

FEATURES

- Trench Gate IGBT
- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Low $V_{ce(sat)}$ Device
- High Current Density
- Isolated AISiC Base with AlN Substrates

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Smart Grid
- Traction Drives

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 DIM2400ESM17-PT500 is a single switch 1700V, trench gate, insulated gate bipolar transistor (IGBT) module with enhanced field stop and implantation technology. 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:

DIM2400ESM17-PT500

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	1700V
$V_{CE(sat)}$ * (typ)	1.75V
I_C (max)	2400A
$I_{C(PK)}$ (max)	4800A

* Measured at the power busbars, not the auxiliary terminals

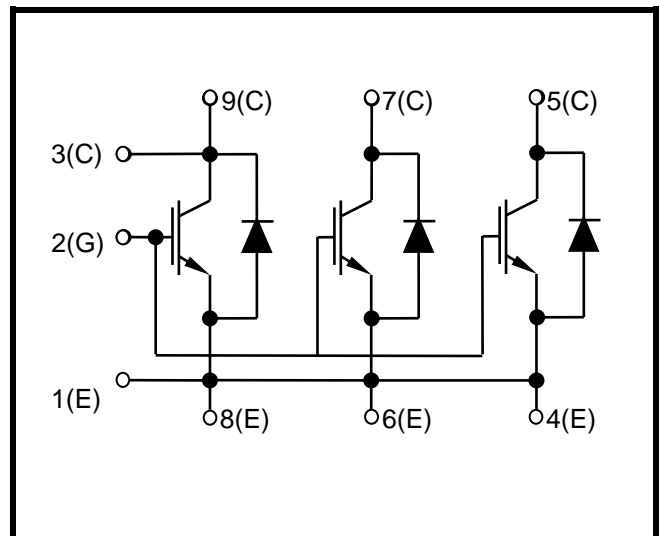
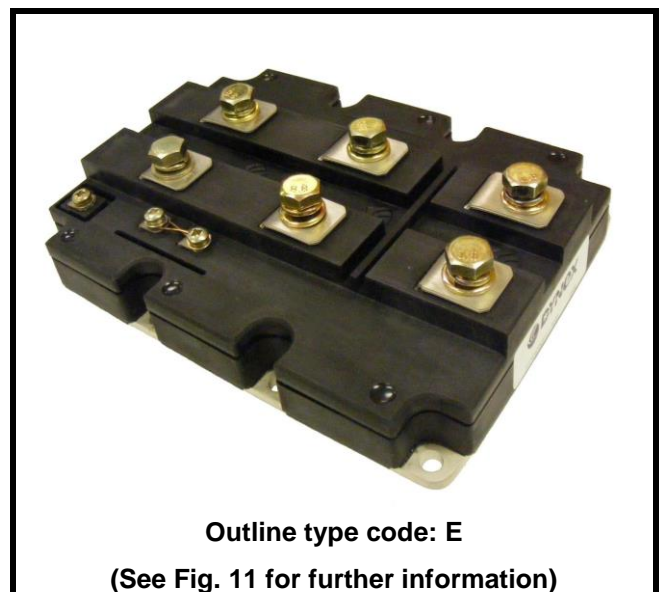


Fig. 1 Circuit configuration



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} = 118°C	2400	A
I _{C(PK)}	Peak collector current	1ms, T _{case} = 140°C	4800	A
P _{max}	Max. transistor power dissipation	T _{case} = 25°C, T _j = 150°C	20.8	kW
I ² t	Diode I ² t value	V _R = 0, t _p = 10ms, T _j = 150°C	1170	kA ² s
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: AIN
 Baseplate material: AISiC
 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	Continuous dissipation - junction to case	-	-	6	°C/kW
R _{th(j-c)}	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	12	°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	-	150	°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	$V_{GE} = 0V, V_{CE} = V_{CES}$			1	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125^{\circ}C$			40	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			60	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 120mA, V_{GE} = V_{CE}$	5.0	6.0	7.0	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 2400A$		1.75		V
		$V_{GE} = 15V, I_C = 2400A, T_j = 125^{\circ}C$		1.95		V
		$V_{GE} = 15V, I_C = 2400A, T_j = 150^{\circ}C$		2.05		
I_F	Diode forward current	DC		2400		A
I_{FM}	Diode maximum forward current	$t_p = 1ms$		4800		A
V_F	Diode forward voltage	$I_F = 2400A$		1.65		V
		$I_F = 2400A, T_j = 125^{\circ}C$		1.75		V
		$I_F = 2400A, T_j = 150^{\circ}C$		1.75		
C_{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		400		nF
Q_g	Gate charge	$\pm 15V$		19		μC
C_{res}	Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		3		nF
L_M	Module inductance			10		nH
R_{INT}	Internal transistor resistance			110		$\mu\Omega$
SC_{Data}	Short circuit current, I_{SC}	$T_j = 150^{\circ}C, V_{CC} = 1000V$ $t_p \leq 10\mu s, V_{GE} \leq 15V$ $V_{CE(max)} = V_{CES} - L^* \times di/dt$ IEC 60747-9		12000		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 = 2400A V _{GE} = ±15V V _{CE} = 900V R _{G(ON)} = 0.5Ω R _{G(OFF)} = 0.5Ω L _S ~ 50nH		2320		ns	
t _f	Fall time			500		ns	
E _{OFF}	Turn-off energy loss				1050		mJ
t _{d(on)}	Turn-on delay time				450		ns
t _r	Rise time				210		ns
E _{ON}	Turn-on energy loss				410		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 2400A V _{CE} = 900V dI _F /dt = 10000A/μs		480		μC	
I _{rr}	Diode reverse recovery current			1000		A	
E _{rec}	Diode reverse recovery energy				320		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 = 2400A V _{GE} = ±15V V _{CE} = 900V R _{G(ON)} = 0.5Ω R _{G(OFF)} = 0.5Ω L _S ~ 50nH		2340		ns	
t _f	Fall time			510		ns	
E _{OFF}	Turn-off energy loss				1320		mJ
t _{d(on)}	Turn-on delay time				450		ns
t _r	Rise time				220		ns
E _{ON}	Turn-on energy loss				660		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 2400A V _{CE} = 900V dI _F /dt = 10000A/μs		750		μC	
I _{rr}	Diode reverse recovery current			1200		A	
E _{rec}	Diode reverse recovery energy				550		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 = 2400A V _{GE} = ±15V V _{CE} = 900V R _{G(ON)} = 0.5Ω R _{G(OFF)} = 0.5Ω L _S ~ 50nH		2340		ns	
t _f	Fall time			510		ns	
E _{OFF}	Turn-off energy loss				1400		mJ
t _{d(on)}	Turn-on delay time				450		ns
t _r	Rise time				220		ns
E _{ON}	Turn-on energy loss				820		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 2400A V _{CE} = 900V dI _F /dt = 12000A/μs		820		μC	
I _{rr}	Diode reverse recovery current			1250		A	
E _{rec}	Diode reverse recovery energy				620		mJ

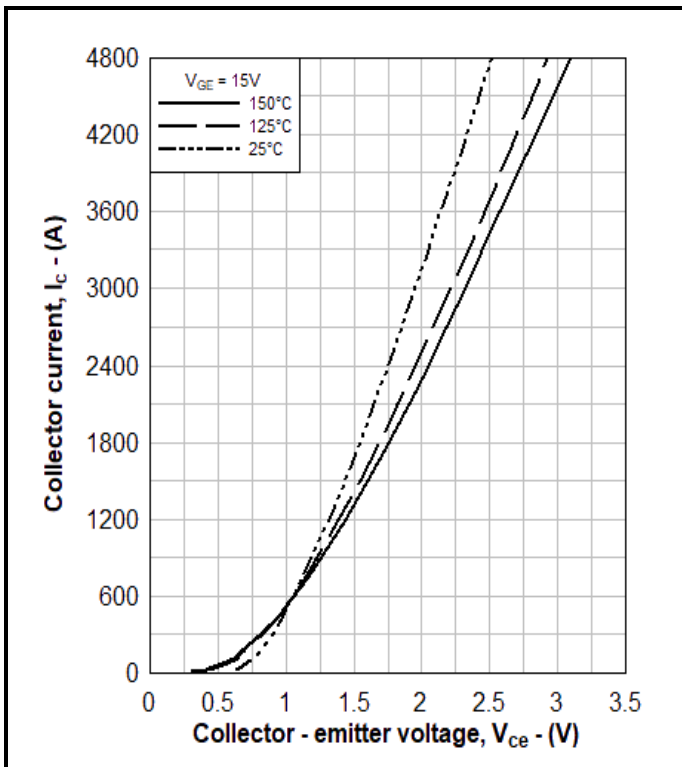


Fig. 3 Typical output characteristics

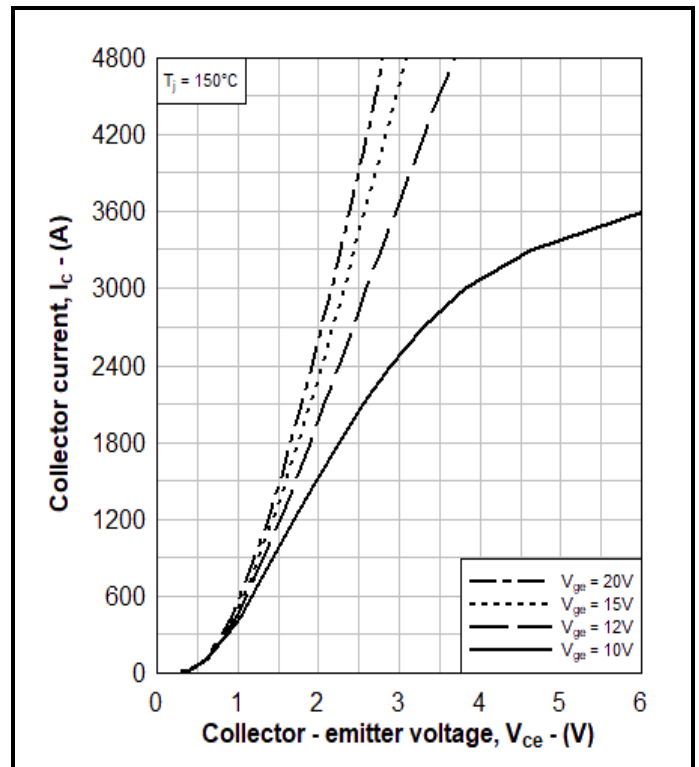


Fig. 4 Typical output characteristics

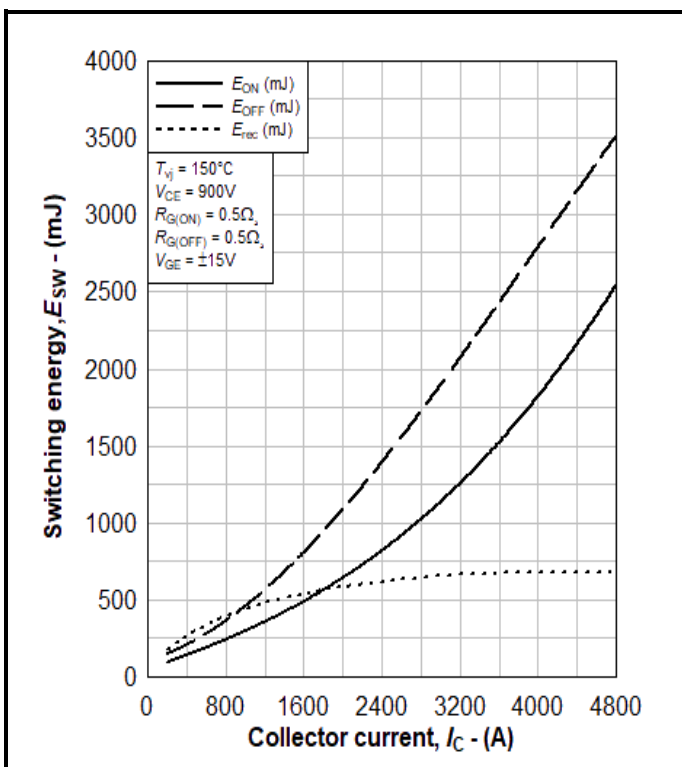


Fig. 5 Typical switching energy vs collector current

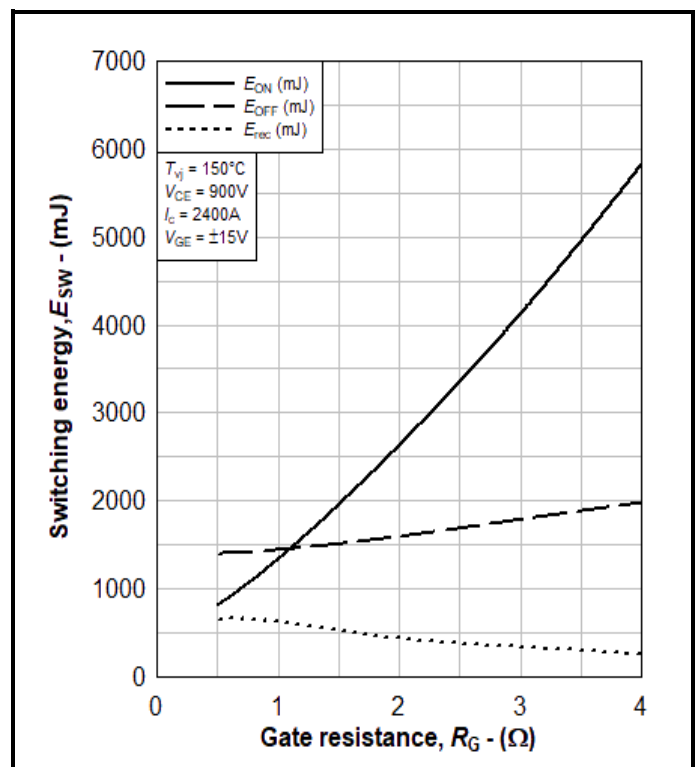


Fig. 6 Typical switching energy vs gate resistance

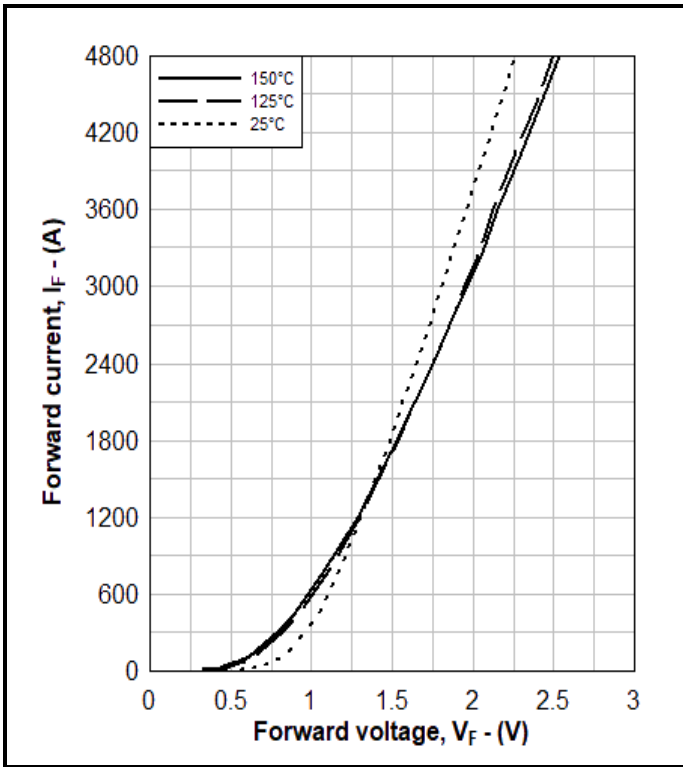


Fig. 7 Diode typical forward characteristics

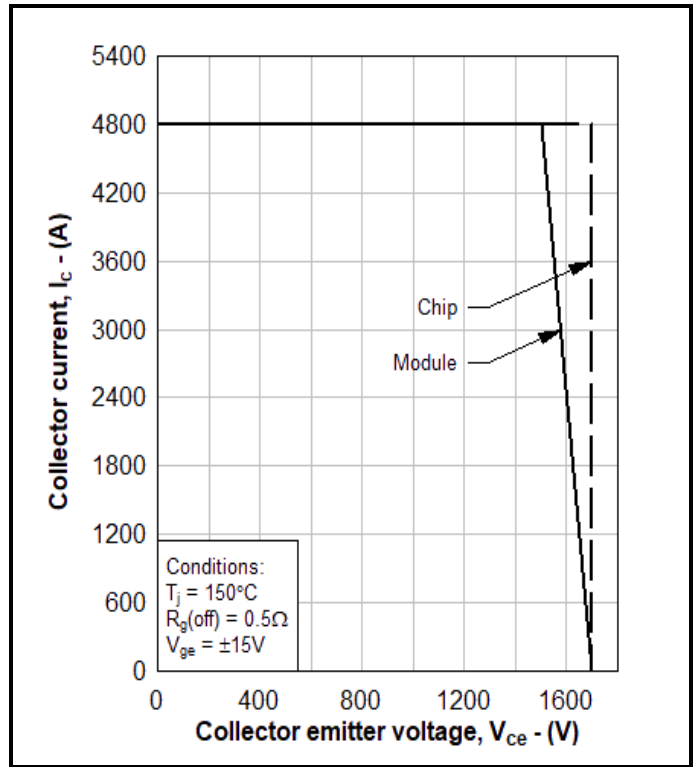


Fig. 8 Reverse bias safe operating area

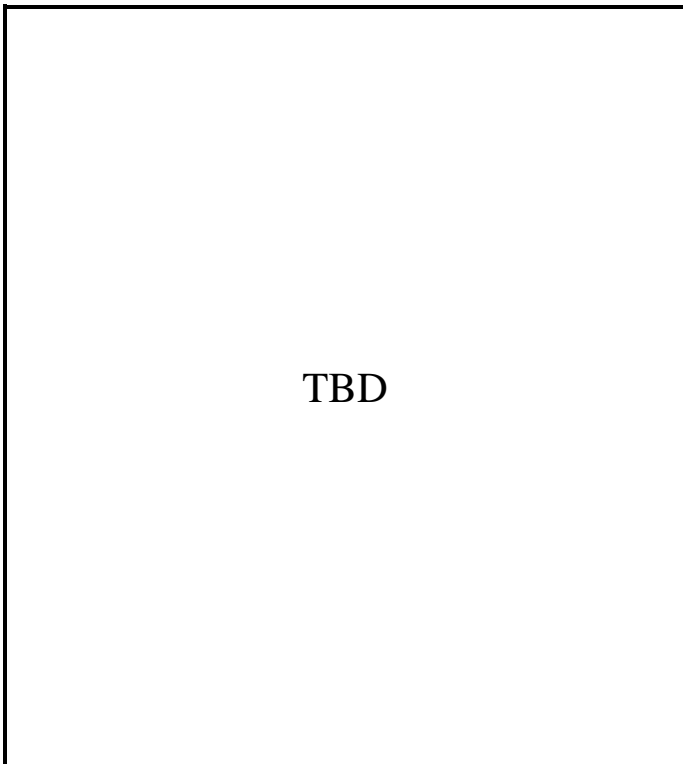


Fig. 9 Diode reverse bias safe operating area

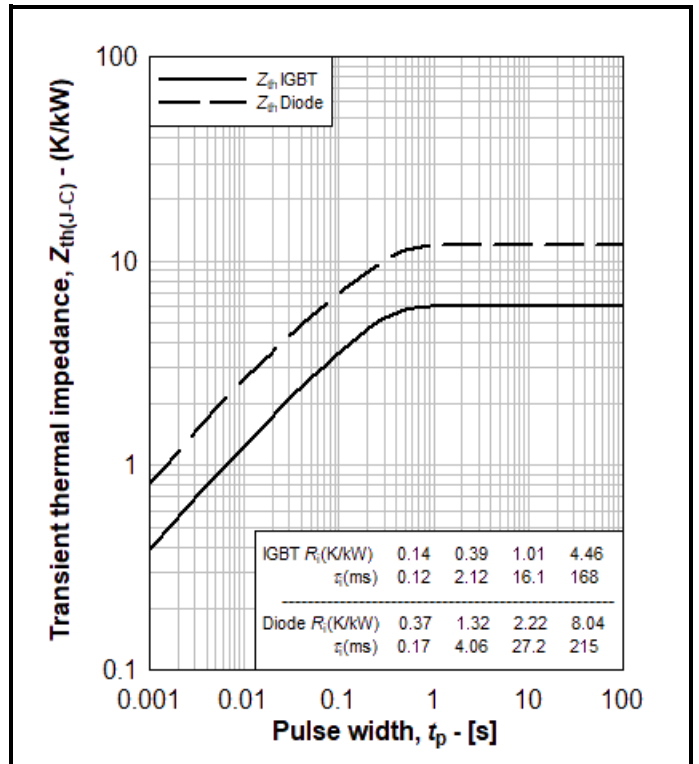


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

For further package information, please visit our website or contact Customer Services.
All dimensions in mm, unless stated otherwise.

DO NOT SCALE.

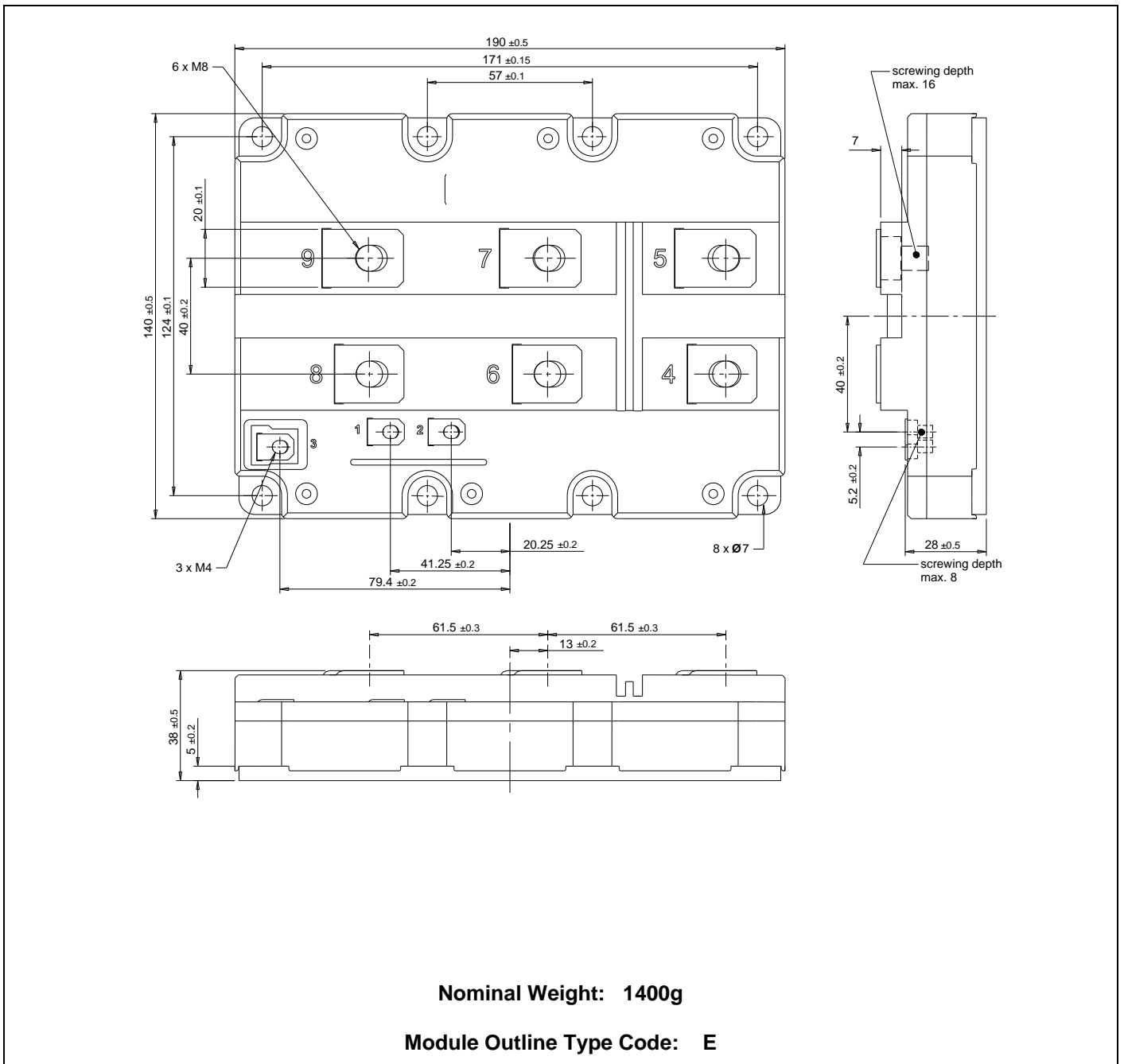


Fig. 11 Module outline drawing

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