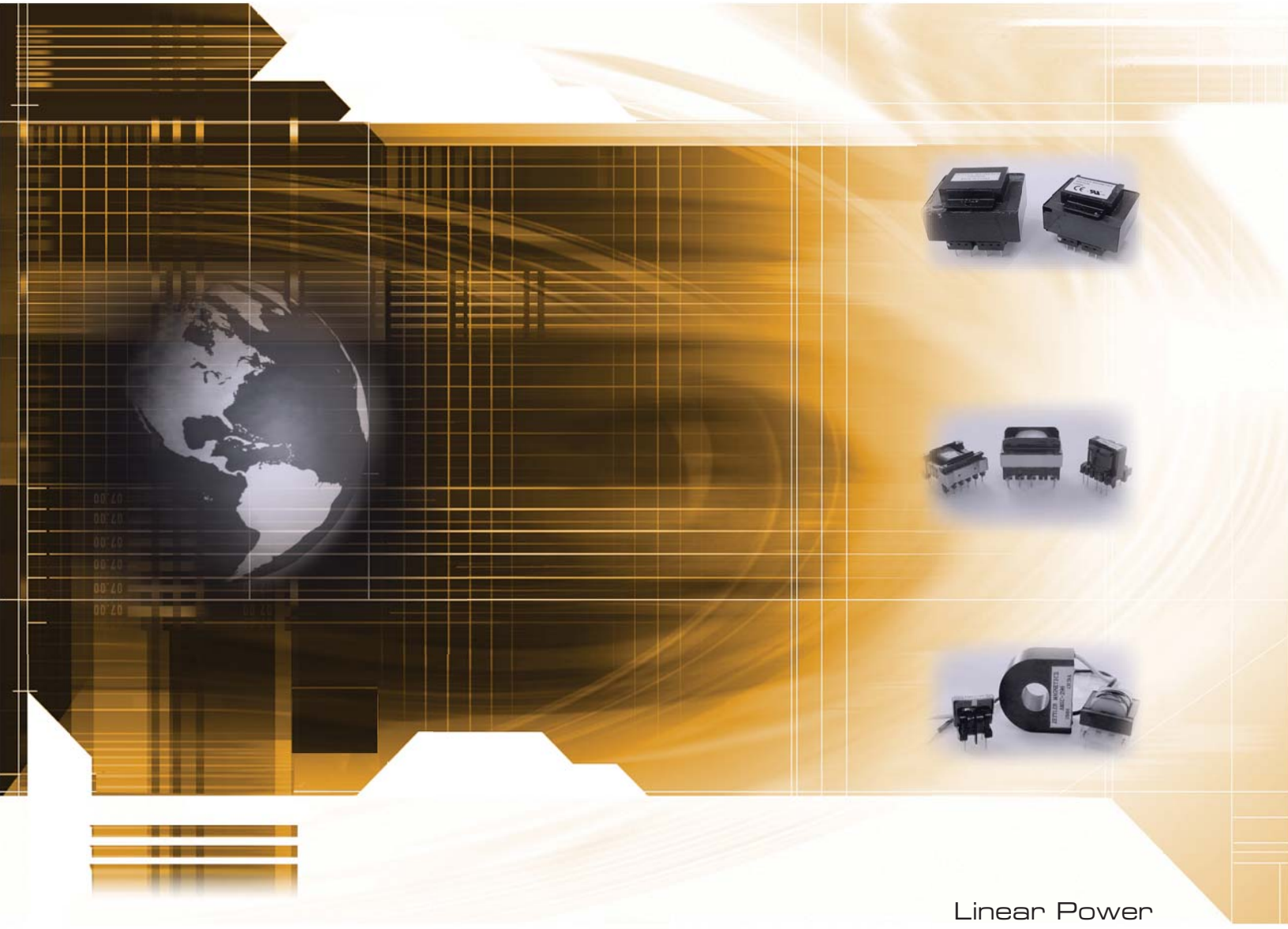
ZETTLER Magnetics, Inc.

The Power to Transform



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TRANSFORMERS

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Corporate Profile

Zettler Magnetics, Inc. is a wholly-owned subsidiary of Zettler Components, Inc. Zettler Magnetics, Inc. offers a wide range of UL approved open frame power transformers available in horizontal or vertical designs, low profile, and international style designs. We also offer a complete line of vacuum sealed transformers with power ratings from 0.6VA to 60VA that carry UL and VDE approvals. In addition to our standard open frame and sealed PCB mount power transformers, we also provide our customers with custom designs for specialized applications. Zettler Magnetics offers a truly global solution to almost every transformer requirement from our headquarters located in Aliso Viejo, California.

The global manufacturing facilities for Zettler Magnetics are strategically located in Europe and Asia with prototype production based in California. Controlling the manufacturing and quality of each transformer gives assurance that our products meet the highest possible standards in the industry. In addition, a highly knowledgeable sales force works closely with an experienced applications engineering department to help define the needs of our customers and to provide optimal solutions.

Zettler Magnetics is well renowned for traditional craftsmanship that is coupled with engineering excellence. Utilizing state of the art manufacturing techniques and equipment, such as a fully automated vacuum sealed transformer production line, creates uniform manufacturing that ensures quality at a reliable consistency. Zettler Magnetics is committed to providing the highest quality products to our customers.

Features

- UL 506 approved Class 1 for use in the US and Canada
- UL approved Class B (130° C) Insulation System
- Split Bobbin Design
- Dielectric Stength 2500 Vrms
- Standard Single 115V or Dual 115/230V primaries at 50/60Hz
- Standard Dual Secondaries for variety of applications
- Precision Molded-in Terminals
- Available in 6 Standard Power Ratings

Order Number		Secondary RMS Rating	
Single Pri. 115v 6 Pin	Dual Pri. 115/230V 8 Pin	Series	Parallel
AH20010	ADH20010	10VCT @ 0.110A	5V @ 0.220A
AH30010	ADH30010	10VCT @ 0.250A	5V @ 0.500A
AH40010	ADH40010	10VCT @ 0.600A	5V @ 1.200A
AH50010	ADH50010	10VCT @ 1.200A	5V @ 2.400A
AH60010	ADH60010	10VCT @ 2.000A	5V @ 4.000A
AH20012	ADH20012	12.6VCT @ 0.090A	6.3V@ 0.180A
AH30012	ADH30012	12.6VCT @ 0.200A	6.3V@ 0.400A
AH40012	ADH40012	12.6VCT @ 0.500A	6.3V@ 1.000A
AH50012	ADH50012	12.6VCT @ 1.000A	6.3V@ 2.000A
AH60012	ADH60012	12.6VCT @ 1.600A	6.3V@ 3.200A
AH20016	ADH20016	16VCT @ 0.070A	8V @ 0.140A
AH30016	ADH30016	16VCT @ 0.150A	8V @ 0.300A
AH40016	ADH40016	16VCT @ 0.400A	8V @ 0.800A
AH50016	ADH50016	16VCT @ 0.800A	8V @ 1.600A
AH60016	ADH60016	16VCT @ 1.250A	8V @ 2.500A
AH20020	ADH20020	20VCT @ 0.055A	10V @ 0.110A
AH30020	ADH30020	20VCT @ 0.120A	10V @ 0.240A
AH40020	ADH40020	20VCT @ 0.300A	10V @ 0.600A
AH50020	ADH50020	20VCT @ 0.600A	10V @ 1.200A
AH60020	ADH60020	20VCT @ 1.000A	10V @ 2.000A
AH20024	ADH20024	24VCT @ 0.045A	12V @ 0.090A
AH30024	ADH30024	24VCT @ 0.100A	12V @ 0.200A
AH40024	ADH40024	24VCT @ 0.250A	12V @ 0.500A
AH50024	ADH50024	24VCT @ 0500A	12V @ 1.000A
AH60024	ADH60024	24VCT @ 0.800A	12V @ 1.600A
AH20028	ADH20028	28VCT @ 0.040A	14V @ 0.080A
AH30028	ADH30028	28VCT @ 0.085A	14V @ 0.170A
AH40028	ADH40028	28VCT @ 0.200A	14V @ 0.400A
AH50028	ADH50028	28VCT @ 0.420A	14V @ 0.840A
AH60028	ADH60028	28VCT @ 0.700A	14V @ 1.400A
AH20036	ADH20036	36VCT @ 0.030A	18V @ 0.060A
AH30036	ADH30036	36VCT @ 0.065A	18V @ 0.130A
AH40036	ADH40036	36VCT @ 0.170A	18V @ 0.340A
AH50036	ADH50036	36VCT @ 0.350A	18V @ 0.700A
AH60036	ADH60036	36VCT @ 0.550A	18V @ 1.100A
AH20048	ADH20048	48VCT @ 0.023A	24V @ 0.046A
AH30048	ADH30048	48VCT @ 0.050A	24V @ 0.100A
AH40048	ADH40048	48VCT @ 0.125A	24V @ 0.250A
AH50048	ADH50048	48VCT @ 0.250A	24V @ 0.500A
AH60048	ADH60048	48VCT @ 0.400A	24V @ 0.800A
AH20056	ADH20056	56VCT @ 0.020A	28V @ 0.040A
AH30056	ADH30056	56VCT @ 0.045A	28V @ 0.090A
AH40056	ADH40056	56VCT @ 0.110A	28V @ 0.220A
AH50056	ADH50056	56VCT @ 0.220A	28V @ 0.440A
AH60056	ADH60056	56VCT @ 0.350A	28V @ 0.700A
AH200120	ADH200120	120VCT @ 0.010A	60V @ 0.020A
AH300120	ADH300120	120VCT @ 0.020A	60V @ 0.40A
AH400120	ADH400120	120VCT @ 0.050A	60V @ 0.100A
AH500120	ADH500120	120VCT @ 0.100A	60V @ 0.200A
AH600120	ADH600120	120VCT @ 0.160A	60V @ 0.320A

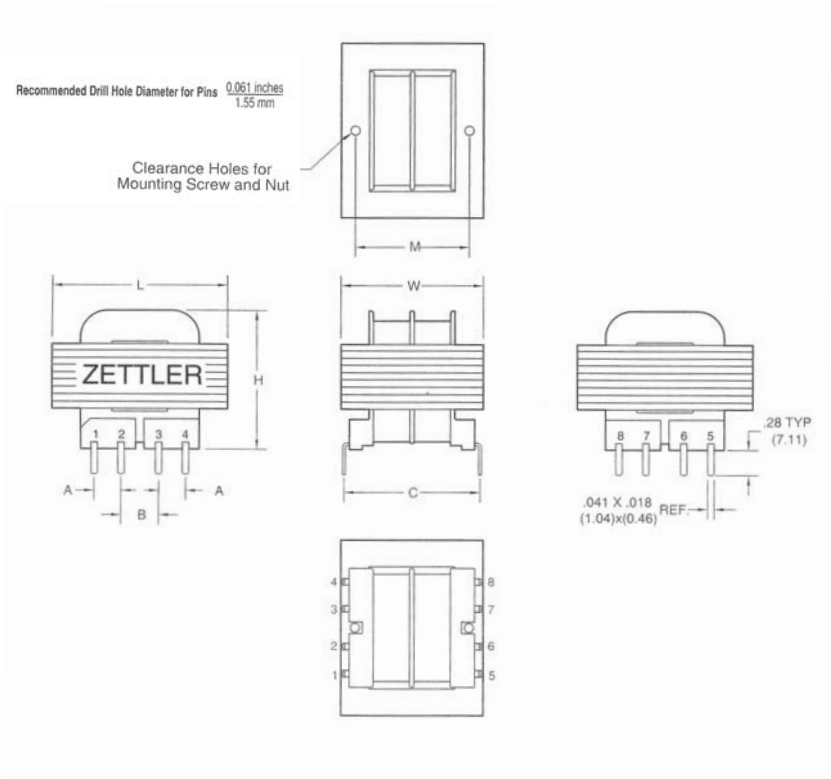
Specifications

SIZE	VA	L*	W*	H*	M*	A*	B*	C*	WT. (lbs.)
2	1.1	1.375 34.93	1.125 28.58	0.930 23.62	-	0.250 6.35	0.250 6.35	1.220 30.99	0.17
3	2.4	1.375 34.93	1.125 28.58	1.170 29.72	-	0.250 6.35	0.250 6.35	1.220 30.99	0.25
4	6.0	1.625 41.28	1.313 33.35	1.290 32.77	1.063 26.99	0.250 6.35	0.350 8.89	1.280 32.51	0.44
5	12.0	1.875 47.63	1.563 39.69	1.410 35.81	1.250 31.75	0.300 7.62	0.400 10.16	1.400 35.56	0.70
6	20.0	2.250 57.15	1.875 47.63	1.410 35.81	1.500 38.10	0.300 7.62	0.400 10.16	1.590 40.39	0.80
7	36.0	2.625 66.68	2.188 55.56	1.560 39.62	-	0.400 10.16	0.400 10.16	1.840 46.74	1.1

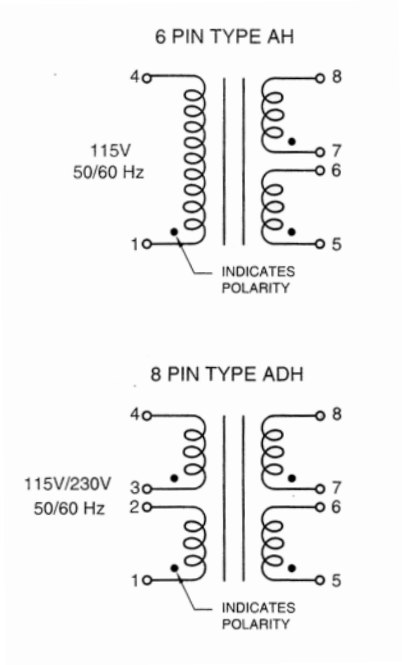
* Inches / Millimeter

Outline Dimensions

Note: Pins 2 and 3 Omitted on Single Primary Versions



Electrical Schematic



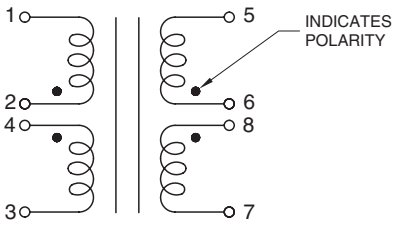
Features

- Has UL and CUR Agency Approvals
- Dielectric Strength 1500 Vrms
- Dual 115 V / 230 V Primaries
- Split Bobbin Design
- Standard Dual Secondaries for a variety of Applications
- Available in 3 Standard Sizes for a Variety of Power Requirements

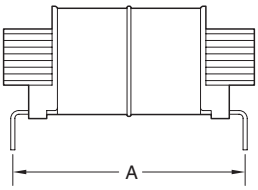
ORDER NUMBER		SECONDARY RMS RATINGS	
115/230V Primary	VA Size	Series	Parallel
AHF02010	2.4	10VCT @ 250mA	5V @ 500mA
AHF06010	6	10VCT @ 600mA	5V @ 1.2A
AHF12010	12	10VCT @ 1.2A	5V @ 2.4A
AHF02012	2.4	12.6VCT @ 200mA	6.3V @ 400mA
AHF06012	6	12.6VCT @ 450mA	6.3V @ 900mA
AHF12012	12	12.6VCT @ 900mA	6.3V @ 1.8A
AHF02016	2.4	16VCT @ 150mA	8V @ 300mA
AHF06016	6	16VCT @ 350mA	8V @ 700mA
AHF12016	12	16VCT @ 700mA	8V @ 1.4A
AHF02020	2.4	20VCT @ 125mA	10V @ 250mA
AHF06020	6	20VCT @ 300mA	10V @ 600mA
AHF12020	12	20VCT @ 600mA	10V @ 1.2A
AHF02024	2.4	24VCT @ 100mA	12V @ 200mA
AHF06024	6	24VCT @ 250mA	12V @ 500mA
AHF12024	12	24VCT @ 500mA	12V @ 1.0A
AHF02030	2.4	30VCT @ 85mA	15V @ 170mA
AHF06030	6	30VCT @ 200mA	15V @ 400mA
AHF12030	12	30VCT @ 400mA	15V @ 800mA
AHF02034	2.4	34VCT @ 75mA	17V @ 150mA
AHF06034	6	34VCT @ 170mA	17V @ 340mA
AHF12034	12	34VCT @ 340mA	17V @ 680mA
AHF02040	2.4	40VCT @ 60mA	20V @ 120mA
AHF06040	6	40VCT @ 150mA	20V @ 300mA
AHF12040	12	40VCT @ 300mA	20V @ 600mA
AHF02056	2.4	56VCT @ 45mA	28V @ 90mA
AHF06056	6	56VCT @ 100mA	28V @ 200mA
AHF12056	12	56VCT @ 200mA	28V @ 400mA
AHF02088	2.4	88VCT @ 28mA	44V @ 56mA
AHF06088	6	88VCT @ 65mA	44V @ 130mA
AHF12088	12	88VCT @ 130mA	44V @ 260mA
AHF02120	2.4	120VCT @ 20mA	60V @ 40mA
AHF06120	6	120VCT @ 50mA	60V @ 100mA
AHF12120	12	120VCT @ 100mA	60V @ 200mA
AHF02230	2.4	230VCT @ 10mA	115V @ 20mA
AHF06230	6	230VCT @ 25mA	115V @ 50mA
AHF12230	12	230VCT @ 50mA	115V @ 100mA

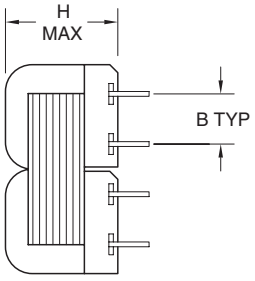
Outline Dimension

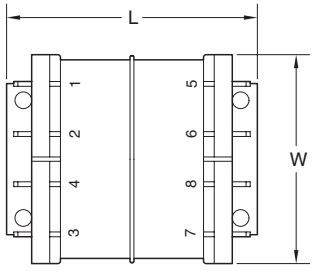
DUAL PRIMARIES



115V/230V
50/60 Hz







Specifications

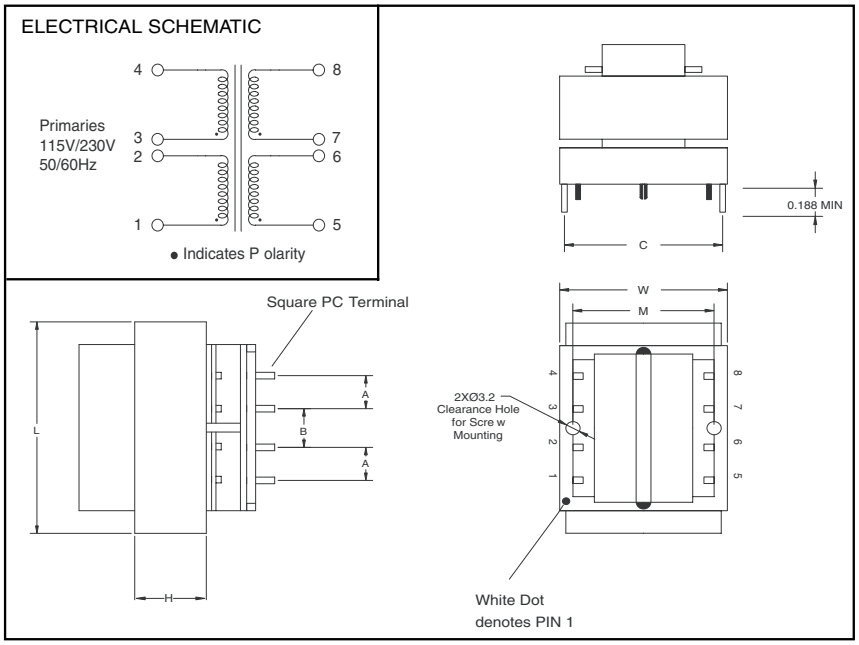
VA	L	W	H	A	B
2.4	1.875 / 47.63	1.562 / 39.67	0.650 / 16.51	1.600 / 40.64	0.375 / 9.53
6	1.875 / 47.63	1.562 / 39.67	0.850 / 21.59	1.600 / 40.64	0.375 / 9.53
12	2.500 / 63.50	2.000 / 50.80	1.065 / 27.05	2.000 / 50.80	0.500 / 12.70

AHI Series Linear Power

Features

- UL 1585 approved Class 2, 3: UL File No. E214561 (for 2.5 & 10 VA configurations, 5 VA is UL pending).
- Class B (130° C) Insulation system
- Built to meet requirments of IEC EN61558-1 & VDE safety standards
- Insulating shroud provides 4200 Vrms Hi-POT dielectric strength
- Bobbin and shroud material meet UL 94V-0 flammability requirements
- Specially designed bobbin wall slots elimi-nates all wire crossovers
- Dual bobbin non-concentric design reduces capacitances and eliminates the need for an electrostatic shield
- Precision pin alignment for easy drop-in application

Mechanical Data



Electrical Data

PART NO.	OUTPUT	SECONDARY RMS RATING	
		SERIES	PARALLEL
AHI02510	2.5VA	10VCT 0.25A	5V 0.50A
AHI05010	5.0VA	10VCT 0.50A	5V 1.00A
AHI01010	10.0VA	10VCT 1.00A	5V 2.00A
AHI02512	2.5VA	12.6VCT 0.20A	6.3V 0.40A
AHI05012	5.0VA	12.6VCT 0.40A	6.3V 0.80A
AHI01012	10.0VA	12.6VCT 0.80A	6.3V 1.60A
AHI02516	2.5VA	16VCT 0.15A	8V 0.30A
AHI05016	5.0VA	16VCT 0.31A	8V 0.62A
AHI01016	10.0VA	16VCT 0.62A	8V 1.25A
AHI02520	2.5VA	20VCT 0.12A	10V 0.24A
AHI05020	5.0VA	20VCT 0.25A	10V 0.50A
AHI01020	10.0VA	20VCT 0.50A	10V 1.00A
AHI02524	2.5VA	24VCT 0.10A	12V 0.20A
AHI05024	5.0VA	24VCT 0.21A	12V 0.42A
AHI01024	10.0VA	24VCT 0.42A	12V 0.84A
AHI02528	2.5VA	28VCT 0.09A	14V 0.18A
AHI05028	5.0VA	28VCT 0.18A	14V 0.36A
AHI01028	10.0VA	28VCT 0.36A	14V 0.72A
AHI02536	2.5VA	36VCT 0.07A	18V 0.14A
AHI05036	5.0VA	36VCT 0.14A	18V 0.28A
AHI01036	10.0VA	36VCT 0.28A	18V 0.56A

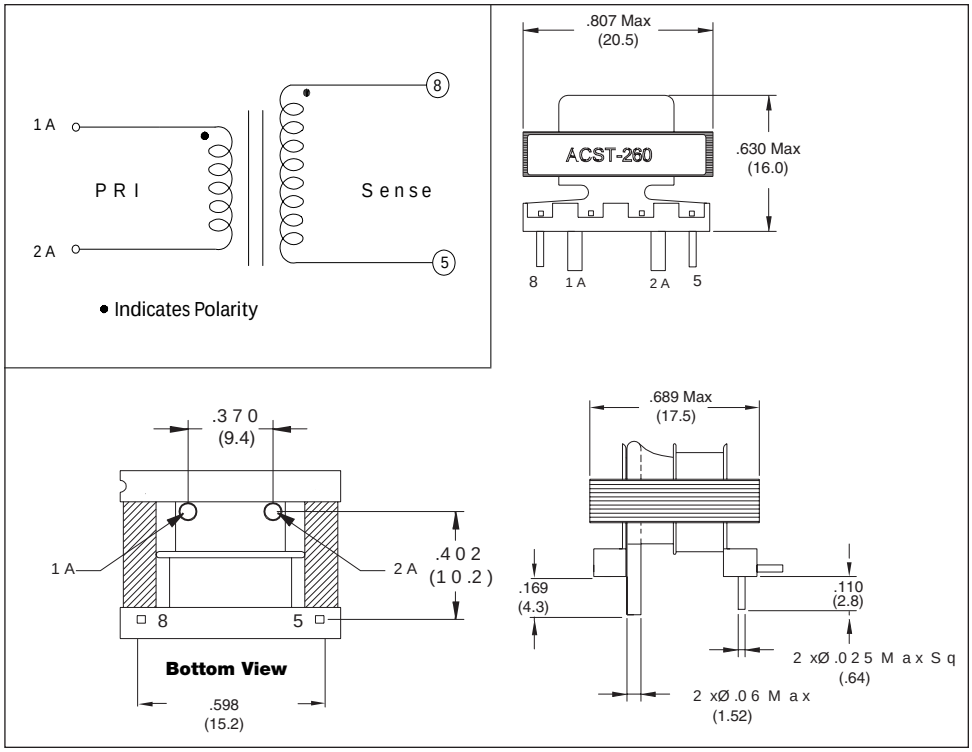
Features

- UL approved Class B insulation system
- Dielectric strength 3000 Vrms
- Specially designed split bobbin
- Small physical package for tight configurations
- Typical output of 110m V per Ampere
- Cost Effective
- ACST-260 have Standard solid wire Primary Leads
- ACST-260- 1 have Tinned solid wire Primary Leads

Electrical Specifications

Part Number	Turns Ratio	Current Range	Typical Output (mV/A)	Primary Resistance (u Ohms) max	Sense Resistance (Ohms)± 10%	Sense Inductance (H)± 30%	Primary Sense Frenquency (Hz)
ACST-255	1:50	1-30A	32	800	0.198	0.008	50-200
ACST-256	1:100	1-30A	64	800	0.785	0.025	50-200
ACST-257	1:150	1-30A	90	800	1.7	0.06	50-200
ACST-258	1:200	1-30A	120	800	3.2	0.12	50-200
ACST-259	1:300	1-30A	140	800	7.4	0.27	50-200
ACST-260	1:500	1-30A	110	800	20	0.73	50-200
ACST-261	1:1000	1-30A	60	800	79	2.4	50-200
ACST-262	1:1500	1-30A	45	800	220	5.2	50-200

Mechanical Data



44000 Series Sealed

Features

- UL and VDE approvals to conform with EN 60742
- Vaccum Sealed for increased protection
- Split Bobbin Design
- Dielectric Strength 4200 Vrms
- Standard Single Primary Winding 115V at 50/60 Hz
- Standard Single or Dual Secondaries for variety of applications
- Inherently Energy Limited
- Available in 11 Power Ratings

Single Secondary				Dual Secondaries			
Part No		Power VA	Output (Vrms)	Part No		Output (Vrms)	
Single Pri. 115V	Single Pri. 230V		Single (V @ A)	Single Pri. 115V	Single Pri. 230V	Series (V @ A)	Parallel (V @ A)
44025	44013	0.6	6 @ 0.100	44031	44019	12 @ 0.050	6 @ 0.100
44026	44014	0.6	9 @ 0.066	44032	44020	18 @ 0.033	9 @ 0.066
44027	44015	0.6	12 @ 0.050	44033	44021	24 @ 0.025	12 @ 0.050
44028	44016	0.6	15 @ 0.040	44034	44022*	30 @ 0.020	15 @ 0.040
44029	44017	0.6	18 @ 0.033	44035	44023*	36 @ 0.017	18 @ 0.033
44030	44018	0.6	24 @ 0.025	44036	44024*	48 @ 0.013	24 @ 0.025
44061	44049	1.0	6 @ 0.167	44067	44055	12 @ 0.084	6 @ 0.167
44062	44050	1.0	9 @ 0.111	44068	44056	18 @ 0.056	9 @ 0.111
44063	44501	1.0	12 @ 0.083	44069	44057	24 @ 0.042	12 @ 0.083
44064	44052	1.0	15 @ 0.067	44070	44058	30 @ 0.034	15 @ 0.067
44065	44053	1.0	18 @ 0.056	44071	44059	36 @ 0.028	18 @ 0.056
44066	44054	1.0	24 @ 0.042	44072	44060*	48 @ 0.021	24 @ 0.042
44097	44085	1.5	6 @ 0.250	44103	44091	12 @ 0.125	6 @ 0.250
44098	44086	1.5	9 @ 0.167	44104	44092	18 @ 0.084	9 @ 0.167
44099	44087	1.5	12 @ 0.125	44105	44093	24 @ 0.063	12 @ 0.125
44100	44088	1.5	15 @ 0.100	44106	44094	30 @ 0.050	15 @ 0.100
44101	44089	1.5	18 @ 0.083	44107	44095*	36 @ 0.042	18 @ 0.083
44102	44090	1.5	24 @ 0.063	44108	44096*	48 @ 0.032	24 @ 0.063
44133	44121	2.0	6 @ 0.333	44139	44127	12 @ 0.167	6 @ 0.333
44134	44122	2.0	9 @ 0.222	44140	44128	18 @ 0.111	9 @ 0.222
44135	44123	2.0	12 @ 0.167	44141	44129	24 @ 0.084	12 @ 0.167
44136	44124	2.0	15 @ 0.133	44142	44130	30 @ 0.067	15 @ 0.133
44137	44125	2.0	18 @ 0.111	44143	44131*	36 @ 0.056	18 @ 0.111
44138	44126	2.0	24 @ 0.083	44144	44132*	48 @ 0.042	24 @ 0.083
44169	44157	2.3	6 @ 0.383	44175	44163	12 @ 0.192	6 @ 0.383
44170	44158	2.3	9 @ 0.256	44176	44164	18 @ 0.128	9 @ 0.256
44171	44159	2.3	12 @ 0.192	44177	44165	24 @ 0.096	12 @ 0.192
44172	44160	2.3	15 @ 0.153	44178	44166	30 @ 0.077	15 @ 0.153
44173	44161	2.3	18 @ 0.128	44179	44167*	36 @ 0.064	18 @ 0.128
44174	44162	2.3	24 @ 0.096	44180	44168*	48 @ 0.048	24 @ 0.096
44205	44193	3.2	6 @ 0.533	44211	44199	12 @ 0.267	6 @ 0.533
44206	44194	3.2	9 @ 0.356	44212	44200	18 @ 0.178	9 @ 0.356
44207	44195	3.2	12 @ 0.267	44213	44201	24 @ 0.134	12 @ 0.267
44208	44196	3.2	15 @ 0.213	44214	44202	30 @ 0.107	15 @ 0.213
44209	44197	3.2	18 @ 0.178	44215	44203	36 @ 0.089	18 @ 0.178
44210	44198	3.2	24 @ 0.133	44216	44204*	48 @ 0.067	24 @ 0.133

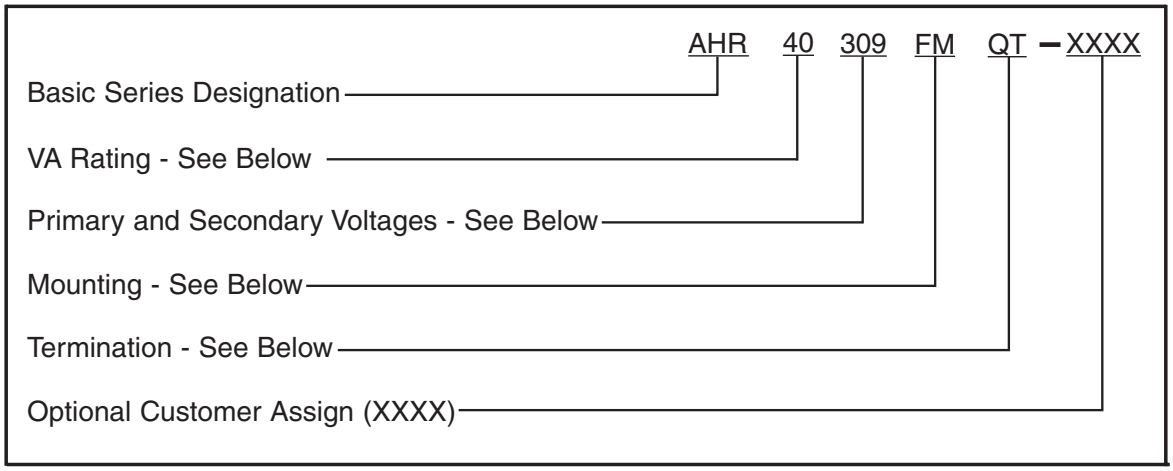
Features

- UL and VDE approvals to conform with EN 60742
- Vaccum Sealed for increased protection
- Split Bobbin Design
- Dielectric Strength 4200 Vrms
- Standard Single Primary Winding 115V at 50/60 Hz
- Standard Single or Dual Secondaries for variety of applications
- Inherently Energy Limited
- Available in 11 Power Ratings

Single Secondary				Dual Secondaries			
Part No		Power VA	Output (Vrms)	Part No		Output (Vrms)	
Single Pri. 115V	Single Pri. 230V		Single (V @ A)	Single Pri. 115V	Single Pri. 230V	Series (V @ A)	Parallel (V @ A)
44241	44229	5.0	6 @ 0.833	44247	44235	12 @ 0.417	6 @ 0.833
44242	44230	5.0	9 @ 0.556	44248	44236	18 @ 0.278	9 @ 0.556
44243	44231	5.0	12 @ 0.417	44249	44237	24 @ 0.209	12 @ 0.417
44244	44232	5.0	15 @ 0.333	44250	44238	30 @ 0.167	15 @ 0.333
44245	44233	5.0	18 @ 0.278	44251	44239	36 @ 0.139	18 @ 0.278
44246	44234	5.0	24 @ 0.208	44252	44240*	48 @ 0.104	24 @ 0.208
44277	44265	10.0	6 @ 1.667	44283	44271	12 @ 0.834	6 @ 1.667
44278	44266	10.0	9 @ 1.111	44284	44272	18 @ 0.556	9 @ 1.111
44279	44267	10.0	12 @ 0.833	44285	44273	24 @ 0.417	12 @ 0.833
44280	44268	10.0	15 @ 0.667	44286	44274	30 @ 0.334	15 @ 0.667
44281	44269	10.0	18 @ 0.556	44287	44275	36 @ 0.278	18 @ 0.556
44282	44270	10.0	24 @ 0.417	44288	44276*	48 @ 0.209	24 @ 0.417
44313	44301	16.0	6 @ 2.667	44319	44307	12 @ 1.334	6 @ 2.667
44314	44302	16.0	9 @ 1.778	44320	44308	18 @ 0.889	9 @ 1.778
44315	44303	16.0	12 @ 1.330	44321	44309	24 @ 0.665	12 @ 1.330
44316	44304	16.0	15 @ 1.067	44322	44310	30 @ 0.534	15 @ 1.067
44317	44305	16.0	18 @ 0.889	44323	44311	36 @ 0.445	18 @ 0.889
44318	44306	16.0	24 @ 0.667	44324	44312*	48 @ 0.334	24 @ 0.667
44444	44432	22.0	6 @ 3.667	44450	44438	12 @ 1.834	6 @ 3.667
44445	44433	22.0	9 @ 2.444	44451	44439	18 @ 1.222	9 @ 2.444
44446	44434	22.0	12 @ 1.833	44452	44440	24 @ 0.917	12 @ 1.833
44447	44435	22.0	15 @ 1.467	44453	44441	30 @ 0.734	15 @ 1.467
44448	44436	22.0	18 @ 1.222	44454	44442	36 @ 0.611	18 @ 1.222
44449	44437	22.0	24 @ 0.917	44455	44443*	48 @ 0.459	24 @ 0.917
44385	44373	30.0	6 @ 5.000	44391	44379	12 @ 2.500	6 @ 5.000
44386	44374	30.0	9 @ 3.333	44392	44380	18 @ 1.667	9 @ 3.333
44387	44375	30.0	12 @ 2.500	44393	44381	24 @ 1.250	12 @ 2.500
44388	44376	30.0	15 @ 2.000	44394	44382	30 @ 1.000	15 @ 2.000
44389	44377	30.0	18 @ 1.667	44395	44383	36 @ 0.834	18 @ 1.667
44390	44378	30.0	24 @ 1.250	44396	44384*	48 @ 0.625	24 @ 1.250

* Limited Approval Ratings

Part Numbering System



Part number ordering information.

Mounting

Designator	Mounting Type
FM	Foot Mount, Bracket
MM	Multi Mount Adapter Plate
PM	Panel Mount, Lam Holes
FC	Screw Term

VA Rating

Designator	Secondary VA
30	30
40	40

Primary & Secondary Voltages

Designator	Primary Volts	Secondary Volts	Freq. Hz
309	120	24	60
310	208/240	24	50/60
311	120	24	50/60
312	240	24	50/60
313	277	24	50/60
314	480	24	50/60
315	380/415	24	50/60
316	575	24	50/60
317	120/240	24	50/60
318	120/208/240	24	50/60

Termination

Designator	Terminal Type
NIL	No QD or Wire
QT	Top Quick Disconnect
Q1	One Side QD
Q2	Both Sides QD
W	Wire Leads
QW	QD and Wire Leads

NOTES

1. This is a partial listing only, consult factory for your specific requirements. All voltage & VA combinations may not be available.
2. Example: AHR40309FMQT-5555. This part is a 40V Class II transformer with a 120V Primary and 24V Secondary. This is a foot mount transformer with top mounted quick disonnect terminals.

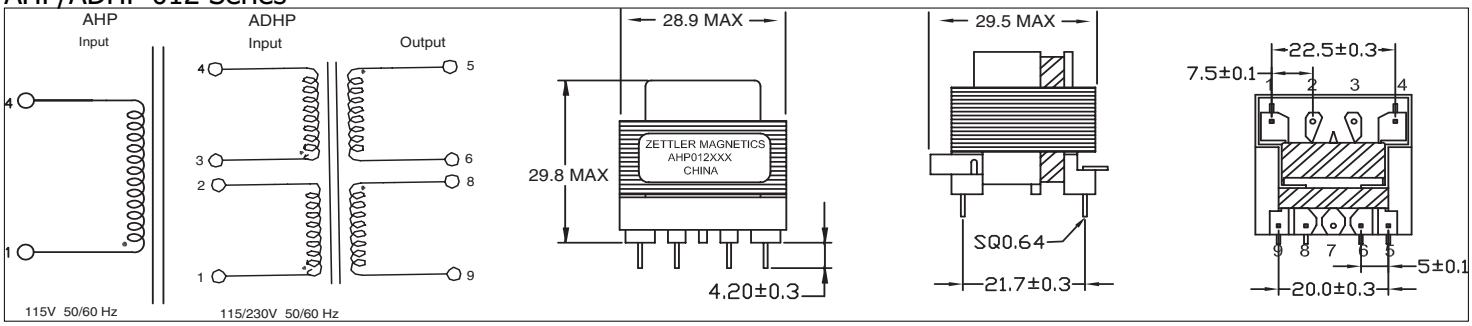
- ° Single or Dual Primary (115/230V)
- ° Designed to meet International Safety Requirements
- ° Inherently Limited Versions available
- ° UL94V-0 Rated materials
- ° 4500 Vrms Isolation Strength (pri:Sec)
- ° Designed for EN60950, UL1477 and UL 1585
- ° Class A & B Insulation

Electrical Data

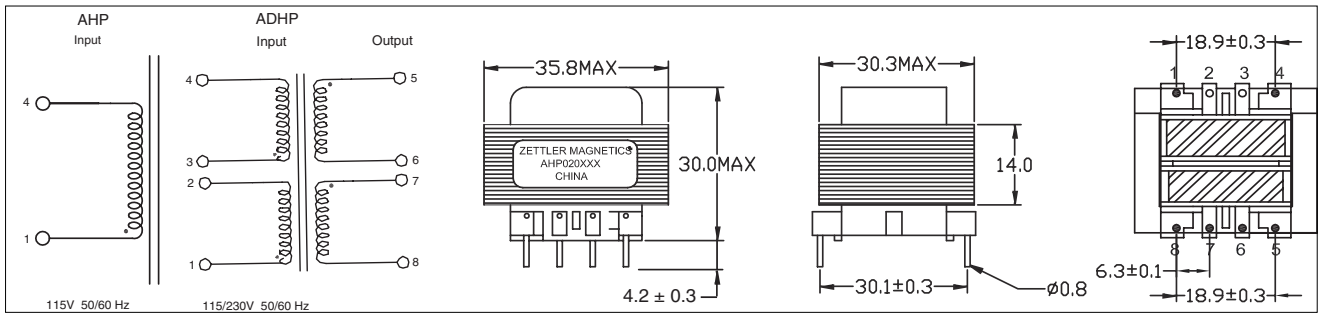
Part No	Part No	Output (VA)	Secondary Output (Vrms)								
			Series			Parallel			Dual Output		
Single Pri. 115V	Dual Pri. 115/230V		VCT		Amps	Vrms		Amps	Vrms-Vrms		Amps
AHP012050	ADHP012050	1.2	10.0	@	0.120	5.0	@	0.240	5-5	@	0.120
AHP020050	ADHP020050	2.0	10.0	@	0.200	5.0	@	0.400	5-5	@	0.200
AHP030050	ADHP030050	3.0	10.0	@	0.300	5.0	@	0.600	5-5	@	0.300
AHP060050	ADHP060050	6.0	10.0	@	0.600	5.0	@	1.200	5-5	@	0.600
AHP105050	ADHP105050	10.5	10.0	@	1.050	5.0	@	2.100	5-5	@	1.050
AHP145050	ADHP145050	14.5	10.0	@	1.450	5.0	@	2.900	5-5	@	1.450
AHP012063	ADHP012063	1.2	12.6	@	0.095	6.3	@	0.190	6.3-6.3	@	0.095
AHP020063	ADHP020063	2.0	12.6	@	0.158	6.3	@	0.315	6.3-6.3	@	0.158
AHP030063	ADHP030063	3.0	12.6	@	0.238	6.3	@	0.476	6.3-6.3	@	0.238
AHP060063	ADHP060063	6.0	12.6	@	0.476	6.3	@	0.952	6.3-6.3	@	0.476
AHP105063	ADHP105063	10.5	12.6	@	0.834	6.3	@	1.667	6.3-6.3	@	0.834
AHP145063	ADHP145063	14.5	12.6	@	1.151	6.3	@	2.302	6.3-6.3	@	1.151
AHP012080	ADHP012080	1.2	16.0	@	0.075	8.0	@	0.150	8-8	@	0.075
AHP020080	ADHP020080	2.0	16.0	@	0.125	8.0	@	0.250	8-8	@	0.125
AHP030080	ADHP030080	3.0	16.0	@	0.188	8.0	@	0.375	8-8	@	0.188
AHP060080	ADHP060080	6.0	16.0	@	0.375	8.0	@	0.750	8-8	@	0.375
AHP105080	ADHP105080	10.5	16.0	@	0.657	8.0	@	1.313	8-8	@	0.657
AHP145080	ADHP145080	14.5	16.0	@	0.907	8.0	@	1.813	8-8	@	0.907
AHP012100	ADHP012100	1.2	20.0	@	0.060	10.0	@	0.120	10-10	@	0.060
AHP020100	ADHP020100	2.0	20.0	@	0.100	10.0	@	0.200	10-10	@	0.100
AHP030100	ADHP030100	3.0	20.0	@	0.150	10.0	@	0.300	10-10	@	0.150
AHP060100	ADHP060100	6.0	20.0	@	0.300	10.0	@	0.600	10-10	@	0.300
AHP105100	ADHP105100	10.5	20.0	@	0.525	10.0	@	1.050	10-10	@	0.525
AHP145100	ADHP145100	14.5	20.0	@	0.725	10.0	@	1.450	10-10	@	0.725
AHP012120	ADHP012120	1.2	24.0	@	0.050	12.0	@	0.100	12-12	@	0.050
AHP020120	ADHP020120	2.0	24.0	@	0.083	12.0	@	0.165	12-12	@	0.083
AHP030120	ADHP030120	3.0	24.0	@	0.125	12.0	@	0.250	12-12	@	0.125
AHP060120	ADHP060120	6.0	24.0	@	0.250	12.0	@	0.500	12-12	@	0.250
AHP105120	ADHP105120	10.5	24.0	@	0.438	12.0	@	0.875	12-12	@	0.438
AHP145120	ADHP145120	14.5	24.0	@	0.604	12.0	@	1.208	12-12	@	0.604
AHP020140	ADHP020140	2.0	36.0	@	0.083	14.0	@	0.165	14-14	@	0.083
AHP030140	ADHP030140	3.0	28.0	@	0.107	14.0	@	0.214	14-14	@	0.107
AHP060140	ADHP060140	6.0	28.0	@	0.215	14.0	@	0.429	14-14	@	0.215
AHP105140	ADHP105140	10.5	28.0	@	0.375	14.0	@	0.750	14-14	@	0.375
AHP145140	ADHP145140	14.5	28.0	@	0.518	14.0	@	1.036	14-14	@	0.518
AHP020180	ADHP020180	2.0	36.0	@	0.055	18.0	@	0.110	18-18	@	0.055
AHP030180	ADHP030180	3.0	36.0	@	0.084	18.0	@	0.167	18-18	@	0.084
AHP060180	ADHP060180	6.0	36.0	@	0.167	18.0	@	0.333	18-18	@	0.167
AHP105180	ADHP105180	10.5	36.0	@	0.292	18.0	@	0.583	18-18	@	0.292
AHP145180	ADHP145180	14.5	36.0	@	0.403	18.0	@	0.806	18-18	@	0.403
AHP020240	ADHP020240	2.0	48.0	@	0.041	24.0	@	0.082	24-24	@	0.041
AHP030240	ADHP030240	3.0	48.0	@	0.063	24.0	@	0.125	24-24	@	0.063
AHP060240	ADHP060240	6.0	48.0	@	0.125	24.0	@	0.250	24-24	@	0.125
AHP105240	ADHP105240	10.5	48.0	@	0.219	24.0	@	0.438	24-24	@	0.219
AHP145240	ADHP145240	14.5	48.0	@	0.302	24.0	@	0.604	24-24	@	0.302

Schematic & Mechanical data

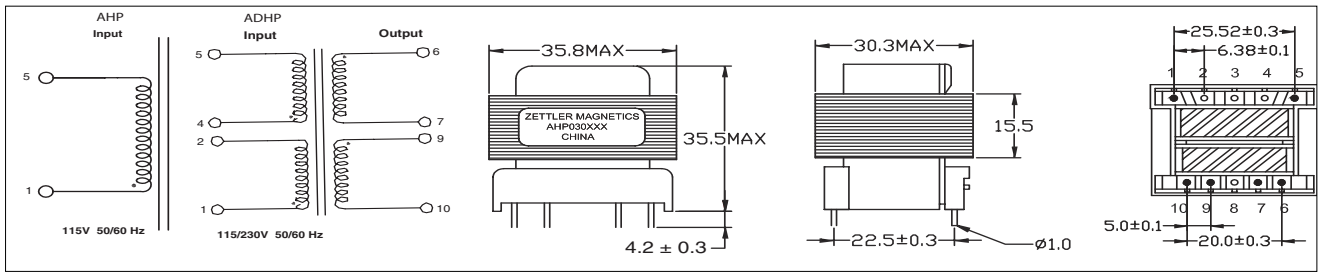
AHP/ADHP 012 Series



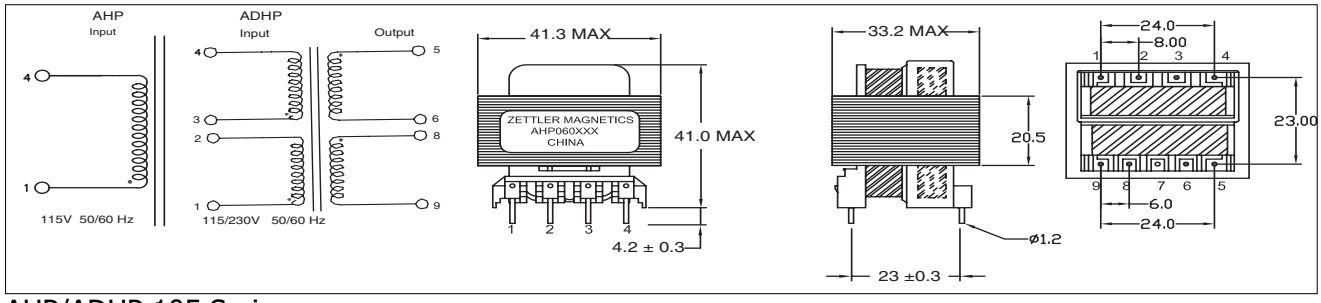
AHP/ADHP 020 Series



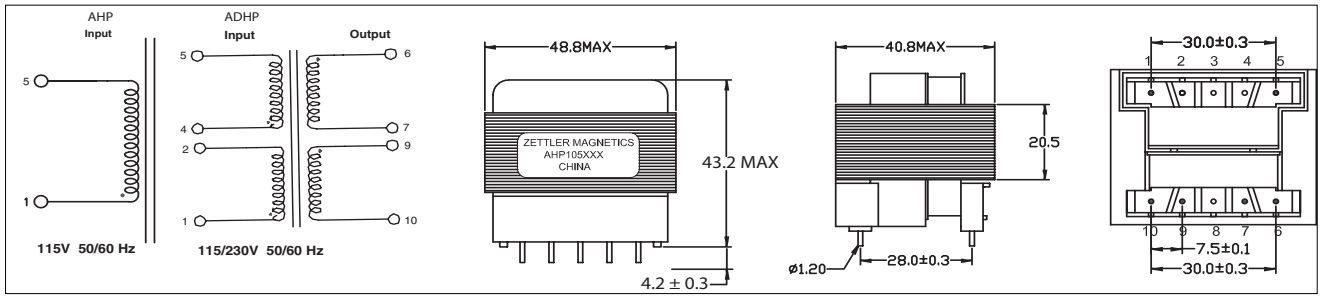
AHP/ADHP 030 Series



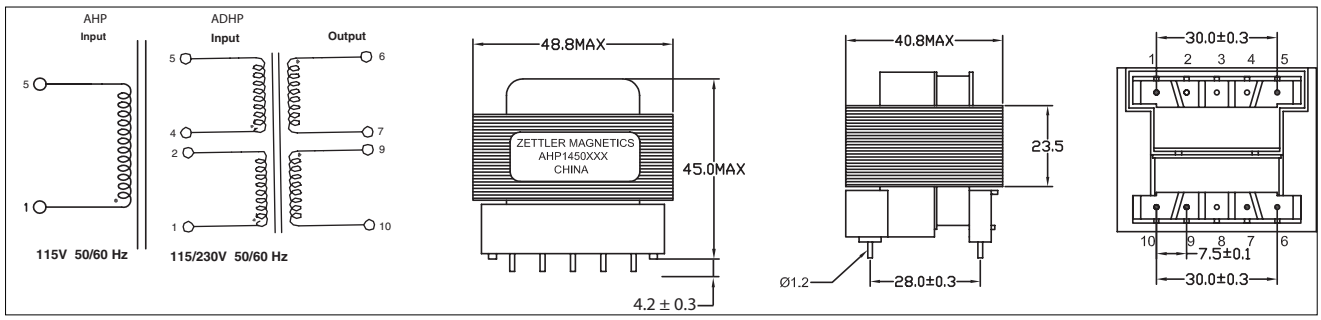
AHP/ADHP 060 Series



AHP/ADHP 105 Series



AHP/ADHP 145 Series



30 VA - 40 VA QUICK CONNECT
CLASS 2 UL 1585 Approval

Features

- 30VA - 40 VA Inherently energy limited
- Compact frame size
- No secondary fusing required
- Low heat rise
- Operation Frequency: 50/60 Hz
- Input voltages 120-575 V, output-24 V
- Terminations with quick-connect: top, one side, or both sides
- Customization for wire length, color, terminations and other preferences
- Split bobbin design
- Class B insulation system 130°C rated
- UL/CUR File E214561

General Data

Mounting Options	Foot Mount, Bracket Multi Mount Adapter Plate (4x4) Panel Mount, Lam Holes
Quick Connect Options	QT – Top mounted QD terminals Q1 – One side QD terminals Q2 – Both sides QD terminals
Quick Connect Size	Standard male quick connect terminals are .250 x .032
Frequency	60 Hz, 50/60 Hz
Insulation System	130˚C Class B

Standard Models Available

Pri. - Sec. Voltage	30VA Standard Model Designation	40VA Standard Model Designation
120 – 24	AHR30309	AHR40309
208/240 – 24	AHR30310	AHR40310
120 – 24	AHR30311	AHR40311
240 – 24	AHR30312	AHR40312
277 – 24	AHR30313	AHR40313
480 – 24	AHR30314	AHR40314
380/415 – 24	AHR30315	AHR40315
575 – 24	AHR30316	AHR40316
120/240 – 24	AHR30317	AHR40317
120/208/240 – 24	AHR30318	AHR40318

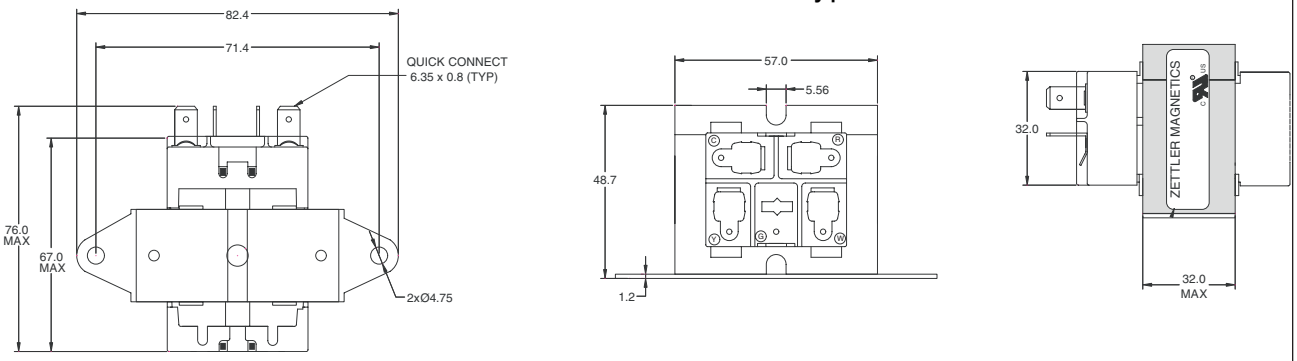
NOTES

Zettler Magnetics, Inc. can custom build transformers to many different specifications. Contact Zettler Magnetics directly for more information

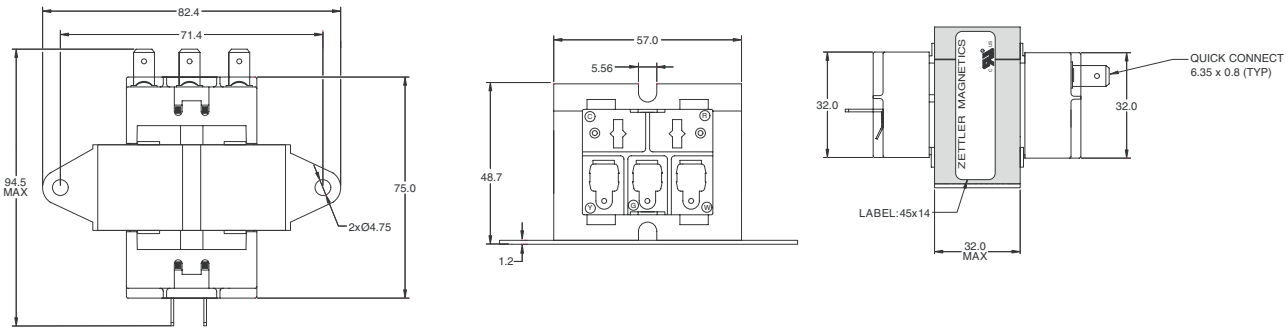
30 VA - 40 VA QUICK CONNECT
CLASS 2 UL 1585 Approval

Mechanical Data

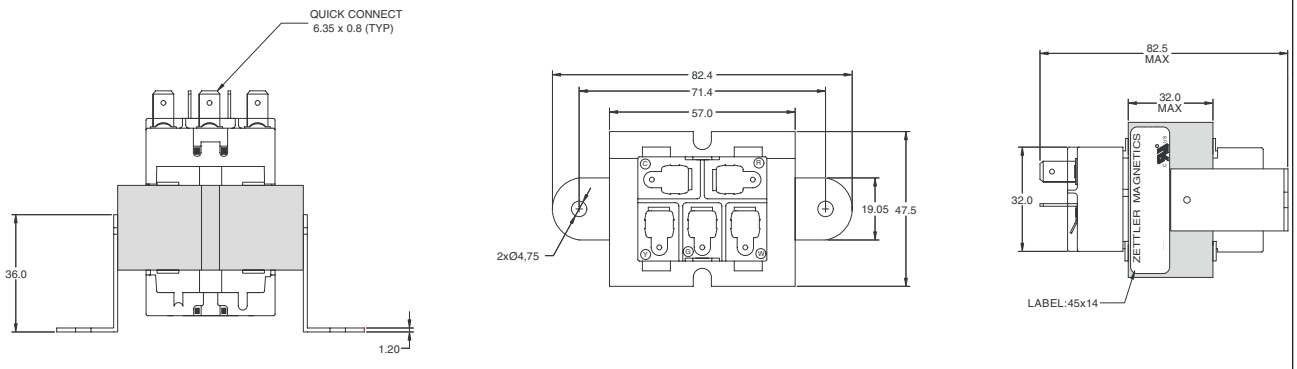
Type Q1 One Side Termination



Type Q2 Both Side Termination



Type QT Top Mount Termination



* All dimensions are shown in millimeters.

30 VA - 40 VA QUICK CONNECT
CLASS 2 UL 1585 Approval

Features

- 30VA - 40 VA Inherently energy limited
- Compact frame size
- No secondary fusing required
- Low heat rise
- Operation Frequency: 50/60 Hz
- Input voltages 120-575 V, output-24 V
- Terminations with screw,quick-connector wire leads
- Customization for wire length, color, terminations and other preferences
- Split bobbin design
- Class B insulation system 130°C rated
- UL/CUR File E214561

General Data

Mounting Options	Foot Mount, Bracket Multi Mount Adapter Plate Panel Mount, Lam Holes Screw Term.
Wire Size	All leads are 18 AWG stranded UL1015 Stranded wires have 300mm total length, with 10mm strip
Frequency	60 Hz, 50/60 Hz
Insulation System	130˚C Class B
Weight	30VA multi-mount 1.86lbs 30VA foot-mount 1.50lbs 40VA multi-mount 2.14lbs 40VA foot-mount 1.78lbs

NOTES

Zettler Magnetics, INC. can custom build transformers to many different specifications. Contact Zettler Magnetics for more information.

Standard Models Available

Pri. - Sec. Voltage	30VA Standard Model Designation	40VA Standard Model Designation
120 – 24	AHR30309	AHR40309
208/240 – 24	AHR30310	AHR40310
120 – 24	AHR30311	AHR40311
240 – 24	AHR30312	AHR40312
277 – 24	AHR30313	AHR40313
480 – 24	AHR30314	AHR40314
380/415 – 24	AHR30315	AHR40315
575 – 24	AHR30316	AHR40316
120/240 – 24	AHR30317	AHR40317
120/208/240 – 24	AHR30318	AHR40318

Wire Lead Details

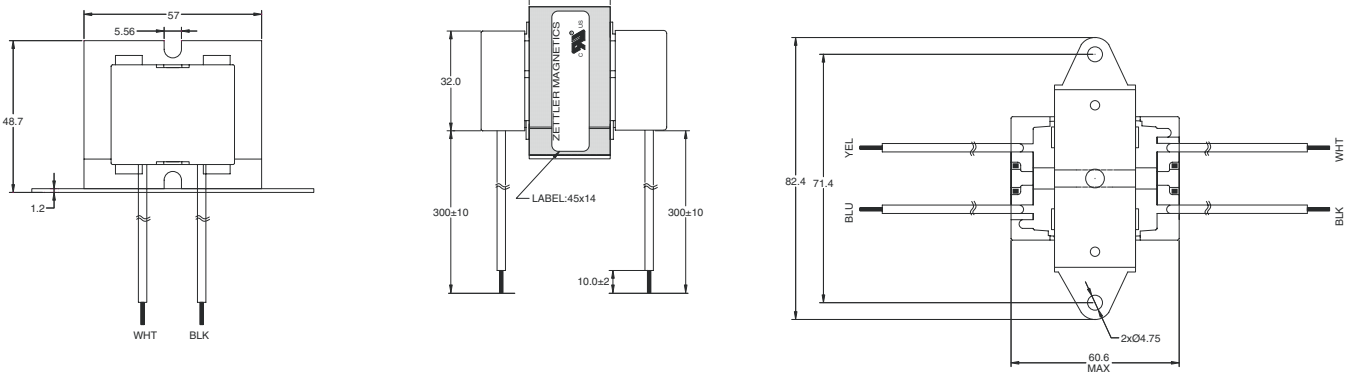
	Voltage	Color*	Length (mm)	Strip Length (mm)
Primary	COM	Black	300	10
	120	White	300	10
	208	Red	300	10
	240	Orange	300	10
	277	Brown	300	10
	480	Black/Red	300	10
	575	Grey	300	10
Secondary	24	Blue	300	10
	COM	Yellow	300	10

* Suggested wire colors: consult factory for specific wire color requirements

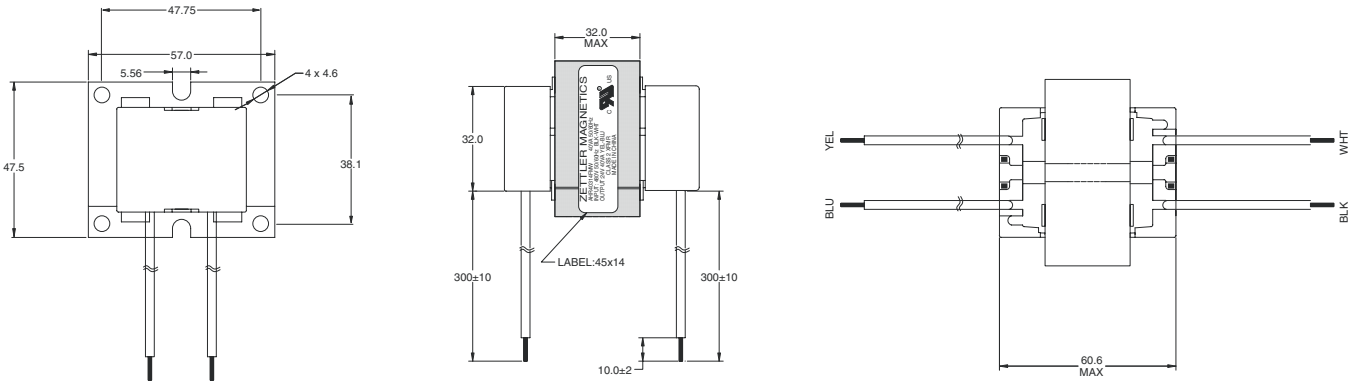
30 VA - 40 VA Wire Lead Connect
CLASS 2 UL 1585 Approval

Mechanican Data

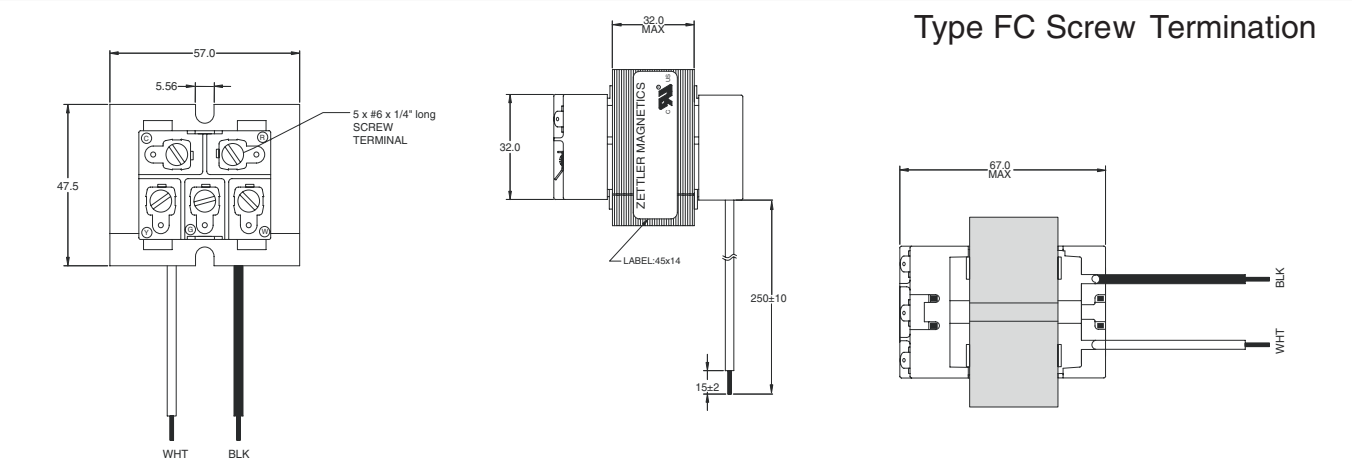
Type FM Foot Mount Bracket



Type PM Panel Mount



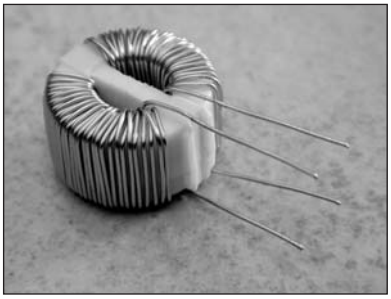
Type FC Screw Termination



All dimensions are shown in millimeters except as noted.

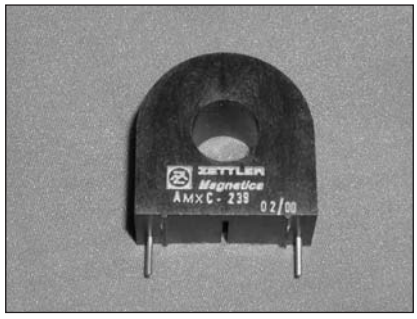
Inductors

Custom designed inductors for a large varity of applications for low frequencies as well as high frequencies.



Common Mode Choke Transformers

Suitable for dimmers, fans, mixers, juicers, power tools, measuring instruments, acoustic systems, TVs, desk top calculators, computers, various types of terminals, prevention of noise (EMI) in the I/O of switching power supplies.



AC Current Sensors

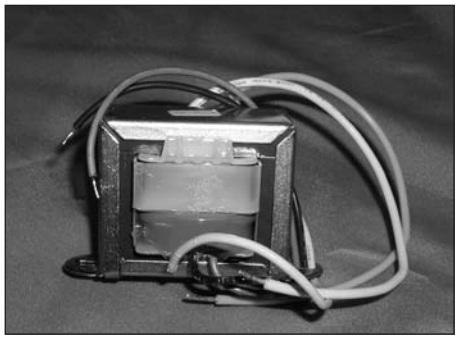
Current sensors for sensing AC loads are used in numerous applications. Zettler Magnetics, Inc. offers a variety of solutions for this type of component up to hundreds of amperes sensed, at 50-400 Hz.

Custom Designs

Custom designs are our specialty! Let our highly experienced design engineers assist you in designing a transformer that is custom tailored to fit your next project application.

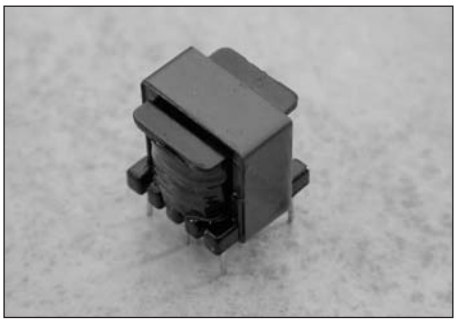
Zettler Magnetics, Inc. has many years of transformer experience. As a result, our engineering staff has the expertise it takes to find solutions to our customers' specialized transformer applications. Whether you need to slightly alter one of our standard products or completely custom design a transformer to support your electrical demands, our engineers are ready to provide the answers to your custom transformer requirements.

At Zettler Magnetics, Inc, we offer many different styles of custom designs. The following categories are just a few of the types of custom transformers that we produce. If you don't see a style below that fits your application, contact us direct to discuss your special transformer needs.



Custom Power Transformers

Custom designed power transformers for one or three phases, low to high power, frequencies of 50, 60 and 400 Hz based on customer specifications.



Switch Mode Transformers

Suitable for converter inverters, computers, telecommunications, switching power supplies, EL driver modules, etc.

CUSTOM TRANSFORMER DESIGN INQUIRY

CUSTOMER INFORMATION			
Company:		**Phone**:	
Address:		Fax:	
City, State, ZIP:		e-mail:	
Contact:		Title:	

DESIGN SPECIFICATIONS [wherever applicable]						
Transformer Type	☐ Flyback ☐ Linear Power ☐ Toroidal ☐ Forward ☐ Current Sense ☐ Other _____					
Operating / Switching Frequency						
Duty Cycle (Max)						
Input Voltage	☐ AC ☐ DC			Vmin		Vmax
Output (Switching)	Out 1:	V	A	Out 2:	V	A
	Out 3:	V	A	Out 4:	V	A
	Out 5:	V	A	Aux:	V	A
Output (Linear)	Parallel	V	A	Series:	V	A
Power Rating					VA / Watts	
Dielectric Strength						
Safety Standards	☐UL/CUR_____ ☐ IEC_____ ☐ VDE_____ ☐ CE					
Insulation Class	☐ A: 105°C ☐ B: 130°C ☐ none: 85°C and below					
Mounting Options	☐ PC Board ☐ Chassis ☐ Other: _____					
Termination	Specify: (Solder Lugs, QD-term, lead-wries, etc.) _____					
Limiting Dimensions	W: _____ L: _____ H: _____ Ref P/N: _____					
IC No. & Manufacturer						
Notes	(attach additional sheet(s) if necessary)					

ADDITIONAL INFORMATION	
Application Use: _____	EAU: _____
Target Price: _____	

Applying this table to our hypothetical power supply the transformer current can be approximated as:

For a Full-Wave Center Tap 1.2 x 0.35 = 0.42 A or
For a Full-Wave Bridge 1.8 x 0.35 = 0.63 A

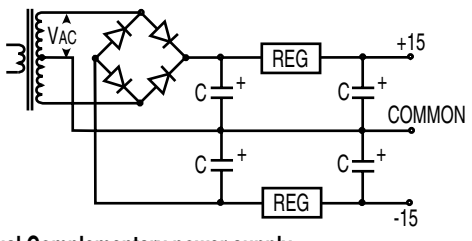
The final transformer specification would then be:

For a Full-Wave center tap application
Secondary rating: 28 VCT @ 0.42 A
Approx. transformer power rating: 12 VA
Possible Zettler Magnetics, Inc. p/n: AH50028

For a Full-Wave bridge application
Secondary rating: 14.6 V @ 0.63 A
Approx. transformer power rating: 9 VA
Possible Zettler Magnetics, Inc. p/n: AH50028

Dual Complementary supplies

Another common power supply is the Dual Complementary design as shown below.



Dual Complementary power supply

One last example concerning the Dual Complementary supply will be shown. In this example we will be selecting a transformer to be used on a Dual Complementary supply with a design voltage of ±10 V @ 100 mA DC. The calculations are as follows:

V_{OUT} = ±10 V

V_{RECT} = 0.7 V

V_{REG} = 3 V

V_{RIPPLE} = 1.0 V

$$V_{AC} = \frac{(10 + 3 + 0.7 + 1.0)}{0.9} \times \frac{115}{95} \times \frac{1}{\sqrt{2}} = 14V$$

I_{AC} = 1.8 x 100 mA = 180 mA rms

The transformer secondary rating is 28 VCT @ 180mA rms. **A possible Zettler Magnetics, Inc. solution would be p/n: AH40028.**

To be safe, a precautionary calculation covering the potential increase in voltage at the filter capacitor (into the regulator) caused by a high line condition needs to be made. If a potential high line voltage of 130 VAC is assumed then the transformer output (compared to low line) would rise by the ratio of 130/95. The following recalculation would then apply:

$$V_{AC} = \frac{(10 + 3 + 0.7 + 1.0)}{0.9} \times \frac{130}{95} \times \frac{1}{\sqrt{2}} = 15.8V$$

The increase in the output must be absorbed by the regulator, which results in higher regulator power dissipation. The illustrated values are safe for a typical IC regulator but should be checked in any specific application.

Load Regulation

Thus far all calculations were performed with the assumption that a full load was applied. Since actual transformers are not ideal devices, variation in loading may cause problems with the transformer's internal impedance. In other words, if the load should be light during a high line condition then there will be an additional rise in the secondary voltage beyond that due to the rising line voltage. This is caused by the decreasing voltage drop in the transformer windings.

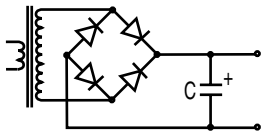
Most smaller transformers (10 VA or less) provide a load regulation of about 20%. The transformer will exhibit a no-load voltage about 20% higher than at full rated load. This factor must be taken into account when calculating the maximum VAC (and voltage drop into the regulator) with low load currents.

Due to inherent transformer characteristics, regulation will vary inversely with size (or VA rating). In larger transformers, size is determined primarily by the heat generated by internal losses while in smaller designs, size is determined by the maximum permissible no-load to full-load regulation.

It is our hope that this brief summary of power supply design and transformer selection will aid you in designing your next project. If there are other questions regarding transformer design and applications please feel free to call Zettler Magnetics, Inc. at 1-949-360-5838.

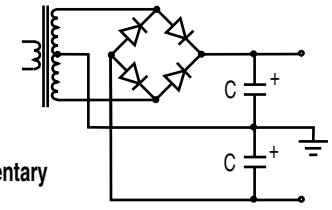
References: Colonel Wm. T. McLyman,Transformer and Inductor Design Handbook, 1988, Marcel Dekker, Inc.
Eric Lowden, Practical Transformer Design Handbook, 2nd Edition, 1989, McGraw Hill

Therefore a center tap configuration is usually preferred in low voltage supply applications.



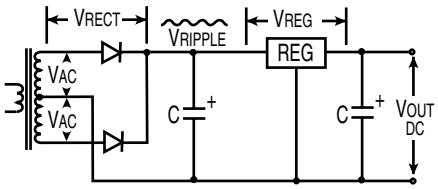
Full-Wave bridge

▶ The dual complementary rectifier is a combination of two full-wave center tap circuits and is a very efficient method of obtaining two identical outputs of reversed polarity. Since a common ground is shared it is also called a center tap bridge rectifier.



Dual Complementary rectifier

▶ The full-wave center tap rectifier is the most common selection for moderate power applications in regulated DC power supplies. Standard assumptions with this configuration are as follows and relate to the diagram below.



Full-Wave center tap

1. V_{REG} is approximately 3 volts DC or greater.
2. V_{RECT} is approximately 0.7 volts DC.
3. V_{RIPPLE} is approximately 10% VDC peak.

The following formula may be used for calculating the secondary voltage of the transformer:

$$V_{AC} = \frac{V_{OUT} + V_{REG} + V_{RECT} + V_{RIPPLE}}{0.9} \times \frac{V_{NOM}}{V_{LOWLINE}} \times \frac{1}{\sqrt{2}}$$

where: 0.9 = typical rectifier efficiency

and $\frac{V_{NOM}}{V_{LOWLINE}}$ is the ratio of the nominal AC line voltage to the required low line conditions.

This equation can be illustrated in the following hypothetical example for a power supply requiring a 10 VDC output at 0.1 Amp. The power supply input is a nominal 115 VAC @ 50/60 Hz but must operate down to an input of 95 V rms. In this example the following conditions would then apply:

V_{OUT} = 10 V

V_{REG} = 3 V

V_{RECT} = 0.7 V

V_{RIPPLE} = 1.0

$$V_{AC} = \frac{14.7}{0.9} \times \frac{115}{95} \times \frac{1}{\sqrt{2}} = 14\ V_{AC}$$

From the above result it can now be seen that the transformer secondary voltage can be specified as 28VCT (center tap). For a bridge rectifier of the same output requirements, only the following would change:

V_{RECT} = 2 x 0.7 = 1.4 V

Therefore, V_{AC} is now calculated as:

$$V_{AC} = \frac{15.4}{0.9} \times \frac{115}{95} \times \frac{1}{\sqrt{2}} = 14.6\ V_{AC}$$

The transformer secondary voltage is now 14.6 V.

Transformer Secondary Current

The final step is determining the transformer rms secondary current. Although this value is properly derived by the use of complex analysis, there are rule-of-thumb approximations that quickly provide values for expedient design. These approximations are shown in the chart below.

Rectifier Type	Filter Type*	Required rms Secondary Current Rating
Full-Wave Center Tap	Choke Input	0.7 x DC Current
Full-Wave Center Tap	Capacitor Input	1.2 x DC Current
Full-Wave Bridge	Choke Input	DC Current
Full-Wave Bridge	Capacitor Input	1.8 x DC Current

***Note:** Although choke input filters are not included in the above discussion they have been included in the above table for reference purposes

Specifying Power Transformers

Introduction

The conversion process in power electronics requires the use of transformers; components that are frequently the heaviest and bulkiest items in the conversion circuitry. They also have a significant effect upon the overall performance and efficiency of the system. Accordingly, the design of such transformers has an important influence on overall system weight, power conversion efficiency and cost. Because of the interdependence and interaction of parameters, judicious tradeoffs are necessary to achieve design optimization.

One of the more common problems for the circuit design engineer is the selection of power transformer ratings for a particular DC power supply. The designer is immediately faced with a number of rectifier circuits and filter variations. For the sake of simplicity, we will make certain assumptions which should be applicable to 99% of the design applications encountered.

Filters

The only filter design that we will be considering is the capacitor input filter. Choke input filter designs will not be considered for the following reasons:

1. The higher weight and cost of chokes.
2. If a regulator is used, which is usually the case, it can be assumed that sufficient extra ripple reduction will be provided. A L-C section will therefore not be required. Also, the regulator will improve output voltage regulation with load.

A disadvantage, however, of capacitive input filter systems is caused by the discontinuous secondary current flow. Current is drawn in short, high amplitude pulses to replace the charge required by the filter capacitor which discharges into the load during diode off time. This results in a higher effective rms value of transformer secondary current. The transformer average VA rating is the same as a choke input filter design because the higher DC output voltage obtained at the capacitor compensates for this effect. An advantage to using a capacitor input filter is that, with the exception of very high current, standard diodes will handle most of the peak or surge current requirements of a capacitive filter design.

Rectifier Circuits

The other design consideration is that of a rectifier circuit configuration. The most common single phase circuits are:

1. Half-Wave (single diode)
2. Full-Wave center tap (two diodes)
3. Full-Wave bridge (four diodes)
4. Dual Complementary supply, also known as a Full-Wave center tap (four diodes)

Half-Wave Rectifiers

The only advantages of a half-wave rectifier are its simplicity and the cost savings of one less diode. Its disadvantages are numerous:

1. Extremely high current spikes are drawn during the capacitor charging interval (one current surge per cycle). This current is limited only by the effective impedance of the transformer and the rectifier. This surge must not be too large or it will damage the rectifier. This short once-per-cycle current spike also results in very high secondary rms currents.
2. The unidirectional DC current in the transformer secondary biases the transformer core with a component of DC flux density. As a result, more iron is needed to avoid core saturation.

The only situation in which a half-wave recitfier should seriously be considered is in an application with very low DC power levels of 1 watt or less.

Full-Wave Rectifiers

The rest of the single-phase recitifier circuits are of the full-wave variety. In these designs, secondary current surges occur twice-per-cycle so that they are of smaller magnitude and the fundamental ripple frequency is double the supply frequency. In addition, all full-wave rectifiers produce the basic rectified waveform.

▸ Full-Wave center tap

1. Uses 1/2 of the secondary winding at a time.
2. Requires a center tap.
3. Utilizes 2 diodes.

▸ Full-Wave bridge

1. Uses the entire secondary winding continuously.
2. No center tap required.
3. Utilizes 4 diodes.

From the above it can be seen that selecting which full-wave rectifier to use is a question of tradeoffs. The bridge rectifier has the best transformer utilization but requires the use of 4 diodes. The extra diodes result in double the voltage drop as that in a center tap circuit.

■ Technical Information

● Rated Power

The power ratings listed are secondary power levels or power available at the load. The rated power is derived as the product of the rms rated secondary voltage under load and the rms rated secondary current. With several secondaries the rated power levels are added. This rated power is defined on the basis of a maximum ambient temperature and on the temperature class attributed to the manufacturing materials.

For Example: P = 3.2VA T70/B defines a transformer with a 3.2 VA output at a maximum ambient temperature of 70˚C. The maximum temperature rise will not exceed the limits set as defined in International Class B specifications.

Note: When the transformer outputs to a rectifier bridge with filter, the required power is greater than the product of VDC and IDC (see the technical notes on pages 3-5).

● Ambient Temperature

The air temperature as measured next to the transformer when placed in its operating environment.

● Maximum Temperature Rise

The difference between the temperature of the hottest internal component (winding) of the transformer, in continuous operation, and ambient temperature.

● Temperature Class

The international classifications of temperature are as follows:

A	105˚C	H	180˚C
E	120˚C	200	200˚C
B	130˚C	220	220˚C
F	155˚C	250	250˚C

These classifications define the maximum temperature the transformer components must withstand in continuous operation in compliance with the parameters outlined in IEC publication 85. These insulating materials are therefore certified for the thermal index corresponding to the declared class in accordance with IEC standard 216.

● Specifics of Safety Transformers Per EN 60742

▸ Full Load Secondary Voltage Tolerance

Deviation from the rated value should be no more than:
A) 10% for transformers with built-in short circuit protection (another 5% is granted on an additional secondary).
B) 5% for transformers with multiple secondaries.

▸ No Load Secondary Voltage Tolerance

The values listed are maximum theoretical values.
Note: For safety transformers the no load voltage should never exceed 50Vrms. This limit applies to the sum total value on transformers with several secondaries.

● Custom Transformer Designs

Any transformer with the same power and ambient temperatures corresponding to the values listed under the 44000 and 45000 series, and where the desired secondary voltages are between listed minimum and maximum values, are covered by EN 60742 or UL 506 depending on the model chosen. Any of the 44000 or 45000 series transformers can be modified to meet your special requirements.

Thermal protection can be added on request in the form of a thermofuse thermoswitch-CTP. In certain instances, the addition of thermal protection enables the ambient operating temperature to be increased while still complying with EN 60742.

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