DIM250PLM33-TL000

IGBT Chopper Module

DS6115-1 July 2013 (LN30664)

FEATURES

- Low $V_{CE(sat)}$ Device
- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- High Current Density Enhanced DMOS SPT
- Isolated AlSiC Base with AlN Substrates

APPLICATIONS

- Choppers
- Motor Controllers
- Power Supplies
- Traction Auxiliaries

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 DIM250PLM33-TL000 is a Low $V_{CE(sat)}$ 3300V, 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:

DIM250PLM33-TL000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**3300V**
$V_{CE(sat)}$ *	**(typ)**	**2.0V**
I_C	**(max)**	**250A**
$I_{C(PK)}$	**(max)**	**500A**

* Measured at the auxiliary terminals

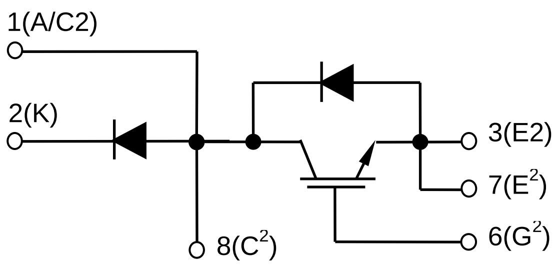
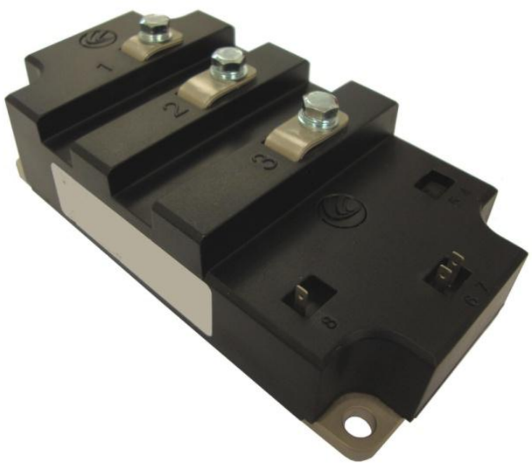


Fig. 1 Circuit configuration



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} = 115°C	250	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 140°C	500	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	2.6	kW
I^2t	Diode I^2t value – IGBT Arm	V_R = 0, t_p = 10ms, T_j = 150ºC	20	kA^2s
	Diode I^2t value – Diode Arm		20	kA^2s
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	-	-	48	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (IGBT Arm)	Continuous dissipation - junction to case	-	-	96	°C/kW
	Thermal resistance – diode (Diode Arm)		-	-	96	°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

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

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}			1	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125°C			15	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150°C			25	mA
I_{GES}	Gate leakage current	V_{GE} = ± 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 = 250A		2.0		V
		V_{GE} = 15V, I_C = 250A, T_j = 125°C		2.6		V
		V_{GE} = 15V, I_C = 250A, T_j = 150°C		2.8		V
I_F	Diode forward current	DC		250		A
I_{FM}	Diode maximum forward current	t_p = 1ms		500		A
V_F	Diode forward voltage † (IGBT arm)	I_F = 250A		2.4		V
	Diode forward voltage ‡ (Diode arm)			2.5		V
	Diode forward voltage † (IGBT arm)	I_F = 250A, T_j = 125°C		2.5		V
	Diode forward voltage ‡ (Diode arm)			2.6		V
	Diode forward voltage † (IGBT arm)	I_F = 250A, T_j = 150°C		2.4		V
	Diode forward voltage ‡ (Diode arm)			2.5		V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		45		nF
Q_g	Gate charge	±15V Including external C_{ge}		5		μC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1		nF
L_M	Module inductance			40		nH
R_{INT}	Internal transistor resistance			500		μΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 150°C, V_{CC} = 2500V t_p ≤ 10μs, V_{GE} ≤ 15V $V_{CE\ (max)} = V_{CES} - L^* \times dI/dt$ IEC 60747-9		950		A

Note:
† Measured at the auxiliary terminals
‡ Measured at the power busbars
* 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 = 250A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 10Ω $R_{g(OFF)}$ = 10Ω C_{GE} = 56nF L_S ~ 150nH		2700		ns
t_f	Fall time			610		ns
E_{OFF}	Turn-off energy loss			650		mJ
$t_{d(on)}$	Turn-on delay time			960		ns
t_r	Rise time			430		ns
E_{ON}	Turn-on energy loss			400		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 250A V_{CE} = 1800V dI_F/dt = 700A/μs		140		μC
I_{rr}	Diode reverse recovery current			150		A
E_{rec}	Diode reverse recovery energy			170		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 = 250A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 10Ω $R_{g(OFF)}$ = 10Ω C_{GE} = 56nF L_S ~ 150nH		2750		ns
t_f	Fall time			590		ns
E_{OFF}	Turn-off energy loss			680		mJ
$t_{d(on)}$	Turn-on delay time			1000		ns
t_r	Rise time			460		ns
E_{ON}	Turn-on energy loss			520		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 250A V_{CE} = 1800V dI_F/dt = 700A/μs		230		μC
I_{rr}	Diode reverse recovery current			190		A
E_{rec}	Diode reverse recovery energy			280		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 = 250A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 10Ω $R_{g(OFF)}$ = 10Ω C_{GE} = 56nF L_S ~ 150nH		2760		ns
t_f	Fall time			590		ns
E_{OFF}	Turn-off energy loss			750		mJ
$t_{d(on)}$	Turn-on delay time			940		ns
t_r	Rise time			460		ns
E_{ON}	Turn-on energy loss			550		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 250A V_{CE} = 1800V dI_F/dt = 700A/μs		270		μC
I_{rr}	Diode reverse recovery current			200		A
E_{rec}	Diode reverse recovery energy			330		mJ

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

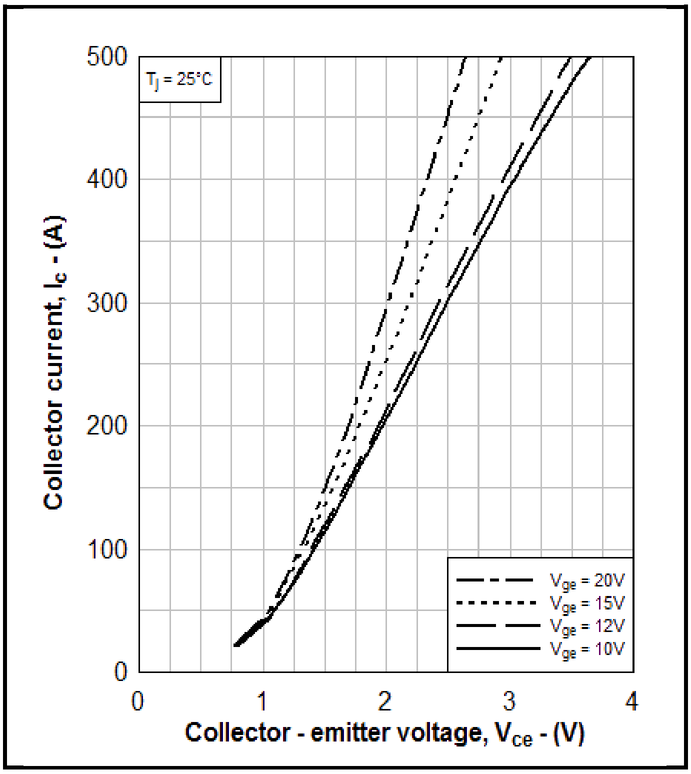


Fig. 3 Typical output characteristics

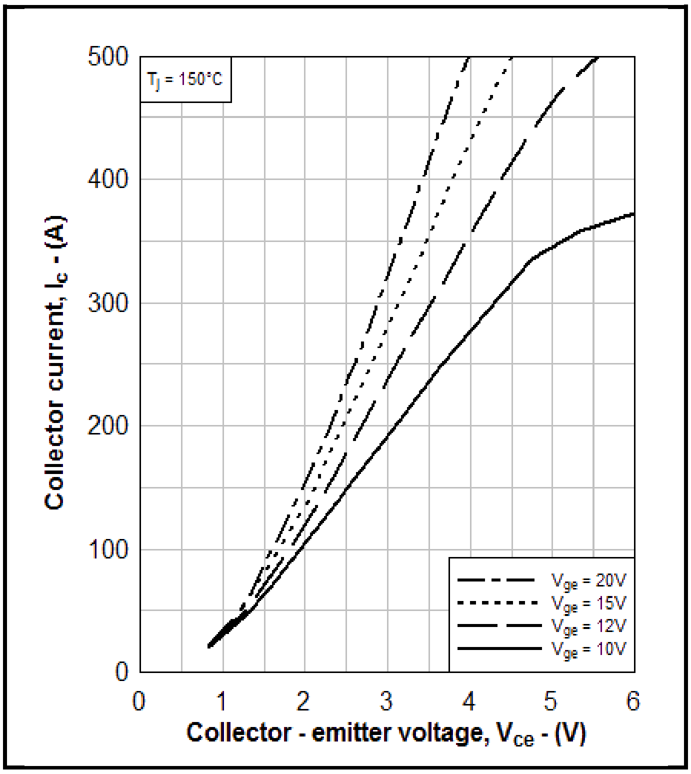


Fig. 4 Typical output characteristics

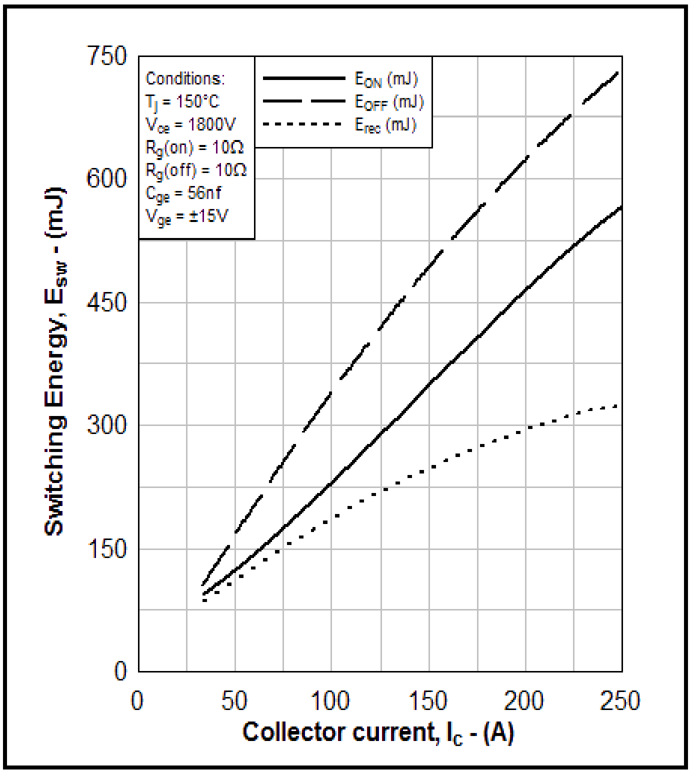


Fig. 5 Typical switching energy vs collector current

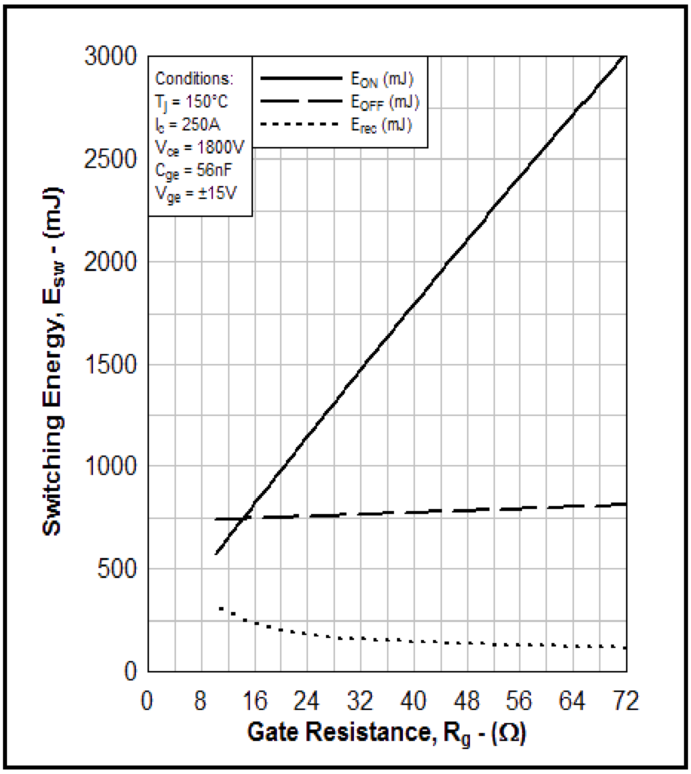


Fig. 6 Typical switching energy vs gate resistance

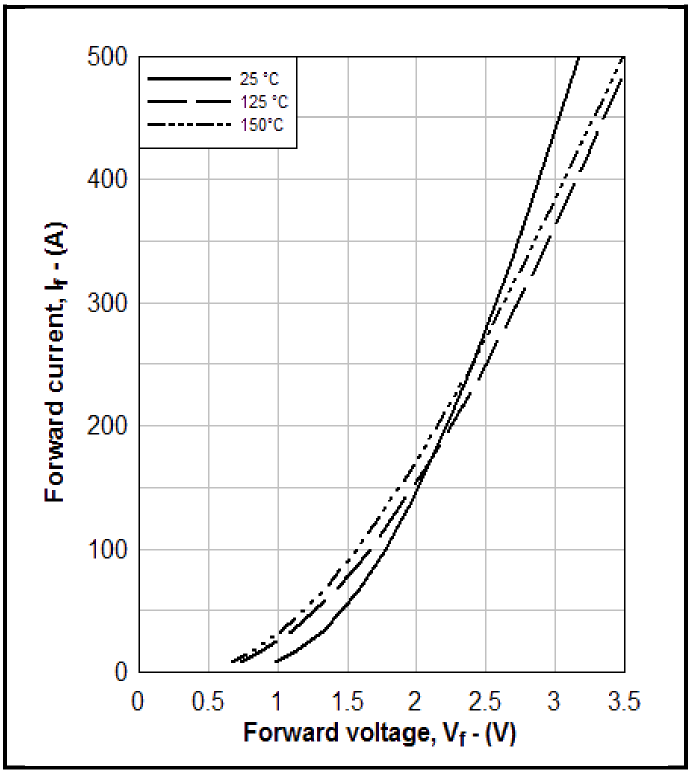


Fig. 7 Diode typical forward characteristics

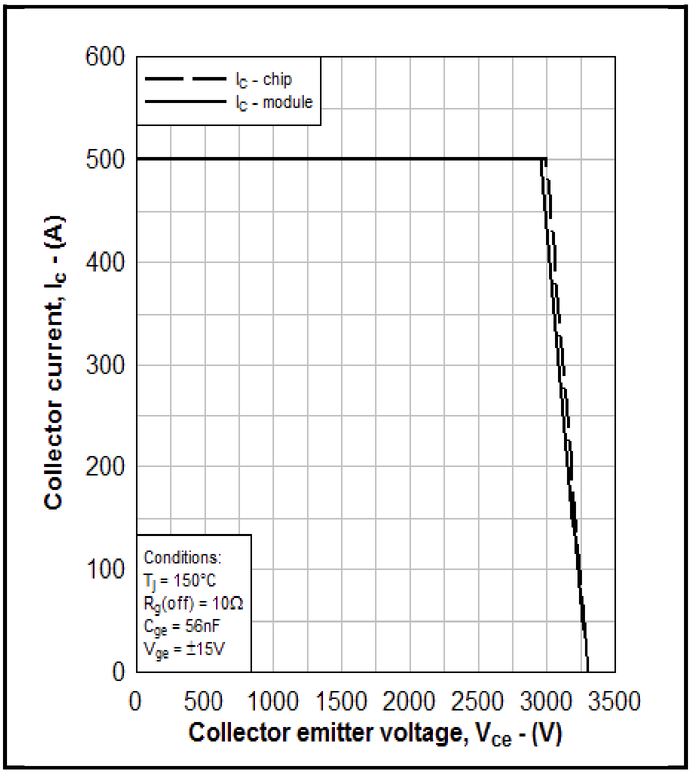


Fig. 8 Reverse bias safe operating area

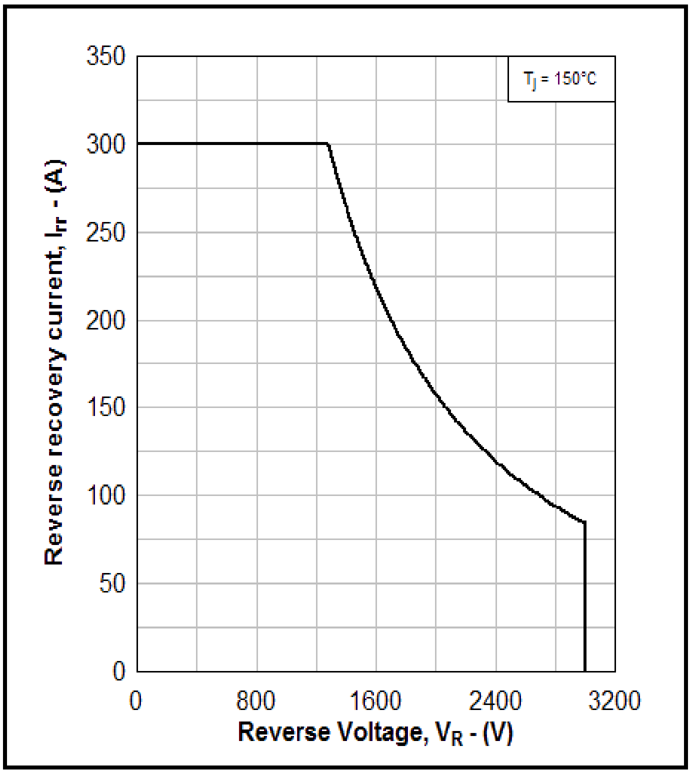


Fig. 9 Diode reverse bias safe operating area

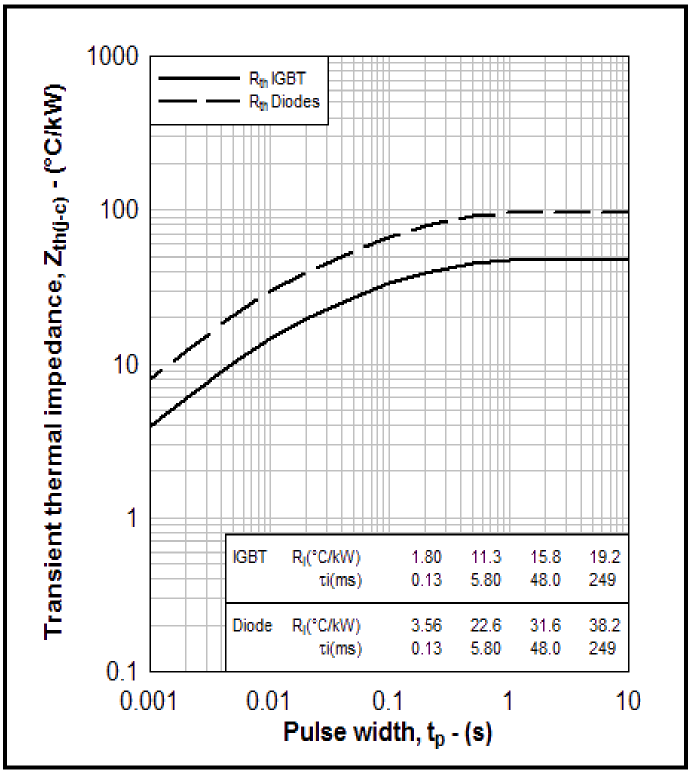
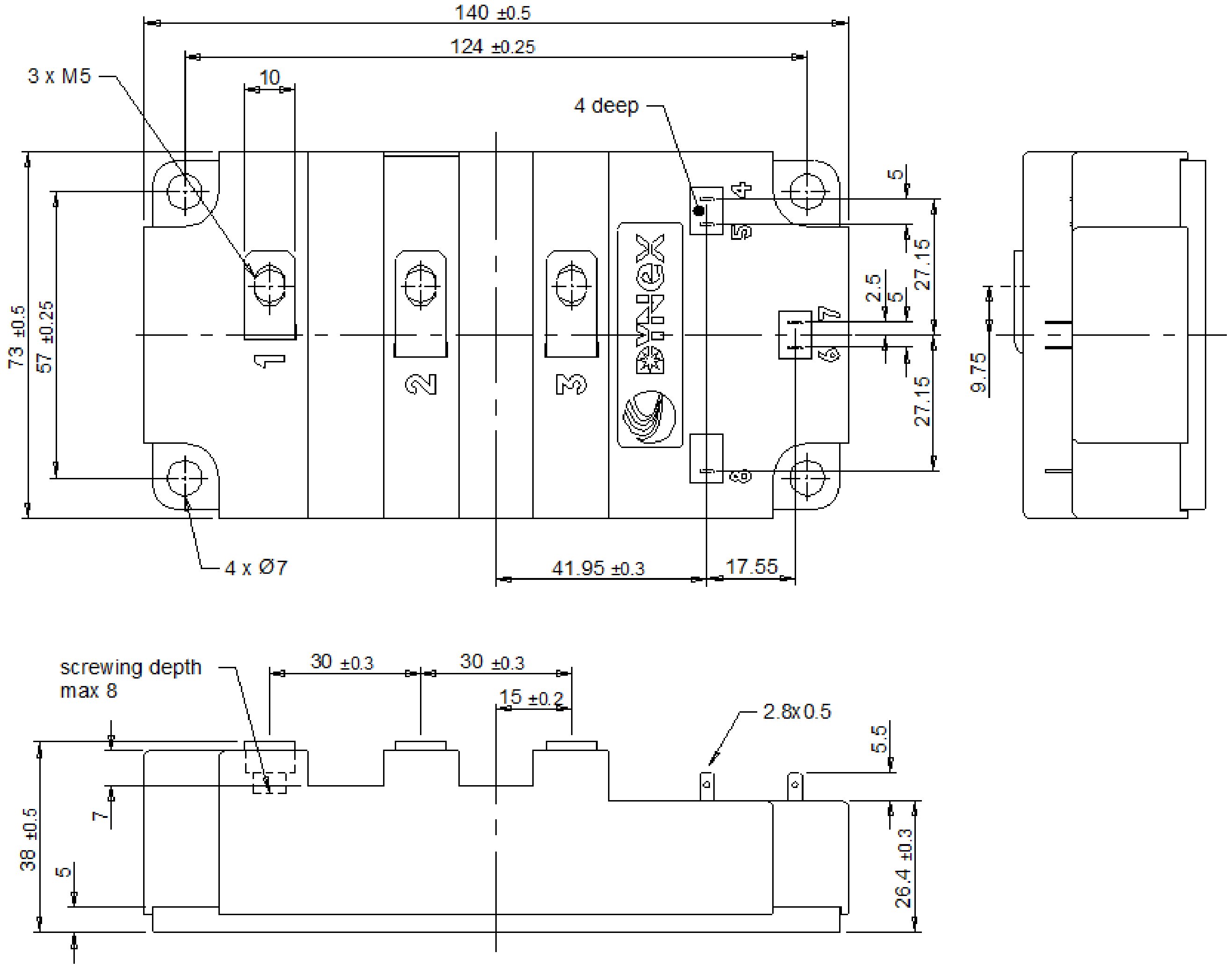


Fig. 10 Transient thermal impedance

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

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: 500g

Module Outline Type Code: P

Fig. 11 Module outline drawing

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Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

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