1. General description

NPN general-purpose transistor in an ultra small DFN1412D-3 (SOT8009) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks.

Table 1. Product overview

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>JEDEC</th>
<th>Version</th>
<th>PNP complement</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC817-16QC-Q</td>
<td>DFN1412D-3</td>
<td>MO-340CA</td>
<td>SOT8009</td>
<td>BC807-16QC-Q</td>
</tr>
<tr>
<td>BC817-25QC-Q</td>
<td>DFN1412D-3</td>
<td>MO-340CA</td>
<td>SOT8009</td>
<td>BC807-25QC-Q</td>
</tr>
<tr>
<td>BC817-40QC-Q</td>
<td>DFN1412D-3</td>
<td>MO-340CA</td>
<td>SOT8009</td>
<td>BC807-40QC-Q</td>
</tr>
</tbody>
</table>

2. Features and benefits

- High power dissipation capability
- High current
- Three current gain selections
- Suitable for Automatic Optical Inspection (AOI) of solder joint
- Smaller footprint compared to conventional leaded SMD packages
- Low package height of 0.5 mm
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- General-purpose switching and amplification
- Space restricted applications

4. Quick reference data

Table 2. Quick reference data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>I_C</td>
<td>collector current</td>
<td>$T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>mA</td>
</tr>
<tr>
<td>I_{CM}</td>
<td>peak collector current</td>
<td>single pulse; $t_p \leq 1 , \text{ms}; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>h_{FE}</td>
<td>DC current gain</td>
<td>$V_{CE} = 1 , V; I_C = 100 , mA T_{amb} = 25 , ^\circ C$</td>
<td>[1]</td>
<td>100</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CE} = 1 , V; I_C = 100 , mA T_{amb} = 25 , ^\circ C$</td>
<td>[1]</td>
<td>160</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CE} = 1 , V; I_C = 100 , mA T_{amb} = 25 , ^\circ C$</td>
<td>[1]</td>
<td>250</td>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>

[1] pulsed; $t_p \leq 300 \, \mu s; \delta \leq 0.02$
5. Pinning information

Table 3. Pinning

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
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<tbody>
<tr>
<td>1</td>
<td>B</td>
<td>base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>E</td>
<td>emitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>collector</td>
<td></td>
<td></td>
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6. Ordering information

Table 4. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC817-16QC-Q</td>
<td>DFN1412D-3</td>
<td>DFN1412D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body: 1.4 x 1.2 x 0.5 mm</td>
<td>SOT8009 (MO-340CA)</td>
<td></td>
</tr>
<tr>
<td>BC817-25QC-Q</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC817-40QC-Q</td>
<td></td>
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<td></td>
<td></td>
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7. Marking

Table 5. Marking

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC817-16QC-Q</td>
<td>9N</td>
</tr>
<tr>
<td>BC817-25QC-Q</td>
<td>9N</td>
</tr>
<tr>
<td>BC817-40QC-Q</td>
<td>9P</td>
</tr>
</tbody>
</table>
8. Limiting values

Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{CBO}</td>
<td>collector-base voltage</td>
<td>open emitter; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>50</td>
<td>V</td>
</tr>
<tr>
<td>V_{CEO}</td>
<td>collector-emitter voltage</td>
<td>open base; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>V_{EBO}</td>
<td>emitter-base voltage</td>
<td>open collector; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>I_c</td>
<td>collector current</td>
<td>$T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>500</td>
<td>mA</td>
</tr>
<tr>
<td>I_{CM}</td>
<td>peak collector current</td>
<td>single pulse; $t_p \leq 1 , ms; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>I_{BM}</td>
<td>peak base current</td>
<td>single pulse; $t_p \leq 1 , ms; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>200</td>
<td>mA</td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>$T_{amb} = 25 , ^\circ C$</td>
<td>[1]</td>
<td>380</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>480</td>
<td>mW</td>
</tr>
<tr>
<td>T_j</td>
<td>junction temperature</td>
<td></td>
<td>-</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{amb}</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>150</td>
<td>°C</td>
</tr>
</tbody>
</table>


Fig. 1. Power derating curves for SOT8009

(1) FR4 PCB; single-sided 70 μm copper, tin-plated and standard footprint
(2) FR4 PCB; single-sided 35 μm copper, tin-plated and standard footprint
9. Thermal characteristics

Table 7. Thermal characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th(j-a)}$</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air; $T_{amb} = 25^\circ C$</td>
<td>[1]</td>
<td>-</td>
<td>-</td>
<td>329 K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>-</td>
<td>-</td>
<td>261 K/W</td>
</tr>
</tbody>
</table>


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
## 10. Characteristics

### Table 8. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{(BR)CBO} )</td>
<td>collector-base breakdown voltage</td>
<td>( I_C = 100 \mu A; I_E = 0 \mu A; T_{amb} = 25 ^\circ C )</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>( V_{(BR)CEO} )</td>
<td>collector-emitter breakdown voltage</td>
<td>( I_C = 10 mA; I_E = 0 A; T_{amb} = 25 ^\circ C )</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>( V_{(BR)EBO} )</td>
<td>emitter-base breakdown voltage</td>
<td>( I_E = 100 \mu A; I_C = 0 A; T_{amb} = 25 ^\circ C )</td>
<td>5</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>( I_CBO )</td>
<td>collector-base cut-off current</td>
<td>( V_{CB} = 20 V; I_E = 0 A; T_{amb} = 25 ^\circ C )</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>( I_CBO )</td>
<td>collector-base cut-off current</td>
<td>( V_{CB} = 20 V; I_E = 0 A; T_{j} = 150 ^\circ C )</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>μA</td>
</tr>
<tr>
<td>( I_EBO )</td>
<td>emitter-base cut-off current</td>
<td>( V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 ^\circ C )</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>( h_{FE} )</td>
<td>DC current gain</td>
<td>( V_{CE} = 1 V; I_C = 100 mA; T_{amb} = 25 ^\circ C ) [1]</td>
<td>100</td>
<td>-</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CE} = 1 V; I_C = 100 mA; T_{amb} = 25 ^\circ C ) [1]</td>
<td>160</td>
<td>-</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CE} = 1 V; I_C = 100 mA; T_{amb} = 25 ^\circ C ) [1]</td>
<td>250</td>
<td>-</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>( V_{CEsat} )</td>
<td>collector-emitter saturation voltage</td>
<td>( I_C = 500 mA; I_B = 50 mA; T_{amb} = 25 ^\circ C ) [1]</td>
<td>-</td>
<td>-</td>
<td>700</td>
<td>mV</td>
</tr>
<tr>
<td>( V_{BE} )</td>
<td>base-emitter voltage</td>
<td>( V_{CE} = 1 V; I_C = 500 mA; T_{amb} = 25 ^\circ C ) [1]</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>V</td>
</tr>
<tr>
<td>( f_T )</td>
<td>transition frequency</td>
<td>( V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz; T_{amb} = 25 ^\circ C )</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>MHz</td>
</tr>
<tr>
<td>( C_C )</td>
<td>collector capacitance</td>
<td>( V_{CB} = 10 V; I_E = I_a = 0 A; f = 1 MHz; T_{amb} = 25 ^\circ C )</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

[1] pulsed; \( t_p \leq 300 \mu s; \delta \leq 0.02 \)
**Nexperia**

**BC817QC-Q series**

45 V, 500 mA NPN general-purpose transistors

---

**Fig. 4.** BC817-16QC-Q: DC current gain as a function of collector current; typical values

\[ V_{CE} = 1 \text{ V} \]

1. \( T_{\text{amb}} = 150 \degree \text{C} \)
2. \( T_{\text{amb}} = 25 \degree \text{C} \)
3. \( T_{\text{amb}} = -55 \degree \text{C} \)

**Fig. 5.** BC817-16QC-Q: Collector current as a function of collector-emitter voltage; typical values

\[ T_{\text{amb}} = 25 \degree \text{C} \]

1. \( I_{B} = 16.0 \text{ mA} \)
2. \( I_{B} = 14.4 \text{ mA} \)
3. \( I_{B} = 12.8 \text{ mA} \)
4. \( I_{B} = 11.2 \text{ mA} \)
5. \( I_{B} = 9.6 \text{ mA} \)
6. \( I_{B} = 8.0 \text{ mA} \)
7. \( I_{B} = 6.4 \text{ mA} \)
8. \( I_{B} = 4.8 \text{ mA} \)
9. \( I_{B} = 3.2 \text{ mA} \)
10. \( I_{B} = 1.6 \text{ mA} \)

**Fig. 6.** BC817-16QC-Q: Base-emitter saturation voltage as a function of collector current; typical values

\[ \text{IC/IB} = 10 \]

1. \( T_{\text{amb}} = -55 \degree \text{C} \)
2. \( T_{\text{amb}} = 25 \degree \text{C} \)
3. \( T_{\text{amb}} = 150 \degree \text{C} \)

**Fig. 7.** BC817-16QC-Q: Collector-emitter saturation voltage as a function of collector current; typical values

\[ \text{IC/IB} = 10 \]

1. \( T_{\text{amb}} = 150 \degree \text{C} \)
2. \( T_{\text{amb}} = 25 \degree \text{C} \)
3. \( T_{\text{amb}} = -55 \degree \text{C} \)
BC817QC-Q series
45 V, 500 mA NPN general-purpose transistors

Fig. 8. BC817-25QC-Q: DC current gain as a function of collector current; typical values

V_{CE} = 1 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 9. BC817-25QC-Q: Collector current as a function of collector-emitter voltage; typical values

T_{amb} = 25 °C
(1) I_{B} = 13.0 mA
(2) I_{B} = 11.7 mA
(3) I_{B} = 10.4 mA
(4) I_{B} = 9.1 mA
(5) I_{B} = 7.8 mA
(6) I_{B} = 6.5 mA
(7) I_{B} = 5.2 mA
(8) I_{B} = 3.9 mA
(9) I_{B} = 2.6 mA
(10) I_{B} = 1.3 mA

Fig. 10. BC817-25QC-Q: Base-emitter saturation voltage as a function of collector current; typical values

IC/IB = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 11. BC817-25QC-Q: Collector-emitter saturation voltage as a function of collector current; typical values

IC/IB = 10
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C
Nexperia

BC817QC-Q series

45 V, 500 mA NPN general-purpose transistors

---

**Fig. 12. BC817-40QC-Q: DC current gain as a function of collector current; typical values**

\[
V_{CE} = 1 \text{ V}
\]

1. \(T_{\text{amb}} = 150 \degree \text{C}\)
2. \(T_{\text{amb}} = 25 \degree \text{C}\)
3. \(T_{\text{amb}} = -55 \degree \text{C}\)

---

**Fig. 13. BC817-40QC-Q: Transition frequency as a function of collector current; typical values**

\[
T_{\text{amb}} = 25 \degree \text{C}
\]

1. \(I_{\text{B}} = 12.0 \text{ mA}\)
2. \(I_{\text{B}} = 10.8 \text{ mA}\)
3. \(I_{\text{B}} = 9.6 \text{ mA}\)
4. \(I_{\text{B}} = 8.4 \text{ mA}\)
5. \(I_{\text{B}} = 7.2 \text{ mA}\)
6. \(I_{\text{B}} = 6.0 \text{ mA}\)
7. \(I_{\text{B}} = 4.8 \text{ mA}\)
8. \(I_{\text{B}} = 3.6 \text{ mA}\)
9. \(I_{\text{B}} = 2.4 \text{ mA}\)
10. \(I_{\text{B}} = 1.2 \text{ mA}\)

---

**Fig. 14. BC817-40QC-Q: Base-emitter saturation voltage as a function of collector current; typical values**

\[
\text{IC/IB} = 10
\]

1. \(T_{\text{amb}} = -55 \degree \text{C}\)
2. \(T_{\text{amb}} = 25 \degree \text{C}\)
3. \(T_{\text{amb}} = 150 \degree \text{C}\)

---

**Fig. 15. BC817-40QC-Q: Collector-emitter saturation voltage as a function of collector current; typical values**

\[
\text{IC/IB} = 10
\]

1. \(T_{\text{amb}} = 150 \degree \text{C}\)
2. \(T_{\text{amb}} = 25 \degree \text{C}\)
3. \(T_{\text{amb}} = -55 \degree \text{C}\)
11. Test information

11.1. Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.
12. Package outline

DFN1412D-3: plastic, leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.8 mm pitch; 1.4 mm x 1.2 mm x 0.48 mm body

Dimensions (mm are the original dimensions)

<table>
<thead>
<tr>
<th>Unit</th>
<th>A</th>
<th>A1</th>
<th>b</th>
<th>D</th>
<th>D1</th>
<th>E</th>
<th>E1</th>
<th>e</th>
<th>e1</th>
<th>e2</th>
<th>G</th>
<th>K</th>
<th>L</th>
<th>T</th>
<th>u</th>
<th>v</th>
<th>w</th>
<th>y</th>
<th>y1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>max</td>
<td>0.50</td>
<td>0.04</td>
<td>0.30</td>
<td>1.25</td>
<td>0.55</td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>mm nom</td>
<td>0.47</td>
<td>0.25</td>
<td>1.4</td>
<td>1.2</td>
<td>1.2</td>
<td>0.50</td>
<td>0.8</td>
<td>0.71</td>
<td>0.26</td>
<td>0.09</td>
<td>(ref)</td>
<td>0.30</td>
<td>0.16</td>
<td>0.05</td>
<td>0.1</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>min</td>
<td>0.44</td>
<td>0.22</td>
<td>1.4</td>
<td>1.2</td>
<td>1.2</td>
<td>0.50</td>
<td>0.8</td>
<td>0.71</td>
<td>0.26</td>
<td>0.09</td>
<td>(ref)</td>
<td>0.25</td>
<td>0.27</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
1. Side Wettable Flank, protrusion max. 0.02 mm.
2. Visible depend upon used manufacturing technology.
Dimension A and T are including plating thickness.

Fig. 16. Package outline SOT8009 (DFN1412D-3)
13. Soldering

Footprint information for reflow soldering of DFN1412D-3 package

Fig. 17. Reflow soldering footprint for SOT8009 (DFN1412D-3)
### 14. Revision history

**Table 9. Revision history**

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<tbody>
<tr>
<td>BC817QC-Q_SER v.2</td>
<td>20210504</td>
<td>Product data sheet</td>
<td>-</td>
<td>BC817QC-Q_SER v.1</td>
</tr>
<tr>
<td>Modifications:</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Features and benefits: added recommendation for automotive applications</td>
</tr>
<tr>
<td>BC817QC-Q_SER v.1</td>
<td>20210222</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
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</table>
15. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
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<tbody>
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<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term "short data sheet" is explained in section "Definitions".
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Date of release: 4 May 2021