DIM900H2HS12-PA500

TRENCH
Gen5 TMOS

Half Bridge IGBT Module

Replaces DS6314-3

DS6314-4 July 2021 (LN41060)

FEATURES

- Trench Gate IGBT
- Cu Base with Al_2O_3 Substrates
- High Thermal Cycling Capability
- 10µs Short Circuit Withstand
- Low $V_{ce(sat)}$ Variant

APPLICATIONS

- Motor Drives
- High Power Converters
- Wind turbines
- 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_{CES}		**1200V**
$V_{CE(sat)}$ *	(typ)	**1.8V**
I_C	(max)	**900A**
$I_{C(PK)}$	(max)	**1800A**

* Measured at the auxiliary terminals

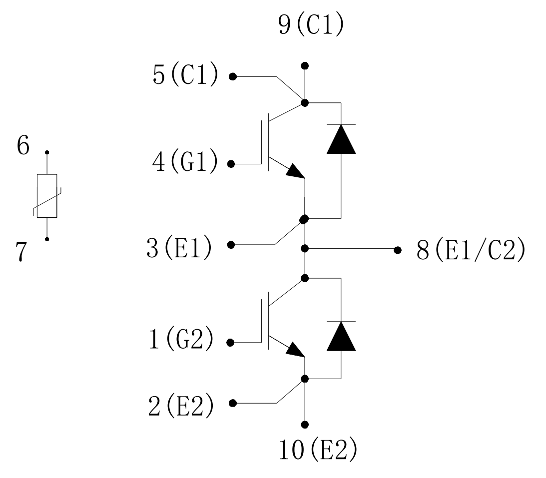


Fig. 1 Circuit configuration

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_{case} = 25°C unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	V_{GE} = 0V, T_C = 25°C	1200	V
V_{GES}	Gate-emitter voltage	T_C = 25°C	±20	V
I_C	Continuous collector current	T_C = 90°C, T_{vj} = 175°C	900	A
$I_{C(PK)}$	Peak collector current	t_P = 1ms	1800	A
P_{max}	Max. transistor power dissipation	T_C = 25°C, T_{vj} = 175°C	5.08	kW
I^2t	Diode I^2t value	V_R = 0, t_p = 10ms, T_{vj} = 150°C	76	kA^2s
V_{isol}	Isolation voltage – per module	Commoned terminals to base plate. AC RMS, 1 min, 50Hz	4000	V

THERMAL AND MECHANICAL RATINGS

Internal insulation material: Al_2O_3

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
$R_{th(j-c)}$	Thermal resistance – IGBT	Continuous dissipation - junction to case	-	-	29.5	°C/kW
$R_{th(j-c)}$	Thermal resistance – diode		-	-	55	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (IGBT)	Mounting torque 3.5Nm (with mounting grease 1W/m °C)	-	14	-	°C/kW
$R_{th(c-h)}$	Thermal resistance – case to heatsink (Diode)		-	25.5	-	°C/kW
T_j	Junction temperature	IGBT	-40	-	150	°C
		Diode	-40	-	150	°C
T_{stg}	Storage temperature range	-	-40	-	150	°C
	Screw torque	Mounting – M5	3	-	6	Nm
		Electrical connections – M4	1.8		2.1	
		Electrical connections – M8	8	-	10	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_C = 125°C			10	mA
		V_{GE} = 0V, V_{CE} = V_{CES}, T_C = 150°C			20	mA
I_{GES}	Gate leakage current	V_{GE} = ± 20V, V_{CE} = 0V			0.5	μA
$V_{GE(TH)}$	Gate threshold voltage	I_C = 40mA, V_{GE} = V_{CE}	5.60	6.20	6.80	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15V, I_C = 900A		1.80	2.20	V
		V_{GE} = 15V, I_C = 900A, T_j = 125°C		2.15		V
		V_{GE} = 15V, I_C = 900A, T_j = 150°C		2.25		V
I_F	Diode forward current	DC		900		A
I_{FM}	Diode maximum forward current	t_p = 1ms		1800		A
V_F	Diode forward voltage	I_F = 900A		1.90	2.30	V
		I_F = 900A, T_j = 125°C		2.00		V
		I_F = 900A, T_j = 150°C		2.00		V
C_{ies}	Input capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 100kHz		121		nF
Q_g	Gate charge	±15V		9.2		μC
C_{res}	Reverse transfer capacitance	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1.2		nF
L_M	Module inductance			18		nH
$R_{CC'+EE'}$	Module Lead resistance, Terminal-chip			0.3		mΩ
R_{Gint}	Internal transistor resistance			1.8		Ω
SC_{Data}	Short circuit current, I_{SC}	T_j = 150°C, V_{CC} = 800V t_p ≤ 10μs, V_{GE} ≤ 15V $V_{CE\,(max)}$ = V_{CES} – L^* x dI/dt IEC 60747-9		3600		A

Note:

* L is the circuit inductance + L_M

NTC-Thermistor Data

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
R_{25}	Rated resistance	T_C = 25°C		5		kΩ
$\Delta R/R$	Deviation of R100	T_C = 100°C, R_{100} = 493Ω	-5		5	%
P_{25}	Power dissipation	T_C = 25°C			20	mW
$B_{25/50}$	B-value	$R_2 = R_{25}\exp[B_{25/50}(1/T_2 - 1/(298.15K))]$		3375		K
$B_{25/80}$		$R_2 = R_{25}\exp[B_{25/80}(1/T_2 - 1/(298.15K))]$		3411		K
$B_{25/100}$		$R_2 = R_{25}\exp[B_{25/100}(1/T_2 - 1/(298.15K))]$		3433		K

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 = 900A V_{CE} = 600V V_{GE} = ±15V $R_{G(OFF)}$ = 1.5Ω $R_{G(ON)}$ = 1.5Ω L_S ~ 50nH	*dv/dt* = 3300V/µs		1045		ns
t_f	Fall time				130		ns
E_{OFF}	Turn-off energy loss				138		mJ
$t_{d(on)}$	Turn-on delay time		*di/dt* = 5300A/µs		730		ns
t_r	Rise time				175		ns
E_{ON}	Turn-on energy loss				46		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 900A V_{CE} = 600V *di/dt* = 5300A/µs			79		µC
I_{rr}	Diode reverse recovery current				465		A
E_{rec}	Diode reverse recovery energy				36		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 = 900A V_{CE} = 600V V_{GE} = ±15V $R_{G(OFF)}$ = 1.5Ω $R_{G(ON)}$ = 1.5Ω L_S ~ 50nH	*dv/dt* = 3300V/µs		1090		ns
t_f	Fall time				155		ns
E_{OFF}	Turn-off energy loss				153		mJ
$t_{d(on)}$	Turn-on delay time		*di/dt* = 5300A/µs		690		ns
t_r	Rise time				175		ns
E_{ON}	Turn-on energy loss				57		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 900A V_{CE} = 600V *di/dt* = 5300A/µs			139		µC
I_{rr}	Diode reverse recovery current				560		A
E_{rec}	Diode reverse recovery energy				68		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 = 900A V_{CE} = 600V V_{GE} = ±15V $R_{G(OFF)}$ = 1.5Ω $R_{G(ON)}$ = 1.5Ω L_S ~ 50nH	*dv/dt* = 3300V/µs		1100		ns
t_f	Fall time				160		ns
E_{OFF}	Turn-off energy loss				158		mJ
$t_{d(on)}$	Turn-on delay time		*di/dt* = 5300A/µs		685		ns
t_r	Rise time				175		ns
E_{ON}	Turn-on energy loss				62		mJ
Q_{rr}	Diode reverse recovery charge	I_F = 900A V_{CE} = 600V *di/dt* = 5300A/µs			163		µC
I_{rr}	Diode reverse recovery current				580		A
E_{rec}	Diode reverse recovery energy				80		mJ

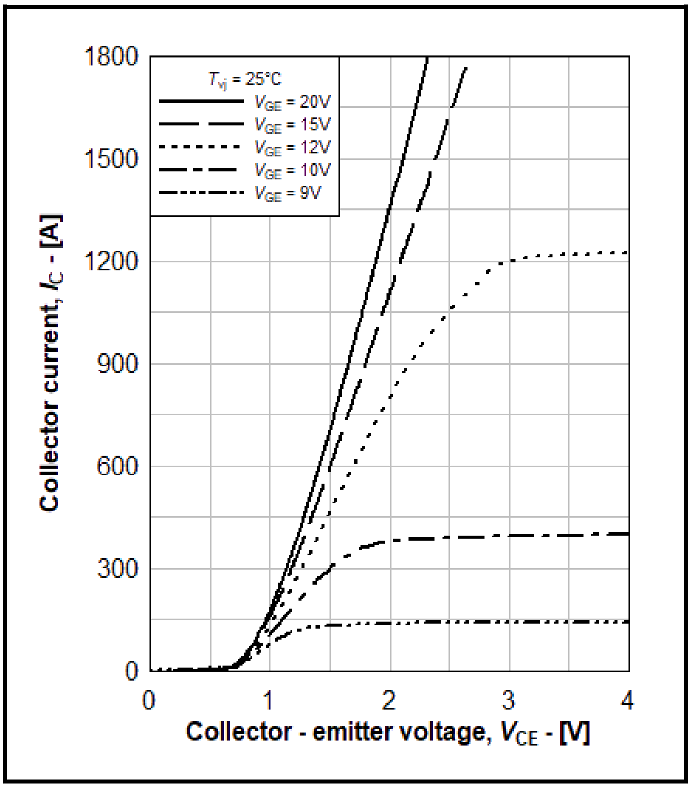


Fig. 3 Typical IGBT output characteristic

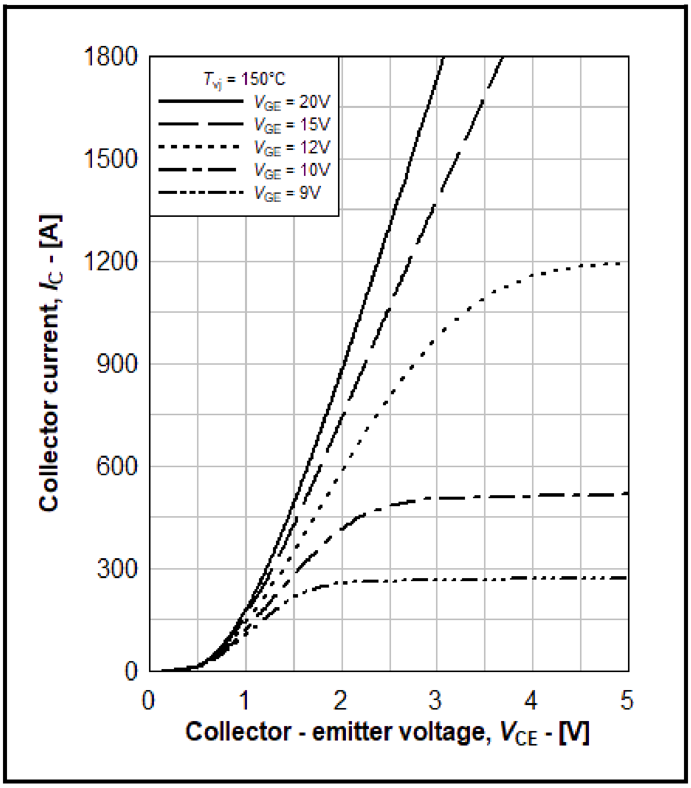


Fig. 4 Typical IGBT output characteristic

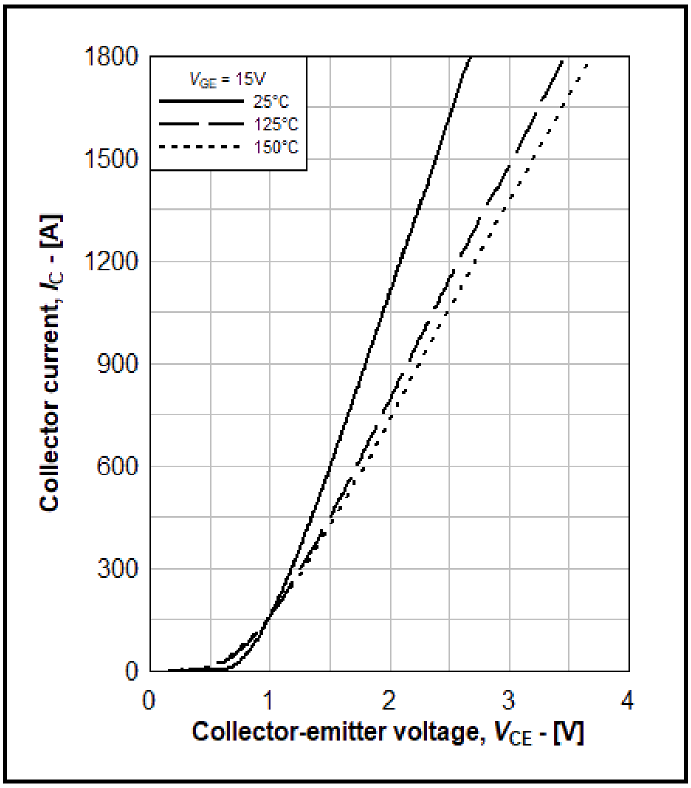


Fig. 5 Typical IGBT output characteristic

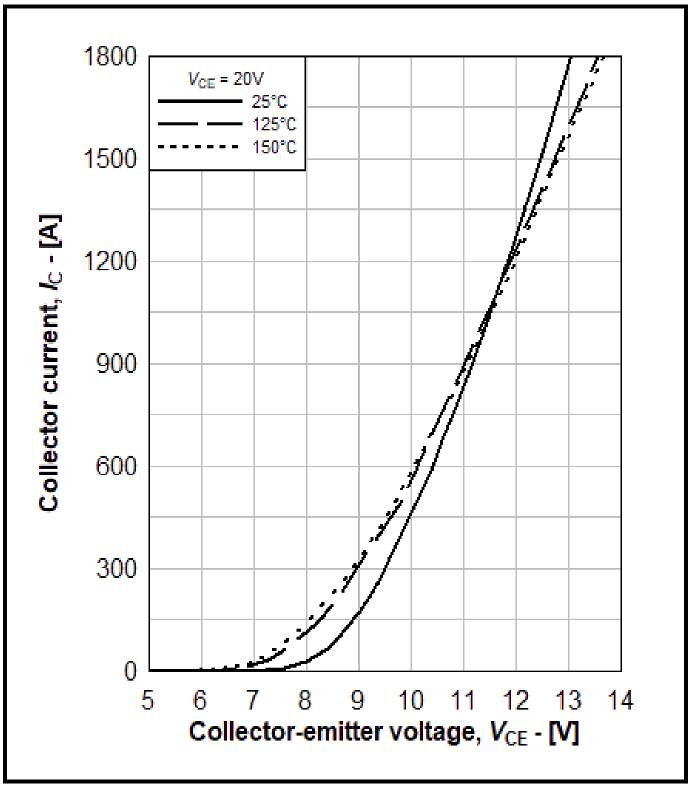


Fig. 6 Typical IGBT transfer characteristic

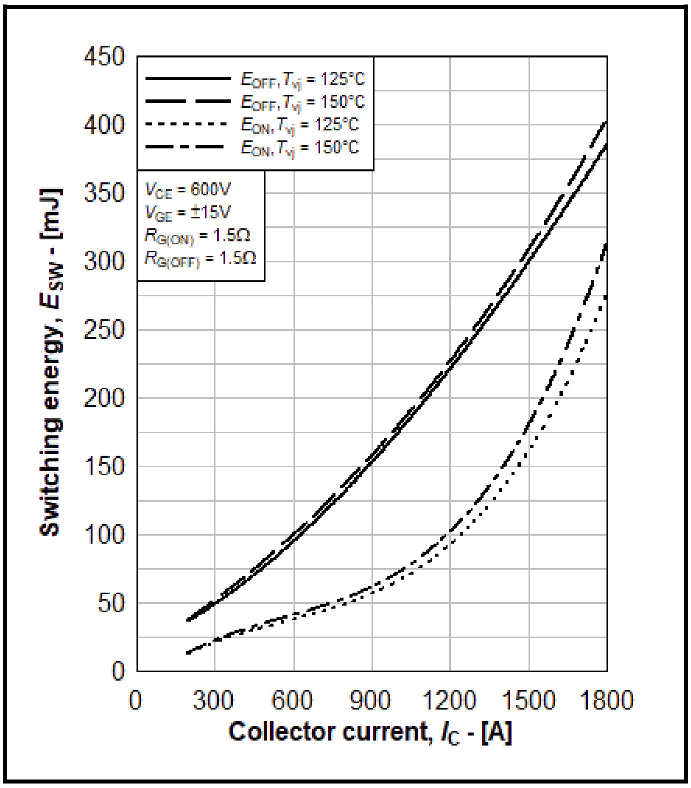


Fig. 7 Typical IGBT switching energy

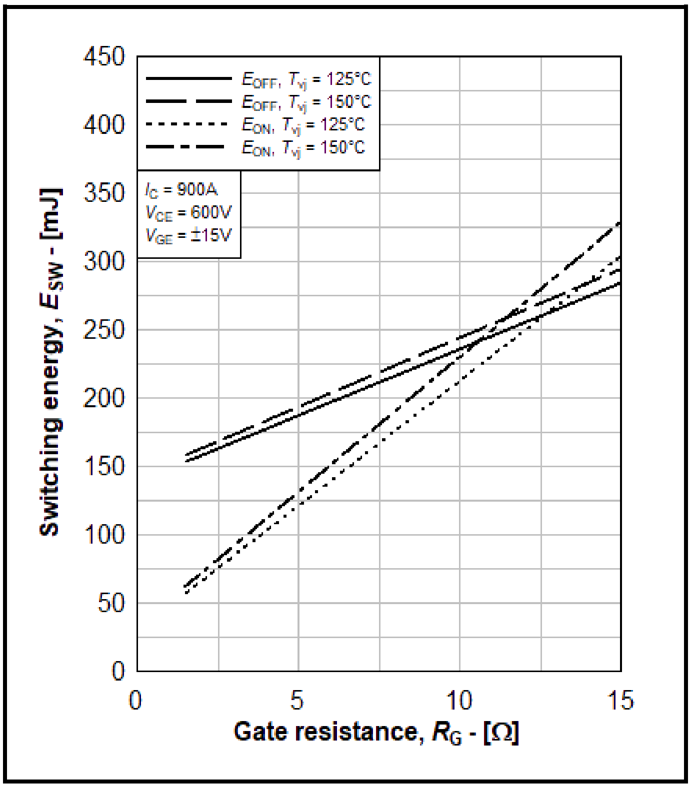


Fig. 8 Typical IGBT switching energy

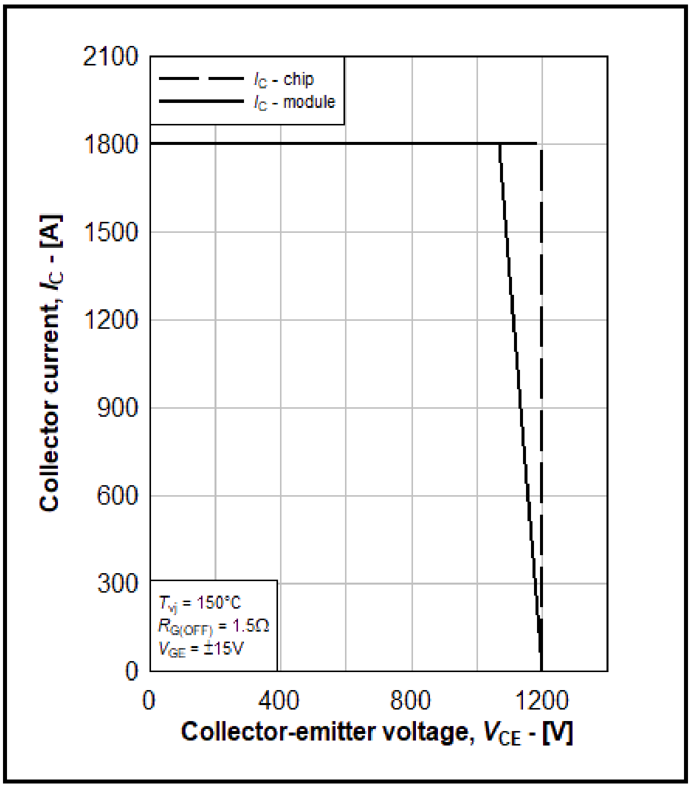


Fig. 9 Reverse bias safe operating area of IGBT

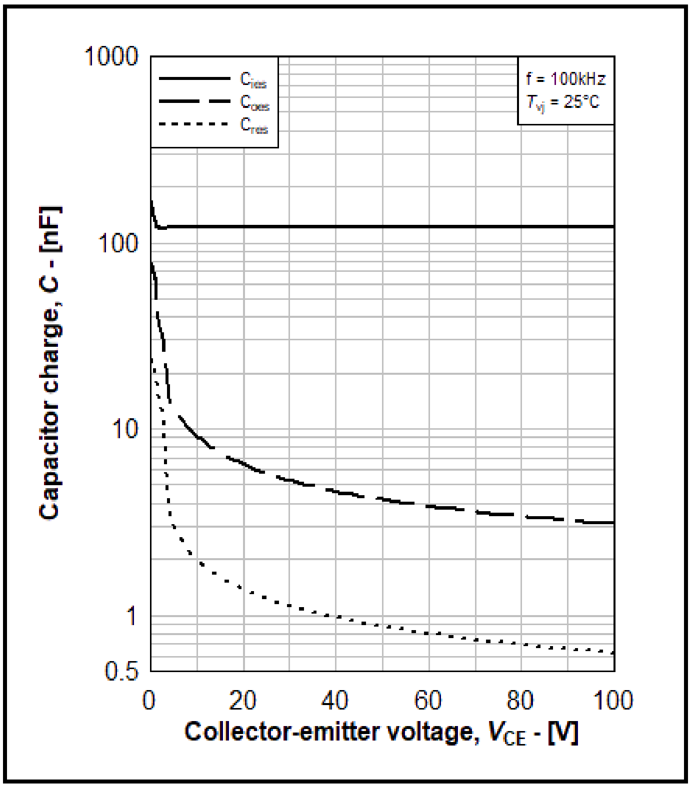


Fig. 10 Typical capacity characteristic

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

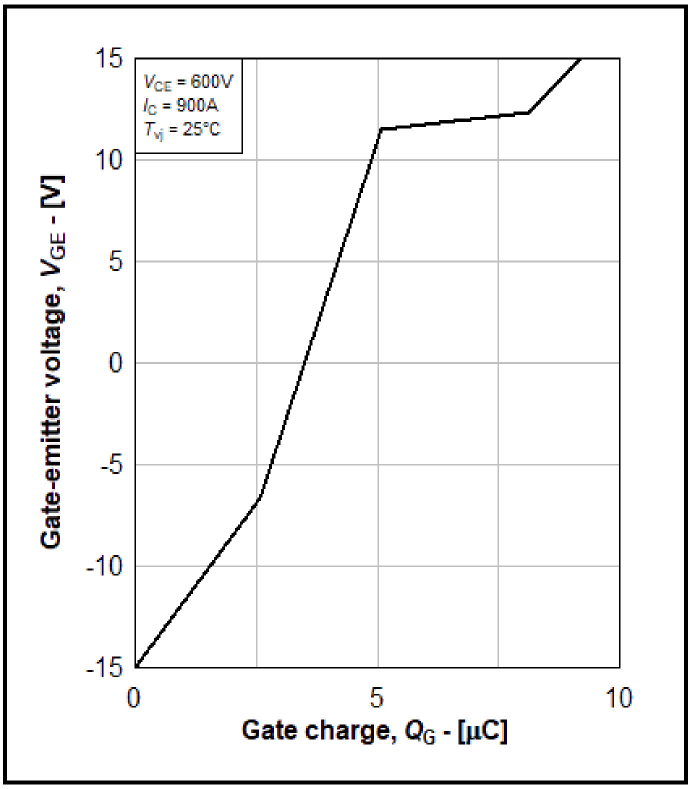


Fig. 11 Typical gate charge characteristic

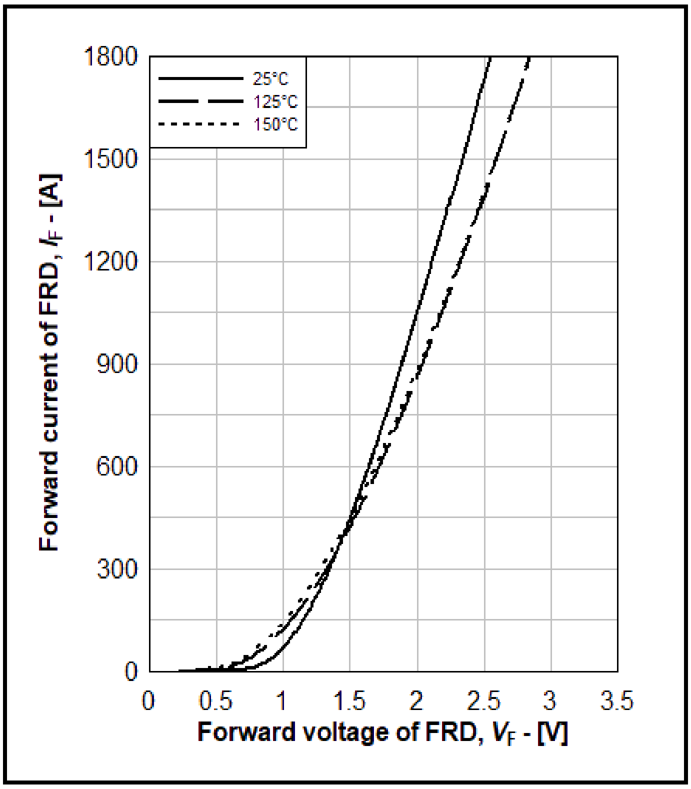


Fig. 12 Typical FRD output characteristics

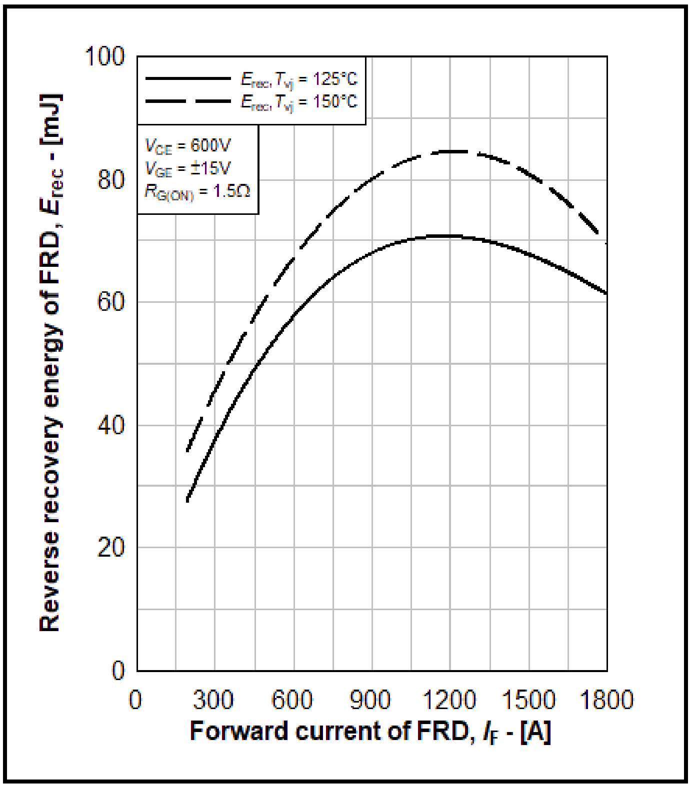


Fig. 13 Typical FRD switching loss

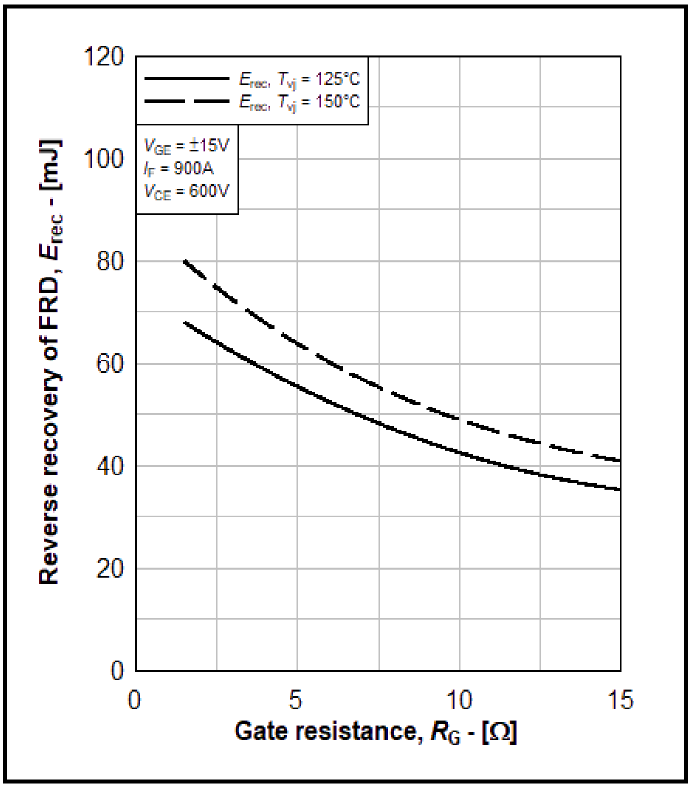


Fig. 14 Typical FRD switching loss

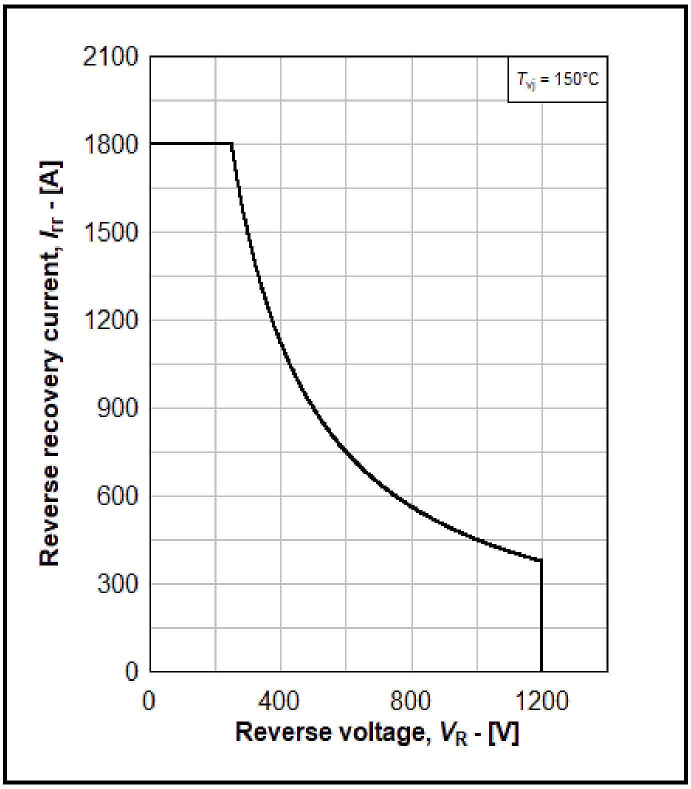


Fig. 15 FRD reverse bias safe operating area

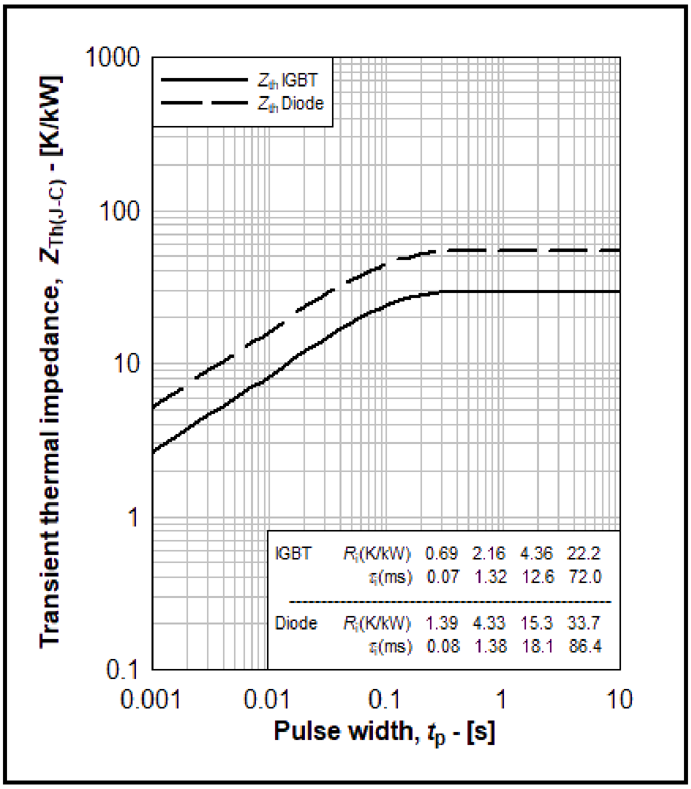


Fig. 16 Transient thermal impedance

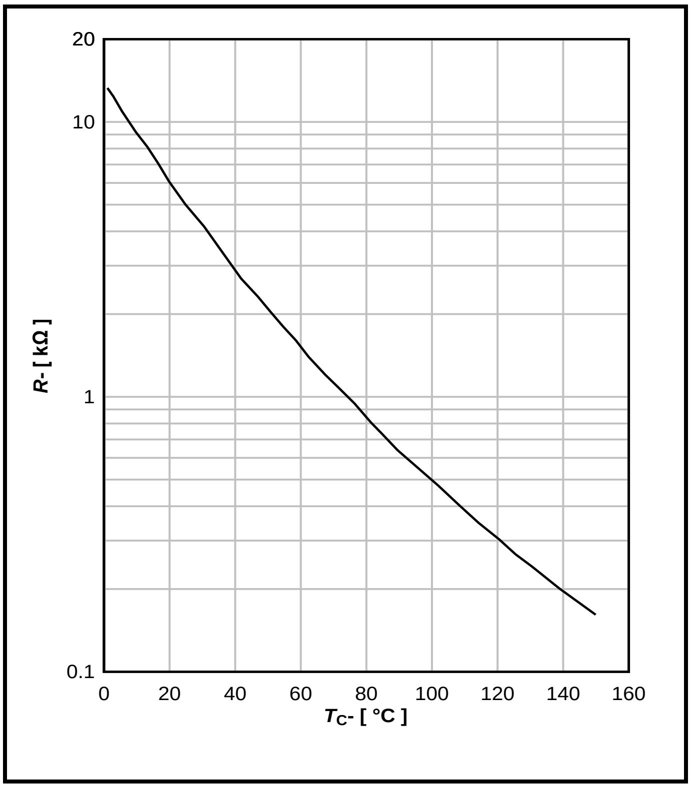
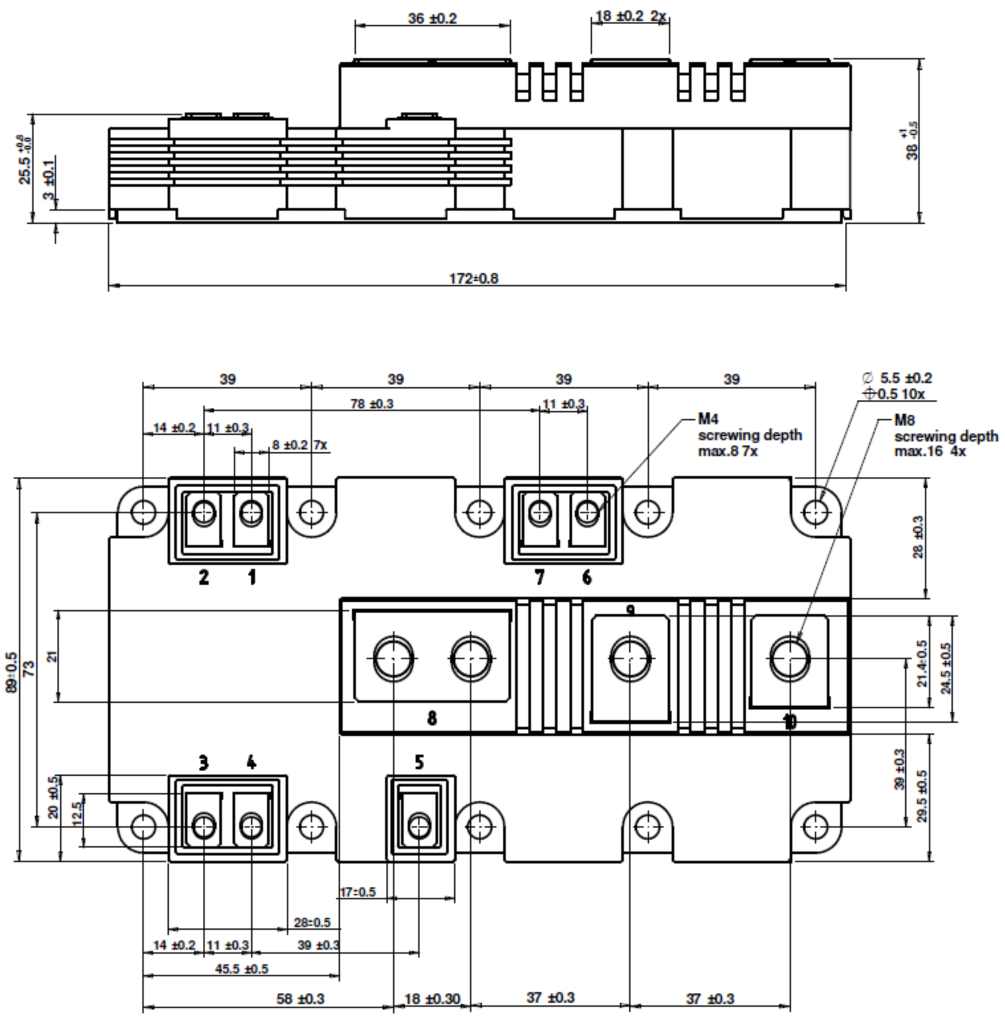


Fig. 17 Typical NTC thermistor characteristics

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

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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The products are not intended for use in applications where a failure or malfunction may cause loss of life, injury or damage to property. The user must ensure that appropriate safety precautions are taken to prevent or mitigate the consequences of a product failure or malfunction.

The products must not be touched when operating because there is a danger of electrocution or severe burning. Always use protective safety equipment such as appropriate shields for the product and wear safety glasses. Even when disconnected any electric charge remaining in the product must be discharged and allowed to cool before safe handling using protective gloves.

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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