

AN5569

Standard Waveforms

Application Note

Replaces AN5569-1.1

AN5569-2 November 2022 (LN42190)

SINGLE PHASE

Circuit and output voltage waveform across a - b

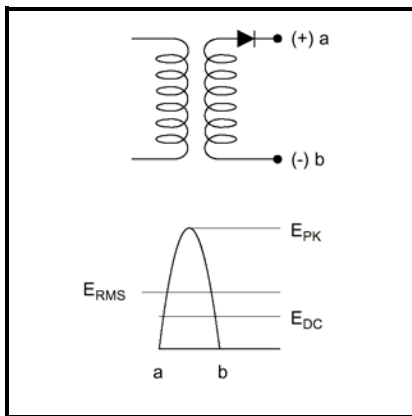


Fig. 1: Half wave

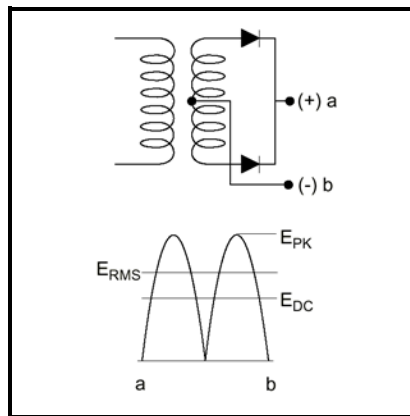


Fig. 2: Full wave centre tap

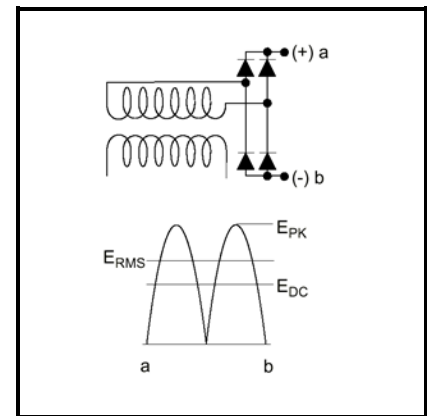


Fig. 3: Full wave bridge

	Fundamental Ripple Frequency	Current Ratios						Voltage Ratios			
		I_{AV} / I_{DC}	I_{RMS} / I_{DC}^A		I_{PK} / I_{DC}^B		I_{PK} / I_{DC}^C		E_{RMS} / E_{DC}^D	E_{RMS} / E_{DC}^E	E_{PK} / E_{DC}^F
			R	L	R	L	R	L			
Half Wave	1f	1.0	1.57	-	3.14	-	1.57	-	2.22	1.57	3.14
Half Wave Centre Tap	2f	0.5	0.785	0.707	1.57	1.0	0.785	0.707	1.11	2.22	1.57
Full Wave Bridge	2f	0.5	0.785	0.707	1.57	1.0	1.11	1.0	1.11	1.11	1.57

Notes:

R = Resistive load.

L = Inductive load.

A = Ratio of RMS current to DC output current. Arm fuses are rated for this RMS current.

B = Ratio of peak device current to DC output current.

C = Ratio of secondary RMS line current from supply to DC output current. Line fuses are rated for this RMS current.

D = Ratio of no load RMS line to line voltage to no load DC voltage.

E = Ratio of RMS phase voltage to DC voltage.

F = Ratio of peak phase voltage to DC voltage.

THREE PHASE

Circuit and output voltage waveform across a - b

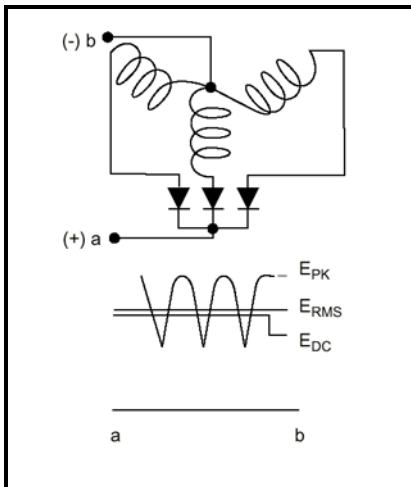


Fig. 4: Half wave

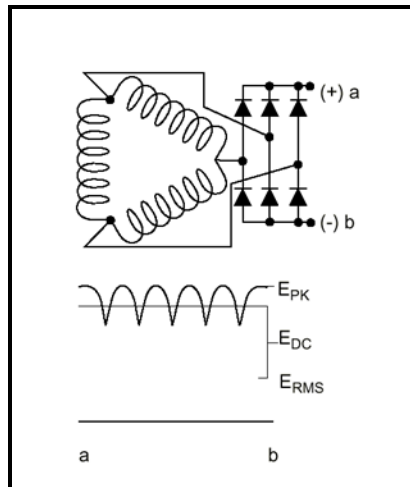


Fig. 5: Bridge

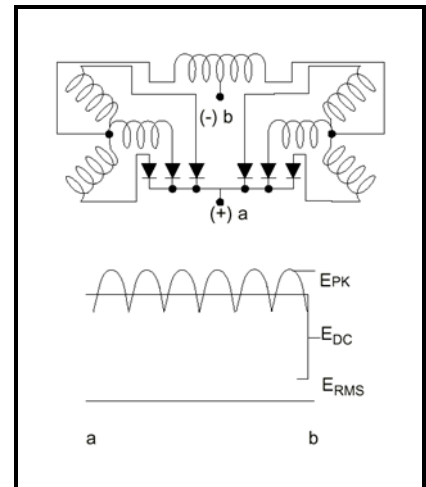


Fig. 6: Double star

	Fundamental Ripple Frequency	Current Ratios						Voltage Ratios			
		I_{AV} / I_{DC}	I_{RMS} / I_{DC}^A		I_{PK} / I_{DC}^B		I_{PK} / I_{DC}^C		E_{RMS} / E_{DC}^D	E_{RMS} / E_{DC}^E	E_{PK} / E_{DC}^F
			R	L	R	L	R	L			
Half Wave	3f	0.33	0.588	0.577	1.21	1.0	0.588	0.577	1.48	0.855	2.1
Bridge	6f	0.33	0.588	0.577	1.05	1.0	0.816	0.816	0.74	0.427	1.05
Double Star	6f	0.167	0.293	0.289	0.525	0.5	0.293	0.289	1.48	0.855	2.42

Notes:

R = Resistive load.

L = Inductive load.

A = Ratio of RMS current to DC output current. Arm fuses are rated for this RMS current.

B = Ratio of peak device current to DC output current.

C = Ratio of secondary RMS line current from supply to DC output current. Line fuses are rated for this RMS current.

D = Ratio of no load RMS line to line voltage to no load DC voltage.

E = Ratio of RMS phase voltage to DC voltage.

F = Ratio of peak phase voltage to DC voltage.

SIX PHASE

Circuit and output voltage waveform across a - b

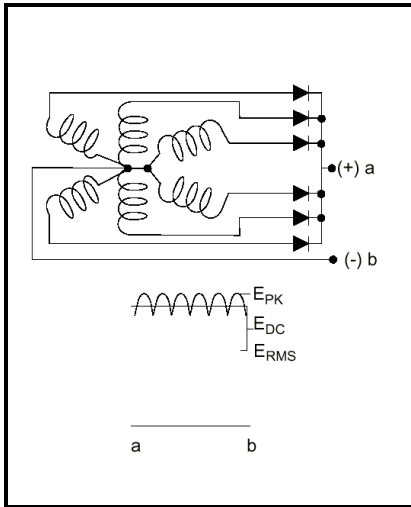


Fig. 7: 5 Star limb core

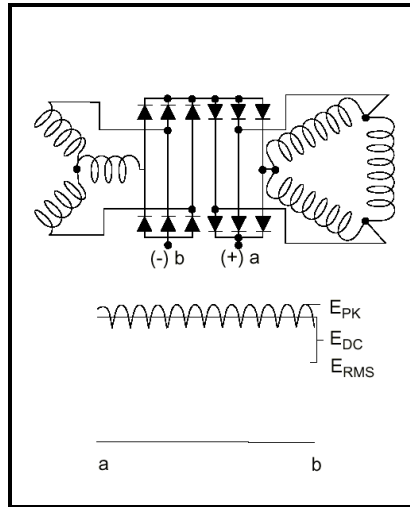


Fig. 8: Series bridges

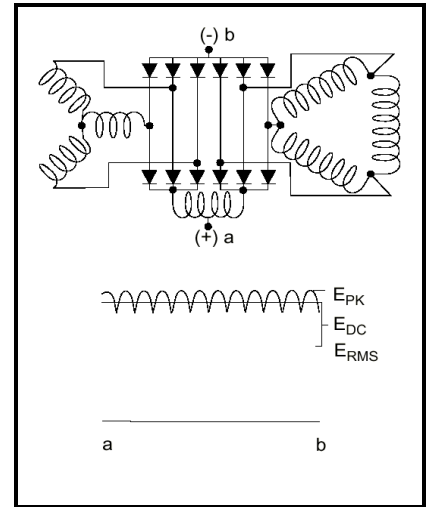


Fig. 9: Star delta with IPT

	Fundamental Ripple Frequency	Current Ratios							Voltage Ratios		
		I_{AV}/I_{DC}	I_{RMS}/I_{DC}^A		I_{PK}/I_{DC}^B		I_{PK}/I_{DC}^C		E_{RMS}/E_{DC}^D	E_{RMS}/E_{DC}^E	E_{PK}/E_{DC}^F
			R	L	R	L	R	L			
5 Star Limb Core	6f	0.167	0.408	0.408	1.05	0.5	0.408	0.408	1.48	0.74	2.1
Series Bridges	12f	0.33	0.588	0.577	1.05	1.0	0.816	0.816	0.37	-	1.05
Star Delta with IPT	12f	0.167	0.293	0.289	0.525	0.5	0.408	0.408	0.74	-	1.05

Notes:

R = Resistive load.

L = Inductive load.

A = Ratio of RMS current to DC output current. Arm fuses are rated for this RMS current.

B = Ratio of peak device current to DC output current.

C = Ratio of secondary RMS line current from supply to DC output current. Line fuses are rated for this RMS current.

D = Ratio of no load RMS line to line voltage to no load DC voltage.

E = Ratio of RMS phase voltage to DC voltage.

F = Ratio of peak phase voltage to DC voltage.

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