BRD8077/D
Rev. 2, Aug-2013

ON Semiconductor

Energy Efficient Innovations

Networking & Telecom Solutions

Power management, protection, and timing solutions for communications infrastructure from ON Semiconductor.

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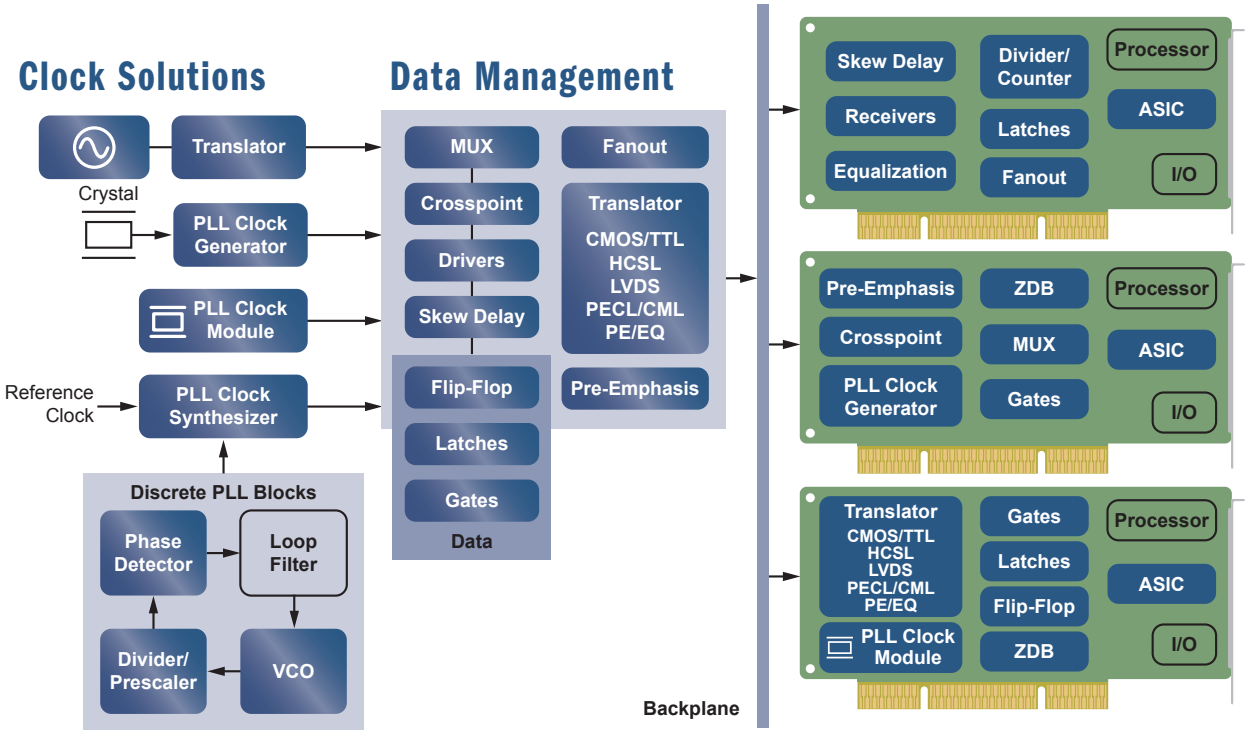
Timing and Data Distribution Subsystem



ON Semiconductor provides a complete portfolio of timing and data management solutions for all aspects of the clock tree. System designers can optimize their clock circuits with industry leading clock distribution devices, demonstrating the industry's lowest jitter and skew. A broad product portfolio, with multiple output and interface options, allows system designers to build clock circuits that satisfy their specific application requirements. ON Semiconductor utilizes CMOS, Bipolar, and SiGe technology to leverage the best performance for any given application. For further details by device, function, or parametrics, refer to our website at **www.onsemi.com**.

Expanding on more than 30 years of experience as the world's leader in high performance ECL-based clock distribution, ON Semiconductor has extended its expertise into ultra low jitter PLL clock synthesis and generation. The new PureEdge™ PLL devices utilize a fully differential architecture that enables performance that satisfies the timing requirements for the most demanding applications.

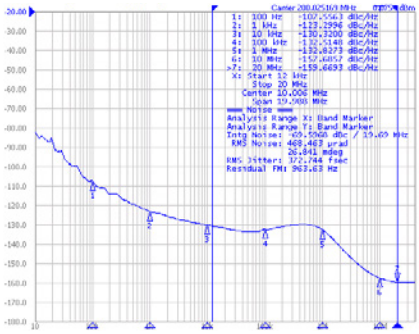
Performance Capabilities

- Differential design for reduced noise
- ECL, PECL, CML, LVDS, HSTL, HCSL, LVTTL/LVCMOS outputs for flexible interfacing
- Maximum clock rates >10 GHz
- Maximum data rates >12 Gbps
- Typical jitter as low as 30 fs
- Integrated termination resistors for simplified circuit design
- Edge rates as low as 28 ps
- Low phase noise floor ≤ –174 dBc/Hz
- Low skew

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, LVTTL/LVCMOS
- Multiple PLLs and multiple output options



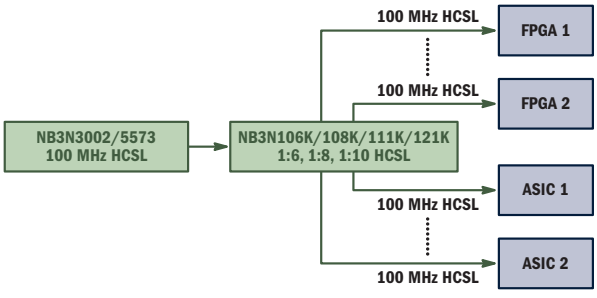
NB3N5573 Typical Phase Noise at Fc = 200 MHz

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	✓		✓		✓	HCSL	3.3	TSSOP-16
NB3N5573	25	25/100/125/200	CPU/DIMM, PCIe Gen 1,2,3	✓		✓		✓	HCSL	3.3	TSSOP-16
NB3N3020	5 to 27	5 to 210	Network GigE	✓	✓	✓	✓		ECL, LVTTL	3.3	TSSOP-16
NB3N501	2 to 50	13 to 160	Networking, Consumer, STB	✓					CMOS	3.3, 5	SOIC-8
NB3N502	2 to 50	14 to 120	Networking, Consumer, STB	✓		✓			LVCMOS	3.3, 5	SOIC-8
NB4N507A	5 to 52	50 to 200	Networking, Consumer, STB	✓		✓			ECL	3.3, 5	SOIC-16
NB3N508S	27	216	VCXO Set Top Box	✓		✓			LVDS	3.3	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	✓		✓			HCSL	3.3	TSSOP-20
NB3N51044*	25	100/125	CPU/DIMM, PCIe Gen 1,2,3	✓		✓			HCSL	3.3	TSSOP-28
NB3N51054*	25	100	CPU/DIMM, PCIe Gen 1,2,3	✓					HCSL	3.3	TSSOP-24

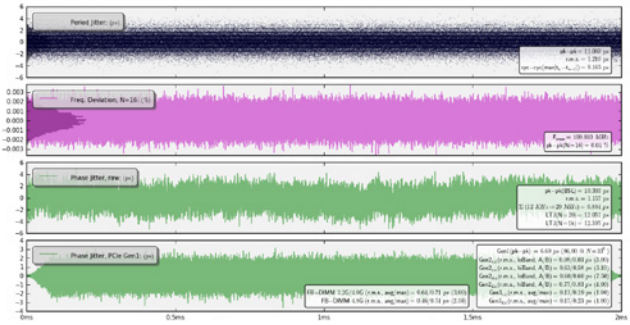
* Pending 2H13.

PCIe Timing Solutions

- PCIe clock synthesizers with single, dual, and quad outputs
- PCIe buffers with 1:6, 1:8, 1:10, and 1:21 fanouts
- Solutions for one, two, six, eight, ten, and twenty-one channel applications available
- Ultra low skew
- Small propagation delay variation (up to 21 output)
- Jitter compliant with PCIe Gen 1,2, 3 specification
- Direct device interface eliminates external termination components and simplifies BOM



PCIe Gen 1, 2, 3 Clock Generation and Distribution



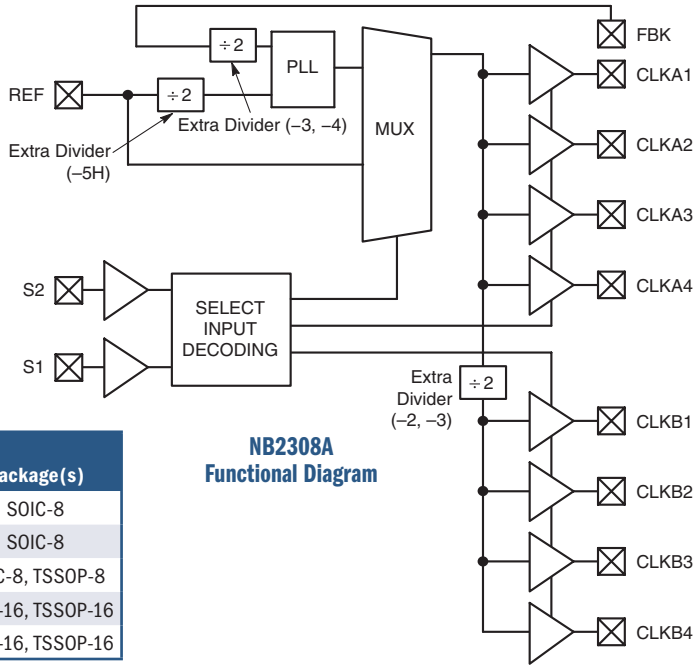
Jitter Results After Fanout

Zero Delay Buffers

Features

- Industry standard functions and pin-outs
- Zero input-output propagation delay, adjustable by capacitive load
- Multiple configurations available for maximum flexibility
- Operating frequency to 133 MHz for CPU and PCI compatibility

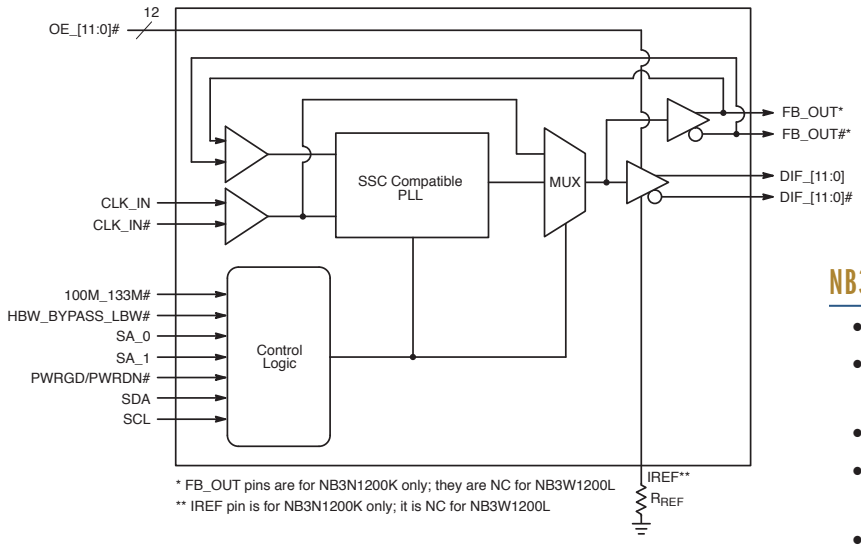
Device	Input Level	Output Level	VCC Typ (V)	fMax Typ (MHz)	Channels	tSkew 0-0 Max (ps)	Package(s)
NB3N2302	CMOS	CMOS	3.3, 5	133	2	250	SOIC-8
NB2304A	CMOS	CMOS	3.3	133.3	4	200	SOIC-8
NB2305A	CMOS	CMOS	3.3	133.3	5	250	SOIC-8, TSSOP-8
NB2308A	CMOS	CMOS	3.3	133.3	8	200	SOIC-16, TSSOP-16
NB2309A	CMOS	CMOS	3.3	133.3	9	250	SOIC-16, TSSOP-16



NB2308A Functional Diagram

PCIe Zero Delay Buffers

12 HCSL/NMOS Push Pull Outputs



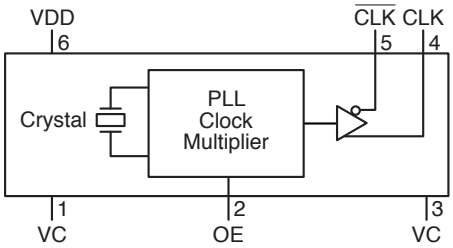
Simplified Block Diagram

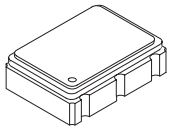
NB3N1200K* & NB3W1200L* Features

- DIF SRC clock support
- Optimized for 100/133 MHz to meet PCIe Gen 2/3 and Intel QPI phase jitter specifications
- Spread spectrum compatible for low EMI
- Pseudo-external fixed-feedback for <100 ps input-to-output delay variation
- Individual OE control pin for each of 12 outputs
- 50 ps output-to-output skew
- 50 ps cycle-to-cycle jitter (PLL mode)
- QFN-64 package

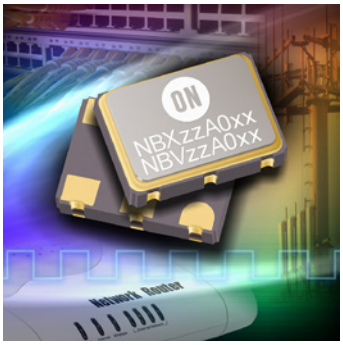
* Pending 2H13.

PureEdge™ Clock Oscillator Modules



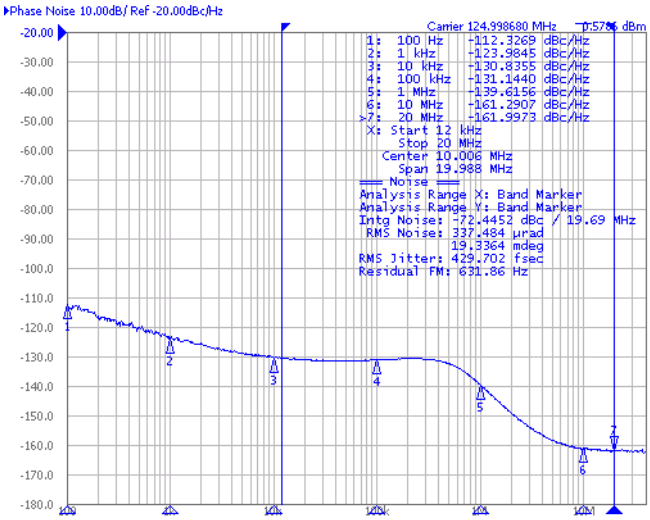


6 PIN CLCC



Features

- Broad portfolio of Crystal Oscillators XO and Voltage-Controlled Crystal Oscillators (VCXO)
- Fully integrated crystal reference and PLL synthesizer in the ceramic module
- Industry standard 5 mm x 7 mm x 1.9 mm ceramic module
- Footprint compatible replacement to 3rd overtone, and SAW based XO/VCXO modules
- XOs offer up to two user selectable frequencies
- Lower cost and shorter lead time
- LVPECL, LVDS and CML outputs
- Output Enable (OE) available
- Total frequency stability of ± 20 PPM or ± 50 PPM
- Industrial temperature range -40°C to +85°C
- Low phase noise floor ≤ -160 dBc/Hz
- Integrated phase RMS jitter (12 kHz – 20 MHz) 0.5 ps (Typ)
- Spurious noise less than -70 dBc
- VCXOs have positive tuning slope
- VCXOs have 10% linearity for specified tuning range
- VCXOs have ±100 PPM pulling range guaranteed
- All standard frequencies available (50 MHz to 700 MHz)
  - NBXzzA0xx –XO with total frequency stability of ±50 PPM
  - NBXzzB0xxx – XO with total frequency stability of ±20 PPM
  - NBVSBA0xx – VCXO with LVPECL output
  - NBVSPA0xx – VCXO with LVDS output



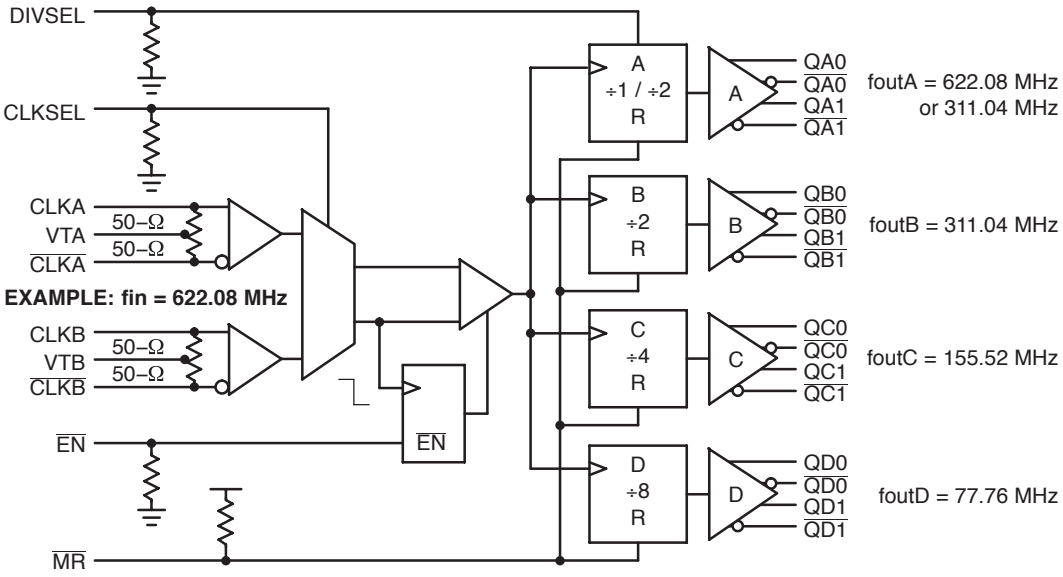
Typical Phase Noise/Jitter Plot @ 125 MHz

Dividers and Counters

Features

- Low jitter and skew for highly accurate phase matching
- Multiple outputs and ratios combined for integrated circuit designs
- Supports interface and voltage translation

Device	Input Level				Output Level	VCC Typ (V)	fMax Typ (GHz)	Div Ratios	Package(s)
	CML	CMOS	LVPECL	LVDS					
NB4L339	✓		✓	✓	ECL	2.5, 3.3	0.7	1 or 2; 2; 4; 8	QFN-32
NB7V32M	✓		✓	✓	CML	1.8, 2.5	10	2	QFN-16
NB7N017M	✓		✓	✓	CML	3.3	3.5	2 to 256	QFN-16
NB7L32M	✓		✓	✓	CML	2.5, 3.3	14	2	QFN-16
NB6N239S	✓	✓	✓	✓	LVDS	3.3	3	1/2/4/8; 2/4/8/16	QFN-16
NB6L239	✓	✓	✓	✓	ECL	2.5, 3.3	3	1/2/4/8; 2/4/8/16	QFN-16

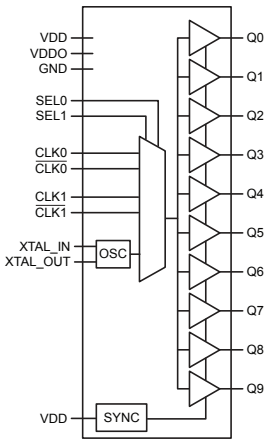


NB4L339 Functional Diagram

Clock and Data Distribution

Features

- Complete portfolio of fanout buffers, multiplexers, cross point switches
- Supporting frequencies from DC to 12 GHz/Gbps
- Device noise floor as low as -174 dBc
- Pre-Emphasis and Equalization blocks available
- Offer new direct X-tal interface capabilities
- Industry leading jitter as low as 200 fs typical
- Industry leading skew as low as 5 ps minimum
- Wide offering of voltage and interface translation:
  - ECL, PECL, CML, LVPECL, LVDS, M-LVDS, HSTL, HCSL, LVCMOS/LVTTL
- Power supply 1.5 V, 1.8 V, 2.5 V, 3.3 V, 5.0 V



NB3F8L3010C
Functional Diagram

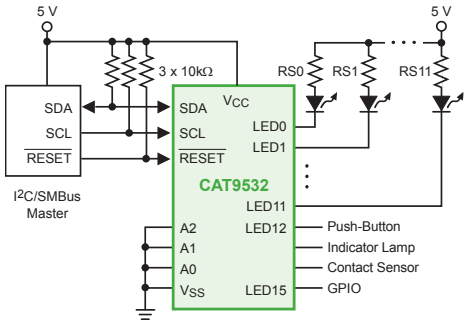
Device	Outputs per Channel	Output Level	Input Level								V_{CC} Typ (V)	t_{Skew} 0-0 (ps)	f_{Max} Typ (GHz)	Package(s)
			CML	CMOS	LVPECL	HCSL	HSTL	LVDS	XTAL	TTL				
NB3N121K	21	HCSL		✓	✓	✓	✓	✓		✓	3.3	100	0.4	QFN-52
NB4N121K	21	HCSL	✓	✓	✓			✓		✓	3.3	50	0.2	QFN-52
NB3L83948C	12	CMOS		✓		✓	✓	✓		✓	2.5, 3.3	25	0.35	LQFP-32
NB3V8312*	12	CMOS		✓						✓	1.8, 2.5, 3.3	150	0.25	LQFP-32
NB3F8L3010C	10	CMOS		✓	✓	✓	✓	✓	✓	✓	1.5, 1.8, 2.5, 3.3	55	0.2	QFN-32
NB3N111K	10	HCSL		✓	✓	✓	✓	✓		✓	3.3	100	0.4	QFN-32
NB4N111K	10	HCSL	✓		✓			✓			3.3	100	0.4	QFN-32
NB7L111M	10	CML	✓	✓	✓			✓		✓	2.5, 3.3	20	5.5	QFN-52
NB3N108K	8	HCSL		✓	✓	✓	✓	✓		✓	3.3	100	0.4	QFN-32
NB7L1008M	8	CML	✓		✓			✓			2.5, 3.3	25	8	QFN-32
NB3N106K	6	HCSL		✓	✓	✓	✓	✓		✓	3.3	100	0.4	QFN-24
NB3N83905C	6	CMOS		✓					✓		1.8, 2.5, 3.3	80	0.1	SOIC-16, TSSOP-16, QFN-20
NB7VQ1006M	6	CML	✓		✓			✓			1.8, 2.5	1	7.5	QFN-24
NB7V585M	6	CML	✓		✓			✓			1.8, 2.5	30	7	QFN-32
NB7V586M	6	CML	✓		✓			✓			1.8	30	6	QFN-32
NBSG14	5	ECL	✓	✓	✓			✓		✓	2.5, 3.3	15	12	QFN-16, BGA-16
NB2304NZ	5	CMOS	✓								3.3	100	0.14	TSSOP-8
NB3L853141*	5	ECL	✓	✓	✓	✓	✓	✓		✓	2.5,3.3	30	700	TSSOP-20
NB3L553	4	CMOS		✓							2.5, 3.3, 5	160	0.2	DFN-8, SOIC-8
NB3N551	4	CMOS		✓							3.3 5	160	0.18	DFN-8, SOIC-8
NB3N853501	4	ECL		✓							3.3	30	0.266	TSSOP-20
NB3N853531E	4	ECL		✓					✓	✓	3.3	30	0.266	TSSOP-20
NB6HQ14M	4	CML	✓	✓	✓			✓		✓	2.5	3	5	QFN-16
NB6L14	4	ECL	✓	✓	✓			✓		✓	2.5, 3.3	20	3	QFN-16
NB6L14M	4	CML	✓	✓	✓			✓		✓	2.5, 3.3	20	3	QFN-16
NB6L14S	4	LVDS	✓	✓	✓		✓	✓		✓	2.5	20	2	QFN-16
NB6N14S	4	LVDS	✓	✓	✓		✓	✓		✓	3.3	20	2	QFN-16
NB7HQ14M	4	CML	✓		✓			✓			2.5	15	7	QFN-16
NB7L14	4	ECL	✓	✓	✓			✓		✓	2.5, 3.3	15	7	QFN-16
NB7L14M	4	CML	✓	✓	✓			✓		✓	2.5, 3.3	15	8	QFN-16
NBSG11	2	ECL	✓	✓	✓			✓		✓	2.5, 3.3	15	12	QFN-16, BGA-16
NB4L339	2	ECL	✓		✓			✓			2.5, 3.3	60	0.7	QFN-32
NB4N11M	2	CML	✓	✓	✓			✓		✓	3.3	25	2.5	TSSOP-8
NB6L11	2	ECL	✓	✓	✓			✓		✓	2.5, 3.3	15	6	TSSOP-8, SOIC-8
NB6L11M	2	CML	✓	✓	✓			✓		✓	2.5, 3.3	15	2	QFN-16
NB6L11S	2	LVDS	✓	✓	✓		✓	✓		✓	3.3	25	2	QFN-16
NB6L611	2	ECL	✓	✓	✓			✓		✓	2.5, 3.3	15	3	QFN-16
NB7L11M	2	CML	✓	✓	✓			✓		✓	2.5, 3.3	15	8	QFN-16
NB7L572	2	CML	✓	✓	✓			✓		✓	2.5, 3.3	15	7	QFN-32
NB7L72M	2	CML	✓	✓	✓			✓		✓	2.5, 3.3	10	8.5	QFN-16
NB7VQ572M	2	CML	✓		✓			✓			1.8, 2.5	15	5	QFN-32
NB6L56	1	ECL	✓		✓		✓	✓			2.5, 3.3	25	2.5	QFN-32

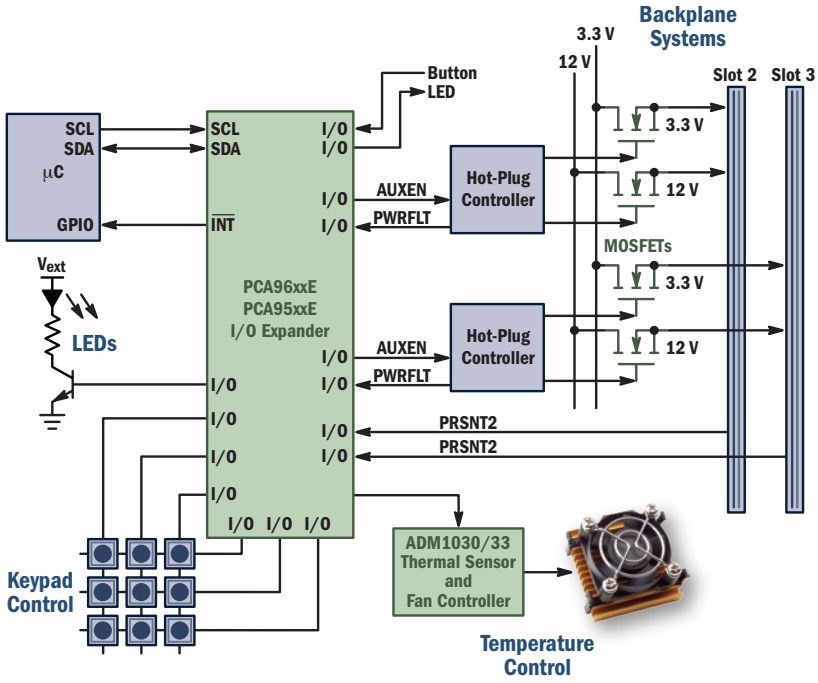
* Pending 2H13.

Cascadable I/O Expanders

Key Features

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





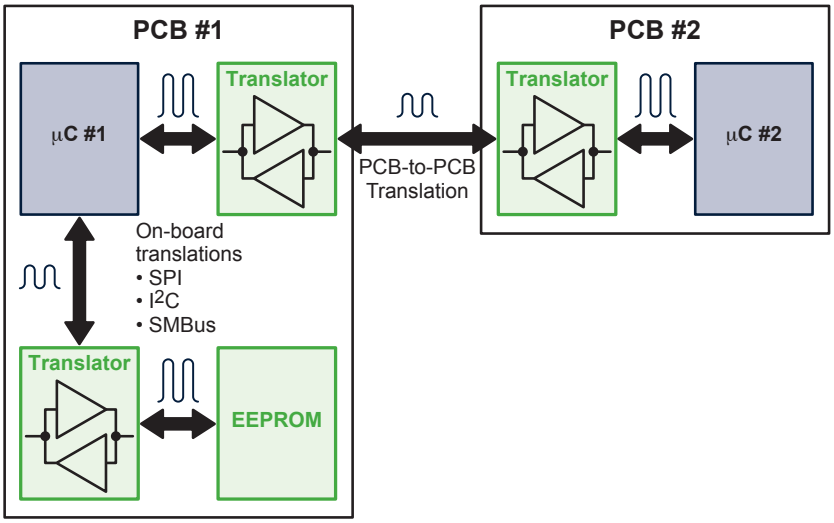
Device	I/O	Cascadable	VCC Min (V)	VCC Max (V)	Interrupt Output	I/O Pullups	LED Blink/ PWM	Package
PCA9535E	16	64 Programmable Slave Addresses	1.65	5.5	✔			QFN-24, SOIC-24, TSSOP-24
PCA9655E	16	64 Programmable Slave Addresses	1.65	5.5	✔			QFN-24, SOIC-24, TSSOP-24
CAT9532	16	8 Slave ID Addresses	2.3	5.5			✔	SOIC-24W, TQFN-24, TSSOP-24
CAT9552	16	8 Slave ID Addresses	2.3	5.5			✔	SOIC-24W, TQFN-24, TSSOP-24
CAT9555	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
CAT9554	8	8 Slave ID Addresses	2.3	5.5	✔	✔		SOIC-16, TQFN-16, TSSOP-16
CAT9554A	8	8 Slave ID Addresses	2.3	5.5	✔	✔		SOIC-16, TQFN-16, TSSOP-16

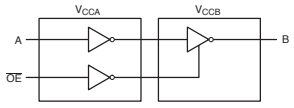
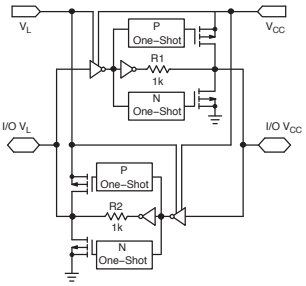
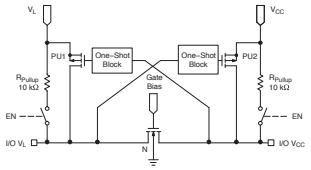
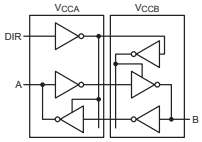
Logic Translators

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

Key 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

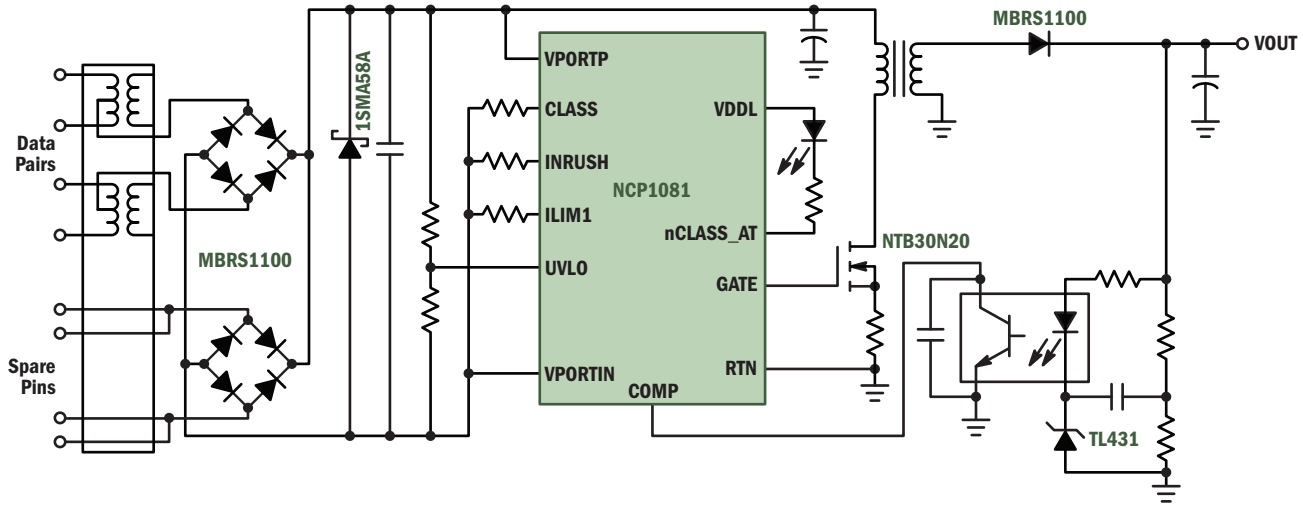


	Unidirectional Translator	Autosense Bidirectional Translator (Push-Pull Output)	Autosense Bidirectional Translator (Open-Drain Output)	Bidirectional Translator (with Direction Pin)
Block Diagram				
Attributes	• High Data Rate • Low Power Consumption	• High Data Rate • Low Power Consumption	• High Data 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	• I2C, 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)

Power over Ethernet

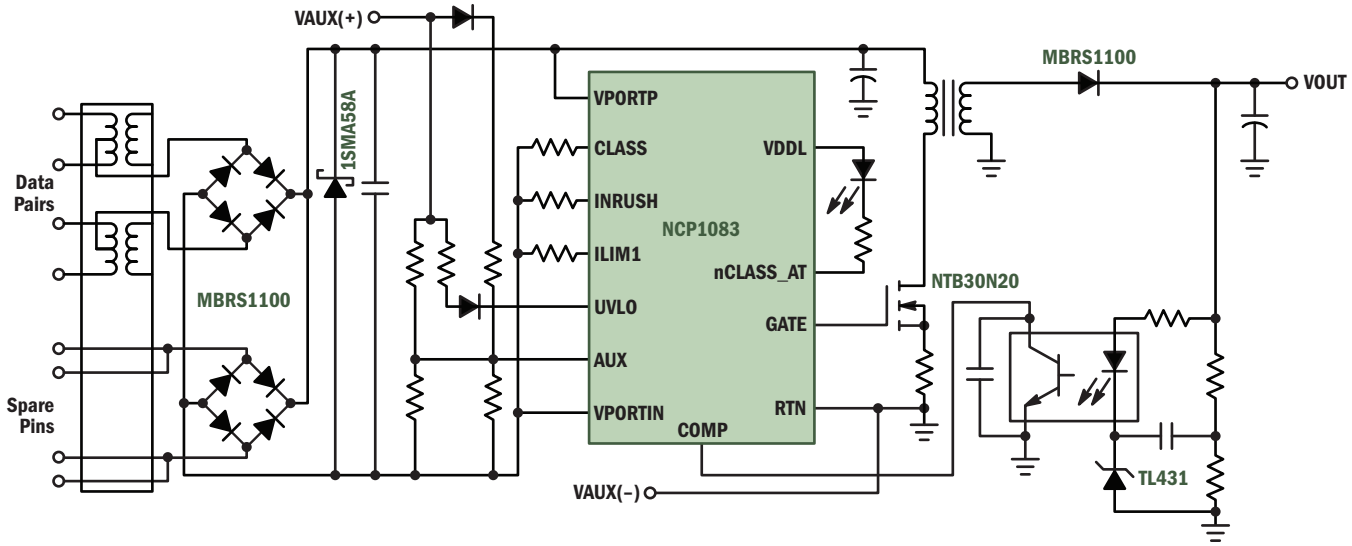
IEEE 802.3at, 40 W

- Delivers 25.5 W for PoE+ IEEE 802.3at (Draft 4.0) and up to 40 W in proprietary applications
- Supports IEEE two event classification
- Integrated multi-topology dc-dc converter controller implements highly efficient power conversion at low output voltages
- Best in-class cable ESD and thermal characteristics



IEEE 802.3at + Auxiliary, 40 W

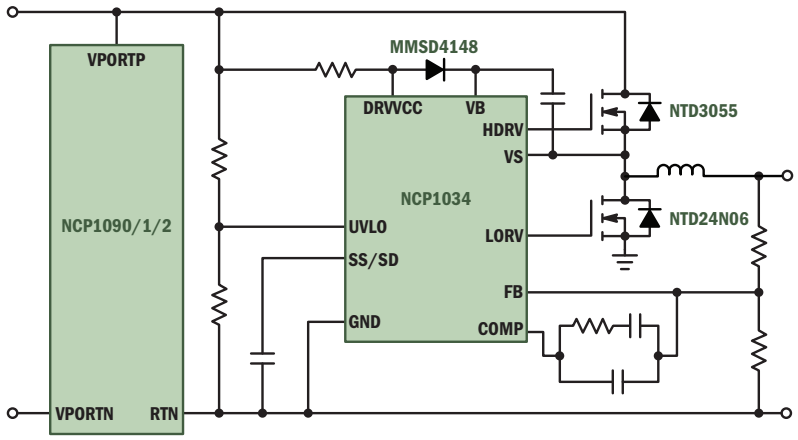
- Auxiliary input voltage range from 9.0 V to 57 V
- Integrated multi-topology dc-dc converter controller implements highly efficient power conversion at low output voltages in conjunction with auxiliary voltage input
- Delivers 25.5 W for PoE+ IEEE 802.3at (Draft 4.0) and up to 40 W in proprietary applications
- Supports IEEE two event classification
- Best-in-class cable ESD and thermal characteristics



Power over Ethernet

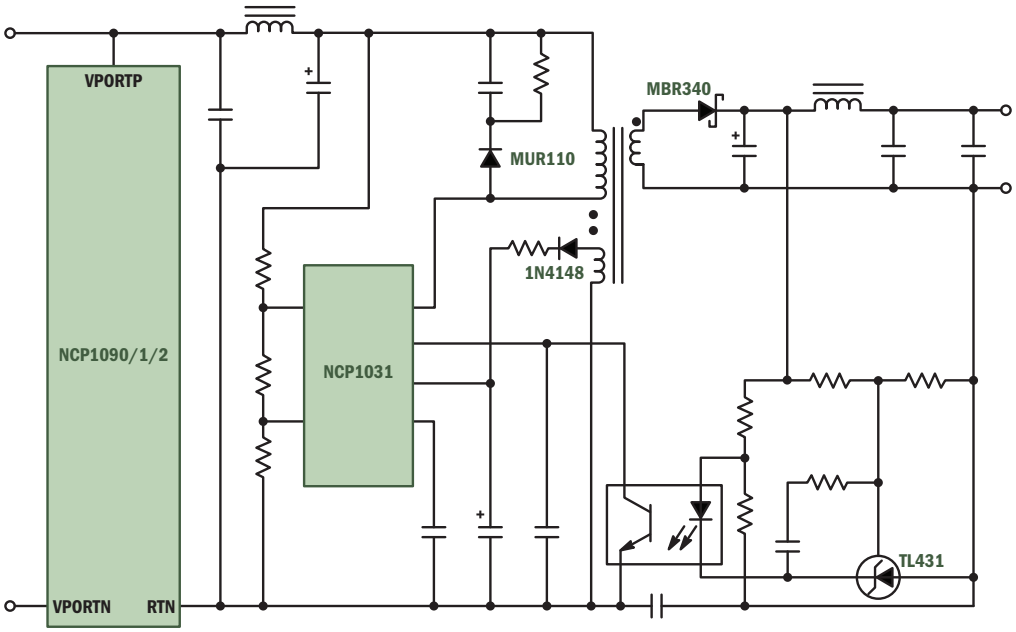
IEEE 802.3at (Non-Isolated), up to 40 W

- Non-isolated application for simple cost effective solution
- Programmable overcurrent protection
- Flexibility to scale output MOSFETs for power requirement

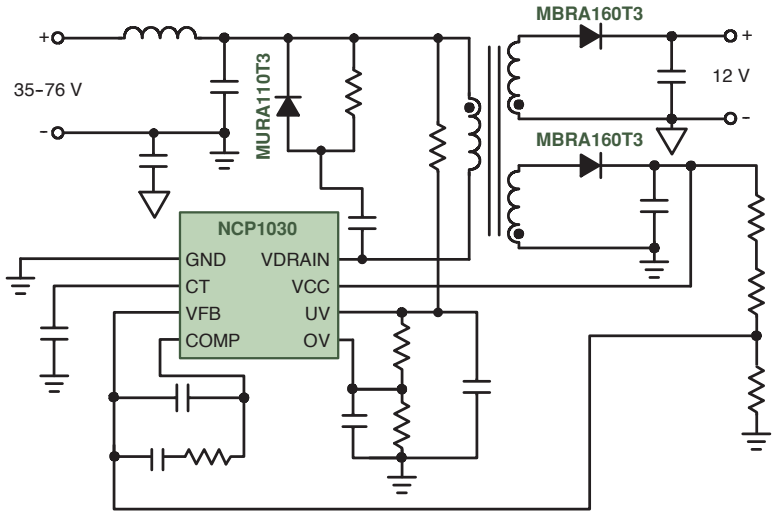


IEEE 802.3af, 3 W

- Integrated PWM controller and Power Device for up to 7.5 W requirements
- Up to 1 MHz switching frequency for high power density design
- Can be configured in any single-ended topology such as forward or flyback



DC-DC Power Conversion



Isolated Bias Supply

Regulators

Device	Topology	Io Typ (A)	fsw Typ (kHz)	Vcc Min (V)	Vcc Max (V)	Features	Package(s)
NCP1592	Step-Down	6.0	Up to 700	3.0	6.0	Output down to 0.891 V with 1.0% accuracy	TSSOP-28
NCP3170A	Step-Down	3.0	500	4.5	18	Output down to 0.8 V	SOIC-8
NCP3170B	Step-Down	3.0	1000	4.5	18	Output down to 0.8 V	SOIC-8
NCP1031	Flyback; Forward; Step-Down	1.0	Up to 1000	–	200	Integrated 200 V switch	DFN-8; SOIC-8
NCP1030	Flyback; Forward; Step-Down	0.5	300	–	200	2nd side bias supply	Micro8

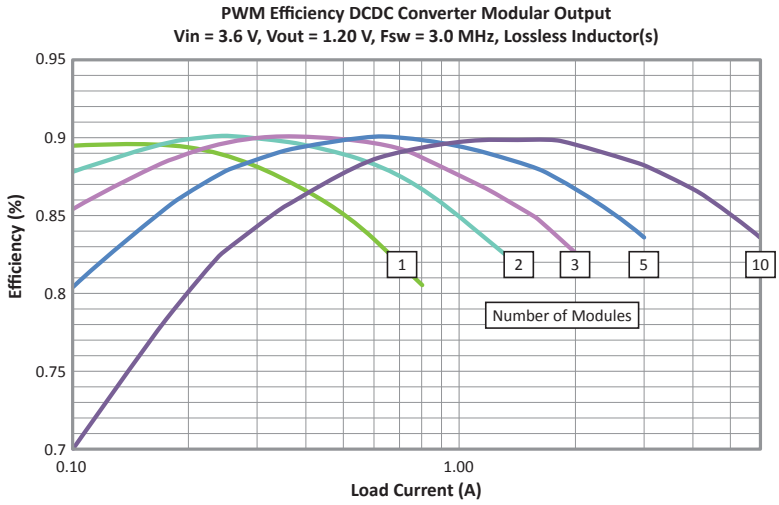
PWM Controllers

Device	Topology	Vcc Min (V)	Vcc Max (V)	fsw Typ (kHz)	Features	Package(s)
CS5124	Flyback; Forward; Step-Down	7.6	75	400	Small package	SOIC-8
NCP1034	Step-Down	8.0	100	Up to 500	Non-isolated buck	SOIC-16
NCP1294	Flyback; Forward; Buck-Boost; Boost	3.3	7.5	Up to 1000	Enhanced UC384x	SOIC-16; TSSOP-16
NCP3011	Step-Down	4.7	28	400	EN, PG, SYNC	TSSOP-14
NCP3020	Step-Down	4.7	28	300; 600	Capable of 20 A output	SOIC-8
TL494	Flyback; Forward; Half-Bridge; Push-Pull; Step-Down; Step-Up	7.0	40	Up to 200	Versatile controller	PDIP-16; SOIC-16
TL594	Flyback; Forward; Half-Bridge; Push-Pull; Step-Down; Step-Up	7.0	40	Up to 300	Versatile controller	PDIP-16; SOIC-16; TSSOP-16

ARM® Core DC-DC Converters

Key Features

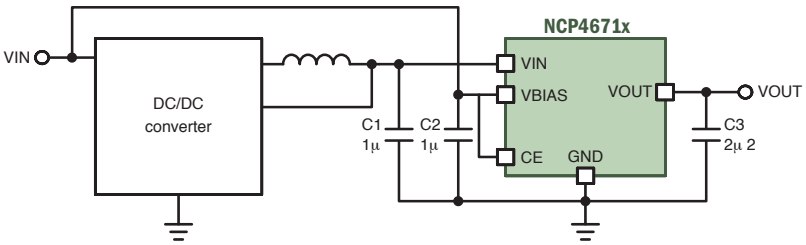
- High regulating performance from 0.6 V to 1.4 V
  - Modular efficiency with fragmented power stage
  - Dynamic voltage scaling per output steps of 6.25 mV by I2C
  - Tight accuracy of ±1%, due to differential sensing
- Fast transient response
  - Proprietary PFM to PWM transition with equivalent performance to PWM only
  - Thermally handle high peak current demands up to 10 ms
  - Flexible design to transient handling output capacitor from 22 µF to 100 µF



Device	V_{IN} (V)	V_{OUT} (V)	I_{OUT} (A)	f_{SW} (MHz)	Control	Features	Package
NCP6338	2.3 – 5.5	0.6 – 1.4	6.0	3.0	I²C; VSEL	Modular power stage; Differential sensing	WLCSP-30
NCP6335	2.3 – 5.5	0.6 – 1.4	4.0	3.0	I²C; VSEL	Transient load helper	WLCSP-20
NCP6343*	2.3 – 5.5	0.6 – 1.4	3.5	3.0	I²C	Dynamic voltage scaling	WLCSP-15
NCP6342*	2.3 – 5.5	0.6 – 1.4	2.5	3.0	I²C	Dynamic voltage scaling	WLCSP-12

* Pending 2H13.

Linear Voltage Regulators



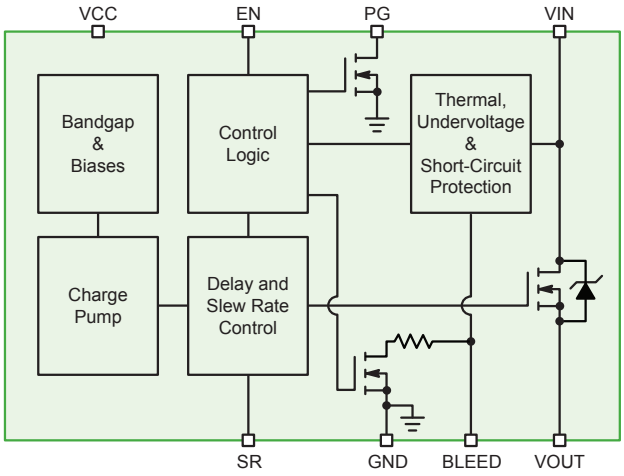
NCP4671 - Typical Application Schematic

NCP59302 Adjustable 3 A LDO Evaluation Board

Device	IO Typ	Function	Features	Package
NCP51460	20 mA	Precision Voltage Reference	• 3.3 V reference	SOT-23-5
LP2951	100 mA	Multi-Feature LDO Linear Voltage Regulator	• Shutdown feature • Fixed or adjustable output (1.25 V to 29 V) • Error flag for out of regulation condition	SOIC-8, Micro8™
NCP4640, NCP4641	50/150 mA	Wide Input Voltage Range LDO Linear Voltage Regulator	• Input voltage range 4 V to 36 V, 50 V max. • Low Iq at 9 μA typical • Output voltage range 2.0 V to 12.0 V in 100 mV steps	SOT-23-5, XDFN-6
NCP702	200 mA	Ultra-low Quiescent Current LDO Linear Voltage Regulator	• High PSRR • Very low dropout • Ultra-low noise	SOT-23-5, XDFN-6
NCP4671	400 mA	Low Output Voltage LDO Linear Voltage Regulator	• Output voltage to 0.6 V • Bias rail structure allows ultra low dropout • Regulates input voltages as low as 0.9 V	SOT-23-5, SC-70-5, XDFN-6
NCP705	500 mA	Ultra-low Quiescent Current LDO Linear Voltage Regulator	• High PSRR • Very low dropout • Ultra-low noise	WDFN-6
NCP690, NCP691, NCP692	1 A	CMOS LDO Linear Voltage Regulator w/wo Enable	• Enhanced ESD: 4 kV and 400 V • Fixed and adjustable outputs • Typical noise voltage of 15 Vrms	DFN-6
NCP693	1 A	CMOS LDO Linear Voltage Regulator	• Minimum output voltage down to 0.8 V for fixed version and 1.0 V for adjustable version	UDFN-6
NCP59150	1.5 A	Fixed and Adjustable True LDO Linear Voltage Regulator	• Typical dropout: 175 mV @ 750 mA; 300 mV @ 1.5 A • Maximum voltage input 18 V • Stable with ceramic capacitors on the output	DFN-8, D2PAK-5
NCP59302	3 A	Adjustable True LDO Linear Voltage Regulator	• Typical dropout: 175 mV @ 1.5 A; 300 mV @ 3 A • Maximum voltage input 18 V • Stable with ceramic capacitors on the output	D2PAK-5
NCP58302	3 A	Adjustable True LDO Linear Voltage Regulator	• Typical dropout: 250 mV @ 1.5 A; 370 mV @ 3 A • Maximum voltage input 18 V • Stable with tantalum capacitors on the output	D2PAK-5

Advanced Load Switches

ecoSWITCH™
ADVANCED LOAD MANAGEMENT



NCP454xx Integrated Load Switch Feature

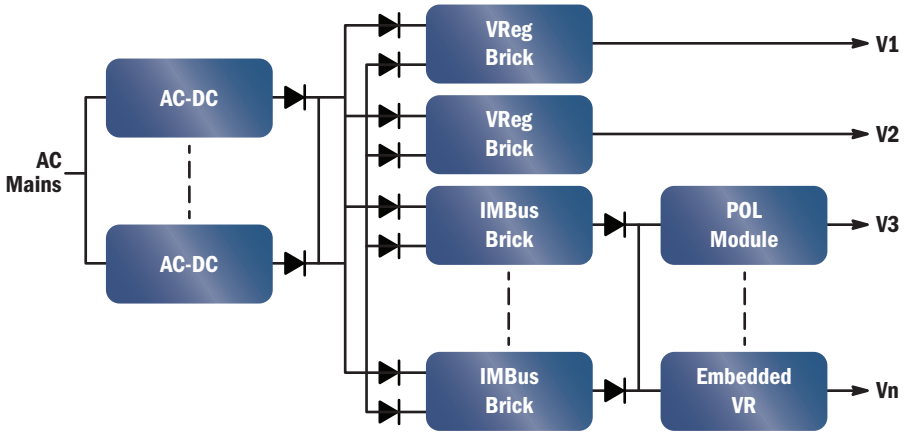
- Simple/clean design
- No current consumption in standby power mode
- Small PCB footprint
- Low $R_{DS(ON)}$ due to charge pump driving NMOS
- Adjustable soft-start time (SR)
- Adjustable integrated discharge
- Fault protection
- Power rail monitoring & sequencing

Type	Device	r_{on} (mΩ)	I Max (A)	V_I Min (V)	V_I Max (V)	I_Q (μA)	Discharge	Slew Rate (μs)	Features	Package(s)
Smart Load Switch	NCP330	26 at 3.3 V	3	1.8	5.5	100	–	2000	Reverse blocking	TDFN-4
	NCP333	55 at 3.3 V	1.5	1.2	5.5	1	Auto	95	–	WLCSP-4
	NCP334	47 at 3.3 V	2	1.2	5.5	1	–	71	–	WLCSP-4
	NCP335	47 at 3.3 V	2	1.2	5.5	1	Auto	71	–	WLCSP-4
	NCP336	23 at 3.3 V	3	1.2	5.5	1	–	810	–	WLCSP-6
	NCP337	23 at 3.3 V	3	1.2	5.5	1	Auto	810	–	WLCSP-6
	NCP338	27 at 1.8 V	2	1	3.6	0.6	Auto	20	–	WLCSP-6
	NCP339	26 at 3.3 V	3	1.2	5.5	2	–	2700	Reverse blocking	WLCSP-6
	NCP432	50 at 1.8 V	1.5	1	3.6	0.6	–	20	–	WLCSP-4
	NCP433	50 at 1.8 V	1.5	1	3.6	0.6	Auto	20	–	WLCSP-4
	NCP434	43 at 1.8 V	2	1	3.6	0.6	–	61	–	WLCSP-4
	NCP435	43 at 1.8 V	2	1	3.6	0.6	Auto	61	–	WLCSP-4
	NCP436	23 at 1.8 V	3	1	3.6	1	–	27	–	WLCSP-6
	NCP437	23 at 1.8 V	3	1	3.6	1	Auto	27	–	WLCSP-6
	NCP439*	28 at 3.3 V	2	1	3.6	4	Auto	75		WLCSP-4
	NCP451	13 at 3.3 V	3	0.5	5.5	15	Auto	640		WLCSP-6
ecoSWITCH™ Integrated Load Switch	NCP45524	18.0	6	0.5	13.5	–	Adj	–	Power good	DFN-8
	NCP45525	18.0	6	0.5	13.5	–	Adj	Adj	–	DFN-8
	NCP45560	2.4	24	0.5	13.5	–	Adj	Adj	Power good; Fault	DFN-12
	NCP45540	3.9	20	0.5	13.5	–	Adj	Adj	Power good; Fault	DFN-12
	NCP4543	10.2	7.3	0.5	6	–	Adj	Adj	–	QFN-18
	NCP4545	4.7	10.5	0.5	6	–	Adj	Adj	–	QFN-18
	NCP45520	9.5	10.5	0.5	13.5	–	Adj	–	Power good; Fault	DFN-8
	NCP45521	9.5	10.5	0.5	13.5	–	Adj	Adj	Fault	DFN-8

* Pending 2H13.

MOSFETs for Power Conversion

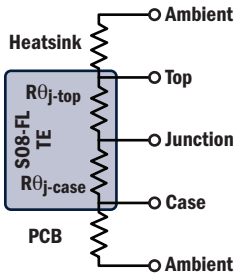
Typical Power Architecture

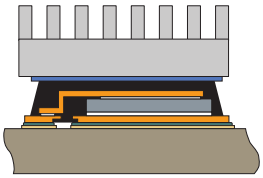


The networking power architecture provides numerous applications for Power MOSFETs: 48 V & IM Bus ORing; isolated topology, primary & secondary; POL phase leg

Thermally Enhanced SO8-FL

- $R\theta_{j\text{-}top}$ = 7°C/W vs. 22°C/W for standard SO-8 FL
- Allows heatsinking from both sides of the package
- Top of package is electrically isolated
- Increases power density
- 1 mm thick
- Mounts on standard SO-8 FL pads





N-Channel MOSFETs

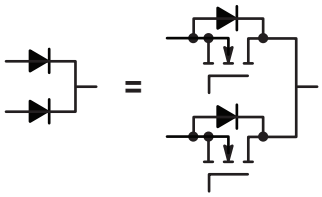
Device	V_{DS} (V)	V_{GS} (V)	$R_{DS(ON)}$ mΩ				Q_g (nC)	Q_{gd} (nC)	R_G (Ω)	Package
			V_{GS} = 10V		V_{GS} = 4.5V					
			Typ	Max	Typ	Max				
NTMFS4825NFE	30	20	1.3	2.0	2.0	3.0	39.6	14.2	1.0	SO8-FL
NTMFS4922NE	30	20	1.5	2.1	2.0	3.0	37.5	7.0	0.5	SO8-FL
NTMFS4923NE	30	20	2.7	3.2	3.2	4.5	22.9	3.8	0.5	SO8-FL
NTMFS4925NE	30	20	4.0	6.0	6.4	10	10.8	4.2	0.78	SO8-FL
NTMFS4926NE	30	20	4.8	7.0	7.8	12	8.7	3.5	1.0	SO8-FL

MOSFETs for Power Conversion

ORing MOSFETs

Features

- Low $R_{DS(on)}$ for low conduction loss
- 30 V for IM bus ORing
- 100 V for 48 V bus ORing



MOSFETs as ORing Diodes

N-Channel MOSFETs

Device	Configuration	V_{DS} (V)	V_{GS} (V)	$R_{DS(ON)}$ mΩ				Q_g (nC)	R_G (Ω)	Package
				V_{GS} = 10 V		V_{GS} = 4.5 V				
				Typ	Max	Typ	Max			
NTMFS4931N	Single	30	20	0.85	1.1	1.2	1.5	61.5	0.7	SO-8 FL
NTMFS4933N	Single	30	20	0.9	1.2	1.5	2	62.1	1.1	SO-8 FL
NTMFS4982NF	Int. Sch	30	20	0.95	1.3	1.4	1.9	40	0.8	SO-8 FL
NTMFS4934N	Single	30	20	1.5	2	2.2	3	34	0.8	SO-8 FL
NTMFS5830NL	Single	40	20	1.7	2.3	2.6	3.6	60	0.5	SO-8 FL
NTMFS5832NL	Single	40	20	3.1	4.2	5	6.5	25	1.2	SO-8 FL
NTP5860N	Single	60	20	2.3	3	–	–	180*	1	TO-220, D2PAK
NTP5860NL	Single	60	20	2.4	3	2.8	3.6	220*	1	TO-220, D2PAK
NTP5863N	Single	60	20	6.5	7.8	–	–	55*	0.4	TO-220
NTP6410AN	Single	100	20	11	13	10	12	120*	2.4	TO-220, D2PAK
NTP6411AN	Single	100	20	12.7	14	–	–	100*	3.1	TO-220, D2PAK

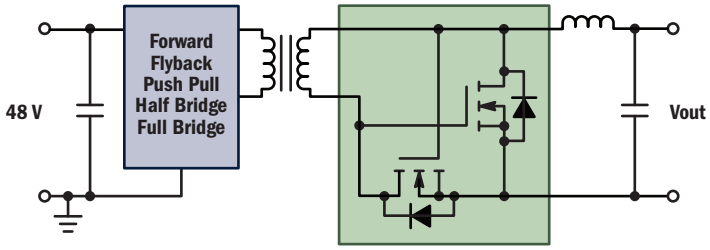
* @ V_{gs} = 10 V.

MOSFETs for Power Conversion

Isolated Topology DC-DC (Bricks)

Features

- Low $R_{DS(on)}$ for low conduction loss
- Integrated Schottky for low diode loss



N-Channel MOSFETs

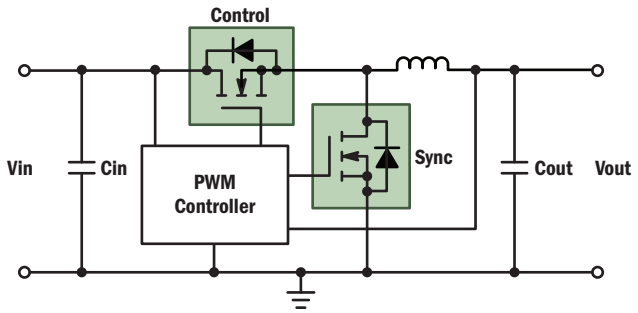
Device	Configuration	V_{DS} (V)	V_{GS} (V)	$R_{DS(ON)}$ mΩ				Q_g (nC)	Q_{gd} (nC)	C_{iss} (pF)	C_{rss} (pF)	R_G (Ω)	Application	Package
				V_{GS}= 10 V		V_{GS}= 4.5 V								
				Typ	Max	Typ	Max							
NTMFS4982NF	Int. Schottky	30	20	0.95	1.3	1.4	1.9	40	12	6000	160	0.8	Secondary Synchronous	SO-8 FL
NTMFS4934N	Single	30	20	1.5	2	2.2	3	34	8.1	5505	90	0.8		SO-8 FL
NTMFS4983NF	Int. Schottky	30	20	1.6	2.1	2.5	3.1	22.6	6.9	3250	90	1		SO-8 FL
NTMFS4985NF	Int. Schottky	30	20	2.7	3.4	4	5	14.2	4.2	2100	60	1		SO-8 FL
NTMFS4C05N	Single	30	20	2.7	3.4	4	5	14	5	1972	59	1		SO-8 FL
NTMFS4C06N	Single	30	20	3.2	4	4.8	6	11.6	4	1683	40	1		SO-8 FL
NTMFS4C08N	Single	30	20	4.6	5.8	6.8	8.5	8.4	3.3	1113	39	1		SO-8 FL
NTMFS4C09N	Single	30	20	4.6	5.8	6.8	8.5	10.9	5.4	1252	126	1		SO-8 FL
NTMFS4C10N	Single	30	20	5.8	6.95	8.9	10.8	9.8	3.7	987	162	1		SO-8 FL
NTMFS4C13N	Single	30	20	7.3	9.1	11.4	13.8	7.8	3.7	770	127	1		SO-8 FL
NTMFS5830NL	Single	40	20	1.7	2.3	2.6	3.6	60	32	5880	500	0.5		SO-8 FL
NTMFS5832NL	Single	40	20	3.1	4.2	5	6.5	25	12.7	2700	250	1.2		SO-8 FL
NTMFS5844NL	Single	60	20	10.2	12	13	16	15	8	1460	96	0.62	Primary	SO-8 FL
NTTFS4C05N	Single	30	20	2.9	3.6	4.1	5.1	14.5	5.5	1988	71	1	Secondary Synchronous	µ8 FL
NTTFS4C06N	Single	30	20	3.4	4.2	4.9	6.1	11.6	4	1683	40	1		µ8 FL
NTTFS4C08N	Single	30	20	4.7	5.9	7.2	9	8.4	3.3	1113	39	1		µ8 FL
NTTFS4C10N	Single	30	20	5.9	7.4	8.8	11	10.1	6.1	993	163	1		µ8 FL
NTTFS4C13N	Single	30	20	7.5	9.4	11.2	14	7.8	3.7	770	127	1		µ8 FL
NTTFS4985NF	Int. Schottky	30	20	2.8	3.5	4.16	5.2	13.6	4.1	2075	46	1		µ8 FL
NTTFS5820NL	Single	60	20	10.1	11.5	13	15	15	8	1462	96	0.62	Primary	µ8 FL
NTTFS5826NL	Single	60	20	19	24	25	32	8.4	3.9	850	50	1.5		µ8 FL

MOSFETs for Power Conversion

Non-Isolated Topology "Buck" DC-DC

Features

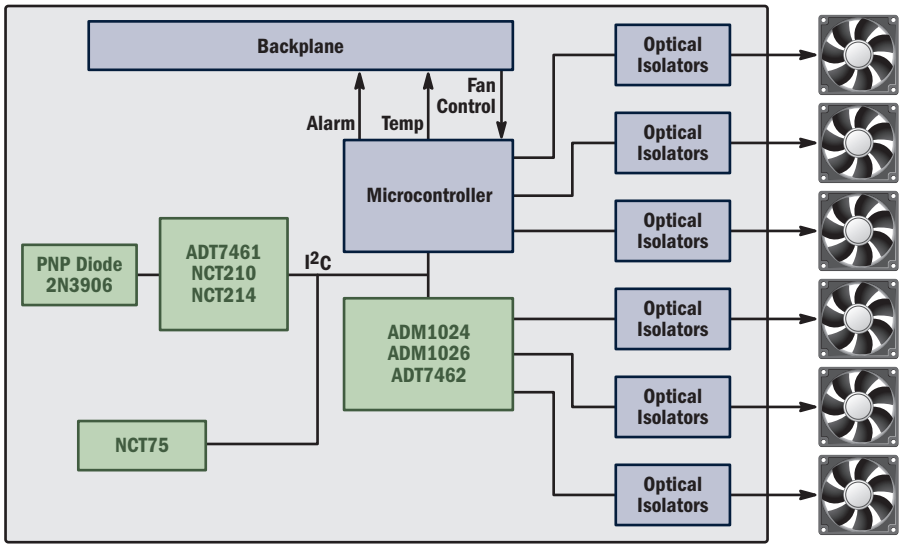
- Low $R_{DS(on)}$ for low conduction loss
- Integrated Schottky for enhanced light load efficiency



N-Channel MOSFETs

Device	Configuration	V_{DS} (V)	V_{GS} (V)	$R_{DS(ON)}$ mΩ				Q_g (nC)	Q_{gd} (nC)	C_{iss} (pF)	C_{rss} (pF)	R_G (Ω)	Application	Package
				V_{GS}= 10 V		V_{GS}= 4.5 V								
				Typ	Max	Typ	Max							
NTMFS4982NF	Int. Schottky	30	20	0.95	1.3	1.4	1.9	40	12	6000	160	0.8	Synch	SO-8 FL
NTMFS4934N	Single	30	20	1.5	2	2.2	3	34	8.1	5505	90	0.8	Synch	SO-8 FL
NTMFS4983NF	Int. Schottky	30	20	1.6	2.1	2.5	3.1	22.6	6.9	3250	90	1	Synch	SO-8 FL
NTMFS4985NF	Int. Schottky	30	20	2.7	3.4	4	5	14.2	4.2	2100	60	1	Synch	SO-8 FL
NTMFS4C05N	Single	30	20	2.7	3.4	4	5	14	5	1972	59	1	Both	SO-8 FL
NTMFS4C06N	Single	30	20	3.2	4	4.8	6	11.6	4	1683	40	1	Both	SO-8 FL
NTMFS4C08N	Single	30	20	4.6	5.8	6.8	8.5	8.4	3.3	1113	39	1	Both	SO-8 FL
NTMFS4C09N	Single	30	20	4.6	5.8	6.8	8.5	10.9	5.4	1252	126	1	Control	SO-8 FL
NTMFS4C10N	Single	30	20	5.8	6.95	8.9	10.8	9.8	3.7	987	162	1	Control	SO-8 FL
NTMFS4C13N	Single	30	20	7.3	9.1	11.4	13.8	7.8	3.7	770	127	1	Control	SO-8 FL
NTTFS4C05N	Single	30	20	2.9	3.6	4.1	5.1	14.5	5.5	1988	71	1	Both	µ8 FL
NTTFS4985NF	Int. Schottky	30	20	2.8	3.5	4.16	5.2	13.6	4.1	2075	46	1	Synch	µ8 FL
NTTFS4C06N	Single	30	20	3.4	4.2	4.9	6.1	11.6	4	1683	40	1	Both	µ8 FL
NTTFS4C08N	Single	30	20	4.7	5.9	7.2	9	8.4	3.3	1113	39	1	Both	µ8 FL
NTTFS4C10N	Single	30	20	5.9	7.4	8.8	11	10.1	6.1	993	163	1	Both	µ8 FL
NTTFS4C13N	Single	30	20	7.5	9.4	11.2	14	7.8	3.7	770	127	1	Both	µ8 FL
NTMFD4901NF	Dual	30	20	5.2	6.5	8	10	9.7	3.7	1150	105	0.8	DC-DC Converter	SO-8 FL
				1.9	2.35	2.8	3.5	20	5.3	2950	82	0.8		
NTMFD4C20N	Dual	30	20	5.8	7.3	8.7	10.8	9.3	4.2	970	125	1	DC-DC Converter	SO-8 FL
				2.7	3.4	4	5.2	13	3	1950	50	1		
NTMFD4902NF	Dual	30	20	5.2	6.5	8	10	9.7	3.7	1150	105	0.8	DC-DC Converter	SO-8 FL
				3.3	4.1	5	6.2	11.5	3.4	1590	83	0.8		
NTLLD4901NF	Dual	30	20	14	17.4	20	25	6.5	3.2	605	102	0.8	DC-DC Converter	µ8 FL, WDFN-8
				11	13.3	16	20	5	1.46	660	17.5	0.8		

Thermal Management



Features

- Convert temperature into digital format for I²C/SMBus
- Programmable set points and limits over I²C/SMBus
- Reduce power consumption by dynamically controlling fan speed

Temperature Sensors

Device	Sensor Type	Data Transmission Standard	Temperature Error (°C)	Package(s)
ADT7461A	Local & Remote	I²C/SMBus	±1	Micro8™
NCT210	Local & Remote	I²C/SMBus	±3	QSOP-16
NCT214	Local & Remote	I²C/SMBus	±1	WDFN-10
NCT75	Local	I²C/SMBus	±1	DFN-8, Micro8, SOIC-8

Hardware Monitors

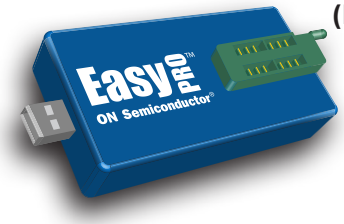
Device	Description	Data Transmission Standard	Package(s)
ADM1024	System Hardware Monitor with Remote Diode Thermal Sensing	I²C/SMBus	TSSOP-24
ADM1026	Thermal System Management Fan Controller	I²C/SMBus	LQFP-48
ADT7462	Flexible Temperature and Voltage Monitor and System Fan Controller	I²C/SMBus	LFCSP-32

EEPROMs for Configuration and Calibration

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	Vcc Min (V)	Vcc Max (V)	Package(s)
I^2C	CAT24M01	1 Mb	128k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8
	CAT24C512	512 kb	64k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, MSOP-8
	CAT24C256	256 kb	32k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, MSOP-8
	CAT24C128	128 kb	16k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, MSOP-8
	CAT24C64	64 kb	8k x 8	1.7	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, MSOP-8, TDFN-8
	CAT24C32	32 kb	4k x 8	1.7	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TSOP-5, TDFN-8
	CAT24C16	16 kb	2k x 8	1.7	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8, MSOP-8, TSOT-23-5, WLCSP-4, WLCSP-5
	CAT24C08	8 kb	1k x 8	1.7	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8, MSOP-8, TSOT-23-5, WLCSP-4, WLCSP-5
	CAT24C04	4 kb	512 x 8	1.7	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8, MSOP-8, TSOT-23-5, WLCSP-4, WLSCP-5
	CAT24C02	2 kb	256 x 8	1.7	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8, MSOP-8, TSOT-23-5
	CAT24C01	1 kb	128 x 8	1.7	5.5	TSSOP-8, SOIC-8, TDFN-8, MSOP-8, TSOT-23-5
SPI	CAT25M01	1 Mb	128k x 8	1.8	5.5	TSSOP-8, SOIC-8
	CAT25512	512 kb	64k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8
	CAT25256	256 kb	32k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8
	CAT25128	128 kb	16k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8
	CAT25640	64 kb	8k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8
	CAT25320	32 kb	4k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8
	CAT25160	16 kb	2k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8
	CAT25080	8 kb	1k x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8
	CAT25040	4 kb	512 x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8, MSOP-8
	CAT25020	2 kb	256 x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8, MSOP-8
	CAT25010	1 kb	128 x 8	1.8	5.5	UDFN-8, TSSOP-8, SOIC-8, PDIP-8, TDFN-8, MSOP-8

Application Specific EEPROMs

Data Transmission Standard	Device	Density	Organization	Vcc Min (V)	Vcc Max (V)	Package(s)	Notes
I^2C	CAT34C02	2 kb	256 x 8	1.7	5.5	UDFN-8, TDFN-8, TSSOP-8	Serial Presence Detect for DDR2 DIMM
	CAT24C21	1 kb	128 x 8	2.5	5.5	MSOP-8, SOIC-8	Dual Mode, VESA
	CAT24C208	8 kb	1k x 8	2.5	5.5	SOIC-8	Dual Port, VESA

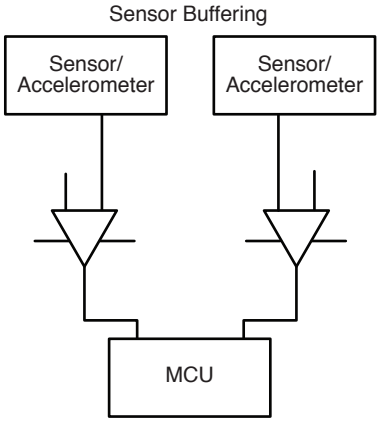
* Pending 2H13.

Signal Conditioning

Low Voltage, Low Power Operational Amplifiers

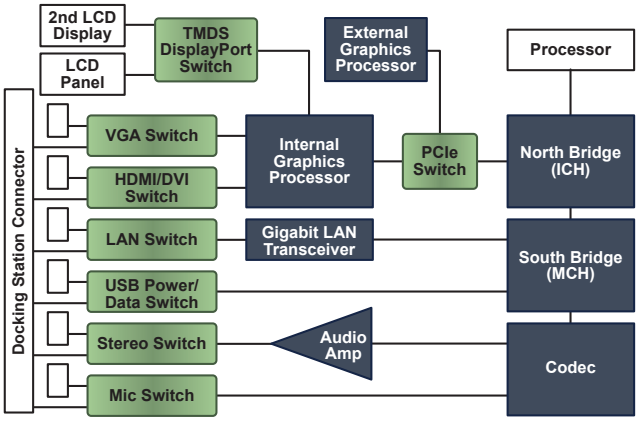
Operational Amplifiers

Device	Description	Package(s)
LMV301	Single 1.8 V RRO CMOS Op Amp	SC-70
LMV321	Single 2.5 V RRO Op Amp	SC-70, SOT-23
LMV324	Quad 2.5 V RRO Op Amp	TSSOP-14, SOIC-14
LMV358	Dual 2.5 V RRO Op Amp	SOIC-8, Micro8, uDFN-8
LMV821	Single 2.5 V RRO Op Amp	SC-70
LMV824	Quad 2.5 V RRO Op Amp	TSSOP-14, SOIC-14
LMV931	Single 1.8 V RRIO CMOS Op Amp	TSOP-5, SC-70
LMV981	Single 1.8 V RRIO CMOS Op Amp with EN	uLLGA-8
LMV982	Dual 1.8 V RRIO CMOS Op Amp with EN	uQFN-10
NCS2001	Single 0.9 V Op Amp	SOT-23, SC-70
NCS2004	Single RRO Op Amp	SC-70
TLV271	Single RRO Op Amp	TSOP-5



Switching Devices

ON Semiconductor offers a range of switching devices for high speed interface in servers, desktop computing, notebook and netbook computers. Applications include PCI Express, DisplayPort, Gigabit Ethernet and USB 2.0.



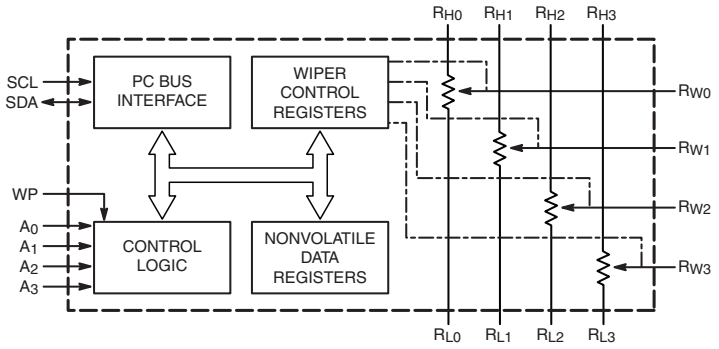
Server Implementation

Device	Interface	Data Rate	No Channels	Quiescent Current
NCN3612B	PCIe 3.0, DisplayPort 1.2	8 Gb/s	12	250 µA
NCN3411	PCIe 3.0	8 Gb/s	8	200 µA
NCN2612B	PCIe 2.0, DisplayPort 1.1	5 Gb/s	12	250 µA
NCN2411	PCIe 2.0	5 Gb/s	8	200 µA
NS3L500	Gigabit Ethernet	1 Gb/s	11	250 µA
NCN7200	Gigabit Ethernet	1 Gb/s	11	380 µA
NCN1188	USB 2.0 / MHL	2.25 Gb/s	2	21 µA
NS5S1153	USB 2.0	480 Mb/s	2	21 µA
NLAS7242	USB 2.0	480 Mb/s	2	1 µA
NLAS52231	Audio	36 MHz	2	1 µA
NLAS4684	Audio	9.5 MHz	2	180 nA

Digitally Programmable Potentiometers 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	Packages
CAT5120/1/2	1	16	10; 50	No	Up/Down	SC-70; SOT-23
CAT5110	1	32	10; 50; 100	No	Up/Down	SC-70; SOT-23
CAT5112	1	32	10; 50; 100	Yes	Up/Down	MSOP-8; PDIP-8; SOIC-8; TSSOP-8
CAT5114	1	32	10; 50; 100	Yes	Up/Down	MSOP-8; PDIP-8; SOIC-8; TDFN-8; TSSOP-8
CAT5115	1	32	10; 50; 100	No	Up/Down	MSOP-8; PDIP-8; SOIC-8; TSSOP-8
CAT5118/9	1	32	10; 50; 100	No	Up/Down	SC-70; SOT-23
CAT5123	1	32	10	No	Up/Down	SOT-23
CAT5124	1	32	50	No	Up/Down	SOT-23
CAT5125	1	32	10	No	Up/Down	SOT-23
CAT5126	1	32	10	OTP	Up/Down	MSOP-8; TDFN-8
CAT5127	1	32	10	Yes	Up/Down	MSOP-8
CAT5128	1	32	10; 50	No	Up/Down	SOT-23-8
CAT5111	1	100	10; 50; 100	Yes	Up/Down	MSOP-8; PDIP-8; SOIC-8; TSSOP-8
CAT5113	1	100	1; 10; 50; 100	Yes	Up/Down	MSOP-8; PDIP-8; SOIC-8; TSSOP-8
CAT5116	1	100	32	Yes	Up/Down	MSOP-8; PDIP-8; SOIC-8; TSSOP-8
CAT5132	1	128	10; 50; 100	Yes	I2C	MSOP-10
CAT5133	1	128	10	Yes	Up/Down	MSOP-10
CAT5136/7	1	128	50	No	I2C	SC-70
CAT5138	1	128	10	No	I2C	SC-70
CAT5140	1	256	50; 100	Yes	I2C	MSOP-8
CAT5171	1	256	50; 100	No	I2C	SOT-23-8
CAT5172	1	256	50	No	SPI	SOT-23-8
CAT5221	2	64	2.5; 10; 50; 100	Yes	I2C	SOIC-20W; TSSOP-20
CAT5411	2	64	2.5; 10; 50; 100	Yes	SPI	SOIC-24W; TSSOP-24
CAT5419	2	64	2.5; 10; 50; 100	Yes	I2C	SOIC-24W; TSSOP-24
CAT5261	2	256	50; 100	Yes	SPI	SOIC-24W; TSSOP-24
CAT5269	2	256	50; 100	Yes	I2C	SOIC-24W; TSSOP-24
CAT5271	2	256	50; 100	No	I2C	MSOP-10
CAT5273	2	256	50	No	I2C	MSOP-10
CAT5241	4	64	2.5; 10; 50; 100	Yes	I2C	SOIC-20W; TSSOP-20
CAT5401	4	64	2.5; 10; 50; 100	Yes	SPI	SOIC-24W; TSSOP-24
CAT5409	4	64	2.5; 10; 50; 100	Yes	I2C	SOIC-24W; TSSOP-24
CAT5251	4	256	50; 100	Yes	SPI	SOIC-24W; TSSOP-24
CAT5259	4	256	50; 100	Yes	I2C	SOIC-24W; TSSOP-24

Ethernet: 10/100BASE-T

Two Pairs, Low Capacitance Surge and ESD Protection

The 10/100BASE-T Ethernet interface is susceptible to ESD strikes, cable-discharge events and lightning-induced transients governed by IEC 61000-4-5, GR-1089-CORE and other standards.

TSPD Features

- C_{line} < 14 pF for 50 A surge under 8/20 μs (NP0080TA series)

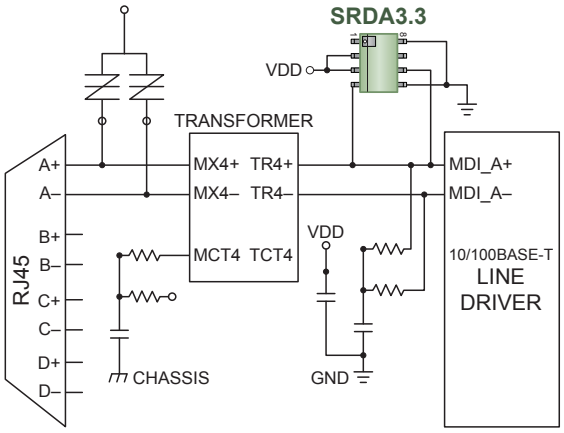
TVS Features

- Wide range of voltages and capacitance values for tertiary protection

Benefits

- The required data-rate is supported by NP0080TA, ensuring a high level of secondary surge protection
- TVS devices provide high levels of tertiary protection without latching

Typical Application

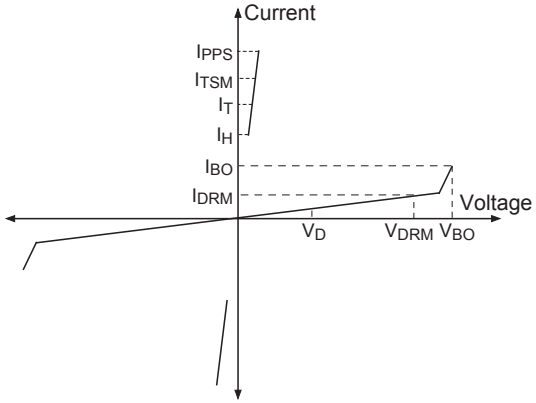


Transformer Side – SRDA3.3
Line-to-Line protection against metallic strikes

Thyristor Surge Protection Devices

Device	V_{DRM} (V)	V_{BO} (V)	V_T (V)	C_O (pF)	I_H (mA)	Surge I_{PP}, 10/1000 μs (A)	Package
NP0080TA Series	8-16	9.5-18	–	11-13	50	50 (8/20 μs)	TSOP-5

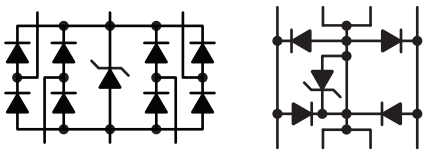
TSPD



Transient Voltage Suppressors

Device	V_{DC} Max (V)	Line Transient Max (V)	Surge I_{PP}, 8/20 μs (A)	Typical Line-Line Capacitance (pF)	ESD Contact Rating (kV)	Package
NUP4114H	5.0	5.0	12*	0.4	±13	TSOP-6
SRDA3.3	3.3	5.0	25	4.0	±8	SOIC-8
SRDA05	5.0	7.0	23	5.0	±8	SOIC-8
ESD1014	3.3	5.0	25	1.5	±30	UDFN-10
LC03-6	6.7	7.0	100	8.0	±30	SOIC-8

* On Pin 5



TVS

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.

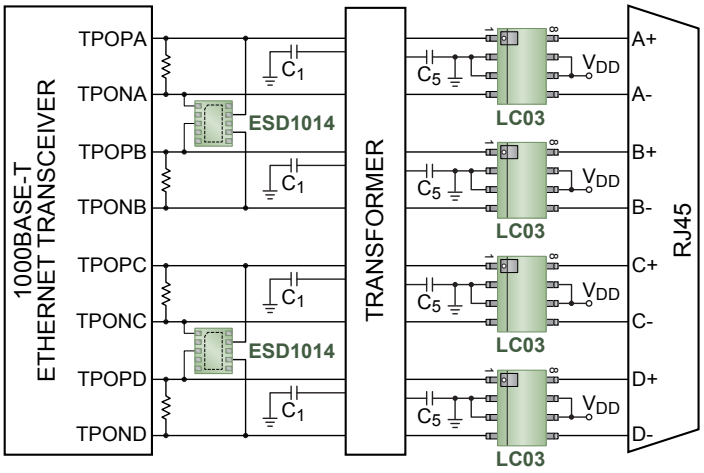
Features

- 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

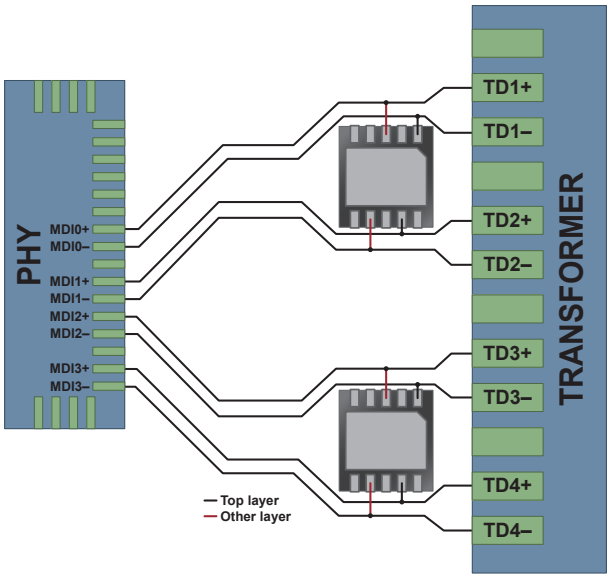
Benefits

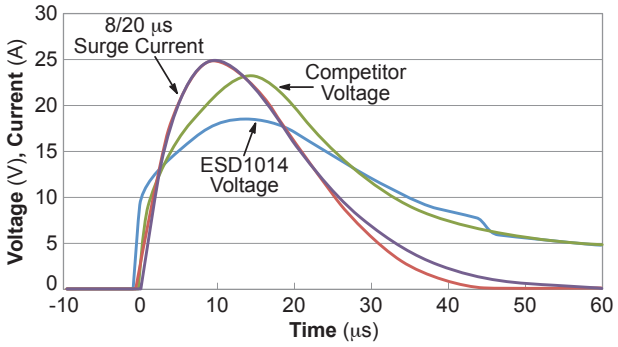
- Compatible with Gb Ethernet and beyond
- Enhanced protection for downstream electronics
- Accommodates operating transients above 3.3 V
- Small form-factor allows integration into connectors

Typical Application

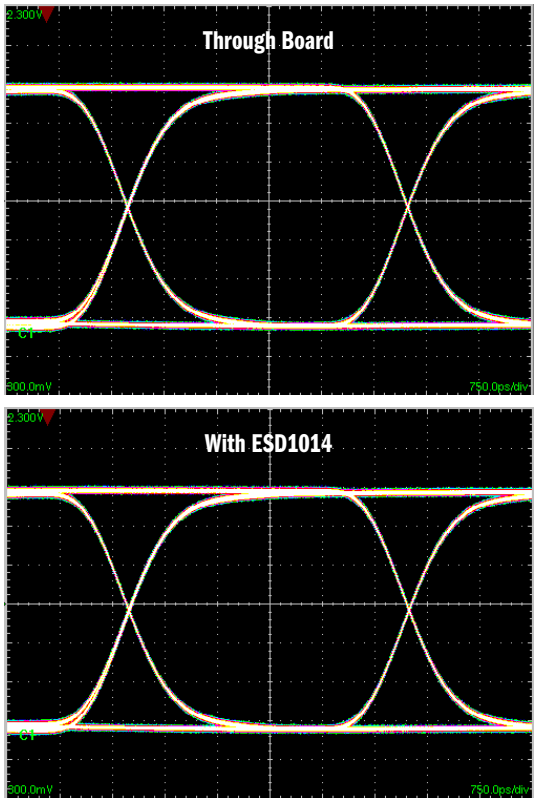


Line Side : LC03-6 (optional)
Transformer Side: ESD1014
Protection against metallic (transverse) strikes





Line-to-Line Surge



Signal Integrity for Gigabit Ehternet

T1/E1, T3/E3, and xDSL Ports

Surge protection for GR-1089, TIA-968-A, ITU-T and IEC 61000-4-5

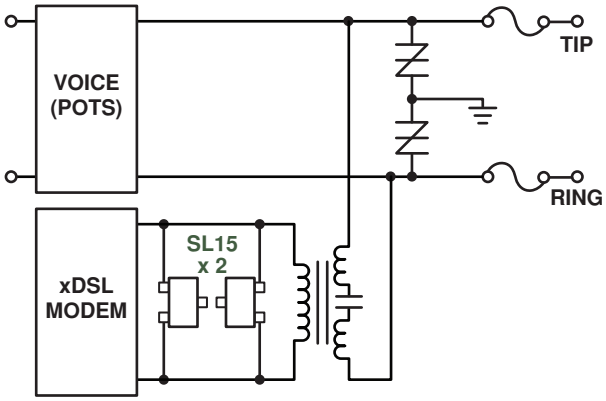
T1/E1 links (< 2 Mbps), T3/E3 links (< 43 Mbps) and xDSL lines (< 52 Mbps) are susceptible to ESD strikes, cable-discharge events and lightning-induced transients.

TVS Features

- Capable of all T1/E1 and xDSL voltages with a variety of capacitance values, for driver-side protection

Benefits

- Required data-rates are supported by TSPDs
- TVS devices provide high levels of tertiary protection without latching

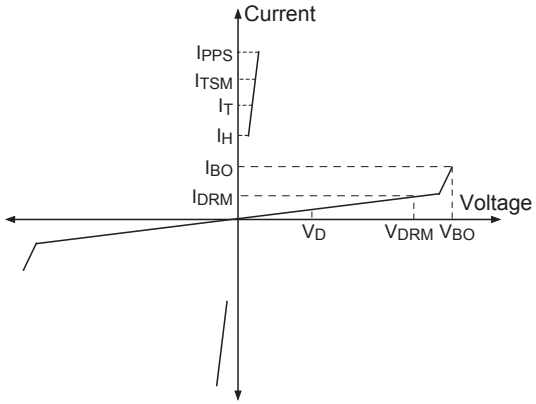


SL15 x 2 (Bidirectional)
Typical xDSL + POTS Application

Thyristor Surge Protection Devices

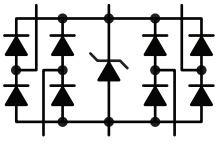
Device	V_{DRM} (V)	V_{BO} (V)	V_T (V)	C_O (pF)	I_H (mA)	Surge I_{PP}, 10/1000 µs (A)	Package
NP0080TA Series	8-16	9.5-18	–	11-13	50	50 (8/20 µs)	TSOP-5

TSPD



Transient Voltage Suppressors

Device	V_{DC} Max (V)	Surge I_{PP}, 8/20 µs (A)	Line-Line Capacitance (pF)	ESD Contact Rating (kV)	Package
SRDA3.3	3.3	25	4.0	±8	SOIC-8
SRDA05	5.0	23	5.0	±8	SOIC-8
LC03-6	6.7	100	8.0	±30	SOIC-8
SL05 to SL24	5 to 24	5 to 17	3.5	±8	SOT-23



TVS

Storage Power Buses: Electronic Fuses

5 V and 12 V Power Bus Protection for HDDs, SSDs, and Other Applications

Key Requirement

- Low $R_{DS(ON)}$ high operating and trip currents (I_{OP}, I_{TRIP}) precision

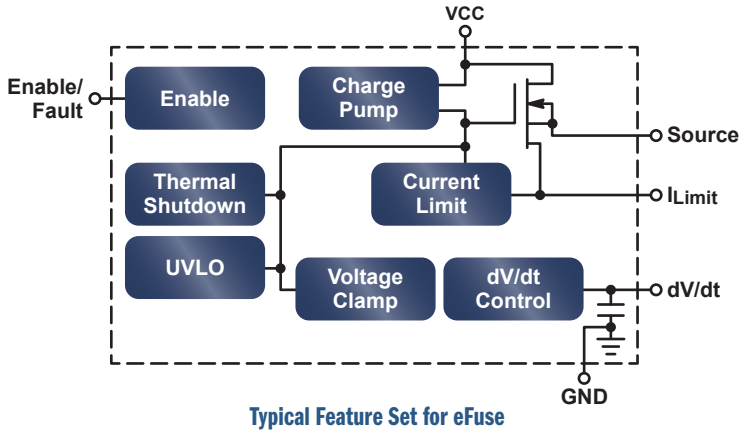
Features

- Low $R_{DS(ON)}$, high operating and trip currents (I_{OP}, I_{TRIP})
- Overvoltage protection
- Precise I_{TRIP} control
- Thermal shut-down
- EN pin for synchronizing multiple eFuses
- Ability to combine eFuses in parallel
- Outperforms poly-fuses:
  - Tighter spec tolerances
  - Lower resistance
  - Lower trip-time
  - Superior repeatability

Benefits

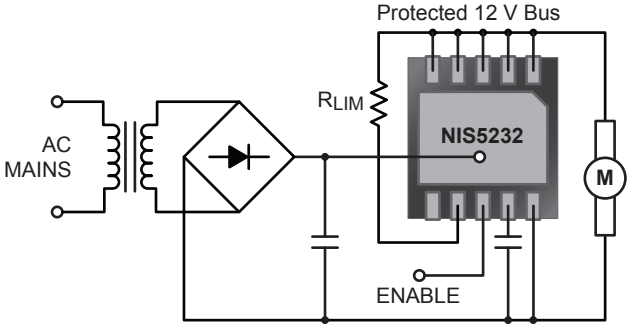
- High efficiency with high current capability
- eFuses combined in parallel achieve practically any desired level of I_{OP} and I_{TRIP}

Electronic (resettable) fuses act as load-switches and protect against inrush currents resulting from load faults, especially in hot-pluggable applications.

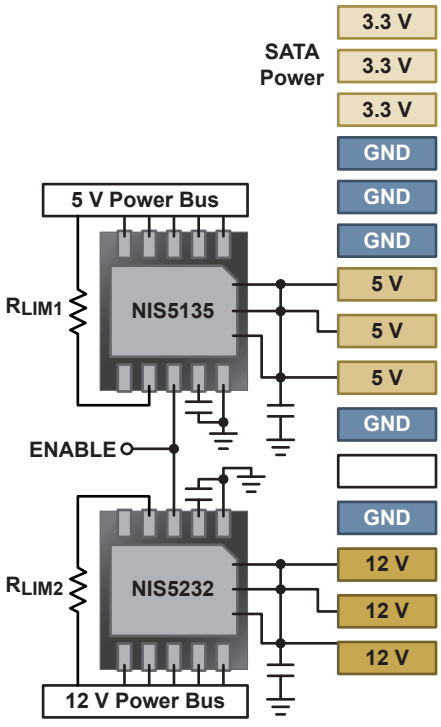


Typical Feature Set for eFuse

Device	Input Voltage (V)	Output Clamping Voltage (V)	I_{TRIP} Trip Current (A)	$R_{DS(ON)}$ (mΩ)	Auto Recovery Option	Latching Option	Package	Size (mm)
NIS5112	-0.6 to 18	15	2.5 (Adjustable)	28	Yes	Yes	SOIC-8	–
NIS5232	-0.6 to 18	15	3.5 (Adjustable)	44	Yes	Yes	DFN-10	3.0 x 3.0
NIS5135	-0.6 to 18	6.65	3.5 (Adjustable)	68	Yes	Yes	DFN-10	3.0 x 3.0



Motor Bus Protection Application



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