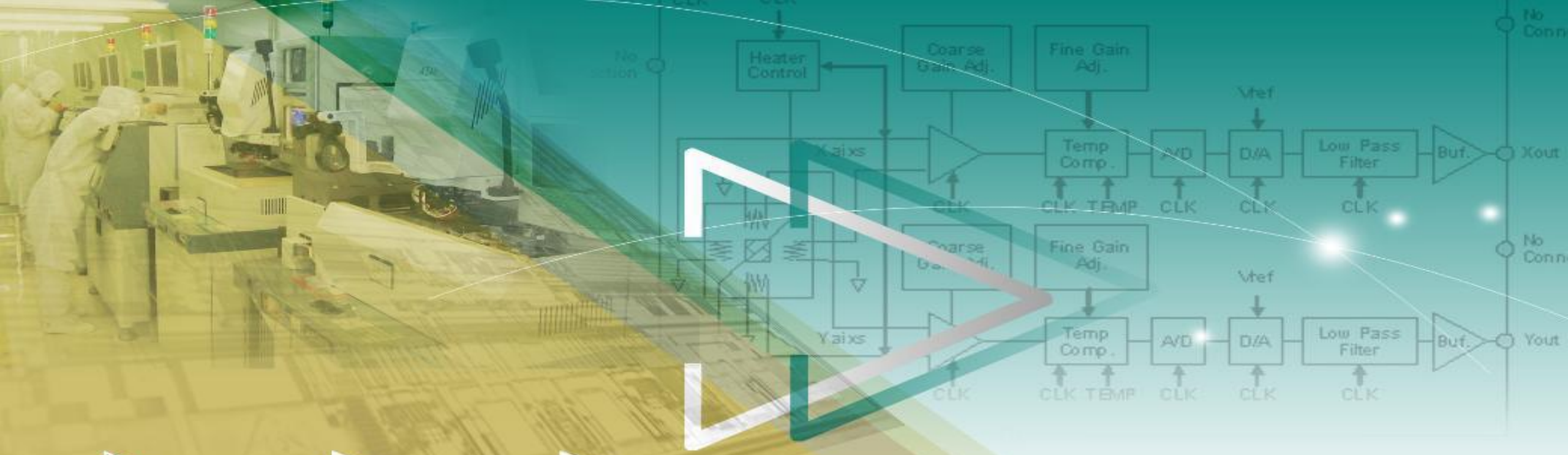


MEMSIC: Accelerometers

"Powerful sensing solutions for a better life"

MEMSIC

Company Profile :

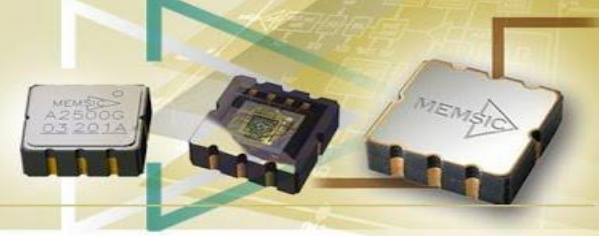
- A global leader of inertial MEMS sensors, founded in 1999.
- US HQ in Andover, MA. Executive leadership in San Jose, CA & Shanghai, China.
- R&D Facilities in San Jose, CA & Wuxi, China.
- Signed Exclusive mCube license in June, 2020.

Technology Leadership :

- Supplier of both unique thermal MEMS and Monolithic Single-Chip capacitive MEMS accelerometers.
- First to bring high performance AMR Magnetic Sensors to Mobile Phone Market.

Proven Supplier :

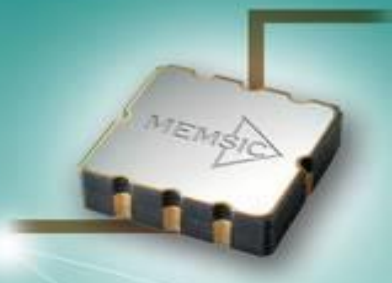
- Accelerometers are used in consumer and automotive safety products.
- As of 2020, MEMSIC sensors had accumulated shipments of more than 2 billion pieces.
- Quality certification covering automotive, industry & consumer standards.



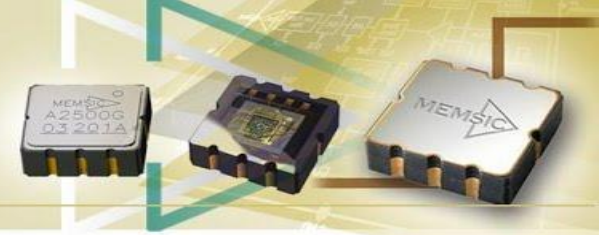
MEMSIC

MEMSIC

3-Axis
Single-Chip Capacitive MEMS Accelerometers

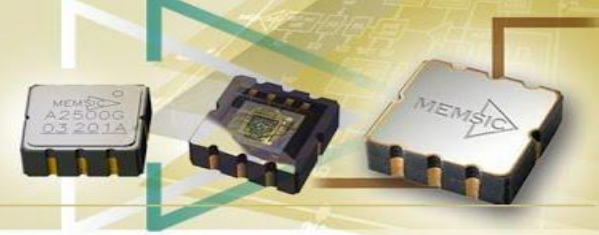


MEMSIC Single-Chip Accelerometers - Intro



- MEMSIC has recently invested in single-chip capacitive accelerometer technology!
  - World's lowest power consumption
  - Monolithic, Integrated MEMS structure
    - Minimizes parasitic noise; less noise requires less power.
    - Allows for low-power modes: sniff, motion-activated wake-up, etc.

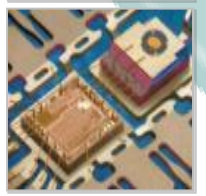
Monolithic Technology Leapfrogs Existing Players



Hybrid / MCM

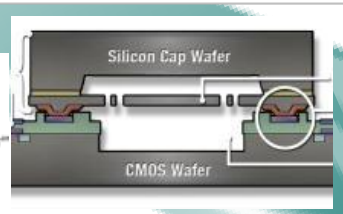
BOSCH

freescale semiconductor

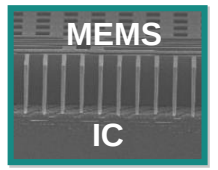


Stacked Chip

InvenSense



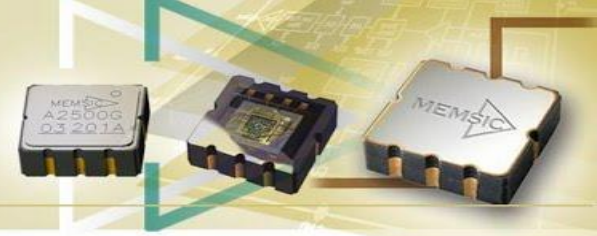
3D Single-chip



Cost, Size, Power

Performance, Function, Integration

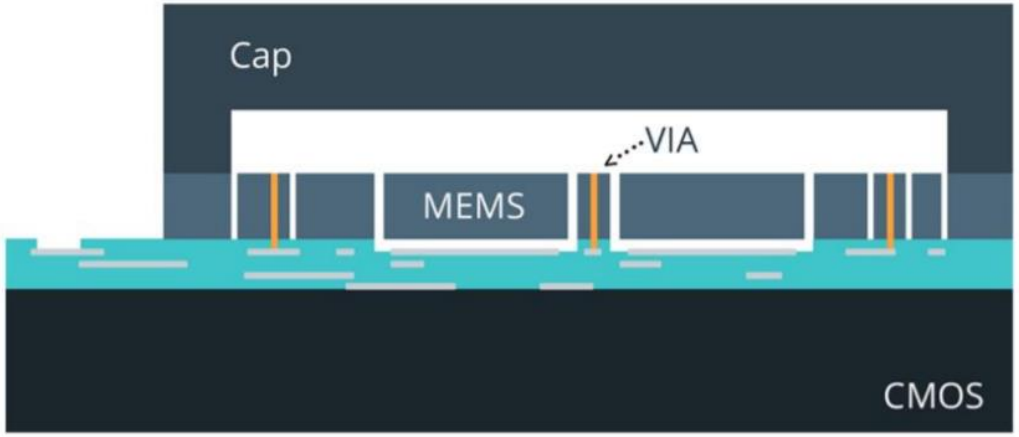
MEMSIC Single-Chip Accelerometers – Advantages



Capacitive MEMS structures are fabricated directly on top of standard CMOS, integrating the two more efficiently than in any previous commercial MEMS process.

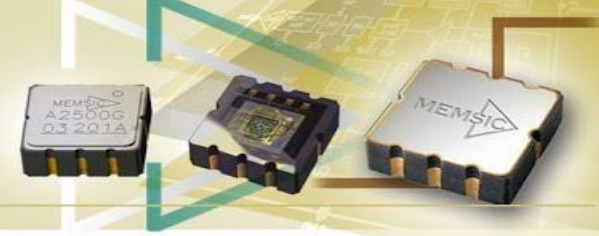
Advantages of this monolithic approach:

- Smaller size
- Higher performance
- Efficient assembly/test (lower cost)
- Simplified integration of multiple sensors onto a single-chip.



Single-Chip Accelerometer Cross Section

MEMSIC – Product Roadmap



Smartphone Accelerometers

MC3413 MC3433 2x2

MC3416 16-bit 2x2

MC3633 14-bit 2x2

MC3419 MC3479 16-bit, I3C, 2x2

IoT Accelerometers

MC3630 2x2 LGA

MC3635 1.6x1.6 LGA

MC3672 1.1x1.3 CSP

MC3600 KGD WAFER

IoT Accel 1.6 LGA

IoT Accel CSP

eCompass & Gyroscope, IMU

MC6470 6-Axis (A+M) 2x2

MC5010 3-Axis (G) 3x3

MC3451 MCU+Accel 2X2

A+G 6-Axis 2.5x3 LGA

AMR Magnetometers

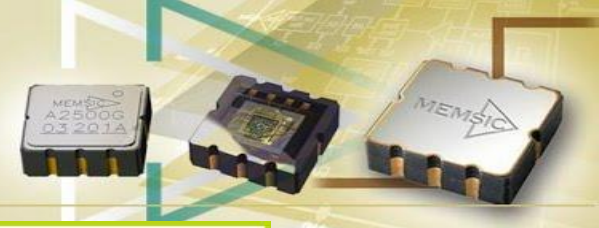
MMC3630KJ 1.2x1.2

MMC5603NJ .8 x .8 CSP

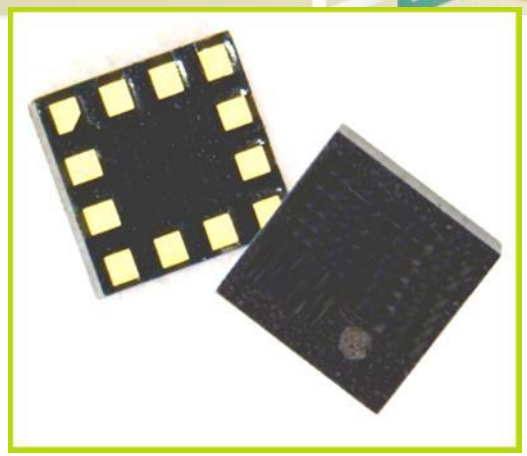
MMC5633NJL I3C .85 x .85 CSP

2016 | 2017 | 2018 | 2019 | 2020 | 2021

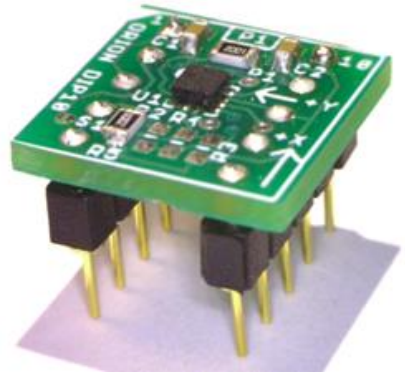
MC3419 and MC3479: High Performance Accelerometers



- **16-bit Resolution ADC Output**
- Output data rates 0.5 Hz to 4 KHz
- Industry Standard Pinouts
  - MC3419 Bosch | MC3479 ST Micro
- 2nd order LPF, ODR/4, ODR/6, ODR/12, ODR/16
- Dedicated On-Board Motion Block
  - “Any Motion”, Shake, Tilt/Flip, Tilt-35
- 2 × 2 × 0.94 mm 12-pin LGA
- VDD and VDDIO: 1.7V – 3.6V
- Wake mode power ~70uA to 300uA, Standby power 4uA
- ±2g / ±4g / ±8g / ±12g / ±16g configurable
- 16-bit single sample resolution
- 16-bit, 32-sample FIFO (each X, Y, Z)
- I2C – 1MHz, SPI – 10MHz, I3C (MIPI) to 12.5 MHz
- Low-Cost EV3419A Evaluation Board

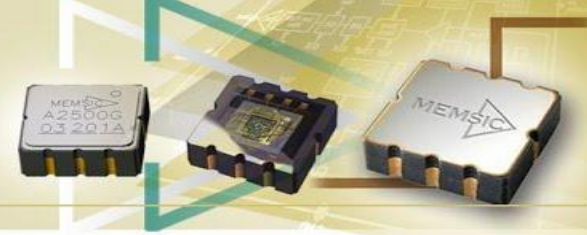


MC3419 / MC3479



EV3419A

MC3672: World's Lowest Power AND Smallest CSP Accelerometer

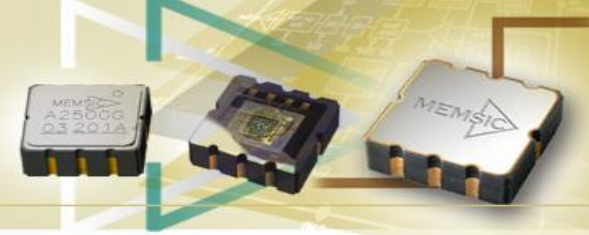


- **1.29 × 1.09 × 0.74 mm 8-ball WLCSP (0.2mm balls, 0.4mm pitch)**
- **0.9uA at 25Hz ODR**
- VDD and VDDIO: 1.7V – 3.6V
- ODR: 14 to 1,300 samples per second
- Ultra Low Power Modes
  - Sleep Mode 0.1uA
  - Sniff Mode 0.4uA at 6Hz
  - Wake Mode 0.3uA at 1Hz
- ±2g / ±4g / ±8g / ±16g configurable
- 14-bit single sample resolution
- 12-bit, 32-sample FIFO (each X, Y, Z)
- SPI (8 MHz, 3/4-wire) or I2C interface
- Sniff Activity Detection: Programmable threshold
- Low-Cost EV3672B Evaluation Board

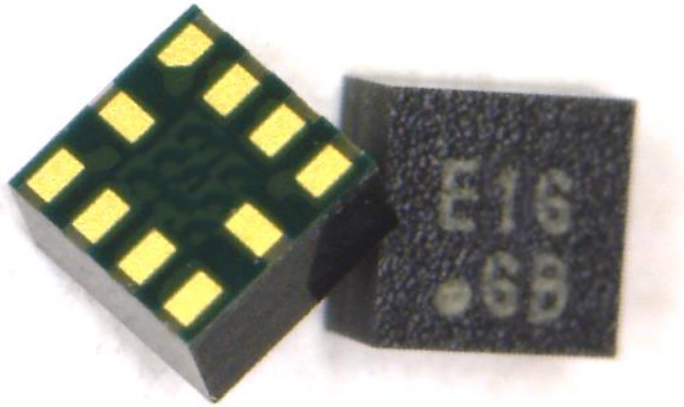
MC3672

EV3672B

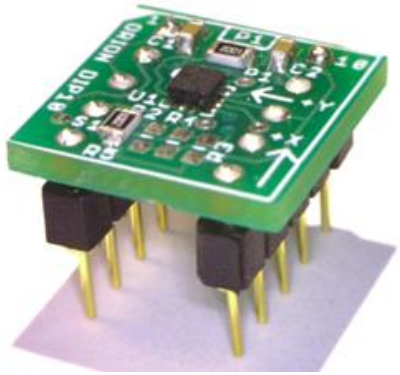
MC3635: World's Lowest Power AND Smallest LGA Accelerometer



- **1.6 × 1.6 × 0.94 mm 10-pin LGA**
- **0.9uA at 25Hz ODR**
- VDD and VDDIO: 1.7V – 3.6V
- ODR: 14 to 1,300 samples per second
- Ultra Low Power Modes
  - Sleep Mode 0.1uA
  - Sniff Mode 0.4uA at 6Hz
  - Wake Mode 0.3uA at 1Hz
- ±2g / ±4g / ±8g / ±16g configurable
- 14-bit single sample resolution
- 12-bit, 32-sample FIFO (each X, Y, Z)
- SPI (8 MHz, 3/4-wire) or I2C interface
- Sniff Activity Detection: Programmable threshold
- Low-Cost EV3635B Evaluation Board

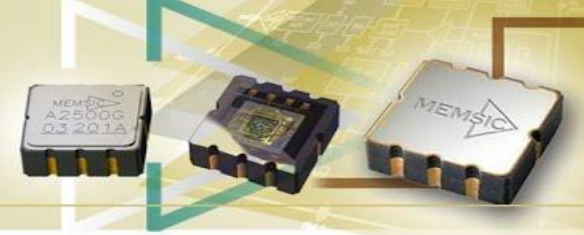


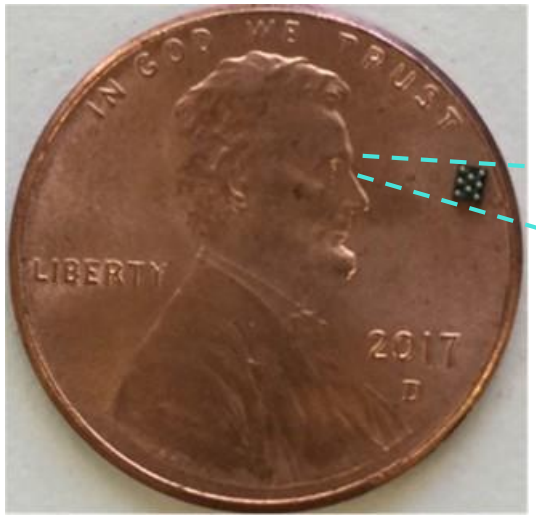
MC3635

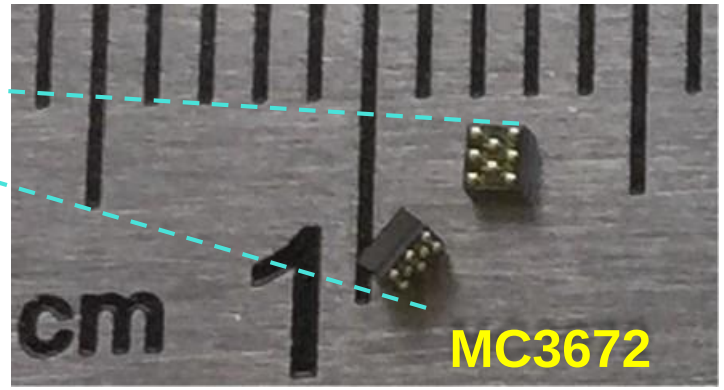


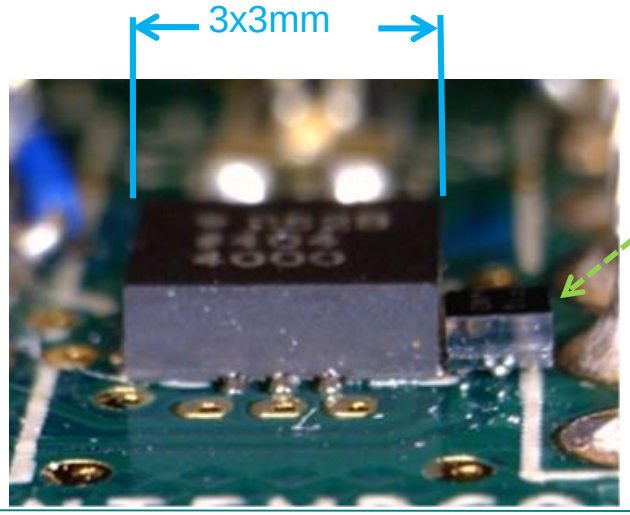
EV3635B

World's Smallest AND Lowest Power Accelerometer
MC3672 Size Comparison vs. 2x2mm & 3x3mm Accels



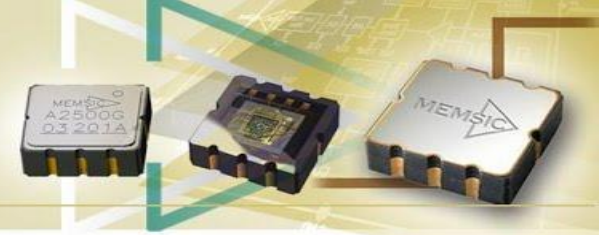




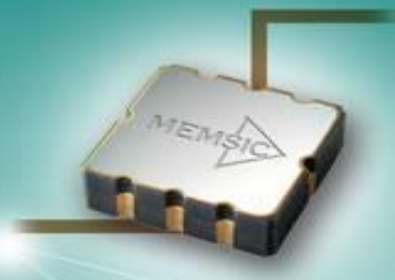


MC3672
1.1 x 1.3 x 0.74 mm
75% smaller than 2x2
89% smaller than 3x3

MEMSIC – Low-power Accel Benchmarking



	MEMSIC	Competition						
Spec	MC3672 MC3635	LIS2DW12	LIS2DS12	LIS2DH LIS3DH	ADXL362	BMA400	BMA456	KI112-1042
Size	1.1x1.3 | 1.6x1.6	2x2	2x2	2x2 3x3	3x3.25	2x2	2x2	2x2
Height (mm)	0.74 | 0.94	0.7	0.86	1	1.1	0.95	0.65	0.6
IDD @ ODR 25Hz (uA)	0.9 (LP Mode) 1.4 (Normal Mode)	2 (LP Mode)	6	6	1.3(LPMode) 3.3(Normal Mode)	0.8 (ULP Mode)	Not Available	7
IDD @ ODR 50Hz (uA)	1.6 (LP Mode) 2.7 (Normal Mode)	3.5	8	11	1.5	4 (LP Mode)	14	13
Sniff Current (uA)	0.4 @ 6Hz	< 1	0.7	3	0.3 @ 6Hz	Not Available	Not Available	0.9
FSR Range (+/-g)	2/4/8/16	2/4/8/16	2/4/8/16	2/4/8/16	2,4,8	2/4/8/16	2/4/8/16	2/4/8
Resolution (bit)	8 to 14	16	16	16	8 or 12	12	16	8
Noise (µg/?Hz)	XY: 280 (8uA), XY: 560 (3uA) (4.4mg RMS,LP @100HZ)	8mg RMS, ±4g	11mg RMS, ±8g	220 (11uA)	XY: 250 (13uA) XY:550 (2uA)	600 LP Mode 320 Typ 220 Max Perf	120	Not Available
FIFO	32 (12) bit	32 (14) bit	256 (14) bit	32 (10) bit	170 (12) bit	1kB	1024 byte	2048 byte



USA Location:

MEMSIC INC.
ADDRESS: One Tech Drive
Suite 325
Andover, Massachusetts 01810
TEL :
FAX : 978 738-0196
EMAIL : info@memsic.com

CHINA Location:

MEMSIC Semiconductor(Wuxi) Co.,Ltd.
ADDRESS: No. 2, Xinhui Huan Road,,
Wuxi, New District,
Jiangsu, P.R. China
P.C : 214028
TEL :
FAX : +86-510-6661-6669

MEMSIC

MEMSIC