DIM450VHM33-UF000

Half Bridge IGBT Module

TRENCH
TSPT

DS6287-1 February 2019 (LN37347)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Trench Gate Soft Punch Through IGBT
- 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 DIM450VHM33-UF000 is a half bridge 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.

ORDERING INFORMATION

Order As:

DIM450VHM33-UF000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		3300V
$V_{CE(sat)}$ *	(typ)	2.6V
I_C	(max)	450A
$I_{C(PK)}$	(max)	900A

* Measured at the auxiliary terminals

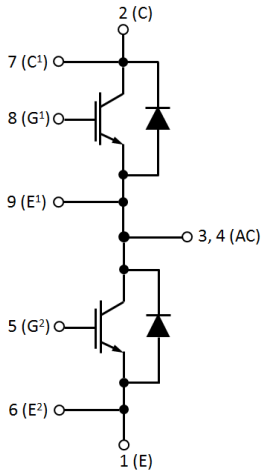


Fig. 1 Circuit configuration

Outline type code: V

(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} = 110°C	450	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 140°C	900	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	5.2	kW
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 150°C	80	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 (per switch)	Continuous dissipation - junction to case	-	-	28	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode (per switch)	Continuous dissipation - junction to case	-	-	40	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	24	°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

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}			2	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125°C			30	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150°C			50	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			0.6	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 120mA, V_{GE} = V_{CE}		6.6		V
$V_{CE(sat)}$ †	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 450A		2.6		V
		V_{GE} = 15V, I_C = 450A, T_j = 125°C		3.0		V
		V_{GE} = 15V, I_C = 450A, T_j = 150°C		3.2		V
I_F	Diode forward current	DC		450		A
I_{FM}	Diode maximum forward current	t_p = 1ms		900		A
V_F †	Diode forward voltage	I_F = 450A		2.1		V
		I_F = 450A, T_j = 125°C		2.4		V
		I_F = 450A, T_j = 150°C		2.5		V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		TBD		nF
Q_g	Gate charge	±15V		TBD		µC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		TBD		nF
L_M	Module inductance			24		nH
R_{INT}	Internal transistor resistance			TBD		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		1900		A

Note:
† Measured at the power busbars, not 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 = 450A V_{GE} = ±15V V_{CE} = 1800V $R_{G(ON)}$ = 3.3Ω $R_{G(OFF)}$ = 3.3Ω C_{ge} = 84nF L_S ~ 100nH		1400		ns
t_f	Fall time			520		ns
E_{OFF}	Turn-off energy loss			1130		mJ
$t_{d(on)}$	Turn-on delay time			670		ns
t_r	Rise time			120		ns
E_{ON}	Turn-on energy loss			430		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 450A V_{CE} = 1800V dI_F/dt = 4000A/µs		160		µC
I_{rr}	Diode reverse recovery current			600		A
E_{rec}	Diode reverse recovery energy			210		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 = 450A V_{GE} = ±15V V_{CE} = 1800V $R_{G(ON)}$ = 3.3Ω $R_{G(OFF)}$ = 3.3Ω C_{ge} = 84nF L_S ~ 100nH		1450		ns
t_f	Fall time			570		ns
E_{OFF}	Turn-off energy loss			1250		mJ
$t_{d(on)}$	Turn-on delay time			680		ns
t_r	Rise time			130		ns
E_{ON}	Turn-on energy loss			560		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 450A V_{CE} = 1800V dI_F/dt = 4000A/µs		330		µC
I_{rr}	Diode reverse recovery current			750		A
E_{rec}	Diode reverse recovery energy			360		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 = 450A V_{GE} = ±15V V_{CE} = 1800V $R_{G(ON)}$ = 3.3Ω $R_{G(OFF)}$ = 3.3Ω C_{ge} = 84nF L_S ~ 100nH		1500		ns
t_f	Fall time			570		ns
E_{OFF}	Turn-off energy loss			1300		mJ
$t_{d(on)}$	Turn-on delay time			700		ns
t_r	Rise time			140		ns
E_{ON}	Turn-on energy loss			620		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 450A V_{CE} = 1800V dI_F/dt = 4000A/µs		380		µC
I_{rr}	Diode reverse recovery current			780		A
E_{rec}	Diode reverse recovery energy			400		mJ

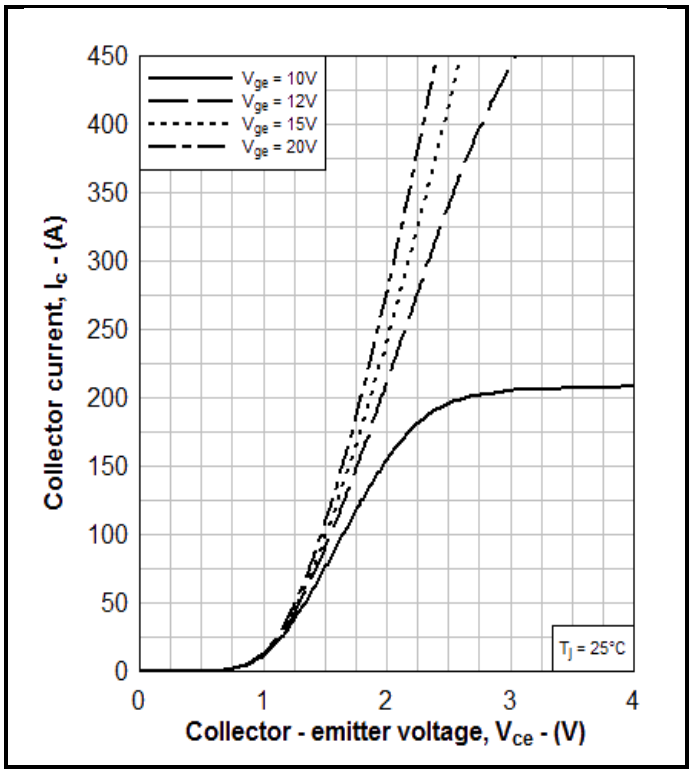


Fig. 3 Typical output characteristics

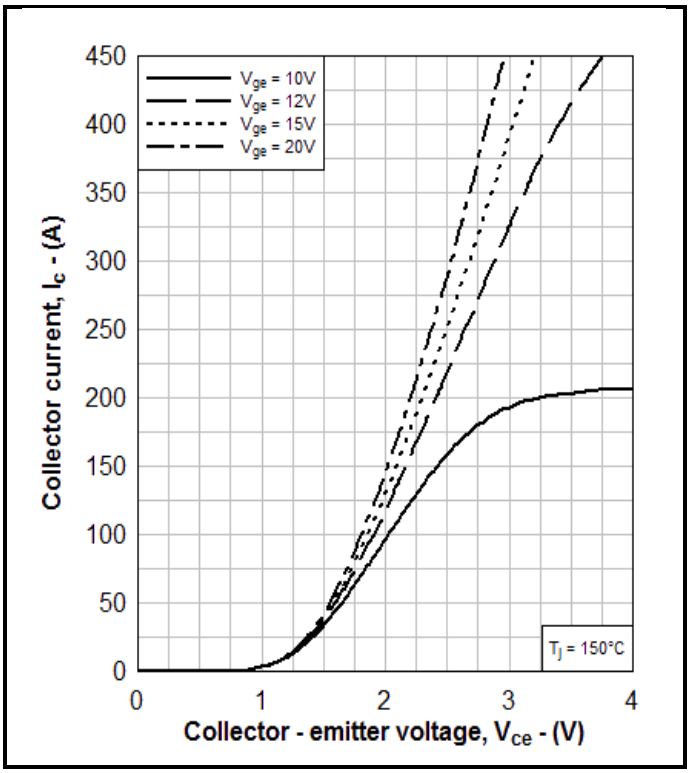


Fig. 4 Typical output characteristics

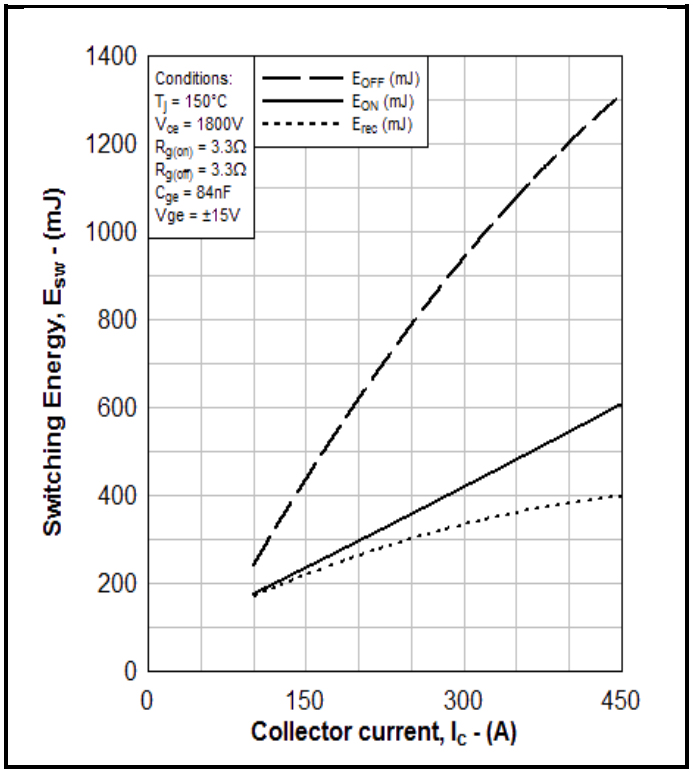


Fig. 5 Typical switching energy vs collector current

TBD

Fig. 6 Typical switching energy vs gate resistance

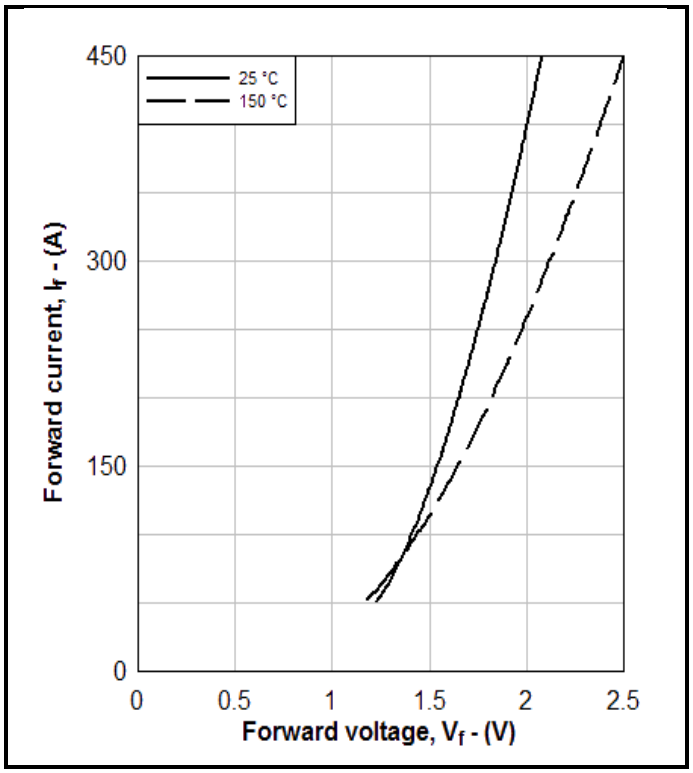


Fig. 7 Diode typical forward characteristics

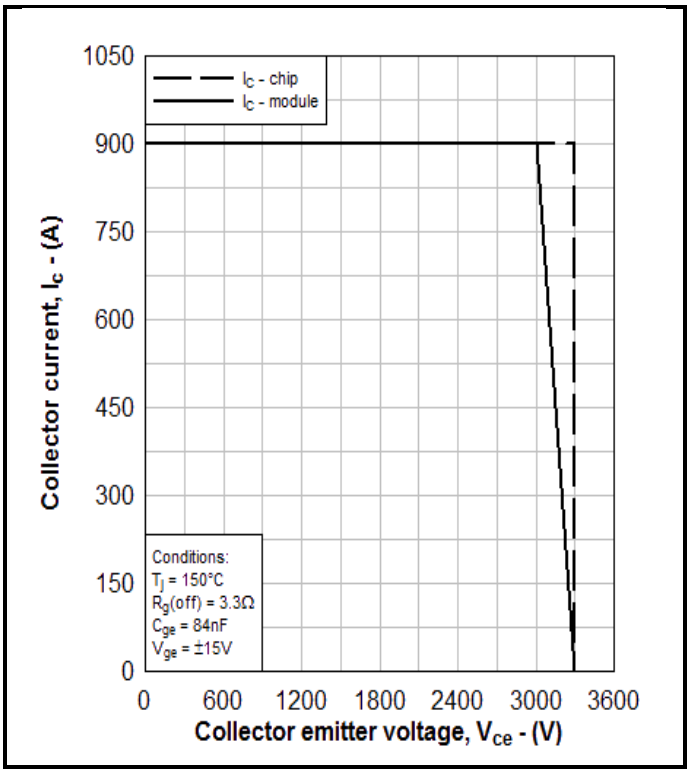


Fig. 8 Reverse bias safe operating area

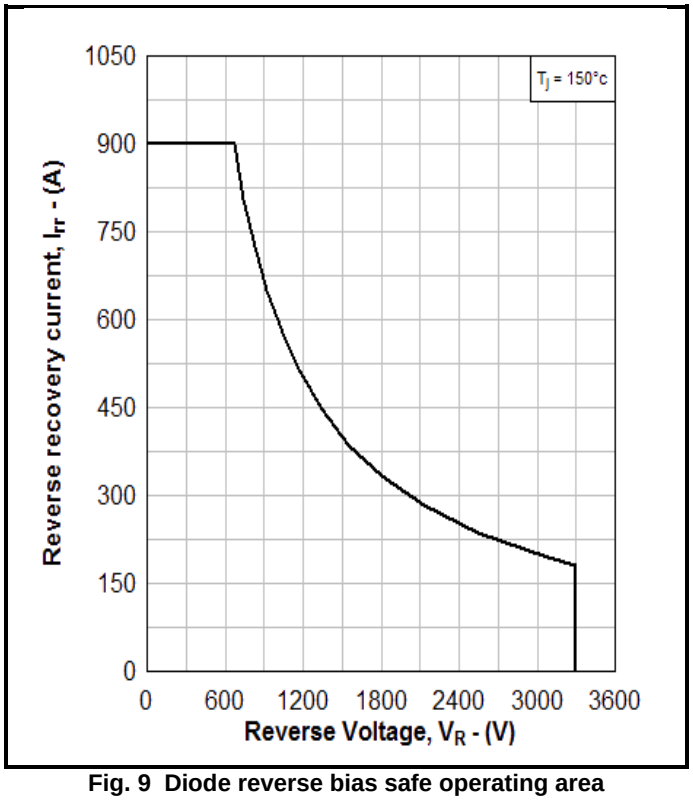


Fig. 9 Diode reverse bias safe operating area

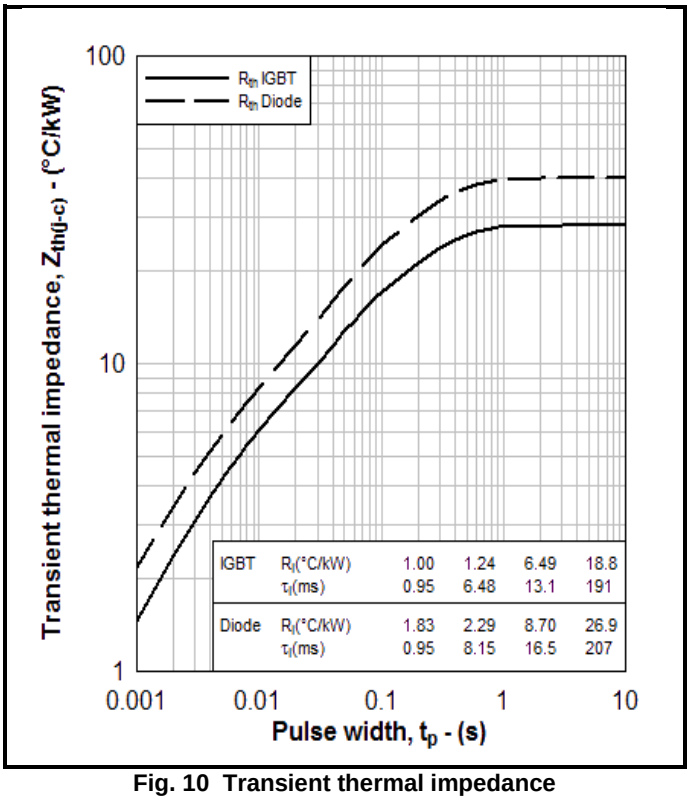
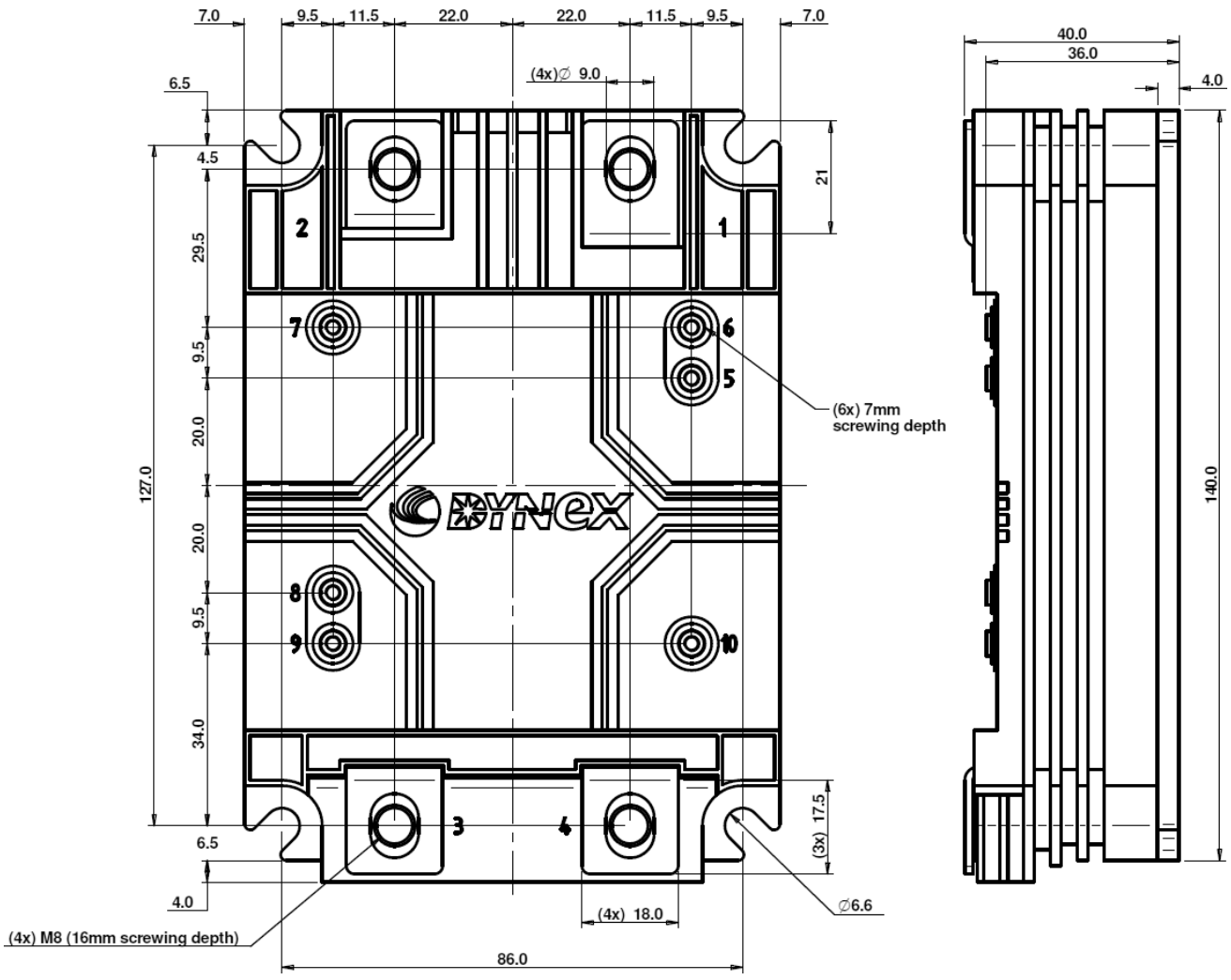


Fig. 10 Transient thermal impedance

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: 700g

Module Outline Type Code: V

Fig. 11 Module outline drawing

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