

AN5569

Standard Waveforms

Application Note

AN5569-1.1 July 2005 (LN24023)

Single Phase

Circuit and output voltage waveform across a - b

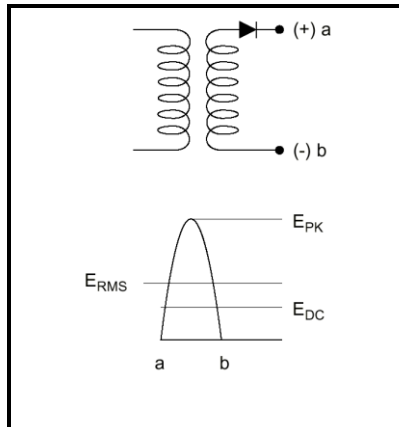


Fig. 1 : Half wave

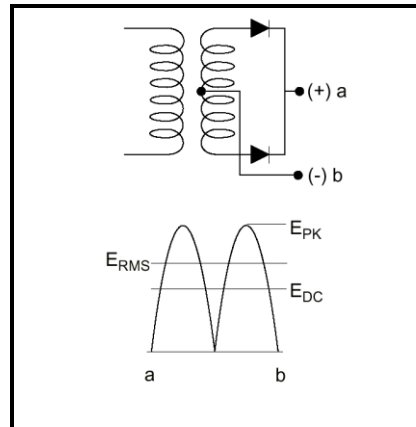


Fig. 2 : Full wave centre tap

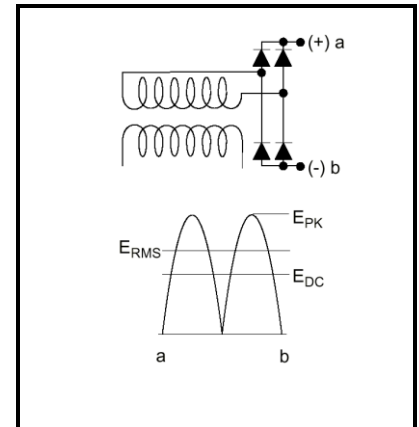


Fig. 3 : Full wave bridge

| | 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

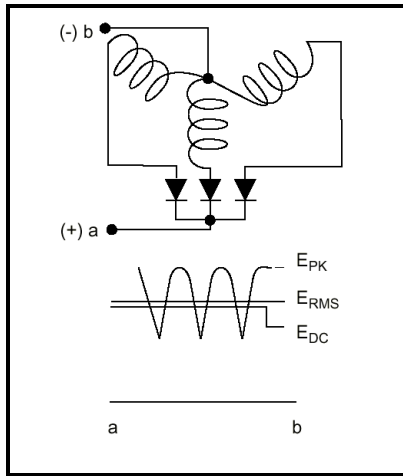


Fig. 4 : Half wave

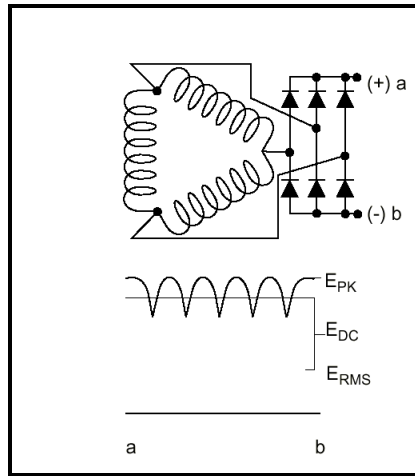


Fig. 5 : Bridge

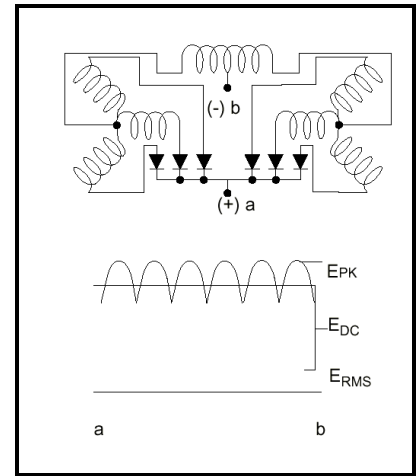


Fig. 6: Double star

| | 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

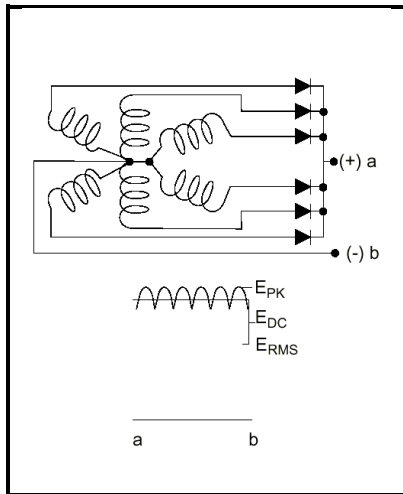


Fig. 7 : 5 Star limb core

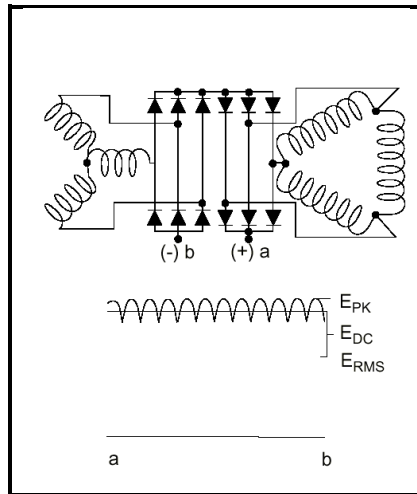


Fig. 8 : Series bridges

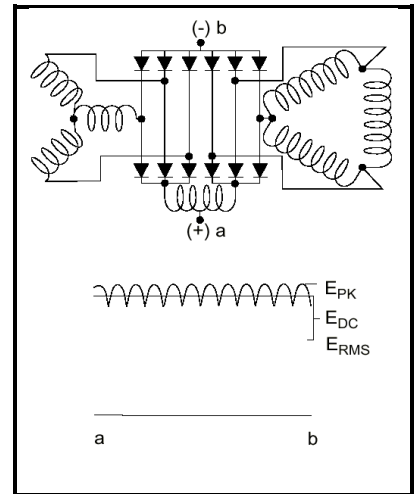


Fig. 9 : Star delta with IPT

| | 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.

POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks, which have been, designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.

IMPORTANT INFORMATION:

This publication is provided for information only and not for resale.

The products and information in this publication are intended for use by appropriately trained technical personnel.

Due to the diversity of product applications, the information contained herein is provided as a general guide only and does not constitute any guarantee of suitability for use in a specific application. The user must evaluate the suitability of the product and the completeness of the product data for the application. The user is responsible for product selection and ensuring all safety and any warning requirements are met. Should additional product information be needed please contact Customer Service.

Although we have endeavoured to carefully compile the information in this publication it may contain inaccuracies or typographical errors. The information is provided without any warranty or guarantee of any kind.

This publication is an uncontrolled document and is subject to change without notice. When referring to it please ensure that it is the most up to date version and has not been superseded.

The products are not intended for use in applications where a failure or malfunction may cause loss of life, injury or damage to property. The user must ensure that appropriate safety precautions are taken to prevent or mitigate the consequences of a product failure or malfunction.

The products must not be touched when operating because there is a danger of electrocution or severe burning. Always use protective safety equipment such as appropriate shields for the product and wear safety glasses. Even when disconnected any electric charge remaining in the product must be discharged and allowed to cool before safe handling using protective gloves.

Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

Product Status & Product Ordering:

We annotate datasheets in the top right-hand corner of the front page, to indicate product status if it is not yet fully approved for production. The annotations are as follows: -

| | |
|---------------------------------|---|
| Target Information: | This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started. |
| Preliminary Information: | The product design is complete and final characterisation for volume production is in progress. The datasheet represents the product as it is now understood but details may change. |
| No Annotation: | The product has been approved for production and unless otherwise notified by Dynex any product ordered will be supplied to the current version of the data sheet prevailing at the time of our order acknowledgement. |

All products and materials are sold and services provided subject to Dynex's conditions of sale, which are available on request.

Any brand names and product names used in this publication are trademarks, registered trademarks or trade names of their respective owners.

HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LIMITED
Doddington Road, Lincoln, Lincolnshire, LN6 3LF
United Kingdom.
Phone: +44 (0) 1522 500500
Fax: +44 (0) 1522 500550
Web: <http://www.dynexsemi.com>

CUSTOMER SERVICE

Phone: +44 (0) 1522 502753 / 502901
Fax: +44 (0) 1522 500020
e-mail: powersolutions@dynexsemi.com