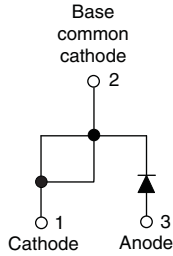
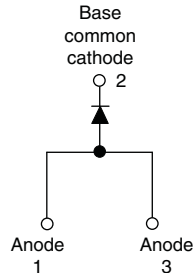


Ultrafast Soft Recovery Diode, 60 A FRED Pt®


TO-247AC modified

VS-60EPU02PbF

TO-247AC

VS-60APU02PbF

FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Output rectification
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified for industrial level


**RoHS
COMPLIANT**

BENEFITS

- Reduced RFI and EMI
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

DESCRIPTION/APPLICATIONS

These diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems.

The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for HF welding, power converters and other applications where switching losses are not significant portion of the total losses.

PRODUCT SUMMARY

| | |
|-----------------|---|
| Package | TO-247AC, TO-247AC modified (2 pins) |
| $I_{F(AV)}$ | 60 A |
| V_R | 200 V |
| V_F at I_F | 1.08 V |
| t_{rr} typ. | See Recovery table |
| T_J max. | 175 °C |
| Diode variation | Single die |

ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | TEST CONDITIONS | VALUES | UNITS |
|---|----------------|-----------------------|-------------|-------|
| Cathode to anode voltage | V_R | | 200 | V |
| Continuous forward current | $I_{F(AV)}$ | $T_C = 127\text{ °C}$ | 60 | A |
| Single pulse forward current | I_{FSM} | $T_C = 25\text{ °C}$ | 800 | |
| Maximum repetitive forward current | I_{FRM} | Square wave, 20 kHz | 120 | |
| Operating junction and storage temperatures | T_J, T_{Stg} | | - 55 to 175 | °C |

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 | $I_R = 100\text{ }\mu\text{A}$ | 200 | - | - | V |
| Forward voltage | V_F | $I_F = 60\text{ A}$ $I_F = 60\text{ A}, T_J = 175\text{ °C}$ | - | 0.98 0.81 | 1.08 0.88 | |
| Reverse leakage current | I_R | $V_R = V_R$ rated $T_J = 150\text{ °C}, V_R = V_R$ rated | - | - | 50 2 | μA mA |
| Junction capacitance | C_T | $V_R = 200\text{ V}$ | - | 87 | - | pF |
| Series inductance | L_S | Measured lead to lead 5 mm from package body | - | 8.0 | - | nH |

VS-60EPU02PbF, VS-60APU02PbF



Vishay Semiconductors Ultrafast Soft Recovery Diode,
60 A FRED Pt®

| DYNAMIC RECOVERY CHARACTERISTICS (T _C = 25 °C unless otherwise specified) | | | | | | |
|--|------------------|---|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Reverse recovery time | t _{rr} | I _F = 1.0 A, dI _F /dt = 200 A/μs, V _R = 30 V | - | - | 35 | ns |
| | | T _J = 25 °C | - | 28 | - | |
| | | T _J = 125 °C | - | 50 | - | |
| Peak recovery current | I _{RRM} | T _J = 25 °C | - | 4 | - | A |
| | | T _J = 125 °C | - | 8 | - | |
| Reverse recovery charge | Q _{rr} | T _J = 25 °C | - | 59 | - | nC |
| | | T _J = 125 °C | - | 220 | - | |

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | | |
|--------------------------------------|-------------------|--|---------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Thermal resistance, junction to case | R _{thJC} | | - | - | 0.70 | K/W |
| Thermal resistance, case to heatsink | R _{thCS} | Mounting surface, flat, smooth and greased | - | 0.2 | - | |
| Weight | | | - | 5.5 | - | g |
| | | | - | 0.2 | - | oz. |
| Mounting torque | | | - | - | 1.2 | N · m |
| Marking device | | Case style TO-247AC modified | 60EPU02 | | | |
| | | Case style TO-247AC | 60APU02 | | | |



VS-60EPU02PbF, VS-60APU02PbF

Ultrafast Soft Recovery Diode,
60 A FRED Pt®

Vishay Semiconductors

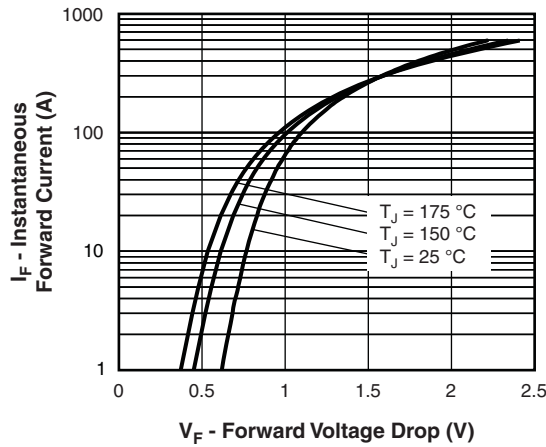


Fig. 1 - Typical Forward Voltage Drop Characteristics

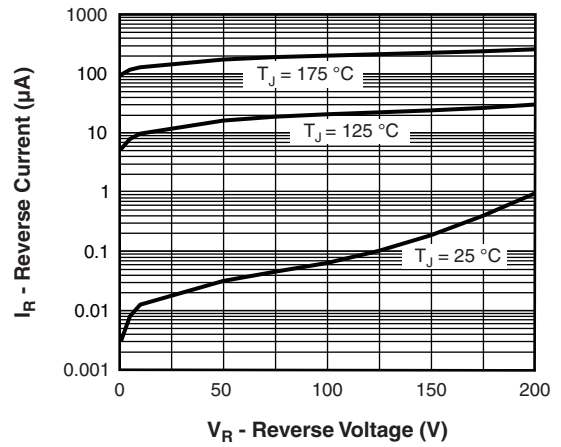


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

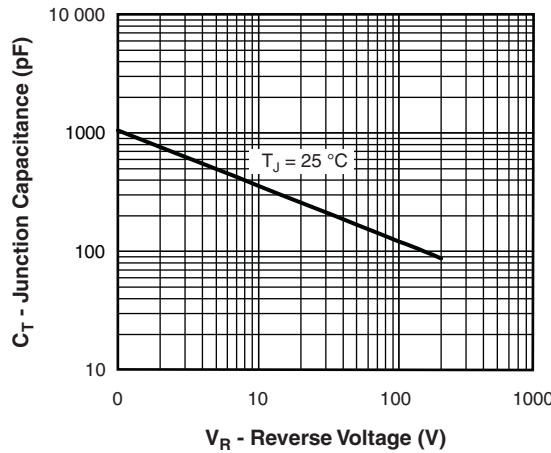


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

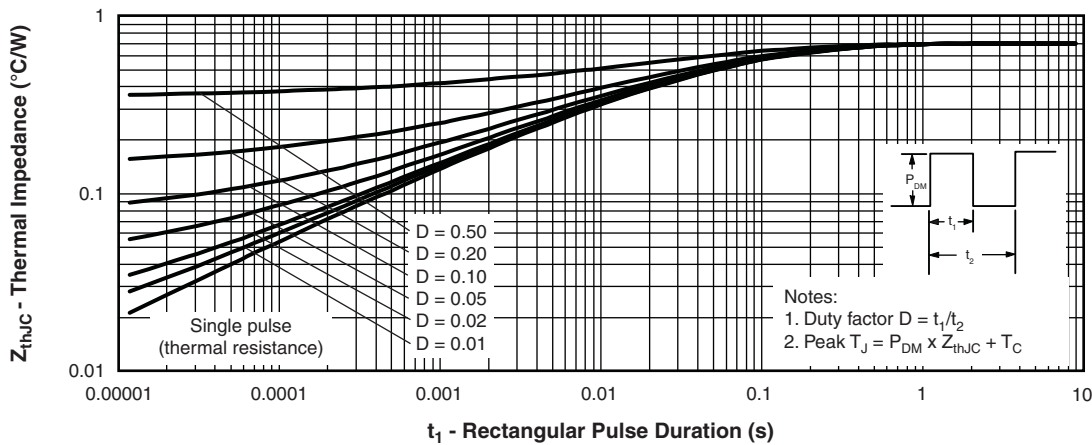


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

VS-60EPU02PbF, VS-60APU02PbF



Vishay Semiconductors Ultrafast Soft Recovery Diode,
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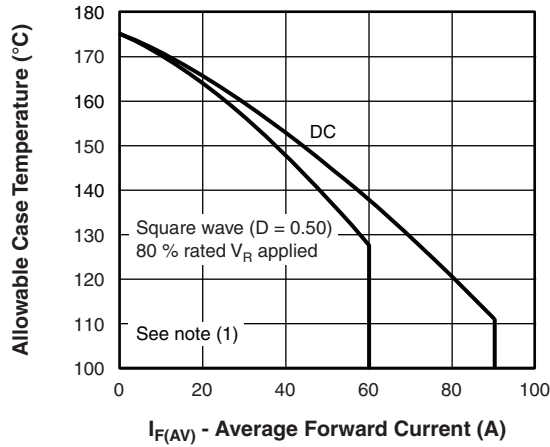


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

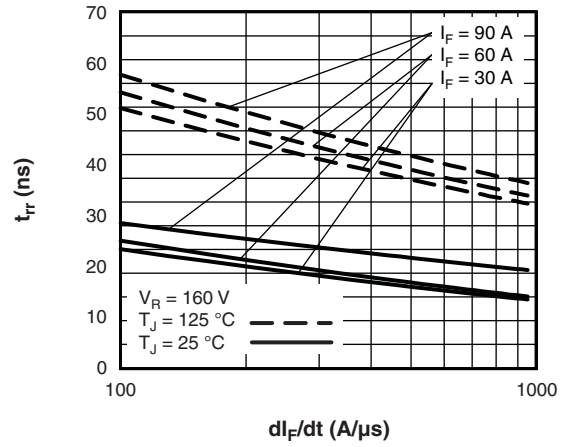


Fig. 7 - Typical Reverse Recovery Time vs. di_F/dt

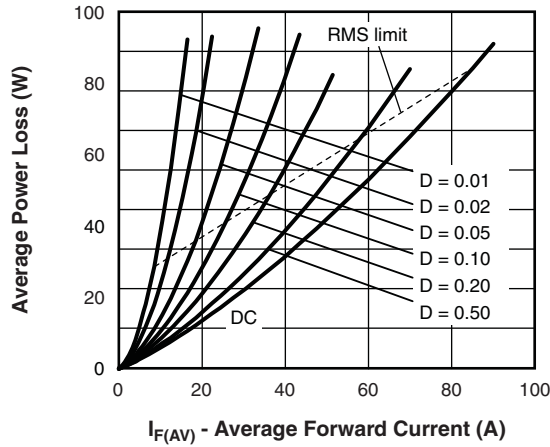


Fig. 6 - Forward Power Loss Characteristics

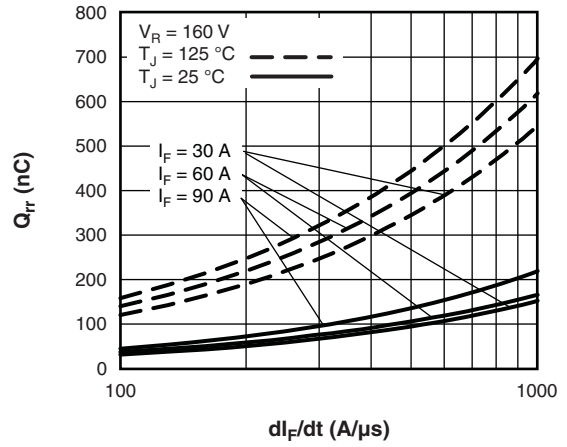


Fig. 8 - Typical Stored Charge vs. di_F/dt

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$;
 P_d = Forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 $P_{d_{REV}}$ = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at $V_{R1} = 80\%$ rated V_R

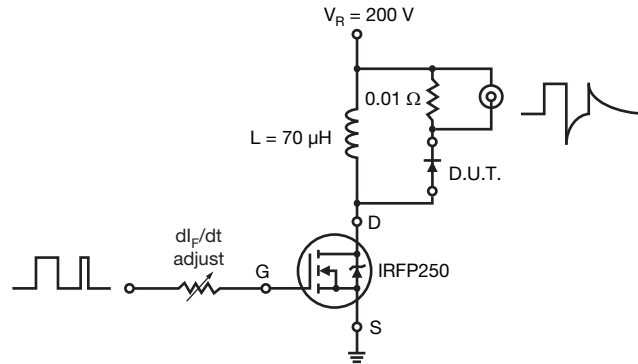
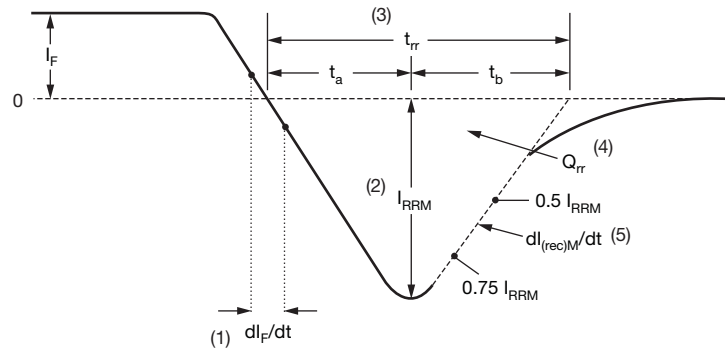


Fig. 9 - Reverse Recovery Parameter Test Circuit



- | | |
|---|---|
| <p>(1) di_F/dt - rate of change of current through zero crossing</p> <p>(2) I_{RRM} - peak reverse recovery current</p> <p>(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.</p> | <p>(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}</p> $Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$ <p>(5) $di_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}</p> |
|---|---|

Fig. 10 - Reverse Recovery Waveform and Definitions

VS-60EPU02PbF, VS-60APU02PbF



Vishay Semiconductors Ultrafast Soft Recovery Diode,
60 A FRED Pt®

ORDERING INFORMATION TABLE

| | | | | | | | |
|-------------|------------|-----------|----------|----------|----------|-----------|------------|
| Device code | VS- | 60 | E | P | U | 02 | PbF |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

- 1** - Vishay Semiconductors product
- 2** - Current rating (60 = 60 A)
- 3** - Circuit configuration:
 - E = Single diode
 - A = Single diode, 3 pins
- 4** - Package:
 - P = TO-247AC (modified)
- 5** - Type of silicon:
 - U = Ultrafast recovery
- 6** - Voltage rating (02 = 200 V)
- 7** - PbF = Lead (Pb)-free

Tube standard pack quantity: 25 pieces

| LINKS TO RELATED DOCUMENTS | | |
|----------------------------|-------------------|--|
| Dimensions | TO-247AC modified | www.vishay.com/doc?95253 |
| | TO-247AC | www.vishay.com/doc?95223 |
| Part marking information | TO-247AC modified | www.vishay.com/doc?95255 |
| | TO-247AC | www.vishay.com/doc?95226 |
| SPICE model | | www.vishay.com/doc?95416 |



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