IGBT Bi-Directional Switch Module

Replaces DS5524-2.3

DS5524-3 November 2010 (LN27710)

FEATURES

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

APPLICATIONS

- Matrix Converters
- Brushless Motor Controllers
- Frequency Converters

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 DIM400PBM17-A000 is a bi-directional switch 1700V, n-channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10µs short circuit withstand. This device is optimised for 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:

DIM400PBM17-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{DRM}		±1700V
V_T*	(typ)	4.9V
I_C	(max)	400A
$I_{C(PK)}$	(max)	800A

* Measured at the power busbars, not the auxiliary terminals

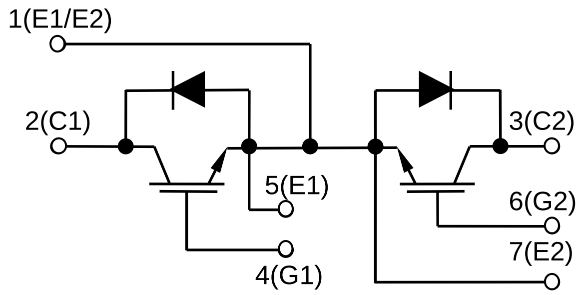


Fig. 1 Circuit configuration

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	±1700	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} = 50°C	400	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 110°C	800	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	3470	W
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 125ºC	30	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):	350

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor	Continuous dissipation - junction to case	-	-	36	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	80	°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	-	-	125	°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			12	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			2	μA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 20mA, V_{GE} = V_{CE}	4.5	5.5	6.5	V
$V_{CE(sat)}$ †	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 400A		2.7	3.2	V
		V_{GE} = 15V, I_C = 400A, T_j = 125°C		3.4	4.0	V
V_T	On-state voltage - (measured across terminals 2 and 3)	V_{GE} = 15V, I_C = 400A		4.9		V
		V_{GE} = 15V, I_C = 400A, T_j = 125°C		5.7		V
I_F	Diode forward current	DC			400	A
I_{FM}	Diode maximum forward current	t_p = 1ms			800	A
V_F †	Diode forward voltage	I_F = 400A		2.2	2.5	V
		I_F = 400A, T_j = 125°C		2.3	2.6	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		30		nF
Q_g	Gate charge	±15V		4.5		μC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz				nF
L_M	Module inductance			20		nH
R_{INT}	Internal resistance			270		μΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 125°C, V_{CC} = 1000V t_p ≤ 10μs, V_{GE} ≤ 15V $V_{CE\ (max)} = V_{CES} - L^* \times dI/dt$ IEC 60747-9		1600		A

Note:
† Measured at the power busbars, not 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 = 400A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 4.7Ω $R_{G(OFF)}$ = 4.7Ω L_S ~ 100nH		1150		ns
t_f	Fall time			100		ns
E_{OFF}	Turn-off energy loss			120		mJ
$t_{d(on)}$	Turn-on delay time			250		ns
t_r	Rise time			250		ns
E_{ON}	Turn-on energy loss			150		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 400A V_{CE} = 900V dI_F/dt = 3000A/μs		100		μC
I_{rr}	Diode reverse recovery current			230		A
E_{rec}	Diode reverse recovery energy			70		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 = 400A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 4.7Ω $R_{G(OFF)}$ = 4.7Ω L_S ~ 100nH		1400		ns
t_f	Fall time			130		ns
E_{OFF}	Turn-off energy loss			180		mJ
$t_{d(on)}$	Turn-on delay time			400		ns
t_r	Rise time			250		ns
E_{ON}	Turn-on energy loss			170		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 400A V_{CE} = 900V dI_F/dt = 2500A/μs		170		μC
I_{rr}	Diode reverse recovery current			270		A
E_{rec}	Diode reverse recovery energy			100		mJ

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

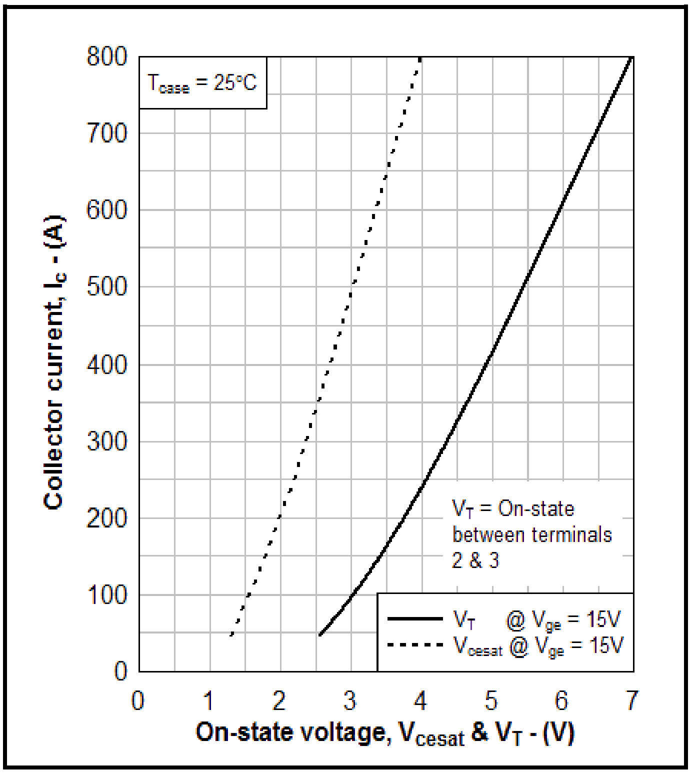


Fig. 3 Typical output characteristics

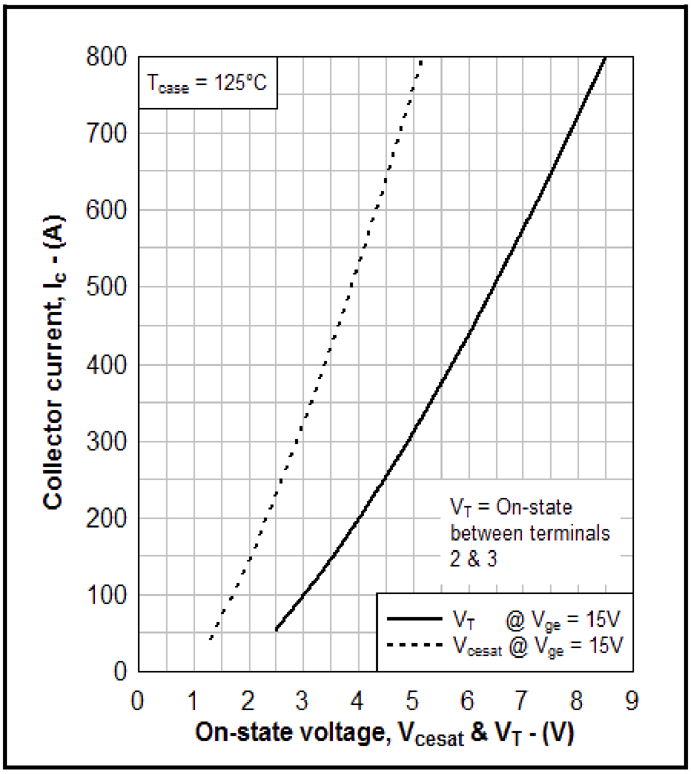


Fig. 4 Typical output characteristics

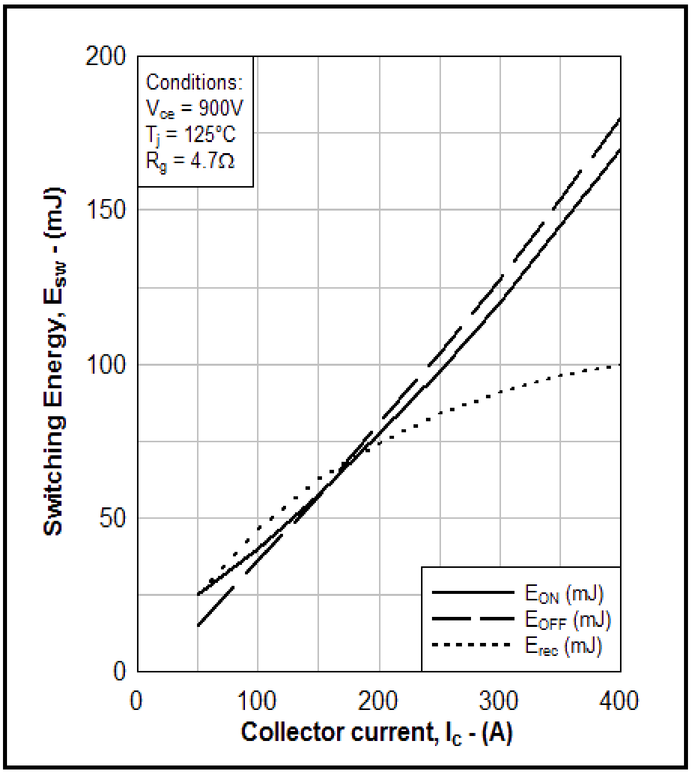


Fig. 5 Typical switching energy vs collector current

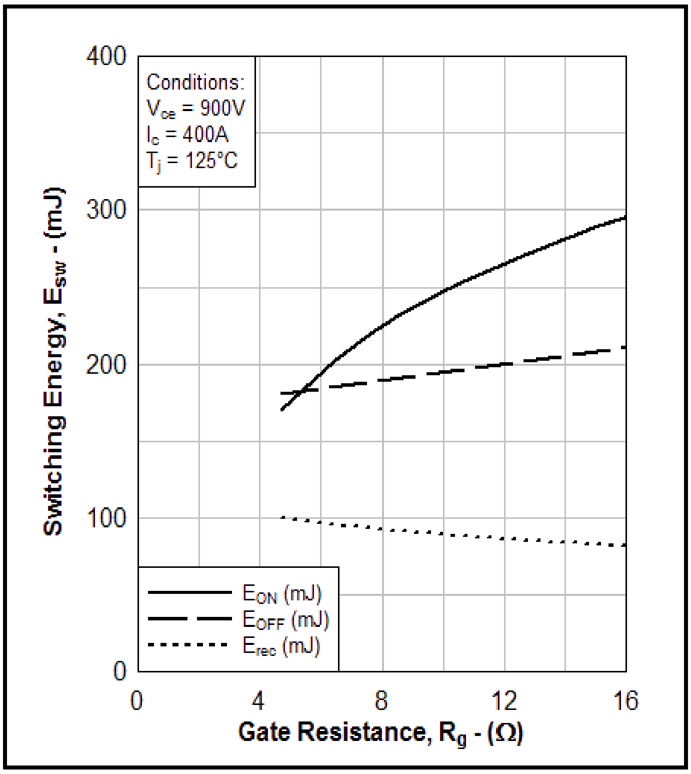


Fig. 6 Typical switching energy vs gate resistance

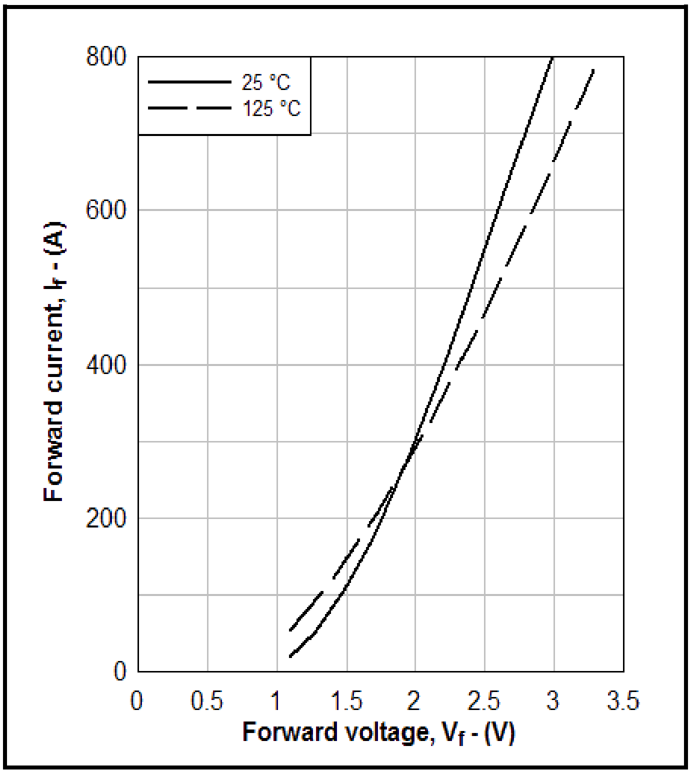


Fig. 7 Diode typical forward characteristics

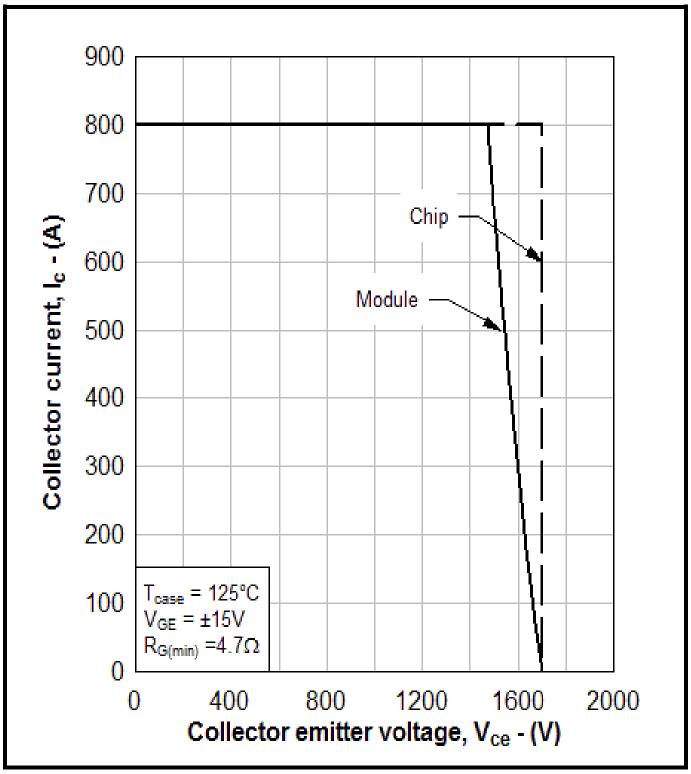


Fig. 8 Reverse bias safe operating area

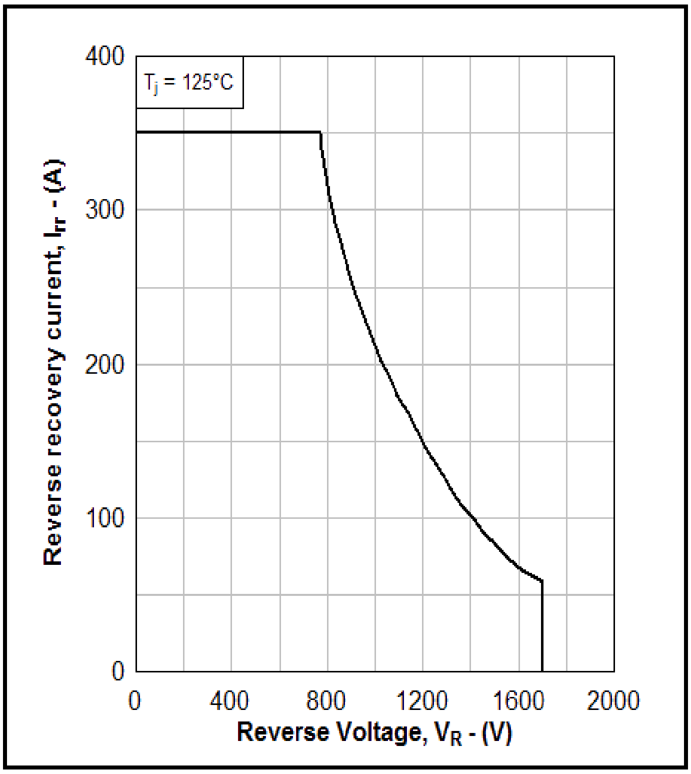


Fig. 9 Diode reverse bias safe operating area

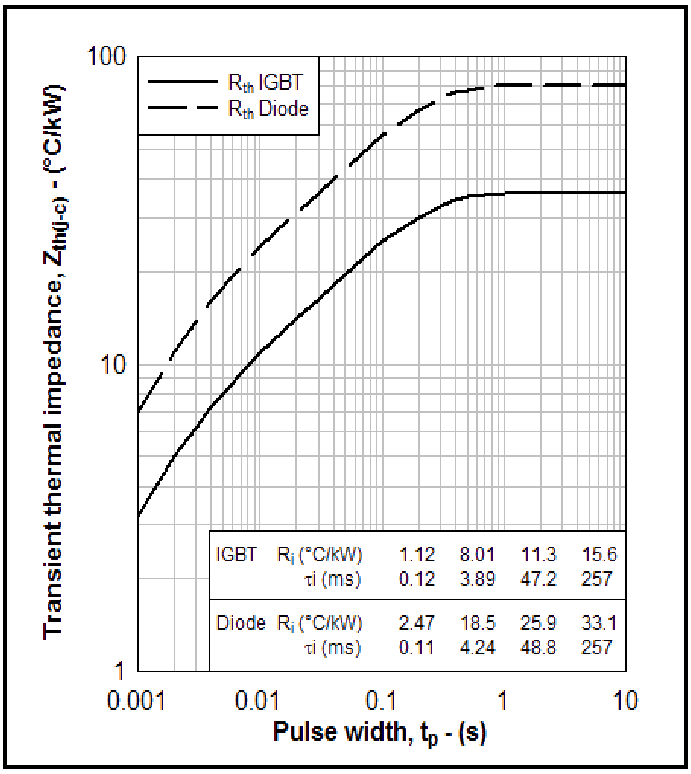
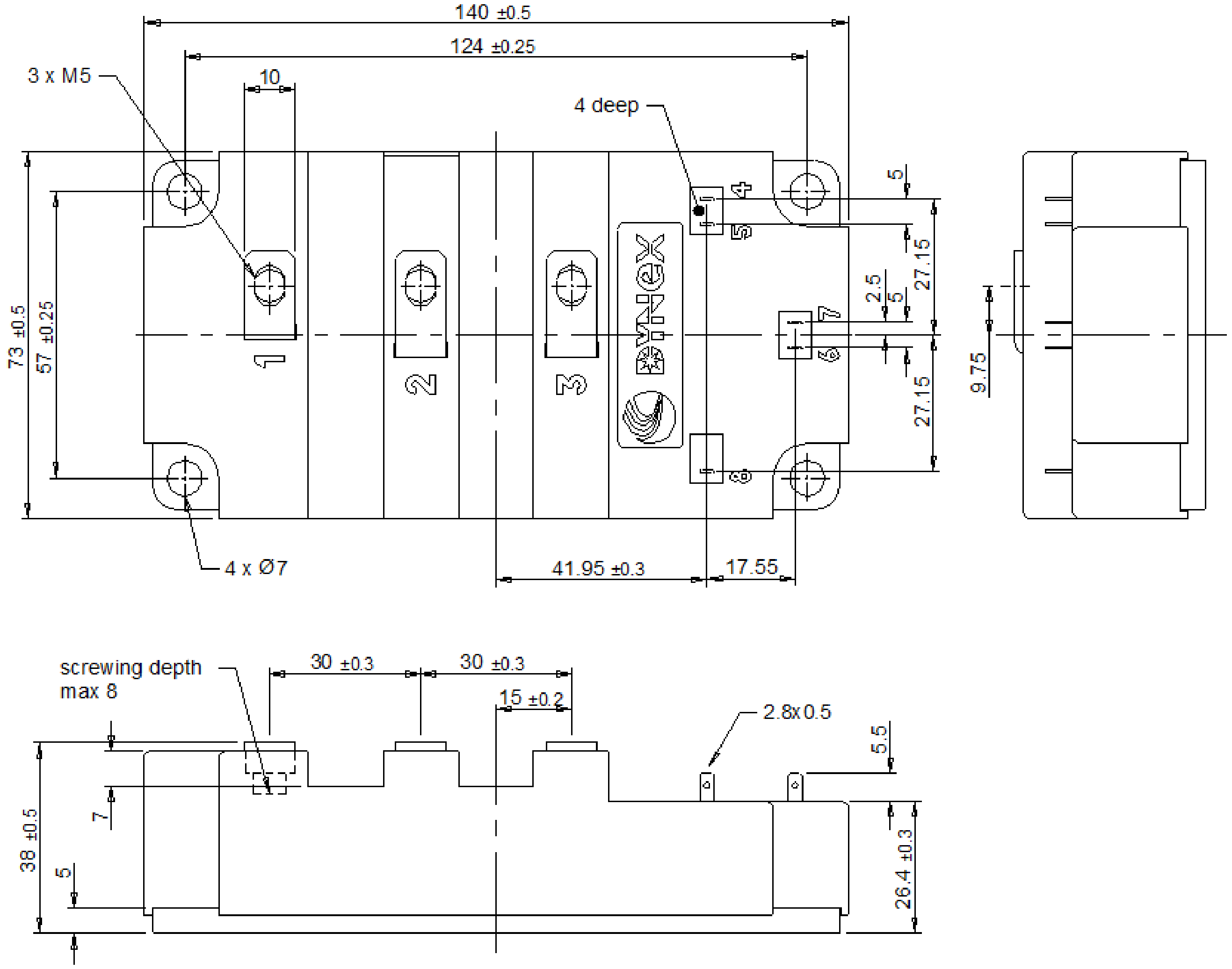


Fig. 10 Transient thermal impedance

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: 750g

Module Outline Type Code: P

Fig. 11 Module outline drawing

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HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LTD
Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom
Fax: +44(0)1522 500550
Tel: +44(0)1522 500500
Web: http://www.dynexsemi.com

CUSTOMER SERVICE

DYNEX SEMICONDUCTOR LTD
Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom
Fax: +44(0)1522 500020
Tel: +44(0)1522 502753 / 502901
Email: Power_solutions@dynexsemi.com