DIM2400ESS12-A000

Single Switch IGBT Module

Replaces DS5840-1.1

DS5840-2 October 2010 (LN27616)

FEATURES

- 10µs Short Circuit Withstand
- Non Punch Through Silicon
- Isolated Cu Base with Al_2O_3 Substrates
- Lead Free construction

APPLICATIONS

- 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 DIM2400ESS12-A000 is a single switch 1200V, 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:

DIM2400ESS12-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**1200V**
$V_{CE(sat)}$ *	**(typ)**	**2.2V**
I_C	**(max)**	**2400A**
$I_{C(PK)}$	**(max)**	**4800A**

* Measured at the power busbars, not the auxiliary terminals

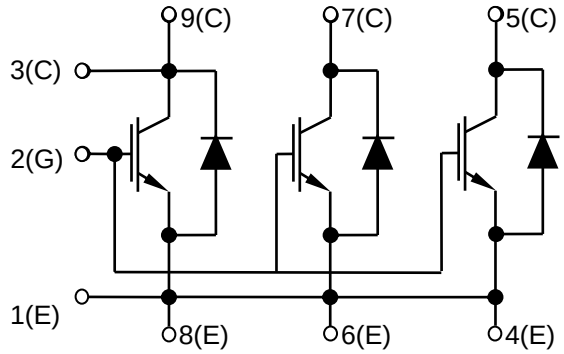


Fig. 1 Circuit configuration

Outline type code: E

(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	2400	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 115°C	4800	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	20830	W
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 125ºC	900	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V

THERMAL AND MECHANICAL RATINGS

Internal insulation material: Al_2O_3

Baseplate material: Cu

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	-	-	6	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	13	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	6	°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 – 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}			3	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125°C			75	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			12	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 120mA, V_{GE} = V_{CE}	4.5	5.5	6.5	V
$V_{CE(sat)}$ †	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 2400A		2.2	2.8	V
		V_{GE} = 15V, I_C = 2400A, T_j = 125°C		2.6	3.3	V
I_F	Diode forward current	DC			2400	A
I_{FM}	Diode maximum forward current	t_p = 1ms			4800	A
V_F †	Diode forward voltage	I_F = 2400A		2.1	2.4	V
		I_F = 2400A, T_j = 125°C		2.1	2.4	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		270		nF
Q_g	Gate charge	±15V		26		µC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz				nF
L_M	Module inductance			10		nH
R_{INT}	Internal transistor resistance			90		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* x dI/dt IEC 60747-9		13500		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 = 2400A V_{GE} = ±15V V_{CE} = 600V $R_{G(ON)}$ = 1.0Ω $R_{G(OFF)}$ = 1.0Ω L_S ~ 50nH		1370		ns
t_f	Fall time			230		ns
E_{OFF}	Turn-off energy loss			520		mJ
$t_{d(on)}$	Turn-on delay time			250		ns
t_r	Rise time			230		ns
E_{ON}	Turn-on energy loss			180		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 2400A V_{CE} = 600V dI_F/dt = 9500A/µs		310		µC
I_{rr}	Diode reverse recovery current			1000		A
E_{rec}	Diode reverse recovery energy			150		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 = 2400A V_{GE} = ±15V V_{CE} = 600V $R_{G(ON)}$ = 1.0Ω $R_{G(OFF)}$ = 1.0Ω L_S ~ 50nH		1570		ns
t_f	Fall time			230		ns
E_{OFF}	Turn-off energy loss			600		mJ
$t_{d(on)}$	Turn-on delay time			360		ns
t_r	Rise time			290		ns
E_{ON}	Turn-on energy loss			200		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 2400A V_{CE} = 600V dI_F/dt = 8500A/µs		540		µC
I_{rr}	Diode reverse recovery current			1260		A
E_{rec}	Diode reverse recovery energy			260		mJ

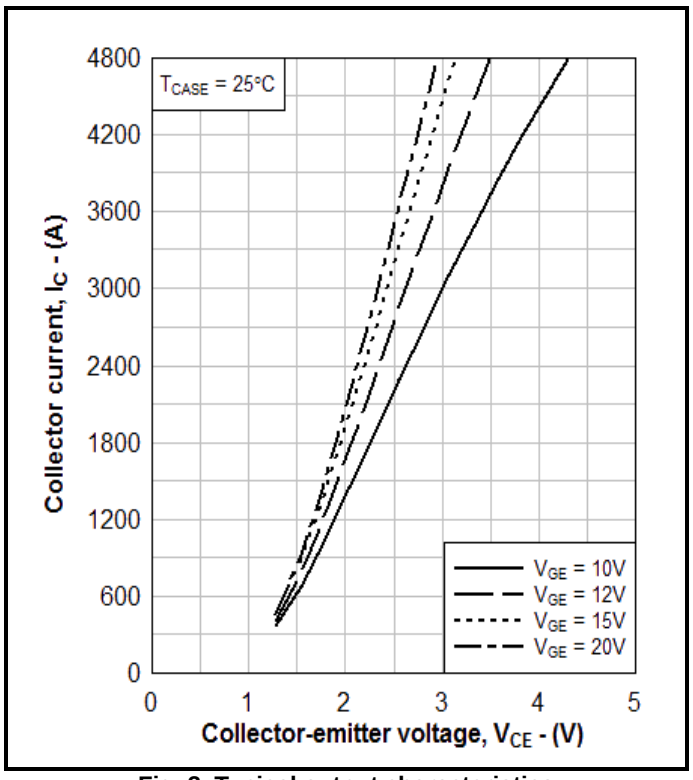


Fig. 3 Typical output characteristics

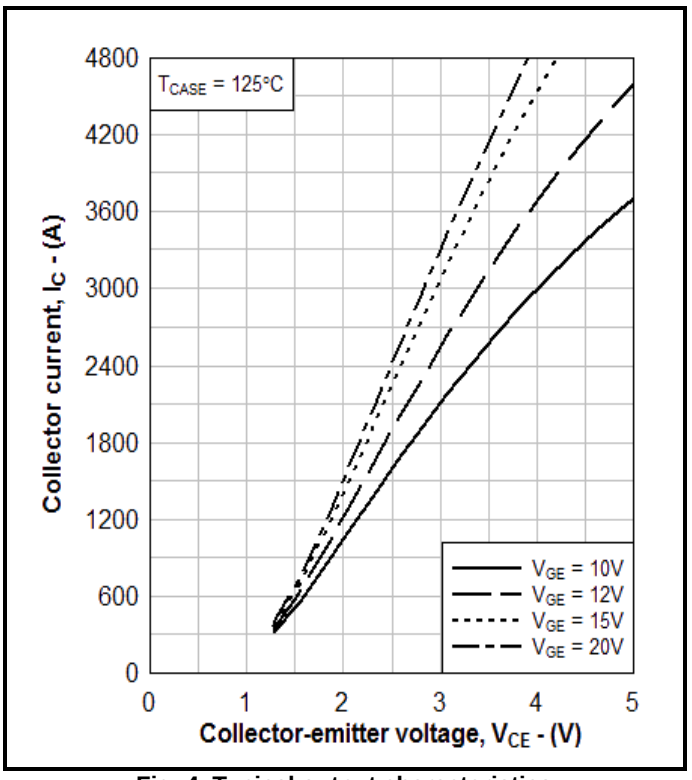


Fig. 4 Typical output characteristics

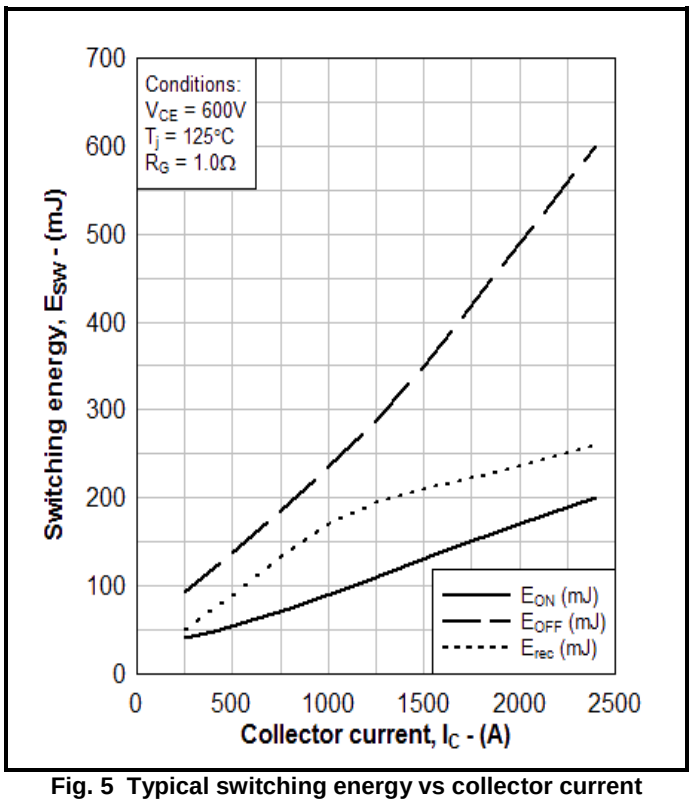


Fig. 5 Typical switching energy vs collector current

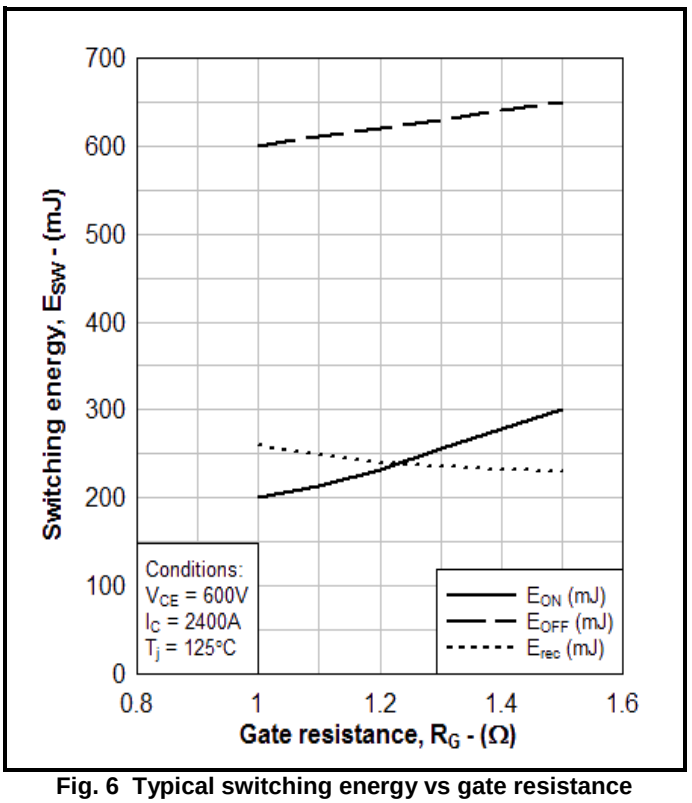


Fig. 6 Typical switching energy vs gate resistance

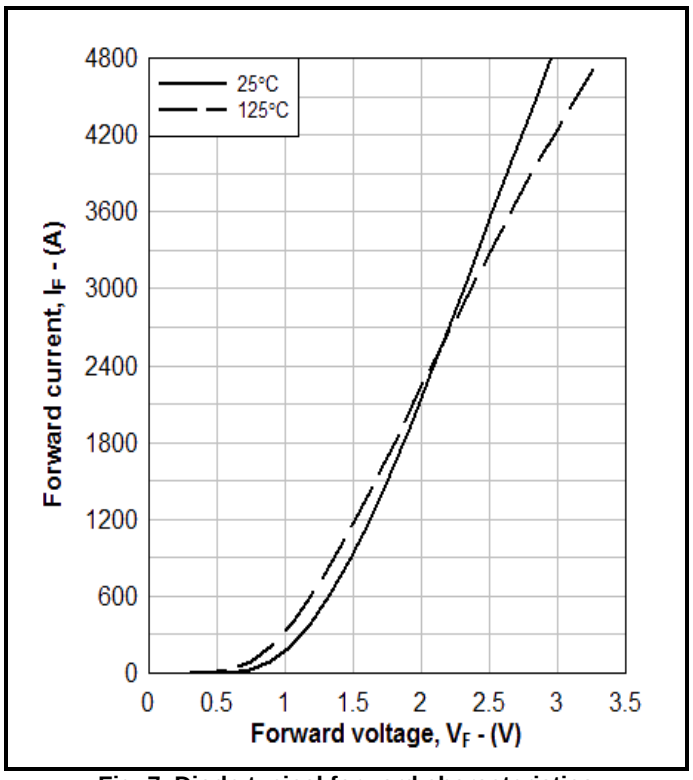


Fig. 7 Diode typical forward characteristics

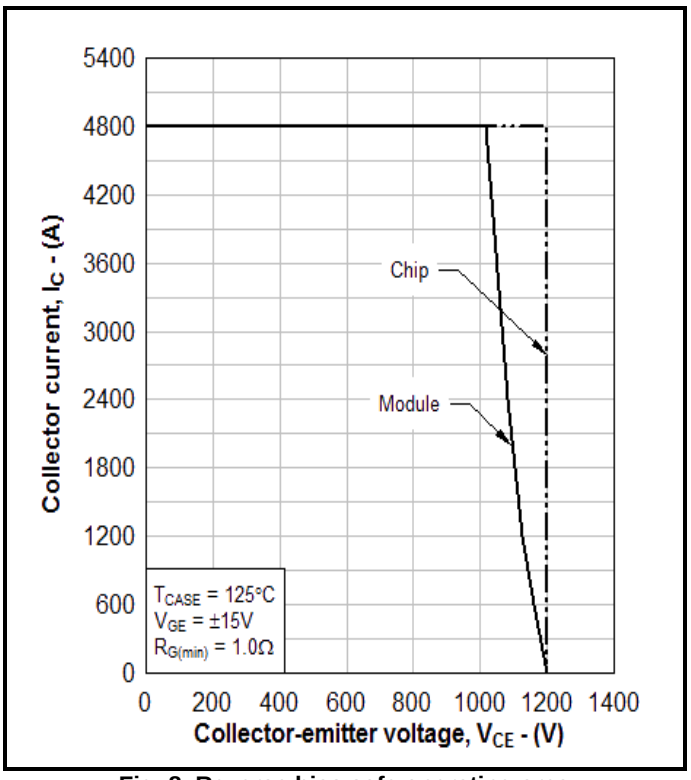


Fig. 8 Reverse bias safe operating area

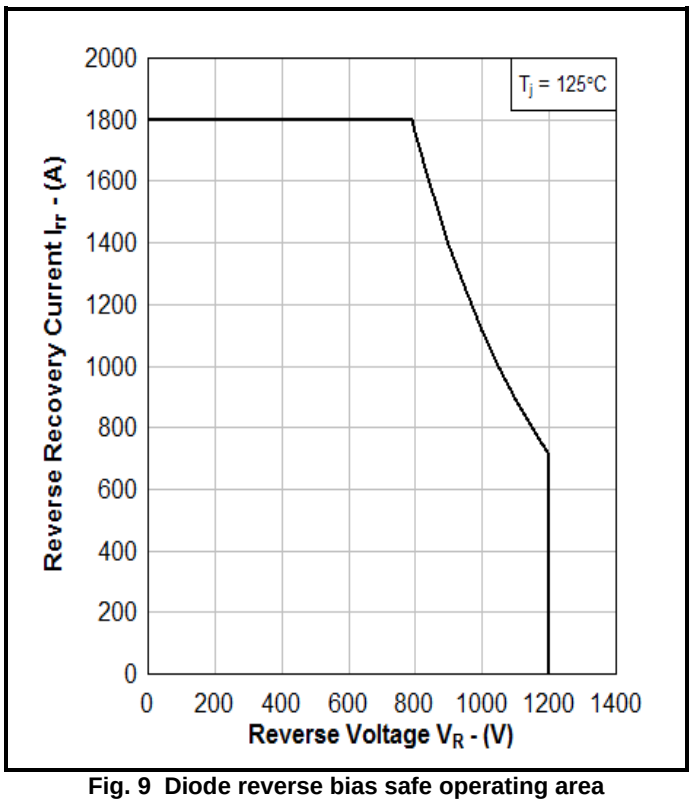


Fig. 9 Diode reverse bias safe operating area

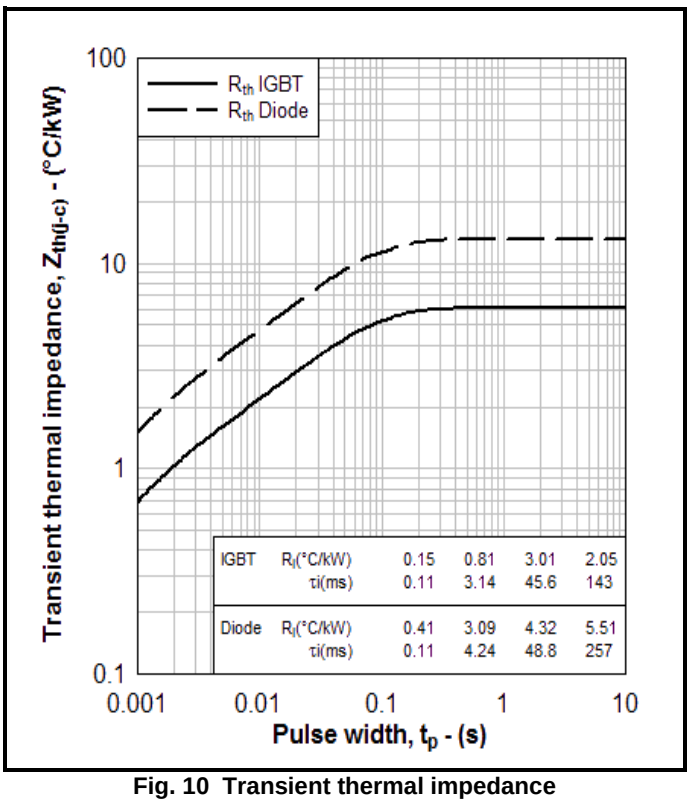
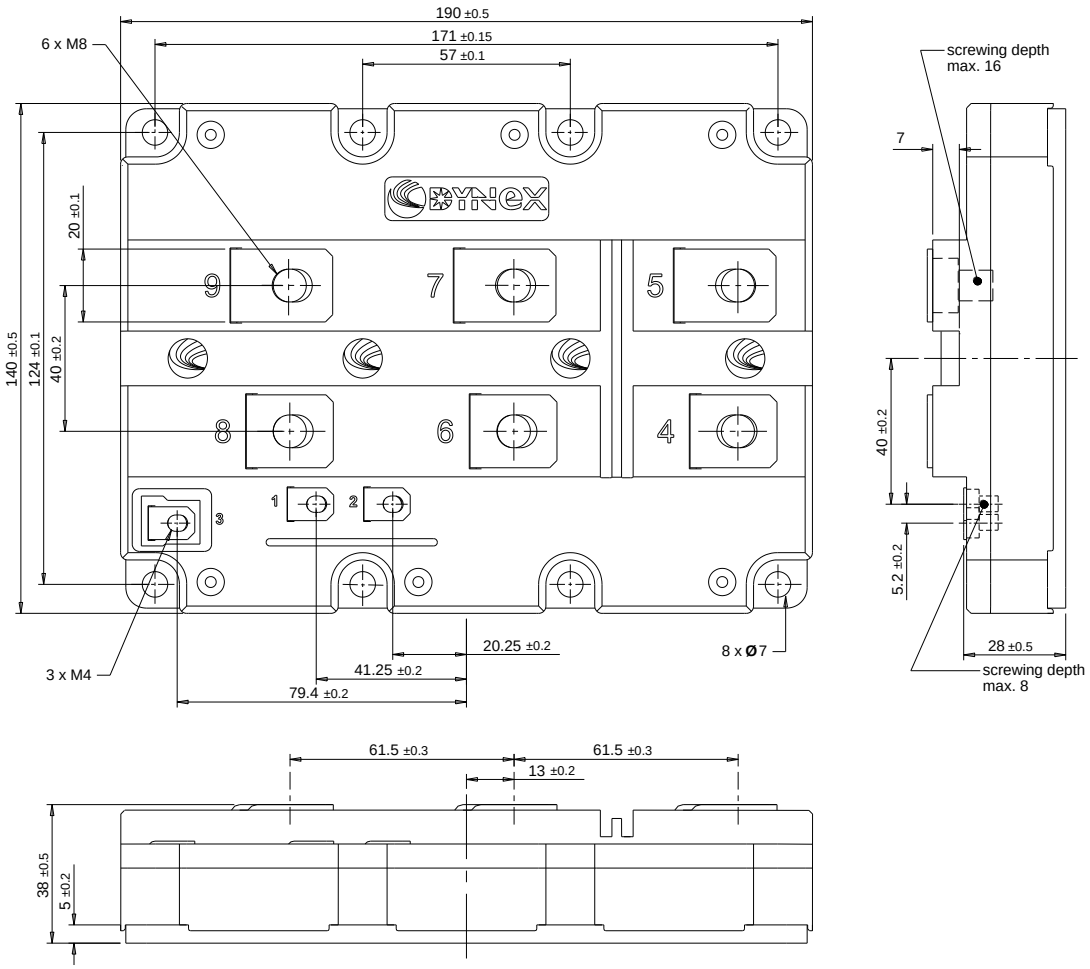


Fig. 10 Transient thermal impedance

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: 2250g

Module Outline Type Code: E

Fig. 11 Module outline drawing

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