DIM800XSM33-F000
Single Switch IGBT Module

FEATURES
- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- Isolated AlSiC Base with AIN Substrates
- Lead Free Construction
- 10.2kV Isolation Package

APPLICATIONS
- High Reliability Inverters
- Motor Controllers
- Traction Drives
- Choppers

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 DIM800XSM33-F000 is a single switch 3300V, soft punch through 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. This device is optimised for traction drives and other applications requiring high thermal cycling capability.

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:

DIM800XSM33-F000

Note: When ordering, please use the complete part number

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.

\[ T_{\text{case}} = 25°C \text{ unless stated otherwise} \]

<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>3300</td>
<td>V</td>
</tr>
<tr>
<td>( V_{\text{GES}} )</td>
<td>Gate-emitter voltage</td>
<td>( \pm 20 \text{V} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_C )</td>
<td>Continuous collector current</td>
<td>( T_{\text{case}} = 90°C )</td>
<td>800</td>
<td>A</td>
</tr>
<tr>
<td>( I_{C(PK)} )</td>
<td>Peak collector current</td>
<td>1ms, ( T_{\text{case}} = 115°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°C, T_j = 150°C )</td>
<td>10400</td>
<td>W</td>
</tr>
<tr>
<td>( I_t^2t )</td>
<td>Diode ( I_t^2t ) value</td>
<td>( V_R = 0, t_p = 10\text{ms}, T_j = 125°C )</td>
<td>320</td>
<td>kA²s</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>10.2</td>
<td>kV</td>
</tr>
<tr>
<td>( Q_{PD} )</td>
<td>Partial discharge – per module</td>
<td>IEC1287, ( V_1 = 6900\text{V}, V_2 = 5100\text{V}, 50\text{Hz RMS} )</td>
<td>10</td>
<td>pC</td>
</tr>
</tbody>
</table>

# THERMAL AND MECHANICAL RATINGS

Internal insulation material: AlN
Baseplate material: AlSiC
Creepage distance: 56mm
Clearance: 26mm
CTI (Comparative Tracking Index): >600

<table>
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<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_{(j-c)} )</td>
<td>Thermal resistance – transistor</td>
<td>Continuous dissipation – junction to case</td>
<td>-</td>
<td>-</td>
<td>12</td>
<td>°C/kW</td>
</tr>
<tr>
<td>( R_{(j-c)} )</td>
<td>Thermal resistance – diode</td>
<td>Continuous dissipation – junction to case</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>°C/kW</td>
</tr>
<tr>
<td>( R_{(c-h)} )</td>
<td>Thermal resistance – case to heatsink</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>150</td>
<td>°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diode</td>
<td>-</td>
<td>-</td>
<td>125</td>
<td>°C</td>
</tr>
<tr>
<td>( T_{\text{stg}} )</td>
<td>Storage temperature range</td>
<td>-</td>
<td>-40</td>
<td>-</td>
<td>125</td>
<td>°C</td>
</tr>
<tr>
<td>( \text{Screw torque} )</td>
<td>Electrical connections – M6</td>
<td>Mounting</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>
## ELECTRICAL CHARACTERISTICS

*T_{case} = 25°C unless stated otherwise.*

<table>
<thead>
<tr>
<th>Symbol</th>
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<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I_{CES})</td>
<td>Collector cut-off current</td>
<td>(V_{GE} = 0V, V_{CE} = V_{CES})</td>
<td></td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125°C)</td>
<td></td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>(I_{GES})</td>
<td>Gate leakage current</td>
<td>(V_{GE} = \pm 20V, V_{CE} = 0V)</td>
<td></td>
<td></td>
<td></td>
<td>(\mu A)</td>
</tr>
<tr>
<td>(V_{GE(TH)})</td>
<td>Gate threshold voltage</td>
<td>(I_C = 80mA, V_{GE} = V_{CE})</td>
<td>5.5</td>
<td>6.5</td>
<td>7.0</td>
<td>V</td>
</tr>
<tr>
<td>(V_{CE(sat)})</td>
<td>Collector-emitter saturation voltage</td>
<td>(V_{GE} = 15V, I_C = 800A)</td>
<td></td>
<td>2.8</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{GE} = 15V, I_C = 800A, T_j = 125°C)</td>
<td></td>
<td>3.6</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>(I_{F})</td>
<td>Diode forward current</td>
<td>DC</td>
<td></td>
<td></td>
<td>800</td>
<td>A</td>
</tr>
<tr>
<td>(I_{FM})</td>
<td>Diode maximum forward current</td>
<td>(t_p = 1ms)</td>
<td></td>
<td></td>
<td>1600</td>
<td>A</td>
</tr>
<tr>
<td>(V_{F})</td>
<td>Diode forward voltage</td>
<td>(I_F = 800A)</td>
<td></td>
<td>2.9</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(I_F = 800A, T_j = 125°C)</td>
<td></td>
<td>3.0</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>(C_{ies})</td>
<td>Input capacitance</td>
<td>(V_{CE} = 25V, V_{GE} = 0V, f = 1MHz)</td>
<td></td>
<td>144</td>
<td></td>
<td>nF</td>
</tr>
<tr>
<td>(Q_g)</td>
<td>Gate charge</td>
<td>(\pm 15V)</td>
<td></td>
<td>20</td>
<td></td>
<td>(\mu C)</td>
</tr>
<tr>
<td>(C_{res})</td>
<td>Reverse transfer capacitance</td>
<td>(V_{CE} = 25V, V_{GE} = 0V, f = 1MHz)</td>
<td></td>
<td>2.2</td>
<td></td>
<td>nF</td>
</tr>
<tr>
<td>(L_M)</td>
<td>Module inductance</td>
<td></td>
<td></td>
<td>15</td>
<td></td>
<td>nH</td>
</tr>
<tr>
<td>(R_{INT})</td>
<td>Internal resistance</td>
<td></td>
<td></td>
<td>135</td>
<td></td>
<td>(\mu \Omega)</td>
</tr>
<tr>
<td>(S_{Data})</td>
<td>Short circuit current, (I_{SC})</td>
<td>(T_j = 125°C, V_{CC} = 2500V)</td>
<td></td>
<td></td>
<td>3700</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(t_p \leq 10\mu s, V_{GE} \leq 15V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{CE(max)} = V_{CES} - L \times dl/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:**

\(\dagger\) Measured at the auxiliary terminals

\(\star\) \(L\) is the circuit inductance + \(L_M\)
**ELECTRICAL CHARACTERISTICS**

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

<table>
<thead>
<tr>
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<th>Typ.</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
</table>
| $t_{d(off)}$ | Turn-off delay time | $I_C = 800\text{A}$  
$V_{GE} = \pm 15\text{V}$  
$V_{CE} = 1800\text{V}$  
$C_{ge} = 220\text{nF}$  
$L_S \sim 100\text{nH}$  
$R_{G(ON)} = 3.9\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 3.0  | µs  |      |       |
| $t_f$ | Fall time | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 270  | ns  |      |       |
| $E_{OFF}$ | Turn-off energy loss | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 1050 | mJ  |      |       |
| $t_{d(on)}$ | Turn-on delay time | $I_C = 800\text{A}$  
$V_{GE} = \pm 15\text{V}$  
$V_{CE} = 1800\text{V}$  
$C_{ge} = 220\text{nF}$  
$L_S \sim 100\text{nH}$  
$R_{G(ON)} = 2.7\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 1300 | ns  |      |       |
| $t_r$ | Rise time | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 275  | ns  |      |       |
| $E_{ON}$ | Turn-on energy loss | $R_{G(ON)} = 2.7\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 1250 | mJ  |      |       |
| $Q_{rr}$ | Diode reverse recovery charge | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 320  | µC  |      |       |
| $I_{rr}$ | Diode reverse recovery current | $V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 670  | A   |      |       |
| $E_{rec}$ | Diode reverse recovery energy | $R_{G(ON)} = 2.7\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 300  | mJ  |      |       |

$T_{case} = 125^\circ\text{C}$ 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>
</table>
| $t_{d(off)}$ | Turn-off delay time | $I_C = 800\text{A}$  
$V_{GE} = \pm 15\text{V}$  
$V_{CE} = 1800\text{V}$  
$C_{ge} = 220\text{nF}$  
$L_S \sim 100\text{nH}$  
$R_{G(ON)} = 3.9\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 3.1  | µs  |      |       |
| $t_f$ | Fall time | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 280  | ns  |      |       |
| $E_{OFF}$ | Turn-off energy loss | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 1200 | mJ  |      |       |
| $t_{d(on)}$ | Turn-on delay time | $I_C = 800\text{A}$  
$V_{GE} = \pm 15\text{V}$  
$V_{CE} = 1800\text{V}$  
$C_{ge} = 220\text{nF}$  
$L_S \sim 100\text{nH}$  
$R_{G(ON)} = 2.7\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 1200 | ns  |      |       |
| $t_r$ | Rise time | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 315  | ns  |      |       |
| $E_{ON}$ | Turn-on energy loss | $R_{G(ON)} = 2.7\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 1750 | mJ  |      |       |
| $Q_{rr}$ | Diode reverse recovery charge | $I_F = 800\text{A}$  
$V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 600  | µC  |      |       |
| $I_{rr}$ | Diode reverse recovery current | $V_{CE} = 1800\text{V}$  
$\frac{dI_F}{dt} = 4000\text{A/µs}$ | 800  | A   |      |       |
| $E_{rec}$ | Diode reverse recovery energy | $R_{G(ON)} = 2.7\Omega$  
$R_{G(OFF)} = 6.2\Omega$ | 600  | mJ  |      |       |
Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

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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:  1100g

Module Outline Type Code:  X

Fig. 11 Module outline drawing

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

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DIM800XSM33-F000

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The products are not intended for use in applications where a failure or malfunction may cause loss of life, injury or damage to property. The user must ensure that appropriate safety precautions are taken to prevent or mitigate the consequences of a product failure or malfunction.

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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<table>
<thead>
<tr>
<th>Target Information:</th>
<th>This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Information:</td>
<td>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.</td>
</tr>
<tr>
<td>No Annotation:</td>
<td>The product has been approved for production and unless otherwise notified by Dynex any product ordered will be supplied to the <strong>current version of the data sheet prevailing at the time of our order acknowledgement</strong>.</td>
</tr>
</tbody>
</table>

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