LT3575
Isolated Monolithic Flyback Converter

DESCRIPTION

Demonstration circuit 1643A is an isolated flyback converter featuring LT®3575, a monolithic switching regulator specifically designed for the isolated flyback converter with an integrated 2.5A, 60V NPN transistor. The DC1643A is designed for 5V output from a 10V to 28V DC input.

The output current capability depends on the input voltage, proper cooling, and the switch voltage stress. The output current is up to 1.4A when the input is higher than 10V, and 2A when the input is higher than 20V but less than 28V. The output current should not be higher than 2.4A for safe operation.

The IC requires minimum load to maintain good output voltage regulation. A Zener diode D4 across the output clamps the voltage to ~5.4V. The light load regulation can be improved if a preload resistor (R4, optional) is installed. Depending on input voltage and output regulation, a 40mA minimum load is usually sufficient.

The DC1643A can be easily modified to generate different output voltages. Some pre-designed transformers from vendors such as Würth Electronics, Sumida, Pulse Engineering and Coilcraft, can be used for various applications.

The LT3575 operates with input supply voltages from 3V to 40V. The part senses the isolated output voltage directly from the primary side flyback waveform. No third winding or opto-coupler is required for regulation. The LT3575 utilizes boundary mode operation to provide a high efficiency, small size solution with improved load regulation. It can be used in industrial, automotive and medical applications where an isolated output is required.

The LT3575 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for DC1643A.

Design files for this circuit board are available at http://www.linear.com/demo

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITION	MIN	TYP	MAX	UNITS
Input Voltage		10		28	V
Output Voltage, V_{OUT}	V_{IN} = 10V to 28V, I_{OUT} = 1.4A	4.75	5	5.25	V
Minimum Output Current	V_{IN} = 20V		40		mA
Maximum Output Current	V_{IN} = 10V to 20V V_{IN} = 21V to 28V			1.4 2	A A
Switching Frequency	V_{IN} = 10V, I_{OUT} = 1.4A		90		kHz
Efficiency	V_{IN} = 28V, I_{OUT} = 2A		86		%

QUICK START PROCEDURE

DC1643A is easy to set up to evaluate the performance of the LT3575. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to V_{IN} (E1) and GND (E2).
2. Connect the load to the terminals V_{OUT}+ (E5) and V_{OUT}– (E6) on the board. Apply 100mA load to V_{OUT}+ and V_{OUT}–.
3. Turn on the power at the input. Increase V_{IN} to 10V slowly.

   Note: Make sure that the input voltage does not exceed 28V.
4. Check for the proper output voltages. The output should be regulated at 5V (±5%).

   Note: If there is no output, temporarily disconnect the power supply. Make sure that the load is connected with correct polarity. If the output voltage is out of spec, make sure minimum load current is applied to the output, the load is not set too high, and the input current does not hit the power supply current limit.

   Note: The compensation loop is designed with trade-off between transient response and output ripple. To reduce the low frequency output ripple, slow down the loop by reducing R15 and increasing C11 (for instance, change R15 to 6.4kΩ, and C11 to 22nF). The switching frequency ripple can be reduced by increasing the output capacitor C4, or adding a second stage LC filter. Please contact factory for more information.

   Note: The input EMI filter circuit (L1, FB1, C5, C19, and C20) can be added by cutting the copper plane along the notch next to C2 and C8 on the top layer of the demo circuit.

   Note: For overload conditions, it is recommended to operate the board at a reduced input voltage range and/or reduce R8 of the RCD snubber. Please contact the factory for more information.
5. Once the proper output voltage is established, adjust the input and load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

   Note: When measuring the input or output voltage ripples, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the V_{IN} and GND, or V_{OUT}+ and V_{OUT}– terminals. See Figure 2 for proper scope probe technique. Typical efficiency and regulation curves are plotted in Figures 3 and 4, respectively.
6. Turn off the power supply. Disconnect the load from the demo circuit.

QUICK START PROCEDURE

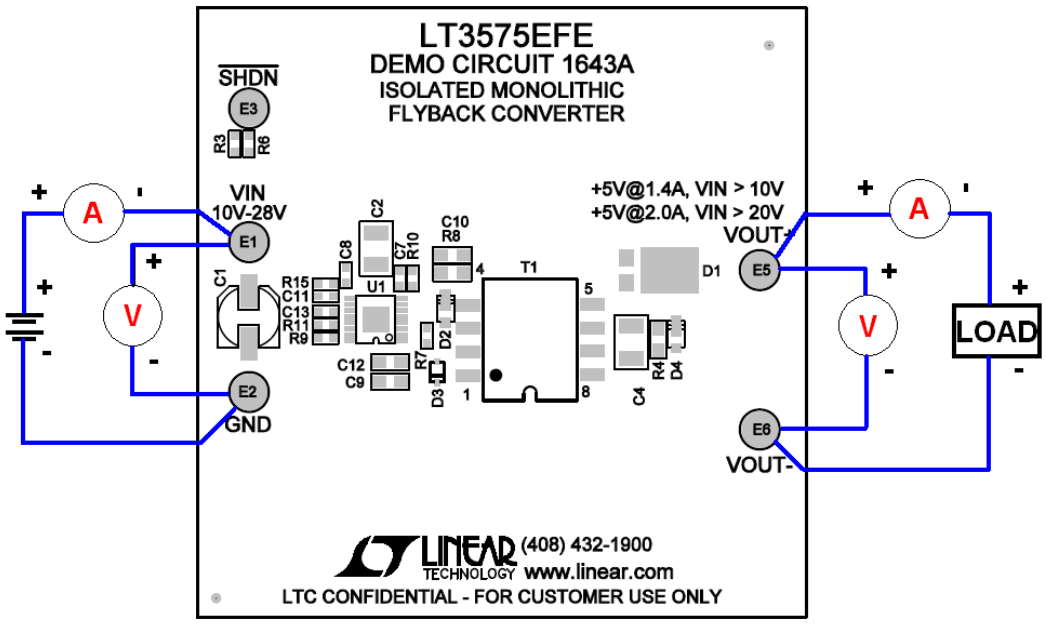


Figure 1. Proper Measurement Equipment Setup

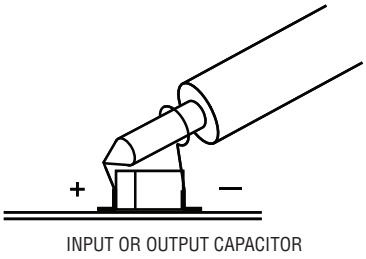


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple

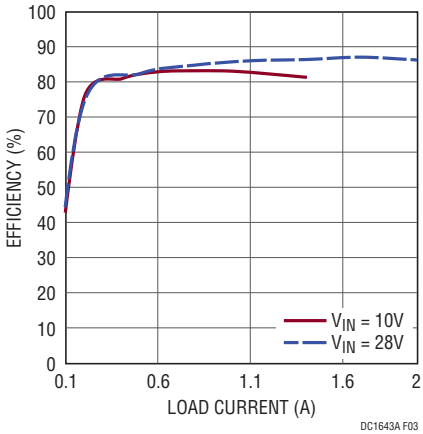


Figure 3. Typical Efficiency Curves

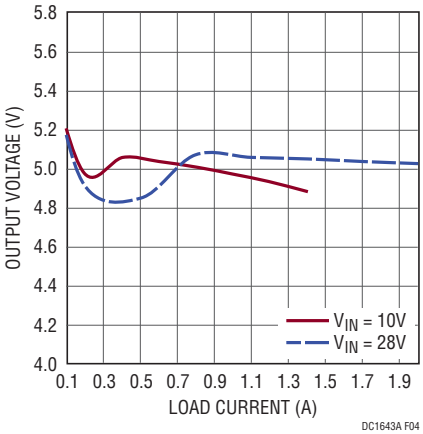
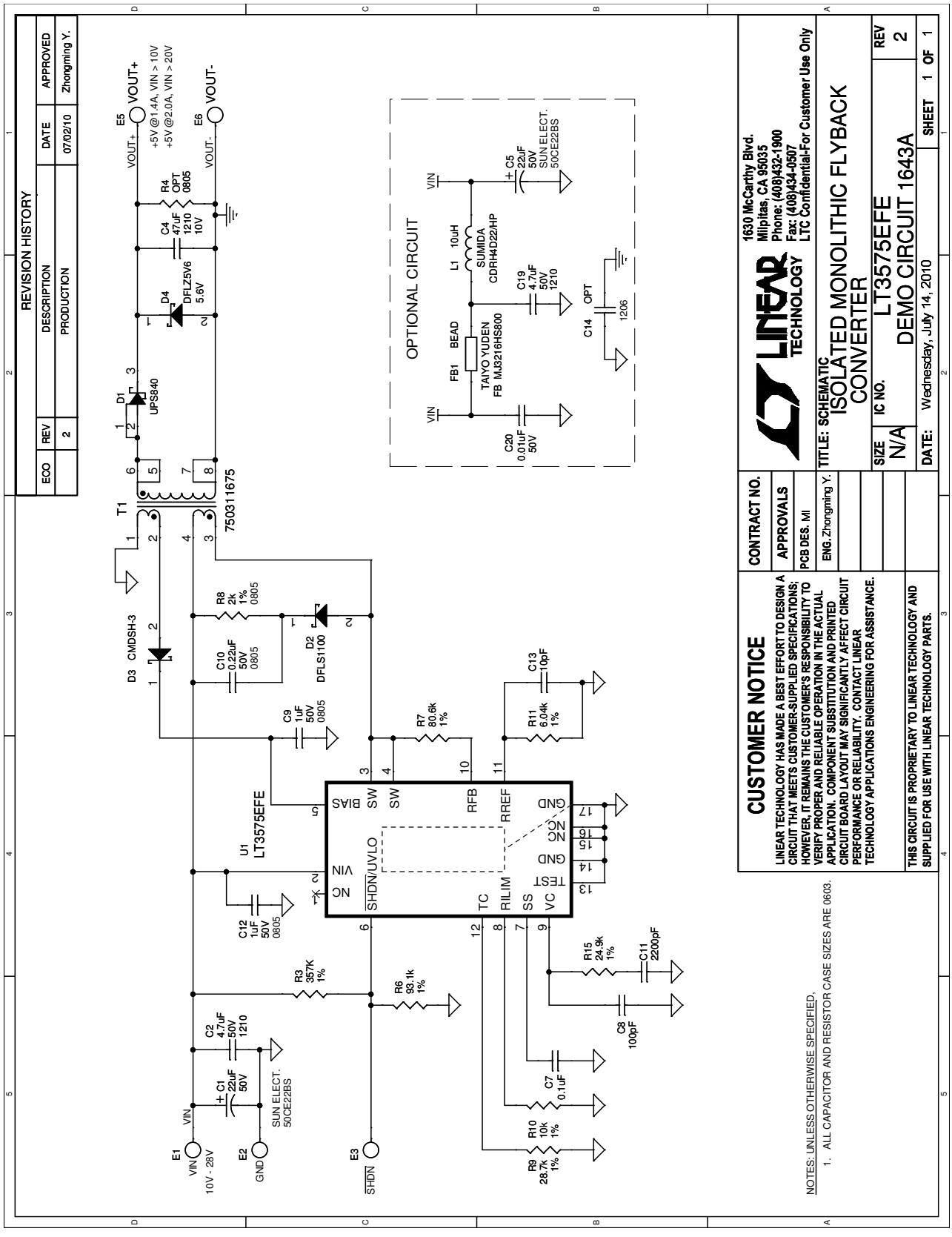


Figure 4. Typical Regulation Curves

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	C1	Capacitor, 22µF 20% 50V Electrolytic	Sun Electronics 50CE22BS
2	1	C2	Capacitor, 1210 4.7µF 10% 50V X7R	Murata GRM32ER71H475KA88L
3	1	C4	Capacitor, 1210 47µF 10% 10V X7R	Murata GRM32ER71A476K
4	1	C7	Capacitor, 0603 0.1µF 10% 25V X5R	TDK C1608X5R1E104K
5	1	C8	Capacitor, 0603 100pF 5% 50V NPO	AVX 06035A101JAT2A
6	2	C9, C12	Capacitor, 0805 1µF 10% 50V X7R	Murata GRM21BR71H105KA12L
7	1	C10	Capacitor, 0805 0.22µF 10% 50V X7R	Taiyo Yuden UMK212B7224KG-T
8	1	C11	Capacitor, 0603 2200pF 10% 50V X7R	AVX 06035C222KAT2A
9	1	C13	Capacitor, 0603 10pF 5% 50V NPO	AVX 06035A100JAT2A
10	1	D1	Diode, Schottky, Barrier Rectifier 8A	Micro Semiconductor UPS840
11	1	D2	Diode, Schottky	Diode Inc. DFLS1100-7
12	1	D3	Diode, Schottky SOD323	Central Semiconductor CMDSH-3
13	1	D4	Diode, Power Zener 1.0W	Diodes/Zetex DFLZ5V6-7
14	1	R3	Resistor, 0603 357kΩ 1% 1/10W	NIC NRC06F3573TRF
15	1	R6	Resistor, 0603 93.1kΩ 1% 1/10W	Vishay CRCW060393K1FKED
16	1	R7	Resistor, 0603 80.6kΩ 1% 1/10W	Vishay, CRCW060380K6FKEA
17	1	R8	Resistor, 0805 2kΩ 1% 1/8W	Vishay CRCW08052K00FKEA
18	1	R9	Resistor, 0603 28.7kΩ 1% 1/10W	NIC NRC06F2872TRF
19	1	R10	Resistor, 0603 10kΩ 1% 1/10W	Vishay CRCW060310K0FKED
20	1	R11	Resistor, 0603 6.04kΩ 1% 1/10W	NIC NRC06F6041TRF
21	1	R15	Resistor, 0603 24.9kΩ 1% 1/10W	NIC NRC06F2492TRF
22	1	T1	Transformer	Würth 750311675
23	1	U1	IC, Monolithic Flyback Converter	Linear Technology LT3575EFE
Hardware – For Demo Board Only				
1	5	E1, E2, E3, E5, E6	Turret	Mill-Max 2501-2-00-80-00-00-07-0
2	1		Fab, Printed Circuit Board	DC1643A
3	1		Stencil	Stencil
Additional Demo Board Circuit Components				
1	0	C5	Capacitor, 22µF 20% 50V Electrolytic Optional	Sun Electronics 50CE22BS Optional
2	0	C14	Capacitor, 1206 0.033µF Optional	Optional
3	0	C19	Capacitor, 1210 4.7µF 10% 50V X7R Optional	Murata GRM32ER71H475K Option
4	0	C20	Capacitor, 0603 0.01µF 10% 50V X7R Optional	NIC NMC0603X7R104K50TRPF Optional
5	0	FB1	Ferrite Bead Optional	Taiyo Yuden FB MJ3216HS800 Optional
6	0	L1	Inductor, 10µH Optional	Sumida CDRH4D22/HP Optional
7	0	Q1	XSTR, MOSFET, N-Channel 30V Optional	Vishay Si3456DDV Optional
8	0	R4	Resistor, 0805 440Ω 1% 1/8W Optional	NIC NRC10F4400TRF

SCHEMATIC DIAGRAM



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