

## Standard Rectifier

$$V_{RRM} = 2 \times 1200 \text{ V}$$

$$I_{FAV} = 45 \text{ A}$$

$$V_F = 1.23 \text{ V}$$

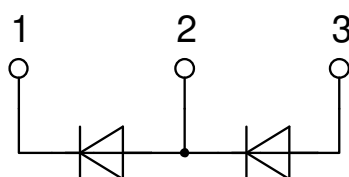
Phase leg

Part number

**DSP45-12A**



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-247

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

### Disclaimer Notice

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| Rectifier  |                                              |                                          |                                | Ratings |      |      |                   |
|------------|----------------------------------------------|------------------------------------------|--------------------------------|---------|------|------|-------------------|
| Symbol     | Definition                                   | Conditions                               |                                | min.    | typ. | max. | Unit              |
| $V_{RSM}$  | max. non-repetitive reverse blocking voltage | $T_{VJ} = 25^{\circ}\text{C}$            |                                |         |      | 1300 | V                 |
| $V_{RRM}$  | max. repetitive reverse blocking voltage     | $T_{VJ} = 25^{\circ}\text{C}$            |                                |         |      | 1200 | V                 |
| $I_R$      | reverse current                              | $V_R = 1200\text{ V}$                    | $T_{VJ} = 25^{\circ}\text{C}$  |         |      | 40   | $\mu\text{A}$     |
|            |                                              | $V_R = 1200\text{ V}$                    | $T_{VJ} = 150^{\circ}\text{C}$ |         |      | 1.5  | mA                |
| $V_F$      | forward voltage drop                         | $I_F = 45\text{ A}$                      | $T_{VJ} = 25^{\circ}\text{C}$  |         |      | 1.26 | V                 |
|            |                                              | $I_F = 90\text{ A}$                      |                                |         |      | 1.57 | V                 |
|            |                                              | $I_F = 45\text{ A}$                      | $T_{VJ} = 150^{\circ}\text{C}$ |         |      | 1.23 | V                 |
|            |                                              | $I_F = 90\text{ A}$                      |                                |         |      | 1.66 | V                 |
| $I_{FAV}$  | average forward current                      | $T_C = 130^{\circ}\text{C}$<br>180° sine | $T_{VJ} = 175^{\circ}\text{C}$ |         |      | 45   | A                 |
| $V_{F0}$   | threshold voltage                            | } for power loss calculation only        | $T_{VJ} = 175^{\circ}\text{C}$ |         |      | 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          |                                          |                                |         | 0.3  |      | K/W               |
| $P_{tot}$  | total power dissipation                      |                                          | $T_C = 25^{\circ}\text{C}$     |         |      | 270  | W                 |
| $I_{FSM}$  | max. forward surge current                   | t = 10 ms; (50 Hz), sine                 | $T_{VJ} = 45^{\circ}\text{C}$  |         |      | 480  | A                 |
|            |                                              | t = 8,3 ms; (60 Hz), sine                | $V_R = 0\text{ V}$             |         |      | 520  | A                 |
|            |                                              | t = 10 ms; (50 Hz), sine                 | $T_{VJ} = 150^{\circ}\text{C}$ |         |      | 410  | A                 |
|            |                                              | t = 8,3 ms; (60 Hz), sine                | $V_R = 0\text{ V}$             |         |      | 440  | A                 |
| $I^2t$     | value for fusing                             | t = 10 ms; (50 Hz), sine                 | $T_{VJ} = 45^{\circ}\text{C}$  |         |      | 1.15 | kA <sup>2</sup> s |
|            |                                              | t = 8,3 ms; (60 Hz), sine                | $V_R = 0\text{ V}$             |         |      | 1.13 | kA <sup>2</sup> s |
|            |                                              | t = 10 ms; (50 Hz), sine                 | $T_{VJ} = 150^{\circ}\text{C}$ |         |      | 840  | A <sup>2</sup> s  |
|            |                                              | t = 8,3 ms; (60 Hz), sine                | $V_R = 0\text{ V}$             |         |      | 805  | A <sup>2</sup> s  |
| $C_J$      | junction capacitance                         | $V_R = 400\text{ V}; f = 1\text{ MHz}$   | $T_{VJ} = 25^{\circ}\text{C}$  |         | 18   |      | pF                |

| Package TO-247 |                              |              | 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   |
| Weight         |                              |              |         | 6    |      | g    |
| $M_D$          | mounting torque              |              | 0.8     |      | 1.2  | Nm   |
| $F_C$          | mounting force with clip     |              | 20      |      | 120  | N    |

### Product Marking



| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|-----------------|--------------------|---------------|----------|----------|
| Standard | DSP45-12A       | DSP45-12A          | Tube          | 30       | 480673   |

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

|           |              |      |
|-----------|--------------|------|
| DSP45-18A | TO-247AD (3) | 1800 |
|-----------|--------------|------|

### Equivalent Circuits for Simulation

\* on die level

$T_{VJ} = 175^{\circ}\text{C}$



Rectifier

$V_{0\max}$  threshold voltage

0.81

V

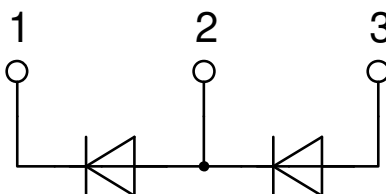
$R_{0\max}$  slope resistance \*

6.5

mΩ

**Outlines TO-247**


| Sym. | Inches |       | Millimeter |       |
|------|--------|-------|------------|-------|
|      | min.   | max.  | min.       | max.  |
| A    | 0.185  | 0.209 | 4.70       | 5.30  |
| A1   | 0.087  | 0.102 | 2.21       | 2.59  |
| A2   | 0.059  | 0.098 | 1.50       | 2.49  |
| D    | 0.819  | 0.845 | 20.79      | 21.45 |
| E    | 0.610  | 0.640 | 15.48      | 16.24 |
| E2   | 0.170  | 0.216 | 4.31       | 5.48  |
| e    | 0.215  | BSC   | 5.46       | BSC   |
| L    | 0.780  | 0.800 | 19.80      | 20.30 |
| L1   | -      | 0.177 | -          | 4.49  |
| Ø P  | 0.140  | 0.144 | 3.55       | 3.65  |
| Q    | 0.212  | 0.244 | 5.38       | 6.19  |
| S    | 0.242  | BSC   | 6.14       | BSC   |
| b    | 0.039  | 0.055 | 0.99       | 1.40  |
| b2   | 0.065  | 0.094 | 1.65       | 2.39  |
| b4   | 0.102  | 0.135 | 2.59       | 3.43  |
| c    | 0.015  | 0.035 | 0.38       | 0.89  |
| D1   | 0.515  | -     | 13.07      | -     |
| D2   | 0.020  | 0.053 | 0.51       | 1.35  |
| E1   | 0.530  | -     | 13.45      | -     |
| Ø P1 | -      | 0.29  | -          | 7.39  |



**Rectifier**


Fig. 1 Forward current versus voltage drop per diode

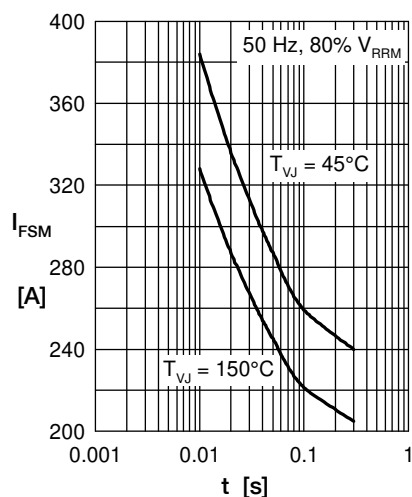


Fig. 2 Surge overload current


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


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

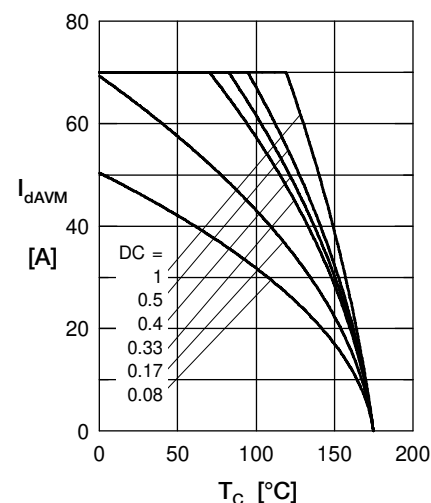


Fig. 5 Max. forward current vs. case temperature



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  |