



Application Note: AZD043

IQ Switch® - ProxSense™ Series

Optical v Capacitive Sensors

Optical vs. Capacitive Proximity Detection:

Focus on Cellular Applications and other areas commonly served by IR sensors.



Proximity sensors are used to take distance measurements to detect a mobile device's operating status without physical contact to the sensor itself. The device can intelligently optimise operating conditions or add features, as tabulated below:

Added Features in a Mobile Phone:

Feature	Description	Benefit
Auto Screen or Key backlighting	Automatic shut-off of displays when no longer needed	Improved power efficiency for extended battery life
No False key detections	Disabling of keypad when in call and phone is close to ear	Improved performance
Auto call-answering	Answer call by placing earpiece close to ear	Added convenience
Auto speaker or Bluetooth hands free	Switch between loud speaker and earpiece mode	Added convenience
Volume adjustment	Adjust volume of device's by measuring distance to user	Improved ease-of-use



Key features of capacitive and optical proximity sensing are summarised and compared in the table below (all applications):

	Azoteq	Freescale	Avago	Capella	Osram
Technology	Capacitive	Capacitive	Optical (IR)	Optical (IR)	Optical Hybrid with Schmitt trigger
Device	IQS127x	MPRO3x	HSDL-9100	CM3612	SFH 7743
Distance / Range	0mm~150mm	0mm~30mm	0mm~60mm	0mm~20mm	0mm~150mm
Operating Voltage	1.8V~5V	1.71V~2.75V	2.4V~3.6V	2.6V~3.6V	2.4V ~3.6V
Power consumption	12uA 4-20uA (IQS132)	50uA~1500uA	54uA~50mA	130uA ++	45uA~10mA
Cost (US\$)	Sub 0.15	0.7 (3ch)	1.60 --	~1.00	1.65
Sensing Electrode	Yes, requires space	Yes, requires space	None	None	External Emitter to improve range
Aesthetics	Concealable Sensor	Concealable Sensor	Visible Sensor	Visible Sensor	Visible Sensor
Target Reflectivity	Sensitivity Independent	Sensitivity Independent	Sensitivity Dependent	Sensitivity Dependent	Sensitivity Dependent
Ambient Light	Sensitivity Independent	Sensitivity Independent	Sensitivity Dependent	Sensitivity Dependent	Sensitivity Dependent (High suppression)
Conductive Objects	Conductive only	Conductive only	Conductive & nonconductive	Conductive & nonconductive	Conductive & nonconductive
Temp Range	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C	-40°C to 85°C
Size <i>l</i> x <i>w</i> x <i>h</i> [mm]	2.9 x 2.8 x 1	2 x 2 x 0.65	7.1 x 2.75 x 2.7	2.35 x 1.8 x 1	3.8 x 3.8 x 1.15
Surface Mount	YES	YES	YES	YES	YES
Min External Component Count	1	1	4-9 active & passive	1 (LED)	1

Proximity sensors are used to take distance measurements to detect when a users hand approaches a soap dispenser or touch applications as hairdryers. Thus eliminating the need for mechanical switches and intelligently activates the application at the right time in a completely hygienic fashion. With the extreme low power consumption of the IQS127, active standby can be achieved with a very low consumption, extending the battery life significantly.



The following table list the benefit for using proximity sensors in common applications, as well as the main advantage (taken from the table above) capacitive sensors enjoy over IR.

Feature	Description	Benefit	Advantage over IR
Activate soap dispenser and water faucets	Automatic activation of soap dispensing without touching the application.	More hygienic.	Improved power efficiency for extended battery life. Ambient light insensitive. Robust against dirt build up.
Actuate hand towel dispenser	Non contact method to dispense paper towels in bathrooms	More hygienic.	Improved power efficiency for extended battery life. Ambient light insensitive. Robust against dirt build up.
Replace mechanical switch	Less moving parts, less wear and tear	Less maintenance required	Lower Cost. No cut-out for lenses required.
Modern Designs	Desired button-less systems	Aesthetics, ease of use. Illuminate backlighting on Proximity detection	No opening required in front cover
Ease of hairdryer operation.	Auto on/off switch when picking up or letting go of hair dryer	Less power usage in operation. Soft start and heating and control of heating element and motor. Ease of use.	Omni directional sensing.
No-touch safety protection.	Power down of hazardous applications such as laundry irons if left unattended.	Safety	Low power contact sensor.
Activate Backlighting	Illuminate backlighting as a user approaches the application	Convenience Aesthetics	Can be integrated in the Touch keys.
Trigger a GUI	Launch a menu or hidden buttons on a user approaching	Improved user experience	Low power consumption. Low impact on the housing





The following patents relate to the device or usage of the device: US 6,249,089 B1, US 6,621,225 B2, US 6,650,066 B2, US 6,952,084 B2, US 6,984,900 B1, US 7,084,526 B2, US 7,084,531 B2, US 7,119,459 B2, US 7,265,494 B2, US 7,291,940 B2, US 7,329,970 B2, US 7,336,037 B2, US 7,443,101 B2, US 7,466,040 B2, US 7,498,749 B2, US 7,528,508 B2, US 7,755,219 B2, US 7,772,781, US 7,781,980 B2, EP 1 120 018 B1, EP 1 206 168 B1, EP 1 308 913 B1, EP 1 530 178 B1, ZL 99 8 14357.X, AUS 761094

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