

Application Brief 42022

ML4833 220V Non-Dimming Ballast Design

GENERAL DESCRIPTION

This Application Brief exists as a supplement to Application Note 63. When used with Application Note 63, this document contains all the necessary information to convert an ML4833 Evaluation Board into a low-cost, non-dimming 220V ballast.

This power factor corrected, 60W non-dimming ballast operates over a 187 to 253V_{RMS} line, and is designed to power two series connected F32T8 lamps. The design preserves the features of the dimming ballast, which include:

- 0.99 minimum power factor
- Less than 10% THD
- Programmable starting sequence for low glow current and extended lamp life
- Greater than 92% efficiency
- On-chip thermal and lamp out detection circuitry
- Power down threshold for GFI or end of lamp life protection

The mode of operation used for preheating and striking of the lamps is the widely accepted variable frequency, non-overlapping inverter topology.

Specific details on power factor correction and resonant lamp network design can be obtained from Application Note 63.

CONVERSION

To convert the ML4833 Evaluation Board to the non-dimming design described:

1. Remove the dimmer control interface subassembly.
2. Remove components R2, R3, R16, C4, C5 and T5 (as shown in Figure 2). Ground LAMP FB.
3. Replace R24 and C22 with jumpers and change the values of R21 and R5 per Table 1.
4. The new components (R26, R27, C27 and D14) can be assembled using available wiring at T5.

Shaded items in Table 1 indicate changes to the original ML4833 Evaluation Board parts list.

VENDOR LIST

All American	(800) 222-6001
Capsco	(800) 538-8587
Future Active Inc.	(800) 723-5817, (408) 434-9599
Digi-Key Corp.	(800) 344-4539
Premier Magnetics	(714) 362-4211
R&D Electronic Parts	(800) 675-1177
PCB Engineering	(408) 946-2075

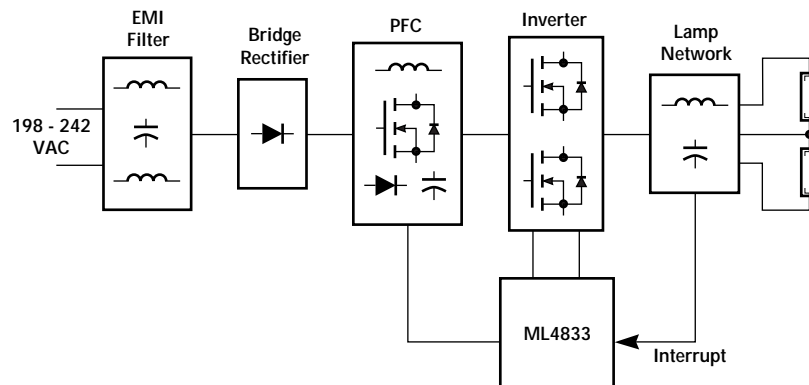


Figure 1. Functional Block Diagram

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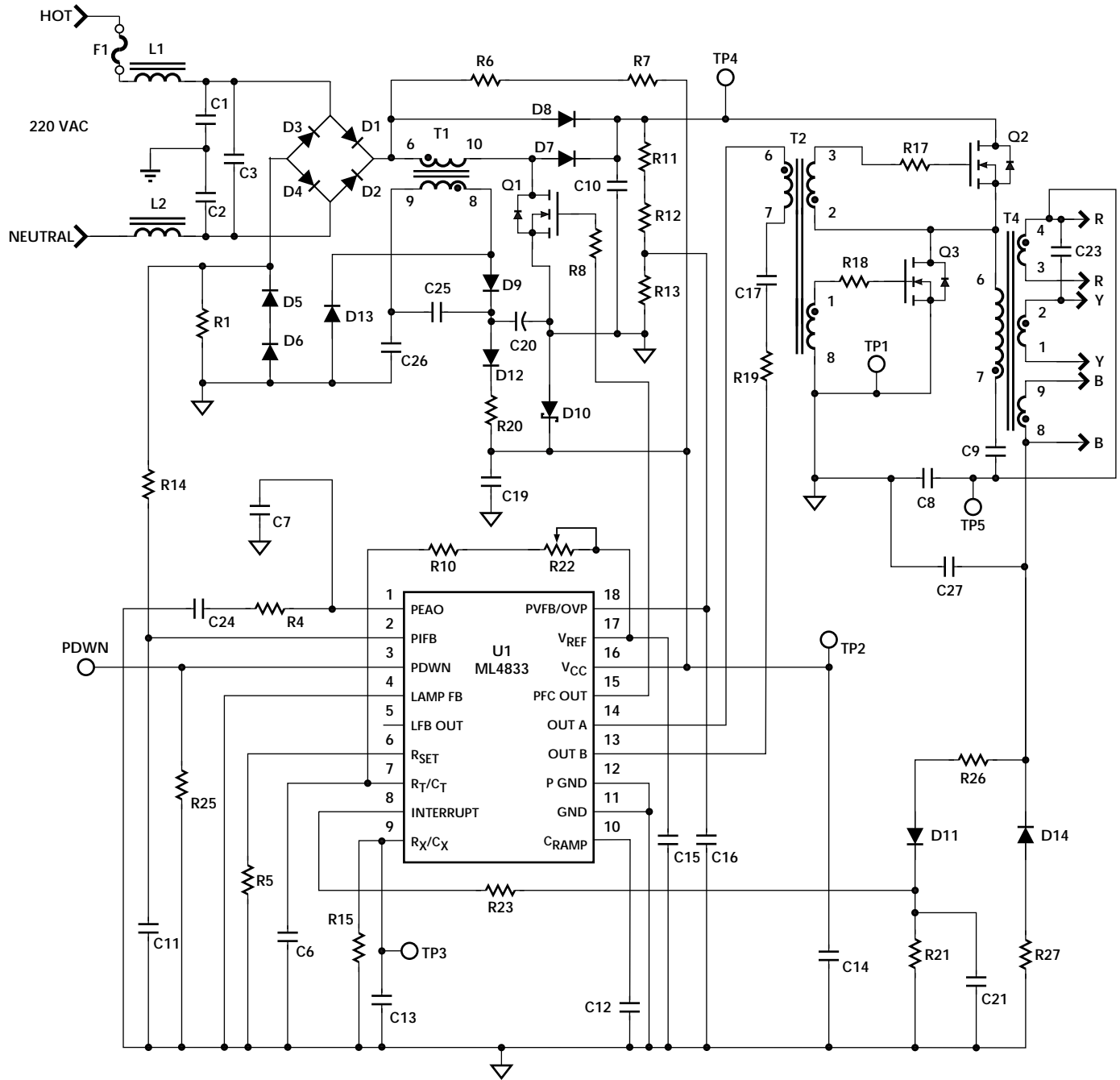


Figure 2. Non-Dimming 220V Schematic

TABLE 1. PARTS LIST

QUANTITY	DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER
RESISTORS				
1	R1	1.0 Ω , 1/2 W, 5%, metal film	NTE	HW1D0
	R2	not used		
	R3	not used		
1	R4	1.1M Ω , 1/4 W, 1%, metal film	Yageo	1.1M-Q
1	R5	24.9k Ω , 1/4 W, 1%, metal film	Yageo	24.9K-X
2	R6, R7, R26, R27	51k Ω , 1/4 W, 5%, carbon film	Yageo	51K-Q
1	R8	22 Ω , 1/4 W, 5%, carbon film	Yageo	22-Q
	R9	not used		
1	R10	17.4k Ω , 1/4 W, 1%, metal film	Yageo	17.4K-X
2	R11, R12	442k Ω , 1/4 W, 1%, metal film	Yageo	442K-X
1	R13	5.76k Ω , 1/4 W, 1%, metal film	Yageo	5.76K-X
1	R14	470 Ω , 1/4 W, 5%, carbon film	Yageo	470-Q
1	R15	820k Ω , 1/4 W, 5%, carbon film	Yageo	820K-Q
	R16	not used - insert jumper		
3	R17, R18, R19	51 Ω , 1/4 W, 5%, carbon film	Yageo	51-Q
1	R20	820 Ω , 1/4 W, 5%, carbon film	Yageo	820K-Q
1	R21	300k Ω , 1/4 W, 5%, metal film	Yageo	300K-Q
1	R22	5k Ω potentiometer	Bourns	3386P-502-ND
2	R23, R25	200k Ω , 1/4 W, 5%, carbon film	Yageo	200K-Q
	R24	not used - insert jumper		
11	J1 - J11	0.0 Ω Jumper	Yageo	0.0-Q
CAPACITORS				
2	C1, C2	2.2nF, 250VAC, 10%, 'Y'	Wima	MP3-Y
1	C3	0.15 μ F, 300VAC, 10%, 'X',	Wima	MP3-X
	C4, C5	not used		
1	C6	1.5nF, 50V, 2.5%, NPO ceramic	AVX	RPE121COG152
1	C7	22nF, 100V, 5%, ceramic	Panasonic	ECU-S2A223JCB
1	C8	4700pF, 630V, 5%, polypropylene	Wima	MKP10
1	C9	15nF, 400V, 5%, polypropylene	Wima	MKP10
1	C10	47 μ F, 450V, 20%, electrolytic	Panasonic	ECE-S2WU470J
1	C11	33nF, 63V, 10% ceramic	Panasonic	ECU-S1J333KBA
1	C12	680pF, 100V, 5%, ceramic	Panasonic	ECU-S2A681JCA
1	C13	6.8 μ F, 35V, 20%, electrolytic	Panasonic	ECE-A16Z6R8
2	C14, C15	0.22 μ F, 50V, 20%, ceramic	Murata	RPE123Z5U105M050
1	C16	100pF, 100V, 5%, ceramic	AVX	SR211A101JAA
1	C17	1.0 μ F, 50V, 20%, electrolytic	Panasonic	ECE-A1HU010
	C18	not used - insert jumper		
1	C19	47 μ F, 16V, 20%, electrolytic	Panasonic	ECE-A1CU470
1	C20	100 μ F, 25V, 20%, electrolytic	Panasonic	ECE-A1EU101
1	C21	1.0 μ F, 50V, 20%, electrolytic	Panasonic	ECE-A1HU010
	C22	not used - insert jumper		
1	C23	120pF, 1kV, 10%, ceramic	Panasonic	ECK-D3A121KBM
1	C24	47nF 63VDC, 10% ceramic	Panasonic	ECU-S1J473KBA
2	C25, C26	0.1 μ F, 50V, 5%, polyester film	Panasonic	ECQ-V1H04JL
1	C27	0.22 μ F, 250V, 5%, polyester film	Panasonic	ECQ-E2224KF

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TABLE 1. PARTS LIST (Continued)

QUANTITY	DESIGNATOR	DESCRIPTION	MANUFACTURER	PART NUMBER
DIODES				
5	D1 - D4, D8	1 A, 600 V, 1N4007 (or 1N5061)	Motorola	1N4007TR
2	D5, D6	1N4001, 1 A, 50 V (or more)	Motorola	1N4001TR
1	D7	BYV26C, 1 A, 600 V ultra fast	GI	BYV26C
4	D9, D11 - D13	1N4148, 0.1 A, 75 V, signal	Motorola	1N4148TR
1	D10	1N5245B, 15 V, .5 W, Zener	Motorola	1N5245B
1	D14	1N5818, 1.0 A, 30V Schottky	Motorola	1N5818
ICs				
1	U1	ML4833 Elec. Ballast Controller	Micro Linear	ML4833CP
TRANSISTORS				
3	Q1 - Q3	IRF820, 2.5A, 500V, power MOSFET	IR	IRF820
HARDWARE				
3		TO-220 Heatsink	Thermalloy	7173D
FUSES				
1	Ref. F1	1A fuse, 5x20mm miniature	Littelfuse	F945-ND
2	Ref. F1	Fuse Clips, 5x20mm, PC Mount		F058-ND
MAGNETICS				
1	T1	Boost inductor, 8.0mH	Premier Magnetics	TDS-965
1	T2	Gate Drive Xfmr, Lpri = 16mH (min)	Premier Magnetics	PMGD-04
1	T3	not used - install jumpers from pin 10 to pin 4, and from pin 5 to pin 6		
1	T4	Inductor, Lpri = 5.4mH	Premier Magnetics	TDS-892
1	T5	not used		
INDUCTORS				
2	L1, L2	EMI/RFI, 600mH, DC resistance = 0.45Ω.	Premium Magnetics	SPE116A

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