

# OPTIREG™ PMIC TLF35585QVS02

## Functional safety PMIC



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Technical documents



Simulation



Family overview



Support



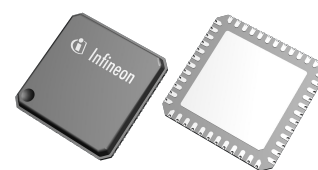
RoHS



ISO 26262 compliant

## Features

- High efficient power management integrated circuit (PMIC)
- Serial step up and step down pre-regulator for wide input voltage range from 3.0 V to 40 V with full performance and low overall power loss
- Low drop post regulator 3.3 V/600 mA for microcontroller main supply (QUC)
- Low drop post regulator 5.0 V/200 mA for communication supply (QCO)
- Voltage reference ( $\pm 1\%$ ) 5.0 V/150 mA for ADC supply (QVR)
- Two trackers for sensor supply following voltage reference 150 mA current capability each (QT1 and QT2)
- Standby regulator 3.3 V/10 mA (QST)
- Enable, sync out signal and voltage monitoring of an optional external post regulator for core supply
- Independent voltage monitoring block and error pin monitoring
- Configurable window watchdog and functional watchdog
- Safe State Control with two safe state signals with programmable delay
- 16-bit SPI, interrupt and reset function
- High junction temperature operation up to 175°C
- PRO-SIL™ Features:
  - ISO 26262 Safety Element out of Context for requirements up to ASIL D
  - Safety documentation for ISO 26262 compliant system integration
- Green Product (RoHS compliant)



## Potential applications

- Electric power steering
- Battery management
- Engine management
- Domain control
- Traction inverter

## Product validation

Qualified for automotive applications with higher temperature requirements. Product validation according to AEC-Q100, Grade 0.

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**Description**

## Description

The OPTIREG™ PMIC TLF35585QVS02 is a highly efficient Functional Safety PMIC (Power management integrated circuit) for safety-relevant applications.

The power supply includes a boost-buck pre-regulator supplying post regulator rails for microcontroller supply, communication supply and a precise voltage reference. In addition, two trackers following the voltage reference are available to supply off-board sensors.

The OPTIREG™ PMIC TLF35585QVS02 comes with a configurable window watchdog (time based trigger) and functional watchdog (question and answer based trigger), error pin monitoring and voltage monitoring functions as major supervision functions. For microcontroller interaction a 16-bit SPI, interrupt and reset function are provided.

The device has been developed according to ISO 26262 targeting systems up to ASIL D and supports an extended junction temperature range of up to 175°C.

Type	Package	Marking (Line1 / Line2)
TLF35585QVS02	PG-VQFN-48-79	TLF35585 / S02

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**1 General product characteristics**

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**1.1 Absolute maximum ratings**

**Table 1 Absolute maximum ratings<sup>1)</sup>**

$T_j = -40^\circ\text{C}$  to  $175^\circ\text{C}$ , all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or condition	Number
		Min.	Typ.	Max.			
<b>Voltages</b>							
Boost driver ground	$V_{BSG}$	-0.3	-	0.3	V	-	P_4.1.1
Input standby supply	$V_{VST}$	-0.3	-	40	V	2) 3)	P_4.1.2
Input voltage pin 1 (pre-regulator)	$V_{VS1}$	-0.3	-	40	V	2) 3)	P_4.1.3
External step up power stage, gate	$V_{DRG}$	-0.3	-	40	V	2)	P_4.1.4
External power stage, sense resistor high	$V_{RSH}$	-0.3	-	40	V	2)	P_4.1.5
External power stage, sense resistor low	$V_{RSL}$	-0.3	-	2.5	V	-	P_4.1.6
Enable input	$V_{ENA}$	-0.3	-	40	V	2)	P_4.1.7
Enable input	$I_{ENA}$	-5	-	-	mA	4)	P_4.1.8
Wake input	$V_{WAK}$	-0.3	-	40	V	2)	P_4.1.9
Wake input	$I_{WAK}$	-5	-	-	mA	4)	P_4.1.10
Reset output	$V_{ROT}$	-0.3	-	40.0	V	-	P_4.1.11
SPI chip select input	$V_{SCS}$	-0.3	-	40.0	V	-	P_4.1.12
SPI clock input	$V_{SCL}$	-0.3	-	40.0	V	-	P_4.1.13
SPI data in (MOSI) input	$V_{SDI}$	-0.3	-	40.0	V	-	P_4.1.14
SPI data out (MISO output)	$V_{SDO}$	-0.3	-	40.0	V	-	P_4.1.15
Interrupt output	$V_{INT}$	-0.3	-	40.0	V	-	P_4.1.16
Window watchdog trigger input	$V_{WDI}$	-0.3	-	40.0	V	-	P_4.1.17
Error pin input	$V_{ERR}$	-0.3	-	40.0	V	-	P_4.1.18
Safe state 1 output	$V_{SS1}$	-0.3	-	40.0	V	-	P_4.1.19
Safe state 2 output	$V_{SS2}$	-0.3	-	40.0	V	-	P_4.1.20
Output voltage reference supply	$V_{QVR}$	-0.3	-	6.0	V	-	P_4.1.21
Output tracker 2	$V_{QT2}$	-1.0	-	40	V	-	P_4.1.22

**(table continues...)**

**1 General product characteristics**

**Table 1 (continued) Absolute maximum ratings<sup>1)</sup>**

$T_j = -40^\circ\text{C}$  to  $175^\circ\text{C}$ , all voltages with respect to ground, positive current flowing into pin (unless otherwise specified)

Parameter	Symbol	Values			Unit	Note or condition	Number
		Min.	Typ.	Max.			
Output tracker 1	$V_{QT1}$	-1.0	–	40	V	–	P_4.1.23
Output communication supply	$V_{QCO}$	-0.3	–	6.0	V	–	P_4.1.24
Output microcontroller main supply	$V_{QUC}$	-0.3	–	6.0	V	–	P_4.1.25
External core voltage monitor input	$V_{VCI}$	-0.3	–	6.0	V	–	P_4.1.26
HW config: ext. core voltage monitor	$V_{SEC}$	-0.3	–	6.0	V	–	P_4.1.27
Synchronization output	$V_{SYN}$	-0.3	–	40.0	V	–	P_4.1.28
Enable output for ext. core supply	$V_{EVC}$	-0.3	–	40.0	V	–	P_4.1.29
Step down feedback input 2	$V_{FB2}$	-0.3	–	8.0	V	–	P_4.1.30
Step down feedback input 1	$V_{FB1}$	-0.3	–	8.0	V	–	P_4.1.31
Step down power ground 2	$V_{PG2}$	-0.3	–	0.3	V	–	P_4.1.32
Step down power ground 1	$V_{PG1}$	-0.3	–	0.3	V	–	P_4.1.33
Step down switching node	$V_{SW1}$	-0.3	–	40	V	<sup>3)</sup>	P_4.1.34
HW config: step up pre-regulator	$V_{STU}$	-0.3	–	6.0	V	–	P_4.1.35
HW config: step down frequency	$V_{FRE}$	-0.3	–	6.0	V	–	P_4.1.36
Output standby supply	$V_{QST}$	-0.3	–	6.0	V	–	P_4.1.37
Input MPS	$V_{MPS}$	-0.3	–	20	V	–	P_4.1.38

**Temperatures**

Junction temperature	$T_j$	-40	–	175	°C	–	P_4.1.39
Storage temperature	$T_{stg}$	-55	–	175	°C	–	P_4.1.40

**ESD susceptibility**

ESD robustness to GND	$V_{ESD}$	-2	–	2	kV	HBM <sup>5)</sup>	P_4.1.41
ESD robustness to GND	$V_{ESD}$	-500	–	500	V	CDM <sup>6)</sup>	P_4.1.42
ESD robustness (corner pins) to GND	$V_{ESD,Corner}$	-750	–	750	V	CDM <sup>6)</sup>	P_4.1.43

1) Not subject to production test, specified by design.

2) Maximum rating is 60 V, if rising slewrate of voltage at the pin is lower than 6 V/ms, for an overall time of 1 hour during the lifetime of the product

3) Maximum rating is 43.5 V, for an overall time of 10 s (in the range of 40 V to 43.5 V) during the lifetime of the product independent from the rise time.

4) Consider external series resistor for negative voltages < -0.3 V to ensure maximum rating of current

## **1 General product characteristics**

- 5) Human body model (HBM) robustness according to ANSI/ESDA/JEDEC JS-001 (1.5 kΩ, 100 pF).
  - 6) Charged device model (CDM) robustness according to ESDA STM5.3.1 or ANSI/ESD S.5.3.1.
- 

**Note:** *This thermal data was generated in accordance with JEDEC JESD51 standards. For more information visit [www.jedec.org](http://www.jedec.org).*

## **2 Application information**

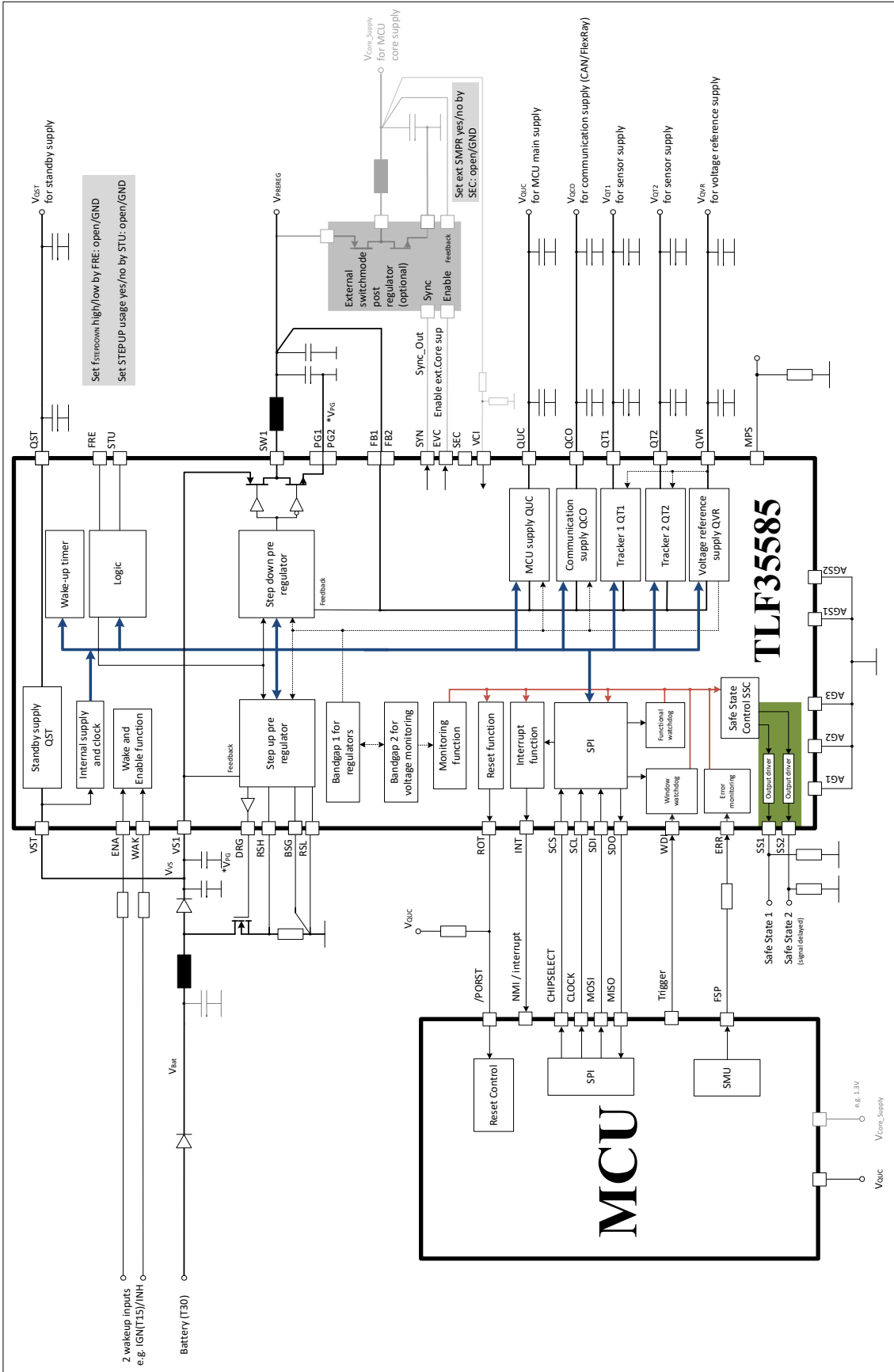
The following figure describes how the IC is used in its environment.

**Note:** *The following information is given as an example for the implementation of the device only and shall not be regarded as a description or warranty of a certain functionality, condition or quality of the device.*

- Please contact us for additional supportive documentation.
- For further information you may contact <http://www.infineon.com/>

**Note:** *This figure is a simplified example of an application circuit. The function must be verified in the application.*

**2 Application information**

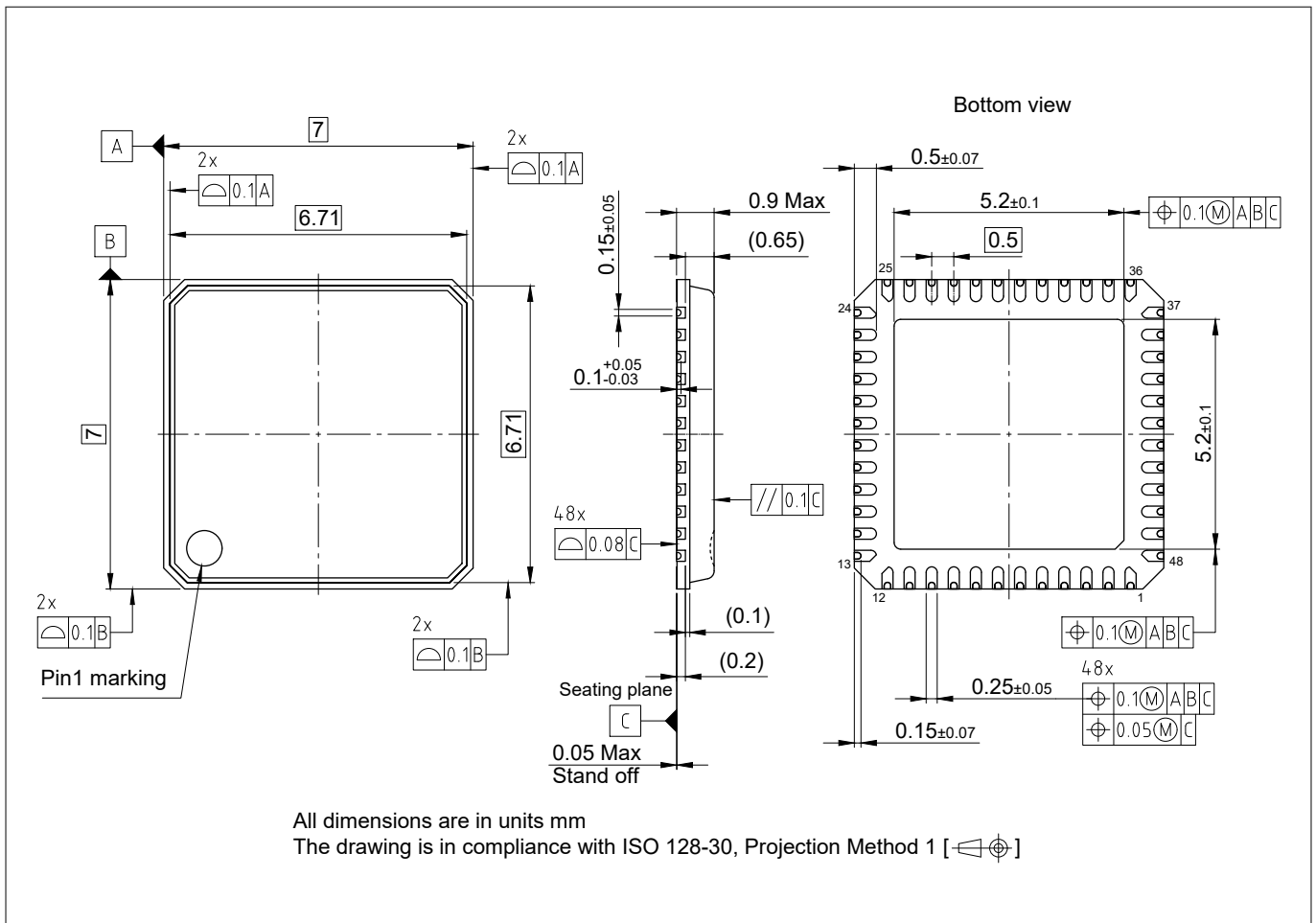


**Figure 1** Application diagram



**3 Package information**

**3 Package information**



**Figure 2 PG-VQFN-48-79**

**Green Product (RoHS compliant)**

To meet the world-wide customer requirements for environmentally friendly products and to be compliant with government regulations the device is available as a Green Product. Green Products are RoHS compliant (Pb-free finish on leads and suitable for Pb-free soldering according to IPC/JEDEC J-STD-020).

**Information on alternative packages**

Please visit [www.infineon.com/packages](http://www.infineon.com/packages).

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