



## Hyperfast Rectifier, 5 A FRED Pt®



SMC (DO-214AB)



## FEATURES

- Hyperfast recovery time, reduced  $Q_{rr}$  and soft recovery
- 175 °C maximum operating junction temperature
- For PFC CRM/CCM, snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Designed and qualified according to JEDEC-JESD47
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## PRODUCT SUMMARY

|                 |            |
|-----------------|------------|
| Package         | SMC        |
| $I_{F(AV)}$     | 5 A        |
| $V_R$           | 600 V      |
| $V_F$ at $I_F$  | 1.95 V     |
| $t_{rr}$ typ.   | 30 ns      |
| $T_J$ max.      | 175 °C     |
| Diode variation | Single die |

## DESCRIPTION/APPLICATIONS

State of the art hyperfast recovery rectifiers designed with optimized performance of forward voltage drop, hyperfast recovery time, and soft recovery.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in PFC Boost stage in the AC/DC section of SMPS, inverters or as freewheeling diodes.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                   | SYMBOL         | TEST CONDITIONS            | VALUES      | UNITS |
|---------------------------------------------|----------------|----------------------------|-------------|-------|
| Peak repetitive reverse voltage             | $V_{RRM}$      |                            | 600         | V     |
| Average rectified forward current           | $I_{F(AV)}$    | $T_L = 73\text{ °C}^{(1)}$ | 5           |       |
| Non-repetitive peak surge current           | $I_{FSM}$      | $T_J = 25\text{ °C}$       | 90          | A     |
| Operating junction and storage temperatures | $T_J, T_{Stg}$ |                            | - 55 to 175 | °C    |

## Note

<sup>(1)</sup> Mounted on PCB with minimum pad size

ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$  unless otherwise specified)

| PARAMETER                           | SYMBOL        | TEST CONDITIONS                         | MIN. | TYP. | MAX. | UNITS         |
|-------------------------------------|---------------|-----------------------------------------|------|------|------|---------------|
| Breakdown voltage, blocking voltage | $V_{BR}, V_R$ | $I_R = 100\text{ }\mu\text{A}$          | 600  | -    | -    | V             |
| Forward voltage                     | $V_F$         | $I_F = 5\text{ A}$                      | -    | 1.65 | 1.95 |               |
|                                     |               | $I_F = 5\text{ A}, T_J = 150\text{ °C}$ | -    | 1.2  | 1.4  |               |
| Reverse leakage current             | $I_R$         | $V_R = V_R$ rated                       | -    | -    | 3    | $\mu\text{A}$ |
|                                     |               | $T_J = 150\text{ °C}, V_R = V_R$ rated  | -    | -    | 100  |               |
| Junction capacitance                | $C_T$         | $V_R = 600\text{ V}$                    | -    | 7.8  | -    | pF            |



| DYNAMIC RECOVERY CHARACTERISTICS ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified) |           |                                                                                   |      |      |      |       |
|---------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------------------|------|------|------|-------|
| PARAMETER                                                                                         | SYMBOL    | TEST CONDITIONS                                                                   | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time                                                                             | $t_{rr}$  | $I_F = 1.0\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$ | -    | 30   | -    | ns    |
|                                                                                                   |           | $I_F = 1.0\text{ A}$ , $dI_F/dt = 50\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$  | -    | 35   | -    |       |
|                                                                                                   |           | $I_F = 0.5\text{ A}$ , $I_R = 1\text{ A}$ , $I_{rr} = 0.25\text{ A}$              | -    | -    | 35   |       |
|                                                                                                   |           | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 23   | -    |       |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 38   | -    |       |
| Peak recovery current                                                                             | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 3.5  | -    | A     |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 5.4  | -    |       |
| Reverse recovery charge                                                                           | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$                                                | -    | 41   | -    | nC    |
|                                                                                                   |           | $T_J = 125\text{ }^{\circ}\text{C}$                                               | -    | 111  | -    |       |

| THERMAL - MECHANICAL SPECIFICATIONS            |                  |                           |       |      |      |                             |
|------------------------------------------------|------------------|---------------------------|-------|------|------|-----------------------------|
| PARAMETER                                      | SYMBOL           | TEST CONDITIONS           | MIN.  | TYP. | MAX. | UNITS                       |
| Maximum junction and storage temperature range | $T_J, T_{Stg}$   |                           | - 55  | -    | 175  | $^{\circ}\text{C}$          |
| Thermal resistance, junction to case           | $R_{thJC}^{(1)}$ |                           | -     | -    | 14   | $^{\circ}\text{C}/\text{W}$ |
| Thermal resistance, junction to ambient        | $R_{thJA}^{(1)}$ |                           | -     | -    | 80   |                             |
| Approximate Weight                             |                  |                           | 0.24  |      |      | g                           |
|                                                |                  |                           | 0.008 |      |      | oz.                         |
| Marking device                                 |                  | Case style SMC (DO-214AB) | 5H6   |      |      |                             |

**Note**

(1) Mounted on PCB with minimum pad size

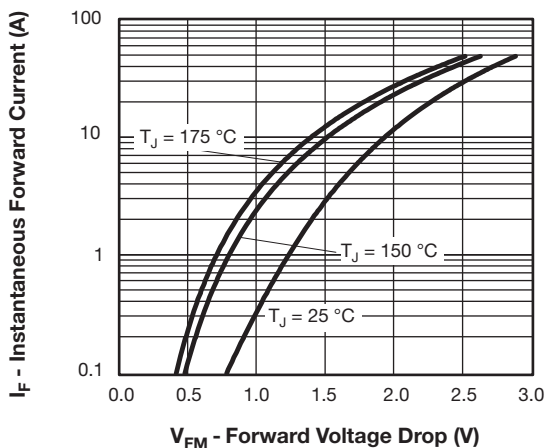


Fig. 1 - Typical Forward Voltage Drop Characteristics

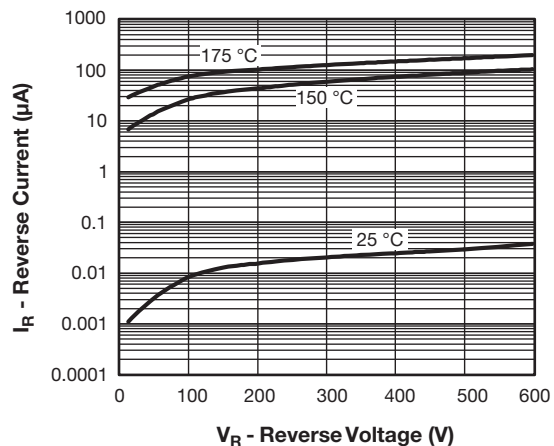


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

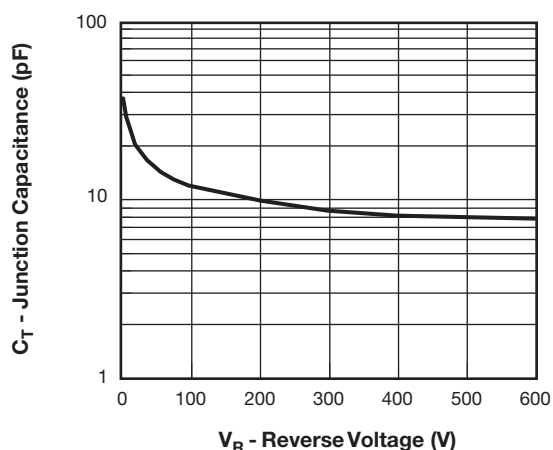


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

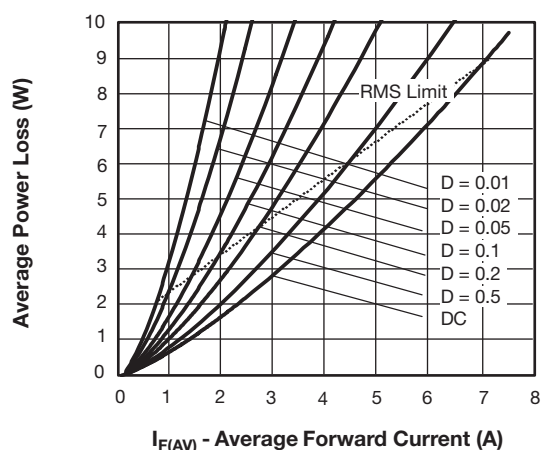


Fig. 5 - Forward Power Loss Characteristics

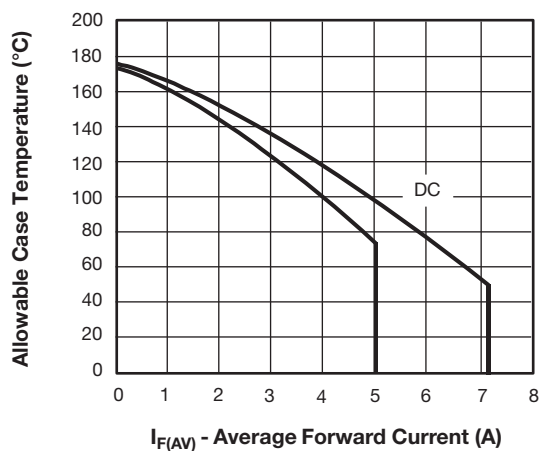
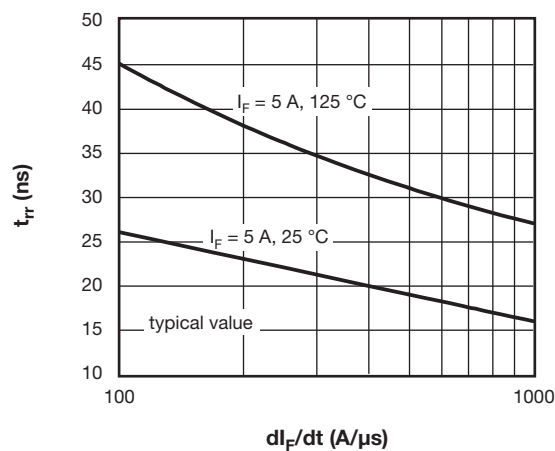
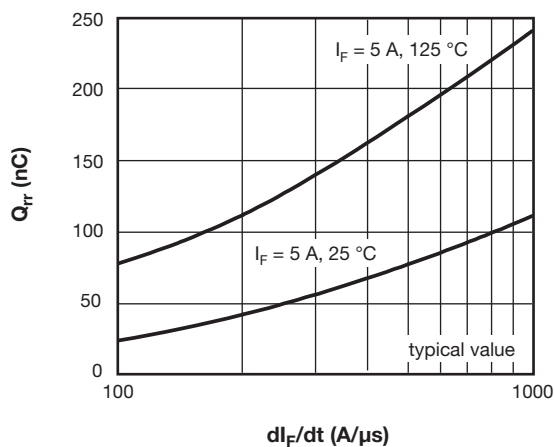


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

Fig. 6 - Typical Reverse Recovery vs.  $di_F/dt$ Fig. 7 - Typical Stored Charge vs.  $di_F/dt$

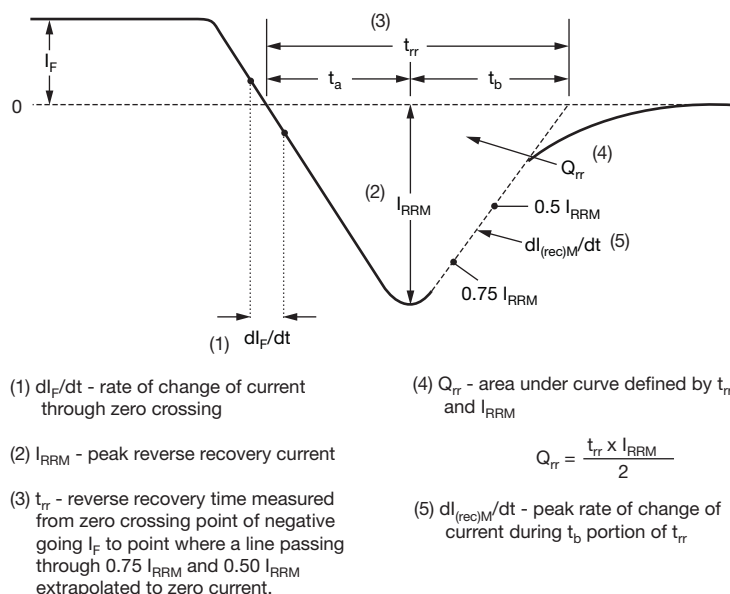


Fig. 8 - Reverse Recovery Waveform and Definitions

## ORDERING INFORMATION TABLE

| Device code | VS- | 5 | E | C | H | 06 | -M3 |
|-------------|-----|---|---|---|---|----|-----|
|             | 1   | 2 | 3 | 4 | 5 | 6  | 7   |

- |   |                                                                      |
|---|----------------------------------------------------------------------|
| 1 | - Vishay Semiconductors product                                      |
| 2 | - Current rating (5 = 5 A)                                           |
| 3 | - Circuit configuration:<br>E = Single diode                         |
| 4 | - C = SMC package                                                    |
| 5 | - Process type,<br>H = Hyperfast recovery                            |
| 6 | - Voltage code (06 = 600 V)                                          |
| 7 | - M3 = Halogen-free, RoHS-compliant, and terminations lead (Pb)-free |

| ORDERING INFORMATION (Example) |                   |                        |                                    |
|--------------------------------|-------------------|------------------------|------------------------------------|
| PREFERRED P/N                  | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION              |
| VS-5ECH06-M3/9AT               | 9AT               | 3500                   | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc?95402">www.vishay.com/doc?95402</a> |
| Part marking information   | <a href="http://www.vishay.com/doc?95472">www.vishay.com/doc?95472</a> |
| Packaging information      | <a href="http://www.vishay.com/doc?95404">www.vishay.com/doc?95404</a> |

## SMC

### DIMENSIONS in inches (millimeters)





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