

Ultrafast Rectifier, 4 A FRED Pt[®]


SMC (DO-214AB)


FEATURES

- Ultrafast 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[®] JESD 47
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
 COMPLIANT
 HALOGEN
FREE

| PRIMARY CHARACTERISTICS | |
|-------------------------|----------------|
| $I_{F(AV)}$ | 4 A |
| V_R | 600 V |
| V_F at I_F | 0.88 V |
| t_{rr} typ. | 45 ns |
| T_J max. | 175 °C |
| Package | SMC (DO-214AB) |
| Circuit configuration | Single |

DESCRIPTION / APPLICATIONS

State of the art ultrafast recovery rectifiers designed with optimized performance of forward voltage drop, ultrafast 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 power 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 | $I_{F(AV)}$ | $T_L = 117\text{ °C}^{(1)}$ | 4 | A |
| Non-repetitive peak surge current | I_{FSM} | $T_J = 25\text{ °C}$, 6 ms square pulse | 120 | |
| Operating junction and storage temperatures | T_J, T_{Stg} | | -55 to +175 | °C |

Note

⁽¹⁾ 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 | $I_R = 100\ \mu\text{A}$ | 600 | - | - | V |
| | | $I_F = 4\ \text{A}$ | - | 1.07 | 1.3 | |
| Forward voltage | V_F | $I_F = 4\ \text{A}, T_J = 150\text{ °C}$ | - | 0.88 | 1.1 | |
| | | $V_R = V_R$ rated | - | - | 3 | |
| Reverse leakage current | I_R | $T_J = 150\text{ °C}, V_R = V_R$ rated | - | - | 100 | |
| | | $V_R = 600\ \text{V}$ | - | 7.8 | - | pF |
| Junction capacitance | C_T | | | | | |

| 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} | $I_F = 1.0\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 45 | - | ns | |
| | | $I_F = 1.0\text{ A}$, $di_F/dt = 50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$ | - | 50 | - | | |
| | | $I_F = 0.5\text{ A}$, $I_R = 1\text{ A}$, $I_{rr} = 0.25\text{ A}$ | - | - | 65 | | |
| | | $T_J = 25\text{ }^\circ\text{C}$ | - | 41 | - | | |
| | | $T_J = 125\text{ }^\circ\text{C}$ | - | 72 | - | | |
| Peak recovery current | I_{RRM} | $I_F = 4\text{ A}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 390\text{ V}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 5.8 | - | A |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 8.0 | - | |
| | | | $T_J = 25\text{ }^\circ\text{C}$ | - | 121 | - | |
| Reverse recovery charge | Q_{rr} | $T_J = 25\text{ }^\circ\text{C}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 300 | - | nC |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | - | - | |

| 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) | 4U6 | | | |

Note

(1) Mounted on PCB with minimum pad size

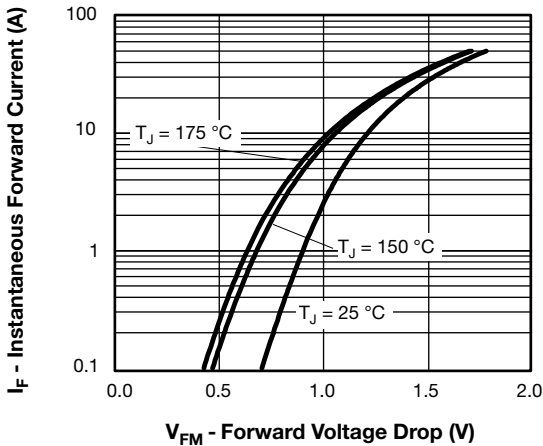


Fig. 1 - Typical Forward Voltage Drop Characteristics

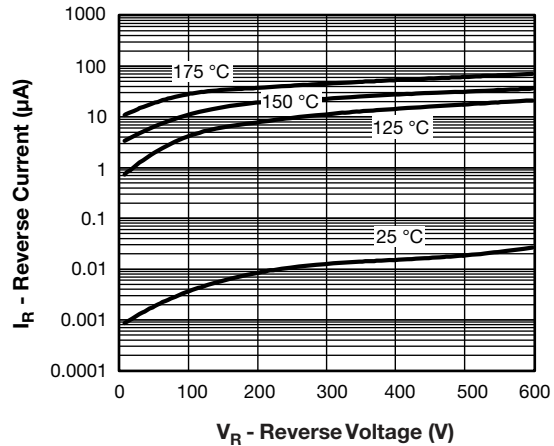


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

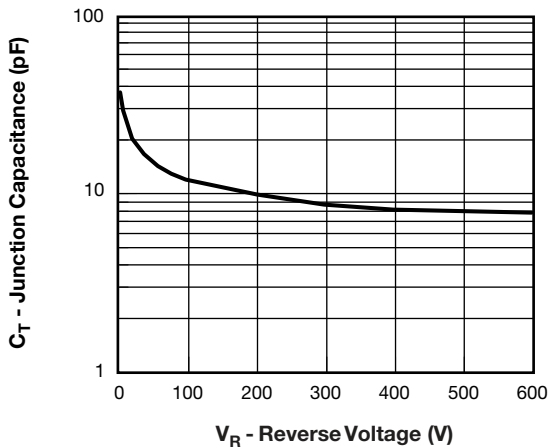


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

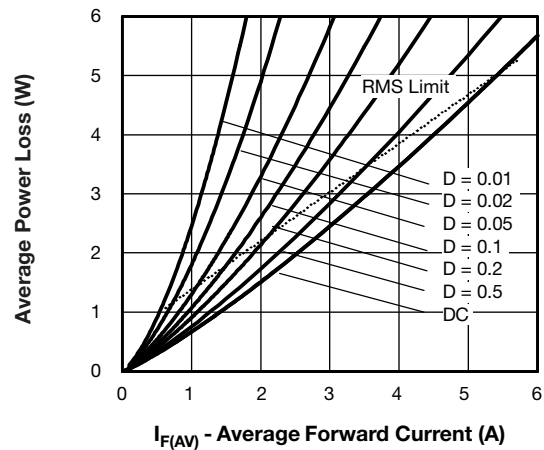


Fig. 5 - Forward Power Loss Characteristics

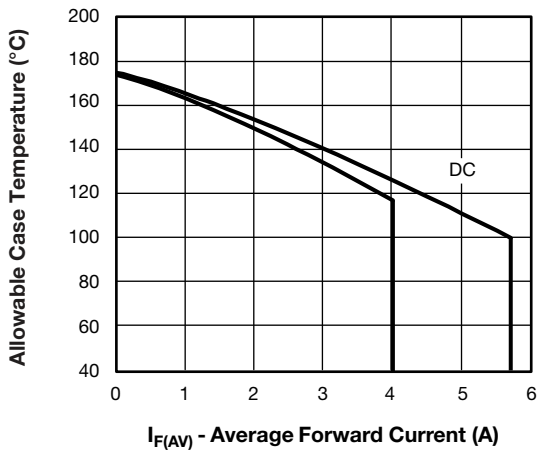


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

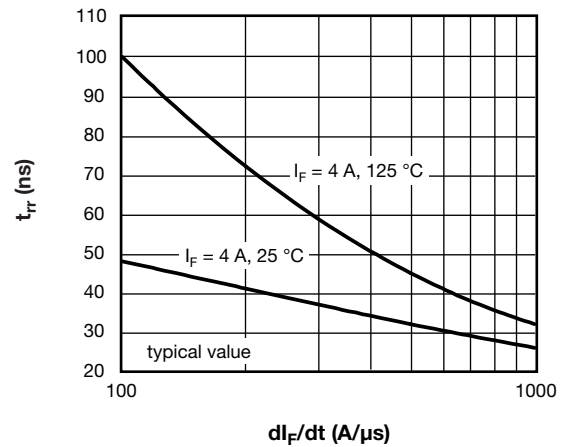


Fig. 6 - Typical Reverse Recovery vs. di/dt

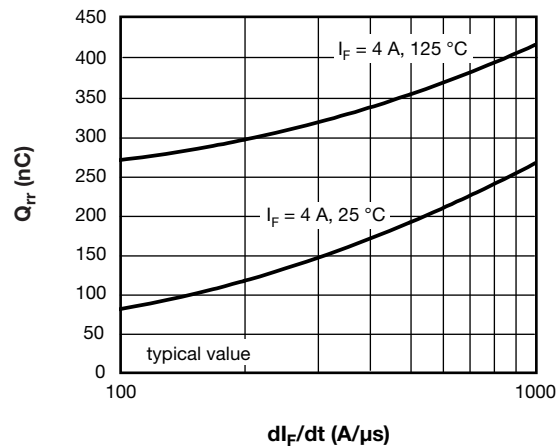
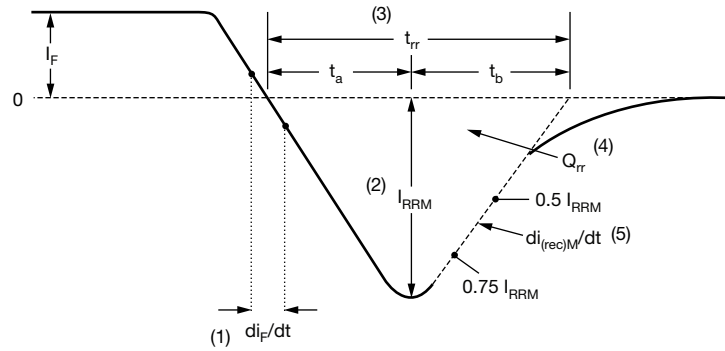


Fig. 7 - Typical Stored Charge vs. di/dt



- (1) di_F/dt - rate of change of current through zero crossing
- (2) I_{RRM} - peak reverse recovery current
- (3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through $0.75 I_{RRM}$ and $0.50 I_{RRM}$ extrapolated to zero current.
- (4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}
- $$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$
- (5) $di_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

Fig. 8 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

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

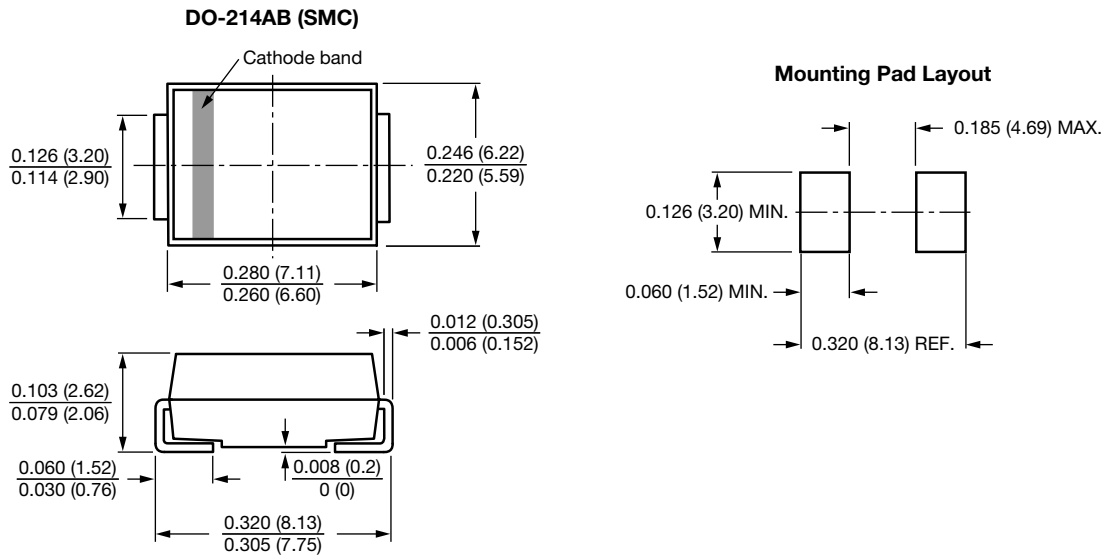
- 1** - Vishay Semiconductors product
- 2** - Current rating (4 = 4 A)
- 3** - Circuit configuration:
E = single diode
- 4** - C = SMC package
- 5** - Process type,
U = ultrafast recovery
- 6** - Voltage code (06 = 600 V)
- 7** - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| ORDERING INFORMATION (Example) | | | |
|---------------------------------------|-------------------|------------------------|------------------------------------|
| PREFERRED P/N | QUANTITY PER TUBE | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION |
| VS-4ECU06-M3/9AT | 9AT | 3500 | 13" diameter plastic tape and reel |

| LINKS TO RELATED DOCUMENTS | |
|-----------------------------------|--|
| Dimensions | www.vishay.com/doc?95402 |
| Part marking information | www.vishay.com/doc?95472 |
| Packaging information | www.vishay.com/doc?95404 |

SMC

DIMENSIONS in inches (millimeters)





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