



# Quad PCI Express, Hot-Plug Controllers

MAX5959/MAX5960

## General Description

The MAX5959/MAX5960 quad hot-plug controllers are designed for PCI Express® (PCIe) applications. These devices provide hot-plug control for the main 12V, 3.3V, and 3.3V auxiliary supplies of four PCIe slots. The MAX5959/MAX5960's logic inputs/outputs allow interfacing directly with the system hot-plug management controller or through an SMBus™ with an external I/O expander such as the MAX7313. An integrated debounced attention switch and present-detect signals simplify system design.

The MAX5959/MAX5960 drive eight external n-channel MOSFETs to control the 12V and 3.3V main outputs. The 3.3V auxiliary outputs are controlled through 0.2Ω n-channel MOSFETs. Internal charge pumps provide the gate drive for the 12V outputs while the gate drive of the 3.3V output is driven by the 12V input supply clamped to 5.5V above the respective 3.3V main supply rail. The 3.3V auxiliary outputs are completely independent from the main outputs with their own charge pumps.

At power-up, the MAX5959/MAX5960 keep all of the MOSFETs off until the supplies rise above their respective undervoltage lockout (UVLO) thresholds. Upon a turn-on command, the MAX5959/MAX5960 enhance the external and internal MOSFETs slowly with a constant gate current to limit the power-supply inrush current.

The MAX5959/MAX5960 actively limit the current to protect all outputs at all times and shutdown if an overcurrent condition persists longer than the programmable overcurrent timeout. After an overcurrent or overtemperature fault condition, the MAX5959L/MAX5960L latch off while the MAX5959A/MAX5960A automatically restart after a restart time delay. The MAX5959/MAX5960 are offered in latch-off or auto-restart versions (see the *Selector Guide*).

The MAX5959/MAX5960 are available in an 80-pin TQFP package and operate over the -40°C to +85°C temperature range.

## Applications

Servers  
Desktop Mobile Server Platforms  
Workstations

## Features

- ◆ PCIe Compliant
- ◆ Hot Swap 12V, 3.3V, and 3.3V Auxiliary for 4 PCIe Slots
- ◆ Integrated Power MOSFETs for Auxiliary Supply Rails
- ◆ Controls di/dt and dv/dt
- ◆ Active Current-Limiting Protects Against Overcurrent/Short-Circuit Conditions
- ◆ Programmable Current-Limit Timeout
- ◆ PWRGD Signal Outputs with Programmable Power-On Reset (POR) (160ms Default)
- ◆ Latched FAULT Signal Output after Overcurrent or Overtemperature Fault
- ◆ Attention Switch Inputs/Outputs with 4ms Debounce
- ◆ Present-Detect Inputs
- ◆ Force-On Inputs Facilitate Testing/Debug
- ◆ Thermal Shutdown
- ◆ Allow Control through SMBus with an I/O Expander

## Ordering Information

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX5959AECS+	-40°C to +85°C	80 TQFP	C80-1
MAX5959LECS+	-40°C to +85°C	80 TQFP	C80-1
MAX5960AECS+	-40°C to +85°C	80 TQFP	C80-1
MAX5960LECS+	-40°C to +85°C	80 TQFP	C80-1

+Denotes lead-free package.

Pin Configuration and Typical Application Circuit appear at end of data sheet.

## Selector Guide

PART	LATCH OFF	AUTO RESTART	GUARANTEED AUX CURRENT (mA)
MAX5959AECS+		√	375
MAX5959LECS+	√		375
MAX5960AECS+		√	550
MAX5960LECS+	√		550

PCI-Express is a registered trademark of PCI-SIG Corp. SMBus is a trademark of Intel Corp.



Maxim Integrated Products 1

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).