International
IOR Rectifier

Application Note AN-1039

IR2159: Dimming Dual Lamp Parallel Configuration with Balance Transformer

By T. Ribarich, R. Marenche

1. Basic Circuit Considerations..... 1

2. Figure 1: Dual Lamp Parallel Configuration..... 2

3. Schematic..... 3

4. Bill of Materials 4

The IR2159 dimming ballast control IC can be used with some modifications to the ballast output stage, to allow both lamps to be dimmed while maintaining equal brightness in both lamps. Through externally programmable components, the IR2159 offers flexibility of various features such as preheat time and current and minimum and maximum brightness settings. Comprehensive protection features protect the circuit against conditions such as lamp strike failures, filament failures, low DC bus, thermal overload, or lamp failure during normal operation. This circuit switches off both lamps when one is taken out, and automatically restarts when both lamps are in place.

International
IOR Rectifier

APPLICATION NOTE

AN1039

International Rectifier · 233 Kansas Street El Segundo CA 90245 USA

IR2159: Dimming Dual Lamp Parallel Configuration with Balance Transformer

By T. Ribarich, R. Marenche

TOPICS COVERED

Basic Circuit Considerations
Schematic Diagrams
Bill of Materials

A popular and economical configuration for dimmable fluorescent ballasts is for driving two lamps in parallel. The IR2159 dimming ballast control IC can be used with some modifications to the ballast output stage, to allow both lamps to be dimmed while maintaining equal brightness in both lamps. Through externally programmable components, the IR2159 offers flexibility of various features such as preheat time and current and minimum and maximum brightness settings. Comprehensive protection features protect the circuit against conditions such as lamp strike failures, filament failures, low DC bus, thermal overload, or lamp failure during normal operation. *This circuit switches off both lamps when one is taken out, and automatically restarts when both lamps are in place.*

1. BASIC CIRCUIT CONSIDERATIONS

The output stage has been modified for two lamps in parallel (Figure 1). The lamps have been placed outside the under-damped resonant circuit loop which consists of L3 and C15. The filament heating during preheat and dimming is achieved using voltage-mode filament heating with secondary windings off of the resonant inductor (L3A, L3B, L3C, L3D). A balance transformer (L4) provides equal currents through both lamps such that equal brightness is obtained during dimming. The DC blocking capacitor, C16, is also placed outside the under-damped resonant circuit loop such that it does not influence the natural resonance frequency of L3 and C15. During lamp removal, both lower filament signals are OR-ed into the shutdown pin, SD, through resistors R16 and R18.

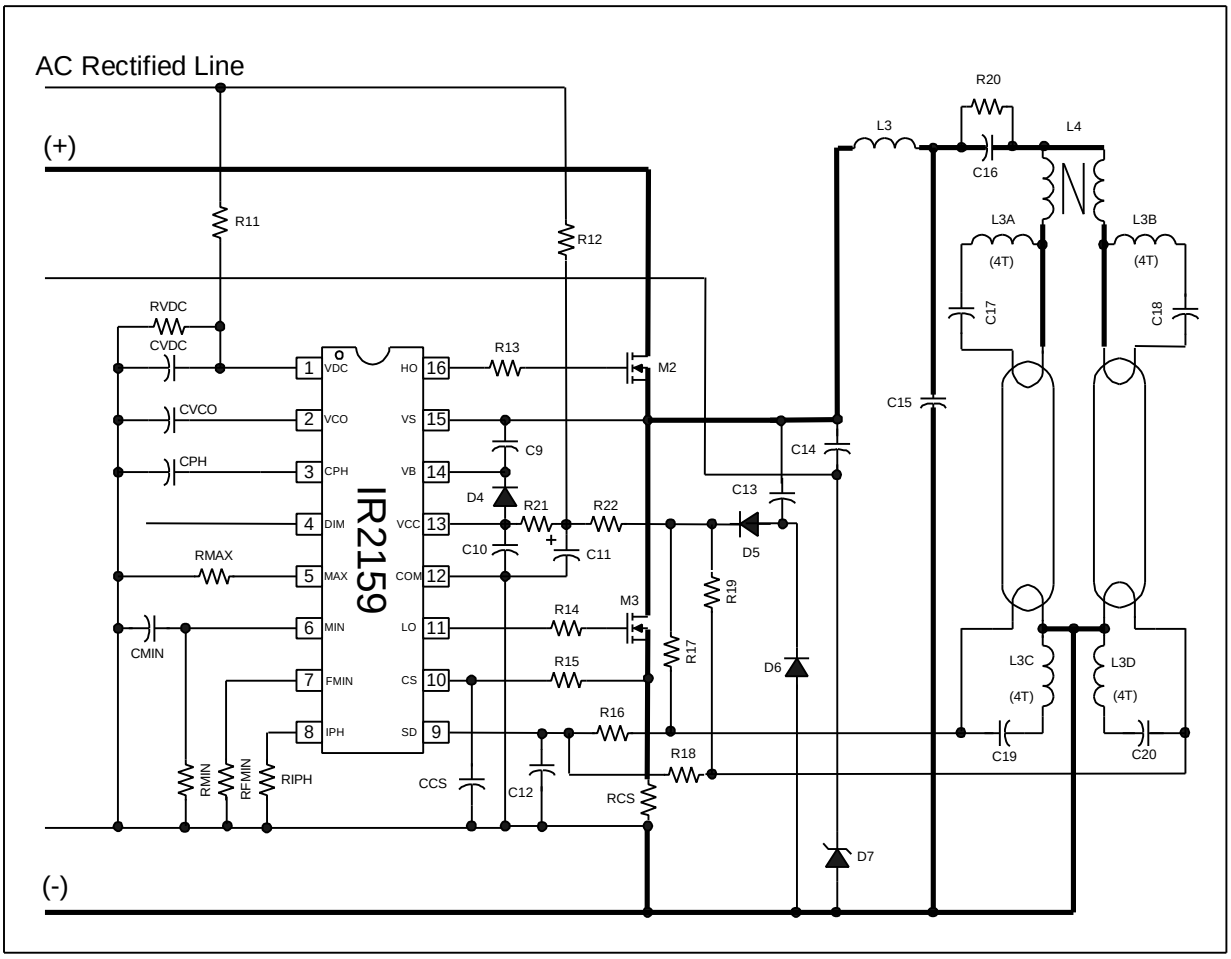
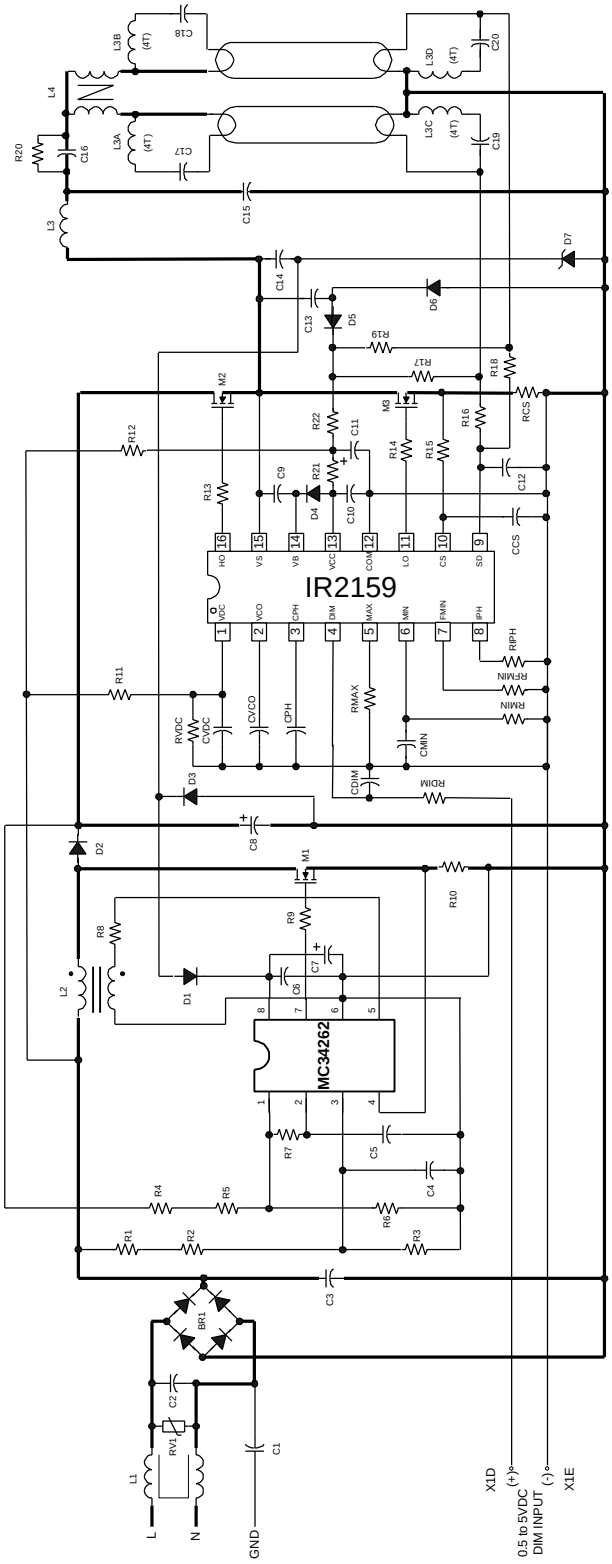


Figure 1, Dual lamp parallel configuration.

Schematic



Note: Thick traces represent high-frequency, high-current paths. Lead lengths should be minimized to avoid high-frequency noise problems

Bill Of Materials

Lamp type: T8/36W X 2

Line Input Voltage: 180..255 VAC/50..60 Hz

Note: Different lamp types require different frequency programming components.

Item #	Qt	Manufacturer	Part Number	Description	Reference
1	1	International Rectifier	DF10S	Bridge Rectifier, 1A 1000V	BR1
2	1	Roederstein	WY0222MCMBF0K	Capacitor, 2.2nF 275 VAC Y Cap	C1
3	1	Roederstein	F1772433-2200	Capacitor, 0.33uF 275 VAC	C2
4	1	Wima	MKP10	Capacitor, 0.1uF 400 VDC	C3
5	3	Panasonic	ECU-V1H103KBM	Capacitor, 0.01uF SMT 1206	C4, CVCO, CDIM
6	2	Panasonic	ECJ-3YB1E474K	Capacitor, 0.47uF SMT 1206	C5,C6
7	1	Panasonic	EEU-FC1H2R2	Capacitor, 2.2uF 50VDC 105C	C7
8	1	Panasonic	EEU-EB2V100	Capacitor, 10uF 350VDC 105C	C8
9	4	Panasonic	ECU-V1H104KBM	Capacitor, 0.1uF SMT 1206	C9,C10,C12, CMIN
10	1	Panasonic	EEU-FC1H4R7	Capacitor, 4.7uF 50VDC 105C	C11
11	2	Vitramon	1812A102KXE	Capacitor, 1nF 1KV SMT 1812	C13,C14
12	1	Wima	MKP10	Capacitor, 6.8 nF,1600V	C15
13	1	Panasonic	ECQ-E4224KZ	Capacitor, 0.22uF, 400V	C16
14	4	Panasonic	ECU-S1H474KBB	Capacitor, 0.47uF, 50V	C17, C18, C19, C20
15	2	Panasonic	ECJ-3VB1E334	Capacitor, 0.33uF, SMT 1206	CVDC,CCPH
16	1	Panasonic	ECU-V1H471KBM	Capacitor, 470pF SMT 1206	CCS
17	4	Diodes	LL4148DICT-ND	Diode, 1N4148 SMT DL35	D1, D3, D5, D6
18	2	International Rectifier	10BF60	Diode, SMT SMB	D2, D4
19	1	Diodes	MMSZ4702T1	Diode, Zener 20V SMT DL35	D7
20	1	Motorola	MC34262	IC, Power Factor Controller	IC1
21	1	International Rectifier	IR2159	IC, Ballast Driver	IC2
22	1	Panasonic	ELF-15N007A	EMI Inductor, 1X10mH 0.7Apk	L1
23	1	RGA	RGA-EF25	PFC Inductor, 2.0mH 2.0Apk	L2
24	1			Inductor, 1.0mH, 2.0Apk with 4 secondary windings of 4 turns	L3, L3A,L3B, L3C, L3D
25	1	Panasonic	ELF-15N008A	EMI Inductor, 1X6.8mH 0.8Apk	L4A, L4B
26	3	International Rectifier	IRF840	Transistor, MOSFET	M1, M2, M3
27	2	Panasonic	ERJ-8GEYJ680K	Resistor, 680K ohm SMT 1206	R1, R2
28	1	Panasonic	ERJ-8GEYJ7.5K	Resistor, 7.5K ohm SMT 1206	R3
29	2	Panasonic	ERJ-8GEYJ820K	Resistor, 820K ohm SMT 1206	R4, R5
30	2	Panasonic	ERJ-8GEYJ10K	Resistor, 10K ohm SMT 1206	R6, RDIM
31	2	Panasonic	ERJ-8GEYJ100K	Resistor, 100K ohm SMT 1206	R7,R20
32	1	Panasonic	ERJ-8GEYJ22K	Resistor, 22K ohm SMT 1206	R8
33	3	Panasonic	ERJ-8GEYJ22	Resistor, 22 ohm SMT 1206	R9, R13, R14
34	1	Dale	CW-1/2	Resistor, 0.8 ohm ½ watt	R10
35	1	Yageo	1.0MQBK-ND	Resistor, 1.0megohm ¼ watt	R11
36	1	Yageo	470KQBK-ND	Resistor, 470Kohm ¼ watt	R12
37	1	Panasonic	ERJ-8GEYJ1K	Resistor, 1K ohm SMT 1206	R15
38	2	Yageo	330KQBK-ND	Resistor, 330K ohm ¼ watt	R16,R18
39	2	Yageo	1.0MQBK-ND	Resistor, 1.0M ohm ¼ watt	R17,R19
40	1	Dale	CW-1/2	Resistor, 0.75 ohm ½ watt	RCS
41	1	Panasonic	ERJ-8GEYJ19K	Resistor, 19K ohm SMT 1206	RMAX
42	1	Panasonic	ERJ-8ENF24.9K	Resistor, 24.9K ohm SMT 1206	RMIN
43	1	Panasonic	ERJ-8GEYJ30K	Resistor, 30K ohm SMT 1206	RFMIN
44	1	Panasonic	ERJ-8GEYJ12K	Resistor, 12K ohm SMT 1206	RIPH
45	1	Panasonic	ERZ-V05D471	Transient Suppressor	RV1
46	2	Panasonic	ERJ-8GEYJ10	Resistor, 10 ohm SMT 1206	R21, R22
Total	**71**				