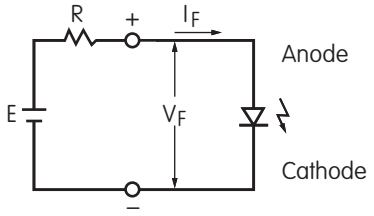
Ballast Resistors

BALLAST RESISTOR CALCULATIONS & RECOMMENDATIONS

If the source voltage is greater than the rated voltage of a lamp or LED, a ballast resistor must be connected in series with the lamp. The following circuit diagram and formula will assist in calculating the value of the required ballast resistor.



$$R = \frac{E - V_F}{I_F}$$

Where: R = Resistor Value (Ohms)
E = Source Voltage (V)
V_F = Forward Voltage (V)
I_F = Forward Current (A)

Watt recommendations provide a margin to reduce heat rise and increase life.

FORWARD VOLTAGE	FORWARD CURRENT	SOURCE VOLTAGE E																	
V_F	I_F	5V		6V		9V		12V		14V		16V		18V		22V		24V		28V	
V	mA	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W
1.65	25	130	1/4	180	1/2	300	1/2	430	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
1.70	30	110	1/2	150	1/2	240	1	360	1	430	1	470	2	560	2	680	2	750	2	910	3
1.75	40	82	1/2	110	1/2	180	1	270	1	300	2	360	2	430	2	510	3	560	3	680	3
1.77	20	160	1/4	220	1/4	360	1/2	510	1/2	620	3/4	750	3/4	820	1	1.0K	1	1.1K	1	1.3K	1.5
1.80	48	68	1/2	91	1/2	150	1	220	2	240	2	300	2	330	2	430	3	470	3	560	3
1.85	20	160	1/4	220	1/4	360	1/2	510	1	620	1	750	1	820	1	1.0K	1	1.2K	2	1.5K	2
1.90	8	390	1/8	510	1/8	910	1/4	1.2K	1/4	1.5K	1/4	1.8K	1/4	2.0K	1/2	2.4K	1/2	2.7K	1/2	3.3K	1/2
	15	220	1/8	270	1/4	470	1/2	680	1/2	820	1/2	1.0K	1	1.1K	1	1.5K	1	1.5K	1	1.8K	2
	16	200	1/4	220	1/4	430	1/2	620	1/2	750	1	910	1	1.0K	1	1.2K	1	1.3K	1	1.6K	1
	20	150	1/4	200	1/4	360	1/2	510	1/2	620	3/4	750	1	820	1	1.0K	1	1.1K	1	1.3K	2
	26	120	1/4	160	1/2	300	1/2	390	1	470	1	560	1	620	1	820	2	910	2	1.1K	2
1.95	15	220	1/8	270	1/4	470	1/2	680	1/2	820	1/2	1.0K	1	1.1K	1	1.5K	1	1.5K	1	1.8K	2
	20	150	1/4	200	1/4	360	1/2	510	1/2	620	3/4	680	3/4	820	1	1.0K	1	1.1K	1	1.3K	2
	24	130	1/4	160	1/2	300	1/2	430	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
1.96	16	200	1/4	240	1/4	430	1/2	620	1/2	750	1/2	910	1	1.0K	1	1.3K	1	1.3K	1	1.6K	1
2.00	15	200	1/8	270	1/4	470	1/2	680	1/2	820	1	910	1	1.1K	1	1.3K	1	1.5K	1	1.8K	1
	20	150	1/4	200	1/4	360	1/2	510	1	620	1	750	1	820	1	1.0K	1	1.1K	2	1.3K	2
	24	120	1/4	160	1/2	300	1/2	430	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
	25	120	1/4	160	1/2	270	1/2	390	1	470	1	560	1	620	2	820	2	910	2	1.1K	2
	26	120	1/4	160	1/2	270	1/2	390	1	470	1	560	1	620	1	820	2	910	2	1.0K	2
	48	62	1/2	82	1/2	150	1	200	1	240	1	300	2	330	2	430	3	470	3	560	3
2.07	16	180	1/8	240	1/4	430	1/2	620	1/2	750	1/2	910	3/4	1.0K	3/4	1.3K	1	1.3K	1	1.6K	1
2.10	15	200	1/8	270	1/4	470	1/2	680	1/2	820	1/2	1K	1	1.1K	1	1.3K	1	1.5K	1	1.8K	1
	20	150	1/4	200	1/4	360	1/2	510	1	620	1	680	1	820	1	1.0K	1	1.1K	1	1.3K	1
	24	120	1/4	160	1/2	300	1/2	430	1	510	1	560	1	680	2	820	2	910	2	1.1K	2
	25	120	1/4	160	1/2	270	1/2	390	1	470	1	560	1	620	2	820	2	910	2	1.1K	2
	30	100	1/4	130	1/2	240	1	330	1	390	1	470	2	510	2	680	2	750	2	910	2
	40	75	1/2	100	1/2	180	1	270	1.5	300	1.5	360	1.5	430	2	510	2	560	3	680	3
	45	68	1/2	91	1/2	160	1	220	2	270	2	330	2	360	2	430	3	510	3	620	3
2.15	16	180	1/8	240	1/4	430	1/2	620	1/2	750	1/2	910	3/4	1.1K	3/4	1.2K	1	1.3K	1	1.6K	1
	20	150	1/4	200	1/4	360	1/2	510	1	620	1	680	1	820	1	1.0K	1	1.1K	1	1.3K	1
2.16	16	180	1/8	240	1/4	430	1/2	620	1/2	750	1/2	910	3/4	1.0K	3/4	1.2K	1	1.3K	1	1.6K	1

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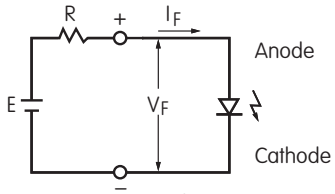
If the source voltage is greater than the rated voltage of a lamp or LED, a ballast resistor must be connected in series with the lamp. The following circuit diagram and formula will assist in calculating the value of the required ballast resistor.



$$R = \frac{E - V_F}{I_F}$$

Where: R = Resistor Value (Ohms)
E = Source Voltage (V)
V_F = Forward Voltage (V)
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FORWARD VOLTAGE	FORWARD CURRENT	SOURCE VOLTAGE E																	
V_F	I_F	5V		6V		9V		12V		14V		16V		18V		22V		24V		28V	
V	mA	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W	Ω	W
2.20	20	150	1/4	200	1/4	360	1/2	510	1	620	1	750	1	820	1	1.0K	1	1.1K	2	1.3K	2
	26	110	1/4	160	1/2	270	1/2	390	1	470	1	560	1	620	1	820	2	910	2	1.0K	2
	30	91	1/2	130	1/2	220	1	330	1	390	1	470	2	510	2	680	2	750	2	820	3
2.25	20	150	1/4	200	1/4	360	1/2	510	1	620	1	750	1	820	1	1.0K	1	1.1K	2	1.3K	2
2.27	20	150	1/4	200	1/4	330	1/2	510	1/2	620	3/4	750	3/4	820	1	1.0K	1	1.0K	1	1.2K	1
2.30	20	130	1/4	180	1/4	330	1/2	510	1/2	620	3/4	680	3/4	820	1	1.0K	1	1.0K	1	1.2K	1
2.35	40	68	1/4	91	1/2	160	1	240	1	300	2	330	2	390	2	510	3	560	3	620	3
2.80	20	110	1/4	160	1/4	330	1/2	470	1/2	560	1	680	1	750	1	1.0K	1	1.1K	1	1.3K	1
3.20	20	91	1/8	150	1/4	300	1/2	470	1/2	560	1/2	680	3/4	750	3/4	1.0K	1	1.0K	1	1.2K	1
3.30	20	91	1/8	150	1/4	300	1/2	430	1/2	560	1/2	680	3/4	750	3/4	1.0K	1	1.0K	1	1.2K	1
3.40	20	82	1/8	130	1/4	300	1/2	430	1/2	560	1/2	680	3/4	750	3/4	1.0K	1	1.0K	1	1.2K	1
3.50	20	75	1/4	120	1/8	270	1/4	430	1/2	560	1	620	1	750	1	1.0K	1	1.1K	2	1.3K	2
3.60	20	68	1/4	120	1/8	270	1/4	430	1/2	560	1	620	1	750	1	1.0K	1	1.1K	2	1.3K	2
	30	47	1/8	82	1/4	180	1/2	270	1	360	1	430	1	470	2	620	2	680	2	820	2
3.80	26	47	1/8	91	1/4	200	1/2	300	1/2	390	1	470	1	560	1	750	1.5	820	1.5	1.0K	2
	30	39	1/8	75	1/4	180	1/2	270	1	330	1	430	1	470	2	620	2	680	2	820	2
3.90	30	36	1/8	68	1/4	180	1/2	270	1	330	1	390	1	470	2	620	2	680	2	820	2
4.00	26	39	1/8	82	1/4	200	1/2	330	1/2	390	1	470	1	560	1	750	1.5	820	1.5	1.0K	2
	30	33	1/8	68	1/4	130	1/2	270	1	330	1	390	1	470	2	620	2	680	2	820	2
4.20	20	39	1/8	91	1/8	240	1/4	390	1/2	510	1	620	1	680	1	910	1	1.0K	1	1.2K	1
	30	27	1/8	62	1/4	160	1/2	270	1	330	1	390	1	470	2	620	2	680	2	820	2
4.30	20	36	1/8	82	1/8	240	1/4	390	1/2	470	1/2	560	1	680	1	910	1	1.0K	1	1.2K	1
4.40	26	24	1/8	62	1/4	180	1/2	300	1/2	390	1	470	1	560	1	680	1.5	750	1.5	910	1.5
5.00	25	—	—	47	1/8	160	1/2	300	1	360	1	470	1.5	560	1.5	680	2	820	2	1.0k	2.5
5.50	12.5	—	—	82	1/8	330	1/2	160	1	560	1/4	910	1/2	1.1K	1	1.5K	1	1.6K	1	1.8K	1
	25	—	—	43	1/8	160	1/4	300	1/2	360	1/2	470	1	560	1	680	1	820	1.5	1.0K	1.5
	45	—	—	24	1/8	91	1/2	160	1	200	1	270	1.5	300	1.5	390	2	430	3	560	3
	52	—	—	20	1/8	82	1/2	150	1	180	1.5	220	1.5	270	3	330	3	390	3	470	3
12.00	12.5	—	—	—	—	—	—	—	—	160	1/8	330	1/8	510	1/4	820	1/2	1K	1/2	1.3K	1
	15	—	—	—	—	—	—	—	—	150	1/8	270	1/8	400	1/4	680	1/2	820	1/2	1.5K	1
	20	—	—	—	—	—	—	—	—	100	1/8	200	1/4	300	1/2	510	1	620	1	820	1
	26	—	—	—	—	—	—	—	—	82	1/8	160	1/4	240	1	390	1	470	1	620	1
24.00	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	400	1/8
	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	330	1/2