Dual Switch IGBT Module

DS6282-1 January 2019 (LN37107)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Soft Punch Through Silicon
- Isolated AlSiC Base with AlN Substrates
- Lead Free construction
- Low $V_{CE(sat)}$ Device
- High Current Density

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

The TIM1200DDM17-TSA000 is a dual switch 1700V, 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:

TIM1200DDM17-TSA000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**1700V**
$V_{CE(sat)}$ *	**(typ)**	**1.8 V**
I_C	**(max)**	**1200A**
$I_{C(PK)}$	**(max)**	**2400A**

* Measured at the power busbars, not the auxiliary terminals

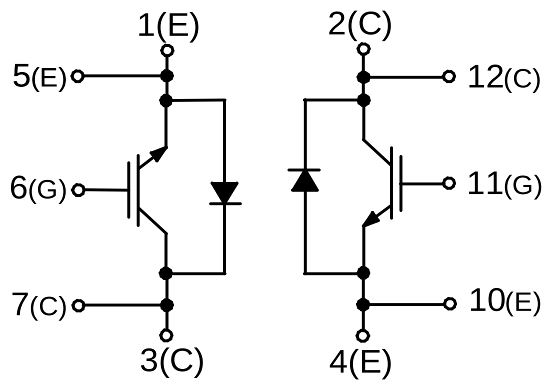
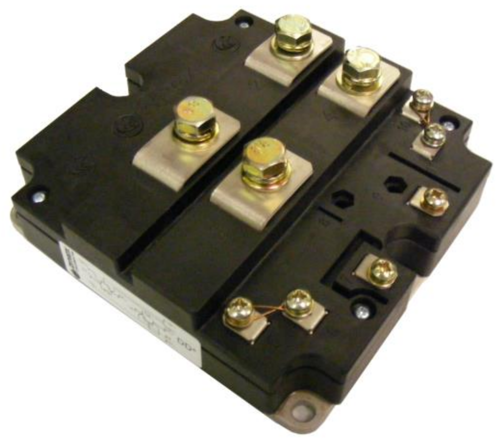


Fig. 1 Circuit configuration



Outline type code: D

(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	1700	V
V_{GES}	Gate-emitter voltage		±20	V
I_C	Continuous collector current	T_{case} = 90°C	1200	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 140°C	2400	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_{vj} = 150°C	5680	W
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 150ºC	130	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V
Q_{PD}	Partial discharge – per module	IEC1287, V_1 = 1800V, V_2 = 1300V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material: AlN

Baseplate material: AlSiC

Creepage distance: 20mm

Clearance: 10mm

CTI (Comparative Tracking Index): >600

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor (per switch)	Continuous dissipation - junction to case		-	22	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (per switch)	Continuous dissipation - junction to case		-	44	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (IGBT)	Mounting torque 5Nm (with mounting grease)		-	12	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (Diode)	Mounting torque 5Nm (with mounting grease)		-	24	°C/kW
T_j	Junction temperature	Transistor	-40	-	150	°C
		Diode	-40	-	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			20	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150°C			30	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			0.5	μA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 40mA, V_{GE} = V_{CE}	5.0	6.0	7.0	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 1200A		1.8	2.2	V
		V_{GE} = 15V, I_C = 1200A, T_j = 125°C		2.1	2.5	V
		V_{GE} = 15V, I_C = 1200A, T_j = 150°C		2.2	2.6	V
I_F	Diode forward current	DC		1200		A
I_{FM}	Diode maximum forward current	t_p = 1ms		2400		A
V_F	Diode forward voltage	I_F = 1200A		1.9	2.3	V
		I_F = 1200A, T_j = 125°C		2.1	2.5	V
		I_F = 1200A, T_j = 150°C		2.1	2.5	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		109		nF
Q_g	Gate charge	±15V		11.6		μC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		3.0		nF
L_M	Module inductance – per switch	-		20		nH
R_{INT}	Internal transistor resistance – per switch	-		270		μΩ
SC_{Data}	Short circuit current, I_{SC}	T_j = 150°C, V_{CC} = 1000V t_p ≤ 10μs, V_{GE} ≤ 15V $V_{CE\ (max)}$ = V_{CES} – L^* x dI/dt IEC 60747-9		4700		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 = 1200A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 0.5Ω $R_{G(OFF)}$ = 0.5Ω L_S ~ 150nH		1200		ns
t_f	Fall time			400		ns
E_{OFF}	Turn-off energy loss			570		mJ
$t_{d(on)}$	Turn-on delay time			480		ns
t_r	Rise time			230		ns
E_{ON}	Turn-on energy loss			83		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1200A V_{CE} = 900V dI_F/dt = 4500A/μs		240		μC
I_{rr}	Diode reverse recovery current			710		A
E_{rec}	Diode reverse recovery energy			155		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 = 1200A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 0.5Ω $R_{G(OFF)}$ = 0.5Ω L_S ~ 150nH		1250		ns
t_f	Fall time			480		ns
E_{OFF}	Turn-off energy loss			640		mJ
$t_{d(on)}$	Turn-on delay time			480		ns
t_r	Rise time			240		ns
E_{ON}	Turn-on energy loss			116		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1200A V_{CE} = 900V dI_F/dt = 4500A/μs		380		μC
I_{rr}	Diode reverse recovery current			835		A
E_{rec}	Diode reverse recovery energy			265		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 = 1200A V_{GE} = ±15V V_{CE} = 900V $R_{G(ON)}$ = 0.5Ω $R_{G(OFF)}$ = 0.5Ω L_S ~ 150nH		1280		ns
t_f	Fall time			490		ns
E_{OFF}	Turn-off energy loss			660		mJ
$t_{d(on)}$	Turn-on delay time			480		ns
t_r	Rise time			240		ns
E_{ON}	Turn-on energy loss			128		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 1200A V_{CE} = 900V dI_F/dt = 4500A/μs		415		μC
I_{rr}	Diode reverse recovery current			870		A
E_{rec}	Diode reverse recovery energy			295		mJ

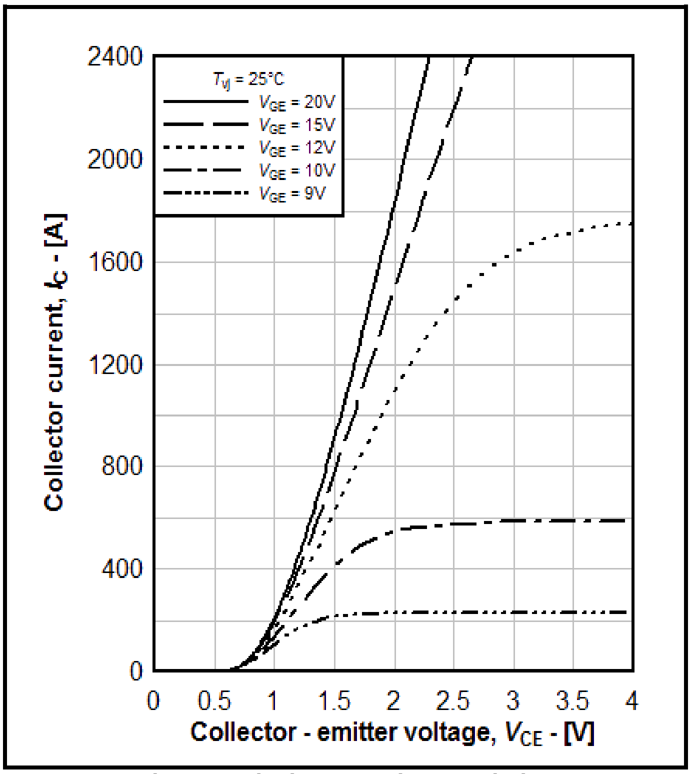


Fig. 3 Typical output characteristics

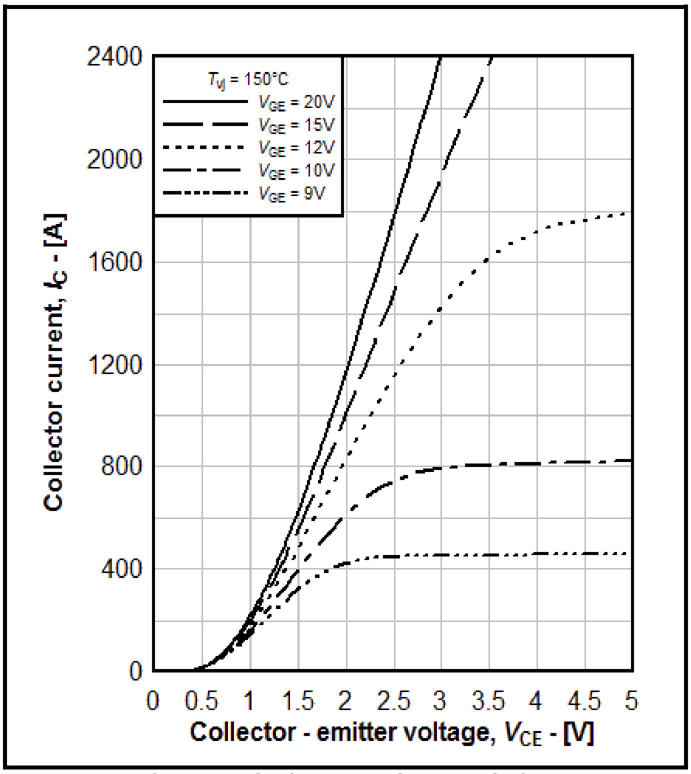


Fig. 4 Typical output characteristics

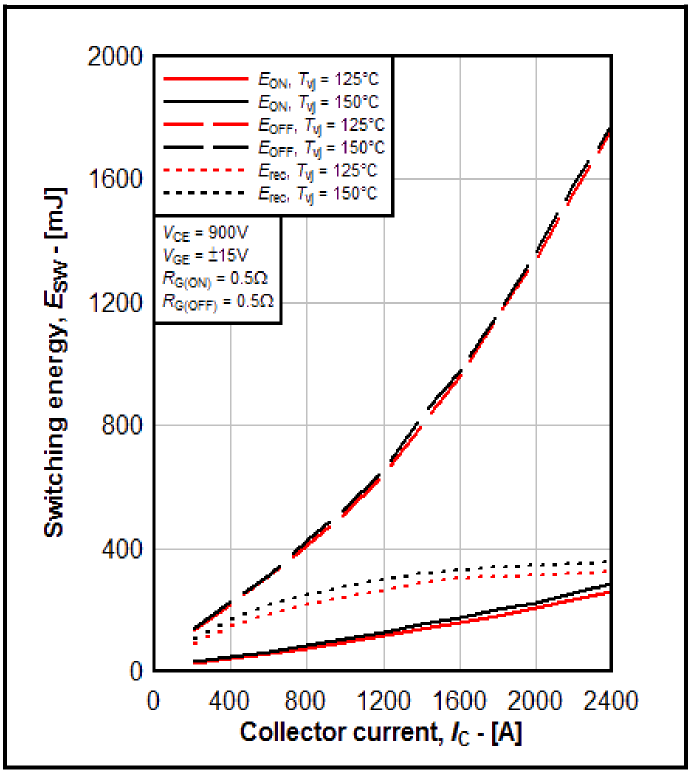


Fig. 5 Typical switching energy vs collector current

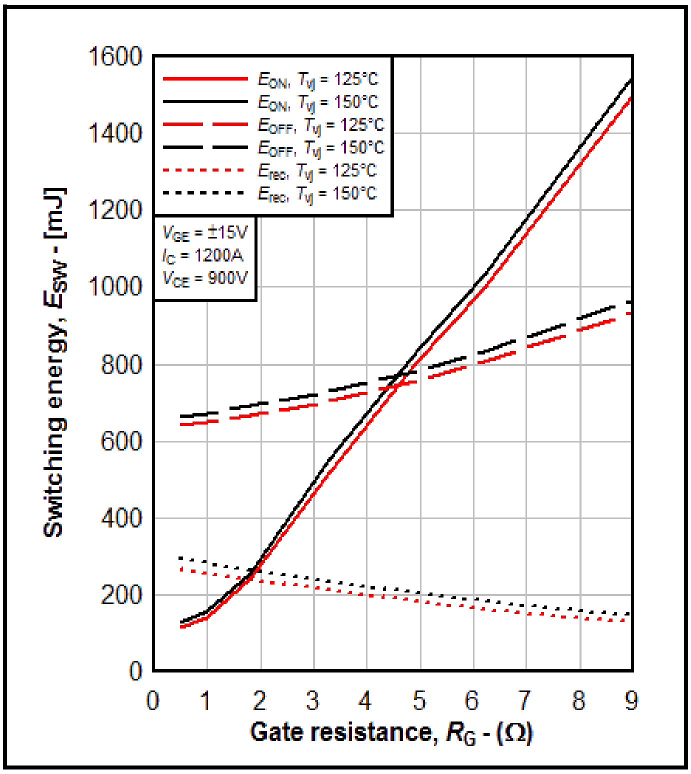


Fig. 6 Typical switching energy vs gate resistance

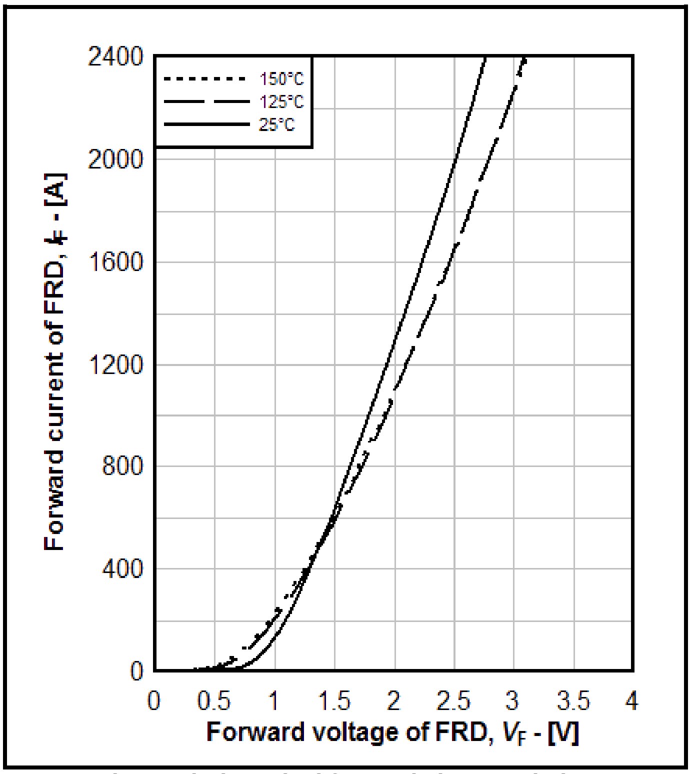


Fig. 7 Diode typical forward characteristics

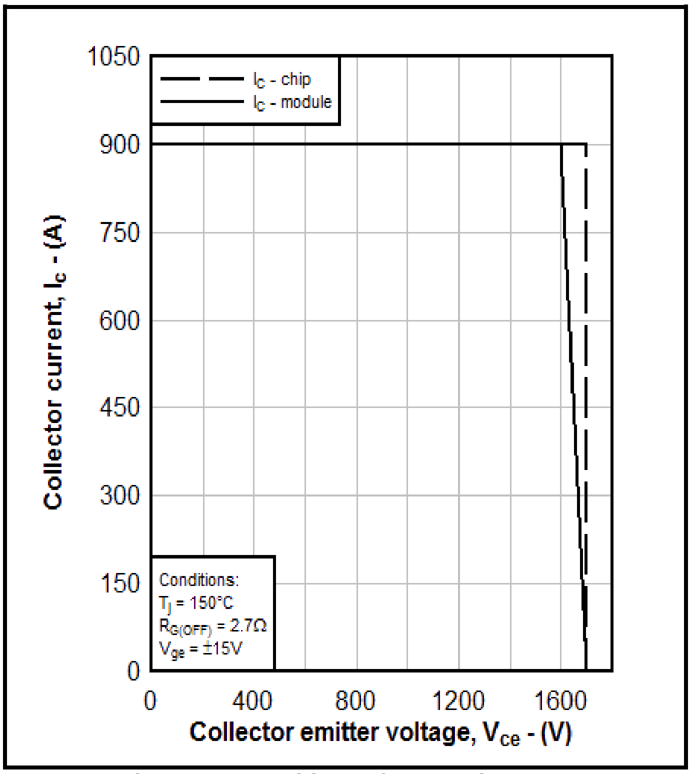


Fig. 8 Reverse bias safe operating area

TBD

Fig. 9 Diode reverse bias safe operating area

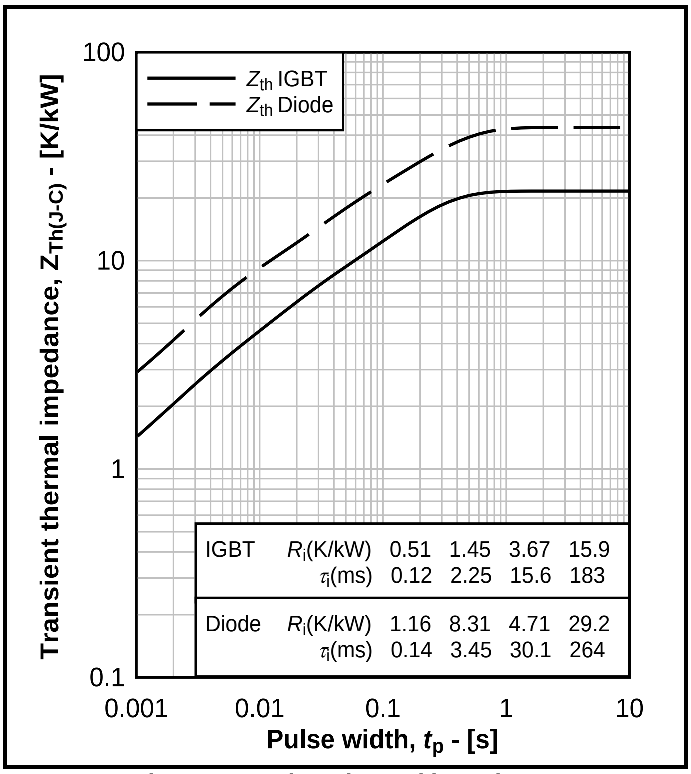
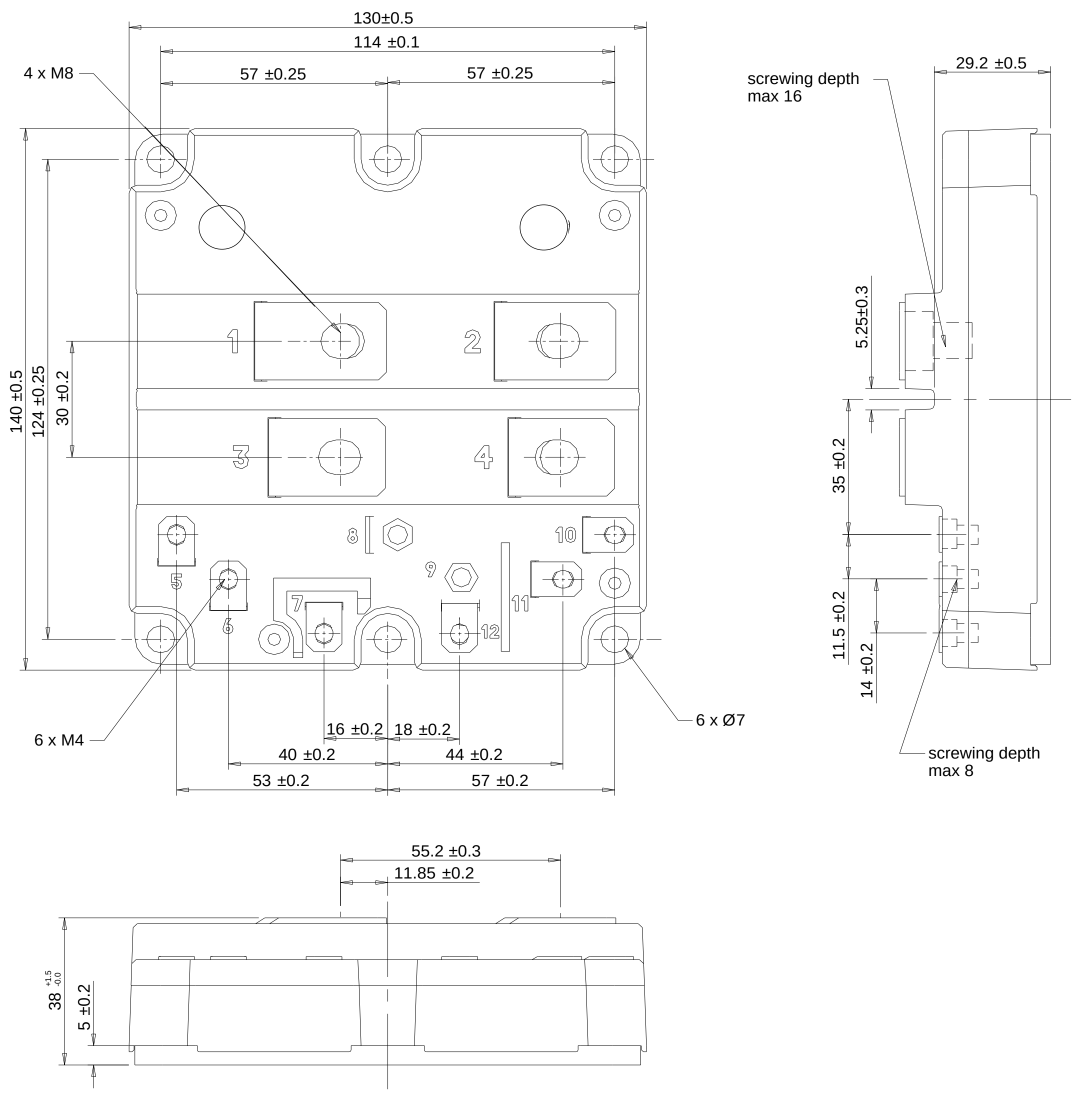


Fig. 10 Transient thermal impedance

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: 900g

Module Outline Type Code: D

Fig. 11 Module outline drawing

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