MALLORY

MALLORY SONALERT PRODUCTS, INC.

Product APPLICATION Guide

# Product Application Guide- 22mm Industrial Alarms with Terminal Block

## Part Number Structure

ZA 016 L D CT

Series: **ZA** = 22mm

Maximum Voltage:
**016** = 6 - 16; **028** = 16 - 28; **048** = 28 - 48; **120** = 48 - 120

Sound Level:
**L** = Loud (85 - 95 dB @ 2 ft); **M** = Medium (75 - 85 dB @ 2 ft)
**S** = Soft (65 - 75 dB @ 2 ft)

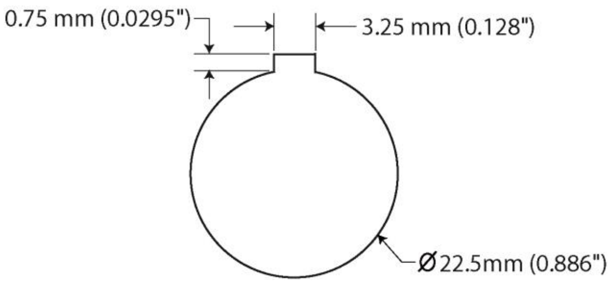
Voltage Type: **D** = DC Only; **A** = AC or DC

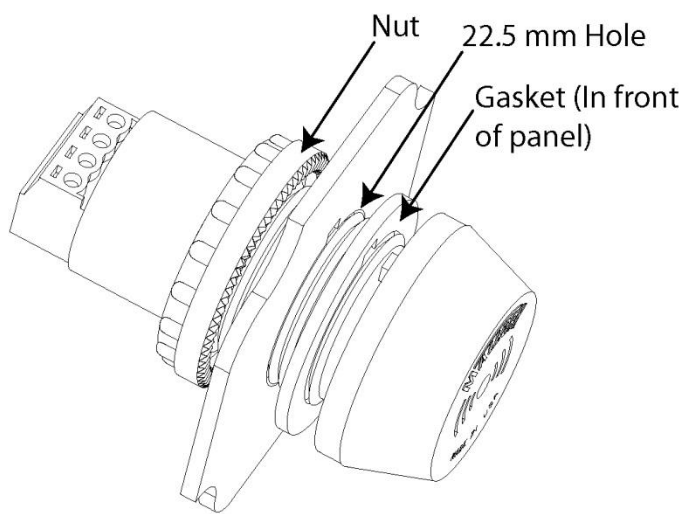
Function:
**CT** = Continuous Tone; **FP1** = Fast Pulse; **MP1** = Medium Pulse
**SP1** = Slow Pulse; **DP2** = Fast Double Pulse; **DP3** = Slow Double Pulse
**PS1** = Short Pulse Tone
**DL1** = 10 Sec. Delay; **SS1** = 1 Min On-Time; **SU2** = Fast Speed-Up
**CM1** = Chime Tone
**DT7** = Fast Warble; **DT8** = Slow Warble
**SR8** = Fast Siren; **SR9** = Slow Siren
**MT1** Thru **MT8** = Multi-Tones

# Sound Descriptions

- Continuous Tone: Constant tone until voltage is removed
- Fast Pulse Tone: 10 pulses per second
- Medium Pulse Tone: 5 pulses per second
- Slow Pulse Tone: 1 pulse per second
- Fast Double Pulse Tone: 1 double beep every half second
- Slow Double Pulse Tone: 1 double beep every 2 seconds
- Short Pulse Tone: 1 beep per second (on for 0.1 sec / off for 0.9 sec)
- 10 Sec. Delay: Wait 10 seconds before issuing continuous tone
- 1 Min On-Time: Issue continuous tone for 1 minute and then turn off
- Fast Speed-Up: Over 30 sec’s, speed up from 1 beep per 2 sec’s to 8 beeps per sec
- Chime Tone: Repeating chime sound at 1 chime every three seconds
- Fast Warble: Alternate between two frequencies at 7 warbles per second
- Slow Warble: Alternate between two frequencies at 1.5 warbles per second
- Fast Siren: Sweeping siren sound at 5 sweeps per second
- Slow Siren: Sweeping siren sound at 2 sweeps per second
- Multi-Tone: Four different tones in one package. See below table for list of sounds.

## Mounting Instructions:




**Panel Hole Cut**

- **Panel Hole Size:** 22.5 mm with Keyway
- **Maximum Panel Thickness:** 12.7 mm (0.5 in)
- **Maximum Nut Torque:** 10 in-lbs (1.13 n-m)

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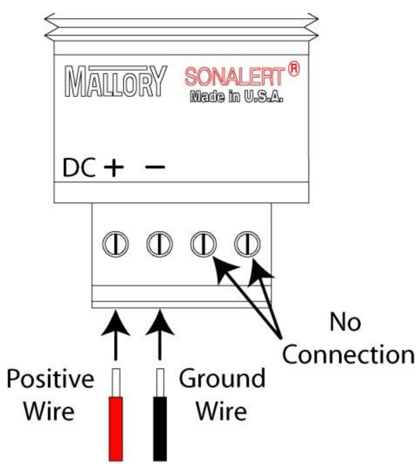
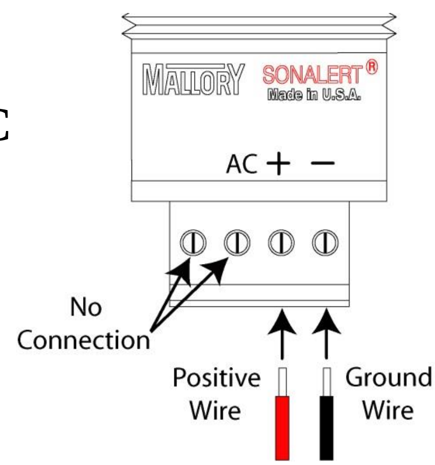
## Electrical Connection:




**DC ONLY**

**AC/DC**




- **Wire Strip Length:** 6.5 mm (0.256 in)
- **Wire Size:** 30 to 16 AWG
- **Maximum Screw Torque:** 2 in-lbs (0.226 n-m)

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## Certifications:

- **RoHS; UL; cUL; NEMA 3R/4X/12; IP-66; CSA 22.2 No. 94**
  - Included gasket must be used to maintain NEMA 3R/4X/12 ratings.

# cUL On-Line Listing:

UCST8.S1290 - AUDIBLE-SIGNAL APPLIANCES, GENERAL SIGNAL CERTIFIED FOR CANADA - COMPONENT

DETAILS

**File No.:** S1290

**UL Category (CCN):** UCST8

**Document Type:** Listing

**Parent Category (CCN):** UCEV8

Document | Company Information

## Audible-signal Appliances, General Signal Certified for Canada - Component

See General Information for Audible-signal Appliances, General Signal Certified for Canada - Component

**MALLORY SONALERT PRODUCTS INC** S1290
4411 S High School Rd
Indianapolis, IN 46241-6404 USA
**Audible tone generator gaskets**, Model(s) *ACC03(f8)*

**Audible tone generators**, Model(s) *PF-35A29EP-48, PF-35A29ER-48, PK-35A29EP-48V, PK-35A29ER-48V, PK-35N29EP-48, PK-35N29ER-48, PL-35A29EP-48V, PL-35A29ER-48V, SBM2(f6), SBM428(f6), SC105(f6), (f7)*, SC110(f3),(f6), (f7)*, SC250(f5),(f6), (f7)*, SC307N, (f6), (f7)*, SC416(f6), (f7)*, SC616(f4),(f6), (f7)*, SC628(f1),(f6), (f7)*, SC648(f2),(f6), (f7)*, SCE uuu v w x yyy z(f7), SCL uuu v w x yyy z(f7), SNP428, (f6), STA05004CT, STA05204, STA05204-ST, STA05204CT, STA05204F, VSB110-1, (f7), VSB110-1L, (f7), VSB110-2, (f7), VSB110-2L, (f7), ZA aaa b c ddd (f9)*

(f1) - May also be followed by A, AD, AJ, AN, ANJ, ANP, AP, D, DJ, DP, H, HJ, HP, J, L, N, NL, P, -9B or -BTR

(f2) - May also be followed by A, AD, AJ, AN, AP, D, S or -BTR

(f3) - May also be followed CP, D, DJ, DP, H, J, K, N, NJ, NP, P, Q or -BTR

(f4) - May also be followed by CP, CPN, N, NJ, NL, NP or -BTR

(f5) - May also be followed by D, J, N, P or -BTR

(f6) - May also be followed by R.

(f7) - May be used in conjunction with neoprene gasket P/N ACC03 in order to maintain the enclosure integrity of a Type 3R, 4X, or 12 enclosure. (Classic Model Series SC, SCE, SCL, and VSB only).

(f8) - May be used in conjunction with Classic Model Series SC & VSB audible signal devices in order to maintain the enclosure integrity of a Type 3R, 4X, or 12 enclosure.

(f9) - Must be used with neoprene gasket type 4216-S to maintain enclosure NEMA Type Ratings 3R, 4X and 12.

aaa - Indicates voltage rating. May be 016, 028, 048 or 120.

b - Indicates sound level. May be L, M or S.

c - Indicates voltage type. May be A or D.

ddd - Indicates Sound Function. May be any combination of letters A through Z and/or numbers 0 through 9.

uuu - 016, 028, 048, or 120.

v - X, L, M, or S.

w - A or D.

x - 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9.

yyy - Any combination of letters A through Z and/or numbers 0 through 9.

z - B, F, S, or W.

Marking: Company name or tradename "Mallory" , "Sonalert" , model designation and the Recognized Component Mark for Canada, .

Last Updated on 2019-08-29



# UL On-line Listing:

UCST2.S1290 - AUDIBLE-SIGNAL APPLIANCES, GENERAL SIGNAL - COMPONENT

DETAILS

**File No.:** S1290

**UL Category (CCN):** UCST2

**Document Type:** Listing

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(f6) - May also be followed by R.

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z - B, F, S, or W.

Marking: Company name or tradename "Mallory" , "Sonalert" and model designation.

Last Updated on 2019-08-29

## Sound Level vs Distance:

| Various Measurement Distances | ZA Series Sound Level Category | | |
|---|---|---|---|
| | **Loud**<br>**85 – 95 dB @ 2 ft** | **Medium**<br>**75 – 85 dB @ 2 ft** | **Soft**<br>**65 – 85 dB @ 2 ft** |
| **10 cm (4 in)** | 100 to 110 dB | 90 to 100 dB | 80 to 90 dB |
| **30 cm (1 ft)** | 91 to 101 dB | 81 to 91 dB | 71 to 81 dB |
| **1 Meter** | 82 to 92 dB | 72 to 82 dB | 62 to 72 dB |
| **10 ft** | 71 to 81 dB | 61 to 71 dB | 51 to 61 dB |

- The ZA Series of 22mm alarms measures sound level at 2 feet. Since sound level drops over distance, the above chart lists the equivalent sound levels at various distances.
- For example, if the Mallory part is in the **LOUD** sound level category, it has a sound level of 85 to 95 dB at 2 feet. At 10 cm, the sound level would measure 100 to 110 dB.

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## Packaging:

- Standard orders are bulk packed.

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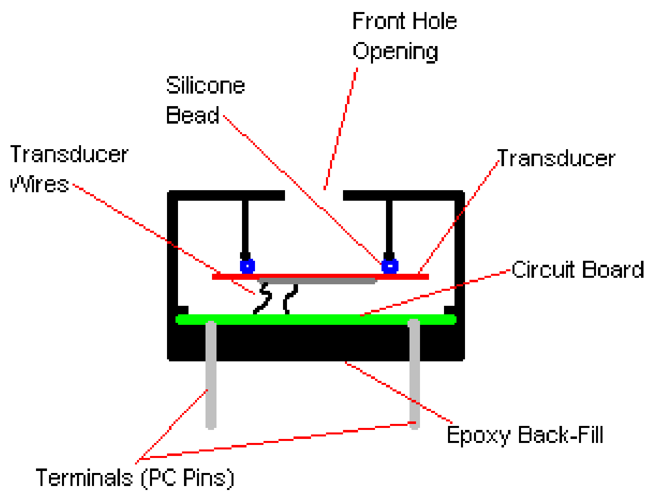
## Accessories & Replacement Parts:

| Part Number | Description | Notes |
|---|---|---|
| 22MMGASKET | Replacement NEMA Gasket | Gasket comes with part |
| 22MMNUT | Replacement Nut | Nut comes with part |

# Piezoelectric Electronic Alarm Construction

Piezoelectric Audible Signal Basic Construction



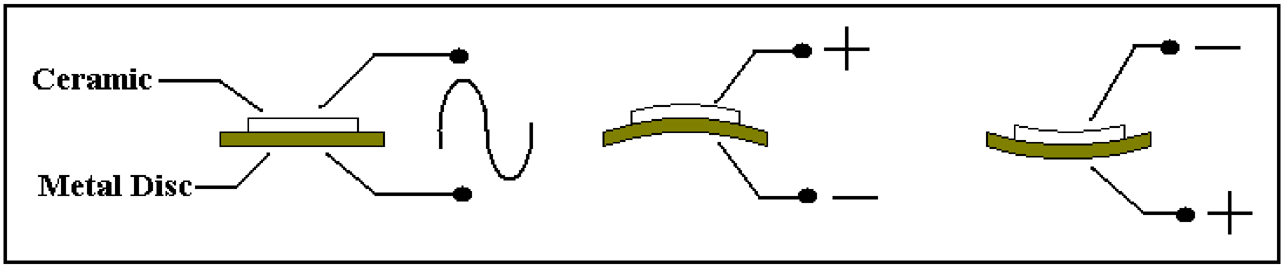

The above cross section picture shows the basic elements used in a piezoelectric audible alarm. The area in front of the transducer element including the front hole opening forms an acoustic cavity that lets the sound radiate out with the most efficiency (i.e. loudest sound level). If the alarm is an indicator that contains a circuit board, the circuit board is attached to the piezoelectric sounder element via soldered wires.

The above picture can be interpreted to represent a board mount package with pc pin terminations, but the same concept is used when building audible alarms in other mounting configurations such as SMT, Flange Mount, and Panel Mount alarms.

If the back of the alarm is sealed with epoxy or other material, the "guts" of the alarm (including the circuit board and components) are protected against fluid intrusion. However, fluid sitting inside the front cavity can obstruct the operation of the device causing the sound level to decrease significantly. If you need to wash the alarms after a soldering operation, it is strongly recommended to use an alarm that comes with a wash label that keeps the washing fluid from getting inside of the front cavity.

# Operation of Piezoelectric Audible Alarms

Piezoelectric electronic audible alarms work by converting the user input voltage to an appropriate oscillating signal that is applied to a sounder element that is mounted in a housing. The piezoelectric sounder element consists of a metal disc that has a special ceramic material




bonded to it that physically bends when voltage is applied to it.
The above picture shows a bare piezoelectric sounder element. By applying a sinusoidal wave-form at an appropriate frequency, the transducer will physically deflect in one direction and then in the opposite direction following the shape of the input wave-form. If this oscillation occurs in the audible frequency range (1 Hz to 20 kHz), then air pressure waves are produced that the human ear interprets as an audible sound.

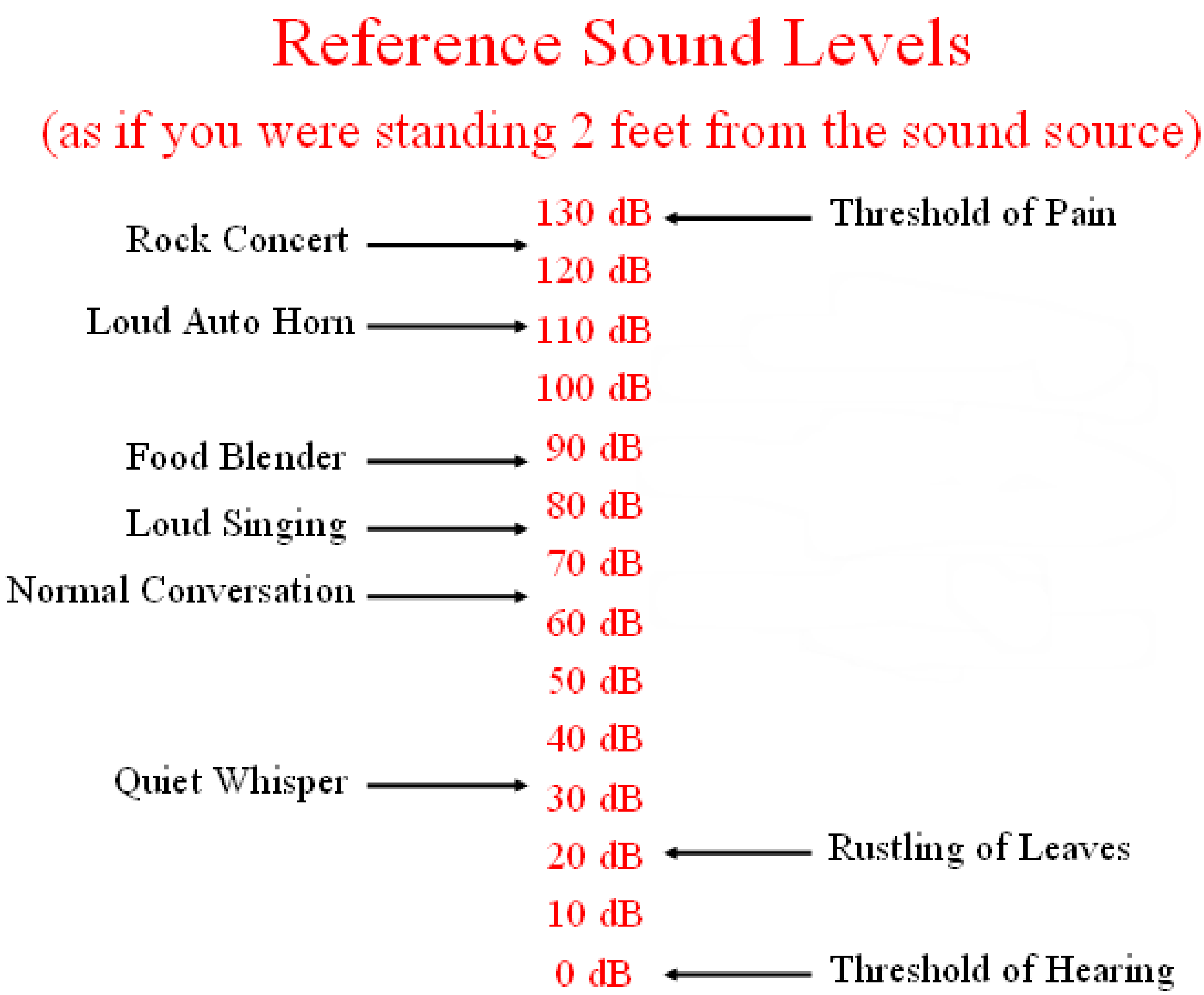
The larger the voltage of the applied wave-form, the larger the amplitude of the air pressure waves resulting in a louder sound level. However, the ceramic portion of the transducer can only bend so far before there is a risk of a catastrophic failure. This maximum voltage is somewhere around 40 to 50 volts. However, it is rare to apply this much voltage to a transducer as you reach a point of diminishing returns for voltages much greater than 32 volts.

By itself, the sound level produced by a transducer element is insignificant. To increase the size of the air pressure waves (and thus the sound level), the transducer element must be mounted inside an acoustic chamber that is optimized for the transducer size and resonant frequency. Every transducer has one frequency where it flexes more efficiently producing the louder sound levels. This frequency where the transducer performs the best is called the resonant frequency.

Self-Drive type devices provide a $3^{rd}$ terminal that connects to an isolated portion of the piezoelectric transducer. This third terminal provides a feed-back signal that is 180 degrees out of phase with the drive signal. This signal can be fed back into the circuit to allow the sounder element to self-tune itself to the transducer's resonant frequency.

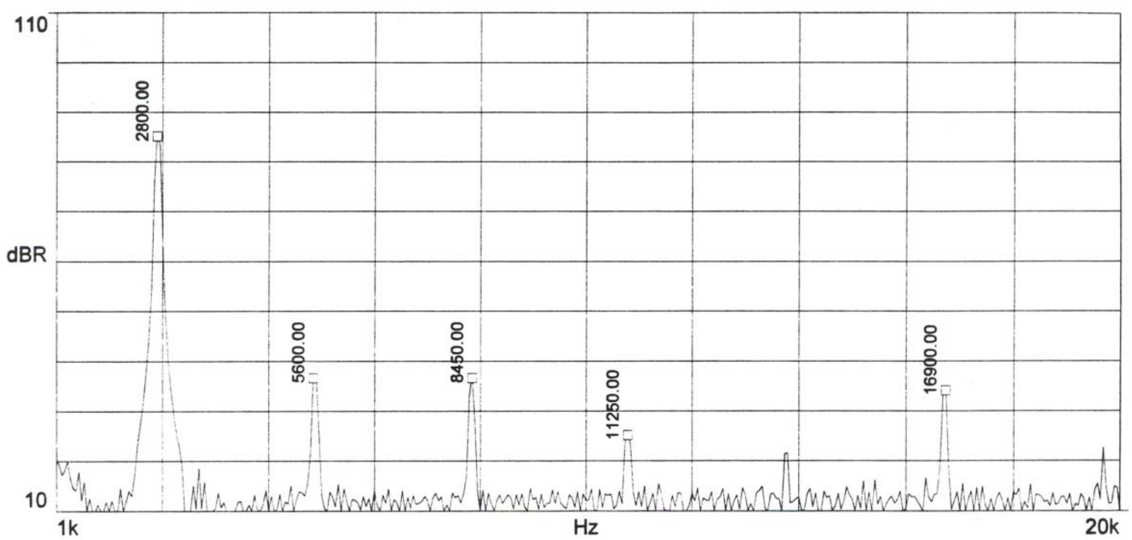
# Decibel Sound Level Scale

The decibel sound level scale is an arbitrary scale that ranges from 0 dB (threshold of hearing) to 130 dB (threshold of pain). The chart below shows where some common sounds fall on this dB scale. Audible alarms are available that have sound levels as soft as 55 dB at 2 feet and as loud as 110 dB at 2 feet.



# Fundamental Frequency & Harmonics

Below is a frequency scan of a piezoelectric audible alarm that has a resonant frequency of 2,800 Hz. As you can see, there is a strong frequency peak at 2.8 kHz and several smaller frequency peaks that follow called harmonic frequencies. The table below the chart shows that the size of the harmonic frequencies are significantly smaller than the fundamental frequency for this particular alarm unit. Because this alarm has a large fundamental frequency and much smaller harmonic frequencies, the sound quality of this part will be very good. When this alarm is activated, the listener will hear one clear frequency (also called sound pitch) from the alarm. Other electronic alarm technologies such as electro-magnetic or electro-mechanical type alarms often have much larger harmonic frequency components resulting in less clear tone.




| | Frequency | dB | % dB of Fundamental |
|---|---|---|---|
| Fundamental: | 2.800 KHz | 86.1 | 100.0% |
| 2nd Harmonic: | 5.600 KHz | 37.6 | 43.7% |
| 3rd Harmonic: | 8.450 KHz | 37.6 | 43.7% |
| 4th Harmonic: | 11.250 KHz | 26.1 | 30.3% |

# Typical Failure Modes of Piezoelectric Audible Alarms

| Component/Subsystem | Failure Mode | End Result | Occurrence |
|---|---|---|---|
| Circuit Components (Resistors, Capacitors, Diodes, IC's, etc.) | Over-voltage by customer's application | Unit ceases working. | Vast Majority of Returns |
| Transducer/Wire Solder Operation | Not enough wire strands in solder joint | Wire breaks after period of time & unit ceases sounding | Rare |
| Physical Assembly | Transducer wire pinched, adhesive/epoxy run down onto transducer, or RTV adhesive seal failure | Intermittent operation | Rare |
| Soldering Operation | Incorrect Solder Temperature or Time Causing Cold Solder Joint | Intermittent operation or unit ceases working after period of time | Very Rare |
| Circuit Components | Random Component Failure; Wrong Component Used; Missing Component | Unit ceases working under normal operating conditions | Very Rare |
| Transducer Wire | Defect in Wire; Wire Strands Damaged in Production | Wire breaks after period of time & unit ceases sounding | Very Rare |
| Piezo Transducer | Incorrect Polarization by Manufacturer; Glue Bonding Failure | Sound volume level decreases over time. | Exceedingly Rare |

**Notes**:

1. Customer returns of Mallory audible alarms for failure to operate are very rare. Of the few parts returned each year, the vast majority of the root cause of failure is an over-voltage or voltage spike condition caused by the customer's application.

2. All Mallory alarms are, at a minimum, function tested 100% during production, and a final audit is performed. Mallory SC/SBM/SBT/SBS/SNP/LSC/VSB/MSR/MSO/ZA series of alarms are audited 100% at final test by checking that sound level, frequency, and current are within specification limits from 2 to 4 different voltage levels.

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

**Офис по работе с юридическими лицами:**

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