



BeStar Technologies Inc.

Address: 761 N. 17th Street Unit 4, St. Charles, IL 60174

Tel : 847-261-2850 E-mail : sales@bestartech.com Web : www.bestartech.com

Document Number : 1701-11
 Revision : A3
 Total Pages : 12
 Prepare by : Loki, Lo
 Date : 8 March, 2017

SoniCrest Brand Acoustic Components

www.jlsonicrest.com

Document Type : Specification
 Product Type : Silicon Microphone with Piezo MEMS Sensor
 Part Number : SPM04C-38/1186

A1 - New issue created by Ting Lok, Ngan on 7 Jan., 2017		
A2 - Updated section 2 and 5 - 7 by Loki, Lo on 17 Feb., 2017		
A3 - Updated section 6 by Loki, Lo on 8 Mar., 2017		

This material is the property of BeStar Technologies Inc.
 Unauthorized copying or use of this material is prohibited.

1. Purpose and Scope

This document contains both general requirements, qualification requirements, and those specific electrical, mechanical requirements for this part.

2. Description

3.76 x 2.95 x 1.1 mm analog silicon microphone with piezo mems sensor and optimized for wind noise reduction, reverse mounted, 7 inch reel tape and reel packing, RoHS compliant.

3. Application

Smartphones, Wearables, Smart home devices, Video cameras, IoT devices, Automotive, Audio Input Peripherals, etc.

4. Features

- High Performance Analog ultra low pressure sensor
- Temperature Coefficient of Sensitivity stability within +/- 0.60 dB/Deg C.
- Pressure Coefficient of Stability within +/- 0.55 dB/Kpa
- Ultra Low Profile Package Availability
- Surface Mountable: MLP Design
- Tape & Reel Packaging
- RoHS Compliance

5. Interface Circuit Design Considerations

5.1. Design Consideration

- 5.1.1.** Must avoid connecting 2.2K resistor between VDD and output terminal will result in non-functional failure or current consumption will be too high.

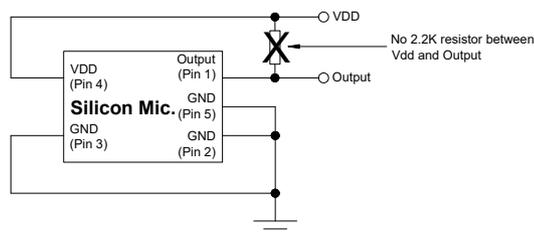


Figure 1. Design Consideration (1)

- 5.1.2.** Must avoid connecting RC to pin 2 because SoniCrest silicon microphones are all fixed gain series. Connecting RC to pin 2 leads to pin 2 floating resulted in malfunctioning or non-functional.

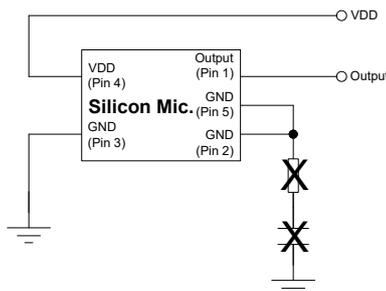


Figure 2. Design Consideration (2)

5.1.3. Interface Schematic

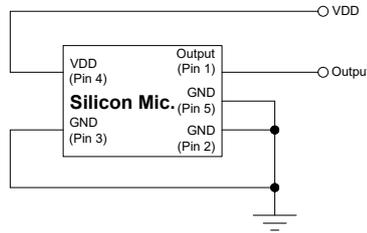
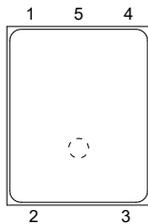


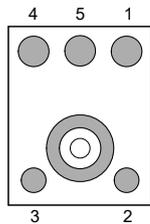
Figure 3. SPM04C-38/1186 Interface Schematic Diagram

5.2. Electrical Layout

Top View



Bottom View



Pin No.	Description
1	Output
2	GND
3	GND
4	Power
5	GND

Figure 4. Electrical Layout of SPM04C-38/1186

5.3. Terminology

- 5.3.1.** Pin 1: The Output Terminal, where the analog signal equivalent to applied pressure is available.
- 5.3.2.** Pin 2, 3: The Terminal where the supply negative is connected to sensor package.
- 5.3.3.** Pin 4: Input Voltage (maximum 3.6V).
- 5.3.4.** Sensitivity: Sensitivity is the open circuit output voltage amplitude for a given sound pressure at the pressure sensor diaphragm. This is frequency dependent so typically quoted at 1KHz. Units are defined in dB logarithmic scale. It is measured at the following conditions, $f = P_{IN} = 1Pa, V_{DD} = 2.1V$.

6. Component Requirement (All data taken at 25°C unless otherwise specified)

6.1. General Requirement

- 6.1.1.** Operating Temperature Range : -40°C to +100°C
- 6.1.2.** Storage Temperature Range : -40°C to +125°C
- 6.1.3.** IP Rating : IP68
(Test conditions refer to section 7.1 and 7.2)

6.2. Electrical Requirement

- 6.2.1.** Directivity : Omnidirectional
- 6.2.2.** Maximum Input Sound Level
(for less than 10% distortion) : 125dB
- 6.2.3.** Sensitivity : -38 ±3dB
(0dB = 1V/Pa, 1kHz)
- 6.2.4.** Operating Voltage Range : 1.6V to 3.6V
- 6.2.5.** Current Consumption : 150μA (Typical)
- 6.2.6.** Frequency Range : 250Hz ~ 10KHz
- 6.2.7.** Output Impedance : ≤ 400Ω
- 6.2.8.** Total Harmonic Distortion : 0.1% (at 94dB)
- 6.2.9.** S/N Ratio : ≥ 60dB
(Sensitivity at 1KHz, A-weighted noise)
- 6.2.10.** Power Supply Rejection Ratio : ≥ -60dB
- 6.2.11.** Power Supply Rejection : ≥ -80dB

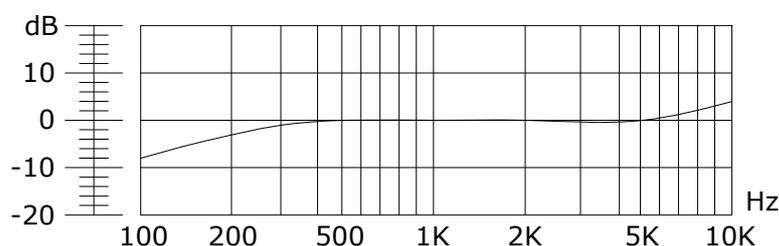


Figure 5. Frequency Response

6.3. Mechanical Requirement

- 6.3.1.** Layout and Dimension : See Section 9, Figure 8

6.4. Test Setup

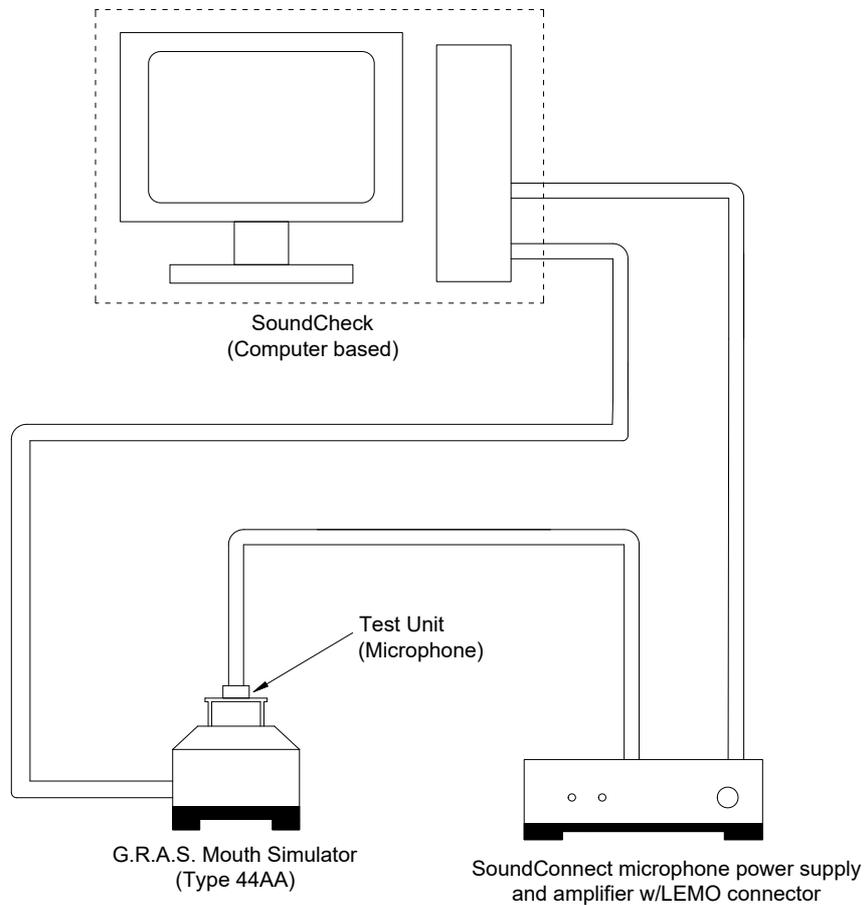


Figure 6. Test Setup

Notes : Apply sinusoidal wave from SoundCheck Audio Analyzer (Computer based) to speaker in G.R.A.S. Mouth Simulator Type 44AA. Measure sensitivity of test unit with specified driving circuit. The whole testing system should be calibrated based on calibration procedure recommended by the manufacturer before measurement. Measurement should be carried out in an excellent insulation from external noise environment.

7. Reliability Test

- 7.1. **Water Immersion** : IPX8 (10m depth, 24 hours, tap, salt or soapy water. Allow the water to drain out of the microphone and dry out for best testing results.)
- 7.2. **Dust Immunity** : IP6X dust immune (20mL of silica flour in 4.3 m³ box, blow dust with compressed air for 10 seconds from 10cm away)
- 7.3. **High Temperature Operating** : Subject samples to +125°C and operate for 168 hours under maximum rated voltage.
- 7.4. **Temperature Shock** : Each cycle consist of 30 minutes at -40°C followed by 30 minutes at +125°C with 5 minutes transition time. Test duration is for 30 cycles, starting from cold to hot temperature.
- 7.5. **Static Humidity** : Precondition at +25°C for 1 hour. Then exposed to +85°C with 85% Relative Humidity for 1000 hours. Dry at room ambient for 4 hours before measurements.
- 7.6. **ESD Sensitivity** : Perform measurements according to MIL-STD 883E, method 3105.7 for Human Body model. Identify the ESD threshold levels indicating passage of 8000V Human Body model.
- 7.7. **Random Vibration** : Secure samples. Vibrated randomly along three perpendicular directions for 30 minutes in each direction, 4 cycles from 20~2000Hz with a peak acceleration 20g.
- 7.8. **Mechanical Shock** : Subject samples to half sine shock pulses (3000g±15% for 0.3ms) in each direction, totally 18 shocks.
- 7.9. **Drop Test** : Drop samples naturally from the height of 1.5m onto a steel surface in 6 directions for 3 times, total 18 times.
- 7.10. **Simulated Reflow (without solder)** : Sames for qualification testing require 3 passes of 260 ±5°C reflow solder profiles. 2 hours of setting time is required between each reflow profile test.

8. Recommended reflow oven temperature profile

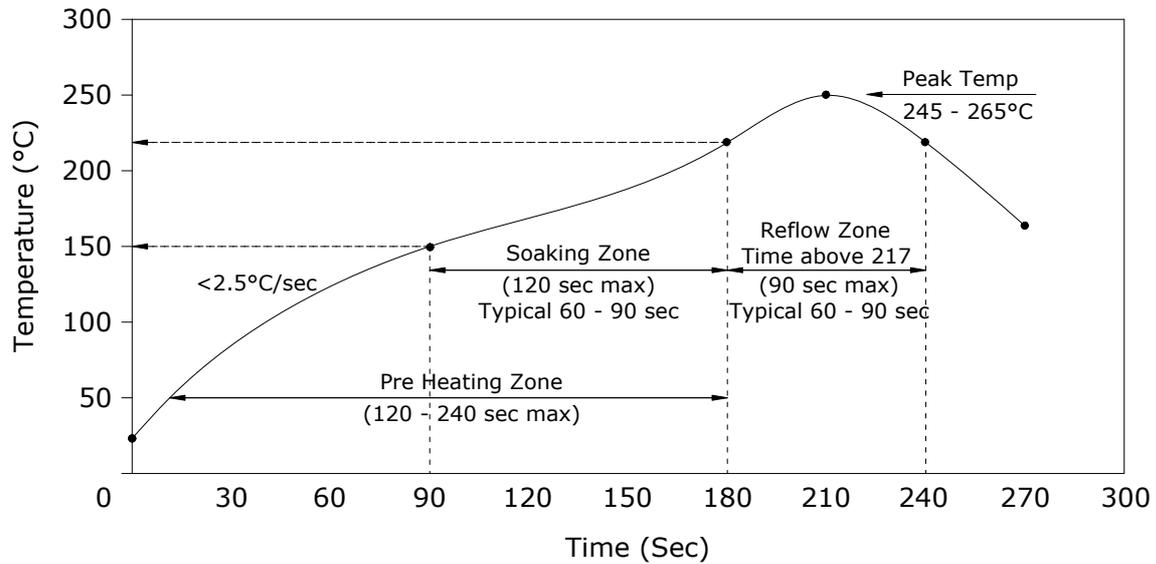


Figure 7. Recommended reflow oven temperature profile

Notes:

1. Pb-free soldering assembling processing: Reference IPC/JEDEC J-STD-020C.
2. Number of Reflows - Recommended not more than 3 cycles.
3. The SMD process should use no clean solder paste, cleaning is not allowed because washing will damage the pressure sensor sensing elements.
4. Do not board wash after the reflow process. Board washing and cleaning can damage the device.
5. Do not expose ultrasonic processing and cleaning.
6. Do not expose plasma cleaning process.

9. Mechanical Requirements

Unit : mm

Tolerance : Linear = ±0.15
(unless otherwise specified)

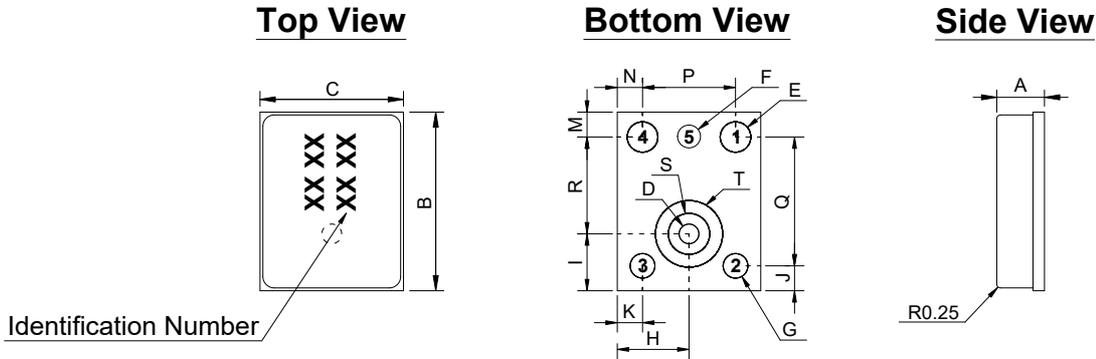


Figure 8. Mechanical Layout of SPM04C-38/1186

Item	Symbols	Diameter (mm)		
		Minimum	Nominal	Maximum
Height	A	1.00	1.10	1.20
Length	B	3.66	3.76	3.86
Width	C	2.85	2.95	3.05
Acoustic Port Hole Diameter	D	0.15	0.25	0.35
Terminal Pad 1, 4 Diameter	E	0.62	0.72	0.82
Terminal Pad 5 Diameter	F	0.51	0.61	0.71
Terminal Pad 2, 3 Diameter	G	0.46	0.56	0.66
AP Hole to Edge 1	H	1.38	1.48	1.58
AP Hole to Edge 2	I	1.03	1.13	1.23
Terminal Pad 2, 3 Edge 1	J	0.39	0.49	0.59
Terminal Pad 2, 3 Edge 2	K	0.36	0.46	0.56
Terminal Pad 1, 4 Edge 1	M	0.43	0.53	0.63
Terminal Pad 1, 4 Edge 2	N	0.41	0.51	0.61
Terminal Pad 1, 4 Pitch	P	1.83	1.93	2.03
Terminal Pad 1, 2 Pitch	Q	2.64	2.74	2.84
Terminal Pad 4 to AP Hole Pitch	R	0.86	0.96	1.06
Acoustic seal inner Diameter	S	0.51	0.61	0.71
Acoustic seal outer Diameter	T	1.12	1.22	1.32

10. PCB Solder Pad Layout

The below figure provide general guidance about the recommended PCB land pattern. The land pattern dimensions are exactly the same size and shape as the pads on the pressure sensor module. Recommended solder paste height is 3-5 mils (75µm to 125µm).

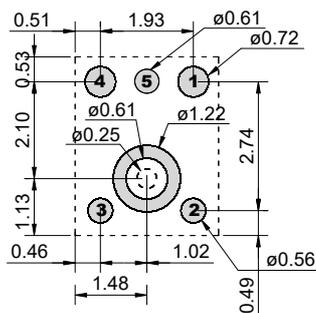


Figure 9. PCB solder pad layout for SPM04C-38/1186

11. Standard Packing Requirements

11.1. Tape and Reel

11.1.1 Packing Quantity : 1250 pcs per reel

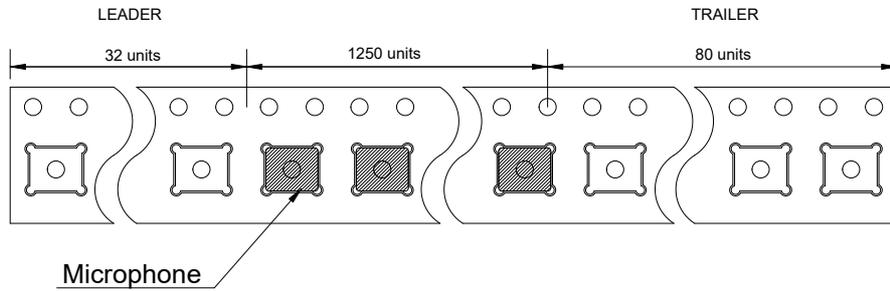


Figure 10. Tape and Reel Packing Quantity

11.1.2 Tape Layout

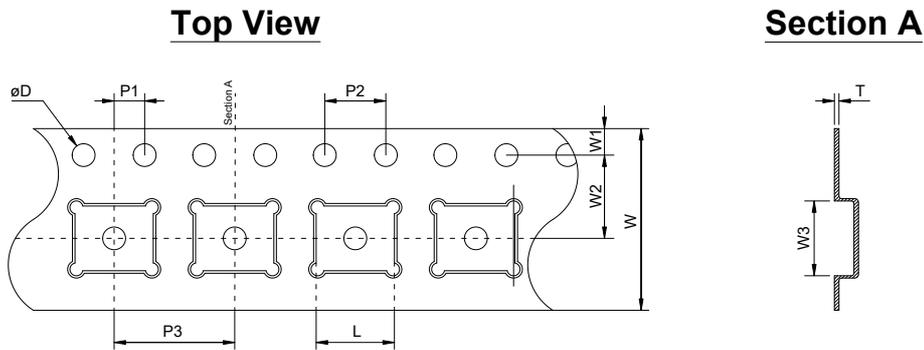


Figure 11. Tape Layout

Symbol	Millimeter		
	MINIMUM	NOMINAL	MAXIMUM
ϕD	1.5	1.5	1.6
P1	1.9	2.0	2.1
P2	3.9	4.0	4.1
P3	7.9	8.0	8.1
L	3.73	3.83	3.93
W	11.7	12	12.3
W1	1.65	1.75	1.85
W2	5.4	5.5	5.6
W3	2.88	2.98	3.08
T	0.25	0.3	0.35

11.1.3 Reel Layout

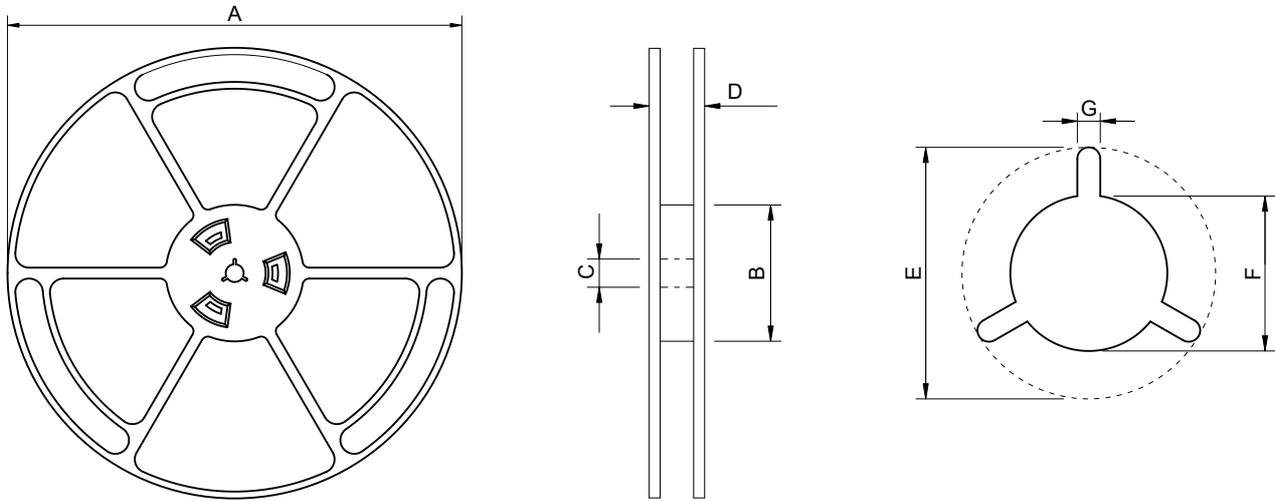


Figure 12. Reel Layout

Item	Symbols	Diameter (mm)		
		Minimum	Nominal	Maximum
Reel Diameter	A	-	180	-
Hub Diameter	B	58	60	62
Hub Hole Diameter	C	12.8	13	13.5
Reel Width (measured at Hub)	D	-	16	16.4
Arbor Hole	E	20.2	-	-
Arbor Hw in mm Diameter	F	12.8	13.0	13.5
Arbor Slot Width	G	1.5	-	-

11.1.4 Reel Installation and Carton Information

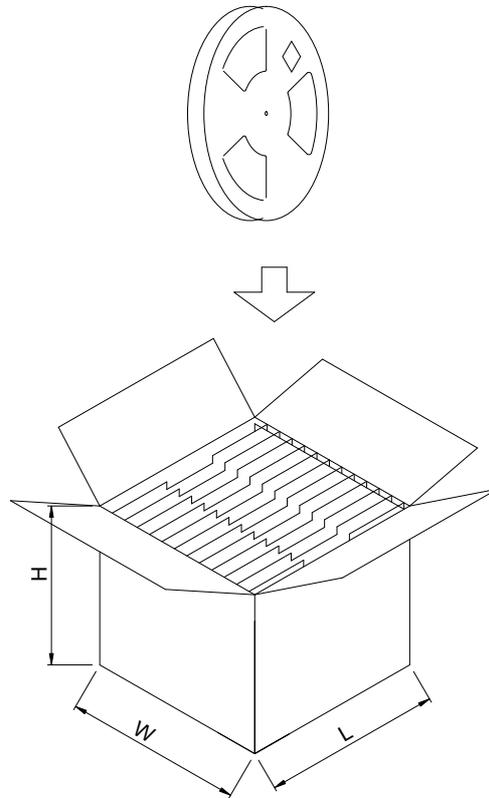
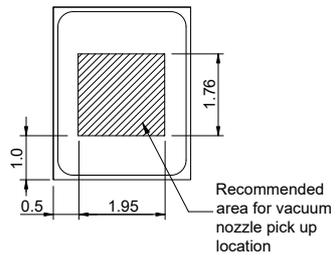


Figure 13. Reel Installation

Qty/reel (pcs)	Weight/reel (kg)	Reel/carton (nos)	Qty/carton (pcs)	Weight full load (kg)	Dimension carton box (LxWxH) mm	Storage (Temp)
1250	0.25	5	6250	~3.00	272 x 159 x 236	-10°C ~ 50°C
1250	0.25	10	12500	~6.00	274 x 272 x 236	-10°C ~ 50°C

11.2. Pickup Tool Pick Location



Pick Up Pressure Limits		
Condition	mmHg	PSI
Max. Air Purge	3000	58
Max. Vacuum	-500	9.6

Figure 14. Pickup Tool Pick Location

11.3. Label Layout

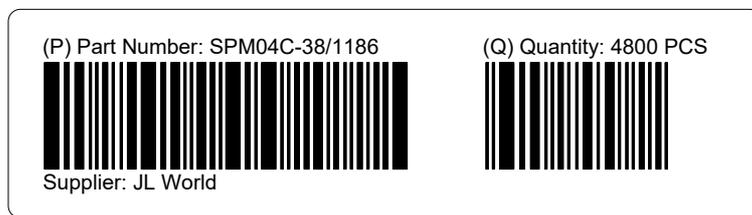


Figure 15. Label Layout Sample