DTA Power Supply Solution

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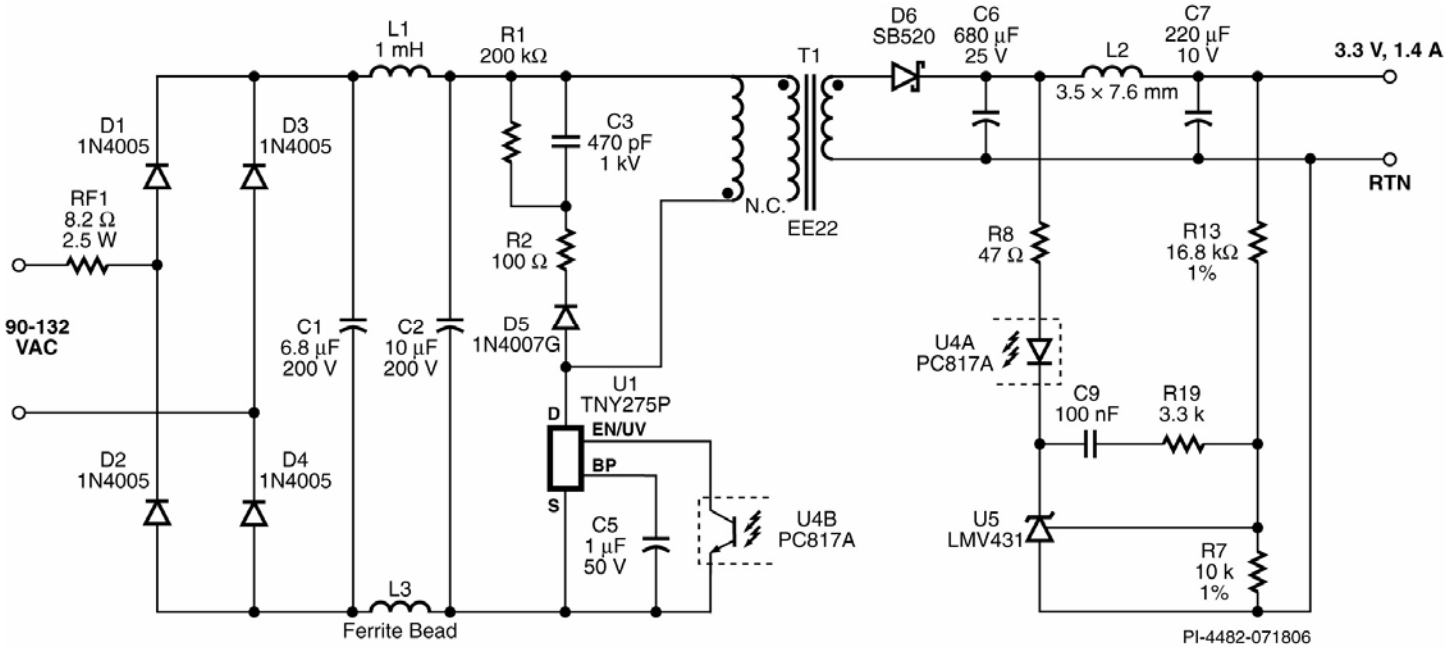
DTA Power Supply Target Specs

- **Electrical**
  - Input voltage (V_{IN})
    - 110 – 120 VAC, 60 Hz
  - Output voltage (V_{OUT})
    - 3.3 VDC, ± 5% regulation, < 1% ripple
  - Output current (I_O)
    - 1.4 A
- **Mechanical**
  - 2-prong input power connector
  - DIN barrel output power connector
- **Efficiency**
  - Conform to CEC 8 W/ 1 W DTA spec & meet CEC and EPA EPS spec
  - <100 mW no-load consumption
- **External ambient temperature: 0°C to 40°C**
- **Equivalent price point with typical STB power supplies at 1 M units**

Suggested DTA Adapter Design with Low Parts Count / High Performance



- **Low parts count – 27 components**
  - Power conversion IC currently used in set-top box applications
  - Standard, non-exotic components
  - Enables single-sided board layout

Suggested DTA Adapter Design with Low Parts Count / High Performance (2)

- **Power conversion IC family has integrated safety features**
  - Accurate thermal shutdown with automatic recovery
  - Lossless, accurate integrated cycle-by-cycle current limit
  - Auto restart delivers < 3% of maximum power in short circuit and open loop fault conditions
- **Meets all current and proposed EPS efficiency standards**
  - EcoSmart® ON-OFF controller
    - Maintains constant efficiency down to very light loads
    - Provides extremely low no-load power consumption

DTA Power Supply Performance

Description	Symbol	Min	Typ	Max	Units	Comment
Input						
Voltage	V_{IN}	90		132	VAC	2 Wire – no P.E.
Frequency	f_{LINE}	47	50/60	64	Hz	
No-load Input Power (115 VAC)				0.1	W	
Output						
Output Voltage 1	V_{OUT1}	3.2	3.3	3.4	V	± 0.1V
Output Ripple Voltage 1	$V_{RIPPLE1}$			35	mV	20 MHz bandwidth
Output Current 1	I_{OUT1}			1.4	A	
Total Output Power						
Continuous Output Power	P_{OUT}			4.6	W	
Output connector						DIN barrel type, dimensions tbd
Efficiency						
Full Load	η		74		%	@ 115Vac
Average active efficiency at 25, 50, 75 and 100 % of P_{OUT}	η_{CEC}	74			%	Per California Energy Commission (CEC) / Energy Star requirements (63% min)
Environmental						
Conducted EMI		Meets CISPR22B / EN55022B				
Safety		Designed to meet IEC950, UL1950 Class II				
Ambient Temperature	T_{AMB}	0		40	°C	Free convection, sea level

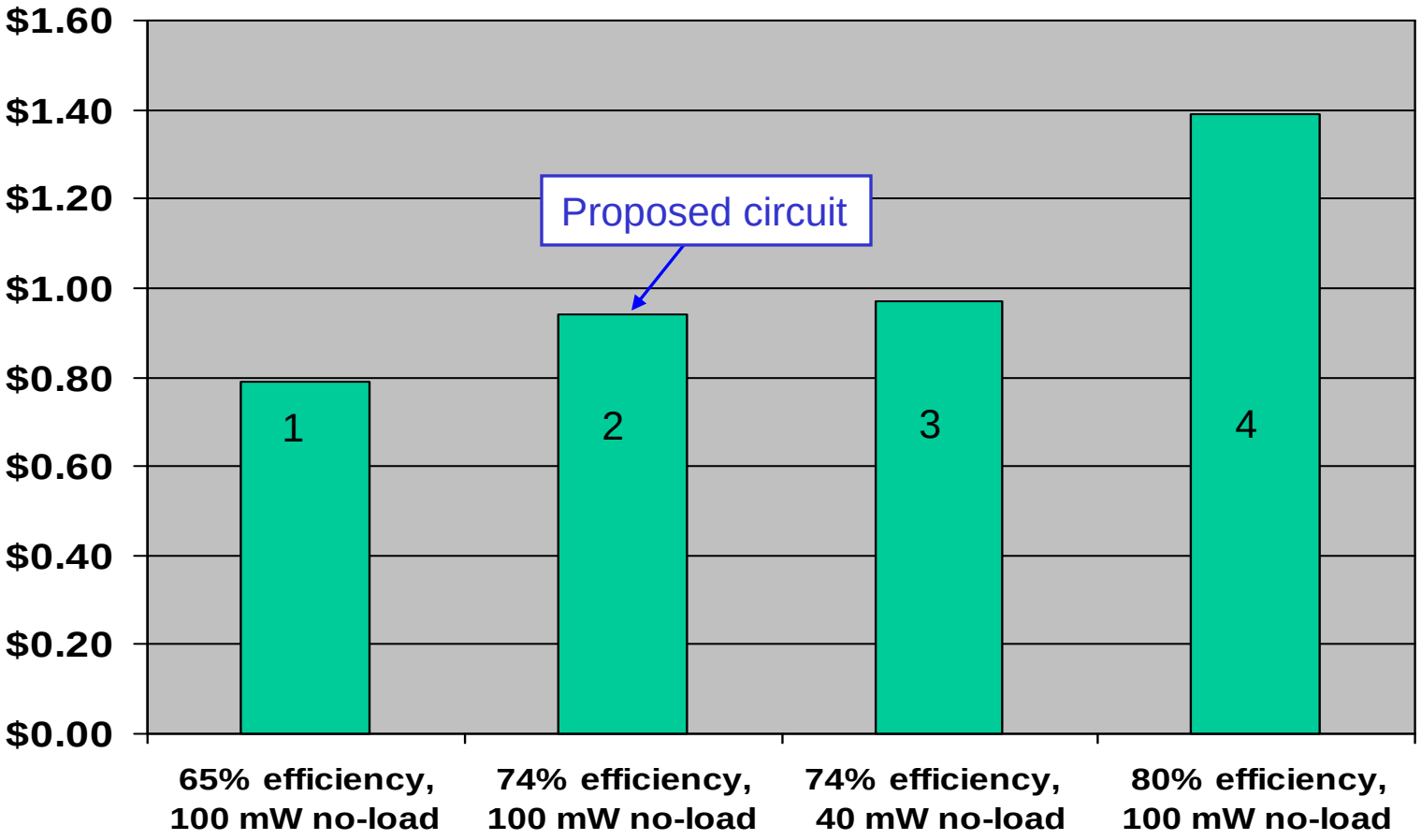
BOM Cost Discussion*

Item Number	Quantity	Part Reference	Value	Description
1	1	C1	6.8 uF	6.8 uF, 200 V, Electrolytic, (10 x 12),
2	1	C2	10 uF	10 uF, 200 V, Electrolytic, Low ESR, 2.9 Ohms, (10 x 20)
3	1	C3	0.47 nF	0.47 nF, 1 kV, Disc Ceramic
4	1	C5	1uF	1 uF, 50 V, Electrolytic
5	1	C9	100 nF	100 nF, 50 V, Ceramic, X7R, 0805
6	1	C6	680 uF	680 uF, 25 V, Electrolytic, Very Low ESR, 23 mOhm, (10 x 20)
7	1	C7	220 uF	220 uF, 10 V, Electrolytic, Very Low ESR, 130 mOhm, (6.3 x 11)
8	4	D1 D2 D3 D4	1N4005	600 V, 1 A, Rectifier, DO-41
9	1	D5	1N4007GP	1000 V, 1 A, Rectifier, Glass Passivated, 2 us, DO-41
10	1	D6	SB520	20 V, 5 A, Schottky, DO-201AD
11	1	L1	1 mH	1 mH, 0.15 A, Ferrite Core
12	2	L2 L3	3.5 x 7.6 mm	3.5 mm x 7.6 mm, 75 Ohms at 25 MHz, 22 AWG hole, Ferrite Bead
13	1	R1	200 k	100 k, 5%, 1/4 W, Metal Film, 1206
14	1	R2	100	100 R, 5%, 1/4 W, Metal Film, 1206
15	1	R7	10 k	10 k, 1%, 1/8 W, Metal Film, 0805
16	1	R8	47	47 R, 5%, 1/8 W, Metal Film, 0805
17	1	R13	16.8 k	16.9k, 1%, 1/16 W, Metal Film, 0805
18	1	R19	3.3 k	3.3 k, 5%, 1/8 W, Metal Film, 0805
19	1	RF1	8.2	8.2 R, 2.5 W, Fusible/Flame Proof Wire Wound
20	1	T1	EE22	Transformer, EE16, 10pins, Pri, Sec, 2 Shields
21	1	U1	TNY275P	TinySwitch-III, TNY275P, DIP-8C
22	1	U4	PC817A	Opto coupler, 35 V, CTR 80-200%, 4-DIP
	1	U5	LMV431	1.24 V Shunt Regulator IC, 1%, -40 to 85C, SOT23

- **BOM cost for circuit shown - $0.94**
  - 74% active mode average efficiency
  - <100 mW no-load

***BOM costs are approximate and do not include cables, connectors, pcb, or enclosure**

BOM Cost Discussion



Note: BOM 1- smaller transformer, lower power IC, smaller output diode and bulk cap (-0.15). 3- added bias winding plus D,C,&R (+0.03). 4- added IC (+0.45).

Summary

- **Adapter can easily be designed and manufactured to meet the DTA target specifications**
- **For additional adapter details, contact rfassler@powerint.com**
- **Additional information on PI power conversion ICs at www.powerint.com**