OPTIREG™ PMIC TLF35585QUS02

Functional safety PMIC

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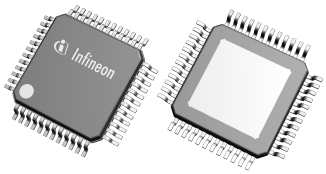
AEC Qualified | RoHS | ISO 26262 compliant

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 (±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.

Description

The OPTIREG™ PMIC TLF35585QUS02 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 TLF35585QUS02 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)
TLF35585QUS02	PG-TQFP-48-10	TLF35585 / S02

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1 General product characteristics

1.1 Absolute maximum ratings

Table 1 Absolute maximum ratings[1)]

T_j = -40°C to 175°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.			
Voltages							
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...)

Table 1 (continued) Absolute maximum ratings[1)]

T_j = -40°C to 175°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	[3)]	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 [5)]	P_4.1.41
ESD robustness to GND	V_{ESD}	-500	–	500	V	CDM [6)]	P_4.1.42
ESD robustness (corner pins) to GND	$V_{ESD,Corner}$	-750	–	750	V	CDM [6)]	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

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.*

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

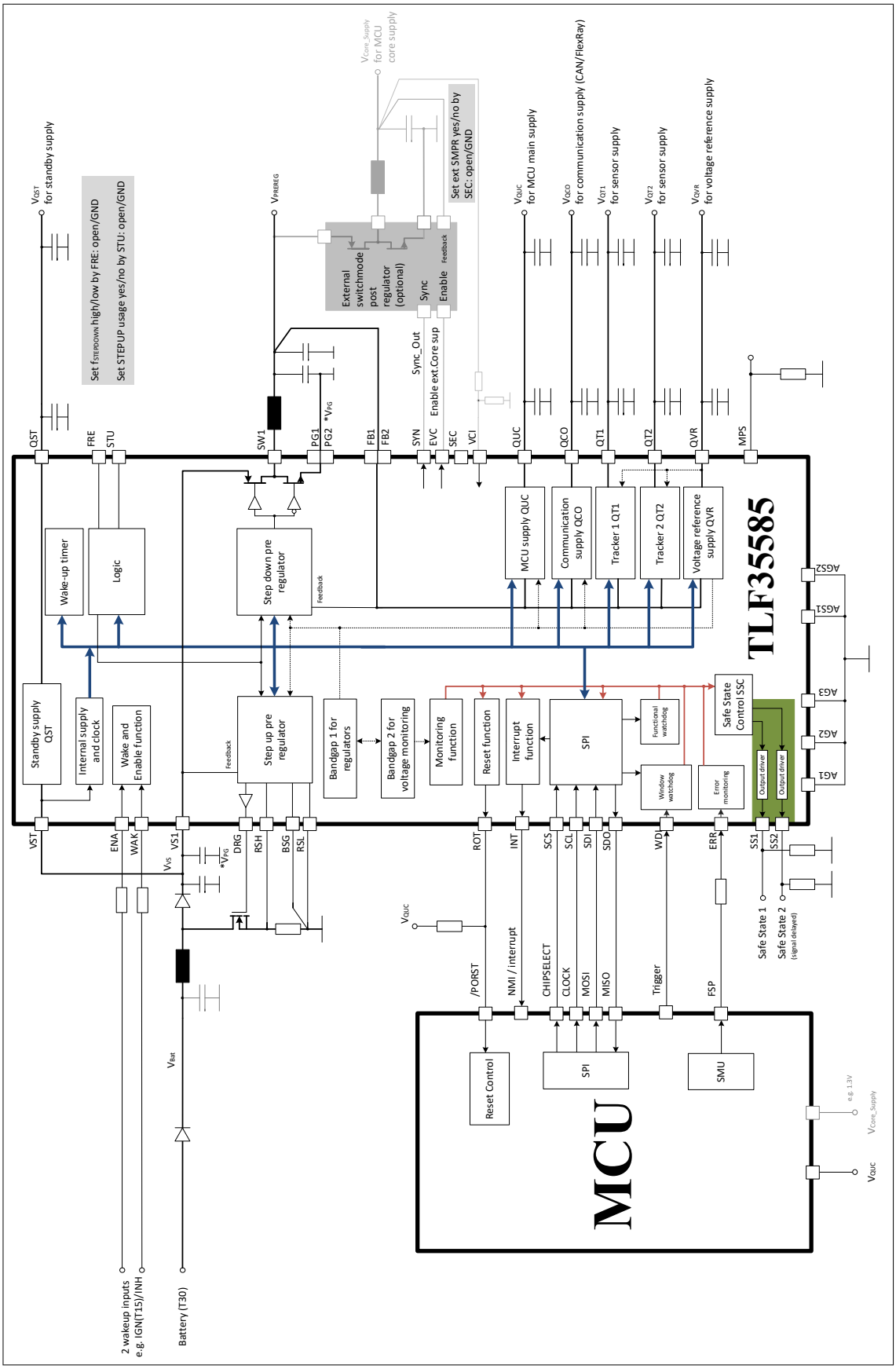

Figure 1 Application diagram

3 Package information

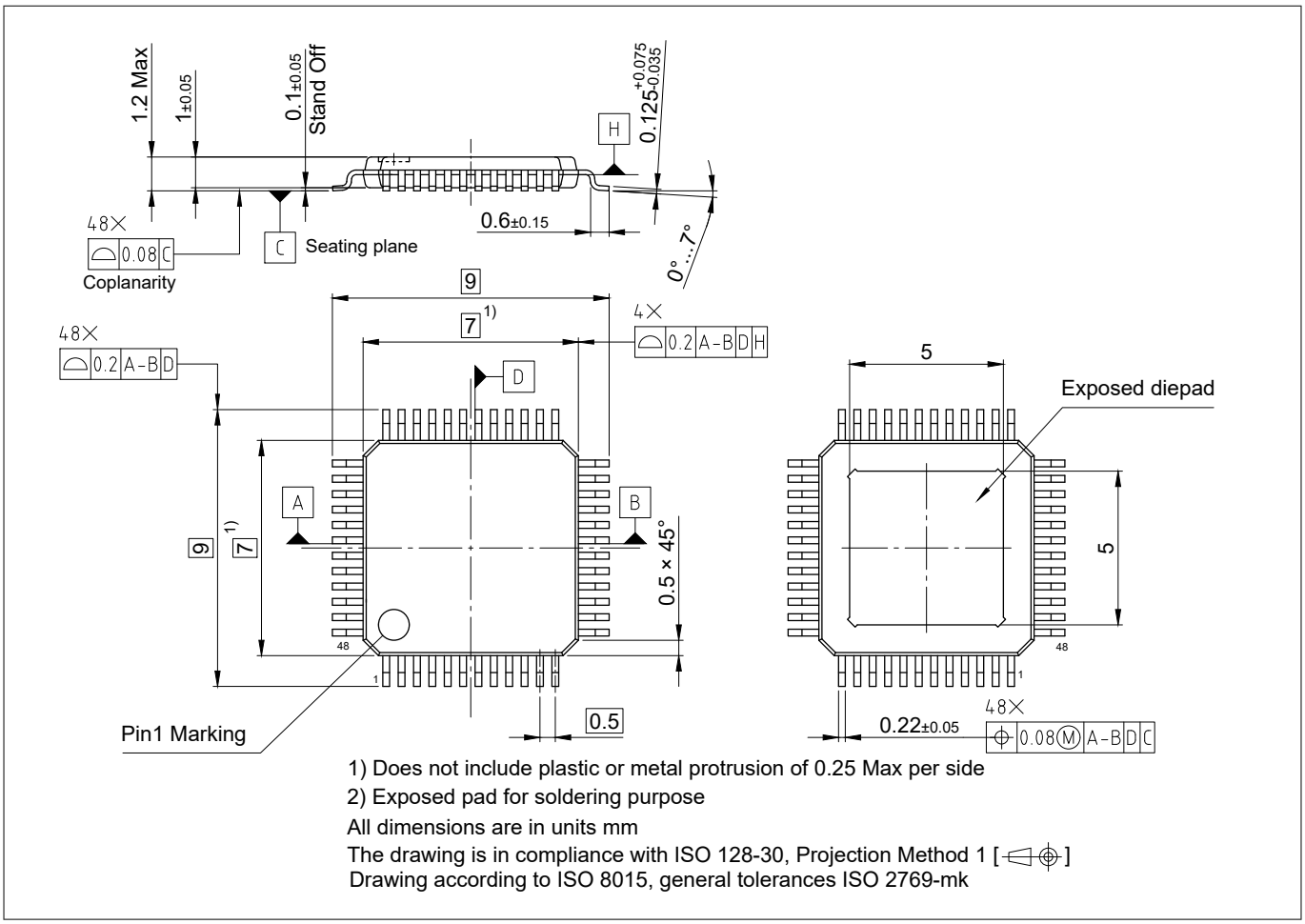

Figure 2 PG-TQFP-48-10

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.

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