

FEATURES

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

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 DIM400DDM12-A000 is a dual switch 1200V, n-channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA) plus 10us 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:

DIM400DDM12-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		1200V
$V_{CE(sat)}$ *	(typ)	2.2 V
I_C	(max)	400A
$I_{C(PK)}$	(max)	800A

*(measured at the power busbars and not the auxiliary terminals)

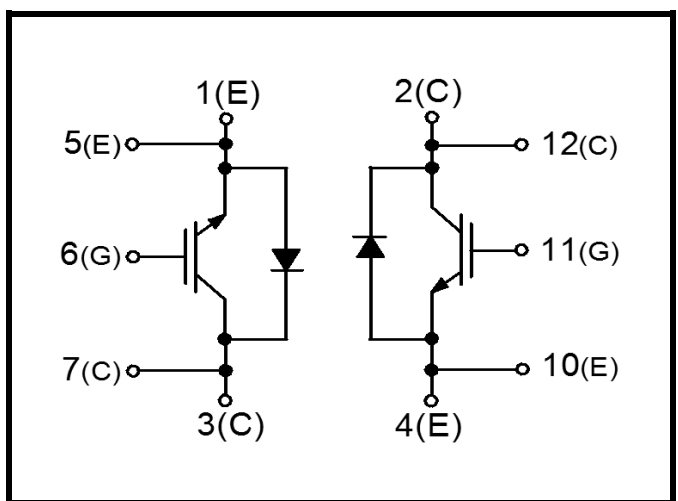
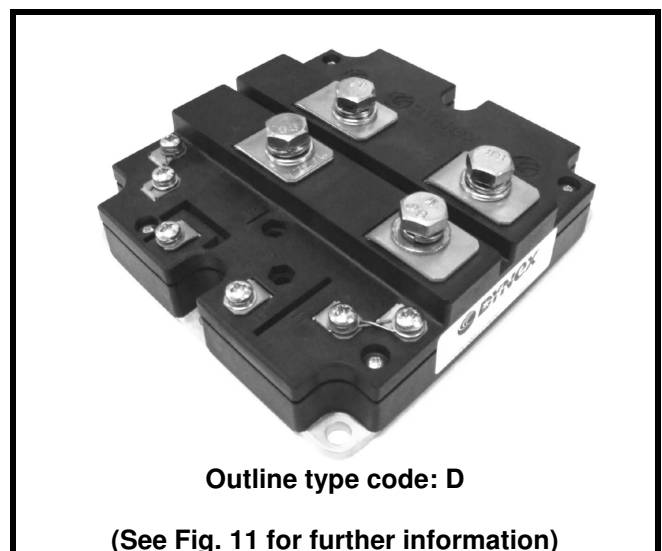


Fig. 1 Circuit configuration



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	$V_{GE} = 0\text{V}$	1200	V
V_{GES}	Gate-emitter voltage		± 20	V
I_C	Continuous collector current	$T_{case} = 85^{\circ}\text{C}$	400	A
$I_{C(PK)}$	Peak collector current	1ms, $T_{case} = 115^{\circ}\text{C}$	800	A
P_{max}	Max.transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$, $T_j = 150^{\circ}\text{C}$	3470	kW
I^2t	Diode I^2t value	$V_R = 0\text{V}$, $t_p = 10\text{ms}$, $T_j = 125^{\circ}\text{C}$	25	KA^2s
V_{isol}	Isolation voltage-per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V
Q_{PD}	Partial discharge-per module	IEC1287. $V_1 = 1300\text{V}$, $V_2 = 1000\text{V}$, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material:	AlN
Baseplate material:	AlSiC
Creepage distance:	20mm
Clearance:	10mm
CTI (Critical Tracking Index)	175

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				125	$^{\circ}\text{C}$
	Screw torque	Mounting M6			5	Nm
		Electrical connections – M4			2	Nm
		Electrical connections – M8			10	Nm

2/8: 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}			0.5	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	uA	
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		2.2	2.8	V	
		V _{GE} = 15V, I _C = 400A, T _{case} = 125 °C		2.6	3.2	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		2.1	2.4	V	
		I _F = 400A, T _{case} = 125 °C		2.1	2.4	V	
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz		20		nF	
L _M	Module inductance	--			20	nH	
R _{INT}	Internal transistor resistance				0.27	μΩ	
SC _{Data}	Short circuit current, I _{SC}	T _j = 125° C, V _{CC} = 900V t _p ≤ 10μs, V _{ge} ≤ 15V V _{CE(max)} = V _{CES} - L * di/dt IEC 6074-9	I ₁		2750		A
			I ₂		2250		A

Note:
[†] Measured at the power busbars and not the auxiliary terminals

^{*} L is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	$I_C = 400A$ $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $R_{G(ON)} = R_{G(OFF)} = 3.3\Omega$ $L \sim 100nH$		710		ns
t_f	Fall time			70		ns
E_{OFF}	Turn-off energy loss			60		mJ
$t_{d(on)}$	Turn-on delay time			190		ns
t_r	Rise time			100		ns
Q_g	Gate charge			4		μC
E_{ON}	Turn-on energy loss			40		mJ
Q_{rr}	Diode reverse recovery charge	$I_F = 400A, V_{CE} = 600V,$ $dI_F/dt = 4700A/\mu s$		55		μC
I_{rr}	Diode reverse recovery current			300		A
E_{rec}	Diode reverse recovery energy			17		mJ

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

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	$I_C = 400A$ $V_{GE} = \pm 15V$ $V_{CE} = 600V$ $R_{G(ON)} = R_{G(OFF)} = 3.3\Omega$ $L \sim 100nH$		890		ns
t_f	Fall time			100		ns
E_{OFF}	Turn-off energy loss			60		mJ
$t_{d(on)}$	Turn-on delay time			440		ns
t_r	Rise time			125		ns
E_{ON}	Turn-on energy loss			60		mJ
Q_{rr}	Diode reverse recovery charge		$I_F = 400A, V_{CE} = 600V,$ $dI_F/dt = 4000A/\mu s$		85	
I_{rr}	Diode reverse recovery current			320		A
E_{rec}	Diode reverse recovery energy			32		mJ

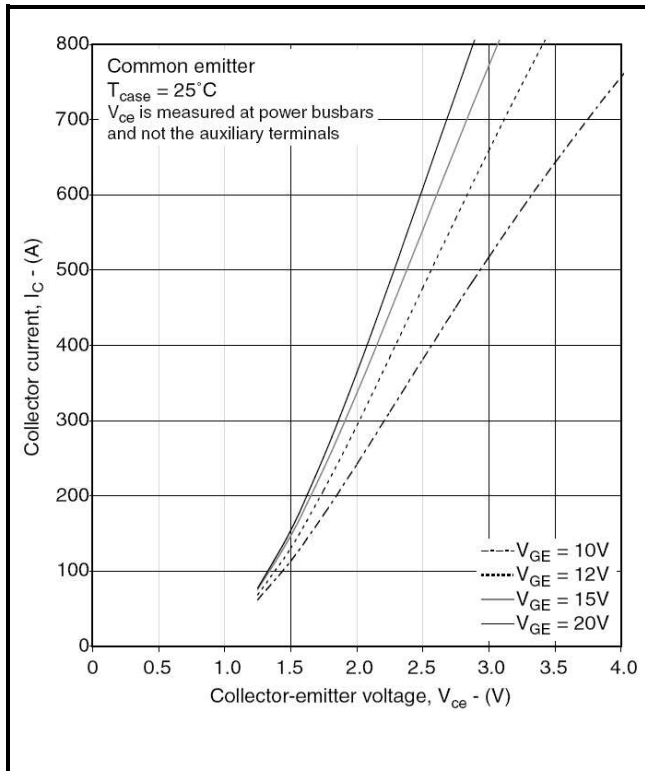


Fig. 3 Typical output characteristics

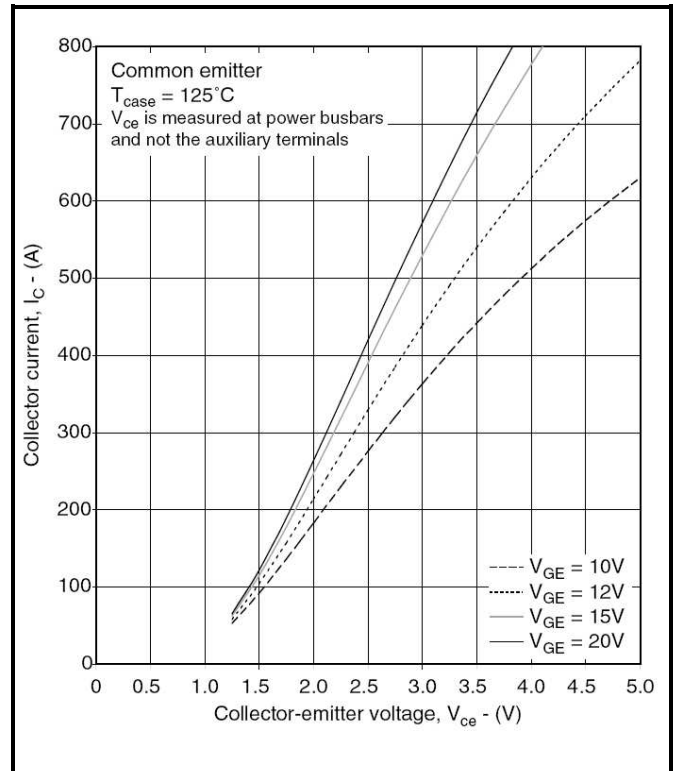


Fig. 4 Typical output characteristics

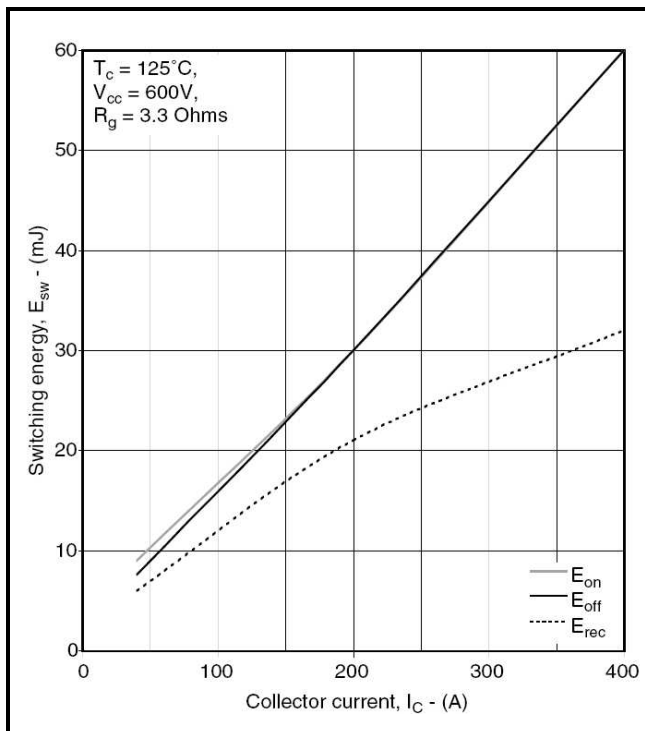


Fig. 5 Typical switching energy vs collector current

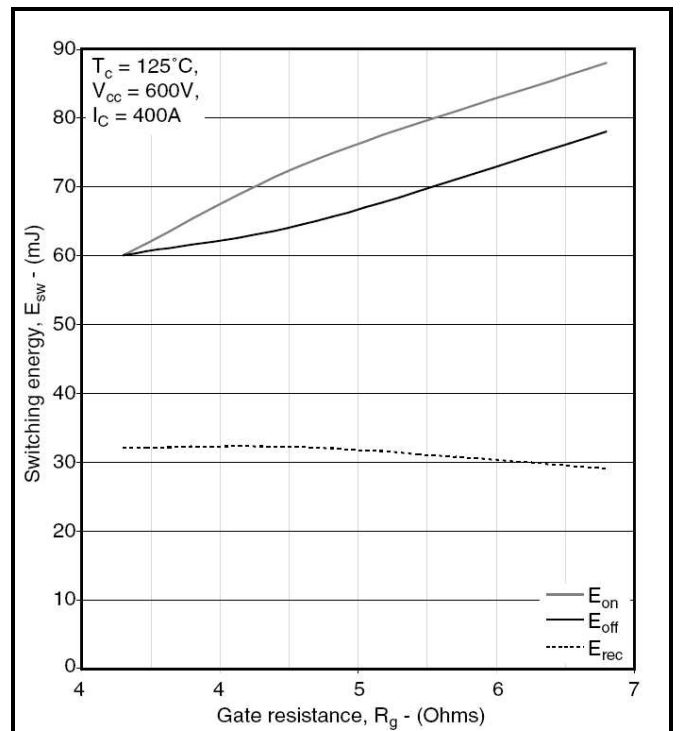


Fig. 6 Typical switching energy vs gate resistance

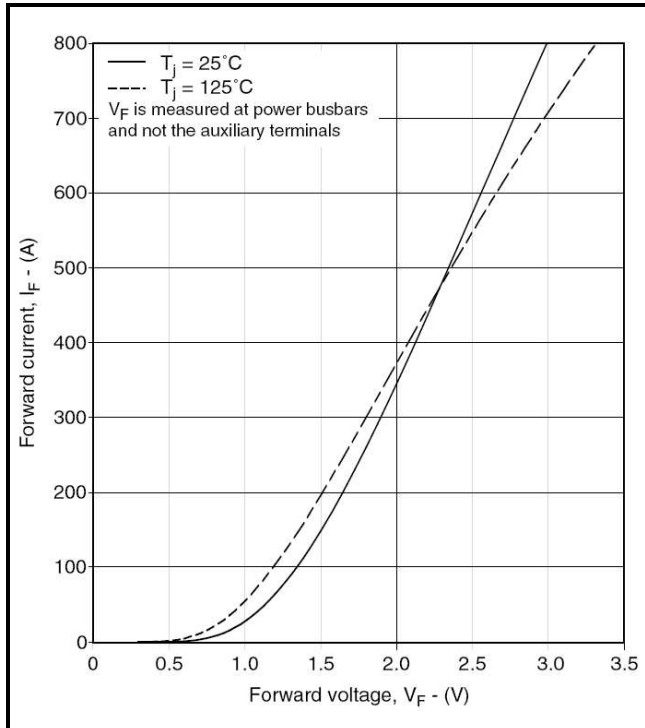


Fig. 7 Diode typical forward characteristics

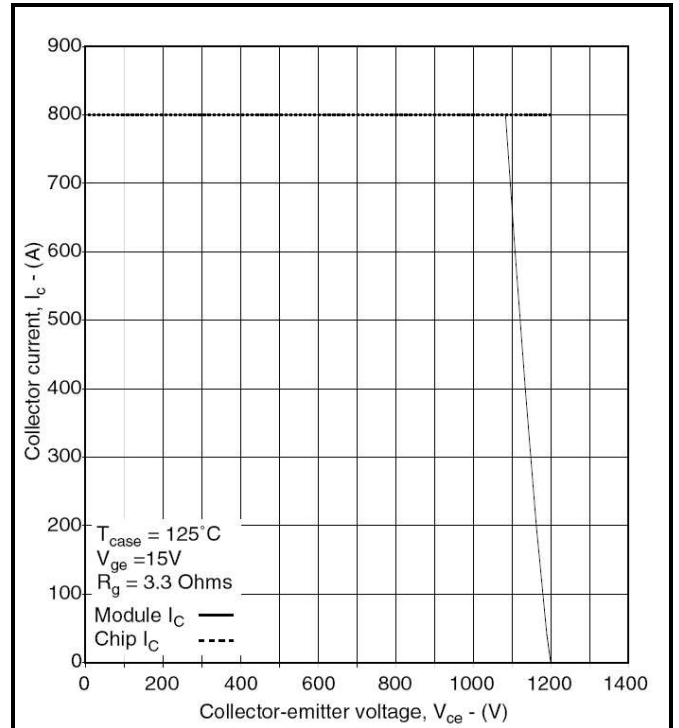


Fig. 8 Reverse bias safe operating area

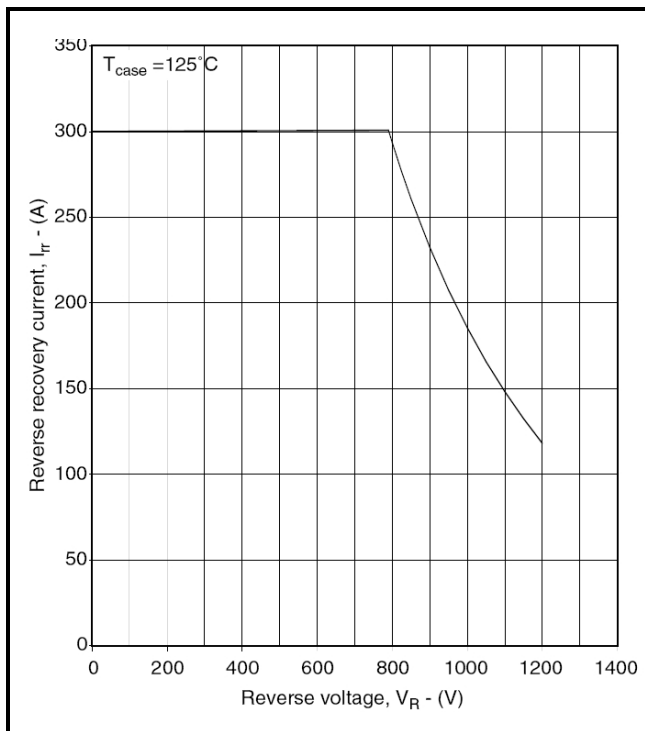


Fig. 9 Diode reverse bias safe operating area

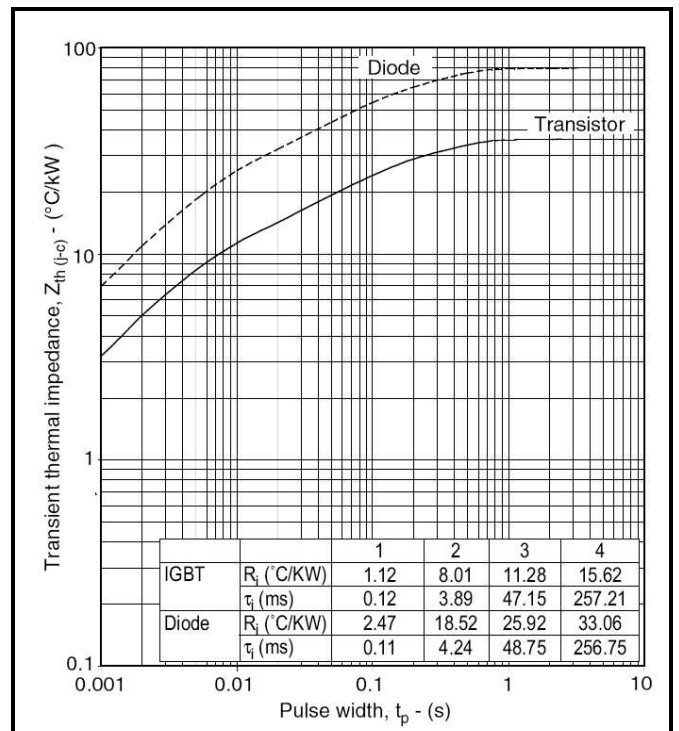
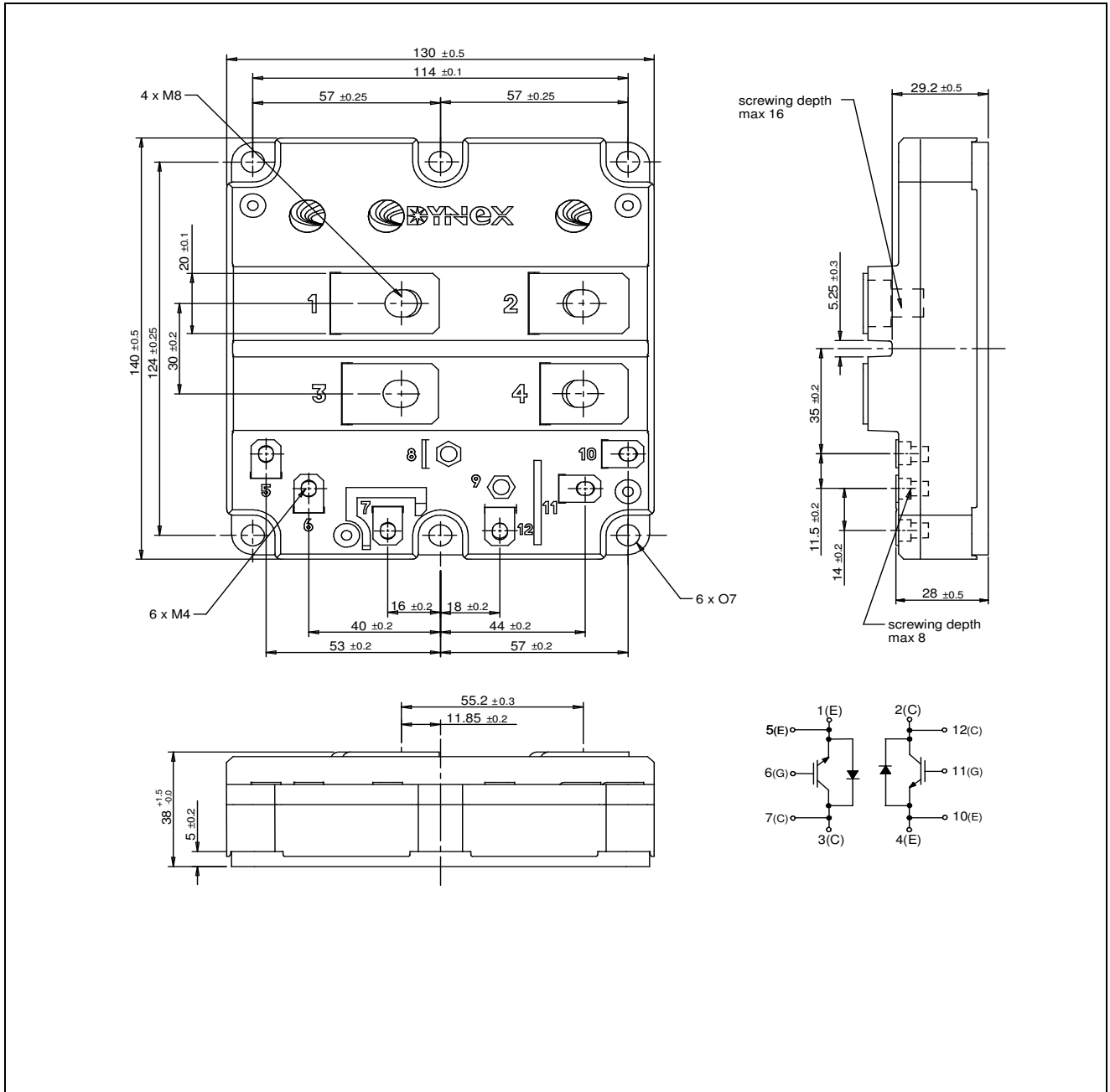


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

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



Nominal weight: 1050g
 Module outline type code: D

Figure 11 Outline drawing

POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.



<http://www.dynexsemi.com>

e-mail: power_solutions@dynexsemi.com

HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln
Lincolnshire, LN6 3LF. United Kingdom.
Fax: +44(0)1522 500550

CUSTOMER SERVICE

Tel: +44(0)1522 502753 / 502901. Fax: +44(0)1522 500020

Tel: +44(0)1522 500500

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Target Information: This is the most tentative form of information and represents a very preliminary specification.

No

actual design 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 details 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.

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