

FEATURES

- 10µs Short Circuit Withstand
- High Thermal Cycling Capability
- Non Punch Through Silicon
- Isolated AISiC Base with AlN Substrates
- Lead Free construction

APPLICATIONS

- Matrix Converters
- Brushless Motor Controllers
- Frequency Converters

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 DIM400PBM17-A000 is a bi-directional 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 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:

DIM400PBM17-A000

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{DRM}		$\pm 1700V$
V_T^*	(typ)	4.9V
I_C	(max)	400A
$I_{C(PK)}$	(max)	800A

* Measured at the power busbars, not the auxiliary terminals

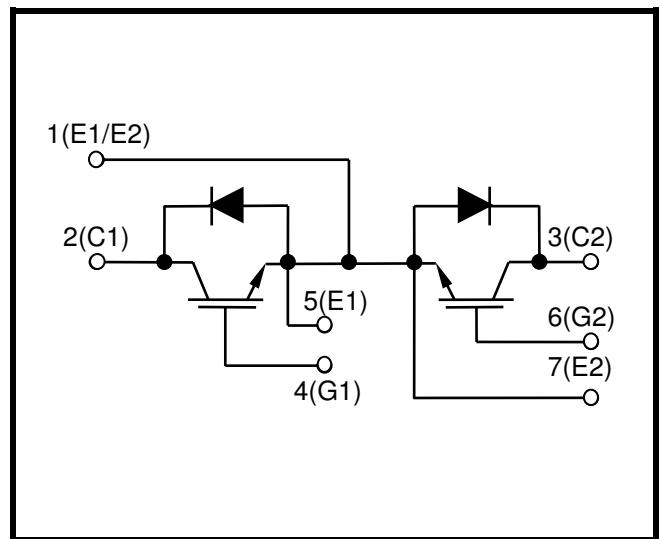


Fig. 1 Circuit configuration



Outline type code: P

(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.

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	$V_{GE} = 0\text{V}$	± 1700	V
V_{GES}	Gate-emitter voltage		± 20	V
I_C	Continuous collector current	$T_{case} = 50^{\circ}\text{C}$	400	A
$I_{C(PK)}$	Peak collector current	1ms, $T_{case} = 110^{\circ}\text{C}$	800	A
P_{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$, $T_j = 150^{\circ}\text{C}$	3470	W
I^2t	Diode I^2t value	$V_R = 0$, $t_p = 10\text{ms}$, $T_j = 125^{\circ}\text{C}$	30	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, $V_1 = 1800\text{V}$, $V_2 = 1300\text{V}$, 50Hz RMS	10	pC

THERMAL AND MECHANICAL RATINGS

Internal insulation material:	AlN
Baseplate material:	AlSiC
Creepage distance:	33mm
Clearance:	20mm
CTI (Comparative Tracking Index):	350

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$R_{th(j-c)}$	Thermal resistance – transistor	Continuous dissipation - junction to case	-	-	36	$^{\circ}\text{C}/\text{kW}$
$R_{th(j-c)}$	Thermal resistance – diode	Continuous dissipation - junction to case	-	-	80	$^{\circ}\text{C}/\text{kW}$
$R_{th(c-h)}$	Thermal resistance – case to heatsink (per module)	Mounting torque 5Nm (with mounting grease)	-	-	16	$^{\circ}\text{C}/\text{kW}$
T_j	Junction temperature	Transistor	-	-	150	$^{\circ}\text{C}$
		Diode	-	-	125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-	-40	-	125	$^{\circ}\text{C}$
	Screw torque	Mounting – M6	-	-	5	Nm
		Electrical connections – M5	-	-	4	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			12	mA
I _{GES}	Gate leakage current	V _{GE} = ± 20V, V _{CE} = 0V			2	µA
V _{GE(TH)}	Gate threshold voltage	I _C = 20mA, V _{GE} = V _{CE}	4.5	5.5	6.5	V
V _{CE(sat)} [†]	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 400A		2.7	3.2	V
		V _{GE} = 15V, I _C = 400A, T _j = 125 °C		3.4	4.0	V
V _T	On-state voltage - (measured across terminals 2 and 3)	V _{GE} = 15V, I _C = 400A		4.9		V
		V _{GE} = 15V, I _C = 400A, T _j = 125 °C		5.7		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		2.2	2.5	V
		I _F = 400A, T _j = 125 °C		2.3	2.6	V
C _{ies}	Input capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz		30		nF
Q _g	Gate charge	±15V		4.5		µC
C _{res}	Reverse transfer capacitance	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz				nF
L _M	Module inductance			20		nH
R _{INT}	Internal resistance			270		µΩ
SC _{Data}	Short circuit current, I _{SC}	T _j = 125 °C, V _{CC} = 1000V t _p ≤ 10µs, V _{GE} ≤ 15V V _{CE(max)} = V _{CES} - L* x di/dt IEC 60747-9		1600		A

Note:
[†] Measured at the power busbars, not the auxiliary terminals

^{*} L is the circuit inductance + L_M

ELECTRICAL CHARACTERISTICS

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units	
$t_{d(off)}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 900\text{V}$ $R_{G(ON)} = 4.7\Omega$ $R_{G(OFF)} = 4.7\Omega$ $L_S \sim 100\text{nH}$		1150		ns	
t_f	Fall time			100		ns	
E_{OFF}	Turn-off energy loss				120		mJ
$t_{d(on)}$	Turn-on delay time				250		ns
t_r	Rise time				250		ns
E_{ON}	Turn-on energy loss				150		mJ
Q_{rr}	Diode reverse recovery charge	$I_F = 400\text{A}$ $V_{CE} = 900\text{V}$ $di_F/dt = 3000\text{A}/\mu\text{s}$		100		μC	
I_{rr}	Diode reverse recovery current				230		A
E_{rec}	Diode reverse recovery energy				70		mJ

$T_{case} = 125^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units	
$t_{d(off)}$	Turn-off delay time	$I_C = 400\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 900\text{V}$ $R_{G(ON)} = 4.7\Omega$ $R_{G(OFF)} = 4.7\Omega$ $L_S \sim 100\text{nH}$		1400		ns	
t_f	Fall time				130		ns
E_{OFF}	Turn-off energy loss				180		mJ
$t_{d(on)}$	Turn-on delay time				400		ns
t_r	Rise time				250		ns
E_{ON}	Turn-on energy loss				170		mJ
Q_{rr}	Diode reverse recovery charge	$I_F = 400\text{A}$ $V_{CE} = 900\text{V}$ $di_F/dt = 2500\text{A}/\mu\text{s}$		170		μC	
I_{rr}	Diode reverse recovery current				270		A
E_{rec}	Diode reverse recovery energy				100		mJ

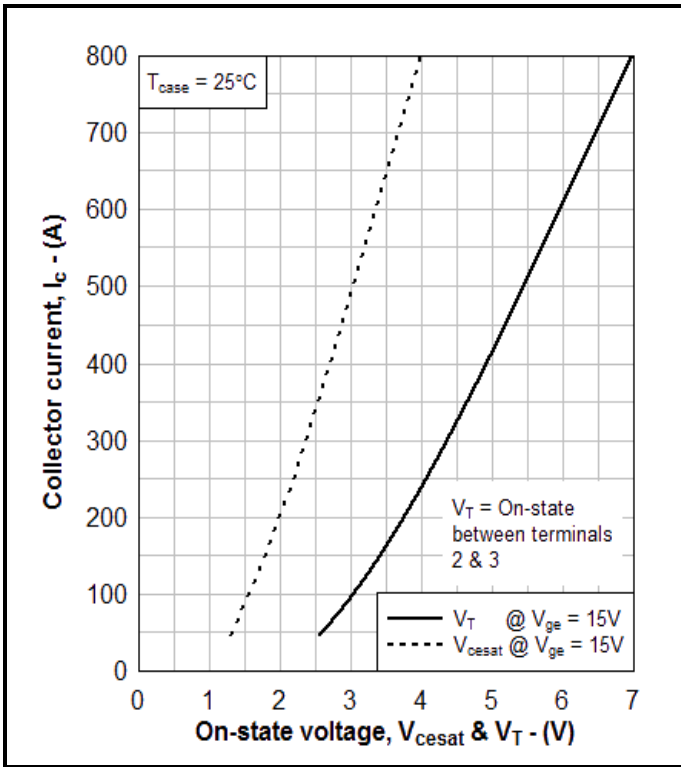


Fig. 3 Typical output characteristics

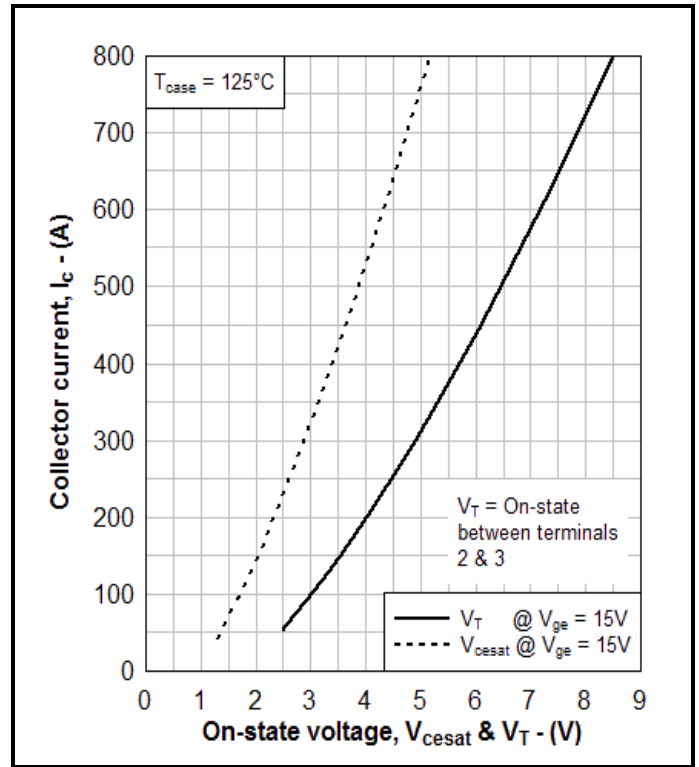


Fig. 4 Typical output characteristics

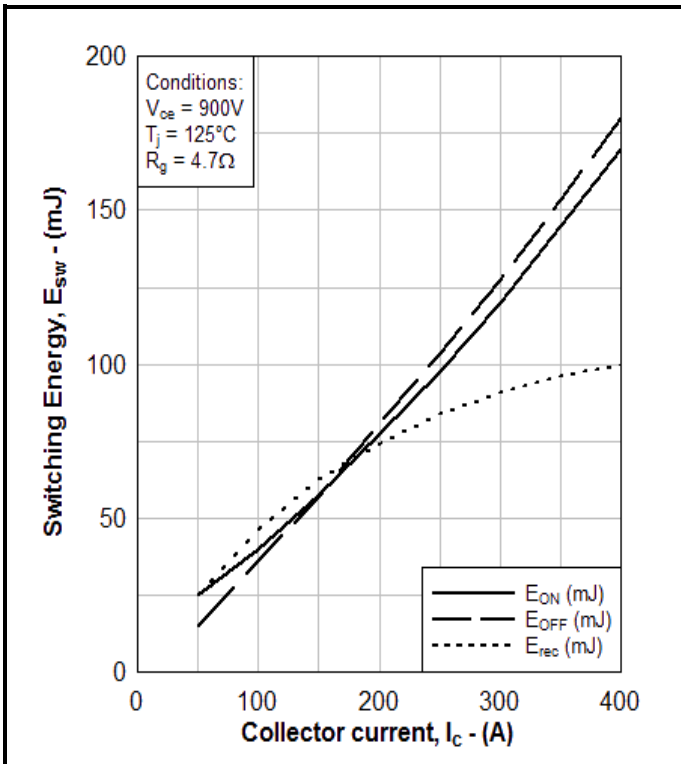


Fig. 5 Typical switching energy vs collector current

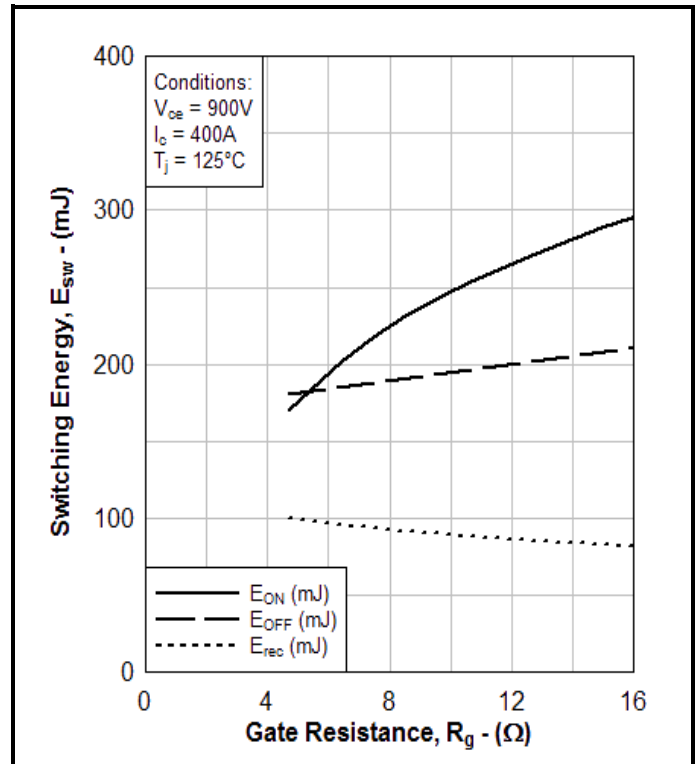


Fig. 6 Typical switching energy vs gate resistance

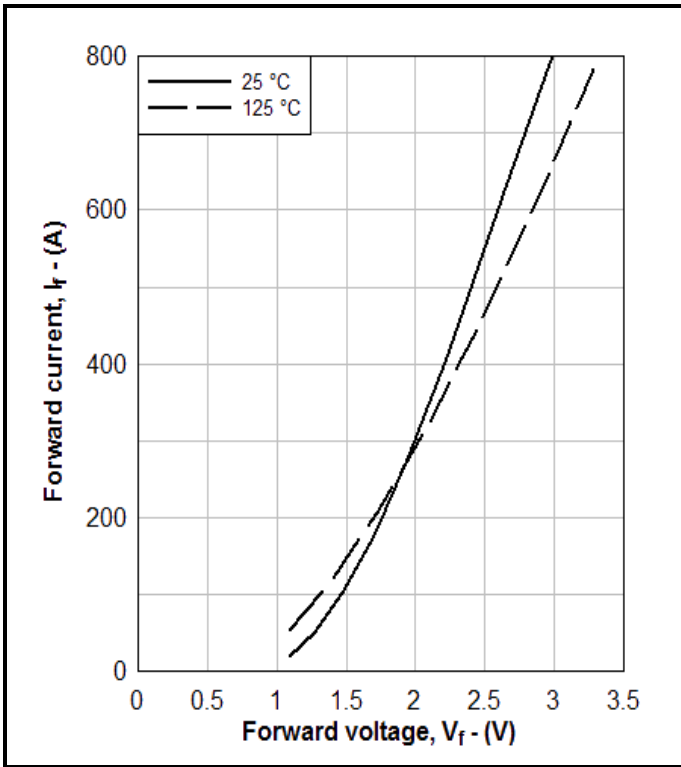


Fig. 7 Diode typical forward characteristics

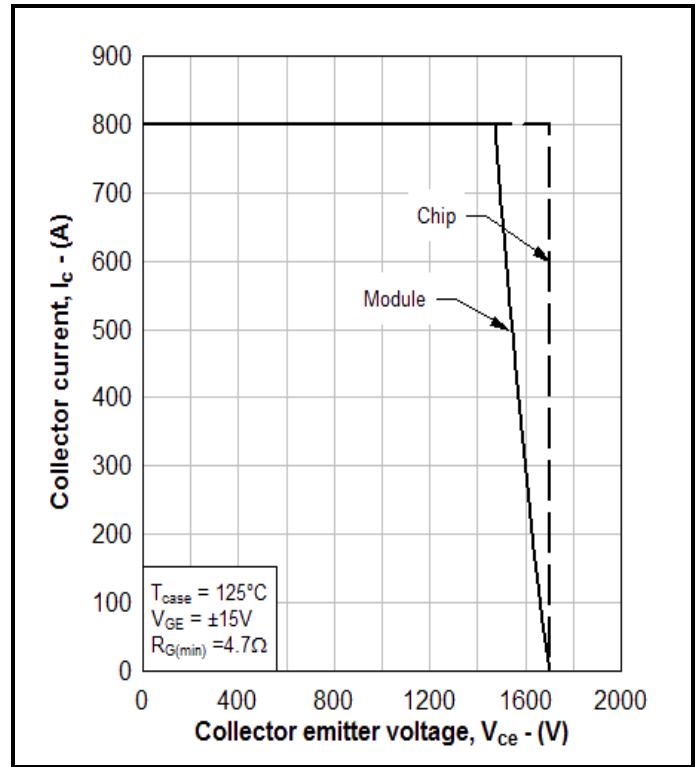


Fig. 8 Reverse bias safe operating area

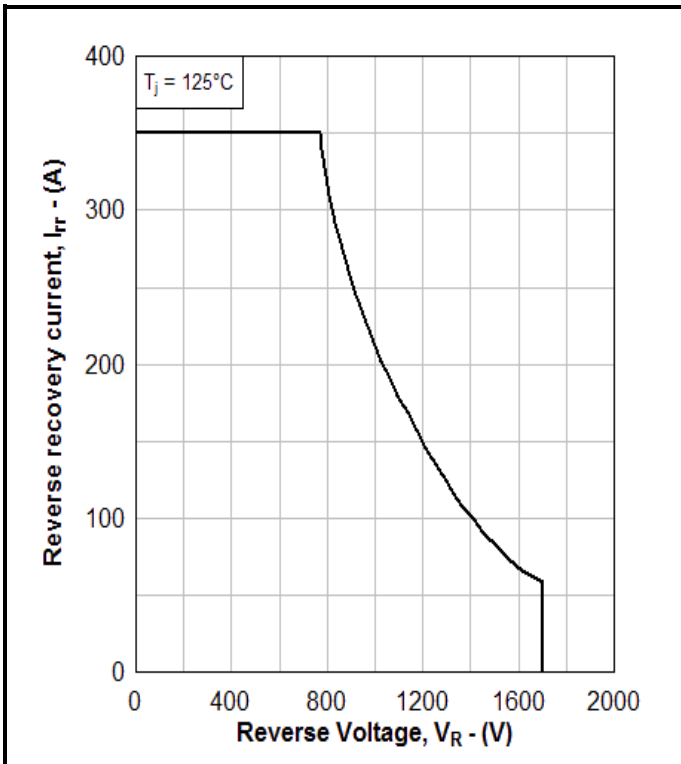


Fig. 9 Diode reverse bias safe operating area

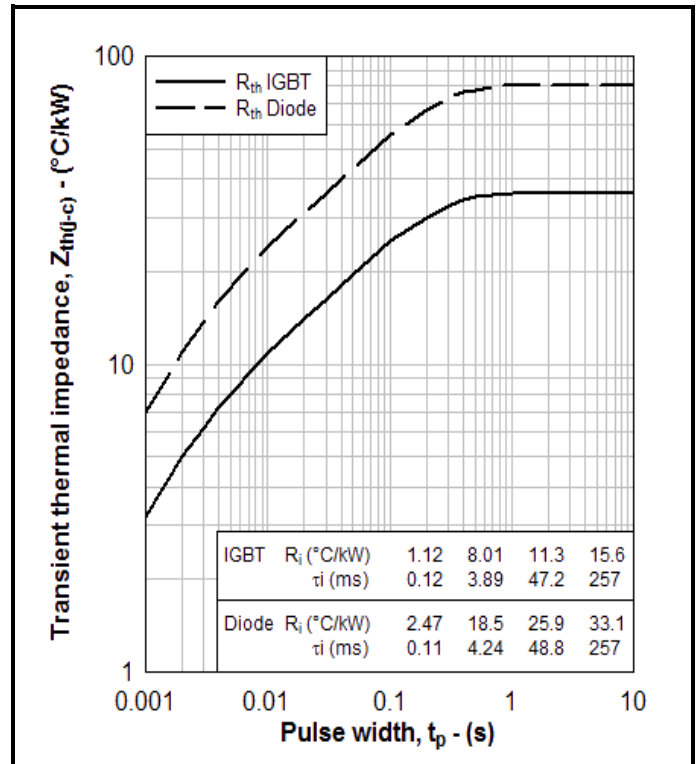


Fig. 10 Transient thermal impedance

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