Keywords: synchoronous buck converter, set top box, LCD TV power supply, step-down controller, auxiliary power

REFERENCE DESIGN 4365 INCLUDES: √Tested Circuit √Schematic √BOM √Test Data

Reference Design Using the MAX15026 for an Auxiliary Power Supply for LCD TVs or Set-Top Boxes

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Apr 15, 2009

Abstract: This application note shows a reference design using the MAX15026 low-cost, high-efficiency synchronous buck converter in an auxiliary power supply for LCD TVs or set-top boxes. This reference design generates a 5V, 5A power supply from a wide, 6.5V to 24V input voltage range.

Key specifications for the reference design are listed below, along with a detailed schematic (**Figure 1**) and the bill of materials (**Table 1**) needed for this application.

Specifications

- Input Voltage Range: 6.5V to 24V
- Output Voltage: 5V
- Output Current: 5A
- Output Voltage Ripple (pk-pk): 50mV
- Switching Frequency of Converter: 300kHz
- Overcurrent Protection Limit: 6A
- Efficiency: > 90% for Normal Operation

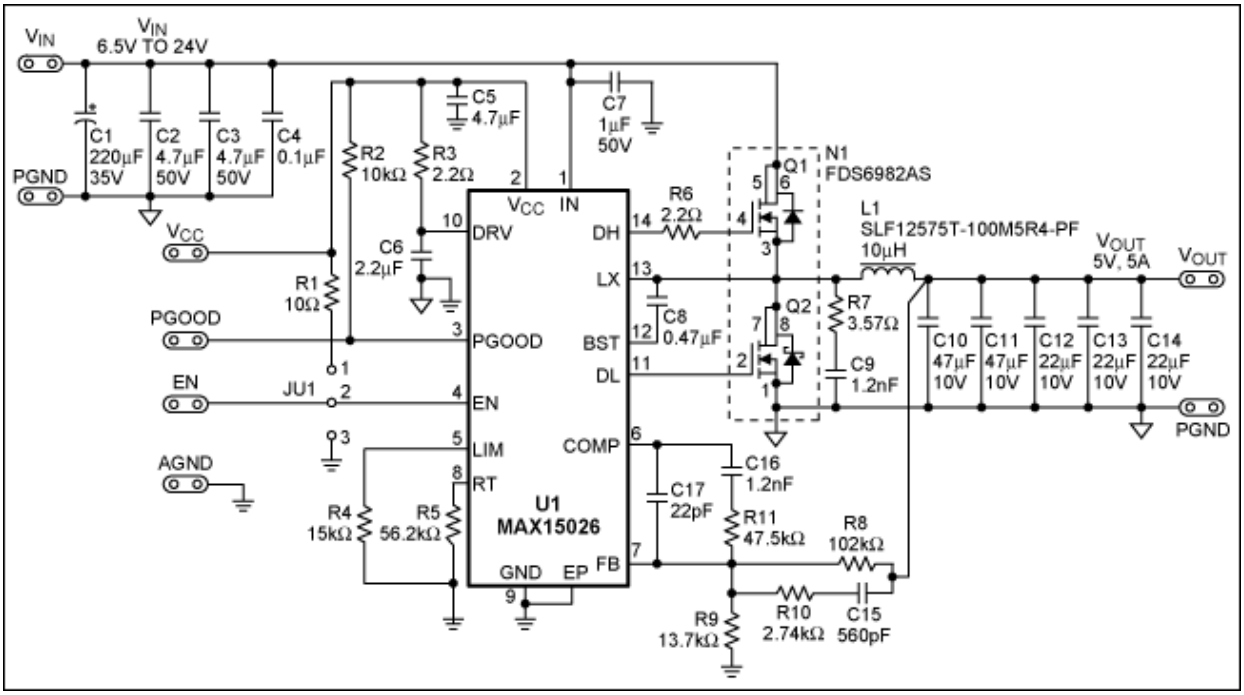

Figure 1. Schematic of the MAX15026 synchronous buck converter for a 300kHz switching frequency.

Table 1. Bill of Materials

Designator	Value	Description	Part	Footprint	Manufacturer	Quantity
C1	220µF, 35V	Capacitor	EEVFK1V221P	8mm x 10.2mm	Panasonic	1
C2, C3	4.7µF, 50V	Capacitor	GRM31CR71H475KA12L	1206	Murata	2
C4	0.1µF, 50V	Capacitor	GRM188R71H104KA93D	0603	Murata	1
C5	4.7µF, 6.3V	Capacitor	GRM188R60J475KE19D	0603	Murata	1
C6	2.2µF, 6.3V	Capacitor	GRM188R60J225KE19D	0603	Murata	1
C7	1µF, 50V	Capacitor	GRM21BR71H105KA12L	0805	Murata	1
C8	0.47µF, 16V	Capacitor	GRM188R71C474KA88D	0603	Murata	1
C9, C16	1200pF, 50V	Capacitor	GRM1885C1H122JA01D	0603	Murata	2
C10, C11	47µF, 10V	Capacitor	GRM32ER71A476KE15L	1210	Murata	2
C12, C13, C14	22µF, 10V	Capacitor	GRM31CR71A226KE15L	1206	Murata	3
C15	560pF, 50V	Capacitor	GRM1885C1H561JA01D	0603	Murata	1
C17	22pF, 50V	Capacitor	GRM1885C1H220JA01D	0603	Murata	1
R1	10Ω	Resistor	SMD 1% Resistor	0603	Vishay	1
R2	10kΩ	Resistor	SMD 1% Resistor	0603	Vishay	1

R3, R6	2.2Ω	Resistor	SMD 1% Resistor	0603	Vishay	2
R4	15kΩ	Resistor	SMD 1% Resistor	0603	Vishay	1
R5	56.2kΩ	Resistor	SMD 1% Resistor	0603	Vishay	1
R7	3.57Ω	Resistor	SMD 1% Resistor	1206	Vishay	1
R8	102kΩ	Resistor	SMD 1% Resistor	0603	Vishay	1
R9	13.7kΩ	Resistor	SMD 1% Resistor	0603	Vishay	1
R10	2.74kΩ	Resistor	SMD 1% Resistor	0603	Vishay	1
R11	47.5kΩ	Resistor	SMD 1% Resistor	0603	Vishay	1
L1	10µH ±20%, 5.5A	Inductor	SLF12575T-100M5R4-PF	12.5mm x 12.5mm x 7.5mm	TDK	1
N1	30V, 6.3A, 35.5mΩ—Q1; 30V, 8.6A, 16.5mΩ—Q2	Dual MOSFET	FDS6982AS	8-SO	Fairchild	1
U1	**PWM Controller**	**Low-Cost, DC-DC Synchronous Buck Controller with a 4.5V to 28V Operating Range**	**MAX15026BETD+**	**14-TDFN-EP**	**Maxim**	**1**

Performance Data

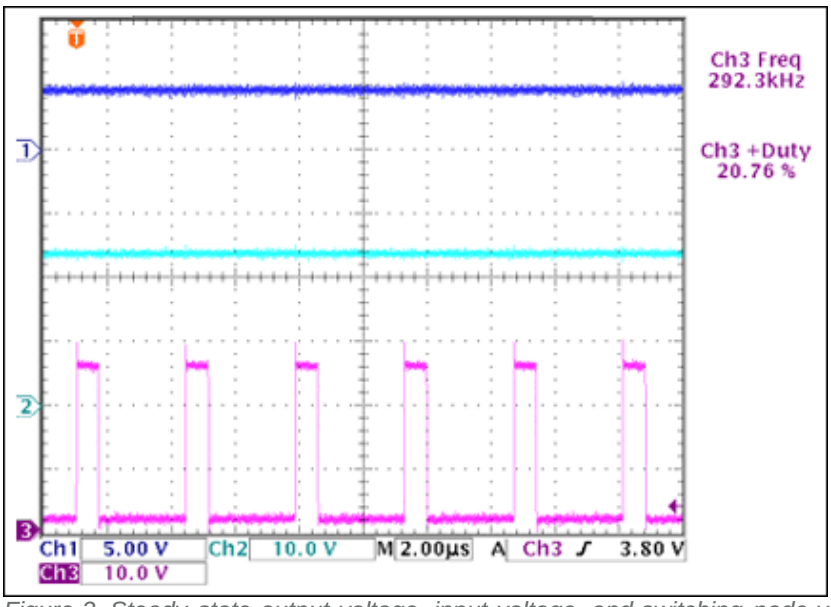

Figure 2. Steady-state output voltage, input voltage, and switching-node voltage at V_{IN} = 24V, V_{OUT} = 5V. Ch1: V_{OUT}; Ch2: V_{IN}; Ch3: Lx Node Voltage

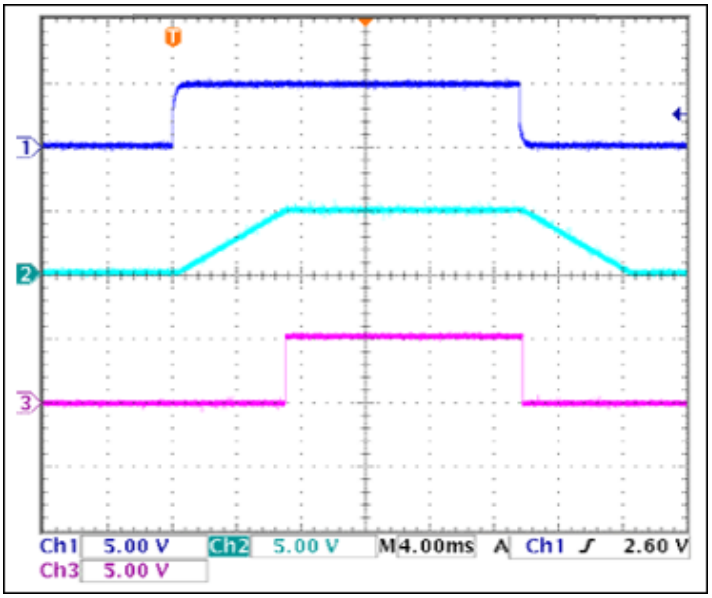

Figure 3. Enable, soft-start, soft-stop and P_{GOOD} sequence waveforms. Ch1: Enable; Ch2: V_{OUT}; Ch3: P_{GOOD}

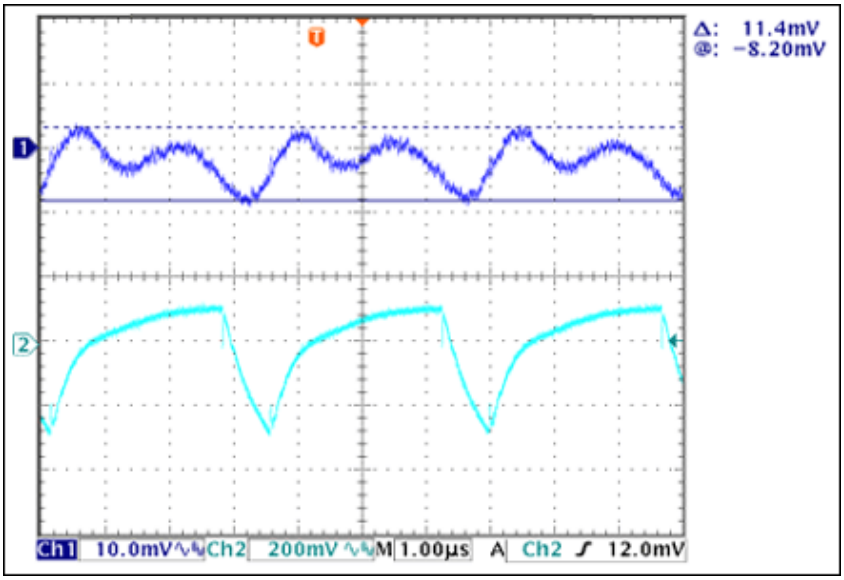

Figure 4. Output and input ripples at V_{IN} = 24V, V_{OUT} = 5V and I_{OUT} = 5A. Ch1: Output Voltage Ripple; Ch2: Input Voltage Ripple

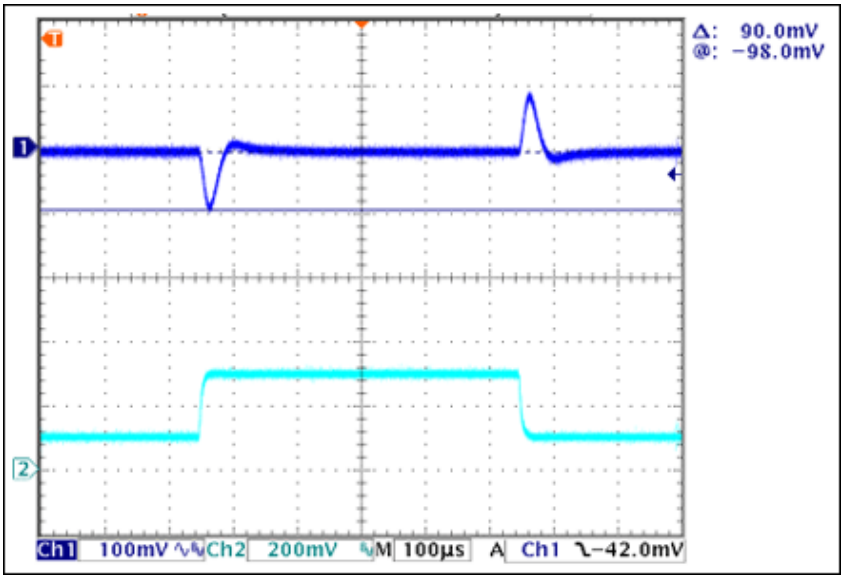

Figure 5. Converter load transient response with a 2A step change in load current. Ch1: Output Voltage Dip; Ch2: Load-Step Change (1A/div)

Test Conditions

V_{IN} = 12V, V_{OUT} = 5V
Load Current Step Change: 1A to 3A
Load Current Slew Rate: 2A/µs

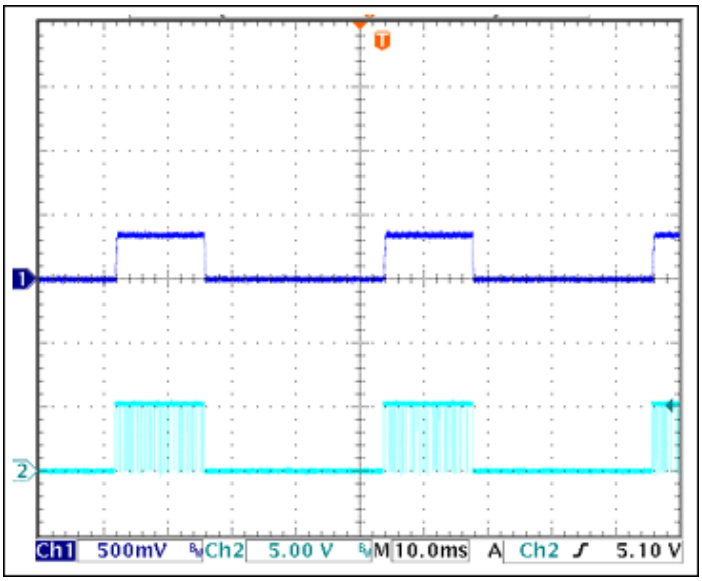

Figure 6.Hiccup-mode overcurrent protection with output shorted. CH1: Output Voltage; CH2: Gate Pulses

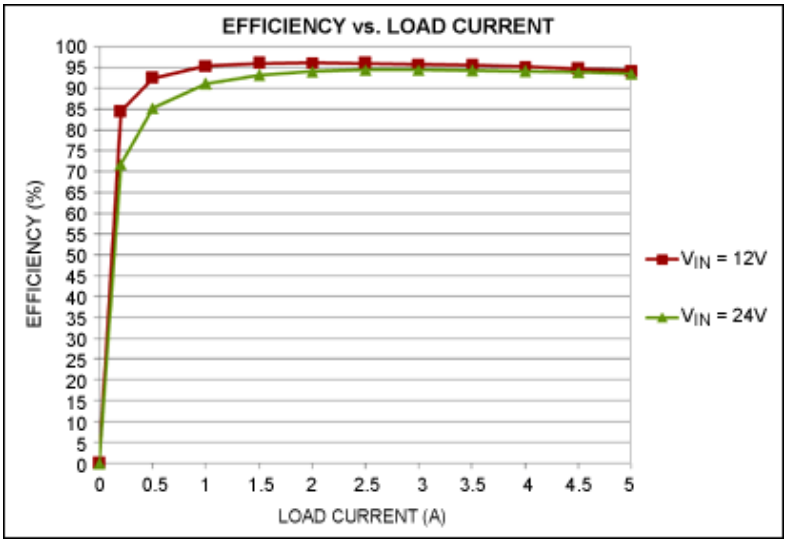

Figure 7. Efficiency vs. load current plots.

Related Parts		
MAX15026	Low-Cost, Small, 4.5V to 28V Wide Operating Range, DC-DC Synchronous Buck Controller	Free Samples

More Information
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Application Note 4365: http://www.maximintegrated.com/an4365
REFERENCE DESIGN 4365, AN4365, AN 4365, APP4365, Appnote4365, Appnote 4365