

5367

SMOKE DETECTOR WITH INTERCONNECT AND TIMER

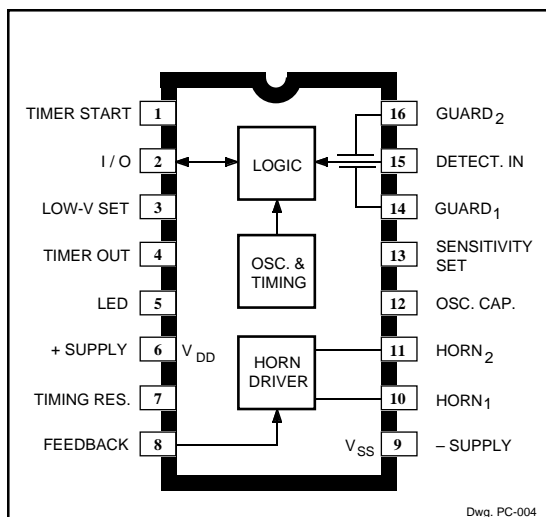
The A5367CA is a low-current, CMOS circuit providing all of the required features for an ionization-type smoke detector. A networking capability allows as many as 125 units to be interconnected so that if any unit senses smoke, all units will sound an alarm. In addition, special features are incorporated to facilitate alignment and test of the finished smoke detector. This device is designed to comply with Underwriters Laboratories Specification UL217.

The internal oscillator and timing circuitry keeps standby power to a minimum by powering down the device for 1.66 seconds and sensing smoke for only 10 ms. Every 24 on/off cycles, a check is made for low battery condition. By substituting other types of sensors, or a switch for the ionization detector, this very-low power device can be used in numerous other battery-operated safety/security applications.

The A5367CA is supplied in a low-cost, 16-pin dual in-line plastic package. It is rated for continuous operation over the temperature range of 0°C to +50°C.

FEATURES

- Interconnect Up to 125 Detectors
- Piezoelectric Horn Driver
- Guard Outputs for Detector Input
- Pulse Testing for Low Battery
- Power-ON Reset
- Internal Reverse Battery Protection
- Internal Timer & Control for Reduced Sensitivity
- Built-In Hysteresis Reduces False Triggering
- Temporal Horn Pattern



Dwg. PC-004

The selectable Hush Feature may be covered by U.S. patent number Re. 33,920. Any sale or use of the Hush Feature in a smoke alarm in the U.S. would be a possible infringement of this patent.

ABSOLUTE MAXIMUM RATINGS (Voltages are referenced to V_{SS})

Supply Voltage Range,	
V_{DD}	-0.5 V to +15 V
Reverse Battery (10.5 V)	20 s
Input Voltage Range,	
V_{IN}	-0.3 V to $V_{DD} + 0.3$ V
Input Current, I_{IN}	10 mA
Operating Temperature Range,	
T_A	0°C to +50°C
Storage Temperature Range,	
T_S	-55°C to +125°C

CAUTION: CMOS devices have input static protection but are susceptible to damage when exposed to extremely high static electrical charges.

Always order by complete part number: **A5367CA**.

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**ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$, $V_{DD} = 9.0\text{ V}$, $V_{SS} = 0\text{ V}$, $C_{12} = 0.1\ \mu\text{F}$,
 $R_7 = 8.2\ \text{M}\Omega$ (unless otherwise noted).**

Characteristic	Test Pin	Test Conditions	Limits			Units
			Min.	Typ.	Max.	
Supply Voltage Range	6	Operating	6.0	9.0	12	V
Detector Input Current	15	0 to 40% RH, $V_{IN} = 0$ to 9.0 V	—	—	± 1.0	pA
Input Offset Voltage	14-15	Active Guard	—	—	± 100	mV
	16-15	Active Guard	—	—	± 100	mV
	15-13	Detect Comparator	—	—	± 50	mV
Hysteresis	13	No Alarm to Alarm	90	130	170	mV
Common Mode Range	14-15	Guard Amplifier	2.0	—	$V_{DD} - 0.5$	V
	13-15	Smoke Comparator	0.5	—	$V_{DD} - 2.0$	V
Active Guard Impedance	14	to V_{SS}	—	10	—	k Ω
	16	to V_{SS}	—	500	—	k Ω
Oscillator Period	12	No Alarm	1.34	1.67	2.00	s
		Alarm	32	40	48	ms
Oscillator Pulse Width	4		8.0	10	12	ms
Timer Period	4	After Pin 1 High-to-Low, No Smoke	8.0	10	12	min
Low Voltage Threshold	6	$T_A = 0$ to 50°C	7.2	—	7.8	V
Sensitivity Adj. Voltage	13	V_{13}/V_{DD} , pin 13 open circuit	48.5	50	51.5	%
Horn Output Voltage	10-11	$I_{OUT} = 16\ \text{mA}$, $V_{DD} = 9.0\ \text{V}$	—	0.1	0.5	V
		$I_{OUT} = 16\ \text{mA}$, $V_{DD} = 7.2\ \text{V}$	—	—	0.9	V
		$I_{OUT} = -16\ \text{mA}$, $V_{DD} = 9.0\ \text{V}$	8.5	8.8	—	V
		$I_{OUT} = -16\ \text{mA}$, $V_{DD} = 7.2\ \text{V}$	6.3	—	—	V
Horn Output ON Time	10-11	Alarm (see figure, time "A")	450	500	550	ms
		Low Battery	8.0	10	12	ms
Horn Output OFF Time	10-11	Alarm (see figure, time "B")	450	500	550	ms
		Alarm (see figure, time "C")	1350	1500	1650	ms
		Low Battery	32	40	48	s
Timer Start Logic Levels	1	V_{IH}	4.5	—	—	V
		V_{IL}	—	—	2.5	V

NOTE 1: Negative current is defined as coming out of (sourcing) the specified device pin.

Continued next page . . .

NOTE 2: Alarm (Smoke) Condition is defined as $V_{15} < V_{13}$; No Alarm (No Smoke) Condition as $V_{15} > V_{13}$.

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ELECTRICAL CHARACTERISTICS continued

Characteristic	Test Pin	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Timer Start Input Current	1	$V_{IN} = 9.0\text{ V}$	20	—	80	μA
Timer Out Output Current	4	$V_{OUT} = 0.5\text{ V}$	500	—	—	μA
LED Output ON Current	5	$V_{DD} = 7.2\text{ V}, V_{OUT} = 1.0\text{ V}$	10	—	—	mA
LED Output ON Time	5	No Local Alarm; Not Latched	8.0	10	12	ms
LED Output OFF Time	5	No Alarm, In Standby	32	40	48	s
		No Alarm, Timer Mode	8.0	10	12	s
I/O Current	2	No Alarm, $V_{I/O} = V_{DD} - 2.0\text{ V}$	25	—	60	μA
		Alarm, $V_{I/O} = V_{DD} - 2.0\text{ V}$	-7.5	—	—	mA
		Charge Dump, $V_{I/O} = 1.0\text{ V}$	5.0	—	—	mA
I/O Charge Dump Duration	2	After Local Alarm or Test	1.33	1.66	1.99	s
I/O Alarm Voltage	2	External "Alarm" In	3.0	—	—	V
I/O Delay	2	"Alarm" Out	—	3.0	—	s
Supply Current	6	$V_{DD} = 9.0\text{ V}$, No Alarm, No Loads	—	5.0	9.0	μA
		$V_{DD} = 12\text{ V}$, No Alarm, No Loads	—	—	12	μA

NOTE 1: Negative current is defined as coming out of (sourcing) the specified device pin.

NOTE 2: Alarm (Smoke) Condition is defined as $V_{15} < V_{13}$; No Alarm (No Smoke) Condition as $V_{15} > V_{13}$.

CIRCUIT DESCRIPTION

The A5367CA is a low-current CMOS circuit providing all of the required features for an ionization-type smoke detector.

Oscillator. An internal oscillator operates with a period of 1.67 seconds during no-smoke conditions. Every 1.67 seconds, internal power is applied to the entire circuit and a check is made for smoke. Every 24 clock cycles (40 seconds), the LED is pulsed and a check is made for low battery by comparing V_{DD} to an internal reference. Since very-low currents are used in the device, the oscillator capacitor at pin 12 should be a low-leakage type (PTFE, polystyrene, or polypropylene).

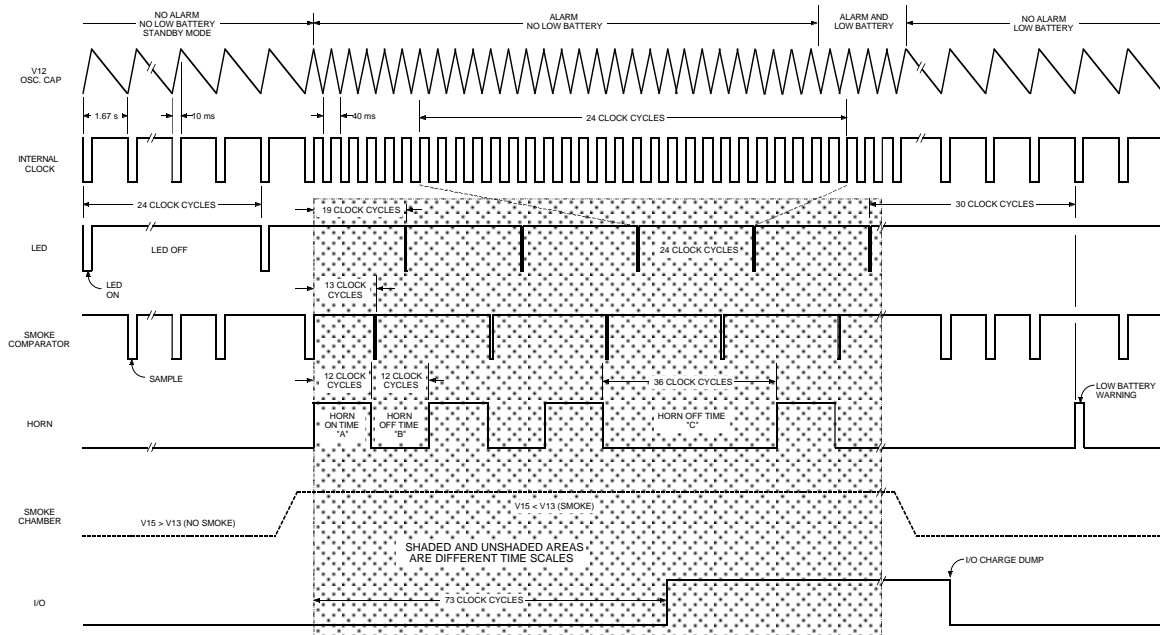
Detector Circuitry. When smoke is detected, the resistor divider network that sets the sensitivity (smoke trip point) is altered to increase the sensitivity set voltage (pin 13) by typically 130 mV with no external connections to pins 3 or 13. This provides hysteresis and reduces false triggering. An active guard is provided on both pins adjacent to the detector input (pin 15). The voltage at pins 14 and 16 will be within 100 mV of the input. This will keep surface leakage currents to a minimum and provide a method of measuring the input voltage without loading the ionization chamber. The active guard amplifier is not power strobed and thus provides constant protection from surface leakage currents. The detector input has internal diode protection against static damage.

Alarm Circuitry. If smoke is detected, the oscillator period changes to 40 ms and the horn is enabled. The horn output is typically 0.5 s ON, 0.5 s OFF, 0.5 s ON, 0.5 s OFF, 0.5 s ON, 1.5 s OFF (temporal horn pattern). During the OFF time, smoke is checked and will inhibit further alarm output if smoke is not sensed. During smoke conditions the low battery alarm is inhibited and the LED is driven at a 1 Hz rate.

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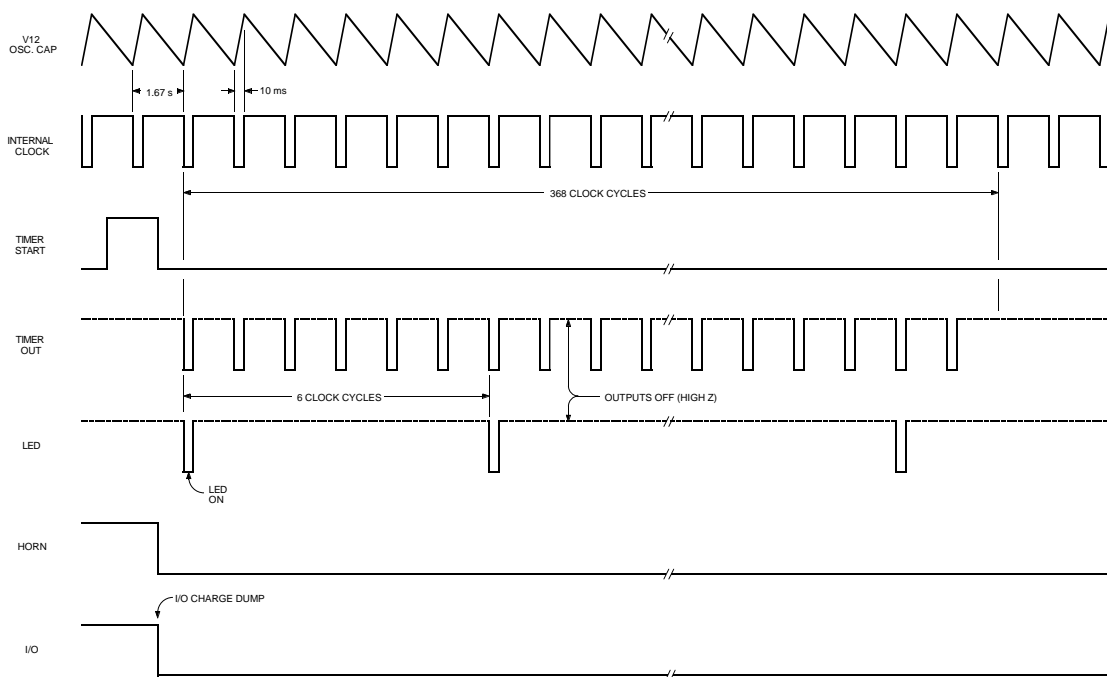
TIMING DIAGRAMS IN TYPICAL APPLICATION

NON-TIMER MODE



Dwg. WC-003-2

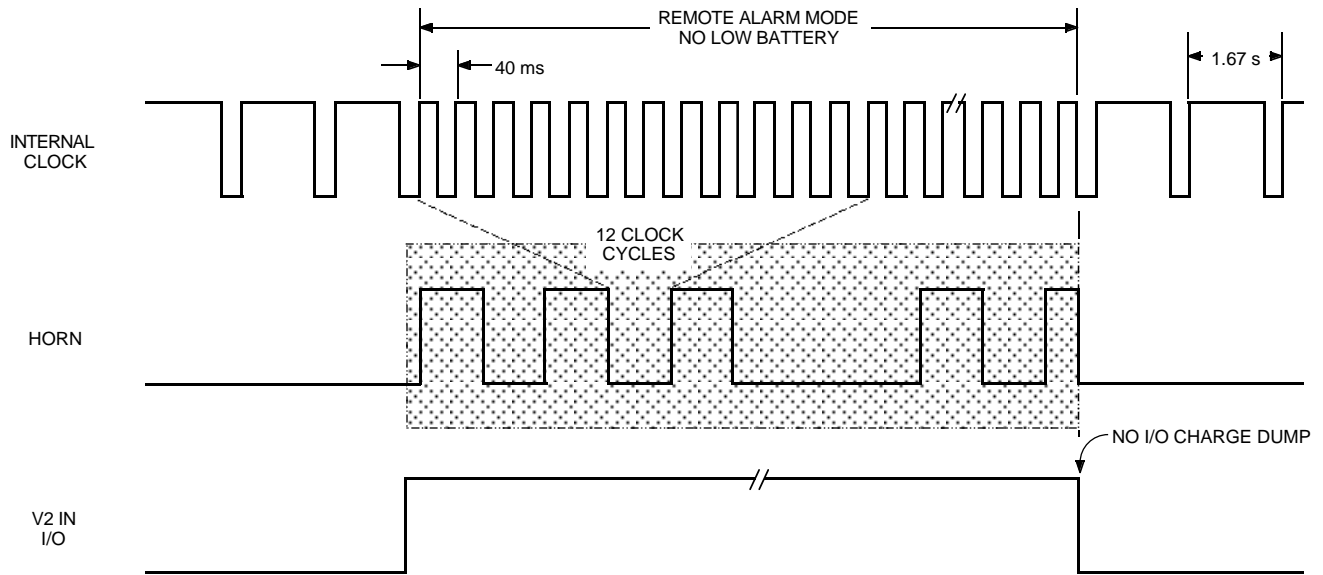
TIMER MODE



Dwg. WC-005-2

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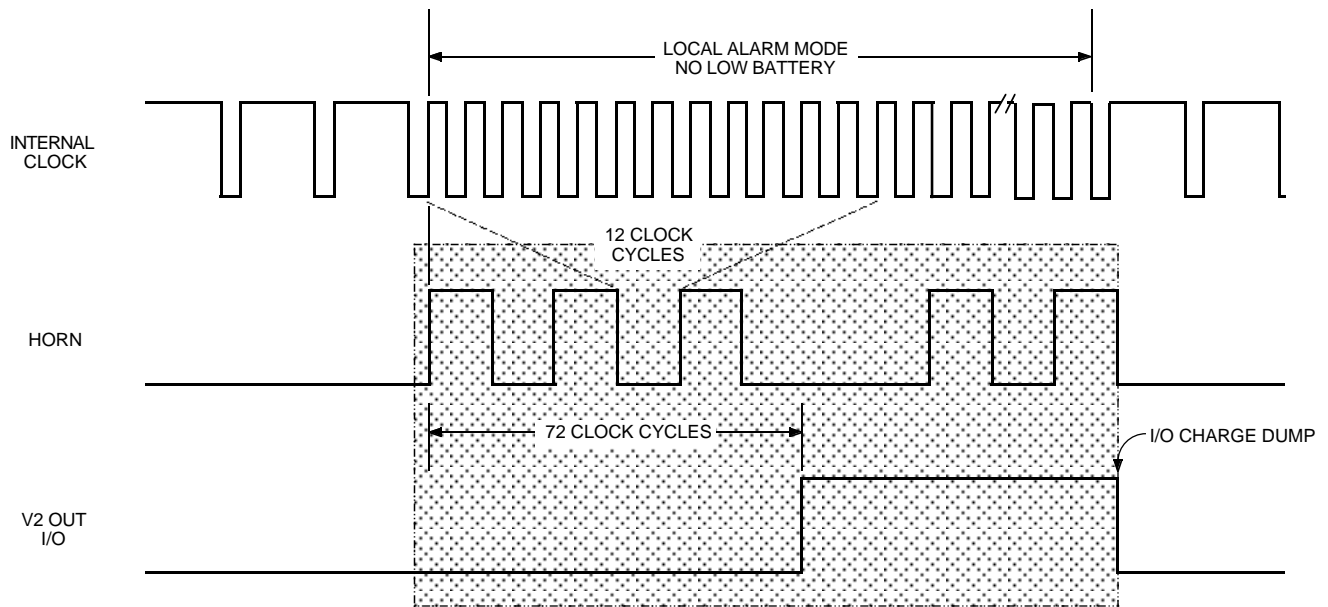
I/O OPERATION



SHADED AND UNSHADED AREAS
 ARE DIFFERENT TIME SCALES

HORN CYCLE NOT SELF COMPLETING
 AFTER REMOTE OR LOCAL ALARM CONDITION IS REMOVED

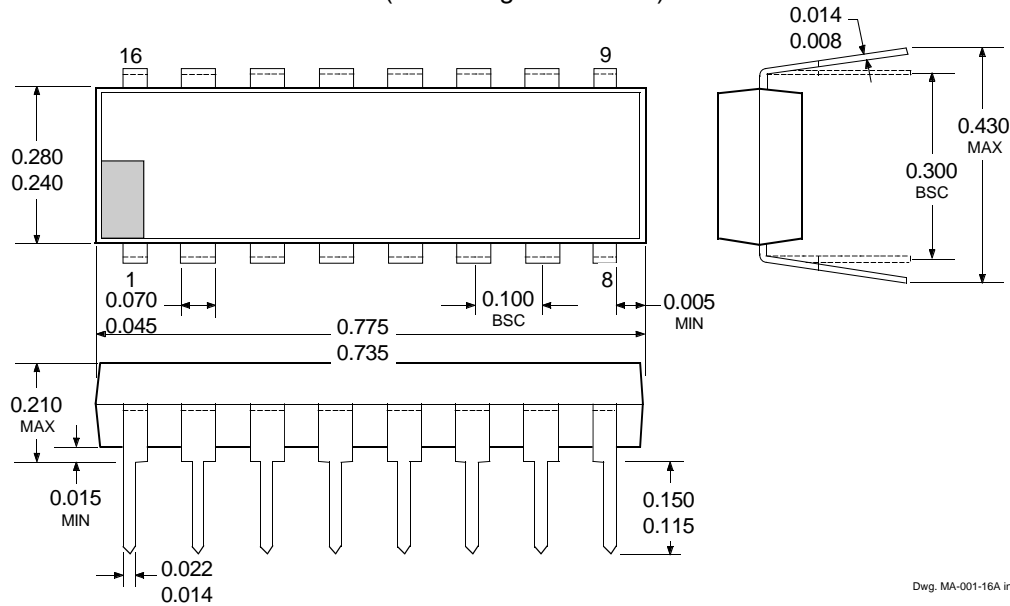
SINGLE HORN PULSE IN PROGRESS IS SELF COMPLETING
 AFTER LOCAL ALARM CONDITION IS REMOVED



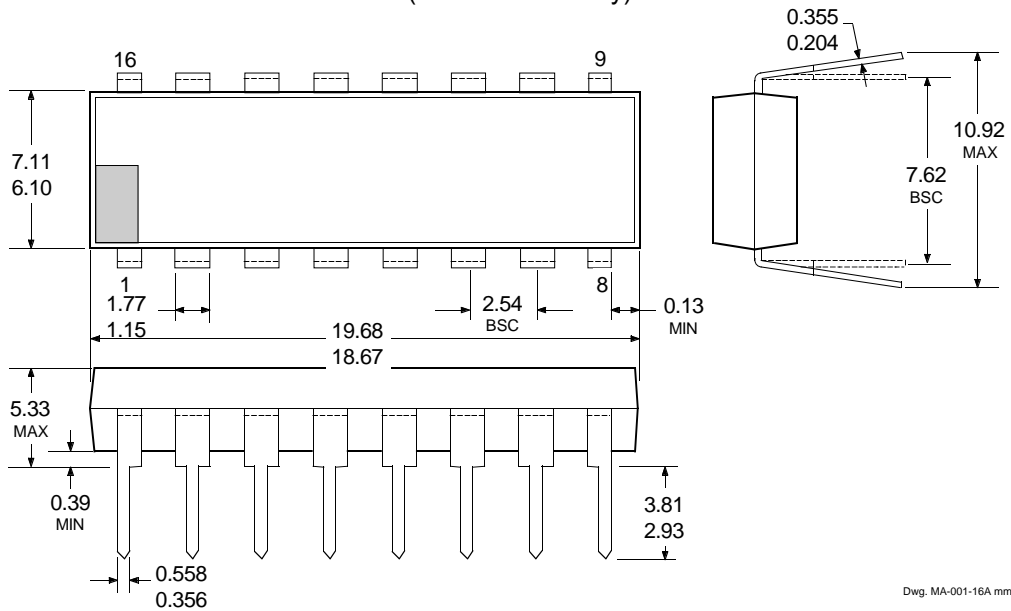
Dwg. WC-004-1

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Dimensions in Inches
 (controlling dimensions)



Dimensions in Millimeters
 (for reference only)



- NOTES: 1. Lead thickness is measured at seating plane or below.
 2. Lead spacing tolerance is non-cumulative.
 3. Exact body and lead configuration at vendor's option within limits shown.
 4. Supplied in standard sticks/tubes of 25 devices.

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The products described here are manufactured under one or more U.S. patents or U.S. patents pending.

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SAFETY & SECURITY ICs

Part Number	Function
A5347CA	Ionization-type smoke detector with interconnect and timer
A5348CA	Ionization-type smoke detector with interconnect, timer, and reverse-battery protection
A5349CA	Ionization-type smoke detector with interconnect and timer for ac line operation
A5350CA	Ionization-type smoke detector with interconnect and reverse-battery protection
A5354CA	Ionization-type smoke detector with interconnect and reverse-battery protection
A5355CA	Ionization-type smoke detector with interconnect
A5358CA	Photoelectric-type smoke detector with interconnect and timer
A5364CA	Ionization-type smoke detector with interconnect, reverse-battery protection, and temporal horn pattern
A5366CA	Photoelectric-type smoke detector with interconnect, timer, and temporal horn pattern
A5367CA	Ionization-type smoke detector with interconnect, timer, reverse-battery protection, and temporal horn pattern
A5368CA	Ionization-type smoke detector with interconnect, timer, reverse-battery protection, and temporal horn pattern