**FEATURES**

- High current density package
- Low stray inductance & low Rth(j-c)
- Half-bridge (2in1)
- Built in temperature sensor
- Scalable large current easily handled by paralleling
- Equipped with current sensing terminals

### ABSOLUTE MAXIMUM RATINGS (Tc=25°C)

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Unit</th>
<th>Min</th>
<th>Typ.</th>
<th>Max.</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Emitter Voltage</td>
<td>VCES</td>
<td>V</td>
<td>-</td>
<td>1</td>
<td>20</td>
<td>VCE=1,700V, VGE=0V, TJ=25°C</td>
</tr>
<tr>
<td>Gate Emitter Voltage</td>
<td>VGE</td>
<td>V</td>
<td>±20</td>
<td>-</td>
<td>-</td>
<td>VCE=1,700V, VGE=0V, TJ=150°C</td>
</tr>
<tr>
<td>Collector Current</td>
<td>IC</td>
<td>A</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>IC=1,000A, VCE=15V, TJ=25°C</td>
</tr>
<tr>
<td>DC</td>
<td>IF</td>
<td>A</td>
<td>-</td>
<td>-</td>
<td>1000</td>
<td>VCE=10V, VGE=0V, f=100kHz, TOJ=25°C</td>
</tr>
<tr>
<td>Forward Current</td>
<td>IFM</td>
<td>A</td>
<td>-</td>
<td>1000</td>
<td>-</td>
<td>VCE=10V, VGE=0V, f=100kHz, TOJ=25°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>T(Jo)</td>
<td>°C</td>
<td>-</td>
<td>-50</td>
<td>-150</td>
<td>-5 ~ +150</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>Tstg</td>
<td>°C</td>
<td>-</td>
<td>-55</td>
<td>-150</td>
<td>-55 ~ +150</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>VISO</td>
<td>V</td>
<td>-</td>
<td>4000</td>
<td>-</td>
<td>4,000(AC 1 minute)</td>
</tr>
<tr>
<td>Screw Torque</td>
<td>M</td>
<td>m</td>
<td>-</td>
<td>0.8</td>
<td>1/16</td>
<td>0.8/15</td>
</tr>
<tr>
<td>Terminals (M3/M8)</td>
<td>M</td>
<td>m</td>
<td>-</td>
<td>6.0</td>
<td>-</td>
<td>- (1)</td>
</tr>
<tr>
<td>Mounting (M6)</td>
<td>M</td>
<td>m</td>
<td>-</td>
<td>6.0</td>
<td>-</td>
<td>- (1)</td>
</tr>
</tbody>
</table>

Notes: (1) Recommended Value 5.5±0.5N·m

### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Unit</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Test Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector Emitter Cut-Off Current</td>
<td>ICES</td>
<td>mA</td>
<td>-</td>
<td>1</td>
<td>20</td>
<td>VCE=1,700V, VGE=0V, TJ=25°C</td>
</tr>
<tr>
<td>Gate Emitter Leakage Current</td>
<td>IGES</td>
<td>nA</td>
<td>-500</td>
<td>-</td>
<td>+500</td>
<td>VCE=±20V, VGE=0V, TJ=25°C</td>
</tr>
<tr>
<td>Collector Emitter Saturation Voltage</td>
<td>VCEsat</td>
<td>V</td>
<td>1.7</td>
<td>2.15</td>
<td>2.6</td>
<td>Ic=1,000A, VCE=15V, TJ=25°C</td>
</tr>
<tr>
<td>Gate Emitter Threshold Voltage</td>
<td>VGE(th)</td>
<td>V</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>VCE=10V, IC=1,000mA, TJ=25°C</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td>Ciss</td>
<td>nF</td>
<td>-</td>
<td>75</td>
<td>-</td>
<td>Ciss=10V, VGE=0V, f=100kHz, TOJ=25°C</td>
</tr>
<tr>
<td>Internal Gate Resistance</td>
<td>RS(on)</td>
<td>Ω</td>
<td>-</td>
<td>0.4</td>
<td>-</td>
<td>VCE=900V, IC=1,000A</td>
</tr>
<tr>
<td>Rise Time</td>
<td>tr</td>
<td>μs</td>
<td>-</td>
<td>0.2</td>
<td>-</td>
<td>Ls=40nH</td>
</tr>
<tr>
<td>Turn-Off Delay Time</td>
<td>td(off)</td>
<td>μs</td>
<td>-</td>
<td>1.1</td>
<td>-</td>
<td>R0(on/off)=2.7μΩ/10Ω</td>
</tr>
<tr>
<td>Fall Time</td>
<td>tf</td>
<td>μs</td>
<td>-</td>
<td>0.8</td>
<td>-</td>
<td>VCE=±15V, TJ=150°C</td>
</tr>
<tr>
<td>Forward Voltage Drop</td>
<td>VF</td>
<td>V</td>
<td>-</td>
<td>1.75</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Reverse Recovery Time</td>
<td>tr</td>
<td>μs</td>
<td>-</td>
<td>0.5</td>
<td>-</td>
<td>VCC=900V, Ic=1,000A, Ls=40nH</td>
</tr>
<tr>
<td>Turn-on Loss per Pulse</td>
<td>Eon</td>
<td>J/P</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td>VCC=900V, IC=1,000mA, Ls=40nH</td>
</tr>
<tr>
<td>Turn-off Loss per Pulse</td>
<td>Eoff</td>
<td>J/P</td>
<td>-</td>
<td>0.38</td>
<td>-</td>
<td>R0(on/off)=2.7μΩ/10Ω</td>
</tr>
<tr>
<td>Reverse Recovery Loss per Pulse</td>
<td>Etr</td>
<td>J/P</td>
<td>-</td>
<td>0.39</td>
<td>-</td>
<td>VCE=±15V, TJ=150°C</td>
</tr>
<tr>
<td>Short Circuit Pulse Width</td>
<td>LSC</td>
<td>μH</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>VCC=1300V, Ls=40nH</td>
</tr>
<tr>
<td>Stray Inductance Module</td>
<td>LSCE</td>
<td>nH</td>
<td>-</td>
<td>9</td>
<td>-</td>
<td>Between C1(main) and E2(main)</td>
</tr>
<tr>
<td>NTC-Thermistor</td>
<td>Res</td>
<td>kΩ</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>Tc=25°C</td>
</tr>
<tr>
<td>Deviation</td>
<td>dR/R</td>
<td>%</td>
<td>-5</td>
<td>5</td>
<td>-</td>
<td>Tc=25°C</td>
</tr>
<tr>
<td>B-constant</td>
<td>B25(50)</td>
<td>K</td>
<td>-</td>
<td>3375</td>
<td>-</td>
<td>Between 25°C and 50°C</td>
</tr>
<tr>
<td>Thermal Impedance</td>
<td>Rth(i-c)</td>
<td>K/W</td>
<td>-</td>
<td>0.032</td>
<td>-</td>
<td>Junction to case</td>
</tr>
<tr>
<td>Contact Thermal Impedance</td>
<td>Rth(c-f)</td>
<td>K/W</td>
<td>-</td>
<td>0.053</td>
<td>-</td>
<td>Case to fin (per 1 arm)</td>
</tr>
</tbody>
</table>

Notes: (2) R0 value is a test condition value for evaluation, not recommended value.

Please determine the suitable R0 value by measuring switching behavior and checking results with the respective SOA.

* Please contact our representatives at order.

* For improvement, specifications are subject to change without notice.

* For actual application, please confirm this spec sheet is the newest revision.

* ELECTRICAL CHARACTERISTIC items shown in above table are according to IEC 60747–2 and IEC 60747–9.
OUTLINE DRAWING

Weight: 770(g)
IGBT MODULE
Spec.No.IGBT-SP-16034 R6 P 4

MBM1000FS17G

Switching time vs. Collector Current

**Conditions**
- $L_s=40\,\text{nH}$
- $V_{CC}=900\,\text{V}$
- $R_g=2.7\,\Omega/10\,\Omega$
- $V_{GE}=\pm15\,\text{V}$
- $T_{uj}=150\,^\circ\text{C}$
- $T_{uj}=25\,^\circ\text{C}$

Switching time $t_{on}$, $t_{off}$, $t_{rr}$, $t_{tr}$ (\text{ms})

- $t_{on}=1.43\times10^{-6}x^2 - 2.03\times10^{-6}x - 1.33\times10^{-6}$
- $t_{off}=4.39\times10^{-6}x^2 - 4.99\times10^{-6}x + 5.59\times10^{-6}$
- $t_{rr}=3.05\times10^{-6}$
- $t_{tr}=2.27\times10^{-6}$

**Recovery Loss vs. Forward Current**

**Conditions**
- $L_s=40\,\text{nH}$
- $V_{CC}=900\,\text{V}$
- $R_g=2.7\,\Omega/10\,\Omega$
- $V_{GE}=\pm15\,\text{V}$
- $T_{uj}=150\,^\circ\text{C}$
- $T_{uj}=25\,^\circ\text{C}$

Recovery Loss $E_{rr}$ (\text{J/pulse})

- $E_{rr}=5.62\times10^{-11}x^3 - 3.10\times10^{-7}x^2 + 5.99\times10^{-6}x + 5.03\times10^{-2}$
- $E_{rr}=3.21\times10^{-11}x^3 - 1.77\times10^{-7}x^2 + 3.43\times10^{-6}x + 2.88\times10^{-2}$

**Turn-on Loss vs. Collector Current**

**Conditions**
- $L_s=40\,\text{nH}$
- $V_{CC}=900\,\text{V}$
- $R_g=2.7\,\Omega/10\,\Omega$
- $V_{GE}=\pm15\,\text{V}$
- $T_{uj}=150\,^\circ\text{C}$
- $T_{uj}=25\,^\circ\text{C}$

Turn-on Loss $E_{on}$ (\text{J/pulse})

- $E_{on}=1.43\times10^{-20}x^6 - 2.03\times10^{-17}x^5 - 1.33\times10^{-13}x^4 + 4.29\times10^{-10}x^3 + 5.59\times10^{-6}x + 3.05\times10^{-2}$
- $E_{on}=1.51\times10^{-20}x^6 - 9.89\times10^{-14}x^4 + 3.19\times10^{-10}x^3 + 4.16\times10^{-6}x + 2.27\times10^{-2}$

**Turn-off Loss vs. Collector Current**

**Conditions**
- $L_s=40\,\text{nH}$
- $V_{CC}=900\,\text{V}$
- $R_g=2.7\,\Omega/10\,\Omega$
- $V_{GE}=\pm15\,\text{V}$
- $T_{uj}=150\,^\circ\text{C}$
- $T_{uj}=25\,^\circ\text{C}$

Turn-off Loss $E_{off}$ (\text{J/pulse})

- $E_{off}=1.06\times10^{-20}x^6 - 1.51\times10^{-17}x^5 - 9.89\times10^{-14}x^4 + 3.19\times10^{-10}x^3 + 4.16\times10^{-6}x + 2.27\times10^{-2}$

**Collector Current $I_c$ (A)**

- $0.00$ to $2.00$ A
- $0.00$ to $2.00$ A
- $0.00$ to $2.00$ A
**Turn-on Loss vs. Gate Resistance**

- Conditions: 
  - $T_{j}=150°C$
  - $I_a=1000A$
  - $V_{CC}=900V$
  - $V_{GE}=±15V$

**Turn-off Loss vs. Gate Resistance**

- Conditions: 
  - $T_{j}=150°C$
  - $I_a=1000A$
  - $V_{CC}=900V$
  - $V_{GE}=±15V$

**Recovery Loss vs. Gate Resistance**

- Conditions: 
  - $T_{j}=150°C$
  - $I_a=1000A$
  - $V_{CC}=900V$
  - $V_{GE}=±15V$

**Switching time vs. Gate Resistance**

- Conditions: 
  - $T_{j}=150°C$
  - $I_a=1000A$
  - $V_{CC}=900V$
  - $V_{GE}=±15V$
**MBM1000FS17G**

**RBSOA**

Reverse bias safe operation area (RBSOA)

**Reverse Recovery SOA**

Conditions:
- $L_s \leq 40\,\text{nH}$, $V_{cc} \leq 1200\,\text{V}$, $I_F \leq 2000\,\text{A}$, $di/dt \leq 8000\,\text{A/us}$, $T_j = 150^{\circ}\text{C}$

**Definition of Recovery $di/dt$**

\[
\frac{\Delta}{\Delta t} (0 - 0.5I_{rm})
\]

**Definition of RBSOA waveform**

$V_c e$ (spike Voltage)

$I_c$ (to be turned off)

**Pmax \leq 1.2\,\text{MW}**

Reverse Recovery SOA

**Conditions:**
- $V_{cc} \leq 1200\,\text{V}$, $I_c \leq 2000\,\text{A}$, $R_{G(OFF)} \geq 10\,\Omega$
- $V_{GE} = \pm 15\,\text{V}$, $T_j = 150^{\circ}\text{C}$
- $L_s \leq 40\,\text{nH}$, on pulse width $\geq 10\,\text{us}$

(Vce spike voltage and $L_s$ are defined at auxiliary terminal)
**MBM1000FS17G**

**IGBT MODULE**

### Typical

**Thermistor Resistance vs. Temperature**

- **Case Temperature, **Tc (°C)

**Thermistor Resistance (kΩ)**

- **Maximum**

**Transient Thermal Impedance Curve**

- **Cies, Coes, Cres (nF)**

**Collector to Emitter Voltage, **VCE (V)

- **Collector Emitter Voltage, **VCE (V)

- **Capacitance vs. Collector to Emitter Voltage**

**Conditions**

- Tj=25°C
- f=100kHz
HITACHI POWER SEMICONDUCTORS

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