# Standard Rectifier Module

| | | |
|---|---|---|
| $V_{RRM}$ | $=$ | **1600 V** |
| $I_{FAV}$ | $=$ | **560 A** |
| $V_F$ | $=$ | **0.98 V** |

Single Diode

**Part number**

**MDO500-16N1**
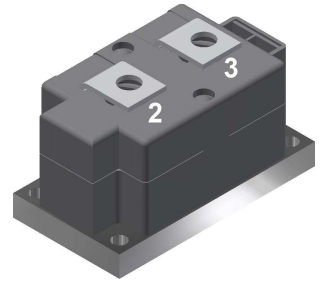
Backside: isolated

E72873



2 ○———◁│———○ 3
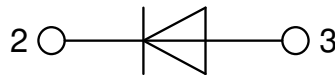
**Features / Advantages:**
● Planar passivated chips
● Very low leakage current
● Very low forward voltage drop
● Improved thermal behaviour

**Applications:**
● Diode for main rectification
● For single and three phase
  bridge configurations
● Supplies for DC power equipment
● Input rectifiers for PWM inverter
● Battery DC power supplies
● Field supply for DC motors

**Package:** Y1
● Isolation Voltage: 3600 V~
● Industry standard outline
● RoHS compliant
● Base plate: Copper
  internally DCB isolated
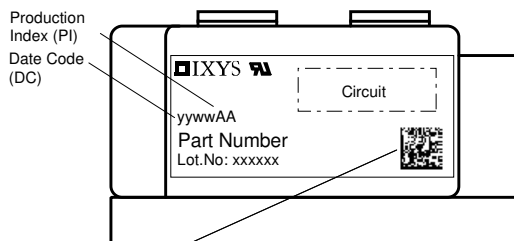● Advanced power cycling

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evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for,
and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

## Rectifier

| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RSM}$ | max. non-repetitive reverse blocking voltage | | $T_{VJ} = 25°C$ | | | 1700 | V |
| $V_{RRM}$ | max. repetitive reverse blocking voltage | | $T_{VJ} = 25°C$ | | | 1600 | V |
| $I_R$ | reverse current | $V_R = 1600$ V | $T_{VJ} = 25°C$ | | | 1 | mA |
| | | $V_R = 1600$ V | $T_{VJ} = 140°C$ | | | 30 | mA |
| $V_F$ | forward voltage drop | $I_F = 500$ A | $T_{VJ} = 25°C$ | | | 1.09 | V |
| | | $I_F = 1000$ A | | | | 1.24 | V |
| | | $I_F = 500$ A | $T_{VJ} = 125°C$ | | | 0.98 | V |
| | | $I_F = 1000$ A | | | | 1.17 | V |
| $I_{FAV}$ | average forward current | $T_C = 85°C$ | $T_{VJ} = 140°C$ | | | 560 | A |
| $I_{F(RMS)}$ | RMS forward current | 180° sine       d = 0.5 | | | | | A |
| $V_{F0}$ | threshold voltage | | $T_{VJ} = 140°C$ | | | 0.80 | V |
| $r_F$ | slope resistance | } for power loss calculation only | | | | 0.38 | mΩ |
| $R_{thJC}$ | thermal resistance junction to case | | | | | 0.072 | K/W |
| $R_{thCH}$ | thermal resistance case to heatsink | | | | 0.024 | | K/W |
| $P_{tot}$ | total power dissipation | | $T_C = 25°C$ | | | 1600 | W |
| $I_{FSM}$ | max. forward surge current | t = 10 ms; (50 Hz), sine | $T_{VJ} = 45°C$ | | | 15.0 | kA |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0$ V | | | 16.2 | kA |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ} = 140°C$ | | | 12.8 | kA |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0$ V | | | 13.8 | kA |
| $I^2t$ | value for fusing | t = 10 ms; (50 Hz), sine | $T_{VJ} = 45°C$ | | | 1.13 | MA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0$ V | | | 1.09 | MA²s |
| | | t = 10 ms; (50 Hz), sine | $T_{VJ} = 140°C$ | | | 812.8 | kA²s |
| | | t = 8,3 ms; (60 Hz), sine | $V_R = 0$ V | | | 788.8 | kA²s |
| $C_J$ | junction capacitance | $V_R = 400$ V; f = 1 MHz | $T_{VJ} = 25°C$ | | 762 | | pF |

Ratings

| Package | Y1 | | Ratings | | | |
|---|---|---|---|---|---|---|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| I_RMS | RMS current | per terminal | | | 600 | A |
| T_VJ | virtual junction temperature | | -40 | | 140 | °C |
| T_op | operation temperature | | -40 | | 125 | °C |
| T_stg | storage temperature | | -40 | | 125 | °C |
| Weight | | | | 650 | | g |
| M_D | mounting torque | | 4.5 | | 7 | Nm |
| M_T | terminal torque | | 11 | | 13 | Nm |
| d_Spp/App | creepage distance on surface \| striking distance through air | terminal to terminal | 16.0 | | | mm |
| d_Spb/Apb | | terminal to backside | 25.0 | | | mm |
| V_ISOL | isolation voltage | t = 1 second | 3600 | | | V |
| | | t = 1 minute    50/60 Hz, RMS; I_ISOL ≤ 1 mA | 3000 | | | V |

Production Index (PI)
Date Code (DC)

IXYS 🅤🅛
Circuit

yywwAA
Part Number
Lot.No: xxxxxx

Data Matrix: *part no.* (1-19), *DC + PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | MDO500-16N1 | MDO500-16N1 | Box | 2 | 464813 |

| Similar Part | Package | Voltage class |
|---|---|---|
| MDO500-12N1 | Y1-2-CU | 1200 |
| MDO500-14N1 | Y1-2-CU | 1400 |
| MDO500-18N1 | Y1-2-CU | 1800 |
| MDO500-20N1 | Y1-2-CU | 2000 |

| | | |
|---|---|---|
| MDO500-22N1 | Y1-2-CU | 2200 |

## Equivalent Circuits for Simulation          *on die level*          $T_{VJ} = 140°C$

I → $V_0$ — $R_0$
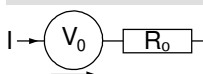
**Rectifier**

| | | | |
|---|---|---|---|
| V_0 max | threshold voltage | 0.8 | V |
| R_0 max | slope resistance * | 0.19 | mΩ |

**Outlines   Y1**

2x M8

15 ±1

52 $^{+0}_{-1,4}$

49

43

10

22.5    35    28.5

50

38

2

3

4 5 6 7

6.2

80

92

2 ○——▷|——○ 3
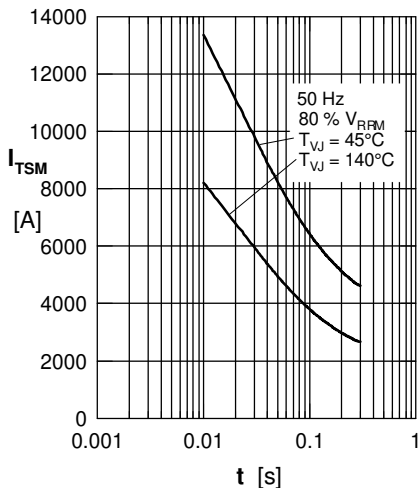
## Rectifier



Fig. 1  Surge overload current
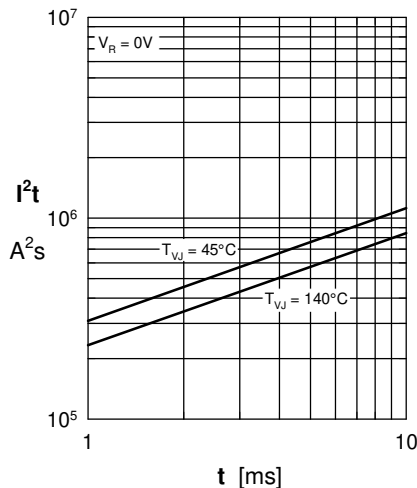$I_{FSM}$: Crest value, t: duration


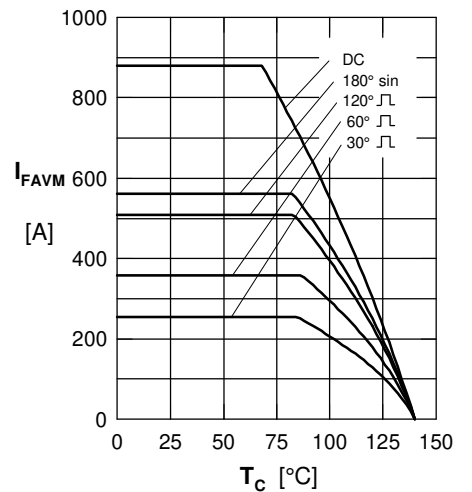
Fig. 2  $I^2t$ versus time (1-10 ms)



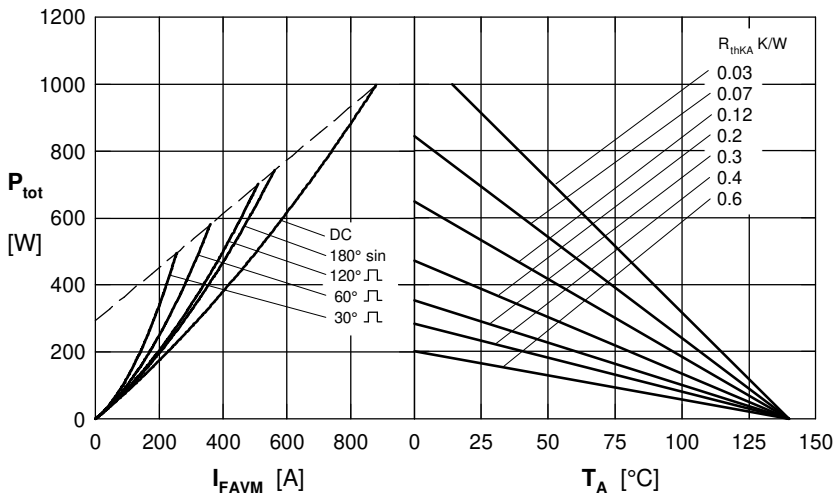Fig. 3  Maximum forward current
at case temperature



Fig. 4  Power dissipation vs. forward current and ambient temperature
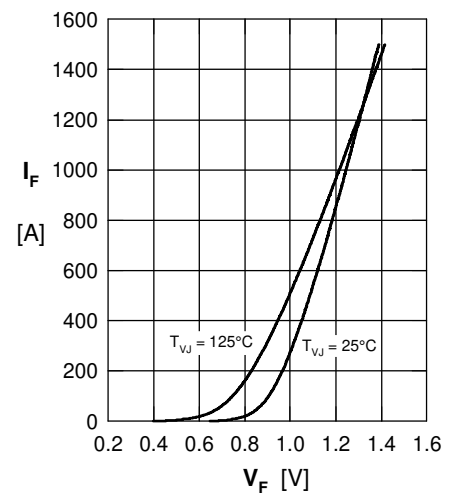


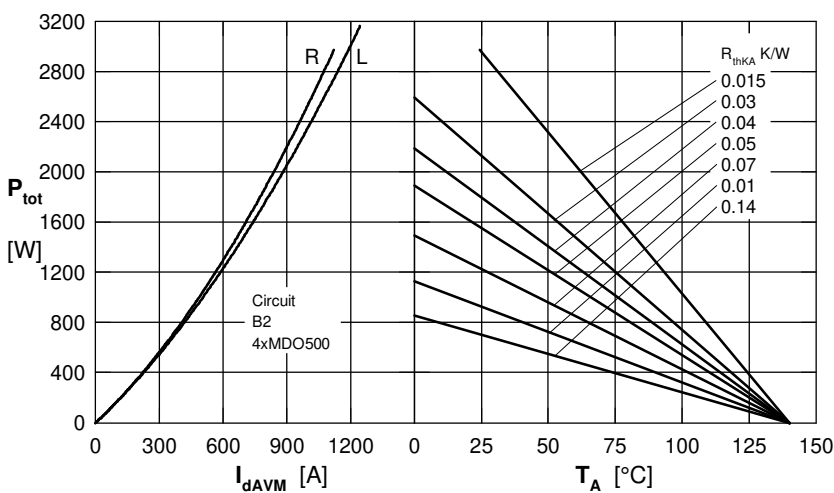Fig. 5  Forward current
$I_F$ versus $V_F$



Fig. 6  Single phase rectifier bridge: Power dissipation vs. direct output current
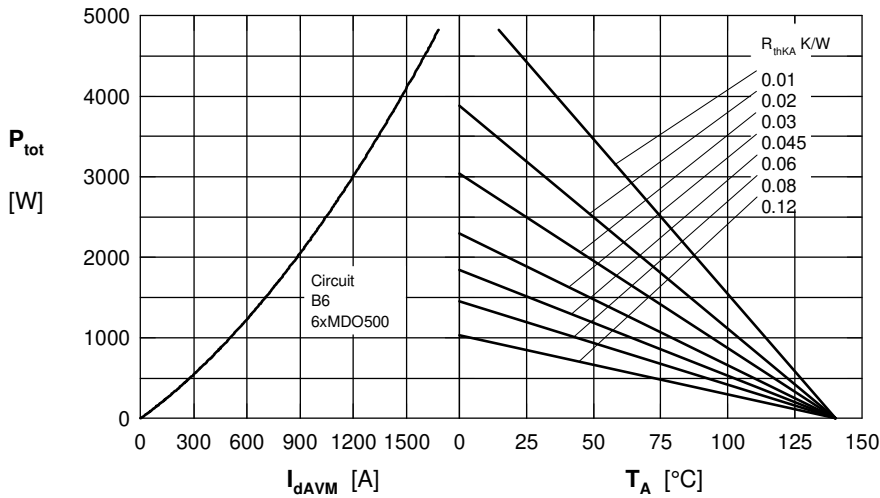and ambient temperature. R = resistive load, L = inductive load

**Rectifier**



Fig. 6  Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature
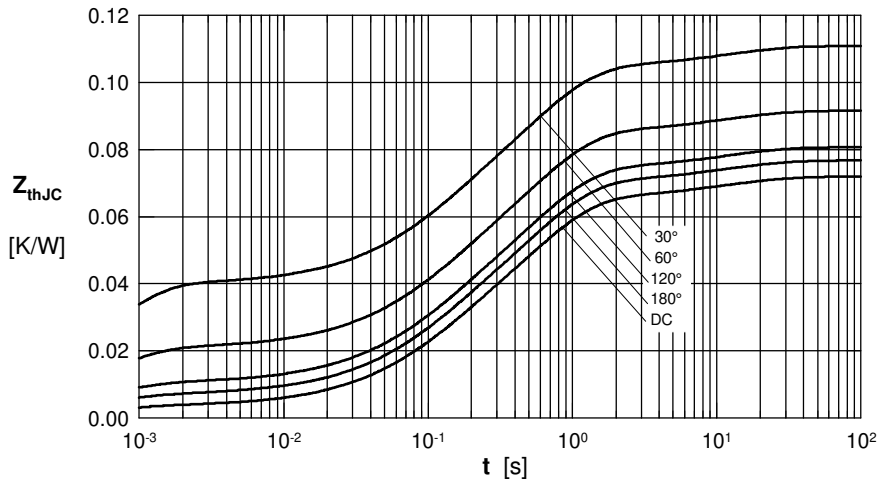


Fig. 7  Transient thermal impedance junction to case

$R_{thJC}$ for various conduction angles d:

| d | $R_{thJC}$ (K/W) |
|------|--------|
| DC | 0.072 |
| 180° | 0.0768 |
| 120° | 0.081 |
| 60° | 0.092 |
| 30° | 0.111 |

Constants for $Z_{thJC}$ calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-------|--------|
| 1 | 0.0035 | 0.0054 |
| 2 | 0.0186 | 0.098 |
| 3 | 0.0432 | 0.54 |
| 4 | 0.0067 | 12 |
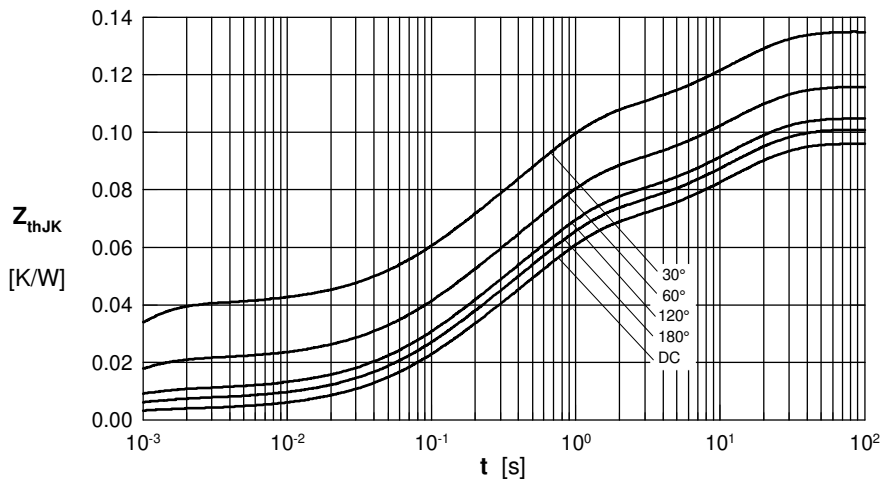


Fig. 8  Transient thermal impedance junction to heatsink

$R_{thJK}$ for various conduction angles d:

| d | $R_{thJK}$ (K/W) |
|------|--------|
| DC | 0.096 |
| 180° | 0.1 |
| 120° | 0.105 |
| 60° | 0.116 |
| 30° | 0.135 |

Constants for $Z_{thJK}$ calculation:

| i | $R_{thi}$ (K/W) | $t_i$ (s) |
|---|-------|--------|
| 1 | 0.0035 | 0.0054 |
| 2 | 0.0186 | 0.098 |
| 3 | 0.0432 | 0.54 |
| 4 | 0.0067 | 12 |
| 5 | 0.024 | 12 |

Data according to IEC 60747and per semiconductor unless otherwise specified        20191204c

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