

## Standard Rectifier

$$V_{RRM} = 2 \times 1600V$$

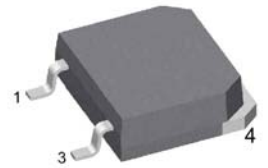
$$I_{FAV} = 45A$$

$$V_F = 1.23V$$

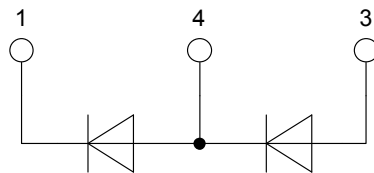
Phase leg

Part number

DSP45-16AZ



Backside: anode/cathode



### Features / Advantages:

- Planar passivated chips
- Very low leakage current
- Very low forward voltage drop
- Improved thermal behaviour

### Applications:

- Diode for main rectification
- For single and three phase bridge configurations

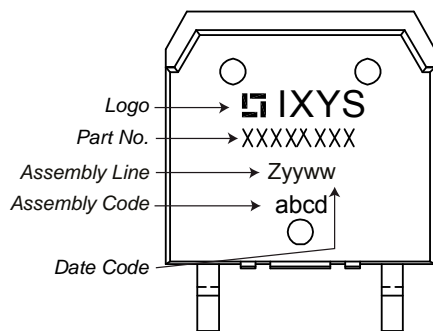
### Package: TO-268AA (D3Pak-HV)

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

| Rectifier  |  |                                   | Ratings                 |      |      |                   |   |
|------------|--|-----------------------------------|-------------------------|------|------|-------------------|---|
| Symbol     | Definition                                   | Conditions                        | min.                    | typ. | max. | Unit              |   |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}C$            |                         |      | 1700 | V                 |   |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}C$            |                         |      | 1600 | V                 |   |
| $I_R$      | reverse current                              | $V_R = 1600 V$                    |                         |      | 40   | $\mu A$           |   |
|            |  | $V_R = 1600 V$                    |                         |      | 1.5  | mA                |   |
| $V_F$      | forward voltage drop                         | $I_F = 45 A$                      |                         |      | 1.26 | V                 |   |
|            |  | $I_F = 90 A$                      |                         |      | 1.57 | V                 |   |
|            |  | $I_F = 45 A$                      | $T_{VJ} = 150^{\circ}C$ |      |      | 1.23              | V |
|            |  | $I_F = 90 A$                      | $T_{VJ} = 150^{\circ}C$ |      |      | 1.66              | V |
| $I_{FAV}$  | average forward current                      | $T_C = 130^{\circ}C$<br>180° sine |                         |      | 45   | A                 |   |
| $V_{FO}$   | threshold voltage                            | } for power loss calculation only |                         |      | 0.81 | V                 |   |
| $r_F$      | slope resistance                             |                                   |                         |      | 9.1  | m $\Omega$        |   |
| $R_{thJC}$ | thermal resistance junction to case          |                                   |                         |      | 0.55 | K/W               |   |
| $R_{thCH}$ | thermal resistance case to heatsink          |                                   | 0.15                    |      |      | K/W               |   |
| $P_{tot}$  | total power dissipation                      | $T_C = 25^{\circ}C$               |                         |      | 270  | W                 |   |
| $I_{FSM}$  | max. forward surge current                   | t = 10 ms; (50 Hz), sine          | $T_{VJ} = 45^{\circ}C$  |      | 480  | A                 |   |
|            |  | t = 8,3 ms; (60 Hz), sine         | $V_R = 0 V$             |      | 520  | A                 |   |
|            |  | t = 10 ms; (50 Hz), sine          | $T_{VJ} = 150^{\circ}C$ |      | 410  | A                 |   |
|            |  | t = 8,3 ms; (60 Hz), sine         | $V_R = 0 V$             |      | 440  | A                 |   |
| $I^2t$     | value for fusing                             | t = 10 ms; (50 Hz), sine          | $T_{VJ} = 45^{\circ}C$  |      | 1.15 | kA <sup>2</sup> s |   |
|            |  | t = 8,3 ms; (60 Hz), sine         | $V_R = 0 V$             |      | 1.13 | kA <sup>2</sup> s |   |
|            |  | t = 10 ms; (50 Hz), sine          | $T_{VJ} = 150^{\circ}C$ |      | 840  | A <sup>2</sup> s  |   |
|            |  | t = 8,3 ms; (60 Hz), sine         | $V_R = 0 V$             |      | 805  | A <sup>2</sup> s  |   |
| $C_J$      | junction capacitance                         | $V_R = 400 V; f = 1 MHz$          | $T_{VJ} = 25^{\circ}C$  | 18   |      | pF                |   |

| Package TO-268AA (D3Pak-HV) |  |                      | Ratings |      |      |      |
|-----------------------------|--|----------------------|---------|------|------|------|
| Symbol                      | Definition   | Conditions           | min.    | typ. | max. | Unit |
| $I_{RMS}$                   | RMS current  | per terminal         |         |      | 70   | A    |
| $T_{VJ}$                    | virtual junction temperature                                 |                      | -40     |      | 175  | °C   |
| $T_{op}$                    | operation temperature  |                      | -40     |      | 150  | °C   |
| $T_{stg}$                   | storage temperature  |                      | -40     |      | 150  | °C   |
| <b>Weight</b>               |  |                      |         | 4    |      | g    |
| $F_C$                       | mounting force with clip                                     |                      | 20      |      | 120  | N    |
| $d_{Spp/App}$               | creepage distance on surface   striking distance through air | terminal to terminal | 9.4     |      |      | mm   |
| $d_{Spbl/Apb}$              |  | terminal to backside | 5.6     |      |      | mm   |

### Product Marking



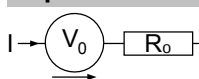
| Ordering | Part Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-------------|--------------------|---------------|----------|----------|
| Standard | DSP45-16AZ  | DSP45-16AZ         | Tube          | 30       | 514141   |

| Similar Part | Package                | Voltage class |
|--------------|------------------------|---------------|
| DSP45-12AZ   | TO-268AA (D3Pak) (2HV) | 1200          |
| DSP45-12A    | TO-247AD (3)           | 1200          |
| DSP45-16A    | TO-247AD (3)           | 1600          |
| DSP45-16AR   | ISOPLUS247 (3)         | 1600          |
| DSP45-18A    | TO-247AD (3)           | 1800          |

### Equivalent Circuits for Simulation

\* on die level

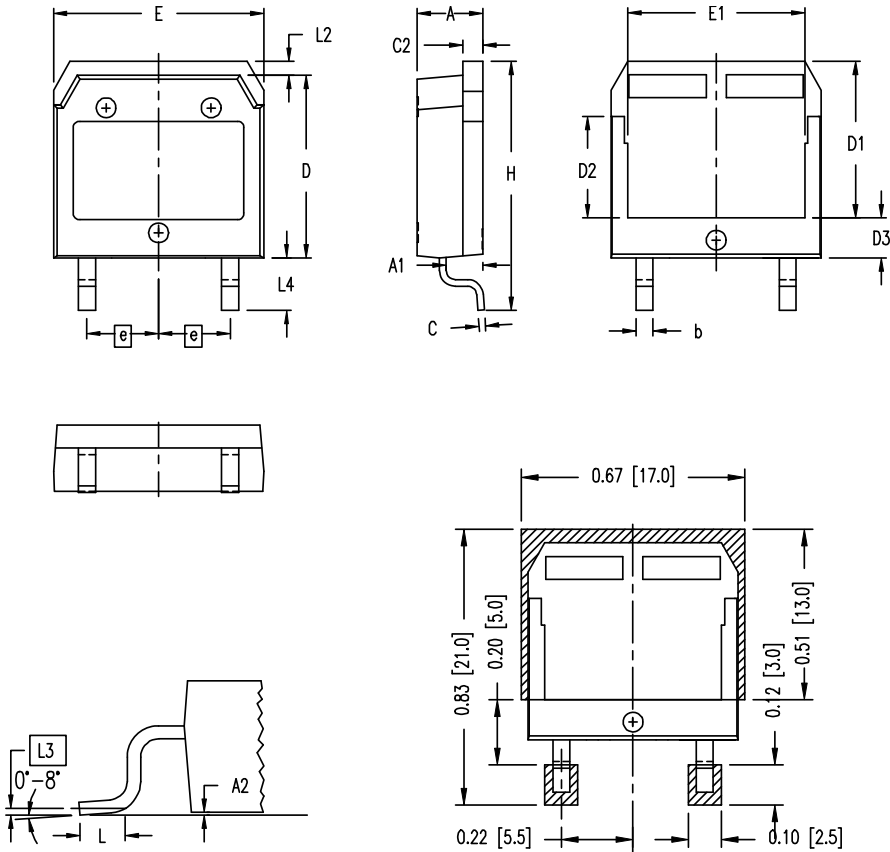
$T_{VJ} = 175\text{ °C}$



**Rectifier**

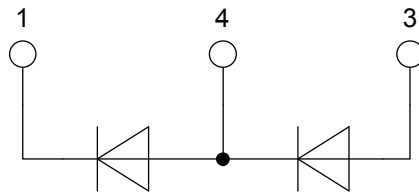
|              |                    |      |    |
|--------------|--------------------|------|----|
| $V_{0\ max}$ | threshold voltage  | 0.81 | V  |
| $R_{0\ max}$ | slope resistance * | 6.5  | mΩ |

## Outlines TO-268AA (D3Pak-HV)



| Dim. | Millimeter |       | Inches    |       |
|------|------------|-------|-----------|-------|
|      | min        | max   | min       | max   |
| A    | 4.90       | 5.10  | 0.193     | 0.201 |
| A1   | 2.70       | 2.90  | 0.106     | 0.114 |
| A2   | 0.02       | 0.25  | 0.001     | 0.010 |
| b    | 1.15       | 1.45  | 0.045     | 0.057 |
| C    | 0.40       | 0.65  | 0.016     | 0.026 |
| C2   | 1.45       | 1.60  | 0.057     | 0.063 |
| D    | 13.80      | 14.00 | 0.543     | 0.551 |
| D1   | 11.80      | 12.10 | 0.465     | 0.476 |
| D2   | 7.50       | 7.80  | 0.295     | 0.307 |
| D3   | 2.90       | 3.20  | 0.114     | 0.126 |
| E    | 15.85      | 16.05 | 0.624     | 0.632 |
| E1   | 13.30      | 13.60 | 0.524     | 0.535 |
| e    | 5.450 BSC  |       | 0.215 BSC |       |
| H    | 18.70      | 19.10 | 0.736     | 0.752 |
| L    | 1.70       | 2.00  | 0.067     | 0.079 |
| L2   | 1.00       | 1.15  | 0.039     | 0.045 |
| L3   | 0.250 BSC  |       | 0.010 BSC |       |
| L4   | 3.80       | 4.10  | 0.150     | 0.161 |

RECOMMENDED MINIMUM FOOT PRINT



## Rectifier

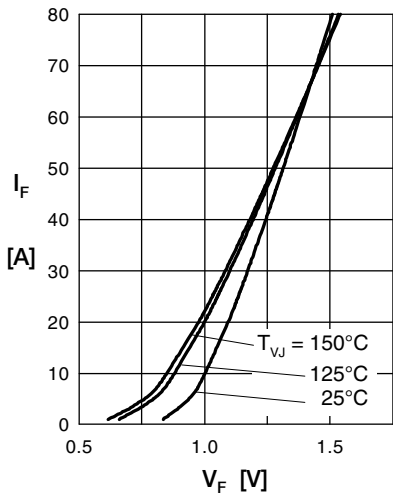


Fig. 1 Forward current versus voltage drop per diode

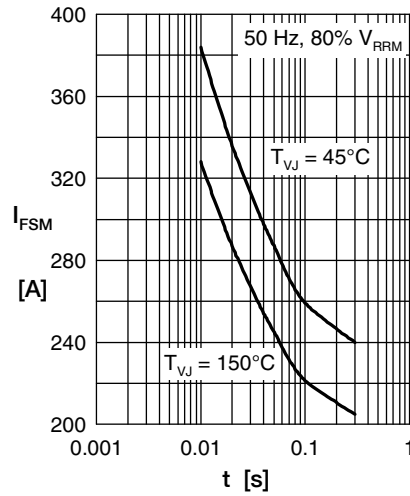


Fig. 2 Surge overload current

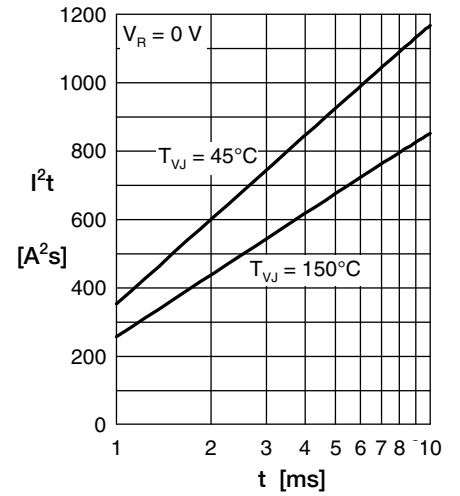


Fig. 3  $I^2t$  versus time per diode

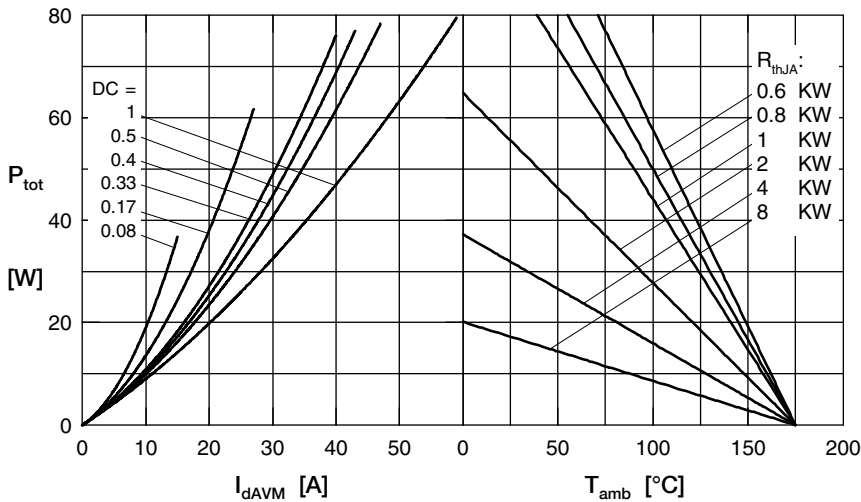


Fig. 4 Power dissipation vs. direct output current & ambient temperature

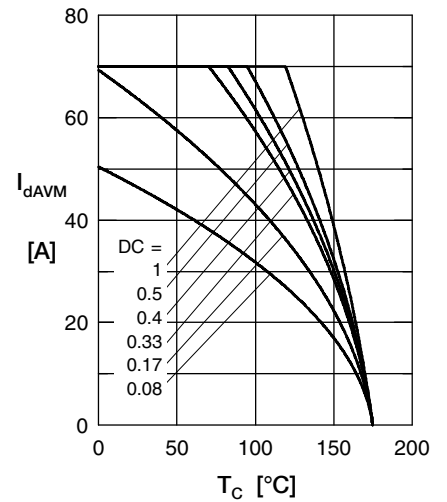


Fig. 5 Max. forward current vs. case temperature

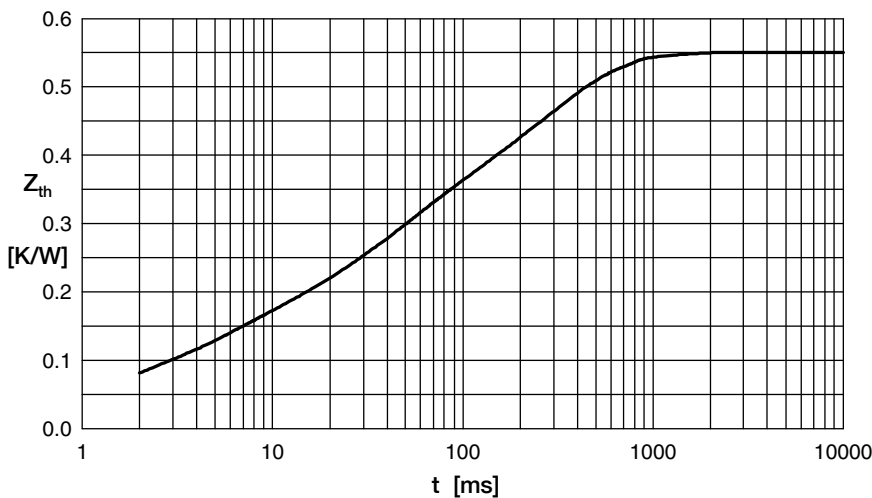


Fig. 6 Transient thermal impedance junction to case

| i | $R_i$ | $t_i$  |
|---|-------|--------|
| 1 | 0.033 | 0.0006 |
| 2 | 0.095 | 0.0039 |
| 3 | 0.164 | 0.033  |
| 4 | 0.258 | 0.272  |