OPTIREG™ TLF35584 PMIC for safety-relevant applications

October 2022
The OPTIREG™ PMIC
An integrated power supply including system safety functions

System supply

Features

Diagnosis and supervision
OPTIREG™ TLF35584 PMIC: System **power supply** and **safety functions integrated** into a single package

**System supply**
- Boost Converter
- Buck Converter
- Linear Regulator
- Linear Regulator
- Linear Regulator
- Linear Regulator
- Trackers
- Trackers

**Diagnosis and supervision**
- Watchdog
- Reset
- Internal monitor
- Error monitor
- Voltage monitor

*Power Management Integrated Circuit*
OPTIREG™ TLF35584 PMIC
Functional safety applications

› Powertrain
  - Engine management
  - Transmission
  - Transfer case
  - Clutch actuator
  - Starter generator (e.g. ISG)

› xEV
  - Battery management
  - Traction Inverter
  - ...

› Chassis/ safety
  - Electric power steering
  - Electric steering column lock
  - Braking (e.g. brake booster)
  - Electric parking brake
  - Active suspension
  - Chassis control
  - Domain control
  - ADAS domain control
  - ...
OPTIREG™ TLF35584 PMIC supports ASIL-D applications, enabling extended lifetime in harsh automotive environments.

Application examples:
- Sensor fusion (TLF35584)
- Electric Parking Brake (TLF35584)
- Battery management (TLF35584)
- Chassis control (TLF35584)
- Steering column lock (TLF35584)
- Electric power steering (TLF35584)
- Traction inverter (TLF35584)
- Transfer case (TLF35584)
- ADAS domain control (TLF35584)
- Transmission (TLF35584)
- On-board charger (TLF35584)
- Engine management (TLF35584)
- Chassis domain (TLF35584)
- Chassis & safety
- Powertrain
- Engine management
- Transmission
- On-board charger
- ADAS domain control
- ADAS domain control
- Chassis domain
- Electric power steering
- Traction inverter
- Transfer case
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- Engine management
OPTIREG™ PMIC together with OPTIREG™ TLF11251 for a safe and optimized multi-channel power supply of Infineon µC families

IFX offers a scalable PMIC portfolio which can cover the complete AURIX™ TC2x/TC3x portfolio
TLF35584
OPTIREG™ PMIC Functional safety

Key features

› Buck/boost-pre-regulator
  - Iₒ = 1.25 A; f: 300 kHz-2.5 MHz
› µC-Supply: 3.3 V/5 V @600 mA
› Reference-LDO: 5 V @150 mA (±1%)
› 2 x Tracker: 5 V @150 mA
› Communication-supply: 5 V @200 mA
› Stand-by-LDO: 3.3 V/5 V @10 mA
› Vin: 3 V .. 40 V

EN/ wake (T15 and CAN/ flexRay™)
› SPI
› Safety features
  - Multiple bandgap (supply vs V-monitoring)
  - UV/OV-monitoring, ERR-monitoring
  - Functional-WD & window-WD
  - Safe-state control, secondary safety path
  - Protected safety area
  - Built-in self-test (BIST)

Application diagram

Applications

Powertrain
EDT
Chassis
Safety
TLF35584QKV/VVSx
OPTIREG™ PMIC Functional safety

Key features

› Buck/boost-pre-regulator
  - \( I_Q = 1.25 \text{ A}; f: 300 \text{ kHz}-2.5 \text{ MHz} \)
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Package

OPTIREG™ PMIC
FuSa Power Supply TLF35584

Vbatt
Tracker
SMPR
LDO
OPTIREG™ PMIC 
FuSa Power Supply TLF35584
Window- & Q/A-Watchdog
UV-/OV-/Error-Monitoring
Safe State Controller

Boost/Buck Pre-Reg
StdBy LDO
\( \mu \text{C} \) LDO
Ref LDO
Tracker1 Tracker2
Com LDO

AURIX™ TC2x/ TC3x

Sensors

Safety Path

CAN
FlexRay™

PG-VQFN-48
PG-LQFP-64

Grade 1+

ISO 26262 compliant

AEC-Q Qualified

RoHS
TLF35584QVHSx
OPTIREG™ PMIC Functional safety

Key Features

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  - $I_Q = 1.25\, \text{A; f: 300 kHz-2.5 MHz}$
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› Safety features
  - Multiple bandgap (supply vs V-monitoring)
  - UV/OV-monitoring, ERR-monitoring
  - Functional-WD & window-WD
  - Safe-state control, secondary safety path
  - Protected safety area
  - Built-in self-test (BIST)
› Vin: 3 V .. 40 V

Package

› Leadless VQFN-48 for $T_J > 150°C$ (AEC-Q100 Grade 0) is now available

Vin

LDO

SMPR

Tracker

Boost/Buck
Pre-Reg

StdBy
LDO

μC
LDO

Ref
LDO

Tracker1
Tracker2

Com
LDO

Sensors

Sensors

CAN

FlexRay™

Window- & Q/A-Watchdog

UV-/OV-/Error-Monitoring

Safe State
Controller

AURIX™ TC2x/ TC3x

Optireg™ PMIC FuSa Power Supply TLF35584

Optireg™ compliant

ISO 26262 compliant

ISO 26262 compliant

PG-VQFN-48
OPTIREG™ TLF35584 PMIC Functional safety to supply the AURIX™ microcontroller and the other loads of your system

OPTIREG™ PMIC FuSa power supply TLF35584

- Window- & Q/A- Watchdog
- UV-/OV-/Error-Monitoring
- Safe State Controller

- Boost/Buck Pre-Reg
- StdBy LDO
- μC LDO
- Ref LDO
- Tracker1 Tracker2
- Com LDO

AURIX™ TC2x/ TC3x

- Sensors

- CAN FlexRay™

Vbatt

Safety Path
# OPTIREG™ TLF35584 PMIC Functional safety Features - benefits

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>ISO 26262-compliant</td>
<td>Usage in applications with ASIL-requirement</td>
</tr>
<tr>
<td>Boost capability</td>
<td>Ensure operation in cold cranking condition</td>
</tr>
<tr>
<td>Pre-/Post-Regulator architecture</td>
<td>High efficiency</td>
</tr>
<tr>
<td>Multiple voltage supplies</td>
<td>System supply: µC, communication, sensors</td>
</tr>
<tr>
<td>Dedicated reference voltage supply</td>
<td>ADC-supply independent of µC-load</td>
</tr>
<tr>
<td>Bandgap for both safety and supply plus electrical isolation</td>
<td>Avoid common cause failures</td>
</tr>
<tr>
<td>WWD &amp; Q/A-WD</td>
<td>Flexible WD to achieve proper ASIL-level</td>
</tr>
<tr>
<td>BIST (analog &amp; logic)</td>
<td>Ensuring “safe” operation</td>
</tr>
<tr>
<td>UV/OV-monitoring</td>
<td>Flexible RESET/interrupt management</td>
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<tr>
<td>Flexible safe state control</td>
<td>Ensuring “safe” operation</td>
</tr>
<tr>
<td>Enable/ wake</td>
<td>Flexible wake-up management</td>
</tr>
</tbody>
</table>
AURIX™ microcontroller & OPTIREG™ PMIC
team up for Functional Safety in the focus automotive applications
**OPTIREG™ PMIC powers up** your automotive system while supervising the microcontroller and the power supply.

**AURIX™ MCU**
- Supply
- SPI
- Interrupt
- SMU
- ISO 26262 compliant

**OPTIREG™ PMIC**
- Supply
- SPI
- V-MON
- WD
- ERR
- Safestate Control
- ISO 26262 compliant

**PMIC internal**
- Internal supplies
- SPI error
- Thermal sensors
- BIST

**Voltage Monitoring**
- Over voltage
- Under voltage
- Over current

**Watchdog**
- Timing error
- Software execution error

**Error monitor**
- React on MCU alarm
OPTIREG™ PMIC Functional safety
genesis of safety requirements

› OPTIREG™ PMICs have been defined based on AURIX™ requirements for external monitoring

› Those requirements have then been extended to support also other MCUs.
  - Choice between different types of flexible watchdogs (Window- & functional-watchdogs)
  - Ability to monitor MCU core supply

› OPTIREG™ PMICs are developed as safety element out of context (SEooC) supporting ASIL-D acc. ISO 26262:2018

ISO 26262 compliant
Infineon’s OPTIREG™ TLF35584 PMIC provides robust, safe and reliable supply for AURIX™ microcontrollers up to TC3x for a dependable system with the highest functional safety demand.

**TLF35584QKVSx**
- PG-LQFP-64
- S1 (5.0V), S2 (3.3V)
- Tj: -40°C .. 150°C
- Grade 1+
- 12 mm x 12 mm
- Development acc. ISO 26262
  Safety standard

**TLF35584QVVSx**
- PG-VQFN-48
- S1 (5.0V), S2 (3.3V)
- Tj: -40°C .. 150°C
- Grade 1
- 7 mm x 7 mm
- Lead-tip inspection
- Development acc. ISO 26262
  Safety standard

**TLF35584QVHSx**
- PG-VQFN-48
- S1 (5.0V), S2 (3.3V)
- Tj: -40°C .. 175°C
- Grade 0+
- 7 mm x 7 mm
- Lead-tip inspection
- Development acc. ISO 26262
  Safety standard

New
OPTIREG™ TLF35584 PMIC Functional safety

General

- PG-VQFN-48
  - As TLF35584QV
  - With lead-tip-inspection
  - Footprint: 7 mm x 7 mm
  - Pitch: 0.5
- PG-LQFP-64
  - As TLF35584QK
  - Footprint: 12 mm x 12 mm
  - Pitch: 0.5
- Vin: 3 V .. 40 V (60V with rise time >10 ms)
- Tj: -40°C .. 150°C, up to 175°C with QFN (extension to be checked on request acc. customer’s load/temperature-profile for PG-LQFP-64)
- Development acc. ISO 26262:2018 safety standard

<table>
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<th>Sales Name</th>
<th>Package</th>
<th>LDO1</th>
<th>Stanby-LDO</th>
<th>LDO2</th>
<th>Tracker 1 &amp; 2</th>
<th>Ref.-LDO</th>
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### OPTIREG™ TLF35584 PMIC

**Variants:** PG-VQFN-48-31

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## OPTIREG™ TLF35584 PMIC

Variants: PG-VQFN-48-79

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### Variants: PG-LQFP-64-13

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## OPTIREG™ TLF35584 PMIC
Learn more about OPTIREG™ PMICs support material

### Collaterals and Brochures
- Product briefs
- Selection guides
- Application brochures
- Presentations
- Press releases

### Technical Material
- Application notes
- Technical articles
- Simulation models
- Datasheets, MCDS files
- PCB Design Data

### Evaluation Boards
- Evaluation boards
- Demoboards
- Reference designs

### Further Info
- Technical videos
- Product videos

* Accessible only via myICP

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**Evaluation Board**
- **TLF35584QVHS1 Board**
- **TLF35584QVHS2 Board**

**Companion Board**
- **PMIC Boards**

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**Datasheet**
- **Datasheet**

**Technical Material**
- **Technical Material**

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**Why Infineon’s OPTIREG™ PMIC family is relevant for safety-related automotive applications (E1)**
- ATV: OPTIREG™ PMIC - Technical safety requirements and goals (E2)
Learn how to integrate AURIX™ TC3xx microcontrollers with Infineon system power supplies of the TLF family and check out existing HW

- Application Note
- Triboard Manuals

Get software support from the wide partners ecosystem of Infineon

- Hitex SafeTpack TC3x
- Vector vSBC
- AURIX™ SafeTlibTC2x

* myICP Access required

Find out more on AURIX™ support

More info on the power supply partners
OEMs/Tier1s can skip one step in the manufacturing

Providing a solder-able sidewall on lead tip of the VQFN leadless package to enable automated optical inspection (AOI)
Part of your life. Part of tomorrow.