

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- High Current Density Enhanced DMOS SPT
- Isolated AlSiC Base with AlN Substrates

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 DIM1000ECM33-TS000 is a 3300V, 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:

DIM1000ECM33-TS000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	3300V
$V_{CE(sat)}$ * (typ)	2.2V
I_C (max)	1000A
$I_{C(PK)}$ (max)	2000A

* Measured at the auxiliary terminals

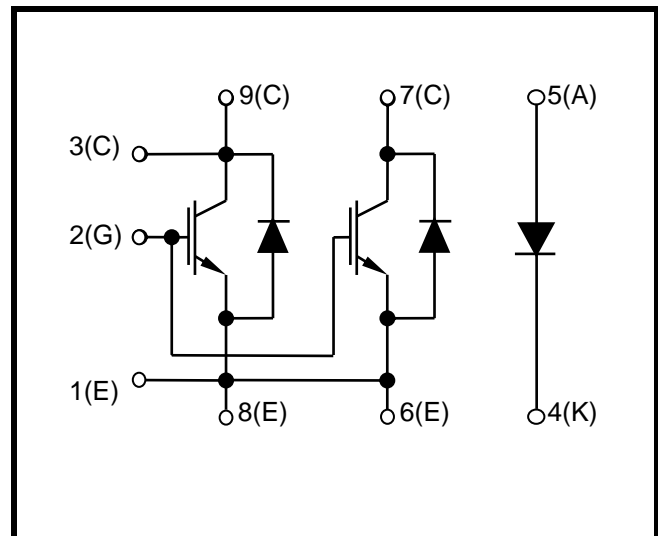


Fig. 1 Circuit configuration



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	3300	V
V _{GES}	Gate-emitter voltage		±20	V
I _C	Continuous collector current	T _{case} = 110°C	1000	A
I _{C(PK)}	Peak collector current	1ms, T _{case} = 140°C	2000	A
P _{max}	Max. transistor power dissipation	T _{case} = 25°C, T _j = 150°C	10.4	kW
I ² t	Diode I ² t value (IGBT arm)	V _R = 0, t _p = 10ms, T _j = 125°C	320	kA ² s
	Diode I ² t value (Diode arm)		320	kA ² s
V _{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	6000	V
Q _{PD}	Partial discharge – per module	IEC1287, V ₁ = 3500V, V ₂ = 2600V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material: AIN
 Baseplate material: AISiC
 Creepage distance: 31mm
 Clearance: 20mm
 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	-	-	12	°C/kW
R _{th(j-c)}	Thermal resistance – diode (IGBT arm)	Continuous dissipation – junction to case	-	-	24	°C/kW
R _{th(j-c)}	Thermal resistance – diode (Diode arm)	Continuous dissipation – junction to case	-	-	24	°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	-	-	150	°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

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{CES}	Collector cut-off current	$V_{GE} = 0V, V_{CE} = V_{CES}$			4	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125^{\circ}C$			60	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150^{\circ}C$			100	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			1	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 80mA, V_{GE} = V_{CE}$		5.7		V
$V_{CE(sat)}^{\dagger}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 1000A$		2.2		V
		$V_{GE} = 15V, I_C = 1000A, T_j = 125^{\circ}C$		2.8		V
		$V_{GE} = 15V, I_C = 1000A, T_j = 150^{\circ}C$		3.0		V
I_F	Diode forward current	DC		1000		A
I_{FM}	Diode maximum forward current	$t_p = 1ms$		2000		A
V_F^{\dagger}	Diode forward voltage (IGBT & Diode arm)	$I_F = 1000A$		2.4		V
		$I_F = 1000A, T_j = 125^{\circ}C$		2.5		V
		$I_F = 1000A, T_j = 150^{\circ}C$		2.4		V
C_{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		170		nF
Q_g	Gate charge	$\pm 15V$ Including external C_{ge}		17		μC
C_{res}	Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		4		nF
L_M	Module inductance	IGBT		15		nH
		Diode		25		
R_{INT}	Internal resistance	IGBT		135		
		Diode		270		$\mu\Omega$
SC_{Data}	Short circuit current, I_{SC}	$T_j = 150^{\circ}C, V_{CC} = 2500V$ $t_p \leq 10\mu s, V_{GE} \leq 15V$ $V_{CE(max)} = V_{CES} - L^* \times di/dt$ IEC 60747-9		3700		A

Note:

\dagger 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 = 1000A V _{GE} = ±15V V _{CE} = 1800V R _{G(ON)} = 2.7Ω R _{G(OFF)} = 2.2Ω C _{ge} = 220nF L _S ~ 100nH		2700		ns	
t _f	Fall time				520		ns
E _{OFF}	Turn-off energy loss				1950		mJ
t _{d(on)}	Turn-on delay time				1000		ns
t _r	Rise time				400		ns
E _{ON}	Turn-on energy loss				1300		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 1800V dI _F /dt = 2700A/μs		570		μC	
I _{rr}	Diode reverse recovery current				615		A
E _{rec}	Diode reverse recovery energy				670		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} = 1800V R _{G(ON)} = 2.7Ω R _{G(OFF)} = 2.2Ω C _{ge} = 220nF L _S ~ 100nH		2750		ns	
t _f	Fall time				570		ns
E _{OFF}	Turn-off energy loss				2200		mJ
t _{d(on)}	Turn-on delay time				1020		ns
t _r	Rise time				420		ns
E _{ON}	Turn-on energy loss				1700		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 1800V dI _F /dt = 2700A/μs		935		μC	
I _{rr}	Diode reverse recovery current				775		A
E _{rec}	Diode reverse recovery energy				1150		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} = 1800V R _{G(ON)} = 2.7Ω R _{G(OFF)} = 2.2Ω C _{ge} = 220nF L _S ~ 100nH		2800		ns	
t _f	Fall time				550		ns
E _{OFF}	Turn-off energy loss				2300		mJ
t _{d(on)}	Turn-on delay time				1030		ns
t _r	Rise time				430		ns
E _{ON}	Turn-on energy loss				1850		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 1000A V _{CE} = 1800V dI _F /dt = 2700A/μs		1070		μC	
I _{rr}	Diode reverse recovery current				800		A
E _{rec}	Diode reverse recovery energy				1300		mJ

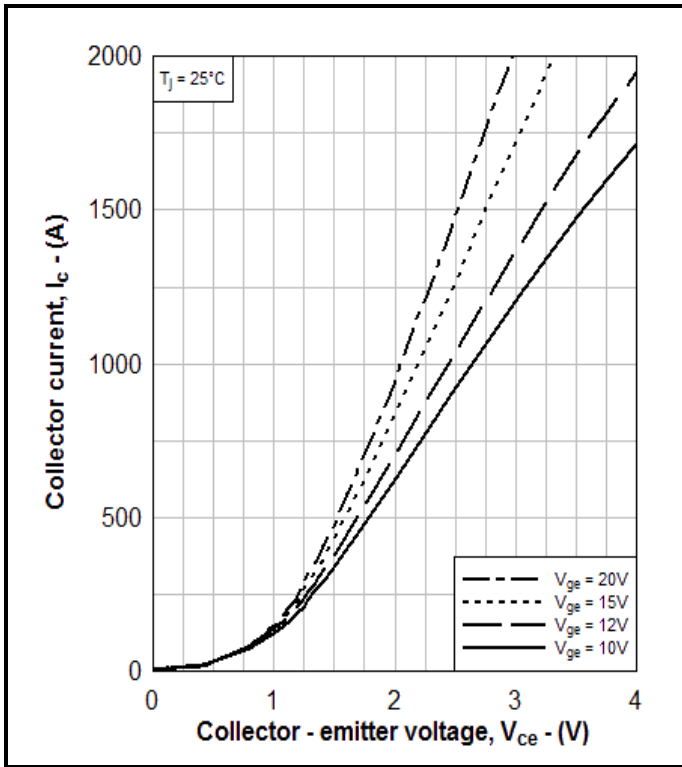


Fig. 3 Typical output characteristics

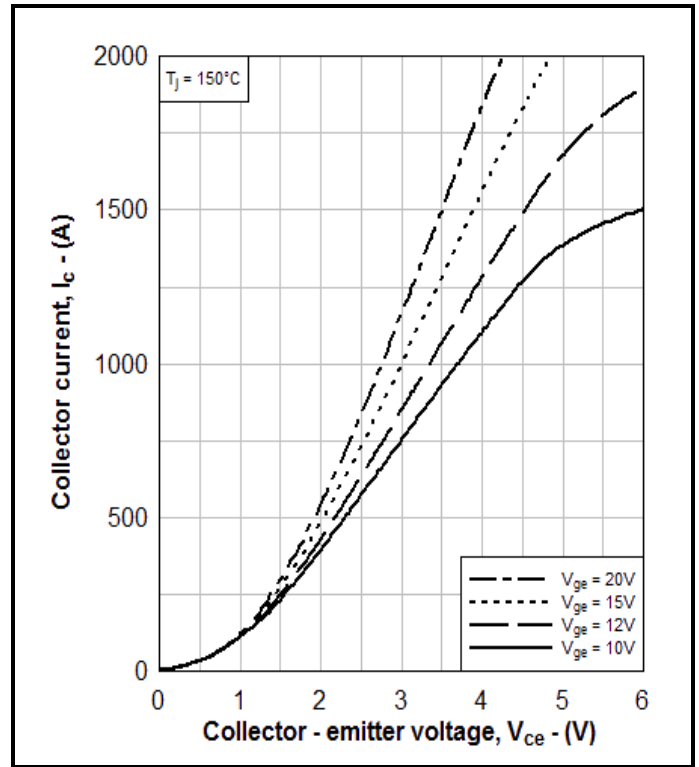


Fig. 4 Typical output characteristics

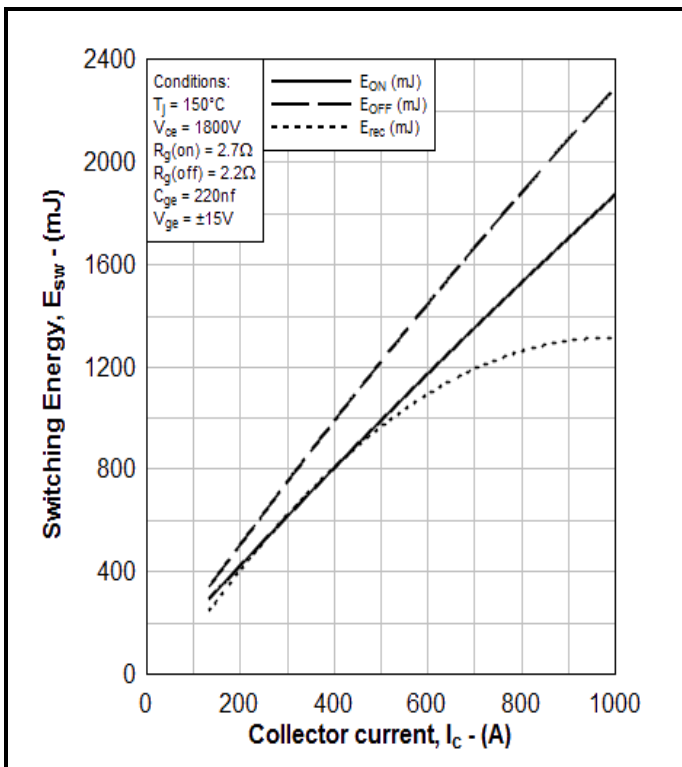


Fig. 5 Typical switching energy vs collector current

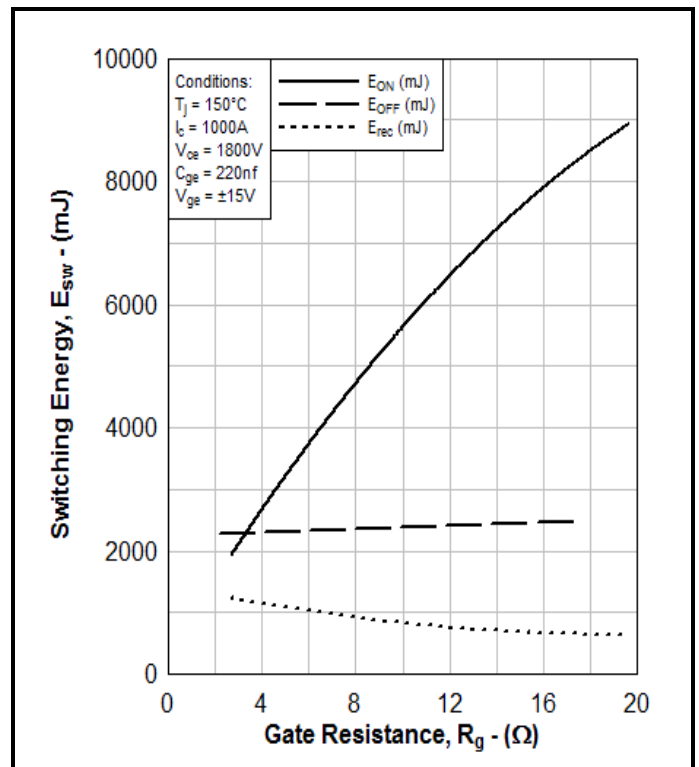


Fig. 6 Typical switching energy vs gate resistance

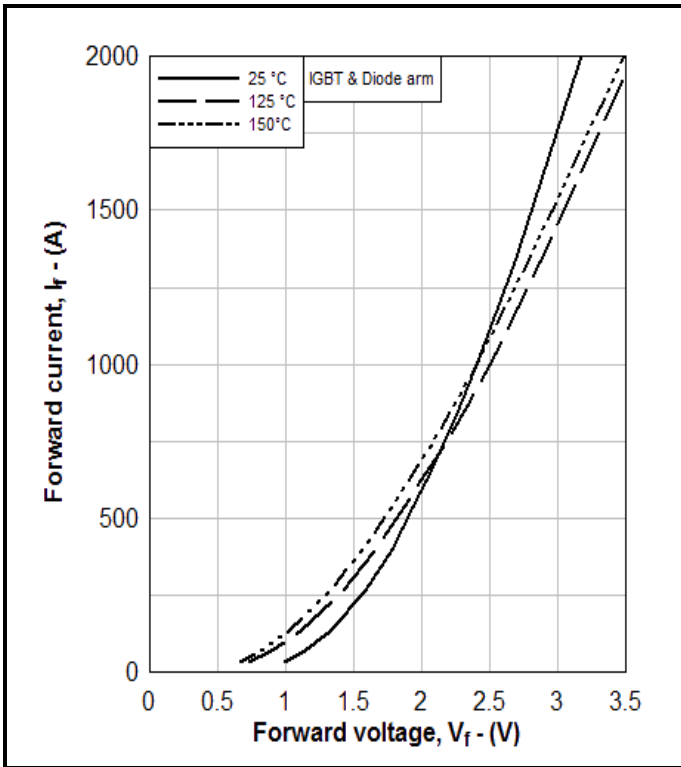


Fig. 7 Diode typical forward characteristics

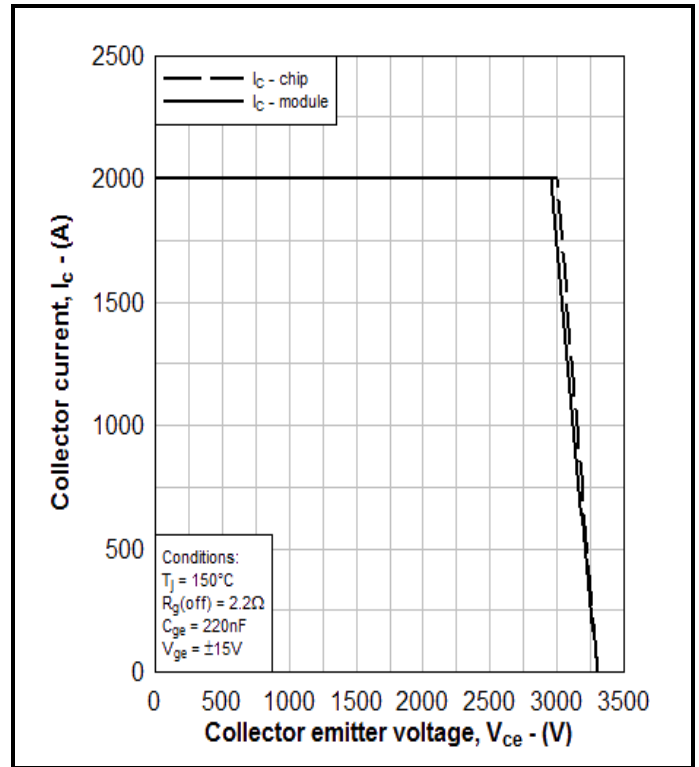


Fig. 8 Reverse bias safe operating area

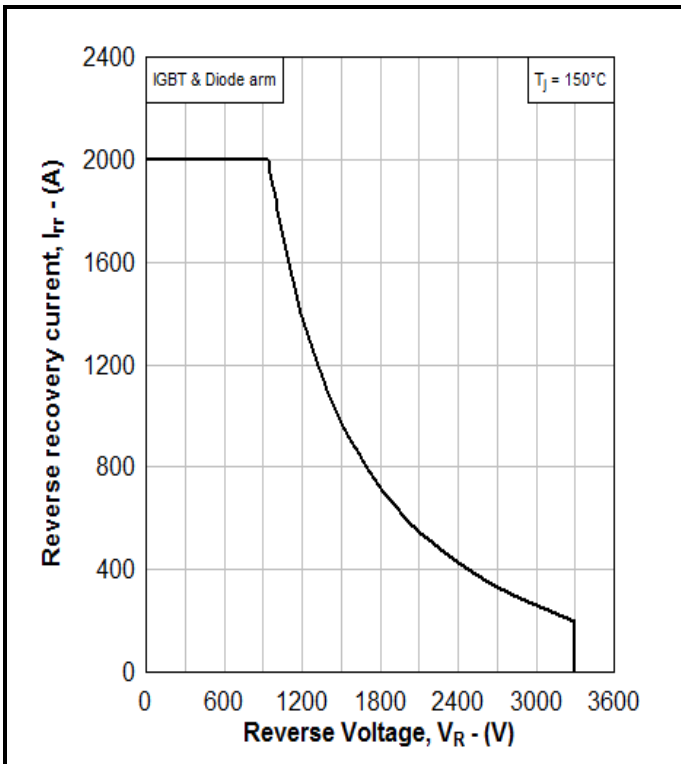


Fig. 9 Diode reverse bias safe operating area

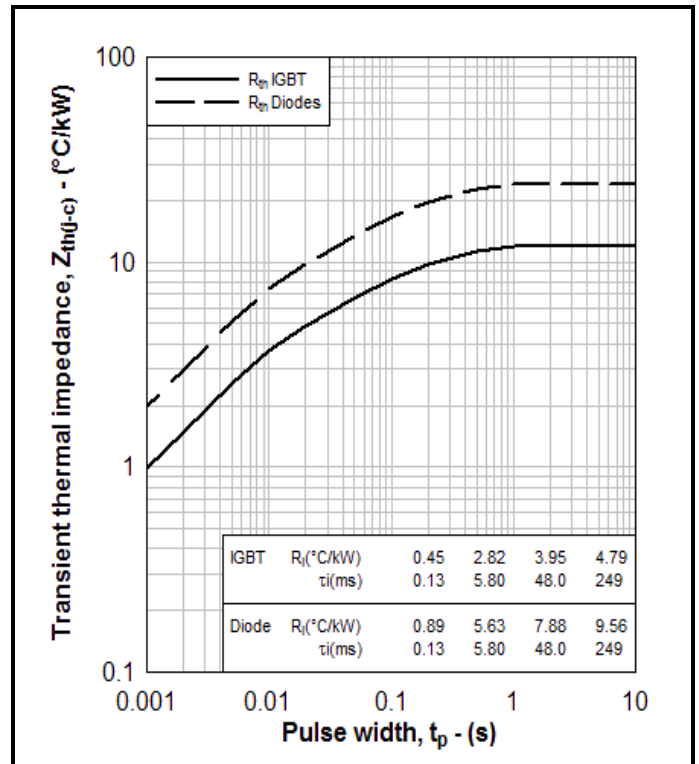


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

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

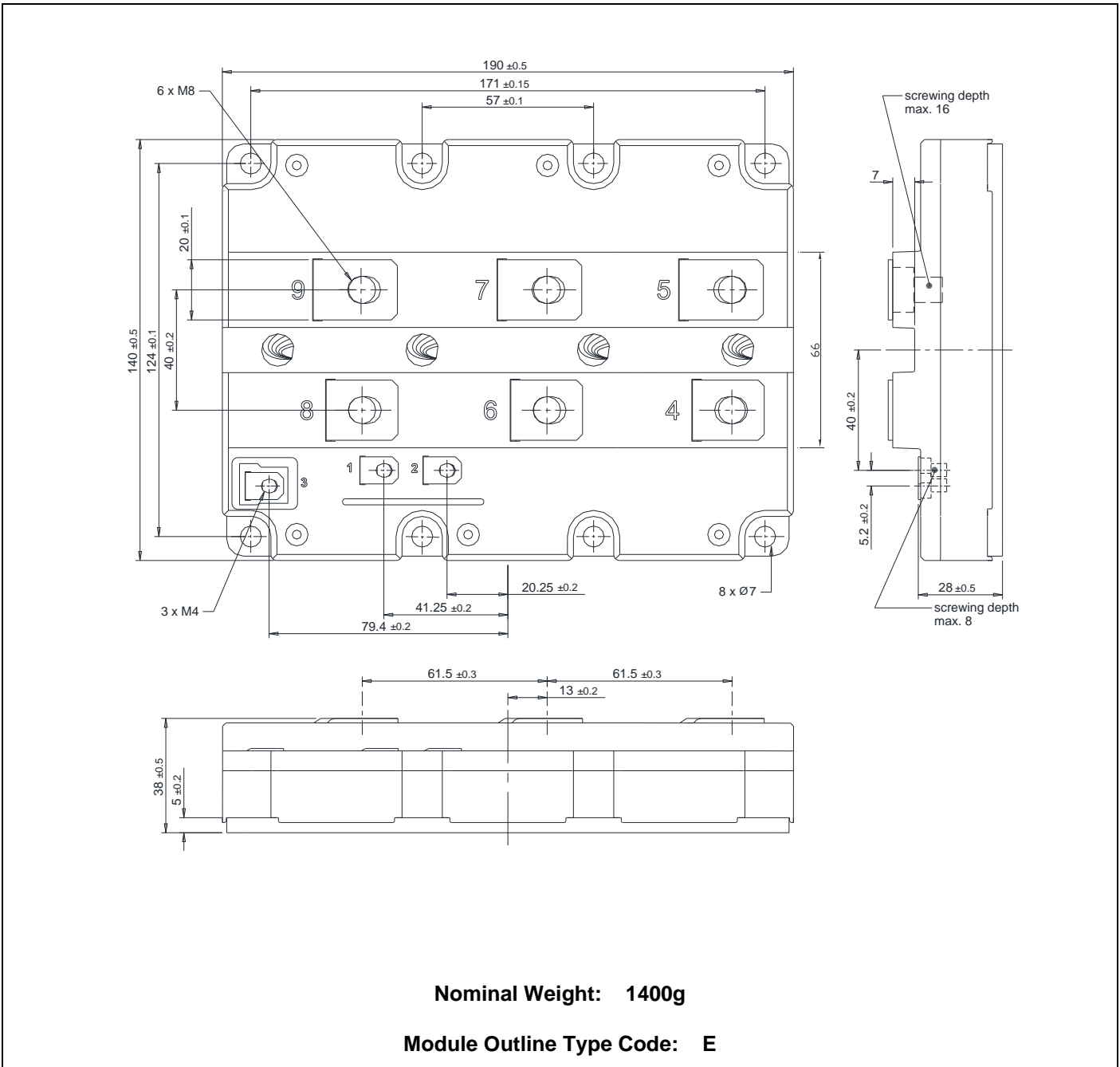


Fig. 11 Module outline drawing

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