Trench MOS Barrier Schottky Rectifier for PV Solar Cell Bypass Protection

Ultra Low $V_F = 0.28$ V at $I_F = 5$ A

**FEATURES**
- Trench MOS Schottky technology
- Low forward voltage drop, low power losses
- High efficiency operation
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Material categorization:
  - For definitions of compliance please see www.vishay.com/doc?99912

**TYPICAL APPLICATIONS**
For use in solar cell junction box as a bypass diode for protection, using DC forward current without reverse bias.

**MECHANICAL DATA**
**Case:** TO-263AB
Molding compound meets UL 94 V-0 flammability rating
Base P/N-E3 - RoHS-compliant and commercial grade
**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD 22-B102
E3 suffix meets JESD 201 class 1A whisker test
**Polarity:** As marked
**Mounting Torque:** 10 in-lbs maximum

**PRIME CHARACTERISTICS**
- $I_{RDC}$: 40 A
- $V_{RRM}$: 45 V
- $I_{FSM}$: 240 A
- $V_F$ at $I_F = 40$ A: 0.51 V
- $T_{OP}$ max. (AC mode): 150 °C
- $T_J$ max. (DC forward current): 200 °C

**MAXIMUM RATINGS** ($T_A = 25$ °C unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>VBT4045BP</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum repetitive peak reverse voltage</td>
<td>$V_{RRM}$</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>Maximum DC forward bypassing current (fig. 1)</td>
<td>$I_{F(DC)}$ (1)</td>
<td>40</td>
<td>A</td>
</tr>
<tr>
<td>Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load</td>
<td>$I_{FSM}$</td>
<td>240</td>
<td>A</td>
</tr>
<tr>
<td>Operating junction temperature range (AC mode)</td>
<td>$T_{OP}$</td>
<td>-40 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Junction temperature in DC forward current without reverse bias, $t \leq 1$ h</td>
<td>$T_J$ (1)</td>
<td>≤ 200</td>
<td>°C</td>
</tr>
</tbody>
</table>

Notes
(1) With heatsink
(2) Meets the requirements of IEC 61215 Ed. 2 bypass diode thermal test
VBT4045BP-E3
Vishay General Semiconductor

ELECTRICAL CHARACTERISTICS (T_A = 25 °C unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>TEST CONDITIONS</th>
<th>SYMBOL</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous forward voltage</td>
<td></td>
<td>V_F (1)</td>
<td>0.41</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>I_F = 5 A</td>
<td></td>
<td>0.50</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T_A = 25 °C</td>
<td></td>
<td>0.57</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I_F = 20 A</td>
<td></td>
<td>0.28</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T_A = 125 °C</td>
<td></td>
<td>0.41</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I_F = 40 A</td>
<td></td>
<td>0.51</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Reverse current</td>
<td>V_R = 45 A</td>
<td>I_R (2)</td>
<td>-</td>
<td>3000</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td>T_A = 25 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T_A = 125 °C</td>
<td></td>
<td>29</td>
<td>85</td>
<td>mA</td>
</tr>
</tbody>
</table>

Notes
(1) Pulse test: 300 μs pulse width, 1 % duty cycle
(2) Pulse test: Pulse width ≤ 40 ms

THERMAL CHARACTERISTICS (T_A = 25 °C unless otherwise noted)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>VBT4045BP</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical thermal resistance</td>
<td>R_θJC</td>
<td>0.8</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

ORDERING INFORMATION (Example)

<table>
<thead>
<tr>
<th>PACKAGE</th>
<th>PREFERRED P/N</th>
<th>UNIT WEIGHT (g)</th>
<th>PACKAGE CODE</th>
<th>BASE QUANTITY</th>
<th>DELIVERY MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO-263AB</td>
<td>VBT4045BP-E3/4W</td>
<td>1.37</td>
<td>4W</td>
<td>50/tube</td>
<td>Tube</td>
</tr>
<tr>
<td>TO-263AB</td>
<td>VBT4045BP-E3/8W</td>
<td>1.37</td>
<td>8W</td>
<td>800/reel</td>
<td>Tape and reel</td>
</tr>
</tbody>
</table>

RATINGS AND CHARACTERISTICS CURVES (T_A = 25 °C unless otherwise noted)
**Fig. 3 - Typical Reverse Characteristics**

- Percent of Rated Peak reverse Voltage (%)
- Percent of rated peak reverse voltage (%)

**Fig. 4 - Typical Junction Capacitance**

- Junction Capacitance (pF)
- Junction capacitance (pF)

**Fig. 5 - Typical Transient Thermal Impedance**

- Transient Thermal Impedance (°C/W)
- Transient thermal impedance (°C/W)

**PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)

**TO-263AB**

- Mounting Pad Layout
- Mounting pad layout

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

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