

## Fast Recovery Diodes (Stud Version), 6 A/12 A/16 A



DO-203AA (DO-4)

### FEATURES

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- Standard JEDEC types
- Stud cathode and stud anode versions
- Fully characterized reverse recovery conditions
- Compliant to RoHS directive 2002/95/EC



**RoHS**  
COMPLIANT

### PRODUCT SUMMARY

$I_{F(AV)}$

6 A/12 A/16 A

### TYPICAL APPLICATIONS

- DC power supplies
- Inverters
- Converters
- Choppers
- Ultrasonic systems
- Freewheeling diodes

### MAJOR RATINGS AND CHARACTERISTICS

| SYMBOL        | CHARACTERISTICS                     | 6FL..                              | 12FL.. | 16FL.. | UNITS                       |
|---------------|-------------------------------------|------------------------------------|--------|--------|-----------------------------|
| $I_{F(AV)}$   | $T_C = 100\text{ }^{\circ}\text{C}$ | 6                                  | 12     | 16     | A                           |
| $I_{F(RMS)}$  |                                     | 9.5                                | 19     | 25     | A                           |
| $I_{FSM}$     | 50 Hz                               | 110                                | 145    | 180    | A                           |
|               | 60 Hz                               | 115                                | 150    | 190    |                             |
| $I^2t$        | 50 Hz                               | 60                                 | 103    | 160    | $\text{A}^2\text{s}$        |
|               | 60 Hz                               | 55                                 | 94     | 150    |                             |
| $I^2\sqrt{t}$ |                                     | 1452                               | 1452   | 2290   | $\text{I}^2\sqrt{\text{s}}$ |
| $V_{RRM}$     | Range                               | 50 to 1000                         |        |        | V                           |
| $t_{rr}$      |                                     | See Recovery Characteristics table |        |        | ns                          |
| $T_J$         | Range                               | - 65 to 150                        |        |        | $^{\circ}\text{C}$          |

# 6FL(R), 12FL(R), 16FL(R) Series

Vishay Semiconductors

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## ELECTRICAL SPECIFICATIONS

| VOLTAGE RATINGS           |              |                                                                |                                                      |                                                                          |                                                                |                                                                |
|---------------------------|--------------|----------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------|
| TYPE NUMBER               | VOLTAGE CODE | $V_{RRM}$ , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE<br>V | $V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK VOLTAGE<br>V | $I_{RRM}$ MAXIMUM AT $T_J = 25\text{ }^{\circ}\text{C}$<br>$\mu\text{A}$ | $I_{RRM}$ MAXIMUM AT $T_J = 100\text{ }^{\circ}\text{C}$<br>mA | $I_{RRM}$ MAXIMUM AT $T_J = 150\text{ }^{\circ}\text{C}$<br>mA |
| 6FL..<br>12FL..<br>16FL.. | 5            | 50                                                             | 75                                                   | 50                                                                       | -                                                              | 6.0                                                            |
|                           | 10           | 100                                                            | 150                                                  |                                                                          |                                                                |                                                                |
|                           | 20           | 200                                                            | 275                                                  |                                                                          |                                                                |                                                                |
|                           | 40           | 400                                                            | 500                                                  |                                                                          |                                                                |                                                                |
|                           | 60           | 600                                                            | 725                                                  |                                                                          |                                                                |                                                                |
|                           | 80           | 800                                                            | 950                                                  |                                                                          |                                                                |                                                                |
|                           | 100          | 1000                                                           | 1250                                                 |                                                                          |                                                                |                                                                |

| FORWARD CONDUCTION                                     |                     |                                                                         |                                  |                                                       |       |                    |        |                   |  |
|--------------------------------------------------------|---------------------|-------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------|-------|--------------------|--------|-------------------|--|
| PARAMETER                                              | SYMBOL              | TEST CONDITIONS                                                         |                                  |                                                       | 6FL.. | 12FL..             | 16FL.. | UNITS             |  |
| Maximum average forward current at case temperature    | I <sub>F(AV)</sub>  | 180° conduction, half sine wave DC                                      |                                  |                                                       | 6     | 12 <sup>(1)</sup>  | 16     | A                 |  |
|                                                        |                     |                                                                         |                                  |                                                       | 100   | 100                | 100    | °C                |  |
| Maximum RMS current                                    | I <sub>F(RMS)</sub> |                                                                         |                                  |                                                       | 9.5   | 19                 | 25     | A                 |  |
| Maximum peak, one-cycle non-repetitive forward current | I <sub>FSM</sub>    | t = 10 ms                                                               | No voltage reapplied             | Sinusoidal half wave, initial T <sub>J</sub> = 150 °C | 130   | 170                | 215    |                   |  |
|                                                        |                     | t = 8.3 ms                                                              |                                  |                                                       | 135   | 180                | 225    |                   |  |
|                                                        |                     | t = 10 ms                                                               | 100 % V <sub>RRM</sub> reapplied |                                                       | 110   | 145                | 180    |                   |  |
|                                                        |                     | t = 8.3 ms                                                              |                                  |                                                       | 115   | 150 <sup>(1)</sup> | 190    |                   |  |
| Maximum I <sup>2</sup> t for fusing                    | I <sup>2</sup> t    | t = 10 ms                                                               | No voltage reapplied             |                                                       | 86    | 145                | 230    | A <sup>2</sup> s  |  |
|                                                        |                     | t = 8.3 ms                                                              |                                  |                                                       | 78    | 130                | 210    |                   |  |
|                                                        |                     | t = 10 ms                                                               | 100 % V <sub>RRM</sub> reapplied |                                                       | 60    | 103                | 160    |                   |  |
|                                                        |                     | t = 8.3 ms                                                              |                                  |                                                       | 55    | 94                 | 150    |                   |  |
| Maximum I <sup>2</sup> √t for fusing                   | I <sup>2</sup> √t   | t = 0.1 ms to 10 ms, no voltage reapplied                               |                                  |                                                       | 856   | 1452               | 2290   | A <sup>2</sup> √s |  |
| Maximum forward voltage drop                           | V <sub>FM</sub>     | T <sub>J</sub> = 25 °C; I <sub>F</sub> = Rated I <sub>F(AV)</sub> (DC)  |                                  |                                                       | 1.4   | 1.4 <sup>(1)</sup> | 1.4    | V                 |  |
|                                                        |                     | T <sub>C</sub> = 100 °C; I <sub>FM</sub> = π x rated I <sub>F(AV)</sub> |                                  |                                                       | 1.5   | 1.5 <sup>(1)</sup> | 1.5    |                   |  |

### Note

<sup>(1)</sup> JEDEC registered values

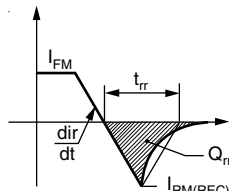


## 6FL(R), 12FL(R), 16FL(R) Series

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### RECOVERY CHARACTERISTICS

| PARAMETER                       | SYMBOL               | TEST CONDITIONS                                                                                       | 6FL..<br>12FL..<br>16FL.. |     | UNITS |  |
|---------------------------------|----------------------|-------------------------------------------------------------------------------------------------------|---------------------------|-----|-------|-------------------------------------------------------------------------------------|
|                                 |                      |                                                                                                       | S02                       | S05 |       |                                                                                     |
| Maximum reverse recovery time   | t <sub>rr</sub>      | T <sub>J</sub> = 25 °C, I <sub>F</sub> = 1 A to V <sub>R</sub> = 30 V, di <sub>F</sub> /dt = 100 A/μs | -                         | -   | ns    |                                                                                     |
|                                 |                      | T <sub>J</sub> = 25 °C, di <sub>F</sub> /dt = 25 A/μs, I <sub>FM</sub> = π x rated I <sub>F(AV)</sub> | 200                       | 500 |       |                                                                                     |
| Maximum peak recovery current   | I <sub>RM(REC)</sub> | I <sub>FM</sub> = π x rated I <sub>F(AV)</sub>                                                        | -                         |     | -     |                                                                                     |
| Maximum reverse recovery charge | Q <sub>rr</sub>      | T <sub>J</sub> = 25 °C, I <sub>F</sub> = 1 A to V <sub>R</sub> = 30 V, di <sub>F</sub> /dt = 100 A/μs | -                         | -   | nC    |                                                                                     |
|                                 |                      | T <sub>J</sub> = 25 °C, di <sub>F</sub> /dt = 25 A/μs, I <sub>FM</sub> = π x rated I <sub>F(AV)</sub> | -                         | -   |       |                                                                                     |

#### Note

(1) JEDEC registered values

### THERMAL AND MECHANICAL SPECIFICATIONS

| PARAMETER                                    | SYMBOL            | TEST CONDITIONS                            | 6FL..                  | 12FL.. | 16FL.. | UNITS               |
|----------------------------------------------|-------------------|--------------------------------------------|------------------------|--------|--------|---------------------|
| Maximum junction operating temperature range | T <sub>J</sub>    |                                            | - 65 to 150            |        |        | °C                  |
| Maximum storage temperature range            | T <sub>Stg</sub>  |                                            | - 65 to 175            |        |        |                     |
| Maximum thermal resistance, junction to case | R <sub>thJC</sub> | DC operation                               | 2.5                    | 2.0    | 1.6    | °C/W                |
| Maximum thermal resistance, case to heatsink | R <sub>thCS</sub> | Mounting surface, smooth, flat and greased | 0.5                    |        |        |                     |
| Allowable mounting torque                    |                   | Not lubricated threads                     | 1.5 + 0 - 10 %<br>(13) |        |        | N · m<br>(lbf · in) |
|                                              |                   | Lubricated threads                         | 1.2 + 0 - 10 %<br>(10) |        |        |                     |
| Approximate weight                           |                   |                                            | 7                      |        |        | g                   |
|                                              |                   |                                            | 0.25                   |        |        | oz.                 |
| Case style                                   |                   | JEDEC                                      | DO-203AA (DO-4)        |        |        |                     |

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| $\Delta R_{thJC}$ CONDUCTION |                       |        |        |                        |        |        |                         |       |
|------------------------------|-----------------------|--------|--------|------------------------|--------|--------|-------------------------|-------|
| CONDUCTION ANGLE             | 6FL..                 | 12FL.. | 16FL.. | 6FL..                  | 12FL.. | 16FL.. | TEST CONDITIONS         | UNITS |
|                              | SINUSOIDAL CONDUCTION |        |        | RECTANGULAR CONDUCTION |        |        |                         |       |
| 180°                         | 0.58                  | 0.46   | 0.37   | 0.33                   | 0.26   | 0.21   | T <sub>J</sub> = 150 °C | K/W   |
| 120°                         | 0.60                  | 0.48   | 0.39   | 0.58                   | 0.46   | 0.37   |                         |       |
| 60°                          | 1.28                  | 1.02   | 0.82   | 1.28                   | 1.02   | 0.82   |                         |       |
| 30°                          | 2.20                  | 1.76   | 1.41   | 2.20                   | 1.76   | 1.41   |                         |       |

## Note

- The table above shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC

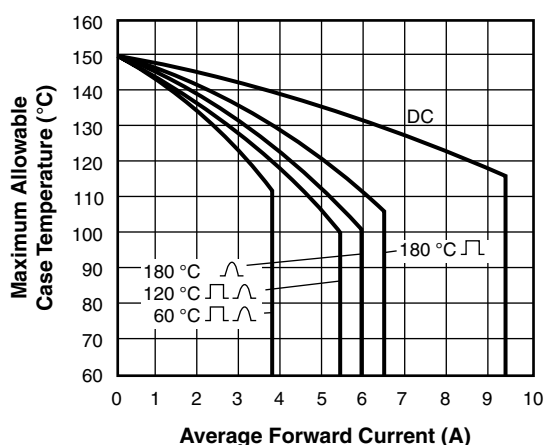


Fig. 1 - Average Forward Current vs. Maximum Allowable Case Temperature, 6FL Series

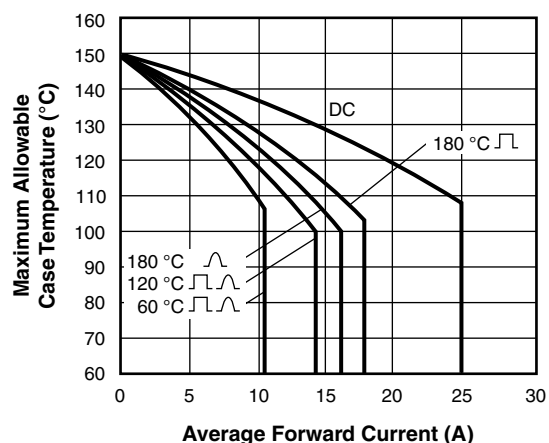


Fig. 3 - Average Forward Current vs. Maximum Allowable Case Temperature, 16FL Series

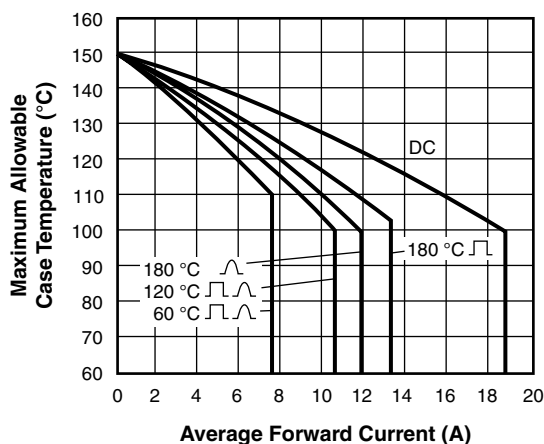


Fig. 2 - Average Forward Current vs. Maximum Allowable Case Temperature, 12FL Series

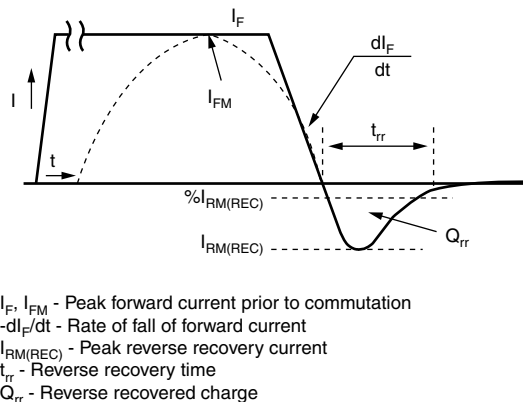


Fig. 4 - Reverse Recovery Time Test Waveform



## 6FL(R), 12FL(R), 16FL(R) Series

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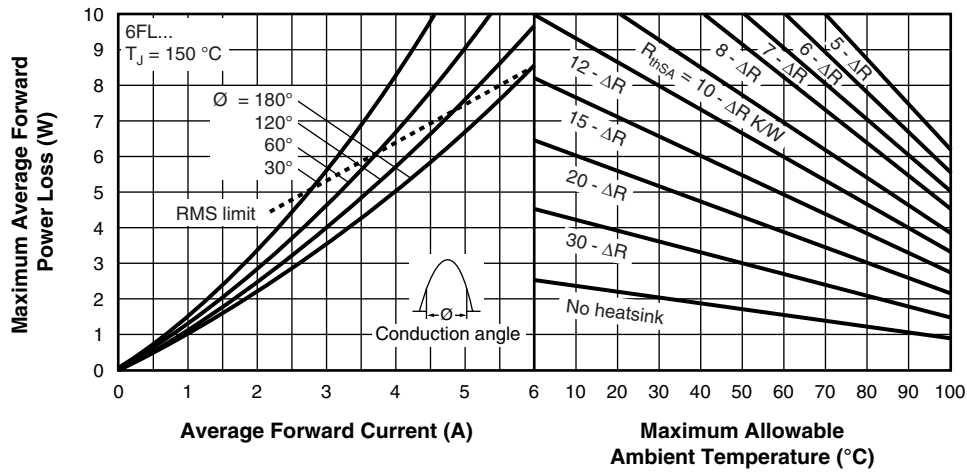


Fig. 5 - Current Rating Nomogram (Sinusoidal Waveforms), 6FL Series

| Conduction angle - $\phi$ | $\Delta R$ - K/W |
|---------------------------|------------------|
| 180°                      | 0.58             |
| 120°                      | 0.60             |
| 60°                       | 1.28             |
| 30°                       | 2.20             |

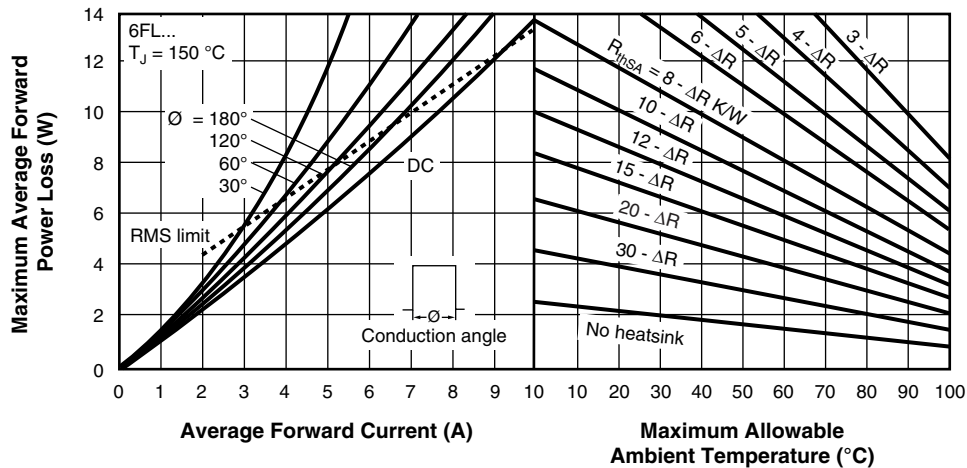


Fig. 6 - Current Rating Nomogram (Rectangular Waveforms), 6FL Series

| Conduction angle - $\phi$ | $\Delta R$ - K/W |
|---------------------------|------------------|
| DC                        | 0                |
| 180°                      | 0.33             |
| 120°                      | 0.58             |
| 60°                       | 1.28             |
| 30°                       | 2.20             |

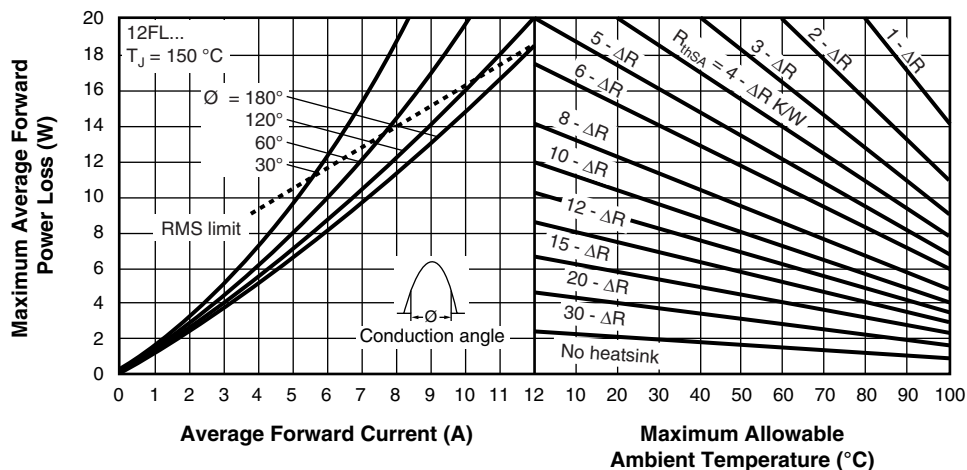


Fig. 7 - Current Rating Nomogram (Sinusoidal Waveforms), 12FL Series

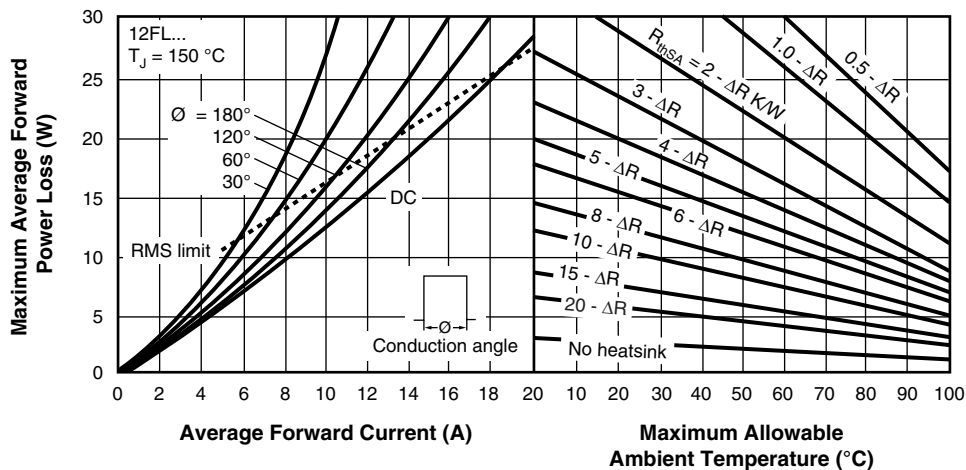
| Conduction angle - $\phi$ | $\Delta R$ - K/W |
|---------------------------|------------------|
| 180°                      | 0.46             |
| 120°                      | 0.48             |
| 60°                       | 1.02             |
| 30°                       | 1.76             |

# 6FL(R), 12FL(R), 16FL(R) Series



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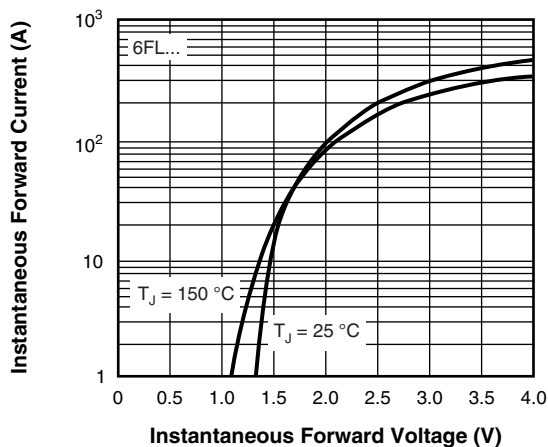


Fig. 11 - Maximum Forward Voltage vs. Forward Current, 6FL Series

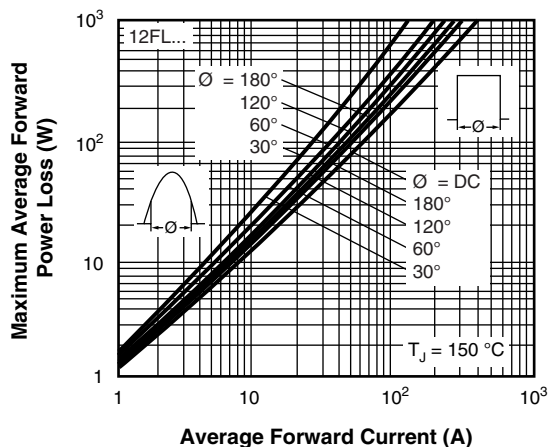


Fig. 14 - Maximum High Level Forward Power Loss vs. Average Forward Current, 12FL Series

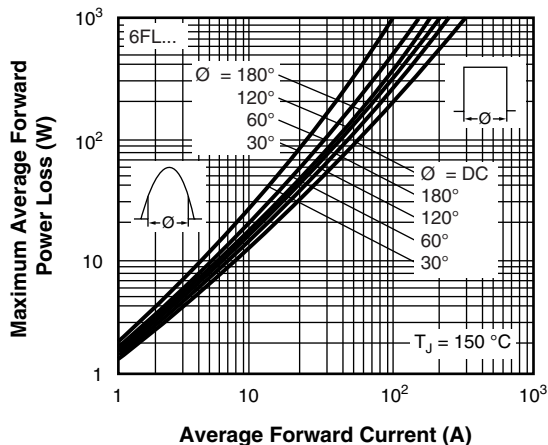


Fig. 12 - Maximum High Level Forward Power Loss vs. Average Forward Current, 6FL Series

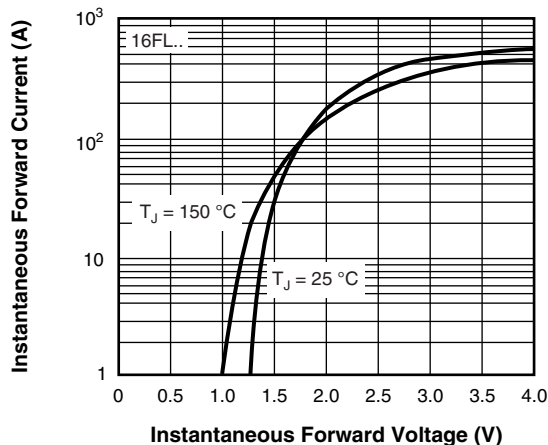


Fig. 15 - Maximum Forward Voltage vs. Forward Current, 16FL Series

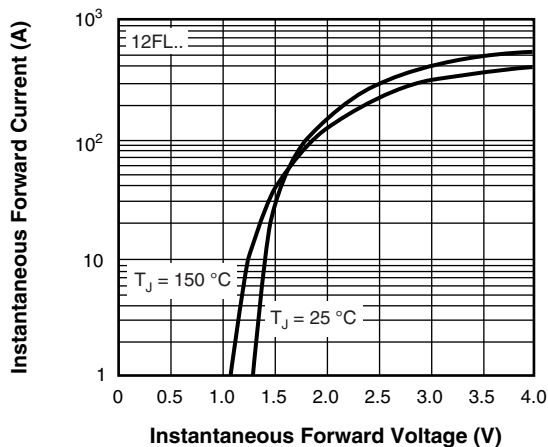


Fig. 13 - Maximum Forward Voltage vs. Forward Current, 12FL Series

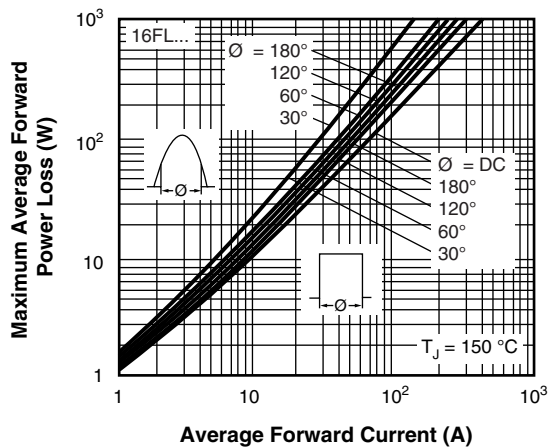


Fig. 16 - Maximum High Level Forward Power Loss vs. Average Forward Current, 16FL Series

# 6FL(R), 12FL(R), 16FL(R) Series

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Fast Recovery Diodes  
(Stud Version), 6 A/12 A/16 A

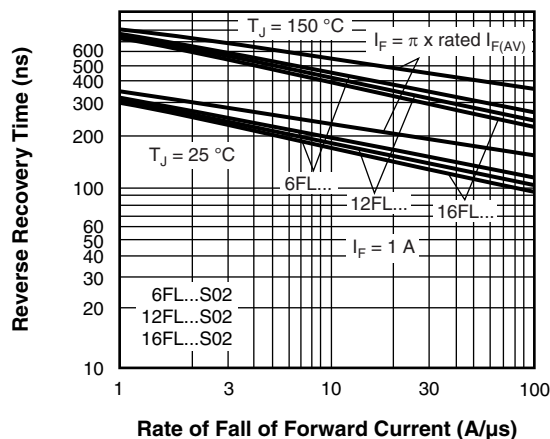


Fig. 17a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series ...S02

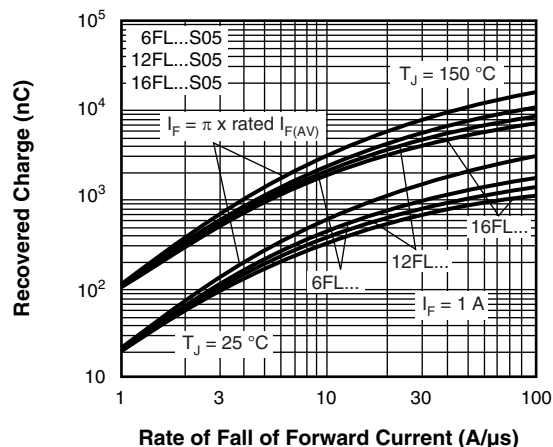


Fig. 18b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series ...S05

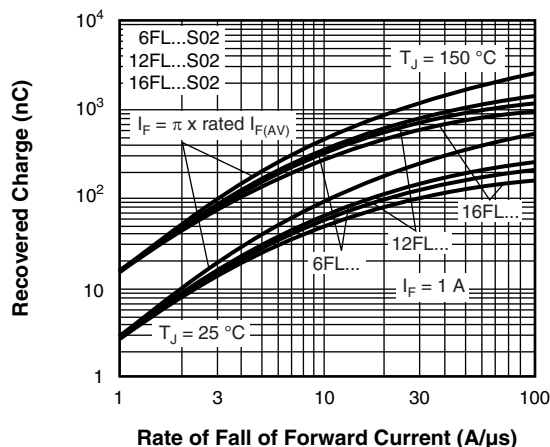


Fig. 17b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series ...S02

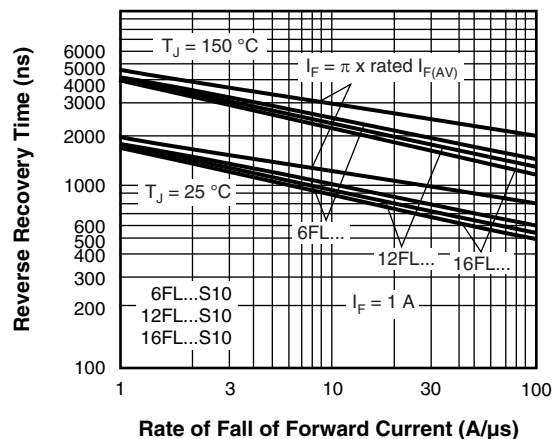


Fig. 19a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series ...S10

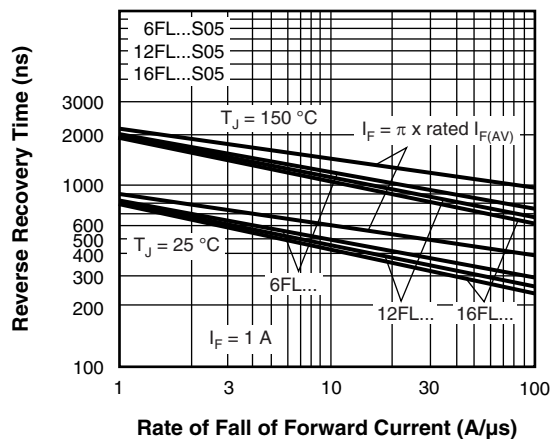


Fig. 18a - Typical Reverse Recovery Time vs. Rate of Fall of Forward Current, All Series ...S05

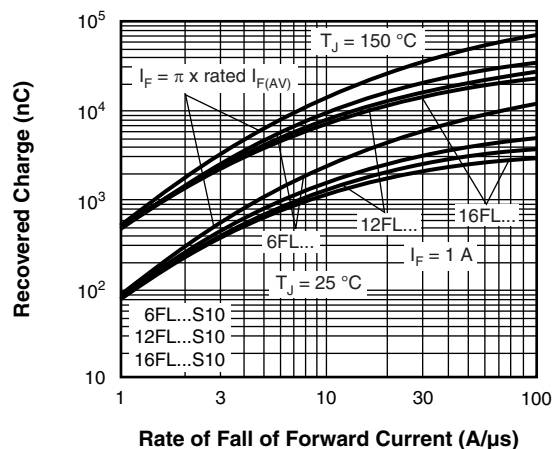


Fig. 19b - Typical Recovered Charge vs. Rate of Fall of Forward Current, All Series ...S10



## 6FL(R), 12FL(R), 16FL(R) Series

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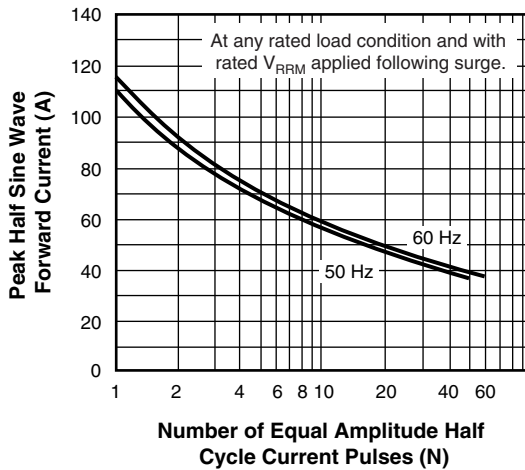


Fig. 20 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 6FL Series

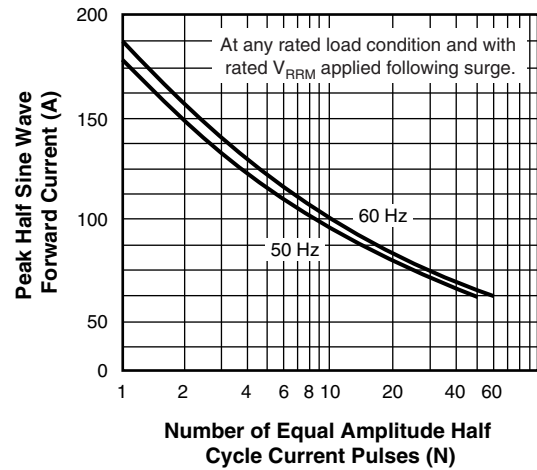


Fig. 22 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 16FL Series

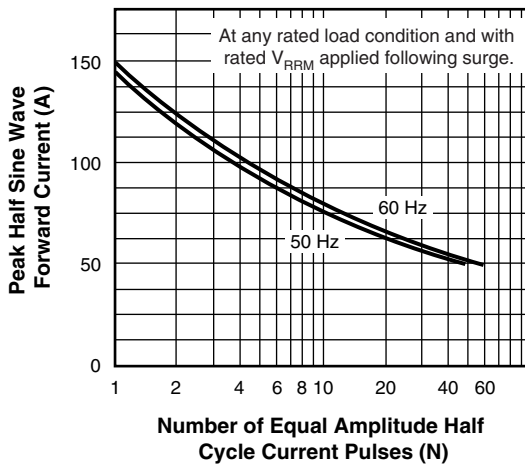


Fig. 21 - Maximum Non-Repetitive Surge Current vs. Number of Current Pulses, 12FL Series

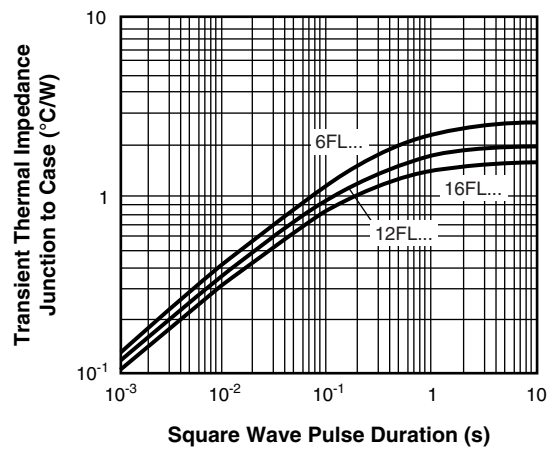


Fig. 23 - Maximum Transient Thermal Impedance, Junction to Case vs. Pulse Duration, All Series

# 6FL(R), 12FL(R), 16FL(R) Series



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Fast Recovery Diodes  
(Stud Version), 6 A/12 A/16 A

## ORDERING INFORMATION TABLE

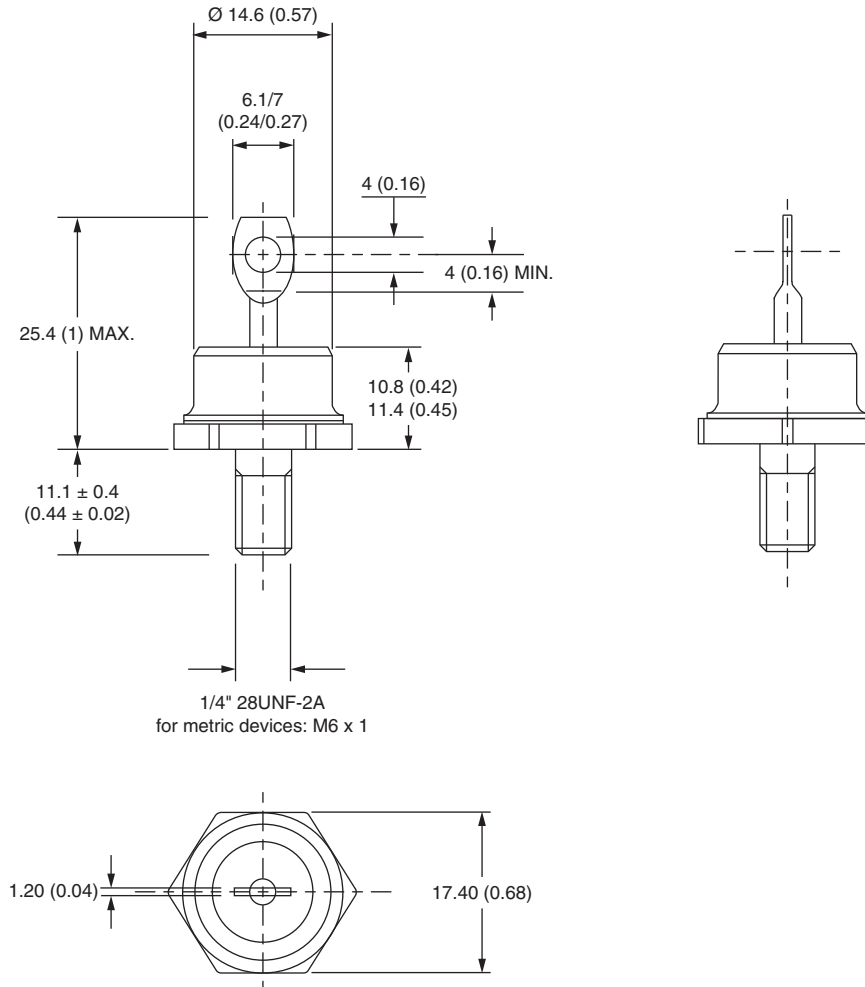
|             |    |   |   |   |    |   |     |
|-------------|----|---|---|---|----|---|-----|
| Device code | 16 | F | L | R | 60 | M | S02 |
|             | ①  | ② | ③ | ④ | ⑤  | ⑥ | ⑦   |

- 1** - Current code  $I_{(AVG)}$  = Exact current rating
- 2** - F = Diode
- 3** - Omit = Standard recovery diode  
L = Only for fast diode
- 4** - Omit = Stud forward polarity  
R = Stud reverse polarity
- 5** - Voltage code  $\times 10 = V_{RRM}$  (see Voltage Ratings table)
- 6** - Outlines:  
Omit = Stud base UNF thread  
M = Stud base metric thread
- 7** -  $t_{rr}$  code only for fast diode (see Recovery Characteristics table)

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95311">www.vishay.com/doc?95311</a> |

## DO-203AB (DO-5) for 40HFL, 70HFL and 85HFL

### DIMENSIONS FOR 40HFL/70HFL in millimeters (inches)



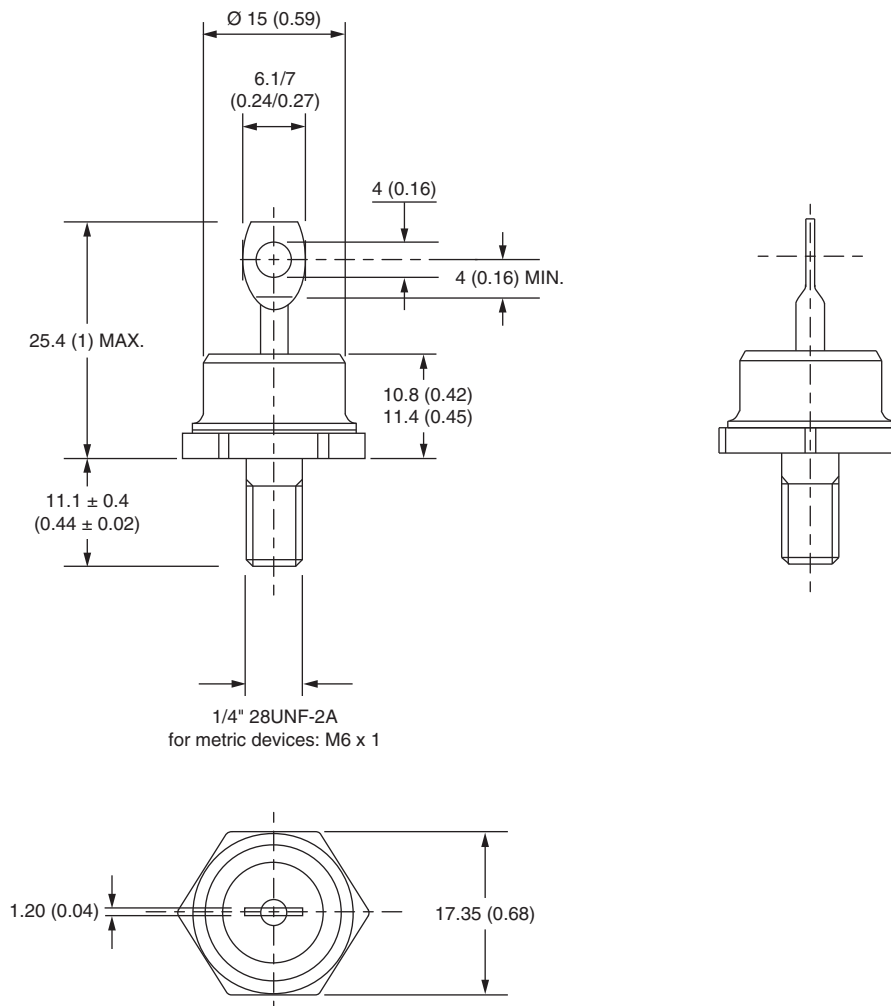
# Outline Dimensions

Vishay Semiconductors

DO-203AB (DO-5) for  
40HFL, 70HFL and 85HFL



## DIMENSIONS FOR 85HFL in millimeters (inches)





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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**



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- Техническая поддержка
- Подбор комплектации
- Индивидуальный подход
- Гибкое ценообразование
- Работаем по 275 ФЗ