DIM1500ESM33-PS500

Single Switch IGBT Module

Replaces DS6297-1

DS6297-2 February 2020 (LN39621)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Low Switching Loss Device
- High Current Density
- Isolated AlSiC Base With AlN Substrates

KEY PARAMETERS

V_{CES}		**3300V**
$V_{CE(sat)}$ *	**(typ)**	**2.4V**
I_C	**(max)**	**1500A**
$I_{C(PK)}$	**(max)**	**3000A**

* Measured at the auxiliary terminals

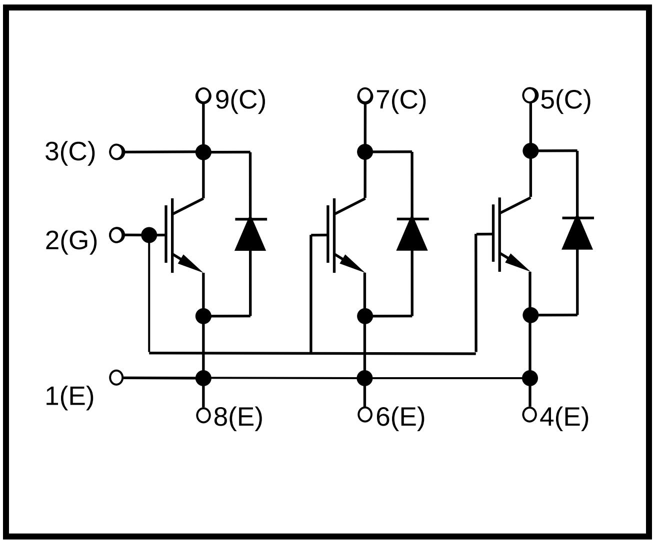


Fig. 1 Circuit configuration

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Drives
- Smart Grid

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 DIM1500ESM33-PS500 is a single switch 3300V, 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.

Outline type code: E

(See Fig. 11 for further information)

Fig. 2 Package

ORDERING INFORMATION

Order As:

DIM1500ESM33-PS500

Note: When ordering, please use the complete part number

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	3300	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} = 112°C	1500	A
$I_{C(PK)}$	Peak collector current	t_p = 1ms	3000	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	15.6	kW
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 150ºC	720	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	6000	V
Q_{PD}	Partial discharge – per module	IEC1287, V_1 = 3500V, V_2 = 2600V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material:	AlN
Baseplate material:	AlSiC
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	-	-	8	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	16	°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	-	-	150	°C
T_{stg}	Storage temperature range	-	-40	-	150	°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} = 125°C			90	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150°C			150	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}	5.5	6.1	7.0	V
$V_{CE(sat)}$ †	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 1500A		2.4	2.9	V
		V_{GE} = 15V, I_C = 1500A, T_j = 125°C		2.95	3.4	V
		V_{GE} = 15V, I_C = 1500A, T_j = 150°C		3.1	3.6	V
I_F	Diode forward current	DC		1500		A
I_{FM}	Diode maximum forward current	t_p = 1ms		3000		A
V_F †	Diode forward voltage	I_F = 1500A		2.1	2.6	V
		I_F = 1500A, T_j = 125°C		2.25	2.7	V
		I_F = 1500A, T_j = 150°C		2.25	2.7	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		165		nF
Q_g	Gate charge	±15V		14.8		µC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		4.2		nF
L_M	Module inductance			10		nH
R_{INT}	Internal transistor resistance			110		µΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 150°C, V_{CC} = 2500V t_p ≤ 10µs, V_{GE} ≤ 15V $V_{CE\ (max)}$ = V_{CES} – L^* x dI/dt IEC 60747-9		5800		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 = 1500A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 1.0Ω $R_{g(OFF)}$ = 1.5Ω C_{GE} = 330nF L_S ~ 150nH		2100		ns
t_f	Fall time			540		ns
E_{OFF}	Turn-off energy loss			2400		mJ
$t_{d(on)}$	Turn-on delay time			750		ns
t_r	Rise time			340		ns
E_{ON}	Turn-on energy loss			1450		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1500A V_{CE} = 1800V dI_F/dt = 4800A/μs		1150		μC
I_{rr}	Diode reverse recovery current			1250		A
E_{rec}	Diode reverse recovery energy			1550		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 = 1500A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 1.0Ω $R_{g(OFF)}$ = 1.5Ω C_{GE} = 330nF L_S ~ 150nH		2250		ns
t_f	Fall time			570		ns
E_{OFF}	Turn-off energy loss			2950		mJ
$t_{d(on)}$	Turn-on delay time			730		ns
t_r	Rise time			350		ns
E_{ON}	Turn-on energy loss			1900		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1500A V_{CE} = 1800V dI_F/dt = 4800A/μs		1800		μC
I_{rr}	Diode reverse recovery current			1420		A
E_{rec}	Diode reverse recovery energy			2450		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 = 1500A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 1.0Ω $R_{g(OFF)}$ = 1.5Ω C_{GE} = 330nF L_S ~ 150nH		2290		ns
t_f	Fall time			580		ns
E_{OFF}	Turn-off energy loss			3200		mJ
$t_{d(on)}$	Turn-on delay time			730		ns
t_r	Rise time			360		ns
E_{ON}	Turn-on energy loss			2100		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1500A V_{CE} = 1800V dI_F/dt = 5000A/μs		1980		μC
I_{rr}	Diode reverse recovery current			1450		A
E_{rec}	Diode reverse recovery energy			2720		mJ

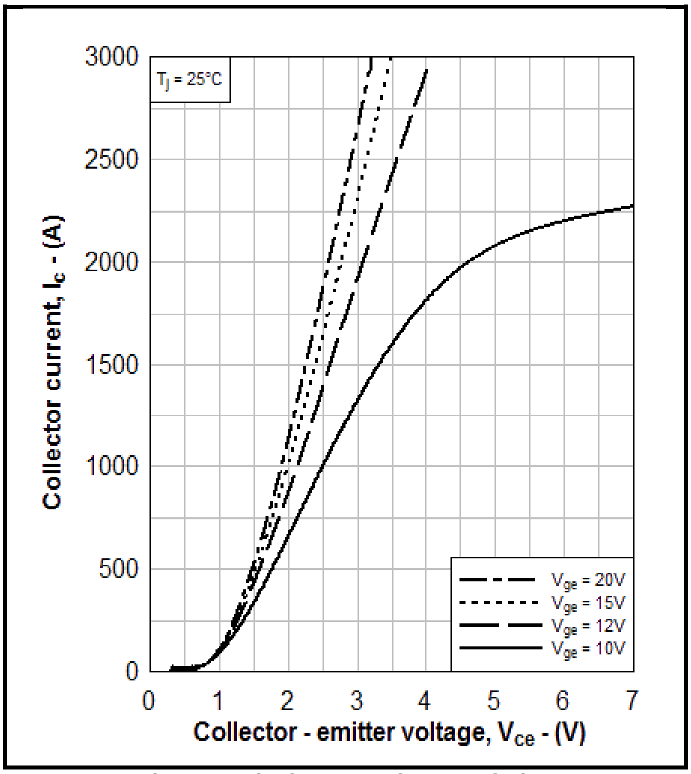


Fig. 3 Typical output characteristics

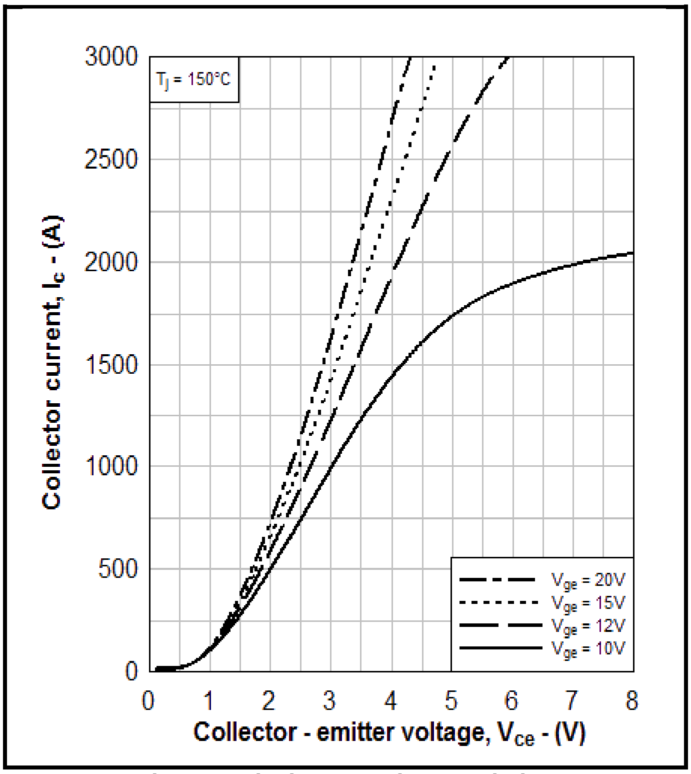


Fig. 4 Typical output characteristics

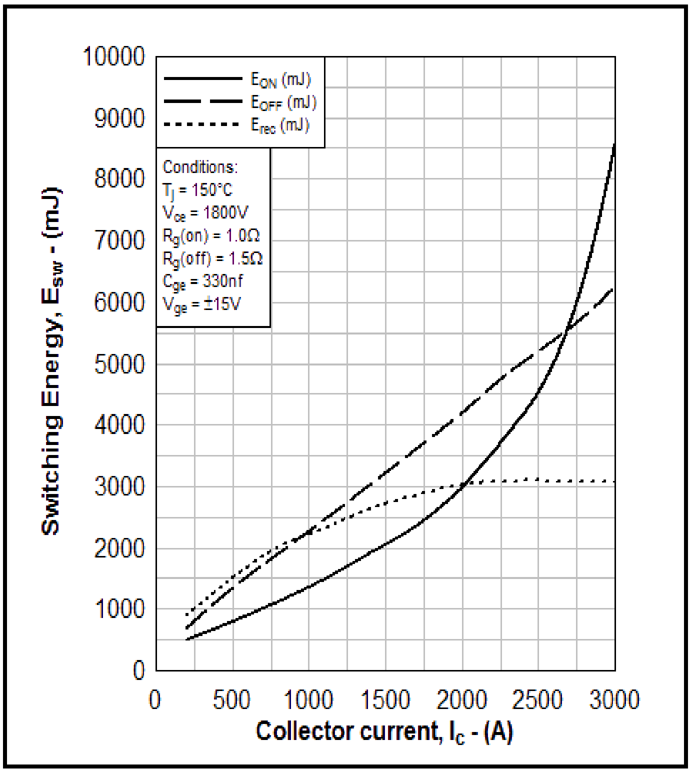


Fig. 5 Typical switching energy vs collector current

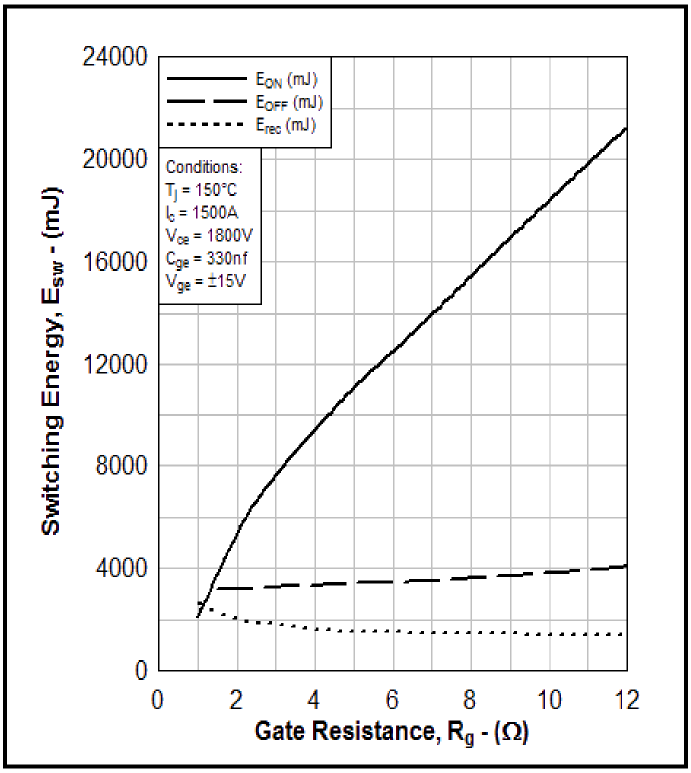


Fig. 6 Typical switching energy vs gate resistance

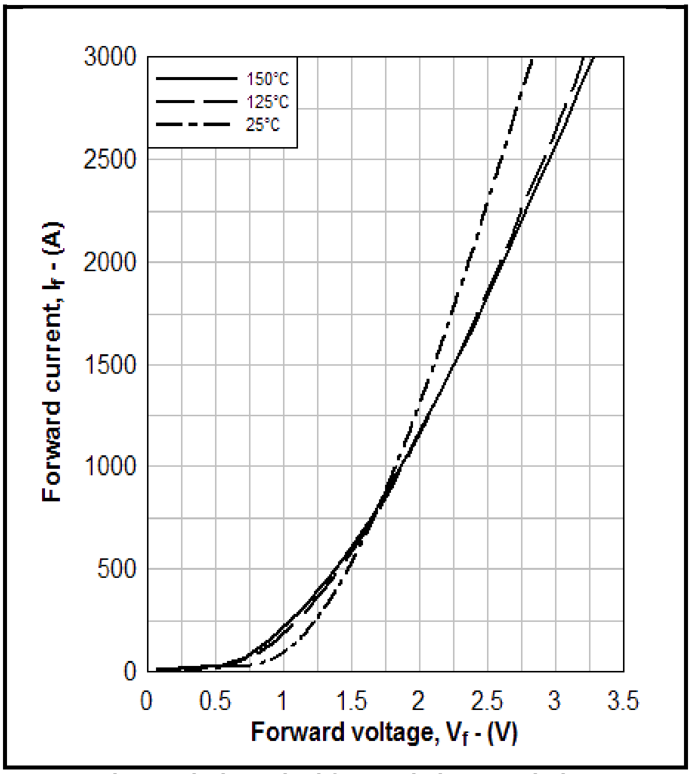


Fig. 7 Diode typical forward characteristics

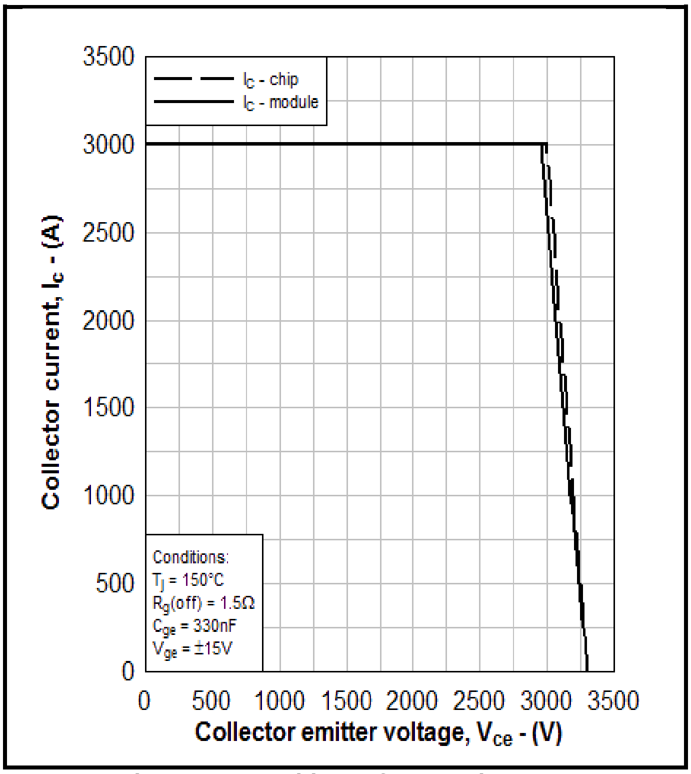


Fig. 8 Reverse bias safe operating area

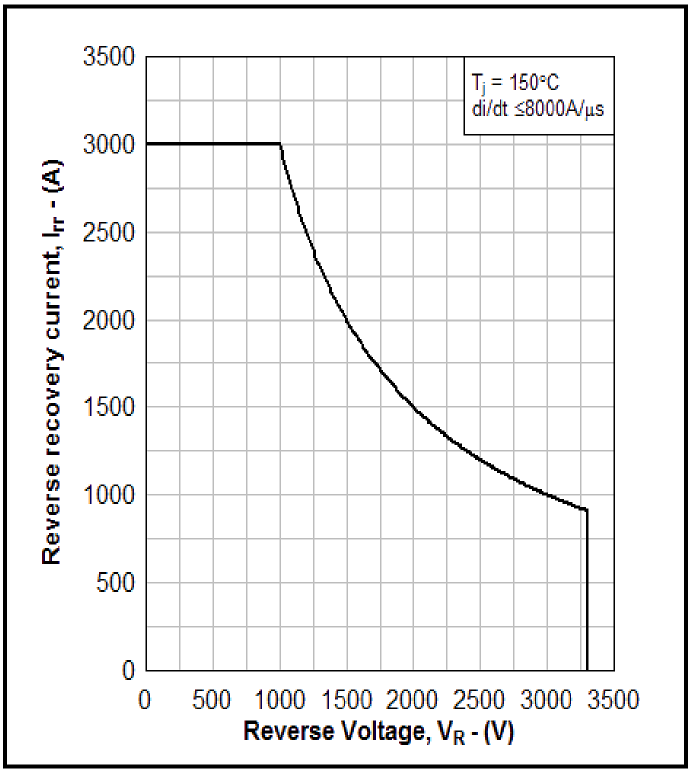


Fig. 9 Diode reverse bias safe operating area

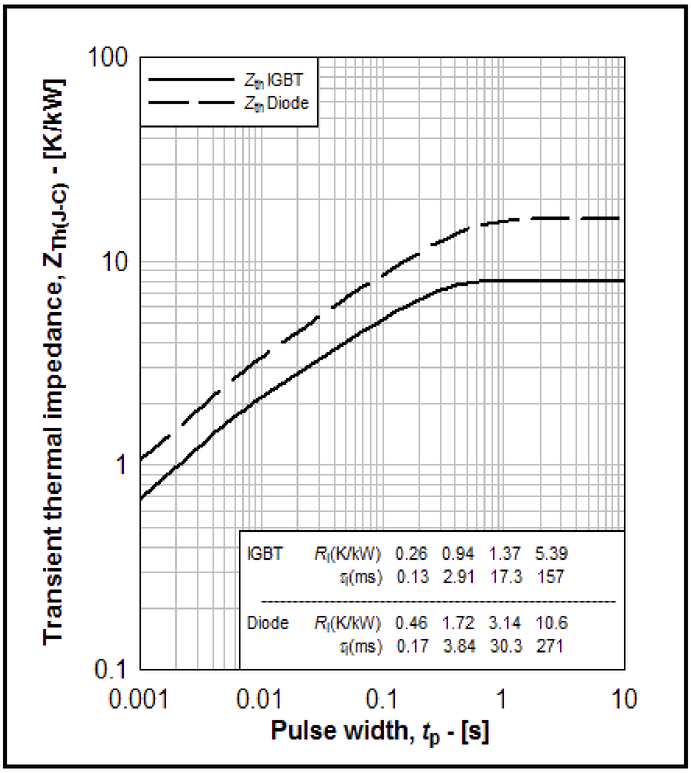
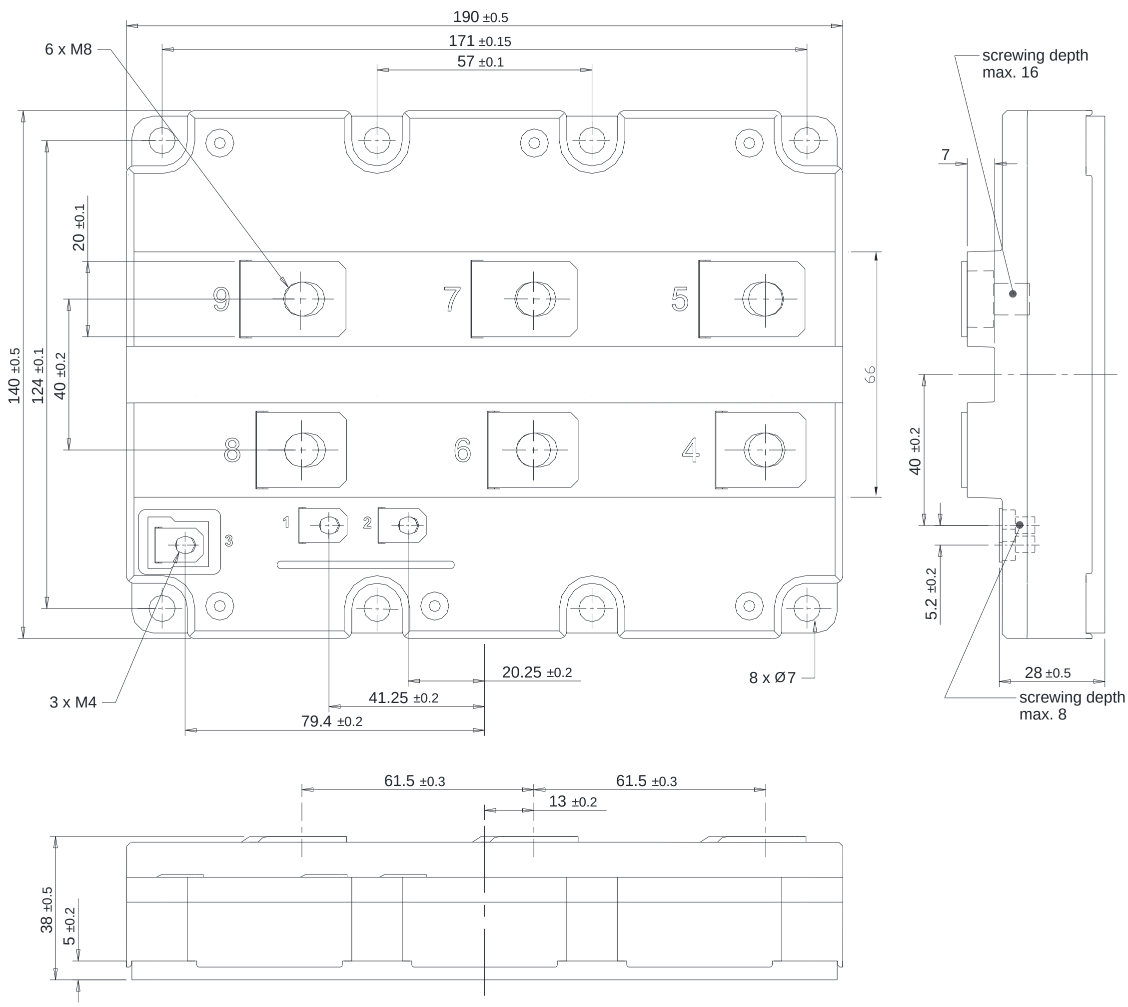


Fig. 10 Transient thermal impedance

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: 1400g

Module Outline Type Code: E

Fig. 11 Module outline drawing

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