

FEATURES

- 10 μ s Short Circuit Withstand
- High Thermal Cycling Capability
- High Current Density Enhanced DMOS SPT
- Isolated AISiC Base with AlN Substrates

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Auxiliaries
- 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 DIM125PHM33-TS000 is a half bridge 3300V, soft punch through n-channel enhancement mode, insulated gate bipolar transistor (IGBT) chopper module configured with the lower arm of the bridge controlled. The IGBT has a wide reverse bias safe operating area (RBSOA). 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:

DIM125PHM33-TS000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	3300V
$V_{CE(sat)}$ * (typ)	2.2V
I_C (max)	125A
$I_{C(PK)}$ (max)	250A

* Measured at the auxiliary terminals

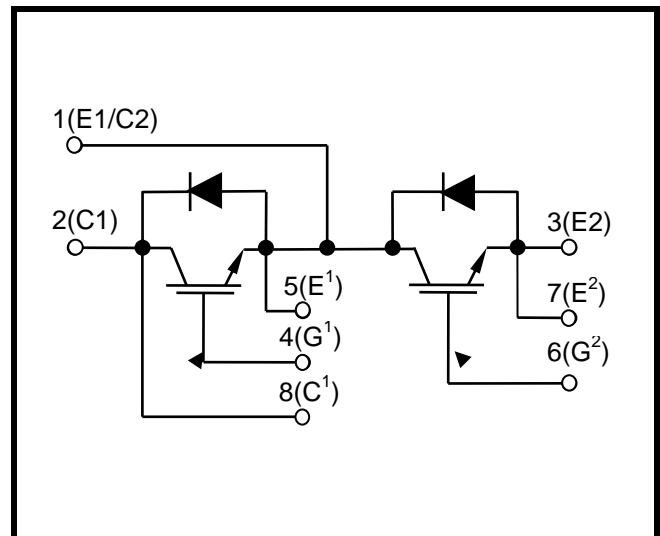
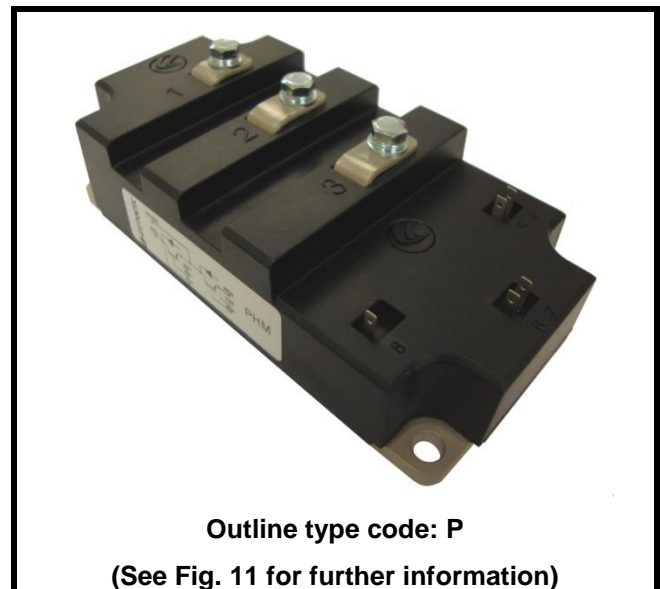


Fig. 1 Circuit configuration



Outline type code: P
(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	125	A
I _{C(PK)}	Peak collector current	1ms, T _{case} = 140°C	250	A
P _{max}	Max. transistor power dissipation	T _{case} = 25°C, T _j = 150°C	1.3	kW
I ² t	Diode I ² t value	V _R = 0, t _p = 10ms, T _j = 125°C	5	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:	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	Continuous dissipation - junction to case	-	-	96	°C/kW
R _{th(j-c)}	Thermal resistance – Diode	Continuous dissipation - junction to case	-	-	192	°C/kW
R _{th(c-h)}	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	16	°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 – M5	-	-	4	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
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125^{\circ}C$			7.5	mA
		$V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150^{\circ}C$			12.5	mA
I_{GES}	Gate leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$			1	μA
$V_{GE(TH)}$	Gate threshold voltage	$I_C = 20mA, V_{GE} = V_{CE}$		5.7		V
$V_{CE(sat)}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 125A$		2.2		V
		$V_{GE} = 15V, I_C = 125A, T_j = 125^{\circ}C$		2.8		V
		$V_{GE} = 15V, I_C = 125A, T_j = 150^{\circ}C$		3.0		V
I_F	Diode forward current	DC		125		A
I_{FM}	Diode maximum forward current	$t_p = 1ms$		250		A
V_F	Diode forward voltage	$I_F = 125A$		2.4		V
		$I_F = 125A, T_j = 125^{\circ}C$		2.5		V
		$I_F = 125A, T_j = 150^{\circ}C$		2.4		V
C_{ies}	Input capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		22.5		nF
Q_g	Gate charge	$\pm 15V$ Including external C_{ge}		2.5		μC
C_{res}	Reverse transfer capacitance	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		0.5		nF
L_M	Module inductance			40		nH
R_{INT}	Internal transistor resistance			540		$\mu\Omega$
SC_{Data}	Short circuit current, I_{SC}	$T_j = 150^{\circ}C, V_{CC} = 2500V$ $t_p \leq 10\mu s, V_{GE} \leq 15V$ $V_{CE(max)} = V_{CES} - L \cdot \frac{dI}{dt}$ IEC 60747-9		480		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 = 125A V _{GE} = ±15V V _{CE} = 1800V R _{g(ON)} = 20Ω R _{g(OFF)} = 20Ω C _{GE} = 27nF L _S ~ 150nH		2700		ns
t _f	Fall time			520		ns
E _{OFF}	Turn-off energy loss			240		mJ
t _{d(on)}	Turn-on delay time			1000		ns
t _r	Rise time			400		ns
E _{ON}	Turn-on energy loss			160		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 125A V _{CE} = 1800V di _F /dt = 350A/μs		90		μC
I _{rr}	Diode reverse recovery current			80		A
E _{rec}	Diode reverse recovery energy			85		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 = 125A V _{GE} = ±15V V _{CE} = 1800V R _{g(ON)} = 20Ω R _{g(OFF)} = 20Ω C _{GE} = 27nF L _S ~ 150nH		2750		ns
t _f	Fall time			570		ns
E _{OFF}	Turn-off energy loss			270		mJ
t _{d(on)}	Turn-on delay time			1020		ns
t _r	Rise time			420		ns
E _{ON}	Turn-on energy loss			210		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 125A V _{CE} = 1800V di _F /dt = 350A/μs		115		μC
I _{rr}	Diode reverse recovery current			100		A
E _{rec}	Diode reverse recovery energy			140		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 = 125A V _{GE} = ±15V V _{CE} = 1800V R _{g(ON)} = 20Ω R _{g(OFF)} = 20Ω C _{GE} = 27nF L _S ~ 150nH		2800		ns
t _f	Fall time			550		ns
E _{OFF}	Turn-off energy loss			290		mJ
t _{d(on)}	Turn-on delay time			1030		ns
t _r	Rise time			430		ns
E _{ON}	Turn-on energy loss			230		mJ
Q _{rr}	Diode reverse recovery charge	I _F = 125A V _{CE} = 1800V di _F /dt = 350A/μs		135		μC
I _{rr}	Diode reverse recovery current			100		A
E _{rec}	Diode reverse recovery energy			165		mJ

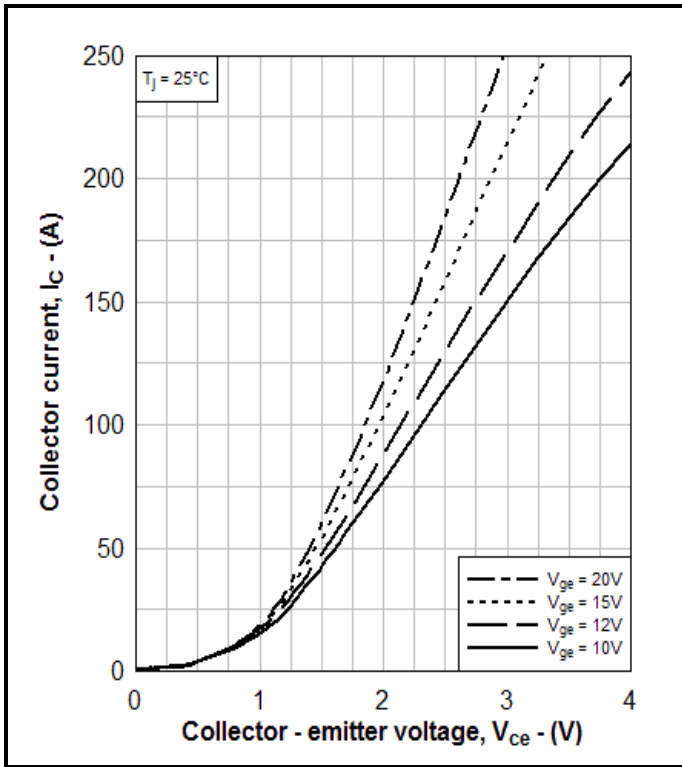


Fig. 3 Typical output characteristics

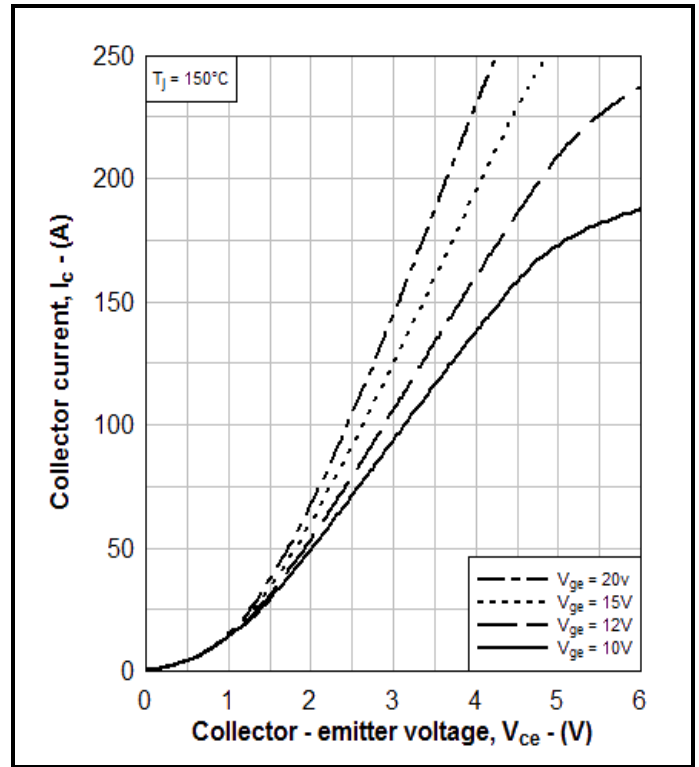


Fig. 4 Typical output characteristics

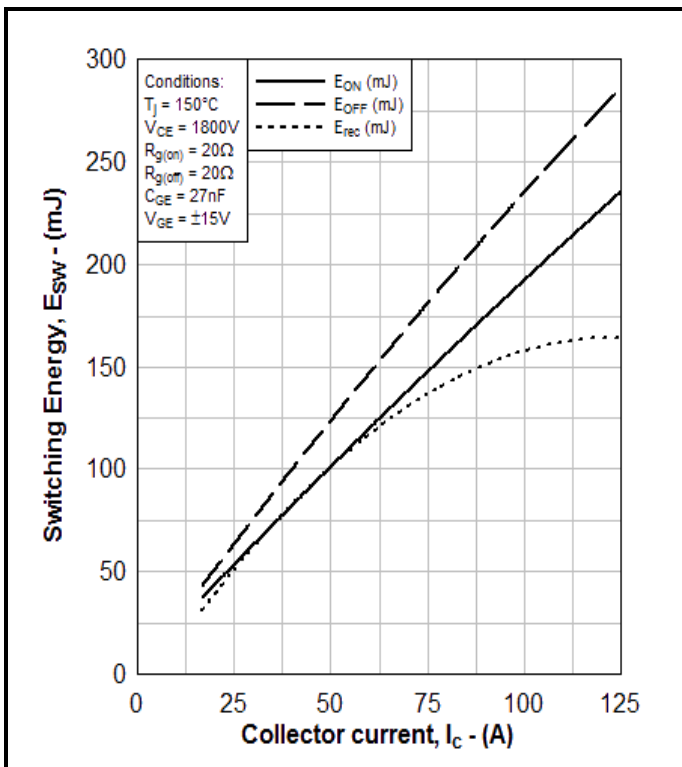


Fig. 5 Typical switching energy vs collector current

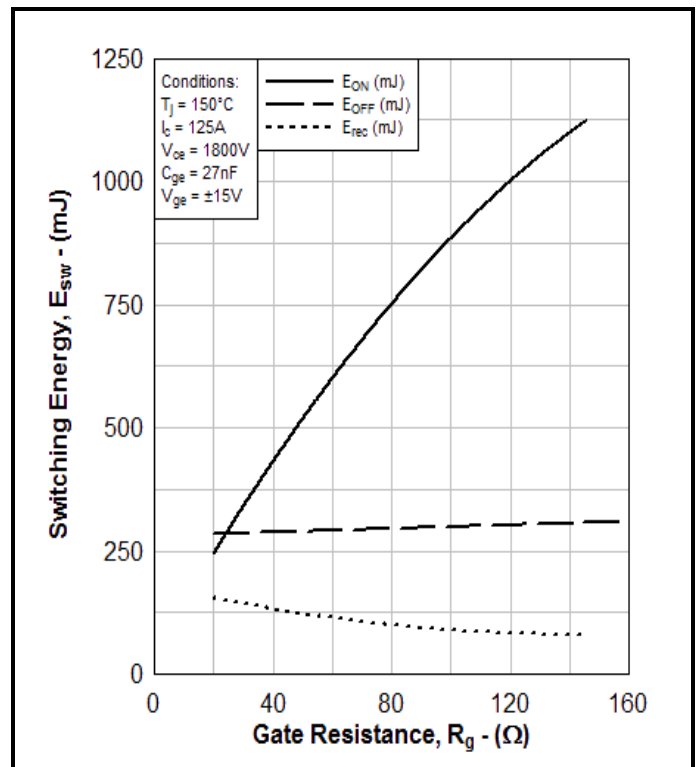


Fig. 6 Typical switching energy vs gate resistance

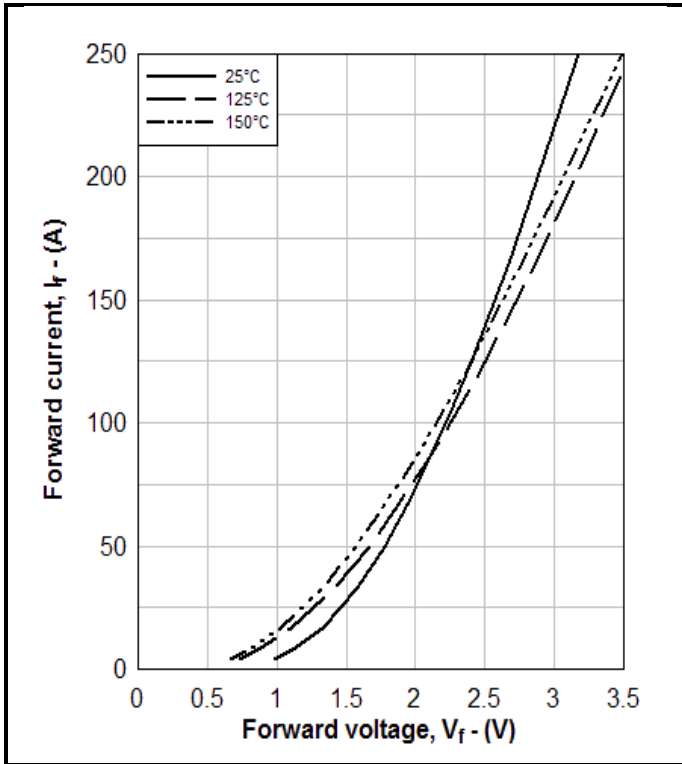


Fig. 7 Diode typical forward characteristics

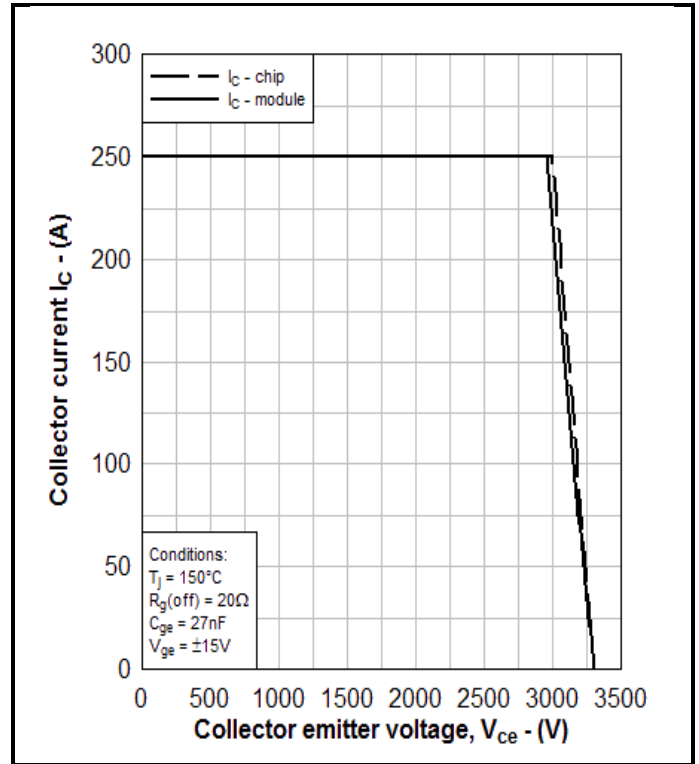


Fig. 8 Reverse bias safe operating area

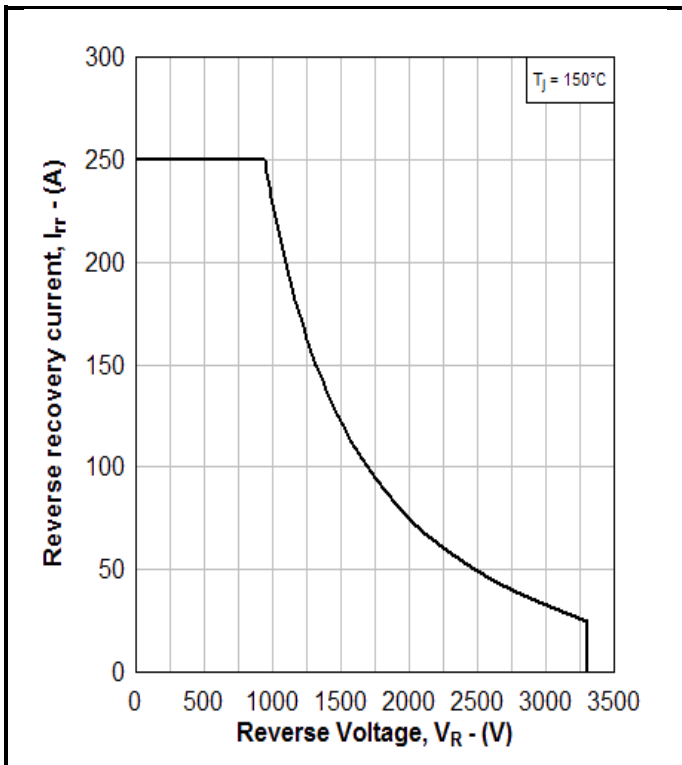


Fig. 9 Diode reverse bias safe operating area

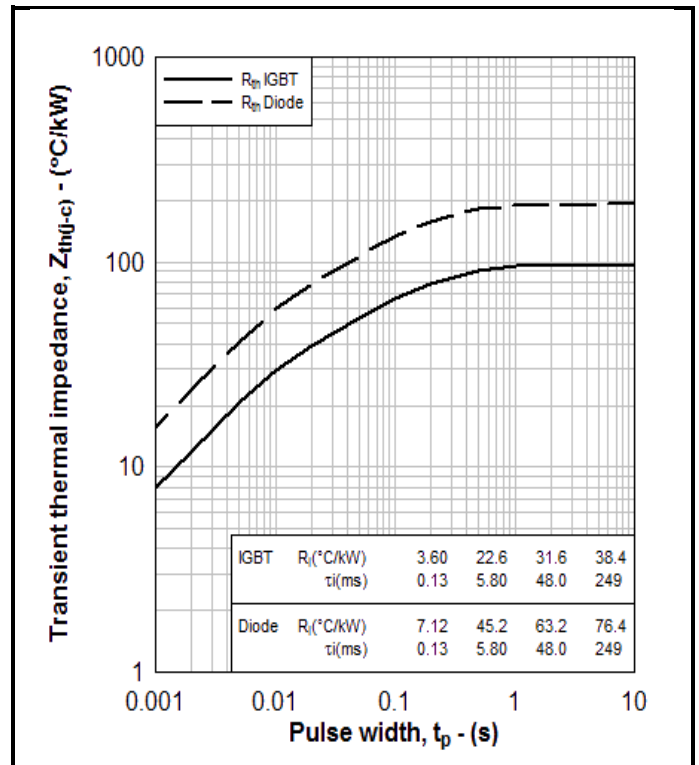


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

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

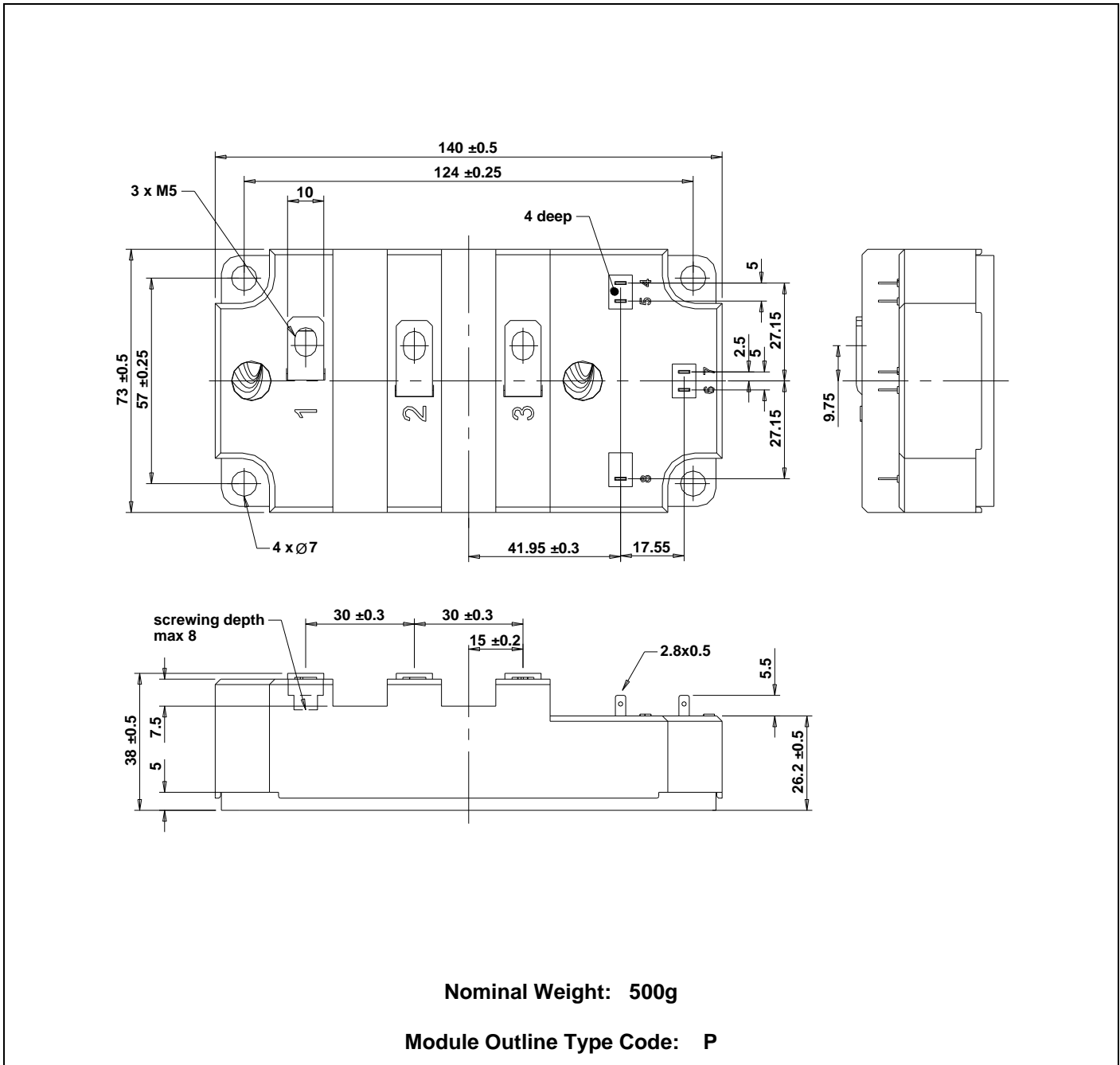


Fig. 11 Module outline drawing

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