UCC3917 Floating Hot Swap Power Manager Evaluation Board

Power Distribution & Power Supply

Contents

1   Introduction

The DV3917 evaluation board allows the designer to evaluate the performance of the UCC3917 Positive Floating Hot-Swap Power Manager (HSPM) in a typical application setting. Component selection for the DV3917 is for operation at 28 V – 60 V, 1 A. Operation at other voltages and currents may be accomplished by proper component selection and replacement. The DV3917 schematic is shown in Figure 1. The list of materials with component ratings is specified in Table 1.

2   Connectors

J1: 28 V – 60 V input. The power supply at this input should be able to source at least 3 A.

J2: Load output.

P1: FAULT output. This TTL compatible status signal is referenced to load ground. FAULT is high when Q1 opens as a result of a fault but is low otherwise.

P2: REMOTE SHUTDOWN input. Set S3 to RUN inorder to use the REMOTE SHUTDOWN input. This TTL compatible input is referenced to load ground. A logic "1" turns off power to the load. A logic "0" re-enables power to the load.

P3: REMOTE LATCH input. Set S2 to OFF inorder to use the REMOTE LATCH input. This TTL compatible input is referenced to load ground. A logic "1" latches off power to the load in a fault. A logic "0" causes a retry in a fault.
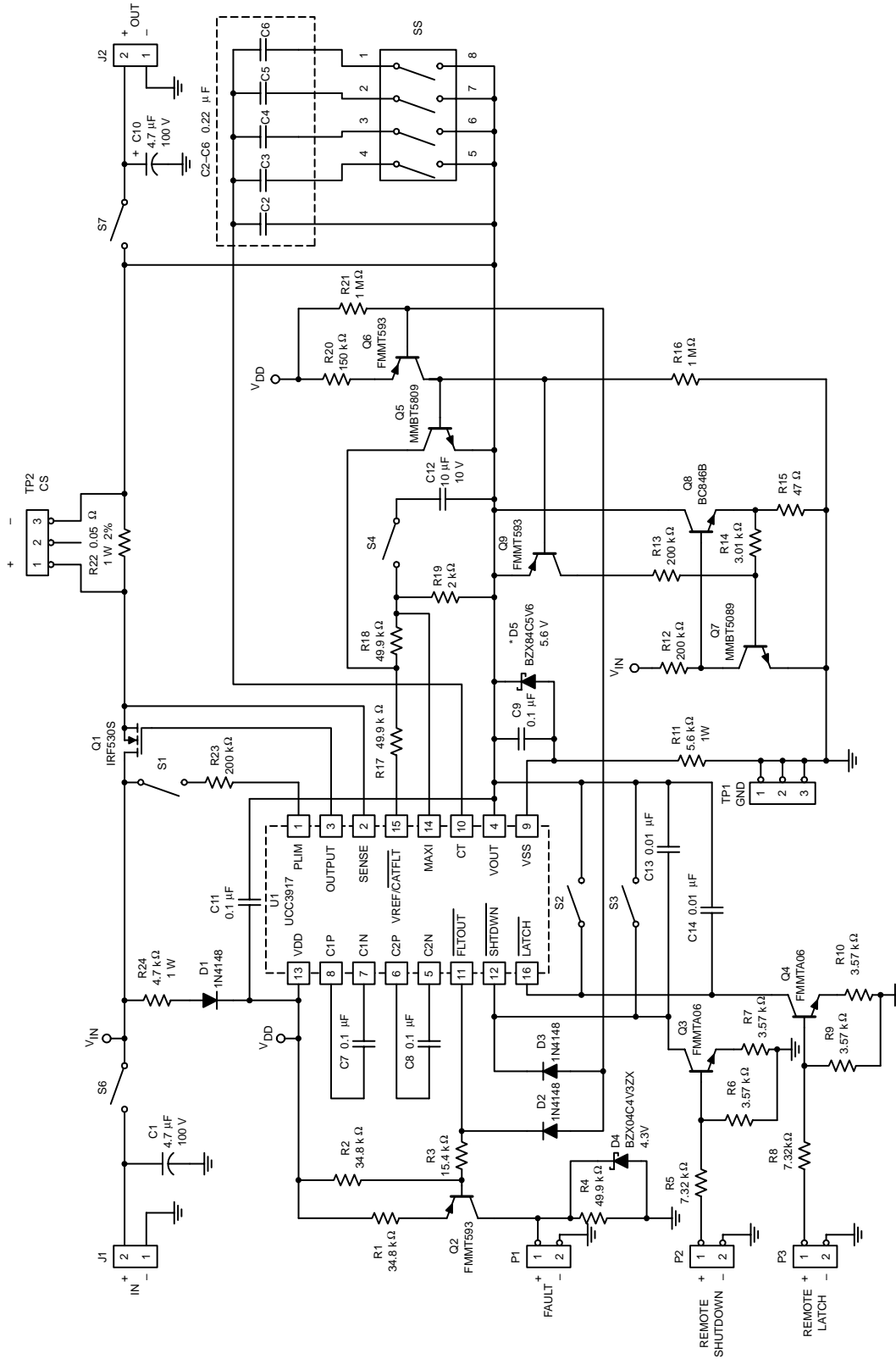
Figure 1. Evaluation Module Schematic

UDG–00003

3 Switch Functions

S1: POWER LIMIT SWITCH. Power limiting of the external MOSFET, Q1, is enabled with S1 on. This feature limits the average MOSFET power dissipation to 0.6W in the RETRY mode (i.e., S2 off) by lowering the MOSFET's *on* duty cycle below 3%. The MOSFET's *on* duty cycle is fixed at 3% if power limiting is disabled with S1 off. This duty cycle results in a MOSFET average power dissipation of 1.68 W for 28 Vdc input and 3.6 W for 60 Vdc input.

CAUTION:
Do not operate the DV3917 at 60 Vdc into a shorted load for more than 10 minutes with power-limiting disabled or Q1 may be damaged.

S2: LATCH/RETRY SWITCH. An overcurrent fault causes the external MOSFET to latch off with S2 set to ON. The MOSFET is reset by toggling S2 or by cycling power to the DV3917. The UCC3917 repeatedly resets in a fault with S2 set to OFF.

S3: SHUTDOWN SWITCH. In the STOP mode, the MOSFET, Q1, disconnects the load from input power. In the RUN mode, the UCC3917 resumes normal operation if the REMOTE SHUTDOWN input is low/floating or shuts down if the REMOTE SHUTDOWN input is high.

S4: SOFT-START SWITCH. This switch enables soft-start in the ON position. Q5 initializes the soft-start capacitor, C12, to allow soft-start on a cycle-by-cycle basis.

S5: FAULT TIME SWITCH. This DIP switch sets the fault time in nine millisecond increments according to the equation:

$$t = 9 \text{ ms} \times (1 + N) \tag{1}$$

where N is the number of *on* switches (i.e., N = 0 to 4). The external MOSFET turns off if the fault timer times out in an overcurrent condition.

S6: INPUT POWER SWITCH. This switch is used to simulate hot swapping of a plug-in card with a resident HSPM (S7 is on).

S7: LOAD SWITCH. This switch is used to simulate hot swapping of a plug-in card with the HSPM resident on the motherboard (S6 is on).

4 Test Points

TP1: A 4-pin header connected to load ground.

TP2 (+,–): Connected across the current sense resistor. The load current is measured by monitoring the voltage across the outer pins of TP2. The load current is:

$$I = \frac{V(TP2)}{R6} \tag{2}$$

5   Electrical Characteristics

T_A = 0 C to 70 C. All voltages are with respect to load ground (TP1) unless otherwise indicated.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input voltage		28	–	60	V
Fault current limit		0.92	1.00	1.08	A
Current limit		–	2	–	
Fault time	PLIM OFF, S5-1 – S5-4 OFF	–	9	–	ms
	PLIM OFF, S5-1 – S5-4 ON	–	45	–	
Remote shutdown threshold voltage		2.7	–	–	V
Remote shutdown input voltage		–	–	5.0	
Remote latch threshold voltage		2.7	–	–	
Remote latch input voltage		–	–	5.0	
High-level output voltage, FAULT	I_{SOURCE} = 0 μA	–	4.3	–	
Low-level output voltage, FAULT	I_{SINK} = 0 μA	–	0	–	

6   Safety Considerations

Although the UCC3917 is designed to provide system protection for all fault conditions, all integrated circuits can ultimately fail short. For this reason, if the UCC3917 is intended for use in safety critical applications, where UL® or some other safety agency requires a redundant safety device such as a fuse, it should be placed in series with the power MOSFET device. In addition to providing the hot-swap benefits of the device, the UCC3917 prevents the fuse from blowing for virtually all fault conditions increasing system reliability and reducing maintenance cost.

Table 1. Evaluation Board List of Materials

REFERENCE DESIGNATOR	DESCRIPTION	PART VALUE	MANUFACTURER
U1	IC, UCC3917D, SOIC–16		Texas Instruments
Q1	N–FET, IRF530S	0.16Ω, 100 V, TO–263	International Rectifier
Q2, Q6, Q9	Transistor, PNP, FMMT593	100 V, SOT–23	Zetex
Q3, Q4	Transistor, NPN, FMMTA06	80 V, SOT–23	Zetex
Q5, Q7	Transistor, NPN, MMBT5089	25 V, SOT–23	Motorola
Q8	Transistor, NPN, BC846B	65 V, SOT23	Motorola/Phillips
D1, D2, D3	Diode, IMBD4148	100 V, 0.35 W, SOT–23	Diodes Inc.
D4	Diode, Zener, BZX84C4V3ZX	4.3 V, 0.35 W, SOT–23	Zetex
D5 (not used)	Diode, Zener, BZX84C5V6	5.6 V, 0.3 W, SOT–23	Zetex
R22	Resistor	0.05 Ω, 1 W, 2%, 2512	IRC
R15	Resistor	47 Ω, 5%, 0.1 W, 0805	Panasonic
R19	Resistor	2.0 kΩ, 1%, 0.1 W, 0805	Panasonic
R14	Resistor	3.01 kΩ, 1%, 0.1 W, 0805	Panasonic
R6, R7, R9, R10	Resistor	3.57k, 1%, 0805	Panasonic
R24	Resistor	4.7 kΩ, 5%, 1 W, 2512	Panasonic
R11	Resistor	5.6 kΩ, 5%, 1 W, 2512	Panasonic
R5, R8	Resistor	7.32 kΩ, 1%, 0.1 W, 0805	Panasonic
R3	Resistor	15.4 kΩ, 1%, 0.1 W, 0805	Panasonic
R1, R2	Resistor	34.8 kΩ, 1%, 0.1 W, 0805	Panasonic
R4, R17, R18	Resistor	49.9 kΩ, 1%, 0.1 W, 0805	Panasonic
R20	Resistor	150 kΩ, 1%, 0.1 W, 0805	Panasonic
R12, R13, R23	Resistor	200 kΩ, 1%, 0.1 W, 0805	Panasonic
R16, R21	Resistor	1 MΩ, 5%, 0.1 W, 0805	Panasonic
C13, C14	Capacitor	0.01 μF, 10%, 50 V, X7R, 0805	Venkel
C7–C9, C11	Capacitor	0.1 μF, X7R, 25 V, 10%, 0805	Samsung
C2–C6	Capacitor	0.22 μF, X7R, 25 V, 10%, 0805	Panasonic: ECJ2YB1C224K
C1, C10	Capacitor, Aluminum	4.7 μF, 100 V, Size–F	Panasonic: ECE–V2AA4R7P
C12	Capacitor, Tantalum	10 μF, 10 V, Size: 3216	
S1, S2, S3, S4	Slide switch, SPDT, thru–hole		EAO
S6, S7	Slide switch, SPDT, thru–hole	6 A @ 28 V	C&K: 1101M2S3AQE2
S5	Switch, DIP, 4–position, SMT, 219–4MST		CTS
P1–P3	Header, 2–pin, 0.1" center		
TP1, TP2	Header, 3–pin, 0.1" center		
J1, J2	Connector, Lever		RDI
REF	PCB		

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Customers are responsible for their applications using TI components.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, license, warranty or endorsement thereof.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations and notices. Representation or reproduction of this information with alteration voids all warranties provided for an associated TI product or service, is an unfair and deceptive business practice, and TI is not responsible nor liable for any such use.

Resale of TI's products or services with _statements different from or beyond the parameters_ stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service, is an unfair and deceptive business practice, and TI is not responsible nor liable for any such use.

Also see: Standard Terms and Conditions of Sale for Semiconductor Products. www.ti.com/sc/docs/stdterms.htm

Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

Copyright © 2001, Texas Instruments Incorporated