

FEATURES

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

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- 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 DIM400DDM17-A000 is a dual 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 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:

DIM400DDM17-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}	1700V
$V_{CE(sat)}$ * (typ)	2.7 V
I_C (max)	400A
$I_{C(PK)}$ (max)	800A

* Measured at the power busbars, not the auxiliary terminals

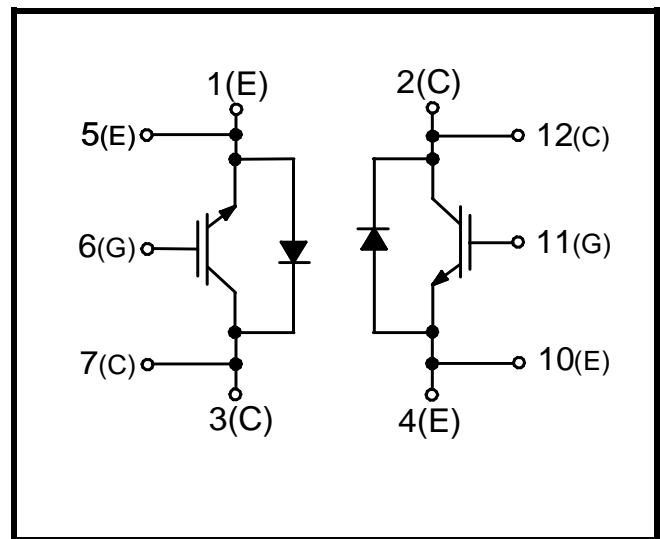
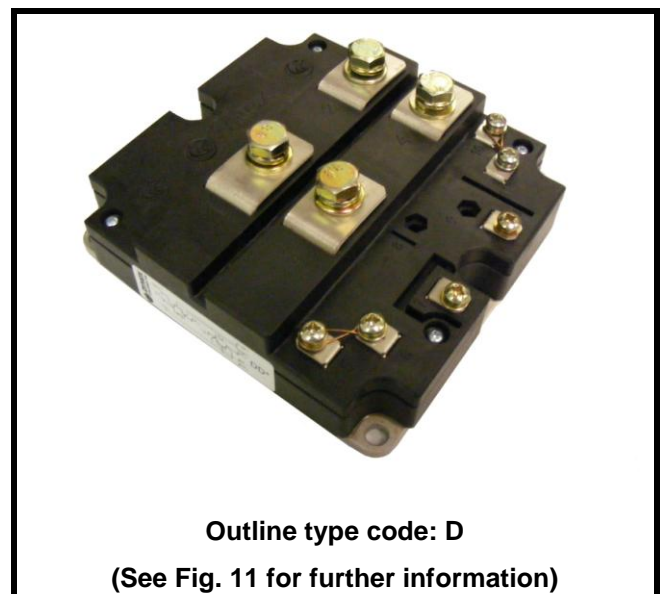


Fig. 1 Circuit configuration



Outline type code: D

(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.

$T_{case} = 25^{\circ}\text{C}$ 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	$T_{case} = 75^{\circ}\text{C}$	400	A
$I_{C(PK)}$	Peak collector current	1ms, $T_{case} = 110^{\circ}\text{C}$	800	A
P_{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$, $T_j = 150^{\circ}\text{C}$	3470	W
I^2t	Diode I^2t value	$V_R = 0$, $t_p = 10\text{ms}$, $T_j = 125^{\circ}\text{C}$	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:	20mm
Clearance:	10mm
CTI (Comparative Tracking Index):	350

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor (per switch)	Continuous dissipation - junction to case			36	$^{\circ}\text{C}/\text{kW}$
$R_{th(j-c)}$	Thermal resistance – diode (per switch)	Continuous dissipation - junction to case			80	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)			8	$^{\circ}\text{C}/\text{kW}$
T_j	Junction temperature	Transistor			150	$^{\circ}\text{C}$
		Diode			125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-	-40		125	$^{\circ}\text{C}$
	Screw torque	Mounting – M6			5	Nm
		Electrical connections – M4			2	Nm
		Electrical connections – M8			10	Nm

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	
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 – per switch	-		20		nH	
R _{INT}	Internal transistor resistance – per switch	-		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* x di/dt IEC 60747-9	I ₁		1850		A
			I ₂		1600		A

Note:

† Measured at the power busbars, not the auxiliary terminals

 * L is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units	
$t_{d(off)}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 900\text{V}$ $R_{G(ON)} = 4.7\Omega$ $R_{G(OFF)} = 4.7\Omega$ $L_S \sim 100\text{nH}$		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	$I_F = 400\text{A}$ $V_{CE} = 900\text{V}$ $di_F/dt = 3000\text{A}/\mu\text{s}$		100		μC	
I_{rr}	Diode reverse recovery current				230		A
E_{rec}	Diode reverse recovery energy				70		mJ

$T_{case} = 125^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units	
$t_{d(off)}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 900\text{V}$ $R_{G(ON)} = 4.7\Omega$ $R_{G(OFF)} = 4.7\Omega$ $L_S \sim 100\text{nH}$		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	$I_F = 400\text{A}$ $V_{CE} = 900\text{V}$ $di_F/dt = 2500\text{A}/\mu\text{s}$		170		μC	
I_{rr}	Diode reverse recovery current				270		A
E_{rec}	Diode reverse recovery energy				100		mJ

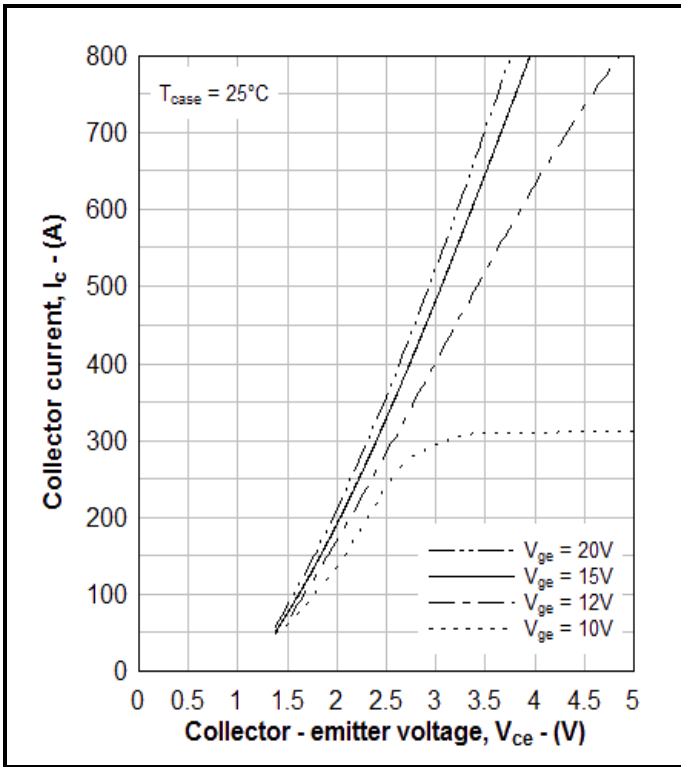


Fig. 3 Typical output characteristics

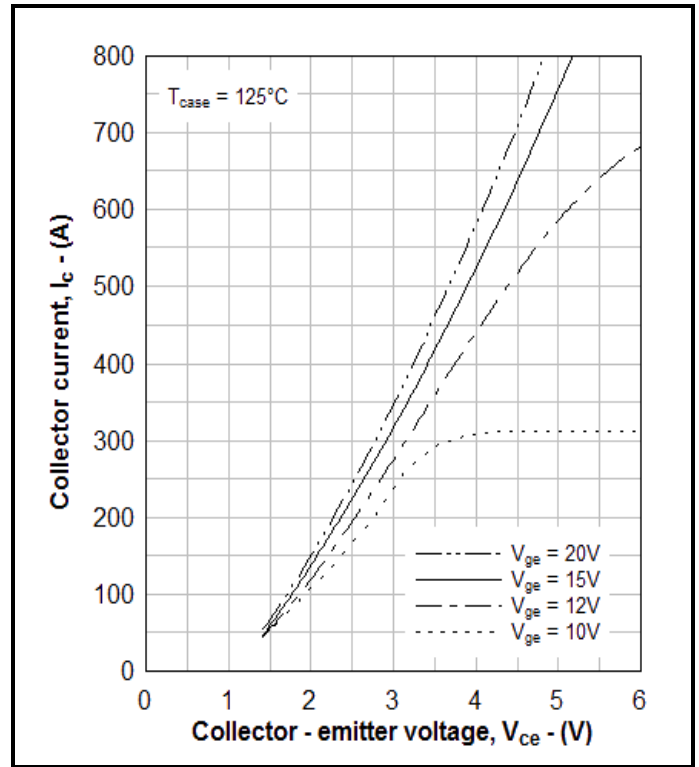


Fig. 4 Typical output characteristics

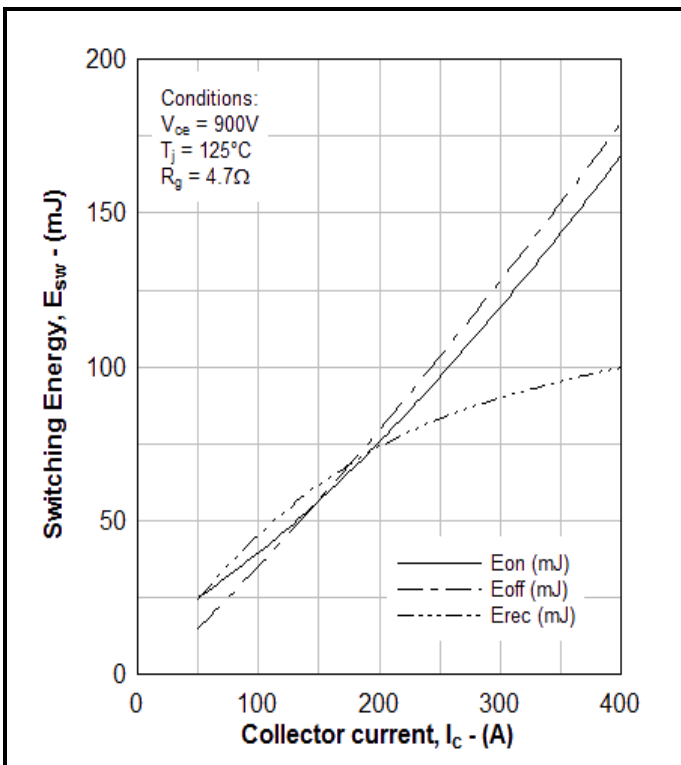


Fig. 5 Typical switching energy vs collector current

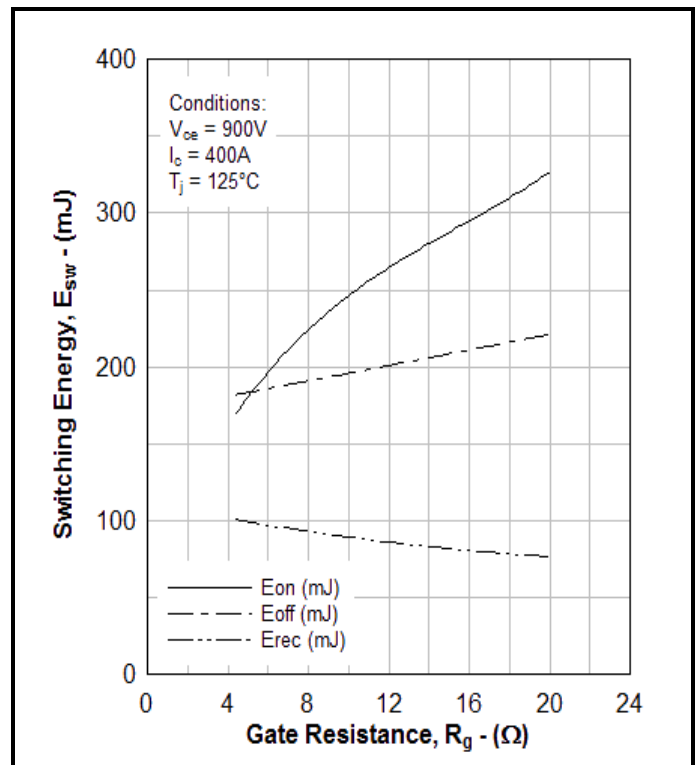


Fig. 6 Typical switching energy vs gate resistance

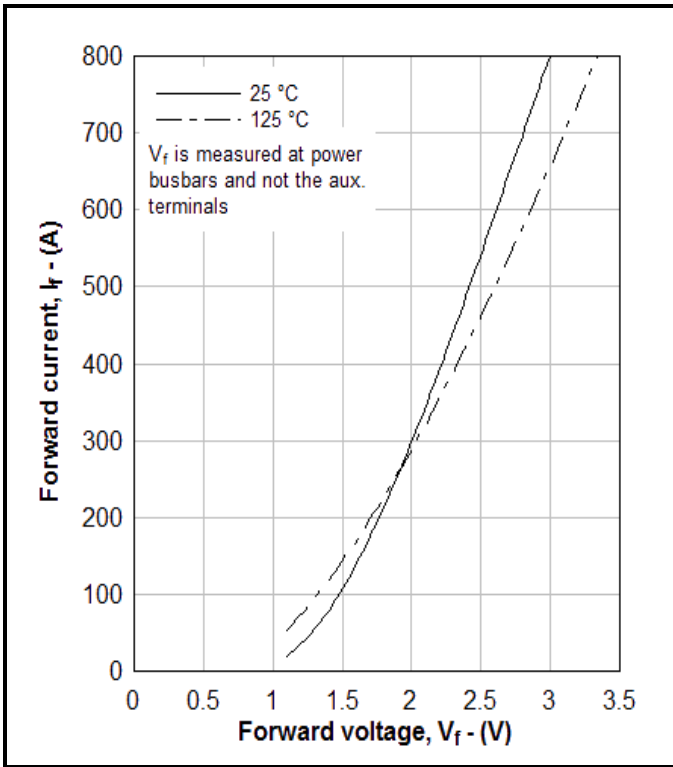


Fig. 7 Diode typical forward characteristics

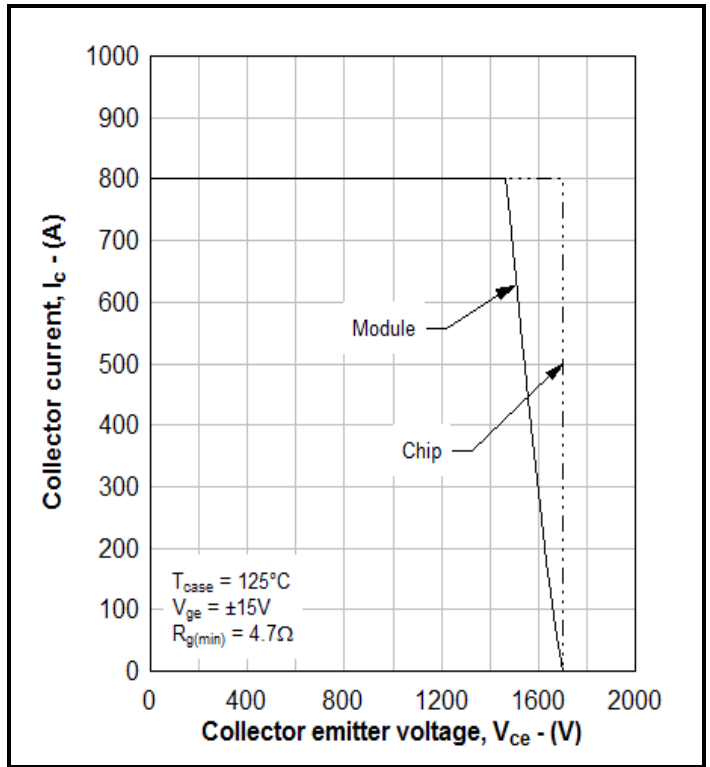


Fig. 8 Reverse bias safe operating area

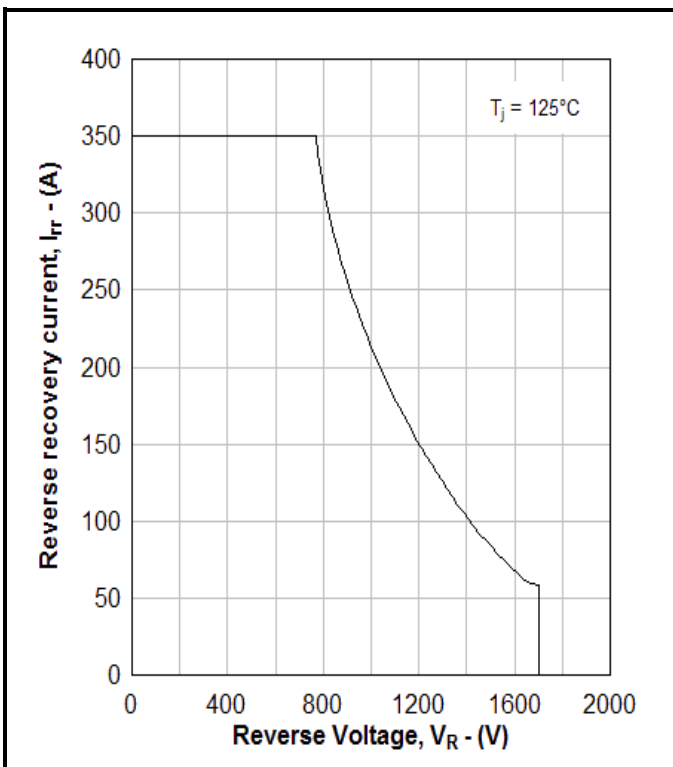


Fig. 9 Diode reverse bias safe operating area

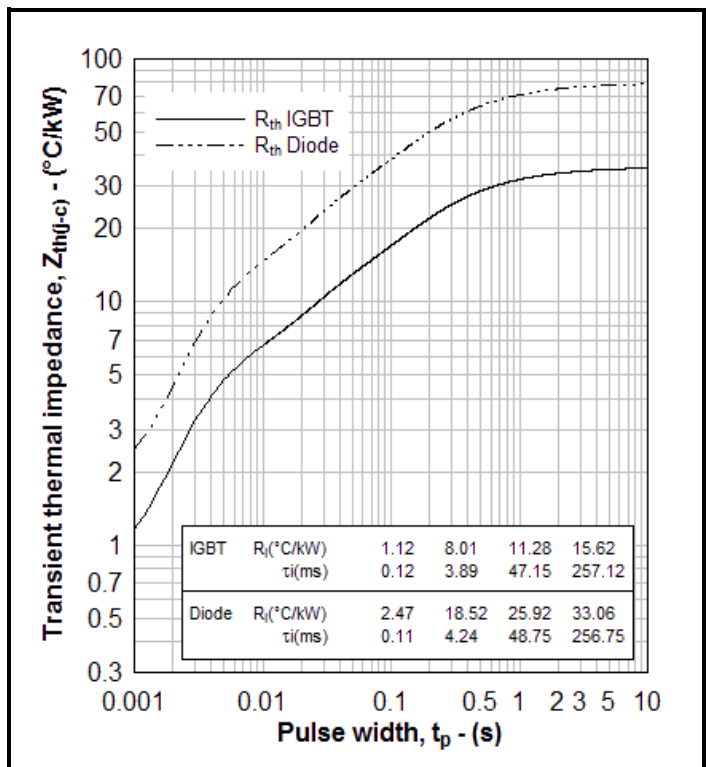
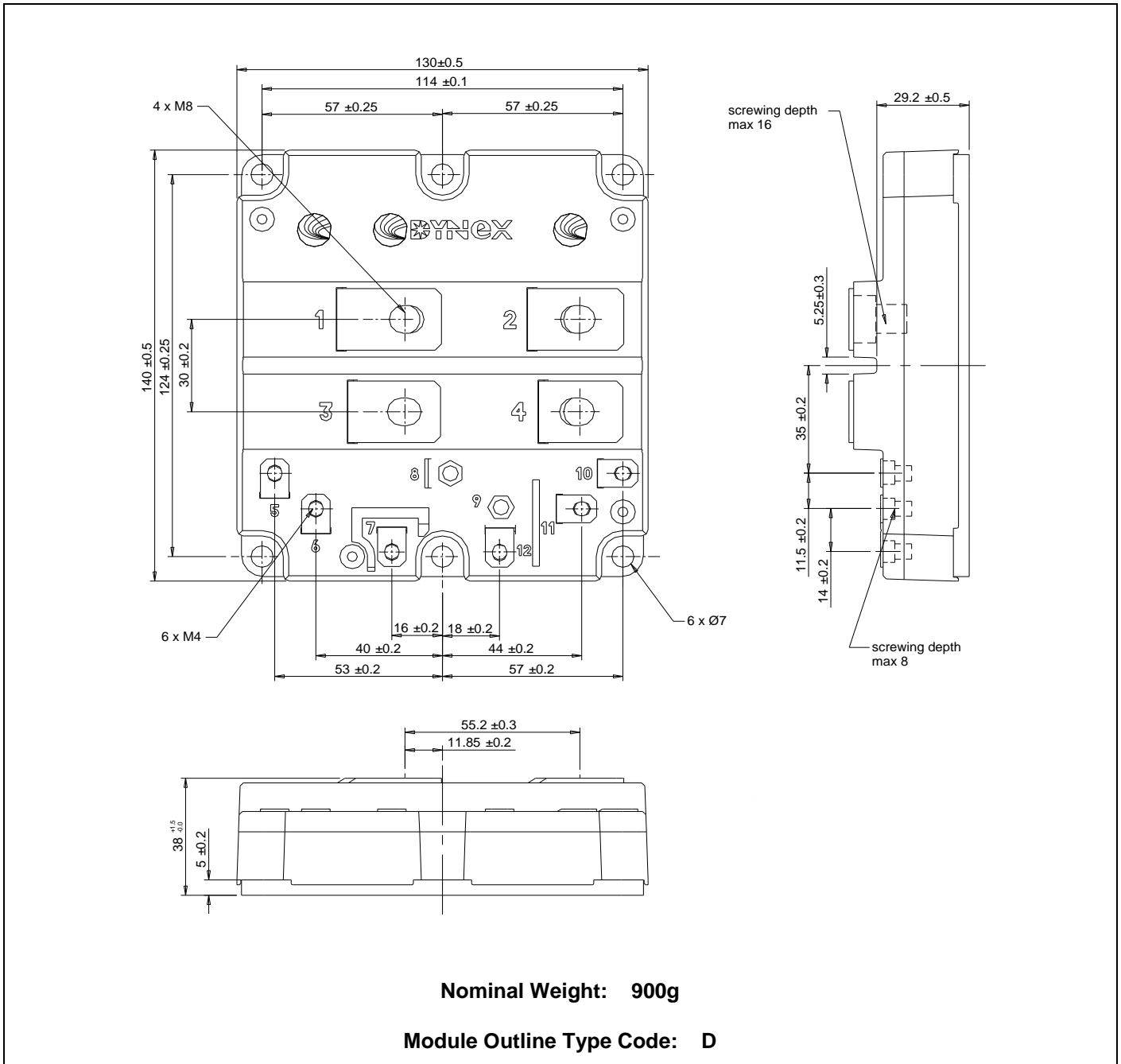


Fig. 10 Transient thermal impedance

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

HEADQUARTERS OPERATIONS**DYNEX SEMICONDUCTOR LTD**

Doddington Road, Lincoln
Lincolnshire, LN6 3LF, United Kingdom

Fax: +44(0)1522 500550

Tel: +44(0)1522 500500

CUSTOMER SERVICE**DYNEX SEMICONDUCTOR LTD**

Doddington Road, Lincoln
Lincolnshire, LN6 3LF, United Kingdom

Fax: +44(0)1522 500020

Tel: +44(0)1522 502901 / 502753

email: power_solutions@dynexsemi.com

© Dynex Semiconductor TECHNICAL DOCUMENTATION – NOT FOR RESALE. PRODUCED IN UNITED KINGDOM.

Datasheet Annotations: Dynex Semiconductor annotate datasheets in the top right hand corner of the front page, to indicate product status.

The annotations are as follows:-

Target Information:	This is the most tentative form of information and represents a very preliminary specification. No actual work on the product has been started.
Preliminary Information:	The product is in design and development. The datasheet represents the product as it is understood but may change.
Advance Information:	The product design is complete and final characterisation for volume production is well in hand.
No Annotation:	The product parameters are fixed and the product is available to datasheet specification.

This publication is issued to provide information only which (unless agreed by the company in writing) may not be used, applied or reproduced for any purpose nor form part of any order or contract nor to be regarded as a representation relating to the products or services concerned. No warranty or guarantee expressed or implied is made regarding the capability, performance or suitability of any product or service. The Company reserves the right to alter without prior notice the specification, design or price of any product or service. Information concerning possible methods of use is provided as a guide only and does not constitute any guarantee that such methods of use will be satisfactory in a specific piece of equipment. It is the users responsibility to fully determine the performance and suitability of any equipment using such information and to ensure that any publication or data used is up to date and has not been superseded. These products are not suitable for use in any medical products whose failure to perform may result in significant injury or death to the user. All products and materials are sold and services provided subject to the Company's conditions of sale, which are available on request.

All brand names and product names used in this publication are trademarks, registered trademarks or trade names of their respective owners.