CONTROLLER ENTRY DEVICE WITH INTEGRATED DST80 AUTHENTICATION, EEPROM, AND LF IMMOBILIZER INTERFACE

Check for Samples: TMS37F158

FEATURES

- **Wide Supply Voltage Range: 2.0 V to 3.6 V**
- **Ultra-Low Power Consumption**
  - **CPU Active Mode: 200 µA/MHz at 2.2 V**
  - **Standby Mode (LPM3): 0.7 µA**
  - **Off Mode (LPM4): 0.1 µA**
  - **Power Down Mode: 60 nA**
- **Microcontroller System and Peripherals**
  - **16-Bit RISC Architecture, 125-ns Instruction Cycle Time**
  - **Wake-Up From Standby Mode in <6 µs**
  - **Basic Clock Module Configurations**
    - **Single External Resistor**
    - **32-kHz Crystal**
    - **High-Frequency Crystal**
    - **Resonator**
    - **External Clock Source**
  - **16-Bit Timer_A With Three Capture/Compare Registers**
  - **8KB + 256B Flash Memory**
  - **256B RAM**
  - **150-Byte EEPROM**
  - **Serial Onboard Programming, No External Programming Voltage Needed**
  - **Programmable Code Protection by Security Fuse**
  - **80-Bit DST80 Security Authentication Coprocessor**
  - **12 I/O Ports**
  - **Integrated Push-Button Logic**
- **Low-Frequency (LF) Immobilizer Interface**
  - **Integrated Batteryless Immobilizer Interface**
  - **Half-Duplex (HDX) Immobilizer Communication Achieves up to 4-in (10-cm) Read Range**
  - **Special Selective Addressing Mode Allows Reliable Learn-In Sequence**
  - **80-Bit Authentication Key Length**
  - **Up to 8-kbit/s Uplink Data Rate**
  - **5/3-Byte Challenge/Response Algorithm**
  - **Fast Authentication Within 42 ms**
  - **Fast Mutual Authentication Within 65 ms**
  - **150-Byte EEPROM**
    - **124-Byte Available EEPROM User Memory**
    - **32-Bit Unique Serial Number**
    - **High EEPROM Security and Flexibility**
    - **Write-Only Authentication Keys**
    - **Pages Are Irreversibly Lockable and Protectable**
    - **Protected Pages Programmable Only Through Mutual Authentication**
  - **Battery Check and Charge Functions**
  - **Each User Page is Lockable**
  - **Resonant Frequency: 134.2 kHz**
  - **Integrated Resonant Frequency Trimming**

DESCRIPTION

The TMS37F158 Controller Entry Device (CED80) combines an ultra-low-power 16-bit RISC microcontroller with the proven TI DST80 immobilizer interface and a sophisticated power management system. It is the ideal device for any remote control or remote keyless entry application. The embedded DST80 low-frequency (LF)immobilizer interface offers a high level of security through its hardware encryption and mutual authentication with 80-bit security key length. The immobilizer interface is always accessible and operates without the need for a battery. The low-power microcontroller MSP430 core offers a 16-bit RISC architecture, 8KB program memory, battery charge and check functions, and 12 user-accessible I/O ports.

The CED80 manages the immobilizer communication and push-button interaction. During sleep state, the device enters a special low-power mode with only 60 nA of current consumption. By sensing the pressing of a push button, the device wakes up and controls an external UHF transmitter or UHF transceiver. Security keys and rolling codes can be stored in the integrated EEPROM memory. This memory is accessible over the LF interface without support from the battery in the keyfob or by the internal microcontroller if the battery is functional. The CED80 offers a special battery-charge mode; to achieve faster charging, it is recommend to add a charging amplifier device on the base station side. The external resonant circuit with an LF coil and a resonant capacitor can be trimmed to the correct resonant frequency with the integrated trimming capability, which eliminates part tolerances.

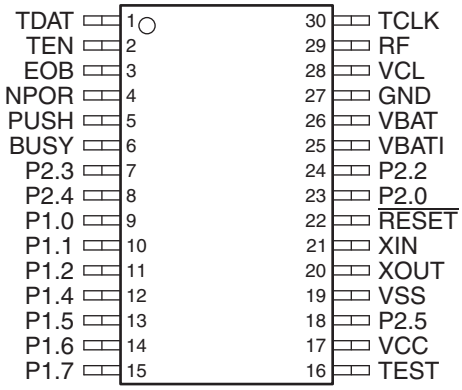
The small DBT 30-pin package together with only a few external components results in cost-efficient design.

Ordering Information(1)

T_A	PACKAGE(2)	ORDERABLE PART NUMBER
–40°C to 85°C	TSSOP – DBT	TMS37F158LGIDBTRG4

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

DBT PACKAGE
(TOP VIEW)



Functional Block Diagram

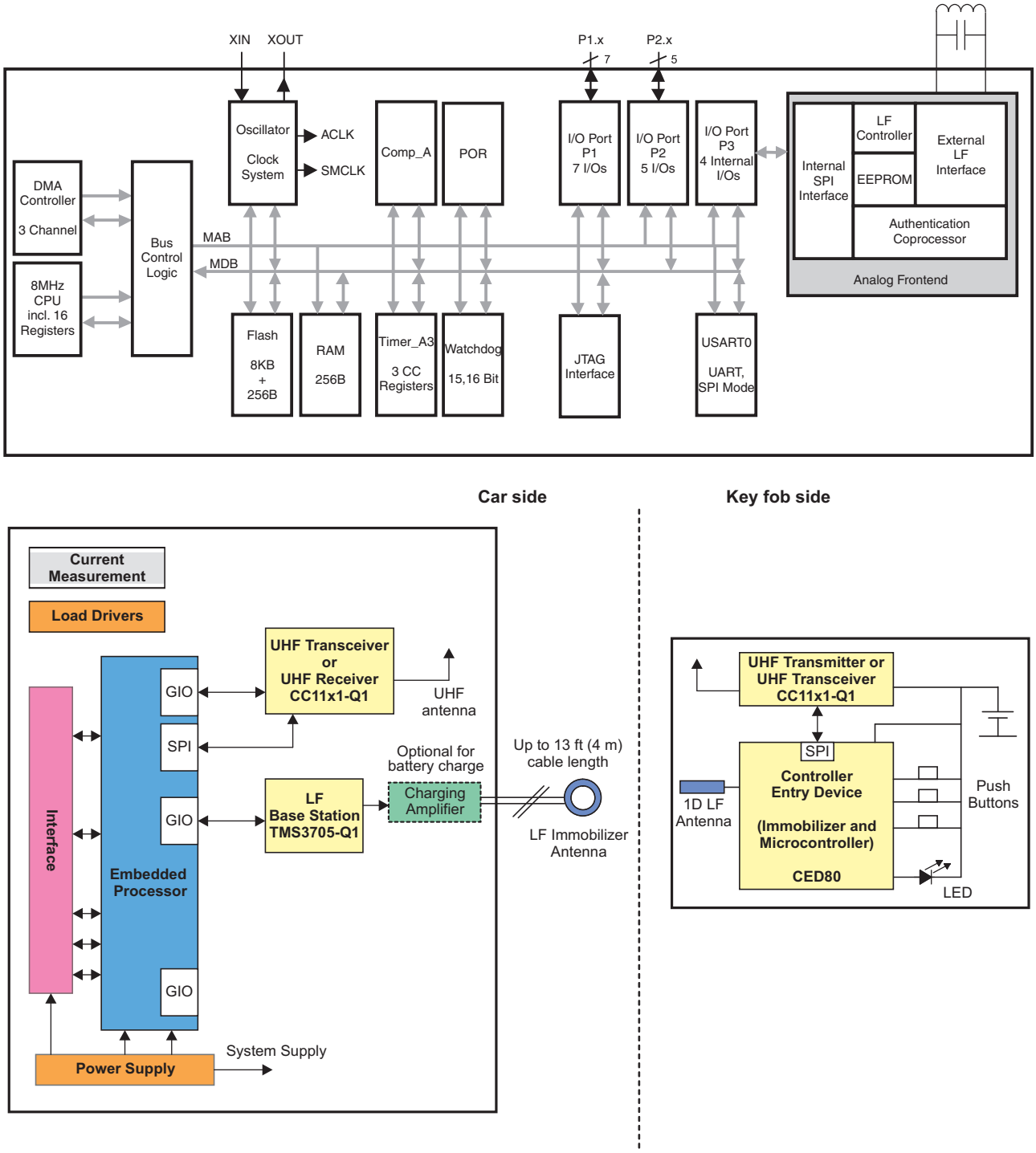


Figure 1. Application Diagram

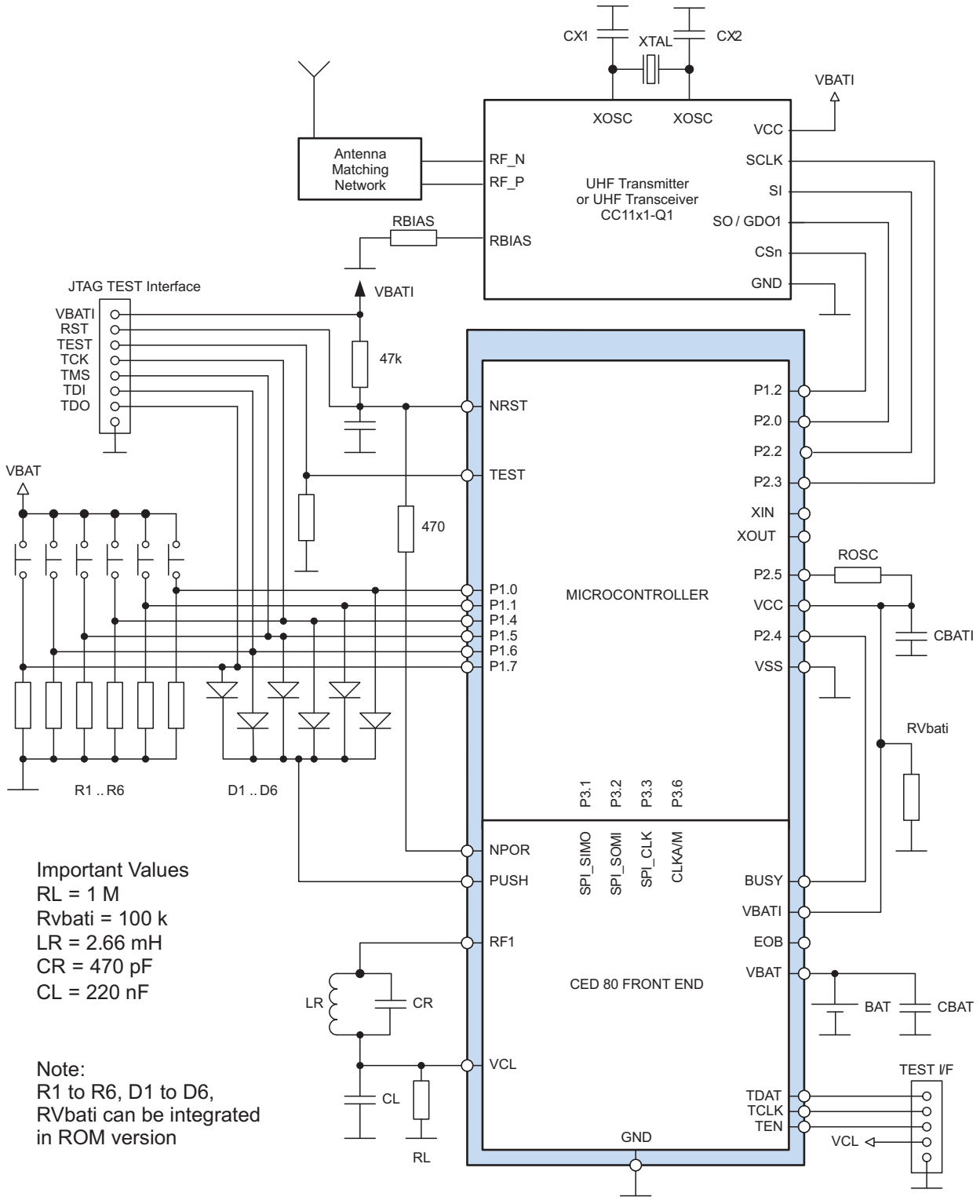


Figure 2. Application Schematic

Operating Characteristics

PART NUMBER	**TMS37F158ADBTIRG4**	
Features	Immobilizer plus microcontroller with integrated power management	
DST80 authentication logic	80-bit key length, 4-byte or 5-byte challenge, 3-byte signature	
DST80 encryption time	Mutual authentication: 65 ms Fast authentication: 42 ms	
Microcontroller	16-bit RISC ultra-low power based on MSP430F123 core	
Supply voltage (VBAT)	2.0 V to 3.6 V	
Active current consumption	200 µA (V_{CC} = 2.2 V, f_{osc} = 1 MHz)	
Standby current consumption	60 nA (typ) (with PUSH logic)	
Transponder		
Transmission principle	HDX (half duplex telegram protocol)	
Operating frequency	134.2 kHz Integrated resonant frequency trimming capability via LF or test interface	
Security	Challenge/response, mutual authentication	
Downlink	100% AM, PPM bit coding with 2 kbit/s (typ)	
Uplink	FSK modulation with 7.9 kbit/s (typ)	
EEPROM memory	150 bytes	124-byte free available EEPROM user memory
		32-bit unique serial number
EEPROM endurance	200 000 cycles (T_A = 25°C) (min)	
Clock reference for microcontroller	Resonant circuit can be used as clock reference for the microcontroller	
Battery check	Two free programmable voltage levels: 2.0 V to 3.6 V with 0.1-V steps	
Battery charge	Integrated battery-charge functionality	
Key learn-in	Special selective addressing to provide secure learn-in procedure	
Microcontroller		
Memory	8KB program memory , 256-byte RAM	
User data flash memory	256-byte information memory	
Flash program and erase endurance	100 000 cycles (typ)	
Flash data retention	100 years (min)	
Program, erase, read supply voltage	2.7 V (min)	
I/O ports	12	
Operating temperature	-40 to 85°C	
Package	30-pin TSSOP (DBT)	

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/ Ball Finish	MSL Peak Temp (3)	Samples (Requires Login)
TMS37F158LGIDBTRG4	ACTIVE	TSSOP	DBT	30		TBD	Call TI	Call TI	

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
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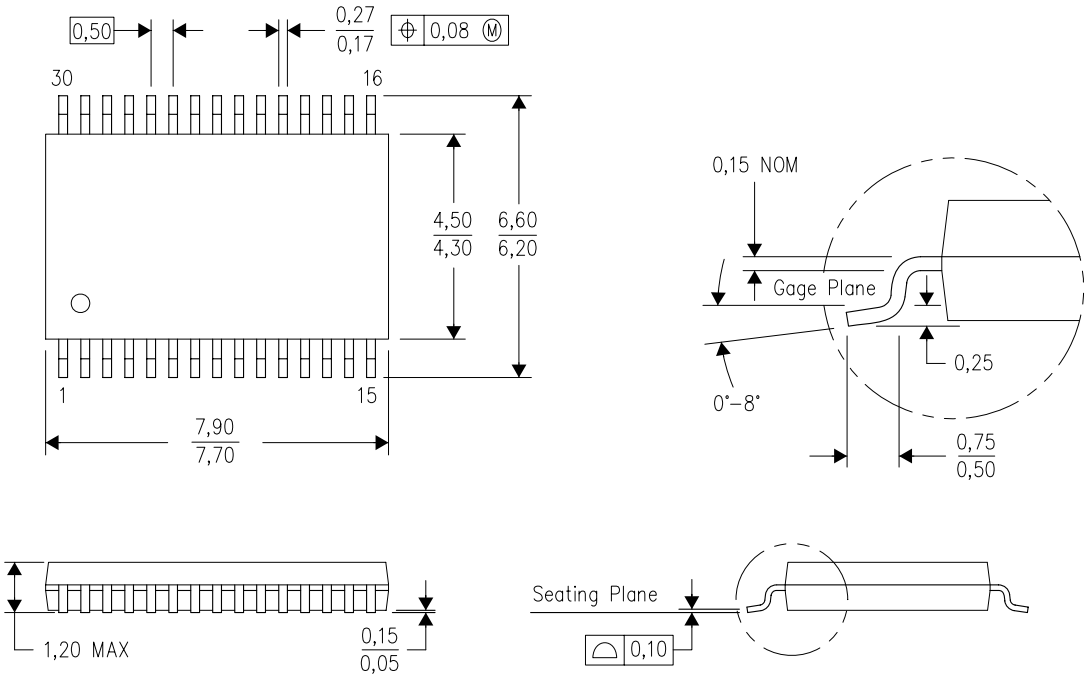
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

DBT (R–PDSO–G30) PLASTIC SMALL OUTLINE



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NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion.
D. Falls within JEDEC MO–153.

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