DIM1000ECM33-MS018

IGBT Chopper Module

DS6257-1 October 2018 (LN36405)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- High Current Density Enhanced DMOS SPT
- Isolated AlSiC Base with AlN Substrates

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 1200V to 6500V and currents up to 2400A.

The DIM1000ECM33-MS000 is a 3300V, 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:

DIM1000ECM33-MS000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**3300V**
$V_{CE(sat)}$ *	**(typ)**	**2.2V**
I_C	**(max)**	**1000A**
$I_{C(PK)}$	**(max)**	**2000A**

* Measured at the auxiliary terminals

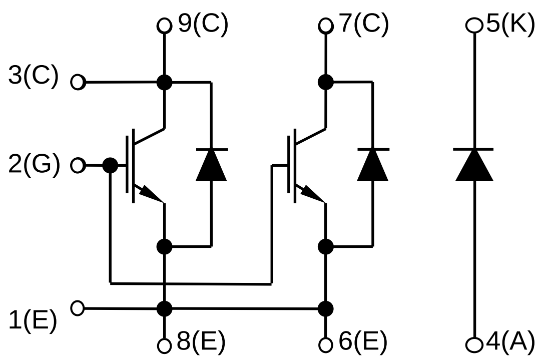


Fig. 1 Circuit configuration

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	3300	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} = 120°C	1000	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 138°C	2000	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	11.9	kW
I^2t	Diode I^2t value (IGBT arm)	V_R = 0, t_p = 10ms, T_j = 150ºC	320	kA^2s
	Diode I^2t value (Diode arm)		320	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:	31mm
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	-	-	10.5	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (IGBT arm)	Continuous dissipation – junction to case	-	-	18	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (Diode arm)	Continuous dissipation – junction to case	-	-	18	°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	-	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 (All module arms)	V_{GE} = 0V, V_{CE} = V_{CES}			5	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 = 80mA, V_{GE} = V_{CE}		5.7		V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 1000A		2.2		V
		V_{GE} = 15V, I_C = 1000A, T_j = 125°C		2.6		V
		V_{GE} = 15V, I_C = 1000A, T_j = 150°C		2.8		V
I_F	Diode forward current	DC		1000		A
I_{FM}	Diode maximum forward current	t_p = 1ms		2000		A
V_F	Diode forward voltage (IGBT & Diode arm)	I_F = 1000A		1.9		V
		I_F = 1000A, T_j = 125°C		1.9		V
		I_F = 1000A, T_j = 150°C		1.9		V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		TBD		nF
Q_g	Gate charge	±15V Including external C_{ge}		TBD		μC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		TBD		nF
L_M	Module inductance	IGBT		9		nH
		Diode		18		nH
R_{INT}	Internal resistance	IGBT		100		
		Diode		200		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		3700		A

Note:

* 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 = 1000A V_{GE} = ±15V V_{CE} = 1800V $R_{G(ON)}$ = 2.7Ω $R_{G(OFF)}$ = 2.7Ω C_{ge} = 220nF L_S ~ 150nH		2400		ns
t_f	Fall time			660		ns
E_{OFF}	Turn-off energy loss			2300		mJ
$t_{d(on)}$	Turn-on delay time			700		ns
t_r	Rise time			430		ns
E_{ON}	Turn-on energy loss			1900		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1000A V_{CE} = 1800V dI_F/dt = 2800A/μs		900		μC
I_{rr}	Diode reverse recovery current			950		A
E_{rec}	Diode reverse recovery energy			850		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 = 1000A V_{GE} = ±15V V_{CE} = 1800V $R_{G(ON)}$ = 2.7Ω $R_{G(OFF)}$ = 2.7Ω C_{ge} = 220nF L_S ~ 150nH		2430		ns
t_f	Fall time			640		ns
E_{OFF}	Turn-off energy loss			2500		mJ
$t_{d(on)}$	Turn-on delay time			750		ns
t_r	Rise time			470		ns
E_{ON}	Turn-on energy loss			2400		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1000A V_{CE} = 1800V dI_F/dt = 2800A/μs		1450		μC
I_{rr}	Diode reverse recovery current			1200		A
E_{rec}	Diode reverse recovery energy			1500		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 = 1000A V_{GE} = ±15V V_{CE} = 1800V $R_{G(ON)}$ = 2.7Ω $R_{G(OFF)}$ = 2.7Ω C_{ge} = 220nF L_S ~ 150nH		2450		ns
t_f	Fall time			640		ns
E_{OFF}	Turn-off energy loss			2750		mJ
$t_{d(on)}$	Turn-on delay time			700		ns
t_r	Rise time			470		ns
E_{ON}	Turn-on energy loss			2750		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1000A V_{CE} = 1800V dI_F/dt = 2800A/μs		1650		μC
I_{rr}	Diode reverse recovery current			1250		A
E_{rec}	Diode reverse recovery energy			1700		mJ

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

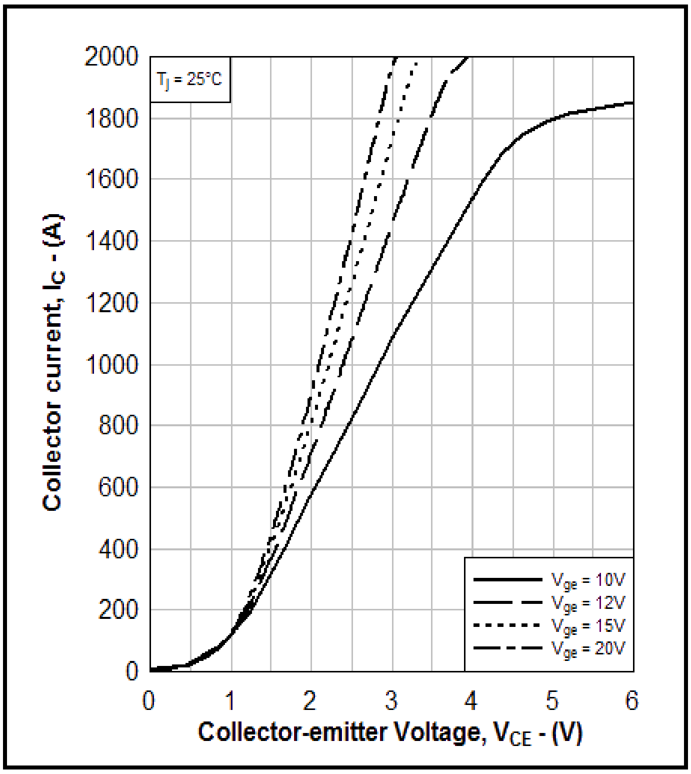


Fig. 3 Typical output characteristics

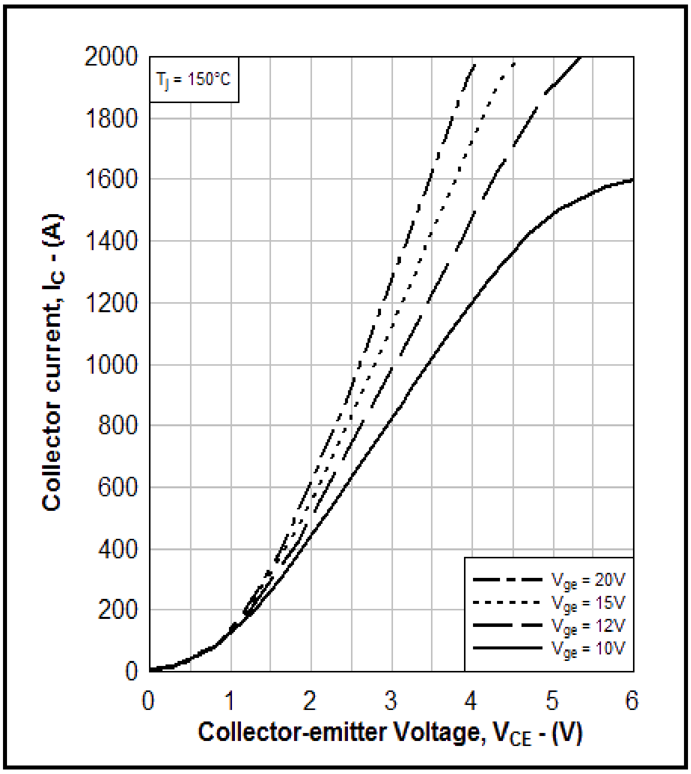


Fig. 4 Typical output characteristics

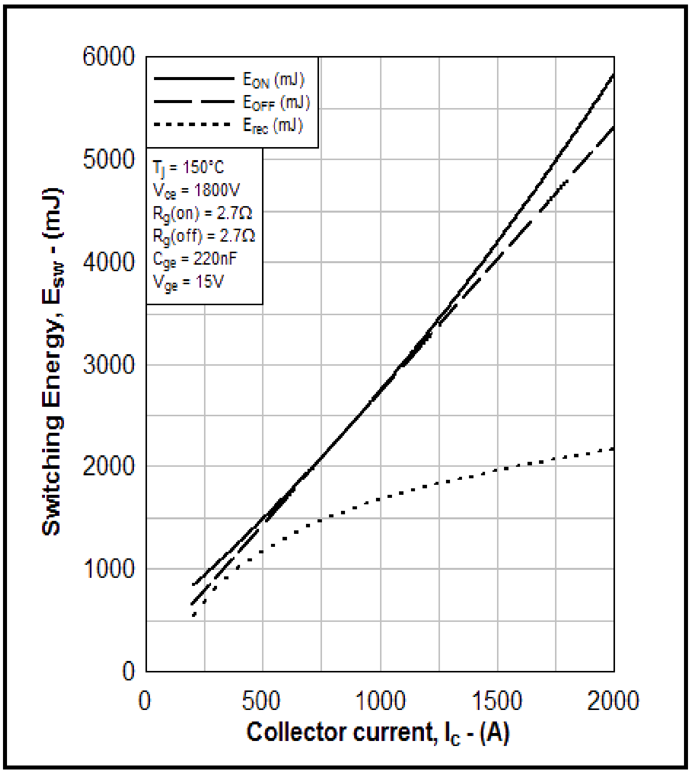


Fig. 5 Typical switching energy vs collector current

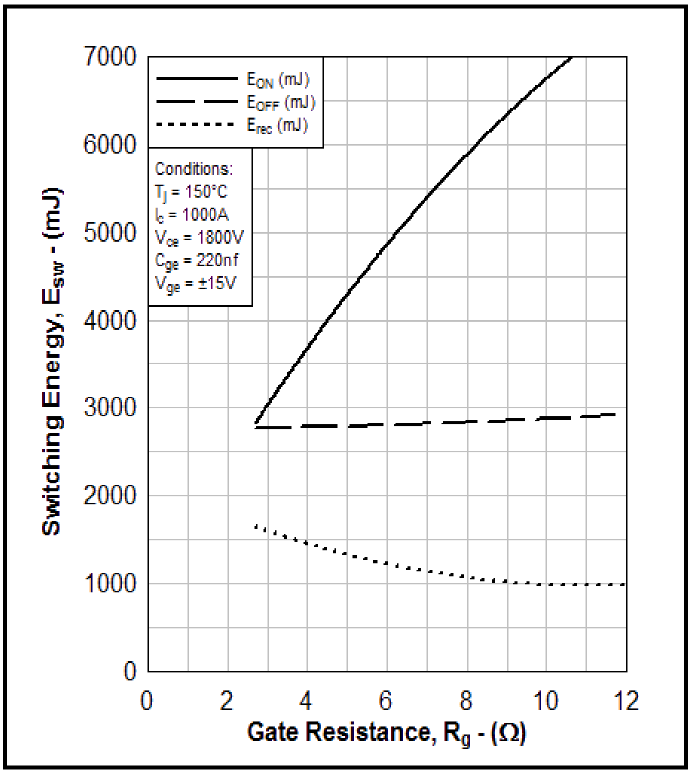


Fig. 6 Typical switching energy vs gate resistance

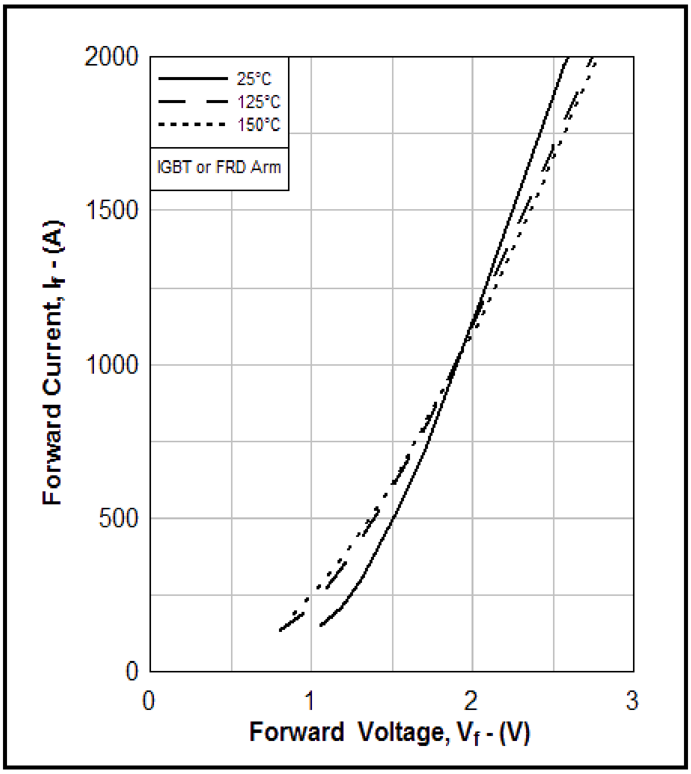


Fig. 7 Diode typical forward characteristics

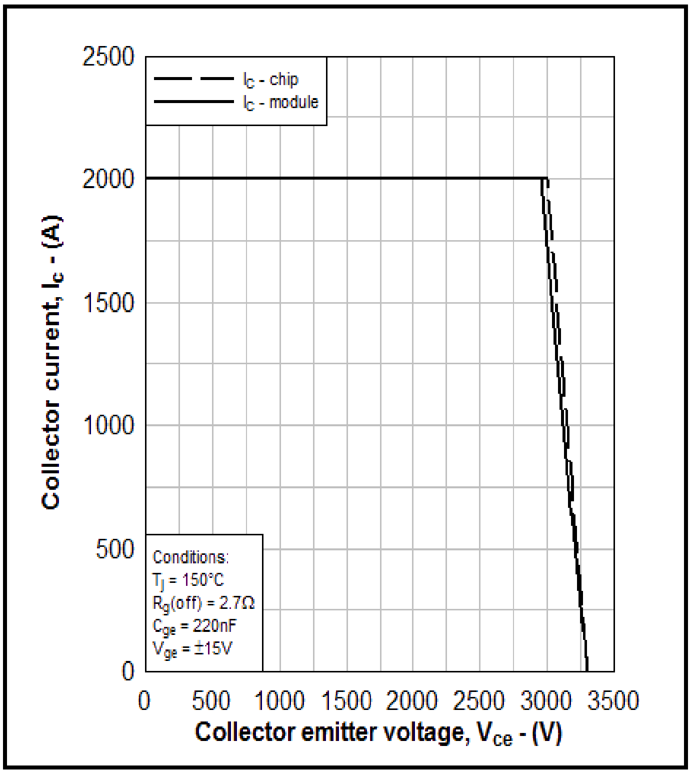


Fig. 8 Reverse bias safe operating area

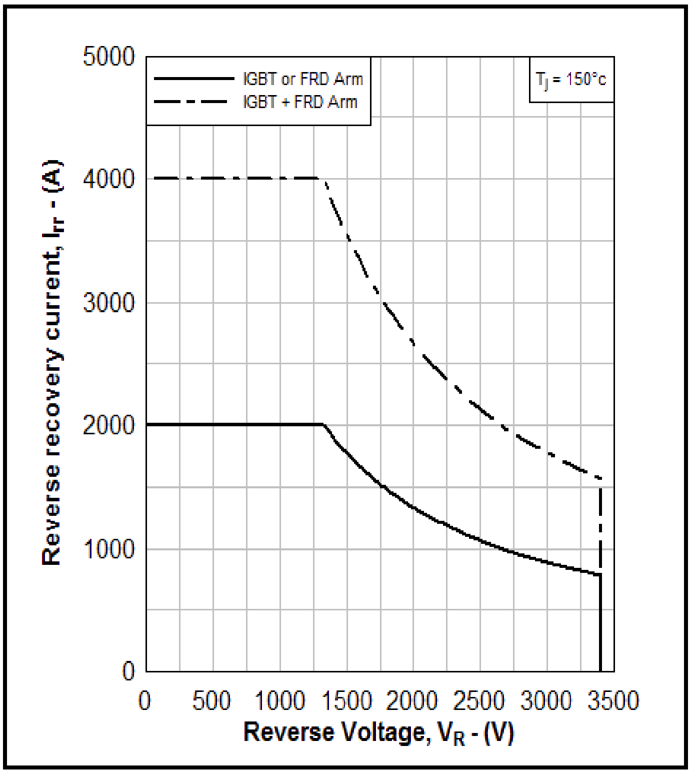


Fig. 9 Diode reverse bias safe operating area

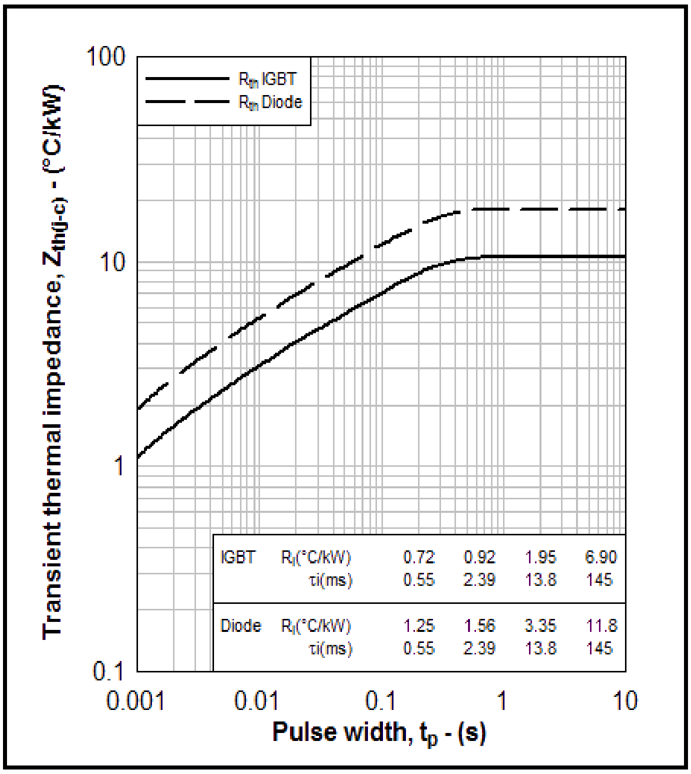
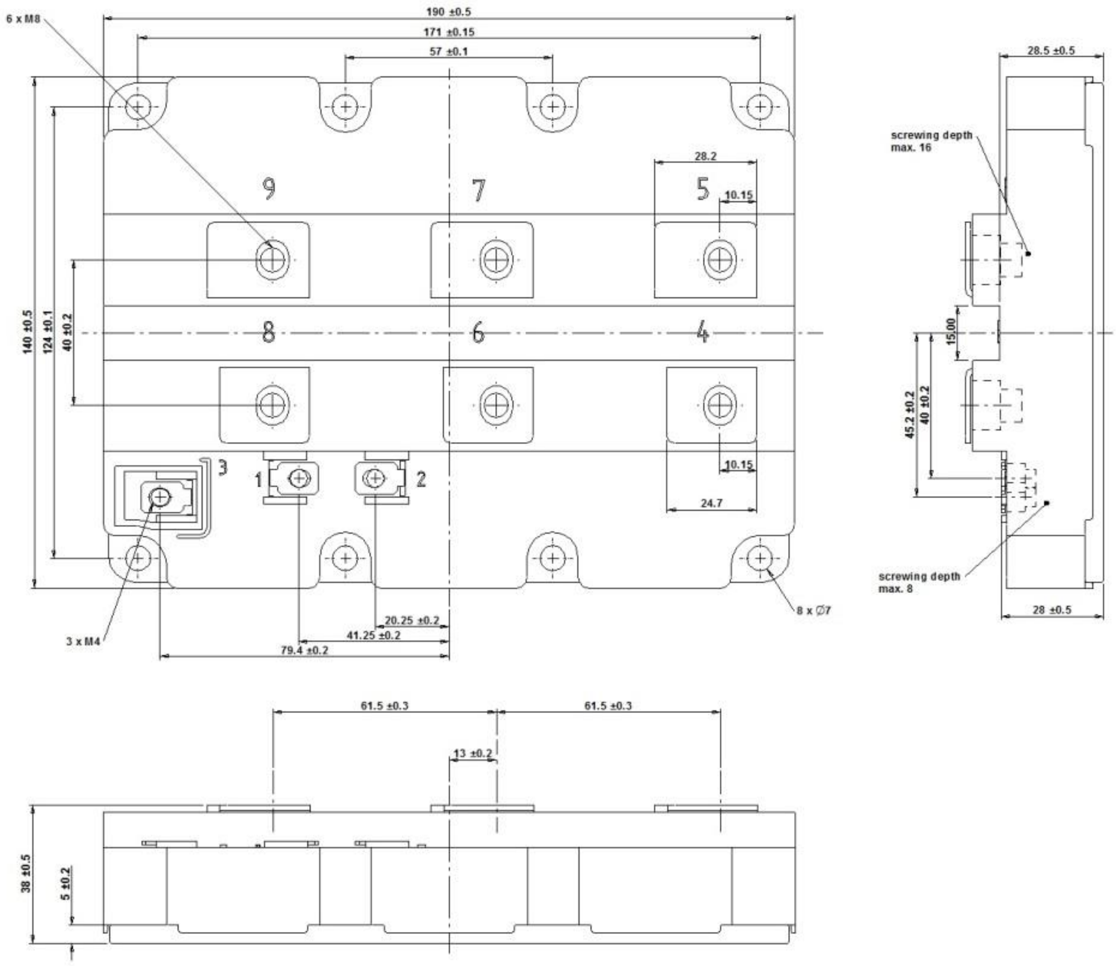


Fig. 10 Transient thermal impedance

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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