

## Fairchild Reference Design RD-512

The following reference design supports inclusion of FSQ510 in design of an auxiliary power supply. It should be used in conjunction with the FSQ510 datasheet as well as Fairchild's application notes and technical support team. Please visit Fairchild's website at [www.fairchildsemi.com](http://www.fairchildsemi.com).

Application	Fairchild Device	Input Voltage Range	Rated Output Power	Output Voltage (Rated Current)	Topology
Auxiliary Power	FSQ510	85-265 V <sub>AC</sub>	3.3 W	5.1 V (0.65 A)	SSR Flyback

### Key Features

- Uses a LDMOS Integrated Power Switch
- Optimized for Valley Switching Converter (VSC)
- Low EMI through Variable Frequency Control and Inherent Frequency Modulation
- High Efficiency through Minimum Drain Voltage Switching
- Extended Valley Switching for Wide Load Ranges
- Small Frequency Variation for Wide Load Ranges
- Advanced Burst-Mode Operation for Low Standby Power Consumption
- Pulse-by-Pulse Current Limit
- Protection Functions: Overload Protection (OLP), Internal Thermal Shutdown (TSD) with Hysteresis
- Under Voltage Lockout (UVLO) with Hysteresis
- Internal Startup Circuit
- Internal High-Voltage SenseFET: 700 V
- Built-in Soft Start: 5 ms

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## 2. Transformer

### 2.1. Transformer Schematic Diagram

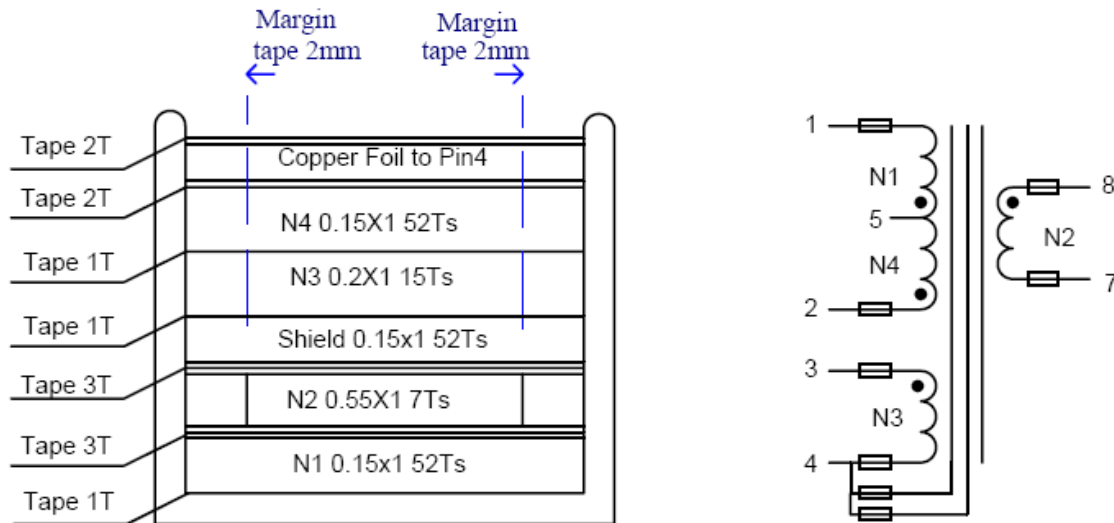


Figure 2. Transformer Configuration and Winding Stackup

### 2.2. Winding Specification

Windings	Pins (S→F)	Wire	Turns
N1	2→5	2UEW 1x $\Phi$ 0.15 mm	52
Shield	4→*	2UEW 1x $\Phi$ 0.15 mm	52
N2	8→7	CR(W) 1x $\Phi$ 0.55 mm	7
N4	3→4	2UEW 3x $\Phi$ 0.16 mm x 3	15
N5	5→2	2UEW $\Phi$ 0.15 mm x 1	52
Shield	4→*	Copper Foil	1.1

Core: EE16

Material: PC40 (TDK)

Bobbin: EE16 Horizontal 4+4 pins

### 2.3. Electrical Characteristics

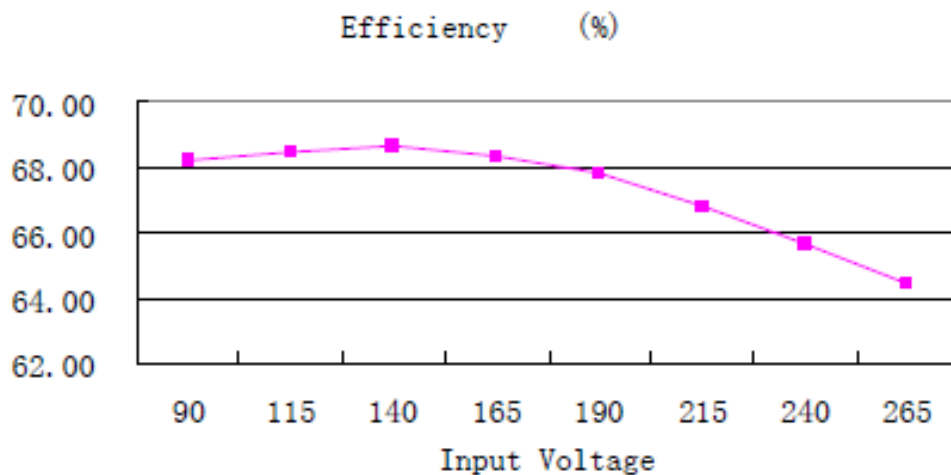
	Pin	Specification	Remark
Inductance	1→2	1.6 mH $\pm$ %	100 kHz, 1 Vrms
Leakage	1→2	< 80 $\mu$ H	Short all secondaries

### 3. Bill of Materials

Reference	Value	Qty.	Remark
U3	FSQ510	1	IC (Fairchild)
U1	FOD817B	1	IC (Fairchild)
U2	TL431	1	IC
Q1	2N2222A	1	Transistor
T1	EE1616H	1	Transformer
C10	39 pF	1	Ceramic Cap
C2, C3	4.7 $\mu$ F 400 V	2	Electrolytic Cap, (Samsung Elec. KHD Series)
C4	680 $\mu$ F 16 V	1	Electrolytic Cap, (Samsung Elec. NXC Series)
C5	220 $\mu$ F 10 V	1	Electrolytic Cap
C6	330 nF	1	Ceramic Cap
C7	4.7 $\mu$ F	1	Ceramic Cap
C8	47 $\mu$ F 25 V	1	Electrolytic Cap
C9	22 nF	1	Ceramic Cap
CS2	1n 1 kV	1	Ceramic Cap
BD1, BD2, BD3, BD4, DS1	1N4007	5	Diode
D1	SB240	1	Diode
D2, D4	1N4148	2	Diode
L1	330 $\mu$ H	1	Inductor
L2	3 $\mu$ H	1	Inductor
J1	0	1	Jumper
R1	4.7 k	1	Resistor
R10	510	1	Resistor
R11, R13, R14	3	3	Resistor
R12	27 k	1	Resistor
R15, R16	6 k	2	Resistor
R17	300	1	Resistor
R2	30	1	Resistor
R3	560	1	Resistor
R4	3.9 / 2 W	1	Resistor
R5	2.2 k	1	Resistor
R6	2 k	1	Resistor
R7	5	1	Resistor
R8	300	1	Resistor
R9	150	1	Resistor
RS2	200 k	1	Resistor
RS4	30	1	Resistor
THR1	10 k	1	NTC

## 4. Performance

### 4.1. Efficiency



Input Voltage (Vac)	Efficiency (%)
90	68.23
115	68.50
140	68.63
165	68.36
190	67.83
215	66.78
240	65.65
265	64.43

## 5. Related Resources

[FSQ510 – Product Folder](#)

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