ABRIDGED DATA SHEET

EVALUATION KIT AVAILABLE

MAX16970/MAX16971 — 3A Automotive Hi-Speed USB Protectors with Apple iPhone/iPad and USB 2.0 Charge Detection

General Description

The MAX16970/MAX16971 provide high-ESD and short-circuit protection for the low-voltage internal USB data and USB power line in automotive radio, navigation, connectivity, and USB hub applications. The devices support both Hi-Speed USB (480Mbps) and full-speed USB (12Mbps) operation. In addition, the devices also include integrated circuitry to enable fast-charging for consumer devices adhering to either the Apple method or the Hi-Speed USB host-charger port-detection protocol and support USB On-The-Go (OTG).

The short-circuit protection features include short-to-battery on the protected HVBUS, HVD+, and HVD- outputs, as well as short-to-HVBUS on the protected HVD+ and HVD- outputs. The devices are capable of a short-to-battery condition of up to +18V. Short-to-GND and overcurrent protection are also provided on the HVBUS output to protect the internal BUS power rail from overcurrent faults.

Each device features high-ESD protection to ±15kV Air Gap method and ±8kV Contact method on all protected HVBUS, HVD+, and HVD- outputs.

Each device features two low 4.0Ω on-resistance Hi-Speed USB switches, a current-limited low-voltage 31mΩ BUS switch, and provides an integrated high-voltage external power-switch controller. The BUS switch can start up into large capacitive noncompliant USB loads. The devices also feature an enable input, a fault output, integrated Apple iPhone®/iPad® fast-charging termination resistors, and an integrated host-charger port-detection circuit adhering to the USB 2.0 battery charging specification version 1.2.

The devices are available in 16-pin QSOP and 16-pin (4mm x 4mm) TQFN packages and operate over the -40°C to +105°C temperature range. The MAX16970GEEA/ V+ and MAX16971GEEA/V+ are drop-in compatible with MAX16969DGEE/V+ and MAX16969BGEE/V+, respectively.

Benefits and Features

- Minimized Voltage Drop on Bus Line Due to Industry-Leading $RDS_{(ON)}$ Helps Meet USB Voltage Specifications at Device Connector
  - Current-Limited 31mΩ (typ) BUS Switch with High-Capacitive Load Capability
- Robust Overvoltage and ESD Protection for Automotive Environment Saves on External Protection Components
  - Short-to-Battery and Short-to-GND Protection on Protected HVBUS Output
  - Short-to-Battery and Short-to-HVBUS Protection on Protected HVD+ and HVD- Outputs
  - Two 4.0Ω (typ) R_{ON} USB 2.0 Data Switches
  - Integrated Overcurrent and Short-Circuit Autoretry
  - High ESD Protection (HVD+, HVD-, HVBUS)
    - ±15kV Human Body Model
    - ±15kV IEC 61000-4-2 Air Gap
    - ±8kV IEC 61000-4-2 Contact
  - 20ms Fault-Blanking Timeout Period
- Automatic Transitioning of Charge Modes Through Intelligent State Machine for Seamless Device Integration
  - Integrated Apple iPhone 1.0A Dedicated Charging Mode
  - Integrated Apple iPad 2.1A Dedicated Charging Mode
  - USB-IF BC1.2 Charging Downstream Port (CDP) and Dedicated Charging Port (DCP) Modes
  - Chinese Telecommunication Industry-Standard YD/T 1591-209
  - USB On-The-Go (OTG) Support
- Drop-In Pin Compatibility with MAX16919/MAX16969 in 16-Pin QSOP Package
- AEC-Q100 Qualified

Applications

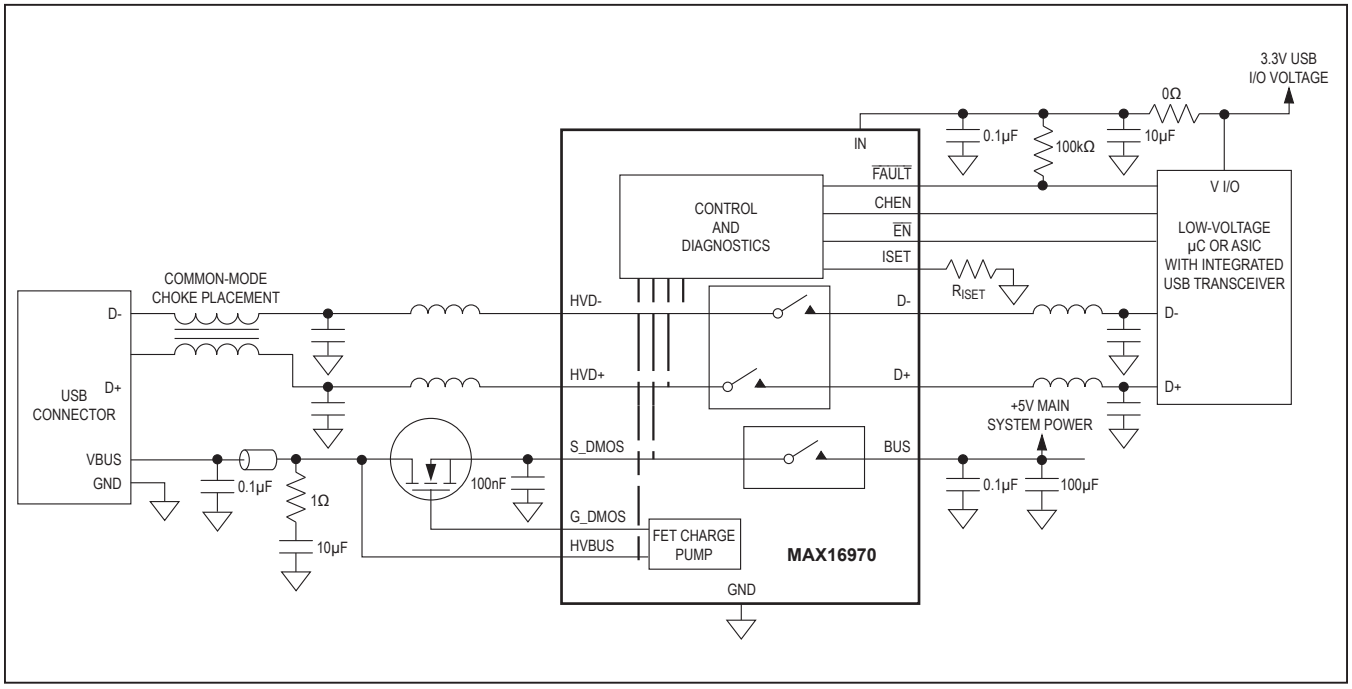
- Automotive Radio and Navigation
- USB Hub
- Automotive Connectivity
- Telematics

Typical Operating Circuit* and *Ordering Information* appear at end of data sheet.

19-6819; Rev 4; 9/16

maxim integrated™

Typical Operating Circuit



Ordering Information

PART	PIN-PACKAGE	ENABLE INPUT LOGIC	SUPPORTED MODES
MAX16970GEEA/V+	16 QSOP	Low	1A/DCP
MAX16970GEEB/V+	16 QSOP	Low	1A/2.1A/DCP, OTG
MAX16970GTEB/V+	16 TQFN-EP*	Low	1A/2.1A/DCP, OTG
MAX16971GEEA/V+	16 QSOP	High	1A/DCP
MAX16971GEEB/V+	16 QSOP	High	1A/2.1A/DCP, OTG
MAX16971GTEB/V+	16 TQFN-EP*	High	1A/2.1A/DCP, OTG

Note: *All devices operate over the -40°C to +105°C temperature range and support CDP/HS modes.*
/V denotes an automotive qualified part. +Denotes a lead(Pb)-free/RoHS-compliant package.
**EP = Exposed pad.*

Chip Information

PROCESS: BiCMOS

Package Information

For the latest package outline information and land patterns (footprints), go to **www.maximintegrated.com/packages**. Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

PACKAGE TYPE	PACKAGE CODE	OUTLINE NO.	LAND PATTERN NO.
16 QSOP	E16+11C	21-0055	90-0167
16 TQFN	T1644+4C	21-0139	90-0070