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# Ultrafast Rectifier, 1 A FRED Pt®




DFN3820A

Anode ○—▶—○ Cathode

## FEATURES

- Very low profile - typical height of 0.88 mm
- Ideal for automated placement
- Wettable flanks allows easy inspection with AOI (automated optical inspection). No X-ray necessary
- Low forward voltage drop, low power losses
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- For PFC, CRM snubber operation
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

AUTOMOTIVE GRADE

RoHS COMPLIANT

HALOGEN FREE

## LINKS TO ADDITIONAL RESOURCES

Ultra Librarian EDA / CAD

## PRIMARY CHARACTERISTICS

| | |
|---|---|
| $I_{F(AV)}$ | 1 A |
| $V_R$ | 200 V |
| $V_F$ at $I_F$ | 0.72 V |
| $t_{rr}$ (typ.) | 15 ns |
| $I_{FSM}$ | 32 A |
| $T_J$ max. | 175 °C |
| Package | DFN3820A |
| Circuit configuration | Single |

## TYPICAL APPLICATIONS

For use in high frequency inverters, DC/DC converters, freewheeling diodes, clamping and snubber, polarity protection, dual voltage injector drivers, piezo drivers, ECU, Antilock Braking Systems (ABS), HID and LED lighting

## MECHANICAL DATA

**Case:** DFN3820A

Molding compound meets UL 94 V-0 flammability rating

**Terminals:** matte tin plated leads, solderable per J-STD-002, meets JESD 201 class 2 whisker test

**Polarity:** color band denotes cathode end

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|---|---|---|---|
| Peak repetitive reverse voltage | $V_{RRM}$ | | 200 | V |
| Average rectified forward current | $I_{F(AV)}$ | $T_M$ = 168 °C | 1 | A |
| Non-repetitive peak surge current | $I_{FSM}$ | $T_J$ = 25 °C, 10 ms sine pulse | 32 | |
| Operating junction and storage temperatures | $T_J$, $T_{Stg}$ | | -55 to +175 | °C |

## ELECTRICAL SPECIFICATIONS ($T_J$ = 25 °C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|---|
| Breakdown voltage, blocking voltage | $V_{BR}$, $V_R$ | $I_R$ = 100 µA | 200 | - | - | V |
| Forward voltage | $V_F$ | $I_F$ = 1 A | - | 0.88 | 0.97 | |
| | | $I_F$ = 1 A, $T_J$ = 150 °C | - | 0.72 | 0.76 | |
| Reverse leakage current | $I_R$ | $V_R$ = $V_R$ rated | - | - | 1 | µA |
| | | $T_J$ = 150 °C, $V_R$ = $V_R$ rated | - | - | 50 | |
| Junction capacitance | $C_T$ | $V_R$ = 200 V | - | 5 | - | pF |



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| DYNAMIC RECOVERY CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified) | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | $t_{rr}$ | $I_F$ = 0.5 A, $I_R$ = 1 A, $I_{rr}$ = 0.25 A | | - | 15 | 23 | ns |
| | | $T_J$ = 25 °C | $I_F$ = 1 A<br>$dI_F/dt$ = 500 A/µs<br>$V_R$ = 200 V | - | 9 | - | |
| | | $T_J$ = 125 °C | | - | 13 | - | |
| Peak recovery current | $I_{RRM}$ | $T_J$ = 25 °C | | - | 2.1 | - | A |
| | | $T_J$ = 125 °C | | - | 3.1 | - | |
| Reverse recovery charge | $Q_{rr}$ | $T_J$ = 25 °C | | - | 11 | - | nC |
| | | $T_J$ = 125 °C | | - | 22 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Maximum junction and storage temperature range | $T_J$, $T_{Stg}$ | | -55 | - | 175 | °C |
| Thermal resistance, junction to mount | $R_{thJM}$ (1) | | - | 6.5 | 8.5 | °C/W |
| Thermal resistance, junction to ambient | $R_{thJA}$ | Device mounted on FR4 PCB, 2 oz. standard footprint | - | 140 | - | |
| Weight | | | - | 0.023 | - | g |
| Marking device | | Case style DFN3820A | 1H2 | | | |

**Note**

(1) Thermal resistance junction to mount follows JEDEC® 51-14 transient dual interface test method (TDIM)

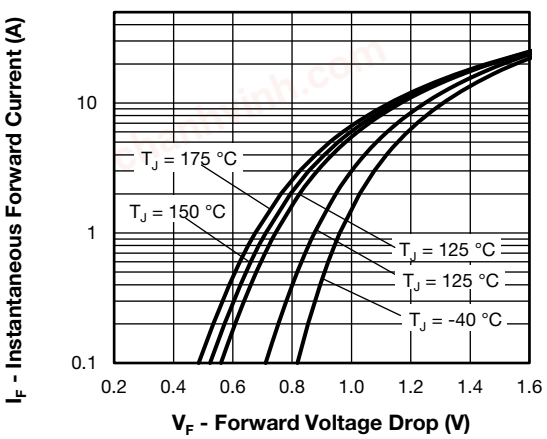



Fig. 1 - Typical Forward Voltage Drop Characteristics

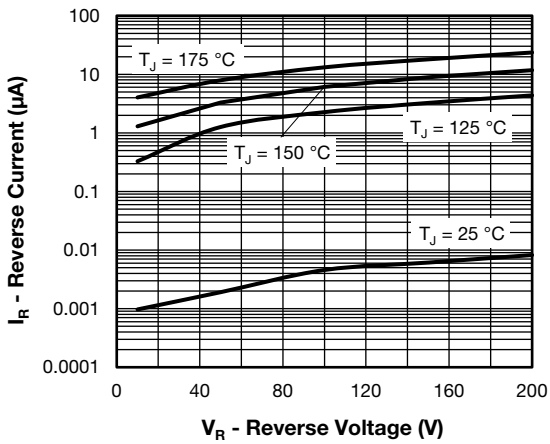



Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage


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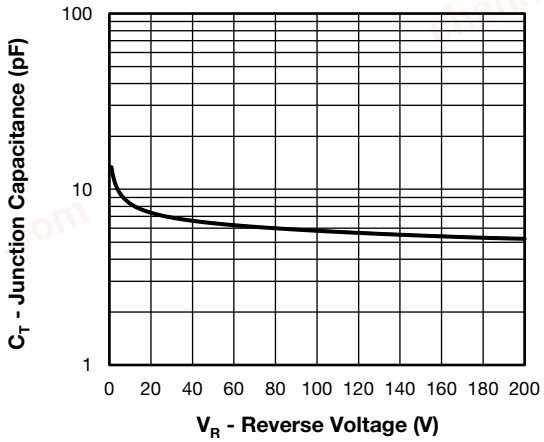



Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

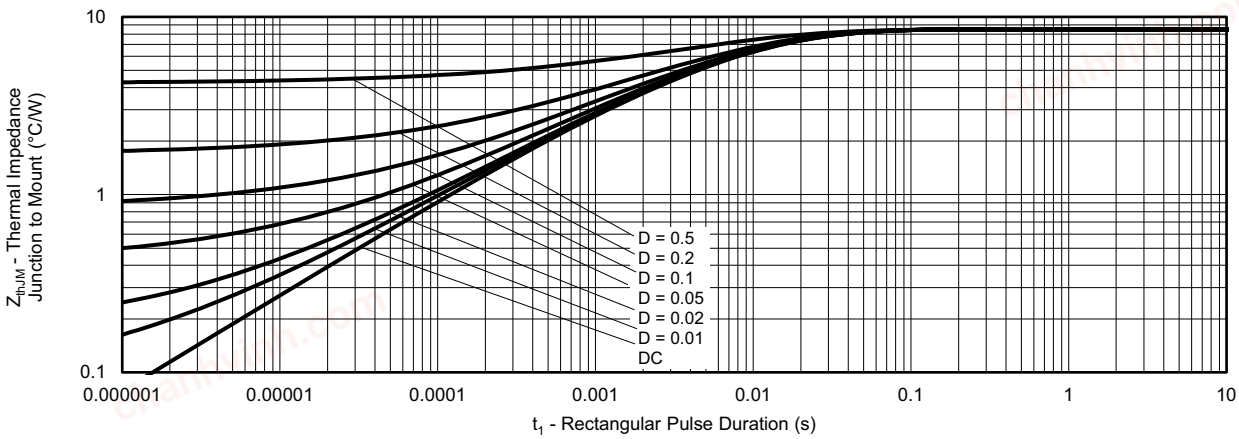



Fig. 4 - Maximum Transient Thermal Impedance, Junction to Mount

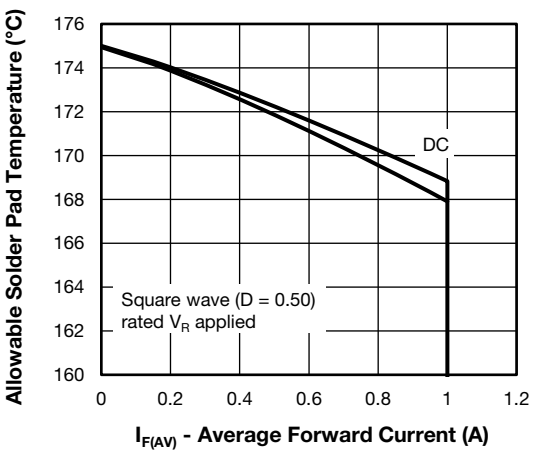



Fig. 5 - Maximum Allowable Mount Temperature vs. Average Forward Current

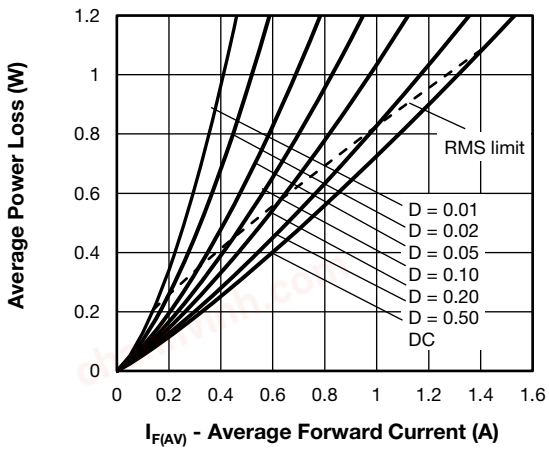



Fig. 6 - Forward Power Loss Characteristics

**Note**

Formula used: $T_M = T_J - (Pd + Pd_{REV}) \times R_{thJM}$;
Pd = forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 5);
$Pd_{REV}$ = inverse power loss = $V_{R1} \times I_R$ (1 - D); $I_R$ at $V_{R1}$ = rated $V_R$


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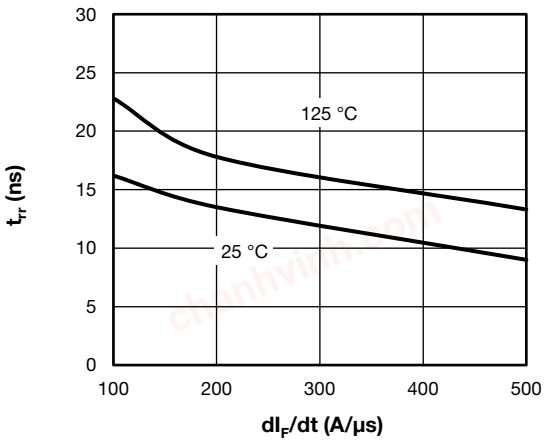



Fig. 7 - Typical Reverse Recovery Time vs. $dI_F/dt$

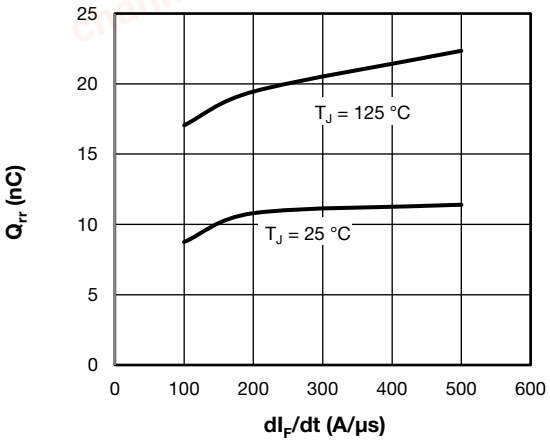



Fig. 8 - Typical Stored Charge vs. $dI_F/dt$

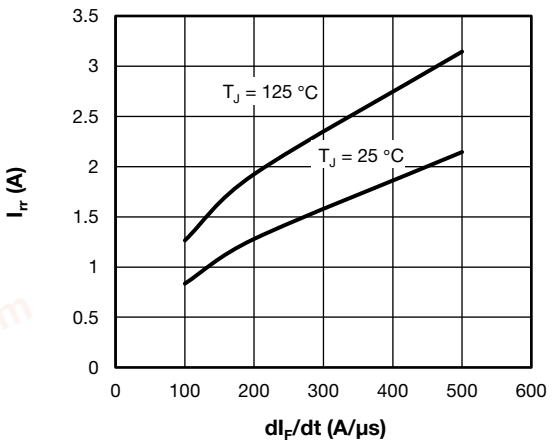
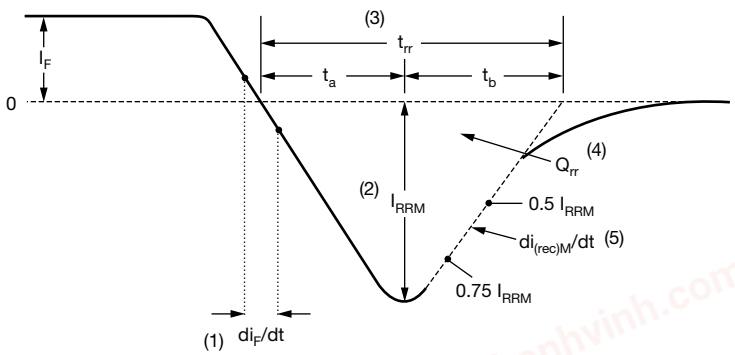



Fig. 9 - $I_{rr}$ vs. dI/dt




(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. 10 - Reverse Recovery Waveform and Definitions


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## ORDERING INFORMATION TABLE

Device code

| VS- | 1 | E | A | H | 02 | H | M3 |
|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |

1 - Vishay Semiconductors product
2 - Current rating (1 = 1 A)
3 - Circuit configuration:
E = single diode
4 - A = DFN3820A package
5 - Process type,
H = ultrafast recovery
6 - Voltage code (02 = 200 V)
7 - H = AEC-Q101 qualified
8 - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

| **ORDERING INFORMATION** (Example) | | | |
|---|---|---|---|
| **PREFERRED P/N** | **PREFERRED PACKAGE CODE** | **BASE QUANTITY** | **PACKAGING DESCRIPTION** |
| VS-1EAH02HM3/H | H | 3500 | 7" diameter plastic tape and reel |
| VS-1EAH02HM3/I | I | 14 000 | 13" diameter plastic tape and reel |

| **LINKS TO RELATED DOCUMENTS** | |
|---|---|
| Dimensions | www.vishay.com/doc?97066 |
| Part marking information | www.vishay.com/doc?97065 |
| Packaging information | www.vishay.com/doc?88869 |
| SPICE model | www.vishay.com/doc?97095 |

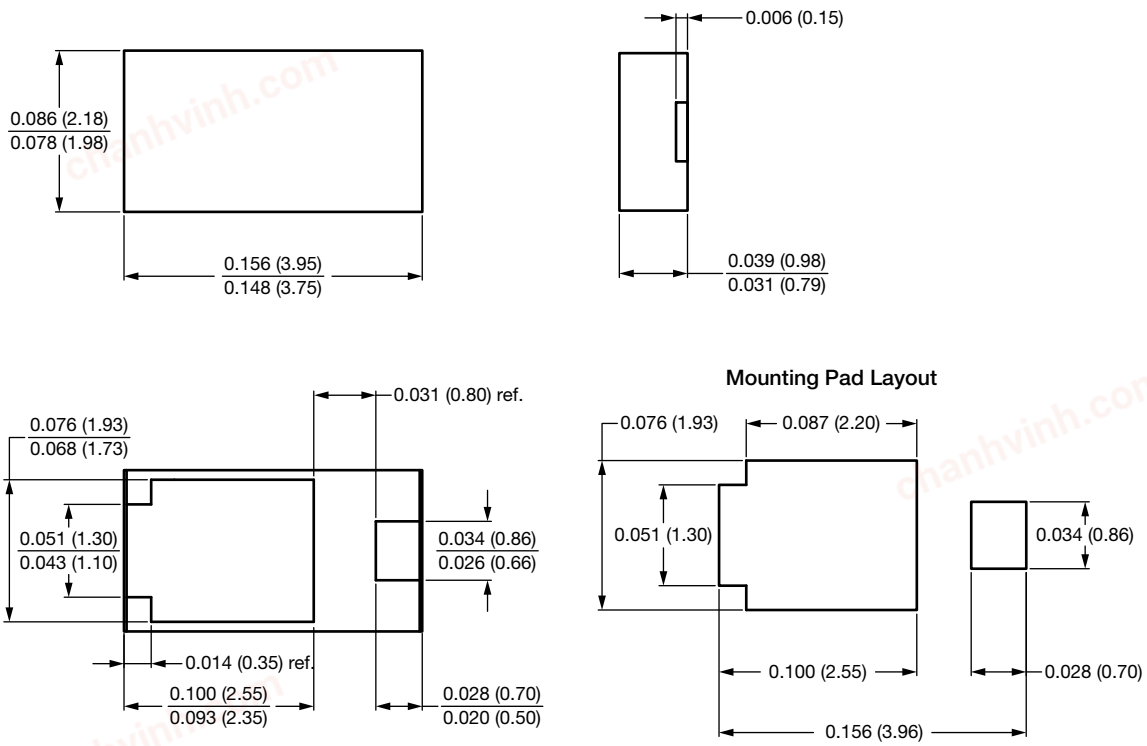

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# DFN3820A, FRED Pt®

**DIMENSIONS** in inches (millimeters)






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