

TVS and Sensing Automotive Solutions



AEC-Q qualified solutions featuring:

- Industry leading clamping voltage performance, high electrostatic discharge (ESD) immunity and low capacitance TVS arrays
- High-performance, power efficient capacitive and MEMS force sensors for HMI applications



CONTENTS

USB Protection	3
Ethernet Protection	4
CAN Bus Protection	4
VBUS/DC & SD Card Protection	5
HDMI Protection	6
Antenna/RF Protection	6
Audio & Keypad Protection	7
High Speed SERDES	7
Smart Sensing Solutions	8

HIGH PERFORMANCE

Circuit Protection and Sensing Automotive Products

Semtech's industry leading TVS protection devices safeguard automotive data-line circuits from ESD and other overvoltage transients. With leading edge process technologies and applications expertise, Semtech is leading the way in automotive circuit protection.

Semtech also offers high-performance sensing devices for automotive Human Machine Interface (HMI) applications. Featuring superior sensitivity and strong immunity which enhance the user experience.



2-WIRE ETHERNET
ADAS, 360 Camera
View, Audio



ANALOG VIDEO, LVDS
ADAS, Backup Camera
Applications



USB
Infotainment
Phone Connectivity



HDMI
Audio Video Infotainment,
Back-End Display



CAN, LIN
Control Bus, Networking



ANTENNAS
AM/FM, DAB, GPS, Satellite,
Wi-Fi, Telematics Applications



SD CARD/MEMORY
Navigation Applications



AUDIO
Infotainment,
Console Display



STANDARD ETHERNET
On-Board Diagnostics,
Networking



CONSOLE CONTROL
Touch and Proximity Sensors
for HMI Applications

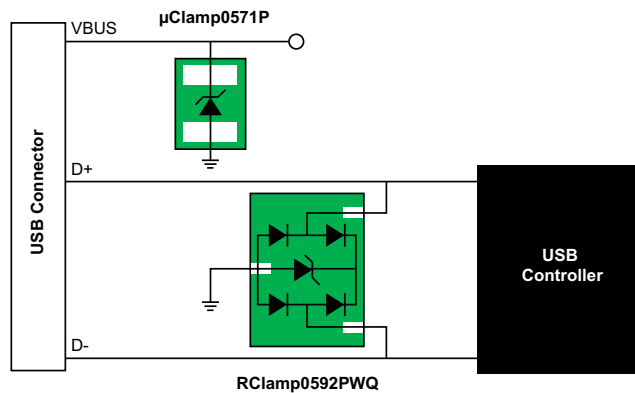


DOOR HANDLE
Touch and Proximity Sensors
to Support Keyless Entry

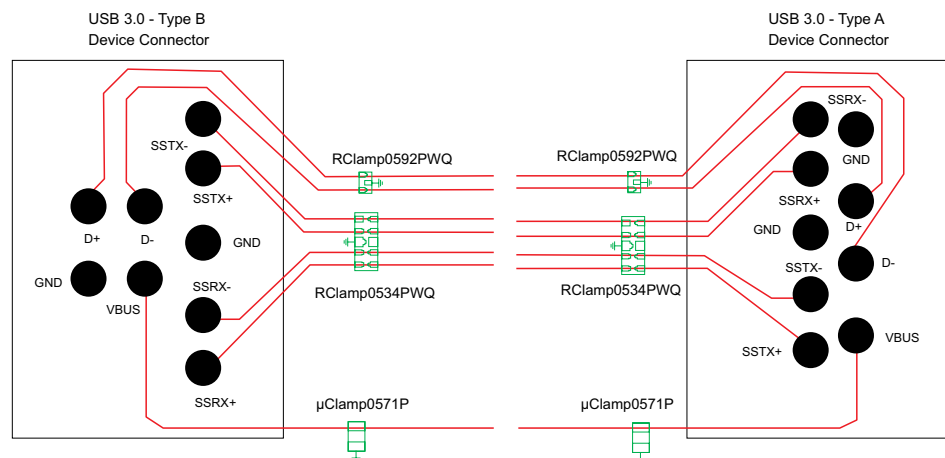


USB Protection

USB 2.0							
Interface to Protect	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
USB 2.0	RClamp®0592PWQ	5	2	$\pm 30\text{kV} / \pm 30\text{kV}$	10A	1	1.0 x 0.6 x 0.55
	RClamp0531TQ	5	1	$\pm 20\text{kV} / \pm 12\text{kV}$	4A	0.5	1.0 x 0.6 x 0.4
	RClamp0582BQ	5	2	$\pm 30\text{kV} / \pm 25\text{kV}$	15A	1.2	1.6 x 1.6 x 0.75

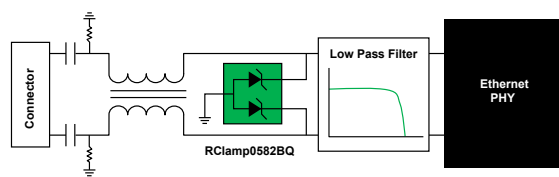


USB 3.0							
Interface to Protect	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
USB 3.0	RClamp3552TQ	3.5	2	$\pm 20\text{kV} / \pm 17\text{kV}$	4A	0.3	1.0 x 0.6 x 0.4
	RClamp0592PWQ	5	2	$\pm 30\text{kV} / \pm 30\text{kV}$	10A	1	1.0 x 0.6 x 0.55
	RClamp0534PWQ	5	4	$\pm 15\text{kV} / \pm 10\text{kV}$	4A	0.14	2.5 x 1.0 x 0.55

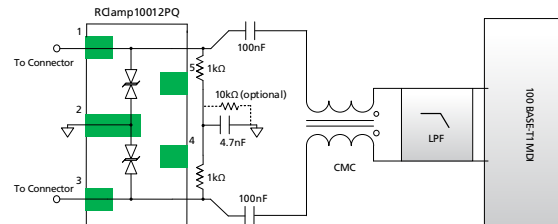


Ethernet Protection

2-Wire Ethernet (PHY Side)							
Interface to Protect	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
2-Wire Ethernet Single Twisted Pair	RClamp®01892PWQ	1.8	2	NA / ± 8 kV	2.5A	0.3	1.0 x 0.60 x 0.55
	RClamp0592PWQ	5	2	± 30 kV / ± 30 kV	10A	1	1.0 x 0.6 x 0.55
	RClamp0582BQ	5	2	± 30 kV / ± 25 kV	15A	1.2	1.6 x 1.6 x 0.75
2-Wire Ethernet (Line side)							
Interface to Protect	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
2-Wire Ethernet Single Twisted Pair	EClamp10012PQ	30	2	± 17 kV / ± 12 kV	3A	1.2	2.0 x 1.0 x 0.60
	RClamp10012PQ	30	2	± 17 kV / ± 12 kV	3A	1.2	2.0 x 1.0 x 0.60
	RClamp10022PWQ	30	2	± 25 kV / ± 15 kV	6A	0.3	2.0 x 1.0 x 0.55



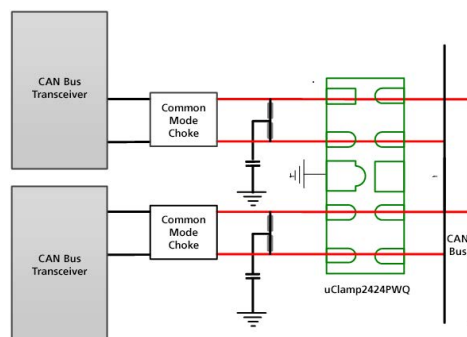
2-Wire Ethernet application



2-Wire Ethernet (Line Side) application with RClamp10012PQ
*(Contact Semtech for more details)

CAN Bus Protection

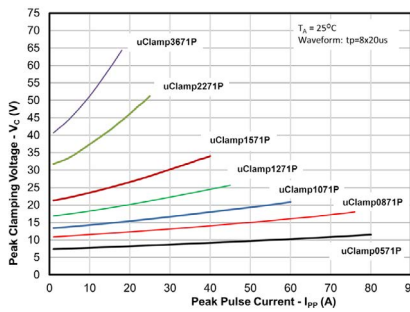
CAN BusProtection						
Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
RClamp1631PQ	16	1	± 30 kV / ± 30 kV	8A	0.33	1.6 x 1.0 x 0.53
RClamp2831PQ	28	1	± 30 kV / ± 30 kV	7A	0.35	1.6 x 1.0 x 0.53
uClamp®2482PWQ	24	2	± 30 kV / ± 30 kV	5A	15	1.3 x 0.8 x 0.55
μClamp2424PWQ	24	4	± 30 kV / ± 30 kV	5A	15	2.5 x 1.0 x 0.55



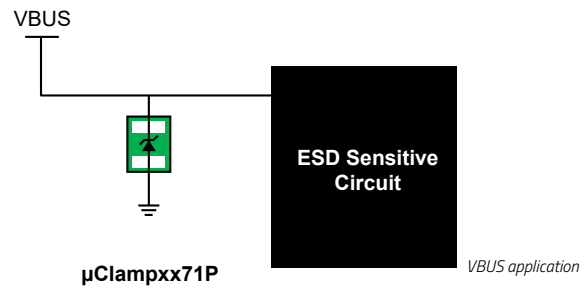
VBUS/DC and SD Card Protection

Qualified Single-line DC Bus Protection

Type Application	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
VBUS Protection	μClamp®0571P	5	1	±30kV / ±30kV	80A	675	1.6 x 1.0 x 0.5
	μClamp0871P	8	1	±30kV / ±30kV	65A	475	1.6 x 1.0 x 0.5
	μClamp1071P	10	1	±30kV / ±30kV	60A	350	1.6 x 1.0 x 0.5
	μClamp1271P	12	1	±30kV / ±30kV	45A	275	1.6 x 1.0 x 0.5
	μClamp1571P	15	1	±30kV / ±30kV	40A	220	1.6 x 1.0 x 0.5
	μClamp1871P	18	1	±30kV / ±30kV	35A	220	1.6 x 1.0 x 0.5
	μClamp2271P	22	1	±30kV / ±30kV	25A	165	1.6 x 1.0 x 0.5
	μClamp2671P	26	1	±30kV / ±30kV	23A	155	1.6 x 1.0 x 0.5
	μClamp3671P	36	1	±30kV / ±30kV	18A	150	1.6 x 1.0 x 0.5
	TDS2211P	22	1	±30kV / ±30kV	40A	175	1.6 x 1.6 x 0.55
	TDS2201P	22	1	±30kV / ±8kV	16A	58	1.0 x 0.6 x 0.25

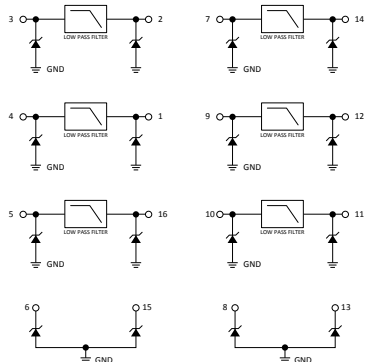


ESD surge clamping performance

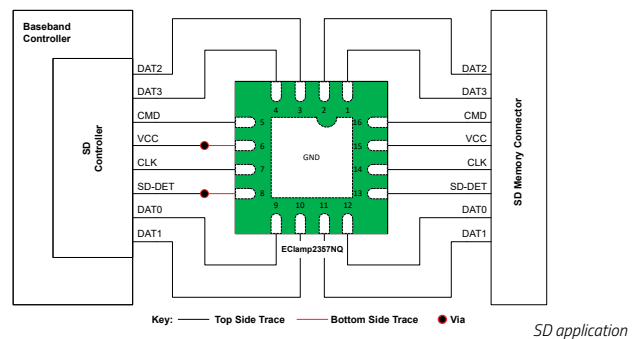


Filter Devices - TVS + EMC Filter

Type Application	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Filter Type	Cap (pF)	Pkg Size (mm)
SD Card	EClamp®2410PQ	5	6	±17kV / ±12kV	SD Card termination	15	4.0 x 1.6 x 0.58
	EClamp2357NQ	5	6	±20kV / ±12kV	RC filter SD Card termination	20	3.0 x 3.0 x 0.6

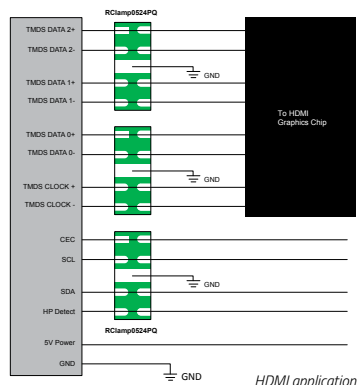
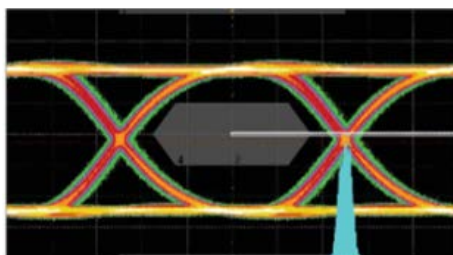


EClamp2357NQ pin configuration



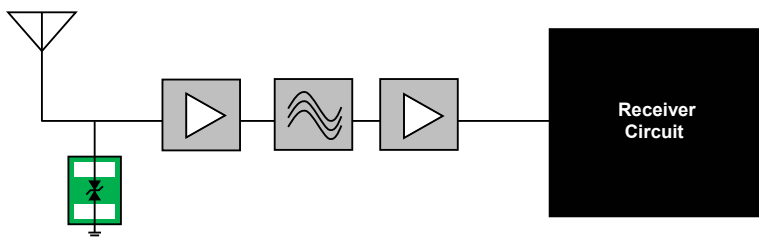
HDMI Protection

HDMI, MIPI, MHL							
Interface to Protect	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
HDMI, MIPI, MHL	RClamp[®]0524PQ	5	4	± 25 kV / ± 20 kV	5A	0.6	2.5 x 1.0 x 0.5
	RClamp0534PWQ	5	4	± 15 kV / ± 10 kV	4A	0.14	2.5 x 1.0 x 0.55



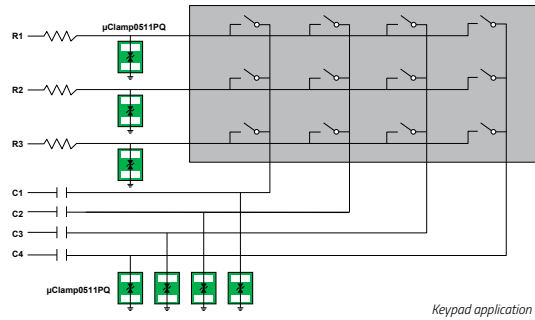
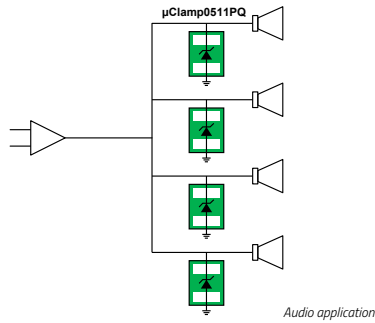
Antenna/RF Protection

Antenna/RF							
Interface to Protect	Part Number	V_{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20 μ s)	Cap (pF)	Pkg Size (mm)
Antenna Interfaces	RClamp3331PQ	3.3	1	± 30 kV / ± 30 kV	10A	0.35	1.0 x 0.6 x 0.5
	RClamp0531TQ	5	1	± 20 kV / ± 12 kV	4A	0.8	1.0 x 0.6 x 0.4
	RClamp0551PQ	5	1	± 25 kV / ± 25 kV	3A	0.45	1.0 x 0.6 x 0.5
	RClamp0561PQ	5.5	1	± 18 kV / ± 15 kV	2A	0.14	1.0 x 0.6 x 0.5
	RClamp0582BQ	5	2	± 30 kV / ± 25 kV	15A	1.2	1.6 x 1.6 x 0.75
	RClamp1521PQ	15	1	± 15 kV / ± 8 kV	4A	0.5	1.0 x 0.6 x 0.5
	RClamp1561PQ	15	1	± 15 kV / ± 10 kV	2A	0.25	1.0 x 0.6 x 0.5
	RClamp1631PQ	16	1	± 30 kV / ± 30 kV	8A	0.33	1.6 x 1.0 x 0.53
	RClamp2431TQ	24	1	± 15 kV / ± 8 kV	2A	0.5	1.0 x 0.6 x 0.4
	RClamp2831PQ	28	1	± 30 kV / ± 30 kV	7A	0.35	1.6 x 1.0 x 0.53



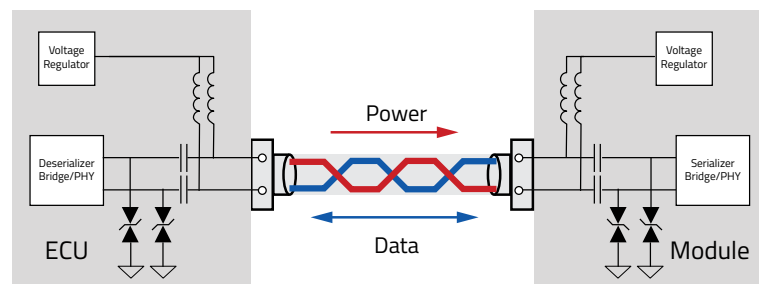
Audio and Touchkey/Keypad Protection

Touchkey/keypad/Audio Protection							
Interface to Protect	Part Number	V _{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20μs)	Cap (pF)	Pkg Size (mm)
Audio	μClamp[®]0511PQ	5	1	±30kV / ±30kV	12A	75	1.0 x 0.6 x 0.5
Keypads, Touchbuttons, Control Lines	μClamp0301PQ	3.0	1	±30kV / ±25kV	5A	25	1.0 x 0.6 x 0.5
	μClamp3311PQ	3.3	1	±25kV / ±20kV	5A	12	1.0 x 0.6 x 0.5
	μClamp0511PQ	5	1	±30kV / ±30kV	12A	75	1.0 x 0.6 x 0.5



High Speed SERDES

GMSL, FPD-Link, APIX, MIPI A-Phy, ASA							
Interface to Protect	Part Number	V _{RWM} (V)	Lines	ESD Rating (air/contact)	Surge (8x20μs)	Cap (pF)	Pkg Size (mm)
ADAS, Collision Avoidance, Break Assist; Emergency Breaking	RClamp[®]3331PQ	3.3	1	±30kV / ±30kV	10A	0.38	1.0 x 0.6 x 0.5
	RClamp3552TQ	3.5	2	±20kV / ±17kV	4A	0.35	1.0 x 0.6 x 0.4
	RClamp0534PWQ	5	4	±15kV / ±10kV	4A	0.14	2.5 x 1.0 x 0.55
	RClamp1561PQ	15	1	±15kV / ±10kV	2A	0.25	1.0 x 0.60 x 0.50
	RClamp1561PWQ	15	1	±15kV / ±10kV	2A	0.15	1.0 x 0.60 x 0.55
	RClamp1631PQ	16	1	±30kV / ±30kV	8A	0.33	1.6 x 1.0 x 0.53
	RClamp2831PQ	28	1	±30kV / ±30kV	7A	0.35	1.6 x 1.0 x 0.53

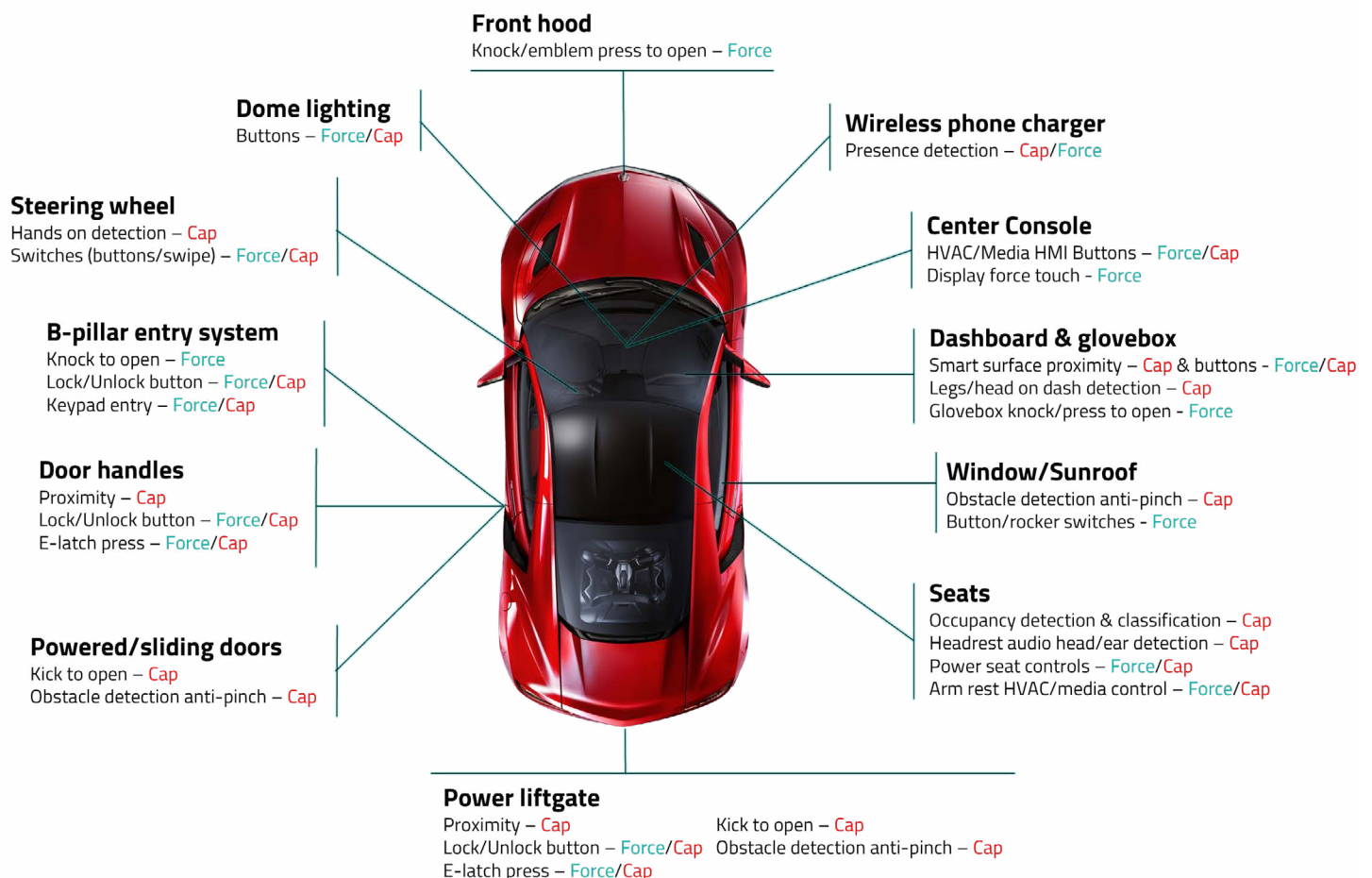


Smart Sensing Solutions

Intelligent capacitive and MEMS force sensors for all stages of HMI: Proximity, Touch, Press, and gesturing.

Semtech's Smart Sensing technologies enable intelligent, responsive human-machine interaction. From capacitive proximity and touch detection through thick overlays to material-agnostic precision force measurements, our sensor solutions provide designers with the flexibility to create intuitive, reliable interfaces for automotive applications.

APPLICATIONS



FEATURES & BENEFITS

- Capacitive sensors
 - **Water rejection** to reduce false triggers
 - **Smart human sensing** to distinguish human touch
 - **Temperature compensation** to reduce capacitance drift
 - **Offset compensation** to cancel out parasitic capacitances
 - Up to two **integrated PWM LED drivers** w/20mA sink current each
 - **Start-up detection** to ensure reliable detection from the moment the system powers on.
- Force sensors
 - **Preload offset adjustment** zeros out mechanical preload at assembly
 - **Baseline tracking** self corrects for slow drift over lifetime
 - **Temperature compensation** to reduce the impact of environmental changes
 - **Edge detection** for fast response time
 - Gauge Sensor linearity (>0.99) for predictable responses
 - **High sensitivity** with a wide dynamic range
 - Hardware or software programmable thresholds

SMART SENSING				
Part number	Device type	Interface	Temperature range	Package
CAPACITIVE SENSORS				
SX9331Q	5-Channel capacitive sensor	I2C (2 addr.)	-40 to 105C	1.6 x 1.6 x 0.55mm QFN-10
MEMS FORCE SENSORS				
DF-8805	Integrated force sensor	I2C (4 addr.)	-40 to 105C	1.33 x 1.33 x 0.25mm WLCSP-6
FT-4500	Discrete force sensor	Analog	-40 to 105C	1.33 x 1.33 x 0.57mm WLCSP-5
AF-3568	AFE for FT-4500	I2C	-40 to 105C	1.16 x 1.16 x 0.47mm WLCSP-9



For a detailed list of sales representatives
in your area please visit semtech.com/sales



About Semtech

Semtech Corporation (Nasdaq: SMTC) is a leading provider of high-performance semiconductors powering AI data center networking, IoT connectivity and intelligent connected devices worldwide. Our global teams are committed to empowering solution architects and application developers to develop breakthrough products for the infrastructure, industrial and consumer markets.

To learn more about Semtech technology, visit us at Semtech.com or follow us on [LinkedIn](#) or [X](#).

200 Flynn Road, Camarillo, California 93012 | 805-498-2111

Semtech and the Semtech logo are registered marks of Semtech Corporation or its subsidiaries. All other trademarks and trade names mentioned may be marks and names of their respective companies. Semtech reserves the right to make changes to, or discontinue any products described in this document without further notice. Semtech makes no warranty, representation or guarantee, express or implied, regarding the suitability of its products for any particular purpose. ©2026 Semtech Corporation. All rights reserved. Power Management Solutions. 2026.07.22