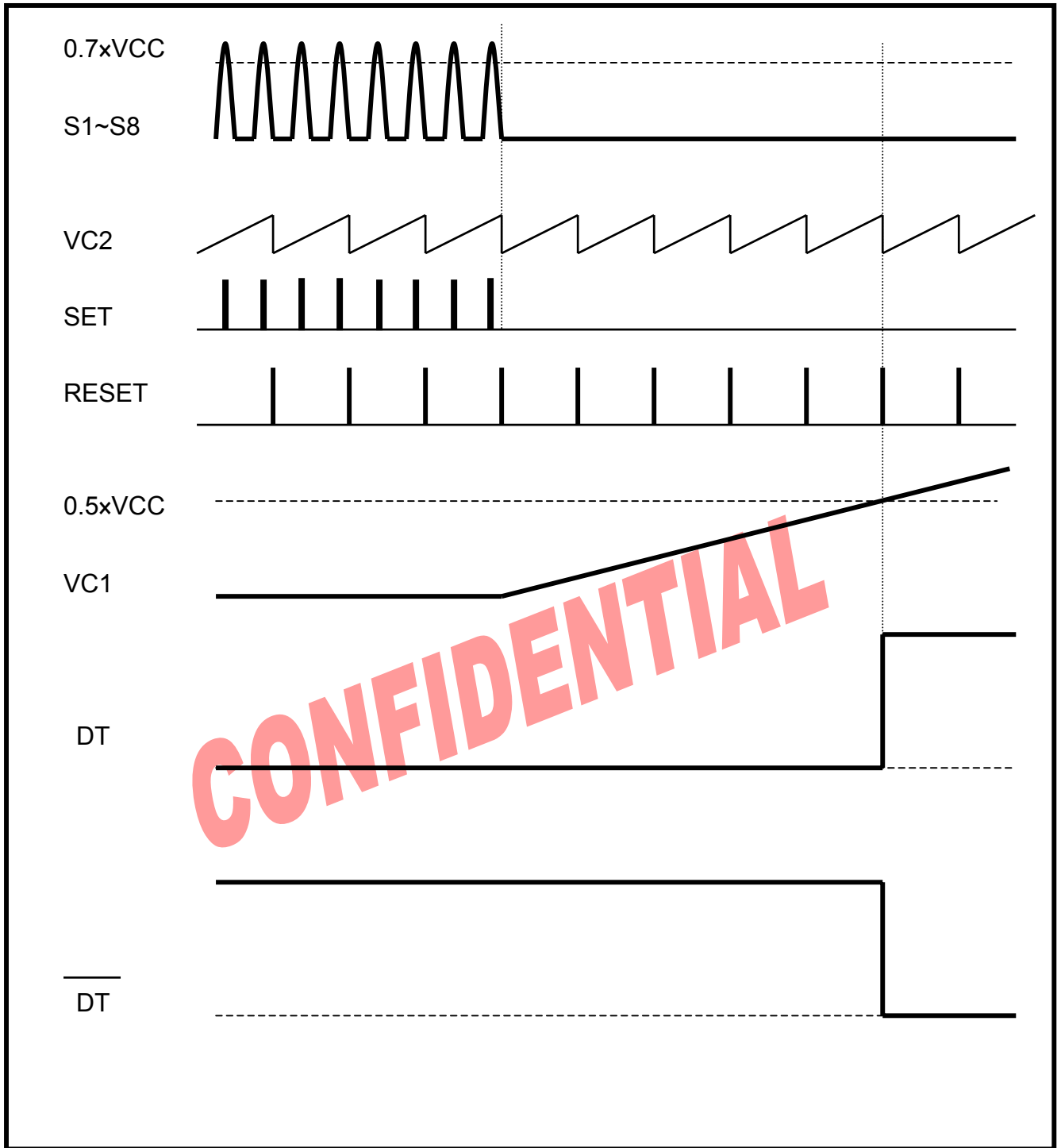


S1~S8 ARE COMPARED WITH INTERNAL REFERENCE ( 0.7\* VCC )  
 S1~S4 ARE WITH COMON OUTPUT PIN( FB1)  
 S5~S6 ARE WITH COMON OUTPUT PIN( FB2)  
 VC1 AND VC2 ARE COMPARED WITH INTERNAL REFERENCE ( 0.5\* VCC )

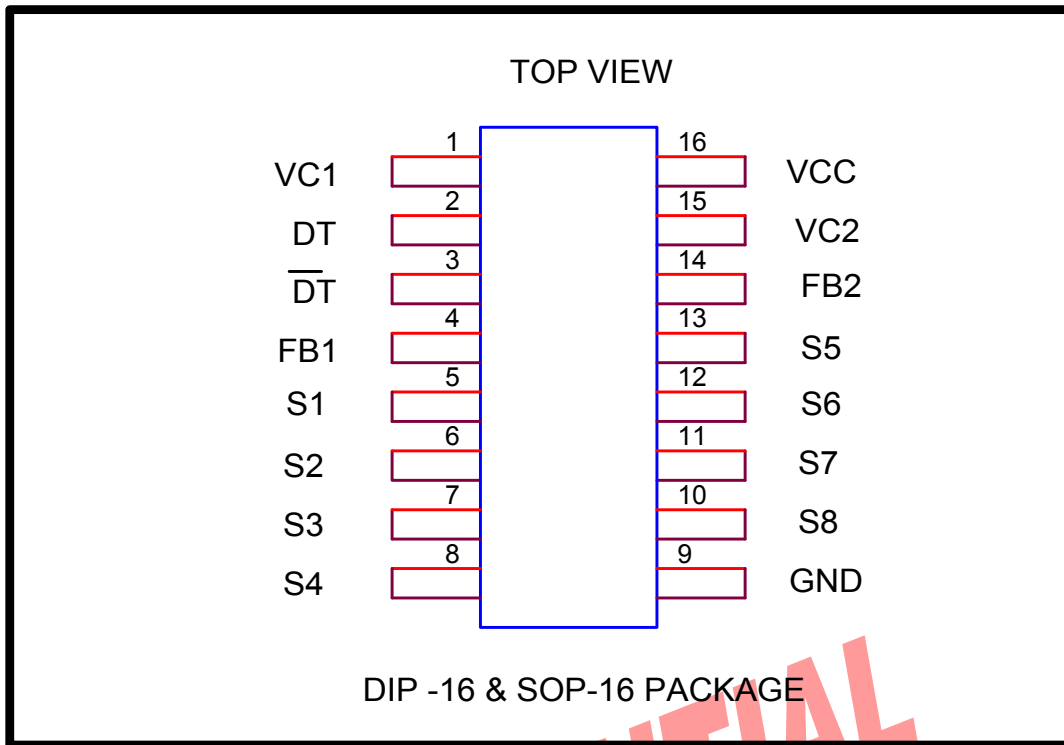
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TO OTHER PROTECTION CONTROLLER

OPERATING WAVEFORM



**PIN CONFIGURATIONS**



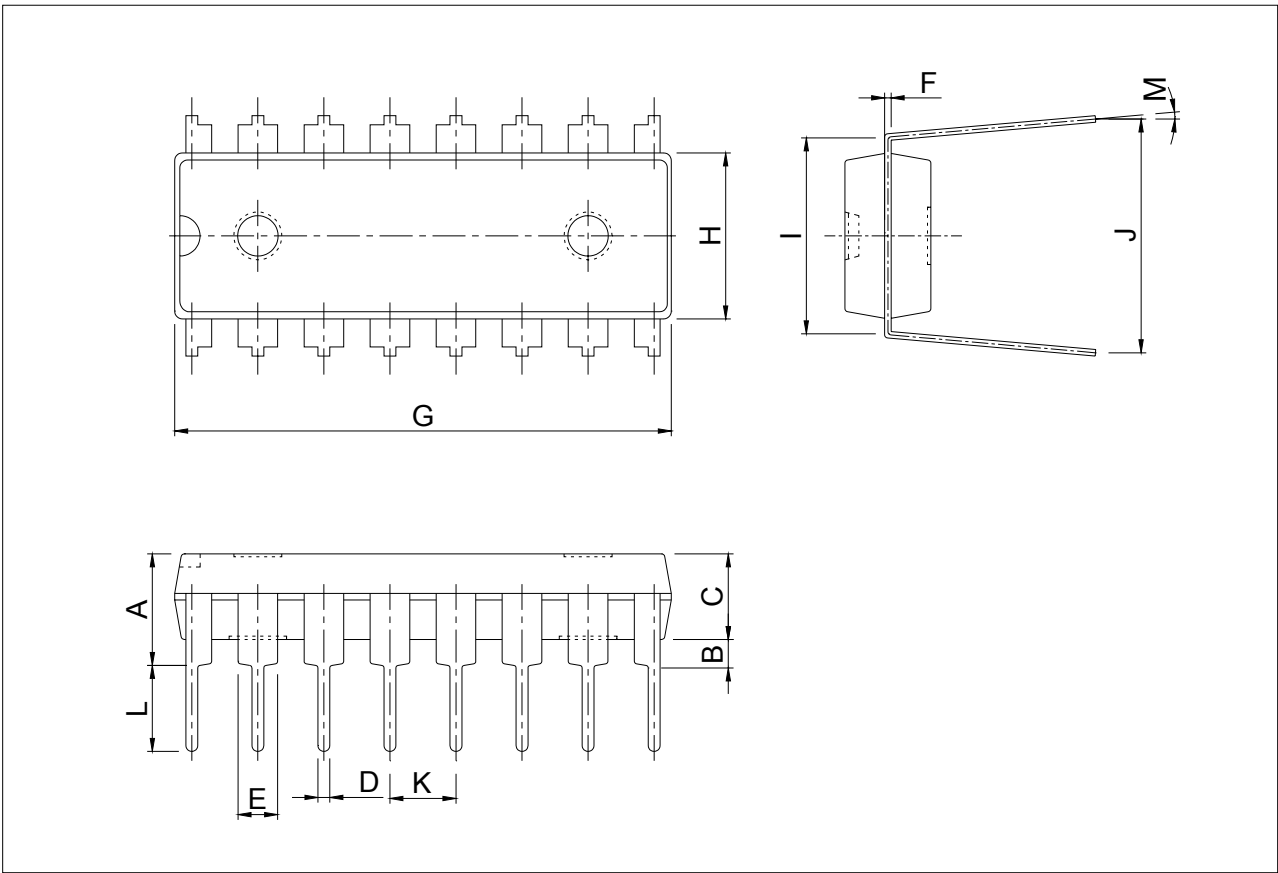
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## PINFUNCTIONS

NO	FUNCTION	DESCRIPTION
1	VC1	The delay control pin for S1~S8, connects a capacitor to determine delay time to control DT and DT pin (recommended to connect a 1uF capacitor).
2	DT	The positive output is to provide a positive signal.
3	$\overline{DT}$	The negative output is to provide a negative signal.
4	FB1	The first feedback pin is for collecting S1~S4 signals and connect to feedback control of PWM controller.
5	S1	The first detective input pin.
6	S2	The second detective input pin.
7	S3	The third detective input pin.
8	S4	The fourth detective input pin.
9	GND	The GND pin of the controller.
10	S8	The eighth detective input pin.
11	S7	The seventh detective input pin.
12	S6	The sixth detective input pin.
13	S5	The fifth detective input pin.
14	FB2	The second feedback pin is for collecting S5~S6 signals and connect to feedback control of PWM controller.
15	VC2	The reset timing control pin, connects a capacitor to set the frequency of reset signal(recommended to connect a 330pF capacitor).
16	VCC	The supply voltage pin of the controller.

**DIP-16(L) MECHANICAL DATA**

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	----	----	4.318	H	6.274	6.401	6.528
B	0.381	----	----	I	7.366	7.62	7.874
C	3.175	3.302	3.429	J	8.509	9.017	9.525
D	----	0.457	----	K	----	2.540	----
E	----	1.524	----	L	3.048	3.302	3.566
F	----	0.254	----	M	0°	----	15°
G	18.974	19.101	19.228	N			



**SOIC-16(D) MECHANICAL DATA**

Dimension	mm			Dimension	mm		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	1.35	1.60	1.75	H	---	1.27	---
B	0.10	---	0.25	I	5.80	---	6.20
C	---	1.45	---	J	0.40	---	1.27
D	0.33	---	0.51	K	0°		8°
E	0.19	---	0.25	L		7°(4X)	
F	9.80	---	10.00	M			
G	3.80	---	4.00	N			

