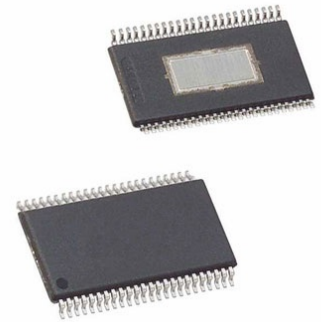


Power Supply for Microcontrollers in Safety-Relevant Applications



Images are for reference only

[Inquiry](#)

Manufacturer: [Texas Instruments, Inc](#)

Package/Case: HTSSOP48

Product Type: Power Management ICs

RoHS: RoHS Compliant/Lead free 

Lifecycle: Active

General Description

The TPS653853A-Q1 and TPS653854A-Q1 device is a multirail power supply designed to supply microcontrollers in safety relevant applications, such as those found in the automotive industry.

The device supports functional safety microcontrollers with dual-core lockstep (LS) and other multi-core architectures.

The TPS653853A-Q1 and TPS653854A-Q1 device integrates multiple supply rails to power the MCU, CAN or FlexRay, and external sensors. A buck-boost converter with internal FETs converts the input battery voltage between 2.3 V and 36 V to a 6-V preregulator output that supplies the other regulators. An integrated charge pump provides an overdrive voltage for the internal regulators, and can also be used to drive an external NMOS FET as reverse battery protection. The device supports wake-up from an ignition signal (IGN pin) or wake-up from a CAN transceiver or other signal (CAN_WU pin).

The device has a steering-angle monitoring (SAM) unit that allows the ECU to indirectly capture the position of the steering wheel through the motor-position sensors. A dedicated low-power mode allows this SAM unit to operate even when the ECU is in sleep mode. Integrated SAM-switches allow passing-through of the Motor-Position Sensor signals to the MCU during normal operation, or decoupling the MCU ADC inputs from the motor-position sensor signals when the ECU is in sleep mode.

An independent voltage monitoring unit inside the device monitors undervoltage and overvoltage on all internal supply rails and regulator outputs of the battery supply. Regulator current limits and temperature protections are also implemented. The TPS653853A-Q1 and TPS653854A-Q1 device features a question-answer watchdog, MCU error-signal monitor, clock monitoring on internal oscillator, self-check on clock monitor, cyclic redundancy check (CRC) on non-volatile memory and SPI communication, a diagnostic output pin allowing MCU to observe device internal analog and digital signals, a reset circuit for the MCU (NRES pin) and a safing output (ENDRV pin) to disable external power-stages on any detected system-failure. The device automatically runs a built-in self-test (BIST) at start up and the MCU may re-run the BIST during system run time through software control if needed. A dedicated DIAGNOSTIC state allows the MCU to check TPS653853A-Q1 and TPS653854A-Q1 functionality.

The TPS653853A-Q1 and TPS653854A-Q1 device also has an error reporting capability through the SPI register. The device has separate status bits in the SPI register for each specific error on the system level or device level. When the device detects a particular error condition, it sets the appropriate status bit and keeps this status bit set until the MCU reads-out the SPI register in which this status bit was set. Based on which status bit was set, the MCU can decide whether it must keep the system in a safe state or whether it can resume with the operation of the system.

The TPS653853A-Q1 and TPS653854A-Q1 device is available in a 48-pin HTSSOP PowerPAD IC package.

Key Features

AEC-Q100 Qualified with the Following Results:
Device Temperature Grade 1: -40°C to +125°C Ambient Operating Temperature

Device HBM ESD Classification Level 2

Device CDM ESD Classification Level C4B

Functional Safety-Compliant
Developed for Functional Safety Applications

Documentation Available to Aid ISO 26262 System Design up to ASIL D

Systematic Capability and Hardware Integrity up to ASIL D

Input Voltage Range
7 to 36-V for Initial Battery Power Up

4 to 36-V Full Functionality After Initial Battery Power Up

Minimum 2.3 V During Operation After Wake-up

Supply Rails (With Internal FETs)
6-V Synchronous Buck-Boost Preregulator

5-V, 285-mA LDO (CAN, Peripherals or ADC REF 1% Accuracy with 20 to 120 mA Load)

3.3-V or 5-V, 350-mA LDO (MCU) TPS653853A-Q1.3.3-V 350-mA or 5-V 500 mA LDO (MCU)TPS653854A-Q1

2 LDOs Protected for Sensor Supply or Peripherals
120 mA for Sensor Supply 1 (VSOUT1), 20 mA for Sensor Supply 2 (VSOUT2)

Configurable Tracking Mode (Tracking Input Pin), or 3.3-V or 5-V Fixed Output Voltage

Short-to-Ground and Battery Protection

Charge Pump: 6-V Minimum, 11-V Maximum Above Battery Voltage

Monitoring and Protection
Independent Undervoltage and Overvoltage Monitoring on All Regulator Outputs, Battery Voltage, and Internal Supplies

Voltage Monitoring Circuitry, Including Independent Bandgap Reference, Supplied from Separate Battery Voltage Input Pin

Self-Check on All Voltage Monitoring (During Power-Up and After Power-Up Initiated by External MCU)

All Supplies Protected with Current Limit and Overtemperature Prewarning and Shutdown

Steering-Angle Monitoring (SAM)
2 Signal Comparators for Position Sensor Signals

Rotation Counter

Low-Power Mode With Periodically Sampling of Position Sensor Signals

Switches for Passing-Through Sensor Signals to MCU

Microcontroller Interface
Open and Close Window or Question-Answer Watchdog Function

Monitor for Functional Safety MCU Fault output (PWM or level), MCU Error-Signal Monitor

DIAGNOSTIC state for Performing Device Self-Tests and System Diagnostics

SAFE State for Device and System Protection upon Detected System Failure

Clock Monitor for Internal Oscillator

Analog and Logic Built-In Self-Test

CRC on Non-Volatile Memory as well as Device and System Configuration Registers and SPI Communications

Reset Circuit for MCU

Diagnostic Output Pin

SPI With CRC on Command Plus Data

Error Reporting Through SPI Registers for Errors on System Level and Device Level

Enable-Drive Output for Disabling External Power-Stages on Any Detected System Failure

Wake-up through IGN Pin (Ignition) or CAN_WU Pin (Transceiver or Other Function)

48-Pin HTSSOP PowerPAD IC Package

Recommended For You

O3854AQDCARQ1

Texas Instruments, Inc

HTSSOP48

O3850AQDCARQ1

Texas Instruments, Inc

HTSSOP-48

O31310QRWGRQ1

Texas Instruments, Inc

VQFN-40

O3851AEDCARQ1

Texas Instruments, Inc

HTSSOP-48

O3852AQDCARQ1

Texas Instruments, Inc

HTSSOP-48

LM2637M

Texas Instruments, Inc

SOP24

TL2843P

Texas Instruments, Inc

DIP8

SG3524N

Texas Instruments, Inc

DIP16

TL431CP

Texas Instruments, Inc

DIP8

BQ51013BRHLR

Texas Instruments, Inc

VQFN20

BQ51050BRHLT

Texas Instruments, Inc

QFN

TL7705ACDR

Texas Instruments, Inc

SOP8

LM5116MH

Texas Instruments, Inc

TSSOP20

BQ51050BRHLR

Texas Instruments, Inc

VQFN-20

TL3843P

Texas Instruments, Inc

DIP8