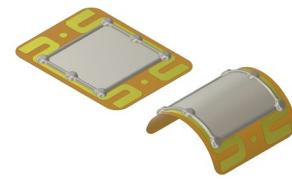




PUIaudio



Data Sheet

HD-PAF1419

Features:

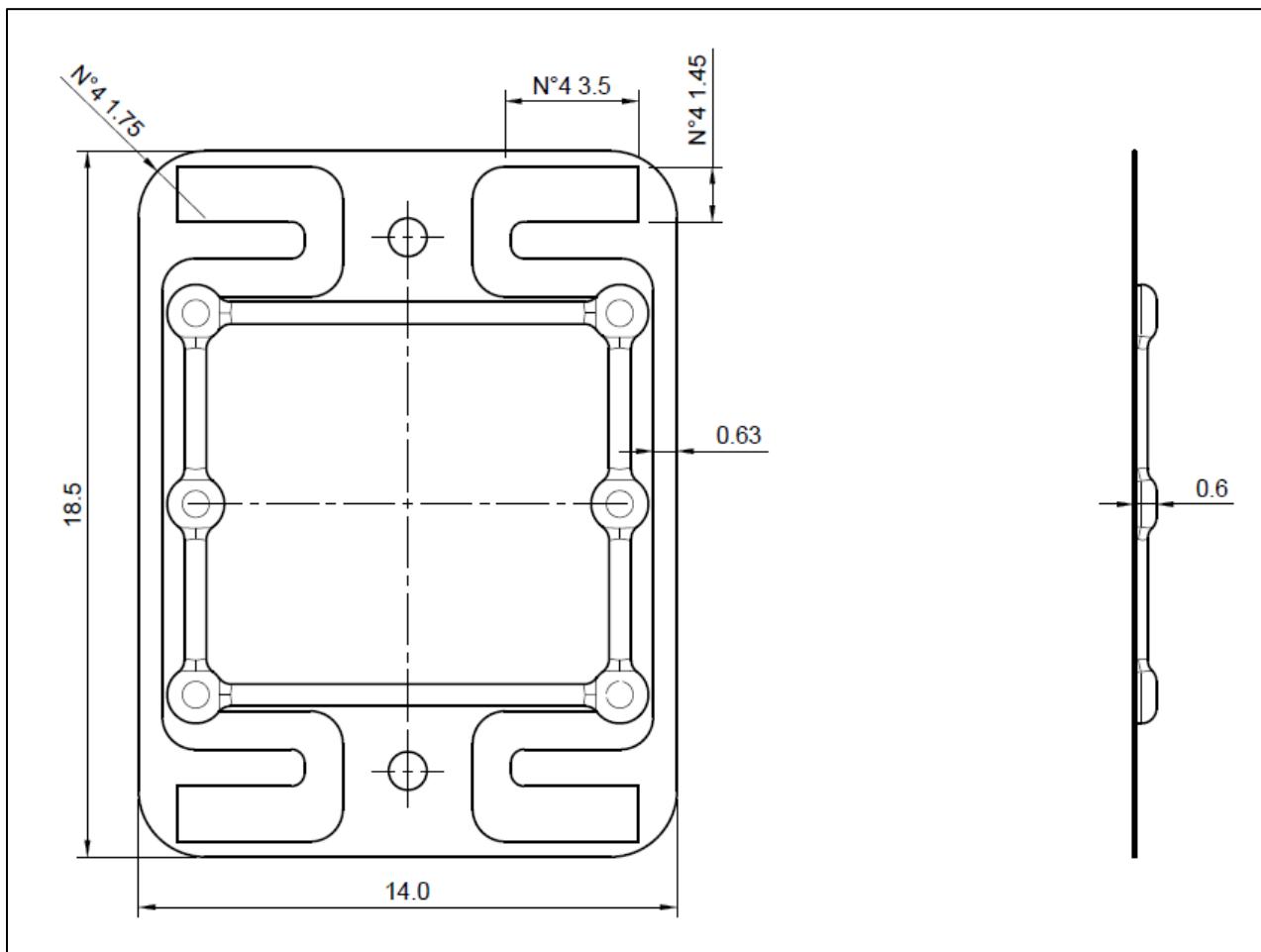
- Flexible piezoelectric film which can seamlessly be integrated into application surfaces.
- Wide operating frequency range for replication of harmonic content within haptic waveforms.
- Lead-Free Haptics Solution, RoHS and REACH Compliant.

Specifications

Parameters	Values	Units
Maximum Input Voltage	212V	Vp-p
Working Input Voltage (Positive Voltage Only)	0V to 212V	Vp-p
Operational Frequency	0 to 500	Hz
Typical Displacement (Unloaded, 212V/150Hz)	230	µm
Capacitance (1V/1kHz, 5~30 minutes after voltage application)	225 ± 20%	nF
Maximum Peak Current (Slew Rate: 0.2V/µs)	200	mA
Maximum Slew Rate	0.2	V / µs
Acceptable Soldering Methods (Hand Solder Only, See Note)	Maximum temperature 350°C±10°C, Time ≤ 1 sec	-
Weight	0.076	Grams
Storage Temperature	-20 ~ +90	°C
Operating Temperature	0 ~ +60	°C
Maximum Assembly Temperature	+100	°C
Maximum Bend Radius	6	mm
Environmental Compliances	REACH, RoHS	-

Dimensions

All dimensions in mm; default tolerance $\pm 0.5\text{mm}$, unless otherwise stated

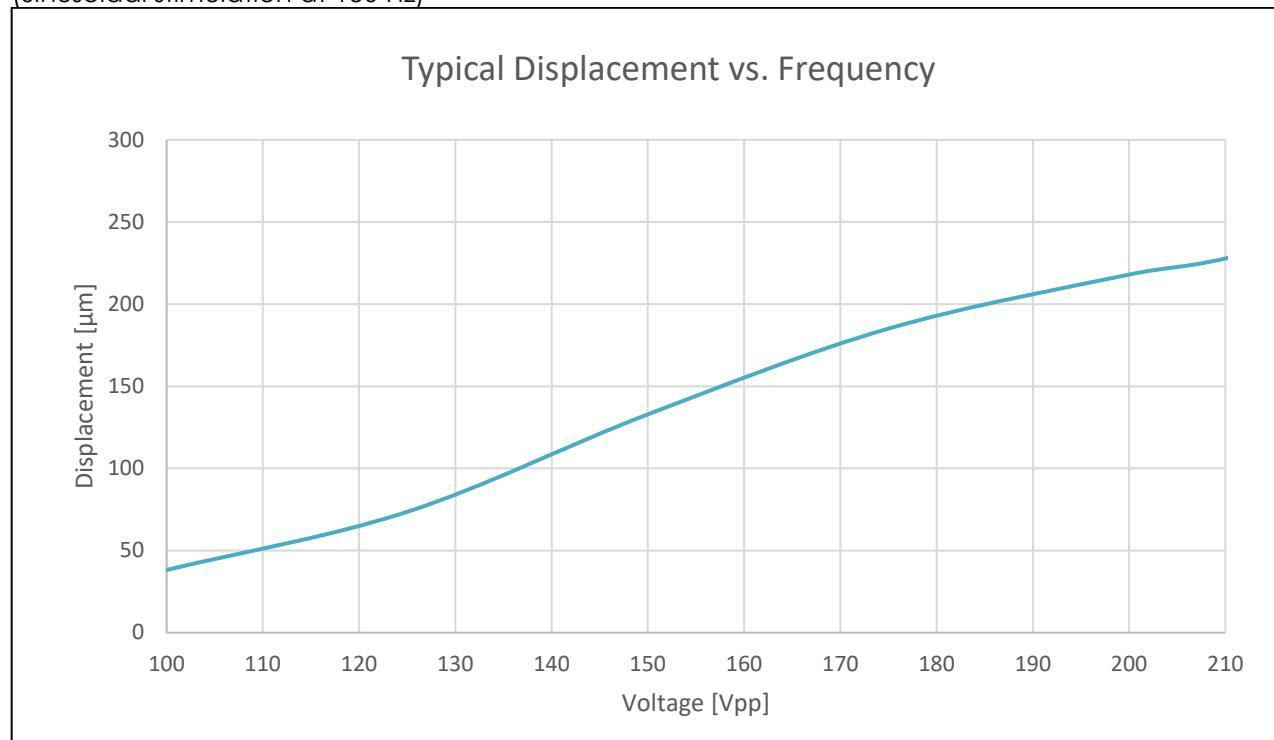


Typical Performance Characteristics

(Reference Only)

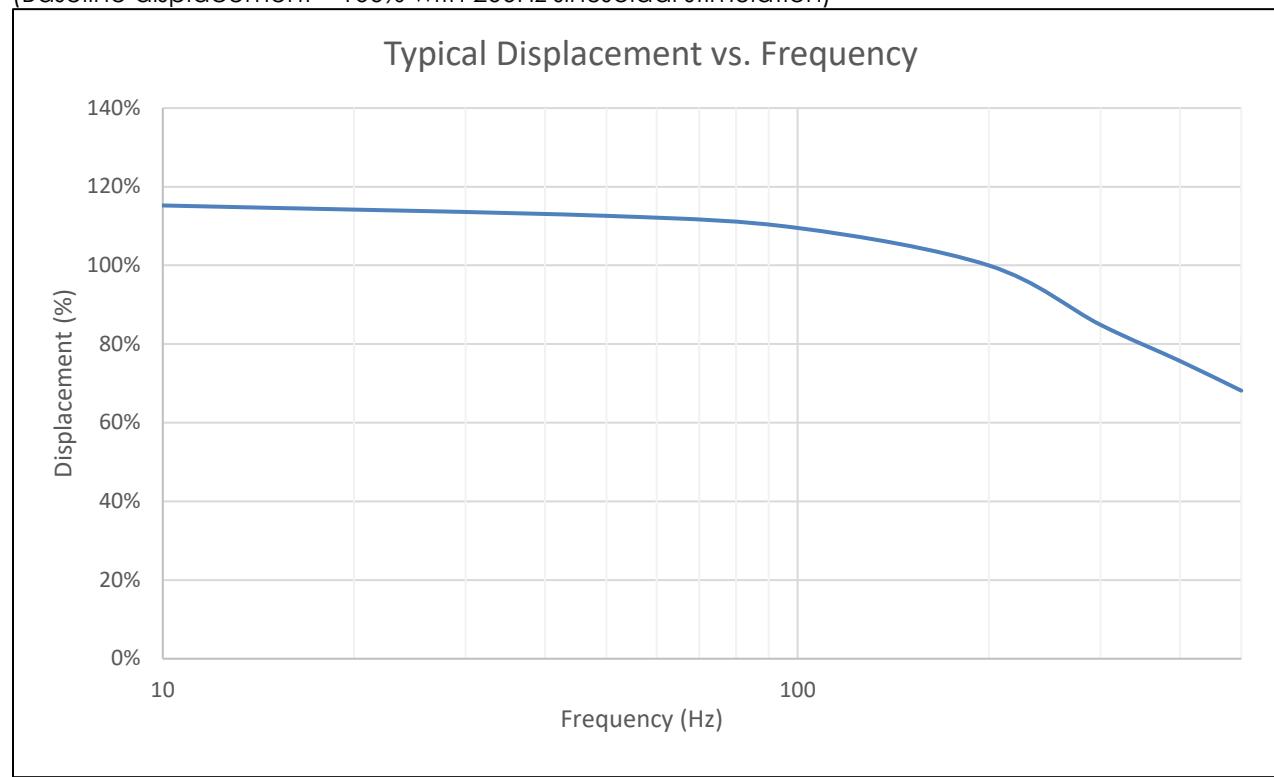
Out of Plane Displacement vs. Voltage Applied

(Sinusoidal stimulation at 150 Hz)



Out of Plane Displacement vs. Frequency

(Baseline displacement – 100% with 200Hz sinusoidal stimulation)



Displacement measured with actuator fixed with four external pogo-pins on the edges or electrical contact points.

Reliability Testing

Type of Test	Test Specifications
High Temperature Test	Temperature: +90°C Test Duration Time: 24 hours
Low Temperature Test	Temperature: -20°C Test Duration Time: 24 hours
Temperature Cycle Testing	Temperature: -20°C ~ +90°C Test Duration: 5 minutes Test Cycles: 1,000 cycles
Endurance Test	1,000,000 operating cycles at 25°C and 50% R.H., sine wave voltage pattern at 212V _{PP} , 150Hz. Test cycle: 1 second on, 3 seconds off. Test Cycle: 100% duty cycle (no pause).

After tests, capacitance shall decrease by no more than 20% from rated value.

Solder & Conductive Paste Recommendations

Electrical connections to the actuators should be done in such a way as to:

- Allow sufficient electrical connections
- Avoid mechanical stress to the Flex Assembled Actuator, specifically to the flexible PCB substrate.
- Provide the easiest path to the driver connectors

Lead Wires:

Type	Main Parameters	Temperature Rating	Voltage Rating
PTFE Hook-Up Wire	Stranded, 0.12mm / 26AWG	$\geq 200^{\circ}\text{C}$	$\geq 300\text{V}$

Soldering:

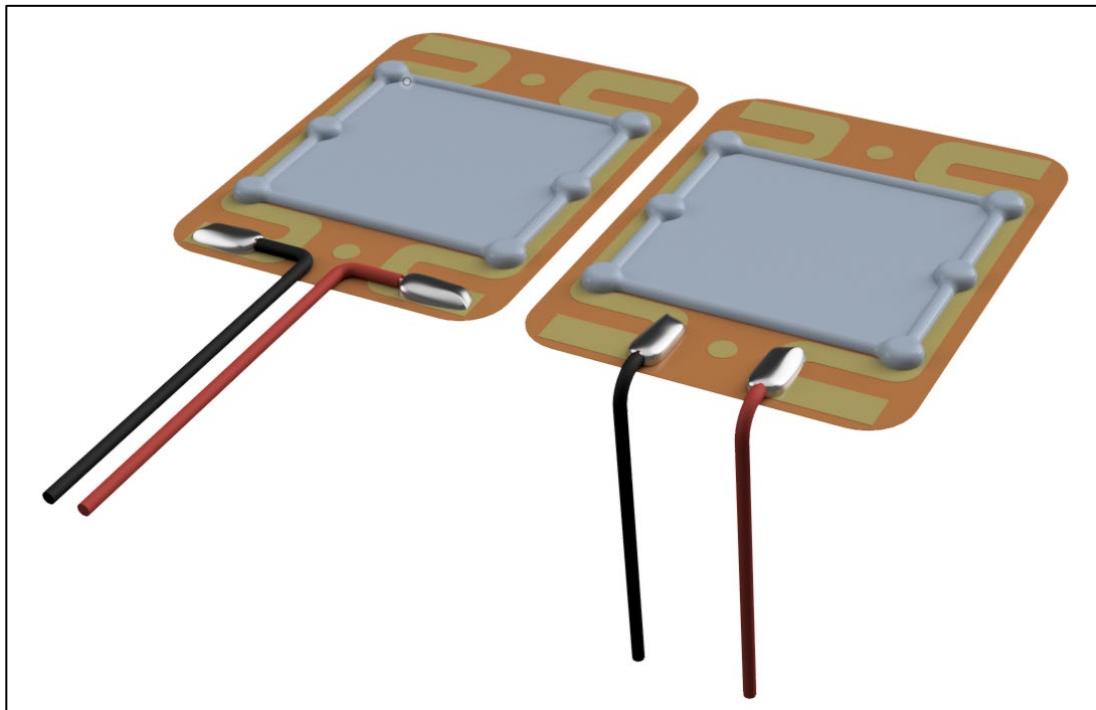
PUI Audio only recommends manual hand solder methods for attaching lead wires to the HD-PAF1419.

Do not allow contact between actuator body and solder iron tip.

Acceptable Solder Types:	SnAuCu (SAC) alloys SnCu alloys
Solder Profile:	Hand Solder Only $350 \pm 10^{\circ}\text{C}$ maximum temperature 1 second solder time maximum

Soldering can be done following the same plane as the actuator or normal to it (see picture). Adequate strain relief must be provided for all electrical connections.

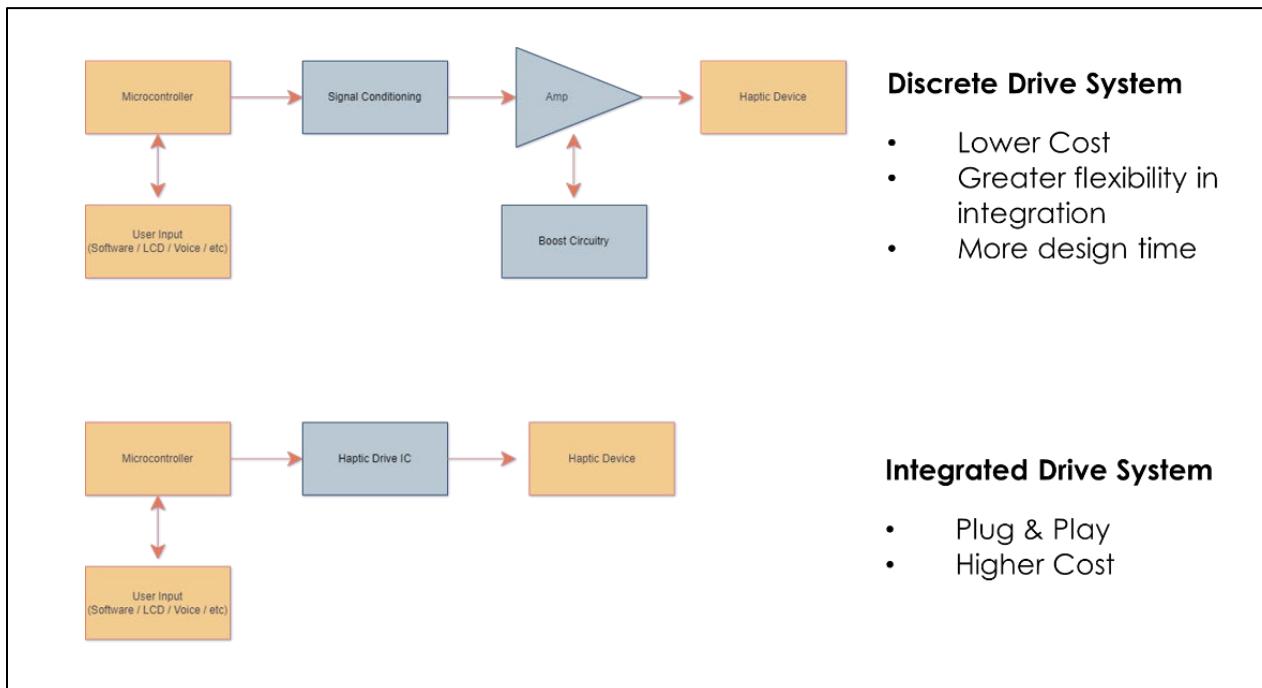
Conductive paste may be used in place of solder if appropriate strain relief is implemented



Amplifier Recommendations

- The HD-PAF1419 must be driven by a unipolar input voltage. This is different from traditional PZT actuators which typically use bipolar voltages.
- The amplifier must be capable of supplying adequate current to the actuator across the operating frequency range.
- Input waveforms for the HD-PAF1419 should not exceed a slew rate of 0.2V/μs.

The diagram below illustrates high-level differences between using an amplification system designed with discrete components, and the use of an integrated drive system / evaluation module.



The [HV56020/22 Evaluation Board](#) from Microchip is a piezoelectric haptic driver specially designed for use with thin-film haptic actuators. This device may be used out-of-the-box for evaluating the HD-PAF1419 flexible haptic actuator.

Another example of an integrated drive system for the HD-PAF1419 is the [DRV2700 Industrial Piezo Driver](#) Texas Instruments. This single-chip piezo driver features selectable differential or single-ended modes of operation, powered by a 5V DC input. Care must be taken to drive the HD-PAF1419 in single-ended mode only. Other configurations may damage the actuator or driver. This driver features 200Vpp output potential when operating as a differential device, but only 100Vpp when operating single ended. As such, external circuitry may be required to boost the single-ended output voltage to higher levels appropriate for the HD-PAF1419.

To simplify testing and integration, an evaluation module may be used, such as the [DRV2700EVM-HV500](#). This is a preconfigured, single-ended, high-voltage evaluation board for the Texas Instruments DRV2700 Piezo Driver. Integrated high voltage switching on the board enables up to +500V output capability off of a 5V DC supply. DIP switches on the

board are used to set the maximum gain of the amplifier; since the output capability of this evaluation board exceeds the maximum voltage rating of the HD-PAF1419, it is essential to set the gain properly and ensure that the HD-PAF1419 is never driven above +212V. The driver could run up to 50Hz max, frequency limit.

Precautions for Operation, Storage, Soldering, and Transportation

Handling Precautions

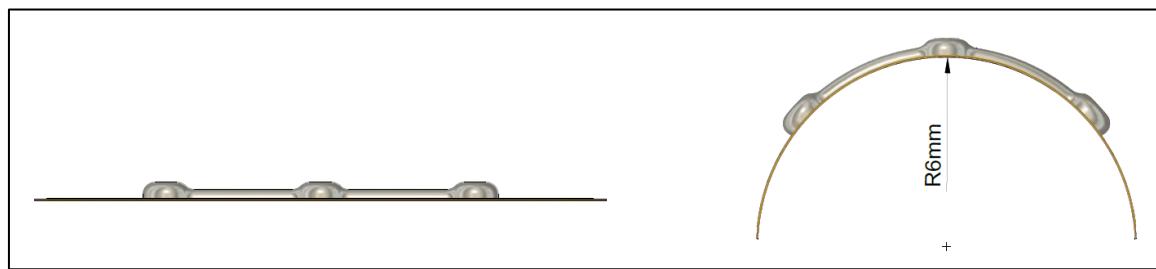
Precautions to be taken when using Flexible Piezoelectric Haptic Modules

Material selection, installation and activation of Piezoelectric Haptic Modules should be decided upon by users according to the applications. For proper evaluation and decision, products should be tested repeatedly in both realistic and abnormal operating conditions.

- Do not use near flammable gas or solvent as alcohol, thinner, benzene, gasoline, propane gas due to risk of explosion or fire.
- Do not clean with flammable solvents such as alcohol, thinner and benzene due to risk of explosion or fire.

Assembly

- Carefully apply bending or other mechanical stress as it may change the performance characteristics.
- Carefully apply bending stress during product handling or assembling process.
- Do not modify the actuator.
- Do not reuse film flex assembled actuator modules that have been removed from a assembly unit.
- Do not exceed a bend radius of 6mm during installation or use.

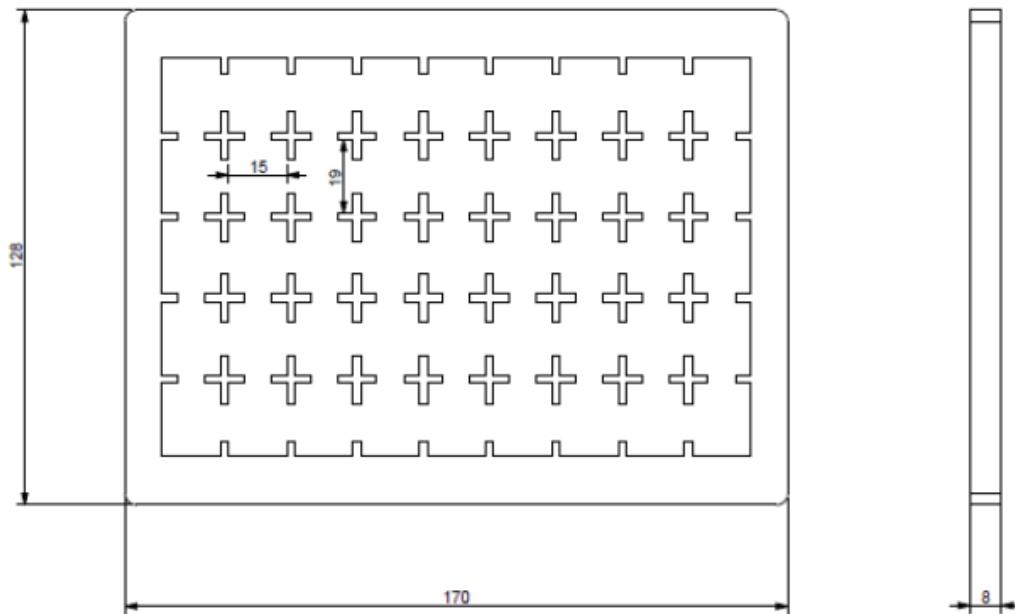


Environmental

- Maximum storage temperature should not exceed 90°C.
- Maximum storage humidity should not exceed 50% relative humidity.
- Atmospheres should be free of chlorine and sulfur bearing compounds.
- Temperature fluctuations should be minimized to avoid condensation on the part.
- Do not operate or store in high temperature environments, near fire, under sunlight or other strong lights, in the air containing salt, oil, dust, or other particulate matter
- Keep product inside dry pack until use.

Packaging

- 180pcs/Box
- 45pcs/Tray (4 trays in one box)



Specifications Revisions

Revision	Description	Date	Approved
A	Released from Engineering	10/04/24	KM

Note:

1. Unless otherwise specified:
 - A. All dimensions are in millimeters.
 - B. Default tolerances are $\pm 0.5\text{mm}$.
2. Specifications subject to change or withdrawal without notice.