



DIM200MBS12-A000

IGBT Bi-Directional Switch Module

Preliminary Information

Replaces issue May 2002, version DS5543-1.3

DS5545-2.1 June 2002

FEATURES

- 10 μ s Short Circuit Withstand
- Non Punch Through Silicon
- Isolated Copper Baseplate

APPLICATIONS

- Matrix Converters
- Brushless Motor Controllers
- Frequency Converters

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 600V to 3300V and currents up to 2400A.

The DIM200MBS12-A000 is a bi-directional 1200V, n channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus full 10 μ s 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:

DIM200MBS12-A000

Note: When ordering, please use the whole part number.

KEY PARAMETERS

V_{DRM}		$\pm 1200V$
V_T	(typ)	4.3V
I_C	(max)	200A
$I_{C(PK)}$	(max)	400A

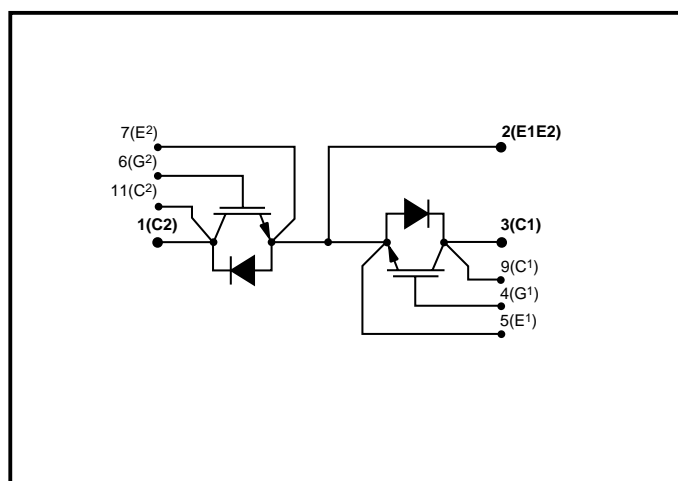


Fig. 1 Bi-directional switch circuit diagram

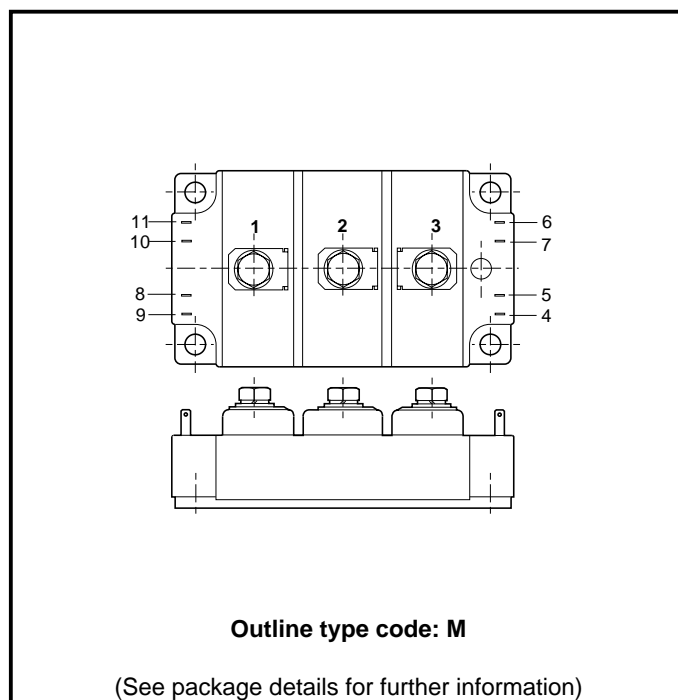


Fig. 2 Electrical connections - (not to scale)

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

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ABSOLUTE MAXIMUM RATINGS - PER ARM

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.

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

Symbol	Parameter	Test Conditions	Max.	Units
V_{DRM}	Collector-emitter voltage (measured across terminals 2 and 3)	$V_{GE} = 0\text{V}$	1200	V
V_{GES}	Gate-emitter voltage	-	± 20	V
I_C	Continuous collector current	$T_{case} = 80^{\circ}\text{C}$	200	A
$I_{C(PK)}$	Peak collector current	1ms, $T_{case} = 115^{\circ}\text{C}$	400	A
P_{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$, $T_j = 150^{\circ}\text{C}$	1435	W
I^2t	Diode I^2t value	$V_R = 0$, $t_p = 10\text{ms}$, $T_{vj} = 125^{\circ}\text{C}$	6.25	kA^2s
V_{isol}	Isolation voltage - per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V
Q_{PD}	Partial discharge - per module	IEC1287. $V_1 = 1300\text{V}$, $V_2 = 1000\text{V}$, 50Hz RMS	10	PC

THERMAL AND MECHANICAL RATINGS

Internal insulation: Al_2O_3
 Baseplate material: Cu
 Creepage distance: 22mm
 Clearance: 12mm
 CTI (Critical Tracking Index): 175

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - transistor (per arm)	Continuous dissipation - junction to case	-	-	87	$^{\circ}\text{C}/\text{kW}$
$R_{th(j-c)}$	Thermal resistance - diode (per arm)	Continuous dissipation - junction to case	-	-	194	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance - case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	15	$^{\circ}\text{C}/\text{kW}$
T_j	Junction temperature	Transistor	-	-	150	$^{\circ}\text{C}$
		Diode	-	-	125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-	-40	-	125	$^{\circ}\text{C}$
-	Screw torque	Mounting - M6	-	-	5	Nm
		Electrical connections - M4	-	-	2	Nm

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.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
I_{CES}	Collector cut-off current	$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = V_{\text{CES}}$	-	-	0.25	mA
		$V_{\text{GE}} = 0\text{V}, V_{\text{CE}} = V_{\text{CES}}, T_{\text{case}} = 125^{\circ}\text{C}$	-	-	6	mA
I_{GES}	Gate leakage current	$V_{\text{GE}} = \pm 20\text{V}, V_{\text{CE}} = 0\text{V}$	-	-	1	μA
$V_{\text{GE(TH)}}$	Gate threshold voltage	$I_{\text{C}} = 10\text{mA}, V_{\text{GE}} = V_{\text{CE}}$	4.5	5.5	6.5	V
$V_{\text{CE(sat)}}^{\dagger}$	Collector-emitter saturation voltage	$V_{\text{GE}} = 15\text{V}, I_{\text{C}} = 200\text{A}$	-	2.2	2.6	V
		$V_{\text{GE}} = 15\text{V}, I_{\text{C}} = 200\text{A}, T_{\text{case}} = 125^{\circ}\text{C}$	-	2.6	3.0	V
V_{T}	On-state voltage (measured across terminals 2 and 3)	$V_{\text{GE}} = 15\text{V}, I_{\text{C}} = 200\text{A}$	-	4.3	5.0	V
		$V_{\text{GE}} = 15\text{V}, I_{\text{C}} = 200\text{A}, T_{\text{case}} = 125^{\circ}\text{C}$	-	4.7	5.4	V
I_{F}	Diode forward current	DC	-	-	200	A
I_{FM}	Diode maximum forward current	$t_{\text{p}} = 1\text{ms}$	-	-	400	A
V_{F}^{\dagger}	Diode forward voltage	$I_{\text{F}} = 200\text{A}$	-	2.1	2.4	V
		$I_{\text{F}} = 200\text{A}, T_{\text{case}} = 125^{\circ}\text{C}$	-	2.1	2.4	V
C_{ies}	Input capacitance	$V_{\text{CE}} = 25\text{V}, V_{\text{GE}} = 0\text{V}, f = 1\text{MHz}$	-	23	-	nF
L_{M}	Module inductance - per arm	-	-	30	-	nH
R_{INT}	Internal transistor resistance - per arm	-	-	0.27	-	m Ω
SC_{Data}	Short circuit. I_{SC}	$T_{\text{j}} = 125^{\circ}\text{C}, V_{\text{CC}} = 900\text{V},$	I_1	1375	-	A
		$t_{\text{p}} \leq 10\mu\text{s}, V_{\text{CE(max)}} = V_{\text{CES}} - L^* \cdot di/dt$ IEC 60747-9	I_2	1125	-	A

Note:
 \dagger Measured at the power busbars and not the auxiliary terminals)

 L^* is the circuit inductance + L_{M}

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(\text{off})}$	Turn-off delay time	$I_C = 200\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 600\text{V}$ $R_{G(\text{ON})} = R_{G(\text{OFF})} = 4.7\Omega$ $L \sim 100\text{nH}$	-	600	-	ns
t_f	Fall time		-	50	-	ns
E_{OFF}	Turn-off energy loss		-	20	-	mJ
$t_{d(\text{on})}$	Turn-on delay time		-	240	-	ns
t_r	Rise time		-	95	-	ns
E_{ON}	Turn-on energy loss		-	25	-	mJ
Q_g	Gate charge		-	2	-	μC
Q_{rr}	Diode reverse recovery charge	$I_F = 200\text{A}, V_R = 600\text{V},$ $di_F/dt = 2100\text{A}/\mu\text{s}$	-	30	-	μC
I_{rr}	Diode reverse current		-	125	-	A
E_{REC}	Diode reverse recovery energy		-	13	-	mJ

 $T_{\text{case}} = 125^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(\text{off})}$	Turn-off delay time	$I_C = 200\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 600\text{V}$ $R_{G(\text{ON})} = R_{G(\text{OFF})} = 4.7\Omega$ $L \sim 100\text{nH}$	-	800	-	ns
t_f	Fall time		-	70	-	ns
E_{OFF}	Turn-off energy loss		-	27	-	mJ
$t_{d(\text{on})}$	Turn-on delay time		-	385	-	ns
t_r	Rise time		-	110	-	ns
E_{ON}	Turn-on energy loss		-	40	-	mJ
Q_{rr}	Diode reverse recovery charge		$I_F = 200\text{A}, V_R = 600\text{V},$ $di_F/dt = 1900\text{A}/\mu\text{s}$	-	50	-
I_{rr}	Diode reverse current	-		140	-	A
E_{REC}	Diode reverse recovery energy	-		20	-	mJ

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TYPICAL CHARACTERISTICS

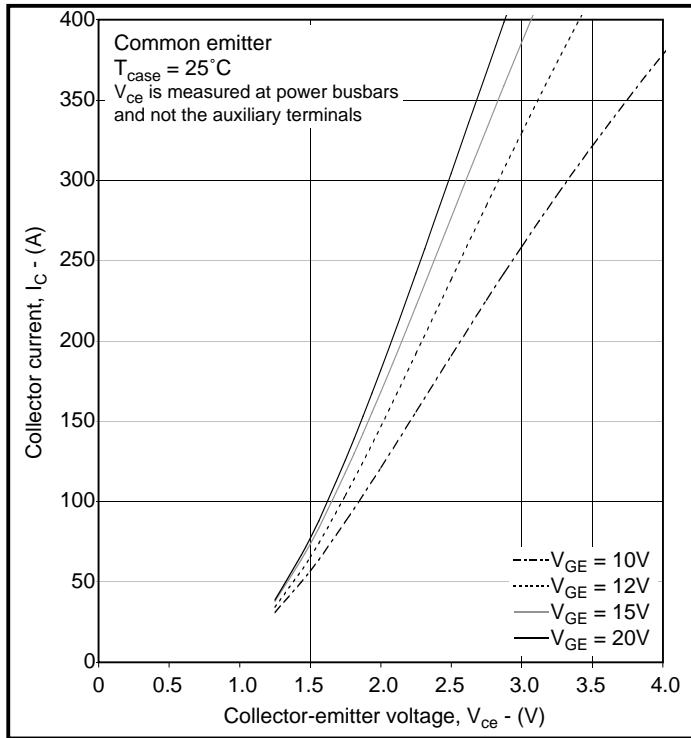


Fig. 3 Typical output characteristics

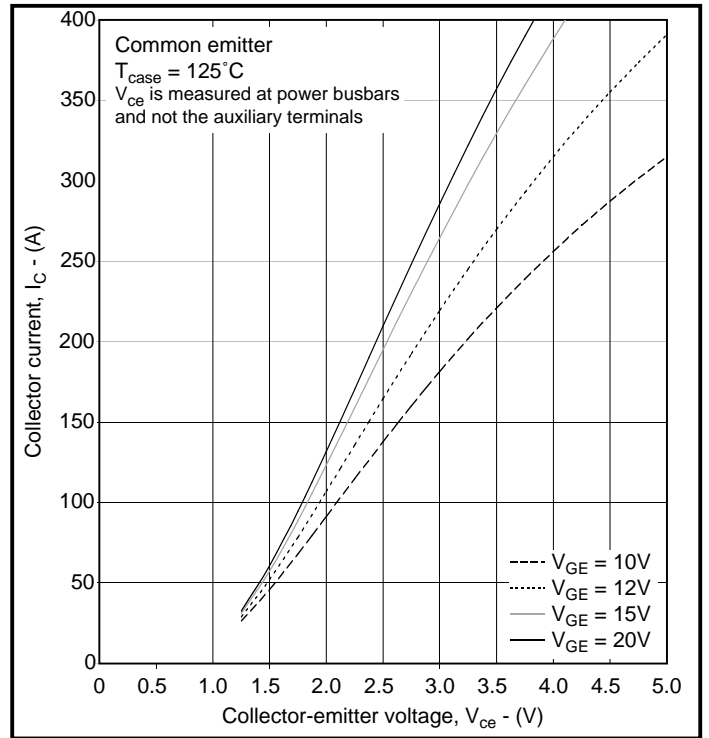


Fig. 4 Typical output characteristics

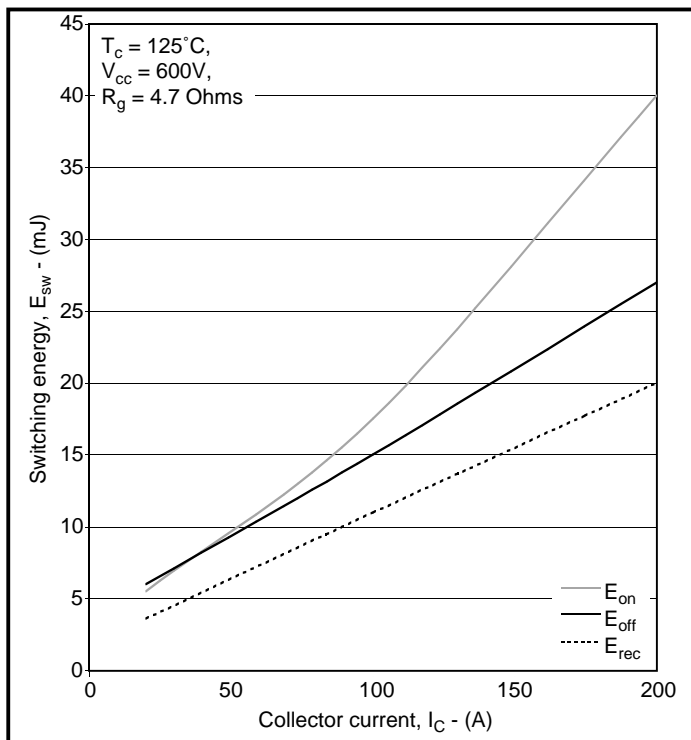


Fig. 5 Typical switching energy vs collector current

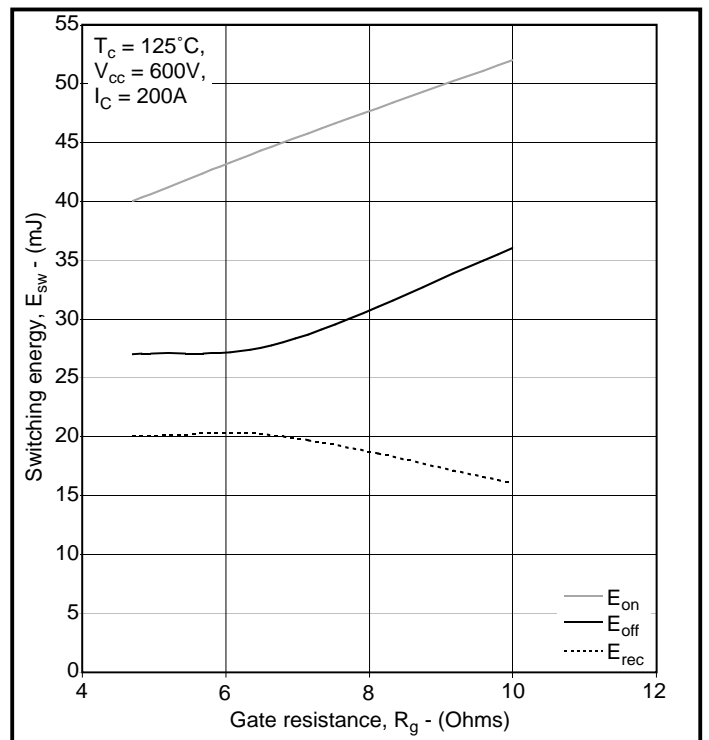
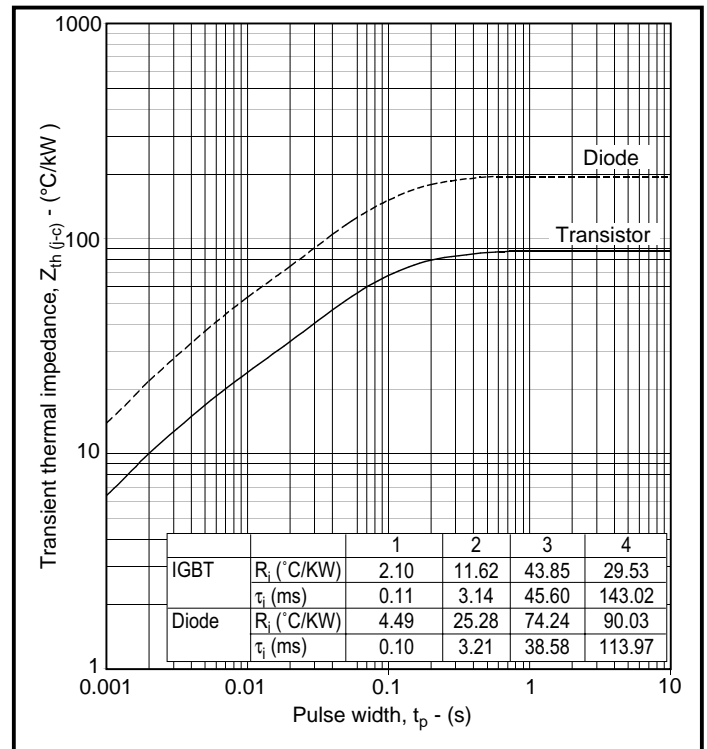
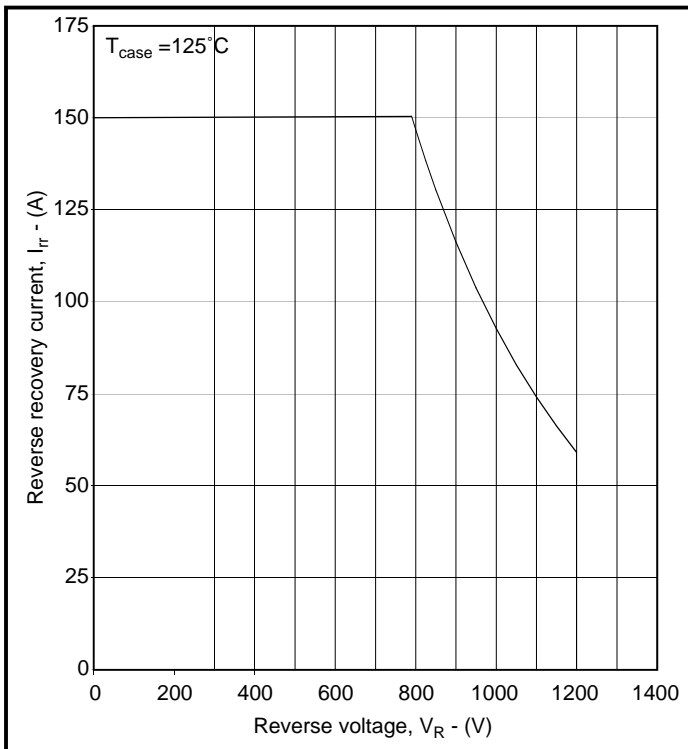
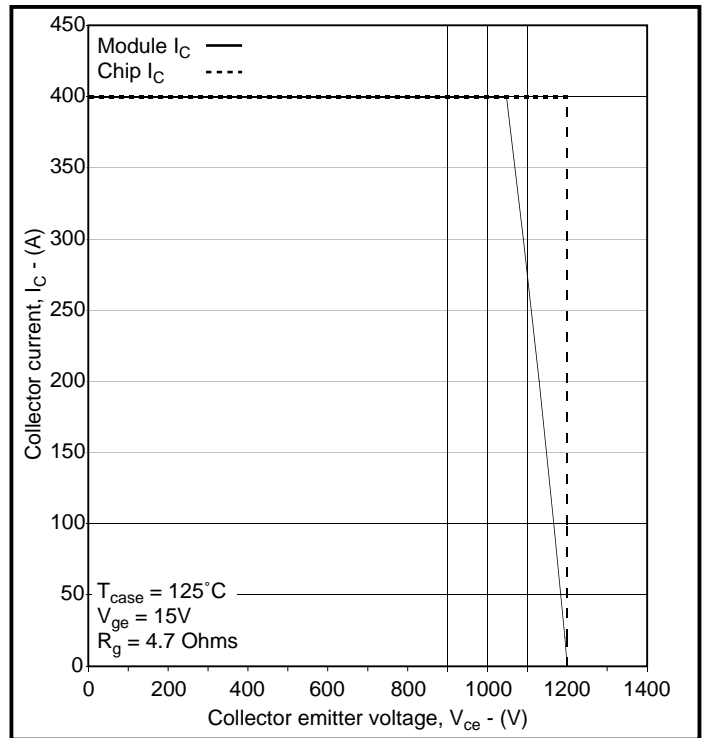
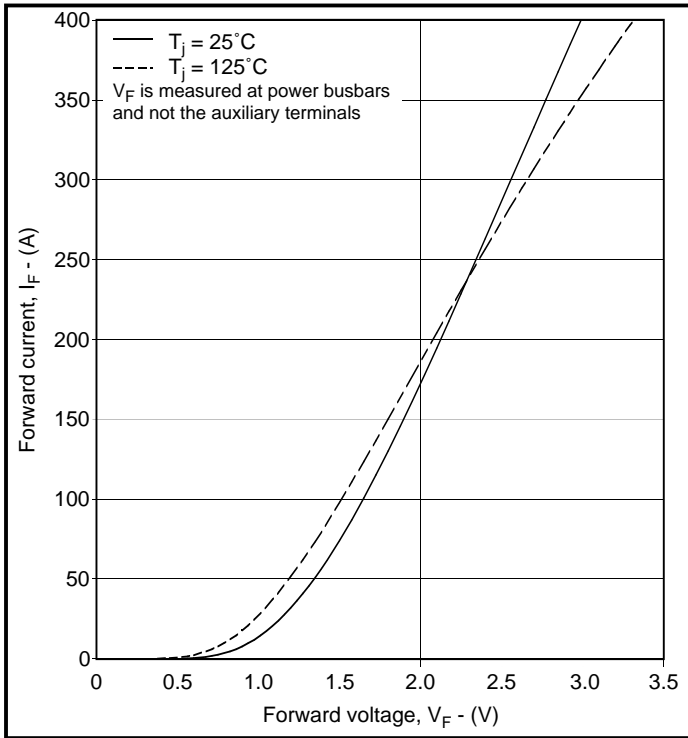


Fig. 6 Typical switching energy vs gate resistance



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

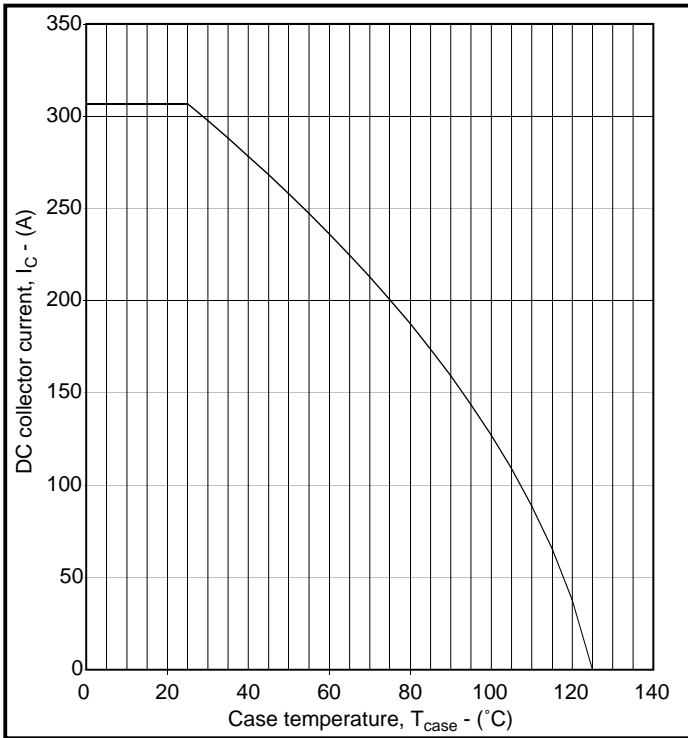


Fig. 11 DC current rating vs case temperature

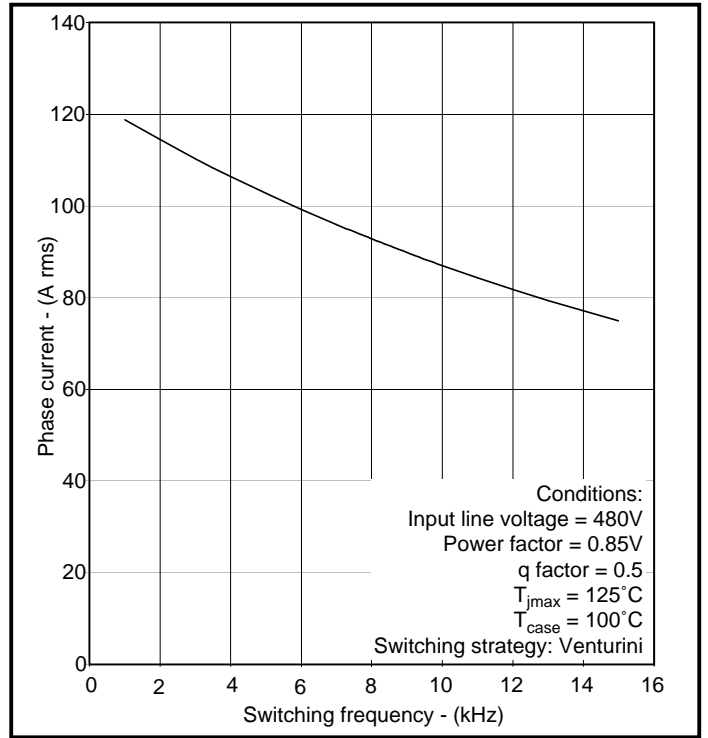
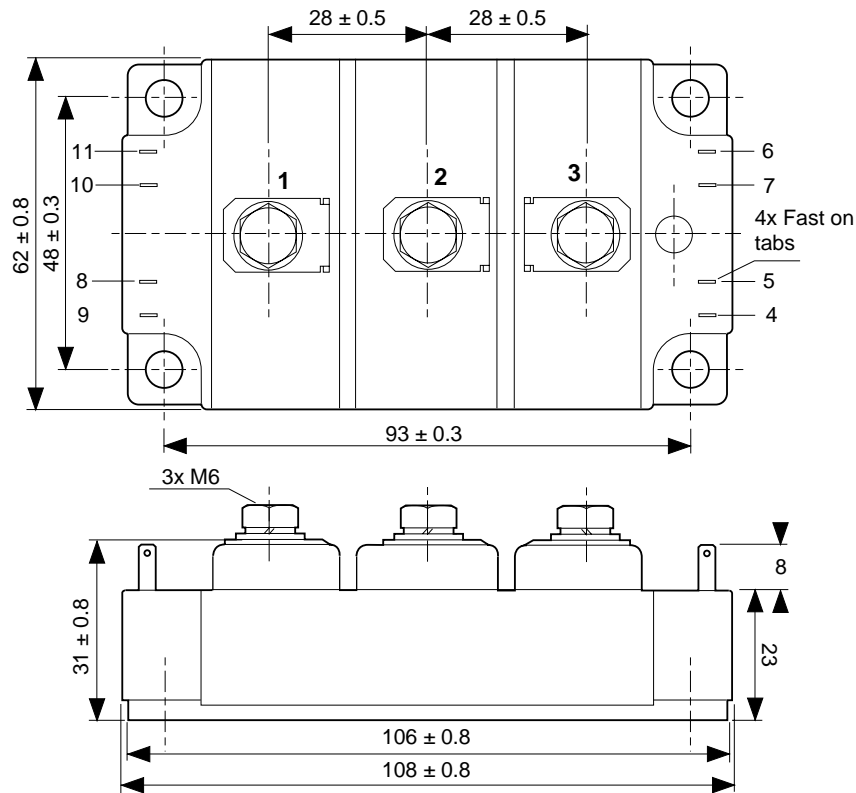


Fig. Fig. 12 Matrix converter phase current vs switching frequency

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: 270g
 Recommended fixings for mounting: M6
 Recommended mounting torque: 5Nm (44lbs.ins)
 Recommended torque for electrical connections (M6): 5Nm (44lbs.ins)

Module outline type code: M



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The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.



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