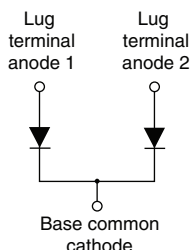


# Gen 2 High Performance Schottky Rectifier Not Insulated TO-244 Power Module 200 V, 400 A



TO-244



## FEATURES

- Max.  $T_J = 175\text{ }^{\circ}\text{C}$
- Trench MOS Barrier Schottky technology
- Ultra low forward voltage drop
- Easy to use and parallel
- Optimized for power conversion: welding and industrial SMPS applications
- Designed for industrial level
- UL approved file E222165 
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


RoHS  
COMPLIANT

## BENEFITS

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

## DESCRIPTION / APPLICATIONS

The VS-402CNQ200PBF not insulated modules integrate two state of the art Trench MOS barrier Schottky technology rectifiers in the compact industry standard TO244 package.

These devices are thus intended for high frequency converters and switching power supplies.

## PRIMARY CHARACTERISTICS

|                                                            |                           |
|------------------------------------------------------------|---------------------------|
| $I_{F(AV)}$ , module - $T_C = 128\text{ }^{\circ}\text{C}$ | 400 A                     |
| $V_R$                                                      | 200 V                     |
| $Q_{rr}$ (typical)                                         | 540 nC                    |
| $t_{rr}$                                                   | 132 ns                    |
| Type                                                       | Modules - diode, Schottky |
| Package                                                    | TO-244                    |
| Circuit configuration                                      | Two diodes common cathode |

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                              | SYMBOL      | TEST CONDITIONS                                                  | MAX.        | UNITS              |
|----------------------------------------|-------------|------------------------------------------------------------------|-------------|--------------------|
| Cathode to anode voltage               | $V_R$       |                                                                  | 200         | V                  |
| Continuous forward current per diode   | $I_{F(DC)}$ | $T_C = 25\text{ }^{\circ}\text{C}$                               | 551         | A                  |
|                                        |             | $T_C = 85\text{ }^{\circ}\text{C}$                               | 397         |                    |
|                                        |             | $T_C = 143\text{ }^{\circ}\text{C}$                              | 200         |                    |
| Single pulse forward current per diode | $I_{FSM}$   | $T_C = 175\text{ }^{\circ}\text{C}$ , $t = 6\text{ ms}$ , square | 2100        |                    |
| Maximum power dissipation              | $P_D$       | $T_C = 25\text{ }^{\circ}\text{C}$                               | 789         | W                  |
|                                        |             | $T_C = 85\text{ }^{\circ}\text{C}$                               | 474         |                    |
| Operating junction temperatures        | $T_J$       |                                                                  | -40 to +175 | $^{\circ}\text{C}$ |
| Storage temperatures                   | $T_{Stg}$   |                                                                  | -40 to +150 | $^{\circ}\text{C}$ |

## ELECTRICAL SPECIFICATIONS PER LEG ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

| PARAMETER                            | SYMBOL   | TEST CONDITIONS                                                           | MIN. | TYP.  | MAX.  | UNITS         |
|--------------------------------------|----------|---------------------------------------------------------------------------|------|-------|-------|---------------|
| Breakdown voltage                    | $V_{BR}$ | $I_R = 2\text{ mA}$                                                       | 200  | -     | -     |               |
| Forward voltage                      | $V_{FM}$ | $I_F = 200\text{ A}$                                                      | -    | 0.845 | 1.045 | V             |
|                                      |          | $I_F = 400\text{ A}$                                                      | -    | 0.958 | 1.358 |               |
|                                      |          | $I_F = 200\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$                | -    | 0.715 | -     |               |
|                                      |          | $I_F = 400\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$                | -    | 0.850 | -     |               |
| Reverse leakage current              | $I_{RM}$ | $T_J = 25\text{ }^{\circ}\text{C}$ , $V_R = 200\text{ V}$                 | -    | 50    | 200   | $\mu\text{A}$ |
|                                      | $I_{RM}$ | $T_J = 175\text{ }^{\circ}\text{C}$ , $V_R = 200\text{ V}$                | -    | 198   | 500   | mA            |
| Maximum junction capacitance per leg | $C_T$    | $V_{DC} = 5\text{ V}$ , $f = 1\text{ MHz}$ , $25\text{ }^{\circ}\text{C}$ | -    | -     | 20    | nF            |
| Series inductance                    | $L_S$    | From top of terminal hole to mounting plane                               | -    | 5     | -     | nH            |

**DYNAMIC RECOVERY CHARACTERISTICS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

| PARAMETER               | SYMBOL    | TEST CONDITIONS                     | MIN. | TYP. | MAX. | UNITS |
|-------------------------|-----------|-------------------------------------|------|------|------|-------|
| Reverse recovery time   | $t_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  | -    | 132  | -    | ns    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$ | -    | 155  | -    |       |
| Peak recovery current   | $I_{RRM}$ | $T_J = 25\text{ }^{\circ}\text{C}$  | -    | 6    | -    | A     |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$ | -    | 8    | -    |       |
| Reverse recovery charge | $Q_{rr}$  | $T_J = 25\text{ }^{\circ}\text{C}$  | -    | 540  | -    | nC    |
|                         |           | $T_J = 125\text{ }^{\circ}\text{C}$ | -    | 840  | -    |       |

**THERMAL - MECHANICAL SPECIFICATIONS**

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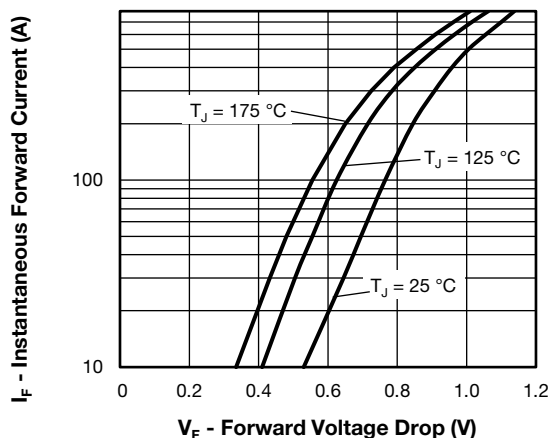


Fig. 1 - Typical Forward Voltage Drop vs. Instantaneous Forward Current (Per Diode)

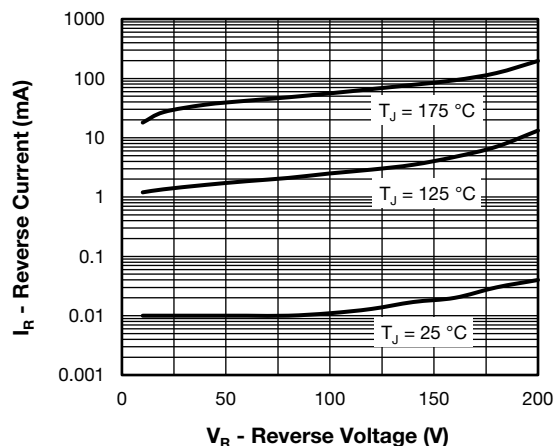


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Diode)

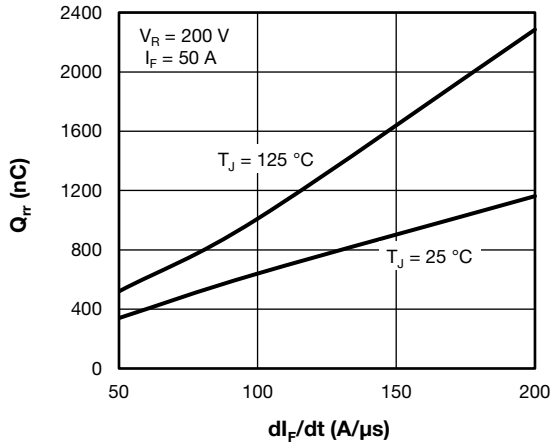


Fig. 3 - Typical Reverse Recovery Charge vs.  $dI_F/dt$  (Per Diode)

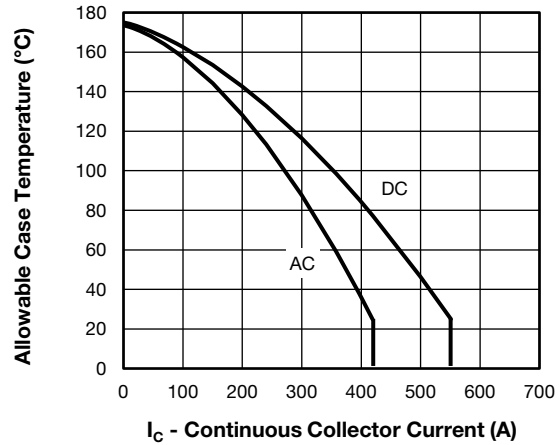


Fig. 6 - Maximum Continuous Forward Current vs. Case Temperature

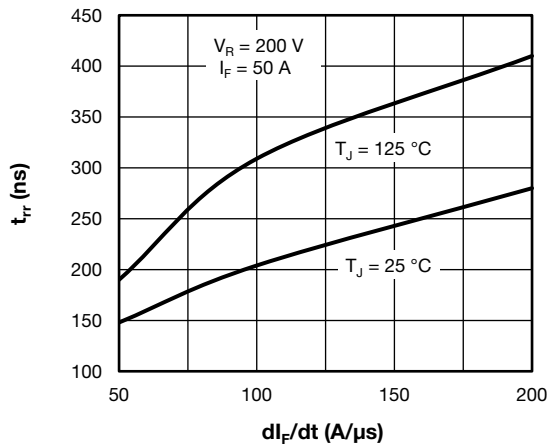


Fig. 4 - Typical Reverse Recovery Time vs  $dI_F/dt$  (Per Diode)

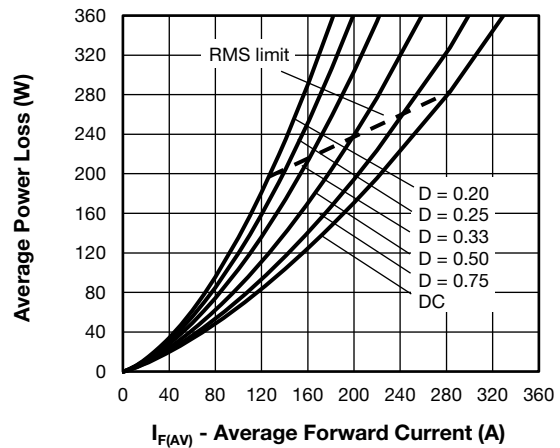


Fig. 7 - Average Power Loss vs Average Forward Current (Forward Power Loss Characteristics)

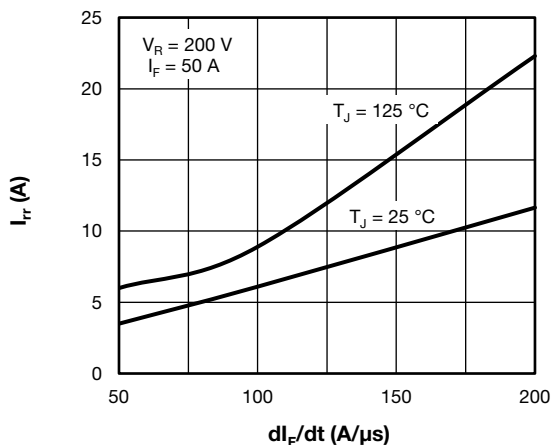


Fig. 5 - Typical Reverse Recovery Current vs.  $dI_F/dt$  (Per Diode)

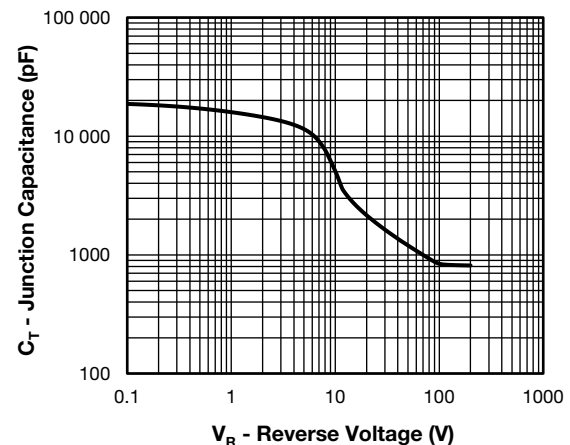


Fig. 8 - Typical Junction Capacitance vs. Reverse Voltage

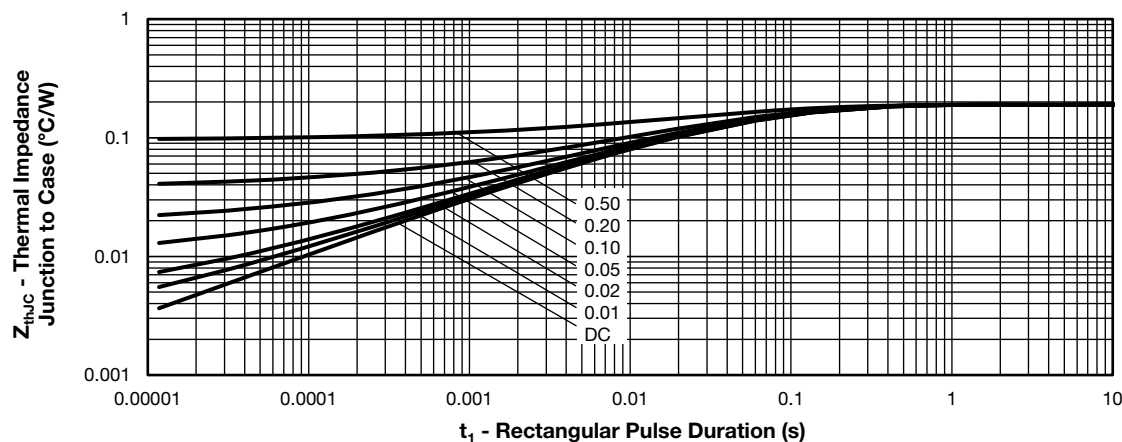


Fig. 9 -  $Z_{th,JC}$  Maximum Thermal Impedance Junction to Case vs.  $t_1$  Rectangular Pulse Duration

## ORDERING INFORMATION TABLE

|             |     |    |   |   |   |   |     |     |
|-------------|-----|----|---|---|---|---|-----|-----|
| Device code | VS- | 40 | 2 | C | N | Q | 200 | PbF |
|             | 1   | 2  | 3 | 4 | 5 | 6 | 7   | 8   |

- 1 - Vishay Semiconductors product
- 2 - Average current rating (x 10)
- 3 - Product silicon identification
- 4 - Circuit configuration:  
C = two diodes common cathode
- 5 - N = not isolated
- 6 - Q = Schottky rectifier diode
- 7 - 200 = 200 V
- 8 - PbF = lead (Pb)-free

| Circuit Configuration     |                            |                 |
|---------------------------|----------------------------|-----------------|
| Circuit                   | Circuit Configuration Code | Circuit Drawing |
| Two diodes common cathode | C                          |                 |

| LINKS TO RELATED DOCUMENTS |                                                                        |
|----------------------------|------------------------------------------------------------------------|
| Dimensions                 | <a href="http://www.vishay.com/doc295021">www.vishay.com/doc295021</a> |



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