

LT1641-1, LT1641-2, LT4256-1, and LT4256-2 Positive High Voltage Hot Swap Controller

DESCRIPTION

Demonstration circuit 1354 is a Positive High Voltage Hot Swap Controller featuring either the LT1641-1, LT1641-2, LT4256-1, or LT4256-2.

The board facilitates measurement of transient conditions, steady state operation with different loads, and fault conditions. The Controller responds to fault conditions such as input undervoltage(UV), output power good (PWRGD) fault, and overcurrent and response can be verified by the output voltage (VOUT) LED state and PWRGD pin signal.

The LT1641-1 and LT4256-1 latch off, if MOSFET shuts off under overcurrent condition, while LT1641-2 and LT4256-2 automatically restart after time-out delay.

The DC1354 contains one Hot Swap Controller, power MOSFET, current sense resistor, enable circuit, input voltage clamp, gate protection circuit, resistive output voltage divider for feedback signal, and three LEDs to indicate the presence of input and output voltages and power good condition.

Design files for this circuit board are available. Call the LTC factory.

LT, LTC, LTM, LT, Burst Mode, OPTI-LOOP, Over-The-Top and PolyPhase are registered trademarks of Linear Technology Corporation. Adaptive Power, C-Load, DirectSense, Easy Drive, FilterCAD, Hot Swap, LinearView, μ Module, Micropower SwitcherCAD, Multimode Dimming, No Latency $\Delta\Sigma$, No Latency Delta-Sigma, No R_{SENSE} , Operational Filter, PanelProtect, PowerPath, PowerSOT, SmartStart, SoftSpan, Stage Shedding, SwitcherCAD, ThinSOT, UltraFast and VLDO are trademarks of Linear Technology Corporation. Other product names may be trademarks of the companies that manufacture the products.

PERFORMANCE SUMMARY Specifications are at TA = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{CC}	Operating Voltage	LT1641	9.0		80	V
		LT4256	10.8		80	V
V_{LKO}	V_{CC} Undervoltage Lockout	LT1641	7.5	8.3	8.8	V
		LT4256		9.8		V
V_{UNLH}	Undervoltage Threshold	LT1641, ON pin voltage Low to High transition	1.280	1.313	1.345	V
		LT4256, UV pin voltage Low to High transition	3.96	4	4.04	V
V_{FB}	Feedback Voltage Threshold	LT1641, FB Low-to-High Transition,	1.280	1.313	1.345	V
		FB High-to-Low Transition	1.221	1.233	1.245	V
		LT4256, FB Low-to-High Transition,	3.95	3.99	4.03	V
		FB High-to-Low Transition	4.2	4.45	4.65	V
$V_{SENSETrip}$	SENSE Pin Trip-Voltage($V_{CC}-V_{SENSE}$)	LT1641, $V_{FB}=0V$	8	12	17	mV
		$V_{FB}=1V$,	39	47	55	mV
		LT4256, $V_{FB}=0V$,	5.5	14	22	mV
		$V_{FB}\geq 2V$	45	55	65	mV
ΔV_{GATE}	External N-Channel Gate Drive	LT1641, $V_{GATE}-V_{CC}$, $10.8V\leq V_{CC}\leq 20V$	4.5		18	V
		$20V\leq V_{CC}\leq 80V$,	10		18	V
		LT4256, $V_{GATE}-V_{CC}$, $10.8V\leq V_{CC}\leq 20V$	4.5	8.8	12.5	V
		$20V\leq V_{CC}\leq 80V$,	10	11.6	12.8	V
I_{GATEUP}	GATE Pin Pull-Up Current	LT1641	5	10	20	μA
		LT4256	16	32	63	μA
I_{GATEDN}	GATE Pin Pull-Down Current	LT1641	35	70	100	mA
		LT4256	40	62	80	mA

OPERATING PRINCIPLES

The LT1641-1, LT1641-2, LT4256-1, and LT4256-2 are Positive High Voltage Hot Swap Controllers that have absolute maximum supply voltage (V_{CC}) 100V and operating range (9-80) V for LT1641 and (10.8-80) V for LT4256. In the DC1354A any controller operates on the +48V rail. Each board can easily be readjusted for any

rated voltage by replacing the enable circuit (R5, R11), input voltage clamp (D1), gate protection circuit (R8, R14, D3, D6), and resistive output voltage divider (R10, R12). The DC1354A as supplied by the factory is assembled with the SUM90N10-8m2p MOSFET in a D2PAK package and 7m Ω current sense resistor (R1).

QUICK START PROCEDURE

Demonstration circuit DC1354 is easy to set up to evaluate the performance of the LT1641-1, LT1641-2, LT4256-1, and LT4256-2. Refer Figure 1 for proper measurement equipment setup and follow the procedure below.

The board test is performed in several steps by measuring some transient parameters and verifying successful or failed power up actions under defined conditions. In all test steps turn on switch SW_PS to connect demo board to the +48V power supply, turn on switch SW_PS to activate controller (connecting the ENABLE pin to the VIN +48V) and turn +48V off for resetting controller after fault.

1. It should be noted that loading parameters such as Low Capacitive Load, High Capacitive Load, Low Resistive Load, and High Resistive are different for LT4256 and for LT1641. These parameters are shown below separately for each controller:

LTC1641

- Low Capacitive load 1000uF,
- High Capacitive load 8700uF,
- Low Resistive load 10 Ω , 50W ,
- High Resistive load 5.5 Ω .

LTC4256

- Low Capacitive load 250uF,
- High Capacitive load 3500uF,
- Low Resistive load 11 Ω , 50W ,

- High Resistive load 5.0 Ω .

2. Place a scope probe to the VOUT turret, turn on controller, and measure a power-up time with no load. For LT4256 this time must be in the range (13.7 - 54) ms, and for LT1641- (43 - 173) ms.
3. Connect Low Capacitive Load to the output of hot swap circuitry (VOUT +48V turret). Turn on controller. This power up should be successful and two LEDs (VOUT – green - and PWRGD - orange) must light.

NOTE. The following tests verify loaded Controller performance. The transients with Low Load should be successfully completed, while transients with High Load should fail. The LT1641-1 and LT4256-1 in the overcurrent fault condition are latched off, while the LT1641-2 and LT4256-2 provide retry. To avoid power MOSFET damage in the LT1641-2 and LT4256-2 High Load tests keep switch SW_ON in the on position very short time.

4. Connect High Capacitive Load to the output of hot swap circuitry (VOUT +48V turret). Turn on controller. This power up should be unsuccessful, and two LEDs remaining off will confirm this.

For LT4256-1 and LT1641-1 the failed power-up is indicated by the VOUT (green) and PWRGD (orange) LED lights remaining off. Disconnect the ENABLE turret from the VIN +48V turret for short time and connect them again. The controller should be latched off in the shut off mode,

For LT4256-2 and LT1641-2 make short time connection of the ENABLE turret and VIN +48V. The VOUT (green) and PWRGD (orange) LED will blink indicating an autoretry in the failed power up.

LT1641-1, LT1641-2, LT4256-1, AND LT4256-2

5. Load output with Low Resistive Load. Controller should successfully keep this load.
6. Turn controller on. Load output with High Resistive Load. Controller should fail to keep this load.
7. Verify that controller alive after overload test.

NOTE. In the designing of the power-up transient with mentioned Controllers special attention should be paid to correspondence between power MOSFET safe operating area and transient parameters (current limit level, duration of the transient, relationship between capacitive load and resistive load and timer period).

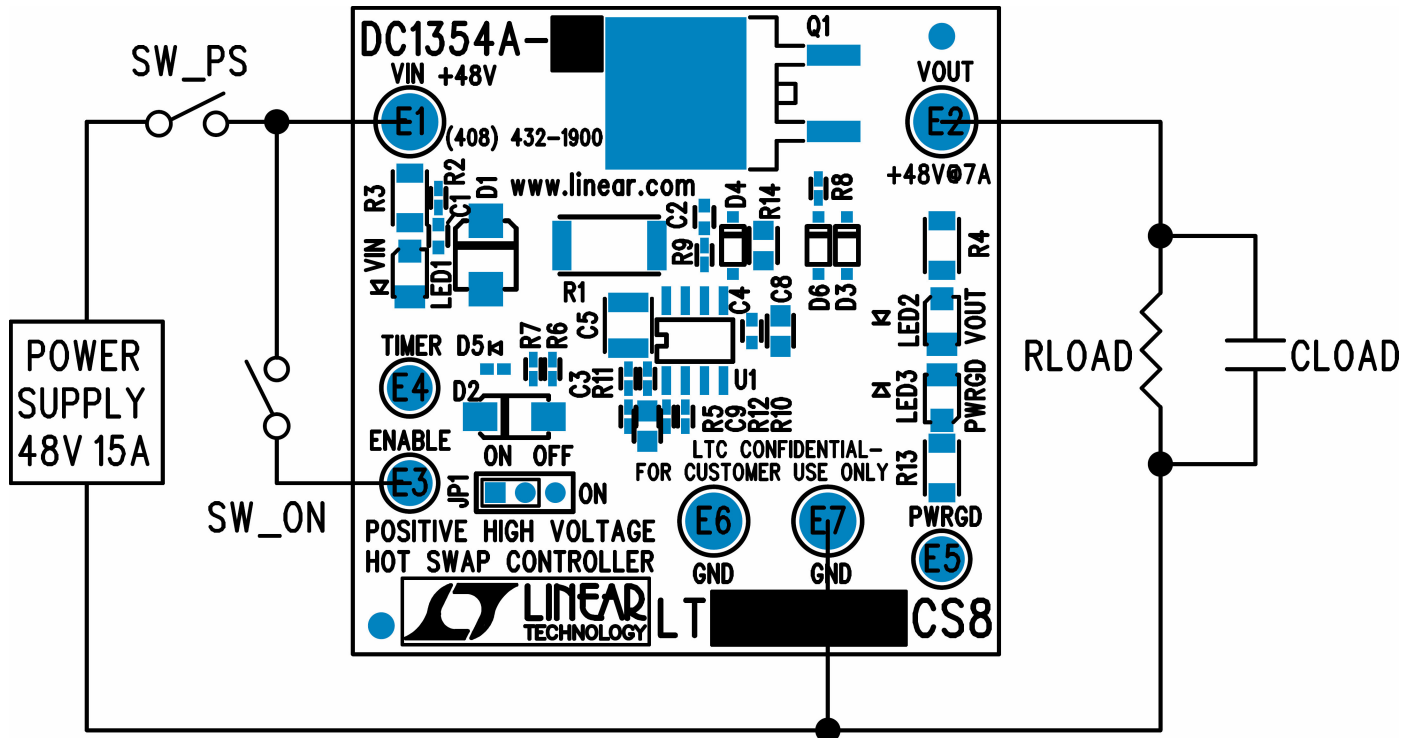
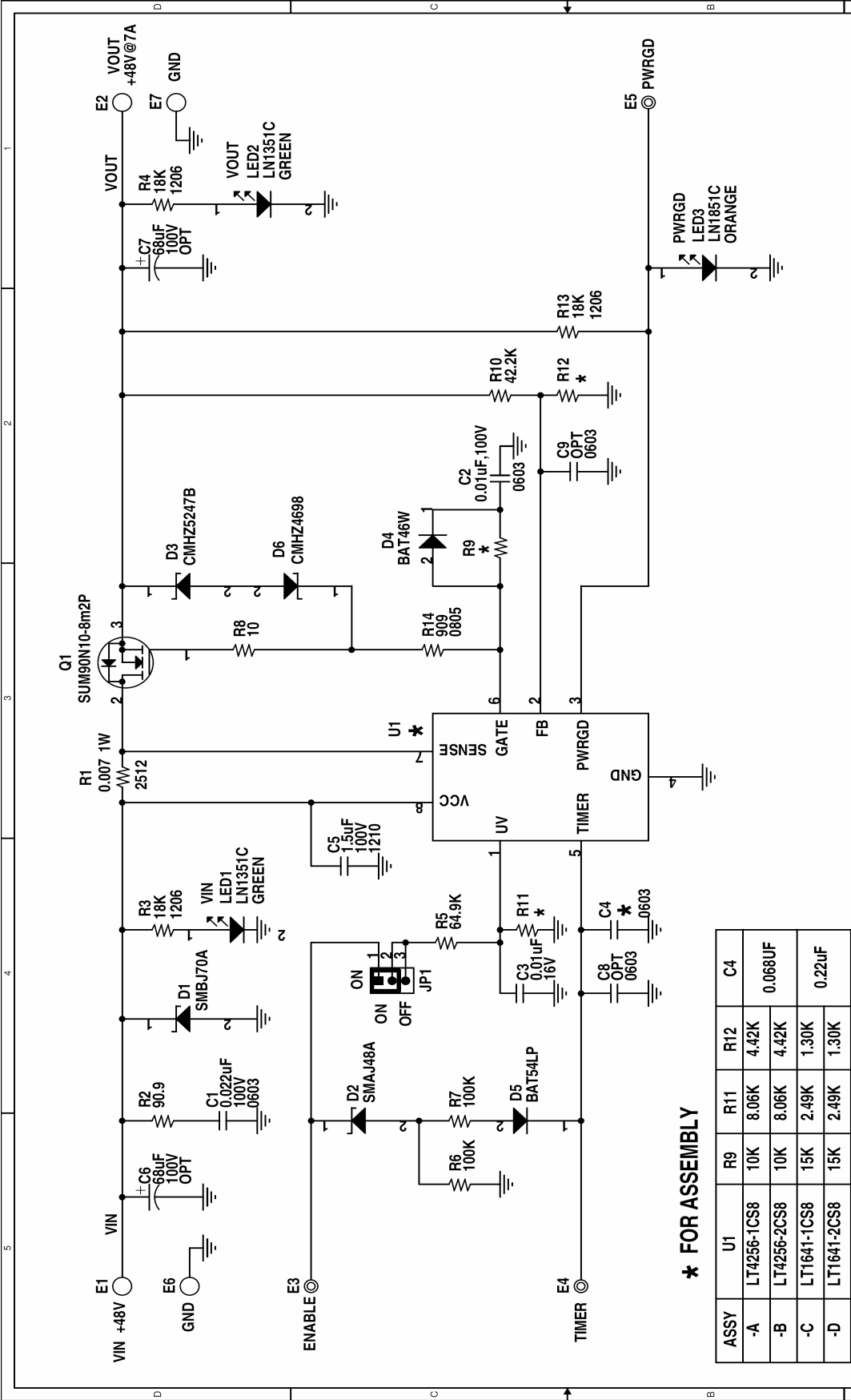


Figure 1. Proper Measurement Equipment Setup

LT1641-1, LT1641-2, LT4256-1, AND LT4256-2



1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507
LTC Confidential-For Customer Use Only

CUSTOMER NOTICE

LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

CONTRACT NO.

APPROVALS

DRAWN: KIM T.

CHECKED:

APPROVED:

ENGINEER: VLADIMIR O.

DESIGNER:

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE IN OHMS, 0402.

ALL CAPACITORS ARE IN MICROFARADS, 0402.

POSITIVE HIGH VOLTAGE HOT SWAP CONTROLLER

SIZE A **DWG NO.** DC1354A **REV** A-2

DATE: Wednesday, September 24, 2008 **SHEET** 1 OF 1



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.