DIM400DDM12-A000

Dual Switch IGBT Module

DS5532-3.1 January 2009(LN26558)

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)

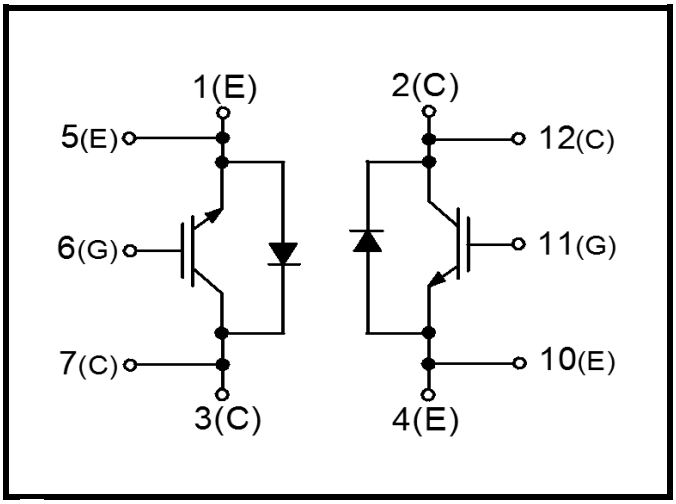
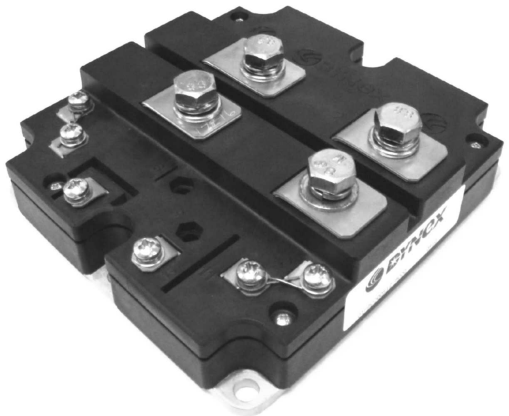


Fig. 1 Circuit configuration



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°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	V_{GE} =0V	1200	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} =85 °C	400	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case}=115 °C	800	A
P_{max}	Max.transistor power dissipation	T_{case} =25 °C, T_j =150 °C	3470	kW
I^2t	Diode I^2t value	V_R = 0V, t_p =10ms, T_j = 125°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 =1300V, V_2 =1000V, 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	°C/kW
$R_{th(j-c)}$	Thermal resistance -diode (per switch)	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)			8	°C/kW
T_j	Junction temperature	Transistor			150	°C
		Diode			125	°C
T_{stg}	Storage temperature range				125	°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}				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 = 125º C, V_{CC} = 900V t_p ≤ 10μs, V_{ge} ≤ 15V $V_{CE(max)}$ = V_{CES} – L* x 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°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	I_C =400A		710		ns
t_f	Fall time	V_{GE} =±15V		70		ns
E_{OFF}	Turn-off energy loss	V_{CE} =600V		60		mJ
$t_{d(on)}$	Turn-on delay time	$R_{G(ON)}$ =$R_{G(OFF)}$=3.3Ω		190		ns
t_r	Rise time			100		ns
Q_g	Gate charge	L ~100nH		4		uC
E_{ON}	Turn-on energy loss			40		mJ
Q_{rr}	Diode reverse recovery charge	I_F =400A,V_{CE} =600V,		55		uC
I_{rr}	Diode reverse recovery current	dI_F/dt =4700A/us		300		A
E_{rec}	Diode reverse recovery energy			17		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		890		ns
t_f	Fall time	V_{GE} =±15V		100		ns
E_{OFF}	Turn-off energy loss	V_{CE} =600V		60		mJ
$t_{d(on)}$	Turn-on delay time	$R_{G(ON)}$ =$R_{G(OFF)}$=3.3Ω		440		ns
t_r	Rise time			125		ns
E_{ON}	Turn-on energy loss	L ~100nH		60		mJ
Q_{rr}	Diode reverse recovery charge	I_F =400A,V_{CE} =600V,		85		uC
I_{rr}	Diode reverse recovery current	dI_F/dt =4000A/us		320		A
E_{rec}	Diode reverse recovery energy			32		mJ

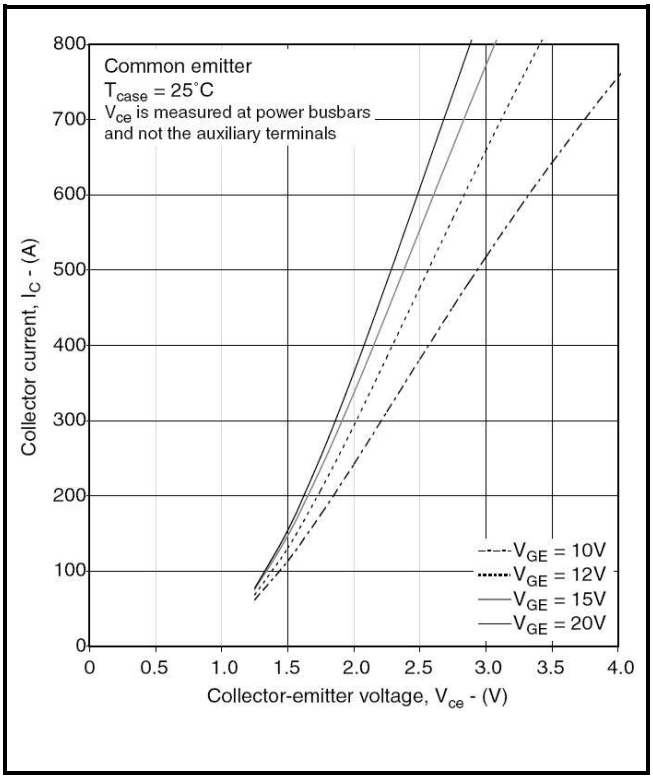


Fig. 3 Typical output characteristics

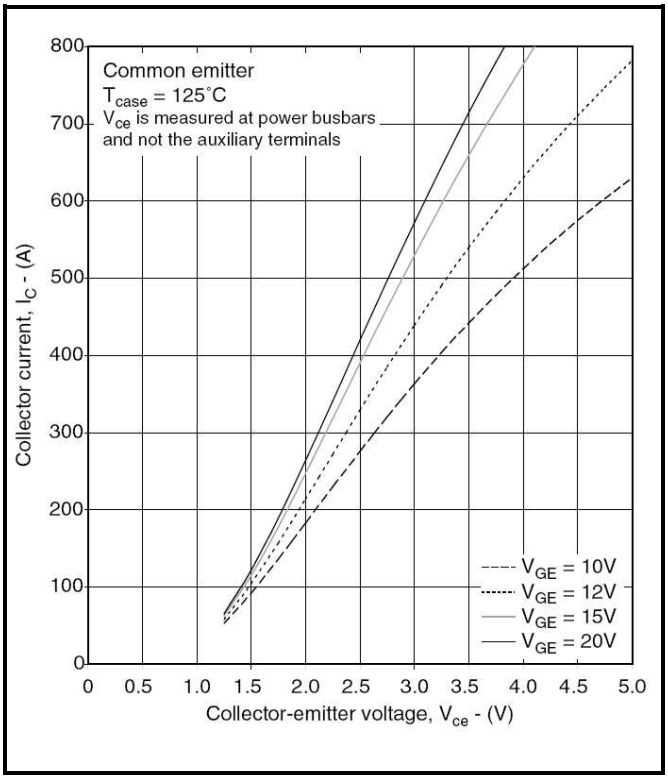


Fig. 4 Typical output characteristics

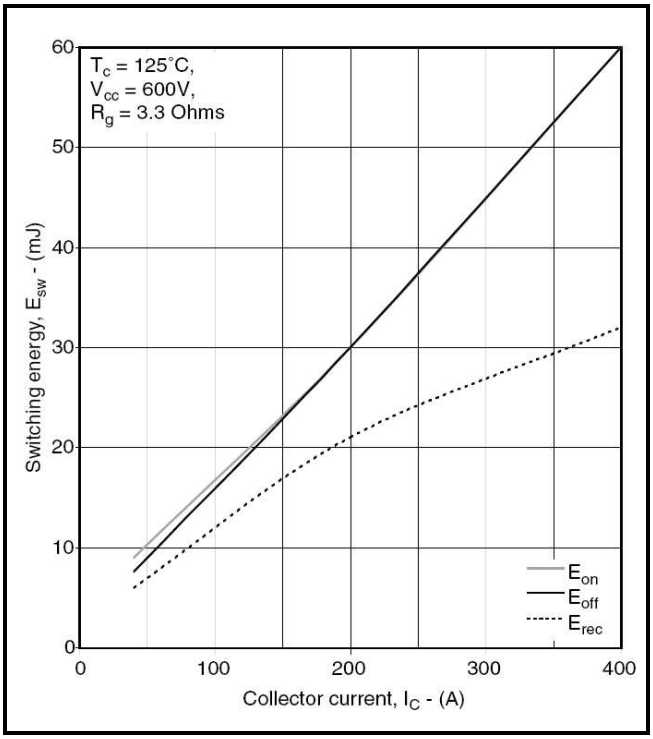


Fig.5 Typical switching energy vs collector current

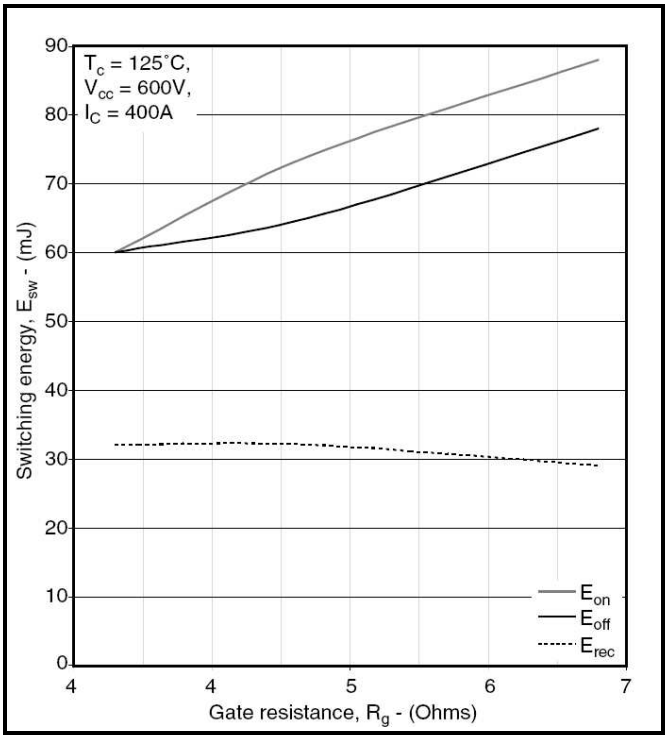


Fig. 6 Typical switching energy vs gate resistance

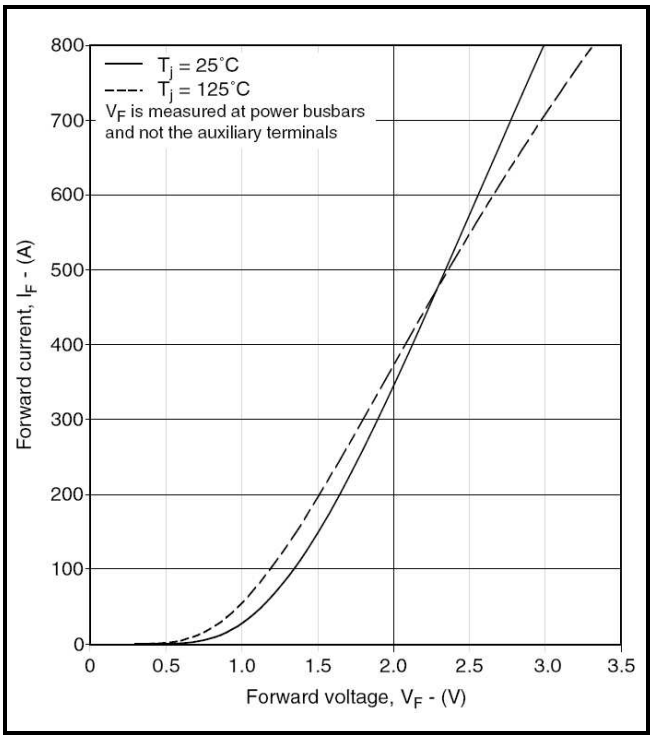


Fig. 7 Diode typical forward characteristics

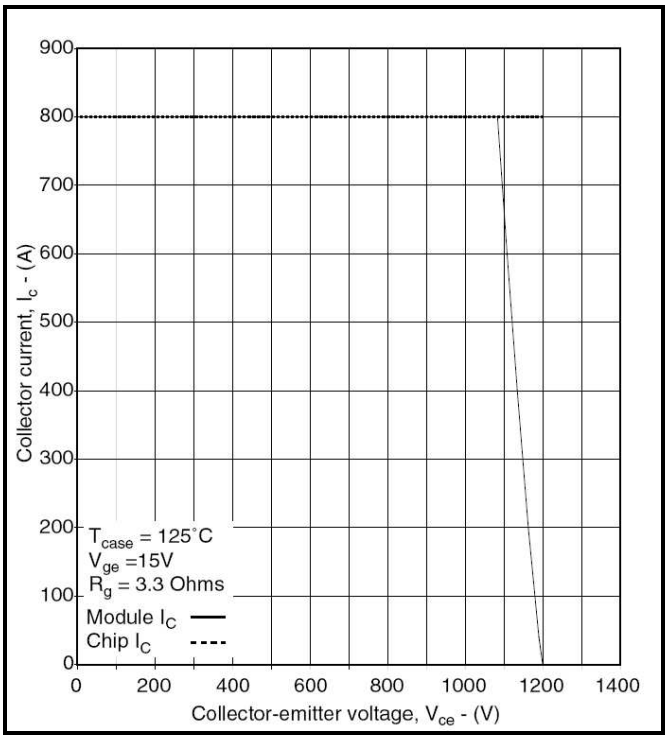


Fig. 8 Reverse bias safe operating area

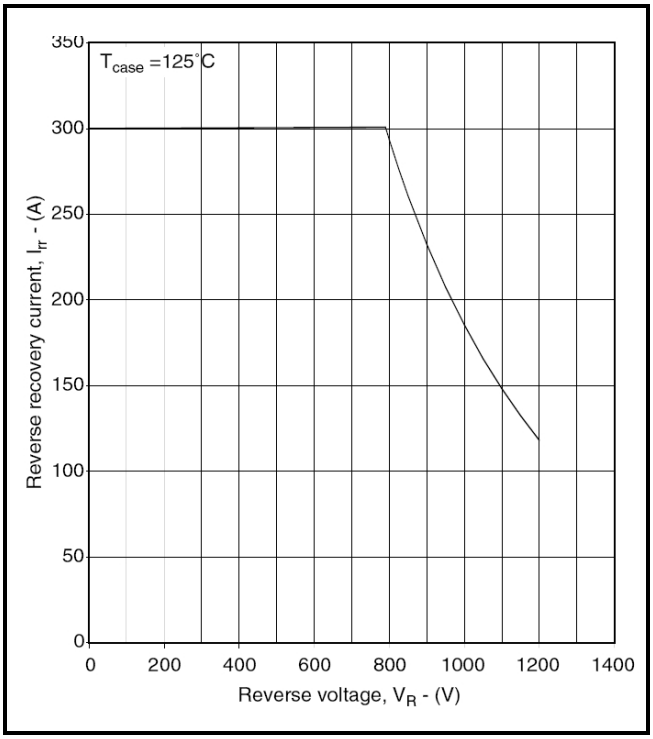
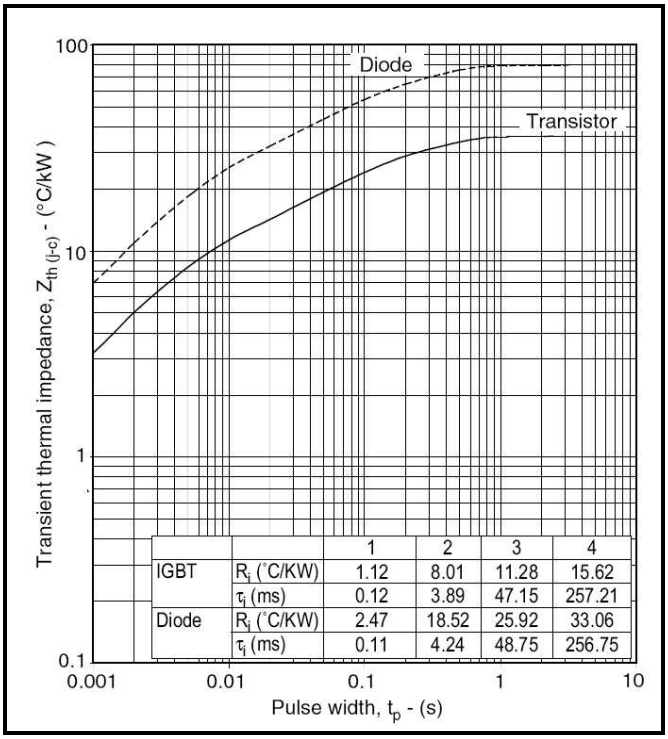


Fig. 9 Diode reverse bias safe operating area

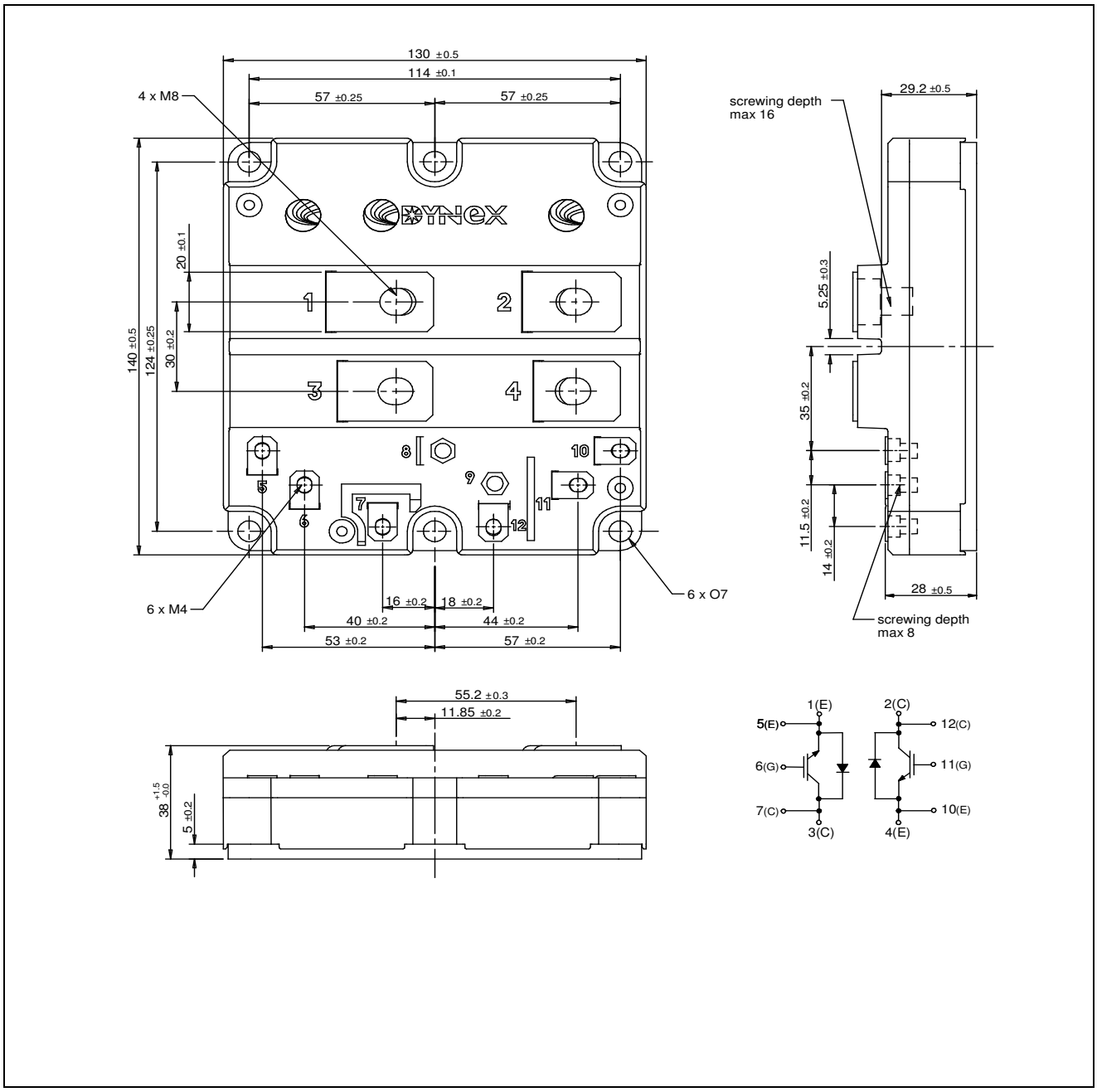


		1	2	3	4
IGBT	R_i (°C/KW)	1.12	8.01	11.28	15.62
	τ_i (ms)	0.12	3.89	47.15	257.21
Diode	R_i (°C/KW)	2.47	18.52	25.92	33.06
	τ_i (ms)	0.11	4.24	48.75	256.75

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

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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 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.