DIM1600ECM17-A000

IGBT Chopper Module

DS6069-1 September 2011 (LN28672)

FEATURES

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

APPLICATIONS

- Motor Controllers
- Power Supplies
- 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 DIM1600ECM17-A000 is a 1700V, 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:

DIM1600ECM17-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**1700V**
$V_{CE(sat)}$ * (typ)		**2.7V**
I_C	**(max)**	**1600A**
$I_{C(PK)}$	**(max)**	**3200A**

* Measured at the auxiliary terminals

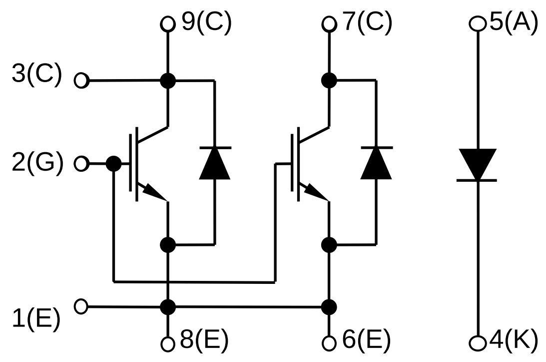


Fig. 1 Circuit configuration

Outline type code: E

(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	1700	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} = 75°C	1600	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 110°C	3200	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	13900	W
I^2t	Diode I^2t value (IGBT arm)	V_R = 0, t_p = 10ms, T_j = 125ºC	480	kA^2s
	Diode I^2t value (Diode arm)		480	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V
Q_{PD}	Partial discharge – per module	IEC1287, V_1 = 1800V, V_2 = 1300V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material: AlN

Baseplate material: AlSiC

Creepage distance: 33mm

Clearance: 20mm

CTI (Comparative Tracking Index): >600

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor (per arm)	Continuous dissipation – junction to case	-	-	9	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (IGBT arm)	Continuous dissipation – junction to case	-	-	20	°C/kW
	Thermal resistance – diode (Diode arm)		-	-	20	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	6	°C/kW
T_j	Junction temperature	Transistor	-	-	150	°C
		Diode	-	-	125	°C
T_{stg}	Storage temperature range	-	-40	-	125	°C
	Screw torque	Mounting – M6	-	-	5	Nm
		Electrical connections – M4	-	-	2	Nm
		Electrical connections – M8	-	-	10	Nm

ELECTRICAL CHARACTERISTICS

T_{case} = 25°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}			2	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125°C			50	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			8	μA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 80mA, V_{GE} = V_{CE}	4.5	5.5	6.5	V
$V_{CE(sat)}$ †	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 1600A		2.7	3.2	V
		V_{GE} = 15V, I_C = 1600A, T_j = 125°C		3.4	4.0	V
I_F	Diode forward current	DC		1600		A
I_{FM}	Diode maximum forward current	t_p = 1ms		3200		A
V_F †	Diode forward voltage (IGBT arm)	I_F = 1600A		2.2	2.5	V
	Diode forward voltage (Diode arm)			2.2	2.5	V
	Diode forward voltage (IGBT arm)	I_F = 1600A, T_j = 125°C		2.3	2.6	V
	Diode forward voltage (Diode arm)			2.3	2.6	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		120		nF
Q_g	Gate charge	±15V		18		μC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz				nF
L_M	Module inductance – IGBT arm			15		nH
R_{INT}	Internal resistance – IGBT arm			140		μΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 125°C, V_{CC} = 1000V t_p ≤ 10μs, V_{GE} ≤ 15V $V_{CE\ (max)}$ = V_{CES} – L^* x dI/dt IEC 60747-9		6400		A

Note:

† Measured at the auxiliary terminals

* 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 = 1600A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 1.5Ω $R_{G(OFF)}$ = 1.5Ω L_S ~ 100nH		1400		ns
t_f	Fall time			200		ns
E_{OFF}	Turn-off energy loss			500		mJ
$t_{d(on)}$	Turn-on delay time			300		ns
t_r	Rise time			200		ns
E_{ON}	Turn-on energy loss			300		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1600A V_{CE} = 900V dI_F/dt = 8000A/μs		400		μC
I_{rr}	Diode reverse recovery current			1000		A
E_{rec}	Diode reverse recovery energy			200		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 = 1600A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 1.5Ω $R_{G(OFF)}$ = 1.5Ω L_S ~ 100nH		1600		ns
t_f	Fall time			250		ns
E_{OFF}	Turn-off energy loss			650		mJ
$t_{d(on)}$	Turn-on delay time			400		ns
t_r	Rise time			250		ns
E_{ON}	Turn-on energy loss			600		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1600A V_{CE} = 900V dI_F/dt = 7000A/μs		600		μC
I_{rr}	Diode reverse recovery current			1050		A
E_{rec}	Diode reverse recovery energy			400		mJ

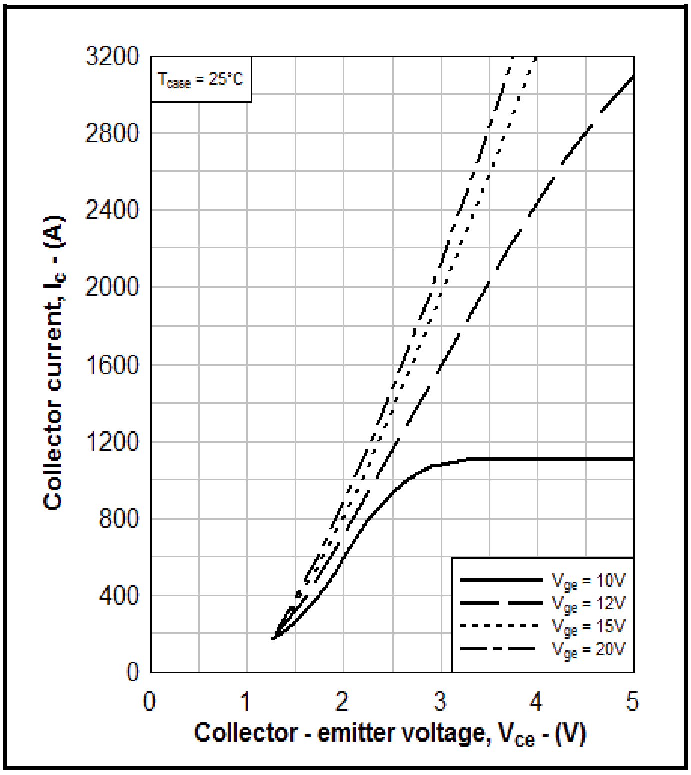


Fig. 3 Typical output characteristics

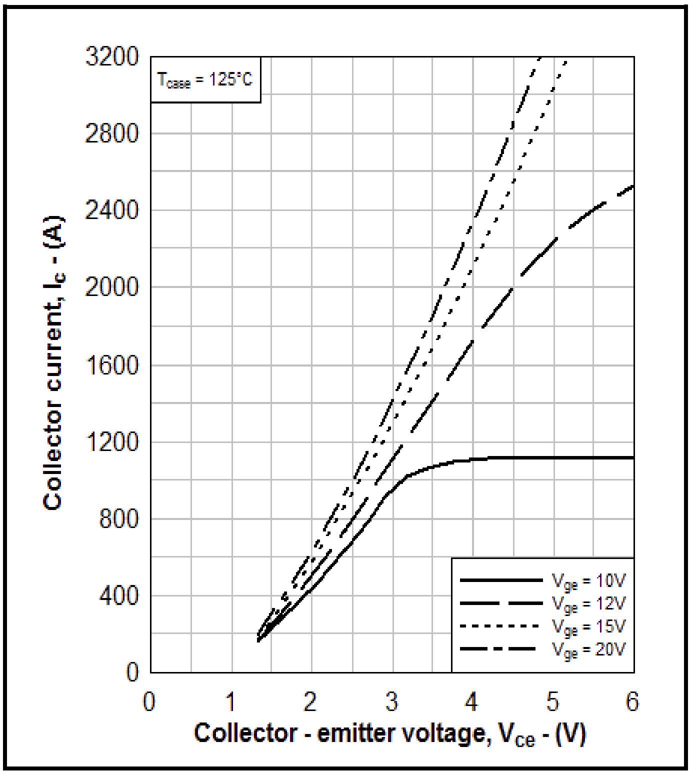


Fig. 4 Typical output characteristics

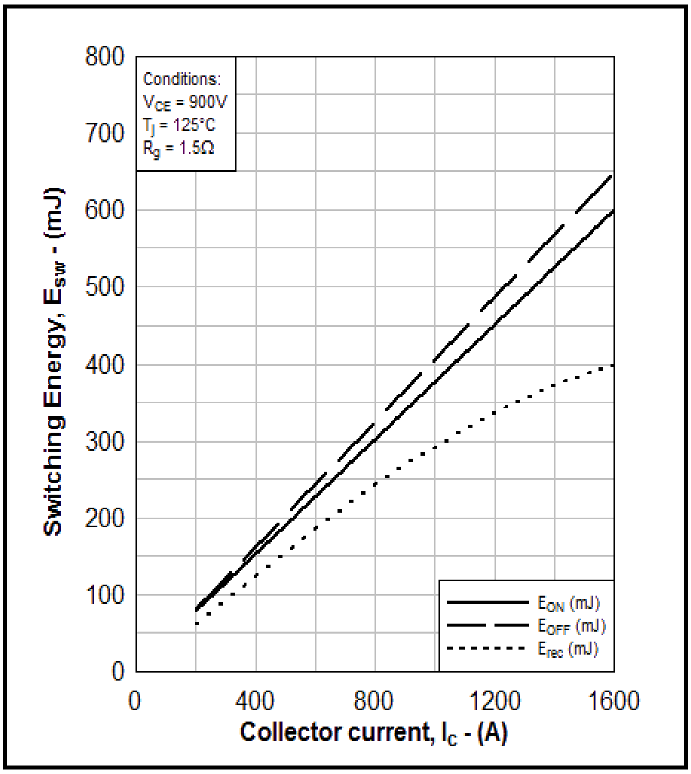


Fig. 5 Typical switching energy vs collector current

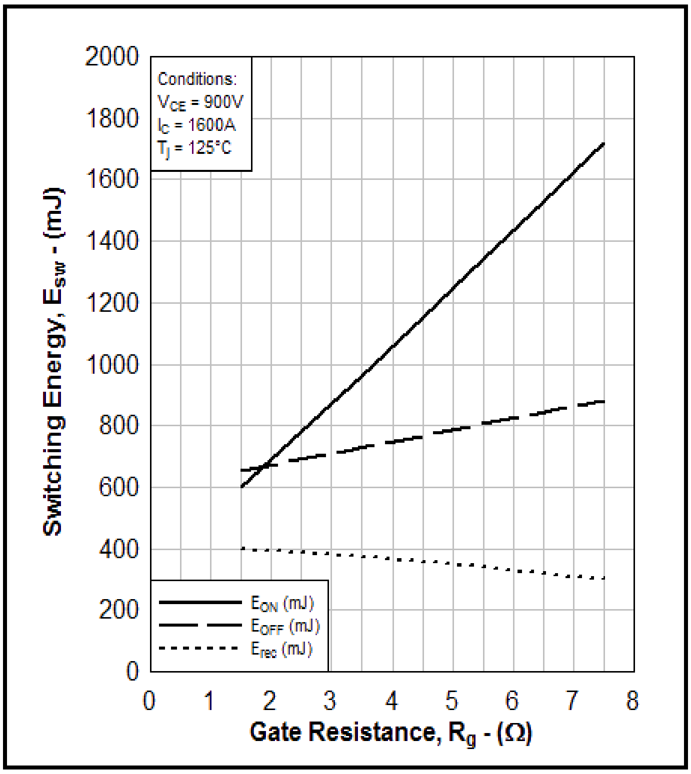


Fig. 6 Typical switching energy vs gate resistance

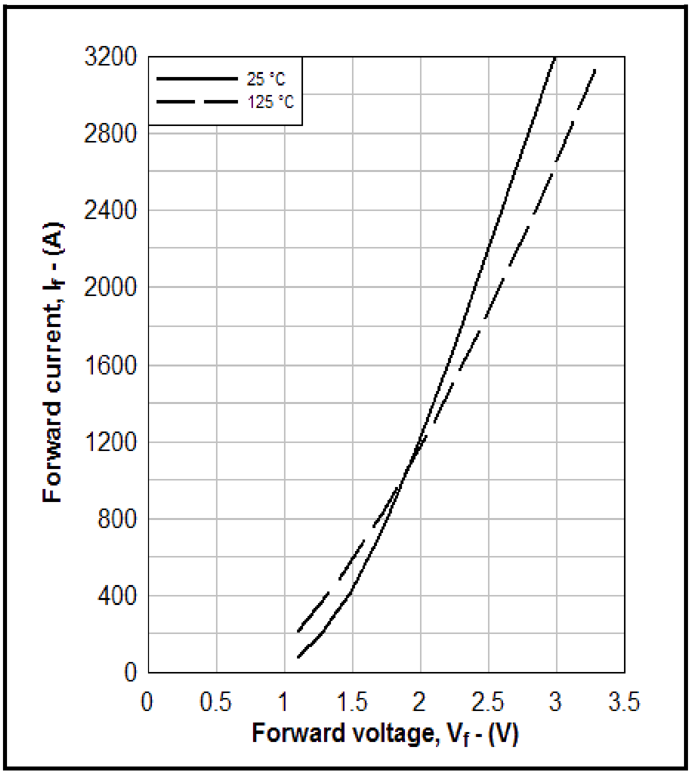


Fig. 7 Diode typical forward characteristics

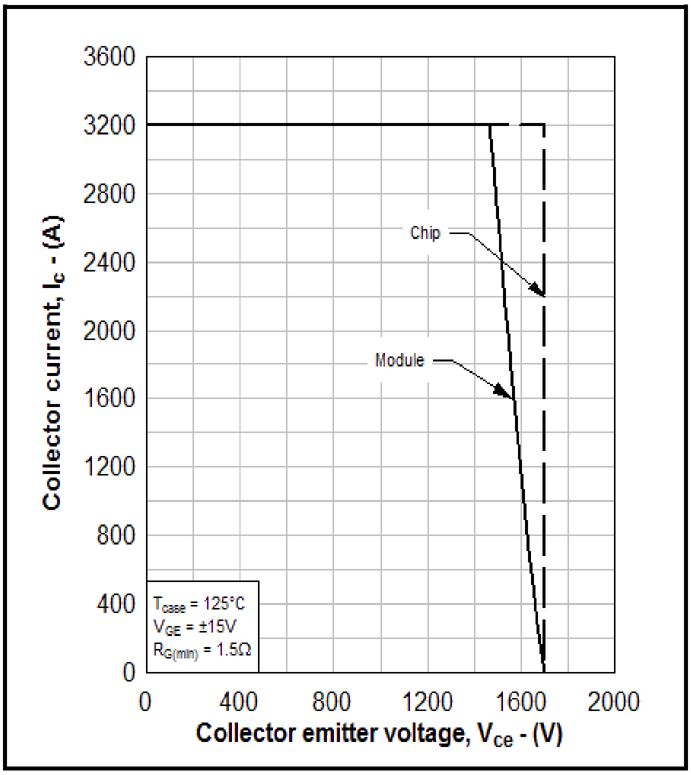


Fig. 8 Reverse bias safe operating area

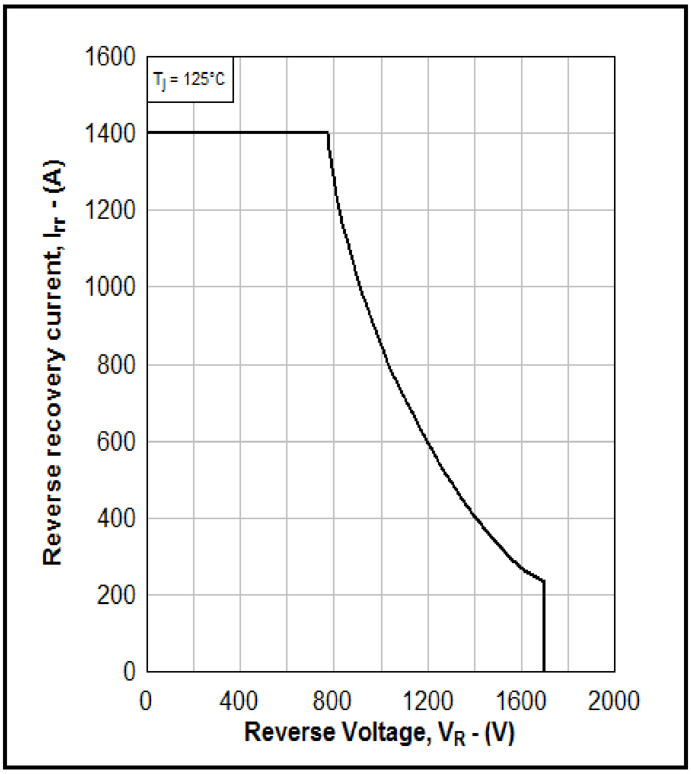


Fig. 9 Diode reverse bias safe operating area

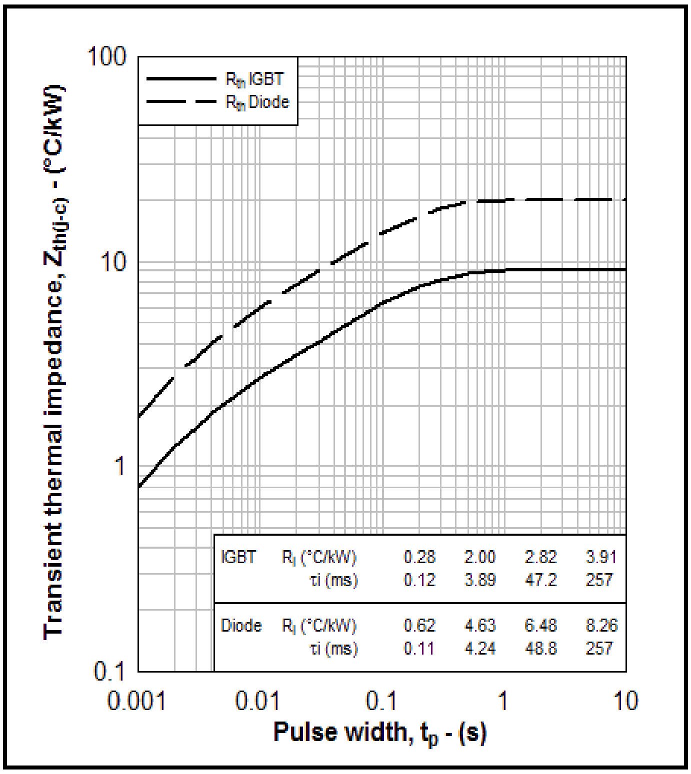
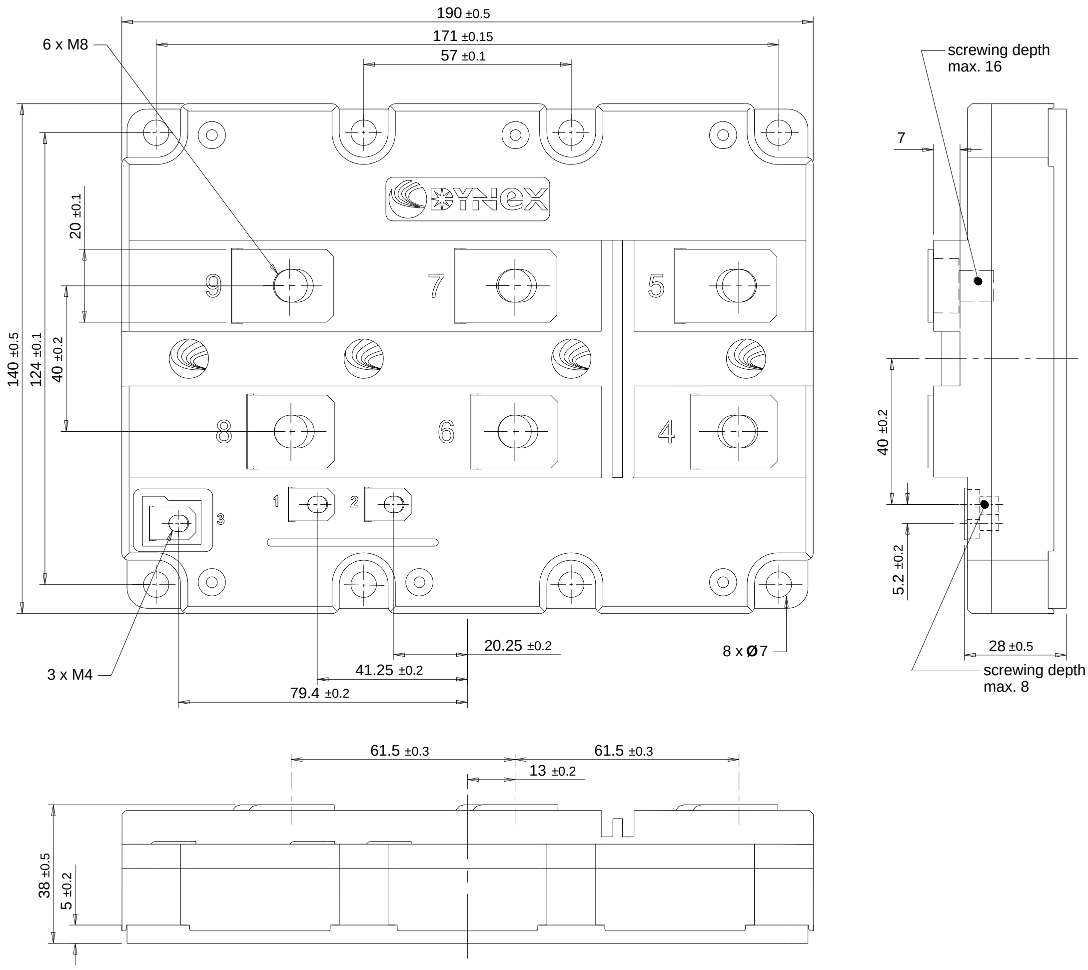


Fig. 10 Transient thermal impedance

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: 1400g

Module Outline Type Code: E

Fig. 11 Module outline drawing

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