50W System-Level Power Reference Design for Automotive Infotainment Systems

(ACTIVE) TIDA-00744

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Key Document

- **TIDA-00744 Test Results** (PDF 10150 KB)
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TIDA-00744 50W System-Level Power Reference Design for Automotive Infotainment Systems Board Image (Top View)

Fully assembled board (shown above) developed for testing and performance validation only, not available for sale.

Description

TIDA-00744 is a 50-W system-level SMPS design for mid-power automotive infotainment systems.
The design has protections, such as load dump through TVS (ISO pulse testing), as well as reverse voltage (innovative smart diode with very low Iq) protection. Furthermore, all the controllers (boost and dual bucks) are in SYNC for EMI-optimized design.
The design is divided into four major blocks:

1. Protection: Reverse battery protection through efficient smart diode and automotive transient protections through TVSs
2. EMI filter: A differential filter for conducted EMI suppression
3. Preboost: Efficient low-cost nonsynchronous preboost design for 50-W applications. The output is maintained at 10 V and when Vin > Vout (programmed boost out), the output follows the input and bypass operation is achieved (through a conducting PFET when VIN > programmed 10-V boost output).
4. Dual buck controller: 2.2-MHz switching for AM band avoidance, as well as small-size solution. Supports two outputs: 5 V at 5 A and 3.3 V at 5 A. The syncout of controller is used to sync boost at F/9 frequency.

Features

- Lossless bypass operation, avoids loss in boost diode
- Wide Vin support for automotive application
- Cycle-by-cycle current limit and optional hiccup-mode overload protection
- Low-cost solution and high-efficiency solution for 50-W application
- Smart diode for highly efficient reverse battery protection

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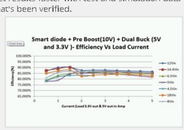
Schematic/Block Diagram

Quickly understand overall system functionality.

Download Schematic

Design Guide

Get results faster with test and simulation data that's been verified.



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Design Files

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Bill of Materials (BOM)

Find the complete list of components in this reference design.

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Parametrics

	TIDA-00744.1 (Output Voltage 1)	TIDA-00744.2 (Output Voltage 2)	TIDA-00744.3 (Output Voltage 3)
Vin (Min) (V)	4	10	10
Vin (Max) (V)	32	32	32
Vout (Nom) (V)	10	3.3	3.3
Iout (Max) (A)	5	5	5
Output Power (W)	50	16.5	16.5
Isolated/Non-Isolated	Non-Isolated	Non-Isolated	Non-Isolated
Input Type	DC	DC	DC
Topology	Boost- Synchronous	Buck- Synchronous	Buck- Synchronous

TI Devices (4)

Order samples, get tools and find more information on the TI products in this reference design.

Part Number	Name	Product Family	Sample & Buy	Design Kits & Evaluation Modules
CD74HC4017	High Speed CMOS Logic Decade Counter/Divider with 10 Decoded Outputs	Specialty Logic	Sample & Buy	Not Available
LM3481-Q1	48V Wide Vin High-Efficiency Controller for Boost, SEPIC and Flyback DC-DC Converters	Step-Up (Boost)	Sample & Buy	View Design Kits & Evaluation Modules
LM5140-Q1	Wide Vin Dual 2.2MHz low Iq Synchronous Buck Controller	Step-Down (Buck)	Sample & Buy	View Design Kits & Evaluation Modules

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CAD/CAE symbols

Part #	Package | Pins	CAD File [.bxl]	STEP Model [.stp]
CD74HC4017	SOIC (D) | 16	Download	Download
	PDIP (N) | 16	Download	Download
	SOP (NS) | 16	Download	-
	TSSOP (PW) | 16	Download	Download
LM3481-Q1	VSSOP (DGS) | 10	Download	Download
LM5140-Q1	VQFNP (RWG) | 40	Download	Download
LM74610-Q1	VSSOP (DGK) | 8	Download	Download

Texas Instruments and Accelerated Designs, Inc. have collaborated together to provide TI customers with schematic symbols and PCB layout footprints for TI products.

Step 1: Download and install the free download.

Step 2: Download the Symbol and Footprint from the CAD.bxl file table.

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Technical Documents

User guides (1)

Title	Abstract	Type	Size (KB)	Date	Views	TI Recommends
TIDA-00744 Test Results		PDF	10150	21 Mar 2016	44	✓

Design files (5)

Title	Abstract	Type	Size (KB)	Date	Views
TIDA-00744 Altium		ZIP	1537	21 Mar 2016	23
TIDA-00744 Gerber		ZIP	640	21 Mar 2016	12
TIDA-00744 BOM		PDF	28	21 Mar 2016	21
TIDA-00744 Block Diagram		PDF	617	21 Mar 2016	48
TIDA-00744 Schematic		PDF	450	21 Mar 2016	63

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