DIM800DCS12-A000
IGBT Chopper Module

FEATURES
- 10µs Short Circuit Withstand
- Non Punch Through Silicon
- Isolated Cu Base With Al₂O₃ Substrates
- Lead Free Construction

APPLICATIONS
- High Reliability Inverters
- Motor Controllers

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 1200V to 6500V and currents up to 2400A.

The DIM800DCS12-A000 is a dual switch 1200V, n-channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10µs short circuit withstand.

The module incorporates an electrically isolated base plate and low inductance construction enabling circuit designers to optimise circuit layouts and utilise grounded heat sinks for safety.

ORDERING INFORMATION
Order As:
DIM800DCS12-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS
- \( V_{CES} \) 1200V
- \( V_{CE(sat)} \) * (typ) 2.2V
- \( I_C \) (max) 800A
- \( I_{C(PK)} \) (max) 1600A

* Measured at the power busbars, not the auxiliary terminals

Fig. 1 Circuit configuration

Fig. 2 Package

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures

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ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under ‘Absolute Maximum Ratings’ may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.

$T_{\text{case}} = 25^\circ\text{C}$ unless stated otherwise

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{\text{CES}}$</td>
<td>Collector-emitter voltage</td>
<td>$V_{\text{GE}} = 0\text{V}$</td>
<td>1200</td>
<td>V</td>
</tr>
<tr>
<td>$V_{\text{GES}}$</td>
<td>Gate-emitter voltage</td>
<td></td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>$I_C$</td>
<td>Continuous collector current</td>
<td>$T_{\text{case}} = 85^\circ\text{C}$</td>
<td>800</td>
<td>A</td>
</tr>
<tr>
<td>$I_{\text{C(PK)}}$</td>
<td>Peak collector current</td>
<td>1ms, $T_{\text{case}} = 115^\circ\text{C}$</td>
<td>1600</td>
<td>A</td>
</tr>
<tr>
<td>$P_{\text{max}}$</td>
<td>Max. transistor power dissipation</td>
<td>$T_{\text{case}} = 25^\circ\text{C}, T_j = 150^\circ\text{C}$</td>
<td>6940</td>
<td>W</td>
</tr>
<tr>
<td>$i^2t$</td>
<td>Diode $i^2t$ value (IGBT arm)</td>
<td>$V_R = 0, t_p = 10\text{ms}, T_j = 125^\circ\text{C}$</td>
<td>100</td>
<td>kA$^2$s</td>
</tr>
<tr>
<td>$i^2t$</td>
<td>Diode $i^2t$ value (Diode arm)</td>
<td></td>
<td>225</td>
<td>kA$^2$s</td>
</tr>
<tr>
<td>$V_{\text{isol}}$</td>
<td>Isolation voltage – per module</td>
<td>Commoned terminals to base plate. AC RMS, 1 min, 50Hz</td>
<td>2500</td>
<td>V</td>
</tr>
</tbody>
</table>

THERMAL AND MECHANICAL RATINGS

Internal insulation material: $\text{Al}_2\text{O}_3$
Baseplate material: Cu
Creepage distance: 20mm
Clearance: 10mm
CTI (Comparative Tracking Index): $>600$

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</tr>
</thead>
<tbody>
<tr>
<td>$R_{\text{th(j-c)}}$</td>
<td>Thermal resistance – transistor (per arm)</td>
<td>Continuous dissipation – junction to case</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td>°C/kW</td>
</tr>
<tr>
<td>$R_{\text{th(j-c)}}$</td>
<td>Thermal resistance – diode (IGBT arm)</td>
<td>Continuous dissipation – junction to case</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td>°C/kW</td>
</tr>
<tr>
<td>$R_{\text{th(c-h)}}$</td>
<td>Thermal resistance – diode (Diode arm)</td>
<td></td>
<td></td>
<td></td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>$R_{\text{th(c-h)}}$</td>
<td>Thermal resistance – case to heatsink (per module)</td>
<td>Mounting torque 5Nm (with mounting grease)</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>°C/kW</td>
</tr>
<tr>
<td>$T_j$</td>
<td>Junction temperature</td>
<td>Transistor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_{\text{stg}}$</td>
<td>Storage temperature range</td>
<td>Mounting – M6</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>Nm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical connections – M4</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>Nm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical connections – M8</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>Nm</td>
</tr>
</tbody>
</table>

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

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# ELECTRICAL CHARACTERISTICS

$T_{\text{case}} = 25^\circ\text{C}$ unless stated otherwise.

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<thead>
<tr>
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<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{\text{CES}}$</td>
<td>Collector cut-off current</td>
<td>$V_{\text{GE}} = 0\text{V}, \ V_{\text{CE}} = V_{\text{CES}}$</td>
<td>1</td>
<td>mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{\text{GE}} = 0\text{V}, \ V_{\text{CE}} = V_{\text{CES}}, \ T_{\text{case}} = 125^\circ\text{C}$</td>
<td>25</td>
<td>mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{\text{GES}}$</td>
<td>Gate leakage current</td>
<td>$V_{\text{GE}} = \pm 20\text{V}, \ V_{\text{CE}} = 0\text{V}$</td>
<td>4</td>
<td>$\mu\text{A}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{\text{GE(TH)}}$</td>
<td>Gate threshold voltage</td>
<td>$I_{\text{C}} = 40\text{mA}, \ V_{\text{GE}} = V_{\text{CE}}$</td>
<td>4.5</td>
<td>V</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>$V_{\text{CE(sat)}}$</td>
<td>Collector-emitter saturation voltage</td>
<td>$V_{\text{GE}} = 15\text{V}, \ I_{\text{C}} = 800\text{A}$</td>
<td>2.2</td>
<td>V</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{\text{GE}} = 15\text{V}, \ I_{\text{C}} = 800\text{A}, \ T_{\text{VJ}} = 125^\circ\text{C}$</td>
<td>2.6</td>
<td>V</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>$I_{\text{F}}$</td>
<td>Diode forward current</td>
<td>DC</td>
<td>800</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{\text{FM}}$</td>
<td>Diode maximum forward current</td>
<td>$t_{\text{p}} = 1\text{ms}$</td>
<td>1600</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{\text{F}}$</td>
<td>Diode forward voltage (IGBT arm)</td>
<td>$I_{\text{F}} = 800\text{A}$</td>
<td>2.1</td>
<td>V</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diode forward voltage (Diode arm)</td>
<td></td>
<td>1.8</td>
<td>V</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diode forward voltage (IGBT arm)</td>
<td>$I_{\text{F}} = 800\text{A}, \ T_{\text{VJ}} = 125^\circ\text{C}$</td>
<td>2.1</td>
<td>V</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diode forward voltage (Diode arm)</td>
<td></td>
<td>1.7</td>
<td>V</td>
<td>2.0</td>
<td></td>
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<tr>
<td>$C_{\text{ies}}$</td>
<td>Input capacitance</td>
<td>$V_{\text{CE}} = 25\text{V}, \ V_{\text{GE}} = 0\text{V}, \ f = 1\text{MHz}$</td>
<td>90</td>
<td>nF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Q_{\text{g}}$</td>
<td>Gate charge</td>
<td>$\pm 15\text{V}$</td>
<td>9</td>
<td>$\mu\text{C}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C_{\text{res}}$</td>
<td>Reverse transfer capacitance</td>
<td>$V_{\text{CE}} = 25\text{V}, \ V_{\text{GE}} = 0\text{V}, \ f = 1\text{MHz}$</td>
<td></td>
<td>nF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$L_{\text{M}}$</td>
<td>Module inductance – per arm</td>
<td></td>
<td>20</td>
<td>nH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{\text{INT}}$</td>
<td>Internal transistor resistance – per arm</td>
<td></td>
<td>270</td>
<td>$\mu\Omega$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$SC_{\text{Data}}$</td>
<td>Short circuit current, $I_{\text{SC}}$</td>
<td>$T_{\text{J}} = 125^\circ\text{C}, \ V_{\text{CC}} = 900\text{V}$</td>
<td>4500</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$t_{\text{p}} \leq 10\mu\text{s}, \ V_{\text{GE}} \leq 15\text{V}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{\text{CE(max)}} = V_{\text{CES}} - L' \times \text{di/dt}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 60747-9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

*L is the circuit inductance + $L_{\text{M}}$
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**T\(_{\text{case}}\) = 25°C unless stated otherwise**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ.</th>
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<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_{\text{d(off)}})</td>
<td>Turn-off delay time</td>
<td></td>
<td>1250</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(t_f)</td>
<td>Fall time</td>
<td></td>
<td>170</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(E_{\text{OFF}})</td>
<td>Turn-off energy loss</td>
<td></td>
<td>130</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>(t_{\text{d(on)}})</td>
<td>Turn-on delay time</td>
<td></td>
<td>250</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(t_r)</td>
<td>Rise time</td>
<td></td>
<td>250</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(E_{\text{ON}})</td>
<td>Turn-on energy loss</td>
<td></td>
<td>80</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>(Q_{rr})</td>
<td>Diode reverse recovery charge</td>
<td>Diode arm</td>
<td>12</td>
<td></td>
<td></td>
<td>μC</td>
</tr>
<tr>
<td>(I_{rr})</td>
<td>Diode reverse recovery current</td>
<td></td>
<td>570</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>(E_{\text{rec}})</td>
<td>Diode reverse recovery energy</td>
<td></td>
<td>60</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
</tbody>
</table>

\(T_{\text{case}} = 125°C\) unless stated otherwise

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ.</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(t_{\text{d(off)}})</td>
<td>Turn-off delay time</td>
<td></td>
<td>1500</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(t_f)</td>
<td>Fall time</td>
<td></td>
<td>200</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(E_{\text{OFF}})</td>
<td>Turn-off energy loss</td>
<td></td>
<td>160</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>(t_{\text{d(on)}})</td>
<td>Turn-on delay time</td>
<td></td>
<td>400</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(t_r)</td>
<td>Rise time</td>
<td></td>
<td>220</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>(E_{\text{ON}})</td>
<td>Turn-on energy loss</td>
<td></td>
<td>120</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>(Q_{rr})</td>
<td>Diode reverse recovery charge</td>
<td>Diode arm</td>
<td>240</td>
<td></td>
<td></td>
<td>μC</td>
</tr>
<tr>
<td>(I_{rr})</td>
<td>Diode reverse recovery current</td>
<td></td>
<td>680</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>(E_{\text{rec}})</td>
<td>Diode reverse recovery energy</td>
<td></td>
<td>110</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
</tbody>
</table>
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PACKAGE DETAILS

For further package information, please visit our website or contact Customer Services.
All dimensions in mm, unless stated otherwise.
DO NOT SCALE.

Nominal Weight: 1450g

Module Outline Type Code: D

Fig. 11 Module outline drawing
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The products and information in this publication are intended for use by appropriately trained technical personnel.

Due to the diversity of product applications, the information contained herein is provided as a general guide only and does not constitute any guarantee of suitability for use in a specific application. The user must evaluate the suitability of the product and the completeness of the product data for the application. The user is responsible for product selection and ensuring all safety and any warning requirements are met. Should additional product information be needed please contact Customer Service.

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The products must not be touched when operating because there is a danger of electrocution or severe burning. Always use protective safety equipment such as appropriate shields for the product and wear safety glasses. Even when disconnected any electric charge remaining in the product must be discharged and allowed to cool before safe handling using protective gloves.

Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

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Target Information: This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

Preliminary Information: The product design is complete and final characterisation for volume production is in progress. The datasheet represents the product as it is now understood but details may change.

No Annotation: The product has been approved for production and unless otherwise notified by Dynex any product ordered will be supplied to the current version of the data sheet prevailing at the time of our order acknowledgement.

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