DIM400WHS17-E000

Half Bridge IGBT Module

Replaces December 2003 version, issue PDS5665-2.1 PDS5665-3.1 February 2004

FEATURES

- Trench Gate Field Stop Technology
- Low Conduction Losses
- Low Switching Losses
- 10µs Short Circuit Withstand

APPLICATIONS

- Motor Drives
- Wind Turbines
- UPS Systems

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 DIM400WHS17-E000 is a half bridge 1700V, n channel enhancement mode, insulated gate bipolar transistor (IGBT) module. 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:

DIM400WHS17-E000

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

KEY PARAMETERS

V_{CES}		1700V
$V_{CE(sat)}$	(typ)	2.0V
I_C	(max)	400A
$I_{C(PK)}$	(max)	800A

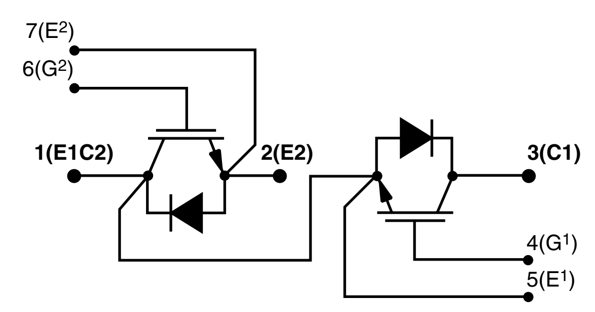


Fig. 1 Half bridge circuit diagram

Outline type code: W

(See package details for further information)

Fig. 2 Module Outline

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	1700	V
V_{GES}	Gate-emitter voltage	-	±20	V
I_C	Continuous collector current	T_{case} = 80˚C	400	A
$I_{C(PK)}$	Peak collector current	1ms, T_{case} = 110˚C	800	A
P_{max}	Max. transistor power dissipation	T_{case} = 25˚C, T_j = 150˚C	2.5	W
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_{vj} = 125˚C	22.5	kA^2s
V_{isol}	Isolation voltage - per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4.0	kV
Q_{PD}	Partial discharge - per module	IEC1287. V_1 = 1800V, V_2 = 1300V, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$R_{th(j-c)}$	Thermal resistance - transistor (per arm)	Continuous dissipation - junction to case	-	-	50	˚C/kW
$R_{th(j-c)}$	Thermal resistance - diode (per arm)	Continuous dissipation - junction to case	-	-	90	˚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}		-	-	1	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_{case} = 125˚C		-	-	5	mA
I_{GES}	Gate leakage current	V_{GE} = ±20V, V_{CE} = 0V		-	-	400	nA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 16mA, V_{GE} = V_{CE}		5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 400A		-	2.0	2.4	V
		V_{GE} = 15V, I_C = 400A, , T_{case} = 125˚C		-	2.3	3.0	V
I_F	Diode forward current	DC		-	-	400	A
I_{FM}	Diode maximum forward current	t_p = 1ms		-	-	800	A
V_F	Diode forward voltage	I_F = 400A		-	1.9	2.3	V
		I_F = 400A, T_{case} = 125˚C		-	2.0	2.4	V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		-	37.5	-	nF
L_M	Module inductance	-		-	20	-	nH
R_{INT}	Internal transistor resistance - per arm	-		-	0.6	-	mΩ
SC_{Data}	Short circuit. I_{SC}	T_j = 125˚C, V_{CC} = 900V,	I_1	-	1750	-	A
		$t_p \leq$ 10μs, $V_{CE(max)}$ = V_{CES} – L*. di/dt	I_2	-	1500	-	A
		IEC 60747-9					

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 = 400A	-	750	-	ns
t_f	Fall time	V_{GE} = ±15V	-	200	-	ns
E_{OFF}	Turn-off energy loss	V_{CE} = 900V	-	80	-	mJ
$t_{d(on)}$	Turn-on delay time	$R_{G(ON)} = R_{G(OFF)}$ = 3.3Ω	-	275	-	ns
t_r	Rise time	L ~ 70nH	-	100	-	ns
E_{ON}	Turn-on energy loss		-	130	-	mJ
Q_g	Gate charge		-	4.5	-	µC
Q_{rr}	Diode reverse recovery charge	I_F = 400A, V_R = 900V,	-	100	-	µC
I_{rr}	Diode reverse current	dI_F/dt = 4200A/µs	-	450	-	A
E_{REC}	Diode reverse recovery energy		-	40	-	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 = 400A	-	850	-	ns
t_f	Fall time	V_{GE} = ±15V	-	200	-	ns
E_{OFF}	Turn-off energy loss	V_{CE} = 900V	-	120	-	mJ
$t_{d(on)}$	Turn-on delay time	$R_{G(ON)} = R_{G(OFF)}$ = 3.3Ω	-	350	-	ns
t_r	Rise time	L ~ 70nH	-	100	-	ns
E_{ON}	Turn-on energy loss		-	170	-	mJ
Q_{rr}	Diode reverse recovery charge	I_F = 400A, V_R = 900V,	-	160	-	µC
I_{rr}	Diode reverse current	dI_F/dt = 4200A/µs	-	470	-	A
E_{REC}	Diode reverse recovery energy		-	70	-	mJ

Note:
Switching Characteristic measurements taken using standard driver circuit conditions.

TYPICAL CHARACTERISTICS

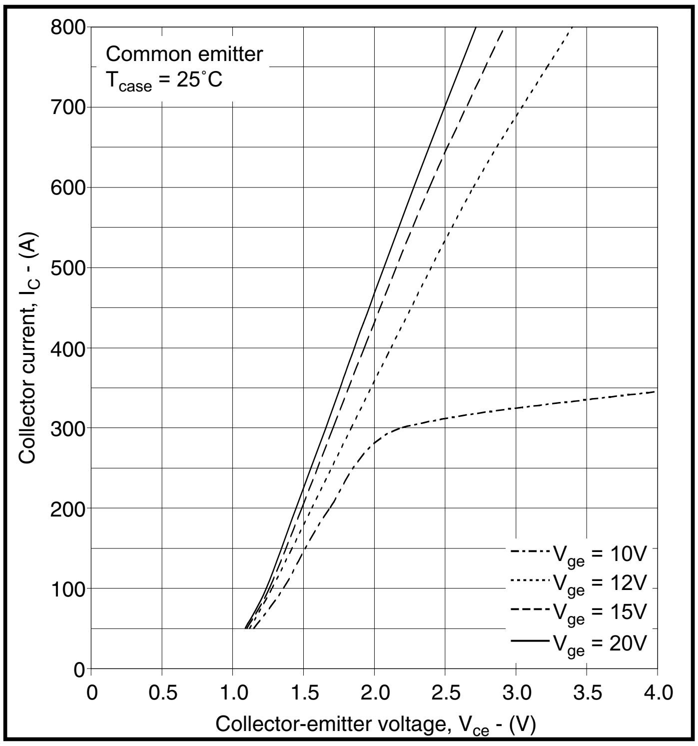


Fig. 3 Typical output characteristics

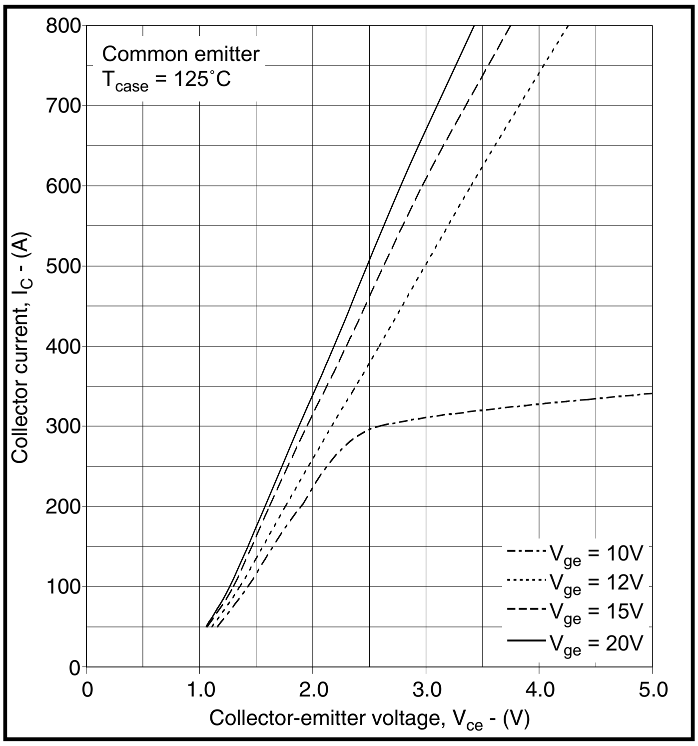


Fig. 4 Typical output characteristics

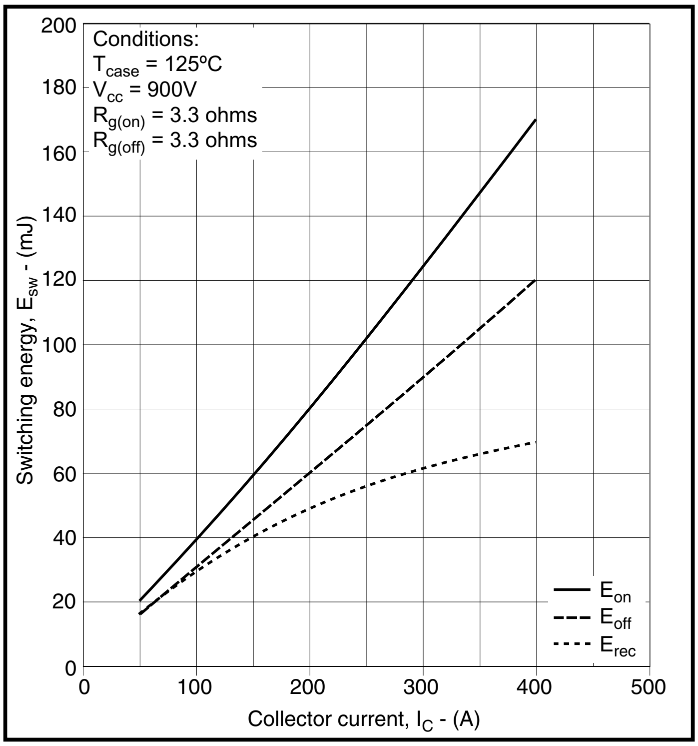


Fig. 5 Typical switching energy vs collector current

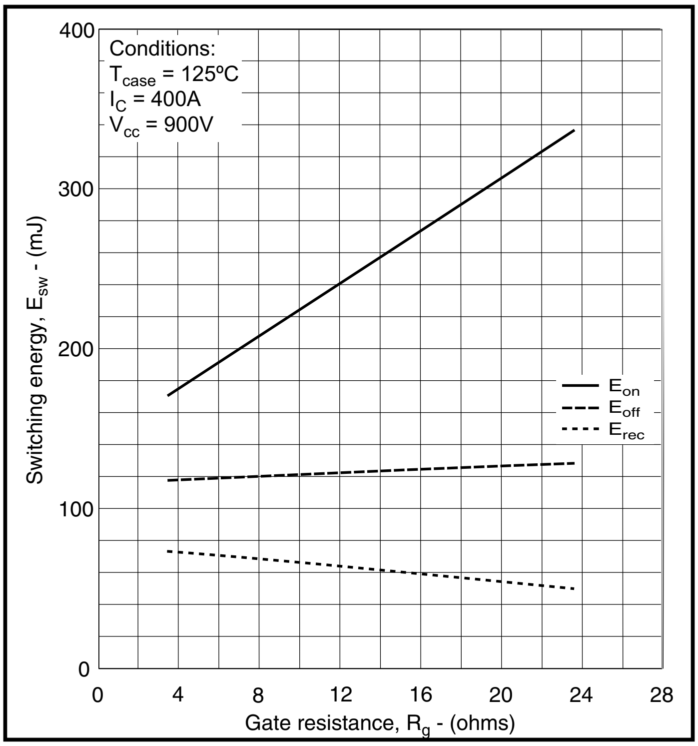


Fig. 6 Typical switching energy vs gate resistance

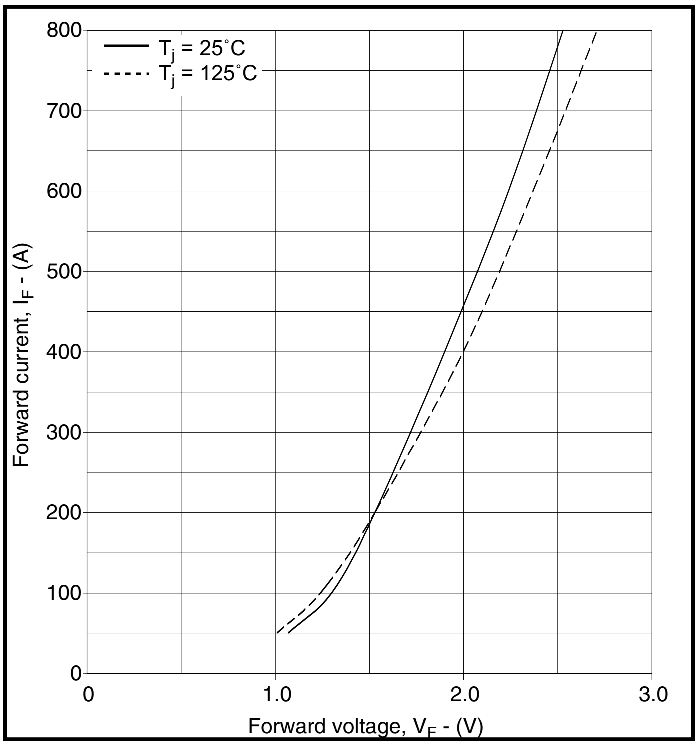


Fig. 7 Diode typical forward characteristics

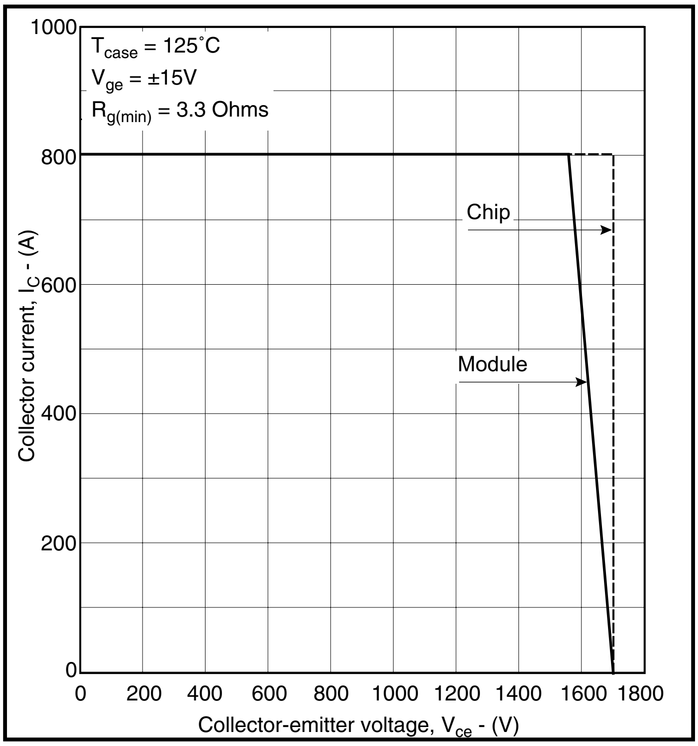


Fig. 8 IGBT reverse bias safe operating area

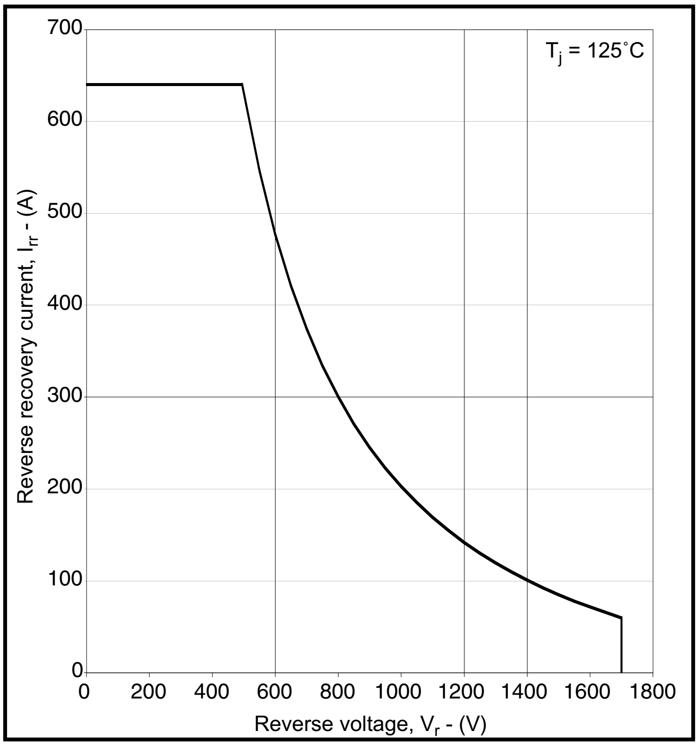
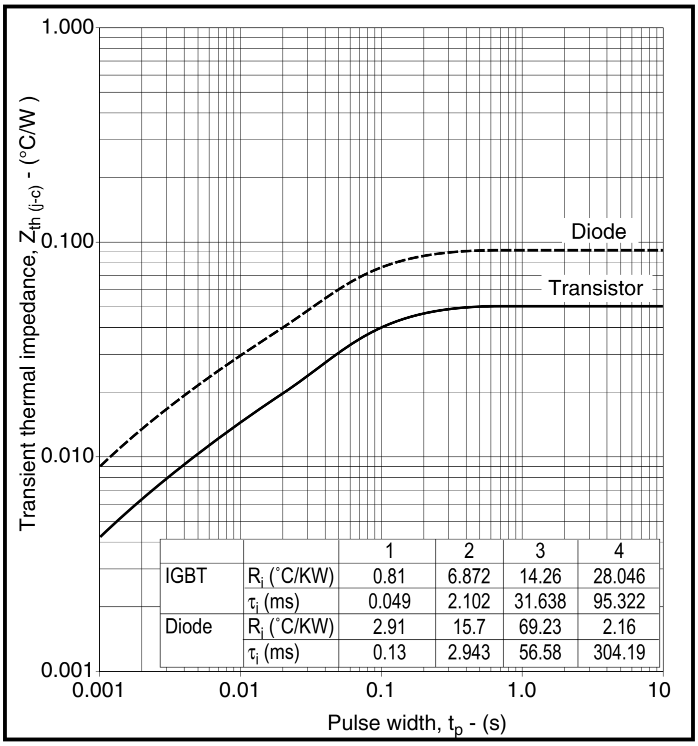


Fig. 9 Diode reverse bias safe operating area

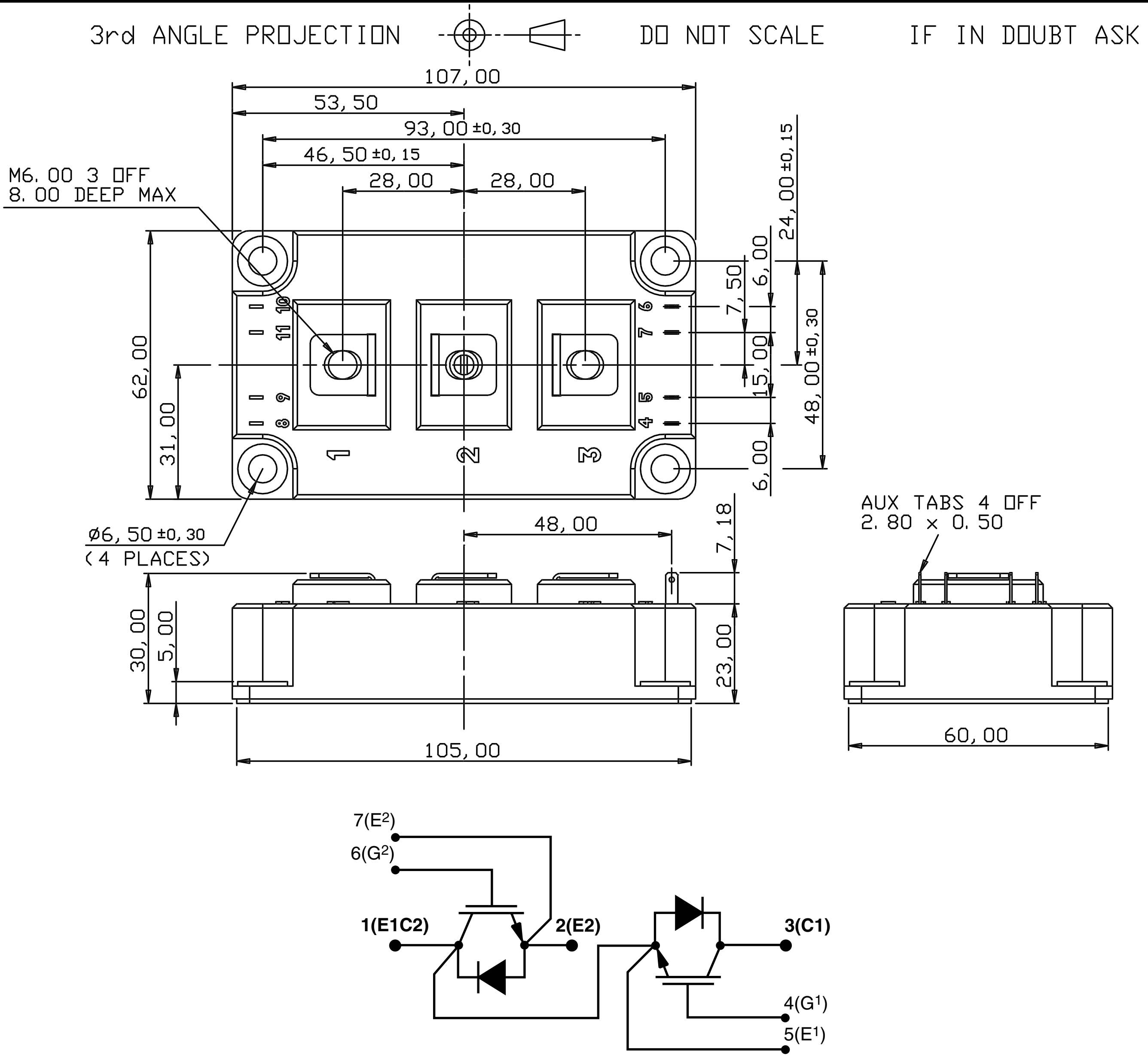


		1	2	3	4
IGBT	R_i (˚C/KW)	0.81	6.872	14.26	28.046
	τ_i (ms)	0.049	2.102	31.638	95.322
Diode	R_i (˚C/KW)	2.91	15.7	69.23	2.16
	τ_i (ms)	0.13	2.943	56.58	304.19

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.

DYNEX

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