Application Guide

Notebook Computing

Introduction

Your partner for notebook computing

Designing notebooks isn't getting any easier. The footprint continues to shrink, and consumers continue to demand more features, faster speeds, and lower power consumption. There are always new protocols on the horizon, and even standard feature sets require smart connectivity and smart energy management.

NXP understands all this, and provides world-class solutions specifically created to help designers deliver exceptional notebook systems. We build on our decades-long leadership in high-performance mixed-signal solutions, providing continuous innovation for each functional block. We specialize in miniature packaging, and always make power efficiency a priority.

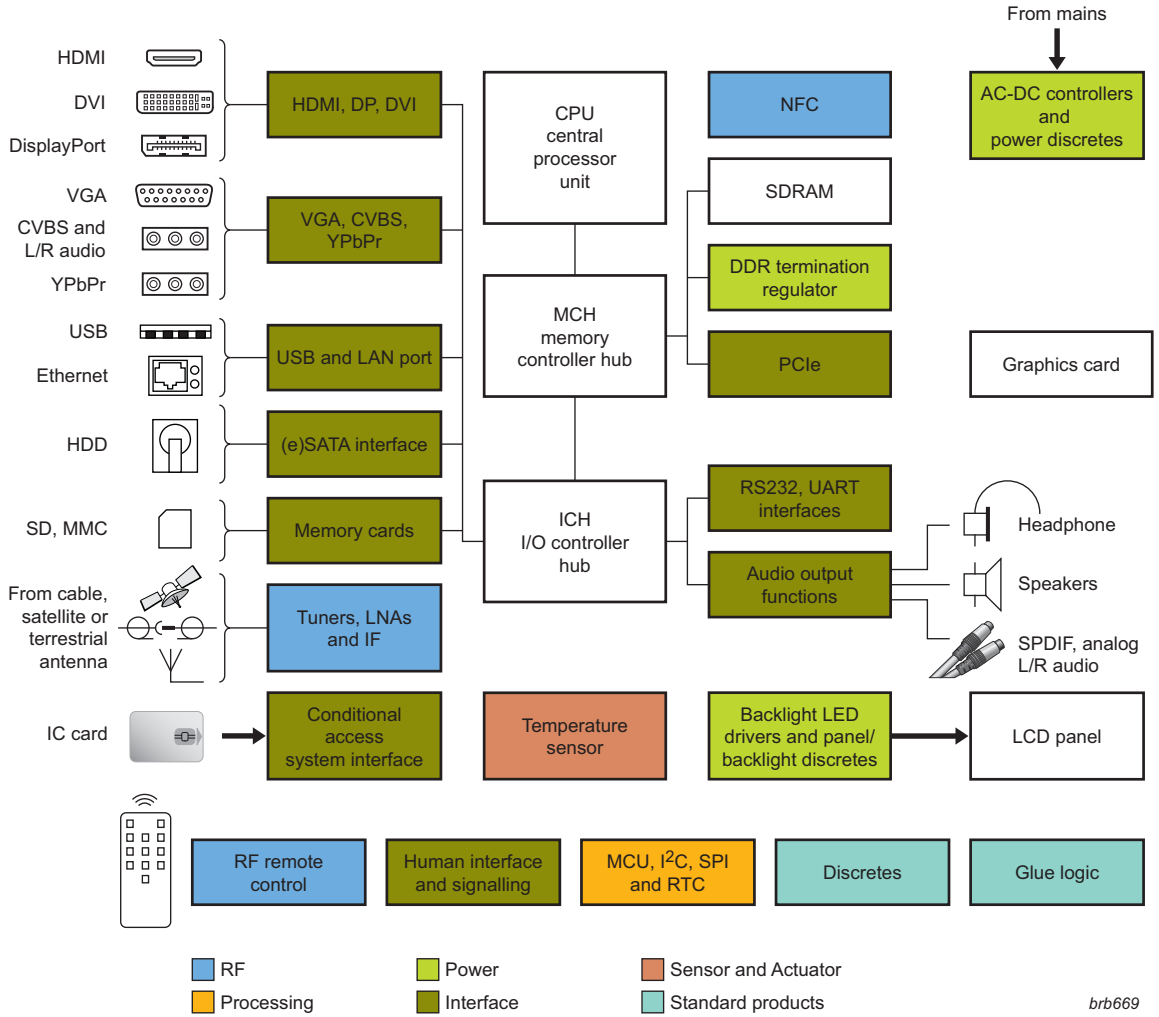
In this guide, you'll find details on our complete range of notebook offerings, including graphic interfaces, power management, audio systems, ESD protection, system control, memory interfaces, and more.

Why NXP for notebooks?

- Technology and manufacturing expertise in high-performance, mixed-signal technologies (RF, interface, power management, security, digital processing, etc.)
- Leadership in discrete and logic solutions
- World-class process technology and manufacturing capabilities, with largely in-house assembly and test
- Trusted supplier with a very broad portfolio

Introduction

NXP enhances performance throughout the system



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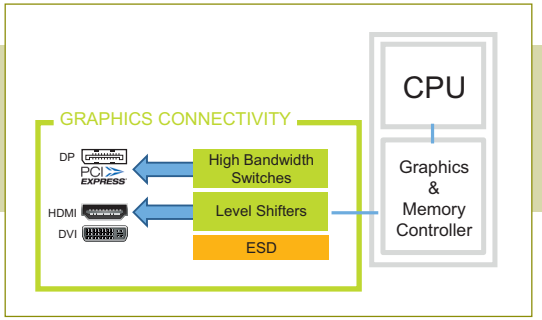
1. High-speed graphics connectivity



1.1 High-bandwidth switches for DisplayPort and PCIe

These devices maintain signal integrity by routing signals between single and multiple sources. They lower system power, and they reduce pin-count in the core chipset. They also help manage battery life, by letting the system switch between discrete graphics during high-performance operation powered by mains and integrated graphics when using the battery. They deliver excellent performance and are available in cost-effective, industry-standard packages.

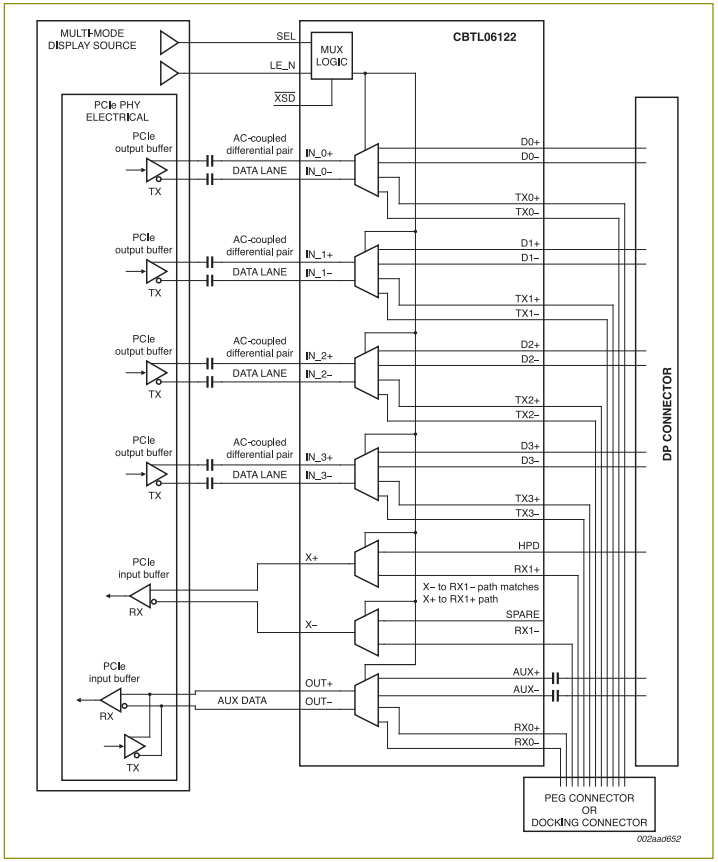
Hex DisplayPort v1.1a and PCIe Gen 1/Gen 2 Muxes CBTL06121/22

Many chipsets use reconfigurable I/O to reduce the pin-count and support a variety of interfaces. The CBTL06121/22 lets the chipset use PCIe and DisplayPort interfaces using the same I/O. It has dedicated channels for Aux and Hot Plug Detect (HPD), and is extremely useful in notebook docking stations, where it can enable two DisplayPort connections to the chipset. The device can also be used to switch between discrete and integrated graphics, to save battery power.

Features

- CBTL06121A/B: Gen1 PCIe @ 2.5 Gb/s, v1.1a DisplayPort @ 2.7 Gb/s
- CBTL06122A/B: Gen2 PCIe @ 5.0 Gb/s, v1.1a DisplayPort @ 2.7 Gb/s
- 1:2 switching/multiplexing of DisplayPort or PCIe signals
- 4 high-speed differential channels
- 1 channel for HPD
- 1 channel for differential AUX or single-ended DDC
- Selectable passive switching
- Power supply: 3.3 V ±10%

- Active-mode current 0.2 mA
- Temperature range: -40 to +85 oC
- ESD HBM 8 kV, MM 500 V, CDM 1.25 kV
- HWQFN56 package with two pin outs for easy PCB routing
- Compatible in form, fit, and function with Pericom PI3PCIE2612



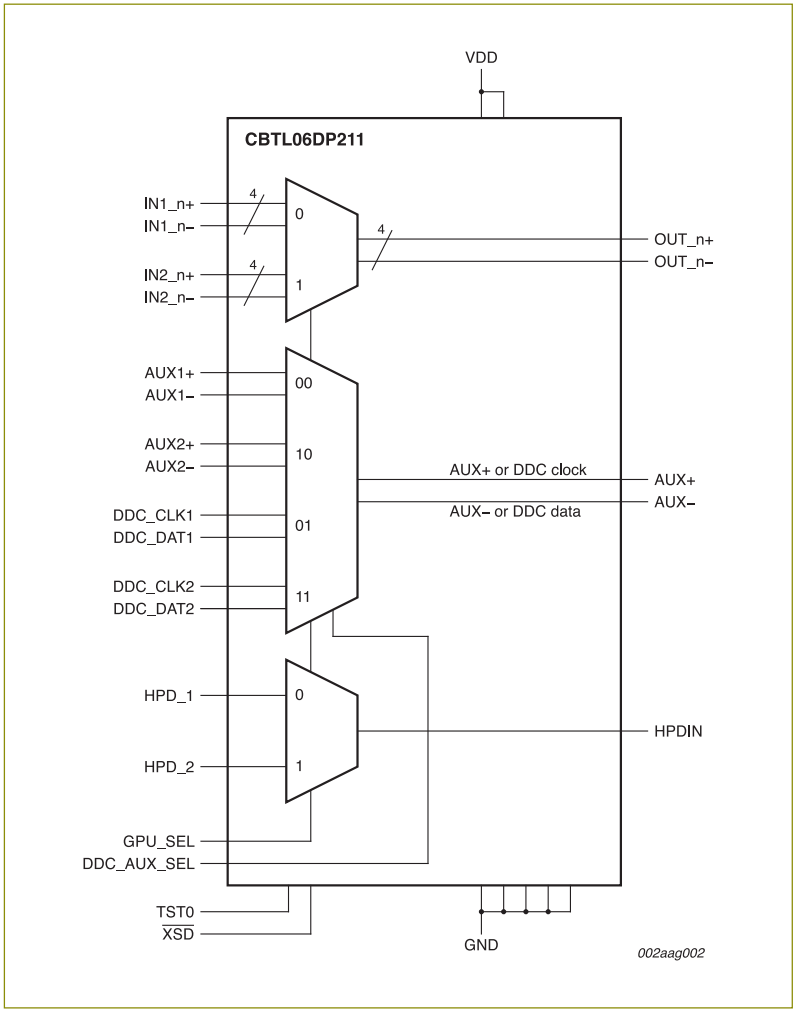
1. High-speed graphics connectivity

Hex DisplayPort v1.1a/1.2 Mux CBTL06DP211/12

Designed using NXP's proprietary high-bandwidth pass-gate technology, these devices perform 1:2 switching or 2:1 multiplexing of four high-speed differential AC-coupled DP channels. They support switching/multiplexing of Hot Plug Detect (HPD) signals as well as Auxiliary (AUX) and Display Data Channel (DDC) signals, and can be used with GPUs/CPUs that have dedicated AUX and DDC I/O.

Features

- CBTL06DP211: v1.1a DisplayPort @ 2.7 Gb/s, Gen1 PCI3 @ 2.5 Gb/s
- CBTL06DP212: v1.2 DisplayPort @ 5.4 Gb/s, Gen2 PCI3 @ 5.0 Gb/s
- 1:2 switching or 2:1 multiplexing of DisplayPort or PCIe signals
  - 4 high-speed differential channels with 2:1 multiplexing for DisplayPort main link signals or PCIe signals
  - 1 channel with 2:1 multiplexing for single-ended HPD signals
  - 1 channel with 4:1 multiplexing for differential AUX or single-ended DDC
- Selectable passive switching
- Power supply: 3.3 V ±10%
- Active-mode current 0.2 mA
- Temperature range: -40 to +85 °C
- ESD HBM 8 kV, ESD CDM 1 kV
- TFBGA (5 x 5 mm, 0.5 mm pitch) and HWQFN56 (11 x 5 mm, 0.5 mm pitch) packages



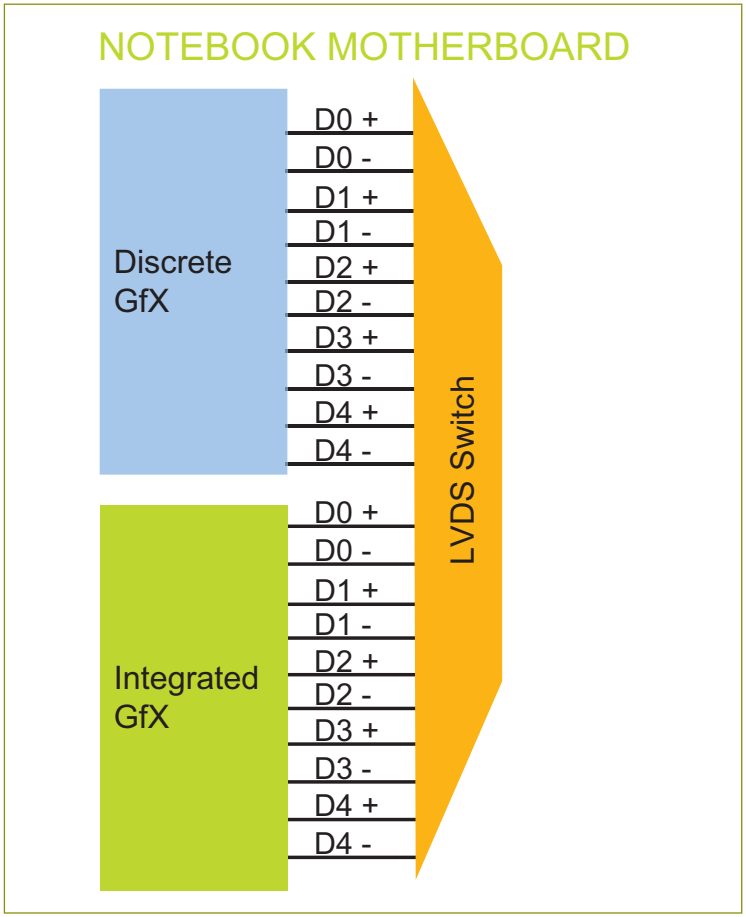
1. High-speed graphics connectivity

USB 3.0/LVDS/PCIe Gen2/DisplayPort switch CBTU04082

A high-speed, general-purpose mux/demux with 5.0 Gb/s bandwidth. Four different channels to support a number of interfaces, including LVDS, USB 3.0, DisplayPort, and PCIe.

Features

- 4 differential channel, 2:1 multiplexer/de-multiplexer
- USB 3.0/PCI Express Gen2 performance: 5.0 Gb/s
- Low intra-pair skew: 7 ps maximum (between positive and negative bits)
- Low crosstalk: -23 dB at 3 GHz
- Low off-isolation: -23 dB at 3 GHz
- V_{DD} operating range: 1.8 V ±10%
- ESD tolerance: 6 kV HBM I/O; 1 kV CDM
- Low inter-pair skew: 35 ps maximum
- Compatible in fit, form, and function with PI2PCIE2412
- HVQFN42 package (3.5 x 9 mm, 0.5 mm pitch)



1. High-speed graphics connectivity

1.2 HDMI/DVI level shifters

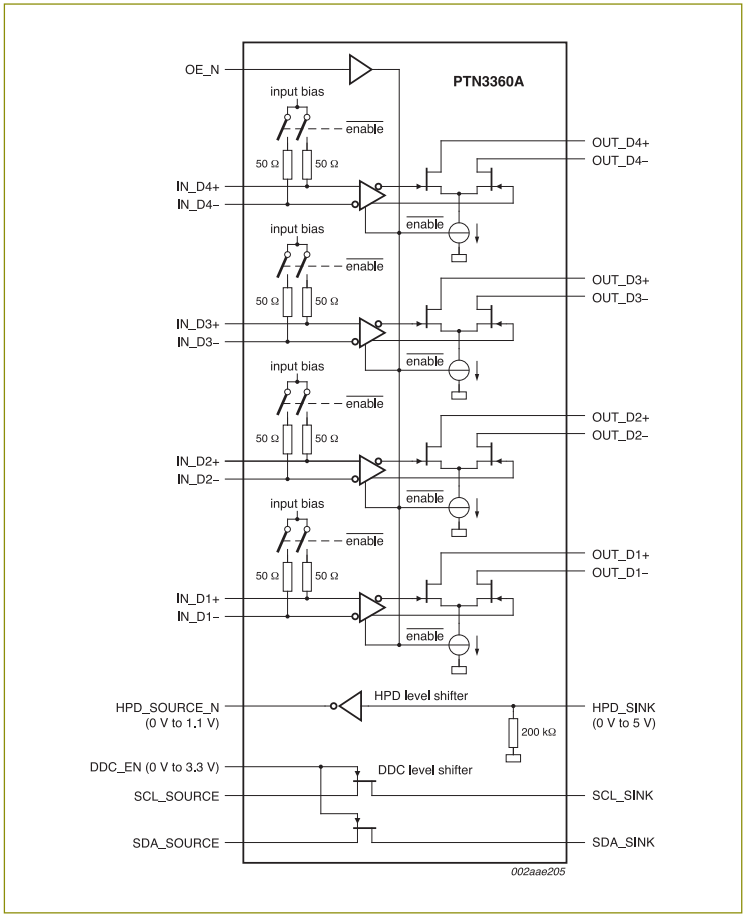
These devices provide HDMI and DVI connectivity on the motherboard. To support various platforms, there are options for inverting and non-inverting Hot Plug Detect (HPD).

Enhanced performance DisplayPort to HDMI/DVI level shifters PTN3360A/B

These devices can communicate directly with the graphics chipset via the DisplayPort interface, so the system can have HDMI or DVI outputs. The PTN3360A has an inverting Hot Plug Detect (HPD) level-shifter and is suitable for use with Intel's Montevina platform. The PTN3360B has a non-inverting level-shifting HPD for use with platforms such as the Intel Calpella and later platforms.

Features

- PTN3360A: Inverting 1.1 V level-shifting HPD
- PTN3360B: Non-inverting 1.1 V level-shifting HPD
- Inputs
  - 4 pairs of low-swing AC-coupled differential for TX from display source to sink with integrated 50-ohm termination resistors and bias voltage
  - 1 HPD from display HPD_Sink to GMCH HPD_Source
  - 1 pair for DDC (I^2C clock and data)
- Outputs
  - 4 pairs of TMDS outputs: up to 2.5 Gb/s per lane
  - 1 pair for DDC level shifter
  - Power supply: 3.3 V ±10%
- Active power 35 mA typical
- ESD 8 kV HBM
- HVQFN48 package (7 x 7 mm)



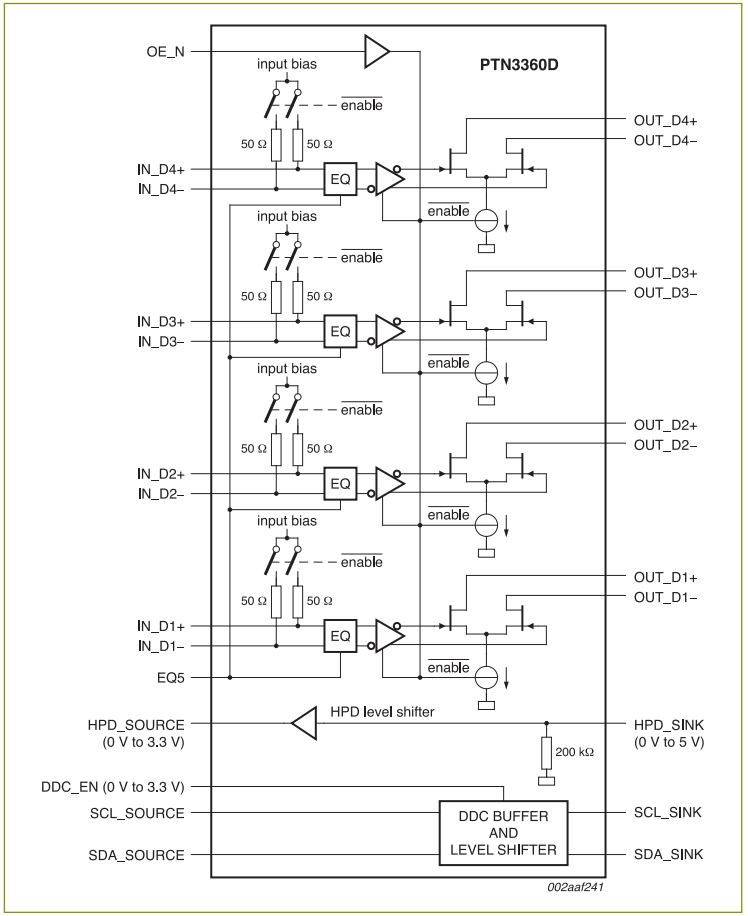
1. High-speed graphics connectivity

Enhanced performance DisplayPort level shifter with HDMI/DVI deep color support PTN3360D

This device can interface directly with the graphics chipset via the DisplayPort interface, and allows the system to have an HDMI output with support for “deep color”.

Features

- Inputs
  - 4 pairs of low-swing AC-coupled differential for TX from display source to sink with integrated 50 Ω termination resistors and bias voltage
  - 1 HPD from display HPD_Sink to GMCH HPD_Source
  - 1 pair for DDC (I^2C SCL and SDA)
- Outputs
  - 4 pairs of TMDS outputs - up to 2.5 Gb/s per lane
  - Supports 36-bit HDMI deep color mode
  - 1 pair for DDC level shifter / buffer
- Programmable equalizer
- Non-inverting level-shifting HPD
- Power supply: 3.3 V ±10%
- Active power 35 mA typical
- ESD 6 kV HBM
- HVQFN48 package (7 x 7 mm)



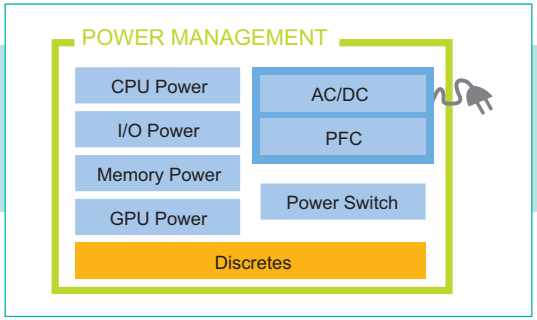
1. High-speed graphics connectivity

1.3 ESD protection for high-speed graphics interfaces

ESD pulses are a major cause of damage and malfunction. NXP offers a variety of devices that deliver outstanding protection against ESD and other voltage-induced transient pulses.

Part number	Description
IP4283	ESD protection for ultra-high-speed interfaces, including HDMI, DVI, DisplayPort, eSata, and LVDS
IP4776	Fully integrated DVI and HDMI host-interface protection, with level shifting for DDS channels and backdrive protection for HDMI, plus high-level ESD protection diodes for TMDS signal lines
IP4777/78	Fully integrated DVI and HDMI host-interface protection, with DDC buffering and decoupling, hot-plug detect, backdrive protection, CEC slew-rate control, and high-level ESD protection diodes for TDMS lines
IP4786	A signal-conditioning and ESD protection device designed to enhance the stability of HDMI transmission and minimize the trace impedance of the TMDS lines
PESD5V0X1B	An ultra-low-capacitance, bidirectional ESD protection diode for use with one signal line. Supports DisplayPort

2. Power management



2.1 CPU/GPU, I/O, memory & power switches

As systems for power management become more complex and board space shrinks, the demand for higher efficiency and smaller footprints has become even more critical. High efficiency is particularly imoprtant in notebooks, since it reduces power consumption, minimizes heat output, and increases reliability, which saves on maintenance costs.

N-channel TrenchMOS family PH/PHLxxxxx

NXP's Trench6 MOSFET family provides the industry's lowest $R_{DS(ON)}$ performance in the LFPAK package, which has a footprint 46% smaller than that of DPAK while offering similar thermal performance.

Features

- Low gate charge
- Low R_{DSon}
- Dimensions comparable to SO8
- Significantly thinner than SO8 & DPAK
- Wirebond free (Cu clip design)
- High current transient robustness
- 100% avalanche tested
- Leads are optical-inspection friendly

Package	Part Number	V_{DS}	$R_{DS(ON)}$ (typ) V_{gs} = 10 V mΩ	$R_{DS(ON)}$ (max) V_{gs} = 10V mΩ
QFN3333	PHL3530AL	30 V	2.9	3.5
	PHL3830AL		3	3.8
	PHL5830AL		5	5.8
	PHL9030AL		8	9
	PHL13030AL		11	13
	PHL17030AL		15	17
LFPAK	PH1225AL	25 V	0.9	1.2
	PH1825AL		1.13	1.5
	PH1330AL	30 V	1.06	1.3
	PH1730AL		1.29	1.7
	PH1930AL		1.55	2
	PH2530AL		1.79	2.4
	PH3030AL		2.19	3
	PH3430AL		2.43	3.5
	PH4030AL		2.72	4
	PH5030AL		3.63	5
	PH6030AL		4.26	6
	PH7030AL		4.92	7
	PH9030AL		6.16	8

L denotes logic-level S denotes standard-level

2. Power management

2.2 AC/DC & PFC solutions

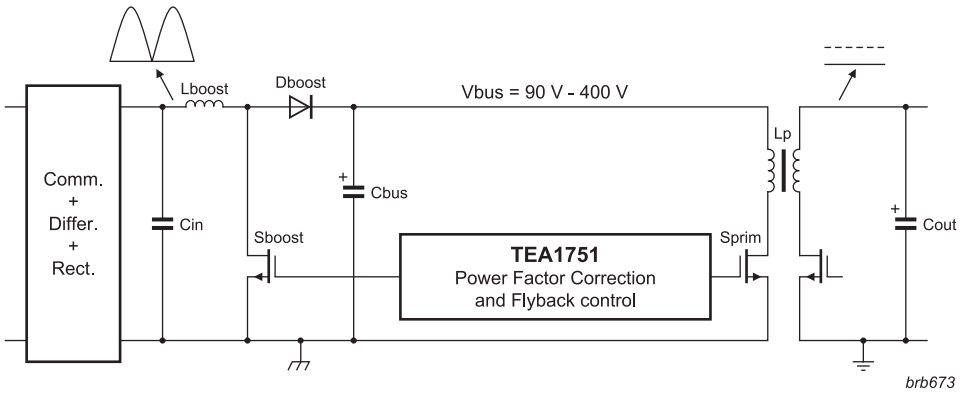
Our GreenChip™ family makes it easier and more cost-effective for power supply manufacturers to comply with energy efficiency specifications such as 80PLUS and EnergyStar. The family is designed specifically for energy savings and has, from its inception, led industry standards in PC power efficiency, especially in notebooks. Active Power Factor Correction (PFC) reduces disturbance on the AC distribution netDistortion (THD). NXP's ultra-fast diodes help boost power efficiency by offering a very low forward voltage together with very fast reverse recovery.

GreenChip III PFC & flyback controller TEA1751

High integration makes this third-generation Switched Mode Power Supply (SMPS) controller IC a cost-efffective choice for notebook power adapters, since it uses very few external components.

Features

- General
  - Integrated PFC controller and flyback controller
  - Low external component count
  - High voltage start-up current source
  - Wide VCC range (38 V)
  - Fast latch reset function for fast recovery by mains interrupt
  - Soft (re)start for flyback and PFC controller
  - Mains under-voltage and brown-out protection integrated
- Flyback controller
  - Zero voltage switching
  - Quasi-resonant operation with frequency limitation
  - Frequency reduction at low loads
- PFC controller
  - Quasi-resonant operation with frequency limitation
  - Input voltage compensation for control loop
  - Switches off automatically during standby/low-power mode (via flyback controller)
  - Dedicated circuitry to prevent audible noise during low-power mode



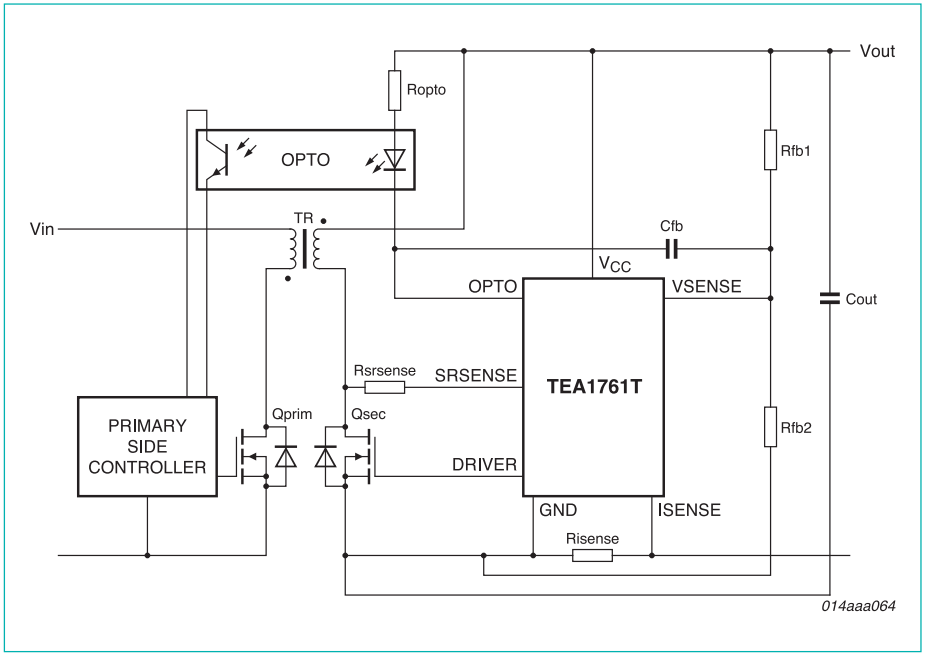
2. Power management

GreenChip synchronous rectifiers TEA1719T and TEA1761T/62T

These controller ICs are dedicated for synchronous rectification on the secondary side of discontinuous conduction mode and quasi-resonant flyback converters. They are are ideal for the design of a cost-effective notebook power adapter. The TEA1761T builds on the TEA1719T by adding internal circuitry for over-temperature protection, and the TEA1762T is an enhanced version of the TEA1761T.

Features

- TEA1719T and TEA1761T/62T
  - Strong drive capability
  - High driver-output voltage (10 V) to drive all MOSFET brands to the lowest $R_{DS(ON)}$
  - Discrimination between primary stroke and ringing at low mains
  - Wide V_{CC} range (8.5 to 38 V)
  - Accurate internal voltage reference for voltage control (within 1%)
  - Integrated primary-side control/feedback function
  - No aux-winding for supply needed
  - Under-voltage protection
  - Internal over-temperature protection (TEA1761T/62T only)
  - Low current consumption
  - High integration (low external component count)
  - Minimum PCB space required
- TEA1762T only
  - General-purpose latch input for protection purposes
  - Accurate reference output (2.5 V) for external OTP protection
  - Additional sense ground for more accurate voltage control
  - Additional optocoupler drive output for higher flexibility (protection and control)



2. Power management

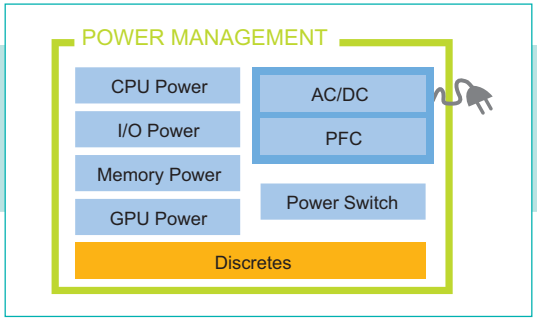
GreenChip resonant controller TEA1713T

This multi-chip IC integrates a PFC controller and a controller for a Half-Bridge resonant Converter (HBC). It provides the drive function for the discrete MOSFET in an up-converter and for the two discrete power MOSFETs in a resonant half-bridge configuration. It enables highly efficient and reliable power supplies providing over 100 W with a minimum of external components.

Features

- General
  - Integrated PFC + resonant controller
  - On-chip high-voltage start-up source
  - Standalone operation or IC supply from external DC supply
  - Extended wide supply voltage range (36 V)
- PFC controller
  - Boundary mode operation with on-time control
  - Valley/zero-voltage switching for minimum switching losses
  - Frequency limitation to reduce switching losses
  - Accurate boost voltage regulation
  - Burst mode switching with soft-start and soft-stop
- Advanced resonant half-bridge controller (HBC)
  - Adaptive non-overlap timing (cycle-by-cycle)
  - Burst-mode switching
  - Integrated high-voltage level shifter
  - Adjustable minimum and maximum frequency (max. freq. = 500 kHz)

2. Power management

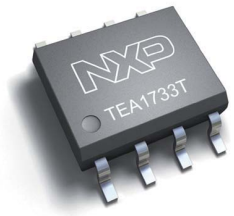


GreenChip III SMPS controllers TEA1733T/33LT

Intended for flyback topologies, these SMPS controllers integrate slope compensation for Continuous Current Mode (CCM) operation, and implement frequency jitter to reduce EMI. They enable low-cost, highly efficient and reliable adapters of up to 75 W with a minimum of external components.

Features

- Large input voltage range (12 to 30 V)
- Very low supply current during start-up and restart (typically 10 µA)
- Low supply current during normal operation (typically 0.5 mA without load)
- Overpower or high/low line compensation
- Adjustable overpower time-out
- Adjustable overpower restart timer
- Fixed switching frequency with frequency jitter to reduce EMI
- Frequency reduction with fixed minimum peak current to maintain high efficiency at low output power levels
- Slope compensation for CCM operation
- Low and adjustable OverCurrent Protection (OCP) trip level
- Adjustable soft start operation
- Two protection inputs
- IC overtemperature protection

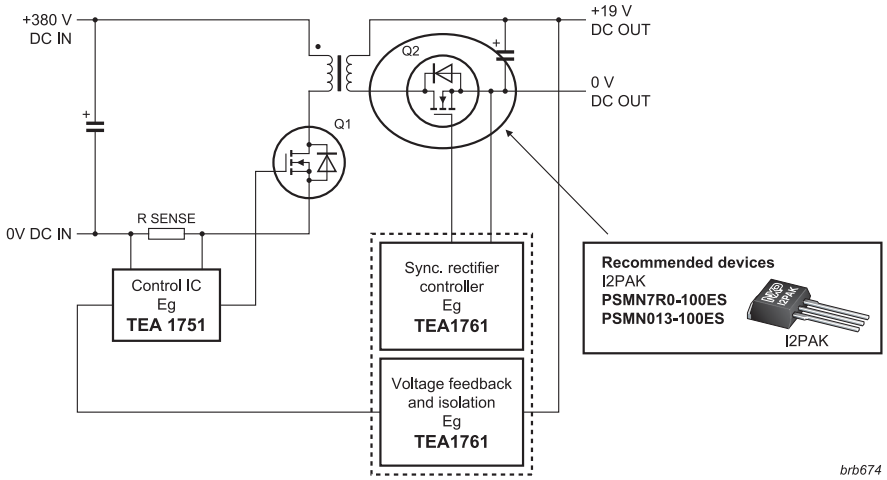


100 V N-channel MOSFETs PSMN7R0-100ES and PSMN013-100ES

These devices are recommended for use with the GreenChip ICs TEA1751 and TEA1761, in applications that use an adapter with AC/DC isolated flyback.

Features

- Low $R_{DS(ON)}$ and $Q_{G(tot)}$ for better efficiency
- Low-profile I^2PAK package



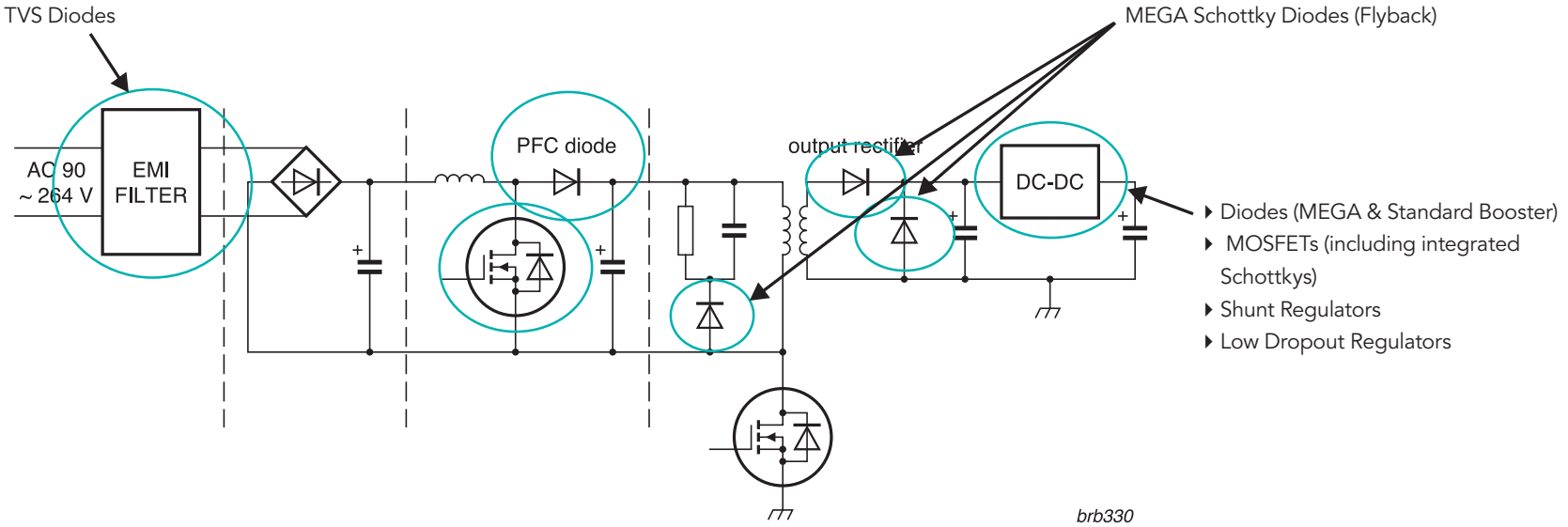
2. Power management

PFC diodes for BYCxxxx

Our Casco diodes form a new family of Continuous Current Mode Power Factor Correction (CCM PFC) diodes with hyperfast recovery speed. Equipped with advanced dice-in-series connection technology, the BYCxxxx family achieves a typical trr value less than 13 ns, and a maximum voltage drop of 2.4 V at 150 °C. This significantly minimizes power losses for the diode and for the switching MOSFET.

Features

- Reduces system losses in order to meet more stringent eco-design standards
- Cooler running devices for improved reliability
- Industrial standard package, for ease of use and better deliver of sustainability
- Better cost/performance ratio compared to SiC Schottky rectifiers



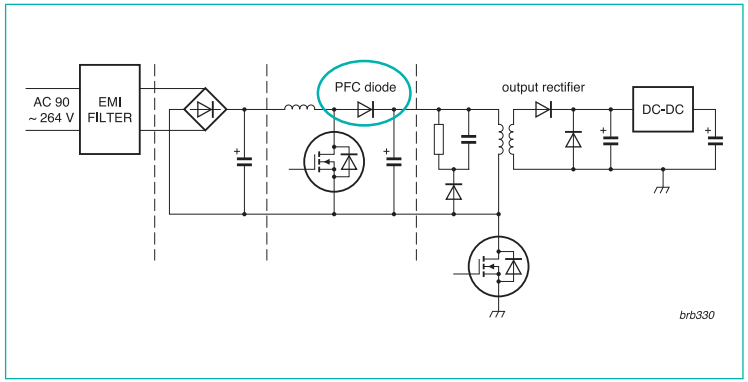
2. Power management

2.3 Discretes for power management

We offer a variety of discrete devices for SMPS systems and DC/DC conversion, including TVS diodes, Schottky diodes, small-signal MOSFETs, shunt regulators, and LDO regulators.

Discretes for SMPS

We make it easier to achieve efficient designs with MEGA Schottky diodes that offer improved low forward voltage characteristics (<0.4 V_F[V]). We also offer a variety of protection diodes, low $R_{DS(ON)}$) MOSFETs, and proven voltage regulator solutions that allow for optimal cost performance.

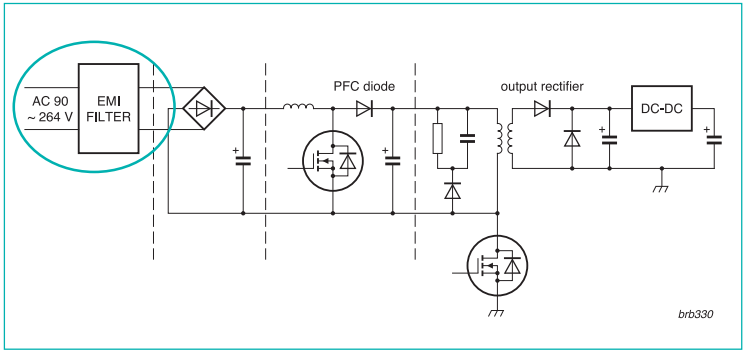


Transient Voltage Suppression (TVS) diodes (400 to 600 W) PTVSxxxxx

Offline power supplies are highly susceptible to damage caused by strong transient voltage surge pulses resulting from lighting strikes or (more commonly) inductive switching or load dumping. Our unidirectional TVS diodes are designed to protect against these transient over-voltage conditions. They're available in plastic surface-mounted packages (such as SOT23), and also in the new Flatpower SOD123W, a small plastic package with flat leads.

Features

- Double peak pulse power compared to competition in same or similar package
- 50% reduced board space compared to SMA package
- 50% reduced height compared to SMA package
- Very low leakage current



Part Number	Description
PTVSxS1UR	400W TVS in SOD123W package V_{rwm} = 3.3 – 64 V
PTVSxP1UP	600W TVS in SOD128 package V_{rwm} = 3.3 – 64 V

2. Power management

Transient Voltage Suppression (TVS) Diodes – 400 W

Type name	Package	Power (10:1000 us waveform)	V_{RWM}	I_{RM} typ @ V_{RWM}	V_{BR} typ @ I_R	I_R	V_{CL} max @ I_{PP}	I_{PP} (A)
PTVS3V3S1UR	SOD123D	350 W	3.3 V	5 µA	5.6 V	10 mA	8 V	43.8 A
PTVS5V0S1UR		400 W	5 V		6.7 V		9.2 V	43.5 A
PTVS6V0S1UR			6 V		7.02 V		10.3 V	38.8 A
PTVS6V5S1UR			6.5 V		7.6 V		11.2 V	35.7 A
PTVS7V0S1UR			7 V	3 µA	8.2 V		12 V	33.3 A
PTVS7V5S1UR			7.5 V	0.2 µA	8.77 V	1 mA	12.9 V	31 A
PTVS8V0S1UR			8 V	0.03 µA	9.36 V		13.6 V	29.4 A
PTVS8V5S1UR			8.5 V	0.01 µA	9.92 V		14.4 V	27.8 A
PTVS9V0S1UR			9 V	0.05 µA	10.55 V		15.4 V	26 A
PTVS10VS1UR			10 V		11.7 V		17 V	23.5 A
PTVS11VS1UR			11 V		12.85 V		18.2 V	22 A
PTVS12VS1UR			12 V		14 V		19.9 V	20.1 A
PTVS13VS1UR			13 V	0.001 µA	15.15 V		21.5 V	18.6 A
PTVS14VS1UR			14 V		16.4 V		23.2 V	17.2 A
PTVS15VS1UR			15 V		17.6 V		24.4 V	16.4 A
PTVS16VS1UR			16 V		18.75 V		26 V	15.4 A
PTVS17VS1UR			17 V		19.9 V		27.6 V	14.5 A
PTVS18VS1UR			18 V		21 V		29.2 V	13.7 A
PTVS20VS1UR			20 V		23.35 V		32.4 V	12.3 A
PTVS22VS1UR			22 V		25.6 V		35.5 V	11.3 A
PTVS24VS1UR			24 V		28.1 V		38.9 V	10.3 A
PTVS26VS1UR			26 V		30.4 V		42.1 V	9.5 A
PTVS28VS1UR			28 V		32.8 V		45.4 V	8.8 A
PTVS30VS1UR			30 V		35.1 V		48.4 V	8.3 A
PTVS33VS1UR			33 V		38.7 V		53.3 V	7.5 A
PTVS36VS1UR			36 V		42.1 V		58.1 V	6.9 A
PTVS40VS1UR			40 V		46.8 V		64.5 V	6.2 A
PTVS43VS1UR			43 V		50.3 V		69.4 V	5.8 A
PTVS45VS1UR			45 V		52.65 V		72.7 V	5.5 A
PTVS48VS1UR			48 V		56.1 V		77.4 V	5.2 A
PTVS51VS1UR			51 V		59.7 V		82.4 V	4.9 A
PTVS54VS1UR			54 V		63.15 V		87.1 V	4.6 A
PTVS58VS1UR			58 V		67.8 V		93.6 V	4.3 A
PTVS60VS1UR			60 V		70.2 V		96.8 V	4.1 A
PTVS64VS1UR			64 V		74.85 V		103 V	3.9 A

2. Power management

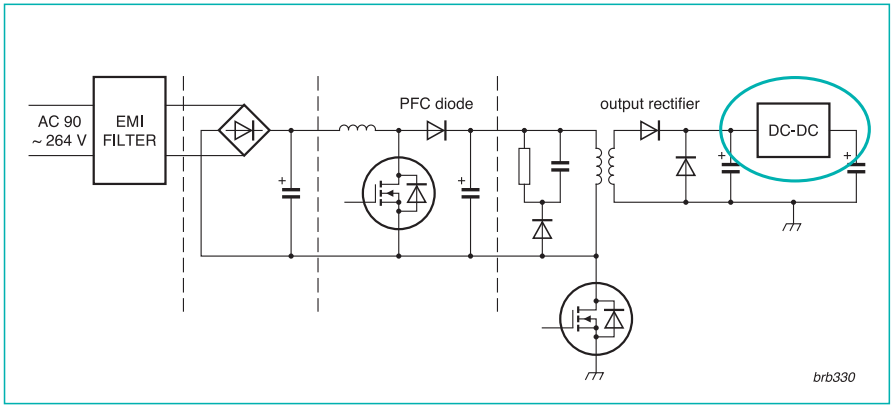
Transient Voltage Suppression (TVS) Diodes – 600 W

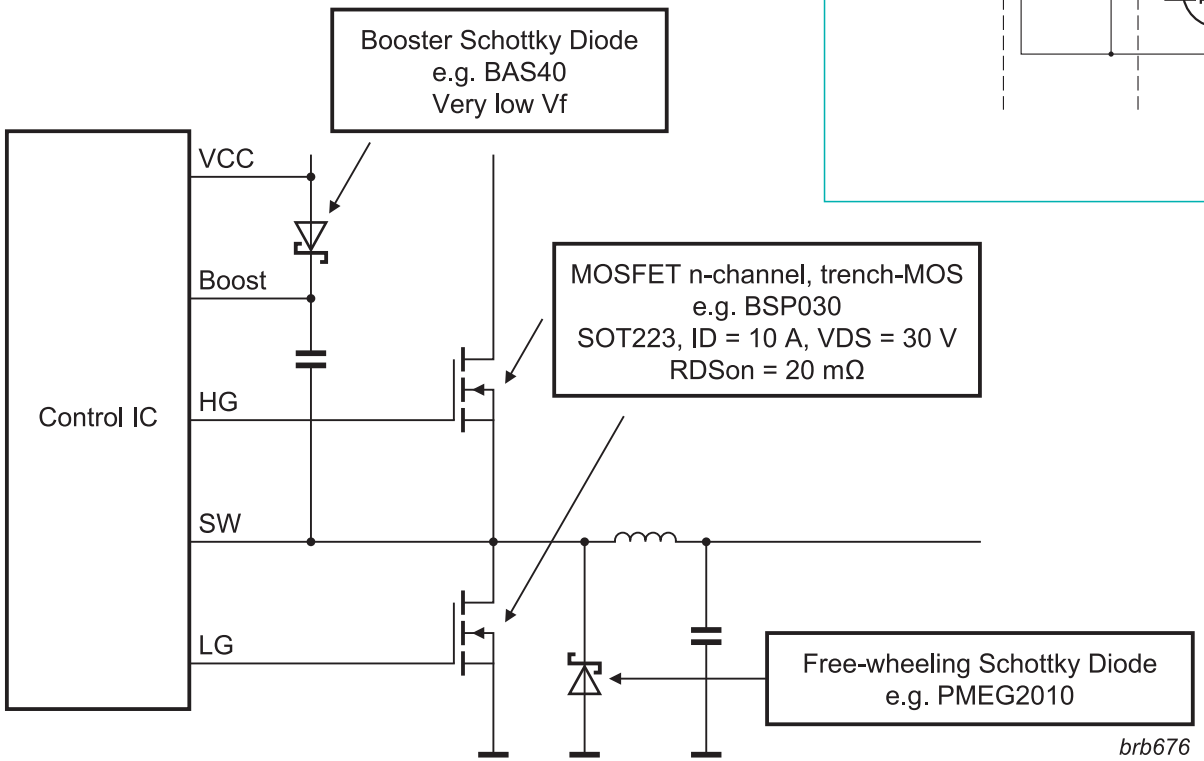
Type name	Package	Power (10:1000 us waveform)	V_{RWM}	I_{RM} typ @ V_{RWM}	V_{BR} typ @ I_R	I_R	V_{CL} max @ I_{PP}	I_{PP} (A)
PTVS3V3P1UP	SOD128	600 W	3.3 V	5 µA	5.6 V	10 mA	8 V	75 A
PTVS5V0P1UP			5 V		6.7 V		9.2 V	65.2 A
PTVS6V0P1UP			6 V		7.02 V		10.3 V	58.3 A
PTVS6V5P1UP			6.5 V		7.6 V		11.2 V	53.6 A
PTVS7V0P1UP			7 V	3 µA	8.2 V		12 V	50 A
PTVS7V5P1UP			7.5 V	0.2 µA	8.77 V	1 mA	12.9 V	46.5 A
PTVS8V0P1UP			8 V	0.03 µA	9.36 V		13.6 V	44.1 A
PTVS8V5P1UP			8.5 V	0.01 uA	9.92 V		14.4 V	41.7 A
PTVS9V0P1UP			9 V	0.005 µA	10.55 V		15.4 V	39 A
PTVS10VP1UP			10 V		11.7 V		17 V	35.3 A
PTVS11VP1UP			11 V		12.85 V		18.2 V	33 A
PTVS12VP1UP			12 V		14 V		19.9 V	30.2 A
PTVS13VP1UP			13 V	0.001 µA	15.15 V		21.5 V	27.9 A
PTVS14VP1UP			14 V		16.4 V		23.2 V	25.9 A
PTVS15VP1UP			15 V		17.6 V		24.4 V	24.6 A
PTVS16VP1UP			16 V		18.75 V		26 V	23.1 A
PTVS17VP1UP			17 V		19.9 V		27.6 V	21.7 A
PTVS18VP1UP			18 V		21 V		29.2 V	20.5 A
PTVS20VP1UP			20 V		23.35 V		32.4 V	18.5 A
PTVS22VP1UP			22 V		25.6 V		35.5 V	16.9 A
PTVS24VP1UP			24 V		28.1 V		38.9 V	15.4 A
PTVS26VP1UP			26 V		30.4 V		42.1 V	14.3 A
PTVS28VP1UP			28 V		32.8 V		45.4 V	13.2 A
PTVS30VP1UP			30 V		35.1 V		48.4 V	12.4 A
PTVS33VP1UP			33 V		38.7 V		53.3 V	11.3 A
PTVS36VP1UP			36 V		42.1 V		58.1 V	10.3 A
PTVS40VP1UP			40 V		46.8 V		64.5 V	9.3 A
PTVS43VP1UP			43 V		50.3 V		69.4 V	8.6 A
PTVS45VP1UP			45 V		52.65 V		72.7 V	8.3 A
PTVS48VP1UP			48 V		56.1 V		77.4 V	7.8 A
PTVS51VP1UP			51 V		59.7 V		82.4 V	7.3 A
PTVS54VP1UP			54 V		63.15 V		87.1 V	6.9 A
PTVS58VP1UP			58 V		67.8 V		96.8 V	6.2 A
PTVS60VP1UP			60 V		70.2 V		96.8 V	6.2 A
PTVS64VP1UP			64 V		74.85 V		103 V	5.8 A

2. Power management

DC/DC conversion: synchronous converter

Synchronous conversion schemes are often used to increase system efficiency by using MOSFET switches. This example highlights how NXP discretes can be used to enhance such a design.





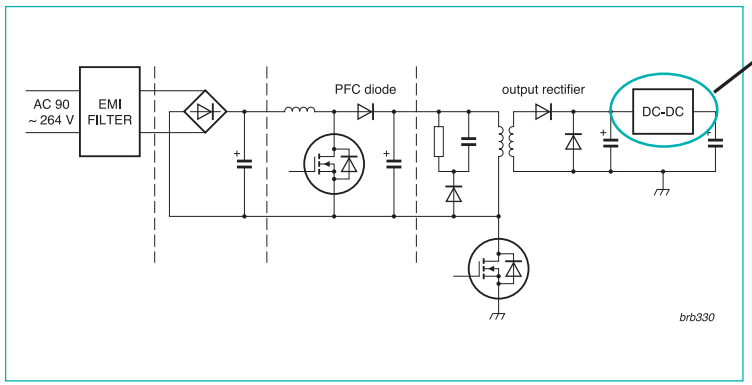
2. Power management

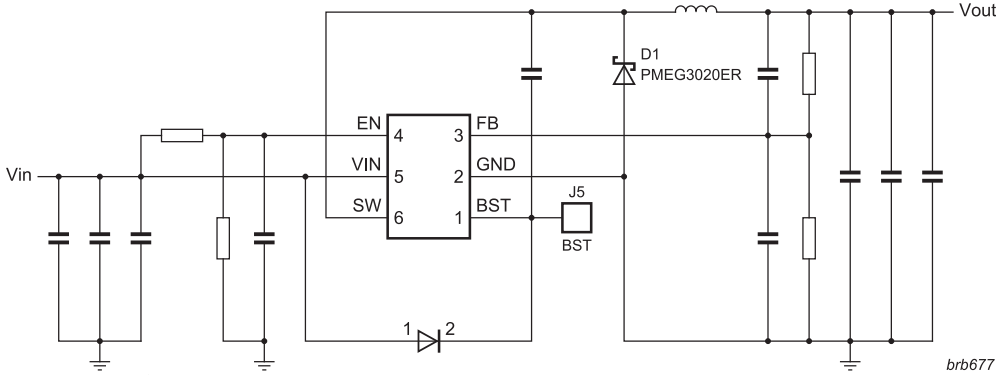
DC/DC conversion: IC-driven buck converter PMEGxxxxx

Various converter topologies are used throughout the industry to achieve the different DC operating voltages (3.3 to 12 V) typically used in notebooks. NXP offers cost-effective component solutions for nearly all these topologies, with proven reliability to enhance any power management system design. The example shown below demonstrates the use of a PMEG (Maximum Efficiency General Application) series diode optimized for use in a typical buck-converter switched-mode application.

Features

- Up to 3 A continuous current capability IF
- Ultra low forward voltage drop VF
- Low reverse current IR
- Low power dissipation
- Integrated guard ring for stress protection





example
PMEG3020ER:
30 V / 2 A Schottky
low VF (520 mV @ 2A I_F)
SOD123W, FlatPower
package

2. Power management

DC/DC conversion: Schottky booster diodes

Typenumber	Package	V_R mAx (V)	I_F mAx (mA)	V_F mAx (mV)	I_R mAx (µA)	I_{FSM} mAx (A)	C_d mAx (pF)
BAS70H	SOD123F	70	70	750 @ I_F = 10 mA	0.1 @ V_R = 50 V	100	2 @ V_R = 0 V
1PS76SB70	SOD323	70	70	750 @ I_F = 10 mA	0.1 @ V_R = 50 V	100	2 @ V_R = 0 V
BAS70L	SOD882	70	70	750 @ I_F = 10 mA	0.1 @ V_R = 50 V	100	2 @ V_R = 0 V
BAS70	SOT23	70	70	750 @ I_F = 10 mA	0.1 @ V_R = 50 V	100	2 @ V_R = 0 V
BAS70W	SOT323	70	70	750 @ I_F = 10 mA	0.1 @ V_R = 50 V	100	2 @ V_R = 0 V
BAS40H	SOD123F	40	120	500 @ I_F = 10 mA	1 @ V_R = 30 V	200	5 @ V_R = 0 V
1PS76SB40	SOD323	40	120	500 @ I_F = 10 mA	1 @ V_R = 30 V	200	5 @ V_R = 0 V
RB751S40	SOD523	40	120	370 @ I_F = 1 mA	0.5 @ V_R = 30 V	200	2 @ V_R = 1 V
BAS40L	SOD882	40	120	500 @ I_F = 10 mA	1 @ V_R = 30 V	200	5 @ V_R = 0 V
RB751CS40	SOD882	40	120	370 @ I_F = 1 mA	0.5 @ V_R = 30 V	200	2 @ V_R = 1 V
BAS40	SOT23	40	120	500 @ I_F = 10 mA	1 @ V_R = 30 V	200	5 @ V_R = 0 V
1PS70SB40	SOT323	40	120	500 @ I_F = 10 mA	1 @ V_R = 30 V	200	5 @ V_R = 0 V
BAS40W	SOT323	40	120	500 @ I_F = 10 mA	1 @ V_R = 30 V	200	5 @ V_R = 0 V
BAT54H	SOD123F	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
1PS76SB21	SOD323	40	200	300 @ I_F = 10 mA	15 @ V_R = 30 V	1000	50 @ V_R = 0 V
BAT54J	SOD323F	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
1PS79SB10	SOD523	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
RB520S30	SOD523	30	200	600 @ I_F = 200 mA	1 @ V_R = 10 V	1000	20 @ V_R = 1 V
BAT54L	SOD882	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
BAT54	SOT23	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
BAT721	SOT23	40	200	300 @ I_F = 10 mA	15 @ V_R = 30 V	1000	50 @ V_R = 0 V
BAT754	SOT23	30	200	340 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
1PS70SB10	SOT323	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
BAT54W	SOT323	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V
BAT54CM	SOT883	30	200	400 @ I_F = 10 mA	2 @ V_R = 25 V	600	10 @ V_R = 1 V

2. Power management

DC/DC conversion: ultra-low-V_F PMEG Schottky diodes

types in **bold** represent new products

I_F max (A)	V_R max (V)	V_F max (mV) @ I_F max	I_R max (mA) @ V_R max	Package	SOD128	SOT457 (SC-74)	SOT23	SOD123W	SOD123F	SOT1061	SOT323 (SC-70)	SOD323F (SC-90)	SOD323 (SC-76)	SOT666	SOD523 (SC-79)	SOD882	SOD882D
				Size (mm)	3.8 x 2.5 x 1.0	2.9 x 1.5 x 1.0	2.9 x 1.3 x 1.0	2.6 x 1.7 x 1.0	2.6 x 1.6 x 1.1	2.0 x 2.0 x 0.65	2.0 x 1.25 x 0.95	1.7 x 1.25 x 0.7	1.7 x 1.25 x 0.95	1.6 x 1.2 x 0.55	1.2 x 0.8 x 0.6	1.0 x 0.6 x 0.5	1.0 x 0.6 x 0.37
				P_{tot} (mW) @ 1 cm²	1050	540	420	950	830	1000	250	830	570	570	450	250	250
				Optimization													
0.2	30	480	0.04	low V_F								PMEG3002EJ			PMEG3002AEB	PMEG3002AEL	**PMEG3002AELD**
	40	600	0.01	low I_R								PMEG4002EJ			PMEG4002EB	PMEG4002EL	**PMEG4002ELD**
	60	600	0.1	low V_F								PMEG6002EJ			PMEG6002EB		
0.5	20	390	0.2	low V_F			PMEG2005ET		PMEG2005EH			PMEG2005EJ	PMEG2005AEA	PMEG2005AEV			
		440	1.5	low V_F												PMEG2005AEL	**PMEG2005AELD**
		480	0.01	low I_R											PMEG2005EB		
		500	0.03	low I_R												PMEG2005EL	**PMEG2005ELD**
	30	430	0.15	low V_F			PMEG3005ET		PMEG3005EH			PMEG3005EJ	PMEG3005AEA	PMEG3005AEV			
		500	0.5	low V_F											PMEG3005EB	PMEG3005EL	**PMEG3005ELD**
	40	470	0.1	low V_F			PMEG4005ET		PMEG4005EH			PMEG4005EJ	PMEG4005AEA	PMEG4005AEV			
		550	0.1	low V_F			BAT720				1PS70SB20						
1.0	20	340	1	low V_F				PMEG2010ER									
		375	1.9	low V_F						PMEG2010EPA							
		430	0.2	low V_F			PMEG2010AET		PMEG2010AEH								
		450	0.05	low I_R				PMEG2010BER									
		500	0.2	low V_F			PMEG2010ET		PMEG2010EH			PMEG2010EJ	PMEG2010BEA	PMEG2010BEV			
		550	0.07	low I_R								PMEG2010AEJ	PMEG2010EA BAT760	PMEG2010EV BAT960			
		620	1.5	low V_F											PMEG2010AEB		
	30	450	1.0	low V_F		1PS74SB23											
		360	1.5	low V_F	PMEG3010EP			PMEG3010ER									
		450	0.05	low I_R	PMEG3010BEP			PMEG3010BER									
		520	0.05	low I_R					PMEG3010CEH			PMEG3010CEJ					
		560	0.15	low V_F			PMEG3010ET		PMEG3010EH			PMEG3010EJ	PMEG3010BEA	PMEG3010BEV			
		680	0.5	low V_F											PMEG3010EB		
	40	490	0.05	low V_F	PMEG4010EP			PMEG4010ER									
		640	0.1	low V_F			PMEG4010ET		PMEG4010EH			PMEG4010EJ	PMEG4010BEA	PMEG4010BEV			
		570	0.05	low I_R					PMEG4010CEH			PMEG4010CEJ					
	60	530	0.06	low V_F	PMEG6010EP			PMEG6010ER									
		650	0.35	low V_F		PMEG6010AED											
		660	0.05	low I_R					PMEG6010CEH			PMEG6010CEJ					
1.5	20	660	0.07	low I_R					PMEG2015EH			PMEG2015EJ	PMEG2015EA	PMEG2015EV			
	30	550	1.0	low V_F					PMEG3015EH			PMEG3015EJ		PMEG3015EV			
2.0	10	460	3.0	low V_F					PMEG1020EH			PMEG1020EJ	PMEG1020EA	PMEG1020EV			
	20	420	1.9	low V_F						PMEG2020EPA							
		525	0.2	low V_F					PMEG2020EH			PMEG2020EJ	PMEG2020AEA				
	30	360	3.0	low V_F	PMEG3020EP												
		420	1.5	low V_F	PMEG3020CEP			PMEG3020ER									
		450	0.1	low I_R	PMEG3020BEP												
		470	2.5	low V_F						PMEG3020EPA							
		520	0.05	low I_R	PMEG3020DEP			PMEG3020BER									
		620	1.0	low V_F					PMEG3020EH			PMEG3020EJ					
	40	490	0.1	low V_F	PMEG4020EP			PMEG4020ER									
		535	0.1	low V_F						PMEG4020EPA							
	60	530	0.15	low V_F	PMEG6020EP			PMEG6020ER									
		575	0.25	low V_F						PMEG6020EPA							
3.0	10	530	3.0	low V_F					PMEG1030EH			PMEG1030EJ					
	30	360	5.0	low V_F	**PMEG3030EP**												
		450	0.15	low I_R	**PMEG3030BEP**												
	40	490	0.2	low V_F	**PMEG4030EP**												
		540	0.1	low I_R				**PMEG4030ER**									
	60	530	0.2	low V_F	**PMEG6030EP**												
5.0	30	360	8.0	low V_F	**PMEG3050EP**												
		450	0.25	low I_R	**PMEG3050BEP**												
	40	490	0.3	low V_F	**PMEG4050EP**												

In the Spotlight

Low V_F (MEGA) Schottky rectifiers in new leadless SOD882D

- Ultra low package height of only 0.37 mm typ
- Tin-plated solderable side pads
- Ultra small dimensions 1.0 x 0.6 mm
- Portfolio of five low V_F (MEGA) Schottky diodes (I_F up to 0.5 A)
- AEC-Q101 qualified

2. Power management

DC/DC conversion: small-signal MOSFETs

V_{DS} max	I_{DS} max	SOT23	SOT323	SOT363 single	SOT363 dual	SOT873	SOT457 single	SOT416	SOT883	SOT23	SOT457 single
12	5.7						PMN28UN				
20	1.0		PMF290XN		PMGD290XN			PMR290XN			
	1.02		PMF280UN		PMG280UN			PMR280UN			
	1.6								PMZ250UN		
	2.15								PMZ270XN		
	3.8									PMV65XP	
	4.1						PMN55LN				
	4.3										PMN50XP
	5.7						PMN23UN				
							PMN27UN				
							PMN34LN				
	5.9	PMV31XN									
	6.0	PMV30UN									
30	0.57		PMF400UN								
	0.83				PMGD400UN			PMR400UN			
	0.87		PMF370XN		PMGD370XN			PMR370XN			
	1.02			PMG370XN							
	1.26								PMZ390UN		
	1.87								PMZ350XN		
	4.6						PMN49EN				
	4.7	PMV60EN									
	4.9	PMV40UN					PMN34UN				
	5.2						PMN45EN				
	5.4	PMV45EN					PMN38EN				
							PMN40LN				
60	0.3	2N7002									
	0.385	2N7002E									
	0.475	2N7002F									
	0.49				PMGD780SN						
	0.57							PMR780SN			
	0.85								PMZ760SN		
	0.87		PMF780SN								
100	1.9	PM213SN									
200	8.8					PML260SN					
220	7.3					PML340SN					

2. Power management

DC/DC conversion: shunt regulators TL431xxxxx

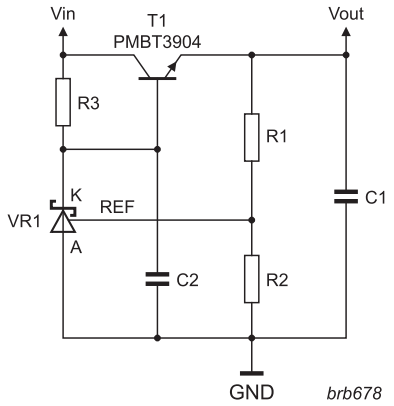
Where cost and space are critical concerns, NXP offers an adjustable shunt regulator option for additional design flexibility. In addition to providing a stable DC output voltage for system use, it also is an effective source to provide a reference voltage for the control system of many power management systems.

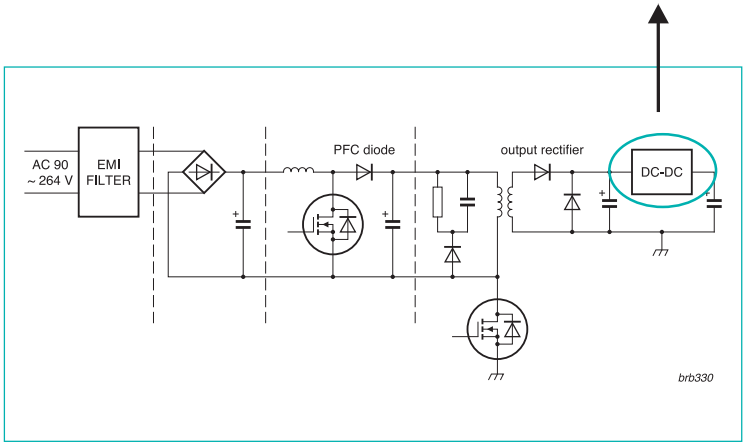
Features

- V_{ref} = 2.5 to 36 V (programmable) [1.2 V possible for TLVH431xxxxx(x)]
- Three tolerances for the reference voltage (0.5, 1.0, and 2.0%)
- Can also be used in isolated feedback loop in power supplies (opto-coupler)
- Replacements for Zener diodes (linear voltage regulator)
- High temperature stability, excellent step response

Part Number	Description
TL431xxx(x)(x)	V_{KA} = 36V_{IK} = 100 mA: CD = 0 – 70 T_{amb} (°C) I_D = -40 – 85 T_{amb} (°C) QD = -40 – 125 T_{amb} (°C)
TLVH431xxxxx(x)	V_{KA} = 20; V_{IK} = 80 mA: CD = 0 – 70 T_{amb} (°C) I_D = -40 – 85 T_{amb} (°C) QD = -40 – 125 T_{amb} (°C)

Linear voltage regulator for >100 mA





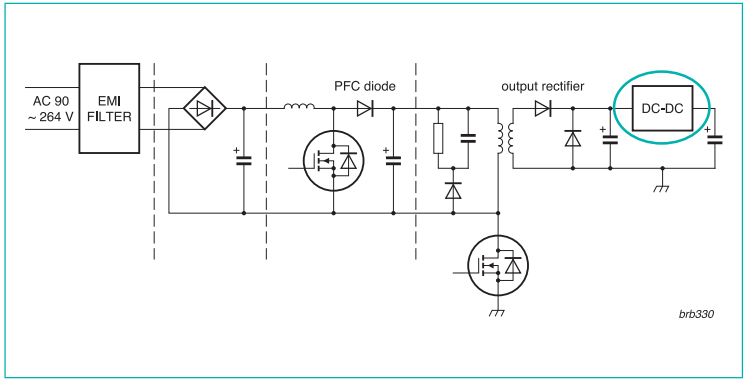
2. Power management

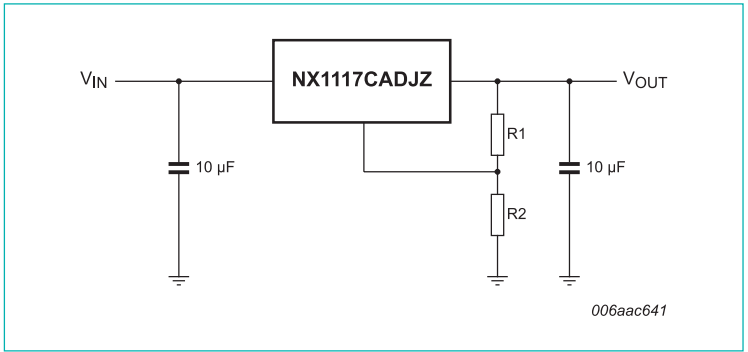
DC/DC conversion: LDO regulators NX1117xxxxx

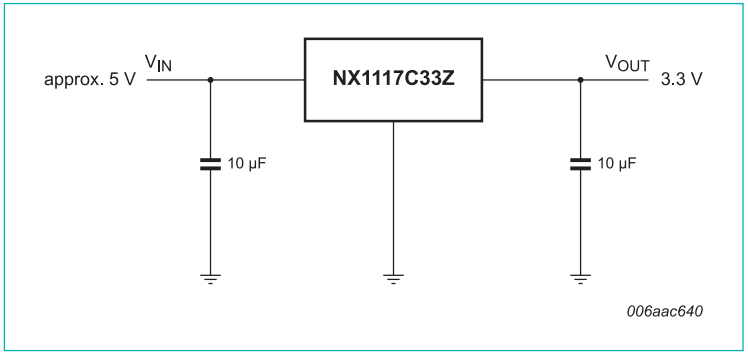
Low DropOut (LDO) voltage regulators are familiar to most notebook designers. NXP is proud to offer an industry-standard SOT223 solution that meets the rigid quality requirements of the automotive AEC-Q100 specification. This family provides a proven, cost-effective way to deliver a stable output voltage in many different load applications.

Features

- Adjustable output voltage with Vref = 1.25 V
- Fixed output voltages (1.2, 1.5, 1.8, 1.9, 2.0, 2.5, 2.85, 3.3, 5.0, 12 V)
- Up to 1000 mA output current
- Input voltage up to 20 V
- Internal current and thermal limit
- Low voltage drop of 1 V at 500 mA
- Two temperature ranges: 0 to 125 and -40 to 125 °C



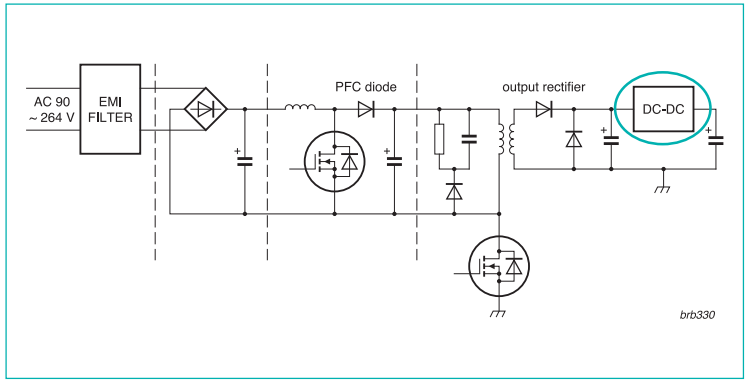


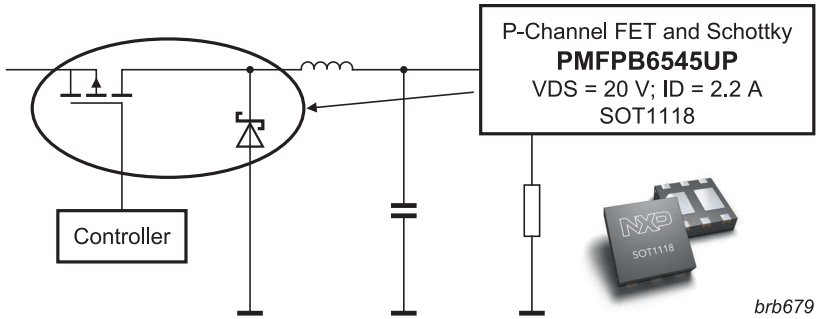


2. Power management

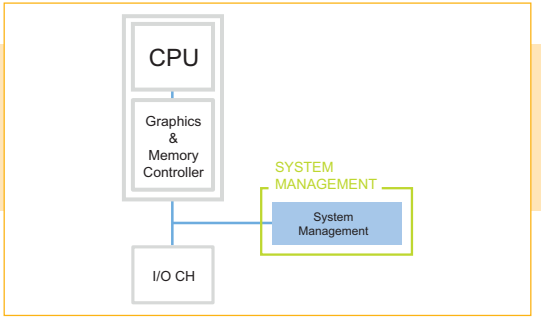
DC/DC conversion: buck converter with FET-KY PMFPB6545UP

For a simpler, more cost-friendly alternative to the common buck converter method, designers can now combine the MOSFET and Schottky diode functions in a single package.





3. System management



Low-power microcontrollers can be used in notebooks to replace discrete components and act as a secondary IC for environment management. They can wake the host CPU when a task needs to be performed, monitor current and voltage levels, track temperature in the system, or serve a variety of other housekeeping functions that let the CPU to perform its primary tasks.

3.1 SLow-power ARM Cortex-M0 microcontrollers

All our Cortex-M devices build on an optimized ARM core to deliver higher performance, consume less power, and offer more peripherals. Designers can choose from the many tools available in the ARM ecosystem, or use a single, comprehensive toolchain to support all

50 MHz, 32-bit ARM Cortex-M0 microcontrollers LPC1100L series

Building on the smallest, lowest-power, and most energy-efficient ARM core ever developed, the LPC1100L series is also the lowest-priced 32-bit MCU solution on the market. It is a high-value, easy-to-use option that delivers unprecedented performance, simplicity, and power. It also uses the optimized Thumb instruction set, which produces remarkably dense code, so the design can often use a smaller memory to support comparable functionality.

Features

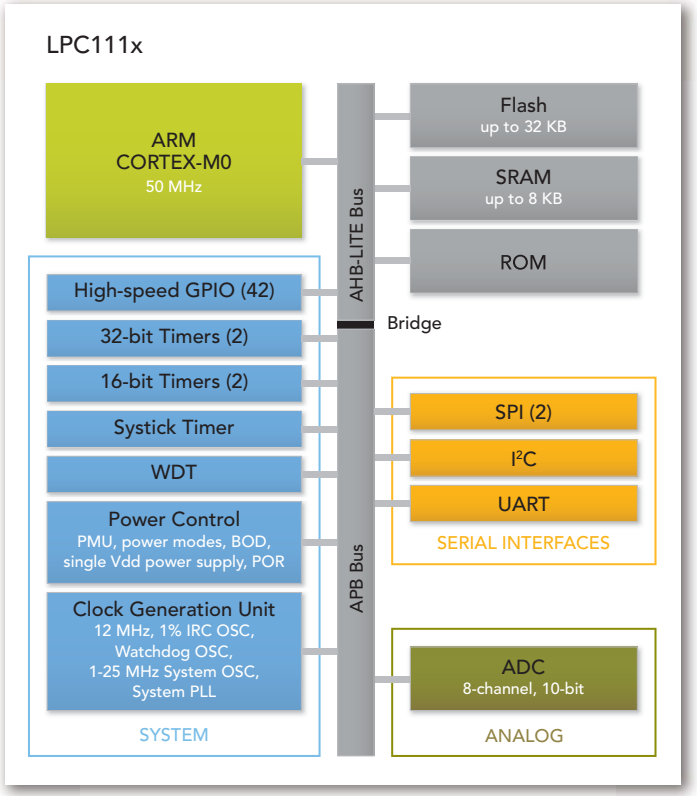
- 50 MHz Cortex-M0 core
- Up to 32 KB Flash
- Up to 8 KB SRAM
- Serial peripherals: I^2C Fast-mode Plus, two SPI with FIFO, UART, RS-485
- 8-channel, 10-bit ADC
- Lowest active power consumption (only 130 µA/MHz)
- Up to 42 high-speed GPIO
- Superior code density compared to traditional 8/16-bit MCUs
- Supported by NXP's low-cost LPCXpresso toolchain

3. System management

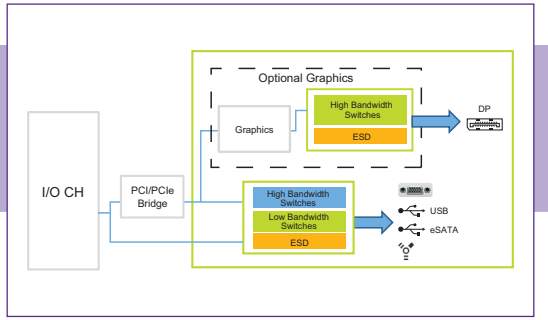
LPC1100L selection guide

Type	Memory		Timers		Serial interfaces			Analog	I/O pins	Package
	Flash (KB)	SRAM (KB)	No. of timers*	PWM channels	UART	I²C	SSP/SPI	ADC channels/ resolution		
LPC1114	32	4 to 8	5	11**	1	1	1 to 2	8ch 10b	28 to 42	HVQFN33, LQFP48
LPC1113	24	4 to 8	5	11**	1	1	1 to 2	8ch 10b	28 to 42	HVQFN33, LQFP48
LPC1112	16	2 to 4	5	11**	1	1	1	8ch 10b	28	HVQFN33
LPC1111	8	2 to 4	5	11**	1	1	1	8ch 10b	28	HVQFN33

LPC1100L block diagram



4. Bus expansion



4.1 High-bandwidth switches and HDMI/DVI level shifters (see 1.1 and 1.2)

Our high-bandwidth switches and HDMI/DVI level shifters (see sections 1.1 and 1.2) are also recommended for use as bus expanders.

4.2 General application and low-bandwidth switches

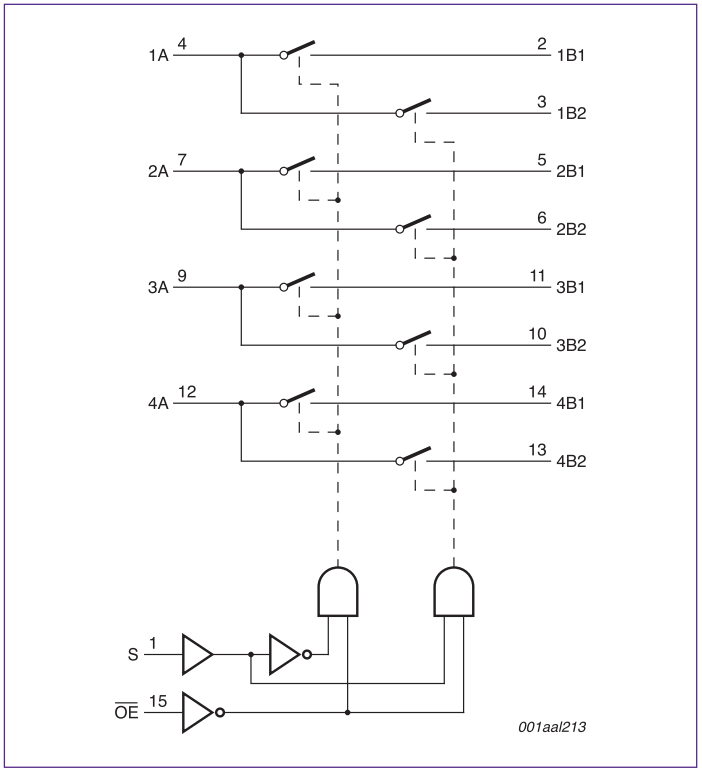
Our portfolio includes NX video switches that support VGA operation, and CBT logic for switching high-speed VSYNC/HSYNC signals to external video connectors.

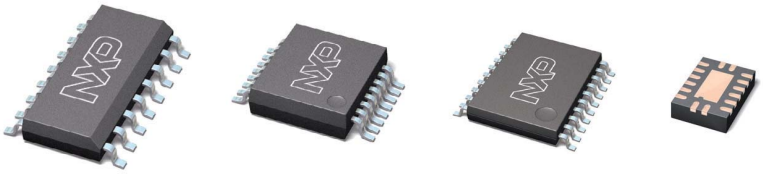
General application switches NX5DV330 and NX3DV330

With low R_{ON}, high bandwidth, and ultra-small packaging, these video switches are ideal for switching VGA signals between the notebook and its docking station.

Features

- Quad 3 and 5 V 2-1 video mux/demux
- NX5DV330: 300 MHz bandwidth
- NX3DV300: 500 MHz bandwidth
- 5Ω on resistance
- SO, SSOP, TSSOP, and DHVQFN packages





SO SSOP TSSOP DHVQFN

4. Bus expansion

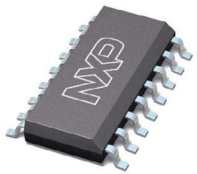
General application switches CBT3257 and CBT(D)3306

Our CBT bus switch family is fully TTL-compatible, delivers minimum propagation delay and inherent ESD protection, and is ideally suited for switching high-speed VSYNC/HSYNC signals to the extended video connectors. These devices perform a variety of unique functions, including memory interleaving and bus exchange, with very low R_{ON} and minimal cross-talk. Other features of NXP's CBT logic include bidirectional voltage level shifting in the 1 to 5 V range, typical signal isolation of up to -40 dB, and I/O signal extension.

The CBT3257A is a quad 1-of-2 high-speed mux/demux and the CBT(D)3306 is a dual-FET bus switch featuring independent line switches. Each switch is disabled when the associated output enable input is HIGH. Both devices can be used to switch high-frequency audio and video data between multiple processors and a single display interface or connector. The CBT3257A mux/demux can also be used to switch data between a single processor and various display interfaces or connectors.

Features

- CBT3257A
  - 5 Ω switch connection between two ports
  - TTL-compatible input levels
  - Minimal propagation delay through the switch
  - Latch-up protection exceeds 500 mA per JEDEC standard JESD78 class II level A
  - ESD protection:
    HBM JESD22-A114E exceeds 2000 V
    MM JESD22-A115-A exceeds 200 V
    CDM JESD22-C101C exceeds 1000 V
  - Multiple 16-pin package options
- CBT(D)3306
  - Designed to be used in 5 V to 3.3 V level shifting applications with internal diode
  - 5 Ω switch connection between two ports
  - TTL-compatible input levels
  - Latch-up protection exceeds 100 mA per JESD78B
  - ESD protection:
    HBM JESD22-A114E exceeds 2000 V
    CDM JESD22-C101C exceeds 1000 V
  - Multiple 8-pin package options


SO


SSOP


TSSOP

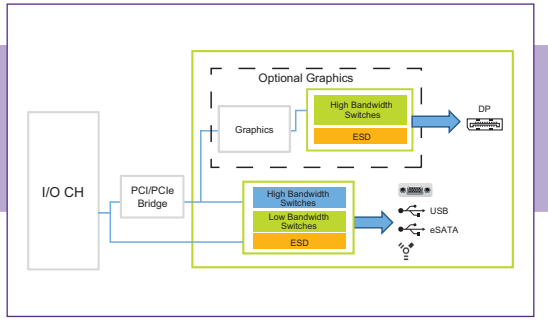

DHVQFN


TSSOP


XSON


XQFN

4. Bus expansion



4.3 ESD protection for high-speed interfaces

Our portfolio includes protection devices for multiple types of notebook interfaces. (For HDMI-specific interfaces, refer to section 1.3).

Part number	Description
IP4220/21/23	Provides ESD protection for I/O lines sensitive to capacitive load, such as USB 2.0, Ethernet, DVI, and IEEE 1394. IP4220 has four pairs of ultra-low-capacitance, rail-to-rail diodes, plus an additional Zener diode. IP4223 has two pairs of back-to-back diodes to protect signal and supply components from ESD voltages as high as ±8 kV contact discharge.
IP4282/83/84/85/92	Protects high-speed interfaces such as HDMI, DVI, DisplayPort (IP4283), SuperSpeed USB 3.0, eSATA (IP4292) and LVDS.
PESD5V0X1B	An ultra-low-capacitance, bidirectional ESD protection diode for use with one signal line. Supports DisplayPort.

ESD protection for the VGA interface

The IP4770/71/72 connects between the VGA/DVI interface and the video graphics controller. The IP4773/74 connects between a video transmitter, such as a PC graphic card, and a VGA or DVI-I receiver, such as a PC monitor.

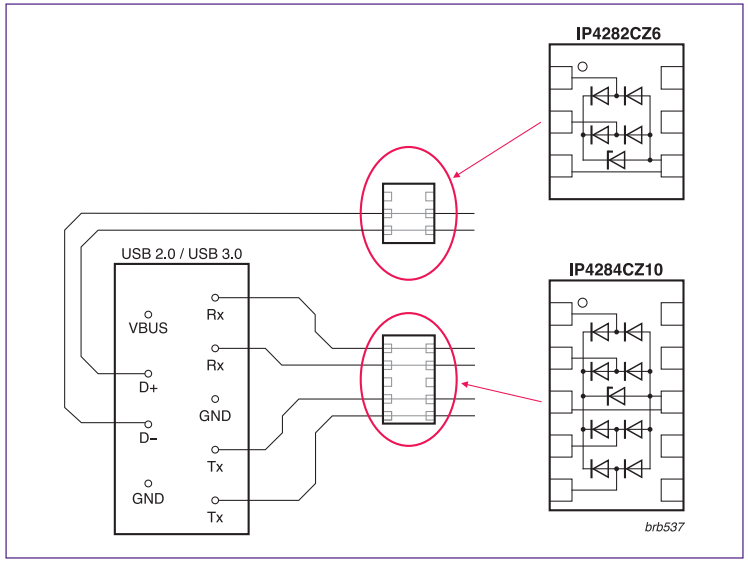
Part number	Sync buffer (R_{OUT})	Other features
IP4770	55 Ω	IEC61000-4-2, level 4, DDC level shifting, HSYNC/VSYNC buffer
IP4771	65 Ω	IEC61000-4-2, level 4, DDC level shifting, HSYNC/VSYNC buffer
IP4772	10 Ω	IEC61000-4-2, level 4, DDC level shifting, HSYNC/VSYNC buffer
IP4773	10 Ω	IEC61000-4-2, level 4, HSYNC/VSYNC buffer
IP4774	10 Ω	IEC61000-4-2, level 4, HSYNC buffer

4. Bus expansion

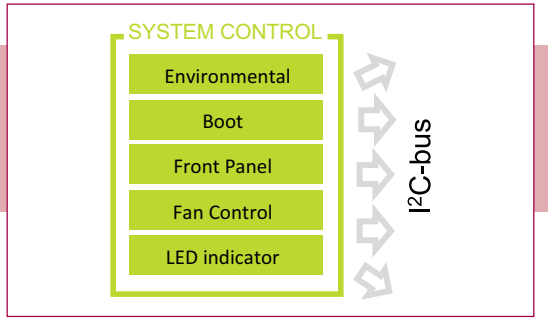
ESD protection for USB

The IP4282 and IP4284 can be used together protect a combination USB connector (USB 2.0 + USB 3.0).

Part number	Description
IP4234	Protects USB 2.0 I/O ports that are sensitive to capacitive load
IP4282	A device with one differential channel that protects the SuperSpeed USB 3.0 interface and offers extremely low capacitive load
IP4292	A device with two differential channels, for protection of SuperSpeed USB 3.0, eSATA



5. System control



For notebook system control, our I²C and SMBus portfolio includes an industry-leading selection of peripherals that enable a variety of functions. There are general-purpose I/O (GPIO) for bus expansion, bus buffers for support of extra devices, level translators for bus-voltage translation, temperature sensors for thermal management, LED drivers for LED control, and ADC/DACs for analog and audio control.

5.1 I²C solutions

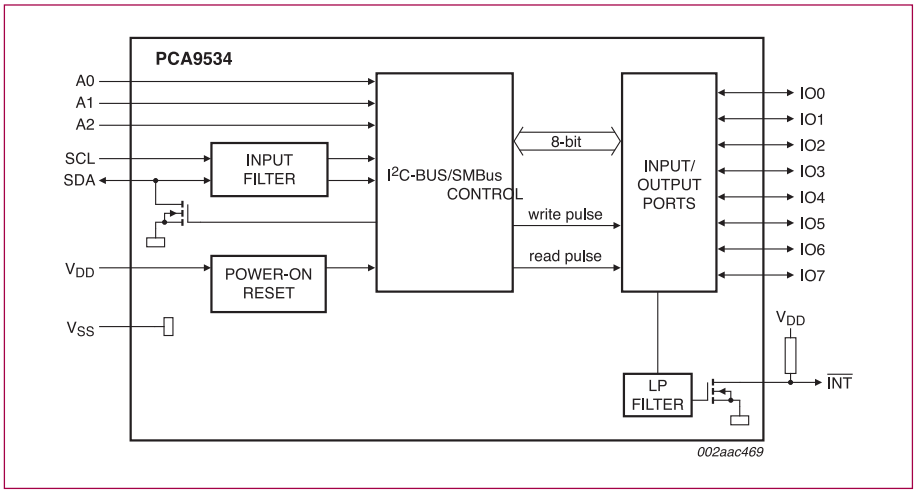
The I²C bus uses a simple two-wire format to carry data one bit at a time. It performs addressing, selection, control, and data transfer, and is a de facto standard for inter-IC communications. NXP invented the I²C bus, as Philips, more than 30 years ago. Since then, we have continued to innovate with the technology, and now offer the industry's broadest selection of bus enablers and bus peripherals, with support for Fast-mode (400 kHz) and Fast-mode Plus (1 MHz).

8/16-bit I²C/SMBus GPIO expanders PCA9534/35

A simple way to add I/O for ACPI power switches, sensors, push-buttons, LEDs, fans, and other functions. Both devices offer low power consumption (the I/O 1000 kΩ pull-up resistor has been removed), creating a very low standby current (<1 µA) that maximizes battery life. The PCA9534 is an 8-bit device and the PCA9535 is a 16-bit device.

Features

- Compatible with I²C-bus and SMBus
- 400 kHz Fast-mode I²C-bus
- 8 or 16 programmable GPIO compatible with most processors
  - Input or output
  - Push-pull or open-drain outputs
  - True bidirectional operation
- Outputs can drive LEDs directly
  - 25 mA (max) sink and 10 mA (max) source per bit
  - 100 mA (max) capacity per 8-bit register
- Active low open-drain interrupt output activates when input changes state
- Low standby current: I_{DD} <1.0 µA (max)
- 2.3 to 5.5 V supply voltage
- All I/O tolerant to 5.5 V
- Temperature range: -40 to +85 °C
- SO, TSSOP, HVQFN, and HWQFN packages



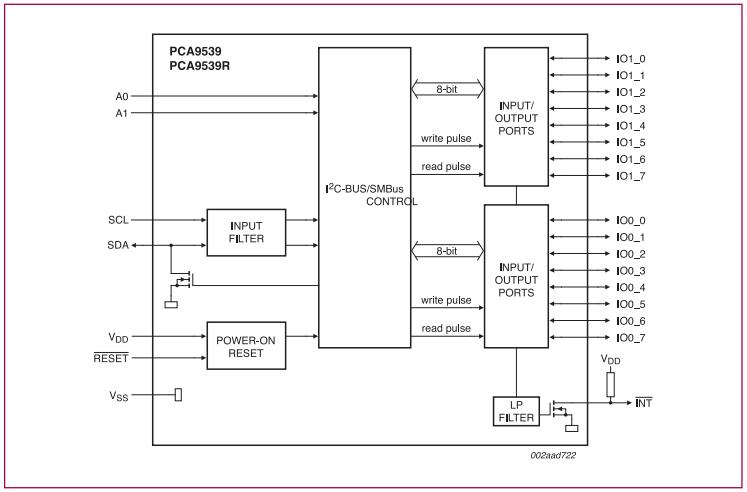
5. System control

16-bit I²C/SMBus GPIO expanders with reset PCA9539/39R

The PCA9539 is identical to the PCA9525 (above), with the addition of reset operations for the device state machine. In the "R" version, the RESET pin resets the I²C interface only (not the entire device), so any devices controlled by the outputs are unaffected by an I²C interface is reset.

Features

- Compatible with I²C-bus and SMBus
- 400 kHz Fast-mode I²C-bus
- Integrated reset function
- I²C two-wire clip-on feature offers design flexibility
- Push-pull outputs can source up to 10 mA and sink up to 25 mA
- 2.3 to 5.5 V supply voltage
- Active low open-drain interrupt output activates when input changes state
- Three programmable I²C addresses: up to 8 devices

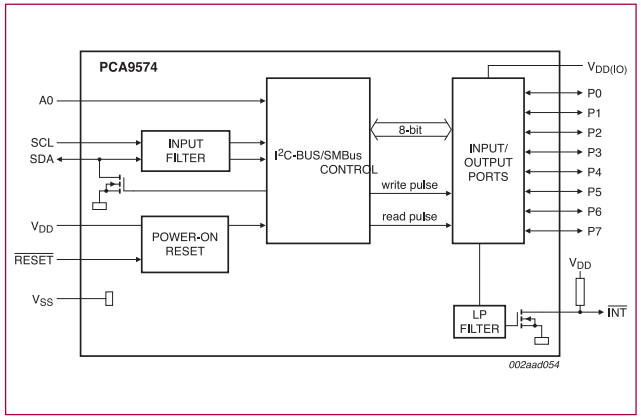


8/16-bit I²C/SMBus GPIO expanders with level translation PCA9574/75

These compact devices have a low supply current, a low operating voltage, and dual, separate supply rails that allow voltage level translation anywhere between 1.1 and 3.6 V. The PCA9574 is an 8-bit device and the PCA9575 is a 16-bit device.

Features

- 8/16 inputs/outputs
  - True bidirectional I/O
  - Push-pull outputs/open drain
  - Bus keeper feature for inputs
  - Programmable pull-up/-down
- 1.1 to 3.6 V operation with level-shifting feature
- PCA9574: 2 programmable slave addresses using 1 address pin
- PCA9575: 16 programmable slave addresses using 4 address pins (TSSOP28)
- Bit-maskable input interrupts
- Hardware/software reset
- Very low standby current (<2 µA)
- Temperature range: -40 to +85 °C
- Small-footprint packages
  - PCA9574: TSSOP16, HVQFN16, HWQFN16U
  - PCA9575: TSSOP24/28, HWQFN24



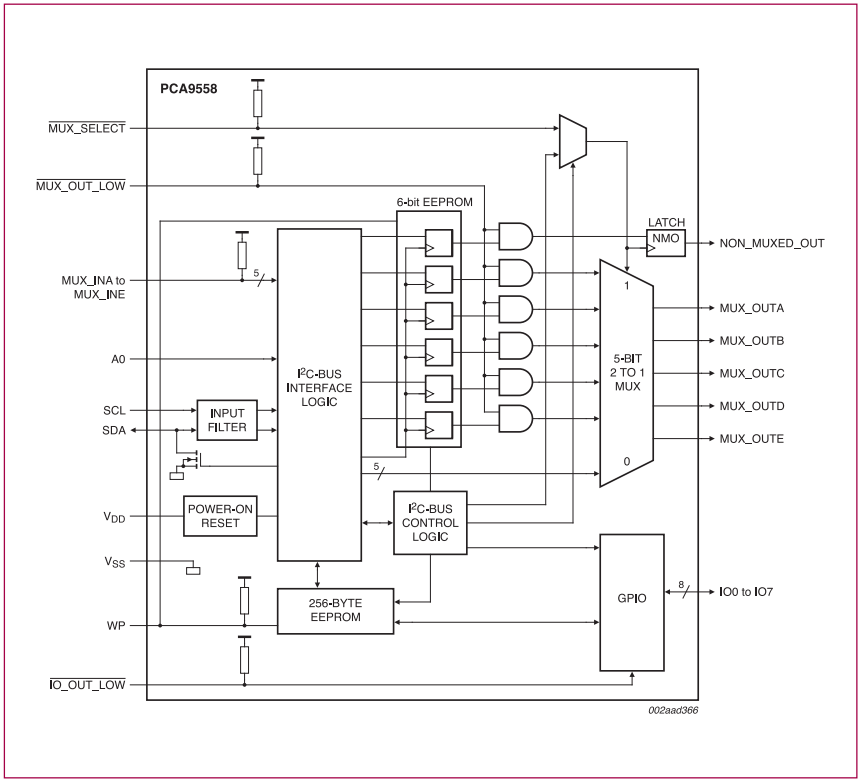
5. System control

8-bit I²C/SMBus GPIO expanders with EEPROM and DIP switch PCA9558

This multi-function device reduces component count by integrating commonly used components into a single chip.

Features

- 8 GPIO
- 5-bit 2-to-1 multiplexer, 1-bit latch DIP switch
- 6-bit EEPROM programmable and readable via I²C-bus
- Active LOW override input forces all MUX_OUTx outputs to logic 0
- 5 V tolerant open-drain I/O pins, power-up default as outputs
- 1 address pin, allowing up to 2 devices on the I²C-bus
- Active LOW reset input with internal pull-up for the 8 I/O pins
- 2048-bit EEPROM programmable and readable via the I²C-bus or I/Os
- 3.0 to 3.6 V supply voltage
- SMBus compliance with fixed 3.3 V levels
- 2.5 to 5 V tolerant inputs



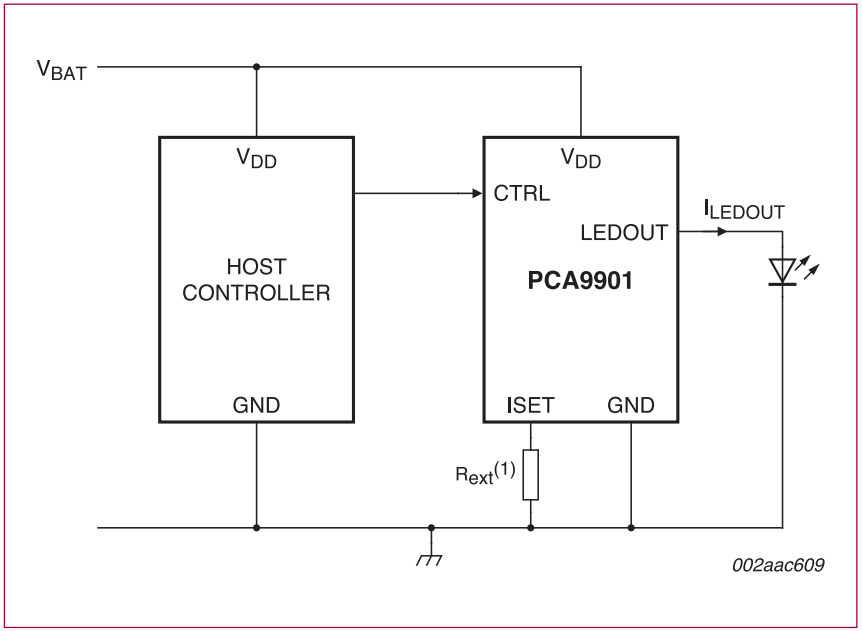
5. System control

One-wire, single-channel LED driver PCA9901

This device, a 20 mA current source for a single LED, offloads the microcontroller and saves battery power by enabling standalone blinking of a predefined pattern. A training sequence is used for programming: the host controller sends the LED lighting sequence to the device and the device memorizes it. The device can then be configured to send the sequence once or in a loop until the host controller requests it be stopped.

Features

- 2.1 to 5.5 V supply voltage
- 1-bit constant-current LED control
- Standalone blinking capability after “learning” the sequence
- 1.8 V compliant, one-wire logic interface
- Wake-up, standby, and reset modes
- I_{max} = 20 mA (current in the LED set by external resistor)
- Ideal for low-power applications:
  I_{CC} < 250 µA, $I_{STANDBY}$ < 1 µA
- Temperature range: -40 to +85 °C
- TSSOP8, XSON8, WLCSP6 packages



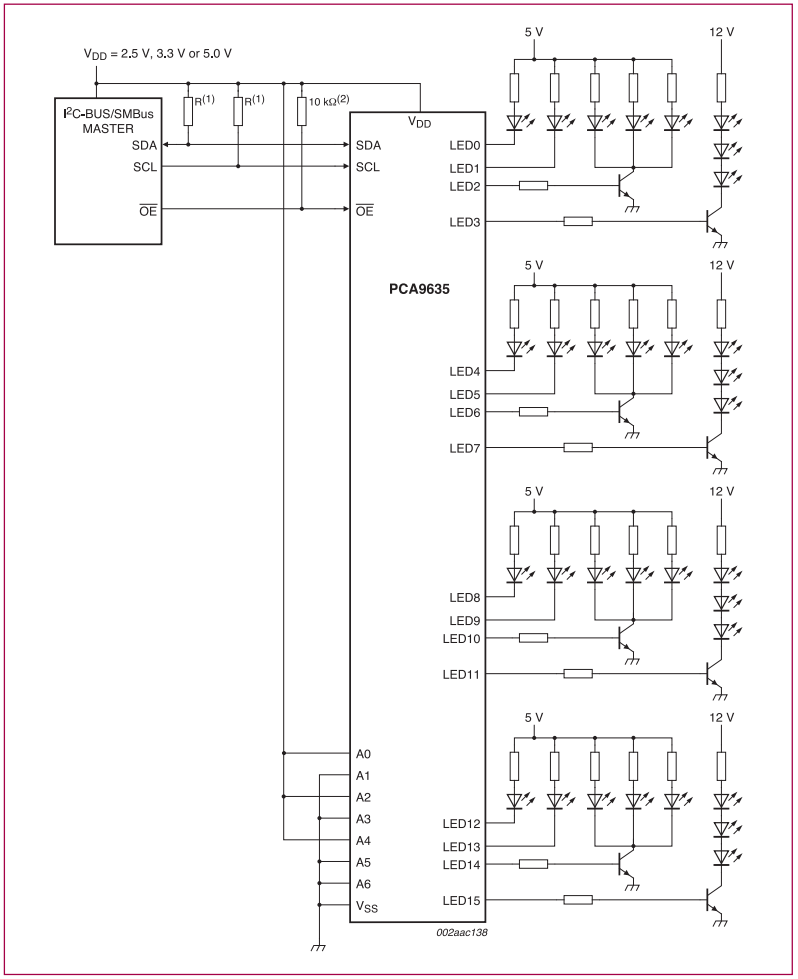
5. System control

25 mA / 5 V I²C LED controllers PCA963x

These drivers can be used for color mixing and LCD backlighting, or to drive multiple LEDs in series. The series includes the 4-bit PCA9633 and PCA9632 (a low-power version), the 8-bit PCA9634, and the 16-bit PCA9635.

Features

- LED drivers with totem-pole outputs to sink up to 25 mA or source up to 10 mA (per output)
- Individual LED dimming with 8-bit (256 steps) individual PWM
- Global LED dimming or blinking with 8-bit (256 steps) PWM
- Fast-mode Plus I²C-bus interface (1 MHz)
- 124 individual addresses with 4 programmable sub-call addresses
- Software compatible with PCA962x LED controller devices



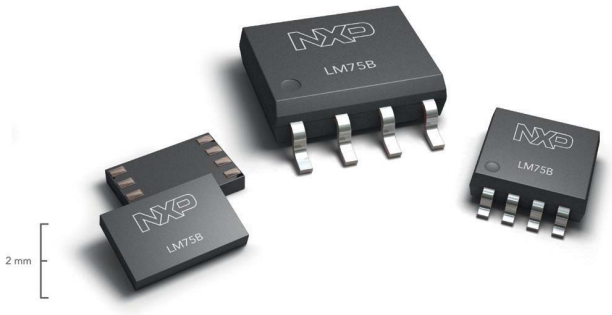
5. System control

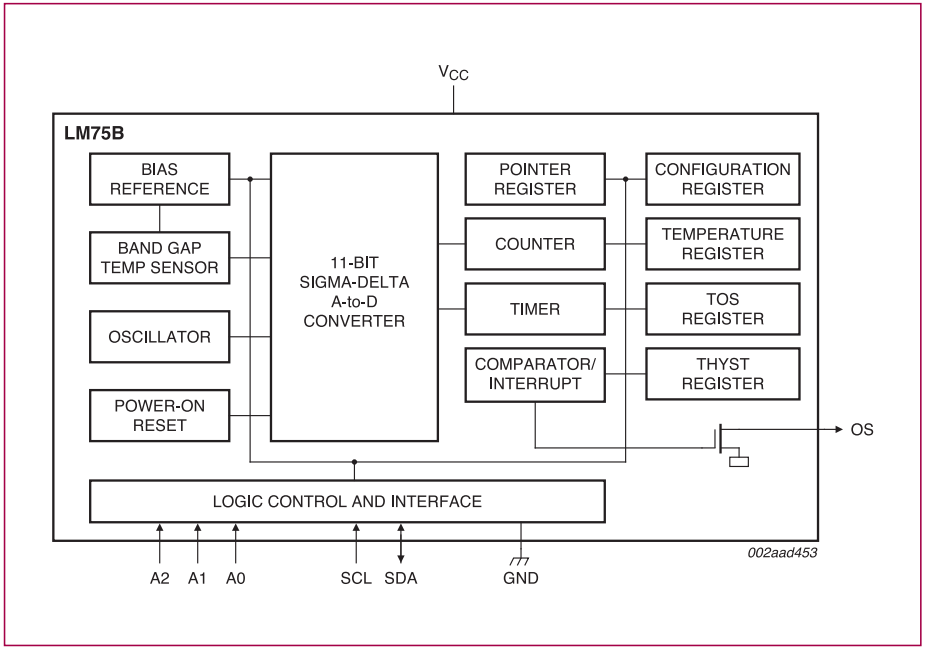
General-purpose thermal sensor LM75B

This device, pin-to-pin compatible with industry-standard LM75 and LM75A devices, enables local thermal measurement by integrating a local digital thermal sensor and a Watchdog timer.

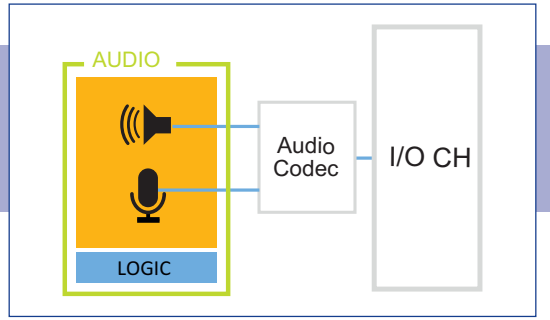
Features

- I²C-bus interface; can support up to 8 devices on the same bus
- Power supply range from 2.8 to 5.5 V
- Temperature range from -55 to +125 °C
- Frequency range from 20 Hz to 400 kHz with bus fault time-out to prevent bus hanging
- 11-bit ADC temperature resolution of 0.125 °C
  - ±2 °C from -25 to +100 °C
  - ±3 °C from -55 to +125 °C
- Programmable temperature threshold and hysteresis set points
- Maximum shut-down mode supply current of 1 mA
- Standalone operation as thermostat at power-up
- Small 8-pin packages: SO8, TSSOP8, and XSON8U





6. Audio control



We enhance notebook audio with a logic portfolio that provides best-in-class logic support for the audio subsystem.

6.1 Low-ohmic analog switches

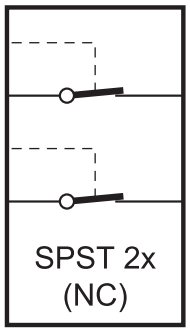
Optimized for audio control, these single pole dual throw (SPDT) and single pole single throw (SPST) switches deliver excellent performance and operate over a wide range of supply voltages and temperatures.

Low-ohmic audio switches N3XLxxx

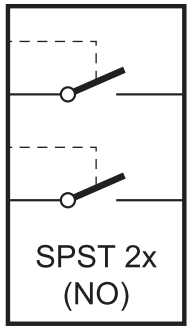
These analog switches reduce ON resistance (R_{ON} < 1.0 Ω), for minimal signal attenuation, and deliver -90 dB isolation and crosstalk for superior signal integrity. Low current consumption brings the added benefit of higher power savings. TheNX3L1G3157 is a single low-ohmic SPDT analog switch. The NX3L2G66 and the NX3L2G384 are dual low-ohmic SPST analog switches. The NX3L2G66 has an active HIGH enable input, while the NX3L2G384 has an active LOW enable input.

Features

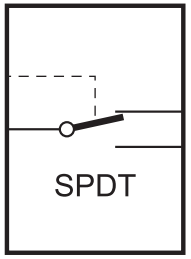
- Low R_{ON} / C_{ON} combination ideal for:
  - Analog applications in audio applications
  - Audio and data multiplexing around interface
  - Digital data switching in portable applications
- -90 dB isolation and crosstalk for superior signal integrity
- Low current consumption for greater power savings
- 7.5 kV ESD performance or better
- Built-in "translator/level shifter" function ("T" models only)
  - Interfaces more easily with low-voltage ASIC applications
  - Reduces component count and costs
- Smallest footprint: PicoGate and MicroPak packages in 0.35 mm pitch



NX3L2G384
brb680

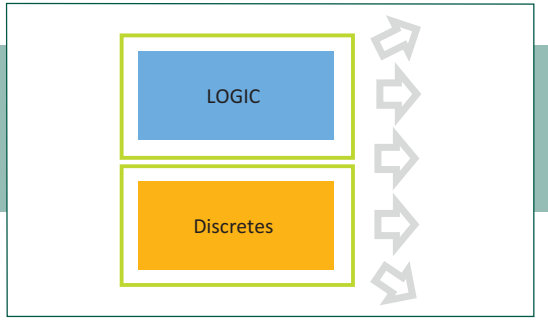


NX3L2G66
brb681



NX3L1G3157
brb682

7. Logic



For notebooks, our logic portfolio includes devices for signal control, buffers and switches for VGA signal enhancement, voltage translators, and temperature sensors. (For analog switches that support audio functions, refer to chapter 6.)

7.1 High- and low-voltage logic families

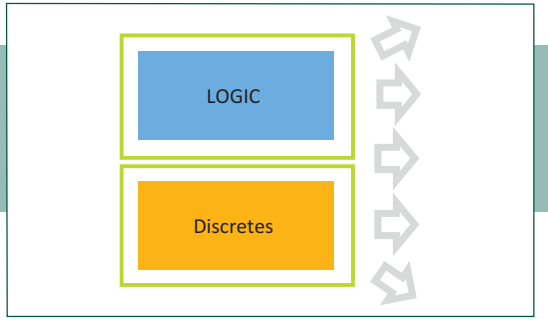
A wide selection of industry-compatible functions covering a broad range of speeds.

High-voltage logic families

Features and functions					
Increasing speed					
HEF4000B	**HC/T**	**AHC/T**	**FAST**	**ABT**	**BCT**
▸ 60 ns performance*	▸ 9 ns performance	▸ 5 ns performance	▸ 4 ns performance	▸ 3 ns performance	▸ Sub 1 ns prop delays
▸ ± 3 mA drive*	▸ ± 8 mA drive	▸ ± 8 mA drive	▸ -15/24 mA drive	▸ -32/64 mA drive	▸ 5 Ω RON
▸ 600 µA standby current	▸ 80 µA standby current	▸ 40 µA standby current	▸ 90 µA standby current	▸ 250 µA standby current	▸ V_{CC}: 4.5-5.5 V
▸ V_{CC}:5-15 V	▸ V_{CC}: 2-6 V	▸ V_{CC}: 2-6 V	▸ V_{CC}: 4.5-5.5 V	▸ V_{CC}: 4.5-5.5 V	▸ For circuit isolation and switching
▸ Gate, MSI, buffer functions	▸ Gate, MSI, buffer functions	▸ Gate, bus interface functions	▸ Termination resistor option	▸ Bus hold option	▸ Precharge circuit for hot plugging
▸ Multi-sourced	▸ PicoGate packaging	▸ PicoGate packaging	▸ Gate, MSI, bus interface functions	▸ Termination resistor option	▸ Schottky or charge pump undershoot protection
▸ NXP number one worldwide	▸ Multi-sourced	▸ Multi-sourced	▸ Multi-sourced	▸ Live insertion	▸ Internal diode for level shifting
▸ DIL, SO, SSOP, TSSOP	▸ MicroPak packaging	▸ MicroPak packaging	▸ DIL, SO, SSOP, TSSOP	▸ Gates, bus interface functions	▸ Multi-sourced
	▸ SO, TSSOP, DQFN	▸ SO, TSSOP, DQFN		▸ Multi-sourced	▸ DIL, SO, SSOP, TSSOP
		▸ Replaces VHC/T		▸ DIL, SO, SSOP, TSSOP	
Function available = 85	Function available = 321	Function available = 105	Function available = 80	Function available = 64	Function available = 30

* At 15 V V_{CC}

7. Logic



Features and functions

Features and functions					
Increasing speed					
LV	**LVC**	**AUP**	**ALVC**	**LVT**	**ALVT**
▸ 9 ns performance ▸ 8 mA drive ▸ 20 µA standby current ▸ V_{CC}: 1-3.6 V* ▸ Gate, MSI, buffer functions ▸ SO, SSOP, TSSOP ▸ Multi-sourced	▸ 4 ns performance ▸ -24/24 mA drive ▸ 20 µA standby current ▸ V_{CC}: 1.2-3.6 V ▸ 5 V tolerant I/O's ▸ Live insertion ▸ Bus hold option ▸ Termination resistor option ▸ Gates, MSI, bus interface functions ▸ Multi-sourced ▸ SO, TSSOP, PicoGate, DQFN ▸ MicroPak ▸ Replaces LCX	▸ 4 ns performance ▸ -4/4 mA static drive ▸ 0.9 µA standby current ▸ Cpd 4.5 pF ▸ Gate, bus interface functions ▸ Optimized for 1.8 V ▸ V_{CC}: 0.8-3.6 V ▸ 3.6 V tolerant I/O's ▸ PicoGate and MicroPak ▸ Multi-sourced ▸ Replaced ULP	▸ 2 ns performance ▸ -24/24 mA drive ▸ 40 µA standby current ▸ V_{CC}: 1.2-3.6 V ▸ 5 V tolerant I/O's** ▸ Bus hold option ▸ Termination resistor option ▸ Bus interface functions ▸ Multi-sourced ▸ SO, VSSOP, TSSOP, BGA, DQFN ▸ Replaces VCX	▸ 2 ns performance ▸ -32/64 mA drive ▸ 120-190 µA standby current ▸ V_{CC}: 2.7-3.6 V ▸ 5 V tolerant I/O's ▸ Live insertion ▸ Built-in Bus hold ▸ Termination resistor option ▸ Gates, bus interface functions ▸ SO, SSOP, BGA, TSSOP, DQFN ▸ Multi-sourced	▸ 1.5 ns performance ▸ -32/64 mA drive ▸ 90 µA standby current ▸ V_{CC}: 2.3-3.6 V ▸ 5 V tolerant I/O's ▸ Live insertion ▸ Built-in Bus hold ▸ Termination resistor option ▸ Bus interface functions ▸ SSOP, TSSOP, BGA ▸ Multi-sourced
Function available = 46	Function available = 137	Function available = 57	Function available = 54	Function available = 44	Function available = 23

* LV: some functions can operate up to 5.5 V

** ALVC: only non-bus hold types are 5 V input tolerant

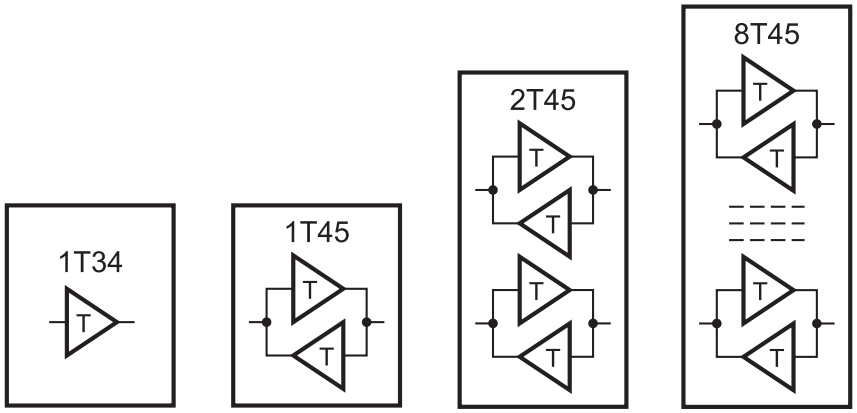
7. Logic

7.2 AUP, AVC, and LVC voltage translators

These devices are ideally suited for use in bus-interface circuits.

Features

- Wide operating voltage (0.8 to 5.5 V)
- High speed (2 ns typical)
- High output current capability (up to 50 mA)
- Over-voltage (> V_{CC}) tolerant inputs and outputs
- Lowest power consumption
- Live insertion
- Bus hold
- Standby / suspend mode
- TTL-compatible inputs
- Configurable logic functions
- Pb-free, RoHS and Dark Green compliant
- TSSOP, PicoGate and MicroPak packages



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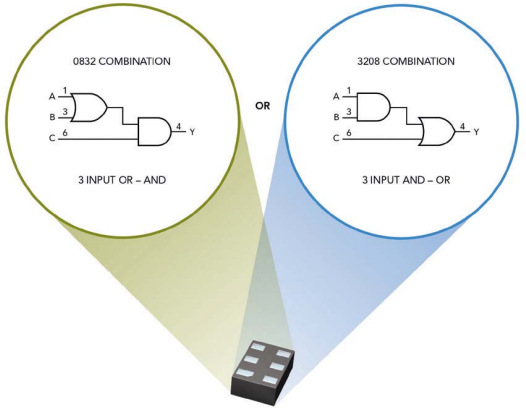
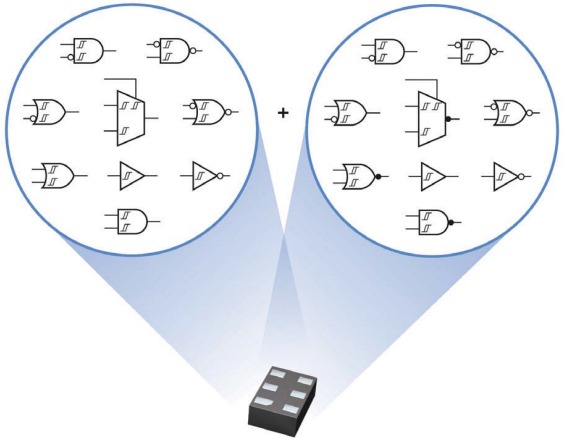
7. Logic

7.3 Combination and configurable logic

For greater design flexibility and simpler inventory management, we offer configurable logic functions, which let a single device perform many different operations, and combination logic, which combines several logic functions into a single package. The 74AUP1T58, for example, provides low-power, low-voltage configurable logic gate functions. Its output state is determined by eight patterns of 3-bit input. The user can choose the logic functions AND, OR, NAND, NOR, XOR, inverter or buffer, and all inputs can be connected to V_{CC} or Ground.





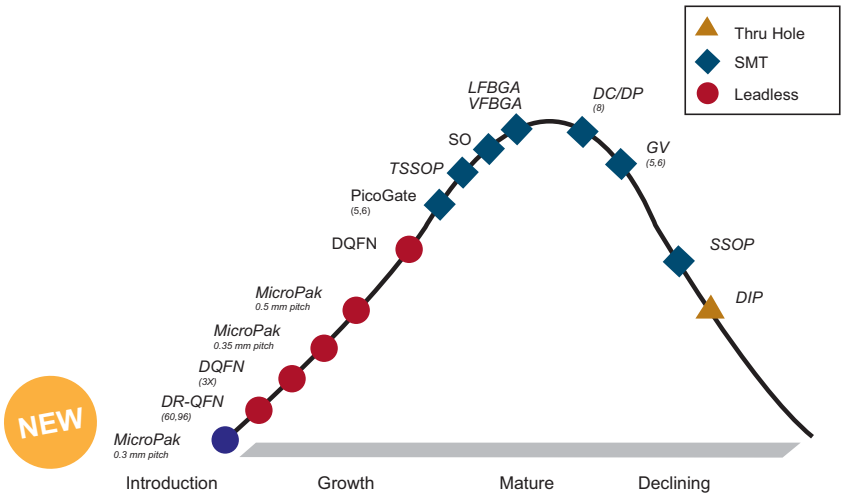
Features

- Very low dynamic power dissipation (C_{PD})
- Wide V_{CC} range (0.8 to 3.6 V)
- Schmitt-trigger inputs provide high noise immunity
- Superior ESD protection
- Wide operating temperature range (-40 to +125 °C)
- T_{pd} of 3.2 ns and I_{OL} of 2.2 mA at 1.8 V V_{CC}
- Available in single- and dual-gate formats
- Picogate and MicroPak packaging

7. Logic

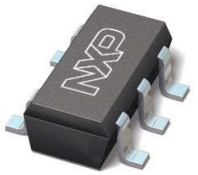
7.4 Logic packaging

Our MicroPak and MicroPak II packages are the world's smallest packages for single-, dual- and triple-gate logic. They are 65 to 74% smaller than their PicoGate equivalents, and offer a larger pad size that provides a more rugged and more reliable bond between the device and the PC board. Logic products housed in these packages make it simple to implement last-minute changes while minimizing the impact on board layouts. With an ASIC design, for example, the designer can fine-tune performance without re-spinning silicon, since it's easy to add discrete logic functions like gates or inverters.



Features

- Optimized to address critical design issues:
  - Miniaturization, for board-space savings
  - ASIC fixes and glue logic, for faster time-to-market
  - Simpler PCB routing, for more cost-effective designs
  - ASIC output drive, for reduced ASIC chip size
  - Voltage translation, for interfacing between 1.2 and 3.3 V



GV
2.8 x 2.9 x 1.0

GW
2.0 x 2.0 x 1.0

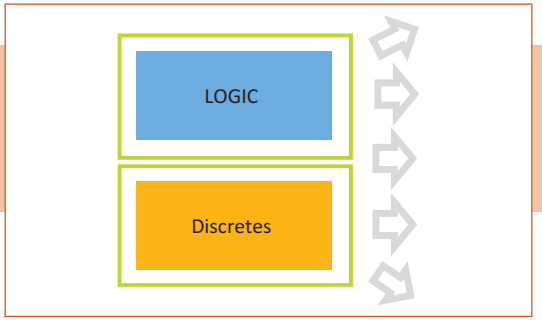
GF
1.0 x 1.0 x 0.5

GM
1.0 x 1.5 x 0.5

GS
1.0 x 1.0 x 0.35

GN
1.0 x 0.9 x 0.35

8. Discretes



Our notebook portfolio includes discretes in complex package options for common functions, such as load switching, current sourcing, and optimized BISS transistors for improved thermal performance.

8.1 BISS transistors, load switches & RETs

NXP's Breakthrough in Small Signal (BISS) technology optimizes transistor and load-switch performance.

BISS transistors PBSSxxxxx

These transistors use an innovative mesh-emitter technology to improve upon the well-known bipolar device structure. This allows for an improvement in saturation voltage loss and an up-to-65% reduction in heat compared to standard transistors.

Features

- Very low collector-emitter saturation voltage $V_{CE(sat)}$
- Benchmark for reduced on-state resistance in small-signal SMD packages
- Highest collector current capability IC
- AECQ-101 qualified
- Exceptionally low losses when switching loads
- Very high current gain
- Space-saving solutions through integration of RETs and low-$V_{CE(sat)}$ transistor
- Low "threshold" voltage (<1 V)
- Low drive power required

Part Number	V_{CEO}	Polarity	I_C	I_{CM}	$V_{CE\ (sat)\ typ\ (mV)}$ IC = 0.5 A; IB = 0.05 A
PBSS4021NT	20 V	NPN	4.3 A	8 A	21
PBSS4021PT	20 V	PNP	3.5 A	8 A	35
PBSS4041NT	60 V	NPN	3.8 A	8 A	29
PBSS4041PT	60 V	PNP	2.7 A	8 A	49
PBSS4032NT	30 V	NPN	2.6 A	5 A	80
PBSS4032PT	30 V	PNP	2.4 A	5 A	95
PBSS4032ND	30 V	NPN	3.5 A	6 A	70
PBSS4032PD	30 V	PNP	2.7 A	5 A	87

8. Discretes

BISS load switches PBLSxxxxx

These devices support advanced power-saving schemes that disable various loads during low-power operation. With BISS technology integrated into a complex device, and pre-biased input control, designers gain the advantage of having a ready-to-use, optimized solution.

Features

- Large load currents driven by only a fraction of a milliamp
- Lowest losses in the pass transistor by using PNP-BISS technology
- Ready-to-use integrated solutions save time for circuit design
- Replaces expensive P-MOSFETs
- Best-in-class solutions for loa- switch applications
- Many resistor combinations available
- Exceptionally low losses when switching loads
- Very high current gain
- Space-saving solution through integration of RET and low-$V_{CE(sat)}$ transistor
- Low “threshold” voltage (<1 V)
- Low drive power required

Part Number	I_C	V_{CEO}	Package
PBLS15xxV	0.5 A	15 V	SOT666
PBLS40xxV	0.5 A	40 V	SOT666
PBLS15xxY	0.5 A	15 V	SOT363
PBLS40xxY	0.5 A	40 V	SOT363
PBLS20xxD	1 A	20 V	SOT457
PBLS20xxS	3 A	20 V	SOT96-1
PBLS40xxD	1 A	40 V	SOT457

8. Discretes

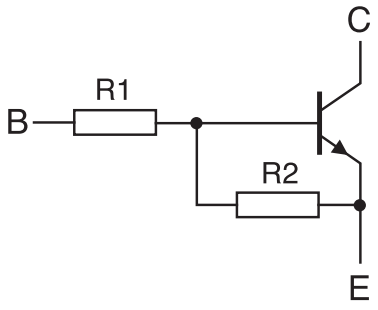
BISS RETs PDTDxxxxx, PBRNxxxxx

A pre-biased switching transistor in a single package is an ideal way to reduce the complexity of any PCB design. With NXP's proven BISS technology as the basis for Resistor-Equipped Transistors (RETs), the designer gains an advantage in layout, plus an overall improvement in thermal performance versus standard transistor circuits.

Features

- Best-in-class solutions for high currents (up to 800 mA)
- Many resistor combinations available
- Very high current gain
- Space-saving solutions through integration of resistor and low-$V_{CE(sat)}$ transistor
- Helps to miniaturize end products

Part Number	I_O	V_{CEO}	R1	R2	Package
PDTD113ET	0.5 A	50 V	1K	1K	SOT23
PDTD113ES	0.5 A	50 V	1K	1K	SOT54
PDTD113EK	0.5 A	50 V	1K	1K	SOT346
PDTD123ET	0.5 A	50 V	2.2K	2.2K	SOT23
PDTD123ES	0.5 A	50	2.2K	2.2K	SOT54
PDTD123EK	0.5 A	50 V	2.2K	2.2K	SOT346
PBRN113ET	0.6 A	40 V	1K	1K	SOT23
PBRN113ES	0.8 A	40 V	1K	1K	SOT54
PBRN113EK	0.6 A	40 V	1K	1K	SOT346
PBRN123ET	0.6 A	40 V	2.2K	2.2K	SOT23
PBRN123ES	0.8 A	40 V	2.2K	2.2K	SOT54
PBRN123EK	0.6 A	40 V	2.2K	2.2K	SOT346



mse190

8. Discretes

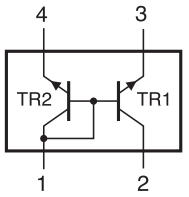
8.2 Matched-pair transistors BCM and PMP series

When transistors are manufactured together in a matched pair, they present an almost ideal match of all parameters due to the localized wafer process steps. This makes these components very well suited for use as current mirrors, comparators, and differential amplifiers.

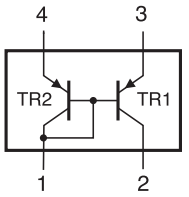
Features

- High performance at a comparatively low price
- Current gain matching
- Base-emitter voltage matching
- Replacement for standard double transistors (BCM series)
- Simplified board layout (PMP series)

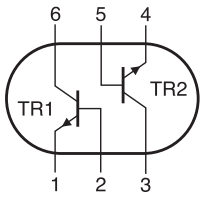
Part Number	Description
BCM61B	NPN/NPN matched double transistor in a SOT143B small Surface-Mounted Device (SMD) plastic package
BCM62B	PNP/PNP matched double transistor in a SOT143B small Surface-Mounted Device (SMD) plastic package
BCM847	NPN/NPN matched double transistors in small Surface-Mounted Device (SMD) plastic packages
BCM857	PNP/PNP matched double transistors in small Surface-Mounted Device (SMD) plastic packages
PMP4501	NPN/NPN matched double transistors in small Surface-Mounted Device (SMD) plastic packages
PMP5501	PNP/PNP matched double transistors in small Surface-Mounted Device (SMD) plastic packages



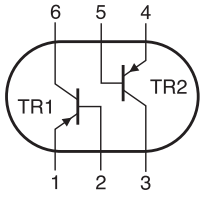
BCM61B

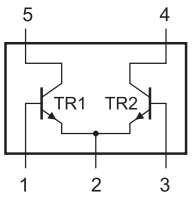


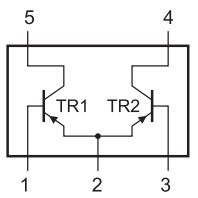
BCM62B



BCM847







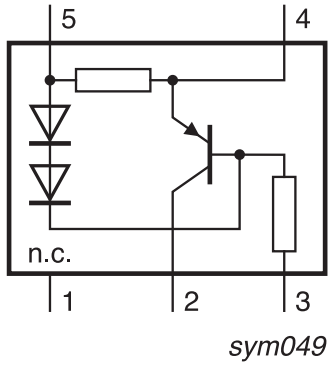
8. Discretes

8.3 Constant current source
PSSI2021SAY

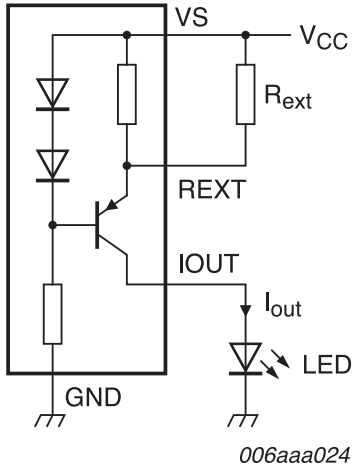
A simple constant current source is a tool many designers keep in their library. NXP meets this demand with a device that provides a variance in load stability of only 0.5% (at Vs = 12, Vout = 1 to 10 V). The small SOT353 package makes it an easy fit on almost any motherboard. Applications include constant-current LED drivers, voltage reference, and generic constant-current sources.

Features

- Single-chip constant current source
- Output current set by an external resistor
- Very small footprint package
- 50 mA maximum output
- Up to 75 V maximum supply voltage



sym049



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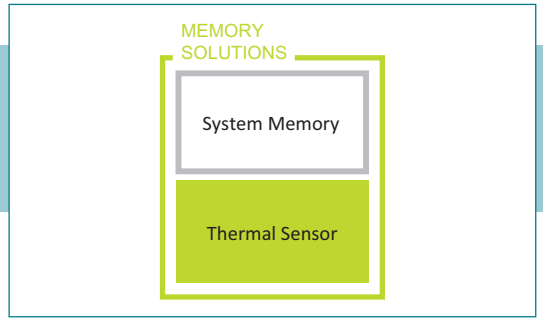
9. Memory solutions



The new, faster Double-Data-Rate (DDR) Dual In-line Memory Modules (DIMMS) increase the risk of exceeding the DRAM maximum temperature of 85 °C. As a result, new techniques for temperature monitoring have become an important part of system design. Direct thermal sense on the DIMM allows the CPU to reduce the speed of the memory traffic as required, to prevent memory from overheating. This also lets the system maximize performance without the artificially lowered limits previously used with legacy algorithms and design studies.

9.1 Thermal sensors

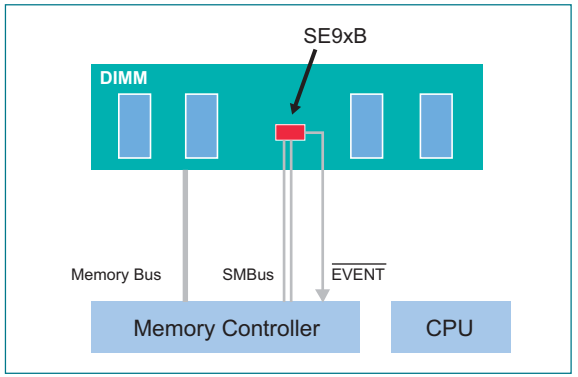
NXP's high-accuracy digital thermal sensors are fully compliant with the new JEDEC JC42.4 DRAM DIMM specification and have been approved by Intel.

Thermal sensors for DDR3 DIMMs SE97B, SE98A

The SE97B combo device integrates the thermal sensor and a 2 kbit Serial Presence Detect (SPD) EEPROM, which is used on DIMMs to store timing parameters and module-specific information. The SE98A is a standalone thermal sensor used when an external EEPROM is needed. Both devices integrate an analog-to-digital converter (ADC), which monitors and digitizes the temperature with a resolution of 0.125 °C and an accuracy of ±1 °C maximum, over the +75 to +95 °C temperature range. Both devices are factory trimmed and calibrated, requiring no additional external components, and both communicate with the CPU chipset through an I²C/SMBus-compatible serial bus.

Features

- JEDEC Grade B accuracy
  - ±0.5 / ±1 °C (typ./max.) +75 to +95 °C
  - ±1.0 / ±2 °C (typ./max.) +40 to +125 °C
  - ±2.0 / ±3 °C (typ./max.) -40 to +125 °C
- Unique I²C addresses for temp sensor and EEPROM so master sees two different devices
- EEPROM is organized as a 256 x 8-bit memory with 10 years of data retention and 100,000 write/erase cycles
- Supports SMBus time-out of 25 to 35 ms (typical is 30.5 ms)
- Support /EVENT pin de-asserted during TS shutdown
- Supports permanent and reversible software write protect
- Supports 0 to 16-byte write buffer
- TS and EEPROM operating range of 3.0 to 3.6 V with power-down reset at 2.4 V (up) and 2.0 V (down) typical
- Maximum operating/shutdown current: 320 µA/10 µA max
- Operating temperature range from –40 to +125 °C
- JEDEC-compliant package



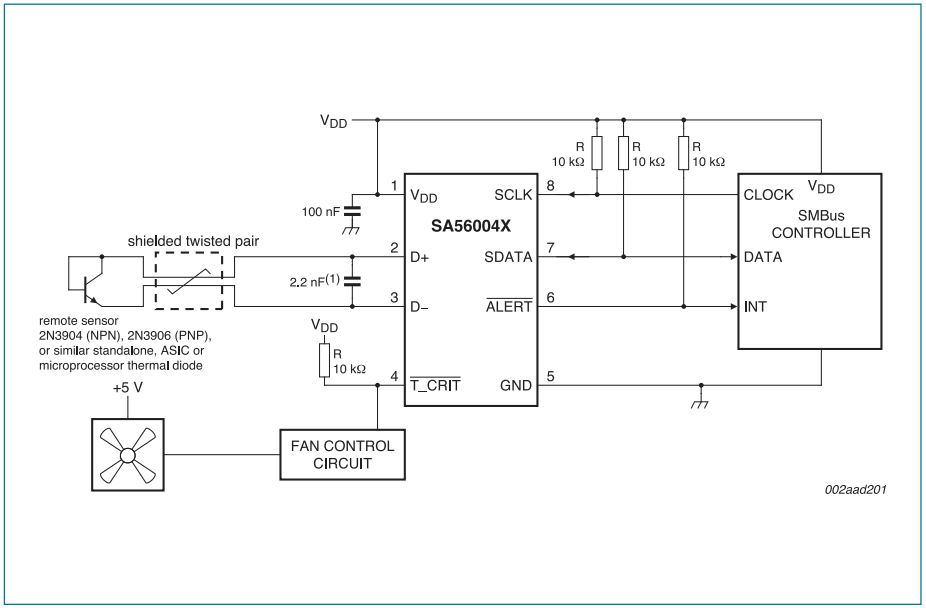
9. Memory solutions

Local and remote I²C/SMBus temperature sensor SA56004

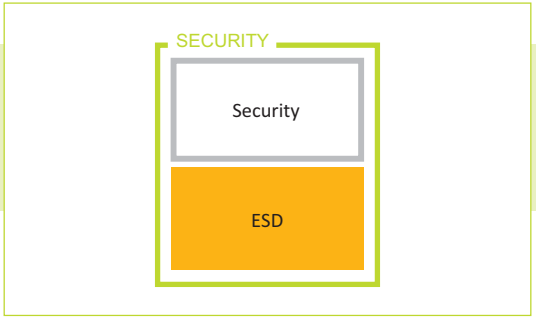
This device is optimized for system thermal management and for monitoring die temperature.

Features

- On-chip local thermal diode or remote transistor diode connected
- Temperature sensing within ±1 ˚C
- Offset register available for adjusting the remote temperature accuracy
- Programmable under/over temperature alarms: ALERT and T_CRIT
- SMBus 2.0 compatible interface, supports TIMEOUT and 100 / 400 kHz I²C-bus interface
- Can support up to 8 devices on the same I2C-bus
- 11-bit ADC temperature resolution of 0.125 ˚C
- Power supply range from 3.0 to 5.5 V
- Temperature range from -40 to +125 ˚C
- The SA56004-ED/EDH is address compatible with National LM86, MAX6657/8 and ADM1032
- Small 8-pin package types: SO8, TSSOP8, and HVSON8



10. Security



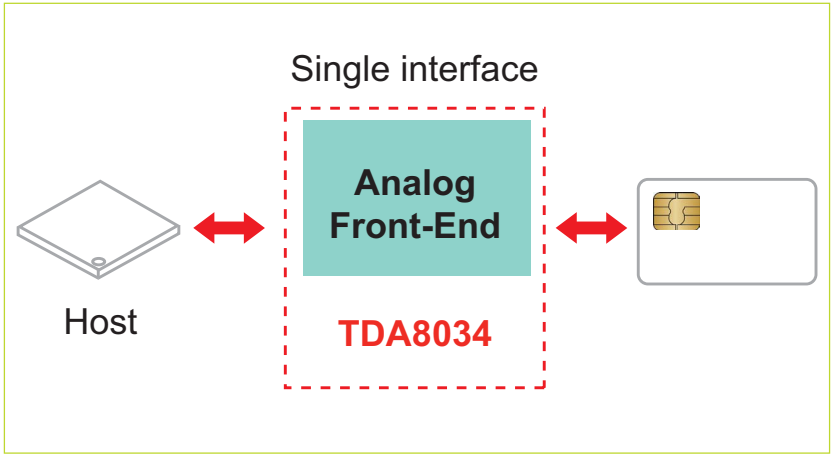
SmartCards that implement pre-booth authentication add an extra layer of protection, making it tougher for unauthorized users to gain access to the system. Before the operating system loads, the user must have a pre-formatted SmartCard, in addition to a power-on password, to use the computer. This level of protection is useful in a range of applications, including logical access control, eGovernment, on-line banking, eCommerce, and systems that use easy pairing for configuration.

10.1 SmartCard interface TDA8034HN

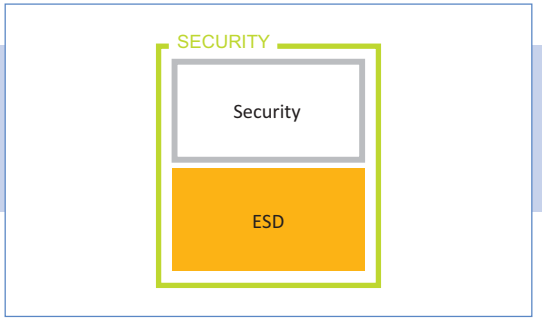
The TDA8034HN is a cost-effective analog interface for asynchronous and synchronous SmartCards operating at 5, 3, or 1.8 V. Using few external components, the TDA8034HN provides all supply, protection, and control functions between a SmartCard and the microcontroller.

Features

- HVQFN24 package
- 5, 3, or 1.8 V smart card supply
- Very low power consumption in Deep Shutdown mode
- Three protected half-duplex bidirectional buffered I/O lines (C4, C7, and C8)
- Thermal and short-circuit protection for all card contacts
- Automatic activation/deactivation sequences triggered by a short-circuit, card take-off, overheating, falling V_{DD}, $V_{DD(INTF)}$, or V_{DDP}
- Enhanced card-side ESD protection of >6 kV
- External clock input up to 26 MHz connected to pin XTAL1
- Non-inverted control of pin RST using pin RSTIN
- Compatible with ISO 7816, NDS, and EMV 4.2 payment systems
- Built-in debouncing on card presence contacts (typically 8 ms)



11. Display and camera interfaces



Our display-specific EMI filters support all the relevant 2G, 3G, WLAN, and Bluetooth frequencies. Available as cost-efficient RC filters or optimized LC filters for interfaces with high clock rates, these products deliver superior filter performance and robust ESD protection at the lowest clamping voltages, and are housed in space-saving leadless and CSP packages.

NXP's robust ESD solutions protect all kinds of portable applications over their full lifetimes, and are backed by a complete in-house production flow for added supply reliability.

For applications that use 18- or 24-bit screens to display video data, our video serializer/deserializer (serdes) solutions are an elegant, low-power way to save space, reduce power, and simplify design-in. Used to replace a cumbersome parallel link, these devices transfer data via serial differential signals. The result is 24-bit color rendering on an 18-bit display, with fewer wires and lower EMI.

11.1 Display-specific EMI filters

RC-based EMI filters IP425xCZx family for cost-efficient protection

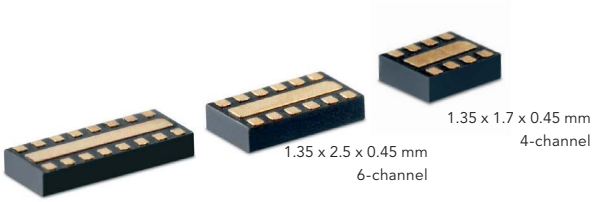
These 30 dB EMI filters offer up to 30 kV IEC contact ESD protection in leadless packages. Their RC structure assures excellent ESD pulse transient response and protects sensitive system chips.

Features

- Up to 30 dB insertion loss at mobile-phone frequencies of 800 MHz to 3 GHz
- High ESD protection exceeding IEC 61000-4-2 level 4
- Low ESD clamping voltage
- Available in 1-, 2-, 4-, 6- or 8-channel formats
- Ultra-thin dark green leadless package in 0.4 mm pitch

Benefits

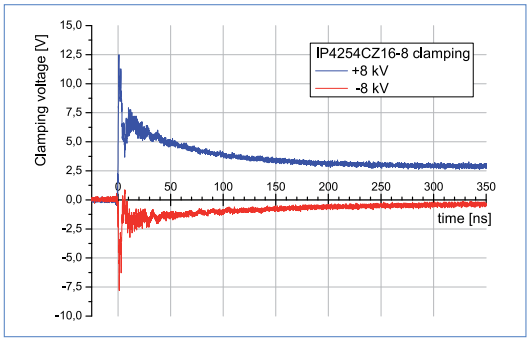
- Reduced component count
- Reduced board space
- Easy routing



Read more

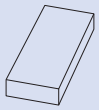
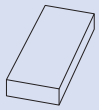
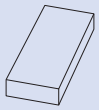
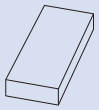
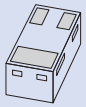
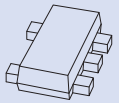
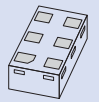
www.nxp.com/acrobat_download2/literature/9397/75016798.pdf

Example of the extremely low ESD clamping voltage (ESD pulse of ±8 V IEC 61000-4-2. level 4)



11. Display and camera interfaces

EMI filters in plastic packages

	IP4251CZ16-8 /CZ12-6/CZ8-4	IP4252CZ16-8 /CZ12-6/CZ8-4	IP4253CZ16-8 /CZ12-6/CZ8-4	IP4254CZ16-8 /CZ12-6/CZ8-4	IP4256CZ3-M	IP4256CZ5-W	IP4256CZ6-F
							
Package	UTLP SOT983/984/985	UTLP SOT983/984/985	UTLP SOT983/984/985	UTLP SOT983/984/985	SOT883	SOT665	SOT886
Number of channels	4, 6, 8	4, 6, 8	4, 6, 8	4, 6, 8	1	2	2
Width (mm)	1.35	1.35	1.35	1.35	0.6	1.2	1
Length (mm)	1.7, 2.5, 3.3	1.7, 2.5, 3.3	1.7, 2.5, 3.3	1.7, 2.5, 3.3	1	1.6	1.45
Maximum height (mm)	0.5	0.5	0.5	0.5	0.5	0.6	0.5
Channel resistance (Ω, typ)	100	40	200	100	100	100	100
Line capacitance (pF @ 0.0 V, typ)	15	18	45	45	30	30	30
Line capacitance (pF @ 2.5 V, typ)	10	12	30	30	19	19	19
ESD IEC61000-4-2 (kV contact, typ)	15	15	30	30	25	25	25
Robustness at ESD level 4 (1000 shots, IEC61000-4-2)	yes	yes	yes	yes	yes	yes	yes

Additional resources

The listed web pages provide access to additional information about NXP and its product lines.

Application notes
www.nxp.com/all_appnotes

Datasheets (all released products and product families)
www.nxp.com/all_datasheets

Interactive selection guides
www.nxp.com/selectionguides/all-selectionguides.html

Sales literature (product leaflets, brochures)
www.nxp.com/all_literature

X-reference tool (search tool for NXP website, for use offline)
www.nxp.com/search/advanced

NXP Chinese website (simplified characters)
www.cn.nxp.com

NXP Chinese website (traditional characters)
www.tw.nxp.com

www.nxp.com

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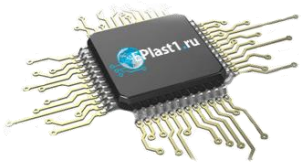
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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