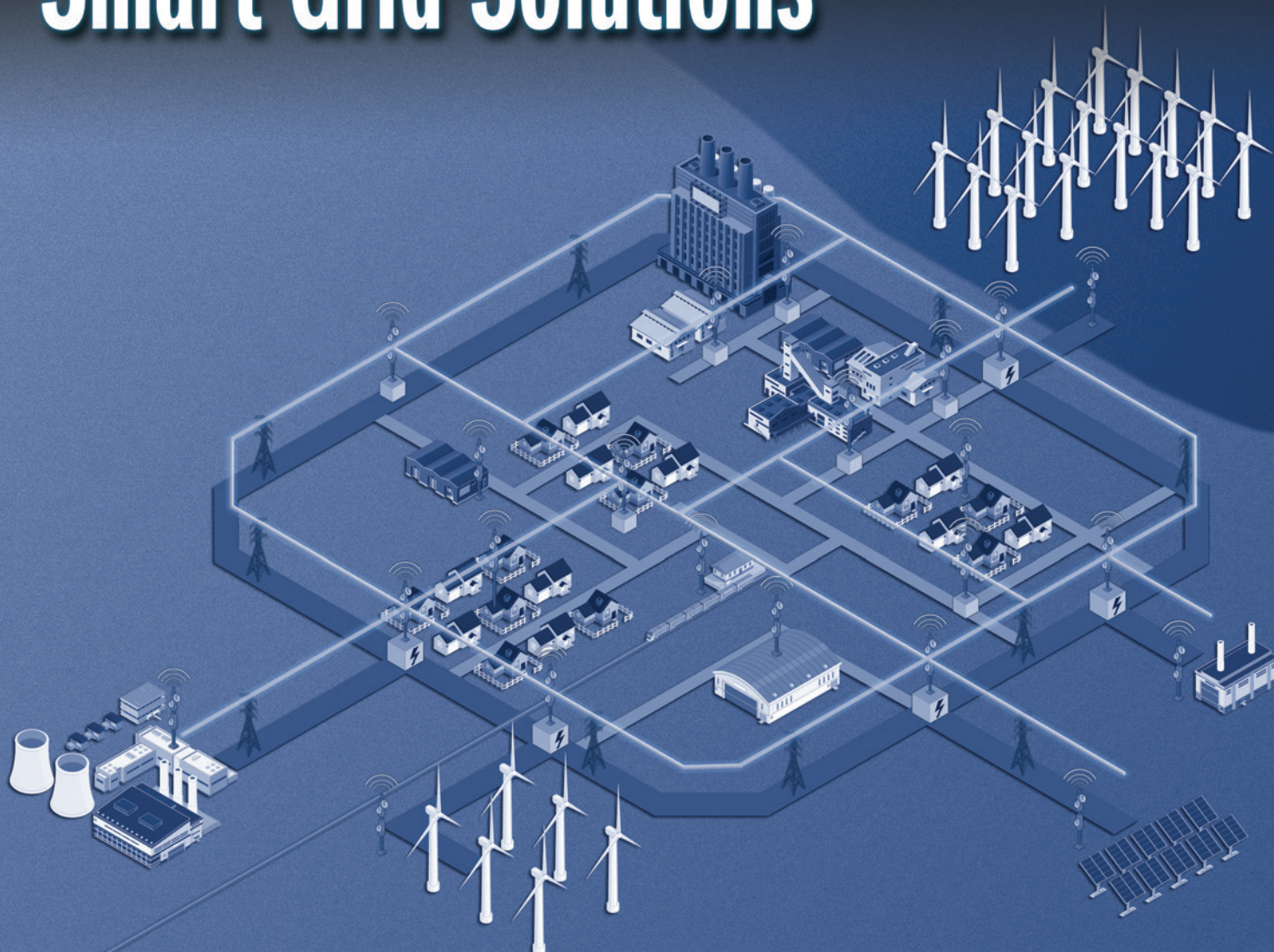# Smart Grid Solutions

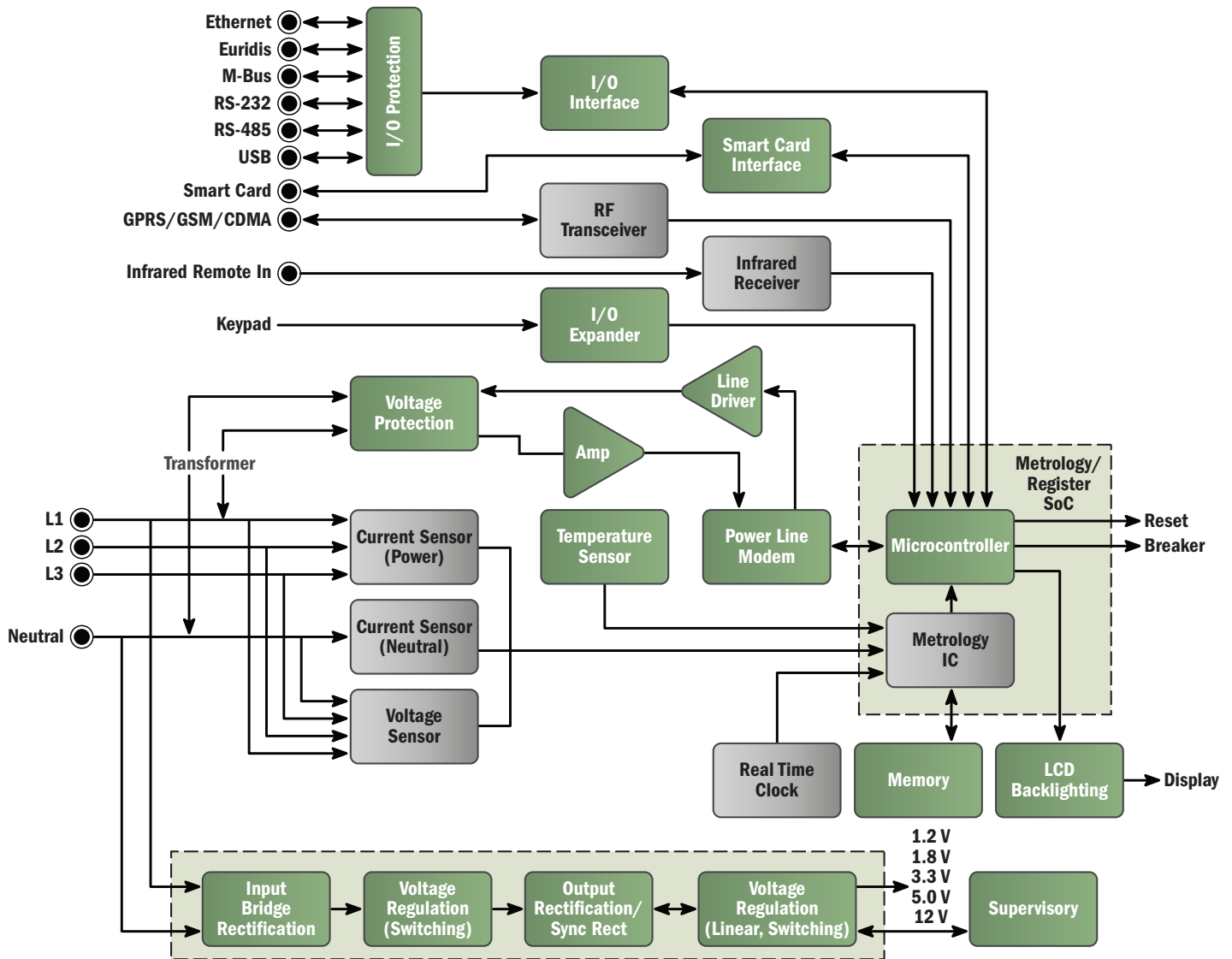*Comprehensive power management, control, communication, and protection solutions for smart grid applications from ON Semiconductor.*

www.onsemi.com

Smart Meter Simplified Block Diagram

ON Semiconductor has a long history in providing solutions for smart metering applications. We have a proven track record of shipping Power Line Communication modems and power management products in electricity meters for many years. In addition, ON Semiconductor offers a comprehensive portfolio of memories (EEPROM and SRAM), logic products, interfaces, and protection/filtering products.
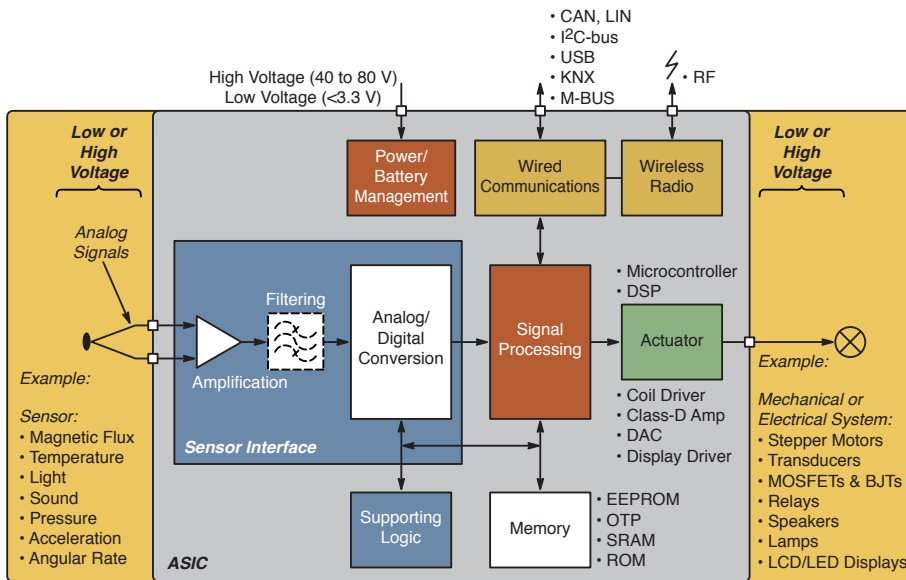
Mixed-Signal ASIC Development Services

Value Proposition

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

Design Engineering

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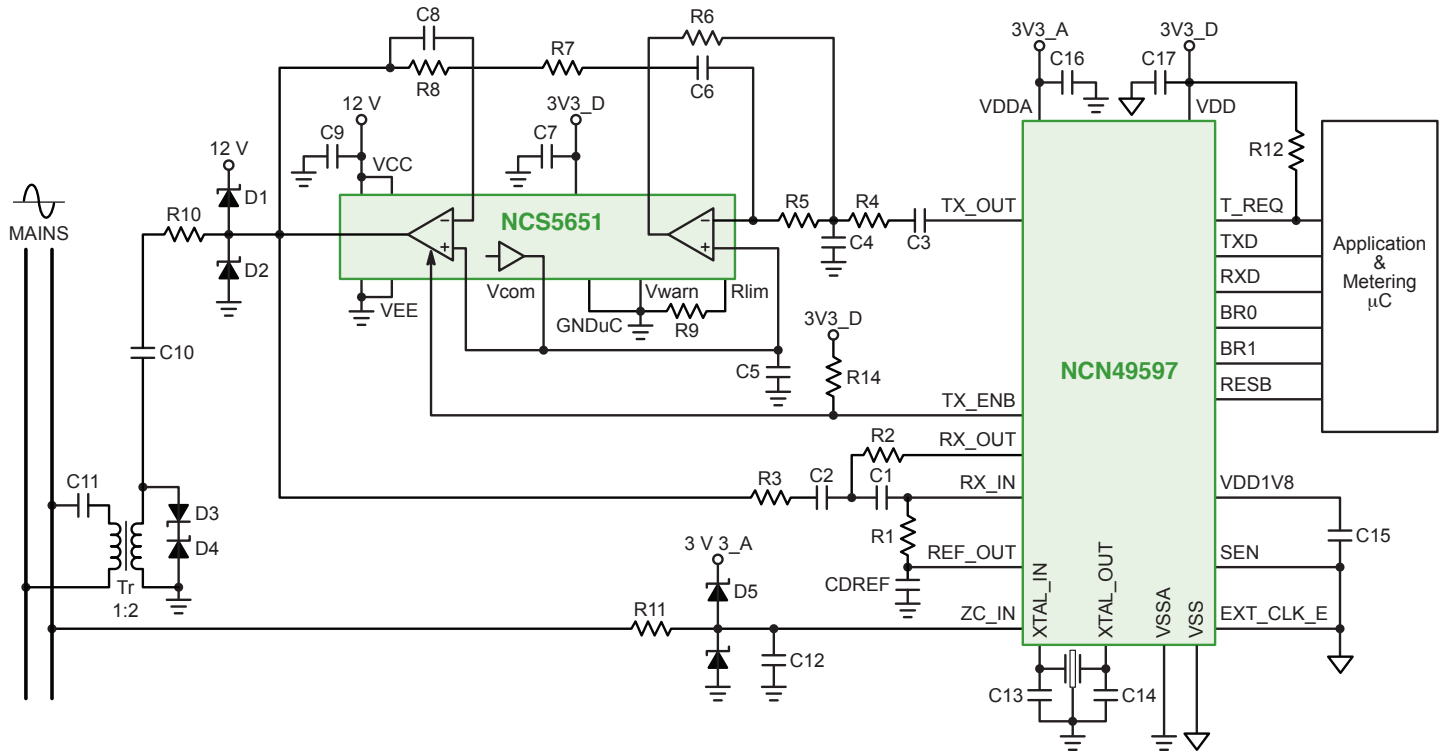 - » Building & home control

IP & Fab Processes

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

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

PLC Modems/Power Line Driver

	Device	Function	Features	Package(s)
Smart Grid Modem	NCN49599	PLC S-FSK Modem; A - D Band	• ARM Cortex M0 • Baud rate: 4800 Bauds • S-FSK modulation • Hardware embedded MAC + PHY • Embedded 1.2 A, 2-stage power amplifier with current limitation and thermal protection	QFN-56
	NCN49597	PLC S-FSK Modem; A - D Band	• ARM Cortex M0 • Baud rate: 4800 Bauds • S-FSK modulation • Hardware embedded MAC + PHY	QFN-52
Smart Metering Modem	AMIS49587	PLC S-FSK Modem; A & B Band	• ARM7TDMi, 24 MHz core • Baud rate: 2400 Bauds • S-FSK modulation • Hardware embedded MAC + PHY	QFN-52
Power Amplifier	NCS5651	Power Line Driver; Class AB	• Low distortion power line driver with optimized interface for PLC modems • Capability to drive 2.0 A peak into reactive loads • Current shutdown minimizes power consumption during power down state • Rail-to-Rail Drop of Only ±1 V with Iout = 1.5 A	QFN-20 EP

KNX Transceiver

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).
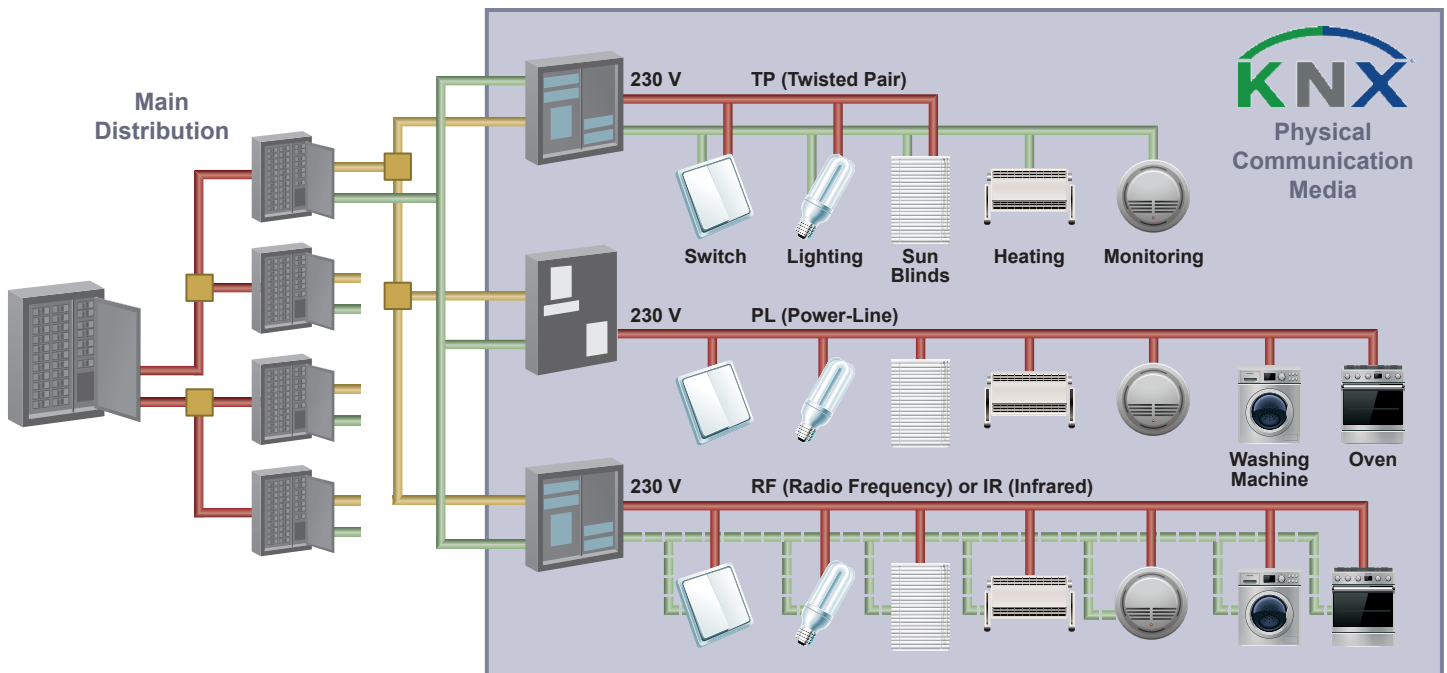
KNX Open Standards

- 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 to the 9600 Baud KNX twisted pair (TP) bus inside a building
- TP bus provides data communication and power supply

Device	DC=DC Converters		20 V Regulator	Embedded MAC + LLC[1]	KNX Host Interface		Package
	Fixed 3.3 V	Adj 3.3 to 21 V			Digital SPI/UART	Analog UART	
NCN5120	✔	✔	✔	✔	✔	✔	QFN-40

Note 1: LLC = Logical Link Control layer of the OSI-based communications network.
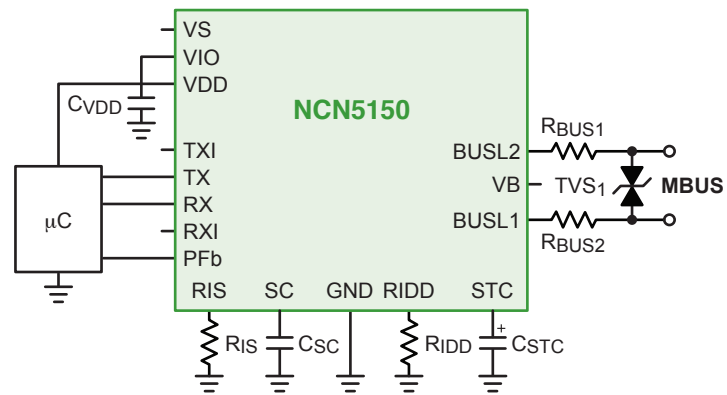
Wired M-BUS Transceiver

Features

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

M-Bus

MEMBER

OMS®
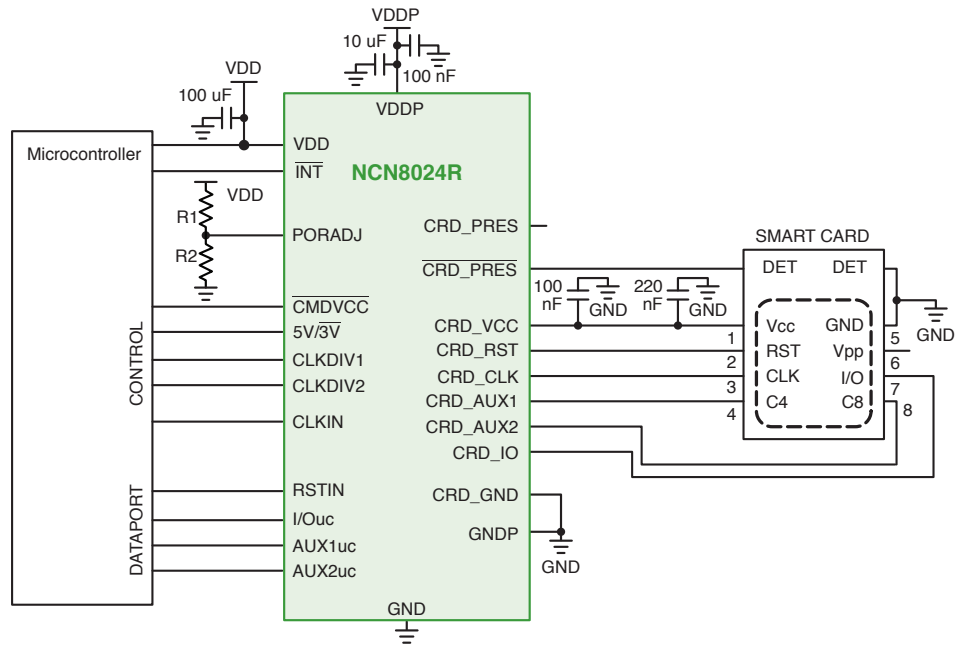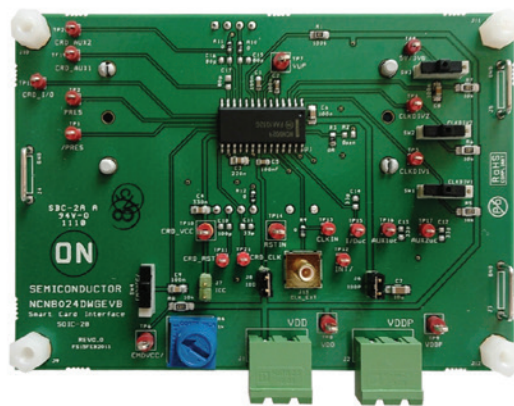Open Metering System
www.oms-group.org

General Application Diagram

Smart Card Interfaces

Features

- ISO & EMV compliance
- ESD protection on card pins up to +8kV (Human Body Model)

	Device	Ports	Control Interface	Card Type	V_{DD} μC Interface (V)	Power Supply	Sequencer	Card Detect	Clock Divider	Standards	Package(s)
Smart Card	NCN6001	1	SPI	A, B, C	2.7 – 5.5	Inductive DC-DC	Yes	Yes	Yes	ISO7816; EMV4.3	TSSOP-20, TLLGA-20
	NCN8024R	1	Parallel	A, B	2.7 – 5.5	LDO	Yes	Yes	Yes	ISO7816; EMV4.3	SOIC-28W
	NCN8025/A (SAM/SIM)	1/3	Parallel	A, B, C	2.7 – 5.5	LDO	Yes	Yes	Yes	ISO7816; EMV4.3; UICC	QFN-16, QFN-24
	NCN8026 (SAM/SIM)	1	Parallel	A, B, C	1.6 – 5.5	LDO	Yes	Yes	Yes	ISO7816; EMV4.3; UICC; SIM	QFN-24
SAM	NCN4555	1	Parallel	B, C	1.8 – 5.5	LDO	No	No	No	UICC; SIM	QFN-16

NCN8024R Demo Board

Specialized, Ultra-Low-Power Microcontrollers

Features

- Ultra-Low-Current consumption
  - As low as 0.02 µA in Standby Mode
  - As low as 0.33 µA in Clock Count Mode
  - As low as 4 mA in Normal Mode
- 1.8 – 5.5 V operating voltage

- Available with USB, UART, SPI, I2C, Smart Card I/F, Manchester Code, Remote Controller Reception
- Available with A/D, D/A, PLL, regulator, op amp, comparator, POR, LVD

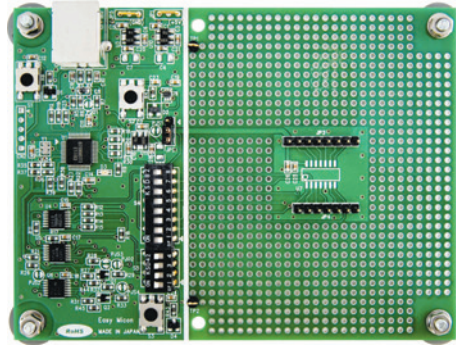| Device	Type	VDD (V)	ROM (kB)	RAM (B)	12-Bit ADC	Features	Package
LC87F2608A	8-bit	2.7 - 5.5	8	512 x 9	3-channel	Highspeed 12-bit PWM, Analog-Comparator	MFP-10SK
LC87F0N04A	8-bit	5.5 - 2.8	4	128 x 9	6-channel (10-bit)	MCPWM, Analog comparator x 2	SSOP-16
LC87FBG08A	8-bit	1.8 - 5.5	8	256 x 9	9-channel	PWM; Internal OSC ±2%, POR, LVD	SSOP-24, VCT-24
LC87FBK08A	8-bit	2.7 - 5.5	8	256 x 9	8-channel	PWM; Internal OSC ±2%, POR, LVD	SSOP-24
LC87F0808A	8-bit	3.3 - 5.5	8	256 x 9	10-channel (10-bit)	3-phase PWM, OP-AMP, comparator	QFP-36
LC87F2J32A	8-bit	1.8 - 5.5	32	1024 x 9	14-channel	PWM (12-bit x 2-channel), RTC, POR, LVD	QIP-48E, SQFP-48
LC87F2W48A	8-bit	2.7 - 5.5	50	1536 x 9	14-channel	PWM (12-bit x 2-channel), Remote control receiver	SQFP-48
LC87FC096A	8-bit	2.5 - 3.6	96	4096 x 9	11-channel	PWM (12-bit x 4-channel), SMIIC	QIP-64E
LC87F5M64A	8-bit	2.2 - 5.5	64	2048 x 9	11-channel (8-bit)	PWM (12-bit x 2-channel), Remote control receiver	QIP-64E
LC87F5R96B	8-bit	2.5 - 5.5	96	4096 x 9	11-channel (8-bit)	PWM (12-bit x 2-channel), Remote control receiver	QIP-64E
LC87F2C64A	8-bit	2.4 - 5.5	64	2048 x 9	16-channel	PWM (12-bit x 4-channel), RTC, POR, LVD	QFP-80
LC87F5WC8A	8-bit	2.2 - 5.5	128	4096 x 9	15-channel	PWM (12-bit x 4-channel)	QIP-100E
LC87F5VP6A	8-bit	2.5 - 5.5	256	10K x 9	15-channel (8-bit)	PWM (12-bit x 4-channel)	QIP-100E, TQFP-100
LC87F1M16A	8-bit	2.7 - 5.5	16	1024 x 9	20-channel	PWM; USB 2.0 controller interface; 1 x UART	SQFP-48
LC87F1A32A	8-bit	2.7 - 5.5	32	2048 x 9	12-channel	PWM; USB 2.0 controller interface; Remote control receiver	SQFP-48
LC88F58B0A	16-bit	2.2 - 5.5	128	6144 x 8	11-channel	PWM; 3 x SIO; 2 x UART	SQFP-64
LC88F52H0A	16-bit	2.5 - 5.5	512	24K x 8	16-channel	PWM, DAC, SMIIC x2, SLIIC x1, RTC, Remote control receiver	TQFP-100
LC87F7932B	8-bit	2.4 - 3.6	32	2048 x 9	7-channel	32-segment LCD controller for 4.5 V panel, RTC	QIP-64E, SQFP-64, DIE

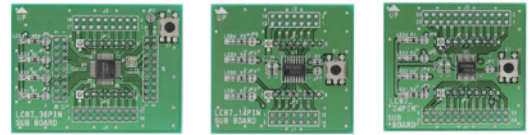# Development Tools for Microcontrollers
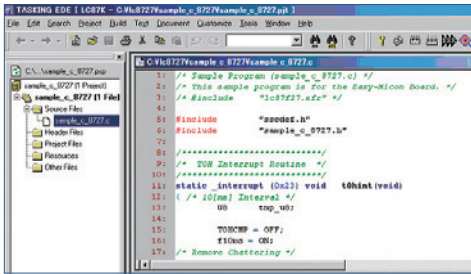
Starter Kit

Environment-Installer CD-R

Main Board EMM02

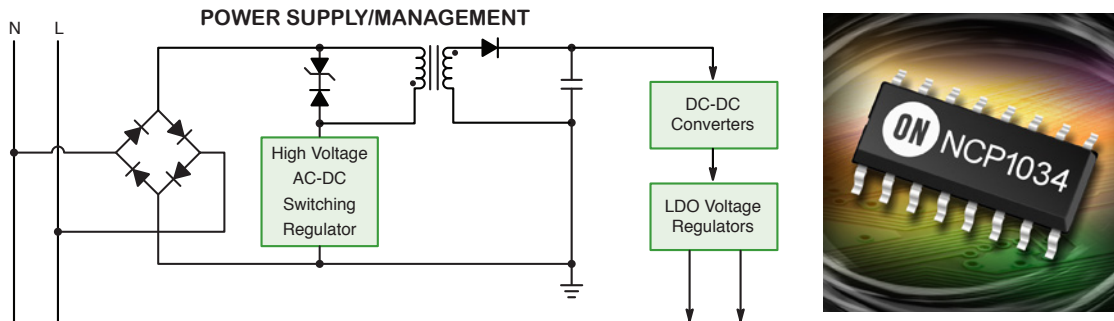**Sub-Board with Microcontroller**

Support Tools

C-Compiler/Assembler

On-Chip Debugger

Flash ROM Writer

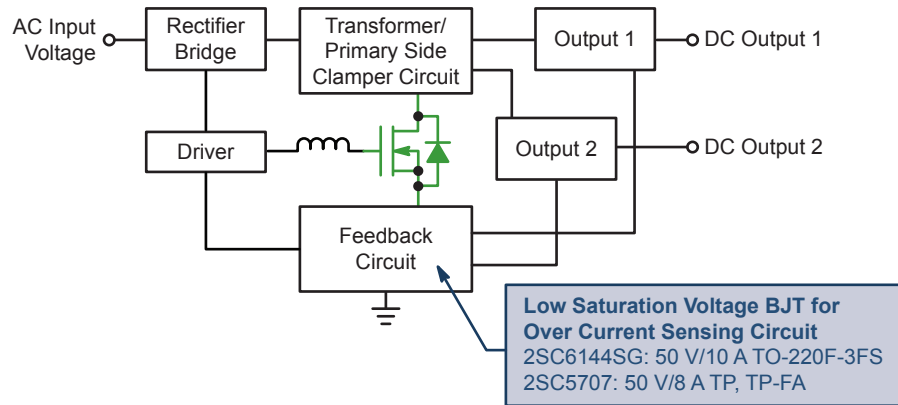**On-Board Writer**

Power Supply/Management, Voltage Regulation

POWER SUPPLY/MANAGEMENT

	Device	Function	Features	Package
AC-DC	NCP1010~15 NCP1070~77	Self-Supply High Voltage Monolithic Switching Regulator for Low Power Offline Power Supplies	• Dynamic self-supply, no need of an auxiliary winding • Current-mode fixed frequency (options of 65 kHz, 100 kHz, 130 kHz)	PDIP-7, SOT-223
	NCP1027~28 NCP1124/26/29* NCP1136*	High Voltage Monolithic Switching Regulator for Medium Power Offline Power Supplies	• 700 V, 5.8 Ω FET current-mode fixed frequency (65 kHz, 100 kHz) • 650 V, 9/6/2 Ω rugged FET current-mode fixed frequency (65 kHz, 100 kHz) • 800 V, 3.8 Ω rugged FET current-mode fixed frequency (65 kHz, 100 kHz)	PDIP-7
	NCP1050~5	High Voltage Gated Oscillator Monolithic Switching Regulator	• Oscillator frequency (options of 44 kHz, 100 kHz, 136 kHz) dithering with controlled slew rate driver for reduced EMI • Startup circuit eliminates the need for transformer auxiliary bias winding	PDIP-7, SOT-223
DC-DC	NCP3170	3 A Switching Regulator	• Output voltage adjustable to 0.8 V • 500 kHz or 1 MHz switching frequency	SOIC-8
	NCP3063/4	1.5 A Switching Regulator or utilize as controller for up to 5 A	• Capable of 40 V input • Up to 250 kHz switching frequency	SOIC-8
	LM2594/5/6	0.5 A/1.0 A/3 A Switching Regulators	• Capable of 40 V input • Fixed 150 kHz switching frequency	TO-220, DPAK, SOIC-8, PDIP-8
	NCP3020/11	PWM Controller	• 4.7-28 V input voltage range • EN/PG/SYNC features • Fixed 300/400/600 kHz switching frequency	SOIC-8, TSSOP-14
	NCP1034	PWM Controller	• Capable of up to 100 V input • Adjustable switching frequency (50-500 kHz)	SOIC-16
LDO	NCP5500	500 mA LDO Linear Voltage Regulator	• Low dropout voltage of 230 mV @ 500 mA	SOIC-8, DPAK-4
	NCP705	500 mA LDO Linear Voltage Regulator	• High PSRR • Very low droput • Ultra-low quiescent current and noise	WDFN-6
	NCP702	200 mA LDO Linear Voltage Regulator	• High PSRR • Very low droput • Ultra-low quiescent current and noise	SOT-23-5, XDFN-6
	NCP752	200 mA LDO Linear Voltage Regulator	• Low droput • Power good	SOT-23-5, XDFN-6
	NCP4640/1	50/150 mA Linear Voltage Regulator	• 4 to 36 V input voltage, 50 V tolerant	SOT-89-5
	LP2951	100 mA LDO Linear Voltage Regulator	• Logic level shutdown input • Fixed or adjustable output (output programmable from 1.25 V to 29 V) • Error flag output signals an out of regulation condition	SO-8, Micro8™
	NCP562	80 mA LDO Linear Voltage Regulator	• Ultra low Iq of 2.5 μA typical	SC-82AB
	NCP716	80 mA LDO Linear Voltage Regulator	• Ultra low Iq of 4.7 μA typical	XDFN-6
	NCP715	50 mA LDO Linear Voltage Regulator	• Ultra low Iq of 4.7 μA typical	XDFN-6, SC-70-5

* Pending 2Q14.

Power MOSFETs for Circuit Breakers and Metering Power Supplies

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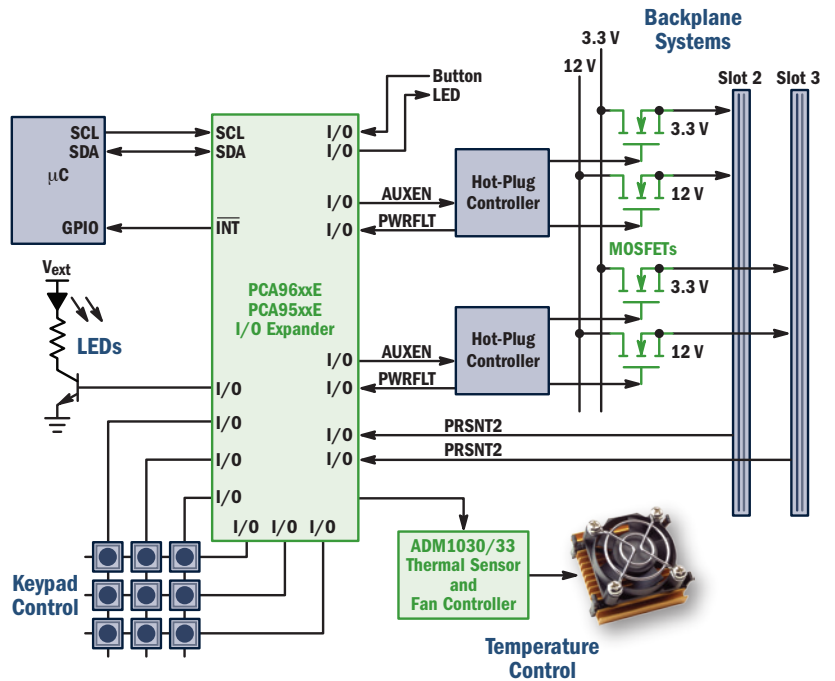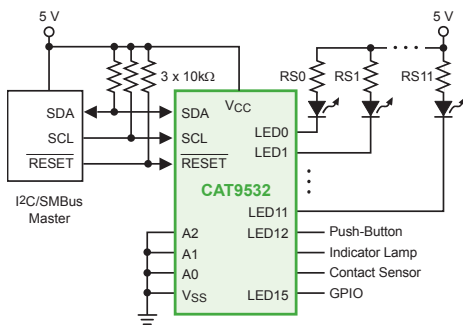- Low power dissipation
- Avalanche ruggedness
- High-speed switching

Low Saturation Voltage BJT for Over Current Sensing Circuit
2SC6144SG: 50 V/10 A TO-220F-3FS
2SC5707: 50 V/8 A TP, TP-FA

Power Source Voltage	Device	V$_{DDS}$ (V)	I$_D$ (A)	R$_{DS(ON)}$ (Ω) @ 10 V Typ	Max	C$_{iss}$ (pF)	Q$_g$ (nC)	G-S Protection Diode	Package
≤AC 120 V	FW276	450	0.7	8.6	11.2	55	3.5	Built in	SOIC-8
	SFT1423	500	2	3.8	4.9	175	8.7	Built in	DPAK
	2SK4196LS	500	5.5	1.2	1.56	360	14.6	–	TO-220F
	2SK4096LS	500	8	0.65	0.85	600	24	–	TO-220F
	BFL4036	500	14	0.4	0.52	1000	38.4	Built in	TO-220F
	BFL4037	500	16	0.33	0.43	1200	48.6	Built in	TO-220F
	2SK4085LS	500	16	0.33	0.43	1200	46.6	–	TO-220F
	2SK4124	500	20	0.33	0.43	1200	–	–	TO-3P
≤AC 240 V	SFT1440	600	1.5	6.2	8.1	130	6.3	Built in	DPAK
	SFT1458	600	1	10	13	73	4.7	Built in	DPAK
	2SK4197FS	600	3.5	2.5	3.25	260	11	–	TO-220F
	2SK4198FS	600	5	1.8	2.34	360	14.3	–	TO-220F
	2SK4099LS	600	8.5	0.72	0.94	750	29	–	TO-220F
	2SK4087LS	600	14	0.47	0.61	1200	46	–	TO-220F
	2SK4125	600	17	0.47	0.61	1200	–	–	TO-3P
	2SK4088LS	650	11	0.65	0.85	1000	37.6	–	TO-220F
	BFL4004	800	6.5	1.9	2.5	710	36	–	TO-220F
	BFL4026	900	5	2.8	3.6	650	33	–	TO-220F
	BFL4001	900	6.5	2.1	2.7	850	44	–	TO-220F
AC 380 V to 480 V	2SK3745LS	1500	2	10	13	380	37.5	Built in	TO-220F
	2SK4177	1500	2	10	13	380	–	Built in	TO-263 (D2PAK)
	2SK3746	1500	2	10	13	380	–	Built in	TO-3P
	2SK3747	1500	2	10	13	380	–	Built in	TO-3PF
	2SK3748	1500	4	5	7	790	80	Built in	TO-3PF
	NDFPD1N150C	1500	0.1	100	150	80	4.2	–	TO-220F
	NDFP03N150C	1500	2.5	8	10.5	650	34	–	TO-220F
	NDTL03N150C	1500	2.5	8	10.5	650	34	–	TO-3P
	NDUL03N150C	1500	2.5	8	10.5	650	34	–	TO-3PF
	NDUL09N150C*	1500	9	2.2	3	2400	130	–	TO-3PF
AC 590 V to 690 V	WPH4003	1700	3	8.2	10.5	850	48	–	TO-3PF

* Pending 2Q14.

Cascadable I/O Expanders

Features

- I2C and SMBus interfaces
- 1 MHz SCL clock frequency
- 30 mA SDA sink capability

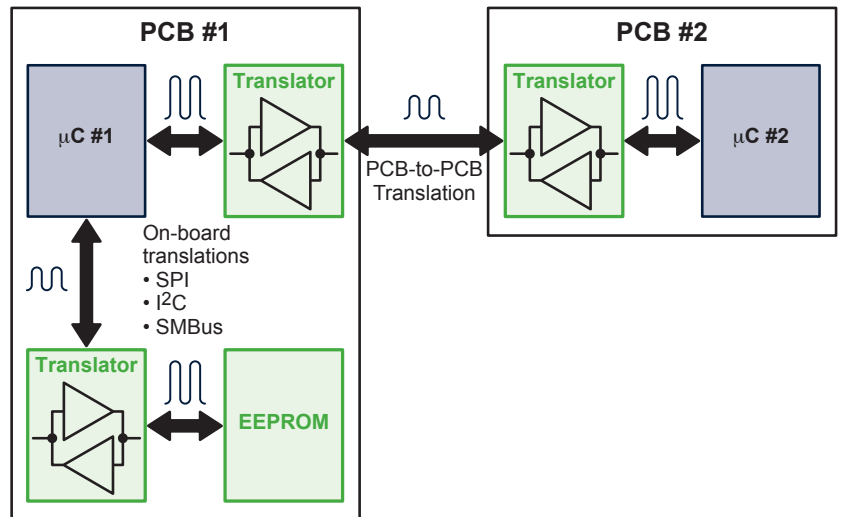| Device	I/O	Cascadable	V_{CC} Min (V)	V_{CC} Max (V)	Interrupt Output	I/O Pullups	LED Blink/ PWM	Package
PCA9535E	16	64 Programmable Slave Addresses	1.65	5.5	✔			QFN-24, SOIC-24, TSSOP-24
PCA9655E	16	64 Programmable Slave Addresses	1.65	5.5	✔			QFN-24, SOIC-24, TSSOP-24
CAT9532	16	8 Slave ID Addresses	2.3	5.5			✔	SOIC-24W, TQFN-24, TSSOP-24
CAT9552	16	8 Slave ID Addresses	2.3	5.5			✔	SOIC-24W, TQFN-24, TSSOP-24
CAT9557	8	8 Slave ID Addresses	2.3	5.5			✔	SOIC-16, TQFN-16, TSSOP-16
CAT9534	8	8 Slave ID Addresses	2.3	5.5	✔			SOIC-16, TQFN-16, TSSOP-16
PCA9654E*	8	8 Slave ID Addresses	1.65	5.5	✔	✔		SOIC-16, WQFN-16, TSSOP-16
CAT9554A	8	8 Slave ID Addresses	2.3	5.5	✔	✔		SOIC-16, TQFN-16, TSSOP-16

* Pending 2Q14.

Logic Translators

Dual supply voltage logic translators connect ICs and PCBs together that operate at different supply voltages.

Features

- Industry's first devices with independent power supplies ($V_L < V_{CC}$, $V_L = V_{CC}$, or $V_L > V_{CC}$)
- High 100 pF capacitive drive capability
- Overvoltage tolerant enable and I/O pins
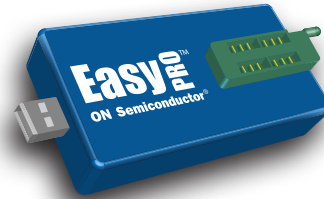- Non-preferential power-up sequencing
- Power-off protection

	Unidirectional Translator	Autosense Bidirectional Translator (Push-Pull Output)	Autosense Bidirectional Translator (Open-Drain Output)	Bidirectional Translator (with Direction Pin)
Block Diagram				
Attributes	• High Data Rate • Low Power Consumption	• High Data Rate • Low Power Consumption	• High Data Rate • Low Power Consumption • Flexible PCB Design	• High Data Rate • Low Power Consumption • Flexible PCB Design
Trade-Offs	• Fixed Input & Output Pins	• Modest Output Current	• Modest Bandwidth	• Directional Control Pin Required
Applications	• SPI • GPIO	• SPI • GPIO	• I^2C, SMBus, PMBus • GPIO • SDIO Cards • 1-Wire Bus	• GPIO
Sample Device (I/O Channels, Package)	• NLSV1T34 (1-Bit, ULLGA-6) • NLSV1T240/244 (1-Bit, UDFN-6) • NLSV2T240/244 (2-Bit, UDFN-8) • NLSV4T240/244 (4-Bit, UDFN-12) • NLSV4T3234 (4-Bit, CSP-11) • NLSV8T240/244 (8-Bit, UDFN-20)	• NLSX3012 (2-Bit, UDFN-8) • NLSX3014 (4-Bit, UQFN-12) • NLSX3013 (8-Bit, CSP-20) • NLSX3018 (8-Bit, UDFN-20) • NLSX4014 (4-Bit, UQFN-12) • NLSX5011 (1-Bit, UULGA-6, UDFN-6) • NLSX5012 (2-Bit, UDFN-8) • NLSX5014 (4-Bit, UDFN-12)	• NLSX3373 (2-Bit, UDFN-8) • NLSX3378 (4-Bit, CSP-12) • NLSX4373 (2-Bit, UDFN-8) • NLSX4378 (4-Bit, CSP-12)	• NLSV1T45 (1-Bit, ULLGA-6) • NLSV2T245 (2-Bit, UQFN-10) • NLSV2T3236 (2-Bit, UQFN-10) • NLA16T245 (16-Bit, TSSOP-48)

Serial EEPROMs

Features

- Broad density range: 1 kb to 2 Mb
- Wide operating Vcc range: 1.8/1.7 V to 5.5 V
- High endurance: 1 million program/erase cycles
- Wide temperature range: industrial and extended

EasyPRO™ is a user-friendly, portable programming tool for ON Semiconductor serial EEPROMs (I^2C, SPI, Microwire)

EEPROMs

Data Transmission Standard	Device	Density	Organization*	V_{CC} Min (V)	V_{CC} Max (V)	f_{CLK} Max (MHz)	Package(s)
I^2C	CAT24M01	1 Mb	128k x 8	1.8	5.5	1	SOIC-8, TSSOP-8, UDFN-8
	CAT24C512	512 kb	64k x 8	1.8	5.5	1	SOIC-8, TSSOP-8, UDFN-8
	CAT24C256	256 kb	32k x 8	1.8	5.5	1	SOIC-8, TSSOP-8, UDFN-8
	CAT24C128	128 kb	16k x 8	1.8	5.5	1	SOIC-8, TSSOP-8, UDFN-8
	CAT24C64	64 kb	8k x 8	1.7	5.5	1	SOIC-8, TSSOP-8, UDFN-8
	CAT24C32	32 kb	4k x 8	1.7	5.5	1	SOIC-8, TSSOP-8, UDFN-8; WLCSP-5
	CAT24C16	16 kb	2k x 8	1.7	5.5	0.4	SOIC-8, TSSOP-8, UDFN-8, TSOT23-5, WLCSP-4, WLCSP-5
	CAT24C08	8 kb	1k x 8	1.7	5.5	0.4	SOIC-8, TSSOP-8, UDFN-8, TSOT23-5, WLCSP-4, WLCSP-5
	CAT24C04	4 kb	512 x 8	1.7	5.5	0.4	SOIC-8, TSSOP-8, UDFN-8, TSOT23-5, WLCSP-4, WLCSP-5
	CAT24C02	2 kb	256 x 8	1.7	5.5	0.4	SOIC-8, TSSOP-8, UDFN-8, TSOT23-5, WLCSP-4, WLCSP-5
SPI	CAT25M02	2 Mb	256k x 8	1.7	5.5	10	SOIC-8
	CAT25M01	1 Mb	128k x 8	1.8	5.5	10	SOIC-8, TSSOP-8
	CAT25512	512 kb	64k x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25256	256 kb	32k x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25128	128 kb	16k x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25640	64 kb	8k x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25320	32 kb	4k x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25160	16 kb	2k x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25080	8 kb	1k x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25040	4 kb	512 x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25020	2 kb	256 x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
	CAT25010	1 kb	128 x 8	1.8	5.5	20	SOIC-8, TSSOP-8, UDFN-8
Microwire	CAT93C86	16 kb	2k x 8 / 1k x 16	1.8	5.5	3	SOIC-8
	CAT93C86B	16 kb	2k x 8 / 1k x 16	1.8 / 1.65	5.5	4	SOIC-8, TSSOP-8, UDFN-8
	CAT93C76	8 kb	1k x 8 / 512 x 16	1.8	5.5	3	SOIC-8, TSSOP-8
	CAT93C76B	8 kb	1k x 8 / 512 x 16	1.8 / 1.65	5.5	4	SOIC-8, TSSOP-8, UDFN-8
	CAT93C66	4 kb	512 x 8 / 256 x 16	1.8	5.5	2	SOIC-8, TSSOP-8
	CAT93C56	2 kb	256 x 8 / 128 x 16	1.8	5.5	2	SOIC-8, TSSOP-8
	CAT93C46	1 kb	128 x 8 / 64 x 16	1.8	5.5	2	SOIC-8, TSSOP-8
	CAT93C46B	1 kb	128 x 8 / 64 x 16	1.8 / 1.65	5.5	4	SOIC-8, TSSOP-8, UDFN-8

* Organization for Microwire devices is selectable.

Protection

Device	Function	Features	Package
ESD1014	Low Capacitance Transient Voltage Suppressor	• I_{pp} = 30 A (8/20 μs) • Capacitance = 1.5 pF	UDFN-10
P6SMB Family	Zener Transient Voltage Suppressors	• Unidirectional and Bidirectional Protection • Surge Peak Power Rating TVS: 600 W	SMB
1SMB Family	Zener Transient Voltage Suppressors	• Unidirectional and Bidirectional Protection • Surge Peak Power Rating TVS: 600 W	SMB

ESD5Z Family	Transient Voltage Suppressors for ESD Protection	• IEC61000-4-2 Level 4 ESD Protection:
		  ◆ Contact: ± 30 kV
		  ◆ Air: ± 30 kV
			SOD-523

ESD9X Family	Transient Voltage Suppressors for ESD Protection	• IEC61000-4-2 Level 4 ESD Protection:
		  ◆ Contact: ± 30 kV
		  ◆ Air: ± 30 kV
			SOD-923

NP0080 NP0120	Thyristor Surge Protection Devices	• I_{pp} = 50 A (8/20 μs) • Bidirectional Protection	TSOP-5

Surge Protection

ON Semiconductor provides solutions for protecting against surge strikes, induced by a lighting strike or power-cross fault. Common interfaces found in a wide variety of consumer and telecommunications/networking equipment are the RJ45 interface for the 10/100BASE-T and 1000BASE-T Ethernet protocols and the RJ11 interface for xDSL protocols. RJ45 consists of four pairs of differential data lines, each carrying a maximum data rate of 250 Mbps in a 1000BASE-T configuration, while RJ11 consists of a single differential data pair. These interfaces are often surge rated to an intra-building standard. Protection for these interfaces mainly consist of ensuring that transverse (metallic or differential) surge strikes do not damage sensitive downstream chips such as PHYs. Differential protection is achieved by connecting shunt protection elements from line-to-line (for each pair of lines) that transfer the incoming hostile surge energy back towards the source. This is different from common mode protection as elements are connected line-to-GND and shunt the surge energy to GND.

For lower data-rates (10/100BASE-T, xDSL), ON Semiconductor offers a combination of crowbar devices known as thyristor surge protector devices (TSPD), and transient voltage suppressor (TVS) devices similar to those used in ESD protection. TSPDs offer the advantage of lower clamping voltages and possess higher surge current capability, for both common and differential mode protection.
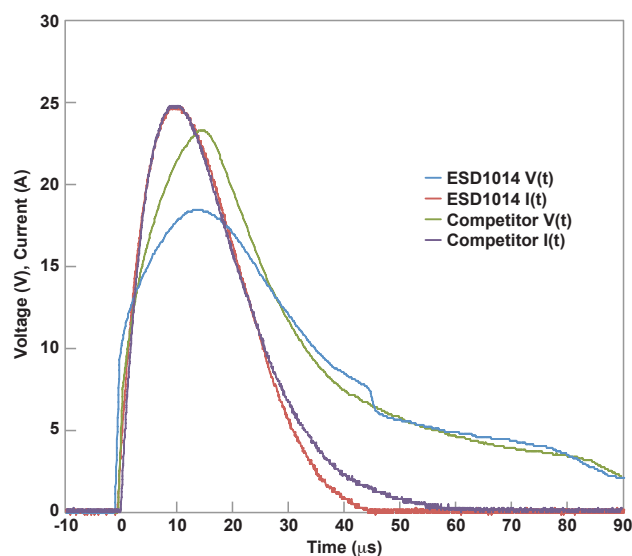

Figure 1. Example of V & I plots in an 8/20 μs surge

TVS clamping devices support surge levels for the 8/20 μs pulse and are commonly used on the tertiary or PHY-side to capture and safely dissipate any residual surge pulses. Pictured in Figure 1 is a time-domain plot of the 8/20 μs surge current applied to the ESD1014 TVS from ON Semiconductor. Also shown are time-domain response voltages, clearly showing the superiority of the ON Semiconductor solution in comparison to a competing device.

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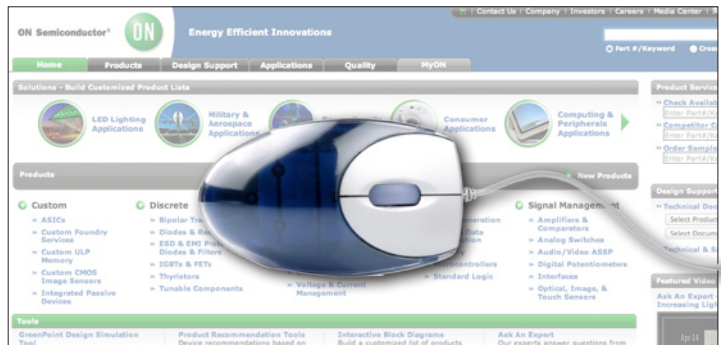|		
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