TRENCH
TSPT

DIM335XCM65-UF000

IGBT Chopper Module

DS6394-1 November 2021 (LN41355)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Trench Gate Soft Punch Through IGBT
- Isolated AlSiC Base with AlN Substrates
- Lead Free construction

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Drives
- Choppers

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 600V to 6500V and currents up to 2400A.

The DIM335XCM65-UF000 is a 6500V, soft punch through n-channel enhancement mode, insulated gate bipolar transistor (IGBT) chopper 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:

DIM335XCM65-UF000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**6500V**
$V_{CE(sat)}$ *	**(typ)**	**3.6V**
I_C	**(max)**	**335A**
$I_{C(PK)}$	**(max)**	**670A**

* Measured at the auxiliary terminals

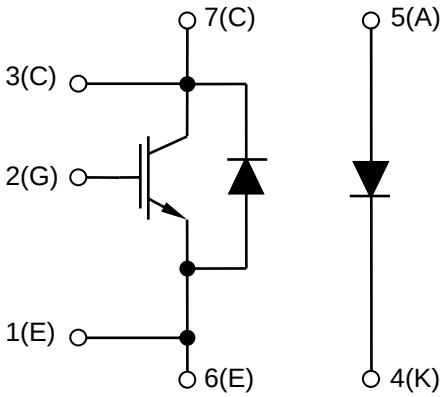
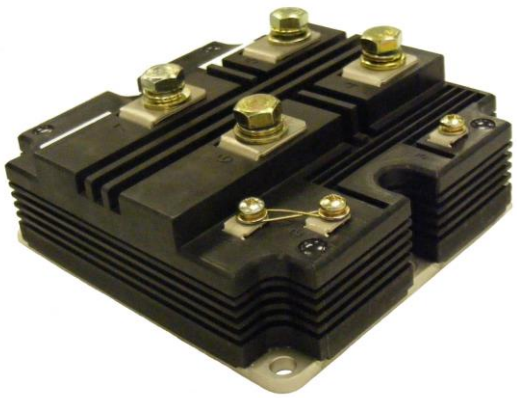


Fig. 1 Circuit configuration



Outline type code: X

(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, T_j = 150°C	6500	V
		V_{GE} = 0V, T_j = 25°C	6300	V
		V_{GE} = 0V, T_j = -50°C	5700	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} = 112°C	335	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 147°C	670	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	4.6	kW
I^2t	Diode I^2t value (IGBT arm)	V_R = 0, t_p = 10ms, T_j = 150°C	52.2	kA^2s
	Diode I^2t value (Diode arm)		52.2	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	10.2	kV
Q_{PD}	Partial discharge – per module	IEC1287, V_1 = 6900V, V_2 = 5100V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material: AlN

Baseplate material: AlSiC

Creepage distance: 56mm

Clearance: 26mm

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			27	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (IGBT arm)	Continuous dissipation – junction to case			54	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (Diode arm)	Continuous dissipation – junction to case			54	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink	Mounting torque 5Nm (with mounting grease)			8	°C/kW
T_j	Junction temperature	Transistor			150	°C
		Diode			150	°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

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} = 150°C			70	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			1	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 120mA, V_{GE} = V_{CE}	6.5	6.75	7.3	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 335A		3.6		V
		V_{GE} = 15V, I_C = 335A, T_j = 125°C		4.0		V
		V_{GE} = 15V, I_C = 335A, T_j = 150°C		4.1		V
I_F	Diode forward current	DC			335	A
I_{FM}	Diode maximum forward current	t_p = 1ms			670	A
V_F	Diode forward voltage	I_F = 335A		3.8		V
		I_F = 335A, T_j = 125°C		4.15		V
		I_F = 335A, T_j = 150°C		4.2		V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		60		nF
Q_g	Gate charge	±15V		5		µC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		2		nF
L_M	Module inductance	IGBT		30		nH
		Diode		30		nH
R_{INT}	Internal resistance	IGBT		270		µΩ
		Diode		270		µΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 150°C, V_{CC} = 4400V t_p ≤ 10µs, V_{GE} ≤ 15V $V_{CE\ (max)}$ = V_{CES} – L* x dI/dt IEC 60747-9		1500		A

Note:

† Measured at 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 = 335A V_{GE} = ±15V V_{CE} = 3600V $R_{G(ON)}$ = 4.7Ω $R_{G(OFF)}$ = 47Ω C_{ge} = 56nF L_S ~ 200nH		4.5		µs
t_f	Fall time			400		ns
E_{OFF}	Turn-off energy loss			1600		mJ
$t_{d(on)}$	Turn-on delay time			720		ns
t_r	Rise time			290		ns
E_{ON}	Turn-on energy loss			2500		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 335A V_{CE} = 3600V dI_F/dt = 1300A/µs		550		µC
I_{rr}	Diode reverse recovery current			670		A
E_{rec}	Diode reverse recovery energy			900		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 = 335A V_{GE} = ±15V V_{CE} = 3600V $R_{G(ON)}$ = 4.7Ω $R_{G(OFF)}$ = 47Ω C_{ge} = 56nF L_S ~ 200nH		5		µs
t_f	Fall time			500		ns
E_{OFF}	Turn-off energy loss			1840		mJ
$t_{d(on)}$	Turn-on delay time			740		ns
t_r	Rise time			250		ns
E_{ON}	Turn-on energy loss			3170		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 335A V_{CE} = 3600V dI_F/dt = 1300A/µs		950		µC
I_{rr}	Diode reverse recovery current			770		A
E_{rec}	Diode reverse recovery energy			1600		mJ

T_{case} = 150°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	I_C = 335A V_{GE} = ±15V V_{CE} = 3600V $R_{G(ON)}$ = 4.7Ω $R_{G(OFF)}$ = 47Ω C_{ge} = 56nF L_S ~ 200nH		5.2		µs
t_f	Fall time			520		ns
E_{OFF}	Turn-off energy loss			1900		mJ
$t_{d(on)}$	Turn-on delay time			750		ns
t_r	Rise time			230		ns
E_{ON}	Turn-on energy loss			3340		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 335A V_{CE} = 3600V dI_F/dt = 1300A/µs		960		µC
I_{rr}	Diode reverse recovery current			780		A
E_{rec}	Diode reverse recovery energy			1700		mJ

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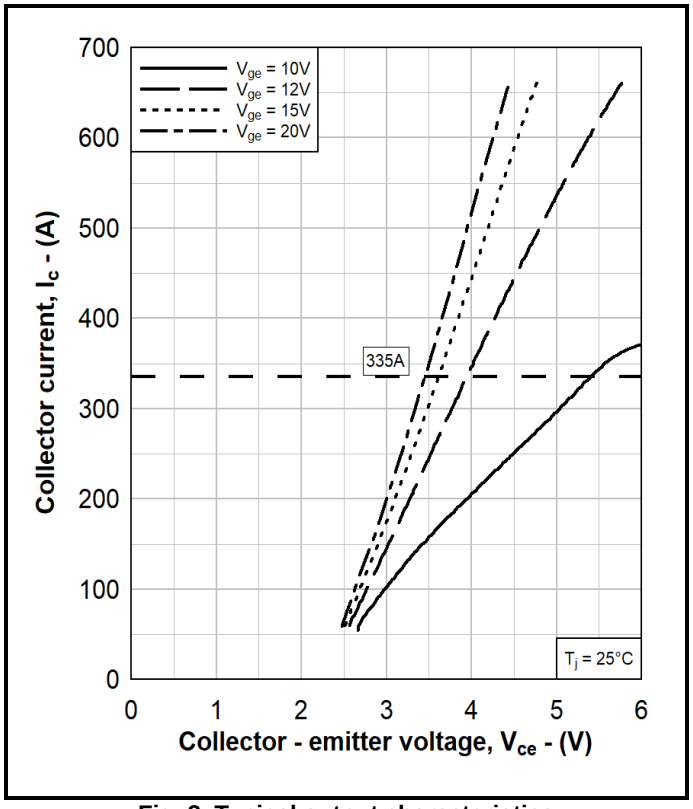


Fig. 3 Typical output characteristics

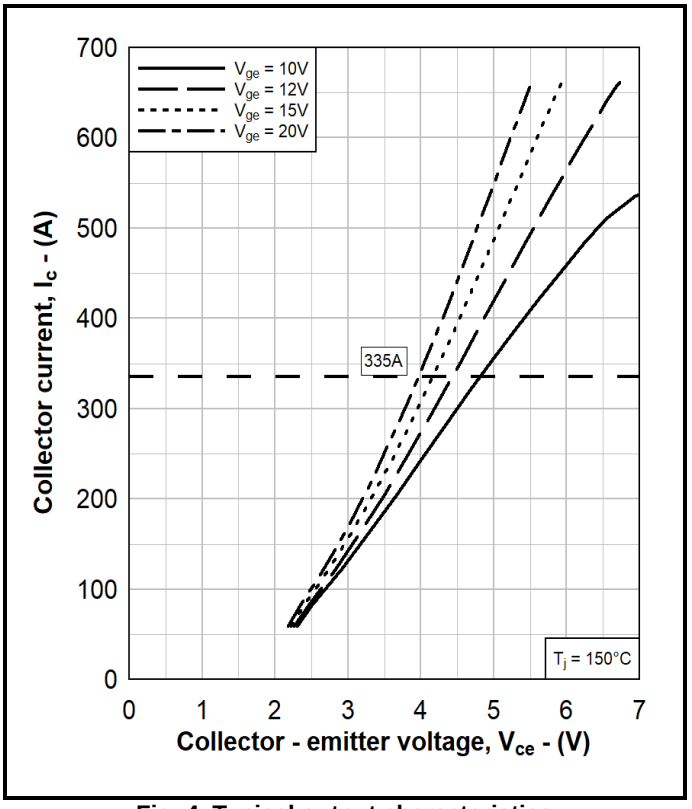


Fig. 4 Typical output characteristics

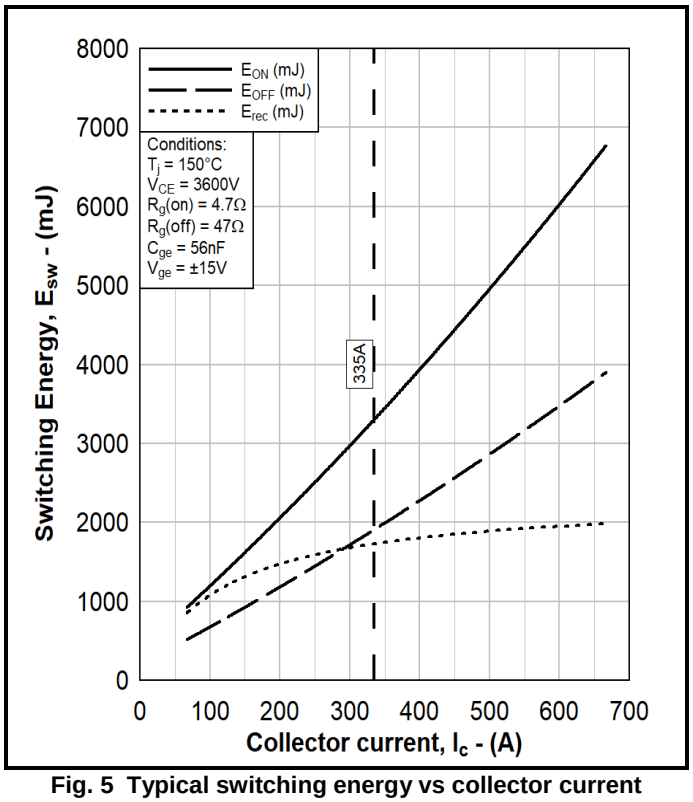


Fig. 5 Typical switching energy vs collector current

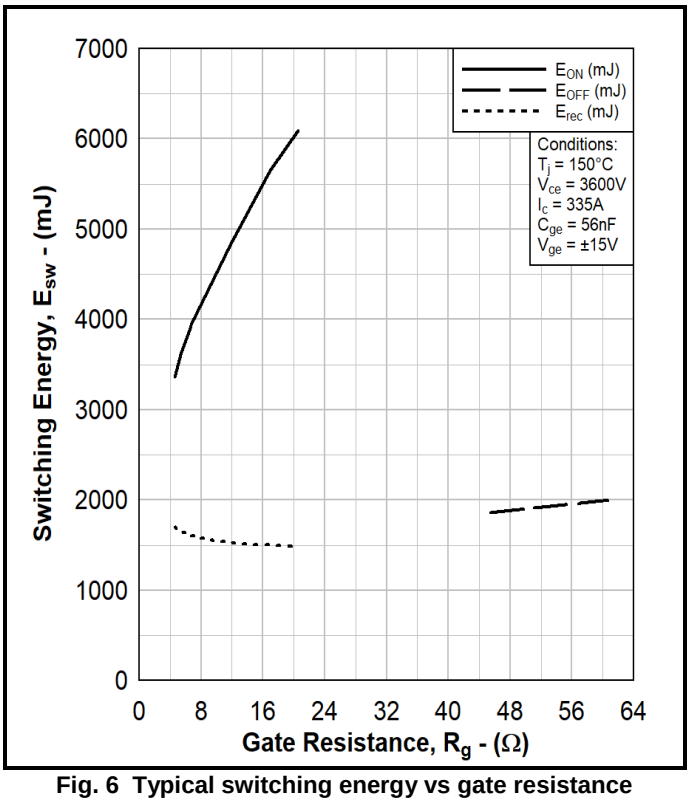


Fig. 6 Typical switching energy vs gate resistance

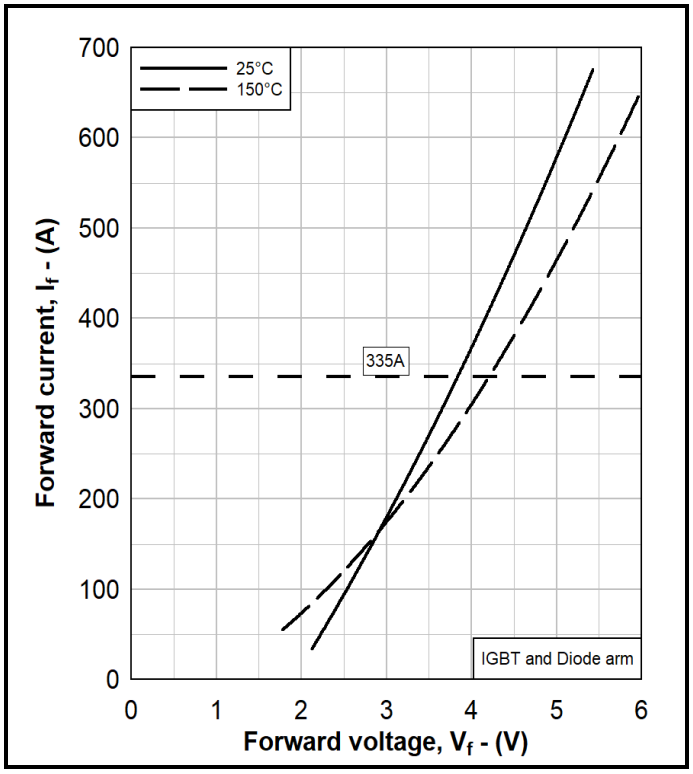


Fig. 7 Diode typical forward characteristics

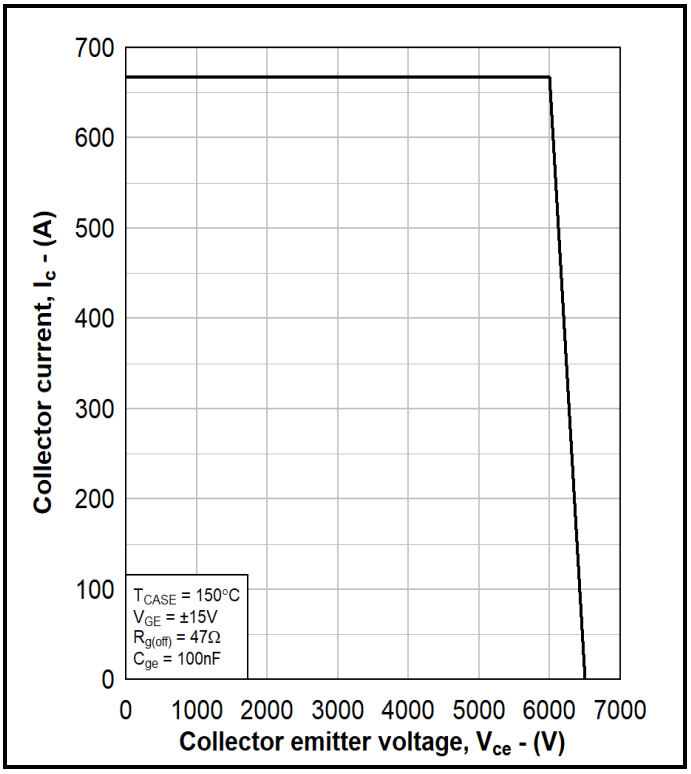


Fig. 8 Reverse bias safe operating area

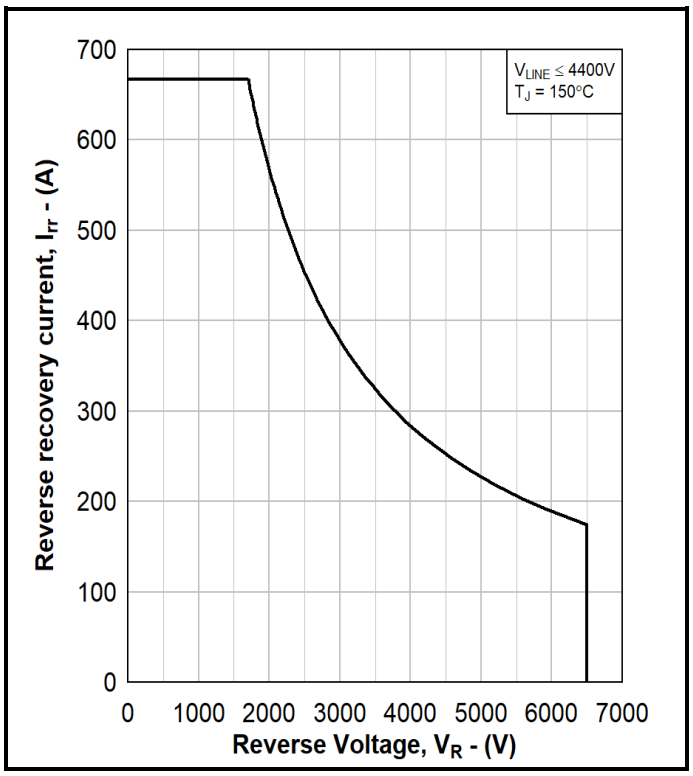


Fig. 9 Diode reverse bias safe operating area

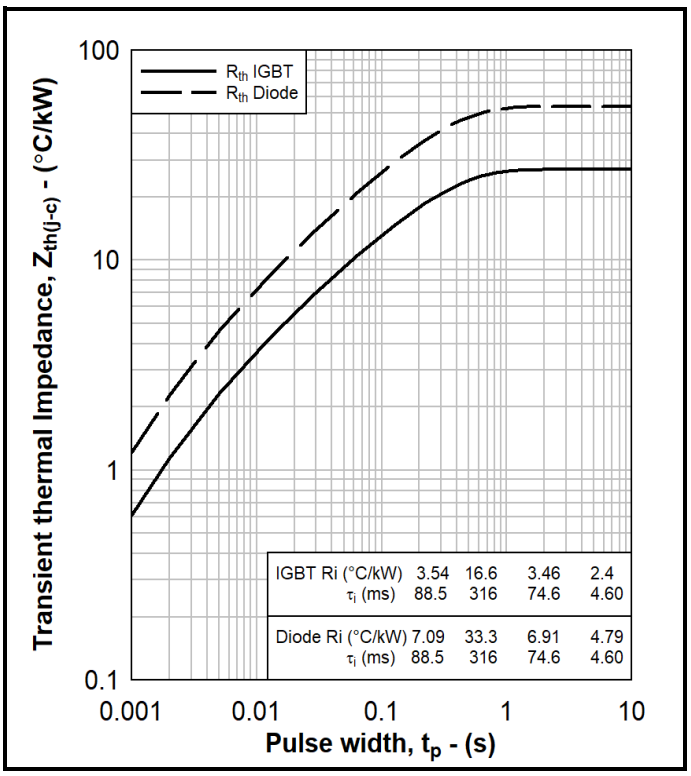
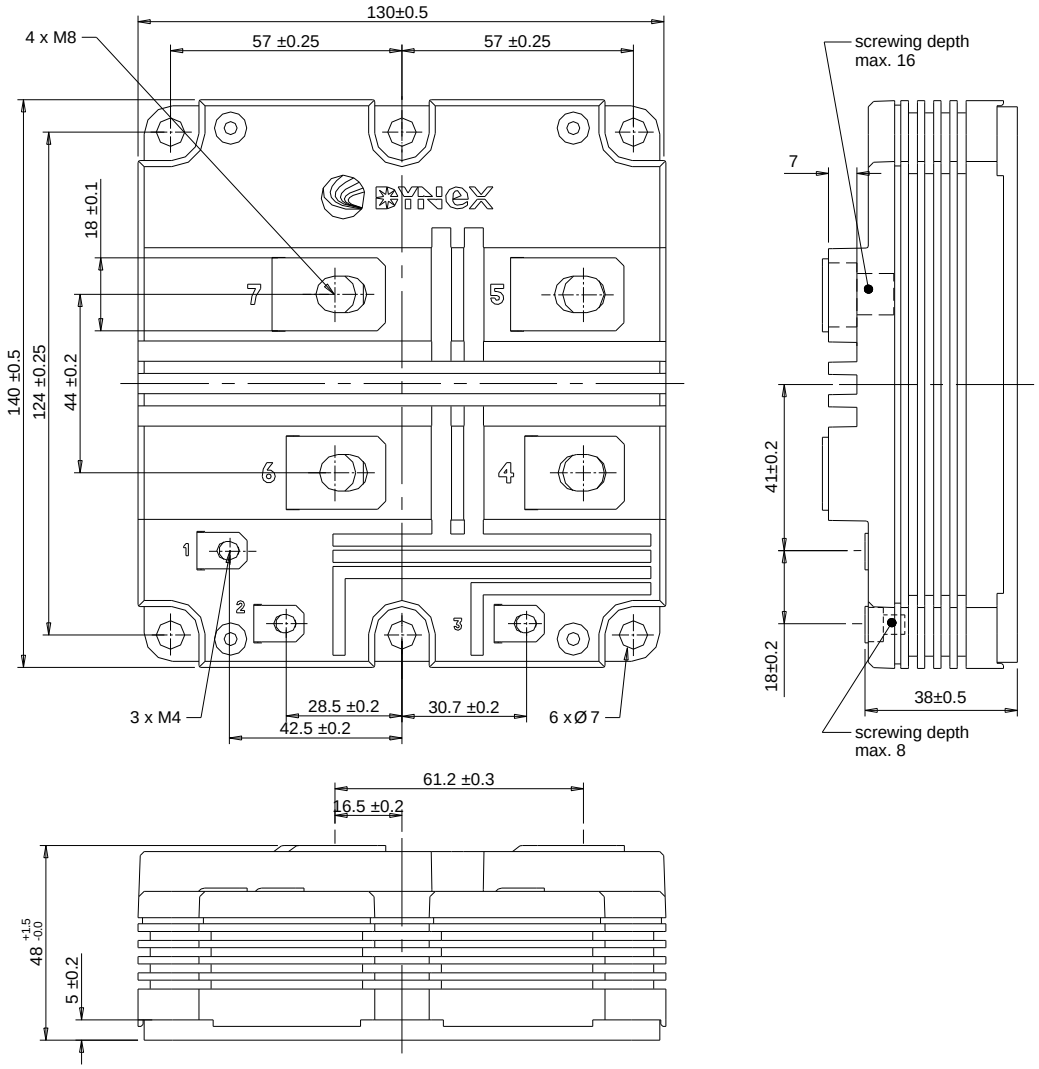


Fig. 10 Transient thermal impedance

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: 1100g

Module Outline Type Code: X

Fig. 11 Module outline drawing

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Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

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