

## FEATURES

- Trench Gate IGBT
- Cu Base with Al<sub>2</sub>O<sub>3</sub> Substrates
- High Thermal Cycling Capability
- 10μs Short Circuit Withstand
- Low V<sub>ce(sat)</sub> Variant

## APPLICATIONS

- Motor Drives
- High Power Converters
- Renewable Energy Power Conversion
- High Reliability Inverters

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 DIM900H2HS12-PA500 is a Half Bridge 1200V, trench gate, insulated gate bipolar transistor (IGBT) module with enhanced field stop and implantation technology. 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:

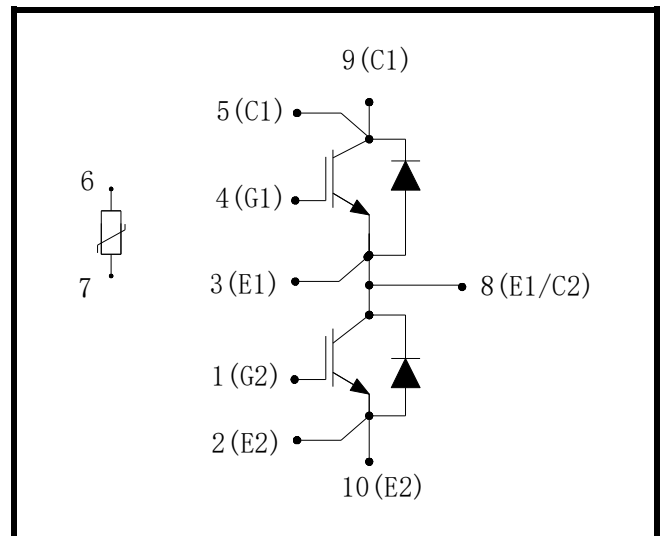
### DIM900H2HS12-PA500

Note: When ordering, please use the complete part number

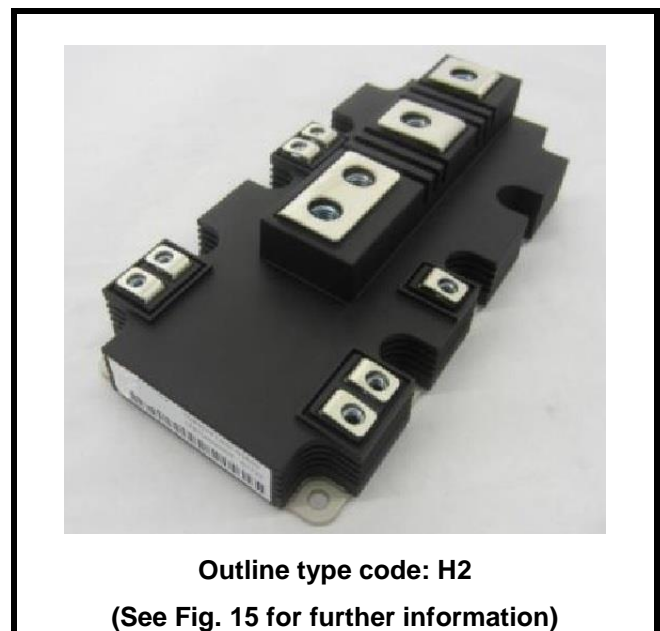
## KEY PARAMETERS

V <sub>CES</sub>	<b>1200V</b>
V <sub>CE(sat)</sub> * (typ)	<b>1.75V</b>
I <sub>C</sub> (max)	<b>900A</b>
I <sub>C(PK)</sub> (max)	<b>1800A</b>

\* Measured at the auxiliary terminals



**Fig. 1 Circuit configuration**



**Outline type code: H2  
(See Fig. 15 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<sub>case</sub> = 25°C unless stated otherwise**

Symbol	Parameter	Test Conditions	Max.	Units
V <sub>CES</sub>	Collector-emitter voltage	V <sub>GE</sub> = 0V, T <sub>C</sub> = 25°C	1200	V
V <sub>GES</sub>	Gate-emitter voltage	T <sub>C</sub> = 25°C	±20	V
I <sub>C</sub>	Continuous collector current	T <sub>C</sub> = 90°C	900	A
I <sub>C(PK)</sub>	Peak collector current	t <sub>P</sub> = 1ms	1800	A
P <sub>max</sub>	Max. transistor power dissipation	T <sub>C</sub> = 25°C, T <sub>vj</sub> = 150°C	4.23	kW
I <sup>2</sup> t	Diode I <sup>2</sup> t value	V <sub>R</sub> = 0, t <sub>p</sub> = 10ms, T <sub>vj</sub> = 150°C	76	kA <sup>2</sup> s
V <sub>isol</sub>	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V

**THERMAL AND MECHANICAL RATINGS**

Internal insulation material:	Al <sub>2</sub> O <sub>3</sub>
Baseplate material:	Cu
Creepage distance – Terminal to heatsink:	33mm
Creepage distance – Terminal to terminal:	33mm
Clearance – Terminal to heatsink:	19mm
Clearance – Terminal to terminal:	19mm
CTI (Comparative Tracking Index):	>400

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
R <sub>th(j-c)</sub>	Thermal resistance – IGBT	Continuous dissipation - junction to case	-	-	29.5	°C/kW
R <sub>th(j-c)</sub>	Thermal resistance – diode		-	-	55	°C/kW
R <sub>th(c-h)</sub>	Thermal resistance – case to heatsink (IGBT)	Mounting torque 3.5Nm (with mounting grease 1W/m °C)	-	-	14	°C/kW
R <sub>th(c-h)</sub>	Thermal resistance – case to heatsink (Diode)		-	-	25.5	°C/kW
T <sub>j</sub>	Junction temperature	IGBT	-40	-	150	°C
		Diode	-40	-	150	°C
T <sub>stg</sub>	Storage temperature range	-	-40	-	150	°C
	Screw torque	Mounting – M5	3	-	6	Nm
		Electrical connections – M8	8	-	10	Nm

## ELECTRICAL CHARACTERISTICS

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I <sub>CES</sub>	Collector cut-off current	V <sub>GE</sub> = 0V, V <sub>CE</sub> = V <sub>CES</sub>			1	mA
		V <sub>GE</sub> = 0V, V <sub>CE</sub> = V <sub>CES</sub> , T <sub>C</sub> = 125°C			10	mA
		V <sub>GE</sub> = 0V, V <sub>CE</sub> = V <sub>CES</sub> , T <sub>C</sub> = 150°C			20	mA
I <sub>GES</sub>	Gate leakage current	V <sub>GE</sub> = ± 20V, V <sub>CE</sub> = 0V			0.5	μA
V <sub>GE(TH)</sub>	Gate threshold voltage	I <sub>C</sub> = 40mA, V <sub>GE</sub> = V <sub>CE</sub>	5.0	6.0	7.0	V
V <sub>CE(sat)</sub>	Collector-emitter saturation voltage	V <sub>GE</sub> = 15V, I <sub>C</sub> = 900A		1.75	2.15	V
		V <sub>GE</sub> = 15V, I <sub>C</sub> = 900A, T <sub>j</sub> = 125°C		2.10	2.50	V
		V <sub>GE</sub> = 15V, I <sub>C</sub> = 900A, T <sub>j</sub> = 150°C		2.20	2.60	V
I <sub>F</sub>	Diode forward current	DC		900		A
I <sub>FM</sub>	Diode maximum forward current	t <sub>p</sub> = 1ms		1800		A
V <sub>F</sub>	Diode forward voltage	I <sub>F</sub> = 900A		1.85	2.25	V
		I <sub>F</sub> = 900A, T <sub>j</sub> = 125°C		2.05	2.45	V
		I <sub>F</sub> = 900A, T <sub>j</sub> = 150°C		2.05	2.45	V
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 100kHz		79		nF
Q <sub>g</sub>	Gate charge	±15V		8.8		μC
C <sub>res</sub>	Reverse transfer capacitance	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz		2.5		nF
L <sub>M</sub>	Module inductance			18		nH
R <sub>INT</sub>	Internal transistor resistance			0.3		mΩ
SC <sub>Data</sub>	Short circuit current, I <sub>SC</sub>	T <sub>j</sub> = 150°C, V <sub>CC</sub> = 800V t <sub>p</sub> ≤ 10μs, V <sub>GE</sub> ≤ 15V V <sub>CE(max)</sub> = V <sub>CES</sub> - L* x di/dt IEC 60747-9		3800		A

**Note:**

\* L is the circuit inductance + L<sub>M</sub>

## NTC-Thermistor Data

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
R <sub>25</sub>	Rated resistance	T <sub>C</sub> = 25°C		5		kΩ
ΔR/R	Deviation of R <sub>100</sub>	T <sub>C</sub> = 100°C, R <sub>100</sub> = 493Ω	-5		5	%
P <sub>25</sub>	Power dissipation	T <sub>C</sub> = 25°C			20	mW
B <sub>25/50</sub>	B-value	R <sub>2</sub> = R <sub>25</sub> exp [B <sub>25/50</sub> (1/T <sub>2</sub> - 1/(298.15K))]		3375		K
B <sub>25/80</sub>		R <sub>2</sub> = R <sub>25</sub> exp [B <sub>25/80</sub> (1/T <sub>2</sub> - 1/(298.15K))]		3411		K
B <sub>25/100</sub>		R <sub>2</sub> = R <sub>25</sub> exp [B <sub>25/100</sub> (1/T <sub>2</sub> - 1/(298.15K))]		3433		K

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

**ELECTRICAL CHARACTERISTICS**

**T<sub>case</sub> = 25°C unless stated otherwise**

Symbol	Parameter	Test Conditions		Min	Typ.	Max	Units
t <sub>d(off)</sub>	Turn-off delay time	I <sub>C</sub> = 900A V <sub>CE</sub> = 600V V <sub>GE</sub> = ±15V R <sub>G(OFF)</sub> = 1.3Ω R <sub>G(ON)</sub> = 0.5Ω L <sub>S</sub> ~ 25nH	dv/dt = 2100V/μs		1200		ns
t <sub>f</sub>	Fall time				210		ns
E <sub>OFF</sub>	Turn-off energy loss				165		mJ
t <sub>d(on)</sub>	Turn-on delay time	I <sub>C</sub> = 900A V <sub>CE</sub> = 600V V <sub>GE</sub> = ±15V R <sub>G(OFF)</sub> = 1.3Ω R <sub>G(ON)</sub> = 0.5Ω L <sub>S</sub> ~ 25nH	di/dt = 6800A/μs		300		ns
t <sub>r</sub>	Rise time				110		ns
E <sub>ON</sub>	Turn-on energy loss				81		mJ
Q <sub>rr</sub>	Diode reverse recovery charge	I <sub>F</sub> = 900A V <sub>CE</sub> = 600V di/dt = 6800A/μs			64		μC
I <sub>rr</sub>	Diode reverse recovery current				390		A
E <sub>rec</sub>	Diode reverse recovery energy				28		mJ

**T<sub>case</sub> = 125°C unless stated otherwise**

Symbol	Parameter	Test Conditions		Min	Typ.	Max	Units
t <sub>d(off)</sub>	Turn-off delay time	I <sub>C</sub> = 900A V <sub>CE</sub> = 600V V <sub>GE</sub> = ±15V R <sub>G(OFF)</sub> = 1.3Ω R <sub>G(ON)</sub> = 0.5Ω L <sub>S</sub> ~ 25nH	dv/dt = 2100V/μs		1280		ns
t <sub>f</sub>	Fall time				300		ns
E <sub>OFF</sub>	Turn-off energy loss				185		mJ
t <sub>d(on)</sub>	Turn-on delay time	I <sub>C</sub> = 900A V <sub>CE</sub> = 600V V <sub>GE</sub> = ±15V R <sub>G(OFF)</sub> = 1.3Ω R <sub>G(ON)</sub> = 0.5Ω L <sub>S</sub> ~ 25nH	di/dt = 6800A/μs		290		ns
t <sub>r</sub>	Rise time				120		ns
E <sub>ON</sub>	Turn-on energy loss				103		mJ
Q <sub>rr</sub>	Diode reverse recovery charge	I <sub>F</sub> = 900A V <sub>CE</sub> = 600V di/dt = 6800A/μs			135		μC
I <sub>rr</sub>	Diode reverse recovery current				465		A
E <sub>rec</sub>	Diode reverse recovery energy				61		mJ

**T<sub>case</sub> = 150°C unless stated otherwise**

Symbol	Parameter	Test Conditions		Min	Typ.	Max	Units
t <sub>d(off)</sub>	Turn-off delay time	I <sub>C</sub> = 900A V <sub>CE</sub> = 600V V <sub>GE</sub> = ±15V R <sub>G(OFF)</sub> = 1.3Ω R <sub>G(ON)</sub> = 0.5Ω L <sub>S</sub> ~ 25nH	dv/dt = 2100V/μs		1300		ns
t <sub>f</sub>	Fall time				330		ns
E <sub>OFF</sub>	Turn-off energy loss				190		mJ
t <sub>d(on)</sub>	Turn-on delay time	I <sub>C</sub> = 900A V <sub>CE</sub> = 600V V <sub>GE</sub> = ±15V R <sub>G(OFF)</sub> = 1.3Ω R <sub>G(ON)</sub> = 0.5Ω L <sub>S</sub> ~ 25nH	di/dt = 6800A/μs		280		ns
t <sub>r</sub>	Rise time				130		ns
E <sub>ON</sub>	Turn-on energy loss				110		mJ
Q <sub>rr</sub>	Diode reverse recovery charge	I <sub>F</sub> = 900A V <sub>CE</sub> = 600V di/dt = 6800A/μs			157		μC
I <sub>rr</sub>	Diode reverse recovery current				510		A
E <sub>rec</sub>	Diode reverse recovery energy				69		mJ

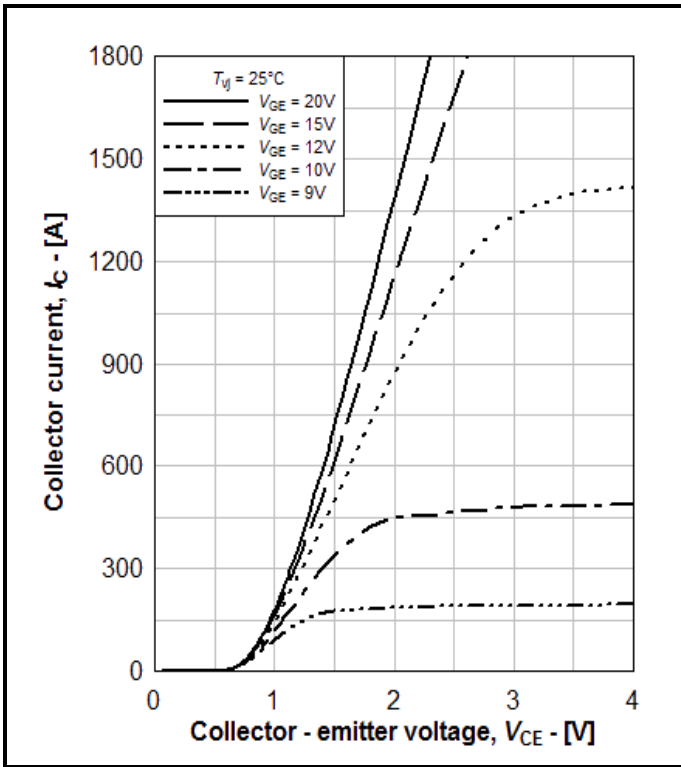


Fig. 3 Typical IGBT output characteristics

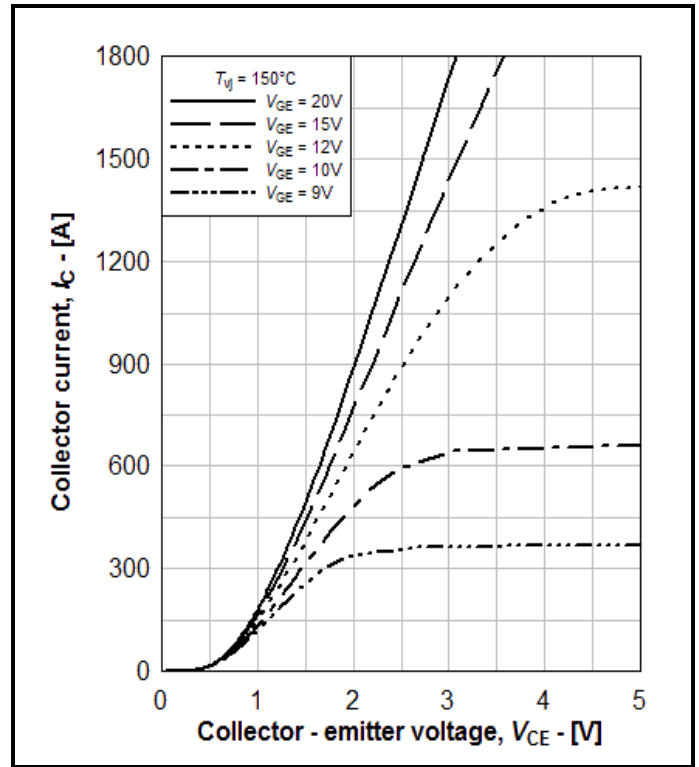


Fig. 4 Typical IGBT output characteristics

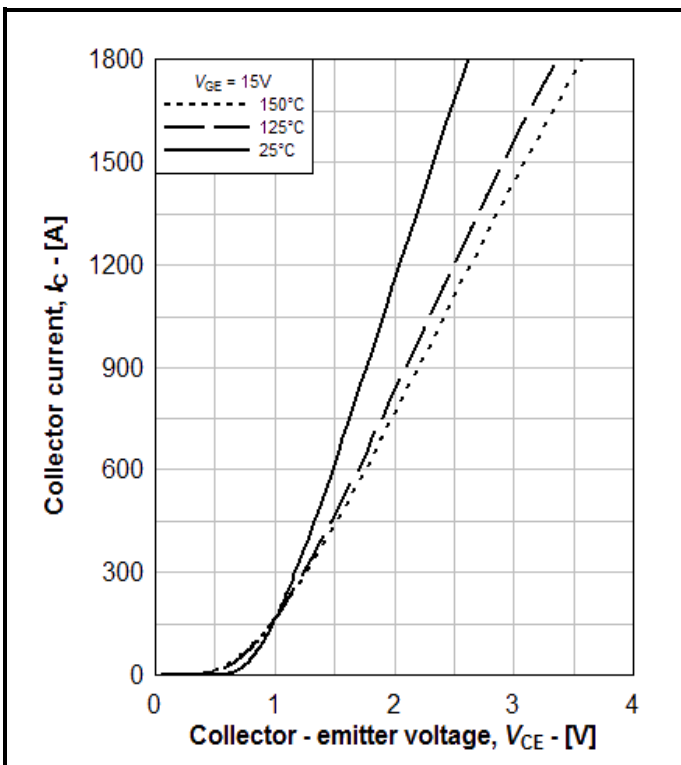


Fig. 5 Typical IGBT output characteristics

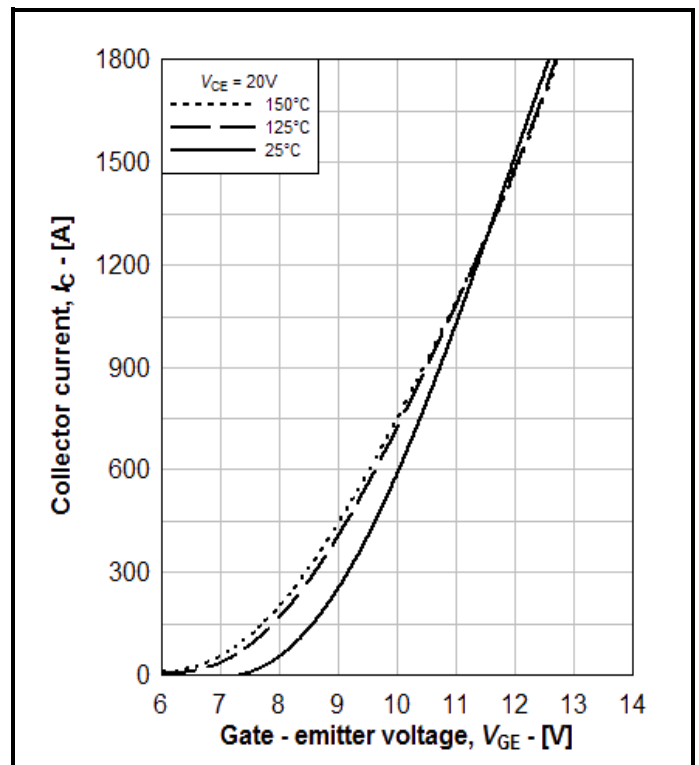


Fig. 6 Typical IGBT transfer characteristics

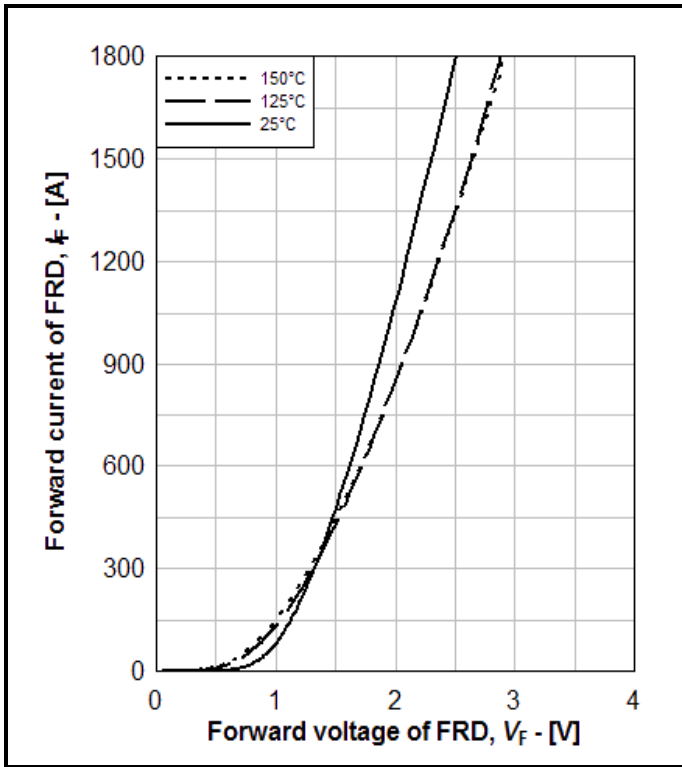


Fig. 7 Diode typical forward characteristics

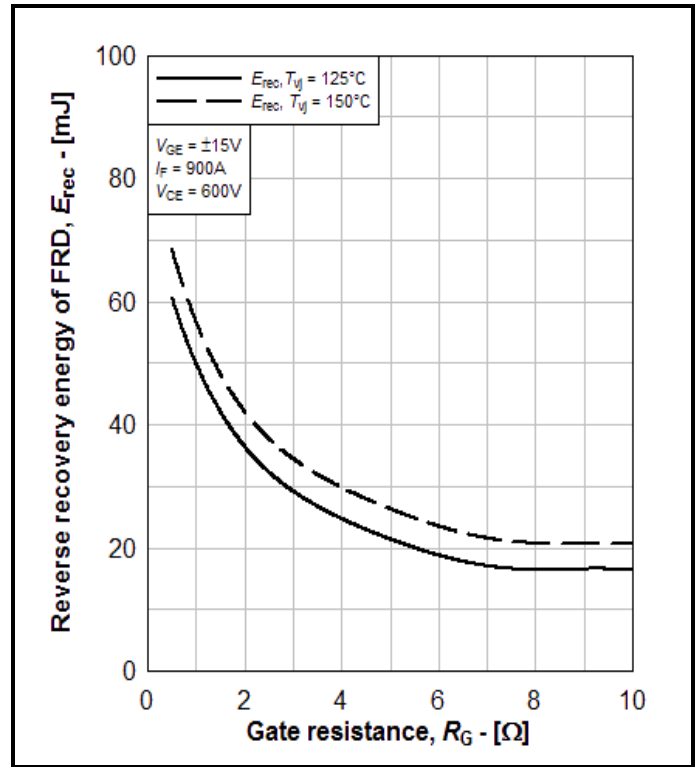


Fig. 8 Typical diode  $E_{rec}$

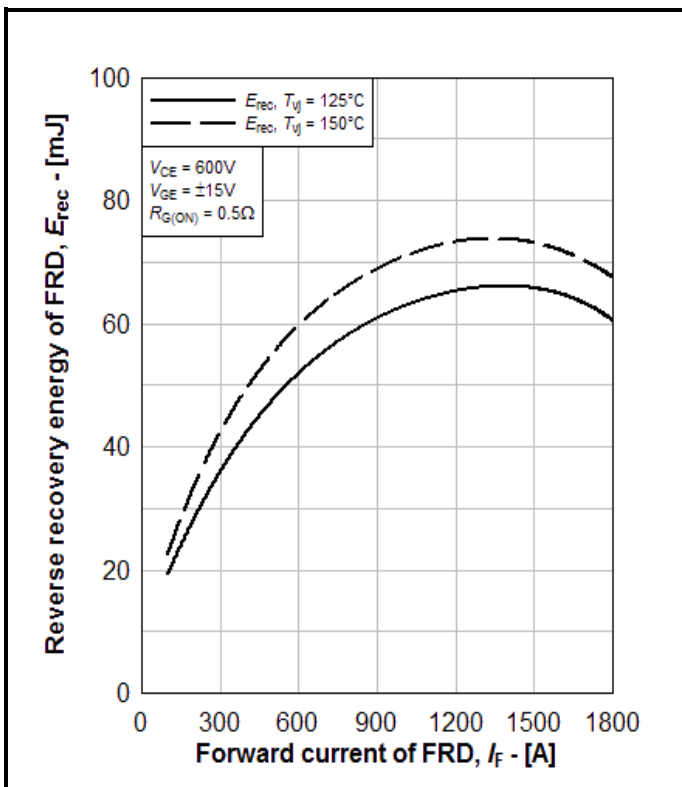


Fig. 9 Typical diode  $E_{rec}$

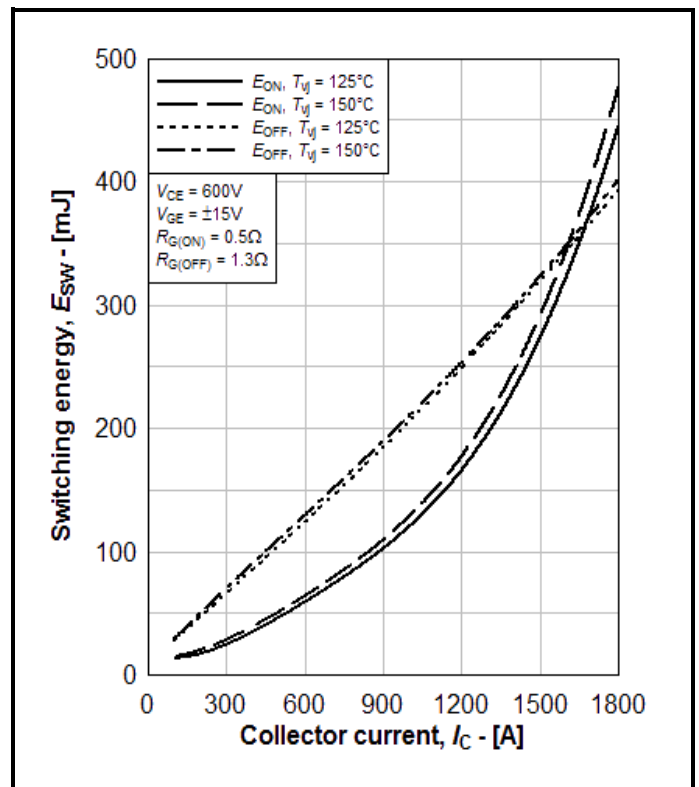


Fig. 10 Typical IGBT switching energy

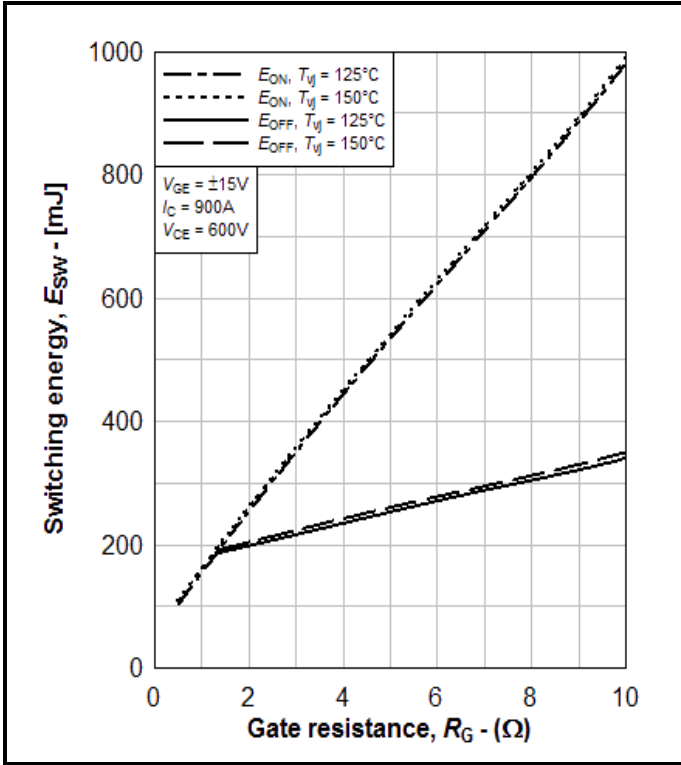


Fig. 11 Typical IGBT switching energy

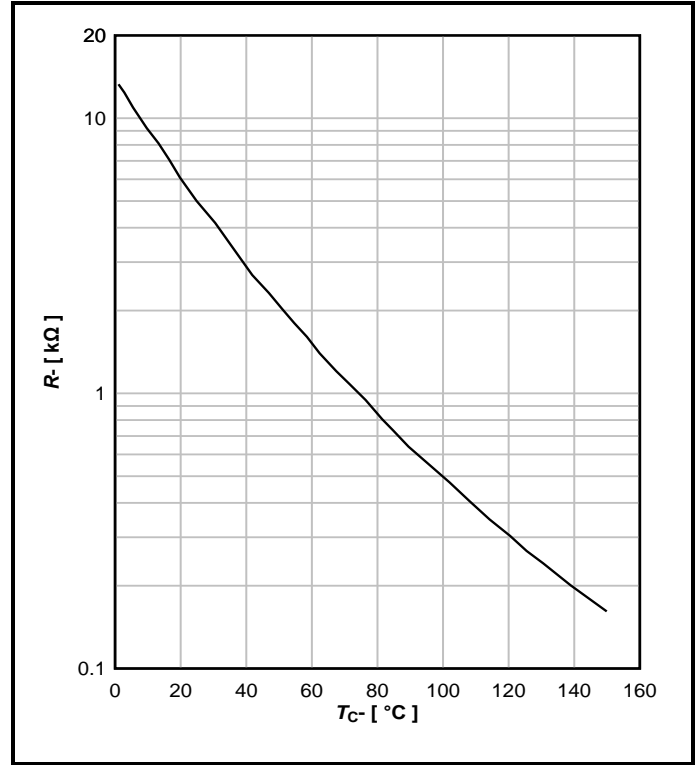


Fig. 12 Typical NTC thermistor characteristics

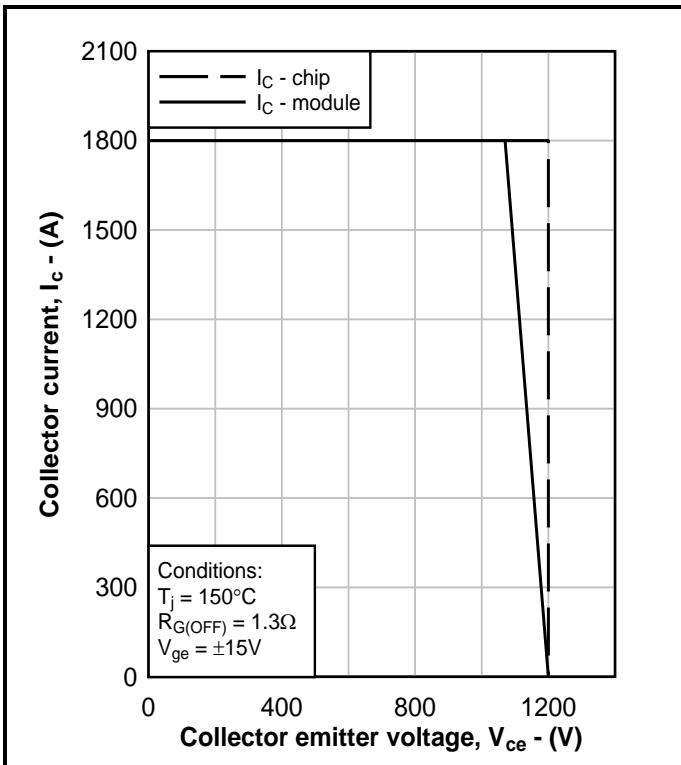


Fig. 13 Reverse bias safe operating area

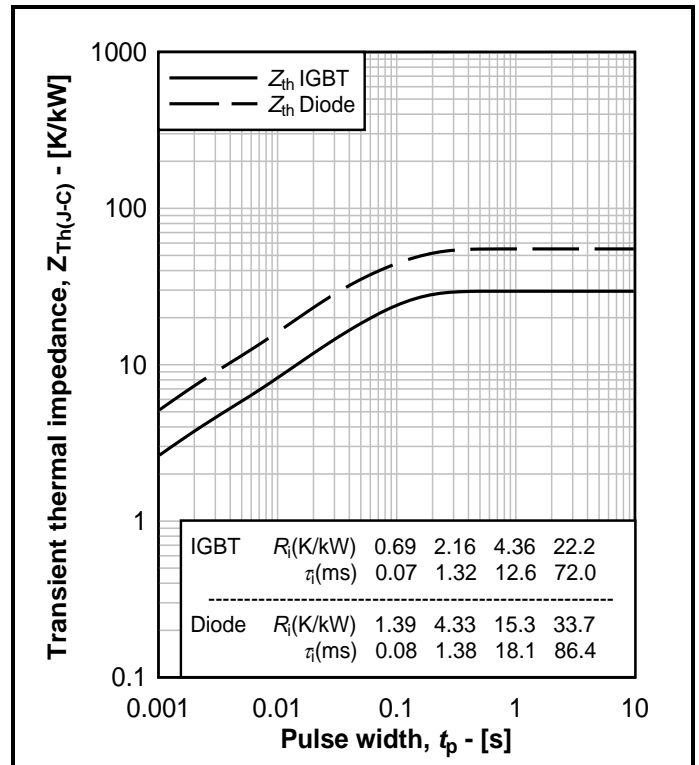
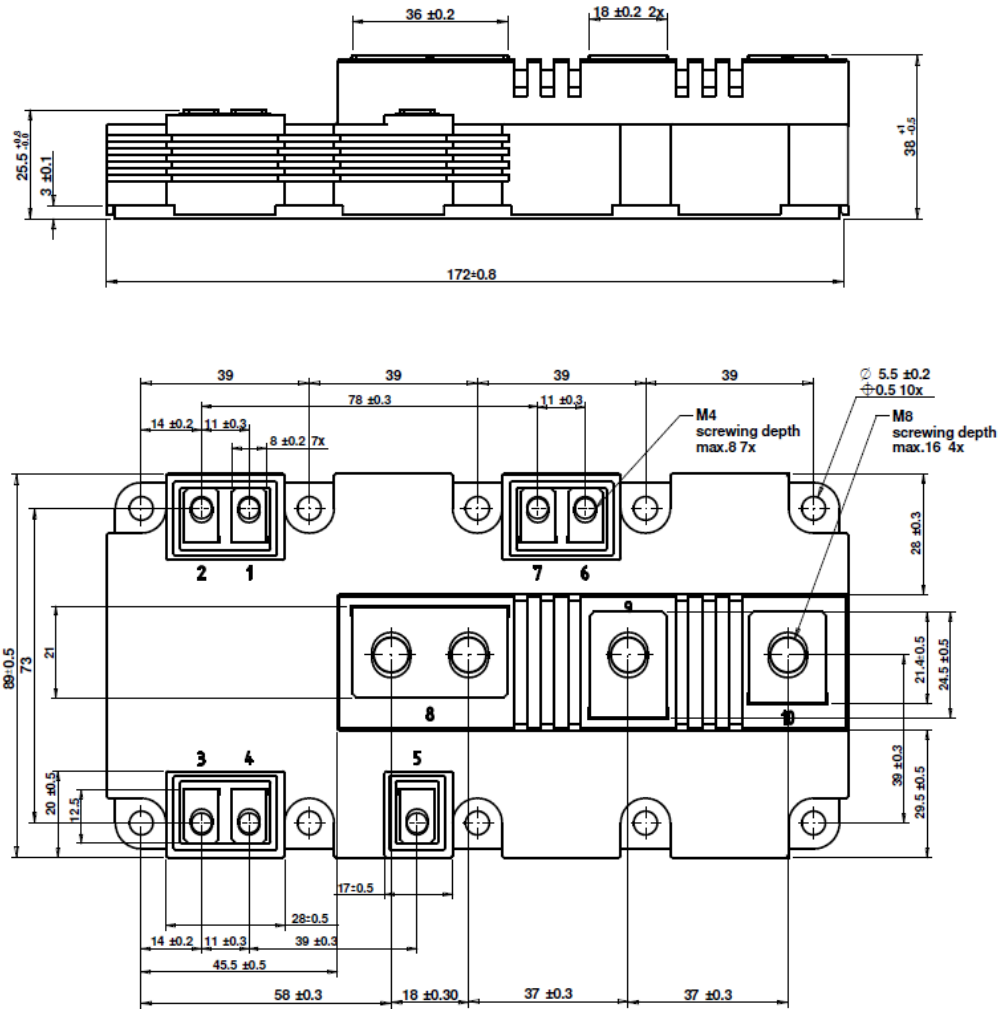


Fig. 14 Transient thermal impedance

**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: 900g**

**Module Outline Type Code: H2**

**Fig. 15 Module outline drawing**



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Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

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<b>Preliminary Information:</b>	The product design is complete and final characterisation for volume production is in progress. The datasheet represents the product as it is now understood but details may change.
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