

# System Photoelectric Smoke Detector

# Description

The CS235 System Smoke Detector is a photo electric type with a pulsed infrared LED as the light source and a silicon photodiode as the light detector. The CS235 IC, along with passive external components, controls the system timing and signal processing.

Low average current is attained by pulsing the system once every 10 seconds for 20 milliseconds. Bias is applied to the signal processing circuitry for this time interval. During the second half of the pulse, the last 10 milliseconds, the IR LED is pulsed and the unit samples for an alarm level smoke condition. After the first alarm level signal the sample rate increases to a two second interval. After three consecutive alarm level samples the logic drives the output latch signalling the system panel.

The signal processing circuit blocks

are amplifiers A1 and A2, synchronous detector, voltage comparator and the decode counter. The voltage gain of A2 and the comparator reference voltage are set by external resistors.

Additional on-chip features include an  $I_{CC}$  current limiter. The current limiter eliminates power-on false alarming.

The oscillator controls the IR LED excitation frequency and provides drive to the synchronous detector. The synchronous detection method has very high noise rejection performance.

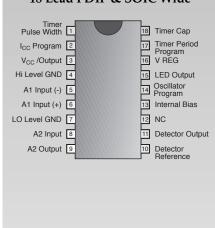
The internal latch is capable of sinking 100 milliamps maximum and will clamp the  $V_{CC}$  pin to 5 volts when tripped. The latch current is determined by an external resistor typically located in the master panel and is reset by temporary removal of detector power.

### **Features**

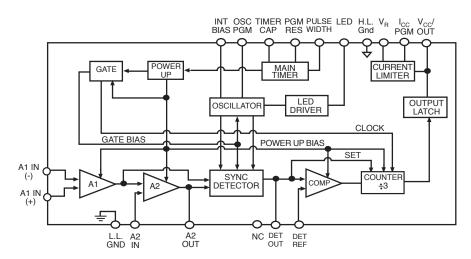
- Synchronous Detection for High Noise Immunity
- Pulsed Operation for Low Average Current Drain
- System Gain Externally Set
- System Sensitivity Externally Adjustable
- System Operation
  Monitored by Means of
  External Red LED

# **Package Options**

#### 18 Lead PDIP & SOIC Wide



#### Block Diagram





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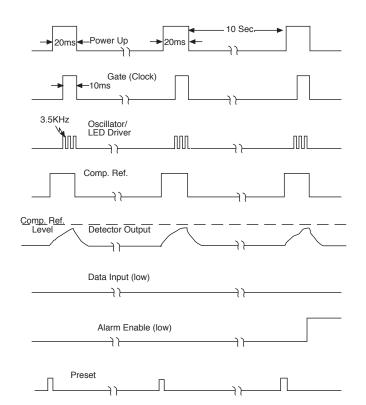
# **Absolute Maximum Ratings**

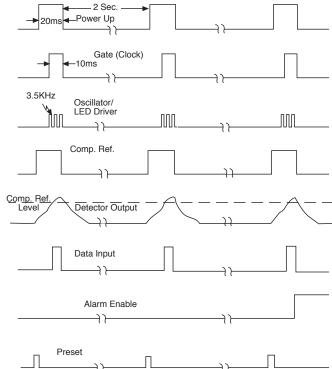
E1	ectrical Characteristics: $T_A = 25^{\circ}$ C, unle	ess otherwis	e stated.		
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Absolute Maximum Voltage (pin 3)				38	V
Output Latch Current				100	mA
Operation Temperature Range, $T_A$		0		70	°C
24V System (C2 = 100 μF, R7	$= 12 \text{ M}\Omega$ )				
Operating Voltage	(pin 3)	13.8	22.5	35	
Average Supply Current	V (pin 3) = 22.5V		35	60	μΑ
Peak Supply Current	V (pin 3) = 22.5V )(non "speed up")			100	μΑ
Peak Supply Current	V (pin 16) = 12V )("speed up")		150	350	μΑ
Regulator Voltage	(pin 16)	12.8		15.7	V
12V System (C2 = 150μF, R7	= 12MΩ)				
Operating Voltage	(pin 3)	8.7	12		V
Average Supply Current $V (pin 3) = 12V$				60	μΑ
Peak Supply Current $V (pin 3) = 12V (non "spee")$				100	$\mu A$
Peak Supply Current V (pin 16) = 8V ("speed up" mode)				350	μΑ
Regulator Voltage	(pin 16) (V pin $3 = 12V$ )		11.85		V
Oscillator	D6 19LO C2 0069E		22		
Output Frequency	$R6 = 18k\Omega$ , $C3 = .0068\mu$ F	2.1	3.3	4.4	kHz
Sink Current	(pin 14)	16	26	35	μA
Source Current (pin 14)		19	26	32	μA
High Trip Point Voltage	(pin 14)	1.8	1.9	2.2	V
Low Trip Point Voltage	(pin 14)	1.2	1.4		_ <u>V</u>
LED Drive (Detector LED an	nd Status LED)				
Source Current (pin 15)	R8=36Ω				
Detector LED	V IR LED = 1.156V	20	30	40	mA
Status LED (alarm) V Status LED = 1.99V		10			mA
Regulator Voltage (pin 15)	$I_{\text{SOURCE}} = 30 \text{mA}$	3.7	4.4	5.2	V
Amplifier A1					
Fixed Gain			26		dB
Input Current B <sub>1</sub>	(pin 5)		500	1000	nA
Input Current B <sub>2</sub>	(pin 6)		500	1000	nA
Input current (B <sub>1</sub> -B <sub>2</sub> )				250	nA

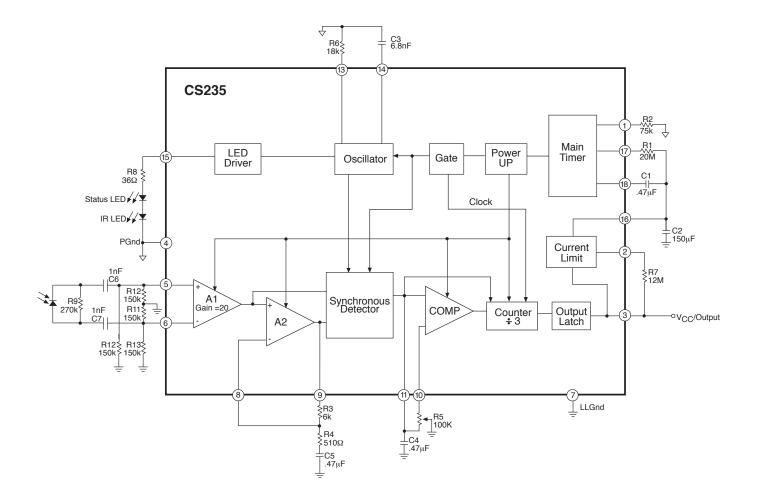
PARAMETER TEST CONDITIONS		MIN	TYP	MAX	UNIT
amplifier A2					
DC Output (pin 9) $R3 = 6k\Omega$ , $R4 = 510\Omega$ , $C5 = .47\mu$ F			2.5		V
Input Bias Current (pin 8)	out Bias Current (pin 8) (Externally adjusted gain with R3 and R4. Unity DC gain)			250	nA
Voltage gain @ 3.5kHz (Externally adjusted gain with R3 and R4. Unity DC gain)			21.6		dB
Detector and Reference Out	eput (C4 = .47μF)				
Reference Resistance		13	19	25	kΩ
Reference Voltage	(pin 10)	1.8	3.6	5.5	V
Detector Output Resistance		10	15	20	kΩ
Detector Output Voltage	(pin 11) (No signal, and at 2X time Constant)	1.4	2.8	4.3	V
Main Timer (R1 = 20MΩ, R	$2 = 75k\Omega$ , $C1 = .47\mu$ F)				
Power Up Pulse Period	Up Pulse Period Standby Mode (pin 1)		10	12	Sec
Power Up Pulse Period	Speed Up Mode (pin 1)	1.5	2	2.5	Sec
Power Up Pulse Width	(pin 1)		20		ms
Gate Pulse Width Power up pulse width 12			10		ms
Sink Current (pin 18) $V (pin 16) = 16V$		415	460	505	nA
Source Current (pin 18) $V (pin 16) = 16V$		-220	-235	-250	μA
Output Circuit	-		5.2	6.1	V
Output Circuit Output Latch Voltage	$(pin 3) I_{SUPPLY} = 100mA$	4.4			μΑ
	(pin 3) $I_{SUPPLY} = 100 \text{mA}$ V (pin 3) = 38V, V (pins 2, 16) = 0V		500		μΠ
Output Latch Voltage			500		μπ
Output Latch Voltage Leakage Current			500	5	Sec

Timing Diagram Out of Alarm

#### Timing Diagram In Alarm





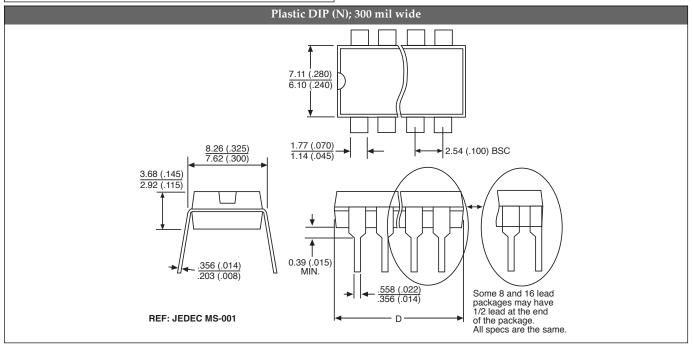


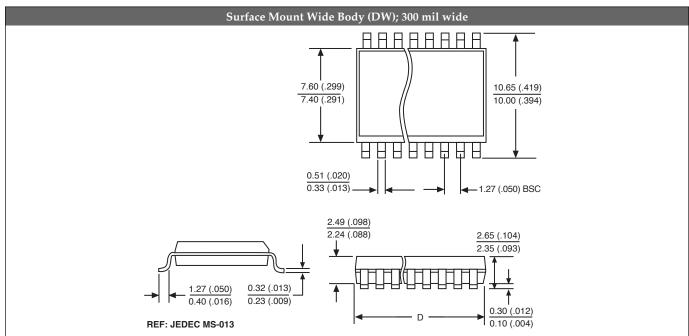
# Package Specification

#### PACKAGE DIMENSIONS IN mm (INCHES)

	D					
Lead Count	Metric			English		
	Max	Min	Max	Min		
18L PDIP	23.37	22.35	.920	.880		
18L SO Wide	11.75	11.35	.463	.447		

PACKAGE THERMAL DATA					
Thermal	Data	18L SO Wide	18L PDIP		
$R_{\Theta JC}$	typ	21	29	°C/W	
$R_{\Theta JA}$	typ	100	65	°C/W	





Ordering Information			
Part Number	Description		
CS235GDW18	18L SO		
CS235GDWR18	18L SO (tape & reel)		
CS235GN18	18L PDIP		

Cherry Semiconductor Corporation reserves the right to make changes to the specifications without notice. Please contact Cherry Semiconductor Corporation for the latest available information.