GMFS02 Analog Force Sensor

General Introduction

GMFS02 is an analog force sensor especially designed for consumer applications like touch panels, seamless buttons, and smart shoes. It is housed in a compact 2.5×2.1×1.0 mm^3 package. The force sensor is based on the industry-recognized piezo-resistive technology featuring long-term stability and EMC robustness. The force sensor is capable of continuously measuring forces from 0N up to 10N.

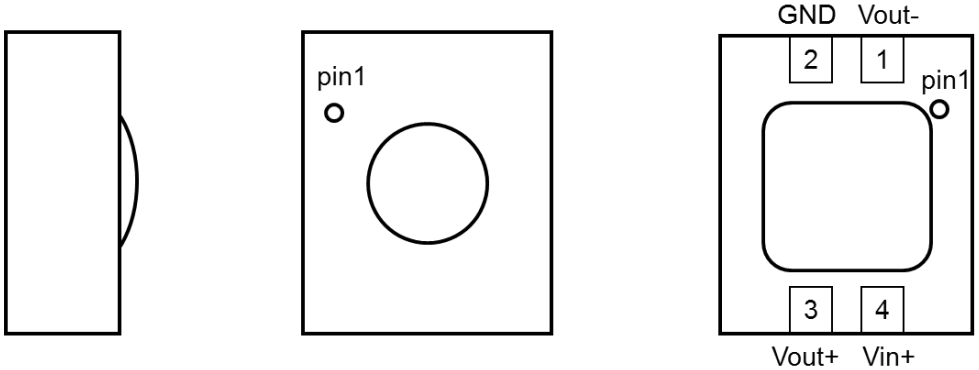
Focusing on micro force measurement, the high sensitivity, and the high resolution makes GMFS02 especially suitable for applications that detect forces from hand related movement such as finger taps or pen drawing.

Features

- Operation range:
  - Force: 0~10N
  - Temperature: -40~+85℃
- Force resolution:
  - Up to1mN
- Supply voltage:
  - VDD: +1V ~ +5V
- RoHS-compliance package:
  - LGA-4L package
  - Footprint: 2.5 × 2.1 mm^2
  - Height: 0.8 mm; 1.0 mm at force point

Applications

Force buttons, painting stylus, gaming, robotic end-effectors, and insoles of smart shoes



Side View　　Top View　　Bottom View

Specifications

Table 1: Pin Descriptions

Pin#	Name	Description
1	Vout-	Analog output voltage -
2	GND	Ground pin
3	Vout+	Analog output voltage +
4	Vin+	Power supply in

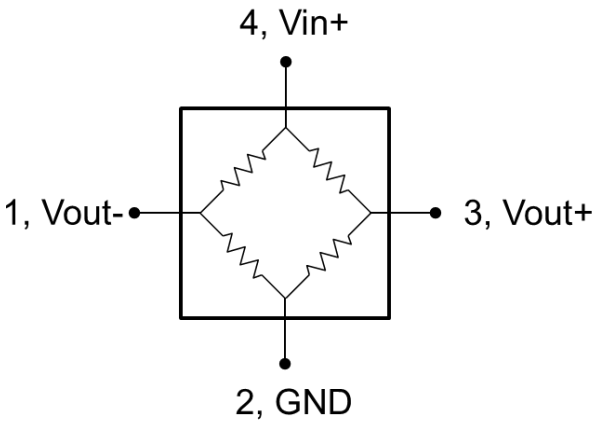
Table 2: Specification

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operation voltage	VDD		1	3.0	5	V
Operation current				550		μA
Impedance				5.4		kΩ
Temperature range	Ta		-40	+25	+85	°C
Force range	F		0	—	10	N
Span@10N				270		mV/V
Zero offset			0	-25	-50	mV/V
Sensitivity			—	60	—	mV/N at 3V
Linearity				±10		%Span
Noise (RMS)				0.01		mV

Table 3: Absolute Maximum Rating

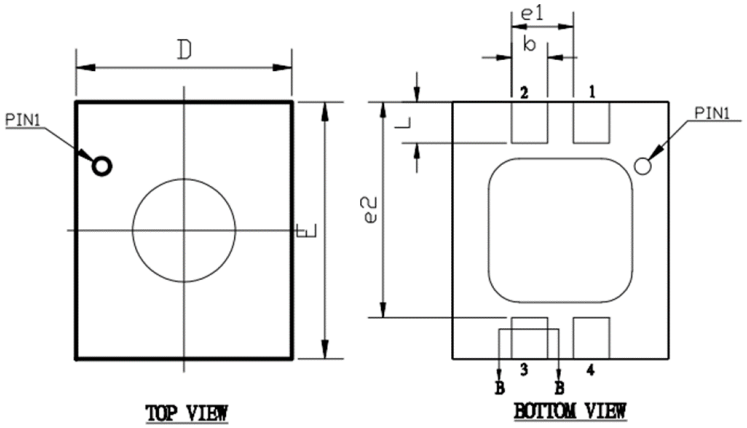
Parameter	Symbol	Min.	Max.	Unit
Power supply voltage	VDD		5.5	V
Overload force	FMAX	0	20	N
Storage temperature	TST	-40	+85	°C
ESD	HBM	—	±2	kV

Block diagram

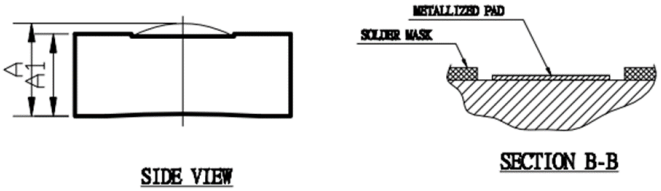


Package

Outline Dimension

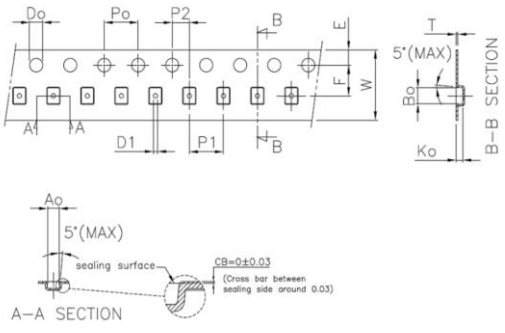


SYMBOL	DIMENSION (MM)		
	MIN.	NOM.	MAX.
A	0.80	1.0	1.20
A1	–	0.80	–
D	2.0	2.1	2.2
E	2.40	2.5	2.60
b	0.30	0.35	0.40
L	0.35	0.40	0.45
e1	–	0.60	–
e2	–	2.10	–

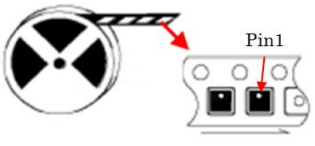


NOTE :
1. CONTROL DIMENSION : MILLIMETER.

Tape and Reel Dimensions



2.6X2.1mm PKG SIZE			
unit: mm	Standard	Data	Tolerance
Ao	EIA-481	2.35	±0.1
Bo	EIA-481	2.85	±0.1
Ko	EIA-481	1.25	±0.1
Po	EIA-481	4.0	±0.1
P1	EIA-481	8.0	±0.1
P2	EIA-481	2.0	±0.05
T	EIA-481	0.3	±0.05
E	EIA-481	1.75	±0.1
F	EIA-481	5.5	±0.05
Do	EIA-481	1.5	+ 0.1 - 0
D1	EIA-481	1.5	min
W	EIA-481	12.0	±0.3



PIN 1 DIRECTION

Recommended PCB Foot Print Layout

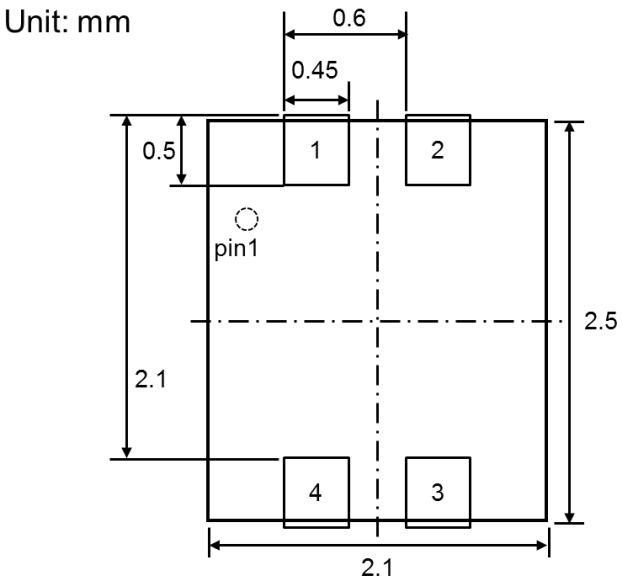


Figure 2: Layout Recommendation for PCB Land Pad

RoHS Compliance

GMEMS LGA packaged sensors are compliant with Restrictions on Hazardous Substances (RoHS) and having lead-free terminations. Reflow profiles applicable to those processes can be used successfully for soldering the devices.

Moisture Sensitivity Level

GMFS02 package MSL rating is Level 3.

Document History and Modification

Revision No.	Description	Date
V0.10	Preliminary datasheet	2018.04.10
V0.20	Modification of the force range to 10N Modification of the overload force to 20N Addition of the block diagram Addition of the tape and reel dimensions	2018.09.13
V0.30	Modification of the package outline dimensions and the recommended PCB foot print layout	2018.10.15
V0.5	Update specification of offset, linearity, and SPAN	2020.08.10