

### FEATURES

- 10μs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- Isolated AlSiC 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 600V to 6500V and currents up to 2400A.

The DIM250XCM65-TS000 is a 6500V, 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:

#### DIM250XCM65-TS000

Note: When ordering, please use the complete part number

### KEY PARAMETERS

$V_{CES}$	6500V
$V_{CE(sat)}$ * (typ)	3.0V
$I_C$ (max)	250A
$I_{C(PK)}$ (max)	500A

\* Measured at the auxiliary terminals

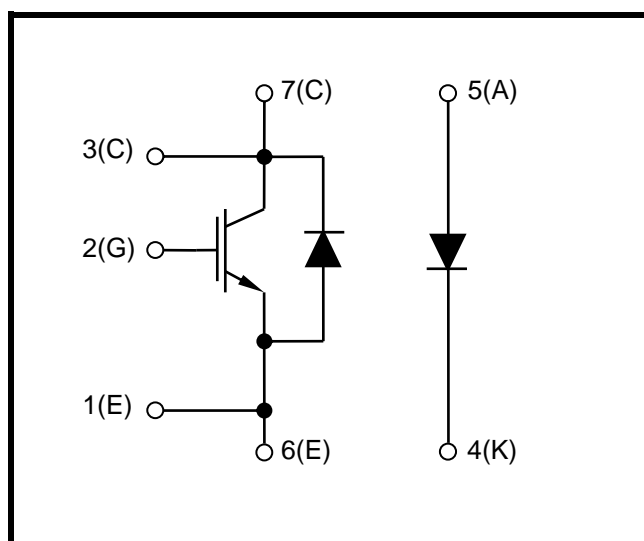


Fig. 1 Circuit configuration



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<sub>case</sub> = 25°C unless stated otherwise**

Symbol	Parameter	Test Conditions	Max.	Units
V <sub>CES</sub>	Collector-emitter voltage	V <sub>GE</sub> = 0V, T <sub>j</sub> = 125°C	6500	V
		V <sub>GE</sub> = 0V, T <sub>j</sub> = 25°C	6500	V
		V <sub>GE</sub> = 0V, T <sub>j</sub> = -40°C	6000	V
V <sub>GES</sub>	Gate-emitter voltage		±20	V
I <sub>C</sub>	Continuous collector current	T <sub>case</sub> = 90°C	250	A
I <sub>C(PK)</sub>	Peak collector current	1ms, T <sub>case</sub> = 115°C	500	A
P <sub>max</sub>	Max. transistor power dissipation	T <sub>case</sub> = 25°C, T <sub>j</sub> = 125°C	3300	W
I <sup>2</sup> t	Diode I <sup>2</sup> t value (IGBT arm)	V <sub>R</sub> = 0, t <sub>p</sub> = 10ms, T <sub>j</sub> = 125°C	22	kA <sup>2</sup> s
	Diode I <sup>2</sup> t value (Diode arm)		22	kA <sup>2</sup> s
V <sub>isol</sub>	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	10.2	kV
Q <sub>PD</sub>	Partial discharge – per module	IEC1287, V <sub>1</sub> = 6900V, V <sub>2</sub> = 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 <sub>th(j-c)</sub>	Thermal resistance – transistor (per arm)	Continuous dissipation – junction to case	-	-	30	°C/kW
R <sub>th(j-c)</sub>	Thermal resistance – diode (IGBT arm)	Continuous dissipation – junction to case	-	-	60	°C/kW
	Thermal resistance – diode (Diode arm)				60	°C/kW
R <sub>th(c-h)</sub>	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	8	°C/kW
T <sub>j</sub>	Junction temperature	Transistor	-	-	125	°C
		Diode	-	-	125	°C
T <sub>stg</sub>	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<sub>case</sub> = 25°C unless stated otherwise.**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I <sub>CES</sub>	Collector cut-off current	V <sub>GE</sub> = 0V, V <sub>CE</sub> = V <sub>CES</sub>			1	mA
		V <sub>GE</sub> = 0V, V <sub>CE</sub> = V <sub>CES</sub> , T <sub>case</sub> = 125°C			30	mA
I <sub>GES</sub>	Gate leakage current	V <sub>GE</sub> = ± 20V, V <sub>CE</sub> = 0V			1	μA
V <sub>GE(TH)</sub>	Gate threshold voltage	I <sub>C</sub> = 40mA, V <sub>GE</sub> = V <sub>CE</sub>	5.5	6.5	7.5	V
V <sub>CE(sat)</sub> <sup>†</sup>	Collector-emitter saturation voltage	V <sub>GE</sub> = 15V, I <sub>C</sub> = 250A		3.0		V
		V <sub>GE</sub> = 15V, I <sub>C</sub> = 250A, T <sub>j</sub> = 125°C		4.0		V
I <sub>F</sub>	Diode forward current	DC			250	A
I <sub>FM</sub>	Diode maximum forward current	t <sub>p</sub> = 1ms			500	A
V <sub>F</sub> <sup>†</sup>	Diode forward voltage (IGBT arm)	I <sub>F</sub> = 250A		3.6		V
	Diode forward voltage (Diode arm)			3.6		V
	Diode forward voltage (IGBT arm)	I <sub>F</sub> = 250A, T <sub>j</sub> = 125°C		4.3		V
	Diode forward voltage (Diode arm)			4.3		V
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz		40		nF
Q <sub>g</sub>	Gate charge	±15V		3		μC
C <sub>res</sub>	Reverse transfer capacitance	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz		0.8		nF
L <sub>M</sub>	Module inductance – per arm			25		nH
R <sub>INT</sub>	Internal resistance – per arm			270		μΩ
SC <sub>Data</sub>	Short circuit current, I <sub>SC</sub>	T <sub>j</sub> = 125°C, V <sub>CC</sub> = 4400V t <sub>p</sub> ≤ 10μs, V <sub>GE</sub> ≤ 15V V <sub>CE(max)</sub> = V <sub>CES</sub> – L* x di/dt IEC 60747-9		1200		A

**Note:**

<sup>†</sup> Measured at the auxiliary terminals

\* L is the circuit inductance + L<sub>M</sub>

## ELECTRICAL CHARACTERISTICS

**T<sub>case</sub> = 25°C unless stated otherwise**

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
t <sub>d(off)</sub>	Turn-off delay time	$I_C = 250A$ $V_{GE} = \pm 15V$ $V_{CE} = 3600V$ $R_{G(ON)} = 6.8\Omega$ $R_{G(OFF)} = 22\Omega$ $C_{ge} = 100nF$ $L_S \sim 280nH$		3.6		$\mu s$
t <sub>f</sub>	Fall time			450		ns
E <sub>OFF</sub>	Turn-off energy loss			1300		mJ
t <sub>d(on)</sub>	Turn-on delay time			900		ns
t <sub>r</sub>	Rise time			400		ns
E <sub>ON</sub>	Turn-on energy loss			1600		mJ
Q <sub>rr</sub>	Diode reverse recovery charge	<b>Diode arm</b> $I_F = 250A$ $V_{CE} = 3600V$ $dI_F/dt = 700A/\mu s$		400		$\mu C$
I <sub>rr</sub>	Diode reverse recovery current			300		A
E <sub>rec</sub>	Diode reverse recovery energy			830		mJ

**T<sub>case</sub> = 125°C unless stated otherwise**

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
t <sub>d(off)</sub>	Turn-off delay time	$I_C = 250A$ $V_{GE} = \pm 15V$ $V_{CE} = 3600V$ $R_{G(ON)} = 6.8\Omega$ $R_{G(OFF)} = 22\Omega$ $C_{ge} = 100nF$ $L_S \sim 280nH$		3.6		$\mu s$
t <sub>f</sub>	Fall time			450		ns
E <sub>OFF</sub>	Turn-off energy loss			1350		mJ
t <sub>d(on)</sub>	Turn-on delay time			800		ns
t <sub>r</sub>	Rise time			450		ns
E <sub>ON</sub>	Turn-on energy loss			2000		mJ
Q <sub>rr</sub>	Diode reverse recovery charge	<b>Diode arm</b> $I_F = 250A$ $V_{CE} = 3600V$ $dI_F/dt = 700A/\mu s$		700		$\mu C$
I <sub>rr</sub>	Diode reverse recovery current			340		A
E <sub>rec</sub>	Diode reverse recovery energy			1500		mJ

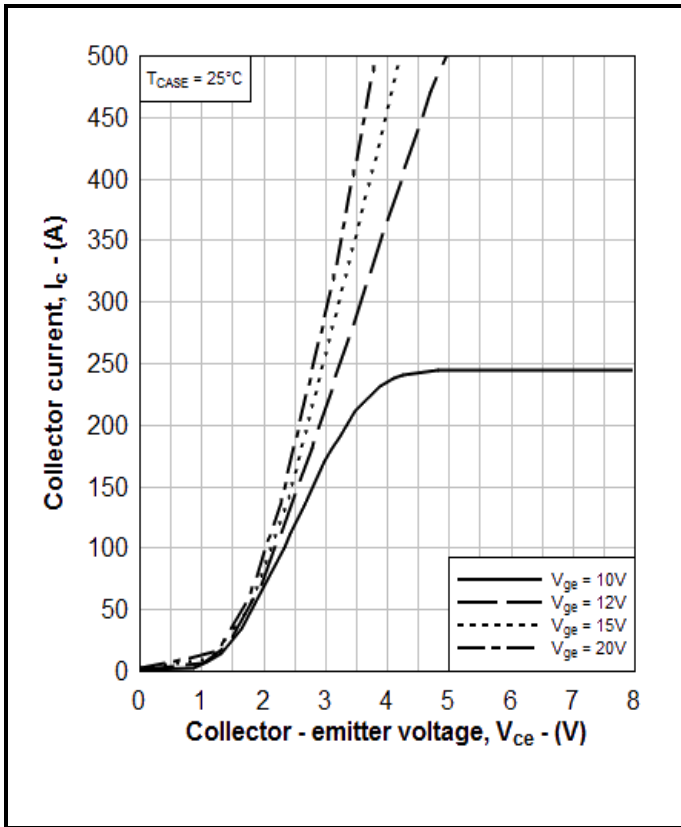


Fig. 3 Typical output characteristics

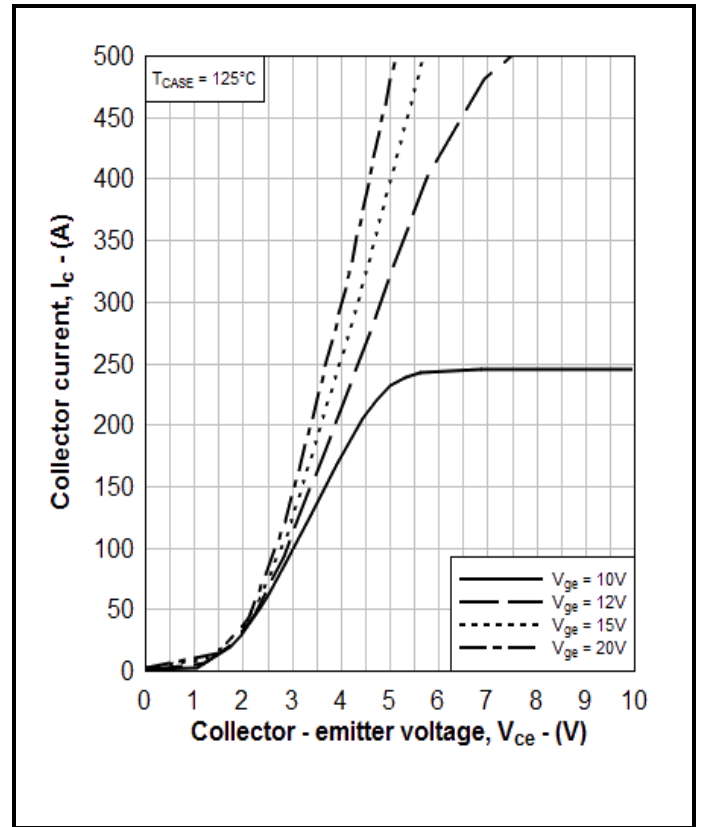


Fig. 4 Typical output characteristics

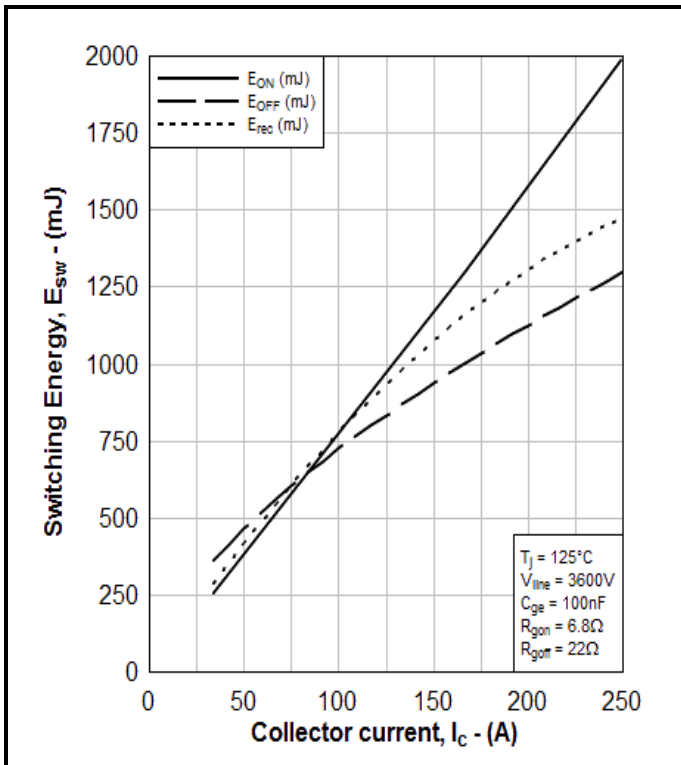


Fig. 5 Typical switching energy vs collector current

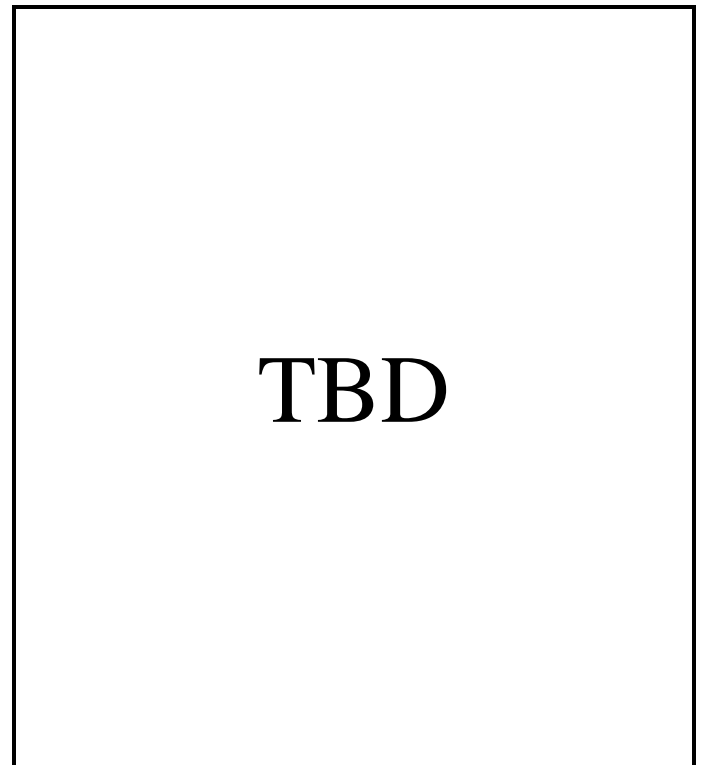


Fig. 6 Typical switching energy vs gate resistance

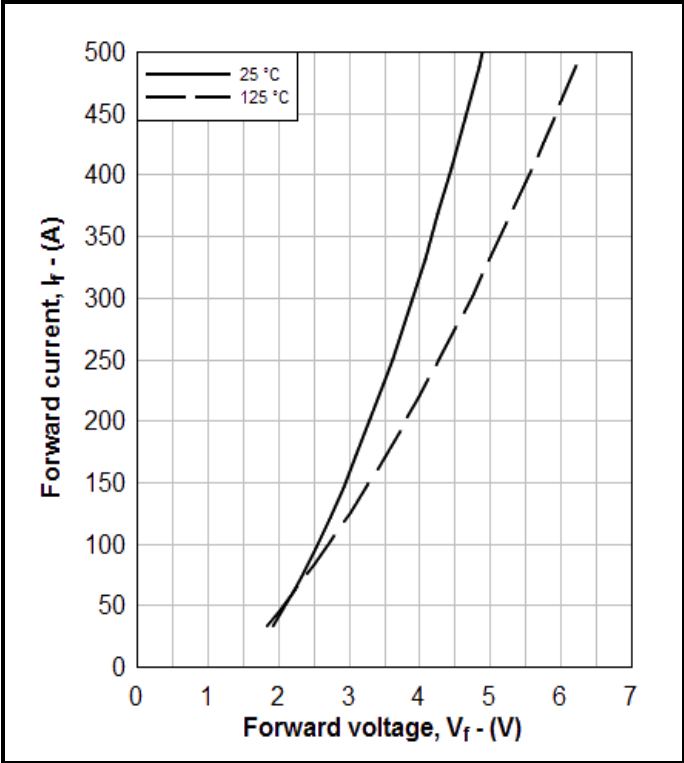


Fig. 7 Diode typical forward characteristics

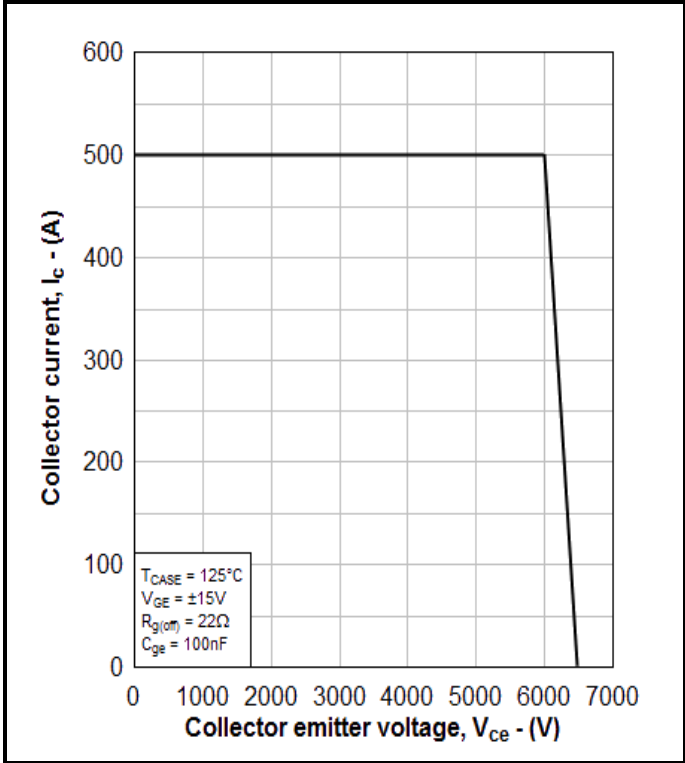


Fig. 8 Reverse bias safe operating area

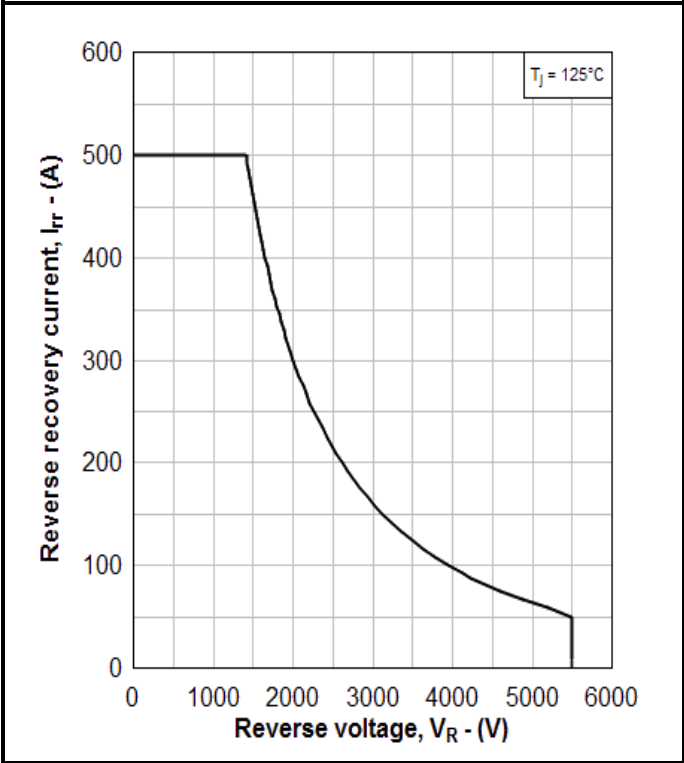


Fig. 9 Diode reverse bias safe operating area

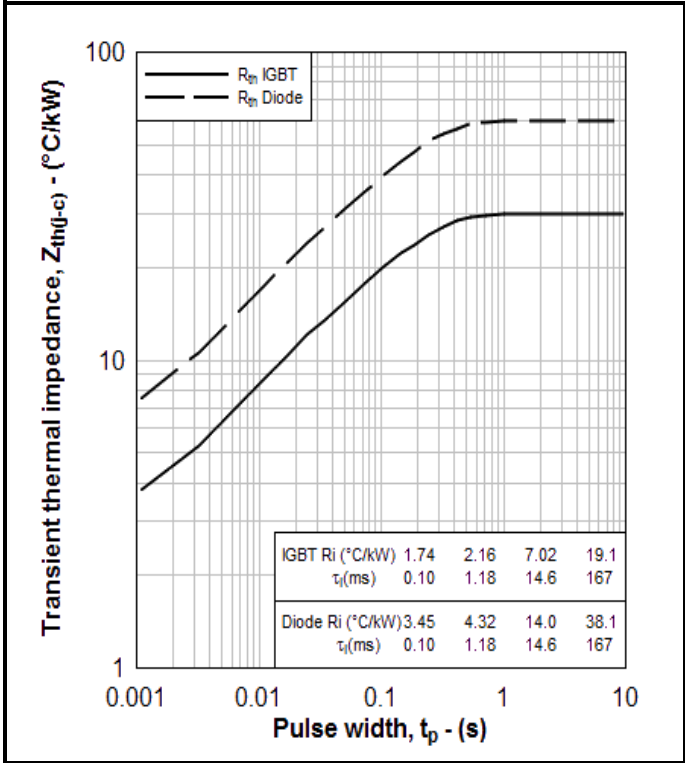
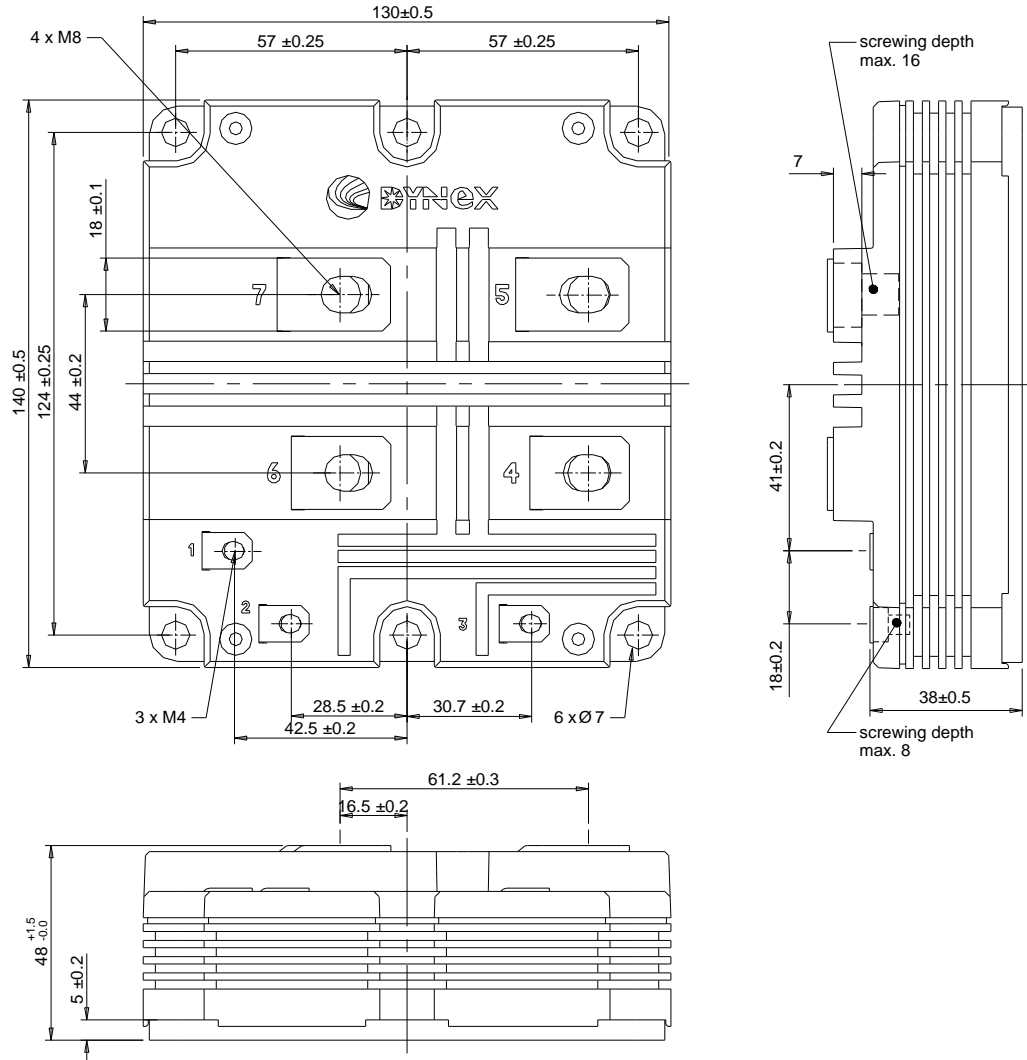


Fig. 10 Transient thermal impedance

**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: 1100g**

**Module Outline Type Code: X**

**Fig. 11 Module outline drawing**

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