



Consumer Electronics Solutions



Comprehensive solutions for home entertainment and information, small appliances, and white goods from ON Semiconductor

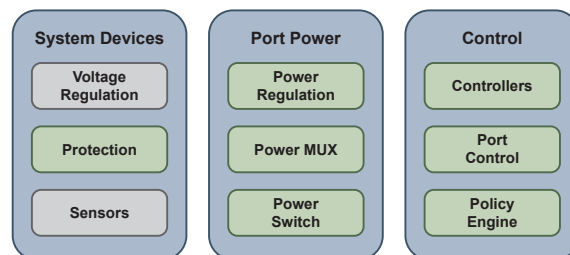


USB-C for Power Bank

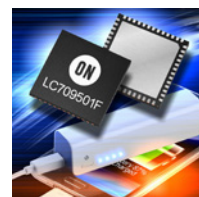
USB-C (Type-C) is becoming the latest standard for accessories including power banks. ON Semiconductor offers both discrete and best-in-class integrated power bank solutions, which meet the latest USB-C and USB Power Delivery (PD) specifications. Our latest integrated, scalable power bank solutions enable a streamlined design process, and accelerate time to market, supporting a range of battery pack sizes.

System Devices

Function	Device	Description
Protection	ESD8704	High Speed Data Line Protection, Unidirectional (3.3 V - USB 3.x)
	ESD7104	ESD Protection, Low Capacitance, High Speed Data
	ESD8116	ESD Protection Array, USB 3.0
	ESD8118	ESD Protection Array, USB 3.0
	ESDM3551	ESD Protection Diode, CC and SBU Protection (5.5 V - USB 3.x), 21 pF, 0.6 x 0.3 mm
	NSPU3051	ESD and Surge Protection, CC, SBU and Vbus, (5.5 V - USB 3.x), 80 pF, 1.0 x 0.6 mm
	NSPM2052	ESD and Surge Protection Device, Vbat and Vbus, 5 V, 120 A, 1.6 x 1.0 mm
	NSPU5132	ESD and Surge Protection Device, Unidirectional, 13.5 V, 200 A, 2.0 x 1.8 mm
	NSPU5201	ESD and Surge Protection Device, Unidirectional, 20 V, 140 A, 2.0 x 1.8 mm
	NIS6350	Electronic Fuse, 5 V, 46 mΩ
	NIS5020	Electronic Fuse, 12 V, 14 mΩ
	LC0611TMT	Battery Protection Controller with Integrated MOSFET, 1-Cell Lithium-Ion
	LC05711ARA	Battery Protection Controller with Integrated MOSFET, 1-Cell Lithium-Ion
	LC05111CMT	Battery Protection Controller with Integrated MOSFET, 1-Cell Lithium-Ion
	FUSB252	High Speed Digital (HSD) Port Protection Switch with Type-C CC



Block Diagram



Port Power

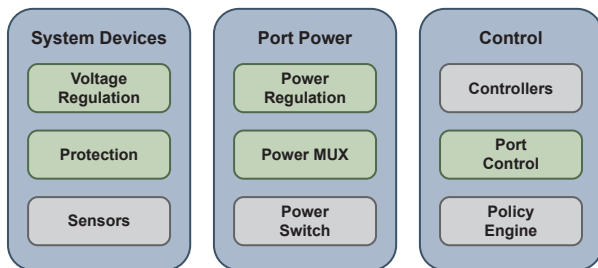
Function	Device	Description
Power Regulation	NCP81231	Buck Controller, USB Power Delivery and Type-C Applications
	NCP81239	4-Switch Buck Boost Controller, USB Power Delivery and Type C Application
Power Switch	FPF3380	Over-Voltage Protection Load Switch
	FPF2281	Over-Voltage Protection Load Switch
	FPF2286	Over-Voltage Protection Load Switch
	FPF2290	Over-Voltage Protection Load Switch
	FPF2495C	Load Switch, Over-Voltage, Over-Current Protection with Adjustable Current-Limit Control, IntelliMAX™ 28 V
	FPF2595	Load Switch, Over-Voltage, Over-Current Protection with Adjustable Current-Limit Control, IntelliMAX 28 V
	ECH8310	P-Channel Power MOSFET, -30 V, -9 A, 17 mΩ
	NTTFS4H05N	Power MOSFET, Single N-Channel, 25 V, 94 A, 3.3 mΩ
	MCH3375	Single P-Channel Power MOSFET, -30 V, 295 mΩ, -1.6 A
	BAT54AL	Schottky Diode, Dual Common Anode, 30 V
Power MUX	BAT54CL	Schottky Diode, Dual Common Cathode, 30 V
	BAT54T	Schottky Barrier Diode
Power MUX	FPF2595	Load Switch, Over-Voltage, Over-Current Protection with Adjustable Current-Limit Control, IntelliMAX 28 V
	FPF2895C	Current Limit Switch with OVP and TRCB, 28 V / 5 A

Control

Function	Device	Description
Controllers/ Policy Engine	LC709501F	Power Bank Controller, USB Type-C & Quick Charge™ 3.0, for 1-Cell Li-Ion and Li-Poly Battery
	LC709511F	Power Bank Controller, USB Type-C & Quick Charge 3.0, for 1-Cell Li-Ion and Li-Poly Battery
Port Control	FUSB302B	Programmable USB Type-C Controller with PD (Default SNK)
	FUSB302T	Programmable USB Type-C Controller with PD (Default SRC)
	FUSB303	Autonomous USB Type-C Port Controller with I2C and GPIO Control
	FUSB307B	USB Type-C Port Controller with USB-PD

USB-C for AC-DC Wall Adapter

ON Semiconductor provides AC-DC wall adapter solutions compatible with the latest USB-C (Type-C) and Power Delivery (PD) specifications. Our solutions are integrated, compact, highly efficient solutions that consume minimal quiescent current to minimize heat dissipation. Fast charge solutions are available, and are compatible with Nebo or existing microcontroller.



Block Diagram

System Devices

Function	Device	Description
Voltage Regulation	FAN6291QH	Secondary-Side Adaptive Charging Controller, Synchronous Rectifier and USB Type-C Control
Protection	NIS6350	Electronic Fuse, 5 V, 46 mΩ
	NIS5020	Electronic Fuse, 12 V, 14 mΩ
	ESD5581	ESD Protection, Bidirectional, 5 V, 10 pF, 6 Am
	ESDM3551	ESD Protection Diode, CC and SBU Protection (5.5 V - USB 3.x), 21 pF
	NSPU3051	ESD and Surge Protection, CC, SBU and Vbus Lines, (5.5V - USB 3.x), 80 pF
	NSPM2052	ESD and Surge Protection Device, Vbat and Vbus Applications, 5 V, 120 A
	NSPM0061	ESD and Surge Protection, 6.3 V, 70 A
	NSPM0101	ESD and Surge Protection, 10 V, 60 A, 1.6 x 1.0 m
	NSPU5132	ESD and Surge Protection Device, Unidirectional, 13.5 V, 200 A
	NSPU5201	ESD and Surge Protection Device, Unidirectional, 20 V, 140 A
	NCS210	Current Sense Amplifier, Bidirectional Zero-Drift, 1% Max. Gain Error, 60 μV Offset
	NCS211	Current Sense Amplifier, Bidirectional Zero-Drift, 1% Max. Gain Error, 60 μV Offset
	NCS213	Current Sense Amplifier, Bidirectional Zero-Drift, 1% Max. Gain Error, 100 μV Offset
	NCS214	Current Sense Amplifier, Bidirectional Zero-Drift, 1% Max. Gain Error, 60 μV Offset
	NCS2333	Precision Operational Amplifier, Low Power, Zero-Drift, 30 μV Offset

Port Power

Function	Device	Description
Power Regulation	NCP1342	High Frequency Quasi-Resonant Flyback Controller
	NCP12601	Multi-mode PWM Controller for USB PD
	NCP4306	Secondary Side Synchronous Rectification Driver
	FAN6390	Adaptive Charging Controller with Synchronous Rectifier Control
	NCP1568	Active Clamp Flyback Controller with ZVS
	NCP51530	High Frequency, 700 V- 2 A High and Low Side Driver
	FAN65008B	Synchronous PWM Buck Regulator, Voltage Mode, 65 V, 10 A
Power MUX	FPF2595	Load Switch, Over-Voltage, Over-Current Protection with Adjustable Current-Limit Control, IntelliMAX™ 28 V
	FPF2895C	Current Limit Load Switch with OVP and TRCB, 28 V, 5 A

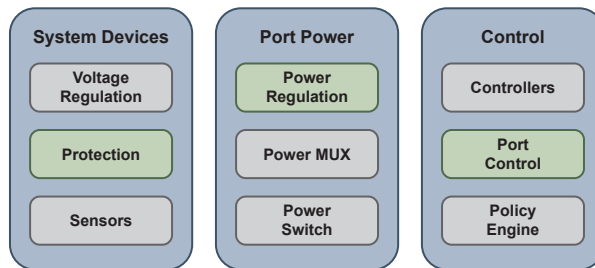


Control

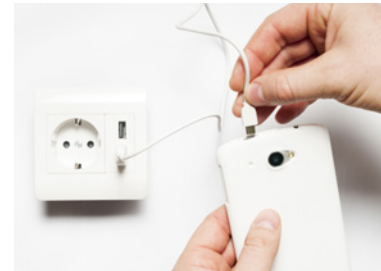
Function	Device	Description
Port Control	FUSB302T	Programmable USB Type-C Controller with PD (Default SRC)
	FUSB3301	USB Type-C Source-Only Controller
	FUSB308BV	USB Type-C Port Controller with USB-PD

USB-C for Wall Receptacle

Wall receptacles that include direct USB cable connections are becoming increasingly 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	NIS6350	Electronic Fuse, 5 V, 46 mΩ
	NIS5020	Electronic Fuse, 12 V, 14 mΩ
	ESD5581	ESD Protection, Bidirectional, 5 V, 10 pF, 6 A, 0.6 x 0.3 mm
	ESDM3551	ESD Protection Diode, CC and SBU Protection (5.5 V - USB 3.x), 21 pF, 0.6 x 0.3 mm
	NSPU3051	ESD and Surge Protection, CC, SBU and Vbus Lines, (5.5V - USB 3.x), 80 pF, 1.0 x 0.6 mm
	NSPM2052	ESD and Surge Protection Device, Vbat and Vbus Applications, 5 V, 120 A, 1.6 x 1.0 mm
	NSPM0061	ESD and Surge Protection, 6.3 V, 70 A, 1.6 x 1.0 mm
	NSPM0101	ESD and Surge Protection, 10 V, 60 A, 1.6 x 1.0 mm
	NSPU5132	ESD and Surge Protection Device, Unidirectional, 13.5 V, 200 A, 2.0 x 1.8 mm
	NSPU5201	ESD and Surge Protection Device, Unidirectional, 20 V, 140 A, 2.0 x 1.8 mm

Port Power

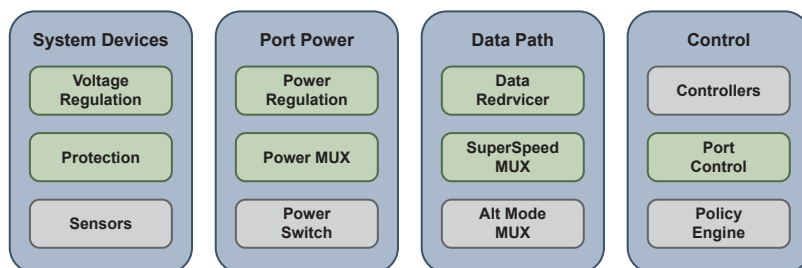
Function	Device	Description
Power Regulation	NCP1342	High Frequency Quasi-Resonant Flyback Controller
	NCP1568	Active Clamp Flyback Controller with ZVS
	NCP4306	Secondary Side Synchronous Rectification Driver

Control

Function	Device	Description
Port Control	FUSB302T	Programmable USB Type-C Controller with PD (Default SRC)
	FUSB3301	USB Type-C Source-Only Controller
	FUSB308BV	USB Type-C Port Controller with USB-PD

USB-C for Docking Station

Greater adaptation of USB-C (Type-C) has caused manufactures to introduce many USB-C devices, including for mobile PCs, tablets, and docking stations. There are various USB-C universal docking stations to connect multiple laptop platforms and peripherals. ON Semiconductor provides docking station solutions including the USB-C Data Hub (USB protocol & signal conditioning), as well as the charging capability for the USB-C systems that support USB Power Delivery/Alternate mode protocol.



System Devices

Block Diagram

Function	Device	Description
Voltage Regulation	NCP81239	4-Switch Buck Boost Controller, USB Power Delivery and Type C Applications
	NCP81231	Buck Controller, USB Power Delivery and Type-C Applications
Protection	FUSB252	High Speed Digital (HSD) Port Protection Switch with Type-C CC
	ESD8704	High Speed Data Line Protection, Unidirectional (3.3 V - USB 3.x)
	ESD8708	High Speed Data Line Protection, Unidirectional (3.3 V - Ethernet)
	ESDL2011	High Speed Data Line Protection, Bidirectional (1 V - Thunderbolt 3.0), 0.2 pF
	ESDL2031	High Speed Data Line Protection, Bidirectional (4 V - USB), 0.35 pF
	ESDL1531	High Speed Data Line Protection, Bidirectional (4 V - USB), 0.2 pF
	ESDM1131	High Speed Data Line Protection, Bidirectional (3.3 V, USB 2.0) 4 pF
	ESDM3551	ESD Protection Diode, CC and SBU Protection (5.5 V - USB 3.x), 21 pF
	ESDM1051	ESD Protection Diode, CC and SBU Protection (5.5 V - USB 3.x), 21 pF
	NSPU3051	ESD and Surge Protection, CC, SBU and Vbus Lines, (5.5V - USB 3.x), 80 pF
	NSPM2052	ESD and Surge Protection Device, Vbat and Vbus Applications, 5 V
	NSPU5132	ESD and Surge Protection Device, Unidirectional, 13.5 V, 200 A
	NSPU5201	ESD and Surge Protection, Unidirectional, 20 V, 140 A
	NIS6350	Electronic Fuse, 5 V, 46 mΩ
	NIS5020	Electronic Fuse, 12 V, 14 mΩ

Data Path

Function	Device	Description
Data Redriver	NB7NPQ7021M	USB 3.1, One Port Linear Redriver, 3.3 V
	NB7NPQ7022M	USB 3.1, One Port Linear High Gain Redriver, 3.3 V
	NB7NPQ7041M	USB 3.1, Two Port Linear Redriver, 3.3 V
	NB7NPQ7042M	USB 3.1, Two Port Linear High Gain Redriver, 3.3 V
	NB7NPQ1002M	USB 3.1, One Port Linear Redriver, 3.3 V
	NB7NPQ1102M	USB 3.1, One Port Linear Redriver, 3.3 V
	NB7NPQ1004M	USB 3.1, Two Port Linear Redriver, 3.3 V
	NB7NPQ1104M	USB 3.1, Two Port Linear Redriver, 3.3 V
	NB7VPQ904M	USB Type-C, DisplayPort™ Linear Redriver, 1.8 V, 10 Gbps
SuperSpeed Mux	FUSB340	USB 3.1 SuperSpeed Switch, 10 Gbps

Port Power

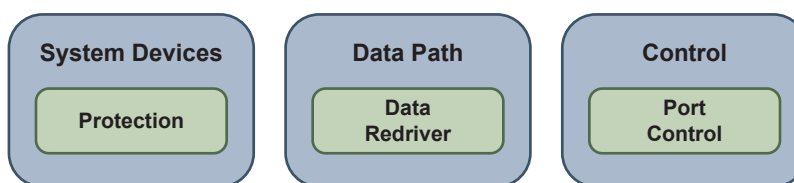
Function	Device	Description
Power Regulation	NCP1342	High Frequency Quasi-Resonant Flyback Controller
	NCP1568	Active Clamp Flyback Controller with ZVS
	NCP4306	Secondary Side Synchronous Rectification Driver
	NCP12601	Multi-mode PWM Controller for USB PD
	FAN65008B	Synchronous PWM Buck Regulator, Voltage Mode, 65 V, 10 A
Power MUX	FPF2595	Load Switch, Over-Voltage, Over-Current Protection with Adjustable Current-Limit Control, IntelliMAX™ 28 V
	FPF2895C	Current Limit Load Switch with OVP and TRCB, 28 V, 5 A

Control

Function	Device	Description
Port Control	FUSB302B	Programmable USB Type-C Controller with PD (Default SRK)
	FUSB302T	Programmable USB Type-C Controller with PD (Default SRC)
	FUSB303	Autonomous USB Type-C Controller with I2C and GPIO Control
	FUSB307B	USB Type-C Port Controller with USB-PD
	FUSB308BV	USB Type-C Port Controller with USB-PD

USB-C for Active Cable

USB-C (Type-C) active cables have the ability to interface to multiple devices with one single cable and eliminate the need for individual cables for each end device. Meanwhile, mitigating signal integrity losses have become a design challenge for the higher data rate possible with USB-C 3.1 Gen 1 and Gen 2. USB active cable solutions from ON Semiconductor enable high-precision, low jitter, high gain equalization with full USB compliance and interoperability. We also provide high speed line data ESD protection products.



Block Diagram

System Devices

Function	Device	Description
Protection	ESDL2011	High Speed Data Line Protection, Bidirectional (1 V – Thunderbolt 3.0), 0.2 pF
	ESD8111P	High Speed Data Line Protection (3.3 V – USB 3.x), (Tx/Rx Pairs), 0.4 pF
	ESD8011	High Speed Data Line Protection (5.5 V – USB 3.x), (D±, Tx/Rx Pairs), 0.1 pF
	ESDM3551	ESD Protection Diode, CC and SBU Protection (5.5 V – USB 3.x), 21 pF
	NSPM2052	ESD and Surge Protection Device, Vbat and Vbus Applications, 5 V
	NSPU5132	ESD and Surge Protection Device, Unidirectional, 13.5 V
	NSPU5201	ESD and Surge Protection, Unidirectional, 20 V, 140 A
	FUSB252	High Speed Digital (HSD) Port Protection Switch with Type-C CC

Data Path

Function	Device	Description
Data Redriver	NB7NPQ7021M	USB 3.1 Dual Channel Linear Redriver, 3.3 V
	NB7NPQ7022M	USB 3.1 Dual Channel Linear Redriver, 3.3 V, High Gain

Control

Function	Device	Description
Port Control	FUSB302B	Programmable USB Type-C Controller with PD (Default SNK)
	FUSB380	USB Type-C Autonomous Cable Marker

RSL10 Bluetooth® Low Energy Technology Radio SoCs

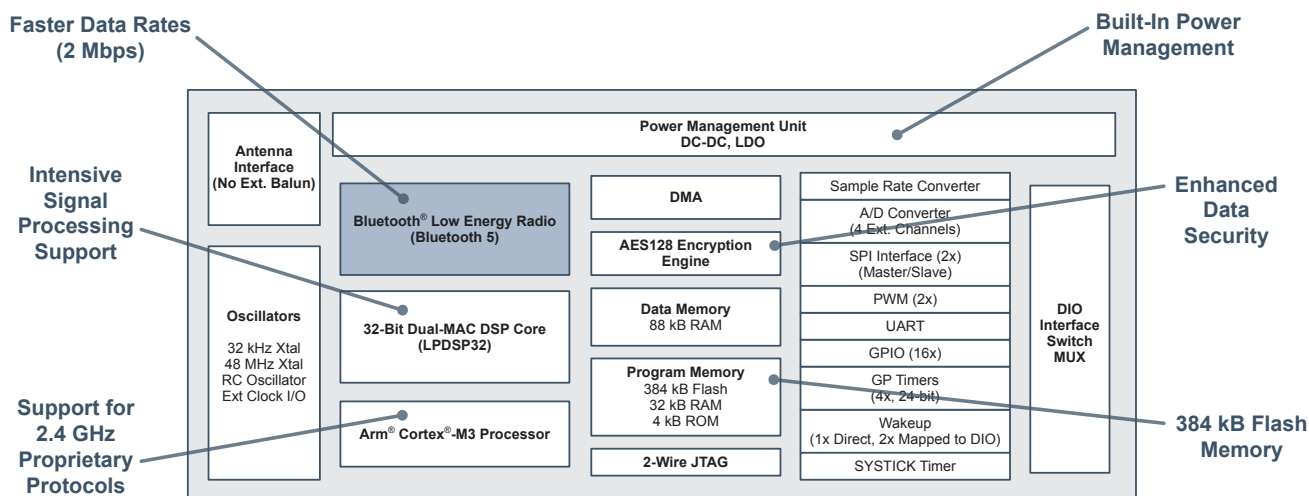
With so many options for wireless available, what sets the RSL10 radio SoC family apart? Simple. It offers the industry's lowest power Bluetooth Low Energy technology. Supporting 2 Mbps data rates provided by Bluetooth 5 (twice the speed as with previous Bluetooth generations), RSL10 enables advanced wireless functionality without compromising battery life. RSL10 can be easily integrated into any device.

SoC Features

- Industry's lowest power consumption (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

SIP Features

- All-in-one solution
 - RSL10 radio SoC
 - Integrated antenna, filtering, power management, passives
- Fully certified to worldwide regulatory standards
 - Bluetooth SIG, FCC (USA), CE (Europe), IC (Canada), KCC (Korea), MIC (Japan)



Development Tools

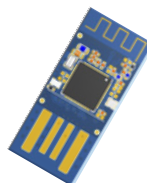
Software Development Kit (SDK)

- IDE support for Eclipse, Keil, and IAR
- Bluetooth Low Energy protocols, precompiled sample code and libraries, technical documentation
- Support for Bluetooth Mesh networking



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

2.4 GHz IEEE 802.15.4 Wireless Transceiver

Low power, fully integrated system-on-chip
for secure wireless connectivity

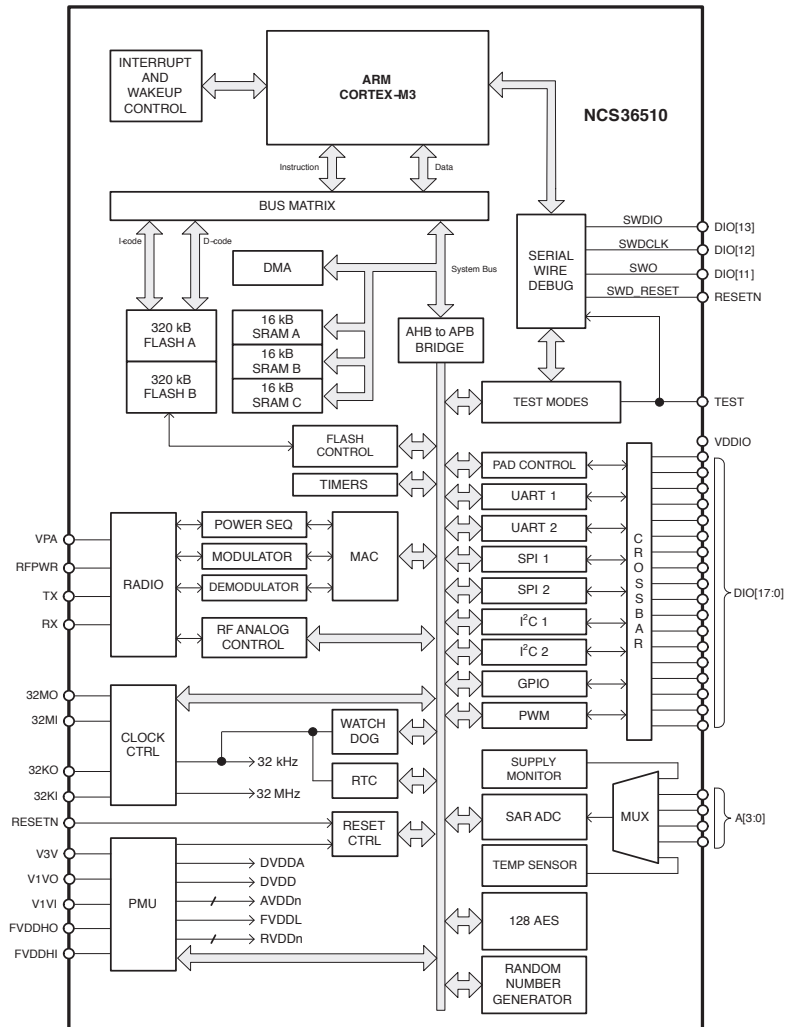


NCS36510 Features

- Integrates Arm® Cortex®-M3 32-bit μ P, 320 kB x2 (FOTA) FLASH, 48 kB RAM, hardware accelerated MAC
- AES 256 / 128 encryption engine
- Peripherals: DMA, UART (x2), SPI (x2), I2C (x2), PWM, RTC, WDT, 18 GPIO, 10-bit ADC, programmable timers (x3), temperature sensor, supply voltage sensor
- Programmable transmit power (up to ~ 8 dBm)
- Receiver sensitivity less than -99 dBm
- Antenna diversity
- Supports external LNA & PA
- 6.9 mW Transmit Mode Power Consumption
- 6.6 mW Receive Mode Power Consumption
- V_{DD} includes low voltage mode with operation down to 1.0 V

Software Ecosystem

- 2.4 GHz IEEE 802.15.4 certified MAC/PHY
- Zigbee® 3.0 compliant platform
- 802.15.4 proprietary



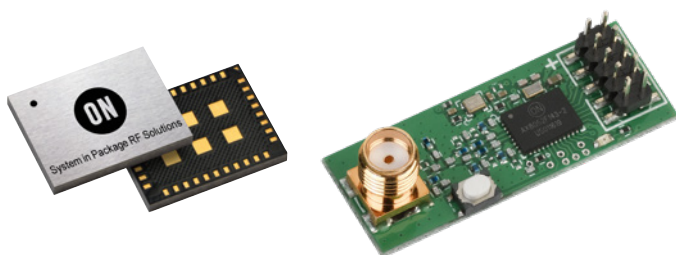
NCS36510 Block Diagram

Comprehensive Sigfox™ Solutions



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® 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	Proprietary	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	QFN-28
AX5243	Proprietary	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	QFN-20
AX5051	Proprietary	433/868/915	1 – 350	2.2 – 3.6	RX 16 - 21 mA TX 11 - 45 mA	0 to 16	-116	QFN-28
AX5031	Proprietary	433/868/915	1 – 350	2.2 – 3.6	RX 16 - 21 mA TX 11 - 45 mA	0 to 16	–	QFN-20

RF SoCs

Device	Protocol Supported	Frequency (MHz)	Data Rate (kbps)	Peripheral Interface	Flash (kB)	RAM (kB)	GPIO	Package
AX8052F131	Proprietary	400 - 700 800 - 940	1 – 600	Configurable	64	8	21	QFN-40
AX8052F143	Proprietary, Sigfox	27 - 1050	0.1 - 125	Configurable	64	8	19	QFN-40
AX8052F151	Proprietary	400 - 700 800 - 940	1 – 600	Configurable	64	8	21	QFN-40
AXM0F243	Proprietary	27 - 1050	1 – 600	Configurable	64	8	20	QFN-40
NCS36510	Proprietary, Zigbee	2400 - 2480	250	Configurable	640	48	18	QFN-40

KNX Transceivers

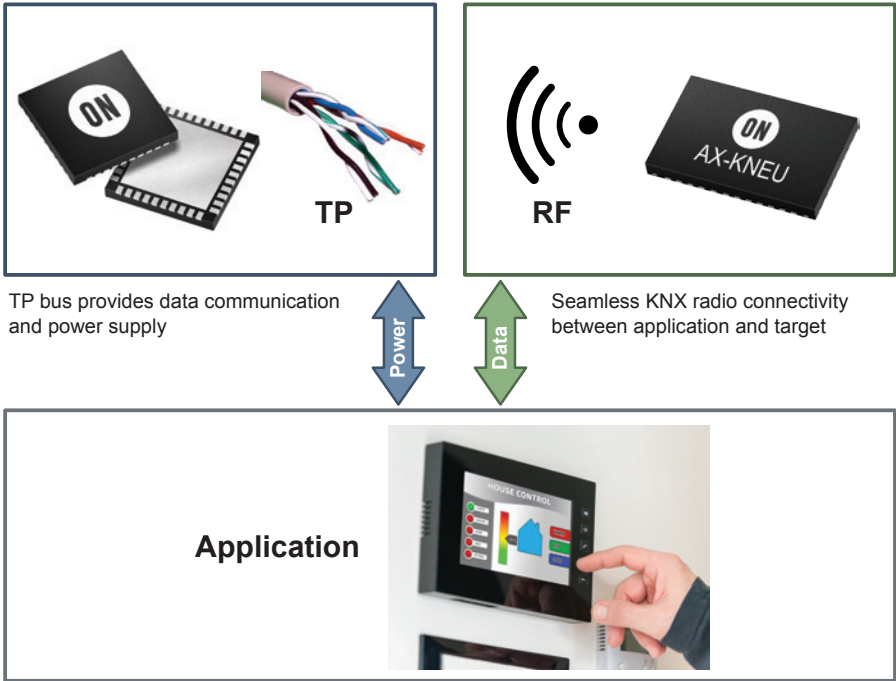
KNX is a standardized (EN 50090, ISO/IEC 14543), OSI-based network communications protocol for intelligent buildings. KNX is the successor to, and convergence of, three previous standards: the European Home Systems Protocol (EHS), BatiBUS, and the European Installation Bus (EIB or Instabus).

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	✓		✓

Power-Over-Ethernet (PoE) Controllers

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

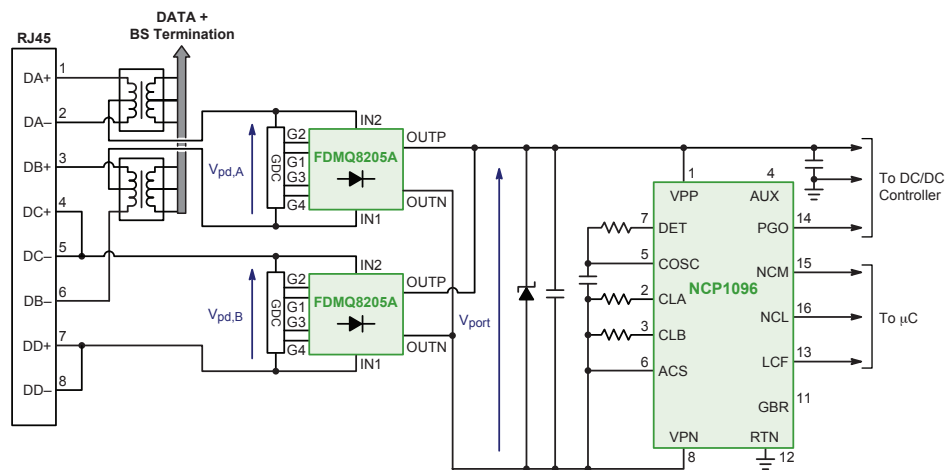
ON Semiconductor offers a complete portfolio of interface controllers for emerging PoE applications. The front-end PD device is compliant with IEEE802.3af, IEEE802.3at, and the new IEEE802.3bt standards, and power is provided using two-pair and four-pair configurations to meet all requirements. The portfolio 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

Image Sensors for Video and User Interface Communications



Devices

- Drones
- VR/AR headsets
- Webcams and WiFi cameras
- Depth sensing cameras
- 360° and home security cameras

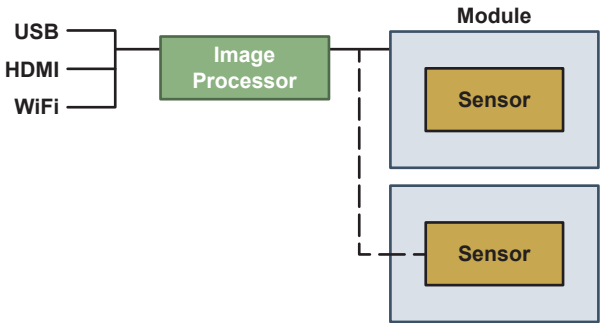
Features

- HD to 18 Megapixel
- HD, FHD, 4K video
- Color, monochromatic
- High performance in low light conditions
- Single sensor and stereo configurations

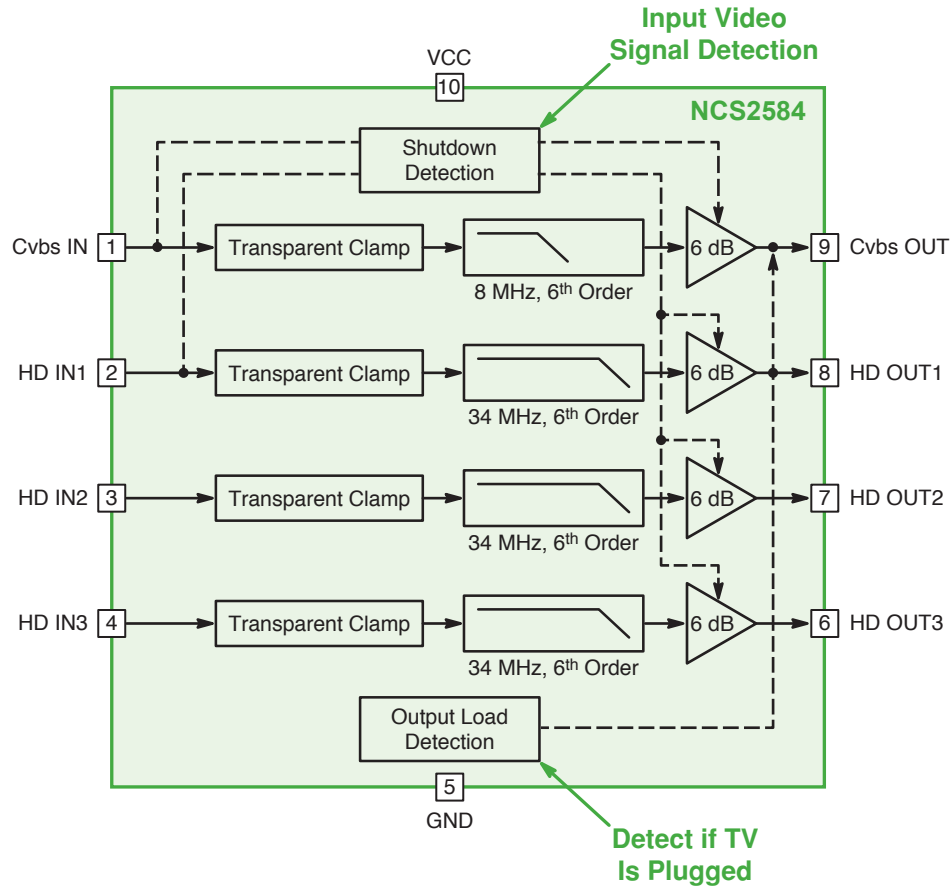
Applications

- Streaming video
- Home monitoring
- Gesture control
- Touchless control for gaming
- Body motion tracking and scene analytics

Device	Description	Resolution (MP)	Frame Rate (fps)	Package
MT9M114	1/6" System-on-Chip 1.9 μm BSI pixel color	1.3 (720P)	30	ODCSP-55
AR0141CS	1/4" CMOS Image Sensor 3.0 μm pixel color, monochrome	1 (720P)	60	IBGA-63
AR0144CS	1/4" Global Shutter CMOS Image Sensor 3.0 μm pixel color, monochrome	1 (720P)	60	ODCSP-69
AR0130	1/3" CMOS Image Sensor 3.75 μm pixel color, monochrome	1.2 (720P)	45	PLCC-48, ILCC-48
AR0135CS	1/3" Global Shutter CMOS Image Sensor 3.75 μm pixel color, monochrome	1.2 (720P)	54	IBGA-63
AS0260	1/6" CMOS Image Sensor System-on-Chip 1.4 μm pixel color	2 (1080P)	30	ODCSP-54
AR0261	1/6" CMOS Imaging Sensor 1.4 μm BSI pixel color	2 (1080P)	60	PLCC-48, IBGA-80
AR0237/AR0238	1/2.7" Full HD Digital Image Sensor 3.0 μm pixel color, RGB-IR	2.1 (1080P)	60	—
AR0239	1/2.7" Full HD Digital Image Sensor 3.0 μm BSI pixel color	2.3 (1080P)	60	IBGA-63
AR0330	1/3" CMOS Imaging Sensor 2.2 μm pixel color	3.5	60	ODCSP-61, PLCC-48
AR0430	1/3.1" CMOS Low Power Imaging Sensor 2.0 μm BSI pixel color, depth	4	120	mPLCC-48
AR0431	1/3.1" CMOS Low Power Imaging Sensor 2.0 μm BSI NIR+ pixel color	4	120	mPLCC-48
AR0521	1/2.5" CMOS Imaging Sensor 2.2 μm BSI pixel color, monochrome	5	60	PLCC-52
AR0522	1/2.5" CMOS Imaging Sensor 2.2 μm BSI NIR+ pixel color, monochrome	5	60	PLCC-52
AR1335	1/3.1" CMOS Imaging Sensor 1.1 μm BSI pixel color, monochrome	13	13MP 30, 4K2K 30, 1080P 60	ODCSP-63
AR1630	1/3.1" CMOS Low Power Imaging Sensor 1.0 μm BSI pixel color	16	16MP 30, 4K2K 60	—
AR1820	1/2.3" CMOS Imaging Sensor 1.25 μm BSI pixel color	18	18MP 24, 1080P 120	IBGA-60



Amplification for Video Signals



Video Amplifiers

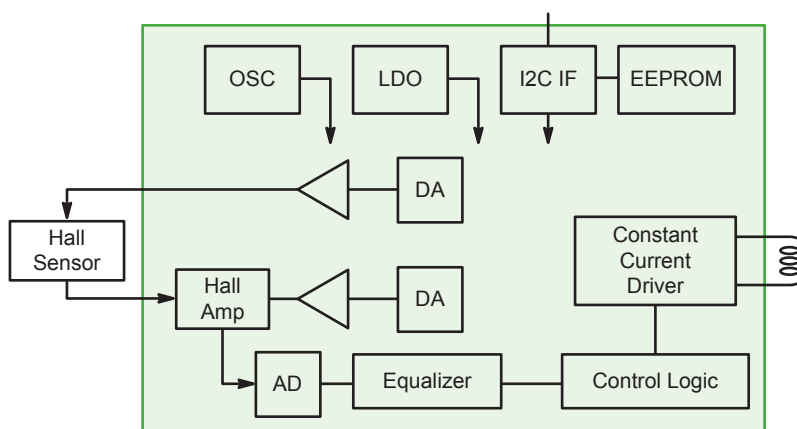
Device	Channels	Gbw Typ (MHz)	Vcc Max (V)	Package
NCS2566	6	8/34	5	TSSOP-20
NCS2584	4	8/34	3.3	TSSOP-14
NCS2563	3	30	5	SOIC-8
NCS2561	1	8	3.3	SC-70
NE592x8	1	40	8	SOIC-8, PDIP-8
NE592x14	1	90	8	SOIC-14, PDIP-14

Closed Auto-Focus Drivers

LC898217XC/XH closed loop auto focus driver includes integrated driver, loop digital filter, and EEPROM. System implementation requires only a Hall sensor and by-pass condenser. LC898217XC/XH enables fast and accurate auto focusing, with low power consumption, from an extremely small footprint.

Features

- Integrated equalizer circuit
- Integrated EEPROM memory (128 byte)
- Integrated OSC, LDO, and Hall amplifier
- Integrated Constant Current Driver and Linear Compensation
- 1-channel, 11-bit ADC; 2-channel, 8-bit DAC



LC898217XC/XH Block Diagram

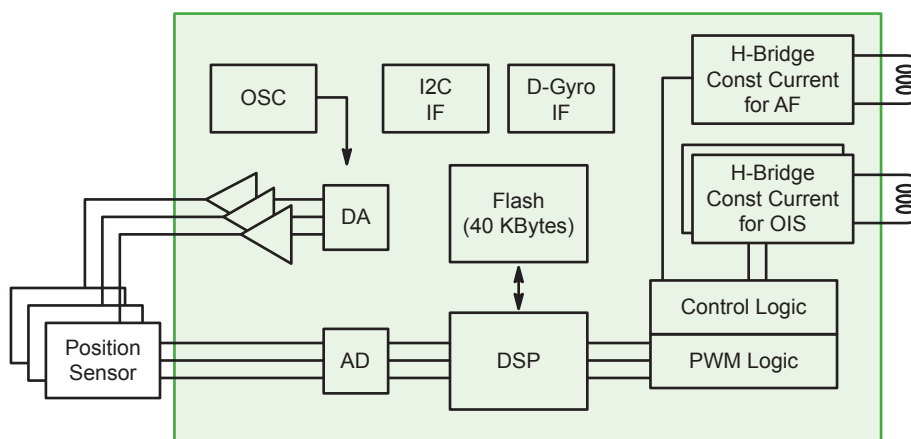
Device	Type	V _{DD} Min (V)	V _{DD} Max (V)	V _M Min (V)	V _M Max (V)	Driver (mA)	CPU IF	D/A	A/D	Package(s)
LC898214XD	Feedback	2.6	3.6	—	—	120	I2C	8-Bit	10-Bit	WLCSP-8
LC898217XC/XH	Feedback	2.6	3.3	—	—	110	I2C	8-Bit	11-Bit	WLCSP-10

Optical Image Stabilization Drivers

LC898123F40 DSP-based Optical Image Stabilization (OIS) and Auto Focus (AF) controller/driver includes integrated Flash memory, analog circuits, H-bridge and constant current drivers. The integrated Flash enables fast wakeup and simplifies Host-side software implementation.

Features

- Integrated DSP software filter
- Integrated Flash memory (40 KB)
- Integrated OSC, LDO, and Hall amplifier
- Digital Gyro I/F
- 4-channel, 14-bit ADC; 3-channel, 8-bit DAC



LC898123F40 Block Diagram

Device	Type	V _{DD} Min (V)	V _{DD} Max (V)	V _M Min (V)	V _M Max (V)	Driver (mA)	CPU IF	D/A	A/D	Package(s)
LC898123AXD	Feedback	2.6	3.6	2.6	3.6	195/120	I2C	8-Bit	12-Bit	WLCSP-35
LC898123F40	Feedback	2.6	3.3	2.6	3.3	200/150	I2C	8-Bit	14-Bit	WLCSP-35

Capacitive Touch Sensors

Features

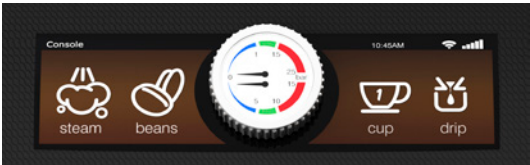
- Differential capacitive detection down to femtofarad level using mutual capacitance
- High noise immunity for improved stability and reliability
- Adhesive free for simplified manufacturing flow
- Calibration function for adaptability



Door Phone

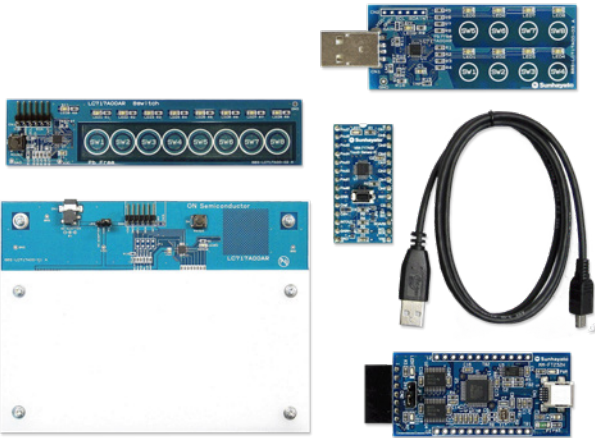


Light Switch



Control Panel

Evaluation Kits



LC717A00ARGEVK



LC717A30UJGEVK

LC717A30URGEVK Available 1Q19

Device	Proximity/Gesture Sensing (cm)	Sensing Inputs	Sensing Outputs	Interface Control	VDD (V)	Package
LC717A00AJ	0-10	8	8	I2C, SPI	2.6 - 5.5	SSOP-30
LC717A00AR	0-10	8	8	I2C, SPI	2.6 - 5.5	VCT-28
LC717A10AJ	0-10	16	0	I2C, SPI	2.6 - 5.5	SSOP-30
LC717A10AR	0-10	16	0	I2C, SPI	2.6 - 5.5	VCT-28
LC717A10PJ	0-10	16	0	I2C, SPI	2.6 - 5.5	SSOP-30
LC717A30UJ	0-20	8	0	I2C, SPI	2.6 - 5.5	SSOP-30
LC717A30UR	0-20	8	0	I2C, SPI	2.6 - 5.5	VCT-28

Haptic Drivers

LC898302A

The LC898302A is a haptic driver able to drive LRA and ERM. The drive frequency is automatically adjusted to the resonance frequency of the linear vibrator without external components.

Unique Features

- Drive LRAs with automatic tuning and braking
- Drive ERM; drive voltage controlled via PWM

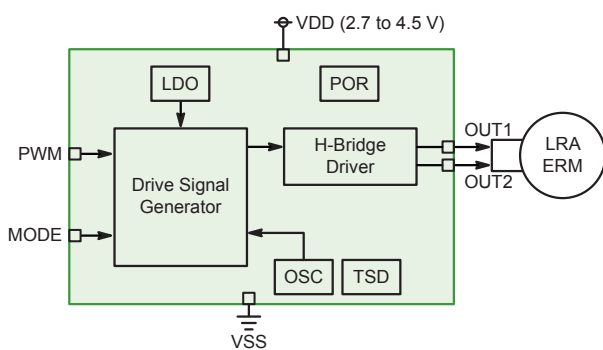
Other Features

- Supply voltage = +2.7 to +5.5 V
- $I_{out\ max} = 200\ mA$
- Bridge $R_{DS(on)} = 2 \times 2\ \Omega$ (4 x 2 Ω MOSFETs embedded)
- Low standby current

Benefits

- High efficiency
- Easy handling (no adjustment for any LRA)
- Strong vibration

Device	Description	Package
LC898302A	Haptic Driver for LRA and ERM	WLCSP-6



Block Diagram

LC898301

The LC898301 is an extended supply range version of the LC898300 LRA driver, compatible with cellular battery voltage. The architecture chosen enables strong vibration in minimal board space. Moreover, the LC898301 exhibits superior vibration performance.

Unique Features

- Automatically adjust driving frequency (ON Semiconductor patent)
- Minimized start-up and brake period (Quick stop)
- Automatically stop braking to avert counter vibration

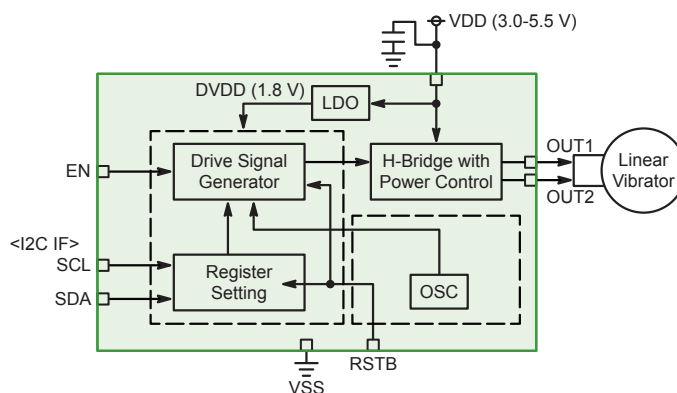
Other Features

- Supply voltage = +3.0 to +5.5 V
- $I_{out\ max} = 200\ mA$
- Bridge $R_{DS(on)} = 2 \times 2\ \Omega$ (4 x 2 Ω MOSFETs embedded)
- No peripheral component required (only 0.1 μF cap)
- Low power consumption

Benefits

- High efficiency
- Easy handling (no adjustment for any LRA)
- Strong vibration
- Fault-detection
- Battery direct supply
- Fully configurable through I2C

Device	Description	Package
LC898301XA	Haptic Driver for LRA	WLCSP-8
LC898301AXA	Haptic Driver for LRA with Immersion System	WLCSP-8

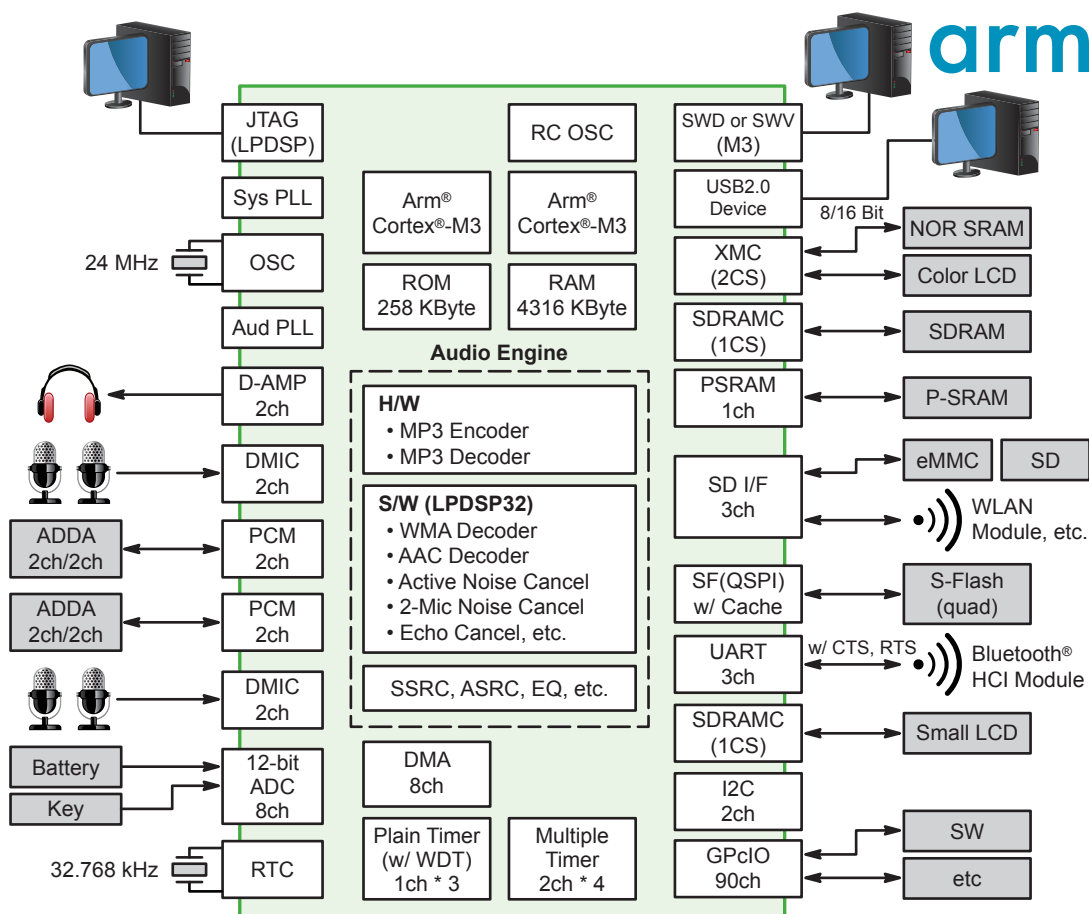


Block Diagram

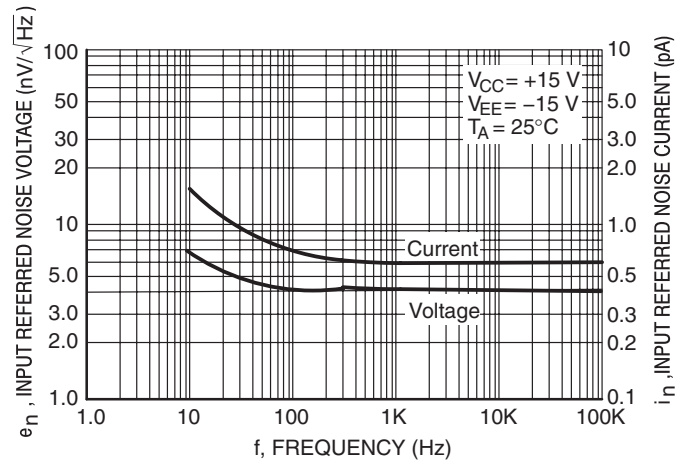
High Resolution, Low Power Audio Processing SoC

LC823455 Features

- System-on-Chip with Arm® Cortex®-M3 Dual, and proprietary 32-bit DSP (LPDSP) multi-core system
- High resolution 32-bit, 192 kHz audio processing capability
- Enabling ANC function to shorten ambient acoustic sound path
- Power saving by reducing CPU/DSP load through hard wired audio functions:
 - ASRC (Asynchronous Sample Rate Converter)
 - Hardware mixer - EQ (6 band equalizer)
- Integrated analog functions:
 - 4 channels of digital MIC PDM I/F
 - Low-power Class D HP amplifier
 - System PLL
 - Dedicated audio PLL, ADC
- Multiple interfaces:
 - USB2.0 HS device
 - eMMC
 - SD card
 - SPI
 - I2C



Amplification and Buffering for Audio Signals



MC33077 Input Referred Noise Voltage and Current vs Frequency

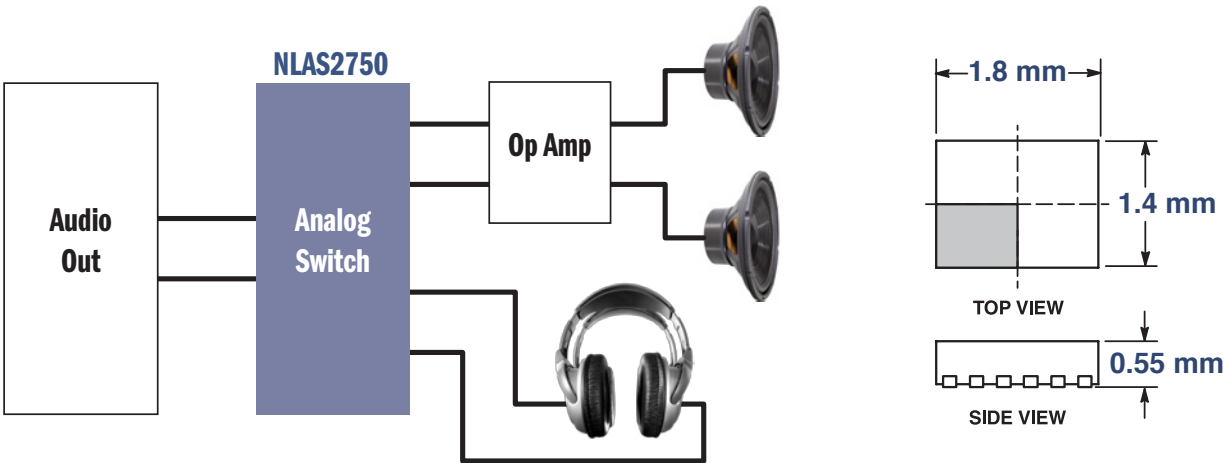
Features

- Low noise
- Fast response times
- Single, dual and quad devices

Low Noise Operational Amplifiers

Device	Channels	Noise Typ (nV/√Hz)	GBW Typ (MHz)	S _R Typ (V/μs)	Package
LM833	2	4.5	15	7	SOIC-8, PDIP-8
MC33077	2	4.4	37	11	SOIC-8, PDIP-8
MC33078	2	4.5	16	7	SOIC-8, PDIP-8
MC33079	4	4.5	16	7	SOIC-14, PDIP-14
MC33178	2	7.5	5	2	Micro8, SOIC-8, PDIP-8
MC33179	4	7.5	5	2	TSSOP-14, SOIC-14, PDIP-14
MC33272A	2	18.0	24	10	SOIC-8, PDIP-8
MC33274A	4	18.0	24	10	SOIC-14, PDIP-14
NE5532	2	5.0	10	9	SOIC-8, PDIP-8
NE5534	1	4.0	10	13	SOIC-8, PDIP-8

Low Resistance Switching for Audio Signals



Audio Switches

Device	Description	Channels	R _{ON} Max (Ω)	Package
NLAS5157	Single SPDT	1	0.5	μDFN-6
FSA515	SPST Depletion Switch with Negative Swing	1	1.1	WLCSP-4
FSA2275/6	DPDT with Negative Swing	2	0.5	UQFN-12
FSA551	Dual SPST, Depletion Mode	2	0.6	WLCSP-9
FSA553	Dual SPST, Depletion Mode	2	0.8	WLCSP-9
NLAS2750	Dual SPDT with Negative Swing	2	0.6	μQFN-10
NLAS5223C	Dual SPDT	2	0.5	μQFN-10
FSA550	Single 4PST, Depletion Mode	4	0.8 Typ	WLCSP-12
NLAS3799B	Dual DPDT	4	0.5	μQFN-16



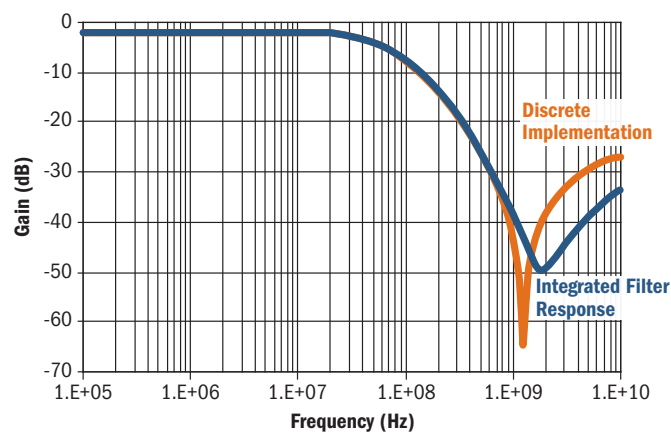
Key Performance Characteristics

- Excellent Audio Fidelity - Very Low THD, 0.011% Typical
- Wide 1.65 - 4.5 V Power Supply Range
- Extended Temperature Capable
- Low RDS(on), Tight Channel Matching

EMI Filters and ESD Protection for Audio

EMI Filter Features

- ESD protection exceeds 8 kV contact (IEC 61000-4-2)
- Matched inductors and capacitors
- Lowest insertion loss, critical for analog signals
- Excellent filtering performance across all wireless bands
- Integrates large scale capacitive elements with resistors or inductors to create excellent noise attenuation starting at 22 MHz



Audio Filters

Device	Description	Type	Lines	f3 dB (MHz)	Attenuation (-dB @ 1 GHz)	IEC 61000 (kV)	Package
NUF2114	2 Line Audio EMI Filter with ESD Protection	RC	2	50	-35	30	DFN-8
NUF2441	Integrated Passive Filter with ESD Protection	LC	2	25	-35	8	FlipChip-6
NUF2450	2 Line EMI Filter with ESD Protection	LC	2	20	-40	20	μDFN-8
NUF4220	4 Line Audio EMI Filter with ESD Protection	LC	4	16	-38	18	DFN-8

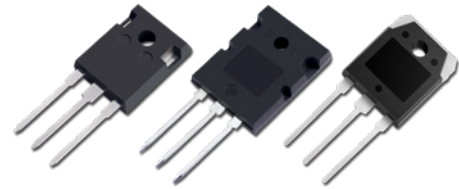
ESD Protection Devices

Device	Polarity	VRWM (V)	8 x 20 μs Surge		Number of Lines	Package
			Ipp Min (A)	VClamp @ Ipp (V)		
ESDM1121*	Bidirectional	12	3	19.5	1	X4DFN-2
NSPU3051	Unidirectional	5.5	40	7.8	1	X2DFN-2
ESDM1051	Bidirectional	5.5	11	10	1	X4DFN-2
ESDM3551	Bidirectional	5.5	10	8.7	1	X2DFN-2, X3DFN-2
NSPM3031	Bidirectional	3.3	45	7	1	X2DFN-2
ESDM3031	Bidirectional	3.3	11	8.4	1	X3DFN-2
ESDM1031*	Bidirectional	3.3	9.5	10.5	1	X4DFN-2
ESDM1131	Bidirectional	3.3	3.9	5.7	1	X4DFN-2

* Pending 4Q19.

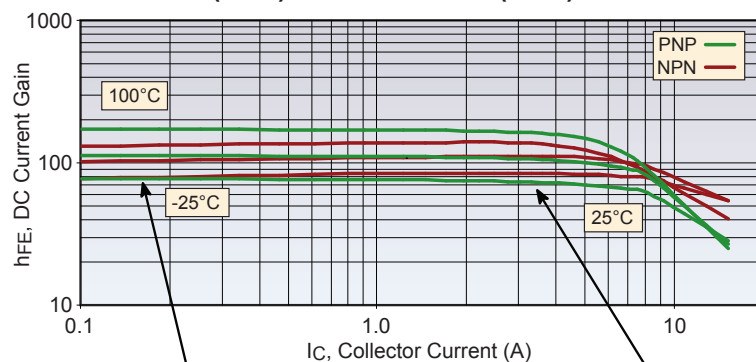
Audio Transistors for Superior Linearity and Gain Matching

Device Number		V _{CE0} (V)	I _C (A)	h _{FE}			f _T Typ (MHz)	P _D @ 25°C (W)	Package
NPN	PNP			Range	@ V _{CE} (A)	@ I _C (A)			
NJW0281	NJW0302	250	15	75 - 150	5	3	30	150	T0-3P
MJW3281A	MJW1302A	230	15	75 - 150	5	5	30	200	T0-247
MJL3281A	MJL1302A	260	15	75 - 150	5	5	30	200	T0-264
NJW3281	NJW1302	250	15	75 - 150	5	5	30	200	T0-3P



**260 V Capability for
Greater Dynamic Range**

MJx1302A (PNP) and MJx3281A (NPN) Gain Linearity



Closely matched complementary pairs
assure symmetrical performance while
minimizing manual gain sorting

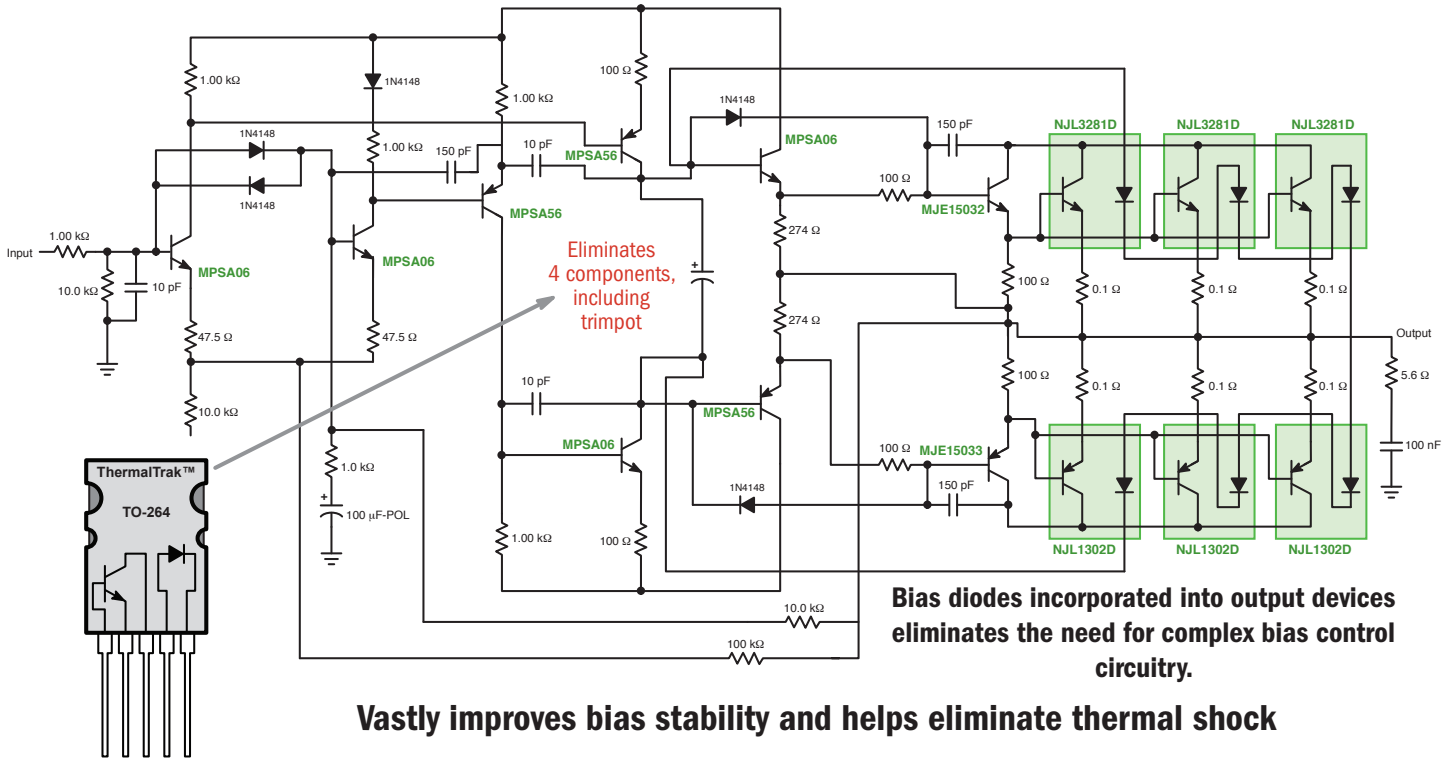
Excellent gain linearity for accurate
reproduction of input signal

Power Bipolar Audio Output Transistors

RMS Power Output	NPN	PNP	V _{CE0} (V)	I _C (A)	h _{FE}			f _T Typ (MHz)	P _D @ 25°C (W)	Package
					Range	@ V _{CE} (V)	@ I _C (A)			
Up to 50 W	MJE15030	MJE15031	150	8	20 -	2	4	30	50	T0-220
	MJE15032	MJE15033	250	8	50 -	5	1	30	50	T0-220
	MJE15034	MJE15035	350	4	50 -	5	1	30	50	T0-220
50 to 180 W	NJW44H11	-	80	10	100 - 400	2	2	85	120	T0-3P
	MJ15003	MJ15004	140	20	25 - 150	2	5	3	150	T0-3
	NJW0281	NJW0302	250	15	75 - 150	5	3	30	150	T0-3P
	MJ15015	MJW5016	120	15	20 - 70	5	4	3	180	T0-3
180 to 200 W	MJL21196	MJ21195	200	16	25 - 75	5	8	4	200	T0-264
	MJW21194	MJW21193	250	16	20 - 60	5	8	4	200	T0-247
	MJW21196	MJW21195	250	16	25 - 60	5	8	4	200	T0-247
	MJL21194	MJL21193	250	15	25 - 75	5	8	4	200	T0-264
	MJW3281A	MJW1302A	230	15	75 - 150	5	5	30	200	T0-247
	MJL3281A	MJL1302A	260	15	75 - 150	5	5	30	200	T0-264
	NJW3281	NJW1302	250	15	75 - 150	5	5	30	200	T0-3P
> 200 W	MJ15024	MJ15025	250	16	15 - 60	4	8	4	250	T0-3
	MJ21194	MJ21193	250	16	25 - 75	5	8	4	250	T0-3

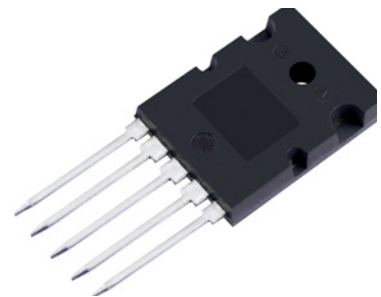
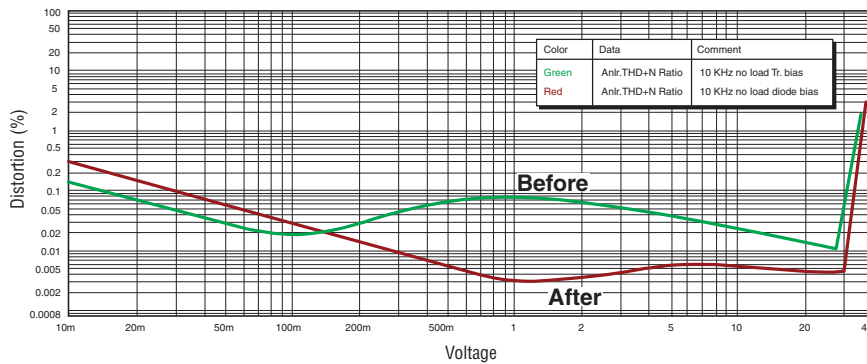
ThermalTrak™ Output Transistors

Eliminate Thermal Lag and Improve Fidelity



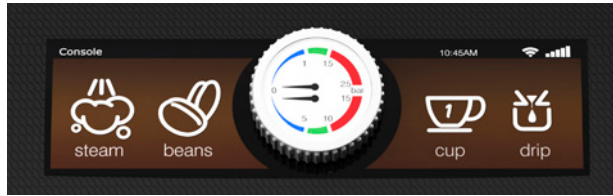
Audio Amplifier Performance

Standard Industry Design vs. ThermalTrak™ Solution



Device Number		V_{CE0} (V)	I_C (A)	h_{FE}		f_T Typ (MHz)	P_D @ 25°C (W)	Package
NPN	PNP			Range	@ V_{CE} (A)	@ I_C (A)		
NJL0281D	NJL0302D	260	15	75 - 150	5	3	180	TO-264-5
NJL3281D	NJL1302D	260	15	75 - 150	5	7	200	TO-264-5

Display Drivers



Dot Matrix Drivers

Device	Duty	Com/Seg	VDD Min (V)	VDD Max (V)	VDD-VEE Min (V)	VDD-VEE Max (V)	Direction of Shift Data	Mode of Shift Data	Package(s)
LC79401KNE	1/64 - 1/256	80 Segment	2.7	5.5	12	32	—	—	QIP-100E
LC79430KNE	1/64 - 1/256	80 Common	2.7	5.5	12	32	Bidirectional	Single/Dual	QIP-100E
LC79431KNE	1/64 - 1/256	80 Common	2.7	5.5	12	32	Bidirectional	Single	QIP-100E

LCD Drivers

Device	Segments	Key Detect	VDD Min (V)	VDD Max (V)	VLCD Min (V)	VLCD Max (V)	V _I for Interface (V)	Output Ports	PWM Outputs	Character Generator	Package(s)
LC75700T		30 (15)	2.7	5.5	—	—	V _{DD}	4	—	—	TSSOP-20
LC75805PE	Static: 38; 1/2 Duty: 74; 1/3 Duty: 108; 1/4 Duty: 140; LED Driver: 48 channel	—	4.5	5.5	V _{DD}	V _{DD}	V _{DD}	48(LED driver)	7	—	QIP-100E
LC75806PT	1/3 Duty: 225 (198) to 231 (204) 1/4 Duty: 296 (260) to 304 (268)	20 to 30	4.5	6	V _{DD}	V _{DD}	3.3 or 5.0	9	—	—	TQFP-100
LC75812PT	1/8 Duty: Dot matrix (5x7)x13+65 1/9 Duty: Dot matrix (5x8)x12+64	35 (20)	2.7	3.6	4.5	10	3.3 or 5.0	3	3	ROM 240; RAM 16	TQFP-100
LC75813T	1/3 Duty: 261 (237) 1/4 Duty: 344 (312)	—	2.7	6	2.7	6	V _{DD}	8	—	—	TQFP-100
LC75814V	1/4 Duty: 64 (48)	—	2.7	6	2.7	6	V _{DD}	4	—	—	SSOP-30
LC75829PW	1/3 Duty: 159 (147) 1/4 Duty: 208 (192)	—	4.5	6	V _{DD}	V _{DD}	3.3 or 5.0	4	—	—	SQFP-64
LC75832E/W	Static: 54 (50) 1/2 Duty: 108 (100)	—	2.7	6	2.7	6	V _{DD}	4	—	—	QIP-64E, SQFP-64
LC75836W	1/4 Duty: 140 (124)	—	4.5	6	V _{DD}	V _{DD}	3.3 or 5.0	4	—	—	SQFP-48
LC75843UGA	Static: 28 (24) 1/2 Duty: 54 (46) 1/3 Duty: 78 (66) 1/4 Duty: 100 (84)	—	4.5	6.3	V _{DD}	V _{DD}	3.3 or 5.0	4	3	—	TSSOP-36
LC75847T	1/3 Duty: 318 (294) 1/4 Duty: 420 (388)	—	2.7	6	2.7	6	V _{DD}	8	—	—	TQFP-120
LC75857W	1/3 Duty: 117 (105) to 126 (114); 1/4 Duty: 152 (136) to 164 (148)	15 to 30	2.7	6	2.7	6	V _{DD}	4	—	—	SQFP-64
LC75878W	1/8 Duty: 600; 1/9 Duty: 666 1/10 Duty: 730	—	2.7	6	4.5	11	V _{DD}	4	—	—	SQFP-100
LC75890W	Static: 37 (25); 1/4 Duty: 148 (100)	—	2.7	3.6	2.7	5.5	V _{DD}	12	3	—	SQFP-48

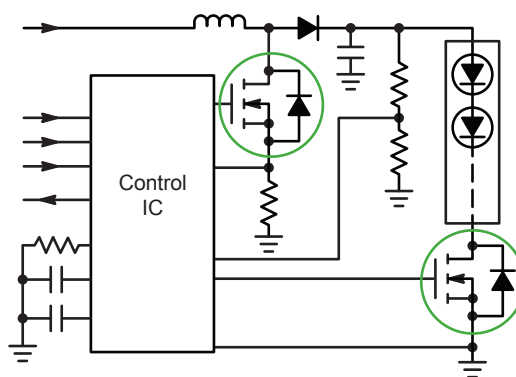
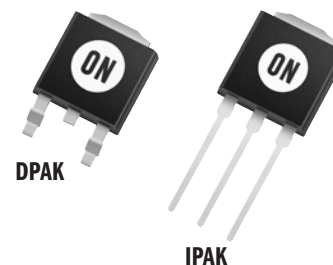
LED Drivers

Device	Description	V _I Min (V)	V _I Max (V)	V _O Max (V)	I _O Max (mA)	Number LEDs	Package(s)
LC75760UJA	Linear, 12-Channel, Constant Current	2.7	5.5	6.3	50	1 in Series; 12 in Parallel	SSOP-24

250 V N-Channel MOSFETs for LED TV

Features

- Ultra Low On-Resistance
 - Improves efficiency by reducing conduction loss
 - Low Gate Charge
 - Ease of drive, faster turn-on
- High Speed Switching
 - Reduces dynamic power loss
- 100% Avalanche Tested
 - Voltage overstress safeguard

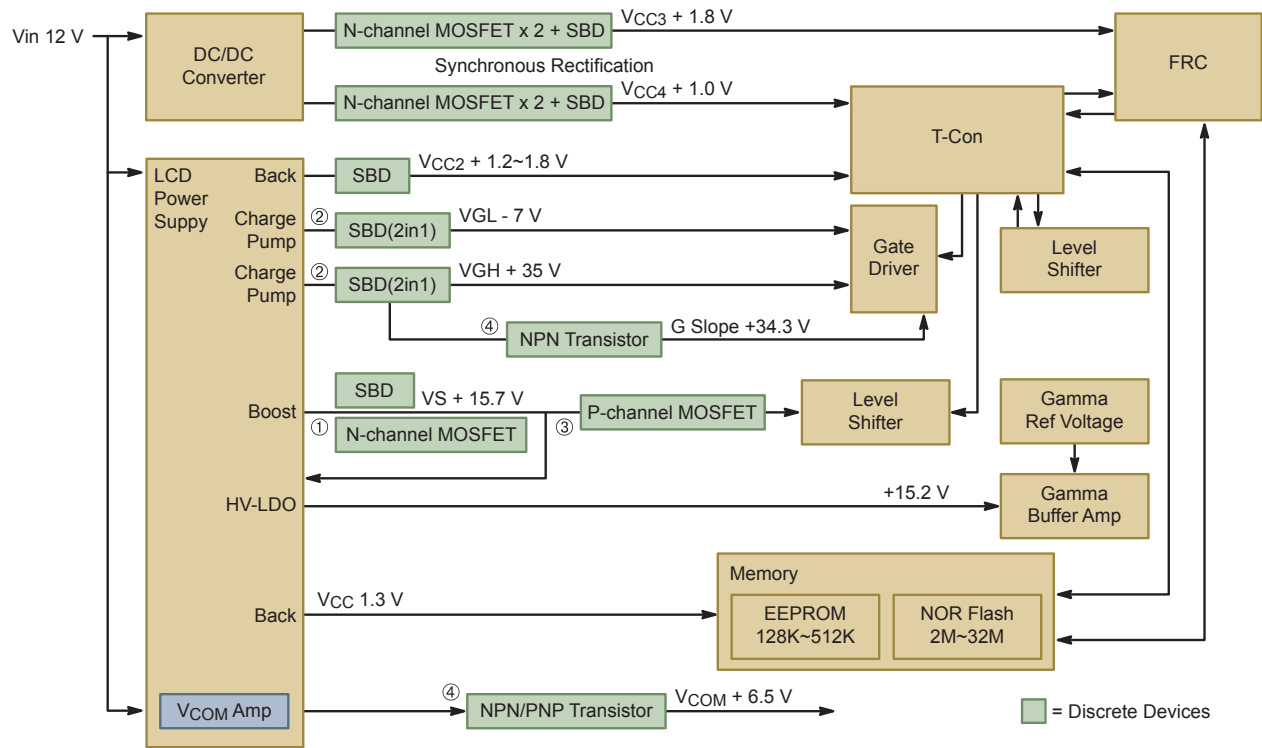


Power Board of LED-Backlight (TVs, PCs)

Device	V _{DSS} (V)	I _D (A)	R _{DS(on)} @ 10 V Typ/Max (Ω)	Q _g Typ (nC)	Package
NDDP010N25AZT4H	250	10	0.32/0.42	16	DPAK/TP-FA
SFT1452-TL-W		3	1.8/2.4	4.2	DPAK/TP-FA
PCP1402-TD-H		1.2			PCP-2/SOT-89
PCP1405-TD-H		0.6	5/6.5*	2.1	PCP-2/SOT-89

* V_{GS} = 4.5 V

TV LED Control Panel



① N-Channel MOSFETs for Boost Chopper

Device	V _{DSS} (V)	V _{GSS} (V)	I _D (A)	R _{DS(on)} @ 10 V Typ/Max (Ω)	Q _g Typ (nC)	Package
MCH6445-TL-W	60	±20	4	60/78	10	SC-88FL/MCPH-6
CPH6442-TL-W	60	±20	6	33/43	20	CPH-6
2SK3703-1E	60	±20	30	20/26	40	T0-220F-3FG
2SK3816-DL-1E	60	±20	40	20/16	40	D2PAK

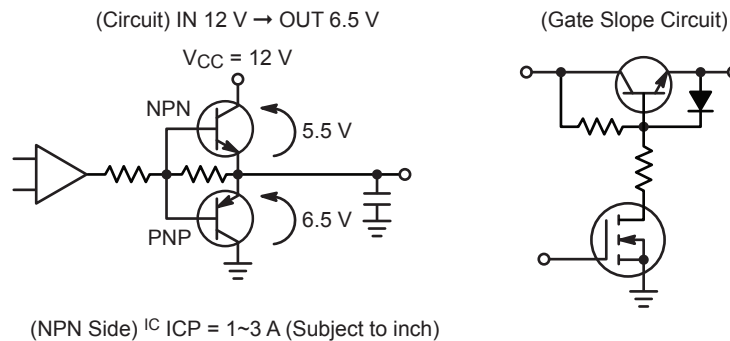
② SBD for 2-in-1 Charge Pump

Device	V _{RRM} (V)	I _O (A)	V _F		I _R		Package
			I _F (A)	Max (V)	V _R (A)	Max (μA)	
SBE805-TL-W	30	0.5	0.5	0.55	15	30	CPH- 5
SBE807-TL-W	30	1	0.7	0.5	16	15	CPH- 5
SB80W06T-TL-H	30	8	3	0.6	30	100	DPAK/TP-FA

TV LED Control Panel

③ P-Channel MOSFETs for Boost Chopper

Device	V _{DSS} (V)	V _{GSS} (V)	I _D (A)	R _{DS(on)} @ 10 V Typ/Max (Ω)	R _{DS(on)} @ 4.5 V Typ/Max (Ω)	Q _g Typ (nC)	Package
MCH6341-TL-W	-30	±20	-5	45/59	71/100	10	MCPH-6/SC-88FL
MCH6342-TL-W	-30	±10	-4.5	—	56/73	8.6	MCPH-6/SC-88FL
CPH6341-TL-W	-30	±20	-5	45/59	71/100	10	CPH-6
CPH6350-TL-W	-30	±20	-6	33/43	58/82	13	CPH-6
ECH8315-TL-H	-30	±20	-7	19/25	31/44	18	ECH-8(S)/SOT-28FL
ECH8667-TL-H	-30	±20	-5.5	30/39	55/77	13	ECH-8(D)/SOT-28FL

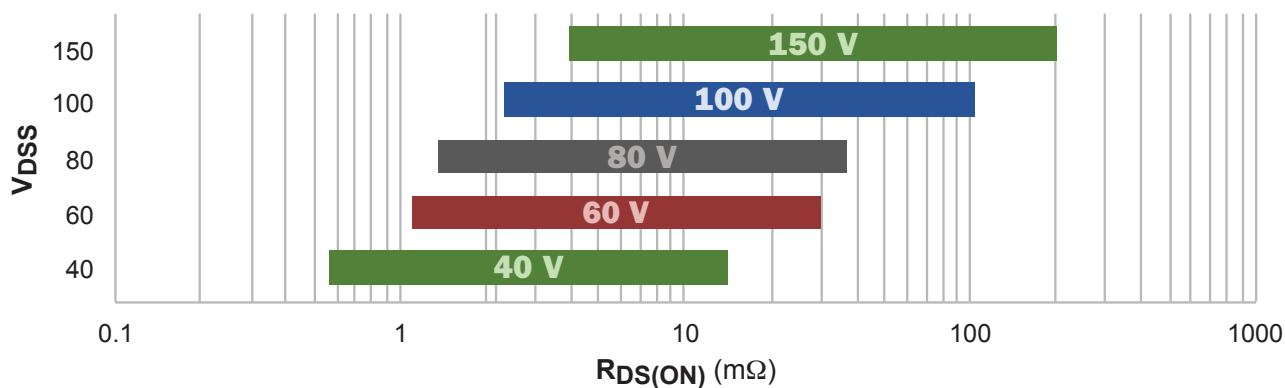


④ Bipolar Transistors for V-com Power Supply Circuit

Device	Polarity	V _{CEO} (V)	I _C (A)	h _{FE}			V _{CE(sat)}				P _D @ 25°C (W)	Package
				Range	V _C (V)	I _C (A)	I _C (A)	I _B (A)	Typ (V)	Typ (V)		
MCH6102-TL-E	PNP	-30	-1.5	200 - 560	2	-0.1	-0.75	-0.015	-0.250	-0.375	1.0	SC-88FL (MCPH-6)
MCH6202-TL-E	NPN	30	1.5	200 - 560	2	0.1	0.75	0.015	0.150	0.225	1.0	SC-88FL (MCPH-6)
PCP1103-TD-H	PNP	-30	-1.5	200 - 560	2	-0.1	-0.75	-0.015	-0.250	-0.375	1.3	SOT-89 (PCP-1)
PCP1203-TD-H	NPN	30	1.5	200 - 560	2	0.1	0.75	0.015	0.150	0.225	1.3	SOT-89 (PCP-1)
2SA2124-TD-E	PNP	-30	-2	200 - 560	2	-0.1	-1.50	-0.075	-0.200	-0.400	1.3	SOT-89 (PCP-1)
2SA2126-TL-H	PNP	-50	-3	200 - 560	2	-0.1	-1.00	-0.050	-0.135	-0.270	15.0	DPAK (TP-FA)
2SA2039-TL-E	PNP	-50	-5	200 - 560	2	-0.5	-2.00	-0.100	-0.255	-0.430	15.0	DPAK (TP-FA)
2SC5706-TI-E	NPN	50	5	200 - 560	2	0.5	2.00	0.100	0.160	0.240	15.0	DPAK (TP-FA)
CPH3140-TL-E	PNP	-100	-1	140 - 400	5	-0.1	-0.40	-0.040	-0.200	-0.600	0.9	CPH-3
CPH3240-TL-E	NPN	100	1	140 - 400	5	0.1	0.40	0.040	0.100	0.400	0.9	CPH-3
2SA1416T-TD-E	PNP	-100	-1	200 - 400	5	-0.1	-0.40	-0.040	-0.200	-0.600	0.5	SOT-89 (PCP-1)
2SC3646T-TD-E	NPN	100	1	200 - 400	5	0.1	0.40	0.040	0.100	0.400	0.5	SOT-89 (PCP-1)

Medium Voltage Power MOSFETs for Motor Control

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



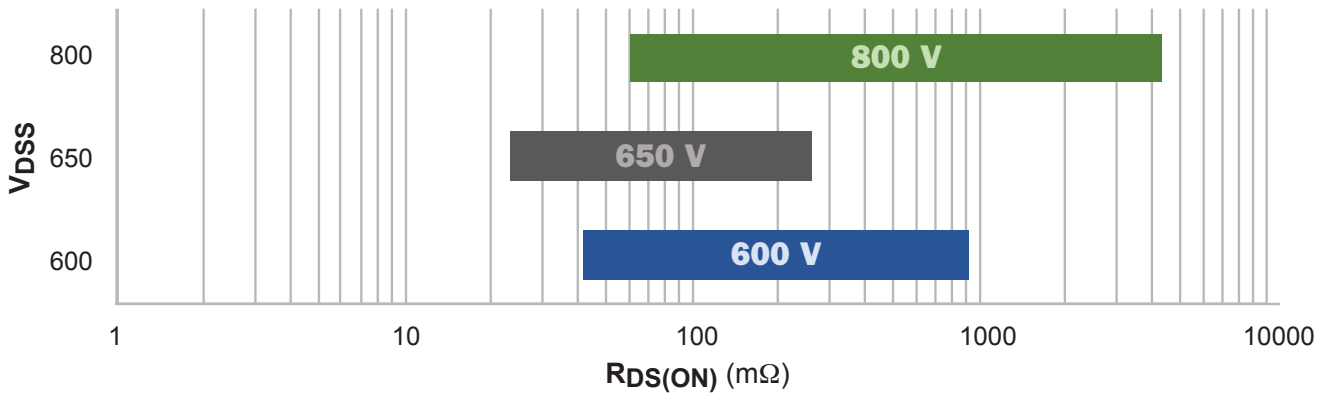
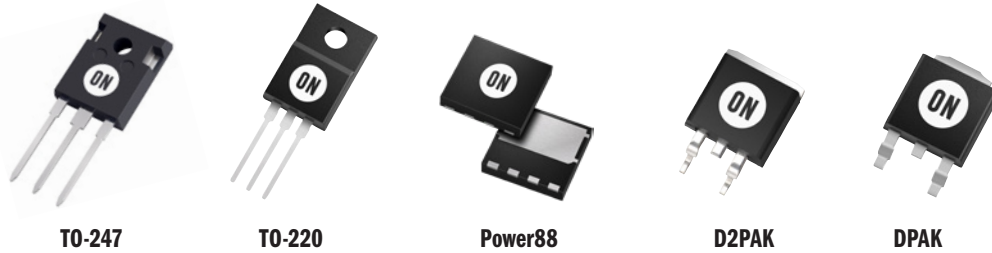
N-Channel Power MOSFETs

Device	Type	V_{DS} (V)	$R_{DS(ON)}$ (mΩ)	$Q_G(TOT)$ (nC)	Package
FDBL0065N40	Single	40	0.65	220	T0-LL (H-PSOF)
FDB0105N407L	Single	40	0.8	208	D2-PAK 7L (TO-263)
NTMFS5C404NLT	Single	40	0.67	181	S0-8FL (DFN-5)
FDMC8360L	Single	40	2.1	57	Power33
NTTFS5C453NL	Single	40	3	35	u8FL
FDMT80040DC	Single	40	0.56	241	PQFN-8 (Power88)
FDBL0110N60	Single	60	1.1	170	T0-LL (H-PSOF)
FDB0170N607L	Single	60	1.4	173	D2-PAK 7L (TO-263)
NTMFS5C604NL	Single	60	1.2	52	S0-8FL (DFN-5)
FDMC86570L	Single	60	4.3	63	Power33
FDMT80060DC	Single	60	1.1	170	PQFN-8 (Power88)
FDBL0150N80	Single	80	1.4	172	T0-LL (H-PSOF)
FDB0165N807L	Single	80	1.6	217	D2-PAK 7L (TO-263)
NTMFS6H800N	Single	80	2.2	82	S0-8FL (DFN-5)
FDMC86340	Single	80	6.5	38	Power33
FDMT80080DC	Single	80	1.35	195	PQFN-8 (Power88)
FDBL0200N100	Single	100	2	95	T0-LL (H-PSOF)
FDB1D7N10CL7	Single	100	1.7	116	D2-PAK 7L (TO-263)
FDM86180	Single	100	3.2	60	Power56
FDMC86184	Single	100	8.5	21	Power33

Device	Type	V_{DS} (V)	$R_{DS(ON)}$ (mΩ)	$Q_G(TOT)$ (nC)	Package
FDMT800100DC	Single	100	2.95	79	PQFN-8 (Power88)
FDMT800120DC	Single	120	4.2	76	PQFN-8 (Power88)
FDBL0630N150	Single	150	6.3	70	T0-LL (H-PSOF)
FDB0630N1507L	Single	150	6.4	97	D2-PAK 7L (TO-263)
FDMT800150DC	Single	150	6.5	77	PQFN-8 (Power88)
FDBL0630N150	Single	150	6.3	70	T0-LL 8L
FDB0630N1507L	Single	150	6.3	97	D2PAK-7
FDB0690N1507L	Single	150	6.9	82	D2PAK-7
FDMT800150DC	Single	150	6.5	25	PQFN-8
FDMT800152DC	Single	150	9	18	PQFN-8
FDB075N15A	single	150	7.5	77	D2PAK-3
FDB082N15A	Single	150	8.2	64.5	D2PAK-3
FDMD8540L	Half Bridge	40	1.5	81	PQFN-8
FDMD8240L	Half Bridge	40	2.6	40	PQFN-12
FDMD8560L	Half Bridge	60	3.2	92	PQFN-8
FDMD8260L	Half Bridge	60	5.8	49	PQFN-12
FDMD8580	Half Bridge	80	4.6	57	PQFN-8
FDMD8280	Half Bridge	80	8.2	31	PQFN-12
FDMD85100	Half Bridge	100	9.9	22	PQFN-8
FDMD82100	Half Bridge	100	19	12	PQFN-12

High Voltage Power MOSFETs for Motor Control

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



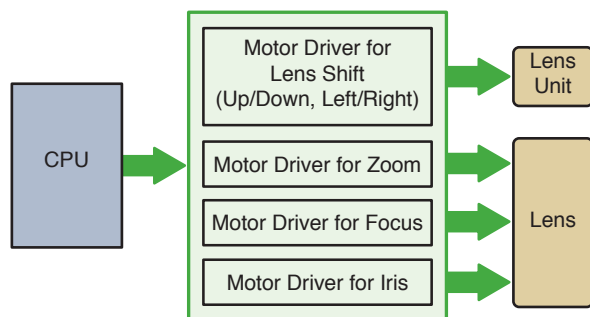
SuperFET® III MOSFETs

Device	V_{DS} (V)	$R_{DS(ON)}$ (mΩ)	$Q_G(TOT)$ (nC)	Package
FCH023N65S3L4	650	23	222	TO-247-4L
FCH023N65S3	650	23	222	TO-247
FCH040N65S3	650	40	136	TO-247
FCH067N65S3	650	67	78	TO-247
FCH099N65S3	650	99	56	TO-247
FCPF067N65S3	650	67	78	TO-220F
FCPF125N65S3	650	125	44	TO-220F
FCPF165N65S3L1	650	165	35	TO-220F
FCPF250N65S3ROL	650	250	24	TO-220F
FCP067N65S3	650	67	78	TO-220
FCP099N65S3	650	99	56	TO-220
FCP125N65S3	650	125	44	TO-220
FCP190N65S3	650	190	30	TO-220
FCMT099N65S3	650	99	56	Power88
FCB070N65S3	650	70	78	D2PAK
FCB199N65S3	650	199	30	D2PAK
FCB260N65S3	650	260	24	D2PAK
FCD260N65S3	650	260	24	DPAK

SuperFET® II MOSFETs

Device	V_{DS} (V)	$R_{DS(ON)}$ (mΩ)	$Q_G(TOT)$ (nC)	Package
FCH041N60E	600	41	285	TO-247
FCH070N60E	600	70	128	TO-247
FCP099N60E	600	99	88	TO-220
FCP125N60E	600	125	75	TO-220
FCP165N60E	600	165	57	TO-220
FCPF190N60E	600	190	63	TO-220F
FCD380N60E	600	380	34	DPAK
FCH060N80-F155	800	60	270	TO-247
FCH085N80-F155	800	85	196	TO-247
FCPF220N80	800	220	78	TO-220F
FCP220N80	800	220	78	TO-220
FCP400N80Z	800	400	43	TO-220
FCB290N80	800	290	58	D2PAK
FCU850N80Z	800	850	22	IPAK
FCD850N80Z	800	850	22	DPAK

Motor Drivers for Lens Control



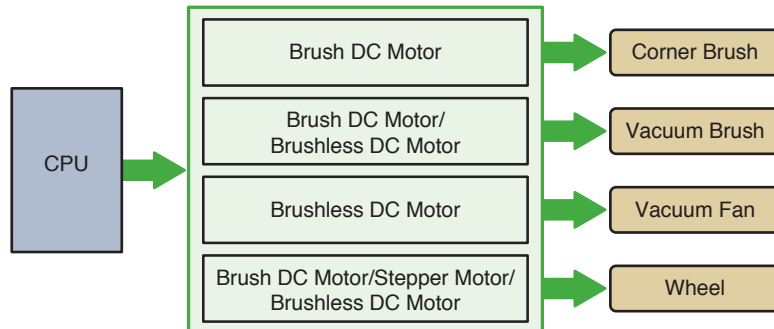
Features

- PWM micro-stepping control on LV8714TA, LV8414CS, LV8712T, LV8713T
- Thermal Shutdown (TSD), Under Voltage Lock Out (UVLO), and Over Current Protection (OCP)
- Over current protection on LV8711T, LV8714TA

Device	Motor	V _M Max (V)	V _{CC} Max (V)	Motor Current Max (A)	Step Resolution	Control Type	PWM Constant Current	Protection	Package
LV8417CS	Brush DC	12.6	6	1	—	Parallel	None	TSD, UVLO	WLP-9
LB1938FA	Brush DC	10.5	—	0.8	—	Parallel	None	TSD, UVLO	Micro8
LV8548MC	Stepper/Brush DC	20	—	1	Half	Parallel	None	TSD, UVLO	SOIC-10
LV8711T	Stepper/Brush DC	18	6	0.8	Half	Parallel	Included	OCP, TSD, UVLO	TSSOP-24
LV8714TA	Stepper/Brush DC	18	—	1.5	Free*	Parallel	Included	OCP, TSD, UVLO	TQFP-48EP
LV8402GP	Stepper/Brush DC	16	6	1.4	Half	Parallel	None	TSD, UVLO	VCT-24
LV8716QA	Stepper/Brush DC	12.6	—	1	Half	Parallel	Included	TSD, UVLO	QFN-16
LV8413GP	Stepper/Brush DC	6	6	0.4	Half	Parallel	None	TSD, UVLO	VCT-16
LV8414CS	Stepper/Brush DC	6	6	0.4	1/64	Clock	Included	TSD, UVLO	WLP-32K
LV8549MC	Stepper	20	—	1	Full	Parallel	None	TSD, UVLO	SOIC-10
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

* Microstep resolution is determined by the reference voltage.

Motor Drivers for Vacuum and Wheels



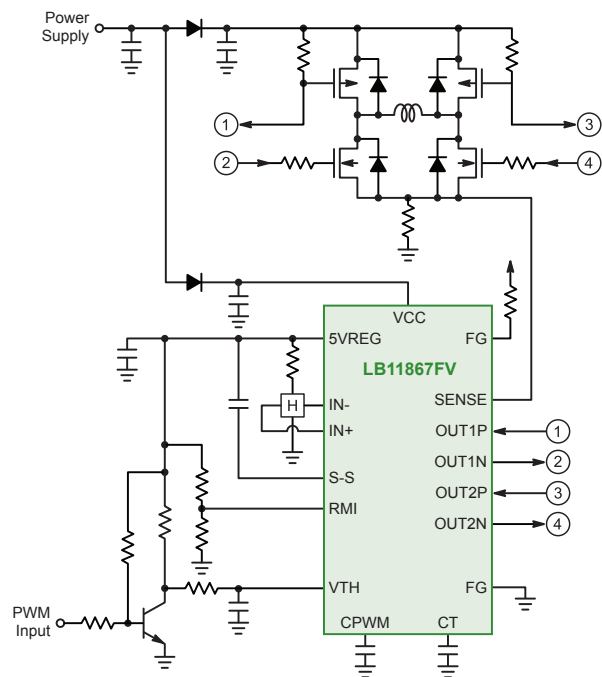
Features

- Low power consumption
- Built-in protection functions
- Synchronous rectification (Brushless DC)
- Available for high-side N-channel Power MOSFET (Brushless DC)

Device	Motor	Type	V _M Max (V)	V _{CC} Max (V)	Motor Current Max (A)	Step Resolution	Speed Control	Control	PWM Constant Current	Protection	Package
LV8548MC	Stepper/Brush DC	Driver	20	—	1	1/2	—	Parallel	None	TSD, UVLO	SOIC-10
LV8731V	Stepper/Brush DC	Driver	36	—	2	1/16	—	Clock/Parallel	Included	OCP, TSD, UVLO	SSOP-44K
LV8734V	Stepper/Brush DC	Driver	36	—	1.5	1/8	—	Clock/Parallel	Included	OCP, TSD, UVLO	SSOP-44K
LV8740V	Stepper/Brush DC	Driver	38	—	2.5	1/4	—	Clock/Parallel	Included	OCP, TSD, UVLO	SSOP-44J
LV8760T	Brush DC	Driver	38	6	3	—	—	Parallel	None	OCP, TSD, UVLO	TSSOP-20J
LV8139JA	Brushless DC	Controller	—	18	*	—	Open Loop	DC	—	OCP, TSD, UVLO, Motor Lock	SSOP-30
LV8824QA	Brushless DC	Controller	—	34	*	—	Open Loop	PWM/DC	—	OCP, TSD, UVLO, Motor Lock	VQFN-32U
LV8907UW	Brushless DC	Controller	—	40	*	—	Open/Closed Loop	PWM	—	OCP, TSD, UVLO, Motor Lock	SQFP-48K

* Motor current max is determined by the motor driver circuit specification.

Motor Drivers for Cooling Fans



Features

- Soft switching in output phase for low noise/vibration
- Built-in protection functions
- Motor rotational speed is controllable by external input
- Rotation output signal

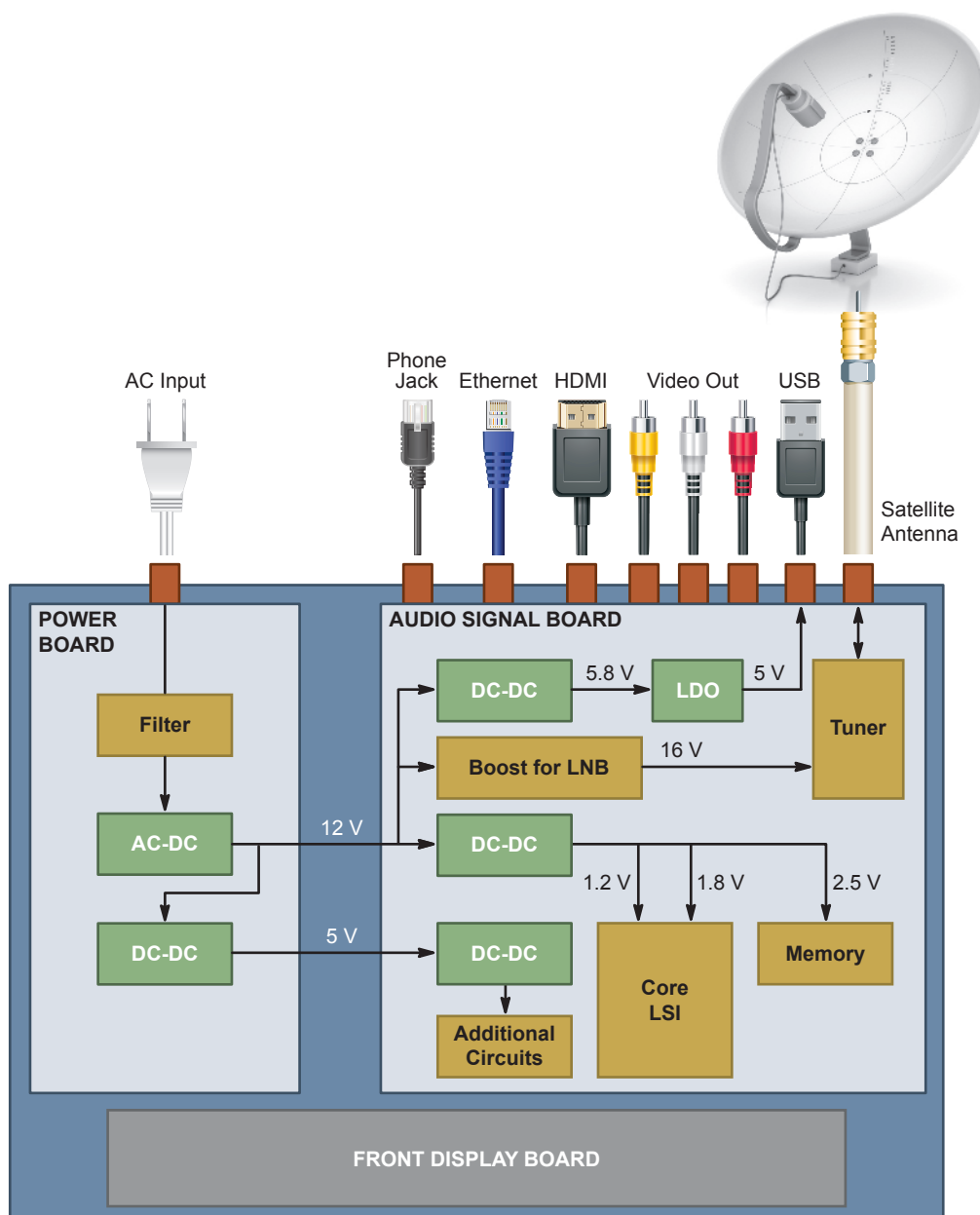
Device	Phase	Motor	Type	Vcc Max (V)	Motor Current Max (A)	Speed Control	Speed Control Input	Protection	Package
LV8806QA	3	Sensor-less	Driver	7	0.7	Open Loop	PWM	OCP, TSD, Motor Lock	SSOP-30
LV8139JA	3	With Sensor	Controller	18	*	Open Loop	DC	OCP, TSD, Motor Lock	SSOP-30
LB11867FV	1	With Sensor	Controller	18	*	Open Loop	DC	OCP, TSD, Motor Lock	SSOP-20J
LV88551JA	1	With Sensor	Controller	20	*	Closed Loop	PWM	OCP, TSD, UVLO, Motor Lock	SSOP-20J
LV88551R	1	With Sensor	Controller	20	*	Closed Loop	PWM	OCP, TSD, UVLO, Motor Lock	VCT-20
LV11961V	1	With Sensor	Driver	18	1	Open Loop	DC	TSD, Motor Lock	HSSOP-14

* Motor current max is determined by the motor driver circuit specification.

Boost for Satellite LNB

Boost Converters for Satellite LNB

Device	fsw (kHz)	V _{in} Min (V)	V _{in} Max (V)	V _{out} (V)	Comments	Package
LV56351HA	425	8	23	set by resistor	Boost plus LDO for satellite LNB; programmable output; short circuit protection	HSSOP-14
LV5636VH	1000	8	23	15.9/11.7	Boost plus LDO for satellite LNB; fixed output; short circuit protection	HSSOP-14

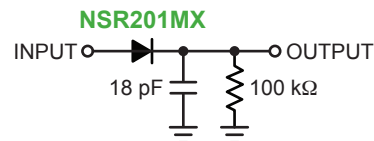


TUNING

RF SBD for Level Detection of Wireless Communications

Features

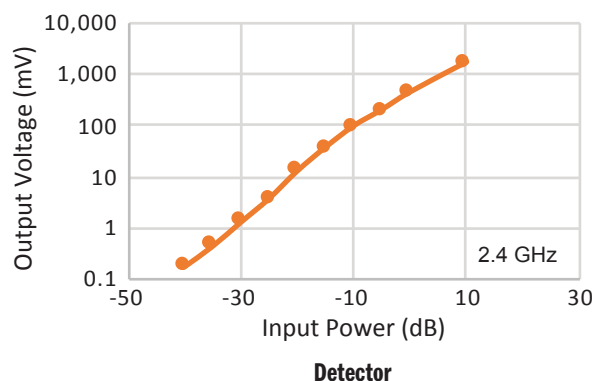
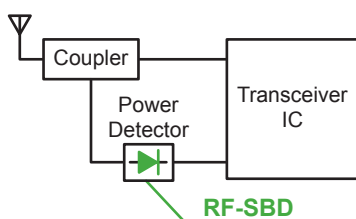
- Low forward voltage and low capacitance improve sensitivity
- Low capacitance suitable for high frequency applications
- Small package X2DFN-2 saves board space
- Dual type SBD reduces mounting area



Device	V_R Min (V)	V_F Max (mV)	C_i Typ (fF)	R_s Typ (Ω)	Connection	Package
NSR201MX	2	320	150	14	Single	X2DFN-2
SBX201C	2	320	250	14	Series	CP-3/SC-59

Application Diagram

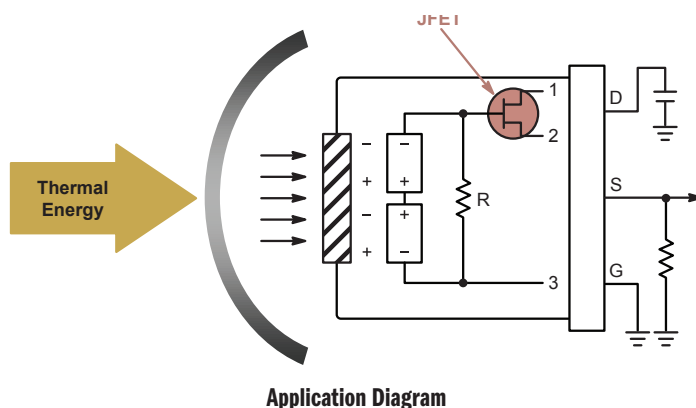
- Power Detector for Wireless LAN
- Level Detector for Radio and TV



JFET for IR Sensor

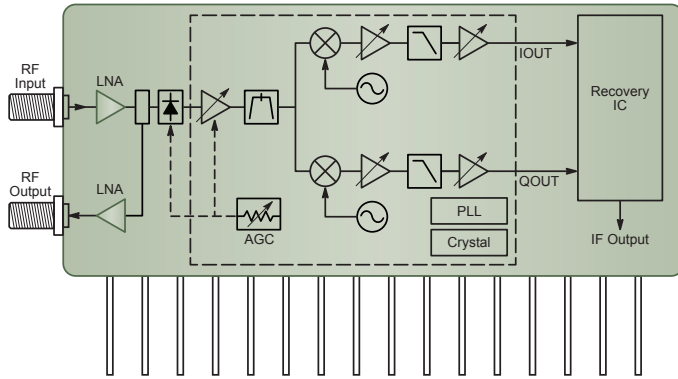
Features

- Small package reduces mounting area
- Low current operation reduces power consumption
- Low IGSS reduces current noise
- Low parasitic capacitance is effective for EMC measures

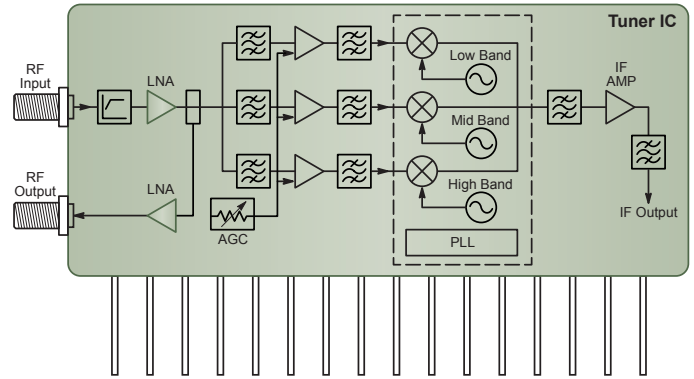


Device	V_{DS} (V)	I_{GSS} (nA)	I_{DSS} (mA)	$V_{GS(off)}$ (V)	$ y_{fs} $ (mS)	Package
TF412S	-30	-1	1.2 to 3.0	-0.18 to -1.5	5.0	SOT-883
TF414	-40	-0.5	0.05 to 0.13	Max -4.0	5	SOT-883
2SK3666	-30	-1	0.6 to 3.0	-0.18 to -2.2	6.5	SC-59-3

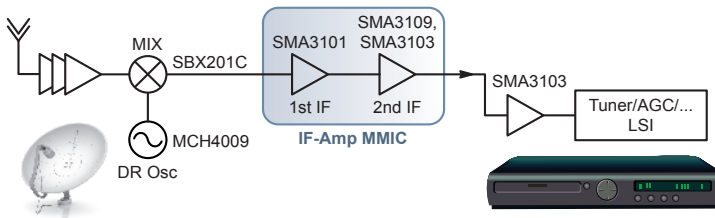
Discrete Devices for Satellite, Terrestrial, & Cable TV Tuners



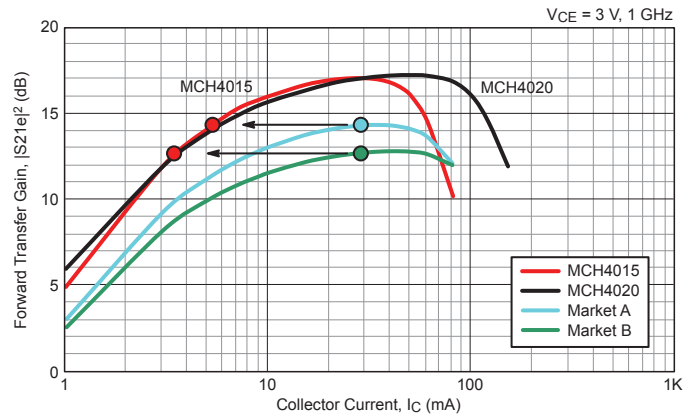
Satellite



Terrestrial, Cable



IF Amplifier for Satellite TV, LNB, STB



LNA Performance

RF Devices for Terrestrial TV/CATV Tuners

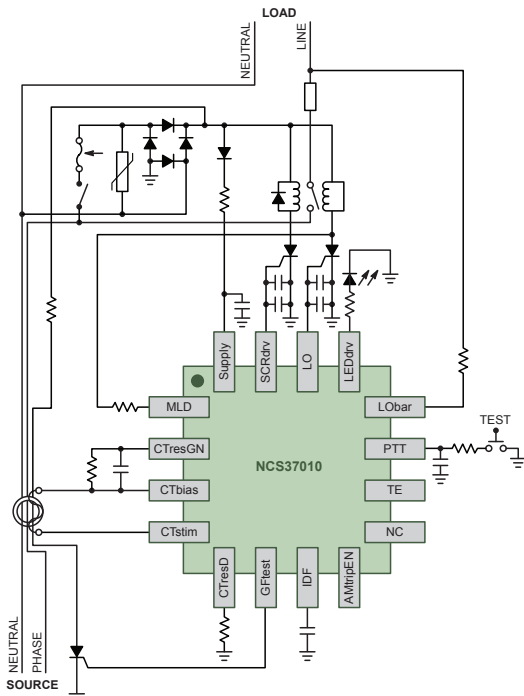
Block	Device	V_{CB0} (V)	I_c (mA)	V_{CE0} (V)	f_T (GHz)	Package
LNA	MCH4009	10	40	3.5	25.0 @ $V_{CE} = 3\text{ V}/I_c = 20\text{ mA}$	MCPH-4
	MCH4014	20	30	12	10.0 @ $V_{CE} = 5\text{ V}/I_c = 10\text{ mA}$	MCPH-4
	MCH4015	20	100	12	10.0 @ $V_{CE} = 5\text{ V}/I_c = 50\text{ mA}$	MCPH-4
	MCH4020	15	150	8	16.0 @ $V_{CE} = 5\text{ V}/I_c = 50\text{ mA}$	MCPH-4
	CPH6001A	20	100	12	6.7 @ $V_{CE} = 5\text{ V}/I_c = 30\text{ mA}$	CPH-6
	2SC5226A	20	70	10	7.0 @ $V_{CE} = 5\text{ V}/I_c = 20\text{ mA}$	MCP
Block	Device	V_{CC} (V)	I_{CC} (mA)	G_p (dB) @ 1 GHz	NF (dB) @ 1 GHz	Package
LNA (MMIC)	SMA3103	5	19	26.5	4.7	MCPH-6
	SMA3109	3	16	23	4.3	MCPH-6

Ground Fault/Earth Leakage Detection and Protection

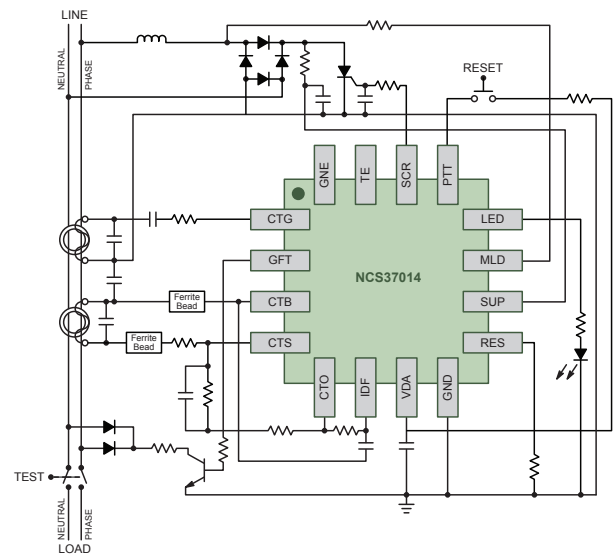
Features

- Broad selection of GFCI controllers for a variety of applications
- Proprietary solutions for Ground Fault and Grounded Neutral Fault sensing
- Auto-monitoring (Self-Test) functions enabled for updated UL943/B
- Industrial grade reliability and quality
- Customized solutions available

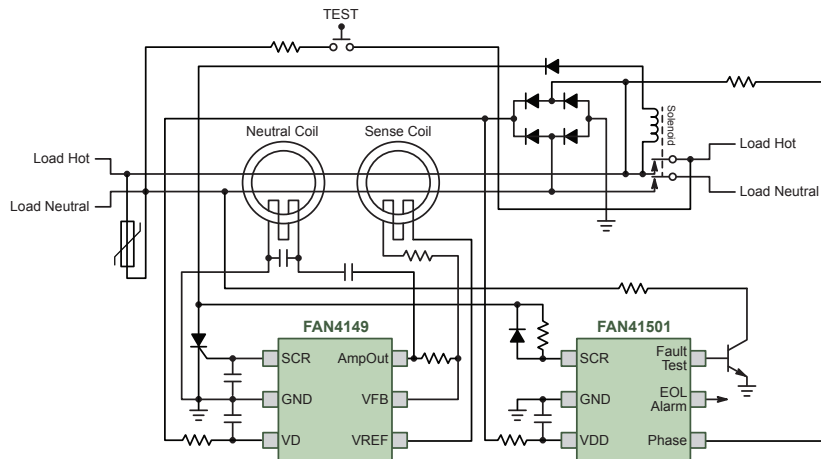
Self-Test GFCI Solutions



NCS37010 with a Single Coil for Both GN and GNF Sensing



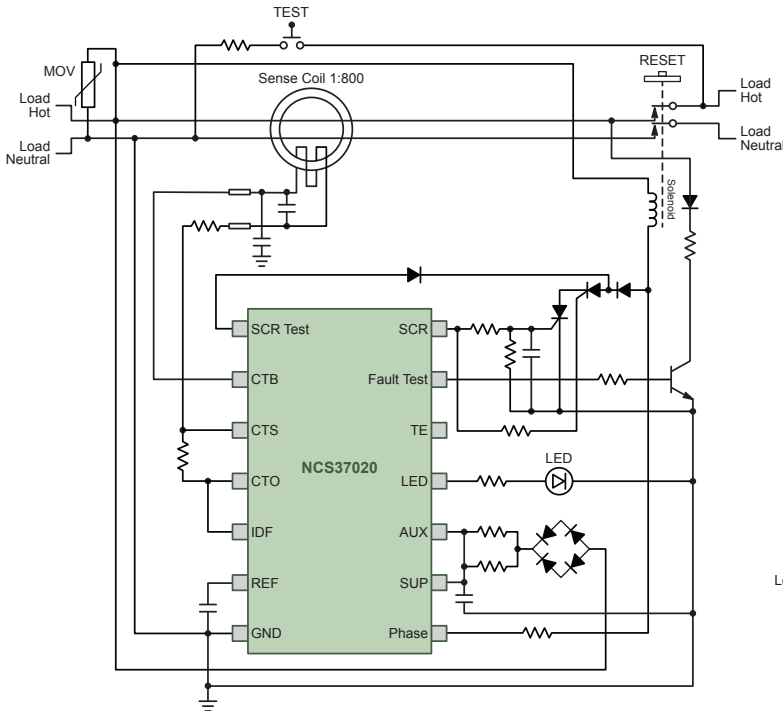
NCS37014 with Two Coils for Low Power Consumption



FAN4149 + FAN41501 Combination with Two Coils for Ease of Design

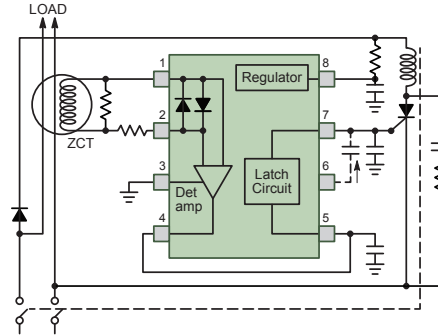
Ground Fault/Earth Leakage Detection and Protection

Self-Test ALCI/RCD Solution



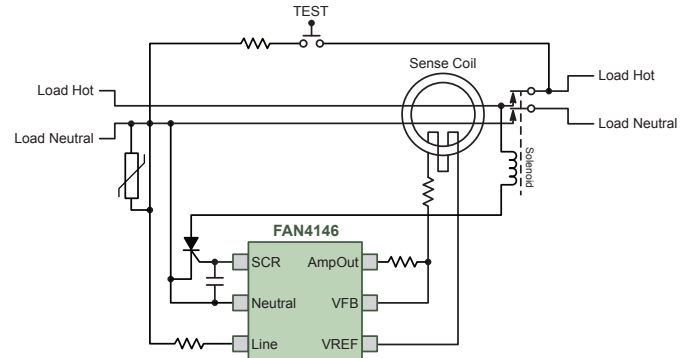
NCS37020 for Single Coil Self-Test

Residual Current Device



KA2803B for M54123 Equivalent KA2803C with Extended Operating Temperature

General Purpose



FAN4146E

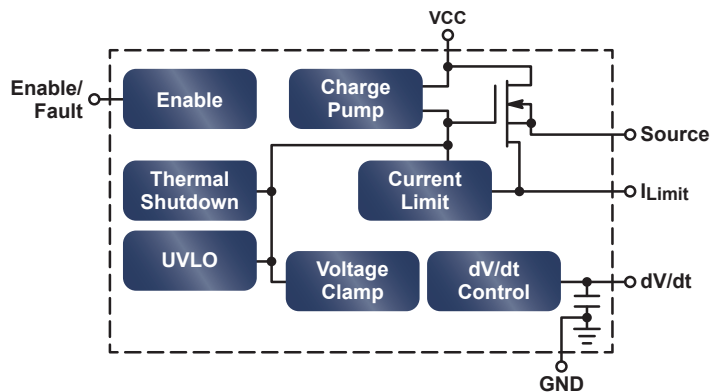
Device	Function	Differential Fault	Grounded-Neutral Fault	Electrical Standard	Current Transformer	Electronic Lockout	Operating Temperature (°C)	Device	Package(s)
NCS37010	Self Test GFCI Controller	✓	✓	UL943, UL2231	Single coil	✓	-40 to +85	Receptacle, circuit breaker, portable power plug	QFN-16, TSSOP-16
NCS37014	Self Test GFCI Controller	✓	✓	UL943, UL2231	Dual coil		-40 to +95	Receptacle, circuit breaker, portable power plug	QFN-16
FAN4149	Self Test GFCI Controller	✓	✓	UL943, UL2231	Dual coil		-35 to +85	Receptacle, circuit breaker, portable power plug	SOT-23-6
FAN41501	Self Test Monitor	✓	✓	UL943, UL2231	N/A		-35 to +85	Receptacle, circuit breaker, portable power plug	SSOT-6
NCS37020	Self Test ALCI Controller	✓		UL943B	Single coil		0 to +70	Portable appliances, products requiring self-test	TSSOP-14
FAN4146E	ALCI/RCD/ELB Controller	✓		IEC 61008/9, GB/T 16916/7	Single coil		-35 to +85	General use, compact solution for appliances	SSOT-6
KA2803B	RCD/ELB Controller	✓		IEC 61008/9, GB/T 16916/7	Single coil		-25 to +80	General use, circuit breaker, portable power plug	SOP-8, DIP-8
KA2803C	RCD/ELB Controller	✓		IEC 61008/9, GB/T 16916/7	Single coil		-25 to +100	General use, circuit breaker, portable power plug	SOP-8

Electronic Fuses for Inrush Current Limiting on Power Buses

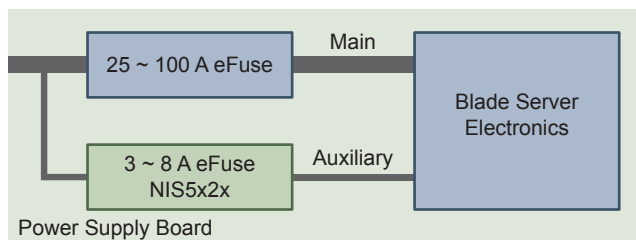
3-12 V Power Bus Hot Plug Protection

Features

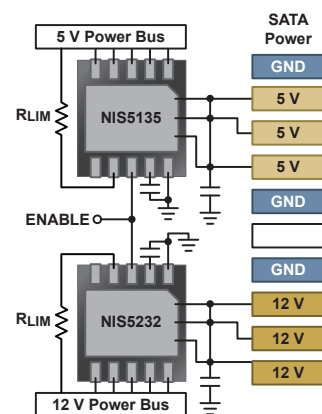
- Low $R_{DS(ON)}$, high operating and trip currents (I_{OP} , I_{TRIP})
- Overvoltage protection
- Precise I_{TRIP} control
- Slew rate control
- Thermal shut-down
- EN pin for synchronizing multiple eFuses
- Outperforms poly-fuses:
 - Tighter spec tolerances
 - Lower resistance
 - Shorter trip-time
 - Superior repeatability
- High efficiency with high current capability
- eFuses in parallel achieve practically any desired level of I_{OP} and I_{TRIP}



Hot-Plugged Fans



Servers



Hard Drive/Solid State Drive or Backplane Application

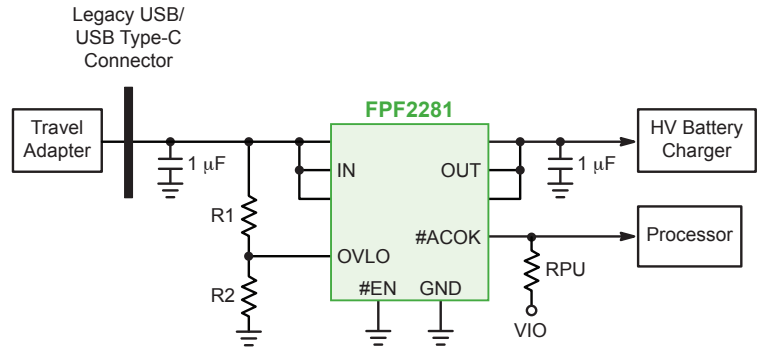
Device	Nominal Voltage (V)	Input Voltage (V)	Output Clamping Voltage (V)	Continuous Current (A)	Trip Current (A)	$R_{DS(ON)}$ (m Ω)	Auto-Retry	Latching	Package
NIS5135	5	-0.6 to 18	6.65	3.6	Adjustable	68	✓	✓	DFN-10
NIS5132	12	-0.6 to 18	15	4.2	Adjustable	44	✓	✓	DFN-10
NIS5232	12	-0.6 to 18	15	4.2	Adjustable	44		✓	DFN-10
NIS5820	12	-0.3 to 20	14	8	Adjustable	24	✓	✓	WDFN-10
NIS5020	12	-0.3 to 20	14	10	Adjustable	14	✓	✓	WDFN-10
NIS5021	12	-0.3 to 20	14	12	Adjustable	14	✓	✓	WDFN-10
NIS6150	5	-0.3 to 10	6.1/6.9	1	Adjustable	190	✓	✓	WDFN-10
NIS6350	5	-0.3 to 10	6.1/6.9	3	Adjustable	50	✓	✓	WDFN-10

Power Protection

Surge and Over-Voltage Protection Switches

Features

- Optimized for Input Power Stage with USB-C
- 100 V Surge Capable Integrated TVS
- Low R_{ON} for Low Power Loss
- Fast Over Voltage Response Time
- Design Flexibility with Adjustable/Selectable OVP
- Reverse Current Block
- Compact Packages, WLCSP and DFN



Over Voltage Protection Switches

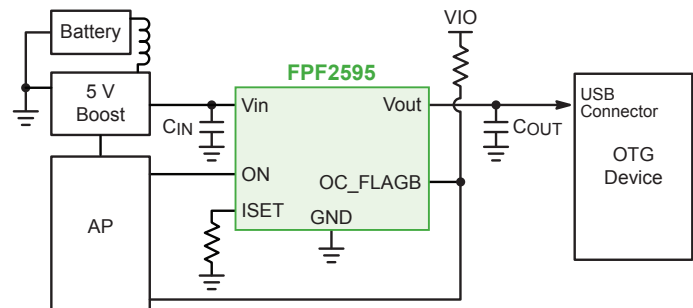
Device	Channel	V_{IN} Min (V)	V_{IN} Max (V)	OVP (V)	R_{ON} (m Ω)	I_{OUT} Max (A)	Integrated TVS	Discharge Path	Package
FPF3042	DISO^	4.0	18	14	70 @ 5.0 V	2.7	No	No	WLCSP-16
FPF2281	Single	2.5	28	14*	30 @ 5.0 V	4.5	Yes	No	WLCSP-12
FPF2283C	Single	2.8	28	6.8*	7.5 @ 5.0 V	10	No	No	WLCSP-20
FPF2286	Single	2.8	28	6.8*	25 @ 5.0 V	4.0	No	No	WLCSP-6
FPF2290	Single	2.5	28	SEL**	30 @ 5.0 V	4.5	Yes	No	WLCSP-12
FPF2498	Single	3.5	28	6.5	80 @ 5.0 V	1.75	No	No	WLCSP-6
FPF3380	Single	2.8	28	6.15*	15 @ 5.0 V	6.25	Yes	No	WLCSP-12
NCP367	Single	1.2	28	OPN^^	50 @ 3.5 V	3.4	No	No	DFN-8
NCP398	Single	2.9	28	5.65	190 @ 5.0 V	0.8	No	Yes	WLCSP-4

* Default but Adjustable w/ external R. ** Selectable w/ Logic Pins. ^ Dual Input Single Output. ^^ By Option.

Over Current Protection Switches

Features

- Optimized for 5V USB-OTG and VCONN with USB-C
- Fast Over Current Response Time
- Design Flexibility with Adjustable Current Limit Set
- True Reverse Current Block
- Compact Packages, WLCSP and DFN
- UL Certified



Over Current Protection Switches

Device	Channel	V_{IN} Min (V)	V_{IN} Max (V)	R_{ON} (m Ω)	I_{LIM} Range (A)	OVP	RCB*	Package
FPF2195	Single	1.8	5.5	55 @ 3.3 V	0.1 ~ 1.5	No	Yes	WLCSP-6
FPF2495C	Single	2.5	5.5	70 @ 5.0 V	0.05 ~ 2.0	Yes	Yes	WLCSP-9
FPF2496	Single	3.5	5.5	70 @ 5.0 V	0.1 ~ 2.5	Yes	Yes	WLCSP-9
FPF2595	Single	2.5	5.5	35 @ 5.0 V	0.1 ~ 3.5	Yes	Yes	WLCSP-12
FPF2895C	Single	4.0	22	27 @ 5.0 V	0.5 ~ 5.0	Yes	Yes	WLCSP-24
NCP380	Single	2.5	5.5	55 @ 5.0 V	0.5 ~ 2.1	No	Yes	UDFN-6
NCP382	SIDO**	2.5	5.5	80 @ 5.0 V	Fixed***	No	Yes	DFN-8
NCP383	SIDO**	2.7	5.5	45 @ 5.0 V	0.5 ~ 2.8	No	Yes	UDFN-10

* Reverse Current Block. ** Single Input Dual Output. *** By Option.

USB 3.x Type A Connector

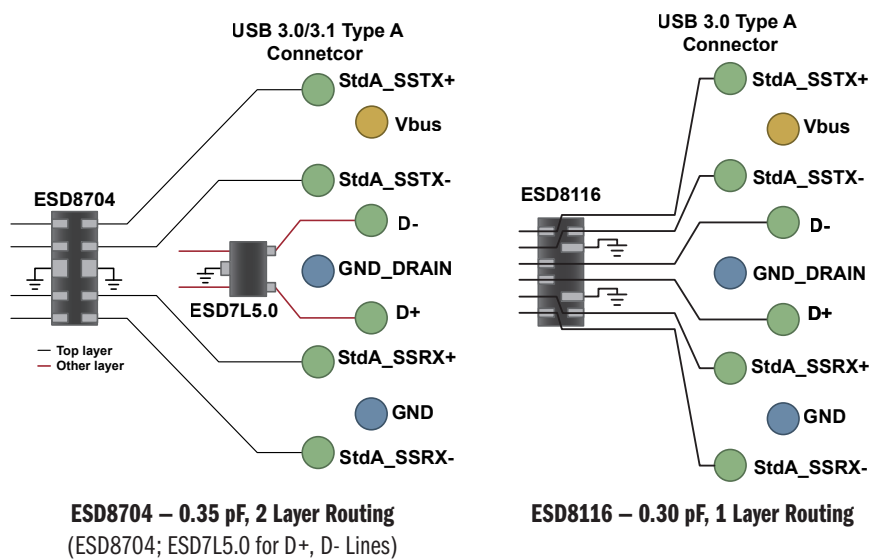
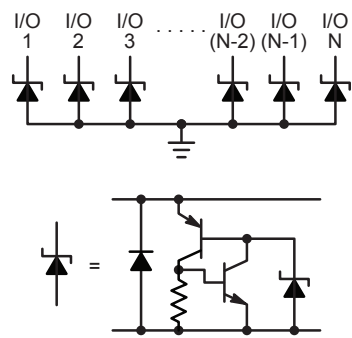
Two SuperSpeed Pairs, One High Speed Pair, VCC, Low Capacitance ESD Protection

Key Requirement

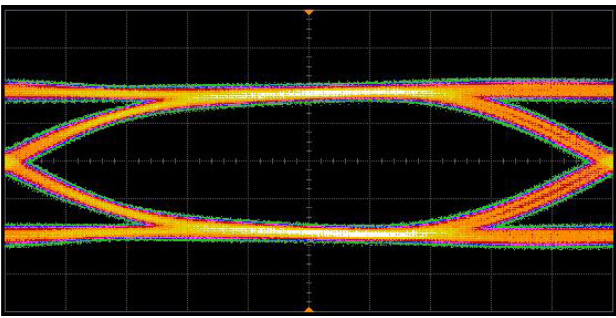
- Cap < 0.7 pF

Features

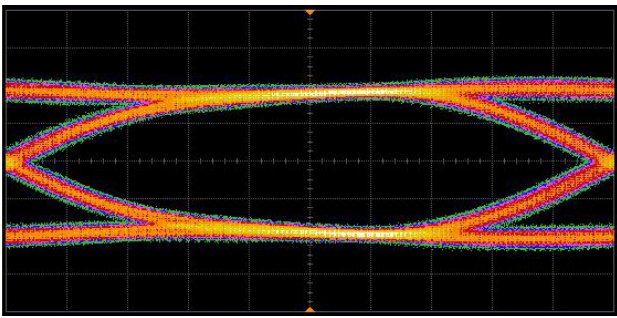
- 0.35 pF
- Flow through routing
- Industry leading low clamping voltage versus competitors



Device	Interface	Data Lines	Capacitance (pF)	Package	Size (mm)
ESD8704	USB 3.x	2 Pair (Tx, Rx)	0.35	UDFN-10	2.5 x 1.0
ESD7L	USB 3.x	1 Pair (D+/-)	0.5	SOT-723	1.2 x 1.2
ESD8504	USB 3.0	2 Pair (Tx, Rx)	0.4	UDFN-10	2.5 x 1.0
ESD8104	USB 3.0	2 Pair (Tx, Rx)	0.3	UDFN-10	2.5 x 1.0
ESD8116	USB 3.0	3 Pair (Tx, Rx, D+/-)	0.3	UDFN-8	2.0 x 1.2
ESDL3552	USB 3.x	1 Pair (Tx, Rx, D+/-)	0.25	X4DFN-3	0.62 x 0.32
ESDL2011	USB 3.x	Single Line (Tx, Rx)	0.17	DSN-2	0.6 x 0.3
ESDL2031	USB 3.x	Single Line (Tx, Rx, D+/-)	0.4	X4DFN-2	0.6 x 0.3
ESD8011	USB 3.x	Single Line	0.10	X3DFN-2	0.62 x 0.32
ESD8111	USB 3.x	Single Line	0.20	WLCSP-2	0.6 x 0.3
ESD8006	USB 3.0	3 Pair (Tx, Rx, D+/-)	0.25	UDFN-8	3.3 x 1.0
ESDL1531	USB 3.x	Single Line (Tx, Rx, D+/-)	0.15	X4DFN-2	0.445 x 0.24



Without ESD



With ESD

USB 3.0 @ 5 Gb/s

USB 2.0

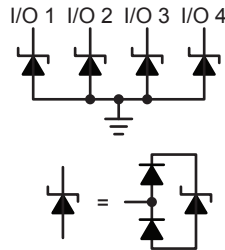
One High Speed Pair, V_{CC}, Low Capacitance ESD Protection

Key Requirement

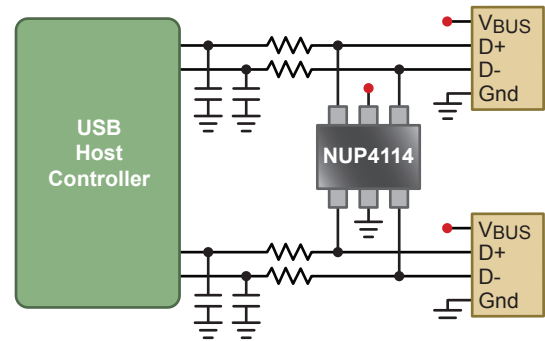
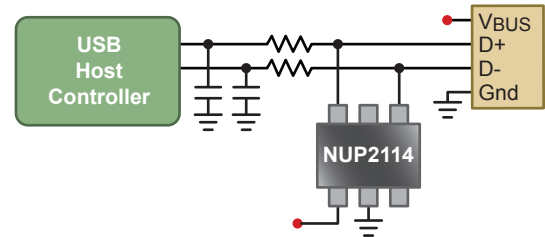
- Cap < 5 pF

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



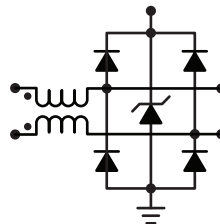
One High Speed Pair, V_{CC}, Common Mode Filter + ESD Protection

Key Requirement

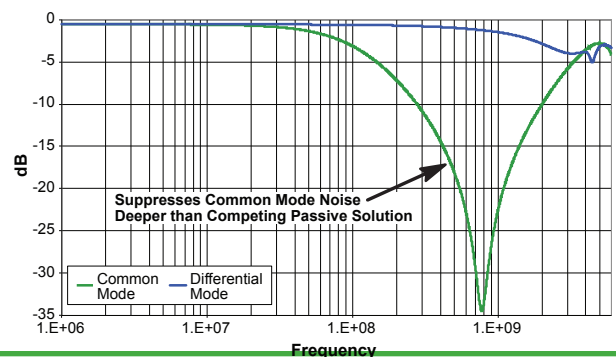
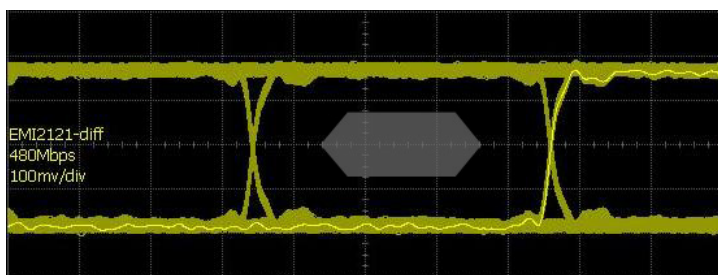
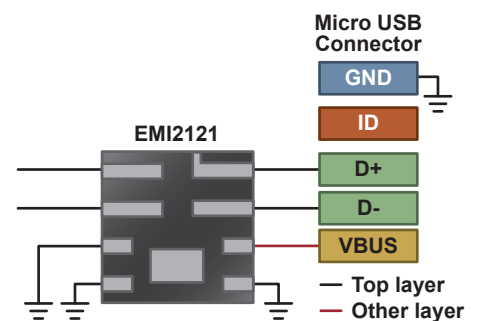
- Cap < 5 pF
- Common Mode Filtering

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

HDMI, Display Port

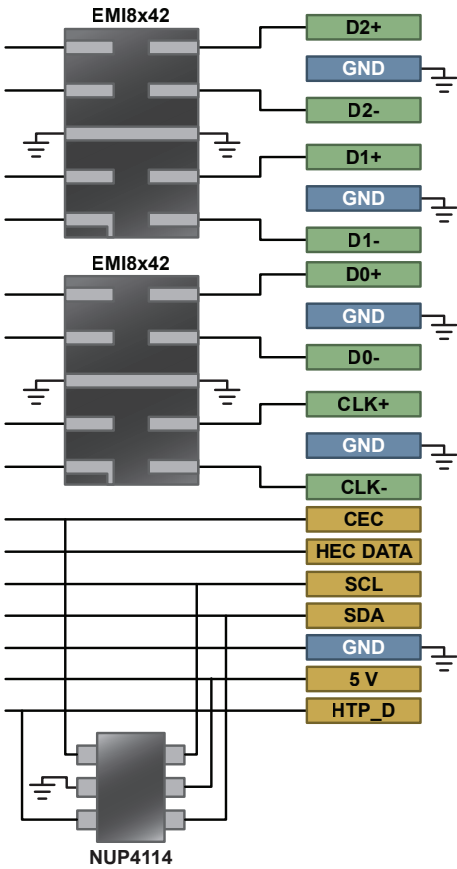
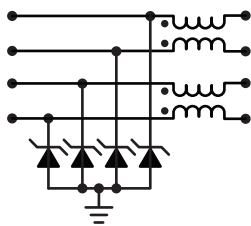
Four High Speed Pairs, Up to Six Additional Lines, Low Capacitance ESD + Common Mode Filters

Key Requirement

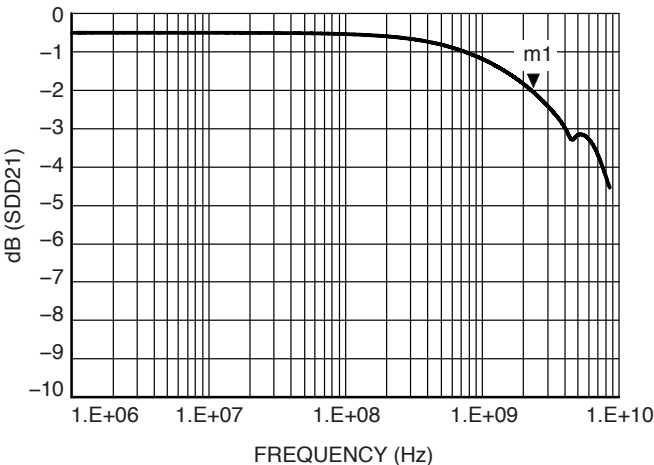
- Differential Mode cutoff frequency >3 GHz for HDMI 2.0
- Common Mode Filtering

Features

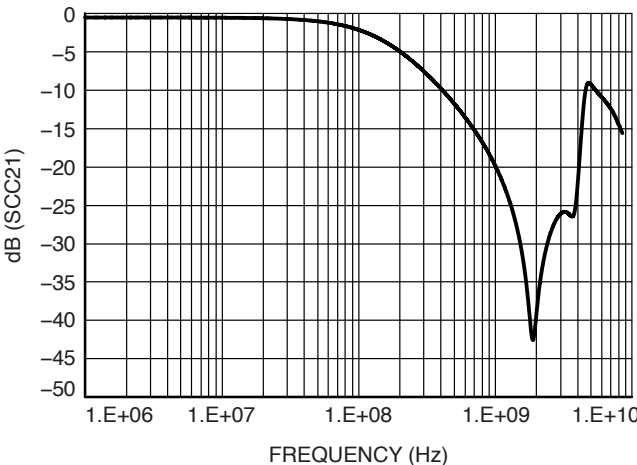
- 3.3 VRWM
- Insertion loss < 2.5 dB @ 2.5 GHz
- -30 dB attenuation @ 2.4 GHz
- VCLAMP < 12 V @ 16 A TLP
- > ±15 kV Contact Discharge
- Available in 0.4P and 0.5P packages



Device	Pairs	CM Attenuation @ 2.4 GHz (-dB)	DM 3 dB Bandwidth (GHz)	VCLAMP @ 16 A TLP	Package	Size (mm)
EMI8042	2	30	4	11.8	XDFN-10	2.5 x 1.35
EMI8142	2	30	4	11.8	XDFN-10	2.2 x 1.35
EMI4192	2	20	5	18	WDFN-10	2.5 x 2.0



Typical Differential Mode Attenuation vs. Frequency



Typical Common Mode Attenuation vs. Frequency

HDMI, Display Port

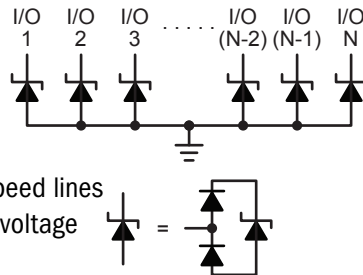
Four High Speed Pairs, Up to Six Additional Interface Lines, Low Capacitance ESD

Key Requirement

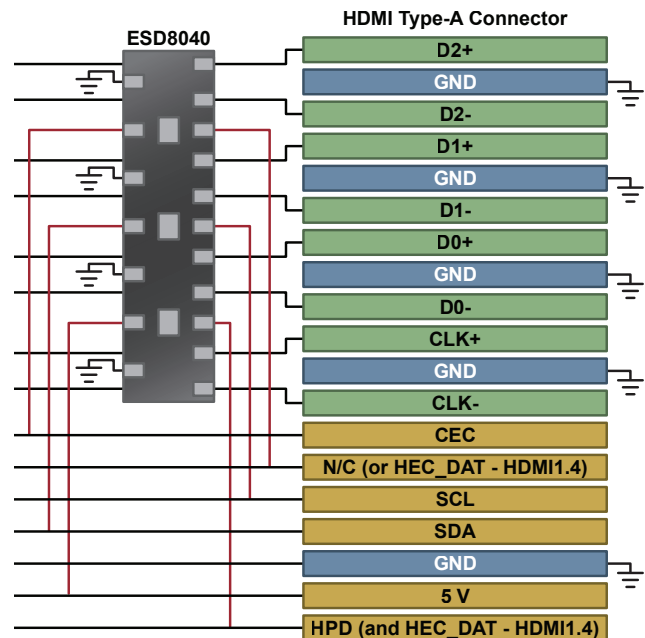
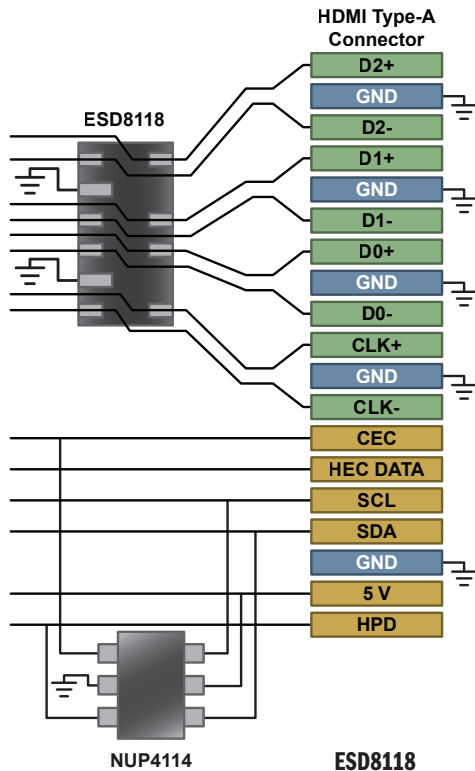
- Cap < 0.5 pF

Features

- 0.3 pF ESD protection
- Flow through routing in high speed lines
- Industry leading low clamping voltage

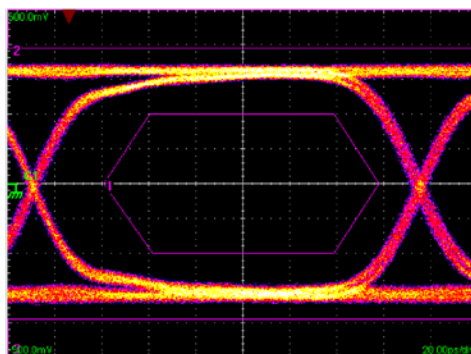


Device	Data Lines	Capacitance (pF)	Package	Size (mm)
ESDL2031	1 (TMDS)	0.4	X4DFN-2	0.6 x 0.3
ESD9101	1 (TMDS)	0.36	SOD-923	1.0 x 0.6
ESD8104	4 (TMDS)	0.3	UDFN-10	2.5 x 1.0
ESD8118	8 (TMDS)	0.3	UDFN-10	3.2 x 1.2
ESD8040	14 (TMDS + Low Speed + Power)	0.3	UDFN-18	5.5 x 1.5
NUP4114UPX	5 (4 Low Speed + Power)	0.5	SOT-563	1.6 x 1.6
NUP4114UCL	5 (4 Low Speed + Power)	0.5	SC-88	2.0 x 2.1
NUP4114H	5 (4 Low Speed + Power)	0.5	TSOP-6	3.0 x 2.75

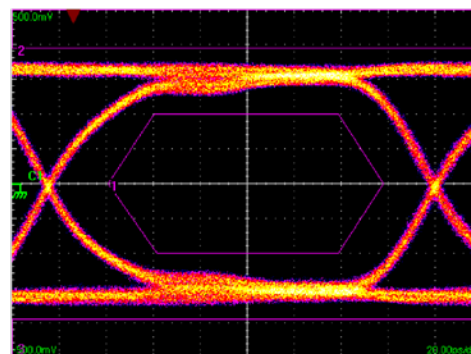


- MediaGuard fully integrated solution
- Includes ethernet protection (HDMI1.4)
- Backdrive current protection

— Top layer
— Other layer



Without ESD



With ESD

HDMI 2.0 @ 6 Gb/s

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

Four Pairs, Low Capacitance Surge and ESD Protection

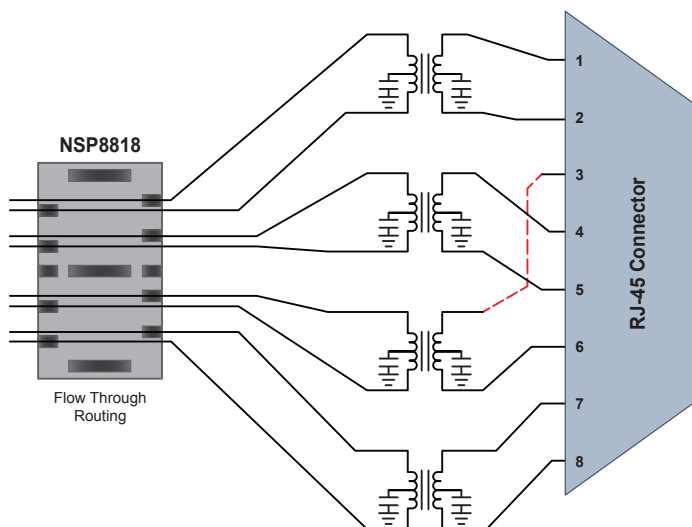
The 1000BASE-T or Gigabit Ethernet interface operating at higher bitrates is susceptible to ESD strikes, cable-discharge events and lightning-induced transients. Our products help meet IEC 61000-4-5, GR-1089-CORE and other Standards.

Features

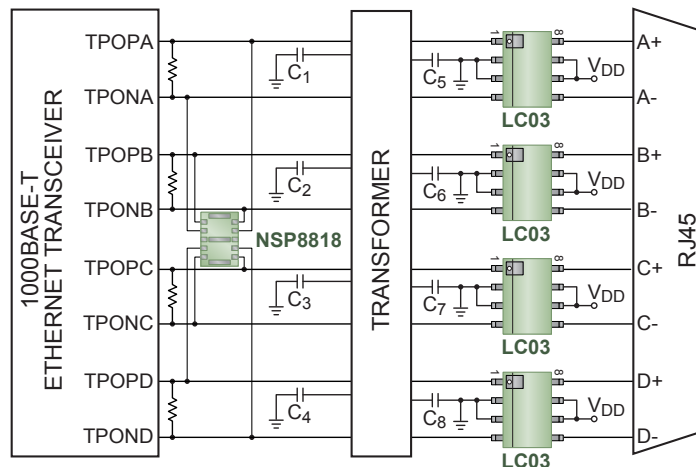
- Line-to-line capacitance < 3 pF
- V_{clamp} (25 A surge) < 11 V
- IEC 61000-4-2 rating > 30 kV
- No latching danger
- Surge rating maintained to 125°C

Benefits

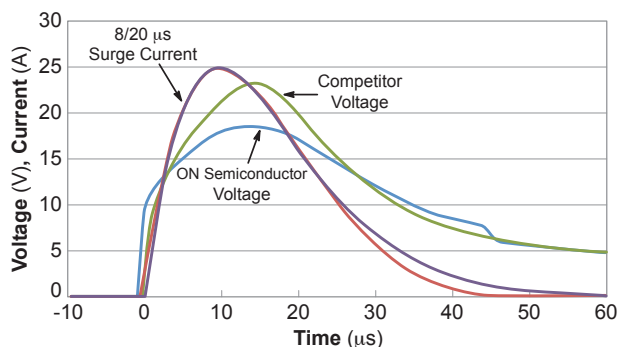
- Compatible with Gb Ethernet and beyond
- Enhanced protection for downstream electronics
- Accommodates operating transients above 3.3 V
- Small form-factor allows integration into connectors



Typical Application



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



Line-to-Line Surge

Surge Protection Devices

Device	V_{DC} Max (V)	Line Transient Max (V)	Surge I_{pp} , 8/20 μ s (A)	Typical Line-Line Capacitance (pF)	ESD Contact Rating (kV)	Package
LC03-6	6.7	7	100	8	± 30	SOIC-8
NSP4201	5	6	25	1.5	± 30	TSOP-6
NUP4114H	5	5	12*	0.4	± 13	TSOP-6
SRDA05	5	7	23	5	± 8	SOIC-8
ESD8708	3.3	6	7.5	0.18	± 30	UDFN-14
SRDA3.3	3.3	5	25	4	± 8	SOIC-8
NSP8814	3	3.2	35	1.5	± 30	UDFN-8
NSP8818	3	3.2	35	1.5	± 30	UDFN-10

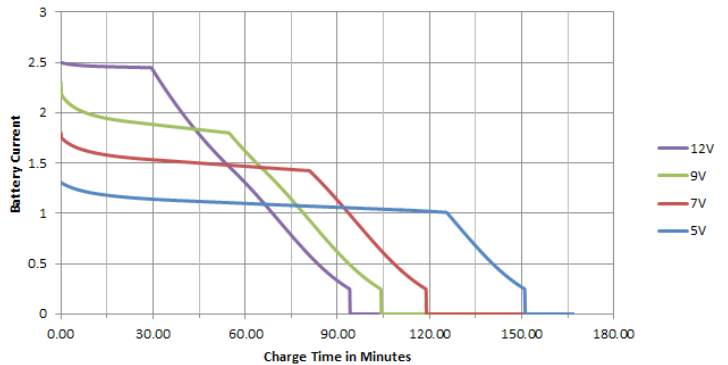
* On Pin 5.

Switching Battery Chargers

Features

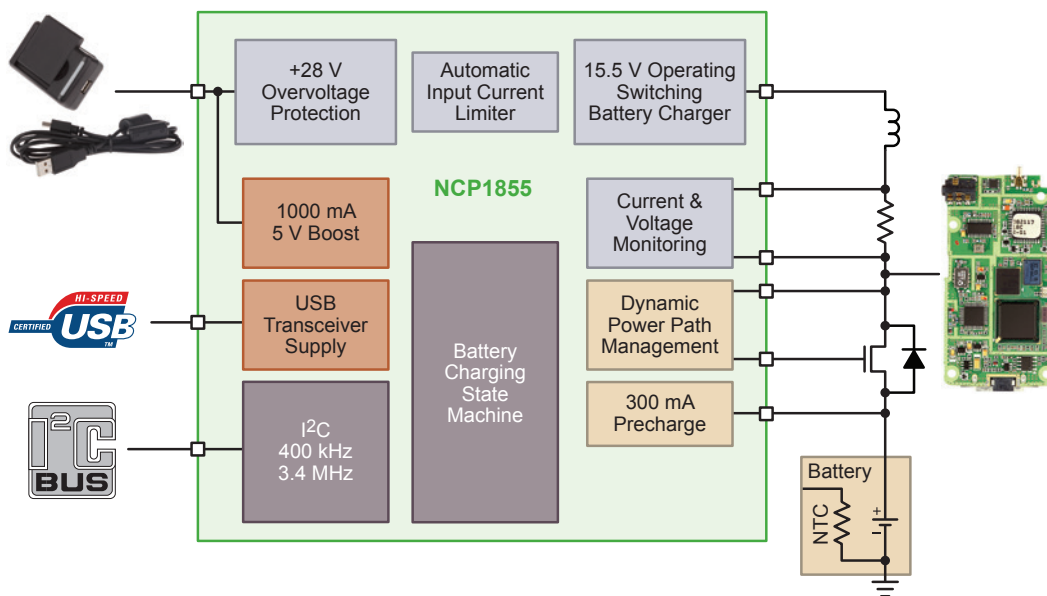
- Sized for micro USB connector (USB BC1.2) with 1.5 A, 1.6 A, 1.8 A, 2.5 A charging current
- Automatic input current limit adapts charging current to the maximum capability of the power source; proven charging time decrease by 10 minutes
- Integrated 28 V over voltage protection with unique negative voltage support
- Up to 1 A embedded boost USB OTG saves BOM cost
- Automatically disconnects battery at end of charge, with reconnect in few seconds in case of peak current activity (GSM for instance)
- Instant turn-on at cable insertion when battery is weak
- Enable smart fast charging ports with input voltage capability up to 16 V (NCP1855)

Battery Charge Time vs Adapter Voltage

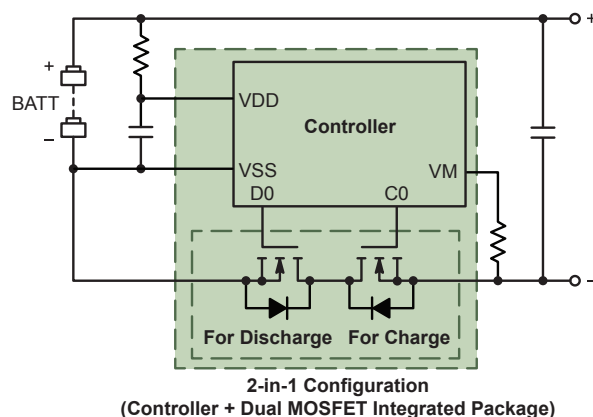
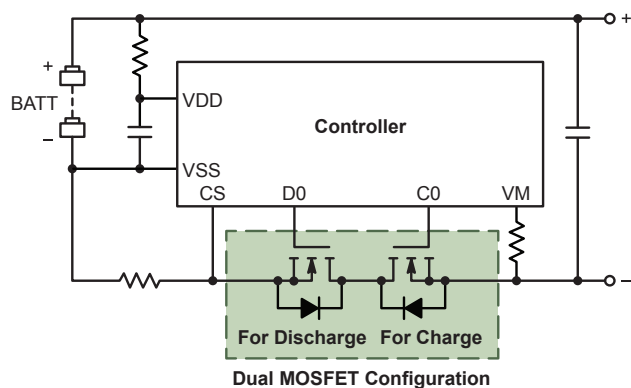


NCP1855 Charging Profile for 4.2 V, 2500 mAh Battery Pack, Input Source Limited to 1 A

Device	Charging Current Max (A)	Pre-Charge Current Max (mA)	OTG Boost Current Max (mA)	Vcc Max (V)	OVP (V)	I2C	Automatic Input Current Limiting	Dual Path Management	Protected USB PHY Supply (mA)	Battery Temperature Sensing	Package
NCP1854	2.5	300	500	7	+28	400 kHz / 3.4 MHz	Yes	Yes (external)	50	JEITA	Flip-Chip-25
NCP1855	2.5	300	500	16	+28	400 kHz / 3.4 MHz	Yes	Yes (external)	50	JEITA	Flip-Chip-25



Li-ion Battery Protection



Dual MOSFETs

Device	Configuration	Polarity	V _{SS} Max (V)	V _{GSS} Max (V)	I _S (DC) (A)	R _{SS(ON)} @ V _{GS} = 4.5 V Min/Typ/Max (mΩ)	R _{SS(ON)} @ V _{GS} = 3.8 V Min/Typ/Max (mΩ)	Package(s)
EFC2K103NUZ	Dual	N-Channel	12	±8	35	0.8/1.25/1.8	0.85/1.35/1.9	WLCSP-10
EFC2K102NUZ	Dual	N-Channel	12	±8	33	1.3/2.0/2.65	1.4/2.1/2.75	WLCSP-10
EFC2K107NUZ	Dual	N-Channel	12	±8	20	1.5/2.2/2.85	1.65/2.4/3.1	WLCSP-10
EFC2J013NUZ	Dual	N-Channel	12	±8	17	3.0/4.35/5.8	3.2/4.6/6.2	WLCSP-6
EFC2K101NUZ	Dual	N-Channel	12	±8	15	3.2/4.7/6.2	3.5/5.0/6.6	WLCSP-6
EFC2J004NUZ	Dual	N-Channel	12	±8	14	3.7/5.4/7.1	4.1/5.9/7.7	WLCSP-6
EFC6604R	Dual	N-Channel	12	±8	13	6.0/7.5/9.0	6.4/8.1/9.7	WLCSP-6
EFC4627R	Dual	N-Channel	12	±8	6	18.5/23.9/29.5	20.3/26.1/32.3	CSP-4
EFC4K110NUZ	Dual	N-Channel	24	±12	25	1.8/2.4/2.95	1.7/2.5/3.0	WLCSP-10
EFC4K105NUZ	Dual	N-Channel	24	±12	25	1.8/2.7/3.55	1.9/2.8/3.65	WLCSP-10
EFC3J018NUZ	Dual	N-Channel	20	±8	23	2.5/3.6/4.7	2.6/3.75/4.9	WLCSP-6
EFC6605R	Dual	N-Channel	20	±10	10	8.8/11.1/13.3	9.3/11.6/13.9	WLCSP-6
EFC4621R	Dual	N-Channel	24	±12	9	10.8/15.5/18	11.1/16/19*	WLCSP-4
EFC4626R	Dual	N-Channel	24	±10	5	29.2/37.5/46.2	32/41/50.5	CSP-4
EFC4612R-S	Dual	N-Channel	24	±12	6	24/39/45	25/41/48	WLCSP-4
EFC4C002N	Dual	N-Channel	30	±20	30	2.2/2.9/5.1	1.5/2.0/2.6**	WLCSP-8
EFC4C012N	Dual	N-Channel	30	±20	19	5.5/7.3/13	3.7/5.0/6.5**	WLCSP-6

NOTE: R_{SS(ON)} = R_{D(ON)} x 2. *@ V_{GS} = 4.0 V. **@ V_{GS} = 10.0 V.

1-Cell Li-ion Battery Protection Controllers

Device	Adjustable Range				V _{SS} Max/ V _{GSS} Max (V)	R _{SS(ON)} @ V _{GS} = 4.5 V Min/Typ/Max (mΩ)	R _{SS(ON)} @ V _{GS} = 3.1 V Min/Typ/Max (mΩ)	Features	Package(s)
	V _{OV} Range (V)	V _{UV} Range (V)	I _{OC} /I _{OH} Range (A)	V _{OC} /V _{OCH} Range (mV)					
LC05111CMT	4.0 to 4.5	2.2 to 2.7	2 to 8	—	24/±12	8.8/11.2/14.0	10.4/13/18.2	Auto Wake-up, 0 V Charge	WDFN-6
LC05132CNMT*	4.0 to 4.5	2.2 to 2.8	2 to 8	—	24/±12	8.8/11.2/14.0	10.4/13/18.2	Reset Function**	WDFN-6
LC05711ARA*	4.1 to 4.6	2.2 to 2.8	2 to 16	—	20/±10	3.8/4.7/5.6	4.4/5.4/6.9	Auto Wake-up, 0 V Charge	ECP-30
LC05732ARA*	4.1 to 4.6	2.1 to 2.7	2 to 16	—	20/±10	3.8/4.7/5.6	4.4/5.4/6.9	Reset Function**	ECP-30
LC05511XA*	4.1 to 4.55	2.0 to 3.3	—	3 to 30	—	***	***	Auto Wake-up, 0 V Charge	WLCSP-6
LC05551XA*	4.1 to 4.55	2.0 to 3.3	—	3 to 30	—	***	***	Auto Wake-up, 0 V Charge, Reset Function**	WLCSP-6
LC06511DMX	4.1 to 4.55	2.0 to 3.3	—	3 to 70	—	***	***	Auto Wake-up, 0 V Charge	X2DFN-6

* Contact ON Semiconductor for details on orderable part numbers. ** Forced off of charge and discharge FET. *** No embedded MOSFET.

LC709204F High Accuracy Fuel Gauge LSI

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

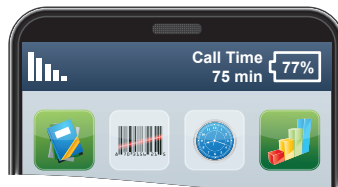
Conventional Display



With
LC709204F



Detailed Display of
Remaining Capacity

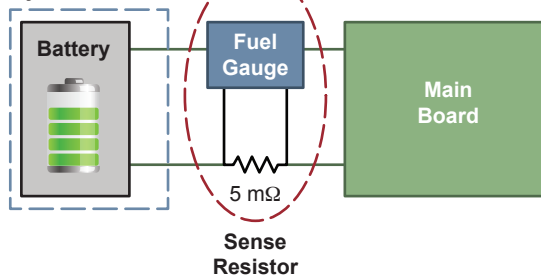


Correct
Operating Time

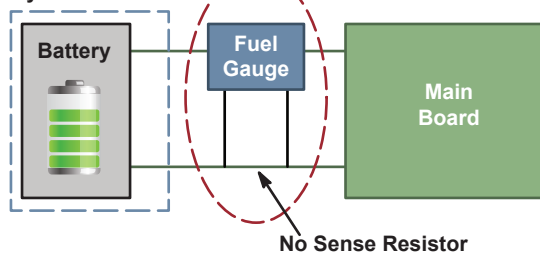
Features

- State of Health reporting
- Accuracy of remaining capacity $\pm 2.8\%$ ($0 \sim +50^{\circ}\text{C}$)
- Ultra-low operating consumption current of $2 \mu\text{A}$
- Standby mode current (RAM retention) of $0.1 \mu\text{A}$
- No need for sense resistor for current detection

Conventional
System



ON Semiconductor
System



ON Semiconductor Solution (No Sense Resistor)

- No power loss
- No heat generation

Power Bank Controller with Portable Device Communication, USB Type-C, & Quick/Fast Charge for 1-Cell Li-Ion and Li-Poly Battery

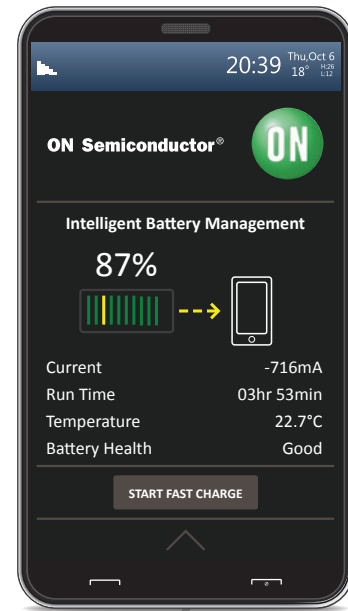
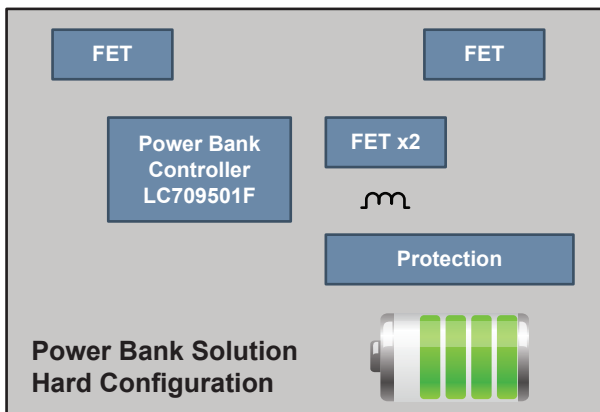
LC709501F Features

- Simple configuration (one main LSI)
- Scalability for Power (by external FETs)
- 5 V, 9 V, 12 V (cover Fast/Quick Charge)
- Smart Phone Data interface (USB Host I/F)

Base Features

- Buck Charge to Power Bank Battery
- Boost Charge to Smart Phone Battery
- Pass through Charge to smart Phone Battery
- Automatic USB detection
- Over voltage/Over current detection
- Redundant battery safety

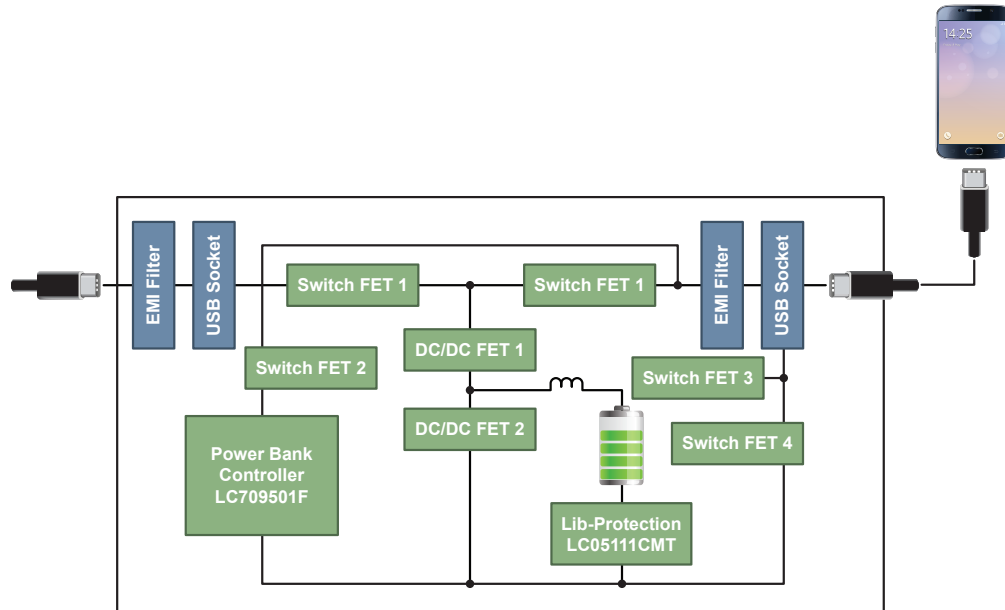
✓ Quick Charge
✓ Data I/F via USB



Reference Board



Support Devices for Power Bank Application



Switch MOSFETs

Function	Device	Configuration	Polarity	V _{DSS} Max (V)	V _{GSS} Max (V)	I _D Max (A)	R _{DS(ON)} @ V _{GS} = 2.5 V Typ/Max (mΩ)	R _{DS(ON)} @ V _{GS} = 4.5 V Typ/Max (mΩ)	R _{DS(ON)} @ V _{GS} = 10 V Typ/Max (mΩ)	Package(s)
Switch FET 1	ECH8310	Single	P-Channel	-30	±20	9	—	20/28	13/17	ECH-8
	ECH8315	Single	P-Channel	-30	±20	7	—	31/44	19/25	ECH-8
Switch FET 2	MCH3375	Single	P-Channel	-30	±20	1.6	—	374/523	227/295	MCPH-3
Switch FET 3	MCH3484	Single	N-Channel	20	±5	4.5	33/40	—	—	MCPH-3
	MCH3481	Single	N-Channel	20	±9	2	105/147	80/104	—	MCPH-3
Switch FET 4	ECH8420	Single	N-Channel	20	±12	14	7.5/10.5	5.2/6.8	—	ECH-8

DC-DC MOSFETs

Function	Device	Configuration	Polarity	V _{DSS} Max (V)	V _{GSS} Max (V)	I _D Max (A)	R _{DS(ON)} @ V _{GS} = 2.5 V Typ/Max (mΩ)	R _{DS(ON)} @ V _{GS} = 4.5 V Typ/Max (mΩ)	R _{DS(ON)} @ V _{GS} = 10 V Typ/Max (mΩ)	Package(s)
DC/DC FET 1	ECH8310	Single	P-Channel	-30	±20	9	—	20/28	13/17	ECH-8
	ECH8315	Single	P-Channel	-30	±20	7	—	31/44	19/25	ECH-8
DC/DC FET 2	NTTFS4H05N	Single	P-Channel	25	±20	94	—	—/4.8	—/3.3	WDFN-8

Li-Ion Battery Protection

Device	Adjustable Range			V _{DSS} Max/ V _{GSS} Max (V)	R _{DS(ON)} @ V _{GS} = 4.5 V Min/Typ/Max (mΩ)	R _{DS(ON)} @ V _{GS} = 3.1 V Min/Typ/Max (mΩ)	Features	Package(s)
	V _{OV} Range (V)	V _{UV} Range (V)	I _{OC} /I _{OH} Range (A)					
LC05111CMT*	4.0 to 4.5	2.2 to 2.7	2 to 8	24/±12	8.8/11.2/14.0	10.4/13.0/18.2	Auto Wake-up, 0 V Charge	WDFN-6

* Contact ON Semiconductor for details on orderable part numbers.

AC-DC Flyback PWM Controllers

Features

- High integration with high-voltage startup and X2 capacitor discharge
- High switching frequency options enable high power density
- Achieve high efficiency with super-junction MOSFETs or GaN HEMTs
- Integrated protection features: SCP, BO, OPP, OTP, OVP
- Standby and light-load performance meets or exceeds efficiency regulations
- Highly configurable with many options available



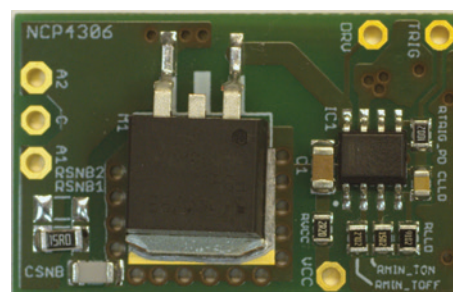
NCP1568 Demo Board

Device	Topology	f _{sw} (kHz)	HV Startup (V)	Features	Packages
NCP12510	Fixed-Frequency	65, 100	—	DSS, frequency jitter	TSOP-6
NCP12400	Fixed-Frequency	65, 100	500	DSS, frequency jitter	SOIC-7
NCP12601	Multi-Mode	65, 100, 130, 200	750	Low loss DSS, auto-tune OCP	SOIC-7
NCP1341	Quasi-Resonant	Up to 500	700	Power excursion mode	SOIC-8, SOIC-9 NB
NCP1342	Quasi-Resonant	Up to 500	700	Rapod frequency foldback	SOIC-8, SOIC-9 NB
NCP1568	Active Clamp Flyback	Up to 1,000	700	Zero-voltage switching	TSSOP-16

Synchronous Rectifier Controllers

Small Form Factor, High Performance Synchronous Rectification Solution Features

- Supports CCM, QR, and DCM operation
- Precise turn-off comparator 0 mV
- Wide input voltage range up to 35 V
- High operation frequency up to 1 MHz
- Adjustable minimum ON and OFF times
- Adjustable light load detection Feature
- For more information, see [EVBUM2520/D](#)



Demo Board

Device	Function	CS Rating (V)	Drive Capability (A)	Package
NCP4308	High Performance Secondary Side Synchronous Rectification Driver without LLD	150	4 / 8	SOIC-8, DFN-8
NCP43080	High Performance Secondary Side Synchronous Rectification Driver	150	4 / 8	SOIC-8, DFN-8
NCP4306	High Performance CCM Secondary Side Synchronous Rectification Driver	200	2 / 7	TSOP-6, SOIC-8, DFN-8

Voltage Supervisors

Features

- Lowest quiescent current for extended battery life
- Large number of voltage thresholds
- Wide operating voltage, up to 10 V

Voltage Supervisors

Device	Channels	Vcc Min (V)	Vcc Max (V)	Icc Typ (μA)	RAH ¹	RAL ²	Threshold Levels (V)	Package
MC33161, MC34161	2	2	40	450	✓	✓	1.27	Micro8, SOIC-8, PDIP-8
MAX708	1	1	5.5	12	✓	✓	2.63, 2.93, 3.08, 4.38	Micro8, SOIC-8
MAX803 ³	1	1	5.5	0.5		✓	1.2, 1.6, 2.32, 2.63, 2.93, 3.08, 4.0, 4.38, 4.63	SC-70-3, SOT-23-3
MAX809	1	1	5.5	0.5		✓	1.2, 1.6, 2.32, 2.63, 2.93, 3.08, 4.0, 4.38, 4.55, 4.63, 4.9	SC-70-3, SOT-23-3
MAX810	1	1	5.5	0.5	✓		1.2, 2.63, 2.93, 3.08, 4.38, 4.63	SC-70-3, SOT-23-3
MC33064, MC34064	1	1	6.5	9		✓	4.59	Micro8, SOIC-8, TSOP-5, TO-92
MC33164, MC34164	1	1	10	9		✓	2.65, 4.27	Micro8, SOIC-8, TSOP-5, TO-92
NCP300/1	1	0.8	10	0.2	✓	✓	0.9, 1.0, 1.2, 1.6, 1.8, 1.85, 2.0, 2.2, 2.5, 2.6, 2.7, 2.8, 3.0, 3.1, 3.2, 3.3, 3.4, 3.6, 3.9, 4.0, 4.2, 4.4, 4.5, 4.6, 4.7	TSOP-5
NCP302	1	0.8	10	0.2	✓	✓	0.9, 1.5, 1.8, 2.0, 2.7, 3.0, 3.3, 3.8, 4.0, 4.3, 4.5, 4.7	TSOP-5
NCP303	1	0.8	10	0.2		✓	0.9, 1.0, 1.1, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 2.0, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.6, 3.8, 4.0, 4.2, 4.5, 4.6, 4.7, 4.9	TSOP-5
NCP304	1	0.8	10	0.8	✓	✓	0.9, 1.5, 1.8, 2.0, 2.2, 2.3, 2.5, 2.7, 2.9, 3.0, 3.3, 3.7, 3.8, 4.0, 4.2, 4.3, 4.5, 4.6, 4.7, 4.9	SC-70-4
NCP305	1	0.8	10	0.8		✓	0.9, 1.1, 1.5, 1.6, 1.7, 1.8, 2.0, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 4.0, 4.4, 4.5, 4.7, 4.9	SC-70-4

1. Reset Active High 2. Reset Active Low 3. See MAX803, NCP803

Voltage References

Voltage References

Device	Type	Tolerance	Reference Voltage (V)	Operating Current (mA)	Package
NCP431	Adjustable	1%	2.5 - 36	40 μA	SOIC-8, TO-92, SOT-23
TL431	Adjustable	2.2%	2.5 - 36	1 - 100	SOIC-8, PDIP-8, Micro8, TO-92
TL431A	Adjustable	1%	2.5 - 36	1 - 100	SOIC-8, PDIP-8, Micro8, TO-92
TL431B	Adjustable	0.4%	2.5 - 36	1 - 100	SOIC-8, PDIP-8, Micro8, TO-92
LM285	Fixed	1%, 1.5%	1.235	0.01 - 20	SOIC-8, TO-92
LM385	Fixed	1%, 1.5%, 2%, 3%	1.235	0.01 - 20	SOIC-8, TO-92
LM385B	Fixed	1%, 1.5%	1.235	0.01 - 20	SOIC-8, TO-92
NCP51460	Fixed	1%	3.3	0 - 20	SOT-23-5

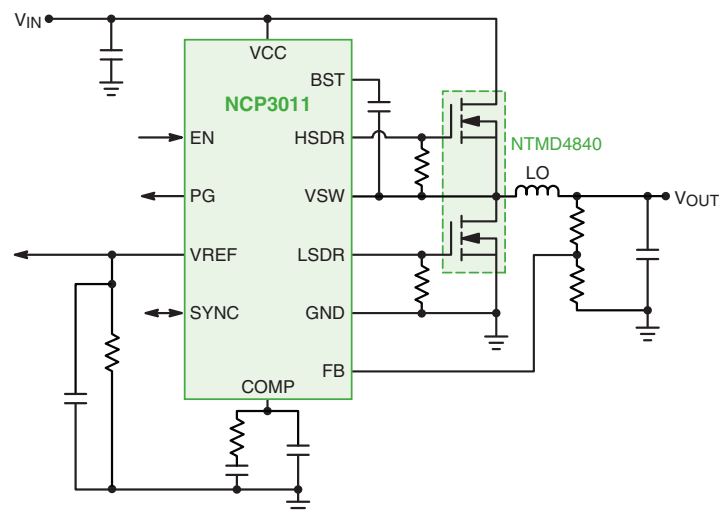
Features

- Tight voltage tolerances from 0.4% to 3%
- Output voltage range up to 36 V
- Low dynamic impedance, low noise and stable operation over time and temperature

DC-DC Switching Controllers

NCP3011 Features

- Wide input voltage range
- Buffered external +1.25 V reference
- PowerGood + Enable/Disable pins
- External synchronization
- Output overvoltage and undervoltage protection



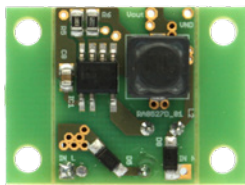
Switching Controllers

Device	fsw (kHz)	Vin Min (V)	Vin Max (V)	Vout Max (V)	Comments	Package
NCP1587	250-300	4.5	13.2	Down to 0.8	1 A drive capability; short circuit protection	SOIC-8
NCP1589D	300/600	4.5	13.2	Down to 0.8	Light load efficiency	SOIC-8
NCP5425	150-750	4.5	13.2	Down to 0.8	Dual output	TSSOP-20
CS51031	200-700	4.5	16	Down to 1.25	No compensation required; PFET	SOIC-8
NCP3011	400	4.7	28	Down to 0.8	PG, EN, SYNC features	TSSOP-14
NCP3020	300/600	4.7	28	Down to 0.6	Ceramic output capacitors	SOIC-8
NCP3030	1200/2400	4.7	28	Down to 0.6	High switching frequency	SOIC-8
TL594	40-300	7	40	External Adj	Buck, boost, forward, flyback	SOIC-16, PDIP-16
LV5749NV	80-500	8.5	42	Down to 0.67	Current mode buck; double OCP function; variable frequency; soft start; EN	SSOP-16
LV5762QA	1000	8	42	Down to 0.7	Current mode buck; fixed high frequency; soft start; EN	VQFN-16J
LV5725JA	50-500	4.5	50	Down to 0.7	Current mode buck; soft start; hiccup; programmable current limit; SYNC; PGOOD	SSOP-16
CS5124	400	7.7	75	External Adj	Small PCB footprint; isolated	SOIC-8
NCP1034	Up to 500	8	100	Down to 1.25	2 A drive capability; synchronization	SOIC-16
NCP1566	100-1000	9.5	120	Adj	Active clamp forward	QFN-24
NCP1030	300	10	200	2.5 up to Vin	PoE applications; integrated switch	Micro8
NCP1031	300	10	200	2.5 up to Vin	PoE applications; integrated switch	SOIC-8, DFN-8
NCP12700	100-1000	9	200	Adj	Fixed frequency flyback	MSOP-10, WQFN-10

Compact Power Delivery with Switching Regulators

NCP10670/1/2 Features

- Built in 700 V MOSFET
- Low standby power
- Flexible design for buck/buck-boost/flyback
- Good EMI performance
- Power coverage: ~10 W
- Evaluation Boards: NCP10671B05GEVB, NCP10672B15GEVB, NCP10672F12GEVB



FSL518/538A/H Features

- Built-in 800 V super-junction MOSFET
- Controllable skip mode entry level
- 100, 130 KHz operating frequency options
- Good EMI performance
- Power coverage: ~20 W
- Evaluation Boards: FSL518AFlyGEVB, FSL538AFlyGEVB, FSL538HFLyGEVB



Device	P _{OUT} (W)	I _{LIMIT} (mA)	Topology	BV _{DS} (V)	R _{DS(ON)} Max (Ω)	Frequency Options (kHz)	Brown-In/Out	Line OVP	F _{SW} Foldback	Dynamic Self Supply	Package(s)
NCP10670	1.5	100	Buck/Non-isolated Flyback/Flyback	700	41	60,100	No	No	No	Yes	SOIC-7
NCP10671	3.7	250	Buck/Non-isolated Flyback/Flyback	700	41	60,100	No	No	No	Yes	SOIC-7
NCP10672	7.8	780	Buck/Non-isolated Flyback/Flyback	700	14	60,100	No	No	No	Yes	SOIC-7
NCP1060	4	Adj.	Buck/Non-isolated Flyback/Flyback	700	41	60,100	Yes	No	Yes	Yes	SOIC-10, PDIP-7
NCP1063	11	Adj.	Buck/Non-isolated Flyback/Flyback	700	14	60,100	Yes	No	Yes	Yes	PDIP-7, SOIC-16
NCP1070	4	250	Flyback	700	32	65, 100, 130	Yes	No	Yes	Yes	SOT-223, PDIP-7
NCP1071	5	350	Flyback	700	32	65, 100, 130	Yes	No	Yes	Yes	SOT-223, PDIP-7
NCP1072	11	350	Flyback	700	16	65, 100, 130	Yes	No	Yes	Yes	SOT-223, PDIP-7
NCP1075A/B	15	350	Flyback	700	17	65, 100, 130	Yes	Yes	Yes	Yes	PDIP-7
NCP1076A/B	20	650	Flyback	700	6.8	65, 100, 130	Yes	Yes	Yes	Yes	PDIP-7
NCP1077A/B	20	850	Flyback	700	6.8	65, 100, 130	Yes	Yes	Yes	Yes	PDIP-7
NCP1079A/B	30	1050	Flyback	700	3.9	65, 100, 130	Yes	Yes	Yes	Yes	PDIP-7
FSL106	10	Adj.	Flyback	650	20	67, 100	No	No	No	No	PDIP-8
FSL116	14	Adj.	Flyback	650	10	50, 100	No	No	No	No	PDIP-8
FSL126	17	Adj.	Flyback	650	6	67, 100	No	No	No	No	PDIP-8
FSL136	20	Adj.	Flyback	650	4	67, 100	No	No	No	No	PDIP-8, LSOP-8
FSL146	26	Adj.	Flyback	650	2.6	67	No	No	No	No	PDIP-8
FSL156	30	Adj.	Flyback	650	2.2	67	No	No	No	No	PDIP-8
FSL117	10	800	Flyback	700	10	67	No	No	No	No	PDIP-8
FSL137	20	1300	Flyback	700	4.75	67	No	No	No	No	PDIP-8
FSL126MRT	25	1200	Flyback	650	6	67	No	No	No	No	TO-220F6
FSL136MRT	35	2150	Flyback	650	4	67	No	No	No	No	TO-220F6
FSL176MRT	70	3500	Flyback	650	1.6	67	No	No	No	No	TO-220F6
FSL128MRT	25	1200	Flyback	800	7.3	67	No	No	No	No	TO-220F6
FSL138MRT	35	2150	Flyback	800	5	67	No	No	No	No	TO-220F6
FSL306	7	Adj.	Buck/Non-isolated Flyback/Flyback	650	18	50	No	No	Yes	Yes	PDIP-7, LSOP-7
FSL336	20	Adj.	Buck/Non-isolated Flyback/Flyback	650	4	50	No	No	Yes	Yes	PDIP-7, LSOP-7
FSL337	20	Adj.	Buck/Non-isolated Flyback/Flyback	700	4	50	No	No	Yes	Yes	PDIP-7, LSOP-7
FSL4110	9	520	Flyback	1000	10	50	No	Yes	No	Yes	PDIP-7, LSOP-7
FSL518A/H	12	460/600	Flyback	800	8	100, 130	Yes	Yes	Yes	Yes	PDIP-7
FSL538A/H	17	660/860	Flyback	800	4.6	100, 130	Yes	Yes	Yes	Yes	PDIP-7

Linear and Switching Regulators

Linear & Switching Regulators for Current of <1 A

Type	Device	I _{out} (mA)	Dropout Typ @ 3.3 V (mV)	I _q (μA)	PSRR @ 120 Hz (dB)	V _{in} Max (V)	V _{out} (V)	Package
Linear Regulators	NCP715	50	350	4.7	52	24	1.2, 1.5, 1.8, 2.5, 3.0, 3.3, 5.0	SC-70-5, xDFN-6
	NCP716	80	350	4.7	52	24	1.2, 1.5, 1.8, 2.5, 3.0, 3.3, 5.0	SC-70-5, xDFN-6
	NCP103	150	75	50	75	5.5	0.9, 1.0, 1.05, 1.1, 1.2, 1.25, 1.3, 1.5, 1.6, 1.8, 1.85, 2.10, 2.2, 2.4, 2.5, 2.6, 2.7, 2.8, 2.85, 3.0, 3.1, 3.2, 3.3, 3.45, 3.5	UDFN-4
	NCP140	150	125	45	62	5.5	1.8, 2.8, 3.0, 3.3	XDFN-4
	NCP170	150	240	0.5	40	5.5	1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3	SOT-563, μDFN-4
	NCP571	150	450	—	—	12	0.8, 0.9, 1.0, 1.2	TSOP-5, DFN-6
	NCP716B	150	700	4.7	55	24	3.0, 3.3, 5.0	TSOP-5
	NCP110	200	45	20	90	5.5	0.6, 0.8, 1.05, 1.1, 1.2, 1.8, 2.8	WLCSP-4, XDN-4
	NCP702	200	140	10	68	6	1.8, 2.8, 3.0, 3.3	XDFN-6, TSOP-5
	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	5.5	1.2, 1.5, 1.8, 2.6, 2.8, 2.85, 2.9	CSP-4, XDFN-4
	NCP114	300	135	50	75	5.5	0.9, 1.0, 1.05, 1.1, 1.2, 1.25, 1.3, 1.5, 1.6, 1.8, 1.85, 2.10, 2.2, 2.4, 2.5, 2.6, 2.7, 2.8, 2.85, 3.0, 3.1, 3.2, 3.3, 3.45, 3.5	UDFN-4
	NCP703	300	180	12	68	6	1.8, 2.8, 3.0, 3.3	XDFN-6, TSOP-5
	NCP164C	300	125	30	83	5.3	Adj, 1.8, 2.8, 3.0, 3.3	TSOP-5, WDFN-6, DFN-8
	NCP718	300	260	4.0	60	24	Adj, 1.2, 1.8, 2.5, 3.0, 3.3, 5.0	WDFN-6, TSOT-23
	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
	NCP133	500	100	80	70	5.5	0.8, 1.0, 1.05, 1.1, 1.15, 1.2, 1.25, 1.3, 1.5, 1.8, Adj	XDFN-6
	NCP134	500	100	80	70	5.5	0.8, 0.9, 1.0, 1.05, 1.1, 1.2, 1.5	XDFN-4
	NCP176	500	130	60	75	5.5	1.0, 1.2, 1.8, 3.0, 3.3	XDFN-6
	NCP177	500	200	60	75	5.5	0.7, 1.0, 1.1, 1.2, 1.35, 1.5, 1.8, 3.3	XDFN-4
	NCP3334	500	250	190	75	18	Adj	SOIC-8
	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
	NCP5500	500	230	300	75	18	Adj, 1.5, 5.0	DPAK-5, SOIC-8
	NCP705	500	250	12	70	6	0.8, 1.8, 2.8, 3.0, 3.3	SOT-223-6, WDFN-6
	NCP167	700	190	12	83	5.5	1.8, 2.8, 2.85, 2.95, 3.0, 3.3, 3.5	WLCSP-4, XDN-4
Type	Device	I _{out} (mA)	f _{sw} (kHz)	V _{in} Min (V)	V _{in} Max (V)	Comments		Package
Switching Regulators	LM2594	500	150	4.5	40	No external compensation required		SOIC-8, PDIP-8
	LA5724MC	600	160	4.5	28	No external compensation		SOIC-8
	NCP1521B	600	1500	2.7	5.5	Auto PWM/PFM mode; Sync rectification		SOT-23-5
	NCP1522B	600	3000	2.7	5.5	Auto PWM/PFM mode; Sync rectification		SOT-23-5

Linear and Switching Regulators (cont.)

Linear & Switching Regulators for Current of 1-5 A

Type	Device	I _{out} (A)	Dropout Typ @ 3.3 V (mV)	I _q (μA)	PSRR @ 120 Hz (dB)	V _{in} Max (V)	V _{out} (V)	Package
Linear Regulators	NCP1117	1	1.2		64	20	Adj, 1.5, 1.8, 1.9, 2.0, 2.5, 2.85, 3.3, 5.0, 12	DPAK-3, SOT-223
	NCP690/1/2	1	0.18		62	6.5	Adj, 1.5, 1.8, 2.5, 3.3, 5.0	DFN-6
	NCP186	1	100	90	75	5.5	1.2, 1.75, 1.8, 1.85, 2.5, 2.8, 3.3, 3.5, 3.9	XDFN-8
	NCP187	1.2	165	30	75	6.0	Adj, 0.8, 1.2, 3.3	WDFN-6
	NCP565	1.5	0.9		85	18	Adj, 1.2, 1.5, 2.8, 3.0, 3.3	D2PAK-3/5, SOT-223, DFN-6
	NCP566	1.5	0.9		85	18	1.2, 1.8, 2.5	SOT-223
	NCP59151	1.5	0.3		60	13.6	1.8, 2.5, 2.8, 3.0, 3.3, 5.0	D2PAK-5, DFN-8
	NCP59748	1.5	60		70	5.5	Adj	QFN-20, DFN-10
	NCP59152	1.5	0.3		60	13.6	Adj	D2PAK-5, DFN-8
	NCP59744	3	115		72	5.5	Adj	QFN-20
	NCP59749	3	120		60	5.5	Adj	QFN-20
	NCP59301	3	0.3		60	18	1.8, 2.5, 2.8, 3.0, 3.3, 5.0	D2PAK-5, DFN-8
	NCP59302	3	0.3		60	18	Adj	D2PAK-5, DFN-8
Type	Device	I _{out} (A)	f _{sw} (kHz)	V _{in} Min (V)	V _{in} Max (V)	Comments		Package
Switching Regulators	LM2595	1.0	150	4.5	40	No external compensation		D2PAK, TO-220
	CS51414	1.5	520	4.5	40	Sync capability; Pin-compatible w/LT1375/6		SOIC-8
	NCP1595A	1.5	1200	4	5.5	Internal compensation; Sync rectification		DFN-6
	MC34063	1.5	Up to 100	3	40	Minimal number of external components		SOIC-8, PDIP-8
	NCP3063	1.5	Up to 250	3	40	High Fsw for optimized size & efficiency		DFN-8, SOIC-8, PDIP-8
	NCP3064	1.5	Up to 250	3	40	High Fsw for optimized size & efficiency; Enable		DFN-8, SOIC-8, PDIP-8
	NCP1597	2.0	1200	4.0	5.5	Internal compensation		DFN-6
	LM2596	3.0	150	4.5	40	No external compensation		D2PAK, TO-220
	LV5980MC	3.0	370	4.5	23	High efficiency from light load to heavy load; I _{sleep} = 63 μA		SOIC-8
	NCP3170	3.0	500/1000	4.5	18	Light load efficiency; PG; EN		SOIC-8
	NCP1593	3.0	1200	2.7	5.5	Internal compensation; PG; EN		DFN-10
	NCP3163	3.4	Up to 300	2.5	40	High Fsw for optimized size & efficiency		DFN-18, SOIC-16

Switching Regulator for Current of >5 A

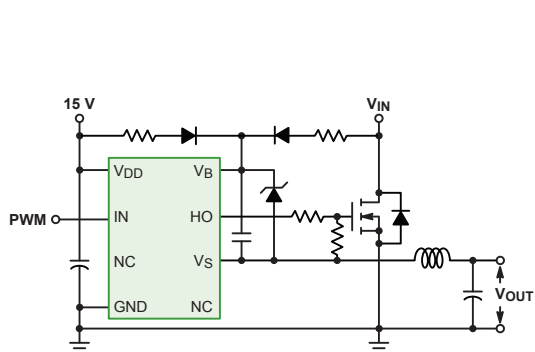
Type	Device	I _{out} (A)	f _{sw} (kHz)	V _{in} Min (V)	V _{in} Max (V)	Comments	Package
Switching Regulator	MC34167	5.0	72	7	40	Standby mode <36 μA	D2PAK, TO-220

High Voltage Gate Drivers (HVICs)

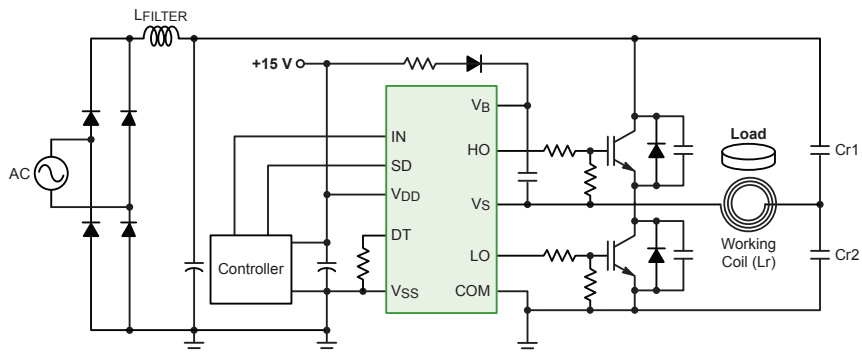
High voltage gate drivers (HVICs) from ON Semiconductor improve system reliability by utilizing an innovative common-mode dv/dt noise canceling circuit that provides excellent noise immunity. With a voltage capability up to 700 V and a very fast switching speed (dv/dt = 50 V/ns max), the devices are optimal for driving MOSFETs and IGBTs in a wide array of applications.

Features

- Better noise immunity (due to noise canceling circuit over high dv/dt common-mode noise)
- Low power consumption (IQBS/IQCC are lower than competitor's device)
- dVs/dt transient immunity voltage level (50 V/ns)
- Extended allowable negative Vs swing to -9.8 V for signal propagation @ VCC = VBS = 15 V
- Matched propagation delay below 50 ns
- UVLO functions
- TTL compatible input threshold levels



High-Side Application Diagram



Half-Bridge Application Diagram

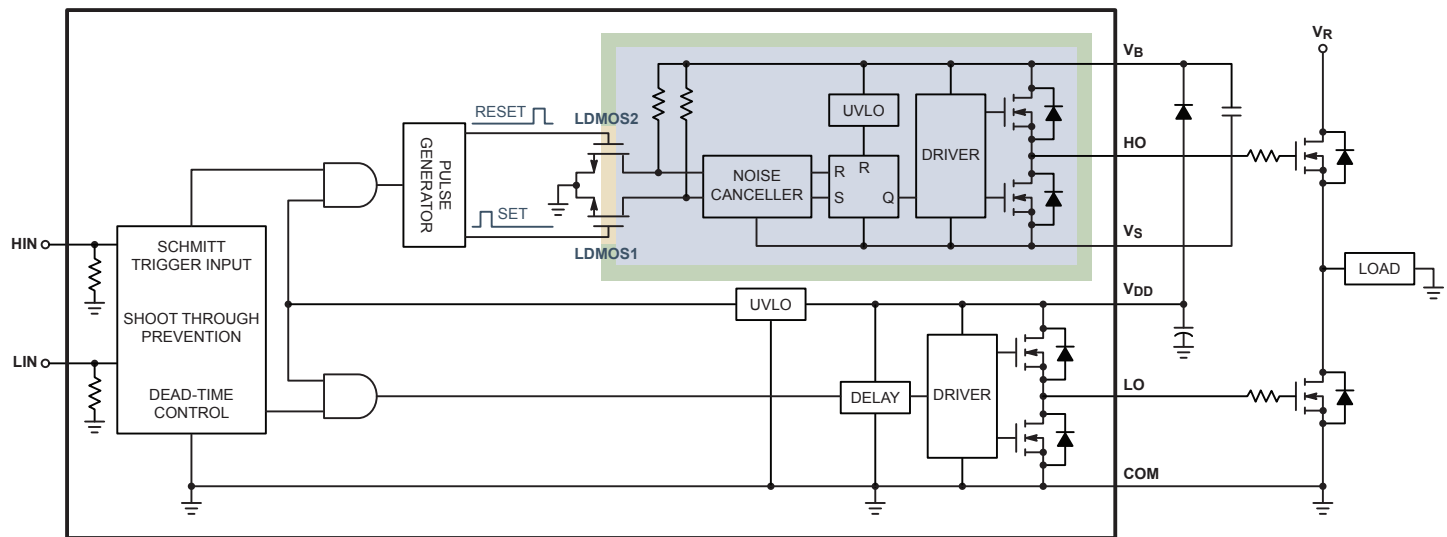
High-Side Drivers

Device	Circuit		Offset Voltage (V)	Output Current		Delay Time		Shut Down	OCP	Typical Dead Time (ns)	Package
	Type	Input to Output		Source (mA)	Sink (mA)	Ton (ns)	Toff (ns)				
FAN7361	High-Side	1 to 1	600	250	500	120	90	No	No	No	SOP-8
FAN73611	High-Side	1 to 1	600	250	500	120	90	No	No	No	SOP-8
FAN7362	High-Side	1 to 1	600	250	500	120	90	No	No	No	SOP-8
FAN7371	High-Side	1 to 1	600	4000	4000	150	150	No	No	No	SOP-8
FAN73711	High-Side	1 to 1	600	4000	4000	150	150	No	No	No	SOP-8
FAN7385	2Ch High side	2 to 2	600	350	650	110	110	No	No	No	SOP-14
FAN7385	2Ch High side	2 to 2	600	350	650	110	110	No	No	No	SOP-14
TND523SS	High-Side	1 to 1	600	200	400	90	85	No	No	No	SOP-8
TND524VS	High-Side	1 to 1	600	200	400	90	85	No	No	No	VEC-8

High Voltage Gate Drivers (HVICs)

High-Side & Low-Side Drivers

Device	Circuit		Offset Voltage (V)	Output Current		Delay Time		Shut Down	OCP	Typical Dead Time (ns)	Package
	Type	Input to Output		Source (mA)	Sink (mA)	Ton (ns)	Toff (ns)				
FAN7382	High & Low-Side	2 to 2	600	350	650	170	200	No	No	No	DIP-8, SOP-8, SOP-14
FAN7390	High & Low-Side	2 to 2	600	4500	4500	140	140	No	No	No	SOP-8, SOP-14
FAN7390A	High & Low-Side	2 to 2	600	4500	4500	140	140	No	No	No	SOP-14
FAN73901	High & Low-Side	2 to 2	600	2500	2500	140	140	No	No	No	SOP-8
FAN7391	High & Low-Side	2 to 2	600	4500	4500	150	150	No	No	No	SOP-14
FAN7392	High & Low-Side	2 to 2	600	3000	3000	130	150	Yes	No	No	WSOP-16
FAN7842	High & Low-Side	2 to 2	200	350	650	170	200	No	No	No	SOP-8
FAN8811	High & Low-Side	2 to 2	100	3000	6000	30	28	No	No	No	WDFN -10
NCP5106A	High & Low-Side	2 to 2	600	250	500	100	100	No	No	No	DIP-8, SOP-8, DFN-10
NCP5109A	High & Low-Side	2 to 2	200	250	500	100	100	No	No	No	SOP-8, DFN-10
NCP5181	High & Low-Side	2 to 2	600	1400	2200	100	100	No	No	No	DIP-8, SOP-8
NCP5183	High & Low-Side	2 to 2	600	4300	4300	120	120	No	No	No	SOP-8
NCP51530A	High & Low-Side	2 to 2	700	2200	1700	60	60	No	No	No	SOIC-8, DFN-10
NCP51530B	High & Low-Side	2 to 2	700	2200	1700	25	25	No	No	No	SOIC-8, DFN-10



HVIC Driver Block Diagram

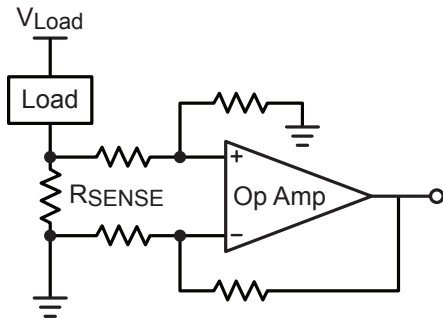
High Voltage Gate Drivers (HVICs)

Half Bridge Drivers

Device	Circuit		Offset Voltage (V)	Output Current		Delay Time		Shut Down	OCP	Typical Dead Time (ns)	Package
	Type	Input to Output		Source (mA)	Sink (mA)	Ton (ns)	Toff (ns)				
FAN7380	Half-Bridge	2 to 2	600	90	180	135	130	No	No	100	SOP-8
FAN7383	Half-Bridge	1 to 2	600	350	650	500	170	Yes	No	Variable	SOP-14
FAN73832	Half-Bridge	1 to 2	600	350	650	580	180	Yes	No	Variable	SOP-8
FAN73833	Half-Bridge	2 to 2	600	350	650	150	140	No	No	450	SOP-8
FAN7384	Half-Bridge	2 to 2	600	250	500	180	170	Yes	Yes	120	SOP-14
FAN7387	Self Osc.	1 to 2	600	350	650	550	160	Yes	No	Variable	SOP-8
FAN7388	3-Phase Half-Bridge	6 to 6	600	350	650	130	150	No	No	270	SOP-20
FAN7389	3-Phase Half-Bridge	6 to 6	600	350	650	500	500	Yes	Yes	300	SOP-28
FAN73892	3-Phase Half-Bridge	6 to 6 (inverting)	600	350	650	500	500	Yes	Yes	290	SOP-28
FAN73893	3-Phase Half-Bridge (MOSFET Target)	6 to 6 (inverting)	600	350	650	500	500	Yes	Yes	320	SOP-28
FAN73894	3-Phase Half-Bridge (IGBT Target)	6 to 6 (inverting)	600	350	650	500	500	Yes	Yes	320	SOP-28
FAN73895	3-Phase Half-Bridge (MOFET Target)	6 to 6	600	350	650	500	500	Yes	Yes	320	SOP-28
FAN73896	3-Phase Half-Bridge (IGBT Target)	6 to 6	600	350	650	500	500	Yes	Yes	320	SOP-28
FAN73912	Half Bridge	2 to 2	1200	2000	3000	500	550	Yes	No	330	WSOP-16
FAN7393A	Half Bridge	1 to 2	600	2500	2500	530	130	Yes	No	Variable	SOP-14
FAN73932	Half Bridge	1 to 2	600	2500	2500	600	200	Yes	No	400	SOP-8
FAN73933	Half Bridge	2 to 2	600	2500	2500	160	160	No	No	Variable	SOP-14
FAN7888	3-Phase Half-Bridge	6 to 6	200	350	650	130	150	No	No	270	SOP-20
FL73282	Half Bridge	2 to 2	900	350	650	150	150	No	No	170	SOP-8
NCP1392B	Half Bridge	1 to 2	600	500	1000	N/A	N/A	No	No	610	SOP-8
NCP1392D	Half Bridge	1 to 2	600	500	1000	N/A	N/A	No	No	305	SOP-8
NCP1393B	Half Bridge	1 to 2	600	1000	1500	N/A	N/A	No	No	610	SOP-8
NCP5104	Half Bridge	1 to 2	600	250	500	620	100	Yes	No	520	DIP-8, SOP-8
NCP5106B	Half Bridge	2 to 2	600	250	500	100	100	No	No	100	DIP-8, SOP-8, DFN-10
NCP5109B	Half Bridge	2 to 2	200	250	500	100	100	No	No	100	SOP-8, DFN-10
NCP5111	Half Bridge	1 to 2	600	250	500	750	100	No	No	650	DIP-8, SOP-8
NCP5304	Half Bridge	2 to 2	600	250	500	100	100	No	No	100	DIP-8, SOP-8

Current Sensing Solutions Using Amplifiers

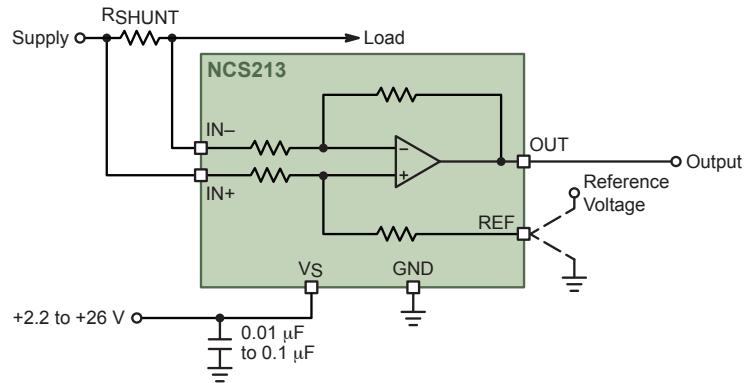
As part of an expansive portfolio, amplifiers from ON Semiconductor offer precision performance over time and temperature, making them ideal for current sensing in system monitoring and protection circuits.



Current Sensing Solution with External Gain Setting Resistors

NCSx333 Zero Drift Op Amp
 $V_{OS} = 10 \mu V$
 50 mV Shunt Drop
 Only 0.02% Offset Error

NCS200xx Low Power Op Amp
 $V_{OS} = 4 mV$
 50 mV Shunt Drop
 8% Offset Error



Current Sensing Solution with Integrated Gain Setting Resistors

NCS21x Current Sense Amplifiers
 $V_{OS} = 35 \mu V$
 50 mV Shunt Drop
 0.07% Offset Error

Zero Drift Current Sense Amplifiers (Integrated and Precision Performance)

Device	Channels	V_S Min (V)	V_S Max (V)	Input CM Range (V)	GBW (kHz)	V_{OS} Max (μV)	V_{OS} Drift ($\mu V/^{\circ}C$)	Gain Error (%)	CMRR (dB)	Features	Package
NCS21x	1	2.2	26	2.2 to 26	14	35	0.5	1	140	Low V_{OS}	SOT-363

Low Voltage, Zero Drift Amplifiers (High Precision)

Device	Channels	V_S Min (V)	V_S Max (V)	I_Q /Channel (μA)	GBW (kHz)	V_{OS} Max (μV)	V_{OS} Drift ($\mu V/^{\circ}C$)	CMRR (dB)	Features	Package
NCS21911	1	4	36	600	2000	2.5	0.085	120	Low V_{OS} , Low Drift	TSOP-5/SOT-23-5
NCS325	1	1.8	5.5	21	350	50	0.02	110	Low V_{OS}	SOT-23
NCSx333	1, 2, 4	1.8	5.5	21	350	10	0.03	120	Low V_{OS}	SOT-23-5, SC-70-5, DFN-8, Micro8, SOIC-8, SOIC-14

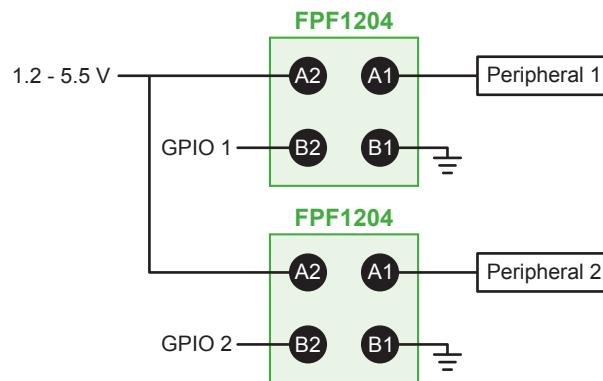
Low Voltage Amplifiers (Standard)

Device	Channels	V_S Min (V)	V_S Max (V)	I_Q /Channel (μA)	GBW (MHz)	V_{OS} Max (mV)	V_{OS} Drift ($\mu V/^{\circ}C$)	I_B (nA)	CMRR (dB)	Rail-to-Rail	Features	Package
NCS2009x	1, 2	1.8	5.5	20	0.35	4	1	0.001	80	I/O	Low I_Q & V_{OS}	SOT-23-5, SC-70-5, UDFN-6, Micro8, TSSOP-8, SO-8
NCS2008x	1, 2	1.8	5.5	50	1.2	4	1	0.001	80	I/O	Low I_Q & V_{OS}	SOT-23-5, SC-70-5, UDFN-6, Micro8, TSSOP-8, SO-8
NCS2006x	1, 2	1.8	5.5	140	3	4	1	0.001	80	I/O	Low I_Q & V_{OS}	SOT-23-5, SC-70-5, UDFN-6, Micro8, TSSOP-8, SO-8
NCS2003x	1, 2, 4	1.7	5.5	275	7	5	2	0.001	80	Output	Fast Slew Rate, Low V_S & I_B	SOT-23-5, SOT-553, Micro8, SOIC-8, TSSOP-8
NCS2007x	1, 2, 4	2.7	36	400	3	4	2	0.005	110	Output	Wide V_S range	SOT-553, TSOP-5, Micro8, SO-8, TSSOP-8

Power Distribution Load Switches

Features

- Optimized for power sequence control and low power consumption by reducing current leakages
- Slew rate control to reduce inrush current
- Low RON as low as 11 mΩ
- Simplified layout reduces PCB footprint
- WLCSP and DFN packages, as small as 0.76 mm x 0.76 mm



Load Switches

Device	Channel	V _{IN} Min (V)	V _{IN} Max (V)	R _{DS(ON)} (mΩ)	I _{OUT} Max (A)	Discharge Path	RCB*	Package
FPF1504B	Single	1	3.6	15 @ 3.3 V	1.5	Yes	No	WLCSP-4
NCP433	Single	1	3.6	50 @ 1.8 V	1.5	Yes	No	WLCSP-4
NCP435	Single	1	3.6	29 @ 3.3 V	2	Yes	No	WLCSP-4
FPF1203	Single	1.2	5.5	55 @ 3.3 V	2.2	No	No	WLCSP-4
FPF1204	Single	1.2	5.5	55 @ 3.3 V	2.2	Yes	No	WLCSP-4
NCP451	Single	0.75	5.5	12 @ 3.6 V	3	No	No	WLCSP-6
NCP451A	Single	0.75	5.5	12 @ 3.6 V	3	Yes	No	WLCSP-6
FPF1048	Single	1.5	5.5	23 @ 4.5 V	3	No	Yes	WLCSP-6
NCP340	Single	1.8	5.5	26 @ 3.0 V	3	No	Yes	UDFN-4
FPF1038	Single	1.2	5.5	21 @ 4.5 V	3.5	No	No	WLCSP-6
FPF1039	Single	1.2	5.5	21 @ 4.5 V	3.5	Yes	No	WLCSP-6
NCP459	Single	0.75	5.5	11 @ 3.3 V	4	Yes	No	WLCSP-8
FPF2411	Single	2.3	5.5	12 @ 3.8 V	6	No	Yes	WLCSP-12
FPF1320	DISO**	1.5	5.5	50 @ 3.3 V	1.5	No	Yes	WLCSP-6
FPF1321	DISO**	1.5	5.5	50 @ 3.3 V	1.5	Yes	Yes	WLCSP-6
FPF3040	DISO**	4	10.5/6.5	95 @ 5 V (V _{IN}) 70 @ 5 V (V _{BUS})	2	No	Yes	WLCSP-16
FPF3042	DISO**	4	12.4	95 @ 5 V (V _{IN}) 70 @ 5 V (V _{BUS})	2.7	No	Yes	WLCSP-16

* Reverse Current Block. ** Dual Input Single Output.

Rectifiers for Power Management

Bridge Rectification

Family	Vbr (V)	Io (A)	Example Device	Packages
Standard	50-1000	12-35	GBPC12005, GBPC3510	GBPC-4
Standard	50-1000	4-25	DFB2020, GBU6J	SIP-4
Standard	50-1000	1-2	DF01S, DF04S1, DF08S1	PSIP-4
Standard	100-1000	0.5-1	MB2S, MB10S	SOIC-4

Input/Primary Rectification

Family	Vbr (V)	Io (A)	Example Device	Packages
Ultrafast	400	1-15	MUR840	Axial, TO-220, FullPack
Ultrafast	520	5	MUR550	Axial, TO-220
Ultrafast	600	1-15	MUR460, MSRF860, MURF860, MSRF1560	Axial, TO-220, FullPack
Ultrafast	800	1-4	MUR480E	Axial

Output/Secondary Rectification

Family	Vbr (V)	Io (A)	Example Device	Packages
Schottky	20-150	1-3	SS12FP, S115FP, FSV360FP	SOD-123 FL
Schottky	30-45	1-60	MBR1045, MBR1545CT, MBR2545CT	TO-220, I2PAK, FullPack
Schottky	30-60	1	SS13HE, SS16HE	SOD-323 EP
Schottky	60-100	10-60	MBRF10L60CT, MBR40L60CT, MBR30H100CT	TO-220, I2PAK, FullPack
Schottky	100	5	MBR5H100MFS	SO-8 Flat Lead
Schottky	150	10-30	MBRF10H150CT, MBRF20H150CT	TO-220, FullPack
Trench Schottky	80	20-30	NTSV2080CT, NTSV20U80CT	TO-220
Trench Schottky	100	20-30	NTSV20100CT, NTSB20U100CT	TO-220, I2PAK, D2PAK, FullPack
Trench Schottky	120	20-40	NTSV20120CT, NTSB40120CT	TO-220, I2PAK, D2PAK, FullPack

Point-of-Load Rectification

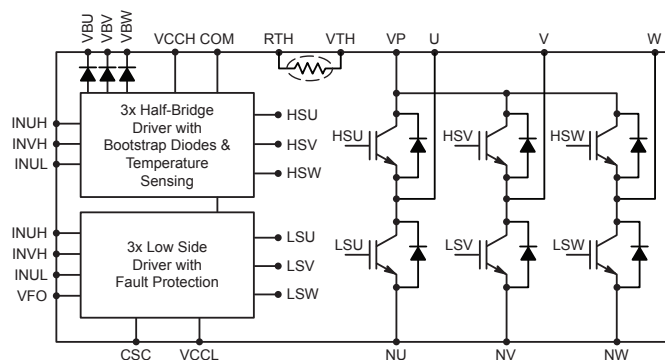
Family	Vbr (V)	Io (A)	Example Device	Packages
Schottky	10-30	1-10	MBRS410L, MBRA320	SMA, SMB, SMC, DPAK, POWERMITE
Schottky	30-45	1-10	MBRD1035CTL, MBRAF440	SMA, SMAF, SMB, SMC, DPAK, POWERMITE

Intelligent Power Modules (IPM) for Inverter Designs

SPM® 45: 500 W – 2.2 kW

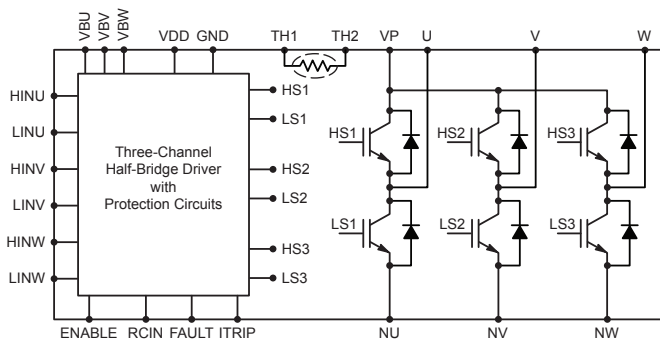
Ceramic substrate optimized for cost and thermal performance; integrated bootstrap diode.

Device	Rating (V)	I _o (A)	V _{CE(SAT)} Typ (V)	Substrate
FNA41560T2	600	15	1.6	Ceramic
FNC42060F2	600	20	1.85	Ceramic
FNB43060T2	600	30	1.65	Ceramic



DIP-S/S6: 200 W–1.1 kW

DBC for lowest thermal resistance and highest power density; IGBT/diode optimized for best power efficiency while meeting EMI requirements.

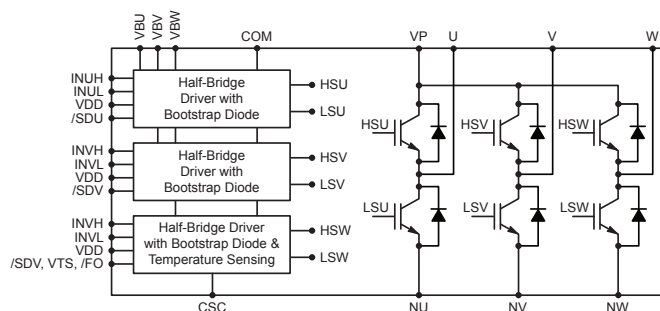


Device	Rating (V)	I _o (A)	V _{CE(SAT)} Typ (V)	Substrate
STK5C4U332J-E	600	3	1.6	IMST

SPM 8 Series: 200 – 800 W

Provides MOSFET & IGBT version together; MOSFET for high efficiency solution; IGBT for economical solution.

Device	Rating (V)	I _o (A)	V _{CE(SAT)} Typ (V)	Substrate
FNB80460T	600	4	1.85	Fullpack
FNB80560T	600	5	1.75	Fullpack
FNB81060T	600	10	1.5	Fullpack
FNB81560T	600	15	1.6	Fullpack

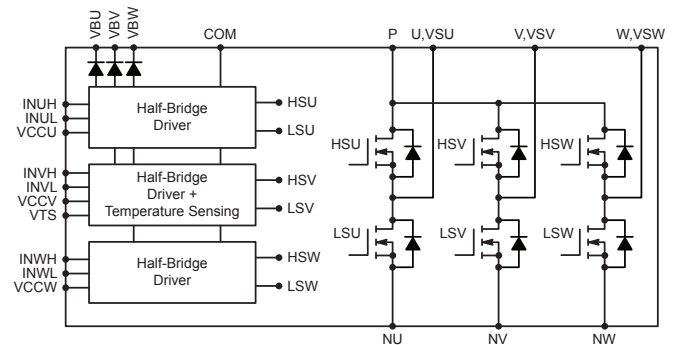


Intelligent Power Modules (IPM) for Inverter Designs

SPM 5: 50 W – 200 W

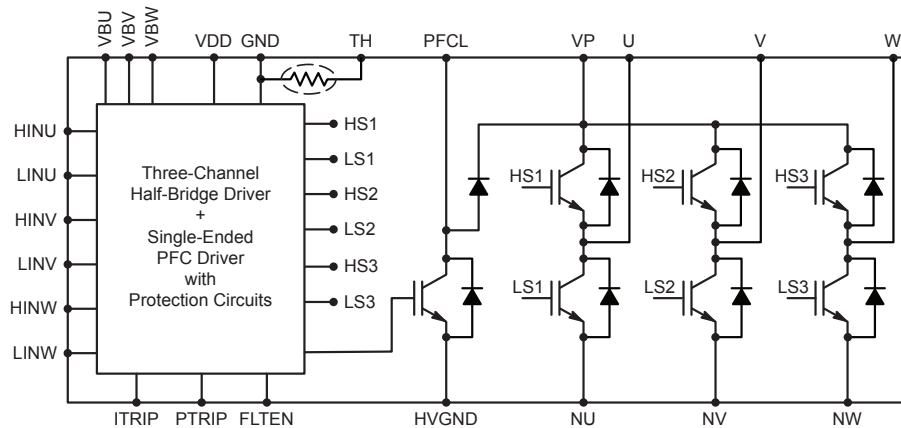
Optimized dv/dt, di/dt for EMI performance; FR MOSFET/body diode optimized for motor drive.

Rating (V)	Device	R _{DS(ON)} Typ @ 25°C (mΩ)	Silicon	Substrate
250	FSB50325A	1.1	UniFET	Fullpack
	FSB50825B	1.1	UniFET	Fullpack
500	FSB50250B	6	UniFET	Fullpack
	FSB50450B	4.3	UniFET	Fullpack
	FSB50550B	2.3	UniFET	Fullpack
	FSB50650B	0.9	UniFET	Fullpack
600	FSB50260SF	2.7	SuperFET	Fullpack
	FSB50660SF	0.59	SuperFET	Fullpack



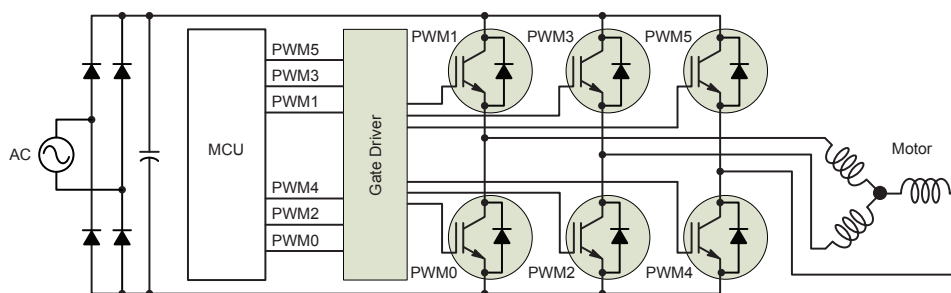
PFCM Solution; SiC Combo

Integrates power devices for PFC and motor control, plus bootstrap circuit; SJ-MOSFET & SiC-SBD for PFC enable high frequency drive over 100 kHz.



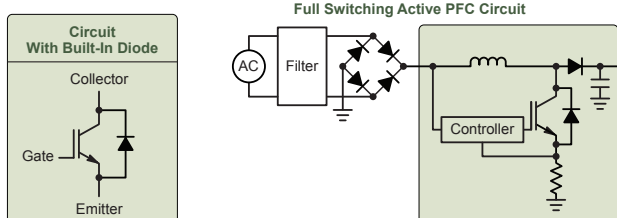
Device	Rating (V)	I _O (A)	Withstand Voltage (kV _{RMS})	Substrate
NFCS1060L3TT	600	10	2	IMST

Discrete IGBTs for Inverter Design



Device	V _{CES} (V)	I _C @ 25°C (A)	I _C @ 100°C (A)	Package
FGD3N60UNDF	600	6	3	DPAK
NGTB03N60R2	600	9	4.5	DPAK
FGB5N60UNDF	600	10	5	D2PAK
FGB7N60UNDF	600	14	7	D2PAK
NGTB05N60R2	600	16	8	DPAK
NGTB10N60R2	600	20	10	DPAK
FGP10N60UNDF	600	20	10	TO-220
FGPF10N60UNDF	600	20	10	TO-220F
NGTB10N60	600	20	10	TO-220F
NGTB15N60R2	600	24	14	TO-220F
FGP15N60UNDF	600	30	15	TO-220
FGPF15N60UNDF	600	30	15	TO-220F

IGBTs for Power Factor Controllers

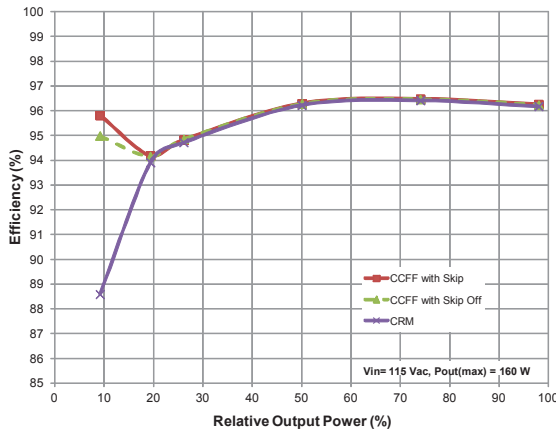


Device	V _{CES} (V)	I _C @ 25°C (A)	I _C @ 100°C (A)	Package
FGAF20S65AQ	650	40	20	TO-3PF
FGAF30S65AQ	650	60	30	TO-3PF
FGA3060ADF	600	60	30	TO-3P
NGTB30N60L2	600	60	30	TO-247
FGAF40S65AQ	650	80	40	TO-3PF
FGA4060ADF	600	80	40	TO-3P
FGHL40S65UQ	600	80	40	TO-247
FGA5065ADF	650	100	50	TO-3P
FGH50T65SQD-F155	650	100	50	TO-247
FGA6065ADF	650	120	60	TO-3P
FGH75T65SQD-F155	650	150	75	TO-247

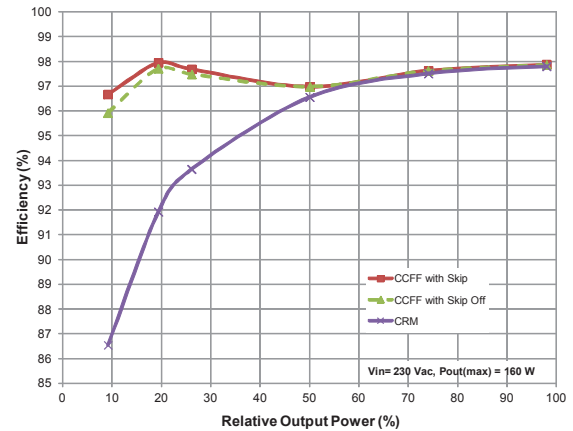
Power Factor Correction

160 W PFC Boost using NCP1611 or NCP1612

- Improved efficiency in light load over traditional CrM PFC
- Unlike CrM, switching frequency is reduced at light load
- Improved reliability and safety without extra components



Efficiency vs Power @ 115 Vac



Efficiency vs Power @ 230 Vac

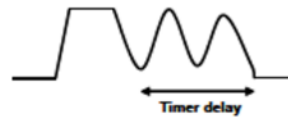
NCP1611 and NCP1612 Features

- CrM with Current Controlled Frequency Foldback (CCFF)
- Shorted Boost or Bypass Diode Protection
- Comprehensive Open / Short Pin Protection
- Enhanced Transient Response
- Soft Overvoltage Protection
- Brownout Detection
- Optional Skip Mode
- Thermal Shutdown
- Wide Vcc Range to 35 Vdc

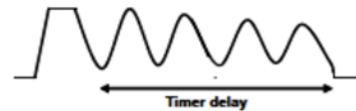
High Current
No delay → CrM



Low Current
The next cycle is delayed



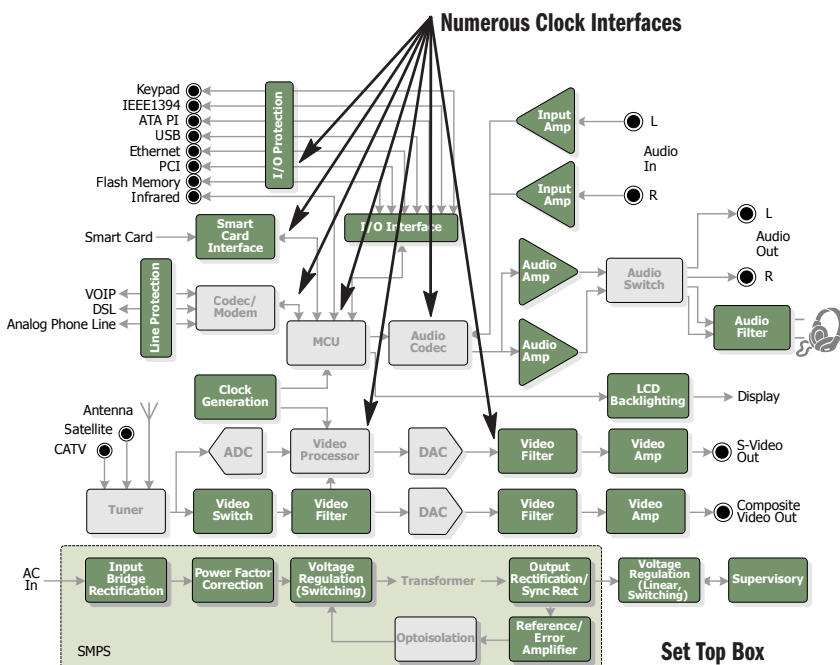
Lower Current
Longer dead-time



Power Factor Controllers

Device	Control Mode	Conduction Mode	Frequency	Package
NCP1654	Current	Continuous	Fixed	SOIC-8
FAN9672/3	Current	Continuous (Interleaved)	Fixed	LQFP-32
NCP1631	Current	Critical, Discontinuous (Interleaved)	Variable and/or Fixed	SOIC-16
NCP1632	Current	Critical, Discontinuous (Interleaved)	Variable and/or Fixed	SOIC-16
NCP1608	Voltage	Critical	Variable	SOIC-8
NCP1611	Voltage	Critical	Variable	SOIC-8
NCP1612	Voltage	Critical	Variable	SOIC-10
NCP1615	Voltage	Critical	Variable	SOIC-14, SOIC-16
NCP1616	Voltage	Critical	Variable	SOIC-10
NCP1605	Voltage	Critical, Discontinuous	Variable and/or Fixed	SOIC-16
NCP1622	Voltage	Critical, Discontinuous	Variable	TSOP-6

Clock Generation and Distribution



Clock Generation

- Programmable PLL Clocks can satisfy all clock tree requirements with pin-strap, OTP, I2C
- Maintain clock architecture flexibility with ability to program new clock configurations through software
- Fixed frequency for specific applications
- PLL-based Zero Delay Buffers
- EMI reduction using spread spectrum frequency modulation to reduce peak emissions
- Low jitter guarantees synchronous system

Clock Distribution

- Low power with integrated LDO extends battery life
- Low additive noise for reliable system operation
- Low output skew assures proper signal timing
- Flexible interface options, i.e., voltage translation, input/output compatibility

Clock Generators

Device	Output Frequency (MHz)	Application	Package
FS6370/7	150	Video	SOIC-16
FS7140/5	150 CMOS, 340 PECL	Printers, Video	SOIC-16, SSOP-16
NB3N3002	25, 100, 125, 200	PCI-e, Gigabit Ethernet	TSSOP-16
NB3N3010B	12.288	USB	SOIC-8, DFN-8
NB3N3020	210	Network Video	TSSOP-16
NB3N502	14-190	CPU, USB, PCI, Network, Ethernet	SOIC-8
NB3N51032/4	100, 200	PCI-e, DIMM, CPU	TSSOP-20
NB3N511	14-200 with selectable multiplier ratios	USB, PCI, PCI-e, SDRAM, Ethernet, Gigabit Ethernet, CPU	SOIC-8
NB3N5573	25, 100, 125, 200	PCI-e, DIMM, CPU	TSSOP-16
NB3x63143G	0.008-200	Printers, Video	QFN-16
NB3x60113G	0.008-200	Printers, Video	DFN-8

Clock Fanout Buffers

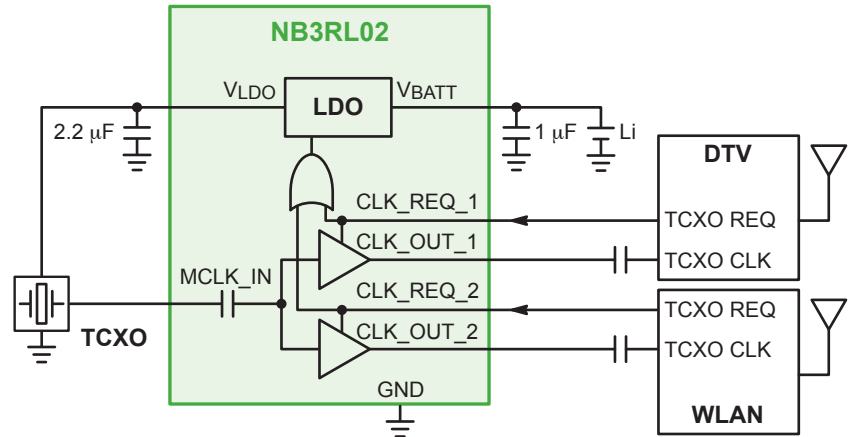
Device	VCC (V)	Output Freq (MHz)	Outputs	Type	Package
NB3N551	3.3, 5.0	180	4	Fanout Buffer	SOIC-8, DFN-8
NB3L553	2.5, 3.3, 5.0	200	4	Fanout Buffer	SOIC-8, DFN-8
NB3N2304NZ	3.3	140	4	Low Skew Fanout Buffer	TSSOP-8, DFN-8
NB2304A/5A	3.3	15-133	4, 5	Zero Delay Buffer	TSSOP-8, SOIC-8
NB2309A	3.3	15-133	8, 9	Zero Delay Buffer	TSSOP-16, SOIC-16
NB3V110xC	1.8, 2.5, 3.3	250	2, 3, 4, 6, 8	Low Skew Fanout Buffer	TSSOP-8, WDFN-8, TSSOP-14, TSSOP-16
NB3M8302C/4C	3.3	200	2, 4	Low Skew Fanout Buffer	SOIC-8
NB3H83905C	1.8, 2.5, 3.3	100	6	Clock Fanout Buffer	SOIC-16, TSSOP-16, QFN-20

Low Noise Clock Buffers

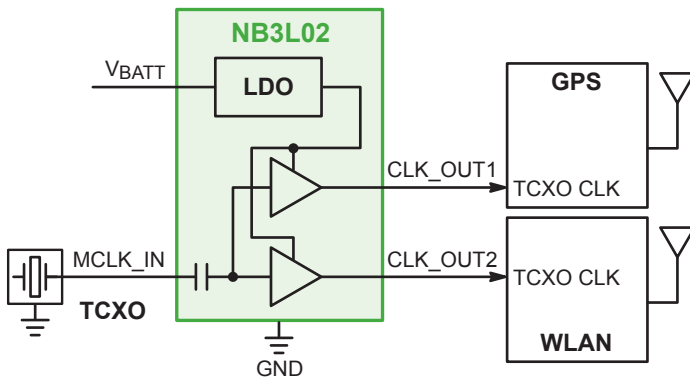
NB3RL02 has two CMOS outputs with clock request lines. Systems in need of TCXO clock will request clock from NB3RL02, and NB3RL02 powers the TCXO and delivers the requested clock, eliminating multiple TCXOs.

NB3RL02 Features

- Frequency: 10-52 MHz
- Low additive noise: -149 dBc/Hz at 10 kHz offset phase noise
- 0.37 ps (rms) output jitter
- Limited output slew rate for EMI reduction (1 to 5 ns rise/fall time for 10–50 pF loads)
- Integrated, regulated 1.8 V externally available I/O supply
- ESD performance exceeds JESD 22
- WLCSP-8 package



NB3RL02 Used to Clock Multiple Applications and Power a TCXO



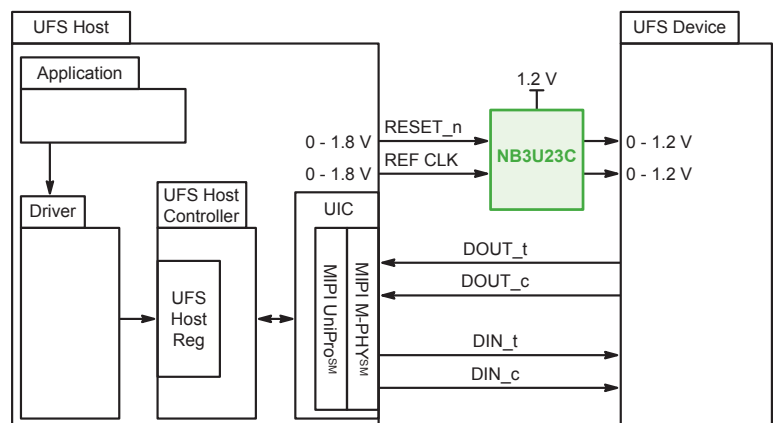
NB3L02 Clocking Two Applications

NB3L02/03 Features

- 1:2, 1:3 Fanout
- Low phase noise TCXO buffer
- AC coupled input accepts sin wave or square wave
- WLCSP-6 package

NB3U23C Features

- Low phase noise
- Low standby current
- Dual channel voltage translator/buffer
- Targeted for Universal Flash Storage (UFS) applications
- SC-70-6, UDFN-6 packages



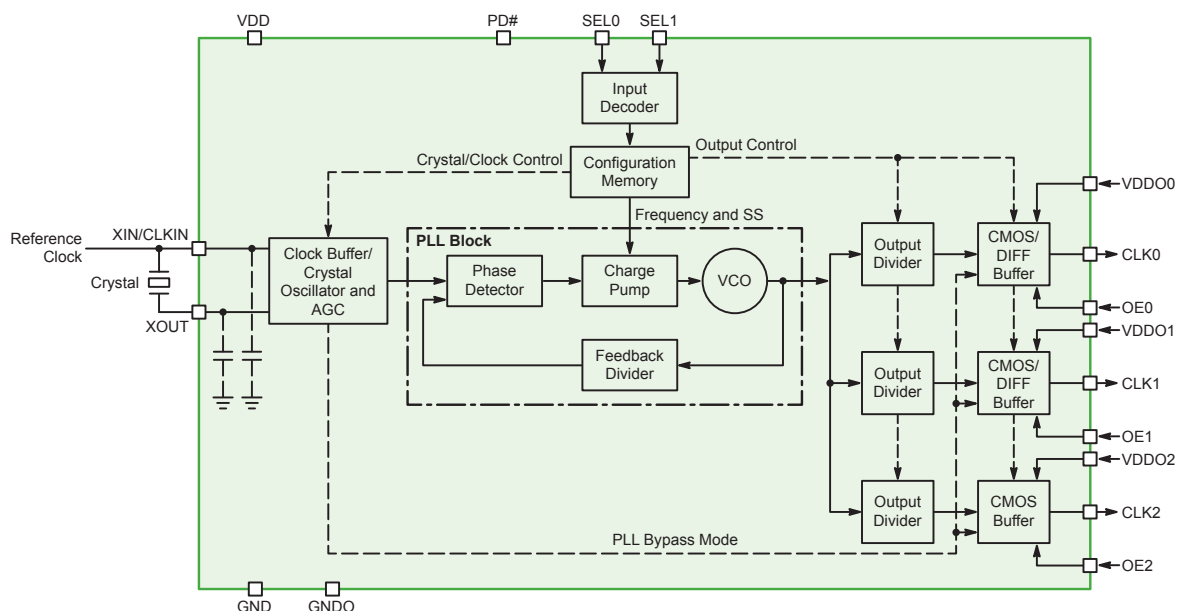
NB3U23C Used for Voltage Translation

OmniClock Programmable Clock Synthesizers

Fits Many Systems, Extends Battery Life, Reduces EMI, and Saves Board Space

Features

- Single PLL
- Input Frequency Range:
 - Crystal: 3 – 50 MHz (low cost ESR crystal compatible)
 - Clock: 3 – 200 MHz (single-ended only)
- Up to 3 single-ended (LVCMOS/LVTTL) outputs, or up to 1 differential (LVPECL, LVDS, HCSL or CML) output + 1 single-ended (LVCMOS/LVTTL) output
- Output Frequency Range: 8 kHz (Min), 200 MHz (Max)
- Programmable Spread Spectrum Capabilities for EMI Suppression
 - Center Spread (0.125% steps): $\pm 0.125\%$ to $\pm 3\%$
 - Down Spread (0.25% steps): -0.25% to -4%
 - Modulation Rate: 30 kHz – 130 kHz
- PLL Bypass mode
- Individual Output Enable pin for each output and Power Down Capability
- Individual Output Voltage pins per output, allowing setting of output voltage (1.8 V, 2.5 V or 3.3 V; equal to or less than VDD)
- Automatic Gain Control (Crystal Power Limiting)
- Programmable internal input crystal load capacitors
- Programmable Output Drive current
- Up to 4 independent configurations using SELx pins
- Supply Voltage: 3.3 V $\pm 10\%$; 2.5 V $\pm 10\%$; 1.8 V ± 0.1 V



Block Diagram

Implementation of OmniClock Programmable Clock Synthesizers

Using OmniClock in Your System

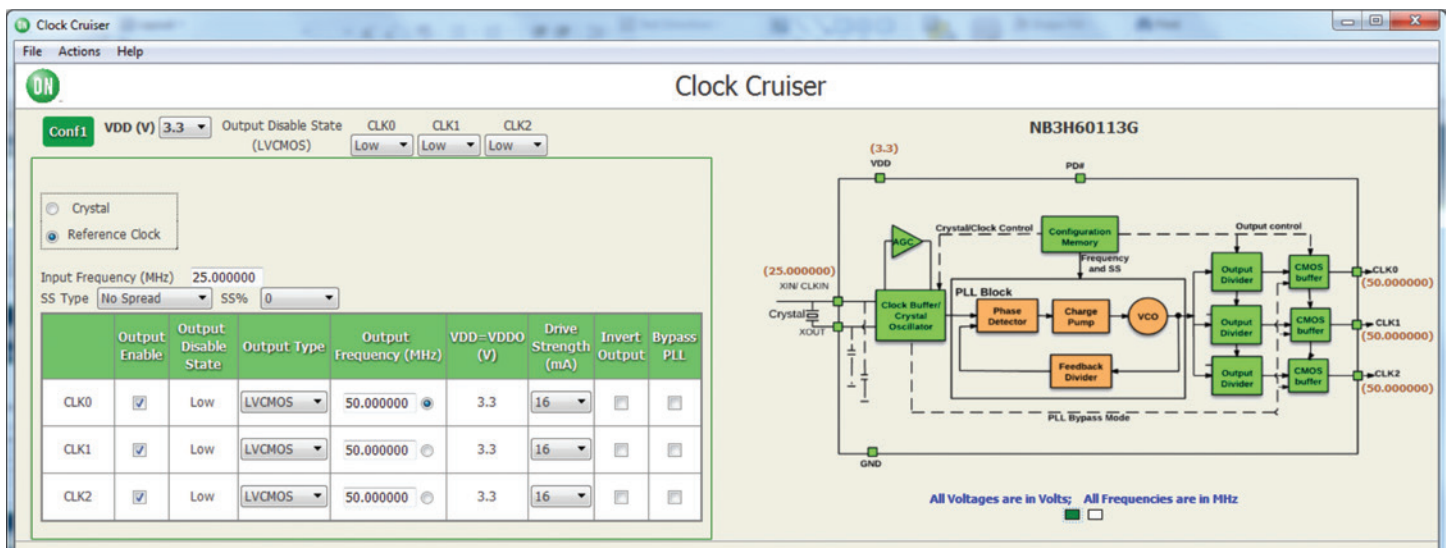
Customer orders blank OmniClock devices

Customer uses free GUI and supplied evaluation board to configure the blank device to the desired parameters: frequency, drive strength, spread spectrum, etc.

Customer provides configuration file to ON Semiconductor sales channel

ON Semiconductor programs device in factory with desired customer configuration, and creates customer-specific part number

TIMING



Configuration GUI

Device	Individual OE	Individual V _{DDO}	Supply Voltage (V)	Number of Configurations	Number of Outputs	Package
NB3H63143G	Yes	Yes	2.5 / 3.3	4	3	QFN-16
NB3H60113G	No	No	2.5 / 3.3	1	3	DFN-8
NB3V63143G	Yes	Yes	1.8	4	3	QFN-16
NB3V60113G	No	No	1.8	1	3	DFN-8

PLL Clock Synthesizers/Generators

Features

- Based on phase-locked-loop techniques with zero PPM synthesis error
- Low jitter for high accuracy clock signals
- Available in industrial temperature range -40°C to +85°C
- Supports output interfaces: LVPECL, LVDS, HCSL, LVTTTL/LVCMOS
- Multiple PLLs and multiple output options

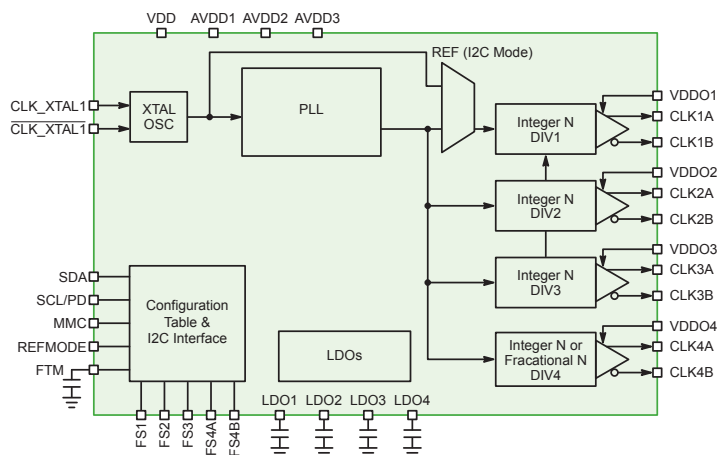


Device	Input (MHz)	Output (MHz)	Application	Input Level					Output Level	Vcc Typ (V)	Package(s)
				XTAL	CML	CMOS	LVPECL	TTL			
NB3N3002	25	25/125/200	CPU/DIMM, PCIe Gen 1, 2, 3, 4	✓		✓		✓	HCSL	3.3	TSSOP-16
NB3N5573	25	25/100/125/200	CPU/DIMM, PCIe Gen 1, 2, 3, 4	✓		✓		✓	HCSL	3.3	TSSOP-16
NB3N51032	25	25/100/125/200	CPU/DIMM, PCIe Gen 1, 2, 3, 4	✓		✓		✓	HCSL	3.3	TSSOP-16
NB3N3020	5 to 27	5 to 210	Network GigE	✓	✓	✓	✓		ECL, LVTTTL	3.3	TSSOP-16
NB3N502	5 to 27	14 to 120	Networking, Consumer, STB	✓		✓			LVC MOS	3.3	SOIC-8
NB4N507A	10 to 27	50 to 200	Networking, Consumer, STB	✓		✓			ECL	3.3, 5	SOIC-16
NB3N508S	27	216	VCXO Set Top Box	✓		✓			LVDS	3.3, 5	TSSOP-16
NB3N511	1 to 50	14 to 200	Networking, Consumer, STB	✓					CMOS	3.3, 5	SOIC-8
NB3N51034	25	100/200	CPU/DIMM, PCIe Gen 1, 2, 3, 4	✓		✓			HCSL	3.3	TSSOP-20
NB3N51044	25	100/125	CPU/DIMM, PCIe Gen 1, 2, 3, 4	✓		✓			HCSL	3.3	TSSOP-28
NB3N51054	25	100	CPU/DIMM, PCIe Gen 1, 2, 3, 4	✓					HCSL	3.3	TSSOP-24
NB3H5150	25	25 to 250	Networking, Telecom	✓	✓	✓	✓	✓	ECL, CMOS	3.3, 2.5	QFN-32
NB3H5150-01	25	25 to 250	Networking, Telecom	✓	✓	✓	✓	✓	ECL, CMOS	3.3, 2.5	QFN-32

Programmable Multi-Rate Clock Generators

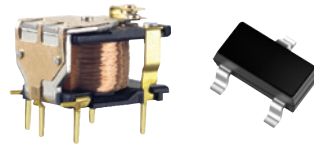
NB3H5150, NB3H5150-01 Features

- Uses 25 MHz Crystal or reference input
- External Loop Filter is not required
- User programmable frequencies with four independent output pairs
- Each output pair can be configured either as two LVC-MOS outputs (or) a differential LVPECL pair
- Supports 3.3 V or 2.5 V supply voltage operation
- Each output pair has an independent supply voltage rail (VDDOx); 3.3 V, 2.5 V, 1.8 V
- I2C enabled PLL Bypass Mode and Power Down Mode
- Free GUI software to configure device for different frequencies and output types using evaluation board
- Each device preconfigured with different default frequencies, that may be overridden using I2C/SMBus interface

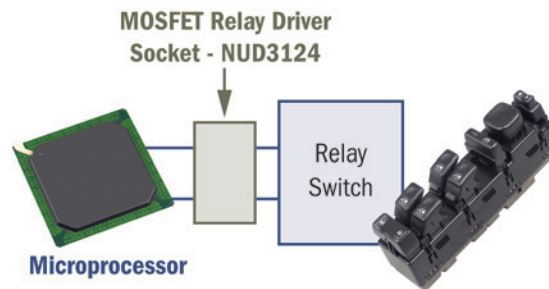


Integrated, Reliable Drive Circuits for Motors and Electro-Mechanical Relays

**Most relays mounted to a PCB
require a relay driver circuit!**



24 V Relay Driver Socket



Features

- Integrates diodes, resistors and capacitors into one circuit
- Delivers additional current to the relay coil and protects against ESD
- Meets IEC61000-4-4 Electrical Fast Transient (EFT) test standards

Relay Drivers

Device	Configuration	Circuit Type *	Voltage (V)	Current (mA)	Package
MDC3105	Single	Bipolar-Clamp	5	500	SOT-23
MDC3105D	Dual	Bipolar-Clamp	5	500	SC-74
NUD3105	Single	MOSFET	5	500	SOT-23
NUD3105D	Dual	MOSFET	5	500	SC-74
NUD3112	Single	MOSFET	12	500	SOT-23
NUD3112D	Dual	MOSFET	12	500	SC-74
NUD3124	Single	MOSFET	24	150	SOT-23
NUD3124D	Dual	MOSFET	24	150	SC-74
NUD3160	Single	MOSFET	60	150	SOT-23
NUD3160D	Dual	MOSFET	60	150	SC-74

* **Bipolar:** the driver circuit consists of a transistor combined with resistors and diodes.

MOSFET: the driver circuit consists of a MOSFET combined with resistors and diodes.

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

EEPROMs

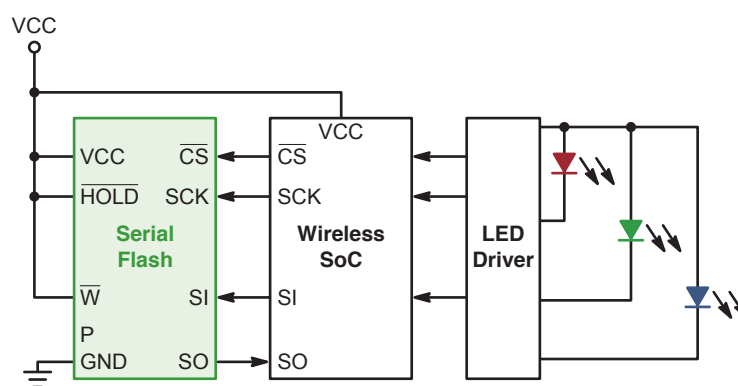
Data Transmission Standard	Density	Organization*	Vcc Min (V)	Vcc Max (V)	fCLK Max (MHz)	Package(s)
I ² C	1 Mb	128k x 8	1.7, 1.8	5.5	0.4, 1	US8, SOIC-8, TSSOP-8, UDFN-8, TSOT23-5, WLCSP-4, WLCSP-5, WLCSP-8
	512 kb	64k x 8				
	256 kb	32k x 8				
	128 kb	16k x 8				
	64 kb	8k x 8				
	32 kb	4k x 8				
	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.

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

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

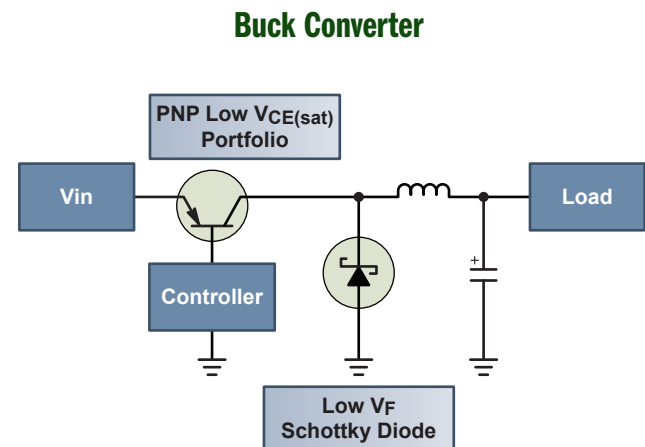
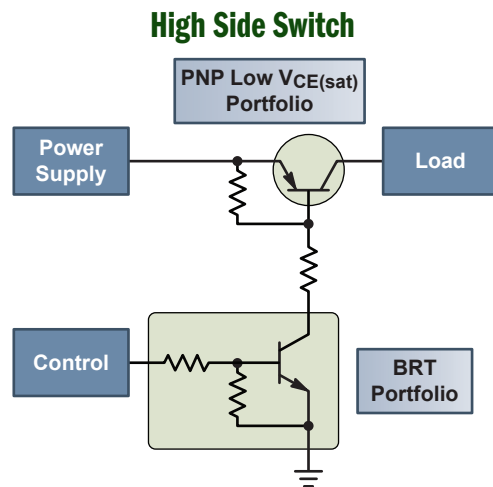
Standard Logic Family	Device Prefix	V _{CC}		t _{PD} (nS)	I _{OUT} (mA)	Input Logic Level	Packages
		Min (V)	Max (V)				
Metal Gate	MC14	3	18	50 @ V _{CC} = 15 V	±4.2 @ V _{CC} = 15 V	CMOS	SOIC, TSSOP, QFN
AC	MC74AC/74AC	2	6	6 @ V _{CC} = 5 V	±24 @ V _{CC} = 4.5 V	CMOS	
ACT	MC74ACT/74ACT	4.5	5.5	5.5 @ 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}		t _{PD} (nS)	I _{OUT} (mA)	Input Logic Level	Packages
			Min (V)	Max (V)				
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	

Wide Selection of Small Signal Discretes

ON Semiconductor offers a wide range of devices that support the systems of white goods, including diodes, bipolar transistors, and digital transistors (BRTs). Within these different technologies, the company offers a range of large to small packaging, meeting the smaller board space requirements of space constrained environments.

Device	Voltage Range	Current Range	Key Features	Functions	Package(s)
Schottky Diodes	7 – 70 V	20 – 1000 mA	Low V_F ; Low Leakage; Duals	DC-DC converters, high-speed switching, Oring/rectifying	SOT-23, SC-70, SC-89, SC-75, SC-88, SOD-123, SOD-323, SOD-523
Switching Diodes	35 – 350 V	—	Switching speed; Low leakage	Broad range	SC-59, SOT-23, SC-70, SC-75, SC-88, SOT-563, SOD-123, SOD-323, SOD-523
Low $V_{CE(sat)}$ Transistors	12 – 100 V	700 – 6000 mA	Ultra-low $V_{CE(sat)}$; Broad portfolio	Switching of power with low power dissipation	DPAK, SOT-223, SOT-23, SC-70, SC-89, SOIC-8, ChipFET, SC-74, TSOP-6, SC-88, SOT-563
Darlington Transistors	30 – 350 V	300 mA – 50 A	High HFE	—	TO-220, TO-225, TO-247, TO-92, DPAK, SOT-223, SOT-23
Digital Transistors (BRTs)	50 V	100 – 500 mA	Integrated resistors in single package; Wide range of R1 and R2 combinations	Switching power supplies, easy interface with μC to control power to downstream electronics	SC-59, SOT-23, SC-70, SC-75, SC-88, SOT-563



Digital Transistors (BRTs)

Features

- Wide range of R1 and R2 combinations
- Simplifies circuit design
- Reduces board space
- Reduces component count
- Wide range of packages

Low $V_{CE(sat)}$ Transistors

Features

- Ultra low saturation voltage
- Broad portfolio
- Cost effective alternative to MOSFETs
- Very high current gain
- High ESD rating

Schottky Diodes

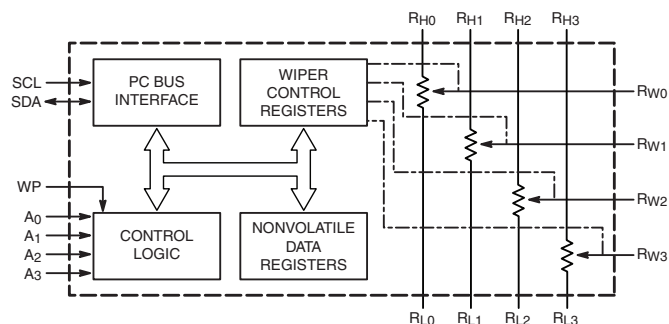
Features

- Low V_F diodes
- Low leakage diodes
- Dual packaged diodes
- Broad portfolio
- Very high switching speed
- Low Capacitance

Digital Potentiometers (POTs) for Trimming and Calibration

Features

- No drift over time or temperature
- No changes due to mechanical stress or shock
- Systems can be calibrated real-time, in the field
- Broad portfolio provides for selection of optimal number of pots and taps



Device	Number of Pots	Number of Taps	Resistance (kΩ)	Buffered Wiper	Interface	Volatile	Non-Volatile	Packages
CAT5120/1/2	1	16	10, 50, 100		UP/DOWN	✓		SOT-23-6, SC-70-6
CAT5110	1	32	10, 50, 100		UP/DOWN	✓		SOT-23-6, SC-70-6
CAT5112	1	32	10, 50, 100	✓	UP/DOWN		✓	PDIP-8, SOIC-8, MSOP-8, TSSOP-8
CAT5114	1	32	10, 50, 100		UP/DOWN		✓	PDIP-8, SOIC-8, MSOP-8, TDFN-8, TSSOP-8
CAT5115	1	32	10, 50, 100		UP/DOWN	✓		PDIP-8, SOIC-8, MSOP-8, TSSOP-8
CAT5118/9	1	32	10, 50, 100		UP/DOWN	✓		SOT-23-5, SC-70-5
CAT5123/4	1	32	10, 50, 100		UP/DOWN	✓		SOT-23-5
CAT5125	1	32	10, 50, 100		UP/DOWN	✓		SOT-23-6
CAT5126	1	32	10, 50, 100		UP/DOWN		OTP	MSOP-8, TDFN-8
CAT5127	1	32	10, 50, 100		UP/DOWN		✓	MSOP-8, TDFN-8
CAT5128	1	32	10, 50, 100		UP/DOWN	✓		SOT-23-8
CAT5129	1	32	10, 50, 100		UP/DOWN		✓	TSOT-23-6
N57M5114	1	32			UP/DOWN		✓	SOIC-8, MSOP-8, TDFN-8, TSSOP-8
N57L5125	1	32			UP/DOWN	✓		SOIC-8, MSOP-8, TDFN-8, TSSOP-8
N57M5127	1	32			UP/DOWN		✓	SOIC-8, MSOP-8, TDFN-8, TSSOP-8
N57L5128	1	32			UP/DOWN	✓		SOT-23-8
CAT5111	1	100	10, 50, 100	✓	UP/DOWN		✓	PDIP-8, SOIC-8, MSOP-8, TSSOP-8
CAT5113	1	100	1, 10, 50, 100		UP/DOWN		✓	PDIP-8, SOIC-8, MSOP-8, TSSOP-8
CAT5116	1	100	32 (Log Taper)		UP/DOWN		✓	PDIP-8, SOIC-8, MSOP-8, TSSOP-8
CAT5132	1	128	10, 50, 100		I ² C		✓	MSOP-10
CAT5133	1	128	10, 50, 100		UP/DOWN		✓	MSOP-10
CAT5137	1	128	50		I ² C		✓	SC-88-6, SC-70-6
CAT5138	1	128	10		I ² C		✓	SC-88-6, SC-70-6
CAT5140	1	256	50, 100		I ² C		✓	MSOP-8
CAT5171	1	256	50, 100		I ² C		✓	SOT-23-8
CAT5172	1	256	50		SPI		✓	SOT-23-8
CAT5221	2	64	2.5, 10, 50, 100		I ² C		✓	SOIC-20, TSSOP-20
CAT5411	2	64	2.5, 10, 50, 100		SPI		✓	SOIC-24, TSSOP-24
CAT5419	2	64	2.5, 10, 50, 100		I ² C		✓	SOIC-24, TSSOP-24
CAT5261	2	256	50, 100		SPI		✓	SOIC-24, TSSOP-24
CAT5269	2	256	50, 100		I ² C		✓	SOIC-24, TSSOP-24
CAT5271	2	256	50, 100		I ² C		✓	MSOP-10
CAT5273	2	256	50		I ² C		✓	MSOP-10
CAT5241	4	64	2.5, 10, 50, 100		I ² C		✓	SOIC-20, TSSOP-20
CAT5401	4	64	2.5, 10, 50, 100		SPI		✓	SOIC-24, TSSOP-24
CAT5409	4	64	2.5, 10, 50, 100		I ² C		✓	SOIC-24, TSSOP-24
CAT5251	4	256	50, 100		SPI		✓	SOIC-24, TSSOP-24
CAT5259	4	256	50, 100		I ² C		✓	SOIC-24, TSSOP-24

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