

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- Isolated AlSiC Base with AlN Substrates
- Lead Free construction

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 600V to 6500V and currents up to 2400A.

The DIM500ACM65-TS000 is a 6500V, soft punch through n-channel enhancement mode, insulated gate bipolar transistor (IGBT) chopper 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:

DIM500ACM65-TS000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	6500V
$V_{CE(sat)}$ * (typ)	3.0V
I_C (max)	500A
$I_{C(PK)}$ (max)	1000A

* Measured at the auxiliary terminals

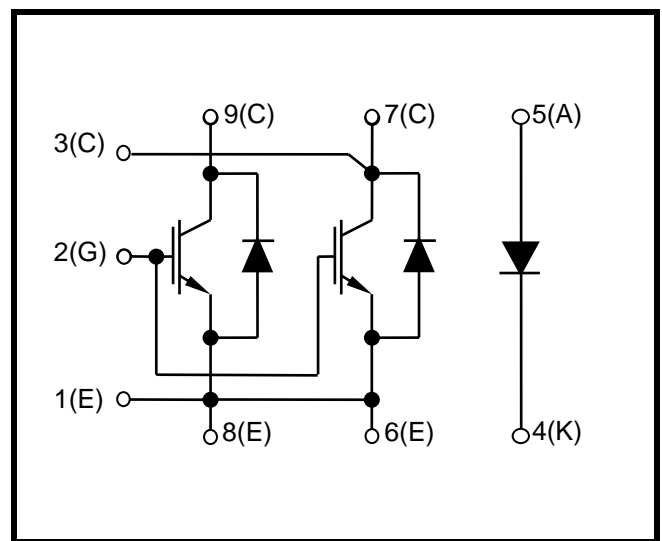


Fig. 1 Circuit configuration



Outline type code: A
 (See Fig. 11 for further information)

Fig. 2 Package

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

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	$V_{\text{GE}} = 0\text{V}, T_j = 125^{\circ}\text{C}$	6500	V
		$V_{\text{GE}} = 0\text{V}, T_j = 25^{\circ}\text{C}$	6500	V
		$V_{\text{GE}} = 0\text{V}, T_j = -40^{\circ}\text{C}$	6000	V
V_{GES}	Gate-emitter voltage		± 20	V
I_{C}	Continuous collector current	$T_{\text{case}} = 95^{\circ}\text{C}$	500	A
$I_{\text{C(PK)}}$	Peak collector current	1ms, $T_{\text{case}} = 115^{\circ}\text{C}$	1000	A
P_{max}	Max. transistor power dissipation	$T_{\text{case}} = 25^{\circ}\text{C}, T_j = 125^{\circ}\text{C}$	6.6	kW
I^2t	Diode I^2t value (IGBT arm)	$V_R = 0, t_p = 10\text{ms}, T_j = 125^{\circ}\text{C}$	90	kA ² s
	Diode I^2t value (Diode arm)		90	kA ² s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	10.2	kV
Q_{PD}	Partial discharge – per module	IEC1287, $V_1 = 6900\text{V}, V_2 = 5100\text{V}, 50\text{Hz RMS}$	10	pC

THERMAL AND MECHANICAL RATINGS

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

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{\text{th(j-c)}}$	Thermal resistance – transistor	Continuous dissipation – junction to case			15	$^{\circ}\text{C/kW}$
$R_{\text{th(j-c)}}$	Thermal resistance – diode (IGBT arm)	Continuous dissipation – junction to case			30	$^{\circ}\text{C/kW}$
$R_{\text{th(j-c)}}$	Thermal resistance – diode (Diode arm)	Continuous dissipation – junction to case			30	$^{\circ}\text{C/kW}$
$R_{\text{th(c-h)}}$	Thermal resistance – case to heatsink	Mounting torque 5Nm (with mounting grease)			8	$^{\circ}\text{C/kW}$
T_j	Junction temperature	Transistor			125	$^{\circ}\text{C}$
		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
		Electrical connections – M8			10	Nm

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{CES}	Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$			1	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125^{\circ}\text{C}$			60	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			1	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 80\text{mA}, V_{GE} = V_{CE}$	5.5	6.5	7.5	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 500\text{A}$		3.0		V
		$V_{GE} = 15V, I_C = 500\text{A}, T_j = 125^{\circ}\text{C}$		4.0		V
I_F	Diode forward current	DC			500	A
I_{FM}	Diode maximum forward current	$t_p = 1\text{ms}$			1000	A
V_F	Diode forward voltage	$I_F = 500\text{A}$		3.6		V
		$I_F = 500\text{A}, T_j = 125^{\circ}\text{C}$		4.3		V
C_{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$		8		nF
Q_g	Gate charge	$\pm 15V$		7		μC
C_{res}	Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$		1.6		nF
L_M	Module inductance	IGBT		20		nH
		Diode		25		nH
R_{INT}	Internal resistance	IGBT		180		$\mu\Omega$
		Diode		360		$\mu\Omega$
SC_{Data}	Short circuit current, I_{SC}	$T_j = 125^{\circ}\text{C}, V_{CC} = 4400V$ $t_p \leq 10\mu\text{s}, V_{GE} \leq 15V$ $V_{CE(max)} = V_{CES} - L^* \times di/dt$ IEC 60747-9		2500		A

Note:

* 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	$I_C = 500\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 3600\text{V}$ $R_{G(\text{ON})} = 4.7\Omega$ $R_{G(\text{OFF})} = 15\Omega$ $C_{ge} = 220\text{nF}$ $L_S \sim 280\text{nH}$		3.6		μs
t_f	Fall time			450		ns
E_{OFF}	Turn-off energy loss			2600		mJ
$t_{d(\text{on})}$	Turn-on delay time			900		ns
t_r	Rise time			400		ns
E_{ON}	Turn-on energy loss			3200		mJ
Q_{rr}	Diode reverse recovery charge	$I_F = 500\text{A}$ $V_{CE} = 3600\text{V}$ $di_F/dt = 1400\text{A}/\mu\text{s}$		800		μC
I_{rr}	Diode reverse recovery current			600		A
E_{rec}	Diode reverse recovery energy			1700		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	$I_C = 500\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 3600\text{V}$ $R_{G(\text{ON})} = 4.7\Omega$ $R_{G(\text{OFF})} = 15\Omega$ $C_{ge} = 220\text{nF}$ $L_S \sim 280\text{nH}$		3.6		μs
t_f	Fall time			450		ns
E_{OFF}	Turn-off energy loss			2700		mJ
$t_{d(\text{on})}$	Turn-on delay time			800		ns
t_r	Rise time			450		ns
E_{ON}	Turn-on energy loss			4000		mJ
Q_{rr}	Diode reverse recovery charge	$I_F = 500\text{A}$ $V_{CE} = 3600\text{V}$ $di_F/dt = 1400\text{A}/\mu\text{s}$		1400		μC
I_{rr}	Diode reverse recovery current			870		A
E_{rec}	Diode reverse recovery energy			3000		mJ

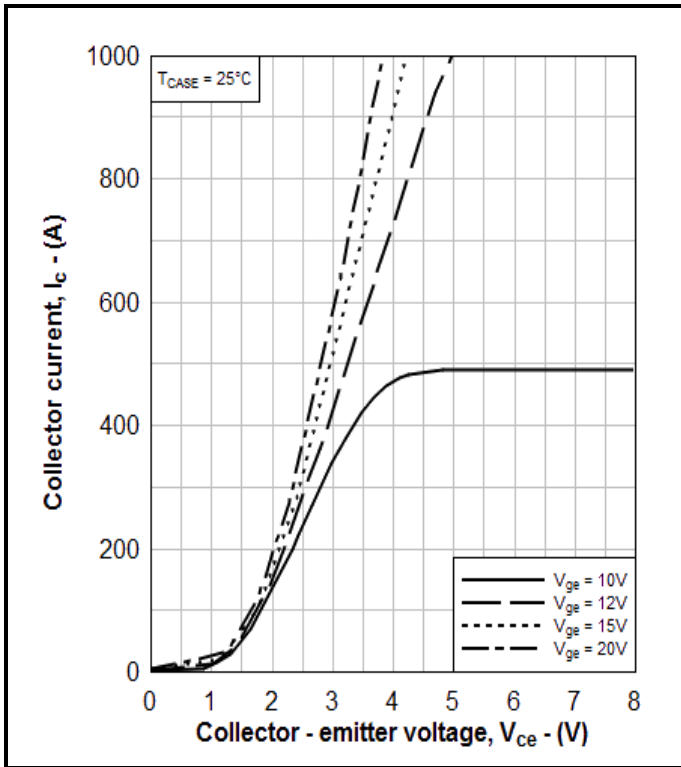


Fig. 3 Typical output characteristics

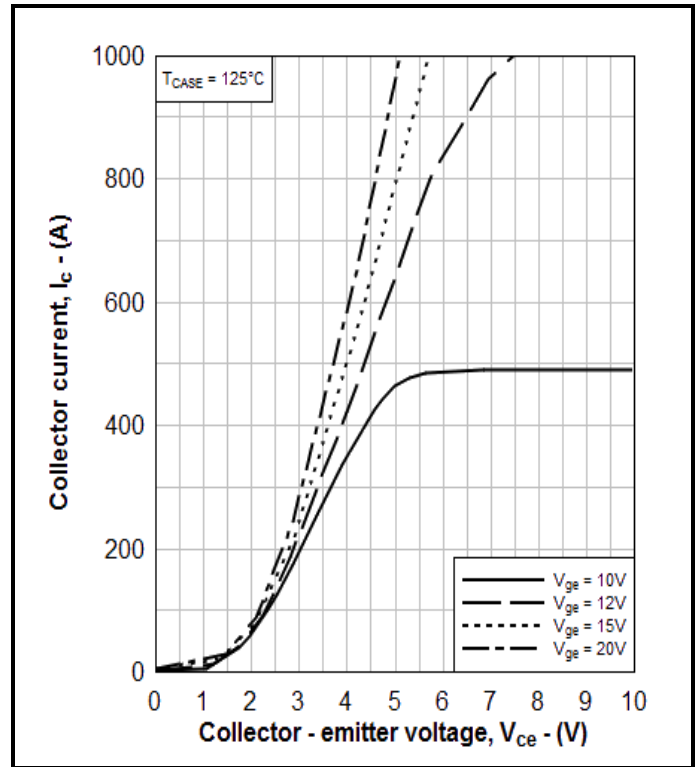


Fig. 4 Typical output characteristics

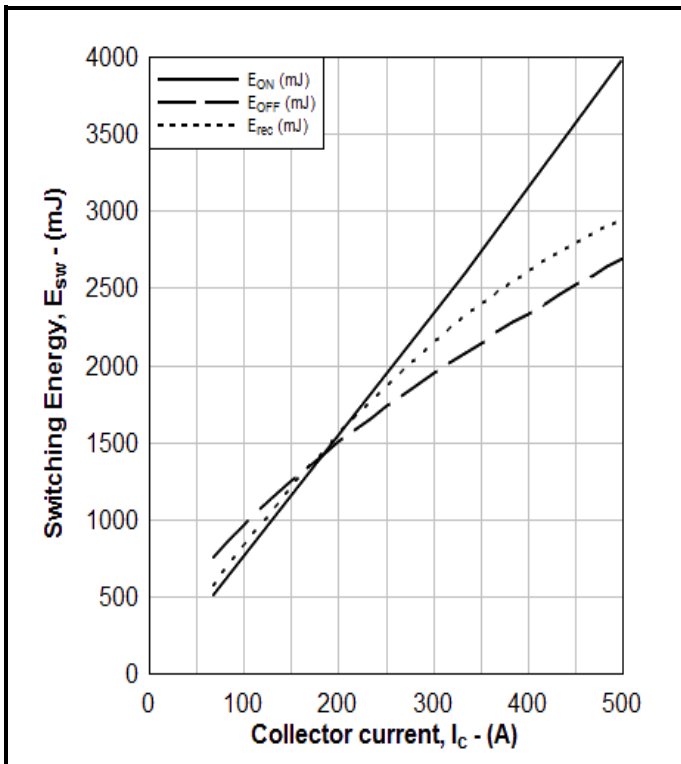


Fig. 5 Typical switching energy vs collector current

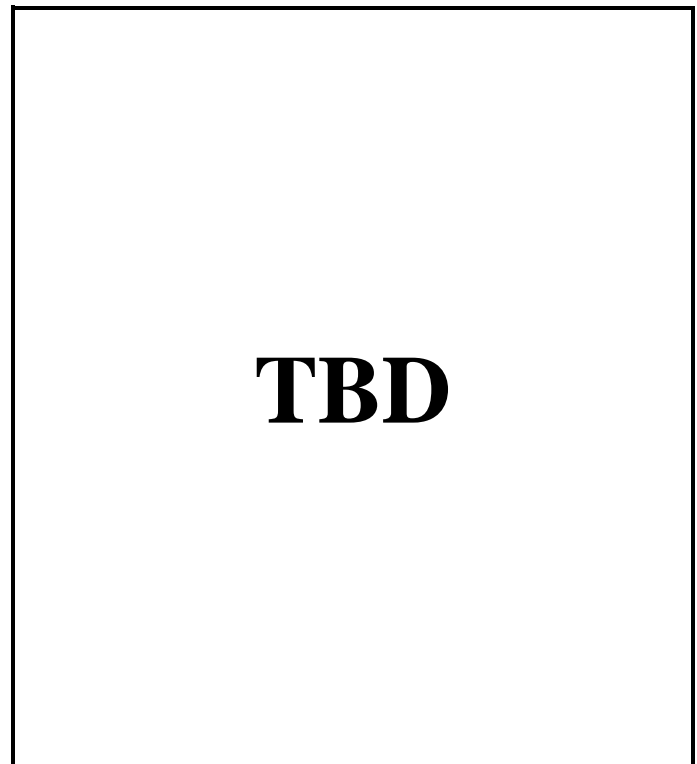


Fig. 6 Typical switching energy vs gate resistance

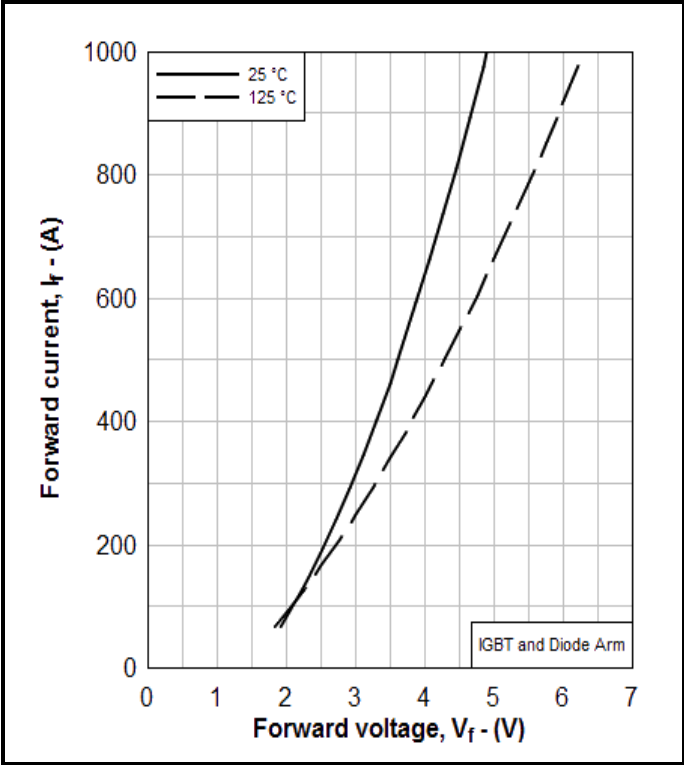


Fig. 7 Diode typical forward characteristics

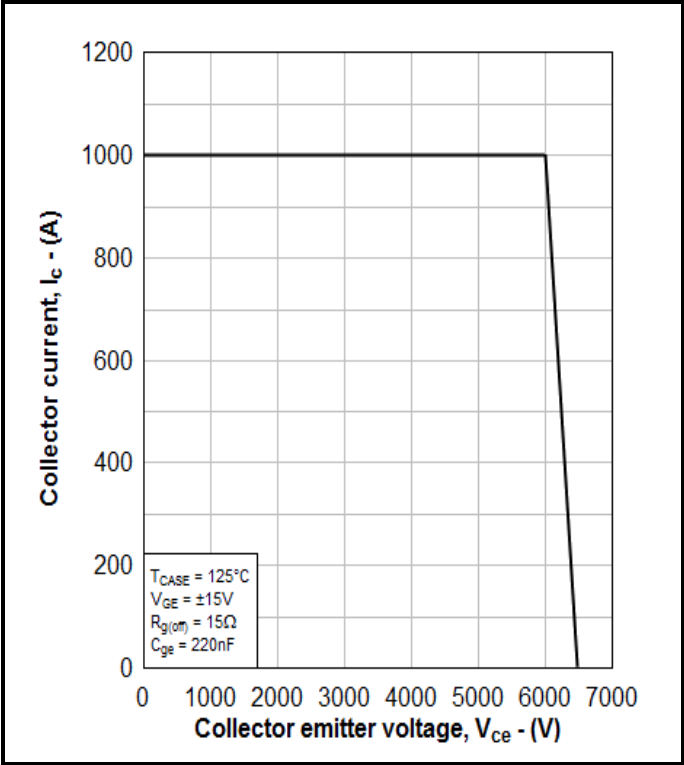


Fig. 8 Reverse bias safe operating area

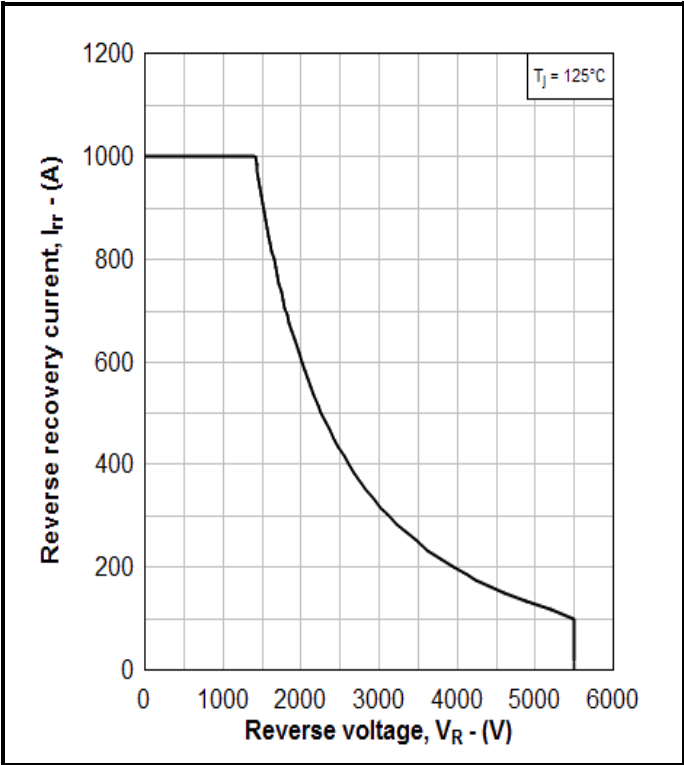


Fig. 9 Diode reverse bias safe operating area

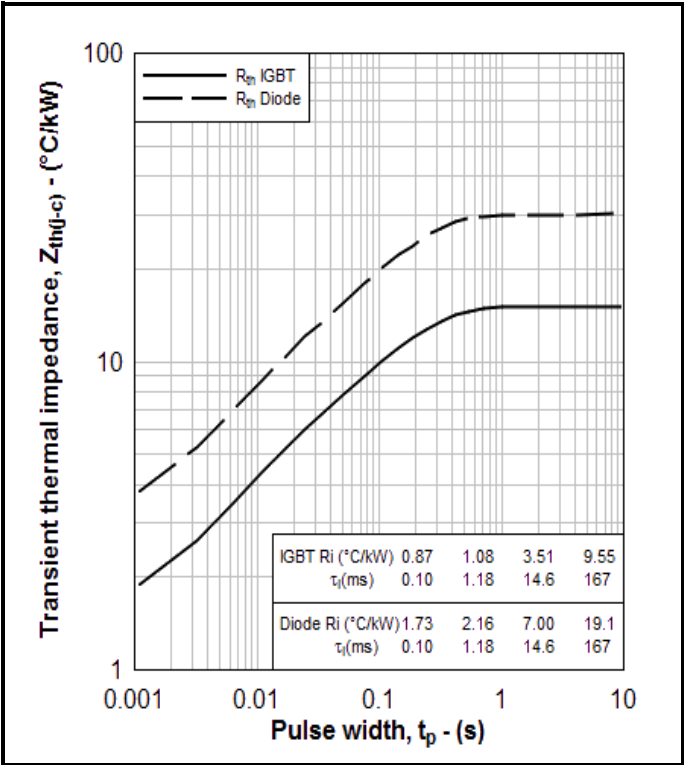
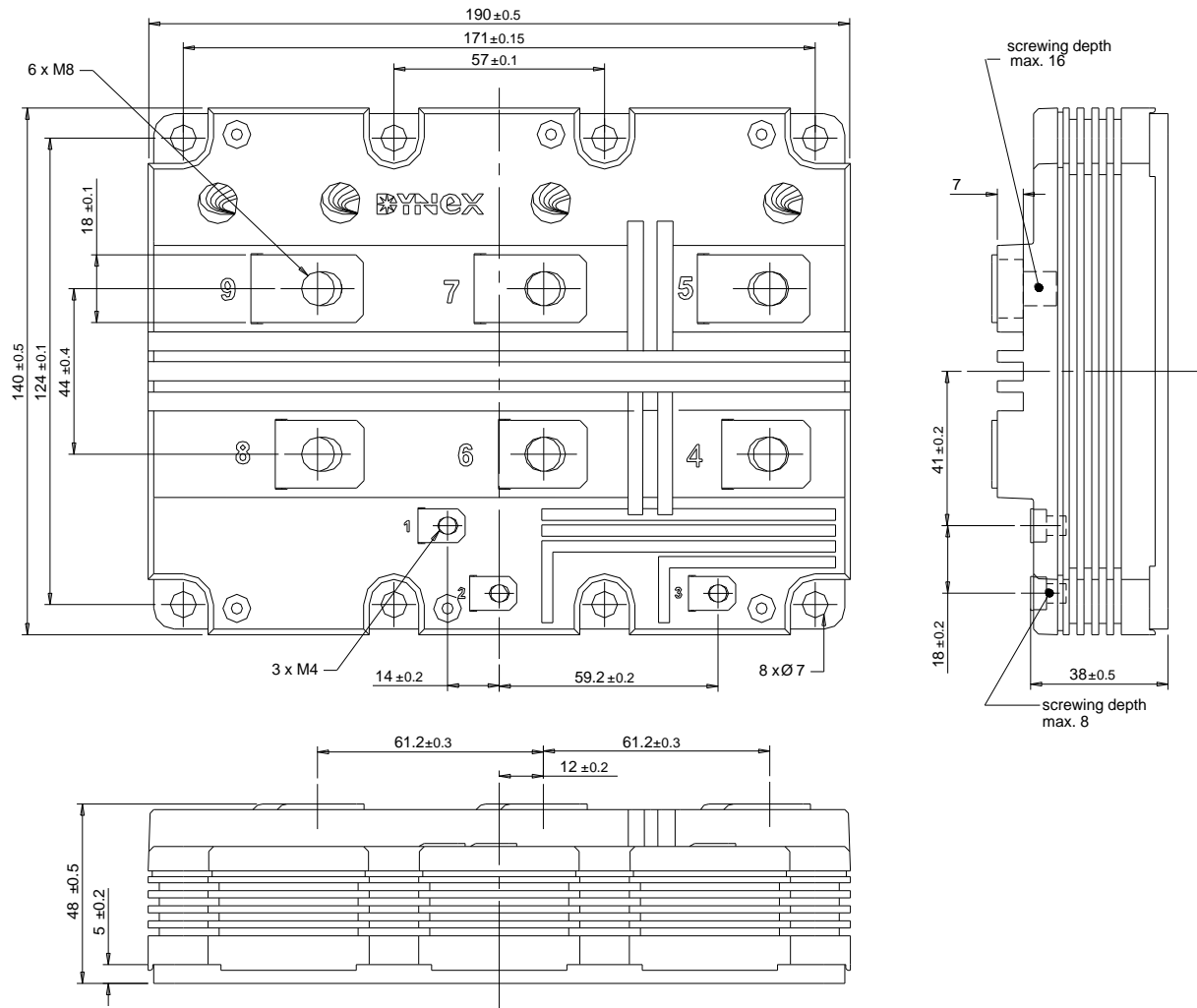


Fig. 10 Transient thermal impedance

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: 1700g

Module Outline Type Code: A

Fig. 11 Module outline drawing

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HEADQUARTERS OPERATIONS**DYNEX SEMICONDUCTOR LTD**

Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom

Fax: +44(0)1522 500550

Tel: +44(0)1522 500500

Web: <http://www.dynexsemi.com>

CUSTOMER SERVICE**DYNEX SEMICONDUCTOR LTD**

Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom

Fax: +44(0)1522 500020

Tel: +44(0)1522 502753 / 502901

Email: Power_solutions@dynexsemi.com