DIM250KHM33-TS001

Half Bridge IGBT Module

Replaces DS6391-5

DS6391-6 April 2024 (LN43308)

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- High Current Density Enhanced DMOS SPT
- Isolated AlSiC Base with AlN Substrates
- Lead Free Construction

APPLICATIONS

- High Reliability Inverters
- Motor Controllers
- Traction Auxiliaries
- 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 DIM250KHM33-TS001 is a half bridge 3300V, soft punch through n-channel enhancement mode, insulated gate bipolar transistor (IGBT) module. The IGBT has a wide reverse bias safe operating area (RBSOA). 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:

DIM250KHM33-TS001

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		**3300V**
$V_{CE(sat)}$ *	**(typ)**	**2.2V**
I_C	**(max)**	**250A**
$I_{C(PK)}$	**(max)**	**500A**

* Measured at the auxiliary terminals

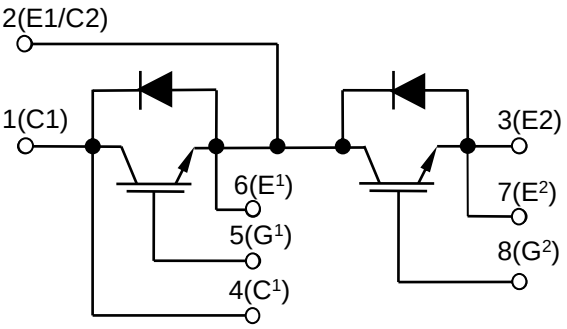


Fig. 1 Circuit configuration

Outline type code: K

(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	250	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 140°C	500	A
P_{max}	Max. transistor power dissipation	T_{case} = 25°C, T_j = 150°C	2.6	kW
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_j = 125°C	20	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	7700	V
Q_{PD}	Partial discharge – per module	IEC1287, V_1 = 4800V, V_2 = 3500V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material: AlN

Baseplate material: AlSiC

Creepage distance: 53mm

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	-	-	48	°C/kW
$R_{th(j-c)}$	Thermal resistance – Diode	Continuous dissipation - junction to case	-	-	96	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 6Nm (with mounting grease)	-	-	16	°C/kW
T_j	Junction temperature	Transistor	-	-	150	°C
		Diode	-	-	150	°C
T_{stg}	Storage temperature range	-	-40	-	125	°C
	Screw torque	Mounting – M6	-	-	6	Nm
		Electrical connections – M6	-	-	6	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}			1	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125°C			15	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 150°C			25	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			1	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 20mA, V_{GE} = V_{CE}		6.3		V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 250A		2.2		V
		V_{GE} = 15V, I_C = 250A, T_j = 125°C		2.8		V
		V_{GE} = 15V, I_C = 250A, T_j = 150°C		3.0		V
I_F	Diode forward current	DC		250		A
I_{FM}	Diode maximum forward current	t_p = 1ms		500		A
V_F	Diode forward voltage	I_F = 250A		2.4		V
		I_F = 250A, T_j = 125°C		2.5		V
		I_F = 250A, T_j = 150°C		2.4		V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		45		nF
Q_g	Gate charge	±15V		5		µC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1		nF
L_M	Module inductance			40		nH
R_{INT}	Internal transistor resistance			500		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		950		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 = 250A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 12Ω $R_{g(OFF)}$ = 16.5Ω L_S ~ 250nH		2000		ns
t_f	Fall time			400		ns
E_{OFF}	Turn-off energy loss			480		mJ
$t_{d(on)}$	Turn-on delay time			240		ns
t_r	Rise time			160		ns
E_{ON}	Turn-on energy loss			330		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 250A V_{CE} = 1800V dI_F/dt = 1500A/µs		150		µC
I_{rr}	Diode reverse recovery current			250		A
E_{rec}	Diode reverse recovery energy			165		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 = 250A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 12Ω $R_{g(OFF)}$ = 16.5Ω L_S ~ 250nH		2050		ns
t_f	Fall time			440		ns
E_{OFF}	Turn-off energy loss			540		mJ
$t_{d(on)}$	Turn-on delay time			260		ns
t_r	Rise time			170		ns
E_{ON}	Turn-on energy loss			420		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 250A V_{CE} = 1800V dI_F/dt = 1500A/µs		250		µC
I_{rr}	Diode reverse recovery current			300		A
E_{rec}	Diode reverse recovery energy			350		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 = 250A V_{GE} = ±15V V_{CE} = 1800V $R_{g(ON)}$ = 12Ω $R_{g(OFF)}$ = 16.5Ω L_S ~ 250nH		2100		ns
t_f	Fall time			450		ns
E_{OFF}	Turn-off energy loss			580		mJ
$t_{d(on)}$	Turn-on delay time			260		ns
t_r	Rise time			180		ns
E_{ON}	Turn-on energy loss			470		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 250A V_{CE} = 1800V dI_F/dt = 1500A/µs		300		µC
I_{rr}	Diode reverse recovery current			310		A
E_{rec}	Diode reverse recovery energy			400		mJ

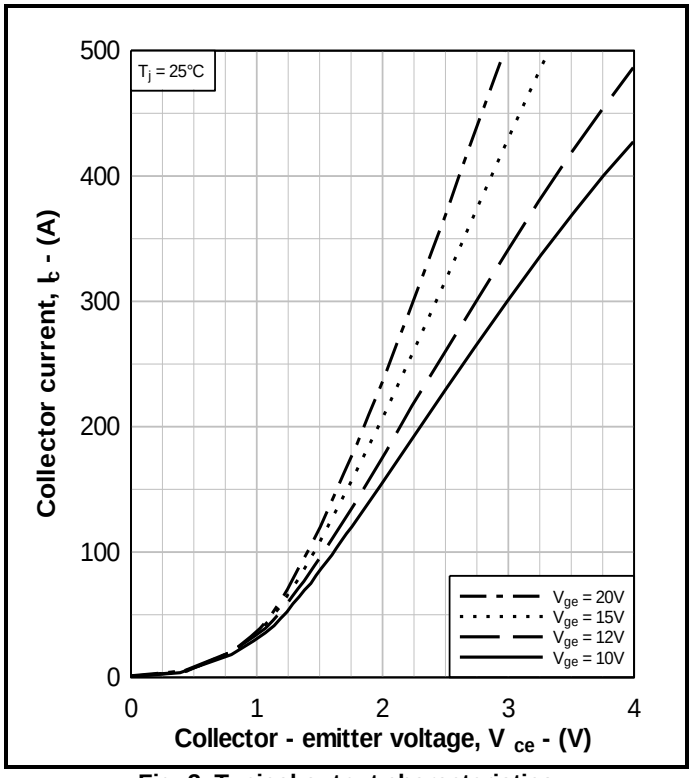


Fig. 3 Typical output characteristics

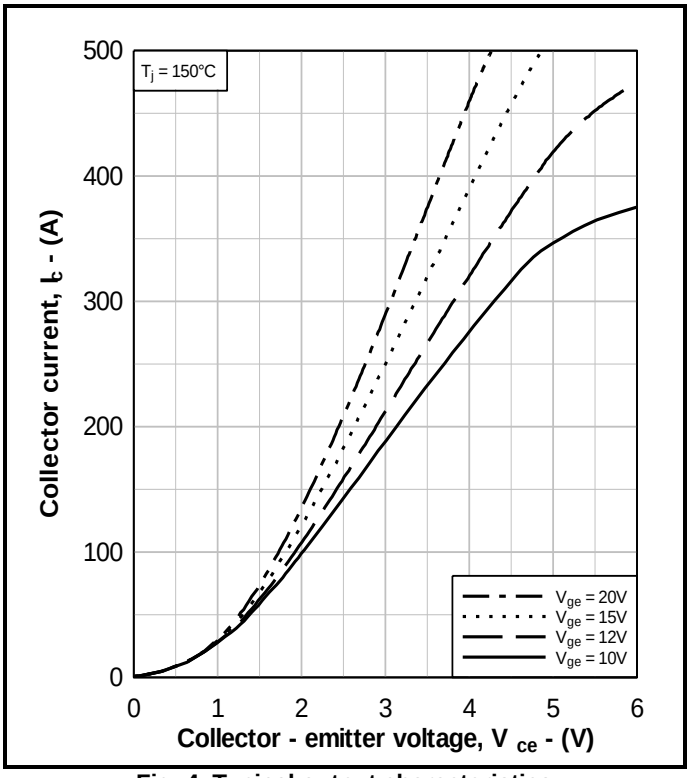


Fig. 4 Typical output characteristics

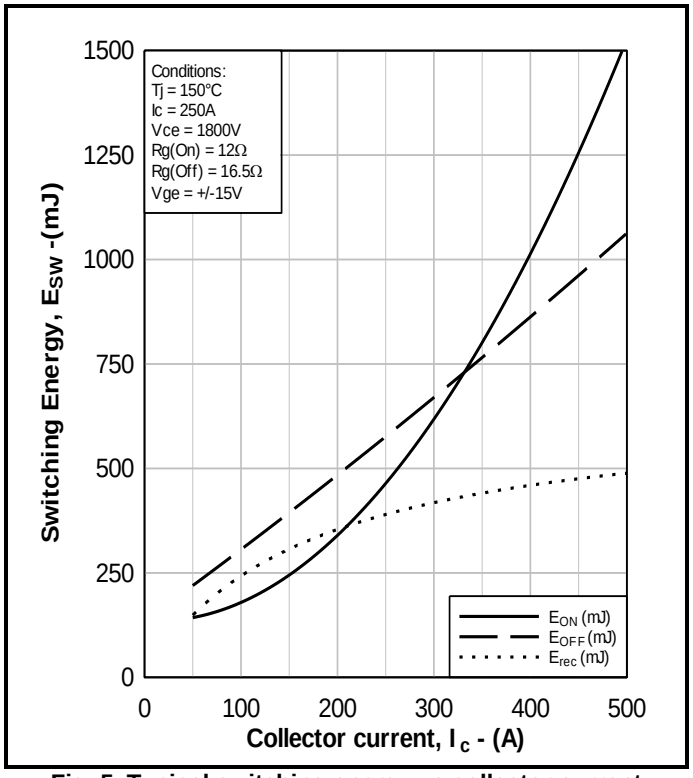


Fig. 5 Typical switching energy vs collector current

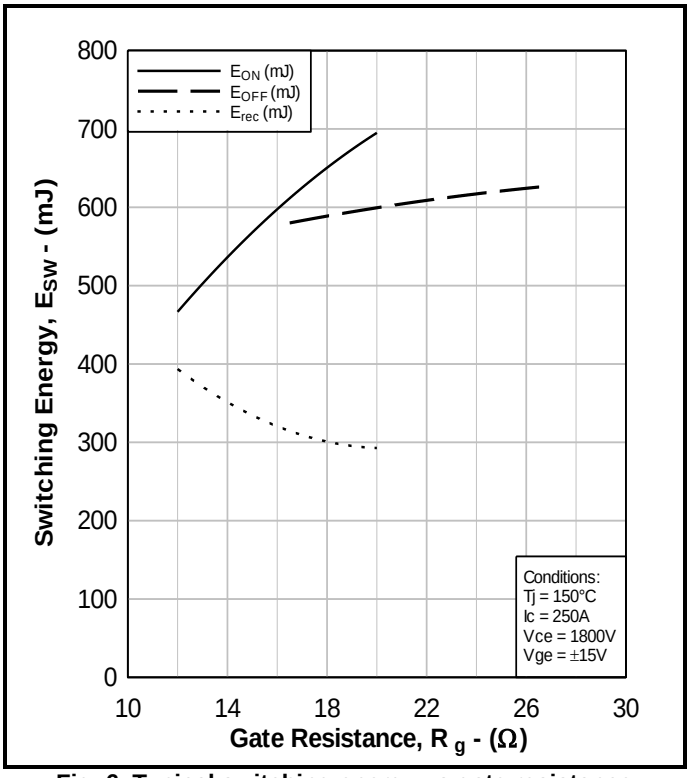


Fig. 6 Typical switching energy vs gate resistance

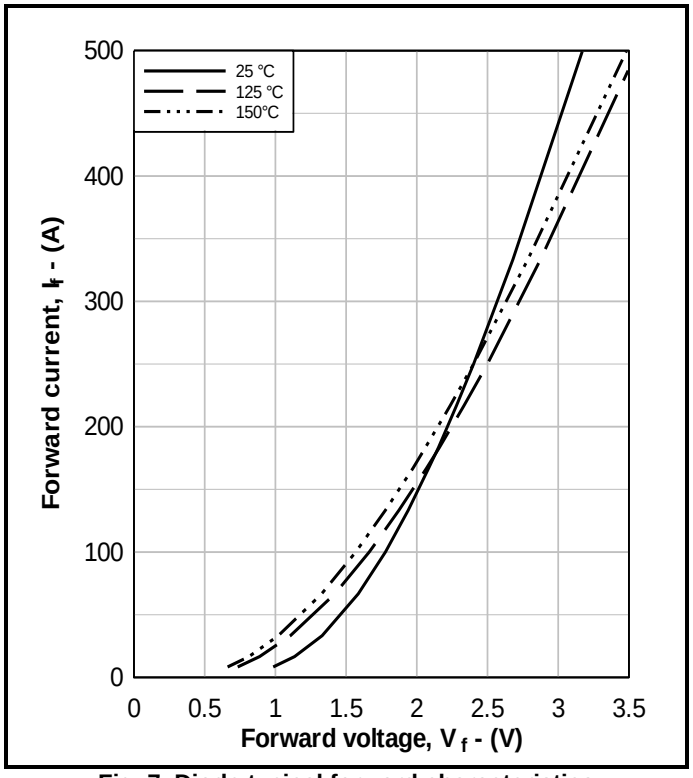


Fig. 7 Diode typical forward characteristics

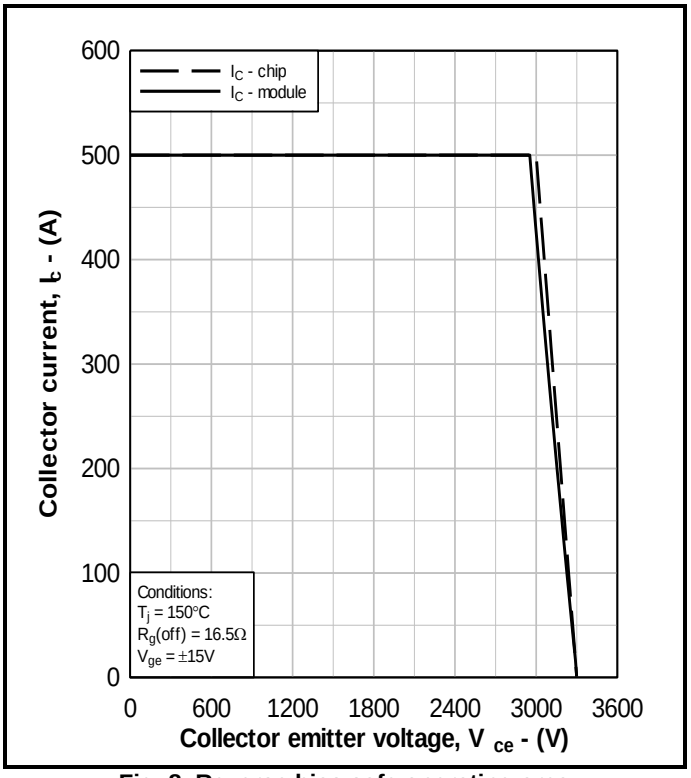


Fig. 8 Reverse bias safe operating area

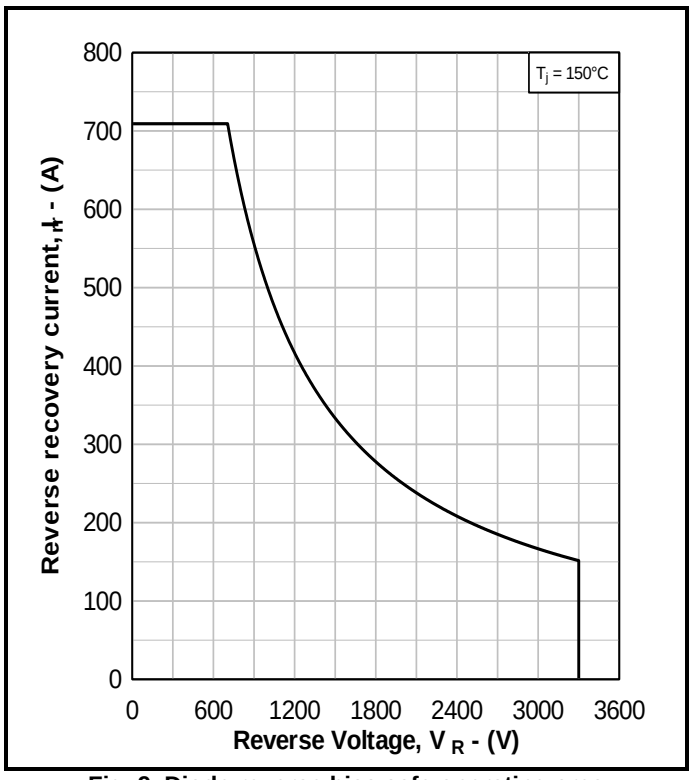


Fig. 9 Diode reverse bias safe operating area

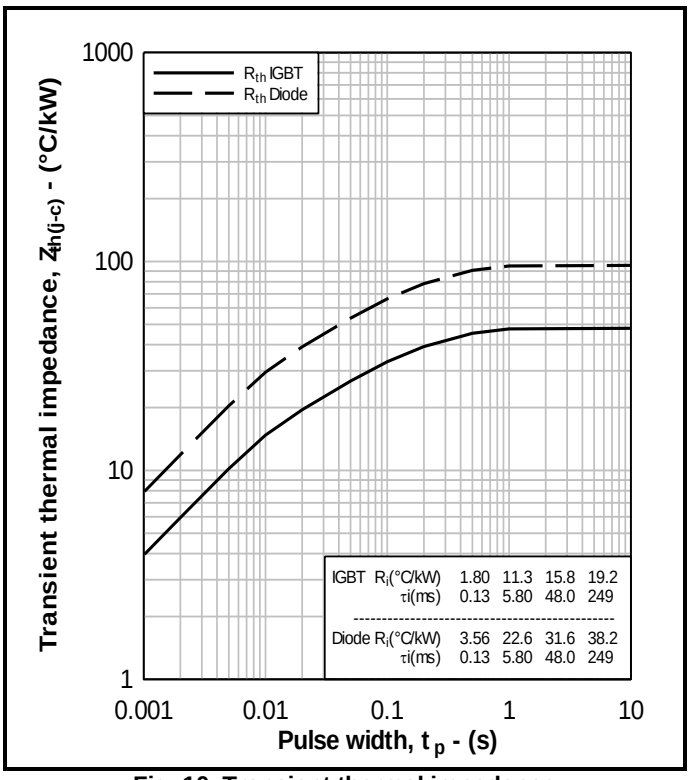
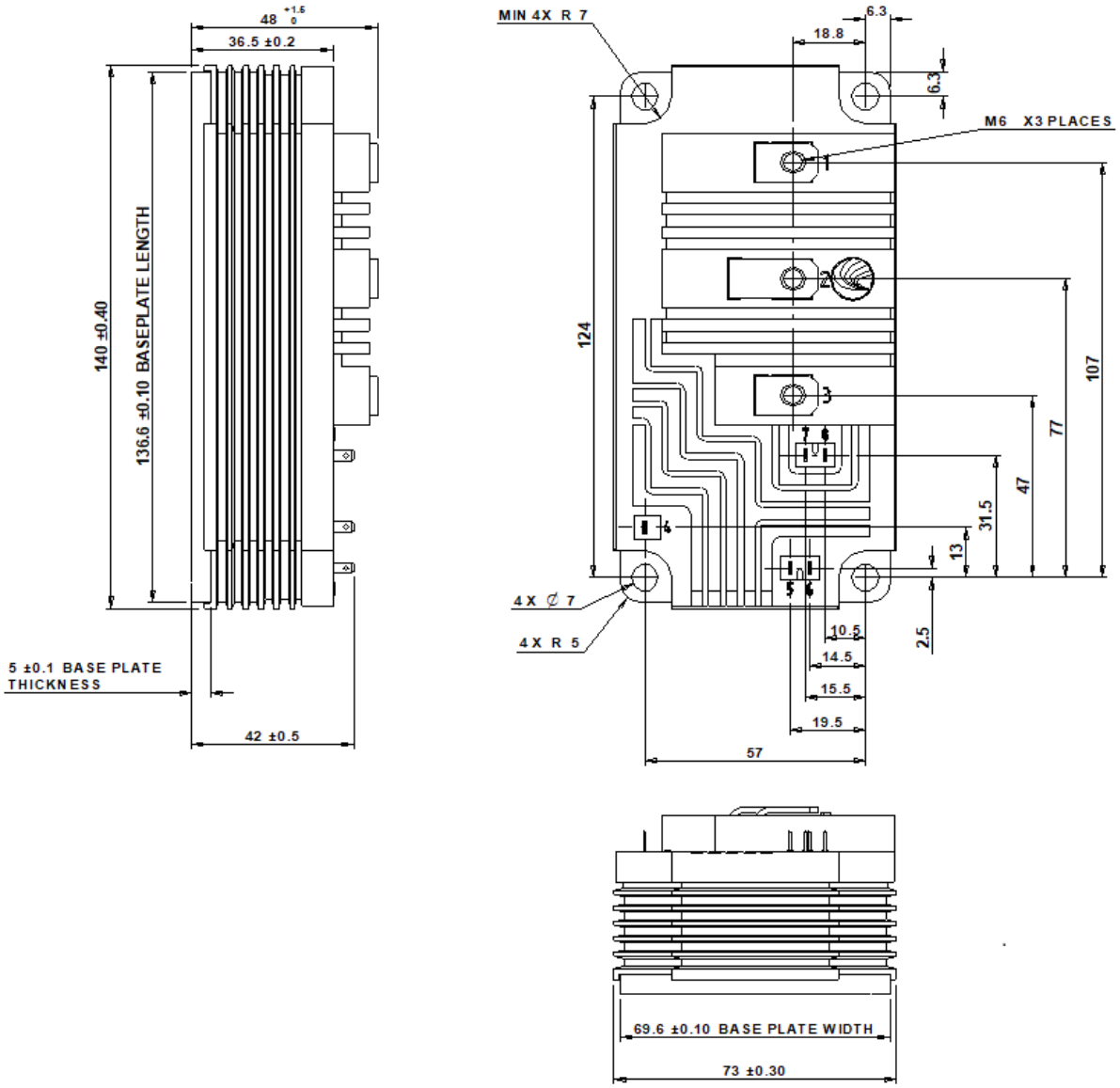


Fig. 10 Transient thermal impedance

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: 500g

Module Outline Type Code: K

Fig. 11 Module outline drawing

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