DIM200WKS12-A000

IGBT Chopper Module - Upper Arm Control

Replaces February 2004 version, issue PDS5969-2.0

DS5969-3.0 June 2004

FEATURES

- 10µs Short Circuit Withstand
- Non Punch Through Silicon
- Isolated Copper Baseplate

APPLICATIONS

- Choppers
- Motor Controllers
- Induction Heating
- Resonant Converters
- Power Supplies

The Powerline range of high power modules includes half bridge, chopper, dual, single and bi-directional switch configurations covering voltages from 600V to 3300V and currents up to 3600A.

The DIM200WKS12-A000 is a 1200V, n channel enhancement mode, insulated gate bipolar transistor (IGBT) chopper module configured with the upper arm of the bridge controlled. The IGBT has a wide reverse bias safe operating area (RBSOA) plus full 10µs short circuit withstand.

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:

DIM200WKS12-A000

Note: When ordering, please use the whole part number.

KEY PARAMETERS

V_{CES}		**1200V**
$V_{CE(sat)}$*	**(typ)**	**2.2V**
I_C	**(max)**	**200A**
$I_{C(PK)}$	**(max)**	**400A**

*(Measured at the power busbars and not the auxiliary terminals)

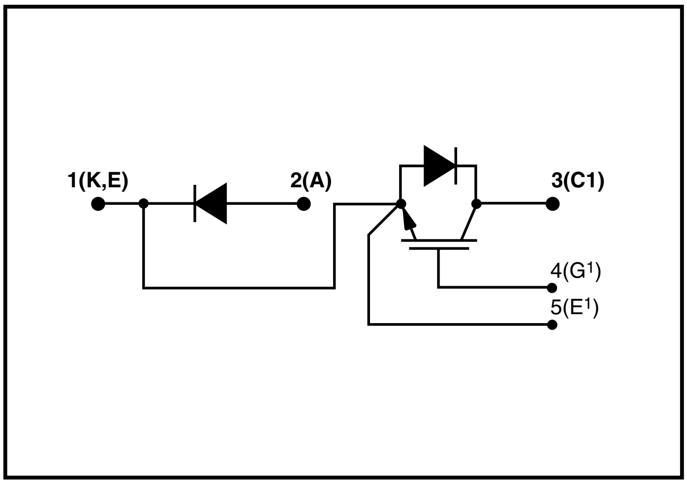


Fig. 1 Chopper circuit diagram

Outline type code: W

(See package details for further information)

Fig. 2 Electrical connections - (not to scale)

ABSOLUTE MAXIMUM RATINGS - PER ARM

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	1200	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_C	Continuous collector current	T_{case} = 80˚C	200	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 115˚C	400	A
P_{max}	Max. transistor power dissipation	T_{case} = 25˚C, T_j = 150˚C	1390	W
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_{vj} = 125˚C	6.25	kA^2s
V_{isol}	Isolation voltage - per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	2500	V
Q_{PD}	Partial discharge - per module	IEC1287. V_1 = 1300V, V_2 = 1000V, 50Hz RMS	10	PC

THERMAL AND MECHANICAL RATINGS

Internal insulation:	Al_2O_3	Clearance:	13mm
Baseplate material:	Cu	CTI (Critical Tracking Index):	175
Creepage distance:	24mm		

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - transistor (per arm)	Continuous dissipation - junction to case	-	-	90	˚C/kW
$R_{th(j-c)}$	Thermal resistance - diode (per arm) (Antiparallel and freewheel diode)	Continuous dissipation - junction to case	-	-	194	˚C/kW
$R_{th(c-h)}$	Thermal resistance - case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	15	˚C/kW
T_j	Junction temperature	Transistor	-	-	150	˚C
		Diode	-	-	125	˚C
T_{stg}	Storage temperature range	-	–40	-	125	˚C
-	Screw torque	Mounting - M6	3	-	5	Nm
		Electrical connections - M6	2.5	-	5	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}		-	-	0.25	mA
	(IGBT and Diode arm)	V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125˚C		-	-	6	mA
I_{GES}	Gate leakage current	V_{GE} = ±20V, V_{CE} = 0V		-	-	1	µA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 10mA, V_{GE} = V_{CE}		4.5	5.5	6.5	V
$V_{CE(sat)}^{\dagger}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 200A		-	2.2	2.7	V
		V_{GE} = 15V, I_C = 200A, , T_{case} = 125˚C		-	2.6	3.1	V
I_F	Diode forward current	DC		-	-	200	A
I_{FM}	Diode maximum forward current	t_p = 1ms		-	-	400	A
$V_F^{\dagger}$	Diode forward voltage	I_F = 200A		-	2.2	2.5	V
	(IGBT and Diode arm)	I_F = 200A, T_{case} = 125˚C		-	2.3	2.6	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		-	33	-	nF
L_M	Module inductance - per arm	-		-	20	-	nH
R_{INT}	Internal transistor resistance	-		-	0.23	-	mΩ
SC_{Data}	Short circuit. I_{SC}	T_j = 125˚C, V_{CC} = 900V,	I_1	-	1375	-	A
		t_p ≤ 10µs, $V_{CE(max)}$ = V_{CES} – L*. di/dt	I_2	-	1125	-	A
		IEC 60747-9					

Note:

† Measured at the power busbars and not the auxiliary terminals)

L* is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS - IGBT ARM

T_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(off)}$	Turn-off delay time	I_C = 200A V_{GE} = ±15V V_{CE} = 600V $R_{G(ON)} = R_{G(OFF)} = 4.7\Omega$ L ~ 70nH	-	600	-	ns
t_f	Fall time		-	50	-	ns
E_{OFF}	Turn-off energy loss		-	20	-	mJ
$t_{d(on)}$	Turn-on delay time		-	240	-	ns
t_r	Rise time		-	95	-	ns
E_{ON}	Turn-on energy loss		-	25	-	mJ
Q_g	Gate charge		-	2	-	µC
Q_{rr}	Diode reverse recovery charge	I_F = 200A, V_R = 600V, dI_F/dt = 2300A/µs	-	30	-	µC
I_{rr}	Diode reverse current		-	150	-	A
E_{REC}	Diode reverse recovery energy		-	13	-	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 = 200A V_{GE} = ±15V V_{CE} = 600V $R_{G(ON)} = R_{G(OFF)} = 4.7\Omega$ L ~ 70nH	-	800	-	ns
t_f	Fall time		-	70	-	ns
E_{OFF}	Turn-off energy loss		-	27	-	mJ
$t_{d(on)}$	Turn-on delay time		-	385	-	ns
t_r	Rise time		-	110	-	ns
E_{ON}	Turn-on energy loss		-	40	-	mJ
Q_{rr}	Diode reverse recovery charge	I_F = 200A, V_R = 600V, dI_F/dt = 2000A/µs	-	50	-	µC
I_{rr}	Diode reverse current		-	160	-	A
E_{REC}	Diode reverse recovery energy		-	20	-	mJ

TYPICAL CHARACTERISTICS

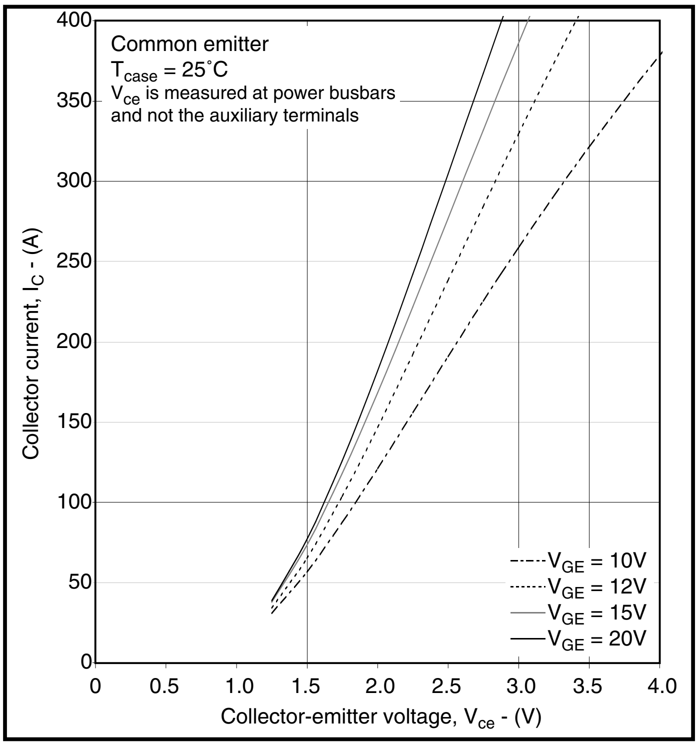


Fig. 3 Typical output characteristics

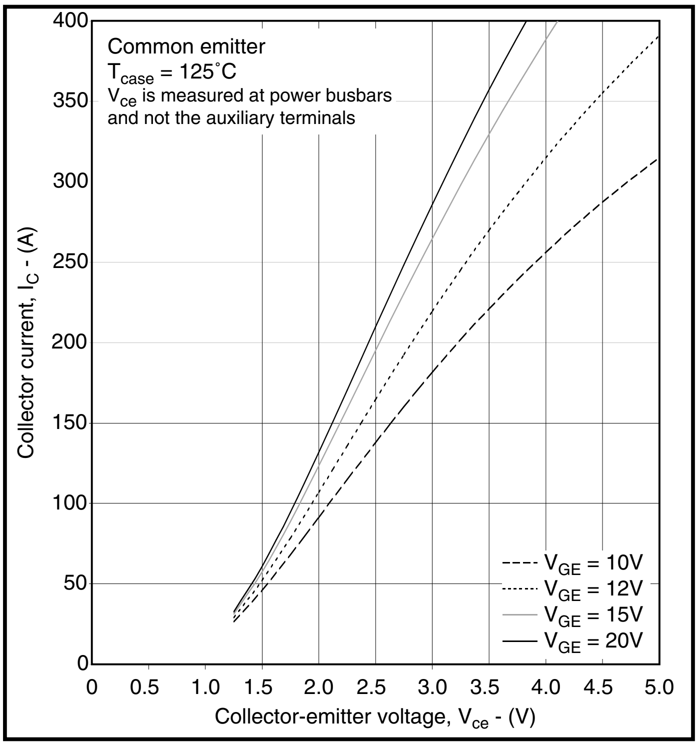


Fig. 4 Typical output characteristics

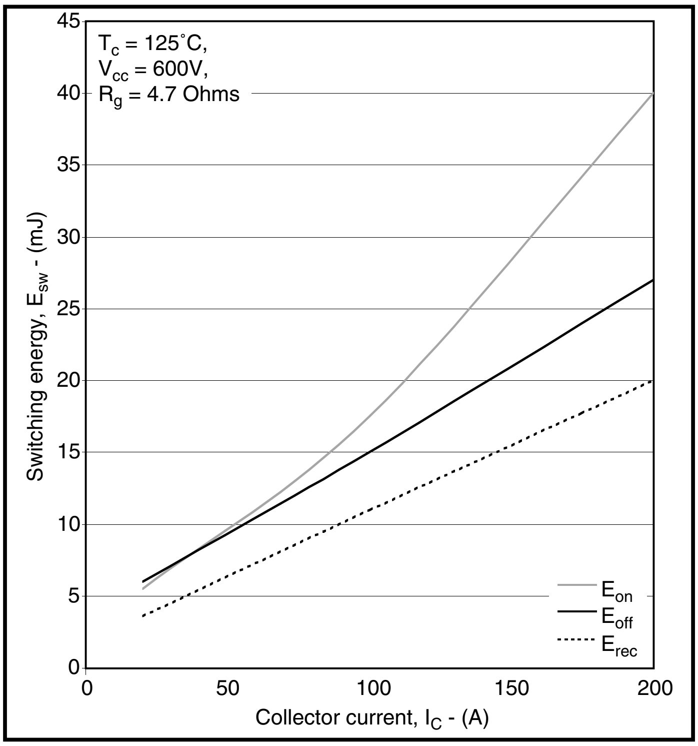


Fig. 5 Typical switching energy vs collector current

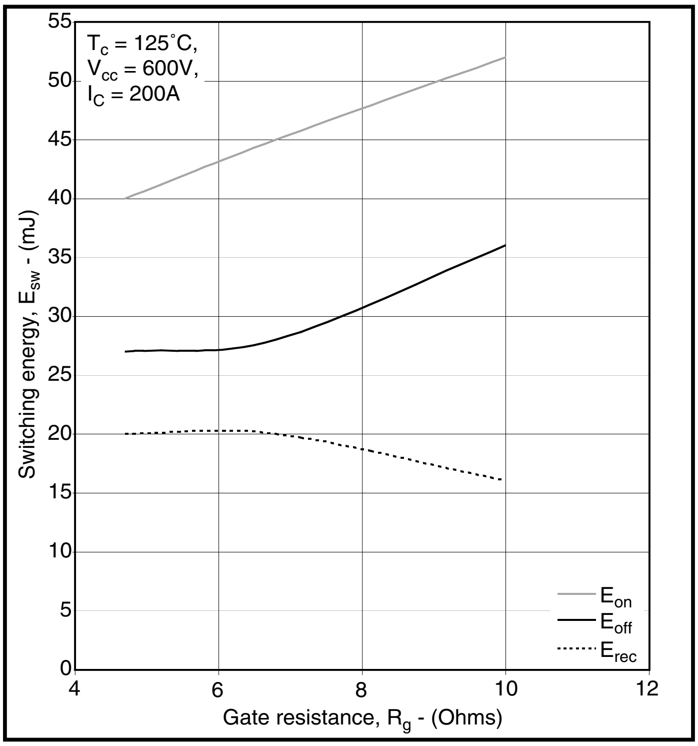


Fig. 6 Typical switching energy vs gate resistance

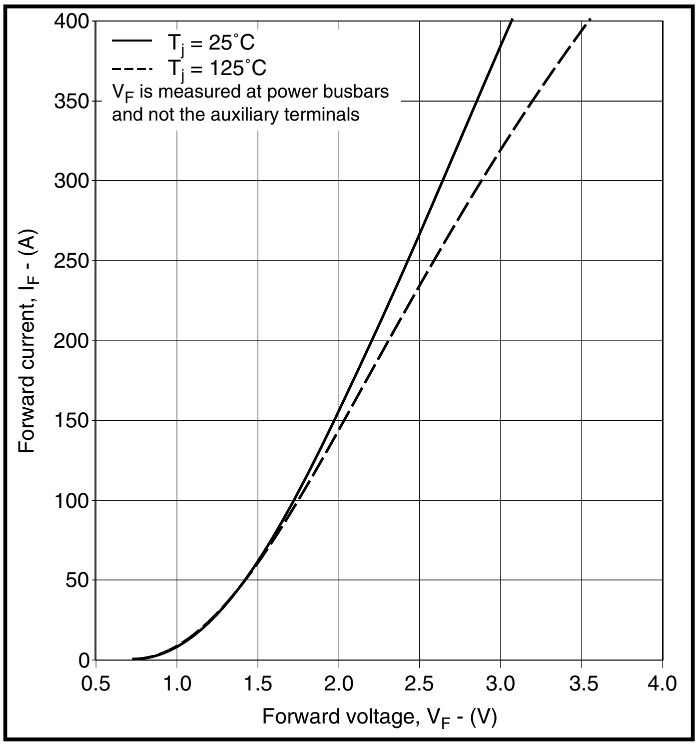


Fig. 7 Diode typical forward characteristics

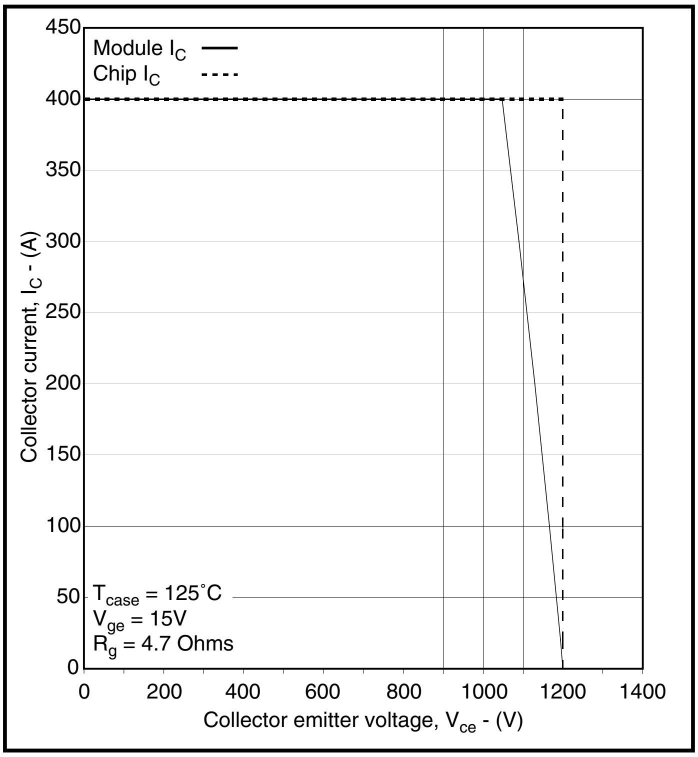


Fig. 8 Reverse bias safe operating area

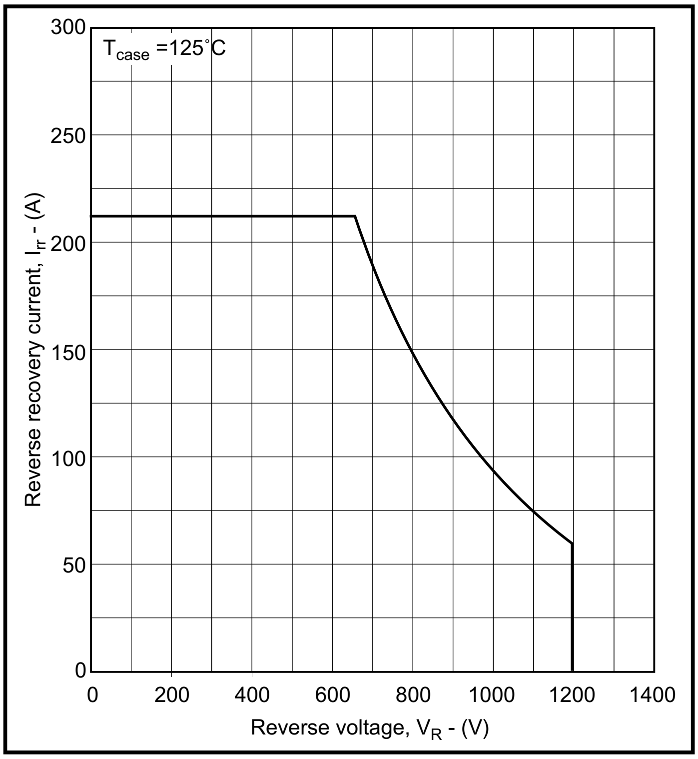
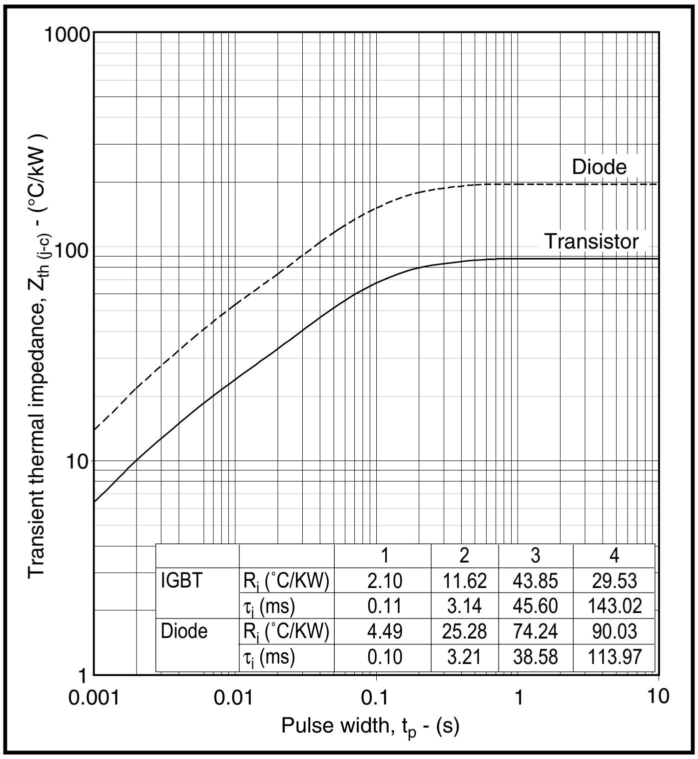


Fig. 9 Diode reverse bias safe operating area - IGBT and diode arm

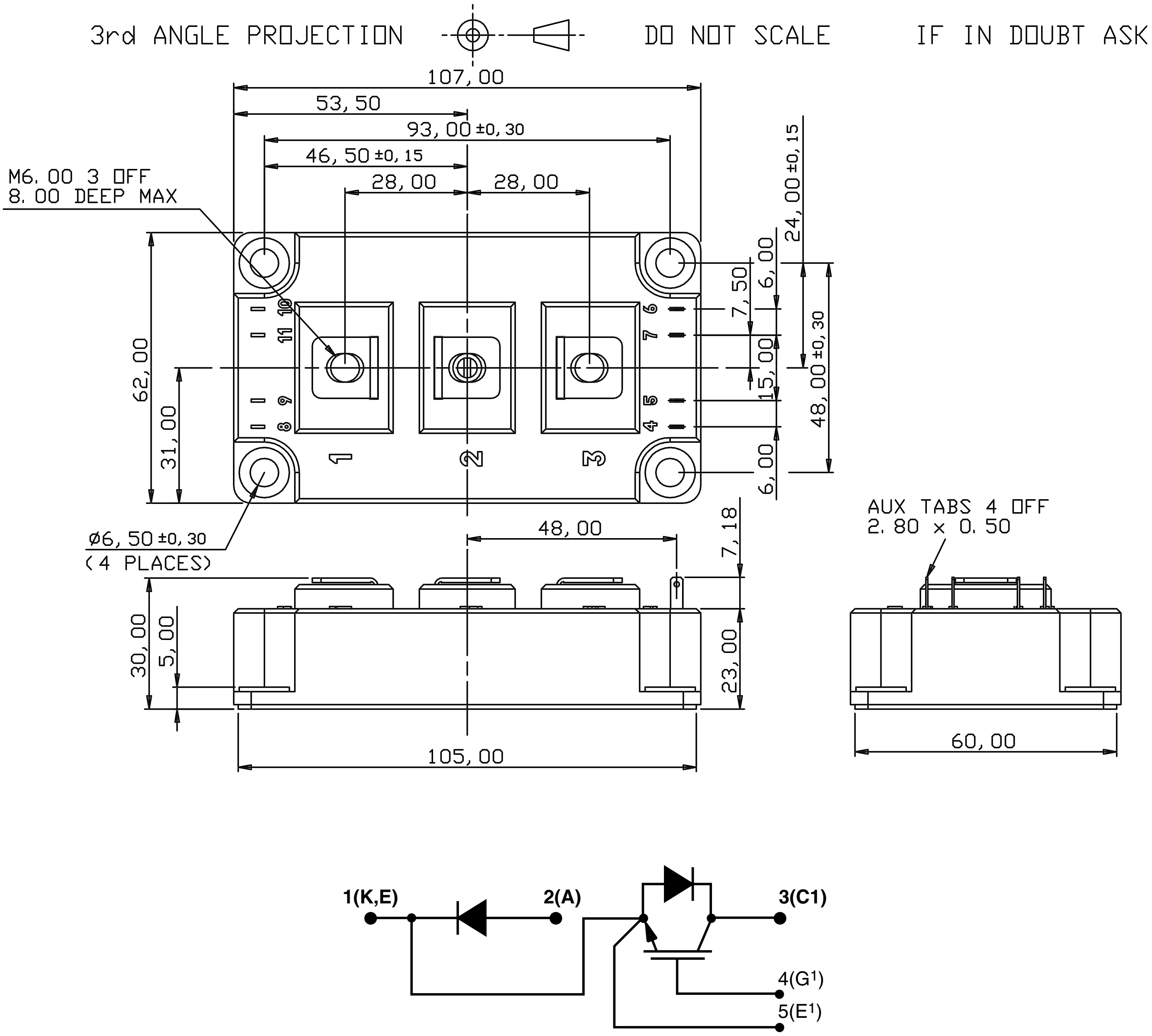


		1	2	3	4
IGBT	R_i (˚C/KW)	2.10	11.62	43.85	29.53
	τ_i (ms)	0.11	3.14	45.60	143.02
Diode	R_i (˚C/KW)	4.49	25.28	74.24	90.03
	τ_i (ms)	0.10	3.21	38.58	113.97

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: 420g
Module outline type code: W

Fig. 11 Package details

POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.

http://www.dynexsemi.com

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