

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Trench Gate Soft Punch Through IGBT
- Isolated AISiC 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 DIM1000ASM65-UF000 is a single switch 6500V, 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:

DIM1000ASM65-UF000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	6500V
$V_{CE(sat)}$ * (typ)	3.6V
I_C (max)	1000A
$I_{C(PK)}$ (max)	2000A

* Measured at the auxiliary terminals

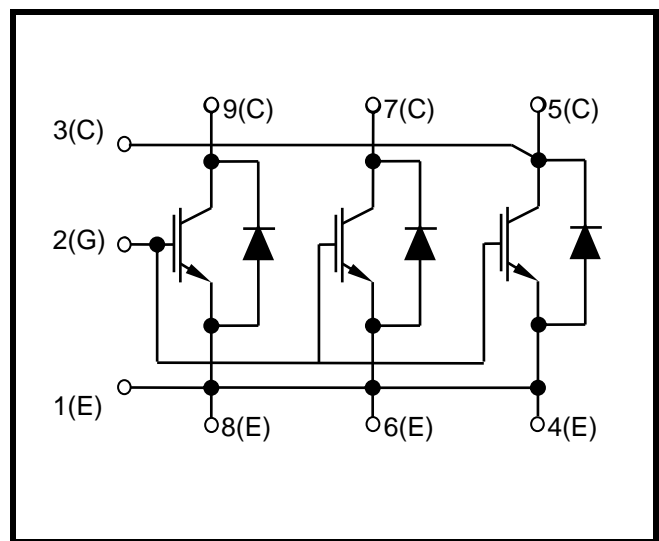


Fig. 1 Circuit configuration



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_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V _{CES}	Collector-emitter voltage	V _{GE} = 0V, T _j = 150°C	6500	V
		V _{GE} = 0V, T _j = 25°C	6300	V
		V _{GE} = 0V, T _j = -50°C	5700	V
V _{GES}	Gate-emitter voltage		±20	V
I _C	Continuous collector current	T _{case} = 112°C	1000	A
I _{C(PK)}	Peak collector current	1ms, T _{case} = 147°C	2000	A
P _{max}	Max. transistor power dissipation	T _{case} = 25°C, T _j = 150°C	13.9	kW
I ² t	Diode I ² t value	V _R = 0, t _p = 10ms, T _j = 150°C	470	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 = 6900V, V ₂ = 5100V, 50Hz 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 _{th(j-c)}	Thermal resistance – transistor	Continuous dissipation – junction to case			9	°C/kW
R _{th(j-c)}	Thermal resistance – diode	Continuous dissipation – junction to case			18	°C/kW
R _{th(c-h)}	Thermal resistance – case to heatsink	Mounting torque 5Nm (with mounting grease)			6	°C/kW
T _j	Junction temperature	Transistor			150	°C
		Diode			150	°C
T _{stg}	Storage temperature range		-50		125	°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	$V_{GE} = 0\text{V}, V_{CE} = V_{CES}$			4	mA
		$V_{GE} = 0\text{V}, V_{CE} = V_{CES}, T_{case} = 150^{\circ}\text{C}$			200	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20\text{V}, V_{CE} = 0\text{V}$			1	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 120\text{mA}, V_{GE} = V_{CE}$	6.5	6.75	7.3	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15\text{V}, I_C = 1000\text{A}$		3.6		V
		$V_{GE} = 15\text{V}, I_C = 1000\text{A}, T_j = 125^{\circ}\text{C}$		4.0		V
		$V_{GE} = 15\text{V}, I_C = 1000\text{A}, T_j = 150^{\circ}\text{C}$		4.1		V
I_F	Diode forward current	DC			1000	A
I_{FM}	Diode maximum forward current	$t_p = 1\text{ms}$			2000	A
V_F	Diode forward voltage	$I_F = 1000\text{A}$		3.8		V
		$I_F = 1000\text{A}, T_j = 125^{\circ}\text{C}$		4.15		V
		$I_F = 1000\text{A}, T_j = 150^{\circ}\text{C}$		4.2		
C_{ies}	Input capacitance	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 100\text{kHz}$		175		nF
Q_g	Gate charge	$\pm 15\text{V}$		15		μC
C_{res}	Reverse transfer capacitance	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 100\text{kHz}$		5.5		nF
L_M	Module inductance			10		nH
R_{INT}	Internal resistance			90		$\mu\Omega$
SC_{Data}	Short circuit current, I_{SC}	$T_j = 150^{\circ}\text{C}, V_{CC} = 4400\text{V}$ $t_p \leq 10\mu\text{s}, V_{GE} \leq 15\text{V}$ $V_{CE(max)} = V_{CES} - L^* \times di/dt$ IEC 60747-9		4500		A

Note:

* L is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS

T_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
t _{d(off)}	Turn-off delay time	I _C = 1000A V _{GE} = ±15V V _{CE} = 3600V R _{G(ON)} = 1.5Ω R _{G(OFF)} = 15Ω C _{ge} = 150nF L _S ~ 200nH		4.5		μs
t _f	Fall time			400		ns
E _{OFF}	Turn-off energy loss			4800		mJ
t _{d(on)}	Turn-on delay time			720		ns
t _r	Rise time			290		ns
E _{ON}	Turn-on energy loss			7500		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 3600V dI _F /dt = 4000A/μs		1650		μC
I _{rr}	Diode reverse recovery current			2000		A
E _{rec}	Diode reverse recovery energy			2700		mJ

T_{case} = 125°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
t _{d(off)}	Turn-off delay time	I _C = 1000A V _{GE} = ±15V V _{CE} = 3600V R _{G(ON)} = 1.5Ω R _{G(OFF)} = 15Ω C _{ge} = 150nF L _S ~ 200nH		5.0		μs
t _f	Fall time			500		ns
E _{OFF}	Turn-off energy loss			5500		mJ
t _{d(on)}	Turn-on delay time			740		ns
t _r	Rise time			250		ns
E _{ON}	Turn-on energy loss			9500		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 3600V dI _F /dt = 4000A/μs		2840		μC
I _{rr}	Diode reverse recovery current			2300		A
E _{rec}	Diode reverse recovery energy			4800		mJ

T_{case} = 150°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
t _{d(off)}	Turn-off delay time	I _C = 1000A V _{GE} = ±15V V _{CE} = 3600V R _{G(ON)} = 1.5Ω R _{G(OFF)} = 15Ω C _{ge} = 150nF L _S ~ 200nH		5.2		μs
t _f	Fall time			520		ns
E _{OFF}	Turn-off energy loss			5700		mJ
t _{d(on)}	Turn-on delay time			750		ns
t _r	Rise time			230		ns
E _{ON}	Turn-on energy loss			10000		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 3600V dI _F /dt = 4000A/μs		2860		μC
I _{rr}	Diode reverse recovery current			2350		A
E _{rec}	Diode reverse recovery energy			5100		mJ

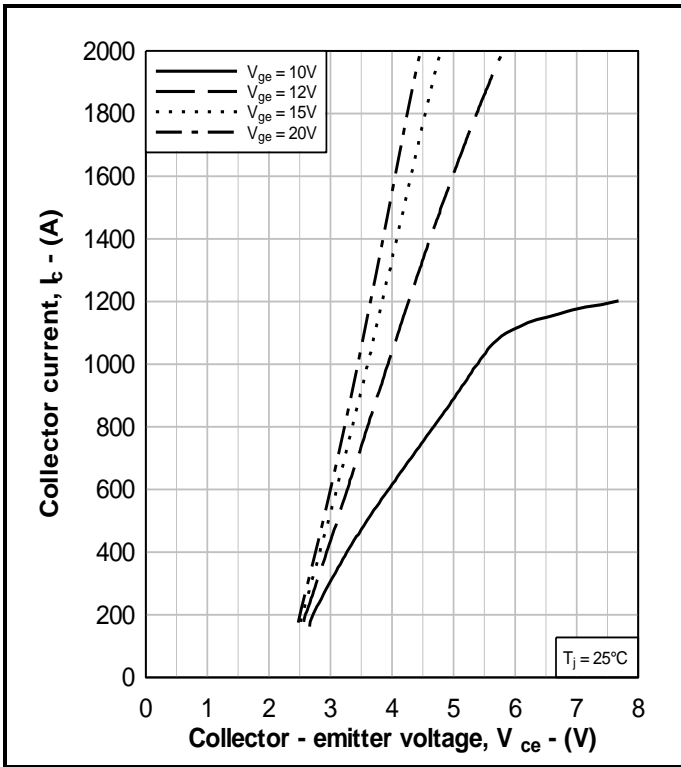


Fig. 3 Typical output characteristics

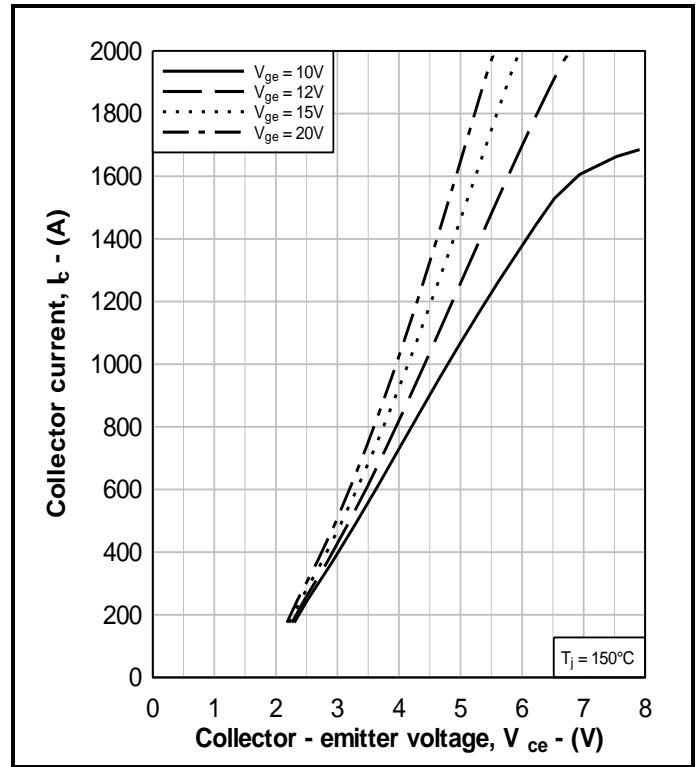


Fig. 4 Typical output characteristics

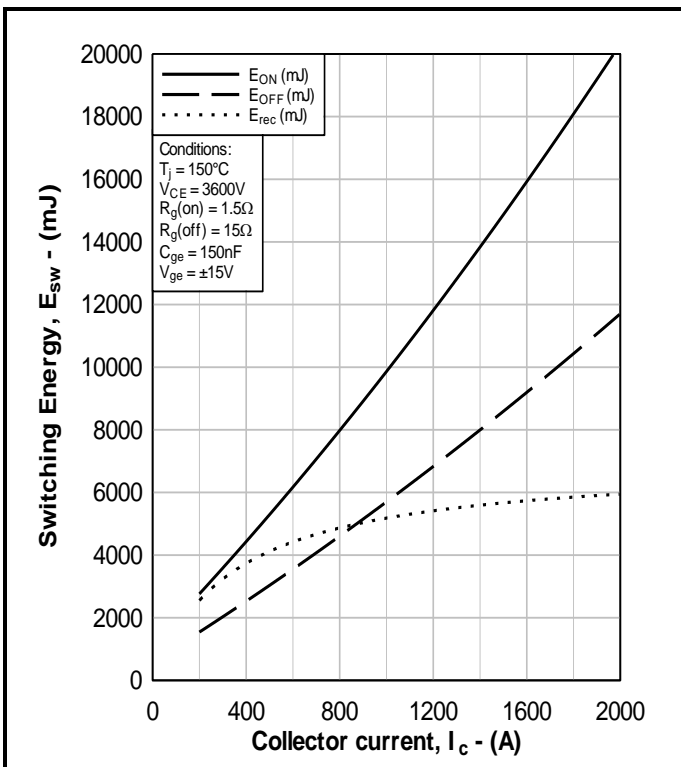


Fig. 5 Typical switching energy vs collector current

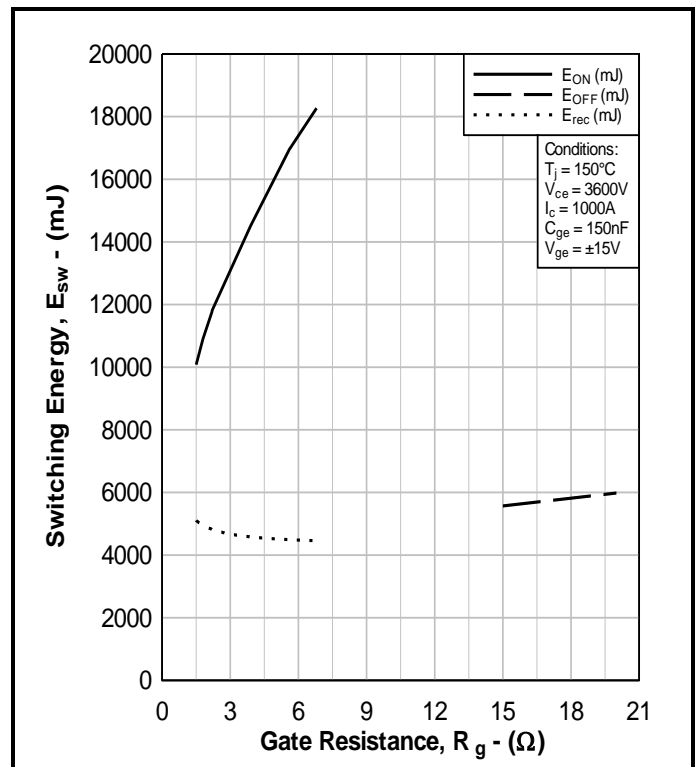


Fig. 6 Typical switching energy vs gate resistance

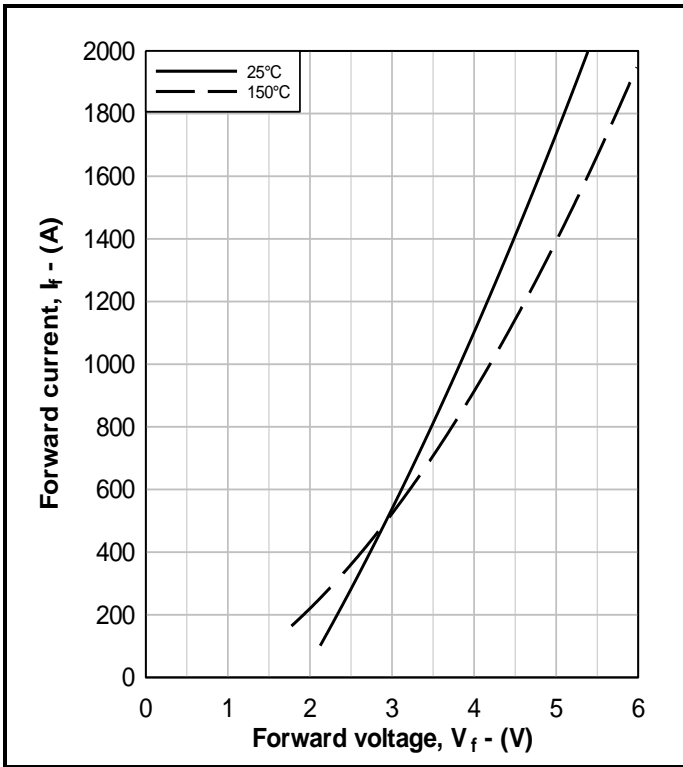


Fig. 7 Diode typical forward characteristics

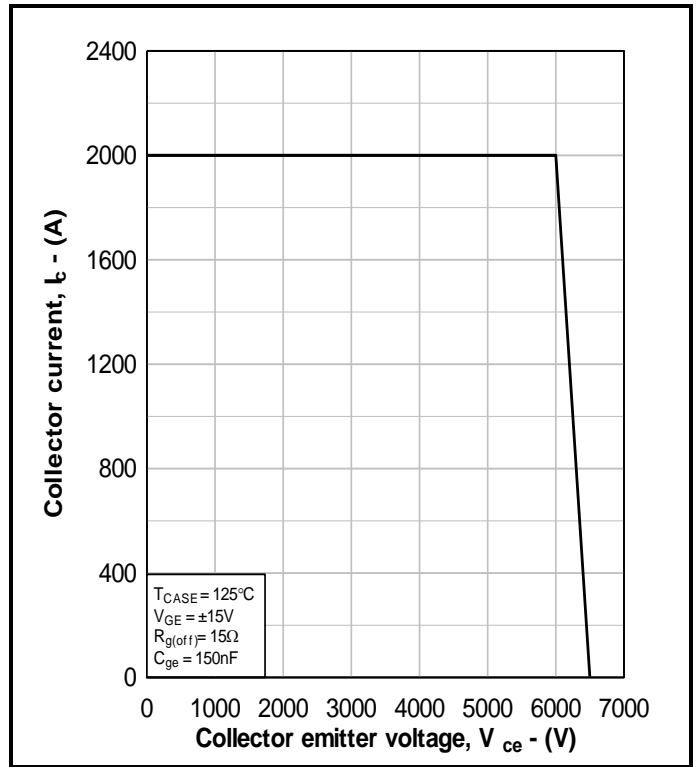


Fig. 8 Reverse bias safe operating area

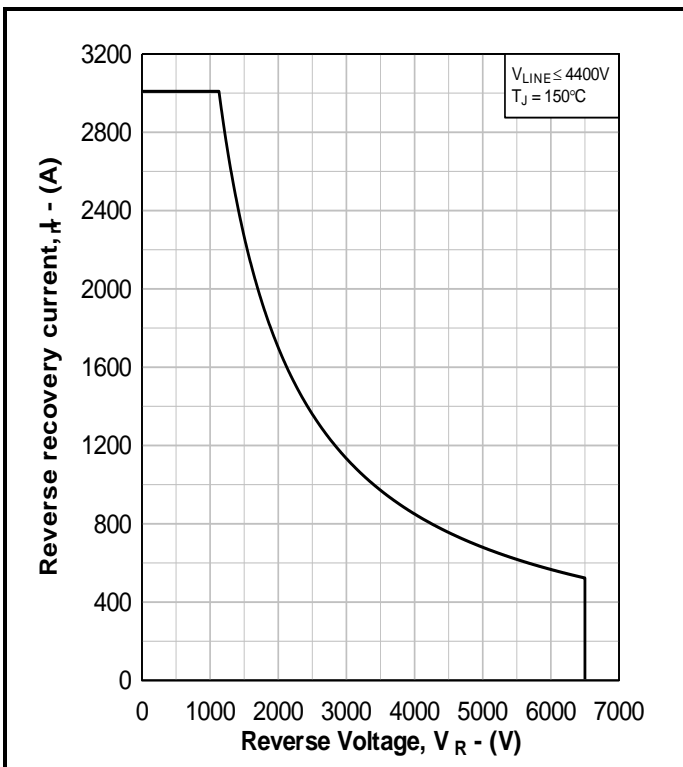


Fig. 9 Diode reverse bias safe operating area

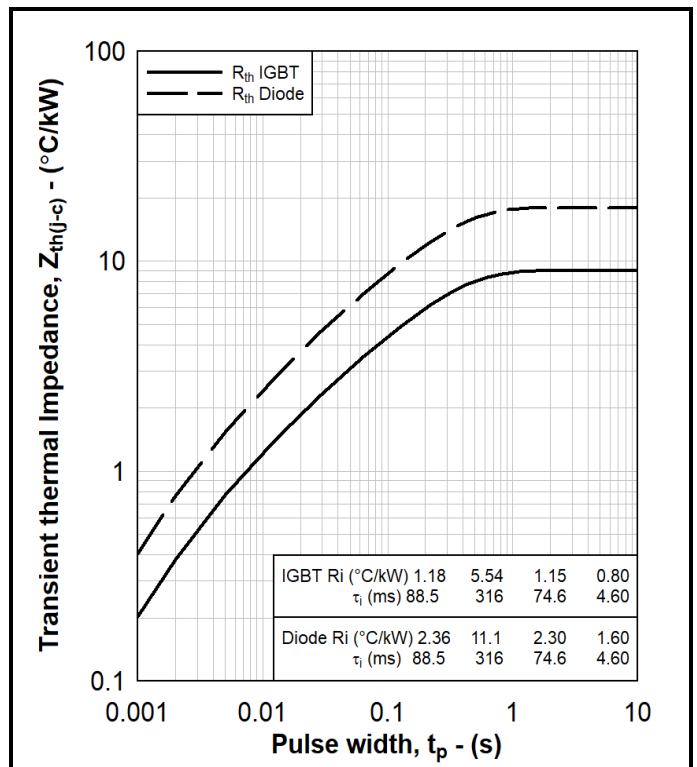


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

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

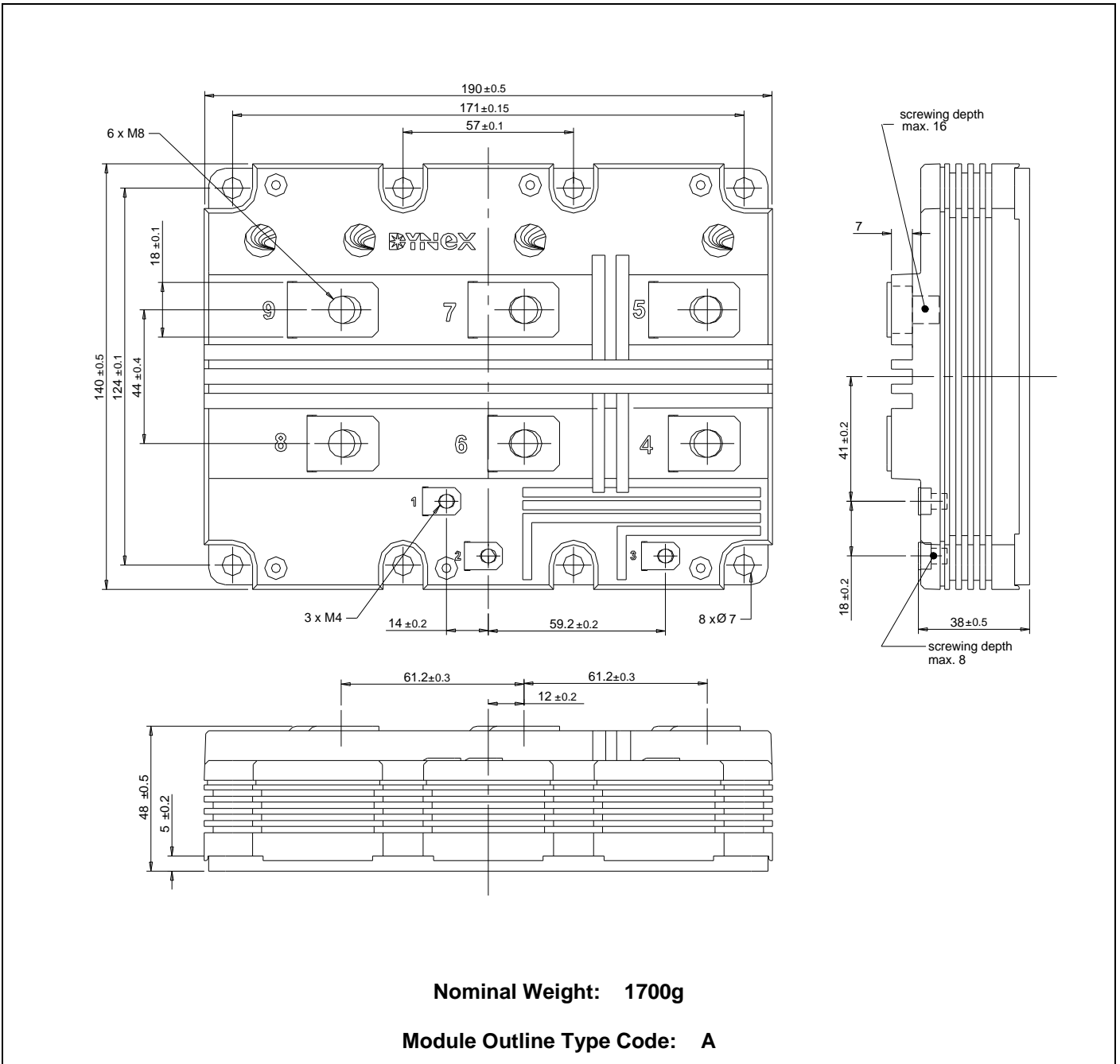


Fig. 11 Module outline drawing

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