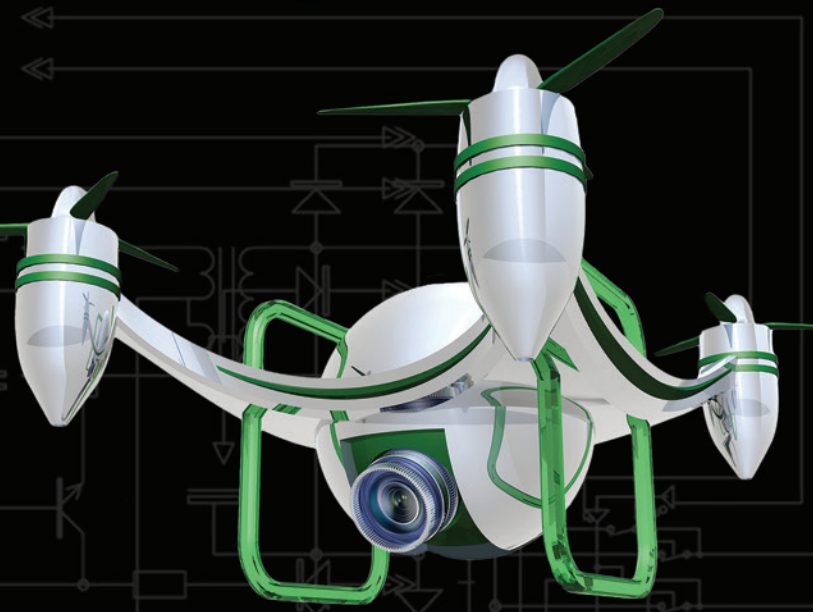
BRD8075/D
Rev. 10, Apr-2019

Presented by AVNET

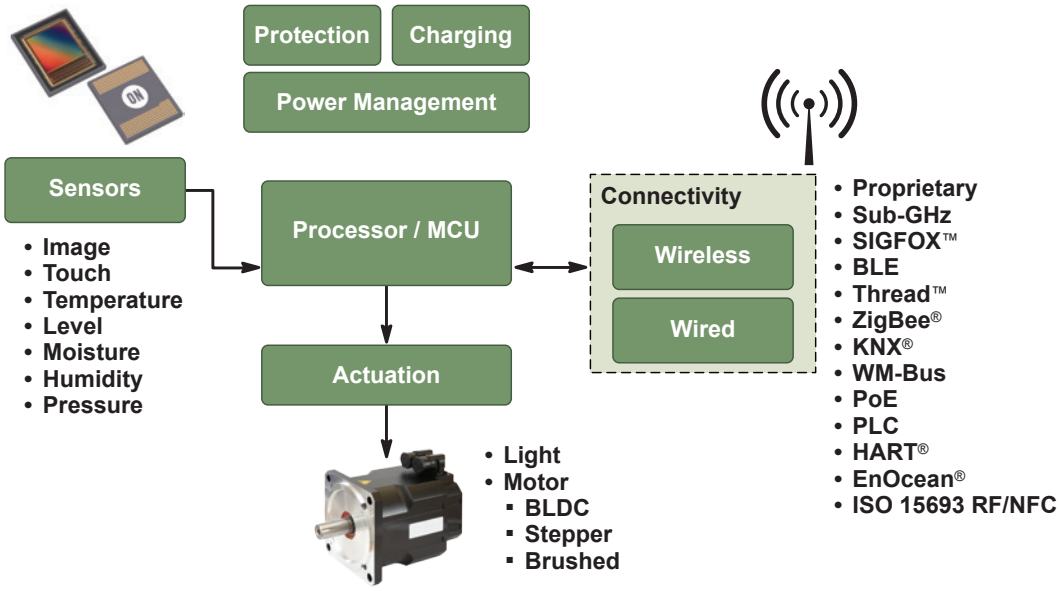
Internet-of-Things Solutions



TRANSFORM YOUR THINKING

Ultra low power battery solutions for advanced IoT applications from ON Semiconductor

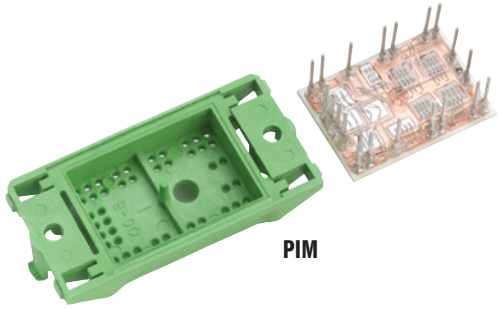
Internet-of-Things Solutions



- Seamlessly connected intelligent devices that sense, analyze and control the environment
- Connected smart lighting, surveillance/security systems, HVAC systems, home appliances, energy management systems, vehicles, traffic control
- Key building blocks include sensors/actuators, ultra low power MCUs/DSPs, connectivity, power management, security and software, chip integration and micro-packaging

Broad Packaging Portfolio

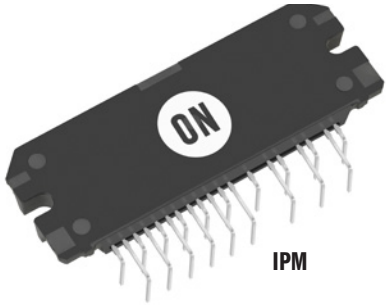
ON Semiconductor offers advanced packaging and integration capabilities, ranging from chip scale packaging through multichip modules. This extensive portfolio of packaging technology helps customers solve their unique design challenges related to thermal performance, power density, and low profile. Shown below is a small sample from the company's broad and deep package portfolio.



PIM

DPAK
6.0 x 6.5 mm

SO8-FL
5.0 x 6.0 x 1.0 mm



IPM

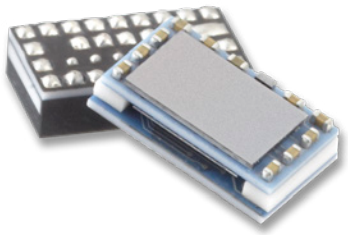
SOT-883
1.0 x 0.6 x 0.4 mm

XDFN-4
0.8 x 0.8 x 0.4 mm

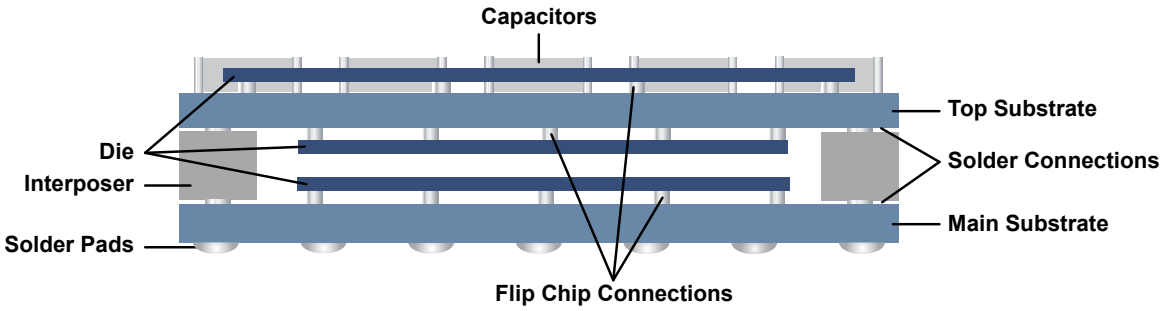
Advanced 3D Packaging

Custom 3D packaging connects different silicon die and discrete components together in the same package to dramatically save space and improve electrical performance by decreasing signal distances.

- Stacking with or without wirebonds
- Modular, scalable architectures with high degree of manufacturing testability
- Mature, robust technologies and structures
- RoHS-compliant and ISO-certified



AYRE SA3291 - Wireless DSP SiP for Hearing Aids

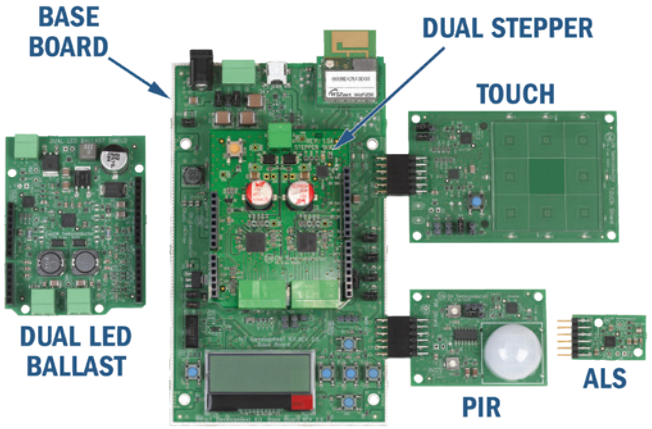


EXPERTISE

IoT Development Kit

Features

- Comprehensive portfolio of sensors, connectivity and actuators
- ARM-Cortex® M3 Processor, ARM Mbed Operating System
- Eclipse based IDE with 40+ IoT use case examples
- Secure Cloud Connectivity (AWS, IBM, Azure, Google Cloud, etc.)
- Mobile Application for Bluetooth Low Energy use cases
- Detailed documentation of system hardware (BoM, schematics and layout files) and software design



Markets & Applications

Smart Home | Predictive Maintenance | Smart Building | Smart Lighting | Smart Cities | Asset Tracking | Personal IoT

Modules

Energy Harvesting BLE Switch BLE-SWITCH-001GEVB

Connectivity

- BLE (BLE-IoT-GEVB)
- Sigfox EU (EU-Sigfox-GEVB)
- Sigfox US (US-Sigfox-GEVB)
- Power over Ethernet (POE-GEVB)
- CAN bus (CAN-GEVB)

Sensors

- Multi-Sensor (ALS, IMU, ENV) (MULTI-SENSE-GEVB)
- Proximity/Motion (PIR-GEVB)
- Touch/Level (TS-GEVB)
- Battery Free Sensors (SPS-READER-GEVK)

Actuators

- Dual LED Ballast (D-LED-B-GEVK)
- Stepper Motor Control (D-STPR-GEVK)
- Brushless DC Motor (BLDC-GEVK)

Baseboard (BB–GEVK)

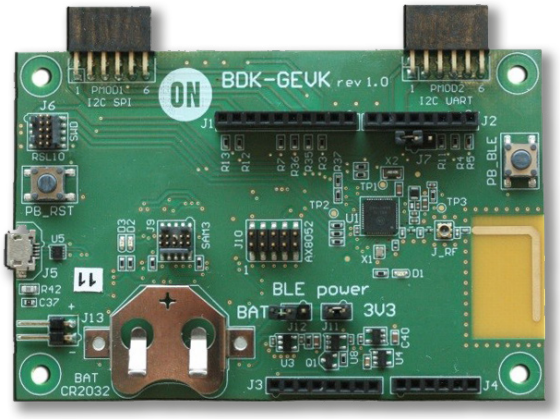
- Arm®-Cortex® M3

GET IT ON Google Play | Download on the App Store

Bluetooth IoT Development Kit

Features

- Features Industry's Lowest Power Bluetooth 5 radio
  - 62.5 nW Deep Sleep
  - 7 mW Peak Receiving
- Configurable mobile application supporting cloud connectivity
  - Compatible with AWS, Azure, Bluemix or custom cloud services
- Ready-to-Use Sample Code
- Easily Connect to Other IoT Development Kit Shield Boards
  - Complete range of options for sensing (proximity, motion, touch), and control (dual LED, stepper motor, brushless DC)



Markets & Applications

Environmental Control | **Security** | **Smart Appliances** | **Wearables** | **Smart Lighting**

Modules

Energy Harvesting BLE Switch
BLE-SWITCH-001GEVB

Power

- DC-DC adapter for connecting higher power shields (BDK-DCDC-GEVB)

Sensors

- Multi-Sensor (ALS, IMU, ENV) (MULTI-SENSE-GEVB)
- Proximity/Motion (PIR-GEVB)
- Touch/Level (TS-GEVB)
- Battery Free Sensors (SPS-READER-GEVK)

Actuators

- Dual LED Ballast (D-LED-B-GEVK)
- Stepper Motor Control (D-STPR-GEVK)
- Brushless DC Motor (BLDC-GEVK)

Baseboard (BDK-GEVK)

- Arm®-Cortex® M3

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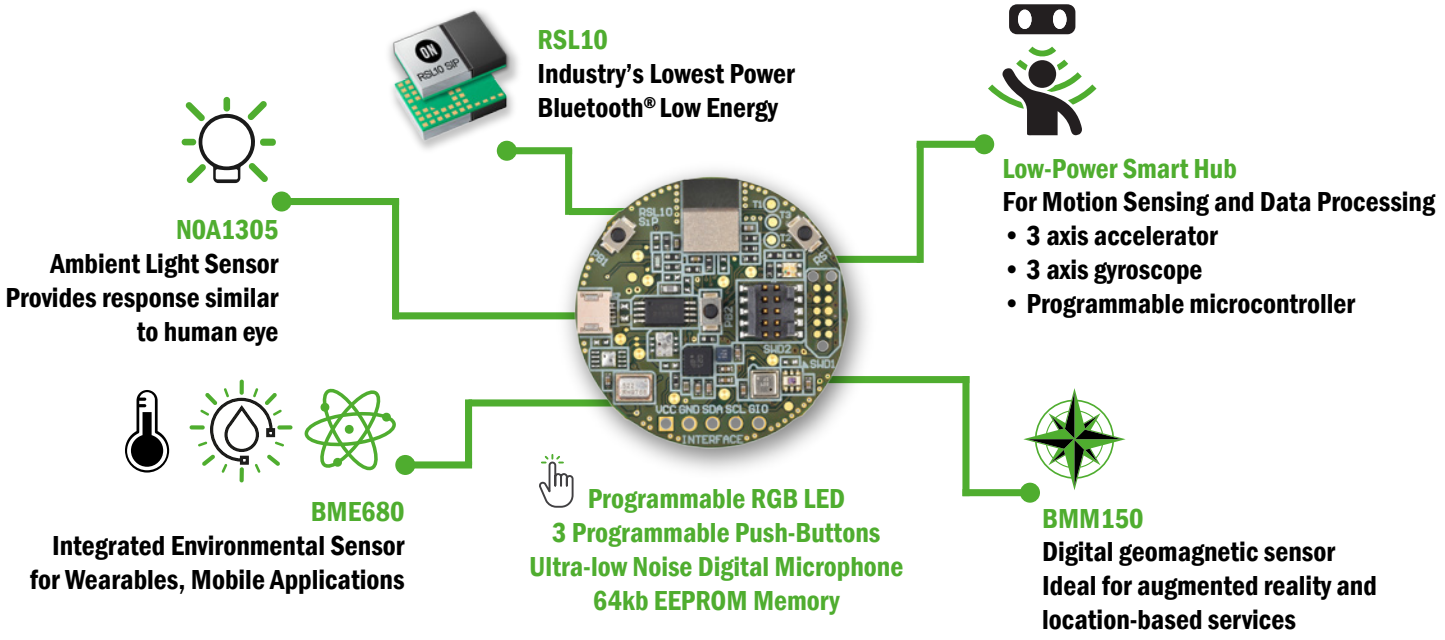
Sensor Development Kit

The RSL10 Sensor Development Kit combines cutting-edge sensor technology, Bluetooth 5 data rates, and optimized power consumption to provide a ready-to-use prototyping platform for developing IoT applications with lasting battery life. Built around the RSL10 SIP, the development kit is pre-loaded with a custom service protocol that requires no additional programming.

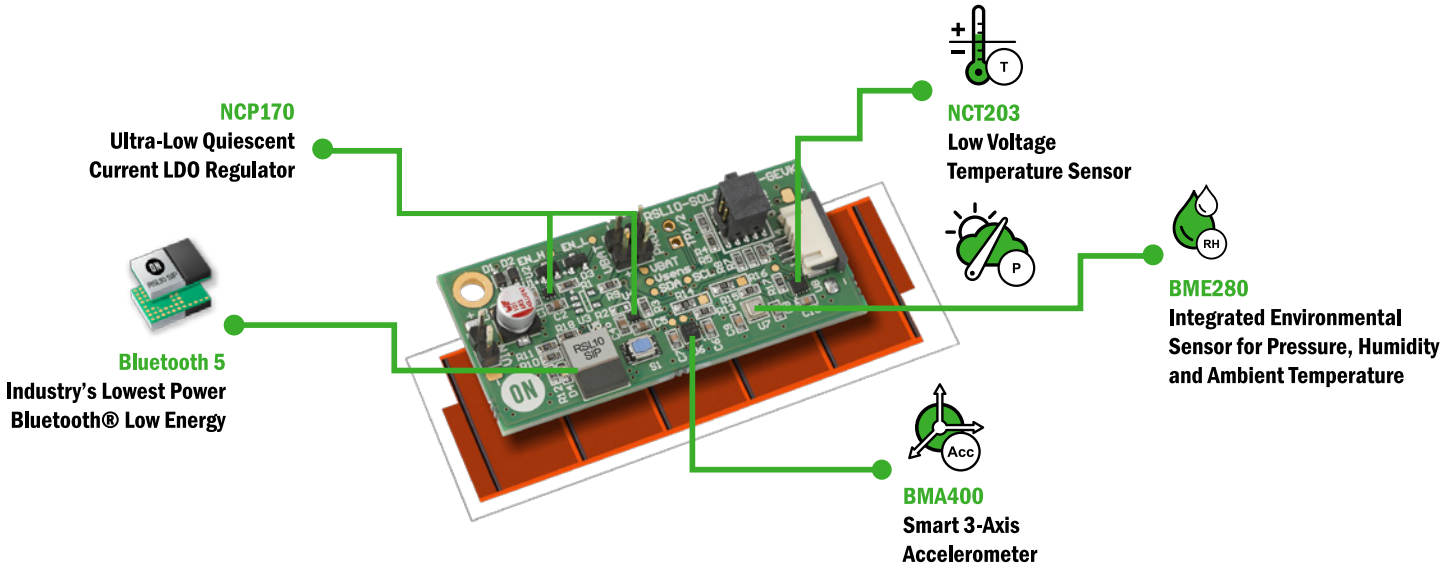
Products	Description
RSL10-SENSE-GEVK	RSL10 Sensor Development Kit
RSL10-SENSE-DB-GEVK	RSL10 Sensor Development Kit with Debugger



RSL10 Solar Cell Multi-Sensor Platform

The RSL10 Sensor Development Kit combines cutting-edge sensor technology, Bluetooth 5 data rates, and optimized power consumption to provide a ready-to-use prototyping platform for developing IoT applications with lasting battery life. Built around the RSL10 SIP, the development kit is pre-loaded with a custom service protocol that requires no additional programming.

Products	Description
RSL10-SOLARSENS-GEVK	RSL10 Solar Cell Multi-Sensor Platform

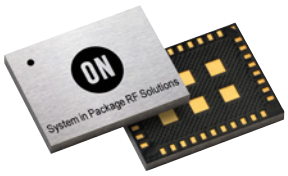


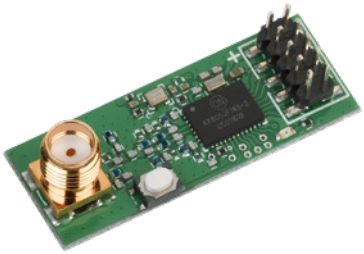
Comprehensive Sigfox™ Solutions

sigfox

Product Features

- ON Semiconductor is a leading Sigfox device supplier
- Sigfox verified solution for all global Sigfox regions
- Reference designs are Sigfox verified and the design files are available for hassle-free copy and paste replication
- Sigfox solution provided as a modem controlled by AT commands or as a system on chip (SoC) controlled by software API
- Multi-protocol support
- New System-in-Package module for ultra-miniature applications; AT version is fully CE certified out of the box
- Rich partner network of pre-certified modules





Device	AT	API	Sigfox Region	Frequency (MHz)	GPIO	Package
AX-SIP-SFEU-x-yy	✓		RC1	868	10	SIP-38
AX-SIP-SFEU-API-x-yy		✓	RC1	868	10	SIP-38
AX-SFEU-x-yy	✓		RC1	868	10	QFN-40
AX-SFEU-API-x-yy		✓	RC1	868	10	QFN-40
AX-SFUS-x-yy	✓		RC2 / RC4 (LATAM)	902 / 920	10	QFN-40
AX-SFUS-API-x-yy		✓	RC2 / RC4 (LATAM)	902 / 920	10	QFN-40
AX-SFJK-x-yy	✓		RC3	923	10	QFN-40
AX-SFJK-API-x-yy		✓	RC3	923	10	QFN-40
AX-SFAZ-x-yy	✓		RC4	920	10	QFN-40
AX-SFAZ-API-x-yy		✓	RC4	920	10	QFN-40

Ultra Low Power Radio Solutions

Sub-GHz Radio Features

- Highly flexible software defined sub-GHz radios for proprietary or standards based networking from 27 MHz to 1.05 GHz
- RadioLab – full featured radio configurator and code generator GUI
- CodeBlocks – full featured software development environment and toolchain with seamless integration of RadioLab and software stacks
- Available as either stand-alone transceivers or combined with MCU (8052 or ARM Cortex M0+) in a SoC
- Multi-protocol support

2.4 GHz Radio Features

- Highly optimized for ultra low power consumption
- Hardware defined IEEE 802.15.4 Radio SoC
- Arm® Cortex®-M3 with 640 kB FLASH and 48 kB RAM
- Advanced power management and security hardware acceleration
- Industry leading receive current of 3.6 mA
- Supports ZigBee®, Thread™, and proprietary (any 802.15.4 software stack)

RF Transceivers

Device	Protocol Supported	Frequency (MHz)	Data Rate (kbps)	Voltage Supply (V)	Power Consumption	TX Power (dBm)	RX Sensitivity (dBm)	Package
AX5043	EnOcean®, ZigBee, KNX®, M-Bus, 802.15.4(g), Proprietary	27 – 1050	0.1 – 125	1.8 – 3.6	RX 6.5 - 9.5 mA TX 7.5 mA @ 0 dBm	16	-137 @ 0.1 kbps	QFN-28
AX5243		27 – 1050	0.1 – 125	1.8 – 3.6	RX 6.5 - 9.5 mA TX 7.5 mA @ 0 dBm	16	-137 @ 0.1 kbps	QFN-20
AX5051		400 - 470 800 - 940	1 - 600	2.2 – 3.6	RX 16 - 21 mA TX 13 mA @ 0 dBm	16	-116	QFN-28
AX5031		400 - 470 800 - 940	1 – 2000	2.2 – 3.6	RX 16 - 21 mA TX 13 mA @ 0 dBm	16	–	QFN-20

RF SoCs

Device	Protocol Supported	Frequency (MHz)	Data Rate (kbps)	Peripheral Interface	Flash (kB)	RAM (kB)	GPIO	Package
AX8052F131	EnOcean, ZigBee, KNX, M-Bus, 802.15.4(g), Proprietary	400 - 700 800 - 940	1 – 2000	Configurable	64	8	21	QFN-40
AX8052F143		27 - 1050	0.1 - 125	Configurable	64	8	19	QFN-40
AX8052F151		400 - 700 800 - 940	1 – 600	Configurable	64	8	21	QFN-40
AXM0F243		27 - 1050	0.1 – 125	Configurable	64	8	20	QFN-40
NCS36510	ZigBee, Thread,802.15.4, Proprietary	2400 - 2483	250	Configurable	320 x 2 (FOTA)	48	18	QFN-40

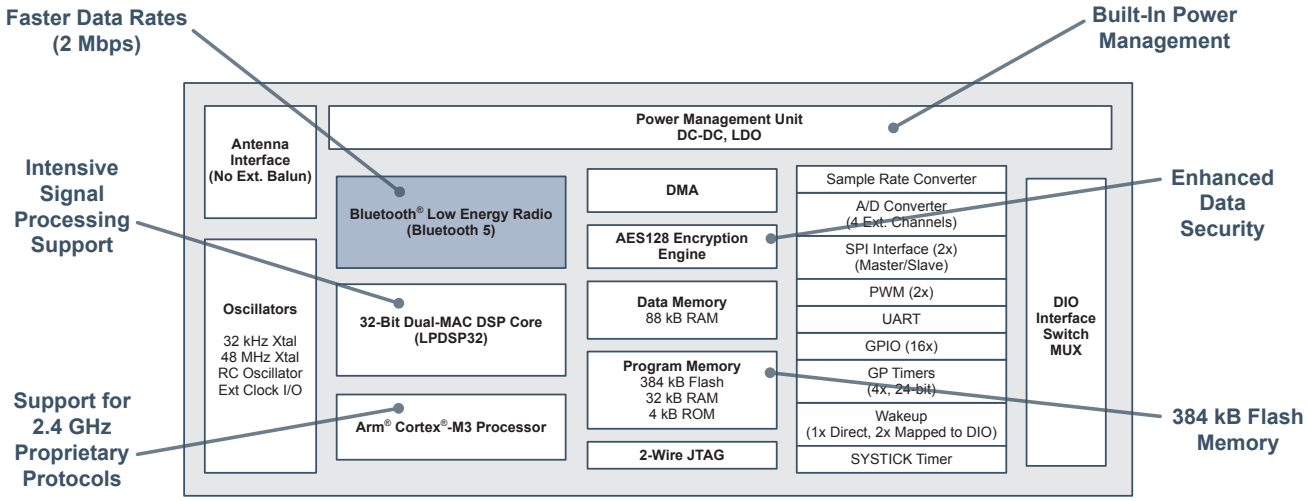
RSL10 Bluetooth® Low Energy Technology Radio SoCs

With so many options for wireless available, what sets the RSL10 radio SoC family apart? Simple. It offers the industry's lowest power Bluetooth low energy technology.

Supporting 2 Mbps data rates provided by Bluetooth 5 (twice the speed as with previous Bluetooth generations), RSL10 enables advanced wireless functionality without compromising battery life. RSL10 can be easily integrated into any device.

Features

- Industry's lowest power (62 nW in Deep Sleep, 7 mW in Receive Mode)
- Supports Bluetooth low energy and 2.4 GHz proprietary protocols
- Flexible Voltage Supply Range (1.1 - 3.3 V)
- IP protection feature
- Available packages WLCSP-51, QFN-48, System-in-Package



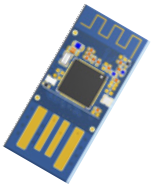
Development Tools

Software Development Kit (SDK)

- Eclipse-based software with a C Development Toolkit (CDT)
- GNU toolchain for programming the Arm Cortex-M3 processor
- Bluetooth low energy protocols, precompiled sample code and libraries, technical documentation

RSL10 Development Board

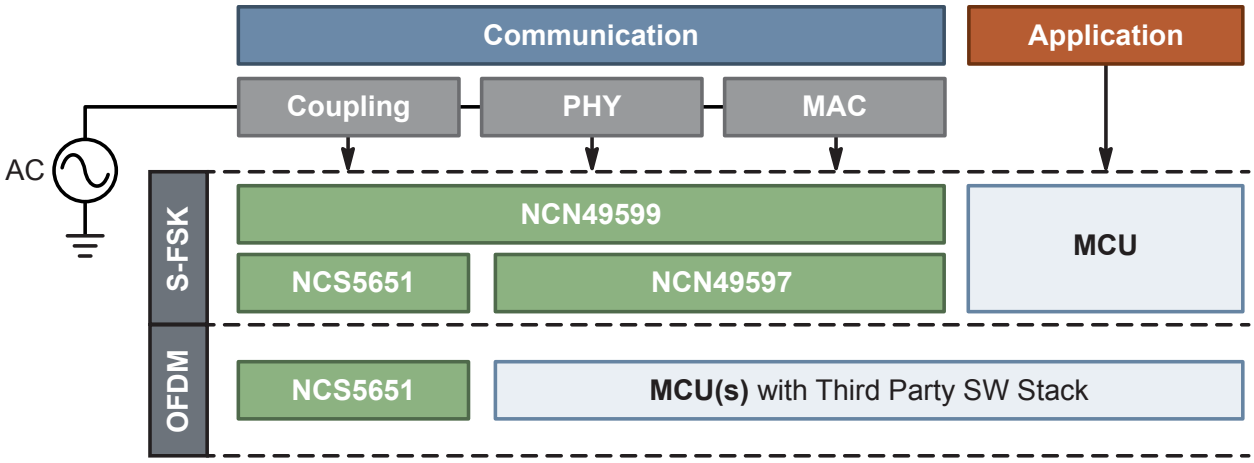
- Compliance with Arduino form factor
- Integrated PCB antenna
- On-board J-link adapter for easy debugging



RSL10 USB Dongle

- Provided with Bluetooth Low Energy Explorer software to help verify or diagnose wireless connections during development

PLC Modems/Power Line Driver



	Device	Function	Features		Package(s)
Smart Grid Modem	NCN49599	PLC S-FSK Modem; A - D Band	• Arm Cortex M0 • Baud rate: 4800 Bauds • S-FSK modulation	• Hardware embedded MAC + PHY • Embedded 1.2 A, 2-stage power amplifier with current limitation and thermal protection	QFN-56
	NCN49597	PLC S-FSK Modem; A - D Band	• Arm Cortex M0 • Baud rate: 4800 Bauds	• S-FSK modulation • Hardware embedded MAC + PHY	QFN-52
Power Amplifier	NCS5651	Power Line Driver; Class AB	• Low distortion power line driver with optimized interface for PLC modems • Capability to drive 2.0 A peak into reactive loads	• Current shutdown minimizes power consumption during power down state • Rail-to-Rail Drop of Only ±1 V with Iout = 1.5 A	QFN-20 EP

KNX Transceivers

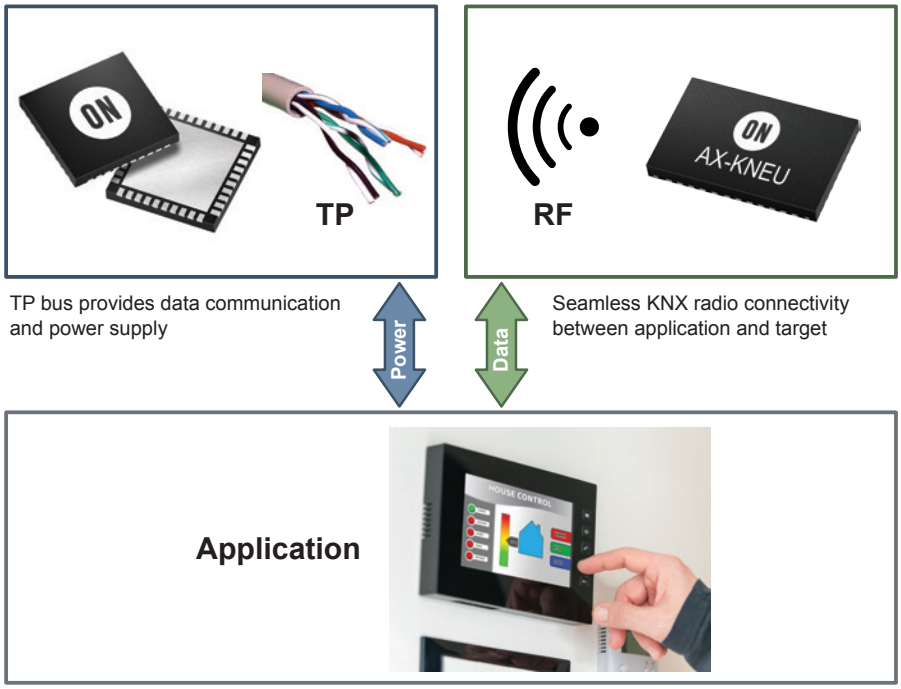
KNX is a standardized (EN 50090, ISO/IEC 14543), OSI-based network communications protocol for intelligent buildings. KNX is the successor to, and convergence of, three previous standards: the European Home Systems Protocol (EHS), BatiBUS, and the European Installation Bus (EIB or Instabus).

KNX Open Standards

- EN 50090: European Standard
- ISO/IEC 14543-3: International Standard
- GB/Z 20965: Chinese Standard
- ANSI/ASHRAE 135: US Standard

Applications

- Connects appliances and sensors, especially for climate and light control – wired or wireless – to the 9600 Baud KNX twisted pair (TP) bus inside a building



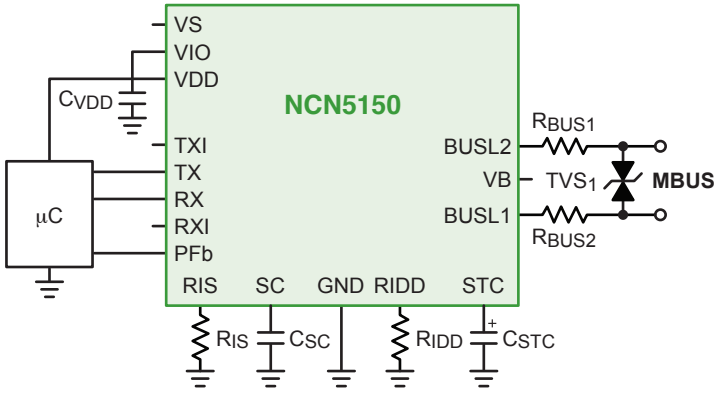
RF	AX8052F143
Multi/Ready	✔
High Sensitivity	✔
Ultra Low Receive and Standby Current	✔
PHY + MAC	✔

Twisted Pair	NCN5121	NCN5110	NCN5130
Efficiency Increase	✔	✔	✔
10/20 mA Bus Current Consumption	✔		
5 to 40 mA Bus Current Consumption		✔	✔
KNX Bus Current Limitation	✔	✔	✔
PHY + MAC Layer (TPUART Compatible)	✔		✔
PHY Layer (Analog Only)		✔	
3.3 V Fixed DC/DC	✔	✔	✔
Adjustable DC/DC	✔	✔	✔
20 V LDO	✔	✔	✔
Analog Monitor Output	✔		✔

M-BUS Transceivers

Wired M-Bus Features

- Satisfies physical requirements for M-BUS, described in EN 13757-2 and EN 1434-3
- UART communication speeds up to 38400 baud
- Integrated 3.3 V VDD LDO regulator (extended peak current of 15 mA)
- Supports powering slave device from the bus or from external power supply
- SOIC-16 and QFN-20 packages



General Application Diagram

AX8052F143 Wireless M-Bus System on Chip

- Ultra-low-power AX8052 MCU
- CPU active mode 150 µA/MHz
- Low-power sleep modes with RAM retention
- High performance narrow-band RF transceiver
- Wide frequency range
- Large amount of memory

Wireless M-Bus Transceivers

- Ultra-low-power
- 50 nA deep sleep current
- 500 nA power-down current
- High sensitivity & selectivity
- -126 dBm @ 1 kbps, 868 MHz, FSK
- Constant Tx output power over V_{DD} = 1.8 – 3.6 V

M-Bus Transceivers

Device	Frequency (MHz)	Data Rate (kbps)	Voltage Supply (V)	Power Consumption	TX Power (dBm)	RX Sensitivity (dBm)	Package
AX5043	27 – 1050	0.1 – 125	1.8 – 3.6	RX 6.5 - 9.5 mA; TX 7.5 mA @ 0 dBm	0 to 16	-133 @ 0.2 kbps; -126 @ 1 kbps; -106 @ 100 kbps	QFN-28
AX5243	27 – 1050	0.1 – 125	1.8 – 3.6	RX 6.5 - 9.5 mA; TX 7.5 mA @ 0 dBm	0 to 16	-135 @ 0.1 kbps; -126 @ 1 kbps; -107 @ 100 kbps	QFN-20

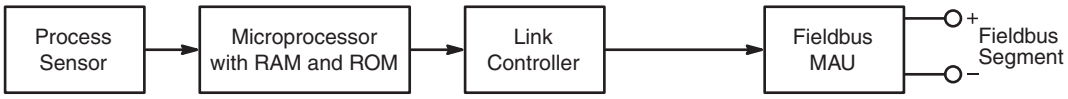
M-Bus System on Chip

Device	Protocol Supported	Frequency (MHz)	Data Rate (kbps)	Peripheral Interface	Flash (kB)	RAM (kB)	GPIO	Package
AX8052F143	EnOcean, KNX, M-Bus, Proprietary	27-1050	0.1 - 125	AT command via UART	64	8	19	QFN-40

Modems

AMIS-49200 & AMIS-49250 Fieldbus Physical Layer Medium Access Units

- Compatible to both FOUNDATION Fieldbus H1 (Type 111 and Type 112 per FF-816) and PROFIBUS PA standards
- Enables Fieldbus to completely power field devices using the integrated power supply block
- Data rate: 31.25 kbps voltage mode
- Low current consumption 500 μA typ
- LQFP-44 and NQFP-44 packages

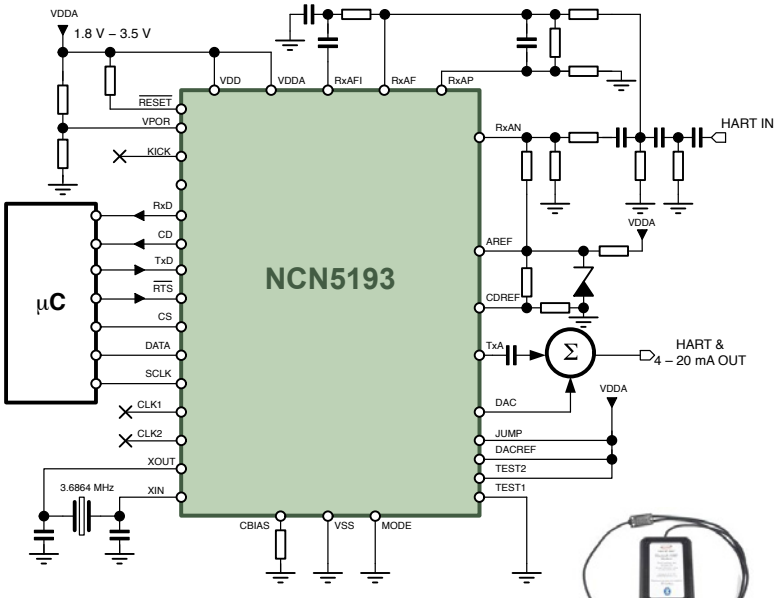


Industrial HART Protocol Modems

- Single-chip, half-duplex 1200 bps FSK modem
- Bell 202 shift frequencies of 1200 Hz and 2200 Hz
- Transmit-signal wave shaping
- Receive band-pass filter

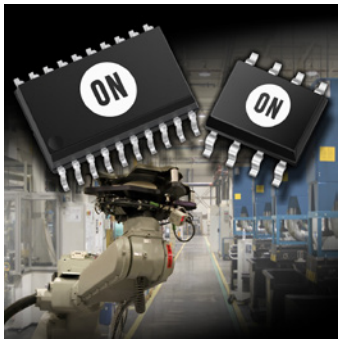
HART Modems

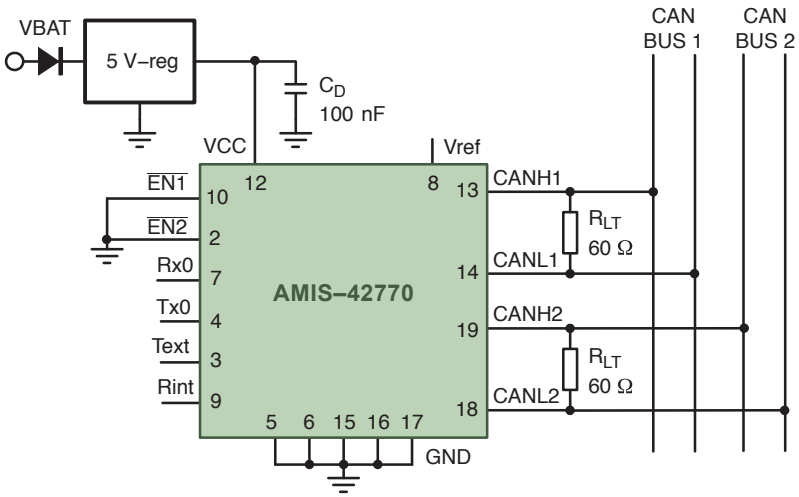
Device	Input Frequency	DAC	Temp Range (°C)	Package
NCN5193	460.8 kHz, 920 kHz,or 1.8 MHz	Integrated 16-bit Sigma-Delta	–40 to +85	QFN-32
NCN5192	460.8 kHz, 920 kHz,or 1.8 MHz	Integrated 16-bit Sigma-Delta	–40 to +85	QFN-32
A5191HRT	460.8 kHz	External	–40 to +85	QFN-32, LQFP-32, PLCC-28



HART® COMMUNICATION PROTOCOL

CAN Transceivers for Long Networks, >500 m





Features

- ISO 11898-2 compliant
- Up to 1 Mb/s communication speed
- Delivers low transmit data rate in networks exceeding 1 km
- Functional in 12 V and 24 V systems

GIFT/ICT

CAN Transceivers

Device	Type	Description	Package
AMIS42770	Dual	High-Speed CAN Repeater	SOIC-20
AMIS42670	Single	High-Speed CAN Transceiver for Long Networks	SOIC-8

Power-Over-Ethernet (PoE) Controllers

for Wireless Access Points, Small Cells, Surveillance Cameras, PoS Terminals, Digital Signage

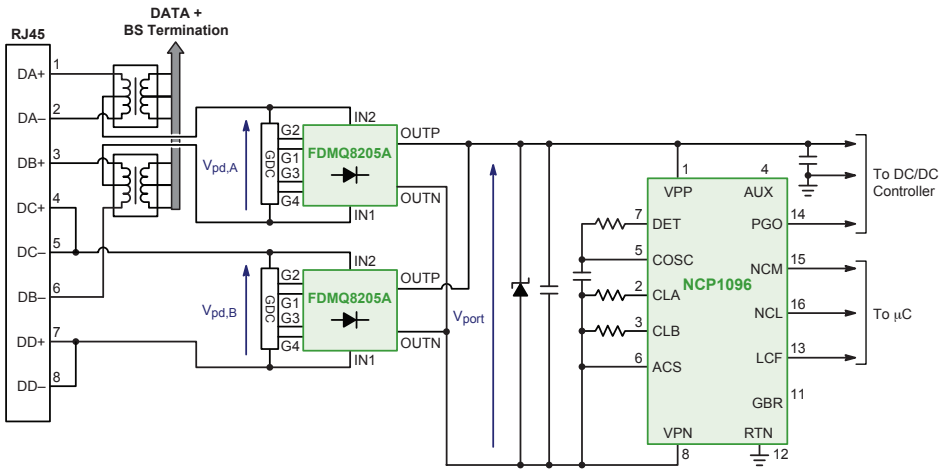
ON Semiconductor offers a complete portfolio of interface controllers for emerging PoE applications. The front-end PD device is compliant with IEEE802.3af, IEEE802.3at, and the new IEEE802.3bt standards, and power is provided using two-pair and four-pair configurations to meet all requirements. The portfolio includes ASSPs PD chips with (NCP108x) and without (NCP109x) integrated PWM controllers, which can convert PoE input power to one or more output voltages in a Powered Device.

Features – NCP1095, NCP1096

- Fully compliant with new IEEE 802.3bt for high power up to 90 W PoE
- Supports Autoclass
- Integrated low RDS(ON) pass-switch (NCP1096)
- Support for Short MPS
- Pass Switch disabling input for rear auxiliary supply operation
- 135 mA typical inrush current limiting
- Full backward compatibility with IEEE 802.3af/at

Complete building blocks for a highly efficient PoE Powered Device

- PoE-PD Interface controller – NCP1095, NCP1096
- Active MOSFET bridge – Greenbridge™2 FDMQ8205A
- Downstream DC-DC controller – NCP1566 Active Clamp Forward Converter
- Supplementary discrete components



Device	Description	Topology	Control Mode	V_{CC} Min (V)	V_{CC} Max (V)	P_d Typ (W)	R_{on} Typ (Ω)	Package
NCP1080	PoE PD Controller and DC-DC Converter	Flyback	Current	0	57	15	0.6	TSSOP-20
NCP1081	PoE PD Controller and DC-DC Converter	Flyback	Current	0	57	40	0.6	TSSOP-20
NCP1082	PoE PD Controller and DC-DC Converter, with Auxiliary Supply Support	Flyback	Current	0	57	15	0.6	TSSOP-20
NCP1083	PoE PD Controller and DC-DC Converter, with Auxiliary Supply Support	Flyback	Current	0	57	40	0.6	TSSOP-20
NCP1090	PoE PD Interface Controller	–	–	0	57	15	0.5	SOIC-8, TSSOP-8
NCP1091	PoE PD Interface Controller with Programmable UVLO	–	–	0	57	15	0.5	SOIC-8, TSSOP-8
NCP1092	PoE PD Interface Controller with Vaux Support	–	–	0	57	15	0.5	SOIC-8, TSSOP-8
NCP1093	PoE PD Interface Controller	–	–	0	57	25	0.5	DFN-10
NCP1094	PoE PD Interface Controller with Vaux Support	–	–	0	57	25	0.5	DFN-10
NCP1095	802.3bt PoE PD Interface Controller with External Hot Swap Transistor	–	–	0	57	100	–	TSSOP-16
NCP1096	802.3bt PoE PD Interface Controller with Internal Hot Swap Transistor	–	–	0	57	100	0.07	TSSOP-16 EP

Motion Detector Passive Infrared Controller (PIR) – NCS36000

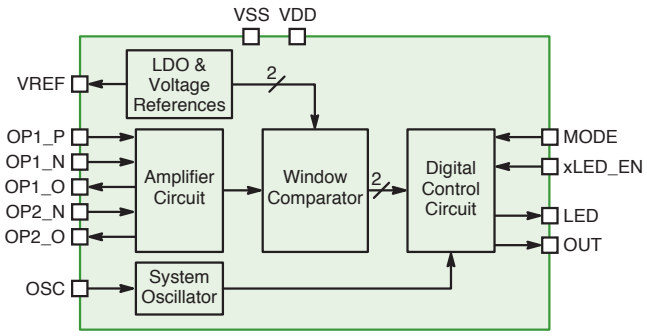
- **Passive infrared controller circuit for the lighting and occupancy sensing market**
- **Amplifies and conditions signal from PIR sensor**

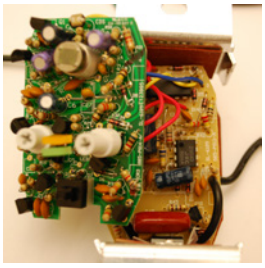
Features

- 3.0 – 5.75 V operation
- Integrated low noise 2-stage amplifiers
- Internal voltage reference to drive sensor
- Internal oscillator with external RC
- Single or dual pulse detection
- Digital filter to minimize false alarms
- Direct drive of LED and relay

Benefits

- Lower BOM cost than comparable discrete solutions
  - Extremely flexible solution
  - Customer can customize digital filtering
- Customer can customize analog processing
- Designed for wide range of occupancy sensors





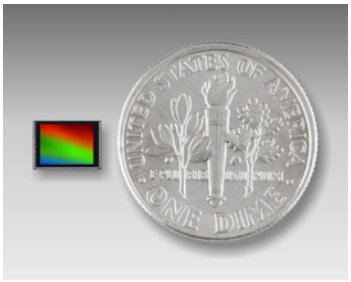
Old Solution

NCS36000 Solution

SENSING

Mainstream CMOS Image Sensors

From security and IP cameras around your home, business and factory; to smart lighting with intelligent sensors; to connected doorbells, appliances, robots, and 2D scanners; the need for image sensing is only growing. Mainstream image sensors from ON Semiconductor provide a wide range of performance, size, power, and resolution options which meet the needs of the growing IoT ecosystem and use models. Using advanced CMOS manufacturing processes allow for great imaging, whether it is a vibrant color image for human viewing or a detailed monochromatic image used in machine vision and light industrial use. The ON Semiconductor mainstream image sensor portfolio has the performance and resolution needed for emerging and established applications.



Device	Sensor/ SOC	Resolution (MP)	Optical Format	Frame Rate	Pixel Size (µm)	Shutter Type[1]	CFA	Operating Temp (°C)
MT9V115	SOC	VGA	1/13"	30 fps	1.8	ERS	Color	-30 to +70
ASX340CS	SOC	VGA	1/4"	60fps	5.6	ERS	Color	-30 to +70
ASX370CS	SOC	VGA	1/7"	30fps	3.0	ERS	Color	-30 to +70
MT9V024	Sensor	WVGA	1/3"	60fps	6.0	GS	Color, Mono	-40 to +105
MT9V034	Sensor	WVGA	1/3"	60fps	6.0	GS	Color, Mono	-30 to +70
AR0141CS	Sensor	1.2	1/4"	1.2 45fps, 720P 60fps	3.0	ERS	Color	-30 to +85
AR0144CS	Sensor	1	1/4"	60fps	3.0	GS	Color, Mono	-40 to +85
AR0130CS	Sensor	1.2	1/3"	1.2 45fps, 720P 60fps	3.8	ERS	Color, Mono	-30 to +70
AR0134CS	Sensor	1.2	1/3"	1.2 54fps, 720 60 fps	3.8	GS	Color, Mono	-30 to +70
AR0135CS	Sensor	1.2	1/3"	1.2 60fps, 720 60 fps	3.8	GS	Color, Mono	-30 to +70
MT9M114	SOC	1.3	1/6"	1.3 30fps, VGA 75 fps	1.9	ERS	Color	-30 to +70
AR0237CS	Sensor	2.1	1/2.7"	1080P 60 fps	3	ERS	Color	-30 to +85
AR0237IR	Sensor	2.1	1/2.7"	1080P 60 fps	3	ERS	RGB-IR	-30 to +85
AR0238	Sensor	2.1	1/2.7"	1080P 60 fps	3	ERS	Color	-30 to +85
AR0239	Sensor	2.1	1/2.7"	1080P 90 fps	3	ERS	Color	-30 to +85
AR0261	Sensor	2.1	1/6"	1080p 60 fps	1.4	ERS	Color	-30 to +70
AS0260	SOC	2.1	1/6"	30 fps	1.4	ERS	Color	-30 to +70
AR0221	Sensor	2.1	1/1.8"	60 fps	4.2	ERS	Color	-30 to +85
AR0330	Sensor	3.5	1/3"	1080P 60 fps	2.2	ERS, GRR	Color	-30 to +70
AR0430	Sensor	4	1/3"	120fps	2	ERS	Color	-30 to +85
AR0431	Sensor	4	1/3"	120fps	2	ERS	Color	-30 to +85
AR0521	Sensor	5	1/2.5"	60fps	2.2	ERS	Color, Mono	-30 to +85
AR0522	Sensor	5	1/2.5"	60fps	2.2	ERS	Color, Mono	-30 to +85
AR01011HS	Sensor	10	1"	60fps	3.4	ERS	Color	-30 to +70
AR1335	Sensor	13	1/3.2"	13 30 fps, 1080P 60 fps	1.1	ERS, GRR	Color	-30 to +70
AR1337	Sensor	13	1/3.2"	13 30 fps, 1080P 60 fps	1.1	ERS, GRR	Color	-30 to +70
AR1820HS	Sensor	18	1/2.3"	18 24 fps, 1080P 120 fps	1.25	ERS, GRR	Color	-30 to +70

1. ERS = Electronic Rolling Shutter, GRR = Global Reset Release, GS = Global Shutter. NOTE: Some products available with extended temperature ranges.

Co-Processors for Mainstream CMOS Image Sensors

Device	Resoution (MP)	Frame Rate (fps)	Video	Output Format	Package
AP0100CS	1	45	1.2 MP/45 fps; 720p/60 fps	NTSC/PAL; YUV	VFBGA-100
AP0101CS	1	45	1.2 MP/45 fps; 720p/60 fps	SMPTE 296M; YUV	VFBGA-81
AP1302	13	30	13 MP/30 fps; 1080p/120 fps	JPEG; RAW; RGB565; RGB888; YUV	VFBGA-120

X-Class CMOS Image Sensors

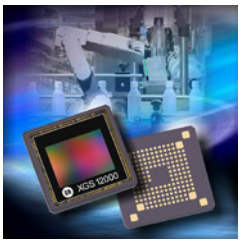
The X-Class image sensor platform supports multiple CMOS pixel architectures within the same image sensor frame, allowing a single camera design to support not only multiple product resolutions but also different pixel functionality. The initial devices in this platform are based on an advanced 3.2 µm global shutter CMOS pixel that features superior imaging performance, high image uniformity, and low noise – providing high-performance imaging in a small camera footprint.

X-Class Features

- One camera design for multiple resolutions and pixel functionality
- High bandwidth, low power HiSPi digital interface
- Speed grades available to match performance to application

XGS Pixel Features

- Advanced 3.2 µm Global Shutter
- High performance, low noise design



Device	Resolution (MPix)	Pixel Count (H x V)	Pixel (µm)	Diagonal (mm)	Lens	CFA[1]	FPS Max	Evaluation Kit
XGS 8000	8.8	4096 x 2160	3.2	14.8	1/1.1"	C/M	130	✓
XGS 12000	12.6	4096 x 2160	3.2	16.4	1"	C/M	87	✓

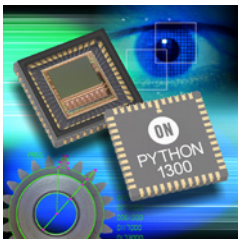
1. CFA Options – Bayer Color (C), Monochrome (M).

PYTHON CMOS Image Sensors

With resolutions from VGA to 25 megapixels, the PYTHON family of image sensors addresses the needs of general purpose industrial imaging applications such as machine vision inspection and motion monitoring, security, surveillance, and intelligent transportation systems (ITS). Combining flexibility in configuration and resolution with high speed and high sensitivity, these devices capture fast moving scenes without distortion by combining low read noise and high sensitivity with frame rates up to 815 fps.

Features

- CDS global shutter technology with low noise performance
- True HW scalable family concept
- High configurability and fast adaptability
- Quadratic speed increase with ROI windowing
- Multiple regions of interest
- High dynamic range
- Color, Monochrome, and Enhanced NIR configurations
- Standard and protective tape configurations
- Low power, cost-effective configurations



Device	Resolution (MPix)	Pixel Count (H x V)	Pixel (µm)	Diagonal (mm)	Lens	CFA[1]	FPS Max	Evaluation Kit
PYTHON 300	0.3	640 x 480	4.8	3.8	1/4"	C/M/NIR	815	✓
PYTHON 480	0.5	800 x 600	4.8	4.8	1/3.6"	C/M	120	✓
PYTHON 500	0.5	800 x 600	4.8	4.8	1/3.6"	C/M/NIR	545	✓
PYTHON 1300	1.3	1280 x 1024	4.8	7.9	1/2"	C/M/NIR	210	✓
PYTHON 2000	2.3	1920 x 1200	4.8	10.9	2/3"	C/M/NIR	225	✓
PYTHON 5000	5.3	2592 x 2048	4.8	15.9	1"	C/M/NIR	100	✓
PYTHON 12K	12.5	4096 x 3072	4.5	23.0	4/3	C/M/NIR	160	✓
PYTHON 16K	16.8	4096 x 4096	4.5	26.1	APS-H	C/M/NIR	120	✓
PYTHON 25K	26.2	5120 x 5120	4.5	32.6	APS-H	C/M/NIR	80	✓

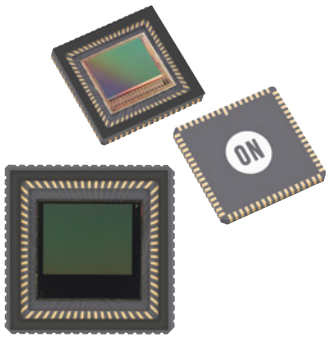
1. CFA Options – Bayer Color (C), Monochrome (M), Enhanced NIR (NIR).

Versatile CMOS Image Sensors

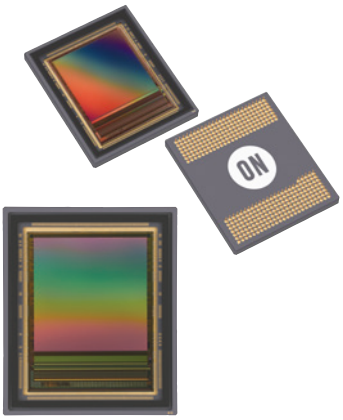
VITA image sensors combine flexibility in configuration and resolution with high speed and high sensitivity, addressing a wide range of customer requirements in a cost-effective family of rolling/global shutter CMOS image sensors. A flexible read-out architecture makes them well suited for machine vision, intelligent transportation systems and surveillance, and other applications that demand high functionality, while delivering excellent image quality.

Features

- 1.3 to 25 Megapixels
- Pipelined and triggered global shutter with dual readout
- Rolling shutter with CDS
- Quadratic speed increase with ROI windowing
- Multiple regions of interest



VITA 5000



VITA 25K

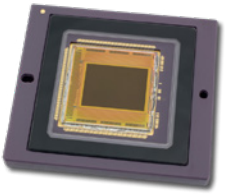
Device	Resolution (MPix)	Pixel Count (H x V)	Pixel (µm)	Diagonal (mm)	Lens	CFA[1]	FPS Max	Evaluation Kit
VITA 1300	1.3	1280 x 1024	4.8	7.9	1/2”	C/M	150	✓
VITA 2000	2.3	1920 x 1200	4.8	10.9	2/3”	C/M	90	✓
VITA 5000	5.3	2592 x 2048	4.8	15.9	1”	C/M	75	✓
VITA 12K	12.6	4096 x 3072	4.5	23.0	4/3”	C/M	160	✓
VITA 16K	16.8	4096 x 4096	4.5	26.1	APS-H	C/M	125	✓
VITA 25K	26.2	5120 x 5120	4.5	32.6	APS-H	C/M	80	✓

1. CFA Options – Bayer Color (C), Monochrome (M).

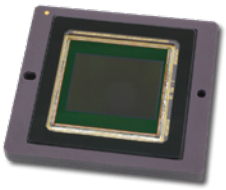
KAC image sensors provide both global shutter and low noise rolling shutter modes, combined with programmable bit depth (8 to 14 bit) with a flexible readout architecture that supports interspersed video streams. These features enable the use of multiple regions of interest that can simultaneously monitor both wide areas and local regions, making these devices ideal for machine vision, surveillance, ITS, and analytical microscopy.

Features

- Global shutter, low noise rolling shutter
- Programmable bit depth
- Interspersed video streams
- Multiple regions of interest
- High frame rates
- High NIR sensitivity



KAC-06040



KAC-12040

Device	Resolution (MPix)	Pixel Count (H x V)	Pixel (µm)	Diagonal (mm)	Lens	CFA[1]	FPS Max	Evaluation Kit
KAC-06040	6	2832 x 2128	4.7	16.7	1”	C/M	160	✓
KAC-12040	12	4000 x 3000	4.7	23.5	4/3”	C/M	70	✓

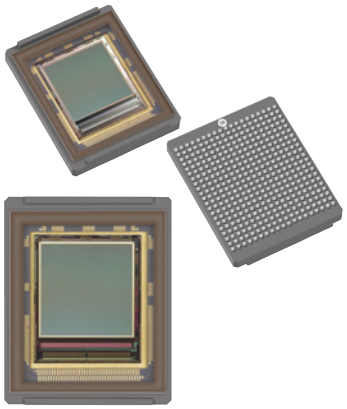
1. CFA Options – Bayer Color (C), Monochrome (M).

High Speed CMOS Image Sensors

LUPA devices offer resolution as high as 2048 x 2048 and frame rates up to 500 fps. These features, combined with a power consumption as low as 150 mW with absolutely no blooming or lag, create a perfect foundation for highly reliable, high sensitivity image sensors.

Features

- Frame rates up to 500 fps at several megapixel resolutions
- Unprecedented sensitivity
- Pipelined global shutter
- Low power dissipation
- High resolution
- No blooming or image lag
- Mono and color variants



LUPA 3000

Device	Resolution (MPix)	Pixel Count (H x V)	Pixel (μm)	Diagonal (mm)	Lens	CFA[1]	FPS Max	Evaluation Kit
LUPA 300	0.3	640 x 480	9.9	7.9	1/2”	C/M	250	✓
LUPA 1300-2	1.3	1280 x 1024	14	22.9	1”	C/M	500	✓
LUPA 3000	3	1696 x 1710	8	19.3	1”	C/M	485	✓

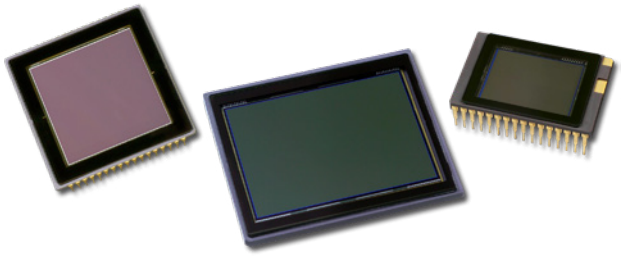
1. CFA Options – Bayer Color (C), Monochrome (M).

Full Frame CCD Image Sensors

From the intricacies of microscopy to the far reaches of astrophotography, Full Frame CCD image sensors deliver high performance results. With high quantum efficiency across the entire visible spectrum, these sensors are ideal for demanding imaging applications that can accommodate a mechanical shutter or strobe illumination, such as electronic still photography, medical X-ray, and inspection.

Features

- High resolution
- Support for large sensor formats
- Simple, two-phase clocking
- Very low dark current for long exposures
- Vertical and horizontal binning



Full Frame CCD Image Sensors

Device	Resolution (MPix)	Pixel Count	Pixel (µm)	Diagonal (mm)	Lens	CFA[1]	FPS Max	Evaluation Kit
KAF-0261	VGA	512 x 512	20.0	14.5	1”	M	15.0	✓
KAF-0402	WVGA	768 x 512	9.0	8.3	1/2"	M	20.0	✓
KAF-1001	1.0	1024 x 1024	24.0	34.8	APS-H	M	3.0	✓
KAF-1603	1.6	1536 x 1024	9.0	16.6	1”	M	2.2	✓
KAF-3200	3.3	2184 x 1510	6.8	18.0	4/3”	M	2.5	✓
KAF-4320	4.3	2084 x 2084	24.0	70.7	645	M	2.0	✓
KAF-6303	6.3	3088 x 2056	9.0	33.4	APS-H	M	0.6	✓
KAF-8300	8.3	3326 x 2504	5.4	22.5	4/3”	M	2.9	✓
KAF-09000	9.3	3056 x 3056	12.0	51.9	645 1.3x	M	0.4	
KAF-09001	9.1	3024 x 3024	12.0	51.3	645 1.3x	M	5.0	
KAF-16200	16.2	4500 x 3600	6.0	34.6	APS-H	C/M	1.5	
KAF-16801	16.8	4096 x 4096	9.0	52.1	645 1.3x	M	0.4	✓
KAF-16803	16.8	4096 x 4096	9.0	52.1	645 1.3x	M	0.2	
KAF-40000	40.0	7304 x 5478	6.0	54.8	645 1.3x	C	1.3	
KAF-50100	50.1	8176 x 6132	6.0	61.3	645 1.1x	M	1.0	

1. CFA Options – Bayer Color (C), Monochrome (M).

Interline Transfer CCD Image Sensors

With an integrated electronic shutter, Interline Transfer CCD image sensors provide real time imaging in applications where a mechanical shutter or strobe illumination is either not required or desired. With progressive scan readouts, they are particularly well suited for machine vision, microscopy, fluoroscopy, and other applications that demand the highest imaging performance. Most 5.5 μm and 7.4 μm devices share common pin-out and electrical connections, allowing a single camera design to support a full family of products.

Features

- Progressive scan with electronic shutter and anti-blooming support
- High resolution
- High sensitivity
- Low image lag and smear

5.5 μm Interline Transfer CCD Image Sensors

Device	Resolution (MPix)	Pixel Count	Pixel (μm)	Diagonal (mm)	Lens	CFA[1]	FPS Max	Evaluation Kit
KAI-0330	VGA	648 x 484	9	7.3	1/2”	C/M	120	✓
KAI-0340	VGA	640 x 480	7.4	5.9	1/3”	C/M	210	✓
KAI-0373	WVGA	768 x 484	11.6 x 13.6	11.1	2/3”	M	30	
KAI-01150[2]	0.9	1280 x 720	5.5	8.1	1/2”	C/M/S	138	✓
KAI-1003	1	1024 x 1024	12.8	18.5	4/3”	M	30	✓
KAI-1010	1	1008 x 1018	9	12.9	1”	M	30	
KAI-1020	1	1000 x 1000	7.4	10.5	2/3”	C/M	50	✓
KAI-01050[2]	1	1024 x 1024	5.5	8	1/2”	C/M	120	✓
KAI-2020	1.9	1600 x 1200	7.4	14.8	1”	C/M	30	✓
KAI-02050[2]	1.9	1600 x 1200	5.5	11.1	2/3”	C/M	68	✓
KAI-02170[2]	2.1	1920 x 1080	7.4	16.3	1”	C/M/S	60	✓
KAI-02150[2]	2.1	1920 x 1080	5.5	12.1	2/3”	C/M/S	64	✓
KAI-04070[2]	4.2	2048 x 2048	7.4	21.4	4/3”	C/M/S	28	✓
KAI-04050[2]	4.1	2336 x 1752	5.5	16.1	1”	C/M/S	32	✓
KAI-08051[2]	8.1	3296 x 2472	5.5	22.7	4/3”	C/M/S	16	✓
KAI-08052[2]	8.1	3296 x 2472	5.5	22.7	4/3”	C/M/S	16	✓
KAI-08670	8.6	3600 x 2400	7.4	32.0	APS-H	C/M/S	12	✓
KAI-11002	10.7	4008 x 2672	9	43.4	35 mm	C/M	5	✓
KAI-16000	15.8	4872 x 3248	7.4	43.3	35 mm	C/M	3	
KAI-16050[2]	16	4896 x 3264	5.5	32.4	APS-H	C/M/S	8	✓
KAI-16070[2]	15.7	4864 x 3232	7.4	43.2	35 mm	C/M/S	8	✓
KAI-29050[2]	28.8	6576 x 4384	5.5	43.5	35 mm	C/M/S	4	✓
KAI-29052[2]	28.8	6576 x 4384	5.5	43.5	35 mm	C/M/S	4	✓
KAI-43140	43.1	8040 x 5360	4.5	43.5	35 mm	C/M/S	4	✓
KAI-47051	46.8	8856 x 5280	5.5	56.7	645 1.1x	C/M/S	7	✓

1. CFA Options – Bayer Color (C), Monochrome (M), and Sparse CFA (S). 2. Pin and Electrically Compatible.

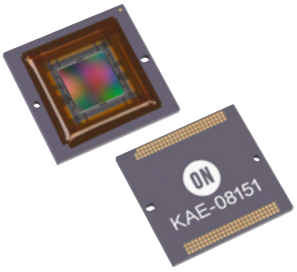
Interline Transfer EMCCD Image Sensors

Combining the high sensitivity of an electron-multiplied output register with the pixel uniformity and resolution scalability available from Interline Transfer CCDs, KAE devices enable the capture of scenes with widely varying lighting conditions – from sunlight to starlight – in a single image and from a single camera. This flexibility makes them ideal for light starved applications such as surveillance, scientific imaging, medical imaging, and intelligent transportation systems.

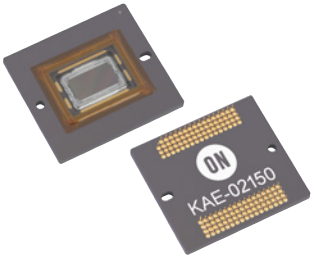
US export controls currently apply to all shipments of KAE devices designated for destinations outside of the US and Canada, requiring ON Semiconductor to obtain an export license from the US Department of Commerce before image sensors or evaluation kits can be exported.

Features

- High dynamic range with sub-electron read
- High sensitivity, low noise architecture
- Excellent smear performance
- Available with integrated thermoelectric cooler



KAE-08151 Image Sensor



KAE-02150 Image Sensor

Device	Resolution (MPix)	Pixel Count	Pixel (μm)	Diagonal (mm)	Lens	CFA	FPS Max	Evaluation Kit
KAE-02150	2.1	1920 x 1080	5.5	12.1	2/3"	C/M	30	✓
KAE-02152	2.1	1920 x 1080	5.5	12.1	2/3"	C/M	30	✓
KAE-04471	4.4	2096 x 2096	7.4	21.9	4/3"	C/M	15	✓
KAE-08151	8.2	2856 x 2856	5.5	22.2	4/3"	C/M	8	✓
KAE-08152	8.2	2856 x 2856	5.5	22.2	4/3"	C/M	8	✓

SENSING

Linear CCD Image Sensors

Linear CCD image sensors combine high resolution with high dynamic range, making them ideal for use in applications such as flatbed scanners, high-speed document scanners and copiers, machine vision cameras, and satellite imaging.

Features

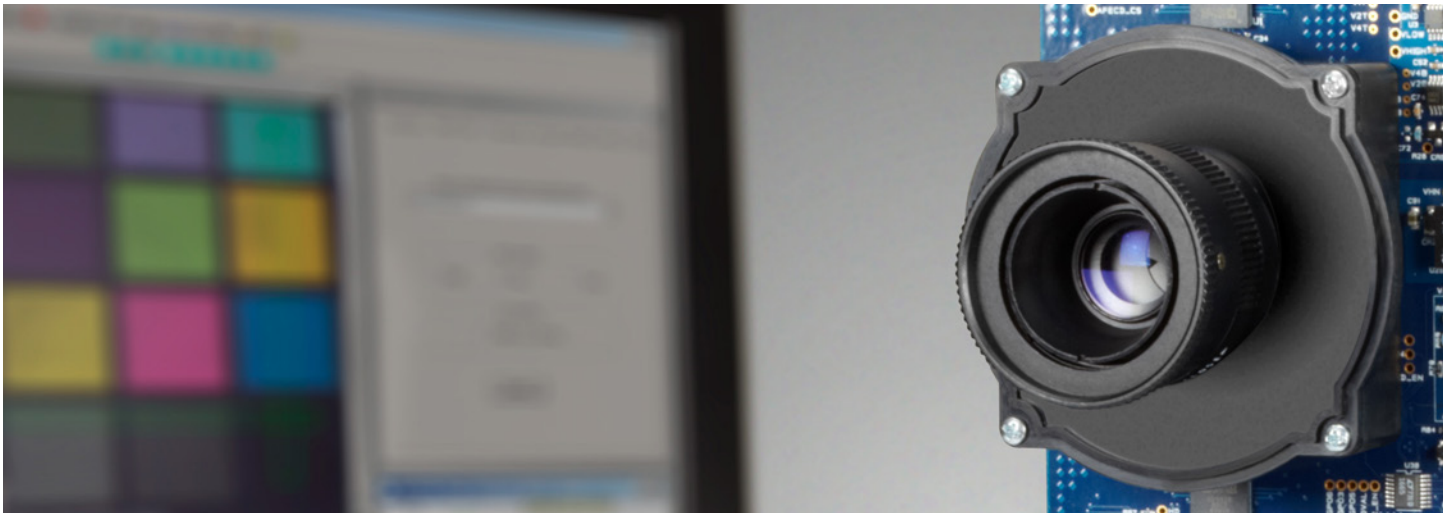
- High dynamic range
- Pinned photodiodes for low lag and low dark current
- Channel independent electronic exposure control
- Single output per color, including multi-readout register architectures
- High data rates

Linear CCD Image Sensors

Device	Pixel Count	Pixel (μm)	Diagonal (mm)	CFA[1]	Evaluation Kit
KLI-2113	2098 x 3	14	29.4	C/M	✓
KLI-4104	8160 x 1, 4080 x 3	5.0, 10.0	40.8	Luma+C/M	✓
KLI-8023	8002 x 3	9	72	C/M	✓

1. CFA Options – Bayer Color (C), Monochrome (M).

Image Sensor Evaluation Support



ON Semiconductor provides supporting hardware and software to qualified engineering teams to accelerate product development. These kits contain everything necessary to build a working prototype with test functionality.

Capacitive Touch Sensors

Design-Friendly, Low-Cost Operation, High Reliability

• Adhesive free	➔	• Reduce manufacturing cost and improve reliability by eliminating existing adhesive process
• Long sensor trace	➔	• Provide flexible PCB design
• Wide range operational temperature	➔	• Available in high-temperature environment
• No extra components	➔	• Reduce BOM
• High noise immunity	➔	• Improve stability and reliability

Door Phone

Light Switch

Control Panel

Capacitive Touch Sensors

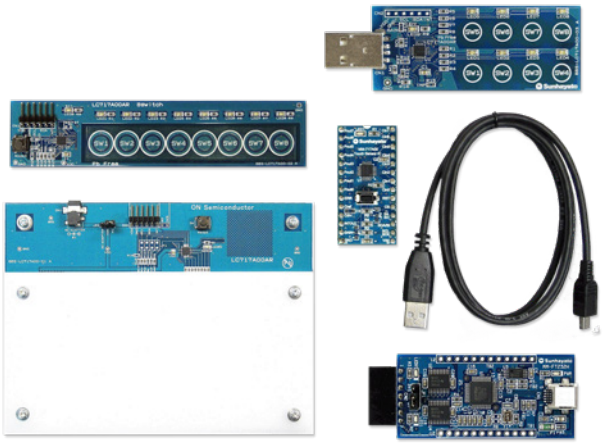
LC717A devices are high performance, cost-effective, and highly usable capacitance converters, for use in touch switch applications. They have 8 or 16 channel capacitance-sensor inputs, and can replace mechanical switches. In particular, the LC717A30 devices have superior sensitivity performance, so it can detect both hands wearing multiple layers of gloves and hands with 15 cm of distance. In addition, it can perform gesture detection.

Features

- Differential capacitive detection using mutual capacitance
- Capacitance detection down to femtofarad level
- High sensibility performance
- High adaptability – calibration function, noise reduction, wide range temperature operation
- Design friendly – adhesive free, various circuit board design, minimal external components

Device	Proximity/Gesture Sensing (cm)	Sensing Inputs	Sensing Outputs	Interface Control	V_{DD} (V)	Package
LC717A00AJ	0-10	8	8	SPI / I2C	2.6 - 5.5	SSOP-30
LC717A00AR	0-10	8	8	SPI / I2C	2.6 - 5.5	VCT-28
LC717A10AJ/PJ	0-10	16	0	SPI / I2C	2.6 - 5.5	SSOP-30
LC717A10AR	0-10	16	0	SPI / I2C	2.6 - 5.5	VCT-28
LC717A30UJ	0-20	8	0	SPI / I2C	2.6 - 5.5	SSOP-30
LC717A30UR	0-20	8	0	SPI / I2C	2.6 - 5.5	VCT-28

Evaluation Kits



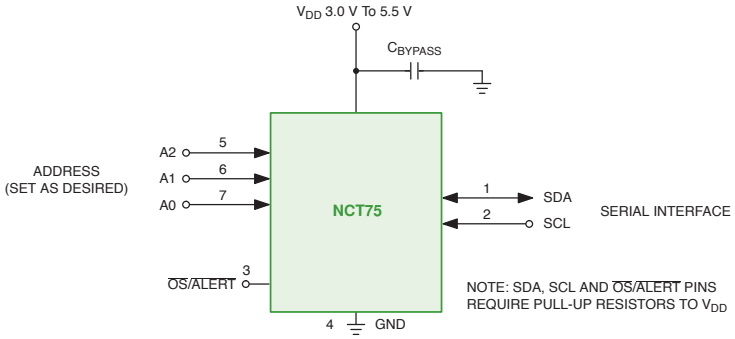
LC717A00ARGEVK

LC717A30UJGEVK

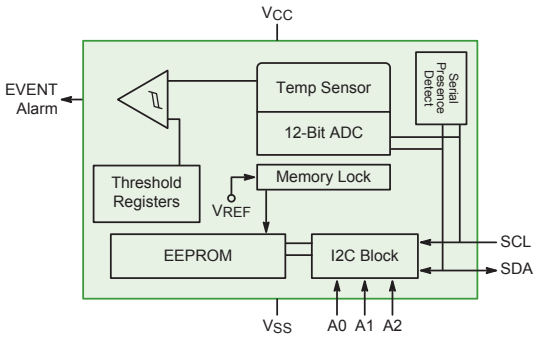
LC717A30URGEVK Available 1Q19

SENSING

Temperature Sensors



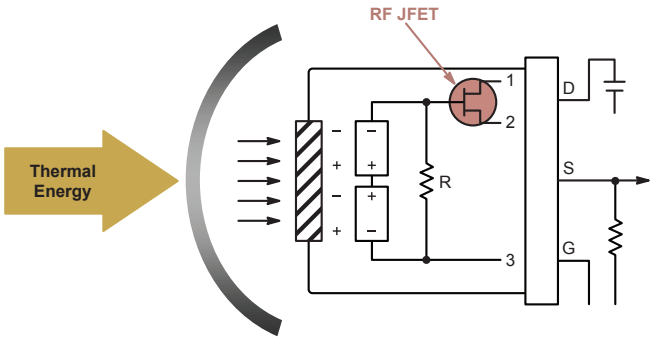
NCT75 Application Diagram



Temperature Sensor + EEPROM Block Diagram

Device	Sensor Type	EEPROM	Data Transmission Standard	Icc Max (mA)	Vcc Max (V)	Vcc Min (V)	T Min (°C)	T Max (°C)	Temperature Error (°C)	Package
NCT75	Local	–	SMBus	0.575	3	5.5	-55	125	±1	DFN-8, Micro8, SOIC-8
NCT218	Remote	–	I2C	–	1.6	2.75	–	–	–	WDFN-8, WLCSP-8
NCT214	Local & Remote	–	SMBus	0.35	3	3.6	-40	125	±1	WDFN-10
NCT72	Local & Remote	–	I2C	0.35	2.8	3.6	-40	125	±1	DFN-8, WDFN-8
CAT34TS00	Local	–	SMBus/I2C	0.5	1.9	1.7	-20	125	±1	UDFN-8
CAT34TS02	Local	2 kb	SMBus/I2C	0.5	3.63	2.97	-20	125	±1	UDFN-8, TDFN-8
N34TS04	Local	4 kb	SMBus/I2C	1.0	5.5	1.7	-20	125	±1	UDFN-8, TDFN-8

RF JFETs for Infrared (IR) Sensing

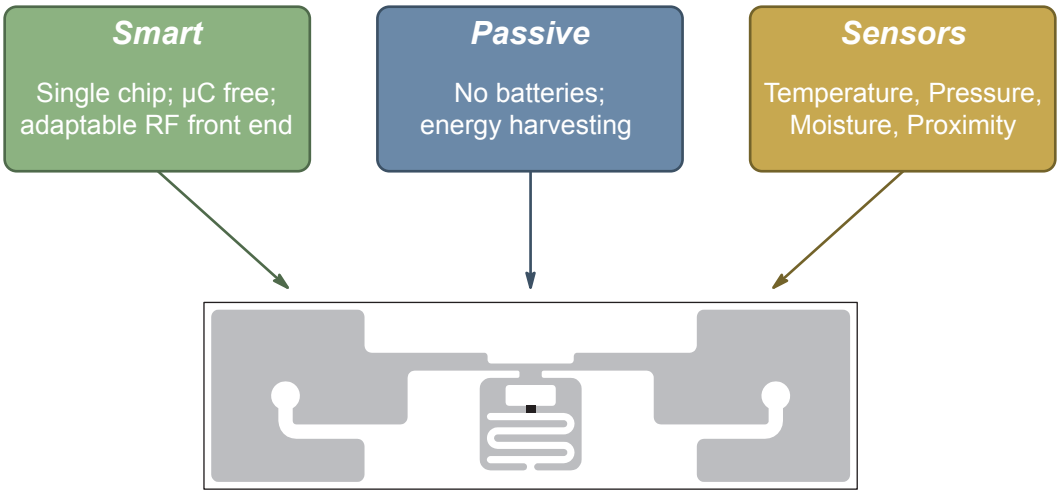


Infrared Sensor for White Goods, Security, and Lighting

Device	VGDO Min (V)	IDSS Min (mA)	IDSS Max (mA)	|yfs| Typ (mS)	Ciss Typ (pF)	Crss Typ (pF)	Package
TF412S	30	1.2	3	5	4	1.1	SOT-883
TF414	40	0.05	0.13	0.11	0.7	0.3	SOT-883
2SK545	40	0.055	0.095	0.13	1.7	0.7	CP (SOT-23)
2SK3666	30	0.6	3	6.5	4	1.1	CP (SOT-23)

Battery-Free Wireless Sensors

Introducing the World's First Battery-Free, µC-Free Sensor Tag
Breakthrough Sensor Technology Implemented on RFID



Features		Benefits
• Battery-free and wireless	➔	Ideal for locations with limited access • underground, within walls, intrusive to body, within boxes, toxic or dangerous locations
• Ultra-thin	➔	Ideal for space-constrained applications • Within doorways, within RFID tags, peel and stick, bandages
• Low cost to scale	➔	Effective where multiple sensors are required • Disposable products, multiple data points, increasing needs over time

Device	Sensing Functions	Sensor Reading Sensitivity	Surface Placement	Form Factor
SPS1M001FOM	Moisture	Low Sensitivity	Metal	Flexible PET
SPS1M002PET	Moisture	Low Sensitivity	Non-Metal	Flexible PET
SPS1F001PET	Fluid Level	High Sensitivity	Non-Metal	Flexible PET
SPS1T001PET	Temperature	0 to +50°C (±0.3°C) or -40 to 85°C (±1°C)	Non-Metal	Flexible PET
SPS1T001PCB	Temperature	0 to +50°C (±0.3°C) or -40 to 85°C (±1°C)	Metal	Hard Tag PCB

- High performance, 8 port reader
- USB, Ethernet, and WiFi connectivity
- Fully certified for regulatory compliance
- Options for different geographic regions

SPSPRDR1-8 UHF Reader Hub

SENSING

General and LCD MCUs

MCU Features

- Pins: 10 – 100
- ROM: 4 – 768 KBytes
- RAM: 256 – 48,640 Bytes
- ADC: 3 – 16 channels
- Operation Voltage: 1.8 – 5.5 (V)
- Stand-by IDD: 0.02 µA
- RTC (Clock) IDD: 0.45 µA (with low power model)

Device	Type	ROM (kByte)	RAM (Byte)	I/Os	PWMs	UARTs	ADC	LVD	POR	Features	Package
LC87FBG08A	8-bit General	8	256	21	2	1	12/8-bit x 9ch	✔	✔	High accuracy internal OSC (±2.0%); all operation is minimum 1.8 V	SSOP-24, VCT-24
LC87FBK08A	8-bit General	8	256	21	2	–	12/8-bit x 8ch	✔	✔	High accuracy internal OSC (±3.0%); Support Mask Type	SSOP-24
LC87FBL08A	8-bit General	8	256	26	2	–	12/8-bit x 11ch	✔	✔	High accuracy internal OSC (±3.0%)	QFP-36
LC87FBH08A	8-bit General	8	256	26	2	1	12/8-bit x 11ch	✔	✔	High accuracy internal OSC (±3.0%)	QFP-36
LC87F2R04A	8-bit General	4	128	21	–	–	12/8-bit x 8ch	✔	✔	Small scale 8bit MCU; Remote Control Receiver Circuit	SSOP-24
LC87BK08A*	8-bit General	8	256	21	2	–	12/8-bit x 8ch	✔	✔	Mask ROM edition of LC87FBK08A	SSOP-24
LC87F2416A	8-bit General	16	512	26	2	1	12/8-bit x 10ch	–	–	–	QFP-36
LC87F2J32A	8-bit General	32	1024	41	2	1	12/8-bit x 14ch	✔	✔	–	SQFP-48, QIP-48
LC87F2W48A	8-bit General	50	1536	40	2	1	12/8-bit x 14ch	✔	–	–	SQFP-48
LC87F2C64A	8-bit General	64	2048	73	4	2	12/8-bit x 16ch	✔	✔	RTC; low power consumption	QFP-80
LC87FC096A	8-bit General	96	4096	55	6	2	12/8-bit x 11ch	✔	✔	12-bit PWM x 6	QIP-64E
LC87F2608A	8-bit General	8	512	7	1	–	12/8-bit x 3ch	✔	✔	High speed 12-bit PWM; Analog Comparator	MFP-10SK
LC87F0808A	8-bit General	8	256	30	6	1	10/8-bit x 10ch	✔	✔	MCPWM; High speed ADC (10-bit); Analog Comparator/Amplifier x 2	QFP-36
LC87F0N04A	8-bit General	4.5	128	12	4	–	10/8-bit x 6ch	✔	✔	MCPWM; High speed ADC (10-bit); Analog Comparator x 2	SSOP-16
LC87F0G08A	8-bit General	8	256	18	3	–	12/8-bit x 7ch	–	–	MCPWM, OP-AMP, Analog comparator	SSOP-24
LC87F0A08A	8-bit General	8	256	30	2	–	12/8-bit x 8ch	✔	✔	OP-AMP, Analog comparator, Constant current output port	QFP-36
LC87F5VP6A	8-bit General	256	10240	89	4	2	8-bit x 15ch	–	–	Large scale memory	QIP-100E
LC88F58B0A	16-bit General	128	6144	54	2	2	12/8-bit x 11ch	–	✔	Motor control signal generator	SQFP-64
LC88FC3K0A	16-bit General	768	49152	90	4	3	12/8-bit x 16ch	✔	✔	2 x SMIC, SLIIC; RTC; CRC calculation circuit	TQFP-100
LC87F7932B	8-bit LCD	32	2048	49	2	1	12/8-bit x 7ch	–	✔	32 x 4 segment driver; RTC; low power consumption	SQFP-64
LC87F7J32A	8-bit LCD	32	1024	51	2	1	12/8-bit x 12ch	✔	✔	24 x 4 segment driver; support 5 V/3 V for LCD-panel	TQFP-64
LC87F76C8A	8-bit LCD	128	4096	71	2	1	12/8-bit x 12ch	–	–	32 x 4 segment driver	QFP-80
LC87F7DC8A	8-bit LCD	128	4096	91	2	2	12/8-bit x 15ch	–	–	54 x 4 segment driver; many segment drivers	QIP-100E
LC87F7NC8A	8-bit LCD	128	4096	91	2	2	12/8-bit x 15ch	–	–	54 x 4 segment driver; large scale memory	QIP-100E
LC87F7NJ2A	8-bit LCD	192	8192	91	2	2	12/8-bit x 15ch	–	–	54 x 4 segment driver; large scale memory	QIP-100E
LC87F7NP6A	8-bit LCD	256	8192	91	2	2	12/8-bit x 15ch	–	–	54 x 4 segment driver; large scale memory	QIP-100E

* Mask ROM Device; Contact ON Semiconductor for additional information.

MCUs for USB

MCU Features

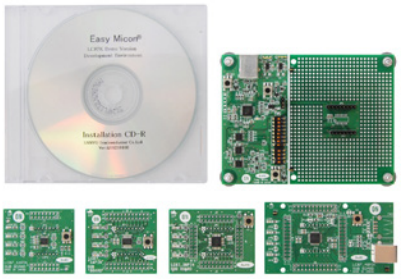
- USB 2.0 full-speed/low speed functions
- USB device function/USB host function
- Integrated voltage regulator
- USB D+ line pull-up function

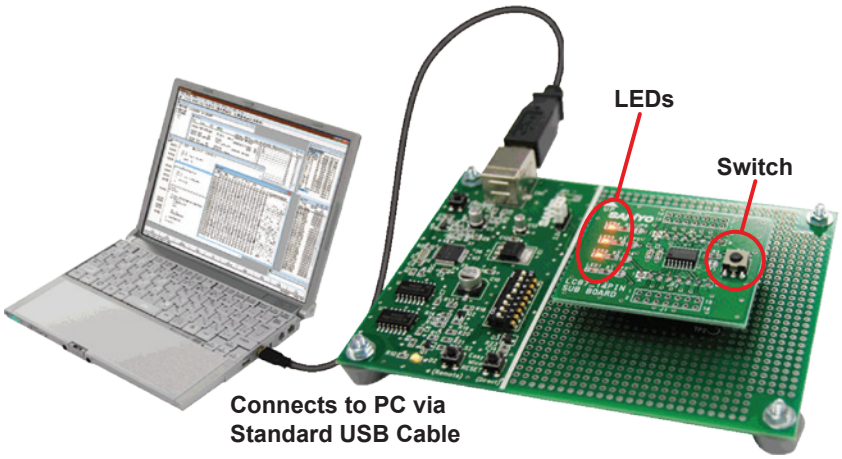
Device	Type	ROM (kByte)	RAM (Byte)	I/Os	PWMs	UARTs	ADC	LVD	POR	Features	Package
LC87F1A32A	8-bit USB	32	2048	39	2	1	12/8-bit x 12ch	–	–	IR reciever	SQFP-48
LC87F1M16A	8-bit USB	16	1024	38	2	1	12/8-bit x 20ch	✔	✔	UART & SCUART; high current driver	SQFP-48
LC87F1K64A	8-bit USB	64	8192	39	2	1	12-bit x 12ch	✔	✔	USB I/F x 2; USB Host; Audio I/F	SQFP-48
LC87F17C8A	8-bit USB	128	8192	39	2	1	12/8-bit x 12ch	✔	✔	USB 2.0 full speed host/device controller x2; audio IF	SQFP-48
LC87F1HC8A	8-bit USB	128	16384	39	2	1	8-bit x 12ch	–	–	USB Host; Audio I/F	SQFP-48
LC87F1JJ2A	8-bit USB	192	16384	39	2	1	8-bit x 12ch	–	–	USB Host; Audio I/F	SQFP-48
LC87F1JJ4A	8-bit USB	192	20480	39	2	1	8-bit x 12ch	–	–	USB Host; Audio I/F	SQFP-48
LC87F1JJ8A	8-bit USB	192	24576	39	2	1	8-bit x 12ch	–	–	USB Host; Audio I/F	SQFP-48

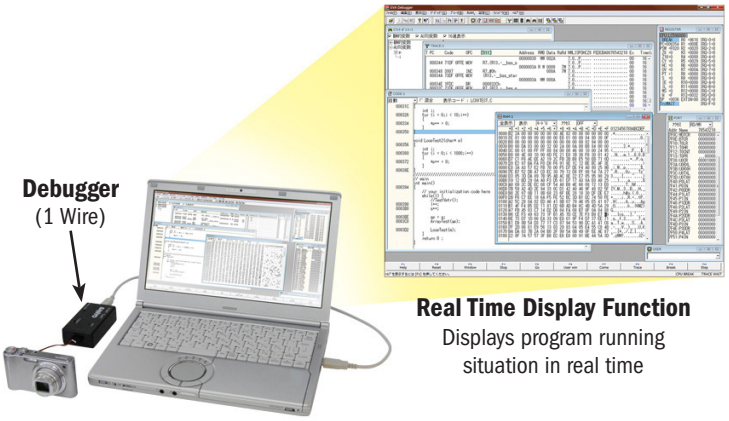
MCU Starter Kit for Software Development

Trial kit includes Main Board, Sub Board, and Development Environment CD. With Main Board as a base, it is possible to connect different Sub Boards with different pin numbers.

- 8 bit Easy Micon Development Tool
  Sub Board Line Up: 16-pin, 24-pin, 36-pin, 48-pin
- 16 bit Xstromy16 Development Tool
  Sub Board Line Up: 48-pin, 64-pin, 100-pin







MCU On-Chip Debugger System

- Software development with 1 wire communication
- Reduction of development time with Real Time Display function, Break function, and Trace function

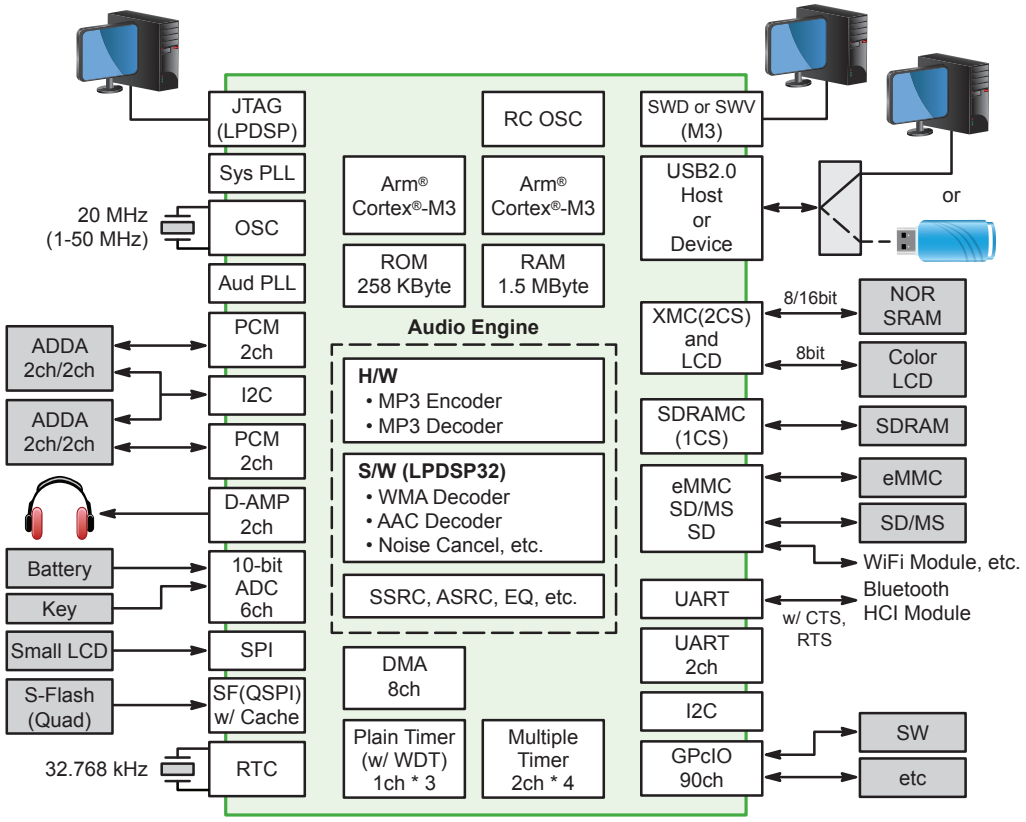
PROCESSING

Portable Sound Solution ASSP

LC823450 series high resolution, ultra-low power portable audio system solution

Features

- Ultra low power consumption
- Integrated 1656 KByte SRAM
- Arm® Cortex®-M3 Dual Core
- Proprietary 32-bit DSP Core (LPDSP32)
- DSP audio code available for MP3 codec, FLAC codec, Noise Cancel, Zoom Mic
- High resolution 32-bit & 192 KHz audio processing capability
- Integrated analog blocks for low-power Class D HP amplifier, system PLL, dedicated audio PLL
- Hard wired audio functions for MP3 encoder and decoder, EQ (6-band equalizer), ASRC (Asynchronous Sample Rate Converter)
- Integrated interfaces for USB2.0 HS device or host (not OTG), eMMC, SD card I/F
- ASRC with jitter hiding function, DSP code for SBC/AAC, UART with DMA & FIFO support for low power Bluetooth® audio



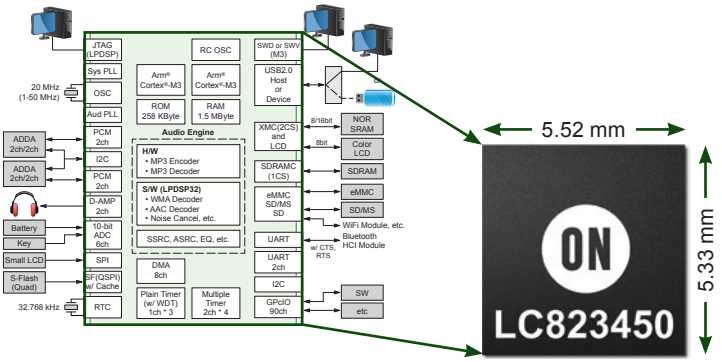
Device	Design Focus	Frequency (MHz)	RAM (KByte)	Arm Cortex-M3 Cores	SD Card I/F Channels	Features	Package
LC823450TA	Voice Recorder	160 @ 1.2 V Typ 100 @ 1.0 V Typ	1656	Single	3	Class D HP Amplifier	TQFP-128L
LC823450XC	Wearable	160 @ 1.2 V Typ 100 @ 1.0 V Typ	1656	Single	2	External LCD I/F (8-bit)	WLCSP-154
LC823450XD	High End	160 @ 1.2 V Typ 100 @ 1.0 V Typ	1656	Dual	3	Class D HP Amplifier; External LCD I/F (8-bit); HW MP3 Encoder	WLCSP-154

Portable Sound Solution ASSP

Ultra Low Power

- Over 120 hours playback with 2 x AAA battery (70% longer than popular portable music players)
- Advanced power management technology
- 4.8 mA @ 128 Kbps by MP3 hardware decoding
- 0.11 mW/MHz @ 1.0 V while Cortex®-M3 Single Core operation
- Integrated low power D class amplifier

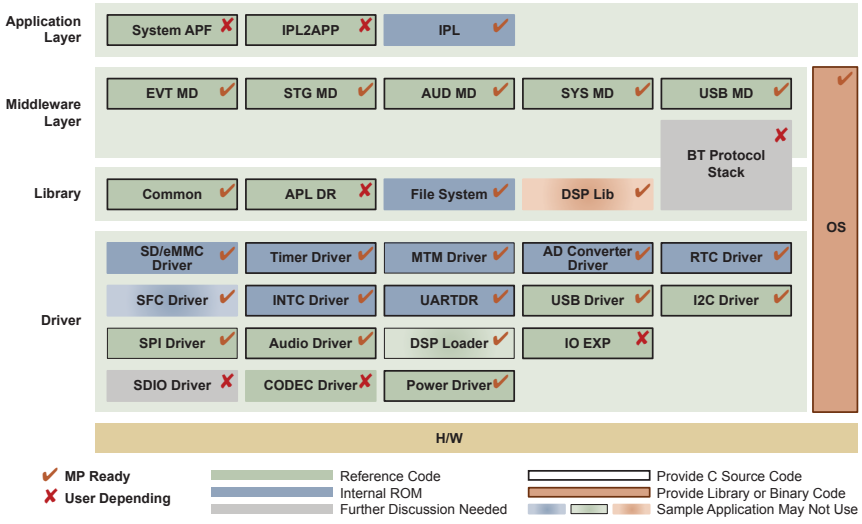
Small Footprint



- 5.52 mm x 5.33 mm WLCSP-154 suitable for portable, wearable audio
- Highly integrated SoC (CPU+DSP+AUDIO)
  - Hi-Resolution Recording/Playback capability
  - Cortex®-M3 dual core
  - Proprietary 32-bit DSP (LPDSP32)
  - 1656 Kbyte internal SRAM

Turn Key Software Support

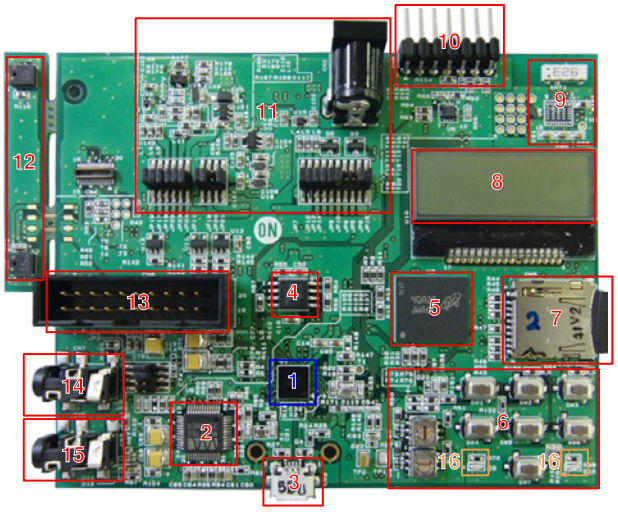
- Suitable for portable, wearable digital music
- Support wireless synchronized stereo playback



PROCESSING

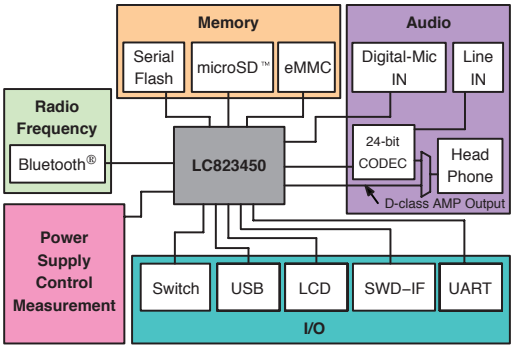
Portable Sound Solution ASSP Evaluation Kit

The LC823450XGEVK is an audio processing system Evaluation Kit used to demonstrate the LC823450. This part can record and playback, and offers high-resolution 32-bit & 192 kHz audio processing capability. It is possible to cover most of the functions necessary for portable audio with only this LSI. It has Dual CPU and DSP with high processing capability, and internal 1656K-Byte SRAM, which make it possible to implement large scale program. And it has integrated analog functions (low-power Class D HP amplifier, PLL, ADC etc.) so that PCB space and cost can be reduced, and it has various interface (USB, SD, SPI, UART, etc.) to make extensibility high. Also it is provided with various function including SBC/AAC codec by DSP and UART and ASRC (Asynchronous Sample Rate Converter) for Bluetooth audio. Low power consumption makes it suitable for portable audio devices, such as wireless headsets.



1 LC823450
2 Audio CODEC
3 USB Connector
4 Serial Flash
5 eMMC
6 Switches
7 microSD™
8 LCD
9 Bluetooth®
10 UART Connector
11 Power Supply Control
12 Digital Mic
13 ICE Connector
14 Headphone
15 Line Input
16 LEDs

LC823450XGEVK Evaluation Board



LC823450XGEVK Block Diagram

Features

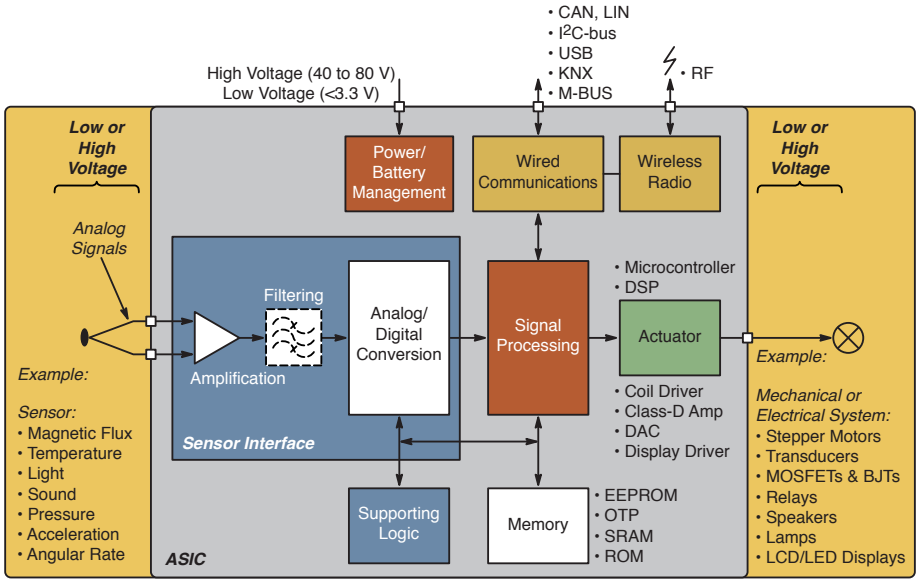
- File Transfer Connecting to PC with USB
- MP3 Recording with USB Bus Power Supply
- MP3 Playback with USB Bus Power Supply
- Measurement of Current Consumption

PROCESSING

Mixed-Signal Custom Solutions

Value Proposition

- Experienced resources and assets to bring customers' design objectives successfully to market
- Ability to integrate customers' IP into single-chip solution, thereby protecting the IP
- Flexible cost models to reduce customers' total cost



Design Engineering

- Approximately 200 expert mixed-signal designers with extensive SoC and SiP experience
- Robust custom development process
- Dedicated project managers track & report development progress
- Flexible customer development engagement – from full turnkey to subcontractor production services
- Design expertise in:
  - » Sensor interface
  - » Wireless systems
  - » Medical imaging
  - » Energy management
  - » Building & home control

IP & Fab Processes

- ≥55 nm, analog-focused CMOS/BCDMOS process technologies utilizing internal fabs and external foundry partners
- Low, medium, high voltages – ≤1 V to 90 V
- Low current optimization – active & standby
- Low noise design – "count the electrons"
- High temperature – ≤200°C (profile, for selected technologies)
- Integrated low power wireless
- Non-Volatile Memory (EEPROM, OTP), RAM & ROM
- Embedded digital IP
- Robust ESD protection
- Extensive building block 'starting points' consisting of amplifiers, references, DACs, ADCs, linear & switching regulators, power management, etc.

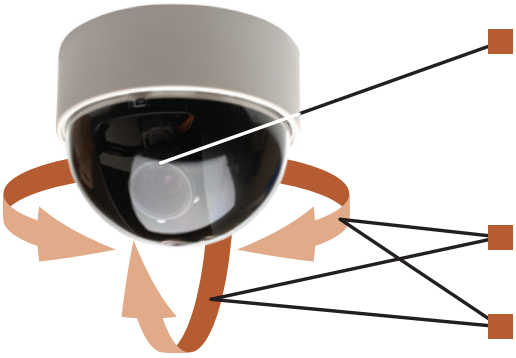
Category	Mixed Signal Intellectual Property (IP)
Serial Interfaces	USB 3.0/2.0/1.1, HDMI, MIPI, I2C, SPI, CAN, UART
Microprocessors	Arm, RCore DSP, R8051, AMBA/AHB/APB Peripherals
Memory	SRAM, DPRAM, ROM, EEPROM, OTP, FLASH
Clocking	Oscillators, PLLs, DLLs
Communication	Wireless (Proprietary & Standards), Wired (KNX, PLC and others)
Encryption	ECC, AES, 3-DES, DES, RSA
Data Converters	DAC, ADC (8 - 20 bits, 1 KSPS – 120 MSPS)
Wireless IP	PGA, LNA, PLLs, Correlators, DSP
Power Management	Efficient Switching Regulators, LDOs, Charge Pumps, Thermal Protection
References	Precision Bandgaps, Current References, Temperature Sensors
Analog and High Voltage Interfaces	High-Voltage Drivers, Display and LCD Drivers, Class D Amplifiers
Signal Conditioning	PGA, Instrumentation Amps, Digital and Analog Filters

Motor Drive for Small Motor Control

Stepper Motor Driver for Paper Feed – DC 3~12 V
LV8716QA, LV8711T, LV8712T, LV8713T,
LB1935FA, LB1940T, LV8548MC, LV8549MC

DC Motor Driver for Paper Cut – DC 3~12 V
LB1938FA, LV8417CS

Hand Terminal (POS) Printer



Stepper Motor Driver for Zoom/Focus – DC 5 V
LV8414CS, LV8411GR, LV8413GP, LV8716QA

Stepper Motor Driver for Panning/Tilt - DC 12 V
LV8714TA, LV8711T, LV8712T, LV8713T,
LV8402GP, LV8548MC

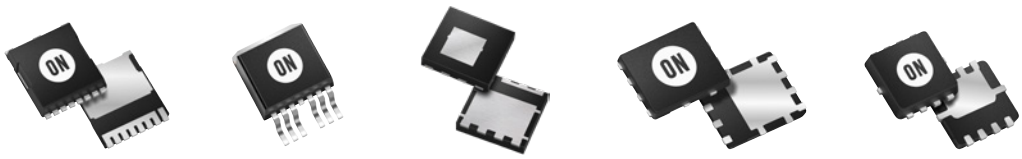
Stepper Motor Driver for Panning/Tilt - DC 24 V
LV8729V, LV8731V

Security Camera

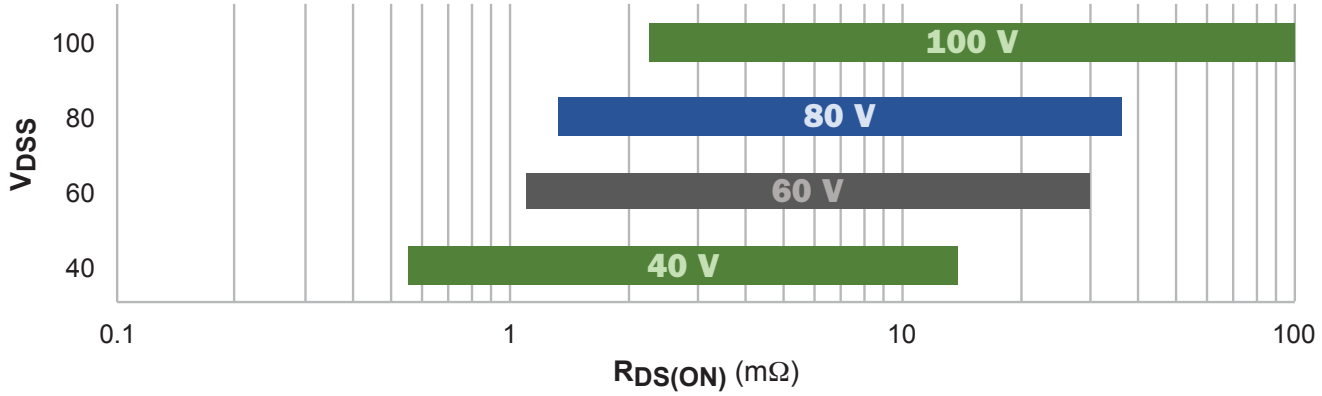
Device	Motor	V_M Max (V)	V_{CC} Max (V)	Motor Current Max (A)	Step Resolution	Control Type	PWM Constant Current	Protection	Package(s)
LV8413GP	Stepper / 2 x Brush DC	6	6	0.4	Half	Parallel	None	TSD, UVLO	VCT-16
LV8411GR	2 x Stepper / 4 x Brush DC	6	6	0.4	Half	Parallel	None	TSD, UVLO	VCT-24
LV8414CS	2 x Stepper	6	6	0.4	1/64	Clock	Included	TSD, UVLO	WLP-32K
LB1935FA	Stepper	8	–	0.4	Full Step	Parallel	None	TSD	Micro10
LB1938FA	Brush DC	10.5	–	0.8	–	Parallel	None	TSD, UVLO	Micro8
LB1940T	Stepper	10.5	–	0.4	Half	Parallel	None	TSD	TSSOP-20
LV8417CS	Brush DC	12.6	6	1	–	Parallel	None	TSD, UVLO	WLP-9
LV8716QA	Stepper / 2 x Brush DC	12.6	–	1	Half	Parallel	Included	TSD, UVLO	QFN-16
LV8402GP	Stepper / 2 x Brush DC	16	6	1.4	Half	Parallel	None	TSD, UVLO	VCT-24
LV8711T	Stepper / 2 x Brush DC	18	6	0.8	Half	Parallel	Included	OCP, TSD, UVLO	TSSOP-24
LV8712T	Stepper	18	6	0.8	1/8	Clock	Included	TSD, UVLO	TSSOP-24
LV8713T	Stepper	18	6	0.8	1/32	Clock	Included	TSD, UVLO	TSSOP-24
LV8714TA	2 x Stepper	18	–	1.5	Free	Parallel	Included	OCP, TSD, UVLO	TQFP-48 EP
LV8548MC	Stepper / 2 x Brush DC	20	–	1	Half	Parallel	None	TSD, UVLO	SOIC-10
LV8549MC	Stepper	20	–	1	Full Step	Parallel	None	TSD, UVLO	SOIC-10
LV8702V	Stepper	36	–	2.5	Quarter	Clock	Included	Stall, OCP, TSD, UVLO	SSOP-44J EP
LV8729V	Stepper	36	–	1.8	1/128	Clock	Included	OCP, TSD, UVLO	SSOP-44K EP
LV8731V	Stepper / 2 x Brush DC	36	–	2	1/16	Clock/Parallel	Included	OCP, TSD, UVLO	SSOP-44K EP

Power MOSFETs for Motor Control

ON Semiconductor offers an expansive portfolio of power MOSFETs, utilizing advanced Trench technology. Devices that enable increased system level efficiency through low conduction losses, and low switching losses, are available in a range of standard and innovative packages.



TO-Leadless | D2PAK 7L | DualCool® Power88 | SO-8 FL | μ8FL

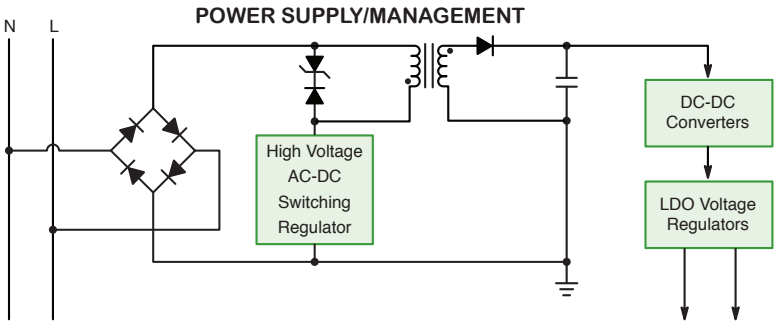


N-Channel Power MOSFETs

Device	Type	V_{DSS} (V)	$R_{DS(ON)}$ (mΩ)	$Q_{G(TOT)}$ (nC)	Package
FDBL0065N40	Single	40	0.65	220	TO-LL (H-PSOF)
FDBL0110N60	Single	60	1.1	170	TO-LL (H-PSOF)
FDBL0150N80	Single	80	1.4	172	TO-LL (H-PSOF)
FDBL0200N100	Single	100	2	95	TO-LL (H-PSOF)
FDBL0630N150	Single	150	6.3	70	TO-LL (H-PSOF)
FDB0105N407L	Single	40	0.8	208	D2-PAK 7L (TO-263)
FDB0170N607L	Single	60	1.4	173	D2-PAK 7L (TO-263)
FDB0165N807L	Single	80	1.6	217	D2-PAK 7L (TO-263)
FDB1D7N10CL7	Single	100	1.7	116	D2-PAK 7L (TO-263)
FDB0630N1507L	Single	150	6.4	97	D2-PAK 7L (TO-263)
FDMD85100	Half Bridge	100	9.9	22	PQFN-8
FDMD8580	Half Bridge	80	4.6	57	PQFN-8
FDMD8560L	Half Bridge	60	3.2	92	PQFN-8
FDMD8540L	Half Bridge	40	1.5	81	PQFN-8
FDMD82100	Half Bridge	100	19	12	PQFN-12
FDMD8280	Half Bridge	80	8.2	31	PQFN-12
FDMD8260L	Half Bridge	60	5.8	49	PQFN-12
FDMD8240L	Half Bridge	40	2.6	40	PQFN-12

Device	Type	V_{DSS} (V)	$R_{DS(ON)}$ (mΩ)	$Q_{G(TOT)}$ (nC)	Package
NTMFS5C404NLT	Single	40	0.67	181	SO-8FL (DFN-5)
NTMFS5C604NL	Single	60	1.2	52	SO-8FL (DFN-5)
NTMFS6H800N	Single	80	2.2	82	SO-8FL (DFN-5)
FDMS86180	Single	100	3.2	60	Power56
FDMC8360L	Single	40	2.1	57	Power33
NTTFS5C453NL	Single	40	3	35	u8FL
FDMC86570L	Single	60	4.3	63	Power33
FDMC86340	Single	80	6.5	38	Power33
FDMC86184	Single	100	8.5	21	Power33
FDMT80040DC	Single	40	0.56	241	PQFN-8 (Power88)
FDMT80060DC	Single	60	1.1	170	PQFN-8 (Power88)
FDMT80080DC	Single	80	1.35	195	PQFN-8 (Power88)
FDMT800100DC	Single	100	2.95	79	PQFN-8 (Power88)
FDMT800120DC	Single	120	4.2	76	PQFN-8 (Power88)
FDMT800150DC	Single	150	6.5	77	PQFN-8 (Power88)

Power Supply/Management, Voltage Regulation

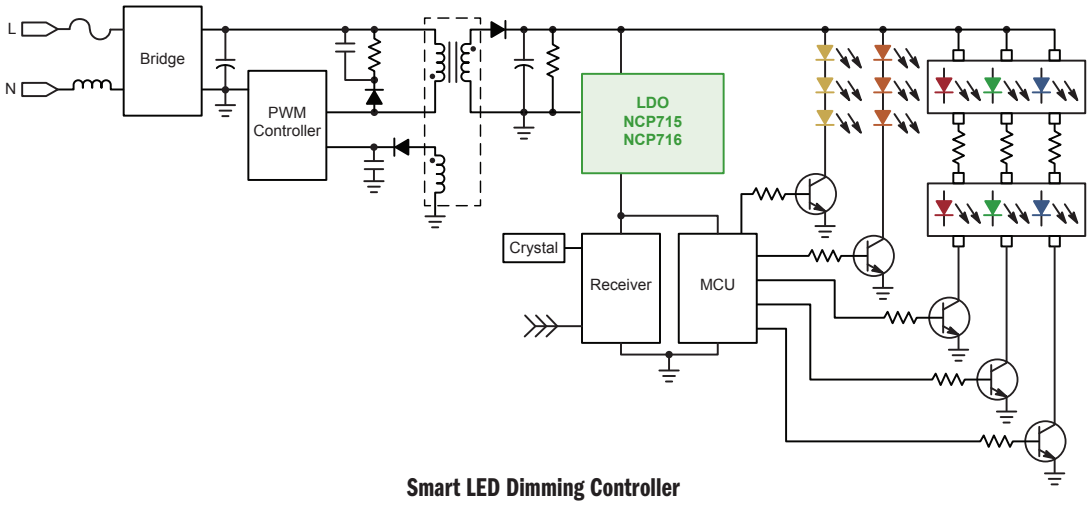


	Device	Function	Features	Package
AC-DC	FSL3276A/306LR/336LR	High Voltage Rugged Buck Switcher	• 650 V, $R_{DS(ON)}$ = 30/18/4 Ω, 50 kHz, with enhanced protection	PDIP-7, LSOP-7
	NCP1010~15 NCP1070~77	Self-Supply High Voltage Monolithic Switching Regulator for Low Power Offline Power Supplies	• Dynamic self-supply, no need of an auxiliary winding • Current-mode fixed frequency (options of 65 kHz, 100 kHz, 130 kHz)	PDIP-7, SOT-223
	NCP1075~79A/B	Enhanced Switcher for Robust, Highly Efficient Power Supplies	• 700 V, 2.9 to 13.5 Ω with enhanced protection	PDIP-7
	NCP1124/26/29	High Voltage Monolithic Switching Regulator for Medium Power Offline Power Supplies	• 650 V, 9/6/2 Ω rugged FET current-mode fixed frequency (65 kHz, 100 kHz)	PDIP-7
DC-DC	NCP3170	3 A Switching Regulator	• Output voltage adjustable to 0.8 V • 500 kHz or 1 MHz switching frequency	SOIC-8
	NCP3063/4	1.5 A Switching Regulator or utilize as controller for up to 5 A	• Capable of 40 V input • Up to 250 kHz switching frequency	SOIC-8
	LM2594/5/6	0.5 A/1.0 A/3 A Switching Regulators	• Capable of 40 V input • Fixed 150 kHz switching frequency	TO-220, DPAK, SOIC-8, PDIP-8
	NCP3020/11	PWM Controller	• 4.7-28 V input voltage range • EN/PG/SYNC features • Fixed 300/400/600 kHz switching frequency	SOIC-8, TSSOP-14
	NCP1034	PWM Controller	• Capable of up to 100 V input • Adjustable switching frequency (50-500 kHz)	SOIC-16

LDO Regulators

Device	I_{out} (mA)	Dropout Typ @ 3.3 V (mV)	I_q (μA)	P_{SRR} @ 1 kHz (dB)	V_{in} Max (V)	V_{out} (V)	Package(s)
NCP785A	10	–	12	80	450	3.3, 5.0, 12, 15	SOT-89-3
NCP786A	10	–	10	65	450	1.275	DFN-6
NCP508	50	180	145	70	13	1.5, 1.8, 2.5, 2.8, 3.0, 3.3	SC-70-5, WDFN-6
NCP715	50	350	4.7	52	24	1.2, 1.5, 1.8, 2.5, 3.0, 3.3, 5.0	SC-70-5, XDFN6
NCP716	80	350	4.7	52	24	1.2, 1.5, 1.8, 2.5, 3.0, 3.3, 5.0	SC-70-5, XDFN6
NCP171*	80	41	0.05/50	65	6	0.8, 1.0, 1.2, 1.65, 1.8, 2.5, 2.8, 3.0, 3.3	XDFN-4
NCP781	100	–	2.5	80	150	Adj., 1.5, 3.3, 5.0, 12.0, 15.0	DFN-6
NCP120	150	30	80	72	6	0.8, 1.05, 1.1, 1.15, 1.2, 1.5, 1.8, 2.1	XDFN-6
NCP571	150	450	40	–	12	0.8, 0.9, 1.0, 1.2	TSOP-5, DFN-6
NCP170	150	240	0.5	40	5.5	1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3	SOT-563, XDFN-4, TSOP-5
NCP716B	150	70	3.2	55	24	3.0, 3.3, 5.0	TSOP-5
NCP700B	200	118	70	82	5.5	1.8, 2.8, 3.0, 3.3	WDFN-6, TSOP-5
NCP702	200	140	10	68	6	1.8, 2.8, 3.0, 3.3	XDFN-6, TSOP-5
NCP752	200	130	12	68	6	1.8, 2.8, 3.0, 3.3	SOT-23-5, XDFN-6
NCP160	250	120	20	100	6	1.8, 2.5, 2.8, 2.85, 3.0, 3.3, 3.5, 4.5, 5.0, 5.14	XDFN-4, WLCSP-4
NCP163	250	80	12	92	6	1.8, 2.6, 2.8, 2.85, 2.9, 2.925	XDFN-4, WLCSP-4
NCP703	300	180	12	68	6	1.8, 2.8, 3.0, 3.3	XDFN-6, TSOP-5
NCP130	300	60	80	75	6	0.8, 1.05, 1.1, 1.15, 1.2, 1.5, 1.8, 2.1	XDFN-6
NCP718	300	300	4	60	24	1.2, 1.5, 1.8	TSOT-23, WDFN-6
NCP161	450	120	20	100	6	1.8, 2.5, 2.8, 2.85, 3.0, 3.3, 3.5, 4.5, 5.0, 5.14	XDFN-4, WLCSP-4
NCP3335A	500	250	190	75	18	Adj., 1.5, 1.8, 2.5, 2.8, 2.85, 3.0, 3.3, 5.0	Micro8, DFN-10
NCP3334	500	250	190	75	18	Adj.	SOIC-8
NCP705	500	250	12	70	6	0.8, 1.8, 2.8, 3.0, 3.3	SOT-223-6, WDFN-6
NCP5500	500	230	300	75	18	Adj., 1.5, 5.0	DPAK-5, SOIC-8
NCP133	500	140	80	72	6	Adj, 0.9, 1.0, 1.05, 1.1, 1.15, 1.2, 1.25, 1.3, 1.8	XDFN-6
NCP137	700	40	35	85	6	Adj.	WLCSP-6
NCP186	1 A	100	90	75	6	1.2, 1.75, 1.8, 1.85, 2.5, 2.8, 3.0, 3.3, 3.5, 3.9	XDFN-8
NCP187*	1.2 A	180	30	75	6	1.2, 1.8, 3.3	DFN-6
NCP59748	1.5 A	60	–	70	6	Adj.	DFN-10, QFN-20
NCP59744	3 A	100	–	70	6	Adj.	QFN-20

* Pending 2Q19.

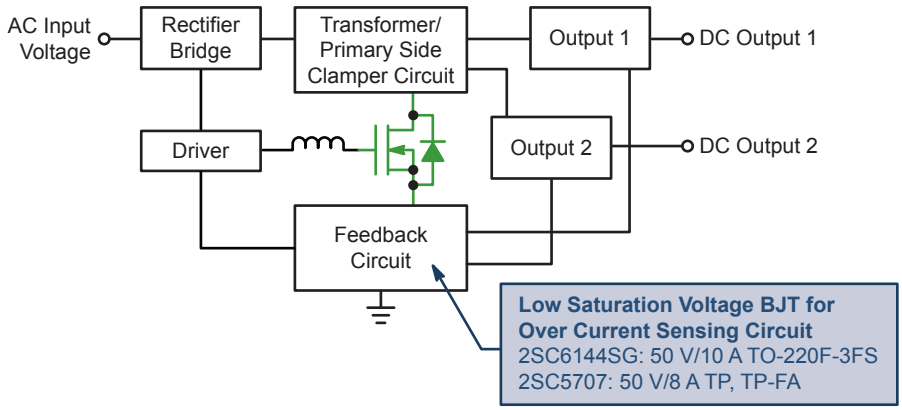


Smart LED Dimming Controller

Power MOSFETs for Circuit Breakers and Metering Power Supplies

Features

- High reliability
- Low power dissipation
- Avalanche ruggedness
- High-speed switching



Power Source Voltage	Device	V_{DDS} (V)	I_D (A)	$R_{DS(ON)}$ (Ω) @ 10 V		C_{iss} (pF)	Q_g (nC)	G-S Protection Diode	Package
				Typ	Max				
≤AC 240 V	BFL4004	800	6.5	1.9	2.5	710	36	–	TO-220F
	BFL4026	900	5	2.8	3.6	650	33	–	TO-220F
	BFL4001	900	6.5	2.1	2.7	850	44	–	TO-220F
AC 380 V to 480 V	2SK4177	1500	2	10	13	380	37.5	Built in	TO-263 (D2PAK)
	2SK3748	1500	4	5	7	790	80	Built in	TO-3PF
	NDFPD1N150C	1500	0.1	100	150	80	4.2	–	TO-220F
	NDFP03N150C	1500	2.5	8	10.5	650	34	–	TO-220F
	NDTL03N150C	1500	2.5	8	10.5	650	34	–	TO-3P
	NDUL03N150C	1500	2.5	8	10.5	650	34	–	TO-3PF
	NDUL09N150C	1500	9	2.2	3	2025	114	–	TO-3PF
AC 590 V to 690 V	WPH4003	1700	3	8.2	10.5	850	48	–	TO-3PF

MOSFET Drivers

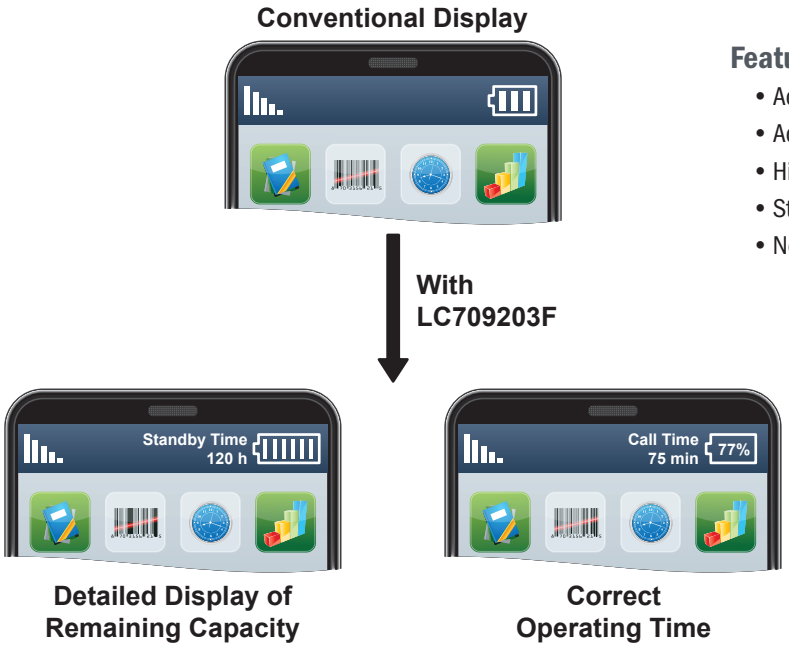
Features

- Drives high voltage power MOSFETs and IGBTs, provides two outputs
- Suitable for multiple topologies like half-bridge, asymmetrical half-bridge, active clamp, full bridge
- High voltage range, up to 600 V
- Robust devices with dV/dt immunity of ±50 V/ns
- Pin to pin compatible with industry standards

Device	Function	Type	No of Drivers	Package
NCP5104	Single Input High and Low Side Power MOSFET Driver	Half-Bridge	2	SOIC-8, PDIP-8
NCP5111	Single Input Half-Bridge Power MOSFET or IGBT Driver	Half-Bridge	2	SOIC-8, PDIP-8
NCP5106A/B	Dual Input High Voltage High and Low-Side MOSFET or IGBT Driver	Half-Bridge	2	SOIC-8, PDIP-8
NCP5304	Dual Input High Voltage High and Low-Side MOSFET or IGBT Driver	Half-Bridge	2	SOIC-8, PDIP-8
NCP5181	Dual Input High Voltage High and Low-Side MOSFET or IGBT Driver	Half-Bridge	2	SOIC-8, PDIP-8
NCP5183	Dual Input High Voltage High and Low-Side MOSFET or IGBT Driver	Half-Bridge	2	SOIC-8
NCP81075	Dual Input High Voltage High and Low-Side MOSFET Driver	Half-Bridge	2	SOIC-8, DFN-8, WDFN-10
NCP80180	Dual Input High Voltage High and Low-Side MOSFET Driver	Half-Bridge	2	SOIC-8, DFN-8

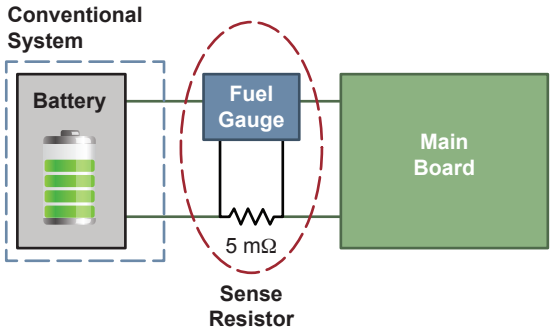
LC709203F High Accuracy Fuel Gauge LSI

Fuel Gauge for 1 Cell Li+ with Low Power and with No Sense Register



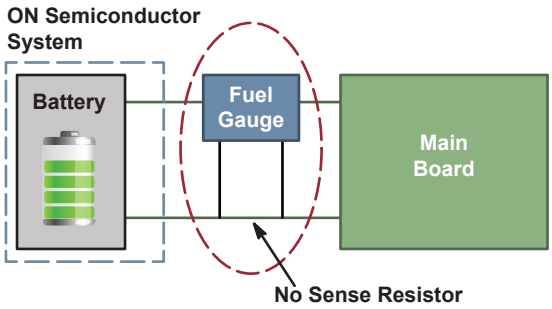
Features

- Accuracy of remaining capacity ±2.8% (0 ~ +50°C)
- Active mode current of 15 μA
- Hibernate mode current of 2 μA
- Standby mode current (RAM retention) of 0.1 μA
- No need for sense resistor for current detection



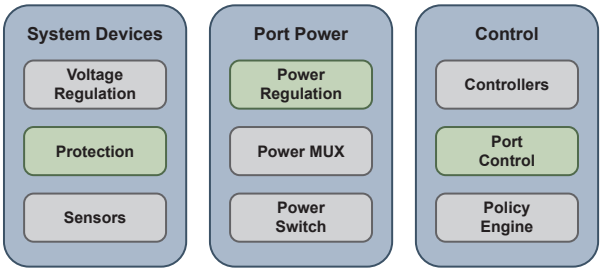
ON Semiconductor Solution (No Sense Resistor)

- No power loss
- No heat generation

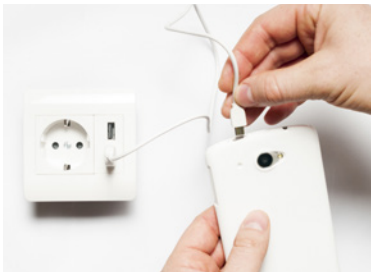


USB Wall Receptacle

Wall receptacles that include direct USB cable connections are becoming increasing popular for charging mobile devices. ON Semiconductor offers high performance, high density USB-C (Type-C) power supplies for the USB wall receptacle solutions.



Block Diagram



System Devices

Function	Device	Description
Protection	NIS5135	Electronic Fuse, 5 V
	ESD5581	ESD Protection, Bidirectional, 5 V, 10 pF
	NSPM2052	ESD and Surge Protection Device, Vbat and Vbus Applications, 5 V
	NSPM0061	ESD and Surge Protection, 6.3 V
	NSPM0101	ESD and Surge Protection, 10 V, 60 A
	NSPM5131	ESD and Surge Protection Device, Unidirectional, 13.5 V

Power Port

Function	Device	Description
Power Regulation	NCP1342	Quasi-Resonant Flyback Controller with Valley Lock-Out Switching
	NCP4305	Secondary Side Synchronous Rectification Driver for High Efficiency SMPS Topologies
	NCP4306	Secondary Side Synchronous Rectification Driver for High Efficiency SMPS Topologies
	NCP43080	Synchronous Rectifier Controller with LLD Function

Control

Function	Device	Description
Port Control	FUSB302TMPX	Programmable USB Type-C Controller with PD (Default SRC)
	FUSB3301MPX	USB Type-C Source-Only Controller

USB 2.0

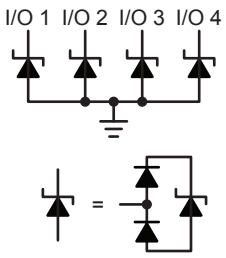
One High Speed Pair, VCC, Low Capacitance ESD Protection

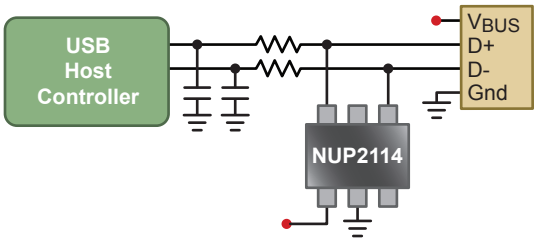
Key Requirement

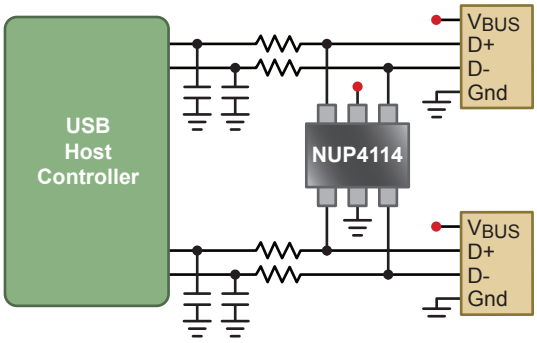
- Cap < 5 pF

Features

- 0.35 - 3.0 pF
- Multi-part solutions available
- Industry leading low clamping voltage







Device	Data Lines	Capacitance (pF)	Package	Size (mm)
NUP2114UPX	1 Pair (D+/-) + Vbus	0.8	SOT-553	1.2 x 1.6
NUP2114UCM	1 Pair (D+/-) + Vbus	0.8	TSOP-6	3.0 x 2.75
ESDL3552	1 Pair (Tx, Rx, D+/-)	0.25	X4DFN-3	0.62 x 0.32
NUP4114UPX	2 Pair (D+/-) + Vbus	0.5	SOT-563	1.6 x 1.6
NUP4114UCL	2 Pair (D+/-) + Vbus	0.5	SC-88	2.0 x 2.1
NUP4114H	2 Pair (D+/-) + Vbus	0.5	TSOP-6	3.0 x 2.75
ESDL2031	Single Line (Tx, Rx, D+/-)	0.4	X4DFN-2	0.6 x 0.3
ESDL1531*	Single Line (Tx, Rx, D+/-)	0.2	X4DFN-2	0.445 x 0.24
ESD7L5.0	2	0.5	SOT-723	1.2 x 1.2
ESD8351MUT	1	0.37	X3DFN-2	0.6 x 0.3
ESD8351P2T	1	0.37	SOD-923	1.0 x 0.6
ESD9L5.0	1	0.5	SOD-923	1.0 x 0.6

* Pending 2Q19.

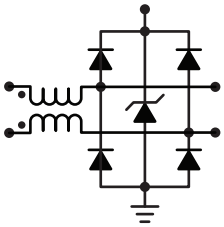
One High Speed Pair, V_{CC}, Common Mode Filter + ESD Protection

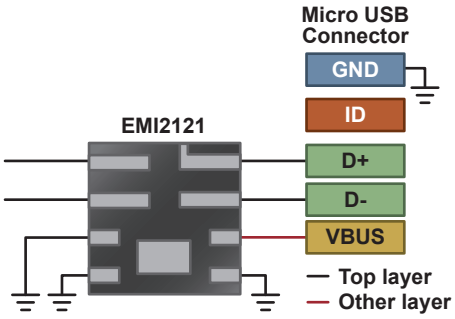
Key Requirement

- Cap < 5 pF
- Common Mode Filtering

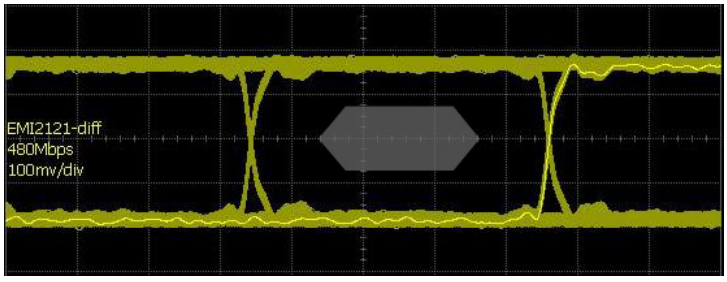
Features

- 0.5 - 0.8 pF
- Integrated EMI suppression with ESD protection
- Industry leading low clamping voltage

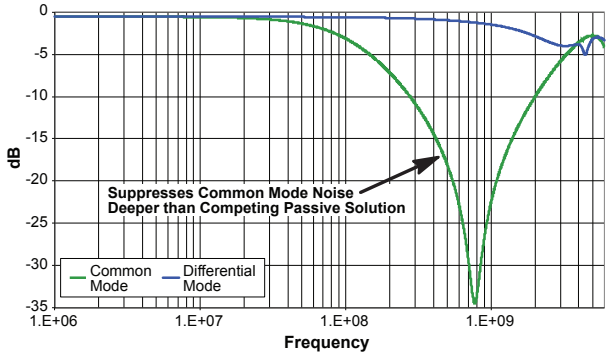




Device	Pairs	Capacitance @ 2.5 V (pF)	CM Attenuation @ 800 MHz (-dB)	DM Bandwidth F3dB (GHz)	Package	Size (mm)
EMI2121	1	0.9	-25	2.5	WQFN-8	2.2 x 2.0 x 0.75



USB 2.0 @ 480 Mb/s



PROTECTION

Ethernet: 10/100BASE-T, 1000BASE-TX, and Gigabit

Four Pairs, Low Capacitance Surge and ESD Protection

The 1000BASE-T or Gigabit Ethernet interface operating at higher bitrates is susceptible to ESD strikes, cable-discharge events and lightning-induced transients. Our products help meet IEC 61000-4-5, GR-1089-CORE and other Standards.

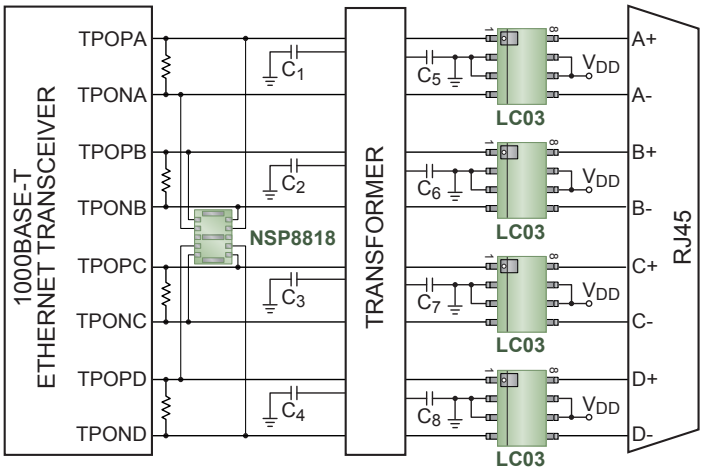
Features

- Line-to-line capacitance < 3 pF
- V_{clamp} (25 A surge) < 11 V
- IEC 61000-4-2 rating > 30 kV
- No latching danger
- Surge rating maintained to 125°C

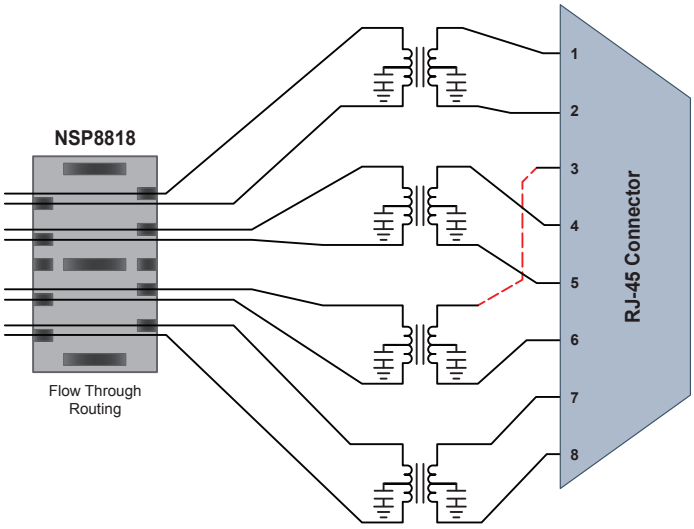
Benefits

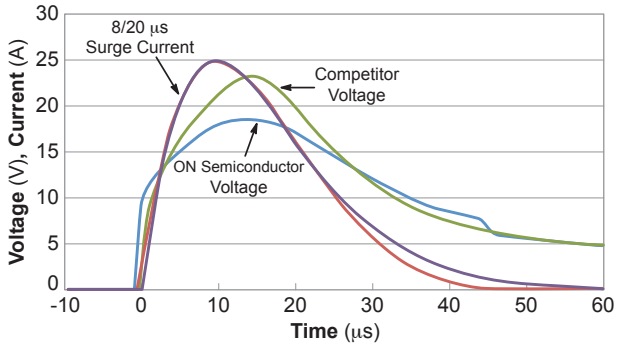
- Compatible with Gb Ethernet and beyond
- Enhanced protection for downstream electronics
- Accommodates operating transients above 3.3 V
- Small form-factor allows integration into connectors

Typical Application



Line Side : LC03-6 (optional)
Transformer Side: NSP8818
Protection against metallic (transverse) strikes





Line-to-Line Surge

Surge Protection

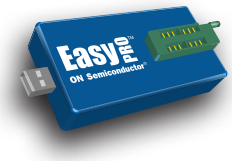
Device	V_{DC} Max (V)	Line Transient Max (V)	Surge I_{PP}, 8/20 µs (A)	Typical Line-Line Capacitance (pF)	ESD Contact Rating (kV)	Package
LC03-6	6.7	7.0	100	8.0	±30	SOIC-8
NSP4201	5.0	6.0	25	1.5	±30	TSOP-6
NSP8814	3.0	3.2	35	1.5	±30	UDFN-8
NSP8818	3.0	3.2	35	1.5	±30	UDFN-10
NUP4114H	5.0	5.0	12*	0.4	±13	TSOP-6
SRDA3.3	3.3	5.0	25	4.0	±8	SOIC-8
SRDA05	5.0	7.0	23	5.0	±8	SOIC-8

* On Pin 5.

EEPROMs for Configuration and Calibration

Features

- Broad density range: 1 kb to 2 Mb
- Wide operating Vcc range: 1.7 V to 5.5 V
- High endurance: 1 million program/erase cycles
- Wide temperature range: industrial and extended



EasyPRO™ is a user-friendly, portable programming tool for ON Semiconductor serial EEPROMs (I2C, SPI, Microwire)

EEPROMs

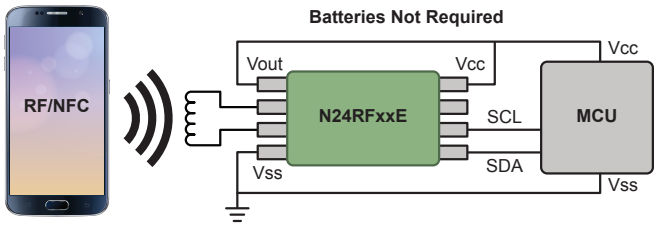
Data Transmission Standard	Density	Organization*	Vcc Min (V)	Vcc Max (V)	fCLK Max (MHz)	Package(s)
I2C	1 Mb	128k x 8	1.7, 1.8	5.5	0.4, 1	US8, SOIC-8, TSSOP-8, UDFN-8, TSOT23-5, WLCSP-4, WLCSP-5, WLCSP-8
	512 kb	64k x 8				
	256 kb	32k x 8				
	128 kb	16k x 8				
	64 kb	8k x 8				
	32 kb	4k x 8				
	16 kb	2k x 8				
	8 kb	1k x 8				
	4 kb	512 x 8				
	2 kb	256 x 8				
SPI	2 Mb	256k x 8	1.7, 1.8	5.5	10, 20	SOIC-8, TSSOP-8, UDFN-8
	1 Mb	128k x 8				
	512 kb	64k x 8				
	256 kb	32k x 8				
	128 kb	16k x 8				
	64 kb	8k x 8				
	32 kb	4k x 8				
	16 kb	2k x 8				
	8 kb	1k x 8				
	4 kb	512 x 8				
	2 kb	256 x 8				
	1 kb	128 x 8				
Microwire	16 kb	2k x 8 / 1k x 16	1.65, 1.8	5.5	2, 3, 4	SOIC-8, TSSOP-8, UDFN-8
	16 kb	2k x 8 / 1k x 16				
	8 kb	1k x 8 / 512 x 16				
	8 kb	1k x 8 / 512 x 16				
	4 kb	512 x 8 / 256 x 16				
	2 kb	256 x 8 / 128 x 16				
	1 kb	128 x 8 / 64 x 16				
	1 kb	128 x 8 / 64 x 16				

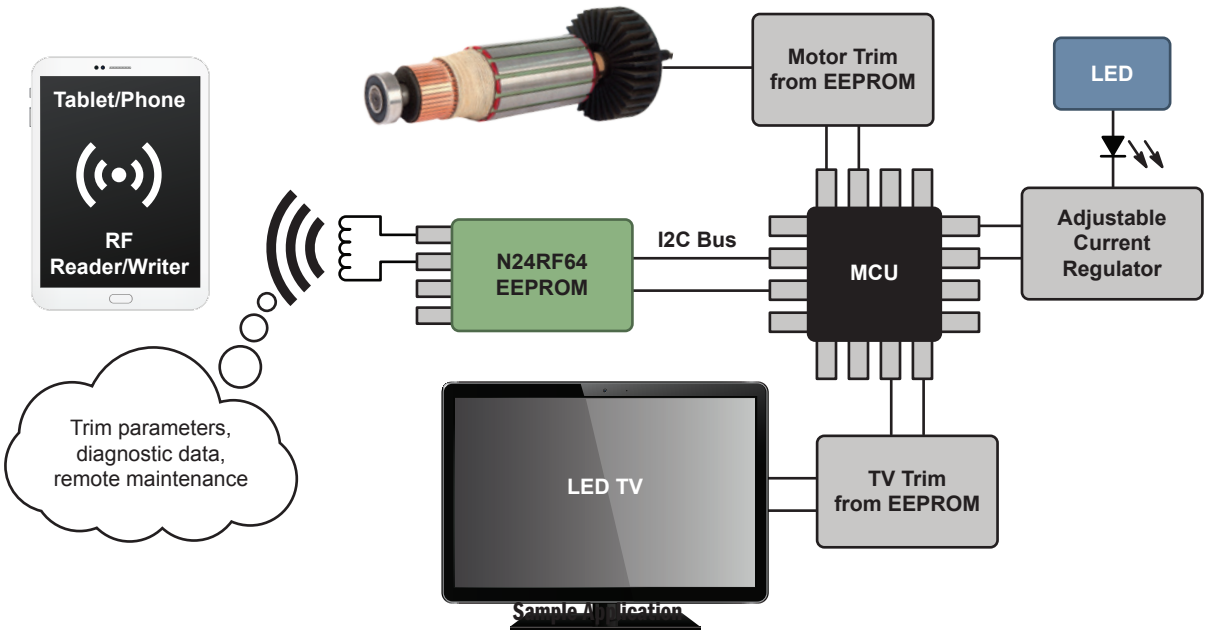
* Organization for Microwire devices is selectable.

RF/NFC EEPROM

Features

- RF/NFC interface for contactless transmission of data up to 150 cm
- ISO 15693 / ISO 18000-3 Mode 1 Compliant RF/NFC at 13.56 MHz
- 2,000,000 Program / Erase Cycles
- 200 year data retention
- 64-bit Unique Identifier (UID)
- Multiple 32-bit passwords and Lock Feature
- I2C Interface
  - 4 selectable slave addresses using pins A0 ad A1
  - 1 MHz bus speeds
- Energy harvesting output pin; able to power small peripheral or MCU





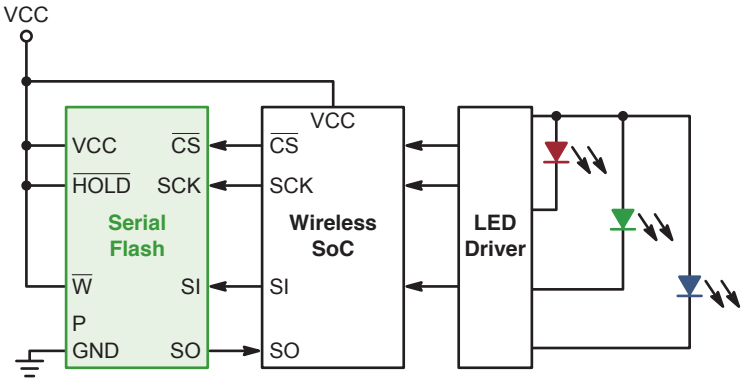
RF EEPROMs

Device	Memory Density (kb)	Energy Harvesting Output	Temperature Range	Package(s)
N24RF64E	64	Yes	-40 to +105°C	SOIC-8, TSSOP-8
N24RF64	64	No	-40 to +105°C	SOIC-8, TSSOP-8
N24RF16E	16	Yes	-40 to +105°C	SOIC-8, TSSOP-8
N24RF16	16	No	-40 to +105°C	SOIC-8, TSSOP-8
N24RF04E	4	Yes	-40 to +105°C	SOIC-8, TSSOP-8
N24RF04	4	No	-40 to +105°C	SOIC-8, TSSOP-8

Serial NOR Flash

Features

- Faster data rewrite (Sector Erase/Page Program)
- Lower power consumption with efficient rewrite operation
- 20-year data retention with no data deterioration
- Consistent Sector Erase operation time (t_{SE}) over device lifetime
- Industry's fastest WRITE performance minimizes system risk during field firmware upgrades



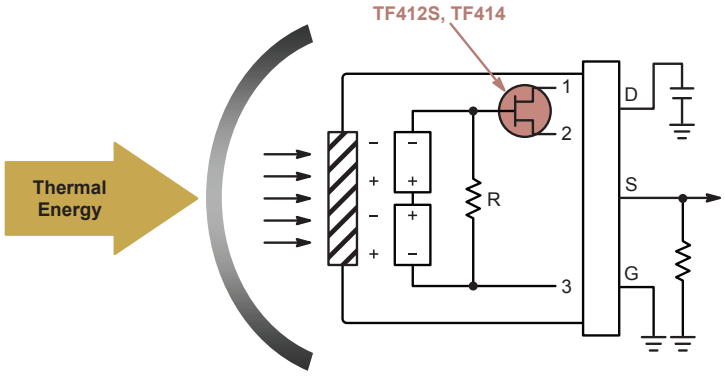
Smart LED Block Diagram

Device	Density	Power Supply (V)	Sector Erase Time (ms)	Page Program Time (ms)	Read/Write Current (mA)	Package
LE25S20	2 Mb	1.65 - 1.95	80	3	6 Read; 15 Write	SOIC-8, VSOIC-8
LE25U20A	2 Mb	2.3 - 3.6	80	4	6 Read; 15 Write	SOIC-8, VSOIC-8, WDFN-8
LE25U40C	4 Mb	2.3 - 3.6	80	4	6 Read; 15 Write	SOIC-8, VSON-8, VDFN-8
LE25S40	4 Mb	1.65 - 1.95	80	6	6 Read; 15 Write	SOIC-8, VSOIC-8, VDFN-8, VSON-8
LE25W81	8 Mb	2.45 - 3.6	100	0.3	6 Read; 15 Write	VSON-8, VDFN-8
LE25S81A	8 Mb	1.65 - 1.95	15	0.3	5 Read; 4.5 Erase	SOIC-8, VSOIC-8
LE25S161	16 Mb	1.65 - 1.95	15	0.4	4.5 Read; 4.5 Erase	SOIC-8, VSOIC-8, UDFN-8, WLCSP-8

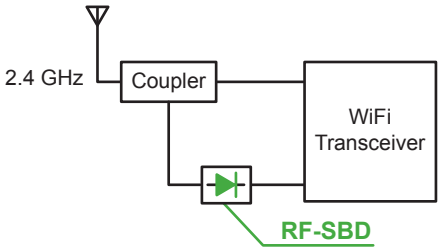
RF Discretes

ON Semiconductor offers a range of discrete RF devices for Internet-of-Things products. These efficient, micro-packaged devices provide capabilities for tuning, low-noise amplification, and sensor interface.

Device Type	Key Features	Functions	Package(s)
RF BJTs	Low noise figure (≤1.5 dB), high gain (9 to 18 dB), high cut-off frequency, low operation voltage	FM LNA, Buffer, IF Amp	TSOP-6, SOT-343
RF Schottky Diodes	Small interterminal capacitance (0.15 to 0.69 pF), small forward voltage (≤0.32 V), fewer parasitic components	Level Detection	X2DFN-2
PIN Diodes	Small interterminal capacitance (≤0.23 dB), small forward series resistance (≤4.5 Ω), auto gain control	Gain Control	SC-70, SC-59
RF MMIC	Wide band response (up to 3.6 GHz), high gain (up to 33 dB), low current, high output power	Buffer, IF Amp	SC-88FL
RF JFETs	High |yfs| (up to 50 mS), low noise figure (≤1.5 dB), low capacitance (Ciss ≤10 pF), low I_{DSS}, low I_{GSS}	AM LNA	SC-59, SOT-883 (XDFN)
Varactors	Capacitance ratio range (1.65 to 6.0), high Q factor (up to 150), low reverse current	FM Tuning	SC-59, SC-70



IR Sensor



Power Detector

	Consumer		Industrial		Communications	
	Set-Top Box	Satellite LNB	Smart Meters	Drones	Wireless LAN	Walkie-Talkie
						
RF BJT 2SCxx, 15NGNxx, CPHxx, MCHxx	◆	◆	◆	◆	◆	◆
RF Schottky 1SSxx, NSRxx, SBXxx	◆	◆	◆	◆	◆	
PIN Diode 1SVxx	◆	◆				
JEFT 2SKxx, CPHxx, MCHxx, MMBFxx, TFxx						◆
MMIC SMAxx	◆	◆	◆	◆	◆	◆

COMPONENTS

Standard Logic and MiniGate™

Available logic functions

- Logic Gates, Buffers, Flip-Flops
- Arithmetic Functions
- Bus Transceivers
- Latches and Registers
- Multiplexers and Analog Switches
- Logic Level Translators

Standard Logic Family	Device Prefix	V_{CC} Min (V)	V_{CC} Max (V)	t_{PD} (nS)	I_{OUT} (mA)	Input Logic Level	Packages
Metal Gate	MC14	3	18	50 @ V_{CC} = 15 V	±4.2 @ V_{CC} = 15 V	CMOS	SOIC, TSSOP, QFN
AC	MC74AC/74AC	2	6	6 @ V_{CC} = 5 V	±24 @ V_{CC} = 4.5 V	CMOS	
ACT	MC74ACT/74ACT	4.5	5.5	5.5 @ V_{CC} = 5 V	±24 @ V_{CC} = 4.5 V	TTL	
HC	MC74HC/MM74HC	2	6	13 @ V_{CC} = 6 V	±5.2 @ V_{CC} = 6 V (Std) ±7.8 @ V_{CC} = 6 V (Bus Driver)	CMOS	
HCT	MC74HCT/MM74HCT	4.5	5.5	15 @ V_{CC} = 5 V	±4.0 @ V_{CC} = 4.5 V (Std) ±6.0 @ V_{CC} = 4.5 V (Bus Driver)	TTL	
LCX	MC74LCX/74LCX	2.3	3.6	5.5 @ V_{CC} = 3 V	±24 @ V_{CC} = 3 V	LVTTL	
LVX	MC74LVX/74LVX	2	3.6	6.6 @ V_{CC} = 3 V	±4 @ V_{CC} = 3 V	LVTTL	
VCX	MC74VCX/74VCX	1.65	3.6	3.5 @ V_{CC} = 3 V	±24 @ V_{CC} = 3 V	LVTTL	
VHC	MC74VHC/74VHC	2	5.5	5.2 @ V_{CC} = 4.5 V	±8 @ V_{CC} = 4.5 V	CMOS	
VHCT	MC74VHCT/74VHCT	4.5	5.5	3.6 @ V_{CC} = 4.5 V	±8 @ V_{CC} = 4.5 V	TTL	
LVT	74LVT	2.7	3.6	3.6 @ V_{CC} = 3.0 V	-32/64 @ V_{CC} = 3.0 V	TTL	

MiniGate Family	Number of Gates	Device Prefix	V_{CC} Min (V)	V_{CC} Max (V)	t_{PD} (nS)	I_{OUT} (mA)	Input Logic Level	Packages
HC	1	MC74HC1G/NC7S	2	6	6.5 @ V_{CC} = 5 V	±5.2 @ V_{CC} = 6 V	CMOS	TSOP, SC-88, SC-74, SOT-553, SOT-953, US8, UDFN, UQFN, MicroPak
HCT	1	NC7ST	4.5	5.5	6.5 @ V_{CC} = 5 V	±2 @ V_{CC} = 6 V	TTL	
VHC	1	MC74VHC1G/NLU1G/NL17SH	1.65	5.5	3.8 @ V_{CC} = 4.5 V	±8 @ V_{CC} = 4.5 V	CMOS	
	2	NLU2G						
	3	NLU3G						
VHCT	1	MC74VHCT1G/NLU1GT/NL17SHT	4.5	5.5	3.6 @ V_{CC} = 4.5 V	±8 @ V_{CC} = 4.5 V	TTL	
	2	NLU2GT						
	3	NLU3GT						
LCX	1	NL17SZ/NC7SZ/NLX1G	1.65	5.5	2.4 @ V_{CC} = 3 V	±24 @ V_{CC} = 3 V	CMOS	
	2	NC27WZ/NC7WZ/NLX2G						
	3	NL37WZ/NC7NZ/NLX3G						
VCX	1	NL17SV/NC7SV	0.9	3.6	1.0 @ V_{CC} = 3 V	±24 @ V_{CC} = 3 V	LVTTL	
SG	1	NL17SGxx	0.9	3.6	2.2 @ V_{CC} = 3 V	±8 @ V_{CC} = 3 V	LVTTL	
SP	1	NC7SP	0.9	3.6	3.0 @ V_{CC} = 3 V	±2.6 @ V_{CC} = 3 V	LVTTL	
	2	NC7WP						
	3	NC7NP						
AUP	1	74AUP1G	0.8	3.6	2.9 @ V_{CC} = 3 V	±4 @ V_{CC} = 3 V	Schmitt	
	1	74AUP1T	2.3	3.6	3.3 @ V_{CC} = 3 V	±4 @ V_{CC} = 3 V	Schmitt	

Integrated Passive Devices (IPD)

Efficient RF System-in-Package Solutions

Integrating passive devices into our HighQ™ copper platform gives a cost-effective, space-saving solution for all RF needs.

IPD Technology Characteristics

- Target frequency: 500 MHz to 40 GHz
- Low profile, minimal footprint
- Tight tolerance

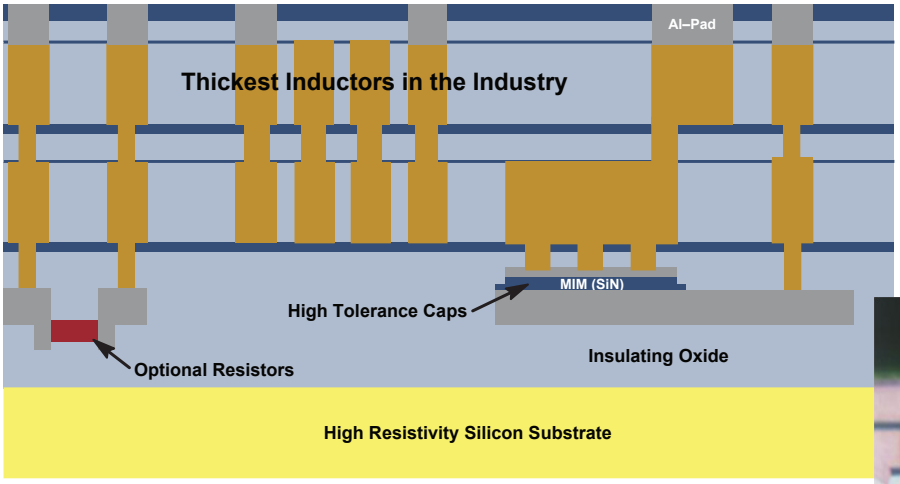
Typical Applications

- Antenna Switch
- WiFi®/Bluetooth
- Power Amplifier
- Zigbee

Typical IPD Designs

- Baluns
- Couplers
- Diplexers
- Balanced Filters
- Splitters
- Matching networks

IPD Technology (R, L, C)



Performance

- Guaranteed ±5.0% capacitor tolerance
- Typical < 1% variance between capacitors on common IPD
- Dual Cu stack up of 12 μm for high Q inductors

Dual Copper Stackup with Full Length Stitched Via

COMPONENTS

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