Sensors

Quarter 1, 2008
SG1010Q12008 Rev 0

freescale semiconductor

ACCELERATION SENSORS

Low g Digital Output Consumer Acceleration Sensors

Part Number	Sensing Range (g)	Sensing Axis	High Sensitivity (LSB/g)	I_{DD} (μA)	Sleep Mode (Typ) I_{DD} (μA)	Sleep Mode Response Time (Typ) (ms)	Start Up Response Time (Typ) (ms)	Analog V_{DD} Supply Voltage (Typ) (V)	Digital I/O Pins V_{DD} Supply Voltage (Typ) (V)	Measurement Frequency (Hz)	Packaging
MMA7450L	2/4/8	XYZ	64	400	5	0.5	1.0	2.8	1.8	62.5/125	3 x 5 x 0.8 mm LGA
MMA7455L	2/4/8	XYZ	64	400	5	0.5	1.0	2.8	1.8	62.5/125	3 x 5 x 1.0 mm LGA

Low g Analog Output Consumer Acceleration Sensors

Product	Sensing Range (g)	Sensing Axis	Sensitivity (mV/g)	I_{DD} (Typ) (mA)	Sleep Mode (Typ) I_{DD} (μA)	Sleep Mode Response Time (Typ) (ms)	Start Up Response Time (Typ) (ms)	Rolloff Frequency (Hz)	V_{DD} Supply Voltage (V)	Zero g Output (Typ) (V)	Packaging
MMA7360L	1.5/6	XYZ	800/200	0.4	3.0	0.5	1.0	400 (XY)/300 (Z)	2.2 – 3.6	1.65	3 x 5 x 1.0 mm LGA
MMA7340L	3/11	XYZ	440/118	0.4	3.0	0.5	1.0	400 (XY)/300 (Z)	2.2 – 3.6	1.65	3 x 5 x 1.0 mm LGA
MMA7330L	4/12	XYZ	308/84	0.4	3.0	0.5	1.0	400 (XY)/300 (Z)	2.2 – 3.6	1.4	3 x 5 x 1.0 mm LGA
MMA7260Q	1.5/2/4/6	XYZ	800/600/300/200	0.5	3.0	0.5	1.0	350 (XY)/150 (Z)	2.2 – 3.6	1.65	6 x 6 x 1.45 mm QFN
MMA7261Q	2.5/3.3/6.7/10	XYZ	480/360/180/120	0.5	3.0	0.5	1.0	350 (XY)/150 (Z)	2.2 – 3.6	1.65	6 x 6 x 1.45 mm QFN
MMA6280Q	1.5/2/4/6	XZ	800/600/300/200	0.5	3.0	0.5	1.0	350 (X)/150 (Z)	2.2 – 3.6	1.65	6 x 6 x 1.45 mm QFN
MMA6281Q	2.5/3.3/6.7/10	XZ	480/360/180/120	0.5	3.0	0.5	1.0	350 (X)/150 (Z)	2.2 – 3.6	1.65	6 x 6 x 1.45 mm QFN
MMA6270Q	1.5/2/4/6	XY	800/600/300/200	0.5	3.0	0.5	1.0	350 (XY)	2.2 – 3.6	1.65	6 x 6 x 1.45 mm QFN
MMA6271Q	2.5/3.3/6.7/10	XY	480/360/180/120	0.5	3.0	0.5	1.0	350 (XY)	2.2 – 3.6	1.65	6 x 6 x 1.45 mm QFN

Low g Industrial Acceleration Sensors

Product	Sensing Range (g)	Sensing Axis	Sensitivity (mV/g)	Rolloff Frequency (Hz)	V_{DD} Supply Voltage (Typ) (V)	Zero g Output (Typ) (V)	Packaging
MMA2260EG	1.5	X	1200	50	5.0	2.5	16-pin SOIC
MMA1260EG	1.5	Z	1200	50	5.0	2.5	16-pin SOIC
MMA1270EG	2.5	Z	750	50	5.0	2.5	16-pin SOIC
MMA1250EG	5.0	Z	400	50	5.0	2.5	16-pin SOIC
MMA1220EG	8.0	Z	250	250	5.0	2.5	16-pin SOIC

Medium g Acceleration Sensors

Product	Sensing Range (g)	Sensing Axis	Sensitivity (mV/g)	Rolloff Frequency (Hz)	V_{DD} Supply Voltage (Typ) (V)	Zero g Output (Typ) (V)	Packaging
MMA3201EG	40/40	XY	50/50	400	5.0	2.5	20-pin SOIC
MMA2201EG	40	X	50	400	5.0	2.5	16-pin SOIC
MMA2202EG	50	X	40	400	5.0	2.5	16-pin SOIC
MMA3204EG	100/30	XY	20/66.67	400	5.0	2.5	20-pin SOIC
MMA3202EG	100/50	XY	50/100	400	5.0	2.5	20-pin SOIC
MMA2204EG	100	X	20	400	5.0	2.5	16-pin SOIC
MMA1213EG	50	Z	40	400	5.0	2.5	16-pin SOIC
MMA1210EG	100	Z	20	400	5.0	2.5	16-pin SOIC

High g Acceleration Sensors

Product	Sensing Range (g)	Sensing Axis	Sensitivity (mV/g)	Rolloff Frequency (Hz)	V_{DD} Supply Voltage (Typ) (V)	Zero g Output (Typ) (V)	Packaging
MMA1211EG	150	Z	13	400	5.0	2.5	16-pin SOIC
MMA2301EG	200	X	10	400	5.0	2.5	16-pin SOIC
MMA1212EG	200	Z	10	400	5.0	2.5	16-pin SOIC
MMA2300EG	250	X	8.0	400	5.0	2.5	16-pin SOIC
MMA1200EG	250	Z	8.0	400	5.0	2.5	16-pin SOIC

A change bar appears in the left margin to mark the location of new or revised information.

PRESSURE SENSORS

Integrated Pressure Sensors

Product Family[1]	Pressure Rating Maximum (PSI)	Pressure Rating Maximum (kPa)	Pressure Rating Maximum (in H_2O)	Pressure Rating Maximum (cm H_2O)	Pressure Rating Maximum (mm Hg)	Full Scale Span (Typ) (Vdc)	Sensitivity (mV/kPa)	Accuracy 0°C to 85°C (% of VFSS)	Pressure Type[2]			
									A	D	G	V
MPX4080	11.6	80	321	815	600	4.3	54	±3.0		•		
MPX4100	15.2	105	422	1070	788	4.6	54	±1.8	•			
MPX4101	14.8	102	410	1040	765	4.6	54	±1.8	•			
MPXH6101	14.8	102	410	1040	765	4.6	54	±1.8	•			
MPX4105	15.2	105	422	1070	788	4.6	51	±1.8	•			
MPX4115	16.7	115	462	1174	863	4.6	46	±1.5	•			
	16.7	115	462	1174	863	4.0	38	±1.5				•
MPX6115	16.7	115	462	1174	863	4.6	46	±1.5	•			
MPX4200	29	200	803	2040	1500	4.6	26	±1.5	•			
MPX4250	36	250	1000	2550	1880	4.7	20	±1.5	•			
	36	250	1000	2550	1880	4.7	19	±1.4		•	•	
MPXH6250	36	250	1000	2550	1880	4.7	19	±1.5	•			
MPXV4006	0.87	6.0	24	61	45	4.6	766	±5.0		•		•
MPXV5004	0.57	4.0	16	40	29	3.9	1000	±2.5		•		•
MPX5010	1.45	10	40	102	75	4.5	450	±5.0		•		•
MPX5050	7.25	50	201	510	375	4.5	90	±2.5		•	•	•
MPX5100	14.5	100	401	1020	750	4.5	45	±2.5	•	•	•	
	16.7	115	462	1174	863	4.5	45	±2.5				
MPX5500	72.5	500	2000	5100	3750	4.5	9.0	±2.5		•	•	
MPX5700	102	700	2810	7140	5250	4.5	6.0	±2.5	•	•	•	
MPX5999	150	1000	4150	10546	7757	4.5	5.0	±2.5		•		
MPXH6300	44	300	1200	3060	2250	4.7	16	±1.8	•			
MPXH6400	60	400	1600	4000	3000	4.7	12	±1.5	•			
MPXV7002	±0.3	±2	±8	±20	±15.2	4.5	1000	±2.5				
MPXV7007	±1.0	±7	±28	±70	±53	4.0	286	±5.0		•	•	•
MPXV7025	±3.5	±25	±100	±254	±190	4.5	90	±5.0		•	•	•

Compensated Pressure Sensors

Product Family[1]	Pressure Rating Maximum (PSI)	Pressure Rating Maximum (kPa)	Pressure Rating Maximum (in H_2O)	Pressure Rating Maximum (cm H_2O)	Pressure Rating Maximum (mm Hg)	Offset (mV)	Full Scale Span (Typ) (mV)	Sensitivity (mV/kPa)	Linearity Minimum (% of VFSS)	Linearity Maximum (% of VFSS)	Pressure Type[2]			
											A	D	G	V
MPX2010	1.45	10	40	102	75	±1.0	25	2.5	-1.0	1.0		•	•	
MPX2053	7.0	50	201	510	375	±1.0	40	0.8	-0.6	0.4		•		•
MPX2102	14.5	100	400	1020	750	±2.0	40	0.4	-1.0	1.0	•	•		•
	14.5	100	400		750	±1.0	40	0.4	-0.6	0.4				
MPX2202	29	200	800	2040	1500	±1.0	40	0.2	-1.0	1.0	•	•		•
	29	200	800		1500	±1.0	40	0.2	-0.6	0.4				
MPX2050	7.0	50	201	510	375	±1.0	40	0.8	-0.3	-0.3		•	•	
MPX2100	14.5	100	400	1020	750	±2.0	40	0.4	-1.0	-1.0	•	•		•
	14.5	100	400		750	±1.0	40	0.4	-0.3	-0.3				
MPX2200	29	200	800	2040	1500	±1.0	40	0.2	-1.0	-1.0	•	•		•
	29	200	800		1500	±1.0	40	0.2	-0.3	-0.3				

Compensated Medical Grade Pressure Sensors

Product Family[1]	Pressure Rating Maximum (PSI)	Pressure Rating Maximum (kPa)	Pressure Rating Maximum (in H_2O)	Pressure Rating Maximum (cm H_2O)	Pressure Rating Maximum (mm Hg)	Supply Voltage (Typ) (Vdc)	Offset Maximum (mV)	Sensitivity (mV/kPa)	Linearity Minimum (% of VFSS)	Linearity Maximum (% of VFSS)	Pressure Type[2]			
											A	D	G	V
MPXC2011	1.45	10	40	102	75	10.0	1.0	2.5	-1.0	1.0			•	
MPX2300	5.8	40	161	408	300	6.0	0.75	5.0	-2.0	2.0			•	

PRESSURE SENSORS (continued)

Uncompensated Pressure Sensors

Product Family	Pressure Rating Maximum (PSI)	Pressure Rating Maximum (kPa)	Pressure Rating Maximum (in H_2O)	Pressure Rating Maximum (cm H_2O)	Pressure Rating Maximum (mm Hg)	Offset (Typ) (mV)	Full Scale Span (Typ) (mV)	Sensitivity (mV/kPa)	Linearity Minimum (% of VFSS)	Linearity Maximum (% of VFSS)	Pressure Type[2]			
											A	D	G	V
MPX10	1.45	10	40	102	75	20	35	3.5	-1.0	1.0		•	•	
MPX12	1.45	10	40	102	75	20	55	3.5	-1.0	1.0		•	•	
MPX53	7.0	50	200	510	375	20	60	1.2	-0.6	0.4		•	•	

[1] The primary core pressure sensor families are listed above. For orderable parts, please see page 9 or www.freescale.com/sensors

[2] A = Absolute, D = Differential, G = Gauge, V = Vacuum, ▪ = Available

PROXIMITY SENSORS

Product	Main Attributes	Shield Driver	No. of Channels	5 V Reg. Current Limit (mA)	Operating Voltage (V)	Operating Temp Range (°C)	Communications	Packaging
MPR083	8-Position notary (8 electrodes), digital position interface, debounced outputs	No	8	N/A	1.8 - 3.6	-40 – 85	I^2C	16-pin QFN 16-pin TSSOP
MPR084	8 independent touch pads (8 electrodes), digital position interface, debounced outputs	No	8	N/A	1.8 - 3.6	-40 – 85	I^2C	16-pin QFN 16-pin TSSOP
MC33794EGR2	120 kHz generator, shield driver, 9 electrodes + 2 VREF outputs, 5 V regulator, RF/environmental noise resistant	Yes	9	75	9 - 18 (12 nominal)	-40 – 85	ISO-9141	54-pin SOICW
MC33941EGR2	Sensitivity scaling with output frequency variation, shield driver, 7 electrodes, 5 V regulator, RF/environmental noise resistant	Yes	7	75	9 - 18 (12 nominal)	0 – 110	N/A	24-pin SOICW
MC34940EGR2	Sensitivity scaling with output frequency variation, shield driver, 7 electrodes, RF/environmental noise resistant	Yes	7	N/A	9 - 18 (12 nominal)	0 – 90	N/A	24-pin SOICW

ZigBee®TECHNOLOGY PRODUCTS

The Freescale Semiconductor ZigBee Technology Products offer a comprehensive, scalable platform designed for a variety of monitoring, automation, and control applications in the home, commercial, industrial, and medical environments. The platform enables cost-effective, low-power applications ranging from simple point-to-point networks through fully compliant ZigBee mesh networks. Freescale is a complete one-stop-shop for wireless connectivity designs offering the MC1320x family of transceivers and the MC1321x family of System in a Package or SiP solutions (which contain both the MCU and transceiver in a single package). All solutions are supported by the easy to use BeeKit™ GUI-based software and the 1321x development hardware. The product offerings can be used to implement a variety of MAC options including the proprietary Simple MAC (SMAC), IEEE® 802.15.4 MAC, and the BeeStack™ fully compliant ZigBee stack. The Generation II MC1320x transceivers offer designers the alternative to select Freescale microcontrollers from the HCS08GB, HCS08GT, and HCS08QE series which connect to the transceivers through a 4-wire serial peripheral interface or SPI. Flexibility, easy to use products, software and hardware design tools, and the right performance at the right price provide embedded designers the optimized solution to meet their wireless personal area network (WPAN) application objectives.

MC1320x Transceivers

Product	Supply Voltage (V)	Supply Current @ 1% Duty Cycle (Typ) mA	Standby Current (Typ) µA	Frequency Band GHz	Sensitivity @ 1% PER (Typ) dBm	Serial Interface	Data Rate (Spec) kbps	Tx/RX Switch	Communication Protocol	Packaging
MC13201FC (18B)	2.0 to 3.4	30, TX 37, RX	500	2.4-2.5	-92	SPI	250	Yes	Simple MAC	1311 (32 QFN)
MC13202FC (18B)	2.0 to 3.4	30, TX 37, RX	500	2.4-2.5	-92	SPI	250	Yes	Simple MAC/IEEE®802.15.4 MAC/BeeStack™	1311 (32 QFN)

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ZigBee®TECHNOLOGY PRODUCTS (continued)

MC1321x System in a Package

The MC1321x System in Package or SiP solutions include Freescale's 2.4 GHz RF transceiver and the HCS08 microcontroller in a single package, providing for a cost-effective solution that reduces system external component counts. Similar to the MC1320x family of transceivers, the MC1321x SiP family supports a variety of MAC options including the proprietary Simple MAC (SMAC), IEEE 802.15.4 MAC, and the BeeStack fully compliant ZigBee stack. The MC13211 is the ideal option for Simple MAC networks which require a smaller memory footprint, 16KB of MCU memory. The MC13212 best supports the Simple MAC and IEEE 802.15.4 MAC networks with its 32KB of MCU memory. The MC13213 supports the Simple MAC, IEEE 802.15.4 MAC and the BeeStack networks with its 60KB of MCU memory.

ZigBee-Compliant SiP Products

Product	CPU	Memory	Peripherals	Supply Voltage (V)	Supply Current @ 1% Duty Cycle, CPU @ 2MHz (Typ) mA	Standby Current (Tpy) µA	Frequency Band (GHz)	Sensitivity @ 1% PER (Tpy) dBm	Data Rate (Spec) kbps	Tx/RX Switch	Communication Protocol	Packaging
MC13211 (18m)	HCS08	16KB Flash 1KB RAM	IIC, SCI (2), Timer/PWM(2), KBI, 8-CH 10-bit ADC, Up to 32 GPIO	2.0 to 3.4	31.1, TX 38.1, RX	0.675	2.4-2.5	-92	250	Yes	Simple MAC	1664 (71-LGA)
MC13212 (18m)	HCS08	32KB Flash 2KB RAM	IIC, SCI (2), Timer/PWM(2), KBI, 8-CH, 10-bit ADC, Up to 32 GPIO	2.0 to 3.4	31.1, TX 38.1, RX	0.675	2.4-2.5	-92	250	Yes	Simple MAC/IEEE®802.15.4 MAC	1664 (71-LGA)
MC13213 (18m)	HCS08	60KB Flash 4KB RAM	IIC, SCI (2), Timer/PWM(2), KBI, 8ch. 10-bit ADC, Up to 32 GPIO	2.0 to 3.4	31.1, TX 38.1, RX	0.675	2.4-2.5	-92	250	Yes	Simple MAC/IEEE®802.15.4 MAC/BeeStack™	1664 (71-LGA)

SAFETY AND ALARM INTEGRATED CIRCUITS

Smoke Ion

Product	Operating Voltage (V)	Horn Tone	Interconnectable	Primary Power Source	Ordering Suffix [Note]
MC14467	6 to 12	Continuous - Old Tone - 4/6	No	DC	P1
MC14468	6 to 12	Continuous - Old Tone - 4/6	Yes	AC/DC	P
MC14568	6 to 12	Continuous - Old Tone - 4/6	Yes	AC/DC	P
MC145017	6 to 12	Temporal - New Tone - NFPA Tone	No	DC	P
MC145018	6 to 12	Temporal - New Tone - NFPA Tone	Yes	AC/DC	P

Smoke Photo

Product	Operating Voltage (V)	Horn Tone	Interconnectable	Primary Power Source	Ordering Suffix [Note]
MC145010	6 to 12	Continuous - Old Tone - 4/6	Yes	AC/DC	P, DW, DWR2
MC145011	6 to 12	Continuous - Old Tone - 4/6	Yes	AC	P, DW, DWR2
MC145012	6 to 12	Temporal - New Tone - NFPA Tone	Yes	AC/DC	P, DW, DWR2

Comparator

Product	Description	Operating Voltage (V)	Horn Modulation	Primary Power Source	Ordering Suffix [Note]
MC14578	Micro-Power Comparator Plus Voltage Follower	3.5 to 14	No Horn Driver	AC/DC	P
MC14568	Low Power CMOS Ionization Smoke Detector with Interconnect and Timer	6.0-12	Continuous	AC/DC	ED

Note: ED, P or P1 = 16-pin DIP, DW = SOIC 16-pin, DWR2 = SOIC 16-pin tape & reel

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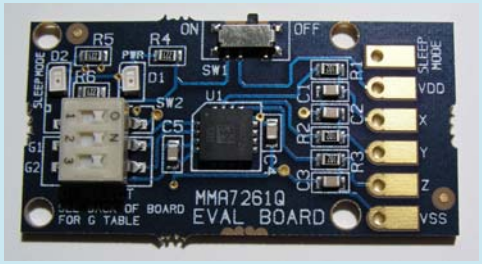
SENSORS DEVELOPMENT TOOLS

KIT3376MMA73x0LE: XYZ-axis Evaluation Boards

These evaluation boards can be used to demonstrate key accelerometer features of the MMA7360L, MMA7340L and MMA7330L products.

RD3152MMA7260Q: Wireless Sensing Triple Axis Reference Design (ZSTAR)

The ZSTAR demo board was designed to demonstrate Freescale's latest innovations in sensors, wireless connectivity and embedded flash microcontrollers.

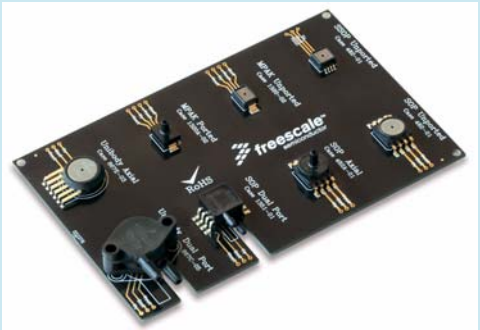


KIT3109MMAX2X0Q: Multi-axis g-Select Evaluation Boards

These evaluation boards can be used to demonstrate key accelerometer features of the MMA7260Q, MMA7261Q, MMA6270Q, MMA6271Q, MMA6280Q, MMA6281Q products.

RD3473MMA7360L: Wireless Sensing Triple Axis Reference Design (ZSTAR2)

The ZSTAR2 demo board has been updated with Freescale's newer smaller 3x5x1 mm MMA7360L 3-axis accelerometer.



KITMPXSHOWEVK: Pressure Sensor PCB Board

This pressure sensor board is a marketing tool that shows Freescale's most popular package types mounted to a PCB board. All the parts are functional with pads connecting the necessary device pins to the board edge.

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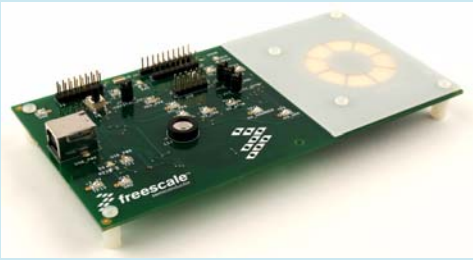
SENSORS DEVELOPMENT TOOLS (continued)

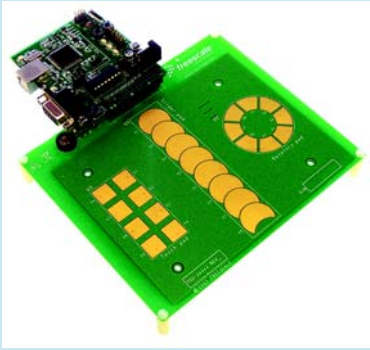
KITMC33941EVM: Proximity Sensor Evaluation Board

This evaluation kit can be used to demonstrate key proximity capacitive sensor features of the MC33941 and MC33940 products for touch sensing applications.



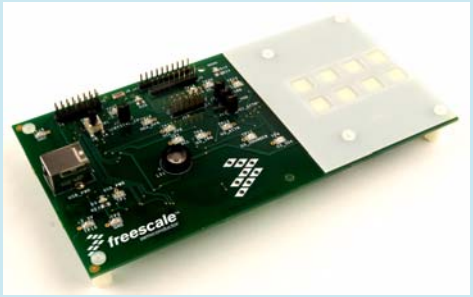
KITMPR083EVM: 8-Position Rotary Touch Sensor Controller Evaluation Kit

This evaluation kit can be used to demonstrate key touch sensing features of the MPR083 device.



KITMPROXIMITYEVM: Touch Sensor Controller Evaluation Kit.

This evaluation kit can be used to for S08/V1 microcontrollers to demonstrate key touch sensing features.



KITMPR084EVM: 8-Pad Touch Sensor Controller Evaluation Kit

This evaluation kit can be used to demonstrate key touch sensing features of the MPR084 device.

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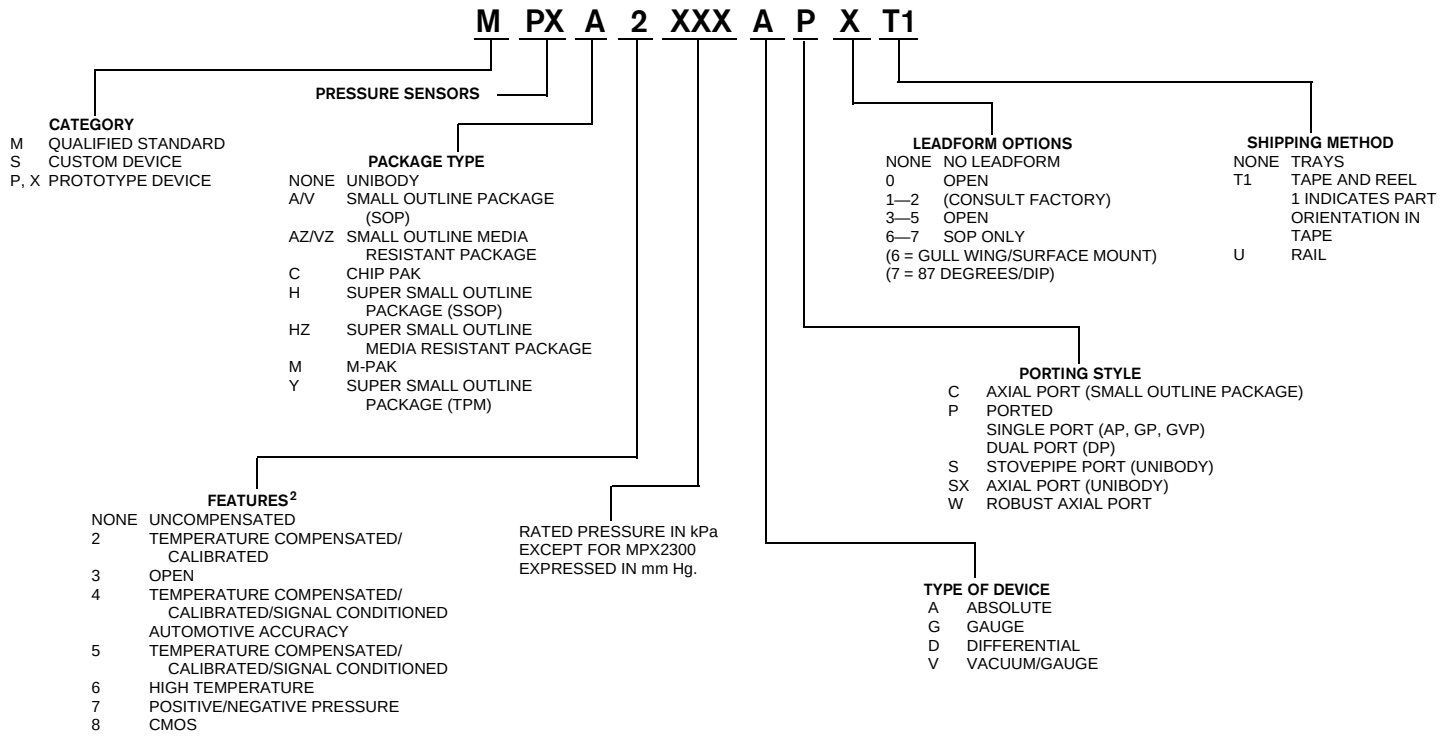
PRODUCT NUMBERING SYSTEM FOR PRESSURE SENSORS[1]



[1]Actual product marking may be abbreviated due to space constraints but packaging label will reflect full part number.

[2]Only applies to qualified and prototype products. This does not apply to custom products.

Examples:

MPX10DP 10 kPa uncompensated, differential device in minibody package, ported, no leadform, shipped in trays.

MPXA4115A6T1 115 kPa automotive temperature compensated and calibrated device with signal conditioning, SOP surface mount with gull wing leadform, shipped in tape and reel.

PRESSURE SENSOR ORDERABLE PART NUMBERS

Uncompensated

MPX10D
MPX10DP
MPX10GP
MPXV10GC6U
MPXV10GC7U

MPX12D
MPX12DP
MPX12GP

MPX53D
MPX53DP
MPX53GP
MPXV53GC6U
MPXV53GC7U

Compensated

MPX2300DT1
MPX2301DT1

MPX2010D
MPX2010GP
MPX2010DP
MPX2010GS
MPX2010GSX
MPXM2010DT1
MPXM2010GS
MPXM2010GST1
MPXC2011DT1
MPXC2012DT1
MPXV2010GP
MPXV2010DP

MPXM2051GS
MPXM2051GST1
MPX2053D
MPX2053GP
MPX2053DP
MPXM2053D
MPXM2053DT1
MPXM2053GS
MPXM2053GST1
MPXV2053GP
MPXV2053DP
MPX2050D
MPX2050GP
MPX2050DP
MPX2050GSX

MPX2102GP
MPX2102DP
MPX2102GVP
MPXM2102DT1
MPXM2102GS
MPXM2102GST1
MPXV2102GP

MPX2102A
MPX2102AP
MPX2102ASX
MPXM2102A
MPXM2102AT1
MPXM2102AS
MPXM2102AST1
MPX2100D
MPX2100GP
MPX2100DP
MPX2100GVP

MPX2100A
MPX2100AP
MPX2100ASX
MPX2202GP
MPX2202DP
MPXM2202DT1
MPXM2202GS
MPXM2202GST1
MPXV2202GP
MPXV2202DP
MPX2202A
MPX2202AP
MPXM2202A
MPXM2202AT1
MPXM2202AS
MPXM2202AST1
MPX2200D
MPX2200GP
MPX2200DP
MPX2200GSX
MPX2200A
MPX2200AP

Integrated

MPXV7002DP
MPXV7002DPT1

MPVZ5004GW6U
MPVZ5004GW7U
MPVZ5004G6U
MPVZ5004G6T1
MPVZ5004G7U
MPXV5004GC6T1
MPXV5004GC6U
MPXV5004GC7U
MPXV5004GP
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MPXV5004GVP

MPVZ4006GW6U
MPVZ4006G6U
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MPXV4006GP
MPXV4006DP
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MPX7002GC6T1

MPXV7007DP
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MPXV7007GC6U
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MPX5700DP
MPX5700GP
MPX5700GP1
MPX5700GS

MPX5999D

Legend

Uncompensated
Compensated
Integrated

NOTES

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